



REVISIONS (Δ DENOTES CHANGE)

REV.	DATE (YYYY/MM/DD)	RCN NO	DESCRIPTION OF CHANGE	UPDATED BY
-	2004/09/28	RLSD	N/A	J. VANDEUSEN
A	2010/01/21	16865	Add 4.1.9 flow down to subtier	J. VANDEUSEN
B	2014/01/03	20757	Add 4.1.10 Requirements for record retention	J. VANDEUSEN
C	2015/02/27	176066	Tie in Anaren Doc. #81000, general clarification, remove redundant information now located in 81000.	J. VANDEUSEN
D	2018/07/26	209426	Add packaging requirements and update document	J. VANDEUSEN
E	2021/01/21	309973	Update procurement specification formats, remove MIL-STD-981, Clarify EE data IAW MIL-PRF-38534 Rev L release.	J. VANDEUSEN

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES -TOLERANCES-		FRACTIONS DECIMALS ANGLES			PROCUREMENT SPECIFICATION FOR CRYSTAL	
DRAWN BY	DATE (YYYY/MM/DD)	THIRD ANGLE PROJECTION 				
J. VANDEUSEN	2004/09/28		A	31597	1032-11833	
DESIGNER N/A			SCALE	DOC CODE	REV	
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APPROVAL SIGNATURES ON FILE						
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1.0 PURPOSE:

The purpose of this document is to define the supplier requirements of all procured crystals used in devices. This document is used in conjunction with Document #81000.

2.0 APPLICATION:

This procedure shall apply to all crystals as follows:

- 2.1 **Condition A** - Elements to be used in "fully" compliant devices as defined in MIL-PRF-38534 Class H and are manufactured in compliance with MIL-PRF-3098. Element evaluation is not required.
- 2.2 **Condition B** - Elements intended to be used in full compliance with MIL-PRF-38534 Class H and MIL-PRF-3098 but testing and element evaluation will be the responsibility of the supplier as specified in the element drawing.
- 2.3 **Condition C** - Elements to be used on devices which do not impose MIL-PRF-38534 or MIL-PRF-3098.
- 2.4 **Condition D** - Elements to be used in "fully" compliant devices as defined in MIL-PRF-38534 Class K and are manufactured in compliance with MIL-PRF-3098. Element evaluation is not required.

3.0 DEFINITIONS:

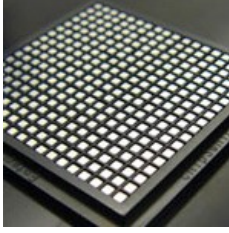

- 3.1 **Element** - A constituent of the device that contributes directly to its operation.
- 3.2 **Inspection Lot** - An inspection lot shall consist of crystals of a single type submitted at one time for inspection to determine compliance with the applicable requirements and acceptable criteria.
- 3.3 **Element Evaluation** - As applicable to this specification shall consist of crystal die IAW MIL-PRF-3098.
- 3.4 **Lot Control**- Crystals supplied under this specification shall be manufactured in homogenous lots. The homogenous lot shall be defined as a lot of identical crystals manufactured to the same drawing, same drawing revision, same specification and same specification revision in one unchanged process.
- 3.5 **Environmentally Controlled Area** - An area which exhibits the following conditions:
 - 3.5.1 Temperature shall be 25°C (+3/-5°C)
 - 3.5.2 Class 8 per ISO 14644-1, -2 or Class 100,000 per MIL-STD-209.
 - 3.5.3 Humidity - RH 30 to 65%
 - 3.5.4 Positive Pressure .01" water column or greater
 - 3.5.5 Element Storage shall be in a nitrogen atmosphere dry box.

4.0 REQUIREMENTS:

- 4.1 **General:**
 - 4.1.1 All materials and processes used by the crystal mfg will be suitable for polymeric adhesive and/or solder mounting.
 - 4.1.2 All electrical tests and visual inspection may be done at the packaged level provided all rejects are removed from the lot.
- 4.2 **Packaging Requirements:**
 - 4.2.1 **Packaging:**
Refer to element packaging Table 1.
Elements shall be packaged to prevent damage during shipment and for automated assembly.
 - 4.2.2 **Package Marking:**
The element part number, manufacturer's name, manufacturer's lot number and quantity shall appear on each waffle tray/gel pack. All samples and test data shall be identified by its device type, manufacturer's name and manufacturer's lot number. markings shall be sufficient for inspection lot traceability.
 - 4.2.3 **Certificate of Compliance:**
As defined in document #81000.

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Element Packaging Requirements Table 1

Element Type	Packaging Requirement			
Passive elements (crystals, resistors, capacitors, inductors and transformers)	2" x 2" black conductive waffle tray with: - carrier well must be deep enough so that the die surface is below the top plane of the waffle tray - protective sheet or pad - secure lid (hinge or clamp)		OR 2" x 2" black conductive gel pack with vacuum release for auto pick and place capability: - secure lid (hinge or clamp)	
For elements which will not fit into a 2" x 2" waffle tray or gel pack	Elements shall be packaged in a manner that: 1. Physically restrained from vibration and mechanically isolated from shock that could cause physical damage or electrical degradation of the elements. 2. Sealed in an electrostatic bag.			

4.3 Condition A - Requirements for crystals (MIL-PRF-3098 screened and element evaluated).

- 4.3.1 The supplier shall perform 100% electrical testing at 25°C to ensure compliance to the manufacturer’s electrical data book and/or element drawing.
- 4.3.2 The supplier shall have an accepted internal document for visual inspection to MIL-PRF-3098.
- 4.3.3 The supplier shall perform 100% visual inspection to MIL-PRF-3098 in an environmentally controlled area and ensure compliance to all visual and mechanical specifications.
- 4.3.4 Element evaluation shall be performed by the supplier on each inspection lot in accordance with MIL-PRF-3098.
- 4.3.5 **Delivery Conditions:**
 - 4.3.5.1 IAW Section 4.2 Packaging Requirements
 - 4.3.5.2 **Required Documentation** - Crystal performance data to be submitted with the inspection lot:
 - 1. Element Evaluation Screening\Attributes Data
 - 2. Test Data

4.4 Condition B - Requirements for all crystals (MIL-PRF-3098 screened and element evaluated).

- 4.4.1 The supplier shall perform 100% electrical testing at 25°C to ensure compliance to the manufacturer’s electrical data book and/or element drawing.
- 4.4.2 The supplier shall have an accepted internal document for visual inspection to MIL-PRF-3098.
- 4.4.3 The supplier shall perform 100% visual inspection to MIL-PRF-3098 in an environmentally controlled area and ensure compliance to all visual and mechanical specifications.
- 4.4.4 Element evaluation shall be performed by the supplier on each inspection lot in accordance with MIL-PRF-3098.
- 4.4.5 **Delivery conditions:**
 - 4.4.5.1 IAW Section 4.2 Packaging Requirements.

4.5 Condition C - Crystals procured to element drawing.

- 4.5.1 The supplier shall perform 100% electrical testing at 25°C in accordance with the element drawing.
All electrical rejects shall be removed.

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4.5.2 Devices shall be capable of meeting the visual and mechanical requirements of MIL-PRF-3098.

The supplier shall perform a sample inspection on each lot to assure conformance.

4.5.3 **Delivery Conditions** -

4.5.3.1 IAW Section 4.2 Packaging Requirements.

4.6 **Condition D** - Requirements for crystals (MIL-PRF-3098 Screened, QCI, Element Evaluated).

4.6.1 The supplier shall perform 100% electrical testing at 25°C to ensure compliance to the manufacturer's electrical characteristics and/or element drawing. For specific applications, an element may require testing over full temperature range and will be specified on the element drawing.

4.6.2 The supplier shall have an accepted internal document for visual inspection to MIL-PRF-3098.

4.6.3 The supplier shall perform 100% visual inspection to MIL-PRF-3098 in an environmentally controlled areas and ensure compliance to all visual and mechanical specifications.

4.6.4 Element evaluation shall be performed by the supplier for each inspection lot in accordance with MIL-PRF-3098. Test samples shall be delivered with each lot.

4.6.5 QCI testing shall have been performed in accordance with MIL-PRF-3098. QCI data shall be available for review.

4.6.6 **Delivery Conditions:**

4.6.6.1 IAW Section 4.2 Packaging Requirements.

4.6.6.2 **Required Documentation** - Crystal performance data to be submitted with the inspection lot:

1. Element Evaluation Screening\Attributes data.
2. Test data

5.0 **ACCEPT/REJECT CRITERIA:**

5.1 Accept all lots which pass the applicable paragraphs of this procedure and the source control drawing.

5.2 Reject any device(s) and separate it from the lot which fails an electrical parameter or visual/mechanical criteria.

5.3 Reject any inspection lot which does not pass element evaluation.

6.0 **QUALITY ASSURANCE PROVISIONS:**

6.1 TTM reserves the right to perform testing in accordance with paragraph 2.0 and any failure of the material to meet the requirements of this document shall be cause for rejection.

6.2 TTM reserves the right to review any suppliers program, process and data to assure conformance to the requirements of this specification, the purchase order and the applicable element drawing.

7.0 **REFERENCE DOCUMENTS:**

7.1 MIL-PRF-3098

7.2 Element SCD

7.3 Purchase Order

7.4 MIL-PRF-38534

7.5 ISO14644-1, -2 or MIL-STD-209

7.6 TTM supplier requirements for Quality, Design & Manufacturing, Document #81000.

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