RECIPIENT

# SPECIFICATIONS

**Product No. :** Q22FA12800199

**Model :** FA-128

**SPEC. No. :** A11-773-3B

**DATE :** Feb. 15. 2012

**EPSON TOYOCOM CORPORATION**
**421-8 Hino, Hino-shi Tokyo 191-8501, Japan**

CHECKED 金子 猪一

M. Kaneko : CS Quality Assurance Department

# SPECIFICATIONS

## 1. Application

This document is applicable to the crystal unit FA-128 that are delivered to 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 product s 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 unit is Q22FA12800199.
The model is FA-128.

## 3. Packing

It is subject to the packing standard of Epson Toyocom Corp.

## 4. Warranty

Defective parts which originate with us are replaced free of charge in the case of defects being found with 12 months after delivery.

## 5. Amendment and/or termination

Amendment and/or termination of this specification is subject to the agreement between the two parties.

## 6. Contents


| Item No. | Item | Page |
|---|---|---|
| [ 1 ] | Absolute maximum ratings | 2 |
| [ 2 ] | Operating range | 2 |
| [ 3 ] | Electrical characteristics | 2 |
| [ 4 ] | Environmental and mechanical characteristics | 3 |
| [ 5 ] | Dimensions and circuit | 4 |
| [ 6 ] | Recommended soldering pattern and marking layout | 5 |
| [ 7 ] | Notes | 6 |

## [ 1 ] Absolute maximum ratings

| No. | Parameter | Rating value | Note |
|---|---|---|---|
| 1 | Storage temperature | -40 °C to +125 °C | Suppose to be within CI std. at +25 °C ± 3 °C |

## [ 2 ] Operating range

| No. | Parameter | Symbol | Value | | |
|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. |
| 1 | Operating temperature | T_use | -30 °C | — | +85 °C |
| 2 | Drive level | DL | 10 μW | — | 100 μW |

## [ 3 ] Electrical characteristics

| No. | Parameter | Symbol | Standard | Conditions |
|---|---|---|---|---|
| 1 | Nominal frequency | $f_0$ | 48 MHz | Fundamental |
| 2 | Load Capacitance | CL | 7.0 pF | Network Analyzer E5100A |
| | | | 8.7 pF | IEC Standard#60444 |
| 3 | Frequency tolerance | f_tol | $\pm 8 \times 10^{-6}$ | T_use = +25 °C±3 °C<br>Drive level : 100 μW<br>Not include aging |
| 4 | Motional resistance | R1 | 22 Ω Max. | Drive level : 100 μW<br>T_use= -30 °C to +85 °C |
| 5 | Shunt capacitance | $C_0$ | 0.9 pF ± 20%. | |
| 6 | Motional capacitance | C1 | 3.4fF ± 20% | |
| 7 | Motional Inucatioe | L1 | 3.2 mH ± 20% | |
| 8 | Spurious mode series resistance | | 1,100 Ω Min. | ±700 kHz from operating frequency |
| 9 | Frequency versus temperature characteristics | f_tem | $\pm 10 \times 10^{-6}$ | T_use = -30 °C to +85 °C<br>(Ref. at +25 °C±3 °C)<br>Drive level : 100 μW |
| 10 | Isolation resistance | IR | 500 MΩ Min. | DC 100V × 60 sec.<br>Between each terminals |
| 11 | Aging | f_age | $\pm 1 \times 10^{-6}$/year<br>$\pm 5 \times 10^{-6}$/7years | T_use = +25 °C±3 °C<br>Drive level : 100 μW |

## [4] Environmental and mechanical characteristics

Item No.3 to No.6 shall be tested after following pre conditioning.

Pre conditioning : Test crystal must be leaving in room temperature for 24h after reflow × 3.

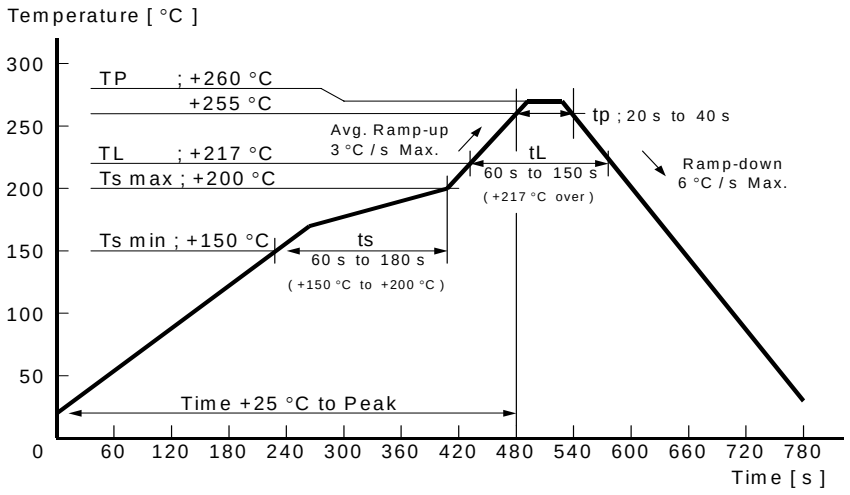
(The company evaluation condition : We evaluate it by the following examination item and examination condition.)

| No. | Item | Value *1 *2 | Test Conditions |
|---|---|---|---|
| | | $\Delta f / f\ [1 \times 10^{-6}]$ | |
| 1 | Drop | *3 ±3 | 150 g dummy Jig (Epson Toyocom Standard) drop from 1500 mm height on the Concrete 6 directions 10 times |
| 2 | Vibration | *3 ±3 | 10 Hz to 55 Hz amplitude 0.75 mm<br>55 Hz to 500 Hz acceleration 98 $m/s^2$<br>10 Hz → 500 Hz → 10 Hz 15 min./cycle<br>6 h (2 hours , 3 directions) |
| 3 | High temperature storage | *3 ±3 | +85 °C × 1 000 h |
| 4 | Low temperature storage | *3 ±3 | -40 °C × 1 000 h |
| 5 | Temperature cycle | *3 ±3 | -40 °C ↔ +85 °C<br>30 minutes at each temp. 100 cycle |
| 6 | Temperature humidity storage | *3 ±3 | +85 °C × 85 %RH × 1 000 h |
| 7 | Resistance to soldering heat | ± 2 | For convention reflow soldering furnace (3 times) |
| 8 | Substrate bending | No peeling-off at a soldered part | Bend width reaches 3 mm and hold for 5 s ± 1 s × 1 time Ref. IEC 60068-2-21 |
| 9 | Shear | No peeling-off at a soldered part | 10 N press for 10 s ± 1 s<br>Ref. IEC 60068-2-21 |
| 10 | Pull – off | No peeling-off at a soldered part | 10 N press for 10 s ± 1 s<br>Ref. IEC 60068-2-21 |
| 11 | Solder ability | Terminals must be 95 % covered<br>With fresh solder. | Dip termination into solder bath at +235 °C ± 10 °C for 5 s<br>(Using Rosin Flux) |

< Notes >

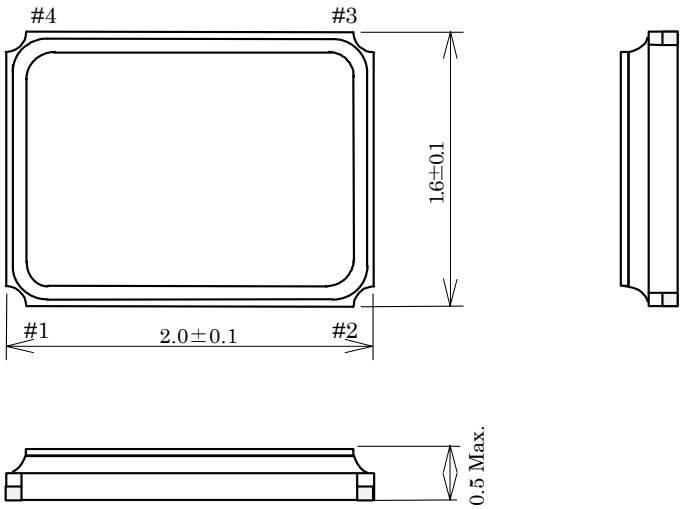
1. *1 each test done independently.
2. *2 measuring 2 h to 24 h later leaving in room temperature after each test.
3. *3 Item No.1 to No.6 shall be tested after following pre conditioning.
4. Item No.1 to No.11 resistance at before above tests should be less than ±20 % or less than ±10 Ω.
5. Pre conditioning : Test crystal must be leaving in room temperature for 24h after reflow × 3.

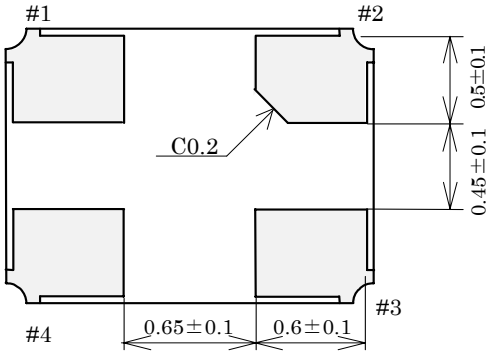
Reflow condition (follow to IPC / JEDEC J-STD-020C)



## [ 5 ] Dimensions and Circuit

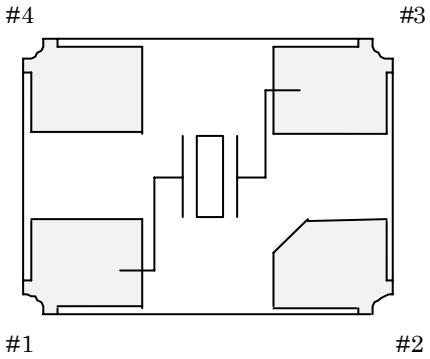
1) Dimension




2) Circuit

(Top View)




Pin connection

#1, #3: X'tal

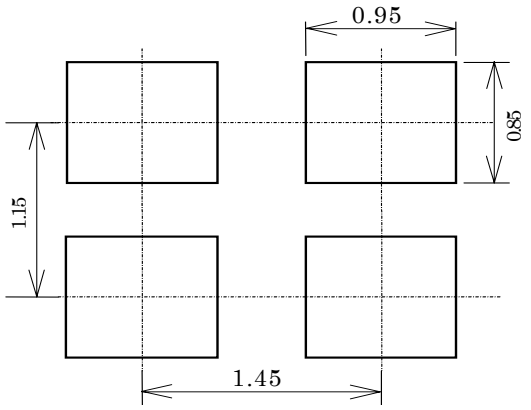
#2, #4: GND

| Type | FA-128 | Terminal treatment | Au plate | Unit | 1 = 1mm |
|---|---|---|---|---|---|

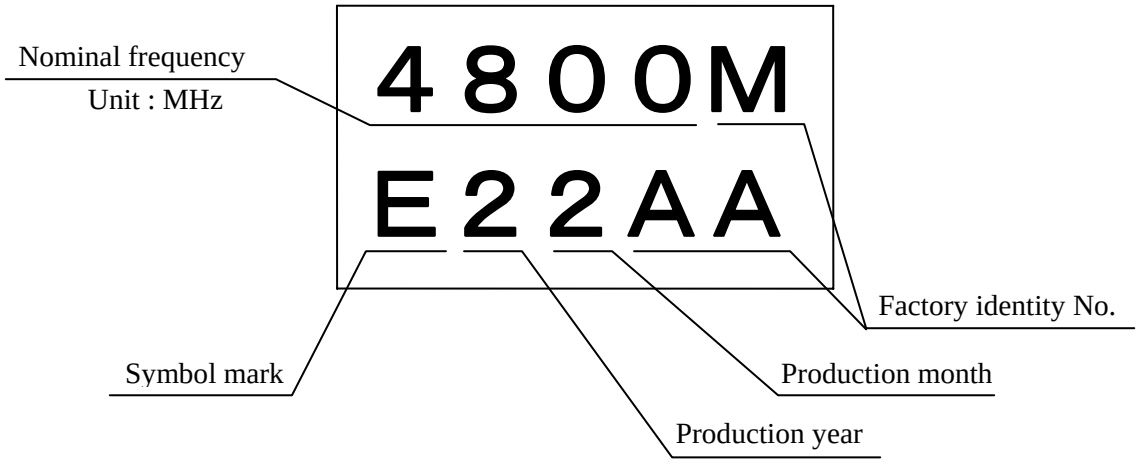
## [ 6 ] Recommended soldering pattern and Marking layout

1)Recommended soldering pattern

Unit : mm




2) Marking layout




Production month

| January | February | ..... | October | November | December |
|---|---|---|---|---|---|
| 1 | 2 | ..... | X | Y | Z |

- Nominal frequency is only one example.
- Nominal frequency omits the figure below the second place of decimals.
  ex) 48 MHz ..... [4800]
- The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

| Type : FA-128 | Unit : 1 = 1mm |
|---|---|

## [ 7 ] Notes

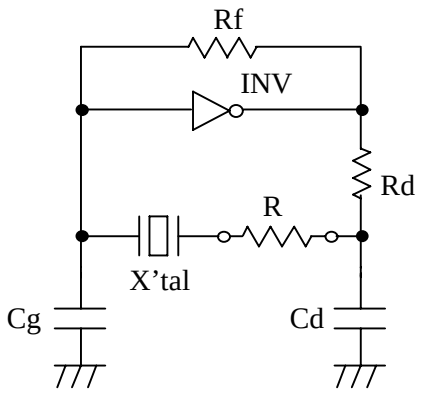
1. Max three (3) times re-flow is allowed. Its recommended to manually solder when not enough/no solder detected.( Using soldering iron at +350 °C × within 5 seconds)

2. Patterning on a board should follow our company recommended pattern.

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

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

   How to check the negative resistance




(1) Connect the resister(R) to the circuit in series with the crystal unit.

(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

5. It is recommended to do patterning to the oscillator as short as possible. Abnormal oscillation may happened if the line is too long.

6. To avoid malfunction, no pattern across or near the crystal unit is allowed.

7. Few data or readings taken at user side may be different from our company's data. Confirmation of the different value is necessary before application.

8. Too much exciting shock or vibration may cause deterioration on damage.
   The product may damage depends on the condition such as a shock in assembly machinery.
   Please check your process condition in advance to minimize and maintain the shock level.

9. This product may be affected to ultrasonic cleaning. It is depends on the cleaning conditions (Cleaning machine type/power/time/content/position etc.). The warranty will not cover any damage due to this type of usage. Check conditions prior to use.

10. Condensation may occur when used/stored under high humidity condition.
    Please take precautions to prevent condensation.

11. Please refer to packing specification for the storage method and packing standard.

# TAPING SPECIFICATION

## 1. APPLICATION

This document is applicable to FA-128

## 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

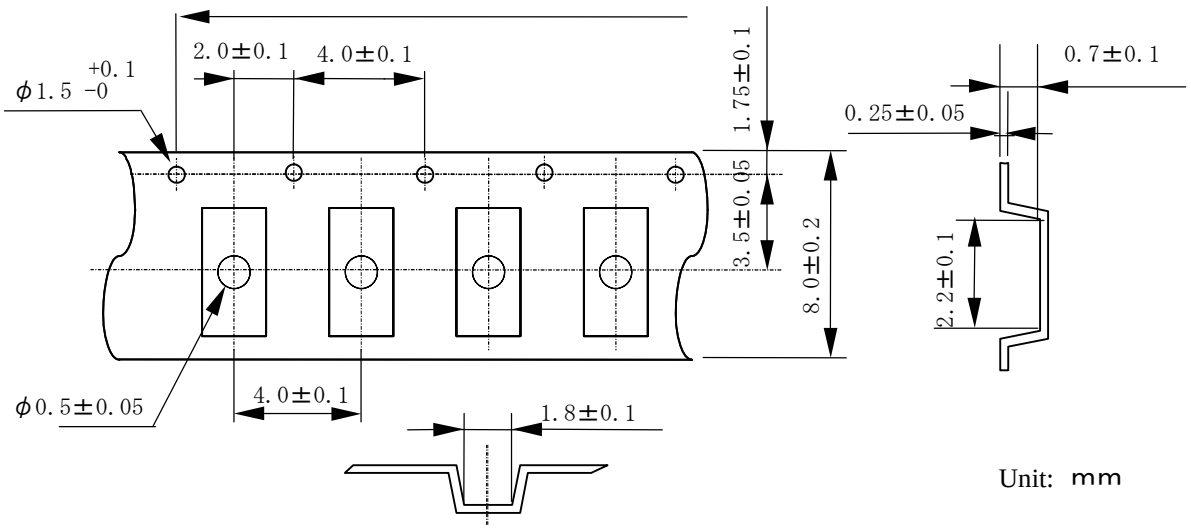
Subject to EIA-481 & IEC-60286

(1) Tape dimensions TE0804L

Material of the Carrier Tape : PS

Material of the Top Tape : PET+PE

10P : 40±0.15

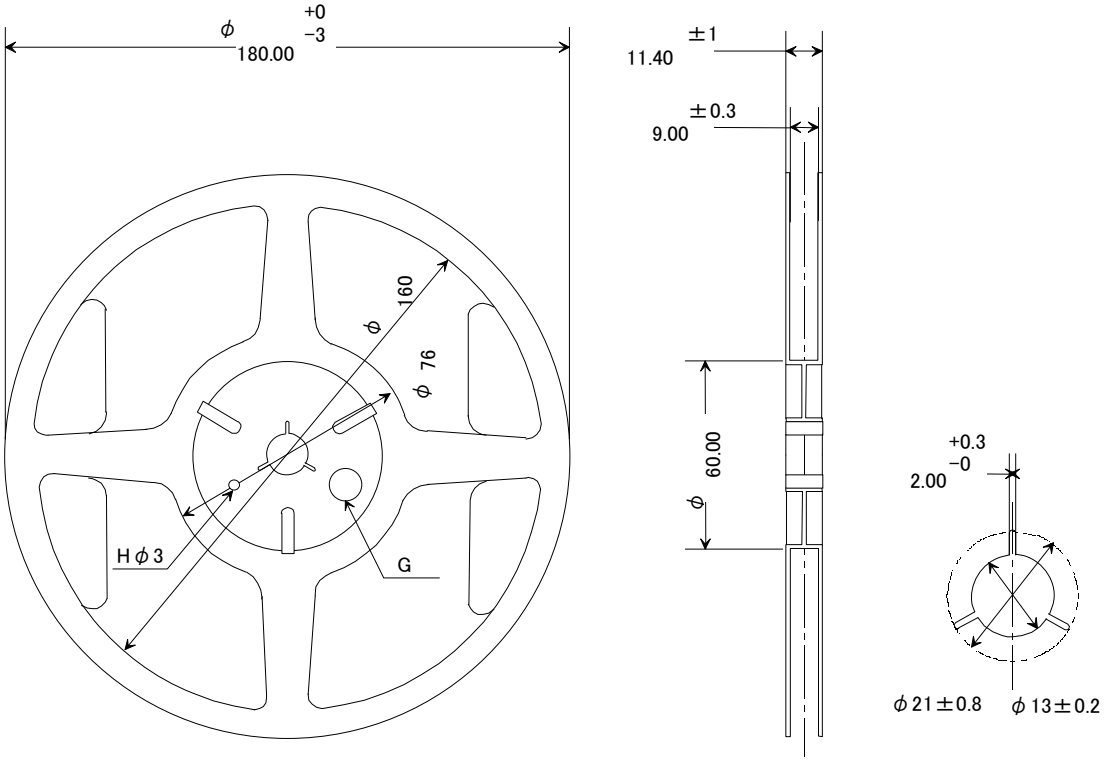



Unit: mm

(2) Reel dimensions

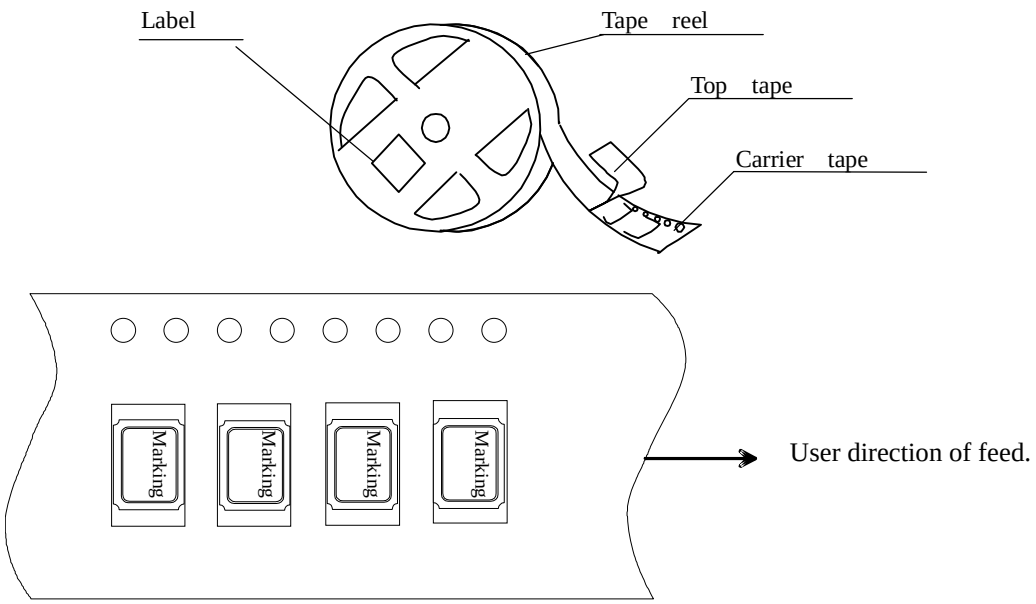
(a) Center material : PS

(b) Material of the Reel : PS

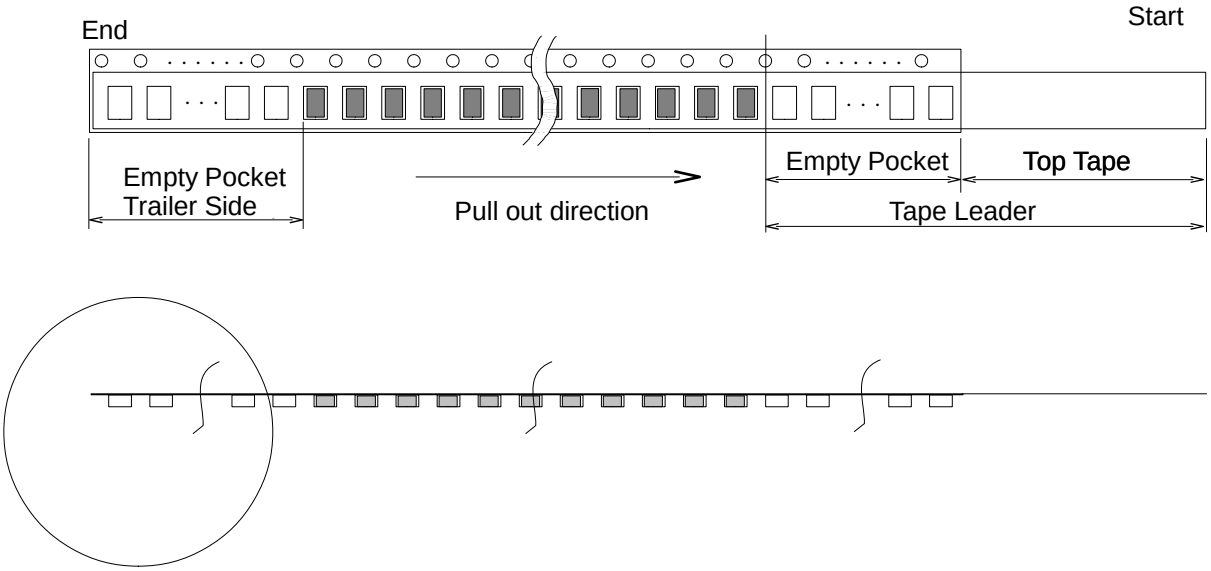


(3) Packing

(a) Tape & Reel




(b) Start & End Point




| Item | | Empty Space |
|---|---|---|
| Tape Leader | Top Tape | Min. 1 000 mm |
| | Carrier Tape | Min. 100 mm |
| Tape Trailer | Top Tape | Min. 0 mm |
| | Carrier Tape | Min. 160 mm |

(4) Peel force of the cover tape

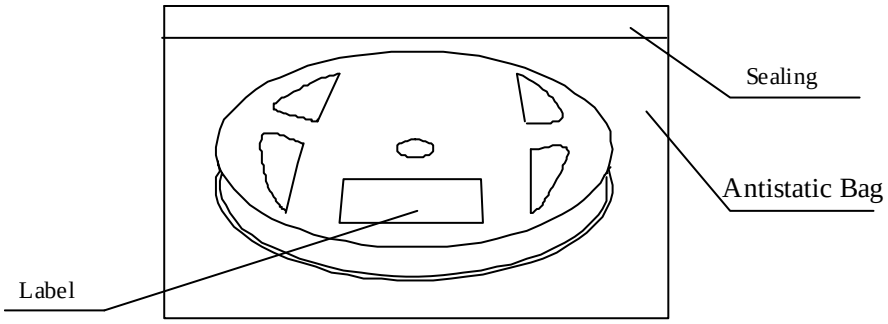
① angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.

② peel speed : 300 mm / min.

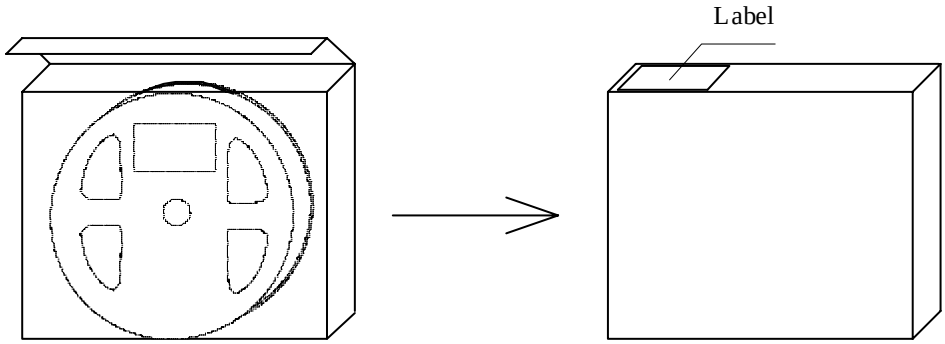
③ strength : 0.1 to 1 N.

## [ 2 ] Inner Carton

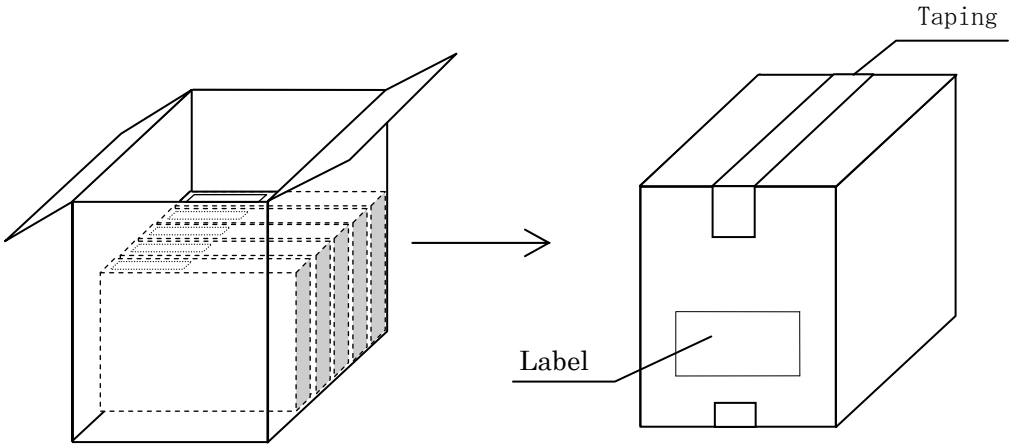
a) Packing to antistatic bag




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

However it is not the limit, in case that the order quantity does not fill with 3,000 pieces.
Packing quantity is defined by 14th and 15th digit of product number

| 14th and 15th digit of Product number | Quantity |
|---|---|
| 00 | 3,000 pcs |
| 14 | 1,000 pcs |
| 12 | 250 pcs |
| 11 | Any Q'ty |

## [ 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.

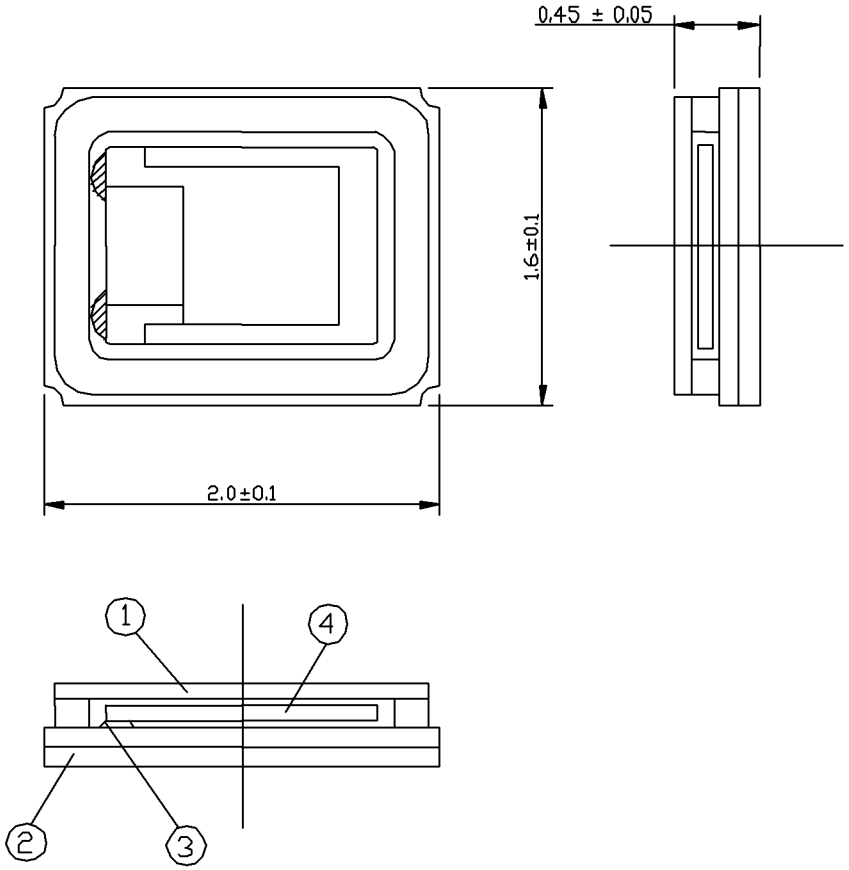
## [ 7 ] Handling

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

# ＦＡ－１２８ Construction Drawing

No. : A-0502-AE-1

Unit : mm




| No | Parts NAME | Material | Surface Treatment |
|---|---|---|---|
| ① | LID | Covar | Ni Plating |
| ② | BASE | Ceramic・Covar | Au Plating |
| ③ | Ag Paste | Bonding Paste of Electric Conductor | |
| ④ | Crystal Chip | Crystal | Electrode Pattern(Cr+Au) |

| | | | |
|---|---|---|---|
| 4 | Est. No. | | |
| 3 | Est. No. | | |
| 2 | Est. No. | | |
| 1 | Est. No. | | |
| Est. | Est. No. 05-051 | | |

AT(Consumer) Business Unit

| Check | Check | Prepare |
|---|---|---|
| S.Maeda | W.Kogami | A.Tsuchida |