

RECIPIENT

SPECIFICATIONS

MODEL : SG-211SEE

SPEC. No. : A13-173-1B

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SPECIFICATIONS

1. Application

This document is applicable to the crystal oscillator that are delivered to from Seiko Epson Corp.

This product is compliant with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by Seiko Epson Corporation shall not be used for the development and manufacture of weapon of mass destruction or for other military purposes. Making available such products and technology to any third party who may use such products or technologies for the said purposes are also prohibited.

This product listed here is designed as components or parts for electronics equipment in general consumer use. We do not expect that any of these products would be incorporated or otherwise used as a component or part for the equipment, which requires an extra high reliability, such as satellite, rocket and other space systems, and medical equipment, the functional purpose of which is to keep life.

2. Model

The model is SG-211SEE

3. Packing

It is subject to the packing standard of Seiko Epson Corp.

4. Warranty

Defective parts which are originated by us are replaced free of charge in case defects are found within 12 months after delivery.

5. Amendment and abolishment

Amendment and/or abolishment of this specification are subject to the agreement between both parties.

6. Contents

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7. MSL

MSL level 1

[1] Absolute maximum ratings

| Parameter | Symbol | Value | Unit | Note |
|-----------------------|----------------------|------------------------------|------|---|
| Supply voltage | V _{CC} -GND | -0.6 to +6.0 | V | |
| Storage temperature * | T _{stg} | -40 to +125 | °C | Stored as bare product after unpacking. |
| Input voltage | V _{IN} | -0.6 to V _{CC} +0.6 | V | $\overline{\text{ST}}$ Terminal |

* Concerning the frequency change, please refer [8] Environmental and mechanical characteristics.

[2] Operating range

| Parameter | Symbol | Value | | | Unit | Note |
|-----------------------|-------------------|-------|------|-----------------|------|------|
| | | Min. | Typ. | Max. | | |
| Supply voltage | V _{CC} | 1.6 | 1.8 | 2.2 | V | |
| Supply voltage | GND | 0.0 | 0.0 | 0.0 | V | |
| Input voltage | V _{IN} | GND | - | V _{CC} | V | |
| Operating temperature | T _{use} | -20 | +25 | +70 | °C | |
| Output load condition | L _{CMOS} | - | - | 15 | pF | |

- Start up time(0 %V_{CC}→90 %V_{CC}) of power source should be more than 150 μs.
- By-pass capacitor (0.01 μF to 0.1 μF) is connected near V_{CC} between V_{CC} and GND.
(Refer to [12] Recommendable patterning)

[3] Frequency characteristics

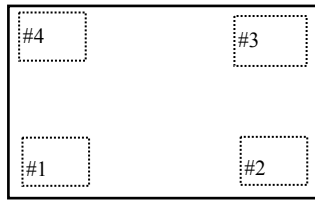
Output frequency (F₀) 19.2 MHz

| Parameter | Symbol | Value[1 × 10 ⁻⁶] | Note |
|-----------------------|---------------------------|------------------------------|------------------------------------|
| Frequency tolerance * | F _{tol} (OSC) | D: ± 20 | T _{use} =-20 °C to +70 °C |

* This includes initial frequency tolerance, temperature characteristics, input voltage characteristics(V_{CC}, ± 10%), reflow , Aging and load characteristics, aging.

[4] Terminal assignment

Top View



| Terminal name | Terminal No. | Terminal type. |
|------------------------|--------------|----------------|
| $\overline{\text{ST}}$ | 1 | INPUT |
| GND | 2 | — |
| OUT | 3 | OUTPUT |
| Vcc | 4 | — |

$\overline{\text{ST}}$ pin : High or open. → Specified frequency output = enable.

$\overline{\text{ST}}$ pin : Low. → Output is high impedance = disabled.

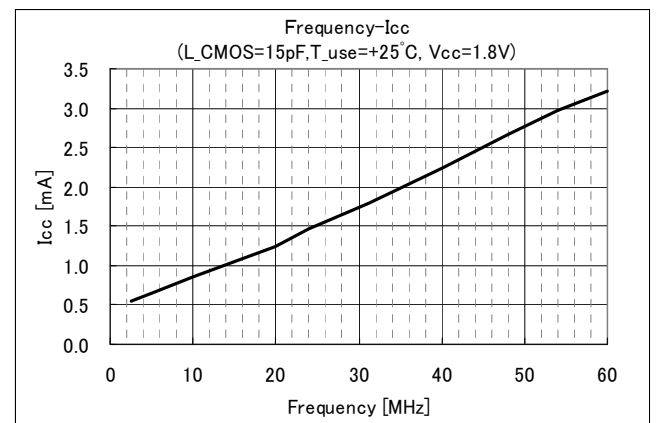
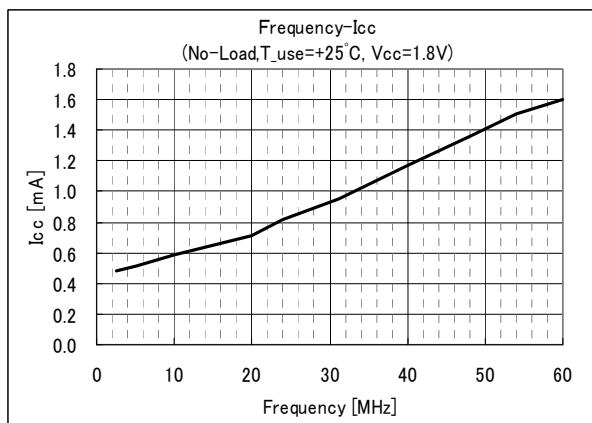
[5] Electrical characteristics

(Please see page 2 [2] Operating range)

| Parameter | Symbol | Value | | Unit | Note |
|---------------------------|------------------|---------------------|---------------------|------|---|
| | | Min. | Max. | | |
| Start up time | t _{osc} | - | 5 | ms | t=0 at 90 % V _{CC} |
| Current consumption | I _{CC} | - | 2.3 | mA | No load |
| Standby current | I _{std} | - | 5.0 | μA | $\overline{ST} = \text{GND}$ |
| Output rise time | t _r | - | 4.5 | ns | 20 % V _{CC} → 80 % V _{CC} |
| Output fall time | t _f | - | 4.5 | ns | 80 % V _{CC} → 20 % V _{CC} |
| Symmetry | SYM | 45 | 55 | % | 50 % V _{CC} Level |
| High level output voltage | V _{OH} | 0.9 V _{CC} | - | V | I _{OH} = -1 mA |
| Low level output voltage | V _{OL} | - | 0.1 V _{CC} | V | I _{OL} = 1 mA |
| High level input voltage | V _{IH} | 0.8 V _{CC} | - | V | \overline{ST} terminal |
| Low level input voltage | V _{IL} | - | 0.2 V _{CC} | V | \overline{ST} terminal |
| Input current | I _{IH} | - | 10 | μA | V _{IN} = V _{CC} |
| | I _{IL} | -10 | - | μA | V _{IN} = GND |
| Output disable time | t _{stp} | - | 150 | ns | \overline{ST} terminal High → Low |
| Output enable time | t _{sta} | - | 5 | ms | \overline{ST} terminal Low → High |
| Input pull-up resistance | R _{UP} | 50 | 300 | k Ω | V _{CC} =1.8V, $\overline{ST} = 0.8V_{CC}$, at +25°C |
| | | 2 | 150 | MΩ | V _{CC} =1.8V, $\overline{ST} = \text{GND}$ |

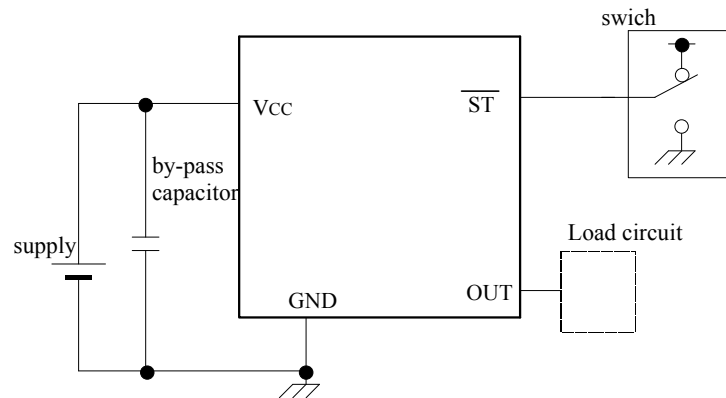
Refer to [6] Test circuit [7] Timing chart

◆ Reference : Current consumption Typ. Value (V_{CC} = 1.8 V, T_{use} = +25 °C)



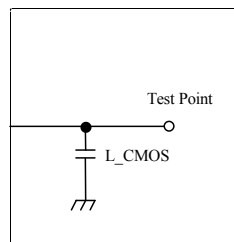
[6] Test circuit

1) Waveform observation

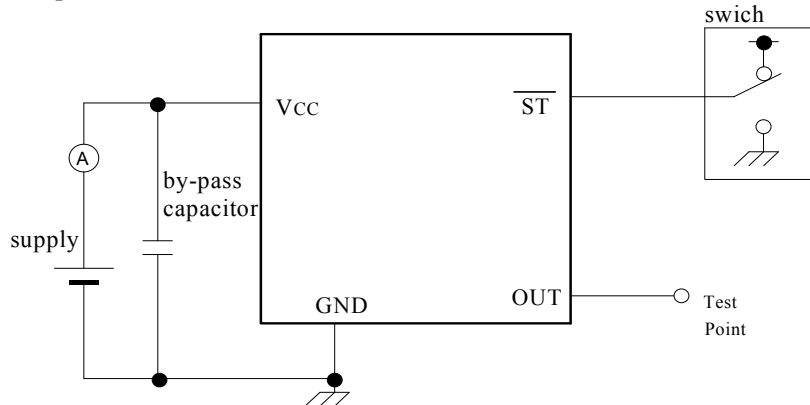


Load circuit

load capacitance



2) Current consumption



*Current consumption under the disable function should be $\overline{ST} = \text{GND}$.

3) Condition

(1) Oscilloscope

- Band width should be minimum 5 times higher (wider) than measurement frequency.
- Probe earth should be placed closely from test point and lead length should be as short as possible.

* Recommendable to use miniature socket. (Don't use earth lead.)

(2) L_CMOS also includes probe capacitance.

(3) By-pass capacitor (0.01 μF to 0.1 μF) is placed closely between VCC and GND.

(4) Use the current meter whose internal impedance value is small.

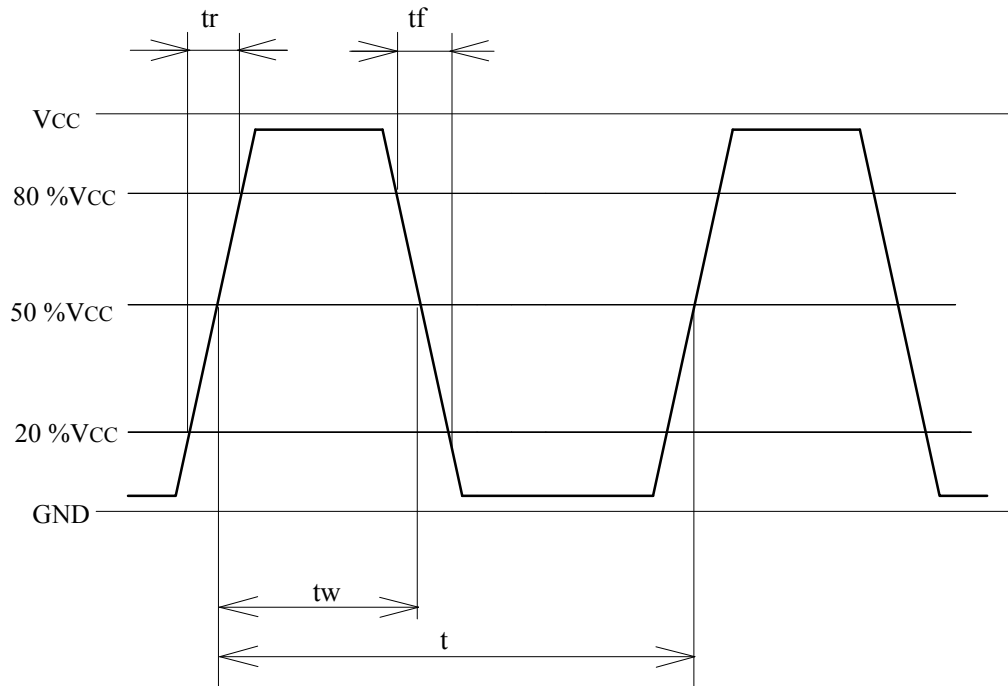
(5) Power supply

- Start up time (0 %VCC \rightarrow 90 %VCC) of power source should be more than 150 μs .
- Impedance of power supply should be as lowest as possible.

[7] Timing chart

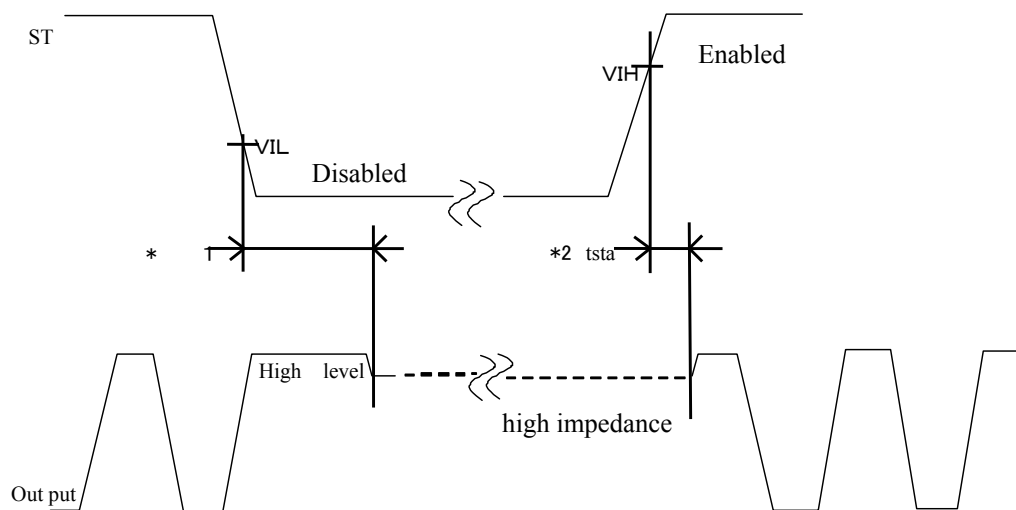
1) C-MOS load

$$\text{SYM} = \frac{t_w}{t} \times 100 (\%)$$



2) $\overline{\text{ST}}$ function and timing

| $\overline{\text{ST}}$ function | Osc. circuit | Output status |
|---------------------------------|------------------|---|
| High or Open | Oscillation | Specified frequency is output : Enable |
| Low | Oscillation stop | Output becomes high impedance : Disable |



*1 The time taken from $\overline{\text{ST}} = V_{IL}$ to output = Disable (high impedance)

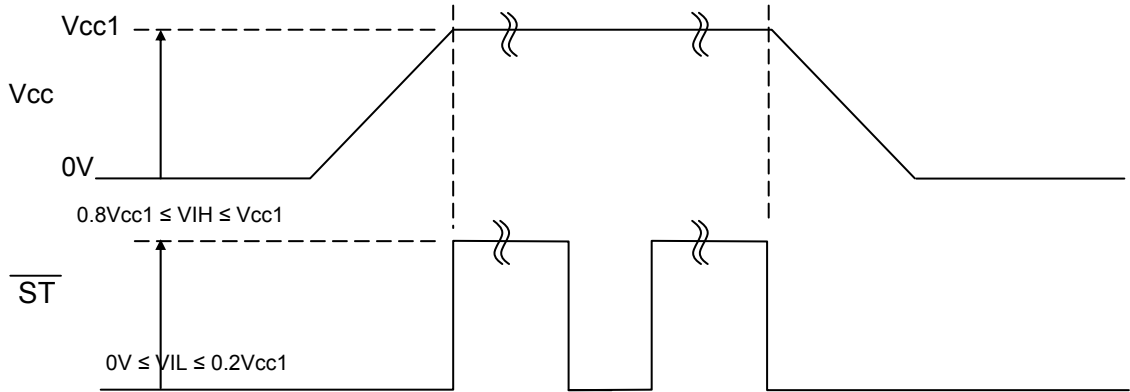
*2 The time taken from $\overline{\text{ST}} = V_{IH}$ to output = Start

Output start : $V_{OH} \geq 90\%V_{CC}$, $V_{OL} \leq 10\%V_{CC}$, $F_{out} = F_o \pm 1000 \times 10^{-6}$

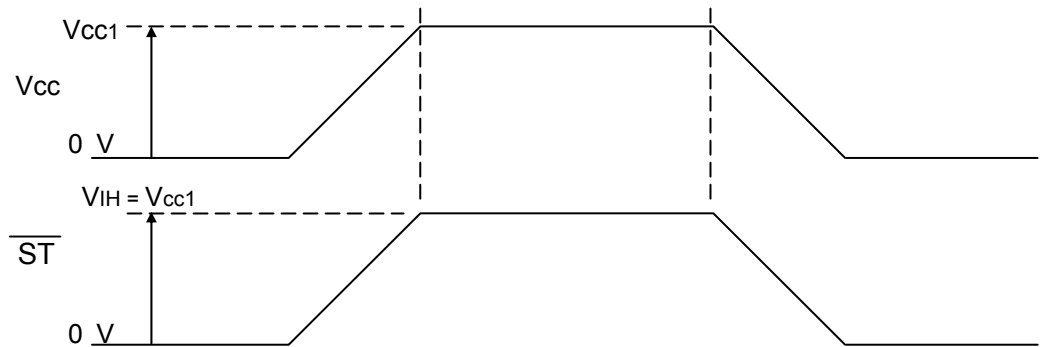
3) \overline{ST} Control timing

\overline{ST} function is used on the voltage below supply voltage.

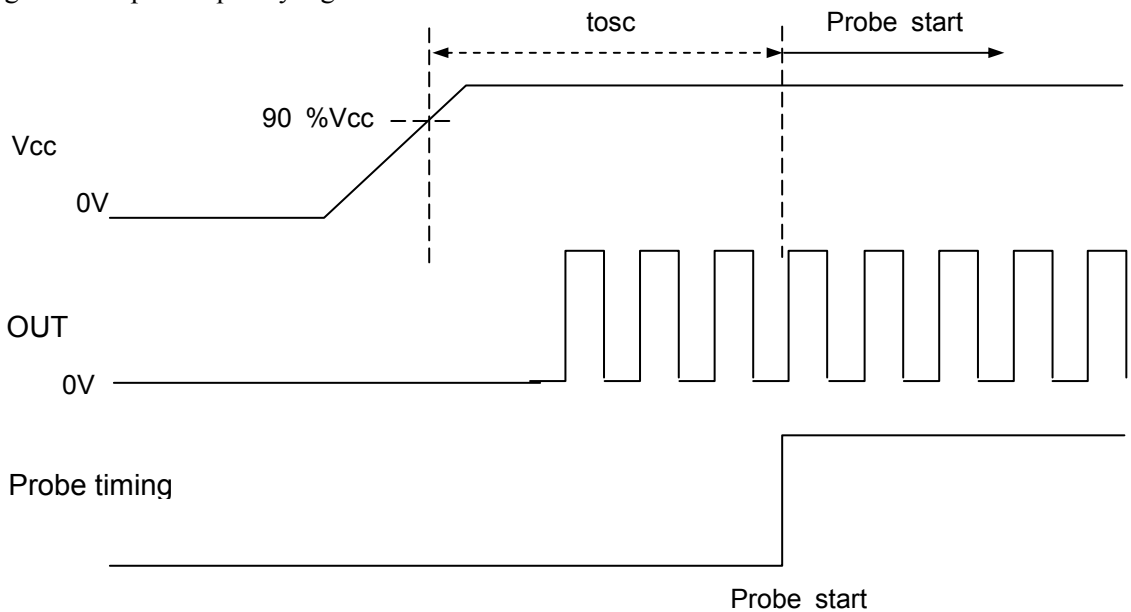
\overline{ST} control timing differs from V_{cc} control timing



\overline{ST} terminal is connected to V_{cc} terminal



4) Timing of an output frequency signal



[8] Environmental and mechanical characteristics

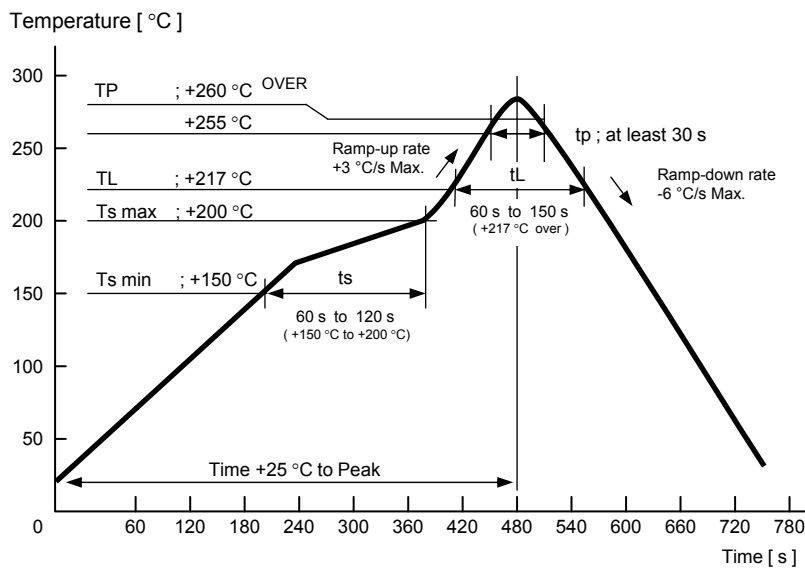
(The company evaluation condition We evaluate it by the following examination item and examination condition.)

| No. | Item | Value *1 | | Test Conditions |
|-----|------------------------------|--|------------------------------|--|
| | | $\Delta f / f$ *2 [1×10^{-6}] | Electrical characteristics | |
| 1 | High temperature storage | *3 ± 10 | Satisfy Item [5] after test. | +125 °C × 1 000 h |
| 2 | Low temperature storage | *3 ± 3 | | -40 °C × 1 000 h |
| 3 | High temperature bias | *3 ± 5 | | +85 °C × V _{CC} Max. × 1 000 h |
| 4 | Low temperature bias | *3 ± 3 | | -40 °C × V _{CC} Max. × 1 000 h |
| 5 | Temperature humidity bias | *3 ± 5 | | +85 °C × 85 %RH × V _{CC} Max. × 1 000 h |
| 6 | Temperature cycle | *3 ± 5 | | -40 °C ↔ +125 °C 30 min. at each temperature 100 cycles |
| 7 | Resistance to soldering heat | ± 2 | | Convection reflow soldering furnace (3 time) Ref. IPC/JEDEC J-STD-020D.1 |
| 8 | Shock | ± 3 | | 150 g dummy Jig (SE Standard) drop from 1 500 mm height on the Concrete 3 directions 10 times. |
| 9 | Vibration | ± 2 | | 10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s ² 10 Hz → 500 Hz → 10 Hz 15 min./cycle 6 h (2 hours , 3 directions) |
| 10 | Seal | 1×10^{-9} Pa·m ³ /s | | He leakage detector |
| 11 | Solderability | Termination must be 95 % covered with fresh solder | | Dip termination into solder bath at +235 °C ± 5 °C for 5 s. (Using Rosin Flux) |
| 12 | Pull - off | No peeling-off at a solder part | | 10 N press for 10 s ± 1 s Ref. EIAJ ED-4702 |

< Notes >

- *1 Each test done independently.
- *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
- *3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning.
Pre-conditioning: Reflow (3 time)

Convection reflow condition (Ref. IPC/JEDEC J-STD-020D.1)



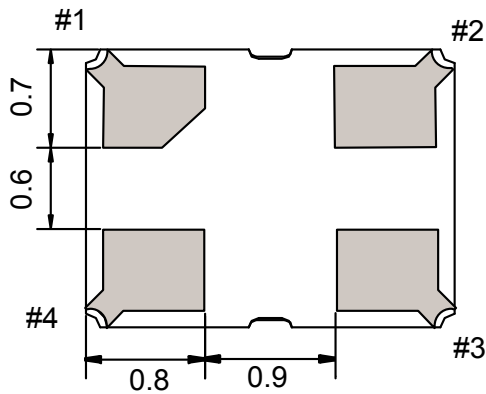
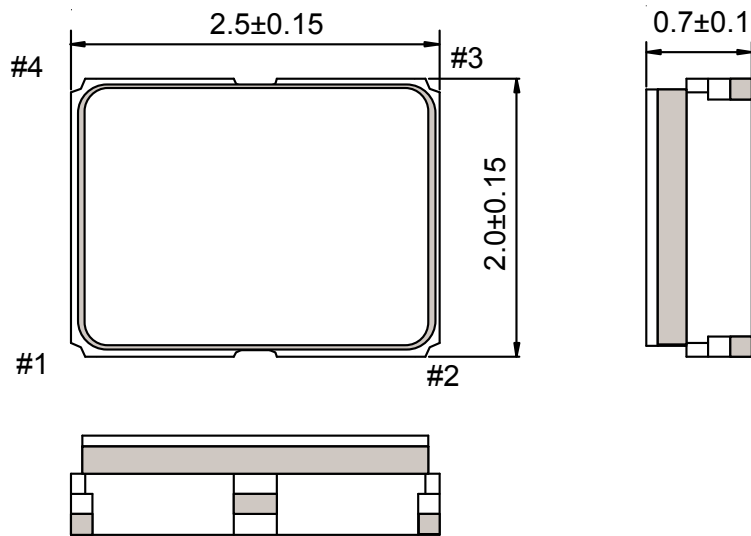
[9] Electro Static Discharge

- ESD

| Item | Electro Static Discharge | Test term |
|------|--------------------------|---|
| HBM | 2 000 V Min. | EIAJ ED-4701-1 C111A,100 pF,1.5 K Ω , 3 time |
| MM | 200 V Min. | EIAJ ED-4701-1 C111,200 pF, 0 Ω , 1 time |

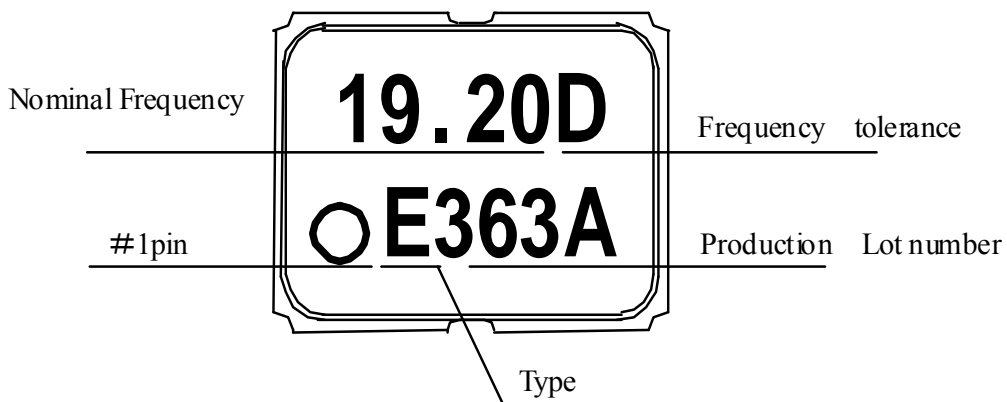
[10] Dimensions and marking layout

1) Dimensions



Terminal treatment : Au plating
Unit : mm

2) Marking layout



- ◆ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.
- ◆ Output frequency shall indicate 5 digits (include decimal point), if the value of frequency over 5 digits, the least significant digits will be omitted.

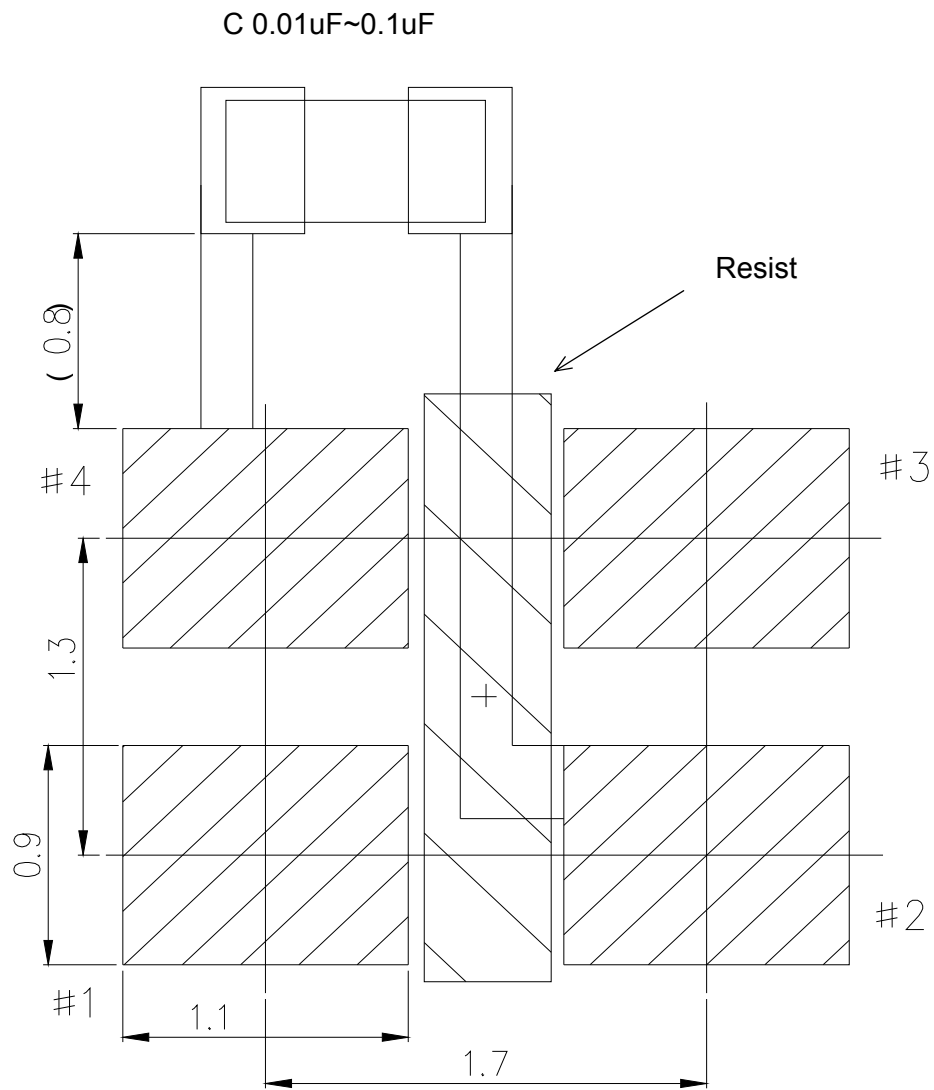
[11] Notes

- 1) This device is made with C-MOS IC.
Please take necessary precautions to prevent damage due to electrical static discharge.
- 2) Epson Toyocom recommends a 0.01 μF to 0.1 μF capacitor must be connected near V_{CC} between V_{CC} and GND to obtain stable operation and protect against power line ripple.
- 3) V_{CC} and GND pattern shall be as large as possible so that high frequency impedance shall be small.
- 4) Epson Toyocom cannot recommend to put filtering element into power line so as to reduce noise. Oscillator might be unstable oscillation because high frequency impedance of power line become higher. When use filtering element, please verify electrical construction and or element's spec.
- 5) Epson Toyocom doesn't recommend to power on from intermediate electric voltage or extreme fast power on, Those powering conditions may cause no oscillation or abnormal oscillation.
- 6) Power ripple: 200 mV P-P max. Start up time (0 % V_{CC} →90 % V_{CC}) of power source should be more than 150 μs .
- 7) A long output line may cause irregular output, so try to make the output line as short as possible.
- 8) Other high-level signal lines may cause incorrect operation, so please do not place high level signal line close to this device.
- 9) This device contains a crystal resonator, so please don't expose excessive shock or vibration. Epson Toyocom recommends store device under normal temperature and humidity to keep the specification.
- 10) An automatic insertion is available, however, the internal crystal resonator might be damaged in case that too much shock or vibration is applied by machine condition.
Be sure to check your machine condition in advance.
- 11) Ultrasonic cleaning can be used on the SG-211SEE, however, since the oscillator might be damaged under some conditions, please exercise in advance.
- 12) Epson Toyocom recommends to use and store under room temperature and normal humidity to secure frequency accuracy and prevent moisture.
- 13) $\overline{\text{ST}}$ -pin has pull-up resistor internally. The resistor value is switched depending on input voltage. Please refer to electrical characteristics. And if $\overline{\text{ST}}$ -pin is not controlled please connect it to V_{CC} -pin.
- 14) Lid is electrically connected to GND.
Please don't apply electrical voltage.

[12] Recommendable patterning

The soldering pad sample indicated as like following:

Soldering position (Unit : mm)



TAPING SPECIFICATION

I . Application

This standard will apply to 2.5×2.0 Ceramic package.

Spec : CG package

II . Contents

| Item No. | Item | Page |
|----------|----------------------|--------|
| [1] | Taping specification | 1 to 2 |
| [2] | Inner carton | 3 |
| [3] | Shipping carton | |
| [4] | Marking | 4 |
| [5] | Quantity | |
| [6] | Storage environment | |
| [7] | Handling | |

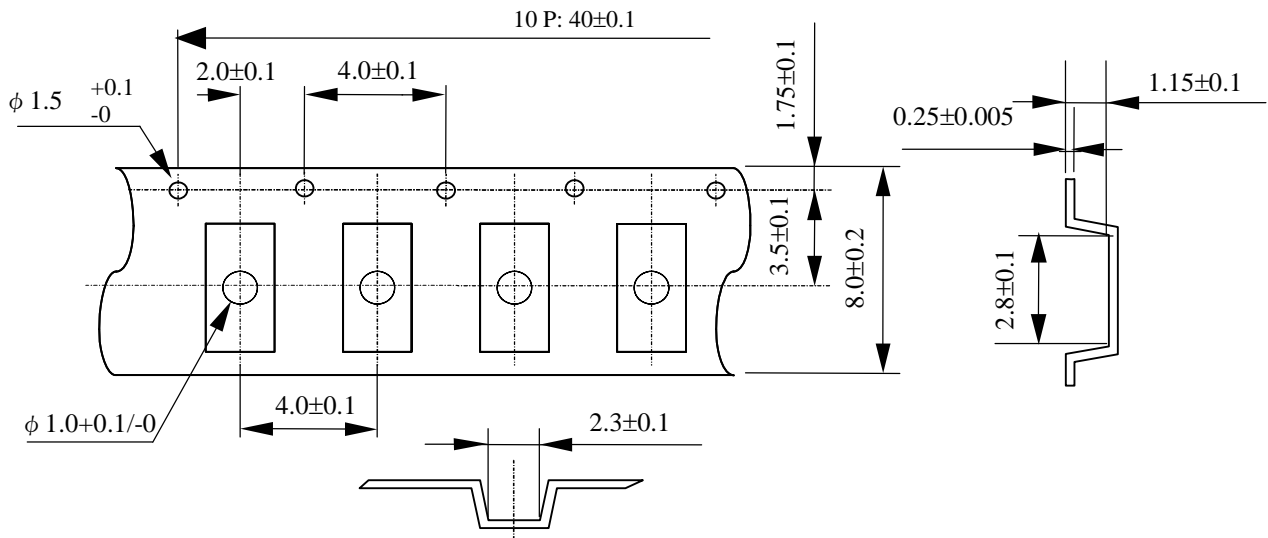
[1] Taping specification

Subject to 「EIA-481」 and 「IEC-60286」

(1) Tape dimensions

Material of the carrier tape : P S

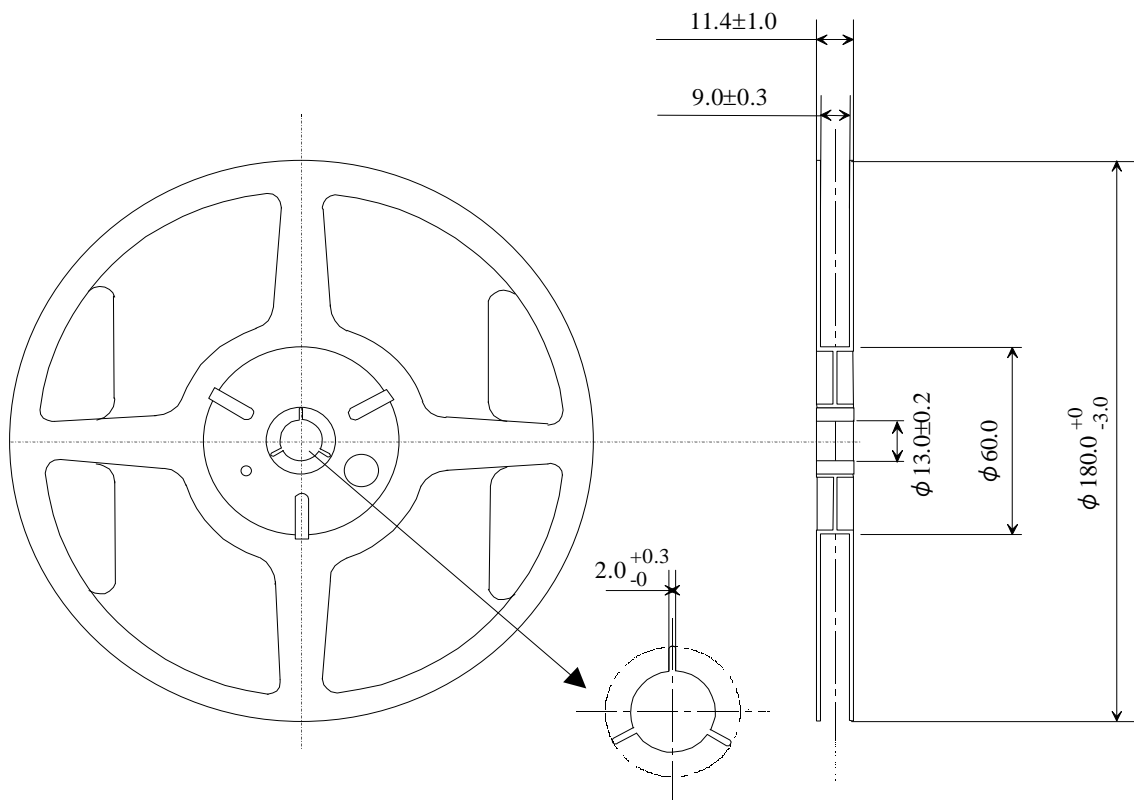
Material of the top tape : PET+PE



Unit : mm

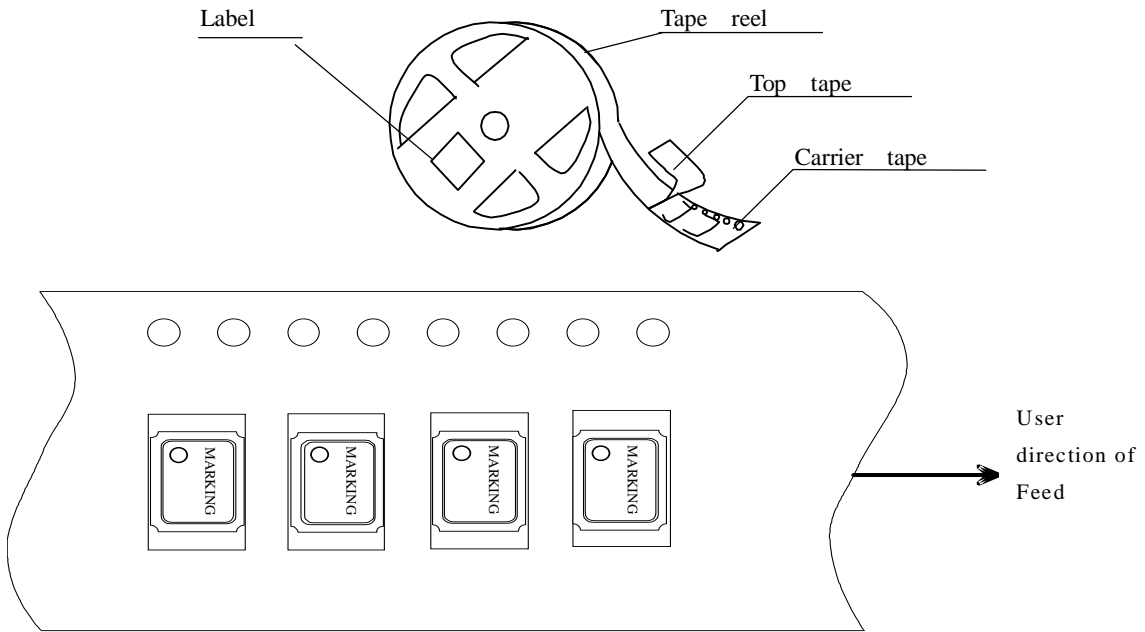
(2) Reel dimensions

Material of the reel : Conductive polystyrene

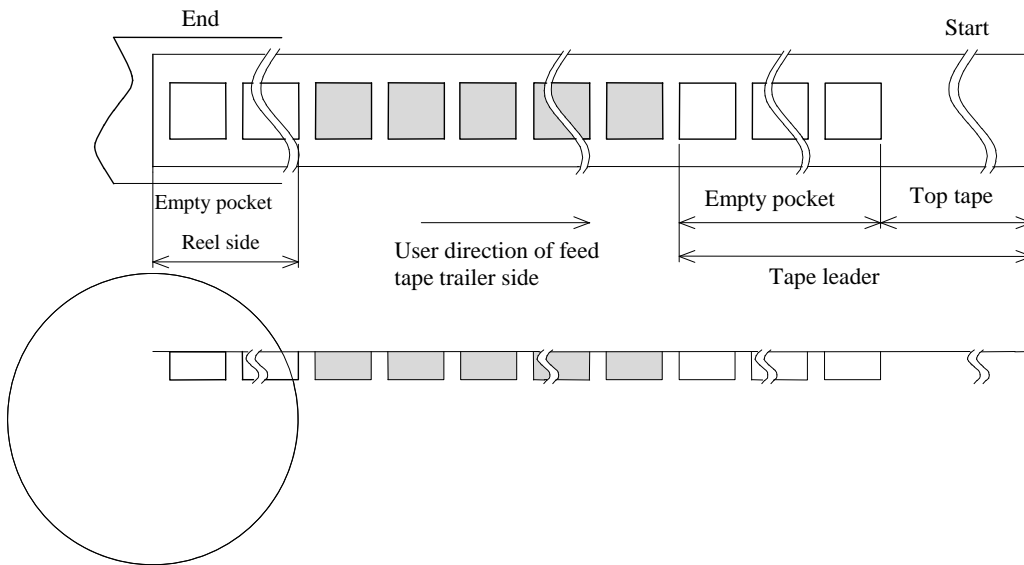


(3) Packing

① Tape & reel



② Start & end point



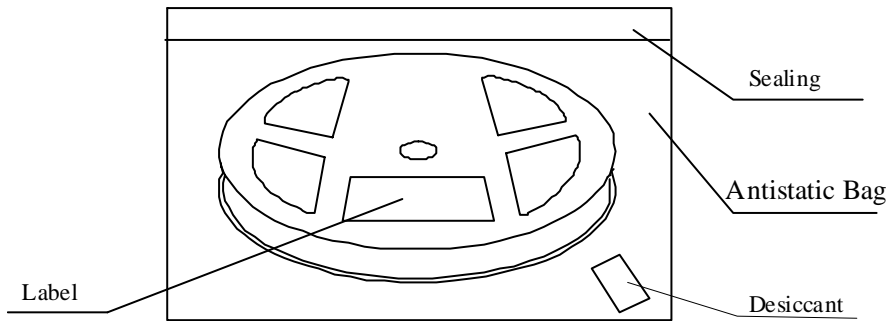
| Item | | Empty space |
|--------------|--------------|---------------|
| Tape leader | Top tape | Min. 1 000 mm |
| | Carrier tape | Min. 160 mm |
| Tape trailer | Top tape | Min. 0 mm |
| | Carrier tape | Min. 160 mm |

(4) Peel force of the cover tape

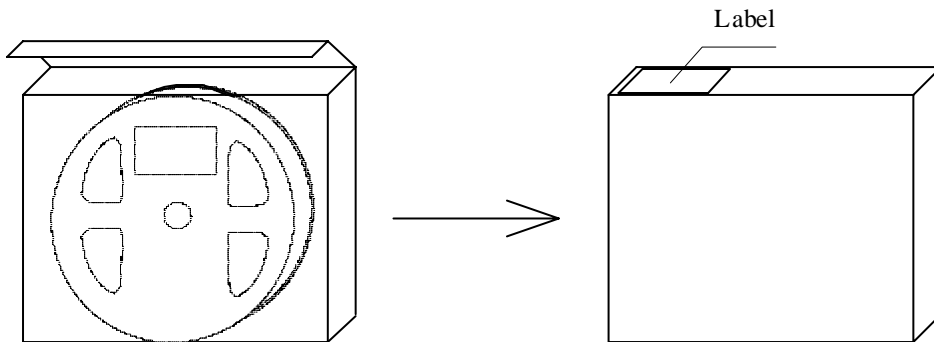
- ① angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.
- ② peel speed : 300 mm / min.

[2] Inner carton

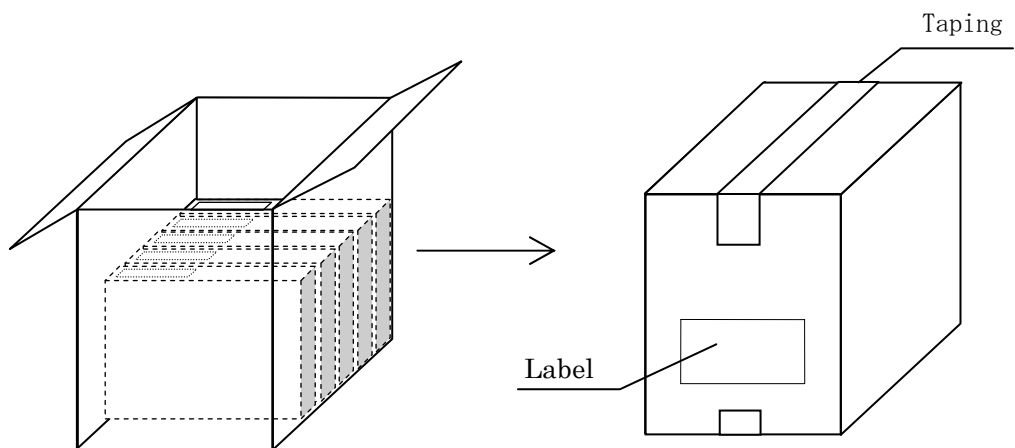
a) Packing to antistatic bag



b) Packing to inner carton



[3] Shipping carton



[4] Marking

(1) Reel marking

- Reel marking shall consist of :

- 1) Parts name
- 2) Quantity
- 3) Manufacturing date or symbol
- 4) Manufacturer's date or symbol
- 5) Others (if necessary)

(2) Inner carton marking

- Same as reel marking.

(3) Shipping carton marking

- Shipping carton marking shall consist of :

- 1) Parts name
- 2) Quantity

[5] Quantity

- 3 000 pcs./reel

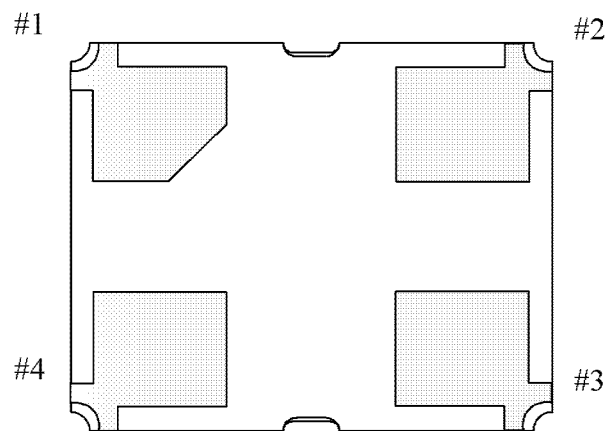
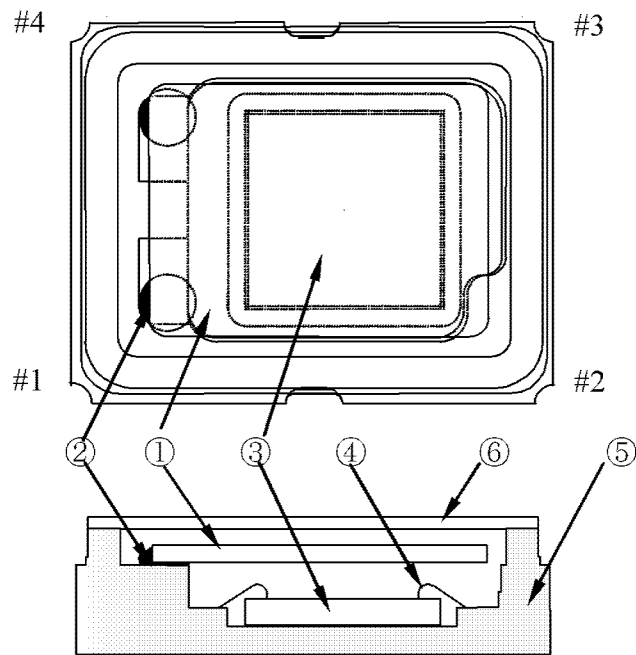
[6] Storage environment

- (1) Before open the packing, we recommend to keep less than +30 °C and 85 %RH of Humidity, and to use it less than 6 months after delivery.
- (2) We recommend to open Package in immediately before use. After open Package, We recommend to keeps less than 6 month. No need dry air before soldering work if it is less than temperature +30 °C, 85 humidity %RH.
- (3) Not to expose the sun.
- (4) Not to storage with some erosive chemicals.
- (5) Nothing is allowed to put on the reel or carton to prevent mechanical damage.

[7] Handling

- To handle with care to prevent the damage of tape, reel and products.

Structure diagram SG-211S*E



LIST

| Name of part | | Material |
|--------------|------------------------|---|
| ① | Crystal chip | AT cut |
| ② | Crystal adhesive | Ag paste |
| ③ | IC | C-MOS |
| | IC conductive adhesive | Ag paste |
| ④ | Bonding wire | Au |
| ⑤ | Package | Ceramic (Al ₂ O ₂) |
| ⑥ | Cap | Kovar |

RELIABILITY TEST DATA

Product Name : SG-211S*E series

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition .

No. G-0815A-01-001E

| No. | ITEM | TEST CONDITIONS | VALUE *1 | | TEST | FAIL |
|-----|------------------------------|---|--|--|--------------|--------------|
| | | | $\Delta f / f$ *2 [1×10^{-6}] | Electrical characteristics | Qty [n] | Qty [n] |
| 1 | High temperature storage | +125 °C × 1 000 h | ± 10 | Satisfy specification after test | 22 | 0 |
| 2 | Low temperature storage | -40 °C × 1 000 h | *3 ± 3 | | 22 | 0 |
| 3 | High temperature bias | +85 °C × Spec bias × 1 000 h | *3 ± 5 | | 22 | 0 |
| 4 | Low temperature bias | -40 °C × Spec bias × 1 000 h | *3 ± 3 | | 22 | 0 |
| 5 | Temperature humidity bias | +85 °C × 85 %RH × Spec bias × 1 000 h | *3 ± 5 | | 22 | 0 |
| 6 | Temperature cycle | -40 °C ⇔ +125 °C 30 min at each temp. 100 cycles | *3 ± 5 | | 22 | 0 |
| 7 | Resistance to soldering heat | For convention reflow soldering furnace (3 times) Ref. IPC/JEDEC J-STD-020D.1 | ± 2 | | 22 | 0 |
| 8 | Shock | 150 g dummy (Epson Toyocom Standard) drop from 1 500 mm height on to the concrete 3 directions 10 times | ± 3 | | 22 | 0 |
| 9 | Vibration | 10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s ² 10 Hz → 500 Hz → 10 Hz 15 min / cycle 6 h (2 h × 3 directions) | ± 2 | | 22 | 0 |
| 10 | Seal | He leakage detector | 1×10^{-9} Pa·m ³ /s Max. | 11 | 0 | |
| 11 | Pull-off | 10N press for 10s ± 1s Ref.EIAJ ED-4702 | No Peeling-off at a solder part | 11 | 0 | |
| 12 | Solderability | Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux) | Termination must be 95 % covered with fresh solder | 11 | 0 | |

Notes

- *1 Each test done independently.
- *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
- *3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning. Pre-conditioning: R

Product Name : SG-211S*E series

$\Delta f/f$

No. G-0815A-01-001E

