

# EQUG33C6D1H-16.000M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Nov 22, 2019)


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## ITEM DESCRIPTION

Temperature Compensated Voltage Controlled Quartz Crystal Clock Oscillators TCVCXO LVPECL (PECL) 3.3Vdc 6 Pad 2.5mm x 3.2mm Ceramic Surface Mount (SMD) 16.000MHz -30°C to +75°C

## ELECTRICAL SPECIFICATIONS

Nominal Frequency	16.000MHz
Frequency Stability	±5.0ppm Maximum (Inclusive of Operating Temperature Range, at Vdd=3.3Vdc, at Vc=1.5Vdc)
Frequency Stability vs. Frequency Tolerance	±2.0ppm Maximum (at 25°C ±2°C, at Vdd=3.3Vdc, 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	-30°C to +75°C
Supply Voltage	3.3Vdc ±5%
Input Current	75mA Maximum
Output Voltage Logic High (Voh)	Vdd-1.025Vdc Minimum, 2.4Vdc Typical, Vdd-0.6Vdc Maximum
Output Voltage Logic Low (Vol)	Vdd-1.85Vdc Minimum, 1.6Vdc Typical, Vdd-1.62Vdc Maximum
Rise/Fall Time	300pSec Maximum (Measured at 10% to 90% of Waveform)
Duty Cycle	50 ±5(%) (Measured at 50% of Waveform)
Load Drive Capability	50 Ohms into Vdd-2Vdc
Output Logic Type	LVPECL
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 and Complementary Output
Output Control Input Voltage Logic Low (Vil)	10% of Vdd Maximum to Disable Output and Complementary Output (High Impedance)
Output Enable Time	100nSec Maximum
Output Disable Time	50nSec Maximum
Output Enable Current	18mA 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	Complementary Output
6	Supply Voltage

LINE	MARKING
1	<b>E16.000</b> E=Ecliptek Designator
2	<b>XXXXX</b> XXXXX=Ecliptek Manufacturing Identifier

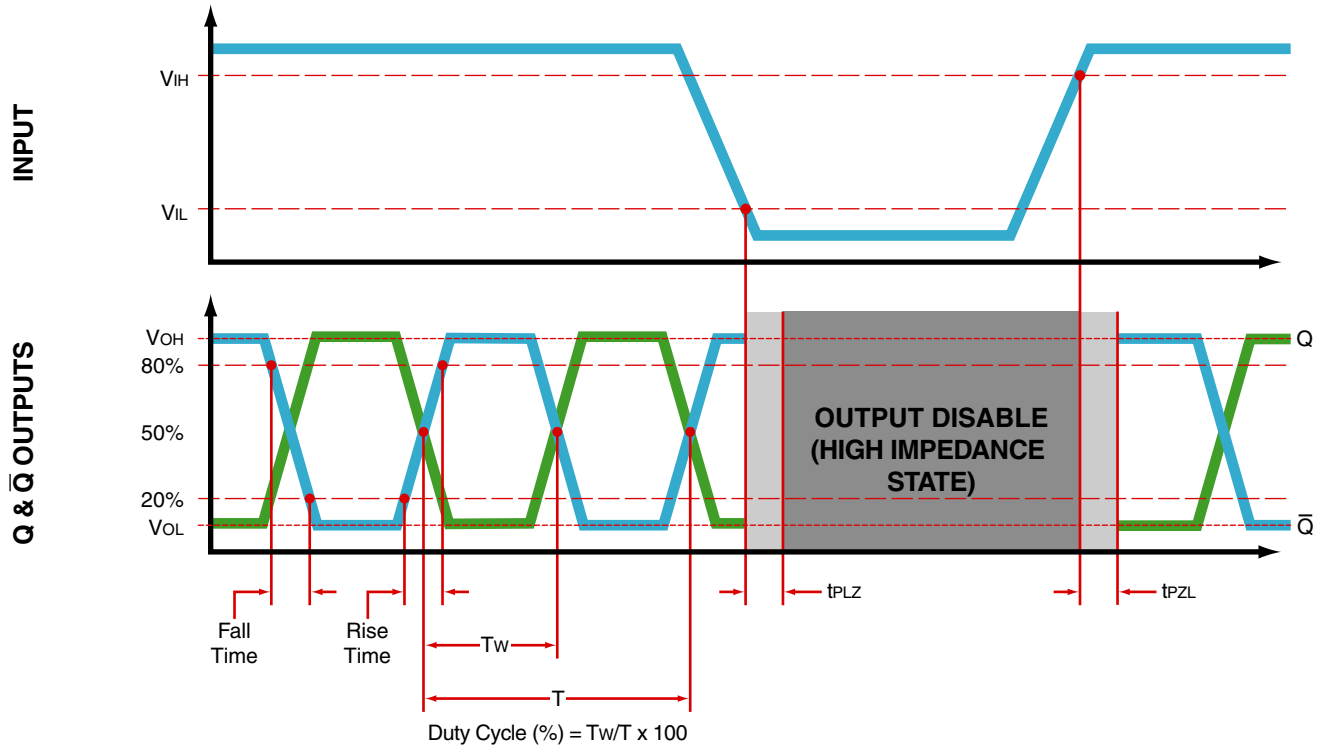
**Terminal Plating Thickness:** Gold (0.3 to 1.0 $\mu$ m) over Nickel (1.27 to 8.89 $\mu$ m).

### Suggested Solder Pad Layout

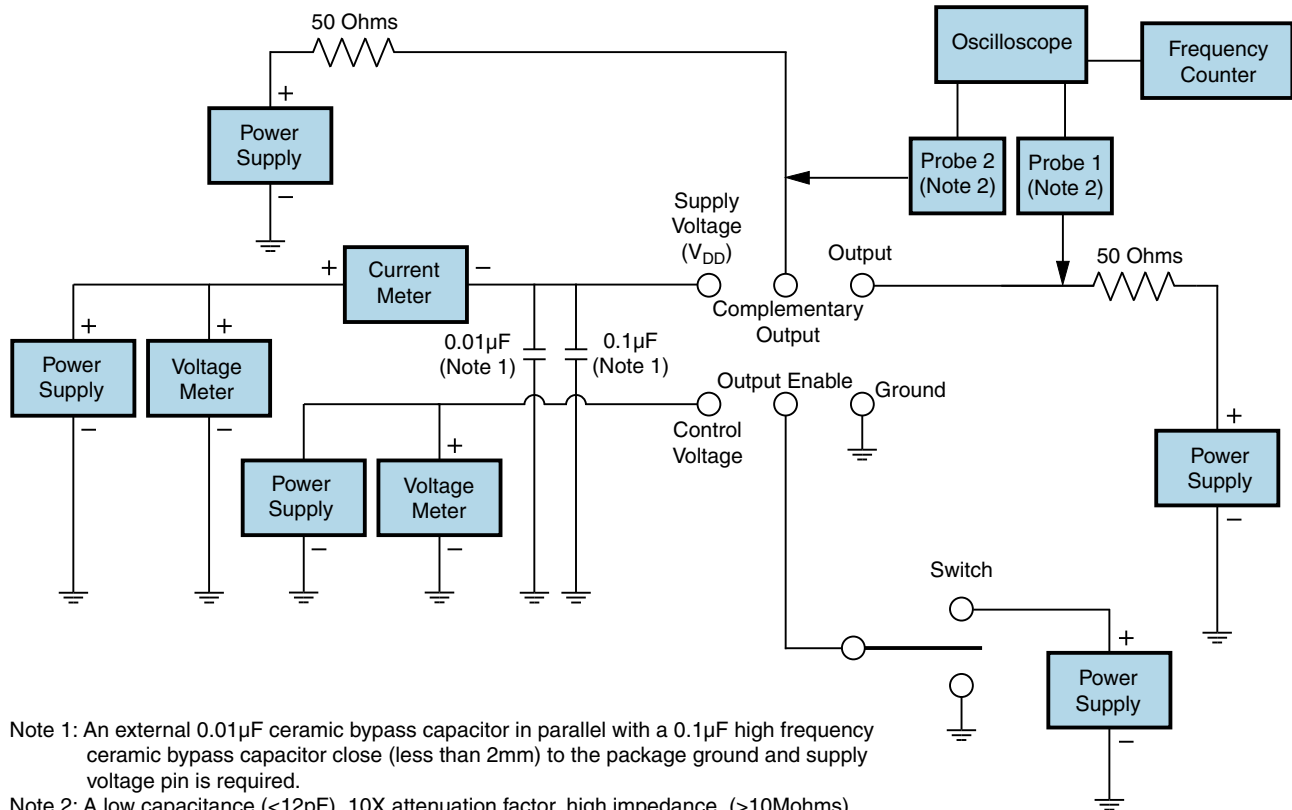
All Dimensions in Millimeters



All Tolerances are  $\pm 0.1$

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**OUTPUT WAVEFORM & TIMING DIAGRAM**


## Test Circuit for PECL 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 (>500MHz) passive probe is recommended.

Note 3: Test circuit PCB traces need to be designed for a characteristic line impedance of 50 ohms.

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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>	Temperatures shown are applied to body of device.

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## Recommended Solder Reflow Methods



### Low Temperature Infrared/Convection 240°C

<b>Ts MAX to TL (Ramp-up Rate)</b>	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.)