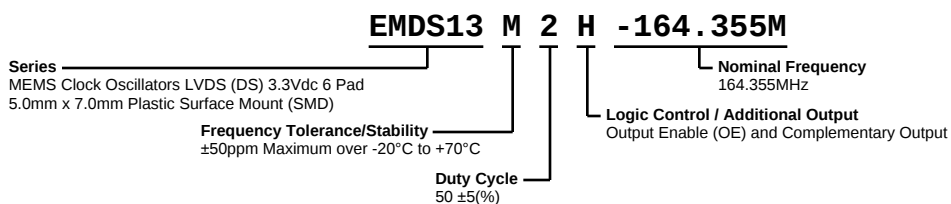


# EMDS13M2H-164.355M



## ELECTRICAL SPECIFICATIONS

|                                                   |                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                                 | 164.355MHz                                                                                                                                                                                                                                                                                                                                 |
| Frequency Tolerance/Stability                     | $\pm 50\text{ppm}$ Maximum over $-20^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ (Inclusive of all conditions: Calibration Tolerance at $25^{\circ}\text{C}$ , Frequency Stability over the Operating Temperature Range, Supply Voltage Change, Output Load Change, First Year Aging at $25^{\circ}\text{C}$ , Reflow, Shock, and Vibration) |
| Aging at $25^{\circ}\text{C}$                     | $\pm 1\text{ppm}$ First Year Maximum                                                                                                                                                                                                                                                                                                       |
| Supply Voltage                                    | $+3.3\text{Vdc} \pm 0.3\text{Vdc}$                                                                                                                                                                                                                                                                                                         |
| 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                                        | $50 \pm 5(\%)$ (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)   | 1.6pSec Typical                                                                                                                                                                                                                                                                                                                            |
| RMS Phase Jitter (Fj = 1MHz to 20MHz; Random)     | 0.7pSec Typical                                                                                                                                                                                                                                                                                                                            |
| RMS Phase Jitter (Fj = 1.875MHz to 20MHz; Random) | 0.6pSec Typical                                                                                                                                                                                                                                                                                                                            |
| Start Up Time                                     | 10mSec Maximum                                                                                                                                                                                                                                                                                                                             |
| Storage Temperature Range                         | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$                                                                                                                                                                                                                                                                                            |

## 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                             |

# EMDS13M2H-164.355M



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

# EMDS13M2H-164.355M

## 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 |

## Suggested Solder Pad Layout

All Dimensions in Millimeters



All Tolerances are ±0.1

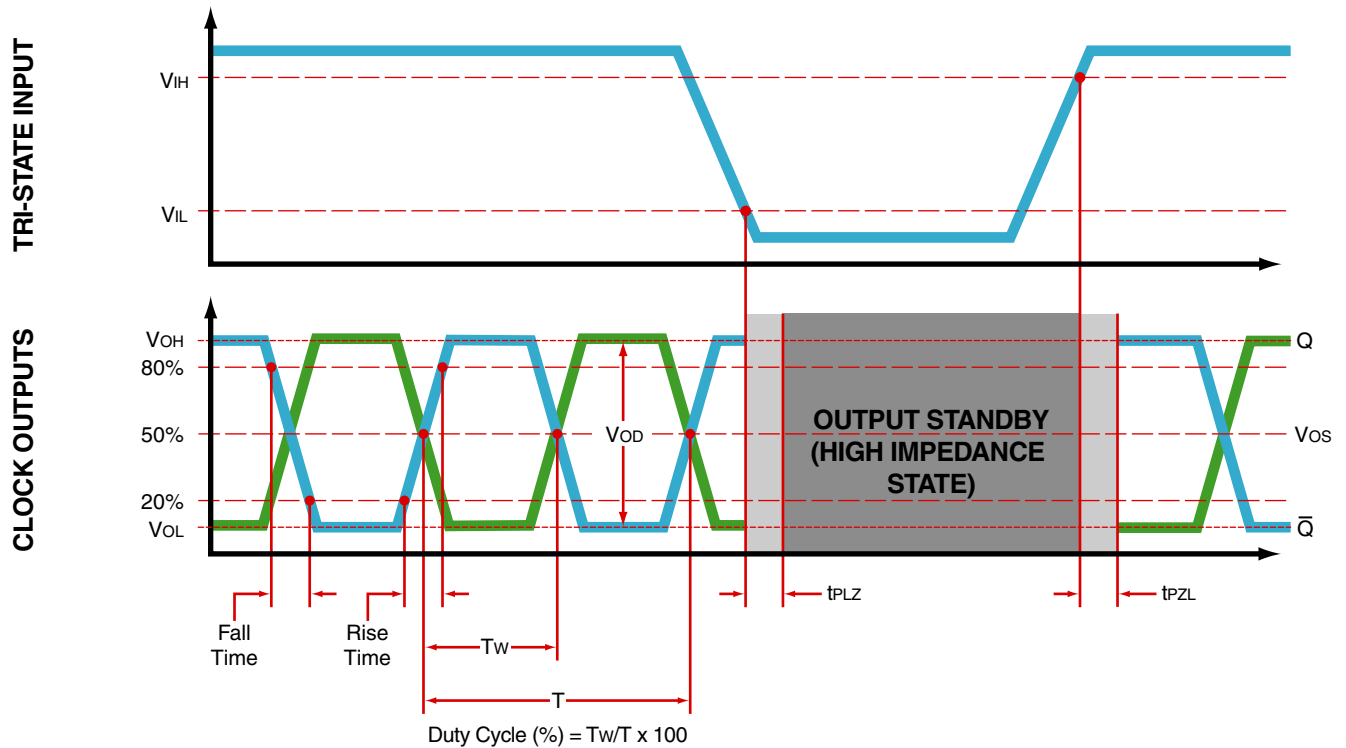
# EMDS13M2H-164.355M

## OUTPUT WAVEFORM & TIMING DIAGRAM



# EMDS13M2H-164.355M

## OUTPUT WAVEFORM & TIMING DIAGRAM



# EMDS13M2H-164.355M

## 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.



The schematic diagram illustrates the experimental setup for measuring the frequency response of a common-emitter amplifier. The circuit includes the following components and connections:

- Power Supply:** A DC power supply connected to the circuit.
- Voltage Meter:** Connected in parallel with the input signal source.
- Current Meter:** Connected in series with the input signal source.
- Switch:** A switch that can be connected to either the input signal source or ground.
- 100 Ohm Resistor:** A resistor connected between the input and output of the amplifier.
- Oscilloscope:** Connected to the output of the amplifier to measure the output signal.
- Frequency Counter:** Connected to the output of the amplifier to measure the frequency of the output signal.

The circuit is connected to a common-emitter amplifier circuit, which is shown in the diagram. The input signal is provided by a voltage source ( $V_{DD}$ ) and the output is measured by the oscilloscope. The circuit is connected to a common-emitter amplifier circuit, which is shown in the diagram.

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

## Recommended Solder Reflow Methods



### High Temperature Infrared/Convection

|                                   |                    |
|-----------------------------------|--------------------|
| $T_S$ MAX to $T_L$ (Ramp-up Rate) | 3°C/second Maximum |
|-----------------------------------|--------------------|

#### Preheat

|                                    |                  |
|------------------------------------|------------------|
| - 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 |

|                                 |                    |
|---------------------------------|--------------------|
| Ramp-up Rate ( $T_L$ to $T_P$ ) | 3°C/second Maximum |
|---------------------------------|--------------------|

#### Time Maintained Above:

|                         |                  |
|-------------------------|------------------|
| - Temperature ( $T_L$ ) | 217°C            |
| - Time ( $t_L$ )        | 60 - 150 Seconds |

|                            |                                      |
|----------------------------|--------------------------------------|
| Peak Temperature ( $T_P$ ) | 260°C Maximum for 10 Seconds Maximum |
|----------------------------|--------------------------------------|

|                                         |               |
|-----------------------------------------|---------------|
| Target Peak Temperature ( $T_P$ Target) | 250°C +0/-5°C |
|-----------------------------------------|---------------|

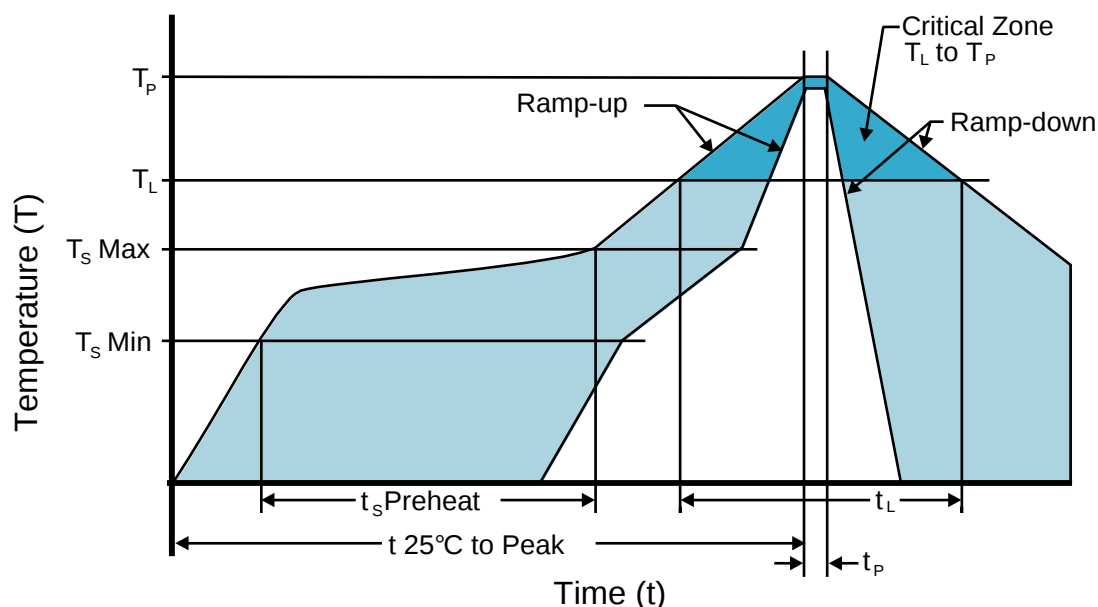
|                                          |                 |
|------------------------------------------|-----------------|
| Time within 5°C of actual peak ( $t_p$ ) | 20 - 40 seconds |
|------------------------------------------|-----------------|

|                |                    |
|----------------|--------------------|
| Ramp-down Rate | 6°C/second Maximum |
|----------------|--------------------|

|                                   |                   |
|-----------------------------------|-------------------|
| Time 25°C to Peak Temperature (t) | 8 minutes Maximum |
|-----------------------------------|-------------------|

|                            |         |
|----------------------------|---------|
| Moisture Sensitivity Level | Level 1 |
|----------------------------|---------|

## Recommended Solder Reflow Methods



### Low Temperature Infrared/Convection 240°C

$T_S$  MAX to  $T_L$  (Ramp-up Rate) 5°C/second Maximum

#### Preheat

- 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

Ramp-up Rate ( $T_L$  to  $T_P$ ) 5°C/second Maximum

#### Time Maintained Above:

- Temperature ( $T_L$ ) 150°C  
 - Time ( $t_L$ ) 200 Seconds Maximum

Peak Temperature ( $T_P$ ) 240°C Maximum

Target Peak Temperature ( $T_P$  Target) 240°C Maximum 2 Times / 230°C Maximum 1 Time

Time within 5°C of actual peak ( $t_P$ ) 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.