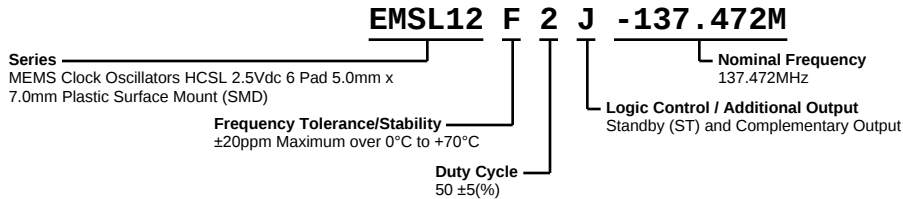


# EMSL12F2J-137.472M



## ELECTRICAL SPECIFICATIONS

|                                                   |                                                                                                                                                                                                                                                                  |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                                 | 137.472MHz                                                                                                                                                                                                                                                       |
| Frequency Tolerance/Stability                     | $\pm 20$ ppm 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, First Year Aging at 25°C, Reflow, Shock, and Vibration) |
| Aging at 25°C                                     | $\pm 1$ ppm First Year Maximum                                                                                                                                                                                                                                   |
| Supply Voltage                                    | +2.5Vdc $\pm 0.125$ Vdc                                                                                                                                                                                                                                          |
| Input Current                                     | 65mA 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                 | Standby (ST) 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)                                                                                         |
| Standby Current                                   | 30 $\mu$ A 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)   | 0.6pSec Typical                                                                                                                                                                                                                                                  |
| RMS Phase Jitter (Fj = 1.875MHz to 20MHz; Random) | 0.5pSec 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                                                  |
| 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                        |

# EMSL12F2J-137.472M

## MECHANICAL DIMENSIONS (all dimensions in millimeters)

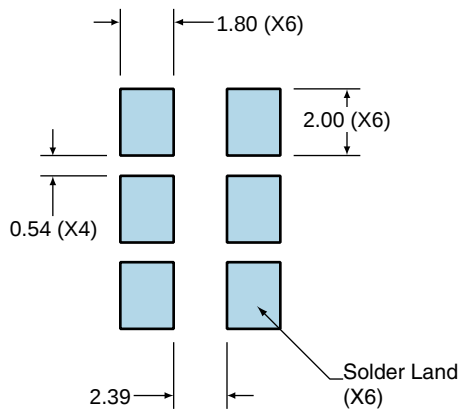


| PIN | CONNECTION           |
|-----|----------------------|
| 1   | Standby (ST)         |
| 2   | No Connect           |
| 3   | Case Ground          |
| 4   | Output               |
| 5   | Complementary Output |
| 6   | Supply Voltage       |

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

## Suggested Solder Pad Layout

All Dimensions in Millimeters



All Tolerances are ±0.1

# EMSL12F2J-137.472M

## OUTPUT WAVEFORM & TIMING DIAGRAM



## OUTPUT WAVEFORM & TIMING DIAGRAM



## 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.

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

**$T_s \text{ MAX to } T_L$  (Ramp-up Rate)** 3°C/second Maximum

#### Preheat

- Temperature Minimum ( $T_s \text{ MIN}$ ) 150°C
- Temperature Typical ( $T_s \text{ TYP}$ ) 175°C
- Temperature Maximum ( $T_s \text{ MAX}$ ) 200°C
- Time ( $t_s \text{ MIN}$ ) 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 ( $T_p \text{ Target}$ )** 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.