

Appendix L

Sample Crystal Specification

DESCRIPTION

Metal-plated quartz resonator, wire-mounted in an HC-18/U holder; designed to operate on the fifth overtone mode of the fundamental frequency of the resonator under noncontrolled temperature conditions. The crystal unit shall be similar to type CR-56/U, per the latest version of MIL-C-3098, except for those paragraphs of this specification noted with a double asterisk (**) prefix.

1. GENERATION INFORMATION
 - 1.1. Crystal element: AT-cut.
 - 1.2. Resonance: Series.
 - 1.3. Mode of vibration: Fifth overtone.
 - 1.4. Maximum drive level: 2.0 mW.
2. ELECTRICAL PARAMETERS
 - 2.1. Frequency range: 50.0-125.0 MHz.
 - 2.2. Specified frequency: Attach table.
 - **2.3. Frequency tolerance.
 - 2.3.1. Finishing (calibration) tolerance: ± 0.0005 percent of the specified frequency when measured at $+25^{\circ}\text{C}$ ($+1, -1^{\circ}\text{C}$).
 - 2.3.2. Drift tolerance (frequency stability): ± 0.002 percent from the frequency measurement made at room ambient when measured over the operating temperature range.
 - 2.3.2.1. Method of measurement: Method B per the latest version of MIL-C-3098 and paragraphs 6.1 and 6.2 of this specification.
 - **2.4. Test drive level: 1.0 ± 0.5 mW into $60\ \Omega$.
 - **2.5. Pin-to-pin capacitance: 4.5 pF, maximum.
 - 2.5.1. Method of measurement: Per latest version of MIL-C-3098 and paragraph 6.1 of this specification.
 - **2.6. Equivalent resistance: $60\ \Omega$, maximum, when measured over the operating temperature range.
 - 2.6.1. Method of measurement: Method B per latest version of MIL-C-3098 and paragraphs 6.1 and 6.2 of this specification.
 - **2.7. Unwanted modes: Crystal units shall have a minimum unwanted

mode effective resistance of $120\ \Omega$ or an unwanted-to-main-mode resistance ratio of 3 to 1, whichever is greater.

3. ENVIRONMENTAL REQUIREMENTS

- 3.1. Operable temperature range: -55°C (+0, -3°C) to $+105^{\circ}\text{C}$ (+3, -0°C).
- 3.2. Storage temperature range: -65°C (+0, -3°C) to $+105^{\circ}\text{C}$ (+3, -0°C).
- 3.3. Shock: Crystal units shall meet the test requirements of paragraph 3.5 of this specification subsequent to testing in accordance with the latest version of MIL-STD-202, method 202, except for the details noted in the latest version of MIL-C-3098, method A.
- **3.4. Vibration: Crystal units shall meet the test requirements of paragraph 3.5 of this specification subsequent to testing in accordance with the latest version of MIL-STD-202, method 204, test condition A, except the limiting acceleration shall be 0.01 inch double amplitude or 5 g, whichever is less, and the details and exceptions noted in the latest version of MIL-C-3098.
- 3.5. Vibration and shock test requirements: Maximum permitted change in frequency and equivalent resistance shall be as follows:
 - Permitted frequency change: ± 0.0005 percent (± 5 ppm).
 - Permitted equivalent-resistance change: ± 10 percent.
- 3.6. Leakage: In accordance with the latest version of MIL-C-3098.
- 3.7. Insulation resistance: Crystal units shall have a minimum insulation resistance of $500\ \text{M}\Omega$ subsequent to testing in accordance with the latest version of MIL-STD-202, method 302, except for the details noted in the latest version of MIL-C-3098.
- 3.8. Immersion: Crystal units shall meet the electrical requirements of paragraphs 3.7, 2.3, and 2.6 subsequent to testing in accordance with the latest version of MIL-STD-202, method 104, test condition B.
- 3.9. Salt spray: Crystal units shall show no visible evidence of corrosion in addition to meeting the electrical requirements of paragraphs 3.7, 2.3, and 2.6 subsequent to testing in accordance with the latest version of MIL-STD-202, method 101, test condition B.
- 3.10. Moisture resistance: Crystal units shall meet the electrical requirements of paragraphs 3.7, 2.3, and 2.6 subsequent to testing in accordance with the latest version of MIL-STD-202, method 106, except for the details and exceptions noted in the latest version of MIL-C-3098.
- 3.11. Aging: The permitted change in frequency from the highest to the lowest measurements shall be 0.0005 percent (5 ppm) when tested in accordance with the latest version of MIL-C-3098 at $+85^{\circ}\text{C}$ ($\pm 2^{\circ}\text{C}$) for a period of 30 days.

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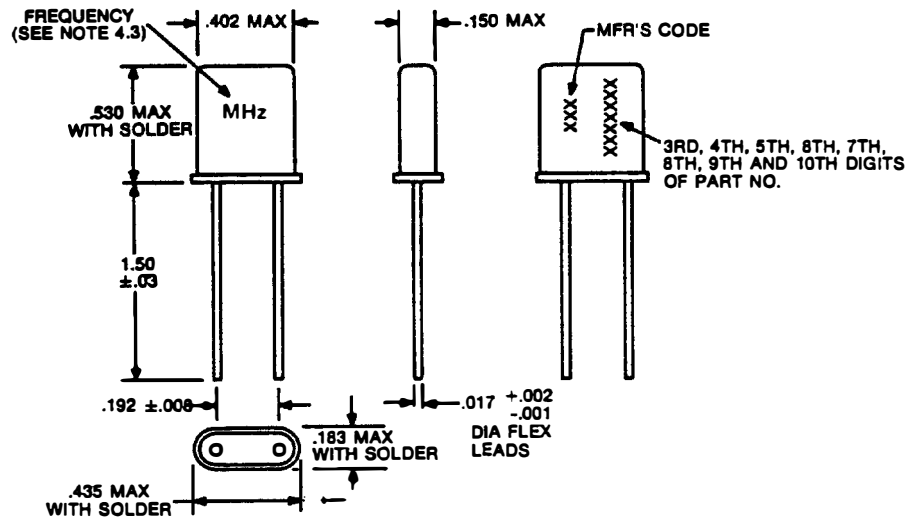


Figure L-1. HC-18/U crystal holder.

- 3.12. Low-temperature storage: Per latest version of MIL-C-3098.
4. MECHANICAL REQUIREMENTS
- 4.1. Holder: HC-18/U with leads tinned suitable for soldering. (See Figure L-1.)
- **4.2. Markings: Shall include frequency in megahertz, purchaser's part number, manufacturer's code, and date of manufacture. Markings shall be in accordance with the latest version of MIL-C-3098.
- 4.3. Example crystal frequency markings:

Below 100 MHz	XX.XXXXXX MHz.
100 MHz and above	XXX.XXXXX MHz.
5. QUALITY ASSURANCE PROVISIONS
- 5.1. Receiving inspection: Each lot of material submitted to this specification will be inspected in accordance with a sampling plan approved by quality control and quality assurance departments. Acceptance of the lot will be determined upon successful measurement of the following critical and/or major characteristics:
 - a. Visual and mechanical inspection (external) . . . (major).
 - b. Frequency at room ambient and over the operating temperature range . . . (major).
 - c. Equivalent resistance at room ambient and over the operating temperature range . . . (major).
 - d. Pin-to-pin capacitance at room ambient . . . (major).

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- e. Unwanted modes at room ambient . . . (major).
- f. Leakage, in accordance with the latest version of MIL-C-3098 . . . (major).
- 5.2. Quality control: Sample quantities from parts furnished on production orders may be tested to any requirement specified herein and disassembled to check for quality of workmanship by the purchaser.
- 5.3. Design change approval: Any deviations in the manufacturing process or materials used in preparing the component evaluation and/or engineering samples must be approved by the company's engineering division.
- 6. TESTING
- 6.1. Method of testing: The crystal unit holder shall be ungrounded when making frequency, pin-to-pin capacitance, and equivalent resistance measurement. The lead length for test shall be $\frac{1}{4}$ inch ($\pm \frac{1}{16}$ inch) from the holder base.
- 6.2. Test equipment: TS-683/TSM with a Radio Frequency Lab model HB8770 adaptor.
- 6.3. Frequency correlation: The frequency of a given crystal unit, as measured by the supplier's equivalent test set, shall agree with or be within ± 0.0005 percent (± 5 ppm) of the same measurement made with the Government reference standard test set, or the company's equivalent test set.
- 6.4. Resistance correlation: The equivalent resistance of a given crystal unit, as measured by the supplier's equivalent test set, shall agree with or be within ± 10 percent of the same measurement made with the Government reference standard test set or the company's equivalent test set.
- 6.5. Government source inspection marking: When parts to be supplied are required to have government source inspection as indicated by the part number shown on the purchase order, said parts shall be identified as Government-inspected items by the letter "G" stamped in ink or paint on each item prior to shipment. The letter "G" shall be of sufficient size to be easily identified by a person with normal or corrected vision, but not so large that it interferes with other markings. Method of marking is optional but must be capable of withstanding abrasion and scuffing that may be encountered in normal handling and shipping.