

# EMK31G2J-16.400M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on Sep 6, 2018)


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## ITEM DESCRIPTION

MEMS Clock Oscillators LVCMOS (CMOS) 1.8Vdc 4 Pad 2.5mm x 3.2mm Plastic Surface Mount (SMD) 16.400MHz  $\pm 100$ ppm over -40°C to +85°C

## ELECTRICAL SPECIFICATIONS

|                                 |                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency               | 16.400MHz                                                                                                                                                                                                                                                                 |
| Frequency Tolerance/Stability   | $\pm 100$ ppm 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) |
| Aging at 25°C                   | $\pm 1$ ppm Maximum First Year                                                                                                                                                                                                                                            |
| Supply Voltage                  | 1.8Vdc $\pm 5\%$                                                                                                                                                                                                                                                          |
| Input Current                   | 15mA Maximum                                                                                                                                                                                                                                                              |
| Output Voltage Logic High (Voh) | 90% of Vdd Minimum (IOH=-8mA)                                                                                                                                                                                                                                             |
| Output Voltage Logic Low (Vol)  | 10% of Vdd Maximum (IOL=+8mA)                                                                                                                                                                                                                                             |
| 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         | Power Down (Disabled Output: Logic Low)                                                                                                                                                                                                                                   |
| Output Control Input Voltage    | +0.7Vdd Minimum or No Connect to Enable Output, +0.3Vdd Maximum to Disable Output                                                                                                                                                                                         |
| Standby Current                 | 50 $\mu$ A Maximum (Disabled Output: Logic Low)                                                                                                                                                                                                                           |
| Peak to Peak Jitter (tPK)       | 250pSec Maximum, 100pSec Typical                                                                                                                                                                                                                                          |
| Start Up Time                   | 50mSec Maximum                                                                                                                                                                                                                                                            |
| Storage Temperature Range       | -55°C to +125°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 (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   | Power Down     |
| 2   | Ground         |
| 3   | Output         |
| 4   | Supply Voltage |

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

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  $0.01\mu F$  ceramic bypass capacitor in parallel with a  $0.1\mu F$  high frequency ceramic bypass capacitor close (less than 2mm) to the package ground and supply voltage pin is required.

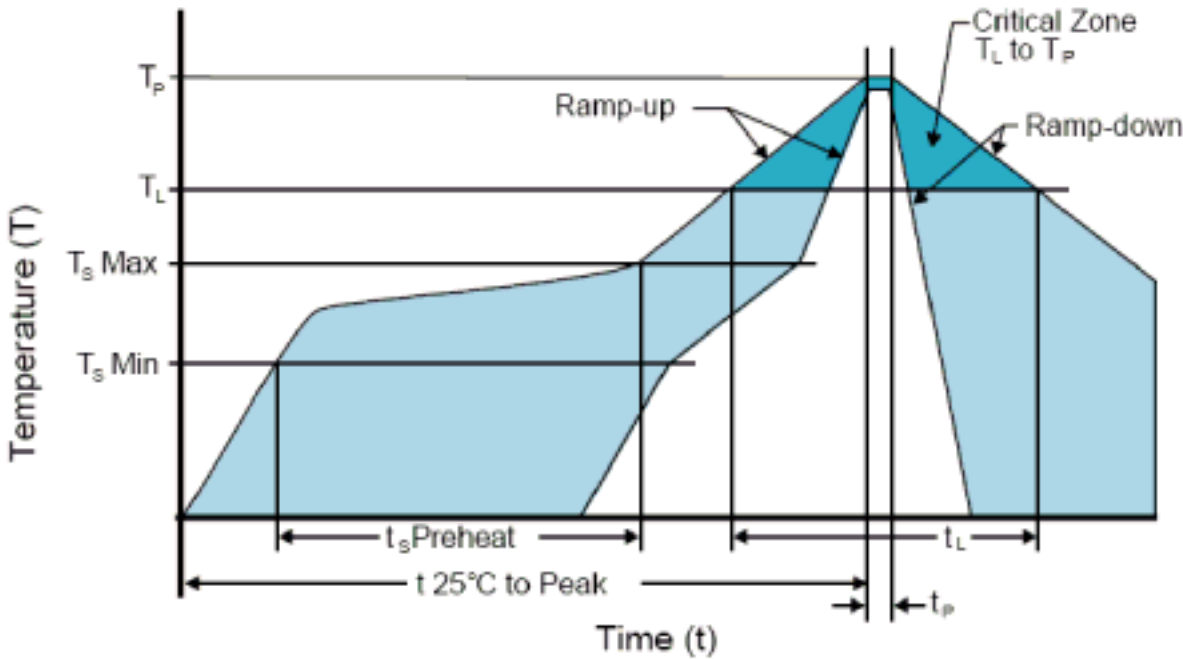
Note 2: A low input capacitance ( $<12pF$ ), 10X Attenuation Factor, High Impedance ( $>10M\Omega$ ), and High bandwidth ( $>300MHz$ ) passive probe is recommended.

Note 3: Capacitance value  $C_L$  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

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| Ts MAX to TL (Ramp-up Rate)         | 3°C/Second Maximum                   |
| Preheat                             |                                      |
| - Temperature Minimum (Ts MIN)      | 150°C                                |
| - Temperature Typical (Ts TYP)      | 175°C                                |
| - Temperature Maximum (Ts MAX)      | 200°C                                |
| - Time (ts MIN)                     | 60 - 180 Seconds                     |
| Ramp-up Rate (TL to TP)             | 3°C/Second Maximum                   |
| Time Maintained Above:              |                                      |
| - Temperature (TL)                  | 217°C                                |
| - Time (tL)                         | 60 - 150 Seconds                     |
| Peak Temperature (TP)               | 260°C Maximum for 10 Seconds Maximum |
| Target Peak Temperature (TP Target) | 250°C +0/-5°C                        |
| Time within 5°C of actual peak (tp) | 20 - 40 Seconds                      |
| Ramp-down Rate                      | 6°C/Second Maximum                   |
| Time 25°C to Peak Temperature (t)   | 8 Minutes Maximum                    |
| Moisture Sensitivity Level          | Level 1                              |

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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                                     |
| Preheat                             |                                                        |
| - Temperature Minimum (TS MIN)      | N/A                                                    |
| - Temperature Typical (TS TYP)      | 150°C                                                  |
| - Temperature Maximum (TS MAX)      | N/A                                                    |
| - Time (ts MIN)                     | 60 - 120 Seconds                                       |
| Ramp-up Rate (TL to TP)             | 5°C/Second Maximum                                     |
| Time Maintained Above:              |                                                        |
| - Temperature (TL)                  | 150°C                                                  |
| - Time (tL)                         | 200 Seconds Maximum                                    |
| Peak Temperature (TP)               | 240°C Maximum                                          |
| Target Peak Temperature (TP Target) | 240°C Maximum 2 Times / 230°C Maximum 1 Time           |
| Time within 5°C of actual peak (tP) | 10 Seconds Maximum 2 Times / 80 Seconds Maximum 1 Time |
| Ramp-down Rate                      | 5°C/Second Maximum                                     |
| Time 25°C to Peak Temperature (t)   | N/A                                                    |
| Moisture Sensitivity Level          | 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.