PRODUCT SPECIFICATION SHEET

Customer	-		
Customer P/N			
Product Type	Temperature Sensing Crystal		
Part Number	2Z26000013	**Version**	S0
Part Description	SMD TSX 2.5 x 2.0 (TH + Xtal)		
Nominal Frequency	26.000000MHz		

Prepared	Li Xiang
Reviewed	Kuro Peng
Approved	Xing Yue
Date	2023-2-7

Customer's Approval & Date：

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RoHS COMPLIANT

Pb Lead-Free

Moisture Sensitivity Level 1

CONTENTS

1. History of Specification Revision

Ver.	Content	Date	Reviser	Remark
S0	Initial released	2023-2-7	Li Xiang	

2. Electrical Specifications

2.1 Specifications for operation condition and electrical characteristics

#	Parameter	Min.	Typ.	Max.	Unit	Remark
1	Nominal frequency		26.000000		MHz	-
2	Crystal cut type		AT-cut		-	-
3	Mode of vibration		Fundamental		-	-
4	ESD		HBM＞2000V			JESD22-A114-B
5	MSL		Level 1			IPC/JEDEC J-STD-033C
6	Load capacitance (C_L)	-	7.0	-	pF	Note 1.
7	Drive level	10	50	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	-2.0	-	+2.0	ppm	After two times of reflow (0.5Hr freq. driftsubstruct 168Hr freq.)
12	Frequency tolerance over temperature	-12	-	+10	ppm	Within -30°C to +85°C. Above +85°C see Note 2.
13	Frequency aging	-0.7	-	+0.7	ppm/yr	at 25±2°C
		-1.4	-	+1.4	ppm/2yr	
		-2.5	-	+2.5	ppm/5yr	
		-5	-	+5	ppm/10yr	
14	Equivalent series resistance (ESR)	-	-	50	Ω	Note 3.
15	Insulation resistance	500	-	-	MΩ	at DC 100V
16	Quality factor (Q)	75,000	-	-	-	Note 4.
17	Spurious mode series resistance	500	-	-	Ω	Within ±500 KHz offset.
18	Room temperature	-	30.5	-	°C	-
19	Tuning sensitivity	13.5	15.0	16.5	ppm/pF	-
20	Inflection point	29.0	30.5	32.0	°C	Specified at max drive level. $t = \left(t_0 - \frac{C2}{3C3}\right)$
21	First-order curve fitting parameter (C1)	-0.40	-0.25	-0.10	ppm/°C	Note 5.
22	Second-order curve fitting parameter (C2)	-4.5	0	+4.5	$x10^{-4}$ ppm/°C^2	Note 5.
23	Third-order curve fitting parameter (C3)	+8.70	+9.85	+11.00	$x10^{-5}$ 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.

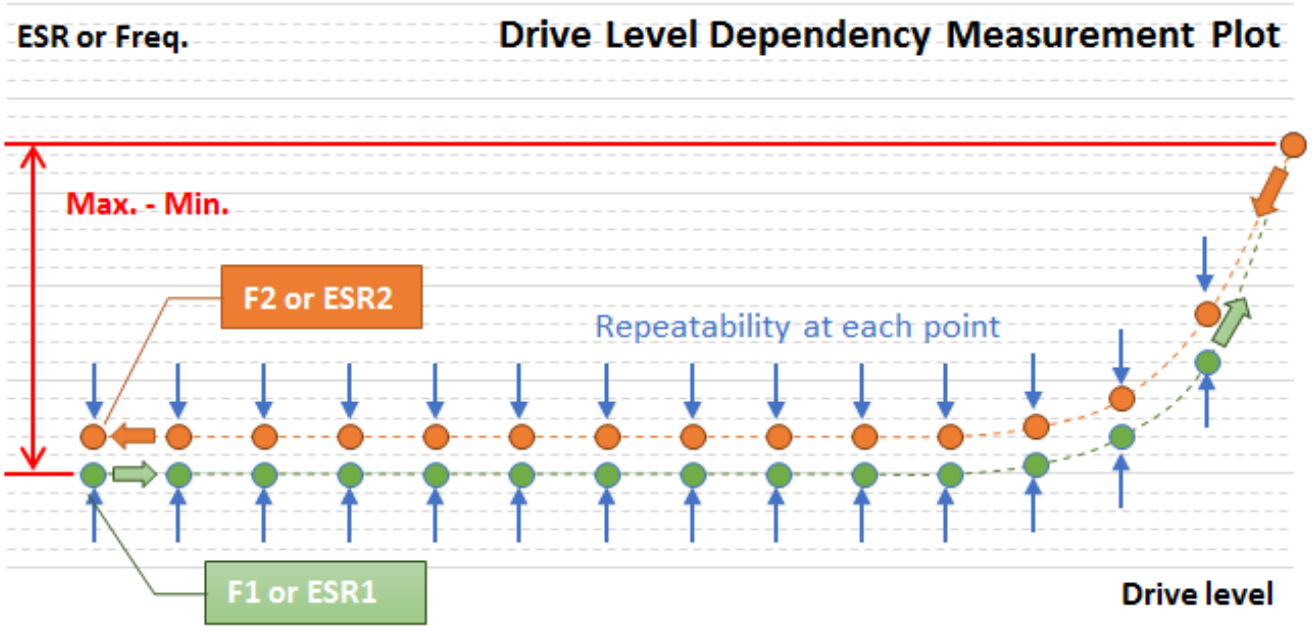
Note 5 The curve fitting parameter is obtained from the third-order polynomial as below, using the temperature inflection point t0 =30.5°C.
f(t)=C3(θ)(t-t0)3+C2(θ)(t-t0)2+C1(θ)(t-t0)+C0

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)	-	-	3.5	ppm	Define as FDLD. Note 6.
3	DLD Frequency (hysteresis)	-	-	0.7	ppm	Define as FDLDH. Note 7.
4	DLD ESR (maximum - minimum)	-	-	2.5	Ω	Define as DLD. Note 6.
5	DLD ESR (hysteresis)	-	-	1.5	Ω	Define as DLDH2. Note 7~9.

Note 6 Maximum - minimum: Difference between the maximum and minimum in a two-way measurement.
Note 7 Repeatability of the two-way measurement is defined in the above Drive level measurement condition.
Note 8 ESR1: This is the first measurement on each drive level.
Note 9 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	Full cycle temperature hysteresis	-0.5	-	+0.5	ppm	At -30°C to 85°C. Note 10.
2	Full cycle frequency stability slope	-50	-	+50	ppb/°C	Note 11.
3	5℃ Small cycle temperature hysteresis	-0.05	-	+0.05	ppm	-
4	5℃ Small cycle frequency stability slope 1	-50	-	+50	ppb/°C	-

Note 10 Temp. range:-30 to 85℃ for each 1℃, Temp. rate: ~1.0°C/min
Test flow: 25℃(1)->-30℃->85℃->25℃(2), (25℃(1) freq. drift subtract 25℃(2) freq. drift)

Note 11 Test condition: Continuous temperature rate change of~ 1.0°C/min
Measure FT points every 1℃, heating up from -30 to 85℃, subtract a fifth-order polynomial best fit, and then calculate the slope of the residual.

2. Electrical Specifications (Cont.)

2.4 NTC thermistor specification table

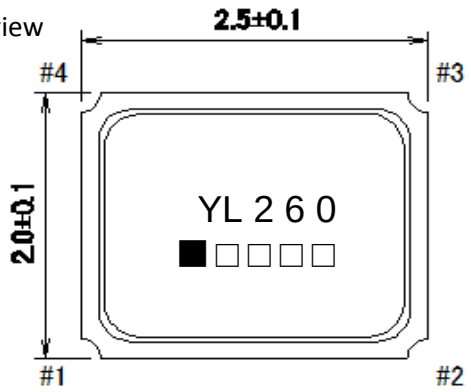
#	Parameter	Min.	Typ.	Max.	Unit	Remark
1	Operating temperature range	-30	-	+105	°C	-
2	Storage temperature range	-40	-	+105	°C	-
3	Resistance	-	100	-	kΩ	At 25°C*
4	B-constant	-	4,250	-	K	At 25°C - 50°C
5	Tolerance	-1	-	1	%	-

*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

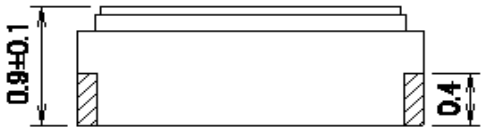
3. Product Design

3.1 Package dimensions and pad functions (Unit : mm)

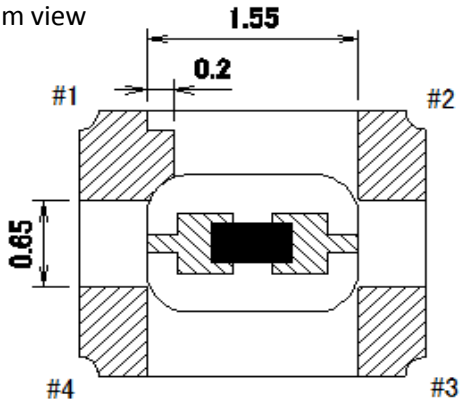
Top view



Lateral view

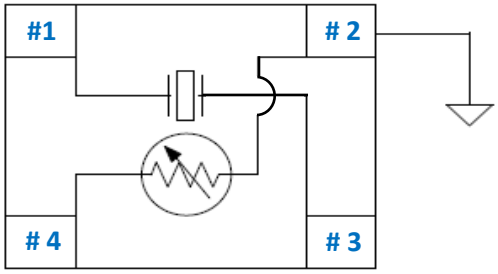


Bottom view



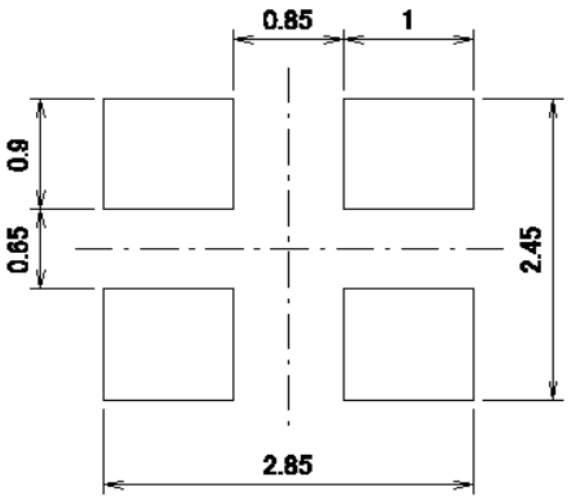
3.2 Pad connection diagram and function

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

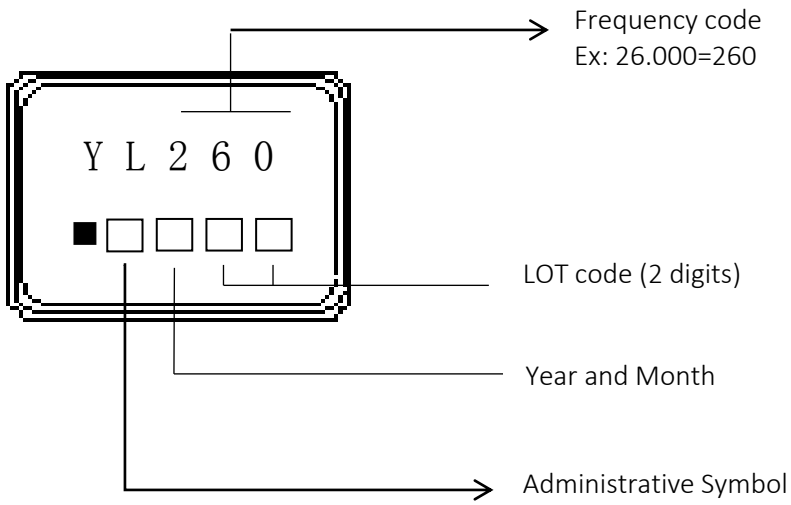
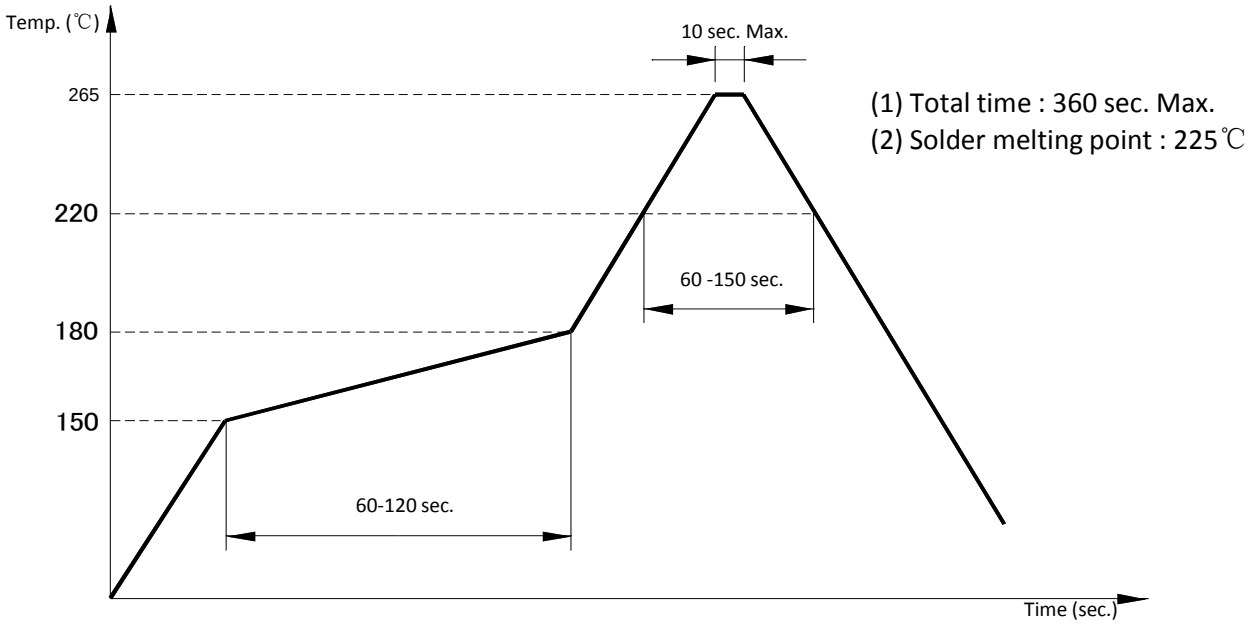


Table of Year and Month code

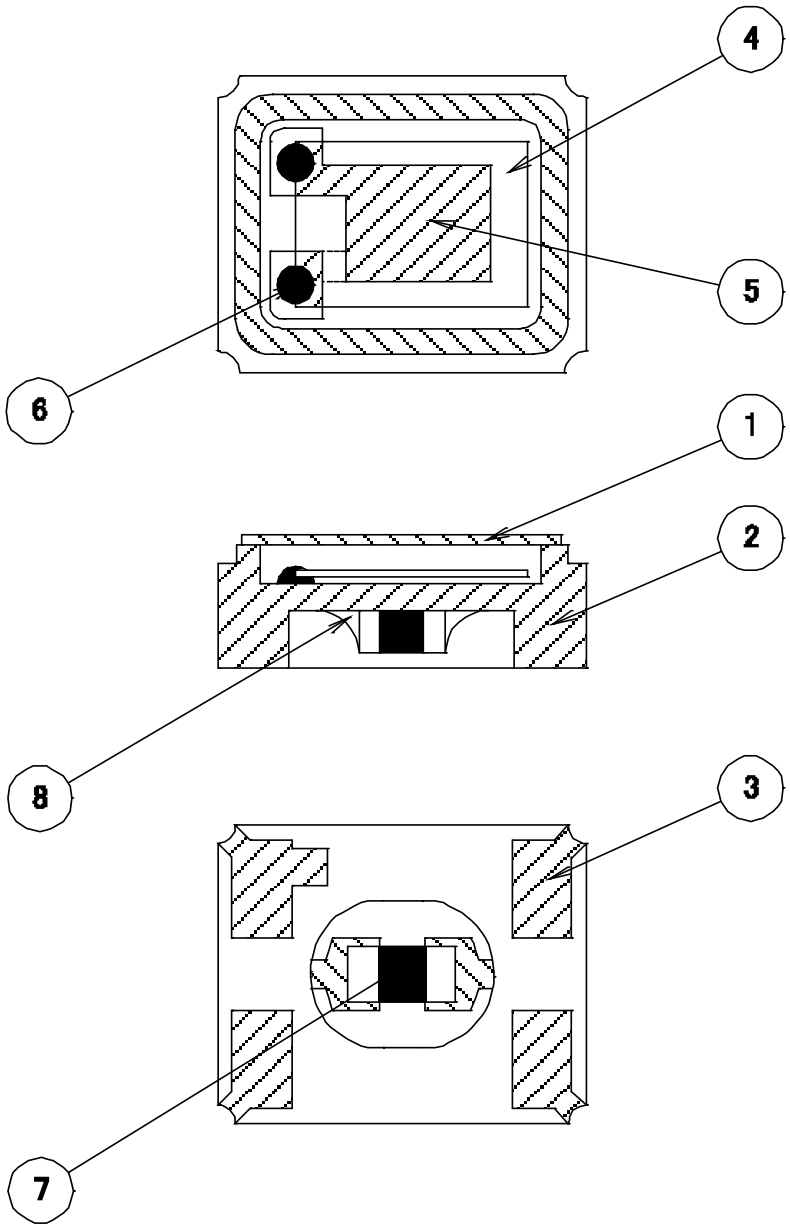
Year \ Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2021	2025	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	n	p	q	r	s	t	u	v	w	x	y	z

3.5 Recommended reflow profile



3. Product Design (Cont.)

3.6 Structure illustration



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

* Material vendor： CCTC

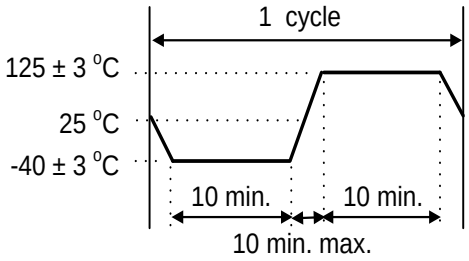
4. Reliability Assurance

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

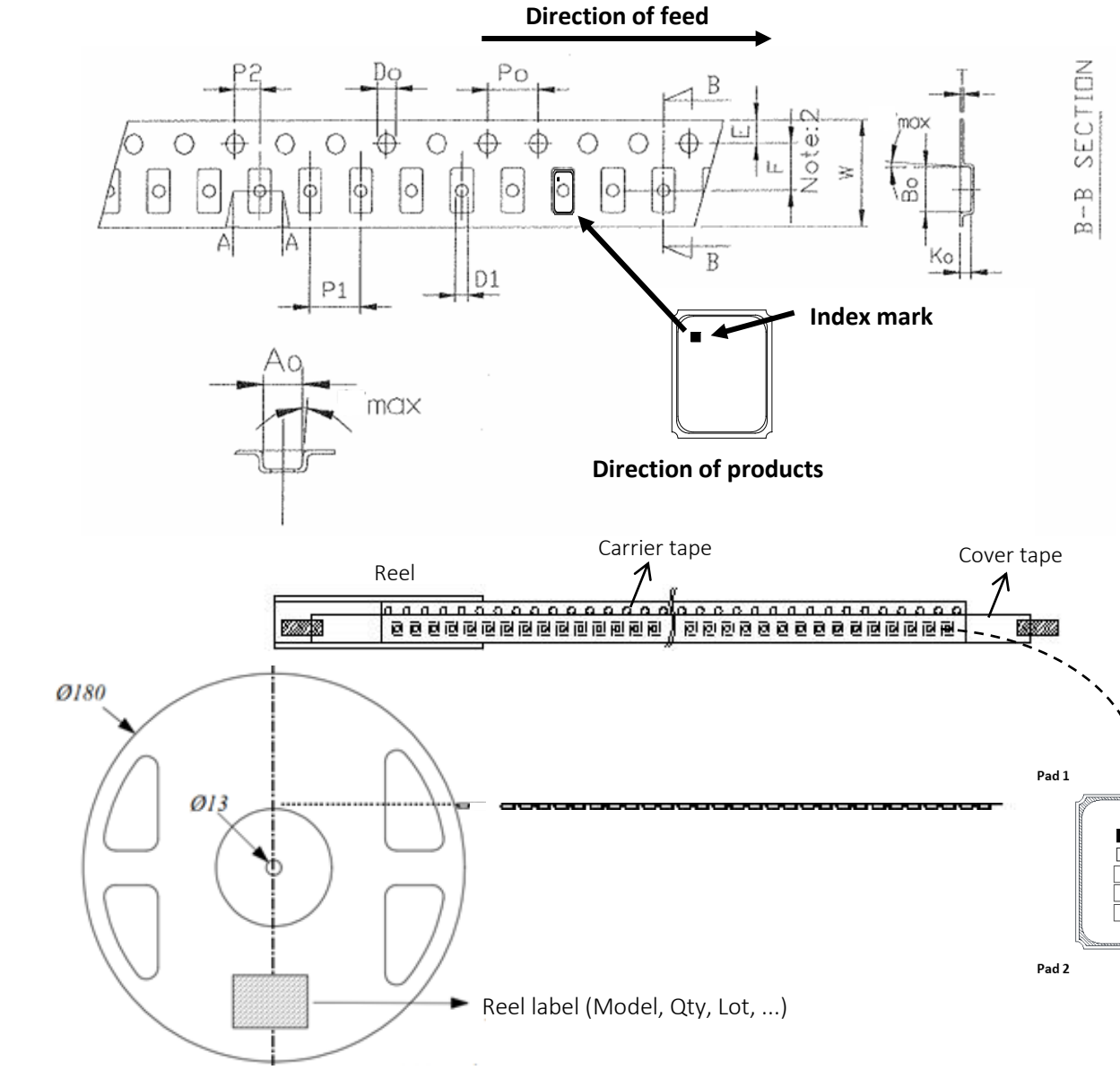
*Storage conditions： 18 months *Constant humidity： 40~70%

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