INFORMATION

PRODUCT No. : X1A000141000200

MODEL : FC-135R

INFO. No. : Q13-190-0B

DATE : Nov. 11. 2013

SEIKO EPSON 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.

1. Application

1) RoHS compliant
FC-135R contains lead in Low melting type solder which is exempted in RoHS directive.

2) 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.

3) 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 systems, and medical equipment, the functional purpose of which is to keep extra high reliability, such as satellite, rocket and other space life.

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[1] Absolute maximum ratings

No.	Item	Symbol	Rating value			Unit	Note
			Min.	Typ.	Max.		
1	Storage temperature range	T_stg	- 55		+ 125	°C	Suppose to be within CI STD at + 25 °C ± 3 °C.
2	Maximum level of drive	GL		0.5		μW	

[2] Operating range

No.	Item	Symbol	Rating value			Unit	Note
			Min.	Typ.	Max.		
1	Operating temperature range	T_use	- 40		+ 85	°C	
2	Level of drive	DL	0.01	0.1	0.5	μW	
3	Vibration mode		Fundamental				

[3] Static characteristics

No.	Item		Symbol	Value	Unit	Conditions
1	Nominal Frequency		f_nom	32.768	kHz	
2	Frequency tolerance		f_tol	± 20	× 10^{-6}	CL = 12.5 pF Ta = + 25 ± 3 °C Level of drive : 0.1 μW Not include aging
3	Motional resistance		R1	50 Max.	kΩ	CI meter : Saunders 140B Level of drive : 0.5 μW
4	Motional capacitance		C1	3.4 Typ.	fF	
5	Shunt capacitance		C0	1.0 Typ.	pF	
6	Frequency temperature characteristics	Turnover temperature	Ti	+ 25 ± 5	°C	Values are calculated by The frequencies at + 10, + 25, + 40 °C with C-MOS circuit.
		Parabolic coefficient	B	- 0.04 Max.	× 10^{-6}/°C^2	
7	Isolation resistance		IR	500 Min.	MΩ	DC 100 V ± 15, 60 seconds Between terminal # 1 and terminal # 2
8	Frequency Aging		f_age	± 3	× 10^{-6}/year	Ta = + 25 °C ± 3 °C Level of drive : 0.1 μW

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[4] Environmental and Mechanical characteristics

No.	Items	Value	Conditions
1	Shock resistance	*3Δ f/f : ± 15 × 10^{-6}	100 g dummy(EPSON Standard), Natural drop from 1 500 mm height on to the concrete. 3 directions × 10 times *2
2	Vibration resistance	*3Δ f/f : ± 3 × 10^{-6}	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) *2
3	Soldering heat resistance	Δ f/f : ± 8 × 10^{-6}	IPC/JEDEC J-STD-020D.1 Reflow (3 times)
4	High temperature storage	*3Δ f/f : ± 10 × 10^{-6}	+ 125 °C × 1 000 h *1
		*3Δ f/f : ± 7 × 10^{-6}	+ 85 °C × 1 000 h *1
5	Low temperature storage	*3Δ f/f : ± 15 × 10^{-6}	- 55 °C × 1 000 h *1
6	High temperature and humidity	*3Δ f/f : ± 10 × 10^{-6}	+ 85 °C × 85 %RH × 1000 h *1
7	Temperature cycle	*3Δ f/f : ± 10 × 10^{-6}	- 55 °C ↔ + 125 °C 30 minutes at each temperature × 100 cycles *1
8	Sealing	*3 1 × 10^{-8} hPa·l / s Max.	For He leak detector
9	Shear	No peeling-off at a soldered part	20 N press for 10 ± 1 s. Ref. IEC 60068-2-21
10	Pull - off	No peeling-off at a soldered part	20 N press for 10 ± 1 s. Ref. IEC 60068-2-21
11	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
12	Solvent resistance	The marking shall be legible	Ref. JIS C 0052 or IEC 60068-2-45

< Notes >

1. *1 Each test done independently.
2. *2 Measuring 2 h to 24 h later leaving in room temperature after each test. Drive level : 0.5 μW

*3 Pre conditionings

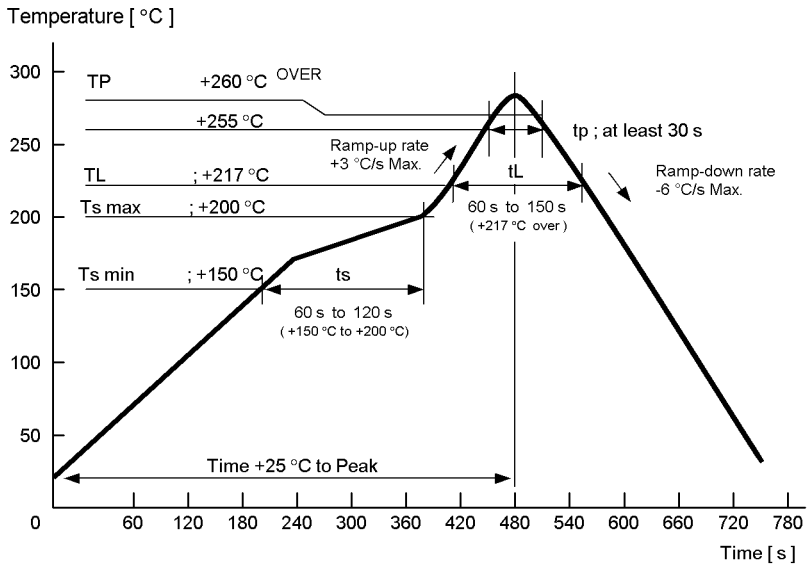
1. + 125 °C × 24 h to + 85 °C × 85 %RH × 168 h ± 1 h → reflow 3 times
2. Initial value shall be after 24 h at room temperature.

Shift of series resistance at before and after the test should be less than ± 30 % or less than ± 20 kΩ.

In case high temperature storage(+ 125 °C × 1 000 h), Soldering heat resistance, shift of series resistance at before and after the test should be less than ± 40 % or ± 30 kΩ.

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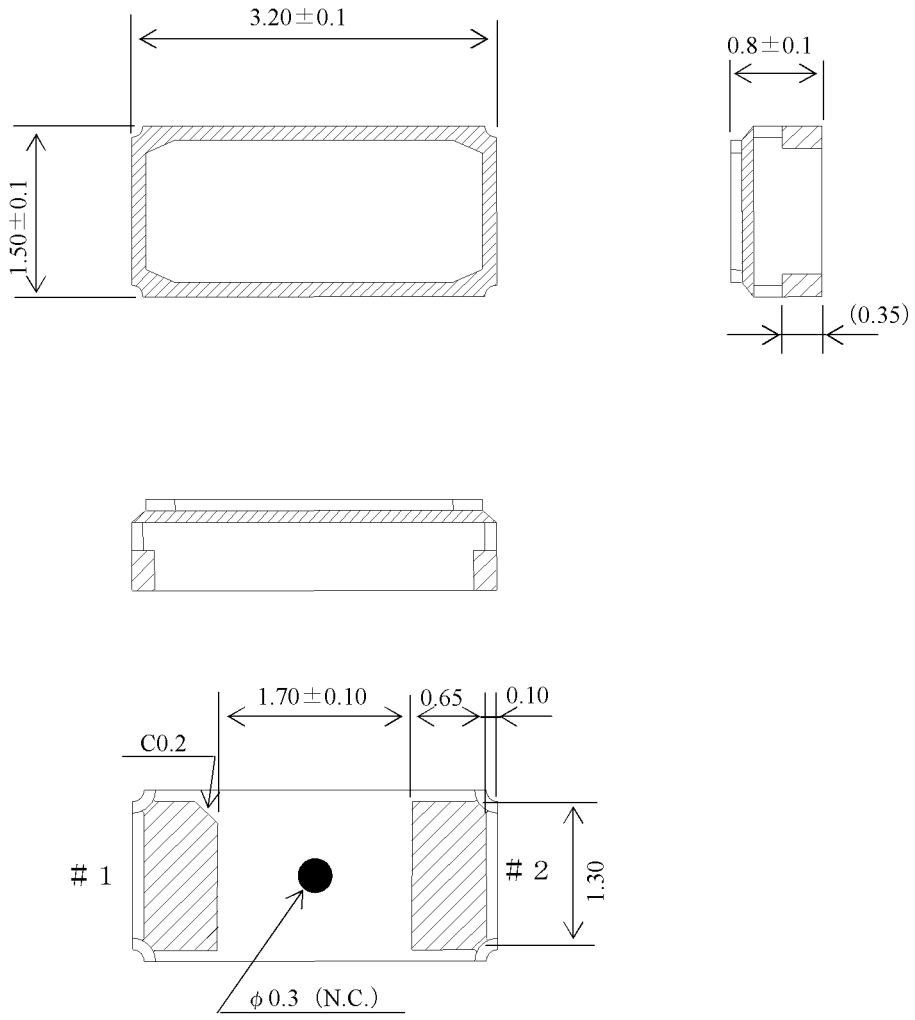
♦ Reflow condition (follow to IPC / JEDEC J-STD-020D.1)



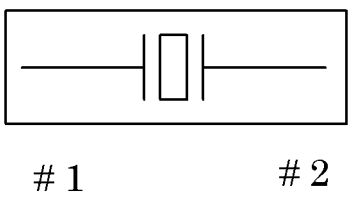
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[5] Dimensions and Marking layout

1. Dimensions



2. Internal Connection



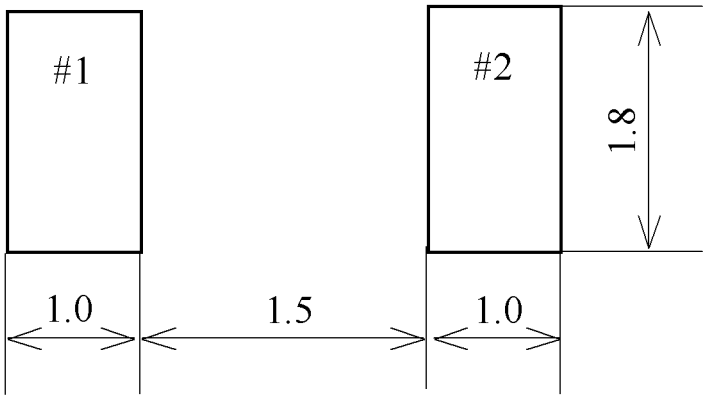
Package : Ceramic(Al_2O_3)
Terminal Au plate : 0.5 μm Min.
Lid : Glass

Type	FC-135R	Terminal treatment	Au plating	Unit	1 = 1 mm

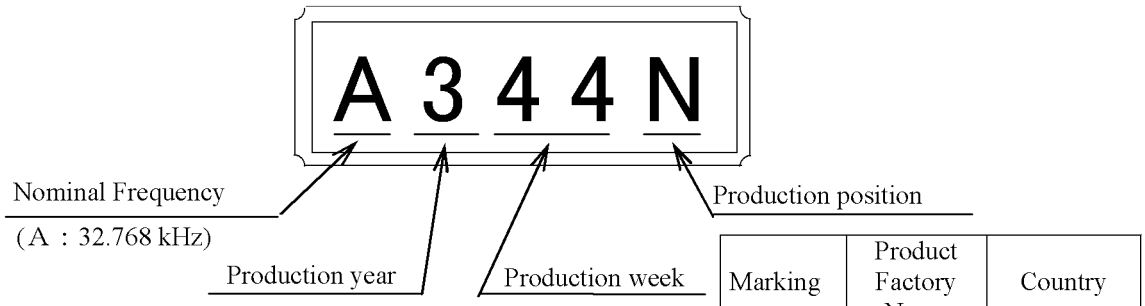
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3. Recommended soldering pattern

Unit : 1 = 1 mm



4. Marking layout



Marking	Product Factory Name	Country
J	INA	Japan
C	EPSZ	China
L	EPMY	Malaysia
K	KATO	Japan
N	GKL	Malaysia

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

Type	FC-135R	Unit	1 = 1 mm

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[6] Notes

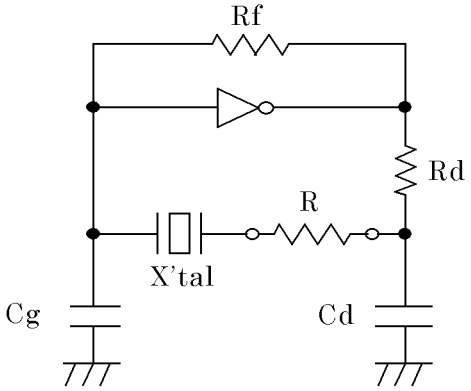
1. Max two (2) times reflow is allowed. Once miss soldering is happened, hand work soldering by soldering iron is recommended. (+ 350 °C × within 5 s)

2. Patterning should be followed by our recommended one.

3. Applying excessive excitation force to the crystal unit 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.

   How to check the negative resistance.



(1) Connect the resistance (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
$|-R| > CI \times (5 \sim 10)$

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

6. To avoid mull function, no pattern under or near the crystal is allowed.

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 may cause resonant damage of the internal crystal unit. Since we are unable to determine the conditions (type of cleaning unit, power, time, conditions inside the bath, etc.) to be used in your company, we cannot guarantee the safety of this unit when it is cleaned in an ultrasonic cleaner.

10. Ink marking may be damaged by some kind of solvent, please take precautions when choosing solvent by your selves.

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

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TAPING SPECIFICATION

1. APPLICATION

This document is applicable to FC-135.

2. CONTENTS

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

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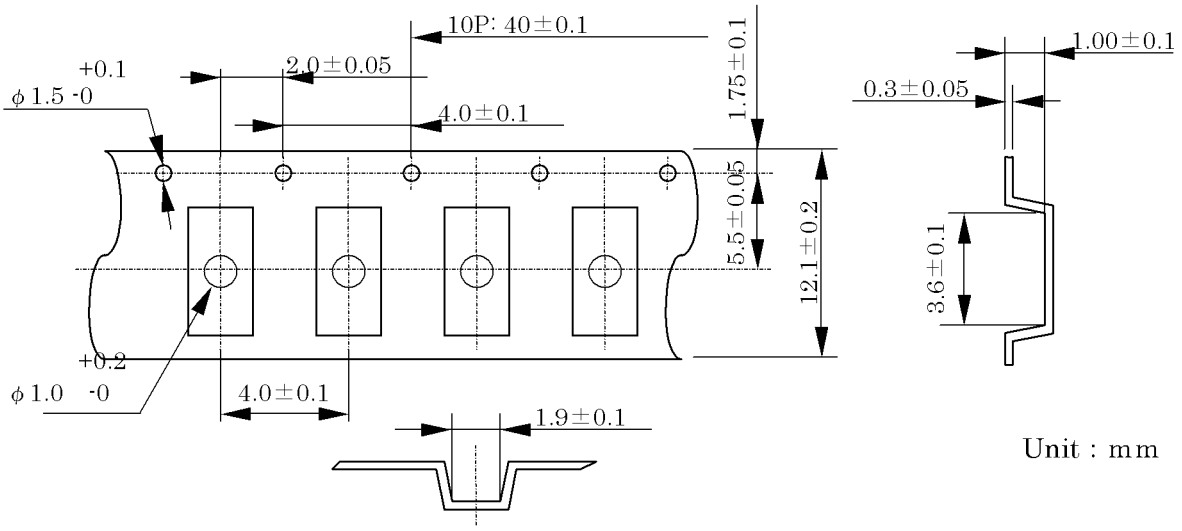
[1] Taping specification

Subject to EIA-481 , IEC 60286.

(1) Tape dimensions TE1204L

Material of the Carrier Tape : PS

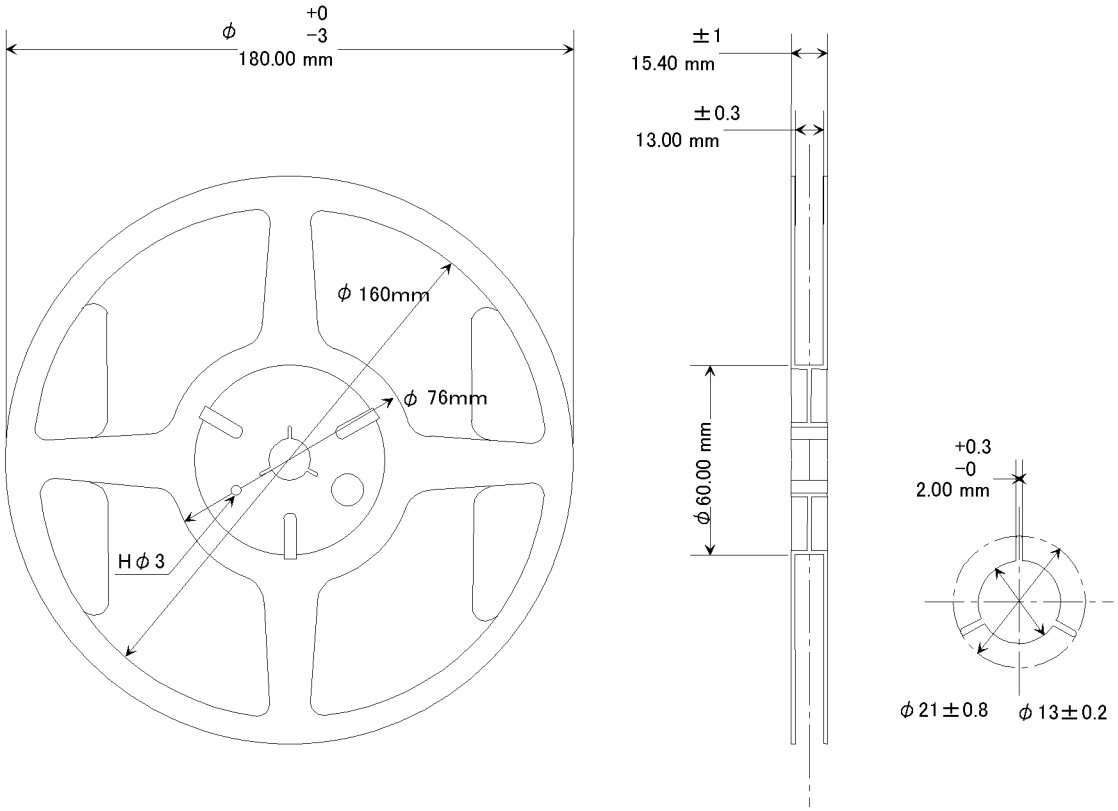
Material of the Top Tape : PET+PE



Unit : mm

(2) Reel dimensions EIAJRRM φ180

Material of the Reel : PS

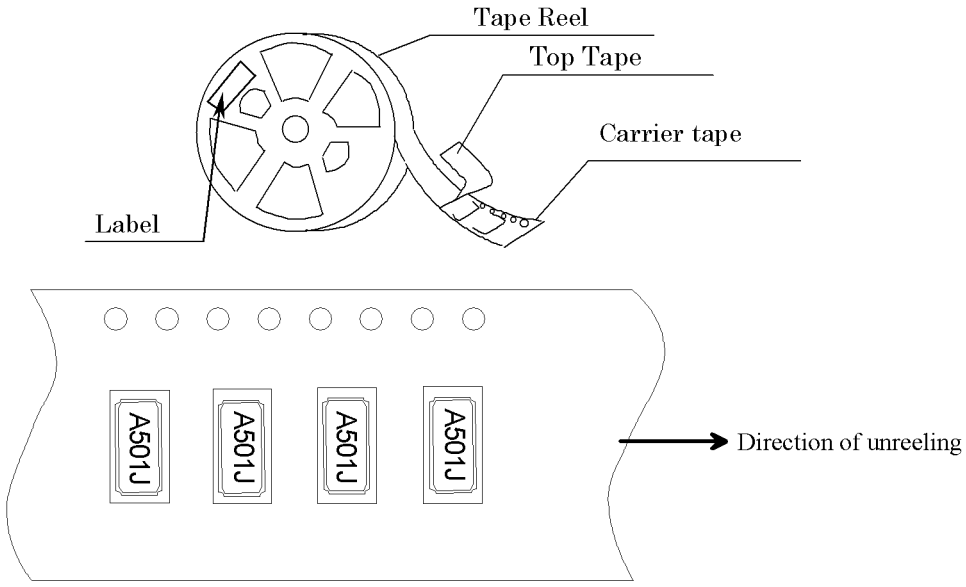


Form and Size of reel window shows are one of the example

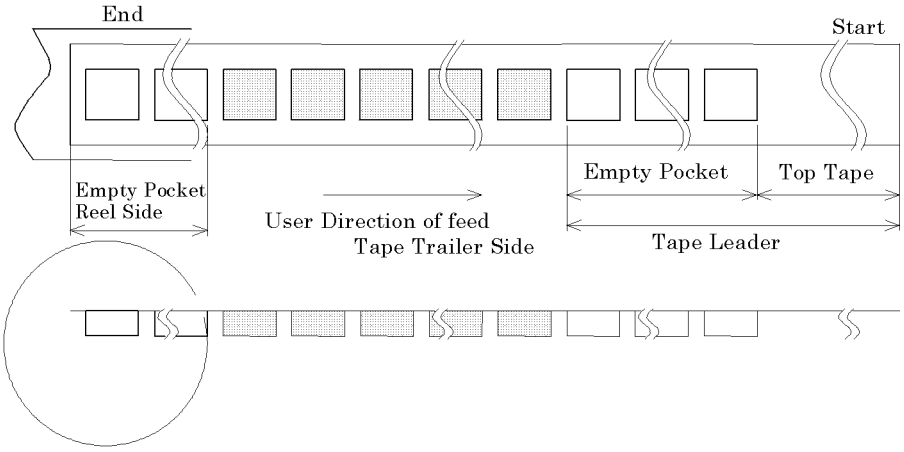
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(3) Packing

(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°.

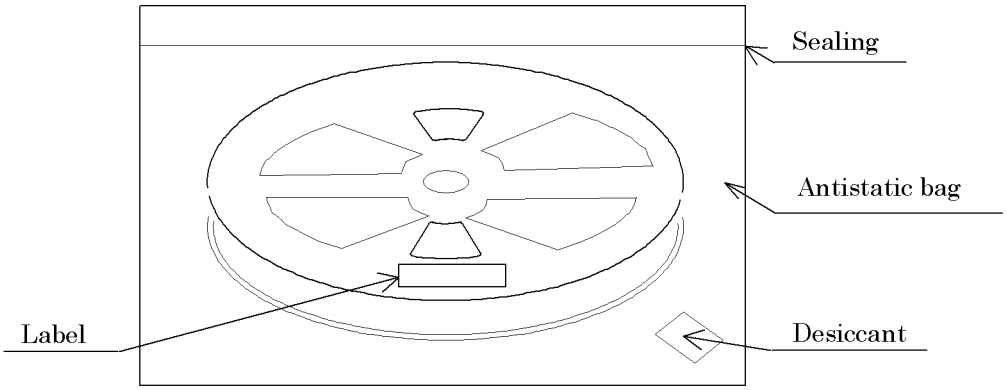
(2) peel speed : 300 mm/min

Item		Empty Space
Tape Leader	Top Tape	Min. 1 000 mm
	Carrier Tape	Min. 80 mm
Tape Trailer	Top Tape	Min. 0 mm
	Carrier Tape	Min. 80 mm

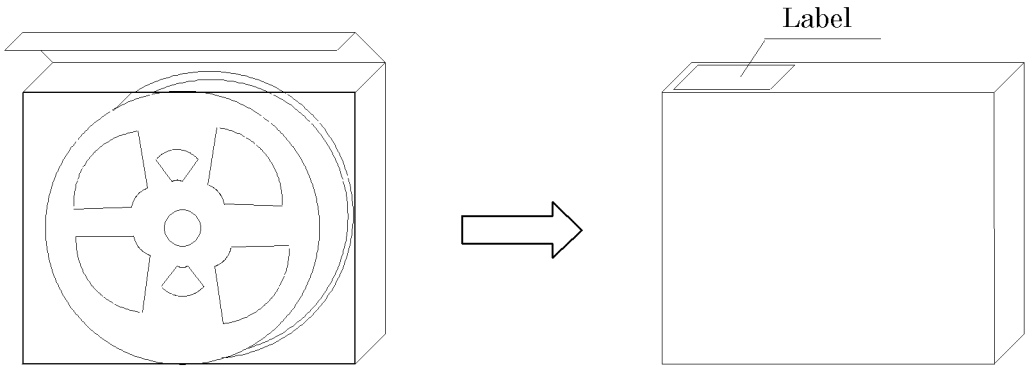
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[2] Inner Carton

a) Packing to antistatic bag

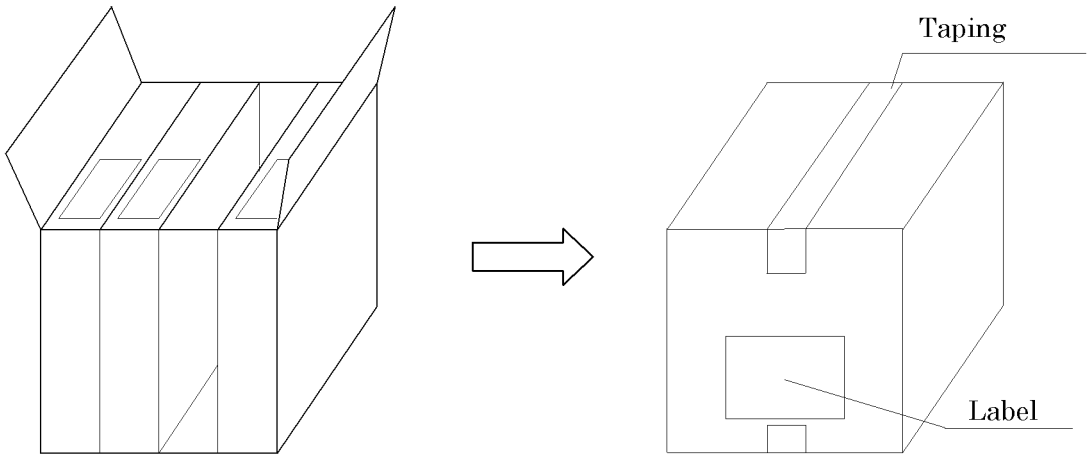


b) Packing to innercarton



[3] Shipping Carton

- Put inner boxes into an outer box.
- If there are room in the outer box,material is put in a shock absorbing together.



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[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) Before open the packing, we recommend to keep less than +30 °C and 85 %RH of Humidity, and to use it less than 6 months after delivery.

(2) We recommend to open Package in immediately before use. After open Package, We recommend to keeps less than 6 month. No need dry air before soldering work if it is less than temperature +30 °C, 85 humidity %RH.

(3) Not to storage with some erosive chemicals.

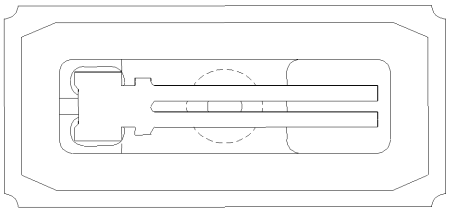
(4) Nothing is allowed to put on the reel or carton to prevent mechanical damage.

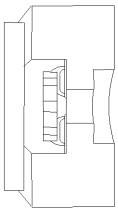
[7] Handling

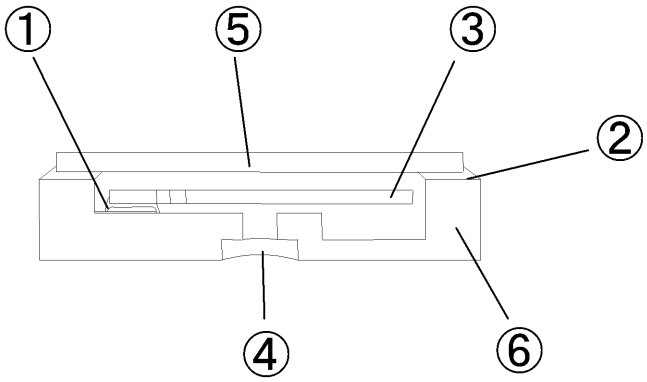
To handle with care to prevent the damage of tape, reel and products.

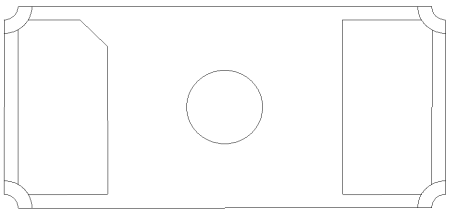
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Structure diagram FC-135R









LIST		
Name of part		Material
①	Cristal Adhesive	Ag Paste
②	Sealing	Seal Glass
③	Crystal chip	tuning fork
④	Sealing	Au/Ge
⑤	Lid	Glass
⑥	Package	Ceramic(Al2O3)