

# EB15E2D2H-38.400M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Aug 29, 2018)


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## ITEM DESCRIPTION

Quartz Crystal Clock Oscillators XO (SPXO) LVC MOS (CMOS) 2.5Vdc 4 Pad 2.5mm x 3.2mm Ceramic Surface Mount (SMD) 38.400MHz  $\pm 50$ ppm over -20°C to +70°C

## ELECTRICAL SPECIFICATIONS

|                                       |                                                                                                                                                                                                                                                            |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                     | 38.400MHz                                                                                                                                                                                                                                                  |
| Frequency Tolerance/Stability         | $\pm 50$ ppm Maximum over -20°C to +70°C (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) |
| Supply Voltage                        | 2.5Vdc $\pm 5\%$                                                                                                                                                                                                                                           |
| Input Current                         | 5mA 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                        | 4nSec Maximum (Measured at 20% to 80% of waveform)                                                                                                                                                                                                         |
| Duty Cycle                            | 50 $\pm 5$ (%) (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) | 80% of Vdd Minimum or No Connect to Enable Output, 20% of Vdd Maximum to Disable Output (High Impedance)                                                                                                                                                   |
| Standby Current                       | 10 $\mu$ A Maximum (Disabled Output: High Impedance)                                                                                                                                                                                                       |
| RMS Phase Jitter                      | 1pSec Maximum (Fj = 12kHz to 20MHz)                                                                                                                                                                                                                        |
| 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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OUTPUT WAVEFORM & TIMING DIAGRAM



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## Test Circuit for CMOS Output



Note 1: An external 0.01µF ceramic bypass capacitor in parallel with a 0.1µF 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 (>10Mohms), 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                              |

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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                                                |

Low Temperature Manual Soldering

185°C Maximum for 10 Seconds Maximum, 2 times Maximum.

High Temperature Manual Soldering

260°C Maximum for 5 Seconds Maximum, 2 times Maximum.