

# SPECIFICATION FOR APPROVAL

CUSTOMER : \_\_\_\_\_

PRODUCT TYPE : SMD TSX 2.5 × 2.0

NOMINAL FREQ. : 19.2 MHz

TXC P/N : OZ19270001

REVISION : A2

CUSTOMER P/N : \_\_\_\_\_

PM / SALES : \_\_\_\_\_

DATE : \_\_\_\_\_

CUSTOMER SIGNATURE & DATE  
: \_\_\_\_\_

- (1) TXC requires one copy returned with signature and title of authorized individual that signifies acceptance of the attached specifications.
- (2) Orders received and accepted by TXC after return of signed copy of specification will be produced per these specifications.
- (3) Any changes to these specifications must be agreed upon by both parties and new revision of the Product Specification Sheet will be issued.
- (4) Any issuance of purchase order prior to consigning back the Approval page of "Specification Sheets" from customers will be regarded as the agreement on the contents of these specifications.

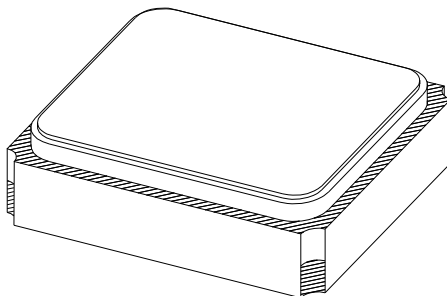
Attachment(s):

- 1. Product Specification Sheet
- 2. Testing Report(Electrical & Temperature)
- 3. Reliability Report

**RoHS Compliant**

# PRODUCT SPECIFICATION SHEET

CUSTOMER : \_\_\_\_\_  
PRODUCT TYPE : SMD TSX 2.5 × 2.0  
NOMINAL FREQ. : 19.2 MHz  
TXC P/N : OZ19270001  
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PE/RD	QA	MFG
 Mike Chiu	 Alex Huang	 Rick Lo
20-Jan-14	20-Jan-14	20-Jan-14

**NOTE:**

- (1) Lead Free Products are " Directive 2002 / 95 / EC of The European Parliament of 27 January 2003 on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment" Compliant (Attachment: SGS Test Report).
- (2) Revision "Sx" is for engineering samples only. PE/RD's approval required.
- (3) Revision "Ax" is production ready. PE, QA and MFG's approval required.

**RoHS Compliant**

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P/N : OZ19270001

REVISION : A2

<u>Rev</u>	<u>Revise page</u>	<u>Revise contents</u>	<u>Date</u>	<u>Ref.No.</u>	<u>Reviser</u>
A1	N/A	Initial released	27-Jun-12	N/A	Yachuan Miao
A2	2	Change ESR:80 Ohm to 70 Ohm	20-Jan-14	EC-PCF-140117-02	Yachuan Miao

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## ■ CRYSTAL ELECTRICAL SPECIFICATIONS

### Standard Atmospheric Conditions

Unless otherwise specified, the standard range of atmospheric conditions for making measurement and tests are as follow:

Ambient temperature : 30±10°C

Relative humidity : 40%~70%

If there is any doubt about the results, measurement shall be made within the following limits:

Ambient temperature : 30±3°C

Relative humidity : 40%~70%

### Measurement Equipment

Electrical characteristics measured by HP E5100A or equivalent

### Crystal Cutting Type

The crystal is using AT CUT (thickness shear mode)

	Parameters	Symbol	Condition	Electrical Spec.				Note
				Min.	Typ.	Max.	Units	
1	Nominal Frequency	FL		19.200000			MHz	
2	Oscillation Mode	-		Fundamental				
3	Load Capacitance	CL			7		pF	1
4	Frequency Tolerance	-	+30°C ± 3°C			±10	ppm	
5	Tolerance Over Temperature	-	-30 to +85°C			±12	ppm	2
6	Frequency Drift After Reflow	-	two reflows			±2	ppm	
7	Operating Temperature	-		-30		+105	°C	
8	Aging	-				±0.7	ppm/Year	
9	Drive Level	DL		10		100	μW	
10	Effective Resistance R <sub>r</sub>	R <sub>r</sub>				70	Ω	
11	Shunt Capacitance C <sub>0</sub>	C <sub>0</sub>		0.3		1.3	pF	
12	Motional Capacitance C <sub>1</sub>	C <sub>1</sub>		1.8		3.1	fF	
13	Insulation Resistance	-	at DC 100 V	500			MΩ	
14	Storage Temperature Range	-	-	-40		+105	°C	
15	Spurious Mode Series Resistance	-	±1 MHz	1100			Ω	
16	Q Factor	Q		75000				3
17	First-order Curve Fitting Parameter	-		-0.4		-0.1	ppm/°C	4
18	Second-order Curve Fitting Parameter	-		-4.5	0	4.5	x10 <sup>-4</sup> ppm/°C <sup>2</sup>	4
19	Third-order Curve Fitting Parameter	-		8.5	10	11.5	x10 <sup>-5</sup> ppm/°C <sup>3</sup>	4
20	Residual frequency stability slope	-				±50	ppb/°C	5
21	5°C small orbit hysteresis 1	-				±50	ppb/°C	6
22	5°C small orbit hysteresis 2	-			100		ppb pk-pk	7

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	Parameters	Symbol	Condition	Electrical Spec.				Note
				Min.	Typ.	Max.	Units	
23	DLD Freq (Max-Min)	-				3.0	ppm	8
24	DLD Freq (Repeatability)	-				0.7	ppm	8
25	DLD ESR (Max-Min)	-				±20	%	8
26	DLD ESR (Repeatability)	-				±10	%	8

Note 1 The load capacitance is measured according to IEC Standard #60444-7

Note 2 Above 85°C tolerance over temperature bound by third-order coefficient range

Note 3 Minimum Q value calculated from ESR and L is smaller than this specification

Note 4 The curve fitting parameter is obtained from the Qualcomm crystal curve fitting algorithm,  $t_0=30\text{ }^\circ\text{C}$   
(Refer to Curve Fitting Calculation Table: 80-V9690-23)

Note 5 Condition 1A – Test condition (continuous temperature rate change of  $\sim 1.0\text{ }^\circ\text{C}/\text{min}$ ):

- Measure FT points every  $1\text{ }^\circ\text{C}$ , heating up from  $-30$  to  $+85\text{ }^\circ\text{C}$ , subtract a fifth-order polynomial best fit and then calculate the slope of the residual.
- The residual slope should be within  $\pm 50\text{ ppb}/^\circ\text{C}$ .

Note 6 Condition 1B – Hysteresis 1 test condition (continuous temperature rate change of  $\sim 1.0\text{ }^\circ\text{C}/\text{min}$ ):

- Measure FT points every  $0.5\text{ }^\circ\text{C}$  while cycling temperature over a  $5\text{ }^\circ\text{C}$  small temperature orbit; an example  $5\text{ }^\circ\text{C}$  small orbit temperature cycle is  $+30\text{ }^\circ\text{C}$  to  $+35\text{ }^\circ\text{C}$  to  $+30\text{ }^\circ\text{C}$ .
- 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.
- The residual slope should be within  $\pm 50\text{ ppb}/^\circ\text{C}$ .

Note 7 Hysteresis 2 test condition (continuous temperature rate change of  $\sim 1.0\text{ }^\circ\text{C}/\text{min}$ ):

- Measure FT points every  $0.5\text{ }^\circ\text{C}$  while cycling temperature over a  $5\text{ }^\circ\text{C}$  small temperature orbit; an example  $5\text{ }^\circ\text{C}$  small orbit temperature cycle is  $+30\text{ }^\circ\text{C}$  to  $+35\text{ }^\circ\text{C}$  to  $+30\text{ }^\circ\text{C}$ .
- 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.

Note 8  $0.01\text{ }^\mu\text{W}$  to  $100\text{ }^\mu\text{W}$  to  $0.01\text{ }^\mu\text{W}$ , number of points: 15 points up and 15 points down = 29 total data points

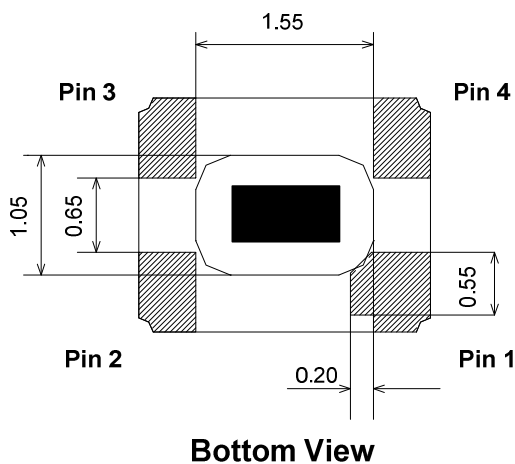
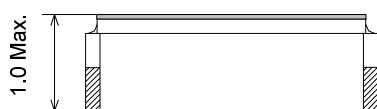
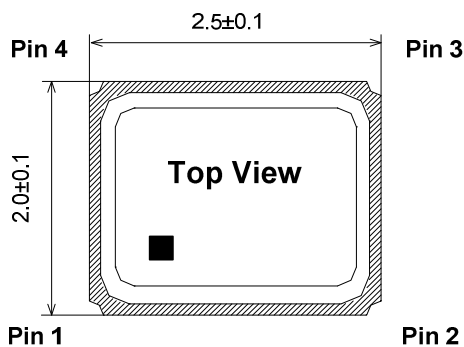
Note 9 This crystal specification complies to Qualcomm Mini-Specification 80-V9690-24 Rev. D

**NTC THERMISTOR ELECTRICAL SPECIFICATIONS**

	Parameters	Symbol	Condition	Electrical Spec.				Note
				Min.	Typ.	Max.	Units	
1	Resistance (25 °C)			100k ± 1%			Ω	
2	B-Constant (25-50 °C)			4250 ± 1%			K	1
3	Operating Temperature			-30		+105	°C	

Note 1 The B constant is calculated using the zero-power resistance values measured at 25°C and 50°C

**DIMENSIONS**



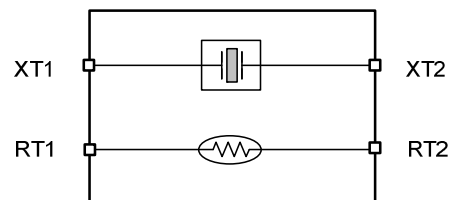
Unit:mm

**PIN FUNCTION**

	Symbol	Function
Pin 1	XT1	XTAL Terminal 1
Pin 2	RT2	Thermistor Terminal 2
Pin 3	XT2	XTAL Terminal 2
Pin 4	RT1	Thermistor Terminal 1

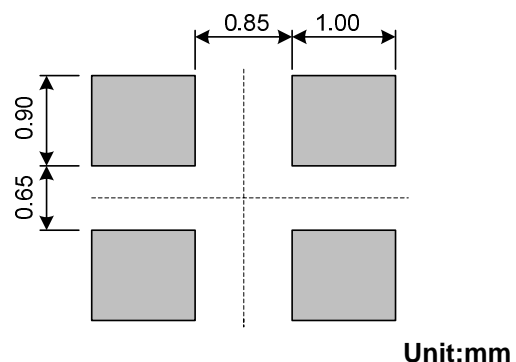
Note: Pin 2 is connected to the metal lid and thermistor  
Pin 4 is connected to the thermistor only

**BLOCK DIAGRAM**



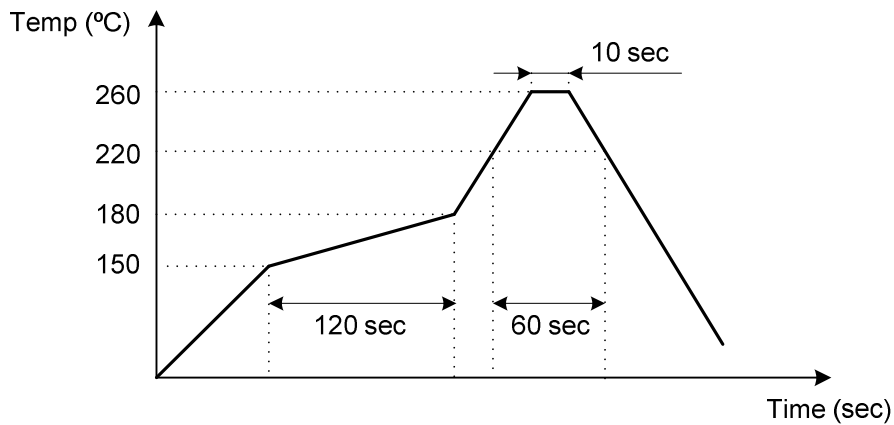
Note: RT2 shall be connected to GND is recommended

**SUGGESTED LAYOUT**



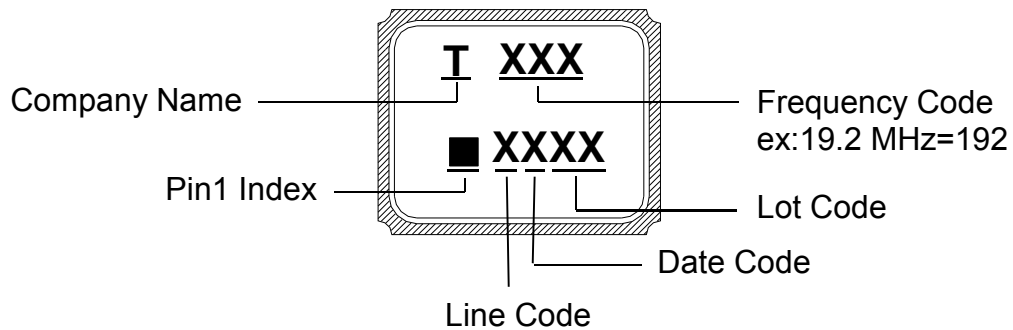
Unit:mm

■ SUGGESTED REFLOW PROFILE



Note : Total Time: 200 sec. Max., Solder Melting Point: 220°C

■ MARKING

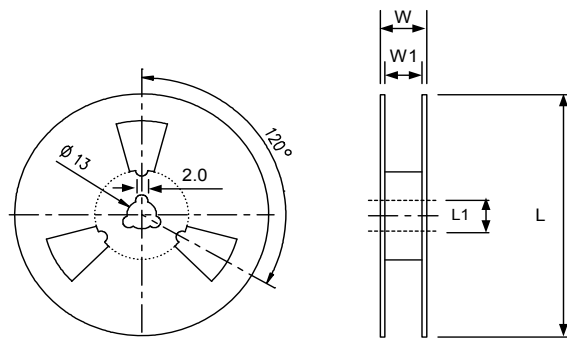
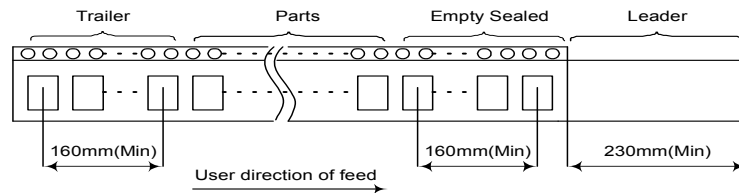
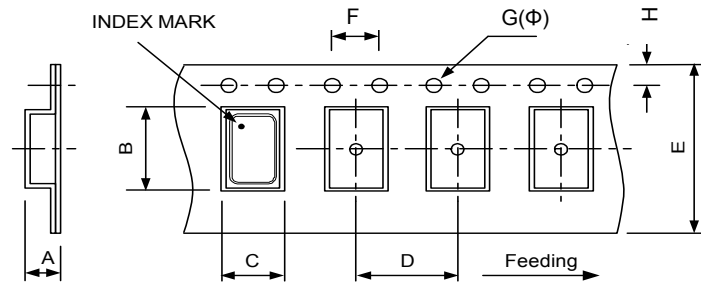


DATE CODE

MONTH				JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YEAR															
2005	2009	2013	2017	A	B	C	D	E	F	G	H	J	K	L	M
2006	2010	2014	2018	N	P	Q	R	S	T	U	V	W	X	Y	Z
2007	2011	2015	2019	a	b	c	d	e	f	g	h	j	k	l	m
2008	2012	2016	2020	n	p	q	r	s	t	u	v	w	x	y	z

Note: This date code will be cycled every four years

■ **PACKING :**



Unit: mm

DIMENSIONS (mm)	A	B	C	D	E	F	G	H	L	L1	W	W1	Standard Reel Quantity is 3,000 pcs per reel
	1.15	2.70	2.25	4.00	8.00	4.00	1.55	1.75	178	13.0	11.6	8.4	

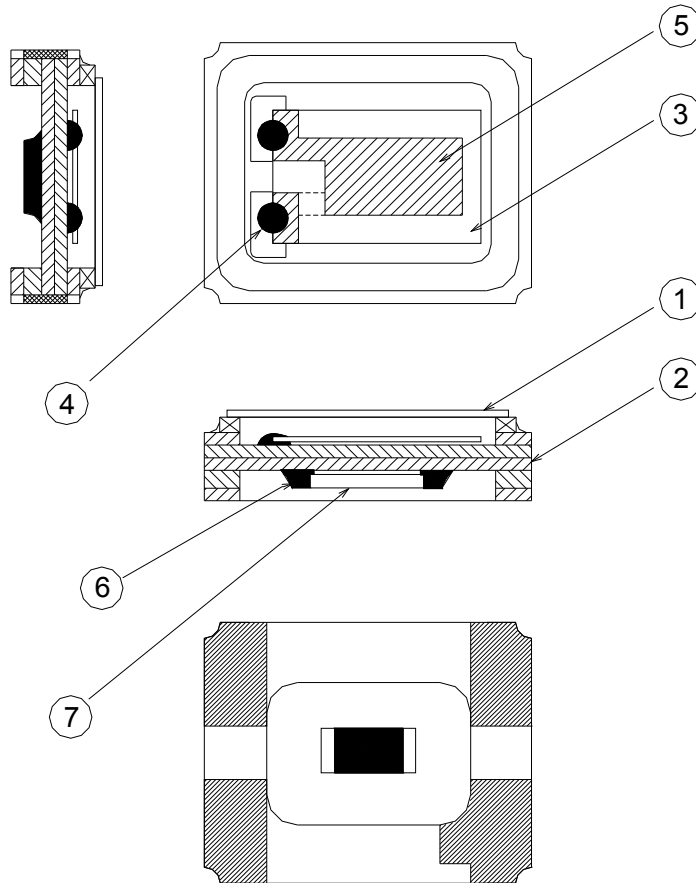
■ **WEIGHT**

0.0135 g / piece(TYP), 40 ± 2 g / 3 kpcs( regardless of tape weight )



■ **STRUCTURE ILLUSTRATION**

Crystal Enclosure Seal : Seam Welding



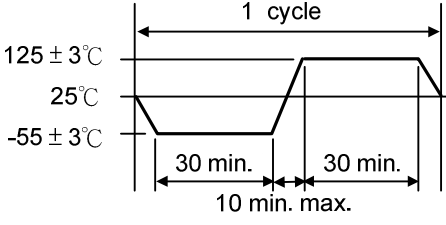
No.	COMPONENTS	MATERIALS	FINISH/SPECIFICATIONS
1	Lid	Metal (Fe+Co+Ni)	-
2	Base (Package)	Ceramic (Al <sub>2</sub> O <sub>3</sub> ) + Kovar (Fe+Co+Ni) + Ag/Cu	Alumina Ceramics
3	Crystal Blank	SiO <sub>2</sub>	-
4	Conductive Adhesive	Ag	Silicone Resin
5	Electrode	Noble Metal	-
6	Solder	Sn	-
7	Thermistor	Al <sub>2</sub> O <sub>3</sub> , Ag, Ni	-

■ **RELIABILITY SPECIFICATIONS**

1. Mechanical Endurance

No.	Test Item	Test Methods	Reference
1.1	Drop Test	150 cm height, 3 times on concrete floor.	JIS C6701
1.2	Mechanical Shock	Device are shocked to half sine wave ( 1000 G ) three mutually perpendicular axes each 3 times. 0.5 msec. duration time	MIL-STD-202
1.3	Vibration	Frequency range 10 ~ 2000 Hz Amplitude 1.52 mm/20 G Sweep time 20 minutes Perpendicular axes each test time 4 Hrs (Total test time 12 Hrs)	MIL-STD-883
1.4	Gross Leak	Standard sample for automatic gross leak detector Test pressure: 2 kg / cm <sup>2</sup>	MIL-STD-883
1.5	Fine Leak	Helium bombing 4.5 kg/ cm <sup>2</sup> for 2 Hrs	
1.6	Solderability	Temperature 245°C ± 5°C Immersing depth 0.5 mm minimum Immersion time 5 ± 1 seconds Flux Rosin resin methyl alcohol solvent ( 1 : 4 )	MIL-STD-883

2. Environmental Endurance

No.	Test Item	Test Methods	Reference
2.1	Resistance To Soldering Heat	Pre-heat temperature 125°C Pre-heat time 60 ~ 120 sec. Test temperature 260 ± 5°C Test time 10 ± 1 sec.	MIL-STD-202
2.2	High Temp. Storage	+ 125 °C ± 3 °C for 500 ± 12 Hrs	MIL-STD-883
2.3	Low Temp. Storage	- 40°C ± 3°C for 500 ± 12 Hrs	
2.4	Thermal Shock	Total 100 cycles of the following temperature cycle 	MIL-STD-883
2.5	High Temp & Humidity	85°C ± 3°C, RH 85% , 500 Hrs	JIS C5023