

# YANTAI HUAFENG CRYSTAL CO., LTD

## APPROVAL SHEET

**DATE:** January 4, 2013

**CUSTOMER:**

**PRODUCTION NAME:** Tuning Fork CRYSTAL UNIT

**PART NUMBER:** PMX405/406 /32.768KHZ +/-20PPM 12.5PF

**PREPARED BY:** \_\_\_\_\_ **CONFIRMED BY:** \_\_\_\_\_

**MANUFACTURER:** YANTAI HUAFENG CRYSTAL CO., LTD

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# 1.ELECTRICAL SPECIFICATIONS

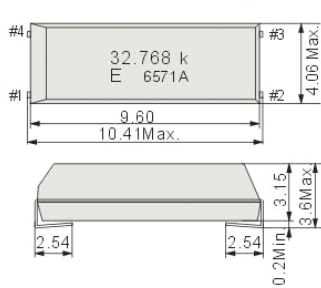
## 1.1 Hold Type: PMX-406 /405

Parameter	Symb	Value	Condition
Frequency Range	$F_0$	<b>32.768Khz</b>	
Frequency Tolerance	$\Delta f/f_0$	<b><math>\pm 20</math>PPM</b>	REF TO 25°C
Temperature Coefficient	$\Delta f/f_0$	<b><math>-0.034 \pm 0.006</math> ppm/(°C)<sup>2</sup></b>	
Turnover temperature	$T_m$	<b><math>25 \pm 5</math>°C</b>	
Operating Temperature Range	$T_{OPR}$	<b><math>-40</math>°C to <math>85</math>°C</b>	
Storage Temperature Range	$T_{STG}$	<b><math>-55</math>°C to <math>125</math>°C</b>	
Quality factor		<b>60,000TYP</b>	
Series resistance	$R_1$	<b>50 K <math>\Omega</math></b>	REF TO 25°C
Shunt Capacitance	$C_0$	<b>0.85PF TYP</b>	0.9~2.0PF
Motional Capacitance	$C_1$	<b>2.0 Ff TYP</b>	
Load Capacitance	$C_L$	<b>12.5PF</b>	
Insulator Resistance	IR	<b>500 M <math>\Omega</math></b>	DC100V $\pm$ 15V
Drive Level	DL	<b>1 <math>\mu</math> W</b>	
Capacitance ratio	r	<b>450TYP</b>	
Aging	$\Delta f/f_0$	<b><math>\pm 5</math>PPM</b>	at 25°C $\pm$ 3°C

## 1.2 DIMENSION Unit:mm

### External dimensions

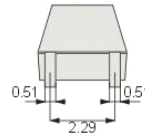
• **PMX-405 / 406** (Unit:mm)



Internal connection in PMX-405



Internal connection in PMX-406

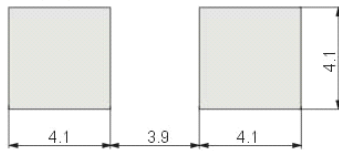


Do not connect #2 and #3 to external device.  
The first digit of N o. Means: 5xxxx PMX-405  
6xxxx PMX-406

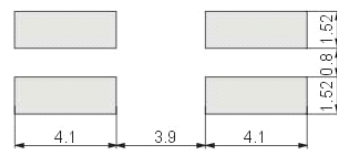
### Footprint(Recommended)

(Unit:mm)

• **PMX-405**

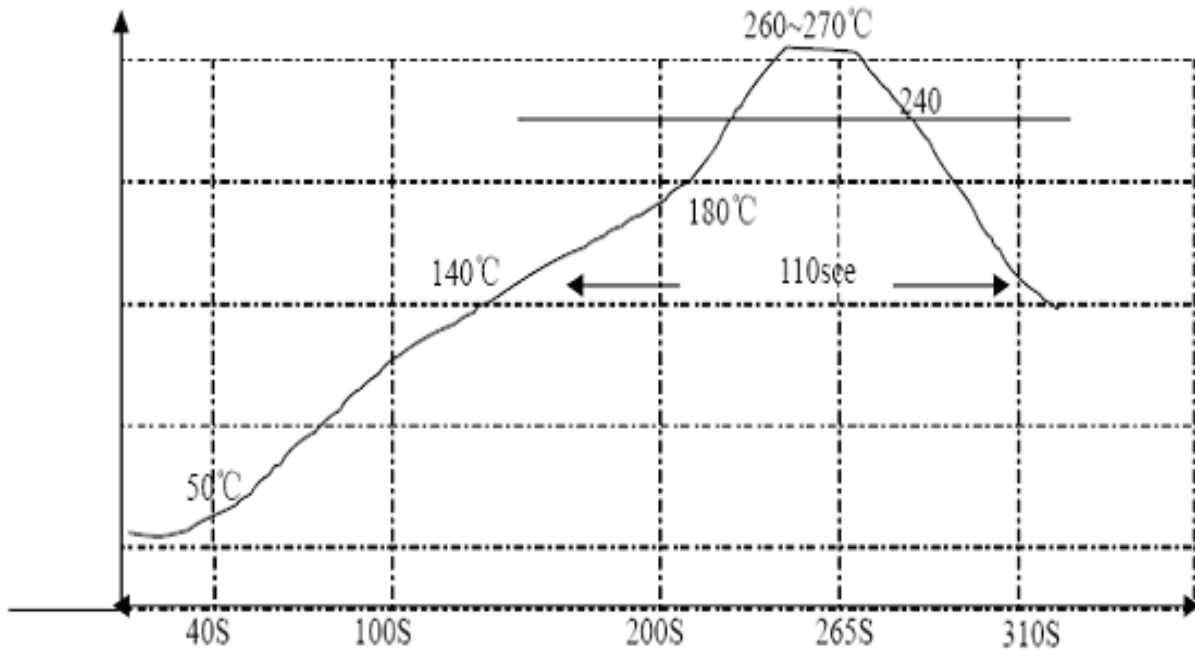


• **PMX-406**



## 1.3 Reflow solder

温度 (°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

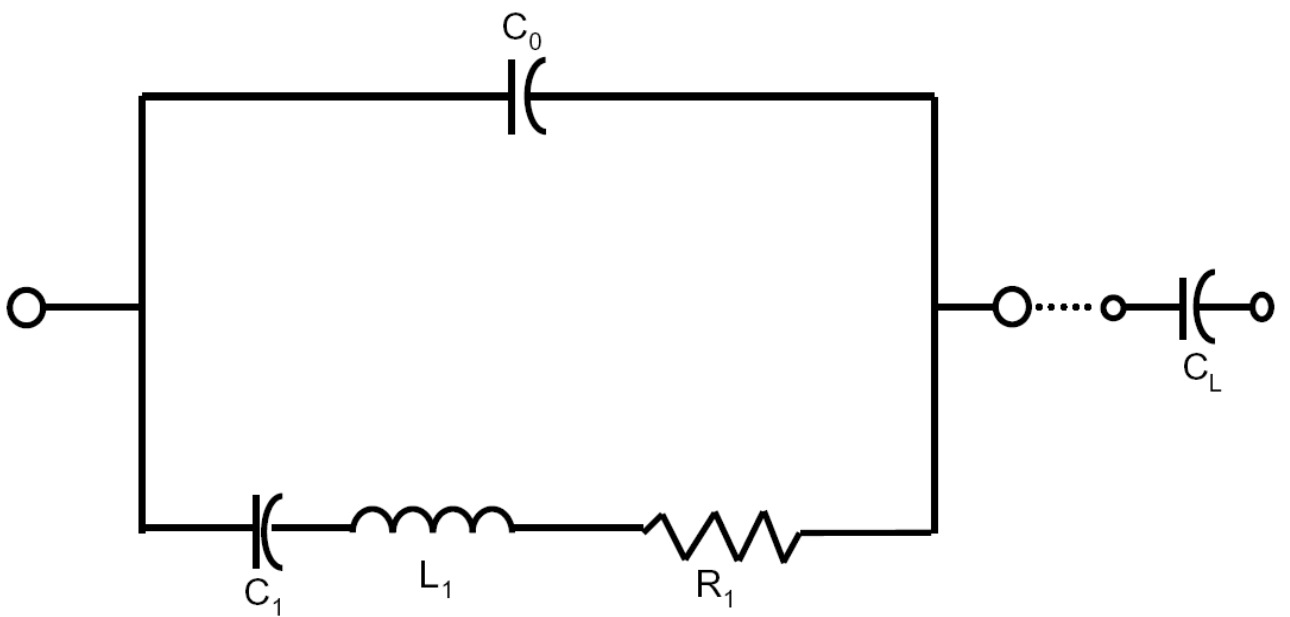
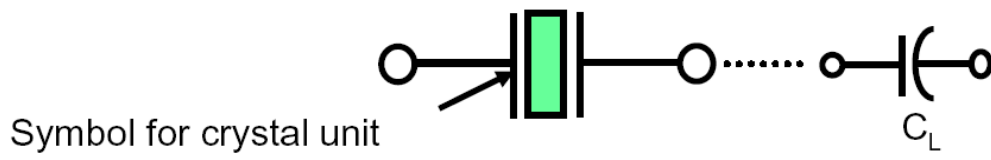
- A] HIGH LEVEL DEFECT : AQL 0.065% [200 PCS]
- B] MEDIUM LEVEL DEFECT : AQL 0.25% [50 PCS]
- C] LOW LEVEL DEFECT : AQL 0.4% [32 PCS]

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

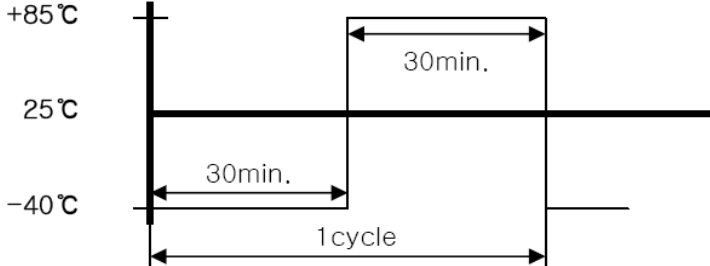
TESTING METHOD AND ITS STANDARD CAN BE MODIFIED DEPENDING ON THE CUSTOMER'S REQUEST.

## 2.2 EQUIVALENT CIRCUITS



## 3. RELIABILITY TEST STANDARD

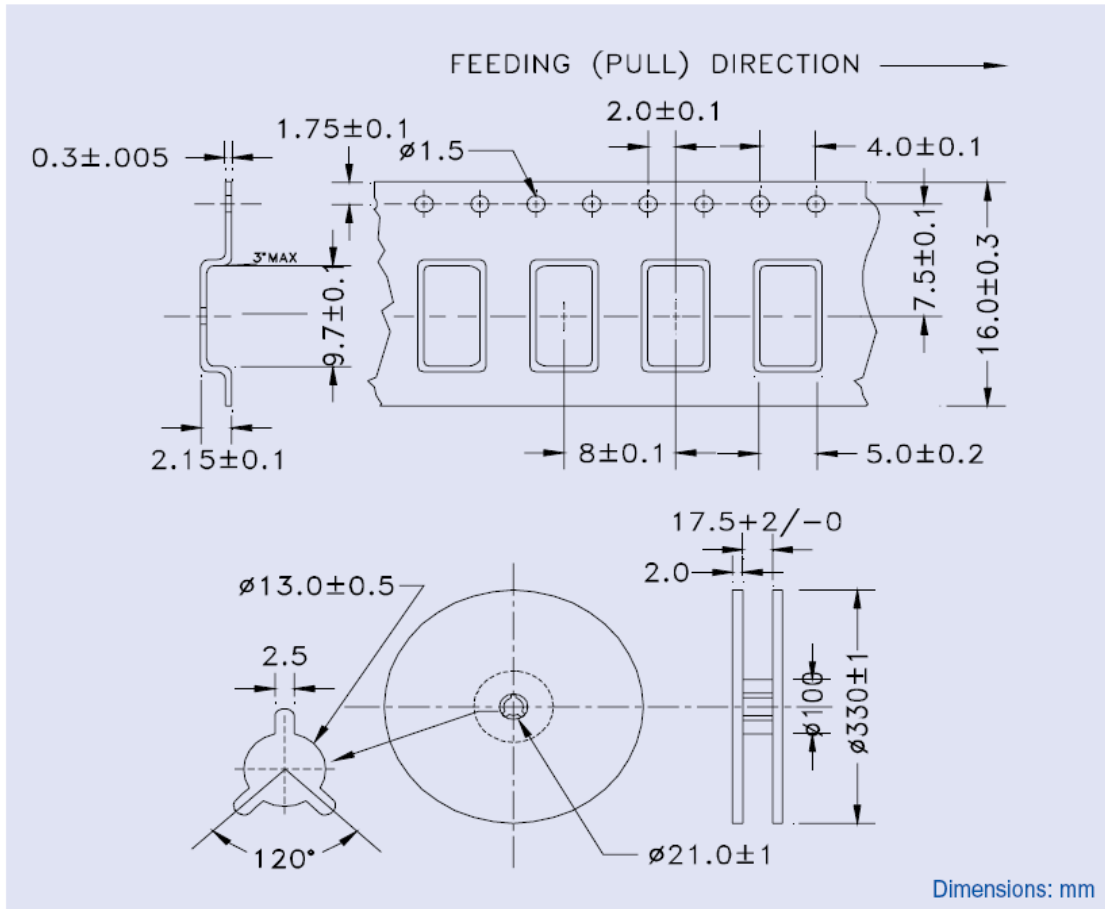
### 3.1 ENVIRONMENTAL

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 : <math>+40^{\circ}\text{C} \pm 2^{\circ}\text{C}</math>            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 : <math>-40^{\circ}\text{C} \pm 2^{\circ}\text{C}</math>            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 : <math>+85^{\circ}\text{C} \pm 2^{\circ}\text{C}</math>            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 : <math>+85^{\circ}\text{C} \pm 2^{\circ}\text{C}</math>            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"> <li>1. FIX THE UNIT.</li> <li>2. APPLY 2LB OF WEIGHT AXIS TO THE LEADS.</li> <li>3. TIME : 5 SECONDS</li> </ol>	SHOULD PASS SEALING AND VISUAL TEST
2. LEAD BENDING	<ol style="list-style-type: none"> <li>1. ATTACH 1 LB OF WEIGHT TO EACH OF THE LEADS.</li> <li>2. BENDING ANGLE : 90° (FROM THE NORMAL POSITION TO 45° OPPOSITE DIRECTION)</li> <li>3. BENDING TIME : 3 SECONDS(EACH DIRECTION)</li> <li>4. NUMBER OF BENDING : 2 TIMES</li> </ol>	SHOULD PASS SEALING AND VISUAL TEST
3. LEADS SOLDERABILITY	<ol style="list-style-type: none"> <li>1. DIP THE LEADS INTO FLUX(ROJIN METHANOL) FOR 5 SECONDS</li> <li>2. DIP THE LEADS INTO 250±5℃ 99% Sn DIPPING SOLUTION FOR 5 SECONDS.</li> </ol>	THE DIPPED PART OF THE LEADS SHOULD HAVE 90~95% Sn COATING.
4. SOLDERING HEAT RESISTANCE TEST	<ol style="list-style-type: none"> <li>1. PERFORM ELECTRICAL CHARACTERISTICS TEST BEFORE STARTING THIS PROCEDURE.</li> <li>2. DIP THE LEADS INTO FLUX(ROJIN METHANOL) FOR 5 SECONDS.</li> <li>3. DIP THE LEADS INTO 260±5℃ 99% Sn DIPPING SOLUTION FOR 5 SECONDS.</li> <li>4. TAKE THE UNIT OUT, STORE AT ROOM TEMPERATURE FOR 30 SECONDS THEN MEASURE THE ELCTRICAL CHARACTERISTICS.</li> </ol>	SHOULD PASS SEALING AND VISUAL TEST
5. VIBRATION	<ol style="list-style-type: none"> <li>1. PERFORM ELECTRICAL CHARACTERISTICS TEST BEFORE STARTING THIS PROCEDURE.</li> <li>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</li> </ol>	SHOULD PASS SEALING AND VISUAL TEST
6. DROP TEST	<ol style="list-style-type: none"> <li>1. PERFORM ELECTRICAL CHARACTERISTICS TEST BEFORE STARTING THIS PROCEDURE.</li> <li>2. FROM THE HEIGHT OF 500mm DROP THE UNIT 3 TIMES ONTO A HARD RUBBER SURFACE.</li> </ol>	SHOULD PASS SEALING AND VISUAL TEST
7. LEAK TEST	<p>USE Helium Leak Detector.</p> <p>Bombing PRESSURE : 5kg/cm<sup>2</sup></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



### 4.2 PACKAGING METHOD

4.2.1 TAPE & REEL AS SHOWN IN ABOVE DIMENSION,

4.2.2 INSERT 2,000 PCS OF TAPE & REEL COVERED WITH SHOCK ABSORBANT PAD INTO THE INNER BOX (INNER BOX SHOULD HAVE DESCRIPTION OF THE PART CONTAINED) AS SHOWN IN PICTURE1.

INNER-BOX CAN ACCOMODATE UPTO 1,000PCS.[PICTURE2]

4.2.3 INSERT SHOCK-ABSORBANT PAD ON ALL SIDES (INCLUDING TOP), AND THEN INSERT UPTO 5 INNER BOXES INTO THE OUTER BOX. [PICTURE3]

4.2.4 ON THE INNER-BOX COVER, LABEL CONTENTS OF THE BOX (FREQUENCY, LOAD CAPACITANCE, AND QUANTITY).

4.2.5 TO PREVENT INNER-BOX COVER OPENING DUE TO SHOCK, FASTEN THE COVER WITH A CLEAR TAPE AS SHOWN IN PICTURE4.



PICTURE1



PICTURE2



PICTURE3



PICTURE4



## 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.

## 6. Pb-Free PRODUCTS

Joinic Pb-free program.

The Joinic Pb-free program is implemented in accordance with European Union (EU) Legislation titled "Restriction of the use of certain Hazardous Substances (RoHS)" including banning the use of Pb in electronic assemblies after July 1, 2006.

Joinic Definitions

Pb-Free Classification: Component and Assembly Pb content shall be less than 0.1% by weight of the device (in accordance to IPC/EIA J-STD-006) and shall not be intentionally introduced .

Components: Joinic's definition of components apply to quartz crystal devices  
Assemblies: Joinic's definition of assemblies apply to oscillator devices (XO, VCXO and TCXO's)

Recommended Solder Composition

Joinic's is following industry trend of using alloy range Sn-Ag(3.4-4.1)-Cu(0.45-0.9) for reflow and wave soldering.

Pb-free Part Number Identification:

When applicable, the Joinic specification sheet shall indicate if the device is classified as Pb-free.

Marking and Labeling: Joinic has a Pb-free labeling method for the packaging of all Pb-free products. The lowest level shipping container shall identify the products as Pb-free.