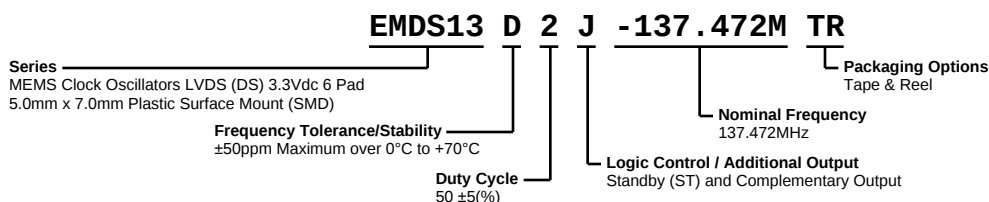


# EMDS13D2J-137.472M TR



## ELECTRICAL SPECIFICATIONS

|                                                   |                                                                                                                                                                                                                                                          |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                                 | 137.472MHz                                                                                                                                                                                                                                               |
| Frequency Tolerance/Stability                     | ±50ppm Maximum over 0°C to +70°C (Inclusive of all conditions: Calibration Tolerance at 25°C, Frequency Stability over the Operating Temperature Range, Supply Voltage Change, Output Load Change, 1st Year Aging at 25°C, Reflow, Shock, and Vibration) |
| Aging at 25°C                                     | ±1ppm First Year Maximum                                                                                                                                                                                                                                 |
| Supply Voltage                                    | +3.3Vdc ±0.3Vdc                                                                                                                                                                                                                                          |
| 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 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)                                                                                                                                                                                  |
| Differential Output Error (dVod)                  | 50mVdc Maximum                                                                                                                                                                                                                                           |
| Duty Cycle                                        | 50 ±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                 | Standby (ST) and Complementary Output                                                                                                                                                                                                                    |
| Output Control Input Voltage                      | Vih of 70% of Vcc Minimum or No Connect to Enable Output and Complementary Output, Vil of 30% of Vcc Maximum to Disable Output and Complementary Output (High Impedance)                                                                                 |
| Standby Current                                   | 30µA Maximum (ST) 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)   | 1.7pSec Typical                                                                                                                                                                                                                                          |
| RMS Phase Jitter (Fj = 1MHz to 20MHz; Random)     | 1.2pSec Typical                                                                                                                                                                                                                                          |
| RMS Phase Jitter (Fj = 1.875MHz to 20MHz; Random) | 0.7pSec 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                                                  |
| 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                             |

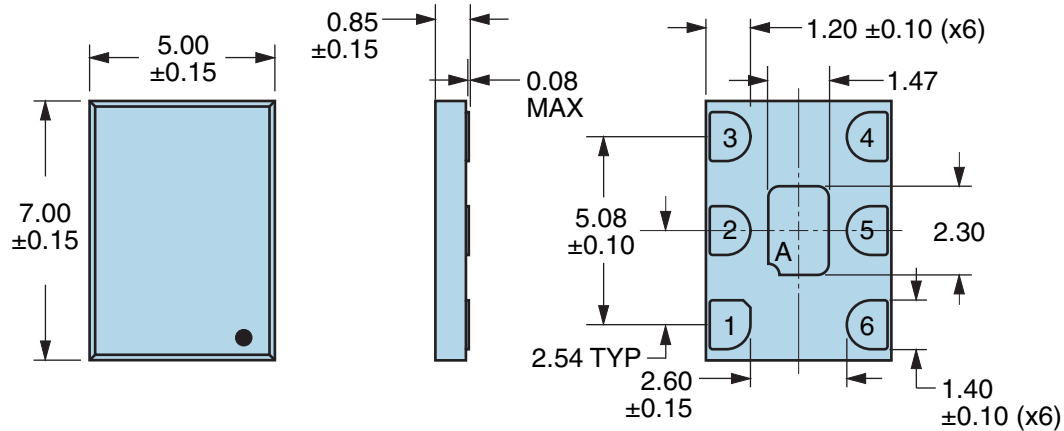
# EMDS13D2J-137.472M TR



|               |                                            |
|---------------|--------------------------------------------|
| Thermal Shock | MIL-STD-883, Method 1011, Condition B      |
| Vibration     | MIL-STD-883, Method 2007, Condition A, 20G |

# EMDS13D2J-137.472M TR

## MECHANICAL DIMENSIONS (all dimensions in millimeters)



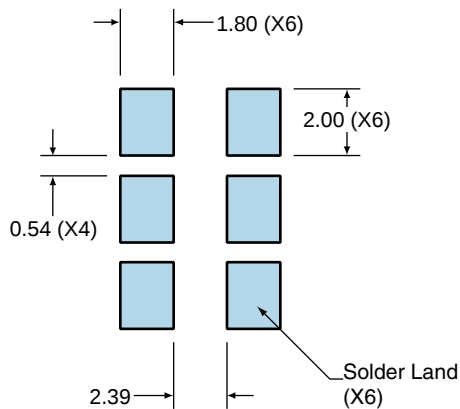
| PIN | CONNECTION           |
|-----|----------------------|
| 1   | Standby (ST)         |
| 2   | No Connect           |
| 3   | Case Ground          |
| 4   | Output               |
| 5   | Complementary Output |
| 6   | Supply Voltage       |

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

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

## Suggested Solder Pad Layout

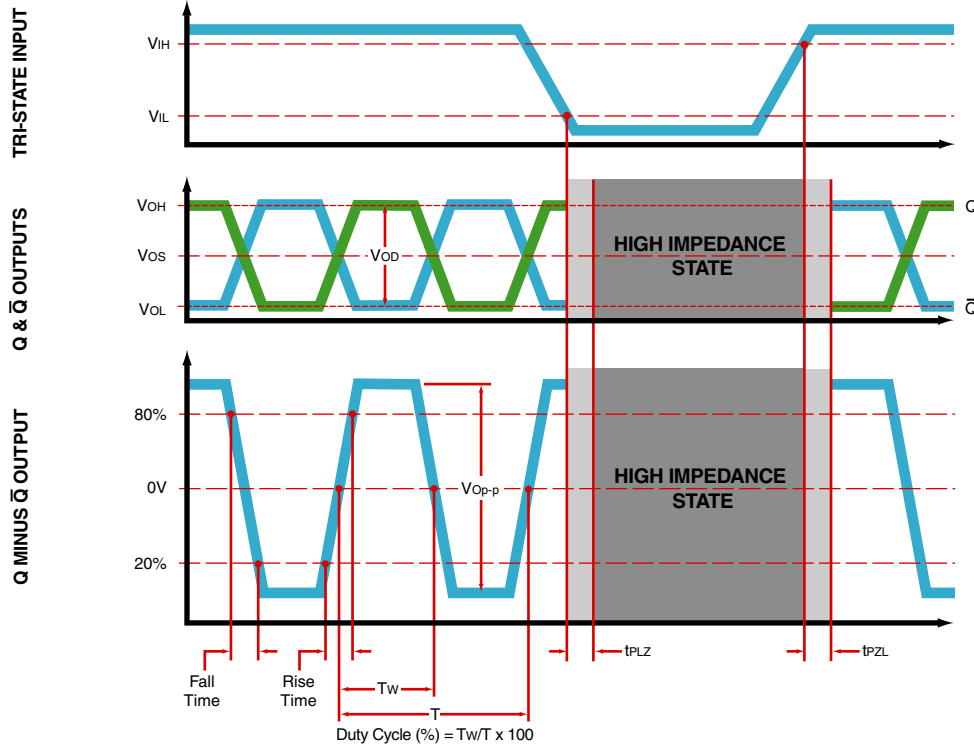
All Dimensions in Millimeters



All Tolerances are  $\pm 0.1$

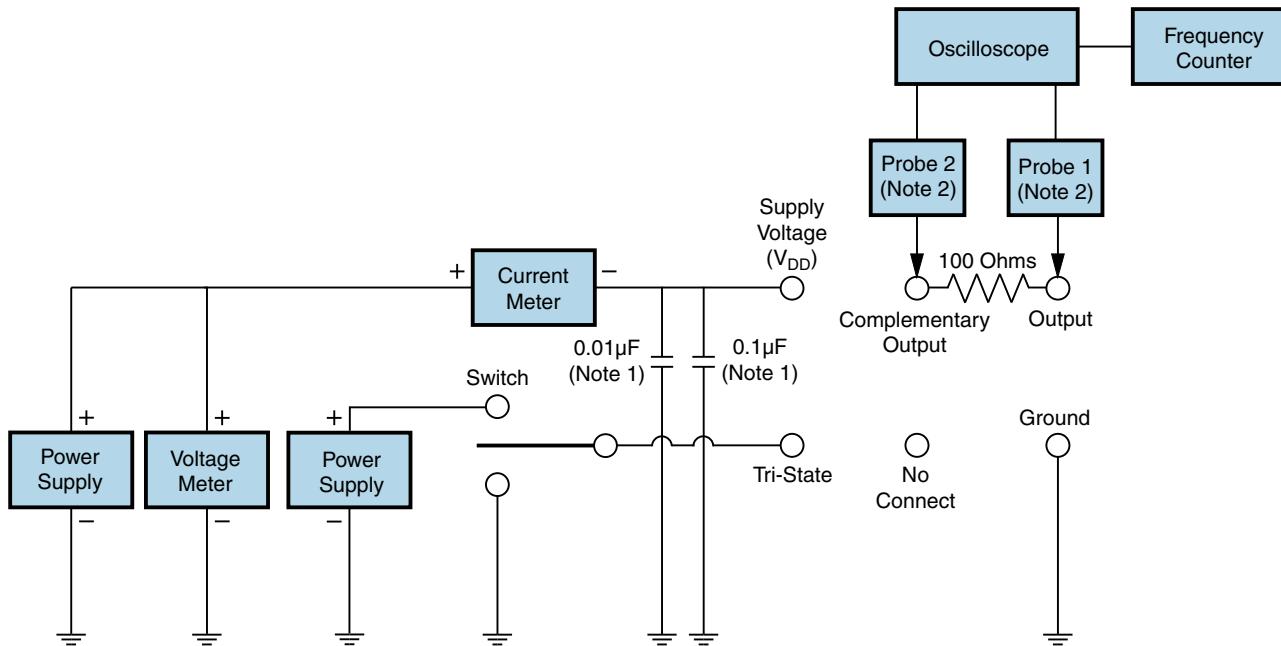
# EMDS13D2J-137.472M TR

## OUTPUT WAVEFORM & TIMING DIAGRAM



# EMDS13D2J-137.472M TR

## Test Circuit for Tri-State and Complementary Output

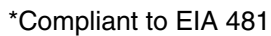


Note 1: An external  $0.01\mu\text{F}$  ceramic bypass capacitor in parallel with a  $0.1\mu\text{F}$  high frequency ceramic bypass capacitor close (less than 2mm) to the package ground and supply voltage pin is required.

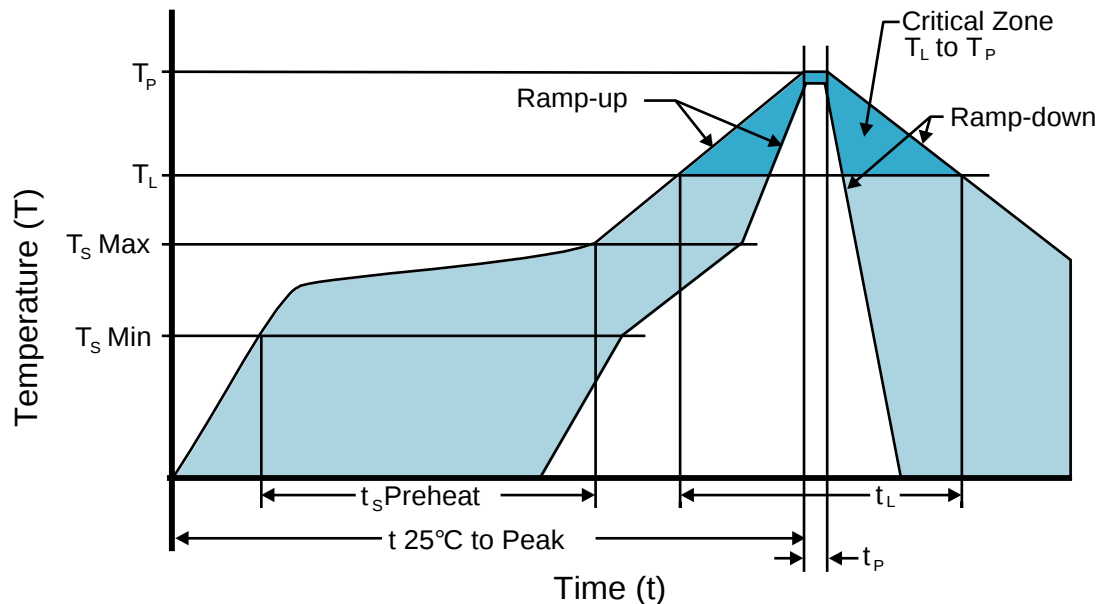
Note 2: A low capacitance ( $<12\text{pF}$ ), 10X attenuation factor, high impedance ( $>10\text{Mohms}$ ), and high bandwidth ( $>500\text{MHz}$ ) passive probe is recommended.

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

Quantity Per Reel: 1,000 units



## Recommended Solder Reflow Methods



### High Temperature Infrared/Convection

|                                    |                    |
|------------------------------------|--------------------|
| <b>TS MAX to TL (Ramp-up Rate)</b> | 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 |

|                                |                    |
|--------------------------------|--------------------|
| <b>Ramp-up Rate (TL to TP)</b> | 3°C/second Maximum |
|--------------------------------|--------------------|

#### Time Maintained Above:

|                    |                  |
|--------------------|------------------|
| - Temperature (TL) | 217°C            |
| - Time (tL)        | 60 - 150 Seconds |

|                              |                                      |
|------------------------------|--------------------------------------|
| <b>Peak Temperature (TP)</b> | 260°C Maximum for 10 Seconds Maximum |
|------------------------------|--------------------------------------|

|                                            |               |
|--------------------------------------------|---------------|
| <b>Target Peak Temperature (TP Target)</b> | 250°C +0/-5°C |
|--------------------------------------------|---------------|

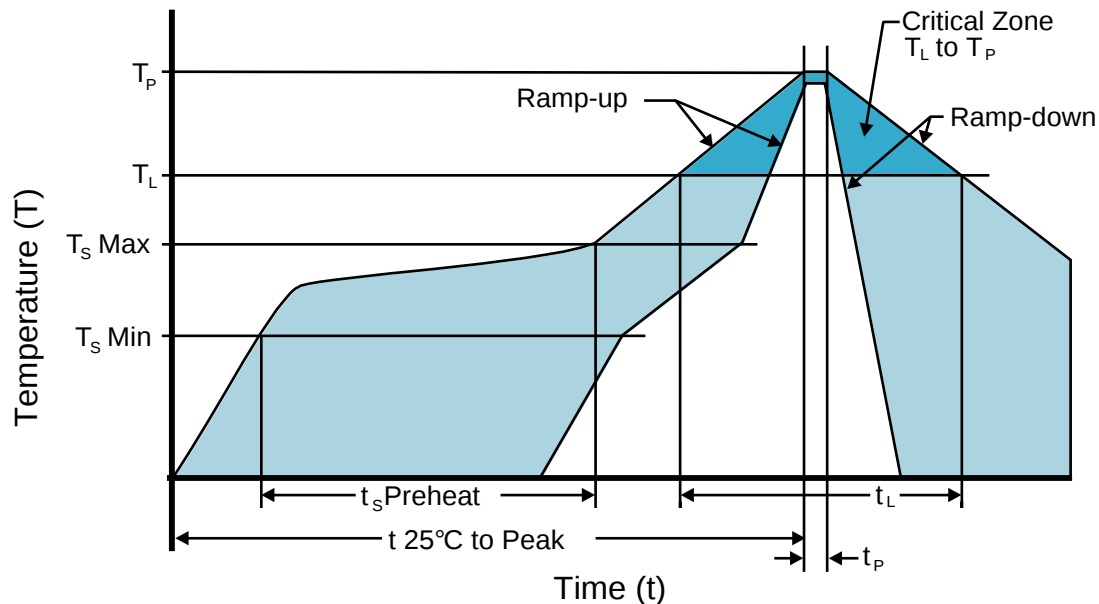
|                                            |                 |
|--------------------------------------------|-----------------|
| <b>Time within 5°C of actual peak (tp)</b> | 20 - 40 seconds |
|--------------------------------------------|-----------------|

|                       |                    |
|-----------------------|--------------------|
| <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

T<sub>s</sub> MAX to T<sub>L</sub> (Ramp-up Rate) 5°C/second Maximum

#### Preheat

- 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

Ramp-up Rate (T<sub>L</sub> to T<sub>P</sub>) 5°C/second Maximum

#### Time Maintained Above:

- Temperature (T<sub>L</sub>) 150°C  
 - Time (t<sub>L</sub>) 200 Seconds Maximum

Peak Temperature (T<sub>P</sub>) 240°C Maximum

Target Peak Temperature (T<sub>P</sub> Target) 240°C Maximum 2 Times / 230°C Maximum 1 Time

Time within 5°C of actual peak (t<sub>p</sub>) 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.