

# EMS11HHA-5.000M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Dec 8, 2019)


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## ITEM DESCRIPTION

Spread Spectrum MEMS Clock Oscillators LVCMOS (CMOS) 1.8Vdc 4 Pad 5.0mm x 7.0mm Plastic Surface Mount (SMD) 5.000MHz  $\pm 50$ ppm Maximum over  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  Tri-State  $\pm 0.25\%$  Center Spread

## ELECTRICAL SPECIFICATIONS

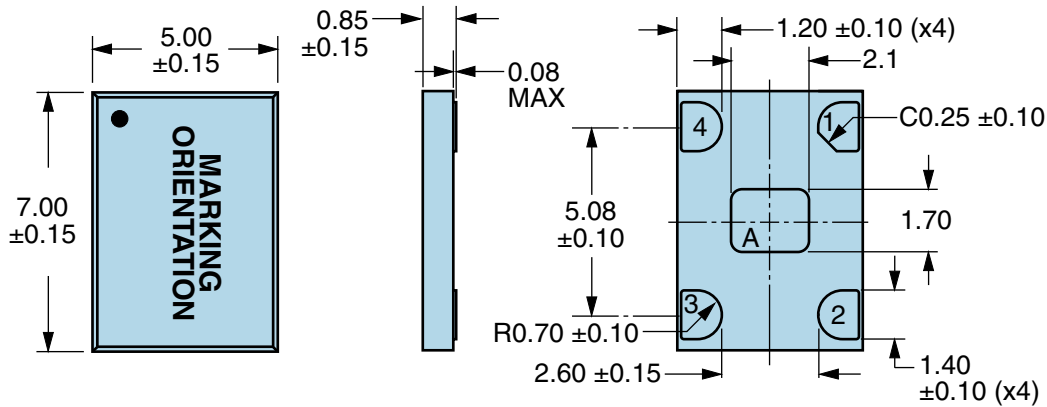
|                                       |  |
|---------------------------------------|--|
| Nominal Frequency                     | 5.000MHz   |
| Frequency Tolerance/Stability         | $\pm 50$ ppm Maximum over $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ (Inclusive of all conditions: Calibration Tolerance at $25^{\circ}\text{C}$ , Frequency Stability over the Operating Temperature Range, Supply Voltage Change, Output Load Change, First Year Aging at $25^{\circ}\text{C}$ , $260^{\circ}\text{C}$ Reflow, Shock, and Vibration) |
| Aging at $25^{\circ}\text{C}$         | $\pm 1$ ppm Maximum First Year   |
| Supply Voltage                        | 1.8Vdc $\pm 5\%$   |
| Maximum Supply Voltage                | $-0.5\text{Vdc}$ to $+1.98\text{Vdc}$  |
| Input Current                         | 25mA Maximum (Unloaded; Nominal Vdd)   |
| Output Voltage Logic High (Voh)       | 90% of Vdd Minimum (IOH= $-8\text{mA}$ )   |
| Output Voltage Logic Low (Vol)        | 10% of Vdd Maximum (IOL= $+8\text{mA}$ )   |
| Rise/Fall Time                        | 2nSec Maximum (Measured from 20% to 80% of waveform)   |
| Duty Cycle                            | 50 $\pm 5$ (%) (Measured at 50% of waveform)   |
| Load Drive Capability                 | 15pF Maximum   |
| Output Logic Type                     | CMOS   |
| Output Control Function               | Tri-State (Disabled Output High Impedance)   |
| Tri-State Input Voltage (Vih and Vil) | 70% of Vdd Minimum or No Connection to Enable Output, 30% of Vdd Maximum to Disable Output   |
| Disable Current                       | 20mA Maximum (Disabled Output: High Impedance) (Pad 1=Ground)  |
| Spread Spectrum                       | $\pm 0.25\%$ Center Spread   |
| Modulation Frequency                  | 30kHz Minimum, 32kHz Typical, 35kHz Maximum  |
| Period Jitter                         | 90pSec Maximum (Cycle to Cycle; Spread Spectrum-On; Fo=133.333M, Vdd=1.8Vdc)   |
| Start Up Time                         | 10mSec Maximum   |
| Storage Temperature Range             | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$  |

## ENVIRONMENTAL & MECHANICAL SPECIFICATIONS

|                              |  |
|------------------------------|--|
| ESD Susceptibility           | MIL-STD-883, Method 3015, Class 2, HBM 2000V                       |
| Flammability                 | UL94-V0  |
| Mechanical Shock             | MIL-STD-883, Method 2002, Condition G, 30,000G                     |
| Moisture Resistance          | MIL-STD-883, Method 1004   |
| Moisture Sensitivity Level   | 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 (Four I/O Pads on bottom of package only) |
| Temperature Cycling          | MIL-STD-883, Method 1010, Condition B                              |
| Thermal Shock                | MIL-STD-883, Method 1011, 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    | <b>XXXX or XXXXX</b><br>XXXX or XXXXX=Ecliptek Manufacturing Identifier |

Note A: Center paddle is connected internally to oscillator ground (Pad 2).

### 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><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                              |

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## Recommended Solder Reflow Methods



### Low Temperature Infrared/Convection 240°C

|  |  |
|--|--|
| <b><math>T_s</math> MAX to <math>T_L</math> (Ramp-up Rate)</b> | 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  |

### 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.