

# EQUA35C4F1H-16.3683M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on May 25, 2020)


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## ITEM DESCRIPTION

Temperature Compensated Voltage Controlled Quartz Crystal Clock Oscillators TCVCXO LVCMOS (CMOS) 3.0Vdc 6 Pad 2.5mm x 3.2mm Ceramic Surface Mount (SMD) 16.3683MHz -20°C to +70°C

## ELECTRICAL SPECIFICATIONS

|   |   |
|---|---|
| Nominal Frequency                             | 16.3683MHz  |
| Frequency Stability                           | ±2.5ppm Maximum (Inclusive of Operating Temperature Range, at Vdd=3.0Vdc, at Vc=1.5Vdc)   |
| Frequency Stability vs. Frequency Tolerance   | ±2.0ppm Maximum (at 25°C ±2°C, at Vdd=3.0Vdc, at Vc=1.5Vdc ±0.1Vdc, Pre-Reflow)   |
| Frequency Stability vs. Input Voltage         | ±0.2ppm Maximum (±5%)   |
| Frequency Stability vs. Load                  | ±0.2ppm Maximum (±2pF)  |
| Frequency Stability vs. Reflow                | ±1.0ppm Maximum (at 25°C, 24 hours after reflow, 1 time)  |
| Frequency Stability vs. Aging                 | ±1ppm/Year Maximum (at 25°C)  |
| Operating Temperature Range                   | -20°C to +70°C  |
| Supply Voltage                                | 3.0Vdc ±5%  |
| Input Current                                 | 20mA 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 ±5% (Measured at 50% of Waveform)  |
| Load Drive Capability                         | 15pF Maximum  |
| Output Logic Type                             | CMOS  |
| Control Voltage                               | 1.5Vdc ±1.0Vdc  |
| Frequency Deviation                           | ±8ppm Minimum   |
| Linearity                                     | 10% Maximum   |
| Transfer Function                             | Positive Transfer Characteristic  |
| Modulation Bandwidth                          | 10kHz Minimum (Measured at -3dB)  |
| Input Impedance                               | 1MOhms Minimum  |
| Phase Noise                                   | -64dBc/Hz at 10Hz offset; -96dBc/Hz at 100Hz offset; -124dBc/Hz at 1kHz offset; -131dBc/Hz at 10kHz offset; -132dBc/Hz at 100kHz offset; -149dBc/Hz at 1MHz offset; -157dBc/Hz at 10MHz offset; -159dBc/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 2 = Ground))  |
| RMS Phase Jitter                              | 1.5pSec 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  |

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## ELECTRICAL SPECIFICATIONS CONTINUED

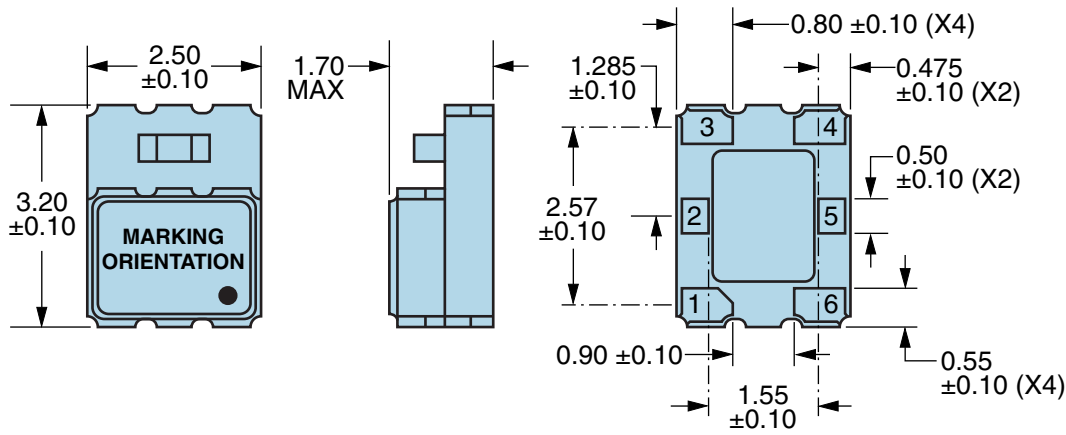
|                                  |                 |
|----------------------------------|-----------------|
| <b>Start Up Time</b>             | 10mSec Maximum  |
| <b>Storage Temperature Range</b> | -55°C to +125°C |

## ENVIRONMENTAL & MECHANICAL SPECIFICATIONS

|                                     |   |
|-------------------------------------|---|
| <b>ESD Susceptibility</b>           | MIL-STD-883, Method 3015, Class 1, HBM: 1500V |
| <b>Fine Leak Test</b>               | MIL-STD-883, Method 1014, Condition A         |
| <b>Flammability</b>                 | UL94-V0                                       |
| <b>Gross Leak Test</b>              | MIL-STD-883, Method 1014, Condition C         |
| <b>Mechanical Shock</b>             | MIL-STD-883, Method 2002, Condition B         |
| <b>Moisture Resistance</b>          | MIL-STD-883, Method 1004                      |
| <b>Moisture Sensitivity</b>         | J-STD-020, MSL 1                              |
| <b>Resistance to Soldering Heat</b> | MIL-STD-202, Method 210, Condition K          |
| <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   | Control Voltage    |
| 2   | Output Enable (OE) |
| 3   | Case/Ground        |
| 4   | Output             |
| 5   | Do Not Connect     |
| 6   | Supply Voltage     |

| LINE | MARKING  |
|------|--|
| 1    | <b>E16.368</b><br>E=Ecliptek Designator                    |
| 2    | <b>XXXXX</b><br>XXXXX=Ecliptek<br>Manufacturing Identifier |

**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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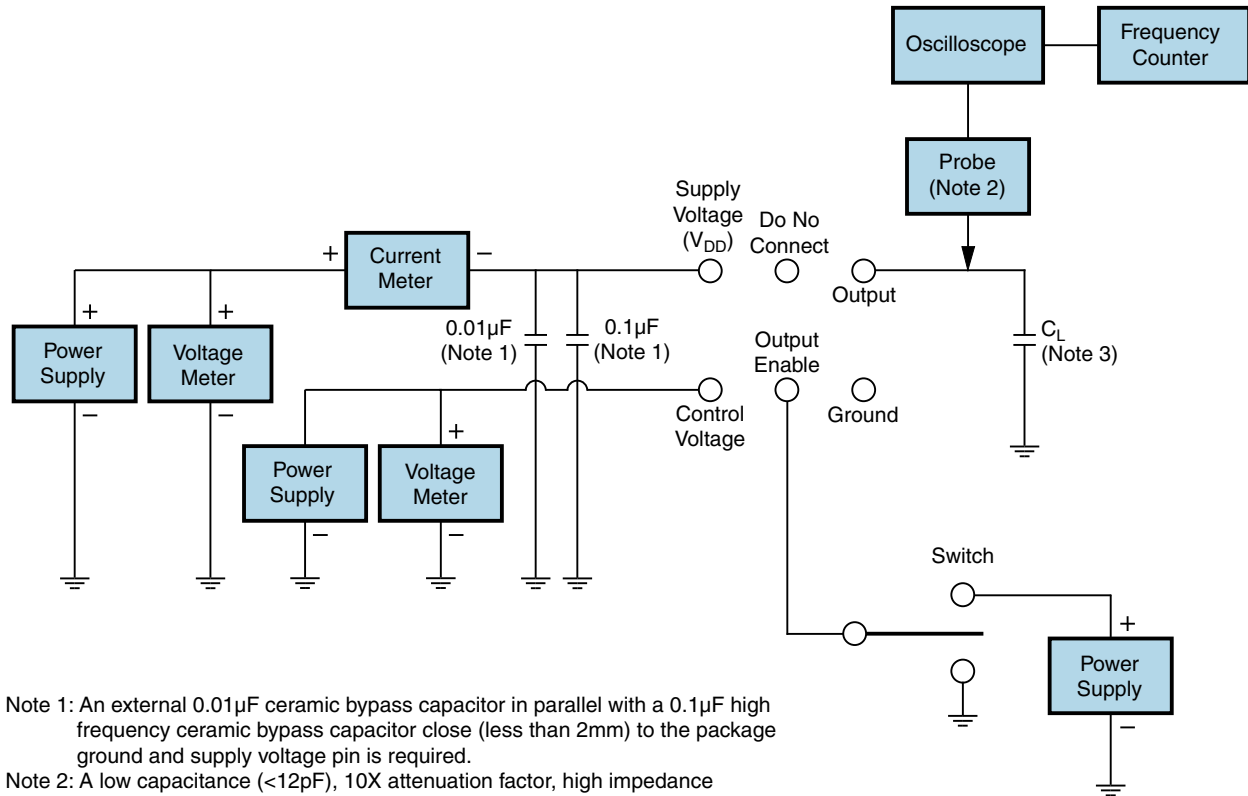
**OUTPUT WAVEFORM & TIMING DIAGRAM**



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## Test Circuit for CMOS Output



Note 1: An external  $0.01\mu\text{F}$  ceramic bypass capacitor in parallel with a  $0.1\mu\text{F}$  high frequency ceramic bypass capacitor close (less than 2mm) to the package ground and supply voltage pin is required.

Note 2: A low capacitance ( $<12\text{pF}$ ), 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>Ts MAX to TL (Ramp-up Rate)</b>         | 3°C/Second Maximum                                |
| <b>Preheat</b>                             |   |
| - Temperature Minimum (Ts MIN)             | 150°C   |
| - Temperature Typical (Ts TYP)             | 175°C   |
| - Temperature Maximum (Ts MAX)             | 200°C   |
| - Time (ts MIN)                            | 60 - 180 Seconds                                  |
| <b>Ramp-up Rate (TL to TP)</b>             | 3°C/Second Maximum                                |
| <b>Time Maintained Above:</b>              |   |
| - Temperature (TL)                         | 217°C   |
| - Time (tL)                                | 60 - 150 Seconds                                  |
| <b>Peak Temperature (TP)</b>               | 260°C Maximum for 10 Seconds Maximum              |
| <b>Target Peak Temperature (TP Target)</b> | 250°C +0/-5°C                                     |
| <b>Time within 5°C of actual peak (tp)</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>                    | 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                                     |
| <b>Preheat</b>                             |  |
| - Temperature Minimum (Ts MIN)             | N/A  |
| - Temperature Typical (Ts TYP)             | 150°C  |
| - Temperature Maximum (Ts MAX)             | N/A  |
| - Time (ts MIN)                            | 60 - 120 Seconds                                       |
| <b>Ramp-up Rate (TL to TP)</b>             | 5°C/Second Maximum                                     |
| <b>Time Maintained Above:</b>              |  |
| - Temperature (TL)                         | 150°C  |
| - Time (tL)                                | 200 Seconds Maximum                                    |
| <b>Peak Temperature (TP)</b>               | 240°C Maximum  |
| <b>Target Peak Temperature (TP Target)</b> | 240°C Maximum 2 Times / 230°C Maximum 1 Time           |
| <b>Time within 5°C of actual peak (tp)</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>                    | 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.)