

**LC Future Center Limited**

**INFORMATION**

**PRODUCT No. : Q13FC1350000300**

**MODEL : FC-135**

**INFO. No. : Q12-123-8A**

**DATE : Aug. 30. 2012**

**SEIKO EPSON CORPORATION**

**8548 Naka-minowa  
Minowa-machi Kamiina-gun  
Nagano-ken  
399-4696 Japan**

## 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) RoHS compliant

FC-135 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.

## Contents

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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 <sup>-6</sup>	CL = 9 pF Ta = + 25 ± 3 °C Level of drive : 0.1 μW Not include aging	
3	Motional resistance	R1	70 Max.	kΩ	CI meter : Saunders 140B Level of drive : 0.5 μW	
4	Motional capacitance	C1	3.4 Typ.	fF		
5	Shunt capacitance	C0	1.2 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 <sup>-6</sup> /°C <sup>2</sup>	
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 <sup>-6</sup> /year	Ta = + 25 °C ± 3 °C Level of drive : 0.1 μW	

[ 4 ] Environmental and Mechanical characteristics

No.	Items	Value	Conditions
1	Shock resistance	*3 $\Delta$ f/f : $\pm 8 \times 10^{-6}$	100 g dummy(EPSON TOYOCOM Standard), Natural drop from 1 500 mm height on to the concrete. 3 directions $\times$ 10 times *2
2	Vibration resistance	*3 $\Delta$ f/f : $\pm 3 \times 10^{-6}$	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s <sup>2</sup> 10 Hz $\rightarrow$ 500 Hz $\rightarrow$ 10 Hz 15 min./cycle 6 h (2 hours , 3 directions) *2
3	Soldering heat resistance	$\Delta$ f/f : $\pm 5 \times 10^{-6}$	For convention reflow soldering furnace (2 times)
4	High temperature storage	*3 $\Delta$ f/f : $\pm 10 \times 10^{-6}$	+ 125 °C $\times$ 1 000 h *1
		*3 $\Delta$ f/f : $\pm 7 \times 10^{-6}$	+ 85 °C $\times$ 1 000 h *1
5	Low temperature storage	*3 $\Delta$ f/f : $\pm 10 \times 10^{-6}$	- 55 °C $\times$ 1 000 h *1
6	High temperature and humidity	*3 $\Delta$ f/f : $\pm 10 \times 10^{-6}$	+ 85 °C $\times$ 85 %RH $\times$ 1000 h *1
7	Temperature cycle	*3 $\Delta$ f/f : $\pm 10 \times 10^{-6}$	- 55 °C $\leftrightarrow$ + 125 °C 30 minutes at each temperature $\times$ 100 cycles *1
8	Sealing	*3 1 $\times$ 10 <sup>-8</sup> hPa $\cdot$ 1 / s Max.	For He leak detector
9	Shear	No peeling-off at a soldered part	20 N press for 10 $\pm$ 1 s. Ref. IEC 60068-2-21
10	Pull - off	No peeling-off at a soldered part	20 N press for 10 $\pm$ 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 $\pm$ 1 s $\times$ 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 >

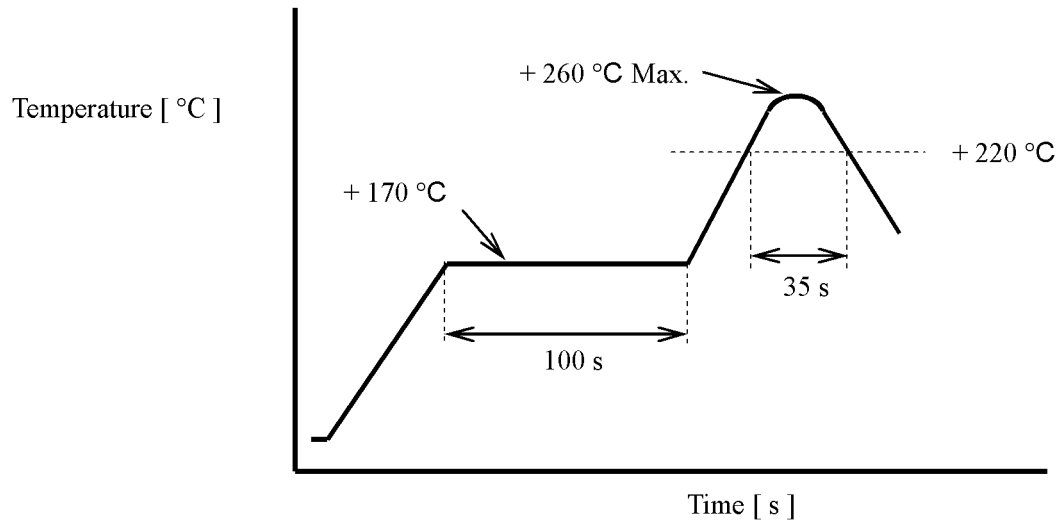
- \*1 Each test done independently.
- \*2 Measuring 2 h to 24 h later leaving in room temperature after each test. Drive level : 0.5  $\mu$ W
- \*3 Pre conditionings( Treat the Reflow 2 times with the following profile) Initial value shall be after 24 h at room temperature.

Shift of series resistance at before and after the test should be less than  $\pm 20$  % or less than  $\pm 15$ k $\Omega$ .

In case high temperature storage(+ 125 °C  $\times$  1 000 h), Soldering heat resistance,shift of series resistance at before and after the test should be less than  $\pm 30$  % or  $\pm 20$  k $\Omega$ .

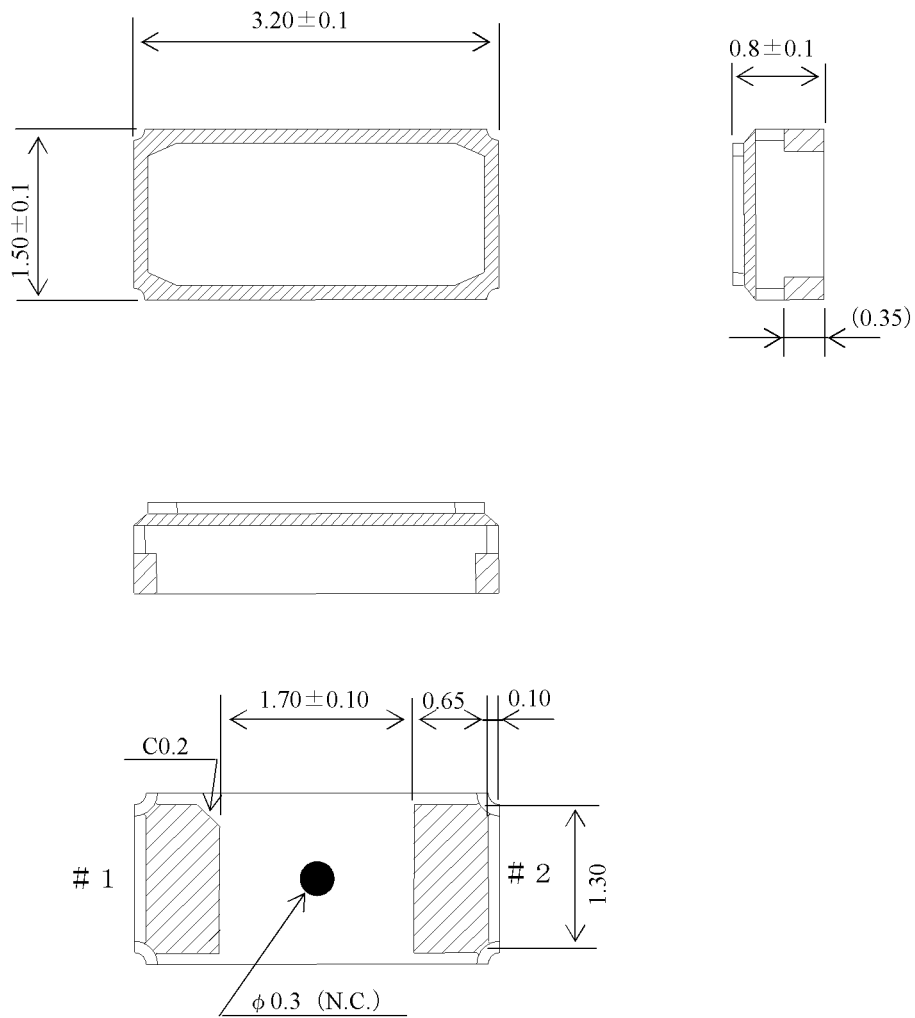
- ◆ Conditions of hot air convection reflow  
Pre heating temperature : + 170 °C  
Heating temperature : + 220 °C

Pre heating time : 100 s  
Heating time : 35 s

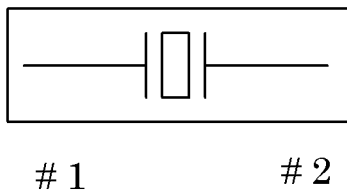


[ 5 ] Dimensions and Marking layout

1. Dimensions



2. Internal Connection

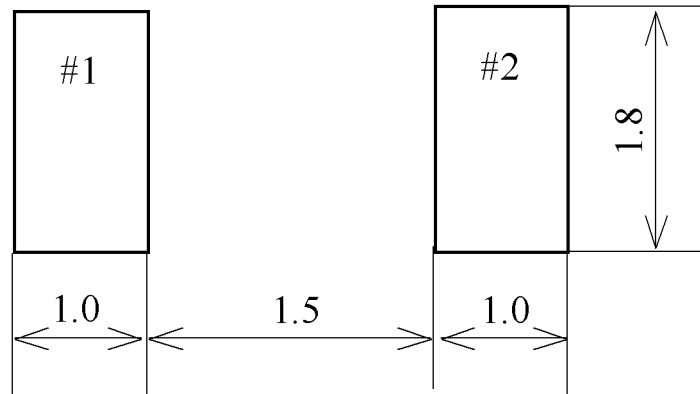


Package : Ceramic( $Al_2O_3$ )  
 Terminal Au plate :  $0.5 \mu m$  Min.  
 Lid : Glass

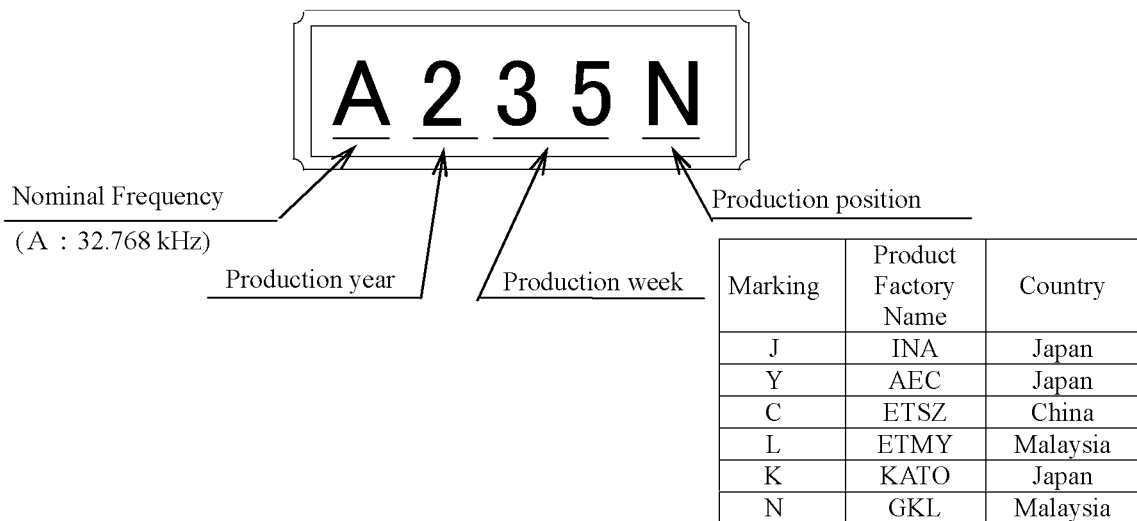
Type	FC-135	Terminal treatment	Au plating	Unit	1 = 1 mm
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### 3. Recommended soldering pattern

Unit : 1 = 1 mm



### 4. Marking layout



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

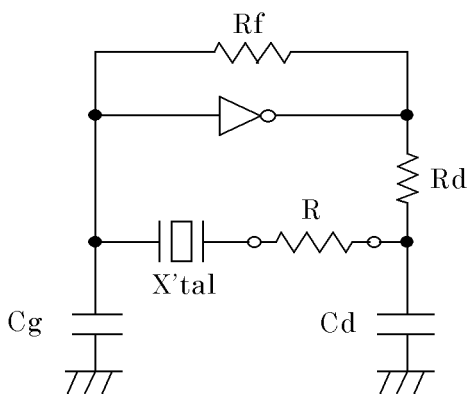
Type	FC-135	Unit	1 = 1 mm
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## [ 6 ] Notes

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.

# 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	
[ 4 ]	Marking	4
[ 5 ]	Quantity	
[ 6 ]	Storage environment	
[ 7 ]	Handling	

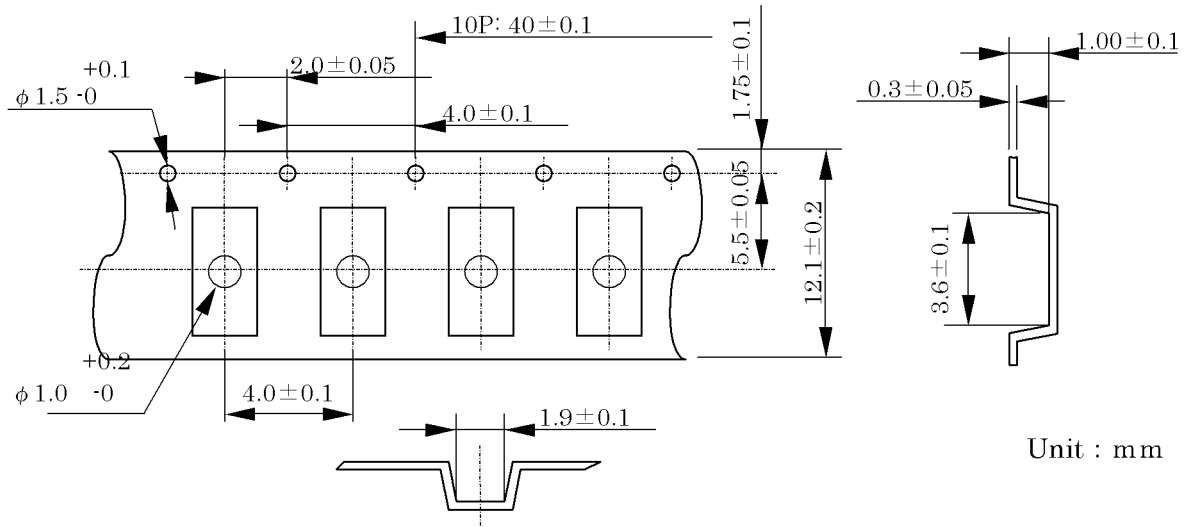
# [ 1 ] Taping specification

Subject to EIA-481 and IEC 60286

(1) Tape dimensions TE1204L

Material of the Carrier Tape : PS

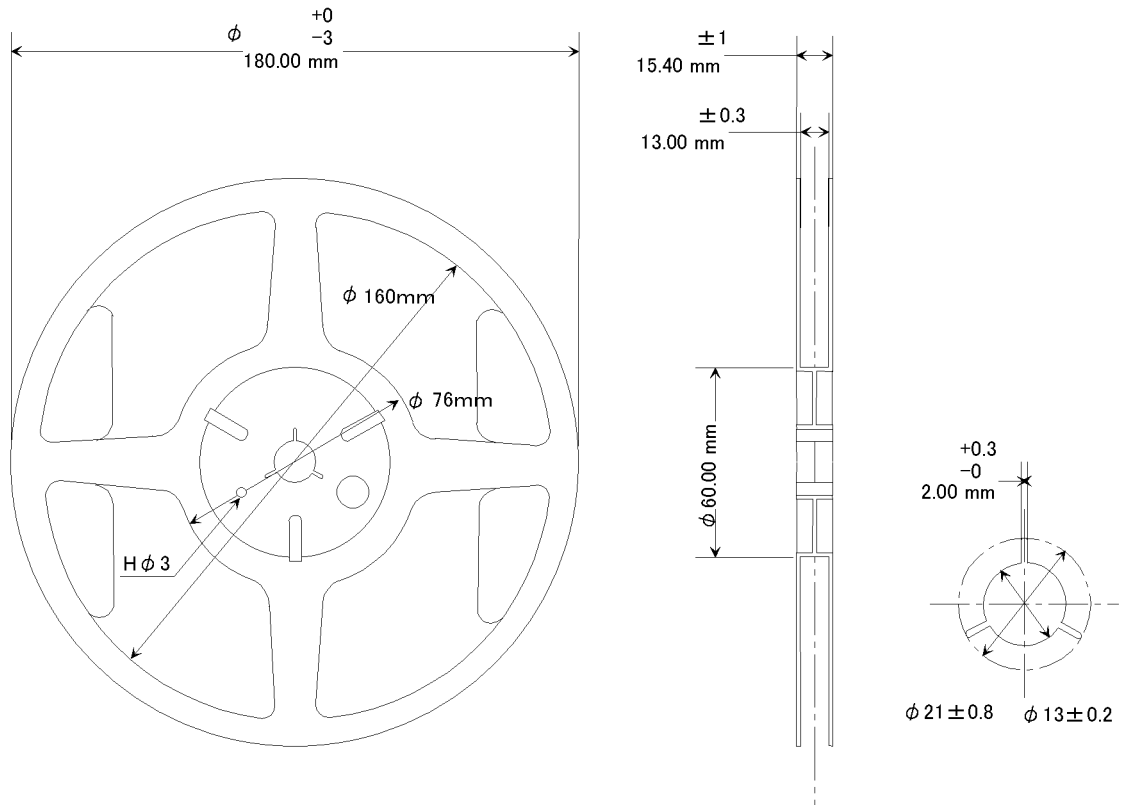
Material of the Top Tape : PET+PE



Unit : mm

(2) Reel dimensions EIAJRRM  $\phi 180$

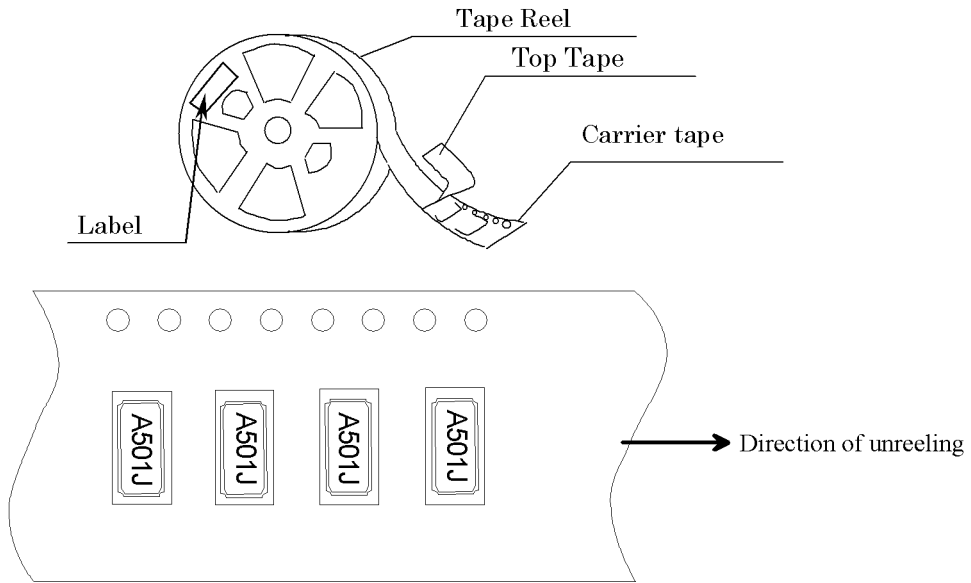
Material of the Reel : PS



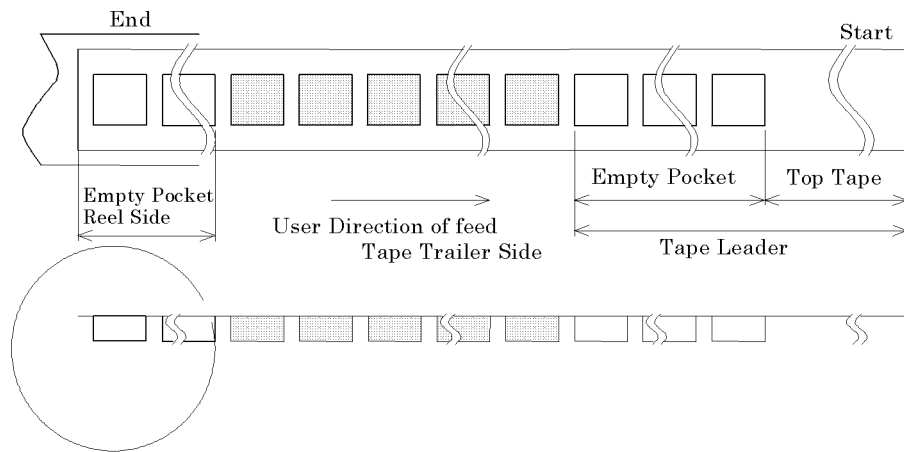
Form and Size of reel window shows are one of the example

(3) Packing

(a) Tape & Reel



(b) Start & End Point



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

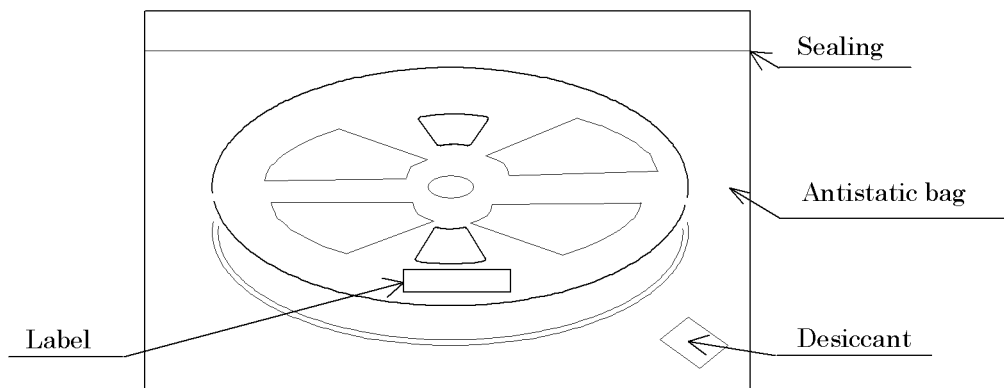
(4) Peel force of the cover tape

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

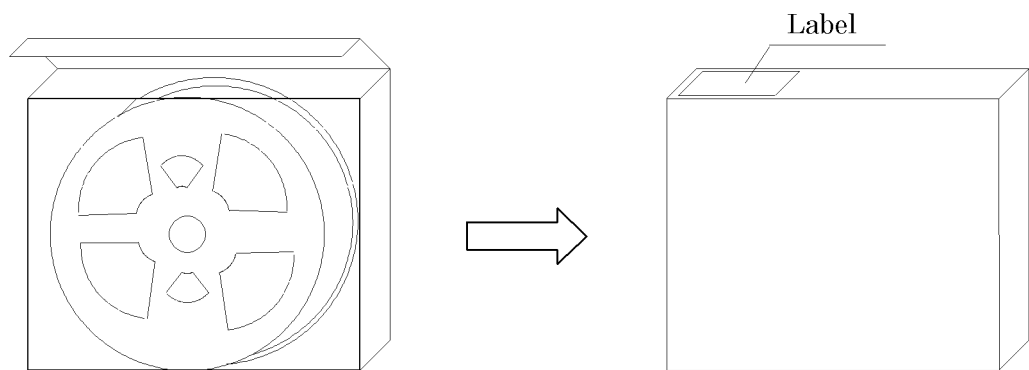
(b) peel speed : 300 mm/min

## [ 2 ] Inner Carton

### a) Packing to antistatic bag

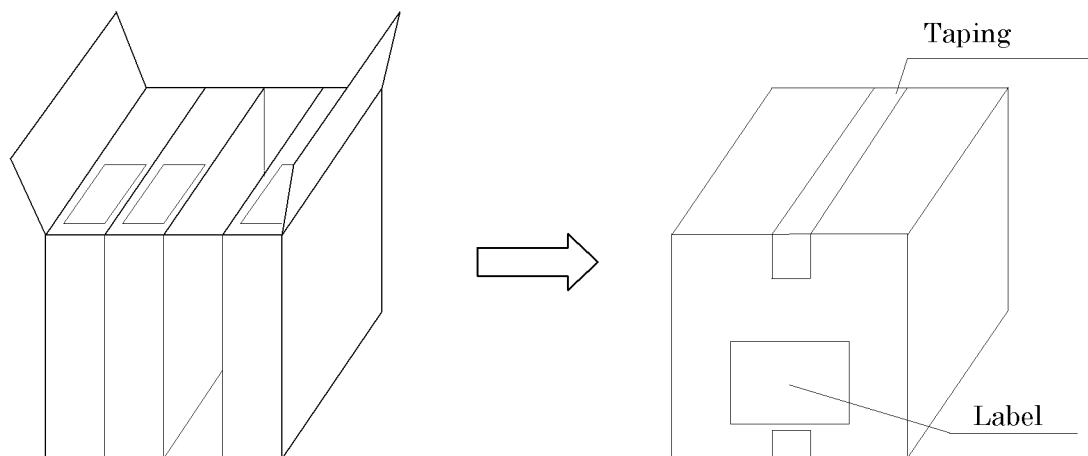


### b) Packing to innercarton



## [ 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.



#### [ 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

FC-135

No.C-0102-AIE-3

2008/7/29

Manufacturing process chart	No.	Section In Charge	Standards	Inspection Control Item	Inspection Methods	Instruments	Record
	1	Inspection Section (INA Plant QA)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Sampling Sampling	Visual Inspection Tool Microscope	In-coming Inspection Data Sheet
	2	INA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	3	INA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	4	INA Plant	Manufacturing Instruction Sheet	Appearance Height Measure	100% Inspection Sampling	Microscope Inspection Jig	Process Data Sheet
	5	INA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	6	INA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	7	INA Plant	Manufacturing Instruction Sheet	Frequency	100% Inspection	Frequency Adjust- ment Machine	Data Sheet
	8	INA Plant	Manufacturing Instruction Sheet	Appearance Marking Strength	100% Inspection Sampling	Microscope Rubbing Test	Process Data Sheet Data Sheet
	9	INA Plant	Manufacturing Instruction Sheet	Frequency Crystal Impedance Appearance	100% Inspection 100% Inspection 100% Inspection	Characteristics In- spection Machine Microscope	Process Data Sheet
	10	INA Plant	Specification Outgoing Inspection Standard	Electrical Characteristics Appearance Dimension	Sampling Sampling Sampling	Measuring Equipment Microscope Tool Microscope	Outgoing Inspection Data Sheet
	11	INA Plant	Packing Instruction Daily Shipping List	Customers Type Quantity	--- --- ---	--- --- ---	Shipment List

# PROCESS QUALITY CONTROL

FC-135

No.C-0102-AAE-5

2009/11/4

Manufacturing process chart	No.	Section In Charge	Standards	Inspection Control Item	Inspection Methods	Instruments	Record
<p>Crystal</p> <p>Base</p> <p>Lid</p> <p>1 In-coming Inspection</p> <p>2 Crystal Setting</p> <p>3 Mounting</p> <p>4 Lid Sealing</p> <p>5 Annealing</p> <p>6 Hermetic Sealing</p> <p>7 Frequency Adjustment</p> <p>8 Marking</p> <p>9 Finish Products Inspection &amp; Taping</p> <p>10 Outgoing Inspection</p> <p>11 Packing</p> <p>Shipping</p>	1	Inspection Section (AKITA EPSON QA)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Sampling Sampling	Visual Inspection Tool Microscope	In-coming Inspection Data Sheet
	2	AKITA EPSON	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	3	AKITA EPSON	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	4	AKITA EPSON	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
				Height Measure	Sampling	Inspection Jig	
	5	AKITA EPSON	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	6	AKITA EPSON	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	7	AKITA EPSON	Manufacturing Instruction Sheet	Frequency	100% Inspection	Frequency Adjust- ment Machine	Data Sheet
	8	AKITA EPSON	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
				Marking Strength	Sampling	Rubbing Test	Data Sheet
	9	AKITA EPSON	Manufacturing Instruction Sheet	Frequency	100% Inspection	Characteristics In- spection Machine	Process Data Sheet
Crystal Impedance				100% Inspection			
Appearance				100% Inspection	Microscope		
10	AKITA EPSON	Specification Outgoing Inspection Standard	Electrical Characteristics	Sampling	Measuring Equipment	Outgoing Inspection Data Sheet	
			Appearance	Sampling	Microscope		
			Dimension	Sampling	Tool Microscope		
11	AKITA EPSON	Packing Instruction Daily Shipping List	Customers	---	---	Shipment List	
			Type	---	---		
			Quantity	---	---		



# PROCESS QUALITY CONTROL

FC-135

No.C-0102-ASE-3

2008/7/29

Manufacturing process chart	No.	Section In Charge	Standards	Inspection Control Item	Inspection Methods	Instruments	Record
	1	Inspection Section (INA Plant QA)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Sampling Sampling	Visual Inspection Tool Microscope	In-coming Inspection Data Sheet
	2	CHINA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	3	CHINA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	4	CHINA Plant	Manufacturing Instruction Sheet	Appearance Height Measure	100% Inspection Sampling	Microscope Inspection Jig	Process Data Sheet
	5	CHINA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	6	CHINA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	7	CHINA Plant	Manufacturing Instruction Sheet	Frequency	100% Inspection	Frequency Adjust- ment Machine	Data Sheet
	8	CHINA Plant	Manufacturing Instruction Sheet	Appearance Marking Strength	100% Inspection Sampling	Microscope Rubbing Test	Process Data Sheet Data Sheet
	9	CHINA Plant	Manufacturing Instruction Sheet	Frequency Crystal Impedance	100% Inspection 100% Inspection	Characteristics In- spection Machine	Process Data Sheet
	10	CHINA Plant	Specification Outgoing Inspection Standard	Appearance Electrical Characteristics Dimension	100% Inspection Sampling Sampling	Microscope Measuring Equipment Microscope Tool Microscope	Outgoing Inspection Data Sheet
	11	CHINA Plant	Packing Instruction Daily Shipping List	Customers Type Quantity	--- --- ---	--- --- ---	Shipment List

# PROCESS QUALITY CONTROL

FC-135  
No.C-0102-AEE-3

2008/7/29

Manufacturing process chart		No.	Section In Charge	Standards	Inspection Control Item	Inspection Methods	Instruments	Record
	1	Inspection Section (INA Plant QA)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Sampling Sampling	Visual Inspection Tool Microscope	In-coming Inspection Data Sheet	
	2	MALAYSIA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	3	MALAYSIA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	4	MALAYSIA Plant	Manufacturing Instruction Sheet	Appearance Height Measure	100% Inspection Sampling	Microscope Inspection Jig	Process Data Sheet	
	5	MALAYSIA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	6	MALAYSIA Plant	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	7	MALAYSIA Plant	Manufacturing Instruction Sheet	Frequency	100% Inspection	Frequency Adjust- ment Machine	Data Sheet	
	8	MALAYSIA Plant	Manufacturing Instruction Sheet	Appearance Marking Strength	100% Inspection Sampling	Microscope Rubbing Test	Process Data Sheet Data Sheet	
	9	MALAYSIA Plant	Manufacturing Instruction Sheet	Frequency Crystal Impedance	100% Inspection 100% Inspection	Characteristics In- spection Machine	Process Data Sheet	
	10	MALAYSIA Plant	Specification Outgoing Inspection Standard	Electrical Characteristics Appearance Dimension	Sampling Sampling Sampling	Measuring Equipment Microscope Tool Microscope	Outgoing Inspection Data Sheet	
	11	MALAYSIA Plant	Packing Instruction Daily Shipping List	Customers Type Quantity	--- --- ---	--- --- ---	Shipment List	

# PROCESS QUALITY CONTROL

FC-135

No.C-0102-AKE-1

2008/7/29

Manufacturing process chart	No.	Section In Charge	Standards	Inspection Control Item	Inspection Methods	Instruments	Record
	1	Inspection Section (INA Plant QA)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Sampling Sampling	Visual Inspection Tool Microscope	In-coming Inspection Data Sheet
	2	SUB-CONTRACTOR	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	3	SUB-CONTRACTOR	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
	4	SUB-CONTRACTOR	Manufacturing Instruction Sheet	Appearance Height Measure	100% Inspection Sampling	Microscope Inspection Jig	Process Data Sheet
	5	SUB-CONTRACTOR	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet
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	8	SUB-CONTRACTOR	Manufacturing Instruction Sheet	Appearance Marking Strength	100% Inspection Sampling	Microscope Rubbing Test	Process Data Sheet Data Sheet
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# PROCESS QUALITY CONTROL

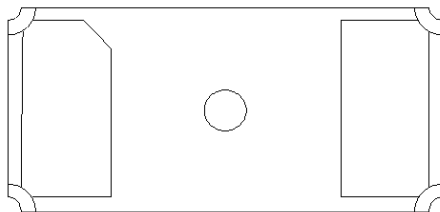
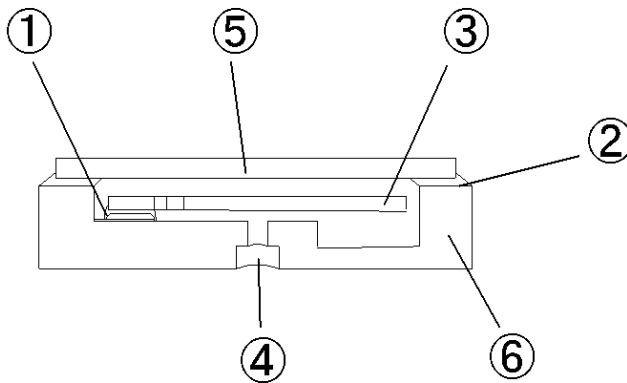
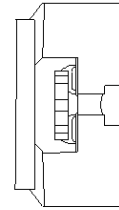
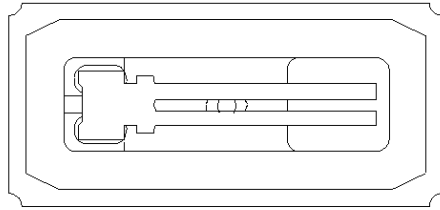
FC-135

No.C-0102-AGE-1

2008/7/29

Manufacturing process chart		No.	Section In Charge	Standards	Inspection Control Item	Inspection Methods	Instruments	Record
	1	Inspection Section (INA Plant QA)	Purchasing Specification Incoming Inspection Standard	Appearance Dimension	Sampling Sampling	Visual Inspection Tool Microscope	In-coming Inspection Data Sheet	
	2	SUB-CONTRACTOR of ETTY	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	3	SUB-CONTRACTOR of ETTY	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	4	SUB-CONTRACTOR of ETTY	Manufacturing Instruction Sheet	Appearance Height Measure	100% Inspection Sampling	Microscope Inspection Jig	Process Data Sheet	
	5	SUB-CONTRACTOR of ETTY	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
	6	SUB-CONTRACTOR of ETTY	Manufacturing Instruction Sheet	Appearance	100% Inspection	Microscope	Process Data Sheet	
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	10	SUB-CONTRACTOR of ETTY	Specification Outgoing Inspection Standard	Electrical Characteristics Appearance Dimension	Sampling Sampling Sampling	Measuring Equipment Microscope Tool Microscope	Outgoing Inspection Data Sheet	
	11	SUB-CONTRACTOR of ETTY	Packing Instruction Daily Shipping List	Customers Type Quantity	--- --- ---	--- --- ---	Shipment List	

## Structure diagram FC-135



LIST		
	Name of part	Material
①	Crystal Adhesive	Ag Paste
②	Sealing	Seal Glass
③	Chip	Crystal
④	Sealing	Au/Ge
⑤	Lid	Glass
⑥	Package	Ceramic (Al <sub>2</sub> O <sub>3</sub> )

RELIABILITY TEST DATA  
**Product Name : FC-135**

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition . No. **F-C-0102-04-007EMH**

No.	ITEM	TEST CONDITIONS	VALUE *1 *2		TEST	FAIL
			$\Delta f / f$ [1 × 10 <sup>-6</sup> ]		Qty [ n ]	Qty [ n ]
1	Shock	100 g dummy (Epson Toyocom Standard) drop from 1 500 mm height on to the concrete 3 directions 10 times	*3	± 8	22	0
2	Vibration	10 Hz to 55 Hz amplitude 0.75 mm 55 Hz to 500 Hz acceleration 98 m/s <sup>2</sup> 10 Hz → 500 Hz → 10 Hz 15 min / cycle 6 h ( 2 h × 3 directions )	*3	± 3	22	0
3	Resistance to soldering heat	For air reflow soldering furnace (2 times)		± 5	22	0
4	High temperature storage	a) +125°C × 1 000 h b) +85 °C × 1 000 h	*3 *3	a) ± 10 b) ± 7	a) 22 b) 22	a) 0 b) 0
5	Low temperature storage	-55 °C × 1 000 h	*3	± 10	22	0
6	Temperature humidity storage	+85 °C × 85 %RH × 1 000 h	*3	± 10	22	0
7	Temperature cycle	-55 °C ⇔ +125 °C 30 min at each temp. 100 cycles	*3	± 10	22	0
8	Sealing	For He leak detector	*3	1 × 10 <sup>-8</sup> hPa · l / s Max.	11	0
9	Shear	20 N press for 10 s ± 1 s Ref. IEC 60068-2-21		No peeling - off at a solder part	11	0
10	Pull - off	20 N press for 10 s ± 1 s Ref. IEC 60068-2-21		No peeling - off at a solder part	11	0
11	Substrate bending	Bend width reaches 3 mm and hold for 5 s ± 1 s × 1 time Ref. IEC 60068-2-21		No peeling - off at a solder part	11	0
12	Solvent resistance	Ref. JIS C 0052 or IEC 60068-2-45		The marking shall be legible	11	0

Notes

\*1 Each test done independently.

\*2 Measuring 2 h to 24 h later leaving in room temperature after each test. DL : 0.5 μW

\*3 Pre conditionings Initial value shall be after 24 h at room temperature.

Shift of series resistance at before and after the test should be less than ±20 % or less than ±15 kΩ.

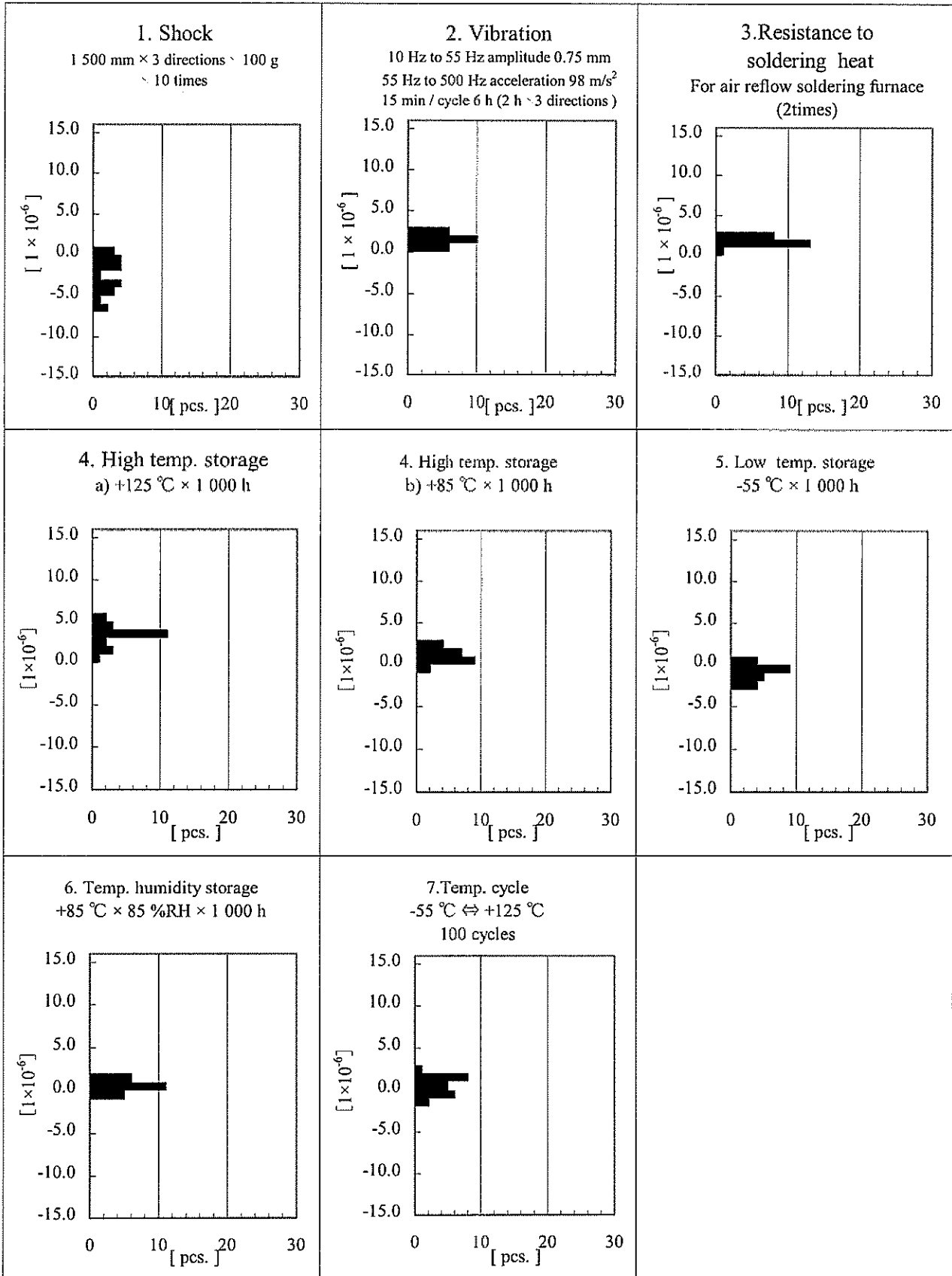
In case high temperature storage(+125 °C × 1 000 h), Soldering heat resistance, shift of series resistance at before and after the test should be less than ±30 % or ±20 kΩ.

**Qualification Data**

# Product Name : FC-135

$\Delta f / f$

No. F-C-0102-04-008EMH



**Product Name : FC-135**

Δ CI

No. F-C-0102-04-009EMH

