

RECIPIENT

SPECIFICATIONS

Product No. : X1G000221005800

MODEL: TCO-7086X1A4

SPEC. No. : A08-989-0B

DATE: Mar. 23. 2009

EPSON TOYOCOM CORPORATION

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SPECIFICATIONS

1. Application

This document is applicable to the crystal oscillator that is delivered to Nokia Siemens Networks Transport System Ltd from Epson Toyocom Corp.

This product is compliant with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by Epson Toyocom 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. Product No. / Model

The product No. of this crystal oscillator is X1G000221005800.

The model is TCO-7086X1A4.

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	Vcc	-0.5 to +7.0	V	
Input voltage	VIN	-0.5 to Vcc+0.5	V	
Storage temperature range *	Tstg	-55 to +125	°C	Stored as bare product after unpacking.

[2] Operating range

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Supply voltage	Vcc	2.97	3.30	3.63	V	
Supply voltage	GND	0.0	-	0.0	V	
Input voltage	VIN	GND	-	Vcc	V	
Output frequency	fo	-	2.048	-	MHz	
Operating temperature range	T_use	-40	-	+85	°C	
Output load condition	L_CMOS	-	-	15	pF	

*1 Start up time(0 %Vcc ~ 90 %Vcc) of power source should be more than 150 μs.

*2.By-pass capacitor (approx. 0.01 μF to 0.1 μF) should be placed closely between Vcc and GND.

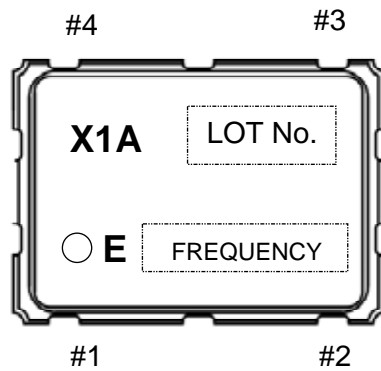
[3] Frequency characteristics

1) Output frequency (fo) 2.048MHz

Parameter	Symbol	Value	Unit	Note
Frequency tolerance *	f_tol	$\pm 50 \times 10^{-6}$	-	T_use = -40 °C ~ +85 °C
Aging	f_aging	$\pm 5 \times 10^{-6}$	-	+25 °C, Vcc=3.3 V, 1year

* This includes initial frequency tolerance, temperature characteristics and input voltage characteristics.

[4] Terminal assignment



Name	No.	Type	Terminal description		
\overline{ST}	#1	INPUT	Stand by control terminal		
			Function	Osc.circuit	Output status
			High or OPEN	Enable	Specified frequency is output
			Low	Disable	Output becomes Hi-Z
GND	#2	-	GND terminal		
OUT	#3	OUTPUT	Clock output terminal		
Vcc	#4	-	Vcc terminal		

[5] Electrical characteristics

(Please see page 2 [2] Operating range)

Parameter	Symbol	Value			Unit	Note
		Min.	Type	Max.		
Oscillation start up time	t_str	-	-	10	ms	90 % Vcc to be 0 s
Current consumption	Icc	-	-	20	mA	No load
Rise time *1	Tr	-	-	6	ns	10 %Vcc → 90 %Vcc
Fall time *1	Tr	-	-	6	ns	90 %Vcc → 10 %Vcc
Symmetry *1	SYM	40	-	60	%	50 %Vcc Level
High level output voltage	V _{OH}	90%Vcc	-	-	V	-
Low level output voltage	V _{OL}	-	-	0.4	V	-
High level input voltage	V _{IH}	70 %Vcc	-	-	V	$\overline{\text{ST}}$ terminal
Low level input voltage	V _{IL}	-	-	30 %Vcc	V	$\overline{\text{ST}}$ terminal
Disable time *2	tstp	-	-	150	ns	$\overline{\text{ST}}$ terminal HIGH → LOW
Enable time *2	tsta	-	-	10	ms	$\overline{\text{ST}}$ terminal LOW → HIGH

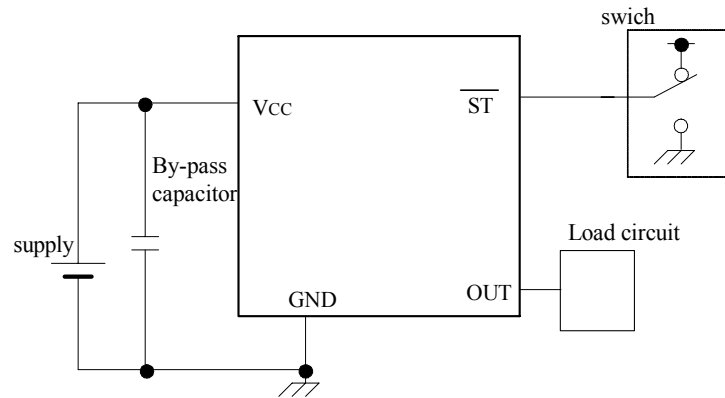
Please see [6] Test circuit.

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

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

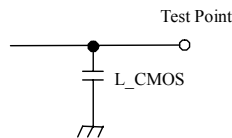
[6] Test circuit

1) Waveform observation

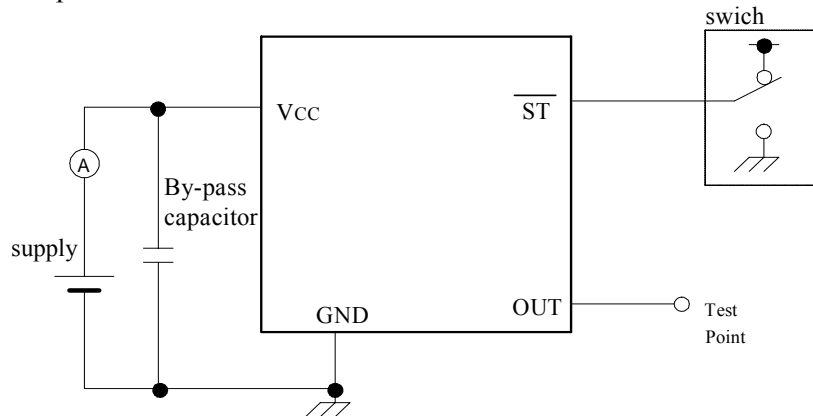


Load circuit

load capacitance



2) Current consumption



3) Condition

(1) Oscilloscope

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

(2) CL includes probe capacitance.

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

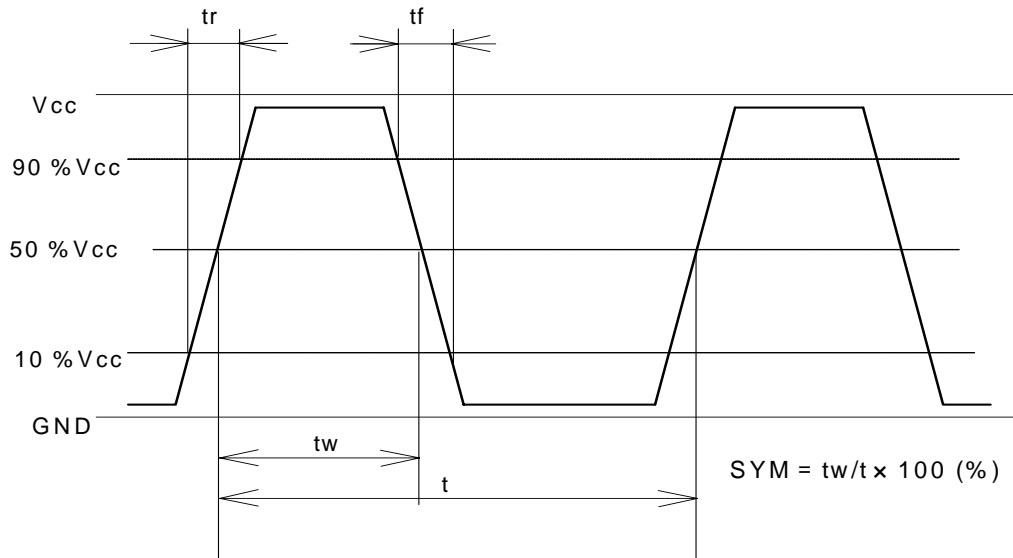
(4) Use the current meter whose internal impedance value is small.

(5) Power supply

- Impedance of power supply should be as low as possible.

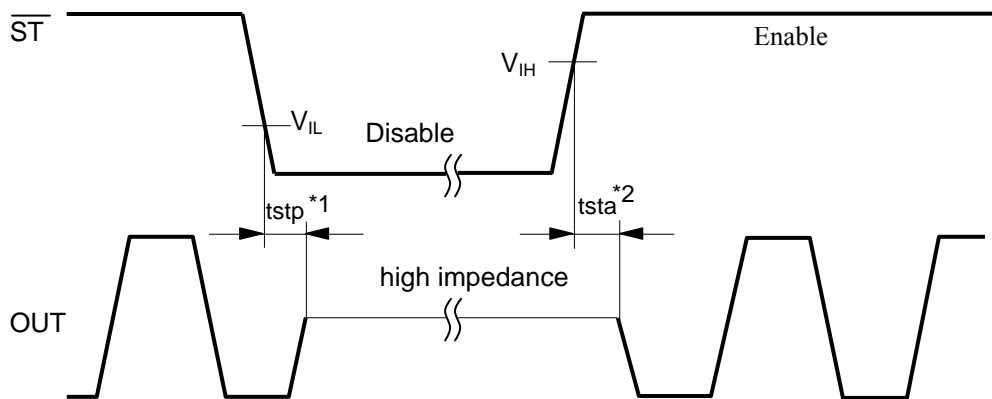
[7] Timing chart

1) C-MOS load



2) \overline{ST} function and timing

\overline{ST} input level	Oscillation circuit	Output
“H” or OPEN	Oscillation	Enable : Specified frequency is output
“L”	Oscillation stop	Disable : high impedance



*1 The time taken from $\overline{ST} = V_{IL}$ to $OUT = \text{Disable (high impedance)}$.

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

Output start : $V_{OH} \geq 90\% V_{CC}$, $V_{OL} \leq 10\% V_{CC}$, $f_{out} = f_o \pm 1000 \times 10^{-6}$

[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	± 10	+85 °C \pm 3 °C \times 1 000 h *JIS-C-0021
2	Temperature cycle	*3	± 10	-55 °C \leftrightarrow +125 °C 30 min. at each temperature 10 cycles *MIL-STD-883D 1010.7(B)
3	Temperature humidity	*3	± 10	+85 °C \pm 2 °C \times 85 %RH \pm 5 %RH \times 250 h
4	Low temperature storage	*3	± 10	-40 °C \pm 3 °C \times 1 000 h
5	Vibration		± 10	10 Hz to 85 Hz amplitude 1.5 mm 85 Hz to 2 000 Hz acceleration 20G 10 Hz \rightarrow 2 000 Hz \rightarrow 10 Hz 20 min./cycle 12 h (4 h \times 3 directions) *MIL-STD-202E Method 205E(D)
6	Shock		± 10	5000 G 1/2 sine wave 3 shocks in X,Y,Z (Total of 9 shocks).
7	Resistance to soldering heat		± 10	Dip termination into solder bath at +260 °C \pm 10 °C for 5 to 10 s. *MIL-STD-202E Method 210A(A)

< Notes >

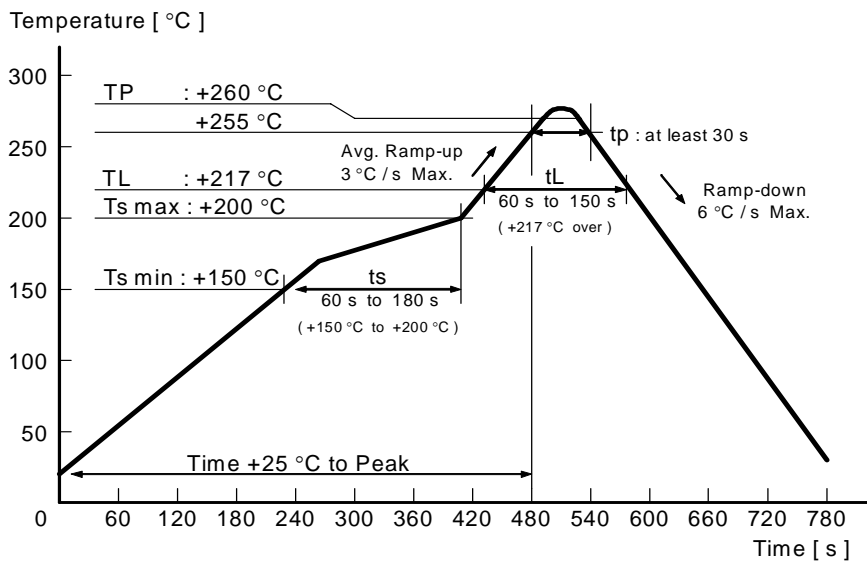
*1 Each test done independently.

*2 Measuring 1 h to 24 h later leaving in room temperature after each test.

*3 Initial values shall be measured after 24 h storage at room temperature after Pre-treatment.

Pre-treatment: Reflow (3 times)

◆ Convection reflow conditions (Ref. IPC/JEDEC J-STD-020D)



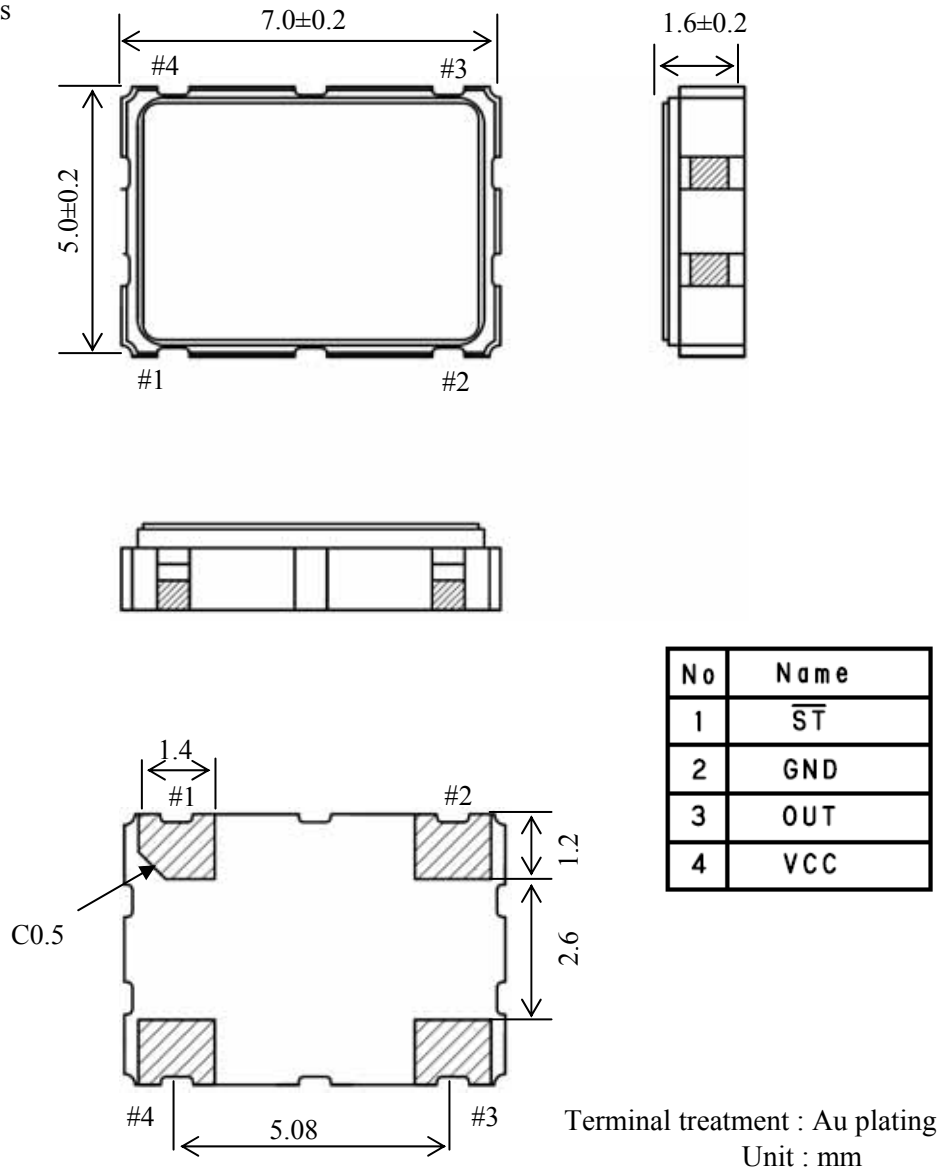
[9] ESD sensitivity

- Electrostatic discharge (ESD)

Item	Value	Test procedure
Human Body Model (HBM)	1500 V Min.	Ref. EIAJ ED-4701-1 C111A, 100 pF, 1.5 k Ω , 3 Pulses
Machine Model (MM)	100 V Min.	Ref. EIAJ ED-4701-1 C111, 200 pF, 0 Ω , 1 Pulse

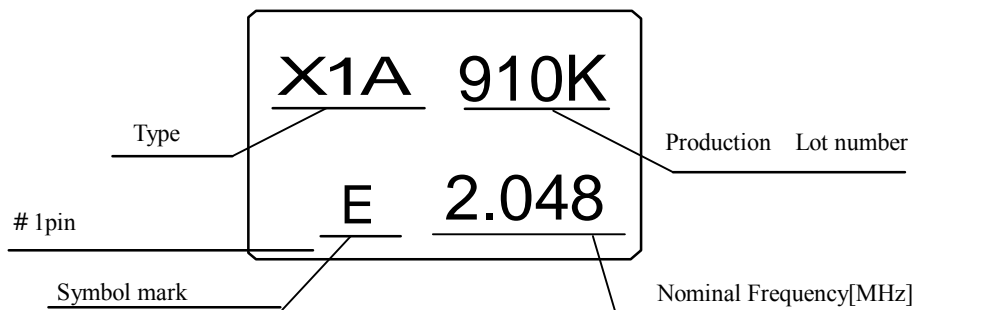
[10] Dimensions and marking layout

1) Dimensions



2) Marking layout

TCO-708x



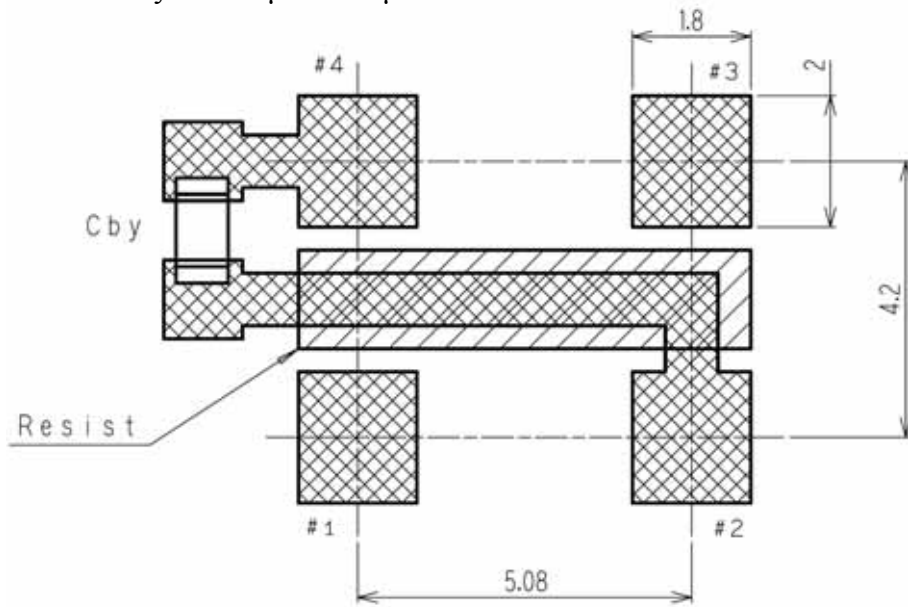
- ◆ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.
- ◆ We show output frequency to the third decimal place and round down the fourth decimal place.

[11] Recommendable patterning

The soldering pad sample indicated as like following:

Soldering position (Unit : mm)

Cby = 0.01 μ F ~ 0.1 μ F



[12] 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 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. (see [11])
- 3) Vcc 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. Start up time (0 %Vcc \rightarrow 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.
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 this product, however, since the oscillator might be damaged under some conditions, please exercise caution in advance.
- 12) Epson Toyocom recommends to use and store under room temperature and normal humidity to secure frequency accuracy and prevent moisture.
- 13) Metal cap of this product is connected to GND. Please don't apply electrical voltage.
- 14) Side leads are connected to IC internally.
Therefore be careful for short or a fall of insulation resistance etc.

15) Recommendation reflow times are less than 2 times.

When there was a soldering error, please do alteration with a soldering iron.

In this case, the iron ahead is equal to or less than +350 °C and asks within 5 s.

In case that this device is reflow soldered on the back side of your circuit board, please carefully verify the device is properly secured to prevent coming detached from card.

[About soldering method]

Soldering method	OK or NG
Reflow soldering (top side)	OK
Reflow soldering (back side)	OK
Solder pot (static solder pot / flow solder pot)	NG
Iron soldering	OK

TAPING SPECIFICATION

I . Application

This standard will apply to 7×5 Ceramic package.

Spec : CA package

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	

[1] Taping specification

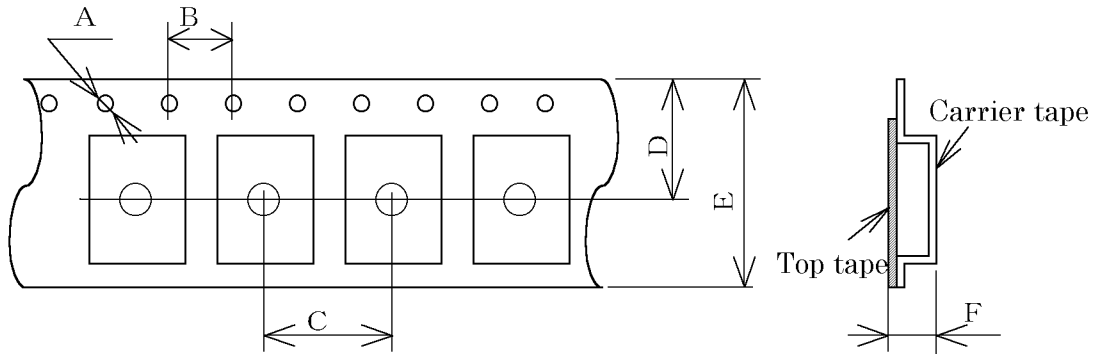
Subject to EIA-481& EIAJ EDX-7602, IEC 60286, JIS C-0806

(1) Tape dimensions

TE-1612L

Material of the carrier tape : P S

Material of the top tape : PET

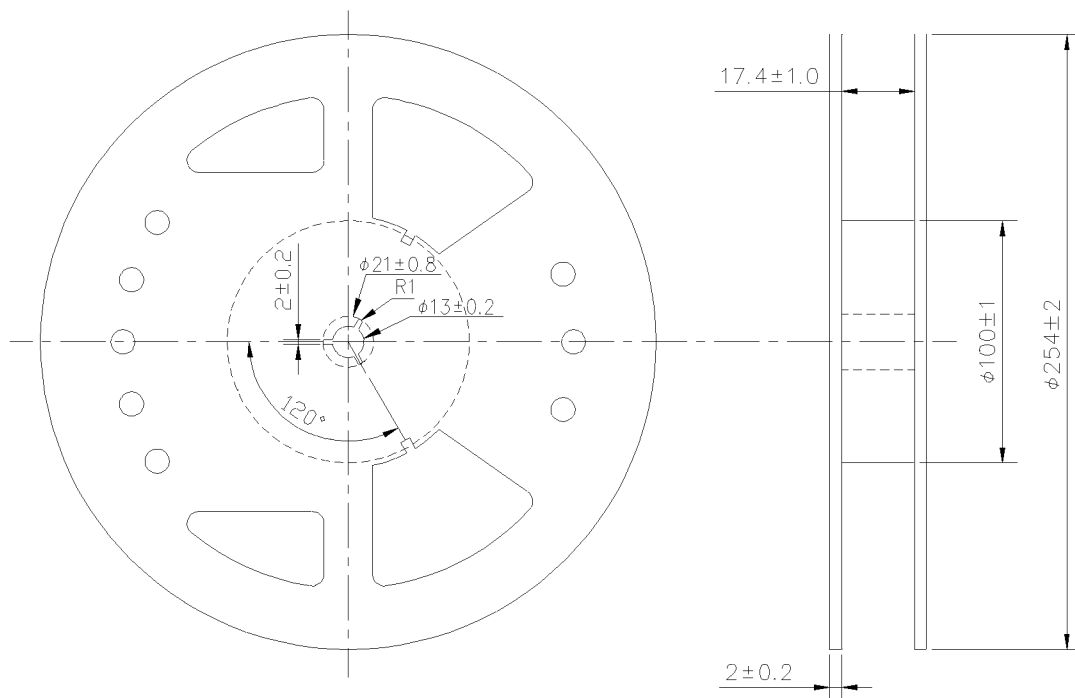


Symbol	A	B	C	D	E	F
Value	$\phi 1.5$	4.0	8.0	9.25	16.0	2.3

Unit : mm

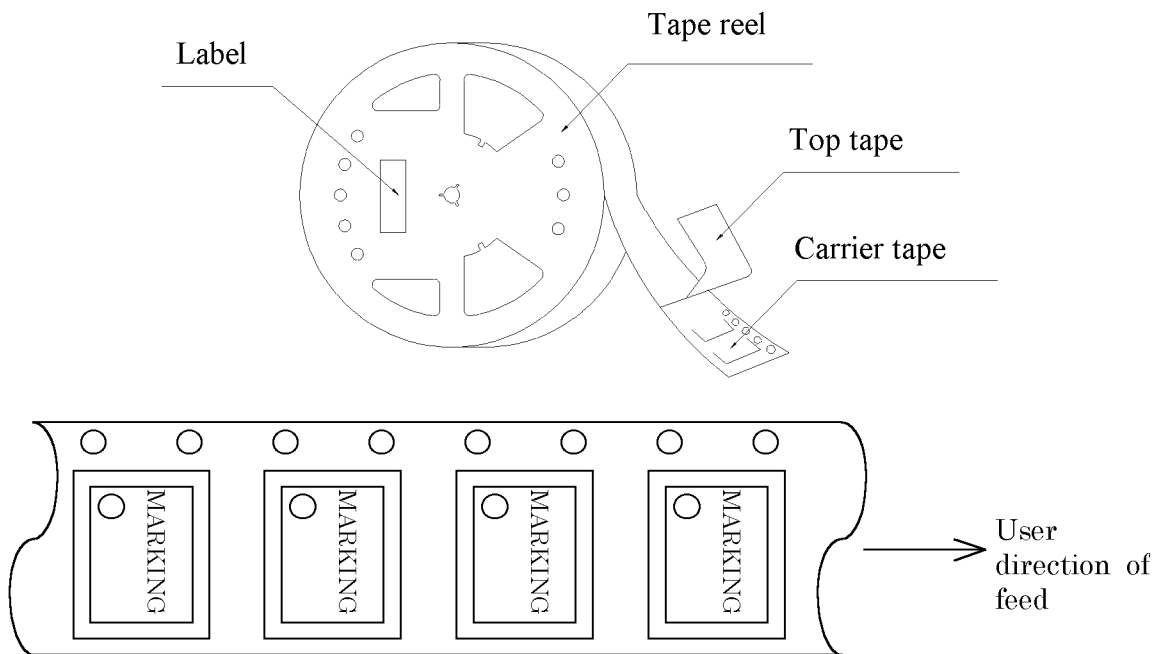
(2) Reel dimensions

Material of the reel : Conductive polystyrene

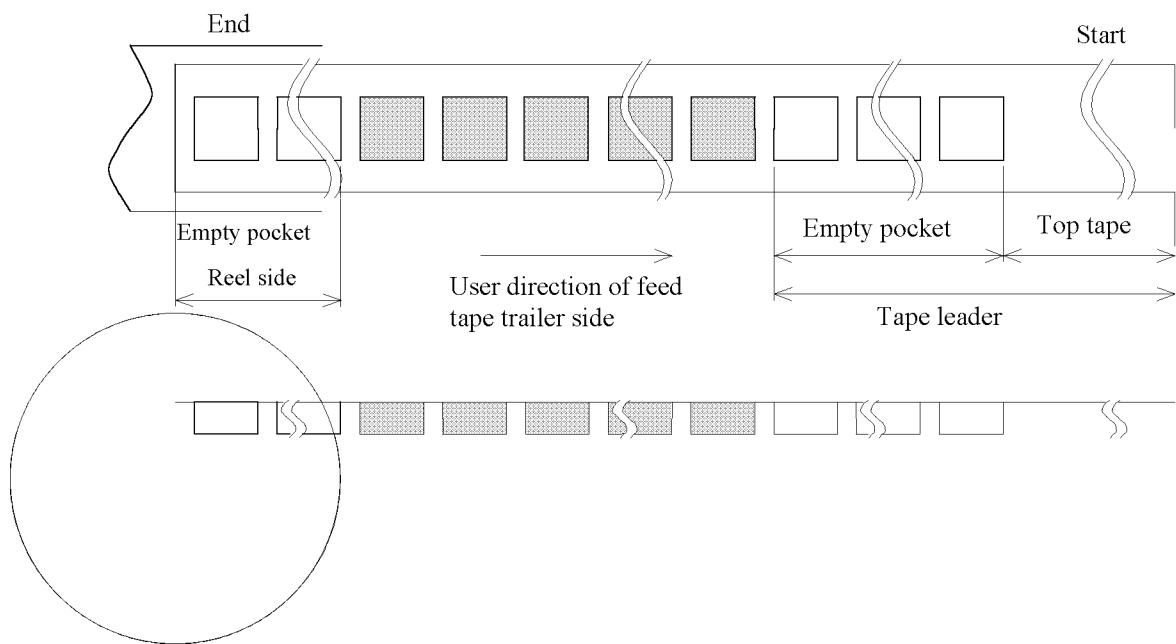


(3) Packing

① Tape & reel



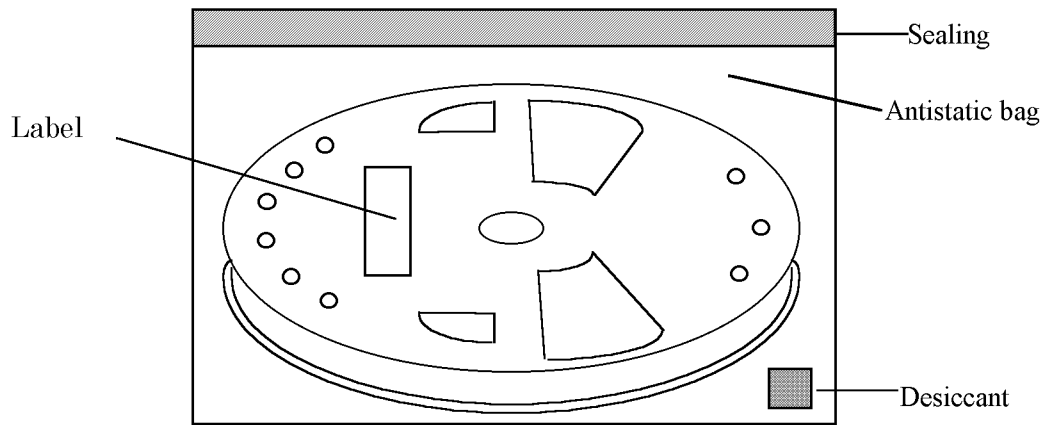
② Start & end point



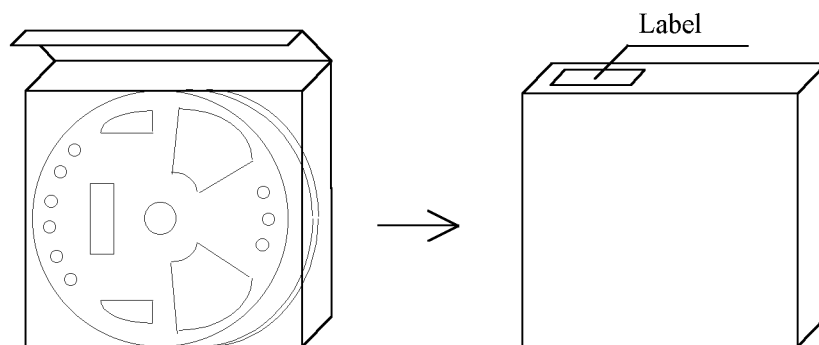
Item		Empty space
Tape leader	Top tape	Min. 1 000 mm
	Carrier tape	Min. 10 pockets
Tape trailer	Top tape	Min. 0 mm
	Carrier tape	Min. 10 pockets

[2] Inner carton

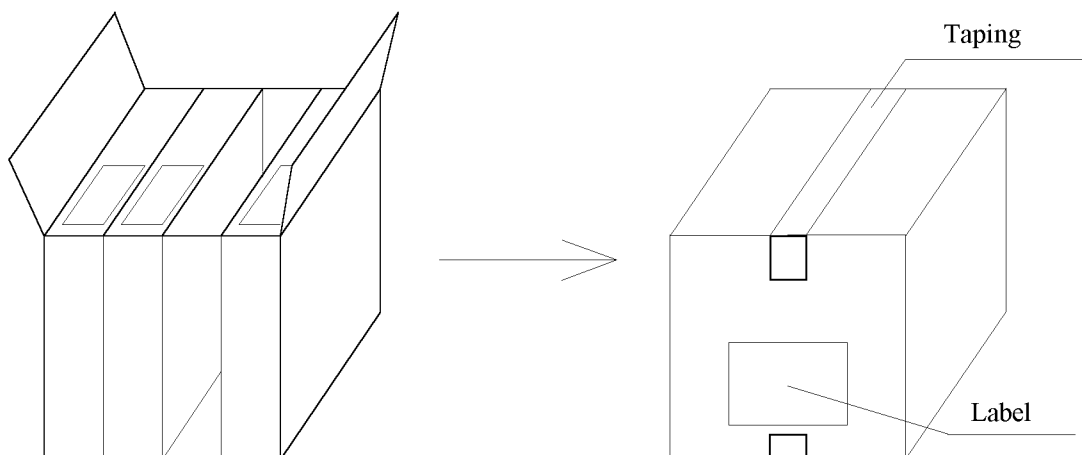
a) Packing to antistatic bag



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

- 1 000 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 -

08. 2. 14
EPSON TOYOCOM CORP
AT Business Unit

No. 708x - 00 - ASE - 1

CRYSTAL OSCILLATOR : TCO-708x***

P. Koyama
M. Koyama
T. Ichijo

Manufacturing process chart	No.	Section In Charge	Standards	Inspection, Control Item	Instruments	Inspection Methods	Record
<p>The diagram shows a vertical flow of 20 steps. Steps 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 are marked with diamonds, indicating inspection points. Steps 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 are marked with diamonds, indicating inspection points. Steps 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 are marked with diamonds, indicating inspection points. Steps 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 are marked with diamonds, indicating inspection points.</p>	1	Inspection Section	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Microscope	Sampling	Data sheet
	2	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	3	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	4	China Plant (Production Section)	Manufacturing Instruction Sheet	Bonding strength Appearance	Gauge Microscope	Sampling	Data sheet
	5	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	100% Inspection	Data sheet
	6	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling 100% Inspection	Data sheet
	7	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	—
	8	China Plant (Production Section)	Manufacturing Instruction Sheet	Frequency	Counter	Sampling	Data sheet
	9	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance Frequency	Microscope Counter	Sampling Sampling	Data 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	Leakage Inspection	Measuring equipment	100% Inspection	Data sheet
	12	China Plant (Production Section)	Manufacturing Instruction Sheet	Temperature	Thermometer	Ons/Dry	Check sheet
	13	China Plant (Production Section)	Manufacturing Instruction Sheet	Characteristic Inspection	Measuring equipment	100% Inspection	Data sheet
	14	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Visual inspection	Sampling	Data sheet
	15	China Plant (Production Section)	Manufacturing Instruction Sheet	Electrical Characteristic	Measuring equipment	100% Inspection	Data sheet
	16	China Plant (Production Section)	Manufacturing Instruction Sheet	Temp Characteristic	Measuring equipment	Sampling	Data sheet
	17	China Plant (Production Section)	Manufacturing Instruction Sheet	Appearance	Microscope	Sampling	Data sheet
	18	China Plant (Inspection Section)	Delivery Specifications Outgoing Inspection Standard	Electrical Characteristic Appearance	Measuring equipment Microscope	Sampling	Data sheet
	19	China Plant (Production Section)	Manufacturing Instruction Sheet	Tape peeling Strength	Peeling strength test machine	Sampling	Data sheet
	20	China Plant (Production Control Section)	Manufacturing Instruction Sheet Daily Shipping List	Customers Type Quantity	—	—	Delivery Slip