RECIPIENT

SPECIFICATIONS

MODEL: **FA-20H**

SPEC. No. : **A06-608-1B**

DATE: **Dec. 11. 2006**

EPSON TOYOCOM CORPORATION

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SPECIFICATIONS

1. Application

This document is applicable to the crystal unit that are delivered
To Plantronics Communications Technology (Suzhou)Co.,Ltd from Epson Toyocom Corp.

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

2. Model

The model is FA-20H.

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 are subject to the agreement between the two parties.

6. Contents

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[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	-20 °C	—	+75 °C
2	Level of drive	DL	10 μW	—	100 μW

[3] Electrical characteristics

No.	Parameter	Symbol	Standard	Conditions
1	Nominal frequency	f	16 MHz	Fundamental
2	Frequency tolerance	f_tol	± 10 × 10^{-6}	CL = 9 pF Ta = +25 °C±3 °C Drive level : 100 μW Not include aging
3	Motional resistance	R1	80 ΩMax	π circuit JIS C6701 Drive level : 100 μW Ta = -20 °C to +75 °C
4	Shunt capacitance	C0	2 pF Max	
5	Frequency versus temperature characteristics	f_tem	± 12 × 10^{-6}	Ta = -20 °C to +75 °C (1 × 10^{-6} at +25 °C±3 °C) Drive level : 100 μW
6	Isolation resistance	IR	500 MΩ Min.	DC 100V × 60 sec. between each terminals
7	Frequency aging	f_age	± 2 × 10^{-6} / year	Ta = +25 °C±3 °C 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.

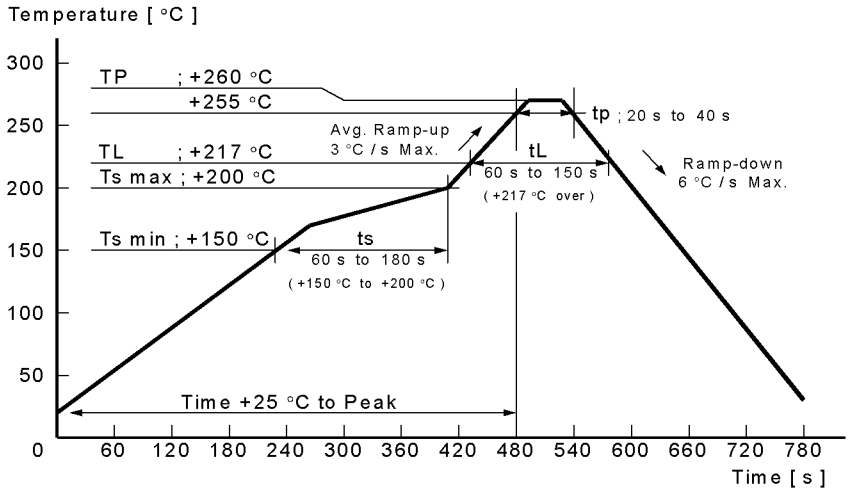
(The company evaluation condition : We evaluate it by the following examination item and examination condition.)

No.	Item	Value *1 *2 $\Delta f / f [1 \times 10^{-6}]$	Test Conditions
1	Drop	(2) ± 2	150g dummy Jig (Epson Toyocom Standard) drop from 1500 mm height on the Concrete 3 directions 10 times
2	Vibration	(2) ± 2	10Hz 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	(1) ± 2	+85°C × 1 000 h
4	Low temperature storage	(1) ± 2	-40°C × 1 000 h
5	Temperature cycle	(1) ± 2	-40°C ↔ +85°C 30 minutes at each temp. 100 cycle
6	Temperature humidity storage	(1) ± 2	+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 Ref. IEC 60068-2-21
10	Pull – off	No peeling-off at a soldered part	10 N press for 10 s ± 1 s Ref. IEC 60068-2-21
11	Solder ability	Terminals must be 95 % covered With fresh solder.	Dip termination into solder bath at +230 °C ± 10 °C for 5 s (Using Rosin Flux)

< Notes >

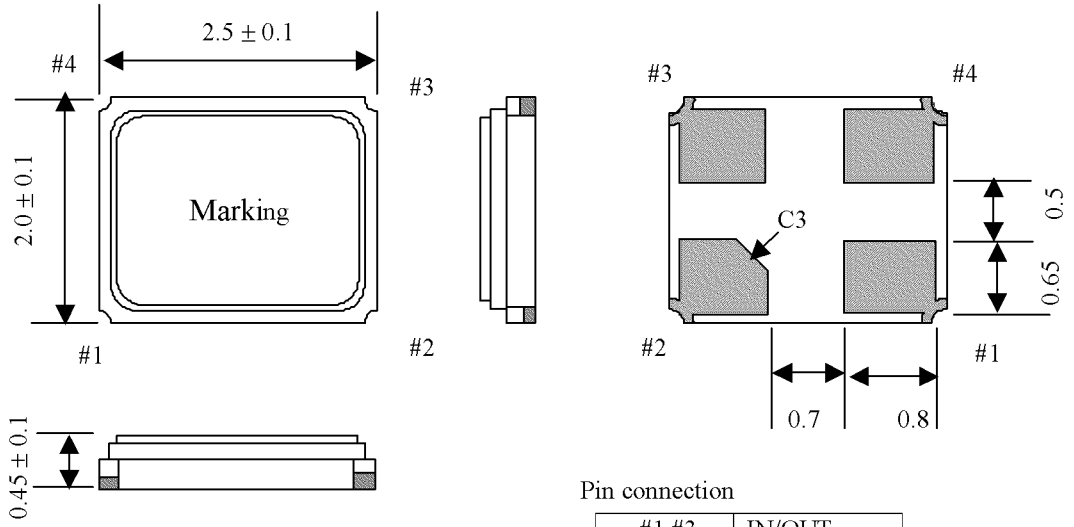
1. Item No.1 to No.10 resistance at before above tests should be less than ±20 % or less than ±10 Ω.
2. *1 each test done independently.
3. *2 measuring 2 h to 24 h later leaving in room temperature after each test.
   (1) Measuring 24 h later leaving in room temperature after each test.
   (2) Measuring 2 h later leaving in room temperature after each test.

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



[5] Dimensions and Circuit

1) Dimension

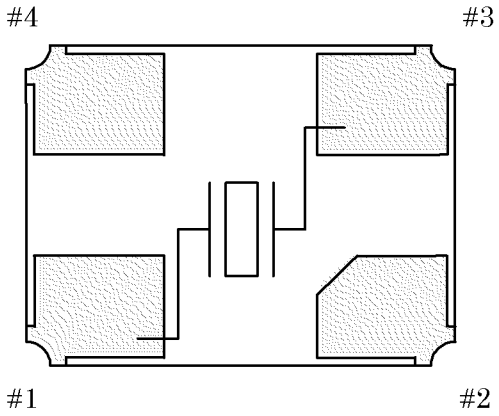


Pin connection

#1,#3	IN/OUT
#2,#4	GND

2) Circuit

(Top View)



Pin

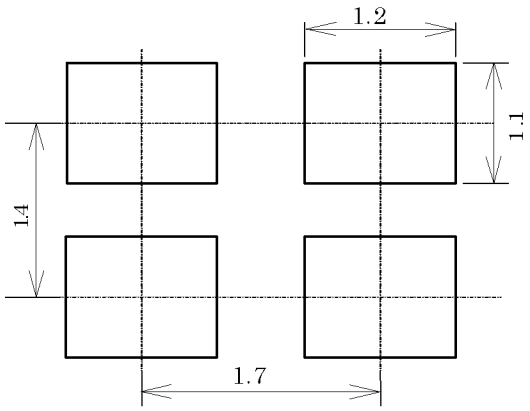
#1 , #3 : X'tal

#2 , #4 : GND

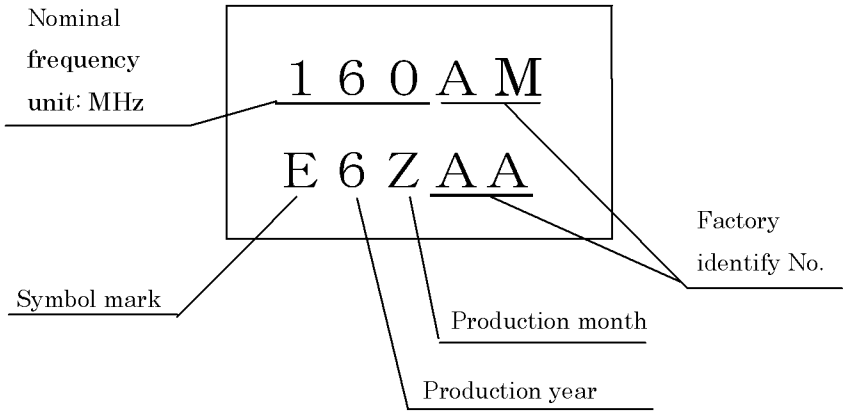
Type	FA-20H	Terminal treatment	Au plate	Unit	1 = 1mm

[6] Recommended soldering pattern and Marking layout

1) Recommended soldering pattern



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 first place of decimals.
  Ex) 16 MHz..... [160]
- The above marking layout shows only marking contents and their approximate position and it is not for font, size and exact position.

Type : FA-20H	Unit : 1 = 1mm

[7] Notes

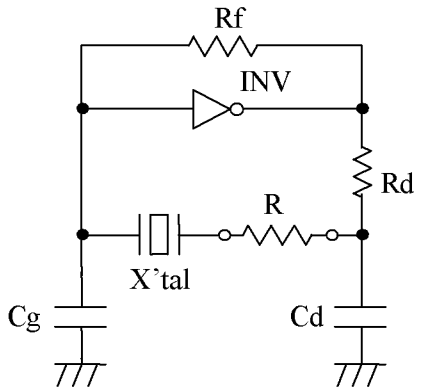
1. Max three (3) times re-flow is allowed. Its recommended to manually solder when not enough/no solder detected.(Using soldering iron at +350 °C Max. × within 5 seconds)

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

3. Applying excessive excitation force to the crystal resonator 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 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

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 is allowed.
   Thickness of the solder paste should be more than 150 μm.

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.

- Process Quality Control -

No. IA-0601-01-AIE-1

SMD TYPE AT STRIP CRYSTAL : FA-20H

06.7.26
EPSON TOYOCOM Corp.

Check	Check	Prepare
H. Komai	Ishigami	M. Tsuchiya

Manufacturing process shart	No.	Section	Standard	Inspection, Control items	Inspection method	Instrument	Record
Crystal block ▽	1	Inspecting section. (INA plant)	Purchasing specification Incoming inspection standard	Size. Outer appearance. Inner appearance.	Sampling. 〃 〃	Measure. Visual inspection. Visual inspection.	In-coming inspection data sheet.
① In-coming inspection	1'	Inspecting section. (INA plant)	〃	Size. Outer appearance.	Sampling. 〃	Comparator. Micro scope.	〃
② Wafer cutting	2	Inspecting section. (Ina / Hobara / China /Thailand / Philippines Plant)	Manufacturing instruction sheet	Cut angle. Wafer thickness.	Sampling. 〃	X-ray raido grafic. Comparator.	Process data sheet.
③ Wafer lapping	3	Producing section. (Ina / Hobara / China /Thailand / Philippines Plant)	〃	Frequency. Wafer thickness.	Sampling. 〃	Frequency counter. Comparator.	〃
Ceramic base ▽ ④ Chip cutting	4	Producing section. (Ina / Hobara / China /Thailand / Philippines Plant)	〃	Size.	Sampling.	Comparator.	〃
⑤ Etching	5	Producing section. (Ina / Hobara / China /Thailand / Philippines Plant)	〃	Frequency. Outer appearance.	Sampling. 〃	Comparator. Micro scope.	〃
1' In-coming inspection ⑥ Deposition	6	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Frequency. Outer appearance.	Sampling. 〃	Comparator. Micro scope.	〃
Lid ▽ ⑦ Mounting	7	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Outer appearance.	All insprcion.	Micro scope.	〃
In-coming ⑧ Frequency adjustment 1' inspection	8	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Frequency.	Sampling.	Frequency counter.	〃
⑨ Welding	9	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Outer appearance.	Sampling.	Micro scope.	〃
⑩ Leak test	10	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Airtightness check.	All insprcion.	Leak tester.	〃
⑪ Marking	11	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Outer appearance.	Sampling.	Micro scope.	〃
⑫ Characteristic inspection	12	Producing section. (Ina / Thailand / Malaysia Plant)	〃	Crystal impedance. Frequency. Insulation resistance. Temp. characteristic. Shock resistance. Outer appearance.	All insprcion. 〃 〃 Sampling. 〃 〃	Inspectional machine 〃 〃 〃 Jig. Micro scope.	〃
⑬ Out-going inspection	13	Inspecting section. (Ina / Thailand / Malaysia Plant)	Out-going inspection standard	Crystal impedance. Frequency. Insulation resistance. Outer appearance.	Sampling. 〃 〃 〃	Inspection M/C. 〃 〃 Micro scope.	Out-going inspection data sheet.
⑭ Taping	14	Producing section. (Ina / Thailand / Malaysia Plant)	Manufacturing instruction sheet	Tape-peel strength.	Sampling.	Peelinf force tester.	Process data sheet.
⑮ Packing	15	Product control section. (Ina / Thailand / Malaysia Plant)	Manufacturing instruction sheet Packing instruction sheet	Address. Quantity.	——	——	Delivery slip.

EPSON TOYOCOM

RELIABILITY TEST DATA

Product Name : FA-20H

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition . **No.A-06014-1-001E**

No.	ITEM	TEST CONDITIONS	VALUE *1 *2 Δ f / f [1 × 10^{-6}]	TEST Qty [n]	FAIL Qty [n]
1	Shock	150g dummy Jig (EPSON TOYOCOM Standard) drop from 1500 mm height on the Concrete	*3 ± 2	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 ± 2	22	0
3	High temperature storage	+85 °C × 1 000 h	*3 ± 2	22	0
4	Low temperature storage	-40 °C × 1 000 h	*3 ± 2	22	0
5	Temperature humidity storage	+85 °C × 85 %RH × 1 000 h	*3 ± 2	22	0
6	Temperature cycle	-40 °C ⇔ + 85 °C 30 min at each temp. 100 cycles	*3 ± 2	22	0
7	Resistance to soldering heat	For convention reflow soldering furnace (3 times)	± 2	22	0
8	Substrate bending	Bend width reaches 3.0 mm and hold for 5 s ± 1 s × 1 time Ref. IEC 60068-2-21	No peeling - off at a solder part	11	0
9	Shear	10 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	Solderability	Dip termination into solder bath at +235 °C ±10 °C for 5 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 Measuring 24 h later leaving in room temperature after each test.
    1. Reflow 3 times
    2. Initial value shall be after 24h at room temperature.
4. Shift series resistance at before above tests should be less than ±20 % or less than ±10 Ω .

AT Business Unit
Production Management Div.

signature S. Macedo

Qualification Data

EPSON TOYOCOM

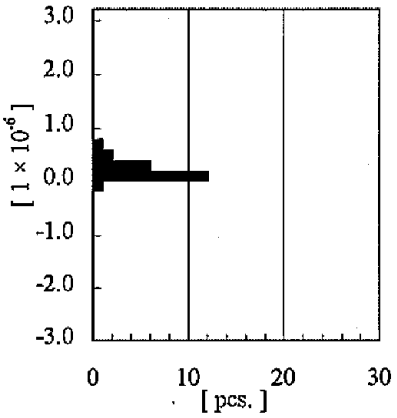
Product Name : FA-20H

Δf/f

No.A-06014-1-002E

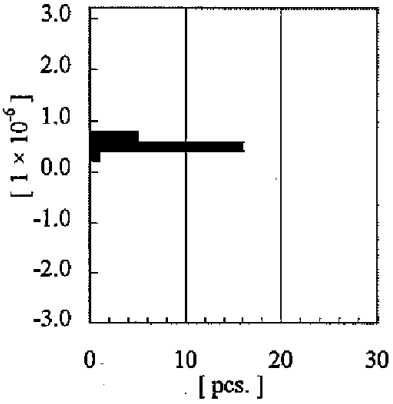
1. Shock

150g × 1500 mm × 3 directions × 10 times



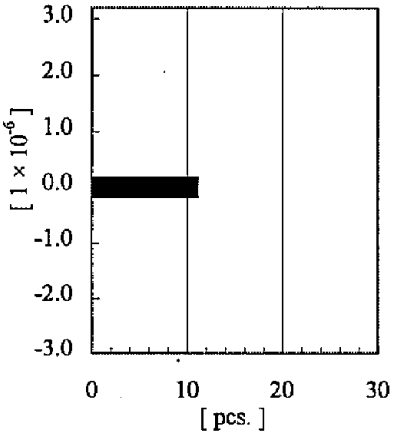
2. Vibration

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



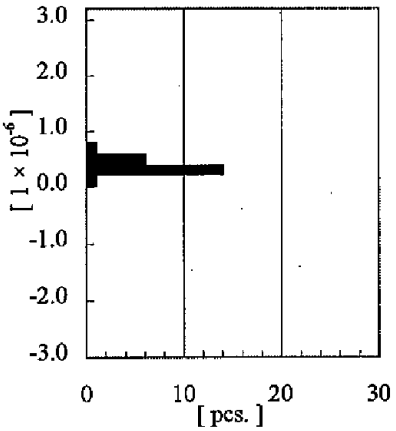
3. High temp. storage

+85 °C × 1 000 h



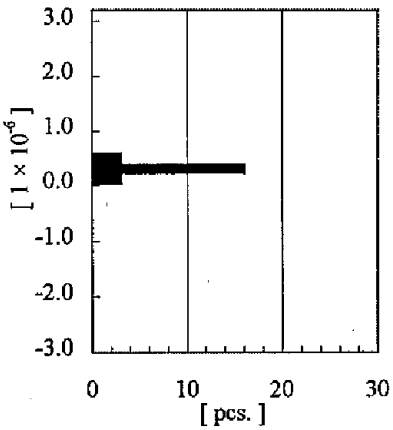
4. Low temp. storage

-40 °C × 1 000 h



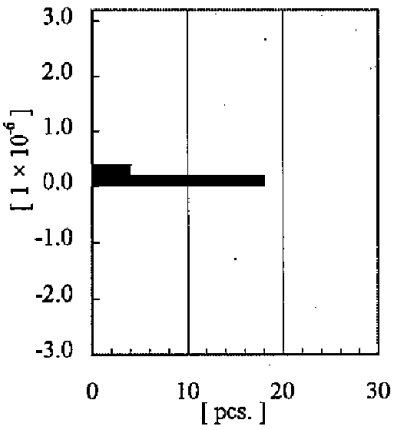
5. Temp. humidity storage

+85 °C × 85 %RH × 1 000 h



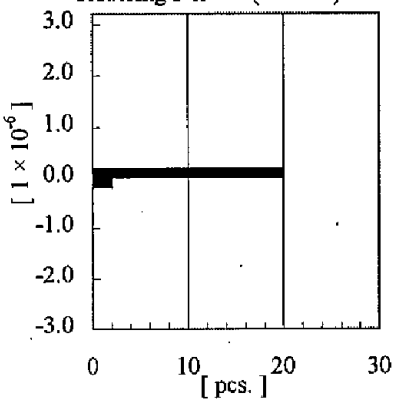
6. Temp. cycle

-40 °C ⇔ +85 °C
100 cycles



7. Resistance to soldering heat

For convention reflow soldering furnace (3 times)



Qualification Data

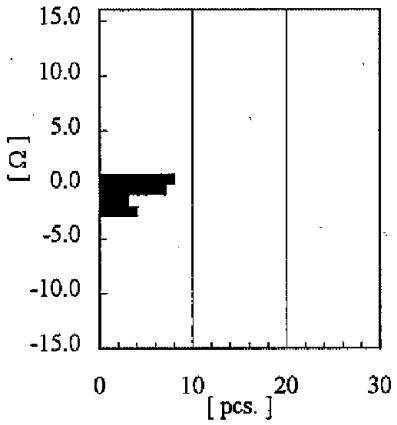
EPSON TOYOCOM

Product Name : FA-20H

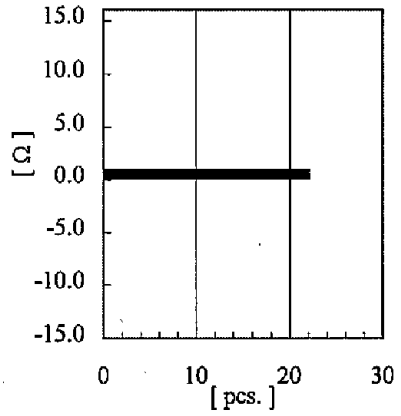
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No.A-06014-1-003E

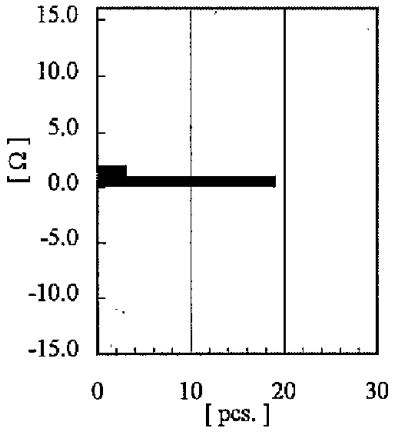
1. Shock
150g × 1500 mm × 3 directions × 10 times



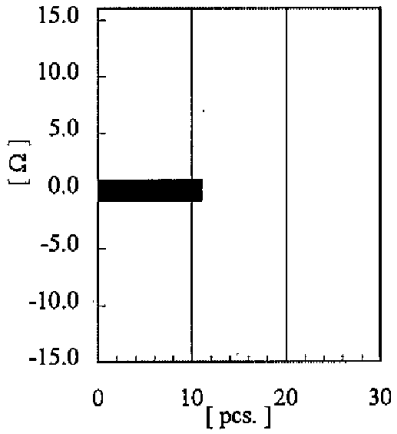
2. Vibration
10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz acceleration 98 m/s^2
15 min /cycle 6 h (2 h ×3 directions)



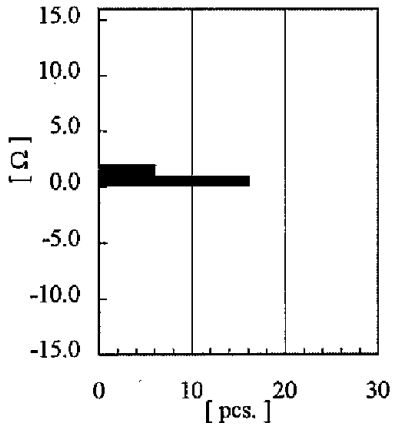
3.High temp. storage
+85 °C × 1 000 h



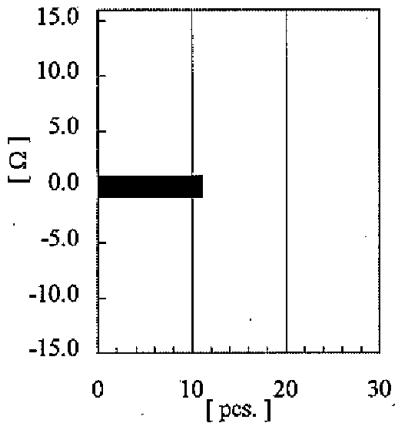
4. Low temp. storage
-40 °C × 1 000 h



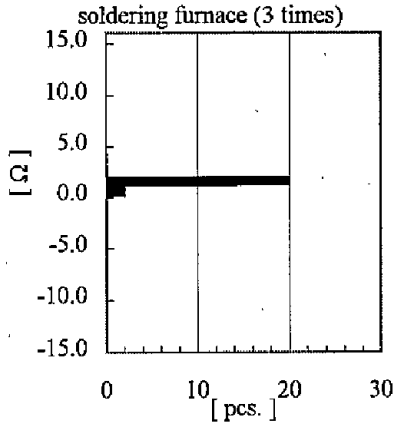
5. Temp. humidity storage
+85 °C × 85 %RH × 1 000 h



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



7. Resistance to soldering heat
For convention reflow soldering furnace (3 times)



Qualification Data