MEDIATEC INC.

RECIPIENT

SPECIFICATIONS

Product No. : X1G003581003300

MODEL : TG-5021CG-27N

SPEC. No. : A12-306-0B

DATE: Jul. 11. 2012

SEIKO EPSON CORPORATION

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SPECIFICATIONS

1. Application

This document is applicable to the temperature compensated crystal oscillator (TCXO) that is delivered to **MEDIATEC INC.** from SEIKO EPSON Corp.

This product is compliant with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by SEIKO EPSON Corp. 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.

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. Model

The product No. of this crystal oscillator unit is X1G003581003300.
The model is TG-5021CG-27N (TCXO).

3. Packing

It is subject to the packing standard of SEIKO EPSON Corp.

4. Warranty

Defective parts which are originated by us are replaced free of charge in case defects are found within 12 months after delivery.

5. Amendment and abolishment

Amendment and/or abolishment of this specification are subject to the agreement of both parties.

6. Contents

Item No.	Item	Page
[1]	Characteristics	2
[2]	Absolute maximum ratings	2
[3]	Operating range	2
[4]	Frequency characteristics	3
[5]	Electrical characteristics	3
[6]	Test circuit	4
[7]	Environmental and mechanical characteristics	5
[8]	Dimensions and marking layout	6
[9]	Recommendable patterning	7
[10]	Handling Precautions	8

[1] Characteristics

- Lead Free Reflowable and ultra small SMD (2.5 × 2.0 × 0.9 mm).
- Using the heat-resisting type AT cut quartz crystal allows almost the same temperature soldering as universal SMD IC.
- Operating supply voltage : 2.8 V.

[2] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	V_{CC}-GND	-0.3 to 4.5	V	
Storage temperature range	$T_{_STG}$	-40 to +95	°C	

[3] Operating range

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power voltage		V_{CC}	2.52	2.8	3.08	V	
Power voltage		GND	0.0		0.0	V	
Operating temperature range		T_use	-40		+85	°C	
Output load		Load_R	9	10	11	kΩ	
		Load_C	9	10	11	pF	
	DC-cut capacitor	C_C	0.01	-	-	μF	

DC-cut capacitor is not included in our TCXO. Please insert DC-cut capacitor in output line.

[4] Frequency characteristics

1) Output frequency 26.000000 MHz

2) Frequency characteristics

(V_{CC}= 2.8 V, GND=0.0 V, Load 10 kΩ//10 pF(DC cut), T_use =+25 °C)

Parameter	Symbol	Value	Note
Frequency tolerance *1	f_tol(OSC)	± 2.0×10^{-6} Max.	T_use =+25 °C ± 2 °C Reflow cycles : 2 times.*2
Frequency / temperature Coefficient	fo-Tc	± 2.0×10^{-6} Max.	T_use =-30 °C to +85 °C Based on frequency at +25°C
		± 3.0×10^{-6} Max.	T_use =-40 °C to -30 °C Based on frequency at +25°C
Frequency / temperature Slope	-	± 0.1×10^{-6} /°C Max.	T_use =-30 °C to +85 °C Based on frequency at +25°C
		± 0.35×10^{-6} /°C Max.	T_use =-40 °C to -30 °C Based on frequency at +25°C
Static temperature hysteresis	-	± 0.6×10^{-6} Max.	T_use =+25 °C
Frequency / Load Coefficient	fo-Load	± 0.1×10^{-6} Max.	Load :10 kΩ//10 pF ± 5 %
Frequency / voltage Coefficient	fo-Vcc	± 0.1×10^{-6} Max.	V_{CC}= 2.8 V ± 5 %
Frequency aging	f_aging	± 1.0×10^{-6} Max.	First year T_use =+25 °C
		± 1.5×10^{-6} Max.	2 years T_use =+25 °C
		± 2.5×10^{-6} Max.	5 years T_use =+25 °C
		± 5.0×10^{-6} Max.	10 years T_use =+25 °C

*1 Include initial frequency tolerance and frequency deviation after reflow cycles.

*2 Measurement of frequency deviation is made 1 h after reflow soldering.

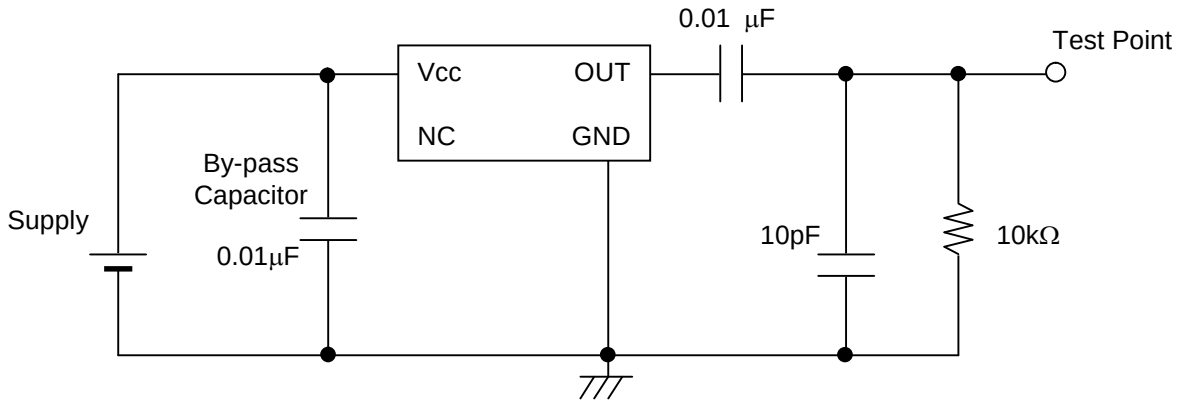
[5] Electrical characteristics

(V_{CC}= 2.8 V GND=0.0 V, Load 10 kΩ//10 pF(DC cut), T_use =+25 °C)

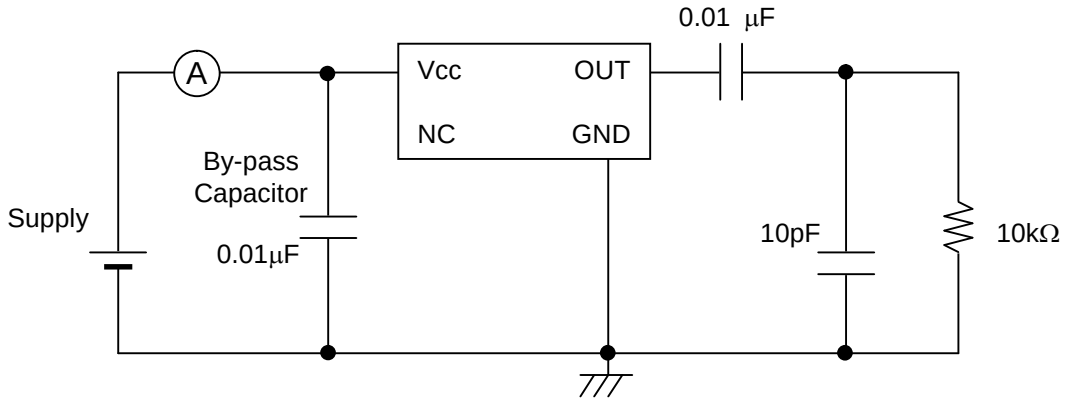
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Current consumption	Icc	-	-	1.5	mA	
Output level	Vpp	0.8	-	-	V	Peak to peak voltage
Harmonics	-	-	-	-8	dBc	All harmonics
Start up time	tosc	-	-	2.0	ms	Within ± 0.5×10^{-6} of final freq.
				2.0		Within 90% of Output level
SSB Phase noise	L(f)	-	-	-50	dBc/Hz	Offset:1 Hz
		-	-	-80		Offset:10 Hz
		-	-	-105		Offset:100 Hz
		-	-	-130		Offset:1 kHz
		-	-	-148		Offset:10 kHz
		-	-	-150		Offset:100 kHz
R.A.V	-	-	-	0.3	ppb	τ=1sec n=100 T_use =+25 °C

[6] Test circuit

1) Output level



2) Current consumption



3) Conditions

1. Oscilloscope : Impedance Min. 1 MΩ
   Input capacitance Max. 10 pF
   Band width Min. 300 MHz
   Impossible to measure both frequency and wave form at the same time.(In case of using oscilloscope's amplifier output, possible to measure both at the same time.)
2. CL includes probe capacitance.
3. A capacitor (By-pass:0.01 μF) is placed between V_{CC} and GND, and closely to TCXO.
4. Use the current meter whose internal impedance value is small.
5. Power Supply
   Impedance of power supply should be as lowest as possible.
6. GND should apply one point earth.

[7] Environmental and mechanical characteristics

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

No.	Item	Value *1		Test method
		Freq. Tolerance [1×10^{-6}] *2	Electrical characteristics	
1	High temp. storage *3	± 2.0	Satisfy Output level after test	+85°C × 1 000 h
2	Low temp. storage *3	± 2.0		-40°C × 1 000 h
3	High temp. with Humidity	± 2.0		+85°C × 85%RH × 1 000 h
4	Temp. cycle *3	± 2.0		-40°C to +85°C (30 min × 100 cycle/each)
5	Resistance to Soldering heat (Reflow characteristics)	± 1.0		Reflow furnace with the condition 2 times
6	Drop	± 2.0		150g dummy jig (Epson Toyocom Standard) drop from 1500 mm height on the concrete 6 directions 3 times.
7	Vibration (variable frequency)	± 2.0		10 Hz to 55 Hz 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)
8	Solderability	Terminals must be 95 % covered with fresh solder		Dip termination into solder bath at +235°C for 5 s (Using Rosin Flux)

Notes

1.*1 each test is independent.

2.*2 measuring 2 h later leaving in room temperature after each test.

3.*3 Pre conditionings

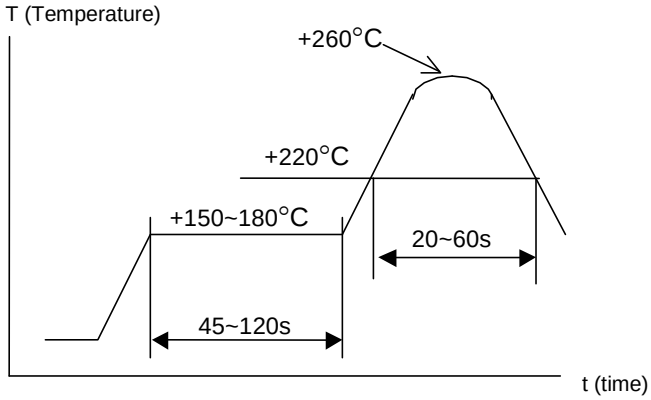
1. +125 °C × 24 h to +85 °C × 60 % × 168 h → reflow 2 times
2. Initial value shall be after 24 h at room temperature.

Infrared-reflow

Pre heating temperature : +150 ~ +180 °C Pre heating time : 45 ~ 120 s

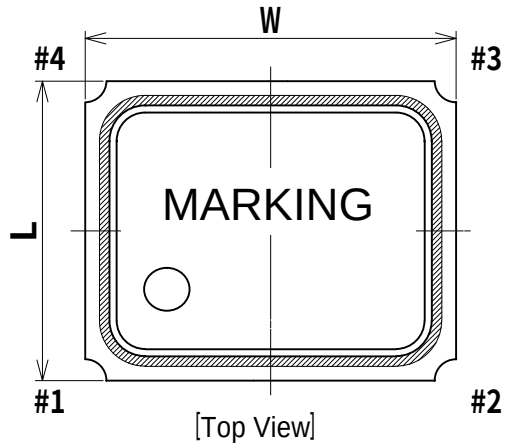
Heating temperature : +220 °C Heating time : 20 ~ 60 s

Peak temperature must not exceed +260 °C

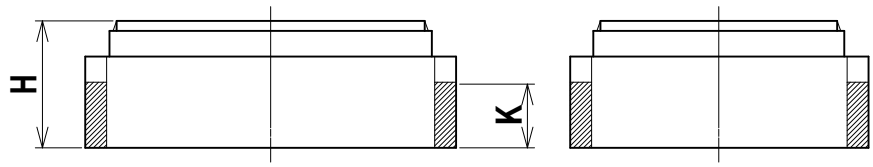


[8] Dimensions And Marking Layout

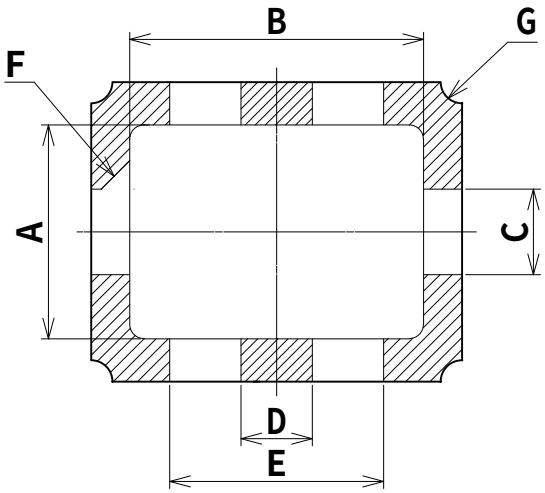
1) Dimensions



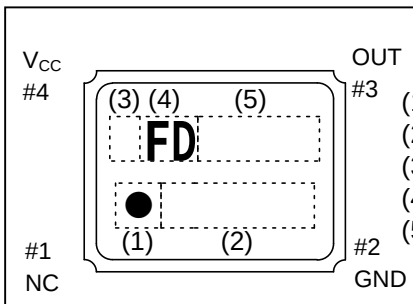
[Top View]



[Side View]



[Bottom View]



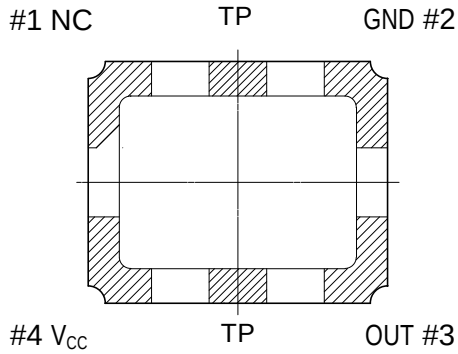
Marking

(1) 1Pin Mark
(2) Arbitrary marking area
(3) Location code
(4) TCXO Model ID (FD
(5) TCXO Lot No.
(3 figure)

Material

Ceramics(base)
Au coated nickel(terminal)
Fe-Ni-Co(lid)

CONNECTION



Bottom View

(unit : mm)

Dim.	Min.	Typ.	Max.	Dim.	Min.	Typ.	Max.
W	2.30	2.50	2.70	D	0.40	0.50	0.60
L	1.80	2.00	2.20	E	1.35	1.50	1.65
H	0.70	0.80	0.90	F	---	C0.2	---
A	1.35	1.50	1.65	G	---	R0.15	---
B	1.95	2.10	2.25	K	---	0.45	---
C	0.50	0.60	0.70				

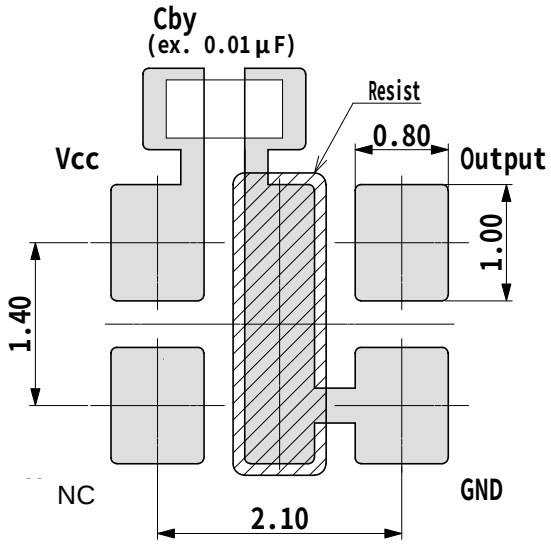
[9] Recommendable patterning

For actual design work, please consider optimum condition together with mounting density, reliability of soldering and mount ability etc.

Do not design any patterns except GND on the shaded area.

Soldering position

Unit: mm



[10] Handling precautions

Prior to using this product, please carefully read the section entitled “Precautions” on our Web site (http://www.epsontoyocom.co.jp/english/support/support.html) for instructions on how to handle and use the product properly to ensure optimal performance of the product in your equipment. Before using the product under any conditions other than those specified therein, please consult with us to verify and confirm that the performance of the product will not be negatively affected by use under such conditions.

In addition to the foregoing precautions, in order to avoid the deteriorating performance of the product, we strongly recommend that you DO NOT use the product under ANY of the following conditions:

(1) Mounting the product on a board using water-soluble solder flux and using the product without removing the residue of the flux completely from the board. The residue of such flux that is soluble in water or water-soluble cleaning agent, especially the residues which contains active halogens, will negatively affect the performance and reliability of the product.
(2) Using the product in any manner that will result in any shock or impact to the product.
(3) Using the product in places where the product is exposed to water, chemicals, organic solvent, sunlight, dust, corrosive gasses, or other materials.
(4) Using the product in places where the product is exposed to static electricity or electromagnetic waves.
(5) Applying ultrasonic cleaning without advance verification and confirmation that the product will not be affected by such a cleaning process, because it may damage the crystal, IC and/or metal line of the product.
(6) Touching the IC surface with tweezers or other hard materials directly.
(7) Using the product under any other conditions that may negatively affect the performance and/or reliability of the product.
(8) Using the product with power line ripple exceeding 200 mV(p-p) level.

Should any customer use the product in any manner contrary to the precautions and/or advice herein, such use shall be done at the customer’s own risk.

TAPING SPECIFICATION

Ⅰ. Application

This standard will apply to 2.5×2.0 Ceramic package.

Spec：CG package

Ⅱ. Contents

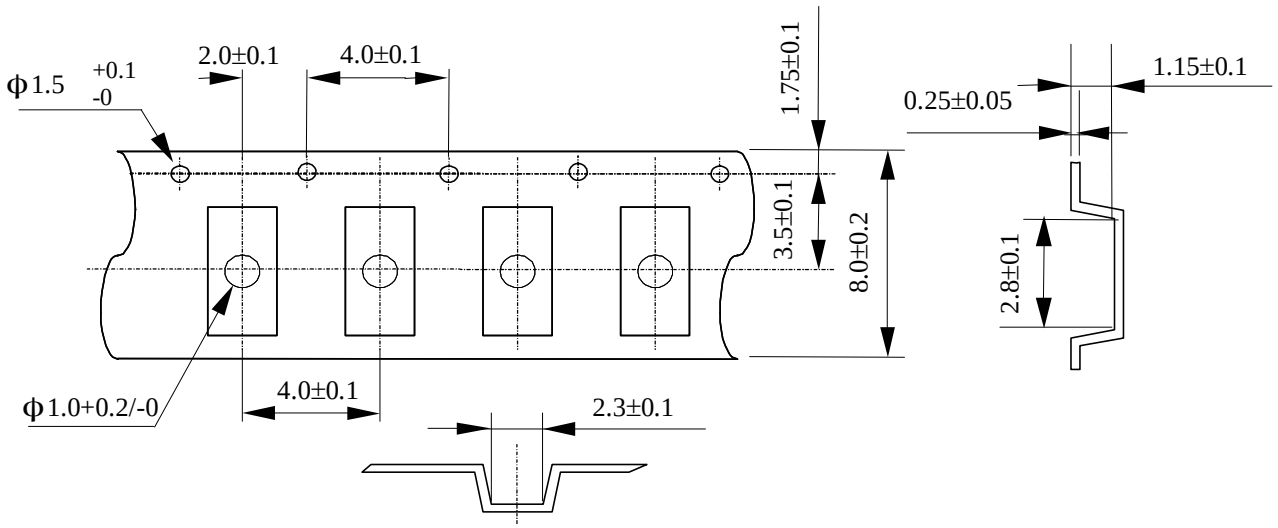
Item No.	Item	Page
〔1〕	Taping specification	1 to 2
〔2〕	Inner carton	3
〔3〕	Shipping carton	
〔4〕	Marking	4
〔5〕	Quantity	
〔6〕	Storage environment	
〔7〕	Handling	

〔1〕 Taping specification

Subject to EIA-481& EIAJ EDX-7602, IEC 60286, JIS C-0806

(1) Tape dimensions

Material of the carrier tape : PS



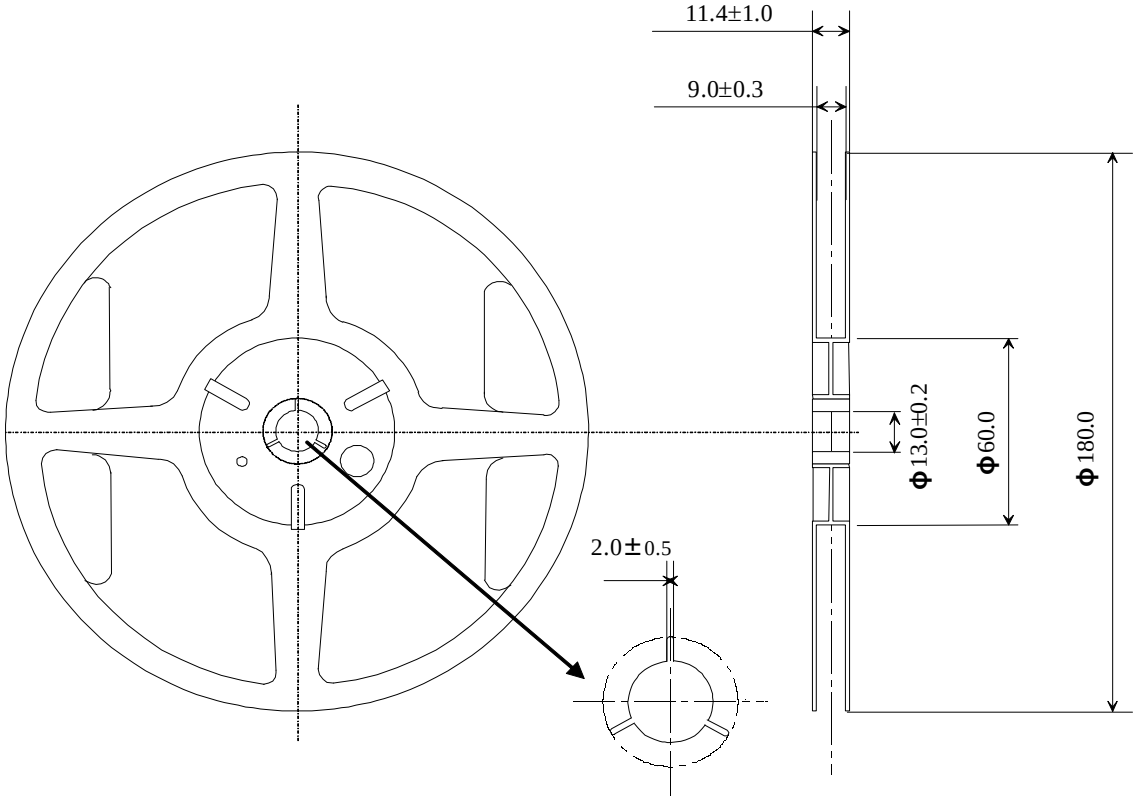
Unit : mm

The radius of each corner is 0.3mm max.

10 feeding holes pitches cumulative tolerance on tape is +/-0.2mm max.

(2) Reel dimensions

Material of the reel : PS

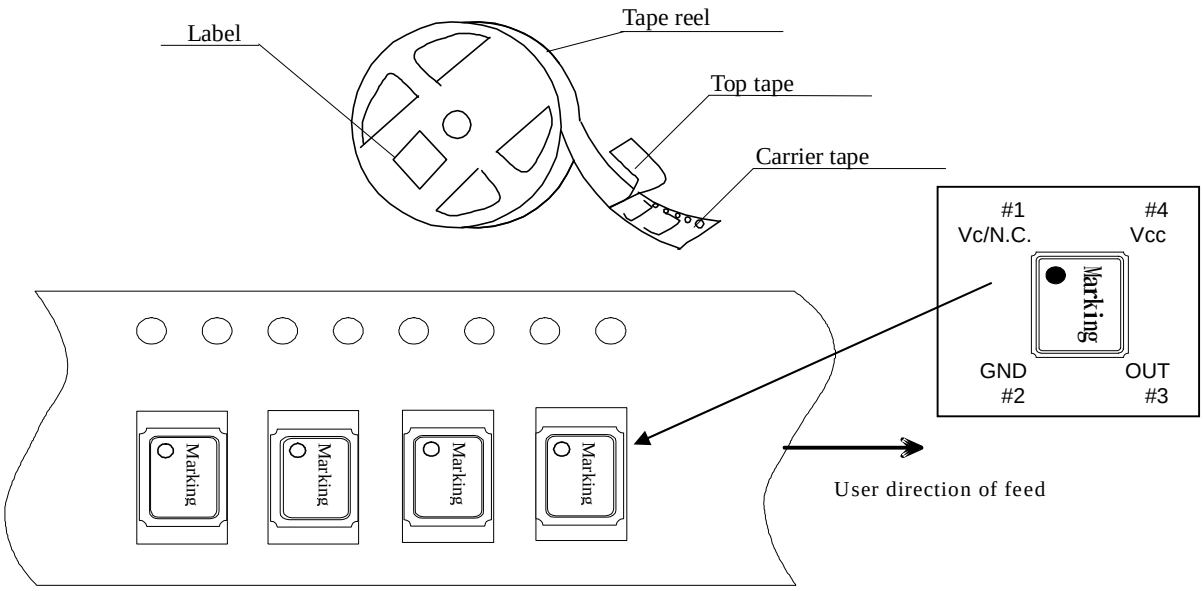


Unit : mm

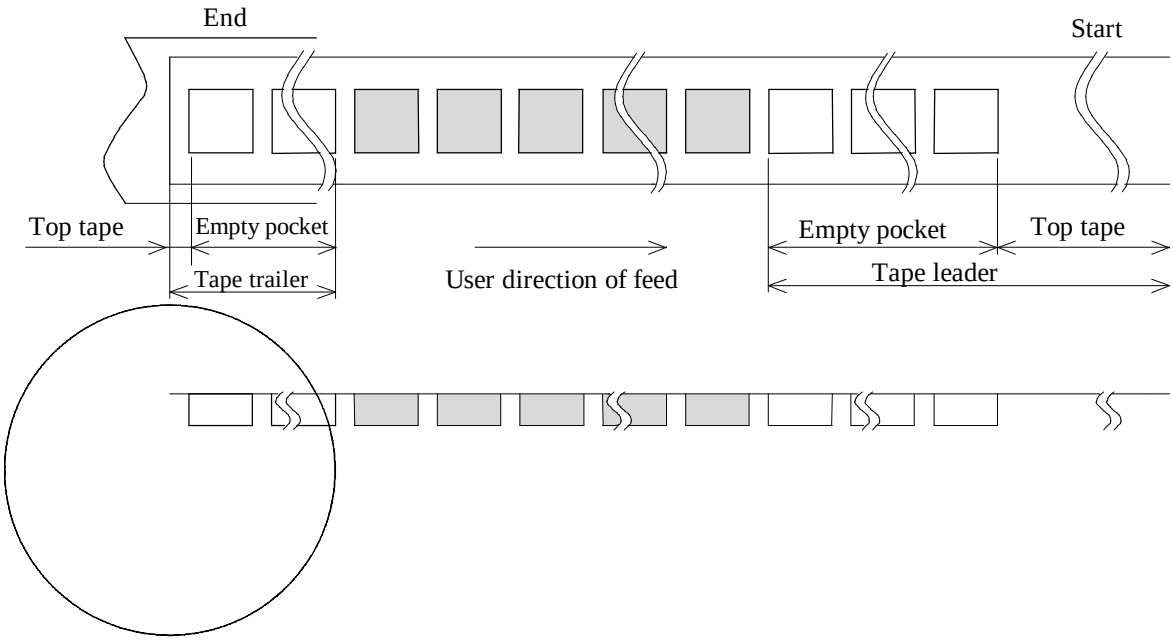
Tolerances for all measurements are ±0.1 mm unless otherwise stated.

(3) Packing

①Tape & reel



②Start & end point

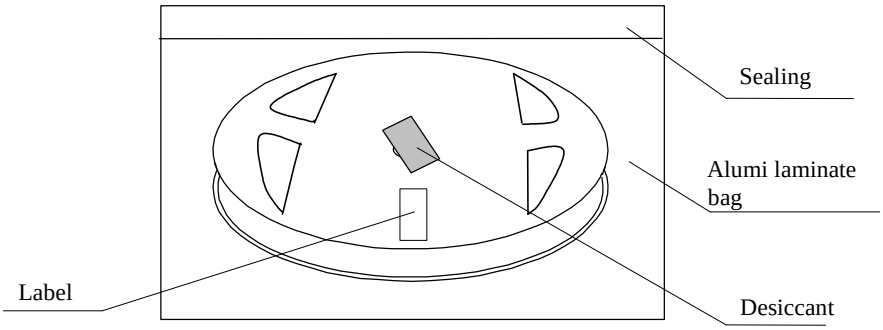


Item		Empty space
Tape leader	Top tape	Min. 200 mm
	Empty pocket	Min. 150 mm
Tape trailer	Top tape	Min. 50 mm
	Empty pocket	Min. 150 mm

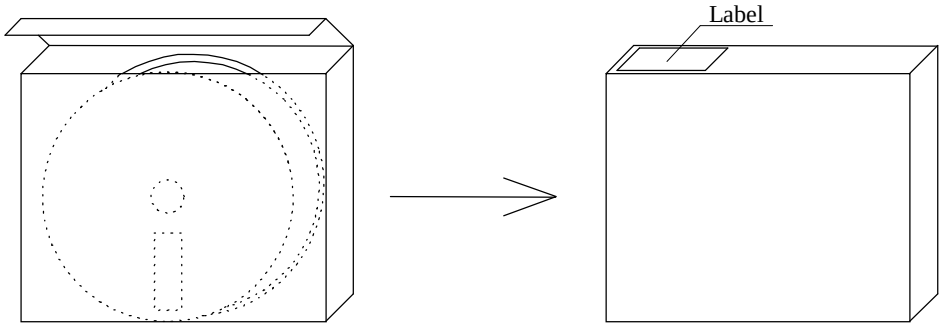
〔2〕 Inner carton

a) Packing to alumi laminate bag

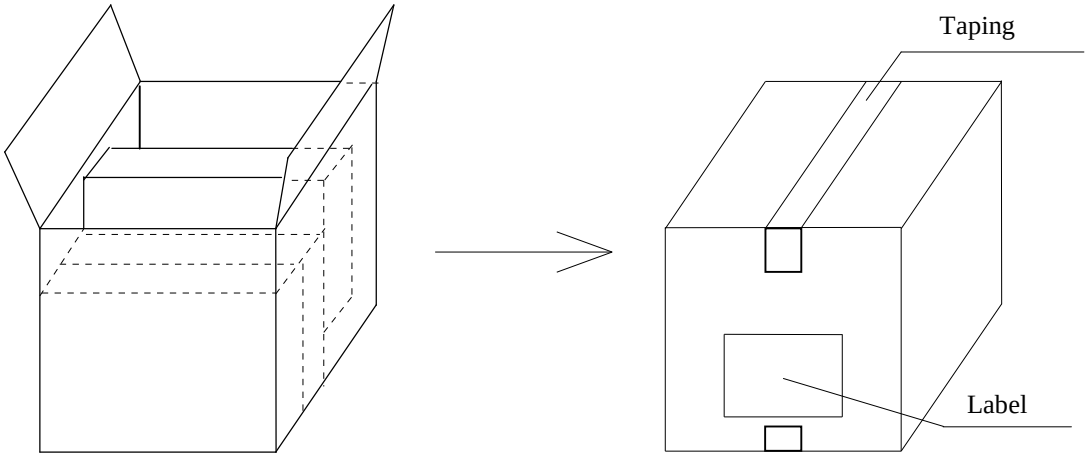
The reel is packed in the vacuum with the alumi laminate bag.



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 name 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

- Max : 2000 pcs/reel Min : 500 pcs/reel

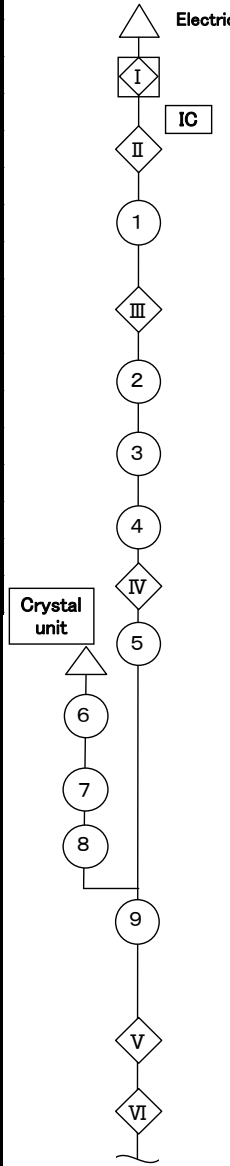
〔6〕 Storage environment

(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.

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Flow chart	Process	Control item	Check item	Inspection item	Operation: Procedure	Operator	Lot	Sampling rate	Equipment	Record	Disposal of defected parts: In process	Defected parts	Remarks
	Incoming inspection			Quantity	TIP-4H-0002	Incoming inspection div.	Delivered lot	100%		Inspection record	Notice of defective	Return to the manufacturer	
	IC appearance inspection			Appearance of IC wafer	IC-001	Production dept.	Wafer	n=10	Microscope	Process card	Notice of defective	Return	
	Bump bonding	Number of tool shots			IC-002	Production dept.	Wafer	100%	Built-in counter		Process investigation	Scrap	
			Heater temperature					Daily	Thermometer	Daily checklist			
	Bump shear strength test			Bump dimension	IC-002	Production dept.	Wafer	FXD=4Bumps /At changed capillary	Microscope	Process card	Process investigation	Scrap	
				Shear strength					Bond tester	Control chart			
	Tape mounting		Cutting condition		IC-003	Production dept.	Wafer	Daily	Visual	Daily checklist	Process investigation	Re-working	
	Dicing	Abrasion loss of Blade			IC-004	Production dept.	Wafer	100%	Built-in gauge	Daily checklist Process card	Process investigation	Scrap	
	Spinner cleaning				IC-006	Production dept.	Wafer			Process card	Process investigation	Re-working	
	Appearance inspection			Dicing condition	IC-002 IC-004	Production dept.	Wafer	n=10	Microscope	Process card	Process investigation	Scrap	
	UV irradiation		UV intensity		IC-007	Production dept.	Wafer	Daily	UV intensity meter	Daily checklist	Process investigation	Scrap or Re-working	
	FC carrier transfer (Xtal tray to FC carrier)				IC-009	Production dept.	Production lot			Process card	Process investigation	Scrap or Re-working	
	Blow & Vacuum		Blow,Vacuum motion		IC-010	Production dept.	Production lot	Daily	Visual	Daily checklist	Process investigation	Re-working	
	Plasma etching		Dynamic contact angle		IC-011	Production dept.	Production lot	Daily	Contact anglemeter	Daily checklist	Process investigation	Re-working	
	Flip chip bonding	Number of US tool shots			IC-016	Production dept.	Production lot	100%	Built-in counter		Process investigation	Scrap	
		Number of ejector needle shot.						100%	Built-in counter				
			Heater temperature					Daily	Thermometer	Daily checklist			
	Die shear strength test			Bump dimension	IC-016	Production dept.	Production lot	n=1	Microscope	Process	Process investigation	Scrap	
				Shear strength				n=1	Bond tester	Process card			
	Appearance inspection			Flipchip bonding condition	IC-016	Production dept.	Production lot	n=2	Microscope	Process card	Process investigation	Scrap	

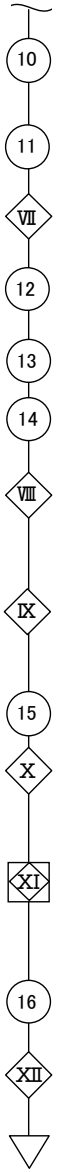
承認 APP.	照査 CHK'D	照査 CHK'D	作成 DRAW
Y.shishido	Y.shishido		H.takanashi

改版記事 DESCRIPTION

TiTle	QC Process Chart of TG-5021CG Series			
Date	13th. Nov. 2009	Document No.	TQFH4-000250E	P 1/2

EPSON TOYOCOM CORPORATION エプソントヨコム株式会社

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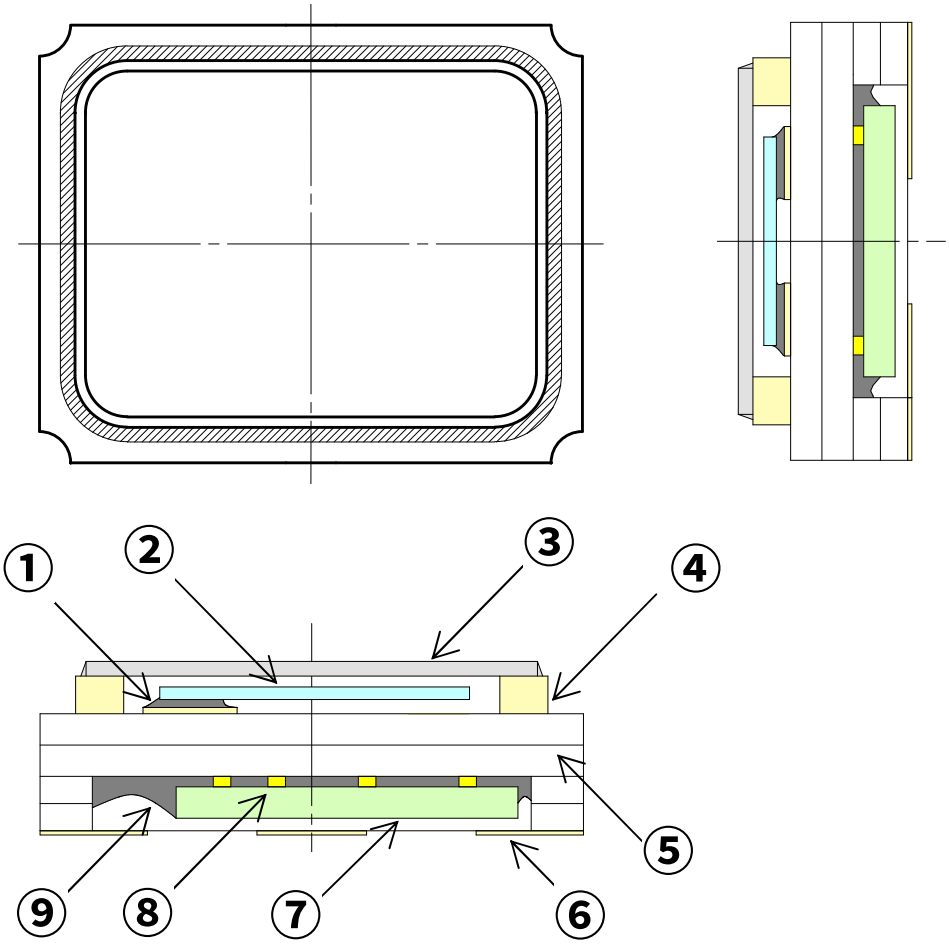
Process	Control item	Check item	Inspection item	Operation: Procedure	Operator	Lot	Sampling rate	Equipment	Record	Disposal of defected parts: In process	Defected parts	Remarks
Under fill filling	Chip coat storage temp.			IC-020	Production dept.	Production lot	Daily	Thermometer	Daily checklist	Process investigation	Scrap	
	Pot lifetime						100%	Built-in timer				
		Heater temperature					Daily	Thermometer				
Curing	Curing time			IC-020	Production dept.	Production lot	100%	Timer	Process card	Process investigation	Scrap	
	Magazine quantity						100%	Visual				
		Oven temperature					Daily	Thermometer	Daily checklist			
Appearance inspection			Under fill condition	IC-020	Production dept.	Production lot	100%	Microscope	Process card	Process investigation	Scrap	
TCXO tray transfer (FC carrier to TCXO tray)				IC-024	Production dept.	Production lot			Process card	Process investigation	Scrap	
1st Temp. characteristic test		Oven temperature		IC-025	Production dept.	Production lot	Daily	Thermometer	Daily checklist	Notice of defective	Scrap or Re-working	
ROM writing				IC-025	Production dept.	Production lot				Notice of defective	Scrap or Re-working	
Temperature characteristic inspection		Oven temperature		IC-025	Production dept.	Production lot	Daily	Thermometer	Daily checklist	Notice of defective	Scrap or Re-working	
			Temperature characteristic				100%	Frequency counter	Process card			
Electrical characteristic inspection			Frequency	IC-025	Production dept.	Production lot	100%	Freq. counter	Process card	Notice of defective	Scrap or Re-working	
			Output-level					Oscilloscope				
			Current drain	Instruction sheet				Multi-meter				
			vs.. Supply voltage					Freq. counter				
Marking		Lamp current		IC-025	Production dept.	Production lot	Daily	Built-in ammeter	Daily checklist	Notice of defective	Scrap	
			Marking				n=1	Magnifier	Process card			
Appearance inspection			Appearance	IC-025	Production dept.	Production lot	100%	Visual	Process card	Notice of defective	Scrap or Return	
Shipping inspection			Frequency	Spec sheet	Quality Assurance dept.	Production lot	AQL=0.4%/daily	Freq. counter	Inspection record	Notice of defective	Return	
			Current drain				AQL=0.4%/daily	Multi-meter				
			Temp. character.				AQL=0.4%/daily					
			Appearance				AQL=1.0%/daily	Visual				
			Dimension				n=3/daily	Calipers				
			Quantity				100%	Visual				
Taping		Peeling off strength		IC-043	Production dept.	Delivery lot	Daily	Peel back tester	Daily checklist	Process investigation	Re-working	
Taping inspection			Direction	IC-043	Quality Assurance dept.	Delivery lot	n=3	Visual	Inspection record	Notice of defective	Return	
Packaging & Shipping			Quantity	P/I	Production Control dept.	Delivery lot	100%	Visual	Delivery record	Notice of defective	Return	

承認 APP.
照査 CHK'D
照査 CHK'D
作成 DRAW

改版記事 DESCRIPTION

TiTle	QC Process Chart of TG-5021CG Series			
Date	13th. Nov. 2009	Document No.	TQFH4-000250E	P 2/2

Structure diagram. TG-5021CG



LIST		
Name of part		Specification
1	XTAL adhesives	Ag paste
2	XTAL chip	AT cut
3	Lid	Fe – Ni – Co
4	Seam ring	Kovar – Ni – Au
5	Base	Ceramic PKG
6	Terminal	Au coated , Ni
7	IC	CMOS
8	FC bump	Au
9	UF	Potting resin
10		

OUT1-2A-3528_01		
MGR.	CHK.	ENG.
Y.Shishido.		H.Hirano.

EPSON TOYOCOM

RELIABILITY TEST DATA

Product Name : TG-50xxCG series

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition . **OUT10-E31-40M**

No.	ITEM	TEST CONDITIONS	VALUE *1		TEST Qty [n]	FAIL Qty [n]
			Δ f / f *2 [1 × 10^{-6}]	Electrical characteristics		
1	High temperature storage	+85 °C × 1 000 h	*3 ± 2.0	Satisfy output level after test	22	0
2	Low temperature storage	-40 °C × 1 000 h	*3 ± 2.0		22	0
3	High Temperature with Humidity	+85 ± 2 °C × 85 ± 5 %RH × 1 000 h	*3 ± 2.0		22	0
4	Temperature cycle	-40 °C ⇔ +85 °C 30 min at each temp. 1000 cycles	*3 ± 2.0		22	0
5	Resistance to soldering heat	Convection reflow soldering furnace (3 times)	± 1.0		22	0
6	Drop	150g dummy jig (Epson Toyocom Standard) drop from 1500 mm height on the concrete 6 directions 3 times.	± 2.0		22	0
7	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)	± 2.0		22	0
8	ESD (MM)	200pF 0Ω 200V , Discharge 3 pulses	± 1.0		22	0
9	ESD (HBM)	100pF 1.5kΩ 2000V , Discharge 3 pulses	± 1.0		22	0
10	Solderability	Dip termination into solder bath at +235 °C ± 5 °C for 5 s (Using Rosin Flux)	Termination must be covered with fresh solder more than 95 % of dip area.		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 Initial value shall be measured after 24 h storage at room temperature Pre-treatment
   Pre-treatment : Bake (+125 ℃ × 24 h) →Moisture soak (+85 ℃ × 60 % × 168 h) →reflow (3 times)

QD Business Unit
Production Management Div.

Qualification Data

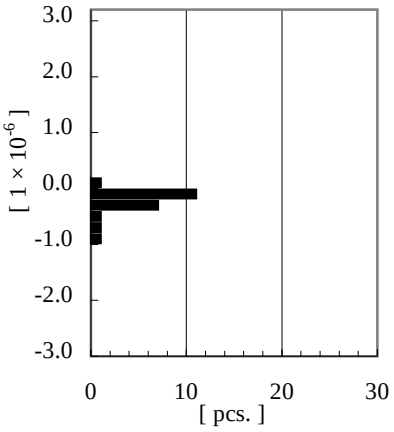
signature Y. Shirahido

EPSON TOYOCOM

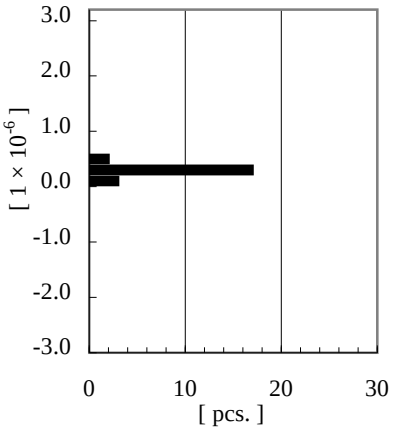
Product Name : TG-50xxCG series

df / f

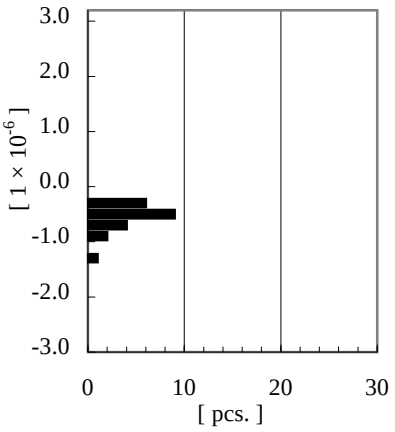
1. High temp. storage
+85 °C × 1 000 h



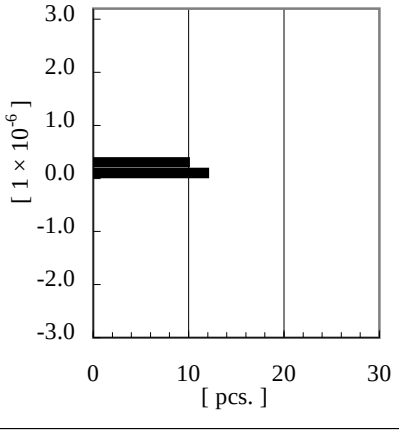
2. Low temp. storage
-40 °C × 1 000 h



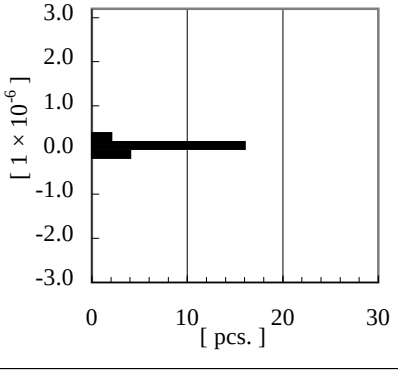
3. Temp. humidity storage
+85 °C × 85 %RH × 1 000 h



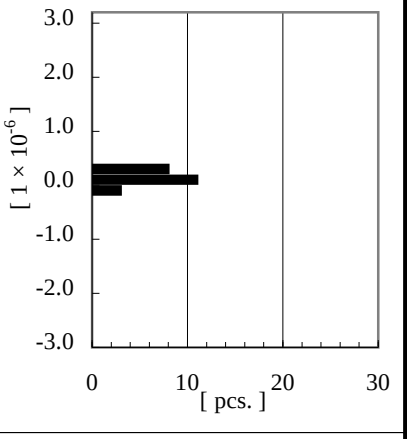
4. Temp. cycle
-40 °C ⇔ +85 °C
1000 cycles



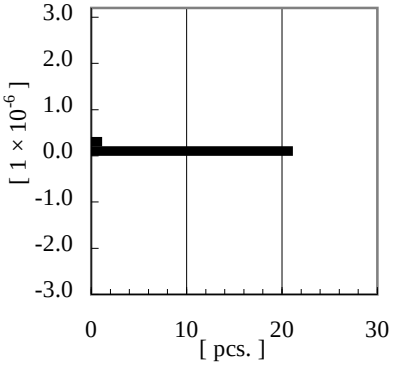
5. Resistance to soldering heat
For convention reflow soldering furnace (3 times)



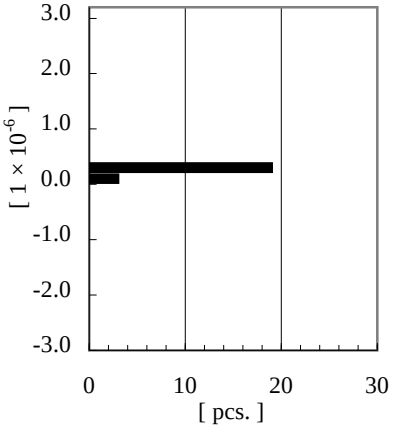
6. Drop
1500 mm × 6 times



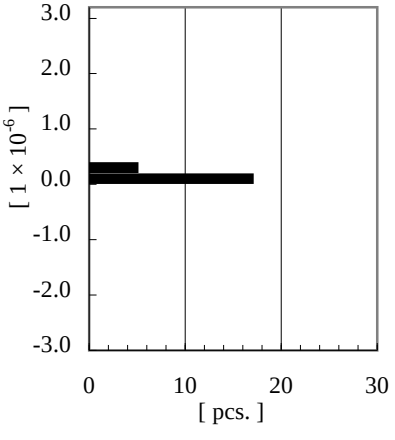
7. Vibration
10 Hz to 55 Hz amplitude 0.75 mm
55 Hz to 500 Hz acceleration 98 m/s^2
15 min / cycle
6 h (2 h × 3 directions)



8. ESD (MM)
200pF 0Ω 200V



9. ESD (HBM)
100pF 1.5kΩ 2000V



Qualification Data