



TCXO / VC-TCXO

VCXO / VCXO

SPXO / SPSO
MHz Range
CMOS

SPXO / SPSO
MHz Range
Differential

Multi output
MHz Range
Differential

SPXO
kHz Range
CMOS

Real Time Clock
module

RF transmitter
module

kHz Range
Crystal unit

MHz Range
Crystal unit

SAW
Resonator

Filter

Sensor

Application
Guide

Crystal Devices Catalogue

PROMOTION OF ENVIRONMENTAL MANAGEMENT SYSTEM CONFORMING TO INTERNATIONAL STANDARDS

At Seiko Epson, all environmental initiatives operate under the Plan-Do-Check-Action (PDCA) cycle designed to achieve continuous improvements. The environmental management system (EMS) operates under the ISO 14001 environmental management standard.

All of our major manufacturing and non-manufacturing sites, in Japan and overseas, completed the acquisition of ISO 14001 certification.

ISO 14000 is an international standard for environmental management that was established by the International Standards Organization in 1996 against the background of growing concern regarding global warming, destruction of the ozone layer, and global deforestation.

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	► Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc.
	► Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc).

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TCXO / VC-TCXO

VCXO / VCSO

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MHz Range
CMOSSPXO / SPSO
MHz Range
DifferentialMulti output
MHz Range
DifferentialSPXO
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module

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RF transmitter
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MHz Range
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Sensor

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TCXO / VC-TCXO

TCXO / VC-TCXO

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VCXO / VCSO

VCXO / VCSO

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SPXO / SPSO

SPXO / SPSO MHz Range

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For Automotive

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For Automotive

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SPXO / SPSO

SPXO / SPSO MHz Range

CMOS

For Automotive

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SPXO kHz Range

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For Automotive

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Real Time Clock Module

I2C bus

For Automotive

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For Automotive

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For Automotive

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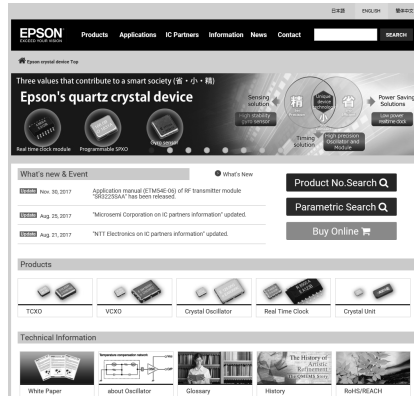


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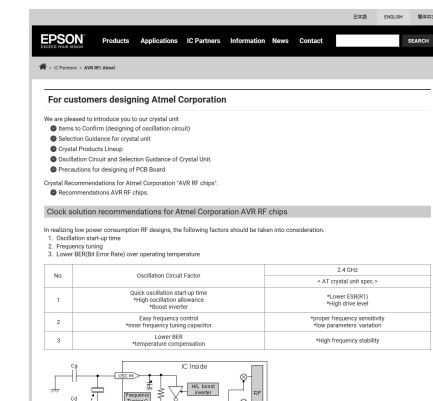
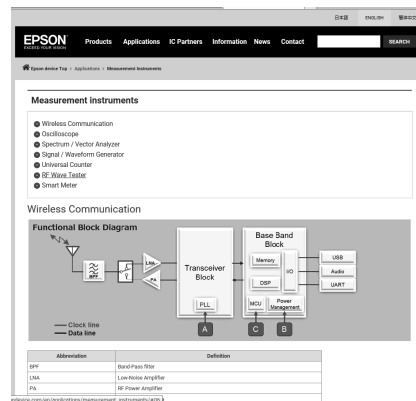
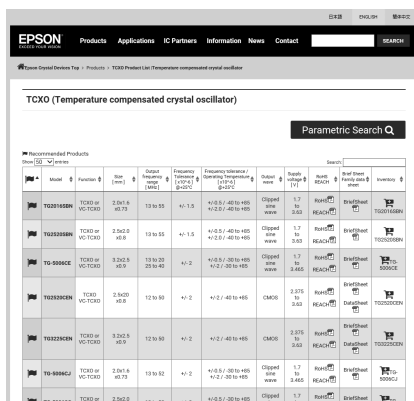
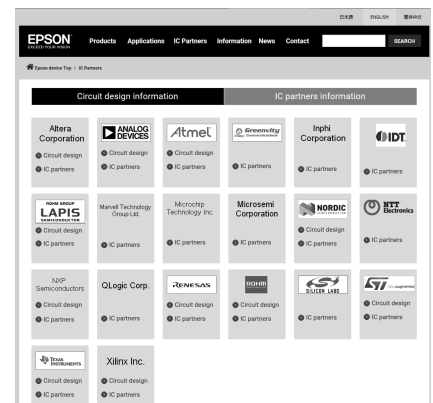
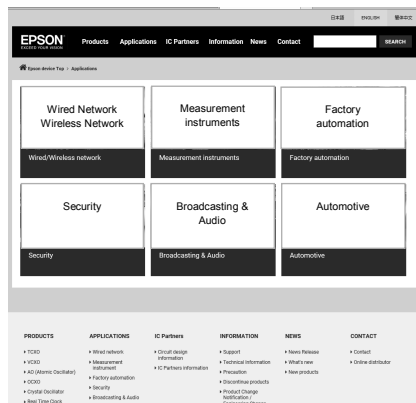
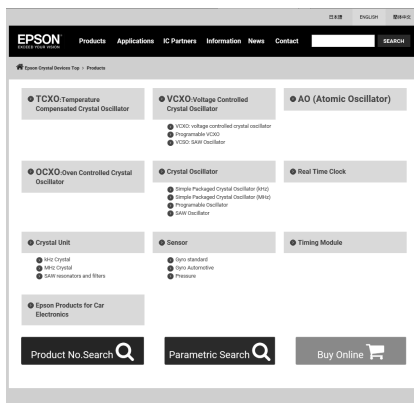
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Products

Applications

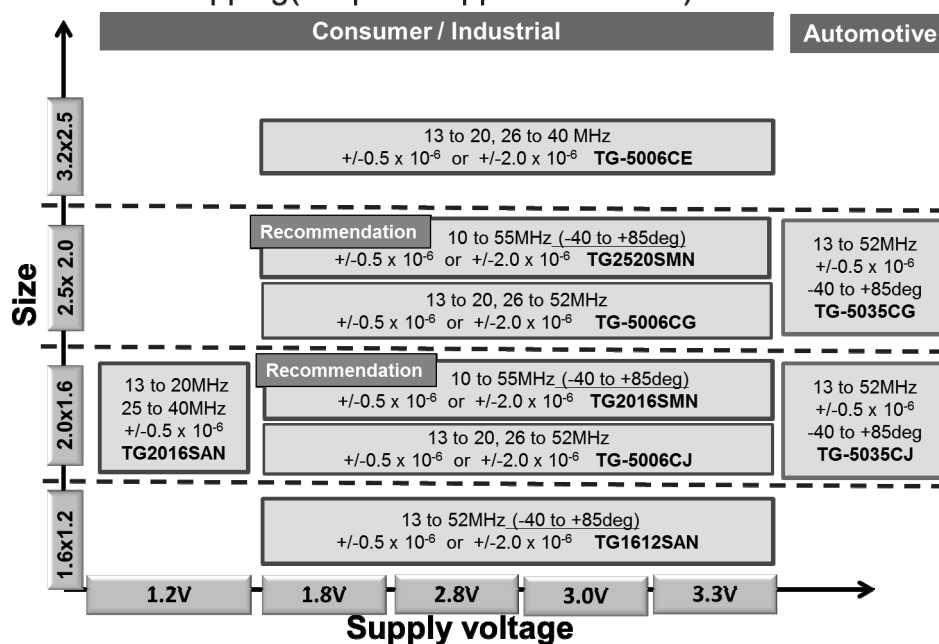
IC Partners





High Precision Oscillator (TCXO / VC-TCXO)

Product Mapping(Output : Clipped sine wave)

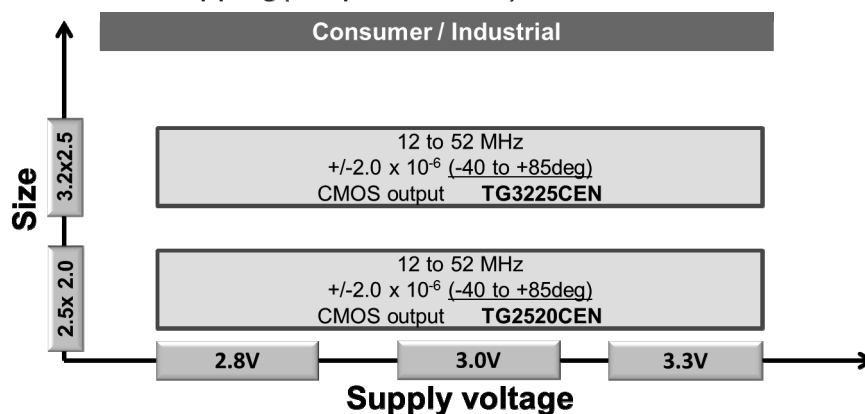


► Output : Clipped sine wave

P	Model	Actual size (mm) † Typ.	Nominal frequency range (MHz) 1 10 50 100	Frequency tolerance ($\times 10^{-6}$)	Frequency / Temperature Characteristics ($\times 10^{-6}$)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
10	TG1612SAN	1.6x1.2x0.65	13 MHz 52 MHz	± 2.0	± 0.5	-40 to +85 °C	1.8 V ± 0.1 V 2.8 V 3.0 V 3.3 V $\pm 5\%$	1.5 mA (≤ 26 MHz) 2.0 mA (> 26 MHz)	10 k Ω /10 pF	Vc
11	TG2016SMN	2.0x1.6x0.73	10 MHz 55 MHz	± 1.5	± 0.5	-40 to +85 °C	1.8 V ± 0.1 V 2.8 V 3.0 V 3.3 V $\pm 5\%$	1.5 mA (≤ 26 MHz) 2.1 mA (> 26 MHz)	10 k Ω /10 pF	Vc
	TG2520SMN	2.5x2.0x0.8								
12	TG2016SBN	2.0x1.6x0.73	13 MHz 55 MHz	± 1.5	± 0.5	-40 to +85 °C	1.8 V ± 0.1 V 2.8 V 3.0 V 3.3 V $\pm 5\%$	1.5 mA (≤ 36 MHz) 2.2 mA (> 26 MHz)	10 k Ω /10 pF	Vc
	TG2520SBN	2.5x2.0x0.8								
13	TG-5006CJ	2.0x1.6x0.73	13 MHz 52 MHz	± 2.0	± 0.5	-30 to +85 °C	1.8 V ± 0.1 V 2.8 V 3.0 V 3.3 V $\pm 5\%$	1.5 mA (≤ 26 MHz) 2.0 mA (> 26 MHz)	10 k Ω /10 pF	Vc
	TG-5006CG	2.5x2.0x0.8								
	TG-5006CE	3.2x2.5x0.9	13 MHz 20 MHz 26 MHz 40 MHz							
Web Site	TG-5035CJ	2.0x1.6x0.73	13 MHz 52 MHz	± 2.0	± 0.5	-30 to +85 °C	1.8 V ± 0.1 V	2.0 mA	10 k Ω /10 pF	Vc
	TG-5035CG	2.5x2.0x0.8								
	TG-5035CE	3.2x2.5x0.9	10 MHz 40 MHz							
14	TG2016SAN	2.0x1.6x0.73	13MHz 20MHz 25MHz 40MHz	± 2.0	± 0.5	-30 to +85 °C	1.2 V ± 0.1 V	1.6 mA (≤ 26 MHz) 2.1 mA (> 26 MHz)	10 k Ω /10 pF	-
15	TG-5035CJ (AEC-Q200)	2.0x1.6x0.73	13 MHz 52 MHz	± 2.0	± 0.5	-40 to +85 °C	1.8 V ± 0.1 V	2.0 mA (≤ 40 MHz) 2.5 mA (> 40 MHz)	10 k Ω /10 pF	Vc
	TG-5035CG (AEC-Q200)	2.5x2.0x0.8	13 MHz 52 MHz	± 2.0	± 0.5	-40 to +85 °C	1.8 V ± 0.1 V	2.0 mA (≤ 40 MHz) 2.5 mA (> 40 MHz)	10 k Ω /10 pF	Vc



Product Mapping(Output :CMOS)

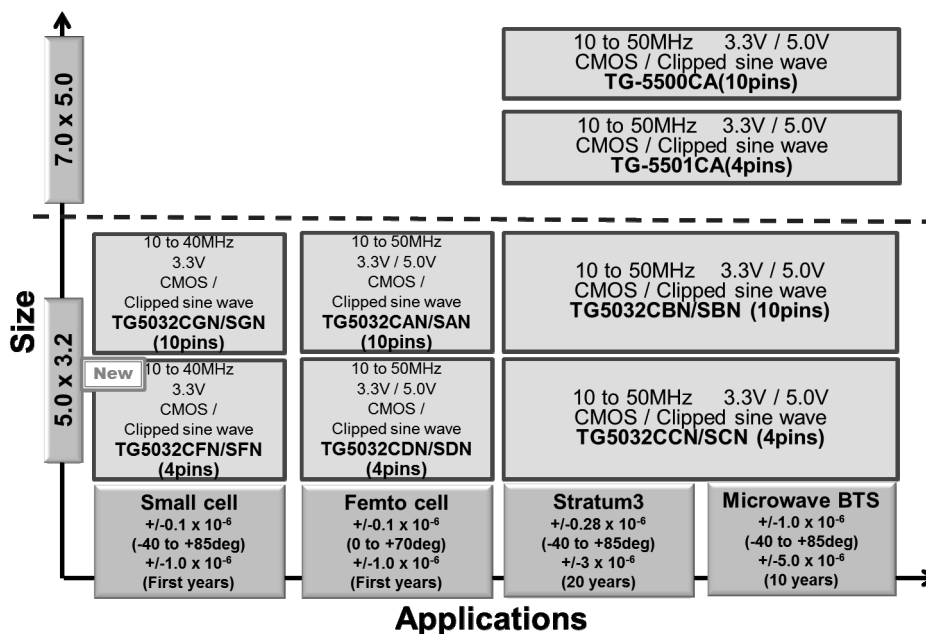


► Output : CMOS

P	Model	Actual size (mm) t Typ.	Nominal frequency range				Frequency tolerance	Frequency / Temperature Characteristics	Operating temperature	Supply voltage	Current consumption	Output load condition	Output control
			1	10	50	100	(× 10 ⁻⁶)	(× 10 ⁻⁶)			(Max.)		
16	TG2520CEN (CMOS Output)	 2.5×2.0×0.8			 12 MHz 52 MHz		±2.0	±2.0	-40 to +85 °C	2.8 V / 3.0 V / 3.3 V ±5 %	6.5mA	15pF	Vc
16	TG3225CEN (CMOS Output)	 3.2×2.5×0.9			 12 MHz 52 MHz		±2.0	±2.0	-40 to +85 °C	2.8 V / 3.0 V / 3.3 V ±5 %	6.5mA	15pF	Vc



Product Mapping(Output : Clipped sine wave or CMOS)



► Output : Clipped sine wave or CMOS

P	Model	Actual size (mm) t Typ.	Nominal frequency range	Frequency tolerance	Frequency / Temperature Characteristics	Operating temperature	Supply voltage	Current consumption	Output load condition	Output control
			(MHz) 1 10 50 100	(× 10 ⁻⁶)	(× 10 ⁻⁶)			(Max.)		
17	TG5032CFN (CMOS Output)	5.0×3.2×1.45 (4 pins)	10 MHz 40 MHz	±1.0	±0.1	-40 to +85 °C	2.375 to 3.63V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG5032SFN (Clipped sine wave)							5.0 mA	10 kΩ//10 pF	
18	TG5032CGN (CMOS Output)	5.0×3.2×1.45 (10 pins)	10 MHz 40 MHz	±1.0	±0.1	-40 to +85 °C	2.375 to 3.63V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG5032SGN (Clipped sine wave)							5.0 mA	10 kΩ//10 pF	
19	TG5032CAN (CMOS Output)	5.0×3.2×1.45 (10 pins)	10 MHz 50 MHz	±2.0	±0.1	0 to +70 °C	2.7 to 5.5V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG5032SAN (Clipped sine wave)							5.0 mA	10 kΩ//10 pF	
20	TG5032CDN (CMOS Output)	5.0×3.2×1.45 (4 pins)	10 MHz 50 MHz	±2.0	±0.1	0 to +70 °C	2.7 to 5.5V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG5032SDN (Clipped sine wave)							5.0 mA	10 kΩ//10 pF	
21	TG5032CBN (CMOS Output)	5.0×3.2×1.45 (10 pins)	10 MHz 50 MHz	±1.0	±0.28 ±1.0	-40 to +85 °C	2.7 to 5.5V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG5032SBN (Clipped sine wave)							5.0 mA	10 kΩ//10 pF	
22	TG5032CCN (CMOS Output)	5.0×3.2×1.45 (4 pins)	10 MHz 50 MHz	±1.0	±0.28 ±1.0	-40 to +85 °C	2.7 to 5.5V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG5032SCN (Clipped sine wave)							5.0 mA	10 kΩ//10 pF	
23	TG-5500CA (CMOS Output)	7.0×5.0×1.5 (10 pins)	10 MHz 50 MHz	±1.0	±0.28 ±1.0	-40 to +85 °C	2.7 to 5.5V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG-5501CA (Clipped sine wave)								10 kΩ//10 pF	
23	TG-5500CA (CMOS Output)	7.0×5.0×1.5 (10 pins)	10 MHz 50 MHz	±1.0	±0.28 ±1.0	-40 to +85 °C	2.7 to 5.5V	5.0 mA (≤ 26MHz) 6.0 mA (> 26MHz)	15pF	Vc
	TG-5501CA (Clipped sine wave)								10 kΩ//10 pF	



VC-TCXO/TCXO

HIGH STABILITY

TG1612SAN

- Output frequency : 13 MHz to 52 MHz
- Supply voltage : 1.8V Typ. / 2.8V Typ. / 3.0V Typ. / 3.3V Typ.
- Frequency / temperature characteristics : $\pm 0.5 \times 10^{-6}$ Max. or $\pm 2.0 \times 10^{-6}$ Max.
- External dimensions: 1.6 × 1.2 × 0.65 mm
- Applications : GPS, RF
- Features : High stability, Ultra small size



Product Number (Please contact us)
X1G004681XXXXXX



Actual size

Specifications (characteristics)

Item	Symbol	VC-TCXO	TCXO	Conditions / Remarks
Output frequency range	fo	13 MHz to 52MHz		Standard frequency
		26 MHz		
Supply voltage	Vcc	1.8 V ±0.1 V / 2.8 V ±5 % / 3.0 V ±5 % / 3.3 V ±5 %		Supply voltage range :1.7 V to 3.63 V
Storage temperature	T_stg	-40 °C to +90 °C		Storage as single product.
Operating temperature	T_use	G: -40 °C to +85 °C / N: -30 °C to +85 °C		
Frequency tolerance	f_tol	±2.0 × 10 ⁻⁶ Max.		After reflow, +25 °C
Frequency/temperature characteristics	fo-Tc	-	C: ±0.5 × 10 ⁻⁶ Max. / N: -30 °C to +85 °C	High stability version (for GPS)
		F: ±2.0 × 10 ⁻⁶ Max. / N: -30 °C to +85 °C	F: ±2.0 × 10 ⁻⁶ Max. / N: -30 °C to +85 °C	Standard stability version (for RF)
		J: ±1.0 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C	C: ±0.5 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C	Customized product (Option)
Frequency/load coefficient	fo-Load	±0.2 × 10 ⁻⁶ Max.		10 kΩ // 10 pF ±10 %
Frequency/voltage coefficient	fo-Vcc	±0.2 × 10 ⁻⁶ Max.		Vcc± 5 %
Frequency aging	f_age	±1.0 × 10 ⁻⁶ Max.		+25 °C, First year, 13 MHz≤ fo ≤20 MHz, 26 MHz≤ fo ≤40 MHz
		±1.5 × 10 ⁻⁶ Max.		+25 °C ,First year, 20 MHz< fo <26 MHz 40 MHz< fo ≤52 MHz
Current consumption	Icc	1.5 mA Max.		13 MHz≤ fo ≤26 MHz
		2.0 mA Max		26MHz<fo
Input resistance	Rin	500 kΩ Min.	-	Vc - GND (DC)
Frequency control range	f_cont	±8.0 × 10 ⁻⁶ to ±15.0 × 10 ⁻⁶	-	B: Vc =0.9 V ±0.6 V (Vcc =1.8 V) or C: Vc =1.4 V ±1.0 V (Vcc =2.8 V) or D: Vc =1.5 V ±1.0 V (Vcc =3.0 V) or E: Vc =1.65 V ±1.0 V (Vcc =3.3 V)
Frequency change polarity	-	Positive polarity	-	
Symmetry	SYM	40 % to 60 %		GND level (DC cut)
Output voltage	Vpp	0.8 V Min.		Peak to Peak
Start-up time	t_str	2.0 ms Max.		T=0 at 90% Vcc
Output load condition	Load_R	10 kΩ		DC cut capacitor = 0.01 μF
	Load_C	10 pF		

* Note : Please contact us for requirements not listed in this specification.

Product Name **TG1612 SAN 26.000000MHz** I C N N N M
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model ② Output (S: Clipped sine wave)

③ Frequency ④ Supply voltage (Refer to symbol table)

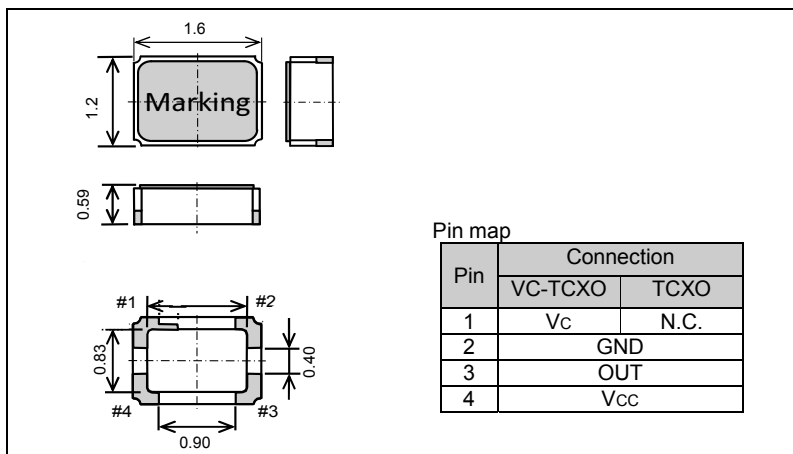
⑤ Frequency / temperature characteristics (C: $\pm 0.5 \times 10^{-6}$ Max.) ⑥ Operating temperature (N: -30 °C to +85 °C)

⑦ Standby function (N: Non) ⑧ V_C function (Refer to symbol table, A: V_C = any) ⑨ Internal identification code ("L", "M", "H" is default)

④ Supply voltage[V _{CC}] , ⑧ V _C function[V _C] (Symbol table)					
Voltage [V]	TCXO	VC-TCXO			
④ V _{CC} (Typ.)	T: 1.8 to 3.3	T: 1.8 to 3.3	K: 2.5 to 3.3	P: 2.6 to 3.3	M: 2.8 to 3.3
⑧ V _C (Typ.)	N: Non	B: 0.9	C: 1.4	D: 1.5	E: 1.65

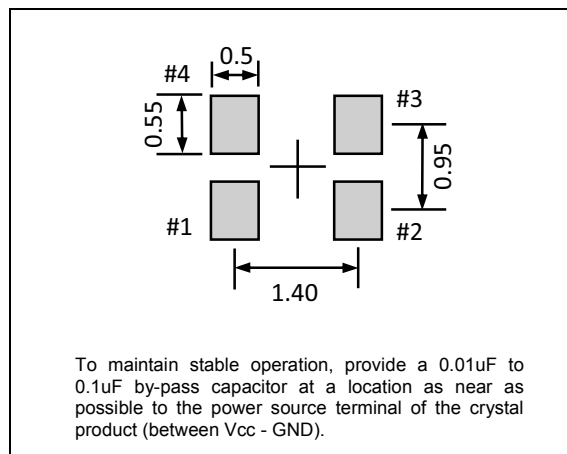
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





VC-TCXO / TCXO

HIGH STABILITY / Low noise

NEW

Product Number (Please contact us)

TG2016SMN : X1G005441xxxxxx

TG2520SMN : X1G005241xxxxxx

TG2016SMN / TG2520SMN

- Output frequency : 10 MHz to 55MHz
- Supply voltage : 1.8 V Typ./ 2.8 V Typ./ 3.0 V Typ./ 3.3 V Typ.
- Frequency / temperature characteristics
 - : $\pm 0.5 \times 10^{-6}$ Max. (-40 °C to +85 °C)
 - : $\pm 2.0 \times 10^{-6}$ Max. (-40 °C to +85 °C)
- External dimensions: 2.0 × 1.6 × 0.73 mm / 2.5 × 2.0 × 0.8 mm
- Applications : GPS, RF
Wireless communication devices
(CDMA, WCDMA, LTE, WiMAX, other)
- Features : Low noise

TG2016SMN
(2.0 × 1.6 × 0.73 mm)TG2520SMN
(2.5 × 2.0 × 0.8 mm)

Actual size

TG2016SMN

TG2520SMN

Specifications (characteristics)

Item	Symbol	VC-TCXO	TCXO	Conditions / Remarks
Output frequency range	f ₀	10 MHz to 55MHz		Standard frequency
		16.368 MHz, 16.369 MHz, 19.2 MHz, 26 MHz, 32 MHz, 38.4 MHz and 40 MHz		
Supply voltage	V _{CC}	1.8 V ±0.1 V / 2.8 V ±5 % / 3.0 V ±5 % / 3.3 V ±5 %		Supply voltage range :1.7 V to 3.63 V
Storage temperature	T _{stg}	-40 °C to +90 °C		Storage as single product.
Operating temperature	T _{use}	G: -40 °C to +85 °C		
Frequency tolerance	f _{tol}	±1.5 × 10 ⁻⁶ Max.		After reflow, +25 °C
Frequency/temperature characteristics	f ₀ -T _C	C: ±0.5 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C F: ±2.0 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C		Standard stability version
Frequency/load coefficient	f ₀ -Load	±0.1 × 10 ⁻⁶ Max.		10 kΩ // 10 pF ±10 %
Frequency/voltage coefficient	f ₀ -V _{CC}	±0.1 × 10 ⁻⁶ Max.		V _{CC} ± 5 %
Frequency aging	f _{age}	±0.5 × 10 ⁻⁶ Max.		+25 °C, First year, 10MHz, 12 MHz≤ f ₀ ≤20 MHz, 24 MHz≤ f ₀ ≤40 MHz
		±1.5 × 10 ⁻⁶ Max.		+25 °C ,First year, 10 MHz< f ₀ <12 MHz, 20 MHz< f ₀ <24 MHz, 40 MHz< f ₀ ≤55 MHz
Current consumption	I _{CC}	1.5 mA Max.		10 MHz≤ f ₀ ≤26 MHz
		1.8 mA Max.		26 MHz< f ₀ ≤40 MHz
		2.0 mA Max.		40 MHz< f ₀ ≤50 MHz
		2.1 mA Max.		50 MHz< f ₀ ≤55 MHz
Input resistance	R _{in}	500 kΩ Min.	-	V _C - GND (DC)
Frequency control range	f _{cont}	±8.0 × 10 ⁻⁶ to ±12.0 × 10 ⁻⁶	-	B: V _C =0.9 V ±0.6 V (V _{CC} =1.8 V) or C: V _C =1.4 V ±1.0 V (V _{CC} =2.8 V) or D: V _C =1.5 V ±1.0 V (V _{CC} =3.0 V) or E: V _C =1.65 V ±1.0 V (V _{CC} =3.3 V)
Frequency change polarity	-	Positive polarity	-	
Symmetry	SYM	45 % to 55 %		GND level (DC cut)
Output voltage	V _{PP}	0.8 V Min.		Peak to Peak
Start-up time	t _{str}	1.0 ms Max.		T=0 at 90% V _{CC}
Output load condition	Load _R	10 kΩ		DC cut capacitor = 0.01 μF
	Load _C	10 pF		

* Note : Please contact us for requirements not listed in this specification.

Product Name TG2016 SMN 26.000000MHz I C G N N M
 (Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model (TG2016, TG2520)

② Output (S: Clipped sine wave) ③ Frequency

④ Supply voltage (Refer to symbol table) ⑤ Frequency / temperature characteristics (C: $\pm 0.5 \times 10^{-6}$ Max., F: $\pm 2.0 \times 10^{-6}$ Max.)

⑥ Operating temperature (G: -40 °C to +85 °C) ⑦ ST function (N: Non)

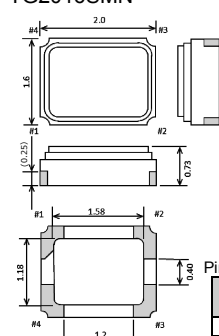
⑧ V_C function (Refer to symbol table, A: V_C = any) ⑨ Internal identification code ("M" is default)

④ Supply voltage [V _{CC}] , ⑧ V _C function [V _C] (Symbol table)					
Voltage [V]	TCXO	VC-TCXO			
④ V _{CC} (Typ.)	T: 1.8 to 3.3	T: 1.8 to 3.3	K: 2.5 to 3.3	P: 2.6 to 3.3	M: 2.8 to 3.3
⑧ V _C (Typ.)	N: Non	B: 0.9	C: 1.4	D: 1.5	E: 1.65

External dimensions

(Unit:mm)

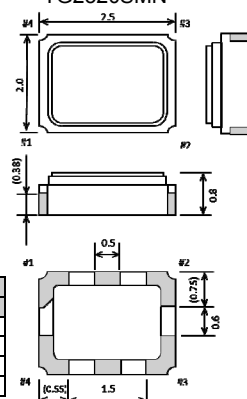
TG2016SMN



Pin map

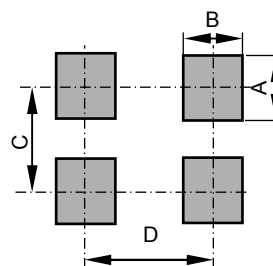
Pin	Connection	
	VC-TCXO	TCXO
1	V _C	N.C.
2	GND	
3	OUT	
4	V _{CC}	

TG2520SMN



Footprint (Recommended)

(Unit:mm)



Size

	TG2016SMN (2.0x1.6mm)	TG2520SMN (2.5x2.0mm)
A	0.75	1.0
B	0.6	0.8
C	1.13	1.4
D	1.65	2.1

To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).



VC-TCXO/TCXO HIGH STABILITY

TG2016SBN / TG2520SBN

- Output frequency : 13 MHz to 55MHz
- Supply voltage : 1.8 V Typ./ 2.8 V Typ./ 3.0 V Typ./ 3.3 V Typ.
- Frequency / temperature characteristics
 - : $\pm 0.5 \times 10^{-6}$ Max. (-40 °C to +85 °C)
 - : $\pm 2.0 \times 10^{-6}$ Max. (-40 °C to +85 °C)
- External dimensions: 2.0 × 1.6 × 0.73 mm / 2.5 × 2.0 × 0.8 mm
- Applications : GPS, RF
Wireless communication devices
(CDMA, WCDMA, LTE, WiMAX, other)
- Features : High stability, Low noise



Product Number (Please contact us)
 TG2016SBN : X1G004691xxxxxx
 TG2520SBN : X1G005151xxxxxx



TG2016SBN
(2.0 × 1.6 × 0.73 mm)



TG2520SBN
(2.5 × 2.0 × 0.8 mm)

Actual size

TG2016SBN

TG2520SBN

Specifications (characteristics)

Item	Symbol	VC-TCXO	TCXO	Conditions / Remarks
Output frequency range	fo	13 MHz to 55MHz		Standard frequency
		16 MHz, 16.368 MHz, 16.369 MHz, 16.384 MHz, 16.8 MHz, 19.2 MHz, 20 MHz, 26 MHz, 27MHz, 28.974 MHz, 30 MHz, 32 MHz, 37.4 MHz, 38.4 MHz, 39 MHz and 40 MHz		
Supply voltage	Vcc	1.8 V ±0.1 V / 2.8 V ±5 % / 3.0 V ±5 % / 3.3 V ±5 %		Supply voltage range :1.7 V to 3.63 V
Storage temperature	T_stg	-40 °C to +90 °C		Storage as single product.
Operating temperature	T_use	G: -40 °C to +85 °C		
Frequency tolerance	f_tol	±1.5 × 10 ⁻⁶ Max.		After reflow, +25 °C
Frequency/temperature characteristics	fo-Tc	C: ±0.5 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C F: ±2.0 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C		Standard stability version
Frequency/load coefficient	fo-Load	±0.1 × 10 ⁻⁶ Max.		10 kΩ // 10 pF ±10 %
Frequency/voltage coefficient	fo-Vcc	±0.1 × 10 ⁻⁶ Max.		Vcc± 5 %
Frequency aging	f_age	±0.5 × 10 ⁻⁶ Max.		+25 °C, First year, 13 MHz≤ fo ≤20 MHz, 26 MHz≤ fo ≤40 MHz
		±1.5 × 10 ⁻⁶ Max.		+25 °C ,First year, 20 MHz< fo <26 MHz 40 MHz< fo ≤55 MHz
Current consumption	Icc	1.2 mA Max.		13 MHz≤ fo <16 MHz
		1.4 mA Max.		16 MHz≤ fo ≤27 MHz
		1.5 mA Max.		27 MHz< fo ≤36 MHz
		1.8 mA Max.		36 MHz< fo ≤40 MHz
		2.0 mA Max.		40 MHz< fo ≤52 MHz
		2.2 mA Max.		52 MHz< fo ≤55 MHz
Input resistance	Rin	500 kΩ Min.	-	Vc - GND (DC)
Frequency control range	f_cont	±8.0 × 10 ⁻⁶ to ±12.0 × 10 ⁻⁶		- B: Vc =0.9 V ±0.6 V (Vcc =1.8 V) or C: Vc =1.4 V ±1.0 V (Vcc =2.8 V) or D: Vc =1.5 V ±1.0 V (Vcc =3.0 V) or E: Vc =1.65 V ±1.0 V (Vcc =3.3 V)
Frequency change polarity	-	Positive polarity	-	
Symmetry	SYM	45 % to 55 %		GND level (DC cut)
Output voltage	VPP	0.8 V Min.		Peak to Peak
Start-up time	t_str	1.0 ms Max.		T=0 at 90% Vcc
Output load condition	Load_R	10 kΩ		DC cut capacitor = 0.01 μF
	Load_C	10 pF		

* Note : Please contact us for requirements not listed in this specification.

Product Name TG2016 SBN 26.000000MHz I C G N N M
 (Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model(TG2016, TG2520)

② Output (S: Clipped sine wave) ③ Frequency

④ Supply voltage (Refer to symbol table) ⑤ Frequency / temperature characteristics (C: $\pm 0.5 \times 10^{-6}$ Max., F: $\pm 2.0 \times 10^{-6}$ Max.)

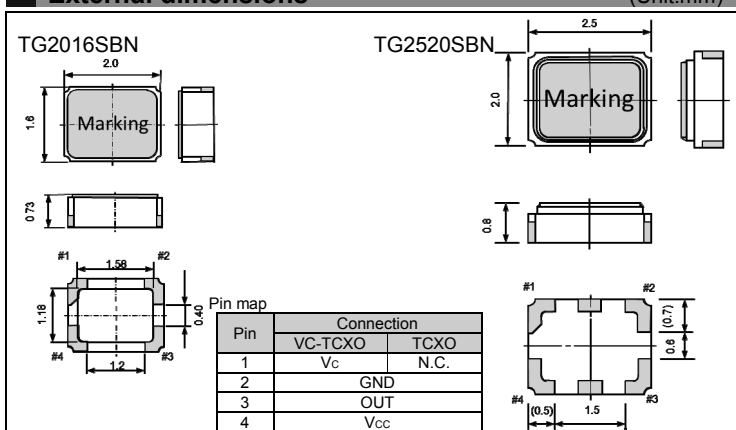
⑥ Operating temperature (G: -40 °C to +85 °C) ⑦ OE function (N: Non) ⑧ Vc function(Refer to symbol table , A: Vc =any)

⑨ Internal identification code ("L", "M", "H" is default)

④ Supply voltage[Vcc] , ⑧ Vc function[Vc] (Symbol table)					
Voltage [V]		VC-TCXO			
④ Vcc (Typ.)	T: 1.8 to 3.3	T: 1.8 to 3.3	K: 2.5 to 3.3	P: 2.6 to 3.3	M: 2.8 to 3.3
⑧ Vc (Typ.)	N: Non	B: 0.9	C: 1.4	D: 1.5	E: 1.65

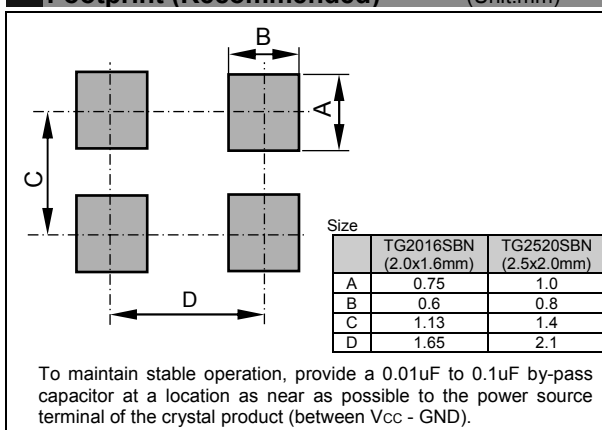
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)



To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between Vcc - GND).

**TCXO/VC-TCXO
HIGH STABILITY**

TG - 5006CJ / CG / CE

- Frequency range : 13 to 52MHz(TG-5006CJ/CG)
13 to 20MHz, 26 to 40MHz(TG-5006CE)
- Supply voltage : 1.8 V Typ./ 2.8 V Typ./ 3.0 V Typ./ 3.3 V Typ.
- Frequency / temperature characteristics : $\pm 0.5 \times 10^{-6}$ Max or $\pm 2.0 \times 10^{-6}$ Max.
- Applications : GPS, RF,
Wireless communication devices
(CDMA, WCDMA, LTE, WiMAX, other)
- Features : High stability



Product Number (Please contact us)
 TG-5006CJ : X1G004131xxx00
 TG-5006CG : X1G004211xxx00
 TG-5006CE : X1G004201xxx00



TG-5006CJ
(2.0 × 1.6 × 0.73 mm)



TG-5006CG
(2.5 × 2.0 × 0.8 mm)



TG-5006CE
(3.2 × 2.5 × 0.9 mm)

Actual size

TG-5006CJ	TG-5006CG	TG-5006CE

Specifications (characteristics)

Item	Symbol	VC-TCXO	TCXO	Conditions / Remarks
Output frequency range	fo	16.367667 MHz, 16.368 MHz, 16.369 MHz, 19.2 MHz, 26 MHz and 38.4 MHz		Standard frequency
		13.000 MHz to 52.000 MHz		TG-5006CJ/TG5006CG
		13.000 MHz to 20.000 MHz,26.000 MHz to 40.000 MHz		TG-5006CE
Supply voltage	Vcc	1.8 V ±0.1 V / 2.8 V ±5% / 3.0 V ±5% / 3.3 V ±5%		Supply voltage range : 1.7 V to 3.465 V
Storage temperature	T_stg	-40 °C to +90 °C		Storage as single product.
Operating temperature	T_use	-30 °C to +85 °C		
Frequency tolerance	f_tol	±2.0 ×10 ⁻⁶ Max.		After reflow, +25 °C
Frequency/temperature characteristics	fo-Tc	±0.5 × 10 ⁻⁶ Max. / -30 °C to +85 °C		High stability version for GPS
		±2.0 × 10 ⁻⁶ Max. / -30 °C to +85 °C		Standard stability version
		±2.0 × 10 ⁻⁶ Max. / -40 °C to +85 °C		Customized product.(Option)
Frequency/load coefficient	fo-Load	±0.2 × 10 ⁻⁶ Max.		10 kΩ // 10 pF ±10 %
Frequency/voltage coefficient	fo-Vcc	±0.2 ×10 ⁻⁶ Max.		Vcc ±5%
Frequency aging	f_age	±1.0 ×10 ⁻⁶ Max.		+25 °C , First year,13 MHz≤fo≤40 MHz
		±1.5 ×10 ⁻⁶ Max.		+25 °C , First year,40 MHz<fo≤52 MHz
Current consumption	Icc	1.5 mA Max.		13 MHz≤fo≤26 MHz
		2.0 mA Max.		26 MHz<fo≤52 MHz
Input resistance	Rin	500 kΩ Min.	—	Vc- GND (DC)
Frequency control range	f_cont	±8.0 × 10 ⁻⁶ to ±15.0 × 10 ⁻⁶	—	Vc =0.9 V ±0.6 V (Vcc =1.8 V) or Vc =1.4 V ±1.0 V (Vcc =2.8 V) or Vc =1.5 V ±1.0 V (Vcc =3.0 V) or Vc =1.65 V ±1.0 V (Vcc =3.3 V)
Frequency change polarity	—	Positive polarity	—	
Symmetry	SYM	40 % to 60 %		GND level (DC cut)
Output voltage	VPP	0.8 V Min.		Peak to Peak
Start-up time	t_str	2.0 ms Max.		T=0 at 90% Vcc
Output load condition	Load_R	10 kΩ		DC cut capacitor = 0.01 μF
	Load_C	10 pF		

* Note : Please contact us for requirements not listed in this specification.

Product Name TG-5006 CJ-*** 19.200000MHz

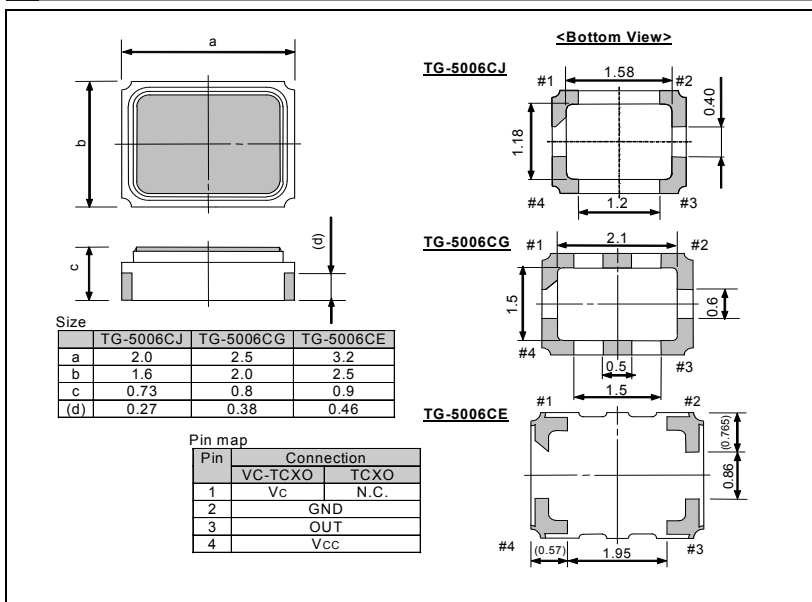
(Standard form)

① ② ③ ④

①Model ②Package type ③Spec segment (Please contact us) ④Frequency

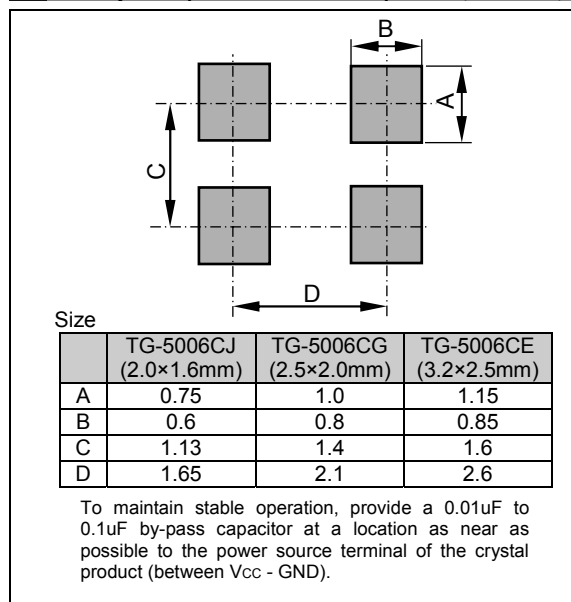
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)





TCXO

LOW VOLTAGE, HIGH STABILITY

TG2016SAN

- Output frequency : 13 MHz to 20MHz, 25 MHz to 40 MHz
- Supply voltage : 1.2 V Typ.
- Frequency / temperature characteristics : $\pm 0.5 \times 10^{-6}$ Max.
- External dimensions: 2.0 × 1.6 × 0.73 mm
- Applications : GPS
- Features : Low supply voltage (1.2 V)
High stability, Stand-by function ($\overline{ST}$)



Product Number (Please contact us)
X1G004421xxxx00



Actual size

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	13 MHz to 20MHz, 25 MHz to 40 MHz 26 MHz, 38.4 MHz	Standard frequency
Supply voltage	V_{CC}	J: 1.2 V ± 0.1 V	Supply voltage range : 1.1 V to 1.4 V
Storage temperature	T_{stg}	-40 °C to +90 °C	Storage as single product.
Operating temperature	T_{use}	N: -30 °C to +85 °C	
Frequency tolerance	f_{tol}	$\pm 2.0 \times 10^{-6}$ Max.	After reflow, +25 °C
Frequency/temperature characteristics	f_0-T_C	C: $\pm 0.5 \times 10^{-6}$ Max. / N: -30 °C to +85 °C	
Frequency/load coefficient	f_0-Load	$\pm 0.2 \times 10^{-6}$ Max.	10 k Ω // 10 pF ± 10 %
Frequency/voltage coefficient	f_0-V_{CC}	$\pm 0.2 \times 10^{-6}$ Max.	$V_{CC}=1.2$ V ± 0.1 V
Frequency aging	f_{age}	$\pm 1.0 \times 10^{-6}$ Max.	+25 °C, First year
Current consumption	I_{CC}	1.6 mA Max. 2.1 mA Max	$f_0 \leq 26$ MHz 26MHz < f_0
Stand-by current	I_{std}	3 μ A Max.	$\overline{ST}$ = GND
Input voltage	V_{IH}	80% V_{CC} Min.	$\overline{ST}$ terminal
	V_{IL}	20 % V_{CC} Max.	
Symmetry	SYM	40 % to 60 %	GND level (DC cut)
Output voltage	V_{PP}	0.8 V Min.	Peak to Peak
Start-up time	t_{str}	2.0 ms Max.	T=0 at 90% V_{CC}
Output load condition	Load_R	10 k Ω	DC cut capacitor = 0.01 μ F
	Load_C	10 pF	

* Note : Please contact us for requirements not listed in this specification.

Product Name
(Standard form)

TG2016 SAN 26.000000MHz J C N S N C

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

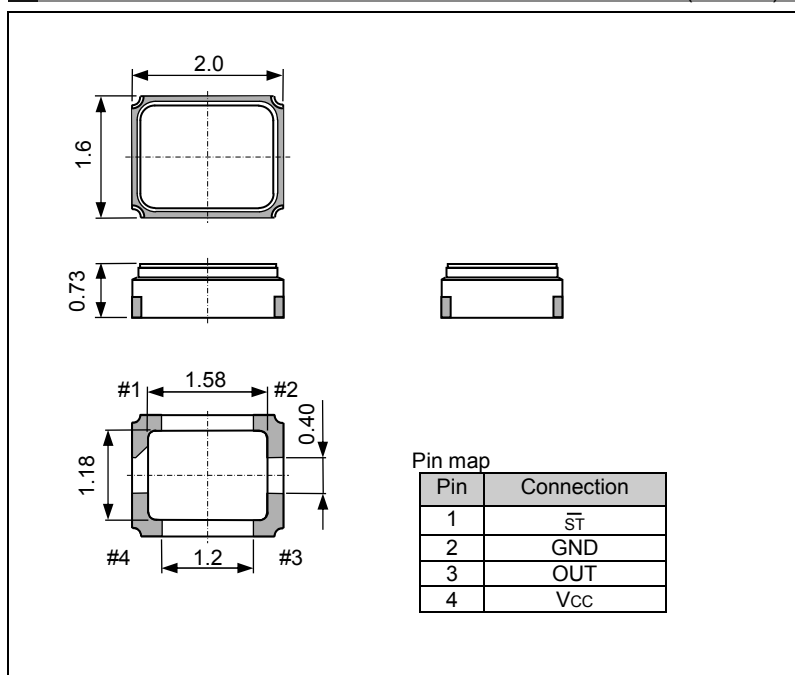
①Model ②Output (S: Clipped sine wave) ③Frequency ④Supply voltage (J: 1.2 V Typ.)

⑤Frequency / temperature characteristics (C: $\pm 0.5 \times 10^{-6}$ Max.) ⑥Operating temperature (N: -30 °C to +85 °C)

⑦Standby function (S: Standby) ⑧Vc function(N: Non) ⑨Internal identification code ("C" is default)

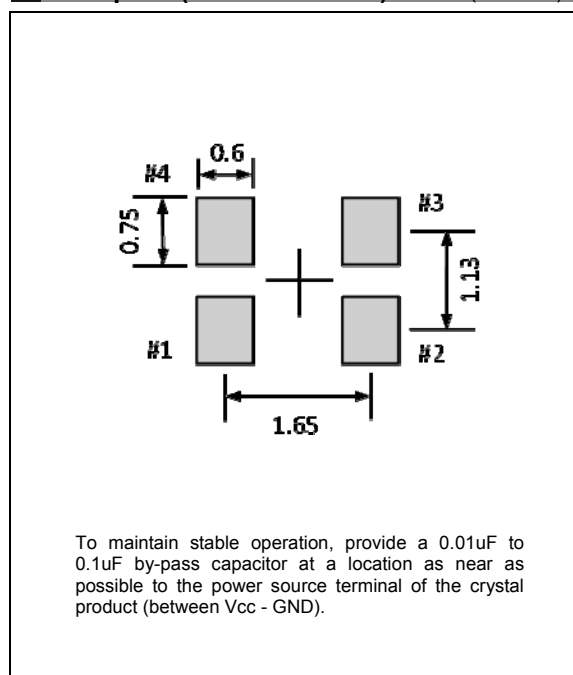
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





TCXO/VC-TCXO

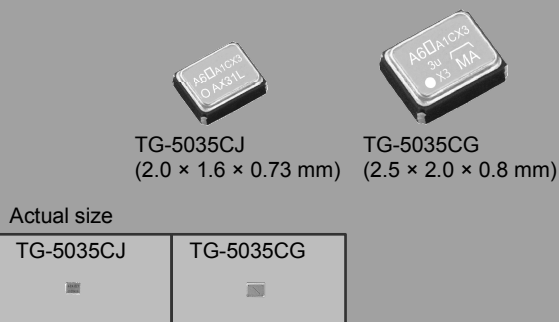
For Automotive, HIGH STABILITY



Product Number (Please contact us)
 TG-5035CJ :X1G003841Axxx00
 TG-5035CG :X1G003851Axxx00

TG - 5035CJ / CG

- Frequency range : 13 MHz to 52 MHz
- Supply voltage : 1.8 V Typ./ 2.8 V Typ./ 3.0 V Typ./ 3.3 V Typ.
- Frequency / temperature characteristics : $\pm 0.5 \times 10^{-6}$ Max or $\pm 2.0 \times 10^{-6}$ Max.
- Applications : Car navigation system, GPS
- Features : High stability, Stand-by function ($\overline{ST}$)
- Conforms to AEC-Q200



Specifications (characteristics)

Item	Symbol	VC-TCXO	TCXO	TCXO-Standby	Conditions / Remarks
Output frequency range	f ₀	13 MHz, 16.368 MHz, 16.369 MHz, 19.2 MHz, 26 MHz, and 38.4 MHz			Standard frequency
		13.000 MHz to 52.000 MHz			
Supply voltage	V _{CC}	1.8 V ±0.1 V / 2.8 V ±5% / 3.0 V ±5% / 3.3 V ±5%			Supply voltage Range :1.7 V to 3.6 V
Storage temperature	T _{stg}	-40 °C to +90 °C			Storage as single product.
Operating temperature	T _{use}	-40 °C to +85 °C			
Frequency tolerance	f _{tol}	±1.5 ×10 ⁻⁶ Max.			After reflow, +25 °C
Frequency/temperature characteristics	f ₀ -T _C	±0.5 × 10 ⁻⁶ Max. / -40 °C to +85 °C			High stability version (for GPS)
		±2.0 × 10 ⁻⁶ Max. / -40 °C to +85 °C			Standard stability version
Frequency/load coefficient	f ₀ -Load	±0.2 × 10 ⁻⁶ Max.			10 kΩ // 10 pF ±10 %
Frequency/voltage coefficient	f ₀ -V _{CC}	±0.2 ×10 ⁻⁶ Max.			V _{CC} ±5%
Frequency aging	f _{age}	±1.0 ×10 ⁻⁶ Max.			+25 °C , First year,13 MHz≤f ₀ ≤40 MHz
		±1.5 ×10 ⁻⁶ Max.			+25 °C , First year,40 MHz<f ₀ ≤52 MHz
Current consumption	I _{CC}	1.5 mA Max.			13 MHz≤f ₀ ≤26 MHz
		2.0 mA Max.			26 MHz<f ₀ ≤52 MHz
Stand-by current	I _{std}	—		10 μA Max.	ST̄ = GND
Input voltage	V _{IH}	—		80% V _{CC} Min.	ST̄ terminal
	V _{IL}	—		20 % V _{CC} Max.	
Input resistance	R _{in}	500 kΩ Min.	—		V _C - GND (DC)
Frequency control range	f _{cont}	±8.0 × 10 ⁻⁶ to ±15.0 × 10 ⁻⁶	—		V _C =0.9 V ±0.6 V (V _{CC} =1.8 V) or V _C =1.4 V ±1.0 V (V _{CC} =2.8 V) or V _C =1.5 V ±1.0 V (V _{CC} =3.0 V) or V _C =1.65 V ±1.0 V (V _{CC} =3.3 V)
Frequency change polarity	—	Positive polarity	—		
Symmetry	SYM	40 % to 60 %			GND level (DC cut)
Output voltage	V _{PP}	0.8 V Min.			Peak to Peak
Start-up time	t _{str}	2.0 ms Max.			T=0 at 90% V _{CC}
Output load condition	Load_R	10 kΩ			DC cut capacitor = 0.01 μF
	Load_C	10 pF			

* Note : Please contact us for requirements not listed in this specification.

Product Name TG-5035CJ-*** 19.200000MHz

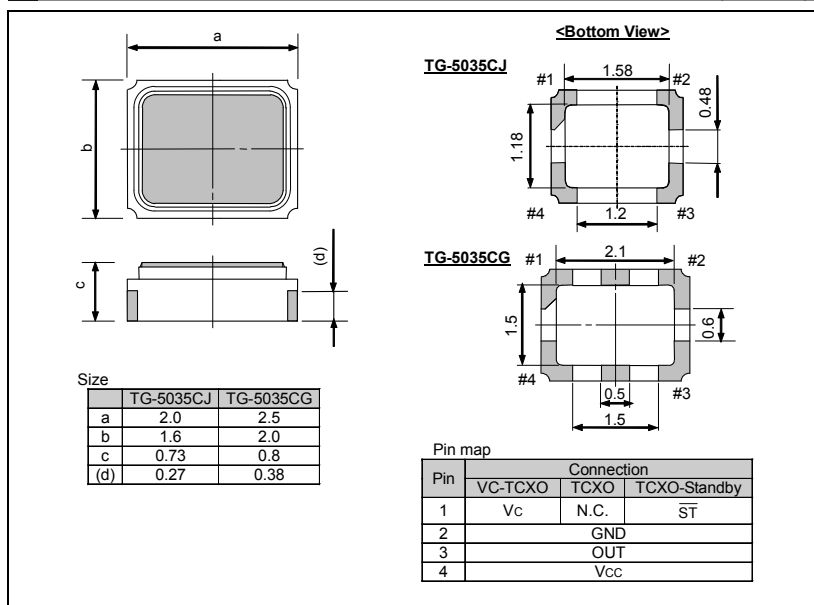
(Standard form)

① ② ③ ④

①Model ②Package type ③Spec segment (Please contact us) ④Frequency

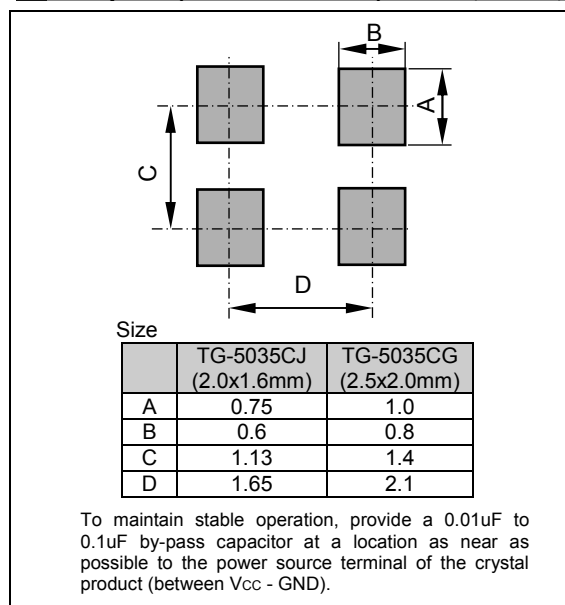
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)



VC-TCXO/TCXO

HIGH STABILITY, CMOS OUTPUT

TG3225CEN / TG2520CEN

- Output frequency : 12 MHz to 52MHz
- Supply voltage : 2.8 V Typ./ 3.0 V Typ./ 3.3 V Typ.
- Frequency / temperature characteristics
: $\pm 2.0 \times 10^{-6}$ Max.
- External dimensions: 3.2 × 2.5 × 0.9 mm / 2.5 × 2.0 × 0.8 mm
- Applications : Reference clock for measurement machine
Wireless communication devices
(Smart meter, Telemeter, other)
- Features : High stability, CMOS output



Product Number (Please contact us)
TG3225CEN : X1G005101xxxxxx
TG2520CEN : X1G005161xxxxxx



TG3225CEN
(3.2 × 2.5 × 0.9 mm)



TG2520CEN
(2.5 × 2.0 × 0.8 mm)

Actual size

TG3225CEN	TG2520CEN
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Specifications (characteristics)

Item	Symbol	VC-TCXO	TCXO	Conditions / Remarks
Output frequency range	f _o	12 MHz to 52MHz 12MHz, 16MHz, 24MHz, 25MHz, 26MHz, 27MHz, 30MHz, 32MHz, 36MHz, 38.4MHz, 39MHz and 40MHz		Standard frequency
Supply voltage	V _{cc}	2.8 V ±5 % / 3.0 V ±5 % / 3.3 V ±5 %		Supply voltage range :2.375 V to 3.63 V
Storage temperature	T _{stg}	-40 °C to +90 °C		Storage as single product.
Operating temperature	T _{use}	G: -40 °C to +85 °C		
Frequency tolerance	f _{tol}	±2.0 × 10 ⁻⁶ Max.		After reflow, +25 °C
Frequency/temperature characteristics	f _o -T _c	F: ±2.0 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C		Standard stability version
Frequency/load coefficient	f _o -Load	±0.2 × 10 ⁻⁶ Max.		15 pF ±10 %
Frequency/voltage coefficient	f _o -V _{cc}	±0.3 × 10 ⁻⁶ Max.		V _{cc} ± 5 %
Frequency aging	f _{age}	±1.0 × 10 ⁻⁶ Max.		+25 °C, First year, 12 MHz≤ f _o ≤20 MHz 24 MHz≤ f _o ≤40 MHz
		±1.5 × 10 ⁻⁶ Max.		+25 °C ,First year, 20 MHz< f _o < 24 MHz 40 MHz< f _o ≤52 MHz
Current consumption	I _{cc}	4.0 mA Max.		12 MHz ≤ f _o ≤ 26 MHz
		6.0 mA Max.		26 MHz <f _o ≤ 39 MHz
		6.5 mA Max.		39 MHz <f _o ≤ 52 MHz
Input resistance	R _{in}	500 kΩ Min.	-	V _c - GND (DC)
Frequency control range	f _{cont}	±8.0 × 10 ⁻⁶ to ±15.0 × 10 ⁻⁶	-	C: V _c =1.4 V ±1.0 V (V _{cc} =2.8 V) or D: V _c =1.5 V ±1.0 V (V _{cc} =3.0 V) or E: V _c =1.65 V ±1.0 V (V _{cc} =3.3 V)
Frequency change polarity	-	Positive polarity	-	
Symmetry	SYM	45 % to 55 %		50 % V _{cc} level, L _{CMOS} ≤ 15 pF
Output voltage	V _{OH}	90 % V _{cc} Min.		
	V _{OL}	10 % V _{cc} Max.		
Start-up time	t _{str}	2.0 ms Max.		T=0 at 90% V _{cc}
Rise time / Fall time	tr/ tr	8.0 ns Max.		10 % V _{cc} to 90 % V _{cc} level, Load:15 pF
Output load condition	Load	15 pF		15 pF ±10 %

* Note : Please contact us for requirements not listed in this specification.

Product Name	<u>TG3225 CEN 39.000000MHz</u>			<u>K</u>	<u>F</u>	<u>G</u>	<u>N</u>	<u>N</u>	<u>M</u>
(Standard form)	①	②	③	④	⑤	⑥	⑦	⑧	⑨

①Model ②Output (C: CMOS)

③Frequency ④Supply voltage (Refer to symbol table)

⑤ Frequency / temperature characteristics (F: $\pm 2.0 \times 10^{-6}$ Max.)

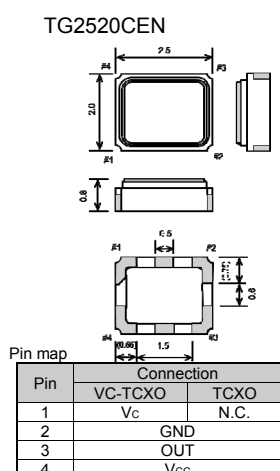
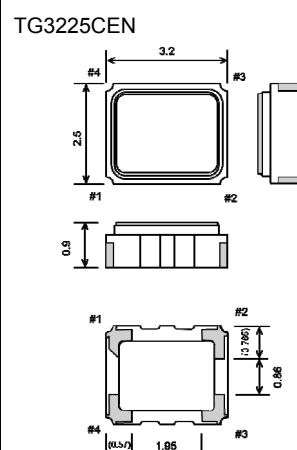
⑦OE function (N: Non) ⑧Vc function(Refer to symbol table , A: Vc =any) ⑨Internal identification code ("M" is default)

Dimensions (Unit:mm) **Footprint (Recommended)** (U

④Supply voltage[V _{CC}] ,⑥V _C function[V _C] (Symbol table)				
Voltage [V]	TCXO	VC-TCXO		
④V _{CC} (Typ.)	K: 2.5 to 3.3	K: 2.5 to 3.3	P: 2.6 to 3.3	M: 2.8 to 3.3
⑥V _C (Typ.)	N: Non	C: 1.4	D: 1.5	E: 1.65

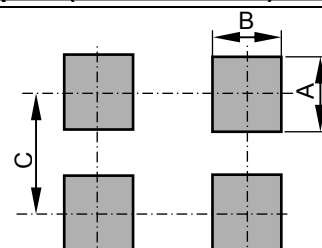
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)



Size	TG3225CEN (3.2x2.5mm)	TG2520CEN (2.5x2.0mm)
A	1.15	1.0
B	0.85	0.8
C	1.6	1.4
D	2.6	2.1

To maintain stable operation, provide a 0.01uF to 0.1uF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between Vcc - GND).



VC-TCXO / TCXO

ULTRA HIGH STABILITY

NEW

Product Number (please contact us)
 TG5032CFN :X1G005391xxxxxx
 TG5032SFN :X1G005401xxxxxx

TG5032CFN

TG5032SFN

- Frequency range : 10 MHz to 40 MHz
- Supply voltage : 3.3 V Typ.
- Frequency / temperature characteristics : $\pm 0.1 \times 10^{-6}$ Max. (-40 °C to +85 °C)
- Frequency aging : $\pm 3.0 \times 10^{-6}$ Max./20years
- External dimensions: 5.0 × 3.2 × 1.45 mm (4 pins)
- Applications : Small Cells, Stratum3
- Features : Ultra high stability, Wide temperature range



Actual size



Specifications (characteristics)

Item	Symbol	TG5032CFN (CMOS output)		TG5032SFN(Clippped sine wave)		Conditions / Remarks
		VC-TCXO	TCXO	VC-TCXO	TCXO	
Output frequency range	f _o	10 MHz to 40 MHz				Standard frequency
Supply voltage	V _{CC}	10, 12.8, 19.2, 20, 24.576, 25, 25.6, 26, 30.72, 38.4, 38.88, 40 MHz				
Storage temperature	T _{stg}	C: 3.3 V ±5% (Supply voltage range :2.375 V to 3.63 V)				Storage as single product
Operating temperature	T _{use}	-40 °C to +90 °C				
a) Frequency tolerance	f _{tol}	G: -40 °C to +85 °C				Standard temp. range
b) Frequency/temperature Characteristics	f _o -Tc	±1.0 × 10 ⁻⁶ Max.				After reflow, +25 °C
		A: ±0.1 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C				Reference to (fmax+fmin)/2
		H: ±0.25 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C				
		B: ±0.28 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C				
c) Frequency/load coefficient	f _o -Load	±0.1 ×10 ⁻⁶ Max.				Load ±10 %
d) Frequency/voltage coefficient	f _o -V _{CC}	±0.1 ×10 ⁻⁶ Max.				V _{CC} ±5%
e) Frequency aging	f _{age}	±0.5 ×10 ⁻⁶ Max.				+25 °C, First year
		±3.0 ×10 ⁻⁶ Max.				+25 °C, 20 years
Holdover stability	-	±0.01 × 10 ⁻⁶ Max.(+25 °C , 24 hours)				After 10 days of continuous operation.
(Constant temperature)		±0.04 × 10 ⁻⁶ Max.(+25 °C , 24 hours)				After 48 hours of continuous operation.
Free-run accuracy	-	±4.6 × 10 ⁻⁶ Max.				This includes Item a),b),c),d)and e)
Current consumption	I _{CC}	5.0 mA Max.		5.0 mA Max.		10 MHz≤f _o ≤26 MHz
		6.0 mA Max.				26 MHz<f _o ≤40 MHz
Input resistance	R _{in}	100 kΩ Min.	—	100 kΩ Min.	—	Vc- GND (DC)
Frequency control range	f _{cont}	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	D :Vc=1.5 V ± 1.0 V at V _{CC} =3.3 V E: Vc=1.65 V ± 1.0 V at V _{CC} =3.3 V
Frequency change polarity	—	Positive polarity	—	Positive polarity	—	
Symmetry	SYM	45 % to 55 %		—		50 % V _{CC} level, L _{CMOS} ≤ 15 pF
Output voltage	V _{OH}	90 % V _{CC} Min.		—		
	V _{OL}	10 % V _{CC} Max.		—		
Output level	V _{PP}	—		0.8 V Min.		Peak to Peak
Rise time / Fall time	t _r / t _f	8.0 ns Max.		—		10 % V _{CC} to 90 % V _{CC} level, Load:15 pF
Start-up time	t _{str}	5.0 ms Max.				T=0 at 90% V _{CC}
Output load condition	Load	15 pF		10 kΩ//10 pF		

* Note : Please contact us for requirements not listed in this specification.

Product Name TG5032 C FN 30.720000MHz C A G N D A
 (Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①Model ②Output (C: CMOS, S: Clipped sine wave) ③Frequency ④Supply voltage (C: 3.3 V Typ.)

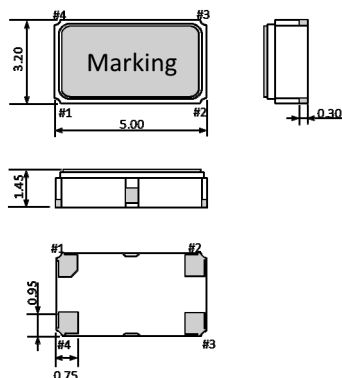
⑤Frequency / temperature characteristics (A: $\pm 0.1 \times 10^{-6}$ Max., H: $\pm 0.25 \times 10^{-6}$ Max., B: $\pm 0.28 \times 10^{-6}$ Max.)

⑥Operating temperature (G: -40 °C to +85 °C) ⑦OE function (N: Non)

⑧V_C function (A: V_C =any, D: V_C =1.5 V, E: V_C =1.65 V, N: Non) ⑨Internal identification code ("A" is default)

External dimensions

(Unit :mm)

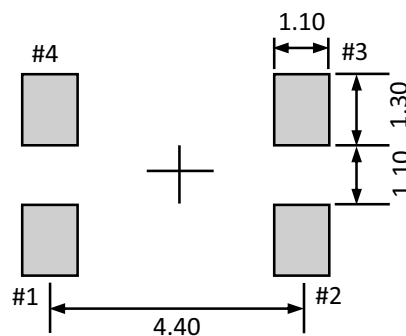


Pin map

Pin	Connection	
	VC-TCXO	TCXO
1	V _C	N.C
2	GND	
3	OUT	
4	V _{CC}	

Footprint (Recommended)

(Unit :mm)



To maintain stable operation, provide a 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).

VC-TCXO / TCXO
ULTRA HIGH STABILITY

TG5032CGN
TG5032SGN

- Frequency range : 10 MHz to 40 MHz
- Supply voltage : 3.3 V Typ.
- Frequency / temperature characteristics : $\pm 0.1 \times 10^{-6}$ Max. (-40 °C to +85 °C)
- Frequency aging : $\pm 3.0 \times 10^{-6}$ Max./20years
- External dimensions : 5.0 × 3.2 × 1.45 mm (10 pins)
- Applications : Small Cells, Stratum3
- Features : Ultra high stability, Wide temperature range



Product Number (please contact us)
TG5032CGN : X1G005231xxxxxx
TG5032SGN : X1G005241xxxxxx



Actual size

Specifications (characteristics)

Item	Symbol	TG5032CGN (CMOS)		TG5032SGN(Clipped sine wave)		Conditions / Remarks
		VC-TCXO	TCXO	VC-TCXO	TCXO	
Output frequency range	f _o	10 MHz to 40 MHz				Standard frequency
Supply voltage	V _{CC}	10,12.8, 19.2, 20, 24.576, 25, 25.6, 26, 30.72, 38.4, 38.88, 40 MHz C: 3.3 V ±5% (Supply voltage range :2.375 V to 3.63 V)				
Storage temperature	T _{stg}	-40 °C to +90 °C				Storage as single product
Operating temperature	T _{use}	G: -40 °C to +85 °C				
a) Frequency tolerance	f _{tol}	±1.0 × 10 ⁻⁶ Max.				After reflow, +25 °C
b) Frequency/temperature Characteristics	f _o -T _C	A: ±0.1 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C H: ±0.25 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C B: ±0.28 × 10 ⁻⁶ Max. / G: -40 °C to +85 °C				Reference to (fmax+fmin)/2
c) Frequency/load coefficient	f _o -Load	±0.1 ×10 ⁻⁶ Max.				Load ±10 %
d) Frequency/voltage coefficient	f _o -V _{CC}	±0.1 ×10 ⁻⁶ Max.				V _{CC} ±5%
e) Frequency aging	f _{age}	±0.5 ×10 ⁻⁶ Max.				+25 °C, First year
		±3.0 ×10 ⁻⁶ Max.				+25 °C, 20 years
Holdover stability	-	±0.01 × 10 ⁻⁶ Max.(+25 °C , 24 hours)				After 10 days of continuous operation.
(Constant temperature)		±0.04 × 10 ⁻⁶ Max.(+25 °C , 24 hours)				After 48 hours of continuous operation.
Free-run accuracy	-	±4.6 × 10 ⁻⁶ Max.				This includes Item a),b),c),d)and e)
Current consumption	I _{CC}	5.0 mA Max.		5.0 mA Max.		10 MHz≤f _o ≤26 MHz
		6.0 mA Max.				26 MHz<f _o ≤40 MHz
Input resistance	R _{in}	100 kΩ Min.	—	100 kΩ Min.	—	V _{CC} - GND (DC)
Frequency control range	f _{cont}	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	D, J :V _C =1.5 V ± 1.0 V at V _{CC} =3.3 V E, K: V _C =1.65 V ± 1.0 V at V _{CC} =3.3 V
Frequency change polarity	—	Positive polarity	—	Positive polarity	—	
Symmetry	SYM	45 % to 55 %		—		50 % V _{CC} level, L _{CMOS} ≤ 15 pF
Output voltage	V _{OH}	90 % V _{CC} Min.		—		
	V _{OL}	10 % V _{CC} Max.		—		
Output level	V _{PP}	—		0.8 V Min.		Peak to Peak
Rise time / Fall time	t _r / t _f	8.0 ns Max.		—		10 % V _{CC} to 90 % V _{CC} level, Load:15 pF
Start-up time	t _{str}	5.0 ms Max.(Non-Filter: Standard) / 2.0 sec. Max.(Filter: Option)				T=0 at 90% V _{CC}
Output load condition	Load	15 pF		10 kΩ/10 pF		
Input voltage	V _{IH}	70% V _{CC} Min.				OE terminal(Enable voltage)
	V _{IL}	30% V _{CC} Max.				OE terminal(Disable voltage)

* Note : Please contact us for requirements not listed in this specification.

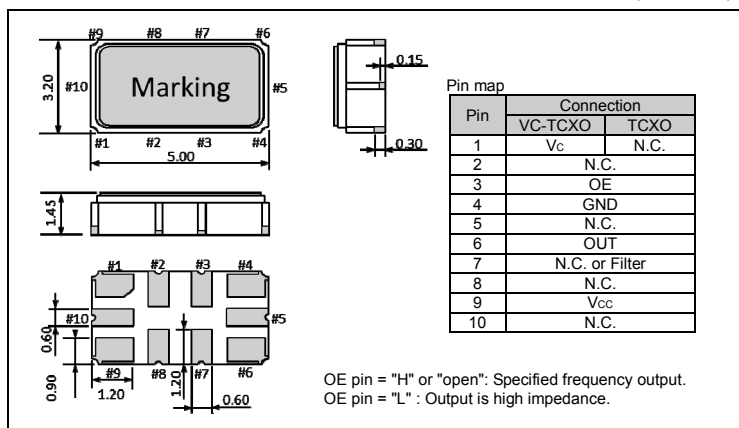
Product Name TG5032 C GN 30.720000MHz C A G H D A
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ①Model ②Output (C: CMOS, S: Clipped sine wave)
③Frequency ④Supply voltage (C: 3.3 V Typ)
⑤Frequency/temperature characteristics (A: $\pm 0.1 \times 10^{-6}$ Max., H: $\pm 0.25 \times 10^{-6}$ Max., B: $\pm 0.28 \times 10^{-6}$ Max.)
⑥Operating temperature (G: -40 °C to +85 °C) ⑦OE function (H: Active High)
⑧V_C function (Refer to symbol table) ⑨Internal identification code ("A" is default)

⑧V _C function (symbol table)				
V _C [V]	Non	1.5	1.65	Any
Non Filter	N	D	E	A
Filter ON	G	J	K	F

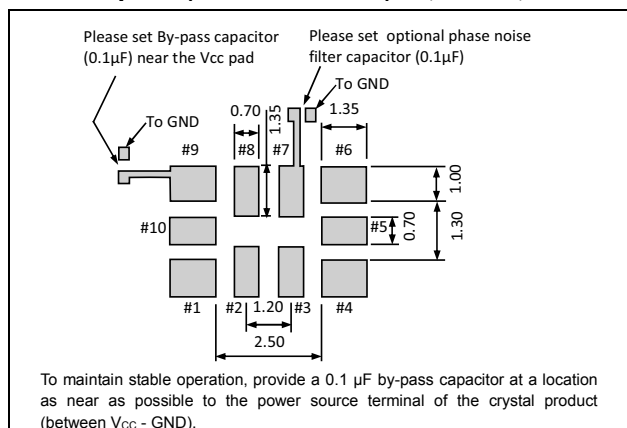
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)





TCXO / VC-TCXO

ULTRA HIGH STABILITY

TG5032CAN

TG5032SAN

- Frequency range : 10 MHz to 50 MHz
- Supply voltage : 3.3 V Typ. / 5.0V Typ.
- Frequency / temperature characteristics : $\pm 0.1 \times 10^{-6}$ Max. *1
- Frequency aging : $\pm 0.02 \times 10^{-6}$ Max./24 hours *2
- External dimensions: 5.0 × 3.2 × 1.45 mm (10 pads)
- Applications : FemtoCell, Small Cells
- Features : Ultra high stability



Product Number (please contact us)
 TG5032CAN :X1G004431xxxxxx
 TG5032SAN :X1G004441xxxxxx



Actual size



Specifications (characteristics)

Item	Symbol	TG5032CAN (CMOS output)		TG5032SAN(Clipped sine wave)		Conditions / Remarks	
		VC-TCXO	TCXO	VC-TCXO	TCXO		
Output frequency range	f _o	10 MHz to 50 MHz				Standard frequency	
Supply voltage	V _{CC}	19.2, 26, 30.72, 40 MHz					
Storage temperature	T _{stg}	C: 3.3 V ±5%, H: 5.0 V ±5% (Supply voltage range :2.7 V to 5.5 V)				Storage as single product	
Operating temperature	T _{use}	-40 °C to +90 °C					
Frequency tolerance	f _{tol}	A: 0 °C to +70 °C				Standard temp. range	
Frequency/temperature Characteristics *1	f _o -T _C	±2.0 × 10 ⁻⁶ Max.				After reflow, +25 °C	
Frequency/load coefficient	f _o -Load	A: ±0.1 ×10 ⁻⁶ Max.				A: 0 to +70 °C (standard spec.) G: -40 to +85 °C (Option spec.)	
		H: ±0.25 ×10 ⁻⁶ Max.					
Frequency/voltage coefficient	f _o -V _{CC}	±0.1 ×10 ⁻⁶ Max. (10 MHz≤f _o ≤40 MHz)				Load ±10 %	
		±0.2 ×10 ⁻⁶ Max. (40 MHz<f _o ≤50 MHz)					
Frequency aging *2	f _{age}	±0.1 ×10 ⁻⁶ Max. (10 MHz≤f _o ≤40 MHz)				V _{CC} ±5%	
		±0.2 ×10 ⁻⁶ Max. (40 MHz<f _o ≤50 MHz)					
Current consumption	I _{CC}	±0.02 ×10 ⁻⁶ Max.				+25 °C, 24h	
		±1.0 ×10 ⁻⁶ Max.				+25 °C, First year	
		5.0 mA Max. / 6.0 mA Max.				10 MHz≤f _o ≤26 MHz (3.3V / 5.0V)	
Input resistance	R _{in}	6.0 mA Max. / 8.0 mA Max.				26 MHz<f _o ≤40 MHz (3.3V / 5.0V)	
		8.0 mA Max. / 10.0 mA Max.				40 MHz<f _o ≤50 MHz (3.3V / 5.0V)	
Frequency control range	f _{cont}	100 kΩ Min.	—	100 kΩ Min.	—	V _C - GND (DC)	
Frequency change polarity	—	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	J,D :V _C =1.5 V ± 1.0 V at V _{CC} =3.3 V K,E: V _C =1.65 V ± 1.0 V at V _{CC} =3.3 V L,H: V _C =2.5 V ± 2.0 V at V _{CC} =5.0 V	
Symmetry	SYM	Positive polarity	—	Positive polarity	—		
Output voltage	V _{OH}	45 % to 55 %				GND level (DC cut)	
Output level	V _{PP}	90 % V _{CC} Min.					
Rise time / Fall time	t _{r/f}	10 % V _{CC} Max.					
Start-up time	t _{str}	—				0.8 V Min.	Peak to Peak
Output load condition	Load	8.0 ns Max.				—	10% V _{CC} to 90 % V _{CC} level,Load:15 pF
		2.0 sec. Max.(Filter: Standard) / 5.0 ms Max.(Non-Filter: Option)				T=0 at 90% V _{CC}	
		15 pF		10 kΩ/10 pF			

* Note : Please contact us for requirements not listed in this specification. *1 Based on frequency at $(f_{max} + f_{min})/2$. *2 After 48 hours operating

Product Name TG5032 C AN 19.200000MHz C A A N D A
 (Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model ② Output (C: CMOS, S: Clipped sine wave)

③ Frequency ④ Supply voltage (C: 3.3 V Typ.)

⑤ Frequency / temperature characteristics (A: $\pm 0.1 \times 10^{-6}$ Max.) ⑥ Operating temperature (A: 0 °C to +70 °C)

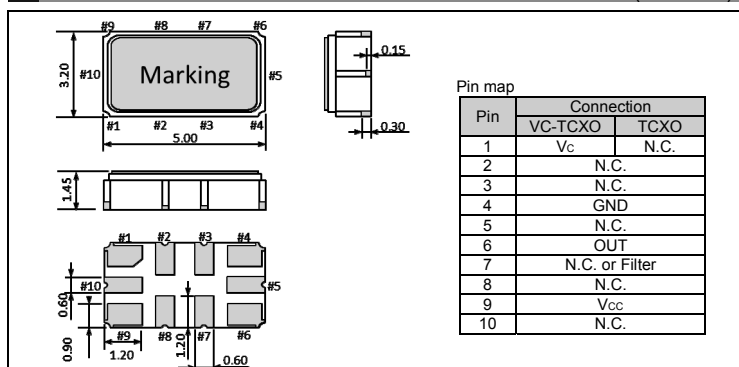
⑦ OE function (N: Non) ⑧ Vc function (Refer to symbol table) ⑨ Internal identification code ("A" is default)

⑧ Vc function (symbol table)

V_c [V]	Non	1.5	1.65	2.5	Any
Filter ON	G	J	K	L	F
Non Filter	N	D	E	H	A

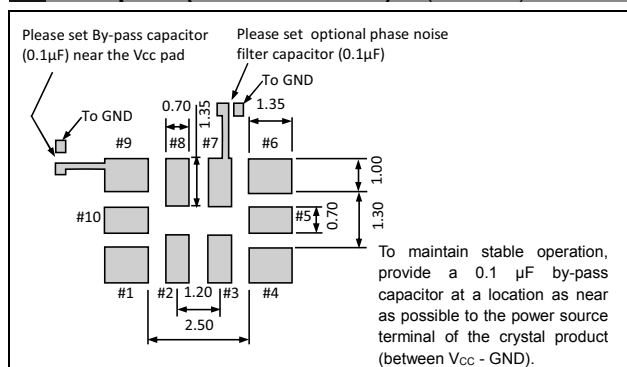
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)





TCXO / VC-TCXO

ULTRA HIGH STABILITY

TG5032CDN

TG5032SDN

- Frequency range : 10 MHz to 50 MHz
- Supply voltage : 3.3 V Typ. / 5.0V Typ.
- Frequency / temperature characteristics : $\pm 0.1 \times 10^{-6}$ Max. *1
- Frequency aging : $\pm 0.02 \times 10^{-6}$ Max./24 hours *2
- External dimensions: 5.0 × 3.2 × 1.45 mm (4 pads)
- Applications : FemtoCell, Small Cells
- Features : Ultra high stability



Product Number (please contact us)
 TG5032CDN : X1G005061xxxxxx
 TG5032SDN : X1G005071xxxxxx



Actual size



Specifications (characteristics)

Item	Symbol	TG5032CDN (CMOS output)		TG5032SDN(Clipped sine wave)		Conditions / Remarks
		VC-TCXO	TCXO	VC-TCXO	TCXO	
Output frequency range	f _o	10 MHz to 50 MHz				Standard frequency
Supply voltage	V _{CC}	19.2, 26, 30.72, 40 MHz				
Storage temperature	T _{stg}	C: 3.3 V ±5%, H: 5.0 V ±5% (Supply voltage range :2.7 V to 5.5 V)				Storage as single product
Operating temperature	T _{use}	-40 °C to +90 °C				
Frequency tolerance	f _{tol}	A: 0 °C to +70 °C				Standard temp. range
Frequency/temperature Characteristics *1	f _o -Tc	±2.0 × 10 ⁻⁶ Max.				After reflow, +25 °C
Frequency/load coefficient	f _o -Load	A: ±0.1 ×10 ⁻⁶ Max.				A: 0 to +70 °C (standard spec.)
		H: ±0.25 ×10 ⁻⁶ Max.				G: -40 to +85 °C (Option spec.)
Frequency/voltage coefficient	f _o -V _{CC}	±0.1 ×10 ⁻⁶ Max. (10 MHz≤f _o ≤40 MHz)				Load ±10 %
		±0.2 ×10 ⁻⁶ Max. (40 MHz<f _o ≤50 MHz)				
Frequency aging *2	f _{age}	±0.1 ×10 ⁻⁶ Max. (10 MHz≤f _o ≤40 MHz)				V _{CC} ±5%
		±0.2 ×10 ⁻⁶ Max. (40 MHz<f _o ≤50 MHz)				
Current consumption	I _{CC}	±0.02 ×10 ⁻⁶ Max.				+25 °C, 24h
		±1.0 ×10 ⁻⁶ Max.				+25 °C, First year
		5.0 mA Max. / 6.0 mA Max.		5.0 mA Max.		10 MHz≤f _o ≤26 MHz (3.3V / 5.0V)
6.0 mA Max. / 8.0 mA Max.		26 MHz<f _o ≤40 MHz (3.3V / 5.0V)				
Input resistance	R _{in}	8.0 mA Max. / 10.0 mA Max.		40 MHz<f _o ≤50 MHz (3.3V / 5.0V)		
Frequency control range	f _{cont}	100 kΩ Min.	—	100 kΩ Min.	—	V _C - GND (DC)
Frequency change polarity	—	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	±5 ×10 ⁻⁶ to ±10 ×10 ⁻⁶	—	D :V _C =1.5 V ± 1.0 V at V _{CC} =3.3 V E: V _C =1.65 V ± 1.0 V at V _{CC} =3.3 V H: V _C =2.5 V ± 2.0 V at V _{CC} =5.0 V
Symmetry	SYM	Positive polarity	—	Positive polarity	—	
Output voltage	V _{OH}	45 % to 55 %		—		GND level (DC cut)
Output level	V _{OL}	90 % V _{CC} Min.		—		
	V _{PP}	10 % V _{CC} Max.		—		
Rise time / Fall time	t _r /t _f	—		0.8 V Min.		Peak to Peak
Start-up time	t _{str}	8.0 ns Max.		—		10% V _{CC} to 90 % V _{CC} level,Load:15 pF
Output load condition	Load	5.0 ms Max.				T=0 at 90% V _{CC}
		15 pF		10 kΩ/10 pF		

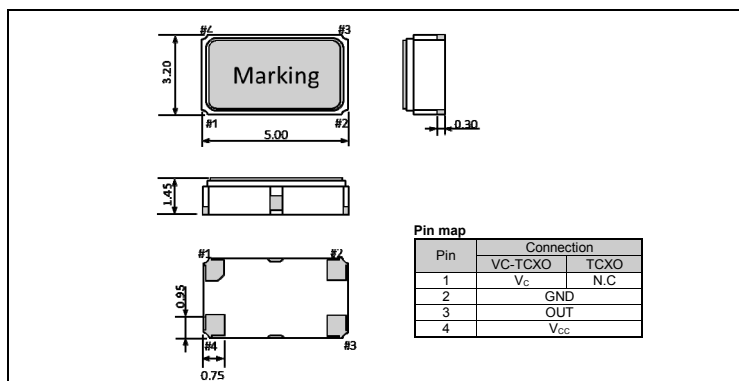
* Note : Please contact us for requirements not listed in this specification. *1 Based on frequency at $(f_{max}+f_{min})/2$. *2 After 48 hours operating

Product Name TG5032 C DN 19.200000MHz C A A N D A
 (Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ①Model ②Output (C: CMOS, S: Clipped sine wave) ③Frequency ④Supply voltage (C: 3.3 V Typ.)
 ⑤Frequency / temperature characteristics (A: $\pm 0.1 \times 10^{-6}$ Max.) ⑥Operating temperature (A: 0 °C to +70 °C)
 ⑦OE function (N: Non) ⑧Vc function (A: Vc =any, D: Vc =1.5 V, E: Vc =1.65 V, H: Vc =2.5 V, N: Non)
 ⑨Internal identification code ("A" is default)

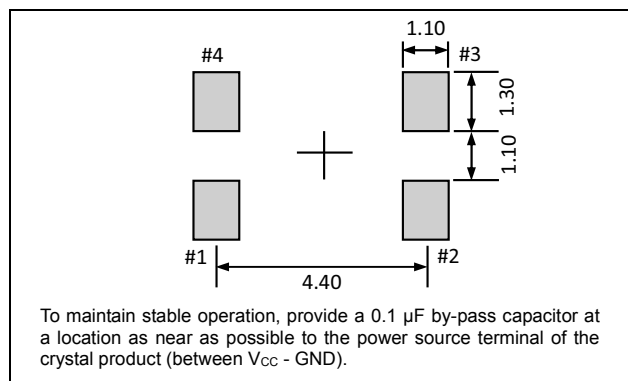
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)



TCXO / VC-TCXO
ULTRA HIGH STABILITY

TG5032CBN
TG5032SBN

- Frequency range : 10 MHz to 50 MHz
- Supply voltage : 3.3 V Typ. / 5.0 V Typ.
- Frequency / temperature characteristics : $\pm 0.28 \times 10^{-6}$ Max. (for Stratum3)
- Frequency aging : $\pm 3.0 \times 10^{-6}$ Max./20years(for Stratum3)
- External dimensions : 5.0 × 3.2 × 1.45 mm (10 pins)
- Applications : Network synchronization, Stratum3, Microwave BTS
- Features : Ultra high stability



Product Number (please contact us)
TG5032CBN : X1G004571xxxxxx
TG5032SBN : X1G004581xxxxxx



Actual size

Specifications (characteristics)

Item	Symbol	TG5032CBN (CMOS)		TG5032SBN (Clipped sine wave)		Conditions / Remarks
		VC-TCXO	TCXO	VC-TCXO	TCXO	
Output frequency range	f _o	10 MHz to 50 MHz 10, 12.8, 15.36, 16.384, 19.44, 20, 24, 24.576, 25, 26, 27, 30.72, 40, 49.152, 50 MHz				Standard frequency
Supply voltage	V _{CC}	C: 3.3 V $\pm 5\%$, H: 5.0 V $\pm 5\%$ (Supply voltage range : 2.7 V to 5.5 V)				
Storage temperature	T _{stg}	-40 °C to +90 °C				Storage as single product
Operating temperature	T _{use}	G: -40 °C to +85 °C				
a) Frequency tolerance	f _{tol}	$\pm 1.0 \times 10^{-6}$ Max. (10 MHz $\leq f_o \leq 40$ MHz) $\pm 0.9 \times 10^{-6}$ Max. (40 MHz $< f_o \leq 50$ MHz)				After reflow, +25 °C
b) Frequency/temperature characteristics	f _o -T _c	B: $\pm 0.28 \times 10^{-6}$ Max. (for Stratum3) H: $\pm 0.25 \times 10^{-6}$ Max. (for Stratum3) : Option				-40 °C to +85 °C
c) Frequency/load coefficient	f _o -Load	$\pm 0.1 \times 10^{-6}$ Max. (10 MHz $\leq f_o \leq 40$ MHz) $\pm 0.2 \times 10^{-6}$ Max. (40 MHz $< f_o \leq 50$ MHz)				Load $\pm 10\%$
d) Frequency/voltage coefficient	f _o -V _{CC}	$\pm 0.1 \times 10^{-6}$ Max. (10 MHz $\leq f_o \leq 40$ MHz) $\pm 0.2 \times 10^{-6}$ Max. (40 MHz $< f_o \leq 50$ MHz)				V _{CC} $\pm 5\%$
e) Frequency aging	f _{age}	$\pm 0.5 \times 10^{-6}$ Max. $\pm 3.0 \times 10^{-6}$ Max. (for Stratum3)				+25 °C, First year +25 °C, 20 years
Holdover stability (Constant temperature)	-	$\pm 0.01 \times 10^{-6}$ Max. (+25 °C, 24 hours) $\pm 0.04 \times 10^{-6}$ Max. (+25 °C, 24 hours)				After 10 days of continuous operation.
Free-run accuracy	-	$\pm 4.6 \times 10^{-6}$ Max.				After 48 hours of continuous operation.
Current consumption	I _{CC}	5.0 mA Max. / 6.0 mA Max. 6.0 mA Max. / 8.0 mA Max. 8.0 mA Max. / 10.0 mA Max.		5.0 mA Max.		This includes Item a), b), c), d) and e) 10 MHz $\leq f_o \leq 26$ MHz (3.3V / 5.0V) 26 MHz $< f_o \leq 40$ MHz (3.3V / 5.0V) 40 MHz $< f_o \leq 50$ MHz (3.3V / 5.0V)
Input resistance	R _{in}	100 k Ω Min.	—	100 k Ω Min.	—	V _C - GND (DC)
Frequency control range	f _{cont}	$\pm 5 \times 10^{-6}$ to $\pm 10 \times 10^{-6}$	—	$\pm 5 \times 10^{-6}$ to $\pm 10 \times 10^{-6}$	—	J,D : V _C =1.5 V ± 1.0 V at V _{CC} =3.3 V K,E : V _C =1.65 V ± 1.0 V at V _{CC} =3.3 V L,H : V _C =2.5 V ± 2.0 V at V _{CC} =5.0 V
Frequency change polarity	—	Positive polarity	—	Positive polarity	—	
Symmetry	SYM	45 % to 55 %	—	—	—	GND level (DC cut)
Output voltage	V _{OH} V _{OL}	90 % V _{CC} Min. 10 % V _{CC} Max.	—	—	—	
Output level	V _{PP}	—	—	0.8 V Min.	—	Peak to Peak
Rise time / Fall time	tr/ff	8.0 ns Max.	—	—	—	10% V _{CC} to 90 % V _{CC} level, Load: 15 pF
Start-up time	t _{str}	2.0 sec. Max. (Filter: Standard) / 5.0 ms Max. (Non-Filter: Option)	—	—	—	T=0 at 90% V _{CC}
Output load condition	Load	15 pF	—	10 k Ω /10 pF	—	
Input voltage	V _{IH} V _{IL}	70% V _{CC} Min. 30% V _{CC} Max.	—	—	—	OE terminal(Enable voltage) OE terminal(Disable voltage)

* Note : Please contact us for requirements not listed in this specification.

Product Name
(Standard form)

TG5032 C BN 30.720000MHz C B G H N A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①Model ②Output (C: CMOS, S: Clipped sine wave)

③Frequency ④Supply voltage (C: 3.3 V Typ.)

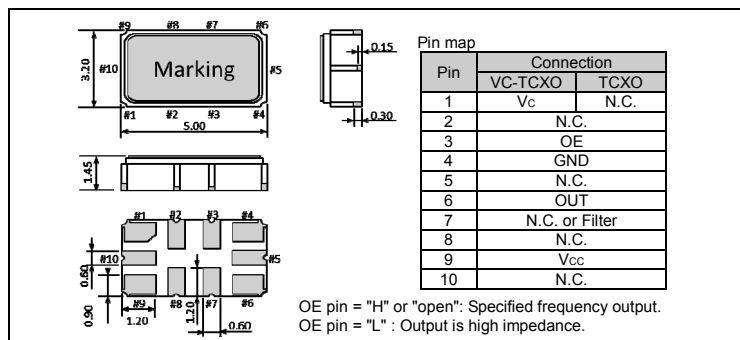
⑤Frequency/temperature characteristics (B: $\pm 0.28 \times 10^{-6}$ Max.) ⑥Operating temperature (G: -40 °C to +85 °C)

⑦OE function (H: Active High) ⑧V_C function (Refer to symbol table) ⑨Internal identification code ("A" is default)

⑧V _C function (symbol table)					
V _C [V]	Non	1.5	1.65	2.5	Any
Filter ON	G	J	K	L	F
Non Filter	N	D	E	H	A

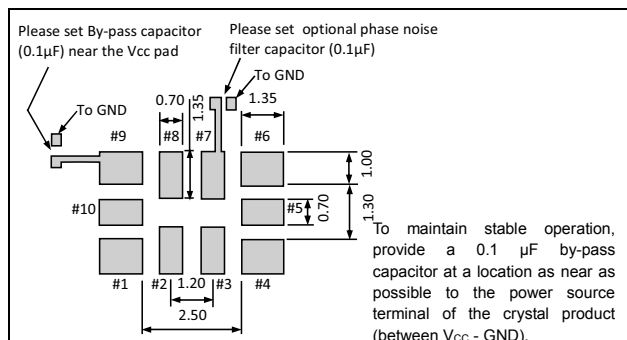
External dimensions

(Unit : mm)



Footprint (Recommended)

(Unit : mm)



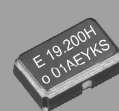
**TCXO / VC-TCXO
ULTRA HIGH STABILITY**

**TG5032CCN
TG5032SCN**

- Frequency range : 10 MHz to 50 MHz
- Supply voltage : 3.3 V Typ. / 5.0 V Typ.
- Frequency / temperature characteristics : $\pm 0.28 \times 10^{-6}$ Max. (for Stratum3)
- Frequency aging : $\pm 3.0 \times 10^{-6}$ Max./20years(for Stratum3)
- External dimensions : 5.0 × 3.2 × 1.45 mm (4 pins)
- Applications : Network synchronization, Stratum3, Microwave BTS
- Features : Ultra high stability



Product Number (please contact us)
TG5032CCN : X1G005251xxxxxx
TG5032SCN : X1G005261xxxxxx



Actual size

Specifications (characteristics)

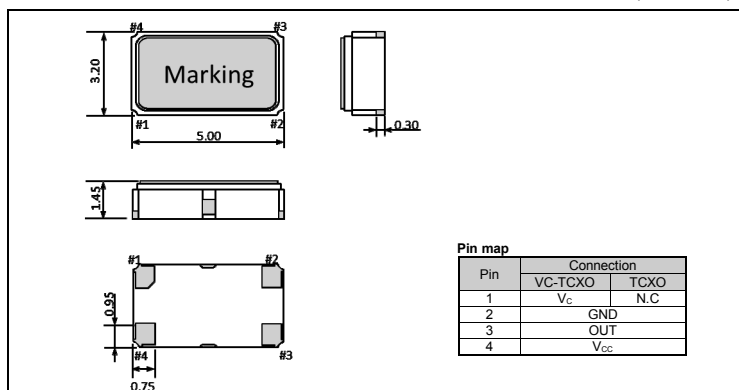
Item	Symbol	TG5032CCN (CMOS)		TG5032SCN (Clipped sine wave)		Conditions / Remarks
		VC-TCXO	TCXO	VC-TCXO	TCXO	
Output frequency range	f _o	10 MHz to 50 MHz 10, 12.8, 15.36, 16.384, 19.44, 20, 24, 24.576, 25, 26, 27, 30.72, 40, 49.152, 50 MHz				Standard frequency
Supply voltage	V _{CC}	C: 3.3 V $\pm 5\%$, H: 5.0 V $\pm 5\%$ (Supply voltage range :2.7 V to 5.5 V)				
Storage temperature	T _{stg}	-40 °C to +90 °C				Storage as single product
Operating temperature	T _{use}	G: -40 °C to +85 °C				
a) Frequency tolerance	f _{tol}	$\pm 1.0 \times 10^{-6}$ Max. (10 MHz $\leq f_o \leq 40$ MHz) $\pm 0.9 \times 10^{-6}$ Max. (40 MHz $< f_o \leq 50$ MHz)				After reflow, +25 °C
b) Frequency/temperature characteristics	f _o -T _c	B: $\pm 0.28 \times 10^{-6}$ Max.(for Stratum3) H: $\pm 0.25 \times 10^{-6}$ Max. (for Stratum3) : Option				-40 °C to +85 °C
c) Frequency/load coefficient	f _o -Load	$\pm 0.1 \times 10^{-6}$ Max. (10 MHz $\leq f_o \leq 40$ MHz) $\pm 0.2 \times 10^{-6}$ Max. (40 MHz $< f_o \leq 50$ MHz)				Load $\pm 10\%$
d) Frequency/voltage coefficient	f _o -V _{CC}	$\pm 0.1 \times 10^{-6}$ Max. (10 MHz $\leq f_o \leq 40$ MHz) $\pm 0.2 \times 10^{-6}$ Max. (40 MHz $< f_o \leq 50$ MHz)				V _{CC} $\pm 5\%$
e) Frequency aging	f _{age}	$\pm 0.5 \times 10^{-6}$ Max. $\pm 3.0 \times 10^{-6}$ Max. (for Stratum3)				+25 °C, First year +25 °C, 20 years
Holdover stability (Constant temperature)	-	$\pm 0.01 \times 10^{-6}$ Max. (+25 °C, 24 hours) $\pm 0.04 \times 10^{-6}$ Max. (+25 °C, 24 hours)				After 10 days of continuous operation.
Free-run accuracy	-	$\pm 4.6 \times 10^{-6}$ Max.				After 48 hours of continuous operation.
Current consumption	I _{CC}	5.0 mA Max. / 6.0 mA Max. 6.0 mA Max. / 8.0 mA Max. 8.0 mA Max. / 10.0 mA Max.		5.0 mA Max.		This includes Item a),b),c),d) and e). 10 MHz $\leq f_o \leq 26$ MHz (3.3V / 5.0V) 26 MHz $< f_o \leq 40$ MHz (3.3V / 5.0V) 40 MHz $< f_o \leq 50$ MHz (3.3V / 5.0V)
Input resistance	R _{in}	100 k Ω Min.	—	100 k Ω Min.	—	V _C - GND (DC)
Frequency control range	f _{cont}	$\pm 5 \times 10^{-6}$ to $\pm 10 \times 10^{-6}$	—	$\pm 5 \times 10^{-6}$ to $\pm 10 \times 10^{-6}$	—	D : V _C =1.5 V $\pm$ 1.0 V at V _{CC} =3.3 V E: V _C =1.65 V $\pm$ 1.0 V at V _{CC} =3.3 V H: V _C =2.5 V $\pm$ 2.0 V at V _{CC} =5.0 V
Frequency change polarity	—	Positive polarity	—	Positive polarity	—	
Symmetry	SYM	45 % to 55 %	—	—	—	GND level (DC cut)
Output voltage	V _{OH}	90 % V _{CC} Min.	—	—	—	
	V _{OL}	10 % V _{CC} Max.	—	—	—	
Output level	V _{PP}	—	—	0.8 V Min.	—	Peak to Peak
Rise time / Fall time	tr/tf	8.0 ns Max.	—	—	—	10% V _{CC} to 90 % V _{CC} level, Load:15 pF
Start-up time	t _{str}	—	5.0 ms Max.	—	—	T=0 at 90% V _{CC}
Output load condition	Load	15 pF	—	10 k Ω /10 pF	—	

* Note : Please contact us for requirements not listed in this specification.

Product Name **TG5032 C CN 30.720000MHz C B G N N A**
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
①Model ②Output (C: CMOS, S: Clipped sine wave) ③Frequency ④Supply voltage (C: 3.3 V Typ.)
⑤Frequency/temperature characteristics (B: $\pm 0.28 \times 10^{-6}$ Max.) ⑥Operating temperature (G: -40 °C to +85 °C)
⑦OE function (N: Non) ⑧V_C function (A: V_C=any, D: V_C=1.5 V, E: V_C=1.65 V, H: V_C=2.5 V, N: Non)
⑨Internal identification code ("A" is default)

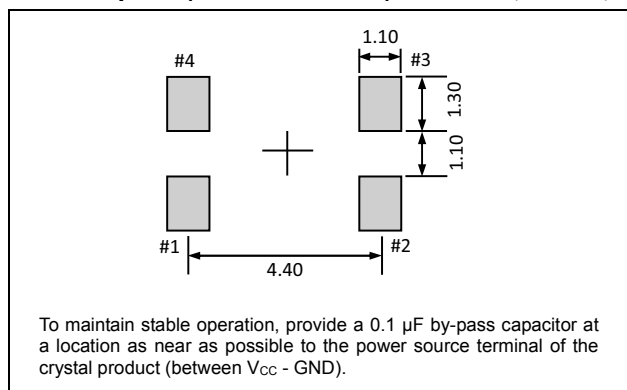
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)



TCXO/VC-TCXO
ULTRA HIGH STABILITY

TG-5500CA / TG-5501CA

- Frequency range : 10 MHz to 50 MHz
- Supply voltage : 3.3 V Typ. / 5.0V Typ.
- Frequency / temperature characteristics : $\pm 0.28 \times 10^{-6}$ Max. (for Stratum3)
- Frequency aging : $\pm 3.0 \times 10^{-6}$ Max./20years (for Stratum3)
- External dimensions: 7.0 × 5.0 × 1.5 mm (10 pads or 4pads)
- Applications : Network system, Stratum3, Microwave BTS
- Features : Ultra high stability



Product Number (Please contact us)
TG-5500CA :X1G003561xxxxxx
TG-5501CA :X1G003901xxxxxx



TG-5500CA
(10 pads)



TG-5501CA
(4 pads)

Actual size

TG-5500CA

TG-5501CA

Specifications (characteristics)

Item	Symbol	CMOS		Clipped sine wave		Conditions / Remarks
		VC-TCXO	TCXO	VC-TCXO	TCXO	
Output frequency range	f _o	10 MHz to 50 MHz 10, 12.8, 15.36, 16.384, 19.44, 20, 24, 24.576, 25, 26, 27, 30.72, 40, 49.152, 50 MHz				Standard frequency
Supply voltage	V _{CC}	3.3 V± 5%, 5.0 V± 5% (Supply voltage range :2.7 V to 5.5 V)				
Storage temperature	T _{stg}	-40 °C to +90 °C				Storage as single product.
Operating temperature	T _{use}	-40 °C to +85 °C				
a) Frequency tolerance	f _{tol}	±1.0 ×10 ⁻⁶ Max.				After reflow, +25 °C
a) Frequency/temperature characteristics	f ₀ -T _C	±0.28 × 10 ⁻⁶ Max.(12.8 MHz≤f _o ≤50 MHz) ±0.25 × 10 ⁻⁶ Max.(12.8 MHz≤f _o ≤50 MHz): Option ±1.0 × 10 ⁻⁶ Max.(10 MHz≤f _o <12.8 MHz)				-40 °C to +85 °C
a) Frequency/load coefficient	f ₀ -Load	±0.1 × 10 ⁻⁶ Max.				Load ±10 %
a) Frequency/voltage coefficient	f ₀ -V _{CC}	±0.1 ×10 ⁻⁶ Max.				V _{CC} ±5%
a) Frequency aging	f _{age}	±0.5 ×10 ⁻⁶ Max.				+25 °C , First year
		±3.0 ×10 ⁻⁶ Max. (for Stratum3)				+25 °C , 20 years
Holdover stability (Constant temperature)	-	±0.01 × 10 ⁻⁶ Max.(+25 °C , 24 hours)				After 10 days of continuous operation.
		±0.04 × 10 ⁻⁶ Max.(+25 °C , 24 hours)				After 48 hours of continuous operation.
Free-run accuracy	-	±4.6 × 10 ⁻⁶ Max. (12.8 MHz≤f _o ≤50 MHz)				This includes Item a).
Current consumption	I _{CC}	5.0 mA Max. / 6.0 mA Max.		5.0 mA Max.		10 MHz≤f _o ≤26 MHz (3.3V / 5.0V)
		6.0 mA Max. / 8.0 mA Max.				26 MHz<f _o ≤40 MHz (3.3V / 5.0V)
		8.0 mA Max. / 10.0 mA Max.				40 MHz<f _o ≤50 MHz (3.3V / 5.0V)
Input resistance	R _{in}	100 kΩ Min.	—	100 kΩ Min.	—	V _C - GND (DC)
Frequency control range	f _{cont}	±5.0 × 10 ⁻⁶ to ±12.0 ×10 ⁻⁶	—	±5.0 × 10 ⁻⁶ to ±12.0 ×10 ⁻⁶	—	V _C =1.65 V ± 1.65 V at V _{CC} =3.3V V _C =2.5 V ± 2.0 V at V _{CC} =5.0V
Frequency change polarity	—	Positive polarity	—	Positive polarity	—	
Symmetry	SYM	45 % to 55 %		—		GND level (DC cut)
Output voltage	V _{OH}	90 % V _{CC} Min.		—		
	V _{OL}	10 % V _{CC} Max.		—		
Output level	V _{PP}	—		0.8 V Min.		Peak to Peak
Rise time / Fall time	tr/tf	8.0 ns Max.		—		10% V _{CC} to 90 % V _{CC} level,Load:15 pF
Start-up time	t _{str}	2.0 sec. Max.				T=0 at 90% V _{CC}
Output load condition	Load	15 pF		10 kΩ/10 pF		
Input voltage	V _{IH}	70% V _{CC} Min.				OE terminal(Enable voltage)
	V _{IL}	30% V _{CC} Max.				OE terminal(Disable voltage)

* Note : Please contact us for requirements not listed in this specification.

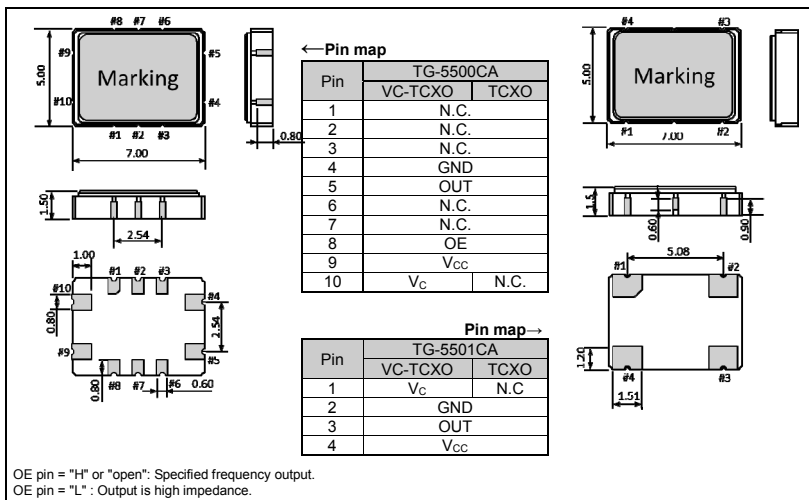
Product Name
(Standard form)

TG-5500 CA 30.720000MHz ***
① ② ③ ④

①Model ②Package type ③Frequency ④Spec segment (Please contact us)

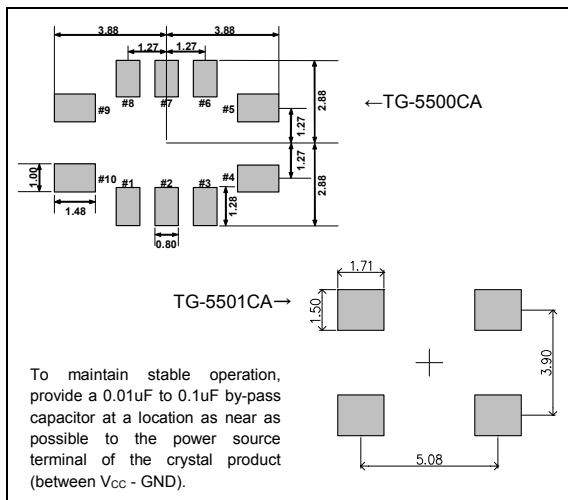
External dimensions

(Unit:mm)



Footprint (Recommended)

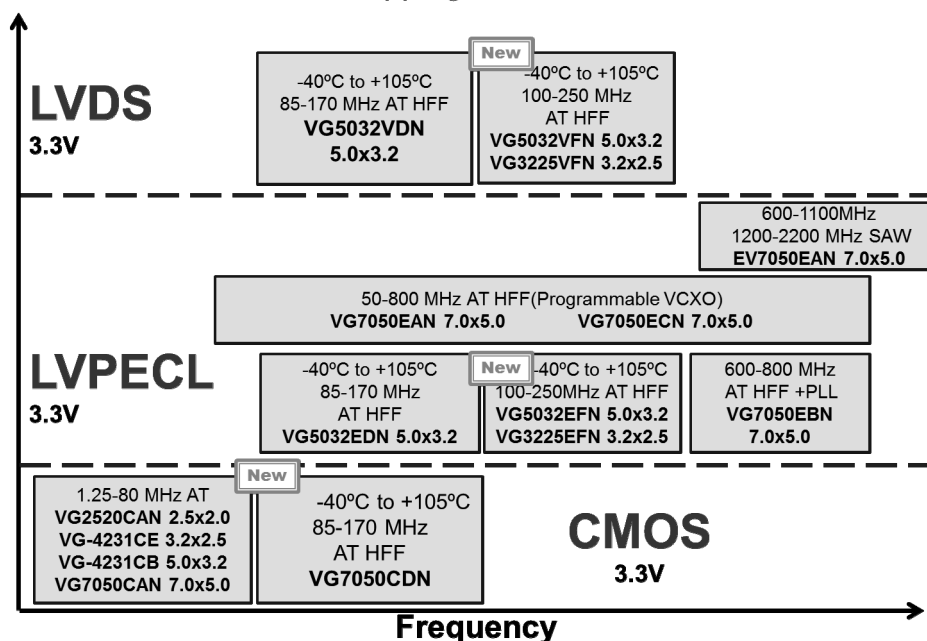
(Unit:mm)





VCXO / VCSO

VCXO/VCSO Product Mapping



► Output : CMOS

Output: CMOS															
P	Model		Actual size (mm)	Nominal frequency range (MHz)				Frequency tolerance (× 10 ⁻⁶)	Operating temperature	Frequency control range (× 10 ⁻⁶)	Supply voltage	Current consumption (Max.)	Output Load condition	Frequency Aging (/year Max.)	Output control
				1	100	500	800								
26	VG7050CDN	CJGHBA		7.0×5.0×1.6 (t: Typ.)	85 MHz	170MHz	±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.165 V	30 mA	15 pF	Include Frequency tolerance (10 years)	OE	
		CJHHBA	-40 to +105 °C												
27	VG2520CAN	CJGNBB		2.5×2.0×0.7 (t: Typ.)	30.72 MHz		±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.165 V	15 mA	15 pF	Include Frequency tolerance (10 years)	ST	
27	VG7050CAN	CJGNBB		7.0×5.0×1.4 (t: Typ.)	30.72 MHz		±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.165 V	15 mA	15 pF	Include Frequency tolerance (10 years)	ST	
28	VG-4231CE	CQEM		3.2×2.5×1.05 (t: Typ.)	3 MHz	60 MHz	±30	-20 to +70 °C	±120	1.8 V ±0.2 V	1.2 mA	15 pF	±5 × 10 ⁻⁶ (5 years)	—	
		±37					-40 to +85 °C								
		CSBM					±30	-20 to +70 °C	±140	2.8 V ±0.2 V	6.2 mA				
		PSBM					±37	-40 to +85 °C							
		CSCM					±30	-20 to +70 °C							
		PSCM					±37	-40 to +85 °C							
29	VG-4231CB	KGCZ		5.0×3.2×1.2 (t: Typ.)	1 MHz	81 MHz	±50	0 to +70 °C	±50 (APR)	3.3 V ±0.165 V	10 mA	15 pF	Include Frequency tolerance (20 years)	OE	
		JGCZ						-20 to +70 °C							
		GGCZ						-40 to +85 °C							
30	VG-4231CA	DRC		7.0×5.0×1.4 (t: Typ.)	1 MHz	60 MHz	±35	-20 to +70 °C	±130	3.3 V ±0.3 V	10 mA	15 pF	±10 × 10 ⁻⁶ (10 years)	OE	
		GRC					-40 to +85 °C								
		DRH					±35	-20 to +70 °C	±130	5.0 V ±0.5 V	20 mA				
		GRH					±50	-40 to +85 °C							
	VG-4232CA	KGC	80.001 MHz	80 MHz	±50	0 to +70 °C	±50 (APR)	3.3 V ±0.165 V	35 mA	15 pF	Include Frequency tolerance (10 years)	OE			
		JGC				-20 to +70 °C									
GGC		-40 to +85 °C													
31	VG-4501CA	KGCT		7.0×5.0×1.6 (t: Typ.)		80 MHz	170 MHz	±50	0 to +70 °C	±50 (APR)	3.3 V ±0.165 V	35 mA	15 pF	Include Frequency tolerance (20 years)	OE (Active High)
		JGCT							-20 to +70 °C						
		GGCT							-40 to +85 °C						
		KHCT							0 to +70 °C						
	VG-4502CA	JHCT				80 MHz	125 MHz	±50	-20 to +70 °C	±100 (APR)*1	±100 (APR)	25 mA			
		GHCT							-40 to +85 °C						
		KHCT							0 to +70 °C						
		JHCT							-20 to +70 °C						

*1 125MHz<f0



Output : LV-PECL

P	Model		Actual size (mm)	Nominal frequency range (MHz)				Frequency tolerance (× 10 ⁻⁶)	Operating temperature	Frequency control range (× 10 ⁻⁶)	Supply voltage	Current consumption (Max.)	Output Load condition	Frequency Aging (/year Max.)	Output control
				1	100	500	800								
32	VG3225EFN VG5032EFN	CJGHBA	 3.2×2.5×1.05 (t: Typ.)					±50	-40 to +85 °C	±50 ~170MHz ±20 ~250MHz	3.3 V ±0.165 V	60 mA	LV-PECL	Include Frequency tolerance (10 years)	OE (Active High)
		CJHHBA	 5.0×3.2×1.3 (t: Typ.)		100 MHz	250MHz			-40 to +105 °C						
34	VG5032EDN	CJGHBA	 5.0×3.2×1.3 (t: Typ.)					±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.165 V	60 mA	LV-PECL	Include Frequency tolerance (20 years)	OE
		CJHHBA	 5.0×3.2×1.3 (t: Typ.)		85 MHz	170 MHz			-40 to +105 °C						
35	VG7050EBN	CJGHBA	 7.0×5.0×1.5 (t: Typ.)					±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.33 V 2.5 V ±0.125 V	90 mA	LV-PECL	Include Frequency tolerance (10 years)	OE (Active High)
		DJGHBA													
		CJGHCA													
		DJGHCA													
Web Site	VG-4513CA VG-4513CB	KFC	 7.0×5.0×1.6 (t: Typ.)					±50 ±70	0 to +70 °C	±30 (APR)	3.3 V ±0.165 V	65 mA	LV-PECL	Include Frequency tolerance (10 years)	OE (Active High or Low)
		JFC							-20 to +70 °C						
		GHC							-40 to +85 °C						
		KGC							0 to +70 °C						
		JGC							-20 to +70 °C						
		GGC							-40 to +85 °C						
		KHC							0 to +70 °C						
		JHC							-20 to +70 °C						
Web Site	VG-4512CA	GHC	 7.0×5.0×1.6 (t: Typ.)					±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.165 V	60 mA	LV-PECL	Include Frequency tolerance (20 years)	OE (Active High or Low)
		KGC							0 to +70 °C						
		JGC							-20 to +70 °C						
		GGC							-40 to +85 °C						
		KHC							0 to +70 °C						
		JHC							-20 to +70 °C						
		GHC							-40 to +85 °C						
		KGC							0 to +70 °C						
36 to 37	EV7050EAN (VCSO)	 7.0×5.0×1.6 (t: Typ.)						±100 ±120	-10 to +85 °C	±50 (APR) ±30 (APR)	3.3 V ±0.165 V	120 mA	LV-PECL	Include Frequency tolerance (10 years)	OE
									-40 to +85 °C						
38 to 39	VG7050EAN (Programmable 1 setup Freq.)	CJGHPF	 7.0×5.0×1.5 (t: Typ.)					±50	-40 to +85 °C	±0 to ±180 (APR)	3.3 V ±0.165 V 2.5 V ±0.125 V	90 mA	LV-PECL	Include Frequency tolerance (10 years)	OE (Active High or Low)
		CJGHPZ													
		CJGLPF													
		CJGLPZ													
		DJGHPF													
		DJGHPZ													
		DJGLPF													
38 to 39	VG7050ECN (Programmable 4 setup Freq.)	CJGHPF	 7.0×5.0×1.5 (t: Typ.)					±50	-40 to +85 °C	±0 to ±180 (APR)	3.3 V ±0.165 V 2.5 V ±0.125 V	90 mA	LV-PECL	Include Frequency tolerance (10 years)	OE (Active High or Low)
		CJGHPZ													
		CJGLPF													
		CJGLPZ													
		DJGHPF													
		DJGHPZ													
		DJGLPF													

► Output : LVDS

P	Model		Actual size (mm)	Nominal frequency range (MHz)				Frequency tolerance (× 10 ⁻⁶)	Operating temperature	Frequency control range (× 10 ⁻⁶)	Supply voltage	Current consumption (Max.)	Output Load condition	Frequency Aging (/year Max.)	Output control
				1	100	500	800								
33	VG3225VFN VG5032VFN	CJGHBA	 3.2×2.5×1.05 (t: Typ.)					±50	-40 to +85 °C	±50 ~170MHz ±20 ~250MHz	3.3 V ±0.165 V	25 mA	LVDS	Include Frequency tolerance (10 years)	OE (Active High)
		GJHHBA	 5.0×3.2×1.3 (t: Typ.)		100 MHz	250MHz			-40 to +105 °C						
34	VG5032VDN	CJGHBA	 5.0×3.2×1.3 (t: Typ.)					±50	-40 to +85 °C	±50 (APR)	3.3 V ±0.165 V	30 mA	LVDS	Include Frequency tolerance (10 years)	OE
		CJHHBA	 5.0×3.2×1.3 (t: Typ.)		85 MHz	170 MHz			-40 to +105 °C						

VOLTAGE -CONTROLLED CRYSTAL OSCILLATOR (VCXO)

VG7050CDN

NEW

- Frequency range : 85 MHz to 170 MHz
- Supply voltage : 3.3 V
- Absolute pull range : $\pm 50 \times 10^{-6}$ min.
- External dimensions : $7.0 \times 5.0 \times 1.6$ mm (t:Typ.)
- Operation temperature : $+85^\circ\text{C} / +105^\circ\text{C}$
- Function : Output enable(OE)
- Output : CMOS



Product Number (please contact us)
X1G004861xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Remarks
Output frequency range	f_o	85 MHz to 170 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	V_{CC}	$3.3 \text{ V} \pm 0.165 \text{ V}$	
Control voltage	V_C	$1.65 \text{ V} \pm 1.65 \text{ V}$	
Storage temperature range	T_{stg}	-55°C to $+125^\circ\text{C}$	Store as bare product after unpacking
Operating temperature range	T_{use}	G: -40°C to $+85^\circ\text{C}$, H: -40°C to $+105^\circ\text{C}$	
Frequency tolerance	f_{tol}	$\pm 50 \times 10^{-6}$ Max.	Includes initial tolerance, temperature change, V_{CC} change and 10years aging at $+25^\circ\text{C}$. At $V_C=1.65\text{V}$, reference to f_o
Current consumption	I_{CC}	30 mA Max.	$CL=15 \text{ pF}$
Absolute pull range*1	APR	$\pm 50 \times 10^{-6}$ Min.	$V_C = 1.65 \text{ V} \pm 1.65 \text{ V}$
Input resistance	R_{in}	10 M Ω Min.	DC level
Frequency change polarity	—	Positive slope	$V_C = 0$ to 3.3 V
Symmetry	SYM	45 % to 55 %	50 % V_{CC} level
High output voltage	V_{OH}	$V_{CC} - 0.4 \text{ V}$ Min.	
Low output voltage	V_{OL}	0.4 V Max.	
Output load condition (CMOS)	L_{CMOS}	15 pF Max.	
Output enable / disable input voltage	V_{IH}	70 % V_{CC} Min.	V_{IH} or OPEN : Enable
	V_{IL}	30 % V_{CC} Max.	V_{IL} or GND : Disable
Rise time / Fall time	t_r / t_f	2 ns Max.	20 % V_{CC} to 80 % V_{CC} level
Start-up time	t_{str}	10 ms Max.	Time at minimum supply voltage to be 0 s

*1 Absolute pull range = Frequency control range- (Frequency tolerance + 20 years Aging + Free fall + Vibration)

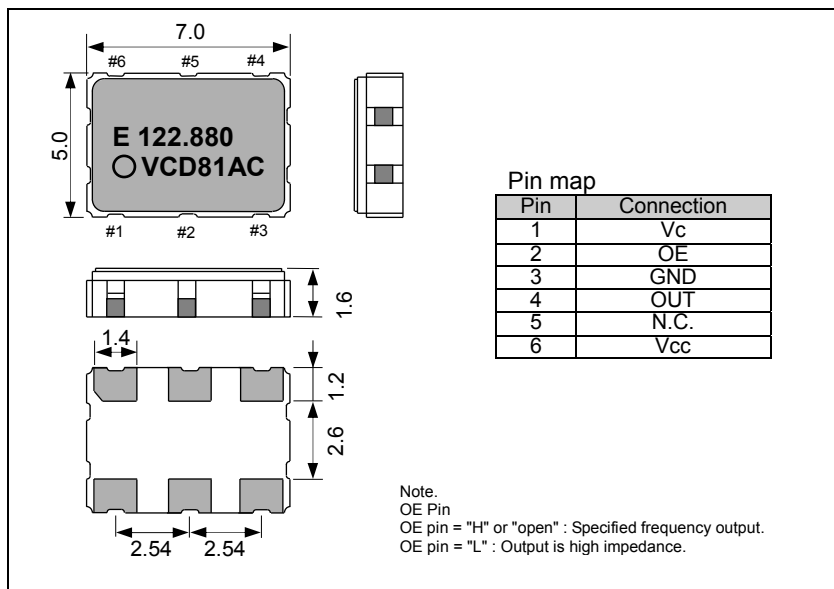
* Please keep V_C pin open or ground while powering up V_{CC} .

Product name VG7050 CDN 122.880000 MHz C J G H B A
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ① Model ②Output (C: CMOS) ③Frequency ④Supply voltage (C: 3.3 V Typ)
⑤Frequency tolerance (J: $\pm 50 \times 10^{-6}$ Max.) ⑥Operating temperature (G: -40 to $+85^\circ\text{C}$, H: -40 to $+105^\circ\text{C}$)
⑦OE Function (H: Active High) ⑧Absolute Pull Range (B: $\pm 50 \times 10^{-6}$ Min.) ⑨Output Standby Type (A: High-Z)

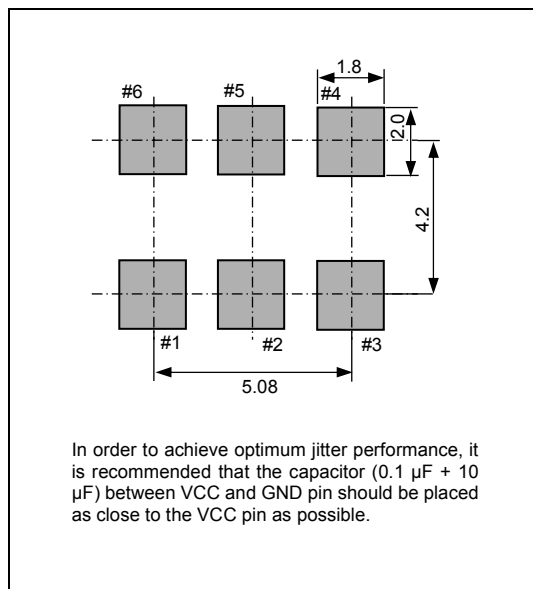
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)





VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT : CMOS

VG2520CAN

VG7050CAN

- Frequency range : 30.72 MHz
- Supply voltage : 3.3 V
- Absolute pull range : $\pm 50 \times 10^{-6}$ Min.
- Output : CMOS



Product Number (please contact us)
 VG2520CAN: X1G004401xxxxxx
 VG7050CAN: X1G004531xxxxxx



VG2520CAN
(2.5 × 2.0 × 0.7 mm)



VG7050CAN
(7.0 × 5.0 × 1.4 mm)

Actual size

VG2520CAN

VG7050CAN

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	30.72 MHz	Please contact us about available frequencies. (1.25 MHz to 80 MHz)
Supply voltage	V _{cc}	3.3 V ± 0.165 V	
Storage temperature range	T _{stg}	-40 °C to +125 °C	Storage as single product
Operating temperature range	T _{use}	-40 °C to +85 °C	
Current consumption	I _{cc}	15 mA Max.	CL=15pF
Frequency tolerance *1	f _{tol}	$\pm 50 \times 10^{-6}$ Max.	
Frequency control range	F _{cont}	$\pm 100 \times 10^{-6}$ Min.	V _c = 1.65 V ± 1.65 V
Absolute pull range *2	APR	$\pm 50 \times 10^{-6}$ Min.	V _c = 1.65 V ± 1.65 V
Modulation band width	BW	10 kHz Min.	± 3 dB (refer to response at 1kHz)
Input resistance	R _{in}	10 M Ω Min.	DC level
Frequency change polarity	—	Positive	V _c = 1.65 V ± 1.65 V
Symmetry	SYM	45 % to 55 %	50 % V _{cc} level
Output voltage	V _{OH}	90 % V _{cc} Min.	
	V _{OL}	10 % V _{cc} Max.	
Output load condition	L _{CMOS}	15 pF Max.	CMOS
Rise/Fall times	Tr/Tf	5 ns Max.	at 20 % to 80 % V _{cc} level
Start-up time	T _{str}	10ms Max.	t=0 at 90 % V _{cc}

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, and aging (+25°C, 10 years).

*2 Absolute pull range = Frequency control range - Frequency tolerance

Please keep V_c pin open or ground while powering up V_{cc}.

Product name
(Standard form)

VG2520 CAN 30.720000 MHz C J G N B B

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model ② Output (C: CMOS) ③ Frequency

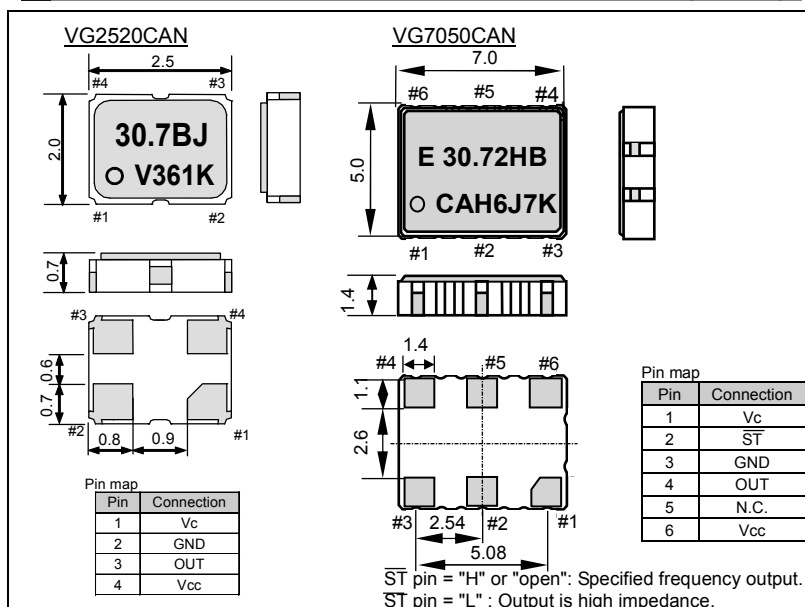
④ Supply voltage (C: 3.3 V Typ.) ⑤ Frequency tolerance (J: $\pm 50 \times 10^{-6}$ Max.)

⑥ Operating temperature (G: -40 to +85°C) ⑦ OE Function (N: Non, S: Standby)

⑧ Absolute Pull Range (B: $\pm 50 \times 10^{-6}$ Min.) ⑨ Internal identification code

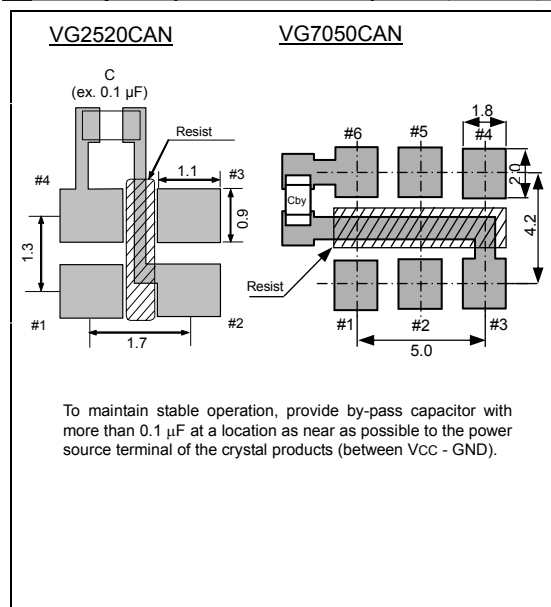
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)



VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO) OUTPUT : CMOS

VG-4231CE

- Frequency range : 3 MHz to 60 MHz
- Supply voltage : 3.3 V (PSCM / CSCM)
2.8 V (PSBM / CSBM)
1.8 V (PQEM / CQEM)
- Frequency control range : $\pm 140 \times 10^{-6}$ (*SCM / *SBM)
 $\pm 120 \times 10^{-6}$ (*QEM)
- Low current consumption : 1.0 mA Typ. (27 MHz, 3.3 V)
- External dimensions : $3.2 \times 2.5 \times 1.05$ mm



Product Number (please contact us)
Q3614CE00xxx00



Actual size

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks
		PSCM / CSCM	PSBM / CSBM	PQEM / CQEM	
Output frequency range	f _o	3 MHz to 60 MHz		24 MHz to 30 MHz	Please contact us about available frequencies.
Supply voltage	V _{cc}	3.3 V ±0.3 V	2.8 V ±0.2 V	1.8 V ±0.2 V	
Storage temperature	T _{stg}	-40 °C to +125 °C			Storage as single product.
Operating temperature	T _{use}	As per below table			
Frequency tolerance	f _{tol}	As per below table			C : V _c =1.65 V / B : V _c =1.40 V / E : V _c =0.90 V
Current consumption	I _{cc}	7 mA Max.	6.2 mA Max.	1.2 mA Max.	
Frequency control range	f _{cont}	S:± 140 × 10 ⁻⁶ Min.		Q:± 120 × 10 ⁻⁶ Min.	No load condition V _c = 1/2 V _{cc} ± 1/2 V _{cc}
Modulation characteristics	BW	15 kHz Min.			± 3 dB (at 1 kHz)
Input resistance	R _{in}	M : 5 MΩ Min.			DC level
Frequency change polarity	—	Positive polarity			V _c =0 V to V _{cc}
Symmetry	SYM	40 % to 60 %			CMOS load:50 % V _{cc} level
Output voltage	V _{OH}	V _{cc} -0.4 V Min.			I _{OH} = -3.0 mA
	V _{OL}	0.4 V Max.			I _{OL} = 3.0 mA
Output load condition (CMOS)	L _{CMOS}	15 pF Max.			CMOS load
Rise time and Fall time	t _r / t _f	4 ns Max.		6 ns Max.	CMOS load: 20 % V _{cc} to 80 % V _{cc} level Time at 90 % V _{cc} to be 0 s
Start-up time	t _{str}	5 ms Max.			
Frequency aging	f _{aging}	± 5 × 10 ⁻⁶ Max.			+25 °C, 5 years

Please keep V_c pin open or ground while powering up V_{cc}.

Product Name VG-4231 CE 27.000000MHz C S C - M (⑥⑦:SE, QC, QB are not available)
(Standard form) ① ② ③ ④⑤⑥ ⑦

①Model ②Package type ③Frequency ④Frequency tolerance / Operating temperature
⑤Frequency control range ⑥Supply voltage ⑦Input resistance (M: 5 M Ω Min.)

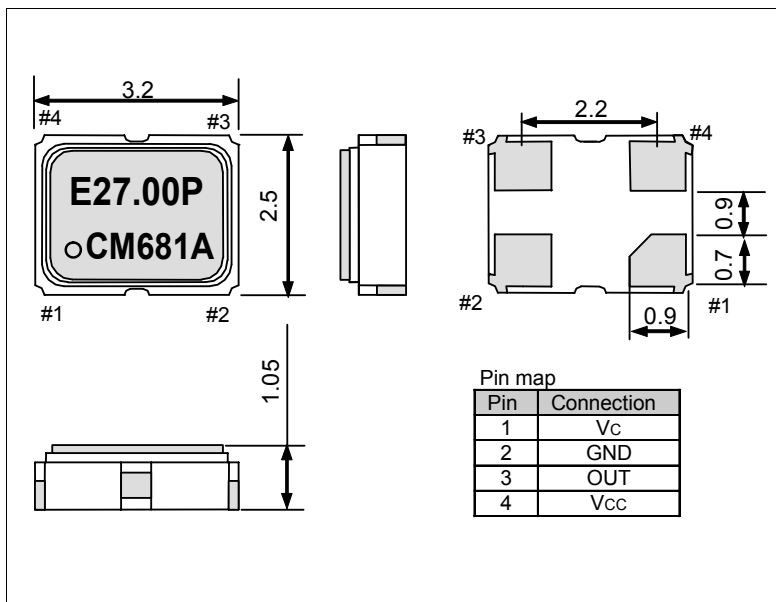
④⑤	④Frequency tolerance / Operating temperature	⑤Frequency control range (Absolute pull range*)
CS	C $\pm 30 \times 10^{-6}$ / -20 to +70 °C	S $\pm 140 \times 10^{-6}$ Min. ($\pm 100 \times 10^{-6}$ Min.)
PS	P $\pm 37 \times 10^{-6}$ / -40 to +85 °C	S $\pm 140 \times 10^{-6}$ Min. ($\pm 95 \times 10^{-6}$ Min.)
CQ	C $\pm 30 \times 10^{-6}$ / -20 to +70 °C	Q $\pm 120 \times 10^{-6}$ Min. ($\pm 80 \times 10^{-6}$ Min.)
PQ	P $\pm 37 \times 10^{-6}$ / -40 to +85 °C	Q $\pm 120 \times 10^{-6}$ Min. ($\pm 75 \times 10^{-6}$ Min.)

⑥Supply voltage	
E	1.8 V Typ.
B	2.8 V Typ.
C	3.3 V Typ.

* Absolute pull range = Frequency control range- (Frequency tolerance + 5 years Aging + Free fall + Vibration)

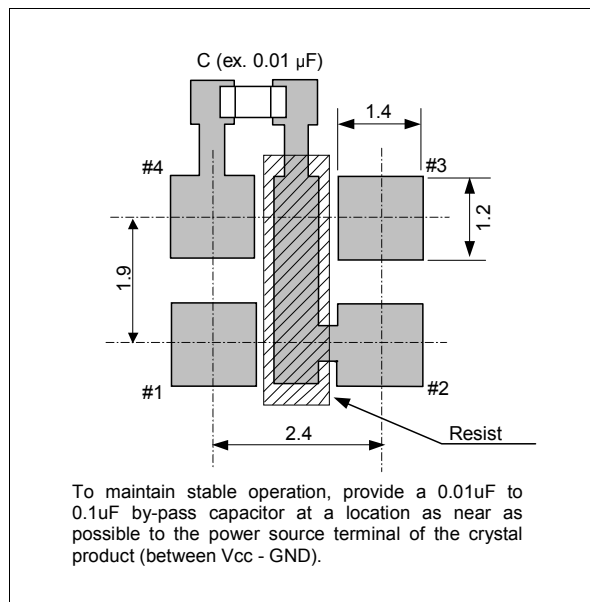
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT : CMOS

VG-4231CB

- Frequency range : 1 MHz to 81 MHz
- Supply voltage : 3.3 V
- Absolute pull range : $\pm 50 \times 10^{-6}$
- Function : Output enable (OE)
- External dimensions: 5.0 × 3.2 × 1.2 mm



Product Number (please contact us)
VG-4231CB: X1G002861xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_o	1.000 MHz to 81.000 MHz	Please contact us about available frequencies.
Supply voltage	V_{CC}	C: 3.3 V ± 0.165 V	
Storage temperature range	T_{stg}	-40 °C to +85 °C	Storage as single product.
Operating temperature range	T_{use}	G: -40 to +85°C, J: -20 to +70°C, K: 0 to +70°C	
Frequency tolerance	f_{tol}	$\pm 50 \times 10^{-6}$ Max.	
Current consumption	I_{CC}	10 mA Max.	No load condition.
Absolute pull range	APR	G : $\pm 50 \times 10^{-6}$ Min.	$V_C = 1.65 \text{ V} \pm 1.5 \text{ V}$
Input resistance	R_{in}	10 M Ω Min.	DC level
Frequency change polarity	—	Positive slope	$V_C = 0.15 \text{ to } 3.15 \text{ V}$
Symmetry	SYM	45 % to 55 %	50 % V_{CC} level
Output voltage	V_{OH}	V_{CC} to 0.4 V Min.	$I_{OH} = -0.8 \text{ mA}$
	V_{OL}	0.4 V Max.	$I_{OL} = 3.2 \text{ mA}$
Output load condition (CMOS)	L_{CMOS}	15 pF Max.	
Input voltage	V_{IH}	70 % V_{CC} Min.	
	V_{IL}	30 % V_{CC} Max.	
Rise time / Fall time	t_r / t_f	6 ns Max.	20 % V_{CC} to 80 % V_{CC} level
Start-up time	t_{str}	10 ms Max.	Time at minimum supply voltage to be 0 s
Frequency aging	f_{aging}	This is included in frequency tolerance specification.	+25 °C, $V_{CC} = 3.3 \text{ V}$, 20 years ($f_o \leq 60 \text{ MHz}$), +25 °C, $V_{CC} = 3.3 \text{ V}$, 10 years ($60 \text{ MHz} < f_o$)

* Please keep V_C pin open or ground while powering up V_{CC} .

Product Name VG-4231CB 52.000000MHz G G C Z

(Standard form)

① ② ③ ④⑤⑥⑦

①Model ②Package type ③Frequency ④Operating temperature range

⑤Absolute pull range ⑥Supply voltage (C: 3.3V Typ.) ⑦Function

⑤Operating temperature range

G	-40 to +85°C
J	-20 to +70°C
K	0 to +70°C

⑤Absolute pull range

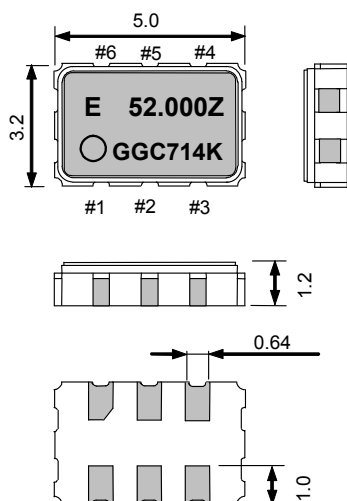
G	$\pm 50 \times 10^{-6}$ Min.
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⑦Function

Z	Output enable
---	---------------

External dimensions

(Unit: mm)



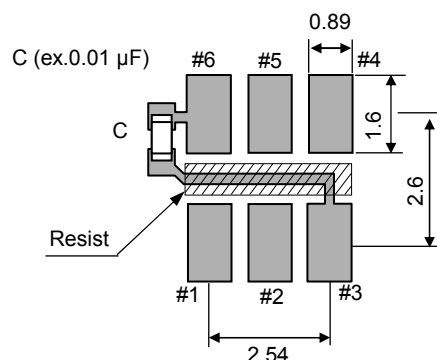
Pin map

Pin	Connection
1	V_C
2	OE
3	GND
4	OUT
5	N.C.
6	V_{CC}

OE pin = "H" or "open": Specified frequency output.
OE pin = "L": Output is high impedance.

Footprint (Recommended)

(Unit: mm)



To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).



VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT : CMOS

VG-4231CA

VG-4232CA

- Frequency range : 1 MHz to 80 MHz
- Supply voltage : 3.3 V / 5.0V ... VG-4231CA
3.3 V ... VG-4232CA
- Absolute pull range : $\pm 80 \times 10^{-6}$, $\pm 65 \times 10^{-6}$... VG-4231CA
 $\pm 50 \times 10^{-6}$... VG-4232CA
- External dimensions : 7.0 × 5.0 × 1.4 mm



Product Number (please contact us)
VG-4231CA: Q3614CA00xxxx00
VG-4232CA: X1G003921xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	VG-4231CA	VG-4232CA	Conditions / Remarks
Output frequency range	f_o	1.000 MHz to 60.000 MHz	60.001 MHz to 80.000 MHz	Please contact us about available frequencies.
Supply voltage	V_{cc}	H:5.0 V ± 0.5 V, C:3.3 V ± 0.3 V	C:3.3 V ± 0.165 V	
Control voltage	V_c	H:2.5 V ± 2.0 V, C:1.65 V ± 1.5 V	1.65 V ± 1.65 V	
Storage temperature	T_{stg}	-40 °C to +125 °C	-55 °C to +125 °C	Storage as single product.
Operating temperature	T_{use}	As per table below		
Frequency tolerance	f_{tol}	As per table below		$V_c=2.5$ V(**H), $V_c=1.65$ V(**C)
Current consumption	I_{cc}	H:20 mA Max., C: 10 mA Max.	35mA Max.	No load condition
Disable current	I_{dis}	H:15 mA Max., C: 7 mA Max.	25mA Max.	OE=GND
Frequency control range	F_{cont}	$\pm 130 \times 10^{-6}$	—	
Absolute pull range *1	APR	$\pm 80 \times 10^{-6}$ Min., $\pm 65 \times 10^{-6}$ Min.	$\pm 50 \times 10^{-6}$ Min.	
Modulation characteristics	BW	15 kHz Min.	5 kHz Min.	± 3 dB (at 1 kHz)
Input resistance	R_{in}	50 k Ω Min. H:—, C:10 M Ω Min.	80 k Ω Min.	F or T Type M or Z Type
Frequency change polarity	—	Positive polarity		
Symmetry	SYM	40 % to 60 %	45 % to 55 %	CMOS load: 50 % V_{cc} level
Output voltage	V_{OH} V_{OL}	$V_{cc}-0.4$ V Min. 0.4 V Max.	90 % V_{cc} Min. 10 % V_{cc} Max.	$I_{OH}=-4$ mA(**H), $I_{OH}=-0.8$ mA(**C) $I_{OL}=4$ mA(**H), $I_{OL}=3.2$ mA(**C)
Output load condition	L_{CMOS}	15 pF Max.		CMOS load
Input voltage	V_{IH} V_{IL}	70 % V_{cc} Min. 30 % V_{cc} Max.		OE terminal
Rise time and Fall time	t_r / t_f	4 ns Max.	5 ns Max.	CMOS load: 20 % V_{cc} to 80 % V_{cc} level
Start-up time	t_{str}	10 ms Max.		Time at 90 % V_{cc} to be 0s
Frequency aging	f_{aging}	$\pm 10 \times 10^{-6}$ Max.*2	Included in Frequency tolerance.	+25 °C, 10 years

*1 Absolute pull range = Frequency control range- (Frequency tolerance + 10 years Aging + Free fall + Vibration) *2 50 MHz < f_o ≤ 60 MHz $\pm 15 \times 10^{-6}$ Max.

* Please keep VC pin open or ground while powering up V_{cc} .

Product Name VG-4231 CA 35.328000MHz G R C - F
(Standard form) ① ② ③ ④⑤⑥ ⑦

VG-4232 CA 65.000000MHz J G C - F
① ② ③ ④⑤⑥ ⑦

- ①Model ②Package type ③Frequency ④Frequency tolerance / Operating temperature / (Absolute pull range)(Only VG-4231)
⑤Frequency control range(VG-4231), Absolute pull range(VG-4232) ⑥Supply voltage
⑦Input resistance / OE pin# (Refer to specification table and Pin map)

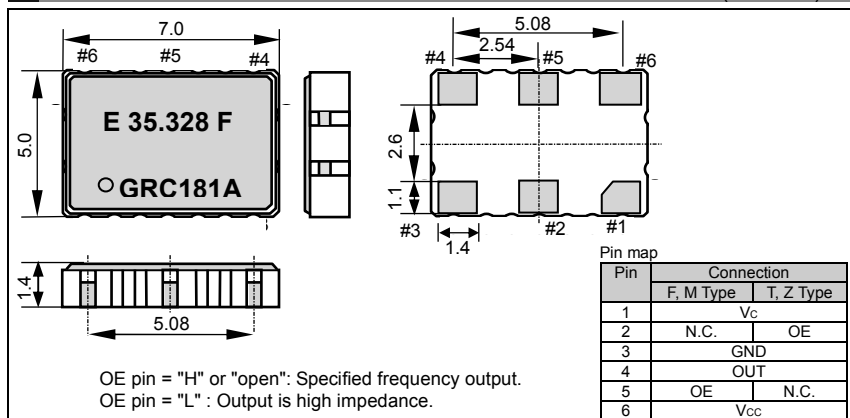
Model	④Frequency tolerance / Operating temperature / Absolute pull range	⑤Frequency control range
4231	G $\pm 50 \times 10^{-6}$ / -40 to +85 °C / $\pm 65 \times 10^{-6}$ Min.	R $\pm 130 \times 10^{-6}$
	D $\pm 35 \times 10^{-6}$ / -20 to +70 °C / $\pm 80 \times 10^{-6}$ Min.	

⑥Supply voltage
H 5.0V Typ.
C 3.3 V Typ.

Model	④Frequency tolerance / Operating temperature	⑤ Absolute pull range
4232	G $\pm 50 \times 10^{-6}$ / -40 to +85 °C	G $\pm 50 \times 10^{-6}$ Min.
	J $\pm 50 \times 10^{-6}$ / -20 to +70 °C	
	K $\pm 50 \times 10^{-6}$ / 0 to +70 °C	

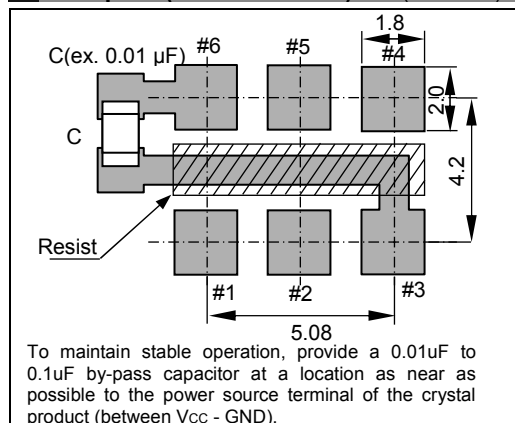
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)





VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT : CMOS

VG-4501CA

VG-4502CA

- Frequency range : 80 MHz to 125 MHz
- Supply voltage : 3.3 V
- Absolute pull range : $\pm 50 \times 10^{-6}$ Min./ $\pm 100 \times 10^{-6}$ Min.
- External dimensions: 7.0 × 5.0 × 1.6 mm
- Function : Output enable (OE), Active High



Product Number (please contact us)
 VG-4501CA : X1G003771xxxxxx
 VG-4502CA : X1G003751xxxxxx



Actual size



Specifications (characteristics)

Item	Symbol	VG-4501CA	VG-4502CA	Conditions / Remarks
Output frequency range	f _o	80.000 to 125.000 MHz		Please contact us about available frequencies.
Supply voltage	V _{cc}	3.3 V ± 0.165 V		
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product.
Operating temperature	T _{use}	G: -40 to +85°C, J: -20 to +70°C, K: 0 to +70°C		
Frequency tolerance	f _{tol}	$\pm 50 \times 10^{-6}$ Max.		-40 °C to +85 °C
Current consumption	I _{cc}	25 mA Max.		L _{CMOS} = 15pF
Absolute pull range*1	APR	G: $\pm 50 \times 10^{-6}$ Min.	H: $\pm 100 \times 10^{-6}$ Min.	V _c = 1.65 V ± 1.65 V
Input resistance	R _{in}	80 kΩ Min.		DC level
Frequency change polarity	—	Positive slope		V _c = 0 to 3.3 V
Symmetry	SYM	45 % to 55 %		50 % V _{cc} level
Output voltage	V _{OH}	90 % V _{cc} Min.		I _{OH} = -0.8 mA
	V _{OL}	10 % V _{cc} Max.		I _{OL} = 3.2 mA
Output load condition (CMOS)	L _{CMOS}	15 pF Max.		
Input voltage	V _{IH}	70 % V _{cc} Min.		
	V _{IL}	30 % V _{cc} Max.		
Rise time / Fall time	t _r / t _f	4 ns Max.		20 % V _{cc} to 80 % V _{cc} level
Start-up time	t _{str}	10 ms Max.		Time at minimum supply voltage to be 0 s
Frequency aging	f _{aging}	This is included Absolute pull range		+25 °C, V _{cc} = 3.3 V, 20 years

*1 Absolute pull range = Frequency control range - Frequency tolerance

* Please keep V_c pin open or ground while powering up V_{cc}.

Product Name VG-4501CA - 122.880000 - G G C T
 (Standard form) ① ② ③ ④⑤⑥⑦

①Model ②Package type ③Frequency(MHz) ④Operating temperature ⑤Absolute pull range
 ⑥Supply voltage (C: 3.3V Typ.) ⑦OE function

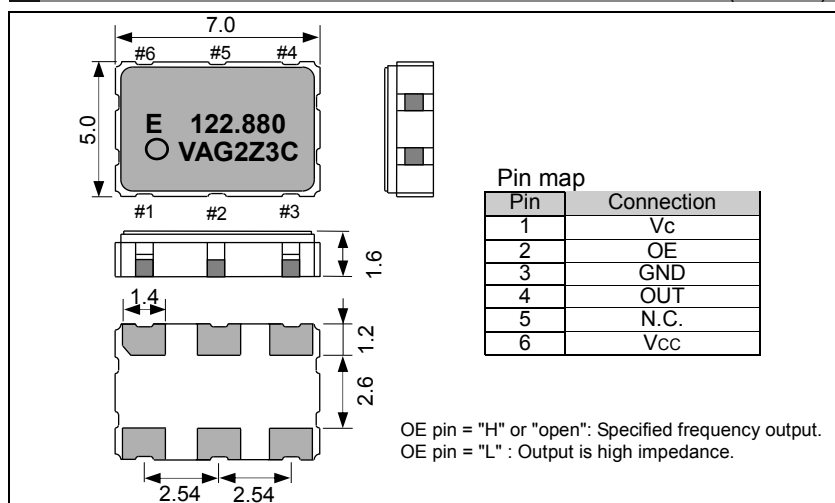
③Operating temperature	
G	-40 to +85°C
J	-20 to +70°C
K	0 to +70°C

⑤Absolute pull range	
H	$\pm 100 \times 10^{-6}$ Min.(VG-4502CA)
G	$\pm 50 \times 10^{-6}$ Min.(VG-4501CA)

⑦OE function	
T	Active High

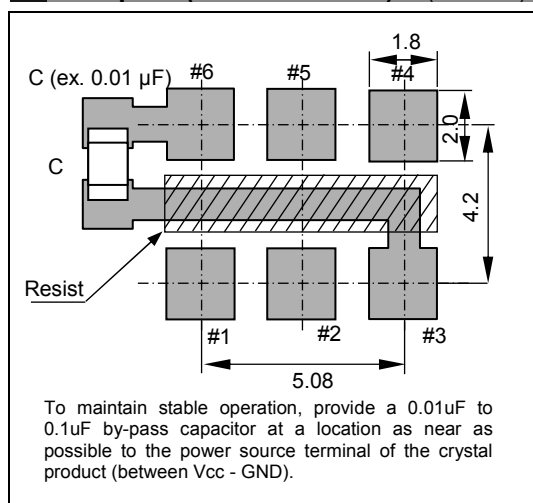
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)





VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT : LV-PECL

NEW**VG3225 / 5032EFN**

- Frequency range : 100 MHz to 250 MHz
- Supply voltage : 3.3 V
- Absolute pull range : 20×10^{-6} Min. / 50×10^{-6} Min.
- Operating temperature:
 - : -40 °C to +85 °C
 - : -40 °C to +105 °C (Option)
- Function : Output enable (OE)
- Output : LV-PECL



Product Number (please contact us)
 VG3225EFN X1G005361xxxx00
 VG5032EFN X1G005471xxxx00



Actual size

VG3225EFN

VG5032EFN

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f ₀	100 MHz to 250 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	VCC	3.3 V ± 0.165 V	
Control voltage*	VC	1.65 V ± 1.65 V	
Storage temperature	T _{stg}	-55 °C to +125 °C	Store as bare product.
Operating temperature	T _{use}	G : -40 °C to +85 °C , H : -40 °C to +105 °C	
Frequency tolerance	f _{tol}	$\pm 50 \times 10^{-6}$ Max.	Includes initial tolerance, temperature change, Vcc change and 10 years aging at +25 °C. At Vc=1.65V, reference to f ₀
Absolute Pull range *1	APR	$\pm 50 \times 10^{-6}$ Min. $\pm 20 \times 10^{-6}$ Min.	100 MHz ~ 170 MHz 100 MHz ~ 250 MHz
Current consumption	ICC	60 mA Max.	OE= VCC, with output load
Input resistance	Rin	10 M Ω Min.	DC level
Frequency change polarity	-	Positive slope	Vc= 0 to 3.3 V
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	VOH VOL	Vcc-1.1 V Min. Vcc-1.5 V Max.	DC characteristics
Output load condition	L _{ECL}	50 Ω	Terminated to VCC-2.0V
Input voltage	VIH VIL	70 % VCC Min. 30 % VCC Max.	OE terminal
Rise/Fall times	Tr / Tf	0.3 ns Max.	20 % ~ 80 % (VOH – VOL)
Oscillation start up time	t _{str}	10 ms Max.	Time at minimum supply voltage to be 0 s
Phase Jitter	tPJ	120 fs Max.(122.88 MHz) 80 fs Max.(245.76 MHz)	Offset Frequency 12kHz to 20MHz

*1 Absolute pull range = Frequency control range- Frequency tolerance

* Please keep Vc pin open or ground while powering up Vcc.

Product name VG3225 EFN 122.880000 MHz C J G H B A

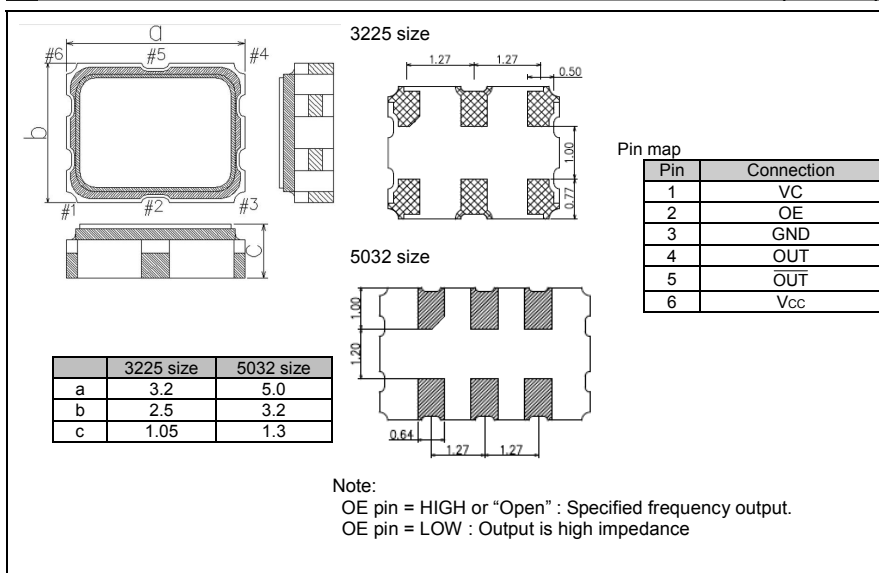
(Standard form)

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

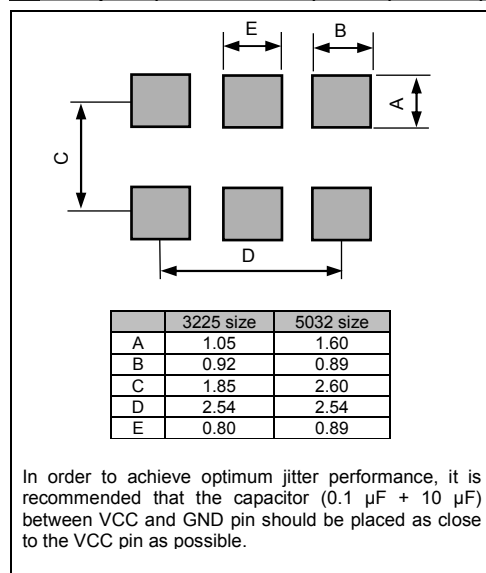
① Model ② Output (E: LV-PECL) ③ Frequency ④ Supply voltage (C: 3.3 V Typ)

⑤ Frequency tolerance (J: $\pm 50 \times 10^{-6}$ Max.) ⑥ Operating temperature (G: -40 to +85 °C)⑦ OE Function (H: Active High) ⑧ Absolute Pull Range (B: $\pm 50 \times 10^{-6}$ Min.) ⑨ Output Standby Type (A: High-Z)**External dimensions**

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)





VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT : LVDS

NEW**VG3225 / 5032VFN**

- Frequency range : 100 MHz to 250 MHz
- Supply voltage : 3.3 V
- Absolute pull range : 20×10^{-6} Min. / 50×10^{-6} Min.
- Operating temperature: -40 °C to +85 °C
- : -40 °C to +105 °C (Option)
- Function : Output enable (OE)
- Output : LVDS



Product Number (please contact us)
 VG3225VFN X1G005461xxxx00
 VG5032VFN X1G005481xxxx00



Actual size

VG3225VFN

VG5032VFN

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f ₀	100 MHz to 250 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	VCC	3.3 V ±0.165 V	
Control voltage*	VC	1.65 V ±1.65 V	
Storage temperature	T _{stg}	-55 °C to +125 °C	Store as bare product.
Operating temperature	T _{use}	G : -40 °C to +85 °C, H : -40 °C to +105 °C	
Frequency tolerance	f _{tol}	±50 × 10 ⁻⁶ Max.	Includes initial tolerance, temperature change, Vcc change and 10 years aging at +25 °C. At Vc=1.65V, reference to f ₀
Absolute Pull range *1	APR	±50 × 10 ⁻⁶ Min. ±20 × 10 ⁻⁶ Min.	100 MHz ~ 170 MHz 100 MHz ~ 250 MHz
Current consumption	ICC	25 mA Max.	OE= VCC, with output load
Input resistance	Rin	10 MΩ Min.	DC level
Frequency change polarity	-	Positive slope	VC= 0 to 3.3 V
Symmetry	SYM	45 % to 55 %	at outputs crossing point
Output voltage	VOD VOS	250 mV to 450mV 1.15 V to 1.35 V	VOD1, VOD2 VOS1, VOS2
Output load condition	L _{LVDS}	100 Ω	DC characteristics
Output load condition	L _{LVDS}	100 Ω	Connected between OUT to $\overline{\text{OUT}}$
Input voltage	VIH VIL	70 % VCC Min. 30 % VCC Max.	OE terminal
Rise/Fall times	Tr / Tf	0.3 ns Max.	at 20 % and 80 % of Differential Output peak to peak voltage
Oscillation start up time	t _{str}	10 ms Max.	Time at minimum supply voltage to be 0 s
Phase Jitter	tPJ	160 fs Max.(122.88 MHz) 80 fs Max.(245.76 MHz)	Offset Frequency 12kHz to 20MHz

*1 Absolute pull range = Frequency control range- Frequency tolerance

* Please keep Vc pin open or ground while powering up Vcc.

Product name **VG3225 VFN 122.880000 MHz C J G H B A**

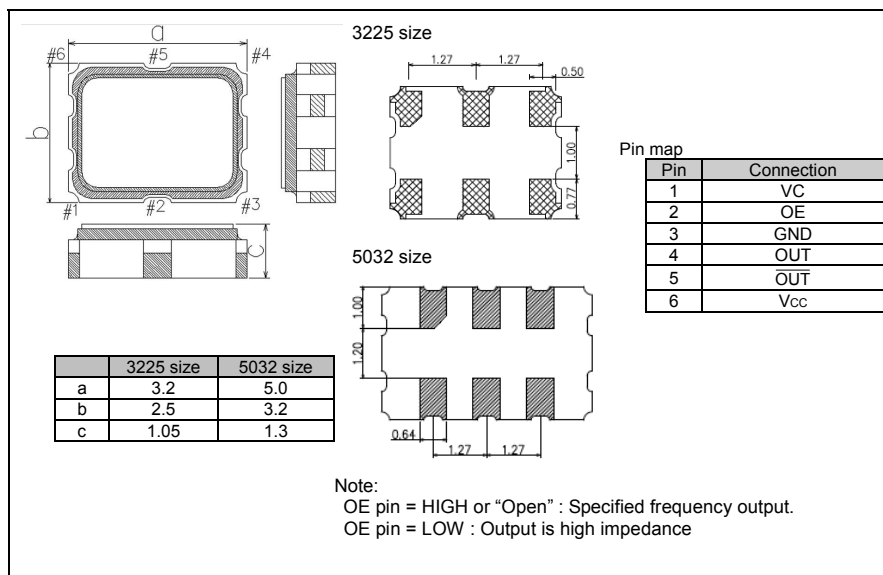
(Standard form)

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

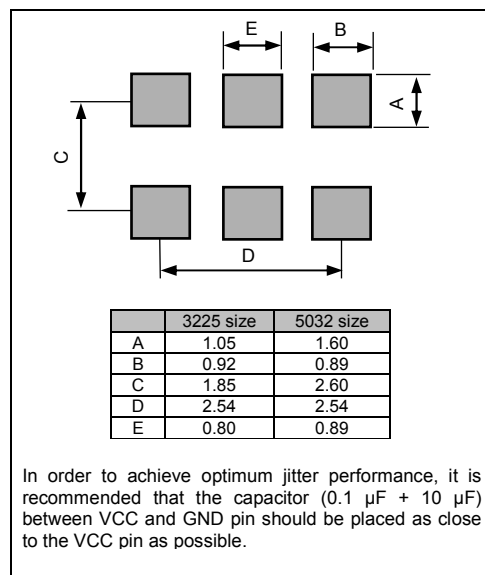
① Model ②Output (V: LVDS) ③Frequency ④Supply voltage (C: 3.3 V Typ)

⑤Frequency tolerance (J: ±50 × 10⁻⁶ Max.) ⑥Operating temperature (G: -40 to +85°C)⑦OE Function (H: Active High) ⑧Absolute Pull Range (B: ±50 × 10⁻⁶ Min.) ⑨Output Standby Type (A: High-Z)**External dimensions**

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)





VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

VG5032EDN
VG5032VDN

- Frequency range : 85 MHz to 170 MHz
- Supply voltage : 3.3 V
- Absolute pull range : 50×10^{-6} Min.
- External dimensions : $5.0 \times 3.2 \times 1.3$ t (mm) Typ.
- Operation temperature : +85 °C / +105 °C
- Function : Output Enable(OE), Active High
- Output : LV-PECL or LVDS



Product Number (Please contact us)
 VG5032EDN: X1G004911xxxxxx
 VG5032VDN: X1G004951xxxxxx



Actual size



Specifications (characteristics)

Item	Symbol	LV-PECL	LVDS	Conditions / Remarks	
		VG5032EDN	VG5032VDN		
Output frequency range	fo	85 MHz to 170 MHz		Please contact us for inquiries regarding available frequencies.	
Supply voltage	Vcc	3.3 V ± 0.165 V			
Storage temperature	T_stg	-55 °C to +125 °C		Store as bare product.	
Operating temperature	T_use	G: -40 °C to +85 °C, H: -40 °C to +105 °C			
Frequency tolerance	f_tol	±50 × 10 ⁻⁶ Max.		Includes initial tolerance, temperature change, Vcc change and 10years aging at +25°C. At Vc=1.65V, reference to f0	
Absolute Pull range *1	APR	±50 × 10 ⁻⁶ Min.		Vc= 0 V to 3.3 V reference to f0	
Input resistance	Rin	10 MΩ Min.		DC level	
Current consumption	Icc	60 mA Max.	30 mA Max.	OE=Vcc, LVPECL: 50 Ω, LVDS: 100 Ω	
Symmetry	SYM	45 % to 55 %		LV-PECL: at Vcc-1.30 V, Vc=1/2Vcc LVDS: at outputs crossing point	
Output voltage	VOH	VCC-1.1 V Min.	–	LV-PECL: DC characteristics	
	VOL	VCC-1.5 V Max.	–		
	VOD	–	250 mV to 450mV	VOD1, VOD2	LVDS:
	VOS	–	1.15 V to 1.35 V	VOS1, VOS2	DC characteristics
Output load condition	L_ECL	50 Ω	–	LV-PECL: Terminated to VCC -2.0 V	
	L_LVDS	–	100 Ω	LVDS: Connected between OUT to $\overline{\text{OUT}}$	
Input voltage	VIH	70 % VCC Min.		OE terminal	
	VIL	30 % VCC Max.			
Rise time / Fall time	tr / tf	0.5 ns Max.		LVP-ECL: at 20 % to 80 % output swing	
		0.3 ns Max.		LVDS: at 20 % and 80 % of Differential Output peak to peak voltage	
Start-up time	t_str	10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	tPJ	0.3 ps Max.		Offset Frequency 12kHz to 20MHz	

*1 Absolute pull range = Frequency control range- Frequency tolerance

* Please keep V_c pin open or ground while powering up V_{cc}.

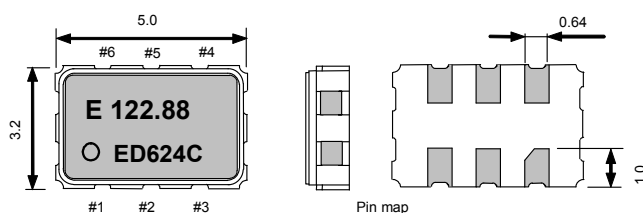
Product name VG5032 EDN 122.880000 MHz C J G H B A
 (Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①Model ②Output (E: LV-PECL, V: LVDS) ③Frequency ④Supply voltage (C: 3.3 V Typ)

⑤Frequency tolerance (J: ±50 × 10⁻⁶ Max.) ⑥Operating temperature (G: -40 to +85°C, H: -40 to +105°C)⑦OE Function (H: Active High) ⑧Absolute Pull Range (B: ±50 × 10⁻⁶ Min.) ⑨Output Standby Type (A: High-Z)

External dimensions

(Unit:mm)



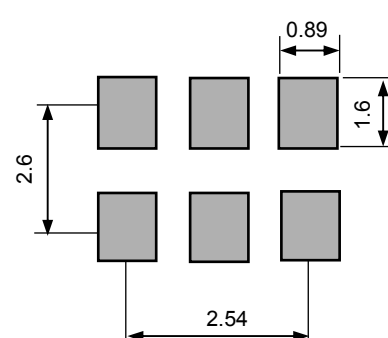
Pin map

Pin	Connection
1	V _c
2	OE
3	GND
4	OUT1(positive)
5	OUT2(Negative)
6	V _{cc}

OE pin = "H" or "open" : Specified frequency output.
 OE pin = "L": Output is high impedance.

Footprint (Recommended)

(Unit:mm)



In order to achieve optimum jitter performance, it is recommended that the capacitor (0.1 μF + 10 μF) between V_{CC} and GND pin should be placed as close to the V_{CC} pin as possible.

VOLTAGE-CONTROLLED CRYSTAL OSCILLATOR (VCXO)

OUTPUT: LV-PECL

VG7050EBN

- Frequency range : 600 MHz to 800 MHz
- Supply voltage : 2.5 V / 3.3 V
- External dimensions : 7.0 × 5.0 × 1.5 mm (6 pins)
- Absolute Pull Range : ±50 × 10⁻⁶ Min., ±100 × 10⁻⁶ Min.
- Function : Output Enable(OE)
- Output : LV-PECL



Product Number (please contact us)
X1G004551xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f _o	600.000 MHz to 800.000 MHz 698.8123 MHz, 753.6211 MHz, 794.7278 MHz	Please contact us about available frequencies. Standard frequency
Supply voltage	V _{cc}	D: 2.5 V ± 0.125 V, C: 3.3 V ± 0.33 V	
Storage temperature range	T _{stg}	-55 °C to +125 °C	Store as bare product after packing
Operating temperature range	T _{use}	-40 °C to +85 °C	
Frequency tolerance*1	f _{tol}	±50 × 10 ⁻⁶ Max.	Includes frequency aging (10 years)
Current consumption	I _{cc}	90 mA Max.	
Absolute pull range	APR	±50 × 10 ⁻⁶ Min. ±100 × 10 ⁻⁶ Min.	V _c = 1.65 V ± 1.35 V (V _{cc} = 3.3 V) V _c = 1.25 V ± 1.00 V (V _{cc} = 2.5 V)
Input resistance	R _{in}	5 MΩ Min.	DC level
Frequency change polarity	-	Positive slope	0 to V _{cc}
Symmetry	SYM	45 % to 55 %	at outputs cross point
High output voltage	V _{OH}	V _{cc} - 1.025 V Min.	DC characteristics
Low output voltage	V _{OL}	V _{cc} - 1.62 V Max.	
Output load condition	L _{ECL}	50 Ω	Terminated to V _{cc} - 2.0V
High input voltage	V _{IH}	70% V _{cc} Min.	
Low input voltage	V _{IL}	30% V _{cc} Max.	
Rise/Fall times	t _r /t _f	0.4 ns Max.	between 20% and 80% of (V _{OH} - V _{OL})
Oscillation start up time	t _{str}	10ms Max.	Time at minimum supply voltage to be 0 s
Phase Jitter	t _{pj}	0.2ps Typ.	Offset Frequency 12kHz to 20MHz

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change and reflow drift and 10 years aging at +25 °C.

Product name
(Standard form)

VG7050 EBN 698.812335 MHz C J G H B Z
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

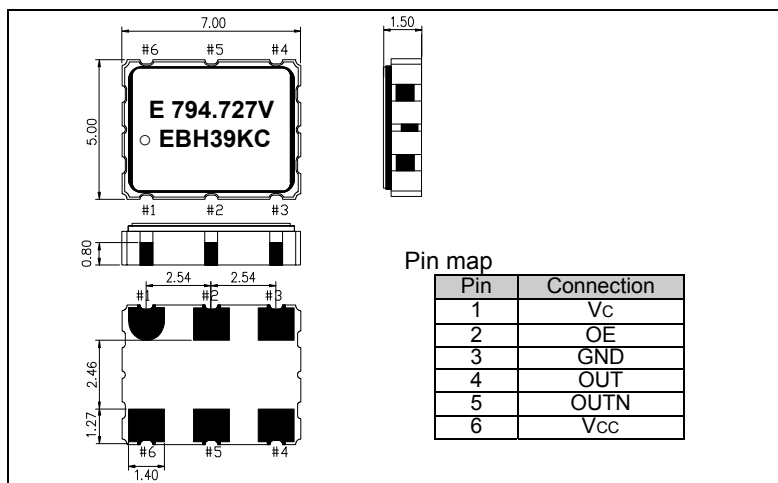
- ①Model ②Output (E: LV-PECL) ③Frequency ④Supply voltage (C: 3.3 V Typ., D: 2.5 V Typ.)
⑤Frequency tolerance (J: ±50 × 10⁻⁶ Max.) ⑥Operating temperature (G: -40 to +85°C)
⑦OE Function (H: Active High, L: Active Low) ⑧Absolute Pull Range (B: ±50 × 10⁻⁶ Min., C: ±100 × 10⁻⁶ Min.)
⑨Output Standby Type (F: Fix (OUT="L", OUTN="H"), Z: High-Z)

OE Function / OE Standby Type

OE Function	OE Standby Type	Frequency output OE pin	Oscillator Stop OE pin	OUT, OUTN state
H: High Active	Z: High-Z	"H" or "OPEN"	"L"	High Impedance
L: Low Active		"L" or "OPEN"	"H"	
H: High Active	F: Fix	"H" or "OPEN"	"L"	OUT="L", OUTN="H"
L: Low Active		"L" or "OPEN"	"H"	

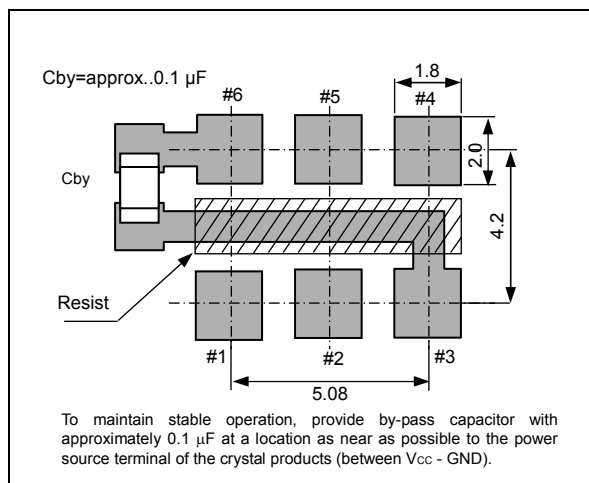
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)



**VOLTAGE-CONTROLLED SAW OSCILLATOR (VCSO)****Output: LV-PECL****LOW PHASE JITTER****EV7050EAN**

- Low phase jitter : 18 fs typ. *3
- Frequency range : 600 MHz to 1100 MHz
: 1200 MHz to 2200 MHz
- Function : OUTPUT disable(OE)/Standby(ST)
- Supply voltage : 3.3 V
- Absolute pull range : $\pm 50 \times 10^{-6}$ Min./ $\pm 30 \times 10^{-6}$ Min.
- External dimensions: 7.0 × 5.0 × 1.6(t) mm
- Output : LV-PECL
- Application : OTN(40GbE, 100GbE, 400GbE),
High Speed ADCs and DACs, Test Instrument



Product Number (please contact us)
X1M00052xxxxxx



Actual size

**Specifications (characteristics)****Type OE**

Item	Symbol	EV7050EAN		Conditions / Remarks
Output frequency range	f ₀	600 MHz to 1100 MHz / 1200 MHz to 2200 MHz		Please contact us about available frequencies
Supply voltage	V _{cc}	3.3 V ±0.165 V		
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product
Operating temperature	T _{use}	-10 °C to +85 °C	-40 °C to +85 °C	
Frequency tolerance *1	f _{tol}	-100 × 10 ⁻⁶ to +100 × 10 ⁻⁶	-120 × 10 ⁻⁶ to +120 × 10 ⁻⁶	
Absolute pull range *2	APR	±50 × 10 ⁻⁶ Min	±30 × 10 ⁻⁶ Min	
Current consumption	I _{cc}	f ₀ =600 to 1100 MHz : 115 mA Max f ₀ =1200 to 2200 MHz : 175 mA Max		
Output disable current	I _{dis}	f ₀ =600 to 1100 MHz : 80 mA Max f ₀ =1200 to 2200 MHz : 135 mA Max		
Input resistance	R _{in}	50 kΩ Min		DC level
Frequency change polarity	—	Positive slope		
Symmetry	SYM	45 % to 55 %		Reference is crossing point of OUT1 and OUT2
Output voltage	V _{OH}	V _{cc} -1.25 V Min		Output termination is L _{ECL}
	V _{OL}	V _{cc} -1.55 V Max		Output termination is L _{ECL}
Input voltage	V _{IH}	80% V _{cc}		OE terminal(#2)
	V _{IL}	20% V _{cc}		
Output load condition	L _{ECL}	50 Ω		Terminated to V _{cc} -2.0V
Rise time / Fall time	t _r / t _f	0.125 ns Max		Between 20% and 80% of output single ended swing
Start-up time	t _{str}	10 ms Max		Time at 90 %V _{cc} to be 0 s
Enable delay time	tpzx	1.0 us Max		The time from release OE to Output signal
Phase Jitter	tPJ	18fs typ. *3 40fs Max		990 MHz ≤ f ₀ ≤ 1100 MHz
		60fs Max		1980 MHz ≤ f ₀ ≤ 2200 MHz Offset frequency: 12 kHz to 20 MHz

Type ST

Item	Symbol	EV7050EAN		Conditions / Remarks
Output frequency range	f _o	600 MHz to 1100 MHz / 1200 MHz to 2200 MHz		Please contact us about available frequencies
Supply voltage	V _{cc}	3.3 V ±0.165 V		
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product
Operating temperature	T _{use}	-10 °C to +85 °C	-40 °C to +85 °C	
Frequency tolerance *1	f _{tol}	-100 × 10 ⁻⁶ to +100 × 10 ⁻⁶	-120 × 10 ⁻⁶ to +120 × 10 ⁻⁶	
Absolute pull range *2	APR	±50 × 10 ⁻⁶ Min	±30 × 10 ⁻⁶ Min	
Current consumption	I _{cc}	f _o =600 to 1100 MHz : 115 mA Max f _o =1200 to 2200 MHz : 175 mA Max		
Standby current	I _{std}	7 mA Max		
Input resistance	R _{in}	50 kΩ Min		DC level
Frequency change polarity	—	Positive slope		
Symmetry	SYM	45 % to 55 %		Reference is crossing point of OUT1 and OUT2
Output voltage	V _{OH}	V _{CC} -1.25 V Min		Output termination is L _{ECL}
	V _{OL}	V _{CC} -1.55 V Max		Output termination is L _{ECL}
Input voltage	V _{IH}	80% V _{CC}		ST terminal(#2)
	V _{IL}	20% V _{CC}		
Output load condition	L _{ECL}	50 Ω		Terminated to V _{CC} -2.0V
Rise time / Fall time	t _r / t _f	0.125 ns Max		Between 20% and 80% of output single ended swing
Start-up time	t _{str}	10 ms Max		Time at 90 %V _{CC} to be 0 s
Resume time	t _{res}	10 ms Max		Time at ST terminal is V _{IH} (Active Low is V _{OL}) to be 0 s
Phase Jitter	tPJ	18fs typ. *3 40fs Max		990 MHz ≤ f _o ≤ 1100 MHz
		60fs Max		1980 MHz ≤ f _o ≤ 2200 MHz Offset frequency: 12 kHz to 20 MHz

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, and aging (+25°C, 10 years).

*2 Absolute pull range (APR) = Frequency control range - Frequency tolerance

*3 Put bypass capacitor (0.1 μ F and 10 μ F) near by V_{cc} terminal for jitter performance.



Product Name EV7050 EAN 1986.819000MHz C L E H B A
(Standard form) ① ② ③ ④⑤⑥⑦⑧⑨

- ①Model ②Output(E: LV-PECL) ③Frequency
④Supply voltage (C: 3.3 V Typ.) ⑤Frequency tolerance
⑥Operating temperature ⑦OE function
⑧Absolute pull range(APR)
⑨Internal identification code ("A" is default)

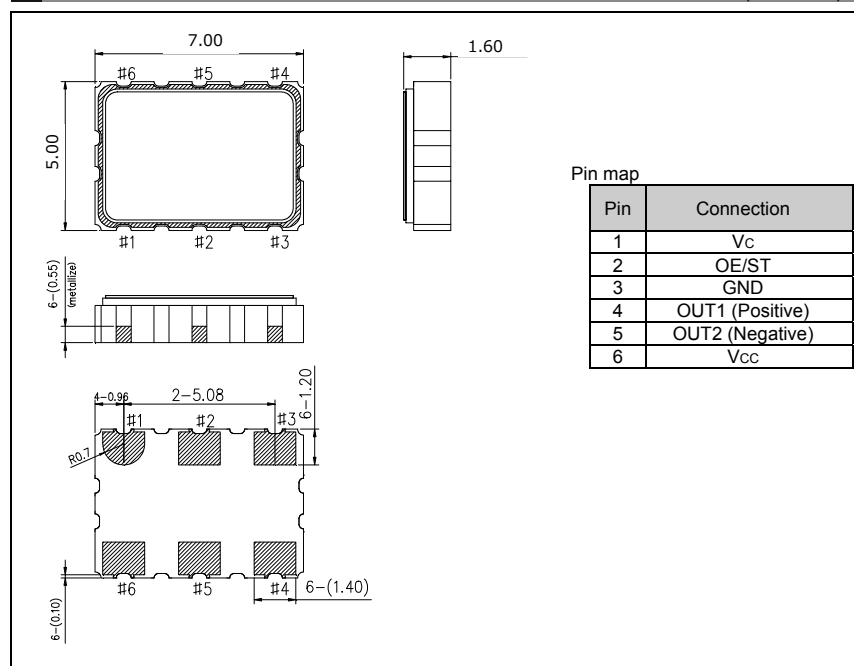
④Supply voltage	⑤Frequency tolerance	⑥Operating temperature	⑦OE function	⑧APR	⑨identification code
C:3.3V Typ	L: $-100 \sim +100 \times 10^{-6}$	E: $-10 \sim +85^{\circ}\text{C}$	H:OE Active High L:OE Active Low S:ST Active High T:ST Active Low	B: $\pm 50 \times 10^{-6}$ Min.	A
	U: $-120 \sim +120 \times 10^{-6}$	G: $-40 \sim +85^{\circ}\text{C}$		A: $\pm 30 \times 10^{-6}$ Min.	

OE Standby Type

Product	Oscillation	Outputs
OE Active High	High: enable /Low: enable	High: enable(specified frequency) Low: disable(Hi-Z)
OE Active Low	High: enable /Low: enable	High: disable(Hi-Z) Low: enable(specified frequency)
ST Active High	High: enable /Low: disable	High: enable(specified frequency) Low: disable(Hi-Z)
ST Active Low	High: disable /Low: enable	High: disable(Hi-Z) Low: enable(specified frequency)

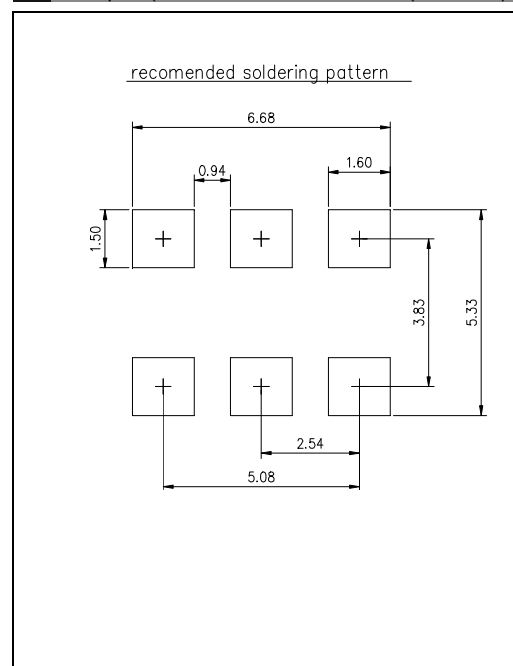
External dimensions

(Unit :mm)



Footprint(Recommended)

(Unit :mm)



**Programmable Voltage Controlled Oscillator (VCXO)****Output: LV-PECL****VG7050EAN / ECN**

- Frequency range : 50 MHz to 800 MHz
(Tuning resolution: $2.2 \sim 2.8 \times 10^{-9}$)
- Supply voltage : 2.5 V / 3.3 V
- External dimensions : EAN : $7.0 \times 5.0 \times 1.5$ mm (8 pins)
ECN : $7.0 \times 5.0 \times 1.5$ mm (10 pins)
- Absolute Pull Range : ± 0 to $\pm 180 \times 10^{-6}$ (12 steps selectable)

Features

- EAN : User-specified one startup frequency, APR and 7-bit I²C address
- ECN : User-specified four startup frequency, APR and 7-bit I²C address
- User Programming : I²C Interface
- Low jitter PLL technology

Applications

SONET/SDH, OTN, GbE, Fibre Channel

*The I²C-Bus is a trademark of
NXP Semiconductors

Product Number (please contact us)

EAN : X1G004541xxxx00

ECN : X1G004561xxxx00



Actual size

**Specifications (characteristics)**

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_o	50 MHz to 800 MHz	It can be changed by I ² C
Supply voltage	V_{CC}	D: $2.5 \text{ V} \pm 0.125 \text{ V}$, C: $3.3 \text{ V} \pm 0.33 \text{ V}$	
Storage temperature	T_{stg}	-55 °C to +125 °C	Store as bare product after packing
Operating temperature	T_{use}	-40 °C to +85 °C	
Frequency tolerance *1	f_{tol}	$\pm 50 \times 10^{-6}$	Includes frequency aging (10 years)
Current consumption	I_{CC}	90 mA Max.	OE Active, L_ECL=50 Ω
Disable current	I_{dis}	40 mA Max.	OE Inactive, Output Standby: Hi-Z mode
		70 mA Max.	OE Inactive, Output Standby: Fix mode
Absolute pull range	APR	± 0 to $\pm 180 \times 10^{-6}$	$V_C = 1.65 \text{ V} \pm 1.35 \text{ V}$ ($V_{CC} = 3.3 \text{ V}$)
		± 0 to $\pm 180 \times 10^{-6}$	$V_C = 1.25 \text{ V} \pm 1.00 \text{ V}$ ($V_{CC} = 2.5 \text{ V}$)
Control voltage tuning range	V_C	0 to V_{CC}	
Frequency change polarity	-	Positive slope	
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V_{OH}	$V_{CC} - 1.025 \text{ V}$ Min.	DC characteristics
	V_{OL}	$V_{CC} - 1.62 \text{ V}$ Max.	
Output load condition	L_{ECL}	50 Ω	Termination to $V_{CC} - 2.0 \text{ V}$
Input voltage	V_{IH}	70% V_{CC} Min.	EAN : OE, SDA and SCL
	V_{IL}	30% V_{CC} Max.	ECN : OE, FSEL0, FSEL1, SDA and SCL
Rise time / Fall time	t_r/t_f	400 ps Max.	Between 20% and 80% of ($V_{OH} - V_{OL}$)
Start-up time	t_{str}	10 ms Max.	Time at minimum supply voltage to be 0 s

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change, reflow drift and 10 years aging at +25 °C.

Product name
(Standard form)

VG7050 EAN SM18xxxx C J G H P Z

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①Model

②Output (E: LV-PECL)

③Parameter Designator (EAN : SM18xxxx, ECN : SM20xxxx)

④Supply voltage (C: 3.3 V Typ., D: 2.5 V Typ.)

⑤Frequency tolerance (J: $\pm 50 \times 10^{-6}$)

⑥Operating temperature (G: -40 ~ +85 °C)

⑦OE Function (H: Active High, L: Active Low)

⑧Absolute Pull Range (P: Programmable)

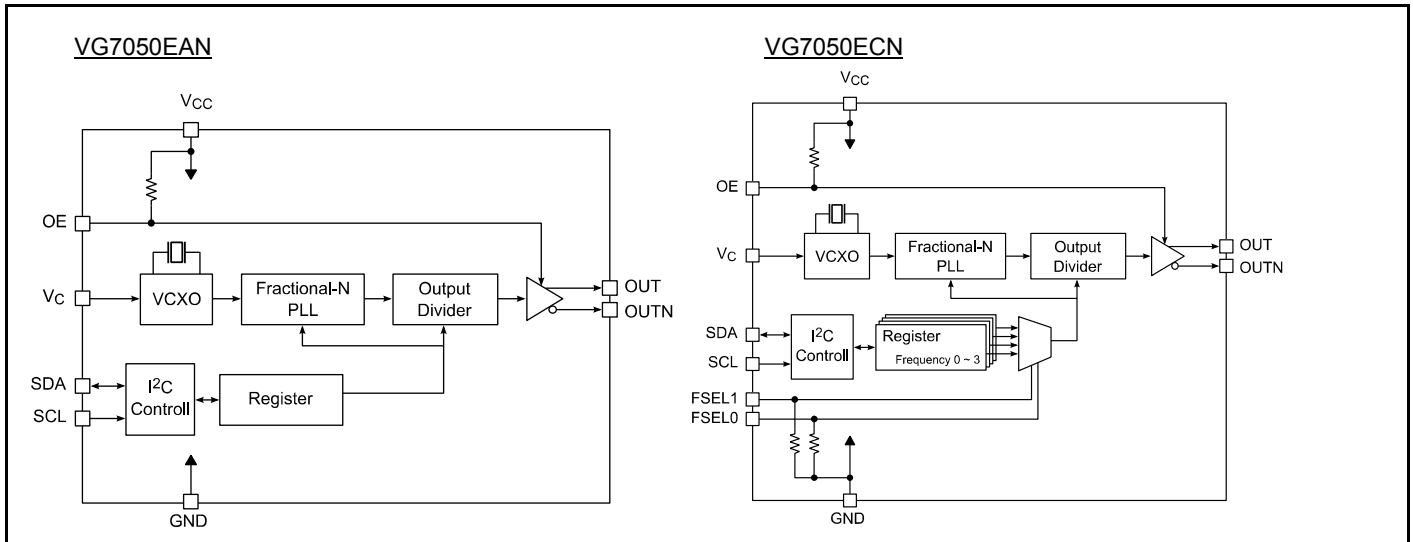
⑨Output Standby Type (F: Fix (OUT="L", OUTN="H"), Z: High-Z)

Phase Jitter

	Offset Frequency	125.00 MHz	156.25 MHz	250.00 MHz	425.00 MHz	622.08 MHz	669.33 MHz	794.73 MHz
Phase jitter*2 Typ.	12 kHz to 20 MHz	0.30 ps	0.26 ps	0.26 ps	0.25 ps	0.26 ps	0.26 ps	0.26 ps
	20 kHz to 50 MHz	0.30 ps	0.27 ps	0.27 ps	0.26 ps	0.27 ps	0.27 ps	0.27 ps
	50 kHz to 80 MHz	0.29 ps	0.27 ps	0.27 ps	0.26 ps	0.27 ps	0.27 ps	0.27 ps

*2 In order to achieve optimum jitter performance, it is recommended that the capacitor (0.1 μF + 10 μF) between V_{CC} and GND pin should be placed as close to the V_{CC} pin as possible.

Block diagram

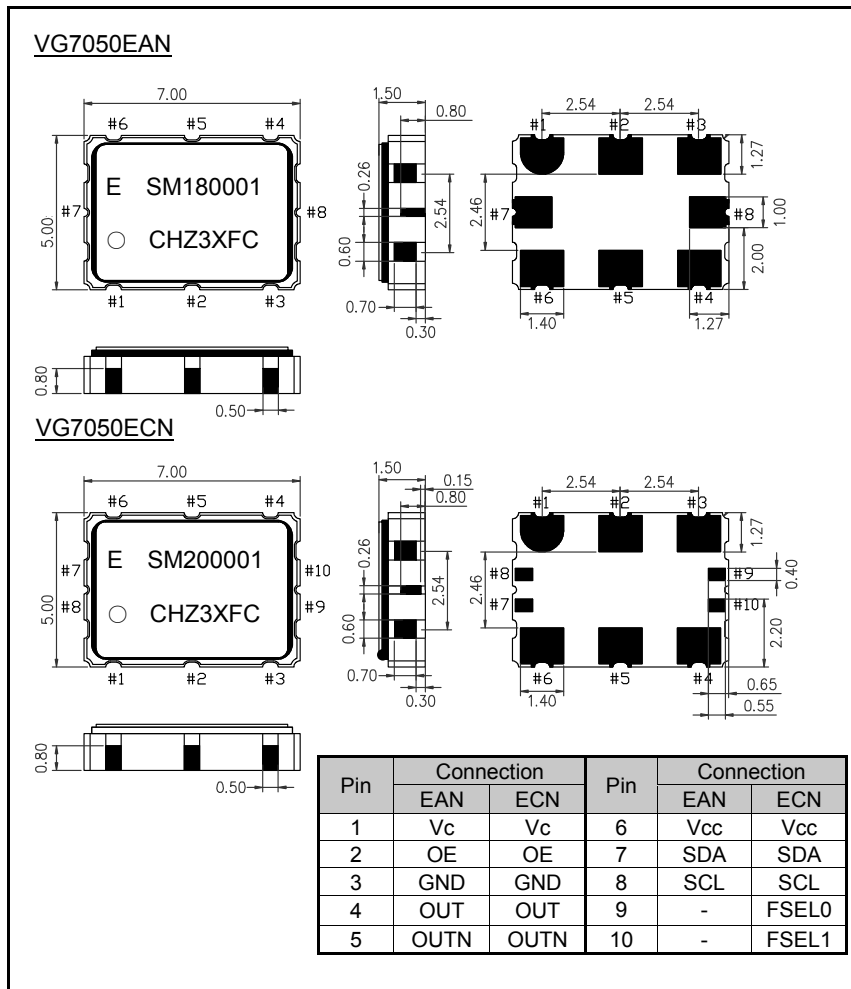


OE Function / OE Standby Type

OE Function	OE Standby Type	Frequency output OE pin	Oscillator Stop	
			OE pin	OUT,OUTN state
H: High Active	Z: High-Z	"H" or "OPEN"	"L"	High Impedance
L: Low Active		"L" or "OPEN"	"H"	
H: High Active	F: Fix	"H" or "OPEN"	"L"	OUT="L", OUTN="H"
L: Low Active		"L" or "OPEN"	"H"	

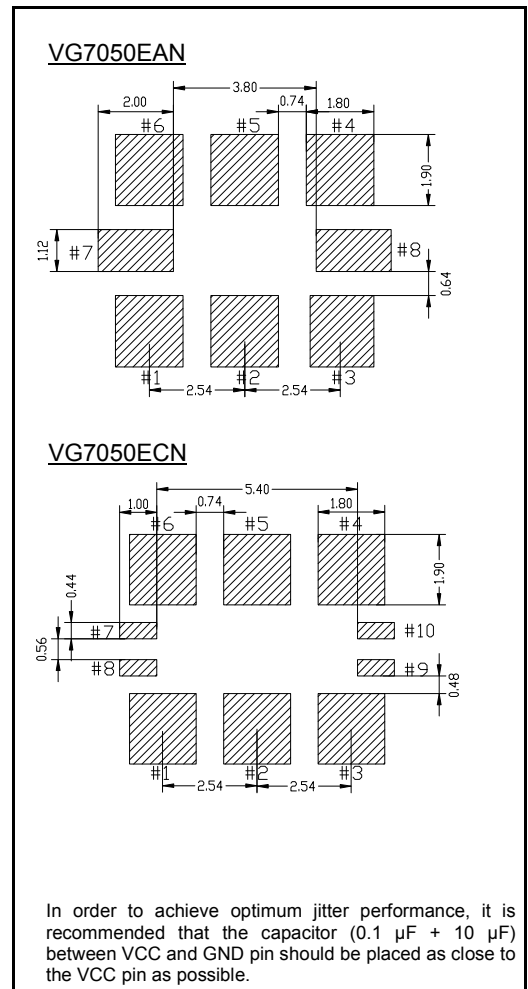
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)





Crystal Oscillator (SPXO / SPSO)

► Output : CMOS Spread Spectrum OSC (MHz)

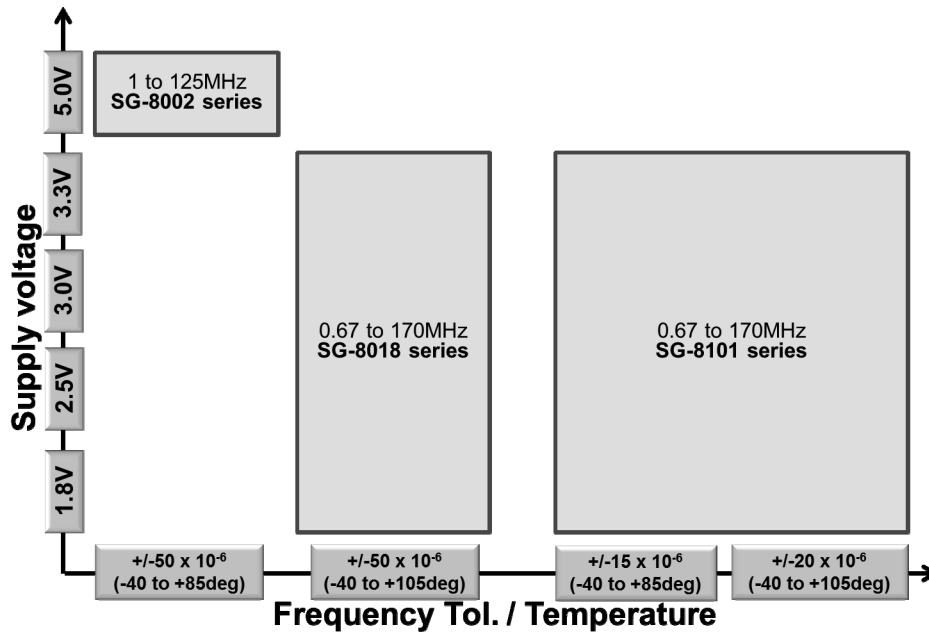
P	Model	Actual size (mm)	Nominal frequency range				Spread Spectrum configuration		Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
			1	50	100	200	Center	Down					
48 to 49	SG-9101CG Series	2.5×2.0×0.7 (t: Typ.)	0.67 MHz 170 MHz				±0.25 % to ±2.0 %	-0.5 % to -4.0 %	-40 °C to +85 °C -40 °C to +105 °C	1.62V to 1.98V	5.7mA	15 pF	OE or ST
										1.98V to 2.2V	6.0 mA		
										2.2V to 2.8V	6.9 mA		
										2.7V to 3.63V	8.3 mA		
	SG-9101CE Series	3.2×2.5×1.05 (t: Typ.)	0.67 MHz 170 MHz				±0.25 % to ±2.0 %	-0.5 % to -4.0 %	-40 °C to +85 °C -40 °C to +105 °C	1.62V to 1.98V	5.7mA		
										1.98V to 2.2V	6.0 mA		
										2.2V to 2.8V	6.9 mA		
										2.7V to 3.63V	8.3 mA		
	SG-9101CB Series	5.0×3.2×1.1 (t: Typ.)	0.67 MHz 170 MHz				±0.25 % to ±2.0 %	-0.5 % to -4.0 %	-40 °C to +85 °C -40 °C to +105 °C	1.62V to 1.98V	5.7mA		
										1.98V to 2.2V	6.0 mA		
										2.2V to 2.8V	6.9 mA		
										2.7V to 3.63V	8.3 mA		
	SG-9101CA Series	7.0×5.0×1.3 (t: Typ.)	0.67 MHz 170 MHz				±0.25 % to ±2.0 %	-0.5 % to -4.0 %	-40 °C to +85 °C -40 °C to +105 °C	1.62V to 1.98V	5.7mA		
										1.98V to 2.2V	6.0 mA		
										2.2V to 2.8V	6.9 mA		
										2.7V to 3.63V	8.3 mA		

► Output : CMOS Spread Spectrum OSC (MHz) For Automotive)

P	Model	Actual size (mm)	Nominal frequency range				Spread Spectrum configuration		Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
			1	50	100	200	Center	Down					
50 to 51	SG-9101CGA (AEC-Q100)	2.5×2.0×0.7 (t: Typ.)	0.67 MHz 170 MHz				±0.25 % to ±2.0 %	-0.5 % to -4.0 %	-40 °C to +125 °C	1.62V to 1.98V	5.8 mA	15 pF	OE or ST
										1.98V to 2.2V	6.1 mA		
										2.2V to 2.8V	7.0 mA		
										2.7V to 3.63V	8.4 mA		

Center Spread	Code	C02P	C05P	C07P	C10P	C15P	C20P
	Percentage	±0.25 %	±0.5 %	±0.75 %	±1.0 %	±1.5 %	±2.0 %
Down Spread	Code	D05P	D10P	D15P	D20P	D30P	D40P
	Percentage	-0.5 %	-1.0 %	-1.5 %	-2.0 %	-3.0 %	-4.0 %

Programmable OSC Product Mapping



► Output : CMOS (MHz) Programmable OSC

P	Model	Actual size (mm)	Nominal frequency range				Frequency Tolerance ($\times 10^{-6}$)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
			1	50	100	200						
52 to 53	SG-8018CG series	2.5×2.0×0.7 (t: Typ.)	0.67MHz 170MHz				±50	-40 °C to +105 °C	1.62V to 1.98V	5.5 mA	15 pF	OE or ST
									1.98 V to 2.2 V	5.8 mA		
									2.2 V to 2.8 V	6.7 mA		
									2.7 V to 3.63 V	8.1 mA		
	SG-8018CE series	3.2×2.5×1.05 (t: Typ.)	0.67MHz 170MHz				±50	-40 °C to +105 °C	1.62V to 1.98V	5.5 mA		
									1.98 V to 2.2 V	5.8 mA		
									2.2 V to 2.8 V	6.7 mA		
									2.7 V to 3.63 V	8.1 mA		
	SG-8018CB series	5.0×3.2×1.1 (t: Typ.)	0.67MHz 170MHz				±50	-40 °C to +105 °C	1.62V to 1.98V	5.5 mA		
									1.98 V to 2.2 V	5.8 mA		
									2.2 V to 2.8 V	6.7 mA		
									2.7 V to 3.63 V	8.1 mA		
	SG-8018CA series	7.0×5.0×1.3 (t: Typ.)	0.67MHz 170MHz				±50	-40 °C to +105 °C	1.62V to 1.98V	5.5 mA		
									1.98 V to 2.2 V	5.8 mA		
									2.2 V to 2.8 V	6.7 mA		
									2.7 V to 3.63 V	8.1 mA		



► Output : CMOS (MHz) Programmable OSC

P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control			
				1	50	100	200									
54 to 55	SG-8101CG series		 2.5×2.0×0.7 (t: Typ.)					±15	-40 °C to +85 °C	1.62V to 1.98V	5.5 mA	15 pF	OE or ST			
				0.67MHz	170MHz		±20 / ±50	-40 °C to +105 °C	1.98 V to 2.2 V	5.8 mA						
	SG-8101CE series		 3.2×2.5×1.05 (t: Typ.)					±15	-40 °C to +85 °C	2.2 V to 2.8 V	6.7 mA					
				0.67MHz	170MHz		±20 / ±50	-40 °C to +105 °C	2.7 V to 3.63 V	8.1 mA						
	SG-8101CB series		 5.0×3.2×1.1 (t: Typ.)					±15	-40 °C to +85 °C	1.62V to 1.98V	5.5 mA					
				0.67MHz	170MHZ		±20 / ±50	-40 °C to +105 °C	1.98 V to 2.2 V	5.8 mA						
	SG-8101CA series		 7.0×5.0×1.3 (t: Typ.)					±15	-40 °C to +85 °C	2.2 V to 2.8 V	6.7 mA					
				0.67MHz	170MHz		±20 / ±50	-40 °C to +105 °C	2.7 V to 3.63 V	8.1 mA						
								±20 / ±50	-40 °C to +105 °C	1.62V to 1.98V	5.5 mA					
								±20 / ±50	-40 °C to +105 °C	1.98 V to 2.2 V	5.8 mA					
	Web Site	SG-8003CG series	PE / SE	 2.5×2.0×0.7 (t: Typ.)					B,C,M,L	-20 °C to +70 °C	1.6 V to 2.2 V			10 mA	15 pF	P*:OE S*:ST
			PD / SD		1 MHz; 166 MHz					-40 °C to +85 °C	2.2 V to 2.8 V			15 mA		
PC / SC							-40 °C to +85 °C	2.7 V to 3.6 V		15 mA						
SG-8003CE Series		PE / SE	 3.2×2.5×1.05 (t: Typ.)					B,C,M,L	-20 °C to +70 °C	1.6 V to 2.2 V	10 mA					
		PD / SD		1 MHz; 166 MHz					-40 °C to +85 °C	2.2 V to 2.8 V	15 mA					
		PC / SC							-40 °C to +85 °C	2.7 V to 3.6 V	15 mA					
SG-8003JF series		PE / SE	 7.1×5.1×1.5 (t: Max.)					B,C,M,L	-20 °C to +70 °C	1.6 V to 2.2 V	10 mA					
		PD / SD		1 MHz; 166 MHz					-40 °C to +85 °C	2.2 V to 2.8 V	15 mA					
		PC / SC							-40 °C to +85 °C	2.7 V to 3.6 V	15 mA					
SG-8003CA series		PE / SE	 7.0×5.0×1.4 (t: Typ.)					B,C,M,L	-20 °C to +70 °C	1.6 V to 2.2 V	10 mA					
		PD / SD		1 MHz; 166 MHz					-40 °C to +85 °C	2.2 V to 2.8 V	15 mA					
		PC / SC							-40 °C to +85 °C	2.7 V to 3.6 V	15 mA					
Web Site	SG-8002CE series	PT / ST	 3.2×2.5×1.05 (t: Typ.)					B,C,M	-20 °C to +70 °C	4.5 V to 5.5 V	40 mA	5 TTL	P*:OE S*:ST			
		PH / SH							-40 °C to +85 °C	3.0 V to 3.6 V	28 mA	15 pF				
		PC / SC		(2.7 V to 3.6 V; 1 MHz to 66.7 MHz)					-40 °C to +85 °C	(2.7 V to 3.6 V)	28 mA	15 pF				
	SG-8002CA Series	PT / ST	 7.0×5.0×1.4 (t: Typ.)					B,C,M	-20 °C to +70 °C	4.5 V to 5.5 V	40 mA	5 TTL				
		PH / SH		1 MHz; 125 MHz					-40 °C to +85 °C	3.0 V to 3.6 V	28 mA	15 pF				
		PC / SC		(2.7 V to 3.6 V; 1 MHz to 66.7 MHz)					-40 °C to +85 °C	(2.7 V to 3.6 V)	28 mA	15 pF				
	SG-8002JC Series	PT / ST	 10.5×5.8×2.7 (t: Max.)					B,C	-20 °C to +70 °C	4.5 V to 5.5 V	40 mA	5 TTL				
		PH / SH		1 MHz; 125 MHz					-20 °C to +70 °C	3.0 V to 3.6 V	28 mA	15 pF				
		PC / SC		(2.7 V to 3.6 V; 1 MHz to 66.7 MHz)					-20 °C to +70 °C	(2.7 V to 3.6 V)	28 mA	15 pF				
	SG-8002JA Series	PT / ST	 14.0×9.8×4.7 (t: Max.)					B,C,M	-20 °C to +70 °C	4.5 V to 5.5 V	40 mA	5 TTL				
		PH / SH		1 MHz; 125 MHz					-40 °C to +85 °C	3.0 V to 3.6 V	28 mA	15 pF				
		PC / SC		(2.7 V to 3.6 V; 1 MHz to 66.7 MHz)					-40 °C to +85 °C	(2.7 V to 3.6 V)	28 mA	15 pF				
	SG-8002DC Series	PT / ST	 DIP half size					B,C,M	-20 °C to +70 °C	4.5 V to 5.5 V	40 mA	5 TTL				
		PH / SH		1 MHz; 125 MHz					-40 °C to +85 °C	3.0 V to 3.6 V	28 mA	15 pF				
		PC / SC		(2.7 V to 3.6 V; 1 MHz to 66.7 MHz)					-40 °C to +85 °C	(2.7 V to 3.6 V)	28 mA	15 pF				
	SG-8002DB Series	PT / ST	 DIP full size					B,C,M	-20 °C to +70 °C	4.5 V to 5.5 V	40 mA	5 TTL				
		PH / SH		1 MHz; 125 MHz					-40 °C to +85 °C	3.0 V to 3.6 V	28 mA	15 pF				
		PC / SC		(2.7 V to 3.6 V; 1 MHz to 66.7 MHz)					-40 °C to +85 °C	(2.7 V to 3.6 V)	28 mA	15 pF				

* Frequency tolerance : B:±50×10⁻⁶ (-20 °C to +70 °C), C:±100×10⁻⁶ (-20 °C to +70 °C), M:±100×10⁻⁶ (-40 °C to +85 °C), L:±50×10⁻⁶ (-40 °C to +85 °C)

► Output : CMOS (MHz) Programmable OSC For Automotive

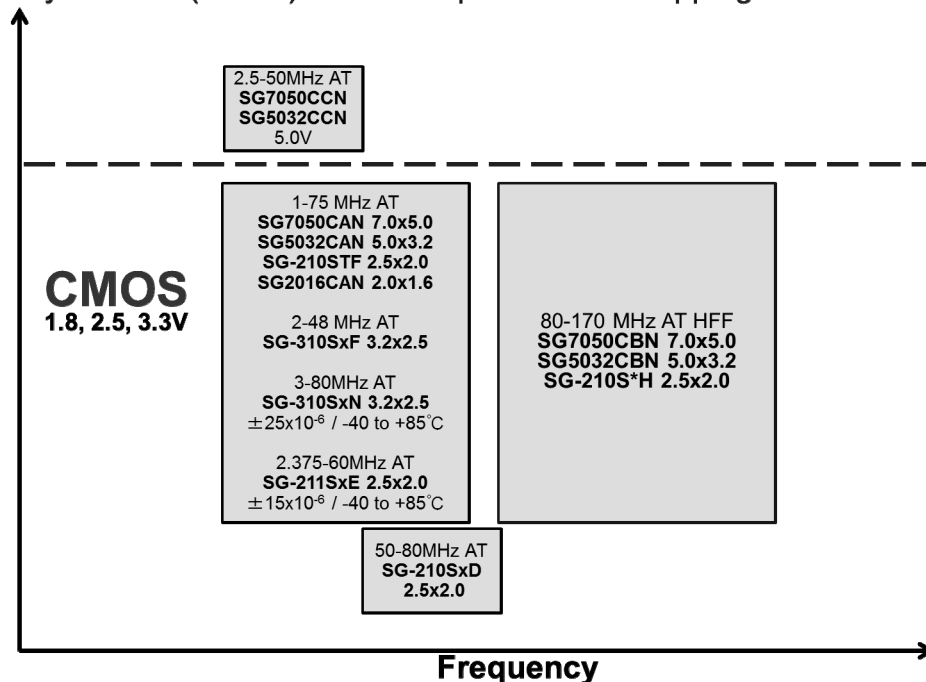
P	Model	Actual size (mm)	Nominal frequency range				Frequency Tolerance (×10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
			(MHz)									
			1	50	100	200						
56 to 57	SG-8101CGA (AEC-Q100)	 2.5×2.0×0.7 (t: Typ.)					±15	-40 °C to +85 °C	1.62V to 1.98V	5.5 mA	15 pF	OE or ST
							±20	-40 °C to +105 °C	1.98 V to 2.2 V	5.8 mA		
									2.2 V to 2.8 V	6.7 mA		
									2.7 V to 3.63 V	8.1 mA		
							±50 / ±100	-40 °C to +125 °C				

► Programming tool for Programmable OSC

58	SG-8000 series Programming Tool (SG-Writer II)											
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Crystal OSC(SPXO) CMOS output Product Mapping

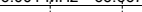
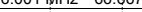
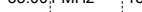
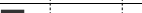
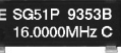


► Output : CMOS (MHz)

P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control		
				(MHz)											
1	50	100	200												
59	SG2016CAN		 2.0x1.6x0.7 (t: Typ.)					±25 ±50 ±50, ±100	-20 °C to +70 °C -40 °C to +85 °C -40 °C to +105 °C	1.6 V to 2.2 V	2.4 mA	15 pF			
										2.2 V to 2.7 V	2.8 mA				
										2.7 V to 3.6 V	3.0 mA				
60	SG-211 series	SEE	 2.5x2.0x0.7 (t: Typ.)					±15 ±20 ±25	-20 °C to +70 °C -40 °C to +85 °C -40 °C to +90 °C	1.6 V to 2.2 V	4.5 mA	15 pF			
		SDE								2.2 V to 2.7 V	5.0 mA				
		SCE								2.7 V to 3.6 V	6.0 mA				
61	SG-210 series	STF	 2.5x2.0x0.8 (t: Typ.)					±25 ±50 ±50, ±100	-20 °C to +70 °C -40 °C to +85 °C -40 °C to +105 °C	1.6 V to 2.2 V	2.4 mA	15 pF			
						2.2 V to 2.7 V	2.8 mA								
						2.7 V to 3.6 V	3.0 mA								
62		SGB						±20 ±50, ±100 ±50, ±100 ±50, ±100 ±100, ±150	-10 °C to +60 °C -20 °C to +70 °C -40 °C to +85 °C	1.3 V to 1.7 V	1.0 mA	15 pF			
		SEB													
		SDB													
SCB															
63		SED						±50, ±100	-20 °C to +70 °C -40 °C to +85 °C	1.6 V to 2.2 V	6.0 mA	30 pF			
		SDD								2.2 V to 3.0 V	7.0 mA				
		SCD								2.7 V to 3.6 V	8.0 mA				
64		SEH						±50, ±100	-20 °C to +70 °C -40 °C to +85 °C	1.8 V±10 %	8.0 mA	15 pF			
		SDH								2.5 V±10 %	9.0 mA				
		SCH								3.3 V±10 %	11.0 mA				
65	SG-310 series	SEF	 3.2x2.5x1.05 (t: Typ.)					±50, ±100	-20 °C to +70 °C -40 °C to +85 °C	1.6 V to 2.2 V	3.0 mA	15 pF			
		SDF								2.2 V to 3.0 V	3.5 mA				
		SCF								2.7 V to 3.6 V	4.5 mA				
		SDN						±20, ±25, ±50, ±100 ±20, ±25 ±25, ±50, ±100	-20 °C to +70 °C -30 °C to +85 °C -40 °C to +85 °C	2.2 V to 2.7 V	6.0 mA				
		SCN								2.7 V to 3.6 V	7.0 mA				
66	SG5032C*N SG7050C*N	CAN	 5.0x3.2x1.1 (t: Typ.)					±25 ±50 ±50, ±100	-20 °C to +70 °C -40 °C to +85 °C -40 °C to +105 °C	1.6 V to 3.6 V	3.0 mA	15 pF			
		CBN									11.0 mA				
		CCN								±50	-40 °C to +85 °C			4.5 V to 5.5 V	20.0 mA
67	HG-2150CA	SVH	 7.0x5.0x1.4 (t: Typ.)					S: ±15 (-20 °C to +70 °C) B: ±25 (-40 °C to +85 °C)	-20 °C to +70 °C -40 °C to +85 °C -20 °C to +70 °C -40 °C to +85 °C	5.0 V±0.5 V	30 mA	15 pF	OE		
		BXH													
		SVC													
		BXC								3.3 V±0.3 V	25 mA				



► Output : CMOS (MHz)

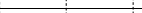
P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control						
				(MHz)															
				1	50	100	200												
Web Site	SG-636 series	PTF	 E 18.4320C PTF9352A					±100	-20 °C to +70 °C	5.0 V±0.5 V	17 mA	10 TTL 50 pF	OE						
		PCE																	
		SCE																	
		PDE						±100 (-20 °C to +70 °C)		3.3 V±0.3 V	9 mA	30 pF	OE						
		PTW																	
		STW																	
		PHW						±50,±100 (-20 °C to +70 °C) *1	-20 °C to +70 °C	5.0 V±0.5 V	45 mA	5 TTL +15 pF	OE						
		SHW																	
		PCW																	
		SCW						±50,±100 (-20 °C to +70 °C) *1		3.3 V±0.3 V	28 mA	15 pF	OE						
		PTG																	
		PHG																	
PCG					±50,±100 (-20 °C to +70 °C) *1		5.0 V±0.5 V	25 mA	25 pF	OE									
SCG																			
																			
Web Site	SG-615 series	P	 SQ-615P C 20.0000M E 9352A					±50,±100 (-20 °C to +70 °C) *2	-20 °C to +70 °C	5.0 V±0.5 V	23 mA	10 TTL 50 pF	OE						
		PTJ																	
		PTW																	
		STW						±50,±100 (-20 °C to +70 °C) ±100 (-40 °C to +85 °C) *3	-20 °C to +70 °C (-40 °C to +85 °C)	3.3 V±0.3 V	28 mA	5 TTL +15 pF	OE						
		PHW																	
		SHW																	
		PCW						±50,±100 (-20 °C to +70 °C) ±100 (-40 °C to +85 °C) *3	-20 °C to +70 °C (-40 °C to +85 °C)	5.0 V±0.5 V	45 mA	15 pF	OE						
		SCW																	
		PCG																	
		SCG						±50,±100 (-20 °C to +70 °C) ±100 (-40 °C to +85 °C) *3	-20 °C to +70 °C (-40 °C to +85 °C)	3.3 V±0.3 V	12 mA	25 pF	OE						
		PCN																	
																			
Web Site	SG-531 series	P	 SQ531PTJ C 60.0000M E 9353B					±50,±100 (-20 °C to +70 °C) *2	-20 °C to +70 °C	5.0 V±0.5 V	23 mA	10 TTL 50 pF	OE						
		PTJ																	
		PTW																	
		STW						±50,±100 (-20 °C to +70 °C) ±100 (-40 °C to +85 °C) *3	-20 °C to +70 °C (-40 °C to +85 °C)	3.3 V±0.3 V	28 mA	5 TTL +15 pF	OE						
		PHW																	
		SHW																	
		PCW						±50,±100 (-20 °C to +70 °C) ±100 (-40 °C to +85 °C) *3	-20 °C to +70 °C (-40 °C to +85 °C)	5.0 V±0.5 V	45 mA	15 pF	OE						
		SCW																	
		PCG																	
		SCG						±50,±100 (-20 °C to +70 °C) ±100 (-40 °C to +85 °C) *3	-20 °C to +70 °C (-40 °C to +85 °C)	3.3 V±0.3 V	12 mA	25 pF	OE						
																			
																			
Web Site	SG-51 series	P	 E SQ51P 9353B 16.0000MHz C					±50,±100 (-20 °C to +70 °C) *2	-20 °C to +70 °C	5.0 V±0.5 V	23 mA	10 TTL 50 pF	OE						
		PTJ																	

*1 SG-636PTW/PHW/SHW/PCW/SCW (±100 / -20 °C to +70 °C: fo > 40 MHz)

*2 PTJ (±50 / -20 °C to +70 °C: fo ≤ 55 MHz)

*3 SG-615/531PTW/STW/PHW/SHW (±100 / -20 °C to +70 °C: fo ≥ 66.67 MHz)

► Output : CMOS (MHz)

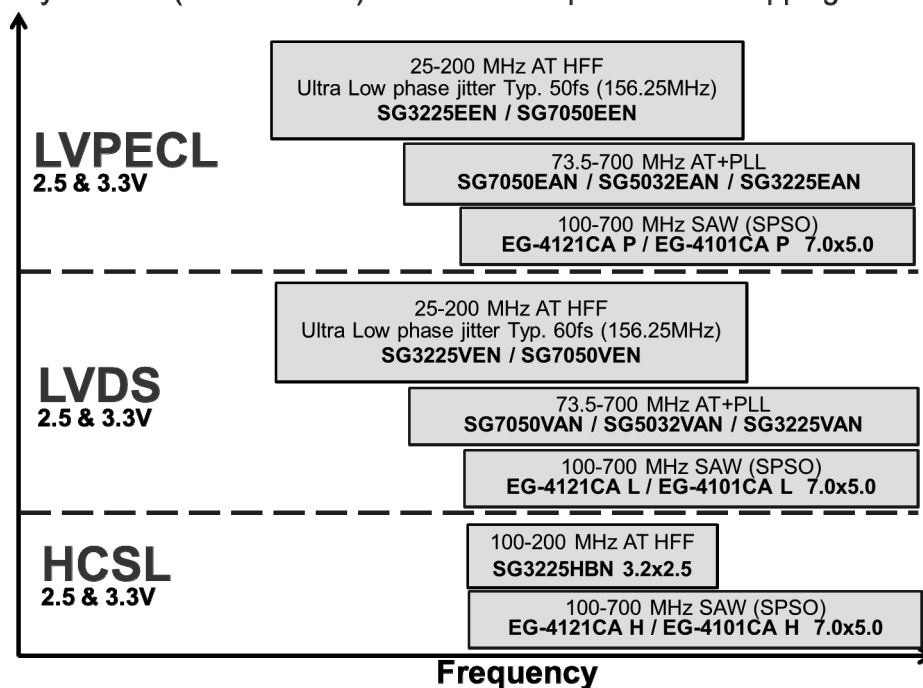
P	Model	Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
			(MHz)									
Web Site	XG-1000CB Series (SPSO)	 E 125.000 OM41AA 5.0×3.2×1.1					±50 ±100	-10 °C to +70 °C	1.8 V ± 0.1 V	20 mA	15 pF	OE
			50 MHz 170 MHz						2.5 V ± 0.125 V	25 mA		
									3.3 V ± 0.3 V	35 mA		
	Web Site	XG-1000CA Series (SPSO)	 E 125.000 OM41AA 7.0×5.0×1.2					±50 ±100	-10 °C to +70 °C	1.8 V ± 0.1 V	20 mA	15 pF
50 MHz 170 MHz				2.5 V ± 0.125 V	25 mA							
				3.3 V ± 0.3 V	35 mA							
Web Site		EG-2021CA Series (SPSO)	 E 125.000H APC323A 7.0×5.0×1.2					±50 ±100	0 °C to +70 °C -5 °C to +85 °C	2.5 V ± 0.125 V	30 mA	15 pF
	62.5 MHz 250 MHz											
	Web Site	EG-2001CA series (SPSO)	 E 125.000H GPC323A 7.0×5.0×1.2					±50 ±100	0 °C to +70 °C	3.3 V ± 0.3 V	50 mA	15 pF
106.5 MHz 170 MHz												

► Output : CMOS(For Automotive MHz)

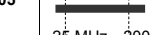
P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature
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Crystal OSC (SPXO/SPSO) Differential Output Product Mapping



► Output : LV-PECL / LVDS / HCSL (MHz)

P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
				50	100	500	800						
70	SG3225EEN SG7050EEN (Ultra Low phase Jitter)	LV-PECL	 3.2×2.5×1.05 (t: Typ.)					±25 ±50 ±100	-40 °C to +85 °C -40 °C to +105 °C	2.5 V ± 0.125 V 3.3 V ± 0.165 V	75 mA	50 Ω	OE
83		LVDS	 7.0×5.0×1.4 (t: Typ.)								25 mA	100 Ω	
71	SG3225EAN SG5032EAN SG7050EAN	LV-PECL	 3.2×2.5×1.05 (t: Typ.)					±20 ±30 ±50	-20 °C to +70 °C -40 °C to +85 °C	2.5 V to 3.3 V	65 mA	50 Ω	OE
		SG3225VAN SG5032VAN SG7050VAN	LVDS	 5.0×3.2×1.0 (t: Typ.) 7.0×5.0×1.4 (t: Typ.)							30 mA	100 Ω	
72	SG7050EBN (Ultra Low phase Jitter)	LV-PECL	 7.0×5.0×1.5 (t: Typ.)					±50	-40 °C to +85 °C	2.5 V±0.125 V	55 mA	50 Ω	OE
										3.3 V±0.165 V	75 mA		
84	SG3225HBN	HCSL	 3.2×2.5×1.05 (t: Typ.)					±50 ±100	-40 °C to +85 °C	3.3 V ± 0.33 V	35mA	50 Ω	OE
73	EG-2121CB Series (SPSO)	LV-PECL	 5.0×3.2×1.4					±50 ±100	0 °C to +70 °C -5 °C to +85 °C -20 °C to +70 °C	2.5 V ± 0.125 V	60 mA		OE
		LVDS								30 mA	100 Ω		
	EG-2102CB Series (SPSO)	LV-PECL								60 mA	50 Ω		
		LVDS								30 mA	100 Ω		
74	EG-2123CB Series (SPSO)	LV-PECL						±100		2.5 V ± 0.125 V	60 mA	50 Ω	
		LVDS								30 mA	100 Ω		
	EG-2103CB Series (SPSO)	LV-PECL								60 mA	50 Ω		
		LVDS								30 mA	100 Ω		
85	XG5032HAN (SPSO)	HCSL						±50 ±100		2.5 V ± 0.125 V 3.3 V ± 0.33 V	35 mA	50 Ω	OE
75	XG-2121CA Series (SPSO)	LV-PECL	 7.0×5.0×1.2					±50 ±100	0 °C to +70 °C -5 °C to +85 °C -20 °C to +70 °C	2.5 V ± 0.125 V	60 mA	50 Ω	OE
		LVDS								30 mA	100 Ω		
	XG-2102CA Series (SPSO)	LV-PECL								60 mA	50 Ω		
		LVDS								30 mA	100 Ω		
76	XG-2123CA Series (SPSO)	LV-PECL						±100		2.5 V ± 0.125 V	60 mA	50 Ω	OE
		LVDS								30 mA	100 Ω		
	XG-2103CA Series (SPSO)	LV-PECL								60 mA	50 Ω		
		LVDS								30 mA	100 Ω		



► Output : LV-PECL / LVDS / HCSL (MHz)

Output : LV-PECL / LVDS / HCSL (MHz)													
P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
				50	100	500	800						
Web Site	EG-2121CA Series (SPSO)	LV-PECL	 7.0×5.0×1.2	53.125 MHz 500 MHz				±50 ±100	0 °C to +70 °C -5 °C to +85 °C -20 °C to +70 °C	2.5 V ± 0.125 V	80mA	50 Ω	OE
		LVDS		53.125 MHz 700 MHz							30 mA	100 Ω	
		HCSL		100 MHz 350 MHz							80 mA	50 Ω	
	EG-2102CA Series (SPSO)	LV-PECL		100 MHz 700 MHz						3.3 V ± 0.3 V	100 mA	50 Ω	
		LVDS		53.125 MHz 700 MHz							45 mA	100 Ω	
		HCSL		100 MHz 350 MHz							85 mA	50 Ω	
Web Site	EG-2101CA Series (SPSO)	LV-PECL	 7.0×5.0×1.2	62.5 MHz 99.999 MHz				±50 ±100	0 °C to +70 °C	3.3 V ± 0.15 V	60 mA	50 Ω	OE
77 to 78	EG-4121CA Series (SPSO)	LV-PECL	 7.0×5.0×1.2	100 MHz 500 MHz				±50	-40 °C to +85 °C	2.5 V ± 0.125 V	80 mA	50 Ω	OE
		LVDS		100 MHz 500 MHz							30 mA	100 Ω	
		HCSL		100 MHz 350 MHz							75 mA	50 Ω	
	EG-4101CA Series (SPSO)	LV-PECL		100 MHz 625 MHz						3.3 V ± 0.33 V	85 mA	50 Ω	
		LVDS		100 MHz 500 MHz							40 mA	100 Ω	
		HCSL		100 MHz 350 MHz							85 mA	50 Ω	

► Multi Output : LV-PECL / LVDS / HCSL (MHz)

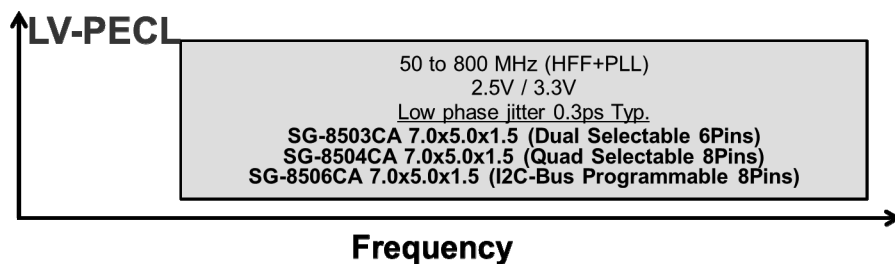
Multi Output : LV-PECL / LVDS / HCSL (MHz)													
P	Model		Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
				(MHz)									
1	100	500	800										
86 to 87	MG7050EAN (Multi output)	LV-PECL	 7.0×5.0×1.6					±50 ±100	0 °C to +70 °C -20 °C to +70 °C -5 °C to +85 °C	2.5 V ± 0.125 V	94 mA (2 Output)	50 Ω	OE
											170 mA (4 Output)		
											102 mA (2 Output)		
											184 mA (4 Output)		
88 to 89	MG7050VAN (Multi output)	LVDS	 7.0×5.0×1.6	100 MHz 700 MHz						2.5 V ± 0.125 V	50 mA (2 Output)	100 Ω	
											66 mA (4 Output)		
								56 mA (2 Output)					
								72 mA (4 Output)					
90 to 91	MG7050HAN (Multi output)	HCSL	 7.0×5.0×1.6	100 MHz 200 MHz				2.5 V ± 0.125 V	84 mA (2 Output)	50 Ω or 42.2 Ω			
									128 mA (4 Output)				
									90 mA (2 Output)				
									136 mA (4 Output)				

► Output : LV-PECL(For Automotive MHz)

P	Model		Actual size (mm)	Nominal frequency range (MHz)				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control
				50	100	500	800						
Web site	EA-2102CB (AEC-Q200)	LV-PECL	 5.0×3.2×1.35	100 MHz				±300	-40 °C to +85 °C	3.3 V ± 0.3 V	80mA	50 Ω	OE



Programmable Differential Output Product Mapping

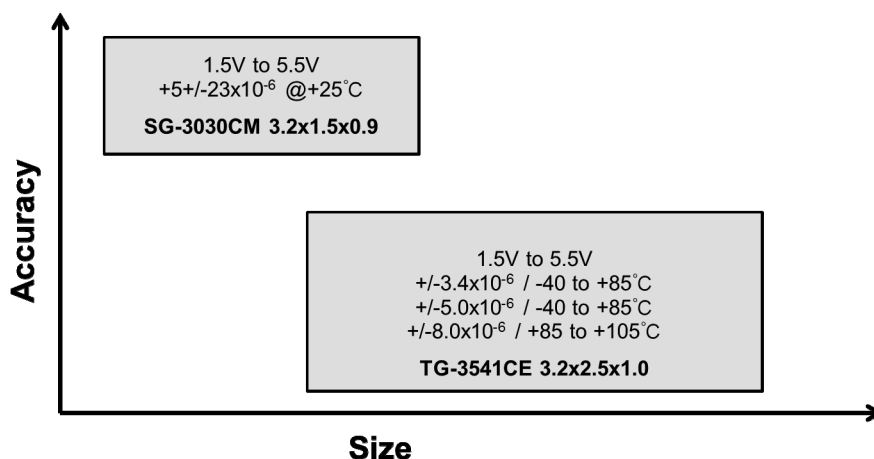


► Output : LV-PECL Programmable OSC (MHz)

P	Model	Actual size (mm)	Nominal frequency range				Frequency Tolerance (x10 ⁻⁶)	Operating temperature	Supply voltage	Current consumption (Max.)	Output load condition	Output control	
			50	100	500	800							
79 to 80	SG-8506CA (I2C-Bus Programmable 8Pins)	 7.0×5.0×1.5 (t: Typ.)					±31.5 ±50	-40 °C to +85 °C	2.5 V±0.125 V	90 mA	LV-PECL	OE	
			50 MHz			800 MHz			3.3 V±0.33 V				
81 to 82	SG-8503CA (Dual Selectable 6Pins)	 7.0×5.0×1.5 (t: Typ.)					±31.5 ±50	-40 °C to +85 °C	2.5 V±0.125 V	90 mA	LV-PECL	OE	
			50 MHz			800 MHz			3.3 V±0.33 V				
		SG-8504CA (Quad Selectable 8Pins)	 7.0×5.0×1.5 (t: Typ.)					±31.5 ±50	-40 °C to +85 °C	2.5 V±0.125 V	90 mA	LV-PECL	OE
				50 MHz			800 MHz			3.3 V±0.33 V			



Crystal OSC (32.768kHz) CMOS output Product Mapping



► Output : CMOS (32.768kHz)

P	Model	Actual size (mm)	Nominal frequency range (MHz)				Frequency Tolerance ($\times 10^{-6}$)	Operating temperature	Supply voltage	Current consumption (Max.) (Vcc)	Output load condition	Output control
			1	50	100	200						
92	SG-3030CM	 3.2×1.5×0.9	•				5±23	+25 °C	1.5 V to 5.5 V	2 μ A (3.3 V)	15 pF	VIO
	SG-3030LC	 3.6×2.8×1.2	•						1.5 V to 5.5 V	2 μ A (3.3 V)	15 pF	VIO
	SG-3040LC								0.9 V to 3.6 V	3.1 μ A (3.3 V)		
Web Site	SG-3030JF	 7.1×5.1×1.5	•						1.5 V to 5.5 V	2 μ A (3.3 V)	15 pF	VIO
92	SG-3030JC	 SG3030 B E 8123A	•						1.5 V to 5.5 V	2 μ A (3.3 V)	15 pF	VIO
	SG-3040JC	10.5×5.8×2.7							0.9 V to 3.6 V	3.1 μ A (3.3 V)		
93	TG-3541CE	 3.2×2.5×1.0 (t: Typ.)	•				±3.4 ±5.0 ±8.0	-40 to +85 °C -40 to +85 °C +85 to +105 °C	1.5 V to 5.5 V	1.5 μ A (3.0 V)	30 pF	OE

► Output : CMOS (32.768kHz) For Automotive

P	Model	Actual size (mm)	Nominal frequency range (MHz)				Frequency Tolerance ($\times 10^{-6}$)	Operating temperature	Supply voltage	Current consumption (Max.) (Vcc)	Output load condition	Output control
			1	50	100	200						
94	TG-3541CEA (AEC-Q100)	 3.2×2.5×1.0 (t: Typ.)	•				±3.4 ±5.0 ±8.0	-40 to +85 °C -40 to +85 °C +85 to +105 °C	1.5 V to 5.5 V	1.5 μ A (3.0 V)	30 pF	OE



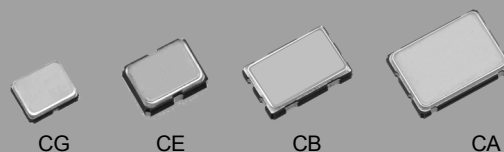
CRYSTAL OSCILLATOR (Programmable) SPREAD SPECTRUM OUTPUT: CMOS

SG-9101 series

- Frequency range : 0.67 MHz ~ 170 MHz (1 ppm Step)
- Supply voltage : 1.62 V ~ 3.63 V
- Function : Output enable (OE) or Standby ($\overline{ST}$)
- Down or Center spread modulation
- Configurable spreading
 - 3 modulation profile (Hershey-kiss, Sine-wave, Triangle),
 - 4 modulation frequency, 6 spread percentage
- Package : 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 (mm)
- PLL technology to enable short lead time
- Available field oscillator programmer "SG-Writer II"



Product Number (please contact us)
 SG-9101CA: X1G005301xxxx00
 SG-9101CB: X1G005311xxxx00
 SG-9101CE: X1G005321xxxx00
 SG-9101CG: X1G005291xxxx00



Specifications (characteristics)

Item	Symbol	Specifications				Conditions/Remarks						
Supply voltage	V _{CC}	1.80 V Typ.		2.50 V Typ.	3.30 V Typ.	-						
		1.62 V ~ 1.98 V	1.98 V ~ 2.20 V	2.20 V ~ 2.80 V	2.70 V ~ 3.63 V							
Output frequency range	f _o	0.67 MHz ~ 170 MHz										
Storage temperature	T _{stg}	-40 °C ~ +125 °C				Storage as single product.						
Operating temperature	T _{use}	-40 °C ~ +85 °C										
		-40 °C ~ +105 °C										
Frequency tolerance ^{*1}	f _{tol}	±50 × 10 ⁻⁶				Average frequency of 1s gate time.						
Current consumption	I _{CC}	3.4 mA Max.	3.5 mA Max.	3.6 mA Max.	3.7 mA Max.	T _{use} = +105 °C	No load, f _o = 20 MHz					
		2.9 mA Typ.		3.0 mA Typ.	3.2 mA Typ.	T _{use} = +25 °C						
		5.7 mA Max.	6.0 mA Max.	6.9 mA Max.	8.3 mA Max.	T _{use} = +105 °C	No load, f _o = 170 MHz					
		4.9 mA Typ.		5.9 mA Typ.	7.0 mA Typ.	T _{use} = +25 °C						
Output disable current	I _{dis}	3.4 mA Max.	3.4 mA Max.	3.5 mA Max.	3.7 mA Max.	OE = GND, f _o = 170 MHz						
Standby current	I _{std}	0.9 μA Max.	1.0 μA Max.	1.5 μA Max.	2.5 μA Max.	T _{use} = +105 °C	ST = GND					
		0.3 μA Typ.	0.4 μA Typ.	0.5 μA Typ.	1.1 μA Typ.	T _{use} = +25 °C						
Symmetry	SYM	45 % ~ 55 %				50 % V _{CC} Level						
Output voltage (DC characteristics)	V _{OH}	90 % V _{CC} Min.				I _{OH} /I _{OL} Conditions [mA]						
						Rise/Fall time		V _{CC}	*A	*B	*C	*D
						Default (f _o > 40 MHz), Fast		I _{OH}	-2.5	-3.5	-4.0	-5.0
								I _{OL}	2.5	3.5	4.0	5.0
	V _{OL}	10 % V _{CC} Max.				Default (f _o ≤ 40 MHz)		I _{OH}	-1.5	-2.0	-2.5	-3.0
								I _{OL}	1.5	2.0	2.5	3.0
						Slow		I _{OH}	-1.0	-1.5	-2.0	-2.5
								I _{OL}	1.0	1.5	2.0	2.5
								*A : 1.62 V ~ 1.98 V, *B : 1.98 V ~ 2.20 V, *C : 2.20 V ~ 2.80 V, *D : 2.70 V ~ 3.63 V				
Output load condition	L _{CMOS}	15 pF Max.				-						
Input voltage	V _{IH}	70 % V _{CC} Min.										
	V _{IL}	30 % V _{CC} Max.				OE or ST						
Rise and Fall time	Default Fast Slow	tr/tf	3.0 ns Max.			f _o > 40 MHz		20 % - 80 % V _{CC} , L _{CMOS} = 15 pF				
			6.0 ns Max.			f _o ≤ 40 MHz						
			3.0 ns Max.			f _o = 0.67 MHz ~ 170 MHz						
			10.0 ns Max.			f _o = 0.67 MHz ~ 20 MHz						
Disable Time	t _{stp}	1 μs Max.				Measured from the time OE or ST pin crosses 30 % V _{CC}						
Enable Time	t _{sta}	1 μs Max.				Measured from the time OE pin crosses 70 % V _{CC}						
Resume Time	t _{res}	3 ms Max.				Measured from the time ST pin crosses 70 % V _{CC}						
Start-up time	t _{str}	3 ms Max.				Measured from the time V _{CC} reaches its rated minimum value, 1.62 V						

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging (+25 °C, 1 year).

Product Name

SG-9101CG 170.000000MHz C 20 P H A A A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

① Model, ② Package type, ③ Frequency,

④ Spread type, ⑤ Spread percentage code,

⑥ Function, ⑦ Operating temperature,

⑧ Modulation frequency, ⑨ Modulation profile, ⑩ Rise/Fall time

② Package Type
CA: 7.0 mm x 5.0 mm
CB: 5.0 mm x 3.2 mm
CE: 3.2 mm x 2.5 mm
CG: 2.5 mm x 2.0 mm

④ Spread type
C: Center spread
D: Down spread

⑥ Function
P: Output enable
S: Standby

⑦ Operating temperature
G: -40 °C ~ +85 °C
H: -40 °C ~ +105 °C

⑧ Modulation frequency
A: 25.4 kHz (default)
B: 12.7 kHz
C: 8.5 kHz
D: 6.3 kHz

⑨ Modulation profile
A: Hershey-kiss (default)
B: Sine-wave
C: Triangle

⑩ Rise/Fall time
A: Default
B: Fast
C: Slow

Spread spectrum configuration

④	C: Center spread modulation	⑥ Code	02	05	07	10	15	20
		Spread percentage	± 0.25 %	± 0.5 %	± 0.75 %	± 1.0 %	± 1.5 %	± 2.0 %
	D: Down spread modulation	⑥ Code	05	10	15	20	30	40
		Spread percentage	-0.5 %	-1.0 %	-1.5 %	-2.0 %	-3.0 %	-4.0 %

Modulation frequency: 25.4 kHz (default), 6.3 kHz, 8.5 kHz, 12.7 kHz

Modulation profile: Hershey-kiss (default), Sine-wave, Triangle



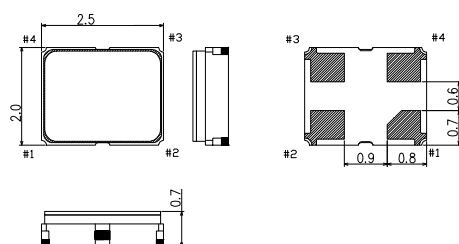
Pin description

Pin	Name	I/O type	Function	
1	OE	Input	Output enable	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), only output driver is disabled.
	ST	Input	Standby	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I _{std} .
2	GND	Power	Ground	
3	OUT	Output	Clock output	
4	V _{CC}	Power	Power supply	

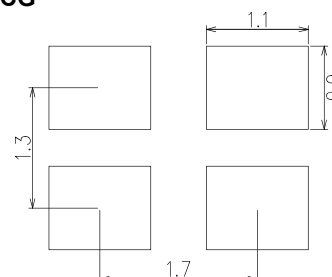
External dimensions

(Unit: mm)

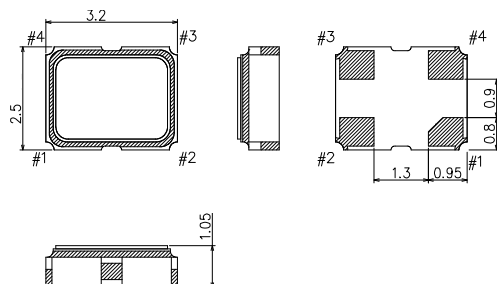
SG-9101CG



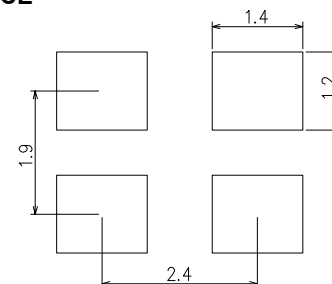
SG-9101CG



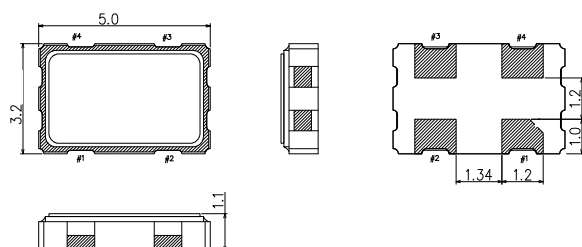
SG-9101CE



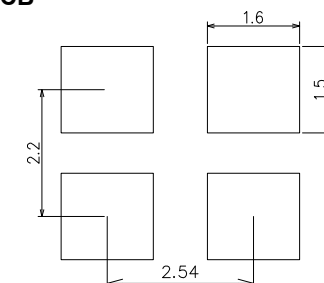
SG-9101CE



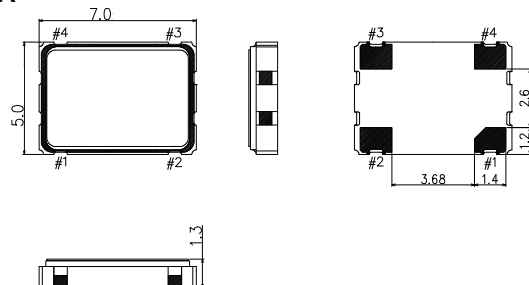
SG-9101CB



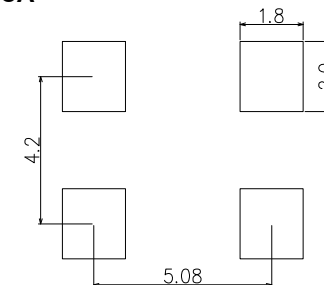
SG-9101CB



SG-9101CA



SG-9101CA



■Notes:

In order to achieve optimum jitter performance, the 0.1 μ F capacitor between V_{CC} and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

CRYSTAL OSCILLATOR (Programmable)
SPREAD SPECTRUM
OUTPUT: CMOS



SG-9101CGA

- Frequency range : 0.67 MHz ~ 170 MHz (1 ppm Step)
- Supply voltage : 1.62 V ~ 3.63 V
- Function : Output enable (OE) or Standby (ST)
- Down or Center spread modulation
- Configurable spreading
 - 3 modulation profile (Hershey-kiss, Sine-wave, Triangle),
 - 4 modulation frequency, 6 spread percentage
- Package : 2.5 x 2.0 (mm)
- PLL technology to enable short lead time
- Conform to AEC-Q100



Product Number (please contact us)

X1G005281xxxx00

NEW



Specifications (characteristics)

Item		Symbol	Specifications				Conditions/Remarks						
Supply voltage		V _{CC}	1.80 V Typ.		2.50 V Typ.	3.30 V Typ.							
			1.62 V to 1.98 V		1.98 V to 2.20 V	2.20 V to 2.80 V				2.70 V to 3.63 V			
Output frequency range		f _o	0.67 MHz to 170 MHz										
Storage temperature		T _{stg}	-40 °C to +125 °C				Storage as single product.						
Operating temperature		T _{use}	-40 °C to +125 °C										
Frequency tolerance ^{*1}		f _{tol}	±100 × 10 ⁻⁶				Average frequency of 1s gate time.						
Current consumption		I _{CC}	3.5 mA Max.	3.6 mA Max.	3.7 mA Max.	3.8 mA Max.	T _{use} = +125 °C	No load, f _o = 20 MHz					
			3.4 mA Max.	3.5 mA Max.	3.6 mA Max.	3.7 mA Max.	T _{use} = +105 °C						
			2.9 mA Typ.		3.0 mA Typ.	3.2 mA Typ.	T _{use} = +25 °C						
			5.8 mA Max.	6.1 mA Max.	7.0 mA Max.	8.4 mA Max.	T _{use} = +125 °C	No load, f _o = 170 MHz					
			5.7 mA Max.	6.0 mA Max.	6.9 mA Max.	8.3 mA Max.	T _{use} = +105 °C						
			4.9 mA Typ.		5.9 mA Typ.	7.0 mA Typ.	T _{use} = +25 °C						
Output disable current		I _{dis}	3.5 mA Max.	3.5 mA Max.	3.6 mA Max.	3.8 mA Max.	T _{use} = +125 °C	OE = GND, f _o = 170 MHz					
			3.4 mA Max.	3.4 mA Max.	3.5 mA Max.	3.7 mA Max.	T _{use} = +105 °C						
Standby current		I _{std}	2.3 µA Max.	2.5 µA Max.	3.0 µA Max.	4.2 µA Max.	T _{use} = +125 °C	ST = GND					
			0.9 µA Max.	1.0 µA Max.	1.5 µA Max.	2.5 µA Max.	T _{use} = +105 °C						
			0.3 µA Typ.	0.4 µA Typ.	0.5 µA Typ.	1.1 µA Typ.	T _{use} = +25 °C						
Symmetry		SYM	45 % to 55 %				50 % V _{CC} Level						
Output voltage (DC characteristics)		V _{OH}	90 % V _{CC} Min.				I _{OH} /I _{OL} Conditions [mA]						
							Rise/Fall time		V _{CC}	*A	*B	*C	*D
							Default (f _o > 40 MHz), Fast		I _{OH}	-2.5	-3.5	-4.0	-5.0
									I _{OL}	2.5	3.5	4.0	5.0
		V _{OL}	10 % V _{CC} Max.				Default (f _o ≤ 40 MHz)		I _{OH}	-1.5	-2.0	-2.5	-3.0
									I _{OL}	1.5	2.0	2.5	3.0
							Slow		I _{OH}	-1.0	-1.5	-2.0	-2.5
									I _{OL}	1.0	1.5	2.0	2.5
						*A : 1.62 V to 1.98 V, *B : 1.98 V to 2.20 V, *C : 2.20 V to 2.80 V, *D : 2.70 V to 3.63 V							
Output load condition		L _{CMOS}	15 pF Max.										
Input voltage		V _{IH}	70 % V _{CC} Min.				OE or ST						
		V _{IL}	30 % V _{CC} Max.										
Rise and Fall time	Default	tr/tf	3.0 ns Max.				f _o > 40 MHz		20 % - 80 % V _{CC} , L _{CMOS} = 15 pF				
	Fast		6.0 ns Max.				f _o ≤ 40 MHz						
			3.0 ns Max.				f _o = 0.67 MHz ~ 170 MHz						
			Slow	10.0 ns Max.				f _o = 0.67 MHz ~ 20 MHz					
Disable Time		t _{stp}	1 µs Max.				Measured from the time OE or ST pin crosses 30 % V _{CC}						
Enable Time		t _{sta}	1 µs Max.				Measured from the time OE pin crosses 70 % V _{CC}						
Resume Time		t _{res}	3 ms Max.				Measured from the time ST pin crosses 70 % V _{CC}						
Start-up time		t _{str}	3 ms Max.				Measured from the time V _{CC} reaches its rated minimum value, 1.62 V						
Frequency aging		f _{aging}	This is included in frequency tolerance specification.				+25 °C, first year						

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging (+25 °C, 1 year).

Product Name

SG-9101CGA 170.000000MHz C 20 P J A A A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

- ①Model, ②Package type, ③Frequency,
- ④Spread type, ⑤Spread percentage code,
- ⑥Function, ⑦Operating temperature,
- ⑧Modulation frequency, ⑨Modulation profile, ⑩Rise/Fall time

②Package Type

CG: 2.5 mm x 2.0 mm

④Spread type

C: Center spread

D: Down spread

⑥Function

P: Output enable

S: Standby

⑦Operating temperature

J: -40 °C ~ +125 °C

⑧Modulation frequency

A: 25.4 kHz (default)

B: 12.7 kHz

C: 8.5 kHz

D: 6.3 kHz

⑨Modulation profile

A: Hershey-kiss (default)

B: Sine-wave

C: Triangle

⑩Rise/Fall time

A: Default

B: Fast

C: Slow

Spread spectrum configuration

④	C: Center spread modulation	⑤Code	02	05	07	10	15	20
		Spread percentage	±0.25 %	±0.5 %	±0.75 %	±1.0 %	±1.5 %	±2.0 %
④	D: Down spread modulation	⑤Code	05	10	15	20	30	40
		Spread percentage	-0.5 %	-1.0 %	-1.5 %	-2.0 %	-3.0 %	-4.0 %

Modulation frequency: 25.4 kHz (default), 6.3 kHz, 8.5 kHz, 12.7 kHz
Modulation profile: Hershey-kiss (default), Sine-wave, Triangle

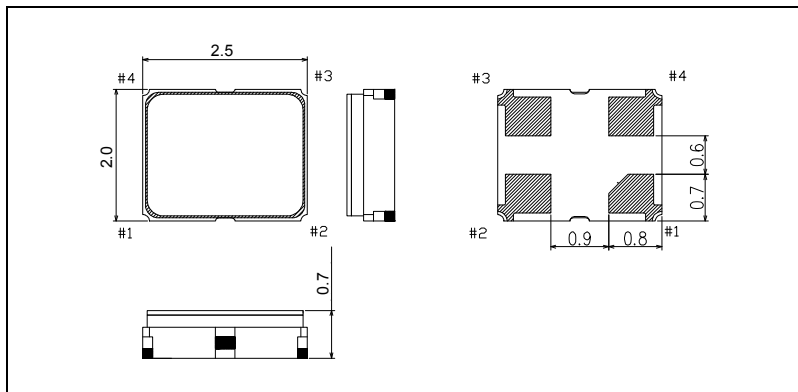


Pin description

Pin	Name	I/O type	Function	
1	OE	Input	Output enable	High: Specified frequency output from OUT pin
				Low: Out pin is low (weak pull down), only output driver is disabled.
	ST	Input	Standby	High: Specified frequency output from OUT pin
				Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I _{std} .
2	GND	Power	Ground	
3	OUT	Output	Clock output	
4	V _{CC}	Power	Power supply	

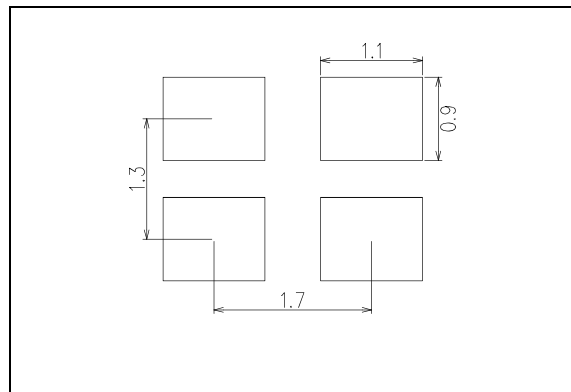
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)



■Notes:

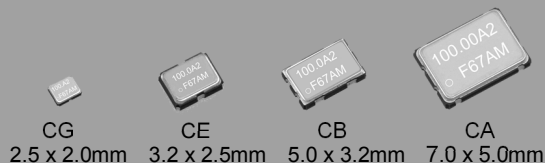
In order to achieve optimum jitter performance, the 0.1 μ F capacitor between V_{CC} and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

CRYSTAL OSCILLATOR (Programmable)
OUTPUT: CMOS**SG-8018**series**NEW**

- Frequency range : 0.67 MHz ~ 170 MHz (1 ppm Step)
- Supply voltage : 1.62 V ~ 3.63 V
- Function : Output enable (OE) or Standby ($\overline{ST}$)
- Frequency tolerance : ± 50 ppm ($-40^\circ\text{C} \sim +105^\circ\text{C}$)
Include frequency aging($+25^\circ\text{C}$, 10 years)
- Package : 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 (mm)
- PLL technology to enable short lead time
- Available field oscillator programmer "SG-Writer II"



Product Number (please contact us)
 SG-8018CA: X1G005571xxxx00
 SG-8018CB: X1G005581xxxx00
 SG-8018CE: X1G005591xxxx00
 SG-8018CG: X1G005601xxxx00



Specifications (characteristics)

Item		Symbol	Specifications				Conditions/Remarks					
Supply voltage		V _{CC}	1.80 V Typ.		2.50 V Typ.	3.30 V Typ.	-					
			1.62 V ~ 1.98 V	1.98 V ~ 2.20 V	2.20 V ~ 2.80 V	2.70 V ~ 3.63 V						
Output frequency range		f _o	0.67 MHz ~ 170 MHz									
Storage temperature		T _{stg}	-40 °C ~ +125 °C				Storage as single product.					
Operating temperature		T _{use}	-40 °C ~ +105 °C				-					
Frequency tolerance ^{*1}		f _{tol}	J: ±50 × 10 ⁻⁶				T _{use} = -40 °C ~ +105 °C					
Current consumption		I _{CC}	3.2 mA Max.	3.3 mA Max.	3.4 mA Max.	3.5 mA Max.	T _{use} = +105 °C	No load, f _o = 20 MHz				
			2.7 mA Typ.		2.9 mA Typ.	3.0 mA Typ.	T _{use} = +25 °C					
			5.5 mA Max.	5.8 mA Max.	6.7 mA Max.	8.1 mA Max.	T _{use} = +105 °C	No load, f _o = 170 MHz				
			4.7 mA Typ.		5.7 mA Typ.	6.8 mA Typ.	T _{use} = +25 °C					
Output disable current		I _{dis}	3.2 mA Max.	3.2 mA Max.	3.3 mA Max.	3.5 mA Max.	OE = GND, f _o = 170 MHz					
Standby current		I _{std}	0.9 µA Max.	1.0 µA Max.	1.5 µA Max.	2.5 µA Max.	T _{use} = +105 °C	ST = GND				
			0.3 µA Typ.	0.4 µA Typ.	0.5 µA Typ.	1.1 µA Typ.	T _{use} = +25 °C					
Symmetry		SYM	45 % ~ 55 %				50 % V _{CC} Level					
Output voltage (DC characteristics)		V _{OH}	90 % V _{CC} Min.				I _{OH} /I _{OL} Conditions [mA]					
							Rise/Fall time	V _{CC}	*A	*B	*C	*D
							Default (f _o > 40 MHz), Fast	I _{OH}	-2.5	-3.5	-4.0	-5.0
								I _{OL}	2.5	3.5	4.0	5.0
		V _{OL}	10 % V _{CC} Max.				Default (f _o ≤ 40 MHz)	I _{OH}	-1.5	-2.0	-2.5	-3.0
								I _{OL}	1.5	2.0	2.5	3.0
							Slow	I _{OH}	-1.0	-1.5	-2.0	-2.5
								I _{OL}	1.0	1.5	2.0	2.5
Output load condition		L _{CMOS}	15 pF Max.				*A: 1.62 V ~ 1.98 V, *B: 1.98 V ~ 2.20 V, *C: 2.20 V ~ 2.80 V, *D: 2.70 V ~ 3.63 V					
Input voltage		V _{IH}	70 % V _{CC} Min.				OE or ST					
		V _{IL}	30 % V _{CC} Max.									
Rise and Fall time	Default	tr/tf	3.0 ns Max.			f _o > 40 MHz			20 % - 80 % V _{CC} , L _{CMOS} = 15 pF			
			6.0 ns Max.			f _o ≤ 40 MHz						
	Fast		3.0 ns Max.			f _o = 0.67 MHz ~ 170 MHz						
			10.0 ns Max.			f _o = 0.67 MHz ~ 20 MHz						
Disable Time		t _{stp}	1 µs Max.				Measured from the time OE or ST pin crosses 30 % V _{CC}					
Enable Time		t _{sta}	1 µs Max.				Measured from the time OE pin crosses 70 % V _{CC}					
Resume Time		t _{res}	3 ms Max.				Measured from the time ST pin crosses 70 % V _{CC}					
Start-up time		t _{str}	3 ms Max.				Measured from the time V _{CC} reaches its rated minimum value, 1.62 V					
Frequency aging		f _{aging}	This is included in frequency tolerance specification.				+25 °C, 10 years					

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging ($+25^\circ\text{C}$, 10 years).

Pin description

Pin	Name	I/O type	Function	
1	OE	Input	Output enable	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), only output driver is disabled.
			Standby	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I_{std} .
	$\overline{ST}$	Input	Standby	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I_{std} .
			Standby	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I_{std} .
2	GND	Power	Ground	
3	OUT	Output	Clock output	
4	V_{CC}	Power	Power supply	



Product Name

SG-8018CG 170.000000MHz I J H P A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①Model, ②Package type,
 ③Frequency, ④Supply voltage,
 ⑤Frequency tolerance, ⑥Operating temperature,
 ⑦Function, ⑧Rise/Fall time

②Package type

CA: 7.0 mm x 5.0 mm

CB: 5.0 mm x 3.2 mm

CE: 3.2 mm x 2.5 mm

CG: 2.5 mm x 2.0 mm

④Supply voltage

T: 1.8 V ~ 3.3 V Typ.

⑤Frequency tolerance

J: 50×10^{-6}

⑥Operating temperature

H: -40 °C ~ +105 °C

⑦Function

P: Output Enable

S: Standby

⑧ Rise/Fall time

A: Default

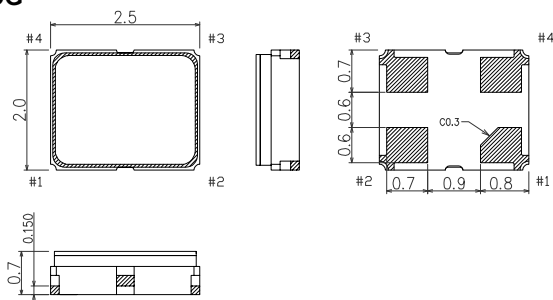
B: Fast

C: Slow

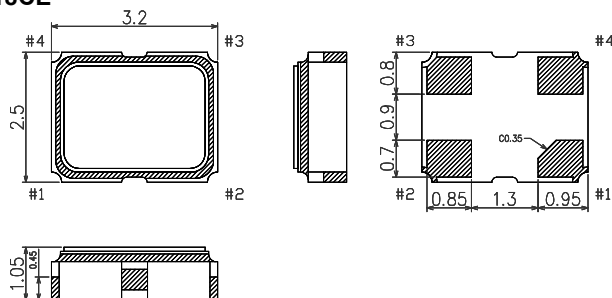
External dimensions

(Unit: mm)

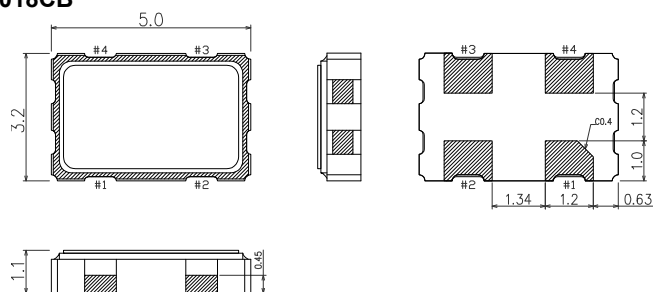
SG-8018CG



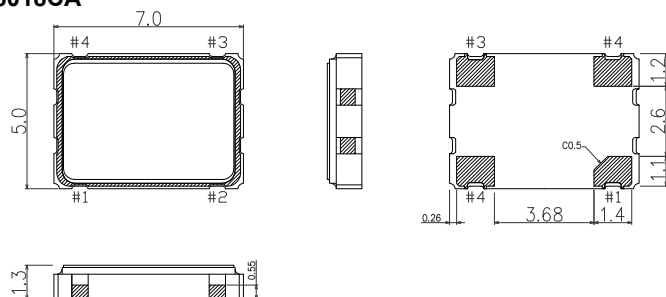
SG-8018CE



SG-8018CB



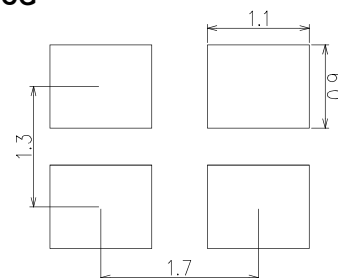
SG-8018CA



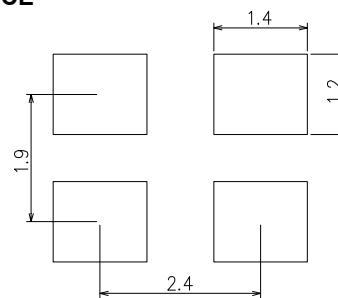
Footprint (Recommended)

(Unit: mm)

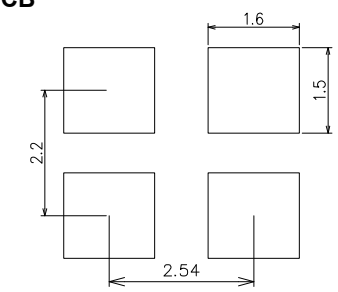
SG-8018CG



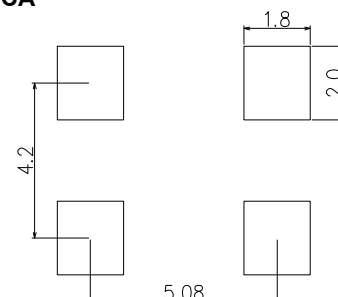
SG-8018CE



SG-8018CB



SG-8018CA



■Notes:

In order to achieve optimum jitter performance, the 0.1 μ F capacitor between V_{CC} and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

CRYSTAL OSCILLATOR (Programmable)

OUTPUT: CMOS

SG-8101series

- Frequency range : 0.67 MHz ~ 170 MHz (1 ppm Step)
- Supply voltage : 1.62 V ~ 3.63 V
- Function : Output enable (OE) or Standby ($\overline{ST}$)
- Frequency tolerance, operating temperature:
 - ± 15 ppm ($-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$)
 - ± 20 ppm, ± 50 ppm ($-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$)
- Package : 2.5 x 2.0, 3.2 x 2.5, 5.0 x 3.2, 7.0 x 5.0 (mm)
- PLL technology to enable short lead time
- Available field oscillator programmer "SG-Writer II"



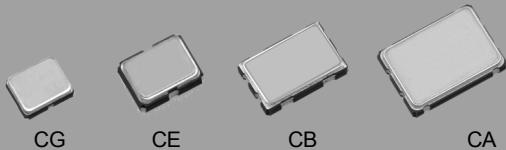
Product Number (please contact us)

SG-8101CA: X1G005191xxxx00

SG-8101CB: X1G005201xxxx00

SG-8101CE: X1G005211xxxx00

SG-8101CG: X1G005181xxxx00



Specifications (characteristics)

Item		Symbol	Specifications				Conditions/Remarks					
Supply voltage		V _{CC}	1.80 V Typ.		2.50 V Typ.	3.30 V Typ.	-					
			1.62 V ~ 1.98 V	1.98 V ~ 2.20 V	2.20 V ~ 2.80 V	2.70 V ~ 3.63 V						
Output frequency range		f _o	0.67 MHz ~ 170 MHz									
Storage temperature		T _{stg}	-40 °C ~ +125 °C				Storage as single product.					
Operating temperature		T _{use}	-40 °C ~ +85 °C				-					
			-40 °C ~ +105 °C									
Frequency tolerance*1		f _{tol}	B: ±15 × 10 ⁻⁶				T _{use} = -40 °C ~ +85 °C					
			C: ±20 × 10 ⁻⁶				T _{use} = -40 °C ~ +105 °C					
			J: ±50 × 10 ⁻⁶				T _{use} = -40 °C ~ +105 °C					
Current consumption		I _{CC}	3.2 mA Max.	3.3 mA Max.	3.4 mA Max.	3.5 mA Max.	T _{use} = +105 °C	No load, f _o = 20 MHz				
			2.7 mA Typ.		2.9 mA Typ.	3.0 mA Typ.	T _{use} = +25 °C					
			5.5 mA Max.	5.8 mA Max.	6.7 mA Max.	8.1 mA Max.	T _{use} = +105 °C	No load, f _o = 170 MHz				
			4.7 mA Typ.		5.7 mA Typ.	6.8 mA Typ.	T _{use} = +25 °C					
Output disable current		I _{dis}	3.2 mA Max.	3.2 mA Max.	3.3 mA Max.	3.5 mA Max.	OE = GND, f _o = 170 MHz					
Standby current		I _{std}	0.9 μA Max.	1.0 μA Max.	1.5 μA Max.	2.5 μA Max.	T _{use} = +105 °C	ST = GND				
			0.3 μA Typ.	0.4 μA Typ.	0.5 μA Typ.	1.1 μA Typ.	T _{use} = +25 °C					
Symmetry		SYM	45 % ~ 55 %				50 % V _{CC} Level					
Output voltage (DC characteristics)		V _{OH}	90 % V _{CC} Min.				[mA]					
							Rise/Fall time	V _{CC}	*A	*B	*C	*D
							Default (f _o > 40 MHz), Fast	I _{OH}	-2.5	-3.5	-4.0	-5.0
		V _{OL}	10 % V _{CC} Max.				Default (f _o ≤ 40 MHz)	I _{OL}	2.5	3.5	4.0	5.0
							I _{OH}	-1.5	-2.0	-2.5	-3.0	
							I _{OL}	1.5	2.0	2.5	3.0	
							I _{OH}	-1.0	-1.5	-2.0	-2.5	
						I _{OL}	1.0	1.5	2.0	2.5		
						*A: 1.62 V ~ 1.98 V, *B: 1.98 V ~ 2.20 V, *C: 2.20 V ~ 2.80 V, *D: 2.70 V ~ 3.63 V						
Output load condition		L _{CMOS}	15 pF Max.				-					
Input voltage		V _{IH}	70 % V _{CC} Min.				OE or ST					
		V _{IL}	30 % V _{CC} Max.									
Rise and Fall time	Default	tr/tf	3.0 ns Max.				f _o > 40 MHz		20 % - 80 % V _{CC} , L _{CMOS} = 15 pF			
	6.0 ns Max.				f _o ≤ 40 MHz							
	Fast		3.0 ns Max.				f _o = 0.67 MHz ~ 170 MHz					
	Slow		10.0 ns Max.				f _o = 0.67 MHz ~ 20 MHz					
Disable Time		t _{stp}	1 μs Max.				Measured from the time OE or ST pin crosses 30 % V _{CC}					
Enable Time		t _{sta}	1 μs Max.				Measured from the time OE pin crosses 70 % V _{CC}					
Resume Time		t _{res}	3 ms Max.				Measured from the time ST pin crosses 70 % V _{CC}					
Start-up time		t _{str}	3 ms Max.				Measured from the time V _{CC} reaches its rated minimum value, 1.62 V					
Frequency aging		f _{aging}	This is included in frequency tolerance specification.				+25 °C, first year					

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging (+25 $^{\circ}\text{C}$, 1 year).

Pin description

Pin	Name	I/O type	Function	
1	OE	Input	Output enable	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), only output driver is disabled.
	$\overline{ST}$	Input	Standby	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I_{std} .
2	GND	Power	Ground	
3	OUT	Output	Clock output	
4	V_{CC}	Power	Power supply	



Product Name

SG-8101CG 170.000000MHz I C H P A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Model, ② Package type,
 ③ Frequency, ④ Supply voltage,
 ⑤ Frequency tolerance, ⑥ Operating temperature,
 ⑦ Function, ⑧ Rise/Fall time

② Package type

CA: 7.0 mm x 5.0 mm

CB: 5.0 mm x 3.2 mm

CE: 3.2 mm x 2.5 mm

CG: 2.5 mm x 2.0 mm

④ Supply voltage

T: 1.8 V ~ 3.3 V Typ.

⑤ Frequency tolerance

B: 15×10^{-6} C: 20×10^{-6} J: 50×10^{-6}

⑥ Operating temperature

G: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ H: $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$

⑦ Function

P: Output Enable

S: Standby

⑧ Rise/Fall time

A: Default

B: Fast

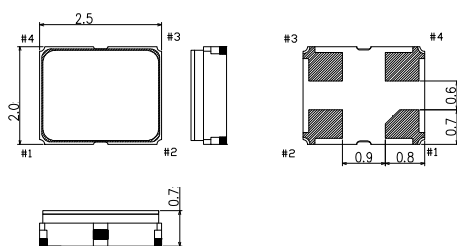
C: Slow

Available combination		CA: 7.0 mm x 5.0 mm			CB: 5.0 mm x 3.2 mm			CE: 3.2 mm x 2.5 mm			CG: 2.5 mm x 2.0 mm		
Frequency tolerance		B: 15×10^{-6}	C: 20×10^{-6}	J: 50×10^{-6}	B: 15×10^{-6}	C: 20×10^{-6}	J: 50×10^{-6}	B: 15×10^{-6}	C: 20×10^{-6}	J: 50×10^{-6}	B: 15×10^{-6}	C: 20×10^{-6}	J: 50×10^{-6}
Operating temperature	G: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$	✓			✓			✓			✓		
temperature	H: $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$		✓			✓			✓			✓	

External dimensions

(Unit: mm)

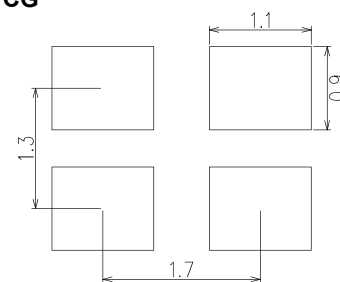
SG-8101CG



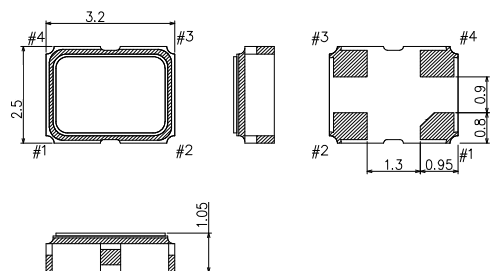
Footprint (Recommended)

(Unit: mm)

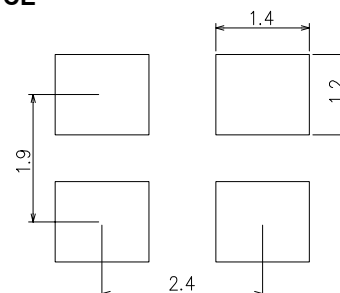
SG-8101CG



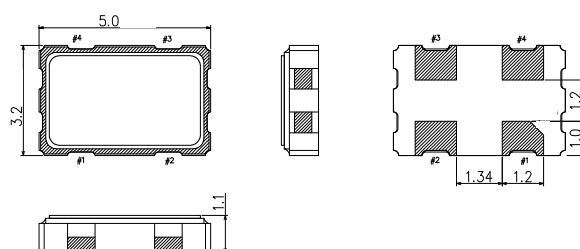
SG-8101CE



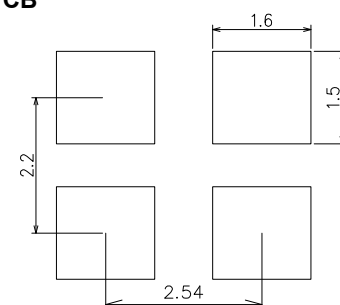
SG-8101CE



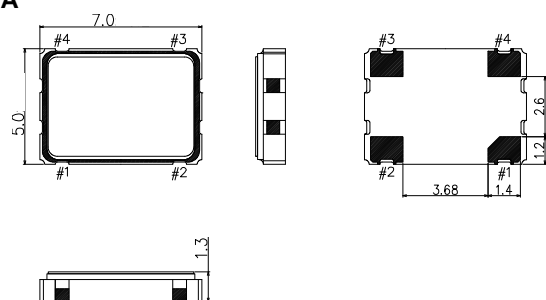
SG-8101CB



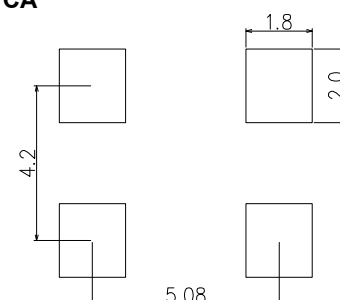
SG-8101CB



SG-8101CA



SG-8101CA



■Notes:

In order to achieve optimum jitter performance, the 0.1 μF capacitor between V_{CC} and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

CRYSTAL OSCILLATOR (Programmable)
OUTPUT: CMOS
SG-8101CGA



- Frequency range : 0.67 MHz to 170 MHz (1 ppm Step)
- Supply voltage : 1.62 V to 3.63 V
- Function : Output enable (OE) or Standby (ST)
- Frequency tolerance, operating temperature:
 - ±15 ppm (-40 °C to +85 °C)
 - ±20 ppm (-40 °C to +105 °C)
 - ±50 ppm (-40 °C to +125 °C)
 - ±100 ppm (-40 °C to +125 °C)
- Package : 2.5 x 2.0 (mm)
- PLL technology to enable short lead time
- Conform to AEC-Q100




NEW

Product Number (please contact us)
X1G005171xxxx00




Specifications (characteristics)												
Item		Symbol	Specifications				Conditions/Remarks					
Supply voltage		V _{CC}	1.80 V Typ.		2.50 V Typ.	3.30 V Typ.						
			1.62 V to 1.98 V	1.98 V to 2.20 V	2.20 V to 2.80 V	2.70 V to 3.63 V						
Output frequency range		f _o	0.67 MHz to 170 MHz									
Storage temperature		T _{stg}	-40 °C to +125 °C				Storage as single product.					
Operating temperature		T _{use}	-40 °C to +85 °C									
			-40 °C to +105 °C									
			-40 °C to +125 °C									
Frequency tolerance*1		f _{tol}	B : ±15 × 10 ⁻⁶				T _{use} = -40 °C to +85 °C					
			C : ±20 × 10 ⁻⁶				T _{use} = -40 °C to +105 °C					
			J : ±50 × 10 ⁻⁶				T _{use} = -40 °C to +125 °C					
			L : ±100 × 10 ⁻⁶				T _{use} = -40 °C to +125 °C					
Current consumption		I _{CC}	3.3 mA Max.	3.4 mA Max.	3.5 mA Max.	3.6 mA Max.	T _{use} = +125 °C	No load, f _o = 20 MHz				
			3.2 mA Max.	3.3 mA Max.	3.4 mA Max.	3.5 mA Max.	T _{use} = +105 °C					
			2.7 mA Typ.		2.9 mA Typ.		3.0 mA Typ.	T _{use} = +25 °C	No load, f _o = 170 MHz			
			5.6 mA Max.	5.9 mA Max.	6.8 mA Max.	8.2 mA Max.	T _{use} = +125 °C					
			5.5 mA Max.	5.8 mA Max.	6.7 mA Max.	8.1 mA Max.	T _{use} = +105 °C					
			4.7 mA Typ.		5.7 mA Typ.		6.8 mA Typ.	T _{use} = +25 °C				
Output disable current		I _{dis}	3.3 mA Max.	3.4 mA Max.	3.4 mA Max.	3.6 mA Max.	T _{use} = +125 °C	OE = GND, f _o = 170 MHz				
			3.2 mA Max.	3.3 mA Max.	3.3 mA Max.	3.5 mA Max.	T _{use} = +105 °C					
Standby current		I _{std}	2.3 µA Max.	2.5 µA Max.	3.0 µA Max.	4.2 µA Max.	T _{use} = +125 °C	ST = GND				
			0.9 µA Max.	1.0 µA Max.	1.5 µA Max.	2.5 µA Max.	T _{use} = +105 °C					
			0.3 µA Typ.	0.4 µA Typ.	0.5 µA Typ.	1.1 µA Typ.	T _{use} = +25 °C					
Symmetry		SYM	45 % to 55 %				50 % V _{CC} Level					
Output voltage (DC characteristics)		V _{OH}	90 % V _{CC} Min.				I _{OH} /I _{OL} Conditions [mA]					
							Rise/Fall time selection	V _{CC}	*A	*B	*C	*D
							Default (f _o > 40 MHz), Fast	I _{OH}	-2.5	-3.5	-4.0	-5.0
		V _{OL}	10 % V _{CC} Max.				Default (f _o ≤ 40 MHz)					
							I _{OL}	-1.5	-2.0	-2.5	-3.0	
							I _{OL}	1.5	2.0	2.5	3.0	
							Slow	I _{OH}	-1.0	-1.5	-2.0	-2.5
	I _{OL}	1.0	1.5	2.0	2.5							
							*A: 1.62 V to 1.98 V, *B: 1.98 V to 2.20 V, *C: 2.20 V to 2.80 V, *D: 2.70 V to 3.63 V					
Output load condition		L _{CMOS}	15 pF Max.									
Input voltage		V _{IH}	70 % V _{CC} Min.				OE or ST					
		V _{IL}	30 % V _{CC} Max.									
Rise and Fall time	Default	tr/tf	3.0 ns Max.				f _o > 40 MHz		20 % - 80 % V _{CC} , L _{CMOS} = 15 pF			
	6.0 ns Max.				f _o ≤ 40 MHz							
	Fast		3.0 ns Max.				f _o = 0.67 MHz to 170 MHz					
	Slow		10.0 ns Max.				f _o = 0.67 MHz to 20 MHz					
Disable Time		t _{stp}	1 µs Max.				Measured from the time OE or ST pin crosses 30 % V _{CC}					
Enable Time		t _{sta}	1 µs Max.				Measured from the time OE pin crosses 70 % V _{CC}					
Resume Time		t _{res}	3 ms Max.				Measured from the time ST pin crosses 70 % V _{CC}					
Start-up time		t _{str}	3 ms Max.				Measured from the time V _{CC} reaches its rated minimum value, 1.62 V					
Frequency aging		f _{aging}	This is included in frequency tolerance specification.				+25 °C, first year					

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging (+25 °C, 1 year).

Pin description				
Pin	Name	I/O type	Function	
1	OE	Input	Output enable	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), only output driver is disabled.
	ST	Input	Standby	High: Specified frequency output from OUT pin Low: Out pin is low (weak pull down), Device goes to standby mode. Supply current reduces to the least as I _{std} .
2	GND	Power	Ground	
3	OUT	Output	Clock output	
4	V _{CC}	Power	Power supply	



Product Name

SG-8101CGA 170.000000MHz I C H P A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

② Package type

CG: 2.5 mm x 2.0 mm

④ Supply voltage

T: 1.8 V to 3.3 V Typ.

⑤ ⑥ ⑤ Frequency tolerance

BG B: 15×10^{-6} CH C: 20×10^{-6} JJ J: 50×10^{-6} LJ L: 100×10^{-6}

⑥ Operating temperature

G: -40°C to $+85^{\circ}\text{C}$ H: -40°C to $+105^{\circ}\text{C}$ J: -40°C to $+125^{\circ}\text{C}$

⑦ Function

P: Output Enable

S: Standby

⑧ Rise/Fall time

A: Default

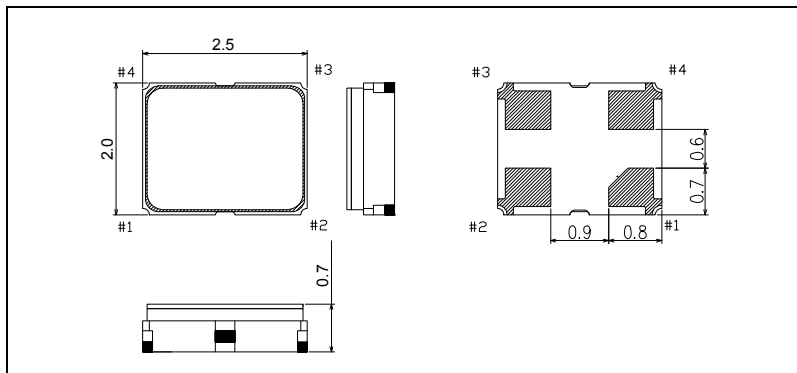
B: Fast

C: Slow

① Model, ② Package type,
③ Frequency, ④ Supply voltage,
⑤ Frequency tolerance, ⑥ Operating temperature,
⑦ Function, ⑧ Rise/Fall time

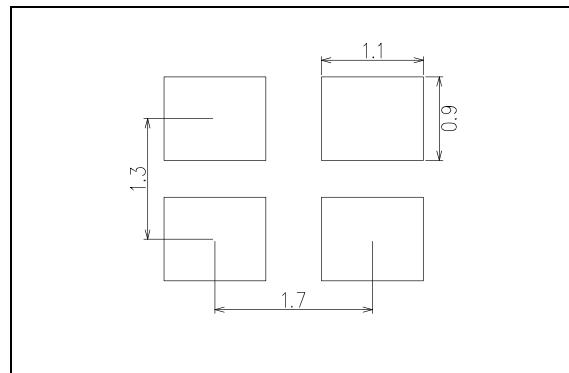
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)



■ Notes:

In order to achieve optimum jitter performance, the 0.1 μF capacitor between V_{CC} and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

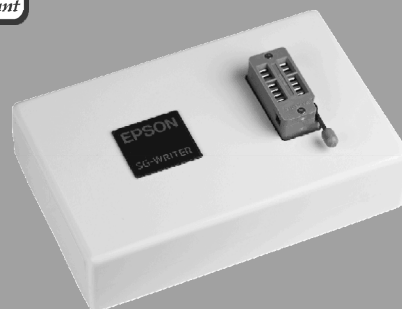


Programming tool for Programmable Crystal Oscillator SG - Writer II

- Programming tool for programmable oscillator: SG-8018, SG-8101, SG-9101, SG-8002, SG-8003, SG-8503, SG-8504 and SG-8506 series (Blank sample).
- Able to program required frequency at customer side
- External power supply by USB cable.
- Available PC OS: Windows 10 etc.,
- Small body and easy carry.



Product Number
Q91PR20W1102000



Main Body Specifications

Name	SG-Writer II for programmable oscillator: SG-8018, SG-8101, SG-9101, SG-8002, SG-8003, SG-8503, SG-8504 and SG-8506 series			
Operating Temperature	+10 °C to +40 °C Writing (+25 °C ±5 °C)			
Electric Power Supply	Via USB			
Standard Interface	USB 2.0 (mini-B)			
Accessories	SG-Writer II, Instruction manual (Documents: English, Japanese)			
Software	SG-Writer II			
Option SG-Writer IC socket *1	Model		Product number	
	SG-8018CA, SG-8101CA, SG-9101CA SG-8003CA		Q91PR10W00021	
	SG-8018CB, SG-8101CB, SG-9101CB		Q91PR10W00025	
	SG-8018CE, SG-8101CE, SG-9101CE, SG-8003CE		Q91PR10W00018	
	SG-8018CG, SG-8101CG, SG-9101CG, SG-8003CG		Q91PR10W00024	
	SG-8003JF		Q91PR10W00020	
	SG-8503CA		Q91PR10W00026	
	SG-8504CA		Q91PR10W00027	
	SG-8506CA		Q91PR10W00028	
Option Blank sample	Model		Product number	
	SG-8018CA		X1G0055710001	
	SG-8018CB		X1G0055810001	
	SG-8018CE		X1G0055910001	
	SG-8018CG		X1G0056010001	
	SG-8101CA		X1G0051910001	
	SG-8101CB		X1G0052010001	
	SG-8101CE		X1G0052110001	
	SG-8101CG		X1G0051810001	
	SG-9101CA		X1G0053010001	
	SG-9101CB		X1G0053110001	
	SG-9101CE		X1G0053210001	
	SG-9101CG		X1G0052910001	
	SG-8003CA 1.8V		X1G0032310001	
	SG-8003CA 2.5V, 3.3V		X1G0032310002	
	SG-8003JF 1.8V		X1G0030220001	
	SG-8003JF 2.5V, 3.3V		X1G0030220002	
	Model		Product number	
	SG-8003CE 1.8V		Q33519E000001	
	SG-8003CE 2.5V, 3.3V		Q33519E000002	
	SG-8003CG 1.8V		X1G0039910001	
	SG-8003CG 2.5V, 3.3V		X1G0039910002	
	SG-8002CE		Q3321CE000001	
	SG-8002CA		Q3309CA000002	
	SG-8002JC		Q3307JC010002	
	SG-8002JA		Q3306JA020002	
	SG-8002DC		Q3204DC010002	
	SG-8002DB		Q3203DB010002	
	SG-8503CA		X1G0050111001	
	SG-8504CA		X1G0050211001	
	SG-8506CA		X1G0050311001	

*1 If you have IC socket of either SG-8002 series or SG-8003 series, it can use for both SG-8002 series and SG-8003 series.

If you are using SG-Writer II now and will purchase IC socket newly, please choose SG-8003 series socket (Except JC, JA package).

Recommend PC Specifications (You need to connect the SG-Writer II to a PC when you are writing.)

Available PC OS	Windows 7 (32 bit, 64 bit), Windows Vista (32 bit), Windows XP (32 bit) Windows 10 (32 bit, 64 bit)
Recommend CPU	Over Pentium 4 1.4 GHz or equivalent Processor
Recommend memory Capacity	Windows XP : Over 512 MB Windows Vista, Windows 7 32 bit : Over 1 GB Windows 7 64 bit : Over 2 GB Windows 10 : Over 2 GB
Other	USB cable (Type A ↔ mini-B) Need SMD *2 socket when you write SG-8000 SMD products. (Sold separately)

*2 Conventional IC socket for PROM Writer or SG-Writer (the previous model) can be used for SG-Writer II.

Precautions

- SG-8003 series has two types of Blank sample. Please write with correct typed sample shown below.

Vcc = 1.8 V type (For PE, SE)

Vcc = 2.5 V and 3.3 V type (For PD, SD, PC, SC)

*It is able to identify Blank sample between SG-8002 series and SG-8003 series by marking.

- The firmware update is required to program SG-8018, SG-8101, SG-9101, SG-8503, SG-8504 and SG-8506 series.
For details please contact your supplier.



CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG2016CAN

- Frequency range : 1.2 MHz to 75 MHz
- Supply voltage : 1.8 V to 3.3 V Typ.
- Function : Standby($\overline{\text{ST}}$)
- External dimensions : $2.0 \times 1.6 \times 0.7$ mm
- Operation temperature : -40 to +105 °C



Product Number (please contact us)
X1G004801xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	1.2 MHz to 75 MHz	Please contact us about available frequencies.
Supply voltage	V_{CC}	T: 1.60 V to 3.63 V	1.2 MHz $\leq f_0 \leq 60$ MHz
		T: 1.71 V to 3.63 V	60 MHz $\leq f_0 \leq 75$ MHz, +85 °C Max.
		K: 2.25 V to 3.63 V	60 MHz $\leq f_0 \leq 75$ MHz, +105 °C Max.
Storage temperature	T_{stg}	-55 °C to +125 °C	Storage as single product.
Operating temperature	T_{use}	B: -20 °C to +70 °C	See of figure ※1
		G: -40 °C to +85 °C	
		H: -40 °C to +105 °C	
		D: $\pm 25 \times 10^{-6}$	
Frequency tolerance	f_{tol}	J: $\pm 50 \times 10^{-6}$	Only -20 °C to +70 °C
		L: $\pm 100 \times 10^{-6}$	
Current consumption	I_{CC}	3.0 mA Max.	No load condition Maximum frequency.
Stand-by current	I_{std}	2.7 μ A Max.	$\overline{\text{ST}}$ = GND
Symmetry	SYM	45 % to 55 %	50 % V_{CC} level, $L_{CMOS} \leq 15$ pF
Output voltage	V_{OH}	$V_{CC} - 0.4$ V Min.	
	V_{OL}	0.4 V Max.	
Output load condition	L_{CMOS}	15 pF Max.	
Input voltage	V_{IH}	80 % V_{CC} Min.	$\overline{\text{ST}}$ terminal
	V_{IL}	20 % V_{CC} Max.	
Rise time and Fall time	t_r / t_f	4 ns Max.	20 % V_{CC} to 80 % V_{CC} level, $L_{CMOS} = 15$ pF
Start-up time	t_{str}	3 ms Max.	$t=0$ at 90 %
Frequency aging	f_{aging}	$\pm 3 \times 10^{-6}$ / year Max.	+25 °C, First year

Product Name **SG2016CAN** **25.000000MHz** **T J G A** (②③: Available code DB,JB,JG,JH,LG,LH)
(Standard form) Model Name Frequency ①②③ Standard Specification A

① Supply voltage

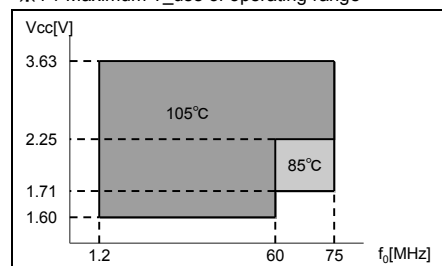
T	1.8 to 3.3 V Typ.
K	2.5 to 3.3 V Typ.

② Frequency tolerance

D	$\pm 25 \times 10^{-6}$
J	$\pm 50 \times 10^{-6}$
L	$\pm 100 \times 10^{-6}$

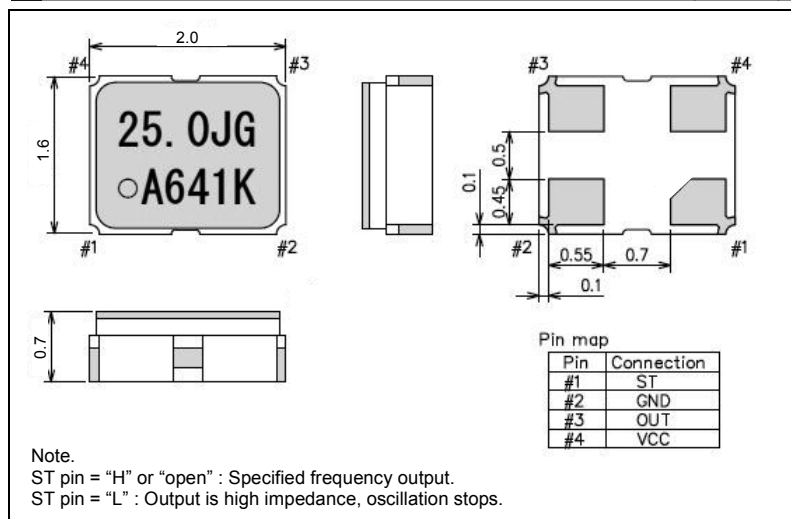
③ Operating temperature

B	-20 °C to +70 °C
G	-40 °C to +85 °C
H	-40 °C to +105 °C

※1 : Maximum T_{use} of operating range

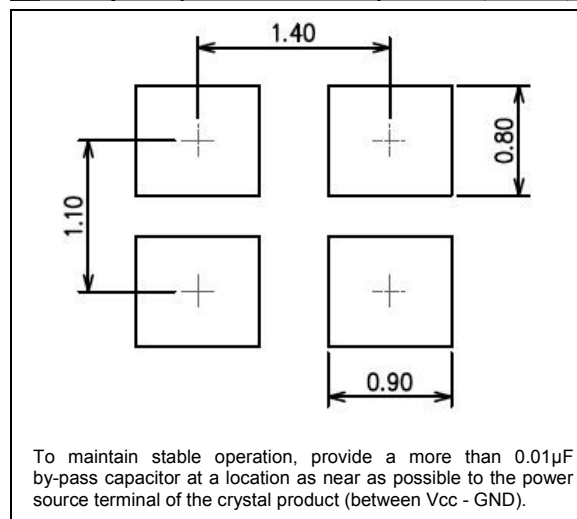
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG-211 S*E

- Frequency range : 2.375 MHz to 60.000 MHz
- Supply voltage : 1.8 V Typ. / 2.5 V Typ. / 3.3 V Typ.
- Current consumption : 1.2 mA Typ.
(SEE: 1.8 V No load condition 40 MHz)
- Function : Standby($\overline{ST}$)
- External dimensions : 2.5 × 2.0 × 0.7 mm



Product Number (please contact us)
X1G0036x1xxxx00



Actual size

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks	
		SG-211SEE	SG-211SDE	SG-211SCE		
Output frequency range	f ₀	2.375 MHz to 60.000 MHz			Please contact us about available frequencies.	
Supply voltage	V _{CC}	1.8 V Typ. 1.6 V to 2.2 V	2.5 V Typ. 2.2 V to 2.7 V	3.3 V Typ. 2.7 V to 3.6 V		
Storage temperature	T _{stg}	-40 °C to +125 °C			Storage as single product.	
Operating temperature	T _{use}	-40 °C to +90 °C				
Frequency tolerance	f _{tol}	D: ±20 × 10 ⁻⁶ , E: ±15 × 10 ⁻⁶			-20 °C to +70 °C	V _{CC} ±10% included in reflow drift
		H: ±20 × 10 ⁻⁶ , T: ±15 × 10 ⁻⁶			-40 °C to +85 °C	
		a: ±15 × 10 ⁻⁶ , b: ±20 × 10 ⁻⁶ , d: ±25 × 10 ⁻⁶			-40 °C to +90 °C	
Current consumption	I _{CC}	2.3 mA Max.	2.5 mA Max.	3.5 mA Max.	No load condition, 2.375 MHz≤f ₀ ≤32 MHz	
		2.8 mA Max.	3.0 mA Max.	4.0 mA Max.	No load condition, 32 MHz<f ₀ ≤40 MHz	
		3.3 mA Max.	3.5 mA Max.	4.5 mA Max.	No load condition, 40 MHz<f ₀ ≤48 MHz	
		4.5 mA Max.	5.0 mA Max.	6.0 mA Max.	No load condition, 48 MHz<f ₀ ≤60 MHz	
Stand-by current	I _{std}	5.0 μA Max.			ST =GND	
Symmetry	SYM	45 % to 55 %			50 % V _{CC} level, L _{CMOS} ≤ 15 pF	
Output voltage	V _{OH}	90 % V _{CC} Min.			I _{OH} = -4 mA	
	V _{OL}	10 % V _{CC} Max.			I _{OL} = 4 mA	
Output load condition (CMOS)	L _{CMOS}	15 pF Max.				
Input voltage	V _{IH}	80 % V _{CC} Min.			ST terminal	
	V _{IL}	20 % V _{CC} Max.				
Rise time / Fall time	t _r / t _f	4.5 ns Max.			20 % V _{CC} to 80 % V _{CC} level, L _{CMOS} =15 pF	
Start-up time	t _{str}	5 ms Max.			t=0 at 90 % V _{CC}	
Frequency aging	f _{aging}	This is included in frequency tolerance specification.			+25 °C, First year, V _{CC} = 1.8 V, 2.5 V, 3.3 V	

Product Name
(Standard form)

SG-211 S E E 40.000000MHz D

① ②③ ④ ⑤

①Model ②Function (S:Standby) ③Supply voltage
④Frequency ⑤Frequency tolerance

③Supply voltage

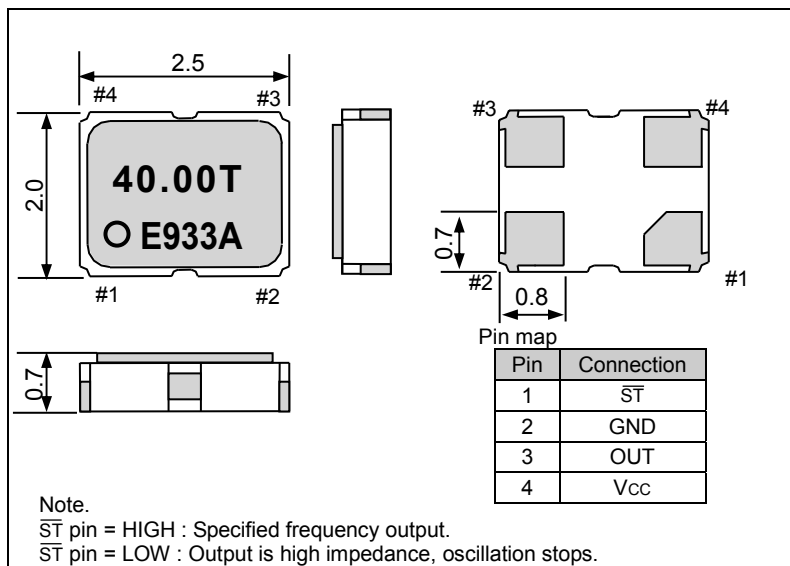
E 1.8 V Typ.
D 2.5 V Typ.
C 3.3 V Typ.

⑤Frequency tolerance

D $\pm 20 \times 10^{-6}$ / -20 to +70 °C
E $\pm 15 \times 10^{-6}$ / -20 to +70 °C
H $\pm 20 \times 10^{-6}$ / -40 to +85 °C
T $\pm 15 \times 10^{-6}$ / -40 to +85 °C
a $\pm 15 \times 10^{-6}$ / -40 to +90 °C
b $\pm 20 \times 10^{-6}$ / -40 to +90 °C
d $\pm 25 \times 10^{-6}$ / -40 to +90 °C

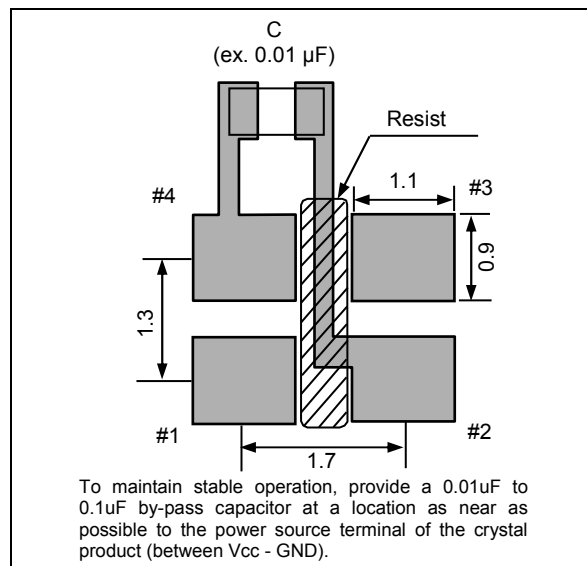
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG-210 STF

- Frequency range : 1 MHz to 75 MHz
- Supply voltage : 1.6 V to 3.6 V
- Function : Standby($\overline{ST}$)
- External dimensions : $2.5 \times 2.0 \times 0.8$ mm
- Operation temperature : -40 to $+105$ °C
- Vibration mode : Fundamental



Product Number (please contact us)
X1G004171xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks
Output frequency range	f _o	1MHz to 75MHz			Please contact us about available frequencies.
Supply voltage	V _{cc}	1.6 V to 3.6 V			1 MHz≤f _o ≤60 MHz
		1.71 V to 3.6 V			60 MHz<f _o ≤75 MHz, T _{use} =+85 °C Max.
		2.2 V to 3.6 V			60 MHz<f _o ≤75 MHz, T _{use} =+105 °C Max.
		1.8 V Typ. 1.6 V to 2.2 V	2.5 V Typ. 2.2 V to 3.0 V	3.3 V Typ. 2.7 V to 3.6 V	See of figure *1
Storage temperature	T _{stg}	-40 °C to +125 °C			Storage as single product.
Operating temperature	T _{use}	-40 °C to +85 °C / -40 °C to +105 °C			See of figure *1
Frequency tolerance	f _{tol}	S: ±25 × 10 ⁻⁶			-20 °C to +70 °C
		L:±50 × 10 ⁻⁶			-40 °C to +85 °C
		Y:±50 × 10 ⁻⁶ , W:±100 × 10 ⁻⁶			-40 °C to +105 °C
Current consumption	I _{cc}	1.5 mA Max.	1.6 mA Max.	1.8 mA Max.	No load condition 1MHz<f _o ≤20MHz
		1.8 mA Max.	2.0 mA Max.	2.2 mA Max.	No load condition 20MHz<f _o ≤40MHz
		2.1 mA Max.	2.4 mA Max.	2.6 mA Max.	No load condition 40MHz<f _o ≤60MHz
		2.4 mA Max.	2.8 mA Max.	3.0 mA Max.	No load condition 60MHz<f _o ≤75MHz
Stand-by current	I _{std}	2.1 μA Max.	2.5 μA Max.	2.7 μA Max.	$\overline{\text{ST}}$ =GND
Symmetry	SYM	45 % to 55 %			50 % V _{cc} level, L _{CMOS} ≤ 15 pF
Output voltage	V _{OH}	V _{cc} -0.4V Min.			
	V _{OL}	0.4V Max.			
Output load condition (CMOS)	L _{CMOS}	15 pF Max.			
Input voltage	V _{IH}	80 % V _{cc} Min.			$\overline{\text{ST}}$ terminal
	V _{IL}	20 % V _{cc} Max.			
Rise time and Fall time	t _r / t _f	4 ns Max.	3 ns Max.		20 % V _{cc} to 80 % V _{cc} level,L _{CMOS} =15 pF
Start-up time	t _{str}	3 ms Max.			t=0 at 90 % V _{cc} +85°C,(+105 °C.)
Frequency aging	f _{aging}	±3 × 10 ⁻⁶ / year Max.			+25 °C, First year, V _{cc} =1.8 V, 2.5 V, 3.3 V
Phase noise	C/N	-145 dBc/Hz Typ.			@1kHz ,f _o =48MHz
		-158 dBc/Hz Typ.			@100kHz ,f _o =48MHz
		-161 dBc/Hz Typ.			@Floor Lv.

Product Name
(Standard form)

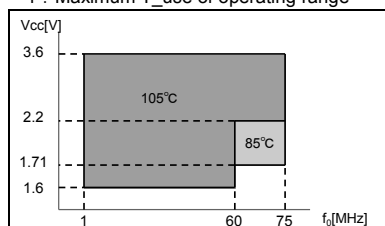
SG-210 S T F 25.000000MHz L

- ① ②③ ④ ⑤
- ①Model ②Function (S:Standby)
③Supply voltage ④Frequency
⑤Frequency tolerance

③Supply voltage

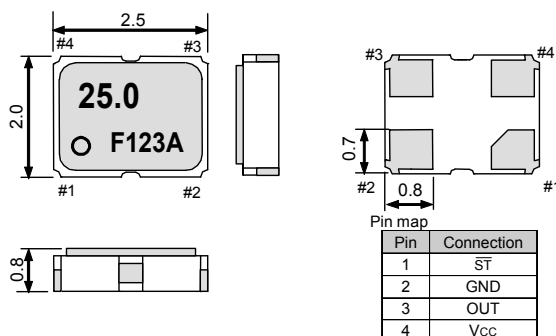
T 1.6 to 3.6 V See of figure *1

⑤Frequency tolerance

S $\pm 25 \times 10^{-6}$ / -20 to $+70$ °CL $\pm 50 \times 10^{-6}$ / -40 to $+85$ °CY $\pm 50 \times 10^{-6}$ / -40 to $+105$ °CW $\pm 100 \times 10^{-6}$ / -40 to $+105$ °C*1 : Maximum T_{use} of operating range

External dimensions

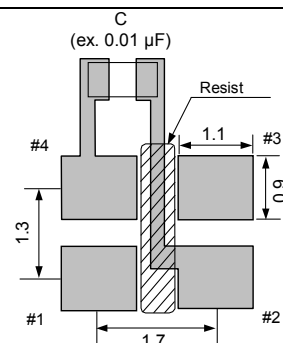
(Unit:mm)



Note.
 $\overline{ST}$ pin = HIGH or "open" : Specified frequency output.
 $\overline{ST}$ pin = LOW : Output is high impedance, oscillation stops.

Footprint (Recommended)

(Unit:mm)



To maintain stable operation, provide a 0.01μF to 0.1μF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).



CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG-210S*B

- Frequency range : 2 MHz to 60 MHz
- Supply voltage : 1.5 V Typ. / 1.8 V Typ. / 2.5 V Typ. / 3.3 V Typ.
- Current consumption : 0.9 mA Typ.
(SEB: 1.8 V No load condition 48 MHz)
- Function : Standby(ST)
- External dimensions : 2.5 × 2.0 × 0.8 mm
- Operation temperature : +105 °C / +125 °C



Product Number (please contact us)
Q33210Bx0xxx00



Actual size

Specifications (characteristics)

Item	Symbol	SG-210SGB	SG-210SEB	SG-210SDB	SG-210SCB	Conditions / Remarks	
Output frequency range	f ₀	2 MHz to 32 MHz	2 MHz to 60 MHz			Please contact us about available frequencies	
Supply voltage	V _{CC}	1.5 V Typ. 1.3 V to 1.7 V	1.8 V Typ. 1.6 V to 2.2 V	2.5 V Typ. 2.2 V to 3.0 V	3.3 V Typ. 2.7 V to 3.6 V		
Storage temperature	T _{stg}	-40 °C to +125 °C				Storage as single product.	
Operating temperature	T _{use}	-40 °C to +85 °C / -40 °C to +105 °C / -40 °C to +125 °C					
Frequency tolerance	f _{tol}	F: ±20 × 10 ⁻⁶				-10 °C to +60 °C, f ₀ ≤ 32 MHz, V _{CC} ±10%, except reflow drift.	
		B: ±50 × 10 ⁻⁶ , C: ±100 × 10 ⁻⁶				-20 °C to +70 °C	
		L:±50 × 10 ⁻⁶ ,M:±100 × 10 ⁻⁶				-40 °C to +85 °C	
		—	Y:±50 × 10 ⁻⁶ ,W:±100 × 10 ⁻⁶			-40 °C to +105 °C	
		—	Z:±100 × 10 ⁻⁶ ,X:±150 × 10 ⁻⁶			-40 °C to +125 °C	
Current consumption	I _{CC}	1.0 mA Max.	1.6 mA Max.	2.4 mA Max.	3.0 mA Max.	No load condition	
		—	2.0 mA Max.	3.0 mA Max.	4.0 mA Max.	No load condition +105 °C,+125 °C	
Stand-by current	I _{std}	0.3 µA Max.	0.5 µA Max.	1.0 µA Max.	1.0 µA Max.	ST =GND	
		—	1.6 µA Max.	2.4 µA Max.	3.0 µA Max.	ST =GND +105 °C,+125 °C	
Symmetry	SYM	45 % to 55 %	45 % to 55 %	45 % to 55 %	45 % to 55 %	2 MHz≤f ₀ ≤16 MHz	50 % V _{CC} level L _{CMOS} ≤ 15 pF
		40 % to 60 %				16 MHz<f ₀ ≤32 MHz	
		—				32 MHz<f ₀ ≤60 MHz	
		—				+105 °C,+125 °C	
Output voltage	V _{OH}	90 % V _{CC} Min.				I _{OH} =-1 mA	
	V _{OL}	10 % V _{CC} Max.				I _{OL} = 1 mA	
Output load condition(CMOS)	L _{CMOS}	15 pF Max.					
Input voltage	V _{IH}	80 % V _{CC} Min.				ST terminal	
	V _{IL}	20 % V _{CC} Max.					
Rise time and Fall time	tr/ tr	5 ns Max.	4 ns Max.	3 ns Max.		+85 °C	20 % V _{CC} to 80 % V _{CC} level,L _{CMOS} =15 pF
		—	7 ns Max			+105 °C,+125 °C	
Start-up time	t _{str}	3 ms Max.				t=0 at 90 % V _{CC} (+105 °C,+125 °C : 5 ms Max.)	
Frequency aging	f _{aging}	±3 × 10 ⁻⁶ / year Max.				+25 °C, First year, V _{CC} =1.5 V,1.8 V, 2.5 V, 3.3 V	

Product Name
(Standard form)

SG-210 S G B 27.000000MHz L

- ① ② ③ ④ ⑤
 ① Model ② Function (S: Standby)
 ③ Supply voltage ④ Frequency
 ⑤ Frequency tolerance

③ Supply voltage

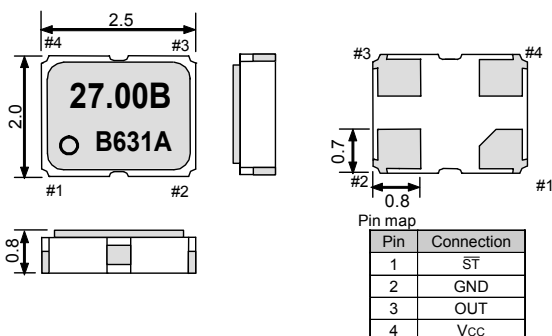
G	1.5 V Typ.
E	1.8 V Typ.
D	2.5 V Typ.
C	3.3 V Typ.

⑤ Frequency tolerance

F	±20 × 10 ⁻⁶ / -10 to +60 °C (f ₀ ≤ 32 MHz)
B	±50 × 10 ⁻⁶ / -20 to +70 °C
C	±100 × 10 ⁻⁶ / -20 to +70 °C
L	±50 × 10 ⁻⁶ / -40 to +85 °C
M	±100 × 10 ⁻⁶ / -40 to +85 °C
Y*	±50 × 10 ⁻⁶ / -40 to +105 °C
W*	±100 × 10 ⁻⁶ / -40 to +105 °C
Z*	±100 × 10 ⁻⁶ / -40 to +125 °C
X*	±150 × 10 ⁻⁶ / -40 to +125 °C

External dimensions

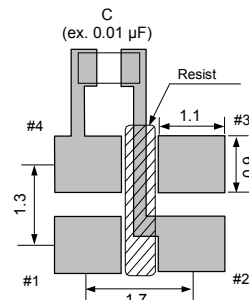
(Unit:mm)



Note.
 ST pin = HIGH or "open" : Specified frequency output.
 ST pin = LOW : Output is high impedance, oscillation stops.

Footprint (Recommended)

(Unit:mm)



To maintain stable operation, provide a 0.01µF to 0.1µF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).

**CRYSTAL OSCILLATOR (SPXO)****OUTPUT : CMOS****Low Jitter****SG-210 S*D**

- Frequency range : 50.000 MHz to 80.000 MHz
- Supply voltage : 1.8 V Typ. / 2.5 V Typ. / 3.3 V Typ.
- Current consumption : 7.0 mA Max.
(SDD: 2.5 V No load condition 80 MHz)
- Function : Standby($\overline{ST}$)
- External dimensions : 2.5 × 2.0 × 0.8 mm



Product Number (please contact us)
X1G0029x1xxxx00



Actual size

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks	
		SG-210SED	SG-210SDD	SG-210SCD		
Output frequency range	f ₀	50.000 MHz to 80.000 MHz			Please contact us about available frequencies.	
Supply voltage	V _{CC}	1.8 V Typ. 1.6 V to 2.2 V	2.5 V Typ. 2.2 V to 3.0 V	3.3 V Typ. 2.7 V to 3.6 V		
Storage temperature	T _{stg}	-40 °C to +125 °C			Storage as single product.	
Operating temperature	T _{use}	-40 °C to +85 °C				
Frequency tolerance	f _{tol}	B: ±50 × 10 ⁻⁶ , C: ±100 × 10 ⁻⁶			-20 °C to +70 °C	
		L: ±50 × 10 ⁻⁶ , M: ±100 × 10 ⁻⁶			-40 °C to +85 °C	
Current consumption	I _{CC}	6.0 mA Max.	7.0 mA Max.	8.0 mA Max.	No load condition	
Stand-by current	I _{std}	10.0 μA Max.			ST =GND	
Symmetry	SYM	45 % to 55 %			50 % V _{CC} level,L _{CMOS} ≤ 30 pF	
Output voltage	V _{OH}	V _{CC} -0.4 V Min.			I _{OH} = -8 mA(SCD,SDD), -4 mA(SED)	
	V _{OL}	0.4 V Max.			I _{OL} = 8 mA(SCD,SDD), 4 mA(SED)	
Output load condition (CMOS)	L _{CMOS}	30 pF Max.				
Input voltage	V _{IH}	70 % V _{CC} Min.			ST terminal	
	V _{IL}	30 % V _{CC} Max.				
Rise time / Fall time	t _r / t _f	4 ns Max.			20 % V _{CC} to 80 % V _{CC} level, L _{CMOS} ≤ 30 pF	
Start-up time	t _{str}	2 ms Max.			t=0 at 90 % V _{CC}	
Frequency aging	f _{aging}	±3 × 10 ⁻⁶ / year Max..			+25 °C, First year, V _{CC} = 1.8 V, 2.5 V, 3.3 V	
		±10 × 10 ⁻⁶ / 10 years Max.			+25 °C, 10 years, V _{CC} = 1.8 V, 2.5 V, 3.3 V	
Jitter *1	t _{DJ}	0.1 ps Typ.	0.1 ps Typ.		Deterministic Jitter	L _{CMOS} ≤ 15 pF
	t _{RJ}	3.2 ps Typ.	2.7 ps Typ.		Random Jitter	
	t _{RMS}	30 ps Typ.	25 ps Typ.		Peak to Peak	
Phase Jitter	t _{PJ}	1.0 ps Max.			Offset frequency: 12 kHz to 20 MHz	

*1 Tested using a DTS-2075 Digital timing system made by WAVECREST with jitter analysis software VISI6.

Product Name SG-210 S E D 50.000000MHz L

(Standard form)

① ② ③ ④ ⑤

① Model ② Function (S: Standby) ③ Supply voltage

④ Frequency ⑤ Frequency tolerance

③ Supply voltage

E 1.8 V Typ.

D 2.5 V Typ.

C 3.3 V Typ.

⑤ Frequency tolerance

B $\pm 50 \times 10^{-6}$ / -20 to +70 °C

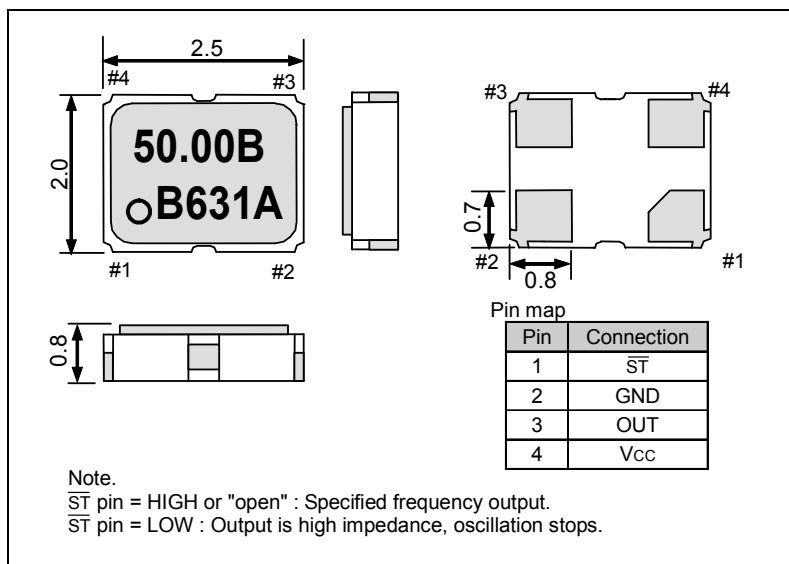
C $\pm 100 \times 10^{-6}$ / -20 to +70 °C

L $\pm 50 \times 10^{-6}$ / -40 to +85 °C

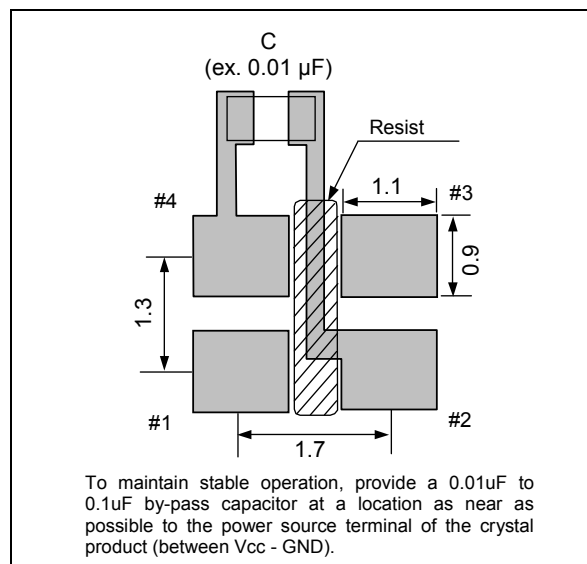
M $\pm 100 \times 10^{-6}$ / -40 to +85 °C

External dimensions

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)



**CRYSTAL OSCILLATOR (SPXO)****OUTPUT : CMOS****Low Jitter****SG-210 S*H**

- Frequency range : 80.000 MHz to 170.000 MHz
Fundamental mode oscillator
- Supply voltage : 1.8 V Typ. / 2.5 V Typ. / 3.3 V Typ.
- Output : CMOS
- Function : Standby($\overline{ST}$)
- External dimensions : 2.5 × 2.0 × 0.8 mm



Product Number (please contact us)

SG-210SCH: X1G003931xxxx00

SG-210SDH: X1G003941xxxx00

SG-210SEH: X1G003951xxxx00



Actual size

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks	
		SG-210SEH	SG-210SDH	SG-210SCH		
Output frequency range	fo	80.000 MHz to 170.000 MHz			Please contact us about available frequencies.	
		100MHz, 106.25MHz, 125MHz, 133.33MHz, 150MHz, 156.25MHz			Standard frequency. *1	
Supply voltage	Vcc	1.8 V ± 10%	2.5 V ± 10%	3.3 V ± 10%	*2	
Storage temperature	T_stg	-40 °C to +125 °C			Storage as single product.	
Operating temperature	T_use	-40 °C to +85 °C				
Frequency tolerance	f_tol	B: ±50 × 10 ⁻⁶ , C: ±100 × 10 ⁻⁶			-20 °C to +70 °C	
		L: ±50 × 10 ⁻⁶ , M: ±100 × 10 ⁻⁶			-40 °C to +85 °C	
Current consumption	Icc	6.0 mA Max.	7.0 mA Max.	9.0 mA Max.	No load condition,80 MHz≤fo≤125 MHz	
		8.0 mA Max.	9.0 mA Max.	11.0 mA Max.	No load condition,125 MHz<fo≤170 MHz	
Stand-by current	I_std	10.0 μA Max.			ST =GND	
Symmetry	SYM	45 % to 55 %			50 % Vcc level, L_CMOS ≤ 15 pF	
Output voltage	VOH	90 % Vcc Min.			IOH = -4mA	
	VOL	10 % Vcc Max.			IOL = 4mA	
Output load condition (CMOS)	L_CMOS	15 pF Max.				
Input voltage	VIH	80 % Vcc Min.			ST terminal	
	VIL	20 % Vcc Max.				
Rise time / Fall time	tr/ tr	3 ns Max.	2 ns Max.		20 % Vcc to 80 % Vcc level, L_CMOS ≤15 pF	
Start-up time	t_str	5 ms Max.			T=0 at 90 % Vcc	
Frequency aging	f_aging	±5 × 10 ⁻⁶ / year Max.			+25 °C, First year	
Jitter *3	tp-p	22 ps Typ.	20 ps Typ.		Peak to Peak	L_CMOS ≤ 15 pF
Phase Jitter	tpJ	0.7 ps Max.	0.6 ps Max.		Offset frequency: 12kHz to 20MHz	

*1 Please contact us for requirements not listed in the specification.

*2 $f_0 \geq 157$ MHz: $V_{CC} \pm 5\%$

*3 Based on SIA-3100C signal integrity analyzer made from WAVECREST.

Product Name
(Standard form)

SG-210 S E H 125.000000MHz L

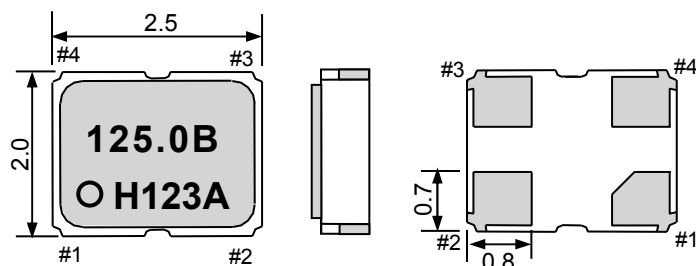
- ① ② ③ ④ ⑤
 ① Model ② Function (S: Standby) ③ Supply voltage
 ④ Frequency ⑤ Frequency tolerance

③ Supply voltage	
E	1.8 V Typ.
D	2.5 V Typ.
C	3.3 V Typ.

⑤ Frequency tolerance	
B	$\pm 50 \times 10^{-6}$ / -20 to +70 °C
C	$\pm 100 \times 10^{-6}$ / -20 to +70 °C
L	$\pm 50 \times 10^{-6}$ / -40 to +85 °C
M	$\pm 100 \times 10^{-6}$ / -40 to +85 °C

External dimensions

(Unit:mm)



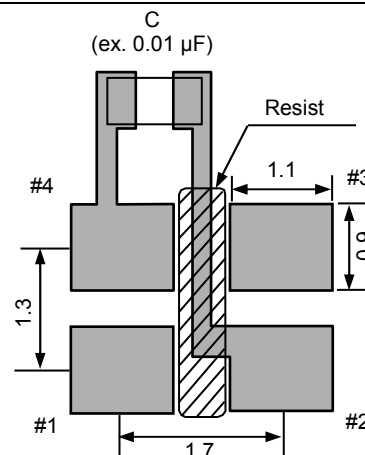
Pin map

Pin	Connection
1	$\overline{ST}$
2	GND
3	OUT
4	V_{CC}

Note.

 $\overline{ST}$ pin = HIGH or "open": Specified frequency output. $\overline{ST}$ pin = LOW : Output is high impedance, oscillation stops.**Footprint (Recommended)**

(Unit:mm)



To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).



CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG-310 series

- Frequency range : 2 MHz to 80 MHz
- Supply voltage : 1.8 V Typ. / 2.5 V Typ. / 3.3 V Typ.
- Current consumption : 1.5 mA Typ.
(SEF: 1.8 V No load condition 48 MHz)
- Function : Standby($\overline{\text{ST}}$)
- External dimensions : 3.2 × 2.5 × 1.05 mm

Pb

Free

RoHS

Compliant

Product Number (please contact us)
Q33310xx0xxxx00



Actual size

Specifications (characteristics)

Item	Symbol	SG-310 SEF	SG-310 SDF	SG-310 SCF	SG-310 SDN	SG-310 SCN	Conditions / Remarks	
Output frequency range	f ₀	2.000 MHz to 48.000 MHz			3.000 MHz to 80.000 MHz		Please contact us about available frequencies.	
Supply voltage	V _{CC}	1.8 V Typ. 1.6 V to 2.2 V	2.5 V Typ. 2.2 V to 3.0 V	3.3 V Typ. 2.7 V to 3.6 V	2.5 V Typ. 2.2 V to 2.7 V	3.3 V Typ. 2.7 V to 3.6 V		
Storage temperature	T _{stg}	-40 °C to +125 °C				Storage as single product.		
Operating temperature	T _{use}	-40 °C to +85 °C			-40 °C to +85 °C (+105 °C)		Please contact us about +85 °C < T _{use}	
Frequency tolerance	f _{tol}	B: ±50 × 10 ⁻⁶ , C: ±100 × 10 ⁻⁶				-20 °C to +70 °C		
		L: ±50 × 10 ⁻⁶ , M: ±100 × 10 ⁻⁶				-40 °C to +85 °C		
		—				D:±20 × 10 ⁻⁶ ,S:±25 × 10 ⁻⁶		-20 °C to +70 °C
		—				R:±25 × 10 ⁻⁶ ,P:±20 × 10 ⁻⁶		-30 °C to +85 °C
		—				J:±25 × 10 ⁻⁶		-40 °C to +85 °C
Current consumption	I _{CC}	1.5 mA Max.	1.5 mA Max.	1.5 mA Max.	4.0 mA Max.	5.0 mA Max.	No load condition, 2 MHz<f ₀ ≤ 4 MHz	
		1.5 mA Max.	1.5 mA Max.	2.0 mA Max.			No load condition, 4 MHz<f ₀ ≤ 8 MHz	
		1.5 mA Max.	2.0 mA Max.	2.5 mA Max.			No load condition, 8 MHz<f ₀ ≤16 MHz	
		2.0 mA Max.	2.0 mA Max.	2.5 mA Max.			No load condition, 16 MHz<f ₀ ≤25 MHz	
		2.0 mA Max.	2.5 mA Max.	3.5 mA Max.			No load condition, 25 MHz<f ₀ ≤33 MHz	
		3.0 mA Max.	3.5 mA Max.	4.5 mA Max.			No load condition, 33 MHz<f ₀ ≤48 MHz	
		—			6.0 mA Max.	7.0 mA Max.	No load condition, 48 MHz<f ₀ ≤80 MHz	
Stand-by current	I _{std}	0.7 μA Max. (0.2 μA Typ.)	1.5 μA Max. (0.5 μA Typ.)	2.0 μA Max. (1.0 μA Typ.)	10 μA Max.		ST =GND	
Symmetry	SYM	45 % to 55 %	45 % to 55 %	45 % to 55 %	45 % to 55 %	2 MHz<f ₀ ≤16 MHz		50 % V _{CC} level L _{CMOS} ≤ 15 pF
		40 % to 60 %				16 MHz<f ₀ ≤40 MHz		
Output voltage	V _{OH}	90 % V _{CC} Min.				I _{OH} = -3 mA		
	V _{OL}	10 % V _{CC} Max.				I _{OL} = 3 mA		
Output load condition (CMOS)	L _{CMOS}	15 pF Max.						
Input voltage	V _{IH}	80 % V _{CC} Min.			70 % V _{CC} Min.		ST terminal	
	V _{IL}	20 % V _{CC} Max.			30 % V _{CC} Max.			
Rise time / Fall time	t _r / t _f	4 ns Max.				20 % V _{CC} to 80 % V _{CC} level, L _{CMOS} =15 pF		
Start-up time	t _{str}	10 ms Max.			2 ms Max.		t=0 at 90 % V _{CC}	
Frequency aging	f _{aging}	±5 × 10 ⁻⁶ / year Max.			±3 × 10 ⁻⁶ / year Max.		+25 °C, First year, V _{CC} =1.8 V, 2.5 V, 3.3 V	
		—			±10 × 10 ⁻⁶ Max.		+25 °C, 10 years	

Product Name
(Standard form)

SG-310 S E F 25.000000MHz L

① ② ③ ④ ⑤

①Model ②Function (S:Standby)

③Supply voltage ④Frequency

⑤Frequency tolerance

③Supply voltage

E 1.8 V Typ.

D 2.5 V Typ.

C 3.3 V Typ.

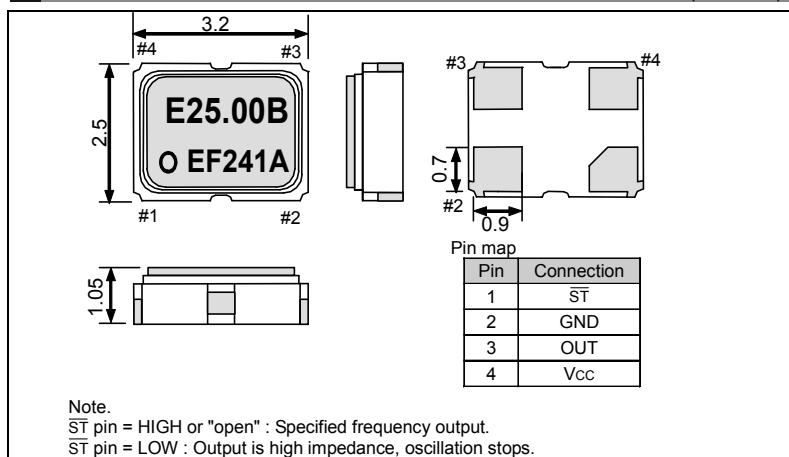
⑤Frequency tolerance

*Only SDN, SCN are available

B $\pm 50 \times 10^{-6}$ / -20 to +70 °C D* $\pm 20 \times 10^{-6}$ / -20 to +70 °CC $\pm 100 \times 10^{-6}$ / -20 to +70 °C S* $\pm 25 \times 10^{-6}$ / -20 to +70 °CL $\pm 50 \times 10^{-6}$ / -40 to +85 °C R* $\pm 25 \times 10^{-6}$ / -30 to +85 °CM $\pm 100 \times 10^{-6}$ / -40 to +85 °C P* $\pm 20 \times 10^{-6}$ / -30 to +85 °CJ* $\pm 25 \times 10^{-6}$ / -40 to +85 °C

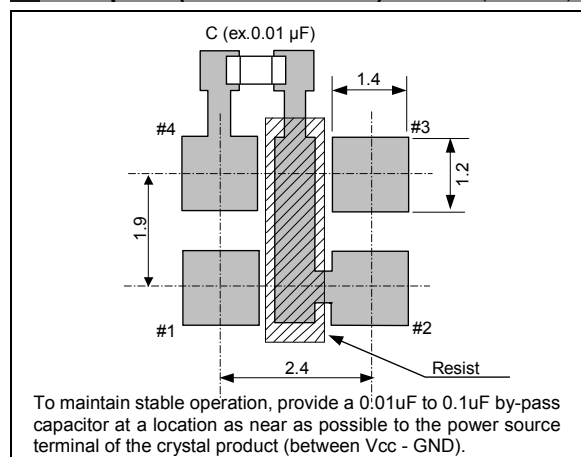
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG5032CAN / CBN / CCN
SG7050CAN / CBN / CCN

- Frequency range : CAN 1 to 75 MHz (Fundamental mode)
: CBN 80 to 170 MHz (Fundamental mode)
: CCN 2.5 to 50 MHz (Fundamental mode)
- Supply voltage : CAN / CBN 1.8 V to 3.6 V Typ.
: CCN 5.0 V Typ.
- Function : CAN / CBN Standby($\overline{ST}$)
: CCN Output enable(OE)
- Output : CMOS



Product Number (please contact us)
 SG5032CAN: X1G004451xxxx00
 SG5032CBN: X1G004461xxxx00
 SG5032CCN: X1G004471xxxx00
 SG7050CAN: X1G004481xxxx00
 SG7050CBN: X1G004491xxxx00
 SG7050CCN: X1G004501xxxx00

SG5032CAN/CBN/CCN
(5.0 × 3.2 × 1.1 mm)SG7050CAN/CBN/CCN
(7.0 × 5.0 × 1.3 mm)

Actual size

SG5032CAN
/CBN/CCNSG7050CAN
/CBN/CCN

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks	
		SG5032CAN SG7050CAN	SG5032CBN SG7050CBN	SG5032CCN SG7050CCN		
Output frequency range	f _o	1 MHz to 75 MHz	80 MHz to 170 MHz	2.5 MHz to 50 MHz	Please contact us about available frequencies.	
Supply voltage	V _{cc}	T: 1.6 V to 3.63 V	T: 1.6 V to 3.63 V	H: 4.5 V to 5.5 V	1 MHz≤f _o ≤60 MHz	See *1 (CAN)
		T: 1.71 V to 3.63 V			60 MHz<f _o ≤75 MHz, +85 °C Max.	
		K: 2.25 V to 3.63 V			60 MHz<f _o ≤75 MHz, +105 °C Max.	
Storage temperature	T _{stg}	-40 °C to +125 °C			Storage as single product.	
Operating temperature	T _{use}	B: -20 °C to +70 °C, G: -40 °C to +85 °C			See of figure *1 (CAN)	
		H: -40 °C to +105 °C				
Frequency tolerance	f _{tol}	D (Only CAN type) : ±25 × 10 ⁻⁶ , J : ±50 × 10 ⁻⁶			-20 °C to +70 °C	
		J : ±50 × 10 ⁻⁶			-40 °C to +85 °C	
		J : ±50 × 10 ⁻⁶	-	-	-40 °C to +105 °C	
		L : ±100 × 10 ⁻⁶				
Current consumption	I _{cc}	3.0 mA Max.	11 mA Max.	20 mA Max.	No load condition Maximum frequency.	
Stand-by current	I _{std}	2.7 μA Max.	10 μA Max.	-	S _T =GND	
Disable current	I _{dis}	-	-	10 mA Max.	OE=GND	
Symmetry	SYM	45 % to 55 %			40 % to 60 %	50 % V _{cc} level, L _{CMOS} ≤ 15 pF
Output voltage	V _{OH}	V _{cc} -0.4 Min.				
	V _{OL}	0.4 V Max.				
Output load condition	L _{CMOS}	15 pF Max.			50 pF Max.	CMOS load
Input voltage	V _{IH}	80 % V _{cc} Min.				S _T , OE terminal
	V _{IL}	20 % V _{cc} Max.				
Rise time / Fall time	t _r / t _f	4 ns Max.	3 ns Max.	5 ns Max.	20 % V _{cc} to 80 % V _{cc} level, L _{CMOS} =15 pF	
Start-up time	t _{str}	3 ms Max.	5 ms Max.			t=0 at 90 % V _{cc} +85°C,(+105°C)
Frequency aging	f _{aging}	±3 × 10 ⁻⁶ / year Max.	±5 × 10 ⁻⁶ / year Max.			+25 °C. First year.

Product Name SG5032 CAN 25.000000MHz T J G A (⑤⑥: Available code DB,JB,JG,JH,LG,LH)

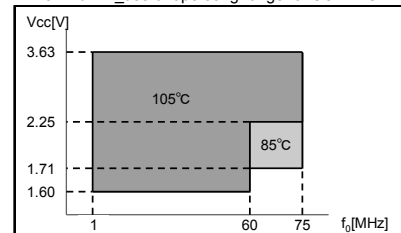
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦

①Model ②Output (C:CMOS) ③Frequency ④Supply voltage ⑤Frequency tolerance
⑥Operating temperature range ⑦Internal identification code ("A" is default)

④Supply voltage		
T	1.6 ~ 3.63 V	See *1 (CAN)
	1.71 ~ 3.63 V	
K	2.25 ~ 3.63 V	
H	4.5 ~ 5.5 V	

⑤Frequency tolerance	
D	±25 × 10 ⁻⁶
J	±50 × 10 ⁻⁶
L	±100 × 10 ⁻⁶

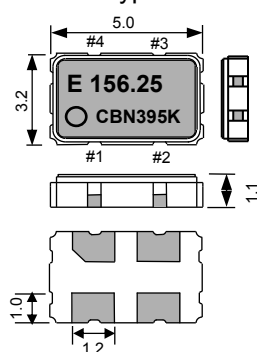
⑥Operating temperature range	
B	-20 to +70 °C
G	-40 to +85 °C
H	-40 to +105 °C

*1 : Maximum T_{use} of operating range for SGxxxxCAN

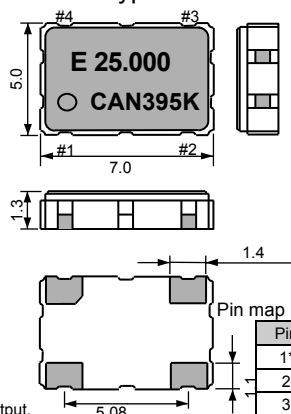
External dimensions

(Unit:mm)

•SG5032 type



•SG7050 type

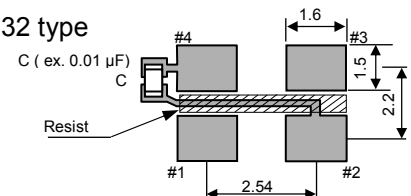


*OE function is only available SGxxxxCCN

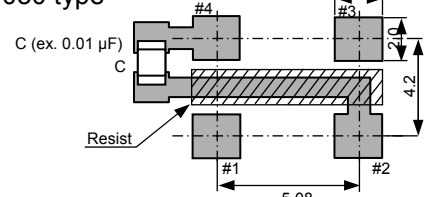
Footprint (Recommended)

(Unit:mm)

•SG5032 type



•SG7050 type



To maintain stable operation, provide a 0.01µF to 0.1µF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).

CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

HIGH-STABILITY

HG - 2150CA series

- Frequency range : 1 MHz to 60 MHz
- Supply voltage : 3.3 V Typ. / 5.0 V Typ.
- Frequency tolerance : $\pm 15 \times 10^{-6}$ / -20 °C to +70 °C
- Function : Output enable (OE)
- External dimensions : 7.0 × 5.0 × 1.4 mm



Product Number (please contact us)
Q3514CA00xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		SVH / BXH	SVC / BXC	
Output frequency range	f ₀	1.000 MHz to 60.000 MHz		Please contact us about available frequencies.
Supply voltage	V _{cc}	H:5.0 V ± 0.5 V	C:3.3 V ± 0.3 V	
Storage temperature	T _{stg}	-40 °C to +125 °C		Storage as single product.
Operating temperature	T _{use}	V:-20 °C to +70 °C X:-40 °C to +85 °C		
Frequency tolerance	f _{tol}	S: $\pm 15 \times 10^{-6}$ *1		-20 °C to +70 °C
		B: $\pm 25 \times 10^{-6}$ *1		-40 °C to +85 °C
Current consumption	I _{cc}	30 mA Max.	25 mA Max.	No load condition, OE = V _{cc}
Disable current	I _{dis}	15 mA Max.	12 mA Max.	OE=GND
Symmetry	SYM	45 % to 55 %		50 % V _{cc} level
Output voltage	V _{OH}	V _{cc} -0.4 V Min.		I _{OH} =-4 mA
	V _{OL}	0.4 V Max.		I _{OL} = 4 mA
Output load condition	L _{CMOS}	15 pF Max.		CMOS load
	V _{IH}	70 % V _{cc} Min.		
Input voltage	V _{IL}	30 % V _{cc} Max.		OE terminal
	t _r / t _f	4 ns Max.		20 % V _{cc} to 80 % V _{cc} level
Start-up time	t _{str}	10 ms Max.		Time at minimum supply voltage to be 0 s.
Frequency aging	f _{aging}	$\pm 10 \times 10^{-6}$ Max. *2		+25 °C, 10 years

*1 Frequency tolerance includes variation in reflow soldering drift, operating temperature range, supply voltage range and load change.

*2 50 MHz < f₀ ≤ 60 MHz: $\pm 15 \times 10^{-6}$ Max.

Product Name HG-2150CA 35.328000MHz S V H

(Standard form)

① ② ③④⑤

①Model ②Frequency ③Frequency tolerance ④Operating temperature ⑤Supply voltage

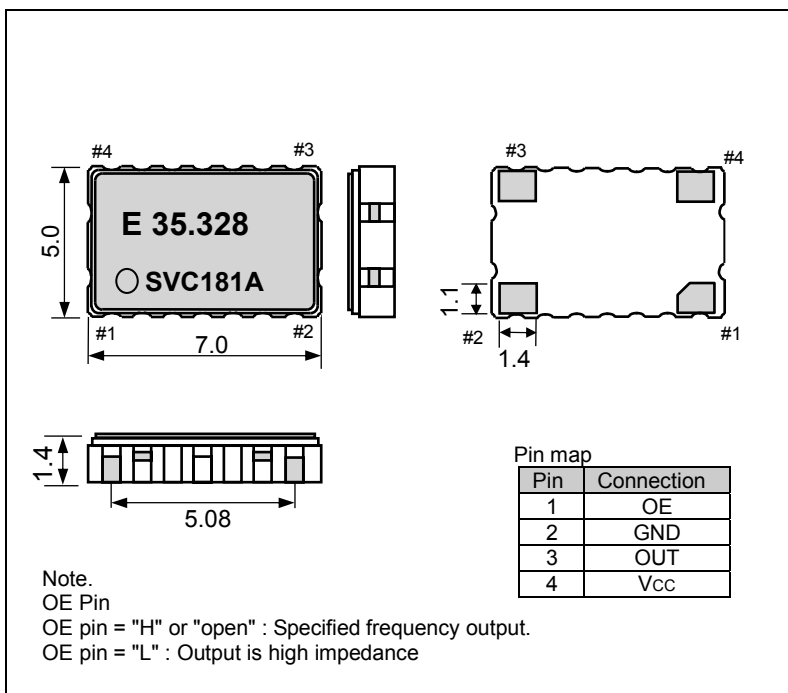
③Frequency tolerance	
S	$\pm 15 \times 10^{-6}$ / -20 to +70°C
B	$\pm 25 \times 10^{-6}$ / -40 to +85°C

④Operating temperature	
V	-20 to +70°C
X	-40 to +85°C

⑤Supply voltage	
C	3.3 V Typ.
H	5.0 V Typ.

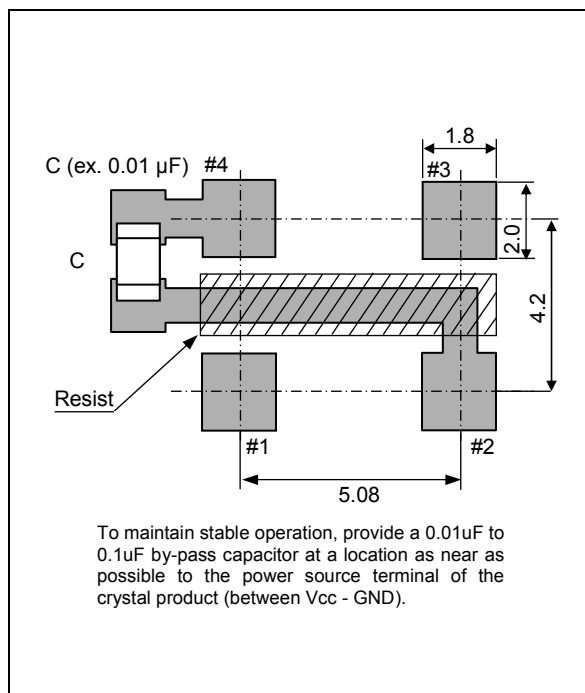
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





CRYSTAL OSCILLATOR (SPXO)

OUTPUT : CMOS

SG2016CAA

- Frequency range : 1.2 MHz to 75 MHz
- Supply voltage : 1.8 V to 3.3 V Typ.
- Function : Standby($\overline{ST}$)
- External dimensions : $2.0 \times 1.6 \times 0.7$ mm
- Operation temperature : -40 to +125 °C

•Conforms to AEC-Q200



Product Number (please contact us)
X1G005341xxxxxx



Actual size

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	1.2 MHz to 75 MHz	Please contact us about available frequencies.
Supply voltage	V_{CC}	1.60 V to 3.63 V	See of figure ※1
Storage temperature	T_{stg}	-55 °C to +125 °C	Storage as single product.
Operating temperature	T_{use}	G: -40 °C to +85 °C	See of figure ※1
		H: -40 °C to +105 °C	
		J: -40 °C to +125 °C	
		J: $\pm 50 \times 10^{-6}$	
Frequency tolerance	f_{tol}	L: $\pm 100 \times 10^{-6}$	
		T: $\pm 150 \times 10^{-6}$	
Current consumption	I_{CC}	3.5 mA Max.	No load condition Maximum frequency.
Stand-by current	I_{std}	3.3 μ A Max.	$\overline{ST}$ = GND
Symmetry	SYM	45 % to 55 %	50 % V_{CC} level , $L_{CMOS} \leq 15$ pF
Output voltage	V_{OH}	$V_{CC} - 0.4$ V Min.	
	V_{OL}	0.4 V Max.	
Output load condition	L_{CMOS}	15 pF Max.	
Input voltage	V_{IH}	80 % V_{CC} Min.	$\overline{ST}$ terminal
	V_{IL}	20 % V_{CC} Max.	
Rise time and Fall time	t_r / t_f	4 ns Max.	20 % V_{CC} to 80 % V_{CC} level , $L_{CMOS} = 15$ pF
Start-up time	t_{str}	3 ms Max.	$t=0$ at 90 %
Frequency aging	f_{aging}	$\pm 3 \times 10^{-6}$ / year Max.	+25 °C, First year

Product Name **SG2016CAA** **25.000000MHz** **T J G A** (②③: Available code JG, JH, LG, LH, LJ, TJ)
(Standard form) Model Name Frequency ①②③ Standard Specification A

① Supply voltage

T	1.8 to 3.3 V Typ.
K	2.5 to 3.3 V Typ.

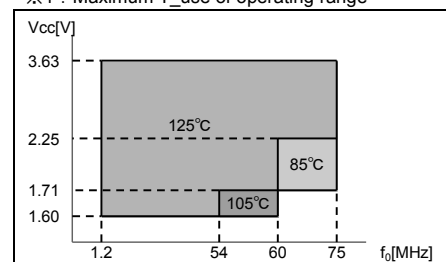
② Frequency tolerance

J	$\pm 50 \times 10^{-6}$
L	$\pm 100 \times 10^{-6}$
T	$\pm 150 \times 10^{-6}$

③ Operating temperature

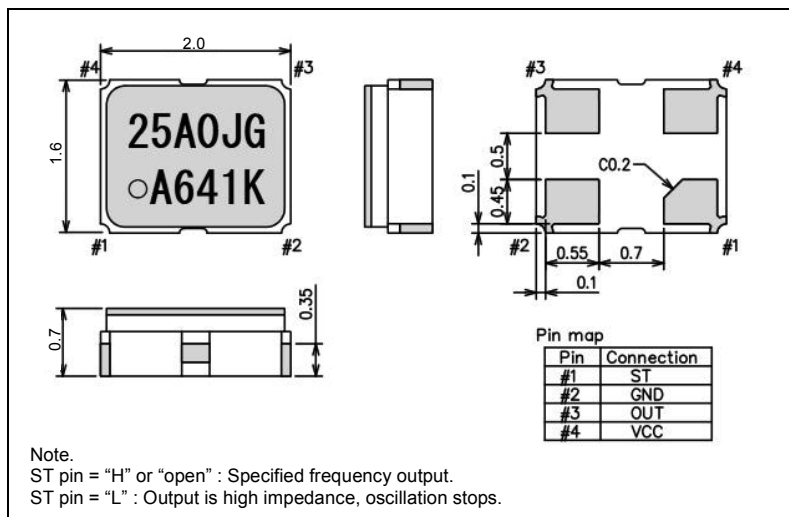
G	-40 °C to +85 °C
H	-40 °C to +105 °C
J	-40 °C to +125 °C

※1 : Maximum T_{use} of operating range



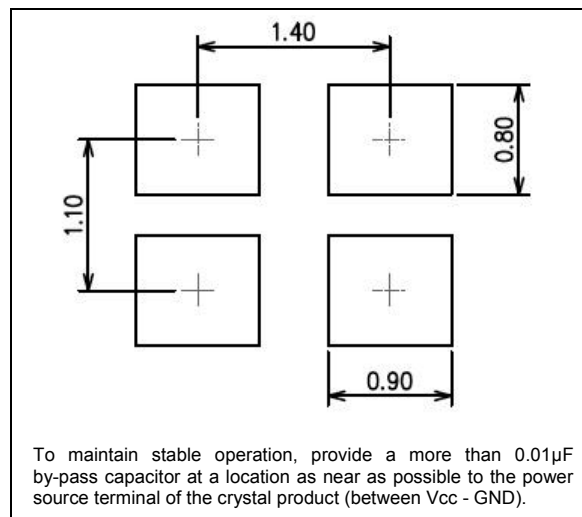
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)



**CRYSTAL OSCILLATOR (SPXO)****OUTPUT : CMOS****For Automotive****SG-210S*BA**

- Frequency range : 2 MHz to 60 MHz
- Supply voltage : 1.8 V Typ. / 2.5 V Typ. / 3.3 V Typ.
- Current consumption : 0.9 mA Typ.
(SEB: 1.8 V No load condition 48 MHz)
- Function : Standby(ST)
- External dimensions : 2.5 × 2.0 × 0.8 mm
- Operation temperature : +105 °C / +125 °C
- Applications : Car audio, Vehicle camera system,
Car navigation system, ECU clock,
Clock, Meter, Remote keyless entry
- Conforms to AEC-Q200



Product Number (please contact us)
 SG-210SEBA : X1G004611Axxx00
 SG-210SDBA : X1G004601Axxx00
 SG-210SCBA : X1G004591Axxx00



Actual size

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks	
		SG-210SEBA	SG-210SDBA	SG-210SCBA		
Output frequency range	f _o	2 MHz to 60 MHz			Please contact us about available frequencies.	
Supply voltage	V _{CC}	1.8 V Typ. 1.6 V to 2.2 V	2.5 V Typ. 2.2 V to 3.0 V	3.3 V Typ. 2.7 V to 3.6 V		
Storage temperature	T _{stg}	-40 °C to +125 °C			Storage as single product.	
Operating temperature	T _{use}	-40 °C to +85 °C / -40 °C to +105 °C / -40 °C to +125 °C				
Frequency tolerance	f _{tol}	B: ±50 × 10 ⁻⁶ , C: ±100 × 10 ⁻⁶			-20 °C to +70 °C	
		L:±50 × 10 ⁻⁶ ,M:±100 × 10 ⁻⁶			-40 °C to +85 °C	
		Y:±50 × 10 ⁻⁶ ,W:±100 × 10 ⁻⁶			-40 °C to +105 °C	
		Z:±100 × 10 ⁻⁶ ,X:±150 × 10 ⁻⁶			-40 °C to +125 °C	
Current consumption	I _{CC}	1.6 mA Max.	2.4 mA Max.	3.0 mA Max.	No load condition	
		2.0 mA Max	3.0 mA Max.	4.0 mA Max.	No load condition +105 °C,+125 °C	
Stand-by current	I _{std}	0.5 µA Max.	1.0 µA Max.	1.0 µA Max.	ST =GND	
		1.6 µA Max.	2.4 µA Max.	3.0 µA Max.	ST =GND +105 °C,+125 °C	
Symmetry	SYM	45 % to 55 %	45 % to 55 %	45 % to 55 %	2 MHz≤f _o ≤32 MHz	50 % V _{CC} level L _{CMOS} ≤ 15 pF
		40 % to 60 %	40 % to 60 %		32 MHz<f _o ≤60 MHz	
		40 % to 60 %			+105 °C,+125 °C	
Output voltage	V _{OH}	90 % V _{CC} Min.			I _{OH} =-1 mA	
	V _{OL}	10 % V _{CC} Max.			I _{OL} = 1 mA	
Output load condition (CMOS)	L _{CMOS}	15 pF Max.				
Input voltage	V _{IH}	80 % V _{CC} Min.			ST terminal	
	V _{IL}	20 % V _{CC} Max.				
Rise time and Fall time	tr/ tf	4 ns Max.	3 ns Max.		+85 °C	20 % V _{CC} to 80 % V _{CC}
		7 ns Max		+105 °C,+125 °C	level,L _{CMOS} =15 pF	
Start-up time	t _{str}	3 ms Max.			t=0 at 90 % V _{CC} (+105 °C,+125 °C : 5 ms Max.)	
Frequency aqing	f _{aging}	±3 × 10 ⁻⁶ / year Max.			+25 °C, First year, V _{CC} =1.8 V, 2.5 V, 3.3 V	

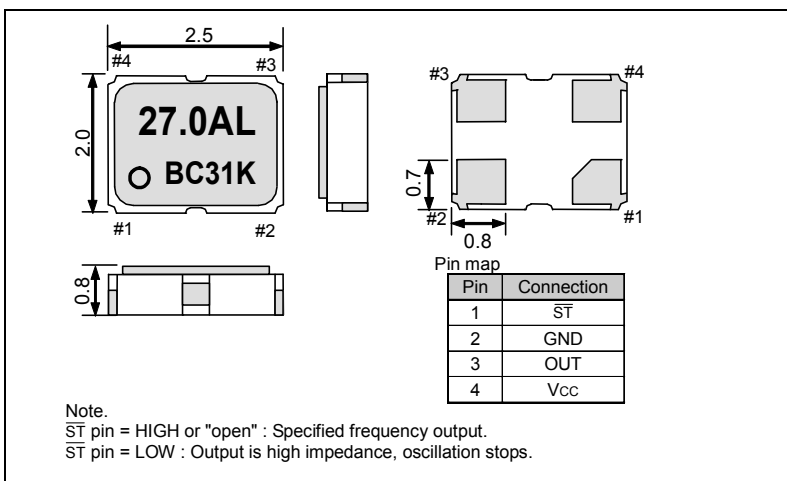
Product Name SG-210 S E BA 27.000000MHz L
 (Standard form) ① ② ③ ④ ⑤
 ① Model ② Function (S: Standby)
 ③ Supply voltage ④ Frequency
 ⑤ Frequency tolerance

③ Supply voltage	
E	1.8 V Typ.
D	2.5 V Typ.
C	3.3 V Typ.

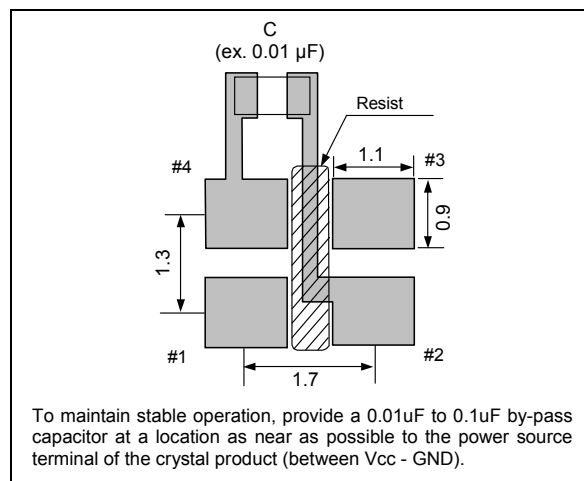
⑤ Frequency tolerance	
B	±50 × 10 ⁻⁶ / -20 to +70 °C
C	±100 × 10 ⁻⁶ / -20 to +70 °C
L	±50 × 10 ⁻⁶ / -40 to +85 °C
M	±100 × 10 ⁻⁶ / -40 to +85 °C
Y	±50 × 10 ⁻⁶ / -40 to +105 °C
W	±100 × 10 ⁻⁶ / -40 to +105 °C
Z	±100 × 10 ⁻⁶ / -40 to +125 °C
X	±150 × 10 ⁻⁶ / -40 to +125 °C

External dimensions

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)



CRYSTAL OSCILLATOR (SPXO)

OUTPUT : LV-PECL

SG3225 / 7050EEN

- Frequency range : 25 MHz to 200 MHz
- Supply voltage : 2.5 V , 3.3 V
- Output : LV-PECL
- Function : Output enable (OE)
- Phase jitter : 50 fs Typ. ($f_0 = 156.25\text{MHz}$)
- Operating temperature : -40 °C to +85 °C
- : -40 °C to +105 °C



Product Number (please contact us)
SG3225EEN X1G005221xxxxxx
SG7050EEN X1G005131xxxxxx



Actual size

SG3225EEN



SG7050EEN



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	25 MHz to 200 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	V _{cc}	D : 2.5 V ± 0.125 V , C : 3.3 V ± 0.165 V	
Storage temperature	T _{stg}	-55 °C to +125 °C	Store as bare product.
Operating temperature	T _{use}	G : -40 °C to +85 °C , H : -40 °C to +105 °C	
Frequency tolerance	f _{tol}	D : $\pm 25 \times 10^{-6}$ Max. (Not available H : -40 °C to +105 °C)	Includes initial tolerance, temperature change, V _{cc} change and 5 years aging(+25 °C)
		J : $\pm 50 \times 10^{-6}$ Max.	Includes initial tolerance, temperature change, V _{cc} change and 10 years aging(+25 °C)
		L : $\pm 100 \times 10^{-6}$ Max.	Includes initial tolerance, temperature change, V _{cc} change and 10 years aging(+25 °C)
Current consumption	I _{cc}	75 mA Max.	OE= V _{cc} , with output load
Disable current	I _{dis}	25 mA Max.	OE=GND
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V _{OH}	V _{cc} -1.1 V Min.	DC characteristics
	V _{OL}	V _{cc} -1.5 V Max.	
Output load condition	L _{ECL}	50 Ω	Terminated to V _{cc} -2.0V
Input voltage	V _{IH}	70 % V _{cc} Min.	OE terminal
	V _{IL}	30 % V _{cc} Max.	
Rise/Fall times	Tr / Tf	300 ps Max. (V _{cc} : 3.3V)	20% ~ 80% (V _{OH} - V _{OL})
		350 ps Max. (V _{cc} : 2.5V)	
Oscillation start up time	t _{str}	10 ms Max.	Time at minimum supply voltage to be 0 s

Phase jitter

	100 MHz	125 MHz	156.25 MHz	200 MHz
Phase jitter Typ. [fs] (Offset frequency 12k to 20MHz)	75	60	50	40

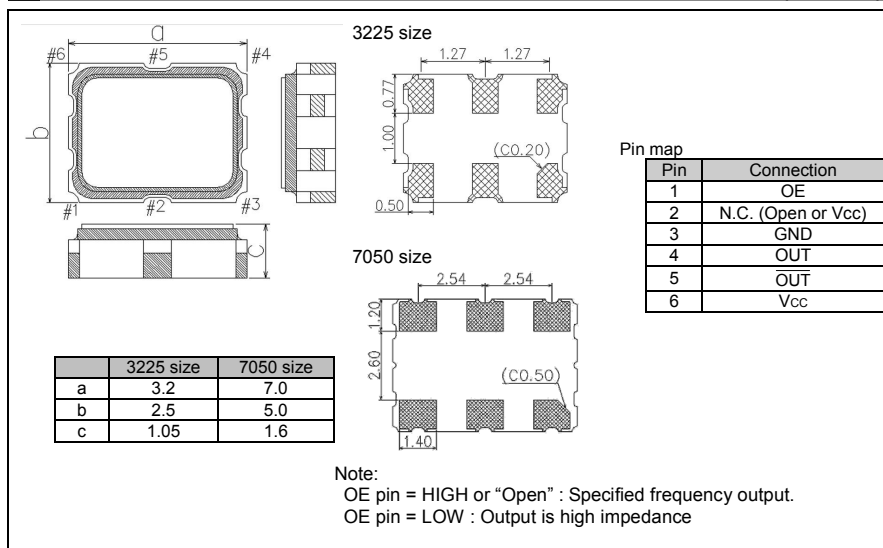
Product Name SG3225 EEN 156.250000MHz C D G A (⑤⑥: Not Available code DH)

(Standard form)

- ① Model ② Output (E: LV-PECL) ③ Frequency ④ Supply voltage (C: 3.3 V Typ. D: 2.5 V Typ.)
⑤ Frequency tolerance (D: $\pm 25 \times 10^{-6}$ Max. J: $\pm 50 \times 10^{-6}$ Max. L: $\pm 100 \times 10^{-6}$ Max.)
⑥ Operating temperature (G: -40 to +85°C , H: -40 to +105°C) ⑦ Internal identification code("A" is default)

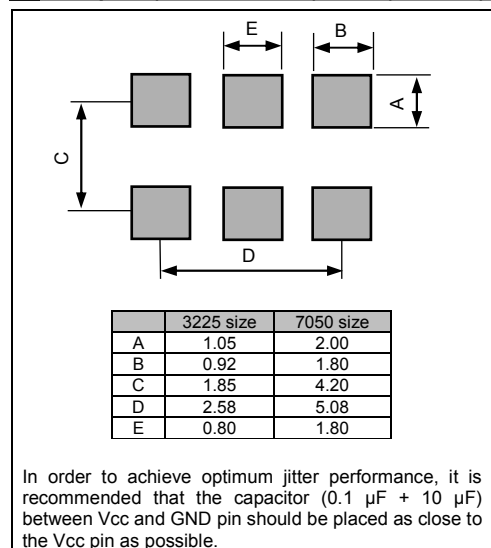
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





CRYSTAL OSCILLATOR (SPXO)

OUTPUT : LV-PECL, LVDS

SG3225EAN / VAN

SG5032EAN / VAN

SG7050EAN / VAN

- Achieved wide frequency range by PLL technology and Fundamental AT crystal units.

- Frequency range : 73.5 MHz to 700 MHz
- Supply voltage : 2.5 V to 3.3 V
- Function : Output enable (OE)
- Output : LV-PECL or LVDS



Product Number (please contact us)

SG3225EAN: X1G004251xxxx00

SG3225VAN: X1G004241xxxx00

SG5032EAN: X1G004271xxxx00

SG5032VAN: X1G004261xxxx00

SG7050EAN: X1G004291xxxx00

SG7050VAN: X1G004281xxxx00

SG3225EAN/VAN
(3.2 × 2.5 × 1.05 mm)
Actual sizeSG5032EAN/VAN
(5.0 × 3.2 × 1.0 mm)SG7050EAN/VAN
(7.0 × 5.0 × 1.4 mm)

SG3225EAN/VAN

SG5032EAN/VAN

SG7050EAN/VAN

Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks	
		LV-PECL	LVDS		
		SG3225EAN / SG5032EAN / SG7050EAN	SG3225VAN / SG5032VAN / SG7050VAN		
Output frequency range	f _o	73.5 MHz to 700 MHz		Please contact us about available frequencies.	
Supply voltage	V _{cc}	K: 2.5 V - 10 % to 3.3 V + 10 %			
Storage temperature	T _{stg}	-40 °C to +125 °C		Storage as single product.	
Operating temperature	T _{use}	B: -20 °C to +70 °C, G: -40 °C to +85 °C			
Frequency tolerance	f _{tol}	J: ± 50 × 10 ⁻⁶ , E: ± 30 × 10 ⁻⁶ , C: ± 20 × 10 ⁻⁶			
Current consumption	I _{cc}	65 mA Max.	30 mA Max.	OE = V _{cc} , L _{ECL} = 50 Ω or L _{LVDS} = 100 Ω	
Disable current	I _{dis}	20 mA Max.		OE = GND	
Symmetry	SYM	45 % to 55 %		At outputs crossing point	
Output voltage (LV-PECL)	V _{OH}	V _{cc} - 1.0 V to V _{cc} - 0.8 V	—	DC characteristics	
	V _{OL}	V _{cc} - 1.78 V to V _{cc} - 1.62 V	—		
Output voltage (LVDS)	V _{OD}	—	250 mV to 450 mV	V _{OD1} , V _{OD2}	DC characteristics
	dV _{OD}	—	50 mV Max.	dV _{OD} = V _{OD1} -V _{OD2}	
	V _{OS}	—	1.15 V to 1.35 V	V _{OS1} , V _{OS2}	
	dV _{OS}	—	150 mV Max.	dV _{OS} = V _{OS1} -V _{OS2}	
Output load condition (ECL) / (LVDS)	L _{ECL}	50 Ω	—	Terminated to V _{cc} -2.0 V	
	L _{LVDS}	—	100 Ω	Connected between OUT to OUT	
Input voltage	V _{IH}	70 % V _{cc} Min.		OE terminal	
	V _{IL}	30 % V _{cc} Max.			
Rise time / Fall time	t _r / t _f	350 ps Max.	300 ps Max.	LV-PECL: Between 20 % and 80 % of (V _{OH} -V _{OL}). LVDS: Between 20 % and 80 % of Differential Output peak to peak voltage	
Start-up time	t _{str}	3 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	t _{pj}	0.6 ps Max.*1		Offset frequency: 12 kHz to 20 MHz	
Frequency aging	f _{aging}	± 5 × 10 ⁻⁶ / year Max.		+25 °C, First year, V _{cc} = 2.5 V, 3.3 V	

*1 0.9 ps Max. (f_o = 243 MHz ~ 250 MHz, 486 MHz ~ 500 MHz)

Product Name SG3225 EAN 156.250000MHz K J G A (⑤⑥: CG is not available)

(Standard form)

① Model ② Output (E: LV-PECL, V: LVDS) ③ Frequency ④ Supply voltage ⑤ Frequency tolerance

⑥ Operating temperature ⑦ Internal identification code ("A" is default)

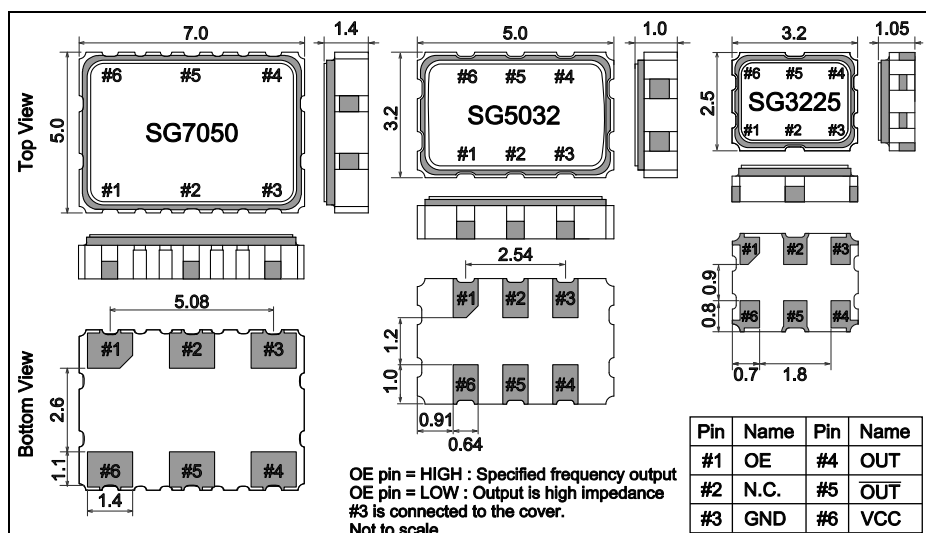
④ Supply voltage	
K	2.5 V ~ 3.3 V

⑤ Frequency tolerance	
J	± 50 × 10 ⁻⁶
E	± 30 × 10 ⁻⁶
C	± 20 × 10 ⁻⁶

⑥ Operating temperature	
B	-20 °C ~ +70 °C
G	-40 °C ~ +85 °C

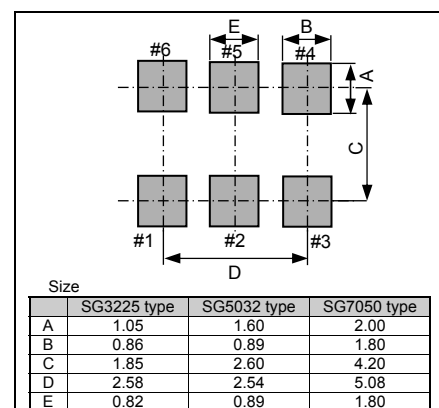
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)



To maintain stable operation, provide a 0.01 μF to 0.1 μF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{cc} - GND).



CRYSTAL OSCILLATOR (SPXO)

OUTPUT : LV-PECL

LOW PHASE JITTER

SG7050EBN

- Low phase jitter : 65fs typ. *2
- Frequency range : 100 MHz to 175 MHz
- Supply voltage : 2.5V Typ. / 3.3 V Typ.
- Function : Output Enable (OE)
- External dimensions : 7.0 × 5.0 × 1.5 mm
- Output : LV-PECL



Product Number (Please contact us)
SG7050EBN: X1G004511xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_o	100.000 MHz to 175.000 MHz	Please contact us about available frequencies.
Supply voltage	V _{CC}	C: 3.3 V ± 0.165 V D: 2.5 V ± 0.125 V	
Storage temperature	T _{stg}	-55 °C to +125 °C	Store as bare product after packing
Operating temperature	T _{use}	G: -40 °C to +85 °C	
Frequency tolerance *1	f _{tol}	J: ±50 × 10 ⁻⁶ Max.	
Current consumption	I _{CC}	75 mA Max. 55mA Max.	OE=V _{CC} , L _{ECL} =50Ω
Disable current	I _{dis}	15μA Max.	OE=GND
Output load condition	L _{ECL}	50Ω	Terminated to V _{CC} -2.0V
Output voltage	V _{OH} V _{OL}	V _{CC} -1.025 V Min. V _{CC} -1.62 V Max.	DC characteristics
Symmetry	SYM	45 % to 55 %	at outputs crossing point
Rise/Fall times	T _r /T _f	0.4 ns Max. 0.5 ns Max.	at 20 % to 80 % output swing
Input voltage	V _{IH} V _{IL}	70% V _{CC} Min. 30% V _{CC} Max.	OE terminal
Oscillation start up time	t _{str}	3 ms Max.	Time at minimum supply voltage to be 0 s

*1 Includes initial tolerance, temperature change, V_{CC} change and 10years aging*2 Output frequency is 156.25MHz (at V_{CC}=3.3V±0.165V)

Phase Jitter

	Output frequency	100 MHz	125 MHz	156.25 MHz	175 MHz	Supply voltage
Phase Jitter [fs] (Offset Frequency 12k to 20MHz)	Typ.	125	95	85	82	V _{CC} =2.5V±0.125V
	Max.	165	160	125	125	
	Typ.	110	80	65	65	V _{CC} =3.3V±0.165V
	Max.	140	120	100	100	

Product Name SG7050 E BN 156.250000MHz C J G A

(Standard form)

① ② ③ ④ ⑤ ⑥ ⑦

①Model ②Output (E: LV-PECL) ③Frequency ④Supply voltage ⑤Frequency tolerance

⑥Operating temperature ⑦Internal identification code ("A" is default)

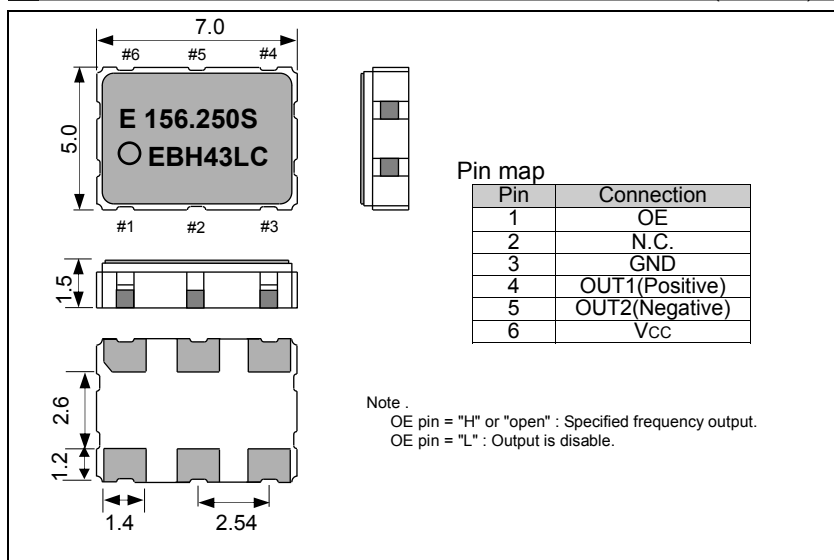
④Supply voltage	
C	3.3 V Typ.
D	2.5 V Typ.

⑤Frequency tolerance	
J	±50 × 10 ⁻⁶

⑥Operating temperature	
G	-40 to +85°C

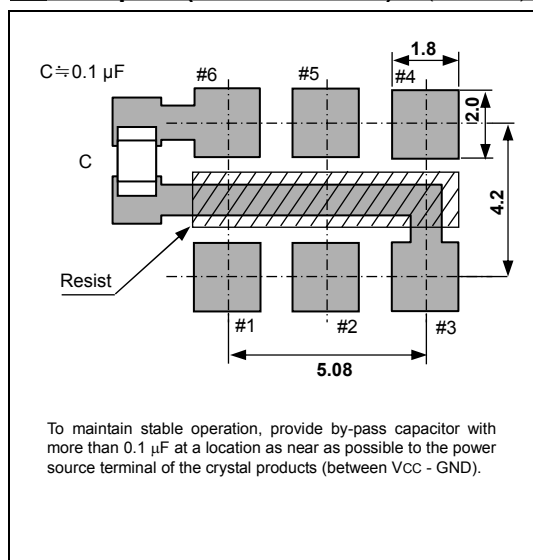
External dimensions

(Unit :mm)



Footprint (Recommended)

(Unit :mm)





LOW-JITTER SAW OSCILLATOR (SPSO)

OUTPUT : LV-PECL, LVDS

EG-2121 / 2102CB

- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V ... EG-2121CB
3.3 V ... EG-2102CB
- Output : LV-PECL or LVDS
- Function : Output enable (OE)
- External dimensions : 5.0 × 3.2 × 1.4 mm
- Low jitter and low phase noise by SAW unit.



Product Number (please contact us)
EG-2121CB P: X1M000211xxxx00
EG-2121CB L: X1M000231xxxx00
EG-2102CB P: X1M000201xxxx00
EG-2102CB L: X1M000221xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	LV-PECL		LVDS		Conditions / Remarks	
		EG-2121CB P	EG-2102CB P	EG-2121CB L	EG-2102CB L		
Output frequency range	f _o	100 MHz to 700 MHz				Please contact us about available frequencies.	
Supply voltage	V _{CC}	2.5 V ±0.125 V	3.3 V ±0.33 V	2.5 V ±0.125 V	3.3 V ±0.33 V		
Storage temperature	T _{stg}	-55 °C to +125 °C				Storage as single product.	
Operating temperature	T _{use}	P:0 °C to +70 °C ,R:-5 °C to +85 °C ,S:-20 °C to +70 °C					
Frequency tolerance	f _{tol}	G: ± 50 × 10 ⁻⁶ ,H: ±100 × 10 ⁻⁶					
Current consumption	I _{CC}	60 mA Max.		30 mA Max.		OE=V _{CC} , L _{ECL} =50 Ω or L _{LVDS} =100 Ω	
Disable current	I _{dis}	2 mA Max.		15 mA Max.		OE=GND	
Symmetry	SYM	45 % to 55 %				At outputs crossing point	
Output voltage (LV-PECL)	V _{OH}	1.55 V Typ.	2.35 V Typ.	—		DC characteristics	
		V _{CC} -1.025 V to V _{CC} -0.88 V		—			
	V _{OL}	0.80 V Typ.	1.60 V Typ.	—			
		V _{CC} -1.81 V to V _{CC} -1.62 V		—			
Output voltage (LVDS)	V _{OD}	—		350 mV Typ, 247 mV to 454 mV		V _{OD1} , V _{OD2}	DC characteristics
	dV _{OD}	—		50 mV Max.		dV _{OD} = V _{OD1} -V _{OD2}	
	V _{OS}	—		1.25 V Typ, 1.125 V to 1.375 V		V _{OS1} , V _{OS2}	
	dV _{OS}	—		150 mV Max.		dV _{OS} = V _{OS1} -V _{OS2}	
Output load condition (ECL) / (LVDS)	L _{ECL}	50 Ω		—		Terminated to V _{CC} -2.0 V	
	L _{LVDS}	—		100 Ω		Connected between OUT to OUT	
Input voltage	V _{IH}	70 % V _{CC} Min.				OE terminal	
	V _{IL}	30 % V _{CC} Max.					
Rise time / Fall time	tr / tf	400 ps Max.				Between 20 % and 80 % of (V _{OH} -V _{OL}). Between 20 % and 80 %of Differential Output Peak to Peak voltage.	
Start-up time	t _{str}	10 ms Max.				Time at minimum supply voltage to be 0 s	
Phase Jitter	tPJ	0.23 ps Max.		0.27 ps Max.		100 MHz ≤ f _o < 150 MHz	Offset frequency: 12 kHz to 20 MHz
		0.22 ps Max.		0.24 ps Max.		150 MHz ≤ f _o < 200 MHz	
		0.21 ps Max.		0.23 ps Max.		200 MHz ≤ f _o < 300 MHz	
		0.18 ps Max.		0.19 ps Max.		300 MHz ≤ f _o < 400 MHz	
		0.16 ps Max.		0.16 ps Max.		400 MHz ≤ f _o < 500 MHz	
		0.14 ps Max.		0.14 ps Max.		500 MHz ≤ f _o < 600 MHz	
		0.10 ps Max.		0.10 ps Max.		600 MHz ≤ f _o ≤ 700 MHz	
Frequency aging	f _{aging}	± 10 × 10 ⁻⁶ / year Max.				+25 °C, First year, V _{CC} =2.5 V,3.3 V	

Product Name EG-2121 CB 212.500000MHz P H P A (⑤⑥⑦: GRA, GSA are not available)

(Standard form)

① ② ③ ④⑤⑥⑦

①Model ②Package type ③Frequency

④Output(P:LV-PECL, L:LVDS)

⑤Frequency tolerance ⑥Operating temperature

⑦Frequency aging (A*1: Frequency tolerance include aging, N*2: Frequency tolerance exclude aging)

*1 This includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, and aging(+25 °C, 10 years).

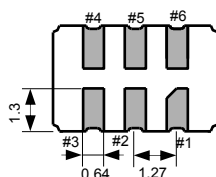
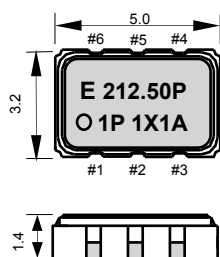
*2 This includes initial frequency tolerance, temperature variation, supply voltage variation, and reflow drift (except aging).

⑤Frequency tolerance	
G	±50 × 10 ⁻⁶
H	±100 × 10 ⁻⁶

⑥Operating temp.	
P	0 to +70 °C
R	-5 to +85 °C
S	-20 to +70 °C

External dimensions

(Unit:mm)



Pin map

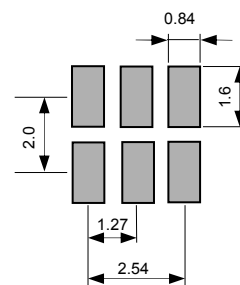
Pin	Connection
1	OE *
2	GND
3	GND
4	OUT
5	OUT
6	V _{CC}

*) Standby function built-in.

OE pin = HIGH : Specified frequency output.
OE pin = LOW : Output is high impedance
#2 and #3 are connected to the cover.

Footprint (Recommended)

(Unit:mm)



To maintain stable operation, provide a 0.01 μF to 0.1 μF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).

**LOW-JITTER SAW OSCILLATOR (SPSO)****OUTPUT : LV-PECL, LVDS****For high temperature environment****EG-2123 / 2103CB**

- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V ... EG-2123CB
3.3 V ... EG-2103CB
- Output : LV-PECL or LVDS
- Function : Output enable (OE)
- External dimensions : 5.0 × 3.2 × 1.4 mm
- Low jitter and low phase noise by SAW unit.



Product Number (please contact us)
 EG-2123CB P: X1M000451xxxx00
 EG-2123CB L: X1M000291xxxx00
 EG-2103CB P: X1M000441xxxx00
 EG-2103CB L: X1M000281xxxx00



Actual size

**Specifications (characteristics)**

Item	Symbol	LV-PECL		LVDS		Conditions / Remarks	
		EG-2123CB P	EG-2103CB P	EG-2123CB L	EG-2103CB L		
Output frequency range	f _o	100 MHz to 700 MHz				Please contact us about available frequencies.	
Supply voltage	V _{CC}	2.5 V ±0.125 V	3.3 V ±0.33 V	2.5 V ±0.125 V	3.3 V ±0.33 V		
Storage temperature	T _{stg}	-55 °C to +125 °C				Storage as single product.	
Operating temperature	T _{use}	P:0 °C to +70 °C ,R:-5 °C to +85 °C ,S:-20 °C to +70 °C					
Frequency tolerance	f _{tol}	H: ±100 × 10 ⁻⁶					
Current consumption	I _{CC}	60 mA Max.		30 mA Max.		OE=V _{CC} , L _{ECL} =50 Ω or L _{LVDS} =100 Ω	
Disable current	I _{dis}	2 mA Max.		15 mA Max.		OE=GND	
Symmetry	SYM	45 % to 55 %				At outputs crossing point	
Output voltage (LV-PECL)	V _{OH} V _{OL}	1.55 V Typ.	2.35 V Typ.	—		DC characteristics	
		V _{CC} -1.025 V to V _{CC} -0.88 V		—			
		0.80 V Typ.	1.60 V Typ.	—			
		V _{CC} -1.81 V to V _{CC} -1.62 V		—			
Output voltage (LVDS)	V _{OD}	—		350 mV Typ, 247 mV to 454 mV		V _{OD1} , V _{OD2}	DC characteristics
	dV _{OD}	—		50 mV Max.		dV _{OD} = V _{OD1} -V _{OD2}	
	V _{OS}	—		1.25 V Typ, 1.125 V to 1.375 V		V _{OS1} , V _{OS2}	
	dV _{OS}	—		150 mV Max.		dV _{OS} = V _{OS1} -V _{OS2}	
Output load condition (ECL) / (LVDS)	L _{ECL}	50 Ω		—		Terminated to V _{CC} -2.0 V	
	L _{LVDS}	—		100 Ω		Connected between OUT to OUT	
Input voltage	V _{IH}	70 % V _{CC} Min.				OE terminal	
	V _{IL}	30 % V _{CC} Max.					
Rise time / Fall time	t _r / t _f	400 ps Max.				Between 20 % and 80 % of (V _{OH} -V _{OL}). Between 20 % and 80 % of Differential Output Peak to Peak voltage.	
Start-up time	t _{str}	10 ms Max.				Time at minimum supply voltage to be 0 s	
Phase Jitter	t _{pj}	0.23 ps Max.		0.27 ps Max.		100 MHz ≤ f _o < 150 MHz	Offset frequency: 12 kHz to 20 MHz
		0.22 ps Max.		0.24 ps Max.		150 MHz ≤ f _o < 200 MHz	
		0.21 ps Max.		0.23 ps Max.		200 MHz ≤ f _o < 300 MHz	
		0.18 ps Max.		0.19 ps Max.		300 MHz ≤ f _o < 400 MHz	
		0.16 ps Max.		0.16 ps Max.		400 MHz ≤ f _o < 500 MHz	
		0.14 ps Max.		0.14 ps Max.		500 MHz ≤ f _o < 600 MHz	
		0.10 ps Max.		0.10 ps Max.		600 MHz ≤ f _o ≤ 700 MHz	
Frequency aging	f _{aging}	H: Included in Frequency tolerance				Max operating temperature,5years,V _{CC} =2.5 V,3.3 V	

Product Name **EG-2123 CB 212.500000MHz P H R H**

(Standard form)

- ① ② ③ ④ ⑤ ⑥ ⑦
- ① Model ② Package type ③ Frequency
- ④ Output (P: LV-PECL, L: LVDS)
- ⑤ Frequency tolerance ⑥ Operating temperature
- ⑦ Frequency aging (H*1: Frequency tolerance include aging)

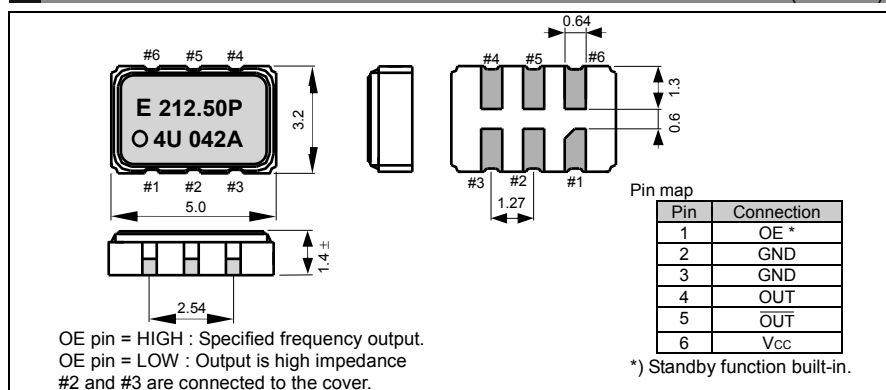
⑤ Frequency tolerance	
H	±100 × 10 ⁻⁶

⑥ Operating temp.	
P	0 to +70 °C
R	-5 to +85 °C
S	-20 to +70 °C

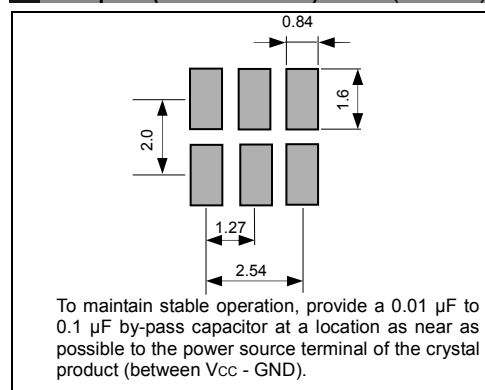
*1 This includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift and estimation of 5 years aging at max operating temperature.

External dimensions

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)



LOW-JITTER SAW OSCILLATOR (SPSO) **OUTPUT : LV-PECL, LVDS**

XG-2121 / 2102CA

- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V ... XG-2121CA
3.3 V ... XG-2102CA
- Output : LV-PECL or LVDS
- Function : Output enable (OE)
- External dimensions : 7.0 × 5.0 × 1.2 mm
- Low jitter and low phase noise by SAW unit.



Product Number (please contact us)
XG-2121CA P: X1M000311xxxx00
XG-2121CA L: X1M000351xxxx00
XG-2102CA P: X1M000301xxxx00
XG-2102CA L: X1M000341xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	LV-PECL		LVDS		Conditions / Remarks	
		XG-2121CA P	XG-2102CA P	XG-2121CA L	XG-2102CA L		
Output frequency range	f _o	100 MHz to 700 MHz				Please contact us about available frequencies.	
Supply voltage	V _{cc}	2.5 V ±0.125 V	3.3 V ±0.33 V	2.5 V ±0.125 V	3.3 V ±0.33 V		
Storage temperature	T _{stg}	-55 °C to +125 °C				Storage as single product.	
Operating temperature	T _{use}	P:0 °C to +70 °C ,R:-5 °C to +85 °C ,S:-20 °C to +70 °C					
Frequency tolerance	f _{tol}	G: ± 50 × 10 ⁻⁶ ,H: ±100 × 10 ⁻⁶					
Current consumption	I _{cc}	60 mA Max.		30 mA Max.		OE=V _{cc} , L _{ECL} =50 Ω or L _{LVDS} =100 Ω	
Disable current	I _{dis}	2 mA Max.		15 mA Max.		OE=GND	
Symmetry	SYM	45 % to 55 %				At outputs crossing point	
Output voltage (LV-PECL)	V _{OH}	1.55 V Typ.	2.35 V Typ.	—		DC characteristics	
		V _{cc} -1.025 V to V _{cc} -0.88 V		—			
		0.80 V Typ.	1.60 V Typ.	—			
		V _{cc} -1.81 V to V _{cc} -1.62 V		—			
Output voltage (LVDS)	V _{OD}	—		350 mV Typ,	247 mV to 454 mV	V _{OD1} , V _{OD2}	DC characteristics
	dV _{OD}	—		50 mV Max.		dV _{OD} = V _{OD1} -V _{OD2}	
	V _{OS}	—		1.25 V Typ,	1.125 V to 1.375 V	V _{OS1} , V _{OS2}	
	dV _{OS}	—		150 mV Max.		dV _{OS} = V _{OS1} -V _{OS2}	
Output load condition (ECL) / (LVDS)	L _{ECL}	50 Ω		—		Terminated to V _{cc} -2.0 V	
	L _{LVDS}	—		100 Ω		Connected between OUT to $\overline{\text{OUT}}$	
Input voltage	V _{IH}	70 % V _{cc} Min.				OE terminal	
	V _{IL}	30 % V _{cc} Max.					
Rise time / Fall time	t _r / t _f	400 ps Max.				Between 20 % and 80 % of (V _{OH} -V _{OL}). Between 20 % and 80 %of Differential Output Peak to Peak voltage	
Start-up time	t _{str}	10 ms Max.				Time at minimum supply voltage to be 0 s	
Phase Jitter	tp _J	0.23 ps Max.		0.27 ps Max.		100 MHz ≤ f _o < 150 MHz	Offset frequency: 12 kHz to 20 MHz
		0.22 ps Max.		0.24 ps Max.		150 MHz ≤ f _o < 200 MHz	
		0.21 ps Max.		0.23 ps Max.		200 MHz ≤ f _o < 300 MHz	
		0.18 ps Max.		0.19 ps Max.		300 MHz ≤ f _o < 400 MHz	
		0.16 ps Max.		0.16 ps Max.		400 MHz ≤ f _o < 500 MHz	
		0.14 ps Max.		0.14 ps Max.		500 MHz ≤ f _o < 600 MHz	
		0.10 ps Max.		0.10 ps Max.		600 MHz ≤ f _o ≤ 700 MHz	
Frequency aging	f _{aging}	± 10 × 10 ⁻⁶ / year Max.				+25 °C, First year, V _{cc} =2.5 V,3.3 V	

Product Name XG-2121 CA 212.500000MHz P H P A (⑤⑥⑦: GRA, GSA are not available)

(Standard form)

① ② ③ ④⑤⑥⑦

①Model ②Package type ③Frequency

④Output (P:LV-PECL, L:LVDS)

⑤Frequency tolerance ⑥Operating temperature

⑦Frequency aging (A*1: Frequency tolerance include aging, N*2: Frequency tolerance exclude aging)

⑤Frequency tolerance	
G	$\pm 50 \times 10^{-6}$
H	$\pm 100 \times 10^{-6}$

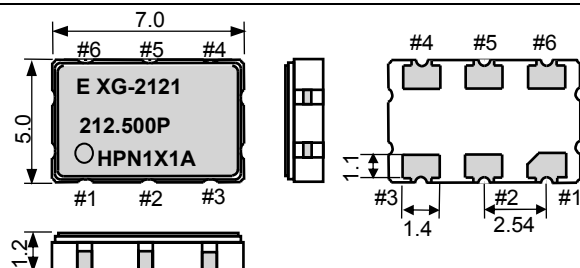
⑥Operating temp.	
P	0 to +70 °C
R	-5 to +85 °C
S	-20 to +70 °C

*1 This includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, and aging(+25 °C, 10 years).

*2 This includes initial frequency tolerance, temperature variation, supply voltage variation, and reflow drift (except aging).

External dimensions

(Unit:mm)



Pin map

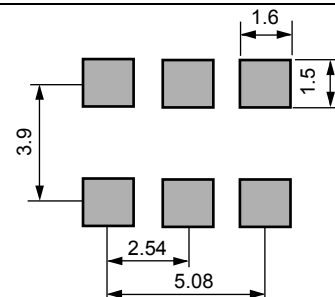
Pin	Connection
1	OE *
2	N.C.
3	GND
4	OUT
5	OUT
6	V_{cc}

* Standby function built-in.
(Only LV-PECL output model)

OE pin = HIGH : Specified frequency output.
OE pin = LOW : Output is high impedance
#3 is connected to the cover.

Footprint (Recommended)

(Unit:mm)



To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{cc} - GND).

**LOW-JITTER SAW OSCILLATOR (SPSO)****OUTPUT : LV-PECL, LVDS****For high temperature environment****XG-2123 / 2103CA**

- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V ... XG-2123CA
3.3 V ... XG-2103CA
- Output : LV-PECL or LVDS
- Function : Output enable (OE)
- External dimensions : 7.0 × 5.0 × 1.2 mm
- Low jitter and low phase noise by SAW unit.



Product Number (please contact us)
 XG-2123CA P: X1M000331xxxx00
 XG-2123CA L: X1M000371xxxx00
 XG-2103CA P: X1M000321xxxx00
 XG-2103CA L: X1M000361xxxx00



Actual size

**Specifications (characteristics)**

Item	Symbol	LV-PECL		LVDS		Conditions / Remarks	
		XG-2123CA P	XG-2103CA P	XG-2123CA L	XG-2103CA L		
Output frequency range	f _o	100 MHz to 700 MHz				Please contact us about available frequencies.	
Supply voltage	V _{CC}	2.5 V ±0.125 V	3.3 V ±0.33 V	2.5 V ±0.125 V	3.3 V ±0.33 V		
Storage temperature	T _{stg}	-55 °C to +125 °C				Storage as single product.	
Operating temperature	T _{use}	P: 0 °C to +70 °C ,R:-5 °C to +85 °C ,S:-20 °C to +70 °C					
Frequency tolerance	f _{tol}	H: ±100 × 10 ⁻⁶					
Current consumption	I _{CC}	60 mA Max.		30 mA Max.		OE=V _{CC} , L _{ECL} =50 Ω or L _{LVDS} =100 Ω	
Disable current	I _{dis}	2 mA Max.		15 mA Max.		OE=GND	
Symmetry	SYM	45 % to 55 %				At outputs crossing point	
Output voltage (LV-PECL)	V _{OH} V _{OL}	1.55 V Typ.	2.35 V Typ.	—		DC characteristics	
		V _{CC} -1.025 V to V _{CC} -0.88 V		—			
		0.80 V Typ.	1.60 V Typ.	—			
		V _{CC} -1.81 V to V _{CC} -1.62 V		—			
Output voltage (LVDS)	V _{OD}	—		350 mV Typ, 247 mV to 454 mV		V _{OD1} , V _{OD2}	DC characteristics
	dV _{OD}	—		50 mV Max.		dV _{OD} = V _{OD1} -V _{OD2}	
	V _{OS}	—		1.25 V Typ, 1.125 V to 1.375 V		V _{OS1} , V _{OS2}	
	dV _{OS}	—		150 mV Max.		dV _{OS} = V _{OS1} -V _{OS2}	
Output load condition (ECL) / (LVDS)	L _{ECL}	50 Ω		—		Terminated to V _{CC} -2.0 V	
	L _{LVDS}	—		100 Ω		Connected between OUT to OUT	
Input voltage	V _{IH}	70 % V _{CC} Min.				OE terminal	
	V _{IL}	30 % V _{CC} Max.					
Rise time / Fall time	t _r / t _f	400 ps Max.				Between 20 % and 80 % of (V _{OH} -V _{OL}). Between 20 % and 80 % of Differential Output Peak to Peak voltage.	
Start-up time	t _{str}	10 ms Max.				Time at minimum supply voltage to be 0 s	
Phase Jitter	t _{pJ}	0.23 ps Max.		0.27 ps Max.		100 MHz ≤ f _o < 150 MHz	Offset frequency: 12 kHz to 20 MHz
		0.22 ps Max.		0.24 ps Max.		150 MHz ≤ f _o < 200 MHz	
		0.21 ps Max.		0.23 ps Max.		200 MHz ≤ f _o < 300 MHz	
		0.18 ps Max.		0.19 ps Max.		300 MHz ≤ f _o < 400 MHz	
		0.16 ps Max.		0.16 ps Max.		400 MHz ≤ f _o < 500 MHz	
		0.14 ps Max.		0.14 ps Max.		500 MHz ≤ f _o < 600 MHz	
		0.10 ps Max.		0.10 ps Max.		600 MHz ≤ f _o ≤ 700 MHz	
Frequency aging	f _{aging}	H: Included in Frequency tolerance				Max operating temperature, 5years, V _{CC} =2.5 V, 3.3 V	

Product Name XG-2123 CA 156.25000MHz P H R H

(Standard form)

- ① ② ③ ④ ⑤ ⑥ ⑦
 ① Model ② Package type ③ Frequency
 ④ Output(P: LV-PECL, L: LVDS)
 ⑤ Frequency tolerance ⑥ Operating temperature
 ⑦ Frequency aging (H*1: Frequency tolerance include aging)

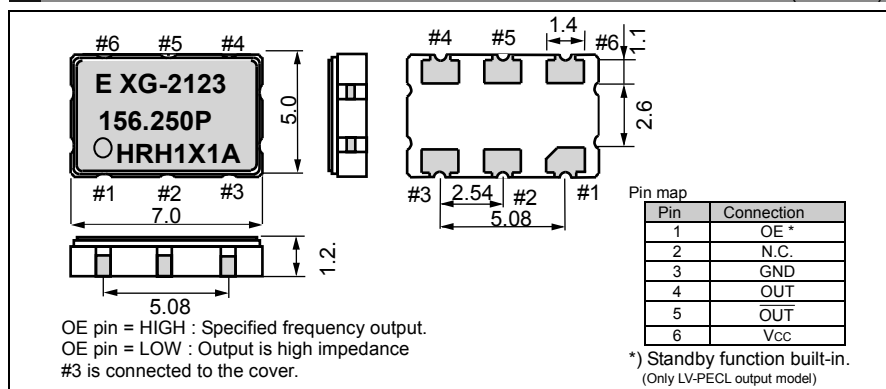
⑤ Frequency tolerance	
H	$\pm 100 \times 10^{-6}$

⑥ Operating temp.	
P	0 to +70 °C
R	-5 to +85 °C
S	-20 to +70 °C

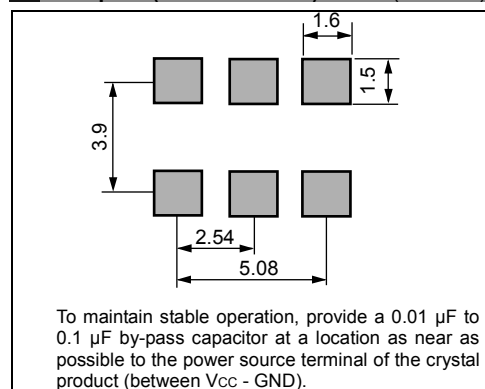
*1 This includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift and estimation of 5 years aging at max operating temperature.

External dimensions

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)





LOW-JITTER SAW OSCILLATOR (SPSO)

OUTPUT : LV-PECL, LVDS, HCSL

EG-4121/4101CA

- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V ... EG-4121CA
3.3 V ... EG-4101CA
- Output : LV-PECL or LVDS or HCSL
- Function : Output enable (OE)
- External dimensions : 7.0 × 5.0 × 1.2 mm

- Very low jitter and low phase noise by SAW unit.



Product Number (please contact us)
X1M0001x1xxxx00



Actual size

EG-4121CA

EG-4101CA



Specifications (characteristics)

► Differential LV-PECL Output

Item	Symbol	EG-4121CA P	EG-4101CA P	Conditions / Remarks	
		LV-PECL			
Output frequency range	f _o	100 MHz to 700 MHz		Please contact us about available frequencies.	
Supply voltage	V _{CC}	2.5 V ±0.125 V	3.3 V ±0.33 V		
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product.	
Operating temperature	T _{use}	W: -40 °C to +85 °C			
Frequency tolerance	f _{tol}	G: ± 50 × 10 ⁻⁶			
Current consumption	I _{CC}	60 mA Max.		OE=V _{CC} , L _{ECL} =50 Ω	
Disable current	I _{dis}	2 mA Max.		OE=GND	
Symmetry	SYM	45 % to 55 %		at outputs crossing point	
Output voltage	V _{OH}	1.55 V Typ.	2.35 V Typ.	DC characteristics	
		V _{CC} -1.025 V to V _{CC} -0.88 V			
	V _{OL}	0.8 V Typ.	1.6 V Typ.		
		V _{CC} -1.81 V to V _{CC} -1.62 V			
Output load condition (ECL)	L _{ECL}	50 Ω		Terminated to V _{CC} -2.0 V	
Input voltage	V _{IH}	70 % V _{CC} Min.		OE terminal	
	V _{IL}	30 % V _{CC} Max.			
Rise time / Fall time	t _r / t _f	400 ps Max.		Between 20 % and 80 % of (V _{OH} -V _{OL})	
Start-up time	t _{str}	10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	tp _J	0.23 ps Max.		100 MHz ≤ f _o < 150 MHz	Offset frequency: 12 kHz to 20 MHz
		0.22 ps Max.		150 MHz ≤ f _o < 200 MHz	
		0.21 ps Max.		200 MHz ≤ f _o < 300 MHz	
		0.18 ps Max.		300 MHz ≤ f _o < 400 MHz	
		0.16 ps Max.		400 MHz ≤ f _o < 500 MHz	
		0.14 ps Max.		500 MHz ≤ f _o < 600 MHz	
		0.10 ps Max.		600 MHz ≤ f _o ≤ 700 MHz	

Offset frequency:
12 kHz to 20 MHz

► LVDS Output

Item	Symbol	EG-4121CA L	EG-4101CA L	Conditions / Remarks	
		LVDS			
Output frequency range	f _o	100 MHz to 700 MHz		Please contact us about available frequencies.	
Supply voltage	V _{cc}	2.5 V ±0.125 V	3.3 V ±0.33 V		
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product.	
Operating temperature	T _{use}	W: -40 °C to +85 °C			
Frequency tolerance	f _{tol}	G: ± 50 × 10 ⁻⁶			
Current consumption	I _{cc}	30 mA Max		OE=V _{cc} , L _{LVDS} =100 Ω	
Disable current	I _{dis}	15 mA Max		OE=GND	
Symmetry	SYM	45 % to 55 %		at outputs crossing point	
Output voltage	V _{od}	350 mV Typ. 247 mV to 454 mV		V _{OD1} , V _{OD2}	DC characteristics
	dV _{od}	50 mV Max.		dV _{OD} = V _{OD1} -V _{OD2}	
	V _{os}	1.25 V Typ. 1.125 V to 1.375 V		V _{OS1} , V _{OS2}	
	dV _{os}	150 mV Max.		dV _{OS} = V _{OS1} -V _{OS2}	
Output load condition (LVDS)	L _{LVDS}	100 Ω		Connected between OUT to $\overline{\text{OUT}}$	
Input voltage	V _{IH}	70 % V _{cc} Min.		OE terminal	
	V _{IL}	30 % V _{cc} Max.			
Rise time / Fall time	t _r / t _f	400 ps Max.		Between 20 % and 80 % of Differential Output Peak to Peak voltage.	
Start-up time	t _{str}	10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	tp _J	0.27 ps Max.		100 MHz ≤ f _o < 150 MHz	Offset frequency: 12 kHz to 20 MHz
		0.24 ps Max.		150 MHz ≤ f _o < 200 MHz	
		0.23 ps Max.		200 MHz ≤ f _o < 300 MHz	
		0.19 ps Max.		300 MHz ≤ f _o < 400 MHz	
		0.16 ps Max.		400 MHz ≤ f _o < 500 MHz	
		0.14 ps Max.		500 MHz ≤ f _o < 600 MHz	
		0.10 ps Max.		600 MHz ≤ f _o ≤ 700 MHz	

Offset frequency:
12 kHz to 20 MHz

► **HCSL Output**

Item	Symbol	EG-4121CA H	EG-4101CA H	Conditions / Remarks	
		HCSL			
Output frequency range	f _o	100 MHz to 200 MHz		Please contact us about available frequencies.	
Supply voltage	V _{cc}	2.5 V ±0.125 V		3.3 V ±0.3 V	
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product.	
Operating temperature	T _{use}	W: -40 °C to +85 °C			
Frequency tolerance	f _{tol}	G: ± 50 × 10 ⁻⁶			
Current consumption	I _{cc}	35 mA Max.		OE=V _{cc} ,L _{HCSL} =50 Ω	
Disable current	I _{dis}	15 mA Max.		OE=GND	
Symmetry	SYM	45 % to 55 %		at outputs crossing point	
Output Voltage	V _{OH}	0.75 V Typ.		DC characteristics	
	V _{OL}	-0.3 V Typ.			
Output load condition (HCSL)	L _{HCSL}	50 Ω		Terminated to GND	
Input voltage	V _{IH}	70 % V _{cc} Min.		OE terminal	
	V _{IL}	30 % V _{cc} Max.			
Rise time / Fall time	t _r / t _f	500 ps Max.		Between 0.175 V and 0.525 V of output	
Start-up time	t _{str}	10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	t _{PJ}	0.3 ps Max.		f _o ≤ 160 MHz	
		0.4 ps Max.		160 MHz < f _o ≤ 175 MHz	
		0.2 ps Max.		f _o >175 MHz	

Product Name **EG-4121 CA 250.000000MHz P G W A**

(Standard form)

- ① ② ③ ④⑤⑥⑦
- ① Model ② Package type ③ Frequency
 ④ Output(P:LV-PECL, L:LVDS, H: HCSL)
 ⑤ Frequency tolerance ⑥ Operating temperature
 ⑦ Frequency aging (A*1: Frequency tolerance include aging)

*1 This includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, and aging(+25 °C, 10 years).

⑤Frequency tolerance		⑥Operating temp.	
G	±50 × 10 ⁻⁶	W	-40 to +85°C

Table 2 Jitter

Item	Symbol	Specifications	Remarks
Jitter *	t _{DJ}	0.3 ps Typ.	Deterministic Jitter
	t _{RJ}	2 ps Typ.	Random Jitter
	t _{RMS}	2 ps Typ.	σ (RMS of total distribution)
	t _{p-p}	20 ps Typ.	Peak to Peak
	t _{acc}	3 ps Typ.	Accumulated Jitter(σ) n=2 to 50000 cycles

* Tested using a DTS-2075 Digital timing system made by WAVECREST with jitter analysis software VISI6.

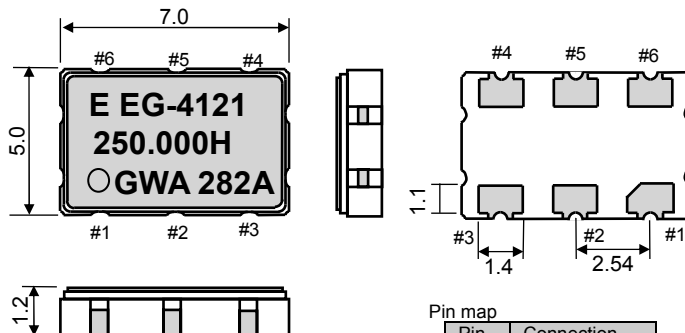
* Based on SIA-3100C signal integrity analyzer made from WAVECREST.

: LV-PECL, LVDS output

: HCSL output

External dimensions

(Unit:mm)

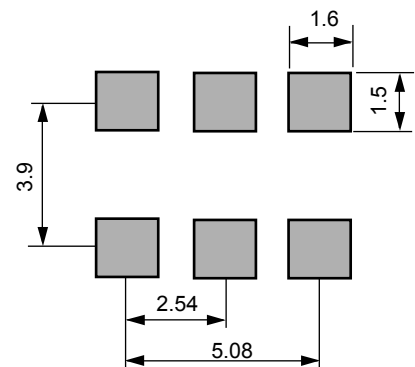


OE pin = HIGH : Specified frequency output.
 OE pin = LOW : Output is high impedance
 #3 is connected to the cover.

*) Standby function is built-in
 (Only LV-PECL output model).

Footprint (Recommended)

(Unit:mm)



To maintain stable operation, provide a 0.01 μF to 0.1 μF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{cc} - GND).

I²C-Bus Programmable Crystal Oscillator (SPXO)

Output: LV-PECL

SG-8506CA

- Frequency range : 50 MHz to 800 MHz
- Supply voltage : 2.5 V to 3.3 V
- External dimensions : 7.0 × 5.0 × 1.5 mm (8 pins)

Features

- User-specified one startup frequency, 7-bit I²C
- User Programming: I²C Interface
- High frequency fundamental tone crystal, Low jitter PLL technology
- Available field oscillator programmer "SG-Writer II"

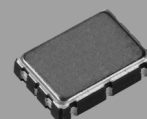
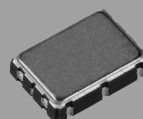
Application

- OTN, BTS, Test Instrument

*The I²C-Bus is a trademark of
NXP Semiconductors



Product Number (please contact us)
X1G005031xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f _o	50 MHz to 800 MHz	It can be changed by I ² C
Supply voltage	V _{CC}	2.5 V - 0.125 V to 3.3 V + 0.33 V	-
Storage temperature	T _{stg}	-55 °C to +125 °C	Store as bare product after packing
Operating temperature	T _{use}	-40 °C to +85 °C	-
Frequency tolerance *1	f _{tol}	K : ±31.5 × 10 ⁻⁶ L : ±50 × 10 ⁻⁶	Customized Product (Option)
Current consumption	I _{CC}	90 mA Max.	OE Active, L _{ECL} =50 Ω
Disable current	I _{dis}	40 mA Max. 70 mA Max.	OE Inactive, Output Standby: Hi-Z mode OE Inactive, Output Standby: Fix mode
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V _{OH} V _{OL}	V _{CC} - 1.025 V Min. V _{CC} - 1.62 V Max.	DC characteristics
Output load condition	L _{ECL}	50 Ω	Termination to V _{CC} - 2.0 V
Input voltage	V _{IH} V _{IL}	70% V _{CC} Min. 30% V _{CC} Max.	OE, SDA and SCL
Rise time / Fall time	t _r /t _f	400 ps Max.	Between 20% and 80% of (V _{OH} - V _{OL})
Start-up time	t _{str}	10 ms Max.	Time at minimum supply voltage to be 0 s
Setting time for frequency change	t _{SET1}	1.5 ms Max.	From setting NEW_FREQ bit to output new frequency

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change, reflow drift and 10 years aging at +25 °C.

Product Name SG-8506 CA 156.2MHz 0x37 A P R L Z
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model, ② Package type,

③ Power-on default output frequency (50 ~ 800 MHz), ④ I²C slave address, ⑤ Internal crystal frequency,

⑥ Output enable pin Polarity, ⑦ Supply voltage/Output format, ⑧ Frequency tolerance/Operating temperature, ⑨ Output standby type

⑤ Internal crystal frequency
A 114.1444 MHz

⑥ Output enable pin Polarity
P Active High
Q Active Low

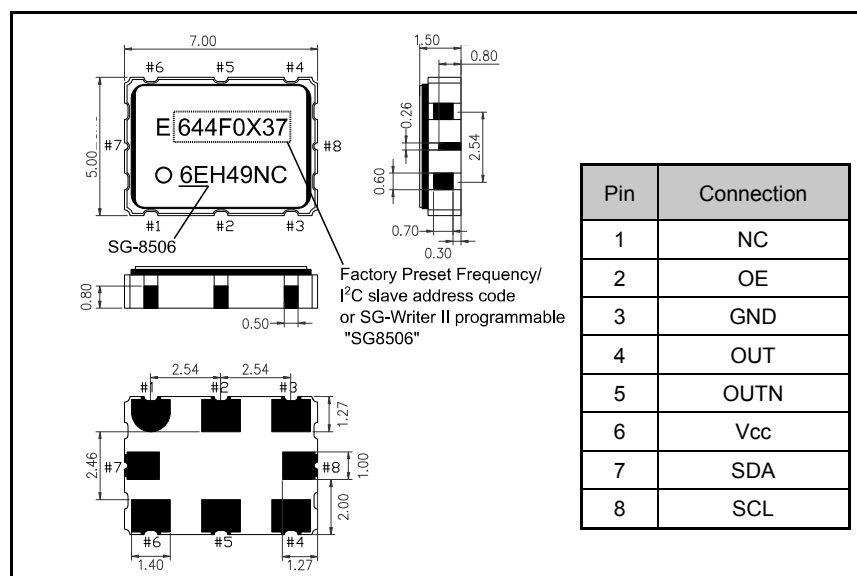
⑦ Supply voltage/Output format
R 2.5 V ~ 3.3 V/LVPECL

⑧ Frequency tolerance/Operating temperature
K ±31.5 × 10 ⁻⁶ /-40 to +85 °C
L ±50 × 10 ⁻⁶ /-40 to +85 °C

⑨ Output standby type
F Fix (OUT="L", OUTN="H")
Z High-Z

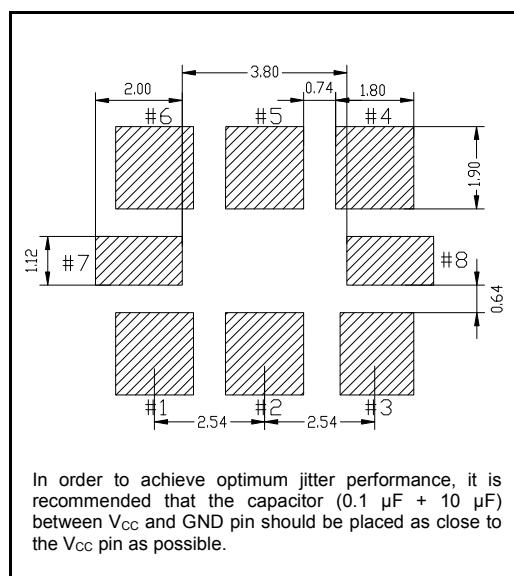
External dimensions

(Unit: mm)



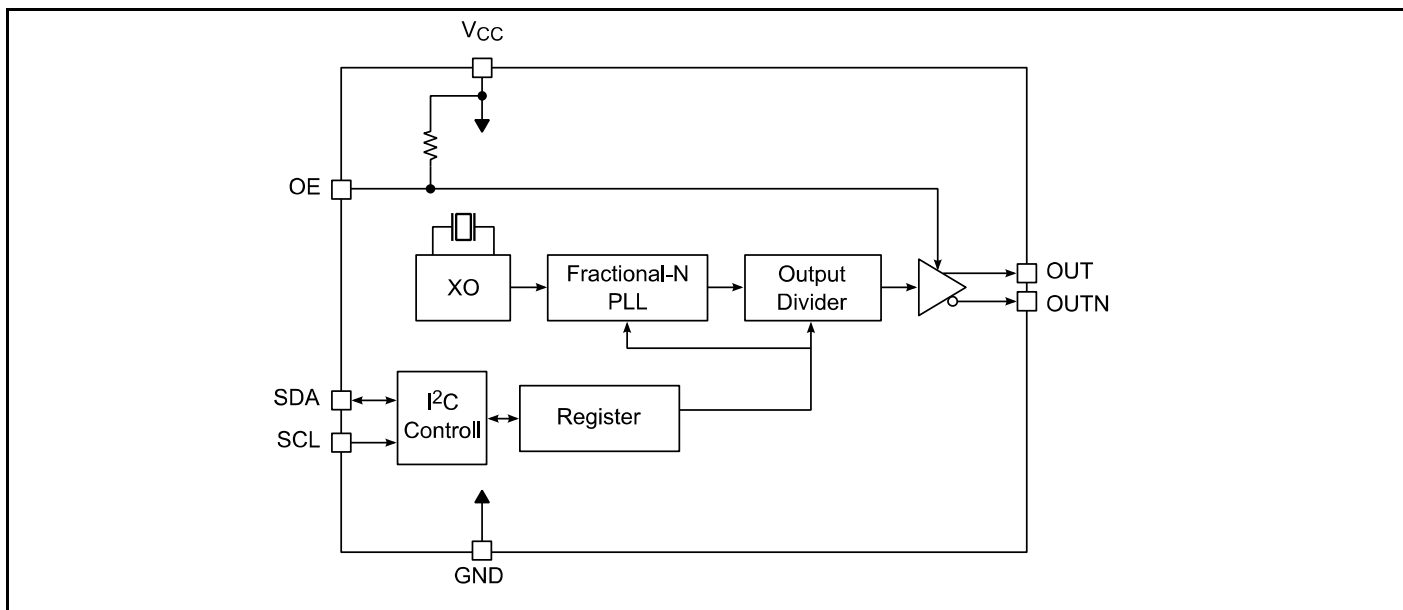
Footprint (Recommended)

(Unit: mm)

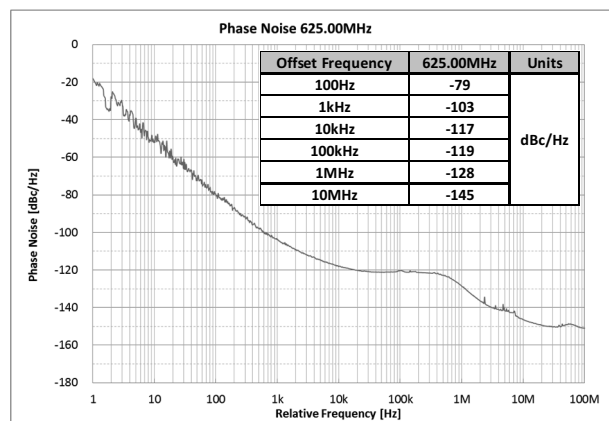
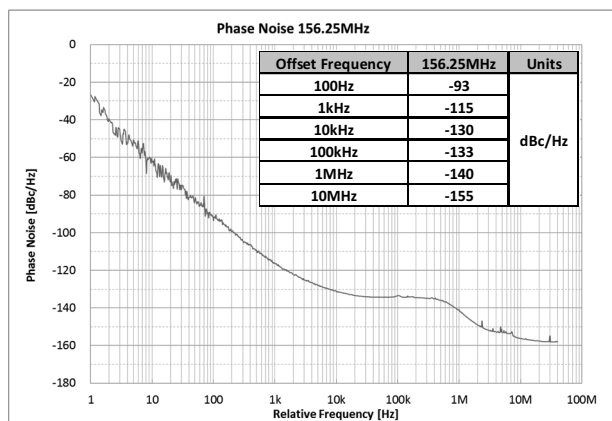




Block diagram



Phase Noise



Phase Jitter

	Offset Frequency	100.00 MHz	125.00 MHz	156.25 MHz	250.00 MHz	312.50 MHz	500.00 MHz	625.00 MHz
Phase jitter *2 Typ.	12 kHz to 20 MHz	0.31 ps	0.30 ps	0.26 ps	0.26 ps	0.29 ps	0.28 ps	0.29 ps

*2 In order to achieve optimum jitter performance, it is recommended that the capacitor (0.1 μ F + 10 μ F) between VCC and GND pin should be placed as close to the VCC pin as possible.



Dual or Quad Selectable Programmable Crystal Oscillator

Output: LV-PECL

SG-8503CA / SG-8504CA

- Dual frequency Selectable: SG-8503CA, 7.0 × 5.0 × 1.5 mm (6 pins)
- Quad frequency Selectable: SG-8504CA, 7.0 × 5.0 × 1.5 mm (8 pins)
- Frequency range: 50 MHz to 800 MHz
- Supply voltage: 2.5 V to 3.3 V

Features

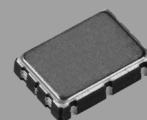
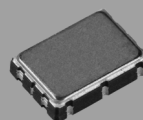
- User-specified two (FSEL) or four (FSEL0, FSEL1) startup frequencies
- High frequency fundamental tone crystal, Low jitter PLL technology
- Available field oscillator programmer "SG-Writer II"

Application

- OTN, BTS, Test Instrument



Product Number (please contact us)
SG-8503CA : X1G005011xxxx00
SG-8504CA : X1G005021xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	50 MHz to 800 MHz	-
Supply voltage	V_{CC}	2.5 V - 0.125 V to 3.3 V + 0.33 V	-
Storage temperature	T_{stg}	-55 °C to +125 °C	Store as bare product after packing
Operating temperature	T_{use}	-40 °C to +85 °C	-
Frequency tolerance *1	f_{tol}	K : $\pm 1.5 \times 10^{-6}$	Customized Product (Option)
		L : $\pm 5.0 \times 10^{-6}$	
Current consumption	I_{CC}	90 mA Max.	OE Active, $L_{ECL} = 50 \Omega$
Disable current	I_{dis}	40 mA Max.	OE Inactive, Output Standby: Hi-Z mode
		70 mA Max.	OE Inactive, Output Standby: Fix mode
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V_{OH}	$V_{CC} - 1.025 \text{ V Min.}$	DC characteristics
	V_{OL}	$V_{CC} - 1.62 \text{ V Max.}$	
Output load condition	L_{ECL}	50 Ω	Termination to $V_{CC} - 2.0 \text{ V}$
Input voltage	V_{IH}	70% V_{CC} Min.	SG-8503CA : OE, FSEL
	V_{IL}	30% V_{CC} Max.	SG-8504CA : OE, FSEL0, FSEL1
Rise time / Fall time	t_r/t_f	400 ps Max.	Between 20% and 80% of ($V_{OH} - V_{OL}$)
Start-up time	t_{str}	10 ms Max.	Time at minimum supply voltage to be 0 s
Setting time for frequency change	t_{SET1}	1.5 ms Max.	SG-8503CA : From setting FSEL pin to output new frequency SG-8504CA : From setting FSEL0 / FSEL1 pin to output new frequency

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change, reflow drift and 10 years aging at +25 °C.

Product Name SG-8503 CA 156MHz 625MHz A P R L Z
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model, ② Package type,

③ Frequency-0 (50 ~ 800 MHz), ④ Frequency-1 (50 ~ 800 MHz), ⑤ Internal crystal frequency, ⑥ Output enable pin Polarity,

⑦ Supply voltage/Output format, ⑧ Frequency tolerance/Operating temperature, ⑨ Output standby type

Product Name SG-8504 CA 156.2MHz nnnn A P R L Z
(Standard form) ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① Model, ② Package type,

③ Frequency-0 (50 ~ 800 MHz), ④ Parameter identifier, ⑤ Internal crystal frequency, ⑥ Output enable pin Polarity,

⑦ Supply voltage/Output format, ⑧ Frequency tolerance/Operating temperature, ⑨ Output standby type

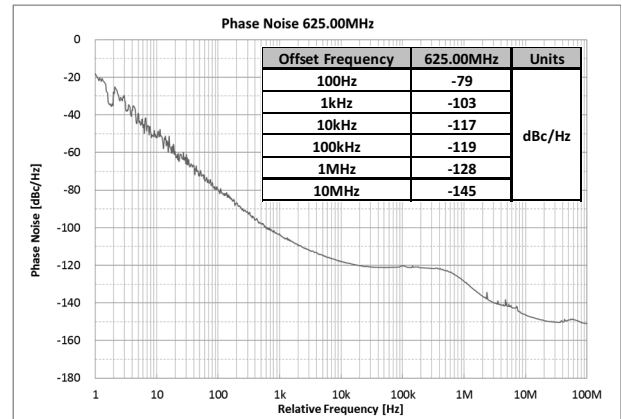
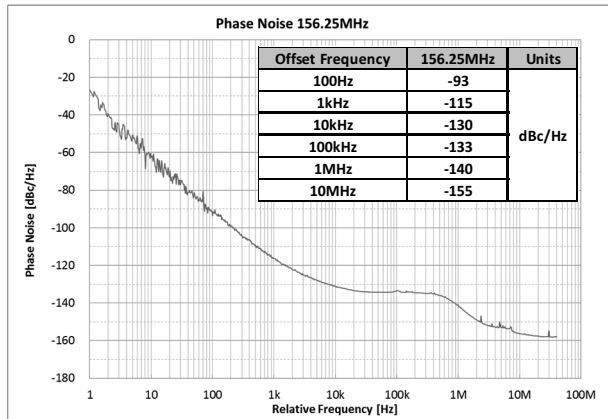
⑤ Internal crystal frequency	⑥ Output enable pin Polarity	⑦ Supply voltage/Output format	⑧ Frequency tolerance/Operating temperature	⑨ Output standby type
A 114.1444 MHz	P Active High Q Active Low	R 2.5 V ~ 3.3 V/LVPECL	K $\pm 1.5 \times 10^{-6}$ / -40 to +85 °C L $\pm 5.0 \times 10^{-6}$ / -40 to +85 °C	F Fix (OUT="L", OUTN="H") Z High-Z

Phase Jitter

	Offset Frequency	100.00 MHz	125.00 MHz	156.25 MHz	250.00 MHz	312.50 MHz	500.00 MHz	625.00 MHz
Phase jitter *2 Typ.	12 kHz to 20 MHz	0.31 ps	0.30 ps	0.26 ps	0.26 ps	0.29 ps	0.28 ps	0.29 ps

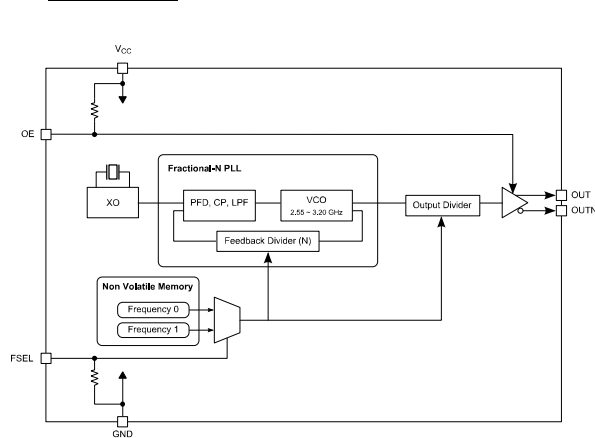
*2 In order to achieve optimum jitter performance, it is recommended that the capacitor (0.1 μF + 10 μF) between V_{CC} and GND pin should be placed as close to the V_{CC} pin as possible.

Phase Noise

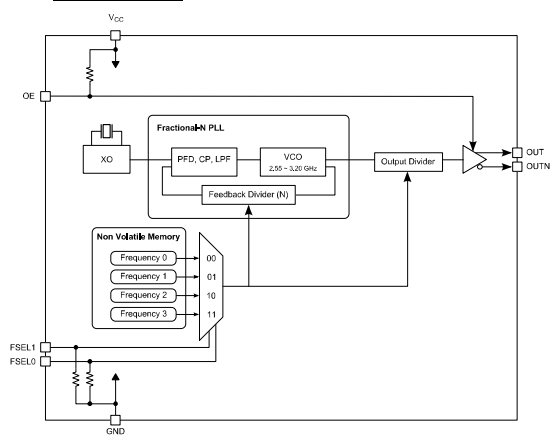


Block diagram

SG-8503CA



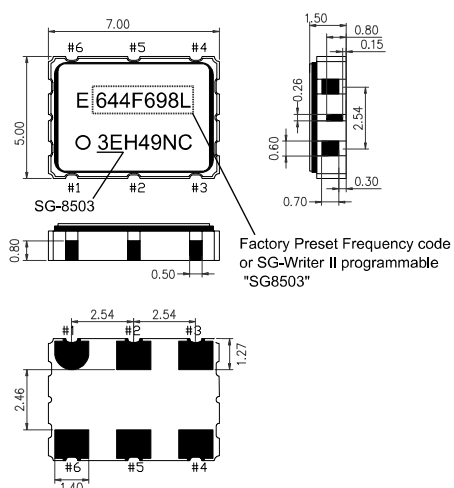
SG-8504CA



External dimensions

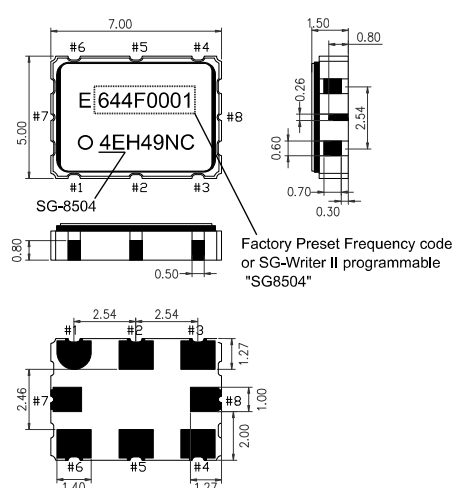
(Unit: mm)

SG-8503CA



Pin	Connection
1	OE
2	FSEL (L = Frequency-0, H = Frequency-1)
3	GND
4	OUT
5	OUTN
6	Vcc

SG-8504CA

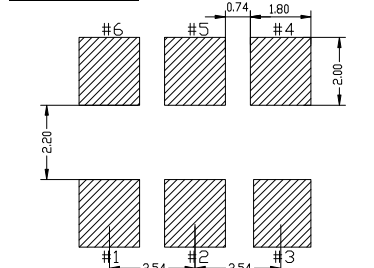


Pin	Connection	Pin	Connection
1	NC	5	OUTN
2	OE	6	Vcc
3	GND	7	FSEL1
4	OUT	8	FSEL0

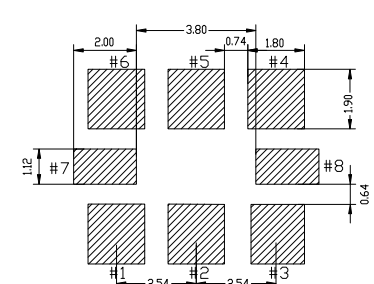
FSEL1, FSEL0	Output Frequency
LL	Frequency-0
LH	Frequency-1
HL	Frequency-2
HH	Frequency-3

Footprint (Recommended)(Unit: mm)

SG-8503CA



SG-8504CA



In order to achieve optimum jitter performance, it is recommended that the capacitor (0.1 μ F + 10 μ F) between Vcc and GND pin should be placed as close to the Vcc pin as possible.

CRYSTAL OSCILLATOR (SPXO)

OUTPUT : LVDS

SG3225 / 7050VEN

- Frequency range : 25 MHz to 200 MHz
- Supply voltage : 2.5V , 3.3 V
- Output : LVDS
- Function : Output enable (OE)
- Phase jitter : 60 fs Typ. ($f_0 = 156.25\text{MHz}$)
- Operating temperature : -40 °C to +85 °C
- : -40 °C to +105 °C



Product Number (please contact us)

Product Number (please contact us)
SG3225VEN X1G005351xxxxxx

SG7050VEN X1G005331xxxxxx



SG3225VEN



SG7050VEN

Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f ₀	25 MHz to 200 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	V _{CC}	D : 2.5 V ±0.125 V , C : 3.3 V ±0.165 V	
Storage temperature	T _{stg}	-55 °C to +125 °C	Store as bare product.
Operating temperature	T _{use}	G : -40 °C to +85 °C , H : -40 °C to +105 °C	
Frequency tolerance	f _{tol}	D : ±25 × 10 ⁻⁶ Max. (Not available H : -40 °C to +105 °C)	Includes initial tolerance, temperature change, V _{CC} change and 5 years aging(+25 °C)
		J : ±50 × 10 ⁻⁶ Max.	Includes initial tolerance, temperature change, V _{CC} change and 10 years aging(+25 °C)
		L : ±100 × 10 ⁻⁶ Max.	Includes initial tolerance, temperature change, V _{CC} change and 10 years aging(+25 °C)
Current consumption	I _{CC}	25 mA Max.	OE= V _{CC} , with output load
Disable current	I _{dis}	15 mA Max.	OE=GND
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V _{OD}	250 mV to 450 mV	V _{OD1} , V _{OD2}
	dV _{OD}	50 mV Max.	dV _{OD} = V _{OD1} - V _{OD2}
	V _{OS}	1.15 V to 1.35 V	V _{OS1} , V _{OS2}
	dV _{OS}	50 mV Max.	dV _{OS} = V _{OS1} - V _{OS2}
Output load condition	L _{LVDS}	100 Ω	Connected between OUT1 to OUT2
Input voltage	V _{IH}	70 % V _{CC} Min.	OE terminal
	V _{IL}	30 % V _{CC} Max.	
Rise/Fall times	Tr / Tf	300 ps Max. (V _{CC} : 3.3V) 350 ps Max. (V _{CC} : 2.5V)	at 20 % to 80 % of Differential Output peak to peak voltage
Oscillation start up time	t _{str}	10 ms Max.	Time at minimum supply voltage to be 0 s

Phase jitter

	100 MHz	125 MHz	156.25 MHz	200 MHz
Phase jitter Typ. [fs] (Offset frequency 12k to 20MHz)	90	70	60	50

Product Name	SG3225 VEN 156.250000MHz C D G A	(⑤⑥: Not Available code DH)
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(Standard form)

① ② ③ ④ ⑤ ⑥ ⑦

(5)(6): Not Available code DH)

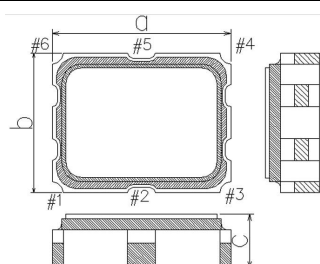
①Model ②Output (V: LVDS) ③Frequency ④Supply voltage (C: 3.3 V Typ. D: 2.5 V Typ.)

⑤Frequency tolerance (D: $\pm 25 \times 10^{-6}$ Max. J: $\pm 50 \times 10^{-6}$ Max. L: $\pm 100 \times 10^{-6}$ Max.)

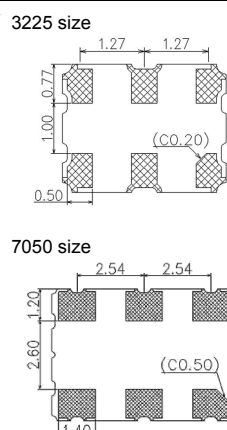
⑥Operating temperature (G:-40 to +85°C , H:-40 to +105°C) ⑦Internal identification code("A" is default)

External dimensions

(Unit:mm)



	3225 size	7050 size
a	3.2	7.0
b	2.5	5.0
c	1.05	1.6



Pin map

Pin	Connection
1	OE
2	N.C. (Open or Vcc)
3	GND
4	OUT
5	$\overline{\text{OUT}}$
6	Vcc

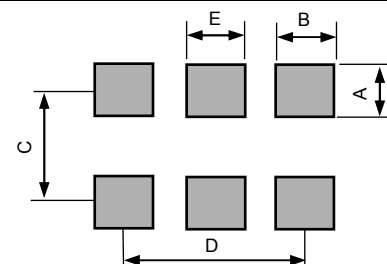
Note:

OE pin = HIGH or "Open" : Specified frequency output.

OE pin = LOW : Output is high impedance

Footprint (Recommended)

(Unit:mm)



	3225 size	7050 size
A	1.05	2.00
B	0.92	1.80
C	1.85	4.20
D	2.58	5.08
E	0.80	1.80

In order to achieve optimum jitter performance, it is recommended that the capacitor ($0.1\ \mu\text{F} + 10\ \mu\text{F}$) between VCC and GND pin should be placed as close to the VCC pin as possible.

**CRYSTAL OSCILLATOR (SPXO)****OUTPUT : HCSL****SG3225HBN**

- Frequency range : 100 MHz to 325 MHz
- Supply voltage : 3.3 V
- Output : HCSL
- Function : Output enable (OE)
- External dimensions : 3.2 × 2.5 × 1.05 mm
- Phase jitter : 85 fs Typ ($f_0 = 156.25\text{MHz}$)



Product Number (please contact us)
X1G005141xxxx00



Actual size

**Specifications (characteristics)**

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	100 MHz to 325 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	V_{CC}	3.3 V ± 0.165 V	
Storage temperature	T_{stg}	-55 °C to +125 °C	Store as bare product.
Operating temperature	T_{use}	-40 °C to +85 °C	
Frequency tolerance	f_{tol}	$\pm 50 \times 10^{-6}$, $\pm 100 \times 10^{-6}$	Includes initial tolerance, temperature change, V_{CC} change and 10 years aging(+25 °C)
Current consumption	I_{CC}	25 mA Typ. 35 mA Max.	OE = V_{CC} , with output load
Disable current	I_{dis}	15 mA Max.	OE = GND
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V_{OH}	0.75 V Typ., 0.66 V to 0.85 V	DC characteristics, single output
	V_{OL}	0 V Typ., -0.15 V to 0.15 V	
Crossing voltage	V_{CR}	0.25 V to 0.55 V	
Output load condition	L_{HCSL}	50 Ω	
	R_s	33 Ω	
Input voltage	V_{IH}	70 % V_{CC} Min.	OE terminal
	V_{IL}	30 % V_{CC} Max.	
differential output rise slew rate/ fall slew rate	R_r / R_f	1 V/n to 4 V/ns	Between -0.15 V and 0.15 V of differential output
Start-up time	t_{str}	10 ms Max.	Time at minimum supply voltage to be 0 s

Phase Jitter

	Output frequency	100 MHz	125 MHz	156.25 MHz	200 MHz	322.265625 MHz	Supply voltage
Phase Jitter [fs]	Typ.	110	95	85	75	65	$V_{CC} = 3.3V \pm 0.165V$
(Offset Frequency 12k to 20MHz)	Max.	180	160	140	125	110	

Product Name
(Standard form)

SG3225 HBN 156.250000MHz C J G A

① ② ③ ④ ⑤ ⑥ ⑦

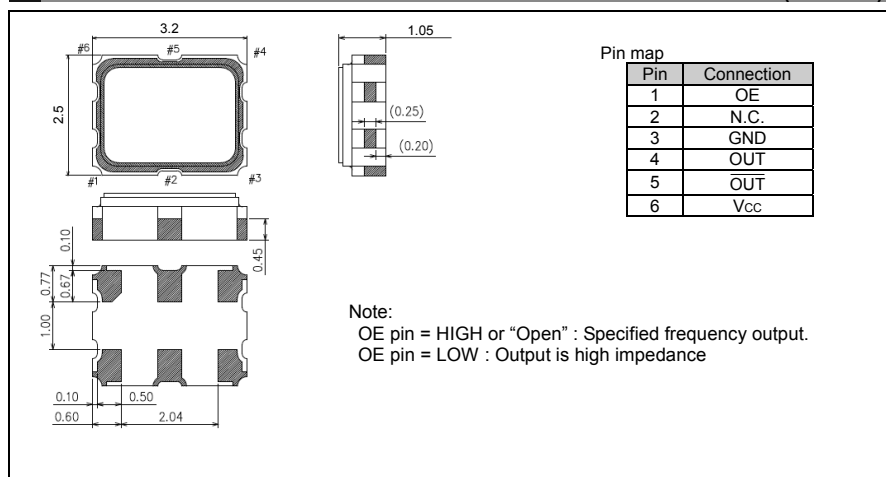
①Model ②Output (H: HCSL) ③Frequency ④Supply voltage (C: 3.3 V Typ.)

⑤Frequency tolerance (J: $\pm 50 \times 10^{-6}$ Max. L: $\pm 100 \times 10^{-6}$ Max.)

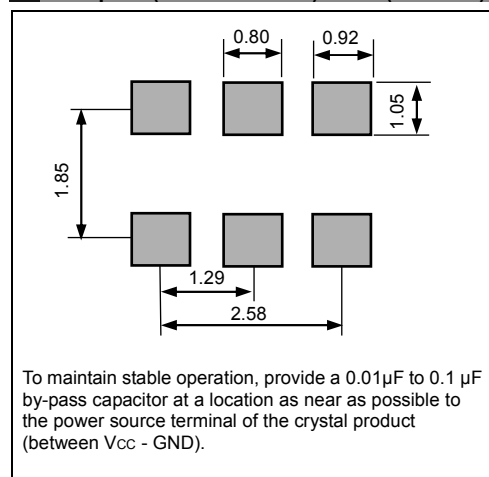
⑥Operating temperature (-40 to +85°C) ⑦Internal identification code("A" is default)

External dimensions

(Unit:mm)

**Footprint (Recommended)**

(Unit:mm)



LOW-JITTER SAW OSCILLATOR (SPSO) OUTPUT : HCSSL

XG5032HAN

- Frequency range : 100 MHz to 200 MHz
- Supply voltage : 2.5 V, 3.3 V
- Output : HCSSL
- Function : Output enable (OE)
- External dimensions : 5.0 × 3.2 × 1.4 mm

- Low jitter and low phase noise by SAW unit.



Product Number (please contact us)
X1M000461xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Output frequency range	f_0	100 MHz to 200 MHz	Please contact us for inquiries regarding available frequencies.
Supply voltage	V_{CC}	C: 3.3 V ± 0.33 V, D: 2.5 V ± 0.125 V	
Storage temperature	T_{stg}	-55 °C to +125 °C	Store as bare product.
Operating temperature	T_{use}	A: 0 °C to +70 °C, B: -20 °C to +70 °C, D: -5 °C to +85 °C	
Frequency tolerance	f_{tol}	J: $\pm 50 \times 10^{-6}$, L: $\pm 100 \times 10^{-6}$	
Current consumption	I_{CC}	35 mA Max.	OE = V_{CC} , with output load
Disable current	I_{dis}	15 mA Max.	OE = GND
Symmetry	SYM	45 % to 55 %	At outputs crossing point
Output voltage	V_{OH}	0.75 V Typ., 0.66 V to 0.85 V	
	V_{OL}	0 V Typ., -0.15 V to 0.15 V	DC characteristics, single output
Crossing voltage	V_{CR}	0.25 V to 0.55 V	
Output load condition	L_{HCSSL}	50 Ω	
	R_s	33 Ω	As per measurement circuit below.
	C_L	2 pF	
Input voltage	V_{IH}	70 % V_{CC} Min.	
	V_{IL}	30 % V_{CC} Max.	OE terminal
differential output rise slew rate/ fall slew rate	R_r / R_f	1 V/n to 4 V/ns	Between -0.15 V and 0.15 V of differential output
Start-up time	t_{str}	10 ms Max.	Time at minimum supply voltage to be 0 s
Phase Jitter	tpj	0.3 ps Max. 0.4 ps Max. 0.2 ps Max.	$f_0 \leq 160$ MHz 160 MHz $< f_0 \leq 175$ MHz $f_0 > 175$ MHz
Frequency aging	f_{aging}	$N \pm 10 \times 10^{-6}$ / year Max. A: Included in Frequency tolerance	First year 10 years

Product Name XG5032 HAN 100.000000MHz C J A A (⑤⑥⑦: JBA, JDA are not available)

(Standard form)

① Model ② Output(H: HCSSL) ③ Frequency

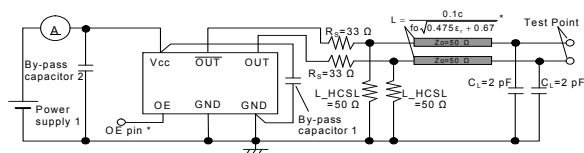
④ Supply voltage (C: 3.3 V Typ., D: 2.5 V Typ.) ⑤ Frequency tolerance ⑥ Operating temperature

⑦ Frequency aging (A: Frequency tolerance include aging, N: Frequency tolerance exclude aging)

⑤ Frequency tolerance	
J	$\pm 50 \times 10^{-6}$
L	$\pm 100 \times 10^{-6}$

⑥ Operating temp.	
A	0 to +70 °C
B	-20 to +70 °C
D	-5 to +85 °C

Measurement circuit



By-pass capacitor 1 (approx. 0.01 μ F to 0.1 μ F) places closely between V_{CC} and GND.

By-pass capacitor 2 (approx. 10 μ F) places closely between power supply terminals on the board.

Output line length L is estimated as follows

$$L = \frac{0.1c}{f_0 \sqrt{0.475\epsilon_r + 0.67}}$$

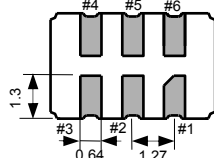
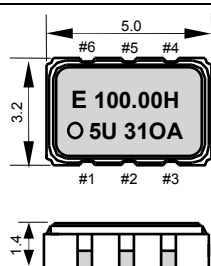
c : Velocity of light in a vacuum
 ϵ_r : Relative dielectric constant of the board
 f_0 : Output frequency

External dimensions

(Unit:mm)

Footprint (Recommended)

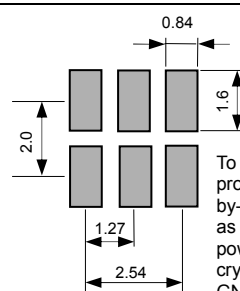
(Unit:mm)



Pin map

Pin	Connection
1	OE
2	GND
3	GND
4	OUT
5	OUT
6	V_{CC}

OE pin = HIGH : Specified frequency output.
OE pin = LOW : Output is high impedance
#2 and #3 are connected to the cover.



To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).



Multi output SAW Oscillator (MOSO)

OUTPUT : LV-PECL

MG7050EAN

Feature

- Ultra Low jitter : 0.3 ps Max.
- 2 or 4 outputs and it is able to reduce fan-out buffers
- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V / 3.3 V
- External dimensions : 7.0 × 5.0 × 1.6 mm
- Output : LV-PECL (2 or 4 outputs)

Application

GbE, Fiber Channel, SAS, PCI express
Server, Storage, Router/Switch, Networking, OTN



Product Number (please contact us)
X1M000411xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks	
Output frequency range	f _o	100 MHz to 700 MHz		Please contact us about available frequencies.	
		100MHz, 106.25MHz, 125MHz, 150MHz, 156.25MHz, 200MHz, 212.5MHz, 250MHz, 300MHz, 312.5MHz		Standard frequency	
Supply voltage	V _{CC}	D: 2.5 V ± 0.125 V	C: 3.3 V ± 0.33 V	V _{CC} , V _{CC1} and V _{CC2} need same voltage	
Storage temperature	T _{stg}	-55 °C to +125 °C		Store as bare product after packing	
Operating temperature	T _{use}	A: 0 °C to +70 °C, B: -20 °C to +70 °C D: -5 °C to +85 °C			
Frequency tolerance *1	f _{tol}	J: ±50 × 10 ⁻⁶ , L: ±100 × 10 ⁻⁶			
Current consumption	I _{CC}	75 mA Typ., 94 mA Max.	80 mA Typ., 102 mA Max.	2-outputs	OE=V _{CC} L _{ECL} =50 Ω
		125 mA Typ., 170 mA Max.	130 mA Typ., 184 mA Max.	4-outputs	
Disable current	I _{dis}	7 mA Typ., 18 mA Max.	8 mA Typ., 20 mA Max.	OE=GND	
Symmetry	SYM	45 % to 55 %		At outputs crossing point	
Output voltage	V _{OH}	V _{CC} -1.025 V to V _{CC} -0.88 V		DC characteristics	
	V _{OL}	V _{CC} -1.81 V to V _{CC} -1.62 V			
Output load condition	L _{ECL}	50 Ω		Termination to V _{CC} -2.0 V	
Input voltage	V _{IH}	70% V _{CC} Min.		OE and FSEL terminals	
	V _{IL}	30% V _{CC} Max.			
Rise time / Fall time	t _r /t _f	200 ps Typ., 400 ps Max.		Between 20% and 80% of (V _{OH} -V _{OL})	
Start-up time	t _{str}	5 ms Typ., 10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	t _{PJ}	0.17 ps Typ.	0.14 ps Typ.	f _o =100 MHz	Offset frequency: 12 kHz to 20 MHz
		0.16 ps Typ.	0.13 ps Typ.	f _o =125 MHz	
		0.15 ps Typ.	0.12 ps Typ.	f _o =156.25 MHz	
		0.13 ps Typ.	0.11 ps Typ.	f _o =212.5 MHz	
		0.11 ps Typ.	0.10 ps Typ.	f _o =312.5 MHz	
		0.05 ps Typ.	0.05 ps Typ.	f _o =700 MHz	
		0.3 ps Max.			
Skew	t _{skew}	20 ps Typ., 50 ps Max.		FSEL=H	
Aging	f _{age}	N: ±10 × 10 ⁻⁶ / year Max.		First year	+25 °C, V _{CC} =2.5 V, 3.3 V
		A: Included in Frequency tolerance *2		10 years	

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change and reflow drift.

*2 "A" is not acceptable when Frequency tolerance is "J" and Operating temperature is "B" or "D".

Product Name
(Standard form)

MG7050 E AN 156.250000MHz 4 A C J A N
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

(⑦⑧⑨:JDA, JBA are not available)

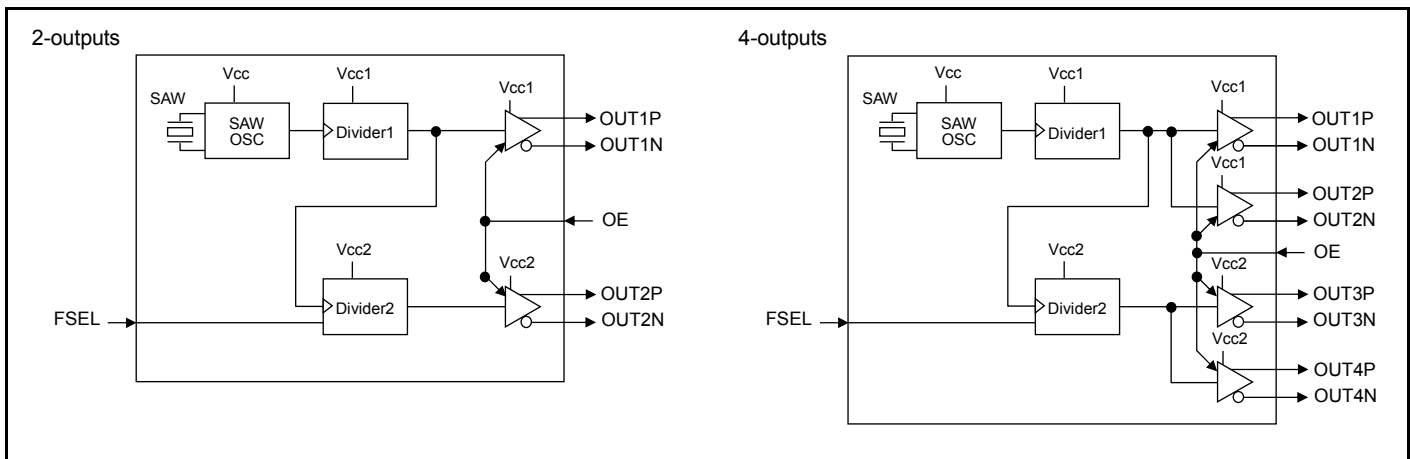
- ① Model
② Output (E: LV-PECL)
③ Frequency
④ Number of outputs (2: 2outputs, 4: 4outputs)
⑤ "A": Fixed
⑥ Supply voltage
⑦ Frequency tolerance
⑧ Operating temperature
⑨ Frequency aging

⑥ Supply voltage	
C	3.3 V Typ.
D	2.5 V Typ.

⑦ Frequency tolerance	
J	±50 × 10 ⁻⁶
L	±100 × 10 ⁻⁶

⑧ Operating temp.	
A	0 to +70°C
B	-20 to +70°C
D	-5 to +85°C

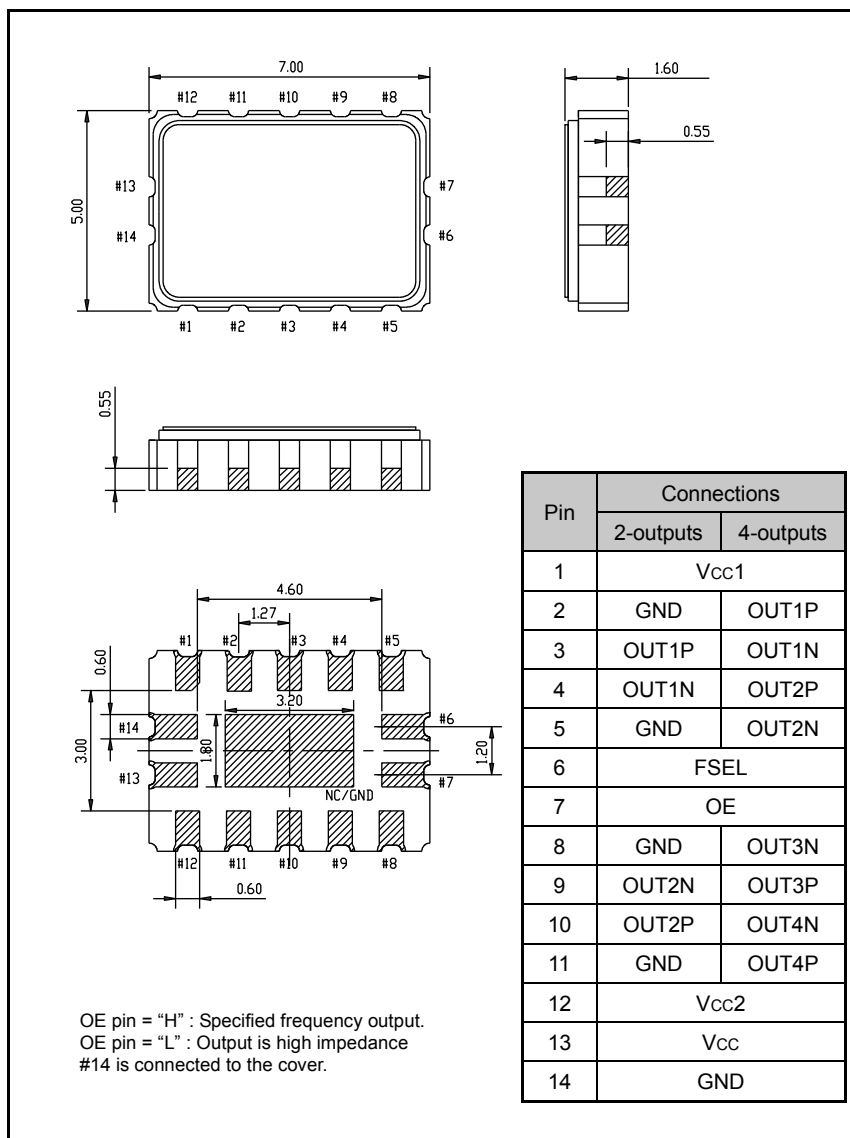
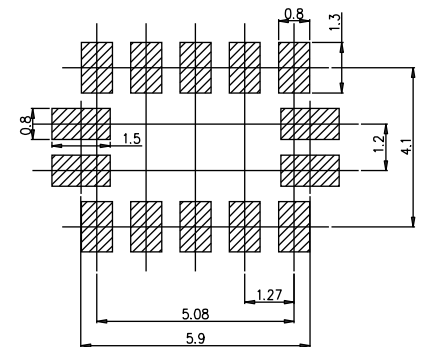
⑨ Frequency aging	
A	Frequency tolerance include aging
N	Frequency tolerance exclude aging

**Block diagram****FSEL function**

2-outputs		OUT1	OUT2
4-outputs		OUT1 / OUT2	OUT3 / OUT4
FSEL	H	fo	fo
	L	fo	fo/2

External dimensions

(Unit :mm)

**Footprint (Recommended) (Unit :mm)**

To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between Vcc, Vcc1, Vcc2 - GND).

Multi output SAW Oscillator (MOSO)
OUTPUT : LVDS
MG7050VAN
Feature

- Ultra Low jitter : 0.3 ps Max.
- 2 or 4 outputs and it is able to reduce fan-out buffers
- Frequency range : 100 MHz to 700 MHz
- Supply voltage : 2.5 V / 3.3 V
- External dimensions : 7.0 × 5.0 × 1.6 mm
- Output : LVDS (2 or 4 outputs)

Application

Server, Storage, Network Instrument.


Product Number (please contact us)
X1M000421xxxx00


Actual size


Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks	
Output frequency range	f _o	100 MHz to 700 MHz		Please contact us about available frequencies.	
		100MHz, 106.25MHz, 125MHz, 150MHz, 156.25MHz, 200MHz, 212.5MHz, 250MHz, 300MHz, 312.5MHz		Standard frequency	
Supply voltage	V _{CC}	D: 2.5 V ± 0.125 V	C: 3.3 V ± 0.33 V	V _{CC} ,V _{CC1} and V _{CC2} need same voltage	
Storage temperature	T _{stg}	-55 °C to +125 °C		Store as bare product after packing	
Operating temperature	T _{use}	A: 0 °C to +70 °C, B: -20 °C to +70 °C D: -5 °C to +85 °C			
Frequency tolerance *1	f _{tol}	J: ±50 × 10 ⁻⁶ , L: ±100 × 10 ⁻⁶			
Current consumption	I _{CC}	35 mA Typ., 50 mA Max.	45 mA Typ., 56 mA Max.	2-outputs	OE=V _{CC} , L_LVDS=100 Ω
		40 mA Typ., 66 mA Max.	50 mA Typ., 72 mA Max.	4-outputs	
Disable current	I _{dis}	7 mA Typ., 18 mA Max.	8 mA Typ., 20 mA Max.	OE=GND	
Symmetry	SYM	45 % to 55 %		At outputs crossing point	
Output voltage	V _{OD}	247 mV to 454 mV		DC characteristics	
	V _{OS}	1.125 V to 1.375 V			
Output load condition	L_LVDS	100 Ω		Connected between OUTnP and OUTnN	
Input voltage	V _{IH}	70% V _{CC} Min.		OE and FSEL terminals	
	V _{IL}	30% V _{CC} Max.			
Rise time / Fall time	t _r /t _f	200 ps Typ., 400 ps Max.		Between 20% and 80% of differential output peak to peak voltage	
Start-up time	t _{str}	5 ms Typ., 10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	t _{PJ}	0.19 ps Typ.	0.16 ps Typ.	f ₀ =100 MHz	Offset frequency: 12 kHz to 20 MHz
		0.18 ps Typ.	0.15 ps Typ.	f ₀ =125 MHz	
		0.17 ps Typ.	0.14 ps Typ.	f ₀ =156.25 MHz	
		0.15 ps Typ.	0.13 ps Typ.	f ₀ =212.5 MHz	
		0.12 ps Typ.	0.11 ps Typ.	f ₀ =312.5 MHz	
		0.06 ps Typ.	0.05 ps Typ.	f ₀ =700 MHz	
		0.3 ps Max.			
Skew	t _{skew}	20 ps Typ., 50 ps Max.		FSEL=H	
Aging	f _{age}	N: ±10 × 10 ⁻⁶ / year Max.		First year	+25 °C, V _{CC} =2.5 V, 3.3 V
		A: Included in Frequency tolerance *2		10 years	

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change and reflow drift.

*2 "A" is not acceptable when Frequency tolerance is "J" and Operating temperature is "B" or "D".

 Product Name
 (Standard form)

MG7050 V AN 156.250000MHz 4 A C J A N
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

(⑦⑧⑨:JDA, JBA are not available)

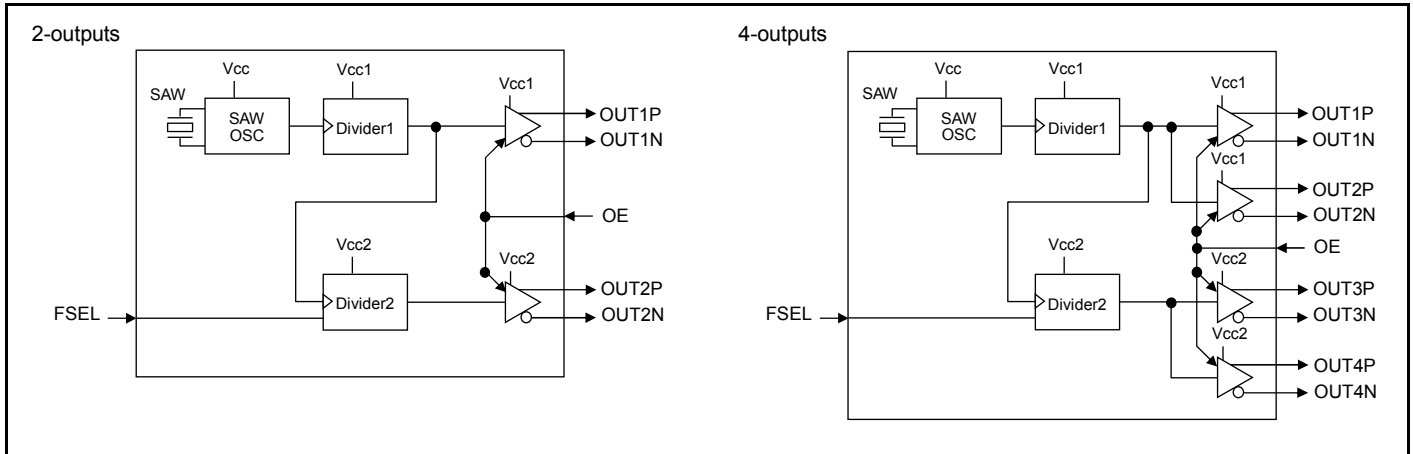
- ① Model
- ② Output (L: LVDS)
- ③ Frequency
- ④ Number of outputs (2: 2outputs, 4: 4outputs)
- ⑤ "A": Fixed
- ⑥ Supply voltage
- ⑦ Frequency tolerance
- ⑧ Operating temperature
- ⑨ Frequency aging

⑥ Supply voltage	
C	3.3 V Typ.
D	2.5 V Typ.

⑦ Frequency tolerance	
J	±50 × 10 ⁻⁶
L	±100 × 10 ⁻⁶

⑧ Operating temp.	
A	0 to +70°C
B	-20 to +70°C
D	-5 to +85°C

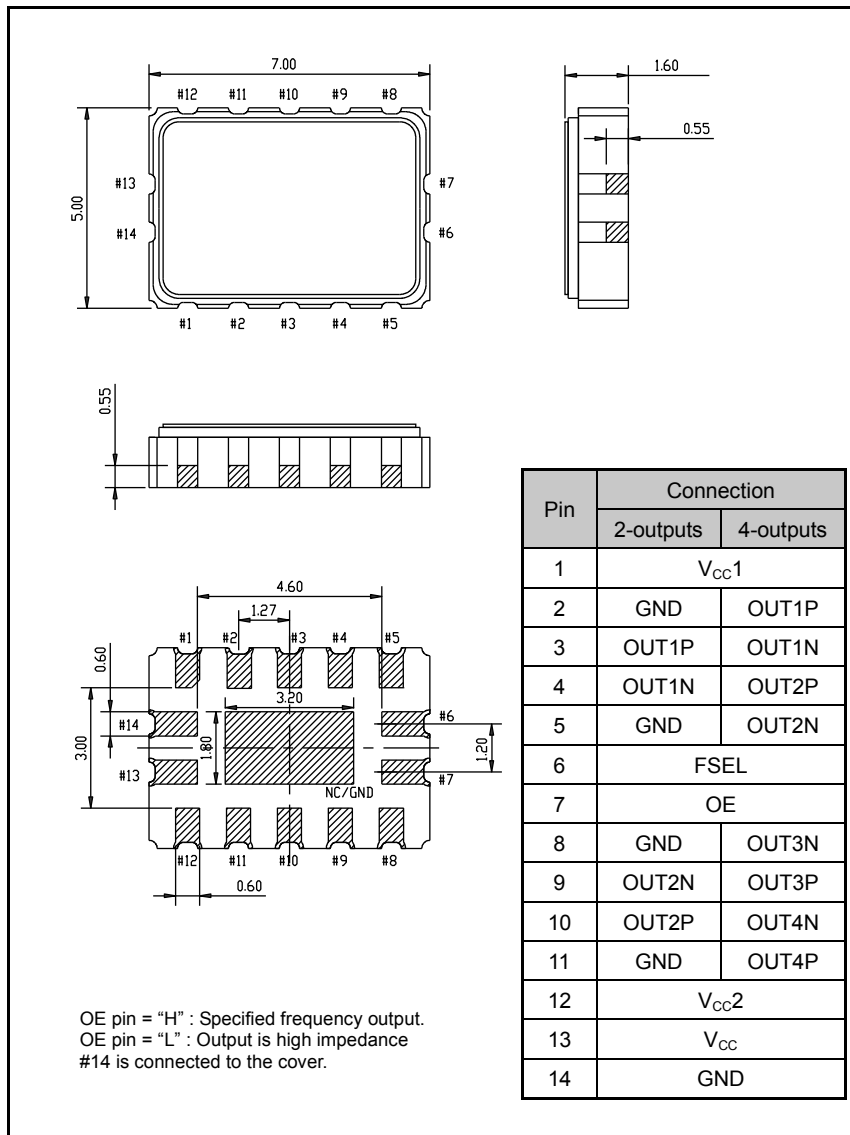
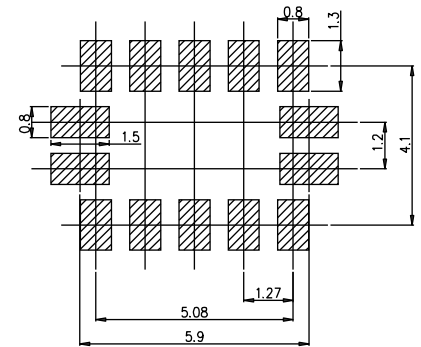
⑨ Frequency aging	
A	Frequency tolerance include aging
N	Frequency tolerance exclude aging

**Block diagram****FSEL function**

2-outputs		OUT1	OUT2
4-outputs		OUT1 / OUT2	OUT3 / OUT4
FSEL	H	fo	fo
	L	fo	fo/2

External dimensions

(Unit : mm)

**Footprint (Recommended) (Unit : mm)**

To maintain stable operation, provide a 0.01 μ F to 0.1 μ F by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC}, V_{CC1}, V_{CC2} - GND).



Multi output SAW Oscillator (MOSO)

OUTPUT : HCSL

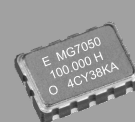
MG7050HAN

Feature

- Ultra Low jitter : 0.3 ps Max.
- 2 or 4 outputs and it is able to reduce fan-out buffers
- Frequency range : 100 MHz to 200 MHz
- Supply voltage : 2.5 V / 3.3 V
- External dimensions : 7.0 × 5.0 × 1.6 mm
- Output : HCSL (2 or 4 outputs)
- Output impedance select by ZSEL

Application

GbE, Fiber Channel, SAS, PCI express

Product Number (please contact us)
X1M000431xxxx00

Actual size



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks	
Output frequency range	f ₀	100 MHz to 200 MHz		Please contact us about available frequencies.	
		100 MHz, 125 MHz, 156.25 MHz, 200 MHz		Standard frequency	
Supply voltage	V _{CC}	D: 2.5 V ± 0.125 V	C: 3.3 V ± 0.33 V	V _{CC} ,V _{CC1} and V _{CC2} need same voltage	
Storage temperature	T _{stg}	-55 °C to +125 °C		Store as bare product after packing	
Operating temperature	T _{use}	A: 0 °C to +70 °C, B: -20 °C to +70 °C D: -5 °C to +85 °C			
Frequency tolerance *1	f _{tol}	J: ±50 × 10 ⁻⁶ , L: ±100 × 10 ⁻⁶			
Current consumption	I _{CC}	55 mA Typ., 84 mA Max.	60 mA Typ., 90 mA Max.	2-outputs	OE=V _{CC} , with L_HCSL
		95 mA Typ., 128 mA Max.	100 mA Typ., 136 mA Max.	4-outputs	
Disable current	I _{dis}	11 mA Typ., 23 mA Max.	12 mA Typ., 25 mA Max.	2-outputs	OE=GND
		15 mA Typ., 28 mA Max.	16 mA Typ., 30 mA Max.	4-outputs	
Symmetry	SYM	45 % to 55 %		At outputs crossing point	
Output voltage	V _{OH}	0.66 V to 0.85 V		DC characteristics	
	V _{OL}	-0.15 V to 0.15 V			
Output load condition	L_HCSL	50 Ω or 42.2 Ω, with C _L =2 pF, R _s =33 Ω or 27 Ω			
Input voltage	V _{IH}	70% V _{CC} Min.		OE and ZSEL terminals	
	V _{IL}	30% V _{CC} Max.			
Rise / Fall skew rate	R _r /R _f	1 V/ns to 4 V/ns		Between -0.15 V and 0.15 V of differential output.	
Start-up time	t _{str}	5 ms Typ., 10 ms Max.		Time at minimum supply voltage to be 0 s	
Phase Jitter	tpj	0.19 ps Typ.	0.16 ps Typ.	f ₀ =100 MHz	Offset frequency: 12 kHz to 20 MHz
		0.18 ps Typ.	0.15 ps Typ.	f ₀ =125 MHz	
		0.16 ps Typ.	0.13 ps Typ.	f ₀ =156.25 MHz	
		0.14 ps Typ.	0.12 ps Typ.	f ₀ =200 MHz	
		0.3 ps Max.			
Skew	t _{skew}	20 ps Typ., 50 ps Max.		ZSEL=H	
Aging	f _{age}	N: ±10 × 10 ⁻⁶ /year Max.		First year	+25 °C, V _{CC} =2.5 V, 3.3 V
		A: Included in Frequency tolerance *2		10 years	

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage change and reflow drift.

*2 "A" is not acceptable when Frequency tolerance is "J" and Operating temperature is "B" or "D".

Product Name
(Standard form)

MG7050 HAN 156.250000MHz 4 A C J A N
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

(⑦⑧⑨:JDA, JBA are not available)

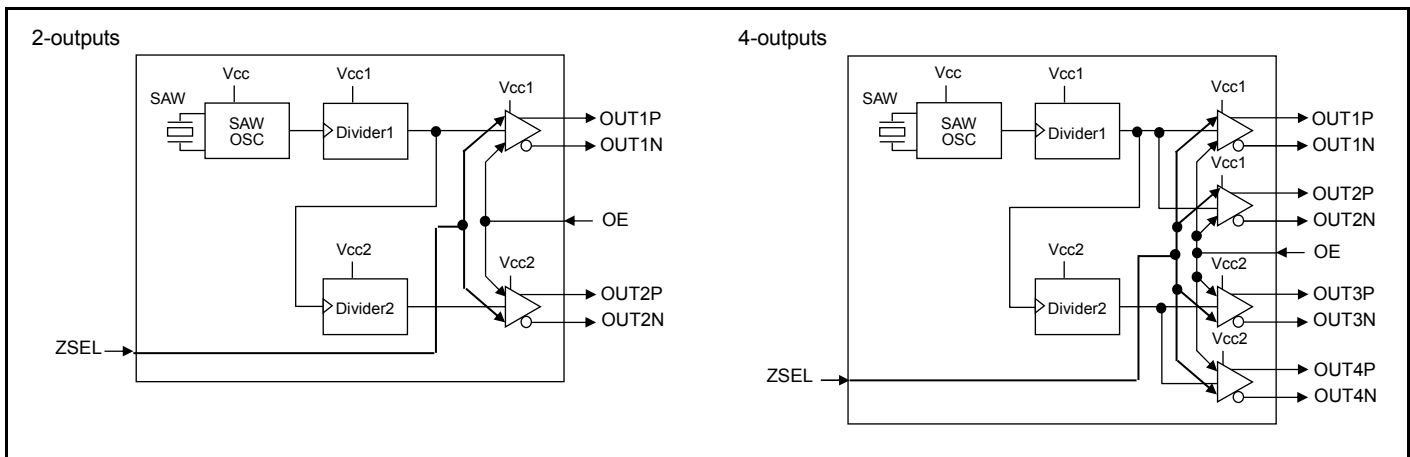
- ①Model
 ②Output (H: HCSL)
 ③Frequency
 ④Number of outputs (2: 2outputs, 4: 4outputs)
 ⑤"A": Fixed
 ⑥Supply voltage
 ⑦Frequency tolerance
 ⑧Operating temperature
 ⑨Frequency aging

⑥Supply voltage	
C	3.3 V Typ.
D	2.5 V Typ.

⑦Frequency tolerance	
J	±50 × 10 ⁻⁶
L	±100 × 10 ⁻⁶

⑧Operating temp.	
A	0 to +70°C
B	-20 to +70°C
D	-5 to +85°C

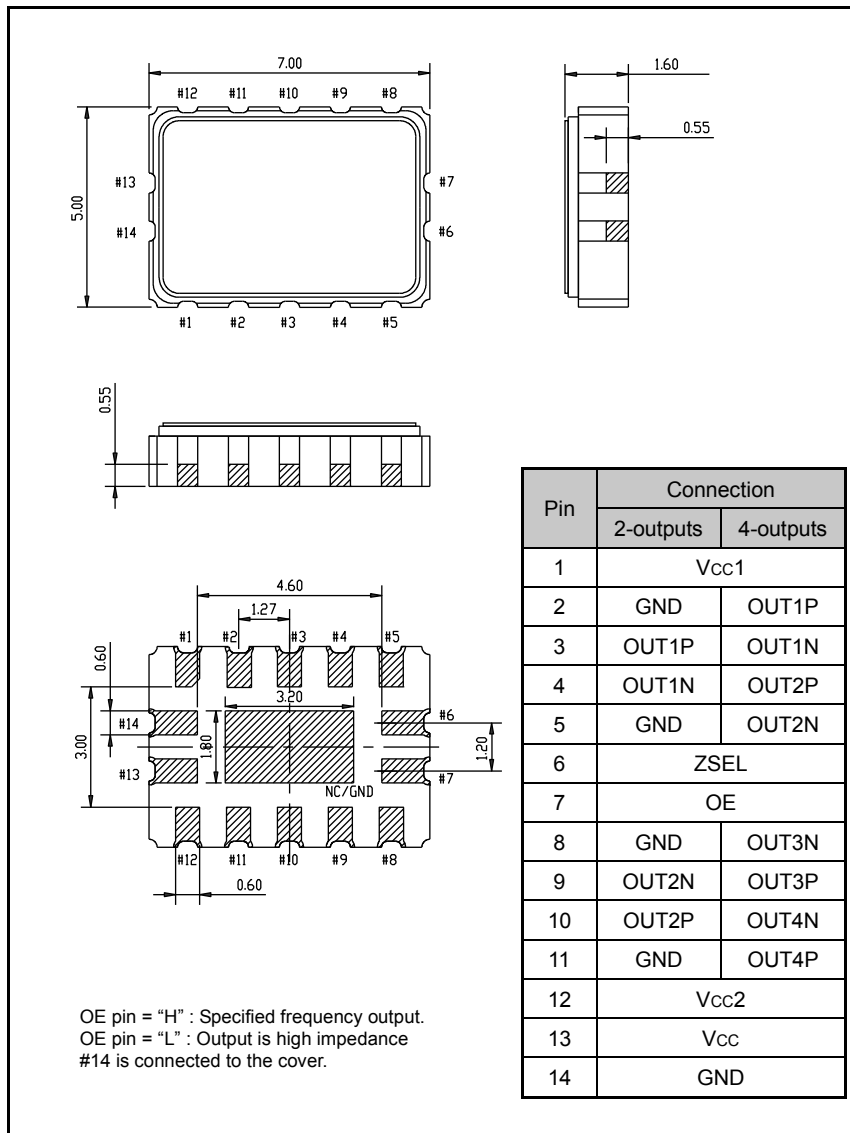
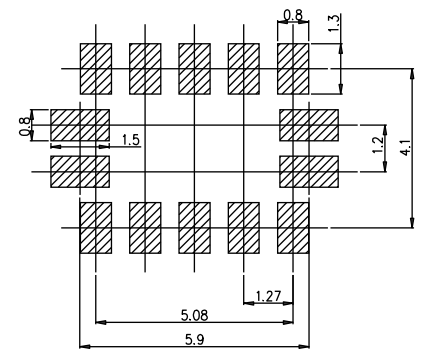
⑨Frequency aging	
A	Frequency tolerance include aging
N	Frequency tolerance exclude aging

**Block diagram****ZSEL function**

		Output line Differential Z_o	HCSL load L_{HCSL}	Shunt resistor R_s
ZSEL	H	100 Ω	50 Ω	33 Ω
	L	85 Ω	42.2 Ω	27 Ω

External dimensions

(Unit :mm)

**Footprint (Recommended) (Unit :mm)**

To maintain stable operation, provide a 0.01 μF to 0.1 μF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between Vcc, Vcc1, Vcc2 - GND).

CRYSTAL OSCILLATOR (SPXO)

32.768 kHz

SG-3030CM / LC / JC SG-3040LC / JC

- Built-in 32.768 kHz crystal unit allows adjustment-free efficient operation.
- Use of C-MOS IC enables reduction of current consumption.
- V_{IO} controls swing amplitude.



CM Type



CM, LC,
JC Type

Product Number (please contact us)

SG-3030CM : X1B000211xxxx00

SG-3030LC : Q3102LC02000100

SG-3030JC : Q3102JC02000100

SG-3040LC : Q3103LC02000100

SG-3040JC : Q3103JC01000100



SG-3030CM



SG-3030LC
SG-3040LC



SG-3030JC
SG-3040JC

Actual size

CM Type.



LC Type.



JC Type.

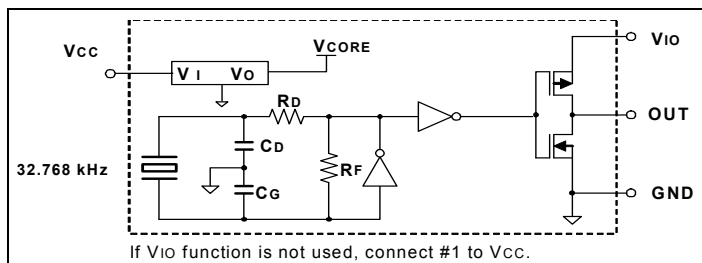


Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		SG-3030CM / LC / JC	SG-3040LC / JC	
Output frequency range	f ₀	32.768 kHz		
Supply voltage	V _{CC}	1.5 V to 5.5 V	0.9 V to 3.6 V	
Interface power supply voltage	V _{IO}	1.5 V to 5.5 V	0.9 V to 3.6 V	
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product
Operating temperature	T _{use}	-40 °C to +85 °C		
Frequency tolerance	f _{tol}	5 ±23 × 10 ⁻⁶		+25 °C, V _{CC} =3.3 V (SG-3040: V _{CC} =1.2 V)
Frequency temperature coefficient	f ₀ -T _C	+10 × 10 ⁻⁶ / -120 × 10 ⁻⁶		-20 °C to +70 °C (+25 °C is reference)
Frequency / voltage coefficient	f ₀ -V _{CC}	±2 × 10 ⁻⁶ / V Max.		+25 °C
Current consumption	I _{CC}	2 µA Max.	3.1 µA Max.	3.3 V, No load condition
Symmetry	SYM	45 % to 55 %		1/2 V _{CC} (V _{IO})level (SG-3040: V _{IO} =1.2 V to 3.6 V)
Output voltage	V _{OH}	V _{IO} -0.4 V Min.		I _{OH} =-0.4 mA (SG-3040: V _{IO} =1.2 V to 3.6 V)
	V _{OL}	0.4 V Max.		I _{OL} = 0.4 mA (SG-3040: V _{IO} =1.2 V to 3.6 V)
Output load condition (CMOS)	L _{CMOS}	15 pF Max.		CMOS load
Rise time / Fall time	t _r / t _f	200 ns Max.	100 ns Max.	CMOS load: 20 % V _{CC} (V _{IO}) to 80 % V _{CC} (V _{IO})level (SG-3040: V _{IO} =1.2 V to 3.6 V)
Start-up time	t _{str}	1 s Max.	3 s Max.	Time at minimum Supply voltage to be 0 s
Frequency aging	f _{aging}	±5 × 10 ⁻⁶ / year Max.		+25 °C, V _{CC} = 3.3 V, First year

Unless otherwise stated, characteristics (specifications) shown in the above table are based on the rated operating temperature and voltage condition.

Block diagram



Product name
(Standard form)

SG-3030 LC 32.768000kHz B

① ② ③ ④

① Model ② Package type ③ Frequency

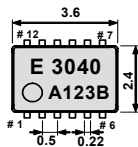
④ Frequency tolerance (B: 5±23×10⁻⁶, +25 °C)

External dimension and Footprint (Recommended)

(Unit:mm)

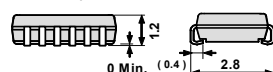
● SG-3030LC/3040LC

*Stop using the glue
Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

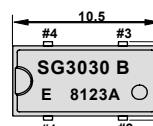


Pin map

Pin	Connection	Pin	Connection
1	V _{IO}	12	V _{CC}
2	N.C.	11	N.C.
3	N.C.	10	N.C.
4	N.C.	9	N.C.
5	N.C.	8	N.C.
6	GND	7	OUT

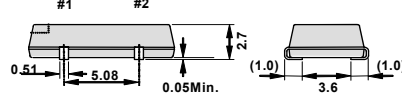


● SG-3030JC/3040JC



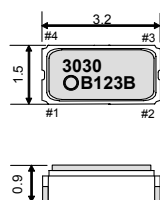
Pin map

Pin	Connection
1	V _{IO}
2	GND
3	OUT
4	V _{CC}



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

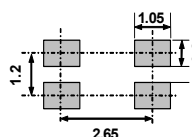
● SG-3030CM



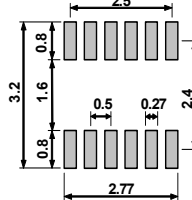
Pin map

Pin	Connection
1	V _{IO}
2	GND
3	OUT
4	V _{CC}

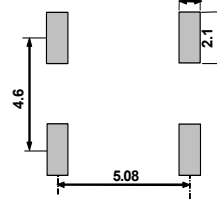
● SG-3030CM



● SG-3030LC/3040LC



● SG-3030JC/3040JC



To maintain stable operation, provide a 0.01µF to 0.1µF by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between V_{CC} - GND).



TCXO

TG-3541CE**NEW**Product Number (Please contact us)
TG-3541CE : X1B000351xxxx00TG-3541CE
(3.2 × 2.5 × 1.0 mm)

Actual size

TG-3541CE



- Output frequency : 32.768 kHz
- Built-in 32.768 kHz-DTCXO
- Supply voltage : 1.5 V to 5.5 V
- Frequency tolerance :
- XA
 - ± 3.4 × 10⁻⁶ / -40 °C to +85 °C
 - ± 8.0 × 10⁻⁶ / +85 °C to +105 °C
- XB
 - ± 5.0 × 10⁻⁶ / -40 °C to +85 °C
 - ± 8.0 × 10⁻⁶ / +85 °C to +105 °C

Specifications (characteristics)

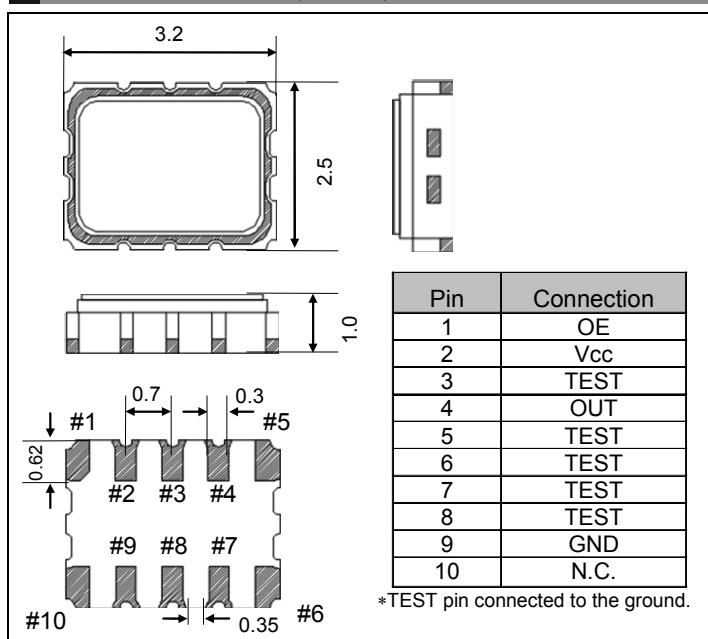
Item	Symbol	Specifications	Conditions
Output frequency range	Fo	32.768 kHz	
Supply voltage	VCC	1.5 V to 5.5 V	
Storage temperature	T_stg	-55 °C to +125 °C	
Operating temperature	T_use	-40 °C to +105 °C	
Frequency tolerance	f_tol	XA	±3.4 *1
			±8.0 *2
		XB	±5.0 *3
			±8.0 *2
Current consumption	Icc	1.0 µA Typ./3.0 µA Max.	No load condition, Vcc = 3.0 V
Disable current	I_dis	1.5 µA Max.	OE=GND, Vcc = 3.0 V
Symmetry	SYM	40 % to 60 %	50 % Vcc level
Output voltage	VOH	80 % Vcc Min.	IOH=-0.5 mA, Vcc=3.0 V
	VOL	20% Vcc Max.	IOL=0.5 mA, Vcc=3.0 V
Output load condition(CMOS)	L_CMOS	30 pF Max.	
Start-up time	t_str	1 s Max.	Ta= +25 °C, Vcc=1.5 V to 5.5 V
Frequency aging	f_aging	±3 × 10 ⁻⁶	Ta= +25 °C, Vcc=3.0 V, first year

*1) Equivalent to 9 seconds of month deviation.

*2) Equivalent to 21 seconds of month deviation.

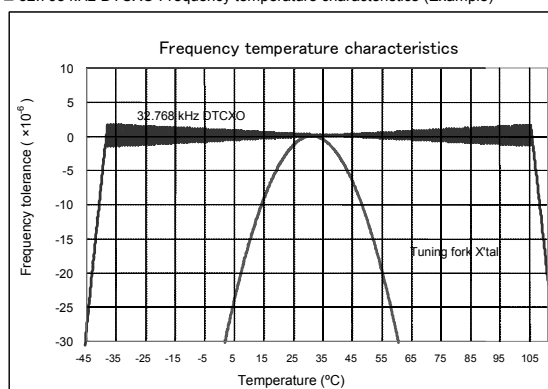
*3) Equivalent to 13 seconds of month deviation.

External dimensions (Unit:mm)



Frequency temperature characteristics

■ 32.768 kHz-DTCXO Frequency temperature characteristics (Example)





TCXO

For Automotive

TG-3541CEA

**NEW**

- Output frequency : 32.768 kHz
- Built-in 32.768 kHz-DTCXO
- Supply voltage : 1.5 V to 5.5 V
- Frequency tolerance :
 - XA
 - $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
 - $\pm 8.0 \times 10^{-6}$ / +85 °C to +105 °C
 - XB
 - $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
 - $\pm 8.0 \times 10^{-6}$ / +85 °C to +105 °C
- Conforms to AEC-Q100



Product Number (Please contact us)
TG-3541CEA : X1B000361Axxx00



TG-3541CEA
(3.2 × 2.5 × 1.0 mm)

Actual size

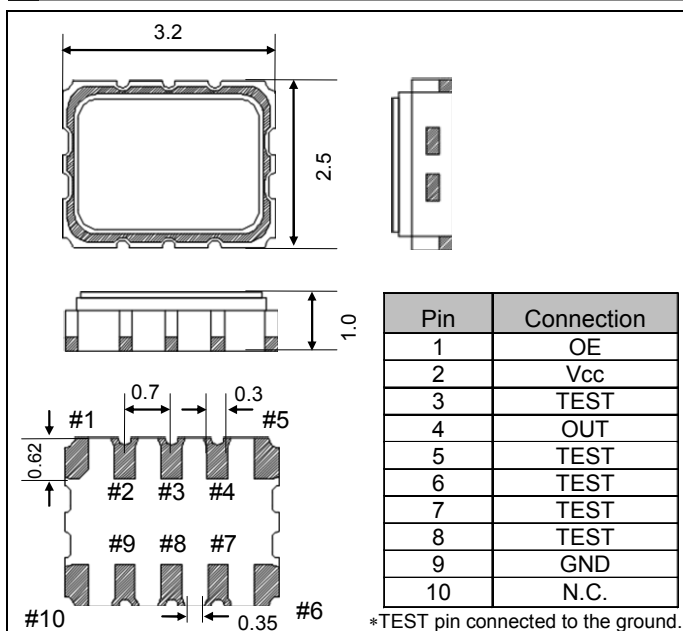
TG-3541CEA

Specifications (characteristics)

Item	Symbol	Specifications	Conditions
Output frequency range	Fo	32.768 kHz	
Supply voltage	VCC	1.5 V to 5.5 V	
Storage temperature	T_stg	-55 °C to +125 °C	
Operating temperature	T_use	-40 °C to +105 °C	
Frequency tolerance	f_tol	XA	± 3.4 *1
			± 8.0 *2
		XB	± 5.0 *3
			± 8.0 *2
Current consumption	Icc	1.0 μ A Typ./3.0 μ A Max.	No load condition, Vcc = 3.0 V
Disable current	I_dis	1.5 μ A Max.	OE=GND, Vcc = 3.0 V
Symmetry	SYM	40 % to 60 %	50 % Vcc level
Output voltage	VOH	80 % Vcc Min.	IOH=-0.5 mA, Vcc=3.0 V
	VOL	20% Vcc Max.	IOL=0.5 mA, Vcc=3.0 V
Output load condition(CMOS)	L_CMOS	30 pF Max.	
Start-up time	t_str	1 s Max.	Ta= +25 °C, Vcc=1.5 V to 5.5 V
Frequency aging	f_aging	$\pm 3 \times 10^{-6}$	Ta= +25 °C, Vcc=3.0 V, first year

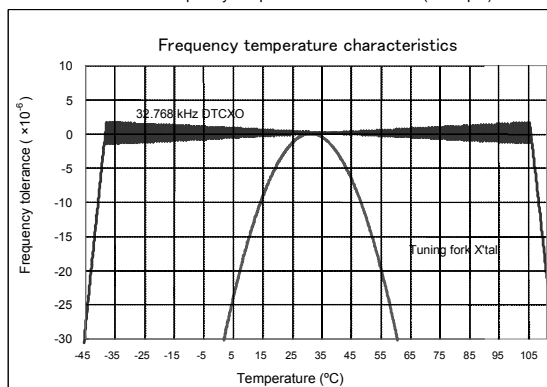
*1) Equivalent to 9 seconds of month deviation. *2) Equivalent to 21 seconds of month deviation. *3) Equivalent to 13 seconds of month deviation.

External dimensions (Unit:mm)



Frequency temperature characteristics

■ 32.768 kHz-DTCXO Frequency temperature characteristics (Example)



Real Time Clock Module

Real Time Clock Module Product Mapping

			FOUT	Alarm	Memory	Timer	Buckup Current Typ. (μA)	Voltage Range (V)
3-wire	RX-4571 LC/SA	Standard	●	●		~4095min	0.32	1.0 ~ 5.5
	RTC-4574 LC/SA	Standard	●	●		~255min	0.5	1.6 ~ 5.5
	RTC-4543 SA	Simple function	●				1.0	1.4 ~ 5.5
4-wire	RX-4035 LC/ SA	PWR-switch ($5 \pm 5 \times 10^{-6}$ @25°C)	●	●		-	0.4	1.0 ~ 5.5
	RX-4045 SA/NB	High Stability ($\pm 5 \times 10^{-6}$ @+25°C)	●	●		-	0.48	1.15 ~ 5.5
	RX-4803 SA/LC	High Stability ($\pm 5 \times 10^{-6}$ @-40~85°C)	●	●		~255min	0.8	1.6 ~ 5.5
I ² C bus	RX6110SA	Low power, Power-switch	●	●	●	~65535h	0.16	1.1 ~ 5.5
	RX8804CE	High Stability	●	●		~65535h	0.35	1.5 ~ 5.5
	RX8900 SA / CE	Power-switch , High Stability	●	●		~255min	0.8	1.6 ~ 5.5
	RX8130CE	Battery control, Power-switch	●	●		~255min	0.3	1.1 ~ 5.5
	RX8010SJ	Simple function, Low power	●	●	●	~65535h	0.16	1.1 ~ 5.5
	RX-8571 LC/SA	Low power	●	●	●	~65535h	0.2	1.3 ~ 5.5
	RTC-8564 LC	Low power	●	●		~255min	0.275	1.1 ~ 5.5
	RX-8581 SA	High Quality 32kHz output	●	●		~4095min	0.45	1.6 ~ 5.5
	RX-8035 SA/LC	PWR-switch ($5 \pm 5 \times 10^{-6}$ @25°C)	●	●		-	0.35	1.0 ~ 5.5
	RX-8025 SA	High Stability ($\pm 5 \times 10^{-6}$ @+25°C)	●	●		-	0.48	1.15 ~ 5.5
	RX-8731 LC	ID-ROM + EEPROM(80bit)	●	●	●	~4095min	0.35	1.3 ~ 5.5
	RX-8803 SA/LC	High Stability ($\pm 5 \times 10^{-6}$ @-40~85°C)	●	●		~255min	0.8	1.6 ~ 5.5
4-bit	RTC-72423 / 3		●	●		●	0.6	1.6 ~ 5.5

Real Time Clock Module Product Mapping for Automotive

			FOUT	Alarm	Memory	Timer	Buckup Current Typ. (μA)	Voltage Range (V)
3-wire	RA-4574 SA	Standard	●	●		~255min	0.5	1.6 ~ 5.5
4-wire	RA-4565 SA	Ope. Temp. -40°C to +125°C	●	●		~255min	0.5	1.2 ~ 5.5
	RA4803 SA	High Stability ($\pm 5 \times 10^{-6}$ @-40~85°C)	●	●		~255min	0.8	1.6 ~ 5.5
I ² C bus	RA8804 CE	High Stability ($\pm 3.4 \times 10^{-6}$ / -40 to +85°C, $\pm 8.0 \times 10^{-6}$ /+85 to 105°C)	●	●		~65535h	0.35	1.5 ~ 5.5
	RA8900 CE	Power-switch , High Stability $\pm 5 \times 10^{-6}$ / -40 to +85°C)	●	●		~255min	0.8	1.6 ~ 5.5
	RA-8581 SA	Standard	●	●		~4095min	0.45	1.6 ~ 5.5
	RA-8565 SA	Ope. Temp. -40°C to +125°C	●	●		~255min	0.5	1.7 ~ 5.5

<SPI-Bus & I²C-Bus>

P	Model	Actual size (mm) (t: Max.)	Frequency tolerance (Standard) ($\times 10^{-6}$)	Interface voltage	Clock voltage	Current consumption (Typ.) (Vcc)	FOUT	Alarm	memory	Timer	Power Switching *	Other features
98	RX6110SA	 R6110 E 1234A 10.1×7.4×3.3	5±23	1.6 V to 5.5 V	1.1 V to 5.5 V	0.13 μA (3.0 V)	✓	✓	✓	✓	✓	Low power consumption Built-in SRAM Power Switching

* Power switching function specifications are different for each product. For more information please refer to the data sheet of each product.

<SPI-Bus>

P	Model	Actual size (mm) (t: Max.)	Frequency tolerance (Standard) ($\times 10^{-6}$)	Interface voltage	Clock voltage	Current consumption (Typ.) (Vcc)	FOUT	Alarm	memory	Timer	Power Switching *	Other features
99	RX-4803SA	 R4803 E 123A 10.1×7.4×3.3	± 3.4 ± 5.0 (-40 to +85°C)	1.6V to 5.5 V	1.6 V to 5.5 V	0.75 μA	✓	✓	-	✓	-	Built-in DTCXO High-Stability
	RX-4803LC	 R4803 E 123A 3.6×2.4×1.2										
100	RX-4035SA	 R4035 E 1234A 10.1×7.4×3.3	5±23 5±5 0±5	2.4V to 5.5 V	1.0 V to 5.5 V	0.35 μA (3.0 V)	✓	✓	-	-	✓	High-Stability Built-in Timestamp Power Switching
	RX-4035LC	 R4035 E 123A 3.6×2.4×1.2				0.40 μA (3.0 V)						
101	RX-4045SA	 R4045 E 1234A 10.1×7.4×3.3	5±5 0±5	1.7 V to 5.5 V	1.15 V to 5.5 V	0.48 μA (3.0 V)	✓	✓	-	-	-	High-Stability
Web Site	RX-4045NB	 R4045 E 123A 6.3×5.2×1.4										

* Power switching function specifications are different for each product. For more information please refer to the data sheet of each product.

<SPI-Bus>

P	Model	Actual size (mm) (t: Max.)	Frequency tolerance (Standard) ($\times 10^{-6}$)	Interface voltage	Clock voltage	Current consumption (Typ.) (Vcc)	FOUT	Alarm	memory	Timer	Power Switching *	Other features
Web Site	RX-4581NB	 6.3×5.2×1.4	5±23	1.6 V to 5.5 V	1.6 V to 5.5 V	0.4 μ A (3.0 V)	✓	✓	✓	✓	—	Built-in SRAM
102	RX-4571SA	 10.1×7.4×3.3	5±23	1.6 V to 5.5 V	1.1 V to 5.5 V	0.32 μ A (3.0 V)	✓	✓	—	✓	—	Low Backup Voltage
Web Site	RX-4571NB	 6.3×5.2×1.4										
102	RX-4571LC	 3.6×2.8×1.2										
103	RTC-4574SA	 10.1×7.4×3.3	5±23	1.6 V to 5.5 V	1.6 V to 5.5 V	0.5 μ A (3.0 V)	✓	✓	—	✓	—	Simple function
Web Site	RTC-4574JE	 7.3×6.2×1.5										
	RTC-4574NB	 6.3×5.2×1.4										
104	RX-4574LC	 3.6×2.8×1.2			1.3 V to 5.5 V	0.35 μ A (3.0 V)						
105	RTC-4543SA	 10.1×7.4×3.3	5±23	2.5 V to 5.5 V	1.4 V to 5.5 V	1.0 μ A (3.0 V)	✓	—	—	—	—	Simple function
Web Site	RTC-4543SB	 11.6×8.0×2.0										
106	RA4803SA (AEC-Q200)	 10.1×7.4×3.3	± 3.4 ± 5.0 (-40 to +85°C)	1.6V to 5.5 V	1.6V to 5.5 V	0.75 μ A	✓	✓	—	✓	—	Built-in DTCXO
107	RA-4565SA (AEC-Q200)	 10.1×7.4×3.3	5±23 (-40 to +125°C)	1.6V to 5.5 V	1.5 V to 5.5 V	0.5 μ A (3.0 V)	✓	✓	—	✓	—	Extended operating temperature range(+125°C)
108	RA-4574SA (AEC-Q200)	 10.1×7.4×3.3	5±23 (-40 to +85°C)	1.6 V to 5.5 V	1.6 V to 5.5 V	0.5 μ A (3.0 V)	✓	✓	—	✓	—	—

<I²C-Bus>

P	Model	Actual size (mm) (t: Max.)	Frequency tolerance (Standard) ($\times 10^{-6}$)	Interface voltage	Clock voltage	Current consumption (Typ.) (Vcc)	FOUT	Alarm	memory	Timer	Power Switching *	Other features
109	RX8804CE	 3.2×2.5×1.0	± 3.4 ± 5.0 (-40 to +85°C) ± 8.0 (+85 to +105°C)	1.6 V to 5.5 V	1.5 V to 5.5 V	0.35 μ A (3.0 V)	✓	✓	—	✓	✓	Built-in DTCXO High-Stability
110	RX8900SA	 10.1×7.4×3.3	± 3.4 ± 5.0 (-40 to +85°C)	2.5 V to 5.5 V	1.6 V to 5.5 V	0.7 μ A (3.0 V)	✓	✓	—	✓	✓	Built-in DTCXO High-Stability Power Switching
	RX8900CE	 3.2×2.5×1.0										
111	RX-8803SA	 10.1×7.4×3.3	± 3.4 ± 5.0 (-40 to +85°C)	1.6V to 5.5 V	1.6 V to 5.5 V	0.75 μ A	✓	✓	—	✓	—	Built-in DTCXO High-Stability
	RX-8803LC	 3.6×2.4×1.2										
112	RX8130CE	 3.2×2.5×1.0	5±23	1.6 V to 5.5 V	1.1 V to 5.5 V	0.3 μ A (3.0 V)	✓	✓	✓	✓	✓	Power Switching Backup battery charge control Delay with reset output
113	RX8010SJ	 7.0×6.0×2.65	5±23	1.6 V to 5.5 V	1.1 V to 5.5 V	0.16 μ A (3.0 V)	✓	✓	✓	✓	—	Low current consumption Built-in SRAM
114	RX-8571SA	 10.1×7.4×3.3	5±23	1.6 V to 5.5 V	1.3 V to 5.5 V	0.2 μ A (3.0 V)	✓	✓	✓	✓	—	Low current consumption Built-in SRAM Long-running timer (65535 hours)
Web Site	RX-8571NB	 6.3×5.2×1.4										
114	RX-8571LC	 3.6×2.8×1.2				0.22 μ A (3.0 V)						

* Power switching function specifications are different for each product. For more information please refer to the data sheet of each product.

<I²C-Bus>

	Model	Actual size (mm) (t: Max.)	Frequency tolerance (Standard) ($\times 10^{-6}$)	Interface voltage	Clock voltage	Current consumption (Typ.) (Vcc)	FOUT	Alarm	memory	Timer	Power Switching*	Other features
Web Site	RTC-8564JE  7.3×6.2×1.5	5±23	1.8 V to 5.5 V	1.1 V to 5.5 V	0.275 μ A (3.0 V)	✓	✓	-	✓	-	-	Low current consumption
	RTC-8564NB  6.3×5.2×1.4											
115	RX-8564LC  3.6×2.8×1.2											
116	RX-8035SA  10.1×7.4×3.3	5±23 5±5 0±5	2.4V to 5.5 V	1.0 V to 5.5 V	0.35 μ A (3.0 V)	✓	✓	-	-	✓	-	High-Stability Built-in Timestamp Power Switching
	RX-8035LC  3.6×2.8×1.2				0.40 μ A (3.0 V)							
117	RX-8025SA  10.1×7.4×3.3	5±5 0±5	1.7 V to 5.5 V	1.15 V to 5.5 V	0.48 μ A (3.0 V)	✓	✓	-	-	-	-	High-Stability
Web Site	RX-8025NB  6.3×5.2×1.4											
118	RX-8731LC  3.6×2.8×1.2	5±23	1.7 V to 5.5 V	1.3 V to 5.5 V	0.35 μ A (3.0 V)	✓	✓	✓	✓	-	-	Built-in EEPROM Unique ID-ROM
119	RX-8581SA  10.1×7.4×3.3	5±23	1.8 V to 5.5 V	1.6 V to 5.5 V	0.45 μ A (3.0 V)	✓	✓	-	✓	-	-	Simple Function
Web Site	RX-8581JE  7.3×6.2×1.5											
	RX-8581NB  6.3×5.2×1.4											
120	RA8804CE (AEC-Q100)  3.2×2.5×1.0	±3.4 ±5.0 (-40 to +85°C) ±8.0 (+85 to +105°C)	1.6 V to 5.5 V	1.5 V to 5.5 V	0.35 μ A (3.0 V)	✓	✓	-	✓	✓	-	Built-in DTCXO High-Stability
121	RA8900CE (AEC-Q200)  3.2×2.5×1.0	±3.4 ±5.0 (-40 to +85°C)	2.5V to 5.5 V	1.6 V to 5.5 V	0.7 μ A (3.0 V)	✓	✓	-	✓	✓	-	Built-in DTCXO High-Stability Power Switching
122	RA8803SA (AEC-Q200)  10.1×7.4×3.3	±3.4 ±5.0 (-40 to +85°C)	1.6V to 5.5 V	1.6V to 5.5 V	0.75 μ A	✓	✓	-	✓	-	-	Built-in DTCXO
123	RA-8565SA (AEC-Q200)  10.1×7.4×3.3	5±23 (-40 to +125°C)	1.8 V to 5.5 V	1.7 V to 5.5 V	0.55 μ A (3.0 V)	✓	✓	-	✓	-	-	Extended operating temperature range (+125°C)
124	RA-8581SA (AEC-Q200)  10.1×7.4×3.3	5±23 (-40 to +85°C)	1.8 V to 5.5 V	1.6 V to 5.5 V	0.45 μ A (3.0 V)	✓	✓	-	✓	-	-	-

* Power switching function specifications are different for each product. For more information please refer to the data sheet of each product.

<Parallel Interface>

P	Model	Actual size (mm) (t: Max.)	Frequency tolerance (Standard) ($\times 10^{-6}$)	Interface voltage	Clock voltage	Current consumption (Typ.) (Vcc)	FOUT	Alarm	memory	Timer	Power Switching*	Other features
Web Site	RTC-7301SF  10.2×7.8×2.0	5±23	2.4V to 5.5 V	1.6 V to 5.5 V	0.6 μ A (3.0 V)	✓	✓	-	✓	-	-	Built-in Temperature Sensor
	RTC-7301DG  DIP 18 pin											
125	RTC-72421  DIP 18 pin	±10 ±50	4.5 V to 5.5 V	2.0 V to 5.5 V	0.9 μ A (2.0 V)	✓	✓	-	-	-	-	4-bit Simple Function
	RTC-72423  16.3×12.2×2.8											

REAL TIME CLOCK MODULE (SPI & I²C-Bus)

Power Switching and Low current consumption

RX6110SA B

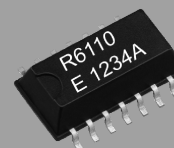
- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : SPI & I²C -Bus
- Operating voltage range : 1.6 V to 5.5 V
- The wide voltage for time keeping : 1.1 V to 5.5 V
- Low backup current : 130 nA / 3 V (Typ.)
- Built-in user RAM : 128 bit (8 bit × 16, SRAM)
- Auto power switching functions : When VDD deteriorates than 1.6V, internal source is switched to VBAT.

• The various functions include full calendar, alarm, timer.
Epson prepared Linux driver for development.
(http://www5.epsondevice.com/en/information/support/linux_rtc/)

The registered trademark Linux® is used pursuant to a sublicense from LMI(Linux Mark Institute)
The I²C-Bus is a trademark of NXP Semiconductors



Product Number (Please contact us)
RX6110SA B : X1B000232000100

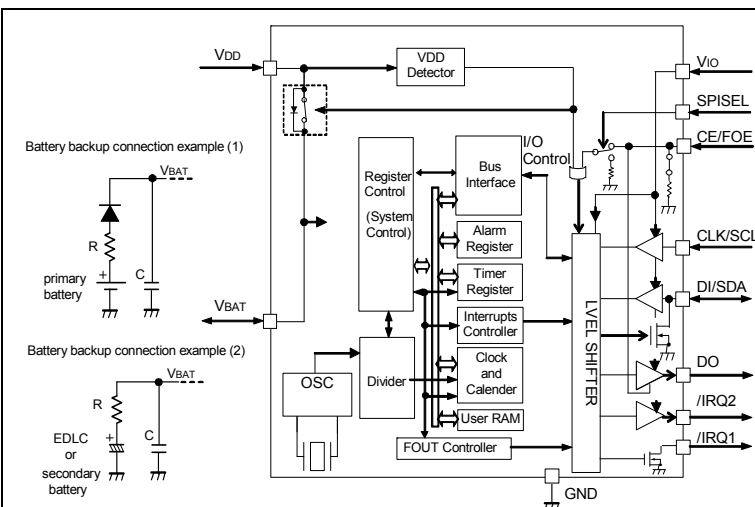


Actual size



Block diagram

Overview



- Interface type.
 - SPI-Bus and I²C-Bus interface.
 - By a terminal, a switchover of the interface is possible.
- Built-in auto power switching function
 - To efficiently charge from VDD to backup battery (Secondary battery, Large capacitor) connected to VBAT is possible. Detects VDD voltage drop(VDET-) and automatically switches to the backup battery.
- Frequency output function
 - Output frequency is selectable from 32.768kHz, 1024Hz, 1Hz.
- Timer function
 - Timer function is selectable in 1/4096 second from 65535 hours.
- Timer source clock are 1hour, 1min, 64Hz, 4096Hz.
 - It is recorded automatic to TF-bit at the time of event occurrence, and possible to output with /IRQ1 or /IRQ2 pin.
- Alarm function
 - Alarm function can be set to day of week, day, hour, and minute.
 - It is recorded automatic to AF-bit at the alarm occurrence, and possible to output with /IRQ1 pin output.
- User RAM
 - 128 bit (8 bit × 16, SRAM)

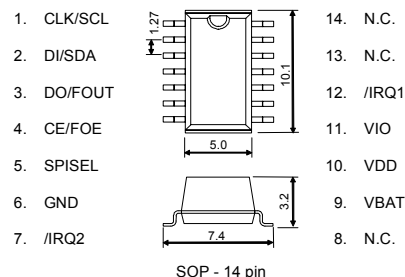
Pin Function

Terminal connection / External dimensions

(Unit:mm)

Signal Name	Input/Output	Function
SPISEL	Input	The interface select pin. SPI is chosen at a "H" level (Vio voltage) / I ² C is chosen at a "L" level (GND voltage).
CE/FOE	Input	SPI: Should be held high to allow access to the CPU. Incorporates a pull-down resistor. I ² C: It is an input pin for controlling the DO/FOUT output. When the frequency output from a DO/FOUT pin does not need, CE/FOE pin must be connected to GND.
CLK/SCL	Input	This is a shift clock input pin for serial data transmission.
DI/SDA	Input / Output	SPI: This is the data input pin for serial data transfer. I ² C: This is the data input/output pin for serial data transfer.
DO/FOUT	Output	SPI: This is the data output pin for serial data transfer. I ² C: This is the C-MOS output pin with output control provided via the CE/FOE pin. (frequency selection: 32.768 kHz / 1024 Hz / 1Hz / Hi-z)
/IRQ1	Output	This pin outputs interrupt signals ("L" level) for alarm, timer, time update, and FOUT. This is an N-ch open-drain output. This pin can output even a backup mode.
/IRQ2	Output	This pin outputs interrupt signals ("L" level) for timer and FOUT. This is an C-MOS output. This pin becomes Hi-z in less than VDD=1.6V.
VDD	-	This is a power-supply pin. It can impress the voltage unlike Vio.
Vio	-	This pin is a power supply for input and the output and input / output pins. Connected to a positive power supply.
VBAT	-	Connect a secondary battery or capacitor for backup power supply. If a backup power supply is not present, this pin connect to VDD.
GND	-	Connected to a ground.

RX 6110 SA



The metal case inside of the molding compound may be exposed on the top or bottom of this product.
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.6	3.0	5.5	V
Clock voltage	VCLK	—	1.1	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	Ta = +25 °C VDD = 3.0 V	B: 5 ± 23 *1	× 10 ⁻⁶
Oscillation start-up time	tSTA	Ta = +25 °C VDD = 1.6 V	1 Max.	s

*1) Equivalent to 1 minute of monthly deviation (excluding offset.) / Standard product

Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	VBAT = 3.0 V Input pins are "L", VDD = 0 V DO/FOUT=OFF, fCLK = 0 Hz, /IRQ1,2 = OFF, TSEL2="1" It include an OFF leak current of SW between the power supply (VBAT-VDD)	-	130	250	nA
	I _{32k}	VDD = 3.0 V fCLK = 0 Hz, /IRQ1,2 = OFF, CE/FOE = VIO, DO/FOUT : 32.768 kHz ON, CL = 0 pF	-	1.5	2.1	μA

**REAL TIME CLOCK MODULE (SPI-Bus)****Built-in 32.768 kHz-DTCXO, High Stability****RX-4803 SA/LC**

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
 - 1/100s resolution Time register
 - Interface Type : 4-wire serial interface
 - Interface voltage range : 1.6 V to 5.5 V
 - Temp. compensated voltage range : 2.2 V to 5.5 V
 - Clock supply voltage range : 1.6 V to 5.5 V
 - Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
 - The various functions include full calendar, alarm, timer, EVIN input. Epson prepared Linux driver for development.
(http://www5.epsondevice.com/en/information/support/linux_rtc/)
- The registered trademark Linux® is used pursuant to a sublicense from LMI(Linux Mark Institute)



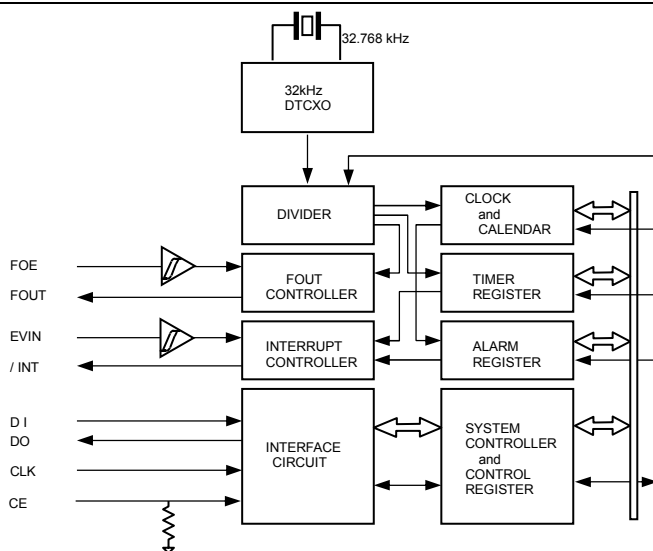
Product Number (Please contact us)
 RX-4803SA :X1B000131xxx00
 RX-4803LC :X1B000122xxx00
 RX-4803LC UB :X1B000122000200



Actual size

RX-4803SA

RX-4803LC

**Block diagram****Overview**

- **High Stability**
 - UA $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 9 seconds of month deviation)
 - UB $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 13 seconds of month deviation)
 - UC $\pm 5.0 \times 10^{-6}$ / -30 °C to +70 °C
 - AA $(+5 \pm 5.0) \times 10^{-6}$ / +25 °C
- **High Resolution:** 1/100s Time register with capture buffer
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **The various interrupt**
 - Timer Function can be set between 1/ 4096 second and 4095 minutes.
 - Alarm Function can be set to day of week, day, hour, or minute.
 - EVIN input.
- **Time synchronize function with 1PPS signal input**
- **Register compatibility:** upper compatible with RX-4801.

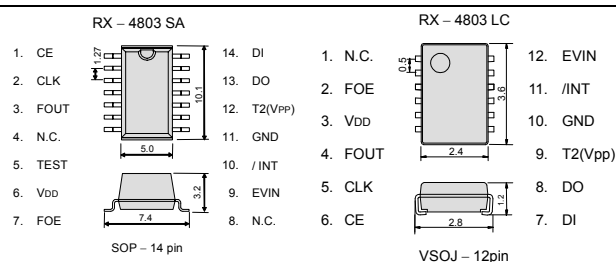
*It is possible to use it by the terminal connection as 32.768 kHz-DTCXO.

Pin Function

Signal Name	I / O	Function
CE	input	The chip enable input pin.
CLK	input	The shift clock input pin for serial data transfer.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
TEST	input	Use by the manufacture for testing. (Do not connect externally. RX-4803SA only.)
VDD	-	Connected to a positive power supply
FOE	input	The input pin for the FOUT output control.
EVIN	input	External event input.
/INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(Vpp)	-	Use by the manufacture for testing. (Do not connect externally.)
DO	Output	The data output pin for serial data transfer.
DI	input	The data input pin for serial data transfer.

Terminal connection / External dimensions

(Unit:mm)



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***Stop using the glue**

Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

Specifications (characteristics)

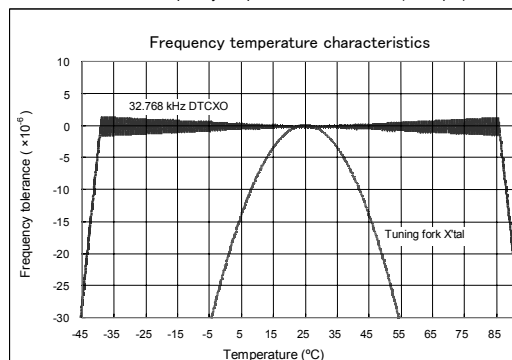
* Refer to application manual for details.

Electrical Characteristics

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit	
Interface voltage	V _{DD}	Interface voltage		1.6	3.0	5.5	V	
Temp. compensated Voltage	V _{TEM}	Temp. compensated voltage		2.2	3.0	5.5	V	
Clock supply voltage	V _{CLK}	-		1.6	3.0	5.5	V	
Operating temperature	T _{OPR}	No condensation		-40	+25	+85	°C	
Stability	$\Delta f / f$	UA	Ta = -40 °C to +85 °C	$\pm 3.4^{*1}$			$\times 10^{-6}$	
		UB	Ta = -40 °C to +85 °C	$\pm 5.0^{*2}$				
		UC	Ta = -30 °C to +70 °C	$5 \pm 5.0^{*3}$				
		AA	Ta = +25 °C					
Current consumption (1)	I _{DD1}	Backup Mode FOE = GND, /INT = V _{DD} FOUT output : OFF		V _{DD} = 5V	-	0.75	3.4	μA
Current consumption (2)	I _{DD2}			V _{DD} = 3V	-	0.75	2.1	

*1) Equivalent to 9 seconds of month deviation. *2) Equivalent to 13 seconds of month deviation.

*3) Equivalent to 13 seconds of month deviation. (excluding offset)

32.768 kHz-DTCXO Frequency temperature characteristics (Example)

REAL TIME CLOCK MODULE (SPI-Bus) High-Stability Frequency with Built in Timestamp and Power Switching

RX-4035 SA/LC

- Built-in 32.768 kHz crystal unit : Frequency adjusted for high accuracy.
($\pm 5 \times 10^{-6}$ / $T_a = +25^\circ\text{C}$)
- Interface Type : SPI-Bus (1MHz)
- Operating voltage range : 2.4 V to 5.5 V
- Timekeeping voltage range : 1.0 V to 5.5 V
- Low backup current : 350 nA (SA) 400 nA (LC) / 3 V (Typ.)
- Event detection and Time stamp : One-shot full timestamp and interrupt.
- Dual event detection ports : Each terminal has a de-bounce circuit.
- Auto power switching functions : When V_{DD} deteriorates than 2.4V, internal source is switched to V_{BAT} .



Product Number (Please contact us)
RX-4035SA B: X1B000192000100
RX-4035SA AC: X1B000192000200
RX-4035SA AA: X1B000192000300
RX-4035LC B: X1B000202000100
RX-4035LC AC: X1B000202000200
RX-4035LC AA: X1B000202000300

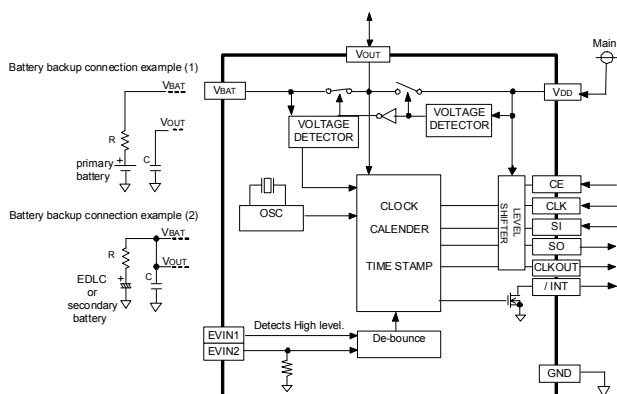


Actual size

RX-4035SA

RX-4035LC

Block diagram



Overview

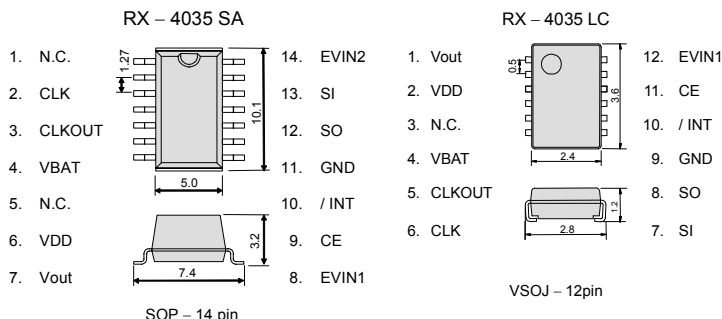
- **The event detection and Timestamp function**
Dual event detection terminals.
Selectable de-bounce time 35ms or 2s.
Available event detection interrupt output.
- **Power switching functions.**
 - An external diode is unnecessary to have a reverse current prevention switch built-in in the VBAT side to connect a primary cell to.
 - When V_{DD} is less than 2.4V, an internal source is switched to V_{BAT} .
 - Note: When the supply from V_{BAT} , SPI interface are disabled.
- **Alarm, Periodic interrupt, 32.768kHz clock output.**
 - Available monthly-alarm and weekly-alarm.
 - Interrupt period are selectable from 2Hz to Monthly.
 - CLKOUT outputs 32.768kHz clock powered by V_{DD} .

Pin function

Signal Name	Input / Output	Function
VBAT	—	Power supply for backup.
Vout	Output	Switched power out. (maximum output current 20mA)
CE	Input	SPI chip enable.
CLK	Input	SPI serial clock.
SO	Output	SPI data out.
SI	Input	SPI data in.
GND	—	Ground
EVIN1	Input	Event detection input 1
EVIN2	Input	Event detection input 2
/ INT	Output	Interrupt out.
CLKOUT	Output	32.768kHz output. (CMOS. Can not inhibit.)
N.C.	—	Do not connect.
VDD	—	Main power supply.

Terminal connection / External dimensions

(Unit:mm)



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Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating voltage	V_{ACCESS}	V_{DD}	2.4	3.0	5.5	V
Time keeping voltage	V_{CLK}	V_{BAT}	1.0	3.0	5.5	V
Operating temperature	T_{OPR}	—	-40	+25	+85	$^\circ\text{C}$
Storage temperature	T_{STG}	—	-55	—	+125	$^\circ\text{C}$

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	$T_a = +25^\circ\text{C}$ $V_{BAT} = 3.0\text{ V}$	B: $5 \pm 23^{*1}$ AA: $5 \pm 5^{*2}$ AC: $0 \pm 5^{*2}$	$\times 10^{-6}$
Oscillation start-up time	t_{STA}	$T_a = +25^\circ\text{C}$ $V_{DD} = 3.0\text{ V}$	1 Max.	s
Frequency / voltage characteristics	f / V	$T_a = +25^\circ\text{C}$ $V_{DD} = 2.4\text{ V to } 5.5\text{ V}$	$\pm 1\text{ Max.}$	$\times 10^{-6}$

*1) Equivalent to 1 minute of monthly deviation (excluding offset.)
*2) Equivalent to 13 seconds of monthly deviation (excluding offset.)

Current consumption characteristics

$T_a = -40^\circ\text{C to } +85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I_{BAT}	RX-4035SA $V_{BAT} = 3.0\text{ V}, V_{DD} = 0.0\text{ V}$ $CE = 0\text{ V}, CLKOUT = \text{open}$	-	350	1200	nA
	I_{DD}	RX-4035LC $V_{BAT} = 3.0\text{ V}, V_{DD} = 0.0\text{ V}$ $CE = 0\text{ V}, CLKOUT = \text{open}$	-	400	—	nA
		$V_{DD} = 3.0\text{ V}$ $CE = 0\text{ V}$ $CLKOUT = \text{open}$	-	1.40	2.50	μA

Power supply detection voltage

$T_a = -40^\circ\text{C to } +85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Voltage of low battery detection	V_{LOW}	-	1.10	1.25	1.40	V
Power switching voltage (V_{DD} to V_{BAT})	V_{D2B}	$+25^\circ\text{C}$	2.328	2.40	2.472	V

REAL TIME CLOCK MODULE (SPI-Bus)

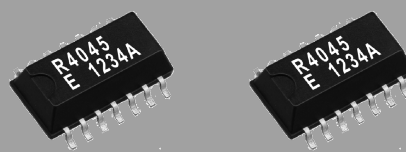
High-Stability Frequency

RX-4045 SA

- Built-in 32.768 kHz crystal unit: Frequency adjusted for high accuracy.
($\pm 5 \times 10^{-6}$ / $T_a = +25^\circ\text{C}$)
- Interface Type : 4-wire serial interface
- Operating voltage range : 1.7 V to 5.5 V
- Wide Timekeeper voltage range : 1.15 V to 5.5 V
- Various detection Functions : Oscillation stop detection function etc.
- Low backup current : 0.48 μA / 3 V (Typ.)
- 32.768 kHz clock frequency output : N-ch open drain output
- Function of time and calendar, the various detection function, and interrupt function etc.



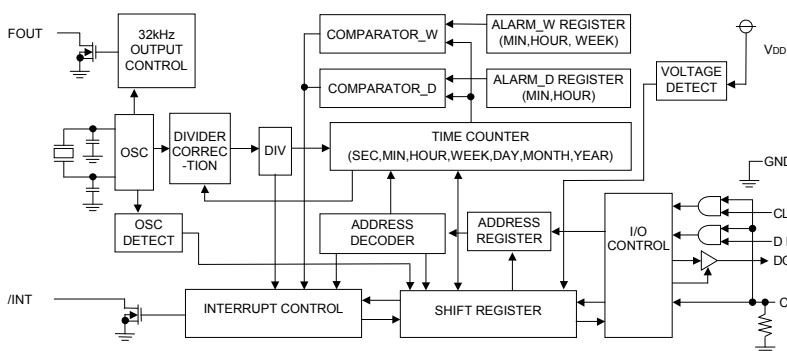
Product Number (Please contact us)
RX-4045SA AA: Q41404552000100
RX-4045SA AC: Q41404551000200



RX-4045SA

R4045
E 1234A

Block diagram



Overview

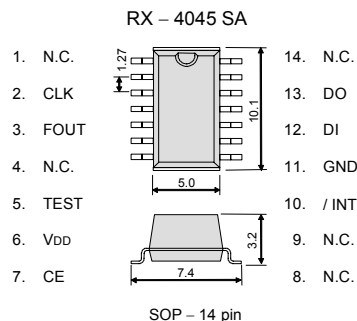
- **Features built-in 32.768 kHz crystal unit**
 - Frequency adjusted for high accuracy
($\pm 5 \times 10^{-6}$ / $T_a = +25^\circ\text{C}$)
(Equivalent to 13 seconds of monthly deviation)
- **The various detection Function**
 - Power supply voltage monitoring function
(with selectable detection threshold)
 - Stop detection function
 - Power-on reset detection function
- **Equipped with alarm and timer**
 - Timer function produces a periodic interruption signal.
As for the Alarm function an optional combination is produced. (Date of the week, time, minute)

Pin function

Signal Name	Input / Output	Function
CE	Input	The chip enabled input pin. (built-in pull-down resistance) At the "H" level, access becomes possible.
CLK	Input	The shift clock input pin for serial data transfer.
DI	Input	The data input pin for serial data transfer.
DO	Output	The data output pin for serial data transfer.
FOUT	Output	32.768 kHz clock output pin with the output control function (N-ch open drain) High impedance at the time of output off.
/INT	Output	Interrupt output (N-ch open drain)
TEST	—	* Used by the manufacturer for testing. (Do not connect externally.)
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

Terminal connection / External dimensions

(Unit:mm)



SOP - 14 pin

The metal case inside of the molding compound may be exposed on the top or bottom of this product.
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.7	3.0	5.5	V
Clock voltage	VCLK	—	1.15	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	$T_a = +25^\circ\text{C}$ $V_{DD} = 3.0\text{ V}$	AA: 5 ± 5 *1) AC: 0 ± 5 *2)	$\times 10^{-6}$
Oscillation start-up time	t_{STA}	$T_a = +25^\circ\text{C}$ $V_{DD} = 2.0\text{ V}$	1 Max.	s
Frequency / voltage characteristics	f / V	$T_a = +25^\circ\text{C}$ $V_{DD} = 2.0\text{ V to } 5.5\text{ V}$	± 1 Max.	$\times 10^{-6}$

*1) *2) Equivalent to 13 seconds of monthly deviation (excluding offset.)

Current consumption characteristics

$T_a = -40^\circ\text{C to } +85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{bk}	CE = GND FOUT ; output OFF (Hi-Z)	$V_{DD} = 5\text{ V}$	-	0.60	1.80 μA
			$V_{DD} = 3\text{ V}$	-	0.48	1.20 μA
	I _{32k}	CE = GND FOUT ; 32.768 kHz output ON	$V_{DD} = 3\text{ V}$	-	0.65	2.00 μA

Power supply detection voltage

$T_a = -30^\circ\text{C to } +70^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
High-voltage mode	V _{DETH}	VDD pin	1.90	2.10	2.30	V
Low-voltage mode	V _{DETL}	VDD pin	1.15	1.30	1.45	V

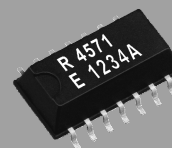
REAL TIME CLOCK MODULE (SPI-Bus) LOW BACKUP VOLTAGE

RX - 4571 LC / SA

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : 3-wire serial interface
- Operating voltage range : 1.6 V to 5.5 V
- The wide voltage for time keeping. : 1.0 V to 5.5 V / $T_a = +25\text{ }^{\circ}\text{C}$
- Low backup current : 0.32 μA (Typ.) / 3 V
- 32.768 kHz frequency output function : C-MOS output With OE pin.
- Real-time clock function
Clock/calendar function, auto leap year correction function,
alarm and Timer interrupt function, etc.



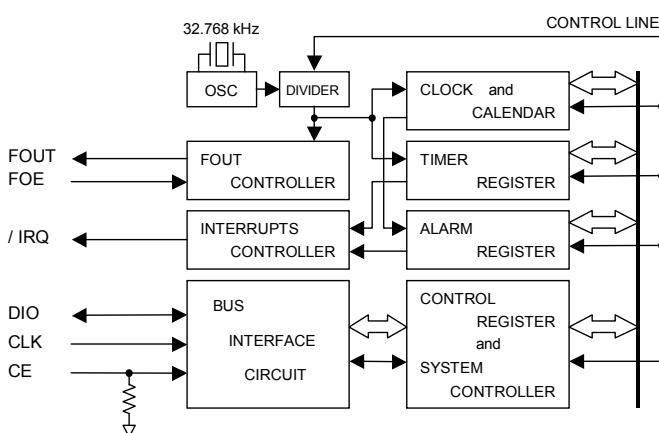
Product Number (Please contact us)
RX-4571LC : Q414571C2000100
RX-4571SA : Q414571S2000100



RX-4571LC

RX-4571SA

Block diagram



Overview

- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), $CL=30\text{ pF}$
- **Timer function**
 - Timer function which can be set up between 1/4096 second and 4095 minutes.
- **Alarm function**
 - Alarm function can be set to any combination of day, day of week, hour, or minute.

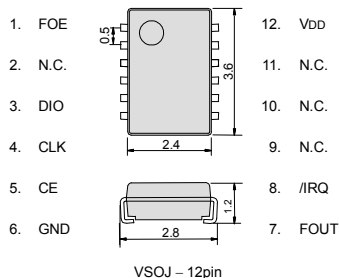
Pin Function

Signal Name	Input / Output	Function
CE	Input	The chip enabled input pin 0. (It has a built -in pull-down resistance)
CLK	Input	The shift clock input pin for serial data transfer.
DIO	Bi-directional	The data input / output pin for serial data transfer.
FOUT	Output	32.768 kHz clock output pin with the output control function. (C-MOS)
FOE	Input	FOE pin control the condition of FOUT with FSEL1-bit, FSEL0-bit, etc.
/ IRQ	Output	Interrupt output (N-ch open drain)
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

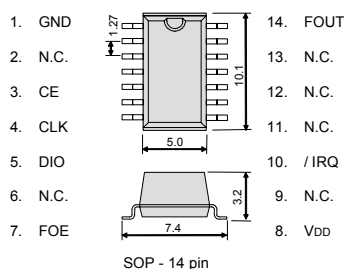
Terminal connection / External dimensions

(Unit:mm)

RX - 4571 LC



RX - 4571 SA



*Stop using the glue

Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.6	3.0	5.5	V
Clock voltage	VCLK	$T_a = +25\text{ }^{\circ}\text{C}$	1.0	3.0	5.5	V
		$T_a = -40\text{ to }+85\text{ }^{\circ}\text{C}$	1.1	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	$^{\circ}\text{C}$

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	$T_a = +25\text{ }^{\circ}\text{C}$ $V_{DD} = 3.0\text{ V}$	B: $5 \pm 23\text{ }^{\circ}$	$\times 10^{-6}$
Oscillation start-up time	t_{STA}	$T_a = +25\text{ }^{\circ}\text{C}$ $V_{DD} = 1.6\text{ V}$	1 Max.	s

* Please ask for tighter tolerance. (Equivalent to 1 minute of monthly deviation)

Current consumption characteristics

$T_a = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$

Symbol	Conditions	Min.	Typ.	Max.	Unit
I _{BK}	CE = GND /IRQ = OFF	$V_{DD} = 5\text{ V}$	-	0.40	μA
	FOUT ; output OFF (Hi - z)	$V_{DD} = 3\text{ V}$	-	0.32	
I _{32k}	CE = GND /IRQ = OFF	$V_{DD} = 5\text{ V}$	-	8.0	μA
	FOUT ; 32.768 kHz output ON CL = 30 pF	$V_{DD} = 3\text{ V}$	-	5.0	



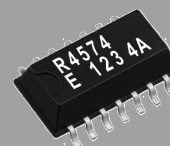
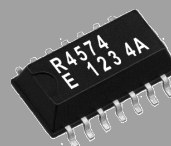
REAL TIME CLOCK MODULE (SPI-Bus)

RTC - 4574 SA

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : 3-wire serial interface
- Operating voltage range : 1.6 V to 5.5 V
- Wide Timekeeper voltage range : 1.6 V to 5.5 V
- Low backup current : 0.5 μ A / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer.



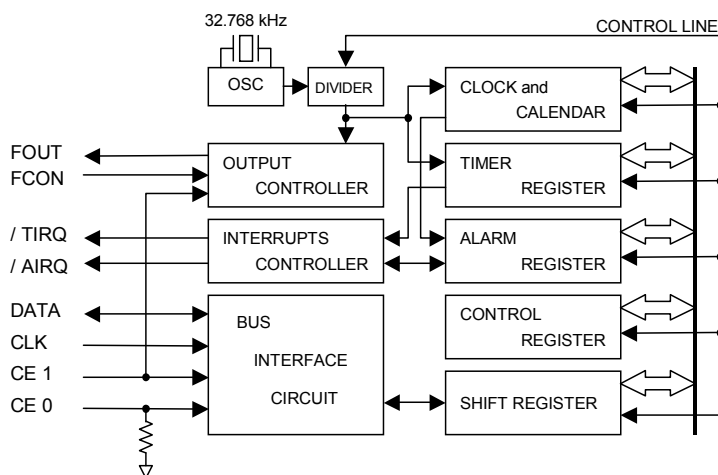
Product Number (Please contact us)
RTC-4574SA : Q41457452000200



RTC-4574SA

R4574
E 123 4A

Block diagram



Overview

• 32.768 kHz frequency output function

- FOUT pin output (C-MOS output), CL=30 pF
- Output frequency selectable from 1/30 Hz to 32.768 kHz (32 Values)

• Timer function

- Timer function can be set up between 1/4096 second and 255 minutes.
- It is recorded automatically to TF-bit at the time of event occurrence, and it's possible to output with /TIRQ pin output (open-drain output).
- Selectable one time mode or repeat mode.

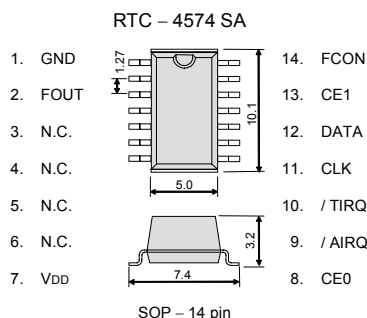
• Alarm function

- Alarm function can be set to any combination of day of week, hour, or minute.
- It is recorded automatically to AF-bit at the time of event occurrence, and it's possible to output with /AIRQ pin output (open-drain output).

• Functions are compatible with RX - 4574 LC.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	V _{DD}	—	1.6	3.0	5.5	V
Clock voltage	V _{CLK}	—	1.6	3.0	5.5	V
Operating temperature	T _{OPR}	—	-40	+25	+85	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	T _a = +25 °C V _{DD} = 3.0 V	B: 5 ± 23 *	× 10 ⁻⁶
Oscillation start-up time	t _{STA}	T _a = +25 °C V _{DD} = 1.6 V	3 Max.	s

* Please ask for tighter tolerance. (Equivalent to 1 minute of monthly deviation)

■ Current consumption characteristics

T_a = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	CE0, CE1 = GND FOUT ; output OFF (Hi - z)	V _{DD} = 5 V	-	1.0	2.0
			V _{DD} = 3 V	-	0.5	1.0
	I _{32k}	CE0 = GND CE1 = V _{DD} FOUT ; 32.768 kHz output ON CL = 30 pF	V _{DD} = 5 V	-	8.0	20.0
			V _{DD} = 3 V	-	5.0	12.0

REAL TIME CLOCK MODULE (SPI-Bus)

RX - 4574 LC

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : 3-wire serial interface
- Operating voltage range : 1.6 V to 5.5 V
- Wide Timekeeper voltage range : 1.3 V to 5.5 V
- Low backup current : 0.35 μ A / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer.

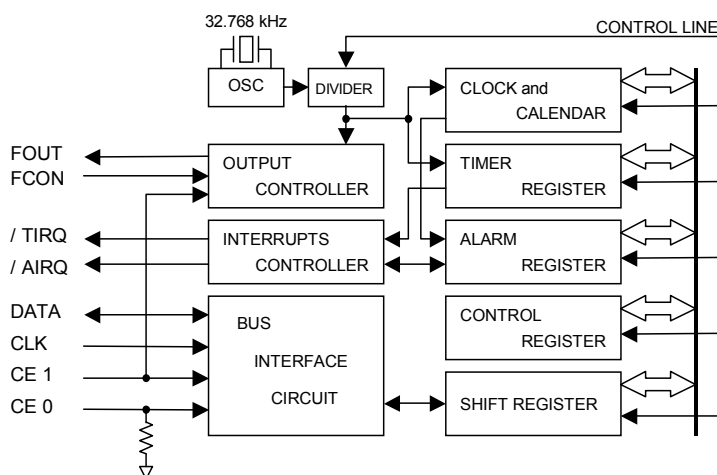


Product Number (Please contact us)
RX-4574LC : Q414574C2000300



Actual size

Block diagram



Overview

• 32.768 kHz frequency output function

- FOUT pin output (C-MOS output), CL=30 pF
- Output frequency is selectable from 1/30 Hz to 32.768 kHz (32 Values)

• Timer function

- Timer function which can be set up between 1/4096 second and 255 minutes.
- It is recorded automatically to TF-bit at the time of event occurrence, and it's possible to output with /TIRQ pin output (open-drain output).
- Selectable one time mode or repeat mode.

• Alarm function

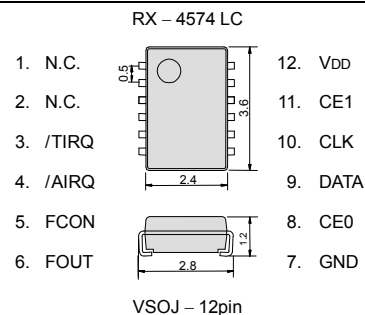
- Alarm function can be set to any combination of day of week, hour, or minute.
- It is recorded automatically to AF-bit at the time of event occurrence, and it's possible to output with /AIRQ pin output (open-drain output).

* Functions are compatible with RTC-4574 SA / JE / NB.

Pin Function

Signal Name	Input / Output	Function
CE0	Input	The chip enabled input pin 0. (Built-in pull-down resistance) When both CE0 and CE1 pins are at the "H" level, access to this Real time clock module becomes possible.
CE1	Input	The chip enabled input pin 1. When the CE1 pin is at the HIGH level, the FOUT pin is in the output state.
CLK	Input	The shift clock input pin for serial data transfer.
DATA	Bi-directional	The data input / output pin for serial data transfer.
FOUT	Output	This pin outputs the reference clock signal at 32.768 kHz (C-MOS output). High impedance at the time of output off.
FCON	Input	The input pin for the FOUT output control.
/AIRQ	Output	The open drain output pin for alarm and time update interrupts.
/TIRQ	Output	The open drain output pin for timer interrupt.
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

Terminal connection / External dimensions (Unit:mm)



***Stop using the glue**
Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.6	3.0	5.5	V
Clock voltage	VCLK	—	1.3	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	Ta = +25 °C VDD = 3.0 V	B: 5 $\pm$ 23 *	$\times 10^{-6}$
Oscillation Start-up time	tSTA	Ta = +25 °C VDD = 1.6 V Ta = -40 °C to +85 °C VDD = 1.6 V	1 Max. 3 Max.	s

*Equivalent to 1 minute of monthly deviation

■ Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	CE0, CE1 = GND FOUT ; output OFF (Hi - z)	VDD = 5 V	-	0.45	μ A
			VDD = 3 V	-	0.35	
	I _{32k}	CE0 = GND CE1 = VDD FOUT ; 32.768 kHz output ON CL = 30 pF	VDD = 5 V	-	8.0	μ A
			VDD = 3 V	-	5.0	

REAL TIME CLOCK MODULE (SPI-Bus)

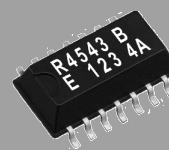
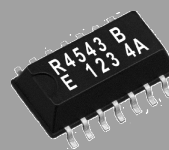
Simple Function

RTC - 4543 SA

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface type : 3-wire serial interface
- Operating voltage range : 2.5 V to 5.5 V
- Wide Timekeeper voltage range: 1.4 V to 5.5 V
- 32.768 kHz frequency output function: C-MOS output With Control Pin
- The various functions include full calendar, timer, and low voltage detection.



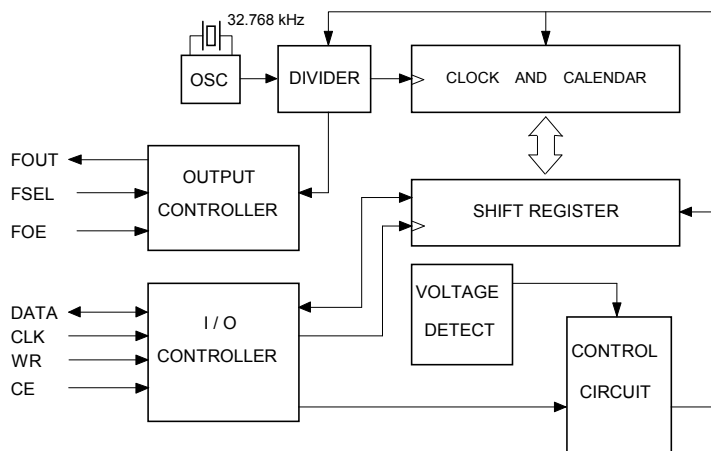
Product Number (Please contact us)
RTC-4543SA : Q41454352000200



RTC-4543SA

R4543 B
E 123 4A

Block diagram



Overview

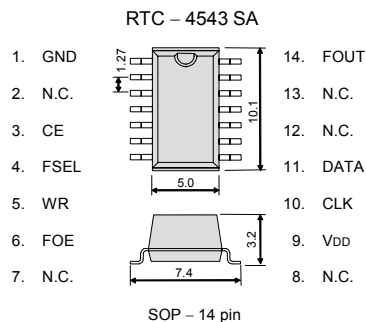
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - FOE pin enables output on/off control.
 - FSEL pin enables output selectable 32.768 kHz or 1 Hz.
- **Power supply voltage monitoring function**
 - Detection that power supply voltage descended to 1.7 V or less.
 - Automatic record to FDT-bit at the time of power supply decline detection.

Pin Function

Signal Name	Input / Output	Function
CE	Input	The chip enabled input pin. At the HIGH level, access becomes possible.
CLK	Input	The shift clock input pin for serial data transfer.
WR	Input	DATA pin input / output switching pin.
DATA	Bi-directional	The data input / output pin for serial data transfer.
FOUT	Output	32.768 kHz or 1Hz clock output pin (C-MOS output). High impedance at output off.
FOE	Input	The input pin for the FOUT output control.
FSEL	Input	Select the frequency that is output from the FOUT pin.
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application Manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	2.5	5.0	5.5	V
Clock voltage	VCLK	—	1.4	5.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	Ta = +25 °C VDD = 5.0 V	B: 5 ± 23 *	× 10 ⁻⁶
Oscillation start-up time	tSTA	Ta = +25 °C VDD = 2.5 V	3 Max.	s

* Please ask for tighter tolerance.(Equivalent to 1 minute of monthly deviation)

Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	CE = GND FOE = GND FOUT ;output OFF (Hi-z)	VDD = 5 V	-	1.5	3.0
			VDD = 3 V	-	1.0	2.0
			VDD = 2 V	-	0.5	1.0

Supply Voltage Detection Characteristic

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply detection voltage	V _{DT}	VDD pin	1.4	1.7	2.0	V

**REAL TIME CLOCK MODULE (SPI-Bus)****For Automotive****Built-in 32.768 kHz-DTCXO, High Stability****RA4803 SA**

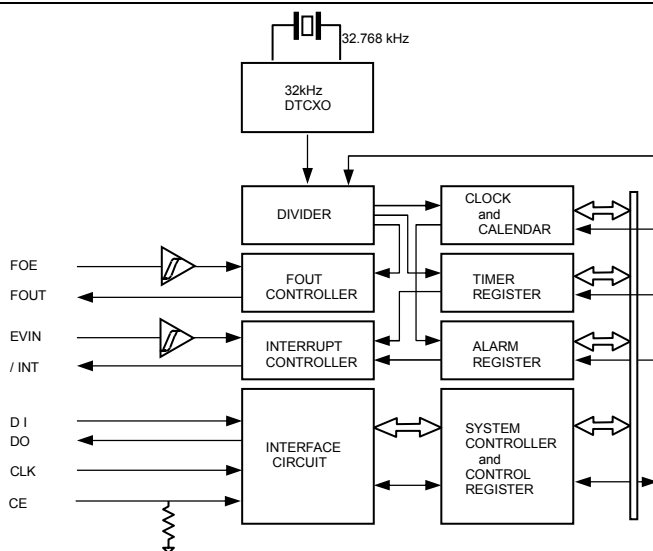
- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- 1/100s resolution Time register
- Interface Type : 4-wire serial interface
- Interface voltage range : 1.6 V to 5.5 V
- Temp. compensated voltage range : 2.2 V to 5.5 V
- Clock supply voltage range : 1.6 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions include full calendar, alarm, timer, EVIN input.
- Applications : Car audio, Car navigation system, Clock
- Conforms to AEC-Q200



Product Number (Please contact us)
 RA4803SA UA: X1B000252A00100
 RA4803SA UB: X1B000252A00200
 RA4803SA UC: X1B000252A00300
 RA4803SA AA: X1B000252A00600



Actual size

**Block diagram****Overview**

- **High Stability**
 - UA $\pm 3.4 \times 10^{-6}$ / -40°C to $+85^\circ\text{C}$
(Equivalent to 9 seconds of month deviation)
 - UB $\pm 5.0 \times 10^{-6}$ / -40°C to $+85^\circ\text{C}$
(Equivalent to 13 seconds of month deviation)
 - UC $\pm 5.0 \times 10^{-6}$ / -30°C to $+70^\circ\text{C}$
 - AA $(\pm 5 \pm 5.0) \times 10^{-6}$ / $+25^\circ\text{C}$
- **High Resolution:** 1/100s Time register with capture buffer
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **The various interrupt**
 - Timer Function can be set between 1/4096 second and 4095 minutes.
 - Alarm Function can be set to day of week, day, hour, or minute.
 - EVIN input.
- **Time synchronize function with 1PPS signal input**
- **Register compatibility:** upper compatible with RX-4801.

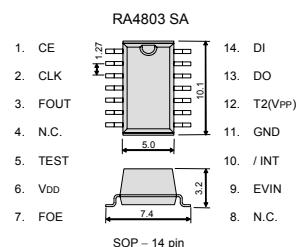
*It is possible to use it by the terminal connection as 32.768 kHz-DTCXO.

Pin Function

Signal Name	I / O	Function
CE	input	The chip enable input pin.
CLK	input	The shift clock input pin for serial data transfer.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
TEST	input	Use by the manufacture for testing.
V _{DD}	-	Connected to a positive power supply
FOE	input	The input pin for the FOUT output control.
EVIN	input	External event input.
/INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(V _{PP})	-	Use by the manufacture for testing. (Do not connect externally.)
DO	Output	The data output pin for serial data transfer.
DI	input	The data input pin for serial data transfer.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

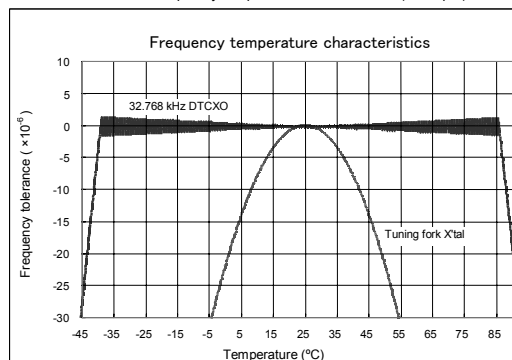
* Refer to application manual for details.

Electrical Characteristics

Electrical Characteristics		Symbol		Conditions		Min.	Typ.	Max.	Unit
Interface voltage		V _{DD}		Interface voltage		1.6	3.0	5.5	V
Temp. compensated Voltage		V _{TEM}		Temp. compensated voltage		2.2	3.0	5.5	V
Clock supply voltage		V _{CLK}		-		1.6	3.0	5.5	V
Operating temperature		T _{OPR}		No condensation		-40	+25	+85	°C
Stability	Δ f / f	UA	Ta = -40 °C to +85 °C		±3.4 *1			× 10 ⁻⁶	
		UB	Ta = -40 °C to +85 °C		±5.0 *2				
		UC	Ta = -30 °C to +70 °C						
		AA	Ta = +25 °C		5 ± 5.0*3				
Current consumption (1)	I _{DD1}	Backup Mode FOE = GND, /INT = V _{DD} FOUT output : OFF		V _{DD} = 5V	-	0.75	3.4	μA	
Current consumption (2)	I _{DD2}			V _{DD} = 3V	-	0.75	2.1		

*1) Equivalent to 9 seconds of month deviation. *2) Equivalent to 13 seconds of month deviation.

*3) Equivalent to 13 seconds of month deviation. (excluding offset)

32.768 kHz-DTCXO Frequency temperature characteristics (Example)

REAL TIME CLOCK MODULE (SPI-Bus)

For Automotive

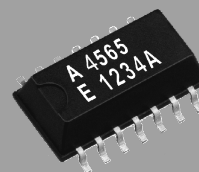
Extended operating temperature range (+125°C)

RA - 4565 SA

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : 4-wire serial interface
- Wide operating voltage range : 1.6 V to 5.5 V
- Wide voltage for long time keeping. : 1.5 V to 5.5 V
- Extended operating temperature range: -40 °C to +125 °C
- 32.768 kHz Clock/calendar function, auto leap year correction function,
- Applications : Car audio, Car navigation system, Clock, ECU sub clock
- Conforms to AEC-Q200



Product Number (Please contact us)
RA-4565SA : Q41A46552xxxx00

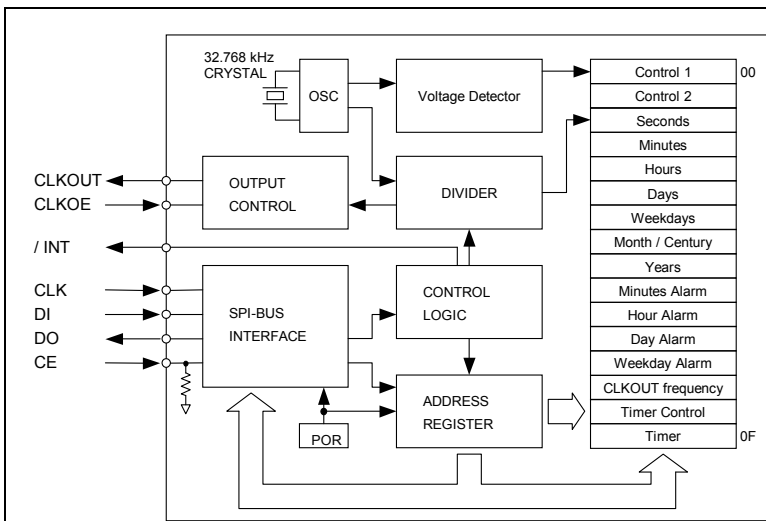


Actual size



Block diagram

Overview



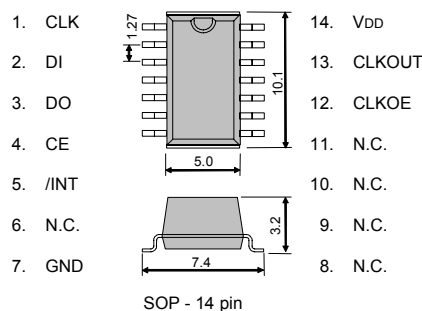
- **Wide operating temperature range**
 - -40 °C to +125 °C
- **Clocking-status detection function**
 - It can judge the validity of data after backup operation return by a status of VL-bit.
- **32.768 kHz frequency output function**
 - CLKOUT pin output (Open Drain output)
 - Output frequency can be selected as 32.768 kHz, 1024 Hz, 32 Hz, or 1 Hz.
- **The various interrupt function**
 - Timer function can be set up between 1/4096 second and 255 minutes.

Pin Function

Terminal connection / External dimensions (Unit:mm)

Signal Name	Directions	Functions
CE	Input	Chip enabled input.
CLK	Input	Serial clock input.
DI	Input	Data input.
DO	Output	Data output.
CLKOUT	Output	The CLKOUT pin is a clock output (open drain output) pin with control output. (Output frequency can be selected as 32.768 kHz, 1024 Hz, 32 Hz, or 1 Hz.)
CLKOE	Input	The CLKOE pin is an input pin used to control the output mode of the CLKOUT output pin. During the initial power-on (when power is applied from 0 V), if the CLKOE input pin is at high level (= H), the power-on reset function selects 32.768 kHz as the frequency.
/INT	Output	Interrupts output by Alarm and Timer events. (Open drain output)
VDD	—	VDD
GND	—	GND

RA - 4565 SA



SOP - 14 pin

The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	unit
Operating voltage	VDD	—	1.6	3.0	5.5	V
Timekeeper voltage	VCLK	—	1.5	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+125	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	unit
Frequency stability	$\Delta f / f$	Ta = +25 °C VDD = 3.0 V	B: 5 ± 23 *1	× 10 ⁻⁶
Oscilation start up time	tSTA	Ta = +25 °C VDD = 1.6 V	1.5 Max.	s
		Ta = -40 °C to +125 °C VDD = 3.0 V	3.0 Max.	s

*1) Equivalent to 1 minutes of monthly deviation.

■ Current consumption under backup mode.

Item	Symbol	Conditions	Min.	Typ.	Max.	unit
Standby current.	IBK	fSCL = 0 Hz CLKOE = "L"	+125 °C	1.0	2.0	μA
		VDD = 5 V				
			-40 to +85 °C	0.6	1.2	μA
		VDD = 3 V				



REAL TIME CLOCK MODULE (SPI-Bus)

For Automotive

RA - 4574 SA

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : 3-wire serial interface
- Operating voltage range : 1.6 V to 5.5 V
- Wide Timekeeper voltage range : 1.6 V to 5.5 V
- Low backup current : 0.5 μ A / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer.
- Applications : Car audio, Car navigation system, Clock, ECU sub clock
- Conforms to AEC-Q200



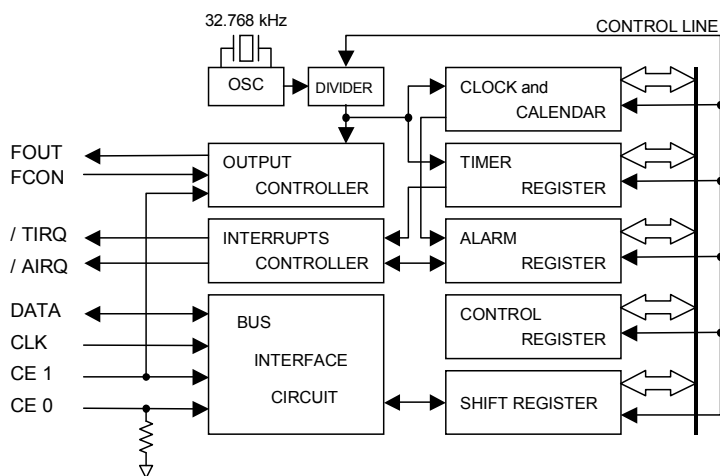
Product Number (Please contact us)
RA-4574SA : Q41A47452xxx00



Actual size



Block diagram



Overview

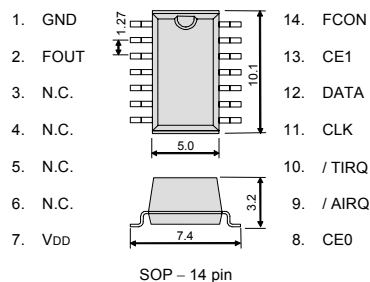
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output frequency selectable from 1/30 Hz to 32.768 kHz (32 Values)
- **Timer function**
 - Timer function can be set between 1/4096 second and 255 minutes.
 - It is recorded automatically to TF-bit at the time of event occurrence, and it's possible to output with /TIRQ pin output (open-drain output).
 - Selectable one time mode or repeat mode.
- **Alarm function**
 - Alarm function can be set to any combination of day of week, hour, or minute.
 - It is recorded automatically to AF-bit at the time of event occurrence, and it's possible to output with /AIRQ pin output (open-drain output).

Pin Function

Signal Name	Input / Output	Function
CE0	Input	The chip enabled input pin 0. (Built-in pull-down resistance) When both CE0 and CE1 pins are at the "H" level, access to this Real time clock module becomes possible.
CE1	Input	The chip enabled input pin 1. When the CE1 pin is at the HIGH level, the FOUT pin is in the output state.
CLK	Input	The shift clock input pin for serial data transfer.
DATA	Bi-directional	The data input / output pin for serial data transfer.
FOUT	Output	This pin outputs the reference clock signal at 32.768 kHz (C-MOS output). High impedance at the time of output off.
FCON	Input	The input pin for the FOUT output control.
/AIRQ	Output	The open drain output pin for alarm and time update interrupts.
/TIRQ	Output	The open drain output pin for timer interrupt.
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

Terminal connection / External dimensions (Unit:mm)

RA - 4574 SA



SOP - 14 pin

The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.6	3.0	5.5	V
Clock voltage	VCLK	—	1.6	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	Ta = +25 °C VDD = 3.0 V	B: 5 ± 23 *	× 10 ⁻⁶
Oscillation start-up time	tSTA	Ta = +25 °C VDD = 1.6 V	3 Max.	s

* Equivalent to 1 minute of monthly deviation

Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	IBK	CE0, CE1 = GND FOUT ; Output OFF (Hi - z)	VDD = 5 V	-	1.0	2.0 μ A
			VDD = 3 V	-	0.5	1.0 μ A
	I32k	CE0 = GND CE1 = VDD FOUT ; 32.768 kHz output ON CL = 30 pF	VDD = 5 V	-	8.0	20.0 μ A
			VDD = 3 V	-	5.0	12.0 μ A



REAL TIME CLOCK MODULE (I²C-Bus)

Built-in 32.768 kHz-DTCXO, High Stability

RX 8804CE

NEW

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- Interface Type : I²C-Bus interface (400kHz)
- Interface voltage range : 1.6 V to 5.5 V
- Temp. compensated voltage range : 1.5 V to 5.5 V
- Timekeeping voltage range : 1.5 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions full calendar, alarm, timer, temp. event detect .
- Applications : Car audio, Car navigation system, Clock
- The I²C-BUS is a trademark of NXP Semiconductors.



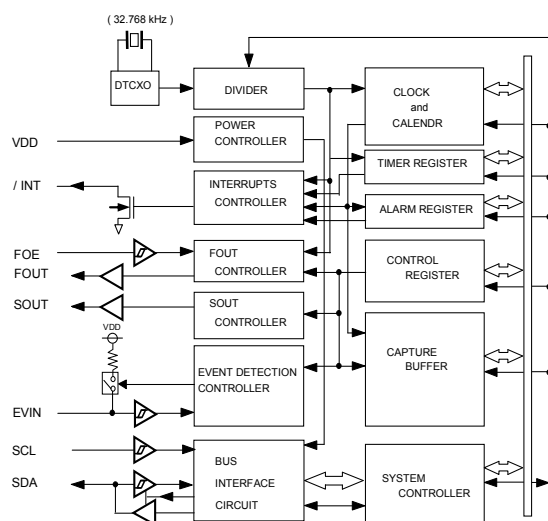
Product Number (Please contact us)
RX8804CE : X1B000371xxxx00



RX8804CE
(3.2 × 2.5 × 1.0 mm)

Actual size

RX8804CE

Block diagram**Overview**

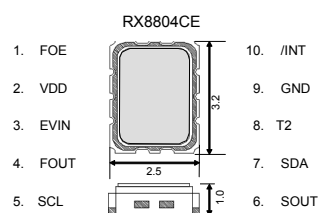
- **High Stability**
 - XA
 - $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
 - $\pm 8.0 \times 10^{-6}$ / +85 °C to +105 °C
 - XB
 - $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
 - $\pm 8.0 \times 10^{-6}$ / +85 °C to +105 °C
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **Event detection function**
 - Event detection and capture the event detection time in the capture buffer.
- **Timer function**
 - Timer source clock are 1min., 1sec., 64Hz, 4096Hz.
 - 24-bit presettable counter
- **Alarm function**
 - Alarm function can be set to day of week, day, hour, and minute.
- **Internal state output function**
 - SOUT pin output (C-MOS output),
 - Outputting a state of the selected flag

Pin Function

Signal Name	I / O	Function
SOUT	Output	Internal state output pin.
SCL	Input	Serial clock input pin.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
EVIN	Input	Event input pin
VDD	-	Connected to a positive power supply
FOE	Input	The input pin for the FOUT output control.
/INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(VPP)	-	Use by the manufacture for testing. (Do not connect externally.)
SDA	I/O	Data input and output pin.

Terminal connection / External dimensions

(Unit:mm)

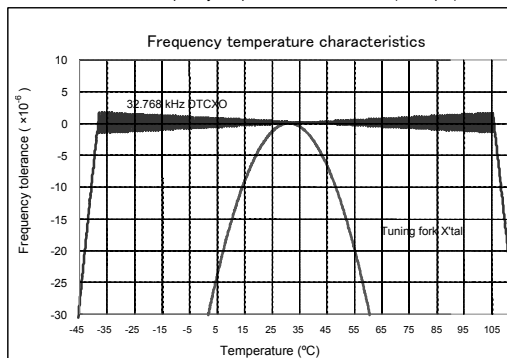
**Specifications (characteristics)**

* Refer to application manual for details.

Electrical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating voltage	VDD	Interface voltage	1.6	3.0	5.5	V
Temp. compensated Voltage	VTEM	Temp. compensated voltage	1.5	3.0	5.5	V
Clock supply voltage	VCLK	Internal clock	1.5	3.0	5.5	V
Operating temperature	TOPR	No condensation	-40	+25	+105	°C
Stability	$\Delta f / f$	XA	Ta = -40 °C ~ +85 °C		$\pm 3.4^{*1}$	$\times 10^{-6}$
			Ta = +85 °C ~ +105 °C		$\pm 8.0^{*2}$	
		XB	Ta = -40 °C ~ +85 °C		$\pm 5.0^{*3}$	
			Ta = +85 °C ~ +105 °C		$\pm 8.0^{*2}$	
Current consumption (1)	IDD1	fSCL=0Hz, /INT=VDD, FOE=GND, FOUT: OFF				μA
Current consumption (2)	IDD2	Temp. Compensation interval 2.0 s.				

^{*1}) Equivalent to 9 seconds of month deviation. ^{*2}) Equivalent to 21 seconds of month deviation. ^{*3}) Equivalent to 13 seconds of month deviation.

32.768 kHz-DTCXO Frequency temperature characteristics (Example)

REAL TIME CLOCK MODULE (I²C-Bus) Built-in 32.768 kHz-DTCXO, High Stability and Power Switching

RX 8900 SA / CE

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- Interface Type : I²C-Bus interface (400kHz)
- Interface voltage range : 2.5 V to 5.5 V
- Temp. compensated voltage range : 2.0 V to 5.5 V
- Clock supply voltage range : 1.6 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions include full calendar, alarm, timer, temp. sensor function.
- Epson prepared Linux driver for development.
(http://www5.epsondevice.com/en/information/support/linux_rtc/)
- The registered trademark Linux® is used pursuant to a sublicense from LMI (Linux Mark Institute)
- The I²C-Bus is a trademark of NXP Semiconductors.



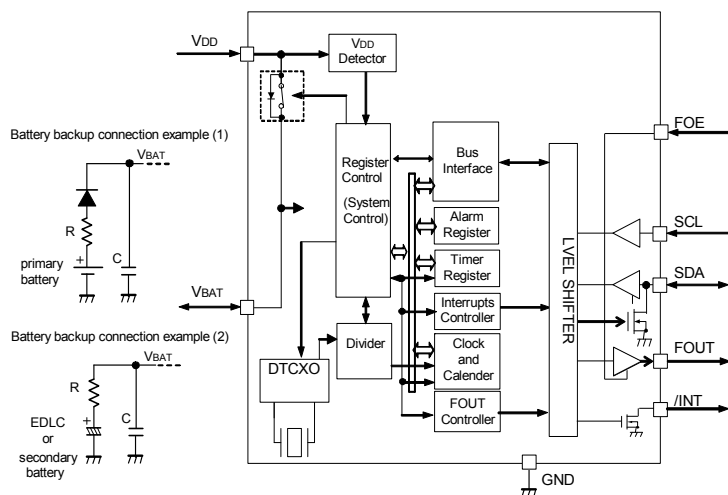
Product Number (Please contact us)
 RX8900SA : X1B000292xxxx00
 RX8900CE UA : X1B000301000100
 RX8900CE UB : X1B000301000200
 RX8900CE UC : X1B000301000300



Actual size



Block diagram



Overview

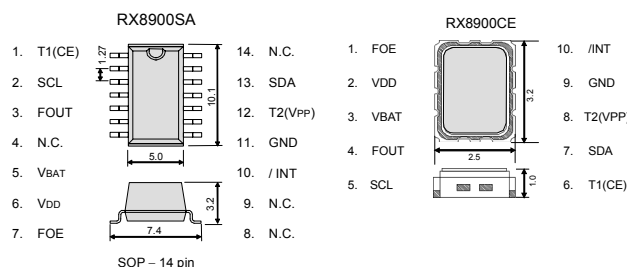
- **High Stability**
 - UA $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 9 seconds of month deviation)
 - UB $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 13 seconds of month deviation)
 - UC $\pm 5.0 \times 10^{-6}$ / -30 °C to +70 °C
(Equivalent to 13 seconds of month deviation)
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **Available automatic battery backup switch-over function**
 - Charge from VDD to backup battery connected to VBAT is possible. VDD voltage drop (VDET3) detection and automatically switches to the backup battery.
 - This circuit is optimal to backup with a secondary battery and a large capacitor.
- **Timer function**
 - Timer period is adjustable in 1/4096 second from 4095 minutes.
- **Alarm function**
 - Available dual-alarm, weekly and monthly.
- **Temp. sensor function**
 - Available readout temperature data from embedded temp sensor. (Bank.2_Add17h)

Pin Function

Signal Name	I / O	Function
T1(CE)	input	Use by the manufacture for testing. (Do not connect externally.)
SCL	input	Serial clock input pin.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
VBAT	-	Battery supply. This pin has charge capability to backup battery.
VDD	-	Connected to a positive power supply
FOE	input	The input pin for the FOUT output control.
/ INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(VPP)	-	Use by the manufacture for testing. (Do not connect externally.)
SDA	I/O	Data input and output pin.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product.
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

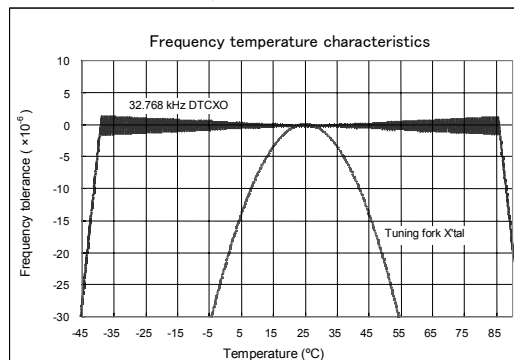
Electrical Characteristics

Item	Sym ol	Conditions		Min.	Typ.	Max.	Unit
Operating voltage	V _{DD}	Interface voltage		2.5	3.0	5.5	V
Temp. compensated Voltage	V _{TEM}	Temp. compensated voltage		2.0	3.0	5.5	V
Clock supply voltage	V _{CLK}	Internal clock		1.6	3.0	5.5	V
Operating temperature	T _{OPR}	No condensation		-40	+25	+85* ¹	°C
Stability	Δ f / f	UA	Ta = -40 °C to +85 °C	±3.4 * ²			× 10 ⁻⁶
		UB	Ta = -40 °C to +85 °C				
		UC	Ta = -30 °C to +70 °C	±5.0 * ³			
Current consumption (1)	I _{DD1}	fSCL=0Hz, /INT=V _{DD} , FOE =GND V _{DD} =V _{BAT}	V _{DD} = 5V	-	0.72	1.5	μA
Current consumption (2)	I _{DD2}	FOUT: OFF Temp. Compensation interval 2.0 s.	V _{DD} = 3V	-	0.70	1.4	

*1) Please contact us about +85 °C < TOPR

*2) Equivalent to 9 seconds of month deviation. *3) Equivalent to 13 seconds of month deviation.

32.768 kHz-DTCXO Frequency temperature characteristics (Example)



REAL TIME CLOCK MODULE (I²C-Bus)

Built-in 32.768 kHz-DTCXO, High Stability

RX - 8803 SA/LC

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- 1/100s resolution Time register
- Interface Type : I²C-Bus interface (400kHz)
- Interface voltage range : 1.6 V to 5.5 V
- Temp. compensated voltage range : 2.2 V to 5.5 V
- Clock supply voltage range : 1.6 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions include full calendar, alarm, timer, EVIN input.

.Epson prepared Linux driver for development.

(http://www5.epsondevice.com/en/information/support/linux_rtc/)

The registered trademark Linux® is used pursuant to a sublicense from LMI (Linux Mark Institute)

The I²C-Bus is a trademark of NXP Semiconductors.



Actual size

RX-8803SA



RX-8803LC

**Product Number (Please contact us)**

RX-8803SA UB : X1B000151000100

RX-8803SA UA : X1B000151000200

BX-8803SA UC : X1B000151000300

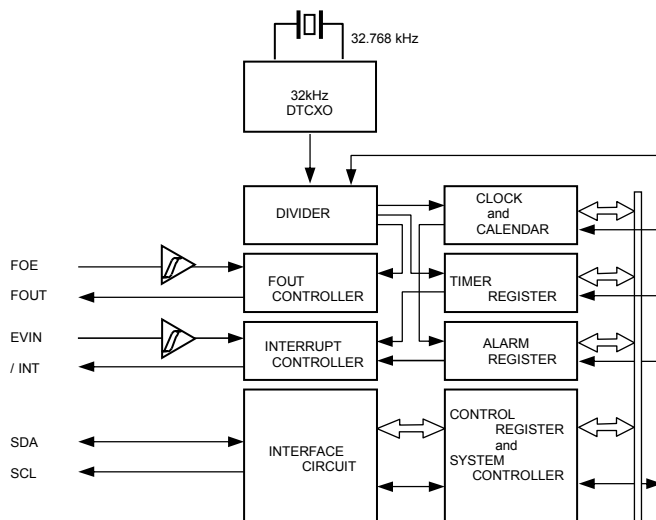
RX-8803SA UC : X1B000151000300
RY-8803SA AA : Y1B000151000400

RY 8803L C IIA : Y1B000142000100

RX-8803LC UA: X1B000142000100
RX-8803LC UB: Y1B000142000200RX-8803LC UB : X1B000142000200
RX-8803LC UC : Y1B000142000200RX-8803LC UC : X1B000142000300
RX-8803LC AA : X1B000142000400

RX-8803LC AA : X1B000142000400

Block diagram



Overview

- **High Stability**
 - UA $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 9 seconds of month deviation)
 - UB $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 13 seconds of month deviation)
 - UC $\pm 5.0 \times 10^{-6}$ / -30 °C to +70 °C
 - AA $(\pm 5 \pm 5.0) \times 10^{-6}$ / +25 °C
- **High Resolution:** 1/100s Time register with capture buffer
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **The various interrupt**
 - Timer Function can be set between 1/ 4096 second and 4095 minutes.
 - Alarm Function can be set to day of week, day, hour, or minute.
 - EVIN input.
- **Time synchronize function with 1PPS signal input**
- **Register compatibility:** upper compatible with RX-8801.

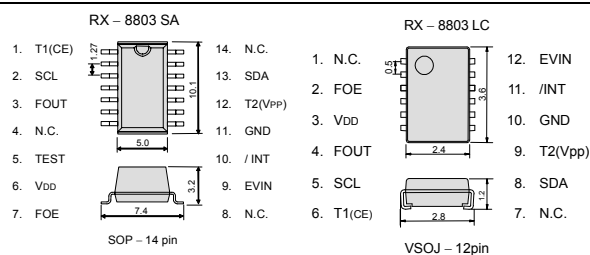
*It is possible to use it by the terminal connection as 32.768 kHz-DTCXO.

Pin Function

Signal Name	I / O	Function
T1(CE)	input	Use by the manufacture for testing. (Do not connect externally.)
SCL	input	Serial clock input pin.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
TEST	input	Use by the manufacture for testing. (Do not connect externally. RX-8803SA only.)
V _{DD}	-	Connected to a positive power supply
FOE	input	The input pin for the FOUT output control.
EVIN	input	External event input.
/ INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(V _{PP})	-	Use by the manufacture for testing. (Do not connect externally.)
SDA	I/O	Data input and output pin.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product.
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

***Stop using the glue**

Stop using the glue
Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

Specifications (characteristics)

* Refer to application manual for details.

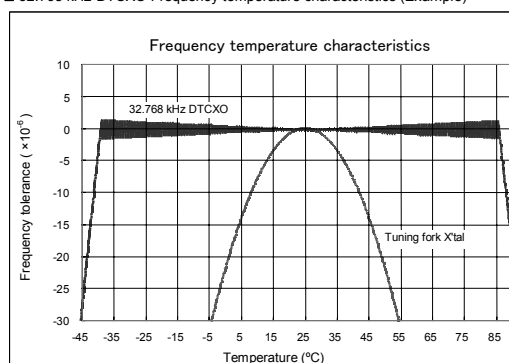
■ Electrical Characteristics

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit
Operating voltage	V _{DD}	Interface voltage		1.6	3.0	5.5	V
Temp. compensated Voltage	V _{TEM}	Temp. compensated voltage		2.2	3.0	5.5	V
Clock supply voltage	V _{CLK}	-		1.6	3.0	5.5	V
Operating temperature	T _{OPR}	-		-40	+25	+85	°C
Stability	Δ f / f	UA	Ta = -40 °C to +85 °C	±3.4 *1			× 10 ⁻⁶
		UB	Ta = -40 °C to +85 °C	±5.0 *2			
		UC	Ta = -30 °C to +70 °C				
		AA	Ta = +25 °C	5 ±5.0 *3			
Current consumption (1)	I _{DD1}	Backup Mode FOE = GND, /INT = V _{DD}	V _{DD} = 5V	-	0.75	3.4	μA
Current consumption (2)	I _{DD2}	FOUT output : OFF	V _{DD} = 3V	-	0.75	2.1	

*1) Equivalent to 9 seconds of month deviation. *2) Equivalent to 13 seconds of month deviation.

*3) Equivalent to 13 seconds of month deviation. (excluding offset)

■ 32.768 kHz-DTCXO Frequency temperature characteristics (Example)



REAL TIME CLOCK MODULE (I²C-Bus)

Build in backup battery charge control function

RX8130 CE

- Built in frequency adjusted 32.768 kHz crystal unit
- Interface Type : I²C -Bus
- Interface voltage range : 1.6 V ~ 5.5 V
- Wide voltage for timekeeping : 1.1 V ~ 5.5 V
- Low backup current : 300 nA (Typ.) / 3 V
- Auto power switching function : Switchover by main power supply monitor.
- Backup battery charge control function : For the rechargeable lithium batteries.
- Reset functions with a delay : Detect a main power supply and remove the reset.
- The various function include full calendar, alarm, timer, etc.

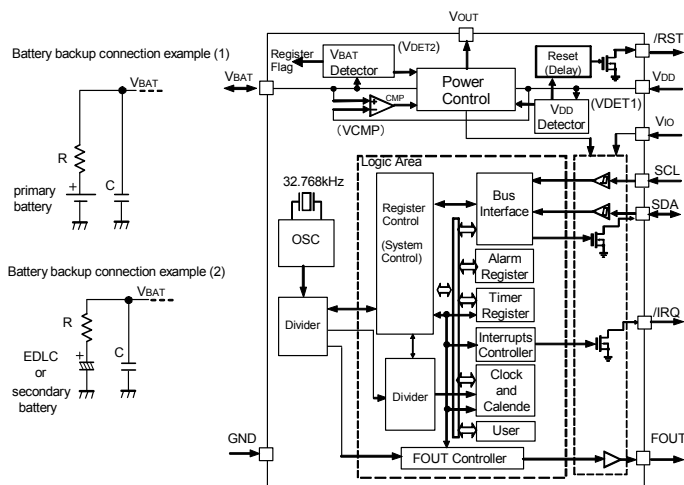
The I²C-Bus is a trademark of NXP Semiconductors.

Product Number (Please contact us)
RX8130CE : X1B000311000100



Actual size

Block diagram



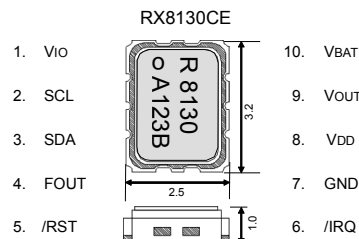
Overview

- I²C-Bus interface.
- Auto power switching function
 - The VDD voltage is monitored and it switches to the backup power supply by the automatic operation.
 - The switch voltage to the backup power supply. 1.25V (Min.)
 - Even if the main power supply voltage is decreased, the current flow from the backup power supply is prevented.
- Charge control function for the rechargeable lithium batteries.
 - Stop charging automatically by detecting the full charge.
 - Records in the register detecting the backup power supply voltage decrease.
- Reset function with a delay
 - When the main power is supplied, reset output is released.
 - The release voltage is selected by the register. (2.80V / 2.75V)
 - Delay time from the voltage rise detection is 60ms Typ.
- Frequency output function
 - Output frequency is selectable from 32.768kHz, 1024Hz, 1Hz.
- Timer function
 - Selectable in 1/4096 second from 65535 hours.
 - Timer source clock are 1hour, 1min, 64Hz, 4096Hz.
 - It is automatically recorded to TF-bit at the time of event occurrence, and possible to output with /IRQ pin.

Pin Function

Signal Name	I / O	Function
SCL	Input	Serial clock input pin.
SDA	Input / Output	Data input and output pin.
FOUT	Output	Frequency output pin with output control function. (C-MOS) Output frequency can be selected as 32.768kHz, 1024Hz, 1Hz.
/ RST	Output	Reset output pin.(N-ch open drain) In case of VDD voltage drop detection, a reset signal is outputted. In case of VDD voltage rise detection, it is released reset signal after 60ms.
/ IRQ	Output	Interrupts output by Alarm and Timer events.(N-ch open drain)
VDD	—	This is a power-supply pin. It can impress the voltage unlike VIO.
VIO	—	This is a interface power supply pin. This is a pin to supply the voltage same as a host.
VOUT	—	Internal voltage output pin. Connect smoothing capacitor of 1.0μF
VBAT	—	This is a power supply pin for backup battery. This is a pin to connect a large-capacity capacitor, a secondary battery, a primary battery. In a backup power supply operating range, the voltage is supplied inside by this pin.
GND	—	Connected to a ground.

Terminal connection / External dimensions (Unit:mm)



Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating supply voltage	VDD	—	1.25	3.0	5.5	V
Clock supply voltage	VCLK	—	1.1	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C
VDD detect voltage	-VDET2	VDD_Fall	1.20	1.30	1.40	V

■ Frequency characteristics

Item	Symbol	Condition	Rating	Unit
Frequency tolerance	$\Delta f / f$	Ta = +25 °C VDD = 3.0 V	B : 5 ± 23*	× 10 ⁻⁶
Oscillation start-up time	tSTA	VDD = 2.75 V ~ 5.5 V	1 Max.	s

* Equivalent to 1 minute of monthly deviation (excluding offset.)

■ Current consumption characteristics

Ta = -40 °C ~ +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current consumption	IBK	SCL=SDA = "L", VBAT=3.0V, VDD=VIO=0.0V	—	300	500	nA
	I32k	SCL=SDA = "H", FOUT=32.768kHz, /IRQ=OFF, VDD=VIO=3.0V, FOUT pin CL=15pF CHGEN=L or VBAT ≥ VDET3	—	3.5	4.0	μA

REAL TIME CLOCK MODULE (I²C-Bus)

Low current consumption

RX8010SJ

- Built in frequency adjusted 32.768 kHz crystal unit.
 - Interface Type : I²C-Bus interface (400 kHz)
 - Operating voltage range : 1.6 V to 5.5 V
 - Wide voltage for time keeping. : 1.1 V to 5.5 V
 - Low backup current : 160 nA / 3 V (Typ.)
 - Frequency output function : C-MOS or Open-Drain output
 - Built-in user RAM : 128 bit (8 bit x 16, SRAM)
 - The various functions include full calendar, alarm, timer, etc.
 - This product is conform to industrial standard SOP8 package, and it can be mounted to the common land pattern.
- Epson prepared Linux driver for development.
(http://www5.epsondevice.com/en/information/support/linux_rtc/)
- The registered trademark Linux® is used pursuant to a sublicense from LMI(Linux Mark Institute)
The I²C-Bus is a trademark of NXP Semiconductors



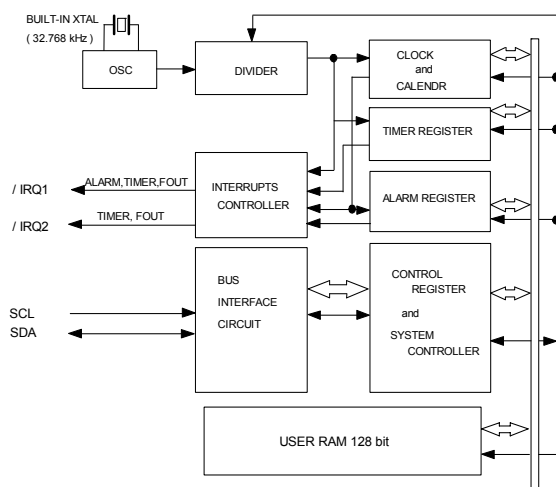
Product Number (Please contact us)
RX8010SJ : X1B000242000100



Actual size



Block diagram



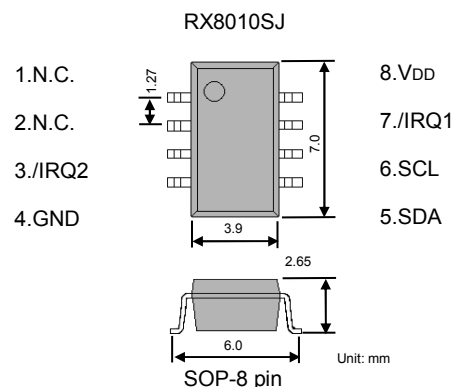
Overview

- **Interface Type**
 - I²C-Bus high-speed bus specifications. (400 kHz)
- **Frequency output function**
 - It may select a CMOS or open drain output
 - Output frequency can be selected as 32.768kHz, 1024Hz, 1Hz.
- **Timer function**
 - Timer function can be set up between 1/4096 second and 65535 hours.
 - Timing period are 1hour, 1min, 64Hz, 4096Hz.
 - It is recorded automatic to TF-bit at the time of event occurrence, and possible to output with /IRQ1 or /IRQ2 pin.
- **Alarm function**
 - Alarm function can be set to day of week, day, hour, and minute.
 - It is recorded automatic to AF-bit at the time of event occurrence, and possible to output with /IRQ1 pin.
- **User RAM**
 - 128 bit (8 bit x 16, SRAM)

Pin Function

Signal Name	Input / Output	Function
SCL	Input	This is a shift clock input pin for serial data transmission.
SDA	Input/Output	This is the data input/output pin for serial data transfer.
/IRQ1	Output	This pin outputs interrupt signals ("L" level) for alarm, timer, time update, and 32.768kHz. This is an N-ch open-drain output.
/IRQ2	Output	This pin outputs interrupt signals ("L" level) for timer and FOUT. This is a C-MOS output.
VDD	Supply	This is a power-supply pin.
GND	Supply	This pin is connected to a ground.

Terminal connection / External dimensions (Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.6	3.0	5.5	V
Clock voltage	VCLK	—	1.1	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	Ta = +25 °C VDD = 3.0 V	B: 5 ± 23 *	× 10 ⁻⁶
Oscillation Start-up time	tSTA	Ta = +25 °C VDD = 1.6 V ~ 5.5 V Ta = -40 °C to +85 °C VDD = 1.6V ~ 5.5V	1 Max. 3 Max.	s

*Equivalent to 1 minute of monthly deviation

Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{bk}	Input pins are "L" fCLK = 0 Hz, /IRQ1,2 = OFF TSEL2="1"	VDD = 5 V	-	350	nA
			VDD = 3 V	-	160	nA
	I _{32k}	fCLK = 0 Hz, /IRQ1: 32.768 kHz ON, /IRQ2: OFF	VDD = 5 V	0.60	1.10	μA
			VDD = 3 V	0.52	0.90	μA

REAL TIME CLOCK MODULE (I²C-Bus)

Low current consumption

RX-8571 SA / LC

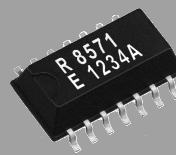
- Built-in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : I²C-Bus Interface (400 kHz)
- Operating voltage range : 1.6 V to 5.5 V
- Wide voltage for timekeeping : 1.3 V to 5.5 V
- Low backup current : 220 nA / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- Built-in user RAM : 128 bit (8 bit x 16, SRAM)
- The various functions include full calendar, alarm, timer, etc.
(Long-running timer : 65535 hours)
- * The I²C-Bus is a trademark of NXP Semiconductors



Product Number (Please contact us)

RX-8571SA : X1B000072000100

RX-8571LC : X1B000052000100



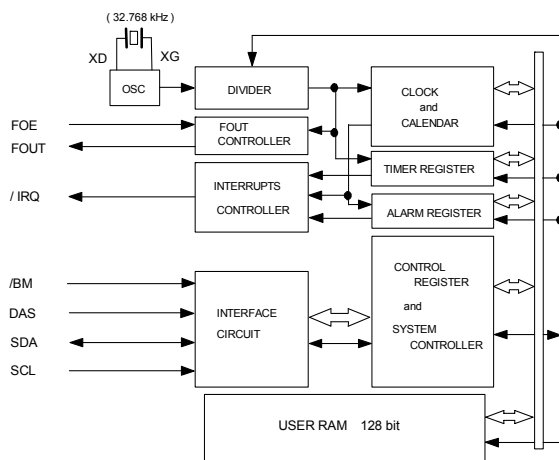
Actual size

RX-8571SA

RX-8571LC



Block diagram

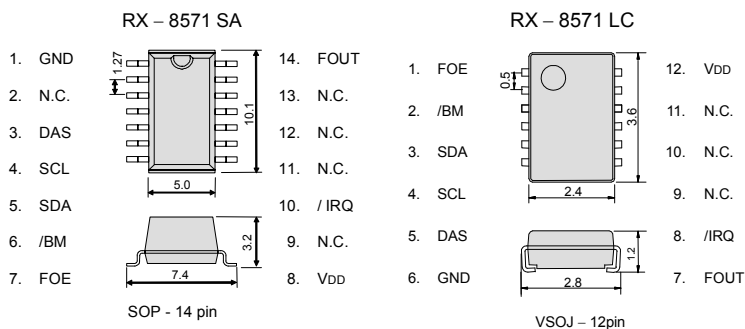


Overview

- 32.768 kHz frequency output function
 - FOE pin enable output on/off control.
 - Output frequency can be selected as 32.768 kHz, 1024 Hz, 1 Hz.
- Timer Function
 - Timer function can be set up between 1/4096 second and 65535 hours.
 - Timing period are 1 h, 1 min, 64 Hz, 4096 Hz.
 - It is recorded automatically to TF-bit at the time of event occurs, and possible to output with /IRQ pin output.
- Alarm function
 - Alarm function can be set to day of week, day, hour, or minute.
 - It is recorded automatically to AF-bit at the time of event occurs, and possible to output with /IRQ pin output.
- User RAM
 - 128 bit (8 bit x 16, SRAM)

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

*Stop using the glue

Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.6	3.0	5.5	V
Clock voltage	VCLK	—	1.3	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f/f$	T _a = +25 °C VDD = 3.0 V	B: 5 ± 23 *	× 10 ⁻⁶
Oscillation start up time	t _{STA}	T _a = +25 °C VDD = 1.6 V	1 Max.	s

* Please ask for tighter tolerance. (Equivalent to 1 minute of monthly deviation)

■ Current consumption characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{DD}	FOE=/BM="L" FOUT= OFF /IRQ = OFF VDD = 3.0V Ta = +25 °C	-	220	400	nA
		FOE=/BM="L" FOUT= OFF /IRQ = OFF VDD = 3.0V Ta = -40 °C to +85 °C	-	200	400	nA

REAL TIME CLOCK MODULE (I²C-Bus)

Low current consumption

RX - 8564 LC

- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : I²C-Bus Interface (400 kHz)
- Operating voltage range : 1.8 V to 5.5 V
- Timekeeper voltage range : 1.0 V to 5.5 V / -20 °C to +70 °C
- Low backup current : 275 nA / 3.0 V(Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer, and power supply voltage monitoring function

* The I²C-Bus is a trademark of NXP Semiconductors

Product Number (Please contact us)
RX-8564LC : Q418564C2000100



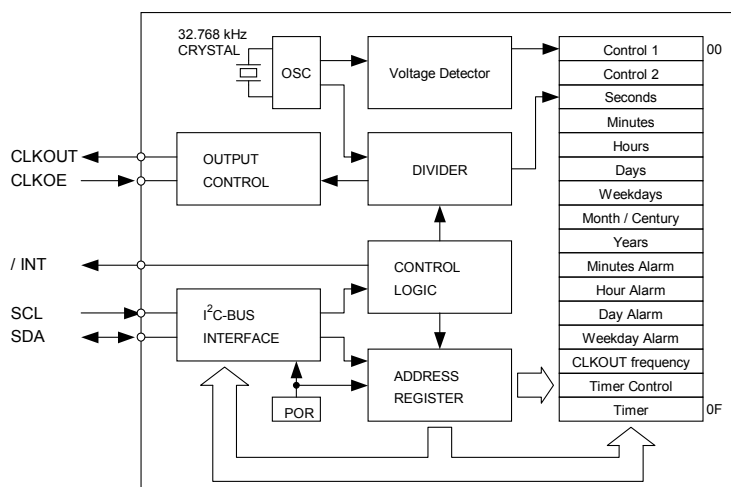
Actual size

RX-8564LC



Block diagram

Overview



• Interface Type

- I²C-Bus Interface. (Hi-speed bus specifications 400 kHz)
- I²C-Bus slave address : read A3h and write A2h

• Low Timekeeper voltage range

- 1.0 V to 5.5 V / Ta = -20 °C to +70 °C
- 1.1 V to 5.5 V / Ta = -40 °C to +85 °C

• 32.768 kHz frequency output function

- CLKOUT pin output (C-MOS output), CL=30 pF
- CLKOE pin enables output on/off control.
- Output selectable
<32.768 kHz, 1024 Hz, 32 Hz, 1 Hz>

• The various interrupt function

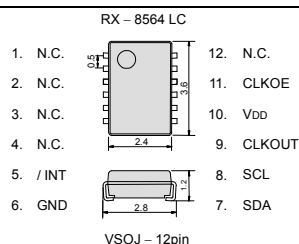
- Timer function can be set up between 1/4096 second and 255 minutes.
- Alarm function can be set to any combination of day of week, hour, or minute.

Pin Function

Signal Name	Input/Output	Function															
SCL	Input	Serial clock input pin.															
SDA	Bi-directional	Data input and output pin.															
CLKOUT	Output	32.768 kHz clock output pin with the output control function. (C-MOS) CLKOE pin control the condition of CLKOUT with FE-bit, etc.															
CLKOE	Input	<table border="1"> <tr> <th>CLKOE pin input</th><th>FE bit</th><th>CLKOUT pin output</th></tr> <tr> <td>HIGH</td><td>1</td><td>Output (C-MOS)</td></tr> <tr> <td></td><td>0</td><td>OFF (LOW)</td></tr> <tr> <td>LOW</td><td>1</td><td>OFF (LOW)</td></tr> <tr> <td></td><td>0</td><td>OFF (LOW)</td></tr> </table>	CLKOE pin input	FE bit	CLKOUT pin output	HIGH	1	Output (C-MOS)		0	OFF (LOW)	LOW	1	OFF (LOW)		0	OFF (LOW)
CLKOE pin input	FE bit	CLKOUT pin output															
HIGH	1	Output (C-MOS)															
	0	OFF (LOW)															
LOW	1	OFF (LOW)															
	0	OFF (LOW)															
/INT	Output	Interrupt output (N-ch open drain)															
VDD	—	Connected to a positive power supply.															
GND	—	Connected to a ground.															

Terminal connection / External dimensions

(Unit:mm)



VSOJ - 12pin

*Stop using the glue

Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.8	3.0	5.5	V
Clock voltage	VCLK	—	VLOW	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

■ Low voltage detection

Item	Symbol	Conditions	Typ.	Max.	Unit
Low voltage detection	VLOW	LC			
		Ta = -20 °C ~ +70 °C	0.9	1.2	V
		Ta = -40 °C ~ +85 °C	0.9	1.3	V

■ Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	Δf/f	Ta = +25 °C VDD = 3.0 V	B: 5 ± 23 *	× 10 ⁻⁶

* Please ask for tighter tolerance. (Equivalent to 1 minute of monthly deviation)

■ Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	f _{SCL} = 0 Hz CLKOE = GND	VDD = 5 V	-	330	800 nA
		CLKOUT ; output OFF (LOW)	VDD = 3 V	-	275	700 nA
	I _{32k}	f _{SCL} = 0 Hz CLKOE = VDD	VDD = 5 V	-	2.5	3.4 μA
		CLKOUT ; 32.768 kHz output ON (Output=OPEN ; CL = 0 pF)	VDD = 3 V	-	1.5	2.2 μA

REAL TIME CLOCK MODULE (I²C-Bus)

High-Stability Frequency with Built in Timestamp and Power Switching

RX-8035 SA/LC

- Built-in 32.768 kHz crystal unit : Frequency adjusted for high accuracy. ($\pm 5 \times 10^{-6} / T_a = +25^\circ\text{C}$)
- Interface Type : I²C-Bus Interface (400kHz)
- Operating voltage range : 2.4 V to 5.5 V
- Wide voltage for Timekeeping. : 1.0 V to 5.5 V
- Low backup current : 350 nA (SA) 400 nA (LC) / 3 V (Typ.)
- Event detection and Time stamp : One-shot full timestamp and interrupt.
- Dual event detection ports : Each terminal has a de-bounce circuit.
- Auto power switching functions : It switches VDD and VBAT, automatically.
- Dual Alarm, Periodic interruption.

Epson prepared Linux driver for development.

(http://www5.epsondevice.com/en/information/support/linux_rtc/)

The registered trademark Linux® is used pursuant to a sublicense from LMI (Linux Mark Institute). The I²C-Bus is a trademark of NXP Semiconductors.



Product Number (Please contact us)
 RX-8035SA B : X1B000172000100
 RX-8035SA AC : X1B000172000200
 RX-8035SA AA : X1B000172000300
 RX-8035LC B : X1B000182000100
 RX-8035LC AC : X1B000182000200
 RX-8035LC AA : X1B000182000300

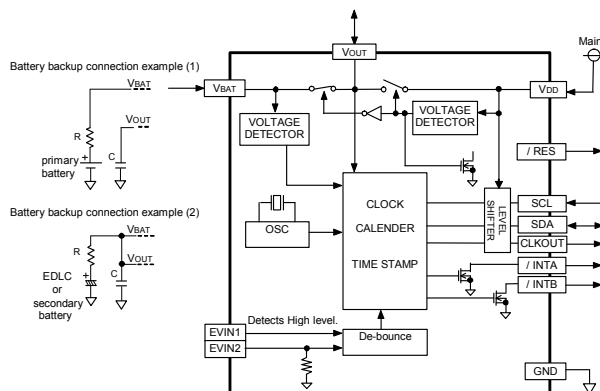


Actual size

RX-8035SA

RX-8035LC

Block diagram



Overview

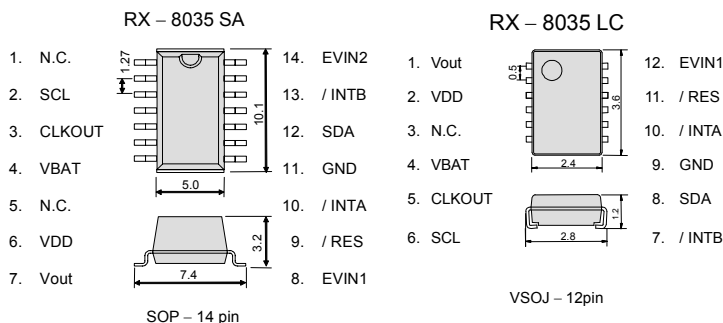
- **The event detection and Timestamp function**
 Dual event detection terminals.
 Selectable de-bounce time 35ms or 2s.
 Available event detection interrupt output.
- **Power switching functions.**
 • An external diode is unnecessary to have a reverse current prevention switch built-in in the VBAT side to connect a primary cell to.
 • When VDD is less than 2.4V, an internal source is switched to VBAT, and /RES is Low level. When VDD voltage rises to higher than 2.52V, an internal source is switched to VDD, and /RES is released with 105ms delay.
 • Note: When the supply from VBAT, SCL and SDA are disabled.
- **Alarm, Periodic interrupt, 32.768kHz clock output.**
 • Available monthly-alarm and weekly- Dual alarm.
 • Interrupt period are selectable from 2Hz to Monthly.
 • CLKOUT outputs 32.768kHz, it powered from VDD.

Pin function

Signal Name	Input / Output	Function
SCL	Input	I ² C serial clock.
SDA	In/Out	I ² C data in/out.
VDD	—	Main power supply.
VBAT	—	Power supply for backup.
Vout	Output	Switched power out. (maximum output current 20mA)
/ RES	Output	VDD voltage state.
GND	—	Ground
EVIN1	Input	Event detection input 1
EVIN2	Input	Event detection input 2
/ INTA	Output	Interrupt out A.
/ INTB	Output	Interrupt out B.
CLKOUT	Output	32.768kHz output. (CMOS. Can not inhibit.)
N.C.	—	Do not connect.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

*Stop using the glue

Any glue must never use it after soldering LC-package to a circuit board. This product has glass on the back side of a package. When glue invasions between circuit board side and glass side, then glass cracks by thermal expansion of glue. In this case a crystal oscillation stops. Consider glue abolition or glue do not touch to LC-package

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating voltage	VACCESS	VDD	2.4	3.0	5.5	V
Time keeping voltage	VCLK	VBAT	1.0	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C
Storage temperature	TSTG	—	-55	—	+125	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	$T_a = +25^\circ\text{C}$ $V_{BAT} = 3.0\text{ V}$	B: $5 \pm 23^{*1}$ AA: $5 \pm 5^{*2}$ AC: $0 \pm 5^{*2}$	$\times 10^{-6}$
Oscillation start-up time	tSTA	$T_a = +25^\circ\text{C}$ $V_{DD} = 3.0\text{ V}$	1 Max.	s
Frequency / voltage characteristics	f / V	$T_a = +25^\circ\text{C}$ $V_{DD} = 2.4\text{ V to } 5.5\text{ V}$	± 1 Max.	$\times 10^{-6}$

*1) Equivalent to 1 minute of monthly deviation (excluding offset.)

*2) Equivalent to 13 seconds of monthly deviation (excluding offset.)

Current consumption characteristics

$T_a = -40^\circ\text{C to } +85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	IBAT	RX-8035SA $V_{BAT} = 3.0\text{ V}, V_{DD} = 0.0\text{ V}$ $SCL = SDA = GND$	-	350	1200	nA
	IBAT	RX-8035LC $V_{BAT} = 3.0\text{ V}, V_{DD} = 0.0\text{ V}$ $SCL = SDA = GND$	-	400	-	nA
	IDD	$V_{DD} = 3.0\text{ V}$ $SCL = SDA = GND$ $CLKOUT = \text{open}$	-	1.40	2.50	μA

Power supply detection voltage

$T_a = -40^\circ\text{C to } +85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Voltage of low battery voltage.	VLOW	-	1.10	1.25	1.40	V
Power switching voltage (VDD to VBAT)	VDB	$+25^\circ\text{C}$	2.328	2.40	2.472	V

REAL TIME CLOCK MODULE (I²C-Bus)

High-Stability

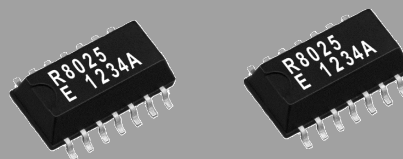
RX - 8025 SA

- Built-in 32.768 kHz crystal unit : Frequency adjusted for high accuracy ($\pm 5 \times 10^{-6}$ / $T_a = +25^\circ\text{C}$)
- Interface Type : I²C-Bus Interface (400 kHz)
- Operating voltage range : 1.70 V to 5.5 V
- Wide voltage for timekeeping : 1.15 V to 5.5 V
- Various detection Functions : Ex. Oscillation stop detection function
- Low backup current : 0.48 μA / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output with OE pin.
- The various functions include full calendar, Dual alarm, Periodic interruption.

* The I²C-Bus is a trademark of NXP Semiconductors



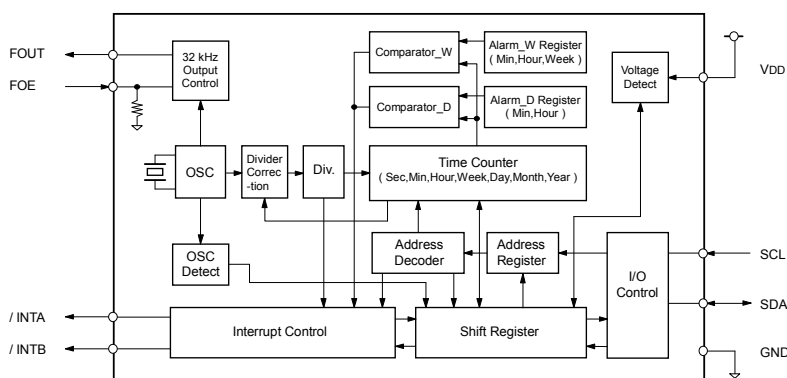
Product Number (Please contact us)
RX-8025SA AA : Q41802552000100
RX-8025SA AC : Q41802551000200



RX-8025SA

R8025
E 1234A

Block diagram



Overview

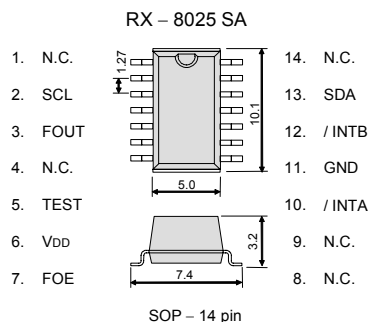
- **Features built-in 32.768 kHz crystal unit**
 - Frequency adjusted for high accuracy. ($\pm 5 \times 10^{-6}$ / $T_a = +25^\circ\text{C}$) (Equivalent to 13 seconds of monthly deviation)
- **The various detection function**
 - Power supply voltage monitoring function (with selectable detection threshold)
 - Stop detection function
 - Power-on reset detection function
- **Alarm function and Periodic interrupt function**
 - The periodic interrupt outputs. Dual Alarm function. (Date of the week, Hour, minute) (Month, Day, Hour, Minute)

Pin Function

Signal Name	Input / output	Function																					
SCL	Input	Serial clock input pin																					
SDA	Bi-directional	Data input and output pin																					
FOUT	Output	32.768 kHz clock output pin with the output control function. (C-MOS)																					
FOE	Input	<table><tr><th>FOE input</th><th>/CLEN1 bit</th><th>/CLEN2 bit</th><th>FOUT output</th></tr><tr><td>L</td><td>X</td><td>X</td><td>OFF (LOW)</td></tr><tr><td rowspan="4">H</td><td>0</td><td>0</td><td>32.768 kHz</td></tr><tr><td>0</td><td>1</td><td>32.768 kHz</td></tr><tr><td>1</td><td>0</td><td>32.768 kHz</td></tr><tr><td>1</td><td>1</td><td>OFF(LOW)</td></tr></table>	FOE input	/CLEN1 bit	/CLEN2 bit	FOUT output	L	X	X	OFF (LOW)	H	0	0	32.768 kHz	0	1	32.768 kHz	1	0	32.768 kHz	1	1	OFF(LOW)
FOE input	/CLEN1 bit	/CLEN2 bit	FOUT output																				
L	X	X	OFF (LOW)																				
H	0	0	32.768 kHz																				
	0	1	32.768 kHz																				
	1	0	32.768 kHz																				
	1	1	OFF(LOW)																				
/ INTA	Output	Interrupt output A pin (N-ch open drain)																					
/ INTB	Output	Interrupt output B pin (N-ch open drain)																					
TEST	—	* Used by the manufacture for testing. (Do not connect externally.)																					
Vdd	—	Connected to a positive power supply.																					
GND	—	Connected to a ground.																					

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.7	3.0	5.5	V
Clock voltage	VCLK	—	1.15	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Range	Unit
Frequency tolerance	$\Delta f/f$	$T_a = +25^\circ\text{C}$ VDD = 3.0 V	AA: 5 ± 5 *1) AC: 0 ± 5 *2)	$\times 10^{-6}$
Oscillation start-up time	tSTA	$T_a = +25^\circ\text{C}$ VDD = 2.0 V	1 Max.	s
Frequency voltage characteristics	f/V	$T_a = +25^\circ\text{C}$ VDD = 2.0 V to 5.5 V	± 1 Max.	$\times 10^{-6}$

*1) *2) Equivalent to 13 seconds of monthly deviation (excluding offset).

Current consumption characteristics

$T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	IBK	fSCL = 0Hz FOE = GND FOUT ; output OFF(LOW)	VDD = 5 V	-	0.60	1.80 μA
	I32k	fSCL = 0Hz VDD, FOE = 5.5 V FOUT ; output ON (Output=OPEN; CL = 0 pF)	VDD = 5.5 V	-	3.0	6.5 μA

Power supply detection voltage

$T_a = -30^\circ\text{C}$ to $+70^\circ\text{C}$

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
High-voltage mode	VDETH	VDD pin	1.90	2.10	2.30	V
Low-voltage mode	VDETL	VDD pin	1.15	1.30	1.45	V

**REAL TIME CLOCK MODULE (I²C-Bus)**

Built-in EEPROM and Unique ID-ROM

RX - 8731 LC

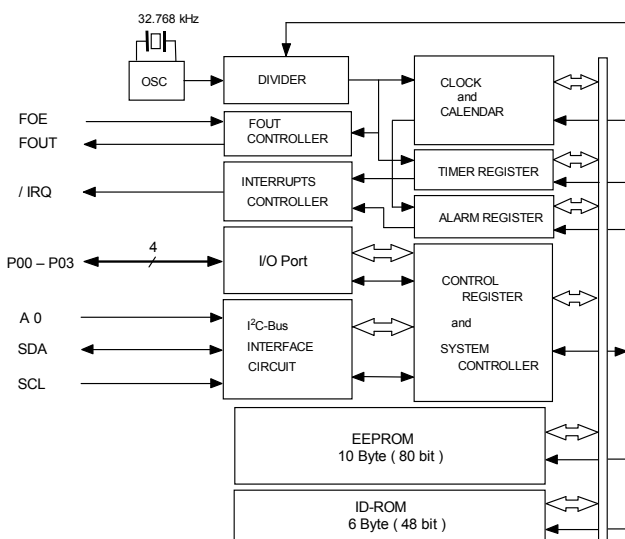
- Built in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : I²C-Bus interface (400 kHz)
- Operating voltage range : 1.7 V to 5.5 V
- Wide voltage for Timekeeping : 1.3 V to 5.5 V
- Low backup current : 0.35 μ A / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer.

* The I²C-Bus is a trademark of NXP Semiconductors

Product Number (Please contact us)
RX-8731LC : Q418731C2000100



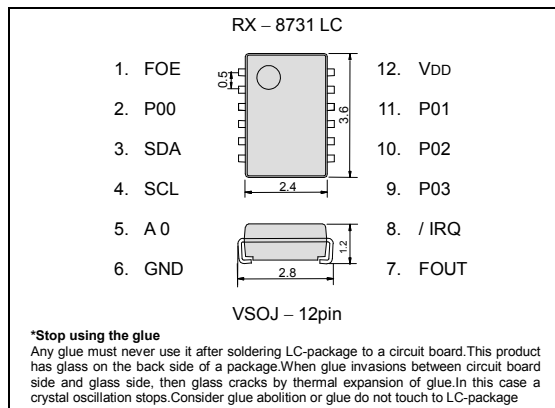
Actual size

**Block diagram****Overview**

- **Built in EEPROM and ID-ROM**
 - Built in 10 Byte (80 bit) EEPROM
 - Built in 6 Byte (48 bit) ID-ROM
- **Programmable I/O ports**
 - 4 Programmable I/O ports
- **Interface Type**
 - I²C-Bus high-speed bus specifications. (400 kHz)
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - FOE pin enables output on/off control.
 - Output frequency is selectable.
< 32.768 kHz, 1024 Hz, 1 Hz >
- **The various interrupt function**
 - Alarm interrupt function
 - Timer interrupt function
 - Update interrupt function

Pin Function

Signal Name	Input / Output	Function
SCL	Input	Serial Clock input pin.
SDA	Bi-directional	Data input and output pin.
A 0	Input	Device address A0 input pin.
FOUT	Output	FOUT pin is 32.768 kHz clock output pin (C-MOS) that output control is possible.
FOE	Input	FOE pin control the frequency output from FOUT pin with FSEL1-bit and FSEL0-bit.
/ IRQ	Output	Interrupt output pin. (N-ch open drain)
P00 P01 P02 P03	Bi-directional	Programmable I/O ports.
VDD	—	Connected to a positive power supply.
GND	—	Connected to a ground.

Terminal connection / External dimensions (Unit:mm)**Specifications (characteristics)**

* Refer to application manual for details.

Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	VDD	—	1.7	3.0	5.5	V
Clock voltage	VCLK	—	1.3	3.0	5.5	V
Operating temperature	TOPR	—	-40	+25	+85	°C

Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	Ta = +25 °C VDD = 3.0 V	B: 5 $\pm$ 23 *	$\times 10^{-6}$
Oscillation Start-up time	tSTA	Ta = +25 °C VDD = 1.6 V	1 Max.	s
		Ta = -40 °C to +85 °C VDD = 1.6 V	3 Max.	s

*Equivalent to 1 minute of monthly deviation

Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	IBK	fSCL = 0 Hz / IRQ = OFF	VDD = 5 V	-	0.45	μ A
		FOUT : output OFF (Hi - z)	VDD = 3 V	-	0.35	
	I32k	fSCL = 0 Hz / IRQ = OFF	VDD = 5 V	-	8.0	μ A
		FOUT : 32.768 kHz output CL = 30 pF	VDD = 3 V	-	5.0	

REAL TIME CLOCK MODULE (I²C-Bus)

RX - 8581 SA

- Built-in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : I²C-Bus Interface (400 kHz)
- Operating voltage range : 1.8 V to 5.5 V
- Wide Timekeeper voltage range : 1.6 V to 5.5 V
- Low backup current : 0.45 μ A / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer.

* The I²C-Bus is a trademark of NXP Semiconductors



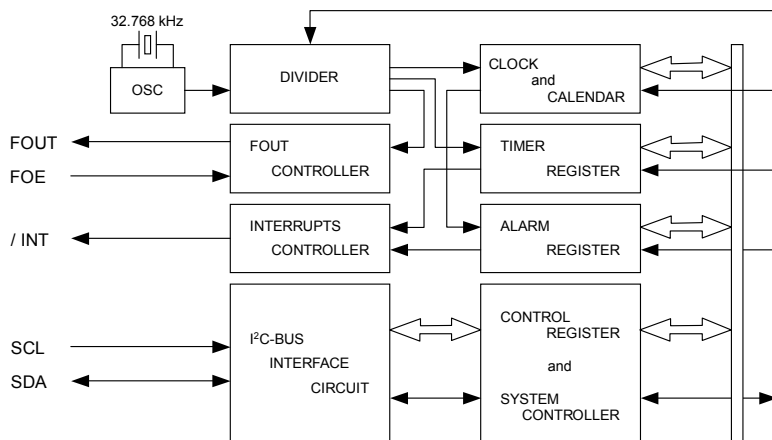
Product Number (Please contact us)
RX-8581SA : Q41858152000200



RX-8581SA

R8581
E 1234A

Block diagram



Overview

• Interface Type

- I²C-Bus interface. (Hi-speed bus specifications 400 kHz)
- * I²C-Bus slave address : read A3h and write A2h

• 32.768 kHz frequency output function

- FOUT pin output (C-MOS output), CL=30 pF
- 32.768 kHz clock frequency output. (Duty 50 ± 5 %)

• Timer function

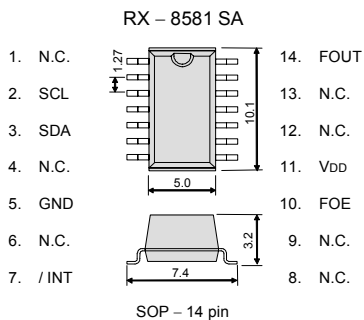
- Timer interrupt function can be set up between 1/4096 second and 4095 minutes.
- It is recorded automatic to TF-bit at the time of event occurrence, and possible to output with /TIRQ pin output (N-ch open-drain output).

• Interrupt function

- Alarm interrupt function, Time update interrupt function.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	V _{DD}	—	1.8	3.0	5.5	V
Clock voltage	V _{CLK}	—	1.6	3.0	5.5	V
Operating temperature	T _{OPR}	—	-40	+25	+85	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	T _a = +25 °C V _{DD} = 3.0 V	B: 5 ± 23 *	× 10 ⁻⁶
FOUT output Duty	tw / t	T _a = -40 °C to +85 °C V _{DD} = 2.4 V to 5.5 V	50 ± 5	%

* Please ask for tighter tolerance. (Equivalent to 1 minute of monthly deviation)

■ Current consumption characteristics

T_a = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	f _{SCL} = 0 Hz FOE = GND	V _{DD} = 5 V	-	0.65	1.2
		FOUT ; output OFF (LOW)	V _{DD} = 3 V	-	0.45	0.8
	I _{32k}	f _{SCL} = 0 Hz FOE = V _{DD}	V _{DD} = 5 V	-	8.0	20.0
		FOUT ; 32.768 kHz output ON CL = 30 pF	V _{DD} = 3 V	-	5.0	12.0

REAL TIME CLOCK MODULE (I²C-Bus)

For Automotive

Built-in 32.768 kHz-DTCXO, High Stability

RA 8804CE

Product Number (Please contact us)
RA8804CE : X1B000381Axxx00

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- Interface Type : I²C-Bus interface (400kHz)
- Interface voltage range : 1.6 V to 5.5 V
- Temp. compensated voltage range : 1.5 V to 5.5 V
- Timekeeping voltage range : 1.5 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions full calendar, alarm, timer, temp. event detect.
- Applications : Car audio, Car navigation system, Clock
- Conforms to AEC-Q100
- *The I²C-BUS is a trademark of NXP Semiconductors.

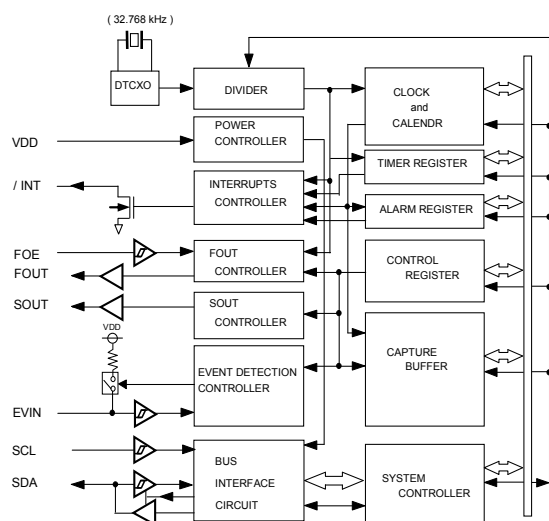
NEW

RA8804CE
(3.2 × 2.5 × 1.0 mm)

Actual size

RA8804CE

Block diagram



Overview

• High Stability

- XA
 $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
 $\pm 8.0 \times 10^{-6}$ / +85 °C to +105 °C
- XB
 $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
 $\pm 8.0 \times 10^{-6}$ / +85 °C to +105 °C

• 32.768 kHz frequency output function

- FOUT pin output (C-MOS output), CL=30 pF
- Output selectable: 32.768 kHz, 1024 Hz, 1 Hz

• Event detection function

- Event detection and capture the event detection time in the capture buffer.

• Timer function

- Timer source clock are 1min., 1sec., 64Hz, 4096Hz.
- 24-bit presettable counter

• Alarm function

- Alarm function can be set to day of week, day, hour, and minute.

• Internal state output function

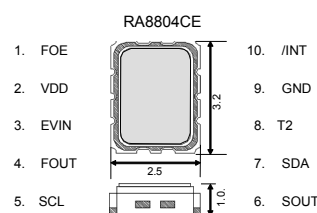
- SOUT pin output (C-MOS output),
- Outputting a state of the selected flag

Pin Function

Signal Name	I / O	Function
SOUT	Output	Internal state output pin.
SCL	Input	Serial clock input pin.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
EVIN	Input	Event input pin
VDD	-	Connected to a positive power supply
FOE	Input	The input pin for the FOUT output control.
/INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(VPP)	-	Use by the manufacture for testing. (Do not connect externally.)
SDA	I/O	Data input and output pin.

Terminal connection / External dimensions

(Unit:mm)



Specifications (characteristics)

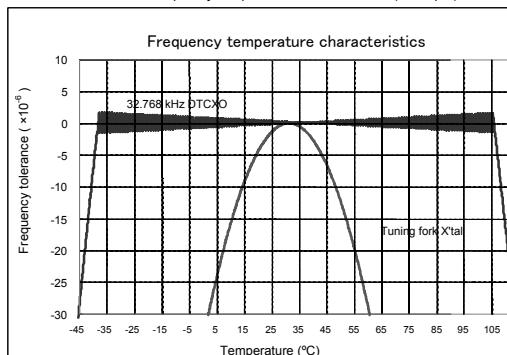
* Refer to application manual for details.

■ Electrical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating voltage	V _{DD}	Interface voltage	1.6	3.0	5.5	V
Temp. compensated Voltage	V _{TEM}	Temp. compensated voltage	1.5	3.0	5.5	V
Clock supply voltage	V _{CLK}	Internal clock	1.5	3.0	5.5	V
Operating temperature	T _{OPR}	No condensation	-40	+25	+105	°C
Stability	$\Delta f / f$	XA	Ta = -40 °C ~ +85 °C		$\pm 3.4^{*1}$	
			Ta = +85 °C ~ +105 °C		$\pm 8.0^{*2}$	
		XB	Ta = -40 °C ~ +85 °C		$\pm 5.0^{*3}$	
			Ta = +85 °C ~ +105 °C		$\pm 8.0^{*2}$	
Current consumption (1)	I _{DD1}	f _{SCL} =0Hz, /INT=V _{DD} , FOE=GND, FOUT: OFF	V _{DD} = 5V	-	0.4	1.6
Current consumption (2)	I _{DD2}	Temp. Compensation interval 2.0 s.	V _{DD} = 3V	-	0.35	1.5

^{*1}) Equivalent to 9 seconds of month deviation. ^{*2}) Equivalent to 21 seconds of month deviation. ^{*3}) Equivalent to 13 seconds of month deviation.

■ 32.768 kHz-DTCXO Frequency temperature characteristics (Example)



REAL TIME CLOCK MODULE (I²C-Bus)

For Automotive

Built-in 32.768 kHz-DTCXO, High Stability

and Power Switching

RA 8900 CE

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- Interface Type : I²C-Bus interface (400kHz)
- Interface voltage range : 2.5 V to 5.5 V
- Temp. compensated voltage range : 2.0 V to 5.5 V
- Timekeeping voltage range : 1.6 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions full calendar, alarm, timer, temp. sensor.
- Applications : Car audio, Car navigation system, Clock
- Conforms to AEC-Q200
- *The I²C-BUS is a trademark of NXP Semiconductors.



Product Number (Please contact us)
 RA8900CE UA : X1B000271A00400
 RA8900CE UB : X1B000271A00500
 RA8900CE UC : X1B000271A00600

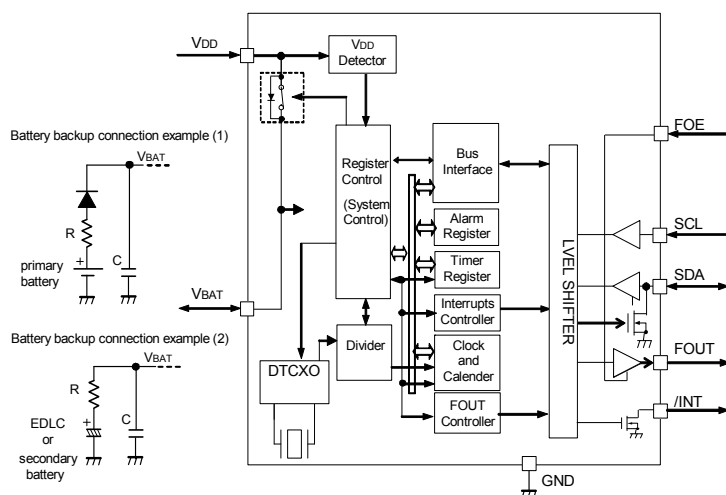


RA8900CE
 (3.2 × 2.5 × 1.0 mm)

Actual size

RA8900CE

Block diagram



Overview

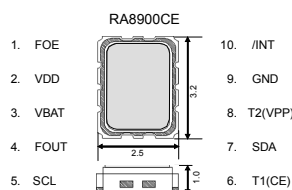
- **High Stability**
 - UA $\pm 3.4 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 9 seconds of month deviation)
 - UB $\pm 5.0 \times 10^{-6}$ / -40 °C to +85 °C
(Equivalent to 13 seconds of month deviation)
 - UC $\pm 5.0 \times 10^{-6}$ / -30 °C to +70 °C
(Equivalent to 13 seconds of month deviation)
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **Available automatic battery backup switch-over function**
 - Charge from VDD to backup battery connected to VBAT is possible. VDD voltage drop(VDET3) detection and automatically switches to the backup battery.
This circuit is optimal to backup with a secondary battery and a large capacitor.
- **Timer function**
 - Timer function can be set up between 1/4096 second and 4095 minutes.
- **Alarm function**
 - Alarm function can be set to day of week, day, hour, and minute.
- **Temp. sensor function**
 - The temperature data are output to a register by a temp. sensor function. (Bank_2_Add17h)

Pin Function

Signal Name	I / O	Function
T1(CE)	input	Use by the manufacture for testing. (Do not connect externally.)
SCL	input	Serial clock input pin.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
VBAT	-	Battery supply. This pin has charge capability to backup battery.
VDD	-	Connected to a positive power supply
FOE	input	The input pin for the FOUT output control.
/INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(VPP)	-	Use by the manufacture for testing. (Do not connect externally.)
SDA	I/O	Data input and output pin.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product.
 This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

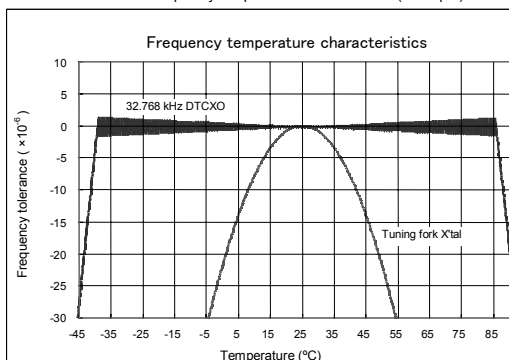
* Refer to application manual for details.

■ Electrical Characteristics

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit
Operating voltage	V _{DD}	Interface voltage		2.5	3.0	5.5	V
Temp. compensated Voltage	V _{TEM}	Temp. compensated voltage		2.0	3.0	5.5	V
Clock supply voltage	V _{CLK}	Internal clock		1.6	3.0	5.5	V
Operating temperature	T _{OPR}	No condensation		-40	+25	+85	°C
Stability	Δ f / f	UA	Ta = -40 °C to +85 °C	±3.4 *1		× 10 ⁻⁶	
		UB	Ta = -40 °C to +85 °C	±5.0 *2			
		UC	Ta = -30 °C to +70 °C				
Current consumption (1)	I _{DD1}	fSCL=0Hz, /INT=V _{DD} , FOE =GND V _{DD} =V _{BAT}	V _{DD} = 5V	-	0.72	1.5	μA
Current consumption (2)	I _{DD2}	FOUT: OFF Temp. Compensation interval 2.0 s.	V _{DD} = 3V	-	0.70	1.4	

*1) Equivalent to 9 seconds of month deviation. *2) Equivalent to 13 seconds of month deviation.

■ 32.768 kHz-DTCXO Frequency temperature characteristics (Example)





REAL TIME CLOCK MODULE (I²C-Bus)

For Automotive

Built-in 32.768 kHz-DTCXO, High Stability

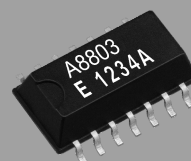
RA8803 SA

- Built in frequency adjusted 32.768 kHz crystal unit and DTCXO.
- 1/100s resolution Time register
- Interface Type : I²C-Bus interface (400kHz)
- Interface voltage range : 1.6 V to 5.5 V
- Temp. compensated voltage range : 2.2 V to 5.5 V
- Timekeeping voltage range : 1.6 V to 5.5 V
- Selectable clock output (32.768 kHz, 1024 Hz, 1 Hz)
- The various functions include full calendar, alarm, timer, EVIN input.
- Applications : Car audio, Car navigation system, Clock
- Conforms to AEC-Q200

*The I²C-BUS is a trademark of NXP Semiconductors.



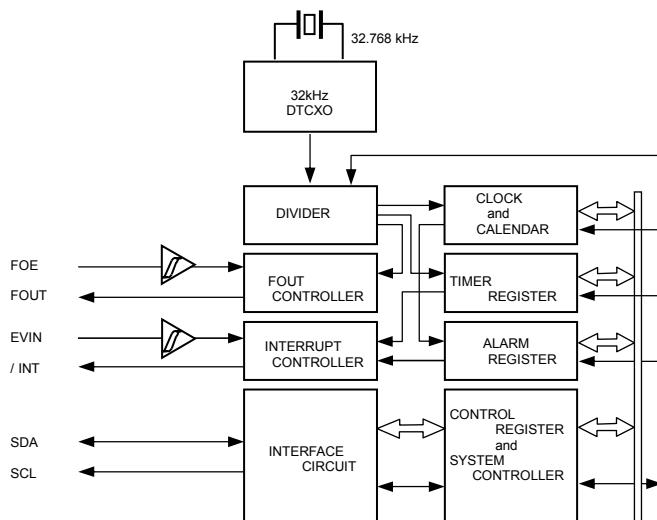
Product Number (Please contact us)
 RA8803SA UA: X1B000262A00100
 RA8803SA UB: X1B000262A00200
 RA8803SA UC: X1B000262A00300
 RA8803SA AA: X1B000262A00600



Actual size



Block diagram



Overview

- **High Stability**
 - UA $\pm 3.4 \times 10^{-6}$ / -40°C to $+85^{\circ}\text{C}$
(Equivalent to 9 seconds of month deviation)
 - UB $\pm 5.0 \times 10^{-6}$ / -40°C to $+85^{\circ}\text{C}$
(Equivalent to 13 seconds of month deviation)
 - UC $\pm 5.0 \times 10^{-6}$ / -30°C to $+70^{\circ}\text{C}$
 - AA $(\pm 5 \pm 5.0) \times 10^{-6}$ / $+25^{\circ}\text{C}$
- **High Resolution:** 1/100s Time register with capture buffer
- **32.768 kHz frequency output function**
 - FOUT pin output (C-MOS output), CL=30 pF
 - Output selectable: 32.768 kHz, 1024 Hz, 1 Hz
- **The various interrupt**
 - Timer Function can be set between 1/4096 second and 4095 minutes.
 - Alarm Function can be set to day of week, day, hour, or minute.
 - EVIN input.
- **Time synchronize function with 1PPS signal input**
- **Register compatibility:** upper compatible with RX-8801.

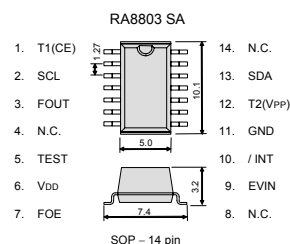
*It is possible to use it by the terminal connection as 32.768 kHz-DTCXO.

Pin Function

Signal Name	I / O	Function
T1(CE)	input	Use by the manufacture for testing. (Do not connect externally.)
SCL	input	Serial clock input pin.
FOUT	Output	The pin outputs the reference clock signal. (CMOS output)
TEST	input	Use by the manufacture for testing.
VDD	-	Connected to a positive power supply
FOE	input	The input pin for the FOUT output control.
EVIN	input	External event input.
/INT	Output	Interrupt output (N-ch. open drain).
GND	-	Connected to a ground
T2(VPP)	-	Use by the manufacture for testing. (Do not connect externally.)
SDA	I/O	Data input and output pin.

Terminal connection / External dimensions

(Unit:mm)



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

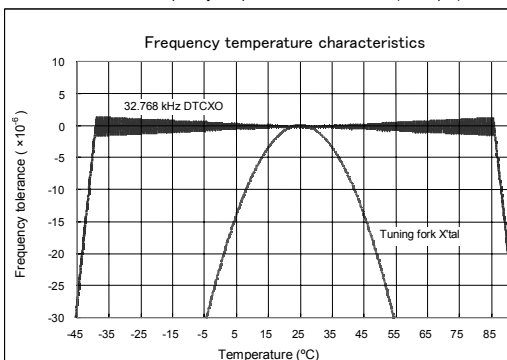
Electrical Characteristics

Item	Symbol	Conditions		Min.	Typ.	Max.	Unit
Operating voltage	V _{DD}	Interface voltage		1.6	3.0	5.5	V
Temp. compensated Voltage	V _{TEM}	Temp. compensated voltage		2.2	3.0	5.5	V
Clock supply voltage	V _{CLK}	-		1.6	3.0	5.5	V
Operating temperature	T _{OPR}	-		-40	+25	+85	°C
Stability	Δ f / f	UA	Ta = -40 °C to +85 °C	±3.4 *1			× 10 ⁻⁶
		UB	Ta = -40 °C to +85 °C	±5.0 *2			
		UC	Ta = -30 °C to +70 °C	±5.0 *2			
		AA	Ta = +25 °C	5 ±5.0 *3			
Current consumption (1)	I _{DD1}	Backup Mode FOE = GND, /INT = V _{DD} FOUT output : OFF	V _{DD} = 5V	-	0.75	3.4	μA
Current consumption (2)	I _{DD2}		V _{DD} = 3V	-	0.75	2.1	

*1) Equivalent to 9 seconds of month deviation. *2) Equivalent to 13 seconds of month deviation.

*3) Equivalent to 13 seconds of month deviation. (excluding offset)

32.768 kHz-DTCXO Frequency temperature characteristics (Example)

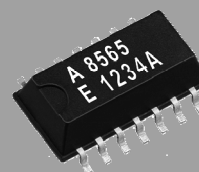


**REAL TIME CLOCK MODULE (I²C-Bus)
For Automotive**

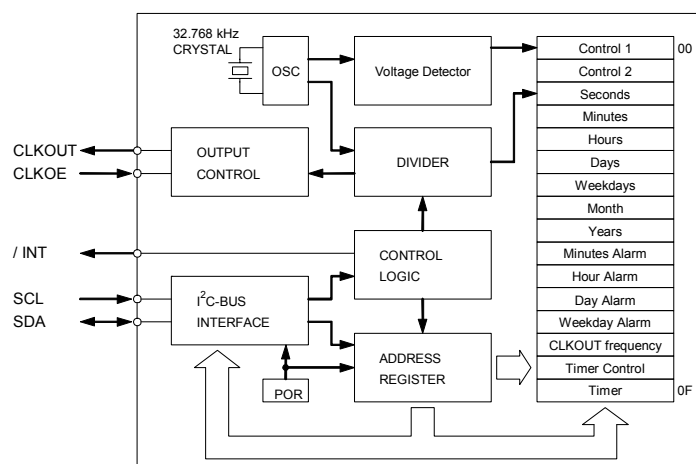
Extended operating temperature range (+125°C)

RA - 8565 SA

- Built in frequency adjusted 32.768 kHz crystal.
- Interface Type : I²C-Bus Interface (400 kHz)
- Wide operating voltage range : 1.8 V to 5.5 V
- Wide voltage for timekeeping. : 1.7 V to 5.5 V
- Extended operating temperature range : -40 °C to +125 °C
- 32.768 kHz frequency output function : N-ch Open drain output With Control Pin
- The various functions include full calendar, alarm, timer, etc.
- Applications : Car audio, Car navigation system, Clock, ECU sub clock
- Conforms to AEC-Q200
- * The I²C-Bus is a trademark of NXP Semiconductors

Product Number (Please contact us)
RA-8565SA : Q41A86552xxxx00

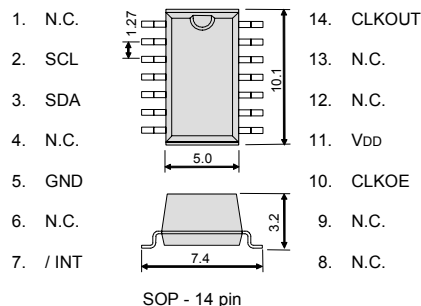
Actual size

**Block diagram****Overview**

- Wide operating temperature range for automotive
 - -40 °C to +125 °C
- Clocking-status detection function
 - It can judge the validity of data after backup operation return by a status of VL-bit.
- 32.768 kHz frequency output function
 - CLKOUT pin output (N-ch Open Drain output)
 - Output frequency can be selected as 32.768 kHz, 1024 Hz, 32 Hz, or 1 Hz.
- The various interrupt function
 - Timer function can be set up between 1/4096 second and 255 minutes.
 - Alarm function can be set to day of week, day, hour, or minute.

Pin Function

Signal Name	Directions	Functions
SCL	Input	Serial clock input.
SDA	Bi-directional	Data input and output.
CLKOUT	Output	The CLKOUT pin is a clock output (open drain output) pin with control output. (Output frequency can be selected as 32.768 kHz, 1024 Hz, 32 Hz, or 1 Hz.)
CLKOE	Input	The CLKOE pin is an input pin used to control the output mode of the CLKOUT output pin. During the initial power-on (when power is applied from 0 V) , if the CLKOE input pin is at high level (= H) , the power-on reset function selects 32.768 kHz as the frequency.
/INT	Output	Interrupts output by Alarm and Timer events. (Open drain output)
VDD	-	Connected to a positive power supply.
GND	-	Connected to a ground.

Terminal connection / External dimensions (Unit:mm)**RA - 8565 SA**

The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	unit
Operating voltage	VDD	-	1.8	3.0	5.5	V
Timekeeper voltage	VCLK	-	1.7	3.0	5.5	V
Operating temperature	TOPR	-	-40	+25	+125	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	unit
Frequency stability	$\Delta f / f$	Ta = +25 °C VDD = 3.0 V	B: 5 ± 23 *1	× 10 ⁻⁶
Oscillation start up time	tSTA	Ta = +25 °C VDD = 1.8 V	1.5 Max.	s
		Ta = -40 °C to +125 °C VDD = 3.0 V	3 Max.	s

*1) Equivalent to 1 minutes of monthly deviation.

■ Current consumption under backup mode.

Item	Symbol	Conditions	Min.	Typ.	Max.	unit
Standby current.	I _{bk}	f _{SCL} = 0 Hz CLKOE = LOW	-	+125 °C	1.10	1.8
		VDD = 5 V		-40 °C to +85 °C	0.60	1.2
		f _{SCL} = 0 Hz CLKOE = LOW	-	+125 °C	1.00	1.6
		VDD = 3 V		-40 °C to +85 °C	0.55	1.0

**REAL TIME CLOCK MODULE (I²C-Bus)**

For Automotive

RA - 8581 SA

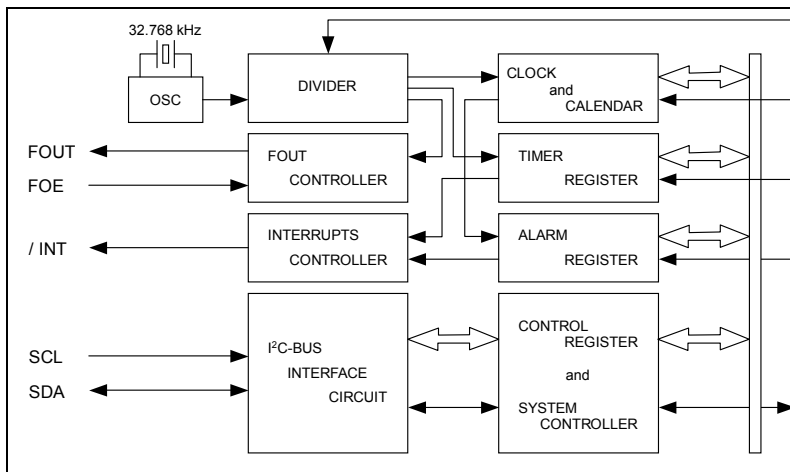
- Built-in frequency adjusted 32.768 kHz crystal unit.
- Interface Type : I²C-Bus Interface (400 kHz)
- Operating voltage range : 1.8 V to 5.5 V
- Wide Timekeeper voltage range : 1.6 V to 5.5 V
- Low backup current : 0.45 μ A / 3 V (Typ.)
- 32.768 kHz frequency output function : C-MOS output With Control Pin
- The various functions include full calendar, alarm, timer.
- Applications : Car audio, Car navigation system, Clock, ECU sub clock
- Conforms to AEC-Q200

* The I²C-Bus is a trademark of NXP Semiconductors

Product Number (Please contact us)
RA-8581SA : Q41A88152xxxx00



Actual size

A 8581A
E 1234A**Block diagram****Overview****• Interface Type**

- I²C-Bus interface. (Hi-speed bus specifications 400 kHz)
- * I²C-Bus slave address : read A3h and write A2h

• 32.768 kHz frequency output function

- FOUT pin output (C-MOS output), CL=30 pF
- 32.768 kHz clock frequency output. (Duty 50 $\pm$ 5%)

• Timer function

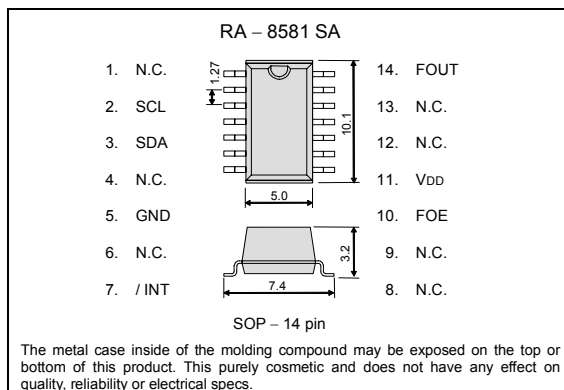
- Timer interrupt function can be set up between 1/4096 second and 4095 minutes.
- It is recorded automatic to TF-bit at the time of event occurrence, and possible to output with /TIRQ pin output (N-ch open-drain output).

• Interrupt function

- Alarm interrupt function, Time update interrupt function.

Pin Function

Signal Name	Input / Output	Function									
SCL	Input	Serial clock input pin									
SDA	Bi-directional	Data input and output pin									
FOUT	Output	FOUT pin outputs the reference clock signal at 32.768 kHz. FOE pin inputs the FOUT output control. <table><tr><th>FOE pin input</th><th colspan="2">FOUT pin output</th></tr><tr><td>HIGH</td><td>Output</td><td>(C-MOS)</td></tr><tr><td>LOW</td><td>OFF</td><td>(LOW)</td></tr></table>	FOE pin input	FOUT pin output		HIGH	Output	(C-MOS)	LOW	OFF	(LOW)
FOE pin input	FOUT pin output										
HIGH	Output	(C-MOS)									
LOW	OFF	(LOW)									
FOE	Input										
/INT	Output	Interrupt output (N-ch open drain)									
VDD	—	Connected to a positive power supply.									
GND	—	Connected to a ground.									

Terminal connection / External dimensions (Unit:mm)**Specifications (characteristics)**

* Refer to application manual for details.

■ Recommended Operating Conditions

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power voltage	V _{DD}	—	1.8	3.0	5.5	V
Clock voltage	V _{CLK}	—	1.6	3.0	5.5	V
Operating temperature	T _{OPR}	—	-40	+25	+85	°C

■ Frequency characteristics

Item	Symbol	Conditions	Rating	Unit
Frequency tolerance	$\Delta f / f$	Ta = +25 °C V _{DD} = 3.0 V	B: 5 $\pm$ 23 *	$\times 10^{-6}$
FOUT output Duty	tw / t	Ta = -40 °C to +85 °C V _{DD} = 2.4 V to 5.5 V	50 $\pm$ 5	%

* Equivalent to 1 minute of monthly deviation

■ Current consumption characteristics

Ta = -40 °C to +85 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Consumption	I _{BK}	f _{SCL} = 0 Hz FOE = GND FOUT ; Output OFF (LOW)	V _{DD} = 5 V	-	0.65	μ A
			V _{DD} = 3 V	-	0.45	
	I _{32k}	f _{SCL} = 0 Hz FOE = V _{DD} FOUT ; 32.768 kHz Output ON CL = 30 pF	V _{DD} = 5 V	-	8.0	μ A
			V _{DD} = 3 V	-	5.0	

REAL TIME CLOCK MODULE (4-bit)

RTC-72421 RTC-72423

- Built-in crystal unit allows adjustment-free efficient operation.
- 24 h / 12 h changeable and leap year automatically adjustable (Gregorian calendar).

Note

- 7242series does not have complete compatibility ability for the "old product RTC-6242 series".
- when replace to 7242series from 6242 series, confirm the technical information of RTC7242 latest manual by all means.



Product Number (Please contact us)

RTC-72421A : Q42724212000100

RTC-72421B : Q42724212000200

RTC-72423A : Q42724232000600

RTC-72423B : Q42724232000700



Actual size

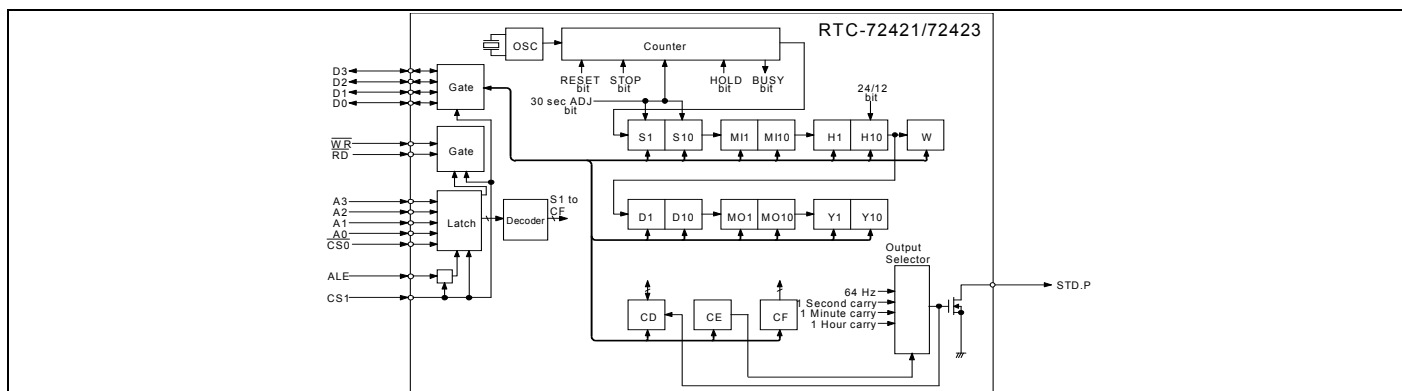
RTC-72421

RTC-72423

RTC72421 A
EPSON 1234A

RTC72423 A
EPSON 1234A

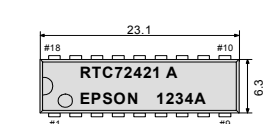
Block diagram



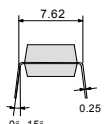
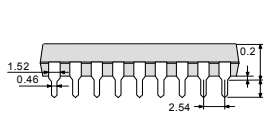
Terminal connection/External dimensions

(Unit:mm)

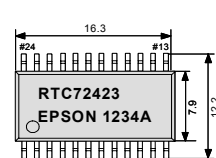
● RTC-72421 (DIP 18-pin)



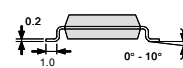
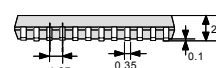
No.	Pin terminal	No.	Pin terminal
1	STD.P	18	VDD
2	/CS0	17	(VDD)
3	ALE	16	(VDD)
4	A0	15	CS1
5	A1	14	C0
6	A2	13	D1
7	A3	12	D2
8	/RD	11	D3
9	GND	10	/WR



● RTC-72423 (SOP 24-pin)



No.	Pin terminal	No.	Pin terminal
1	STD.P	24	VDD
2	/CS0	23	(VDD)
3	N.C.	22	(VDD)
4	ALE	21	N.C.
5	A0	20	CS1
6	N.C.	19	D0
7	A1	18	N.C.
8	N.C.	17	N.C.
9	A2	16	D1
10	A3	15	D2
11	/RD	14	D3
12	GND	13	/WR



The metal case inside of the molding compound may be exposed on the top or bottom of this product. This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Specifications (characteristics)

*Refer to application manual for details.

Absolute Max. rating

Item	Symbol	Conditions	Min.	Max.	Unit
Supply voltage	VDD	Ta=+25 °C	-0.3	+7.0	V
Input voltage	VIO	Ta=+25 °C	GND-0.3	VDD+0.3	V
Storage temperature *	TSTG	RTC-72421	-55	+85	°C
		RTC-72423	-55	+125	°C

*Stored as bare product after unpacking

Operating range

Item	Symbol	Conditions	Min.	Max.	Unit
Power voltage	VDD	—	4.5	5.5	V
Clock voltage	VCLK	—	2.0	5.5	V
Operating temperature	TOPR	RTC-72421	-10	+70	°C
		RTC-72423	-40	+85	°C

Stored as bare product after unpacking

Frequency characteristics

Item	Symbol	Conditions	Range	Unit
Frequency precision	Δf/f	Ta=+25 °C VDD=5.0 V	72421A ±10 72421B ±50 72423A ±20 72423B ±50	×10 ⁻⁶
Frequency temperature characteristics	TOP	-10 °C to +70 °C (+25 °C)	+10 / -120	ppm/°C
		-40 °C to +85 °C (+25 °C)	+10 / -220	ppm/°C
Frequency voltage characteristics	f/V	Ta=+25 °C, VDD=2.0 V to 5.5 V	±5.0 Max.	×10 ⁻⁶ /V
Aging	fa	Ta=+25 °C, VDD=5.0 V, First year	±5.0 Max.	×10 ⁻⁶ /year

DC characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Applicable terminal
Current consumption	ID01	CS1= 0 V Exclude input/output current	—	1	10	μA	—
	ID02	VDD=5 V VDD=2 V	—	0.9	5	μA	—
HIGH input voltage (1)	VIH1	—	2.2	—	—	V	All inputs other than CS1
LOW input voltage (1)	VIL1	—	—	—	0.8	V	D0 to D3, STD.P
LOW output voltage (1)	VOL1	IOL=2.5 mA	—	—	0.4	V	D0 to D3
HIGH output voltage	VOH	IOH=-400 μA	2.4	—	—	V	D0 to D3
LOW output voltage (2)	VOL2	IOL=2.5 mA	—	—	0.4	V	STD.P
OFF leak current	IOFLK	V1=VDD/0 V	—	—	10/-10	μA	Input other than D0 to D3, STD.P
Input capacity	C1	Input frequency 1 MHz	—	10	20	pF	D0 to D3, STD.P
HIGH input voltage (2)	VIH2	VDD=2.0 V to 5.5 V	4/5 VDD	—	—	V	CS1
LOW input voltage (2)	VIL2	—	—	—	1/5 VDD	V	Input other than D0 to D3, STD.P
Input leak current (1)	ILK1	V1=VDD/0 V	—	—	1/-1	μA	D0 to D3
Input leak current (2)	ILK2	—	—	—	10/-10	μA	D0 to D3



► Transmitter Module

P	Model	Actual size (mm)	Feature	Operating temperature	Supply voltage	Current consumption (Max.)
127	SR3225SAA (AEC-Q200)	  3.2×2.5×1.0 (t: Typ.)	UHF range wireless transmitter module. 300 ~ 400 MHz (0.25 kHz step) 600 ~ 930 MHz (0.49 kHz step) Modulation types: ASK / OOK / FSK SPI interface	-40 to +85 °C	1.8 V to 3.6V	16 mA

RF Transmitter Module SR3225SAA



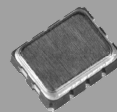
Product Number (please contact us)
SR3225SAA: X1G00479xxxxx00

SR3225SAA is a wireless transmitter module for UHF range. Crystal resonator, oscillator, PLL and Power Amp are integrated in 3.2 mm x 2.5 mm ceramic package.

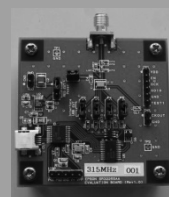
The wireless transmission function can be configured by connect to the external control devices. It is suitable for small wireless transmitter. The evaluation kit is available.

Application

- Remote Keyless Entry, Passive Entry
- Short range radio data transmitter
- Garage door opener
- Transmitter for RFID tag



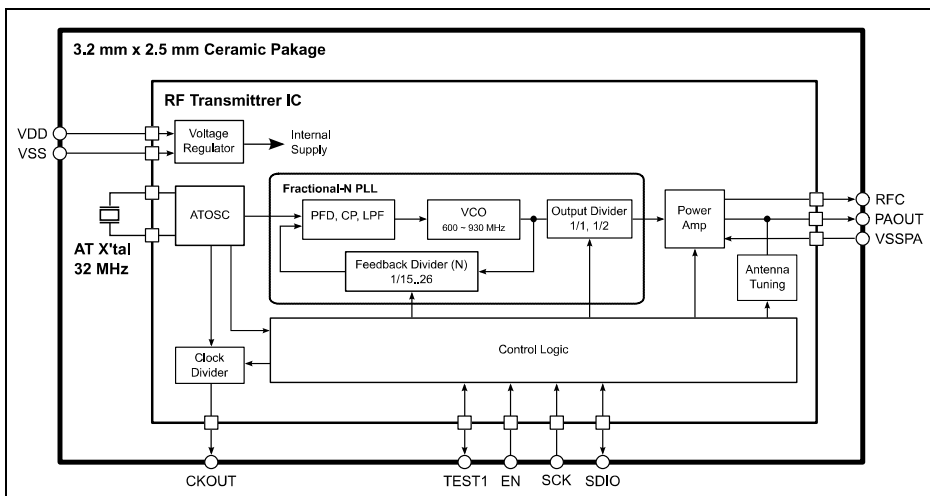
Actual size



Overview

- Carrier frequency bands:
300 MHz ~ 465 MHz (0.25 kHz Step),
600 MHz ~ 930 MHz (0.49 kHz Step)
- $\Delta\Sigma$ fractional-N based PLL
- Programmable Power Amp output power:
-15 ~ 11 dBm, 128 steps
- Modulation types: ASK/OOK/FSK with
Soft-ASK and/or Soft FSK shaping
- 3-wire/4-wire SPI interface
- SFR (Special Function Register)
- Embedded 32 MHz crystal resonator and
oscillation circuit
- Programmable clock output via CKOUT
- Programmable voltage threshold of Under
Voltage Detection: 4 steps (1.8 V ~ 2.4 V)
- Fail-Safe mechanism (PLL Loss of Lock,
VCO auto-calibration error, Under Voltage
Detection)

Block diagram

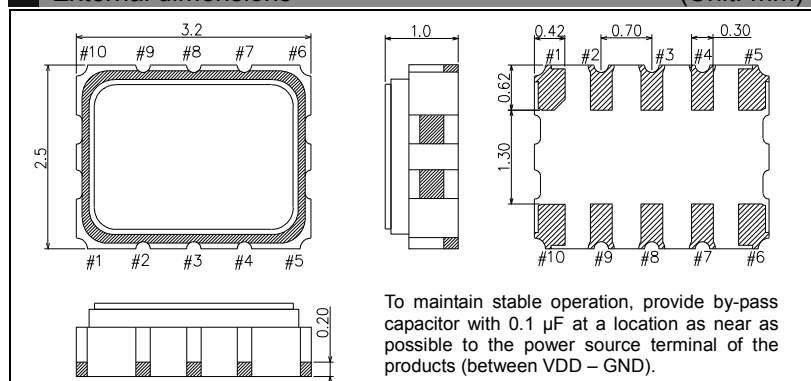


Specification (characteristics)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	VDD	-	1.8	3.0	3.6	V
Operation temperature	Ta	-	-40	-	+85	°C
Storage temperature	Tstg	-	-40	-	+125	°C
Supply current Powerdown Mode	IDD _{PD}	VDD = 3.0 V, Ta = +25 °C	-	20	100	nA
Supply current Transmitter-Active Mode	IDD _{TMA}	F _{TX} = 315 MHz, Pout = 5 dBm,	-	10.0	11.0	mA
		F _{TX} = 315 MHz, Pout = 8 dBm,	-	12.7	13.7	
		F _{TX} = 315 MHz, Pout = 10 dBm,	-	15.0	16.0	
Carrier frequency bands	F _{TX}	-	300	-	465	MHz
		-	600	-	930	
ASK Bit rate	R _{ASK}	NRZ	-	-	100	kbps
FSK Bit rate	R _{FSK}	NRZ	-	-	50	kbps
Crystal frequency tolerance	F _{TOL}	Ta = +25 °C, without aging	-2	-	2	ppm
Crystal temperature variation	F _{TC}	-40 °C ~ +85 °C	-20	-	20	ppm
Nominal output power	P _{OUT}	Ta = +25 °C, VDD = 3.0 V, F _{TX} = 315 MHz, HPWR = 1, AM* = 0x3F	10	11	12	dBm
		Ta = +25 °C, VDD = 3.0 V, F _{TX} = 315 MHz, HPWR = 0, AM* = 0x01	-16	-15	-14	

External dimensions

(Unit: mm)

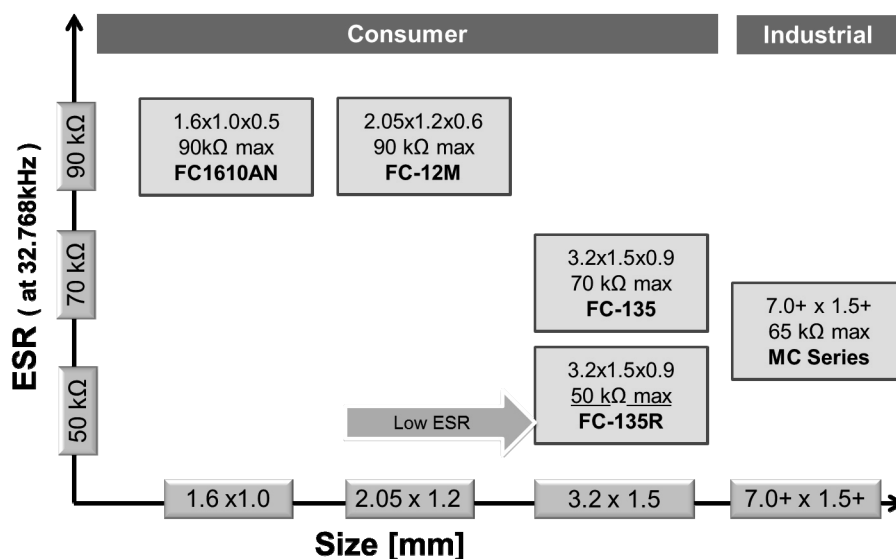


Pin descriptions

Pin No.	Pin Name	Function
1	TEST1	Test, Transmission data input or SPI interface data output
2	EN	Enable input or SPI interface chip select
3	SCK	SPI interface clock input
4	SDIO	SPI data input / output or Transmission data input
5	CKOUT	Clock output
6	VSSPA	GND for Power Amp
7	PAOUT	Power Amp output
8	RFC	RF choke coil connect pin
9	VDD	Positive power supply
10	VSS	GND

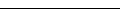
Crystal Unit

kHz Crystal Product Mapping



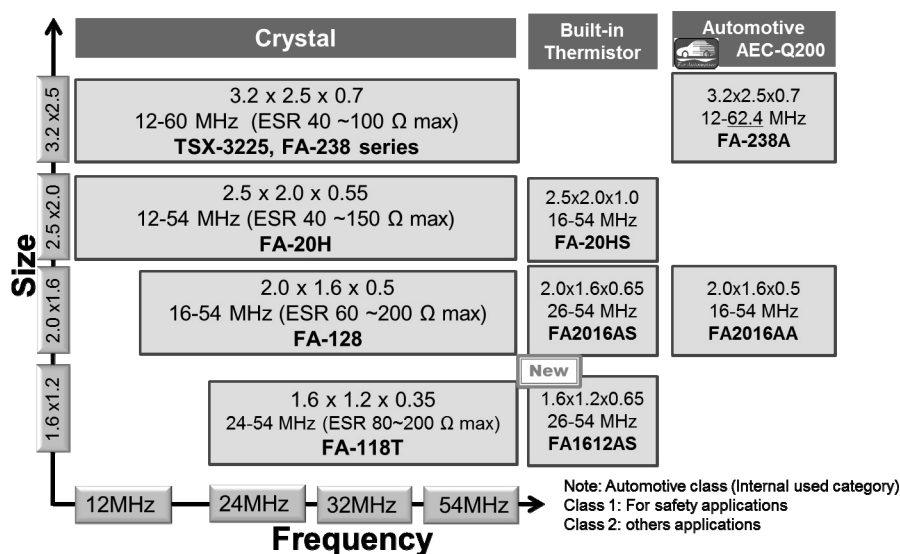
► kHz range crystal unit

*Please Contact us regarding available frequency other than 32.768 kHz.

Notes: Contact us regarding available frequency error than 32.768 kHz													
P	Model	Actual size (mm) t Max.	Nominal frequency range					Frequency tolerance (Standard)	Motional resistance (Max.)	Load capacitance (Standard)	Storage temperature	Operating temperature	Frequency vs. .temperature characteristics
			20	32	100	200	300	f _{tol} (× 10 ⁻⁶)	R1	CL	T_stg	T_use	Turnover Temperature (+25 °C Typ.)
132	FC1610AN	 1.6×1.0×0.5		 32.768 kHz				±20	90 kΩ	9 pF 12.5 pF	-55 °C to +125 °C	-40 °C to +85 °C	Parabolic coefficient (B): -0.04 × 10 ⁻⁶ / °C ² Max. f _{tem} =B (Tl-θx) ²
133	FC-12M	 2.05×1.2×0.6		 32.768 kHz				±20 ±30	90 kΩ 90 kΩ to 65 kΩ	12.5 pF			
Web site	FC-12D	 2.05×1.25×0.35		 32.768 kHz				±20	75 kΩ	7 pF 9 pF 12.5 pF			
134	FC-135R	 3.2×1.5×0.9		 32.768 kHz				±20	50 kΩ	7 pF 9 pF 12.5 pF			
	FC-135			 32.768 kHz					70 kΩ				
					 32 kHz 77.5 kHz								
135	MC-146	 7.0×1.5×1.4		 32.768 kHz				±20 ±50	65 kΩ	7 pF 9 pF 12.5 pF			
Web Site	MC-156	 7.1×3.3×1.5		 32.768 kHz				±20 ±50	65 kΩ				
				 32 kHz 100 kHz				±50 ±100	65 kΩ to 25 kΩ				
136	MC-306	 8.0×3.8×2.54		 32.768 kHz				±20 ±50	50 kΩ	12.5 pF			
Web Site	MC-405 MC-406	 10.41×4.06×3.6		 32.768 kHz				±20 ±50	50 kΩ				
				 20 kHz 120 kHz				±50 ±100	55 kΩ to 12 kΩ				
Web Site	C-002RX			 32.768 kHz				±20	50 kΩ 60 kΩ	6 pF to ∞	-20 °C to +70 °C	-10 °C to +60 °C	Parabolic coefficient (B): -0.04 × 10 ⁻⁶ / °C ² Max. f _{tem} =B (Tl-θx) ²
	C-2 TYPE	 Φ2.0		 20 kHz 120 kHz				±20 ±50 ±100	55 kΩ to 12 kΩ				
	C-004R			 32.768 kHz				±20	50 kΩ				
	C-4 TYPE	 Φ1.5		 32 kHz 120 kHz				±50 ±100	55 kΩ to 15 kΩ				
	C-005R	 Φ1.2		 32.768 kHz				±20	50 kΩ				

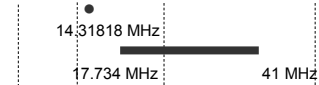
► kHz range crystal unit (For Automotive)
***Please Contact us regarding available frequency other than 32.768 kHz.**

P	Model	Actual size (mm) t Max.	Nominal frequency range					Frequency tolerance (Standard)	Motional resistance (Max.)	Load capacitance (Standard)	Storage temperature	Operating temperature	Frequency vs. temperature characteristics
			(kHz)					f_tol (× 10 ⁻⁶)	R1	CL	T_stg	T_use	Turnover Temperature (+25 °C Typ.)
			20	32	100	200	300						
137	FC-13A (AEC-Q200)	 3.2×1.5×0.9						±20 ±30 ±50	70 kΩ	9 pF 12.5 pF	-55 °C to +125 °C	-40 °C to +125 °C	Parabolic coefficient (B):
138	MC-30A (AEC-Q200)	 8.0×3.8×2.54						±20 ±50 ±50 ±100	50 kΩ 55 kΩ to 12 kΩ	12.5 pF		-40 °C to +85 °C	-0.04 × 10 ⁻⁶ / °C ² Max. f_tem =B (Tl-θx) ²

MHz Crystal Product Mapping

► MHz range crystal unit

MHz range crystal unit													
P	Model	Actual size (mm) t Max.	Nominal frequency range				Frequency tolerance (Standard)	Frequency vs. temperature characteristics (Operating temperature)	Motional resistance (Max.)	Load Capacitance (Standard)	Storage temperature	Operating temperature	
			(MHz)										f_tol (× 10 ⁻⁶)
139	FA-118T	 1.6×1.2×0.35								80 Ω to 200 Ω	6 pF to ∞	-40 °C to +125 °C	-40 °C to +85 °C
Web site	FA2016AN	 2.0×1.6×0.5								60 Ω to 80 Ω			
140	FA-128	 2.0×1.6×0.5								60 Ω to 200 Ω			
141	FA-20H	 2.5×2.0×0.55								40 Ω to 150 Ω			
142	FA-238V	 3.2×2.5×0.7								80 Ω to 100 Ω	7 pF to ∞		
	FA-238	 3.2×2.5×0.7								40 Ω to 80 Ω			
	TSX-3225	 3.2×2.5×0.6								40 Ω to 60 Ω			

▶ MHz range crystal unit

P	Model	Actual size (mm) t Max.	Nominal frequency range				Frequency tolerance (Standard)	Frequency vs. temperature characteristics (Operating temperature)	Motional resistance (Max.)	Load Capacitance (Standard)	Storage temperature	Operating temperature
			(MHz)									
			1	10	20	64	f_tol (× 10 ⁻⁶)	f_tem (× 10 ⁻⁶)	R1	CL	T_stg	T_use
Web Site	MA-306	 8.0×3.8×2.54					±50	±30 (-20 °C to +70 °C)	60 Ω	10 pF to ∞	-55 °C to +100 °C	-20 °C to +70 °C
Web Site	MA-406	 11.7×4.8×3.7	 (30 MHz 以上 3rd overtone mode.)				±50	±30 ±50 (-20 °C to +70 °C)	40 Ω to 150 Ω	基本波: 10 pF to ∞ 3rd Overtone: 5 pF to ∞	-55 °C to +125 °C	
	MA-505 MA-506	 13.46×5.08×4.6										
Web Site	CA-301	 Φ3.1					±30 (±50) (±100)				-40 °C to +85 °C	

*8.0 MHz < f < 8.2 MHz : Unavailable.

Available frequency from 4 MHz to less than 5.5 MHz

(4 MHz , 4.032 MHz , 4.096 MHz , 4.19 MHz , 4.194304 MHz , 4.433619 MHz , 4.5 MHz , 4.8 MHz , 4.9152 MHz)

▶ MHz range crystal unit (Built-in Thermistor)

P	Model	Actual size (mm) t Max.	Nominal frequency range				Frequency tolerance (Standard)	Frequency vs. temperature characteristics (Operating temperature)	Motional resistance (Max.)	Load Capacitance (Standard)	Storage temperature	Operating temperature
			(MHz)									
143	FA1612AS	 1.6×1.2×0.65 (Built-in thermistor)			 26 MHz 54 MHz		±10	±12 (-30 °C to +85 °C)	80 Ω to 200 Ω	6 pF to ∞	-40 °C to +125 °C	-40 °C to +85 °C
144	FA2016AS	 2.0×1.6×0.65 (Built-in thermistor)			 26 MHz 54 MHz				60 Ω to 200 Ω			
Web site	FA-128S	 2.0×1.6×0.9 (Built-in thermistor)							50 Ω to 150 Ω			
145	FA-20HS	 2.5×2.0×1.0 (Built-in thermistor)			 16 MHz 54 MHz							

▶ MHz range crystal unit (For Automotive)

P	Model	Actual size (mm) t Max.	Nominal frequency range				Frequency tolerance (Standard)	Frequency vs. temperature characteristics (Operating temperature)	Motional resistance (Max.)	Load Capacitance (Standard)	Storage temperature	Operating temperature
			(MHz)									
			1	10	20	64	f_tol (× 10 ⁻⁶)	f_tem (× 10 ⁻⁶)	R1	CL	T_stg	T_use
146	FA2016AA (AEC-Q200)	 2.0×1.6×0.5			16 MHz	54 MHz	±10	±20 (-40 °C to +85 °C) ±50 (-40 °C to +125 °C)	40 Ω to 200 Ω	6 pF to ∞	-40 °C to +125 °C	-40 °C to +125 °C
147	FA-238A (AEC-Q200)	 3.2×2.5×0.7			12 MHz	62.4 MHz	±15 to ±50	±30 (-40 °C to +85 °C) ±50 (-40 °C to +125 °C)	50 Ω to 120 Ω	7 pF to ∞	-40 °C to +125 °C	-40 °C to +125 °C

► SAW Resonator

P	Model	Actual size (mm) t Typ.	Nominal frequency range	Frequency tolerance (Standard)	Frequency vs. temperature characteristics		Motional Resistance (Max.) R1	Storage temperature T_stg	Operating temperature T_use
			(MHz) 200 500 700 1000	f_tol (× 10 ⁻⁶)	Parabolic coefficient (B):	Turnover temperature (Ti):			
148	NS-21R	 2.5×2.0×0.86	 300 MHz 500 MHz	±50 ±100 ±150	-(1.6±0.4) × 10 ⁻⁶ / °C ²	+20 °C	20 Ω	-40 °C to +85 °C	-40 °C to +85 °C
Web Site	NS-32R	 3.8×3.8×0.98	 312 MHz 870 MHz	±50 ±100	-(1.6±0.4) × 10 ⁻⁶ / °C ²	+25 °C	30 Ω		
	FS-335	 3.8×3.8×0.98	 300 MHz 870 MHz	±50 ±100	-(3.4±0.8) × 10 ⁻⁶ / °C ²	+25 °C	25 Ω to 40 Ω		
	FS-555	 4.8×5.2×1.5	 230 MHz 500 MHz	±50 ±100	-(3.4±0.8) × 10 ⁻⁶ / °C ²	+25 °C	25 Ω to 40 Ω		

► SAW Filter

P	Model	Actual size (mm) t Typ.	Nominal frequency range	Pass bandwidth	Insertion Loss	Storage temperature	Operating temperature
			(MHz) 200 500 700 1000	P_Bw	IL (Max.)	T_stg	T_use
Web site	FF-555	 4.8×5.2×1.5	 300 MHz 500 MHz	0.2 MHz	3.5 dB	-55 °C to +125 °C	-40 °C to +85 °C
Web site	FF-32N	 3.8×3.8×0.98	 300 MHz 500 MHz	0.4 MHz	3.5 dB	-55 °C to +125 °C	-40 °C to +85 °C
			● 426 MHz, 429 MHz 帯	0.6 MHz	3.5 dB		-10 °C to +60 °C



kHz RANGE CRYSTAL UNIT

FC1610AN

- Frequency range : 32.768 kHz
- External dimensions : 1.65 × 1.05 × 0.5 mm
- Overtone order : Fundamental
- Applications : Small communications devices



Product Number (please contact us)
X1A000121xxxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Nominal frequency range	f _{nom}	32.768 kHz	
Storage temperature	T _{stg}	-55 °C to +125 °C	Storage as single product.
Operating temperature	T _{use}	-40 °C to +85 °C	
Level of drive	DL	0.1 μW Typ. (0.5 μW Max.)	
Frequency tolerance (standard)	f _{tol}	±20 × 10 ⁻⁶	+25 °C, DL=0.1 μW
Turnover temperature	Ti	+25 °C ±5 °C	
Load capacitance	CL	9 pF, 12.5 pF	Please specify
Motional resistance (ESR)	R ₁	90 kΩ Max.	
Frequency aging	f _{age}	±3 × 10 ⁻⁶ / year Max.	+25 °C, First year

Product name FC1610AN 32.768000kHz 12.5 +20.0-20.0

(Standard form)

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①Model

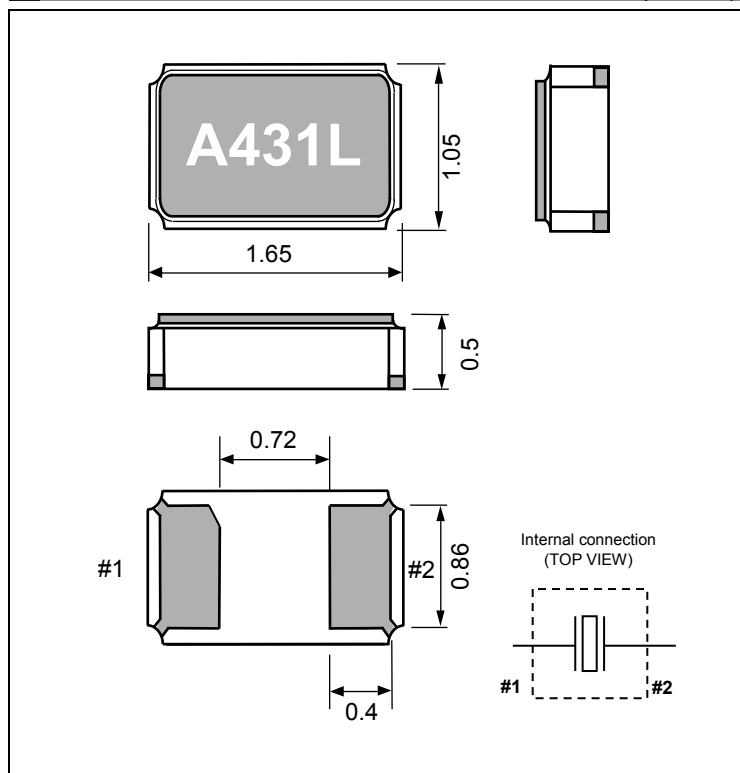
②Frequency

③Load capacitance(pF)

④Frequency tolerance(×10⁻⁶, +25 °C)

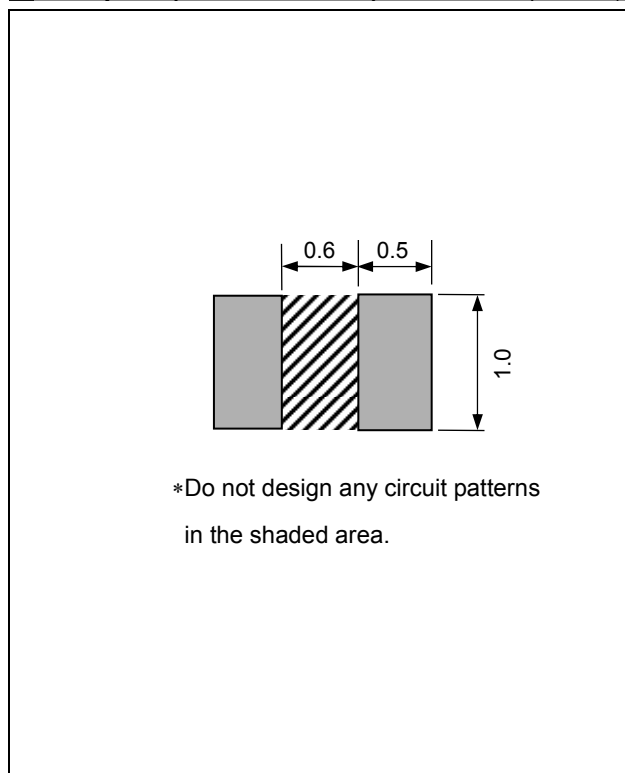
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





kHz RANGE CRYSTAL UNIT

FC - 12M

- Frequency range : 32.768 kHz (32 kHz to 77.5 kHz)
- External dimensions : $2.05 \times 1.2 \times 0.6$ mm
- Overtone order : Fundamental
- Applications : Small devices



Product Number (please contact us)
X1A0000x1xxxx00



Actual size

FC-12M

Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
Nominal frequency range	f_nom	32.768 kHz	32 kHz to 77.5 kHz	Please contact us about available frequencies.
Storage temperature	T_stg	-55 °C to +125 °C		Storage as single product.
Operating temperature	T_use	-40 °C to +85 °C		
Level of drive	DL	0.5 µW Max.		
Frequency tolerance (standard)	f_tol	$\pm 20 \times 10^{-6}$ $\pm 30 \times 10^{-6}$		+25 °C, DL=0.1 µW Please ask for tighter tolerance
Turnover temperature	Ti	+25 °C $\pm$ 5 °C		
Load capacitance	CL	12.5pF		Please specify
Motional resistance (ESR)	R1	90 kΩ Max.	90 kΩ to 65 kΩ	
Frequency aging	f_age	$\pm 3 \times 10^{-6}$ / year Max.		+25 °C, First year

Product name FC-12M 32.768000kHz 12.5 +20.0-20.0

(Standard form)

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①Model

②Frequency

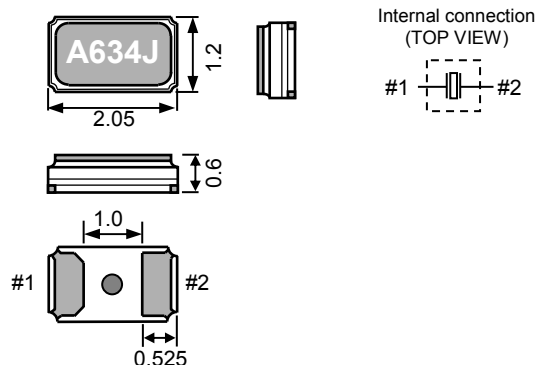
③Load capacitance(pF)

④Frequency tolerance($\times 10^{-6}$, +25 °C)

External dimensions

(Unit: mm)

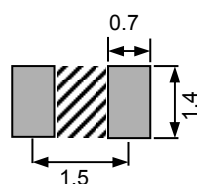
FC-12M



Footprint (Recommended)

(Unit: mm)

FC-12M



*Do not design any circuit patterns in the shaded area.



kHz RANGE CRYSTAL UNIT

FC - 135R / FC - 135

- Frequency range : 32.768 kHz (32 kHz to 100 kHz)
- External dimensions : 3.2 × 1.5 × 0.80 mm ...FC-135R/FC-135
- Overtone order : Fundamental
- Applications : Small communications devices



Product Number (please contact us)

FC-135R : X1A000141xxxx00

FC-135 : Q1xFC1350xxxx00



Actual size

FC-135R/FC-135

A0912

Specifications (characteristics)

Item	Symbol	Specifications			Conditions / Remarks
		FC-135R	FC-135		
Nominal frequency range	f_nom	32.768 kHz	32.768 kHz	32 kHz to 77.5 kHz	Please contact us about available frequencies.
Storage temperature	T_stg	-55 °C to +125 °C			Storage as single product.
Operating temperature	T_use	-40 °C to +85 °C (+105 °C)			Please contact us about +85 °C < T_use
Level of drive	DL	0.5 μW (1.0 μW Max.)			Please contact us if you require 1.0μW Max.
Frequency tolerance (standard)	f_tol	±20 × 10 ⁻⁶			+25 °C, DL=0.1 μW Please ask for tighter tolerance
Turnover temperature	Ti	+25 °C ±5 °C			
Load capacitance	CL	7 pF, 9 pF, 12.5 pF			Please specify
Motional resistance (ESR)	R1	50 kΩ Max.	70 kΩ Max.	70 kΩ to 45 kΩ	
Frequency aging	f_age	±3 × 10 ⁻⁶ / year Max.			+25 °C, First year

Product name FC-135R 32.768000kHz 12.5 +20.0-20.0

(Standard form)

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①Model

②Frequency

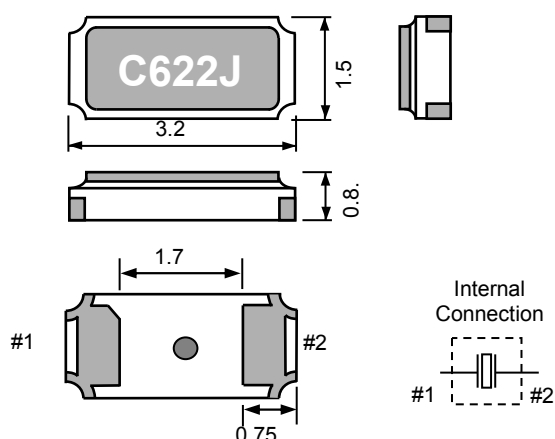
③Load capacitance(pF)

④Frequency tolerance(× 10⁻⁶, +25 °C)

External dimensions

(Unit:mm)

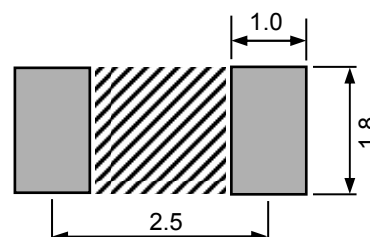
FC-135R / FC-135



Footprint (Recommended)

(Unit:mm)

FC-135R / FC-135



*Do not design any circuit patterns in the shaded area.



kHz RANGE CRYSTAL UNIT

MC - 146

- Frequency range : 32.768 kHz (32 kHz to 100 kHz)
- External dimension : 7.0 × 1.5 × 1.4 mm
- Overtone order : Fundamental
- Applications : Small communications devices



Product Number (please contact us)
MC-146 : Q1xMC1462xxxx0X



MC-146

Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
Nominal frequency range	f_nom	32.768 kHz	32 kHz to 100 kHz	Please contact us about available frequencies.
Storage temperature	T_stg	-55 °C to +125 °C		Storage as single product.
Operating temperature	T_use	-40 °C to +85 °C		
Level of drive	DL	1.0 μW Max.		Operating Drive level 0.5 μW Max.
Frequency tolerance (standard)	f_tol	$\pm 20 \times 10^{-6}$, $\pm 50 \times 10^{-6}$	$\pm 50 \times 10^{-6}$, $\pm 100 \times 10^{-6}$	+25 °C, DL=0.1 μW
Turnover temperature	Ti	+25 °C $\pm$ 5 °C		
Load capacitance	CL	7 pF, 9 pF, 12.5 pF		Please specify
Motional resistance (ESR)	R1	65 kΩ Max.	65 kΩ to 25 kΩ	
Frequency aging	f_age	$\pm 3 \times 10^{-6}$ / year Max.	$\pm 5 \times 10^{-6}$ / year Max.	+25 °C, First year

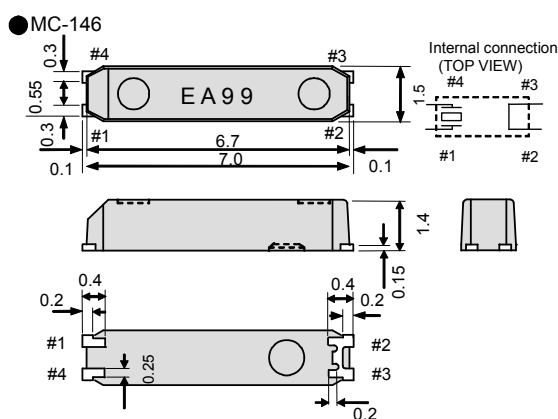
Product name MC-146 32.768000kHz 12.5 +20.0-20.0

(Standard form)

① Model ② Frequency ③ Load capacitance(pF) ④ Frequency tolerance($\times 10^{-6}$, +25 °C)

External dimensions

(Unit:mm)

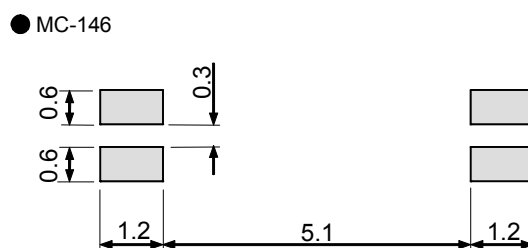


Do not connect #2 and #3 to external device.

The metal case inside of the molding compound may be exposed on the top or bottom of this product.
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Footprint (Recommended)

(Unit:mm)



kHz RANGE CRYSTAL UNIT

MC - 306

- Frequency range : 32.768 kHz (20 kHz to 120 kHz)
- Thickness : 8.0 × 3.8 × 2.54 mm
- Overtone order : Fundamental
- Applications : Clock and Microcomputer



Product Number (please contact us)
MC-306 : Q1xMC3062xxxx00



MC-306



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
Nominal frequency range	f _{nom}	32.768 kHz	20 kHz to 120 kHz	Please contact us about available frequencies.
Storage temperature	T _{stg}	-55 °C to +125 °C		Storage as single product.
Operating temperature	T _{use}	-40 °C to +85 °C		
Level of drive	DL	1.0 μW Max.		
Frequency tolerance (standard)	f _{tol}	±20 × 10 ⁻⁶ , ±50 × 10 ⁻⁶	±50 × 10 ⁻⁶ , ±100 × 10 ⁻⁶	+25 °C, DL=0.1 μW
Turnover temperature	T _i	+25 °C ±5 °C		
Load capacitance	CL	6 pF to ∞ (standard :12.5 pF)		Please specify
Motional resistance (ESR)	R ₁	50 kΩ Max.	As per table below	
Frequency aging	f _{age}	±3 × 10 ⁻⁶ / year Max.	±5 × 10 ⁻⁶ / year Max.	+25 °C, First year

Motional resistance (ESR)

Frequency	20 kHz ≤ f _{nom} < 31.2 kHz	31.2 kHz ≤ f _{nom} < 40 kHz	40 kHz ≤ f _{nom} < 90 kHz	90 kHz ≤ f _{nom} ≤ 120 kHz
Motional resistance	55 kΩ Max.	35 kΩ Max.	20 kΩ Max.	12 kΩ Max.

Product name MC-306 32.768000kHz 12.5 +20.0-20.0

(Standard form)

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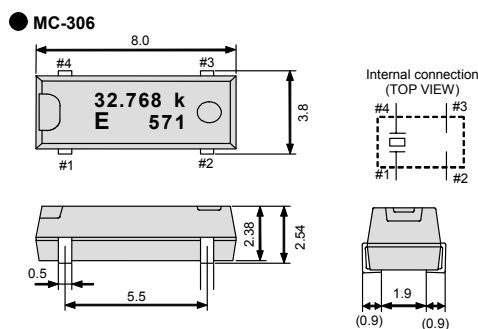
③

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①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× 10⁻⁶, +25 °C)

External dimensions

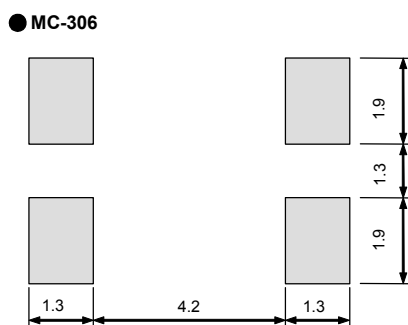
(Unit:mm)



Do not connect #2 and #3 to external device.
The metal case inside of the molding compound may be exposed on the top or bottom of this product.
This purely cosmetic and does not have any effect on quality, reliability or electrical specs.

Footprint (Recommended)

(Unit:mm)





kHz RANGE CRYSTAL UNIT For Automotive



Product Number (please contact us)
X1A000091xxx00

FC-13A

- Frequency range : 32.768 kHz
- External dimensions : 3.2 × 1.5 × 0.9 mm
- Overtone order : Fundamental
- Applications : Car audio, ECU sub clock,
Car navigation system, Clock
- Conforms to AEC-Q200



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Nominal frequency range	f _{nom}	32.768 kHz	
Storage temperature	T _{stg}	-55 °C to +125 °C	Storage as single product.
Operating temperature	T _{use}	-40 °C to +125 °C	
Level of drive	DL	0.5 μW (1.0 μW Max.)	Please contact us if you require 1.0μW Max.
Frequency tolerance (standard)	f _{tol}	±20 × 10 ⁻⁶ , ±30 × 10 ⁻⁶ , ±50 × 10 ⁻⁶	+25 °C, DL=0.1 μW
Turnover temperature	Ti	+25 °C ±5 °C	
Load capacitance	CL	9 pF, 12.5 pF	Please specify
Motional resistance (ESR)	R1	70 kΩ Max.	
Frequency aging	f _{age}	±3 × 10 ⁻⁶ / year Max.	+25 °C, First year

Product name FC-13A 32.768000kHz 12.5 +20.0-20.0

(Standard form)

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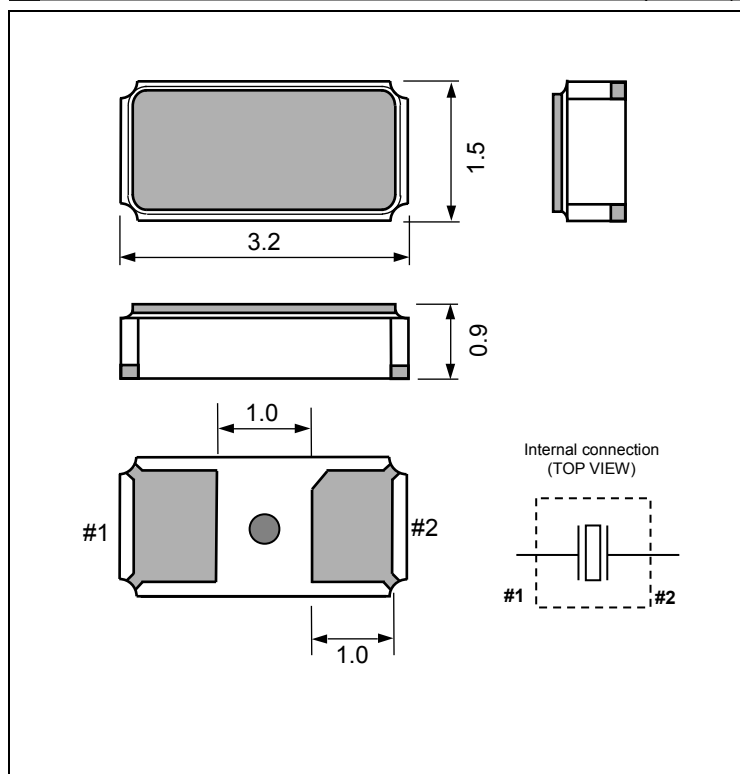
③

④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(×10⁻⁶, +25 °C)

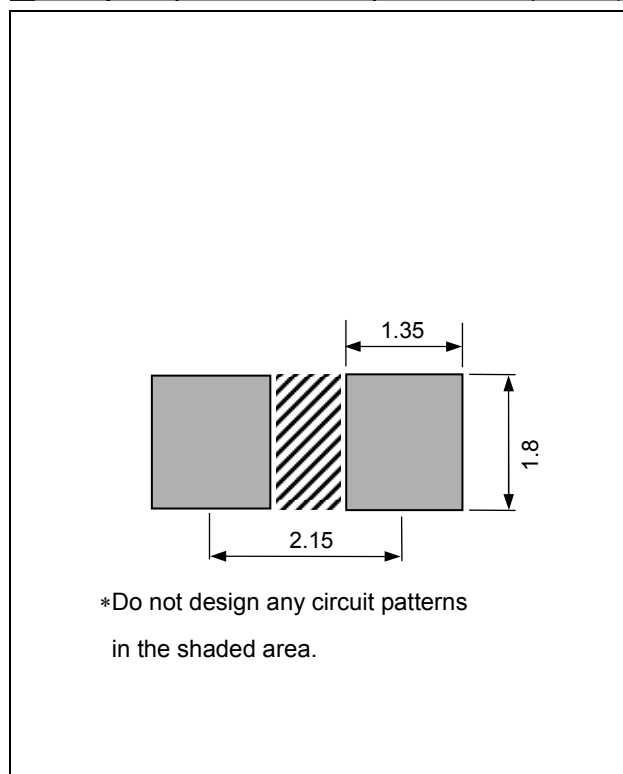
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





kHz RANGE CRYSTAL UNIT For Automotive



Product Number (please contact us)
Q1xMC30A2xxxx00

MC - 30A

- Frequency range : 32.768 kHz (20 kHz to 120 kHz)
- External dimensions : 8.0 × 3.8 × 2.54 mm
- Overtone order : Fundamental
- Applications : Car audio, ECU sub clock,
Car navigation system, Clock
- Conforms to AEC-Q200



Actual size



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
Nominal frequency range	f_nom	32.768 kHz	20 kHz to 120 kHz	Please contact us about available frequencies.
Storage temperature	T_stg	-55 °C to +125 °C		Storage as single product.
Operating temperature	T_use	-40 °C to +85 °C		
Level of drive	DL	1.0 μW Max.		
Frequency tolerance (standard)	f_tol	±20 × 10 ⁻⁶ , ±50 × 10 ⁻⁶	±50 × 10 ⁻⁶ , ±100 × 10 ⁻⁶	+25 °C, DL=0.1 μW
Turnover temperature	Ti	+25 °C ±5 °C		
Load capacitance	CL	6 pF to ∞ (standard : 12.5 pF)		Please specify
Motional resistance (ESR)	R ₁	50 kΩ Max.	As per table below	
Frequency aging	f_age	±3 × 10 ⁻⁶ / year Max.	±5 × 10 ⁻⁶ / year Max.	+25 °C, First year

Motional resistance (ESR)

Frequency	20 kHz ≤ f_nom < 31.2 kHz	31.2 kHz ≤ f_nom < 40 kHz	40 kHz ≤ f_nom < 90 kHz	90 kHz ≤ f_nom ≤ 120 kHz
Motional resistance	55 kΩ Max.	35 kΩ Max.	20 kΩ Max.	12 kΩ Max.

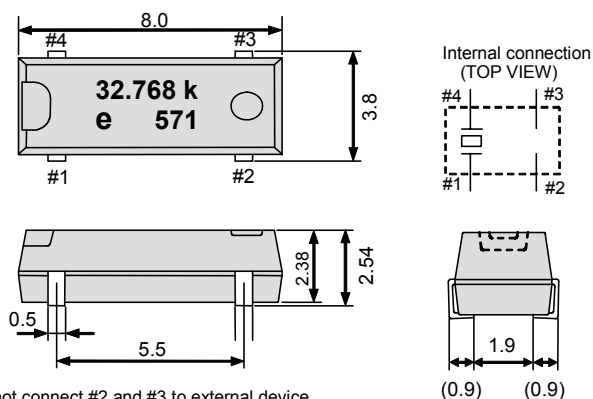
Product name MC-30A 32.768000kHz 12.5 +20.0-20.0

(Standard form)

① Model ② Frequency ③ Load capacitance(pF) ④ Frequency tolerance(× 10⁻⁶, +25 °C)

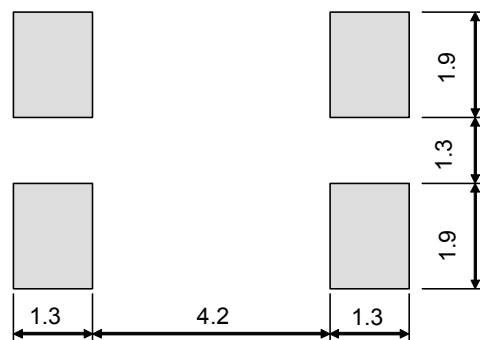
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

FA-118T

- Nominal frequency range : 24 MHz to 54 MHz
- External dimensions : 1.6 × 1.2 × 0.35 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU



Product Number (please contact us)
FA-118T : X1E000251xxxx26



Actual size

Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		For RF Reference	For Clock	
Nominal frequency range	f_nom	24.000 MHz to 54.000 MHz		Fundamental Please contact us about available frequencies.
Storage temperature range	T_stg	-40 °C to +125 °C		Storage as single product.
Operating temperature range	T_use	-40 °C to +85 °C		
Level of drive	DL	100 μW Max.	200 μW Max.	Recommended: 1 μW to 100 μW
Frequency tolerance (standard)	f_tol	$\pm 10 \times 10^{-6} *$	$\pm 30 \times 10^{-6}$	+25 °C, Please contact us for requirements not listed In this specifications.
Frequency versus temperature characteristics (standard)	f_tem	$\pm 12 \times 10^{-6} *$	$\pm 30 \times 10^{-6}$	-20 °C to +75 °C, Please contact us for requirements not listed In this specifications.
Load capacitance	CL	6 pF to ∞		Please specify.
Motional resistance (ESR)	R1	As per table below		-20 °C to +75 °C
Frequency aging	f_age	$\pm 1 \times 10^{-6}$ / year Max.	$\pm 5 \times 10^{-6}$ / year Max.	+25 °C, First year

*1 Please contact us for available frequency tolerances as they are dependent upon the nominal frequency.

Motional resistance (ESR)

Frequency	Motional resistance
24.0 MHz ≤ f_nom < 32.0 MHz	200 Ω Max.
32.0 MHz ≤ f_nom < 36.0 MHz	100 Ω Max.
36.0 MHz ≤ f_nom ≤ 54.0 MHz	80 Ω Max.

Product name FA-118T 24.000000MHz 12.0 +10.0-10.0

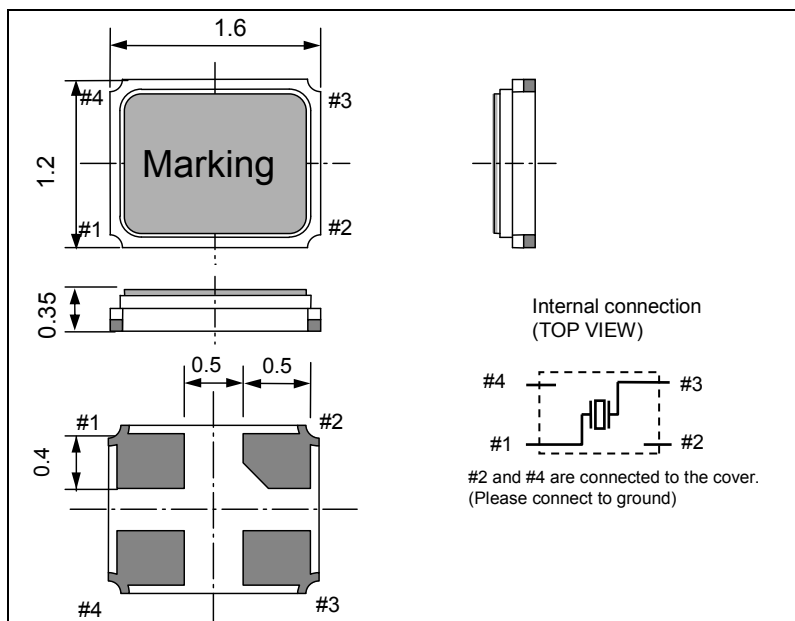
(Standard form)

① Model ② Frequency ③ Load capacitance(pF) ④ Frequency tolerance($\times 10^{-6}$, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

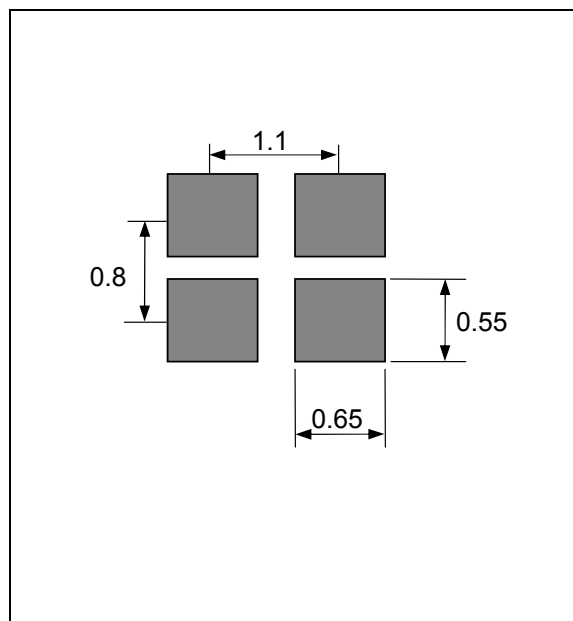
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

FA-128

- Nominal frequency range : 16 MHz to 54 MHz
- External dimensions : 2.0 × 1.6 × 0.5 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU



Product Number (please contact us)
Q22FA1280xxxx18



Actual size

Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		For RF Reference	For Clock	
Nominal frequency range	f_nom	16.000 MHz to 54.000 MHz		Fundamental Please contact us about available frequencies.
Storage temperature range	T_stg	-40 °C to +125 °C		Storage as single product.
Operating temperature range	T_use	-40 °C to +85 °C (+105 °C)		Please contact us about +85 °C < T_use
Level of drive	DL	100 μW Max.	200 μW Max.	Recommended: 1 to 100 μW
Frequency tolerance (standard)	f_tol	±10 × 10 ⁻⁶ *1	±30 × 10 ⁻⁶	+25 °C, Please contact us for requirements not listed in this specifications.
Frequency versus temperature characteristics (standard)	f_tem	±10 × 10 ⁻⁶ *1	±30 × 10 ⁻⁶	-20 °C to +75 °C, Please contact us for requirements not listed in this specifications.
Load capacitance	CL	6 pF to ∞		Please specify.
Motional resistance (ESR)	R1	As per table below		-20 °C to +75 °C
Frequency aging	f_age	±1 × 10 ⁻⁶ / year Max.	±5 × 10 ⁻⁶ / year Max.	+25 °C, First year

*1 Please contact us for available frequency tolerances as they are dependent upon the nominal frequency.

Motional resistance (ESR)

Frequency	Motional resistance
16.0 MHz ≤ f_nom < 18.0 MHz	200 Ω Max.
18.0 MHz ≤ f_nom < 20.0 MHz	150 Ω Max.
20.0 MHz ≤ f_nom < 24.0 MHz	100 Ω Max.
24.0 MHz ≤ f_nom < 26.0 MHz	80 Ω Max.
26.0 MHz ≤ f_nom ≤ 54.0 MHz	60 Ω Max.

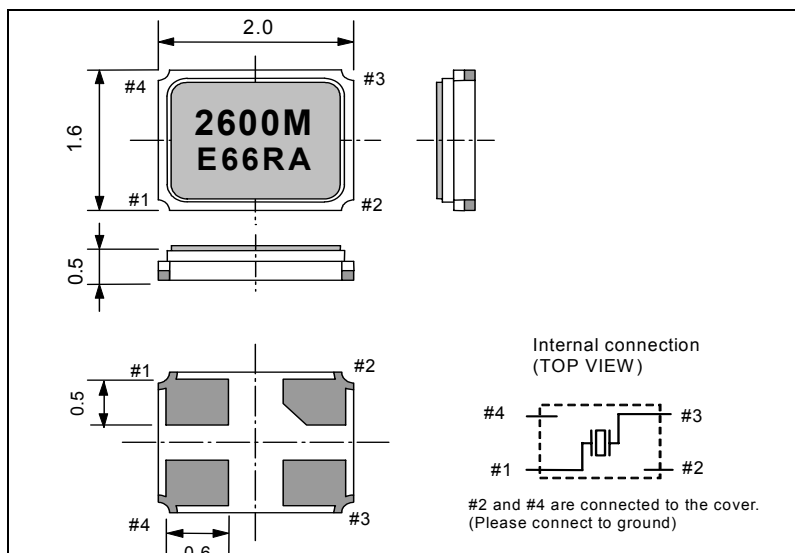
Product name FA-128 24.000000MHz 12.0 +10.0-10.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× 10⁻⁶, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

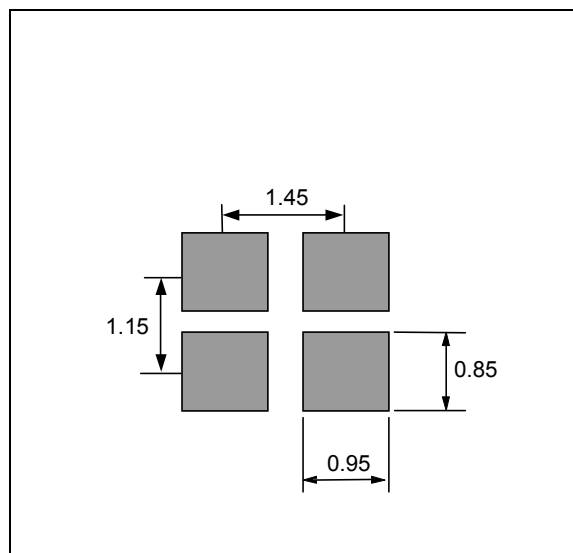
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

FA - 20H

- Nominal frequency range : 12 MHz to 54 MHz
- External dimensions : 2.5× 2.0×0.55 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU



Product Number (please contact us)
Q24FA20H0xxx18



Actual size



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		For RF Reference	For Clock	
Nominal frequency range	f _{nom}	12.000 MHz to 54.000 MHz		Fundamental Please contact us about available frequencies.
Storage temperature range	T _{stg}	-40 °C to +125 °C		Storage as single product.
Operating temperature range	T _{use}	-40 °C to +85 °C (+105 °C)		Please contact us about +85 °C < T _{use}
Level of drive	DL	100 μW Max.	200 μW Max.	Recommended: 1 μW to 100 μW
Frequency tolerance	f _{tol}	±10 × 10 ⁻⁶	±30 × 10 ⁻⁶	+25 °C Please contact us for inquiries.
Frequency versus temperature characteristics	f _{tem}	±10 × 10 ⁻⁶	±30 × 10 ⁻⁶	-20 °C to +75 °C Please contact us for inquiries.
Load capacitance	CL	6 pF to ∞		Please specify.
Motional resistance (ESR)	R ₁	As per table below		-20 °C to +75 °C
Frequency aging	f _{age}	±1 × 10 ⁻⁶ to ±3 × 10 ⁻⁶ / year Max. *1		+25 °C, First year

*1 Please contact us for available frequency tolerances as they are dependent upon the nominal frequency.

Motional resistance (ESR)

Frequency	Motional resistance
12.0 MHz ≤ f _{nom} < 16.0 MHz	150 Ω Max.
16.0 MHz ≤ f _{nom} ≤ 25.0 MHz	80 Ω Max.
25.0 MHz < f _{nom} ≤ 30.0 MHz	60 Ω Max.
30.0 MHz < f _{nom} ≤ 35.0 MHz	50 Ω Max.
35.0 MHz < f _{nom} ≤ 54.0 MHz	40 Ω Max.

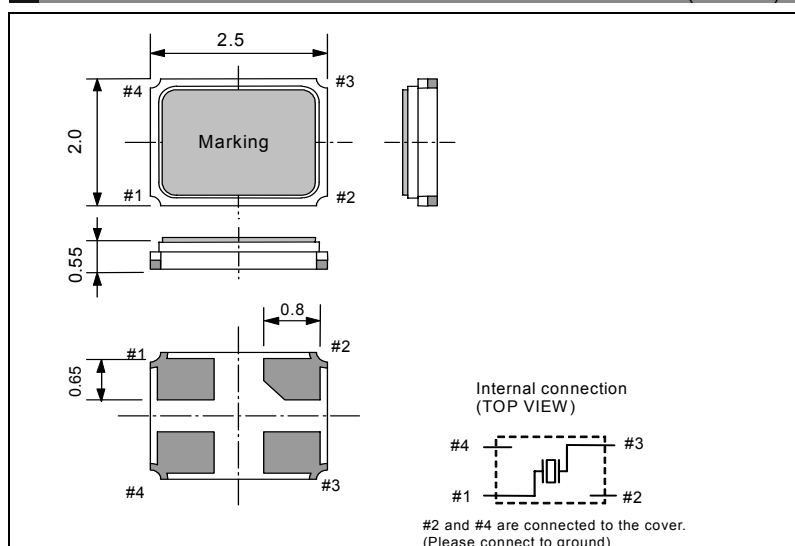
Product name FA-20H 24.000000MHz 12.0 +10.0-10.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× 10⁻⁶, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

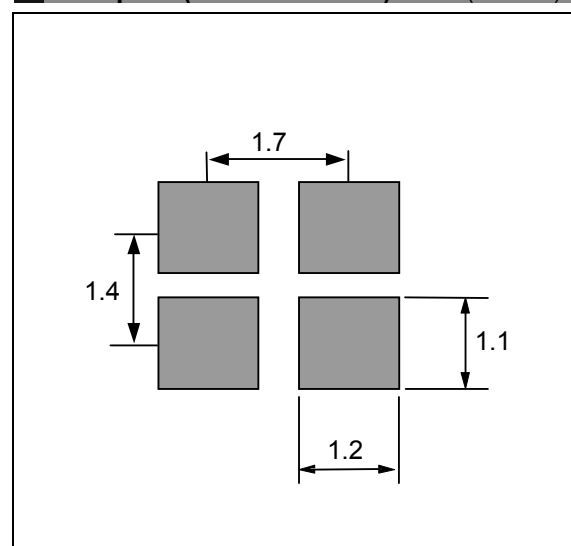
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

FA-238V / FA-238
TSX-3225

- Frequency range : 12 MHz to 60 MHz (FA-238, FA-238V)
- External dimensions : 3.2 × 2.5 × 0.6 mm ... TSX-3225
- : 3.2 × 2.5 × 0.7 mm ... FA-238V / FA-238
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
- ISM band radio, Clock for MPU

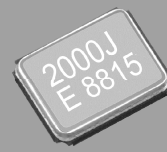


Product Number (please contact us)

FA-238V : Q22FA23V0xxxx17

FA-238 : Q22FA2380xxxx17

TSX-3225 : X1E000021xxxx17



Actual size

FA-238V / FA-238

TSX-3225

Specifications (characteristics)

Item	Symbol	For Clock		For RF Reference	Conditions / Remarks
		FA-238V	FA-238	TSX-3225	
Nominal frequency range	f_nom	12.000 MHz to 15.999 MHz	16.000 MHz to 60.000 MHz	16.000 MHz to 48.000 MHz	Fundamental *1 Please contact us about available frequencies.
Storage temperature	T_stg	-40 °C to +125 °C			Storage as single product.
Operating temperature	T_use	-40 °C to +85 °C (+105 °C)			Please contact us about +85 °C < T_use
Level of drive	DL	200 µW Max.			Recommended: 1 to 100 µW
Frequency tolerance	f_tol	±50 × 10 ⁻⁶ (standard), (±15 × 10 ⁻⁶ to ±50 × 10 ⁻⁶ is available)		±10 × 10 ⁻⁶	+25 °C Please contact us for requirements not listed in this specifications. *1
Frequency versus temperature characteristics	f_tem	±30 × 10 ⁻⁶ / -20 °C to +70 °C		±10 × 10 ⁻⁶ / -20 °C to +75 °C	Please contact us for requirements not listed in this specifications. *1
Load capacitance	CL	7 pF to ∞			Please specify.
Motional resistance (ESR)	R ₁	As per table below		As per table below	-40 °C to +85 °C, DL = 100 µW
Frequency aging	f_age	±5 × 10 ⁻⁶ / year Max.		±1 × 10 ⁻⁶ / year Max.*2	+25 °C, First year

*1 FA-238: For over 40 MHz, only the standard specification applies. *2 40 MHz ≤ f_nom ≤ ±2 × 10⁻⁶ / year Max.

Motional resistance (ESR)

(FA-238V / FA-238)	Frequency	Motional resistance
	12.0 MHz ≤ f_nom ≤ 13.0 MHz	100 Ω Max.
	13.0 MHz < f_nom < 20.0 MHz	80 Ω Max.
	20.0 MHz ≤ f_nom < 25.0 MHz	60 Ω Max.
	25.0 MHz ≤ f_nom < 30.0 MHz	50 Ω Max.
	30.0 MHz ≤ f_nom ≤ 60.0 MHz	40 Ω Max.

(TSX-3225)	Frequency	Motional resistance
	16.0 MHz ≤ f_nom < 21.0 MHz	60 Ω Max.
	21.0 MHz ≤ f_nom ≤ 48.0 MHz	40 Ω Max.

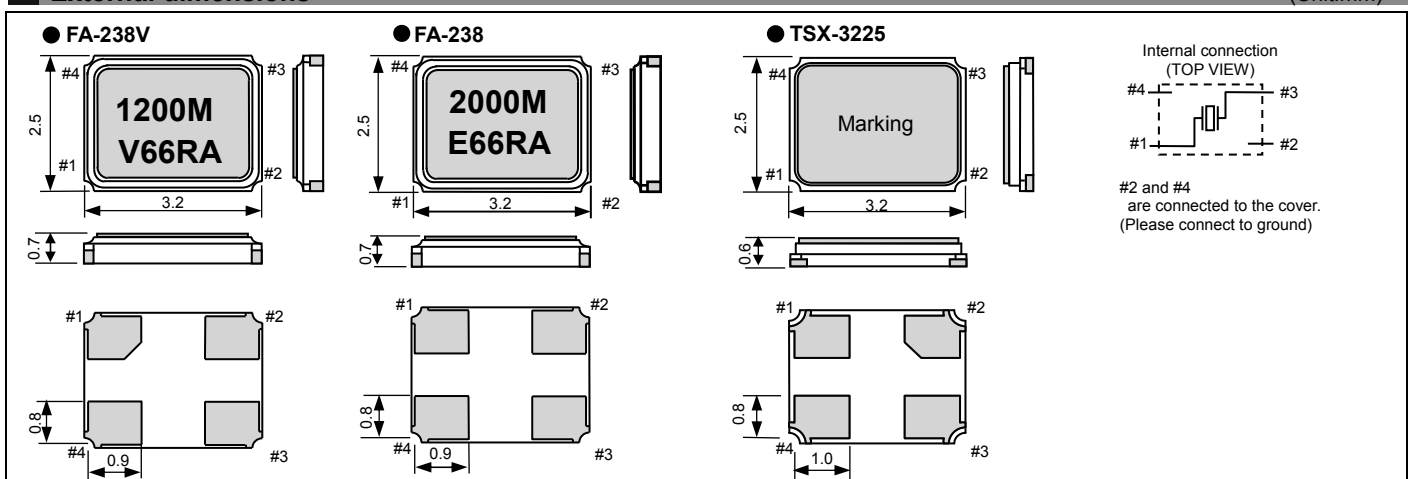
Product name FA-238V 12.000000MHz 12.0 +15.0-15.0
 (Standard form) ① ② ③ ④

① Model ② Frequency ③ Load capacitance(pF) ④ Frequency tolerance(× 10⁻⁶, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

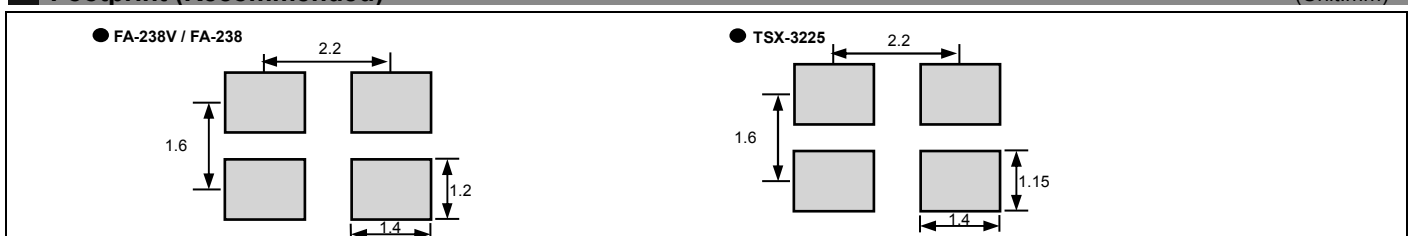
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

Built-in thermistor

NEWProduct Number (please contact us)
FA1612AS: X1E000401xxxx18**FA1612AS**

- Nominal frequency range : 26 MHz to 54 MHz
- External dimensions : 1.6 × 1.2 × 0.65 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU
GPS, Smart phone



Actual size

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Nominal frequency range	f_nom	26.000 MHz to 54.000 MHz	Fundamental Please contact us about available frequencies.
Storage temperature range	T_stg	-40 °C to +125 °C	Storage as single product.
Operating temperature range	T_use	-40 °C to +85 °C	
Level of drive	DL	100 μW Max.	Recommended: 1 to 100 μW
Frequency tolerance	f_tol	$\pm 10 \times 10^{-6}$ *1	Please contact us about reference temperature. Please contact us for inquiries.
Frequency versus temperature characteristics	f_tem	$\pm 12 \times 10^{-6}$ *1	-30 °C to +85 °C Please contact us for inquiries.
Load capacitance	CL	6 pF to ∞	Please specify.
Motional resistance (ESR)	R1	As per table below	-30 °C to +85 °C
Frequency aging	f_age	$\pm 1 \times 10^{-6}$ / year Max.	+25 °C, First year
Thermistor resistance	—	Please contact us about specifications.	
Thermistor B constant	—		

*1 Please contact us for available frequency tolerances as they are dependent upon the nominal frequency.

Motional resistance (ESR)

Frequency	Motional resistance
26.0 MHz $\leq$ f_nom < 32.0 MHz	200 Ω Max.
32.0 MHz $\leq$ f_nom < 36.0 MHz	100 Ω Max.
36.0 MHz $\leq$ f_nom $\leq$ 54.0 MHz	80 Ω Max.

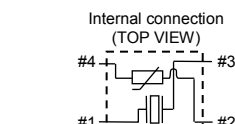
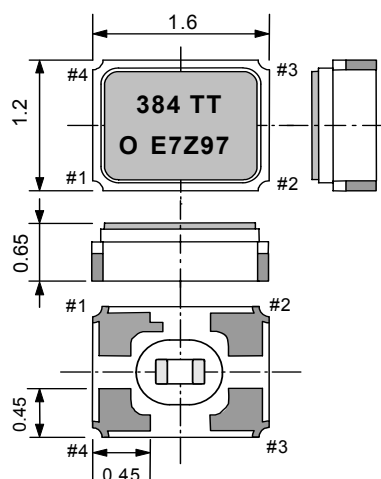
Product name FA1612AS 38.400000MHz 7.0 +10.0-10.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance($\times 10^{-6}$, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

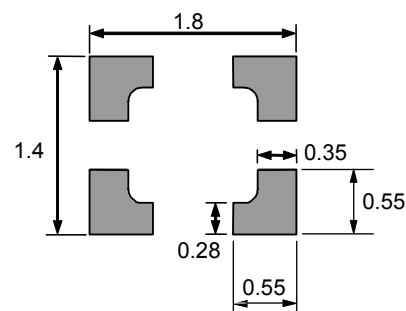
External dimensions

(Unit:mm)



Pin map

Pin	connection
1	Crystal
2	GND, thermistor
3	Crystal
4	thermistor

Footprint (Recommended) (Unit:mm)

**MHz RANGE CRYSTAL UNIT**

Built-in thermistor

FA2016AS

- Nominal frequency range : 26 MHz to 54 MHz
- External dimensions : 2.0 × 1.6 × 0.65 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU
GPS, Smart phone



Product Number (please contact us)
FA2016AS: X1E000371xxxx18



Actual size

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Nominal frequency range	f _{nom}	26.000 MHz to 54.000 MHz	Fundamental Please contact us about available frequencies.
Storage temperature range	T _{stg}	-40 °C to +125 °C	Storage as single product.
Operating temperature range	T _{use}	-40 °C to +85 °C	
Level of drive	DL	100 μW Max.	Recommended: 1 to 100 μW
Frequency tolerance	f _{tol}	±10 × 10 ⁻⁶ *1	Please contact us about reference temperature. Please contact us for inquiries.
Frequency versus temperature characteristics	f _{tem}	±12 × 10 ⁻⁶ *1	-30 °C to +85 °C Please contact us for inquiries.
Load capacitance	CL	6 pF to ∞	Please specify.
Motional resistance (ESR)	R ₁	As per table below	-30 °C to +85 °C
Frequency aging	f _{age}	±1 × 10 ⁻⁶ / year Max.	+25 °C, First year
Thermistor resistance	—	Please contact us about specifications.	
Thermistor B constant	—		

*1 Please contact us for available frequency tolerances as they are dependent upon the nominal frequency.

Motional resistance (ESR)

Frequency	Motional resistance
26.0 MHz ≤ f _{nom} ≤ 54.0 MHz	60 Ω Max.

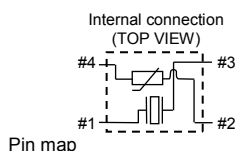
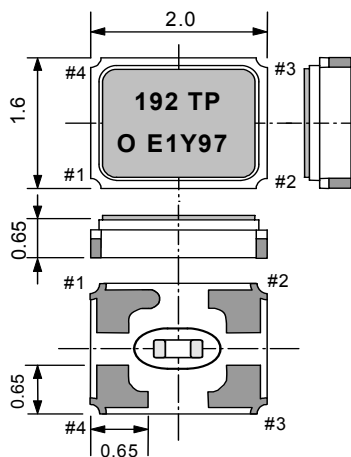
Product name FA2016AS 26.000000MHz 7.0 +10.0-10.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× 10⁻⁶, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

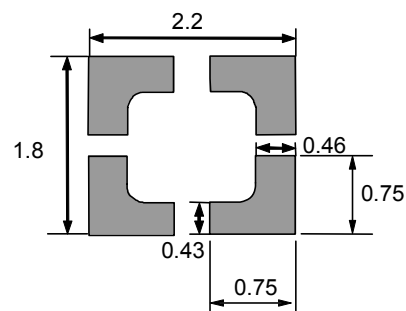
External dimensions

(Unit:mm)



Pin map

Pin	connection
1	Crystal
2	GND, thermistor
3	Crystal
4	thermistor

Footprint (Recommended) (Unit:mm)

**MHz RANGE CRYSTAL UNIT**

Built-in thermistor

FA - 20HS

- Nominal frequency range : 16 MHz to 54 MHz
- External dimensions : 2.5×2.0×1.0 mm
- Overtone order : Fundamental
- Applications : Mobile phone, Bluetooth, W-LAN
ISM band radio, Clock for MPU
GPS, Smart phone



Product Number (please contact us)
FA-20HS: X1E000291xxxx16



Actual size

**Specifications (characteristics)**

Item	Symbol	Specifications	Conditions / Remarks
Nominal frequency range	f_nom	16.000 MHz to 54.000 MHz	Fundamental Please contact us about available frequencies.
Storage temperature range	T_stg	-40 °C to +125 °C	Storage as single product.
Operating temperature range	T_use	-40 °C to +85 °C	
Level of drive	DL	100 μW Max.	Recommended: 1 μW to 100 μW
Frequency tolerance	f_tol	$\pm 10 \times 10^{-6}$ *1	Please contact us about reference temperature. Please contact us for inquiries.
Frequency versus temperature characteristics	f_tem	$\pm 12 \times 10^{-6}$ *1	-30 °C to +85 °C Please contact us for inquiries.
Load capacitance	CL	6 pF to ∞	Please specify.
Motional resistance (ESR)	R1	As per table below	-30 °C to +85 °C
Frequency aging	f_age	$\pm 1 \times 10^{-6}$ to $\pm 3 \times 10^{-6}$ / year Max. *1	+25 °C, First year
Thermistor resistance	—	Please contact us about specifications.	
Thermistor B constant	—		

*1 Please contact us for available frequency tolerances as they are dependent upon the nominal frequency.

Motional resistance (ESR)

Frequency	Motional resistance
16.0 MHz ≤ f_nom ≤ 25.0 MHz	80 Ω Max.
25.0 MHz < f_nom ≤ 30.0 MHz	60 Ω Max.
30.0 MHz < f_nom ≤ 54.0 MHz	50 Ω Max.

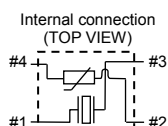
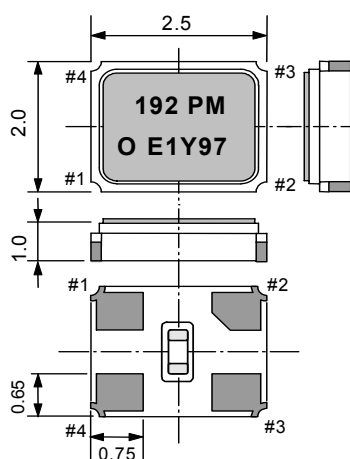
Product name FA-20HS 19.200000MHz 7.0 +10.0-10.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance($\times 10^{-6}$, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

External dimensions

(Unit:mm)

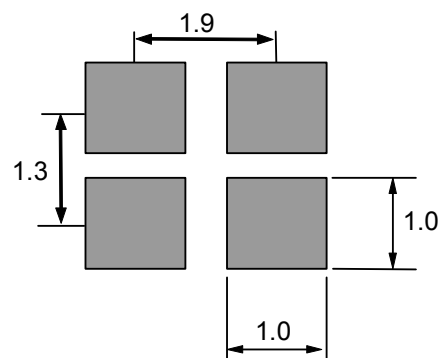


Pin map

Pin	connection
1	Crystal
2	GND, thermistor
3	Crystal
4	thermistor

Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

For Automotive

FA2016AA

- Nominal frequency range : 16 MHz to 54 MHz
- External dimensions : 2.0 × 1.6 × 0.5 mm
- Overtone order : Fundamental
- Applications : Car audio, Vehicle camera system, Car navigation system, ECU clock, Clock, Meter, Remote keyless entry
- Conforms to AEC-Q200



Product Number (please contact us)
X1E000381Axxx18



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
		For Automotive	
Nominal frequency range	f_nom	16.000 MHz to 54.000 MHz	Fundamental Please contact us about available frequencies.
Storage temperature range	T_stg	-40 °C to +125 °C	Storage as single product.
Operating temperature range	T_use	-40 °C to +125 °C	
Level of drive	DL	200 μW Max.	Recommended: 1 to 100 μW
Frequency tolerance	f_tol	±10 × 10 ⁻⁶	+25 °C Please contact us for requirements not listed in this specifications.
Frequency versus temperature characteristics	f_tem	±20 × 10 ⁻⁶ / -40 °C to +85 °C ±50 × 10 ⁻⁶ / -40 °C to +125 °C	Please contact us for requirements not listed in this specifications.
Load capacitance	CL	6 pF to ∞	Please specify.
Motional resistance (ESR)	R ₁	As per table below	-40 °C to +125 °C, DL=100 μW
Frequency aging	f_age	±3 × 10 ⁻⁶ / year Max.	+25 °C, First year

Motional resistance (ESR)

Frequency	Motional resistance
16.0 MHz ≤ f_nom < 18.0 MHz	200 Ω Max.
18.0 MHz ≤ f_nom < 20.0 MHz	150 Ω Max.
20.0 MHz ≤ f_nom < 24.0 MHz	100 Ω Max.
24.0 MHz ≤ f_nom < 26.0 MHz	80 Ω Max.
26.0 MHz ≤ f_nom ≤ 54.0 MHz	60 Ω Max.

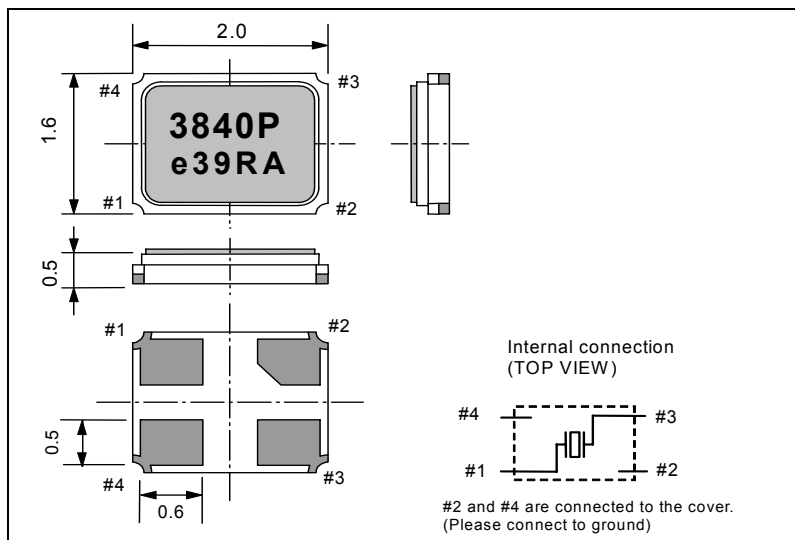
Product name FA2016AA 24.000000MHz 12.0 +10.0-10.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance(× 10⁻⁶, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

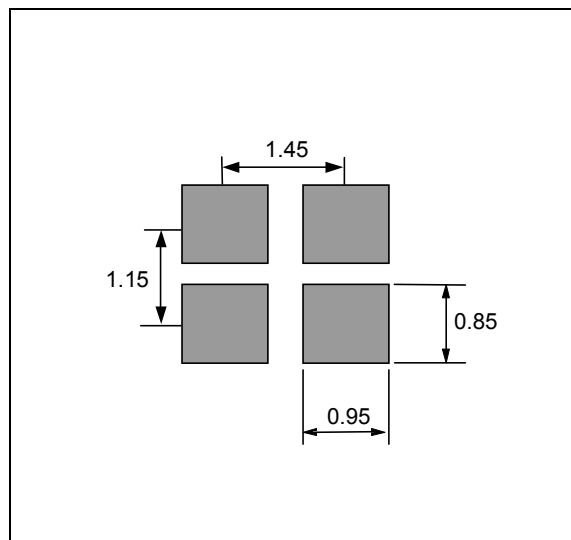
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





MHz RANGE CRYSTAL UNIT

For Automotive



Product Number (please contact us)
X1E000341xxxx00

FA - 238A

- Nominal frequency range : 12 MHz to 62.4 MHz
- External dimensions : 3.2× 2.5×0.7 mm
- Overtone order : Fundamental
- Applications : Car audio, ECU clock, Clock, Car navigation system, Meter, Remote keyless entry
- Conforms to AEC-Q200



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
		For Automotive	
Nominal frequency range	f_nom	12.000 MHz to 62.400 MHz	Fundamental Please contact us about available frequencies.
Storage temperature range	T_stg	-40 °C to +125 °C	Storage as single product.
Operating temperature range	T_use	-40 °C to +125 °C	
Level of drive	DL	200 μW Max.	Recommended: 1 μW to 100 μW
Frequency tolerance	f_tol	$\pm 15 \times 10^{-6}$ to $\pm 50 \times 10^{-6}$	+25 °C Please contact us for requirements not listed in this specifications.
Frequency versus temperature characteristics	f_tem	$\pm 30 \times 10^{-6}$ / -40 °C to +85 °C $\pm 50 \times 10^{-6}$ / -40 °C to +125 °C	Please contact us for requirements not listed in this specifications.
Load capacitance	CL	7 pF to ∞	Please specify.
Motional resistance (ESR)	R1	As per table below	-40 °C to +125 °C, DL=100 μW
Frequency aging	f_age	$\pm 5 \times 10^{-6}$ / year Max.	+25 °C, First year

Motional resistance (ESR)

Frequency	Motional resistance
12.0 MHz ≤ f_nom ≤ 13.0 MHz	120 Ω Max.
13.0 MHz < f_nom < 20.0 MHz	80 Ω Max.
20.0 MHz ≤ f_nom < 25.0 MHz	60 Ω Max.
25.0 MHz ≤ f_nom ≤ 62.4 MHz	50 Ω Max.

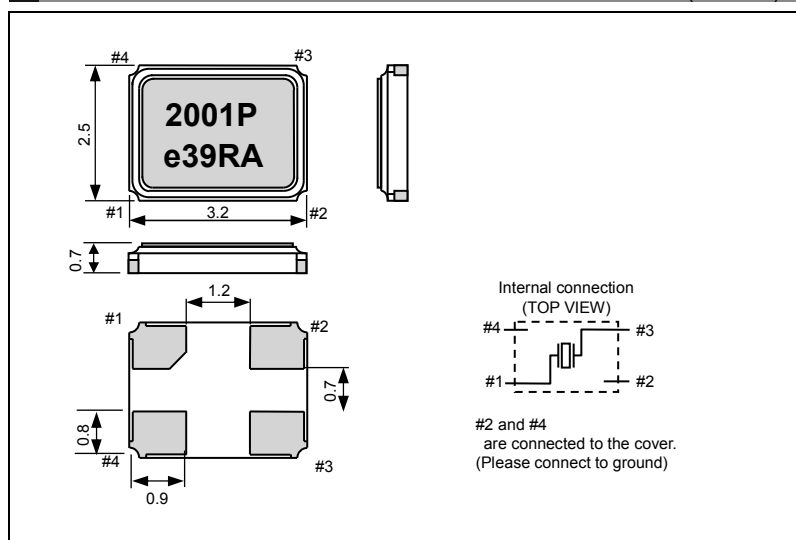
Product name FA-238A 28.636360MHz 18.0 +15.0-15.0
(Standard form) ① ② ③ ④

①Model ②Frequency ③Load capacitance(pF) ④Frequency tolerance($\times 10^{-6}$, +25 °C)

In addition to the above mentioned specification item, please specify frequency temperature characteristics and operating temperature range in case of inquiry.

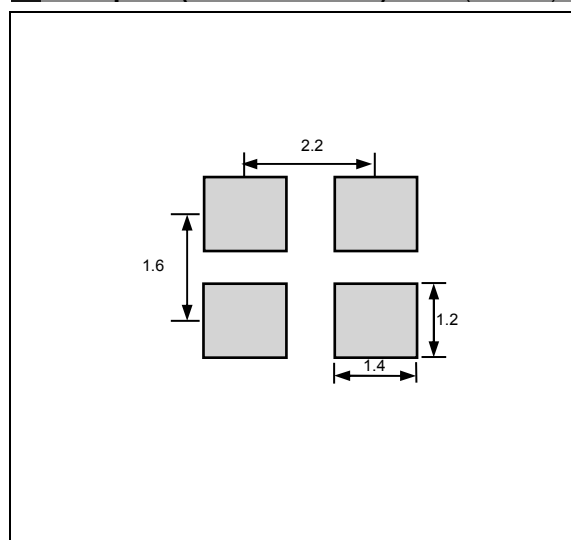
External dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





SAW RESONATOR For Automotive



Product Number (please contact us)
Q25NS21Rxxxxx00

NS-21R

- Frequency range : 300 MHz to 500 MHz
- External dimensions : 2.5 × 2.0 × 0.86 mm
- Overtone order : Fundamental
- Applications : Remote keyless entry(RKE)
(Please contact us for except RKE use.)
- High reliability and excellent temperature characteristic.
- The small package size.



Actual size

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Nominal frequency range	f _{nom}	300 MHz to 500 MHz	Please contact us about available frequencies.
Storage temperature	T _{stg}	-40 °C to +85 °C	Storage as single product.
Operating temperature	T _{use}	-40 °C to +85 °C	
Level of drive	DL	2 mW Max.	
Frequency tolerance (standard)	f _{tol}	±50 × 10 ⁻⁶ , ±100 × 10 ⁻⁶ , ±150 × 10 ⁻⁶	+25 °C
Turnover temperature	T _i	+20 °C ±20 °C	Please contact us for inquires about Peak temperature
Harmonic ratio	Rs/ R ₁	2 Min.	
Motional resistance(ESR)	R ₁	20 Ω Max.	
Frequency aging	f _{age}	±10 × 10 ⁻⁶ / year Max.	+25 °C
Shock resistance	S.R.	±10 × 10 ⁻⁶ Max.	Nine drops on a concrete surface from 1500 mm

Product name
(Standard form)

NS-21R 312.00000MHz 99.0 +50.0-50.0

①

②

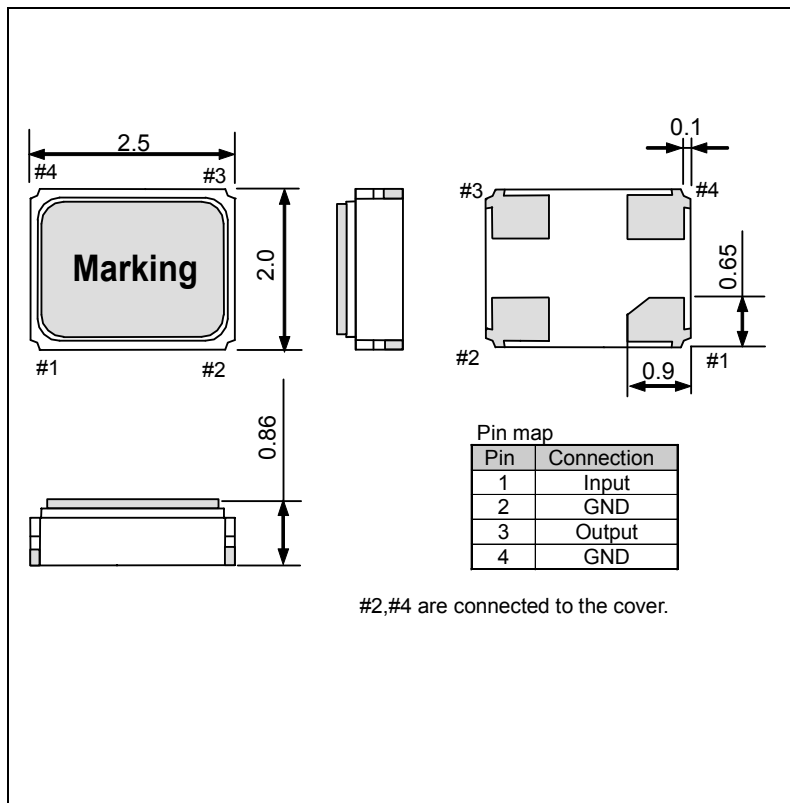
③

④

①Model ②Frequency ③Load capacitance(99.0=∞) ④Frequency tolerance(× 10⁻⁶, +25 °C)

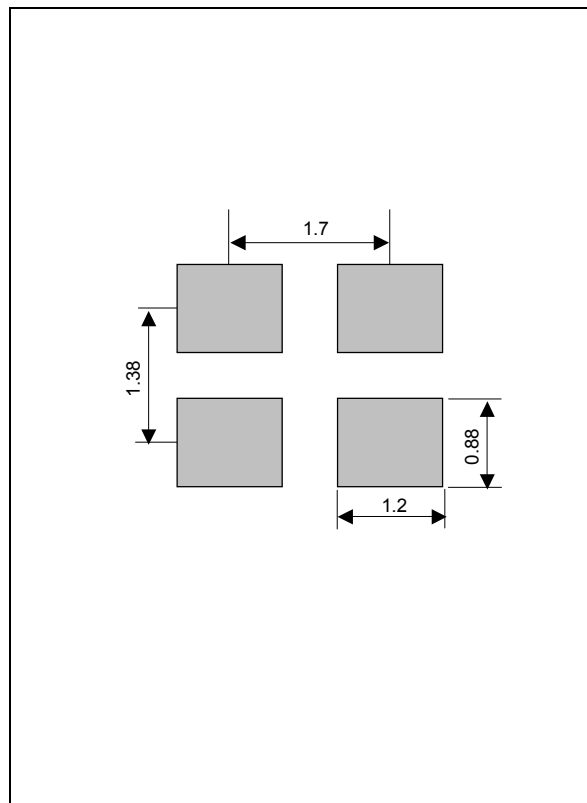
External dimensions

(Unit:mm)



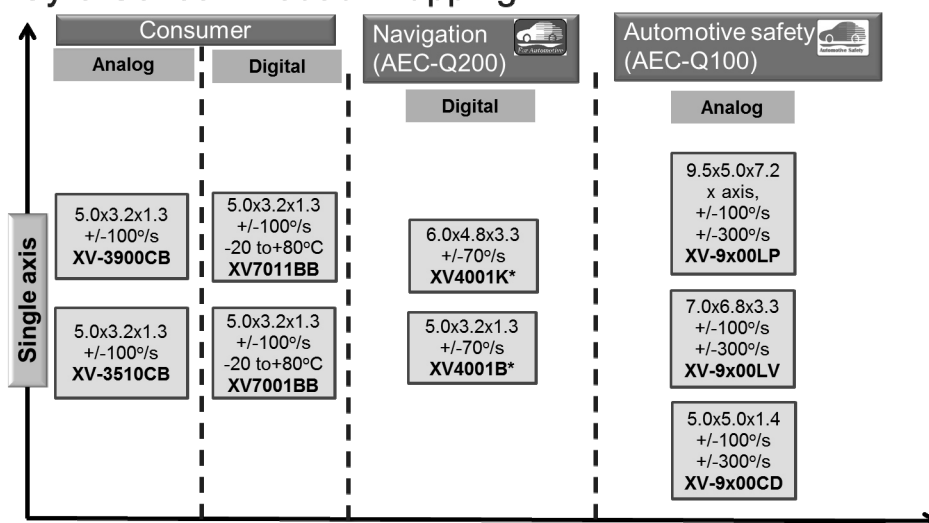
Footprint (Recommended)

(Unit:mm)



Sensors

Gyro Sensor Product Mapping



► Gyro Sensor

P	Model	External Dimensions (mm)	Supply Voltage (V)	Bias	Rate Range (°/s)	Scale Factor (mV/(°/s))	Non Linearity (%FS)	Operating Temperature	Recommended Application
151	XV7011BB (SPI / I²C)	 5.0x3.2x1.3	2.7 ~ 3.3	0 LSB Typ. ± 1 °/s (Digital output)	±100	24bit : 71680 LSB/(°/s) ± 5 % (Digital output)	± 0.5	-20 °C ~ +80 °C (Please contact us about -40 °C ~ +85 °C)	Anti vibration and attitude control for industrial applications etc. Motion detection for man machine interface
152	XV7001BB (SPI / I²C)	 5.0x3.2x1.3	2.7 ~ 3.3	0 LSB Typ. ± 1 °/s (Digital output)	±100	16bit : 280 LSB/(°/s) ± 5 % (Digital output)	± 0.5	-20 °C ~ +80 °C	
153	XV-3900CB	 5.0x3.2x1.3	2.7 ~ 3.3	1500 mV	±100	8.0	± 1	-20 °C ~ +80 °C	Detection picture stabilization
154	XV-3510CB	 5.0x3.2x1.3	2.7 ~ 3.3	1430 mV	±300	3.0	± 0.5	-20 °C ~ +80 °C	Detection picture stabilization
Web Site	XV-3500CB	 5.0x3.2x1.3		1350 mV	±100	0.67	± 5		
Web Site	XV-3700CB	 5.0x3.2x1.3	2.7 ~ 3.3	1500 mV	±300 ±1500	3.624 0.8	± 5	-20 °C ~ +80 °C	Motion UI, Hobby

► Gyro sensor for automotive

P	Model	External Dimensions (mm)	Supply Voltage (V)	Bias	Rate Range (°/s)	Scale Factor (mV/(°/s))	Non Linearity (%FS)	Operating Temperature	Recommended Application
155	XV-9100CD (AEC-Q100)	 5.0×5.0×1.4	4.75 ~ 5.25	0.5 × V _{DD} V	±100	0.004 × V _{DD}	± 0.5	-40 °C ~ +105 °C	Electric Stability Control System, Rollover Protection System
	XV-9300CD (AEC-Q100)				±300	0.0012 × V _{DD}			
156	XV-9100LV (AEC-Q100)	 7.0×6.8×3.3			±100	0.004 × V _{DD}		-40 °C ~ +125 °C	
	XV-9300LV (AEC-Q100)				±300	0.0012 × V _{DD}			
	XV-9100LP (AEC-Q100)	 9.5×5.0×7.2			±100	0.004 × V _{DD}			
	XV-9300LP (AEC-Q100)				±300	0.0012 × V _{DD}			
157	XV4001KC (I ² C-Bus) XV4001KD (SPI-Bus) (AEC-Q200)	 6.0×4.8×3.3 Inclined	3.0 ~ 3.6	0 LSB Typ. ± 2 °/s (Digital output)	±70	370 LSB/(°/s) ±1.5% (Digital output)	± 0.5	-40 °C ~ +85 °C	Car navigation system, Telematics
	XV4001BC (I ² C-Bus) XV4001BD (SPI-Bus) (AEC-Q200)								

► Gyro sensor for automotive

P	Model	External Dimensions (mm)	Supply Voltage (V)	Bias	Rate Range (°/s)	Scale Factor (mV/(°/s))	Non Linearity (%FS)	Operating Temperature	Recommended Application
Web Site	XV-8000LK (AEC-Q200)	 6.0×4.8×3.3 Inclined	4.75 ~ 5.25	0.5 × V _{DD} V	±60	0.005 × V _{DD}	± 0.5	-40 °C ~ +85 °C	Car navigation system, Telematics
	XV-8000CB (AEC-Q200)	 5.0×3.2×1.3							

► Quartz Pressure Sensor

P	Model	External Dimensions (mm)	Pressure measurement range	Linearity after linearization	Accuracy (Linearity, Repeatability, Hysteresis)	Operating Temperature
158	TSU-20G	(W)87× (H)22	0 ~ 200 kPa	±0.01 % FS Max.	±0.023 % FS Max.	-10 °C ~ +70 °C
	TSU-70G	(W)87× (H)22	0 ~ 700 kPa			
	TSU-100G	(W)87× (H)22	0 ~ 1 MPa			

► Temperature Sensing Crystal

P	Model	Actual size (mm) Max.	Frequency Tolerance	Temperature coefficient			Motional resistance	Operating Temperature
				1st.	2nd.	3rd.		
Web Site	HTS-206	 Φ2.0	±2 %	-26.0 × 10 ⁻⁶ / °C	-5.8 × 10 ⁻⁸ / °C ²	-1.5 × 10 ⁻¹⁰ / °C ³ Max.	35 kΩ Max.	-40 °C ~ +85 °C



GYRO SENSOR (Digital Output)

XV7011BB

- SPI or I²C serial interface
- Angular rate output (16/24bit)
- Excellent bias stability over temperature
- Operating temperature range -20 °C to +80 °C
(Option: -40 °C to +85 °C)

- Built-in temperature sensor
- Built-in selectable digital filter
- Low power consumption

Recommended Application

- Anti vibration and attitude control for industrial applications etc.
- Motion detection for man machine interface

*The I2C-Bus is a trademark of NXP Semiconductors



Product number (please contact us)
XV7011BB: X2A000271xxx00



Actual size

XV7011BB

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Supply Voltage	VDDM	2.7 to 3.6 V	
Supply Voltage for interface	VDDI	1.65 V to 3.60 V	
Temperature range	Storage Temperature	TSTG	-40 °C to +85 °C
	Operating Temperature	TOPR	-20 °C to +80 °C Option: -40 °C to +85 °C
Scale factor	So	280 LSB/(°/s) ±5 %	16bit, Ta=+25 °C
		71680 LSB/(°/s) ±5 %	24bit, Ta=+25 °C
Bias	ZRL	±1 °/s (0 LSB Typ.)	Ta=+25 °C
Bias over temperature	ZRL _t	±1 °/s	Variation from Ta = +25 °C
Rate range	I	±100 °/s	
Non linearity	NI	±0.5 %FS	Ta=+25 °C
Cross axes	CS	±5 %	Ta=+25 °C
Current consumption	Iop1	0.9 mA Typ.	Not communicating
Stand-by current	Iop2	160 µA Typ.	
Sleep current	Iop3	3 µA Typ.	
Noise	Nd	0.003 (°/s)/√Hz	at 10Hz

Product Name
(Standard form)

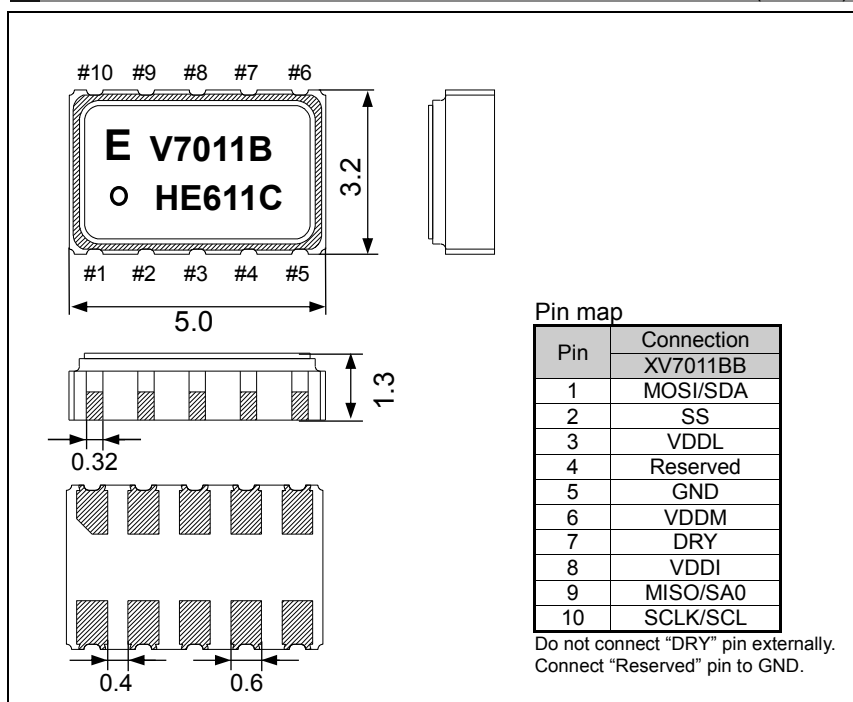
XV7011BB * * *
① ②③④ ⑤ ⑥ ⑦

①Model ②Detection axis (1:Z-axis) ③Package type(B: Ceramic 5032size)

④Output (B: SPI/I²C) ⑤Frequency ⑥,⑦Internal identification code (⑤⑥⑦ are not necessary to specify)

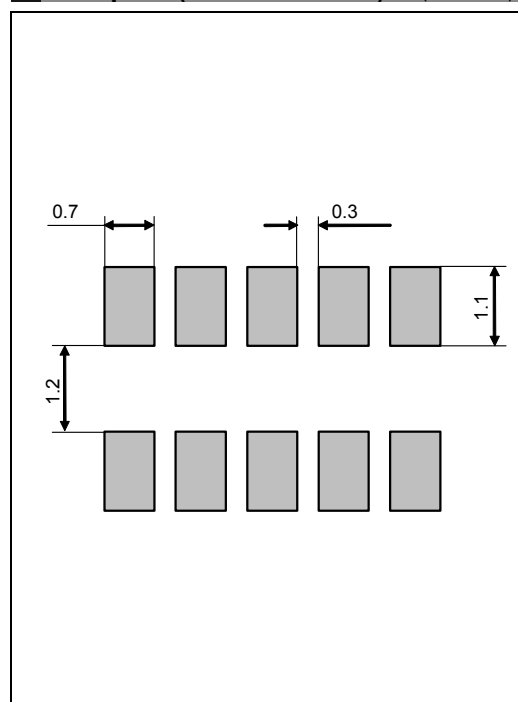
External Dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





GYRO SENSOR (Digital Output)

XV7001BB

- SPI or I²C serial interface
- Angular rate output (16bit)
- Built-in temperature sensor
- Built-in selectable digital filter
- Low power consumption

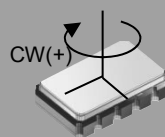
Recommended Application

- Anti vibration and attitude control for industrial applications etc.
- Motion detection for man machine interface

*The I2C-Bus is a trademark of NXP Semiconductors



Product number (please contact us)
XV7001BB: X2A000261xxx00



Actual size

XV7001BB

Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Supply Voltage	VDDM	2.7 to 3.6 V	
Supply Voltage for interface	VDDI	1.65 V to 3.60 V	
Temperature range	Storage Temperature	T _{STG}	-40 °C to +85 °C
	Operating Temperature	T _{OPR}	-20 °C to +80 °C
Scale factor	So	280 LSB/(°/s) ±5 %	16bit, Ta=+25 °C
Bias	ZRL	±1 °/s (0 LSB Typ.)	Ta=+25 °C
Bias over temperature	ZRL _t	±5 °/s	Variation from Ta = +25 °C
Rate range	I	±100 °/s	
Non linearity	NI	±0.5 %FS	Ta=+25 °C
Cross axes	CS	±5 %	Ta=+25 °C
Current consumption	Iop1	0.9 mA Typ.	Not communicating
Stand-by current	Iop2	160 µA Typ.	
Sleep current	Iop3	3 µA Typ.	
Noise	Nd	0.003 (°/s)/√Hz	at 10Hz

Product Name
(Standard form)

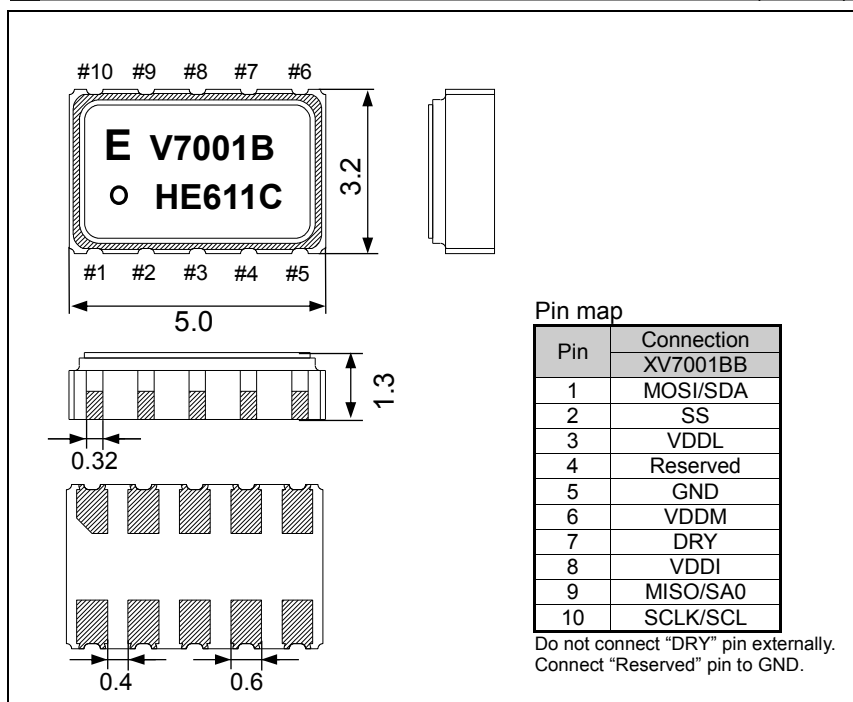
XV700 1 B B * * *

①Model ②Detection axis (1:Z-axis) ③Package type(B: Ceramic 5032size)

④Output (B: SPI/I²C) ⑤Frequency ⑥,⑦Internal identification code (⑤⑥⑦ are not necessary to specify)

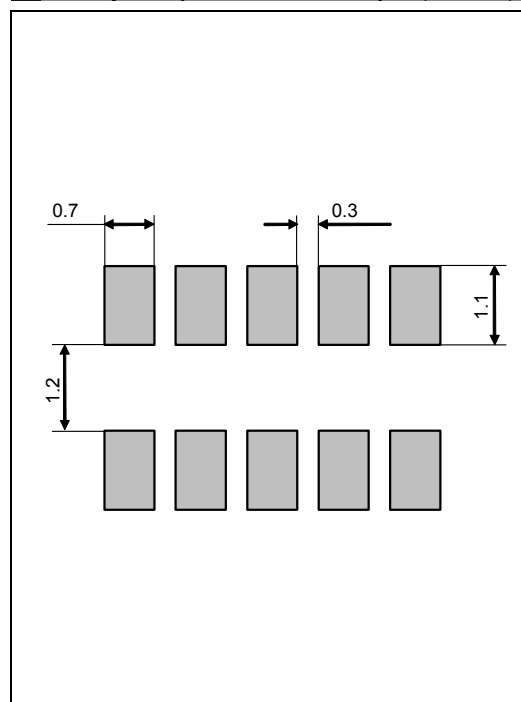
External Dimensions

(Unit:mm)



Footprint (Recommended)

(Unit:mm)





GYRO SENSOR

XV - 3900CB

- Small Package size SMD(5 × 3.2 × 1.3 mm)
- Hermetic sealing provides excellent sustainable environmental capability
- High stability using vibration crystal
- Low noise density

Recommended Application

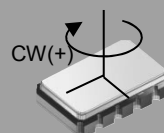
- Detection picture stabilization of DVC and DSC
- Detection of moving with man machine interface



Product number (please contact us)
X2A000091xxx00



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Supply voltage	V _{DD}	3.0 V ±0.3 V	
Temperature range	Storage Temperature	T _{STG}	-40 °C to +85 °C
	Operating Temperature	T _{OPR}	-20 °C to +80 °C
Scale Factor	S _o	8.0 mV/(°/s)	
Bias	V _o	1500 mV Typ.	T _a =+25 °C
Reference Voltage	V _r	1500 mV Typ.	T _a =+25 °C
Rate Range	I	±100 °/s	
Non linearity	NL	±1 % FS	T _a =+25 °C
Phase Delay	φ ₂₀	4 deg.	at 20Hz phase delay angle
Band Width	BW	200 Hz Typ.	phase delay angle 90°
Current consumption	I _{op}	5.4 mA Typ.	V _o , V _r : Output No load condition
Noise	N _d	0.0015 (°/s)/√Hz Typ.	at 10 Hz

Product Name
(Standard form)

XV-3900 CB

** ***** kHz

① ②

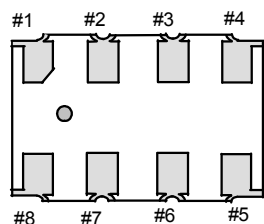
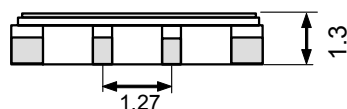
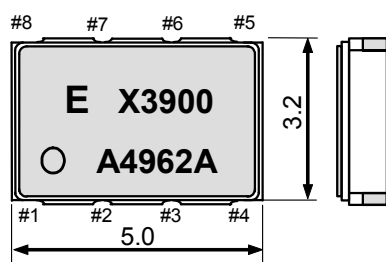
①Model

②Package type

③Frequency (not necessary to specify)

External Dimensions

(Unit:mm)



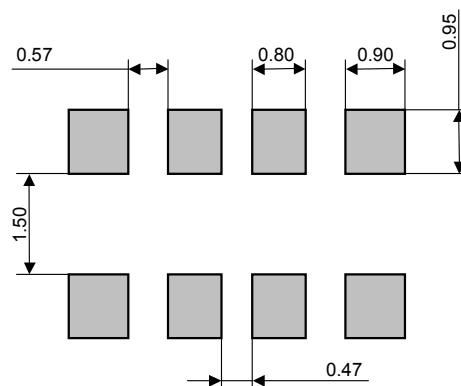
Pin map

Pin	Connection
1	N.C.
2	N.C.
3	N.C.
4	GND
5	V _{OUT}
6	V _{REF}
7	V _{TEMP}
8	V _{DD}

Do not connect "N.C." pins externally.

Footprint (Recommended)

(Unit:mm)





GYRO SENSOR

XV-3510CB

- Small Package size SMD(5.0 × 3.2 × 1.3 mm)
- Hermetic sealing provides excellent sustainable environmental capability
- High stability using vibration crystal

Recommended Application

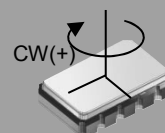
- Detection picture stabilization of DVC and DSC
- Detection of moving with man machine interface



Product number (please contact us)
XV-3510CB:X2A000121xxxxxx



Actual size



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
		XV-3510CB	
Supply voltage	VDD	3.0 V ±0.3 V	
Temperature range	Storage Temperature	TSTG	-40 °C to +85 °C
	Operating Temperature	TOPR	-20 °C to +80 °C
Scale Factor	So	3.0 mV/(°/s)	
Bias	V0	1430 mV Typ.	Ta=+25 °C
Reference Voltage	Vr	1430 mV Typ.	Ta=+25 °C
Rate Range	I	±300 °/s	
Non linearity	NL	±0.5 % FS	Ta=+25 °C
Phase Delay	φ20	9 deg.	at 20Hz phase delay angle
Current consumption	Iop	2.2 mA Typ.	Vo,Vr : Output No load condition

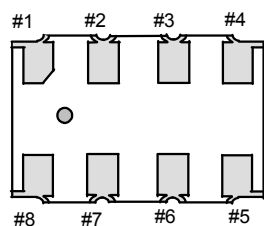
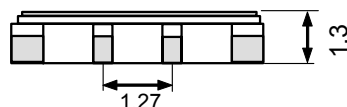
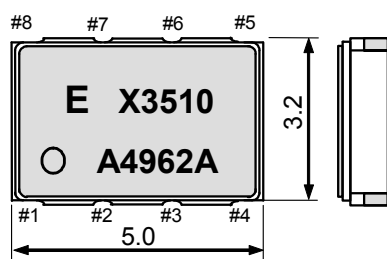
Product Name
(Standard form)

XV-3510 CB * ** .***** kHz

① ② ③ ④
①Model ②Package type ③Spec segment ④Frequency (not necessary to specify)

External Dimensions

(Unit:mm)



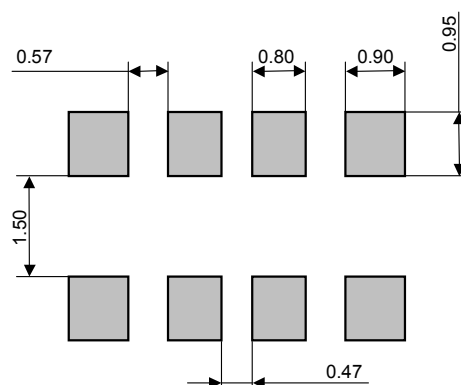
Pin map

Pin	Connection
1	N.C.
2	N.C.
3	N.C.
4	GND
5	VOUT
6	VREF
7	N.C.
8	VDD

Do not connect "N.C." pins externally.

Footprint (Recommended)

(Unit:mm)





GYRO SENSOR FOR AUTOMOTIVE XV-9100CD XV-9300CD



Product number (please contact us)
XV-9100CD: X2A000221xxxx00
XV-9300CD: X2A000231xxxx00

- Wide temperature support, up to +105degree.
- High reliability by installing the self diagnosis function
- Ultra small and light weight using the original Double-T structure quartz crystal element.
- Excellent performance of shock-resistance and vibration-resistance.
- Conforms to AEC-Q100 (please contact us)

Recommended Application

- Electric Stability Control System / Rollover Protection System

Actual size



Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		XV-9100CD	XV-9300CD	
Supply Voltage	V _{DD}	5.0 V ±0.25 V		
Temperature range	Storage Temperature	-40 °C to +105 °C		
	Operating Temperature	-40 °C to +105 °C		
Scale factor	S ₀	0.004 × V _{DD} mV/(°/s)	0.0012 × V _{DD} mV/(°/s)	
Bias	V ₀	0.5 × V _{DD} V Typ.		
Rate range	I	±100 °/s	±300 °/s	
Non linearity	NL	±0.5 % FS		
Frequency response	BW	52.6 Hz Typ.		-3dB point
Cross axes	OS	±5 %		Ta=+25°C
Current consumption	I _{op}	6.7 mA Typ.		V ₀ : Output No load condition
Noise	rN	1.0 (°/s) p-p Max.	3.3 (°/s) p-p Max.	5kHz sampled at 200ms
Start-up time	T _{ACT}	300 ms Max.		

Product Name
(Standard form)

XV-9100 CD

** ***** kHz

① ②

①Model

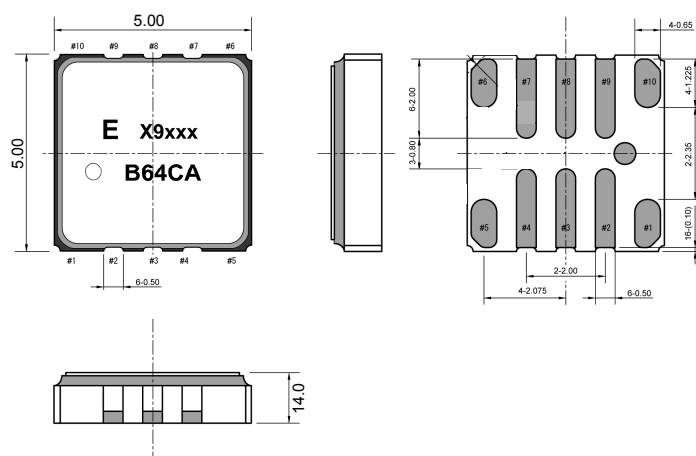
②Package type

③Frequency (not necessary to specify)

External Dimensions

(Unit:mm)

•XV-9100CD / XV-9300CD



Pin map

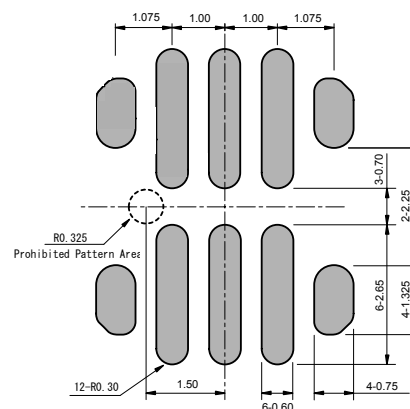
Pin	XV-9100/9300CD
1	GND
2	CLK
3	DIAG
4	V _{DD}
5	GND
6	N.C.
7	V _{out}
8	GND
9	CHECK
10	N.C.

Do not connect "N.C." pins externally devices.

Footprint (Recommended)

(Unit:mm)

•XV-9100CD / XV-9300CD



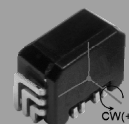
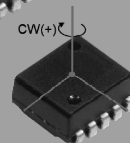
GYRO SENSOR
FOR AUTOMOTIVEXV-9100LV / LP
XV-9300LV / LP

Product number (please contact us)
 XV-9100LV: X2A000031xxx00
 XV-9100LP: X2A000041xxx00
 XV-9300LV: X2A000051xxx00
 XV-9300LP: X2A000061xxx00

- Wide temperature support, up to +125degree, good for engine room usage.
- High reliability by installing the self diagnosis function
- Ultra small and light weight using the original Double-T structure quartz crystal element.
- Excellent performance of shock-resistance and vibration-resistance.
- High reliability and connectivity to PCB using J-lead terminal.
- Conforms to AEC-Q100 (please contact us)

Recommended Application

- Electric Stability Control System / Rollover Protection System



Actual size

LV-PKG

LP-PKG

Specifications (characteristics)

Item	Symbol	Specifications		Conditions / Remarks
		XV-9100LV / LP	XV-9300LV / LP	
Supply Voltage	V _{DD}	5.0 V ±0.25 V		
Temperature range	Storage Temperature	-40 °C to +125 °C		
	Operating Temperature	-40 °C to +125 °C		
Scale factor	S ₀	0.004 × V _{DD} mV/(°/s)	0.0012 × V _{DD} mV/(°/s)	
Bias	V ₀	0.5 × V _{DD} V Typ.		
Rate range	I	±100 °/s	±300 °/s	
Non linearity	NL	±0.5 % FS		
Frequency response	BW	52.6 Hz Typ.		-3dB point
Cross axes	OS	±5 %		T _a =+25 °C
Current consumption	I _{op}	6.7 mA Typ.		V ₀ : Output No load condition
Noise	r _N	1.0 (°/s) p-p Max.	3.3 (°/s) p-p Max.	5kHz sampled at 200ms
Start-up time	T _{ACT}	300 ms Max.		

Product Name
(Standard form)

XV-9100 LV ** ***** kHz

① ② ③

①Model

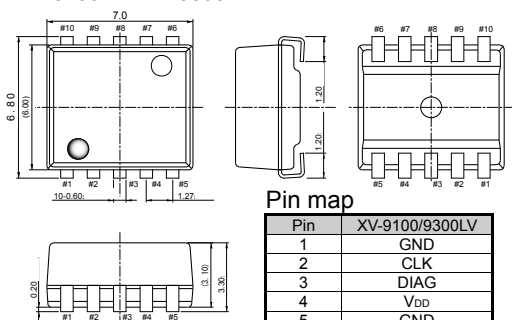
②Package type

③Frequency (not necessary to specify)

External Dimensions

(Unit:mm)

•XV-9100LV / XV-9300LV

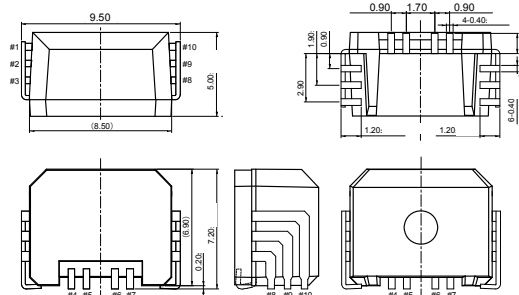


Pin map

Pin	XV-9100/9300LV
1	GND
2	CLK
3	DIAG
4	V _{DD}
5	GND
6	N.C.
7	V _{out}
8	GND
9	CHECK
10	N.C.

Do not connect "N.C." pins externally devices.

•XV-9100LP / XV-9300LP



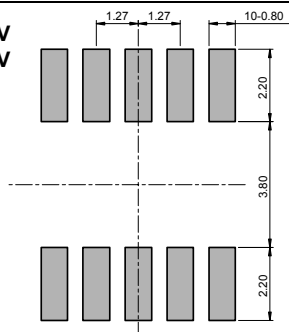
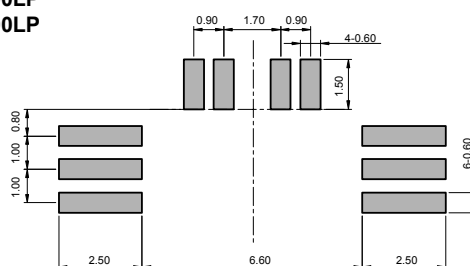
Pin map

Pin	XV-9100/9300LP
1	CHECK
2	GND
3	V _{out}
4	N.C.
5	N.C.
6	GND
7	GND
8	V _{DD}
9	DIAG
10	CLK

Do not connect "N.C." pins externally devices.

Footprint (Recommended)

(Unit:mm)

•XV-9100LV
•XV-9300LV•XV-9100LP
•XV-9300LP



GYRO SENSOR (Digital Output) FOR AUTOMOTIVE XV4001BC / BD XV4001KC / KD



Product number (please contact us)
 XV4001BC: X2A000201xxxx00
 XV4001BD: X2A000161xxxx00
 XV4001KC: X2A000211xxxx00
 XV4001KD: X2A000171xxxx00

- SPI or I²C serial interface
- Angular rate output (16bit), Temperature output (11bit)
- Inclined angle: 20 degrees (XV4001KC/KD)
- XV4001BC ... I²C / 5.0 x 3.2 x 1.3 mm
- XV4001BD ... SPI / 5.0 x 3.2 x 1.3 mm
- XV4001KC ... I²C / 6.0 x 4.8 x 3.3 mm
- XV4001KD ... SPI / 6.0 x 4.8 x 3.3 mm
- Conforms to AEC-Q200

Recommended Application

- Car navigation system, Telematics

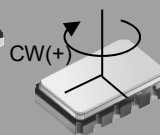
*The I2C-Bus is a trademark of
NXP Semiconductors



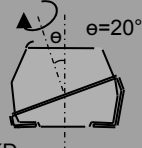
XV4001BC/BD

Actual size

XV4001BC/BD



XV4001KC/KD

 $\theta=20^\circ$

XV4001KC/KD



Specifications (characteristics)

Item	Symbol	Specifications	Conditions / Remarks
Supply Voltage	V _{DD}	3.3 V ± 0.3 V	
Temperature range	Storage Temperature	T _{STG}	-50 °C to +105 °C
	Operating Temperature	T _{OPR}	-40 °C to +85 °C
Scale factor	S _o	370 LSB/(°/s) ± 1.5 %	T _a =+25 °C
Bias	V _o	± 2 °/s (0 LSB Typ.)	T _a =+25 °C
Rate range	I	± 70 °/s	
Non linearity	NL	± 0.5 % FS	T _a =+25 °C
Frequency response	BW	10 Hz Typ.	LPF Gain -3dB bandwidth
Cross axes	OS	± 5 %	T _a =+25 °C
Current consumption	I _{op}	3.5 mA Typ.	not rotation and not communicating
Noise	r _N	0.05 °/s RMS Typ.	

Product Name
(Standard form)

XV4001BC * * *

① ②③④ ⑤ ⑥ ⑦

①Model ②Detection axis (1:Z-axis)

③Package type(B: Ceramic 5032size, K: Lead frame K-Type)

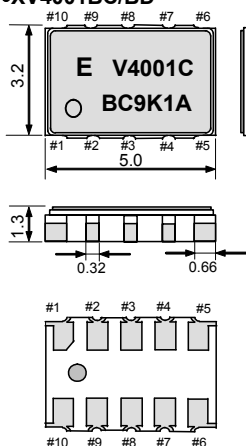
④Output (C: I²C, D: SPI) ⑤Frequency

⑥,⑦Internal identification code (⑤⑥⑦ are not necessary to specify)

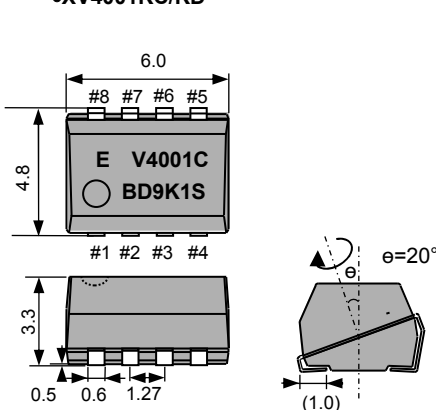
External Dimensions

(Unit:mm)

•XV4001BC/BD



•XV4001KC/KD



Pin map

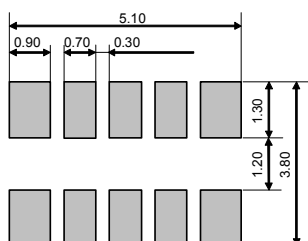
Pin	Connection	
	XV4001BC/BD	XV4001KC/KD
1	N.C.	GND
2	SCLK SCL	MOSI
3	SS	MISO SDA
4	V _{DD}	N.C.
5	N.C.	N.C.
6	N.C.	SCLK SCL
7	GND	SS
8	MOSI	V _{DD}
9	MISO SDA	-
10	N.C.	-

Do not connect "N.C." pins externally.

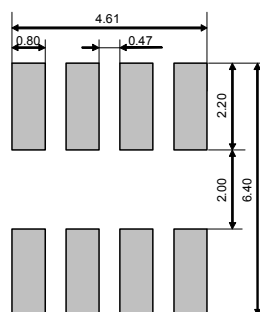
Footprint (Recommended)

(Unit:mm)

•XV4001BC/BD



•XV4001KC/KD





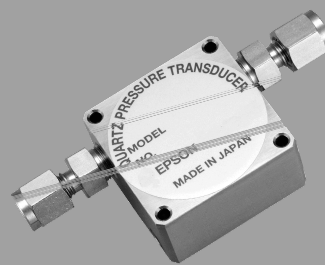
SENSOR QUARTZ PRESSURE SENSOR

TSU series

- High resolution and accuracy
- Excellent repeatability with minimal hysteresis
- High stability against temperature variation
- Output frequency is unaffected by IN/OUT cable length.
- Applications : Various kinds of pressure measurement for industrial use



Product number (please contact us)
X2C0000xxxxxx00



Specifications (characteristics)

Item	Symbol	TSU-20G	TSU-70G	TSU-100G
Pressure measurement range	—	0 to 200 kPa	0 to 700 kPa	0 to 1 MPa
Linearity after linearization	—	0.01 %FS Max.		
Accuracy (Linearity, Repeatability, Hysteresis)	—	0.023 %FS Max.		
Operating temperature range	T_use	-10 °C to +70 °C		
Storage temperature range	T_stg	-20 °C to +80 °C		
Tilt correction	—	Equipped		
Built-in temperature sensor	—	Option	Option	Option
Output frequency without pressure	—	39 kHz Typ.		
Maximum frequency change	—	4 kHz Typ.		7 kHz Typ.
Output voltage	V _{PP}	3.2 V _{PP} Min. (output load 600 Ω) Clipped sine DC cut		
Supply voltage	V _{CC}	12 V (Standard)		
Current consumption	I _{CC}	2 mA Typ. (4 mA Typ. : Built-in temperature sensor)		
Pressure input/output port	—	1/8" Fitting		
Weight	—	200 g		
Material	—	SUS304		

Product Name
(Standard form)

TSU-20G *

①

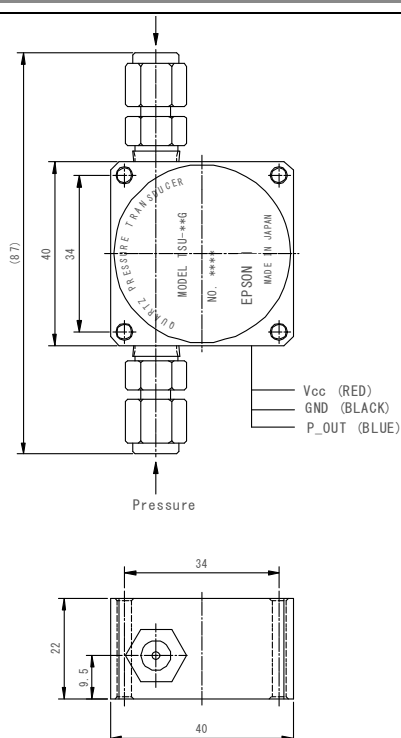
②

①Model

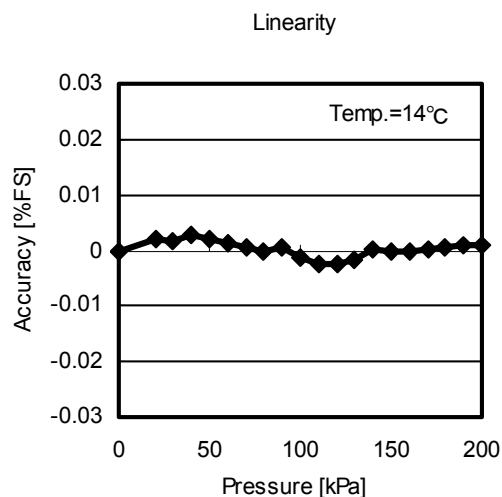
②Detail spec

External dimensions

(Unit:mm)



Typical Data





WORKING FOR EU RoHS / Pb FREE

■ EU RoHS / Pb Free Products

The standard crystal products are compliant with EU RoHS directives.

The appropriate symbol is displayed on individual product pages as applicable.

	● Pb free.
	● Complies with EU RoHS directive. *About the products without the Pb-free mark. Contains Pb in products exempted by EU RoHS directive. (Contains Pb in sealing glass, high melting temperature type solder or other.)

■ DISTINCTIONS

Distinctions between the products with Pb plating terminals and the products that comply with EU RoHS directives.

- Plastic packaged type products.

Marking (year part lot No.) indicates as follows.

	Last digit of year	1	2	3	4	5	6	7	8	9	0
Products Complied with EU RoHS directive (Terminal Plating ; Sn-Bi or Sn-Ag)	Alphabet	A	B	C	D	E	F	G	H	J	K
Products Complied with EU RoHS directive (Terminal Plating ; Sn)	Alphabet	M	N	R	S	T	U	V	W	X	Z

- Cylinder type products

The color of glass plug will be changed as follows.

Terminal Pb Plating products	Blue or Green etc
Complies with EU RoHS directive products	Gray or White

■ Terminal materials of crystal products that comply with EU RoHS directive

We will deliver products that comply with EU RoHS directives for new orders.

Sn plating of terminals is our standard for the products that offer two types of plating.

Category	Model	Terminal Material	Terminal Plating	Complies With EU RoHS Directive	Pb Free	Remarks (Contains Pb in products exempted by RoHS directive.)	Reference weight (Typ.)
kHz Range Crystal unit	C-002RX	Fe-Ni-Co	Sn-Cu	√	√		52 mg
	C-004R	Fe-Ni-Co	Sn-Cu	√	√		30 mg
	C-005R	Fe-Ni-Co	Sn-Cu	√	√		17 mg
	C-2 TYPE	Fe-Ni-Co	Sn-Cu	√	√		52 mg
	C-4 TYPE	Fe-Ni-Co	Sn-Cu	√	√		30 mg
	FC-12D	Mo	Au	√	√		3.1 mg
	FC-12M	Mo	Au	√	√		5 mg
	FC-135 / FC-135R	W	Au	√		7(c) - I	11 mg
	FC-13A	Mo	Au	√	√		14 mg
	FC1610AN	Mo	Au	√	√		3 mg
	MC-146	42 Alloy	Sn or Sn-Bi	√		7(a)	29 mg
	MC-156	42 Alloy	Sn or Sn-Bi	√		7(a)	50 mg
	MC-306	42 Alloy	Sn or Sn-Bi	√		7(a)	126 mg
	MC-30A	42 Alloy	Sn or Sn-Bi	√		7(a)	126 mg
MHz Range Crystal unit	MC-405	42 Alloy	Sn or Sn-Bi	√		7(a)	229 mg
	MC-406	42 Alloy	Sn or Sn-Bi	√		7(a)	229 mg
	CA-301	Fe-Ni-Co	Sn-Cu	√	√		172 mg
	FA-118T	Mo	Au	√	√		3 mg
	FA-128	W	Au	√	√		7 mg
	FA-128S	W	Au	√	√		11 mg
	FA2016AA	W	Au	√	√		7 mg
	FA2016AN	W	Au	√	√		6 mg
	FA-20H	W	Au	√	√		11 mg
	FA1612AS	W	Au	√	√		5 mg
	FA2016AS	W	Au	√	√		8 mg
	FA-20HS	W	Au	√	√		18 mg
	FA-238	W	Au	√	√		16 mg
	FA-238A	W	Au	√	√		16 mg
	FA-238V	W	Au	√	√		16 mg
	MA-306	42 Alloy	Sn or Sn-Bi	√		7(a)	124 mg
	MA-406	42 Alloy	Sn or Sn-Bi	√		7(a)	330 mg
SAW Resonator	MA-505	42 Alloy	Sn or Sn-Bi	√		7(a)	505 mg
	MA-506	42 Alloy	Sn or Sn-Bi	√		7(a)	505 mg
	TSX-3225	W	Au	√	√		17 mg
	FS-335	W	Au	√	√		56 mg
	FS-555	W	Au	√	√		112 mg
	NS-21R	W	Au	√	√		13 mg
	NS-32R	W	Au	√	√		49 mg



Category	Model	Terminal Material	Terminal Plating	Complies With EU RoHS directive	Pb Free	Remarks (Contains Pb in products exempted by RoHS directive.)	Reference weight (Typ.)
Crystal Oscillator (SPXO)	SG2016CAN / SG2016CAA	W	Au	√	√		9.9 mg
	SG-210 STF	W	Au	√	√		12 mg
	SG-210 SxB / SG210SxBA	W	Au	√	√		15 mg
	SG-210 SxD	W	Au	√	√		15 mg
	SG-210 SxH	W	Au	√	√		14 mg
	SG-211 SxE	W	Au	√	√		13 mg
	SG-3030CM	W	Au	√	√		13 mg
	SG-3030JC / SG-3040JC	42 Alloy	Sn or Sn-Bi	√		7(a)	239 mg
	SG-3030JF	42 Alloy	Sn or Sn-Bi	√		7(a)	90 mg
	SG-3030LC / SG-3040LC	42 Alloy	Sn	√		7(c) - I	25 mg
	SG-310 series	W	Au	√	√		26 mg
	SG3225EAN / VAN	W	Au	√	√		25 mg
	SG5032CAN / CBN / CCN	W	Au	√	√		52 mg
	SG5032EAN / VAN	W	Au	√	√		52 mg
	SG-51 series	42 Alloy	Sn or Sn-Bi	√		7(a)	952 mg
	SG-531 series	42 Alloy	Sn or Sn-Bi	√		7(a)	698 mg
	SG-615 series	42 Alloy	Sn or Sn-Bi	√		7(a)	917 mg
	SG-636 series	42 Alloy	Sn or Sn-Bi	√		7(a)	241 mg
	SG7050CAN / CBN / CCN	W	Au	√	√		147 mg
	SG7050EAN / VAN	W	Au	√	√		149 mg
	SG7050EBN	W	Au	√	√		171 mg
	SG3225HBN	W	Au	√	√		26 mg
	SG7050EEN	W	Au	√	√		165 mg
	SG3225EEN	W	Au	√	√		26 mg
	SG7050VEN	W	Au	√	√		165 mg
	SG3225VEN	W	Au	√	√		26 mg
	SG-770 series	W	Au	√	√		166 mg
	HG-2150CA	W	Au	√	√		153 mg
Selectable SPXO	SG-8503CA	W	Au	√	√		167mg
	SG-8504CA	W	Au	√	√		168mg
	SG-8506CA	W	Au	√	√		167mg
Crystal Oscillator (Low-jitter SAW)	EA-2102CB	W	Au	√	√		64 mg
	EG-2001CA	W	Au	√	√		130 mg
	EG-2002CA	W	Au	√	√		135 mg
	EG-2021CA	W	Au	√	√		135 mg
	EG-2101CA	W	Au	√	√		134 mg
	EG-2102CA	W	Au	√	√		129 mg
	EG-2102CB	W	Au	√	√		71 mg
	EG-2103CB	W	Au	√	√		71 mg
	EG-2121CA	W	Au	√	√		133 mg
	EG-2121CB	W	Au	√	√		71 mg
	EG-2123CB	W	Au	√	√		71 mg
	EG-4101CA	W	Au	√	√		140 mg
	EG-4121CA	W	Au	√	√		140 mg
	XG-1000CA	W	Au	√	√		126 mg
	XG-1000CB	W	Au	√	√		56 mg
	XG-2102CA	W	Au	√	√		133 mg
	XG-2103CA	W	Au	√	√		133 mg
	XG-2121CA	W	Au	√	√		133 mg
	XG-2123CA	W	Au	√	√		133 mg
Programmable	XG5032HAN	W	Au	√	√		70 mg
	SG-8002CA	W	Au	√	√		148 mg
	SG-8002CE	W	Au	√	√		27 mg
	SG-8002DB	42 Alloy	Sn orSn-Bi	√		7(a)	942 mg
	SG-8002DC	42 Alloy	Sn or Sn-Bi	√		7(a)	699 mg
	SG-8002JA	42 Alloy	Sn or Sn-Bi	√		7(a)	894 mg
	SG-8002JC	42 Alloy	Sn or Sn-Bi	√		7(a)	234 mg
	SG-8003CA	W	Au	√	√		148 mg
	SG-8003CE	W	Au	√	√		27 mg
	SG-8003CG	W	Au	√	√		13 mg
	SG-8003JF	42 Alloy	Sn orSn-Bi	√	√		98 mg
	SG-8101CG	W	Au	√	√		13 mg
	SG-8101CE	W	Au	√	√		25 mg
	SG-8101CB	W	Au	√	√		51 mg
	SG-8101CA	W	Au	√	√		143 mg
	SG-8018CG	W	Au	√	√		13 mg
	SG-8018CE	W	Au	√	√		25 mg
	SG-8018CB	W	Au	√	√		51 mg
	SG-8018CA	W	Au	√	√		143 mg
	SG-8101CGA	W	Au	√	√		14 mg



Category	Model	Terminal Material	Terminal Plating	Complies With EU RoHS directive	Pb Free	Remarks (Contains Pb in products exempted by RoHS directive.)	Reference weight (Typ.)
Spread Spectrum	SG-9101CG	W	Au	√	√		13 mg
	SG-9101CE	W	Au	√	√		25 mg
	SG-9101CB	W	Au	√	√		51 mg
	SG-9101CA	W	Au	√	√		143 mg
	SG-9101CGA	W	Au	√	√		14 mg
VCXO/ VCSO	EV7050EAN	W	Au	√	√		163 mg
	VG7050CDN	W	Au	√	√		168 mg
	VG2520CAN	W	Au	√	√		13 mg
	VG7050CAN	W	Au	√	√		150 mg
	VG-4231CA	W	Au	√	√		153 mg
	VG-4231CB	W	Au	√	√		54 mg
	VG-4231CE	W	Au	√	√		26 mg
	VG-4232CA	W	Au	√	√		153 mg
	VG-4501CA	W	Au	√		7(c) - I	169 mg
	VG-4502CA	W	Au	√		7(c) - I	164 mg
	VG-4512CA	W	Au	√	√		168 mg
	VG-4513CA	W	Au	√	√		162 mg
	VG-4513CB	W	Au	√	√		65 mg
	VG3225EFN	W	Au	√	√		26 mg
	VG3225VFN	W	Au	√	√		26 mg
	VG5032EFN	W	Au	√	√		66 mg
	VG5032VFN	W	Au	√	√		66 mg
	VG5032EDN	W	Au	√	√		64 mg
	VG5032VDN	W	Au	√	√		64 mg
	VG7050EAN	W	Au	√	√		167 mg
	VG7050EBN	W	Au	√	√		166 mg
	VG7050ECN	W	Au	√	√		168 mg
TCXO	TG1612SAN	Mo	Au	√	√		4 mg
	TG2016SAN	Mo	Au	√	√		9.1 mg
	TG2016SMN	W	Au	√	√		8.7 mg
	TG2016SBN	W	Au	√	√		8.3 mg
	TG2520SMN	W	Au	√	√		16 mg
	TG2520SBN	W	Au	√	√		15 mg
	TG2520CEN	W	Au	√	√		16 mg
	TG3225CEN	W	Au	√	√		26 mg
	TG-5006CE	W	Au	√	√		28 mg
	TG-5006CG	W	Au	√	√		16 mg
	TG-5006CJ	Mo	Au	√	√		9.1 mg
	TG5032CFN / SFN	W	Au	√	√		71 mg
	TG5032CGN / SGN	W	Au	√	√		72 mg
	TG5032CAN / SAN	W	Au	√	√		75 mg
	TG5032CCN / SCN	W	Au	√	√		72 mg
	TG5032CBN / SBN	W	Au	√	√		75 mg
	TG5032CDN / SDN	W	Au	√	√		72 mg
	TG-5035CE	W	Au	√	√		29 mg
	TG-5035CG	W	Au	√	√		16 mg
	TG-5035CJ	Mo	Au	√	√		9.1 mg
	TG-5500CA	W	Au	√	√		165 mg
Multi Output Oscillator	TG-5501CA	W	Au	√	√		167 mg
	TG-3541CE	W	Au	√	√		24 mg
Atomic OSC	TG-3541CEA	W	Au	√	√		24 mg
	MG7050EAN /VAN /HAN	W	Au	√	√		163 mg
Atomic OSC	AO6860LAN	Sn-P-Cu Fe-Ni-Co	Au	√		6(c) , 7(a) , 7(c) - I	117 g
OCXO	OG1409CAN	Cu	Au	√		7(c) - I	1.278 g
	OG2525CCN	Fe-Ni	Sn-Cu	√		7(a) , 7(c) - I	12 g
Module	SR3225SAA	W	Au	√	√		25 mg



Category	Model	Terminal Material	Terminal Plating	Complies With EU RoHS directive	Pb Free	Remarks (Contains Pb in products exempted by RoHS directive.)	Reference weight (Typ.)
Real Time Clock Module	RA-4565SA	42 Alloy	Sn	√		7(a)	309 mg
	RA-4574SA	42 Alloy	Sn	√		7(a)	289 mg
	RA4803SA	42 Alloy	Sn	√		7(a)	314 mg
	RA-8565SA	42 Alloy	Sn	√		7(a)	309 mg
	RA-8581SA	42 Alloy	Sn	√		7(a)	289 mg
	RA8803SA	42Alloy	Sn	√		7(a)	314 mg
	RA8900CE	W	Au	√	√		24 mg
	RA8804CE	W	Au	√	√		24 mg
	RTC-4543SA	42 Alloy	Sn	√		7(a)	291 mg
	RTC-4543SB	42 Alloy	Sn-Ag	√		7(a)	238 mg
	RTC-4574JE	42 Alloy	Sn-Ag	√		7(a)	118 mg
	RTC-4574NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	83 mg
	RTC-4574SA	42 Alloy	Sn	√		7(a)	289 mg
	RTC-72421	42 Alloy	Sn or Sn-Bi	√		7(a)	1090 mg
	RTC-72423	42 Alloy	Sn or Sn-Bi	√		7(a)	661 mg
	RTC-7301DG	42 Alloy	Sn or Sn-Bi	√		7(a)	1082 mg
	RTC-7301SF	Cu Alloy	Sn or Sn-Ag	√		7(a)	233 mg
	RTC-8564JE	42 Alloy	Sn-Ag	√		7(a)	119 mg
	RTC-8564NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	83 mg
	RX-4035LC	42 Alloy	Sn	√		7(c) - I	25mg
	RX-4035SA	42 Alloy	Sn	√		7(a)	314mg
	RX-4045NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	84 mg
	RX-4045SA	42 Alloy	Sn	√		7(a)	290 mg
	RX-4571LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-4571NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	83 mg
	RX-4571SA	42 Alloy	Sn	√		7(a)	309 mg
	RX-4574LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-4581NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	84 mg
	RX-4803LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-4803SA	42 Alloy	Sn	√		7(a)	314 mg
	RX6110SA	42 Alloy	Sn	√		7(a)	313mg
	RX8010SJ	42 Alloy	Sn	√		7(a)	150mg
	RX-8025NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	84 mg
	RX-8025SA	42 Alloy	Sn	√		7(a)	292 mg
	RX-8035LC	42 Alloy	Sn	√		7(c) - I	25mg
	RX-8035SA	42 Alloy	Sn	√		7(a)	314mg
	RX8130CE	W	Au	√	√		24mg
	RX-8564LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-8571LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-8571NB	Cu Alloy	Sn	√		7(a)	84 mg
	RX-8571SA	42 Alloy	Sn	√		7(a)	311 mg
	RX-8581JE	42 Alloy	Sn-Ag	√		7(a)	111 mg
	RX-8581NB	Cu Alloy	Sn or Sn-Ag	√		7(a)	84 mg
	RX-8581SA	42 Alloy	Sn	√		7(a)	289 mg
	RX-8731LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-8803LC	42 Alloy	Sn	√		7(c) - I	25 mg
	RX-8803SA	42Alloy	Sn	√		7(a)	314 mg
	RX8804CE	W	Au	√	√		24 mg
	RX8900CE	W	Au	√	√		24 mg
	RX8900SA	42Alloy	Sn	√		7(a)	313 mg
SAW Filter	FF-32N	W	Au	√	√		49 mg
	FF-555	W	Au	√	√		112 mg
Sensor	XV-3500CB	W	Au	√	√		65 mg
	XV-3510CB	W	Au	√	√		65mg
	XV-3700CB	W	Au	√	√		65 mg
	XV-3900CB	W	Au	√	√		65mg
	XV4001Bx	W	Au	√	√		68mg
	XV4001Kx	Cu Alloy	Ni-Pd-Au	√	√		194 mg
	XV7001BB	W	Au	√	√		65mg
	XV7011BB	W	Au	√	√		65mg
	XV-8000CB	W	Au	√	√		65 mg
	XV-8000LK	Cu Alloy	Ni-Pd-Au	√	√		191 mg
	XV-9100CD	W	Au	√	√		107mg
	XV-9100LP	Cu Alloy	Ni-Pd-Au	√	√		651mg
	XV-9100LV	Cu Alloy	Ni-Pd-Au	√	√		317mg
	XV-9300CD	W	Au	√	√		107mg
	XV-9300LP	Cu Alloy	Ni-Pd-Au	√	√		651mg
	XV-9300LV	Cu Alloy	Ni-Pd-Au	√	√		317mg
	TSU-20G	Cu	Sn	√		7(c) - I	200 g
	TSU-70G	Cu	Sn	√		7(c) - I	200 g
	TSU-100G	Cu	Sn	√		7(c) - I	200 g
	HTS-206	Fe-Ni-Co	Sn-Pb	√		7(a)	52 mg



HANDLING PRECAUTIONS

Please use the each product under the conditions provided in respective specifications and catalogues.

The crystal products are designed and manufactured to satisfy its specification, and quality and reliability of the products are ensured through our stringent reliability tests before shipments. However, it is essential to store, mount, and use the products under proper conditions in order to keep the quality and reliability. Please pay careful attention to following precautions and use the products under the optimal conditions. We shall not be responsible for any deteriorated performance of the products caused by any application or usage of the products adopted at customer's own discretion.

Common points for all products

1. Shock resistance

Crystal products may be damaged under some conditions, such as dropping from desks or receiving shocks during mounting. Please do not use the products if products have received any excessive shocks.

2. Radiation

Exposure to radiation can cause deterioration in performance, so avoid irradiation.

3. Chemicals / pH

Do not use or store the product in a pH range that may cause corrosion or dissolution of the materials or packaging.

4. Adhesive

Do not use an adhesive that may cause corrosion of the packing materials, terminals, components, glass materials, and vapor deposited materials used in the products. (For example, a chlorine-based adhesive may corrode the metal parts "lid" of a crystal unit to diminish the hermetic qualities, lowering the performance.)

5. Halogen Compound

Do not use products in halogen gas. Even a slight amount of halogen gas, such as that found in chlorine gas in the air or in metal parts used in the package, may corrode. Also, do not use any resin that emits halogen gas.

6. Static electricity

Excessive levels of static electricity may damage the product, please treat it in anti-static condition. Choose conductive materials for containers and packing materials. Use a soldering gun and a measurement circuit free from high-voltage leakage and provide grounding conduction when working with them.

7. When designing

7.1 The affect of mechanical vibration

While there is any given shock or mechanical vibration periodically to crystal products, such as, a piezo sounder, a piezo buzzer, and speaker, to crystal products, output frequency and amplitude can be changed. Especially the quality of telecommunication equipment could be affected by this phenomenon. Although crystal products are designed to minimize the effect of mechanical vibration, we recommend to check them in advance and to follow the PCB design guidelines as below.

7.2 PCB design guidelines

- (1) Ideally, the mechanical buzzer source should be mounted on a separate PCB from the crystal device. It is advisable to use cushion or cutting PCB, if you mount on same PCB. Traveling mechanical vibration differs when applied to the PCB only vs. inside the body. It is advisable to confirm characteristics in the body.
- (2) Refer to the recommend footprint when designing.
- (3) In case of using solder flux, please use it on the basis of the flux of the JIS standard (JIS C 60068-2-20/IEC 60,068-2-20).
- (4) Please use the solder on the basis of the JIS standard (JIS Z 3282, Pb content 1000ppm, 0.1wt% or less) lead -free solder.

8. Notes on storage

- (1) Storing the crystal products under higher or lower temperature or high humidity for a long period may affect frequency stability or solderability. Please store the crystal products at the normal temperature and humidity, avoid storing them for a long period and mount them as soon as possible after unpacking.

Normal temperature and humidity:

- Temp, +15 °C to +35 °C, humidity 25 % RH to 85 % RH (refer to the standard conditions of test site JIS C 60068-1/IEC 60068-1)
- (2) Please carefully handle the inner and outer boxes and reel. External pressure may cause deformation of reel and tape.

9. Mounting precautions

9.1 Soldering heat resistance

The crystal products except SMD products use solder having a +180°C to +200°C melting point. Heating up the package more than +150°C may deteriorate the characteristics or damage the products. If the crystal products need to be soldered at temperature of more than +150°C, SMD products are recommended. Using higher temperatures over the following reflow conditions to crystal products, even SMD products, may cause the characteristics to deteriorate. The reflow conditions within following profile are recommended. Always check the soldering temperature and time before mounting these products. Also, please check them again when the mounting conditions are changed. Please contact us for inquiries about heat-resistance if crystal products need to be soldered over the following profile.

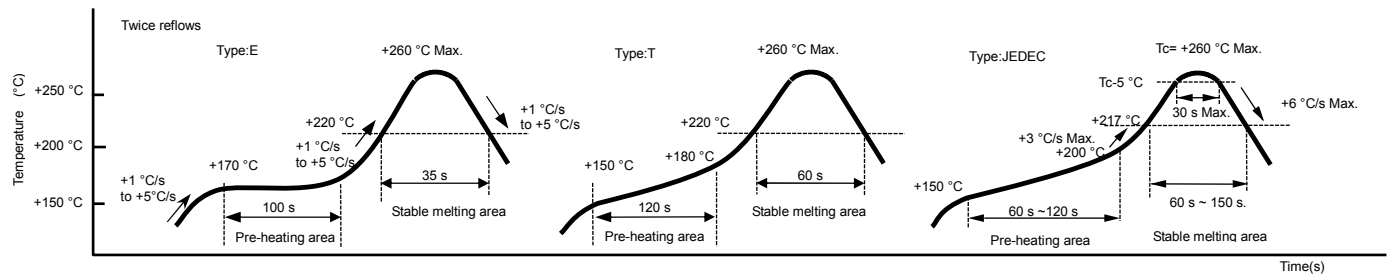
- (1) Cylinder products and DIP products

Model		Soldering conditions
[Cylinder]	C-TYPE, C-2 TYPE, C-4 TYPE, HTS-206	+280 °C or under @ Max. 5 s. Do not heat the package at more than +150 °C.
[Cylinder] [DIP]	CA-301 SG-51 / 531, SG-8002DB / DC, RTC-72421 / 7301DG	+260 °C or under @ Max. 10 s. Do not heat the package at more than +150 °C.



(2) SMD products Reflow profile (example)

The availability of the heat resistance for reflow conditions of JEDEC-STD-020D.01 is judged individually. Please inquire it.



Please make temperature rate as gentle a curve as possible.

Category	Model	Type:E	Type:T	Type:JEDEC	Remarks
kHz Range Crystal unit	FC-12D			√	
	FC-12M			√	
	FC-135/ FC-135R	√		Please contact us	
	FC-13A	√		Available	
	FC1610AN			√	
	MC-146	√		Please contact us	
	MC-156	√		Please contact us	
	MC-306	√		Available	
	MC-30A	√		Available	
	MC-405	√		Available	
	MC-406	√		Available	
MHz Range Crystal unit	FA-118T			√	
	FA-128			√	
	FA-128S			√	
	FA2016AA			√	
	FA2016AN			√	
	FA-20H			√	
	FA1612AS			√	
	FA2016AS			√	
	FA-20HS			√	
	FA-238	√		Available	
	FA-238A	Available		√	
	FA-238V	√		Available	
	MA-306	√		Please contact us	
	MA-406	√		Available	Tc=+250 °C
	MA-505	√		Available	Tc=+250 °C
	MA-506	√		Available	Tc=+250 °C
SAW Resonator	TSX-3225			√	
	NS-21R			√	
	NS-32R	√		Available	
	FS-335	√		Please contact us	
	FS-555	√		Please contact us	
SPXO	SG2016CAN / SG2016CAA			√	
	SG-210 series			√	
	SG-211S*E			√	
	SG-3030CM			√	
	SG-3030LC/ JF/ JC	√		Please contact us	
	SG-3040 series	√		Please contact us	
	SG-310 series			√	
	SG3225EAN/ VAN/ EEN/ VEN			√	
	SG5032CAN/ CBN/ CCN			√	
	SG5032EAN/ VAN			√	
	SG-615 series	√		Available	Tc=+245 °C
	SG-636 series	√		Please contact us	Tc=+250 °C
	SG7050CAN/ CBN/ CCN			√	
	SG7050EAN/ VAN/ EEN/ VEN			√	
	SG7050EBN			√	
	SG3225HBN			√	
	SG-770 series			√	
Selectable SPXO	HG-2150CA	√		Available	
	SG-8503CA			√	
	SG-8504CA			√	
	SG-8506CA			√	

√ : Standard Spec.



Category	Model	Type:E	Type:T	Type:JEDEC	Remarks
SPSO (Low-jitter SAW)	EA-2102CB			√	
	EG-2001CA			√	
	EG-2002CA			√	
	EG-2021CA			√	
	EG-2101CA			√	
	EG-2102CA			√	
	EG-2102CB			√	
	EG-2103CB			√	
	EG-2121CA			√	
	EG-2121CB			√	
	EG-2123CB			√	
	EG-4101CA			√	
	EG-4121CA			√	
	XG-1000CA			√	
	XG-1000CB			√	
	XG-2102CA			√	
	XG-2103CA			√	
	XG-2121CA			√	
	XG-2123CA			√	
	XG5032HAN			√	
Programmable	SG-8002CA/ CE	√		Available	
	SG-8002JA	√		Available	Tc=+245 °C
	SG-8002JC	√		Please contact us	Tc=+250 °C
	SG-8003CA/ CE/ CG/ JF			√	
	SG-8101CA/ CB/ CE/ CG			√	
	SG-8018CA/ CB/ CE/ CG			√	
Spread Spectrum	SG-8101CGA			√	
	SG-9101CA/ CB/ CE/ CG			√	
VCXO / VCSO	SG-9101CGA			√	
	EV7050EAN			√	
	VG7050CDN			√	
	VG2520CAN			√	
	VG7050CAN			√	
	VG-4231CA	√		Available	
	VG-4231CB			√	
	VG-4231CE			√	
	VG-4232CA			√	
	VG-4501CA / VG-4502CA			√	
	VG-4512CA			√	
	VG-4513CA/ CB			√	
	VG5032EDN/ VDN			√	
	VG7050EAN/ EBN/ ECN			√	
	VG3225EFN / VG5032EFN			√	
	VG3225VFN / VG5032VFN			√	
TCXO	TG1612SAN			√	
	TG2016SAN			√	
	TG2016SMN			√	
	TG2016SBN			√	
	TG2520SMN			√	
	TG2520SBN			√	
	TG2520CEN			√	
	TG3225CEN			√	
	TG-5006CE			√	
	TG-5006CG			√	
	TG-5006CJ			√	
	TG5032CGN/ SGN/ CFN/ SFN			√	
	TG5032CAN/ CBN/ CCN/ CDN			√	
	TG5032SAN/ SBN/ SCN/ SDN			√	
	TG-5035CE			√	
	TG-5035CG			√	
	TG-5035CJ			√	
	TG-5500CA			√	
	TG-5501CA			√	
	TG-3541CE			√	
	TG-3541CEA			√	
Multi output Oscillator	MG7050 series			√	
OCXO	OG1409CAN			√	Tc=+245 °C 1 time
Module	SR3225SAA			√	

√ : Standard Spec.



Category	Model	Type:E	Type:T	Type:JEDEC	Remarks
Real Time Clock Module	RA-4565SA			√	Tc=+250 °C
	RA-4574SA	√		Please contact us	Tc=+250 °C
	RA4803SA			√	Tc=+250 °C
	RA-8565SA			√	Tc=+250 °C
	RA-8581SA	√		Please contact us	Tc=+250 °C
	RA8803SA			√	Tc=+250 °C
	RA8900CE			√	
	RA8804CE			√	
	RTC-4543SA	√		Please contact us	Tc=+250 °C
	RTC-4543SB	√		Please contact us	
	RTC-4574JE	√		Please contact us	
	RTC-4574NB	√		Please contact us	
	RTC-4574SA	√		Please contact us	Tc=+250 °C
	RTC-72423	√		Please contact us	Tc=+245 °C
	RTC-7301SF	√		Please contact us	
	RTC-8564JE	√		Please contact us	
	RTC-8564NB	√		Please contact us	
	RX-4035LC			√	
	RX-4035SA			√	
	RX-4045NB	√		Please contact us	
	RX-4045SA	√		Please contact us	Tc=+250 °C
	RX-4571LC			√	
	RX-4571NB			√	
	RX-4571SA			√	Tc=+250 °C
	RX-4574LC	√		Please contact us	
	RX-4581NB	√		Please contact us	
	RX-4803LC			√	
	RX-4803SA			√	Tc=+250 °C
	RX6110SA			√	Tc=+250 °C
	RX8010SJ			√	Tc=+250 °C
	RX-8025NB	√		Please contact us	
	RX-8025SA	√		Please contact us	Tc=+250 °C
	RX-8035LC			√	
	RX-8035SA			√	
	RX8130CE			√	
	RX-8564LC	√		Please contact us	
	RX-8571LC			√	
	RX-8571NB			√	
	RX-8571SA			√	Tc=+250 °C
	RX-8581JE	√		Please contact us	
	RX-8581SA	√		Please contact us	Tc=+250 °C
	RX-8731LC			√	
	RX-8803LC			√	
	RX-8803SA			√	Tc=+250 °C
	RX8804CE			√	
	RX8900CE			√	
	RX8900SA			√	Tc=+250 °C
SAW Filter	FF-32N	√		Please contact us	
	FF-555	√		Please contact us	
Sensor	XV-3500CB/ XV-3510CB			√	
	XV-3700CB			√	
	XV-3900CB			√	
	XV4001Bx			√	
	XV4001Kx			√	
	XV7001BB			√	
	XV7011BB			√	
	XV-8000CB			√	
	XV-8000LK			√	
	XV-9100CD			√	
	XV-9100LP			√	Tc=+250 °C
	XV-9100LV			√	Tc=+250 °C
	XV-9300CD			√	
	XV-9300LP			√	Tc=+250 °C
	XV-9300LV			√	Tc=+250 °C

√ : Standard Spec.



9.2 Shocks by auto mounting

Shocks caused by auto mounting and vacuuming may deteriorate the characteristics and affect the products. Please set the mounting conditions to minimize the shocks as much as possible, and be sure that there is no affect on the characteristics before mounting. Please review the conditions after the conditions are changed. Also please be sure that crystal products don't hit machines or other electric boards, etc. before or after mounting.

9.3 Notes for each package type

(1) Ceramic package products and SON products

Bending the board after soldering ceramic package products and SON products (MC-146, RTC-****NB, RX-****NB) may cause peeling off portions of soldering or package cracks by mechanical stress. Particularly, in the case of cutting boards after soldering these products, please be sure to layout the crystal on a less stressed location and use less stressed cutting method.

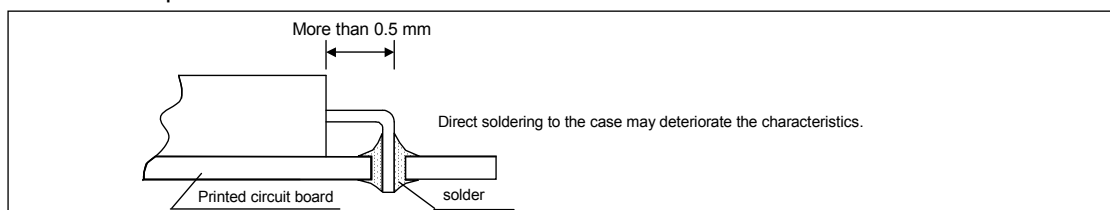
(2) Ceramic package products

In the case of soldering ceramic package products on a different expansion-coefficient board (ex. Epoxy Glass), soldering crack at the foot pattern would be expected under repeated temperature changes for a long period. Under these conditions, be sure to check the solderability in advance.

(3) Cylinder products

Bending the lead on the glass or pulling the lead strongly may cause cracking of the hermetic seal glass at the root of the lead and may cause the airtightness and the characteristics to deteriorate. When the lead of crystal products need to be bent as in the figure below, leave more than 0.5 mm of lead from the case and hold the lead to prevent the lead from cracks. When the lead needs to be repaired, do not pull it, and hold the bent part to correct it. Giving undue pressure on this portion of hermetic seal may cause the airtightness to deteriorate. Please avoid applying pressure. Gluing the case of products on the electric board is recommended to prevent the airtightness from deteriorating.

● Installation example



(4) DIP products and Pin type OCXO

Deformed leads cannot be inserted into board holes. Avoid applying stress sufficient to deform leads.

(5) SOJ Products and SOP products

Please avoid applying stress sufficient to deform the leads. Deformed leads may cause incorrect soldering. Particularly SOP products need to be handled with the greatest care.

9.4 Ultrasonic cleaning

(1) Products using AT-cut crystal and SAW resonator/filter can be cleaned by ultrasonic methods. But under some conditions, the crystal characteristics may be affected and internal wiring may be damaged. Please be sure to check the suitability of your system in advance.

(2) Products using tuning-fork crystals, gyro sensors and OCXOs cannot be guaranteed if cleaned using ultrasonic methods, because crystal may be destroyed.

(3) Do not wash open-type products.

(4) With washable products, avoid the use of cleaners or solvents that may negatively affect the product.

(5) By solder flux residual moisture absorption and solidification, it may cause migration etc. So, it may affect the reliability and quality of the product negatively. Please clean up the residue of flux and dry the PCB.

10. Handling

Do not touch the surface of IC directly with tweezers or any hard tools, jigs.

11. Use environment (temperature and humidity)

Please use the products within rating temperature range in concern temperature distribution in body and seasonal changes. In high humidity environment, it may cause malfunction caused by the dew condensation. Please prevent dew condensation.



■ Crystal unit / Resonator

1. Drive level

Applying excessive drive level to the crystal units may cause deterioration of characteristics or damage. Circuit design must be such as to maintain a proper drive level.(refer to page "Drive level")

2. Negative resistance

Unless adequate negative resistance is allocated in the oscillation circuit, oscillation or oscillation start up time may increase (refer to page "Allowance for Oscillation".)

3. Load capacitance

Differences in the load capacitance in the oscillation circuit may result in deviations in the oscillation frequency from the desired frequency. Attempting to tune by force may merely cause abnormal oscillation. Before use, please specify the load capacitance of the oscillation circuit.(refer to page "Load capacitance")

■ Crystal Oscillator and real time clock module

All crystal oscillators and real time clock modules are provided with an IC.

1. Noise

Applying excessive level of extraneous noise to power source or input terminal may cause latch up or spurious phenomenon, which results in malfunction and breakdown.

2. Power supply line

Line impedance of a power supply should be as low as possible.

3. Output Load

It is recommended that output load is installed as close as possible to an oscillator (within 20 mm).

4. Treatment of unused input terminals

Unused pins that are left open may collect noise, thereby resulting in malfunction. Also, power consumption may increase when both P-channel and N-channel are turned on, therefore connect unused input terminals to VCC or GND.

5. Heat impact

Repeated large changes in temperature may degrade the characteristics of a deteriorated crystal unit and cause breakage of wires inside the plastic mold. This must be avoided.

6. Mounting direction

Incorrect mounting of the oscillator may cause malfunction and breakdown, so please check the mounting direction when installing.

7. Power on

It is not recommended to power on from intermediate electric potential and / or extreme fast power on. Powering on under such conditions may cause no oscillation and / or malfunction.

■ Sensing device

1. Interference between the sensors

The crystal sensor may catch the interference by board vibration and power supply common impedance.

2. Protection against vibration

Please consider about protection against vibration when the crystal sensor is operated in vibration condition.



PRECAUTIONS IN DESIGNING OSCILLATION CIRCUITS

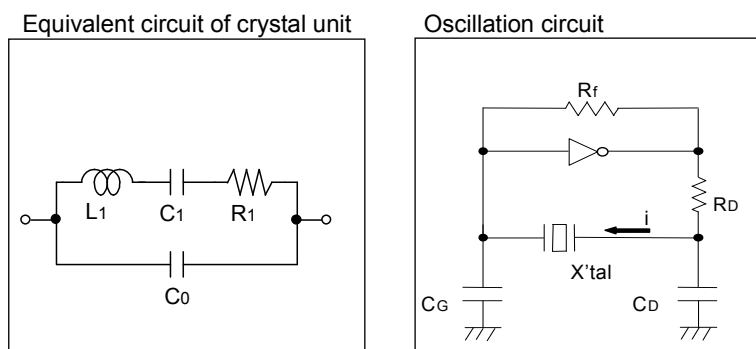
1. Drive level

Drive level denotes electric power required to oscillate a crystal unit, which can be calculated using the following formula.

$$\text{Drive level (P)} = i^2 \cdot R_e$$

Where i stands for current to pass in the crystal unit, R_e for effective resistance of crystal unit, and $R_e = R_1(1 + C_0/C_L)^2$.

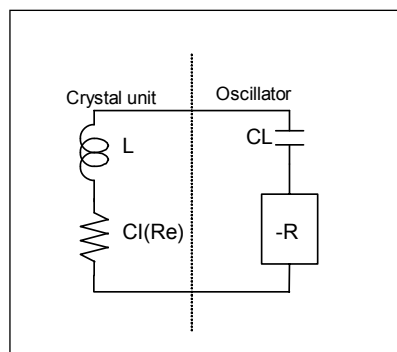
If the Drive level (P) exceeds the specified level, oscillation frequency will shift. This occurs because an excessive level of power causes stress for the crystal and, consequently, temperature rises. If excessive drive level of power is applied to the crystal unit, this may deteriorate or damage the characteristics.



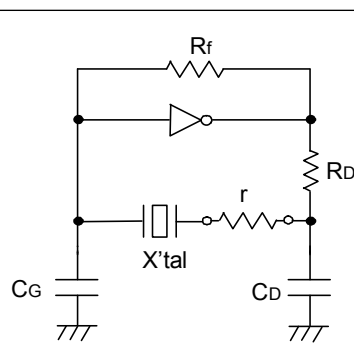
2. Allowance for oscillation

Unless adequate negative resistance is allocated in the oscillation circuit, oscillation start-up time may be increased, or No oscillation may occur. In order to avoid this, provide enough negative resistance in the circuitry design.

● Crystal unit and Oscillator



● Check of Negative resistance



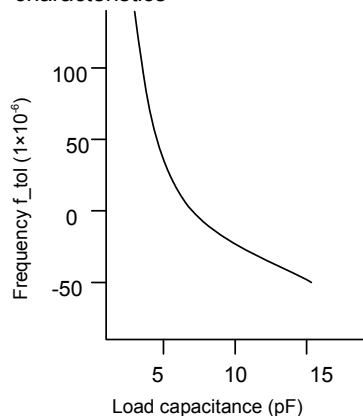
1. Connect the resistance (r) to the circuit in series with the crystal unit.
2. Adjust (r) so that oscillation can start (or stop).
3. Measure (r) when oscillation just starts (or stops) in (2) above.
4. Recommended (r)
(r) > CL × (5 to 10)

3. Load capacitance

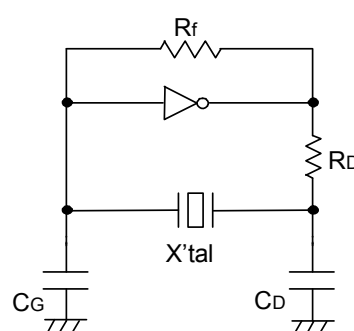
Differences in the load capacitance of the oscillation circuit may result in a different oscillation frequency from the desired one, as shown in the figure below. Approximate expression of the load capacitance of the circuit $CL \cong CG \times CD / (CG + CD) + CS$.

Where CS stands for stray Capacity of the circuit.

● Frequency and load capacitance characteristics



● Reference for setting parameters of oscillation circuit



Symbol	Rf (MΩ)	RD (kΩ)	CG (pF)	CD (pF)
Frequency range				
20 kHz to 60 kHz	20	500	10	10
60 kHz to 165 kHz	10	300	10	10
5.5 MHz to 30 MHz (Fundamental)	1	0.5	5~15	5~15
30 MHz~50 MHz (Fundamental)			5~10	5~10

IC: equivalent to TC74HCU04 (Unbuffer)
 IC: equivalent to TC74VHCU04 (Unbuffer) (30 MHz to 50 MHz)
 (TC74HCU04 and TC74VHCU04 are product number of Toshiba Corp.)



PACKING SPECIFICATIONS

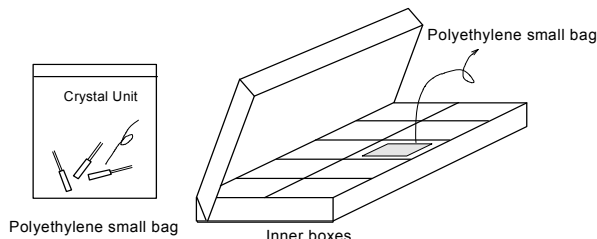
For SMD products, recommendation packing quantity is specified as below table. Please order in accordance with packing quantity.

1. Cylinder

Cylinder products are packed in vinyl bags per lot of 250 to 1000pcs.

From 1 to 20 bags are then placed in inner boxes to make a lot.

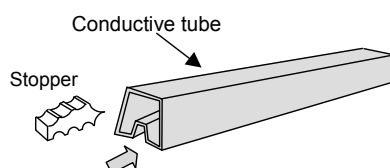
Inner boxes are then placed in cartons for shipment. (the quantity varies with the model.)



Model	Quantity
C-2 TYPE C-4 TYPE C-002RX C-004R C-005R CA-301 HTS-206	500 pcs / vinyl bags

2. DIP

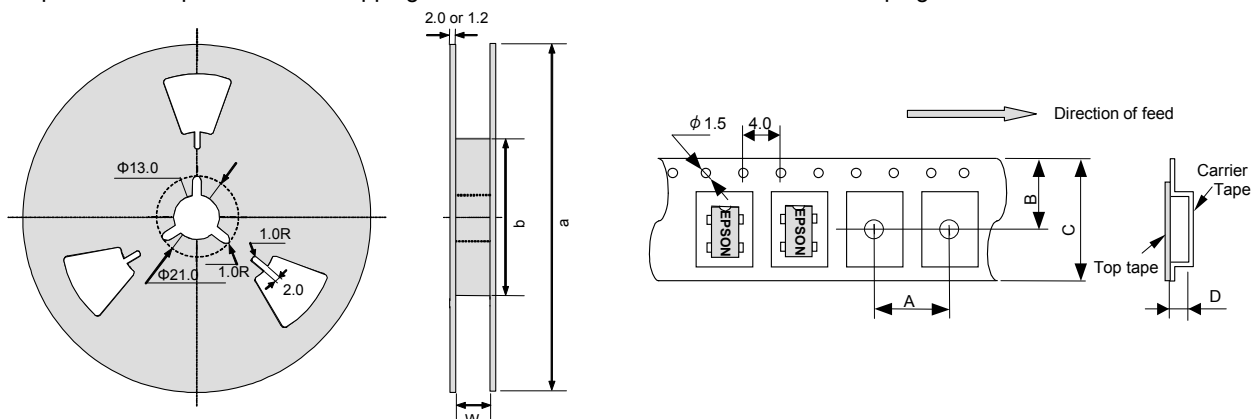
DIP products are placed into antistatic IC tubes and packed into boxes for shipment.



Model	Quantity
SG-531 SG-8002DC	35 pcs / tube
SG-51 SG-8002DB RTC-72421 RTC-7301DG	25 pcs / tube

3. SMD

SMD products are packed in the shipping carton as below table in accordance with taping standards EIA-481 and IEC-60286.



RECOMMENDATION PACKING QUANTITY and DIMENSION (Unit:mm)

●Crystal Unit

Model	Quantity (pcs/Reel)	Reel dimension			Career Tape dimension				Direction of feed (L=left direction)
		a	b	W	A	B	C	D	
kHz Range Crystal unit									
FC-12D	6000	Φ180	Φ60	9	4	5.25	8	0.45	L
FC-12M	5000	Φ180	Φ60	9	4	5.25	8	0.75	L
FC-135 / FC-135R	3000	Φ180	Φ60	13	4	7.25	12	1	L
FC-13A	3000	Φ180	Φ60	13	4	7.25	12	1	L
FC1610AN	5000	Φ180	Φ60	9	4	5.25	8	0.65	L
MC-146	9000	Φ330	Φ80 or Φ100	17	4	9.25	16	1.6	L
MC-156	3000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	1.65	L
MC-306	3000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	2.7	L
MC-30A	3000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	2.7	L
MC-405	1000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	3.8	L
MC-406	1000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	3.8	L
MHz Range Crystal unit									
FA-118T	6000	Φ180	Φ60	9	4	5.25	8	0.5	L
FA-128	5000	Φ180	Φ60	9	4	5.25	8	0.7	L
FA-128S	5000	Φ180	Φ60	9	4	5.25	8	1.0	L
FA2016AA	5000	Φ180	Φ60	9	4	5.25	8	0.7	L
FA2016AN	5000	Φ180	Φ60	9	4	5.25	8	0.7	L
FA-20H	5000	Φ180	Φ60	9	4	5.25	8	0.75	L
FA1612AS	5000	Φ180	Φ60	9	4	5.25	8	0.7	L
FA2016AS	5000	Φ180	Φ60	9	4	5.25	8	0.7	L
FA-20HS	3000	Φ180	Φ60	9	4	5.25	8	1.15	L
FA-238	4000	Φ180	Φ60	9	4	5.25	8	1.05	L
FA-238A	4000	Φ180	Φ60	9	4	5.25	8	1.05	L
FA-238V	4000	Φ180	Φ60	9	4	5.25	8	1.05	L
MA-306	3000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	2.7	L
MA-406	1000	Φ330	Φ80 or Φ100	25.5	12	13.25	24	4	L
MA-505	1000	Φ330	Φ80 or Φ100	25.5	12	13.25	24	4.8	L
MA-506	1000	Φ330	Φ80 or Φ100	25.5	12	13.25	24	4.8	L
TSX-3225	4000	Φ180	Φ60	9	4	5.25	8	1	L



● SAW Resonator

Model	Quantity (pcs/Reel)	Reel dimension			Career Tape dimension				Direction of feed (L=left direction)
		a	b	W	A	B	C	D	
FS-335	4000	Φ330	Φ80 or Φ100	13.5	8	7.25	12	1.52	R
FS-555	4000	Φ330	Φ80 or Φ100	13.5	8	7.25	12	2	R
NS-21R	3000	Φ180	Φ60	9	4	5.25	8	1.15	L
NS-32R	4000	Φ330	Φ80 or Φ100	13.5	8	7.25	12	1.52	R

● SPXO

SG2016CAN / SG2016CAA	3000	Φ180	Φ60	9	4	5.25	8	1	L
SG-210 series	3000	Φ180	Φ60	9	4	5.25	8	1.15	L
SG-211 series	3000	Φ180	Φ60	9	4	5.25	8	1.15	L
SG-3030CM	3000	Φ180	Φ60	13	4	7.25	12	1	L
SG-3030JC	1000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	3.3	L
SG-3030JF	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
SG-3030LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
SG-3040JC	1000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	3.3	L
SG-3040LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
SG-310 series	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
SG3225 series	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
SG5032 series	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
SG7050EEN/ VEN	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
SG7050 series	1000	Φ254	Φ100	17.5	8	9.25	16	2.1	L
SG-615 series	1000	Φ330	Φ80 or Φ100	25.5	12	13.25	24	4.8	L
SG-636 series	1000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	3	L
SG-770 SCD	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
SG-850xCA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
HG-2150CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L

● SPSO (Low-jitter SAW)

EA-2102CB	1000	Φ180	Φ60	13	8	7.25	12	1.7	L
EG-21xxCB	1000	Φ180	Φ60	13	8	7.25	12	1.7	L
EG-2xxxCA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
EG-4101CA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
EG-4121CA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
XG-1000CA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
XG-1000CB	1000	Φ180	Φ60	13	8	7.25	12	1.7	L
XG-21xxCA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
XG5032HAN	1000	Φ180	Φ60	13	8	7.25	12	1.7	L

● Programmable & Spread Spectrum

SG-8002CA/ SG-8003CA/ SG-8101CA/ SG-8018CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
SG-8002CE/ SG-8003CE/ SG-8101CE/ SG-8018CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
SG-8101CB/ SG-8018CB	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
SG-8002JA	1000	Φ330	Φ80 or Φ100	25.5	12	13.25	24	4.8	L
SG-8002JC	1000	Φ330	Φ80 or Φ100	17.5	8	9.25	16	3.3	L
SG-8003JF	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
SG-8003CG/ SG-8101CG SG-8018CG/ SG-8101CGA	3000	Φ180	Φ60	9	4	5.25	8	1.15	L
SG-9101CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
SG-9101CB	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
SG-9101CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
SG-9101CG/ SG-9101CGA	3000	Φ180	Φ60	9	4	5.25	8	1.15	L

● VCXO/VCSO

EV7050EAN	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
VG2520CAN	3000	Φ180	Φ60	9	4	5.25	8	1.15	L
VG7050CDN	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
VG7050CAN	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
VG-4231CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
VG-4231CB	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
VG-4231CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
VG-4232CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
VG-45xxCA	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
VG-4513CB	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
VG3225EFN/ VG3225VFN	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
VG5032EFN/ VG5032VFN	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
VG5032EDN/ VDN	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
VG7050EAN/ EBN/ ECN	1000	Φ180	Φ60	17	8	9.25	16	2.1	L



●TCXO

Model	Quantity (pcs/reel)	Reel dimension			Career Tape dimension				Direction of feed (L=left direction)
		a	b	W	A	B	C	D	
TG1612SAN	18000	Φ330	Φ100	9.4	4	5.25	8	0.7	L
TG2016SAN	12000	Φ330	Φ100	9.4	4	5.25	8	1	L
TG2016SBN/ TG2016SMN	12000	Φ330	Φ100	9.4	4	5.25	8	1	L
TG2520SBN/ TG2520SMN	10000	Φ330	Φ100	9.4	4	5.25	8	1.15	L
TG2520CEN	10000	Φ330	Φ100	9.4	4	5.25	8	1.15	L
TG3225CEN	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
TG-50xxCE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
TG-50xxCG	10000	Φ330	Φ100	9.4	4	5.25	8	1.15	L
TG-5035CG (AEC-Q200)	2000	Φ180	Φ60	9.4	4	5.25	8	1.15	L
TG-50xxCJ	12000	Φ330	Φ100	9.4	4	5.25	8	1	L
TG5032CGN/SGN/CFN/SFN	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
TG5032CAN/CBN/CCN/CDN	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
TG5032SAN/SBN/SCN/SDN	1000	Φ180	Φ60	13	8	7.25	12	1.4	L
TG-5500CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
TG-5501CA	1000	Φ254	Φ100	17.5	8	9.25	16	2.3	L
TG-3541CE/ TG-3541CEA	2000	Φ180	Φ60	9	4	5.25	8	1.4	L

●Multi output oscillator

MG7050 series	1000	Φ180	Φ60	17	8	9.25	16	2.1	L
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●Module

SR3225SAA	3000	Φ180	Φ60	9	4	5.25	8	1.4	L
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●Real time clock module

RA-4565SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RA-4574SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RA4803SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RA-8565SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RA-8581SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RA8803SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RA8900CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
RA8804CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
RTC-4543SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RTC-4543SB	1000	Φ330	Φ80 or Φ100	25.5	12	11.5	24	2.5	L
RTC-4574JE	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	2	L
RTC-4574NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RTC-4574SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RTC-72423	1000	Φ330	Φ80 or Φ100	25.5	16	13.25	24	2.95	L
RTC-7301SF	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	2.4	L
RTC-8564JE	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	2	L
RTC-8564NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-4035LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-4035SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX-4045NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-4045SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX-4571LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-4571NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-4571SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX-4574LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-4581NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-4803LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-4803SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX6110SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX8010SJ	1000	Φ330	Φ80	17.5	12	9.25	16	2.95	L
RX-8025NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-8025SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX-8035LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-8035SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX8130CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
RX-8564LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-8571LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-8571NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-8571SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX-8581JE	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	2	L
RX-8581NB	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	1.8	L
RX-8581SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX-8731LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-8803LC	2000	Φ180	Φ60	13	4	7.25	12	1.45	L
RX-8803SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L
RX8804CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
RX8900CE	2000	Φ180	Φ60	9	4	5.25	8	1.4	L
RX8900SA	1000	Φ330	Φ80 or Φ100	17.5	12	9.25	16	3.65	L



● SAW Filter

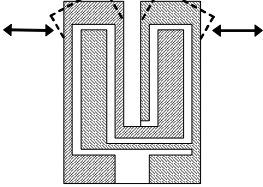
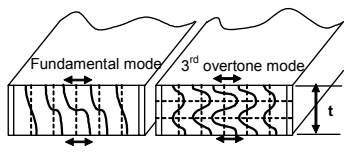
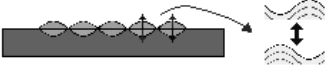
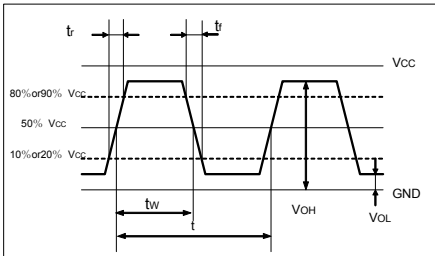
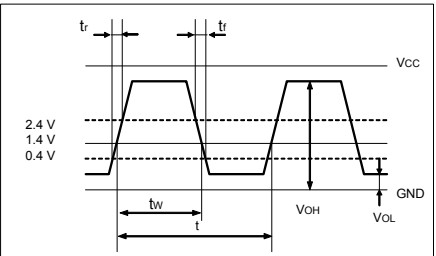
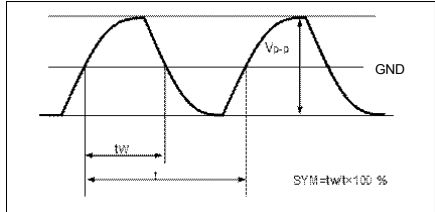
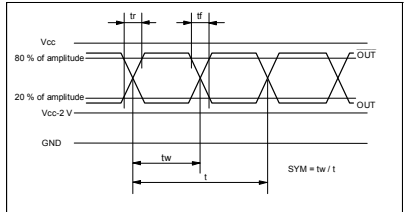
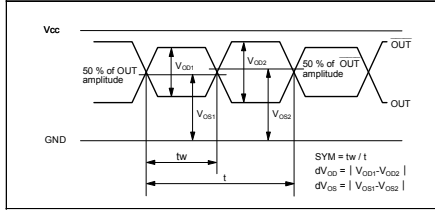
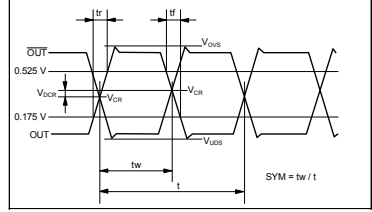
Model	Quantity (pcs/Reel)	Reel dimension			Career Tape dimension				Direction of feed (L=left direction)
		a	b	W	A	B	C	D	
FF-555	4000	Φ330	Φ80 or Φ100	13.5	8.0	7.25	12.0	2.0	R
FF-32N	4000	Φ330	Φ80 or Φ100	13.5	8.0	7.25	12.0	1.52	R

● Sensor

XV-3510CB	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV-3500CB	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV-3700CB	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV-3900CB	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV4001Bx	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV4001Kx	1000	Φ254	Φ100	13.4	8	7.25	12	3.7	L
XV7001BB/XV7001BB	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV-8000CB	2000	Φ254	Φ100	13.4	8	7.25	12	2.1	L
XV-8000LK	1000	Φ254	Φ100	13.4	8	7.25	12	3.7	L
XV-9100CD	2000	Φ254	Φ100	13.4	8	7.25	12	1.8	L
XV-9100LP	500	Φ330	Φ80 or Φ100	25.4	12	13.25	24	8.5	R
XV-9100LV	1000	Φ330	Φ80 or Φ100	17.4	12	9.25	16	4.5	L
XV-9300CD	2000	Φ254	Φ100	13.4	8	7.25	12	1.8	L
XV-9300LP	500	Φ330	Φ80 or Φ100	25.4	12	13.25	24	8.5	R
XV-9300LV	1000	Φ330	Φ80 or Φ100	17.4	12	9.25	16	4.5	L



Glossary

Item	Content	Object
Fundamental mode	First harmonic crystal vibration mode. The AT resonance frequency is determined by the thickness of the crystal, but even with the same thickness the third overtone will be about three times the frequency of the fundamental. With tuning fork crystal unit, the second overtone is about six times the fundamental. Tuning fork crystal unit Fundamental mode  AT-cut crystal unit $F(\text{MHz}) = \frac{1670}{t(\mu\text{m})} \quad (t: \text{Thickness})$  SAW Resonator   SAW Structure figure Vibration mode Output Frequency $f = k/\lambda$ (λ=Interval of an/the electrode, k= Fixed number)	X'tal ,OSC
Divided frequency	The output frequency that is divided by the internal IC.	OSC
Symmetry (tw/t) (SYM)	Ratio of full and half cycles. CMOS  NOTE : SYM=tw/t × 100% TTL  NOTE : SYM=tw/t × 100% Clipped Sine  SYM=tw/t × 100 % LV-PECL  SYM = tw / t LVDS  SYM = tw / t dVds1 = Vds1-Vds2 dVds2 = Vds1-Vds2 HCSL  SYM = tw / t	OSC
(Equivalent)series capacitance (C1) (motional capacitance)	Energy distortion to the (equivalent) internal charge capacitance component of the crystal unit, at the series resonant frequency.	X'tal
(Equivalent)series resonant resistance (R1)	Vibration loss to the (equivalent) internal charge capacitance component of the crystal unit, at the series resonant frequency. A measure of the easiness of oscillation.	X'tal

X'tal:Crystal unit, OSC:Crystal oscillator

More details are available on the website.

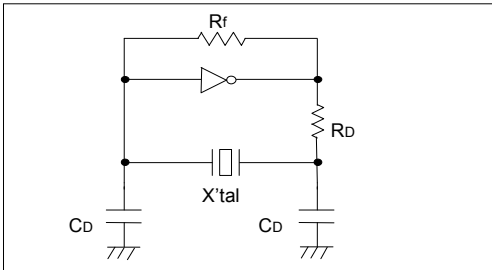
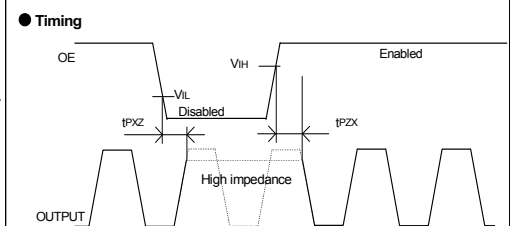
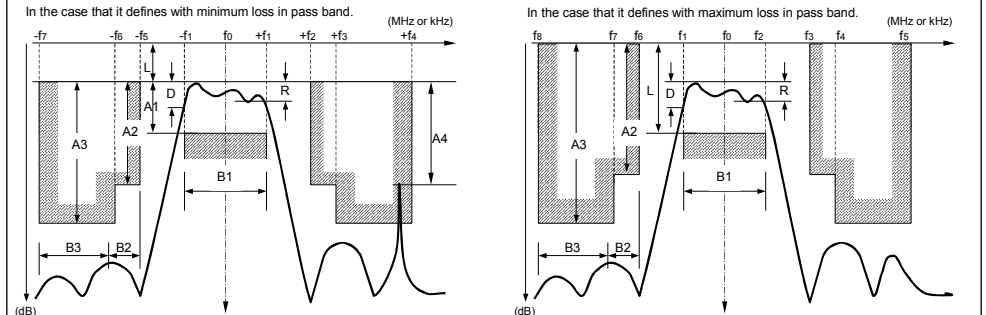


Item	Content	Object
Drive level (DL)	Current or voltage level in the oscillating (operating) state. (Drive power= power required to oscillate crystal unit.)	X'tal
Deviation in PB	The difference between the max. and min. attenuations within a pass band.	Filter
Frequency (f)	Number of waves (cycles) per second. The relation between frequency and cycle is $f(\text{Hz})=1/t(\text{s})$.	ALL
(Frequency) aging (f_age, f_aging)	Amount of frequency drift when operated under the specified conditions for a specified term.	ALL
Frequency tolerance precision (f_tol)	Under specified conditions at an ambient temperature of +25 °C, the difference in actual (measured) frequency from the nominal frequency.	X'tal
Frequency voltage Coefficient	Taking the output frequency at the central voltage in the operating voltage range as the reference, the change in output frequency to voltage. Causes of this change are changes in crystal deformation, and changes in IC internal constants for chips mounted in the oscillator and Real time clock module. The effects of the ICs are larger.	OSC
Frequency tolerance (f_tol)	Within standard temperature and operational voltage ranges, the drift in the output frequency. The output frequency drift including frequency temperature characteristics and frequency voltage characteristics. When there is an annotation in the margin, It is given to priority.	OSC
HFF-XTAL	HFF-XTAL is a high frequency fundamental mode crystal unit using inverted-mesa shape AT-cut blank fabricated with photolithographic technology. Therefore it has an excellent stability for temperature, aging and shock.	OSC
Frequency temperature characteristics	Taking the frequency at 25 degrees Centigrade as the reference, the change in frequency in response to ambient temperature. ● Tuning fork crystal unit. SAW Resonator. $\Delta f/f = B(T_i - \theta X)^2$ θX: specified temperature ● AT crystal unit. $\Delta f/f = \alpha(\theta X - 25) + \beta(\theta X - 25)^2 + \chi(\theta X - 25)^3$ Examples of frequency temperature characteristics Tuning fork crystal units AT-cut crystal units SAW resonator	ALL
Group delay distortion (Δt)	The difference between the max. and min. group delay within a pass band B1 unless otherwise specified.	Filter
Insulation resistance (IR)	Resistance between lead and lead, or between lead and case package. (conductive package)	ALL
Insertion loss (L)	The logarithmic ratio of the power delivered to the load impedance before insertion of the filter to the power delivered to the load impedance after insertion of the filter.	Filter
Load capacitance (CL)	Effective capacitance (series equivalent charge capacitance) of the oscillation circuit as seen from the pins of the crystal unit. This capacitance is determined as a condition when the crystal unit is connected to the oscillation circuit and will determine the output frequency. Load capacitance approximation: CL	X'tal
Max. drive level (GL)	Rating for the drive level. Current or power input over this level may result in characteristic degradation or destruction.	X'tal
Max. supply voltage (Vcc-GND)	Maximum rated value for power input to the power supply pin. Input over this value may result in characteristic degradation or destruction.	OSC
Max. input level (R)	The max. power that can be delivered to the filter without destructing the filter.	Filter
Nominal frequency (f_nom)	Nominal value of frequency of crystal unit. A frequency given in specification, to which other frequencies may be referred.	X'tal Filter
Operating temperature Range(T_use)	Temperature range where specification characteristics are fulfilled, unless otherwise specified.	ALL
Origin frequency (f₀)	Oscillation source frequency of oscillator inside oscillation system.	OSC

X'tal: Crystal unit, OSC: Crystal oscillator

More details are available on the website.

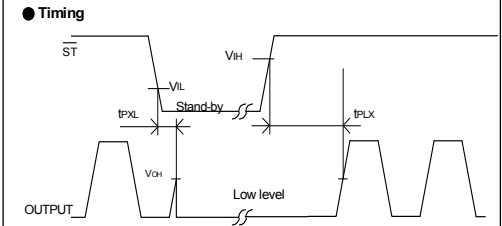


Item	Content	Object
Fall time(t_f)	The time it takes for the output wave form to change from the high voltage(high level) to the low voltage(low level). Also called wave form fall time. See waveform diagram under Symmetry.	OSC
Rise time(t_r)	The time it takes for the output wave form to change from the low voltage (low level) to the high voltage (high level). Also called wave form fall time. See wave from diagram under Symmetry.	OSC
Oscillation circuit	Circuit needed to oscillate crystal unit. Circuit Constants will differ with type of crystal unit and frequency. Basic oscillation circuit using CMOS IC 	X'tal
Start-up time (t_{str})	The time from power on until the wave form stabilizes. However, voltage rise times depend on the power supply. Therefore, the time depends on the power supply, and the time is measured from a specific set of initial conditions.	OSC
Output enable(OE)	Output is switched to high impedance, and wired OR connection can be used to select multiple outputs(frequency). OE pin: High or open. Specified frequency output = enabled. OE pin: Low. Output is high impedance=disabled. Oscillation is not stopped, so after the clock is disabled, it is not synchronized with OE (clock is continuous). 	OSC
Output frequency (f_o)	The frequency output from the oscillator circuit or the crystal oscillator system.	OSC
Output load conditions	The types and quantities (power) of the loads that can be connected to the oscillator. Calculated for 1 TTL as $I_{OH} = -40 \mu A$, $I_{OL} = 1.6 mA$ and for LS-TTL as $I_{OH} = -20 \mu A$, $I_{OL} = 0.4 mA$.	OSC
Overtone	Vibration state when crystal is vibrating as a high harmonic(see base wavelength). It is harder to match the overtone oscillation circuit with the crystal unit than the fundamental oscillation circuit.	X'tal, OSC
Pass band (BW)	Pass band (BW) A band of frequencies B1 in which the attenuation is equal to or less than a specified value A1 A band of frequencies B1 in which the attenuation is equal to or less than the insertion loss L. Stop band attenuation Bands of frequencies B2 and B3 in which the attenuations are equal to or greater than specified values A2 and A3 respectively. 	Filter
Ripple (R)	The difference between the max. and min. peak attenuation within a pass band.	Filter
Recommended drive level (DL)	Excitation level for optimum oscillation characteristics.	X'tal
Shunt capacitance(C_o)	Charge capacitance between the two electrodes in the crystal unit.	X'tal

X'tal:Crystal Unit, OSC:Crystal Oscillator

More details are available on the website.



Item	Content	Object
Soldering conditions (Tsol)	Temperatures or times over these limits may result in characteristic degradation or destruction.	ALL
Stand-by ($\overline{ST}$)	Function that halts crystal unit oscillation and frequency Division. Cuts the current consumed by the oscillators circuit and the frequency division stage. $\overline{ST}$ pin-high or open: Specified frequency output. $\overline{ST}$ pin-low: Output is low level, oscillation stops. : Output is low level (weak pull-down), oscillation stops. : Output is high impedance, oscillation stops. Please refer to each data sheet. 	OSC
Shortage temperature Range(T_stg)	Maximum absolute rating for the discharged state (no input of voltage, current or power). Exposure to temperatures over this level may result in characteristic degradation or destruction. To assure precision, store at room temperature whenever possible.	ALL
Spurious response A4 (dB)	Min. attenuation caused by extraordinary response in the stop band. Spurious response usually appears at a higher frequency than the center frequency.	Filter
Supply voltage (Vcc)	Voltage input to Vcc pin which will support continuous operation with specification characteristics.	OSC
Terminating impedance (Zt)	Either of the impedances presented to the filter by the source or by the load. (Rt: Resistive portion, Ct: Parallel capacitive portion including stray capacitance)	Filter
VSWR	Voltage Standing Wave Ratio	Filter

X'tal:Crystal Unit, OSC:Crystal Oscillator

More details are available on the website.

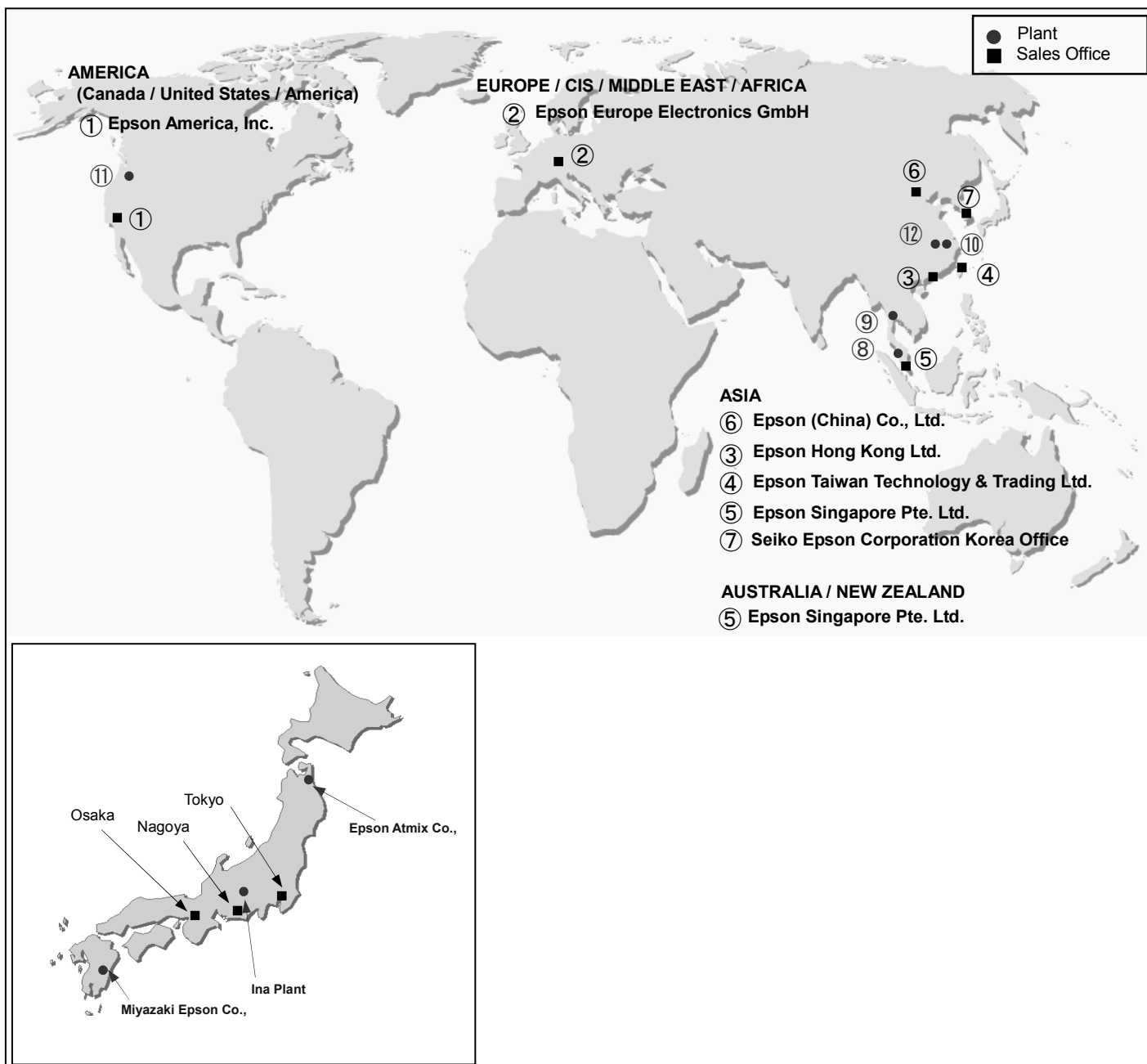


■ Manufacturing Plant

Plant	Date Operations Commenced	Products
Ina Plant / Seiko Epson Corp.	Jun.1959	Crystal unit, Crystal oscillator, Real time clock module, Surface acoustic wave device, Sensing device
Miyazaki Epson Co.,	Jun.1984	Crystal Chip, Synthetic quartz
Epson Atmix Co.,	Oct.1999	Synthetic quartz

Plant	Date Operations Commenced	Products
⑧: Epson Precision Malaysia Sdn. Bhd.	Dec.1974	Crystal unit, Crystal oscillator, Sensing device, Real time clock module
⑨: Epson Precision (Thailand) Ltd.	May.1988	Crystal unit, Surface acoustic wave device, Crystal oscillator
⑩: Epson Precision Suzhou Co.,Ltd.	Mar.1997	Crystal unit, Crystal oscillator, Real time clock module
⑪: Epson Portland ,Inc.	Jun.2000	Synthetic quartz

■ Business area



AMERICA

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Epson Europe Electronics GmbH

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