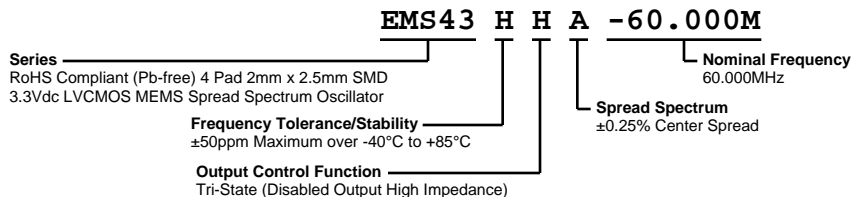


# EMS43HHA-60.000M



**ECLIPTEK**<sup>®</sup>  
CORPORATION



## ELECTRICAL SPECIFICATIONS

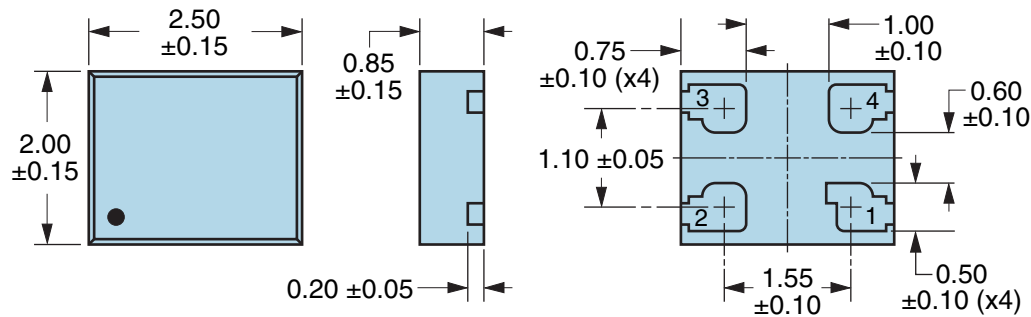
|  |  |
|--|--|
| <b>Nominal Frequency</b>                     | 60.000MHz  |
| <b>Frequency Tolerance/Stability</b>         | ±50ppm Maximum over -40°C to +85°C (Inclusive of all conditions: Calibration Tolerance at 25°C, Frequency Stability over the Operating Temperature Range, Supply Voltage Change, Output Load Change, First Year Aging at 25°C, 260°C Reflow, Shock, and Vibration) |
| <b>Aging at 25°C</b>                         | ±1ppm Maximum First Year   |
| <b>Supply Voltage</b>                        | 3.3Vdc ±10%  |
| <b>Maximum Supply Voltage</b>                | -0.5Vdc to +3.65Vdc  |
| <b>Input Current</b>                         | 40mA Maximum (Unloaded; Nominal Vdd)   |
| <b>Output Voltage Logic High (Voh)</b>       | 90% of Vdd Minimum (IOH=-8mA)  |
| <b>Output Voltage Logic Low (Vol)</b>        | 10% of Vdd Maximum (IOL=+8mA)  |
| <b>Rise/Fall Time</b>                        | 2nSec Maximum (Measured from 20% to 80% of waveform)   |
| <b>Duty Cycle</b>                            | 50 ±5% (Measured at 50% of waveform)   |
| <b>Load Drive Capability</b>                 | 15pF Maximum   |
| <b>Output Logic Type</b>                     | CMOS   |
| <b>Output Control Function</b>               | Tri-State (Disabled Output High Impedance)   |
| <b>Tri-State Input Voltage (Vih and Vil)</b> | 70% of Vdd Minimum or No Connection to Enable Output, 30% of Vdd Maximum to Disable Output   |
| <b>Disable Current</b>                       | 20mA Maximum (Disabled Output: High Impedance) (Pad 1=Ground)  |
| <b>Spread Spectrum</b>                       | ±0.25% Center Spread   |
| <b>Modulation Frequency</b>                  | 30kHz Minimum, 32kHz Typical, 35kHz Maximum  |
| <b>Period Jitter</b>                         | 30pSec Maximum (Cycle to Cycle; Spread Spectrum-On; Fo=133.333M, Vdd=3.3Vdc)   |
| <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 2, HBM 2000V              |
| <b>Flammability</b>                 | UL94-V0   |
| <b>Mechanical Shock</b>             | MIL-STD-883, Method 2002, Condition G, 30,000G            |
| <b>Moisture Resistance</b>          | MIL-STD-883, Method 1004                                  |
| <b>Moisture Sensitivity Level</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 (Pads on Bottom of Package Only) |
| <b>Temperature Cycling</b>          | MIL-STD-883, Method 1010, Condition B                     |
| <b>Thermal Shock</b>                | MIL-STD-883, Method 1011, Condition B                     |
| <b>Vibration</b>                    | MIL-STD-883, Method 2007, Condition A, 20G                |

# EMS43HHA-60.000M

## MECHANICAL DIMENSIONS (all dimensions in millimeters)



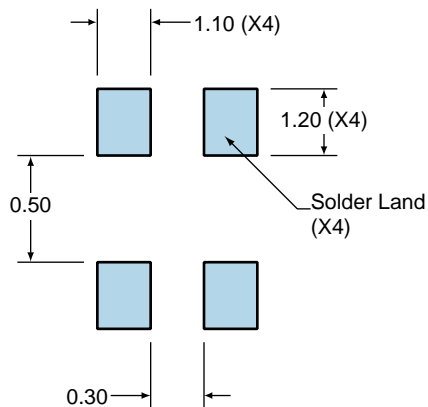
| PIN | CONNECTION                 |
|-----|----------------------------|
| 1   | Tri-State (High Impedance) |
| 2   | Ground                     |
| 3   | Output                     |
| 4   | Supply Voltage             |

| LINE | MARKING  |
|------|--|
| 1    | <b>XXXX or XXXXX</b><br>XXXX or XXXXX=Ecliptek<br>Manufacturing Lot Code |

## Suggested Solder Pad Layout

All Dimensions in Millimeters



All Tolerances are  $\pm 0.1$

# EMS43HHA-60.000M

## OUTPUT WAVEFORM & TIMING DIAGRAM



### Test Circuit for CMOS Output



Note 1: An external 0.1µF low frequency tantalum bypass capacitor in parallel with a 0.01µF high frequency ceramic bypass capacitor close to the package ground and  $V_{DD}$  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  $C_L$  includes sum of all probe and fixture capacitance.

## Recommended Solder Reflow Methods



### High Temperature Infrared/Convection

|  |                                      |
|--|--------------------------------------|
| <b><math>T_s</math> MAX to <math>T_L</math> (Ramp-up Rate)</b> | 3°C/second Maximum                   |
| <b>Preheat</b>   |                                      |
| - Temperature Minimum ( $T_s$ MIN)                             | 150°C                                |
| - Temperature Typical ( $T_s$ TYP)                             | 175°C                                |
| - Temperature Maximum ( $T_s$ MAX)                             | 200°C                                |
| - Time ( $t_s$ 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</math> Target)</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                              |

## Recommended Solder Reflow Methods



### Low Temperature Infrared/Convection 240°C

|  |  |
|--|--|
| <b>T<sub>s</sub> MAX to T<sub>L</sub> (Ramp-up Rate)</b> | 5°C/second Maximum                                     |
| <b>Preheat</b>   |  |
| - Temperature Minimum (T <sub>s</sub> MIN)               | N/A  |
| - Temperature Typical (T <sub>s</sub> TYP)               | 150°C  |
| - Temperature Maximum (T <sub>s</sub> MAX)               | N/A  |
| - Time (t <sub>s</sub> MIN)                              | 60 - 120 Seconds                                       |
| <b>Ramp-up Rate (T<sub>L</sub> to T<sub>p</sub>)</b>     | 5°C/second Maximum                                     |
| <b>Time Maintained Above:</b>                            |  |
| - Temperature (T <sub>L</sub> )                          | 150°C  |
| - Time (t <sub>L</sub> )                                 | 200 Seconds Maximum                                    |
| <b>Peak Temperature (T<sub>p</sub>)</b>                  | 240°C Maximum  |
| <b>Target Peak Temperature (T<sub>p</sub> Target)</b>    | 240°C Maximum 1 Time / 230°C Maximum 2 Times           |
| <b>Time within 5°C of actual peak (t<sub>p</sub>)</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.