

CRYSTAL OSCILLATOR (Programmable)  
SPREAD SPECTRUM  
OUTPUT: CMOS



Product Number  
**X1G005281xxxx00**

# 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
- AEC-Q100 compliant



## Specifications (characteristics)

Item	Symbol	Specifications				Conditions/Remarks																																																				
Supply voltage	V <sub>CC</sub>	1.80 V Typ. 1.62 V to 1.98 V   1.98 V to 2.20 V		2.50 V Typ. 2.20 V to 2.80 V	3.30 V Typ. 2.70 V to 3.63 V																																																					
Output frequency range	f <sub>o</sub>	0.67 MHz to 170 MHz																																																								
Storage temperature	T <sub>stg</sub>	-40 °C to +125 °C																																																								
Operating temperature	T <sub>use</sub>	-40 °C to +125 °C																																																								
Frequency tolerance <sup>*1</sup>	f <sub>tol</sub>	±100 × 10 <sup>-6</sup>				Average frequency of 1s gate time.																																																				
Current consumption	I <sub>CC</sub>	3.5 mA Max.	3.6 mA Max.	3.7 mA Max.	3.8 mA Max.	T <sub>use</sub> = +125 °C	No load, f <sub>o</sub> = 20 MHz																																																			
		3.4 mA Max.	3.5 mA Max.	3.6 mA Max.	3.7 mA Max.	T <sub>use</sub> = +105 °C																																																				
		2.9 mA Typ.		3.0 mA Typ.	3.2 mA Typ.	T <sub>use</sub> = +25 °C																																																				
		5.8 mA Max.	6.1 mA Max.	7.0 mA Max.	8.4 mA Max.	T <sub>use</sub> = +125 °C																																																				
		5.7 mA Max.	6.0 mA Max.	6.9 mA Max.	8.3 mA Max.	T <sub>use</sub> = +105 °C																																																				
Output disable current	I <sub>dis</sub>	4.9 mA Typ.		5.9 mA Typ.	7.0 mA Typ.	T <sub>use</sub> = +25 °C	OE = GND, f <sub>o</sub> = 170 MHz																																																			
		3.5 mA Max.	3.5 mA Max.	3.6 mA Max.	3.8 mA Max.	T <sub>use</sub> = +125 °C																																																				
Standby current	I <sub>std</sub>	3.4 mA Max.	3.4 mA Max.	3.5 mA Max.	3.7 mA Max.	T <sub>use</sub> = +105 °C	ST = GND																																																			
		2.3 µA Max.	2.5 µA Max.	3.0 µA Max.	4.2 µA Max.	T <sub>use</sub> = +125 °C																																																				
		0.9 µA Max.	1.0 µA Max.	1.5 µA Max.	2.5 µA Max.	T <sub>use</sub> = +105 °C																																																				
Symmetry	SYM	45 % to 55 %				50 % V <sub>CC</sub> Level																																																				
		<table border="1"> <thead> <tr> <th colspan="7">I<sub>OH</sub>/I<sub>OL</sub> Conditions [mA]</th> </tr> <tr> <th>Rise/Fall time</th> <th>V<sub>CC</sub></th> <th>*A</th> <th>*B</th> <th>*C</th> <th>*D</th> <th></th> </tr> </thead> <tbody> <tr> <td rowspan="2">Default (f<sub>o</sub> &gt; 40 MHz), Fast</td> <td>I<sub>OH</sub></td> <td>-2.5</td> <td>-3.5</td> <td>-4.0</td> <td>-5.0</td> <td></td> </tr> <tr> <td>I<sub>OL</sub></td> <td>2.5</td> <td>3.5</td> <td>4.0</td> <td>5.0</td> <td></td> </tr> <tr> <td rowspan="2">Default (f<sub>o</sub> ≤ 40 MHz)</td> <td>I<sub>OH</sub></td> <td>-1.5</td> <td>-2.0</td> <td>-2.5</td> <td>-3.0</td> <td></td> </tr> <tr> <td>I<sub>OL</sub></td> <td>1.5</td> <td>2.0</td> <td>2.5</td> <td>3.0</td> <td></td> </tr> <tr> <td rowspan="2">Slow</td> <td>I<sub>OH</sub></td> <td>-1.0</td> <td>-1.5</td> <td>-2.0</td> <td>-2.5</td> <td></td> </tr> <tr> <td>I<sub>OL</sub></td> <td>1.0</td> <td>1.5</td> <td>2.0</td> <td>2.5</td> <td></td> </tr> </tbody> </table> <p>*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</p>						I <sub>OH</sub> /I <sub>OL</sub> Conditions [mA]							Rise/Fall time	V <sub>CC</sub>	*A	*B	*C	*D		Default (f <sub>o</sub> > 40 MHz), Fast	I <sub>OH</sub>	-2.5	-3.5	-4.0	-5.0		I <sub>OL</sub>	2.5	3.5	4.0	5.0		Default (f <sub>o</sub> ≤ 40 MHz)	I <sub>OH</sub>	-1.5	-2.0	-2.5	-3.0		I <sub>OL</sub>	1.5	2.0	2.5	3.0		Slow	I <sub>OH</sub>	-1.0	-1.5	-2.0	-2.5		I <sub>OL</sub>	1.0	1.5	2.0
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	I <sub>OL</sub>	1.0	1.5	2.0	2.5																																																					
Output load condition	L <sub>CMOS</sub>	15 pF Max.																																																								
Input voltage	V <sub>IH</sub>	70 % V <sub>CC</sub> Min.																																																								
	V <sub>IL</sub>	30 % V <sub>CC</sub> Max.																																																								
Rise and Fall time	Default	tr/TF	3.0 ns Max.				f <sub>o</sub> > 40 MHz																																																			
			6.0 ns Max.				f <sub>o</sub> ≤ 40 MHz																																																			
			3.0 ns Max.				f <sub>o</sub> = 0.67 MHz ~ 170 MHz																																																			
			10.0 ns Max.				f <sub>o</sub> = 0.67 MHz ~ 20 MHz																																																			
Disable Time	t <sub>stp</sub>	1 µs Max.				Measured from the time OE or ST pin crosses 30 % V <sub>CC</sub>																																																				
Enable Time	t <sub>sta</sub>	1 µs Max.				Measured from the time OE pin crosses 70 % V <sub>CC</sub>																																																				
Resume Time	t <sub>res</sub>	3 ms Max.				Measured from the time ST pin crosses 70 % V <sub>CC</sub>																																																				
Start-up time	t <sub>str</sub>	3 ms Max.				Measured from the time V <sub>CC</sub> reaches its rated minimum value, 1.62 V																																																				
Frequency aging	f <sub>aging</sub>	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 <sub>std</sub> .
2	GND	Power	Ground	
3	OUT	Output	Clock output	
4	V <sub>CC</sub>	Power	Power supply	



Product Name

SG-9101CGA 170.000000MHz C 20 P J 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
CG 2.5 mm x 2.0 mm

⑦ Operating temperature
J -40 °C to +125 °C

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

④ Spread type
C Center spread
D Down spread

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

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

⑥ Function
P Output enable
S Standby

\* Available only when fo ≤ 20 MHz

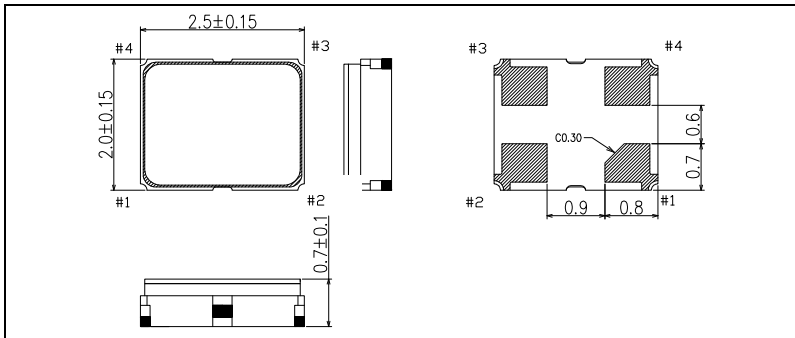
Spread spectrum configuration

④	C: Center spread modulation	⑤ Code	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	⑤ 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

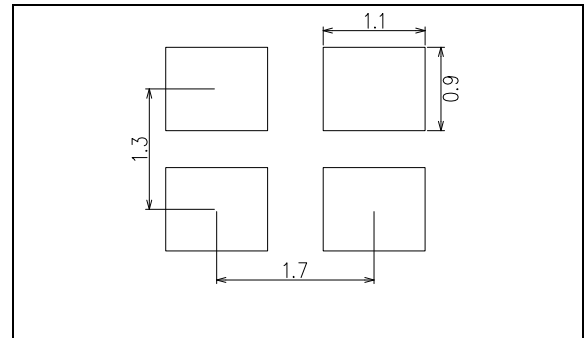
External dimensions

(Unit: mm)



Footprint (Recommended)

(Unit: mm)



Notes:

In order to achieve optimum jitter performance, the 0.1 μF capacitor between V<sub>CC</sub> 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.

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

	► 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.)
	► Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc.
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