

**EH4720TS-48.000M**
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**REGULATORY COMPLIANCE** (Data Sheet downloaded on Feb 13, 2018)
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**ITEM DESCRIPTION**

Quartz Crystal Clock Oscillators XO (SPXO) LVCMOS (CMOS) 2.5Vdc 4 Pad 2.5mm x 3.2mm Ceramic Surface Mount (SMD) 48.000MHz  $\pm 20$ ppm 0°C to +70°C

**ELECTRICAL SPECIFICATIONS**

|                                       |                                                                                                                                                                                                                                                     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                     | 48.000MHz                                                                                                                                                                                                                                           |
| Frequency Tolerance/Stability         | $\pm 20$ 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°, 260°C Reflow, Shock, and Vibration) |
| Aging at 25°C                         | $\pm 5$ ppm/Year Maximum                                                                                                                                                                                                                            |
| Operating Temperature Range           | 0°C to +70°C                                                                                                                                                                                                                                        |
| Supply Voltage                        | 2.5Vdc $\pm 5\%$                                                                                                                                                                                                                                    |
| Input Current                         | 7mA Maximum (No Load)                                                                                                                                                                                                                               |
| 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                        | 6nSec Maximum (Measured at 20% to 80% 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)                                                                                                                                                                                                                          |
| Tri-State Input Voltage (Vih and Vil) | 90% of Vdd Minimum or No Connect to Enable Output, 10% of Vdd Maximum to Disable Output (High Impedance)                                                                                                                                            |
| Standby Current                       | 10 $\mu$ A Maximum (Pin 1 = Ground)                                                                                                                                                                                                                 |
| RMS Phase Jitter                      | 20pSec Typical, 30pSec Maximum (Fj = 12kHz to 20MHz)                                                                                                                                                                                                |
| Period Jitter (RMS)                   | 13pSec Typical                                                                                                                                                                                                                                      |
| Period Jitter (pk-pk)                 | 85pSec Typical, 100pSec Maximum                                                                                                                                                                                                                     |
| 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: 1500Vdc |
| 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>E48.000</b><br>E=Ecliptek Designator                      |
| 2    | <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  $0.01\mu F$  ceramic bypass capacitor in parallel with a  $0.1\mu F$  high frequency ceramic bypass capacitor close (less than 2mm) to the package ground and supply voltage pin is required.

Note 2: A low capacitance ( $<12pF$ ), 10X attenuation factor, high impedance ( $>10M\Omega$ ), and high bandwidth ( $>300MHz$ ) passive probe is recommended.

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

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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.)