

Shoulder Electronics Limited

APPROVAL SHEET

DATE: January 22, 2009

CUSTOMER:

PRODUCTION NAME: Tuning Fork CRYSTAL UNIT

PART NUMBER: ZM405-32.768-12.5-20-E

PREPARED BY: _____ **CONFIRMED BY:** _____

1.ELECTRICAL SPECIFICATIONS

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 factor		60,000TYP	
Series resistance	R_1	50 K Ω	REF TO 25°C
Shunt Capacitance	C_0	0.9 PF TYP	0.9~2.0PF
Motional Capacitance	C_1	2.0 Ff TYP	
Load Capacitance	C_L	12.5PF	
Insulator Resistance	IR	500 M Ω	DC100V \pm 15V
Drive Level	DL	1 μ W	MAX
Aging	$\Delta f/f_0$	± 3PPM	at 25°C \pm 3°C

2. TEST STANDARD

2.1 GENERAL ELECTRICAL CHARACTERISTICS AND VISUAL TESTING

2.1.1 LOT CLASSIFICATION : If the quantity is 1,000 pcs or more, 1,000 pcs is one lot.

2.1.2 SAMPLING TEST METHOD : MIL-STD-105E G-II

2.1.3 TEST LEVEL

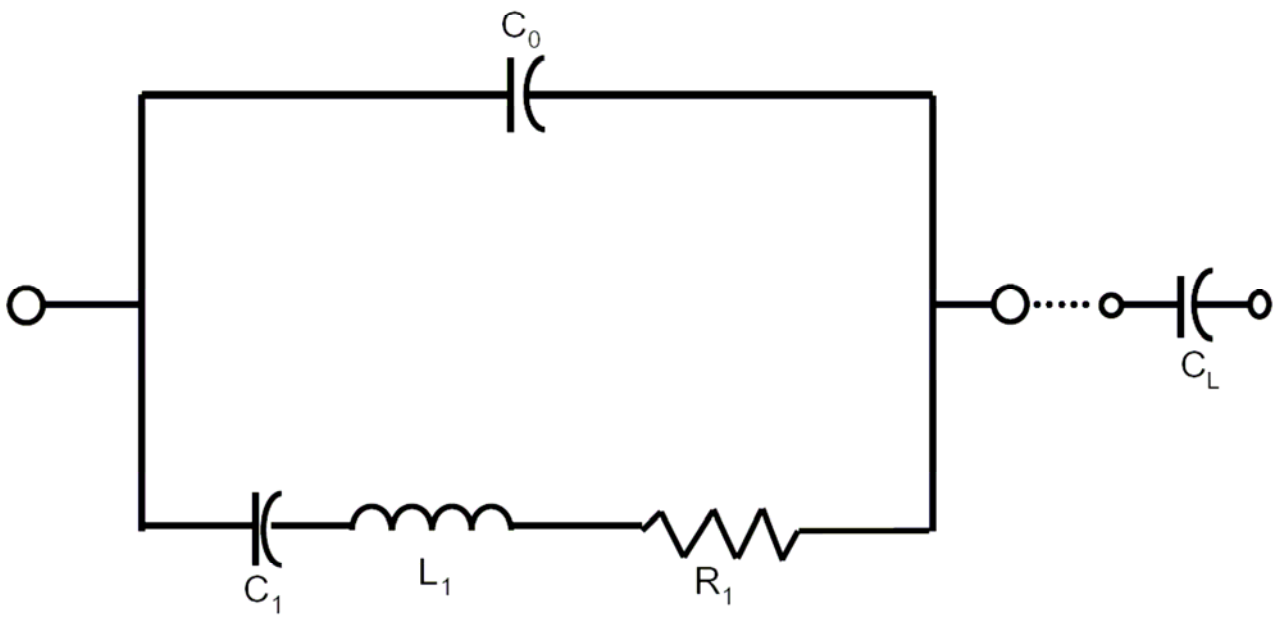
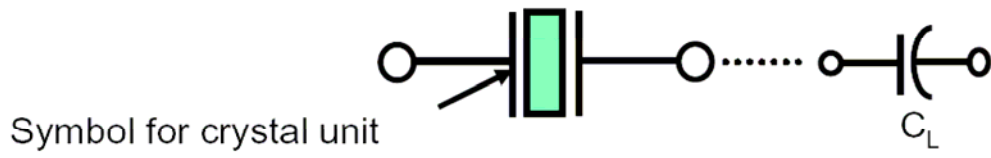
- A] HIGH LEVEL DEFECT : AQL 0.065% [200 PCS]
- B] MEDIUM LEVEL DEFECT : AQL 0.25% [50 PCS]
- C] LOW LEVEL DEFECT : AQL 0.4% [32 PCS]

2.1.4 DEFECT CLASSIFICATION

- A] HIGH LEVEL
 - @NO FREQUENCY
 - @MIXING
 - @LEAK DEFECT
- B] MEDIUM LEVEL – ELECTRICAL CHARACTERISTIC DEFECT
 - @FREQUENCY
 - @OSCILLATION
 - @ELECTRICAL CURRENT
 - @OTHER ELECTRICAL CHARACTERISTICS DEFECT
- C] VISUAL
 - @MARKING
 - @WELDING
 - @LEADS
 - @OTHER VISUAL DEFECT

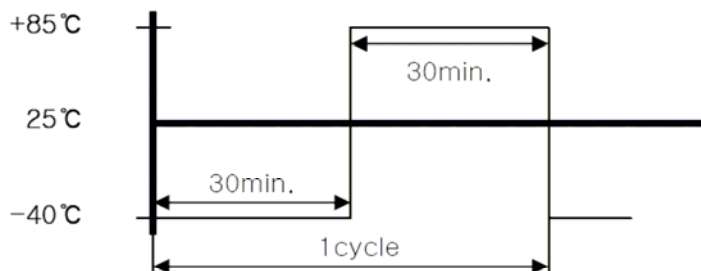
TESTING METHOD AND ITS STANDARD CAN BE MODIFIED DEPENDING ON THE CUSTOMER'S REQUEST.

2.2 EQUIVALENT CIRCUITS



3. RELIABILITY TEST STANDARD

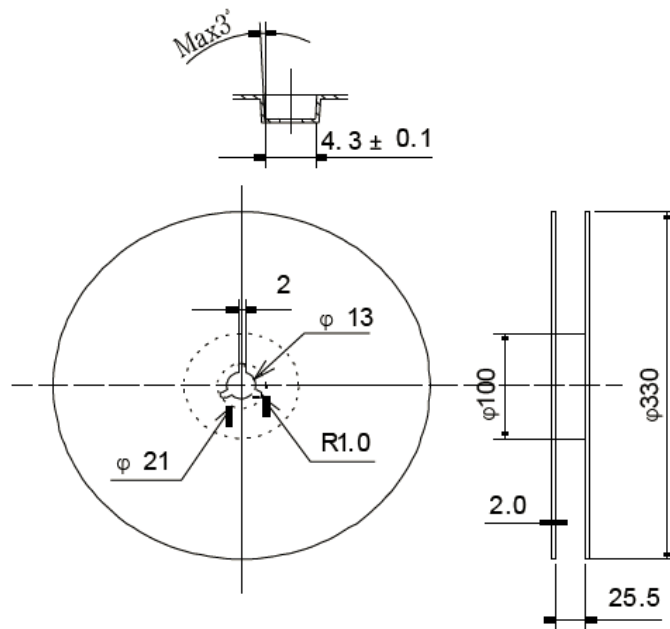
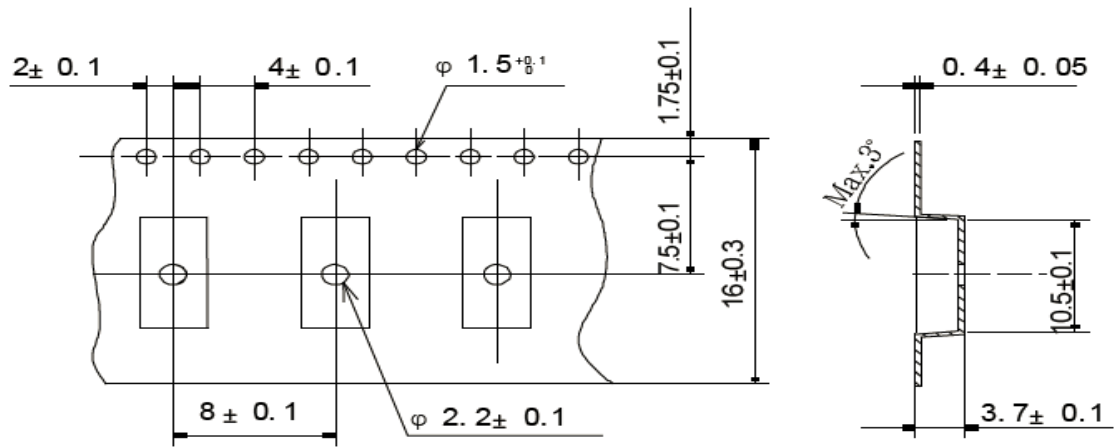
3.1 ENVIRONMENTAL

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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<p>USE Helium Leak Detector.</p> <p>Bombing PRESSURE : 5kg/cm²</p> <p>Bombing TIME : 2 HOURS</p> <p>LEAK SHOULD BE LESS THAN 1E-8 atm.cc/sec.</p>	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



5. CAUTION

* IN ORDER TO MAINTAIN QUALITY, WITHOUT CHANGE IN CHARACTERISTICS OF THE CRYSTAL UNITS, PLEASE FOLLOW BELOW RECOMMENDATION.

5.1 SHOCK

5.1.1 ALL CRYSTAL UNITS HAVE A THIN CRYSTAL BLANKS WITHIN. IF IT IS DROPPED ABOVE THE RECOMMENDED DROPPING HEIGHT(500mm), THE SPECIFIC CHARACTERISTICS AND APPEARANCE CAN BE CHANGED. PLEASE PAY SPECIAL ATTENTION TO EXTERNAL SHOCK.

5.2. ENVIRONMENTAL

5.2.1 CRYSTAL UNITS' FREQUENCY CAN BE CHANGED DUE TO SURROUNDING TEMPERATURE. IF IT IS STORED NEXT TO A HIGH TEMPERATURE HEATER (ABOVE+85℃) OR BELOW 40℃, AND A STRONG LIGHT SOURCE FOR LONG PERIOD OF TIME, THE ELECTRICAL CHARACTERISTICS CAN BE CHANGED. IT IS SUGGESTED THAT THESE ENVIROMENTS BE AVOIDED.

5.2.2 IF THE UNIT IS PLACED IN A HUMID ENVIRONMENT, LEAD TERMINAL CAN BE DAMAGED; THEREFORE, DO NOT STORE THE CRYSTAL UNITS IN A HUMID ENVIRONMENT.

5.2.3 CRYSTAL UNIT HAS VIBRATING CHARACTERISTICS. IF IT IS PLACED WHERE VIBRATION EXISTS, THE OPERATING CHARACTERISTICS CAN BE ALTERED; THEREFORE, THIS ENVIRONMENT SHOULD BE AVOIDED.

5.3 LEADS

5.3.1 IF THE LEADS ARE BENT 90° FROM ITS AXIS FOR MORE THAN 2 TIMES THE TERMINAL COULD BE DISCONNECTED; THEREFORE, DO NOT BENT THE LEADS EXCESSIVELY.

5.3.2 AFTER SOLDERING CRYSTAL UNITS INTO A PCB, IMPACTING THE UNIT FROM THE TOP, BOTTOM, LEFT OR RIGHT SIDE OF THE UNIT CAN SHATTER THE GLASS PORTION OF THE BASE, RENDERING THE UNIT USELESS.

5.4 ASSEMBLY METHOD

5.4.1 CORRECT ULTRASONIC FREQUENCY FOR CLEANING SHOULD BE LESS THAN 20KHz.

5.4.2 SOLDERING SHOULD BE DONE USING IEC 61760-1 OR Pb-Free Products.

5.5 STORAGE

5.5.1 IF THE CRYSTAL UNITS ARE STORED IN HUMID OR SALTY ENVIRONMENT, APPEARANCE CAN BE CHANGED AND SOLDERABILITY CAN DETERIORATE; THEREFORE, AVOID STORING IN SUCH ENVIRONMENT. DO NOT STORE THE CRYSTAL UNIT MORE THAN 3 MONTHS.