

## 1. QUARTZ CRYSTAL UNIT SPECIFICATION

| Parameter                         | Sign             | Specification                                                         |
|-----------------------------------|------------------|-----------------------------------------------------------------------|
| 1.1 Nominal Frequency :           | F0               | 24.000MHz                                                             |
| 1.2 Holder type :                 | -                | FTX321S (SMD3225 Seam type)                                           |
| 1.3 Mode of oscillation :         | -                | Fundamental                                                           |
| 1.4 Frequency tolerance :         | FL               | $\pm 10\text{ppm}$ at $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$      |
| 1.5 Equivalent resistance :       | RR               | 40 $\Omega$ max.                                                      |
| 1.6 Operating temperature range : | T <sub>OPR</sub> | 0 $^{\circ}\text{C}$ To +85 $^{\circ}\text{C}$                        |
| 1.7 Storage temperature range :   | T <sub>STG</sub> | -55 $^{\circ}\text{C}$ To +125 $^{\circ}\text{C}$                     |
| 1.8 Frequency Stability :         | TC               | $\pm 25\text{ppm}$ at 0 $^{\circ}\text{C}$ To +85 $^{\circ}\text{C}$  |
| 1.9 Loading capacitance :         | CL               | 18pF                                                                  |
| 1.10 Drive level :                | DL               | 100 uW Typical, 300uW max.                                            |
| 1.11 Shunt Capacitance :          | C0               | 2.0pF max.                                                            |
| 1.12 Insulation resistance :      | IR               | More than 500M $\Omega$ at DC 100V                                    |
| 1.13 Circuit :                    | -                | Measured in HP/E5100A, S&A 250B                                       |
| 1.14 Aging :                      | Fa               | $\pm 3\text{ ppm max.}$ (+25 $^{\circ}\text{C}$ 1 <sup>st</sup> Year) |
| 1.15 Dimensions and marking :     |                  | Refer to page.4                                                       |
| 1.16 Emboss carrier tape & reel : |                  | Refer to page.6 ~ page.8                                              |
| 1.17 Note :                       |                  |                                                                       |

### Standard atmospheric conditions

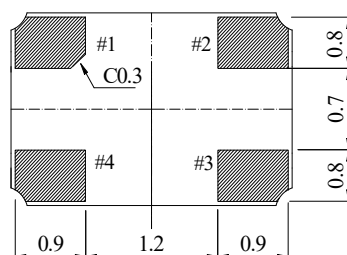
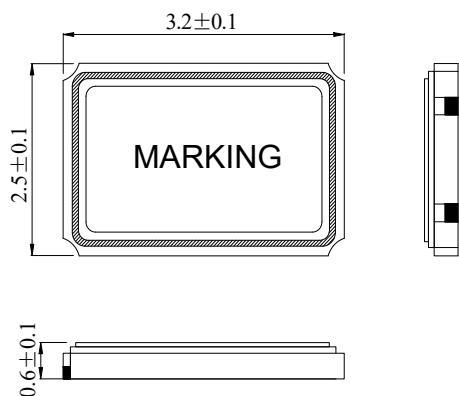
Unless otherwise specified, the standard range of atmospheric conditions for making measurement and tests are as follow:

Ambient temperature :  $25 \pm 3^{\circ}\text{C}$

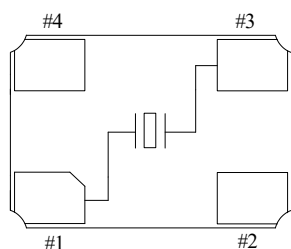
Relative humidity : 40%~70%

## 2. FTX321S MARKING & DIMENSIONS

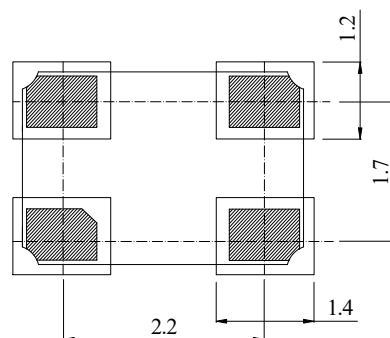
(UNIT: mm)



Marking #2, #4 is connected with metal cap of top.



<TOP VIEW>



Recommended Solder Pad Layout:

\*Marking should be printed as following:

Logo, Nominal Frequency

\*Manufacturing Logo: FT

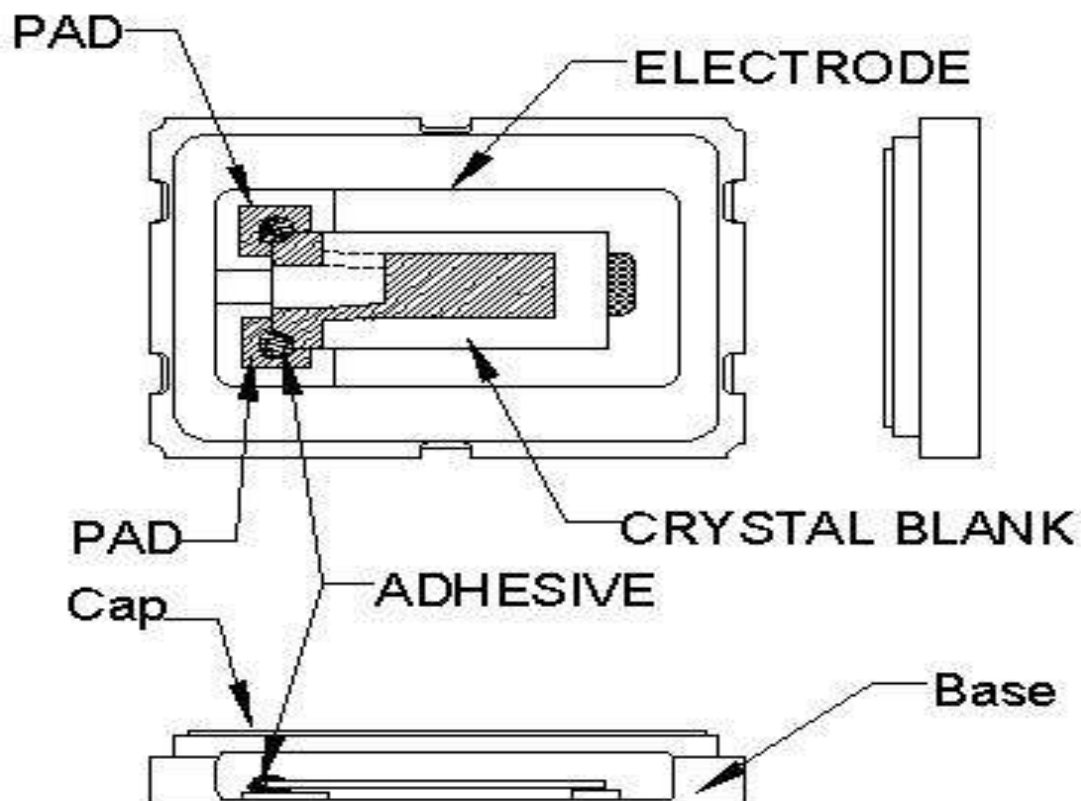
\*Nominal frequency = 3 number after decimal point MAX.

( ex. 12.000 MHz → 12.000 )

| Pin | Connection |
|-----|------------|
| #1  | IN/OUT     |
| #2  | GND        |
| #3  | IN/OUT     |
| #4  | GND        |

Marking: Laser marking

### 3. INSIDE STRUCTURE

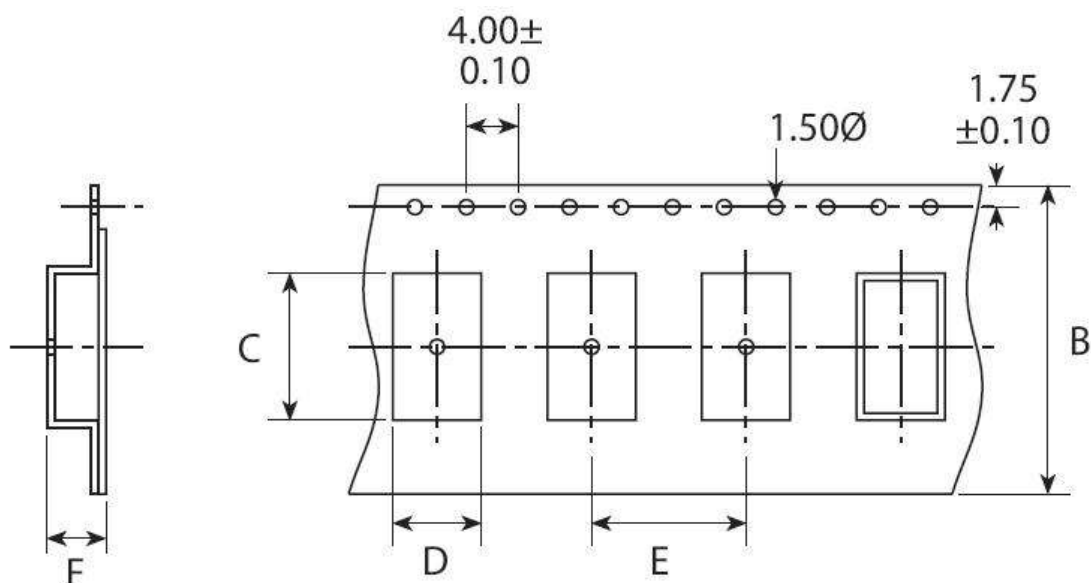


Reference drawing

|                                             |
|---------------------------------------------|
| Base:                                       |
| Alumina Ceramic ( $\text{Al}_2\text{O}_3$ ) |
| Metallized Pad: W                           |
| Ni Plating                                  |
| Au Plating                                  |
| Cap:                                        |
| Fe-Ni                                       |
| (3) Crystal Enclosure Seal:                 |
| Seal Seam                                   |
| (4) Crystal Blank                           |
| Rectangular At-Cut Quartz Crystal Blank     |
| (5) Adhesive                                |
| Silver Conductive Polyimide Resin           |
| (6) Electrode                               |
| Ag                                          |
| (7) PAD                                     |
| Alumina Ceramic (W. Ni. Au)                 |

## 4. FTX321S EMBOSS CARRIER TAPE & REEL

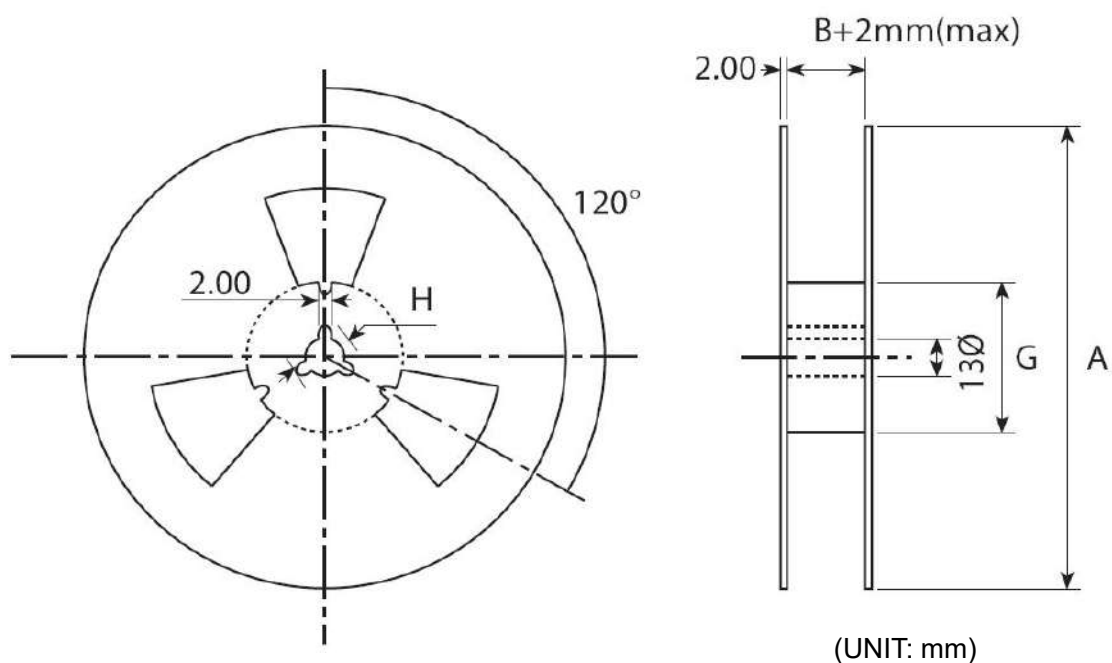
### a.) Dimensions of Carrier Tape



|         | A       | B       | C       | D       | E       | F       | G        |
|---------|---------|---------|---------|---------|---------|---------|----------|
| SMD3225 | 178±2.0 | 8.0±0.3 | 3.5±0.1 | 2.8±0.1 | 4.0±0.1 | 1.4±0.1 | 60.5±1.0 |

### b.) Dimensions of Reel

(UNIT: mm)



(UNIT: mm)

c.) Storage condition

Temperature: +40deg.C Max.

Relative Humidity: 80% Max.

d.) Standard packing quantity

3,000PCS / REEL

e.) Material of the tape

Material(Carrier tape) : Black conductive PS

Material (Cover tape) : Clear PE

Material (Reel) : PS

f.) Label contents

.The type of product

.Our specification No.

.Your Part No.

.Lot No.

.Nominal Frequency

.Quantity

.Our Company Name

Sticks label for every reel.

**INSPECTION RECORDS**

PO NO.:

CUSTOMER P/N:

P/N:

LOT NO.:

PACKAGE:

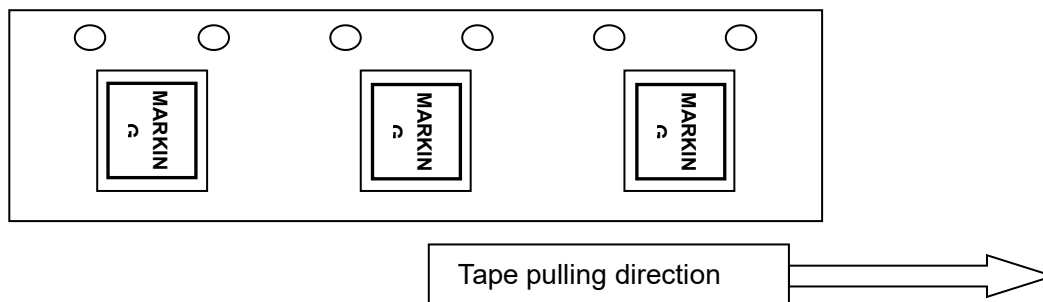
FREQUENCY:

REMARKS:

QUANTITY:

g.) Taping method

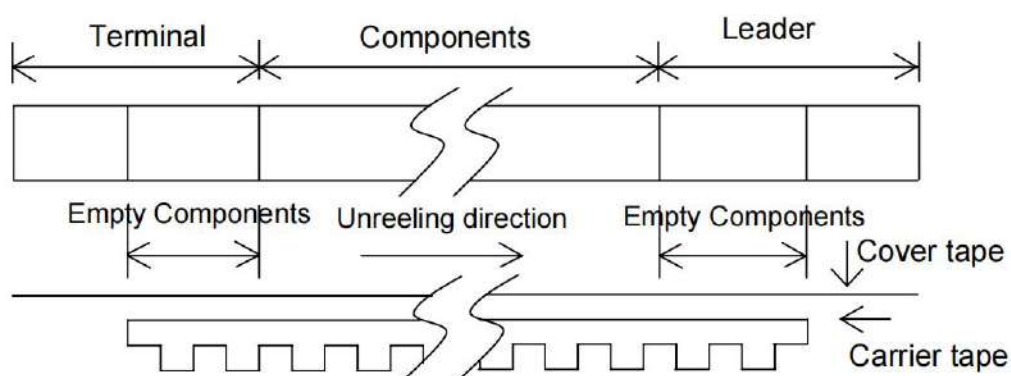
Taping shall be placed in tapes in such manner as to assure that marking of the components is visible as per Fig.1



Note: Crystal resonator belongs to non-directional passive components which doesn't have positive and negative poles. So it won't cause effect on usage even been reversed taped on the carrier.

h.) Taping dimension

|          |              |                                                                                                                                   |
|----------|--------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Leader   | Cover-tape   | The length of cover-tape in the leader is more than 400 mm including empty embossed area.                                         |
|          | Carrier-tape | After all products were packaged, must remain more than twenty pieces or 400 mm empty area, which should be sealed by cover-tape. |
| Terminal | Cover-tape   | The tip of cover-tape shall be fixed temporary by paper tape and roll around the core of reel one round.                          |
|          | Carrier-tape | The empty embossed area which are sealed by top cover-tape must remain more the 40 mm.                                            |



i.) Joint of tape

The carrier-tape and top cover-tape should not be jointed.

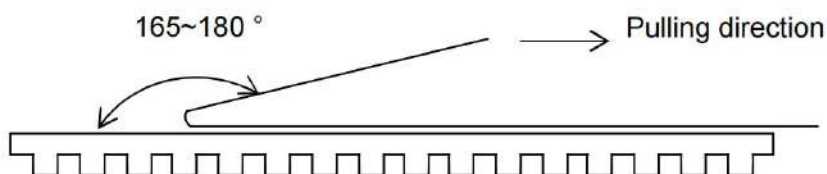
j.) Release strength of cover tape

It has to between 0.1N to 0.7N under following condition.

Pulling direction 165° to 180°

Speed 300mm/min.

Otherwise unless specified.



Other standards shall be based on JIS C 0806-1990.

5. Mechanical Endurance: Provided that measurement shall be carried out after letting it alone in the room temperature for 1 hour.

|     | Item              | Conditions                                                                                                                                                                  | Specifications                                                                                                                    |
|-----|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 5.1 | Drop              | Fall freely from 100 cm of height 3 times on a firm wood                                                                                                                    | MIL-STD-202F-203B                                                                                                                 |
| 5.2 | Mechanical Shock  | Device are shocked to half sine wave (1000 G) three mutually perpendicular axes each 3 times.                                                                               | MIL-STD-202F                                                                                                                      |
| 5.3 | Vibration         | (1)Vibration Frequency: 10~55Hz<br>(2)Cycle: 1 to 2 Min.<br>(3)Full Cycle: 1.5mm P-P.<br>(4)Direction: X.Y.Z<br>(5)Time: 2 Hours / Each Direction                           | MIL-STD-883E                                                                                                                      |
| 5.4 | Substrate Bending | Mount the specimen on substrate.<br>Apply the following pressure<br>Direction: see Fig -1<br>Speed: 0.5 mm/sec<br>Hours: 5 ± 1 sec<br>Amount of substrate: 3 mm Max.        | Without mechanical damage such as breaks.<br><br>Without electrode peeling.<br><br>Electrical characteristics shall be satisfied. |
| 5.5 | Adhesion          | Mount the specimen on substrate.<br>Apply the following pressure<br>Direction: see Fig -2<br>Weight: 10N<br>Hours: 10 ± 1 sec                                               |                                                                                                                                   |
| 5.6 | Body strength     | Mount the specimen on substrate.<br>Apply the following pressure<br>Direction: see Fig -3<br>Weight: 10N<br>Hours: 10 ± 1 sec                                               |                                                                                                                                   |
| 5.7 | Seal              | Fine Leak: 4.5kgf/cm <sup>2</sup> 2hours 1×10 <sup>-9</sup> Pa.m <sup>3</sup> /sec<br>Gross Leak: 4.5kgf/cm <sup>2</sup> 2hours 1.5×10 <sup>-5</sup> Pa.m <sup>3</sup> /sec | MIL-STD-883E                                                                                                                      |

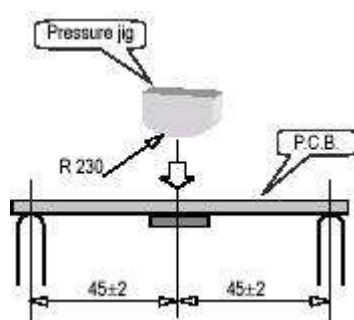


Fig-1

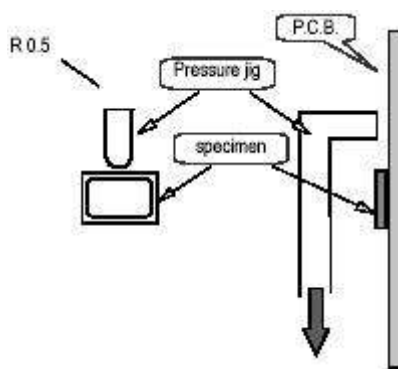


Fig-2

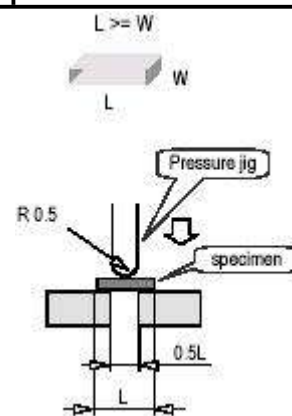
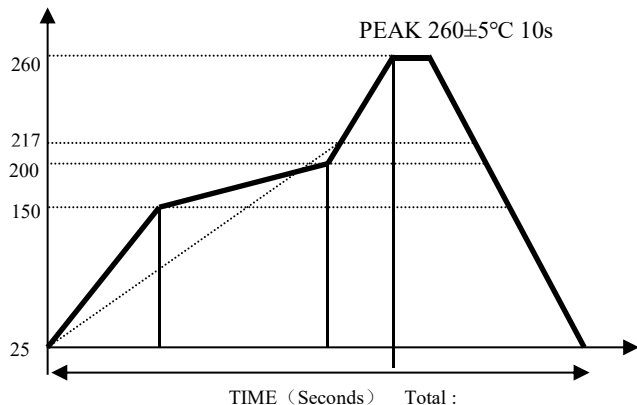
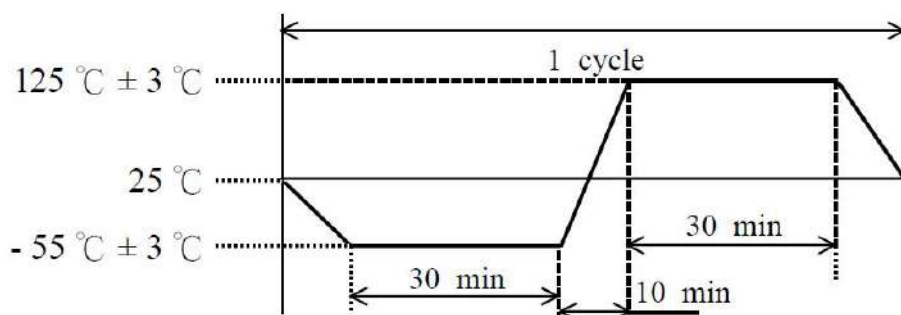


Fig-3

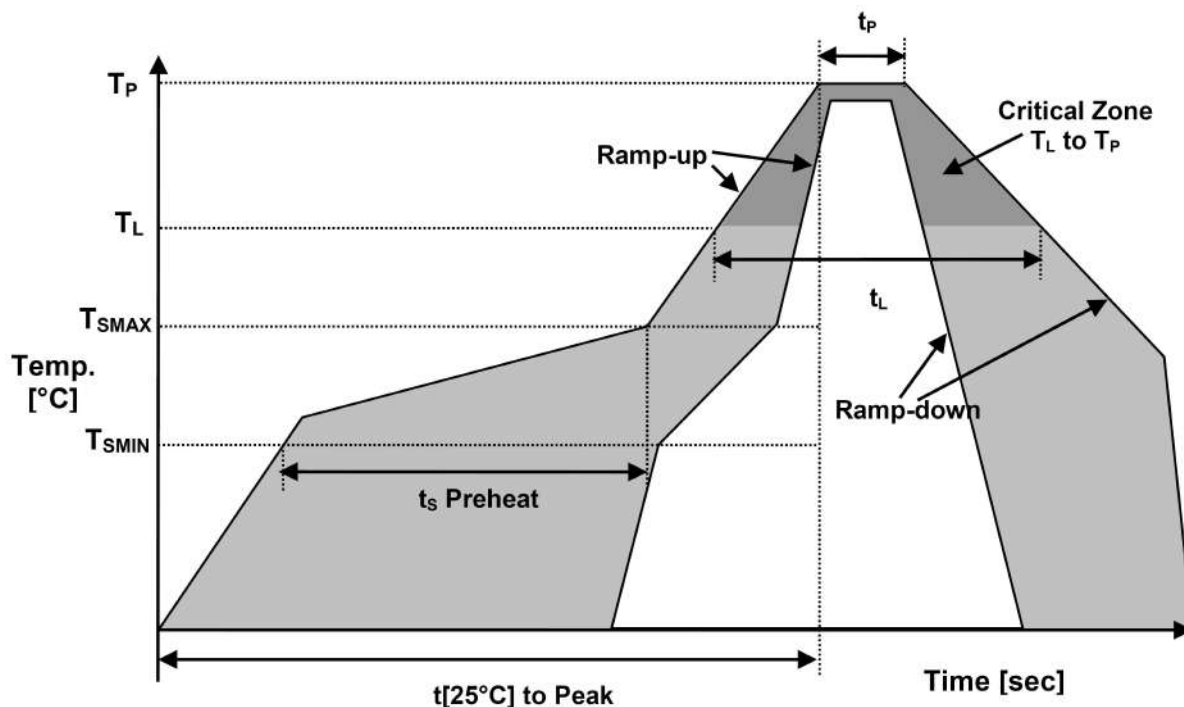
|     |                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |         |               |         |     |              |           |        |     |      |           |             |              |
|-----|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------|---------------|---------|-----|--------------|-----------|--------|-----|------|-----------|-------------|--------------|
| 5.8 | Solder ability               | <p>Pre-heat temperature : <math>+150\pm 10^{\circ}\text{C}</math><br/> Pre-heat time : 60~120s<br/> When the temperature of the specimen is reached at <math>+215\pm 3^{\circ}\text{C}</math>, it shall be left for <math>30\pm 1</math>sec.<br/> Peak temperature <math>240\pm 5^{\circ}\text{C}</math><br/> Material: Pb-free (Sn-3.0Ag-0.5Cu)<br/> Flux : Rosin resin methyl alcohol solvent (1:4)<br/> The electrodes should be covered by a new solder at least 90% of immersed area.</p>          | MIL-STD-883E 2003 |         |               |         |     |              |           |        |     |      |           |             |              |
| 5.9 | Resistance to Soldering Heat | <p>Run in Reflow<br/> Reflow soldering shall be allowed<br/> Only two(2) time.</p> <p><b>Available for Lead Free Soldering</b></p>  <table border="1"> <tbody> <tr> <td>(1)</td><td>Preheat</td><td>160~180 deg.C</td><td>120sec.</td></tr> <tr> <td>(2)</td><td>Primary heat</td><td>220 deg.C</td><td>60sec.</td></tr> <tr> <td>(3)</td><td>Peak</td><td>260 deg.C</td><td>10sec. Max.</td></tr> </tbody> </table> | (1)               | Preheat | 160~180 deg.C | 120sec. | (2) | Primary heat | 220 deg.C | 60sec. | (3) | Peak | 260 deg.C | 10sec. Max. | MIL-STD-202F |
| (1) | Preheat                      | 160~180 deg.C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 120sec.           |         |               |         |     |              |           |        |     |      |           |             |              |
| (2) | Primary heat                 | 220 deg.C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 60sec.            |         |               |         |     |              |           |        |     |      |           |             |              |
| (3) | Peak                         | 260 deg.C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10sec. Max.       |         |               |         |     |              |           |        |     |      |           |             |              |

6. Environmental Endurance: Provided that measurement shall be carried out after letting it alone in the room temperature for 1 hour.

|     | Item                        | Conditions                                                                                                                                                                                    | Specifications |
|-----|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 6.1 | Humidity                    | +60°C±2°C, RH 80~85%, Duration of 500 hours.<br>The units are then allowed to stand for approx 2 hours in room temperature before checking                                                    | MIL-STD-202F   |
| 6.2 | Storage in Low Temperature  | Temperature: -40±2°C ,<br>Duration of 500 hours.<br>The units are then allowed to stand at room temperature for approx 2 hours before checking.                                               | MIL-STD-883E   |
| 6.3 | Storage in High Temperature | Temperature: +85°C±2°C ,<br>Duration of 500 hours.<br>The units are then allowed to stand at room temperature for approx 2 hours before checking.                                             | MIL-STD-883E   |
| 6.4 | Thermal Shock               | Temperature 1: -55°C±5°C<br>Temperature 2: 125°C±5°C<br>Temperature change between T1 and T2 at soonest<br>Run 100 cycles, maintain T1 and T2 30minutes each in one cycle<br>(Refer to Fig-4) | MIL-STD-883E   |



## 7. Recommended Solder Reflow Profile



|                                                |                                       |              |
|------------------------------------------------|---------------------------------------|--------------|
| Temperature Min Preheat                        | $T_{SMIN}$                            | 150°C        |
| Temperature Max Preheat                        | $T_{SMAX}$                            | 175°C        |
| Time ( $T_{SMIN}$ to $T_{SMAX}$ )              | $t_s$                                 | 60-180 sec.  |
| Temperature                                    | $T_L$                                 | 217°C        |
| Peak Temperature                               | $T_P$                                 | 260°C        |
| Ramp-up rate                                   | $R_{UP}$                              | 3°C/sec max. |
| Ramp-down rate                                 | $R_{DOWN}$                            | 6°C/sec max. |
| Time within 5°C of Peak Temperature            | $t_p$                                 | 10 sec max.  |
| Time $t[25^\circ\text{C}]$ to Peak Temperature | $t[25^\circ\text{C}] \text{ to Peak}$ | 480 sec max. |
| Time                                           | $t_L$                                 | 60-150 sec.  |