



**REVISIONS ( Δ DENOTES CHANGE)**

| REV. | DATE (YYYY/MM/DD) | RCN NO | DESCRIPTION OF CHANGE   | UPDATED BY   |
|------|-------------------|--------|---|--------------|
| -    | 1987/05/22        | RLSD   | N/A   | D. MILLER    |
| A    | 1989/07/12        | 1707   | Editorial, Addition of Method 2032; In accordance with Notice 8 of MIL-STD-883  | D. MILLER    |
| B    | 1990/12/17        | 2054   | Add Class S (K) Criteria, Editorial, Reference to MIL-H-38534   | D. MILLER    |
| C    | 1992/12/08        | 3184   | Update to MIL-H-38534 Rev B   | D. MILLER    |
| D    | 1996/07/10        | 5227   | MIL-H-38534 updated to MIL-PRF-38534  | D. MILLER    |
| E    | 1998/03/12        | 6678   | Allow vendor to perform in-house inspection/testing for Condition B orders. MSK still performing Class H EE.  | J. VANDEUSEN |
| F    | 2000/04/07        | 8184   | Add Inductor/Transformer tie in to MIL-STD-981  | J. VANDEUSEN |
| G    | 2003/02/25        | 10734  | Clarification of magnetic requirements  | J. VANDEUSEN |
| H    | 2004/07/11        | 11715  | Update/clarification IAW ISO 9000-2000, AS9100  | J. VANDEUSEN |
| I    | 2010/01/11        | 16865  | Add 5.1.8 flow down to subtier  | J. VANDEUSEN |
| J    | 2010/04/28        | 17232  | Add Condition E   | J. VANDEUSEN |
| K    | 2014/01/03        | 20757  | Add 5.1.9 Requirements for record retention   | J. VANDEUSEN |
| L    | 2015/02/20        | 176066 | Tie in Anaren Doc. #81000, general clarification, remove redundant information now located in 81000.  | J. VANDEUSEN |
| M    | 2017/01/04        | 191677 | Add sample inspection of MIL-PRF-55365 tantalum caps  | J. VANDEUSEN |
| N    | 2017/03/16        | 194612 | Add Condition B Delivery Conditions   | J. VANDEUSEN |
| P    | 2017/12/11        | 205457 | Add waffle pack specifications  | J. VANDEUSEN |
| R    | 2018/08/17        | 210023 | Add packaging requirements and update document  | J. VANDEUSEN |
| T    | 2019/02/19        | 305553 | Adding reference of MIL-PRF-55342   | J. VANDEUSEN |
| U    | 2021/01/21        | 309973 | Update procurement specification formats, remove MIL-STD-981, Clarify EE data IAW MIL-PRF-38534 Rev L release.  | J. VANDEUSEN |
| V    | 2021/08/31        | 310945 | Add Cond F and G, update Cond E, Remove HiRel note, update format so delivery format is the same for all conditions, add established reliability references | J. VANDEUSEN |
| W    | 2021/10/12        | 311367 | Clarify packaging, Add Tape and Reel packaging reference/document, Update 4.1.1 and 4.1.3   | J. VANDEUSEN |
| Y    | 2022/03/08        | 312002 | Significant changes to better define requirements of our suppliers.   | J. VANDEUSEN |
| AA   | 2022/08/22        | 312830 | Add component orientation requirement to packaging section of document.   | J. VANDEUSEN |

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|  |                   |  |  |       |   |          |        |
|--|-------------------|--|--|-------|---|----------|--------|
| UNLESS OTHERWISE SPECIFIED<br>DIMENSIONS ARE IN INCHES<br>-TOLERANCES- |                   | FRACTIONS    DECIMALS    ANGLES  |  |       | <b>PROCUREMENT SPECIFICATION<br/>FOR<br/>PASSIVE ELEMENTS</b> |          |        |
| DRAWN BY   | DATE (YYYY/MM/DD) | <b>THIRD ANGLE<br/>PROJECTION</b><br> |  |       |   |          |        |
| D. MILLER  | 1987/05/22        |  | A  | 31597 | SCALE   | DOC CODE | REV    |
| DESIGNER N/A   |                   |  | N/A  | N/A   | AA  | SHEET    | 1 OF 8 |
| ENGINEER DAN MILLER  |                   |  |  |       |   |          |        |
| APPROVAL SIGNATURES ON FILE  |                   |  |  |       |   |          |        |
| DOC TYPE N/A   |                   |  |  |       |   |          |        |

**1.0 PURPOSE:**

The purpose of this document is to define the requirements for procurement of passive elements (resistors, resistor networks, thickfilm substrates, thinfilm substrates, inductors, transformers and capacitors) for use in devices. This document is used in conjunction with Doc. #81000.

**2.0 APPLICATION:**

This procedure shall apply to all passive elements as follows:

- 2.1 Condition A** - Elements to be used in compliance with MIL-PRF-38534 Class H devices. Element evaluation shall be performed IAW MIL-PRF-38534 Class H and data provided with delivery.
- 2.2 Condition B** - Elements intended to be used in full compliance with MIL-PRF-38534 Class H devices. Element evaluation is the responsibility of TTM. Vendor/mfg is responsible for 100% visual and electrical, at the die level. Die level data is not required with delivery.
- 2.3 Condition C** - Elements to be used in devices which do not impose MIL-PRF-38534 element evaluation.
- 2.4 Condition D** - Elements to be used in compliant MIL-PRF-38534 Class K devices. Element evaluation shall be performed IAW MIL-PRF-38534 Class K and data provided with delivery.
- 2.5 Condition E** - Elements tested IAW the element SCD and data provided with delivery.
- 2.6 Condition F** - Elements tested IAW the element SCD with no data required.
- 2.7 Condition G** - Elements that are MIL-PRF specification qualified and/or are from an established reliability level and are listed on the QPL.

This includes elements from the following:

- MIL-PRF-55681 Ceramic Capacitors (CDR)
- MIL-PRF-123 Ceramic Capacitors (M123)
- MIL-PRF-49470 Stacked Capacitors
- MIL-PRF-55365 Tantalum Capacitors (CWR)
- MIL-PRF-39003 Tantalum Capacitors (CSR)
- MIL-PRF-83446 Coils
- MIL-PRF-15305 Coils
- MIL-PRF-55342 Resistors
- MIL-PRF-27 Transformers/Inductors
- MIL-PRF-32535 Ceramic Capacitors (BME)

**NOTE:** For MIL-PRF-55365 tantalum capacitors, sample visual inspection is acceptable.

**Established Reliability Series:**

- S311-P-829 (NASA compliant capacitor)
- NASA EEE-INST-002 (NASA compliant capacitor)
- TAZH000\*000XXM (M = CWR compliant to 55365)
- SR#123, SR#S311 series ceramic capacitors from Presidio
- GR900 series ceramic capacitor from Kemet
- DSCC/DLA controlled Drawing

**3.0 DEFINITIONS:**

- 3.1 Element** - A constituent of the device that contributes directly to its operation. (ie. capacitor, resistor, inductor, transformer)
- 3.2 Production Lot** - A production lot consists of an element type manufactured from the same basic raw materials on the same production line, processed under the same manufacturing techniques and controls using the same type of equipment. Each lot shall be assigned a unique identification that provides traceability to all processing steps.
- 3.3 Inspection Lot** - MIL-PRF-38534 Inspection Lot. An inspection lot shall consist of passive elements of a single element type submitted at one time for inspection to determine compliance with the applicable requirements and acceptable criteria.
- 3.4 Element Evaluation** - As applicable to this specification shall consist of passive elements evaluated IAW MIL-PRF-38534, Class H or K.

|  |                           |                          |                        |
|--|---------------------------|--------------------------|------------------------|
| CONTENT IS SUBJECT TO TTM TECHNOLOGIES PROPRIETARY PER SHT 1 |                           |                          |                        |
| SIZE<br><b>A</b>   | CAGE CODE<br><b>31597</b> | DOC NO. <b>1026-1628</b> |                        |
| SCALE<br><b>N/A</b>  | DOC CODE<br><b>N/A</b>    | REV<br><b>AA</b>         | SHEET<br><b>2 OF 8</b> |

**3.5 Environmentally controlled area:**

- 3.5.1 Class 8 per ISO 14644-1, -2 or Class 100,000 per MIL-STD-209.
- 3.5.2 Temperature - 25°C +3, -5°C
- 3.5.3 Positive pressure .01" water column or greater.
- 3.5.4 Humidity - RH 30 to 65%.
- 3.5.5 Element storage shall be in a nitrogen atmosphere dry box.

**4.0 GENERAL INFORMATION:**

**4.1 General:**

- 4.1.1 All electrical test (100%) and visual inspection (100%) may be performed at the element level provided rejects are identified and removed from the lot.
- 4.1.2 When assembly is required for element evaluation, the build process may use similar assembly methods, materials and conditions used in typical device production. The processes may include:
  - Die attach material shall be selected based on the element type (power elements may be mounted with solder, eutectic or thermally conductive epoxy and low power elements may be mounted with conductive or non-conductive epoxy)
  - Wire bond material and size shall be selected based on the element type (power elements may be wired with large diameter aluminum wire 5, 8, 10, 12, 15 or 20mil wire and low power elements may be wired with 0.7, 1.0, 1.25, 1.3 or 2.0 mil gold wire).
- 4.1.3 Other Documentation - Evidence of the suppliers inspection, assembly, screening and testing shall be maintained at the suppliers facility. The evidence maintained should include the following:
  - a. Name of operation, specification number and revision of each process or test.
  - b. Part number, wafer lot number and manufacturer internal lot identification number (s).
  - c. Date (s) of test and operator identification.
  - d. Calibration control number and calibration due date of all test equipment.
  - e. Quantity tested and rejected for each process or test and actual quantity tested if sampled.
  - f. For electrical test, test program number and revision.

**4.2 Packaging/Marking Best Practices:**

**4.2.1 Packaging:**

Packaging requirements are placed on the purchase order. This requirement may be waffle pack, gel pack, or tape and reel. **Components must all be oriented in the same direction in the package and this orientation must be maintained for each shipment.**

If no waffle pack is defined, then the supplier may use a waffle pack that does not allow greater than 45 degrees of part rotation in the cavity and the cavity depth will be such that the part cannot either flip or stand on end during transit .

If no gel pack is defined, then the supplier may use a gel pack that provides the same consistent placement/ orientation of the parts on the gel for each pack and for each shipment of that part.

**Tape and reel requirements are defined in specification 302-032-00.**

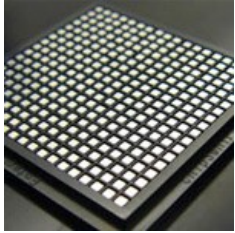
Refer to element packaging table (see next page).

Elements shall be packaged to prevent damage during shipment and for automated assembly.

|   |                           |                          |                        |
|---|---------------------------|--------------------------|------------------------|
| <b>CONTENT IS SUBJECT TO TTM TECHNOLOGIES PROPRIETARY PER SHT 1</b> |                           |                          |                        |
| SIZE<br><b>A</b>  | CAGE CODE<br><b>31597</b> | DOC NO. <b>1026-1628</b> |                        |
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**4.2.2 Package/Container Marking:**

The element part number, manufacturer's name, manufacturer's lot number and quantity shall appear on the paperwork and on each package/container/waffle tray/gel pack. Package/container marking shall be sufficient for lot traceability.

| Element Type   | Packaging Requirement   |   |    |  |
|--|---|---|----|--|
| Passive Elements<br>(crystals, resistors, capacitors,<br>inductors and transformers) | 2" x 2" black<br>conductive waffle tray<br>with: <ul style="list-style-type: none"> <li>- Carrier well must be deep enough so that the die surface is below the top plane of the waffle tray</li> <li>- Protective sheet or pad, as applicable. Optimum insert is Entegris H20-001-0715</li> <li>- Secure lid with single clip. Dual clips not allowed unless stacked.</li> <li>- Hinged lids are not allowed unless prior approval is obtained.</li> </ul> |  | OR | 2" x 2" black<br>conductive gel pack<br>with vacuum release for<br>auto pick and place<br>capability: <ul style="list-style-type: none"> <li>- Secure lid with single clip <u>Dual clips not allowed.</u></li> <li>- Hinged lids are not allowed unless prior approval is obtained.</li> </ul> |
| For elements which will not<br>fit into a 2" x 2" waffle tray<br>or gel pack         | <u>Elements shall be packaged in a manner that:</u> <ol style="list-style-type: none"> <li>1. Physically restrained from vibration and mechanically isolated from shock that could cause physical damage or electrical degradation of the elements.</li> <li>2. Sealed in an electrostatic bag.</li> </ol>  |   |    |  |
| For elements that are placed<br>in tape and reel                                     | Tape and reel requirements are defined in document 302-032.00.<br>Specification for Components to be delivered in Tape and Reel Packaging.<br>EACH INDIVIDUAL REEL MAY NOT CONTAIN MIXED LOTS OF COMPONENTS   |   |    |  |

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| SCALE<br><b>N/A</b>  | DOC CODE<br><b>N/A</b>    | REV<br><b>AA</b>         | SHEET<br><b>4 OF 8</b> |

**5.0 PROCEDURE:**

**5.1 Condition A:**

- 5.1.1 Element evaluation shall be performed by the supplier on each lot (production lot, inspection lot, etc.) IAW MIL-PRF-38534 for Class H elements.
- 5.1.2 The supplier shall have an accepted internal document for visual inspection to MIL-STD-883 Test Method 2032, or applicable MIL-PRF document to ensure compliance.
- 5.1.3 As required by MIL-PRF-38534, the supplier shall perform 100% visual inspection to an in-house control document in an environmentally controlled area and ensure compliance to all visual and mechanical specifications. Visual pass/fail submittal quantity is not required.
- 5.1.4
  - a. As required by MIL-PRF-38534, the supplier shall perform 100% electrical testing at the element level at 25°C to ensure compliance with the manufacturer’s internal requirements, electrical data book and/or element drawing. Data recording and pass/fail submittal quantity is not required.
  - b. Elements shall be capable of operating over full temperature range to minimum and maximum specifications.
- 5.1.5 **Delivery Conditions:**

5.1.5.1 **Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

5.1.5.2 Required Documentation

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)
- c. Element Evaluation screening/attributes data and as applicable, the wire material and diameter
- d. Element test data

**5.2 Condition B:**

- 5.2.1 The supplier shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032 or applicable MIL-PRF document to ensure compliance.
- 5.2.2 As required by MIL-PRF-38534, the supplier shall perform 100% visual inspection to an in-house control document in an environmentally controlled area and ensure compliance to all visual and mechanical specifications. Visual pass/fail submittal quantity is not required.
- 5.2.3
  - a. As required by MIL-PRF-38534, the supplier shall perform electrical test at 25°C 100% to ensure compliance to the manufacturer’s internal requirements, electrical data book and/or element drawing. Data recording and pass/fail submittal quantity is not required.
  - b. Devices shall be capable of operating over full temperature range to minimum and maximum specifications.

5.2.4 **Delivery Conditions**

5.2.4.1 **Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

5.2.4.2 Required Documentation

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)

**5.3 Condition C:**

- 5.3.1 The supplier shall guarantee performance of the elements to conform to the internally specified electrical and mechanical specifications.
- 5.3.2 Elements shall be capable of meeting the visual requirements of MIL-STD-883 Method 2032 or applicable MIL-PRF document.

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|--|---------------------------|--------------------------|------------------------|
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| SIZE<br><b>A</b>   | CAGE CODE<br><b>31597</b> | DOC NO. <b>1026-1628</b> |                        |
| SCALE<br><b>N/A</b>  | DOC CODE<br><b>N/A</b>    | REV<br><b>AA</b>         | SHEET<br><b>5 OF 8</b> |

**5.3.3 Delivery Conditions:**

**5.3.3.1 Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

**5.3.3.2 Required Documentation**

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)

**5.4 Condition D:**

**5.4.1** Element evaluation shall be performed by the supplier on each lot (production lot, inspection lot, etc.) IAW MIL-PRF-38534 for Class K elements.

**5.4.2** The supplier shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032, or applicable MIL-PRF document to ensure compliance.

**5.4.3** As required by MIL-PRF-38534, the supplier shall perform 100% visual inspection to an in-house control document in an environmentally controlled area and ensure compliance to all visual and mechanical specifications. Visual pass/fail submittal quantity is not required.

- 5.4.4 a.** As required by MIL-PRF-38534 the supplier shall perform 100% electrical testing at 25°C to ensure compliance with the manufacturer’s internal requirements, electrical data book and/or element drawing. Data recording and pass/fail submittal quantity is not required.
- b.** Devices shall be capable of operating over full temperature range to minimum and maximum specifications.

**5.4.5 Delivery Conditions:**

**5.4.5.1 Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

**5.4.5.2 Required Documentation**

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)
- c. Element Evaluation screening/attributes data and as applicable, the wire material and diameter
- d. Element test data

**5.5 Condition E:**

**5.5.1** The supplier shall test to the requirements called out in the element SCD.

**5.5.2** The supplier shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032 or applicable MIL-PRF document to ensure compliance.

**5.5.3** As required by MIL-PRF-38534, the supplier shall perform 100% visual inspection to an in-house control document in an environmentally controlled area and ensure compliance to all visual and mechanical specifications. Visual pass/fail submittal quantity is not required.

- 5.5.4 a.** As required by MIL-PRF-38534, the supplier shall perform electrical test at 25°C 100% to ensure compliance to the manufacturer’s internal requirements, electrical data book and/or element drawing. Data recording and pass/fail submittal quantity is not required.
- b.** Devices shall be capable of operating over full temperature range to minimum and maximum specifications.

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|---|----------------------------------|--------------------------|-------------------------------|
| <b>CONTENT IS SUBJECT TO TTM TECHNOLOGIES PROPRIETARY PER SHT 1</b> |                                  |                          |                               |
| <b>SIZE</b><br><b>A</b>   | <b>CAGE CODE</b><br><b>31597</b> | <b>DOC NO. 1026-1628</b> |                               |
| <b>SCALE</b><br><b>N/A</b>  | <b>DOC CODE</b><br><b>N/A</b>    | <b>REV</b><br><b>AA</b>  | <b>SHEET</b><br><b>6 OF 8</b> |

**5.5.5 Delivery Conditions:**

**5.5.5.1 Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

**5.5.5.2 Required Documentation**

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)
- c. Screening/attributes data showing compliance to the special requirements
- d. Element test data
- e. As applicable, the wire material and diameter

**5.6 Condition F:**

**5.6.1** The supplier shall test to the requirements called out in the element SCD.

**5.6.2** The supplier shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032 or applicable MIL-PRF document to ensure compliance.

**5.6.3** As required by MIL-PRF-38534, the supplier shall perform 100% visual inspection to an in-house control document in an environmentally controlled area and ensure compliance to all visual and mechanical specifications. Visual pass/fail submittal quantity is not required.

- 5.6.4 a.** As required by MIL-PRF-38534, the supplier shall perform electrical test at 25°C 100% to ensure compliance to the manufacturer’s internal requirements, electrical data book and/or element drawing. Data recording and pass/fail submittal quantity is not required.
- b.** Devices shall be capable of operating over full temperature range to minimum and maximum specifications.

**5.6.5 Delivery Conditions:**

**5.6.5.1 Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

**5.6.5.2 Required Documentation**

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)
- c. Element traceability to the SCD
- d. Data available upon request

**5.7 Condition G:**

**5.7.1** Element is MIL-PRF qualified and/or from an established reliability level. Element evaluation is not required by the vendor.

**5.7.2** The supplier shall have an accepted internal document for visual inspection to MIL-STD-883, Method 2032 or applicable MIL-PRF document to ensure compliance.

**5.7.3** As required by MIL-PRF-38534 or applicable qualified line the supplier shall perform 100% visual inspection to an in-house control document in an environmentally controlled area and ensure compliance to all visual and mechanical specifications. Visual pass/fail submittal quantity is not required.

- 5.7.4 a.** As required by MIL-PRF-38534 or applicable qualified line, the supplier shall perform 100% electrical testing at 25°C to ensure compliance with the manufacturer’s internal requirements, electrical data book and/or element drawing. Data recording and pass/fail submittal quantity is not required.
- b.** Devices shall be capable of operating over full temperature range to minimum and maximum specifications.

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|---|---------------------------|--------------------------|------------------------|
| <b>CONTENT IS SUBJECT TO TTM TECHNOLOGIES PROPRIETARY PER SHT 1</b> |                           |                          |                        |
| SIZE<br><b>A</b>  | CAGE CODE<br><b>31597</b> | DOC NO. <b>1026-1628</b> |                        |
| SCALE<br><b>N/A</b>   | DOC CODE<br><b>N/A</b>    | REV<br><b>AA</b>         | SHEET<br><b>7 OF 8</b> |

**5.7.5 Delivery Conditions:**

**5.7.5.1 Packaging/Marking:** Packaging and marking shall be IAW Para 4.2.

**5.7.5.2 Required Documentation**

- a. Certificate of Compliance, as defined in Document #81000
- b. OEM C of C and Distributor C of C (if supplied by distributor)
- c. MIL-PRF/Established Reliability Element traceability

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

**7.0 ACCEPT/REJECT CRITERIA:**

- 7.1** Accept all lots which pass the applicable paragraphs of this procedure and the element scd.
- 7.2** Reject any device(s) and separate it from the lot which fails an electrical parameter or visual criteria.
- 7.3** Reject any lot which does not pass the applicable paragraphs of this procedures and the element SCD/element evaluation.

**8.0 REFERENCE DOCUMENTS:**

- 8.1** MIL-STD-883
- 8.2** Element SCD
- 8.3** Purchase order
- 8.4** MIL-PRF-38534
- 8.5** ISO 14644-1, -2 or equivalent
- 8.6** TTM supplier requirements for Quality, Design & Manufacturing, Document #81000
- 8.7** TTM supplier requirements for tape and reel. Document 302-032.00

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|---|----------------------------------|--------------------------|-------------------------------|
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| <b>SIZE</b><br><b>A</b>   | <b>CAGE CODE</b><br><b>31597</b> | <b>DOC NO. 1026-1628</b> |                               |
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