Frequently Asked Questions

Rev A

For Series:	EMML12

1. What is this oscillator series?

This series of devices are oscillators where the output frequency is primarily controlled by an internal micro-electro-mechanical system (MEMS) resonator and an integrated high speed current mode logic (CML) oscillator circuit. Utilizing a proprietary MEMS resonator design and exclusive processing methods, this oscillator series is calibrated to a specified frequency prior to shipment to the customer.

2. What are the typical customer circuit applications for this oscillator series?

This oscillator series can be used in any of the following applications:

- Clock Recovery
- Phase-Locked Loop and Frequency Synthesis
- Synthesizer or System Reference
- Clock Distribution
- Digital Switching Networks
- Clock Translation and Multiplexing

3. What are the typical applications and end item products for this series?

Here is a list of the common applications and products:

- PCI Express
- Gigabit Ethernet
- Fiber Channel
- SATA/SAS
- FBDIMM, DDR, SONET, ATM, SDH
- Routers, Servers, Hubs, and Network Switches
- High Resolution Video, and Set-top Boxes
- Scanners, Printers, Modems
- LCD Displays and HDTV
- Interface Controllers
- Medical Equipment
- PDAs and Portable Media Players
- Digital Cameras and Gaming Products

- Notebook Computers
- Video Cameras and Video Recorders
- Portable Devices
- Computer Peripherals and Networking Products

4. What technical benefits does this product series offer?

This series of MEMS oscillators offers:

- Improved frequency stability through the use of a MEMS resonator
- Commercial, extended commercial, and industrial temperature range options
- 30,000G Shock Resistance
- Superior period jitter performance
- Output Enable (Tri-state, High Impedance) or Standby (Tri-state, High Impedance) output options
- Industry standard six pad SMD package
- High speed CML output with fast rise and fall times
- Complementary output
- Low profile plastic MSL1 rated package
- RoHS Compliant (Pb-free) with high temperature 260°C reflow capability

5. What are the construction characteristics of this product series?

This series consists of a single application specific integrated circuit (ASIC) and a MEMS resonator die stacked inside an industry standard QFN-type plastic injection molded package. This assembly configuration results in superior thermal performance, high reliability, and low lead inductance. The termination I/O pads consist of Ni/Pd/Au metallization.

6. What is the input supply voltage for this product series?

The nominal supply voltage and tolerance is provided on the datasheet.

7. What are the input current specifications for this product series?

The input current specification is listed in milliamps as a maximum value and is provided on the datasheet.

8. What are the frequency stability and operating temperature range options for this product series?

The available operating temperature range and frequency stability options can be found on the datasheet.

9. What are the differences between the output enable and standby function options?

This product series offers a tri-state output function to facilitate the customer's use of in-process assembly testing or for the use of multiple clocks. This series offers output enable and stand-by options for power management.

If the output enable function is selected, the output circuitry within the oscillator is shut down when the voltage at the control pad (pad one) is set to a logic low state. In this condition, the output signal is three-stated (tri-state).

The oscillator output gate becomes high impedance and the oscillator input current on the power supply line is only slightly decreased from normal operating current. The maximum output enable current is specified on the applicable Ecliptek datasheet.

If the stand-by function is selected, then all active circuitry within the oscillator is shut down when the voltage at the control pad (pad one) is set to a logic low state. In this condition, the output signal is three-stated (tri-state). The oscillator output gate becomes high impedance and the oscillator input current on the power supply line is negligible. The maximum stand-by current is listed on the applicable Ecliptek datasheet.

If the voltage at the control pad is set to no connect or a logic high state, the output is enabled (clocking). Note: The oscillator has an internal pull up resistor on the control pad (pad one). The datasheet provides the VIH and VIL thresholds for the control pad.

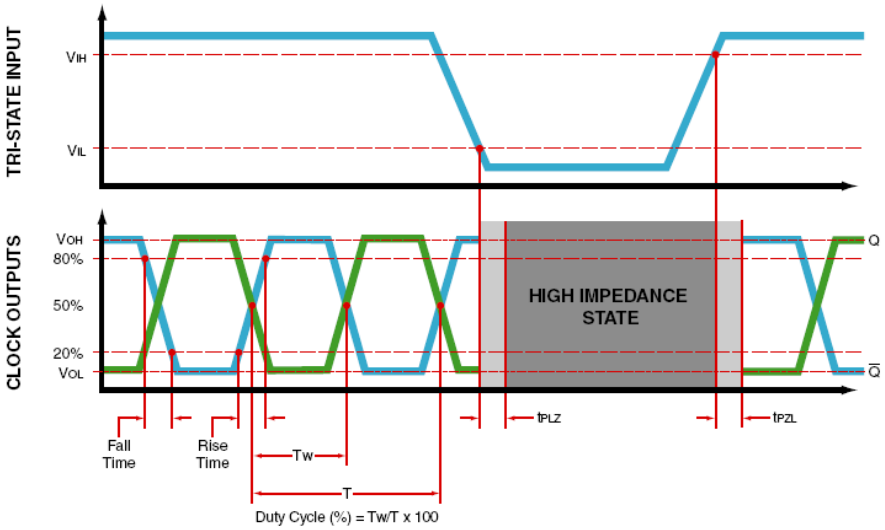

Figure: Tri-State Timing Diagram

When entering the tri-state mode, the time from when the oscillator pad one input control reaches V_{IL} and the oscillator output pad becomes high impedance is shown as t_{PLZ}. When exiting the tri-state mode, the time from when the oscillator pad one input control reaches V_{OH} and the oscillator output begins clocking is shown as t_{PZL}.

10. What is the function of the complementary output on pad five of the oscillator?

The term complementary output, often called a differential pair, is when one output signal is the logical opposite (complement) of the other output signal. Thus, when the output pad four of the oscillator is in a logic high state, the complementary output (pad five) of the oscillator is in a logic low state.

11. Can I obtain a non-tri-state function for this product series?

This product series only offers an output enable or standby function on pad one of the oscillator. The customer can use this oscillator series as a non-tri-state oscillator by setting the voltage on output enable control (pad one) to either no connect or logic high. The oscillator has an internal pull up resistor on output enable control (pad one). The datasheet provides the V_{IH} and V_{IL} thresholds for control of the tri-state function.

12. How do I specify the overall frequency stability for this product series?

Ecliptek defines the frequency stability performance of the device inclusive of specific oscillator operating conditions. This is often called the "Inclusive Method". Ecliptek specifies the following parameters for this series of product:

- Calibration Frequency Tolerance at 25°C
- Frequency Stability over Operating Temperature Range
- Supply Voltage
- Output Load
- First Year Aging at 25°C
- 260°C Reflow
- Shock and Vibration

13. What is oscillator aging and what are the aging specifications for this product series?

Aging is the systematic change in frequency with time due to internal changes in the MEMS and/or oscillator. Aging is often expressed as a maximum value in parts per million per year [ppm/year]. The rate of aging is logarithmic in nature. The following factors effect oscillator aging: adsorption and desorption of contamination on the surfaces of the MEMS resonator, stress relief of the mounting and bonding structures, material outgassing, and seal integrity. The oscillator aging specification is listed on the datasheet.

14. What is the period jitter performance for this product series?

Period jitter is a time domain measurement and is specified in picoseconds (pSec) as a maximum value. Ecliptek uses a proprietary design, exclusive processing methods and a unique ASIC output driver circuit enabling this product series to have exceptionally low period jitter. The period jitter parameters can be found on the datasheet.

15. What are the phase noise and rms phase jitter specifications for this product series?

Phase noise is a measure in the frequency domain and is specified in decibels at various offset points from the carrier (-dBc/Hz). Phase jitter, (often called offset jitter) is derived from the phase noise measurement of the spectral density over a given offset bandwidth. Ecliptek uses a proprietary design, exclusive processing methods and a unique ASIC output driver circuit enabling this product series to have exceptionally low phase jitter. The phase noise and rms phase jitter parameters can be found on the datasheet.

16. What is duty cycle and what is the duty cycle specification for this product series?

Duty cycle is the measure of output waveform uniformity. This term, also referred to as symmetry, is a measurement of the time that the output waveform is in a logic high state, expressed as a percentage (%) of the clock period. This parameter is measured at a specified voltage threshold or at a percentage of the output waveform amplitude. See the datasheet for measurement thresholds and load conditions.

17. What are the output and output load characteristics for this product series?

Ecliptek offers this product series with an 8 mA high speed current mode logic (CML) output with a typical voltage swing of 425mV across a 50Ω output resistor. The oscillator output topology utilizes a constant current source NMOS open-drain differential pair that allows the end user to configure their output termination so as to optimize circuit load matching and signal performance. Minimal reflections are achieved when the traces are terminated with impedances that match the trace impedance. Signal integrity is optimized when the outputs of the oscillator

are driving a 50 ohm transmission line. Thus, Ecliptek specifies a load termination of 50 ohms between the output and V_{DD} (as well as 50 ohms between the complementary output and V_{DD}).

18. Is start-up time specified for this product series?

As shown in the figure below, start-up time is defined as the time from when the power supply reaches its specified V_{IH} value to the time the oscillator output signal amplitude reaches its steady state V_{OH} output logic high level and the output is within the specified frequency tolerance. Note: The complementary output waveform is not shown in the below figure.

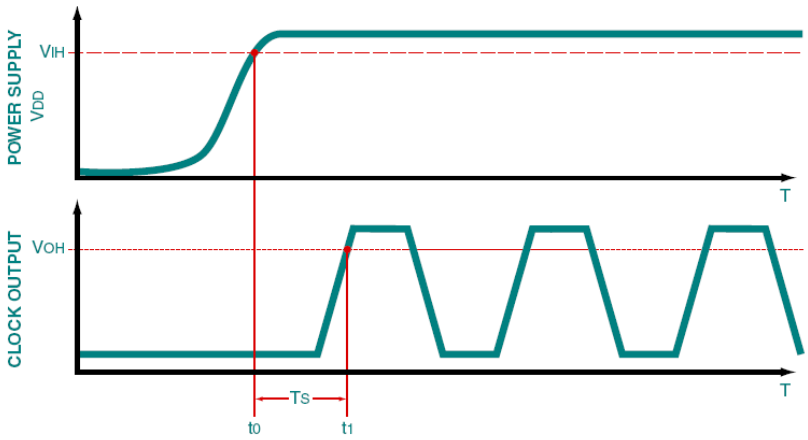

Figure: Oscillator Start-up Timing Diagram

In order to ensure proper start-up, the power supply start-up should have an exponential curve typical of a capacitive charge of a linear voltage ramp. The maximum start-up time specification can be found on the datasheet.

19. How do I electrically test this product series at my facility?

The recommended electrical test fixture can be found on the datasheet.

20. Is this product series compatible with my existing assembly process equipment?

If the part number is specified with the TR packaging option, oscillator products are delivered to the customer in EIA481 compliant tape and reel packaging. Without the TR option, products are delivered to the customer in bulk packaging as specified on the datasheet.

21. Is this product series compatible with my existing reflow processes?

This product series is capable of withstanding industry standard high temperature (260°C, 10 seconds) convection reflow processes and is rated MSL1 per J-STD-020. The suggested solder reflow diagram is provided on the datasheet.

22. Is this product series RoHS compliant and Pb-free?

This product is RoHS compliant and Pb-free as defined in the Ecliptek RoHS Compliant (Pb-free) Roadmap.

23. How can I obtain a RoHS compliant (Pb-free) certification for this product series?

A RoHS and Pb-free product certification letter can be obtained directly from our website by using the Ecliptek RoHS/Pb-Free Certification Letter Generator.

24. Is an IPC-1752 material declaration available for customer review?

Ecliptek can provide a Material Declaration in compliance with IPC-1752 to assist customers with their material compliance requirements.

25. How do I layout my printed circuit board for this product series?

A suggested solder pad layout is provided on the datasheet. The customer should layout their printed circuit board to include proper connections for the tri-state output enable or standby functions (pad one), the complementary output (pad five), and the center paddle (pad A). Pad two should have no connection (isolated).

26. What is the function of 'pad A' on the bottom center of the part?

The pad (often called a paddle), is labeled 'A' and is defined as 'Ground'. This pad is internally connected to the oscillator circuit ground (pad three). Its main function is for thermal heat dissipation.

27. Should I include a land pattern on my PCB layout for the paddle (A)?

It is recommended, but not required, that the customer include a land pattern on the PCB for the paddle (pad A). The addition of the land pattern will improve the dissipation of thermal heat from the bottom of the oscillator.

28. What will happen if 'pad A' is connected to Ground or V_{DD}?

Connecting the paddle (pad A) to V_{DD} is not recommended and may affect operation of the device. Ecliptek engineering recommends connecting the paddle (pad A) to ground. If this is not possible, an acceptable alternate configuration is leaving it as a no connect.

29. Who do I contact if I have additional technical questions about the use of this product series?

The Global Customer Support team at Ecliptek can provide applications engineering support or answer customer technical questions.

30. How do I order an oscillator that has custom requirements not specified on the standard oscillator series specification sheet?

Please contact the Ecliptek Global Customer Support team for additional support or questions regarding your oscillator requirements.

31. What are the environmental and mechanical specifications for this product series?

The environmental and mechanical specifications for this product series are listed on the datasheet.

32. What reliability information is available for this product series?

Failure in Time (FIT) and Mean Time to Failure (MTTF) reliability data is available for this product series within the product series qualification and reliability report found on the series home page.

33. Is thermal resistance information available for this product series?

θ_{JA} and θ_{JC} values are available for this product series and can be found on the Environmental / Mechanical section of the series homepage.

34. Are IBIS models available for this product series?

Input/Output Buffer Information Specification (IBIS) modeling information can be found on the series home page.

35. What is the marking scheme for this product series?

As shown on the datasheet, this series of product has marking content on the top of the part. This marking consists of a pad one (1) locator dot and one additional line of alpha numeric marking. The marking represents an Ecliptek manufacturing designator. This designator is used internally at Ecliptek for manufacturing lot traceability. This manufacturing designator provides no indication of part number or date code or output frequency. The marking content specification is listed on the datasheet.

36. Can I identify the Ecliptek part number or specification based upon the markings on top of the part?

In order to protect our customer's intellectual property, the Ecliptek part marking does not identify the Ecliptek part number or specifications.

37. Where can I get the information regarding discontinued or End of Life (EOL) products?

Any Ecliptek part number currently under an End of Life statement will be identified as EOL on an Ecliptek quotation, along with a link to the EOL statement. This information can also be found on the End of Life Statements for Discontinued and Obsolete Products section of our website.

38. Is Ecliptek ISO 9000 Certified?

Yes, Ecliptek is certified to ISO 9001.

39. How can I obtain a REACH compliance statement for this product series?

A Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) compliance statement can be obtained directly from our website by using the Ecliptek REACH Compliance Resources page of our website.