No. OSC13-CO-058

Preliminary SPECIFICATIONS

CRYSTAL OSCILLATOR

Spec. No. X1G00445xxxxxxx

Type. SG5032CAN

Date. Jun. 14 . 2013

SPECIFICATIONS

1. Application

(1) This document is applicable to the crystal oscillator that are delivered to _____ from SEIKO EPSON Corp.

(2) This product is compliant with RoHS Directive.

(3) You are requested, if applicable, to obtain all necessary licenses for the export of this product(s) (including any technical information furnished, if any) under Foreign Exchange and Foreign Trade Law. You are requested not to export this product(s) in order to use it for development and/or manufacture of weapons of mass destruction or for other military purposes. Exporting this product(s) in order to make it available to any third party who uses or may use this product(s) for such purposes are also prohibited.

(4) 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. Product No. / Model

The product No. of this crystal oscillator unit is X1G00445xxxxxx.
The model is SG5032CAN.

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

[1] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	V_{CC}-GND	-0.3 to +4.0	V	
Storage temperature *	T_stg	-40 to +125	°C	Stored as bare product after unpacking.
Input voltage	V_{IN}	-0.3 to V_{CC}+0.3	V	$\overline{ST}$ 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	-	3.63	V	
Supply voltage	GND	0.0	0.0	0.0	V	
Input voltage	V_{IN}	GND	-	V_{CC}	V	
Operating temperature	T_use	-40	+25	+85	°C	L
		-40	+25	+105		W
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 Vcc between Vcc and GND.
  (Refer to [11] Recommendable patterning)

[3] Frequency characteristics

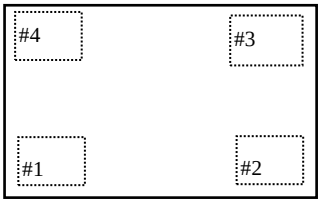
Output frequency (f_0) range ..... 1.0000 MHz to 60.0000 MHz

Parameter	Symbol	Value[1×10^{-6}]	Note
Frequency tolerance *	f_tol (OSC)	L: ± 50	T_use=-40 °C to +85 °C
		W: ± 100	T_use=-40 °C to +105 °C
Aging	F_aging	± 3	T_use=+25 °C, V_{CC}=3.3 V First year

* This includes initial frequency tolerance, temperature characteristics, input voltage characteristics, and load characteristics, but excludes aging.

[4] Terminal assignment

Top View



Terminal name	Terminal No.	Terminal type.
$\overline{ST}$	1	INPUT
GND	2	—
OUT	3	OUTPUT
V_{CC}	4	—

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

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

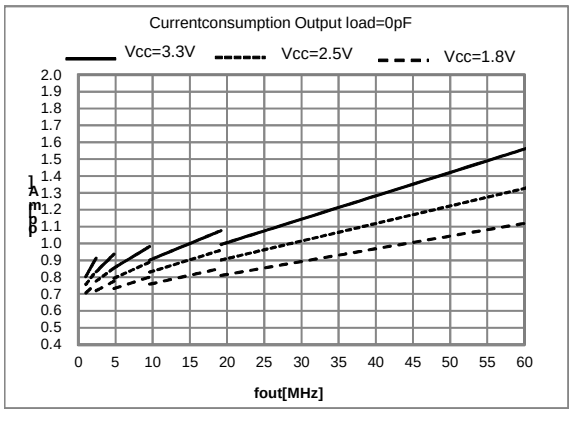
* When the $\overline{ST}$ terminal is not controlled, it should be connected to the Vcc terminal.

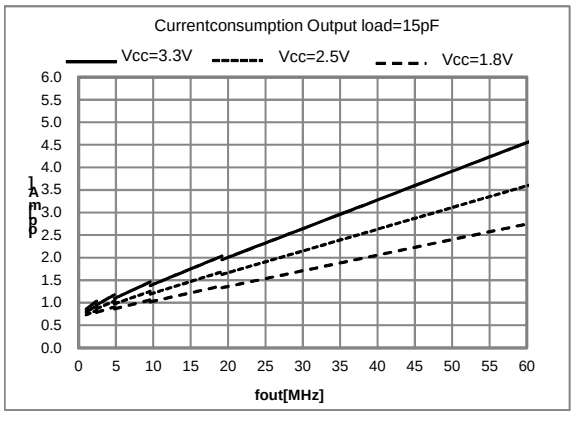
[5] Electrical characteristics

(Please see page 2 [2] Operating range)

Parameter	Symbol	Value Min.	Value Max.	Unit	Note	
Start up time	tOSC	-	3	ms	t=0 at 90 %VCC	
Current consumption	ICC	-	1.5	mA	No load, 1MHz to 20MHz	Vcc=1.8V+/-10%
		-	1.8		No load, 20MHz to 40MHz	
		-	2.1		No load, 40MHz to 60MHz	
		-	1.6		No load, 1MHz to 20MHz	Vcc=2.5V+/-10%
		-	2.0		No load, 20MHz to 40MHz	
		-	2.4		No load, 40MHz to 60MHz	
		-	1.8		No load, 1MHz to 20MHz	Vcc=3.3V+/-10%
		-	2.2		No load, 20MHz to 40MHz	
		-	2.6		No load, 40MHz to 60MHz	
Standby current	I_std	-	2.1	µA	$\overline{ST}$ =GND, Ta<+105℃	Vcc=1.8V+/-10%
		-	2.5			Vcc=2.5V+/-10%
		-	2.7			Vcc=3.3V+/-10%
Output rise time ＊1	tr	-	3.0	ns	20 %VCC → 80 %VCC	
		-	3.5		20 %VCC → 80 %VCC Vcc=1.8V±10%	
Output fall time ＊1	tf	-	3.0	ns	80 %VCC → 20 %VCC	
		-	3.5		80 %VCC → 20 %VCC Vcc=1.8V±10%	
Symmetry	SYM	45	55	%	50 %VCC Level	
High level output voltage	VOH	VCC-0.4	-	V	IOH = -3mA , Vcc=1.8V±10%	
					IOH = -4mA , Vcc=2.5V±10%	
					IOH = -6mA , Vcc=3.3V±10%	
Low level output voltage	VOL	-	0.4	V	IOH = 3mA , Vcc=1.8V±10%	
					IOH = 4mA , Vcc=2.5V±10%	
					IOH = 6mA , Vcc=3.3V±10%	
High level input voltage	VIH	0.8 VCC	-	V	$\overline{ST}$ terminal	
Low level input voltage	VIL	-	0.2 VCC	V	$\overline{ST}$ terminal	
Input current	IIH	-	10	µA	VIN = VCC	
	IIL	-10	-	µA	VIN = GND	
Output disable time ＊2	tstp	-	100	ns	$\overline{ST}$ terminal High → Low	
Output enable time ＊2	tsta	-	3	ms	$\overline{ST}$ terminal Low → High	

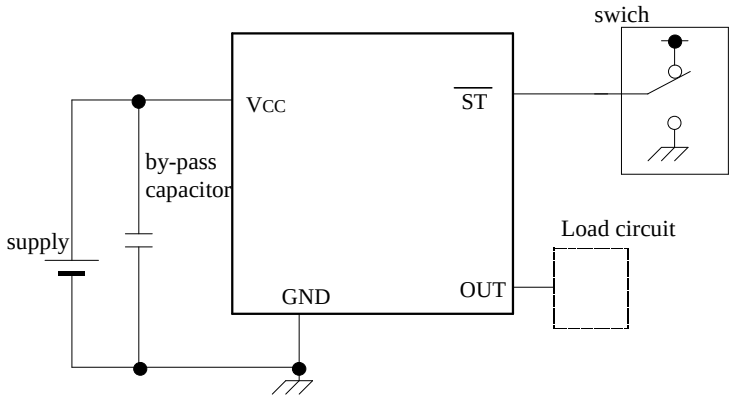
Refer to [6] Test circuit [7] Timing chart



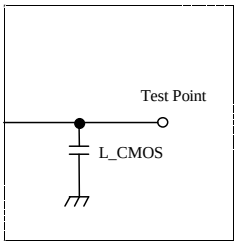


[6] Test circuit

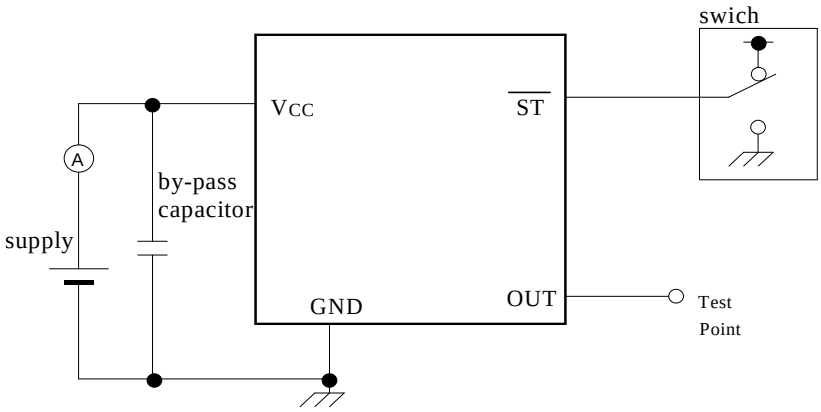
1) Waveform observation



Load circuit load capacitance



2) Current consumption



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

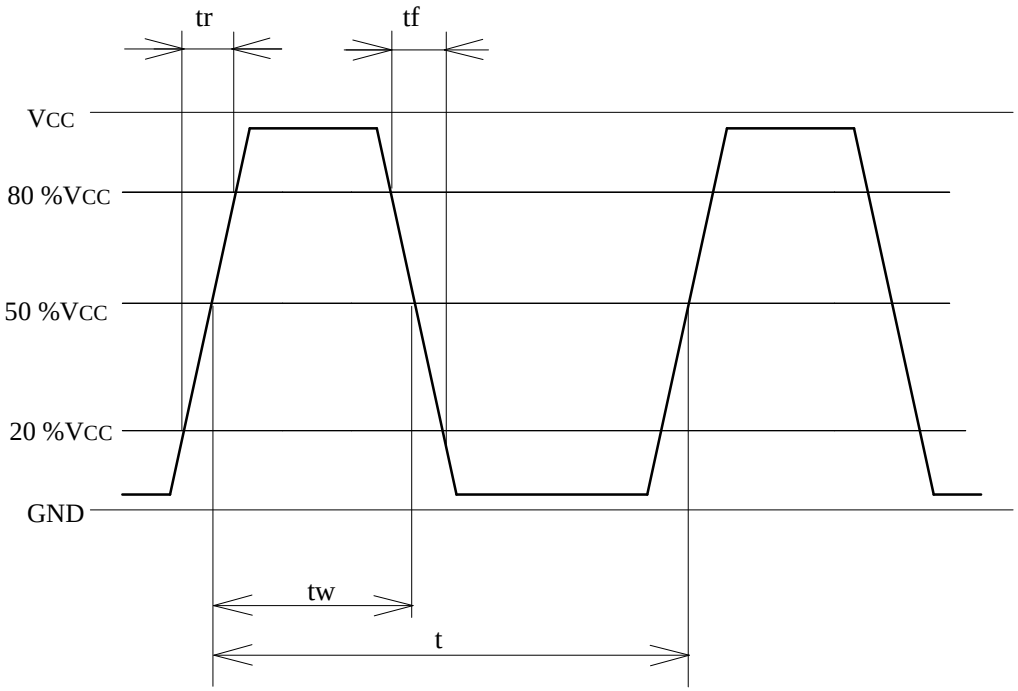
(4) Use the current meter whose internal impedance value is small.

(5) Power supply

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

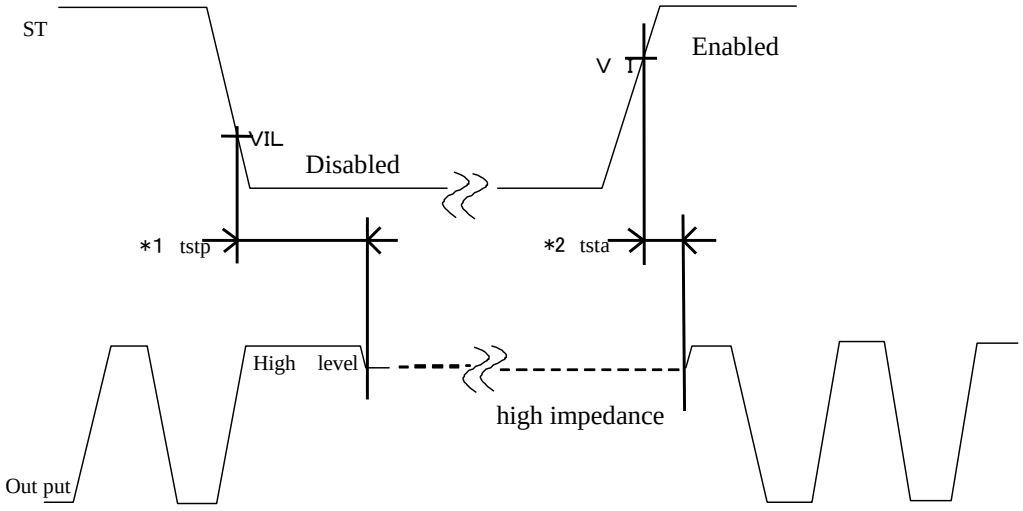
[7] Timing chart

1) C-MOS load SYM = tw/t × 100 (%)



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

$\overline{ST}$ 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 $\overline{ST}$ =VIL to output = Disable (high impedance)

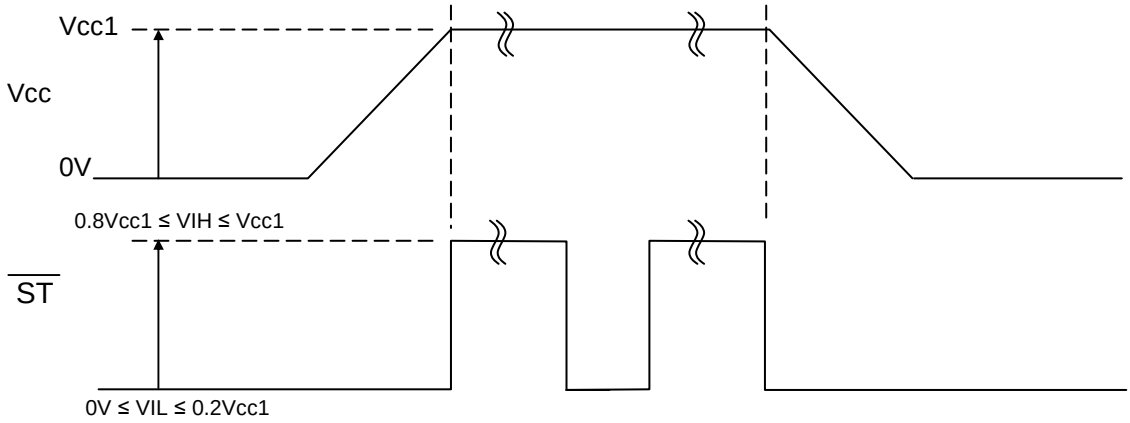
*2 The time taken from $\overline{ST}$ =VIH to output = Start

Output start : VOH≥80%VCC, VOL≤20 %VCC, fout = fo±1 000×10^{-6}

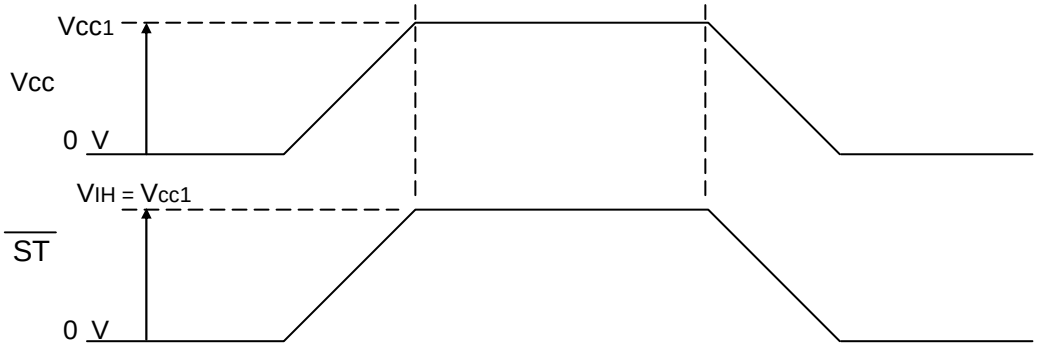
3) $\overline{ST}$ Control timing

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

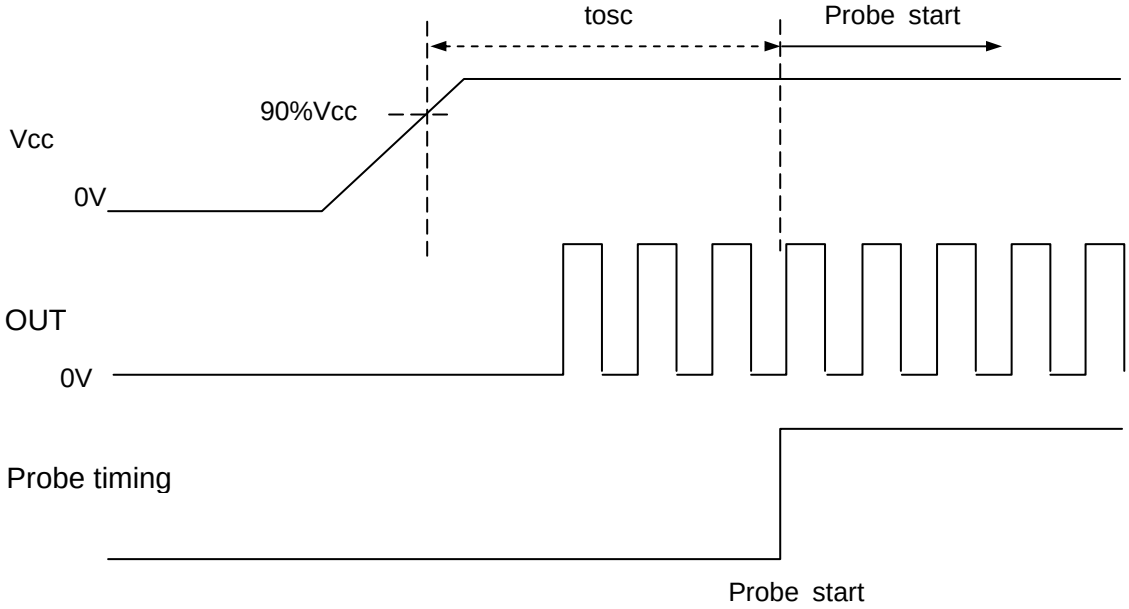
$\overline{ST}$ control timing differs from Vcc control timing



$\overline{ST}$ terminal is connected to Vcc 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 ± 20	Satisfy Item [5] after test.	+125 °C × 1 000 h
2	Low temperature storage	*3 ± 10		-40 °C × 1 000 h
3	High temperature bias	*3 ± 10		+105 °C × V_{CC} Max. × 1 000 h
4	Low temperature bias	*3 ± 10		-40 °C × V_{CC} Max. × 1 000 h
5	Temperature humidity bias	*3 ± 10		+85 °C × 85 %RH × V_{CC} Max. × 1 000 h
6	Temperature cycle	*3 ± 10		-40 °C ↔ +125 °C 30 min. at each temperature 100 cycles
7	Resistance to soldering heat	± 3		Convection reflow soldering furnace (3 time) Ref. IPC/JEDEC J-STD-020D
8	Shock	± 3		150 g dummy Jig (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

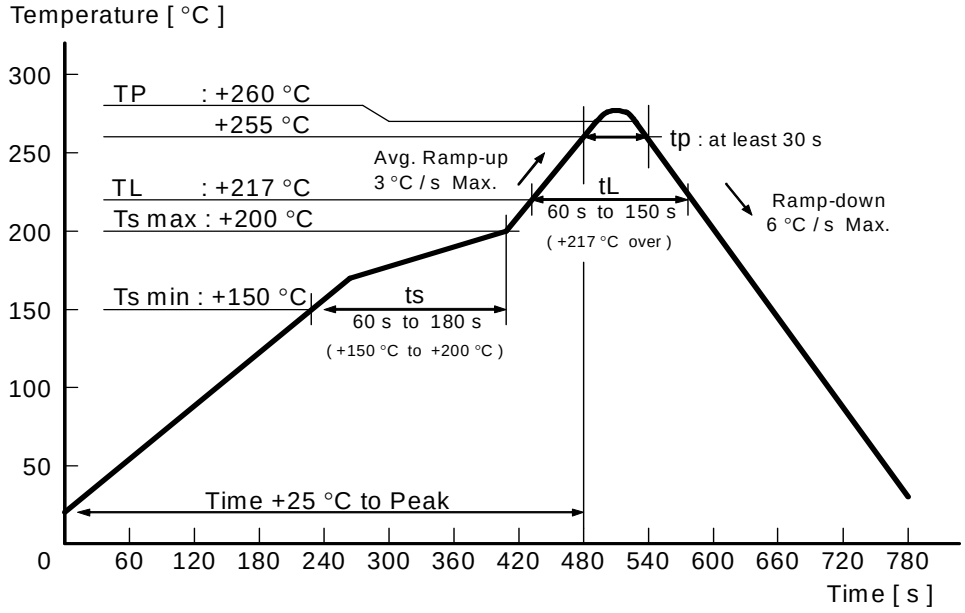
< Notes >

*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 （IPC/JEDEC J-STD-020D.1）



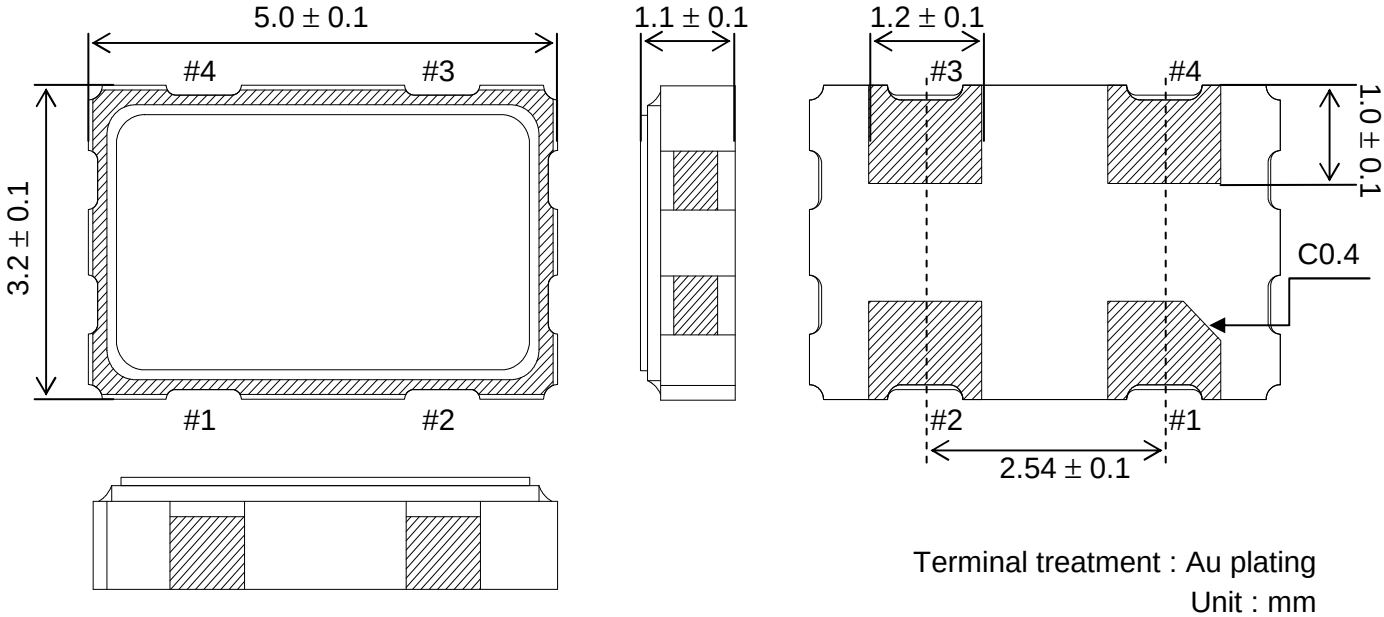
[9] Electro Static Discharge

・ESD

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

[10] Dimensions and marking layout

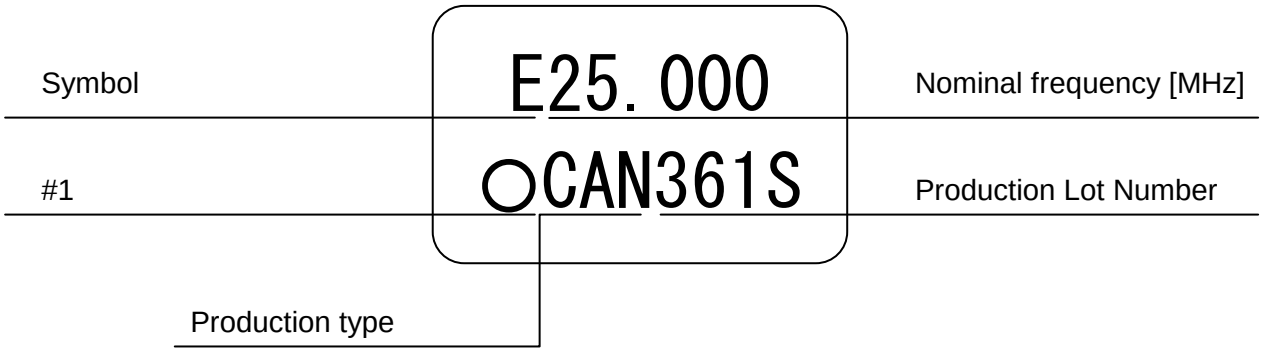
1) Dimensions



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) We recommends a 0.01 μF to 0.1 μF capacitor must be connected near Vcc between Vcc and GND to obtain stable operation and protect against power line ripple.

3) Vcc and GND pattern shall be as large as possible so that high frequency impedance shall be small.

4) We 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) We 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 %Vcc→90 %Vcc) 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. We 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-210SCB, however, since the oscillator might be damaged under some conditions, please exercise in advance.

12) We recommends to use and store under room temperature and normal humidity to secure frequency accuracy and prevent moisture.

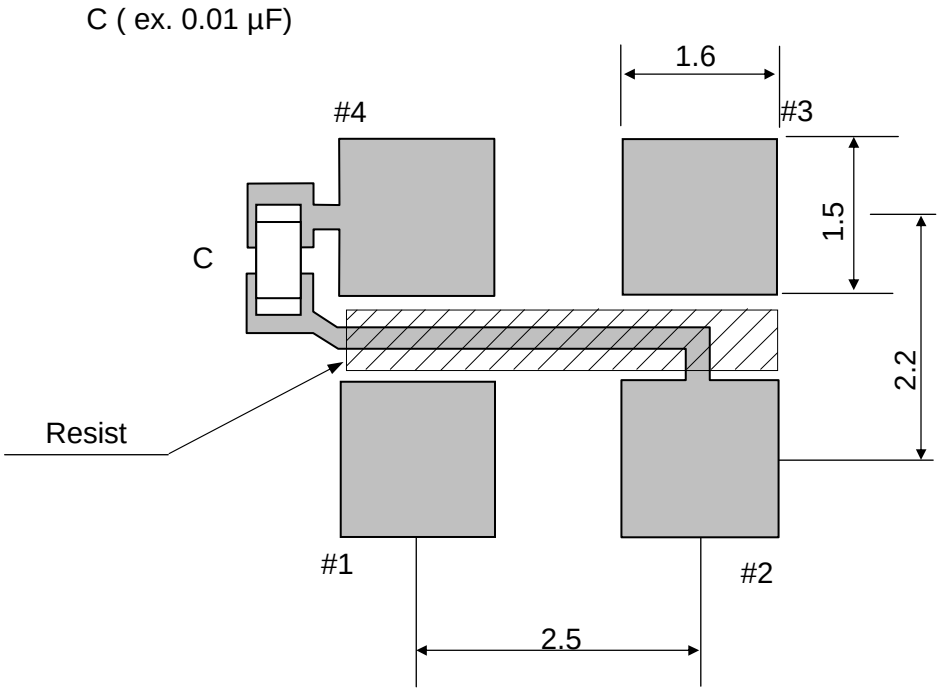
13) $\overline{ST}$ -pin has pull-up resistor internally. The resistor value is switched depending on input voltage. Please refer to electrical characteristics.

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)



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