Frequently Asked Questions

Rev A

For Series: ECCM1 ECCM2 ECCM3 ECCM5A ECCM7 ECCM8 ECCM9

Click on a Question to jump down to the corresponding Answer.

1. What are the Ecliptek ECCM series crystals?

These Ecliptek ECCM series devices are quartz crystal resonators. These product series are an electronic component used in frequency control applications and utilize a crystal made of synthetic quartz that is composed of Silicon and Oxygen (Silicon Dioxide). Often called a finished crystal unit; they consist of a quartz resonator plate (or blank) with electrodes, a holder with suitable mounting structures, and a hermetically sealed package.

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2. How do the ECCM series of crystals work?

A quartz crystal exhibits piezoelectric properties which generate an electrical potential when pressure is applied on the surfaces of the crystal. Conversely, when an electrical potential is applied to the surfaces of a crystal, mechanical deformation or vibration is generated. These vibrations occur at a frequency determined by the crystal mechanical design and the oscillator circuit. Under proper conditions, quartz crystal resonators can be used to stabilize the frequency of an oscillator circuit.

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3. What are the customer applications for the ECCM series crystals?

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

- Set-top Boxes
- Scanners, Printers, and Modems
- LCD Displays and HDTV
- Interface Controllers
- Medical Equipment
- PDA's and Portable Media Players
- Digital Cameras and Gaming Products
- Notebook Computers
- Video Cameras and Video Recorders
- Computer Peripherals and Networking Products

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4. What benefits do these products offer?

These product series offer the following benefits:

- Use of a thickness shear BAW (bulk acoustic wave) crystal
- Improved frequency stability through the use of an AT cut crystal blank
- Frequencies ranging from 7.680MHz up to 70.000MHz
- Fundamental and third overtone mode operation
- Frequency Tolerances as low as ±10ppm Maximum

Frequency (Temperature) Stabilities as low as ±10ppm Maximum

Commercial, extended commercial, and industrial operating temperature ranges

Wide range of available load capacitances

Low crystal resistance

Industry standard MSL 1 devices

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 ECCM series crystals are offered in industry standard leadless chip carrier (LCC) packages. This type of ceramic surface mount crystal package is fabricated using ceramic as its primary packaging material and is hermetically sealed with a metal cover providing an enclosure for the quartz crystal blank. 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. The table below outlines the package size for each ECCM series product offering.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

Table: Click on a series to see package outline drawing

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6. What type of crystal cut is used for these product series?

The type and angle of a quartz cut effects the crystal device operating parameters, the most significant being frequency stability. The frequency stability, often called temperature stability, is dependent upon the plane or the angle of the crystal element in relation to the crystalline axis of the crystal. The plane or angle is referred to as the crystal ‘cut’. These series utilize a common type of thickness shear crystal fabricated from Y bar quartz called the ‘AT cut’. For ‘AT cut’ crystals, the inflection point is at approximately 25°C and the location of the adjacent upper

and lower turning points is dependent upon the exact crystal cut angle. The frequency stability and operating temperature range required by the customer determine the angle of cut utilized by Ecliptek during device manufacturing.

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7. What is the drive level for these product series?

The crystal resonator drive level is a function of the driving or excitation current flowing through the crystal and is defined as the amount of power dissipation in the crystal, expressed in microwatts or milliwatts. Maximum power is the most power the device can dissipate while still maintaining operation with all electrical parameters guaranteed. Drive level should be maintained at the minimum levels necessary to initiate proper start-up and assure steady state oscillation. Excessive drive level can cause poor aging characteristics and crystal damage. The drive level specification is listed as a maximum on the respective ECCM series datasheet.

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

The nominal or center frequency of a quartz crystal unit is the specified reference frequency of the crystal and is typically specified in megahertz (MHz). The ECCM series crystals feature nominal frequencies ranging from 7.680MHz up to 70.000MHz. Available frequencies can be found on the applicable ECCM 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 fundamental or third overtone mode BAW quartz crystal blank packaged inside a hermetically sealed ceramic leadless surface mount package. Often called a header or leadless chip carrier (LCC), this SMD package has gold plated contact I/O pads and a seam sealed metal cover that is case grounded.

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10. What are the mode of operation options for these product series?

The mode of operation of a quartz device is one of the factors that will determine the frequency of oscillation. For AT cut thickness shear quartz crystals, overtone modes are at odd frequency harmonics. These series of crystals feature fundamental and/or third overtone mode oscillation. Please see the applicable series datasheet for the available mode of operation options.

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11. What are the frequency tolerance options for these product series?

The frequency tolerance, often called calibration accuracy, is the amount of frequency deviation from a specified center frequency at ambient temperature (referenced at 25°C). This parameter is specified with a maximum and minimum frequency deviation, expressed in percent (%) or parts per million (ppm). This deviation is associated

with a set of operating test conditions including load capacitance and drive level. Please see the applicable series datasheet for the available frequency tolerance options.

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12. What are the frequency stability options for these product series?

Frequency stability, often called temperature stability, is the amount of frequency deviation from the ambient temperature frequency (referenced at 25°C) over the operating temperature range. This term is specified with a maximum and minimum frequency deviation, expressed in percent (%) or parts per million (ppm). The frequency stability of a crystal is determined by the following primary factors: Type of quartz cut and angle of the quartz cut. Some of the secondary factors include: mode of operation, drive level, load capacitance, and mechanical design. Please see the applicable series datasheet for the available frequency stability options.

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

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

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14. What is the storage temperature range for these product series?

The storage temperature range is defined as the minimum and maximum temperatures that the device can be stored or exposed to when in a non-oscillation state. After exposing or storing the device at the minimum or maximum temperatures, all of the operating specifications are guaranteed over the specified operating temperature range. Please see the applicable series datasheet for the specified storage temperature range.

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15. 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 crystal. 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 ±1.0ppm over the first year, and less than ±0.3ppm 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 resonant mode options for these product series?

A crystal can be used in an oscillator circuit to operate in either of two resonant modes: Series resonance or parallel load resonance (also known as anti-resonance). The crystals used in these two types of modes are physically the same crystal, but are calibrated to slightly different frequencies. When a crystal is placed into an oscillator circuit, they oscillate together at a tuned frequency. This frequency is dependent upon the crystal design and the amount of load capacitance (CL), if any, the oscillator circuit presents to the crystal. Specified in picofarads (pF), load capacitance is comprised of a combination of the circuits discrete load capacitance, stray board capacitance, and capacitance from semiconductor miller effects. When an oscillator circuit presents some amount of load capacitance to a crystal, the crystal is termed "Parallel Load Resonant", and a value of load capacitance must be specified. If the circuit does not exhibit any capacitive loading, the crystal is termed "Series Resonant", and no value of load capacitance is specified. Please see the applicable series datasheet for the available resonant mode options.

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17. What are the load capacitance options for these product series?

These series offer many different load capacitance options. The table below outlines the load capacitance options for each series. If a customer requires a different load from that specified on the datasheet, please consult the factory with your custom requirements.

ECCM Series	Package Size	Load Capacitance
ECCM3	1.6mm x 2.0mm	8pf, 12pf
ECCM2	2.0mm x 2.5mm	8pf, 12pf
ECCM7	2.5mm x 3.2mm	8pf, 10pf, 12pf, 16pf, 18pf, Series
ECCM8	2.5mm x 4.0mm	10pf, 12pf, 16pf
ECCM9	3.2mm x 5.0mm	8pf to 50pf, Series
ECCM5A	3.5mm x 6.0mm	10pf to 50pf, Series
ECCM1	5.0mm x 7.0mm	12pf to 50pf, Series

Table: Click on a series to see electrical specifications

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18. What is the crystal resistance specification for these product series?

The resistive element of a crystal, called the equivalent series resistance (ESR), is measured in ohms and is specified as a maximum value. At the crystals series resonant frequency, the motional inductance (L_1) and motional capacitance (C_1) are of equal ohmic value but are exactly opposite in phase. The net result is that they

cancel one another and only a resistance remains in the series leg of the equivalent circuit. The ESR measurement is made only at the series resonant frequency (F_S), not at some predetermined parallel resonant frequency (F_L). Crystal resistance measured at some parallel load resonant frequency is often called the "effective" resistance. The crystal resistance (ESR) specification can be found on the applicable series datasheet.

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19. What is the shunt capacitance specification for these product series?

Shunt capacitance (C_0) is the static capacitance between the crystal terminals. Measured in picofarads (pF) and specified as a maximum value, shunt capacitance is present whether the device is oscillating or not (unrelated to the piezoelectric effect of the quartz). Shunt capacitance is derived from the dielectric of the quartz, the area of the crystal electrodes, and the capacitance presented by the crystal holder. The crystal shunt capacitance specification can be found on the applicable series datasheet.

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20. What are the motional capacitance and motional inductance specifications for these product series?

The motional capacitance and motional inductance are designated by C_1 and L_1, respectively, in the equivalent crystal resonator circuit. For a "Series" resonant crystal, the value of C_1 resonates with the value of L_1 at a frequency (F_S). The actual values of C_1 and L_1 have physical limitations when it is realized in a quartz crystal design. These constraints include the mode of operation, the quartz cut, the mechanical design, and the nominal frequency of the crystal.

C_1 and L_1 values or limits are not typically listed on crystal datasheets. If these parameters are to be specified, please complete the Ecliptek Custom Crystal Request Form from our website. From this page you will be able to enter custom C_1 and L_1 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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21. What is the capacitive ratio for these product series?

In applications (i.e. VCXO) where variations in the crystal parallel resonant frequency are desired, the capacitive ratio (r) should be specified. The capacitive ratio, the shunt capacitance (C_o) divided by the motional capacitance (C_1), is an indicator of the change in a parallel load resonant frequency as a direct result of a given change in crystal load capacitance. Capacitive ratio values or limits are not typically listed on crystal datasheets. If these parameters are to be specified, please complete the Ecliptek Custom Crystal Request Form from our website our website. From this page you will be able to enter custom capacitive ratio 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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22. What is the pullability specification for these product series?

Pullability is a specification for the change in the parallel load resonant frequency as a function of change in crystal load capacitance. Pullability is used to calculate the frequency difference, expressed in ppm, between two parallel load resonant frequencies (F_{CL1} and F_{CL2}) as a direct result of a given change in crystal load capacitance (C_{L1} and C_{L2}). Pullability values or limits are not typically listed on crystal datasheets. If these parameters are to be specified, please complete the Ecliptek Custom Crystal Request Form from our website. From this page you will be able to enter custom pullability 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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23. 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), crystal 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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24. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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25. Are these crystal series RoHS compliant and Pb-free?

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

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26. 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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27. 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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28. How do I layout my printed circuit board for these product series?

See the below table for the recommended solder pad layout.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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

Please see the Ecliptek Cross Reference by Competitor Part Number.

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30. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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31. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

Table: Click on a series to open the PDF datasheet

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32. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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33. 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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34. How do I order a crystal that has custom requirements not specified on the standard crystal series datasheet?

Complete the Ecliptek Custom Crystal 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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35. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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36. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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

Thermal resistance information (θ_{JA} and θ_{JC} values) is not available for these product series.

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38. Is crystal simulation or model information available for these product series?

Crystal simulation and modeling information is available. Please provide the full part number to the Engineering staff at Ecliptek so they can provide you with this information.

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39. 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.

ECCM Series	Package Size
ECCM3	1.6mm x 2.0mm
ECCM2	2.0mm x 2.5mm
ECCM7	2.5mm x 3.2mm
ECCM8	2.5mm x 4.0mm
ECCM9	3.2mm x 5.0mm
ECCM5A	3.5mm x 6.0mm
ECCM1	5.0mm x 7.0mm

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

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40. 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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41. Is Ecliptek ISO 9000 Certified?

Yes, Ecliptek is certified to ISO 9001.

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