





## REGULATORY COMPLIANCE

|  |  |  |  |
|--|--|--|--|
|  <b>Lead Free</b><br>COMPLIANT |  <b>EU RoHS</b><br>2011/65 +<br>2015/863<br>COMPLIANT |  <b>China RoHS</b><br>COMPLIANT |  <b>REACH</b><br><b>SVHC</b><br>COMPLIANT |
|--|--|--|--|



## ITEM DESCRIPTION

MEMS Clock Oscillators LVCMOS (CMOS) 1.8Vdc 4 Pad 3.2mm x 5.0mm Plastic Surface Mount (SMD)

## ELECTRICAL SPECIFICATIONS

|  |  |
|--|--|
| <b>Nominal Frequency</b>   | 1MHz to 125MHz   |
| <b>Frequency Tolerance/Stability</b>                                 | Inclusive of all conditions: Calibration Tolerance at 25°C, Frequency Stability over the Operating Temperature Range, Supply Voltage Change, and Output Load Change<br>$\pm 100\text{ppm}$ Maximum over 0°C to +70°C<br>$\pm 50\text{ppm}$ Maximum over 0°C to +70°C<br>$\pm 25\text{ppm}$ Maximum over 0°C to +70°C<br>$\pm 20\text{ppm}$ Maximum over 0°C to +70°C<br>$\pm 100\text{ppm}$ Maximum over -20°C to +70°C<br>$\pm 50\text{ppm}$ Maximum over -20°C to +70°C<br>$\pm 25\text{ppm}$ Maximum over -20°C to +70°C<br>$\pm 20\text{ppm}$ Maximum over -20°C to +70°C<br>$\pm 100\text{ppm}$ Maximum over -40°C to +85°C<br>$\pm 50\text{ppm}$ Maximum over -40°C to +85°C<br>$\pm 25\text{ppm}$ Maximum over -40°C to +85°C<br>$\pm 20\text{ppm}$ Maximum over -40°C to +85°C |
| <b>Aging at 25°C</b>   | $\pm 1.5\text{ppm}$ Maximum First Year   |
| <b>Supply Voltage</b>  | 1.8Vdc $\pm 10\%$  |
| <b>Input Current</b>   | No Load<br>4.5mA Maximum over Nominal Frequency of 1MHz to 20MHz<br>5mA Maximum over Nominal Frequency of 20.000001MHz to 50MHz<br>6mA Maximum over Nominal Frequency of 50.000001MHz to 80MHz<br>7mA Maximum over Nominal Frequency of 80.000001MHz to 125MHz   |
| <b>Output Voltage Logic High (<math>V_{OH}</math>)</b>               | $I_{OH} = -2\text{mA}$<br>90% of $V_{DD}$ Minimum  |
| <b>Output Voltage Logic Low (<math>V_{OL}</math>)</b>                | $I_{OL} = +2\text{mA}$<br>10% of $V_{DD}$ Maximum  |
| <b>Rise/Fall Time</b>  | Measured from 20% to 80% of waveform<br>1.5nSec Typical, 3.5nSec Maximum   |
| <b>Duty Cycle</b>  | Measured at 50% of waveform<br>50 $\pm 10$ (%)<br>50 $\pm 5$ (%)   |
| <b>Load Drive Capability</b>   | 15pF Maximum   |
| <b>Output Logic Type</b>   | CMOS   |
| <b>Output Control Function</b>                                       | Tri-State (Disabled Output: High Impedance)<br>Power Down (Disabled Output: Logic Low)   |
| <b>Output Control Input Voltage Logic High (<math>V_{IH}</math>)</b> | 70% of $V_{DD}$ Minimum or No Connect to Enable Output   |
| <b>Output Control Input Voltage Logic Low (<math>V_{IL}</math>)</b>  | 30% of $V_{DD}$ Maximum to Disable Output  |
| <b>Power Down Output Enable Time</b>                                 | 5mSec Maximum  |
| <b>Tri-State Output Enable Time</b>                                  | 150nSec Maximum  |
| <b>Power Down Output Disable Time</b>                                | 150nSec Maximum  |
| <b>Tri-State Output Disable Time</b>                                 | 150nSec Maximum  |
| <b>Standby Current</b>   | 5 $\mu\text{A}$ Maximum (Disabled Output: Logic Low)   |
| <b>Period Jitter (RMS)</b>   | 2pSec Typical, 5pSec Maximum   |
| <b>RMS Phase Jitter (Fj = 900kHz to 7.5MHz; Random)</b>              | 0.5pSec Typical, 1pSec Maximum   |

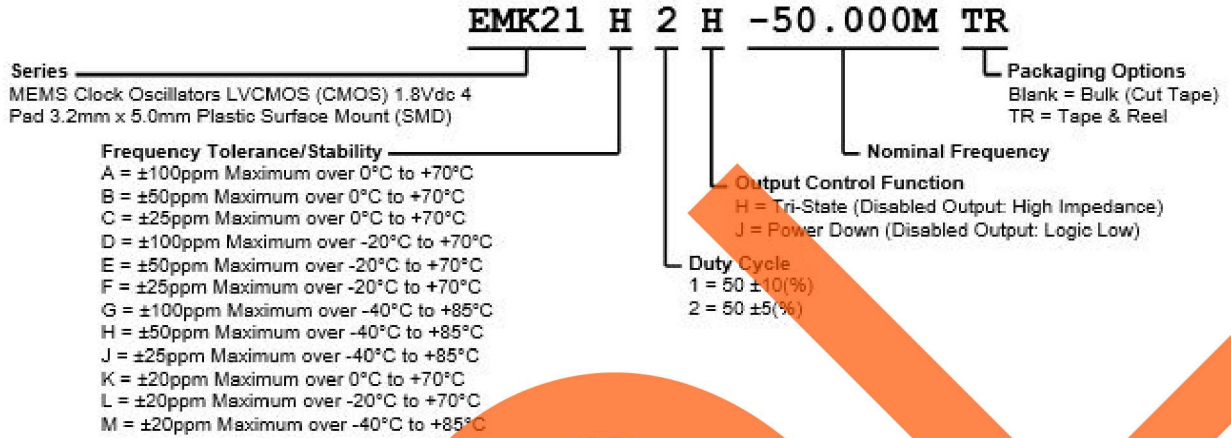
# EMK21 Series



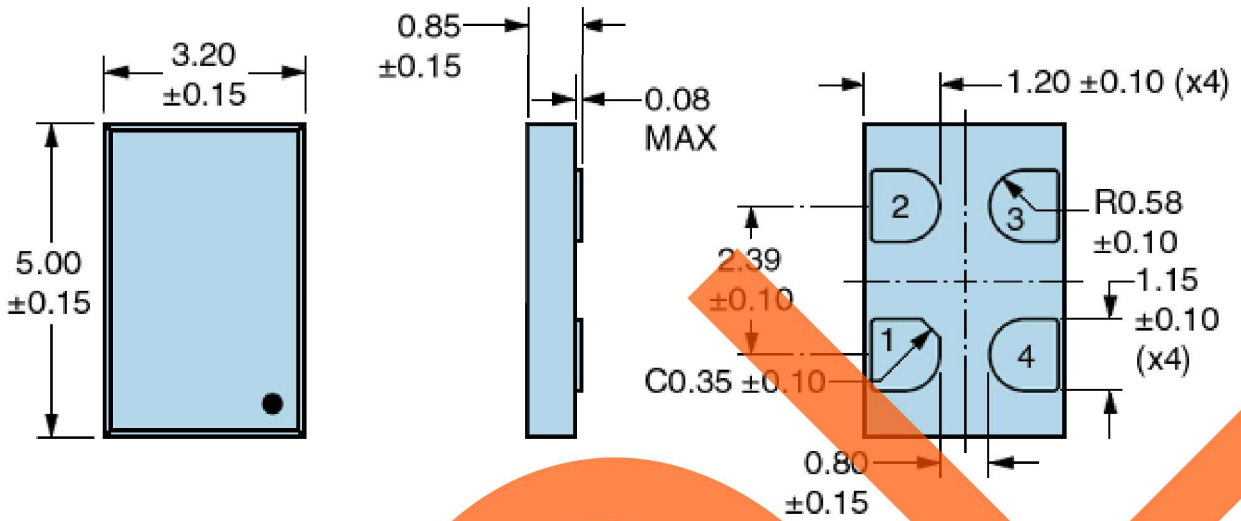
|  |                                |
|--|--------------------------------|
| <b>RMS Phase Jitter</b><br>(Fj = 12kHz to 20MHz; Random) | 1.5pSec Typical, 3pSec Maximum |
| <b>Start Up Time</b>                                     | 5mSec Maximum                  |
| <b>Storage Temperature Range</b>                         | -65°C to +150°C                |



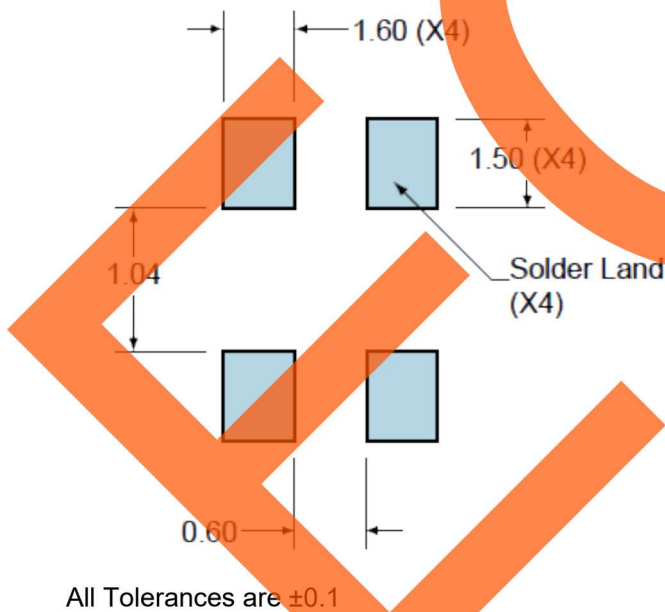
**PART NUMBERING GUIDE**



MECHANICAL DIMENSIONS



SUGGESTED SOLDER PAD LAYOUT

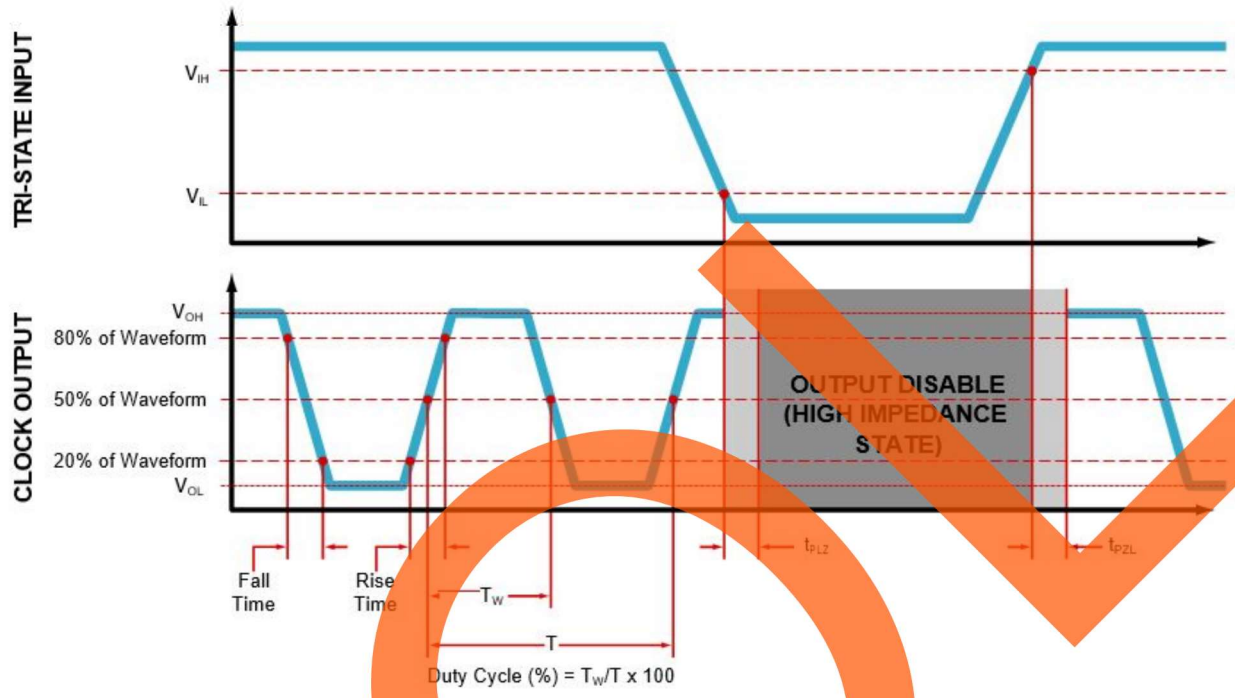


| PIN | CONNECTION              |
|-----|-------------------------|
| 1   | Power Down or Tri-State |
| 2   | Ground                  |
| 3   | Output                  |
| 4   | Supply Voltage          |

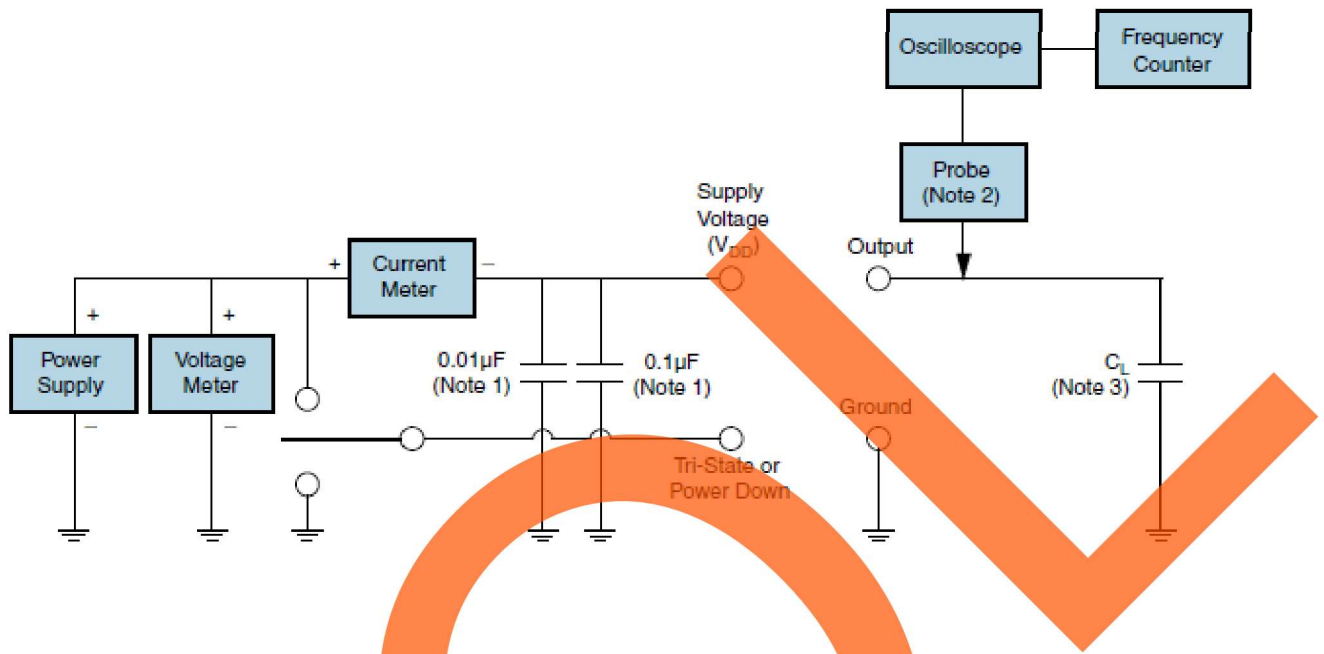
All Tolerances are ±0.1

All Dimensions in Millimeters

OUTPUT WAVEFORM & TIMING DIAGRAM



TEST CIRCUIT FOR CMOS OUTPUT



- Note 1:** An external 0.01µF ceramic bypass capacitor in parallel with a 0.1µF high frequency ceramic bypass capacitor close (less than 2mm) to the package ground and supply voltage pin is required.
- Note 2:** A low input capacitance (<12pF), 10X Attenuation Factor, High Impedance (>10Mohms), and High bandwidth (>300MHz) Passive probe is recommended.
- Note 3:** Capacitance value C<sub>L</sub> includes sum of all probe and fixture capacitance. See applicable specification sheet for Load Drive Capability.

## TAPE & REEL DIMENSIONS

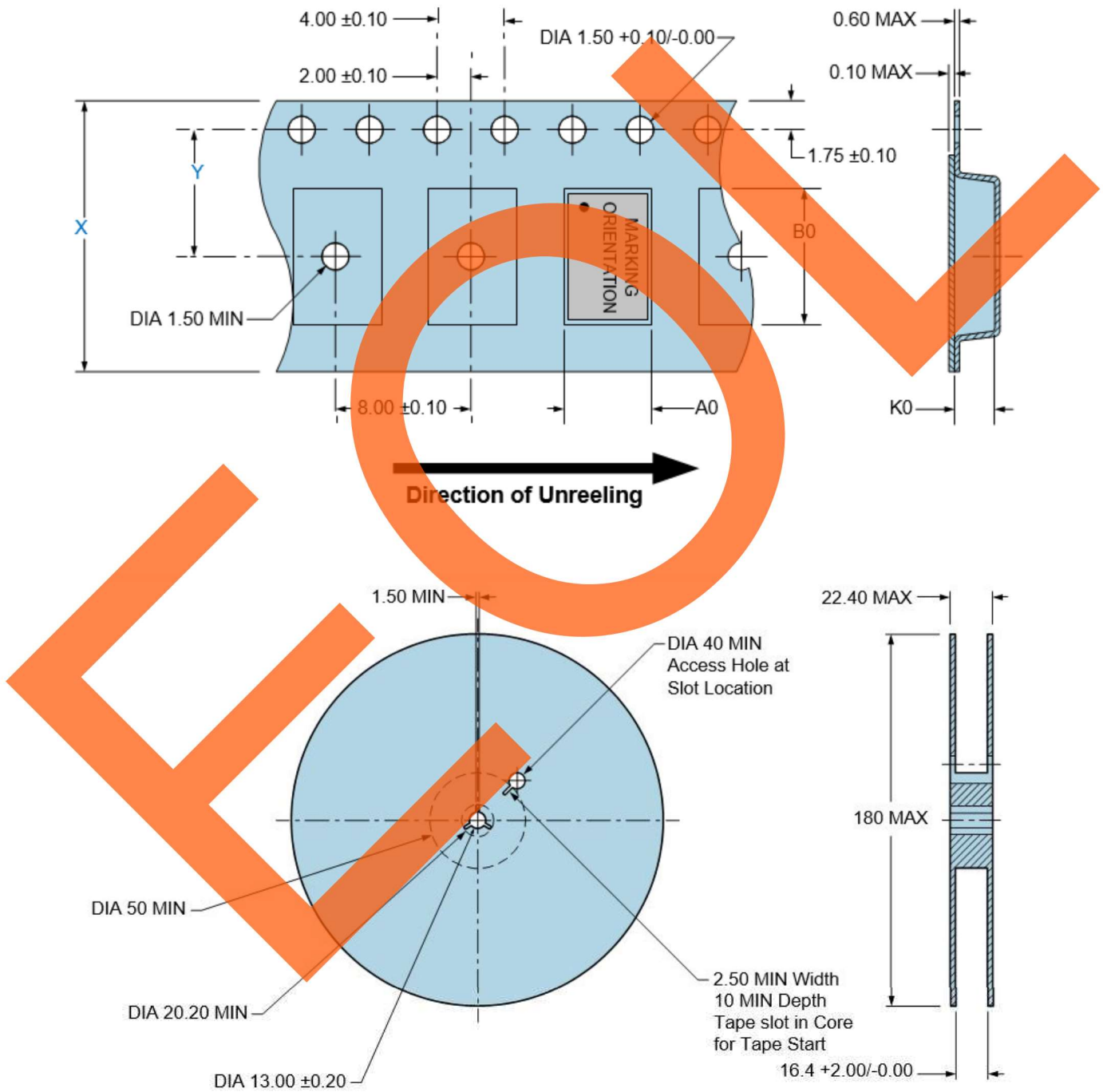
Quantity per Reel: 1,000 Units

All Dimensions in Millimeters

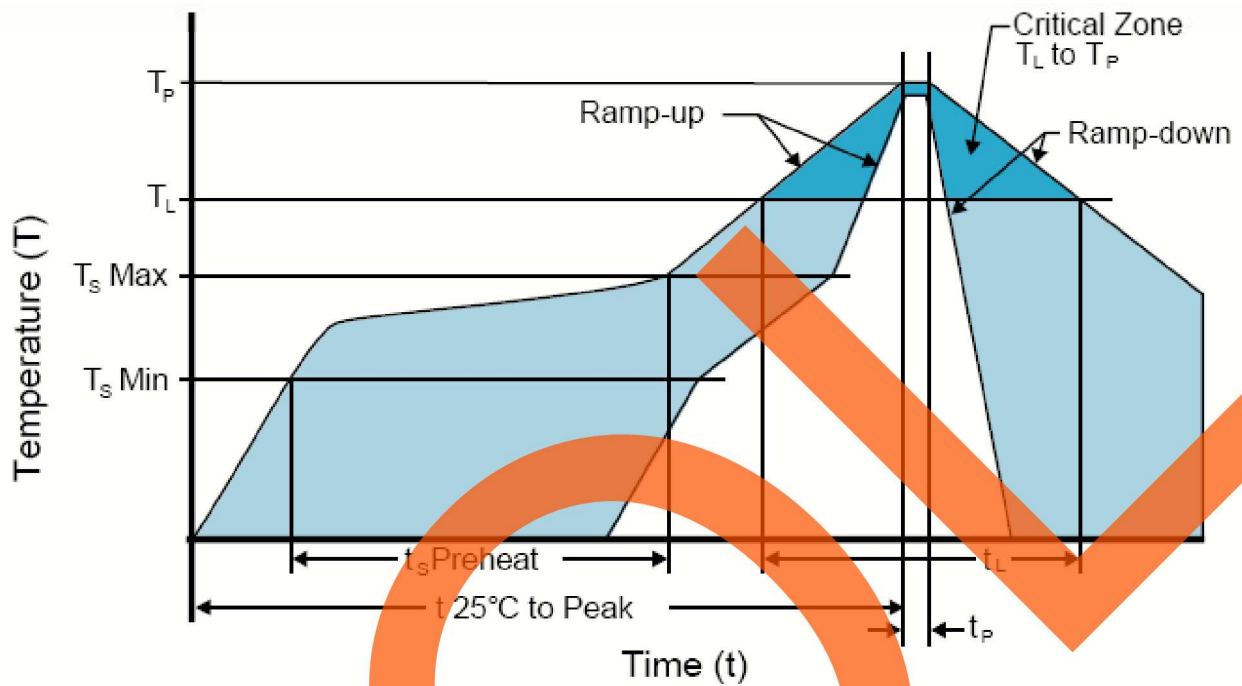
Compliant to EIA-481

X =  $16.00 \pm 0.30$  or  $12.00 \pm 0.30$

Y =  $7.5 \pm 0.05$  or  $5.5 \pm 0.05$



RECOMMENDED SOLDER REFLOW METHOD



**HIGH TEMPERATURE INFRARED/CONVECTION**

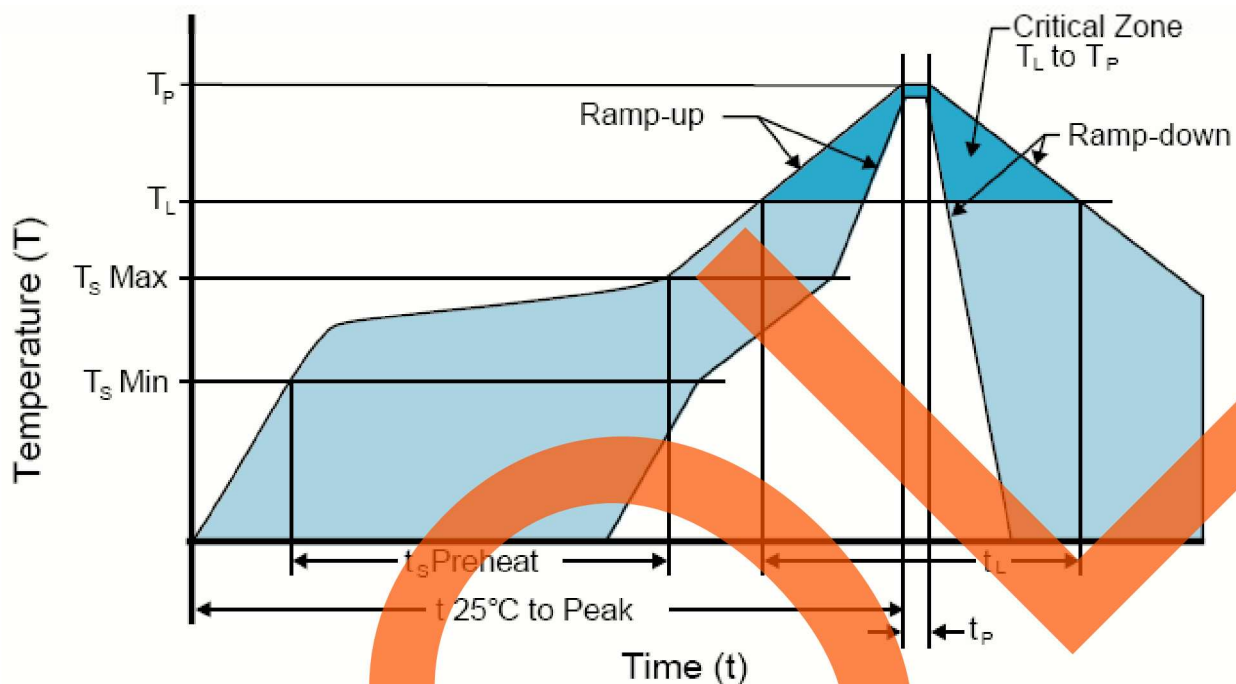
|   |   |
|---|---|
| T <sub>S</sub> MAX to T <sub>L</sub> (Ramp-up Rate)   | 3°C/Second Maximum                                |
| <b>Preheat</b>  |   |
| - Temperature Minimum (T <sub>S</sub> MIN)            | 150°C   |
| - Temperature Typical (T <sub>S</sub> TYP)            | 175°C   |
| - Temperature Maximum (T <sub>S</sub> MAX)            | 200°C   |
| - Time (t <sub>s</sub> )                              | 60 - 180 Seconds                                  |
| <b>Ramp-up Rate (T<sub>L</sub> to T<sub>P</sub>)</b>  | 3°C/Second Maximum                                |
| <b>Time Maintained Above:</b>                         |   |
| - Temperature (T <sub>L</sub> )                       | 217°C   |
| - Time (t <sub>L</sub> )                              | 60 - 150 Seconds                                  |
| <b>Peak Temperature (T<sub>P</sub>)</b>               | 260°C Maximum for 10 Seconds Maximum              |
| <b>Target Peak Temperature (T<sub>P</sub> Target)</b> | 250°C +0/-5°C                                     |
| <b>Time within 5°C of actual peak (t<sub>p</sub>)</b> | 20 - 40 Seconds                                   |
| <b>Ramp-down Rate</b>                                 | 6°C/Second Maximum                                |
| <b>Time 25°C to Peak Temperature (t)</b>              | 8 Minutes Maximum                                 |
| <b>Moisture Sensitivity Level</b>                     | Level 1   |
| <b>Additional Notes</b>                               | Temperatures shown are applied to body of device. |

**High Temperature Manual Soldering**

260°C Maximum for 5 Seconds Maximum, 2 times Maximum. (Temperatures shown are applied to body of device.)



RECOMMENDED SOLDER REFLOW METHOD



**LOW TEMPERATURE INFRARED/CONVECTION**

|   |  |
|---|--|
| T <sub>s</sub> MAX to T <sub>L</sub> (Ramp-up Rate) | 5°C/Second Maximum                                     |
| Preheat   |  |
| - Temperature Minimum (T <sub>s</sub> MIN)          | N/A  |
| - Temperature Typical (T <sub>s</sub> TYP)          | 150°C  |
| - Temperature Maximum (T <sub>s</sub> MAX)          | N/A  |
| - Time (t <sub>s</sub> )                            | 60 - 120 Seconds                                       |
| Ramp-up Rate (T <sub>L</sub> to T <sub>P</sub> )    | 5°C/Second Maximum                                     |
| Time Maintained Above:                              |  |
| - Temperature (T <sub>L</sub> )                     | 150°C  |
| - Time (t <sub>L</sub> )                            | 200 Seconds Maximum                                    |
| Peak Temperature (T <sub>P</sub> )                  | 240°C Maximum  |
| Target Peak Temperature (T <sub>P</sub> Target)     | 240°C Maximum 2 Times / 230°C Maximum 1 Time           |
| Time within 5°C of actual peak (t <sub>p</sub> )    | 10 Seconds Maximum 2 Times / 80 Seconds Maximum 1 Time |
| Ramp-down Rate                                      | 5°C/Second Maximum                                     |
| Time 25°C to Peak Temperature (t)                   | N/A  |
| Moisture Sensitivity Level                          | Level 1  |
| Additional Notes                                    | Temperatures shown are applied to body of device.      |

**Low Temperature Manual Soldering**

185°C Maximum for 10 Seconds Maximum, 2 times Maximum. (Temperatures shown are applied to body of device.)