

# EQRA15M2H-102.400M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Nov 20, 2019)


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## ITEM DESCRIPTION

Quartz Crystal Clock Oscillators XO (SPXO) LVCMOS (CMOS) 3.0Vdc 6 Pad 5.0mm x 7.0mm Ceramic Surface Mount (SMD) 102.400MHz  $\pm 20$ ppm over -40°C to +85°C

## ELECTRICAL SPECIFICATIONS

|   |   |
|---|---|
| Nominal Frequency                             | 102.400MHz  |
| Frequency Tolerance/Stability                 | $\pm 20$ ppm Maximum over -40°C to +85°C (Inclusive of all conditions: Calibration Tolerance (at 25°C), Frequency Stability over the Operating Temperature Range, Supply Voltage Change and Output Load Change)                                     |
| Aging at 25°C                                 | $\pm 2$ ppm Maximum First Year, $\pm 10$ ppm/10 Years Maximum   |
| Supply Voltage                                | 3.0Vdc $\pm 5\%$  |
| Input Current                                 | 45mA Maximum (Unloaded)   |
| 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                                | 3nSec Maximum (Measured at 10% to 90% of Waveform)  |
| Duty Cycle                                    | 50 $\pm 5$ (%) (Measured at 50% of Waveform)  |
| Load Drive Capability                         | 15pF Maximum  |
| Output Logic Type                             | CMOS  |
| Phase Noise                                   | -57dBc/Hz at 10Hz offset; -86dBc/Hz at 100Hz offset; -114dBc/Hz at 1kHz offset; -121dBc/Hz at 10kHz offset; -122dBc/Hz at 100kHz offset; -141dBc/Hz at 1MHz offset; -151dBc/Hz at 10MHz offset; -153dBc/Hz at 20MHz offset (All Values are Typical) |
| Output Control Function                       | Output Enable (OE)  |
| 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)   |
| Output Enable Time                            | 100nSec Maximum   |
| Output Disable Time                           | 50nSec Maximum  |
| Output Enable Current                         | 15mA Maximum (Without Load (Pin 1 = Ground))  |
| RMS Phase Jitter                              | 1.3pSec Maximum (Fj=12kHz to 20MHz (Random))  |
| Period Jitter (Deterministic)                 | 0.2pSec Typical   |
| Period Jitter (Random)                        | 2pSec Typical   |
| Period Jitter (RMS)                           | 3pSec Maximum   |
| Period Jitter (pk-pk)                         | 30pSec 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: 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          |

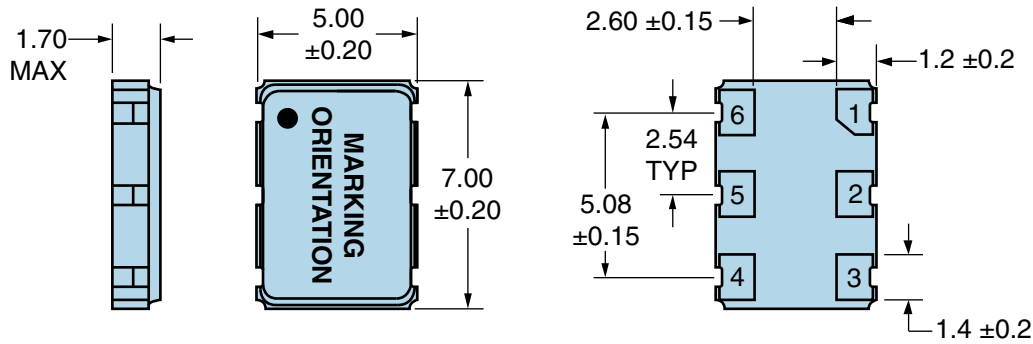
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## ENVIRONMENTAL & MECHANICAL SPECIFICATIONS CONTINUED

|                               |                                       |
|-------------------------------|---------------------------------------|
| <b>Resistance to Solvents</b> | MIL-STD-202, Method 215               |
| <b>Solderability</b>          | MIL-STD-883, Method 2003              |
| <b>Temperature Cycling</b>    | MIL-STD-883, Method 1010, Condition B |
| <b>Vibration</b>              | MIL-STD-883, Method 2007, Condition A |

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### MECHANICAL DIMENSIONS (all dimensions in millimeters)



| PIN | CONNECTION         |
|-----|--------------------|
| 1   | Output Enable (OE) |
| 2   | Do Not Connect     |
| 3   | Case/Ground        |
| 4   | Output             |
| 5   | Do Not Connect     |
| 6   | Supply Voltage     |

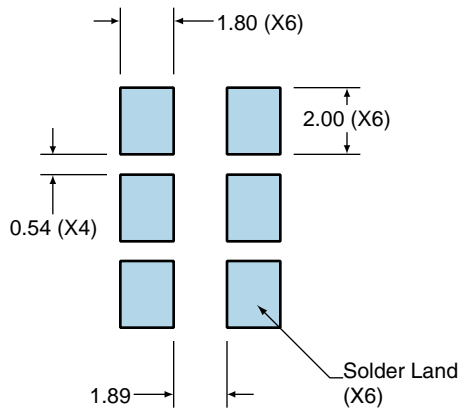
| LINE | MARKING   |
|------|---|
| 1    | ECLIPTEK  |
| 2    | 102.40M   |
| 3    | XXXXX<br>XXXXX=Ecliptek<br>Manufacturing Identifier |

Seam Sealed

Terminal Plating Thickness: Gold (0.3 to 1.0µm) over Nickel (1.27 to 8.89µm).

### Suggested Solder Pad Layout

All Dimensions in Millimeters



All Tolerances are ±0.1

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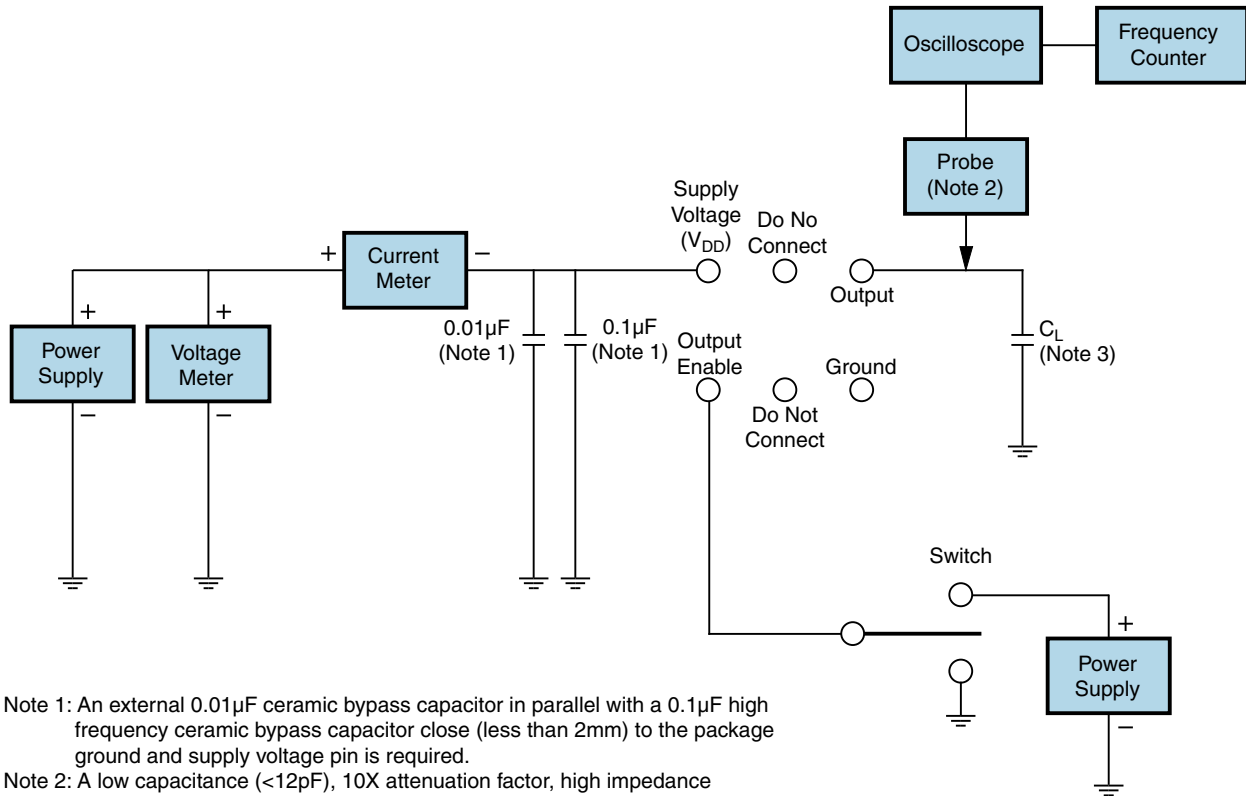
## OUTPUT WAVEFORM & TIMING DIAGRAM



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## Test Circuit for CMOS Output



Note 1: An external 0.01µF 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<sub>L</sub> includes sum of all probe and fixture capacitance.

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## Recommended Solder Reflow Methods



### High Temperature Infrared/Convection

|  |   |
|--|---|
| <b><math>T_s \text{ MAX}</math> to <math>T_L</math> (Ramp-up Rate)</b> | 3°C/Second Maximum                                |
| <b>Preheat</b>   |   |
| - Temperature Minimum ( $T_s \text{ MIN}$ )                            | 150°C   |
| - Temperature Typical ( $T_s \text{ TYP}$ )                            | 175°C   |
| - Temperature Maximum ( $T_s \text{ MAX}$ )                            | 200°C   |
| - Time ( $t_s \text{ MIN}$ )   | 60 - 180 Seconds                                  |
| <b>Ramp-up Rate (<math>T_L</math> to <math>T_P</math>)</b>             | 3°C/Second Maximum                                |
| <b>Time Maintained Above:</b>  |   |
| - Temperature ( $T_L$ )  | 217°C   |
| - Time ( $t_L$ )   | 60 - 150 Seconds                                  |
| <b>Peak Temperature (<math>T_P</math>)</b>                             | 260°C Maximum for 10 Seconds Maximum              |
| <b>Target Peak Temperature (<math>T_P \text{ Target}</math>)</b>       | 250°C +0/-5°C                                     |
| <b>Time within 5°C of actual peak (<math>t_p</math>)</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>  | Temperature listed 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>                                    | Temperature listed are applied to body of device.      |

### Low Temperature Manual Soldering

185°C Maximum for 10 Seconds Maximum, 2 times Maximum. (Temperature listed are applied to body of device.)

### High Temperature Manual Soldering

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