

# EC2945TS-24.576M TR

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Nov 30, 2017)


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## ITEM DESCRIPTION

Quartz Crystal Clock Oscillators XO (SPXO) LVCMOS (CMOS) 1.8Vdc 4 Pad 5.0mm x 7.0mm Ceramic Surface Mount (SMD) 24.576MHz  $\pm 50$ ppm -10°C to +70°C

## ELECTRICAL SPECIFICATIONS

|                                               |                                                                                                                                                                                                                                        |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                             | 24.576MHz                                                                                                                                                                                                                              |
| 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                                | 1.8Vdc $\pm 5\%$                                                                                                                                                                                                                       |
| Input Current                                 | 4mA Maximum                                                                                                                                                                                                                            |
| Output Voltage Logic High (Voh)               | 90% of Vdd Minimum (IOH = -4mA)                                                                                                                                                                                                        |
| Output Voltage Logic Low (Vol)                | 10% of Vdd Maximum (IOL = +4mA)                                                                                                                                                                                                        |
| Rise/Fall Time                                | 6nSec Maximum (Measured at 10% to 90% of waveform)                                                                                                                                                                                     |
| Duty Cycle                                    | 50 $\pm 10$ (%) (Measured at 50% of waveform)                                                                                                                                                                                          |
| Load Drive Capability                         | 15pF Maximum                                                                                                                                                                                                                           |
| Output Logic Type                             | CMOS                                                                                                                                                                                                                                   |
| Pin 1 Connection                              | Tri-State (High Impedance)                                                                                                                                                                                                             |
| Output Control Input Voltage Logic High (Vih) | 90% of Vdd Minimum or No Connect to Enable Output                                                                                                                                                                                      |
| Output Control Input Voltage Logic Low (Vil)  | 10% 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    | ECLIPTEK                                              |
| 2    | 24.576M                                               |
| 3    | XXXXXX<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

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

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Recommended Solder Reflow Methods



Low Temperature Infrared/Convection 240°C

|                                     |                                                        |
|-------------------------------------|--------------------------------------------------------|
| TS MAX to TL (Ramp-up Rate)         | 5°C/Second Maximum                                     |
| Preheat                             |                                                        |
| - Temperature Minimum (TS MIN)      | N/A                                                    |
| - Temperature Typical (TS TYP)      | 150°C                                                  |
| - Temperature Maximum (TS MAX)      | N/A                                                    |
| - Time (ts MIN)                     | 60 - 120 Seconds                                       |
| Ramp-up Rate (TL to TP)             | 5°C/Second Maximum                                     |
| Time Maintained Above:              |                                                        |
| - Temperature (TL)                  | 150°C                                                  |
| - Time (tL)                         | 200 Seconds Maximum                                    |
| Peak Temperature (TP)               | 240°C Maximum                                          |
| Target Peak Temperature (TP Target) | 240°C Maximum 2 Times / 230°C Maximum 1 Time           |
| Time within 5°C of actual peak (tP) | 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.)

High Temperature Manual Soldering

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