INFORMATION

MODEL : **MC-30A**

INFO. No. : **Q14-046-8B**

DATE : **May. 27. 2014**

SEIKO EPSON CORPORATION

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Minowa-machi Kamiina-gun
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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) RoHS compliant
   MC-30A contains lead in high 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.

Model

The model is MC-30A.

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	
2	Maximum level of drive	GL		1.0		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		0.1		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	$\times 10^{-6}$	CL = 12.5 pF Ta = + 25 ± 3°C Not include aging
3	Quality factor		Q	5.0 Min.	$\times 10^{4}$	Decay method
4	Motional resistance		R1	50 Max.	kΩ	CI meter : Saunders 140B Level of drive : 1.0 μW
5	Motional capacitance		C1	1.8 Typ.	fF	
6	Shunt capacitance		C0	0.9 Typ.	pF	
7	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.	$\times 10^{-6}$ /°C^2	
8	Isolation resistance		IR	500 Min.	MΩ	DC 100 V ± 15, 60 seconds Between terminal # 1 and terminal # 4
9	Frequency Aging		f_age	± 3	$\times 10^{-6}$/year	Ta = + 25 °C ± 3 °C

[4] Environmental and Mechanical characteristics

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

No.	Items	Value*1*2 $\Delta f/f$ [1×10^{-6}]	Conditions
1	Drop	± 5	Free drop from 1 000 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	High Temperature bias	*3 ± 20	+ 85 °C × 1 000 h (Bias , Drive level ; 0.1 μW)
5	Low temperature storage	*3 ± 20	- 55 °C × 1 000 h
6	Temperature cycle	*3 ± 20	- 40 °C ⇔ + 85 °C 30 min. at each temp. 1 000 cycles
7	Temperature humidity storage	*3 ± 20	+ 8 5°C × 85 %RH × 1 000 h
8	Soldering heat resistance	± 5	For convention reflow soldering furnace (2 times)
9	Shear	No peeling-off at a soldered part	20 N press the side for 10 ± 1 s Ref. IEC 60068-2-21
10	Pull - off	No peeling-off at a soldered part	10 N press the side for 10 ± 1 s. Ref. IEC 60068-2-21
11	Solvent resistance	The marking shall be legible	Ref. JIS C 0052 or IEC 60068-2-45
12	Solderability	Termination must be 95 % covered with fresh solder	Dip termination into solder bath at + 235 °C ± 5 °C for 3 s (Using Rosin Flux)

< Notes >

*1 Each test done independently.

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

*3 Pre conditionings

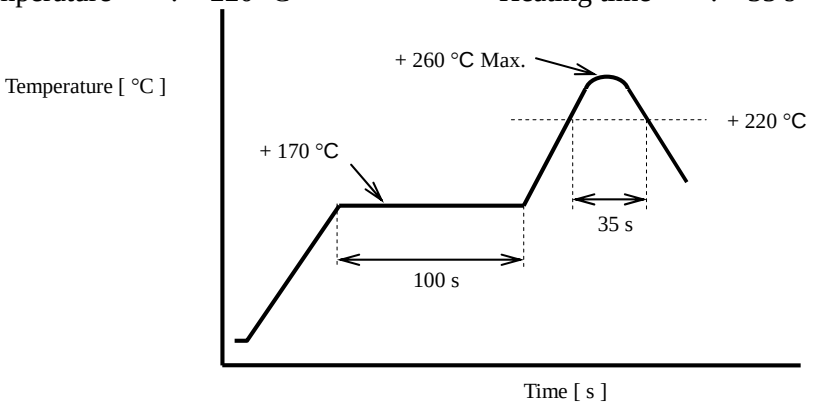
1. + 125 °C × 24 h to + 85 °C × 85 %RH × 48 h ± 1 h→ reflow 2 times
2. Initial value shall be after 24 h at room temperature.

Shift of series resistance at before and after the test should be less than ± 60 kΩ.

♦ Air-reflow

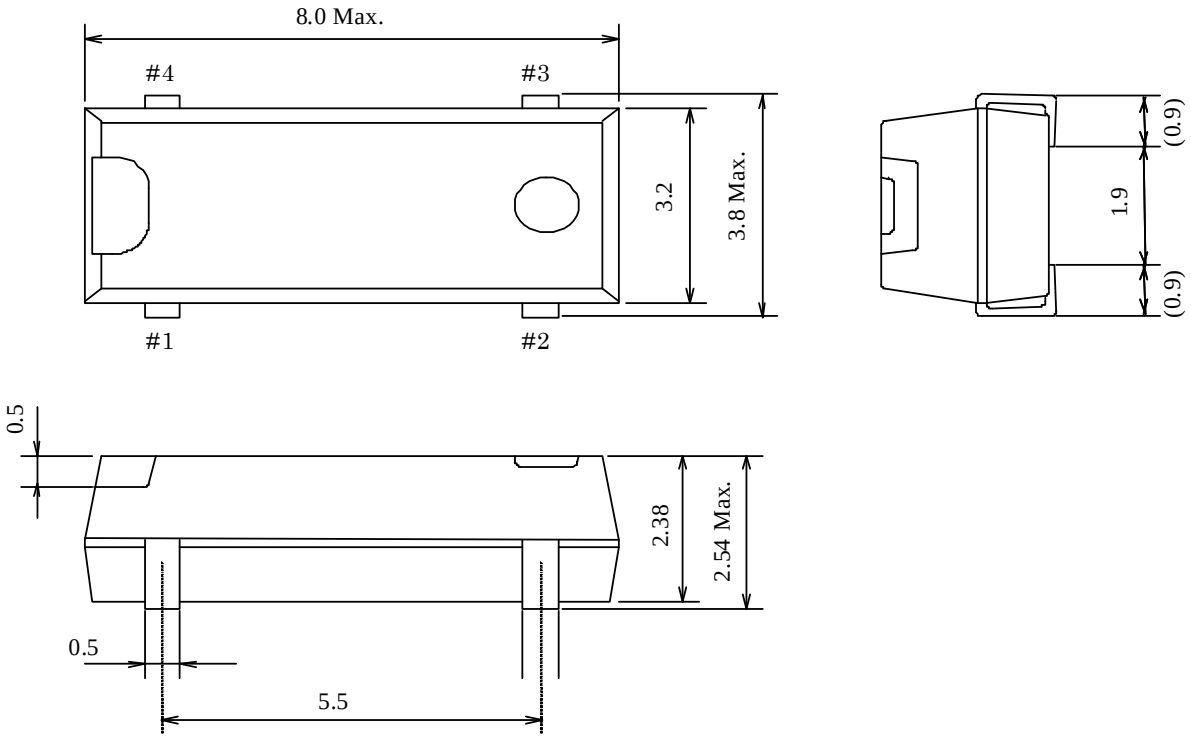
Pre heating temperature : + 170 °C Pre heating time : 100 s

Heating temperature : + 220 °C Heating time : 35 s



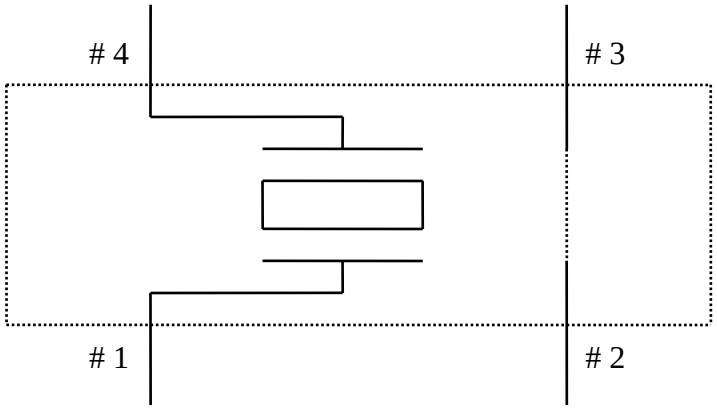
[5] Dimensions and marking layout

1. Dimensions



Metal may be exposed on the top or bottom of this product.
This will not affect any quality, reliability or electrical spec.

2. Circuit location

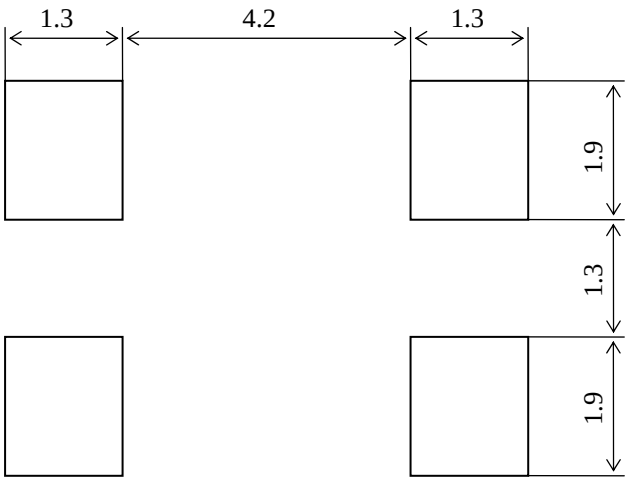


Do not connect # 2 and # 3 terminals to any external terminals.

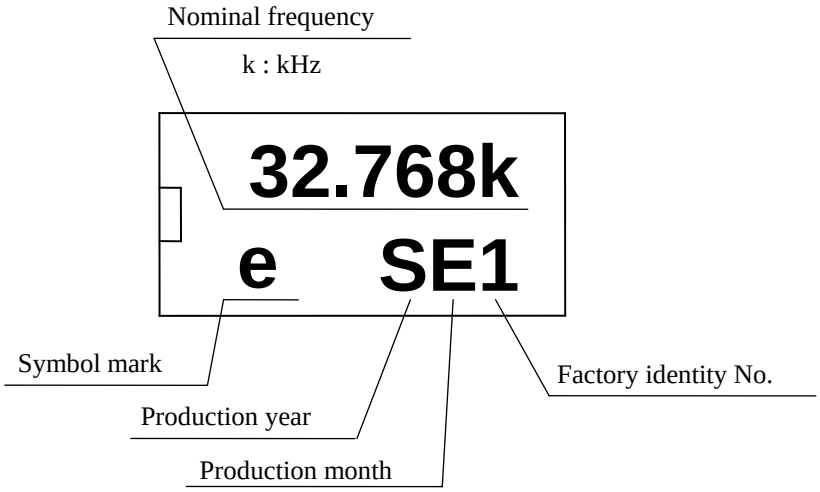
Type	MC-30A	Terminal treatment	Pb Free Solder plate	Unit	1 = 1 mm

3. Recommendable patterning

Unit : 1 = 1 mm



4. Marking layout



Symbol of Manufacturing year

Year digit	1	2	3	4	5	6	7	8	9	0
Marking (Sn plate)	M	N	R	S	T	U	V	W	X	Z

Year digit(1st) of the Production

Symbol of Manufacturing month

Month digit	1	2	3	4	5	6	7	8	9	10	11	12
Marking (Halide free)	A	B	C	D	E	F	G	H	J	K	L	M

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

[6] Notes

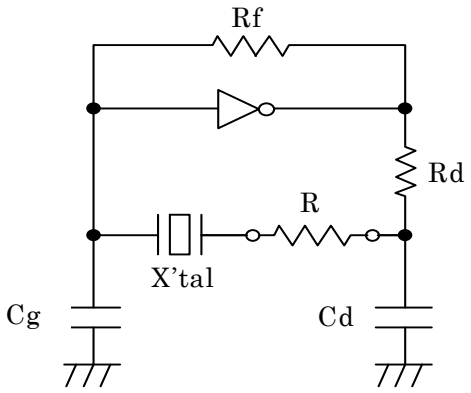
1. Max two (2) times reflow is allowed. Once miss soldering is happened, hand work soldering by soldering iron is recommended. (+ 350 °C × within 5 s)

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 MC-306 and MC-30A.

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	

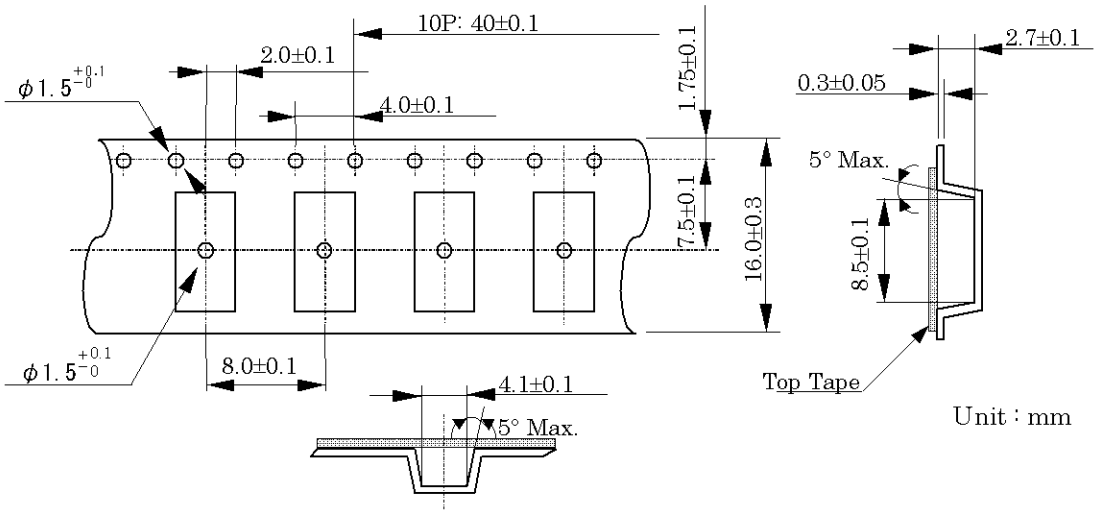
[1] Taping specification

Subject to EIA-481 and IEC 60286.

(1) Tape dimensions TE1608L

Material of the Carrier Tape : PS

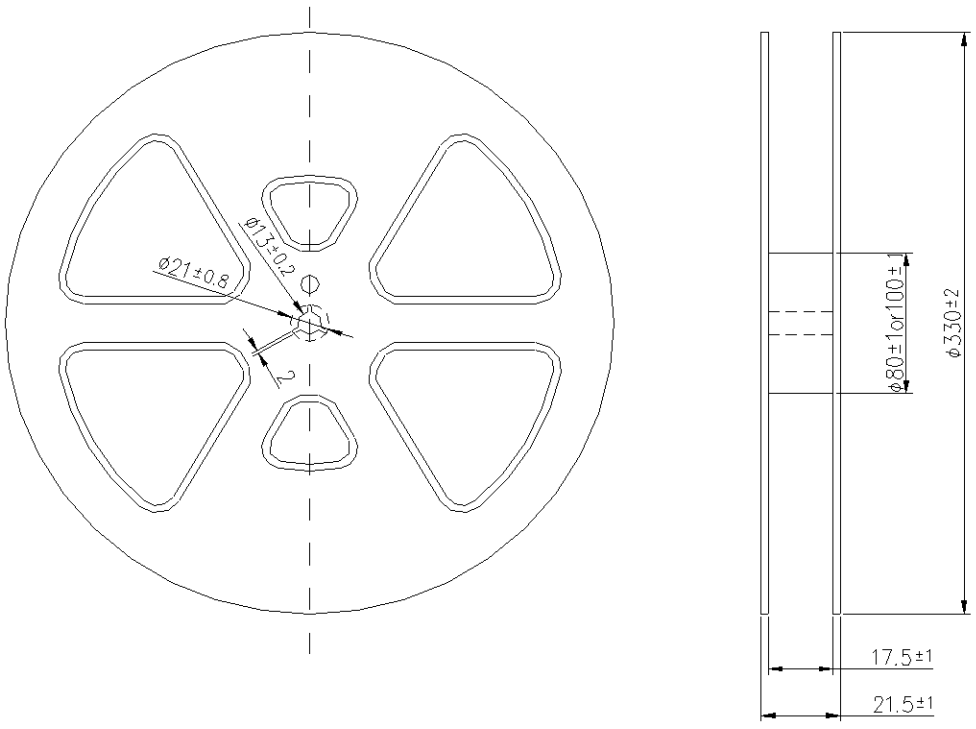
Material of the Top Tape : PET+PE



Unit : mm

(2) Reel dimensions

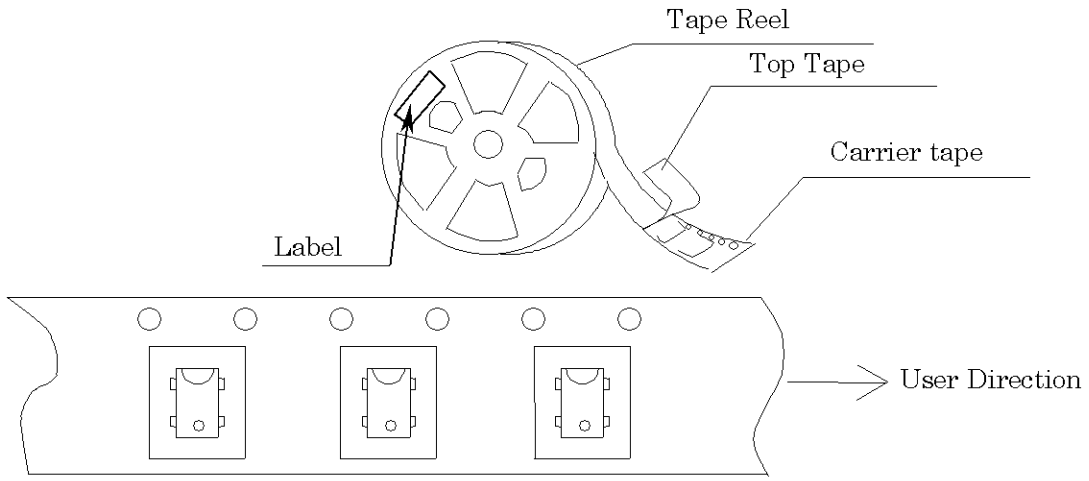
Material of the Reel : PS



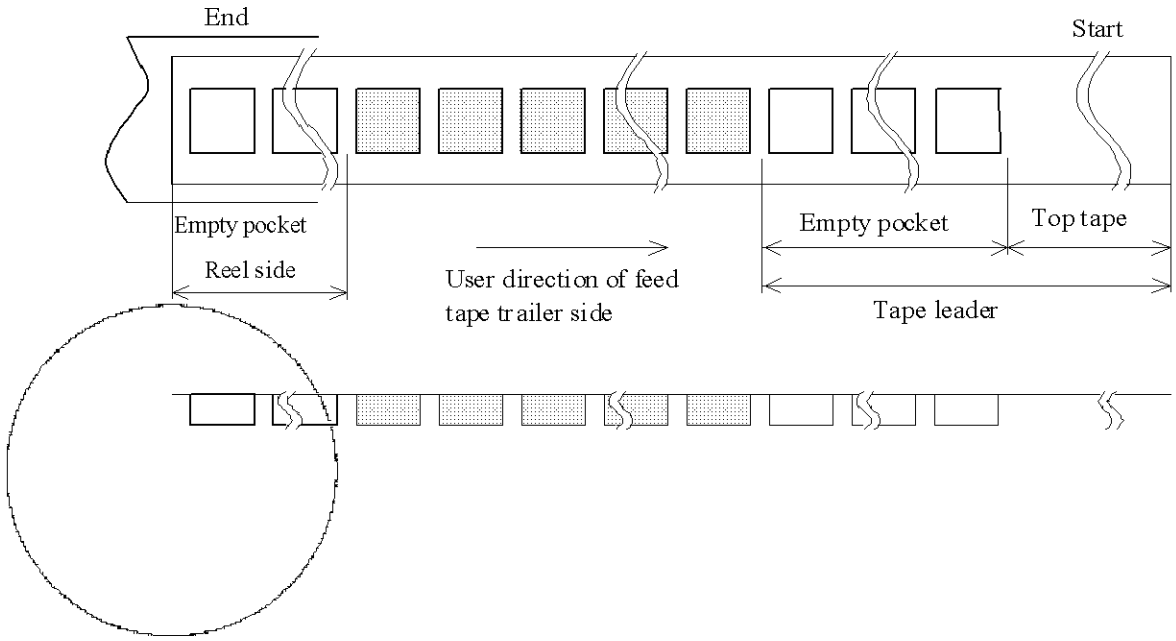
Form and Size of reel window shows are one of the example

(3) Packing

(a) Tape & Reel



(b) Start & End Point



(c) Peel force of the cover tape

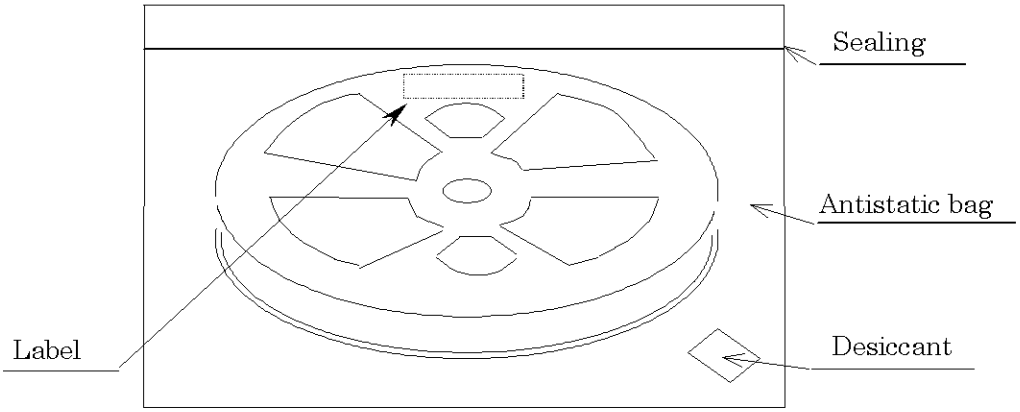
(1) angle : cover tape during peel off and the direction of unreeling shall be 165° to 180°.

(2) peel speed :300 mm/min

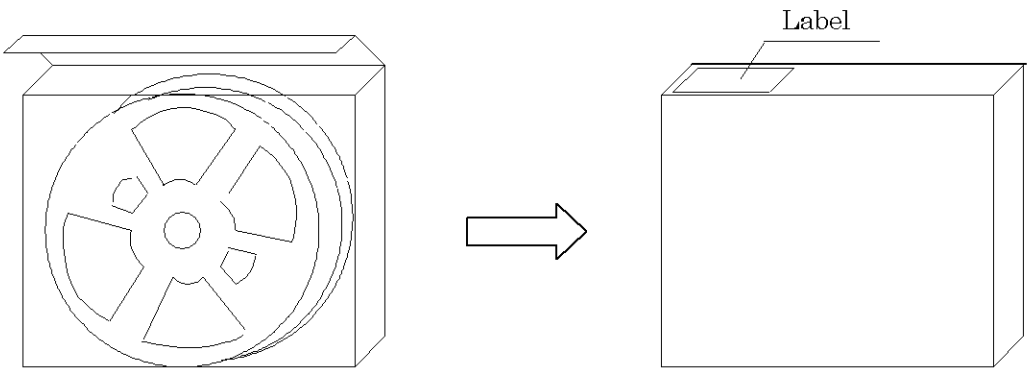
Item		Empty Space
Tape Leader	Top Tape	Min. 1 000 mm
	Carrier Tape	Min. 80 mm
Tape Trailer	Top Tape	Min. 0 mm
	Carrier Tape	Min. 80 mm

[2] Inner Carton

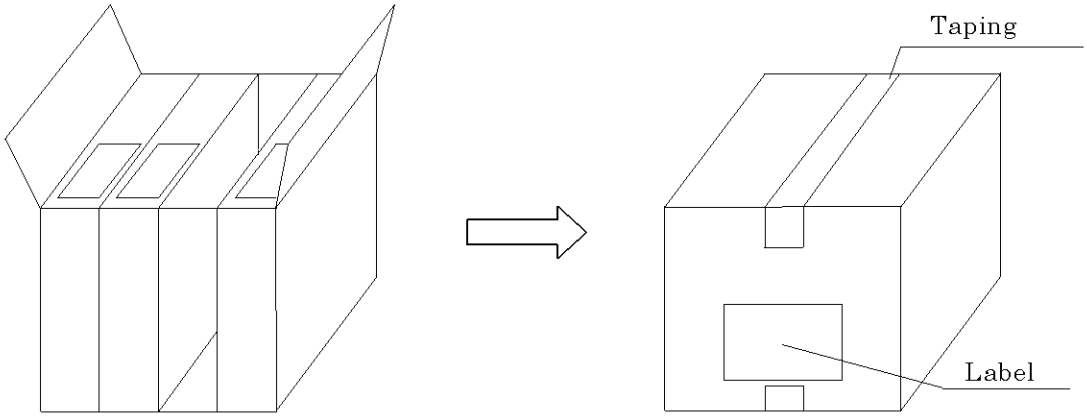
a) Packing to antistatic bag



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

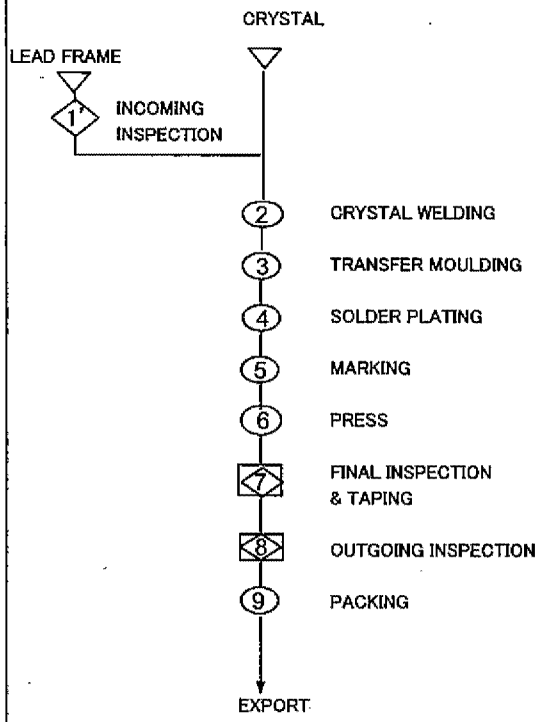
To handle with care to prevent the damage of tape, reel and products.

QC PROCESS FLOW SHEET

CODE : MC-30A

Control No : C-0201-AGE-3

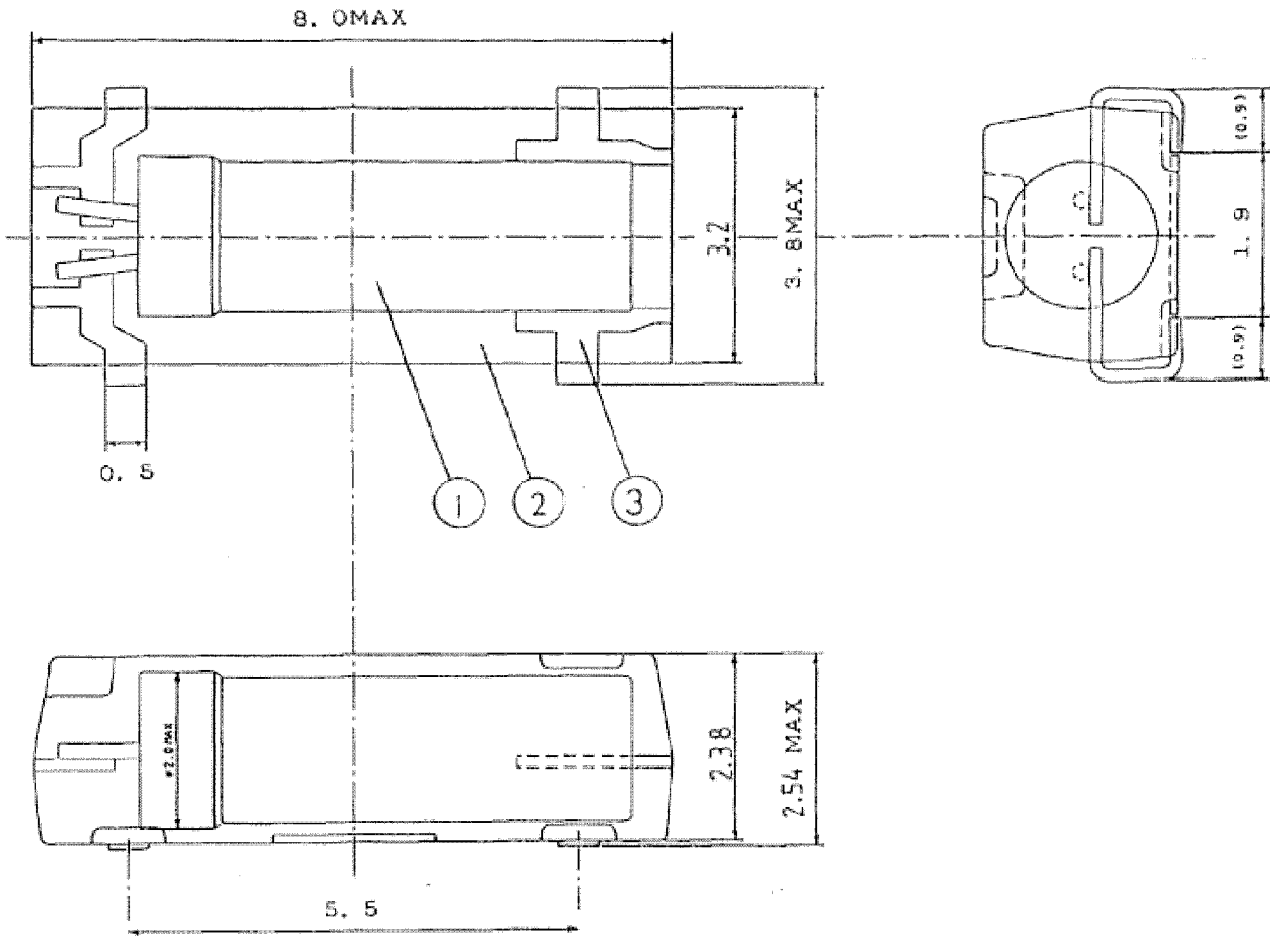
27-May-2013



No	RESPONSIBLE SECTION	STANDARD AND SPECIFICATIONS	INSPECTION AND CONTROL ITEMS	INSPECTION METHORD	MEASURING INSTRUMENTS	DATA COLLECTION
1'	MALAYSIA PLANT (Sub-Contractor)	PURCHASE SPECIFICATION INCOMING INSPECTION STD.	APPEARANCE DIMENSION	SAMPLING SAMPLING	MICROSCOPE MS SCALE SCOPE	RECORD SHEET
2	MALAYSIA PLANT (Sub-Contractor)	MANUFACTURING INSTRUCTION	APPEARANCE STRENGTH	100% INSPECTION SAMPLING	MICROSCOPE PUSH&PULL GAUGE	RECORD SHEET -
3	MALAYSIA PLANT (Sub-Contractor)	MANUFACTURING INSTRUCTION	APPEARANCE	SAMPLING	MICROSCOPE	RECORD SHEET
4	MALAYSIA PLANT (Sub-Contractor)	SOLDER PLATING SPECIFICATION SHEET	S.P THICKNESS APPEARANCE	SAMPLING SAMPLING	FLUOROSCOPE MICROSCOPE	RECORD SHEET
5	MALAYSIA PLANT (Sub-Contractor)	MANUFACTURING INSTRUCTION	APPEARANCE	SAMPLING	MICROSCOPE	RECORD SHEET
6	MALAYSIA PLANT (Sub-Contractor)	MANUFACTURING INSTRUCTION	APPEARANCE DIMENSION	SAMPLING SAMPLING	MICROSCOPE INSPECTION JIG	RECORD SHEET
7	MALAYSIA PLANT (Sub-Contractor)	MANUFACTURING INSTRUCTION	ELECTRICAL CHARACTERISTIC TAPING STRENGTH	100% INSPECTION SAMPLING	F0 CHECKING By m/c STRENGTH TESTER	RECORD SHEET
8	MALAYSIA PLANT (Sub-Contractor)	QUALITY STD.	ELECTRICAL CHARACTERISTIC OUTER APPEARANCE TAPING OUTER APPEARANCE	SAMPLING SAMPLING 100% INSPECTION	T0&CI CHECKER MICROSCOPE MICROSCOPE	RECORD SHEET
9	MALAYSIA PLANT (Sub-Contractor)	MANUFACTURING INSTRUCTION PACKING INSTRUCTION THE LIST OF EXPORT DAILY BASE	EXPORT CUSTOMER LIST FREQUENCY QUANTITY	----	----	EXPORT DOCUMENTS

MC-30A Structure diagram

Unit : mm



No.	Name of Part	Material	Remarks
③	Lead	42Alloy	Sn P
②	Molding	Epoxy Compound (Halide free)	————
①	Crystal C-002SH	————	————

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RELIABILITY TEST DATA
Product Name : MC-30A

The Company evaluation condition
We evaluate environmental and mechanical characteristics by the following test condition . **No. F-M-0614-08-001E**

No.	ITEM	TEST CONDITIONS	VALUE *1 *2 Δf/f [1 × 10^{-6}]	TEST Qty [n]	FAIL Qty [n]
1	Drop	Free drop from 1 000 mm height on a hard wooden board for 3 times (Board is thickness more than 30 mm)	± 5	22	0
2	Vibration	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 h × 3 directions)	± 3	22	0
3	High temperature storage	a) +125 °C× 1 000 h b) + 85 °C × 1 000 h	*2*3 a) ± 20 *2*3 b) ± 10	a) 22 b) 22	a) 0 b) 0
4	High temperature bias	+85 °C×1 000 h × 0.1μW	*2*3 ± 20	22	0
5	Low temperature storage	-55 °C×1 000 h	*2*3 ± 20	22	0
6	Temperature cycle	-40 °C ⇔ +85 °C 30 min at each temp. 1 000 cycles	*2*3 ± 20	22	0
7	Temperature humidity storage	+85 °C× 85 %RH × 1 000 h	*2*3 ± 20	22	0
8	Resistance to soldering heat	Reflow furnace with the condition 2 times	*2 ± 5	22	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	10 N press for 10 s ± 1 s Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
11	Solvent resistance	Ref. JIS C 0052 or IEC 60068-2-45	The marking shall be legible	11	0
12	Solderability	Dip termination into solder bath at +235 °C± 5 °C for 3 s (Using Rosin Flux)	Termination must be 95 % covered with fresh solder	11	0

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 1. +125 °C24 h to +85 °C 85 % 48 h ± 1 h → reflow 2 times
   2. Initial value shall be after 24 h at room temperature.
4. Motional resistance after testing above should be less than 60 kΩ.

Qualification Data

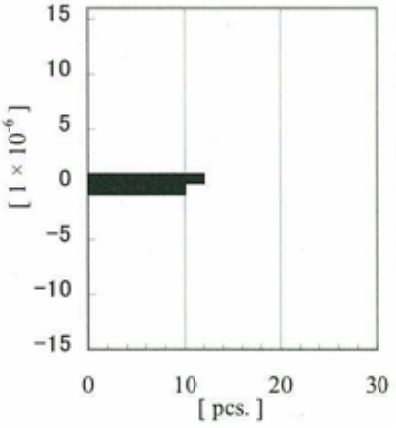
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Product Name : MC-30A

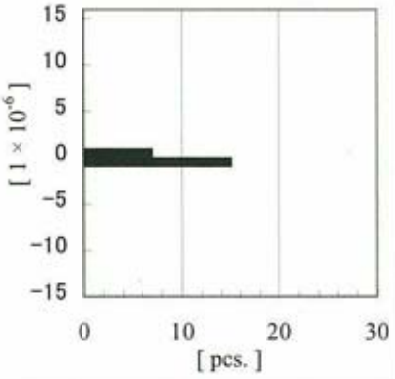
Frequency Shift Rate (Δf/f)

No. F-M-0614-08-002E

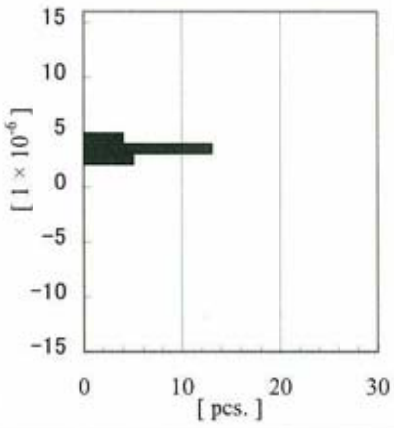
1.Drop
1 000 mm × 3 tim



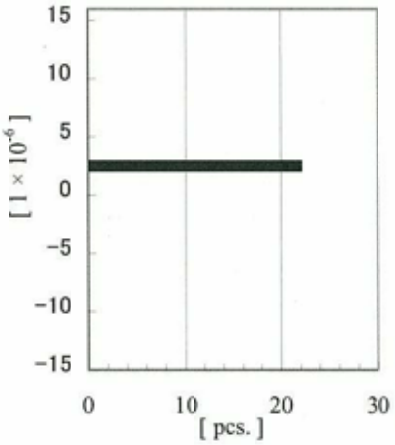
2. Vibration
10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz acceleration 98 m/s²
15 min / cycle 6 h (2 h ×3 directions)



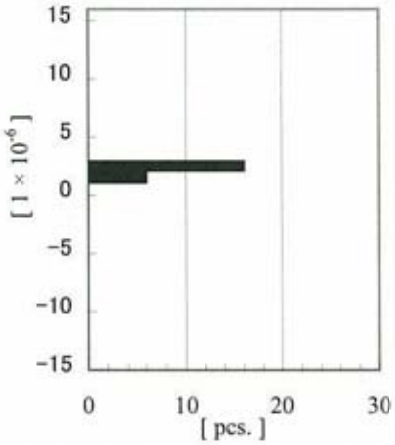
3.High tem.pstoage
a) +125 °C × 1 000 h



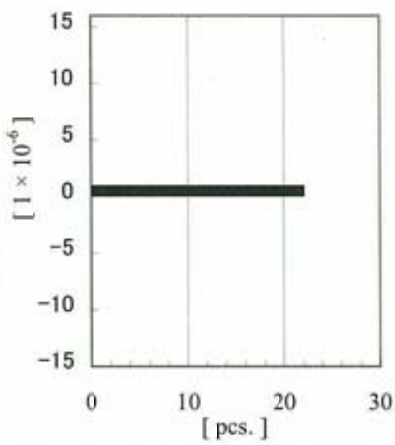
3. High temp. storage
b) +85 °C × 1 000 h



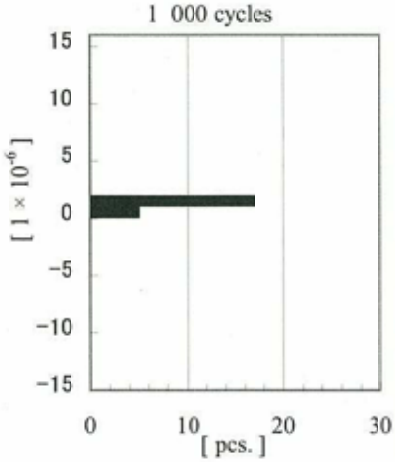
4. High temp. bias
+85 °C × 1 000 h × 0.1μW



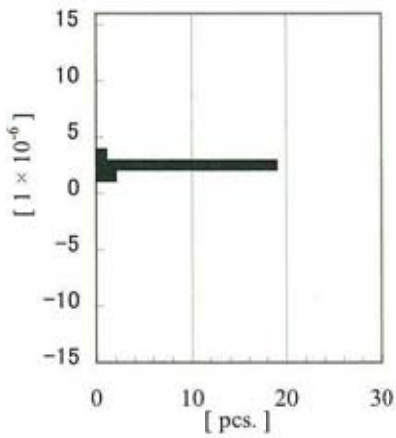
5. Low temp. storage
-55 °C× 1 000 h



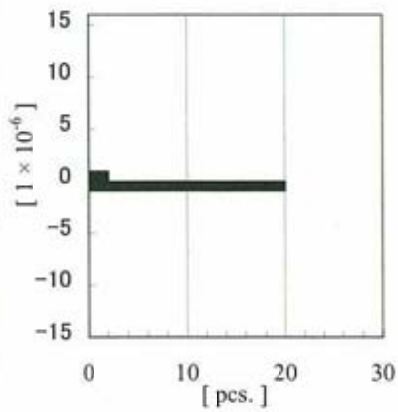
6. Temp. cycle
-40 °C⇔ +85 °C
1 000 cycles



7. Temp. humidity storage
+85 °C× 85 %RH × 1 000 h



8. Resistance to soldering heat
For convention reflow furnace
(2 times)



Qualification Data

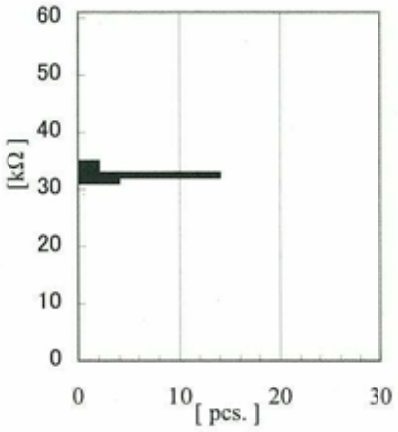
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Product Name : MC-30A

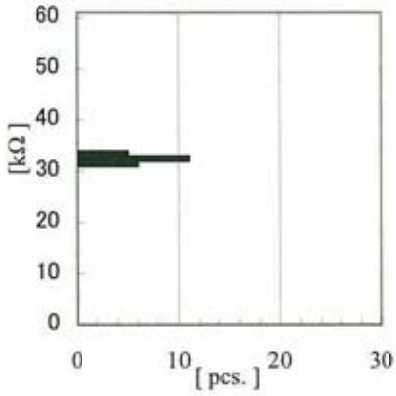
Motional resistance

No. F-M-0614-08-003E

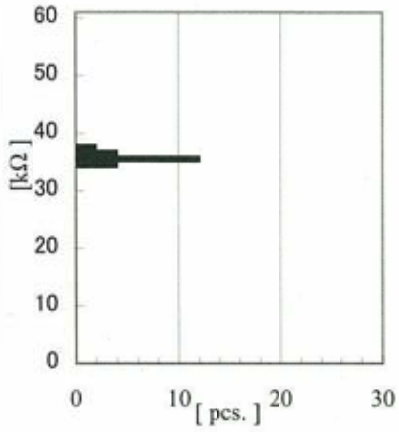
1. Drop
1 000 mm × 3 times



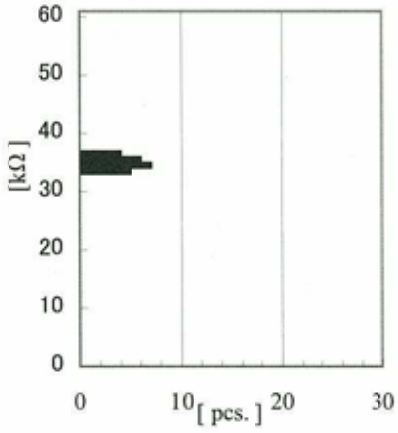
2. Vibration
10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz acceleration 98 m/s^2
15 min / cycle 6 h (2 h ×3 directions)



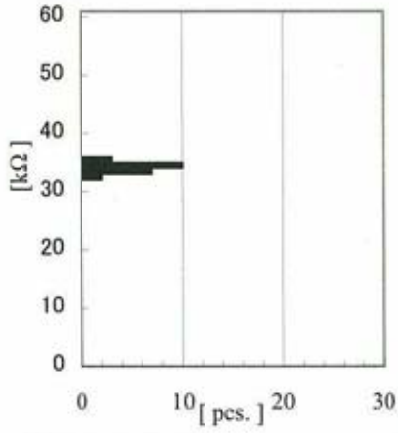
3. High temp. storage
a) +125 °C × 1 000 h



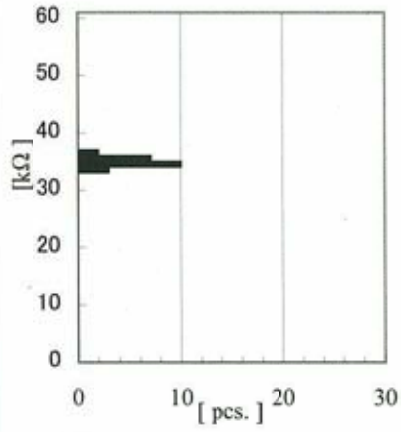
3. High temp. storage
b) +85 °C× 1 000 h



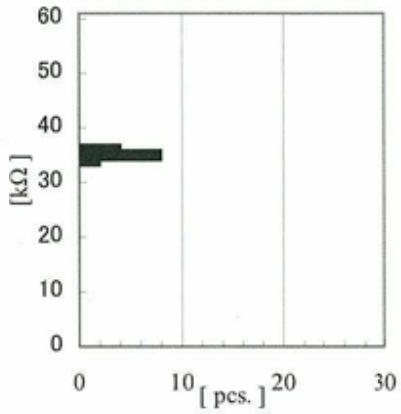
4. High temp. bias
+85 °C× 1 000 h× 0.1μW



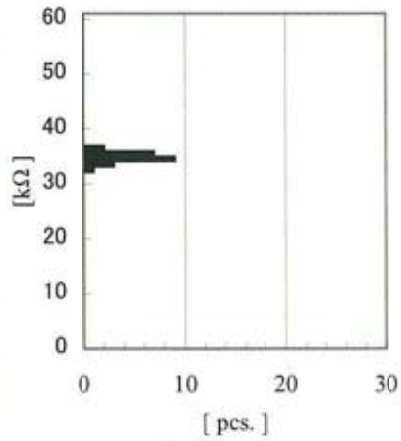
5. Low temp. storage
-55 °C× 1 000 h



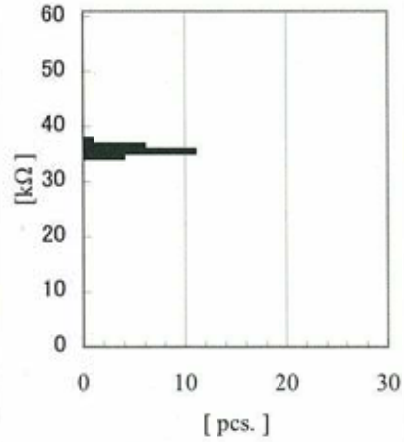
6. Temp. cycle
-40°C ⇔+85°C
1 000 cycles



7. Temp. humidity storage
+85°C× 85 %RH × 1 000 h



8. Reflow furnace with the condition 2 times



Qualification Data