

# Frequently Asked Questions

Rev A

For Series:

[EB52C5](#)[EB54C5](#)

## 1. What are these oscillator series?

These series of temperature compensated crystal controlled oscillators (TCXO) are devices where the output frequency is primarily controlled by a fundamental mode quartz bulk acoustic wave (BAW) crystal resonator and an integrated complementary metal-oxide-semiconductor logic (CMOS) oscillator circuit. Utilizing a proprietary crystal resonator design and exclusive oscillator temperature compensation techniques, these series of oscillators are calibrated to a specified frequency prior to shipment to the customer.

## 2. What are some of the typical oscillator customer circuit applications for these series?

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

- Synthesizer or System Reference
- Clock Distribution

## 3. What are some of the typical applications and end item products for these series?

Here is a list of the common applications and products:

- Test Equipment and Instrumentation
- Wireless Communication Equipment
- Medical Equipment
- Video Cameras and Video Recorders
- Portable Devices
- Computer Peripherals and Networking Products

## 4. What commercial benefits do these product series offer?

These oscillators have industry standard packaging, competitive lead times, and cost effective pricing.

## 5. What technical benefits do these product series offer?

These series of crystal oscillators offer:

- Improved frequency stability through the use of a fundamental mode bulk acoustic wave (BAW) quartz crystal resonator
- Use of a custom ASIC design, no internal PLL
- Output frequencies up to 40.000MHz
- Supply voltage operation at 2.5V<sub>DC</sub> and 3.3V<sub>DC</sub>
- ±2.5ppm and ±5.0ppm maximum frequency stability options

- Commercial and industrial operating temperature range options
- Tight duty cycle of 50% ±5%
- Superior rms phase jitter and phase noise performance
- Tri-state high impedance output
- High speed CMOS output with controlled rise and fall times
- Industry standard 4 pad SMD packages
- Low stand-by current
- Low profile ceramic MSL1 rated SMD packages
- RoHS Compliant (Pb-free) with high temperature 260°C reflow capability

**6. What output frequencies can I obtain for these product series?**

These series feature frequencies ranging from 12.800MHz to 40.000MHz.

**7. What are the package dimensions for these product series?**

These series of oscillators are offered in an industry standard ceramic four pad SMD package. The table below outlines the series product offerings and their respective packages.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see package dimensions**

**8. What are the construction characteristics of these product series?**

These product series consist of a single CMOS ASIC and a fundamental mode BAW quartz crystal packaged inside a hermetically sealed ceramic leadless SMD package. The package has four gold plated contact I/O pads and a seam sealed metal cover that is case grounded for improved EMI performance.

**9. What are the input voltages for these product series?**

These product series offer operation at 2.5V<sub>DC</sub> and 3.3V<sub>DC</sub>. Please contact the [engineering staff](#) at Ecliptek if you have other supply voltage needs.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see supply voltage specifications**

**10. What are the input current specifications for these product series?**

The input current specification is listed in milliamps as a maximum value on the respective datasheet. These current ratings are for oscillators with the output load termination current included.

**11. What are the frequency stability and operating temperature range options for these product series?**

Ecliptek offers  $\pm 2.5\text{ppm}$  or  $\pm 5.0\text{ppm}$  frequency stability options and  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  extended commercial temperature range or a  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  industrial operating temperature range options. The available operating temperature range and frequency stability options can be found on the respective datasheet.

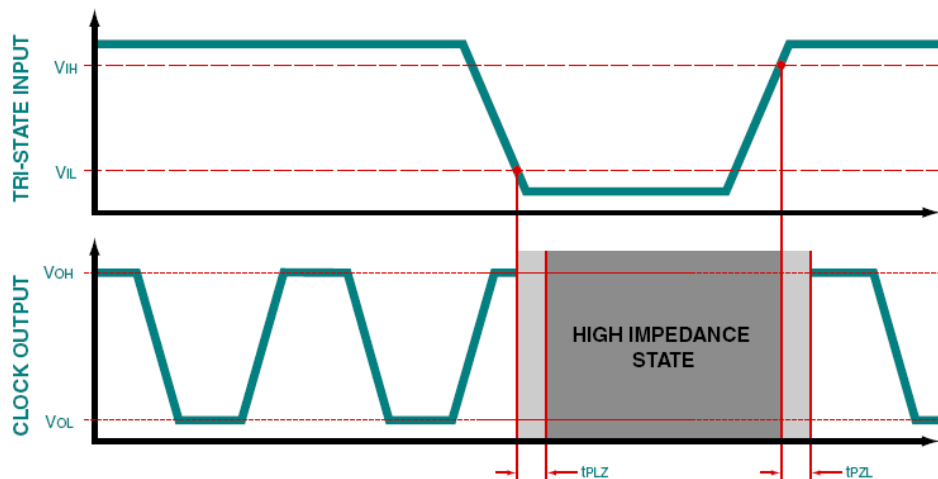
Series	Package Type	Supply Voltage
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**Table: Click on a series to see frequency stability and operating temperature range options**

**12. Do these series offer a tri-state output function?**

These product series offer a tri-state output function to facilitate the customer's use of in-process assembly testing or for the use of multiple clocks on the same node. They feature a tri-state output control function on pad one (1) where the output is three-stated (tri-state condition) when the voltage at the control pad is set to a logic low state. In this condition (see figure below), the oscillator output buffer circuitry within the oscillator is shut down and the output pad is placed into a high impedance state. 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. The respective series datasheet provides the  $V_{IH}$  and  $V_{IL}$  thresholds for control of the tri-state function.



**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  $t_{PZL}$ . For these series, characterization test data indicates that  $t_{PLZ}$  is approximately 50nS and  $t_{PZL}$  is approximately 2 to 3mS.

**13. Do these series offer a stand-by function?**

These oscillator series contain a stand-by function for power management. All active circuitry within the oscillator is shut down when the voltage at the control pad 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 respective series datasheet.

**14. Can I obtain a non-tri-state function for these product series?**

These series of product only offers a tri-state function on pad one of the oscillator. The customer can use these oscillator series as a non-tri-state oscillator by setting the voltage on tri-state control (pad 1) to either no connect or logic high. The oscillator has an internal pull up resistor on tri-state control (pad 1). The respective series datasheet provides the  $V_{IH}$  and  $V_{IL}$  thresholds for control of the tri-state function.

**15. How do I specify the overall frequency stability for these product series?**

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

- Frequency Tolerance at 25°C
- Frequency Stability over Operating Temperature Range
- Frequency Stability over Supply Voltage
- Frequency Stability over Output Load
- Frequency Stability over Aging at 25°C
- Frequency Stability over 260°C Reflow

**16. What is oscillator aging and what are the aging specifications for these product series?**

Aging is the systematic change in frequency with time due to internal changes in the crystal 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 quartz, stress relief of the mounting and bonding structures, material outgassing, and seal integrity. At a rated operating temperature of 25°C, these series of products age at a rate of less than  $\pm 1.0$ ppm over the first year, logarithmically declining each year thereafter. As shown on the respective series datasheet, Ecliptek specifies the aging parameter of the device inclusive of the overall oscillator operating conditions.

**17. What are the rms phase jitter and phase noise characteristics for these 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 these product series to have exceptionally low phase jitter and phase noise. The rms phase jitter and phase noise specification can be found on the series datasheet.

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<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see rms phase jitter and phase noise specifications**

**18. Is tight duty cycle (symmetry) available for these product series?**

Tight duty cycle (45% minimum, 55% maximum) is available for these product series. See the respective datasheet for measurement thresholds and load conditions.

**19. What are the output and output load characteristics for these product series?**

Ecliptek offers these product series with a low voltage high speed CMOS driver that enables the output signal to swing from ground to V<sub>DD</sub>. The oscillator output topology is designed so as to optimize circuit load matching and signal performance. Signal integrity is optimized when the low impedance output of the oscillator is driving a high impedance-low capacitance input. The output load specification is listed on the applicable datasheet. If a customer requires a different load from that specified on the datasheet, shapes), [please contact Ecliptek](#) with your custom requirements.

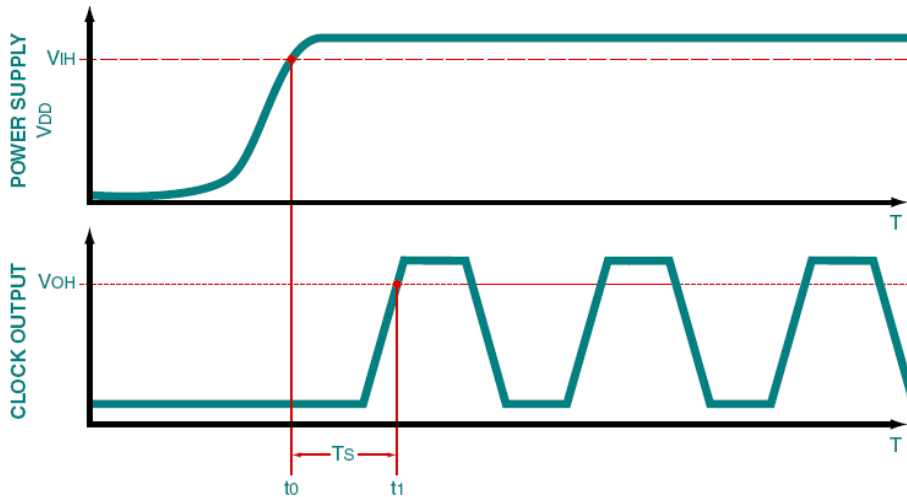
Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see the output load**

**20. Is start-up time specified for these 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<sub>IH</sub> value to the time the oscillator output signal amplitude reaches its steady state V<sub>OH</sub> output logic high level and the output is within the specified frequency tolerance.

**Figure: Oscillator Start-up Timing Diagram**



Note: In order to ensure proper start-up, the power supply start-up should have an exponential curve typical of a capacitive charge or a linear voltage ramp. If you have a special voltage start-up profile (i.e. odd ramp steps or shapes), [please contact Ecliptek](#) to discuss possible oscillator performance issues. For these series, characterization test data indicates that the start-up time is typically around 2 to 3mS. The maximum start-up time specification can be found on the series datasheet.

**21. How do I electrically test these product series at my facility?**

See the below table for the recommended electrical test fixture.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see recommended electrical test fixture**

**22. Are these product series compatible with my existing assembly process equipment?**

If the part number is specified with the TR packaging option (tape and reel packaging), oscillator products are delivered to the customer in EIA481A compliant tape and reel packaging. Without the TR option, products are delivered to the customer in bulk packaging (ESD protective bag). See the table below for the carrier tape and reel dimensions.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see recommended packaging methods**

**23. Are these product series compatible with my existing reflow processes?**

These product series are capable of withstanding industry standard high temperature (260°C, 10 seconds) convection reflow processes and are rated MSL1 per J-STD-020. See the below table for the recommended solder reflow diagram.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see recommended solder reflow methods**

**24. Are these product series RoHS compliant and Pb-free?**

These products are RoHS compliant and Pb-free as defined in the [Ecliptek RoHS Compliant \(Pb-free\) Roadmap](#).

**25. How can I obtain a RoHS compliant (Pb-free) certification for these 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](#).

**26. Is RoHS and RoHS (Pb-free) material declaration data available for customer review?**

Ecliptek can provide [Material Declaration](#) data in compliance with IPC-1752 to assist customers with their RoHS Compliance (Pb-free) requirements.

**27. How do I layout my printed circuit board for these product series?**

The customer should layout their PCB to include proper connections for the tri-state control input function (pad 1). See the below table for the recommended solder pad layout.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see recommended solder pad layout diagram**

**28. How do I cross these product series with a competitor part number?**

Please see the [Ecliptek Cross Reference by Competitor Part Number](#).

**29. What information is needed to obtain a quote for these product series?**

Obtaining a quote on-line is simple. Fill in the required information in the part number constructor for the specific series that you would like to order. This part number will define the specifications you desire. After you construct a part number, you can request a quote or check stock by following the prompts on our website.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to go to part number constructor**

**30. How do I obtain a PDF copy of the product series data sheet?**

You can go to the specific series you require now by selecting a link from the table below.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to open the PDF datasheet**

**31. How do I obtain a PDF copy of the specification data sheet for a specific part number?**

Simply complete the required information in the part number constructor for the specific series that you would like to order. After you construct the part number, you will be prompted with an icon labeled “View Datasheet”. Click on this icon and you can download and save a PDF copy of the specific Ecliptek part number you created.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see the part number constructor**

**32. Who do I contact if I have additional technical questions about the use of these product series?**

The [Engineering staff](#) at Ecliptek can provide applications engineering support or answer customer technical questions.

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

Complete the Ecliptek [Custom Oscillator Request Form](#) from our website. From this page you will be able to enter custom specifications that are unavailable from the standard part number constructor forms. These parameters will be sent to our Engineering team where they will be evaluated. Upon review, you will be contacted by our Sales or Engineering team.



**34. What are the environmental and mechanical specifications for these product series?**

The environmental and mechanical specifications for these product series are listed on the specification datasheet and are outlined in the table below.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to see the mechanical and environmental specifications**

**35. What reliability information is available for these product series?**

Failure in Time (FIT) and Mean Time To Failure (MTTF) reliability data is available for these product series as provided in the below table.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to open the Qualification and Reliability Report in PDF**

**36. Is thermal resistance information available for these product series?**

$\theta_{JA}$  and  $\theta_{JC}$  values are available for these product series. Please see the [Oscillator Thermal Resistance](#) information provided.

**37. Are IBIS models available for these product series?**

IBIS modeling information is currently not available for these product series.

**38. What is the marking scheme for these product series?**

As shown on the applicable datasheet, these series of product have marking content on the top of the part. This marking consists of a pad one (1) locator dot and additional lines of alpha numeric marking. See the respective datasheet for marking content as outlined in the table below.

Series	Package Type	Supply Voltage
<a href="#">EB52C5</a>	3.2mm x 5.0mm	3.3V <sub>DC</sub>
<a href="#">EB54C5</a>	3.2mm x 5.0mm	2.5V <sub>DC</sub>

**Table: Click on a series to go to the marking content**

**39. 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 Ecliptek's 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.

**40. Is Ecliptek ISO 9000 Certified?**

Yes, Ecliptek is certified to [ISO 9001](#).