

# **INFORMATION**

**Model :** **TG-5035CG-17N 26MHz**

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**SPEC. No. :** **A11-864-0S**

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**DATE :** **Mar. 21. 2012**

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**EPSON TOYOCOM CORPORATION**

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## INTRODUCTION

1. The contents is subject to change without notice.  
Please exchange the specification sheets regarding the product's warranty.
2. This sheet is not intended to guarantee or provide an approval of implementation of industrial patents.
3. We have prepared this sheet as carefully as possible.  
If you find it incomplete or unsatisfactory in any respect, We would welcome your comments.

# SPECIFICATIONS

This product is compliant with RoHS Directive.

This Product supplied (and any technical information furnished, if any) by Epson Toyocom 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.

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.

## Model

The product No. of this crystal oscillator unit is **X1G003851001500**.

The model is **TG-5035CG-17N** (TCXO)

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## [ 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: V<sub>CC</sub> 1: 1.80 V / V<sub>CC</sub> 2: 2.80 V.

## [ 2 ] Absolute maximum ratings

Parameter	Symbol	Value	Unit	Note
Supply voltage	V <sub>CC</sub> -GND	-0.3 to 4.5	V	
Storage temperature range	T <sub>-STG</sub>	-40 to +85	°C	

## [ 3 ] Operating range

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power voltage	V <sub>CC</sub> 1	1.70	1.80	1.90	V	V <sub>CC</sub> 1=1.8 V ± 0.1 V
	V <sub>CC</sub> 2	2.52	2.80	3.08		V <sub>CC</sub> 2=2.8 V ± 10 %
Power voltage	GND	0.0	0.0	0.0	V	
Operating temperature range	T <sub>use</sub>	-40	+25	+85	°C	
Output load	Load_R	9.0	10.0	11.0	kΩ	
	Load_C	9	10	11	pF	
DC-cut capacitor	C <sub>C</sub>	0.01			μF	

DC-cut capacitor is not included in our TCXO. Please insert DC-cut capacitor(0.01uF Min.) in output line.

## [ 4 ] Frequency characteristics

- 1) Output frequency 26.000000 MHz
- 2) Frequency characteristics

( Condition :  $V_{CC} = 1.8 / 2.8 \text{ V}$ ,  $GND = 0.0 \text{ V}$ , Load  $10 \text{ k}\Omega // 10 \text{ pF}$ ,  $T_{use} = +25 \text{ }^\circ\text{C}$  )

Parameter	Symbol	Value	Note
Frequency tolerance	f_tol(OSC)	$\pm 2.0 \times 10^{-6}$ Max.	$T_{use} = +25 \text{ }^\circ\text{C} \pm 2 \text{ }^\circ\text{C}$ After 2times Reflow *1,*2
Frequency / temperature characteristics	fo-Tc	$\pm 0.5 \times 10^{-6}$ Max. $\pm 3.0 \times 10^{-6}$ Max.	$T_{use} = -30 \text{ }^\circ\text{C}$ to $+85 \text{ }^\circ\text{C}$ $T_{use} = -40 \text{ }^\circ\text{C}$ to $-30 \text{ }^\circ\text{C}$ (Based on frequency at $+25 \text{ }^\circ\text{C}$ )
Hysteresis	-	$\pm 0.6 \times 10^{-6}$ Max.	Temp.ramped over operating range. Frequency measured before and after at $+25 \text{ }^\circ\text{C}$
Frequency / Load coefficient	fo-Load	$\pm 0.1 \times 10^{-6}$ Max.	Load : $10 \text{ k}\Omega // 10 \text{ pF}$ , $\pm 10 \%$ each
Frequency / voltage coefficient	fo-Vcc	$\pm 0.1 \times 10^{-6}$ Max.	$V_{CC1} = 1.80 \text{ V} \pm 0.1 \text{ V}$ $V_{CC2} = 2.80 \text{ V} \pm 10 \%$
Frequency slope vs. Temp.	-	$\pm 0.05 \times 10^{-6} / \text{ }^\circ\text{C}$ Max.	$-20$ to $+65 \text{ }^\circ\text{C}$ / every $2 \text{ }^\circ\text{C}$
		$\pm 0.10 \times 10^{-6} / \text{ }^\circ\text{C}$ Max.	$-30$ to $+85 \text{ }^\circ\text{C}$ / every $2 \text{ }^\circ\text{C}$
		$\pm 0.35 \times 10^{-6} / \text{ }^\circ\text{C}$ Max.	$-40$ to $+85 \text{ }^\circ\text{C}$ / every $2 \text{ }^\circ\text{C}$
Frequency aging	f_age	$\pm 1.0 \times 10^{-6}$ Max.	$T_{use} = +25 \text{ }^\circ\text{C}$ first year
		$\pm 1.5 \times 10^{-6}$ Max.	$T_{use} = +25 \text{ }^\circ\text{C}$ 2 years
		$\pm 2.5 \times 10^{-6}$ Max.	$T_{use} = +25 \text{ }^\circ\text{C}$ 5 years
		$\pm 5.0 \times 10^{-6}$ Max.	$T_{use} = +25 \text{ }^\circ\text{C}$ 10 years

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

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

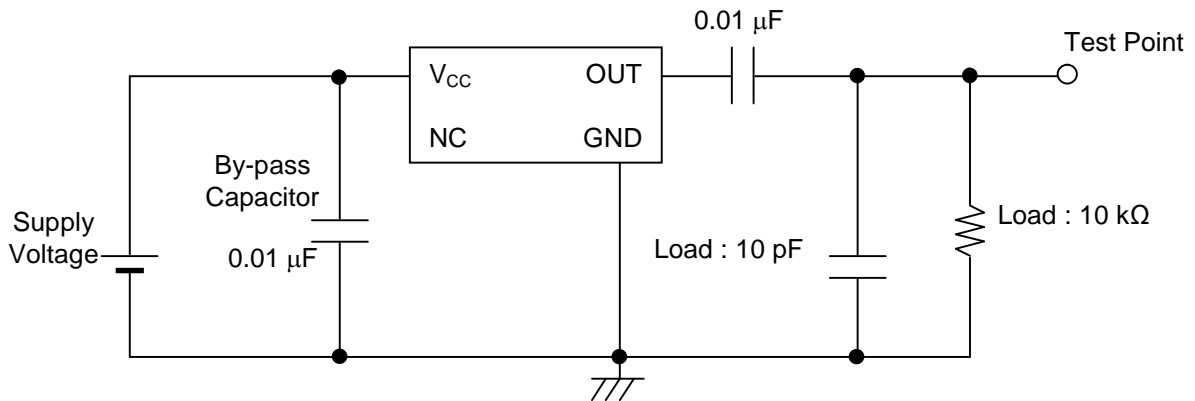
## [ 5 ] Electrical characteristics

( Condition :  $V_{CC} = 1.80 \text{ V}$ ,  $GND = 0.0 \text{ V}$ , Load  $10 \text{ k}\Omega // 10 \text{ pF}$ ,  $T_{use} = +25 \text{ }^\circ\text{C}$  )

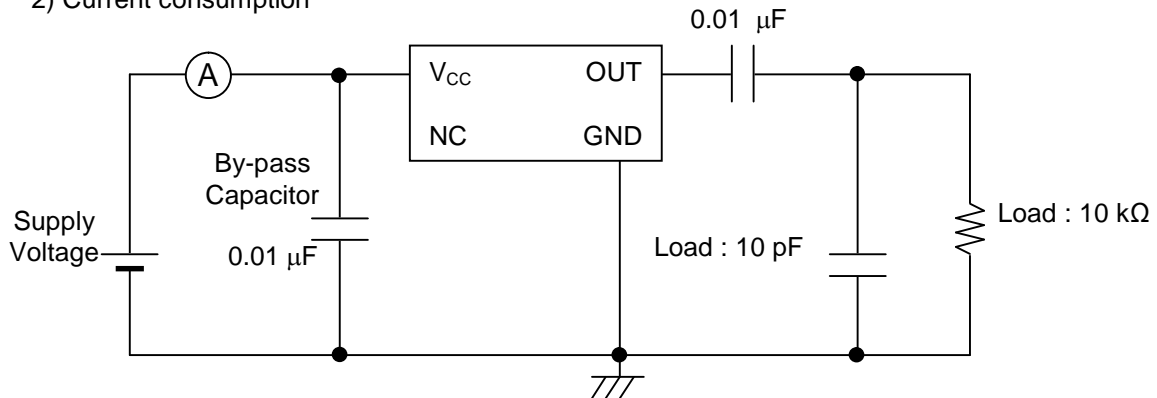
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Current consumption	$I_{CC}$	-	-	1.50	mA	
Output level	$V_{PP}$	0.80	-	-	V	Peak to peak voltage
Symmetry	SYM	40		60	%	GND level
SSB Phase noise	L(f)	-	-	-50	dBc /Hz	Offset:1 Hz
		-	-	-80		Offset:10 Hz
		-	-	-105		Offset:100 Hz
		-	-	-130		Offset:1 kHz
		-	-	-148		Offset:10 kHz
		-	-	-150		Offset:100 kHz
Harmonics	-	-	-	-8	dBc	$T_{use} = -30 \text{ }^\circ\text{C}$ to $+80 \text{ }^\circ\text{C}$
Start up time	$t_{osc}$	-	-	2.0	ms	Until frequency has been reached within $\pm 0.5 \text{ ppm}$ of final frequency. Until output signal has been reached min90% of final amp.

## [ 6 ] Test circuit

### 1) Output Load



### 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<sub>CC</sub> 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.)

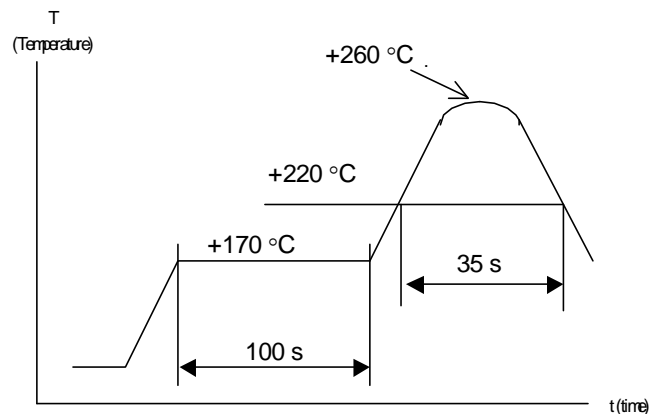
No.	Item	Value *1		Test method
		Freq. Tolerance [ $1 \times 10^{-6}$ ] *2	Electrical characteristics	
1	High temp. storage *3	$\pm 2.0$	Satisfy Item output level after test	+85 °C × 1 000 h
2	Low temp. storage *3	$\pm 2.0$		-40 °C × 1 000 h
3	High temperature with Humidity	$\pm 2.0$		+85 $\pm$ 2 °C × 85 $\pm$ 5 %RH × 1 000 h
4	Temp. cycle *3	$\pm 2.0$		-40 °C to +85 °C (30 min × 100 cycle/each)
5	Resistance to Soldering heat (Reflow characteristics)	$\pm 1.0$		Reflow furnace with the condition 2 times
6	Drop	$\pm 2.0$		Free drop from 750 mm height on a hard wooden board for 3 times. (Board is thickness more than 30 mm)
7	Vibration (variable frequency)	$\pm 1.0$		10 Hz to 55 Hz 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)
8	ESD (MM)	$\pm 1.0$		200pF 0Ω 200V. Discharge 3 pulses
9	ESD (HBM)	$\pm 1.0$		100pF 1.5kΩ 2000V. Discharge 3 pulses
10	Solderability	Terminals must be 95 % covered with fresh solder		Dip termination into solder bath at +235 °C for 5 s (Using Rosin Flux)

### Notes

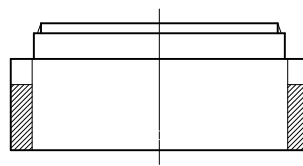
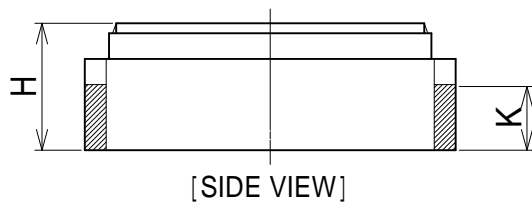
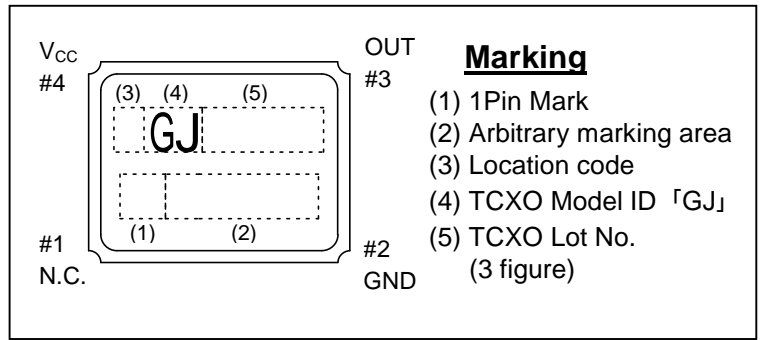
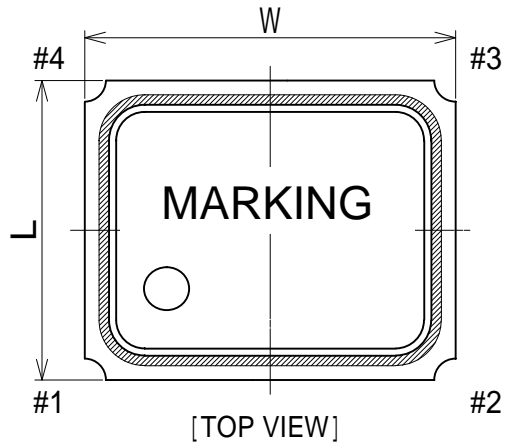
- 1.\*1 each test is independent.
- 2.\*2 measuring 2 h to 24 h later leaving in room temperature after each test.
- 3.\*3 Pre conditionings
  1. reflow 2 times
  2. Initial value shall be after 24 h at room temperature.

### Infrared-reflow

Pre heating temperature : +170 °C      Pre heating time : 100 s  
 Heating temperature : +220 °C      Heating time : 35 s  
 Peak temperature must not exceed +260 °C

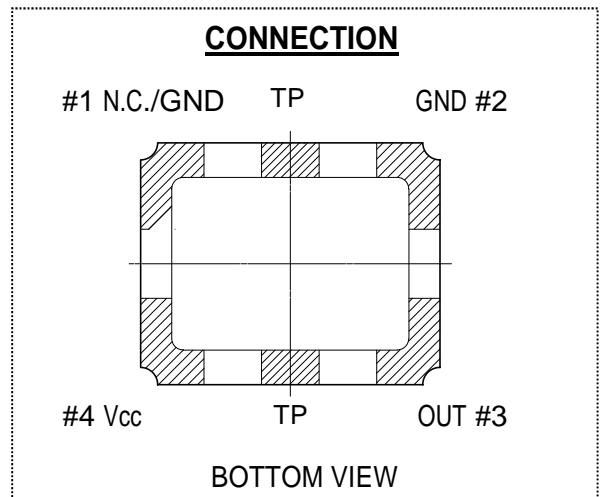
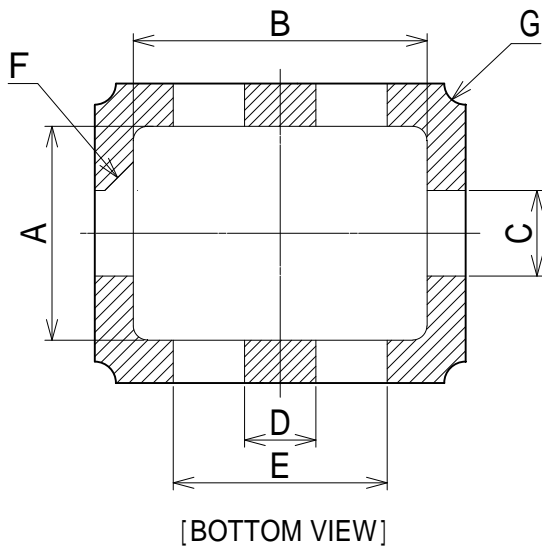


## [ 8 ] Dimensions And Marking Layout



### Material

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



(unit : mm)

Dim.	Min.	Typ.	Max.	Dim.	Min.	Typ.	Max.
W	2.45	2.50	2.65	D	0.40	0.50	0.60
L	1.95	2.00	2.15	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				

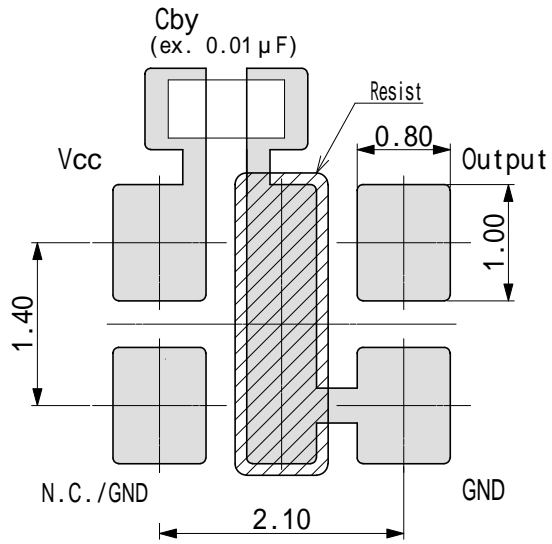


## [ 9 ] Recommendable patterning

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

### 1. Static discharge

This device is made with CMOS IC. Please take precautions to prevent damage against electrical static discharge.

### 2. Power fluctuations

We recommend placing a 0.1  $\mu$ F capacitor between  $V_{CC}$  and GND to obtain stable operation and protect against power line ripple.

$V_{CC}$  and GND pattern shall be biggest as possible.

### 3. Power supply line

EPSON cannot recommend to put filtering element into power line so as to reduce noise. Oscillator might be unstable oscillation because high frequency impedance of power line becomes higher. When use filtering element, please verify electrical construction and or element's spec.

### 4. Power on

EPSON doesn't recommend to power on from intermediate electric voltage or extreme fast power on. Those powering conditions may cause no oscillation or abnormal oscillation.

### 5. Power line ripple

Power line ripple level must be kept less than 200 mVpp.

### 6. Output line

As a long output line may cause irregular output, please take care to design that output line is as shortest possible, and also keeps high level signal source away from this device.

### 7. Layout of TCXO in P.C.B.

Please keep distance in TCXO from Another High Level signal line.

### 8. Shock reliability

This device contains a quartz crystal, so please do not give too much shock or vibration.

We recommend storing of devices under normal temperature and humidity to keep the specification.

### 9. Automatic insertion

An automatic insertion is available. However, the internal quartz crystal might be damaged in case that too much shock or vibration is given by machine condition. Be sure to check your machine conditioning in advance.

### 10. Ultrasonic cleaning

Ultrasonic cleaners can be used on TCXO Series, however, since the oscillator must be damaged under some conditions, please exercise in advance.

### 11. Storage

We recommend storing products at +15 to +35 and 25 %RH to 85 %RH.

### 12. Vibration

When some vibration or periodic mechanical shock will be added from piezoelectric sounder, piezoelectric buzzer and from like that to the oscillator, the phenomena such as a frequency drift or swing level change may exist during the time facing such vibration.

Of cause our oscillator has designed to minimize such problems, however please take care to design the layout as follows to avoid such problems.

(1) To mount a sounder or vibrator on the separated circuit board.

(2) When mounted on a same circuit board, to keep the distance as far as possible between a oscillator and vibrator to put some cushion between a vibrator and a circuit board to put some slit on the portion between a vibrator and a oscillator.

(3) When you want to process electrical tests, it is advised that the circuit should be enclosed in a enclosure because the vibration affects will be changed from the result of a circuit board itself.

# TAPING SPECIFICATION

## . Application

This standard will apply to 2.5 × 2.0 Ceramic package.

Spec : CG package

## . Contents

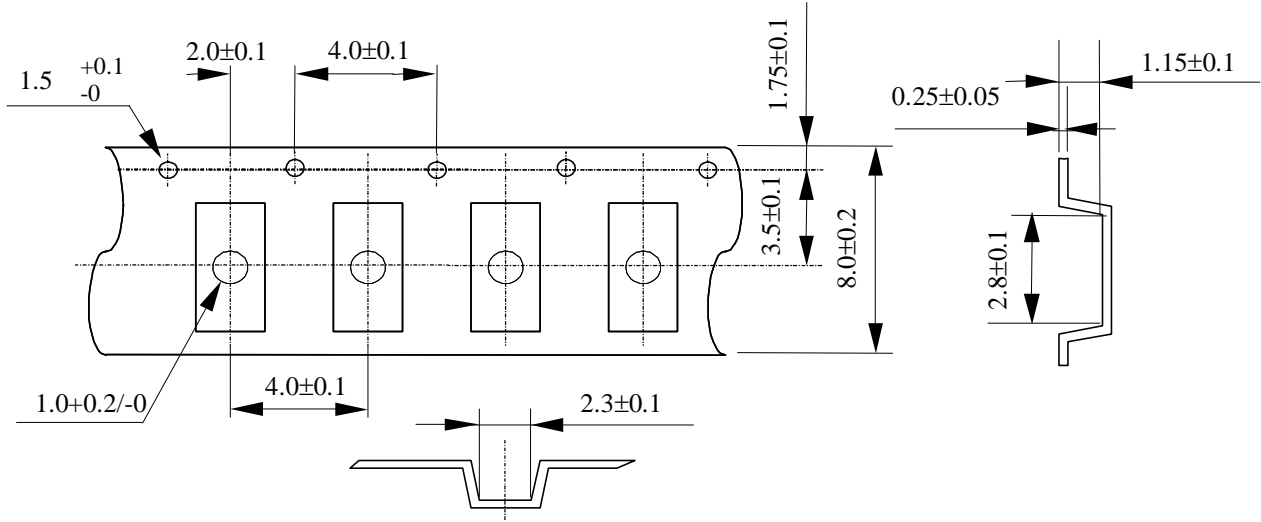
Item No.	Item	Page
{ 1 }	Taping specification	1 to 2
{ 2 }	Inner carton	3
{ 3 }	Shipping carton	
{ 4 }	Marking	4
{ 5 }	Quantity	
{ 6 }	Storage environment	
{ 7 }	Handling	

[ 1 ] Taping specification

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

(1) Tape dimensions

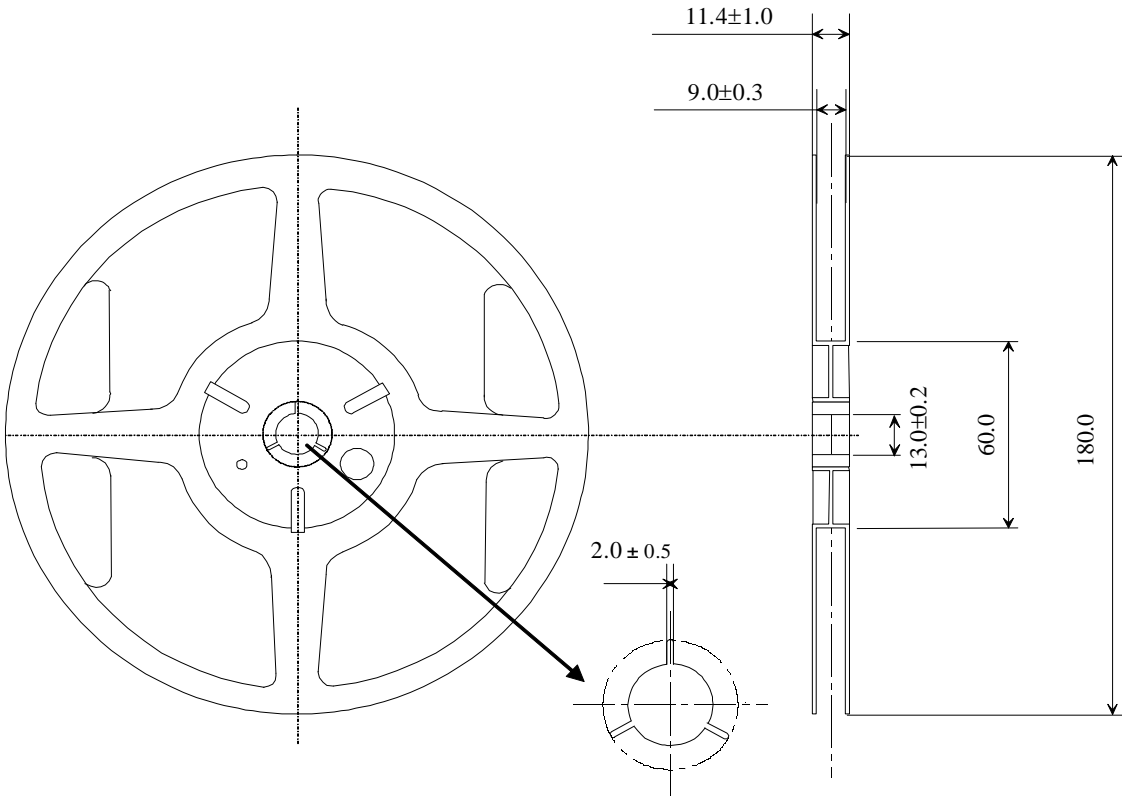
Material of the carrier tape : PS



Unit : mm

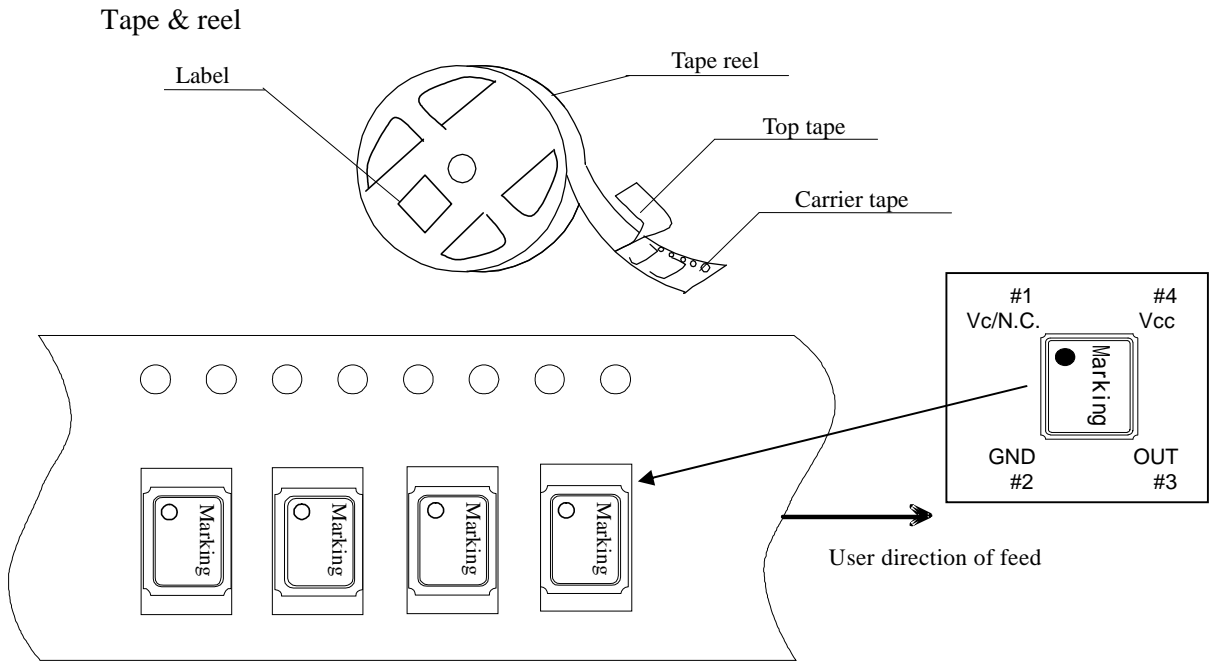
(2) Reel dimensions

Material of the reel : PS

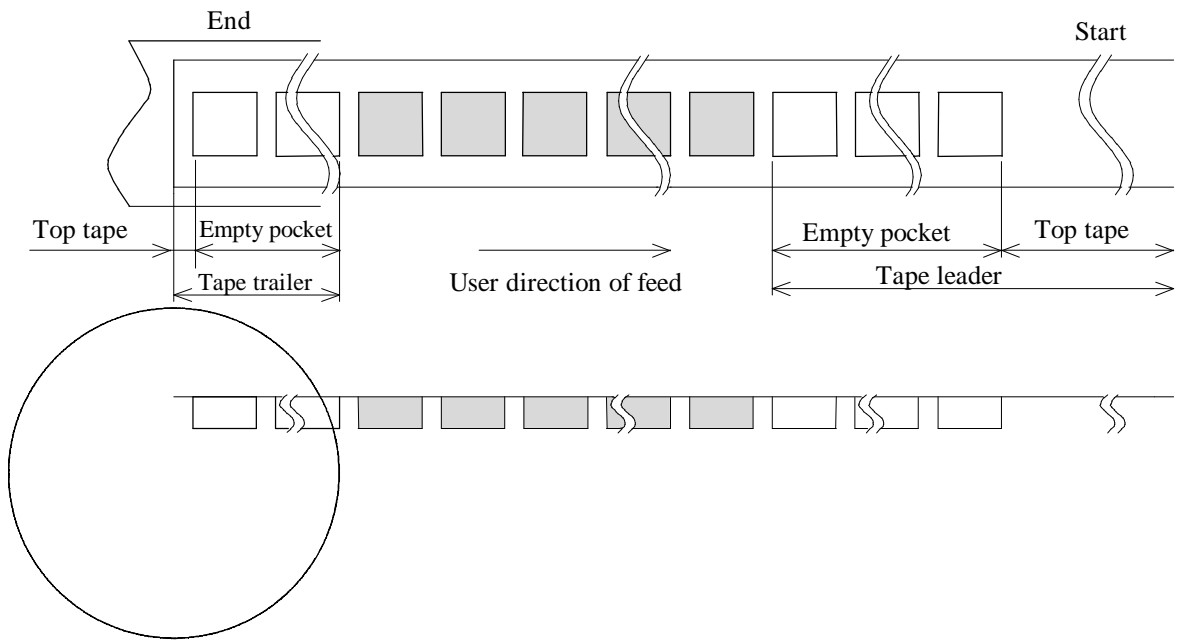


Unit : mm

(3) Packing



Start & end point

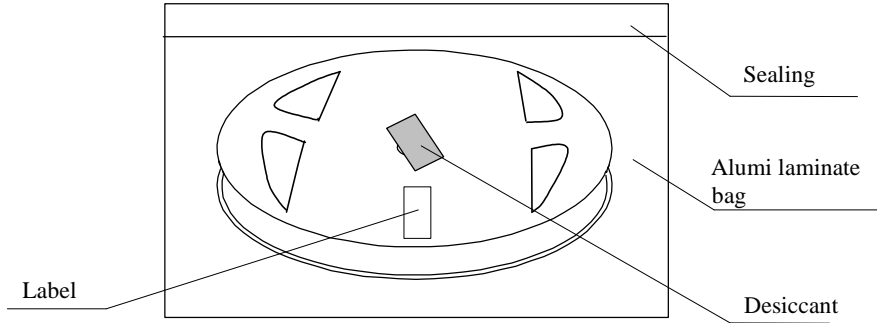


Item		Empty space
Tape leader	Top tape	Min. 200 mm
	Empty pocket	Min. 150 mm
Tape trailer	Top tape	Min. 50 mm
	Empty pocket	Min. 150 mm

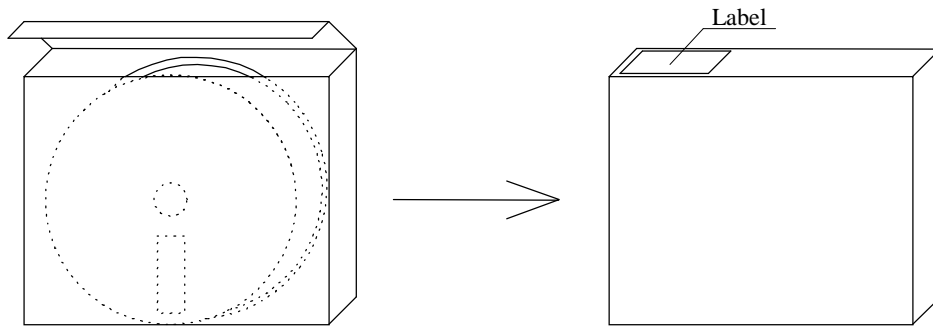
[ 2 ] Inner carton

a) Packing to alumi laminate bag

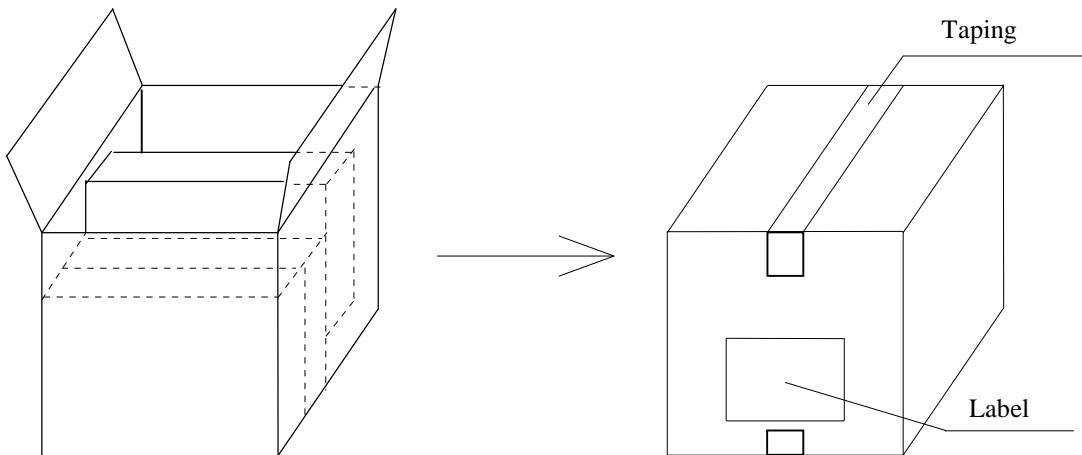
The reel is packed in the vacuum with the alumi laminate bag.



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

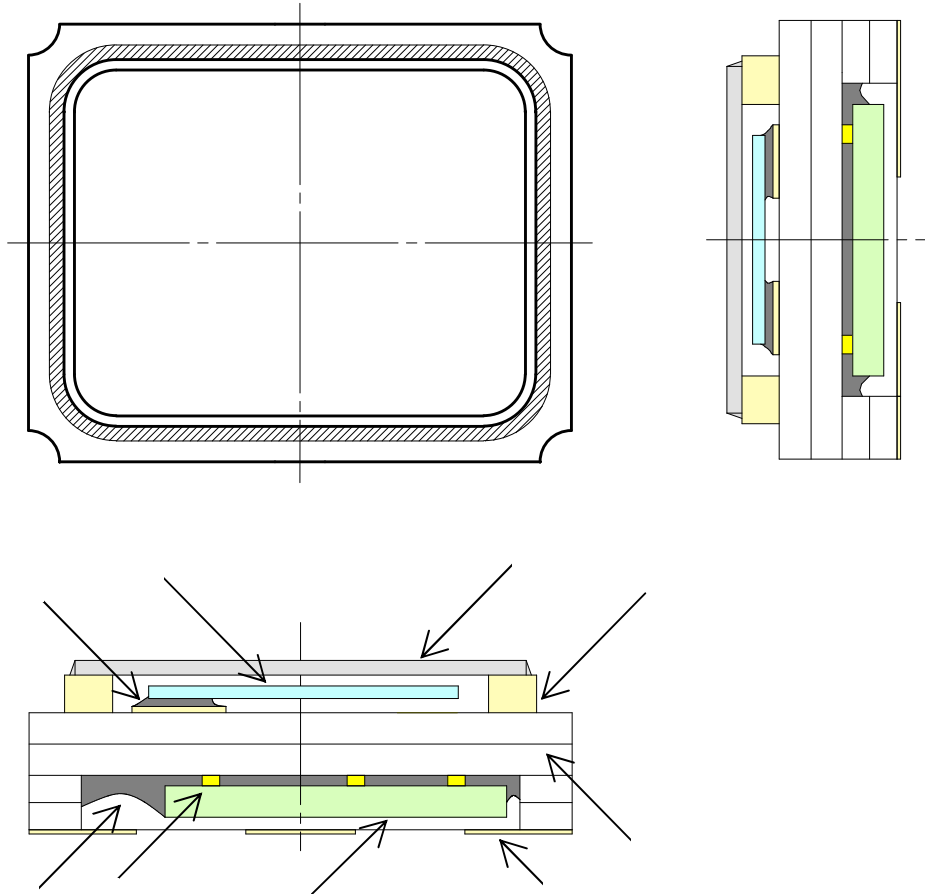
#### [ 6 ] Storage environment

- (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.

## Structure diagram. TG-5035CG



### 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		

### TCE11-CO-074\_02

MGR.	CHK.	ENG.
Y.Shishido		A.Kakumae



## RELIABILITY TEST DATA

**Product Name : TG-50xxCG series**

The Company evaluation condition

We evaluate environmental and mechanical characteristics by the following test condition .

**OUT10-E24-30M**

No.	ITEM	TEST CONDITIONS	VALUE *1		TEST	FAIL
			$\Delta f / f$ *2 [ $1 \times 10^{-6}$ ]	Electrical characteristics	Qty [ n ]	Qty [ n ]
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 <sup>2</sup> 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

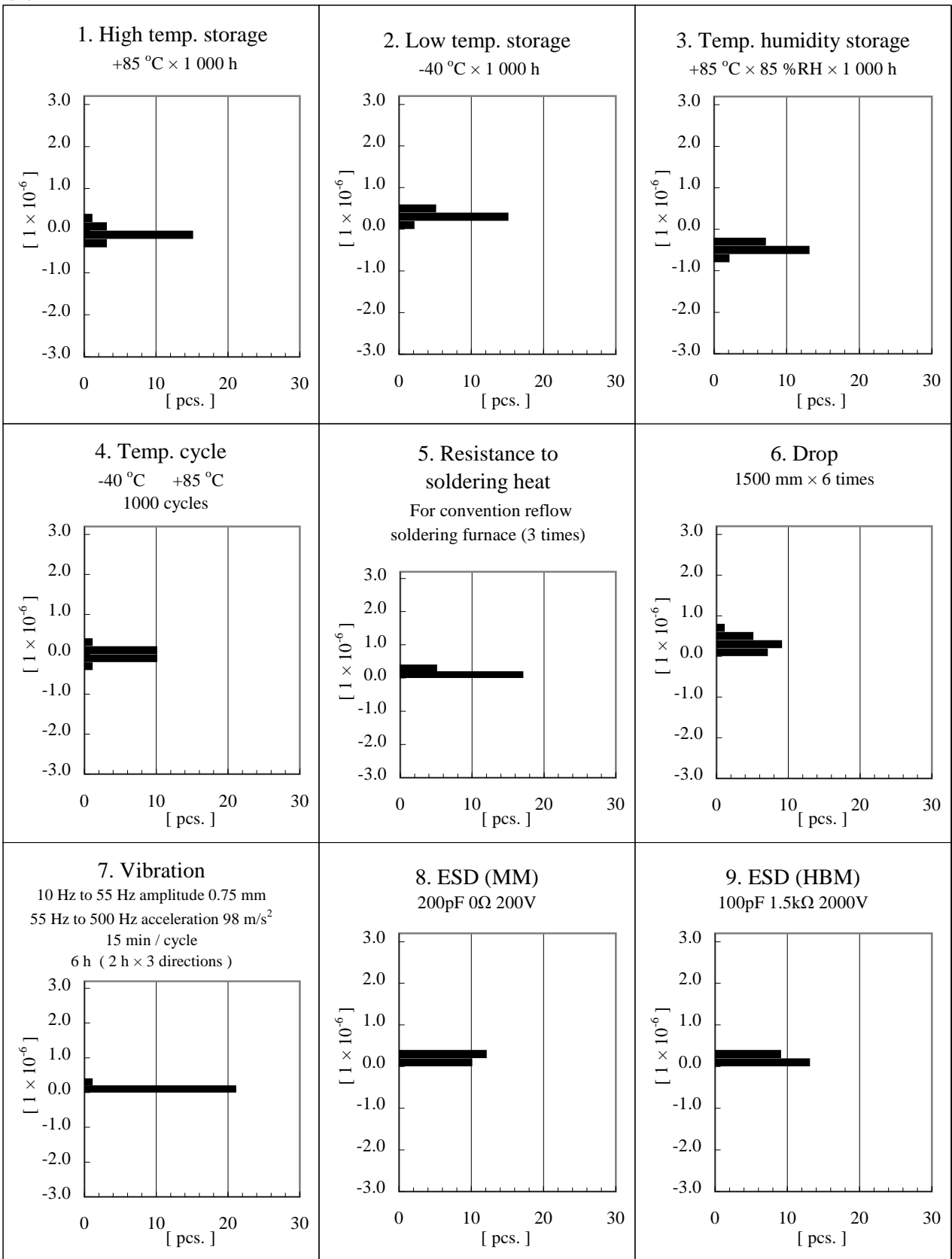
### Notes

- \*1 Each test done independently.
- \*2 Measuring 2 h to 24 h later leaving in room temperature after each test.
- \*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.**

**Product Name : TG-50xxCG series**

df / f



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