

# EMRA52H1H-4.000M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Apr 9, 2020)


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## ITEM DESCRIPTION

MEMS Clock Oscillators LVCMOS (CMOS) 2.5Vdc 4 Pad 1.6mm x 2.0mm Plastic Surface Mount (SMD) 4.000MHz  $\pm$ 20ppm over -20°C to +70°C

## ELECTRICAL SPECIFICATIONS

Nominal Frequency	4.000MHz
Frequency Tolerance/Stability	$\pm$ 20ppm 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, and Output Load Change)
Aging at 25°C	$\pm$ 1.5ppm Maximum First Year
Supply Voltage	2.5Vdc $\pm$ 10%
Input Current	5mA Maximum (No Load)
Output Voltage Logic High (Voh)	90% of Vdd Minimum (IOH = -3mA)
Output Voltage Logic Low (Vol)	10% of Vdd Maximum (IOL = +3mA)
Rise/Fall Time	1.2nSec Typical, 3nSec Maximum (Measured from 20% to 80% of waveform)
Duty Cycle	50 $\pm$ 10(%) (Measured at 50% of waveform)
Load Drive Capability	15pF Maximum
Output Logic Type	CMOS
Output Control Function	Tri-State (Disabled Output: High Impedance)
Output Control Input Voltage Logic High (Vih)	70% of Vdd Minimum or No Connect to Enable Output
Output Control Input Voltage Logic Low (Vil)	30% of Vdd Maximum to Disable Output
Tri-State Output Enable Time	150nSec Maximum
Tri-State Output Disable Time	150nSec Maximum
Period Jitter (RMS)	2pSec Typical, 4pSec Maximum
RMS Phase Jitter (Fj = 900kHz to 7.5MHz; Random)	0.5pSec Typical, 1pSec Maximum
RMS Phase Jitter (Fj = 12kHz to 20MHz; Random)	1.5pSec Typical, 3pSec Maximum
Start Up Time	5mSec Maximum
Storage Temperature Range	-65°C to +150°C

## ENVIRONMENTAL & MECHANICAL SPECIFICATIONS

ESD Susceptibility	JESD22-A114, HBM, 2000V
Flammability	UL94-V0
Mechanical Shock	MIL-STD-883, Method 2002, Condition E, 10,000G
Moisture Sensitivity	J-STD-020, MSL 1
Solderability	MIL-STD-883, Method 2003 (Four I/O Pads on bottom of package only)
Temperature Cycling	JESD22-A104, Condition B
Vibration	MIL-STD-883, Method 2007, Condition A, 20G

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### MECHANICAL DIMENSIONS (all dimensions in millimeters)



PIN	CONNECTION
1	Tri-State (High Impedance)
2	Ground
3	Output
4	Supply Voltage

LINE	MARKING
1	Ecliptek Manufacturing Identifier
2	Ecliptek Manufacturing Identifier (continued)

### 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 input capacitance (<12pF), 10X Attenuation Factor, High Impedance (>10Mohms), and High bandwidth (>300MHz) passive probe is recommended.

Note 3: Capacitance value CL includes sum of all probe and fixture capacitance. See applicable specification sheet for 'Load Drive Capability'.

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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>	$3^\circ\text{C/Second Maximum}$
<b>Preheat</b>	
- Temperature Minimum ( $T_s \text{ MIN}$ )	$150^\circ\text{C}$
- Temperature Typical ( $T_s \text{ TYP}$ )	$175^\circ\text{C}$
- Temperature Maximum ( $T_s \text{ MAX}$ )	$200^\circ\text{C}$
- Time ( $t_s \text{ MIN}$ )	60 - 180 Seconds
<b>Ramp-up Rate (<math>T_L</math> to <math>T_P</math>)</b>	$3^\circ\text{C/Second Maximum}$
<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 \text{ Target}</math>)</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>	$6^\circ\text{C/Second Maximum}$
<b>Time <math>25^\circ\text{C}</math> to Peak Temperature (t)</b>	8 Minutes Maximum
<b>Moisture Sensitivity Level</b>	Level 1
<b>Additional Notes</b>	Temperature 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>	Temperature shown are applied to body of device.

### Low Temperature Manual Soldering

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

### High Temperature Manual Soldering

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