

THE CRYSTAL

Crystal Devices Catalogue

MASTER 2025

kHz Range
Crystal unit

kHz Range
SPXO / TCXO

Real Time Clock
module

MHz Range
Crystal unit
Crystal unit with
Thermistor

MHz Range
SPXO / SPSO
CMOS

MHz Range
SPXO / SPSO
Differential

TCXO

TCXO (For NW)

VCXO / VCSO

RF transmitter
module





Sensor

Automotive

Appendix



► Explanation of the mark that are using it for the catalog

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

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Compact, Low Current Consumption, High Stability, High Frequency and High Precision. We Will Continue to Pursue Better Crystal Devices.

"Crystal devices" are essential to our daily lives, such as TVs, computers, and watches. We Will continue to pursue superior crystal devices that meet the needs of the times.

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Applications

Here are some examples of how Epson's crystal device can benefit our customers. Please refer to the application manual or contact your local sales representative for more specific usage information.



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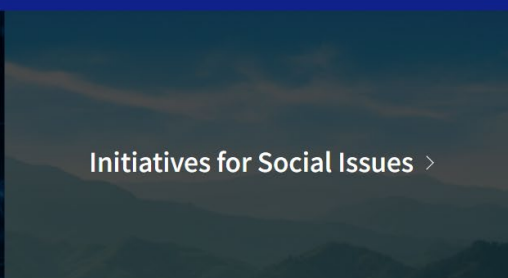
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kHz Range
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RF transmitter
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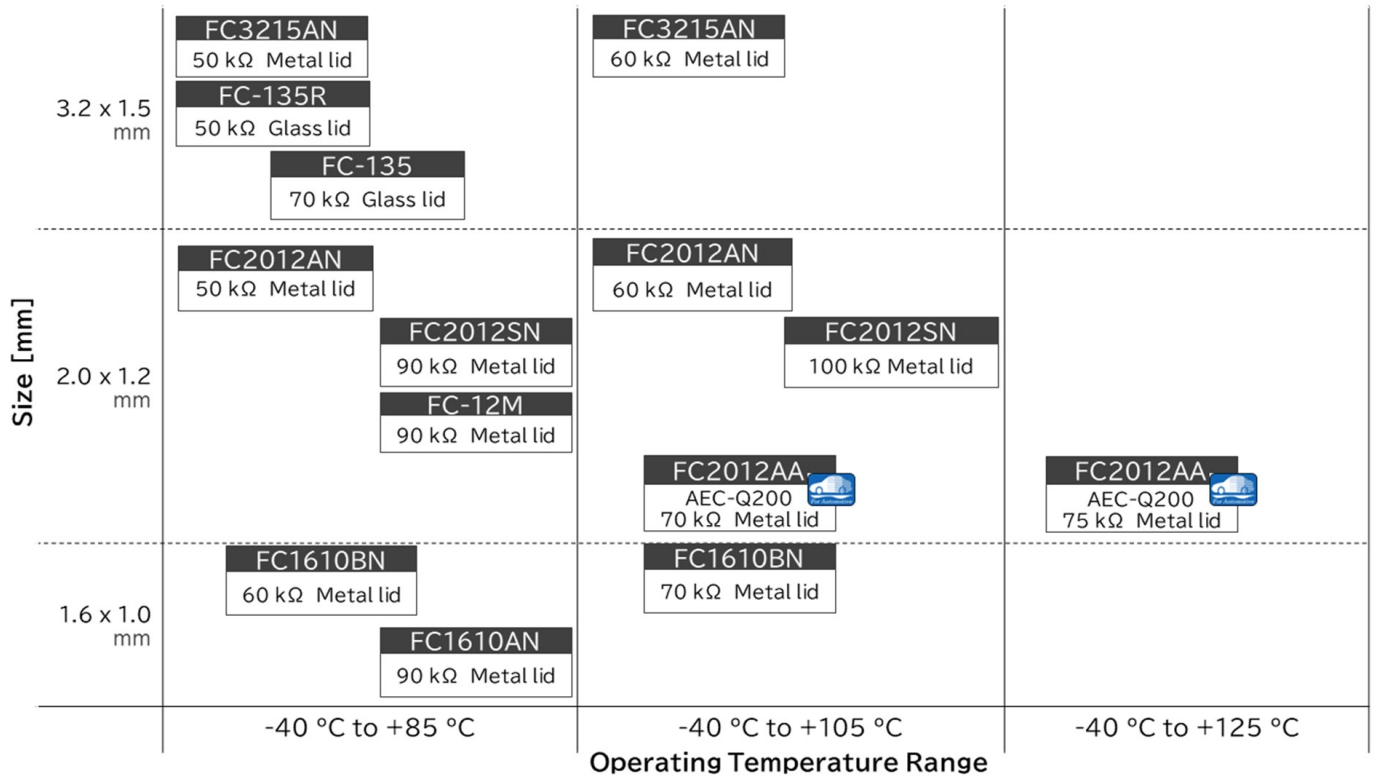
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kHz Products (Crystal Unit, Crystal Oscillator)

kHz Crystal Unit Recommendation Products

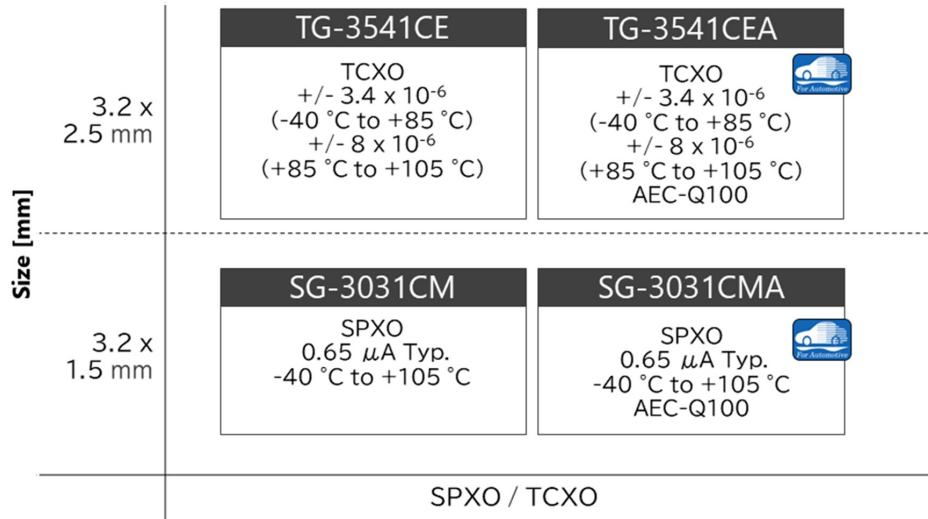


► kHz Crystal Unit

*Please Contact us regarding available frequency other than 32.768 kHz.

Model	Size [mm]	Nominal frequency range	Frequency Tolerance (+25 °C) [$\times 10^{-6}$]	Motional resistance Max. [kΩ]	Load capacitance [pF]	Operating temperature [°C]	Frequency vs temperature characteristics (Turnover Temperature: +25 °C Typ.)
FC1610AN	1.6 x 1.0 x 0.5t	32.768 kHz	±20	90	7 9 12.5	-40 to +85	(B): -0.04 × 10 ⁻⁶ / °C ² Max. f _{tem} = B (Ti-θx) ²
FC1610BN	1.6 x 1.0 x 0.5t	32.768 kHz	±20	45 60 70	7 9 12.5	+25 -40 to +85 -40 to +105	
FC2012SN	2.05 x 1.2 x 0.6t	32.768 kHz	±20	90 100	7 9 12.5	-40 to +85 -40 to +105	
FC2012AN	2.05 x 1.2 x 0.6t	32.768 kHz	±20	50 60	7 9 12.5	-40 to +85 -40 to +105	
FC-12M	2.05 x 1.2 x 0.6t	32.768 kHz 32 kHz - 77.5 kHz	±20 ±30	90 90 to 65	7 9 12.5	-40 to +85 -40 to +85	
FC3215AN	3.2 x 1.5 x 0.9t	32.768 kHz	±20	50 60	7 9 12.5	-40 to +85 -40 to +105	
FC-135R	3.2 x 1.5 x 0.9t	32.768 kHz	±20	50	7 9 12.5	-40 to +85	
FC-135		32.768 kHz		70		-40 to +85	
FC-135		32 kHz - 77.5 kHz		70 to 45		-40 to +85	
FC2012AA (AEC-Q200)	2.05 x 1.2 x 0.6t	32.768 kHz	±20	40 70 75	7 9 12.5	+25 -40 to +105 -40 to +125	

kHz Crystal Unit and kHz Crystal Oscillator Recommendation Products



▶ kHz Crystal Oscillator

▶ SPXO

Model	Size [mm]	Nominal frequency range	Frequency Tolerance (+25 °C) [x 10 ⁻⁶]	Operating temperature (T _{use}) [°C]	Supply voltage [V]	Current consumption Max. [μA] (V _{CC} = 3.3 V, No load, T _{use})	Output load condition [pF]	Output control
SG-3031CM	3.2 × 1.5 × 0.9t	32.768 kHz	5 ± 23	-40 to +85	1.1 to 5.5	1.3	15	V _{IO}
SG-3031CMA (AEC-Q100)								

▶ TCXO

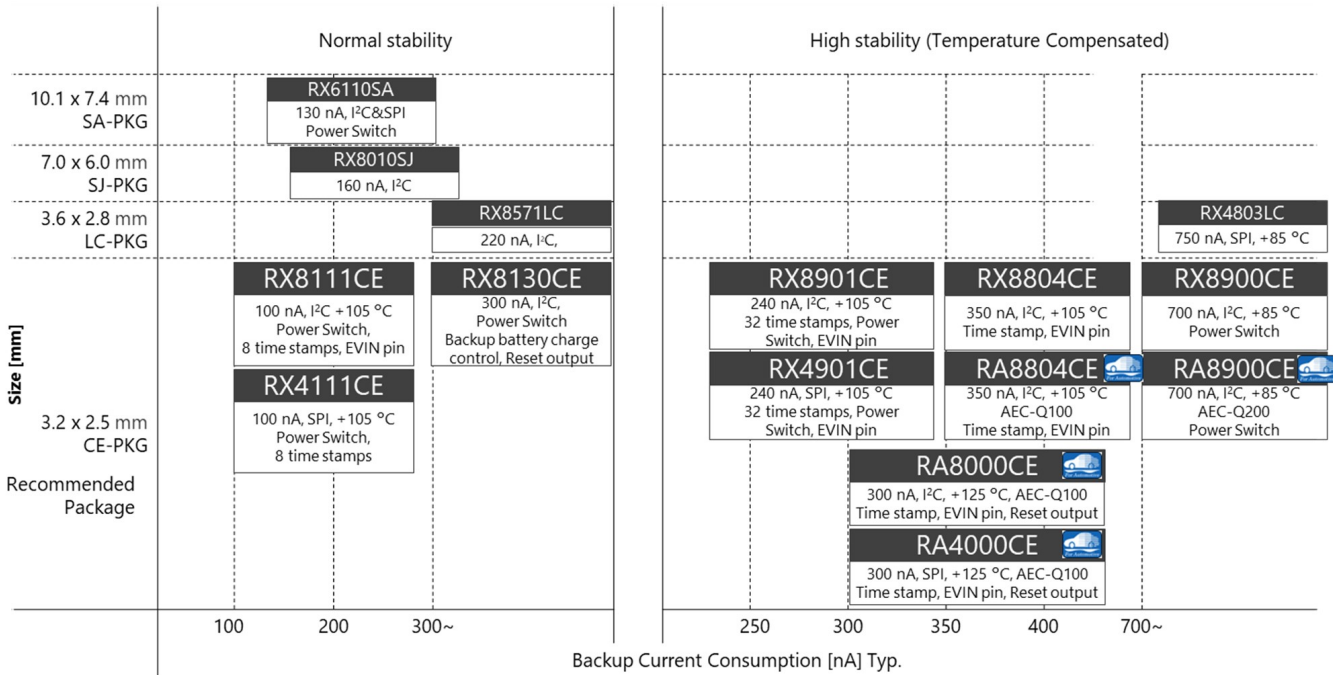
Model	Size [mm]	Nominal frequency range	Frequency tolerance [x 10 ⁻⁶] / Operating temperature (T _{use}) [°C]	Supply voltage [V]	Current consumption Max. [μA] (V _{CC} = 3.3 V, No load, T _{use})	Output load condition [pF]	Output control
TG-3541CE	3.2 × 2.5 × 1.0t	32.768 kHz	± 3.4 / -40 to +85 ± 5.0 / -40 to +85 ± 8.0 / +85 to +105	1.5 to 5.5	3.0	30	OE
TG-3541CEA (AEC-Q100)							

Real Time Clock modules (RTC modules)

Epson's crystal integrated RTC modules offer variety of features such as lower power, accurate clock/date information, Wake-up Timer, Power Switch, and Time-Stamp function. This will help your system lower power with multi-functionality.

Features

- Our lower power design enables our RTC modules to store abnormality on system and time errors even when the main MCU is not in operation
- Tuning Folk Crystal unit and DTCXO (Some products only) integrated RTC modules can assure and manage time information with higher accuracy



Features and Functions

Category	Summary	Use case recommendations, etc
Frequency Tolerance	The variance based on 32.768 kHz under the operating temperature on the integrated crystal inside. For an RTC module, $\pm 23 \times 10^{-6}$ approximately equals to 1 minute per month. Crystal unit inside has a quadratic curve whose peak temperature stays at a room temperature. Therefore, time accuracy varies depending on the external temperature. Epson also offers temperature compensated RTC modules whose clock accuracy has been already adjusted within the operating temperature. (DTCXO)	Temperature compensated models are suitable when.. -your system will be installed outside or a hotter place where the temperature may change drastically. -your system needs time accuracy with a standalone condition (Best accuracy option: $\pm 3.4 \times 10^{-6} \approx 9$ seconds per month)
Backup current consumption	Consumption value when RTC module is individually in operation, whereas the system's main MCU is on sleep mode. " Max." shows the maximum value within the operating temperature (Ta).	Lower power RTC modules are suitable for - your system that operates with a battery. - your system that goes to sleep-mode for a long period Our low power RTC modules can manage time information or system behavior for a long term.
Time-Stamp function	This stores the time data when an event occurs. Time-stamp functions followed by several triggers. For products with EVIN pin, triggers interlock with EVIN pin inputs. For products without EVIN pin, triggers interlock with RTC module's internal operation or Bus access.	RTC modules with time-stamp are suitable for applications such as - anti-tampering for smart meters or security systems - abnormality detection for factory automation
Power Switch	This monitors the main power condition, and this will automatically change the power source to back-up mode when the voltage on the main power reduces. Please refer to application manuals for details since functions vary depending on each product.	By simplifying Diode-OR circuit, it will help reduce a leak current, as well as utilize an engineering resource and PCB area.

3.2 x 2.5 x 1.0t (CE package) Recommendation package

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [μA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	+85 °C to +105 °C	+105 °C to +125 °C	Typ. (25 °C)	Max. (Ta = Max.)						
RX8901CE	I ² C	-40	+105	-	±3.0 ±5.0	±5.0 ±8.0	-	0.24	1.5	32 times	✓	2 or 3	256 bit	24 bit x 1 ch. to 32 years	
RX4901CE	SPI	-40	+105	-	±3.0 ±5.0	±5.0 ±8.0	-	0.24	1.5	32 times	✓	0 to 2	256 bit	24 bit x 1 ch. to 32 years	
RA8000CE (AEC-Q100)	I ² C	-40	+125	-	±5.0	±8.0	±50.0	0.3	1.7	2 times	-	0 or 2	-	24 bit x 1 ch. to 32 years	Reset output with Delay, SOUT pin
RA4000CE (AEC-Q100)	SPI	-40	+125	-	±5.0	±8.0	±50.0	0.3	1.7	2 times	-	0 to 2	-	24 bit x 1 ch. to 32 years	Reset output with Delay, SOUT pin

3.2 x 2.5 x 1.0t (CE package) Recommendation package

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]				Backup current consumption [μA] 3.0V							
		Min.	Max.	+25 °C	-40 °C to +85 °C	+85 °C to +105 °C	+105 °C to +125 °C	Typ. (25 °C)	Max. (Ta = Max.)	Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
RX8111CE	I ² C	-40	+105	±11.5 ±23.0	-	-	-	0.1	0.45	8 times	✓	1	512 bit	24 bit x 1 ch. to 32 years	
RX4111CE	SPI	-40	+105			-	-	0.1	0.45	8 times	✓	-	512 bit	24 bit x 1 ch. to 32 years	
RX8804CE	I ² C	-40	+105	-	±3.4 ±5.0	±8.0	-	0.35	1.5	1 time	-	1	-	16 bit x 1ch. to 7.5 years	SOUT pin
RX8130CE	I ² C	-40	+85	5±23	-	-	-	0.3	0.5	-	✓	-	-	16 bit x 1 ch. to 7.5 years	Backup battery charge control, Reset output with Delay
RX8900CE	I ² C	-40	+85	-	±3.4 ±5.0	-	-	0.7	1.4	-	✓	-	-	12 bit x 1ch. to 2.8 days	Built-in Temp. Sensor
RA8804CE (AEC-Q100)	I ² C	-40	+105	-		±8.0	-	0.35	1.5	1 time	-	1	-	16 bit x 1ch. to 7.5 years	SOUT pin
RA8900CE (AEC-Q200)	I ² C	-40	+85	-		-	-	0.7	1.4	-	✓	-	-	12 bit x 1ch. to 2.8 days	Built-in Temp. Sensor

3.6 x 2.8 x 1.2t (LC package / VSOJ-12 pin)

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]			Backup current consumption [μA] 3.0 V								
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta = Max.)	Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others	
RX-8803LC	I ² C	-40	+85	-	±3.4	-	0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS	
RX-4803LC	SPI				±5.0		0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS	
RX-8035LC	I ² C			5±23	-	-	0.4	1.2	1 time	✓	1	-	-		
RX-4035LC	SPI			5±5 0±5			0.4	1.2	-	-	1	-	-		
RX-8731LC	I ² C			5±23	-	-	0.35	1.4	-	-	-	EEPROM: 80 bit ID-ROM: 48 bit	to 2.8 days		
RX-8571LC	I ² C			0.22	0.4	-	-	-	-	-	128 bit	to 7.5 years	DAS pin		
RX-4571LC	SPI			0.32	0.95	-	-	-	-	-	-	to 2.8 days			
RX-8564LC	I ² C			0.275	0.7	-	-	-	-	-	-	to 255 min.			

6.3 x 5.2 x 1.4t (NB package / SON-22 pin)

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]			Backup current consumption [μA] 3.0 V								
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta = Max.)	Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others	
RX-8025NB	I ² C	-40	+85	5±5	-	-	0.48	1.2	-	-	-	-	-		
RX-4045NB	SPI			0±5			0.48	1.2	-	-	-	-	-		
RX-8571NB	I ² C			5±23			0.2	0.4	-	-	-	128 bit	to 7.5 years	DAS pin	
RX-4571NB	SPI			0.32			0.95	-	-	-	-	-	-	to 2.8 days	

7.0 x 6.0 x 2.65t (SJ package / SOP-8 pin)

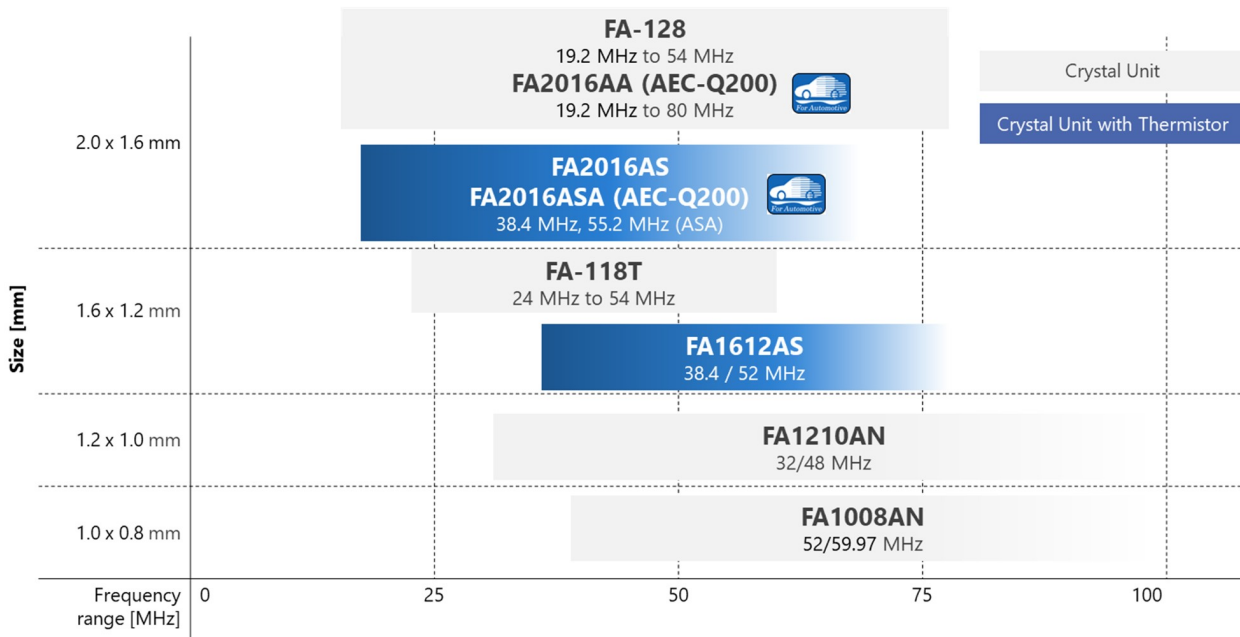
Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]			Backup current consumption [μA] 3.0 V								
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta = Max.)	Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others	
RX8010SJ	I ² C	-40	+85	5±23	-	-	0.16	0.32	-	-	-	128 bit	to 7.5 years	Common pin connection with SOP-8	

10.1 x 7.4 x 3.3t (SA package / SOP-14 pin)

Model	Interface	Specifications							Functions								
		Operating temperature Ta [°C]		Frequency Tolerance [x 10 ⁻⁶]			Backup current consumption [µA] 3.0 V										
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta = Max.)	Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others			
RX6110SA	SPI & I ² C	-40	+85	5±23	-	-	0.16	0.32	-	✓	-	128 bit	to 7.5 years				
RX8900SA	I ² C							0.7	1.4	-	✓	-	-	to 2.8 days	Built-in Temp. Sensor		
RX-8803SA	I ² C							0.75	2.1		-	-	1	to 2.8 days	Time sync. with 1 PPS		
RX-4803SA	SPI							0.75	2.1	-	-	-	1	to 2.8 days	Time sync. with 1 PPS		
RX-8035SA	I ² C						5±23			0.35	1.2	1 time	✓	2	-	-	
RX-4035SA	SPI						5±5			0.35	1.2	1 time	✓	2	-	-	
RX-8025SA	I ² C						0±5			0.48	1.2	-	-	-	-	-	
RX-4045SA	SPI						5±5			0.48	1.2	-	-	-	-	-	
RX-8571SA	I ² C						0±5			0.2	0.4	-	-	-	128 bit	to 7.5 years	DAS pin
RX-4571SA	SPI						5±23			0.32	0.95	-	-	-	-	to 2.8 days	
RA8803SA (AEC-Q200)	I ² C							±3.4		0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS
RA4803SA (AEC-Q200)	SPI							±5.0		0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS
RA-4565SA (AEC-Q200)	SPI						5±23			0.8	1.6	-	-	-	-	to 255 min.	

MHz Crystal Units

MHz Crystal Unit, Crystal Unit with Thermistor Recommendation Products



► MHz Crystal Unit

Model	Size [mm]	Nominal frequency range	Frequency tolerance (+25 °C) [x 10 ⁻⁶]	Frequency vs. temperature characteristics [x10 ⁻⁶] / Operating temperature [°C]	Motional resistance Max. [Ω]	Load Capacitance [pF]	Operating temperature [°C]
FA1008AN	1.0 × 0.8 × 0.3t	40 MHz 100 MHz	±10	±10 / -20 to +75	60	6 to ∞	-40 to +85 (-40 to +105)
				±15 / -30 to +85			
				±20 / -40 to +85			
FA1210AN	1.2 × 1.0 × 0.3t	32 MHz 100 MHz	±10	±10 / -20 to +75	100 (32 ≤ f < 50 MHz)	6 to ∞	-40 to +85 (-40 to +105)
				±15 / -30 to +85	60 (50 ≤ f ≤ 100 MHz)		
				±20 / -40 to +85			
FA-118T	1.6 × 1.2 × 0.35t	24 MHz 54 MHz	±10	±12 / -20 to +75	200 (24 ≤ f < 32 MHz)	6 to ∞	-40 to +85
			±30	±30 / -20 to +75	100 (32 ≤ f < 36 MHz)		
FA-128	2.0 × 1.6 × 0.5t	19.2 MHz 54 MHz	±10	±10 / -20 to +75	150 (19.2 ≤ f < 20 MHz)	6 to ∞	-40 to +85 (-40 to +105)
			±30	±30 / -20 to +75	100 (20 ≤ f < 24 MHz)		
FA-20H	2.5 × 2.0 × 0.55t	12 MHz 54 MHz	±10	±10 / -20 to +75	150 (12 ≤ f < 16 MHz)	6 to ∞	-40 to +85 (-40 to +105)
			±30	±30 / -20 to +75	80 (16 ≤ f ≤ 25 MHz)		
FA-238V	3.2 × 2.5 × 0.7t	12 MHz 15.999 MHz	±15	±30 / -20 to +70	100 (12 ≤ f ≤ 13 MHz)	7 to ∞	-40 to +85 (-40 to +105)
FA-238	3.2 × 2.5 × 0.7t	16 MHz 50 MHz	±50		80 (13 < f < 20 MHz)		
TSX-3225	3.2 × 2.5 × 0.6t	16 MHz 48 MHz	±10	±10 / -20 to +75	60 (16 ≤ f < 21 MHz)	6 to ∞	-40 to +85 (-40 to +105)
FA2016AA (AEC-Q200)	2.0 × 1.6 × 0.5t	19.2 MHz 80 MHz	±10	±20 / -40 to +85	150 (19.2 ≤ f < 20 MHz)	6 to ∞	-40 to +125
				±50 / -40 to +125	100 (20 ≤ f < 24 MHz)		
FA-238A (AEC-Q200)	3.2 × 2.5 × 0.7t	12 MHz 50 MHz	±15	±30 / -40 to +85	120 (12 ≤ f ≤ 13 MHz)	7 to ∞	-40 to +125
				±50 / -40 to +125	80 (13 < f < 20 MHz)		

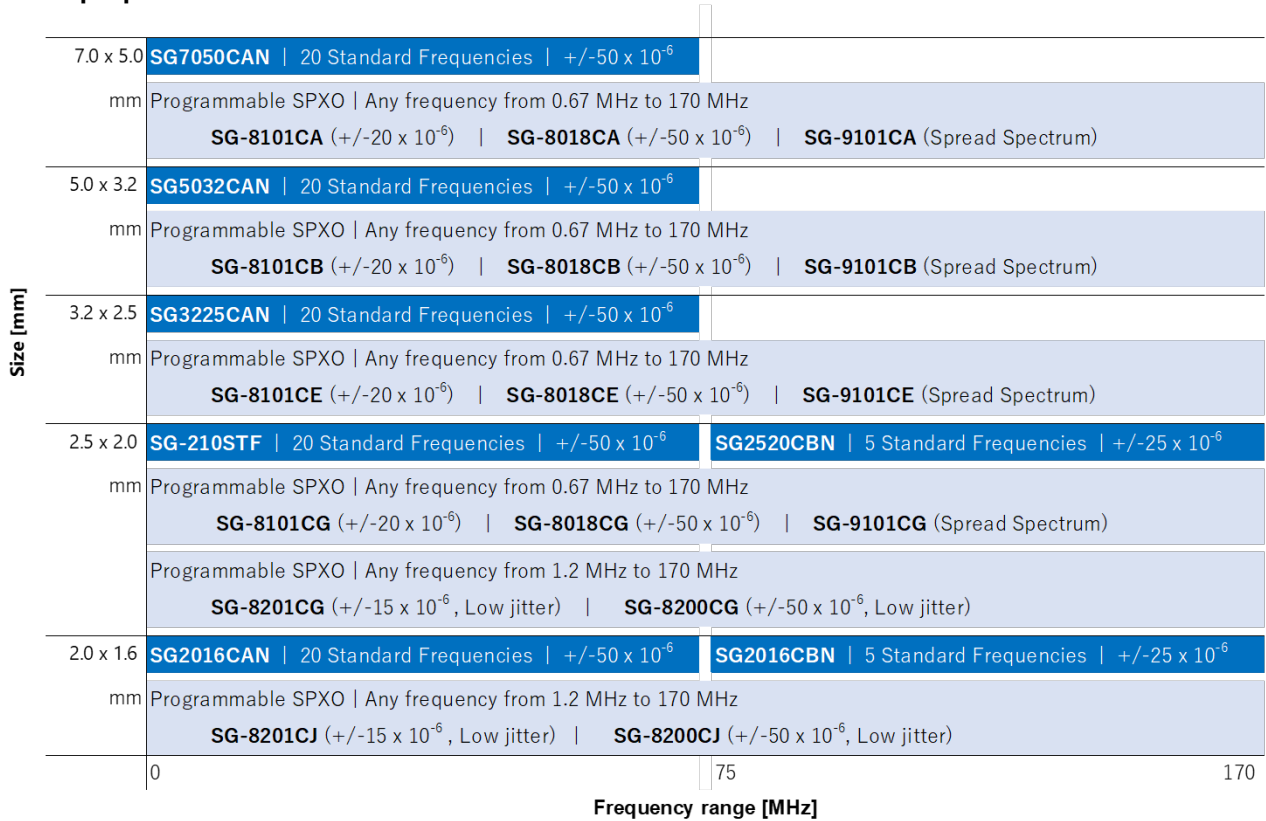
► MHz Crystal Unit (Built-in Thermistor)

Model	Size [mm]	Nominal frequency range	Frequency tolerance (+25 °C) [x 10 ⁻⁶]	Frequency vs. temperature characteristics [x10 ⁻⁶] / Operating temperature [°C]	Motional resistance Max. [Ω]	Load Capacitance [pF]	Operating temperature [°C]
FA1612AS	1.6 × 1.2 × 0.65t	38.4 MHz 52 MHz	±10	±12 / -30 to +85	80	6 to ∞	-40 to +85
FA2016AS	2.0 × 1.6 × 0.65t	38.4 MHz	±10	±12 / -30 to +85	60	6 to ∞	-40 to +85
FA2016ASA (AEC-Q200)	2.0 × 1.6 × 0.68t	38.4 MHz 55.2 MHz	±10	±12 / -30 to +85	50	6 to ∞	-40 to +105
				±30 / -40 to +105			

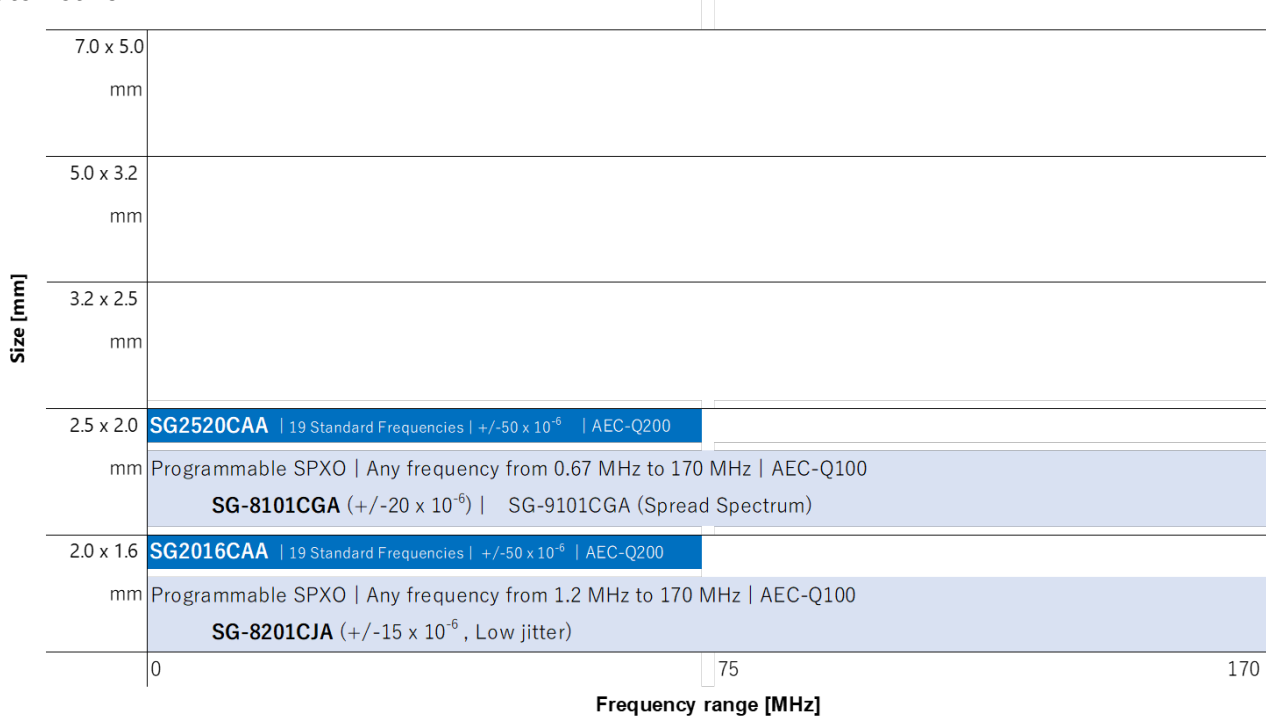
*1 Please contact us about reference temperature.

Crystal Oscillator (SPXO / SPSO) CMOS Output

► General purpose



► Automotive



► Fixed-Frequency SPXO

Model	Size [mm]	Nominal frequency range	Frequency Tolerance [x 10 ⁻⁶]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [pF]	Output control
SG2016CAN SG-210STF SG3225CAN SG5032CAN SG7050CAN	2.0 x 1.6 x 0.7t 2.5 x 2.0 x 0.8t 3.2 x 2.5 x 1.05t 5.0 x 3.2 x 1.1t 7.0 x 5.0 x 1.3t	1.2 MHz 75 MHz 20 standard frequencies	±25 ±50 ±50, ±100	-20 to +70 -40 to +85 -40 to +105	1.6 to 2.2	2.4	15	ST
					2.2 to 2.7	2.8		
					2.7 to 3.6	3.0		
SG5032CCN SG7050CCN	5.0 x 3.2 x 1.1t 7.0 x 5.0 x 1.3t	2.5 MHz 50 MHz	±50	-40 to +85	4.5 to 5.5	20.0	50	OE
SG2016CAA (AEC-Q200) SG2520CAA (AEC-Q200)	2.0 x 1.6 x 0.7t 2.5 x 2.0 x 0.8t	8 MHz 54 MHz 19 standard frequencies	±50, ±100 ±50, ±100 ±100, ±150	-40 to +85 -40 to +105 -40 to +125	1.6 to 2.2	2.9	15	ST
					2.2 to 2.7	3.3		
					2.7 to 3.6	3.5		
SG2016CBN SG2520CBN	2.0 x 1.6 x 0.7t 2.5 x 2.0 x 0.8t	75MHz 170MHz 5 standard frequencies	±15 ±25	-40 to +105 -40 to +125	1.6 to 1.9	12.0	15	ST
					2.2 to 2.7	13.9		
					2.9 to 3.6	16.6		

► Programmable SPXO

Model	Size [mm]	Nominal frequency range	Frequency Tolerance [x 10 ⁻⁶]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [pF]	Output control
SG-8200CJ SG-8200CG	2.0 x 1.6 x 0.6t 2.5 x 2.0 x 0.74t	1.2 MHz 170 MHz	±50	-40 to +125	1.62 to 1.98	10.4	15	OE or ST
					2.25 to 2.75	12.4		
					2.97 to 3.63	15.0		
SG-8201CJ SG-8201CG	2.0 x 1.6 x 0.6t 2.5 x 2.0 x 0.74t	1.2 MHz 170 MHz	±15 ±25	-40 to +105 -40 to +125	1.62 to 1.98	10.4	15	OE or ST
					2.25 to 2.75	12.4		
					2.97 to 3.63	15.0		
SG-8201CJA (AEC-Q100)	2.0 x 1.6 x 0.6t	1.2 MHz 170 MHz	±15 ±25 / ±50	-40 to +105 -40 to +125	1.62 to 1.98	10.4	15	OE or ST
					2.25 to 2.75	12.4		
					2.97 to 3.63	15.0		
SG-8018CG SG-8018CE SG-8018CB SG-8018CA	2.5 x 2.0 x 0.7t 3.2 x 2.5 x 1.05t 5.0 x 3.2 x 1.1t 7.0 x 5.0 x 1.3t	0.67 MHz 170 MHz	±50	-40 to +105	1.62 to 1.98	5.5	15	OE or ST
					1.98 to 2.2	5.8		
					2.2 to 2.8	6.7		
					2.7 to 3.63	8.1		
SG-8101CG SG-8101CE SG-8101CB SG-8101CA	2.5 x 2.0 x 0.7t 3.2 x 2.5 x 1.05t 5.0 x 3.2 x 1.1t 7.0 x 5.0 x 1.3t	0.67 MHz 170 MHz	±15 ±20 / ±50	-40 to +85 -40 to +105	1.62 to 1.98	5.5	15	OE or ST
					1.98 to 2.20	5.8		
					2.20 to 2.80	6.7		
					2.70 to 3.63	8.1		
SG-8101CGA (AEC-Q100)	2.5 x 2.0 x 0.7t	0.67 MHz 170 MHz	±15 ±20 ±50 / ±100	-40 to +85 -40 to +105 -40 to +125	1.62 to 1.98	5.5	15	OE or ST
					1.98 to 2.20	5.8		
					2.20 to 2.80	6.7		
					2.70 to 3.63	8.1		

► Programmable SPXO, Spread Spectrum

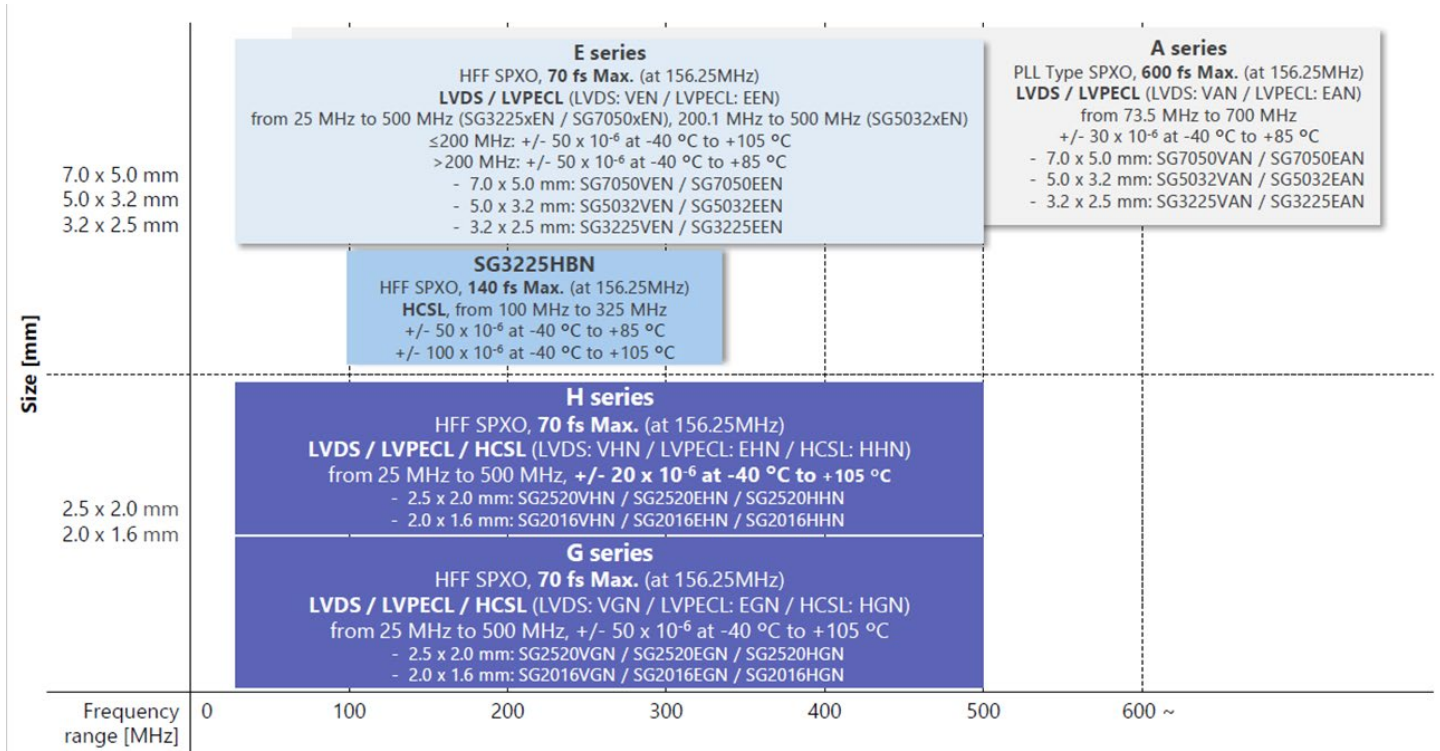
Model	Size [mm]	Nominal frequency range	Frequency Tolerance [x 10 ⁻⁶]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [pF]	Output control
SG-9101CG SG-9101CE SG-9101CB SG-9101CA	2.5 x 2.0 x 0.7t 3.2 x 2.5 x 1.05t 5.0 x 3.2 x 1.1t 7.0 x 5.0 x 1.3t	0.67 MHz 170 MHz	±50	-40 to +85 -40 to +105	1.62 to 1.98	5.7	15	OE or ST
					1.98 to 2.20	6.0		
					2.20 to 2.80	6.9		
					2.70 to 3.63	8.3		
SG-9101CGA (AEC-Q100)	2.5 x 2.0 x 0.7t	0.67 MHz 170 MHz	±100	-40 to +125	1.62 to 1.98	5.8	15	OE or ST
					1.98 to 2.20	6.1		
					2.20 to 2.80	7.0		
					2.70 to 3.63	8.4		

Spread Spectrum Configuration Center [%]	±0.25	±0.5	±0.75	±1.0	±1.5	±2.0
Spread Spectrum Configuration Down [%]	-0.5	-1.0	-1.5	-2.0	-3.0	-4.0

► Programming tool for Programmable SPXO

機種名	
SG-8000 series Programming Tool (SG-Writer II)	



Crystal Oscillator (SPXO / SPSO) Differential Output




▶ SPXO

Model		Size [mm]	Nominal frequency range	Frequency Tolerance [x 10 ⁻⁶]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [Ω]	Phase Jitter Max. (Bandwidth: 12 kHz to 20 MHz) [fs]
SG2016EHN SG2520EHN	LV-PECL	2.0 x 1.6 x 0.63t 2.5 x 2.0 x 0.74t	25 MHz — 500 MHz	±20	-40 to +85 -40 to +105	2.5 ± 0.125 3.3 ± 0.165	60	50	90 (fo = 100.00 MHz) 70 (fo = 156.25 MHz) 60 (fo = 212.50 MHz) 50 (fo = 491.52 MHz)
	LVDS					1.8 ± 0.090 2.5 ± 0.125 3.3 ± 0.165	25	100	100 (fo = 100.00 MHz) 60 (fo = 156.25 MHz) 50 (fo = 212.50 MHz) 50 (fo = 491.52 MHz) *Supply voltage = 2.5 V, 3.3 V
	HCSL					2.5 ± 0.125 3.3 ± 0.165	40	50	90 (fo = 100.00 MHz) 70 (fo = 156.25 MHz) 60 (fo = 212.50 MHz) 50 (fo = 491.52 MHz)
SG2016EGN SG2520EGN	LV-PECL	2.0 x 1.6 x 0.63t 2.5 x 2.0 x 0.74t	25 MHz — 500 MHz	±25 ±50	-40 to +85 -40 to +105	2.5 ± 0.125 3.3 ± 0.165	60	50	90 (fo = 100.00 MHz) 70 (fo = 156.25 MHz) 60 (fo = 212.50 MHz) 50 (fo = 491.52 MHz)
	LVDS					1.8 ± 0.090 2.5 ± 0.125 3.3 ± 0.165	25	100	100 (fo = 100.00 MHz) 60 (fo = 156.25 MHz) 50 (fo = 212.50 MHz) 50 (fo = 491.52 MHz) *Supply voltage = 2.5 V, 3.3 V
	HCSL					2.5 ± 0.125 3.3 ± 0.165	40	50	90 (fo = 100.00 MHz) 70 (fo = 156.25 MHz) 60 (fo = 212.50 MHz) 50 (fo = 491.52 MHz)
SG3225EEN SG5032EEN SG7050EEN	LV-PECL	3.2 x 2.5 x 1.05t 5.0 x 3.2 x 1.3t 7.0 x 5.0 x 1.4t	25 MHz — 500 MHz (SG3225xEN, SG7050xEN)	±25 ±50 ±100	-40 to +85 -40 to +105	2.5 ± 0.125 3.3 ± 0.165	60	50	100 (fo = 100.00 MHz) 70 (fo = 156.25 MHz) 60 (fo = 212.50 MHz) 40 (fo = 491.52 MHz)
	LVDS								150 (fo = 100.00 MHz) 90 (fo = 156.25 MHz) 80 (fo = 212.50 MHz) 60 (fo = 491.52 MHz)
SG3225EAN SG5032EAN SG7050EAN	LV-PECL	3.2 x 2.5 x 1.05t 5.0 x 3.2 x 1.0t 7.0 x 5.0 x 1.4t	73.5 MHz — 700 MHz	±20 ±30 ±50	-20 to +70 -40 to +85	2.375 to 3.63	65	50	600 (none of the following fo) 900 (fo = 243 MHz to 250 MHz, 486 MHz to 500 MHz)
	LVDS								
SG3225HBN	HCSL	3.2 x 2.5 x 1.05t	100 MHz — 325 MHz	±50 ±100	-40 to +85 -40 to +105	3.3 ± 0.33	35	50	180 (fo = 100.00 MHz) 140 (fo = 156.25 MHz) 125 (fo = 200.00 MHz) 110 (fo = 322.27 MHz)


► SPSO

Model		Size [mm]	Nominal frequency range	Frequency Tolerance [$\times 10^{-6}$]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [Ω]	Phase Jitter Max. (Bandwidth: 12 kHz to 20 MHz) [fs]
MG7050EAN (Multi output)	LV-PECL	7.0 x 5.0 x 1.6t	 100 MHz 700 MHz	± 50 ± 100	0 to +70 -5 to +85 -20 to +70	2.5 \pm 0.125	94 (2out)	50	170 / 140 (fo = 100.00 MHz) 150 / 120 (fo = 156.25 MHz) 110 / 100 (fo = 312.50 MHz) 50 / 50 (fo = 700.00 MHz) (Left: 2.5 V / Right: 3.3 V)
						3.3 \pm 0.33	170 (4out) 102 (2out) 184 (4out)		
MG7050VAN (Multi output)	LVDS	7.0 x 5.0 x 1.6t				2.5 \pm 0.125	50 (2out)	100	190 / 160 (fo = 100.00 MHz) 170 / 140 (fo = 156.25 MHz) 120 / 110 (fo = 312.50 MHz) 60 / 50 (fo = 700.00 MHz) (Left: 2.5 V / Right: 3.3 V)
						3.3 \pm 0.33	66 (4out) 56 (2out) 72 (4out)		
MG7050HAN (Multi output)	HCSL	7.0 x 5.0 x 1.6t	 100 MHz 200 MHz			2.5 \pm 0.125	84 (2out)	50 or 42.2	190 / 160 (fo = 100.00 MHz) 180 / 150 (fo = 125.00 MHz) 160 / 130 (fo = 156.25 MHz) 140 / 120 (fo = 200.00 MHz) (Left: 2.5 V / Right: 3.3 V)
						3.3 \pm 0.33	128 (4out) 90 (2out) 136 (4out)		

► Programmable SPXO (Output: LV-PECL)

Model	Size [mm]	Nominal frequency range	Frequency Tolerance [$\times 10^{-6}$]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [Ω]	Phase Jitter Max. (Bandwidth: 12 kHz to 20 MHz) [fs]
SG-8506CA (I2C-Bus, Programmable, 8 pin)	7.0 x 5.0 x 1.5t	 50 MHz 800 MHz	± 31.5 ± 50	-40 to +85	2.5 \pm 0.125	90	50	300
SG-8503CA (Dual Selectable, 6 pin)					3.3 \pm 0.33			
					2.5 \pm 0.125			
SG-8504CA (Quad Selectable, 8 pin)					3.3 \pm 0.33			
					2.5 \pm 0.125			
					3.3 \pm 0.33			

High Precision Oscillator (TCXO / VC-TCXO)

Size [mm]	3.2 x 2.5 mm	Clipped sine wave	CMOS output
	2.5 x 2.0 mm	<p>For Industrial / Consumer (+85 °C Operation, H-Shape) - 2.5 x 2.0 mm: TG2520SMN - 2.0 x 1.6 mm: TG2016SMN 18 Standard frequencies: 16 / 16.368 / 16.369 / 19.2 / 20 / 24 / 25 / 25.6 / 26 / 27 / 27.6 / 30 / 32 / 38.4 / 40 / 48 / 50 / 52 MHz</p>	<p>For Industrial / Consumer (+85 °C Operation, H-Shape) - 3.2 x 2.5 mm: TG3225CEN - 2.5 x 2.0 mm: TG2520CEN 11 Standard frequencies: 12 / 16 / 24 / 25 / 26 / 27 / 32 / 36 / 38.4 / 39 / 48 / 40 MHz</p>
	2.0 x 1.6 mm	<p>For Automotive (AEC-Q100, Single-seal) Operating Temp. Max. SKA: +105 °C / SLA: +85 °C - 2.0 x 1.6 mm: TG2016SKA 26 / 32 / 38.4 / 40 / 48 / 49.58 MHz - 2.0 x 1.6 mm: TG2016SLA 26 / 32 / 38.4 / 40 / 48 / 49.58 MHz</p> 	
	1.6 x 1.2 mm	<p>For Industrial / Consumer (+105 °C Operation, ST-Function, Single-seal) - 2.0 x 1.6 mm: TG2016SLN 26 / 32 / 38.4 / 49.58 MHz - 1.6 x 1.2 mm: TG1612SLN 26 MHz</p>	

► **Output: Clipped sine wave**

Model	Size [mm]	Nominal frequency range	Frequency tolerance ($\times 10^{-6}$)	Frequency / Temperature Characteristics ($\times 10^{-6}$)	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition	Output control
TG2016SMN	2.0 × 1.6 × 0.73t	10 MHz - 55 MHz	±1.5	±0.5	-40 to +85	1.8 ± 0.1 2.8 ± 5 % 3.0 ± 5 % 3.3 ± 5 %	1.5 (≤ 26 MHz) 1.8 (≤ 40 MHz) 2.0 (≤ 50 MHz) 2.1 (≤ 55 MHz)	10 kΩ//10 pF	-
TG2520SMN	2.5 × 2.0 × 0.8t								
TG1612SLN	1.6 × 1.2 × 0.45t	13 MHz - 55.2 MHz	±2.0	±0.5 (≤ 85 °C) ±5.0 (≤ 105 °C)	-40 to +105	1.8 ± 0.1 2.8 ± 5 % 3.0 ± 5 % 3.3 ± 5 %	1.7 (≤ 26 MHz) 2.0 (≤ 38.4 MHz) 2.5 (≤ 55.2 MHz)	10 kΩ//10 pF	ST
TG2016SLN	2.0 × 1.6 × 0.7t	10 MHz - 55.2 MHz					1.7 (≤ 26 MHz) 2.0 (≤ 38.4 MHz) 2.5 (≤ 55.2 MHz)		
TG2016SKA (AEC-Q100)	2.0 × 1.6 × 0.7t	13 MHz - 55 MHz	±2.0	±0.5	-40 to +105	1.8 ± 0.1 3.3 ± 5 %	2.0 (≤ 40 MHz) 2.5 (≤ 55 MHz)	10 kΩ//10 pF	ST
TG2016SLA (AEC-Q100)	2.0 × 1.6 × 0.7t	13 MHz - 55 MHz	±2.0	±0.5	-40 to +85	1.8 ± 0.1 3.3 ± 5 %	2.0 (≤ 40 MHz) 2.5 (≤ 55 MHz)	10 kΩ//10 pF	ST
TG-5006CJ	2.0 × 1.6 × 0.73t	13 MHz - 52 MHz	±2.0	±0.5	-30 to +85	1.8 ± 0.1 2.8 ± 5 % 3.0 ± 5 % 3.3 ± 5 %	1.5 (≤ 26 MHz) 2.0 (> 26 MHz)	10 kΩ//10 pF	-
TG-5006CG	2.5 × 2.0 × 0.8t								
TG-5006CE	3.2 × 2.5 × 0.9t								

► **Output: CMOS**

Model	Size [mm]	Nominal frequency range	Frequency tolerance ($\times 10^{-6}$)	Frequency / Temperature Characteristics ($\times 10^{-6}$)	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition	Output control
TG2520CEN	2.5 × 2.0 × 0.8t	12 MHz - 52 MHz	±2.0	±2.0	-40 to +85	2.8 ± 5 % 3.0 ± 5 % 3.3 ± 5 %	4.0 (≤ 26 MHz) 6.0 (≤ 39 MHz) 6.5 (≤ 52 MHz)	15pF	-
TG3225CEN	3.2 × 2.5 × 0.9t								



Wired network/Wireless network Solutions (TCXO / VC-TCXO)

		TCXO	VC-TCXO
Size [mm]	7.0 x 5.0 mm	TG7050SKN / TG7050SMN Clipped sine wave, +/- 100×10^{-9} at -40 °C to +105 °C SKN: 10pin, SMN: 4pin From 10MHz to 54MHz	
		TG7050CKN / TG7050CMN CMOS, +/- 100×10^{-9} at -40 °C to +105 °C CKN: 10pin, CMN: 4pin From 10MHz to 54MHz	
		TG-5510CA / TG-5511CA Clipped sine wave/CMOS, +/- 280×10^{-9} at -40 °C to +85 °C TG-5510CA: 10pin, TG-5511CA: 4pin From 10MHz to 54MHz	
5.0 x 3.2 mm		TG5032SKN / TG5032SMN Clipped sine wave, +/- 100×10^{-9} at -40 °C to +105 °C SKN: 10pin, SMN: 4pin From 10MHz to 54MHz	TG5032SGN / TG5032SFN Clipped sine wave, +/- 100×10^{-9} at -40 °C to +85 °C SGN: 10pin, SFN: 4pin From 10MHz to 40MHz
		TG5032CKN / TG5032CMN CMOS, +/- 100×10^{-9} at -40 °C to +105 °C CKN: 10pin, CMN: 4pin From 10MHz to 54MHz	TG5032CGN / TG5032CFN CMOS, +/- 100×10^{-9} at -40 °C to +85 °C CGN: 10pin, CFN: 4pin From 10MHz to 40MHz
		TG-5510CB / TG-5511CB Clipped sine wave/CMOS, +/- 280×10^{-9} at -40 °C to +85 °C TG-5510CB: 10pin, TG-5511CB: 4pin From 10MHz to 54MHz	

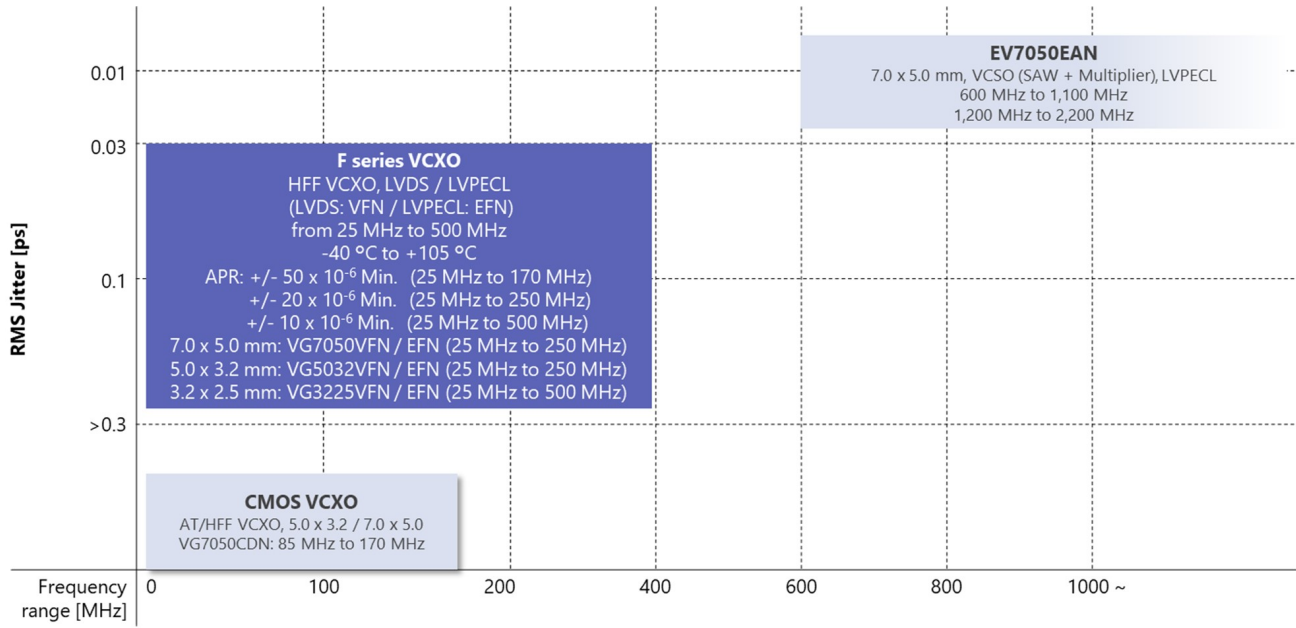
▶ Output: Clipped sine wave or CMOS

Model	Size [mm]	Nominal frequency range	Frequency tolerance ($\times 10^{-6}$)	Frequency / Temperature Characteristics ($\times 10^{-6}$)	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition	Output control
TG7050CKN (CMOS)	7.0 × 5.0 × 1.5t (10 pin)	10 MHz — 54 MHz	±1.0	±0.1	-40 to +105	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	OE
TG7050SKN (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG7050CMN (CMOS)	7.0 × 5.0 × 1.5t (4 pin)	10 MHz — 54 MHz	±1.0	±0.1	-40 to +105	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	-
TG7050SMN (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG-5510CA (CMOS)	7.0 × 5.0 × 1.5t (10 pin)	10 MHz — 54 MHz	±1.0	±0.28	-40 to +85 (+105 option)	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	OE
TG-5511CA (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG-5511CA (CMOS)	7.0 × 5.0 × 1.5t (4 pin)	10 MHz — 54 MHz	±1.0	±0.28	-40 to +85 (+105 option)	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	-
TG-5511CA (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG5032CKN (CMOS)	5.0 × 3.2 × 1.45t (10 pin)	10 MHz — 54 MHz	±1.0	±0.1	-40 to +105	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	OE
TG5032SKN (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG5032CMN (CMOS)	5.0 × 3.2 × 1.45t (4 pin)	10 MHz — 54 MHz	±1.0	±0.1	-40 to +105	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	-
TG5032SMN (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG-5510CB (CMOS)	5.0 × 3.2 × 1.45t (10 pin)	10 MHz — 54 MHz	±1.0	±0.28	-40 to +85 (+105 option)	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	OE
TG-5511CB (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG-5511CB (CMOS)	5.0 × 3.2 × 1.45t (4 pin)	10 MHz — 54 MHz	±1.0	±0.28	-40 to +85 (+105 option)	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	-
TG-5511CB (Clipped sine wave)							9.0 (≤ 40 MHz)		
TG-5511CB (CMOS)	5.0 × 3.2 × 1.45t (4 pin)	10 MHz — 54 MHz	±1.0	±0.28	-40 to +85 (+105 option)	3.3 ±5 %	7.0 (≤ 26 MHz)	15 pF	-
TG-5511CB (Clipped sine wave)							9.0 (≤ 40 MHz)		



Model	Size [mm]	Nominal frequency range	Frequency tolerance ($\times 10^{-6}$)	Frequency / Temperature Characteristics ($\times 10^{-6}$)	Operating temperature [$^{\circ}$ C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition	Output control
TG5032CGN (CMOS)	5.0 \times 3.2 \times 1.45t (10 pin)	 10 MHz 40 MHz	± 1.0	± 0.1	-40 to +85	2.375 to 3.63	5.0 (≤ 26 MHz) 6.0 (> 26 MHz)	15 pF	OE
TG5032SGN (Clipped sine wave)							5.0	10 k Ω /10 pF	
TG5032CFN (CMOS)	5.0 \times 3.2 \times 1.45t (4 pin)	 10 MHz 40 MHz	± 1.0	± 0.1	-40 to +85	2.375 to 3.63	5.0 (≤ 26 MHz) 6.0 (> 26 MHz)	15 pF	-
TG5032SFN (Clipped sine wave)							5.0	10 k Ω /10 pF	

VCXO / VCXO



► Output: CMOS

Model	Size [mm]	Nominal frequency range	Frequency tolerance (× 10 ⁻⁶)	Operating temperature [°C]	Absolute pull range (× 10 ⁻⁶)	Supply voltage [V]	Current consumption Max. [mA]	Output Load condition [pF]	Output control
VG7050CDN	7.0×5.0×1.6t	85 MHz ~ 170MHz	±50	-40 to +85	±50	3.3±0.165	30	15	OE
				-40 to +105					

► Output: LV-PECL

Model	Size [mm]	Nominal frequency range	Frequency tolerance (× 10 ⁻⁶)	Operating temperature [°C]	Absolute pull range (× 10 ⁻⁶)	Supply voltage [V]	Current consumption Max. [mA]	Output Load condition [pF]	Output control
VG3225EFN VG5032EFN VG7050EFN	3.2×2.5×1.05t 5.0×3.2×1.3t 7.0×5.0×1.5t	25 MHz ~ 500MHz 25 MHz ~ 250MHz	±50	-40 to +85	±50 ~170 MHz ±20 ~250 MHz	3.3±0.165	60	50	OE
				-40 to +105					
EV7050EAN	7.0×5.0×1.6t	600MHz ~ 1100MHz 1200MHz ~ 2200MHz	±100 ±120	-10 to +85	±50 ±30	3.3 ±0.165	115 175	50	OE
				-40 to +85					

► Output: LVDS

Model	Size [mm]	Nominal frequency range	Frequency tolerance (× 10 ⁻⁶)	Operating temperature [°C]	Absolute pull range (× 10 ⁻⁶)	Supply voltage [V]	Current consumption Max. [mA]	Output Load condition [pF]	Output control
VG3225VFN VG5032VFN VG7050VFN	3.2×2.5×1.05t 5.0×3.2×1.3t 7.0×5.0×1.5t	25 MHz ~ 500MHz 25 MHz ~ 250MHz	±50	-40 to +85	±50 ~170MHz ±20 ~250MHz	3.3 ±0.165	25	100	OE
				-40 to +105					

► RF Transmitter Module

Model	Size (mm)	Feature	Operating temperature	Supply voltage	Current consumption (Max.)
SR3225SAA (AEC-Q100)	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

Sensing Device

Product Grade



Automotive

XC1011SD
Vo: ± 3 °/s
DRa.: ± 30 G



Automotive

XV4001Bx
ZRLt: ± 3 °/s

XV4001Kx
ZRLt: ± 3 °/s
Inclined 20 °

Consumer & Industrial

XV7081BB
ZRLt: ± 3.0 °/s
1.5 m(°/s)/√Hz

XV7021BB
ZRLt: ± 1.0 °/s
1.5 m(°/s)/√Hz

XV7181BB
ZRLt: ± 1.0 °/s
Bs: 0.9 °/h

XV7001BB
ZRLt: ± 5.0 °/s
3 m(°/s)/√Hz

XV7011BB
ZRLt: ± 1.0 °/s
3 m(°/s)/√Hz

Z axis

others

► Gyro Sensor

Model	Size [mm]	Supply Voltage [V]	Interface Type	Bias	Rate Range [°/s]	Scale Factor [mV/(°/s)]	Non Linearity [%FS]	Operating Temperature [°C]	Recommended Application
XV7181BB	5.0×3.2×1.3t	2.7 to 3.6	Digital (SPI / I ² C)	0 [LSB] Typ. ± 1 [°/s]	± 115 ± 460	16bit: 264 [LSB/(°/s)], 66 [LSB/(°/s)] ± 2 [%], 24bit: 67584 [LSB/(°/s)], 16896 [LSB/(°/s)] ± 2 [%],	± 0.25	-40 to +85	Anti vibration and attitude control for industrial applications etc. Motion detection for Man machine interface
XV7021BB					± 400	24bit: 17920 [LSB/(°/s)] ± 5 [%]	± 0.5	-20 to +80 (Please contact us about -40 °C to +85 °C)	
XV7081BB					± 100	24bit: 71680 [LSB/(°/s)] ± 5 [%]	± 0.5	-20 to +80	
XV7011BB					± 100	16bit: 280 [LSB/(°/s)] ± 5 [%]	± 0.5	-20 to +80	
XV7001BB					± 100	16bit: 280 [LSB/(°/s)] ± 5 [%]	± 0.5	-20 to +80	
XV-3510CB		2.7 to 3.3	Analog Voltage	1430 [mV]	± 300	3.0	± 0.5	-20 to +80	Detection picture stabilization

► Gyro sensor for automotive

Model	Size [mm]	Supply Voltage [V]	Interface Type	Bias	Rate Range [°/s]	Scale Factor [mV/(°/s)]	Non Linearity [%FS]	Operating Temperature [°C]	Recommended Application
XV-9100CD (AEC-Q100)	5.0×5.0×1.3t	4.75 to 5.25	Analog Voltage	0.5 × V _{DD} [V]	± 100	0.004 × V _{DD}	± 0.5	-40 to +105	Electric Stability Control System, Rollover Protection System
XV-9300LP (AEC-Q100)	9.5×5.0×7.2t				± 300	0.0012 × V _{DD}		-40 to +125	
XV4001KC (AEC-Q200)	6.0×4.8×3.3t Inclined	3.0 to 3.6	Digital (I ² C-Bus)	0 [LSB] Typ. ± 2 [°/s]	± 70	370 [LSB/(°/s)] ± 1.5 [%]	± 0.5	-40 to +85	Car navigation system
XV4001KD (AEC-Q200)			Digital (SPI-Bus)						
XV4001BC (AEC-Q200)	5.0×3.2×1.3t	3.0 to 3.6	Digital (I ² C-Bus)						
XV4001BD (AEC-Q200)			Digital (SPI-Bus)						






► Combined sensor for automotive

Model	Size [mm]	Supply Voltage [V]	Interface Type	Gyro Bias	Rate Range [°/s]	Acceleration 0G Output [mG]	Acceleration Range [G]	Operating Temperature [°C]	用途
XC1011SD (AEC-Q100)	6.5×5.2×1.9t	3.135 to 3.465	Digital (SPI-Bus)	0 [LSB] Typ. ± 3 [°/s]	± 160	± 57	± 30	-40 to +105	Electric Stability Control System



■ IMU Product Line-up

- M-G370PDT0 : Low Noise and High Stability IMU
- M-G370PDG0 : High Precision and High Stability IMU
- M-G366PDG0 / M-G330PDG0 : Dynamic Tilt Function IMU
- M-G570PR20 : Water and Dust Proof, High Precision IMU(RS422 Interface)




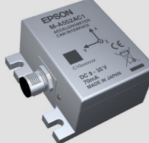
Product Name			M-G370PDT0	M-G370PDG0	M-G366PDG0	M-G330PDG0	M-G570PR20
Features			Low Noise High Stability	High Precision High Stability	Standard Model Dynamic Tilt	Basic Model Dynamic Tilt	Water and Dust proof High Precision
Gyro scope	Bias Instability	°/h	0.8	0.8	1.2	3	0.5
	Output Range	°/s	±200	±450		±400	±475
	Random Walk	°/√H	0.03	0.06	0.08	0.1	0.04
	Band Width	Hz	189	189	472	500	189
Accelerometer	Output Range	G	±8 / ±16*1				±15
	Initial Bias	mG, σ	2	2	3	4	2
Misalignment (Gyro/Accelerometer)		°	0.01				0.15
Current Consumption		mA(Typ.)	16				80
Voltage Supply		V	3.3				12
Operating Temperature		°C	-40~+85				-30 ~ +70
Interface			SPI / UART				RS422
Size		mm	24 × 24 × 10				65 × 60 × 30
Weight		g	10				150
Dynamic Tilt Function EKF(Extended Kalman Filter)			---	---	Built in	Built in	---
Functions			External Trigger Input, etc				IP67
Product Image							

*1 Selectable by register setting





■ Accelerometer/Vibration sensor Product Line-up


- M-A342VD10 : ISO10816/ISO20816 Compliant Vibration Sensor(Interface: SPI/UART)
- M-A542VR10 : Water and Dust Proof ISO10816/ISO3-816 Compliant Vibration Sensor (Interface: RS422)
- M-A352AD10 : High Accuracy Accelerometer(Interface: SPI/UART)
- M-A552AC1/AR1 : Water and Dust Proof, Accelerometer (Interface: CAN/RS422)

Specification/ Product Name	Vibration sensor M-A342	Vibration Sensor M-A542	Accelerometer M-A352	Accelerometer M-A552	
Features	Vibration and accelerometer featuring a wide detection range, high resolution, high accuracy, and excellent triaxial synchronization performance				
	ISO10816 compliant		Low Noise·Low Frequency Detection		
The number of axes	3axes (X/Y/Z)				
Output Physical Quantity	Velocity/Displacement(Selectable)		Acceleration		
Output Range	Velocity: ± 100 mm/s Displacement: ± 200 mm		± 15 G		
Resolution	Velocity: 2.38×10^{-4} mm/s/LSB Displacement: 2.38×10^{-4} mm/LSB		0.06 μ G/LSB		
Noise Density (25°C, Avg.)	Velocity: 1.4×10^{-4} mm/s/ $\sqrt{\text{Hz}}$ (Avg. 200~1,000 Hz) Displacement: 0.7×10^{-5} mm/ $\sqrt{\text{Hz}}$ (Avg. 20~100 Hz)		0.2 μ G/ $\sqrt{\text{Hz}}$ (Avg. 0.5~6Hz)		
Measurement Frequency Range	Velocity: 10~1,000 Hz Displacement: 1~100 Hz		DC~460 Hz		
Bias Temperature Error (-30~ +85°C, Max)	N/A ※Due to the removal of DC components		± 2.0 mG		
Output rate	Velocity: 3,000 sps (Fixed) Displacement: 300 sps (Fixed)		50~1,000 sps (Selectable)		
External Trigger Jitter	N/A		0~5 μ s		
Product Appearance	Product Image				
	Size	48x24x16 mm	65x60x30 mm	48x24x16 mm	65x60x30 mm
	Weight	25 g	128 g	25 g	128 g
	Current Consumption (Typ.)	2.9mA @3.3V	51mA @12V	13.2mA @3.3V	35mA @12V: M-A552AC10 49mA @12V: M-A552AR10
	Interface	UART/SPI(Selectable)	RS422	UART/SPI(Selectable)	CANopen: M-A552AC10 RS-422: M-A552AR10


Automotive Solutions
► kHz Crystal Unit

P	Model	Size [mm]	Nominal frequency range	Frequency Tolerance (+25 °C) [$\times 10^{-6}$]	Motional resistance Max. [k Ω]	Load capacitance [pF]	Operating temperature [°C]
FC-13A (AEC-Q200)	3.2 x 1.5 x 0.9t	 32.768 kHz	± 20 ± 30 ± 50	70	9 12.5	-40 to +125	Parabolic coefficient (B): $-0.04 \times 10^{-6} / ^\circ\text{C}^2$ Max. $f_{\text{tem}} = B (\text{Ti}\theta\text{x})^2$
FC2012AA (AEC-Q200)	2.05 x 1.2 x 0.6t	 32.768 kHz	± 20	40	7	+25	
				70	9	-40 to +105	
				75	12.5	-40 to +125	

► kHz Crystal Oscillator
► SPXO

Model	Size [mm]	Nominal frequency range	Frequency Tolerance (+25 °C) [$\times 10^{-6}$]	Operating temperature (T _{use}) [°C]	Supply voltage [V]	Current consumption Max. [μA] (V _{CC} = 3.3 V, No load, T _{use})	Output load condition [pF]	Output control
SG-3031CMA (AEC-Q100)	3.2 x 1.5 x 0.9t	 32.768 kHz	5 \pm 23	-40 to +85	1.1 to 5.5	1.3	15	V _{IO}

► TCXO

Model	Size [mm]	Nominal frequency range	Frequency tolerance [$\times 10^{-6}$] / Operating temperature (T _{use}) [°C]	Supply voltage [V]	Current consumption Max. [μA] (V _{CC} = 3.3 V, No load, T _{use})	Output load condition [pF]	Output control
TG-3541CEA (AEC-Q100)	3.2 x 2.5 x 1.0t	 32.768 kHz	$\pm 3.4 / -40$ to +85 $\pm 5.0 / -40$ to +85 $\pm 8.0 / +85$ to +105	1.5 to 5.5	3.0	30	OE



► Real Time Clock Module
3.2 x 2.5 x 1.0t (CE package) Recommendation package

Model	Interface	Specifications								Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [$\times 10^{-6}$]				Backup current consumption [μA] 3.0V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	+85 °C to +105 °C	+105 °C to +125 °C	Typ. (25 °C)	Max. (Ta = Max.)						
RA8000CE (AEC-Q100)	I ² C	-40	+125	-	± 5.0	± 8.0	± 50.0	0.3	1.7	2	-	0 or 2	-	24 bit x 1 ch. to 32 years	Reset output with Delay, SOUT pin
RA4000CE (AEC-Q100)	SPI	-40	+125	-	± 5.0	± 8.0	± 50.0	0.3	1.7	2	-	0 to 2	-	24 bit x 1 ch. to 32 years	Reset output with Delay, SOUT pin
RA8804CE (AEC-Q100)	I ² C	-40	+105	-	± 3.4	± 8.0	-	0.35	1.5	1	-	1	-	16 bit x 1 ch. to 7.5 years	SOUT pin
RA8900CE (AEC-Q200)	I ² C	-40	+85	-	± 5.0	-	-	0.7	1.4	-	✓	-	-	12 bit x 1 ch. to 2.8 days	Built-in Temp. Sensor


10.1 x 7.4 x 3.3t (SA package / SOP-14 pin)

Model	Interface	Specifications							Functions					
		Operating temperature Ta [°C]		Frequency Tolerance [$\times 10^{-6}$]			Backup current consumption [μA] 3.0 V		Time Stamp	Power Switch	EVIN pin	User Memory	Timer	Others
		Min.	Max.	+25 °C	-40 °C to +85 °C	-40 °C to +105 °C	Typ. (25 °C)	Max. (Ta = Max.)						
RA8803SA (AEC-Q200)	I ² C	-40	+85	-	± 3.4	-	0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS
RA4803SA (AEC-Q200)	SPI			± 5.0	-	0.75	2.1	-	-	1	-	to 2.8 days	Time sync. with 1 PPS	
RA-4565SA (AEC-Q200)	SPI			5 \pm 23	-	-	0.8	1.6	-	-	-	-	to 255 min.	

► MHz Crystal Unit


Model	Size [mm]	Nominal frequency range	Frequency tolerance (+25 °C) [x 10 ⁻⁶]	Frequency vs. temperature characteristics [x10 ⁻⁶] / Operating temperature [°C]	Motional resistance Max. [Ω]	Load Capacitance [pF]	Operating temperature [°C]
FA2016AA (AEC-Q200)	2.0 × 1.6 × 0.5t	 19.2 MHz 80 MHz	±10	±20 / -40 to +85 ±50 / -40 to +125	150 (19.2 ≤ f < 20 MHz) 100 (20 ≤ f < 24 MHz) 80 (24 ≤ f < 26 MHz) 60 (26 ≤ f ≤ 54 MHz)	6 to ∞	-40 to +125
FA-238A (AEC-Q200)	3.2 × 2.5 × 0.7t	 12 MHz 50 MHz	±15	±30 / -40 to +85	120 (12 ≤ f ≤ 13 MHz) 80 (13 < f < 20 MHz) 60 (20 ≤ f < 25 MHz) 50 (25 ≤ f ≤ 50 MHz)	7 to ∞	-40 to +125

► MHz Crystal Unit (Built-in Thermistor)




Model	Size [mm]	Nominal frequency range	Frequency tolerance (+25 °C) [x 10 ⁻⁶]	Frequency vs. temperature characteristics [x10 ⁻⁶] / Operating temperature [°C]	Motional resistance Max. [Ω]	Load Capacitance [pF]	Operating temperature [°C]
FA2016ASA (AEC-Q200)	2.0 × 1.6 × 0.68t	 38.4 MHz 55.2 MHz	±10	±12 / -30 to +85 ±30 / -40 to +105	50	6 to ∞	-40 to +105

*1 Please contact us about reference temperature.



► Fixed-Frequency SPXO

Model	Size [mm]	Nominal frequency range	Frequency Tolerance [x 10 ⁻⁶]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [pF]	Output control
SG2016CAA (AEC-Q200) SG2520CAA (AEC-Q200)	2.0 × 1.6 × 0.7t 2.5 × 2.0 × 0.8t	 8 MHz 54 MHz 19 standard frequencies	±50, ±100 ±50, ±100 ±100, ±150	-40 to +85 -40 to +105 -40 to +125	1.6 to 2.2 2.2 to 2.7 2.7 to 3.6	2.9 3.3 3.5	15	ST

► Programmable SPXO

Model	Size [mm]	Nominal frequency range	Frequency Tolerance [x 10 ⁻⁶]	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition [pF]	Output control
SG-8201CJA (AEC-Q100)	2.0 × 1.6 × 0.6t	 1.2 MHz 170 MHz	±15 ±25 / ±50	-40 to +105 -40 to +125	1.62 to 1.98 2.25 to 2.75 2.97 to 3.63	10.4 12.4 15.0	15	OE or ST
SG-8101CGA (AEC-Q100)	2.5 × 2.0 × 0.7t	 0.67 MHz 170 MHz	±15 ±20 ±50 / ±100	-40 to +85 -40 to +105 -40 to +125	1.62 to 1.98 1.98 to 2.20 2.20 to 2.80 2.70 to 3.63	5.5 5.8 6.7 8.1	15	OE or ST
SG-9101CGA (AEC-Q100)	2.5 × 2.0 × 0.7t	 0.67 MHz 170 MHz	±0.25 to ±2.0 -0.5 to -4.0	-40 to +125	1.62 to 1.98 1.98 to 2.20 2.20 to 2.80 2.70 to 3.63	5.8 6.1 7.0 8.4	15	OE or ST

► High Precision Oscillator (TCXO / VC-TCXO)

Model	Size [mm]	Nominal frequency range	Frequency tolerance (× 10 ⁻⁶)	Frequency / Temperature Characteristics (× 10 ⁻⁶)	Operating temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]	Output load condition	Output control
TG2016SKA (AEC-Q100)	2.0 × 1.6 × 0.7t	 13 MHz 55 MHz	±2.0	±0.5	-40 to +105	1.8 ± 0.1 3.3 ± 5 %	2.0 (≤ 40 MHz) 2.5 (≤ 55 MHz)	10 kΩ//10 pF	ST
TG2016SLA (AEC-Q100)	2.0 × 1.6 × 0.7t	 13 MHz 55 MHz	±2.0	±0.5	-40 to +85	1.8 ± 0.1 3.3 ± 5 %	2.0 (≤ 40 MHz) 2.5 (≤ 55 MHz)	10 kΩ//10 pF	ST

► Gyro sensor for automotive

Model	Size [mm]	Supply Voltage [V]	Interface Type	Bias	Rate Range [°/s]	Scale Factor [mV/(°/s)]	Non Linearity [%FS]	Operating Temperature [°C]	Recommended Application
XV-9100CD (AEC-Q100)	5.0×5.0×1.3t	4.75 to 5.25	Analog Voltage	0.5 × V _{DD} [V]	±100	0.004 × V _{DD}	± 0.5	-40 to +105	Electric Stability Control System, Rollover Protection System
XV-9300LP (AEC-Q100)	9.5×5.0×7.2t				±300	0.0012 × V _{DD}		-40 to +125	
XV4001KC (AEC-Q200)	6.0×4.8×3.3t Inclined	3.0 to 3.6	Digital (I ² C-Bus)	0 [LSB] Typ. ± 2 [°/s]	±70	370 [LSB/(°/s)] ±1.5 [%]	± 0.5	-40 to +85	Car navigation system
XV4001KD (AEC-Q200)			Digital (SPI-Bus)						
XV4001BC (AEC-Q200)	5.0×3.2×1.3t	Digital (I ² C-Bus)							
XV4001BD (AEC-Q200)		Digital (SPI-Bus)							

► Combined sensor for automotive

Model	Size [mm]	Supply Voltage [V]	Interface Type	Gyro Bias	Rate Range [°/s]	Acceleration 0G Output [mG]	Acceleration Range [G]	Operating Temperature [°C]	用途
XC1011SD (AEC-Q100)	6.5×5.2×1.9t	3.135 to 3.465	Digital (SPI-Bus)	0 [LSB] Typ. ± 3 [°/s]	±160	± 57	± 30	-40 to +105	Electric Stability Control System

► RF Transmitter Module

Model	Size [mm]	Feature	Operating Temperature [°C]	Supply voltage [V]	Current consumption Max. [mA]
SR3225SAA (AEC-Q100)	3.2×2.5×1.0t	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	1.8 to 3.6	16

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

Business area

