

# EC1145ETTS-4.000M

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## REGULATORY COMPLIANCE (Data Sheet downloaded on May 5, 2019)



## ITEM DESCRIPTION

4.000MHz  $\pm 50$ ppm -40°C to +85°C

## ELECTRICAL SPECIFICATIONS

|                                       |                                                                                                                                                                                                                                        |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Frequency                     | 4.000MHz                                                                                                                                                                                                                               |
| Frequency Tolerance/Stability         | $\pm 50$ ppm Maximum (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, Shock, and Vibration) |
| Aging at 25°C                         | $\pm 5$ ppm/year Maximum                                                                                                                                                                                                               |
| Operating Temperature Range           | -40°C to +85°C                                                                                                                                                                                                                         |
| Supply Voltage                        | 5.0Vdc $\pm 10\%$                                                                                                                                                                                                                      |
| Input Current                         | 45mA Maximum                                                                                                                                                                                                                           |
| Output Voltage Logic High (Voh)       | 2.4Vdc Minimum with TTL Load, Vdd-0.5Vdc Minimum with HCMOS Load                                                                                                                                                                       |
| Output Voltage Logic Low (Vol)        | 0.4Vdc Maximum with TTL Load, 0.5Vdc Maximum with HCMOS Load                                                                                                                                                                           |
| Rise/Fall Time                        | 6nSec Maximum (Measured at 0.4Vdc to 2.4Vdc with TTL Load, at 20% to 80% of waveform with HCMOS Load)                                                                                                                                  |
| Duty Cycle                            | 50 $\pm 5$ (%) (Measured at 1.4Vdc)                                                                                                                                                                                                    |
| Load Drive Capability                 | 10TTL or 50pF HCMOS Load                                                                                                                                                                                                               |
| Output Logic Type                     | CMOS                                                                                                                                                                                                                                   |
| Pin 1 Connection                      | Tri-State (High Impedance)                                                                                                                                                                                                             |
| Tri-State Input Voltage (Vih and Vil) | +2.2Vdc Minimum to enable output, +0.8Vdc to disable output (High Impedance), No connect to enable output.                                                                                                                             |
| Absolute Clock Jitter                 | $\pm 100$ pSec Maximum                                                                                                                                                                                                                 |
| One Sigma Clock Period Jitter         | $\pm 25$ pSec Maximum                                                                                                                                                                                                                  |
| Start Up Time                         | 10mSec Maximum                                                                                                                                                                                                                         |
| Storage Temperature Range             | -55°C to +125°C                                                                                                                                                                                                                        |

## ENVIRONMENTAL & MECHANICAL SPECIFICATIONS

|                              |                                       |
|------------------------------|---------------------------------------|
| Fine Leak Test               | MIL-STD-883, Method 1014, Condition A |
| Gross Leak Test              | MIL-STD-883, Method 1014, Condition C |
| Lead Integrity               | MIL-STD-883, Method 2004              |
| Mechanical Shock             | MIL-STD-202, Method 213, Condition C  |
| Resistance to Soldering Heat | MIL-STD-202, Method 210               |
| Resistance to Solvents       | MIL-STD-202, Method 215               |
| Solderability                | MIL-STD-883, Method 2003              |
| Temperature Cycling          | MIL-STD-883, Method 1010              |
| Vibration                    | MIL-STD-883, Method 2007, Condition A |

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MECHANICAL DIMENSIONS (all dimensions in millimeters)



| PIN | CONNECTION                 |
|-----|----------------------------|
| 1   | Tri-State (High Impedance) |
| 7   | Ground/Case Ground         |
| 8   | Output                     |
| 14  | Supply Voltage             |

| LINE | MARKING                                                                             |
|------|-------------------------------------------------------------------------------------|
| 1    | ECLIPTEK                                                                            |
| 2    | EC11TS<br>EC11=Product Series                                                       |
| 3    | 4.0000M                                                                             |
| 4    | XXYYZZ<br>XX=Ecliptek Manufacturing Code<br>Y=Last Digit of Year<br>ZZ=Week of Year |

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OUTPUT WAVEFORM & TIMING DIAGRAM



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## Test Circuit for TTL Output

| Output Load<br>Drive Capability | R <sub>L</sub> Value<br>(Ohms) | C <sub>L</sub> Value<br>(pF) |
|---------------------------------|--------------------------------|------------------------------|
| 10TTL                           | 390                            | 15                           |
| 5TTL                            | 780                            | 15                           |
| 2TTL                            | 1100                           | 6                            |
| 10LSTTL                         | 2000                           | 15                           |
| 1TTL                            | 2200                           | 3                            |

Table 1:  $R_L$  Resistance Value and  $C_L$  Capacitance Value Vs. Output Load Drive Capability



Note 1: An external 0.1 $\mu$ F low frequency tantalum bypass capacitor in parallel with a 0.01 $\mu$ F high frequency ceramic bypass capacitor close to the package ground and V<sub>DD</sub> pin is required.

Note 2: A low capacitance (<12pF), 10X attenuation factor, high impedance (>10Mohms), and high bandwidth (>300MHz) passive probe is recommended.

Note 3: Capacitance value  $C_L$  includes sum of all probe and fixture capacitance.

Note 4: Resistance value  $R_L$  is shown in Table 1. See applicable specification sheet for 'Load Drive Capability'.

Note 5: All diodes are MMBD7000, MMBD914, or equivalent.

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## Test Circuit for CMOS Output



Note 1: An external  $0.1\mu\text{F}$  low frequency tantalum bypass capacitor in parallel with a  $0.01\mu\text{F}$  high frequency ceramic bypass capacitor close to the package ground and  $V_{DD}$  pin is required.

Note 2: A low capacitance ( $<12\text{pF}$ ), 10X attenuation factor, high impedance ( $>10\text{Mohms}$ ), and high bandwidth ( $>300\text{MHz}$ ) passive probe is recommended.

Note 3: Capacitance value  $C_L$  includes sum of all probe and fixture capacitance.

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Recommended Solder Reflow Methods



High Temperature Solder Bath (Wave Solder)

|                                     |                                                                                                                                          |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                                                                                                                  |
| Additional Notes                    | Temperatures shown are applied to back of PCB board and device leads only. Do not use this method for product with the Gull Wing option. |

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Recommended Solder Reflow Methods



Low Temperature Infrared/Convection 185°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)               | 185°C Maximum                                                                                                 |
| Target Peak Temperature (TP Target) | 185°C Maximum 2 Times                                                                                         |
| Time within 5°C of actual peak (tP) | 10 Seconds Maximum 2 Times                                                                                    |
| Ramp-down Rate                      | 5°C/Second Maximum                                                                                            |
| Time 25°C to Peak Temperature (t)   | N/A                                                                                                           |
| Moisture Sensitivity Level          | Level 1                                                                                                       |
| Additional Notes                    | Temperatures shown are applied to body of device. Use this method only for product with the Gull Wing option. |

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Recommended Solder Reflow Methods



Low Temperature Solder Bath (Wave Solder)

|                                     |                                                                                                                                          |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 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)                     | 30 - 60 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)               | 245°C Maximum                                                                                                                            |
| Target Peak Temperature (TP Target) | 245°C Maximum 1 Time / 235°C Maximum 2 Times                                                                                             |
| Time within 5°C of actual peak (tP) | 5 Seconds Maximum 1 Time / 15 Seconds Maximum 2 Times                                                                                    |
| Ramp-down Rate                      | 5°C/Second Maximum                                                                                                                       |
| Time 25°C to Peak Temperature (t)   | N/A                                                                                                                                      |
| Moisture Sensitivity Level          | Level 1                                                                                                                                  |
| Additional Notes                    | Temperatures shown are applied to back of PCB board and device leads only. Do not use this method for product with the Gull Wing option. |

Low Temperature Manual Soldering

185°C Maximum for 10 Seconds Maximum, 2 times Maximum. (Temperatures listed are applied to device leads only. This method can be utilized with both Gull Wing and Non-Gull Wing devices.)

High Temperature Manual Soldering

260°C Maximum for 5 Seconds Maximum, 2 times Maximum. (Temperatures listed are applied to device leads only. This method can be utilized with both Gull Wing and Non-Gull Wing devices.)