PRODUCT SPECIFICATION SHEET



Customer			
Customer P/N	-		
Product Type	Temperature Sensing Crystal		
Part Number	2Z19200001	**Version**	S2
Part Description	SMD TSX 2.5 x 2.0 (TH + Xtal)		
Nominal Frequency	19.200000MHz		

Prepared	Li Xiang
Reviewed	Kuro Peng
Approved	Xing Yue
Date	2023/4/4

Customer's Approval & Date：

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RoHS COMPLIANT

Pb Lead-Free

Moisture Sensitivity Level 1

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* Attention

If you intend to use products on the controlling equipment that relate to medical, aeronautical, aerospace, military science, space and etc, please make sure to let us know your intentions in advance.

Ultrasonic related process may cause damage to crystal blank by resonance itself. If ultrasonic related process is used, we strongly recommend to assess the damage risk under related ultrasonic conditions before use in production.

1. History of Specification Revision

Ver.	Content	Date	Reviser	Remark
S0	Initial released	2020/7/1	Chen XuanRu	
S1	Change Marking	2021/12/1	May Zhang	
S2	Change version & Change electrical specifications and Update product design	2023/4/4	Li Xiang	

2. Electrical Specifications

2.1 Specifications for operation condition and electrical characteristics

#	Parameter	Min.	Typ.	Max.	Unit	Remark
1	Nominal frequency		19.200000		MHz	-
2	Crystal cut type		AT-cut		-	-
3	Mode of vibration		Fundamental		-	-
4	Load capacitance (C_L)	-	7.0	-	pF	-
5	ESD		HBM＞2000V		-	JESD22-A114-B
6	MSL		Level 1		-	IPC/JEDEC J-STD-033C
7	Drive level	10	-	100	μW	-
8	Operating temperature range	-30	-	+105	°C	-
9	Storage temperature range	-40	-	+105	°C	-
10	Initial frequency tolerance	-10	-	+10	ppm	At 25±3°
11	Frequency drift after reflow	-2	-	+2	ppm	After two times of reflow
12	Frequency tolerance over temperature	-12	-	+12	ppm	Within -30°C to +85°C. Above +85°C see Note 2.
13	Frequency aging	-0.7	-	+0.7	ppm/year	-
14	Equivalent series resistance (ESR)	-	-	80	Ω	Note 3.
15	SPUR	50	-	-	Ω	±5000ppm/30 points
16	SPDB	-	-	-3	dB	±5000ppm/30 points
17	SPFR	500	-	-	dKHz	±5000ppm/30 points
18	Insulation resistance	500	-	-	MΩ	at DC 100V
19	Quality factor (Q)	75,000	-	-	-	Note 4.
20	Spurious mode series resistance	1,100	-	-	Ω	Within ±1 MHz offset.
21	Shunt capaitanc	0.3	-	1.3	pF	-
22	Motional capacitance	1.8	-	3.1	fF	-
23	First-order curve fitting parameter (C1)	-0.4	-	-0.1	ppm/°C	Note 5.
24	Second-order curve fitting parameter (C2)	-4.5	0	+4.5	$x10^{-4}$ ppm/°C^2	Note 5.
25	Third-order curve fitting parameter (C3)	+8.5	+10	+11.5	$x10^{-5}$ ppm/°C^3	Note 5.

Note 1 The load capacitance is measured according to IEC Standard #60444-8.

Note 2 Above 85°C, the frequency tolerance over temperature is bound by the third order coefficient range.

Note 3 The ESR max is specified at max drive level minimum Q, drives a smaller ESR; that is, design the crystal to the minimum Q.

Note 4 The minimum Q value calculated from ESR and L is smaller than this specification.

Note 5 The curve fitting parameter is obtained from the QTI crystal curve fitting algorithm, using the temperatureinflection point t0 = 30°C.(Refer to Curve Fitting Calculation Table: 80-V9690-23)

2. Electrical Specifications (Cont.)

2.2 Specifications for crystal drive level dependency (DLD)

#	Parameter	Min.	Typ.	Max.	Unit	Remark
1	Drive level measurement condition	0.01	-	100	μW	Drive level from 0.01 μW to 100 μW to 0.01 μW
2	DLD frequency (maximum - minimum)	-	-	3.0	ppm	Define as FDLD. Note 6.
3	DLD frequency (repeatability)	-	-	0.7	ppm	Define as FDLDH. Note 7.
4	DLD ESR (maximum - minimum)	-	-	20	%	Define as DLD10. Note 6.
5	DLD ESR (repeatability)	-	-	10	%	Define as DLDH3. Note 7 ~ 10.

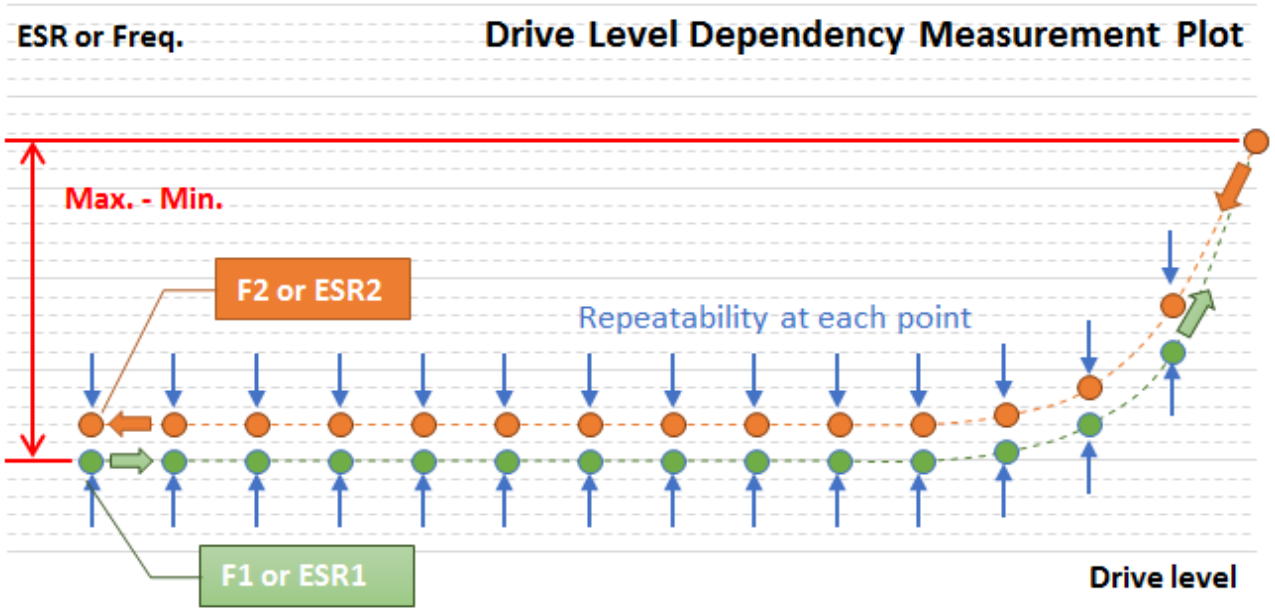
Note 6 Maximum - minimum: Difference between the maximum and minimum in a two-way measurement. In case of ESR, the change rate is (max - min)/min < 20%.

Note 7 Repeatability of the two-way measurement is defined in the above Drive level measurement condition.

Note 8 For DLD ESR (Repeatability), the change rate is defined as (ESR2 - ESR1)/ESR1.

Note 9 ESR1: This is the first measurement on each drive level.

Note 10 ESR2: This is the second measurement on each drive level.



2. Electrical Specifications (Cont.)

2.3 Specifications for GPS quality

#	Parameter	Min.	Typ.	Max.	Unit	Remark
1	Drive level measurement condition		100		μW	All measurements in GPS quality are taken at 100 μW drive level.
2	Residual frequency stability slope	-50	-	+50	ppb/°C	Note 11 and Note 12 (Condition 1A).
3	5°C small orbit hysteresis 1	-50	-	+50	ppb/°C	Note 13 (Condition 1B).
4	5°C small orbit hysteresis 2		100 (magnitude)		ppb pk-pk	Note 14.

Note 11 Residual = difference from fifth-order curve fit.

Note 12 Condition 1A – Test condition (continuous temperature rate change of ~1.0°C/min.):

- Measure F/T points every 1°C, heating up from -30 to +85°C, subtract a fifth-order polynomial best fit and then calculate the slope of the residual.

Note 13 Condition 1B – Hysteresis 1 test condition (continuous temperature rate change of ~1.0°C/minute):

- Measure F/T 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 1A for each of the 10 points, and then calculate the slope of the residual for each of these heating and cooling 10 point curves.

Note 14 Hysteresis 2 test condition (continuous temperature rate change of ~1.0°C/min.):

- Measure F/T 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 9 temperature points. Calculate the average measured peak-to-peak frequency difference for these 9 temperature points.
- The average difference is the magnitude of the small orbit hysteresis 2.

2. Electrical Specifications (Cont.)

2.4 NTC thermistor specification table

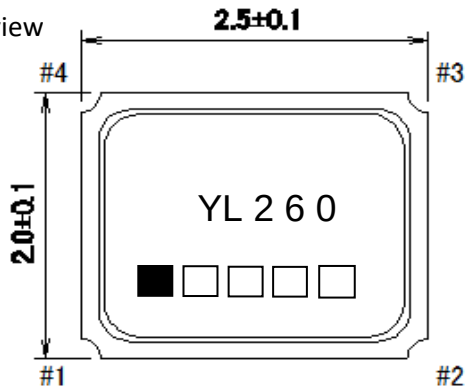
#	Parameter	Min.	Typ.	Max.	Unit	Remark
1	Operating temperature range	-30	-	+105	℃	-
2	Storage temperature range	-40	-	+105	℃	-
3	Resistance	-	100	-	kΩ	At 25℃*
4	B-constant	-	4,250	-	K	At 25℃ - 50℃
5	Tolerance	-	-	1	%	-

*In order to get the precise resistance value of the thermistor, the temperature control will be very important during testing since the resistance value will change ~4% per 1℃ temperature difference.
Please check the following Murata website for detail explanation.
https://www.murata.com/en-us/support/faqs/products/thermistor/ntc/pct/0001

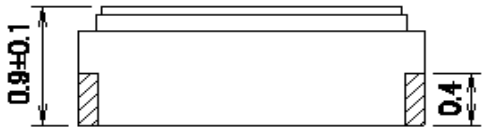
3. Product Design

3.1 Package dimensions and pad functions (Unit : mm)

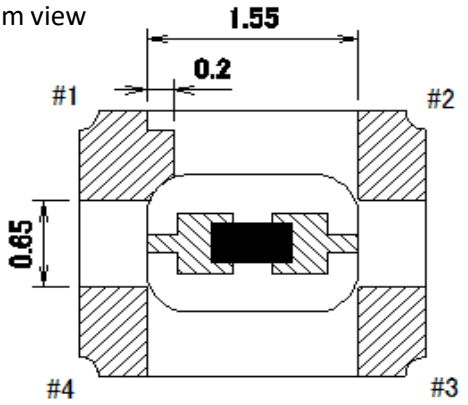
Top view



Lateral view

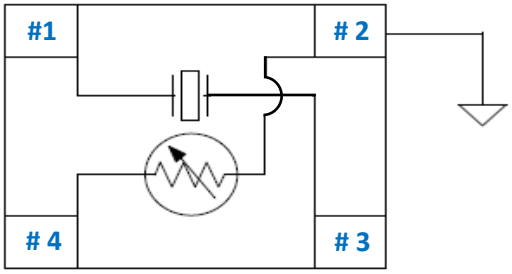


Bottom view



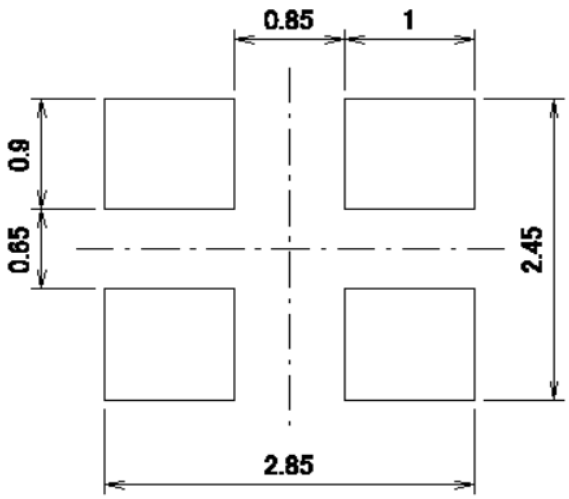
3.2 Pad connection diagram and function

Bottom view



Pad	Function
1	Xtal in
2	Thermistor out, connecting to ground
3	Xtal out
4	Thermistor in

3.3 Recommended land pattern (Unit : mm)



3. Product Design (Cont.)

3.4 Marking definition

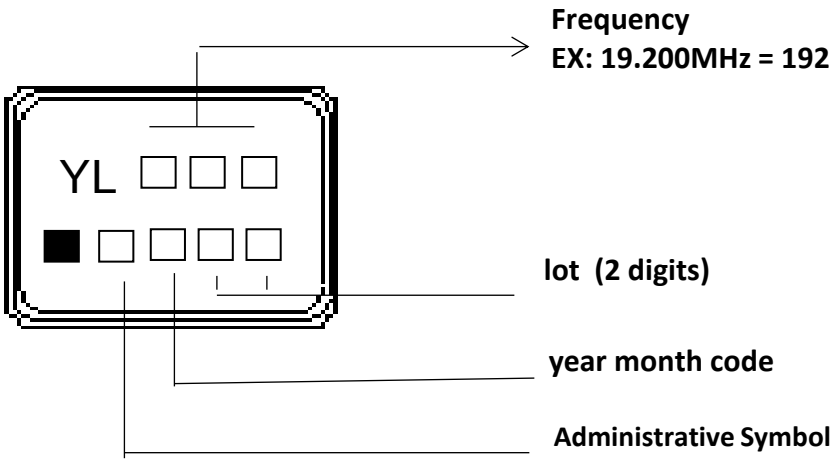
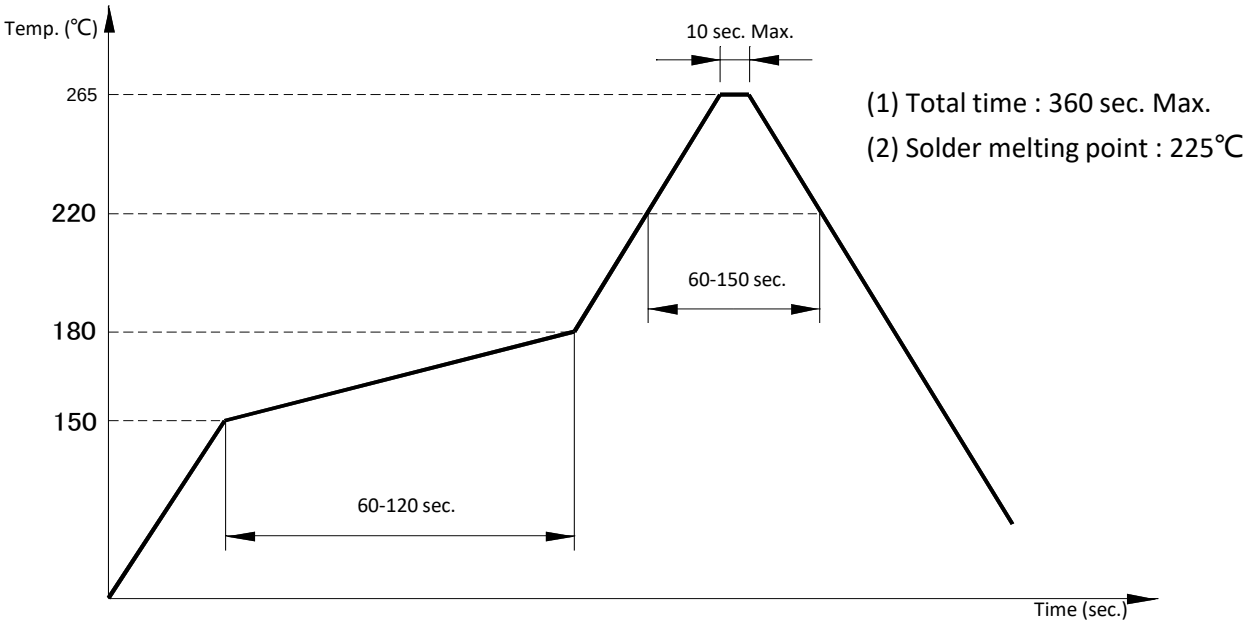


Table of Year and Month code

Year \ Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2021	2025	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	n	p	q	r	s	t	u	v	w	x	y	z

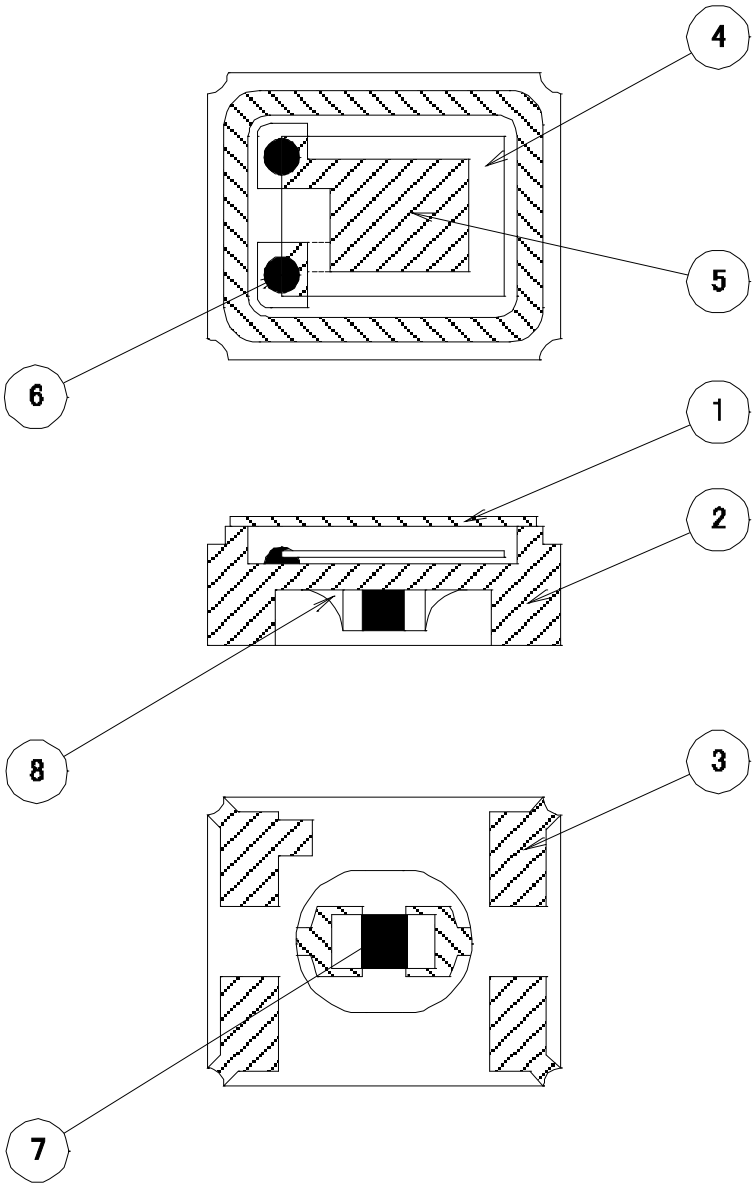
3.5 Recommended reflow profile



(1) Total time : 360 sec. Max.
(2) Solder melting point : 225℃

3. Product Design (Cont.)

3.6 Structure illustration



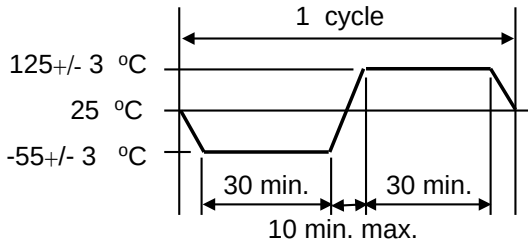
#	Components	Materials	QTY	Finish/Specifications	Material vendor
1	Cap (Lid)	Kovar (Fe + Co + Ni)	1	Ni plating	Yoshikawa
2	Base (Package)	Ceramic (Al_2O_3) + Kovar (Fe + Co + Ni)	1	Alumina ceramics	Kyocera, CCTC
3	Pad (Package)	Ni + Au	4	Tungsten metalization + Ni plating + Au plating	Kyocera, CCTC
4	Crystal blank	SiO_2	1	-	FAITHLONG
5	Electrode	Cr + Nobel material	2		FAITHLONG
6	Conductive adhesive	Ag	2	Silicone resin	Fujikura
7	Thermistor	Alumina Ceramics (Al_2O_3), Ni + Ag+ Sn	1	-	Murata
8	Solder	Sn + Ag + Cu	2	-	Yoshida

4. Reliability Assurance

4.1 Mechanical endurance

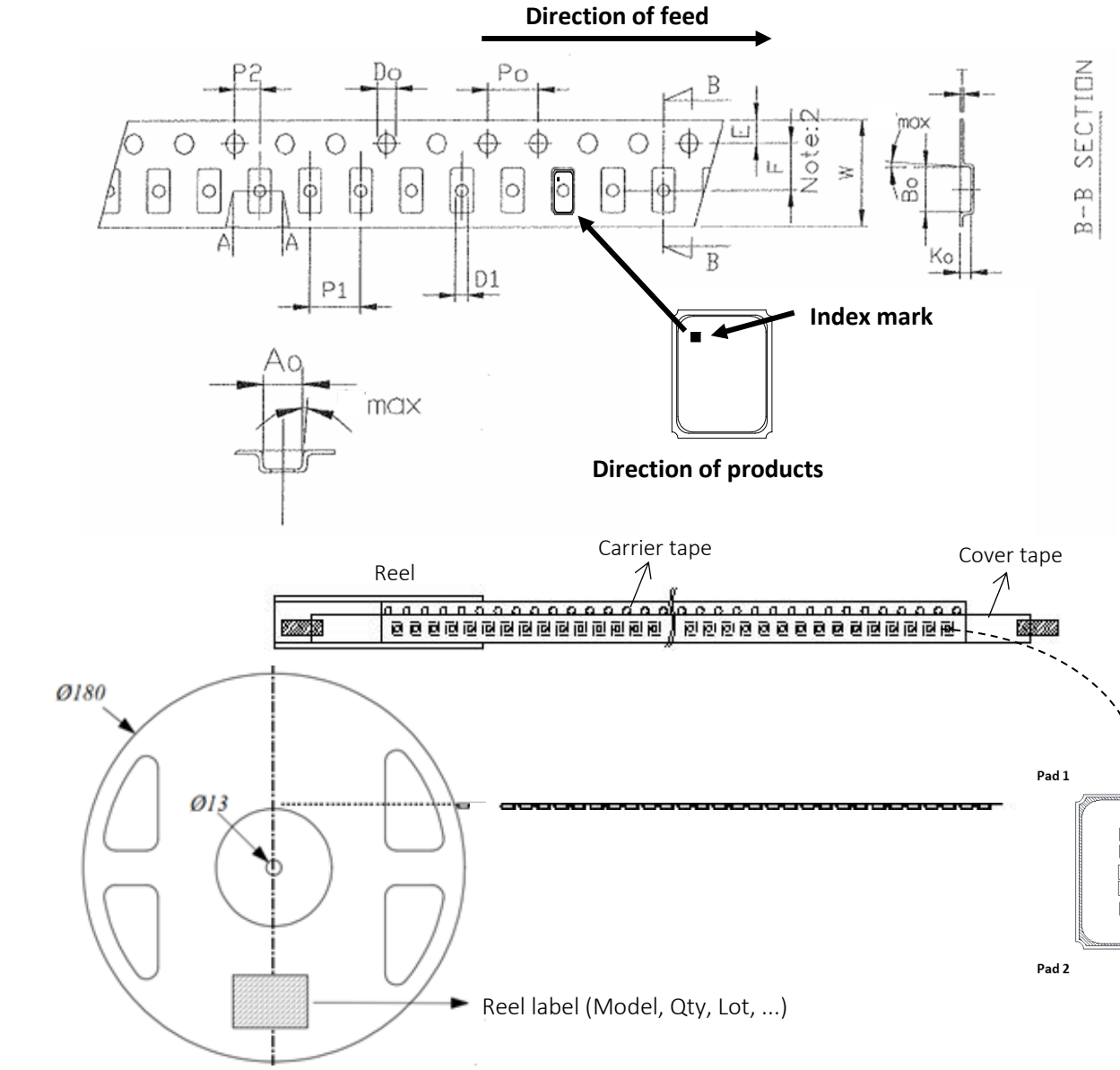
#	Item	Test Condition	Reference
1	Drop test	150 cm height, fall freely onto stainless plate, 3 times.	JIS C6701
2	Shock test	150 g weight, 150 cm height onto concrete floor. Each direction (±x, ±y, ±z) for 3 cycles.	IEC-68-02-27
3	Mechanical shock	Half sine wave 1000 G. Three mutually perpendicular axes, each axis for 3 times. Duration time 1.0ms.	MIL-STD-202F
4	Vibration	Frequency range : 10 ~ 55 Hz Amplitude : 1.52 mm Pendicular axes each test time : 2 hours（x,y,z Axis） Total test time 6 hours	MIL-STD-883E
5	Gross Leak	Standard sample for automatic gross leak detector. Test pressure: 2kg /cm^2.	MIL-STD-883E
6	Fine Leak	Helium bombing 4.5 kgf/cm^2 for 2 hours.	MIL-STD-883E
7	Solderability	Temperature : 260°C ± 5°C Immersing depth : 0.5 mm minimum Immersion time : 5 ±1 seconds Flux : Rosin resin methyl alcohol solvent (1:4)	GB/T 2424.17-2008 / IEC 60068-2-44:1995；GB/T 2423.28-2005 / IEC 60068-2-20:1979
8	Resistance To Soldering Heat	Pre-heat temperature 125℃ Pre-heat time 60 ~ 120 sec. Test temperature 260 ±5℃ Test time 5 ±1 sec.	MIL-STD-202F

4.2 Environmental endurance

#	Item	Test Condition	Reference
1	High temperature storage	Temperature : +125°C ± 3°C Duration : 500 ± 12 hours	MIL-STD-883E
2	Low temperature storage	Temperature : -40°C ± 3°C Duration : 500 ± 12 hours	MIL-STD-883E
3	Thermal shock (Air to Air)	Total 100 cycles of the following temperature cycle 	MIL-STD-883E
4	High temperature & humidity	Temperature : 85°C ± 3°C Humidity : RH 85% Duration : 500 hours	JIS C5023

5. Taping and Packing

5.1 Tape and reel (EIA-481-2)



Package Type	Dimension (Unit : mm)						
2520 TSX (8mm)	A_0	B_0	K_0	T	W	E	F
	2.25±0.1	2.70±0.1	1.45±0.1	0.25±0.05	8.00±0.3	1.75±0.2	3.50±0.1
	P1	P2	D1	D_0	P_0		
	4.00±0.1	2.00±0.1	1.00±0.1	1.55±0.05	4.00±0.1		

Standard Reel Quantity is 3000 pcs per reel.

The inspection standard of tape tension

Item		Defect	Method
Appearance	All	1. The tape is not coincidence 2. The bubble	Visual inspection
Tape tension	2520 - 8mm	Overstep 55±6g (49 to 61g)	Pull test

5. Taping and Packing (Cont.)

5.2 Packing standard

Out-going packing instruction

Reel packing	Inner packing	Carton
Name：Reel Standard：Diameter 18cm Material：Plastics Name：Anti-static shielding bag Standard：205×250mm Material：APET/CPP	Name：Bubble wrap Standard：430×330×(t)20mm Material：HDPE Quantity : Max.15 reels	Name：Carton Standard：400×400×(H)280mm Material：AB corrugated paper Quantity：4 bags
		 

The label information

Label	Label Drawing	Name of Article	Spec.	Label size	Printing
L1	PART NO : 3S26000389 LOT NO : 20041400 Q'TY : 3000 FREQ : 26.000000MHz MSL 1 惠伦晶体 FAITH LONG CRYSTAL MADE IN CHINA	条码标签 Bar Code Label (Chintz Paper)	1. Part No. 2. Lot No. 3. Q'ty 4. Freq.	70×50mm	White
L2	PART NO : 3S26000389 DATE CODE: 2015 Q'TY : 30000 FREQ : 26.000000MHz MSL 1 惠伦晶体 FAITH LONG CRYSTAL MADE IN CHINA	条码标签 Bar Code Label (Chintz Paper)	1. Part No. 2. Date Code 3. Q'ty 4. Freq.	70×50mm	White

Remark: Specifications on the label is for default templates purpose and may change with different product.
If any specified requirements for labels packaging is needed, please provide the instruction information.

6. Specification of the Environment-related Substances

#	Range	Max. concentration (ppm; mg/kg)	
	Banned Substances	Product	Packing
1	镉及镉化合物 Cadmium and cadmium compounds	100	100
2	铅及铅化合物 Lead and lead compounds	1000	100
3	汞及汞化合物 Mercury and mercury compounds	1000	100
4	六价铬化合物 Hexavalent-Chromium VI (Cr^{+6})	1000	100
5	聚溴联苯 PBB Polybrominated biphenyls	1000	N/A
6	聚溴二苯醚 PBDE Polybrominated diphenyl ethers	1000	N/A
7	邻苯二甲酸二(2-乙基己基)酯 DEHP Di (2-ethylhexyl) phthalate	1000	N/A
8	邻苯二甲酸丁苄酯 BBP Butyl Benzyl Phthalate	1000	N/A
9	邻苯二甲酸二丁酯 DBP Dibutyl Phthalate	1000	N/A
10	邻苯二甲酸二异丁酯 DIBP Diisobutyl Phthalate	1000	N/A
11	氟(F)、氯(Cl)、溴(Br)、碘(I) Fluorine, Chlorine, Bromine, Iodine	900、900、900、900 注：Br + Cl < 1000	N/A
12	包装材料中重金属(汞、镉、六价铬、铅、PBB、PBDE)之总量 Heavy metals (mercury, cadmium, lead, Cr^{+6},PBB and PBDE) in packing materials	N/A	100 铅(Pb) + 镉(Cd) + 汞(Hg) + 六价铬(Cr+6) <100ppm
13	高度关注物质 SVHC-Substances of Very High Concern	1000	N/A