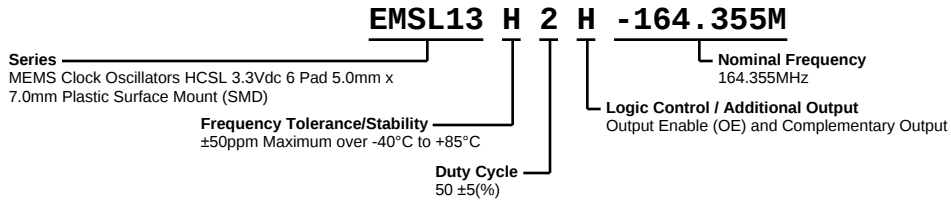


# EMSL13H2H-164.355M



## ELECTRICAL SPECIFICATIONS

|                                                   |                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                                 | 164.355MHz                                                                                                                                                                                                                                                                                                                                 |
| Frequency Tolerance/Stability                     | $\pm 50\text{ppm}$ Maximum over $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ (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                                     | 70mA Maximum (Excluding Load Termination Current)                                                                                                                                                                                                                                                                                          |
| Output Voltage Logic High (Voh)                   | 600mVdc Minimum, 750mVdc Typical, 950mVdc Maximum                                                                                                                                                                                                                                                                                          |
| Output Voltage Logic Low (Vol)                    | 0mVdc Minimum, 25mVdc Typical, 50mVdc Maximum                                                                                                                                                                                                                                                                                              |
| Rise/Fall Time                                    | 300pSec Typical, 350pSec Maximum (Measured over 20% to 80% of waveform)                                                                                                                                                                                                                                                                    |
| Duty Cycle                                        | 50 $\pm 5(\%)$ (Measured at 50% of waveform)                                                                                                                                                                                                                                                                                               |
| Output Swing (VOpp)                               | 600mVdc Minimum, 750mVdc Typical, 950mVdc Maximum                                                                                                                                                                                                                                                                                          |
| Load Drive Capability                             | 50 Ohms to Ground (Output and Complementary Output)                                                                                                                                                                                                                                                                                        |
| Output Logic Type                                 | HCSL                                                                                                                                                                                                                                                                                                                                       |
| 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                             | 65mA Maximum (Without Load)                                                                                                                                                                                                                                                                                                                |
| Period Jitter (Deterministic)                     | 0.2pSec Typical                                                                                                                                                                                                                                                                                                                            |
| Period Jitter (Random)                            | 2.0pSec Typical                                                                                                                                                                                                                                                                                                                            |
| Period Jitter (RMS)                               | 1.5pSec Typical, 3.0pSec Maximum                                                                                                                                                                                                                                                                                                           |
| Period Jitter (pk-pk)                             | 20pSec Typical, 25pSec Maximum                                                                                                                                                                                                                                                                                                             |
| Period Jitter (Cycle to Cycle)                    | 10pSec Typical                                                                                                                                                                                                                                                                                                                             |
| RMS Phase Jitter (Fj = 637kHz to 10MHz; Random)   | 1.6pSec Typical                                                                                                                                                                                                                                                                                                                            |
| RMS Phase Jitter (Fj = 1.5MHz to 22MHz; Random)   | 0.4pSec Typical                                                                                                                                                                                                                                                                                                                            |
| RMS Phase Jitter (Fj = 1.875MHz to 20MHz; Random) | 0.4pSec 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                             |
| Thermal Shock                | MIL-STD-883, Method 1011, Condition B                             |
| Vibration                    | MIL-STD-883, Method 2007, Condition A, 20G                        |

# EMSL13H2H-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

# EMSL13H2H-164.355M

## OUTPUT WAVEFORM & TIMING DIAGRAM



# EMSL13H2H-164.355M

## OUTPUT WAVEFORM & TIMING DIAGRAM



## Test Circuit for Output Enable and Complementary 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 capacitance (<12pF), 10X attenuation factor, high impedance (>10Mohms), and high bandwidth (>500MHz) passive probe is recommended.

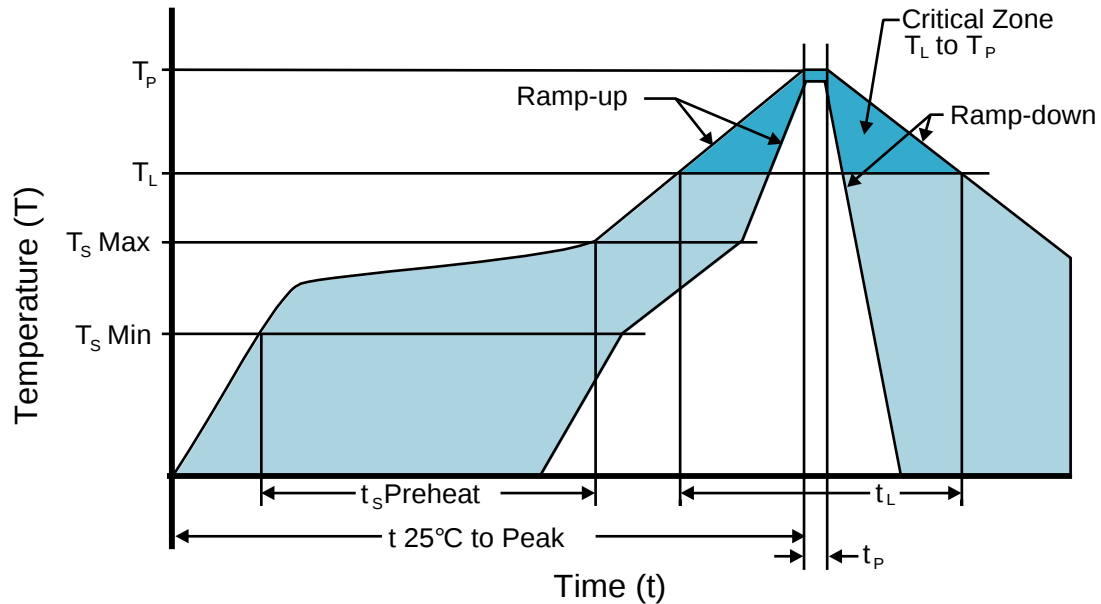
Note 3: Test circuit PCB traces need to be designed for a characteristic line impedance of 50 ohms.

Note 4: A 10 ohm to 33 ohm series resistor is required to limit overshoot.  $R_s$  value is circuit layout dependant.

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 4: A 10 ohm to 33 ohm series resistor is required to limit overshoot. Rs value is circuit layout dependant.

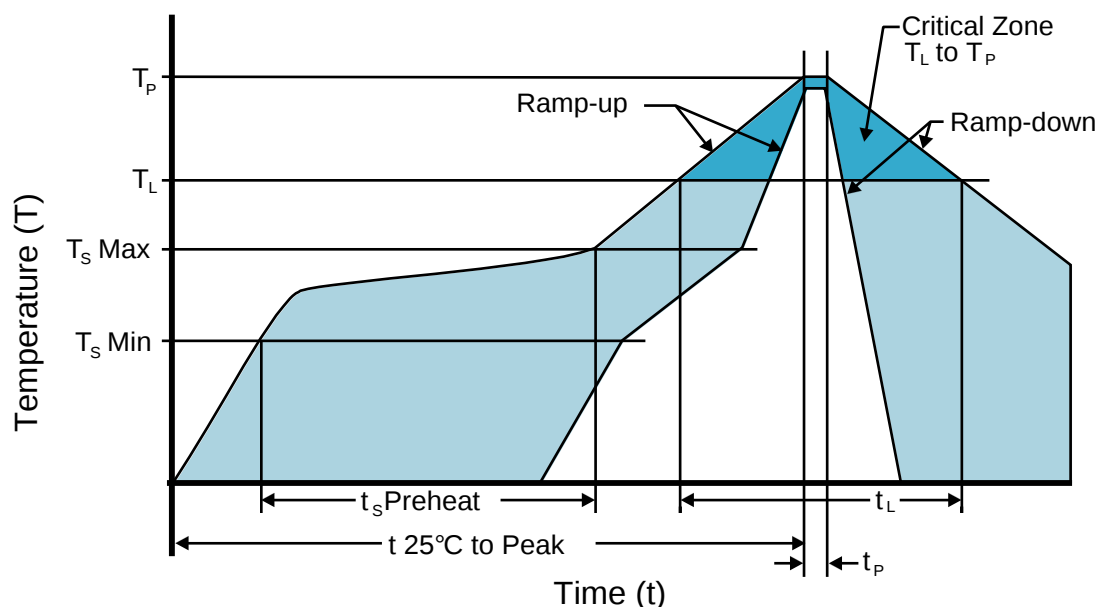
## Recommended Solder Reflow Methods



### High Temperature Infrared/Convection

|                                            |                                      |
|--------------------------------------------|--------------------------------------|
| <b>Ts MAX to TL (Ramp-up Rate)</b>         | 3°C/second Maximum                   |
| <b>Preheat</b>                             |                                      |
| - 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                   |
| <b>Time Maintained Above:</b>              |                                      |
| - 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

**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.