

## REGULATORY COMPLIANCE

 <b>Lead Free</b> COMPLIANT	 <b>EU RoHS</b> 2011/65 + 2015/863 COMPLIANT	 <b>China RoHS</b> COMPLIANT	 <b>REACH</b> SVHC COMPLIANT	 <b>DRC</b> CONFLICT FREE
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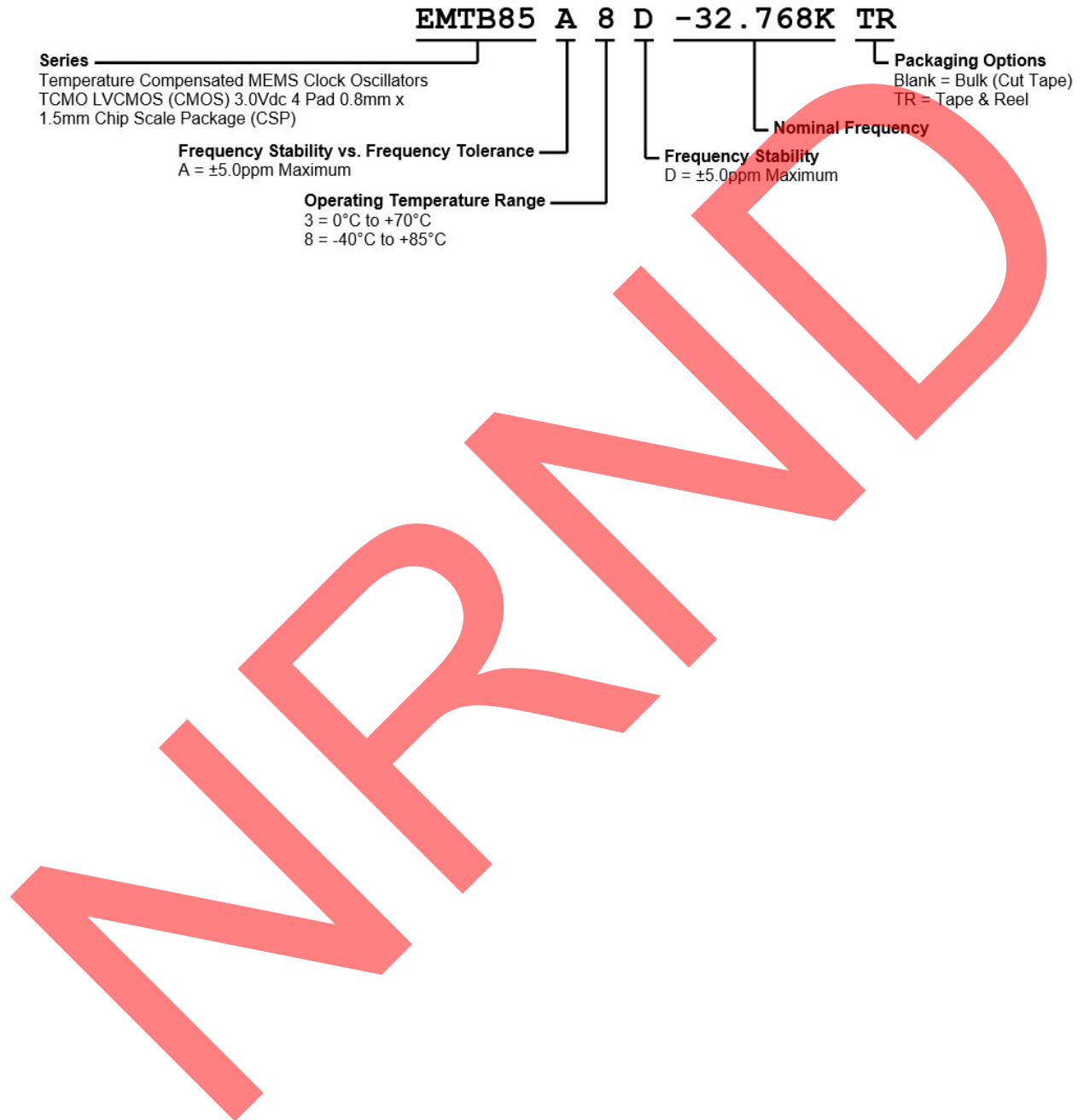
## ITEM DESCRIPTION

Temperature Compensated MEMS Clock Oscillators TCMO LVC MOS (CMOS) 3.0Vdc 4 Pad 0.8mm x 1.5mm Chip Scale Package (CSP)

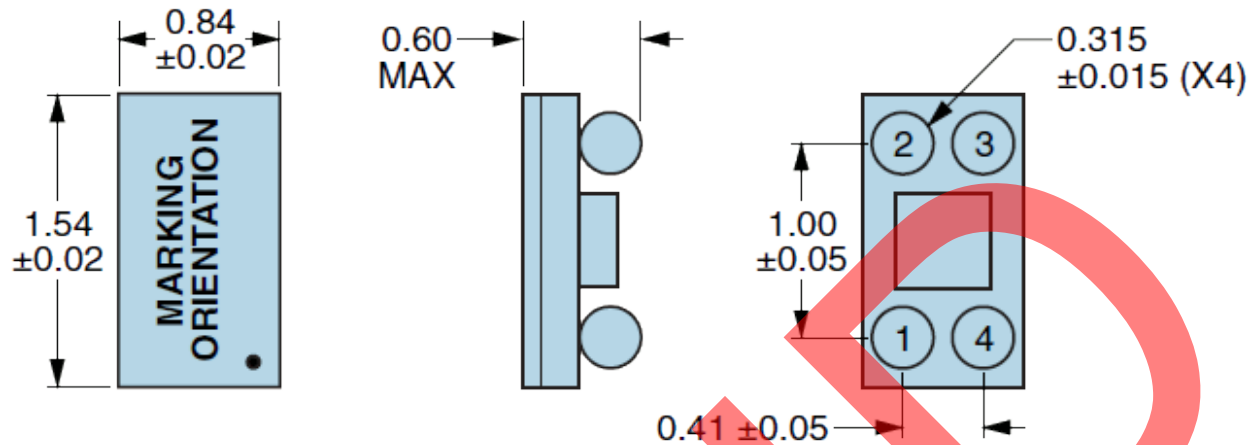
## ELECTRICAL SPECIFICATIONS

<b>Nominal Frequency</b>	32.768kHz
<b>Frequency Tolerance/Stability</b>	Inclusive of Operating Temperature Range, Output Load Change ( $\pm 20\%$ ), and Reflow, at Vdd=3.0Vdc $\pm 5.0$ ppm Maximum
<b>Frequency Stability vs. Frequency Tolerance</b>	Measured at 25°C $\pm 2^\circ\text{C}$ , at Vdd=3.0Vdc, Post Reflow $\pm 5.0$ ppm Maximum
<b>Frequency Stability vs. Input Voltage</b>	$\pm 0.75$ ppm Maximum ( $\pm 10\%$ )
<b>Frequency Stability vs. Aging</b>	$\pm 1$ ppm/Year Maximum (at 25°C)
<b>Operating Temperature Range</b>	0°C to +70°C -40°C to +85°C
<b>Supply Voltage</b>	3.0Vdc $\pm 10\%$
<b>Core Operating Current</b>	0.99 $\mu\text{A}$ Typical (at 25°C), 1.52 $\mu\text{A}$ Maximum
<b>Output Stage Operating Current</b>	0.065 $\mu\text{A}/\text{Vpp}$ Typical, 0.125 $\mu\text{A}/\text{Vpp}$ Maximum
<b>Input Current</b>	No Load, Nominal Vdd 1.2 $\mu\text{A}$ Typical (at 25°C), 1.9 $\mu\text{A}$ Maximum
<b>Output Voltage Logic High (V<sub>OH</sub>)</b>	I <sub>OH</sub> = -10 $\mu\text{A}$ 90% of Vdd Minimum
<b>Output Voltage Logic Low (V<sub>OL</sub>)</b>	I <sub>OL</sub> = +10 $\mu\text{A}$ 10% of Vdd Maximum
<b>Rise/Fall Time</b>	Measured at 10% to 90% of waveform 100nSec Typical, 200nSec Maximum
<b>Duty Cycle</b>	Measured at 50% of waveform 50 $\pm 2$ (%)
<b>Load Drive Capability</b>	15pF Maximum
<b>Output Logic Type</b>	CMOS
<b>Peak to Peak Jitter (t<sub>PK</sub>)</b>	2.5 $\mu\text{Sec}$ Maximum
<b>Period Jitter (RMS)</b>	Measured at 25°C 33nSec Typical
<b>Power Supply Ramp</b>	Measured at 0Vdc to 90% of Vdd 100mSec Maximum
<b>Start Up Time</b>	Measured at Nominal Vdd 180mSec Typical, 380mSec Maximum at Operating Temperature Range of -40°C to +85°C 180mSec Typical, 350mSec Maximum at Operating Temperature Range of 0°C to +70°C
<b>Storage Temperature Range</b>	-55°C to +125°C

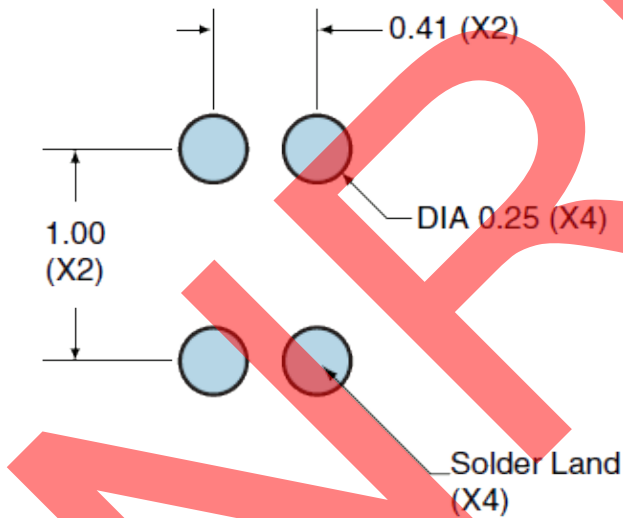
**PART NUMBERING GUIDE**



**MECHANICAL DIMENSIONS**



**SUGGESTED SOLDER PAD LAYOUT**

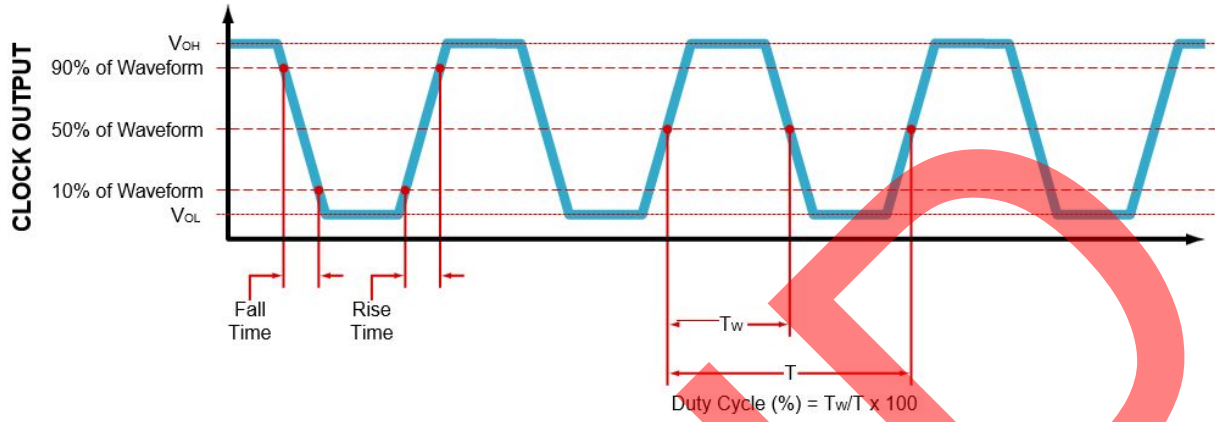


PIN	CONNECTION
1	Ground
2	Output
3	Supply Voltage
4	Ground

All Tolerances are  $\pm 0.1$

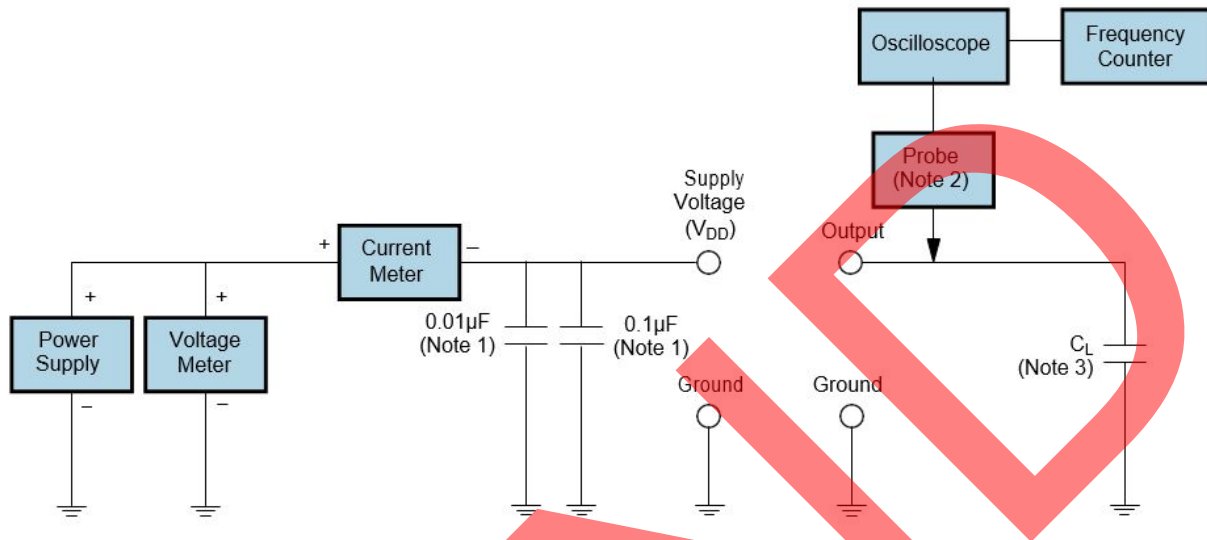
**All Dimensions in Millimeters**

OUTPUT WAVEFORM



MRB

## TEST CIRCUIT FOR CMOS OUTPUT



**Note 1:** An external  $0.01\mu\text{F}$  ceramic bypass capacitor in parallel with a  $0.1\mu\text{F}$  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 ( $<12\text{pF}$ ), 10X Attenuation Factor, High Impedance ( $>10\text{Mohms}$ ), and High bandwidth ( $>300\text{MHz}$ ) Passive probe is recommended.

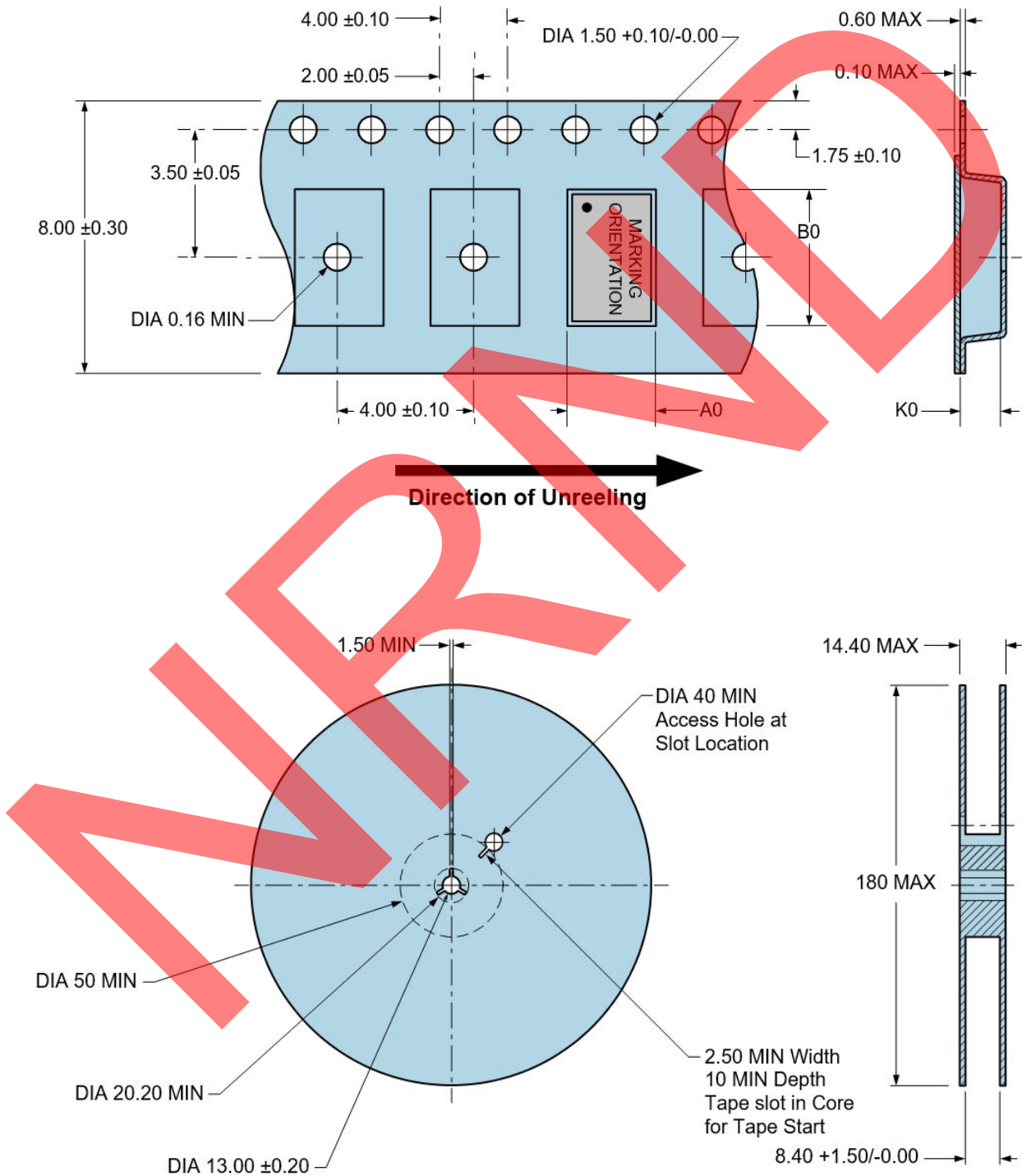
**Note 3:** Capacitance value  $C_L$  includes sum of all probe and fixture capacitance. See applicable specification sheet for 'Load Drive Capability'.

## TAPE & REEL DIMENSIONS

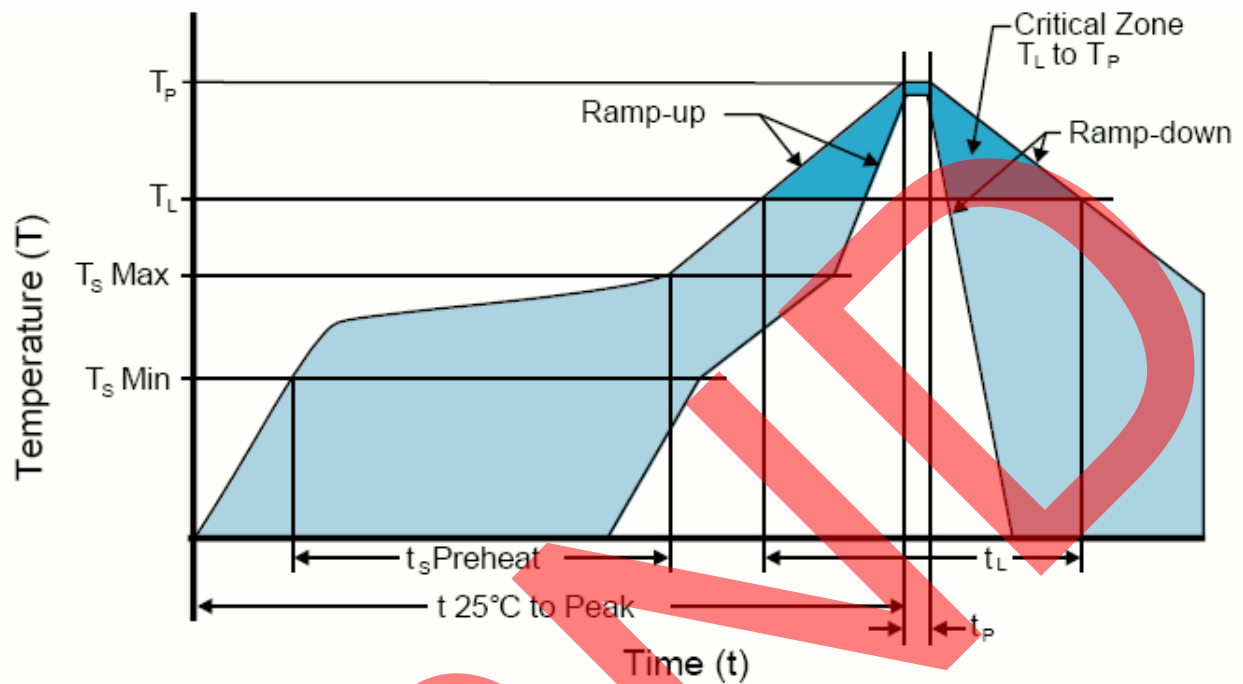
Quantity per Reel: 3,000 Units

All Dimensions in Millimeters

Compliant to EIA-481



RECOMMENDED SOLDER REFLOW METHOD



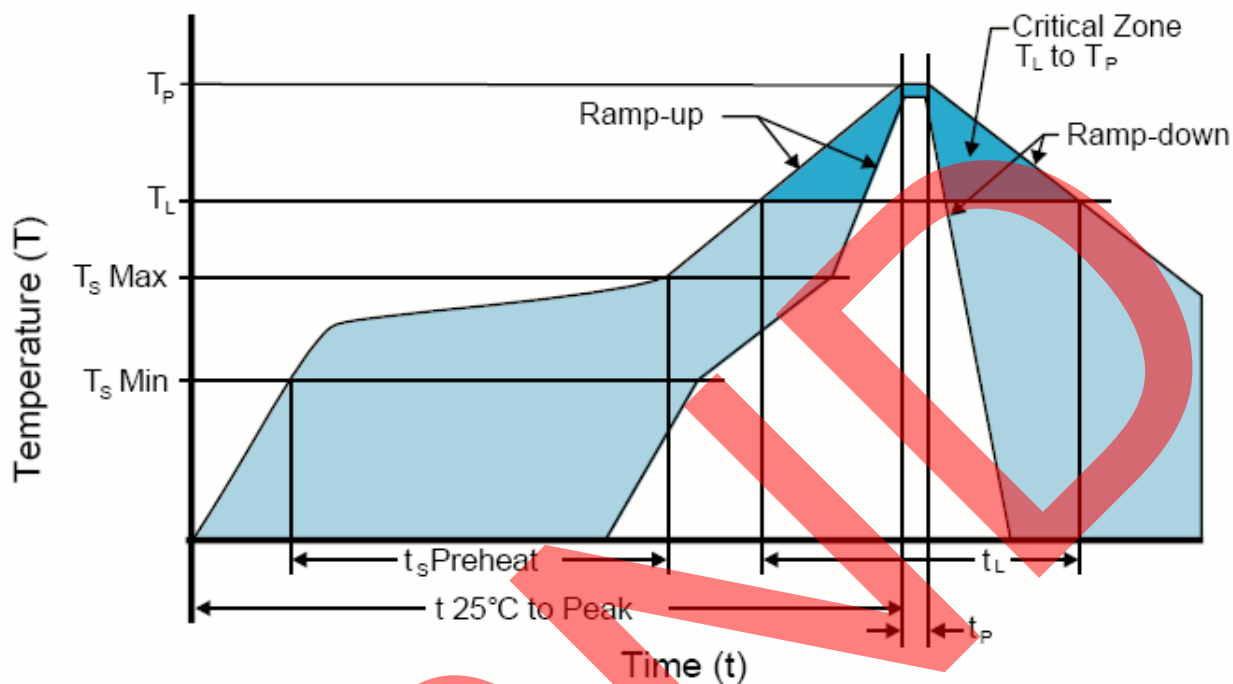
**HIGH TEMPERATURE INFRARED/CONVECTION**

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> MIN)	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
<b>Preheat</b>	
- 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> MIN)	60 - 120 Seconds
<b>Ramp-up Rate (T<sub>L</sub> to T<sub>P</sub>)</b>	5°C/Second Maximum
<b>Time Maintained Above:</b>	
- Temperature (T <sub>L</sub> )	150°C
- Time (t <sub>L</sub> )	200 Seconds Maximum
<b>Peak Temperature (T<sub>P</sub>)</b>	240°C Maximum
<b>Target Peak Temperature(T<sub>P</sub> Target)</b>	240°C Maximum 2 Times/230°C Maximum 1Time
<b>Time within 5°C of actual peak (t<sub>P</sub>)</b>	10 Seconds Maximum 2 Times / 80 Seconds Maximum 1 Time
<b>Ramp-down Rate</b>	5°C/Second Maximum
<b>Time 25°C to Peak Temperature (t)</b>	N/A
<b>Moisture Sensitivity Level</b>	Level 1
<b>Additional Notes</b>	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.)



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