



Halogen Free

**SAMSUNG ELECTRONICS CO.,LTD**

<b>RECIPIENT</b>

**SPECIFICATIONS**

**Product :** Crystal oscillator

**Model :** TG-5006CJ-48W (26.0 MHz)

**Product No. :** X1G0041310025

**SAMSUNG Code :** 2809-001407

**SPEC. No. :** A13-668-0B

**DATE :** Oct. 17. 2013

Nov. 7. 2014



**Original Product Country : Malaysia ,China**

**SEIKO EPSON CORPORATION**

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# Update History

Contents of change			Update date
Page	Current	Update	
Page 7	[ 9 ] Dimensions And Marking Layout Layout change		△ Nov.7.2014
Taping spec P3	Inner carton	Inner sleeve	

# SPECIFICATIONS

## 1. Application

This document is applicable to the temperature compensated crystal oscillator (TCXO) that is delivered to **SAMSUNG ELECTRONICS CO., Ltd.** 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 product No. of this crystal oscillator unit is **X1G0041310025**.

The model is **TG-5006CJ-48W** (VCTCXO)

## 3. Packing

It is subject to the packing standard of SEIKO EPSON Corp.

## 4. Amendment and abolishment

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

## 5. Contents

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## 6. MSL-Level

MSL : Level-2a

## [ 1 ] Characteristics

- Lead Free Reflowable and ultra small SMD(2.0 × 1.6 × 0.75 mm).
- Using the heat-resisting type AT cut quartz crystal allows almost the same temperature soldering as universal SMD IC.
- Operating supply voltage : 1.8V ± 0.1V.or 2.8V ± 5%
- Frequency ontrol voltage : 0.9V (0.05V to 1.8V).

## [ 2 ] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	V <sub>CC</sub> -GND	-0.3 to 4.0	V	
Maximum input voltage	V <sub>IN</sub>	-0.3 to V <sub>CC</sub> +0.3	V	V <sub>C</sub> terminal
Storage temperature range	T <sub>-STG</sub>	-40 to +90	°C	

## [ 3 ] Operating range

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power voltage	V <sub>CC1</sub>	1.70	1.80	1.90	V	V <sub>CC</sub> = 1.8V ± 0.1V
	V <sub>CC2</sub>	2.66	2.80	2.94	V	V <sub>CC</sub> = 2.8V ± 5%
Power voltage	GND	0.0	0.0	0.0	V	
Frequency control voltage	V <sub>C</sub>	0.05	0.90	1.80	V	
Operating temperature range	T <sub>use</sub>	-30	+25	+85	°C	
Output load	Load <sub>R</sub>	9	10	11	kΩ	
	Load <sub>C</sub>	9	10	11	pF	
DC-cut capacitor	C <sub>C</sub>	0.01			μF	

DC-cut capacitor is not included in our TCXO. Please insert DC-cut capacitor (0.01uF Min.) in output line.

## [ 4 ] Frequency characteristics

1) Output frequency 26.000000 MHz

2) Frequency characteristics

(Condition :  $V_{CC} = 1.8V$  or  $2.8V$ ,  $V_C = 0.9V$ , GND = 0.0 V, Load 10 k $\Omega$  // 10 pF(DC cut),  $T_{use} = -30^{\circ}C$  to  $+85^{\circ}C$ )

Parameter	Symbol	Value	Unit	Note
Frequency tolerance	f_tol(osc)	$\pm 1.0$ Max.	$\times 10^{-6}$	$T_{use} = +25^{\circ}C \pm 2^{\circ}C$ Before Reflow
	f_tol	$\pm 2.0$ Max. *1	$\times 10^{-6}$	$T_{use} = +25^{\circ}C \pm 2^{\circ}C$ Reflow cycle : 2 times *2
Frequency / Temperature characteristics	fo-Tc	$\pm 1.0$ Max.	$\times 10^{-6}$	$T_{use} = -30^{\circ}C$ to $+85^{\circ}C$ (Based on frequency at $+25^{\circ}C$ )
Frequency / Load coefficient	fo-Load	$\pm 0.2$ Max.	$\times 10^{-6}$	Load : 10 k $\Omega$ // 10 pF $\pm 10\%$ each
Frequency / Voltage coefficient	fo- $V_{CC}$	$\pm 0.2$ Max.	$\times 10^{-6}$	$V_{CC} = 1.8V \pm 0.1V$ $V_{CC} = 2.8V \pm 5\%$
Frequency aging	f_age	-1.0 to +0.5.	$\times 10^{-6}$	first year, $T_{use} = +25^{\circ}C$
		-4.0 to +1.0		8 years, $T_{use} = +25^{\circ}C$

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

\*2 Measurement of frequency deviation is made 24h after reflow soldering.

3) Frequency adjustment characteristics

(Condition :  $V_{CC} = 1.8V$  or  $2.8V$ ,  $V_C = 0.9V$ , GND = 0.0 V, Load 10 k $\Omega$  // 10 pF(DC cut),  $T_{use} = -30^{\circ}C$  to  $+85^{\circ}C$ )

Parameter	Sym	Valu			Unit	Note
		Min.	Typ.	Max.		
Frequency control range	f_cont	-	-	-8.0	$\times 10^{-6}$	$V_C = 0.05V$ (ref. $V_C = 0.9V$ )
		+105	-	-		$V_C = 1.80V$ (ref. $V_C = 0.9V$ )
Tuning sensitivity	$F_{cont}/V_C$	-	-	$\pm 16.0$	$\times 10^{-6}/V$	$V_C = 0.05V$ to $1.80V$
Tuning linearity	-	-20	-	+20	%-	$V_C = 0.05V$ to $1.80V$
Input impedance ( $V_C$ terminal)	$R_{IN}$	100K	-	-	$\Omega$	$V_C$ - GND (DC level)
Transfer function	-	Positive polarity				

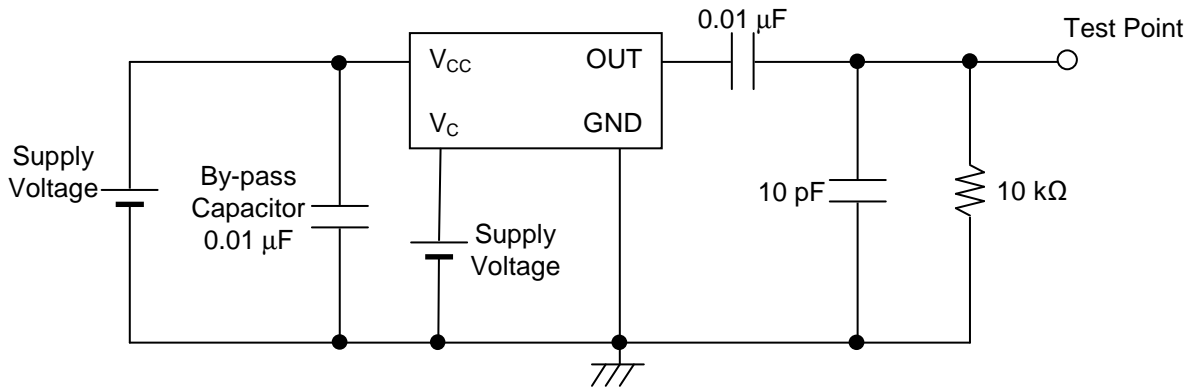
## [ 5 ] Electrical characteristics

(Condition :  $V_{CC} = 1.8V$  or  $2.8V$ ,  $V_C = 0.9V$ ,  $GND = 0.0 V$ , Load  $10 k\Omega // 10 pF$ (DC cut),  $T_{use} = -30^{\circ}C$  to  $+85^{\circ}C$ )

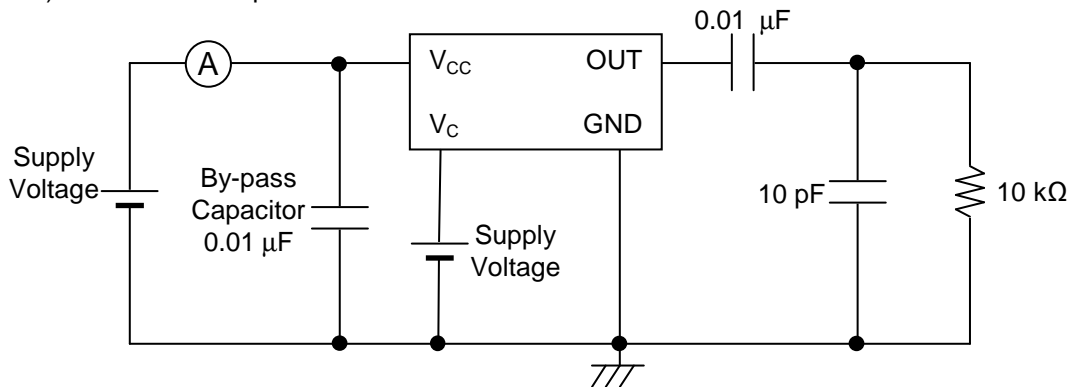
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Current consumption	$I_{CC}$	-	-	1.5	mA	
Output level	$V_{PP}$	0.8	-	1.2	V	Peak to peak voltage
Symmetry	SYM	45	-	55	%	GND Level
Harmonics	-	-	-	-20	dBc	2nd harmonics
		-	-	-10		3rd harmonics
		-	-	-60		34th, 36th & over 69th harmonics
		-	-	-18		Other harmonics
Start up time	f-time	-	-	0.8	msec	To 350mVp-p and within $\pm 20ppm$ of final frequency
		-	-	1.5		To 90% of final amplitude and within $\pm 2ppm$ of final frequency
		-	-	2.5		To 95% of final amplitude and within $\pm 0.1ppm$ of final frequency
		-	-	5.0		To 100% of final amplitude and within $\pm 0.05ppm$ of final frequency
SSB Phase noise ( $T_{use} = +25^{\circ}C$ )	L(f)	-	-	-108	dBc/Hz	Offset:100 Hz
				-130		Offset:1 kHz
				-145		Offset:10 kHz
				-148		Offset:100 kHz
		-	-	-148		Offset:1 MHz

## [ 6 ] Test circuit

1) Output Load : 10 kΩ//10 pF



2) Current consumption



3) Conditions

- |                  |                   |              |
|------------------|-------------------|--------------|
| 1. Oscilloscope: | Impedance         | Min. 1 MΩ    |
|                  | 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. CL includes probe capacitance.
3. A capacitor (By-pass:0.01 μF) is placed between V<sub>CC</sub> 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 lowest as possible.
6. GND should apply one point earth.

## [ 7 ] Environmental and mechanical characteristics

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

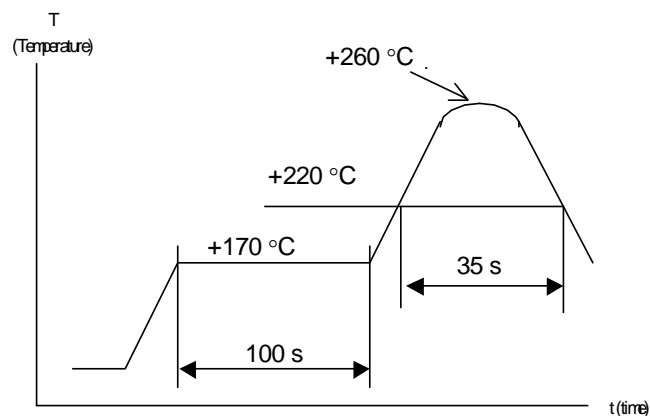
No.	Item	Value *1	Test method
		Freq. Tolerance [1×10 <sup>-6</sup> ] *2 Electrical characteristics	
1	High temp. storage *3	± 2.0	+85 °C × 1000 h
2	Low temp. storage *3	± 2.0	-40 °C × 1000 h
3	Temp. cycle *3	± 2.0	-40 °C to +85 °C (30 min × 100 cycle/each)
4	Resistance to Soldering heat (Reflow characteristics)	± 1.0	Reflow furnace with the condition 2 times
5	Drop	± 2.0	Free drop from 750 mm height on a hard wooden board for 3 times.
6	Solderability	Terminals must be 95 % covered with fresh solder	Dip termination into solder bath at +235 °C for 5 s (Using Rosin Flux)

### Notes

- 1.\*1 each test is independent.
- 2.\*2 measuring 2 h to 24 h later leaving in room temperature after each test.
- 3.\*3 Pre conditionings
  1. reflow 2 times
  2. Initial value shall be after 24 h at room temperature.

### Infrared-reflow

Pre heating temperature : +170 °C      Pre heating time : 100 s  
 Heating temperature : +220 °C      Heating time : 35 s  
 Peak temperature must not exceed +260 °C



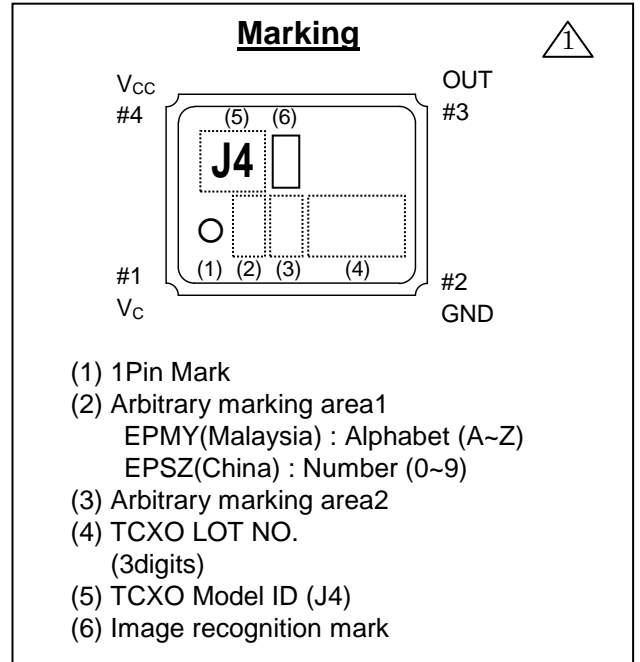
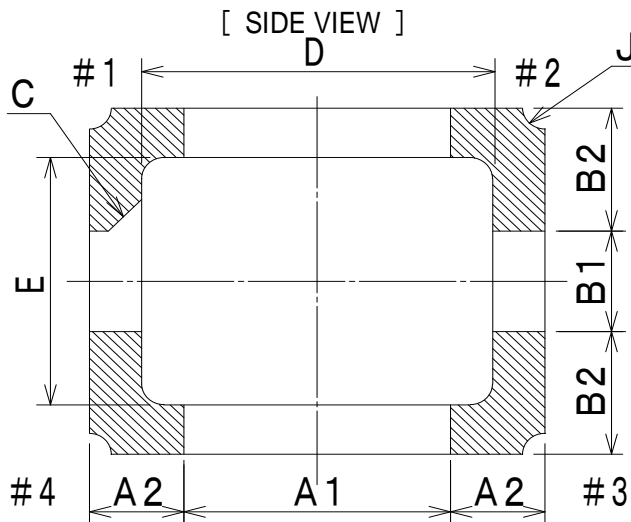
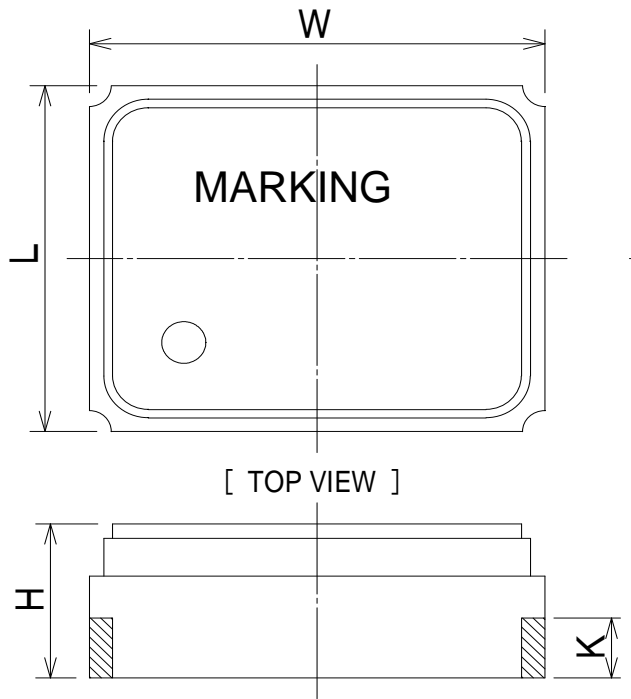
## [ 8 ] Electro Static Discharge

### ESD

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



## [ 9 ] Dimensions And Marking Layout



### Connection

Pin No.	Terminal
# 1	V <sub>c</sub>
# 2	GND
# 3	OUT
# 4	V <sub>cc</sub>

### Material

Ceramics(base)  
 Au coated nickel(terminal)  
 Fe-Ni-Co(lid)

DIM.	MIN.	TYP.	MAX.
W	1.90	2.00	2.10
L	1.50	1.60	1.70
H	0.66	0.73	0.80
J	---	R0.10	---
K	---	0.27	---

Unit : mm

DIM.	TYP.
A1	1.20
A2	0.4
B1	0.4
B2	0.6
C	C0.15
D	1.58
E	1.18

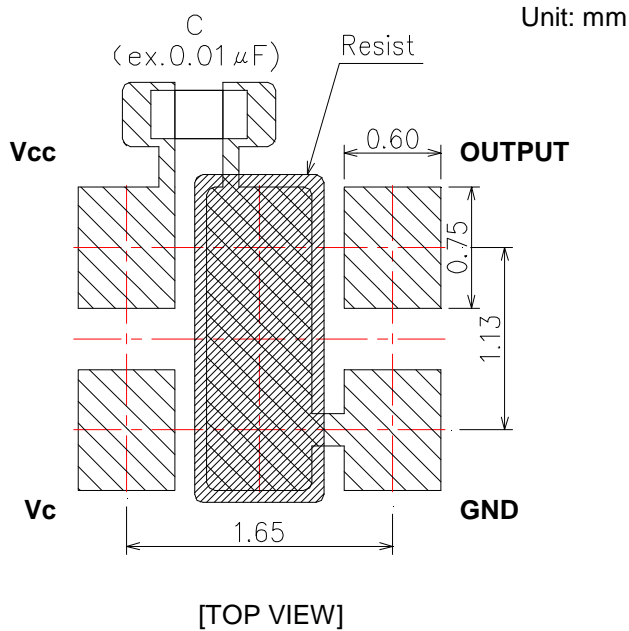
Co-planarity : 0.05mm

## [ 10 ] Recommendable patterning

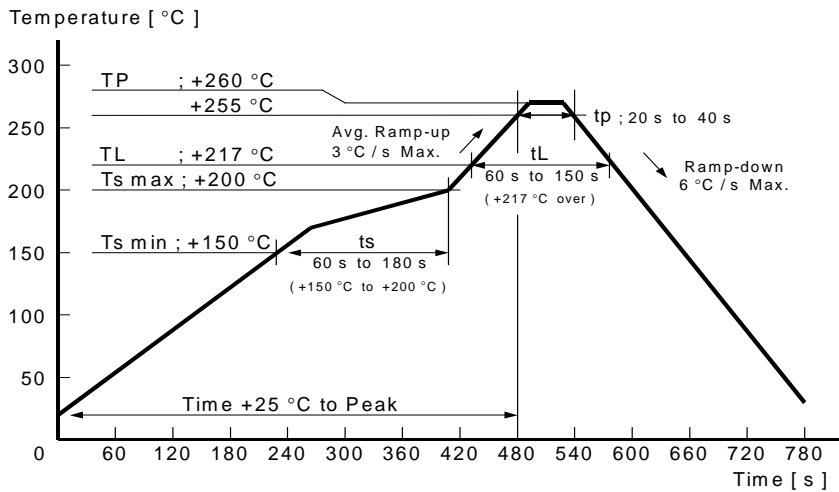
For actual design work, please consider optimum condition together with mounting density, reliability of soldering and mount ability etc.

Do not design any patterns except GND on the shaded area.

Soldering position



Reflow condition (follow to IPC / JEDEC J-STD-020C)



## [ 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) Using the product with power line ripple exceeding 200 mV(p-p) level.

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.

# TAPING SPECIFICATION (STD)

## . Application

This standard will apply to 2.0 × 1.6 SMD package.

Spec : CJ package

## . Contents

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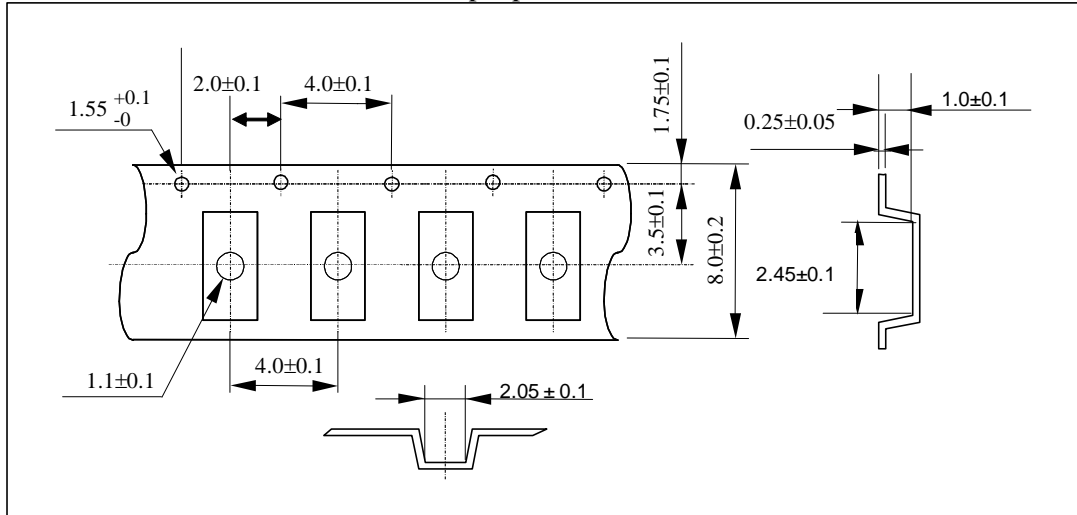
[ 1 ] Taping specification

Subject to EIA-481& EIAJ EDX-7602

(1) Tape dimensions

Material of the carrier tape : PS ( BLACK /Electric conduction )

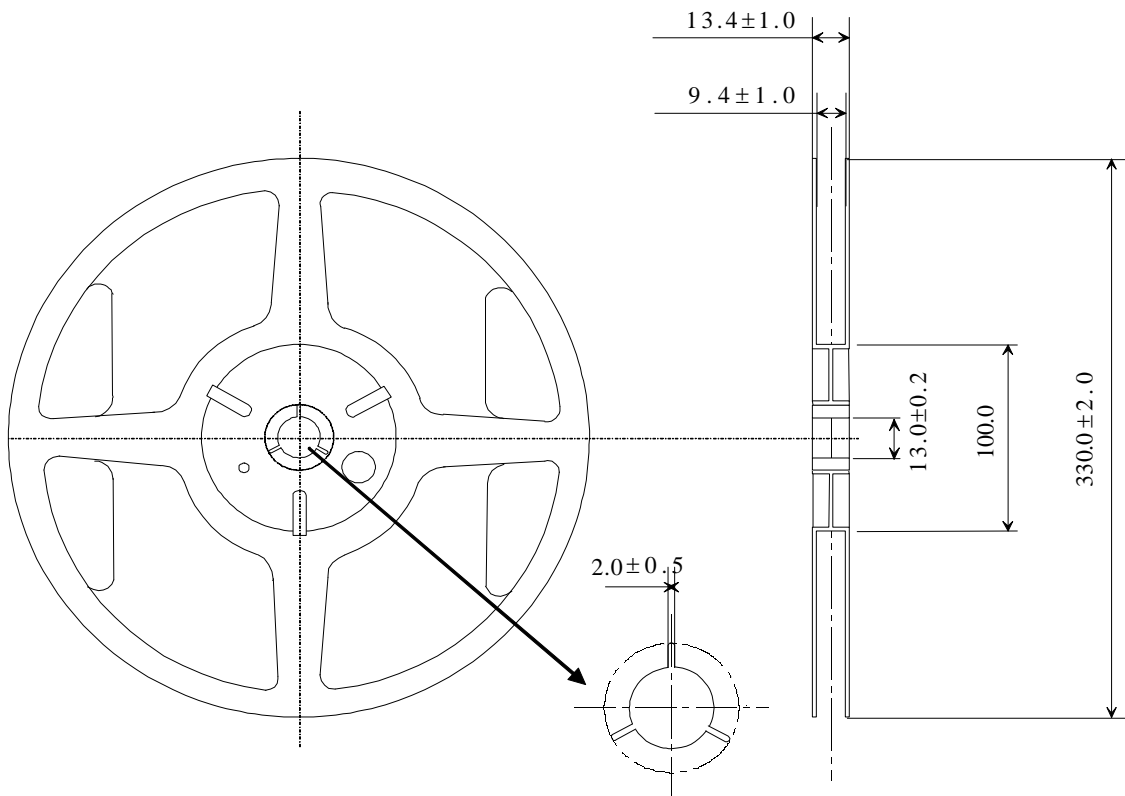
Material of the top tape : PET+PE



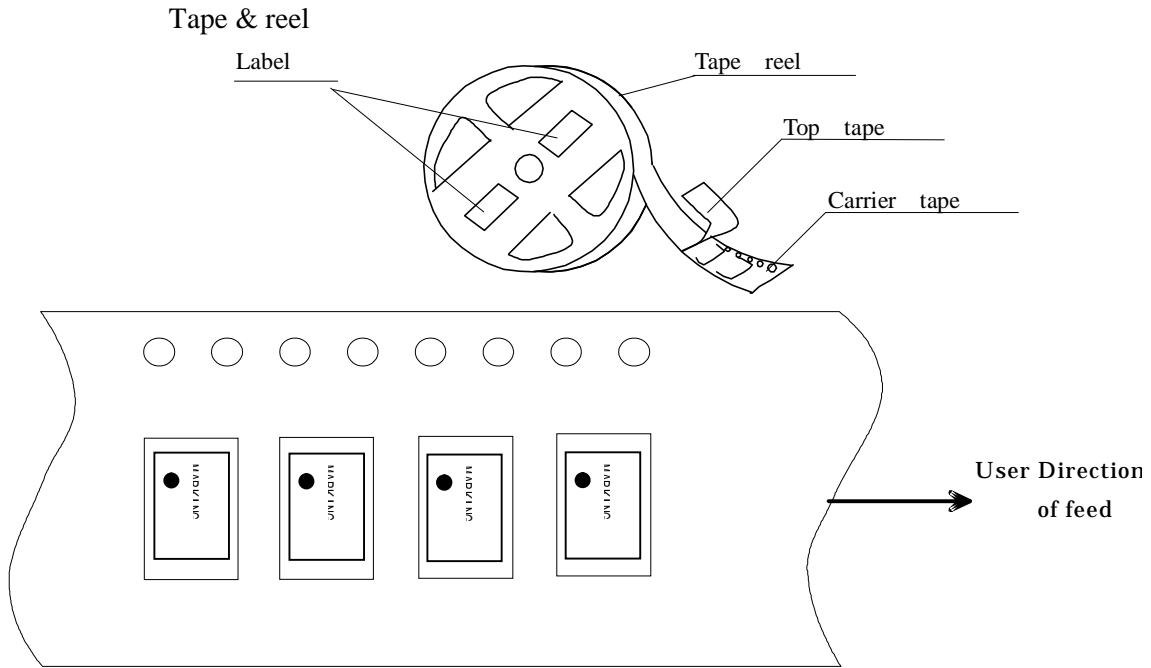
Unit : mm

(2) Reel dimensions

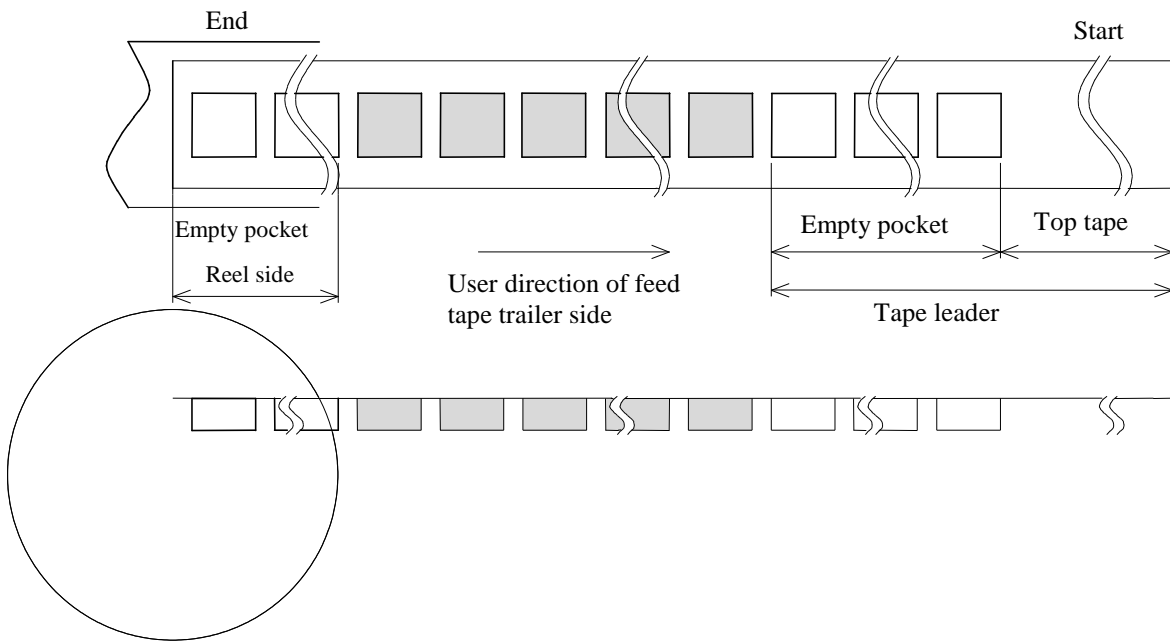
Material of the reel : Conductive polystyrene ( BLACK /Electric conduction )



(3) Packing



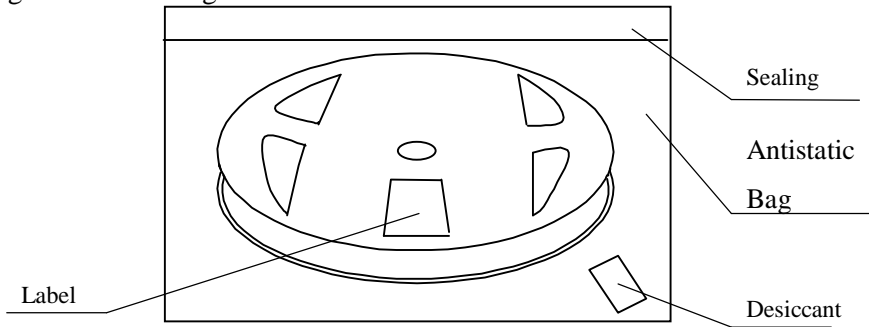
Start & end point



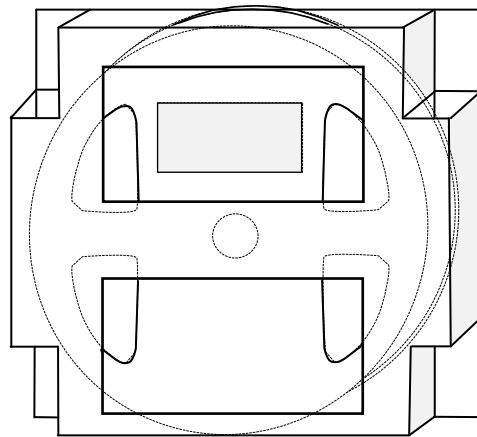
Item		Empty space	Note
Tape leader	Top tape	Min. 200 mm	Top tape shall be fixed using tape and/or polyethylene seal.
	Carrier tape	Min. 150 mm	
Tape trailer	Top tape	Min. 0 mm	Tape end point shall be fixed using tape or hooked in core area.
	Carrier tape	Min. 150 mm	

[2] Inner carton

a) Packing to antistatic bag

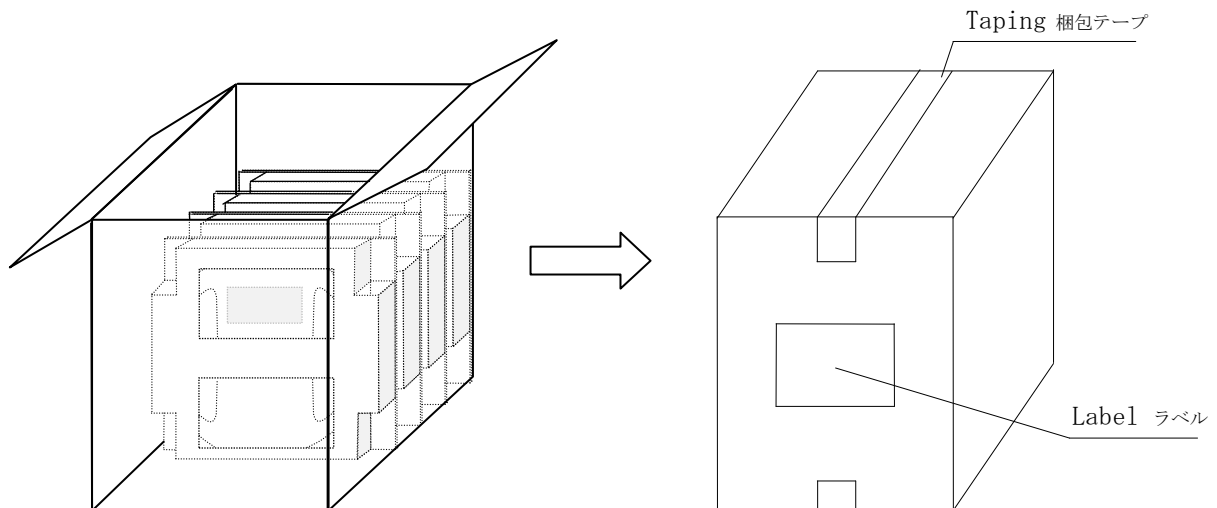


b) Packing to inner carton



\*There is also a case to put the two reel.

[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 or symbol
  - 5) Others (if necessary)
  - 6) Pb-Free Marking : LF

Example of label-1

<b>CRYSTAL OSCILLATOR</b>	
<b>P/N: 452002</b>	<b>P/O: 12345678901234567890</b>
<b>TG-50XXCJ-XXX   XXMHz</b>	<b>MSL Level-2                   LF</b>
<b>LOT NO: 0000000000</b>	<b>QUANTITY:                   12,000</b>
<b>WEEK CODE:/ XXXXXX</b>	<b>X1G000000000   ** YYYY.MM.DD</b>
<b>EPSON TOYOCOM</b>	<b>MADE IN: JAPAN</b>

##### (2) Inner carton and Alumi Laminate bag marking

- Same as reel marking.

##### (3) Shipping carton marking

- Shipping carton marking shall consist of
  - 1) Parts name
  - 2) Quantity

#### [ 5 ] Quantity

- Max. 12,000 pcs./reel
- Min.    500 pcs./reel

note) The above quantity is our standard packing size.

In case of an odd sum as per the purchased quantity, the packing quantity might be below our standard minimum packing size.

#### [ 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.