

Frequently Asked Questions

Rev C

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1. What are the EclipseTek ES series oscillators?

These EclipseTek ES series oscillators are called temperature compensated crystal oscillators (TCXO). These product series utilize an oscillator where the clipped sinewave output frequency is primarily controlled by a quartz crystal and temperature sensitive oscillator compensation circuitry resulting in low temperature stabilities ($\pm 0.5\text{ppm}$ to $\pm 3.0\text{ppm}$). With outstanding frequency stability and exceptional long-term stability performance, a TCXO is a less expensive alternative to an Oven Controlled Crystal Oscillator (OCXO).

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2. How do the ES series of oscillators work?

A TCXO is a quartz crystal controlled oscillator where the output frequency of the device is being controlled by a quartz crystal resonator and temperature sensitive oscillator control circuitry. This circuitry is used to compensate for the frequency temperature characteristics inherent in a quartz crystal resonator. TCXO circuitry consists of five key operational components: 1). An on-board power supply regulator to minimize supply voltage variation effects; 2). A precision quartz crystal resonator designed for superior temperature and aging performance; 3). A low power oscillator design with AGC for reduced crystal drive current and improved aging; 4). An advanced temperature sensor and frequency compensation network used to minimize oscillator frequency-temperature sensitivity; and 5). An output buffer gate used to reduce the effects of external circuit load changes.

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3. What are the customer applications for the ES series oscillators?

These series of oscillators are commonly found in the following customer applications:

- Test and Measurement Equipment
- Industrial Automation, Instrumentation and Control
- Navigation (GPS) and Stratum 3
- Wireless Handheld and Handset Devices
- Wireless Base Stations and Radio Communications
- High-end Multimedia and Broadband Access
- Mobile Phones and PDAs
- WLAN and WiMax Applications

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4. What benefits do these product series offer?

These product series offer the following benefits:

- Improved frequency stability through the use of a fundamental mode BAW (bulk acoustic wave) crystal
- Output frequencies up to 40.000MHz
- Supply Voltages of 2.5V_{DC}, 2.8V_{DC}, 3.0V_{DC}, 3.3V_{DC} and 5.0V_{DC}
- Clipped sinewave output
- Temperature Stabilities as low as ±0.50ppm Maximum
- Commercial and industrial temperature ranges
- A voltage control function with linear frequency deviation
- Low phase noise
- Hermetically sealed low profile ceramic SMD packages
- RoHS Compliant (Pb-free) with high temperature 260°C reflow capability

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5. What are the package types for these product series?

The ES series oscillators are offered in the industry standard leadless ceramic SMD packages. The table below outlines the package size for each ES series product offering.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

Table: Click on a series to see package outline drawing

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6. What are the supply voltage options for these product series?

The table below outlines the supply voltage for each ES series product offering.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC} ±10%
ES52C1	5mm x 7mm	3.3V _{DC} ±5%
ES51C5	3.2mm x 5mm	5.0V _{DC} ±5%
ES52C5	3.2mm x 5mm	3.0V _{DC} ±5%
ES52K1	2.5mm x 3.2mm	3.0V _{DC} ±5%
ES53K2	2mm x 2.5mm	2.8V _{DC} ±5%
ES54K2	2mm x 2.5mm	2.5V _{DC} ±5%

Table: Click on a series to see the specification datasheet

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7. What is the input current performance for these product series?

The input current specification is listed as a maximum on the respective ES series datasheet. These current ratings are for oscillators with the specified output load connected.

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

These ES series oscillators feature output frequencies ranging from 10.000MHz to 40.000MHz. Available output frequencies can be found on the applicable ES series datasheet. Other frequencies not listed on the datasheet may be made available on a case-by-case basis. Please [consult the factory](#) with your custom requirements.

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9. What are the construction characteristics for these product series?

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

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10. What is a TCVCXO?

A TCXO with a voltage control option, called a TCVCXO, combines the frequency pullability of a VCXO with the temperature stability of a TCXO. All ES series oscillators offer a voltage control option.

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11. What is the control voltage range and control voltage for an ES series TCVCXO product?

The control voltage range (V_{CR}) is the minimum and maximum voltage that can be applied to the voltage control pad of the oscillator. The control voltage range is $0.0V_{DC}$ to V_{DD} (Supply Voltage) for these product series. The control voltage (V_C) is the voltage applied to the voltage control pad of the oscillator for the measurement of the frequency deviation test condition. The control voltage is dependent upon the specific product series. The table below outlines the control voltage for each series.

ES Series	Package Type	Supply Voltage	Control Voltage	Frequency Deviation
ES51C1	5mm x 7mm	$5.0V_{DC}$	$1.5V_{DC}$ $\pm 1.0V_{DC}$	$\pm 8\text{ppm}$ Minimum
ES52C1	5mm x 7mm	$3.3V_{DC}$	$1.5V_{DC}$ $\pm 1.0V_{DC}$	$\pm 8\text{ppm}$ Minimum
ES51C5	3.2mm x 5mm	$5.0V_{DC}$	$1.5V_{DC}$ $\pm 1.0V_{DC}$	$\pm 8\text{ppm}$ Minimum
ES52C5	3.2mm x 5mm	$3.0V_{DC}$	$1.5V_{DC}$ $\pm 1.0V_{DC}$	$\pm 8\text{ppm}$ Minimum
ES52K1	2.5mm x 3.2mm	$3.0V_{DC}$	$1.5V_{DC}$ $\pm 1.0V_{DC}$	$\pm 8\text{ppm}$ Minimum
ES53K2	2mm x 2.5mm	$2.8V_{DC}$	$1.4V_{DC}$ $\pm 1.0V_{DC}$	$\pm 5\text{ppm}$ Minimum
ES54K2	2mm x 2.5mm	$2.5V_{DC}$	$1.4V_{DC}$ $\pm 1.0V_{DC}$	$\pm 5\text{ppm}$ Minimum

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12. What is the frequency deviation for an ES series TCVCXO product?

The frequency deviation or pullability of a TCVCXO refers to the amount of frequency change (in ppm) with respect to a change in the control voltage (V_C). The table below outlines the frequency deviation for each series. If a different frequency deviation or control voltage from that specified on the datasheet is required, please [consult the factory](#).

ES Series	Package Type	Supply Voltage	Control Voltage	Frequency Deviation
ES51C1	5mm x 7mm	5.0V _{DC}	1.5V _{DC} ±1.0V _{DC}	±8ppm Minimum
ES52C1	5mm x 7mm	3.3V _{DC}	1.5V _{DC} ±1.0V _{DC}	±8ppm Minimum
ES51C5	3.2mm x 5mm	5.0V _{DC}	1.5V _{DC} ±1.0V _{DC}	±8ppm Minimum
ES52C5	3.2mm x 5mm	3.0V _{DC}	1.5V _{DC} ±1.0V _{DC}	±8ppm Minimum
ES52K1	2.5mm x 3.2mm	3.0V _{DC}	1.5V _{DC} ±1.0V _{DC}	±8ppm Minimum
ES53K2	2mm x 2.5mm	2.8V _{DC}	1.4V _{DC} ±1.0V _{DC}	±5ppm Minimum
ES54K2	2mm x 2.5mm	2.5V _{DC}	1.4V _{DC} ±1.0V _{DC}	±5ppm Minimum

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13. What are the operating temperature range (OTR) options for these product series?

The operating temperature range is defined as the maximum and minimum temperatures that the oscillator device can be exposed to during oscillation. Over this temperature range, all of the specified operating parameters are guaranteed. Ecliptek offers many commercial, extended commercial and industrial temperature ranges. Please see the applicable series datasheet for the available operating temperature ranges

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14. What are the frequency tolerance/stability options for these product series?

Ecliptek offers many frequency tolerance/stability options for these ES series products. Please see the applicable series datasheet for the available frequency tolerance/stability options.

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15. 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 crystal 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 typically age at a rate of less than ± 1.0 ppm over the first year, and less than ± 0.3 ppm over the following year, logarithmically declining each year thereafter. The aging parameters can be found on the applicable series datasheet.

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16. What are the 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). Ecliptek uses a proprietary design, exclusive processing methods, and a unique ASIC output driver circuit enabling these products to have exceptionally phase noise. The phase noise parameters can be found on the applicable series datasheets.

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17. Do these product series offer tri-state output capability?

These series do not offer tri-state output control.

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

Duty cycle is not specified for these product series as the output is a clipped sinewave signal.

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19. What are the output load options for these product series?

The table below outlines the output load for each series. If a customer requires a different load from that specified on the datasheet, please [consult the factory](#) with your custom requirements.

ES Series	Package Type	Supply Voltage	Control Voltage
ES51C1	5mm x 7mm	5.0V _{DC}	10kOhms // 10pF Internal DC-Cut capacitor included
ES52C1	5mm x 7mm	3.3V _{DC}	10kOhms // 10pF Internal DC-Cut capacitor included
ES51C5	3.2mm x 5mm	5.0V _{DC}	10kOhms // 10pF, External DC-Cut capacitor required, 1000pF recommended
ES52C5	3.2mm x 5mm	3.0V _{DC}	10kOhms // 10pF, External DC-Cut capacitor required, 1000pF recommended
ES52K1	2.5mm x 3.2mm	3.0V _{DC}	10kOhms // 10pF, External DC-Cut capacitor required, 1000pF recommended
ES53K2	2mm x 2.5mm	2.8V _{DC}	10kOhms // 10pF, External DC-Cut capacitor required, 150pF recommended
ES54K2	2mm x 2.5mm	2.5V _{DC}	10kOhms // 10pF, External DC-Cut capacitor required, 150pF recommended

Table: Click on a series to see the specification datasheet

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20. What is the transfer function for these product series?

Often called slope, the transfer function of a TCVCXO is the direction the frequency changes with respect to the control voltage. Positive slope means the output frequency increases with an increase in control voltage. Negative slope means that the output frequency is increasing with decreasing control voltage. The transfer function for the ES oscillator series is positive.

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21. What is linearity and what are the linearity specifications for these product series?

Often called monotonic linearity, this parameter is the calculation of the frequency error expressed in percentage with reference from the best straight line curve fit drawn on the output frequency versus control voltage graph. The linearity curve is the relationship between output frequency versus control voltage for a TCVCXO. The linearity parameter is not listed on the Ecliptek datasheet. For ES series products, characterization test data indicates that the linearity is typically around 2 to 4%. In a phase locked loop application, the linearity requirements may be very loose, while in a frequency modulation application the linearity requirement may be very stringent.

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22. What are the modulation bandwidth and input impedance for these product series?

Often called tuning or video bandwidth, modulation bandwidth (MBW) is the modulation frequency at the input of the TCVCXO at which the output frequency deviation decreases to -3dB of its DC value. Input impedance specifies the load of the TCVCXO control voltage input pad. The MBW and input impedance parameters can be found on the applicable Ecliptek datasheet.

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23. Is start-up time specified for these product series?

Start-up time for this series can be found on the applicable datasheet and is defined as the time from when the power supply reaches its specified value to the time the oscillator output signal amplitude reaches its steady state voltage output logic high level and the output is within the specified frequency tolerance. For ES series products, characterization test data indicates that the start-up time is typically around 2 to 4mS.

Note: 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. 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.

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

See the below table for the recommended electrical test fixture.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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

If the part number is specified with the TR 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.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

Table: Click on a series to see tape and reel dimensions

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26. 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.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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27. Are these oscillator series RoHS compliant and Pb-free?

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

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28. 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](#).

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29. Are 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.

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

If applicable, the customer should layout their PCB to include proper connections for the voltage control input function. See the below table for the recommended solder pad layout.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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

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

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

Obtaining a quote on-line is simple. Simply 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.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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33. How do I obtain a PDF copy of the product series datasheet?

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

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

Table: Click on a series to open the PDF datasheet

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34. How do I obtain a PDF copy of the specification datasheet 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.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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35. 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.

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36. How do I order an oscillator that has custom requirements not specified on the standard oscillator series datasheet?

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.

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

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

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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38. 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.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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39. Is thermal resistance information available for these product series?

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

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40. Is IBIS model information available for these product series?

There is no IBIS modeling information available for these product series.

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41. What are the marking specifications for these product series?

As shown on the applicable datasheet, these products have alpha numeric marking content on the top of the part. See the applicable datasheet for marking content as outlined in the below table.

ES Series	Package Type	Supply Voltage
ES51C1	5mm x 7mm	5.0V _{DC}
ES52C1	5mm x 7mm	3.3V _{DC}
ES51C5	3.2mm x 5mm	5.0V _{DC}
ES52C5	3.2mm x 5mm	3.0V _{DC}
ES52K1	2.5mm x 3.2mm	3.0V _{DC}
ES53K2	2mm x 2.5mm	2.8V _{DC}
ES54K2	2mm x 2.5mm	2.5V _{DC}

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

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42. Where can I get the information regarding discontinued or End of Life 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.

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43. Is Ecliptek ISO 9000 Certified?

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

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