

# EH2500ETTS-4.352M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Feb 12, 2018)


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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) 4.352MHz  $\pm 100$ ppm -40°C to +85°C

## ELECTRICAL SPECIFICATIONS

|                                       |                                                                                                                                                                                                                                         |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                     | 4.352MHz                                                                                                                                                                                                                                |
| Frequency Tolerance/Stability         | $\pm 100$ 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           | -40°C to +85°C                                                                                                                                                                                                                          |
| Supply Voltage                        | 5.0Vdc $\pm 10\%$                                                                                                                                                                                                                       |
| Input Current                         | 50mA Maximum (No Load)                                                                                                                                                                                                                  |
| Output Voltage Logic High (Voh)       | 2.4Vdc Minimum with TTL Load, Vdd-0.4Vdc Minimum with HCMOS Load (IOH= -16mA)                                                                                                                                                           |
| Output Voltage Logic Low (Vol)        | 0.4Vdc Maximum with TTL Load, 0.5Vdc Maximum with HCMOS Load (IOL= +16mA)                                                                                                                                                               |
| Rise/Fall Time                        | 6nSec Maximum (Measured at 0.8Vdc to 2.0Vdc with TTL Load; Measured at 20% to 80% of waveform with HCMOS Load)                                                                                                                          |
| Duty Cycle                            | 50 $\pm 5$ (%) (Measured at 50% of waveform with TTL Load or with HCMOS Load)                                                                                                                                                           |
| Load Drive Capability                 | 10TTL Load or 50pF HCMOS Load Maximum                                                                                                                                                                                                   |
| Output Logic Type                     | CMOS                                                                                                                                                                                                                                    |
| Pin 1 Connection                      | Tri-State (High Impedance)                                                                                                                                                                                                              |
| Tri-State Input Voltage (Vih and Vil) | +2.2Vdc Minimum to enable output, +0.8Vdc Maximum to disable output (High Impedance), No Connect to enable output.                                                                                                                      |
| Absolute Clock Jitter                 | $\pm 250$ pSec Maximum, $\pm 100$ pSec Typical                                                                                                                                                                                          |
| One Sigma Clock Period Jitter         | $\pm 50$ pSec Maximum, $\pm 30$ pSec Typical                                                                                                                                                                                            |
| 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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| LINE | MARKING                                               |
|------|-------------------------------------------------------|
| 1    | ECLIPTEK                                              |
| 2    | 4.3520M                                               |
| 3    | XXXXXX<br>XXXXXX=Ecliptek<br>Manufacturing Identifier |

1-800-ECLIPTEK or 714.433.1200

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OUTPUT WAVEFORM & TIMING DIAGRAM



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Test Circuit for TTL Output

| Output Load Drive Capability | R <sub>L</sub> Value (Ohms) | C <sub>L</sub> Value (pF) |
|------------------------------|-----------------------------|---------------------------|
| 10TTL                        | 390                         | 15                        |
| 5TTL                         | 780                         | 15                        |
| 2TTL                         | 1100                        | 6                         |
| 10LSTTL                      | 2000                        | 15                        |
| 1TTL                         | 2200                        | 3                         |

Table 1: R<sub>L</sub> Resistance Value and C<sub>L</sub> 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<sub>DD</sub> 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<sub>L</sub> includes sum of all probe and fixture capacitance.
- Note 4: Resistance value R<sub>L</sub> is shown in Table 1. See applicable specification sheet for 'Load Drive Capability'.
- Note 5: All diodes are MM74VHC00, MM74VHC14, or equivalent.

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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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Recommended Solder Reflow Methods



High Temperature Infrared/Convection

|                                                                                   |                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------|
| <b><math>T_s</math> MAX to <math>T_L</math> (Ramp-up Rate)</b>                    | $3^\circ\text{C}/\text{Second}$ Maximum            |
| <b>Preheat</b>                                                                    |                                                    |
| - Temperature Minimum ( $T_s$ MIN)                                                | $150^\circ\text{C}$                                |
| - Temperature Typical ( $T_s$ TYP)                                                | $175^\circ\text{C}$                                |
| - Temperature Maximum ( $T_s$ MAX)                                                | $200^\circ\text{C}$                                |
| - Time ( $t_s$ MIN)                                                               | 60 - 180 Seconds                                   |
| <b>Ramp-up Rate (<math>T_L</math> to <math>T_P</math>)</b>                        | $3^\circ\text{C}/\text{Second}$ Maximum            |
| <b>Time Maintained Above:</b>                                                     |                                                    |
| - Temperature ( $T_L$ )                                                           | $217^\circ\text{C}$                                |
| - Time ( $t_L$ )                                                                  | 60 - 150 Seconds                                   |
| <b>Peak Temperature (<math>T_P</math>)</b>                                        | $260^\circ\text{C}$ Maximum for 10 Seconds Maximum |
| <b>Target Peak Temperature (<math>T_P</math> Target)</b>                          | $250^\circ\text{C} +0/-5^\circ\text{C}$            |
| <b>Time within <math>5^\circ\text{C}</math> of actual peak (<math>t_p</math>)</b> | 20 - 40 Seconds                                    |
| <b>Ramp-down Rate</b>                                                             | $6^\circ\text{C}/\text{Second}$ Maximum            |
| <b>Time <math>25^\circ\text{C}</math> to Peak Temperature (<math>t</math>)</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

|                                     |                                                        |
|-------------------------------------|--------------------------------------------------------|
| 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.)