Frequently Asked Questions

For Series: ECM2A

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

1.   What are the Ecliptek ECM2A series crystals?

The Ecliptek ECM2A series devices are quartz crystal resonators. The ECM2A series is an electronic component used in frequency control applications and utilizes a crystal made of synthetic quartz that is composed of Silicon and Oxygen (Silicon Dioxide). Often called a finished crystal unit, it consists 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 ECM2A 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 typical customer applications for the ECM2A series crystals?

This 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 does the ECM2A offer?

The ECM2A 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 16.000MHz up to 50.000MHz

Fundamental 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 package

RoHS Compliant (Pb-free) with high temperature 260°C reflow capability

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5.   What is the package type for the ECM2A series?

The ECM2A series crystals are offered in an industry standard leadless chip carrier (LCC) package. 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 the ECM2A series product offering.

Series	Package Size
ECM2A	2.0mm x 2.0mm

Table: Click on the series link to see package outline drawing

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6.   What type of crystal cut is used for the ECM2A 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'. This series utilizes 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 the ECM2A 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 ECM2A series datasheet.

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8. What nominal frequencies can I obtain for the ECM2A 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). Available frequencies can be found on the ECM2A 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 the ECM2A series?

The ECM2A series consists of a fundamental 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 the ECM2A 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. This series of crystals feature fundamental mode oscillation.

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11. What are the frequency tolerance options for the ECM2A 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 ECM2A series datasheet for the available frequency tolerance options.

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12. What are the frequency stability options for the ECM2A 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 ECM2A series datasheet for the available frequency stability options.

13. What are the operating temperature range options for the ECM2A 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 several operating temperature ranges. Please see the ECM2A series datasheet for the available operating temperature range options.

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14. What is the storage temperature range for the ECM2A 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 ECM2A series datasheet for the specified storage temperature range.

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15. What are the aging specifications for the ECM2A 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, this 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 parameter can be found on the ECM2A series datasheet.

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16. What are the resonant mode options for the ECM2A 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 ECM2A series datasheet for the available resonant mode options.

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17. What are the load capacitance options for the ECM2A series?

This series offers Parallel Resonant load capacitances from 8pF to 32pF and a Series Resonant option. If a customer requires a different load from that specified on the datasheet, please consult the factory with your custom requirements.

Series	Package Size	Load Capacitance
ECM2A	2.0mm x 2.5mm	Series Resonant or 8pf to 32pf Parallel Resonant

Table: Click on the series link to see electrical specifications

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18. What is the crystal resistance specification for the ECM2A 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 ECM2A series datasheet.

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19. What is the shunt capacitance specification for the ECM2A 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 ECM2A series datasheet.

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20. What are the motional capacitance and motional inductance specifications for the ECM2A 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 the ECM2A 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. 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 the ECM2A 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. Is the ECM2A 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.

Series	Package Size
ECM2A	2.0mm x 2.5mm

Table: Click on the series link to see tape and reel dimensions

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24. Is the ECM2A series compatible with my existing reflow processes?

The ECM2A series is 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 Size
ECM2A	2.0mm x 2.5mm

Table: Click on the series link to see recommended solder reflow methods

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25. Is this crystal series RoHS compliant and Pb-free?

The ECM2A series is 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 the ECM2A 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 the ECM2A series?

See the below table for the recommended solder pad layout.

Series	Package Size
ECM2A	2.0mm x 2.5mm

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

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29. How do I cross the ECM2A series with a competitor part number?

Please see the Ecliptek Cross Reference by Competitor Part Number.

30. What information is needed to obtain a quote for the ECM2A 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 Size
ECM2A	2.0mm x 2.5mm

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

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.

Series	Package Size
ECM2A	2.0mm x 2.5mm

Table: Click on the series link to open the PDF datasheet

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.

Series	Package Size
ECM2A	2.0mm x 2.5mm

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

33. Who do I contact if I have additional technical questions about the use of the ECM2A series?

The Engineering staff at Ecliptek can provide applications engineering support or answer customer technical questions.

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 the ECM2A series?

The environmental and mechanical specifications for the ECM2A series are listed on the datasheet and are outlined in the table below.

Series	Package Size
ECM2A	2.0mm x 2.5mm

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

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36. What reliability information is available for the ECM2A series?

Failure in Time (FIT) and Mean Time To Failure (MTTF) reliability data is available for the ECM2A series as provided in the below table.

Series	Package Size
ECM2A	2.0mm x 2.5mm

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

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37. Is thermal resistance information available for the ECM2A series?

Thermal resistance information (θ_{JA} and θ_{JC} values) is not available for the ECM2A series.

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38. Is crystal simulation or model information available for the ECM2A 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 the ECM2A series?

As shown on the datasheet, the ECM2A series has alpha numeric marking content on the top of the part. See the ECM2A datasheet for 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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