

# EMRA11U2H-4.000M TR

[Click part number to visit Part Number Details page](#)

## REGULATORY COMPLIANCE (Data Sheet downloaded on Jun 18, 2020)


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## ITEM DESCRIPTION

MEMS Clock Oscillators LVCMOS (CMOS) 1.8Vdc 4 Pad 5.0mm x 7.0mm Plastic Surface Mount (SMD) 4.000MHz  $\pm$ 25ppm over -40°C to +125°C

## ELECTRICAL SPECIFICATIONS

|  |  |
|--|--|
| Nominal Frequency                                | 4.000MHz   |
| Frequency Tolerance/Stability                    | $\pm$ 25ppm Maximum over -40°C to +125°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                                   | 1.8Vdc $\pm$ 10%   |
| Input Current                                    | 4.5mA Maximum (No Load)  |
| Output Voltage Logic High (Voh)                  | 90% of Vdd Minimum (IOH = -2mA)  |
| Output Voltage Logic Low (Vol)                   | 10% of Vdd Maximum (IOL = +2mA)  |
| Rise/Fall Time                                   | 1.5nSec Typical, 3.5nSec 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)  |
| 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, 5pSec 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                         |

## EMRA11U2H-4.000M TR [Click part number to visit Part Number Details page](#)

### 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 |

### Suggested Solder Pad Layout

All Dimensions in Millimeters



All Tolerances are  $\pm 0.1$

# EMRA11U2H-4.000M TR [Click part number to visit Part Number Details page](#)

## OUTPUT WAVEFORM & TIMING DIAGRAM



# EMRA11U2H-4.000M TR [Click part number to visit Part Number Details page](#)

## 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 C<sub>L</sub> includes sum of all probe and fixture capacitance. See applicable specification sheet for 'Load Drive Capability'.

# EMRA11U2H-4.000M TR

## Tape & Reel Dimensions

Quantity Per Reel: 1,000 units

All Dimensions in Millimeters

Compliant to EIA-481



# EMRA11U2H-4.000M TR [Click part number to visit Part Number Details page](#)

## 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  |
| <b>Additional Notes</b>  | Temperature shown are applied to body of device. |

# EMRA11U2H-4.000M TR [Click part number to visit Part Number Details page](#)

## 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  |
| <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.)

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