

**EMDS13H2H-13.513M**
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**REGULATORY COMPLIANCE** (Data Sheet downloaded on Apr 27, 2017)
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**ITEM DESCRIPTION**

MEMS Clock Oscillators LVDS (DS) 3.3Vdc 6 Pad 5.0mm x 7.0mm Plastic Surface Mount (SMD) 13.513MHz  $\pm 50$ ppm over -40°C to +85°C

**ELECTRICAL SPECIFICATIONS**

|                                                   |                                                                                                                                                                                                                                                                    |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                                 | 13.513MHz                                                                                                                                                                                                                                                          |
| Frequency Tolerance/Stability                     | $\pm 50$ 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, Reflow, Shock, and Vibration) |
| Aging at 25°C                                     | $\pm 1$ ppm Maximum First Year                                                                                                                                                                                                                                     |
| Supply Voltage                                    | 3.3Vdc $\pm 10\%$                                                                                                                                                                                                                                                  |
| Input Current                                     | 80mA Maximum (Excluding Load Termination Current)                                                                                                                                                                                                                  |
| Output Voltage Logic High (Voh)                   | 1.425Vdc Typical                                                                                                                                                                                                                                                   |
| Output Voltage Logic Low (Vol)                    | 1.075Vdc Typical                                                                                                                                                                                                                                                   |
| Differential Output Error (dVod)                  | 50mVdc Maximum                                                                                                                                                                                                                                                     |
| Differential Output Voltage (Vod)                 | 247mVdc Minimum, 350mVdc Typical, 454mVdc Maximum                                                                                                                                                                                                                  |
| Offset Voltage (Vos)                              | 1.125V Minimum, 1.250V Typical, 1.375V Maximum                                                                                                                                                                                                                     |
| Rise/Fall Time                                    | 225pSec Typical, 325pSec Maximum (Measured over 20% to 80% of waveform)                                                                                                                                                                                            |
| Duty Cycle                                        | 50 $\pm 5$ (%) (Measured at 50% of waveform)                                                                                                                                                                                                                       |
| Offset Error (dVos)                               | 50mVdc Maximum                                                                                                                                                                                                                                                     |
| Load Drive Capability                             | 100 Ohms Between Output and Complementary Output                                                                                                                                                                                                                   |
| Output Logic Type                                 | LVDS                                                                                                                                                                                                                                                               |
| Logic Control / Additional Output                 | Output Enable (OE) and Complementary Output                                                                                                                                                                                                                        |
| Output Control Input Voltage                      | Vih of 70% of Vdd Minimum or No Connect to Enable Output and Complementary Output, Vil of 30% of Vdd Maximum to Disable Output and Complementary Output (High Impedance)                                                                                           |
| Output Enable Current                             | 75mA Maximum (Without Load)                                                                                                                                                                                                                                        |
| Period Jitter (Deterministic)                     | 0.2pSec Typical                                                                                                                                                                                                                                                    |
| Period Jitter (Random)                            | 2.0pSec Typical                                                                                                                                                                                                                                                    |
| Period Jitter (RMS)                               | 1.8pSec Typical, 2.5pSec Maximum                                                                                                                                                                                                                                   |
| Period Jitter (pk-pk)                             | 25pSec Typical, 30pSec Maximum                                                                                                                                                                                                                                     |
| RMS Phase Jitter (Fj = 637kHz to 10MHz; Random)   | 2.1pSec Typical                                                                                                                                                                                                                                                    |
| RMS Phase Jitter (Fj = 1MHz to 20MHz; Random)     | 1.7pSec Typical                                                                                                                                                                                                                                                    |
| RMS Phase Jitter (Fj = 1.875MHz to 20MHz; Random) | 1.5pSec Typical                                                                                                                                                                                                                                                    |
| Start Up Time                                     | 10mSec 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                               |

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ENVIRONMENTAL & MECHANICAL SPECIFICATIONS CONTINUED

|                              |                                                                   |
|------------------------------|-------------------------------------------------------------------|
| 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 (Six 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   | Output Enable (OE)   |
| 2   | No Connect           |
| 3   | Case Ground          |
| 4   | Output               |
| 5   | Complementary Output |
| 6   | Supply Voltage       |

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

Note A: Center paddle is connected internally to oscillator ground (Pad 3).

Suggested Solder Pad Layout

All Dimensions in Millimeters



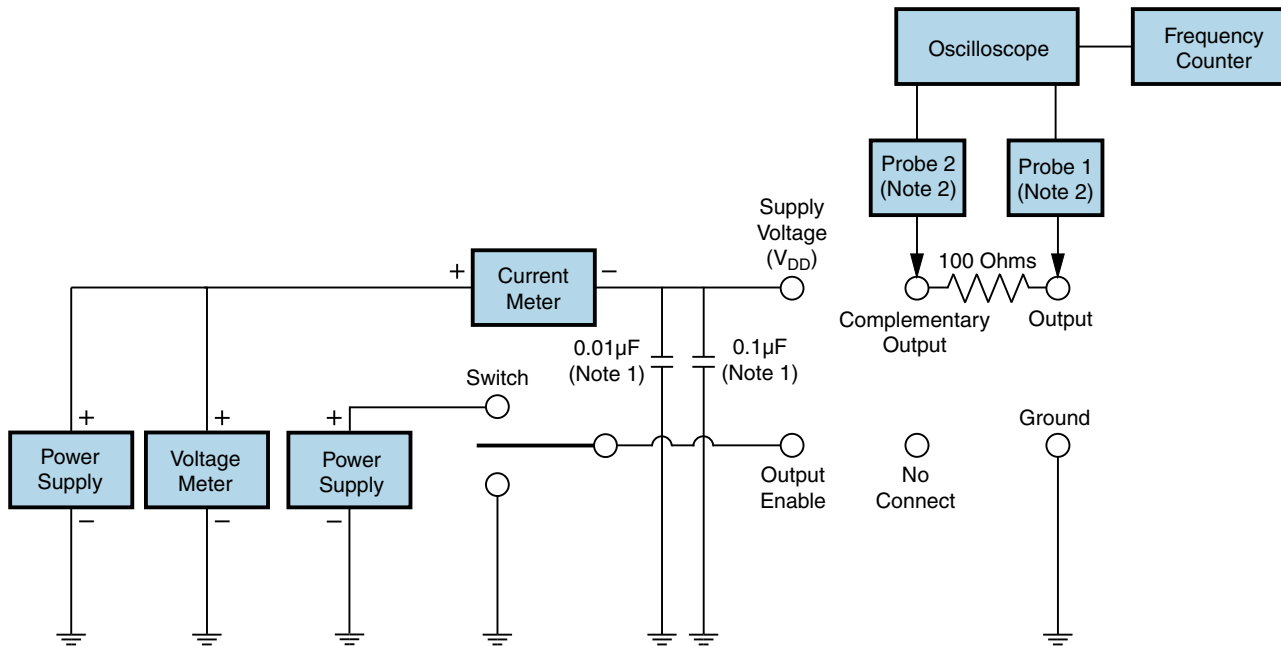
All Tolerances are ±0.1

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OUTPUT WAVEFORM & TIMING DIAGRAM



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**Test Circuit for Output Enable and Complementary 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 ( $>500\text{MHz}$ ) passive probe is recommended.

Note 3: Test circuit PCB traces need to be designed for a characteristic line impedance of 50 ohms.

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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.