

Temperature Compensated Crystal Oscillator (VC-TCXO)



## Data sheet

**MODEL : TG2016SBN 37.400000 MHz KCGNCM**

**Product. No. : X1G0046910318xx**

Please refer to the 10.Packing information about xx (last 2 digits)

**SEIKO EPSON CORPORATION**



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.)

### INTRODUCTION

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## [ 1 ] Characteristics

- Package size (2.0 mm×1.6 mm×0.73 mm)
- High stability VC-TCXO
- Output waveform : Clipped sine wave
- Reference weight Typ.8.3mg

## [ 2 ] Absolute maximum ratings

| Parameter                 | Symbol  | Specifications |      |         | Unit | Conditions                |
|---------------------------|---------|----------------|------|---------|------|---------------------------|
|                           |         | Min.           | Typ. | Max.    |      |                           |
| Supply voltage            | Vcc-GND | -0.3           | -    | +4.0    | V    | -                         |
| Frequency control voltage | Vc-GND  | -0.3           | -    | Vcc+0.3 | V    | Vc Terminal               |
| Storage temperature range | T_stg   | -40            | -    | +90     | °C   | Storage as single product |

## [ 3 ] Recommended operating conditions

| Parameter                   | Symbol | Specifications |      |      | Unit | Conditions         |
|-----------------------------|--------|----------------|------|------|------|--------------------|
|                             |        | Min.           | Typ. | Max. |      |                    |
| Supply voltage              | Vcc    | 2.5            | -    | 3.63 | V    | -                  |
|                             | GND    | 0              | -    | 0    | V    | -                  |
| Frequency control voltage   | Vc     | 0.4            | 1.4  | 2.4  | V    | Vc=1.4 +/-1.0V     |
| Operating temperature range | T_use  | -40            | -    | +85  | °C   | -                  |
| Output load                 | Load_R | 9              | 10   | 11   | kΩ   | -                  |
|                             | Load_C | 9              | 10   | 11   | pF   | -                  |
|                             | Cc     | 0.01           | -    | -    | μF   | DC-cut capacitor * |

\* DC-cut capacitor is not included in this TCXO. Please attach an external DC-cut capacitor to the out pin.

## [ 4 ] Frequency characteristics

### ( 1 ) Frequency characteristics

(Vcc=2.5 to 3.63 V, GND=0.0 V, Vc=1.4 V, Load=10 kΩ // 10 pF, T\_use=+25°C)

| Parameter                               | Symbol  | Specifications |      |      | Unit              | Conditions                                   |
|-----------------------------------------|---------|----------------|------|------|-------------------|----------------------------------------------|
|                                         |         | Min.           | Typ. | Max. |                   |                                              |
| Output Frequency                        | fo      | -              | 37.4 | -    | MHz               |                                              |
| Frequency tolerance                     | f_tol   | -0.5           | -    | +0.5 | x10 <sup>-6</sup> | T_use=+25°C +/-2°C<br>Before reflow          |
| Frequency tolerance *1                  | f_tol   | -1.5           | -    | +1.5 | x10 <sup>-6</sup> | T_use=+25°C +/-2°C<br>After 2 reflows *2     |
| Frequency / temperature characteristics | fo-Tc   | -0.5           | -    | +0.5 | x10 <sup>-6</sup> | T_use=-40°C to +85°C<br>(Reference to +25°C) |
| Frequency / load coefficient            | fo-Load | -0.1           | -    | +0.1 | x10 <sup>-6</sup> | Load +/-10%                                  |
| Frequency / voltage coefficient         | fo-Vcc  | -0.1           | -    | +0.1 | x10 <sup>-6</sup> | Vcc +/-5% *3                                 |
| Frequency aging                         | f_age   | -0.5           | -    | +0.5 | x10 <sup>-6</sup> | T_use = +25°C first year                     |
|                                         |         | -3.5           | -    | +3.5 | x10 <sup>-6</sup> | T_use = +25°C 10 years                       |

\*1 Include initial frequency tolerance and frequency deviation after reflow cycles.

\*2 Measured in the elapse of 24 hours after reflow soldering.

\*3 Vcc +/- 5% must be in operating supply voltage range (2.5 V to 3.63 V)

( 2 ) Frequency control characteristics (Vcc=2.5 to 3.63 V, GND=0.0 V, Vc=1.4 V, Load=10 kΩ // 10 pF, T\_use=+25°C)

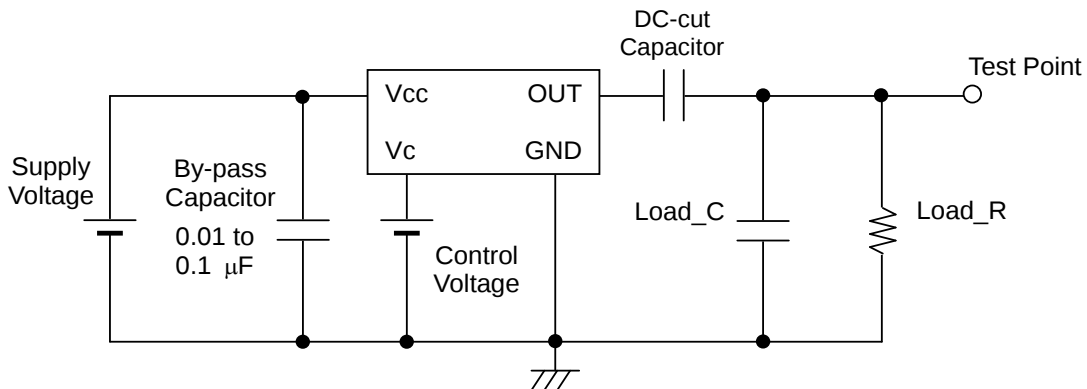
| Parameter                 | Symbol | Specifications    |      |       | Unit             | Conditions       |
|---------------------------|--------|-------------------|------|-------|------------------|------------------|
|                           |        | Min.              | Typ. | Max.  |                  |                  |
| Frequency control range   | f_cont | -12.0             | -    | -8.0  | $\times 10^{-6}$ | Vc=0.4V          |
|                           |        | +8.0              | -    | +12.0 | $\times 10^{-6}$ | Vc=2.4V          |
| Input impedance           | Zin    | 500               | -    | -     | kΩ               | Vc-GND(DC Level) |
| Frequency change polarity | -      | Positive polarity |      |       | -                | -                |

[ 5 ] Electrical characteristics (Vcc=2.5 to 3.63 V, GND=0.0 V, Vc=1.4 V, Load=10 kΩ // 10 pF, T\_use=+25°C)

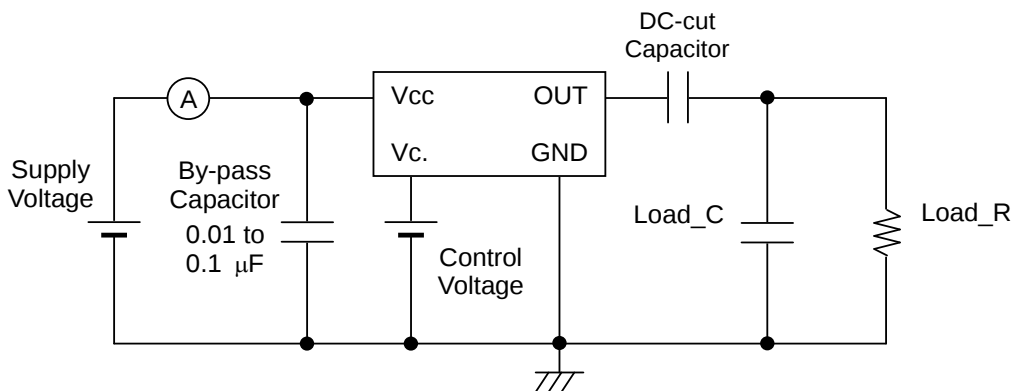
| Parameter           | Symbol | Specifications |      |       | Unit   | Conditions                                                                      |
|---------------------|--------|----------------|------|-------|--------|---------------------------------------------------------------------------------|
|                     |        | Min.           | Typ. | Max.  |        |                                                                                 |
| Current consumption | Icc    | -              | -    | 1.8   | mA     | -                                                                               |
| Output level        | Vp-p   | 0.8            | -    | -     | V      | Peak to peak voltage                                                            |
| Symmetry            | SYM    | 45             | 50   | 55    | %      | GND level (DC-cut)                                                              |
| Start up time       | t_sta  | -              | -    | 2.0   | ms     | Until frequency has been reached within $\pm 0.5 \times 10^{-6}$ of final freq. |
|                     |        | -              | -    | 1.0   | ms     | Until output signal has been reached min 90% of final                           |
| Harmonics           | -      | -              | -    | -10.0 | dBc    | 3rd harmonics                                                                   |
| Phase noise         | L(f)   | -              | -58  | -     | dBc/Hz | 1Hz offset                                                                      |
|                     |        | -              | -86  | -     |        | 10Hz offset                                                                     |
|                     |        | -              | -113 | -     |        | 100Hz offset                                                                    |
|                     |        | -              | -135 | -     |        | 1kHz offset                                                                     |
|                     |        | -              | -149 | -     |        | 10kHz offset                                                                    |
|                     |        | -              | -151 | -     |        | 100kHz offset                                                                   |
|                     |        | -              | -152 | -     |        | 1MHz offset                                                                     |

## [ 6 ] Test circuit

1) Output Load : Load\_R // Load\_C = 10 kΩ // 10 pF



2) Current consumption



## 3) Conditions

1. Oscilloscope: Impedance Min. 1MΩ

Input capacitance Max. 10 pF

Band width Min. 300 MHz

Impossible to measure both frequency and wave form at the same time.

(In case of using oscilloscope's amplifier output, possible to measure both at the same time.)

2. Load\_C includes probe capacitance.

3. A capacitor (By-pass: 0.01 to 0.1 μF) is placed between Vcc and GND, and closely to TCXO.

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

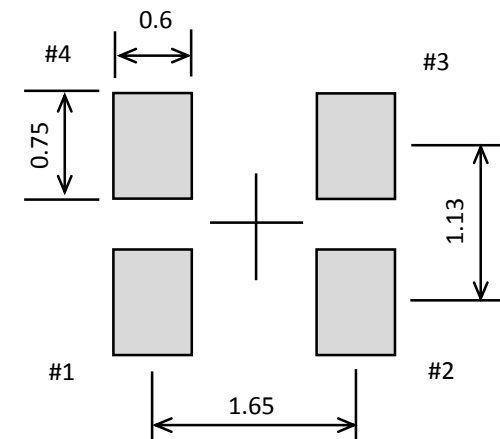
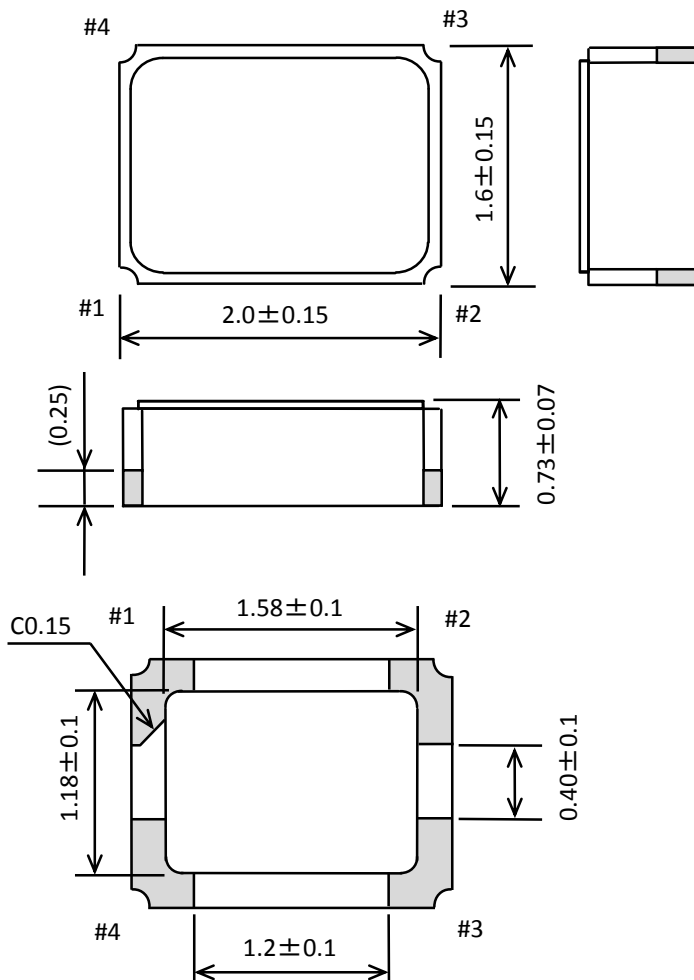
5. Power Supply

Impedance of power supply should be as low as possible.

6. GND pin should be connected to low impedance GND.

[ 7 ] Outline drawing unit:mm

[ 8 ] Recommended foot print unit:mm

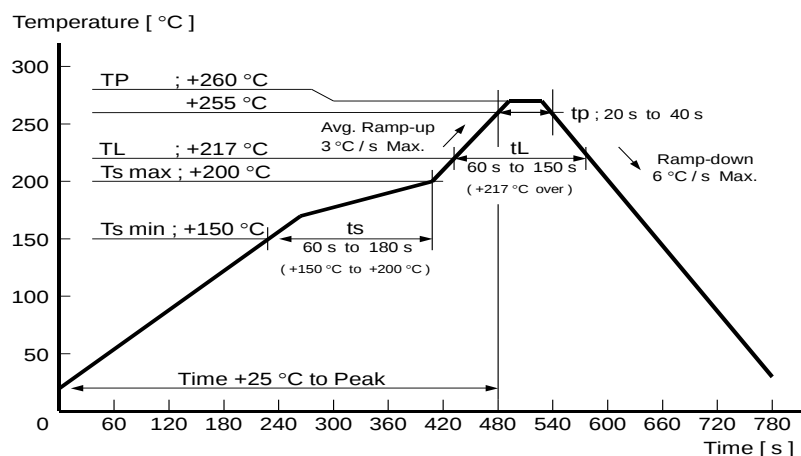


| Pin # | Connection |
|-------|------------|
| 1     | Vc         |
| 2     | GND        |
| 3     | OUT        |
| 4     | Vcc        |

To maintain stable operation, provide a  $0.01$  to  $0.1 \mu\text{F}$  by-pass capacitor at a location as near as possible to the power source terminal of the crystal product (between Vcc - GND).

Material  
Ceramics(Cavity)  
Au plated nickel(Electric terminal)  
Ni / Kovar / Cu / AgCu(Lid)

[ 9 ] Reflow profile



[ 10 ] Packing information

- 1) Product number last 2 digits code(xx) description. The recommended code is "00"  
X1G0046910318xx

| Code | Condition                    |
|------|------------------------------|
| 00   | 12000pcs / Reel              |
| 01   | Any Q'ty vinyl bag(Tape cut) |
| 11   | Any Q'ty / Reel              |
| 14   | 1000pcs / Reel               |
| 15   | 2000pcs / Reel               |
| 16   | 3000pcs / Reel               |

2) Taping specification

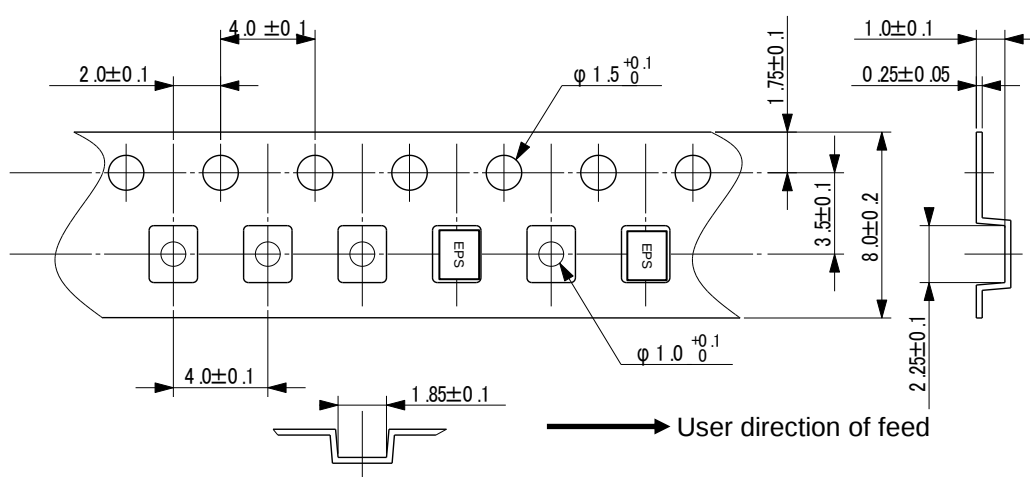
Subject to EIA-481 & IEC-60286

- (1) Tape dimensions TE0804L

Material of the Carrier Tape : PS

Material of the Top Tape : PET+PE

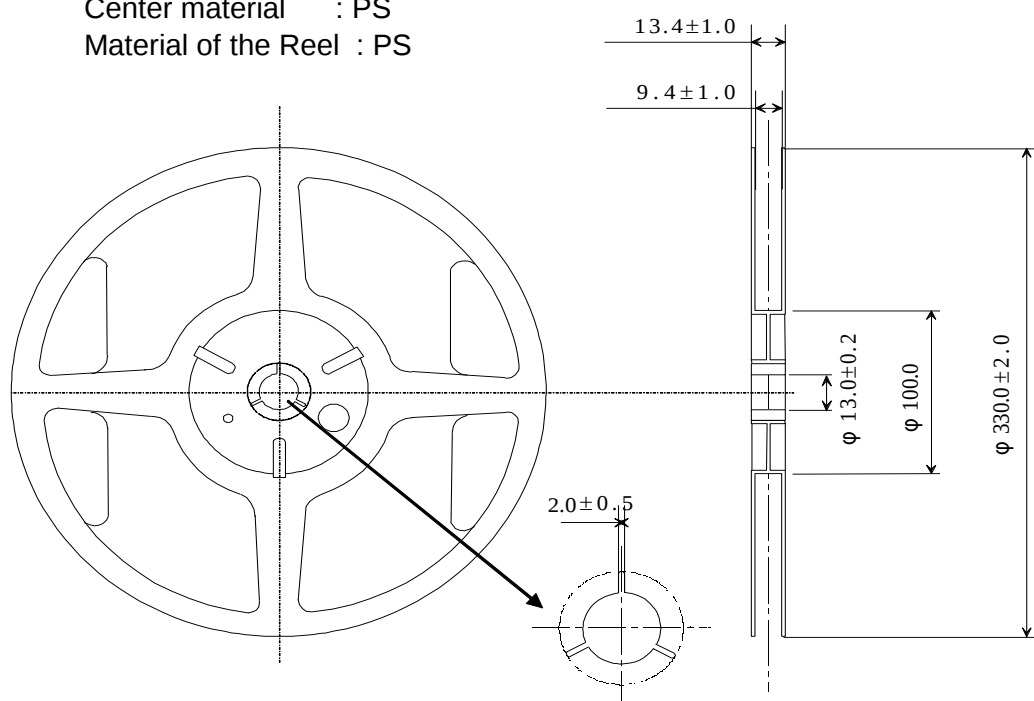
unit:mm



- (2) Reel dimensions

Center material : PS

Material of the Reel : PS



## [ 11 ] Handling precautions

Prior to using this product, please carefully read the section entitled "Precautions" on our Web site ( <http://www5.epsondevice.com/en/quartz/tech/precaution/> ) for instructions on how to handle and use the product properly to ensure optimal performance of the product in your equipment.

Before using the product under any conditions other than those specified therein, please consult with us to verify and confirm that the performance of the product will not be negatively affected by use under such conditions.

In addition to the foregoing precautions, in order to avoid the deteriorating performance of the product, we strongly recommend that you DO NOT use the product under ANY of the following conditions:

- (1) Mounting the product on a board using water-soluble solder flux and using the product without removing the residue of the flux completely from the board. The residue of such flux that is soluble in water or water-soluble cleaning agent, especially the residues which contains active halogens, will negatively affect the performance and reliability of the product.
- (2) Using the product in any manner that will result in any shock or impact to the product.
- (3) Using the product in places where the product is exposed to water, chemicals, organic solvent, sunlight, dust, corrosive gasses, or other materials.
- (4) Using the product in places where the product is exposed to static electricity or electromagnetic waves.
- (5) Applying ultrasonic cleaning without advance verification and confirmation that the product will not be affected by such a cleaning process, because it may damage the crystal, IC and/or metal line of the product.
- (6) Touching the IC surface with tweezers or other hard materials directly.
- (7) Using the product under any other conditions that may negatively affect the performance and/or reliability of the product.
- (8) Power supply with ripple may cause of incorrect operation or degradation of phase noise characteristics, so please evaluate before use.
- (9) Frequency aging is from environmental tests results to the expectation of the amount of the frequency variation. This doesn't guarantee the product-life cycle.
- (10) This components used underfill material at the back side of package.  
After mounting this components on the board, there's possibility of IC damage happened by thermal expansion of adhesive, if adhesive will break into between TCXO and the board.  
Please do not use adhesive, this will cause oscillation stop in case of IC damaged by adhesive.

Should any customer use the product in any manner contrary to the precautions and/or advice herein, such use shall be done at the customer's own risk.

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