

# EC2645TTS-16.000M TR

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Jul 16, 2018)


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## ITEM DESCRIPTION

Quartz Crystal Clock Oscillators XO (SPXO) LVCMOS (CMOS) 3.3Vdc 4 Pad 5.0mm x 7.0mm Ceramic Surface Mount (SMD) 16.000MHz  $\pm 50$ ppm -10°C to +70°C

## ELECTRICAL SPECIFICATIONS

|   |  |
|---|--|
| Nominal Frequency                             | 16.000MHz  |
| Frequency Tolerance/Stability                 | $\pm 50$ ppm Maximum (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) |
| Aging at 25°C                                 | $\pm 5$ ppm/year Maximum   |
| Operating Temperature Range                   | -10°C to +70°C   |
| Supply Voltage                                | 3.3Vdc $\pm 10\%$  |
| Input Current                                 | 10mA Maximum   |
| Output Voltage Logic High (Voh)               | 90% of Vdd Minimum (IOH=-8mA)  |
| Output Voltage Logic Low (Vol)                | 10% of Vdd Maximum (IOL=+8mA)  |
| Rise/Fall Time                                | 5nSec Maximum (w/15pF Load), 7nSec Maximum (w/30pF Load) (Measured at 20% to 80% of waveform)  |
| Duty Cycle                                    | 50 $\pm 5$ (%) (Measured at 50% of waveform)   |
| Load Drive Capability                         | 30pF Maximum   |
| Output Logic Type                             | CMOS   |
| Pin 1 Connection                              | Tri-State (High Impedance)   |
| Output Control Input Voltage Logic High (Vih) | 70% of Vdd Minimum or No Connect to Enable Output  |
| Output Control Input Voltage Logic Low (Vil)  | 30% of Vdd Maximum to Disable Output (High Impedance)  |
| Standby Current                               | 10 $\mu$ A Maximum (Disabled Output: High Impedance)   |
| RMS Phase Jitter                              | 1pSec Maximum (12kHz to 20MHz offset frequency)  |
| Start Up Time                                 | 10mSec Maximum   |
| Storage Temperature Range                     | -55°C to +125°C  |

## ENVIRONMENTAL & MECHANICAL SPECIFICATIONS

|                              |   |
|------------------------------|---|
| ESD Susceptibility           | MIL-STD-883, Method 3015, Class 1, HBM: 1500V |
| Fine Leak Test               | MIL-STD-883, Method 1014, Condition A         |
| Flammability                 | UL94-V0                                       |
| Gross Leak Test              | MIL-STD-883, Method 1014, Condition C         |
| Mechanical Shock             | MIL-STD-883, Method 2002, Condition B         |
| Moisture Resistance          | MIL-STD-883, Method 1004                      |
| Moisture Sensitivity         | J-STD-020, MSL 1                              |
| Resistance to Soldering Heat | MIL-STD-202, Method 210, Condition K          |
| Resistance to Solvents       | MIL-STD-202, Method 215                       |
| Solderability                | MIL-STD-883, Method 2003                      |
| Temperature Cycling          | MIL-STD-883, Method 1010, Condition B         |
| Vibration                    | MIL-STD-883, Method 2007, Condition A         |

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### MECHANICAL DIMENSIONS (all dimensions in millimeters)



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

| LINE | MARKING  |
|------|--|
| 1    | <b>ECLIPTEK</b>  |
| 2    | <b>16.000M</b>   |
| 3    | <b>XXXXXX</b><br>XXXXXX=Ecliptek<br>Manufacturing Identifier |

### Suggested Solder Pad Layout

All Dimensions in Millimeters



All Tolerances are ±0.1

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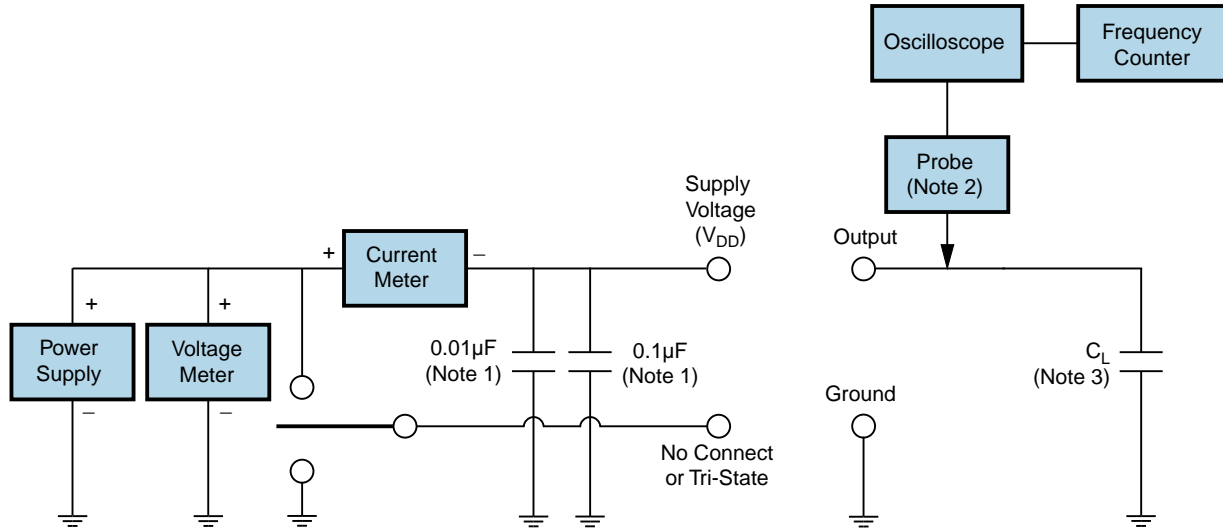
## OUTPUT WAVEFORM & TIMING DIAGRAM



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## Test Circuit for CMOS Output



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

Note 2: A low 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.

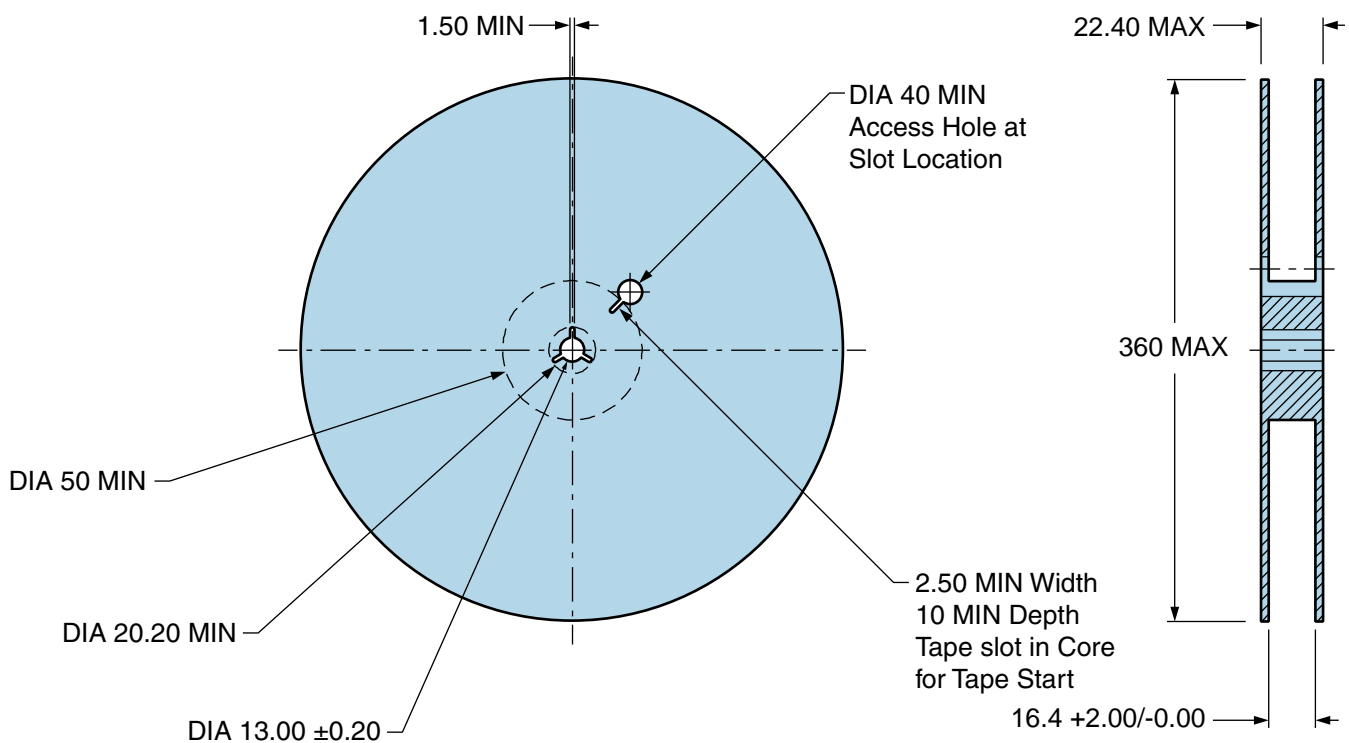
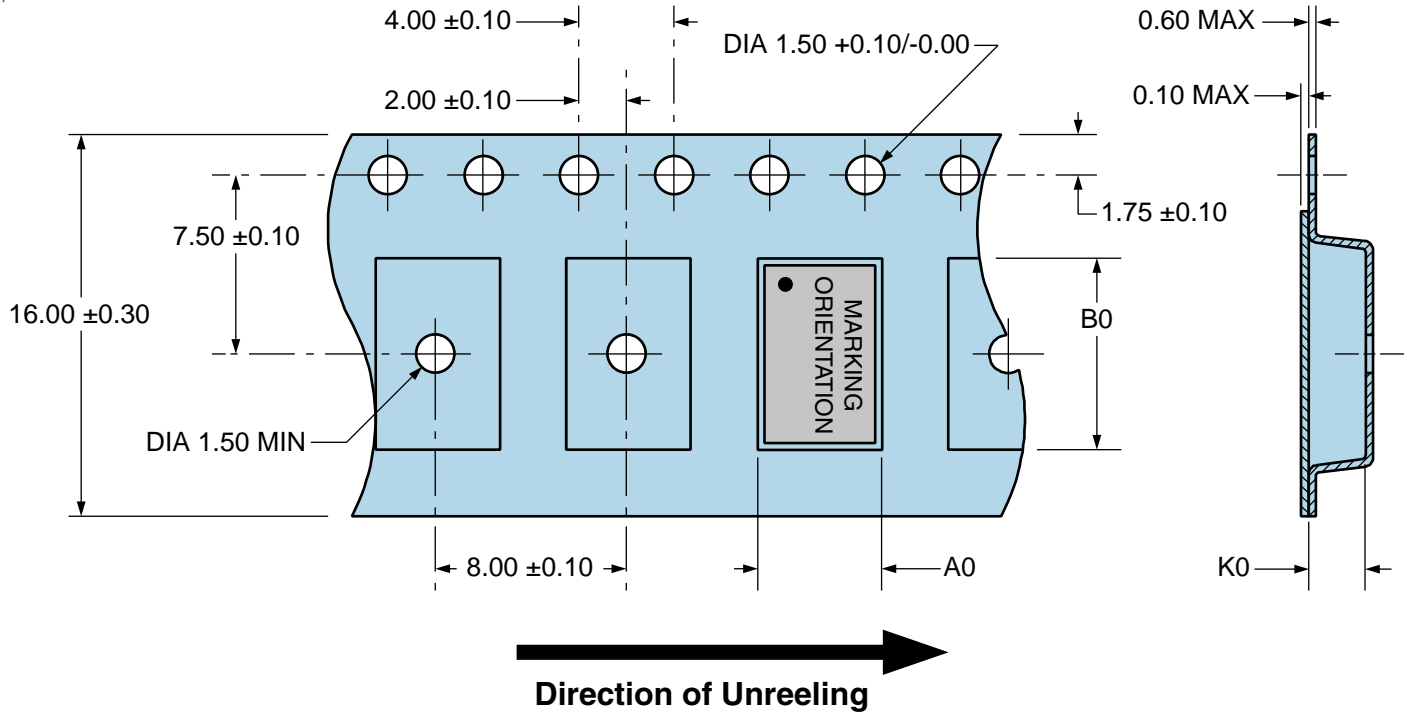
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## Tape & Reel Dimensions

Quantity Per Reel: 1,000 units

All Dimensions in Millimeters

Compliant to EIA-481



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## Recommended Solder Reflow Methods



### High Temperature Infrared/Convection

|  |   |
|--|---|
| <b>Ts MAX to Tl (Ramp-up Rate)</b>         | 3°C/Second Maximum                                |
| <b>Preheat</b>                             |   |
| - Temperature Minimum (Ts MIN)             | 150°C   |
| - Temperature Typical (Ts TYP)             | 175°C   |
| - Temperature Maximum (Ts MAX)             | 200°C   |
| - Time (ts MIN)                            | 60 - 180 Seconds                                  |
| <b>Ramp-up Rate (Tl to Tp)</b>             | 3°C/Second Maximum                                |
| <b>Time Maintained Above:</b>              |   |
| - Temperature (Tl)                         | 217°C   |
| - Time (tL)                                | 60 - 150 Seconds                                  |
| <b>Peak Temperature (Tp)</b>               | 260°C Maximum for 10 Seconds Maximum              |
| <b>Target Peak Temperature (Tp Target)</b> | 250°C +0/-5°C                                     |
| <b>Time within 5°C of actual peak (tp)</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. |

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## Recommended Solder Reflow Methods



### Low Temperature Infrared/Convection 240°C

|  |  |
|--|--|
| $T_s$ MAX to $T_L$ (Ramp-up Rate)                          | 5°C/Second Maximum                                     |
| <b>Preheat</b>   |  |
| - Temperature Minimum ( $T_s$ MIN)                         | N/A  |
| - Temperature Typical ( $T_s$ TYP)                         | 150°C  |
| - Temperature Maximum ( $T_s$ MAX)                         | N/A  |
| - Time ( $t_s$ MIN)  | 60 - 120 Seconds                                       |
| <b>Ramp-up Rate (<math>T_L</math> to <math>T_P</math>)</b> | 5°C/Second Maximum                                     |
| <b>Time Maintained Above:</b>                              |  |
| - Temperature ( $T_L$ )                                    | 150°C  |
| - Time ( $t_L$ )   | 200 Seconds Maximum                                    |
| <b>Peak Temperature (<math>T_P</math>)</b>                 | 240°C Maximum  |
| <b>Target Peak Temperature (<math>T_P</math> Target)</b>   | 240°C Maximum 2 Times / 230°C Maximum 1 Time           |
| <b>Time within 5°C of actual peak (<math>t_p</math>)</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.)

### High Temperature Manual Soldering

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