

## 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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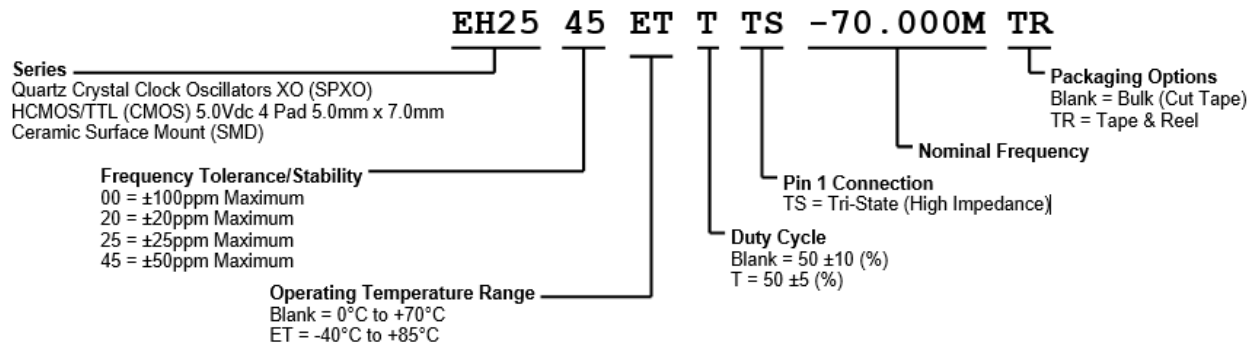
## ITEM DESCRIPTION

Quartz Crystal Clock Oscillators XO (SPXO) HCMOS/TTL (CMOS) 5.0Vdc 4 Pad 5.0mm x 7.0mm Ceramic Surface Mount (SMD)

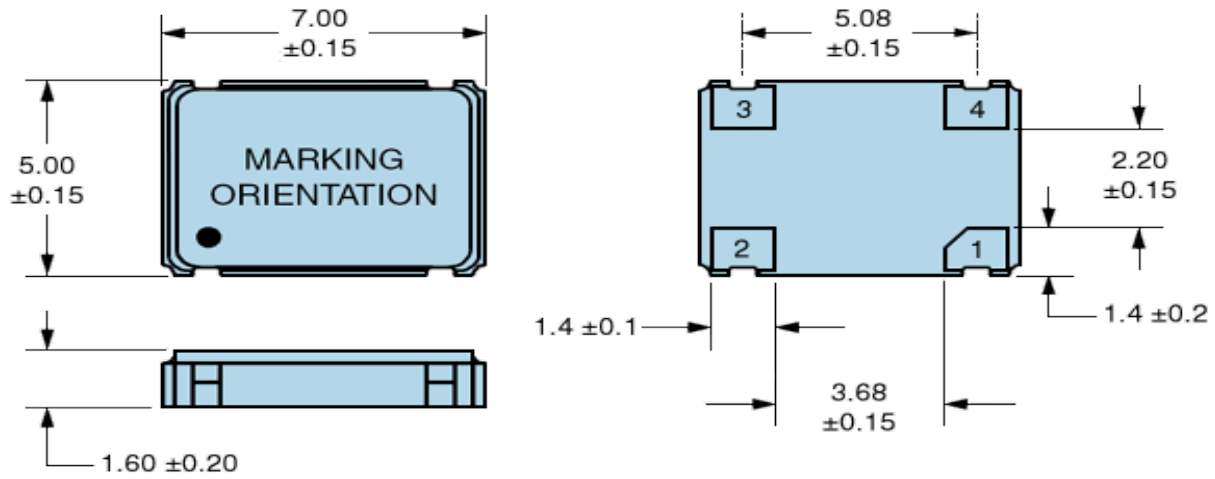
## ELECTRICAL SPECIFICATIONS

<b>Nominal Frequency</b>	1MHz to 155.52MHz
<b>Frequency Tolerance/Stability</b>	Inclusive of all conditions: Calibration Tolerance at 25°C, Frequency Stability over the Operating Temperature Range, Supply Voltage Change, Output Load Change, First Year Aging at 25°C, Shock, and Vibration ±100ppm Maximum ±20ppm Maximum ±25ppm Maximum ±50ppm Maximum
<b>Aging at 25°C</b>	±5ppm/year Maximum
<b>Operating Temperature Range</b>	0°C to +70°C -40°C to +85°C
<b>Supply Voltage</b>	5.0Vdc ±10%
<b>Input Current</b>	No Load 50mA Maximum
<b>Output Voltage Logic High (V<sub>OH</sub>)</b>	I <sub>OH</sub> = -16mA 2.4Vdc Minimum with TTL Load, V <sub>dd</sub> -0.4Vdc Minimum with HCMOS Load
<b>Output Voltage Logic Low (V<sub>OL</sub>)</b>	I <sub>OL</sub> = +16mA 0.4Vdc Maximum with TTL Load, 0.5Vdc Maximum with HCMOS Load
<b>Rise/Fall Time</b>	Measured at 0.8Vdc to 2.0Vdc with TTL Load; Measured at 20% to 80% of waveform with HCMOS Load 6nSec Maximum over Nominal Frequency of 1MHz to 70MHz 4nSec Maximum over Nominal Frequency of 70.000001MHz to 155.52MHz
<b>Duty Cycle</b>	50 ±10 (%) (Measured at 1.4Vdc with TTL Load; Measured at 50% of waveform with HCMOS Load over Nominal Frequency range of 1MHz to 70MHz; Measured at 50% of waveform with TTL Load or with HCMOS Load over Nominal Frequency range of 70.000001MHz to 155.52MHz) 50 ±5 (%) (Measured at 50% of waveform with TTL Load or with HCMOS Load)
<b>Load Drive Capability</b>	10TTL Load or 50pF HCMOS Load Maximum over Nominal Frequency of 1MHz to 70MHz 5TTL Load or 15pF HCMOS Load Maximum over Nominal Frequency of 70.000001MHz to 155.52MHz
<b>Output Logic Type</b>	CMOS
<b>Pin 1 Connection</b>	Tri-State (High Impedance)
<b>Tri-State Input Voltage (V<sub>IH</sub> and V<sub>IL</sub>)</b>	+2.2Vdc Minimum to enable output, +0.8Vdc Maximum to disable output (High Impedance), No Connect to enable output.
<b>Absolute Clock Jitter</b>	±250pSec Maximum, ±100pSec Typical
<b>One Sigma Clock Period Jitter</b>	±50pSec Maximum, ±30pSec Typical
<b>Start Up Time</b>	10mSec Maximum
<b>Storage Temperature Range</b>	-55°C to +125°C

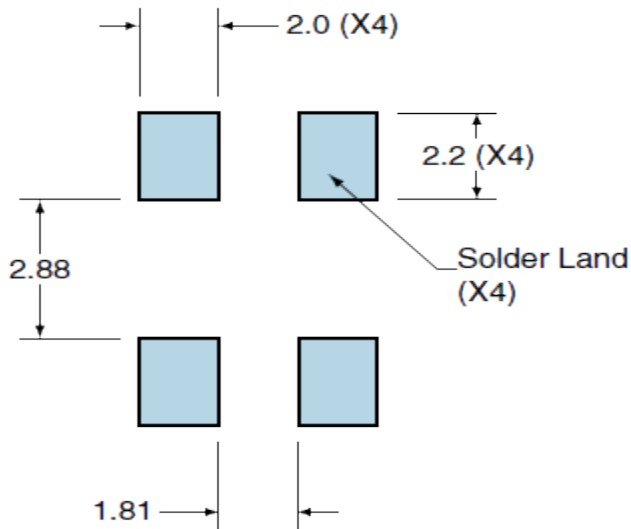
## PART NUMBERING GUIDE



**MECHANICAL DIMENSIONS**



**SUGGESTED SOLDER PAD LAYOUT**

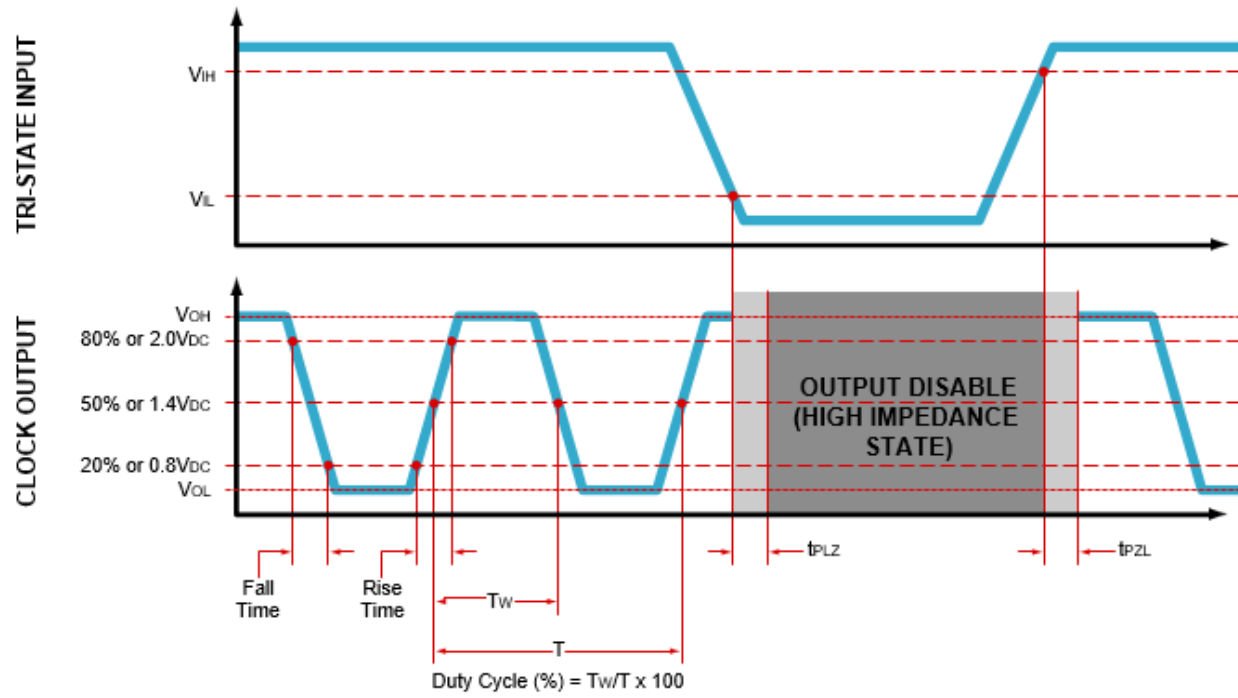


PIN	CONNECTION
1	Tri-State
2	Ground
3	Output
4	Supply Voltage

All Tolerances are ±0.1

**All Dimensions in Millimeters**

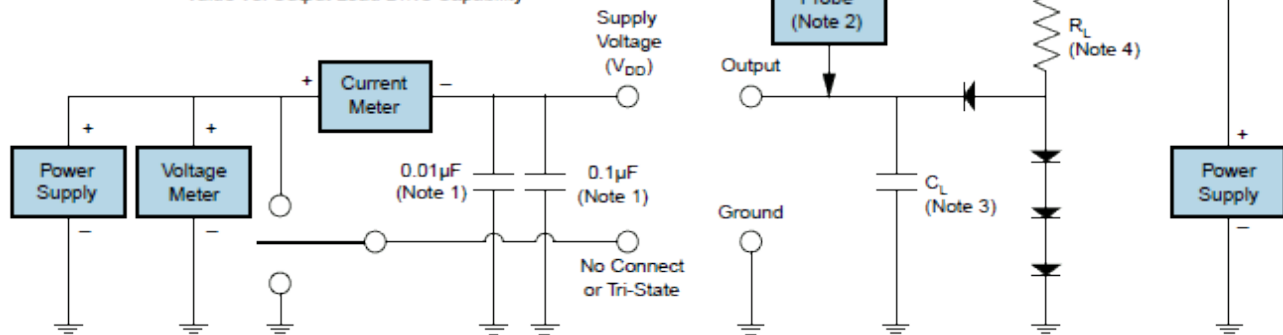
OUTPUT WAVEFORM & TIMING DIAGRAM



## TEST CIRCUIT FOR TTL OUTPUT

Output Load Drive Capability	$R_L$ Value (Ohms)	$C_L$ Value (pF)
10TTL	390	15
5TTL	780	15
2TTL	1100	8
10LSTTL	2000	15
1TTL	2200	3

Table 1:  $R_L$  Resistance Value and  $C_L$  Capacitance Value Vs. Output Load Drive Capability



**Note 1:** An external 0.1µF low frequency tantalum bypass capacitor in parallel with a 0.01µF high frequency ceramic bypass Capacitor close to the package ground and  $V_{DD}$  pin is required.

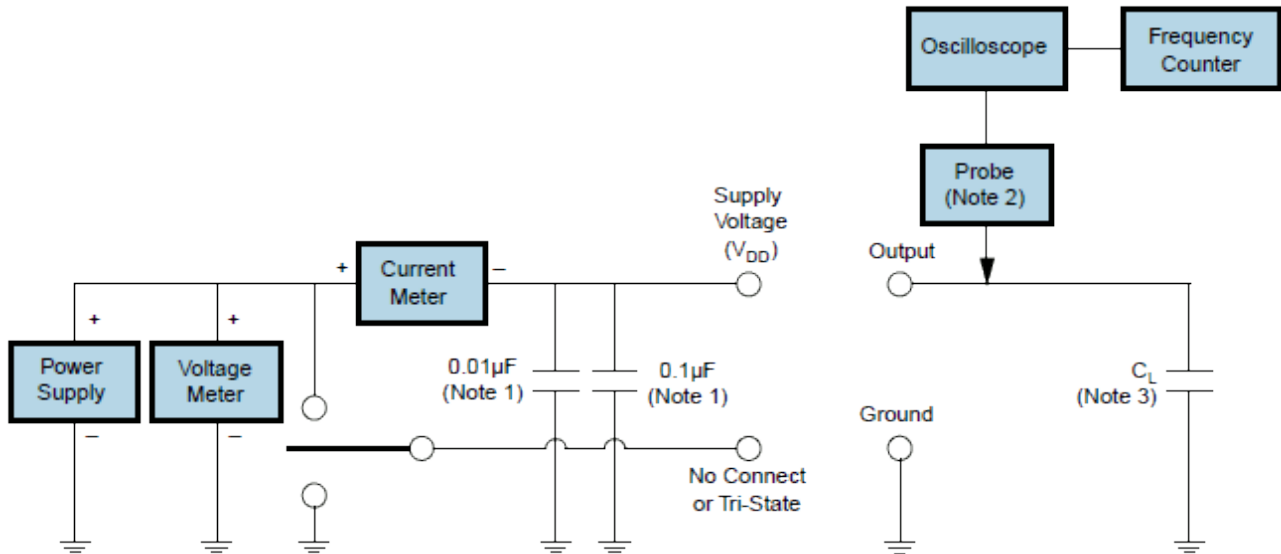
**Note 2:** A low capacitance (<12pF), 10X attenuation factor, high impedance (>10Mohms), and high bandwidth (>300MHz) passive Probe is recommended.

**Note 3:** Capacitance value  $C_L$  includes sum of all probe and fixture capacitance.

**Note 4:** Resistance value  $R_L$  is shown in Table 1. See applicable specification sheet for "Load Drive Capability".

**Note 5:** All diodes are MMBD7000, MMBD914, or equivalent.

## TEST CIRCUIT FOR CMOS OUTPUT



**Note 1:** An external 0.1µF low frequency tantalum bypass capacitor in parallel with a 0.01µF high frequency ceramic bypass Capacitor close to the package ground and  $V_{DD}$  pin is required.

**Note 2:** A low capacitance (<12pF), 10X attenuation factor, high impedance (>10Mohms), and high bandwidth (>300MHz) passive Probe is recommended.

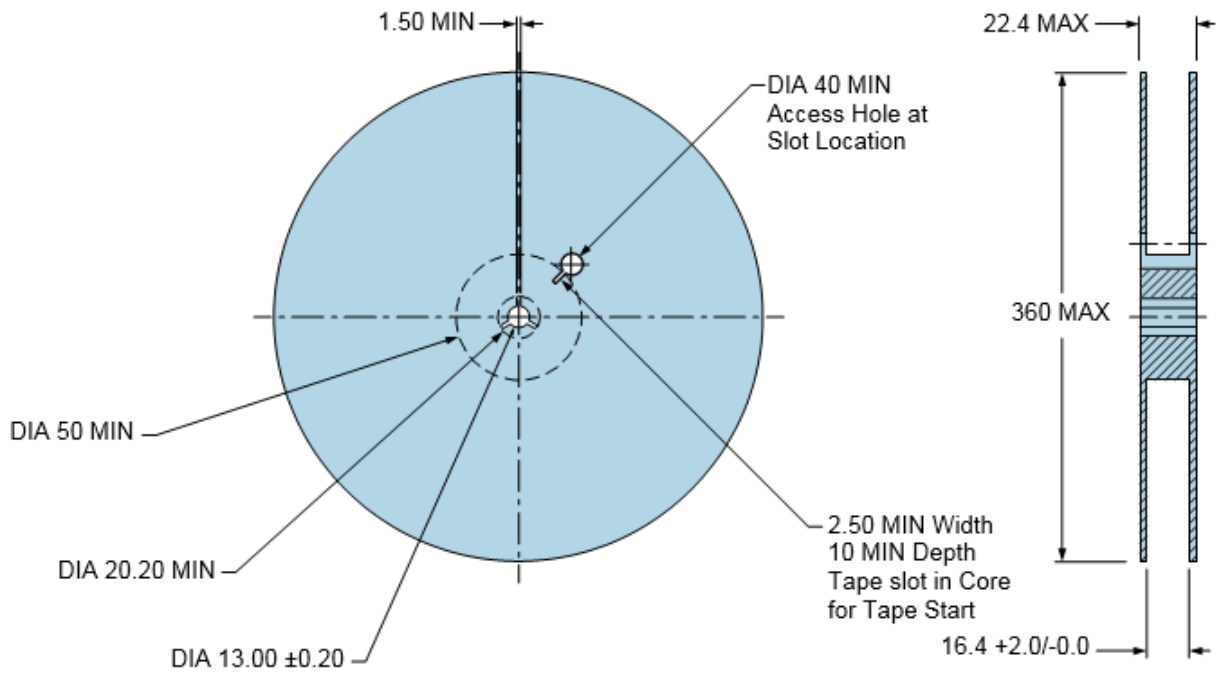
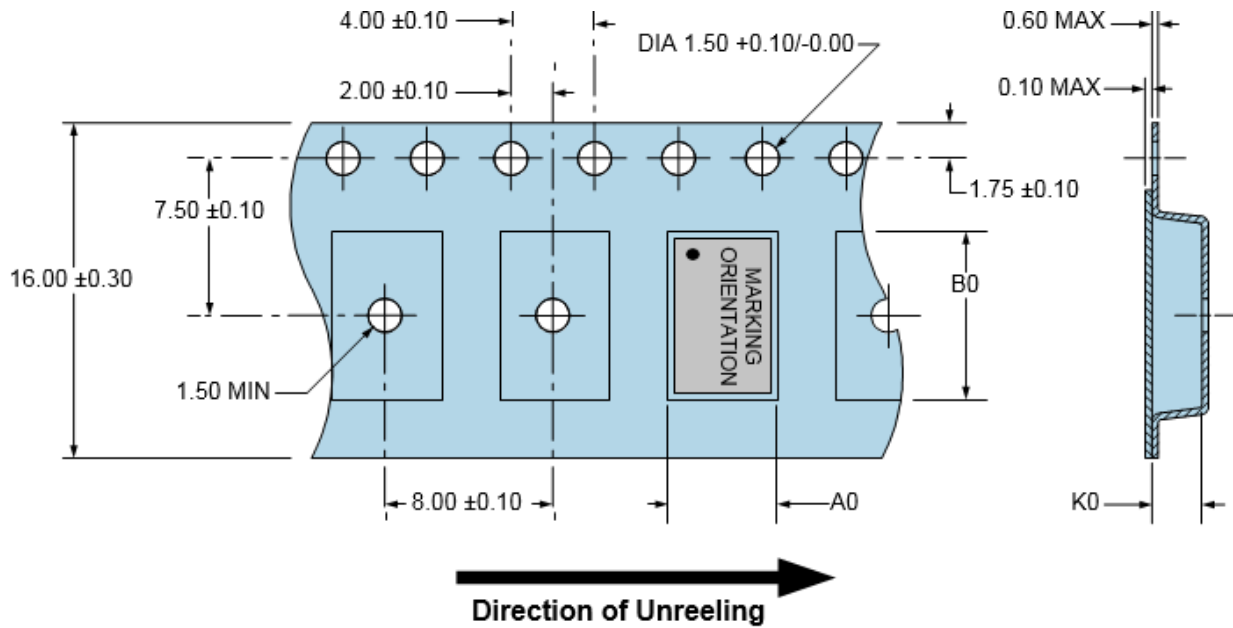
**Note 3:** Capacitance value  $C_L$  includes sum of all probe and fixture capacitance.

## TAPE & REEL DIMENSIONS

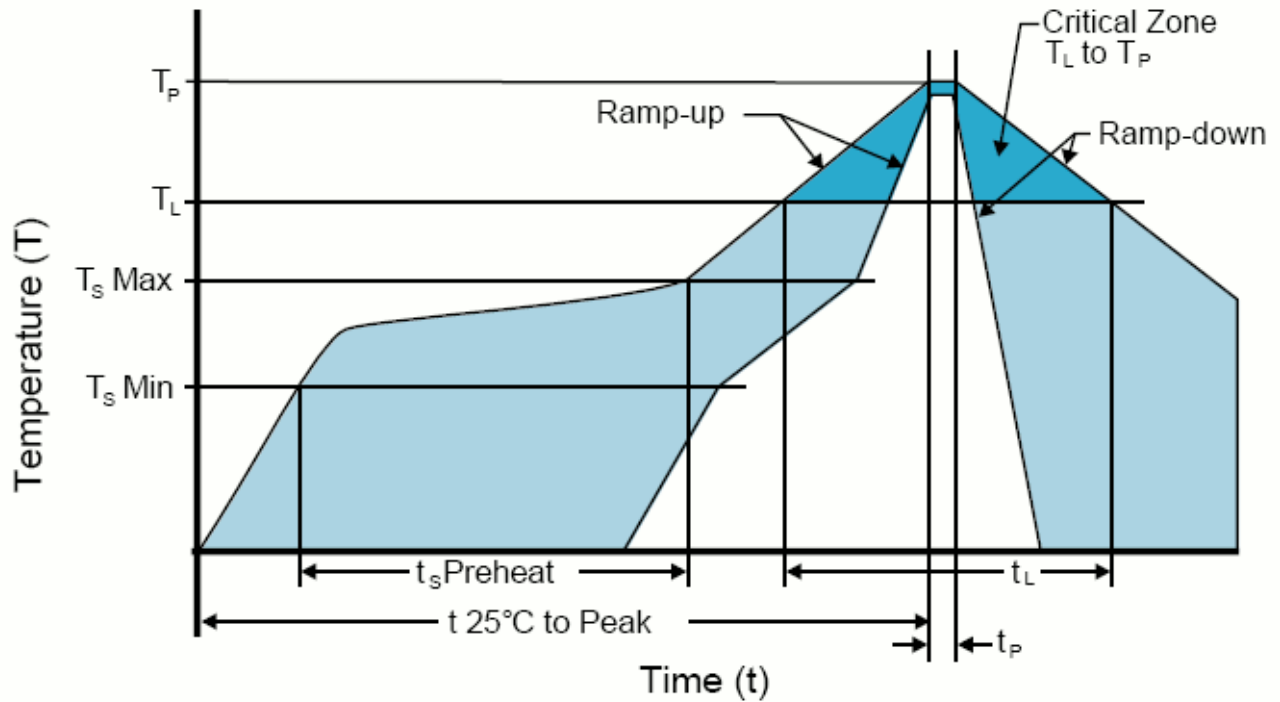
Quantity per Reel: 1,000 Units

All Dimensions in Millimeters

Compliant to EIA-481



**RECOMMENDED SOLDER REFLOW METHOD**



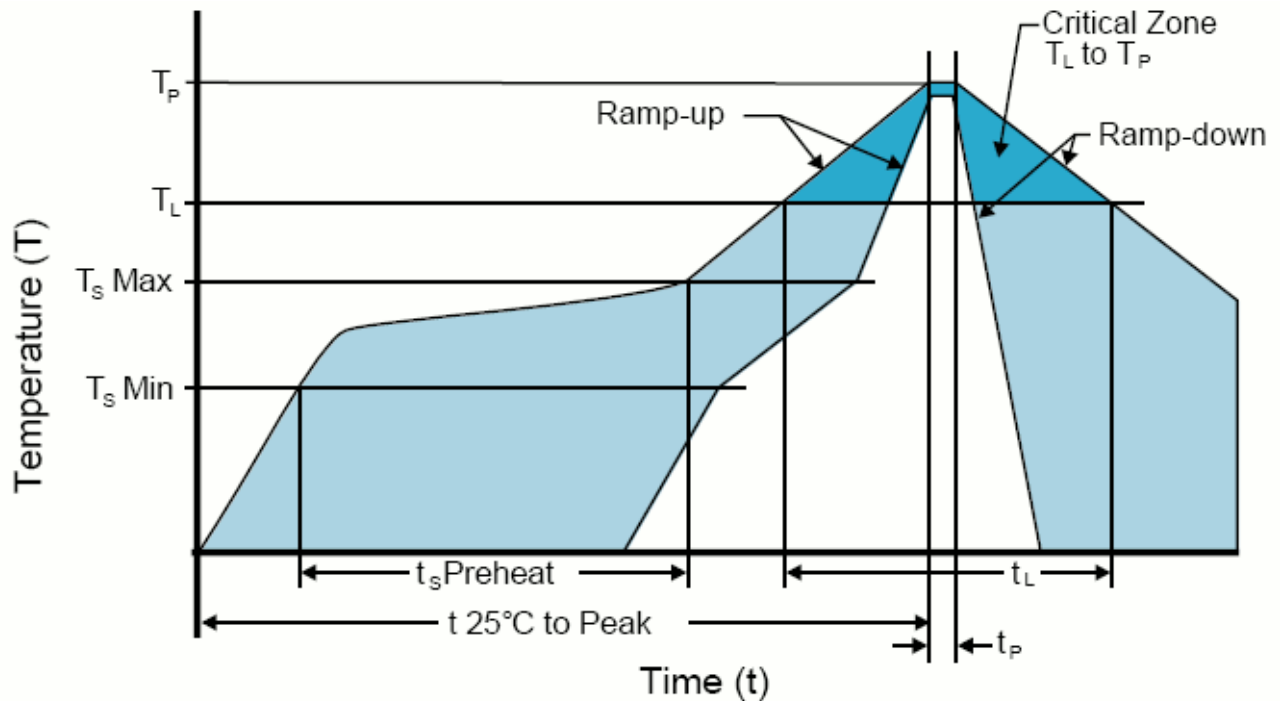
HIGH TEMPERATURE INFRARED/CONVECTION	
<b>T<sub>S</sub> MAX to T<sub>L</sub> (Ramp-up Rate)</b>	3°C/Second Maximum
<b>Preheat</b>	
- Temperature Minimum (T <sub>S</sub> MIN)	150°C
- Temperature Typical (T <sub>S</sub> TYP)	175°C
- Temperature Maximum(T <sub>S</sub> MAX)	200°C
- Time (t <sub>S</sub> MIN)	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 240°C	
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
Ramp-up Rate (T <sub>L</sub> to T <sub>P</sub> )	5°C/Second Maximum
<b>Time Maintained Above:</b>	
- Temperature (T <sub>L</sub> )	150°C
- Time (t <sub>L</sub> )	200Seconds Maximum
Peak Temperature (T <sub>P</sub> )	240°C
Target Peak Temperature(T <sub>P</sub> Target)	240°C Maximum 2 Times/230°C Maximum 1Time
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.)

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