INFORMATION

PRODUCT No. : **Q13MC2061000300**

MODEL : **MC-206**

32.768 kHz 12.5 pF ± 15

INFO. No. : **Q05-328-11B**

DATE : **Jan. 12. 2006**

EPSON TOYOCOM CORPORATION

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

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[1] Absolute maximum ratings

Item	Symbol	Rating value
Storage temperature	T_{STG}	-55°C to +125 °C
Maximum drive level	GL	1.0μW

[2] Operating range

Item	Symbol	Value		
		Min.	Typ.	Max.
Operating temperature range	T_{OPR}	-40 °C		+85 °C
Drive level	DL		0.1μW	

[3] Static characteristics

Item	Symbol	Value	Note
Frequency	f	32.768 kHz	
Frequency tolerance	Δ f/f	$\pm 15 \times 10^{-6}$	CL = 12.5 pF Ta = +25 °C not include aging
Turnover temperature	0T	+25 ± 5 °C	Value calculated on temperature +10, +25, +40 °C degree with C-MOS circuit.
Temperature coefficient	a	-4.0×10^{-8}/°C ^{2} Max.	
Q value	Q	5.0×10^4 Min.	
Series resistance	R_1	55 kΩ Max.	CI meter : Sanders 140B Drive level : 1.0 μW
Motional capacitance	C_1	1.8 fF Typ.	
Shunt capacitance	C_0	0.9 pF Typ.	
Isolation resistance	IR	500 MΩ Min.	DC 100V, 60 sec. between terminals or terminal and case
Aging	fa	$\pm 3 \times 10^{-6}$ / year	Ta = +25 °C ± 3 °C

[4] Environmental and mechanical characteristic

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

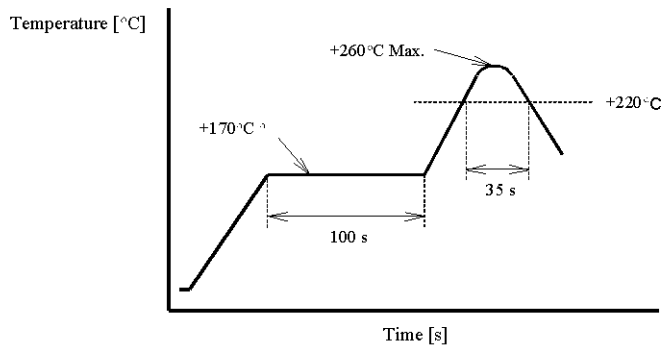
No.	Items	Value*1*2 Δ f/f [1 × 10^{-6}]	Conditions
1	Drop	± 5	Free drop from 750 mm height on a hard wooden board for 3 times (Board is thickness　more than 30 mm)
2	Vibration	± 3	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s^2 10 Hz → 500 Hz → 10 Hz 15 min./cycle 6 h (2 hours , 3 directions)
3	High temperature storage	*3　a) ± 20 *3　b) ± 10	a)　+125 °C × 1 000 h b)　+85 °C × 1 000 h
4	Low temperature storage	*3　± 20	-55 °C　×1 000 h
5	Temperature cycle	*3　± 20	-55 °C ⇔ +125 °C 30 min. at each temp. 100 cycles
6	Temperature humiditystorage	*3　± 20	+85 °C × 85%RH × 1 000 h
7	Resistance to soldering heat for termination	± 5	For convention reflow soldering furnace (2 times)
8	Shear	No peeling-off at a soldered part	20 N press the side for 10 ± 1 s Ref. IEC 60068-2-21
9	Pull - off	No peeling-off at a soldered part	10 N press the side for 10 ± 1 s. Ref. IEC 60068-2-21
10	Solvent resistance	The marking shall be legible	Ref. JIS C 0052 or IEC 60068-2-45
11	Solderability	Termination must be 90 % covered with fresh solder	Dip termination into solder bath at +235 °C ± 5 °C for 3 s (Using Rosin Flux)

< Notes >

1. *1 Each test done independently.
2. *2 Measuring 2 h to 24 h later leaving in room temperature after each test.
3. *3 Pre conditionings Initial value shall be after 24 h at room temperature.
4. Item No.1 to No.7 resistance at after above tests should be less than 60kΩ

♦Air- reflow

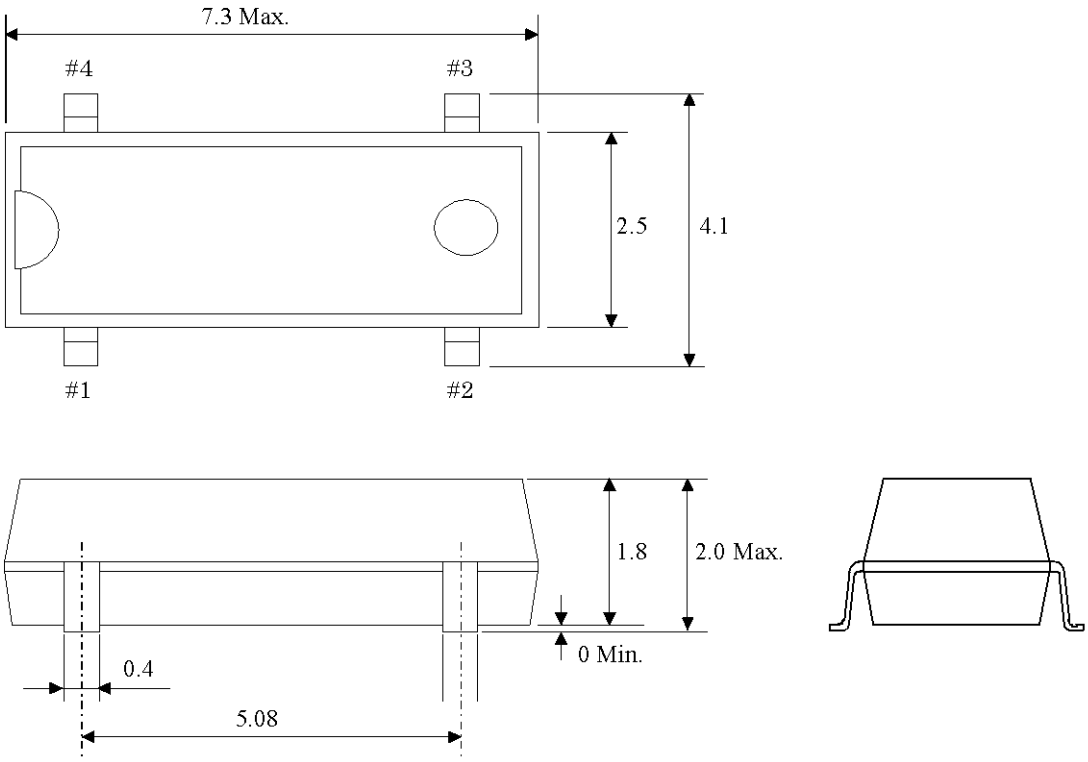
Pre heating temperature : Tp1～Tp2 = +170 °C
Peak temperature must not exceed +260 °C and the duration of over +220 °C should be 35 s



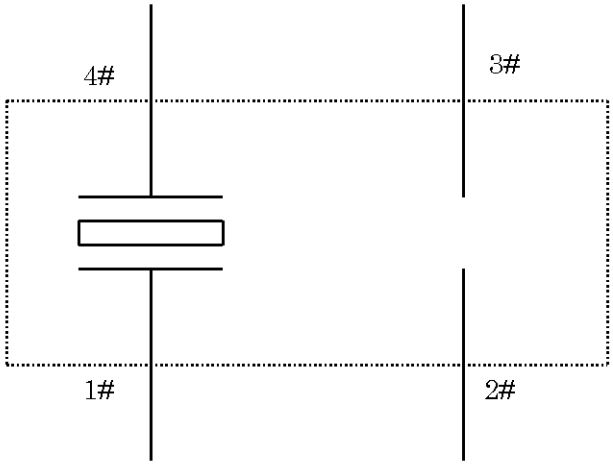
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[5] Dimensions and Marking layout

1. Dimensions



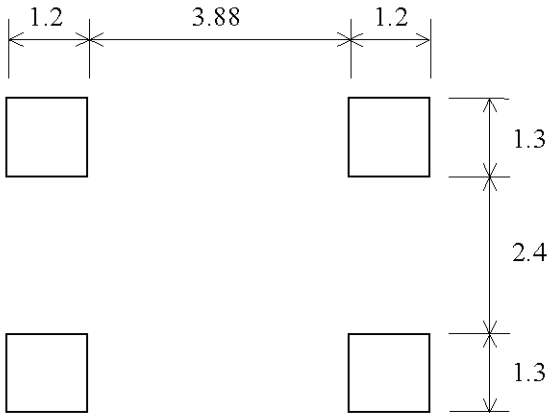
2. Circuit location



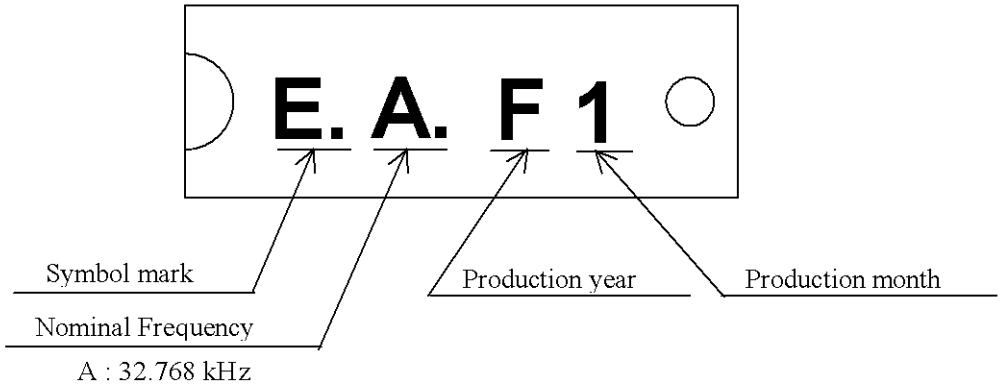
＊Do not connect 2# and 3# terminals to any external terminals.

Type	MC-206	Terminal treatment	Pb Free Solder plate	Unit	1=1 mm

3. Recommendable patterning



4. Marking layout



* Symbol of Manufacturing year

Year digit	1	2	3	4	5	6	7	8	9	0
Marking	A	B	C	D	E	F	G	H	J	K

Year digit(1st) of the Production

* Production month

January	February	····	October	November	December
1	2	····	X	Y	Z

♦ The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

Type	MC-206	Terminal treatment	Pb Free Solder plate	Unit	1=1 mm

[6] Notes

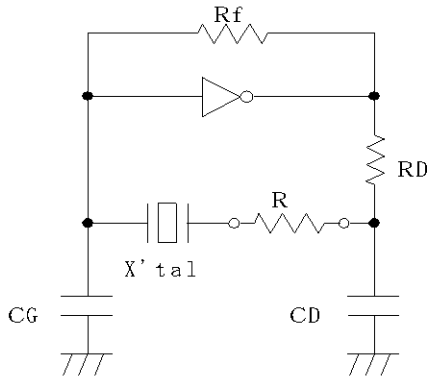
1. Max. two(s) times reflow is allowed. Once miss soldering is happen, hand work soldering by soldering iron is recommended. (+350°C × within 5 sec.)

2. Patterning should be followed by our recommended one.

3. Applying excessive excitation force to the crystal resonator may cause deterioration damage.

4. Unless adequate negative resistance is allocated in the oscillation circuit, start up time of oscillation may be increased, or no oscillation may occur.
   In order to avoid this, please provide enough negative resistance in the circuit design.

   How to check the negative resistance



(1)Connect the resistance (R) to the circuit in series with the crystal resonator.
(2)Adjust R so that oscillation can start (or stop).
(3)Measure R when oscillation just start (or stop). in above(2).
(4)Get the negative resistance
-R=R+CI value.
(5)Recommended -R
| -R | > CI × (5～10)

5. The shortest line patterning on board is recommendable.
   Too long line on board may cause of abnormal oscillation.

6. To avoid mullfunction, no pattern under or near the X'tal is allowed.
   Solder paste should be more than 150μm thickness.

7. This device must be stored at the normal temperature and humidity conditions before mounting on a board.

8. Too much exciting shock or vibration may cause deterioration on damage.
   Depending on the condition such as a shock in assembly machinery, the products may be damaged.
   Please check your condition in advance to maintain shock level to be smallest.

9. Depending on the conditions, ultrasonic cleaning cloud cause resonance damage of the internal crystal resonator. Since we are unable to determine the usage conditions (type of cleaning unit, power, time, conditions inside the bath, etc.) at our company, we cannot guarantee the safety of this unit when it is cleaned in an ultrasonic cleaner.

10. Ink marking is some kind of solvent may damage marking ink ; please take precautions when choosing solvent.

11. Please refer to packing specification regarding how to storage the products in the pack.

TAPING SPECIFICATION

1. APPLICATION

This document is applicable to MC-206

2. 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	

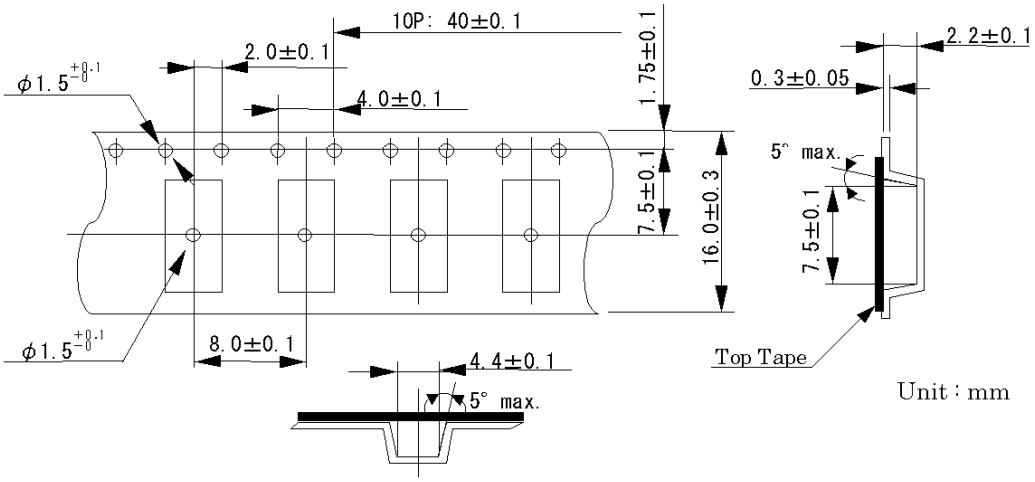
[1] Taping specification

Subject to EIA-481 , EIAJ EDX7602 , IEC 60286 , and JIS C0806.

(1) Tape dimensions TE1608L

Material of the Carrier Tape : PS

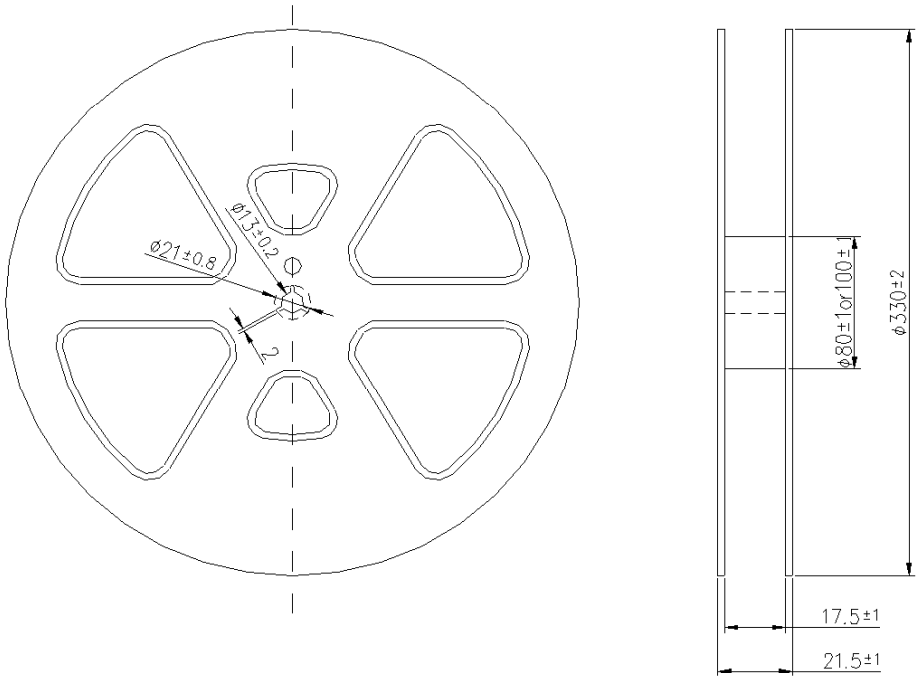
Material of the Top Tape : PET+PE



Unit : mm

(2) Reel dimensions

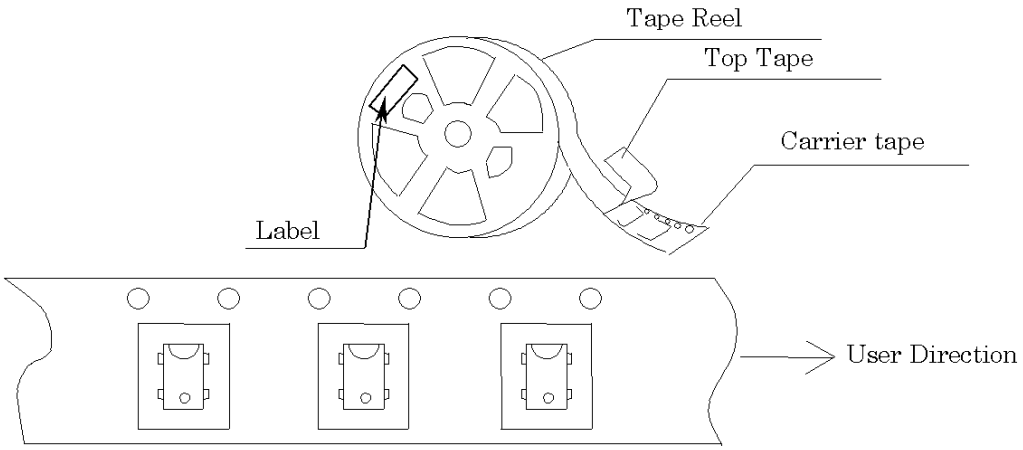
Material of the Reel : PS



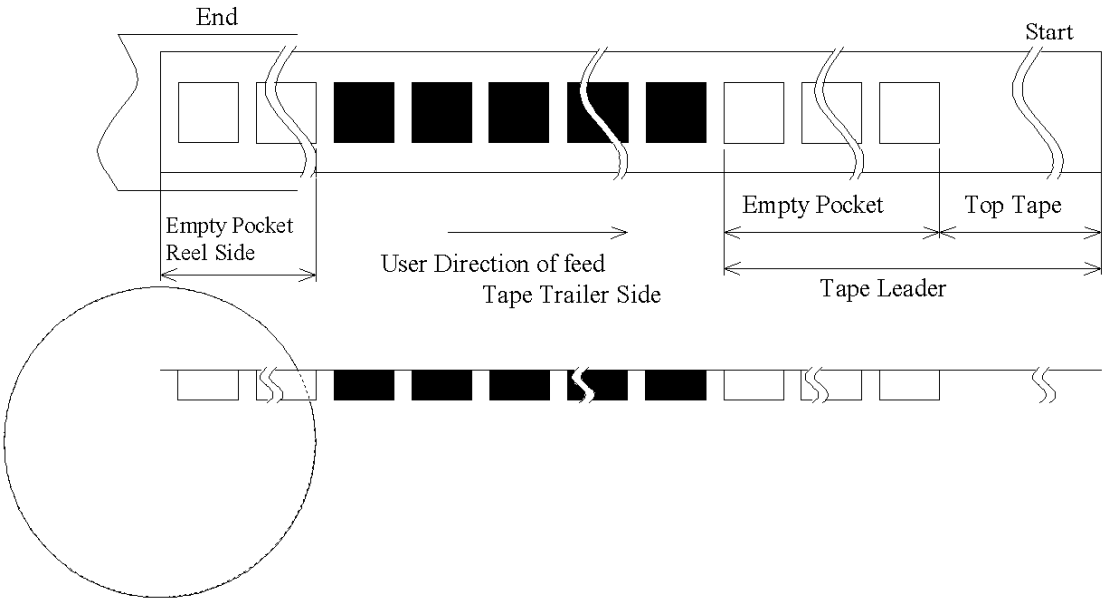
Form and Size of reel window shows are one of the example

(3) Packing

(a) Tape & Reel



(b) Start & End Point



(c) Peel force of the cover tape

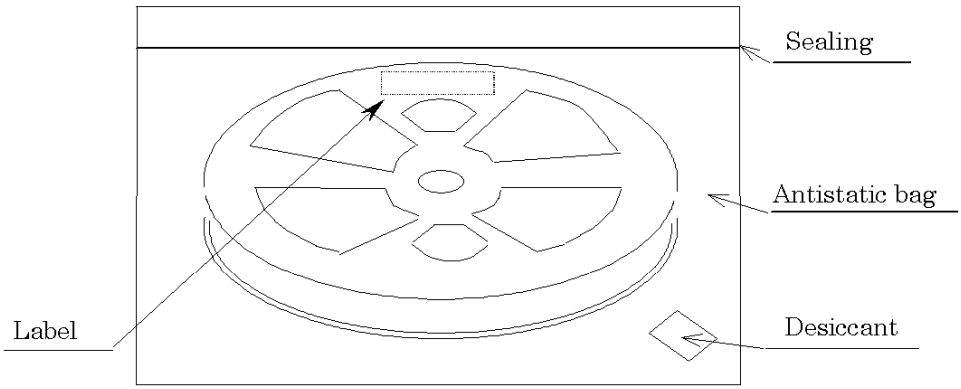
(1) angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.

(2) peel speed : 5 mm/s.

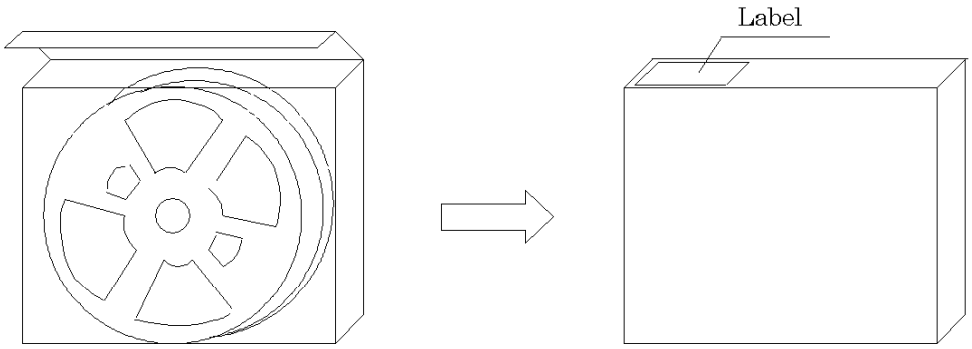
Item		Empty Space
Tape Leader	Top Tape	Min. 1 000 mm
	Carrier Tape	Min. 10 pockets
Tape Trailer	Top Tape	Min. 0 mm
	Carrier Tape	Min. 10 pockets

[2] Inner Carton

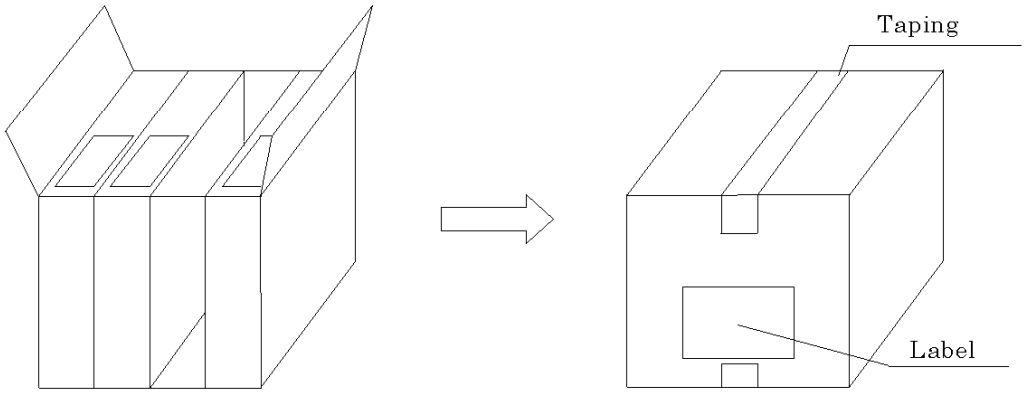
a) Packing to antistatic bag



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

- 3 000 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-

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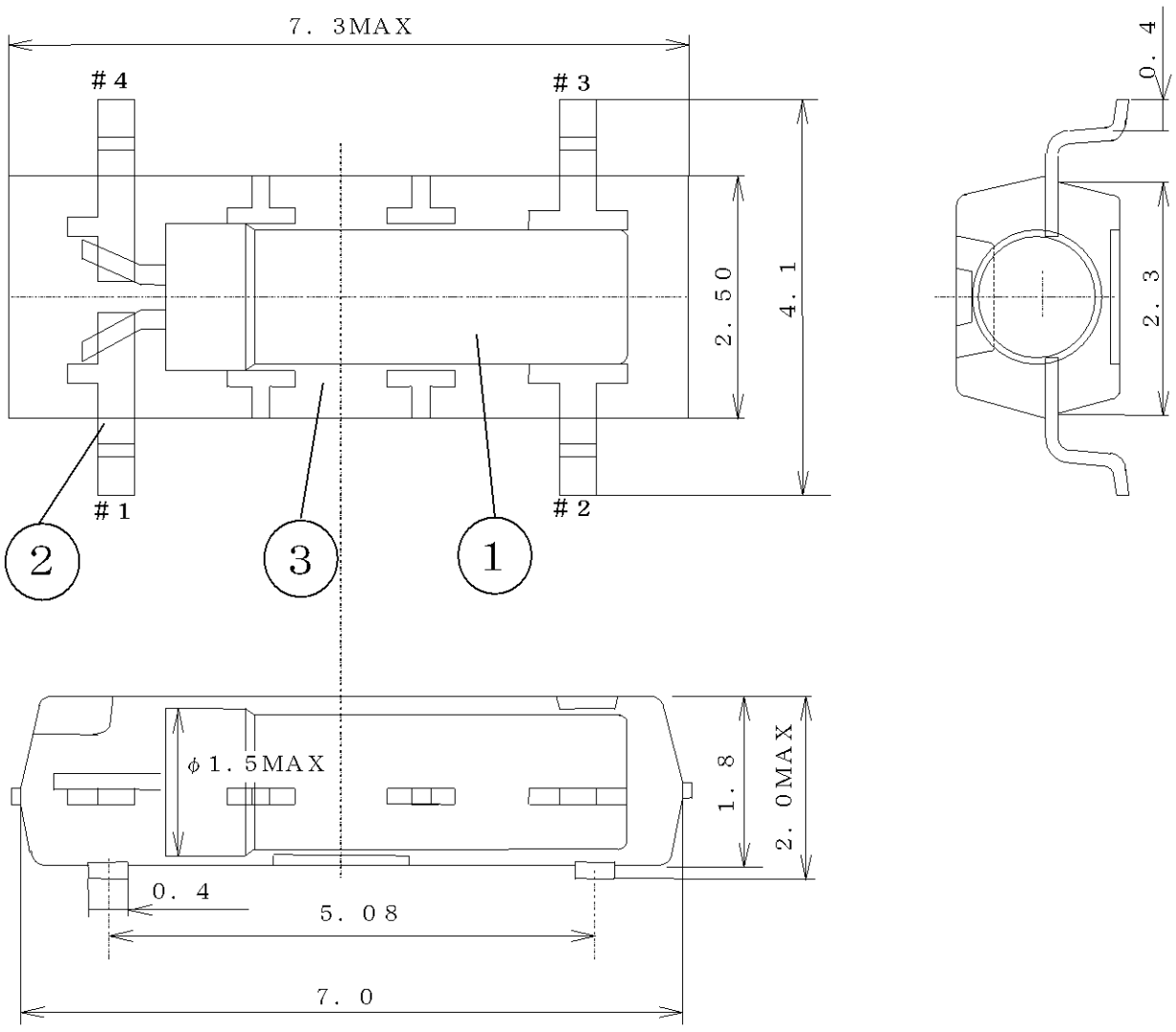
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SURFACE MOUNTING TYPE CRYSTAL MC-206

Manufacturing process chart	No.	Section In Charge	Standards	Inspection, Control Item	Inspection Methods	Instruments	Record
C-004SH Crystal Lead Frame 1' In-coming Inspection	1'	Inspection Section	Purchasing Specification, Incoming Inspection Standard	Dimension Appearance	Sampling 〃	Plug Gauges Microscope	In-comming Inspection Data Sheet
	2	Malaysia Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	3	〃	〃	Appearance	〃	Visual Inspection	〃
	4	〃	Solder Plating Specification	Plating Thickness Appearance	Sampling 100% Inspection	Fluorescent X-ray Visual Inspection	〃
② Crystal Welding	5	〃	Manufacturing Instruction Sheet	Marking Strength Appearance	Sampling 100% Inspection	Cellophane Tape Visual Inspection	〃
③ Transfer Molding	6	〃	〃	Appearance Shape	Sampling 〃	Microscope Dial Gauge	〃
④ Solder Plating	7	〃	〃	Crystal Inpedance Frequency	100% Inspection 〃	Characteristics Inspection Machine	〃
⑤ Marking ⑥ Press	8	〃	Specification Outgoing Inspection Standard	Electrical Characteristics Appearance Marking Strength Dimension	Sampling 〃 〃 〃	CI Meter, Frequency Counter Microscope Cellophane Tape T.M.S	Outgoing Inspection Data Sheet
7 Finish Products Inspection	9	〃	Manufacturing Instruction Sheet	Tape Peeling Force	Sampling	Peeling Force Tester	Process Data Sheet
8 Outgoing Inspection ⑨ Taping	10	〃	Manufacturing Instruction Sheet Daily Shipping list	Customer Frequency Quantity			Delivery Slip
⑩ Packing							

MC－２０６ Structure diagram

Unit:mm



No.	Name of Part	Material	Remarks
①	Crystal　C-005SH	――――	――――
②	Lead	４２ Alloy	Solder Plating (Pb free)
③	Molding	Epoxy Compound	――――