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Rev.	1.0
Page	9

Shoulder Electronics Limited

CRYSTAL UNIT SPECIFICATIONS

Customer	
Customer P/N	
Product	CRYSTAL RESONATORS
Nominal Frequency	32.768KHZ
A-Crystal P/N	ZM1610-32.768-12.5-20/150/E

Drawn	Checked	Approved
LEO	YORK	PERCY

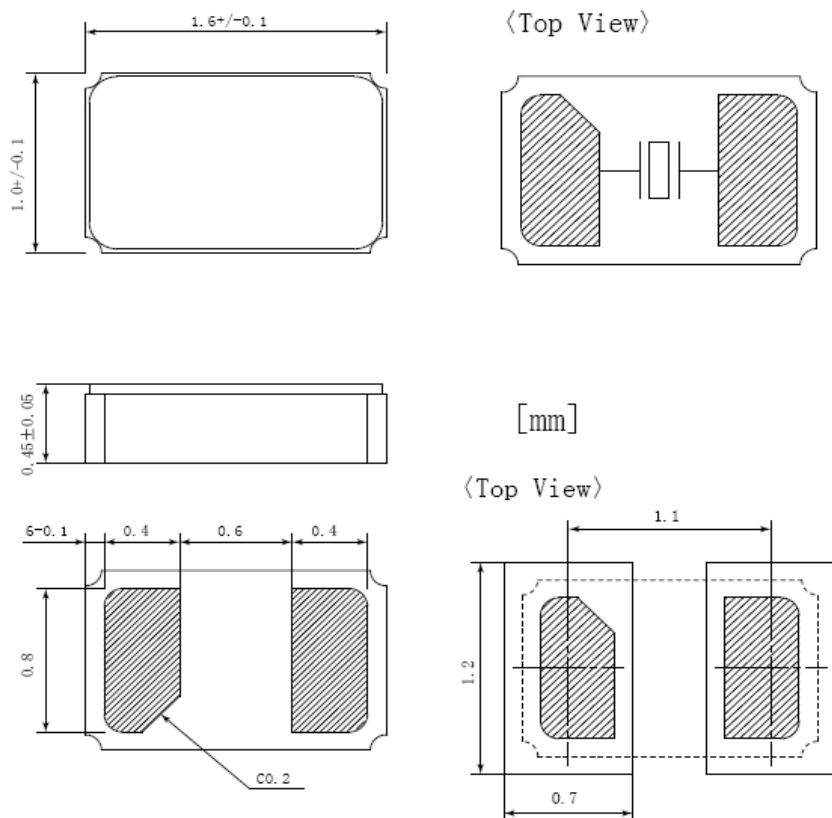


1.ELECTRICAL SPECIFICATIONS

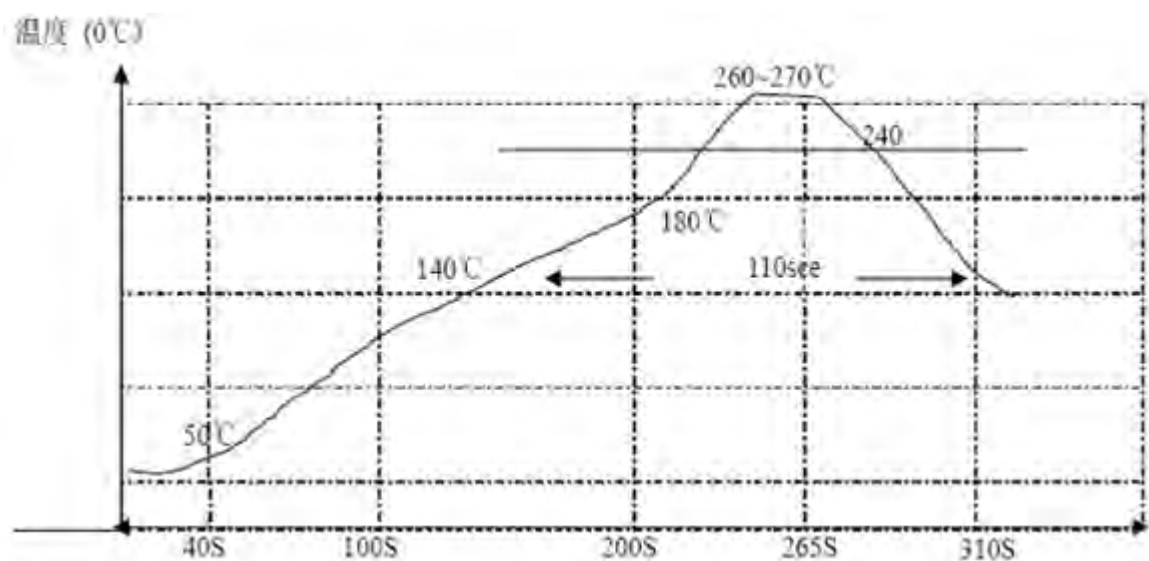
1.1 Hold Type: ZM1610

Parameter	Symb	Value	Condition
Frequency Range	F_0	32.768Khz	
Frequency Tolerance	$\Delta f/f_0$	± 20PPM	REF TO 25°C
Temperature Coefficient	$\Delta f/f_0$	-0.034 ± 0.006 ppm/(°C)²	
Turnover temperature	T_m	25 ± 5°C	
Operating Temperature Range	T_{OPR}	-40°C to 85°C	
Storage Temperature Range	T_{STG}	-55°C to 125°C	
Quality facto		60,000TYP	
Series resistance	R_1	90 K Ω	REF TO 25°C
Shunt Capacitance	C_0	1.3PF TYP	0.9~2.0PF
Motional Capacitance	C_1	2.3Ff TYP	
Load Capacitance	C_L	12.5PF	
Insulator Resistance	IR	500 M Ω	DC100V ± 15 V
Drive Level	DL	0.5 μ W	
Capacitance ratio	r	450TYP	
Aging	$\Delta f/f_0$	± 3PPM	at 25°C ± 3 °C

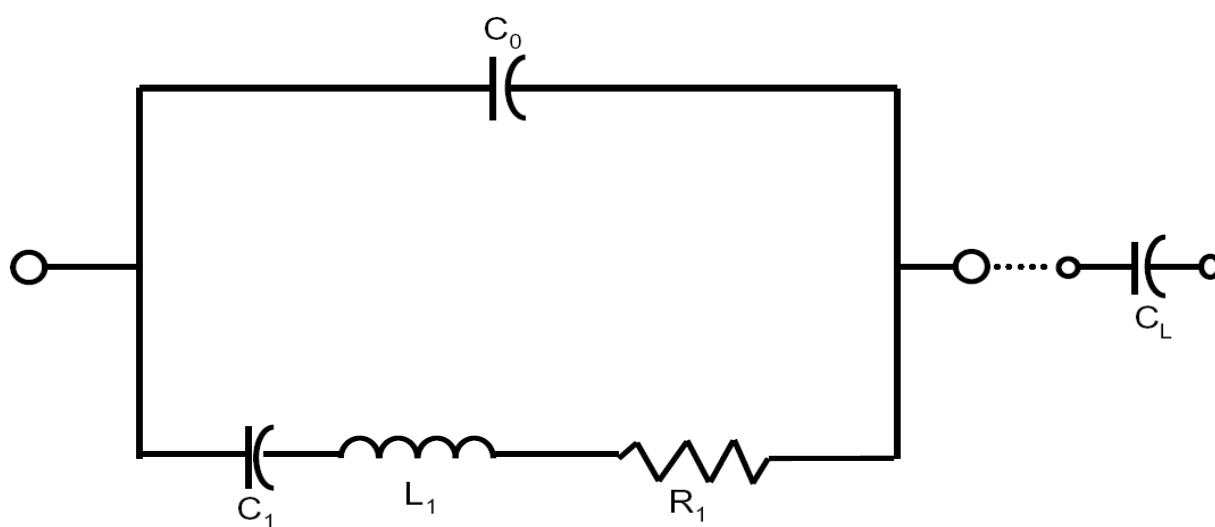
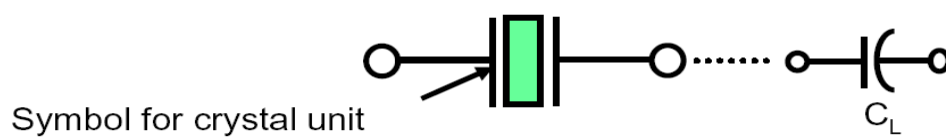
1.2 DIMENSION Unit:mm



1.3 Reflow solder



2.2 EQUIVALENT CIRCUITS





3. RELIABILITY TEST STANDARD

3.1 ENVIRONMENTAL

TEST ITEM	TESTING PROCEDURE & CONDITIONS	EVALUATION
1. THERMAL SHOCK TEST	<p>1. The test should be performed in accordance with the following condition for 10 cycle.</p> <p>2. The crystal unit should be kept in room temperature for 1 hour then tested.</p>	The crystal unit should fulfill the specified requirements of the electrical characteristics and appearance.
2. HUMIDITY	<p>1. temperature : $+40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ RELATIVE HUMIDITY : 90~95% TEST PERIOD : 48 HOURS</p> <p>2. The crystal unit should be kept in room temperature for 1 hour then tested.</p>	The crystal unit should fulfill the specified requirements of the electrical characteristics and appearance.
3. COLD TEMPERATURE TEST	<p>1. TEMPERATURE : $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ TEST PERIOD : 2 HOURS</p> <p>2. The crystal unit should be kept in room temperature for 1 hour then tested.</p>	The crystal unit should fulfill the specified requirements of the electrical characteristics and appearance.
4. THERMAL TEST	<p>1. TEMPERATURE : $+85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ TEST PERIOD : 24 HOURS</p> <p>2. The crystal unit should be kept in room temperature for 1 hour then tested.</p>	The crystal unit should fulfill the specified requirements of the electrical characteristics and appearance.
5. RAPID CHANGE IN TEMPERATURE	<p>1. TEMPERATURE : $+85^{\circ}\text{C} \pm 2^{\circ}\text{C}$ TEST PERIOD : 120 HOURS</p> <p>2. The crystal unit should be kept in room temperature for 1 hour then tested.</p>	The crystal unit should fulfill the specified requirements of the electrical characteristics and appearance.

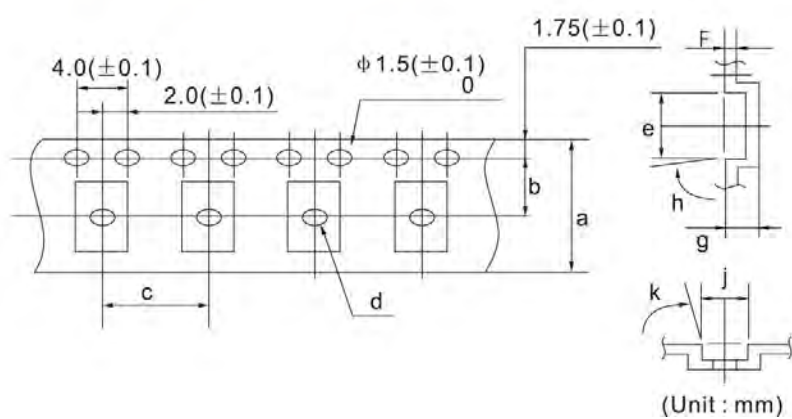


3.2 MECHANICAL

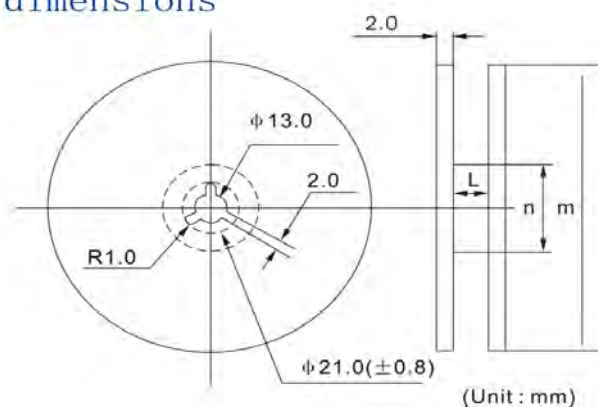
TEST ITEM	TESTING PROCEDURE & CONDITIONS	EVALUATION
1. LEAD TENSILITY	1. FIX THE UNIT. 2. APPLY 2LB OF WEIGHT AXIS TO THE LEADS. 3. TIME : 5 SECONDS	SHOULD PASS SEALING AND VISUAL TEST
2. LEAD BENDING	1. ATTACH 1 LB OF WEIGHT TO EACH OF THE LEADS. 2. BENDING ANGLE : 90° (FROM THE NORMAL POSITION TO 45° OPPOSITE DIRECTION) 3. BENDING TIME : 3 SECONDS(EACH DIRECTION) 4. NUMBER OF BENDING : 2 TIMES	SHOULD PASS SEALING AND VISUAL TEST
3. LEADS SOLDERABILITY	1. DIP THE LEADS INTO FLUX(ROJIN METHANOL) FOR 5 SECONDS 2. DIP THE LEADS INTO 250±5°C 99% Sn DIPPING SOLUTION FOR 5 SECONDS.	THE DIPPED PART OF THE LEADS SHOULD HAVE 90~95% Sn COATING.
4. SOLDERING HEAT RESISTANCE TEST	1. PERFORM ELECTRICAL CHARACTERISTICS TEST BEFORE STARTING THIS PROCEDURE. 2. DIP THE LEADS INTO FLUX(ROJIN METHANOL) FOR 5 SECONDS. 3. DIP THE LEADS INTO 260±5°C 99% Sn DIPPING SOLUTION FOR 5 SECONDS. 4. TAKE THE UNIT OUT, STORE AT ROOM TEMPERATURE FOR 30 SECONDS THEN MEASURE THE ELECTRICAL CHARACTERISTICS.	SHOULD PASS SEALING AND VISUAL TEST
5. VIBRATION	1. PERFORM ELECTRICAL CHARACTERISTICS TEST BEFORE STARTING THIS PROCEDURE. 2. THE UNIT SHOULD BE FIXED ONTO A VIBRATING MACHINE AND THEN SHAKEN X.Y.Z DIRECTIONS. VIBRATING FREQUENCY : 10 ~ 55 Hz AMPLITUDE : 0.03 Inch FACTOR TIME : 1 MINUTES TESTING TIME : 30 MINUTES EACH FOR X, Y, Z DIRECTIONS	SHOULD PASS SEALING AND VISUAL TEST
6. DROP TEST	1. PERFORM ELECTRICAL CHARACTERISTICS TEST BEFORE STARTING THIS PROCEDURE. 2. FROM THE HEIGHT OF 500mm DROP THE UNIT 3 TIMES ONTO A HARD RUBBER SURFACE.	SHOULD PASS SEALING AND VISUAL TEST
7. LEAK TEST	USE Helium Leak Detector. Bombing PRESSURE : 5kg/cm ² Bombing TIME : 2 HOURS LEAK SHOULD BE LESS THAN 1E-8 atm.cc/sec.	GAS OR AIR SHOULD NOT BE DETECTED.
8. MARKING ERASE	SUBMERGE THE UNIT INTO IPA[ISOPROPYL ALCOHOL] SOLUTION FOR 10 MINUTES AND BRUSH THE MARKING 10 TIMES WITH A TOOTH BRUSH.	MARKING SHOULD NOT BE ERASED.

4. Packing

Taping dimensions



Reel dimensions



Model Region	Quantity (pcs / reel)	a	b	c	d (φ)	e	f	h (Max.)	j	k (Max.)	L	m (φ)	n (φ)
1610	3,000	12.0	5.5	4.0	1.0	3.6	1.0	5°	1.9	5°	13.0	180	60