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## Contact us

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# CRYSTAL OSCILLATOR (Programmable)
OUTPUT: CMOS

# SG-8018series

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 (ST)
- Frequency tolerance : ±50 ppm (-40 ºC ~ +105 ºC)
  Include frequency aging(+25 ºC, 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”

Pb Free RoHS Compliant

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

CG 2.5 x 2.0mm | CE 3.2 x 2.5mm | CB 5.0 x 3.2mm | CA 7.0 x 5.0mm

## 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 ºC ~ +125 ºC | | | | Storage as single product. | |
| Operating temperature | T_use | -40 ºC ~ +105 ºC | | | | - | |
| Frequency tolerance*1 | f_tol | J: ±50 × $10^{-6}$ | | | | T_use = -40 ºC ~ +105 ºC | |
| Current consumption | $I_{CC}$ | 3.2 mA Max. | 3.3 mA Max. | 3.4 mA Max. | 3.5 mA Max. | T_use = +105 ºC | No load, $f_O$ = 20 MHz |
| | | 2.7 mA Typ. | | 2.9 mA Typ. | 3.0 mA Typ. | T_use = +25 ºC | |
| | | 5.5 mA Max. | 5.8 mA Max. | 6.7 mA Max. | 8.1 mA Max. | T_use = +105 ºC | No load, $f_O$ = 170 MHz |
| | | 4.7 mA Typ. | | 5.7 mA Typ. | 6.8 mA Typ. | T_use = +25 ºC | |
| 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 ºC | ST = GND |
| | | 0.3 µA Typ. | 0.4 µA Typ. | 0.5 µA Typ. | 1.1 µA Typ. | T_use = +25 ºC | |
| Symmetry | SYM | 45 % ~ 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. | | | | *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, 10 years | |

| $I_{OH}/I_{OL}$ Conditions | | | | | |
|---|---|---|---|---|---|
| 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 |
| 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 |

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

## Pin description

| Pin | Name | I/O type | Function | |
|---|---|---|---|---|
| 1 | OE | Input | Output enable | High: Specified frequency output from OUT pin<br>Low: Out pin is low (weak pull down), only output driver is disabled. |
| | ST | Input | Standby | High: Specified frequency output from OUT pin<br>Low: Out pin is low (weak pull down),<br>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 T 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 x $10^{-6}$ |

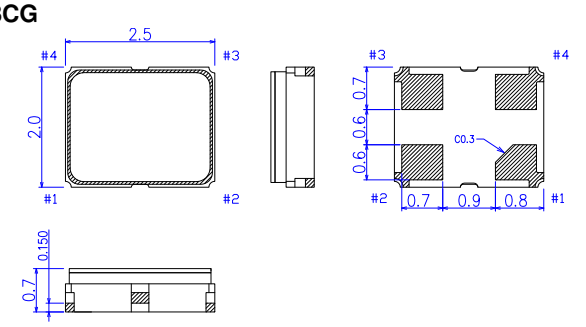
| ⑥Operating temperature |
|---|
| H: -40 °C ~ +105 °C |

| ⑦Function |
|---|
| P: Output Enable |
| S: Standby |

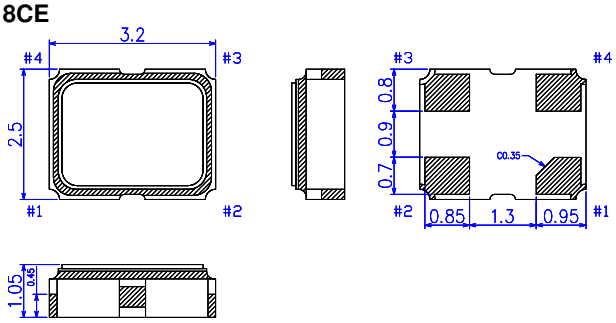
| ⑧ Rise/Fall time |
|---|
| A: Default |
| B: Fast |
| C: Slow |

## External dimensions (Unit: mm)

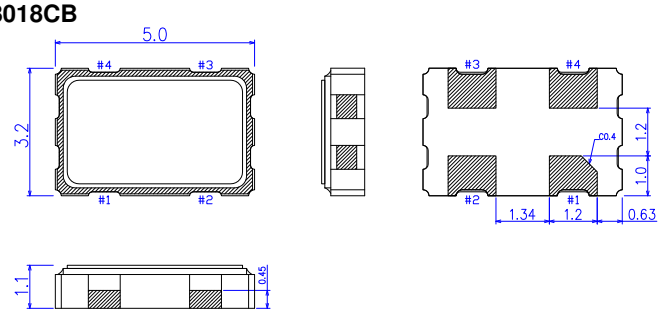
### SG-8018CG



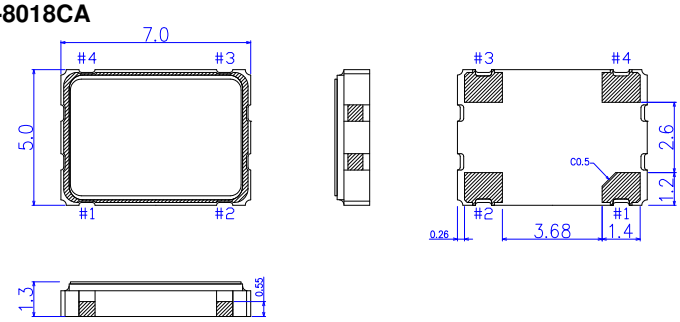

### SG-8018CE




### SG-8018CB

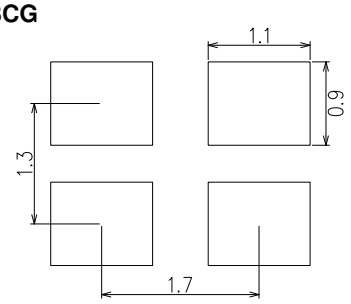



### SG-8018CA




## Footprint (Recommended) (Unit: mm)

### SG-8018CG

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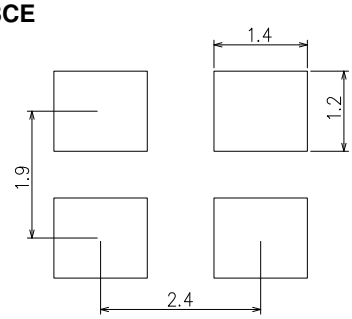


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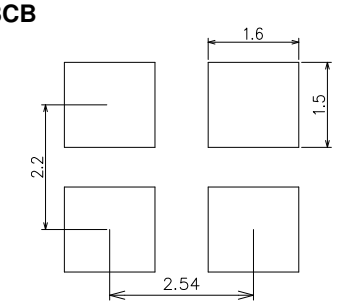
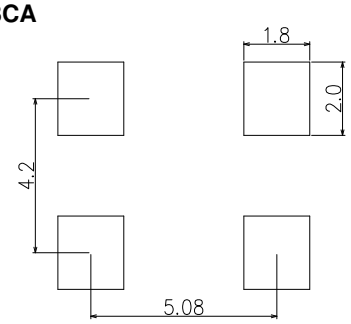


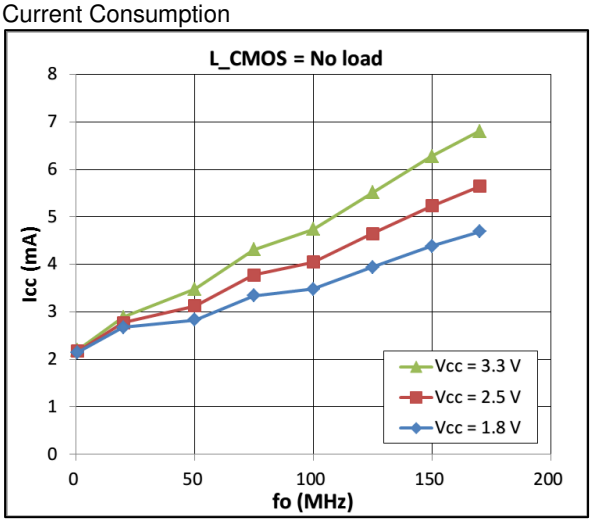

### SG-8018CA

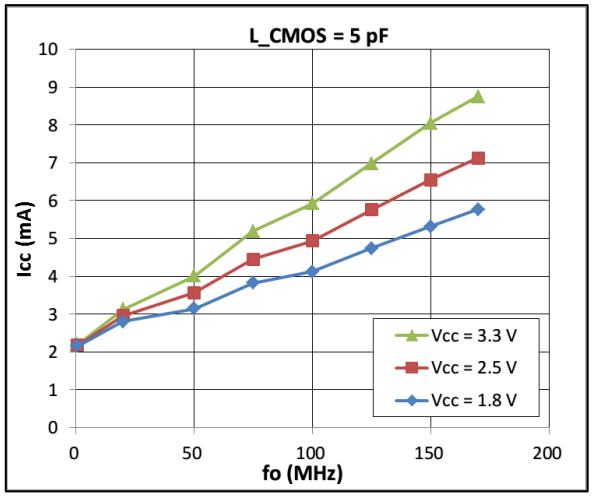


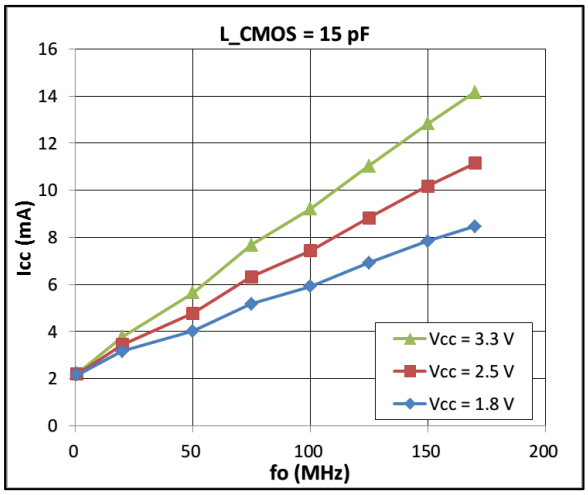

**■Notes:**
In order to achieve optimum jitter performance, the 0.1 µF capacitor between $V_{CC}$ and GND should be placed. It is also recommended that the capacitors are placed on the device side of the PCB, as close to the device as possible and connected together with short wiring pattern.

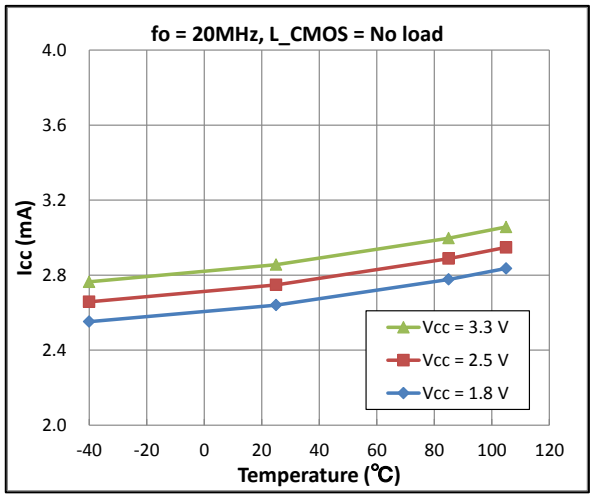
## Specification Graph（Typical supplemental specification. Unless otherwise specified T_use = 25 ℃, L_CMOS = 15pF）

Current Consumption

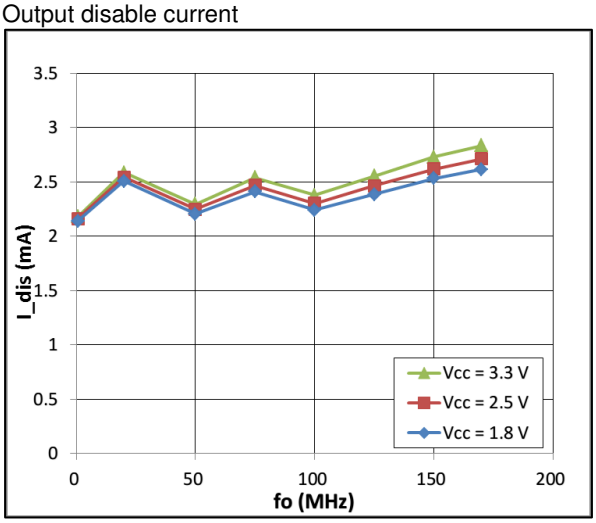


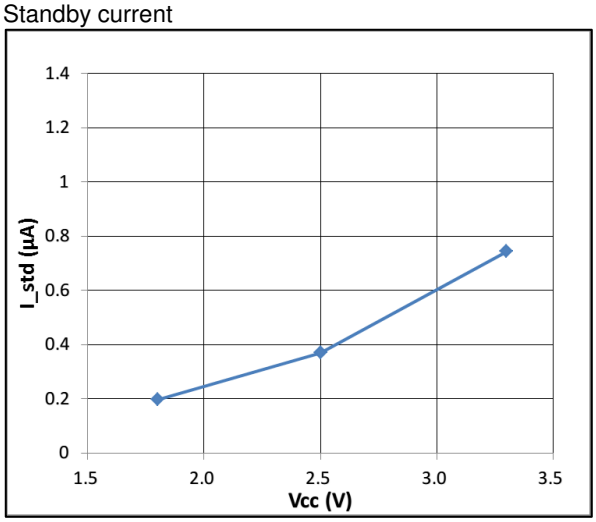




Output disable current



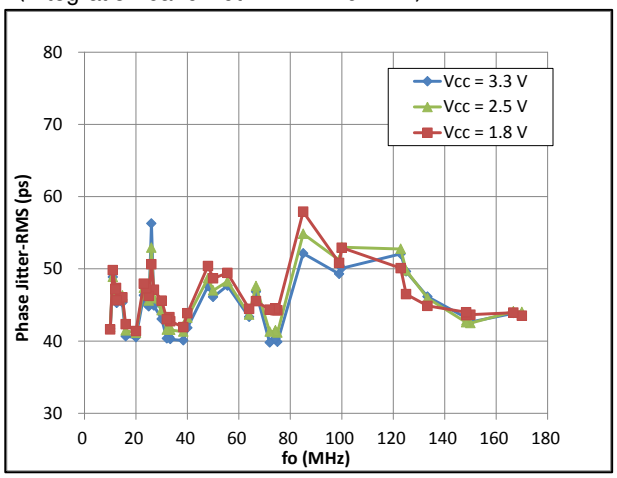

Standby current



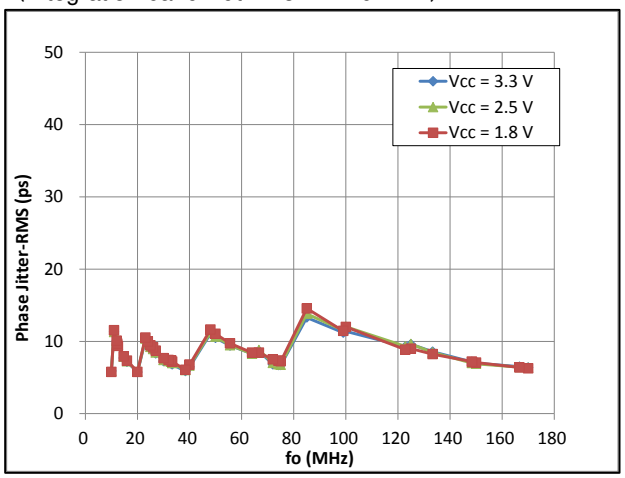

■Notes:

## Specification Graph（Typical supplemental specification. Unless otherwise specified T_use = 25 ℃, L_CMOS = 15pF）

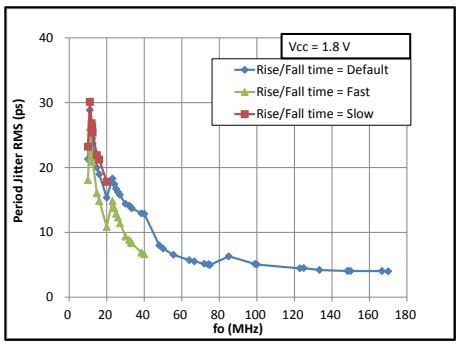
Phase Jitter RMS
（Integration bandwidth 12 k－20 MHz）

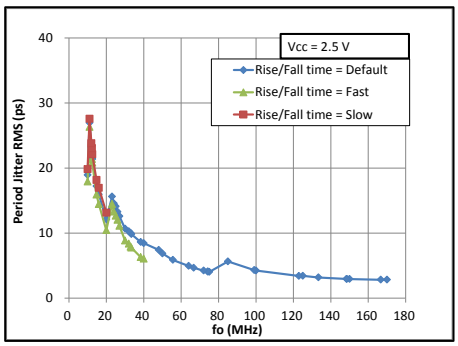


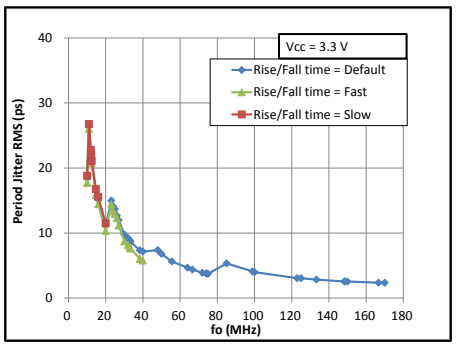

Phase Jitter RMS
（Integration bandwidth 1.8 M－20 MHz）



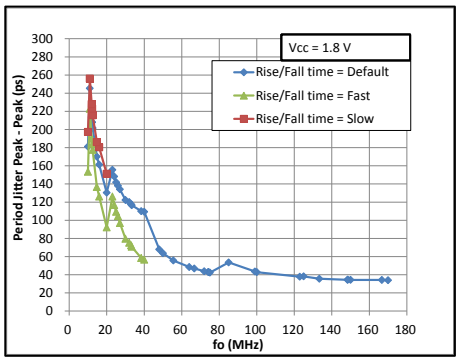

Period Jitter RMS

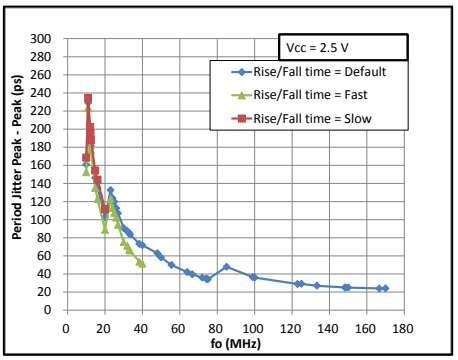


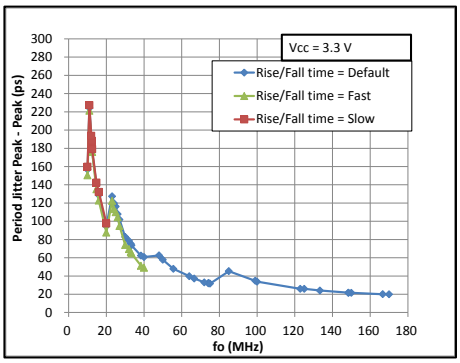



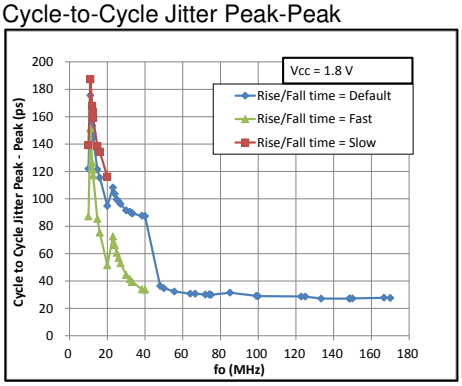

Period Jitter Peak-Peak

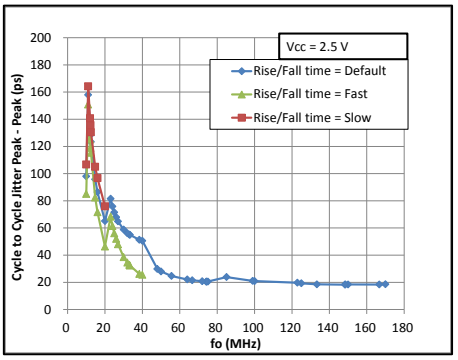


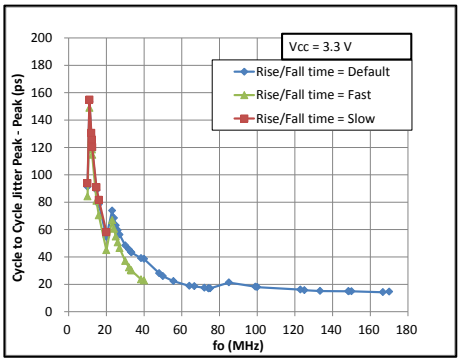




Cycle-to-Cycle Jitter Peak-Peak



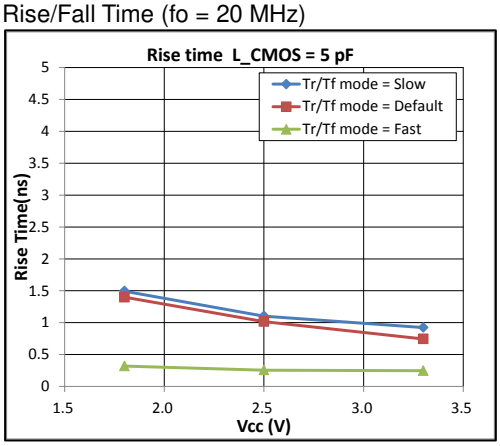



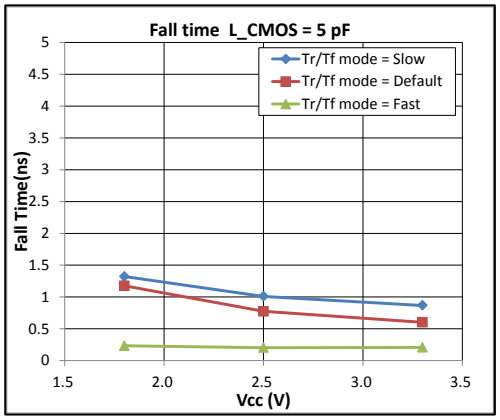



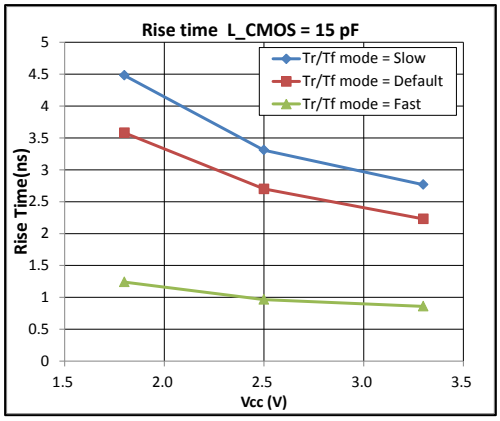

■Notes:

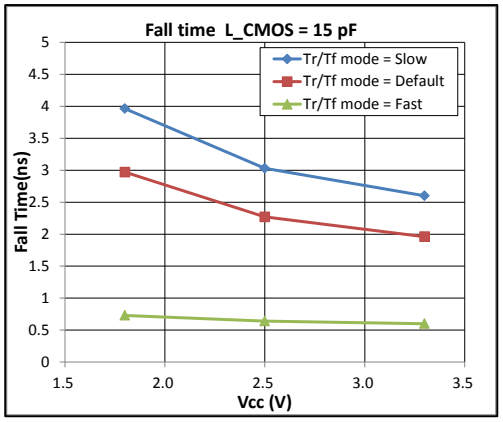
## Specification Graph（Typical supplemental specification. Unless otherwise specified T_use = 25 ℃, L_CMOS = 15pF）

Rise/Fall Time (fo = 20 MHz)



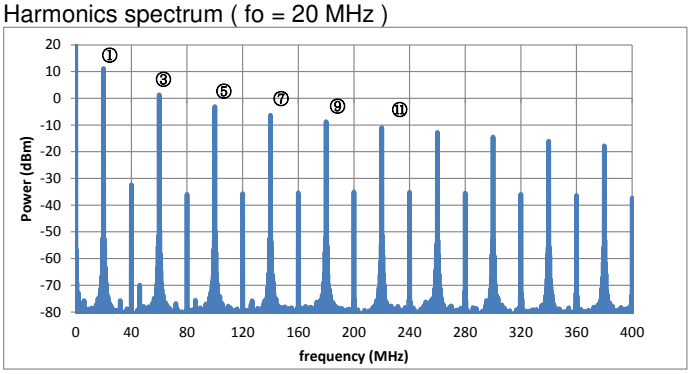



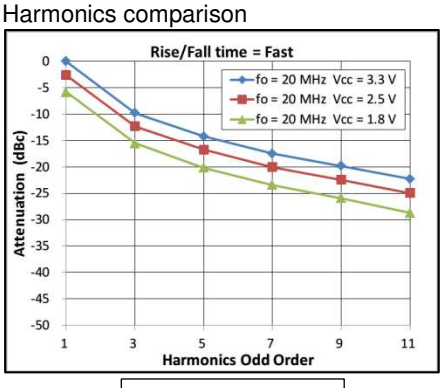

■Notes:

| frequency | slow | default | fast |
|---|---|---|---|
| 0.67 M – 20 M | See Slow | See Default | See Fast |
| 20 M – 40 M | - | See Default | See Fast |
| 40 M – 170 M | - | See Fast | See Fast |

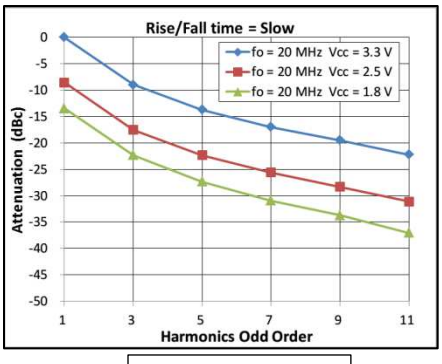
Harmonics spectrum ( fo = 20 MHz )



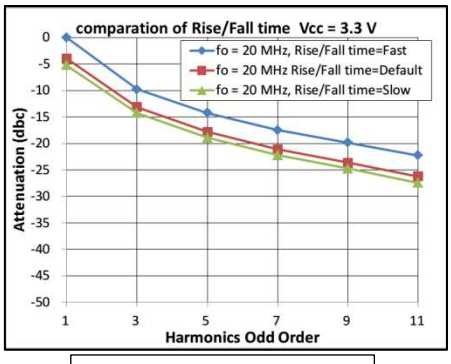

Harmonics comparison




Normalize to Vcc = 3.3V.




Normalize to Vcc = 3.3V.



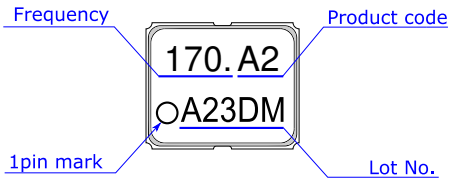
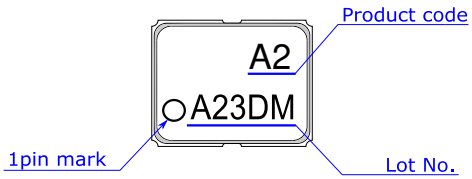
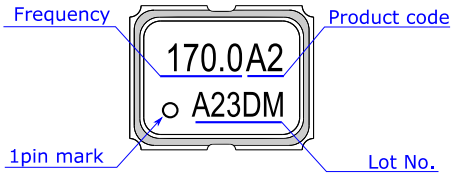
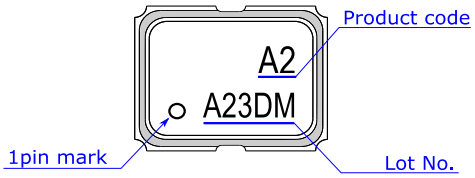
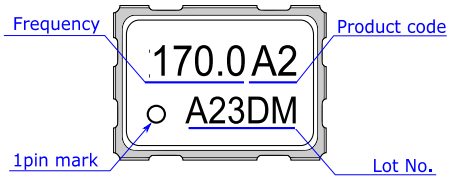
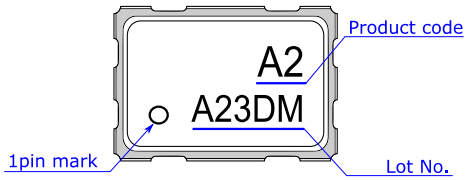
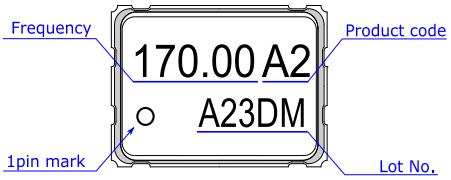
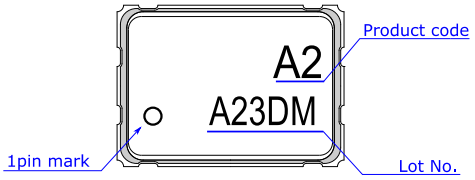

Normalize to Rise/Fall time = “Fast”.

■Notes:

## ESD Rating

| Test items | Breakdown voltage |
|---|---|
| Human Body Model (HBM) | 2000V |
| Machine Model (MM) | 250V |
| Charged Device Model (CDM) | 750V |

## Device Marking (Standard specification)

| Model | Factory Programmed Part Marking | Field Programmable Part Marking (Blank Samples) |
|---|---|---|
| SG-8018CG |  |  |
| SG-8018CE |  |  |
| SG-8018CB |  |  |
| SG-8018CA |  |  |

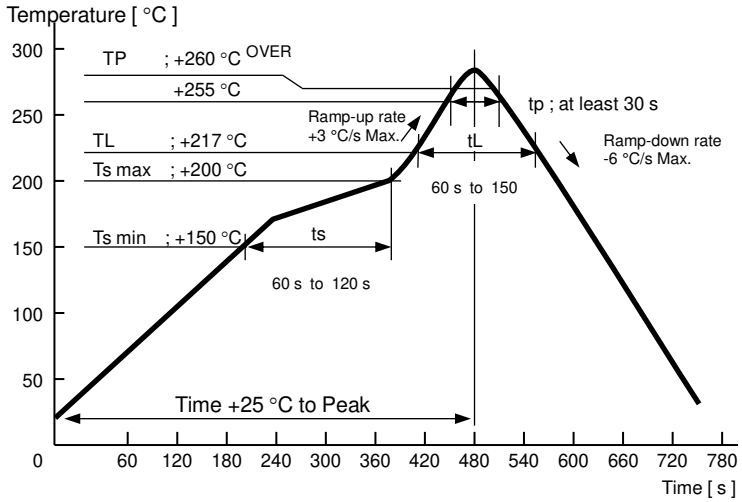
## Simulation Model

- IBIS Model is available upon request. Please contact us.
  Information Required: Oscillator operating condition (i.e. Power Supply, Rise/Fall Time, Temperature)

## Device Material & Environmental Information

| Model | Package Dimensions | # of Pins | Reference Weight (Typ.) | Terminal Material | Terminal Plating | Complies With EU RoHS | Pb Free | MSL Rating | Peak Temp. (Max) |
|---|---|---|---|---|---|---|---|---|---|
| SG-8018CG | 2.5 x 2.0 x 0.7 mm | 4 | 13 mg | W | Au | Yes | Yes | 1 | 260°C |
| SG-8018CE | 3.2 x 2.5 x 1.0 mm | 4 | 25 mg | W | Au | Yes | Yes | 1 | 260°C |
| SG-8018CB | 5.0 x 3.2 x 1.1 mm | 4 | 51 mg | W | Au | Yes | Yes | 1 | 260°C |
| SG-8018CA | 7.0 x 5.0 x 1.3 mm | 4 | 143 mg | W | Au | Yes | Yes | 1 | 260°C |

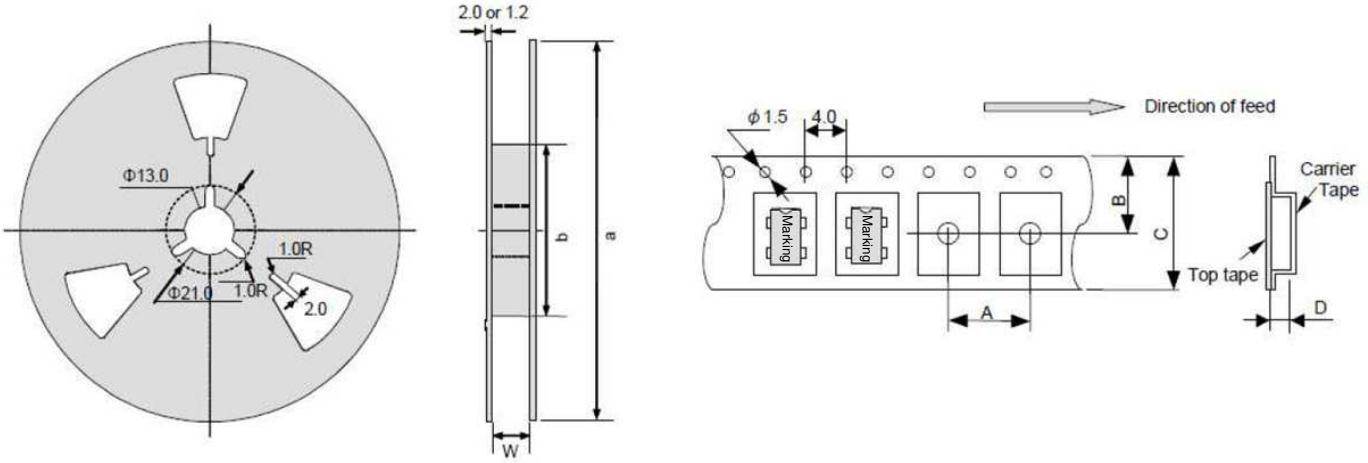
SMD products Reflow profile(example)
The availability of the heat resistance for reflow conditions of JEDEC-STD-020D.01 is judged individually. Please inquire.




| | |
|---|---|
| Pb Free | ● Pb free. |
| RoHS Compliant | ● 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.) |

## Standard Packing Specification

SMD products are packed in the shipping carton as below table in accordance with taping standards EIA-481 and IEC-60286




## Standard Packing Quantity & Dimension(Unit mm)

| Model | Quantity (pcs/Reel) | Reel Dimension | | | Career Tape Dimension | | | | Direction of Feed (L= Left Direction) |
|---|---|---|---|---|---|---|---|---|---|
| | | a | b | W | A | B | C | D | |
| SG-8018CG | 3000 | Φ180 | Φ60 | 9 | 4 | 5.25 | 8 | 1.15 | L |
| SG-8018CE | 2000 | Φ180 | Φ60 | 9 | 4 | 5.25 | 8 | 1.4 | L |
| SG-8018CB | 1000 | Φ180 | Φ60 | 13 | 8 | 7.25 | 12 | 1.4 | L |
| SG-8018CA | 1000 | Φ254 | Φ100 | 17.5 | 8 | 9.25 | 16 | 2.3 | L |

## 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 ISO/TS 16949 certification that is requested strongly by major automotive manufacturers as standard.

ISO/TS16949 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 | ►Pb free. |
| RoHS Compliant | ►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.) |
| For Automotive | ►Designed for automotive applications such as Car Multimedia, Body Electronics, Remote Keyless Entry etc. |
| Automotive Safety | ►Designed for automotive applications related to driving safety (Engine Control Unit, Air Bag, ESC etc ). |

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