

RECIPIENT

SPECIFICATIONS

MODEL: SG-710ECK

SPEC. No. : A06-325-2A

DATE: Jul. 31. 2006

EPSON TOYOCOM CORPORATION

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Epson

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SPECIFICATIONS

1. Application

This document is applicable to the crystal oscillator that are delivered to SOLECTRON SHANGHAI from EPSON TOYOCOM Corp.

This product is not authorized for use as critical components in life support device or systems.

2. Model

The model is SG-710ECK.

3. Packing

It is subject to the packing standard of EPSON TOYOCOM 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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[1] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	V _{DD-GND}	-0.5 to +7.0	V	
Storage temperature *	T _{STG}	-55 to +125	°C	Stored as bare product after unpacking.
Output current	I _{OUT}	25	mA	
Input voltage	V _{IN}	-0.5 to V _{DD} +0.5	V	

* Concerning the frequency change, please refer page 6 [7] Environmental and mechanical characteristics.

[2] Operating range

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Supply voltage	V _{DD}	3.0	3.3	3.6	V	
Supply voltage	GND	0.0		0.0	V	
Operating temperature	T _{OPR}	-10		+70	°C	
		-40		+85		
Input voltage	V _{IN}	GND		V _{DD}	V	
Output load (C-MOS load)	CL			15	pF	

※ By-pass capacitor (0.01 μF to 0.1 μF) is placed closely between V_{DD} and GND.

[3] Frequency characteristics

Output frequency 100 MHz

(V_{DD}=3.3 V±0.3 V, GND=0.0 V, Load CL≤15 pF)

Parameter	Symbol	Value[1 × 10 ⁻⁶]	Note
Frequency stability *	Δ f/fo	B : ± 50	Ta=-10 °C to +70 °C
Aging	fa	± 5	Ta=+25 °C, V _{DD} =3.3 V First year

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

[4] Electrical characteristics

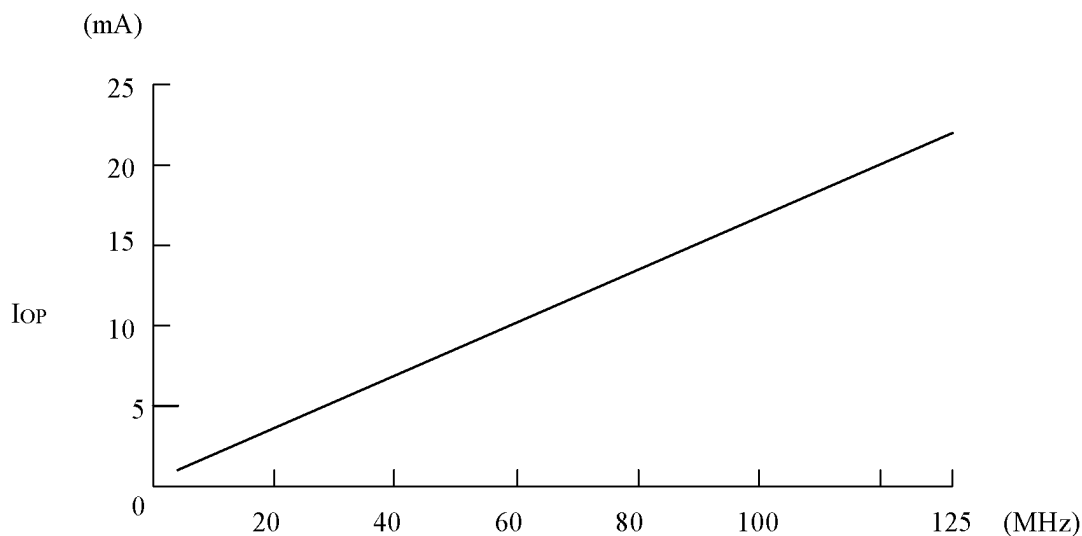
($V_{DD}=3.3\text{ V}\pm 0.3\text{ V}$, $GND=0.0\text{ V}$, $T_a=-10\text{ }^{\circ}\text{C}\sim+70\text{ }^{\circ}\text{C}/-40\text{ }^{\circ}\text{C}\sim+85\text{ }^{\circ}\text{C}$, $Laod\ CL\leq 15\text{ pF}$)

Parameter	Symbol	Value		Unit	Note
		Min.	Max.		
Start up time	tOSC		10	ms	$f_o\leq 125\text{ MHz}$ $t=0(V_{DD}=3.0\text{ V})$
Current consumption	IOP		8.0	mA	No load ($f_o\leq 32\text{ MHz}$)
			15	mA	No load ($f_o\leq 50\text{ MHz}$)
			18	mA	No load ($f_o\leq 67\text{ MHz}$)
			22	mA	No load ($f_o\leq 80\text{ MHz}$)
			30	mA	No load ($f_o\leq 125\text{ MHz}$)
Standby current	\overline{I}_{ST}		10	μA	$\overline{ST}=\text{GND}$ ($f_o\leq 100\text{ MHz}$)
			13	μA	$\overline{ST}=\text{GND}$ ($f_o\leq 125\text{ MHz}$)
High level input voltage	V_{IH}	$0.7 V_{DD}$	V_{DD}	V	\overline{ST} terminal
Low level input voltage	V_{IL}	GND	$0.3 V_{DD}$	V	\overline{ST} terminal
Input current	I_{IL}	-110	-15	μA	$\overline{ST} = \text{GND}$
Output rise time *	tTLH		6.0	ns	$f_o<80\text{ MHz}$ $10\%V_{DD}\rightarrow 90\%V_{DD}$ Level
			4.0	ns	$f_o\geq 80\text{ MHz}$ $10\%V_{DD}\rightarrow 90\%V_{DD}$ Level
Output fall time *	tTHL		6.0	ns	$f_o<80\text{ MHz}$ $90\%V_{DD}\rightarrow 10\%V_{DD}$ Level
			4.0	ns	$f_o\geq 80\text{ MHz}$ $90\%V_{DD}\rightarrow 10\%V_{DD}$ Level
Output duty *	tw/t	45	55	%	$f_o\leq 50\text{ MHz}$, $1/2 V_{DD}$ Level
		40	60	%	$f_o>50\text{ MHz}$, $1/2 V_{DD}$ Level
High level output voltage	V_{OH}	$0.9 V_{DD}$		V	$I_{OH} = -2\text{ mA}$
Low level output voltage	V_{OL}		$0.1 V_{DD}$	V	$I_{OL} = 2\text{ mA}$
Output disable time *	tstp		150	ns	\overline{ST} terminal High \rightarrow Low
Output enable time *	tsta		10	ms	\overline{ST} terminal Low \rightarrow High

* Please refer to [5] Test circuit for each parameter.

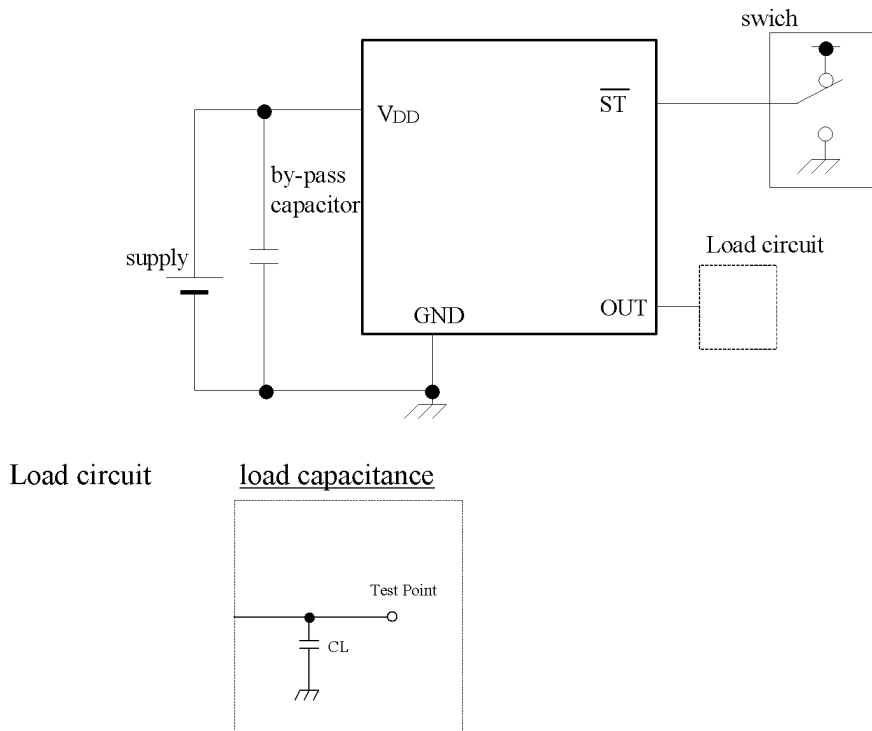
* Please refer to [6] Timing chart

◆ Reference : Current consumption Typ. value ($V_{DD} = 3.3\text{ V}$, $T_a = +25\text{ }^{\circ}\text{C}$, No load)

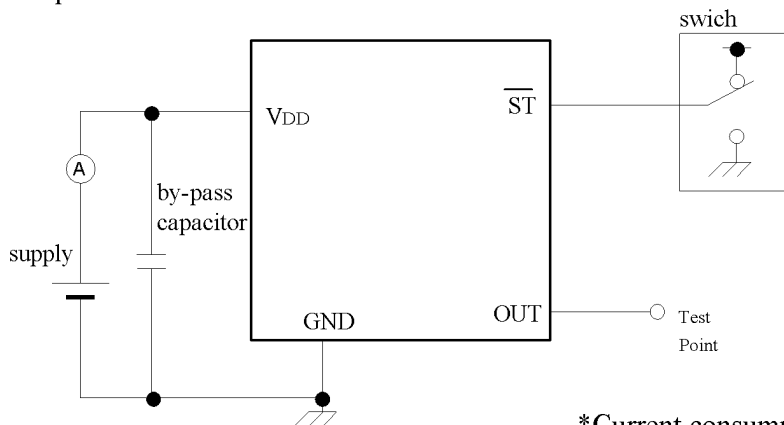


[5] Test circuit

1) Waveform observation



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) 'CL' includes probe capacitance.

(3) By-pass capacitor ($0.01 \mu\text{F}$ to $0.1 \mu\text{F}$) is placed closely between V_{DD} and GND .

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

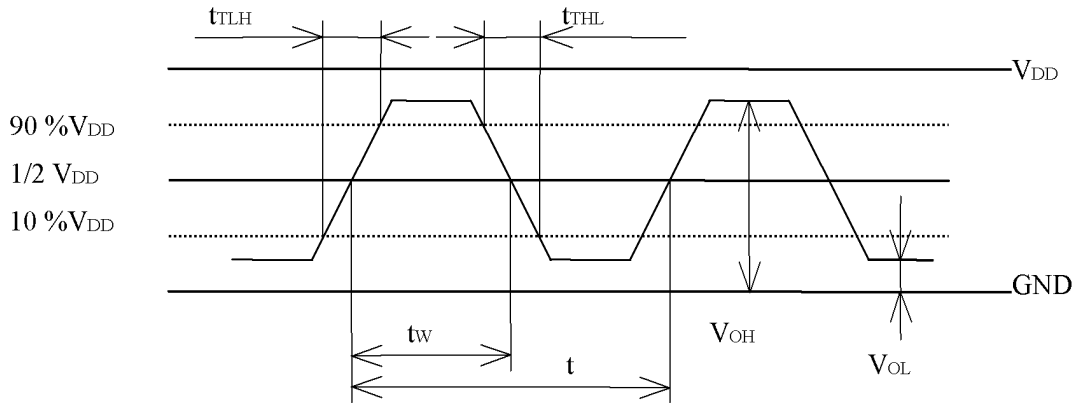
(5) Power supply

- Start up time ($0\%V_{DD} \rightarrow 90\%V_{DD}$) of power source should be more than $150 \mu\text{s}$.
- Impedance of power supply should be as lowest as possible.

[6] Timing chart

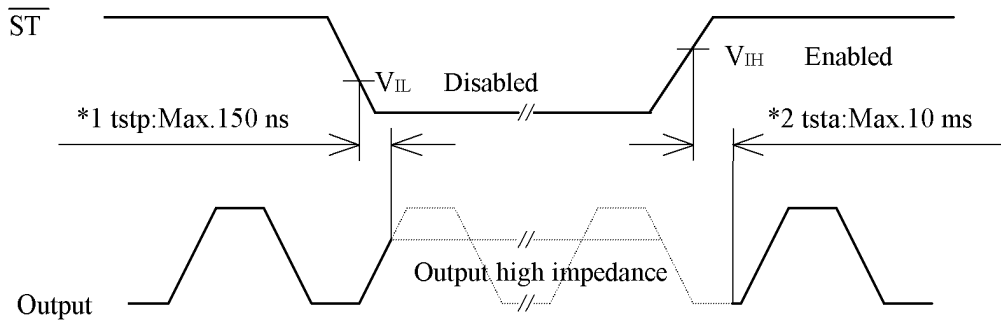
1) C-MOS load (C-MOS Level)

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



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

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

[7] 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 ± 50	Satisfy Item [4] after test.	+125 °C \times 1 000 h
2	Low temperature storage	*3 ± 10		-55 °C \times 1 000 h
3	High temperature bias	*3 ± 20		+85 °C \times 3.6 V \times 1 000 h
4	Low temperature bias	*3 ± 10		-40 °C \times 3.6 V \times 1 000 h
5	Temperature humidity bias	*3 ± 20		+85 °C \times 85 %RH \times 3.6 V \times 1 000 h
6	Temperature cycle	*3 ± 20		-55 °C \leftrightarrow +125 °C 30 min. at each temperature 100 cycles
7	Resistance to soldering heat	± 10		Convection reflow soldering furnace (2 time)
8	Drop	± 10		Free drop from 750 mm height on a hard wooden board for 3 times (Board thickness is more than 30 mm)
9	Vibration	± 10		10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s ² 10 Hz \rightarrow 500 Hz \rightarrow 10 Hz 15 min./cycle 6 h (2 hours , 3 directions)
10	Airtightness	1×10^{-9} Pa·m ³ /s	He leakage detector	
11	Pull - off	No peeling-off at a solder part	10 N press for 10 s \pm 1 s Ref. EIAJ ED-4702	
12	Solderability	Termination must be 95 % covered with fresh solder	Dip termination into solder bath at +235 °C \pm 5 °C for 5 s. (Using Rosin Flux)	

< Notes >

*1 Each test done independently.

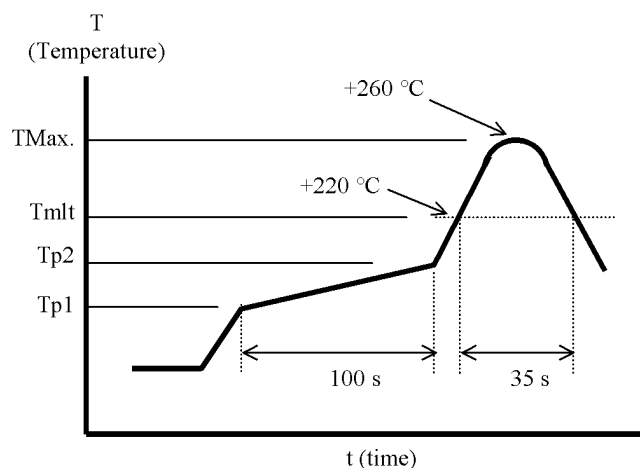
*2 Measuring 2 h to 24 h later leaving in room temperature after each test.

*3 Initial value shall be measured after 24 h storage at room temperature after pre-conditioning.

Convection reflow soldering furnace

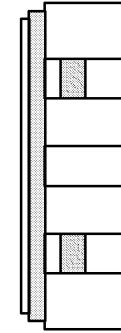
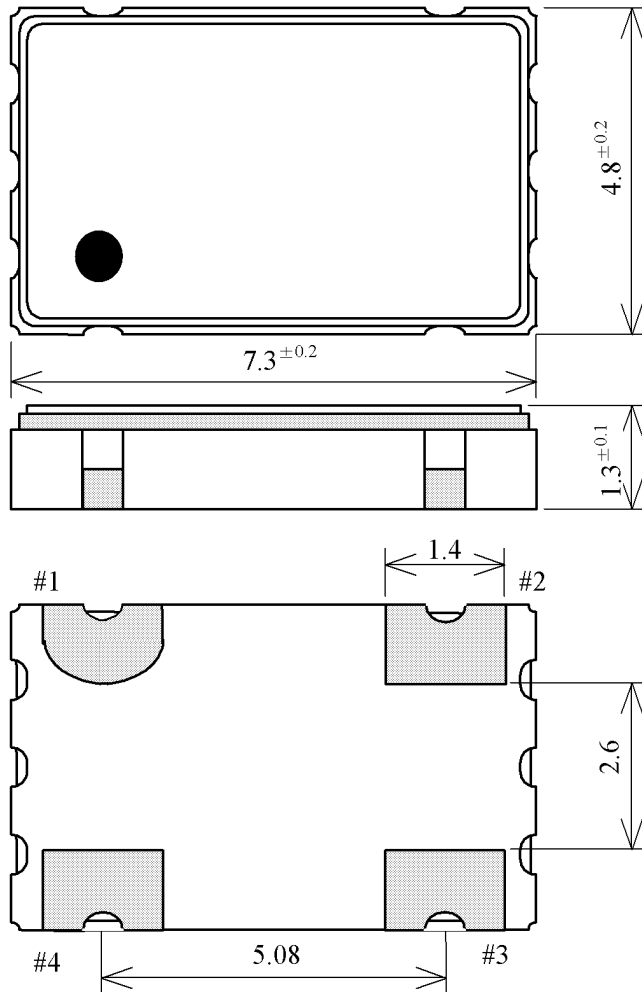
1.Pre heating temperature : Tp1 ~ Tp2 = +170 °C

2.Peak temperature must not exceed +260 °C and the duration of over +220 °C should be 35 s.



[8] Dimensions and marking layout

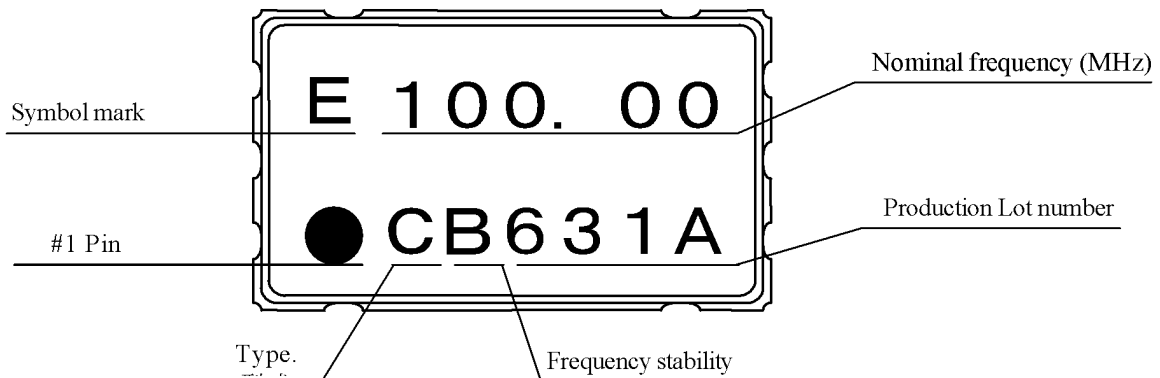
1) Dimensions



No.	Name
#1	$\overline{\text{ST}}$
#2	GND
#3	OUT
#4	VDD

Unit : mm

2) Marking layout



- ◆ Output frequency shall indicate by 6 digits below decimal point, if the value under decimal point over 6 digits, the least significant digits will be omitted.
- ◆ Norminal frequency shows as example.
- ◆ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

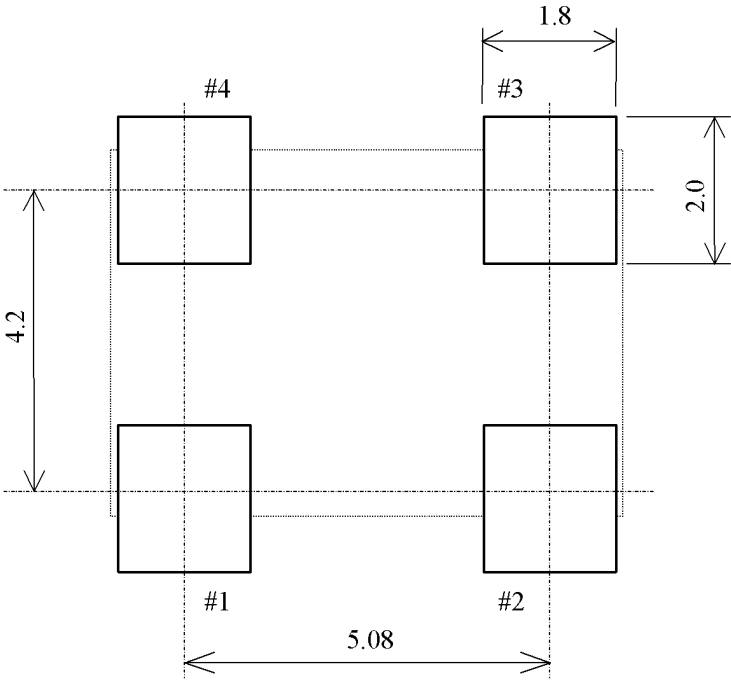
[9] Notes

- 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 placing a 0.01 μ F to 0.1 μ F capacitor closely between V_{DD} and GND to obtain stable operation and protect against power line ripple.
- 3) V_{DD} 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.
- 7) A long output line may cause irregular output, so try to make the output line as short as possible, and also keep high-level signal source away from this device.
- 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-710ECK, 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) When don't intend to use $\overline{\text{ST}}$ pin, please connect the pin to V_{DD}.
We recommend to install a resistor in between to mitigate effect by electrical surge etc.

[10] Recommendable patterning

The soldering pad sample indicated as like following

Soldering position (Unit : mm)



TAPING SPECIFICATION

I . Application

This standard will apply to 7×5 Ceramic package.

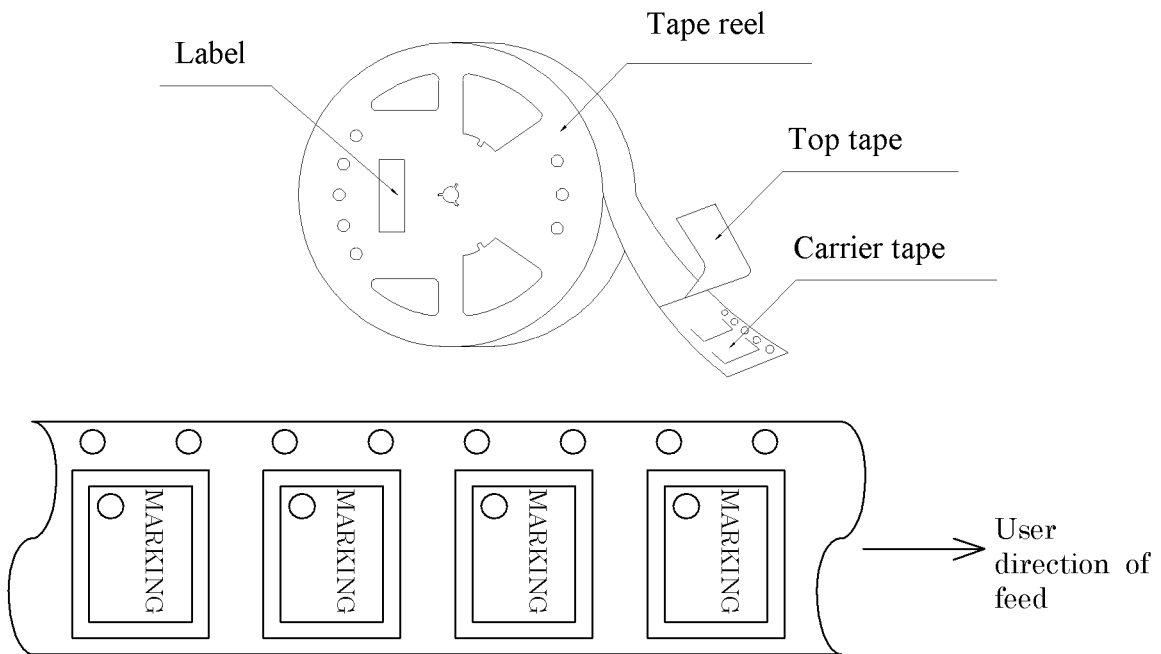
Spec : SG-710**K/**N Series

II . Contents

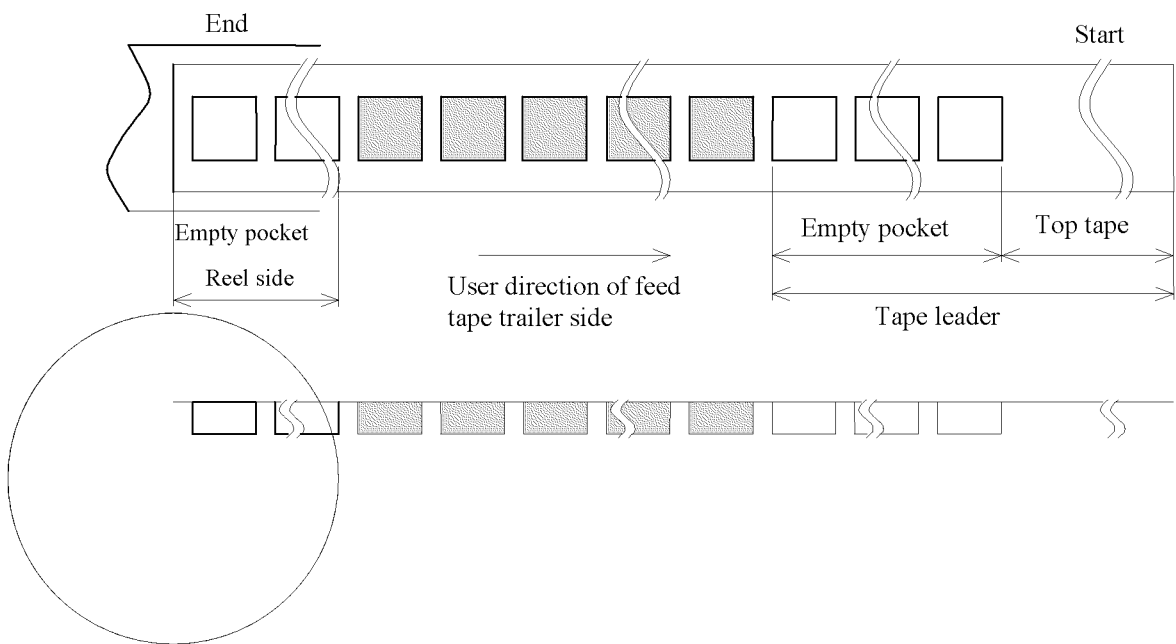
Item No.	Item	Page
[1]	Taping specification	1 to 2
[2]	Inner carton	3
[3]	Shipping carton	
[4]	Marking	4
[5]	Quantity	
[6]	Storage environment	
[7]	Handling	

(3) Packing

① Tape & reel



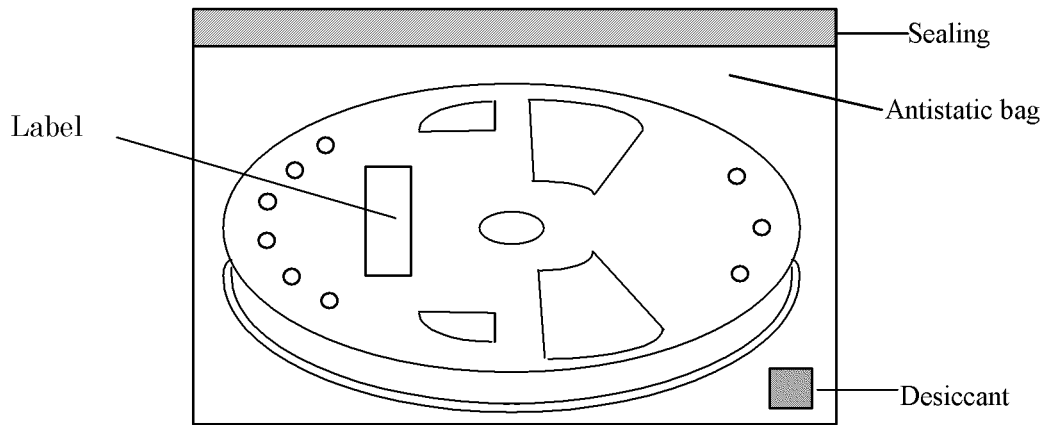
② Start & end point



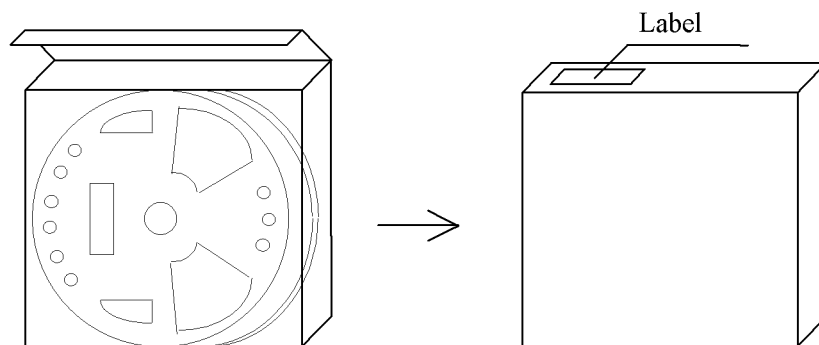
Item		Empty space
Tape leader	Top tape	Min. 1 000 mm
	Carrier tape	Min. 10 pockets
Tape trailer	Top tape	Min. 0 mm
	Carrier tape	Min. 10 pockets

[2] Inner carton

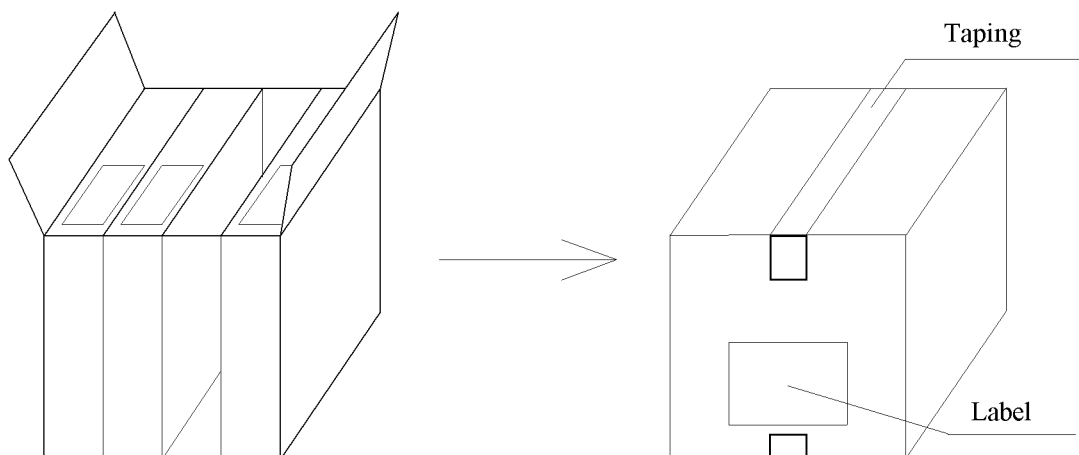
a) Packing to antistatic bag



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

- 2000 pcs./reel

[6] Storage environment

- (1) To storage the reel at 15 °C to 35 °C, 25 %RH to 85 %RH of humidity.
- (2) To open the packing just before using.
- (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. 710 - 00 - AKE - 2

CRYSTAL OSCILLATOR : SG-710 SERIES

'05.11.11
EPSON TOYOCOM CORP.
AT(Consumer) Business Unit

Muda *Ego* *M. Fuj*

Manufacturing process chart	No.	Section In Charge	Standards	Inspection, Control Item	Instruments	Inspection Methods	Record
	1	Inspection Section	Purchasing specification Incoming inspection standard	Appearance Dimension	Microscope	Sampling	Data sheet
	2	Production Section	Manufacturing instruction sheet	Appearance	Microscope	Sampling	Data sheet
	3	Production Section	Manufacturing instruction sheet	Bonding strength Appearance	Gauge Microscope	Sampling 100% inspection	Data sheet
	4	Production Section	Manufacturing instruction sheet	Appearance	Microscope	Sampling	Data sheet
	5	Production Section	Manufacturing instruction sheet	Appearance Frequency	Microscope Blank Oscillator	Sampling	Data sheet
	6	Production Section	Manufacturing instruction sheet	Appearance	Microscope	100% inspection	Data sheet
	7	Production Section	Manufacturing instruction sheet	—	—	—	—
	8	Production Section	Manufacturing instruction sheet	Appearance	Microscope	100% inspection	Data sheet
	9	Production Section	Manufacturing instruction sheet	—	—	—	—
	10	Production Section	Manufacturing instruction sheet	Appearance	Microscope	Sampling	Data sheet
	11	Production Section	Manufacturing instruction sheet	Appearance	Visual inspection	Sampling	Data sheet
	12	Production Section	Manufacturing instruction sheet	Temperature	Thermometer	One/Day	Data sheet
	13	Production Section	Manufacturing instruction sheet	Leakage Rate	Air Leakagr Detector	100% Inspection	Data sheet
	14	Production Section	Manufacturing instruction sheet	Electrical characteristics (Frequency) Master check	Measuring equipment	100% Inspection	Data sheet
	15	Production Section	Manufacturing instruction sheet	Electrical characteristics Appearance Master check	Measuring equipment Visual inspection (Micro scope)	Sampling	Data sheet
	16	Production Section	Manufacturing instruction sheet	Tape peeling force Frequency check function	Peeling force test machine	Sampling	Data sheet
	17	Inspection Section	Delivery specification Outgoing inspection standard	Electrical characteristics Appearance Master check	Measuring equipment Visual inspection (Micro scope)	Sampling	Data sheet
	18	Production Control Section	Manufacturing instruction sheet Daily shipping list	Customers Type Quantity	—	—	Delivery Slip

- PROCESS QUALITY CONTROL -

'05.11.11

EPSON TOYOCOM CORP.
AT(Consumer) Business Unit

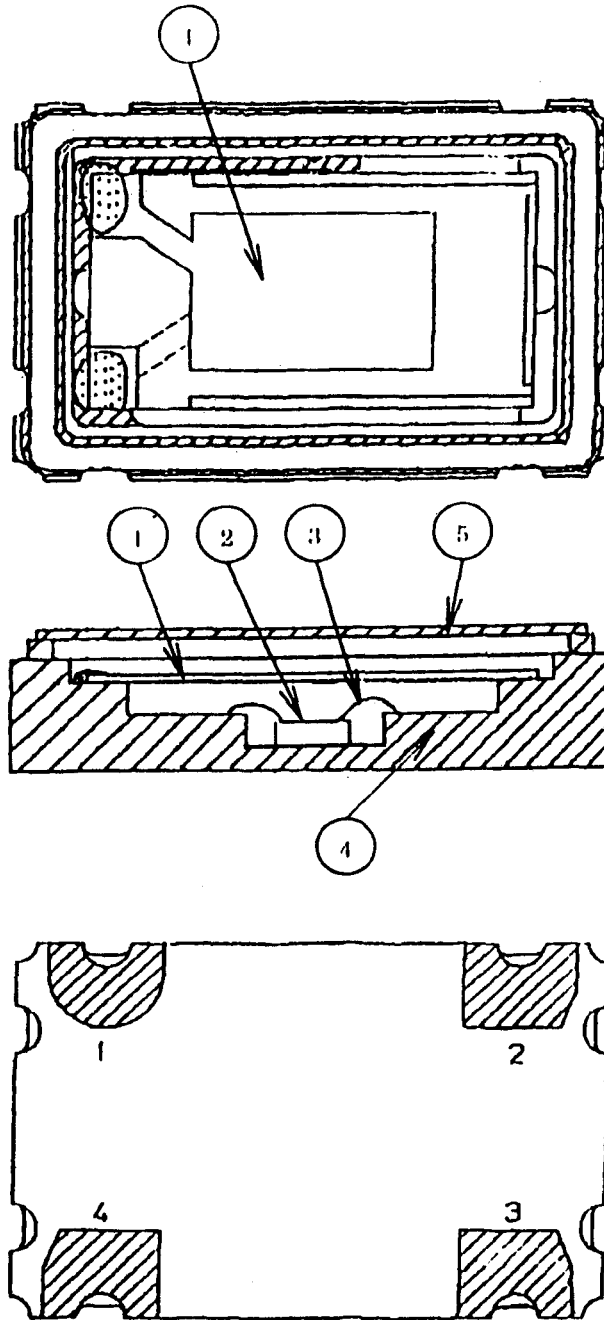
[Handwritten signatures]

No. 710 - 00 - BCE - 1

CRYSTAL OSCILLATOR : SG-710 SERIES

Manufacturing process chart	No.	Section In Charge	Standards	Inspection, Control Item	Instruments	Inspection Methods	Record
	1	Inspection Section	Purchasing specification Incoming inspection standard	Appearance Dimension	Microscope	Sampling	Data sheet
	2	Production Section (China plant)	Manufacturing instruction sheet	Appearance	Microscope	Sampling	Data sheet
	3	Production Section (China plant)	Manufacturing instruction sheet	Bonding strength Appearance	Gauge Microscope	Sampling 100% inspection	Data sheet
	4	Production Section (China plant)	Manufacturing instruction sheet	Appearance	Microscope	Sampling	Data sheet
	5	Production Section (China plant)	Manufacturing instruction sheet	Appearance Frequency	Microscope Blank Oscillator	Sampling	Data sheet
	6	Production Section (China plant)	Manufacturing instruction sheet	Appearance	Microscope	100% inspection	Data sheet
	7	Production Section (China plant)	Manufacturing instruction sheet	—	—	—	—
	8	Production Section (China plant)	Manufacturing instruction sheet	Appearance	Microscope	100% inspection	Data sheet
	9	Production Section (China plant)	Manufacturing instruction sheet	—	—	—	—
	10	Production Section (China plant)	Manufacturing instruction sheet	Appearance	Microscope	Sampling	Data sheet
	11	Production Section (China plant)	Manufacturing instruction sheet	Appearance	Visual inspection	Sampling	Data sheet
	12	Production Section (China plant)	Manufacturing instruction sheet	Temperature	Thermometer	One/Day	Data sheet
	13	Production Section (China plant)	Manufacturing instruction sheet	Leakage Rate	Air Leakagr Detector	100% Inspection	Data sheet
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Structure diagram SG-710



LIST

	Name of part	Material
①	Crystal chip	AT cut
②	IC	C-MOS
③	Bonding wire	Au
④	Package	Ceramic(Al_2O_3)
⑤	Cap	Covar

ESTABLISH REPORT NO.04-084(AT/QO)		
DWG No..		G9605-02-1
DESIGNED	CHECKED	APPROVED
<i>Kurumi</i>	<i>[Signature]</i>	<i>[Signature]</i>



RELIABILITY TEST DATA

Product Name : SG-710K series**

The Company evaluation condition

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

No. F-G-9607-05-005E

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	*3 ± 50	Satisfy specification after test	22	0
2	Low temperature storage	-55 °C × 1 000 h	*3 ± 10		22	0
3	High temperature bias	+85 °C × Spec Bias × 1 000 h	*3 ± 20		22	0
4	Low temperature bias	-40 °C × Spec Bias × 1 000 h	*3 ± 10		22	0
5	Temperature humidity bias	+85 °C × 85 %RH × Spec Bias × 1 000 h	*3 ± 50		22	0
6	Temperature cycle	-55 °C ⇔ +125 °C 30 min at each temp. 100 cycles	*3 ± 20		22	0
7	Resistance to soldering heat (Reflow characteristics)	Reflow furnace with the condition 2 times	± 10		22	0
8	Drop	Free drop from 750 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)	± 10		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)	± 10		22	0
10	Sealing	For He leak detector	1×10^{-9} Pa·m ³ /s Max.	11	0	
11	Pull - off	10 N press for 10 s ± 1 s 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 Pre conditionings Initial value shall be after 24 h at room temperature.

**AT (Consumer) Business Unit
Production Management Div.**

signature

Qualification Data

Product Name : SG-710K series**

$\Delta f/f$

No. F-G-9607-05-006E

