INFORMATION

PRODUCT No. : **X1G004291010200**

MODEL : **SG7050EAN**

INFO. No. : **A14-745-0A**

DATE : **Sep. 12. 2014**

SEIKO EPSON CORPORATION

8548 Naka-minowa
Minowa-machi Kamiina-gun
Nagano-ken
399-4696 Japan

INTRODUCTION

1. The contents is subject to change without notice.
   Please exchange the specification sheets regarding
   the product's warranty.

2. This sheet is not intended to guarantee or provide
   an approval of implementation of industrial patents.

3. We have prepared this sheet as carefully as possible.
   If you find it incomplete or unsatisfactory in any
   respect, We would welcome your comments.

This product 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.

Product No. / Model

The product No. of this crystal clock oscillator's is X1G004291010200.
The model is SG7050EAN
Suffix：KEGA

Contents

[1] Absolute maximum ratings

Item	Symbol	Specifications	Unit	Remarks
Supply voltage	Vcc-GND	-0.3 ~ +4.0	V	
Storage temperature *1	T_stg	-40 ~ +125	°C	Stored as bare product after unpacking
Input voltage	V_{IN}	-0.3 ~ Vcc+0.3	V	

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

[2] Operating range*1

Item	Symbol	Specifications			Unit	Remarks
		Min.	Typ.	Max.		
Supply voltage *2	Vcc	2.25	-	3.63	V	Symbol:K, Vcc±10%
Supply voltage	GND	0.0	0.0	0.0	V	
Input voltage	V_{IN}	GND	-	Vcc	V	
Operating temperature range	T_use	-40	+25	+85	°C	Symbol:G
Output load condition	L_PECL	50			Ω	Terminated to Vcc-2 V

*1 Start up time (Vcc=0 V→90 %Vcc) of power source should be more than 150 μs and slew rate should be less than 19.8 mV/μs.

*2 It is not guarantee that using Single end output.

[3] Frequency characteristics

Output frequency : 135 MHz

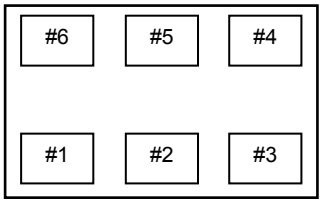
[GND=0.0 V]

Item	Symbol	Specifications [1×10^{-6}]	Remarks
Frequency tolerance *1	f_tol	±30	Symbol : E
Frequency aging	f_aging	±5	T_use=+25 °C, Vcc=3.3 V

*1 This includes initial frequency tolerance, frequency temperature coefficient, frequency voltage coefficient, reflow drift, but excludes aging.

[4] Pin map

Top View



Connection	No.	Type	Remarks
OE *1	1	INPUT	Output enable pin. As per below table. Input level / Oscillation / Outputs "H" / Enable / Enable : specified frequency "L" / Enable / Disable : Hi-Z
N.C. *2	2	-	Non connect
GND *3	3	-	GND pin
OUT	4	OUTPUT	Output pin
$\overline{OUT}$	5	OUTPUT	Output pin, inversion of #4
Vcc	6	-	Vcc pin

*1 Please connect OE #1 Pin to Vcc terminal, when you don't control OE input terminal.
*2 Please connect N.C. #2 Pin to GND terminal.
*3 The metal part of the surface (metal cap) is connected to GND #3 pin.

[5] Electrical characteristics

[Please see [2]]

Item	Symbol	Specifications		Unit	Remarks
		Min.	Max.		
Oscillation start up	t_str	-	3	ms	t=0 at Vcc Min.
Current consumption	Icc	-	65	mA	OE=Vcc, L_ECL=50 Ω
Disable current	I_dis	-	20	mA	OE=GND
Rise time *1	tr	-	350	ps	20 % → 80 % of (V_{OH}-V_{OL})
Fall time *1	tf	-	350	ps	80 % → 20 % of (V_{OH}-V_{OL})
Symmetry *1	SYM	45	55	%	at outputs crossing point
High output voltage	V_{OH}	Vcc-1.0	Vcc-0.8	V	DC characteristics
Low output voltage	V_{OL}	Vcc-1.78	Vcc-1.62	V	DC characteristics
High input voltage	V_{IH}	70 %Vcc	Vcc+0.3	V	OE terminal
Low Input voltage	V_{IL}	-0.3	30 %Vcc	V	OE terminal
Input current	I_{IH}	-	1	μA	V_{IN}=Vcc
	I_{IL}	-20	-2	μA	V_{IN}=GND
Disable delay time *2	t_{pxz}	-	100	ns	OE terminal HIGH → LOW
Enable delay time *2	t_{pzx}	-	10	μs	OE terminal LOW → HIGH
Phase jitter*3	t_{PJ}	-	0.6	ps	Offset frequency 12 kHz ~ 20 MHz

Please see [6] Test circuit.

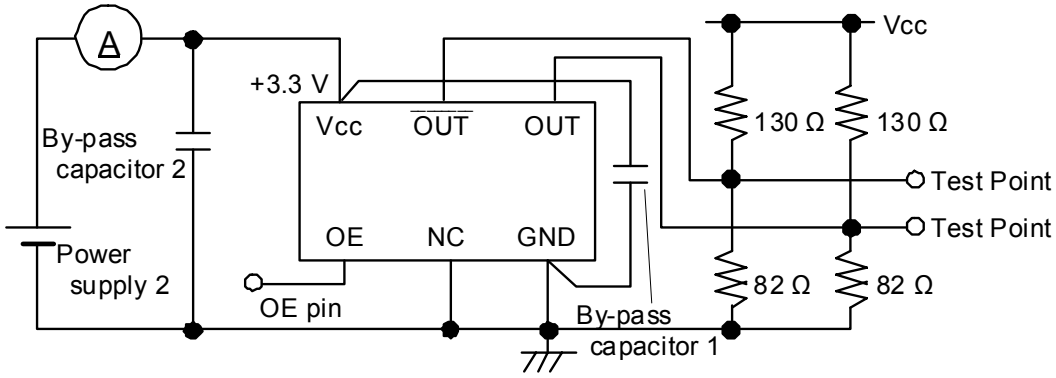
*1 Please see [7] 1) Output waveform.

*2 Please see [7] 2) OE function and timing.

*3 243≦f0≦250MHz and 486MHz≦f0≦500MHz is 0.9ps Max.

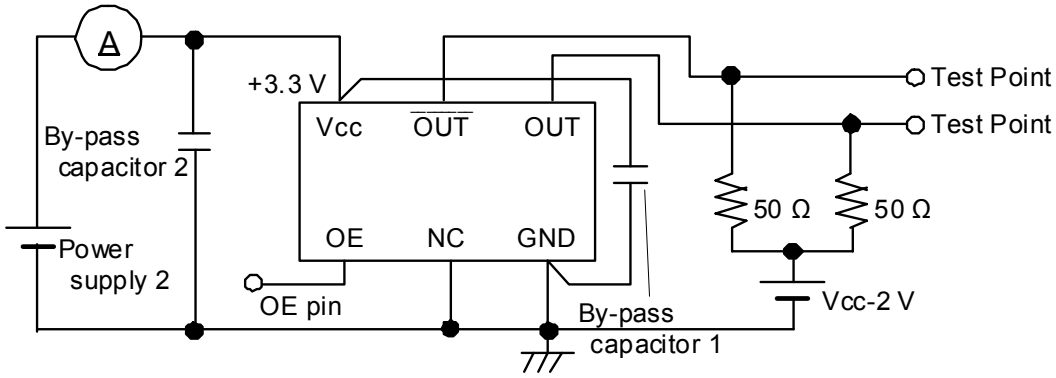
[6] Test circuit

1) To observe waveform and current (case 1)



* The lines from OUT and $\overline{OUT}$ pin are same length.
* To measure the disable current, OE pin is connected to GND
* Please see [7] 2) OE function and timing about OE pin.

2) To observe waveform and current (case 2)



* The lines from OUT and $\overline{OUT}$ pin are same length.
* To measure the disable current, OE pin is connected to GND
* Please see [7] 2) OE function and timing about OE pin.

3) Measurement condition

A) Oscilloscope
- Bandwidth should be 5 times higher than DUT's output frequency (4 GHz).
- Probe ground should be placed closely from test point and lead length should be as short as possible.

B) By-pass capacitor 1 (approx. 0.01 μF to 0.1 μF) places closely between Vcc and GND.

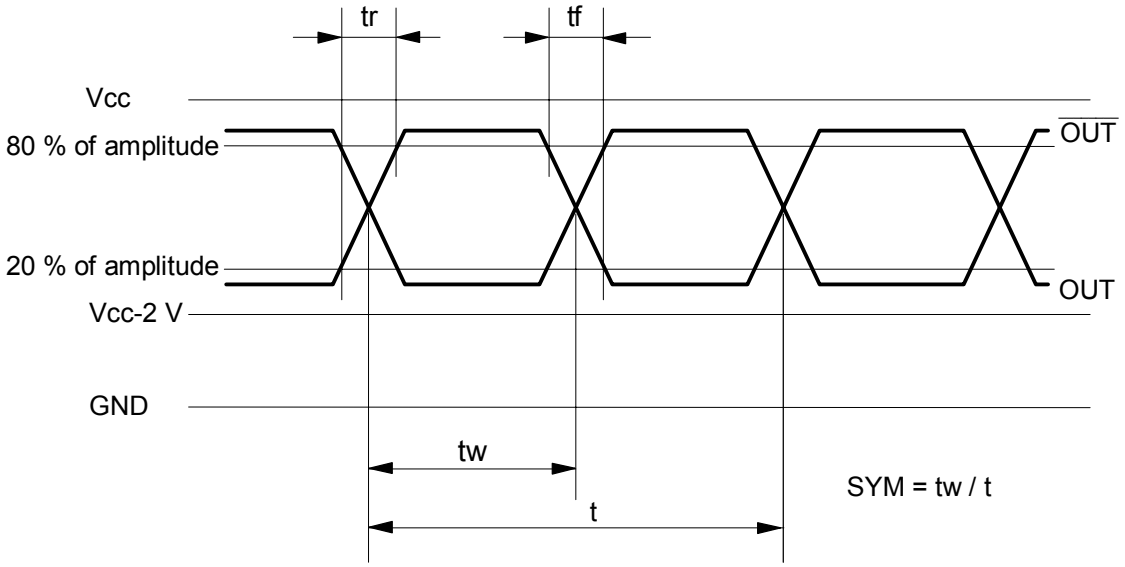
C) By-pass capacitor 2 (approx. 10 μF) places closely between power supply terminals on the board.

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

E) Power supply
- Start up time (0 V→90 %Vcc) of power source should be more than 150 μs and slew rate should be less than 19.8 mV/μs.
- Impedance of power supply should be as low as possible.

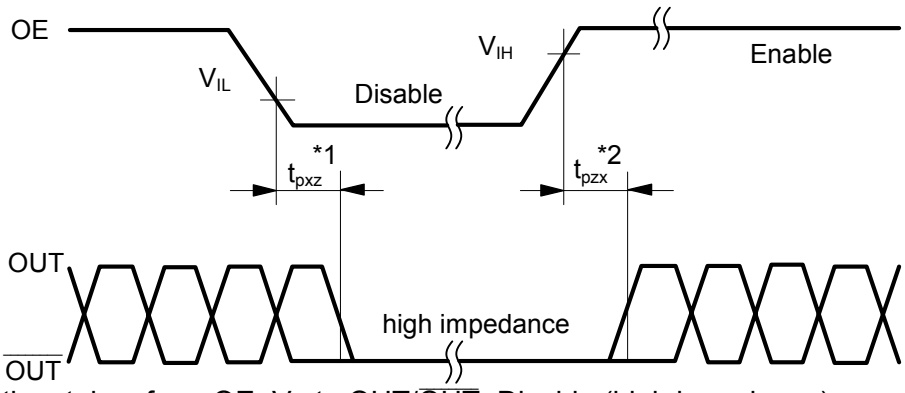
[7] Timing chart

1) Output waveform



2) OE function and timing

OE input level	Oscillation	Outputs
“H”	Enable	Enable : specified frequency
“L”	Disable	Disable : high impedance



*1 The time taken from OE=V_{IL} to OUT/$\overline{OUT}$=Disable (high impedance).
*2 The time taken from OE=V_{IH} to OUT/$\overline{OUT}$=Enable.

* OE input voltage must be lower than Vcc. Note that rise-up time of OE input voltage must not be shorter

than the rise-up time of supply voltage.

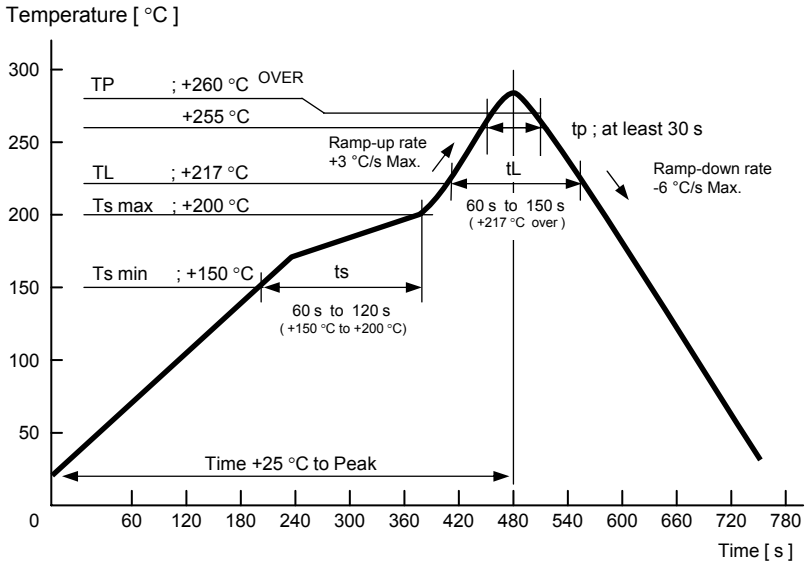
[8] Environmental and mechanical characteristics

* Seiko Epson evaluation condition: Evaluated by the following examination items and conditions.

No	Item	Specifications *1		Test condition
		Frequency tolerance *2 [1×10^{-6}]	Electrical characteristics	
1	High temperature storage	±20	Satisfy [5] Electrical characteristics specification after test	+125 °C × 1 000 h
2	Low temperature storage *3	±10		-40 °C × 1 000 h
3	High temperature bias *3	±10		+85 °C × 3.63 V × 1 000 h
4	Low temperature bias *3	±10		-40 °C × 3.63V × 1 000 h
5	Temperature humidity bias	±10		+85 °C × 85 %RH × 3.63 V × 1 000 h
6	Temperature cycle *3	±20		-40 °C ⇔ +125 °C 30 min.at each temperature × 100
7	Resistance to soldering heat	±4		Convection reflow soldering profile Ref.IPC/JEDECJ-STD-020D.1(3 times)
8	Drop	±5		Free drop from 750 mm height onto a hard wooden board 3 times (Board thickness more than 30 mm)
9	Vibration	±5		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 Logarithm sweep 6 h (2 h × 3 direction)
10	Leakage	1×10^{-9} Pa·m^3/s Max.		Test by Helium leak detector
11	Solderability	More than 95 % of surface is covered by		Dip pins into solder bath at +235 °C±5 °C for 5s (Using rosin flux)
12	Pull-off	No peeling-off at a solder part		Press 10 N × 10 s±1 s Ref. EIAJ ED-4702

<Notes>*1 Each test is independent.
*2 Magnitude of the frequency change that is measured at 2 ~ 24 hours later after test.
*3 The test has been taken after pre-conditioning, and leaving for 24 hours at room temperature, then the initial value is measured. Pre-conditioning: reflow 3 times (Same condition of Resistance to soldering heat test)

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

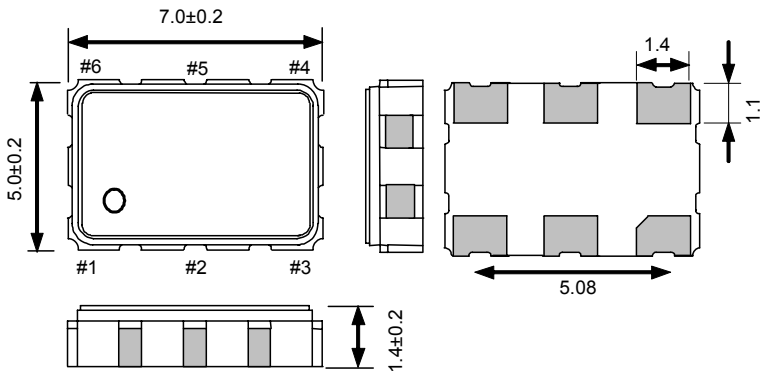


[9] Electrostatic discharge (ESD) sensitivity

Item	Sensitivity	Test condition
Human body model (HBM)	±2 000 V	EIAJ ED-4701-1 C111A 100 pF, 1.5 kΩ, 3 times
Machine model (MM)	±250 V	EIAJ ED-4701-1 C111 200 pF, 0 Ω, 1 time

[10] Dimensions and marking layout

1) Dimensions

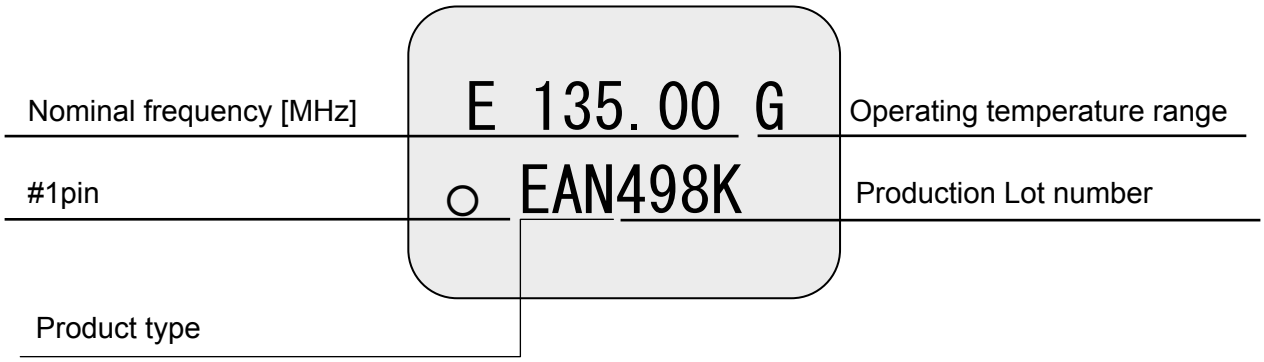


Pin map

Pin	Connection
1	OE *
2	N.C.
3	GND
4	OUT
5	$\overline{OUT}$
6	VCC

Pin coating : Au plating
Unit : mm

2) Marking layout

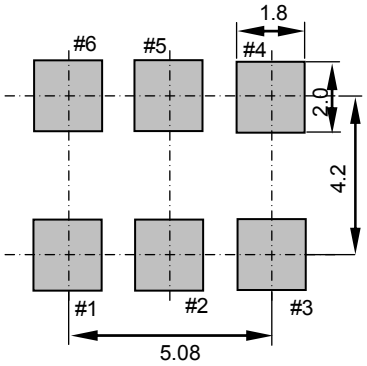


- The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.
- Output frequency shall indicate 6 digits (include decimal point), if the value of frequency is over 6 digits, the least significant digits will be omitted.

[11] Board patterning

Example of patterning design indicated as follows. In an actual design, please consider mounting density, the reliability of soldering, etc. and check whether performance is optimal.

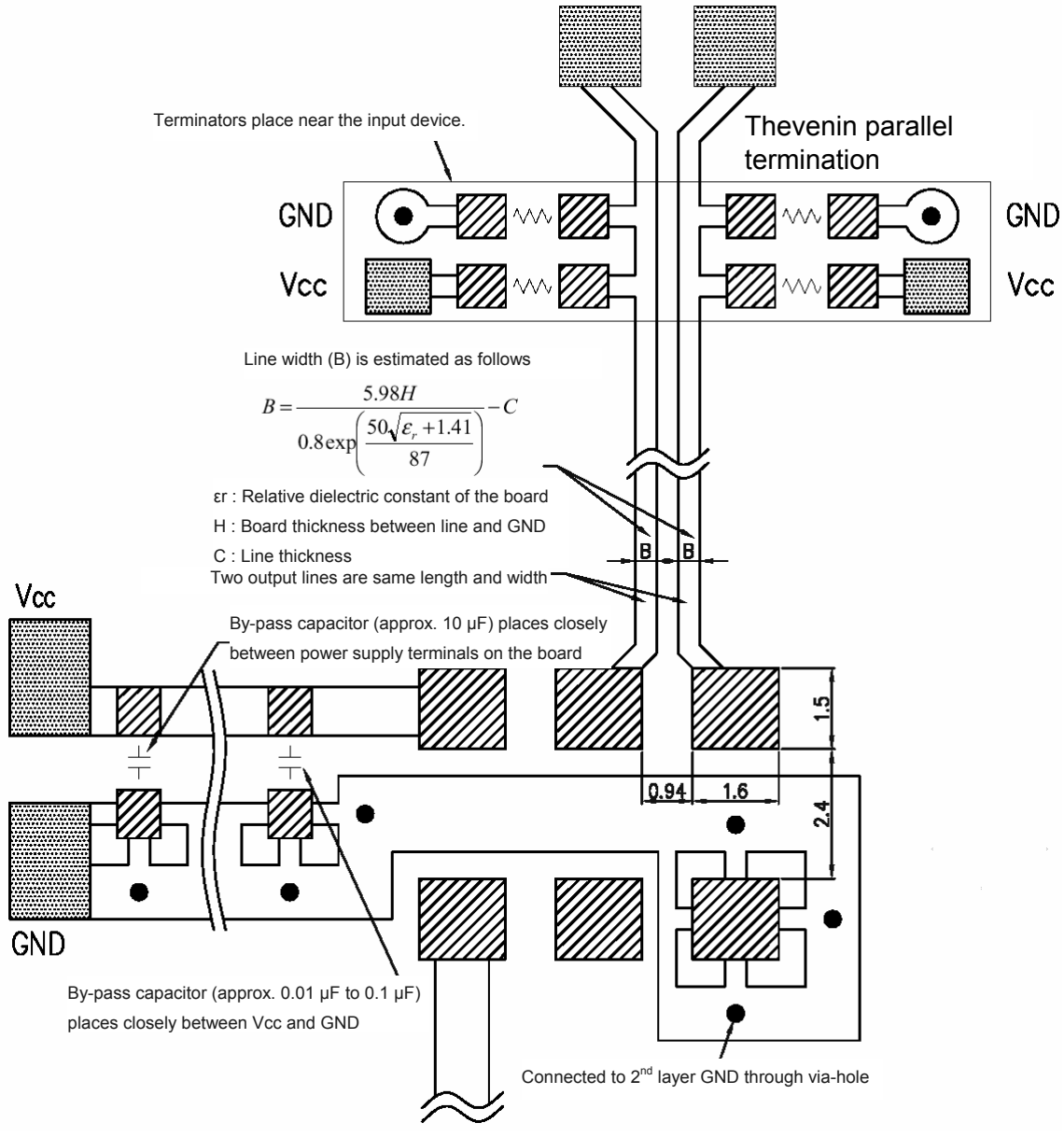
•Soldering pattern



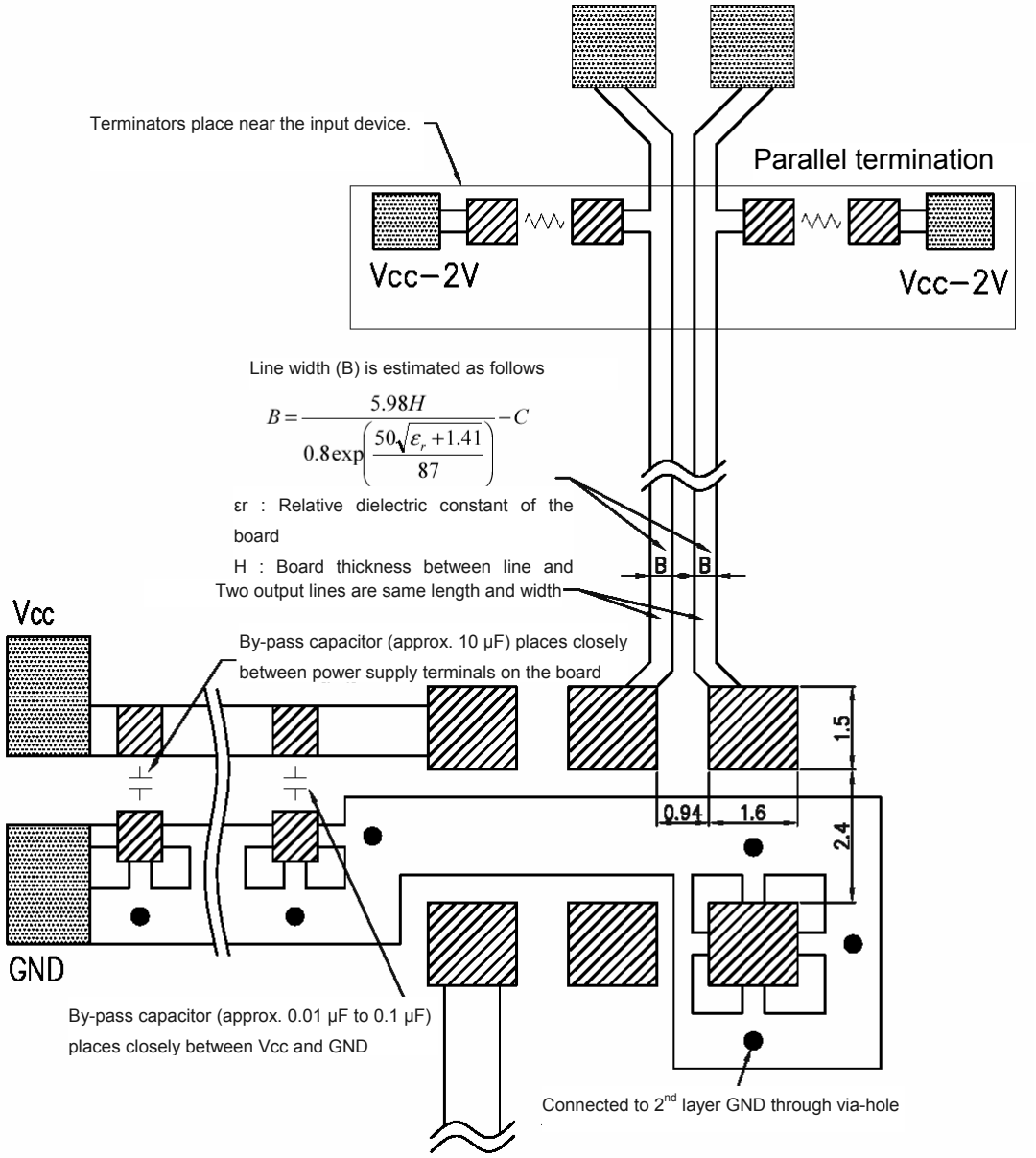
Unit:mm

• PCB layout (2 layers, 2nd layer is all GND pattern)

Case 1



Case 2



* By-pass capacitor (approx. 0.01 μF to 0.1 μF) places closely between Vcc and GND.
* By-pass capacitor (approx. 10 μF) places closely between power supply terminals on the board.
* Please design the two output lines by characteristic impedance 50 Ω and same length, and try to make the output lines as short as possible.
* Terminators place near the input device.

[12] Notes

1) This device is made with C-MOS IC. Please take necessary precautions to prevent damage due to electrical static discharge.

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

3) Seiko Epson 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.

4) Seiko Epson 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.

5) We recommend placing a 0.01 µF to 0.1 µF capacitor closely between Vcc and GND to obtain stable operation and protest against power line ripple.

6) Please design the output lines by characteristic impedance 50 Ω and try to make the output lines as short as possible. A long output line may cause irregular output.

7) Other high level signal lines may cause incorrect operation, so please do not place high-level signal line close to this device.

8) This device contains a crystal resonator, so please don't expose excessive shock or vibration.

9) An automatic insertion is available, however, the internal AT resonator might be damaged in case that too much shock or vibration is produced mechanically. Be sure to check your machine condition in advance.

10) Ultrasonic cleaning can be used on this product, however, since the oscillator might be damaged under some conditions, please exercise caution in advance.

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

12) When not use OE pin connection, please use connecting to Vcc. We recommend installation of a resistor in between to mitigate effect by surge etc.

13) Lid is electrically connected to GND. Please don't apply electrical voltage.

14) Start up time (0 to 90% Vcc) of power source should be more than 150 µs and slew rate should be less than 19.8 mV/µs. 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.

15) When distributing output signals, please use the clock divider IC (Differential LV-PECL fanout buffer).

16) DUT's surface temperature may rise from surrounding temperature by self heat-generation. Please confirm a rise in temperature with DUT mounted to an actual substrate, because it may change from the mounting condition.

TAPING SPECIFICATION

Ⅰ. Application

This standard will apply to 7×5 Ceramic package.

Spec：CA package

Ⅱ. Contents

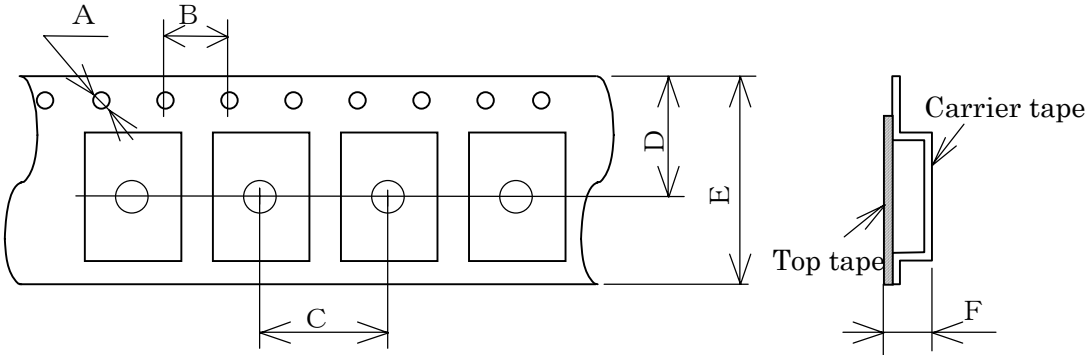
〔1〕 Taping specification

Subject to「EIA-481」and「IEC-60286」

(1) Tape dimensions TE-1612L

Material of the carrier tape : PS

Material of the top tape : PET

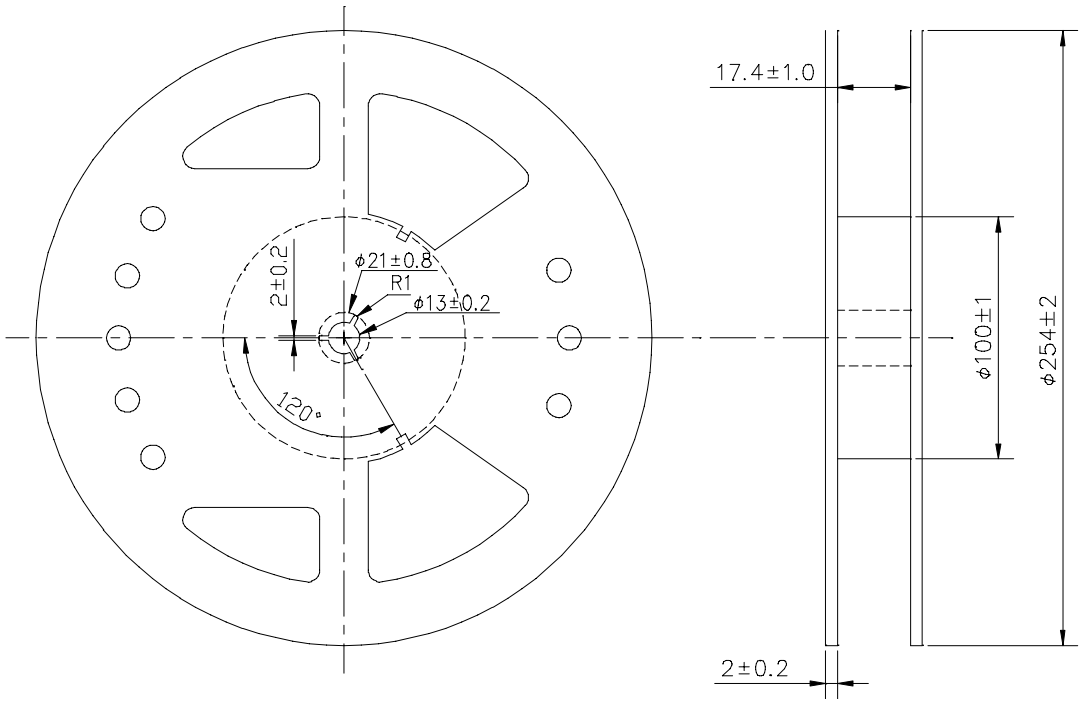


Symbol	A	B	C	D	E	F
Value	ϕ 1.5	4.0	8.0	9.25	16.0	2.3

Unit : mm

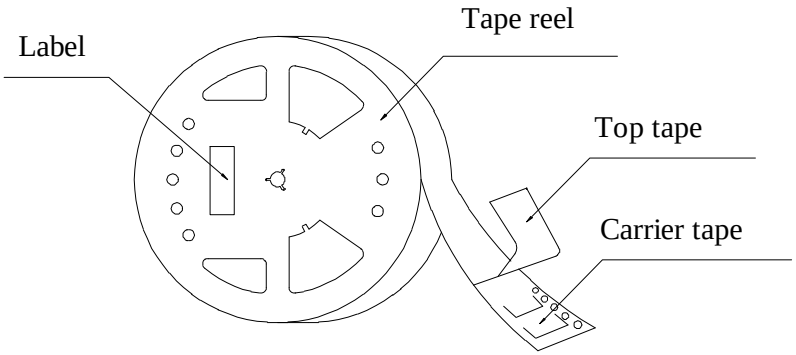
(2) Reel dimensions

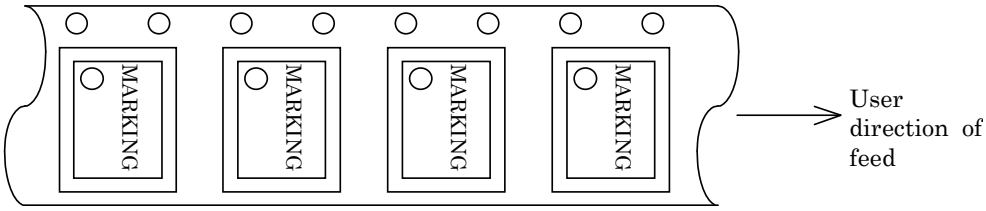
Material of the reel : Conductive polystyrene



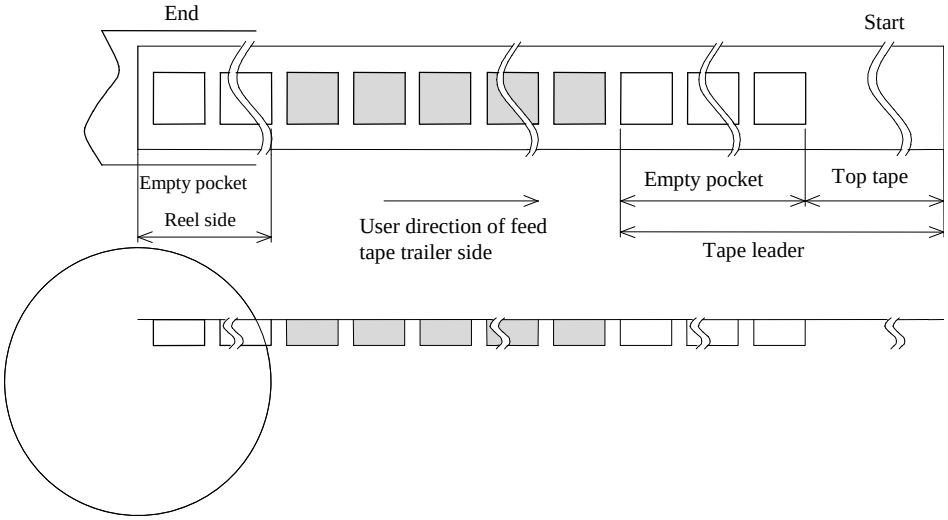
(3) Packing

①Tape & reel





②Start & 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

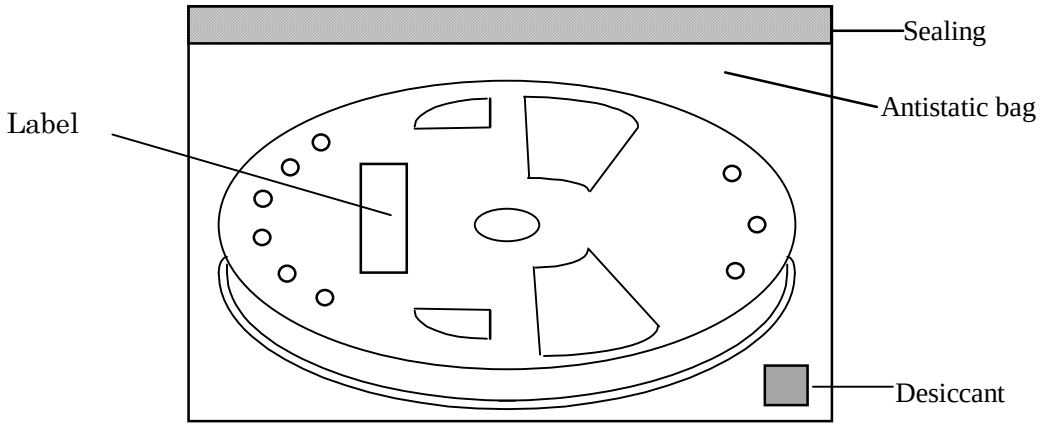
(4) Peel force of the cover tape

① angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.

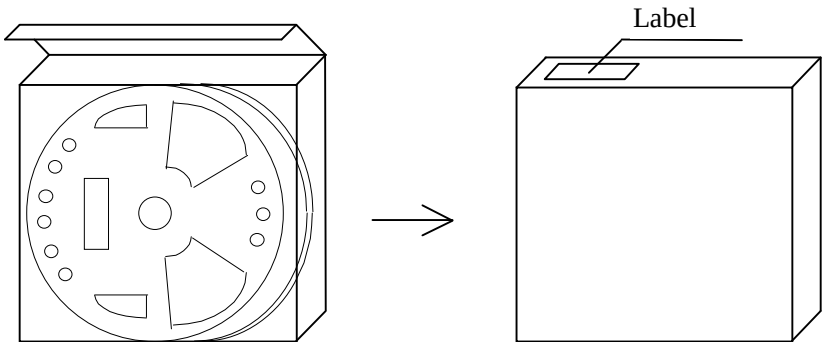
② peel speed : 300 mm / min.

〔2〕 Inner carton

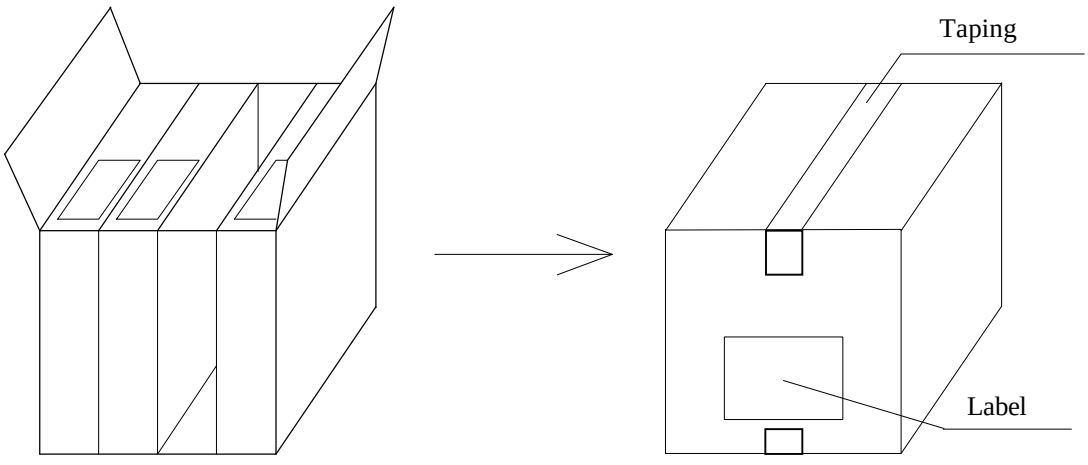
a) Packing to antistatic bag



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

・1 000 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

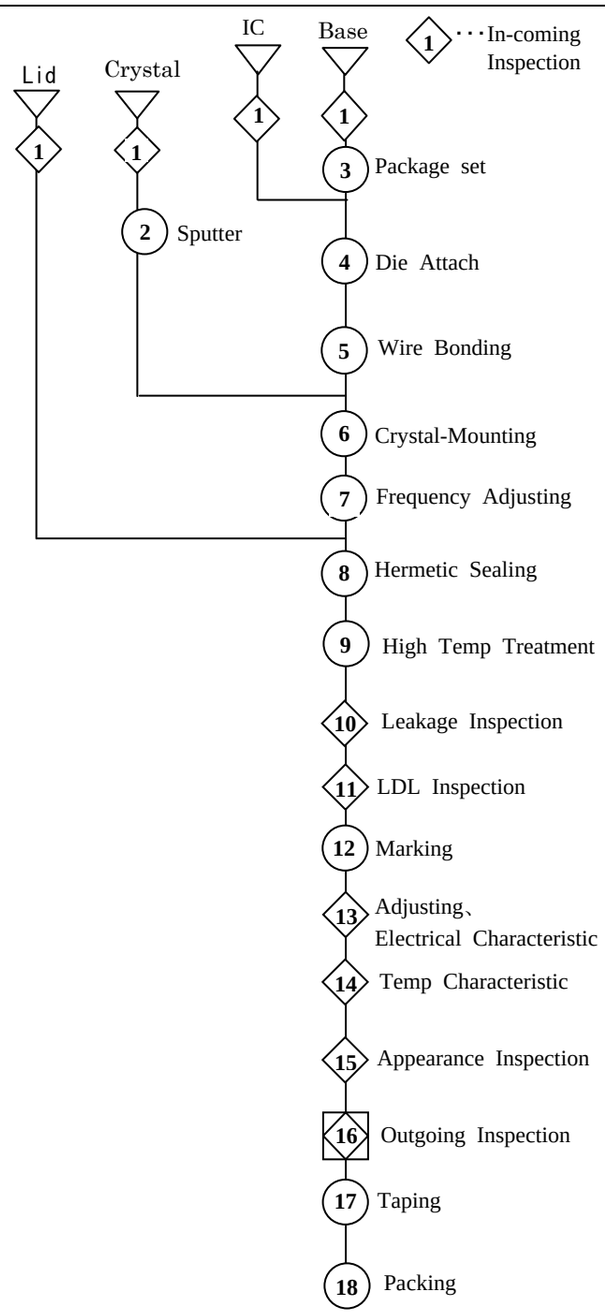
・To handle with care to prevent the damage of tape, reel and products.

- PROCESS QUALITY CONTROL -

No. SG7050xAN - 00 - ASE – 1　　CRYSTAL OSCILLATOR : SG7050EAN,VAN

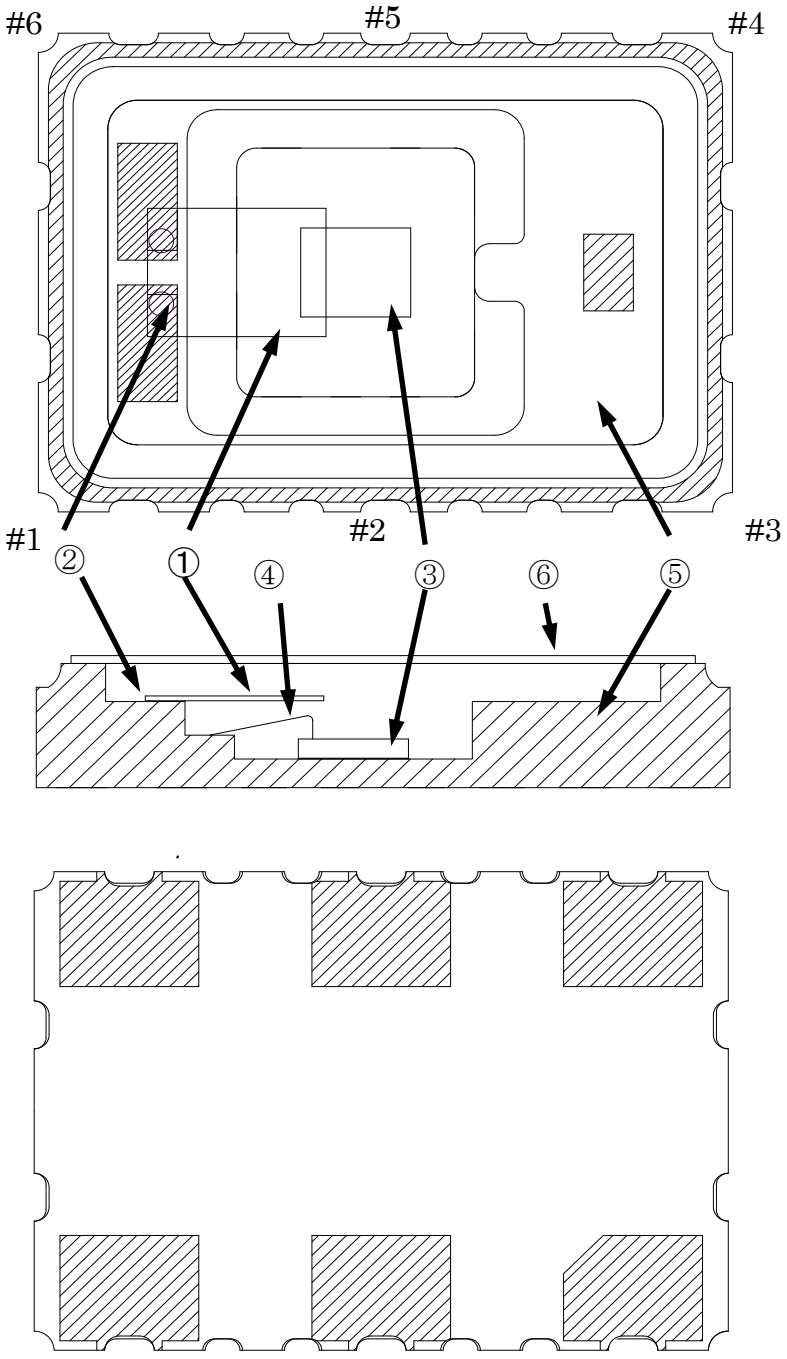
'13.11.19

Manufacturing process chart



No.	Section In Charge	Standards	Inspection, Control Item	Instruments	Inspection Methods	Record
1	China Plant (Inspection Section)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Microscope	Sampling	Data sheet
2	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	100% Inspection	Data sheet
			Peeling Strength	Scratch	Sampling	Data sheet
			Frequency	CI Meter	Sampling	Data sheet
3	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
4	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
5	China Plant (Production Section)	Manufacturing Instruction Sheet	Bonding strength Appearance	Gauge Microscope	Sampling Sampling	Data sheet
6	China Plant (Production Section)	Manufacturing Instruction Sheet	Mounting strength Appearance	Pull tester Microscope	Sampling 100% Inspection	Data sheet
7	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
			Frequency	Counter	Sampling	Data sheet
8	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
9	China Plant (Production Section)	Manufacturing Instruction Sheet	—	—	—	—
10	China Plant (Production Section)	Manufacturing Instruction Sheet	Leakage Inspection	Measuring equipment	100% Inspection	Data sheet
11	China Plant (Production Section)	Manufacturing Instruction Sheet	Characteristic Inspection	Measuring equipment	100% Inspection	Data sheet
12	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Visual Inspection	Sampling	Data sheet
13	China Plant (Production Section)	Manufacturing Instruction Sheet	Electrical Characteristic	Measuring equipment	100% Inspection	Data sheet
14	China Plant (Production Section)	Manufacturing Instruction Sheet	Temp Characteristic Inspection	Measuring equipment	Sampling	Data sheet
15	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	100% Inspection	Data sheet
16	China Plant (Inspection Section)	Delivery Specifications Outgoing Inspection Standard	Electrical Characteristic Appearance	Measuring equipment Microscope	Sampling	Data sheet
17	China Plant (Production Section)	Manufacturing Instruction Sheet	Tape peeling Strength Quantity Frequency check function	Peeling strength test machine	Sampling One/Day	Data sheet
18	China Plant (Production Control Section)	Manufacturing Instruction Sheet Daily Shipping List	Customers Type, Quantity	—	—	Delivery Slip

Structure diagram SG7050EAN/VAN



構 成 材 料 一 覧 表		
構成材料		仕様
①	Crystal chip	AT cut
②	Crystal adhesive	Ag paste
③	IC	LV-PECL or LVDS
	IC conductive adhesive	Ag paste
④	Bonding wire	Au
⑤	Package	Ceramic (Al_20_2)
⑥	LID	Cover