



Serial No. : 2020-0595
DATE: 2020/9/7

SPECIFICATION

Product Name **CRYSTAL RESONATOR**

Type **DSR1612ATH**

Nominal Frequency **76.800MHz**

Spec No. **7CG07680A00**

If there is a change in this specifications,
the specification number may be changed.

RECEIPT

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General Manufacturer of Quartz Devices

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Device name Crystal resonator (with dedicated temperature sensor)
 Model name DSR1612ATH
 Nominal frequency 76.800 MHz
 Mass 0.01g max.
 Absolute maximum ratings

Item	Rating	unit
Storage temperature range	-40~+105	°C

Recommended operating conditions

Item	min.	typ.	max.	unit
Operating temperature range	-30	-	+105	°C

1. Electrical characteristics

Crystal resonator

(This test shall be performed under the conditions of temp. at +25±3°C, Relative humidity 60% R.H. max.)

Item	Limits			unit	Conditions	Notes
	min.	typ.	max.			
1 Mode of vibration	-	AT-cut Fundamental	-			
2 Initial frequency tolerance	-10	-	+22	ppm	T _A =+25°C, DL=10uW	
3 Tolerance over temperature	-12	-	+12	ppm	T _A =-30~+85°C	
4 Aging	-0.7	-	+0.7	ppm/year		
5 Frequency drift after reflow	-2	-	+2	ppm	After two reflows	
6 Equivalent series resistance	-	-	30	Ω		
7 Quality factor	50000	-	-			
8 Spurious mode series resistance	1100	-	-	Ω	±1MHz	
9 Pullability	+10	-	+15	ppm/pF		
10 Load capacitance	-	7	-	pF		
11 Inflection point	+22.5	-	+26.5	°C	T=T ₀ -C ₂ /3C ₃	
12 First-order curve fitting Parameter/ C1	-0.4	-	-0.1	ppm/°C	+25~+35°C	*1
13 Second-order curve fitting Parameter/ C2	-6.0	0.0	+6.0	×10 ⁻⁴ ppm/°C ²		*1
14 Third-order curve fitting Parameter/ C3	+8.5	+10.0	+11.5	×10 ⁻⁵ ppm/°C ³		*1
15 Residual frequency stability slope	-50	-	+50	ppb/°C	T _A =-15~+70°C	*2,3
	-100	-	+100	ppb/°C	T _A =-30~-15°C T _A =+70~+85°C	*2,3
16 5°C small orbit hysteresis1	-50	-	+50	ppb/°C	T _A =-15~+70°C	*2,3,4
	-100	-	+100	ppb/°C	T _A =-30~-15°C T _A =+70~+85°C	*2,3,4
17 5°C small orbit hysteresis2	-	-	100 (magnitude)	ppb pk-pk	T _A =-30~+85°C	*5,6
18 Drive level	10	200	250	uW		
19 Drive level dependency	1. Frequency (max.-min.)	-	-	6	ppm	*7
	2. Frequency (repeatability)	-	-	0.7	ppm	*7
	3. ESR (max.)	-	-	30	Ω	*7
	4. ESR (repeatability)	-	-	10	%	*7
20 Insulation resistance	500	-	-	MΩ		

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Notes

*1. The FT curve of an AT-cut crystal can be modeled as third-order polynomial.
 C_0, C_1, C_2 and C_3 are coefficients that need to be defined are calculated in the order specified by Qualcomm's 80-NJ458-2 Rev J.

C_1 : First-order curve fitting parameter/ C_2 : Second-order curve fitting parameter/
 C_3 : Third-order curve fitting parameter/ $T_0=+24.5^\circ\text{C}$

$$f(t) = c_3(\theta)(t - t_0)^3 + c_2(\theta)(t - t_0)^2 + c_1(\theta)(t - t_0) + c_0$$

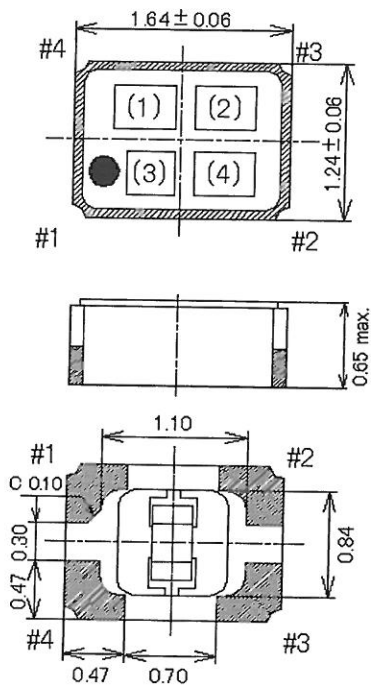
- *2. Measure FT point every 1°C, heating up from -30~+85°C, subtract off 5th order polynomial best fit and calculate the slope of the residual. DL=250uW
- *3. Continuous temperature rate change of ~1.0°C /min
- *4. Measure FT points every 0.5°C while cycling temperature over 5°C small temperature orbit, an example 5°C small orbit temperature cycle is +30~+35~+30°C. DL=250uW
 Subtract the 5th order polynomial best fit from *2 (discard the first point of each heating and cooling cycle), and calculate the slope of the residual for each of these heating and cooling 10points curves.
- *5. Continuous temperature rate change of ~1.0°C/min
- *6. Measure FT points every 0.5°C while cycling temperature over 5°C small temperature orbit, an example 5°C small orbit temperature cycle is +30~+35~+30°C. DL=250uW
 Calculate the average difference between each pair of 9same temperature cooling - heating frequency measurement. (discard the first and last point of each heating and cooling cycle)
- *7. 0.01~250~0.01uW (Measurement point: total 30points)

Thermistor

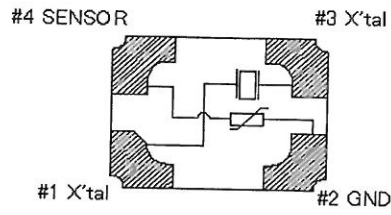
	Item	Limits	unit	Conditions
1	Resistance	100±1%	kΩ	T _A =+25°C
2	B-constant	4250±1%	K	T _A = +25~+50°C

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2. Dimensions and marking



Connection (Top view)



Marking

Country (1) Model code (2) Frequency (3) Logo (4) Date code
(MHz, 3digits)

INDONESIA TH 76.8 D Year (1digit) + Week (2digits)
e.g.2020/1/1→ 001

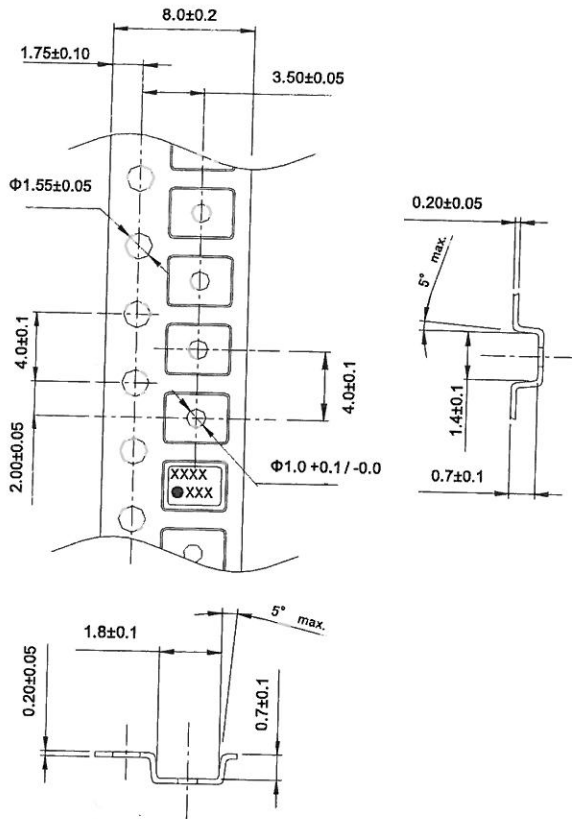
unit : mm

general dimension tolerance : ± 0.1 mm

Figure-1

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3. Emboss carrier tape & reel
 (1) Dimensions of embossed carrier tape

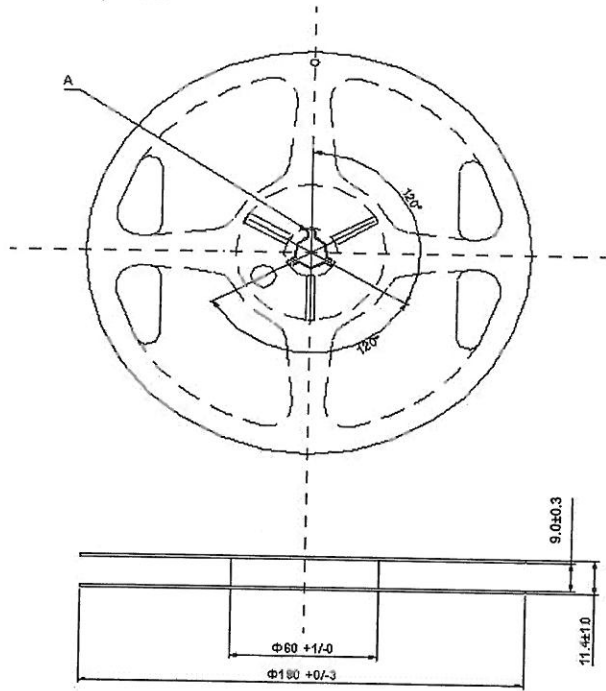


1. Clearance of an embossing tape, and product unit : mm
2. Quality : Polystyrene (conductivity)
3. Tensile strength of an embossing tape : more than 14N

Figure-2

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(2) Dimensions of tape reel



Material :Polystyrene(conductivity)
unit:mm

Section A

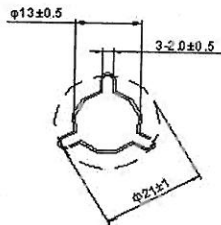


Figure-3

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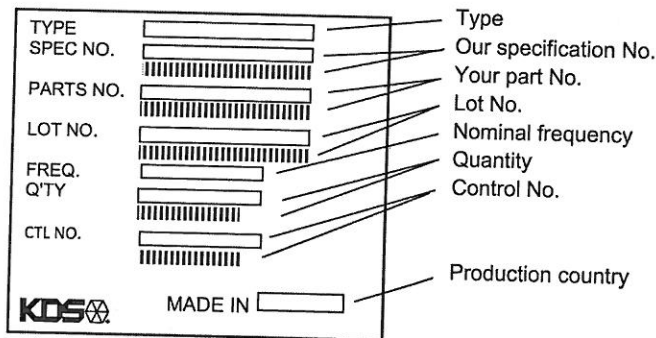
(3) Storage condition
 Temperature : +40°C max.
 Relative humidity : 80% R.H. max.

(4) Standard packing quantity
 3,000 pcs / reel

(5) Material of the tape

Tape	Material
Carrier tape	Polystyrene (electrically conductive)
Cover tape	PET+olefin resin (electrically conductive)
Reel	Polystyrene (electrically conductive)

(6) Label contents
 Label



Stick a label on the each reel.

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(7) Taping dimension

Leader	Cover tape	The length of cover tape in the leader is more than 400mm including empty emboss area.
	Emboss tape	After all products were packaged, must remain more than twenty pieces or 400mm empty area, which should be sealed by cover tape.
Terminal	Cover tape	The tip of cover tape shall be fixed temporary by paper tape and roll around the core of reel one round.
	Emboss tape	The empty emboss area which are sealed by cover tape must remain more than 40mm.

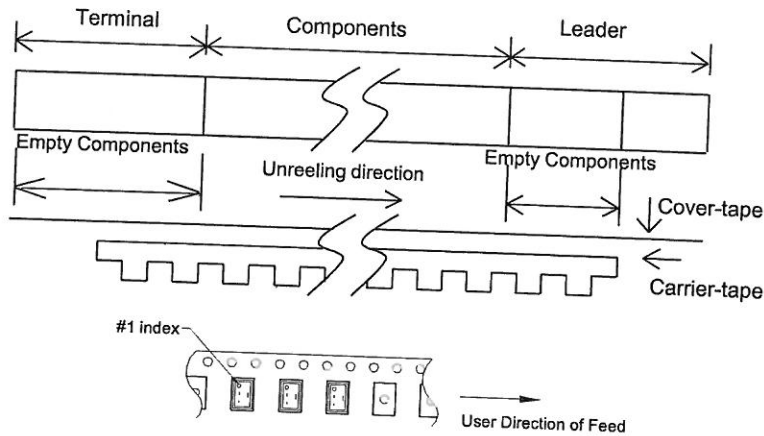


Figure-4

(8) Joint of tape

The carrier-tape and cover-tape should not be jointed.

(9) Release strength of cover tape

It has to between 0.1~0.7N under following condition.

- Pulling direction 165~180°
- Speed 300mm/min
- Otherwise unless specified.

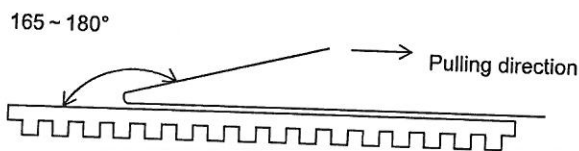


Figure-5

Other standards shall be based on JIS C 0806 -1990.

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4. Packing

(1) Storage method

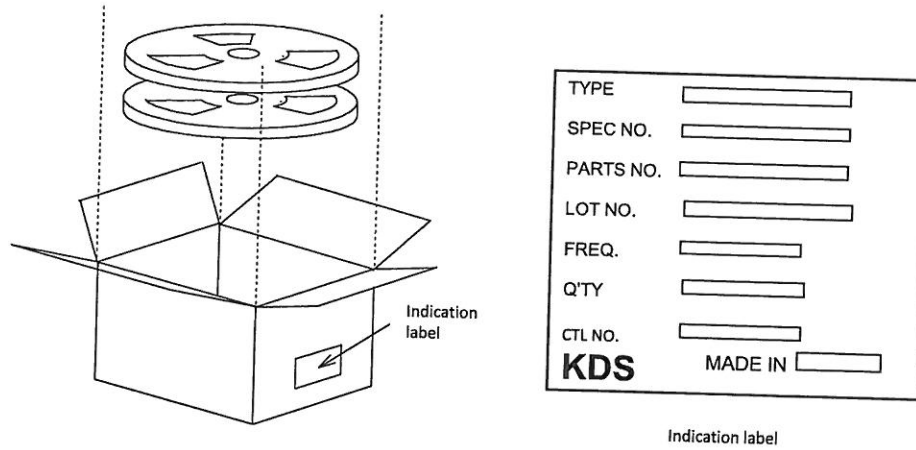


Figure-6

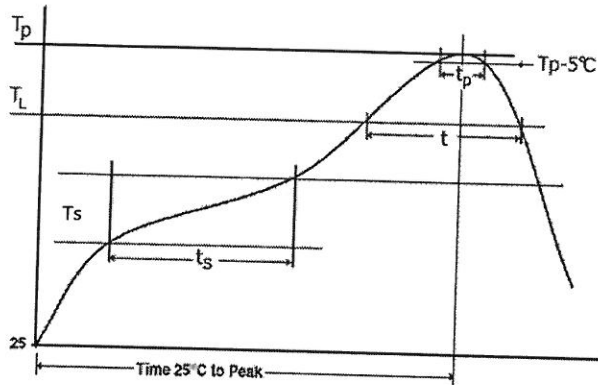
(2) Box size

From lot size packing size shall be changed.
 In the upper and lower part and the opening in box it shall be protected products using aircushion sheets.

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5. Reflow conditions (reference)

During the solder reflow process, please complete within following temperature, period.
Reflow soldering shall be allowed only 3times.



T _s	(°C)	150~200
t _s time	(s)	60~120
T _L	(°C)	217
t time	(s)	60~90
T _p	(°C)	max.260
t _p	(s)	max.30

Figure-7

6. Land pattern (reference)

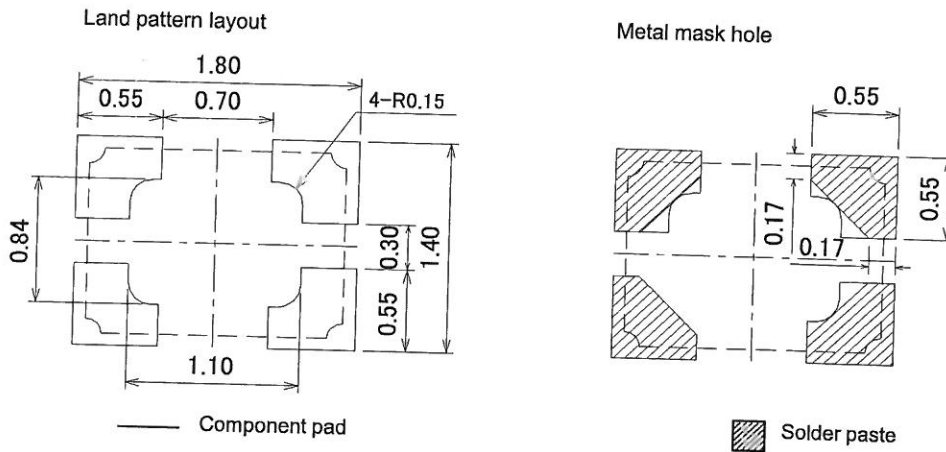


Figure-8

unit : mm

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7. Mechanical endurance

(1) Shock (acceleration)

After the following test, parts shall conform specification 9.B.
1000m/s² by 6ms X, Y, Z each axis (6 directions) , 10cycles

(2) Shock (mounting drop)

After the following test, parts shall conform specification 9.B.
Right and reverse side at 10cycles drop from 150cm heights to marble.
Further, parts shall be soldered on substrate, fixed Aluminum materials (about 200g).
Substrate materials : FR-4 board (thickness 1.6mm)

(3) Vibration

After the following test, parts shall conform specification 9.B.
and no abnormal appearance shall be observed.

- Frequency of vibration : 10~2000Hz
- Amplitude (p-p) : Sine waves of 1.5mm (10~55Hz)
- Acceleration : 200m/s² (55~2000Hz)
- Period : 20min
- Vibration period : 2h for X, Y, Z

(4) Seal

Less than 1.0×10⁻⁹ Pa m³/s by helium leak detector.

(5) Solderability

After the following test, more than 90% of terminal shall be covered by new solder.
3±0.5s dip in +245±5°C solder.
(Solder composition : Sn-3Ag-0.5Cu) (Use rosin type flux for solder.)

(6) Resistance to soldering heat (reflow)

24h or 48h past at room temperature from following test, parts shall conform specification 9.B.
perform the attached reflow 3times (leave 2h) conditions to reference.

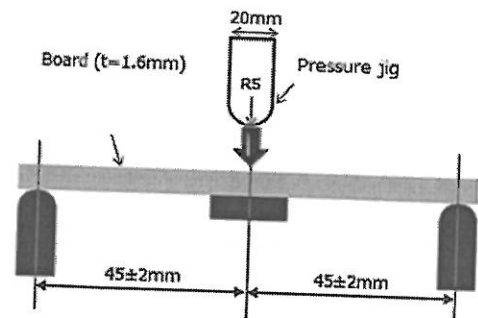
(7) Substrate bending

After the following test, parts shall conform specification 9.B.
and no abnormality shall be observed in external appearance and sealing
tighten and others shall be based on ET-7403 of EIAJ.

Mount the specimen on substrate.

Apply the following pressure

- Direction : see right figure
- Speed : about 1.0mm/s
- Hours : 5±1s
- Amount of substrate : 3mm max.
- Substrate materials : FR-4 board (Thickness 1.6mm)



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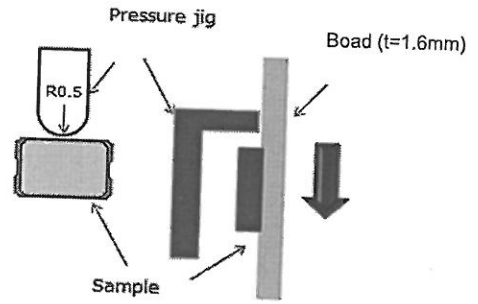
(8) Shear

After the following test, parts shall conform specification 9.B.
and no abnormality shall be observed in external appearance and sealing
tightness and others shall be based on ET-7403 of EIAJ.

Mount the specimen on substrate.

Apply the following pressure

- Weight : 5N
- Hours : 10±1s
- Direction : see right figure



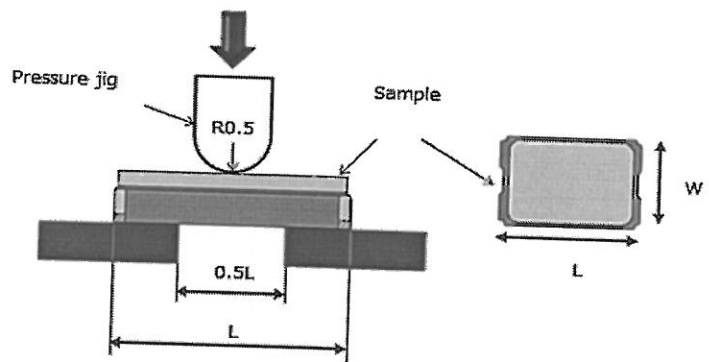
(9) Body strength

After the following test, parts shall conform specification 9.B.
and no abnormality shall be observed in external appearance and sealing
tightness and others shall be based on ET-7403 of EIAJ.

Mount the specimen on substrate.

Apply the following pressure

- Weight : 3N
- Hours : 10±1s
- Direction : see right figure



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8. Environmental endurance

(1) Low temperature

2h past at room temperature after following test, parts shall conform specification 9.B.
240h, $-40\pm 2^{\circ}\text{C}$.

No visible damage.

(2) Humidity

2h past at room temperature after following test, parts shall conform specification 9.B.
240h, $+85\pm 2^{\circ}\text{C}$, relative humidity $85\pm 5\%$ R.H.

No visible damage.

(3) High temperature

2h past at room temperature after following test, parts shall conform specification 9.B.
240h, $+105\pm 2^{\circ}\text{C}$.

No visible damage.

(4) Temperature cycle

$-40\sim +105^{\circ}\text{C}$ at 30min (during transition 2~3min). 200cycles 2h past at room temperature
after of following test, parts shall conform specification 9.B.

No visible damage.

9. SPECIFICATION

Frequency variation and equivalent resistance shall be within table below after the reliability test.

Spec.	Frequency variation	Equivalent resistance
A	$\pm 2\text{ppm}$	$\pm 10\%$ or 1.5Ω max. (Use larger specification)
B	$\pm 2\text{ppm}$	$\pm 15\%$ or 2.0Ω max. (Use larger specification)
C	$\pm 5\text{ppm}$	$\pm 10\%$ or 1.5Ω max. (Use larger specification)
D	$\pm 5\text{ppm}$	$\pm 20\%$ or 2.0Ω max. (Use larger specification)

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10 Handling instructions

- (1) Soldering
Please perform the attached reflow conditions to reference within 3times.
- (2) Mount
Crystal products are designed to be compatible with automatic mounting.
Be sure to have mounting test in advance by using the actual mounting machine and check that the characteristics of the products are not damaged by the automatic mounting.
In the process where the board is warped, such as board separation process, be careful that the warping does not influence the characteristics and soldering of crystal products.
Since mounting by ultrasonic welding and processing have possibility of an excessive vibration spreading inside crystal resonator and becoming the cause of characteristic deterioration and not oscillating, it does not recommend.
- (3) Washing
About use of the washing liquid of a basin system, an alcoholic system, and chlorofluorocarbon-replacing material system, it is checking that it is satisfactory. However please consult in advance about other washing liquid.
Although the check about ultrasonic washing is performed, since it is an examination with simple substance, the check for the second time by the use state is recommended.
- (4) The cautions of use
The piece of crystal it is processed very smaller than the conventional thing inside crystal unit may be damaged, if excessive excitation electric power is applied.
Please use it below with the value specified on catalog and specifications.
Please refrain from forming patterns between crystal land pattern's since there is possibility to cause crack in base.
- (5) Handling product
This product has sufficient intensity to fall and vibration.
However when too much shock is added according to certain cause, the use after a characteristic check is recommended.
- (6) Storage
Since the soldering nature of a terminal may be degraded, please avoid storage in high temperature and humid place.
Please keep it in the place which direct rays do not hit and dew condensation does not generate.

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