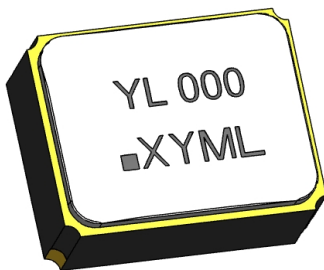




PRODUCT SPECIFICATION SHEET



Customer	-		
Customer P/N	-		
Product Type	Temperature Compensated Crystal Oscillator		
Part Number	9T48000010	Version	S0
Part Description	SMD TCXO 2.0 x 1.6		
Nominal Frequency	48.000000MHz		

Prepared	Li Xiang
Reviewed	Jin Zhe
Approved	Xing Yue
Date	2024-11-29

Customer's Approval & Date :

广东惠伦晶体科技股份有限公司

中国广东省东莞市黄江镇东环路鸡啼岗段68号
68 Donghuan Road, Jitigang Village, Huangjiang,
Dongguan, Guangdong Province, P. R. China



WEB : <http://www.dgylec.com/>

TEL : +86 (0) 769 - 38879888

FAX : +86 (0) 769 - 38879889

EMAIL : yl@dgylec.com



Moisture Sensitivity Level 1

CONTENTS

#	Item	Page
1	History of Specification Revision	3
2	Electrical Specifications	4
	2.1 Operation conditions	4
	2.2 Output characteristics	4
	2.3 Frequency stability characteristics	4
	2.4 Phase noise characteristics	5
3	Product Design	6
	3.1 Package dimensions and pad functions	6
	3.2 Recommended land pattern	6
	3.3 Recommended reflow profile	6
4	Testing Circuit	7
5	Reliability	8
	5.1 Mechanical endurance	8
	5.2 Environmental endurance	9
6	Marking and Packing	10
	6.1 Marking definition	10
	6.2 Packing	11
	6.3 SMD product packing standard	12

ATTENTION

- [1] 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.
- [2] 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.	Contents	Date	Reviser	Remark
S0	Initial release	2024-11-29	Li Xiang	

FAITH LONG CRYSTAL

2. Electrical Specifications

2.1 Operation conditions

#	Parameters	Min.	Typ.	Max.	Unit	Remark
1	Nominal frequency	48.000000			MHz	-
2	Supply voltage (V_{DD})	1.68	-	3.63	V	-
3	ESD	HBM \geq 2000V			-	JESD22-A114-B
4	MSL	Level 1			-	IPC/JEDEC J-STD-033C
5	Current consumption	-	-	2.0	mA	-
6	Operating temperature range	-40	-	+85	$^{\circ}$ C	-
7	Storage temperature range	-40	-	+90	$^{\circ}$ C	-

2.2 Output characteristics

#	Parameters	Min.	Typ.	Max.	Unit	Remark
1	Output type	Clipped sine wave			-	Decoupling capacitor is required in external circuit
2	Standard output Load	10 K Ω //10 pF			-	-
3	Output level	0.8	-	-	V_{pp}	-
4	Duty cycle	40	50	60	%	-
5	Start-up time vs. frequency	-	-	2.0	ms	Within ± 1.0 ppm of final frequency
6	Start-up time vs. output level	-	-	2.0	ms	Reach 90% of final V_{pp} output level

2.3 Frequency characteristics

#	Parameters	Min.	Typ.	Max.	Unit	Remark
1	Nominal frequency	48.000000			MHz	
2	Frequency tolerance after reflow	-1.5	-	+1.5	ppm	At $25\pm 2^{\circ}$ C, after 2 times of reflow, refer to nominal frequency
3	Frequency stability vs. temperature	-0.5	-	+0.5	ppm	Within -30° C to $+85^{\circ}$ C, refer to frequency at 25° C
4	Frequency stability vs. temperature	-4.0	-	+4.0	ppm	Within -40° C to -30° C, refer to frequency at 25° C
5	Slope of Frequency Drift over temperature	-0.1	-	+0.1	ppm/ $^{\circ}$ C	Within -20° C to $+75^{\circ}$ C
		-0.3	-	+0.3	ppm/ $^{\circ}$ C	Within -30° C to $+85^{\circ}$ C
		-0.8	-	+0.8	ppm/ $^{\circ}$ C	Within -40° C to -30° C
6	Frequency stability vs. supply voltage	-0.2	-	+0.2	ppm	$\pm 5\%$ V_{DD} variation
7	Frequency stability vs. load variation	-0.2	-	+0.2	ppm	$\pm 10\%$ load variation
8	Frequency Aging	-1.0	-	+1.0	ppm	First year

2. Electrical Specifications (Cont.)

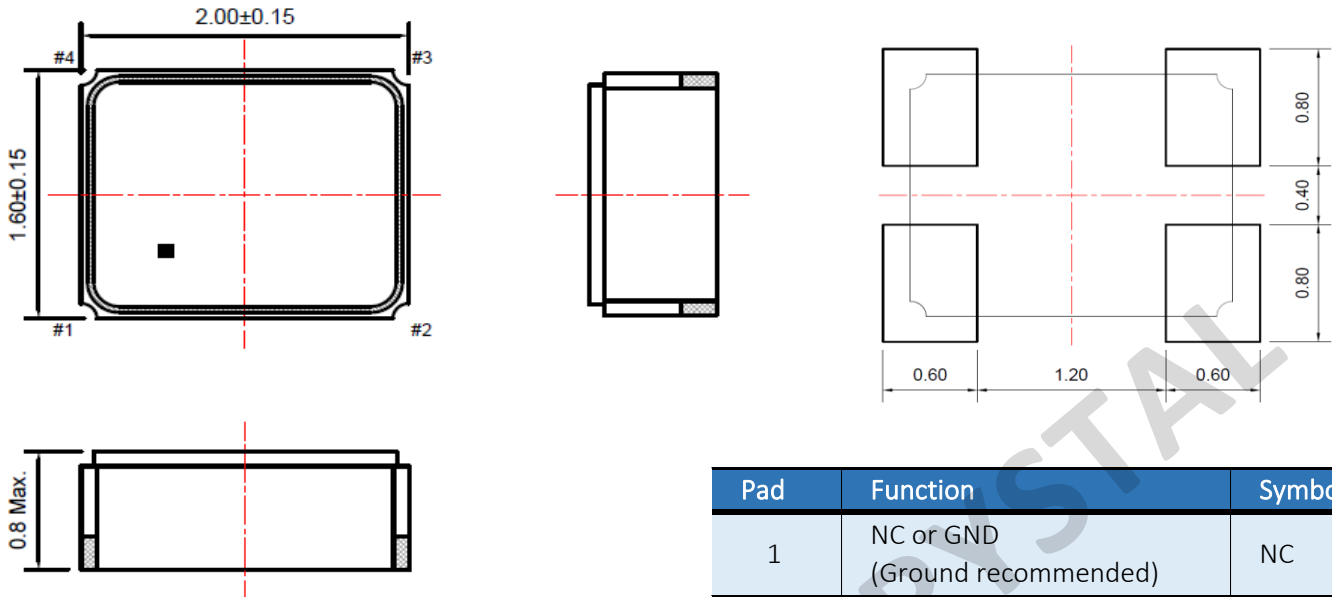
2.4 Phase noise characteristics

#	Parameters	Min.	Typ.	Max.	Unit	Remark
1	Phase noise at 100Hz offset	-	-	-110	dBc/Hz	At 25±2°C
2	Phase noise at 1kHz offset	-	-	-135	dBc/Hz	At 25±2°C
3	Phase noise at 10kHz offset	-	-	-150	dBc/Hz	At 25±2°C
4	Phase noise at 100kHz offset	-	-	-155	dBc/Hz	At 25±2°C
5	Phase noise at 1MHz offset	-	-	-157	dBc/Hz	At 25±2°C

FAITH LONG CRYSTAL

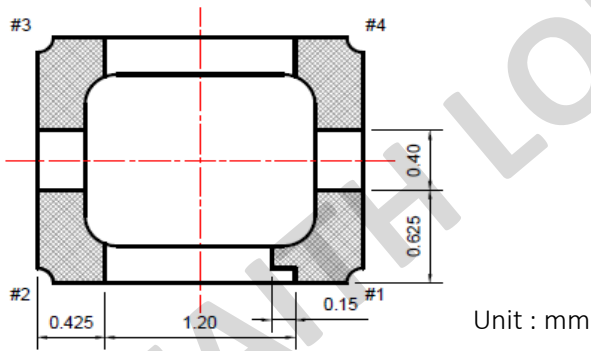
3. Product Design

3.1 Package dimensions and pad functions

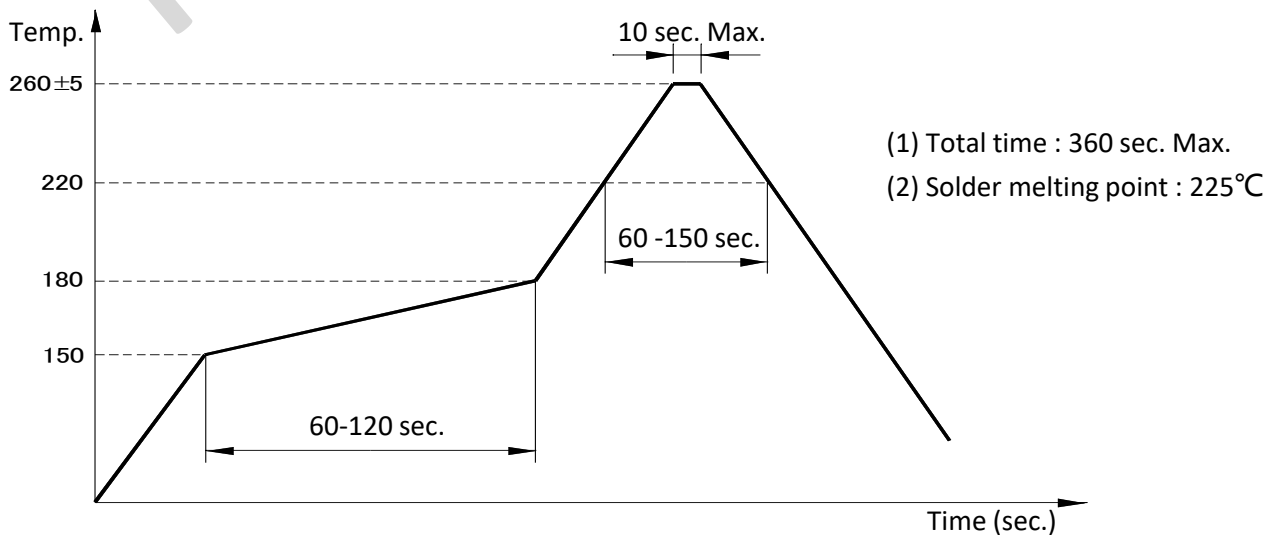


Pad	Function	Symbol
1	NC or GND (Ground recommended)	NC
2	Ground	GND
3	Output	OUT
4	Supply voltage	V _{DD}

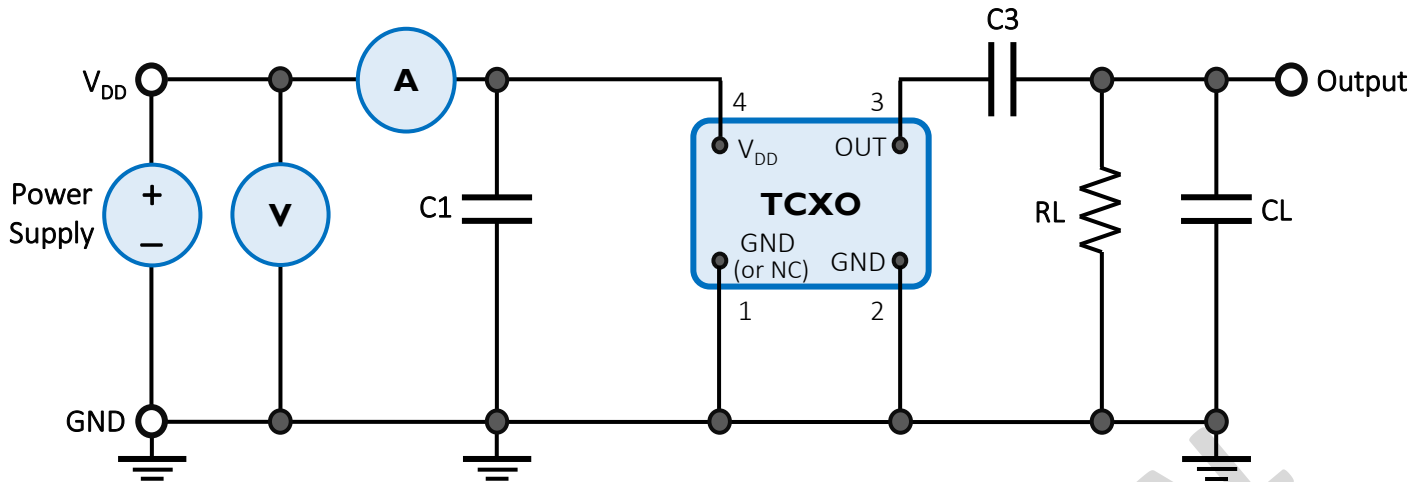
3.2 Recommended land pattern



3.3 Recommended reflow profile



4. Testing Circuit



External Components:

Parts	Function	Recommended
C1	AC noise bypass for V_{DD}	10nF
C3	DC block for output	10nF
RL	Load resistance	10K Ω
CL	Load capacitance	10pF

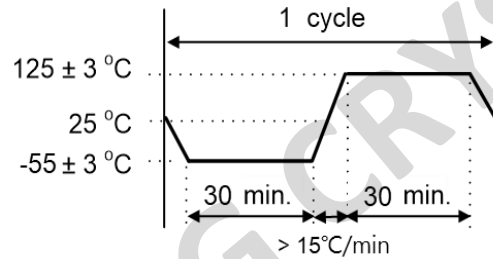
5. Reliability

5.1 Mechanical endurance

#	Item	Test Condition	Reference
1	Mechanical shock	Acceleration : 100 g Duration : 6.0 ms half sine shock pulse Test cycles : 3 times for all 3 directions	JESD47F_JEDEC B
2	Vibration	Acceleration : 20 g Duration : 4 hours/each direction Frequency range : 10 ~ 55 Hz and 55 ~ 2,000 Hz Amplitude : 0.75 mm (for 10 ~ 55 Hz) Direction : X, Y, Z, 3 directions	JESD47F_JEDEC B
3	Gross leak	Standard Sample For Automatic Gross Leak Detector. Test Pressure: 2kg /cm ²	MIL-STD-883E
4	Fine leak	Helium bombing 4.5 kgf / cm ² for 2 hours	MIL-STD-883E

5. Reliability (Cont.)

5.2 Environmental endurance

#	Item	Test Condition	Reference
1	High temperature storage	Temperature : $+125^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Duration : 1,000 hours	JESD47F_JEDEC B
2	Low temperature storage	Temperature : $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Duration : 1,000 hours	JESD47F_JEDEC B
3	High temperature & humidity	Temperature : $85^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Humidity : RH 85% Duration : 1,000 hours	JESD47F_JEDEC B
4	Thermal shock (air to air)	Total 500 cycles of the following temperature cycle 	JESD47F_JEDEC B
5	Highly accelerated stress test (un-bias)	Temperature : $130^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Humidity : RH 85% Pressure : 2 atms Duration : 96 hours	JESD47F_JEDEC B
6	Aging	Temperature : $105^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Duration : 1,000 hours Voltage input by specification	JESD47F_JEDEC B

6. Marking and Packing

6.1 Marking definition

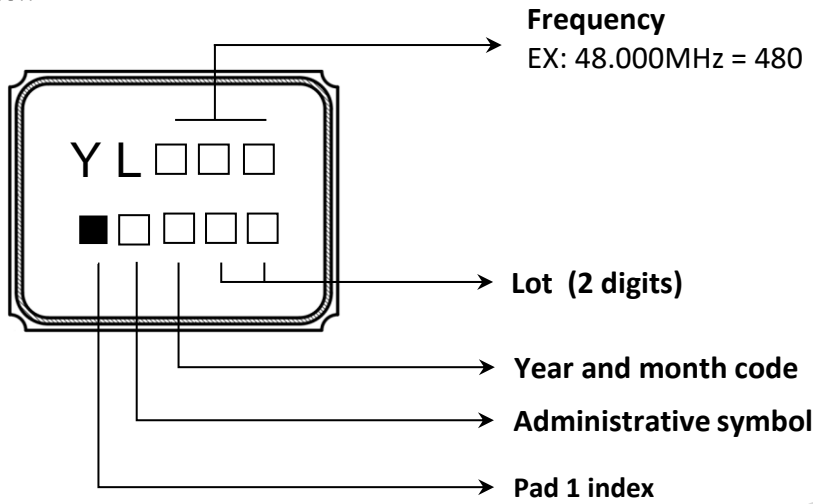
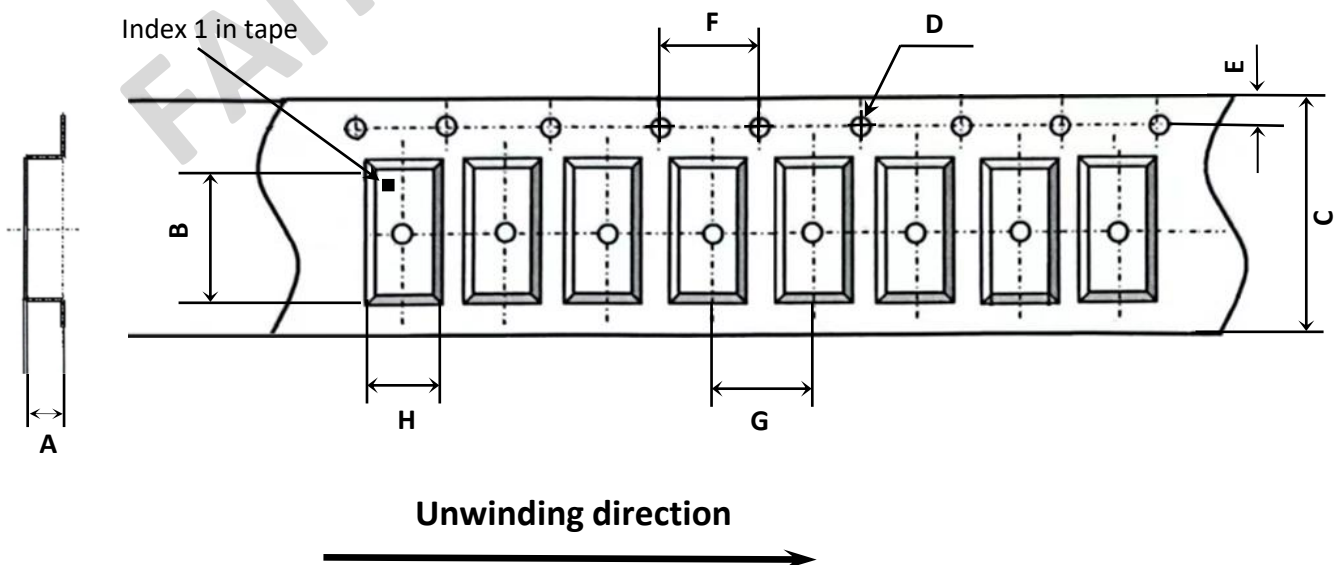


Table of Year and Month code

		Month											
Year		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

6.2 Packing (EIA-481-2)

8mm-4mm, 3,000pcs/reel, $\Phi 178$

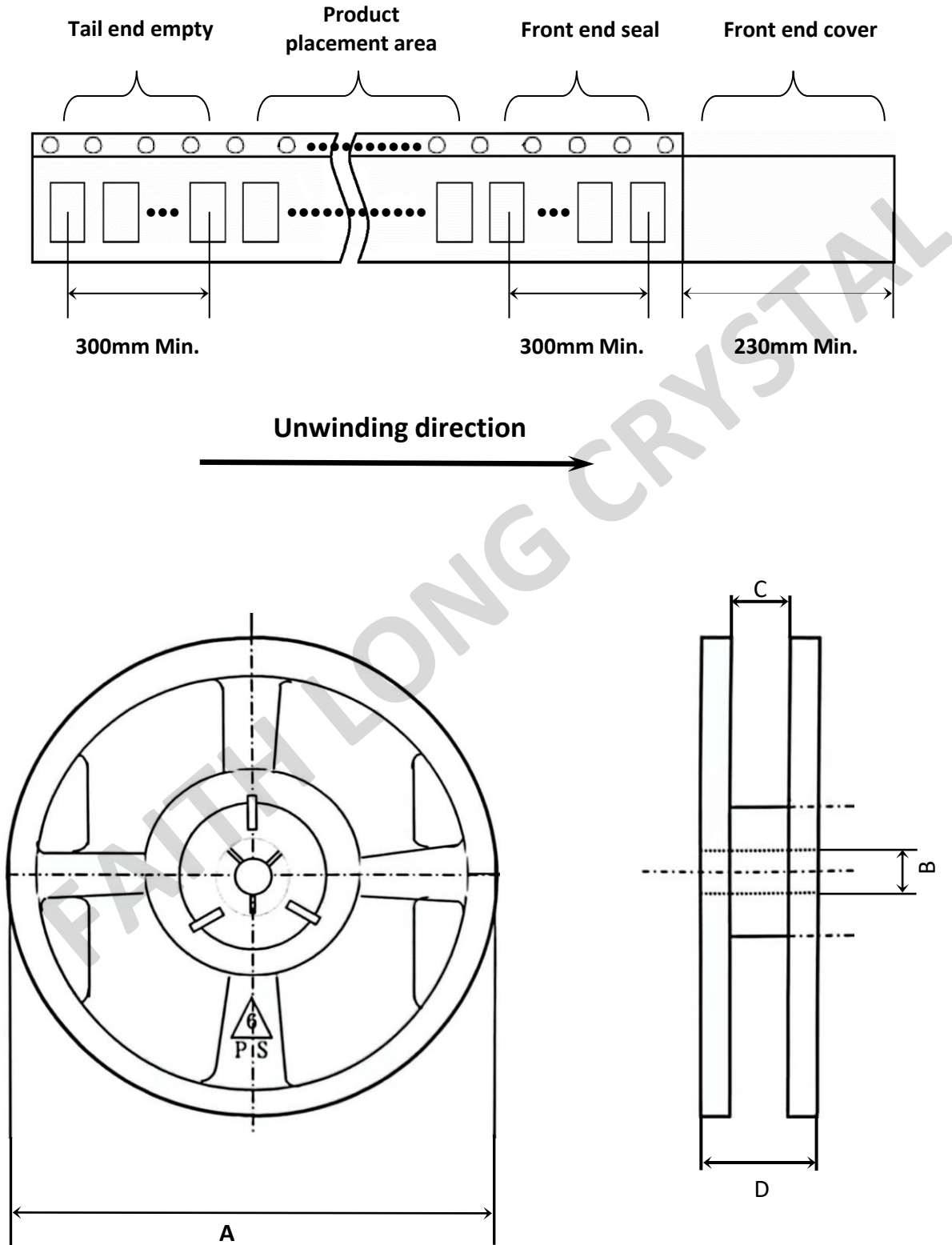


Tape dimension (Unit : mm)

A	B	C	D	E	F	G	H
1.25±0.1	2.45±0.1	8.0±0.3	1.55±0.05	1.75±0.1	4.00±0.2	4.00±0.1	2.00±0.1

6. Marking and Packing (Cont.)

6.2 Packing (EIA-481-2) (Cont.)



3,000 pcs/reel

Reel dimension (Unit : mm)			
A	B	C	D
178±2.0	13.2±0.5	9.0±0.5	11.5±1.4



6. Marking and Packing (Cont.)

6.3 SMD product packing standard

Out-going packing instruction

Reel packing	Inner packing	Carton
Name: reel Standard: diameter 18cm Material: plastics	Name: bubble wrap Standard: 430×330×20mm Material: HDPE Quantity: 15 reels	Name: carton Standard: 400×400×280mm Material: AB corrugated paper Quantity: 4 bags
		
		

The label instruction

Label drawing	Mark	Name of article	Items	Size	Printing
	L1	Bar Code Label (Chintz Paper)	1.Part No. 2.Lot No. 3.Q'ty 4.Freq	70x50mm	White
	L2	Bar Code Label (Chintz Paper)	1.Part No. 2.Date Code 3.Q'ty 4.Freq	70x50mm	White

Remark: The above instruction of label drawing is used for template and may vary with different product specifications .
If customer has specified requirements for labels packaging, please provide the operation procedure.

Product storage conditions:

- [1] Temperature: 15 to 35°C.
- [2] Humidity: 30 to 70% RH.
- [3] Time: within 6 months after delivery.
- [4] Please store the products in a dry, clean, well-ventilated area and avoid direct sunlight exposure, heat, and vibration.