



Management No.: Z1-G08

PRODUCT SPECIFICATION

Customer: _____

Customer P/N: _____

Product Description: SXT-1612 76.800MHz 7pF -10~22ppmTKD P/N: SXT16Y076800S71T11GProduct Compliance: ☒Pb-free ☒RoHS 2.0 ☒REACH ☒HF

CUSTOMER'S APPROVAL

(PLEASE RETURN A COPY WITH APPROVAL)

TKD SCIENCE AND TECHNOLOGY CO.,LTD.

Approved	Checked	Prepared by
Xiong Feng	Peng Zhao Yang	Liu Man

Rev.	Revision Description	Date	Prepared by	Checked
A	Initial Release	2026/9/9	Liu Man	Peng Zhao Yang

**1. QUARTZ CRYSTAL UNIT SPECIFICATION**

※ Description	: Quartz Crystal
※ Product Type	: SXT-1612
※ Crystal Cut	: AT-cut
※ Test Equipment	: S&A 250B
※ Electrical Characteristics	:

Item	Parameters	Symbol	Electrical Specifications				Notes
			Min.	Typ.	Max.	Units	
1	Nominal Frequency	F0	76.800000				MHz
2	Oscillation Mode	-	Fundamental				-
3	Load Capacitance	CL	7				pF IEC π -Network
4	Frequency Tolerance	-	-10	-	22	ppm	Frequency tolerance. 25°C $\pm$ 3°C, drive level 250 μ W
5	Equivalent Series Resistance	ESR	-	-	30	Ω	ESR max is specified at max drive level minimum Q, drives a smaller ESR; that is, design the crystal to the minimum Q.
6	Drive Level	DL	10	200	250	μ W	Per year
7	Frequency Stability Over Operating Temp.Range(Ref.to 25°C)	TC	-12	-	12	ppm	At -30~85°C
8	Operating Temperature	-	-30	-	105	°C	
9	Storage Temperature	-	-40	-	105	°C	
10	Aging (@25°C/ first year)	-	-0.7	-	0.7	ppm	
11	Frequency drift after reflow	-	-2.0	-	2.0	ppm	After three reflows
12	Insulation Resistance	-	500	-	-	M Ω	
13	Spurious mode series resistance	SPUR	1100	-	-	Ω	$\pm$ 1MHz



14	Quality Factor	Q	50000	-	-	-	The minimum Q value calculated from ESR and L is smaller than this specification.
15	Tuning sensitivity	TS	10	-	15	ppm/pF	
16	DLD10	-	-	-	20%	-	0.01uW to 250uW to 0.01uW
17	DLDH3	-	-	-	10%	-	
18	FDLD	-	-	-	6.0	ppm	
19	FDLDH	-	-	-	0.7	ppm	
20	Inflection point	Ti	22.5	-	26.5	°C	$T=T_0-C_2/(3 \cdot C_3)$
21	C1,First-order curve fitting parameter	C1	-0.4	-	-0.1	ppm/°C	The curve can be modeled as a third-order polynomial. $F(T)=C_3(T-T_0)^3+C_2(T-T_0)^2+C_1(T-T_0)+C_0$ See note for Range #1 and Range #2
22	C2,Second-order curve fitting parameter	C2	-6	0	6	10^{-4} ppm/°C ²	
23	C3,Third-order curve fitting parameter	C3	8.5	10	11.5	10^{-5} ppm/°C ³	
24	Package	-	$(1.65 \pm 0.05) \times (1.25 \pm 0.05) \times (0.55 \pm 0.1)$			mm	

Note: Requirement is to perform FT curve coefficients least square fit over these 2 temperature ranges:

Range #1: [-30 to 105 °C]

Range #2: [10 to 65 °C]

it is recommended to set the initial inflection point for factory calibration to 24.5°C.

**2. GPS QUALITY SPECIFICATIONS****Crystal perturbation specification 1 (residual frequency stability slope)**

Item	Condition	Specification	Unit
Residual frequency stability slope (residual = difference from fifth-order curve fit)*	Ta = -30°C to -15°C	± 100 (Max.)	ppb/°C
	Ta = -15°C to +70°C	± 50 (Max.)	
	Ta = +70°C to +85°C	± 100 (Max.)	
5 °C small orbit hysteresis 1*	Ta = -30°C to -15°C	± 100 (Max.)	ppb/°C
	Ta = -15°C to +70°C	± 50 (Max.)	
	Ta = +70°C to +85°C	± 100 (Max.)	

* Must meet the 1A and 1B conditions:

■ Condition 1A -Test condition (continuous temperature rate change of ~1.0 °C/min):

- Measure FT points every 1°C, heating up from -30 °C to +85 °C, subtract a fifth-order polynomial best fit and then calculate the slope of the residual.
- The residual slope should be within ±50 ppb/°C.

■ Condition 1B-Hysteresis 1 test condition (continuous temperature rate change of ~1.0 °C/min):

- Measure FT points every 0.5 °C while cycling temperature over a 5°C small temperature orbit; an example 5 °C small orbit temperature cycle is +30°C to +35°C to +30°C.
- During every individual heating/cooling cycle there should be 11 points; discard the first point of each heating and cooling cycle; this leaves 10 points for each heating and cooling cycle. Subtract the fifth-order polynomial best fit from 1 A for each of the 10 points, and then calculate the slope of the residual for each of these heating and cooling 10 point curves.
- The residual slope should be within ±50 ppb/°C.

Crystal perturbation specification 2 (small orbit hysteresis 2)

Item	Condition	Specification	Unit
5 °C small orbit hysteresis 2*	Ta = -30°C to +85°C	100 (magnitude)	magnitude

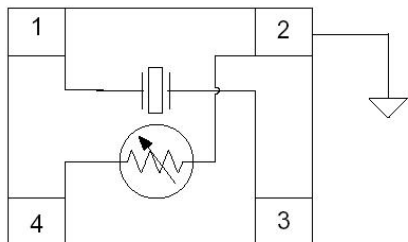
* Must meet condition 2:

■ Condition 2 – Hysteresis 2 test condition (continuous temperature rate change of ~1.0 °C/min):

- Measure FT points every 0.5 °C while cycling temperature over a 5 °C small temperature orbit; an example 5 °C small orbit temperature cycle is +30 °C to +35 °C to +30 °C.
- During every individual heating/cooling cycle there should be 11 points; discard the first and last point of each heating and cooling cycle, which results in nine temperature points. Calculate the average measured peak-to-peak frequency difference for these nine temperature points.
- The average difference is the magnitude of the small orbit hysteresis 2.



3. THERMISTOR SPECIFICATIONS

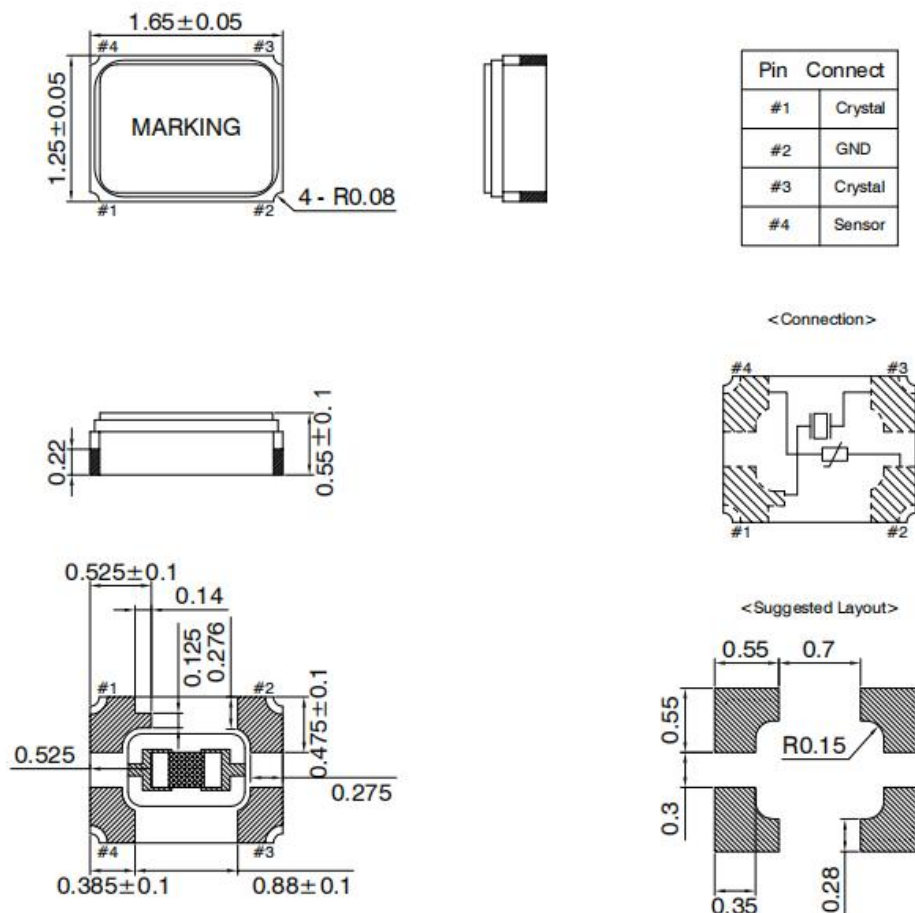


尺寸Size : 0.6mmx0.3mm

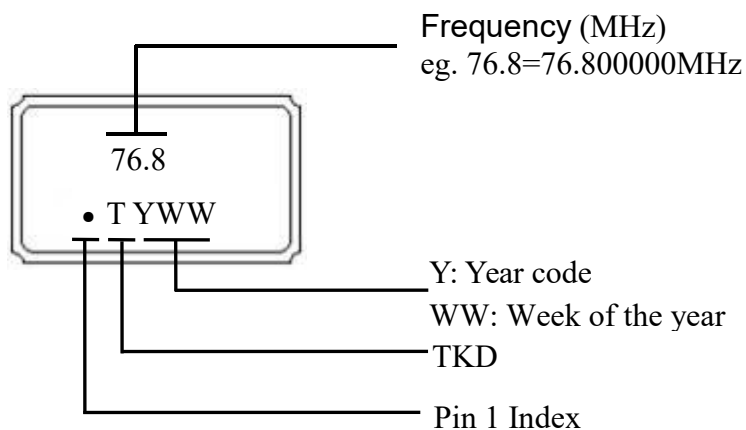
Parameters	Min	TYP.	Max	Unit	Condition
Operating temperature	-30	-	105	°C	
Storage temperature	-40	-	105	°C	
Resistance	-	100	-	K Ω	25°C
B-constant	-	4250	-	K	25~50°C
Tolerance	-1.0	-	+1.0	%	



4. DIMENSIONS (Units:mm)



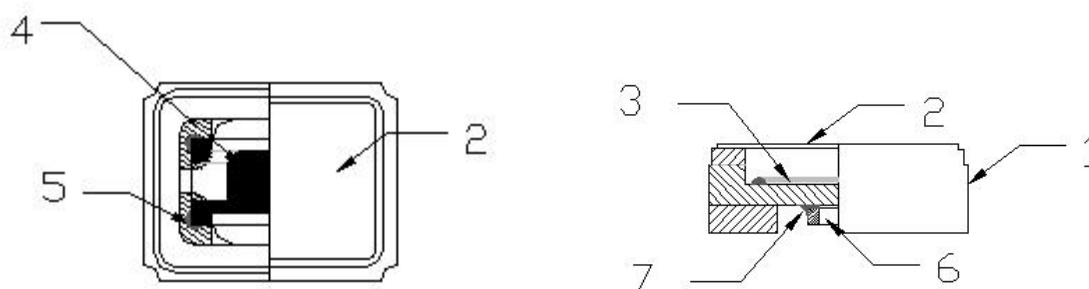
5. MARKING



Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	/	/
Year code	1	2	3	4	5	6	7	8	9	0	/	/
*The Year code will be cycled every ten years.												
WW	Week of the year											

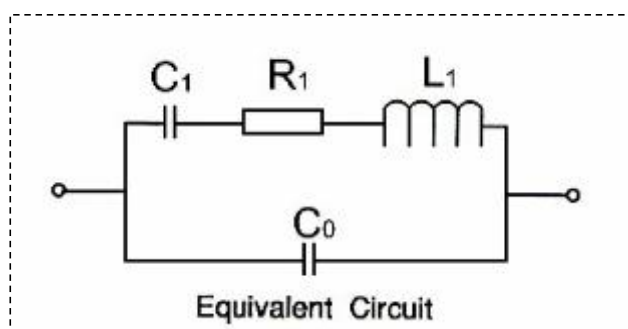
Marking color: Black

6. INTERNAL STRUCTURE



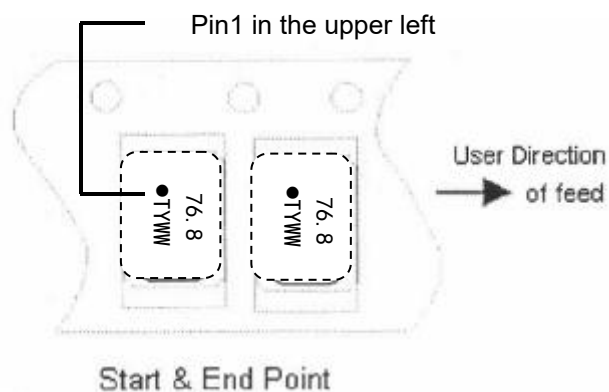
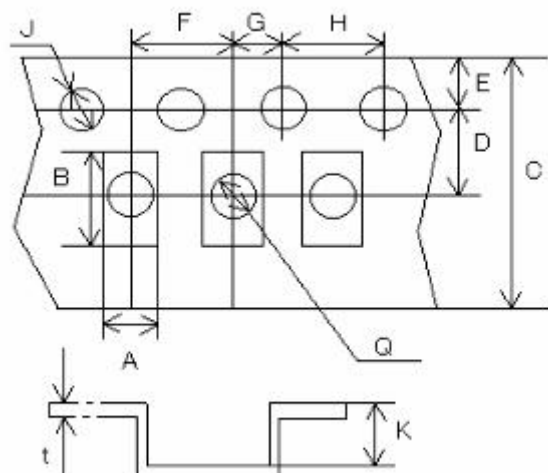
No.	COMPONENTS	MATERIALS
1	Package	Ceramic (Al_2O_3)
2	Lid	Kovar (Fe-Ni-Co alloy)
3	Crystal blank	SiO_2
4	Electrode	Noble Metal
5	Adhesive	Resin, Ag
6	Thermistor	Ceramic, Ag and Ni
7	Solder	Sn96.5Ag3.0Cu0.5

7. EQUIVALENT CIRCUIT



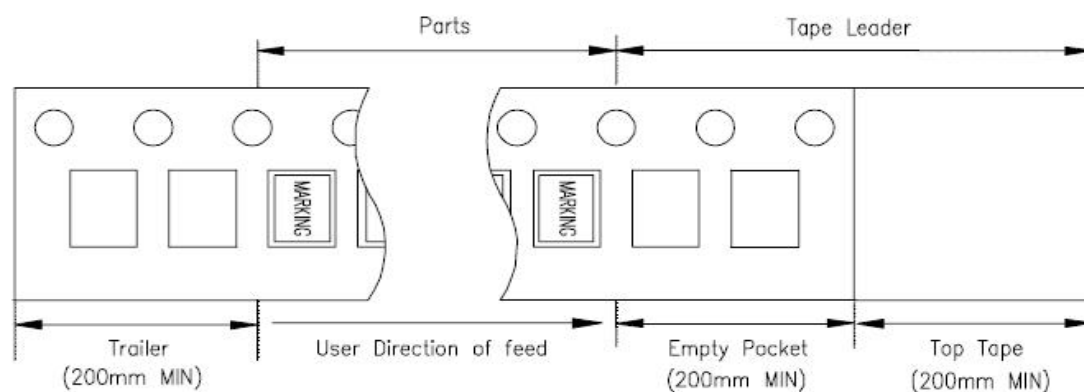
**8. PACKAGING (Unit:mm)**

※ CARRIER TAPE

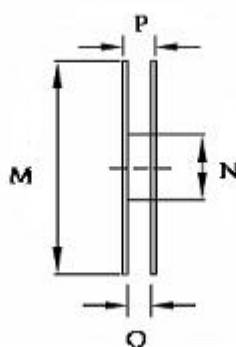
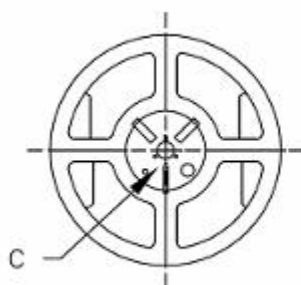


A	B	C	D	E	F	G	H	J	K	t
1.39	1.79	8.0	3.5	1.75	4.0	2.0	4.0	1.55	0.75	0.25

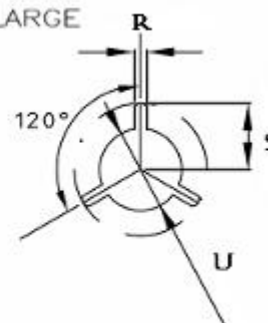
REMARK:



※ Quantity: 3,000 pcs/reel



C.ENLARGE



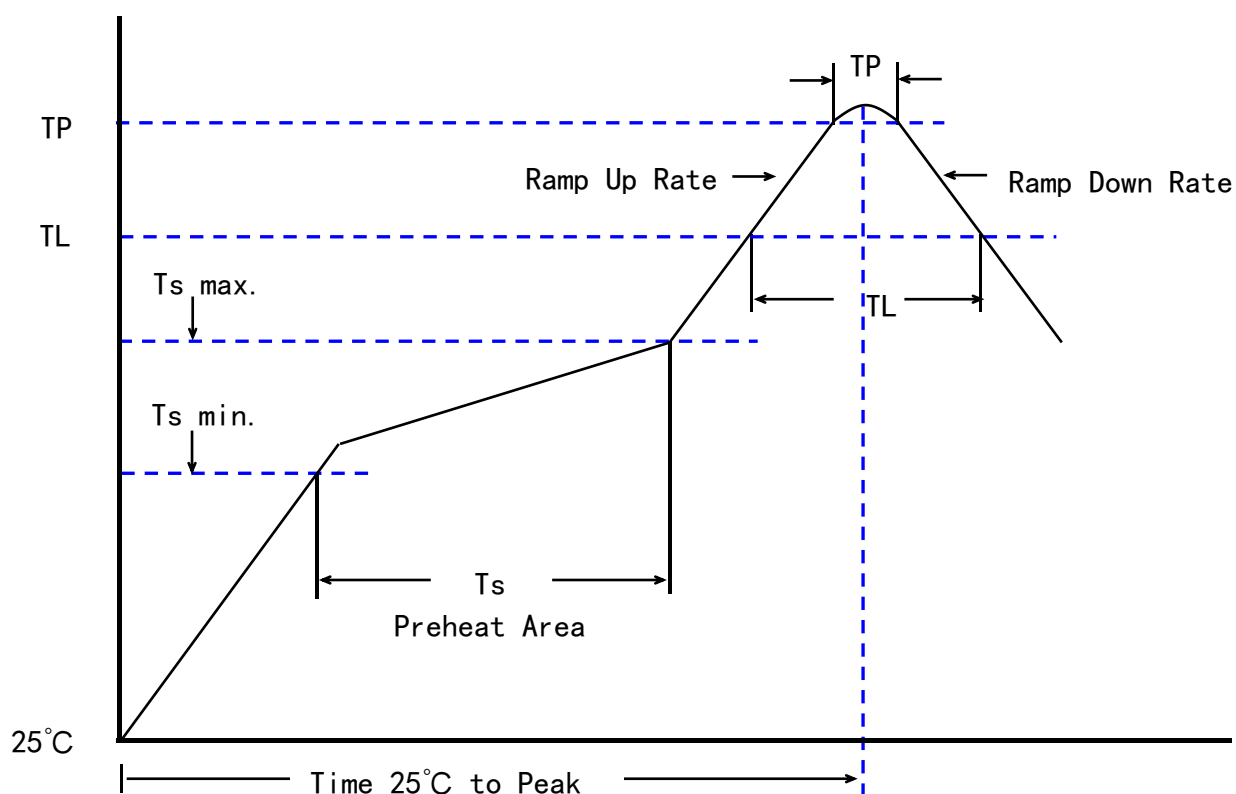
M	N	P	Q	R	S	U
178.0	60.2	11.5	8.0	2.5	11.0	13.0



9. REFLOW SOLDERING PROFILE

Reference: JEDEC J-STD-020D

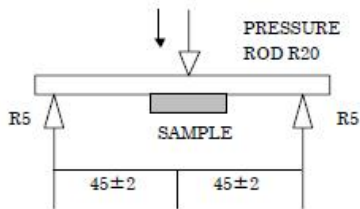
Profile Parameter	Pb-Free Assembly
Preheat/Soak Temperature Min. (Ts min.) Temperature Max. (Ts max.) Time (Ts) from (Ts min. to Ts max.)	150°C 200°C 60~120 seconds
Ramp-up rate (TL to TP)	3°C/second max.
Liquidus temperature (TL) Time maintained above TL	217°C 60~150 seconds
Peak/Classification Temperature (TP)	260±5°C
Time within 5 °C of the actual peak temperature (TP)	20~40 seconds
Ramp-down rate (TP to TL)	6°C/second max.
Time from 25 °C to peak temperature	8 minutes max.
Suggested reflow times	3 times max.



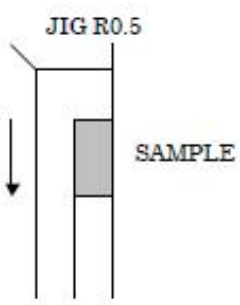
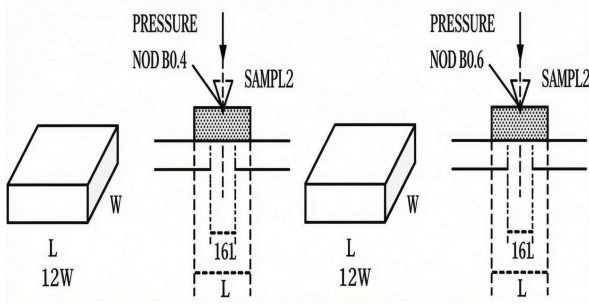
**10. RELIABILITY SPECIFICATION****Reference: JIS C 6701**

No.	Item	Conditions	Criteria
1	High Temperature	Samples shall be stored at $125\pm 2^{\circ}\text{C}$ for $1000\pm 12\text{h}$. Electrical parameters shall be measured by 250B within 24h after conditioning for more than 2h at room temperature($25\pm 2^{\circ}\text{C}$). If the customer's required temperature range exceeds the standard range, the test shall be conducted under the customer-specified conditions.	B,C
2	Low Temperature	Samples shall be stored at $-40 \pm 2^{\circ}\text{C}$ for $500 \pm 12\text{h}$. Electrical parameters shall be measured using an S&A 250B within 24h after conditioning for more than 2h at room temperature($25\pm 2^{\circ}\text{C}$). If the customer's required temperature range exceeds the standard range, the test shall be conducted under the customer-specified conditions.	A,C
3	High Temperature & Humidity	Stored at $85\pm 2^{\circ}\text{C}$ and humidity 85% for $1000\pm 12\text{h}$. The characteristic parameters of 250B must be tested in 24h after conditioning for more than 2h at room temperature($25\pm 2^{\circ}\text{C}$).	B,C,D
4	Temperature Shock	The crystal unit should undergo 100 temperature shocks, and then be left to stand at room temperature ($25\pm 2^{\circ}\text{C}$) for at least 2 hours and tested at 250B within 24 hours. The conditions for each temperature shock are as follows: 1. Last for 2~3 minutes at a temperature of $-40+0/-6^{\circ}\text{C}$ 2. Last for 30 ± 3 minutes at a temperature of $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 3. Last for 30 ± 3 minutes at a temperature of $125+4/-0^{\circ}\text{C}$ 4. Last for 2~3 minutes at a temperature of $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$	A,C
5	Solderability	The lead is immersed in a $245\pm 5^{\circ}\text{C}$ solder bath within 2 ± 0.6 seconds.	G



6	Gross Leak	Standard part of automatic gross leakage detector, test pressure: 0.2 MPa	E
7	Fine Leak	Helium bombing 5.0~5.5 Kgf/cm ² ,for 2 hours.	F
8	Resistance to Soldering Heat	3 reflows,the maximum temperature & time is 260℃±5℃, 15±5 seconds. The characteristic parameters of 250B must be tested in 24h after conditioning for more than 4h at room temperature(25±2℃).	A,C
9	Free Fall	Fall freely from a height of 100cm three times onto a hard wooden board.	A,C
10	Vibration	Frequency Range: 10~55Hz Amplitude (total excursion): The scanning frequency is 0.75oct/min, and the peak acceleration is 5g. Sweep time: 3 direction(x, y, z) each for 2 hours.	A,C
11	Board Flex	Weld the sample onto the PCB and apply a force of 10N on the reverse side of the sample until the bending of the board reaches 3mm, then maintain this state for 5 seconds. 	A,C



12	Folding- plate thrust test	Apply a final force of 10 N onto the movable jig with R0.5 mm radius, and hold the force for 10 seconds. 	A,C
13	Body load test	Apply a force at the center of the sample for 10 seconds. If the sample is greater than 1.6x1.2mm, apply 10N; if the sample is less than or equal to 1.6x1.2mm, apply 5N. 	A,C
14	Mechanical Shock	100g,6ms, half sine shock pulse, 6 axis*3 times	A,C

SPECIFICATIONS

A	Frequency change permitted.	$\Delta F \leq 5 \text{ ppm}$
B	Frequency change permitted.	$\Delta F \leq 10 \text{ ppm}$
C	Equivalent series resistance change permitted.	$\Delta CI \leq 5 \Omega$ or 15 % of initial value, whichever is larger
D	Insulation resistance	$> 500 \text{ M}\Omega$
E	Pressure gap less than	$< 1 \times 10^{-4} \text{ Pa}\cdot\text{m}^3/\text{s}$
F	Leak rate less than	$< 1 \times 10^{-9} \text{ Pa}\cdot\text{m}^3/\text{s}$
G	A new uniform coating of solder shall cover a minimum 95% of the surface	

Remark:

※ Each test item shall be performed on separate samples.

※ Measurement condition: Electrical parameters shall be measured using S&A 250B or equivalent tester.

**Notes:****1. Ultrasonic cleaning**

General cleaning solutions or ultrasonic cleaning method may be used to clean our products. However, under certain circumstances, ultrasonic cleaning machine could generate resonance at the oscillation frequency of our products and thus deteriorate the electrical characteristics in devices, and even damage the overall structure of devices. Therefore, verification test is recommended before cleaning.

2. Ultrasonic welding

Avoid mounting and processing by ultrasonic welding. This method has a possibility of excessive vibration spreading inside the crystal products and becoming the cause of characteristic deterioration and non-oscillation.

3. Storage Conditions

Storage Temperature is only for the product itself. The storage temperature range for packing material is 5°C~40°C.

4. Prohibited Environments

This product shall not be used in toxic, harmful, or corrosive environments such as mercury, chlorine, sulfur, acid-base environments etc.

5. Application scenario description

(1) When the products specified in this specification are used for equipment related to human life or property, the customer is responsible for confirming the impact on this product and equipment. Please conduct necessary safety design (including redundancy design, fault prevention design, etc.) in advance and ensure that the equipment is sufficiently safe before use. Otherwise, we are not responsible for warranty/compensation for the following items: equipment or scenes related to personal and property safety, such as cars, trains, ships, etc., or equipment directly involved in operation; aircraft equipment; aerospace equipment; medical equipment; military equipment; disaster-prevention / crime-prevention equipment; key areas such as transportation and financial systems.

(2) TKD products are designed for general and specific electronic applications and shall not be used in areas beyond expectations. If you require products for specific purposes, please consult TKD sales representatives in advance.