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 ($\overline{ST}$)
- 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 (mm)
- PLL technology to enable short lead time
- AEC-Q100 compliant


## 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 ºC to +125 ºC | | | | Storage as single product. | |
| Operating temperature | T_use | -40 ºC to +125 ºC | | | | | |
| 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 ºC | 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 ºC | |
| | | 2.9 mA Typ. | | 3.0 mA Typ. | 3.2 mA Typ. | T_use = +25 ºC | |
| | | 5.8 mA Max. | 6.1 mA Max. | 7.0 mA Max. | 8.4 mA Max. | T_use = +125 ºC | 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 ºC | |
| | | 4.9 mA Typ. | | 5.9 mA Typ. | 7.0 mA Typ. | T_use = +25 ºC | |
| Output disable current | I_dis | 3.5 mA Max. | 3.5 mA Max. | 3.6 mA Max. | 3.8 mA Max. | T_use = +125 ºC | 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 ºC | |
| Standby current | I_std | 2.3 µA Max. | 2.5 µA Max. | 3.0 µA Max. | 4.2 µA Max. | T_use = +125 ºC | $\overline{ST}$ = GND |
| | | 0.9 µA Max. | 1.0 µA Max. | 1.5 µA Max. | 2.5 µA Max. | T_use = +105 ºC | |
| | | 0.3 µA Typ. | 0.4 µA Typ. | 0.5 µA Typ. | 1.1 µA Typ. | T_use = +25 ºC | |
| 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] | |
| | $V_{OL}$ | 10 % $V_{CC}$ Max. | | | | | |
| Output load condition | L_CMOS | 15 pF Max. | | | | | |
| Input voltage | $V_{IH}$ | 70 % $V_{CC}$ Min. | | | | OE or $\overline{ST}$ | |
| | $V_{IL}$ | 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 $\overline{ST}$ 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 $\overline{ST}$ 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 | |

$I_{OH}$/$I_{OL}$ Conditions [mA]

| Rise/Fall time | Vcc | *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 |
| 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

*1 Frequency tolerance includes initial frequency tolerance, temperature variation, supply voltage variation, reflow drift, load drift and aging (+25 ºC, 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-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 to +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 |

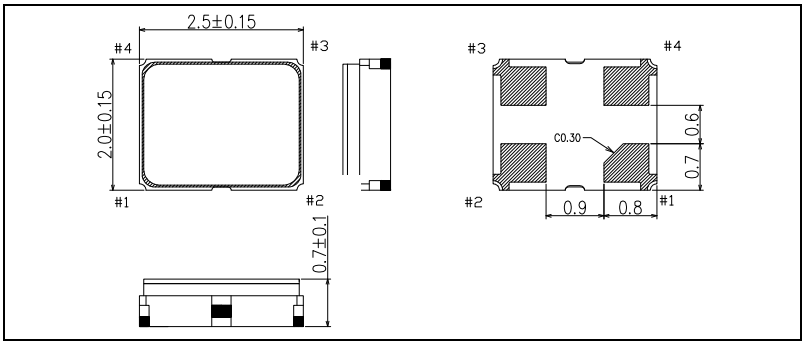
* Available only when fo ≤ 20 MHz

## Spread spectrum configuration

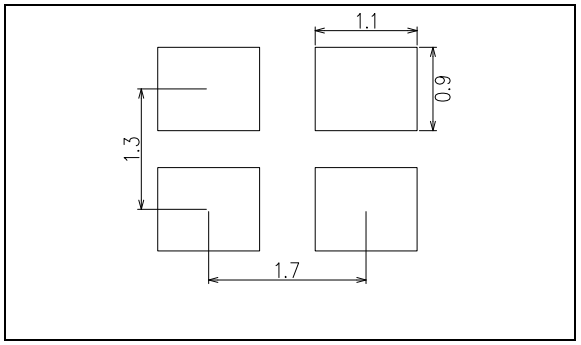
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ④ | C: Center spread modulation | ⑤Code | 02 | 05 | 07 | 10 | 15 | 20 |
| | | Spread percentage | ±0.25 % | ±0.5 % | ±0.75 % | ±1.0 % | ±1.5 % | ±2.0 % |
| | D: Down spread modulation | ⑤Code | 05 | 10 | 15 | 20 | 30 | 40 |
| | | Spread percentage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

## 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.

## 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.

## WORKING FOR HIGH QUALITY

In order provide high quality and reliable products and services than meet customer needs, Seiko Epson made early efforts towards obtaining ISO9000 series certification and has acquired ISO9001 for all business establishments in Japan and abroad. We have also acquired IATF 16949 certification that is requested strongly by major automotive manufacturers as standard.

IATF 16949 is the international standard that added the sector-specific supplemental requirements for automotive industry based on ISO9001.

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

| | |
|---|---|
|   | ►Pb free. |
|   | ►Complies with EU RoHS directive.<br>*About the products without the Pb-free mark.<br>Contains Pb in products exempted by EU RoHS directive.<br>(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. |
|   | ►Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc ). |