M and /883 Screening Program

DESCRIPTION

Apex Microtechnology products have been screened to MIL-PRF-38534, Class H and manufactured in a DSCC Certified Facility using the baseline documents listed herein. These products provide a high reliability product option and satisfy the requirements for components used in airborne and ground-based military applications. Compliance with these requirements is signified by the "/883" suffix in the model number. "Non-compliant" version is identified using "M" only in the model number.

Complete description of an APEX "M" or "/883" product consists of the following:

1. **Industrial Grade Data Sheet** (i.e. PA02/PA02A).
   This contains Typical Characteristics and Performance Graphs.
2. **"M" Data Sheet** (i.e. PA02M).
   This is the Table 4 – Group A Inspection which defines the parameters and limits that the product must meet when tested over the full military case temperature range of –55°C to +125°C.
3. **"/883" Screening Program Data Sheet** (i.e. this document).
   This defines the manufacturing processes and screening steps for an "M" or "/883" product. (Refer to Figure 1 for order of flow.)
4. **Package and Accessories Information Data Sheet**
   This contains the package outline dimensions (i.e. 8-pin TO-3).
   All applications data and performance optimization suggestions given for the Industrial product apply to the "M" or "/883" versions of a given product family as well. Package outlines are identical except that the "M" or "/883" grade pins are hot solder dipped over nickel plating to meet the solderability requirements of MIL-STD-883, Method 2003.

QML-38534 FACILITY APPROVAL STATUS

The Apex Microtechnology manufacturing facility in Tucson, AZ, USA, is a DSCC certified and qualified QML-38534 facility. Certification has been maintained since November 8, 1989, and a QML listing as of May 31, 1990.

CONSTRUCTION

These power products have been built and assembled using standard compliant hybrid processes including high temperature solder and conductive epoxy. A metallized ceramic (beryllia) substrate has thickfilm resistors, thickfilm gold conductors and thickfilm silver conductor. Die to substrate and pin to substrate wirebonds are aluminum. The package is hermetically sealed using resistance welding in a dry nitrogen atmosphere.

1.0 APPLICABLE DOCUMENTS

1.1 SPECIFICATIONS

MIL-PRF-38534 General Specification for Hybrid Microcircuits

1.2 STANDARDS

MIL-STD-883 Test Methods and Procedures for Microelectronics

1.3 BASELINE DOCUMENTS

Apex Microtechnology maintains on file the procedures, process specifications and process qualification reports that are in general the documents which have established the baseline for Apex Microtechnology in satisfying the requirements of certification in accordance with Appendix D of MIL-PRF-38534.

1.4 PERFORMANCE SPECIFICATIONS

The performance specifications for a particular "M" or "/883" hybrid circuit are contained in the following documents:

1. Industrial Grade Data Sheet (i.e. PA02/PA02A).
   This contains Typical Characteristics and Performance Graphs.
2. "M" Data Sheet (i.e. PA02M).
   This is the Table 4 – Group A Inspection which defines the parameters and limits that the product must meet when tested over the full military case temperature range of -55°C to +125°C.

In the event of conflicting requirements, the order of precedence will be: purchase order, customer's SCD, the APEX "M" data sheet, and other reference documents.

2.0 GENERAL REQUIREMENTS

The individual requirements are specified herein and in accordance with the applicable APEX "M" data sheet. The static and dynamic electrical performance requirements for the hybrid circuit and test conditions are as specified in the applicable APEX "M" data sheet.

2.1 PROCESS CONDITIONING, TESTING, RELIABIITY, and QUALITY ASSURANCE SCREENING

Process conditioning, screening and testing are as specified in Section 4.0. Figure 1 illustrates the process flow for "M" or "/883" products processed to MIL-PRF-38534, Class H.

2.1.1 PRODUCT or PROCESS CHANGE

Apex Microtechnology will not implement any major change, as listed in MIL-PRF-38534, to the design, materials, construction, configuration, or manufacturing process which may affect the performance, quality, reliability, or interchangeability of the circuit without full or partial re-qualification. "M" product is a HI-REL non-compliant product.

2.2 QUALITY CONFORMANCE

The "M" or "/883" hybrid circuits furnished under this specification are products which have been produced and tested in conformance with all the provisions of this specification.

2.3 MARKING

2.3.1 MARKING EACH DEVICE

The following marking is placed on each product:

a) Index point (see 2.3.4)
b) Part number (see 2.3.5)
c) CAGE code number (see 2.3.6)
d) Lot identification code (see 2.3.7)
e) Manufacturer's identification (see 2.3.8)
f) Country of origin (see 2.3.9)
g) BeO warning (if applicable, see 2.3.10)
h) ESD identifier Δ

These units are Class 1 as defined in MIL-PRF-38534; therefore, the ESD identifier Δ is incorporated in the mark.

2.3.2 MARKING ON INITIAL CONTAINER

Marking on initial anti-static packaging for delivery includes:

a) Manufacturer's identification
b) Customer name
c) Customer's P.O. number
d) Quantity packaged
e) Lot code
f) Date packaged
g) Packaging operator's initials

2.3.3 MARKING PERMANENCE

Marking is permanent in nature to MIL-STD-883, Method 2015.

2.3.4 INDEX POINT

The index point, denoting location of Pin 1, is indicated as shown on the appropriate Package Outline.

2.3.5 PART NUMBER
The part number is the APEX generic part number and DSCC SMD part number, when applicable.

2.3.6 CAGE CODE NUMBER
The CAGE code number for APEX is 60024 as designated by the Federal government.

2.3.7 LOT IDENTIFICATION CODE
The lot identification and date code are shown as one alphanumeric string. The first 5 characters are the lot number identification. The last 4 digits are the date code as YYWW.

2.3.8 MANUFACTURER'S IDENTIFICATION
The manufacturer's identification is signified by the name, logo, or trademark of APEX incorporated in the mark.

2.3.9 COUNTRY OF ORIGIN
The country of origin is signified by USA incorporated in the mark.

2.3.10 BeO WARNING
Since hybrid circuits contain beryllium oxide substrates, the "BeO" identifier is marked on the package as an alert to the user, that if the package seal is broken, not to crush, machine, or subject the substrate to temperatures in excess of 850°C to avoid generating toxic fumes or inhalable particles.

3.0 CONDITIONS AND METHODS OF TEST
Conditions and methods of test are to MIL-PRF-38534 and as specified herein. This section establishes the stress screening tests and quality conformance inspection tests for this program. The purpose of these tests is to assure the quality and reliability of the product to a particular process level commensurate with the product's intended application. All tests are performed on a 100% basis except where indicated.

3.1 HIGH POWER DIE INSPECTION
High power die inspection is performed to MIL-STD-750 Method 2072 and 2073, and MIL-STD-883 Method 2010.

3.2 INTERNAL VISUAL INSPECTION (PRECAP)
Internal visual inspection is performed to MIL-STD-883, Method 2017 and 2032.

3.3 TEMPERATURE CYCLING
Temperature cycling is performed to MIL-STD-883, Method 1010, Condition C, using 10 cycles from –65°C to +150°C.

3.4 BURN-IN
Burn-in is performed to MIL-STD-883, Method 1015, Condition D for 160 hours at a case temperature of 125°C.

3.5 CONSTANT ACCELERATION
Constant acceleration is performed to MIL-STD-883, Method 2001, Condition A, at 5,000 G's, in the Y1 axis only.

3.6 FINAL ELECTRICAL TEST
Final electrical tests are performed to MIL-PRF-38534*. Both static and dynamic parameters from Group A, Subgroups 1-6, are 100% tested to the "M" data sheet limits at –55°C, +25°C and +125°C. The PDA (Percent Defective Allowable) shall be 10% maximum and shall only apply to static (DC) measurements at +25°C.

3.7 HERMITICITY
Hermiticity tests are performed per the following:

3.7.1 FINE LEAK TESTING
Fine leak testing is performed to MIL-STD-883, Method 1014, Condition A2, at $1X10^{-7}$ cc/sec standard leak rate.

3.7.2 GROSS LEAK TESTING
Gross leak testing is performed to MIL-STD-883, Method 1014, Condition C, at 60 PSIG pre-pressurization.

3.8 EXTERNAL VISUAL INSPECTION
All “M” and “/883” circuits receive external visual to MIL-STD-883, Method 2009.

4.0 QUALITY ASSURANCE PROVISION* SEE FIGURE 1.
4.1 QUALITY CONFORMANCE INSPECTION
Quality Conformance Inspection (QCI) is to MIL-PRF-38534, Option 1, in-line qualification method. Lots failing to meet quality conformance inspection for a given product assurance level are rejected.

4.1.1 GROUP A ELECTRICAL TESTING
Group A electrical testing is performed using in-line verification in accordance with Option 1 of MIL-PRF-38534. Electrical parameters and test limits are as shown in the “M” data sheet.

4.1.2 GROUP B INSPECTION
Group B inspection is satisfied by performing in-line inspection sampling, to MIL-PRF-38534, Option 1.

4.1.3 GROUP C INSPECTION
Group C inspection is performed on the first lot submitted for inspection and as required to evaluate or qualify changes in manufacturing processes per MIL-PRF-38534, Option 1.

4.1.4 GROUP D INSPECTION
Group D testing in accordance with MIL-PRF-38534, Option 1, is accomplished during package evaluation at in-coming inspection and is not repeated.

5.0 DATA AND REPORTS*
5.1 CERTIFICATE of COMPLIANCE
All “/883” circuits are accompanied by a Certificate of Compliance.

5.2 QUALITY CONFORMANCE REPORTS
MIL-PRF-38534, Option 1, Group A lot data is kept on file with the production records. In-line Groups B, C and D (reference 4.1.4) generic data is also on file.

5.3 TRACEABILITY
Traceability is in accordance with MIL-PRF-38534. Each circuit is traceable to the production lot. Re-worked or repaired circuits maintain traceability.

6.0 PACKAGING
Packing and packaging are to MIL-STD-2073/1D.

7.0 CUSTOM MARKING
Production quantities of “M” and “/883” devices may be dual or solely marked with an applicable SCD number.

* Applies to compliant (/883) product only.

FIGURE 1: APEX MICROTECHNOLOGY PRODUCT MILITARY PROCESS FLOW

Header and cap:	Package evaluation to MIL-PRF-38534
Raw Substrate:	Inspected in accordance with APEX specification QUAL52 visual criteria based on MIL-STD-883, Method 2032.
Small signal die:	Component element evaluation to MIL-PRF-38534
Large signal die:	Component element evaluation to MIL-PRF-38534
Chip Components: (diodes, capacitors, etc.)	Component element evaluation to MIL-PRF-38534
Wire:	Inspected in accordance with APEX specification WIRE01
Epoxy:	Inspected to MIL-STD-883, Method 5011
Thick film paste:	Inspected in accordance with APEX specification PASTEI
Solder:	Inspected in accordance with APEX specification PASTEI

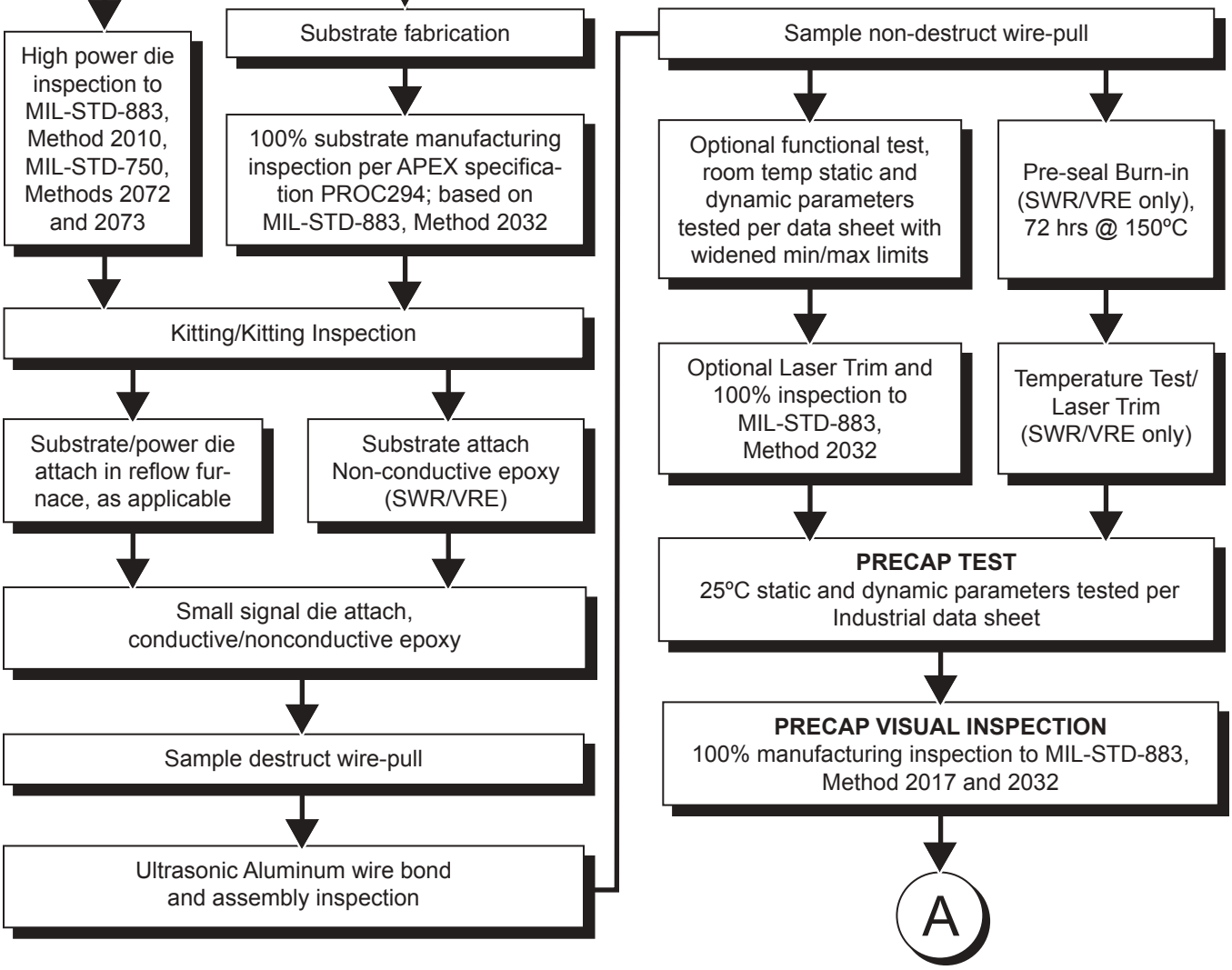
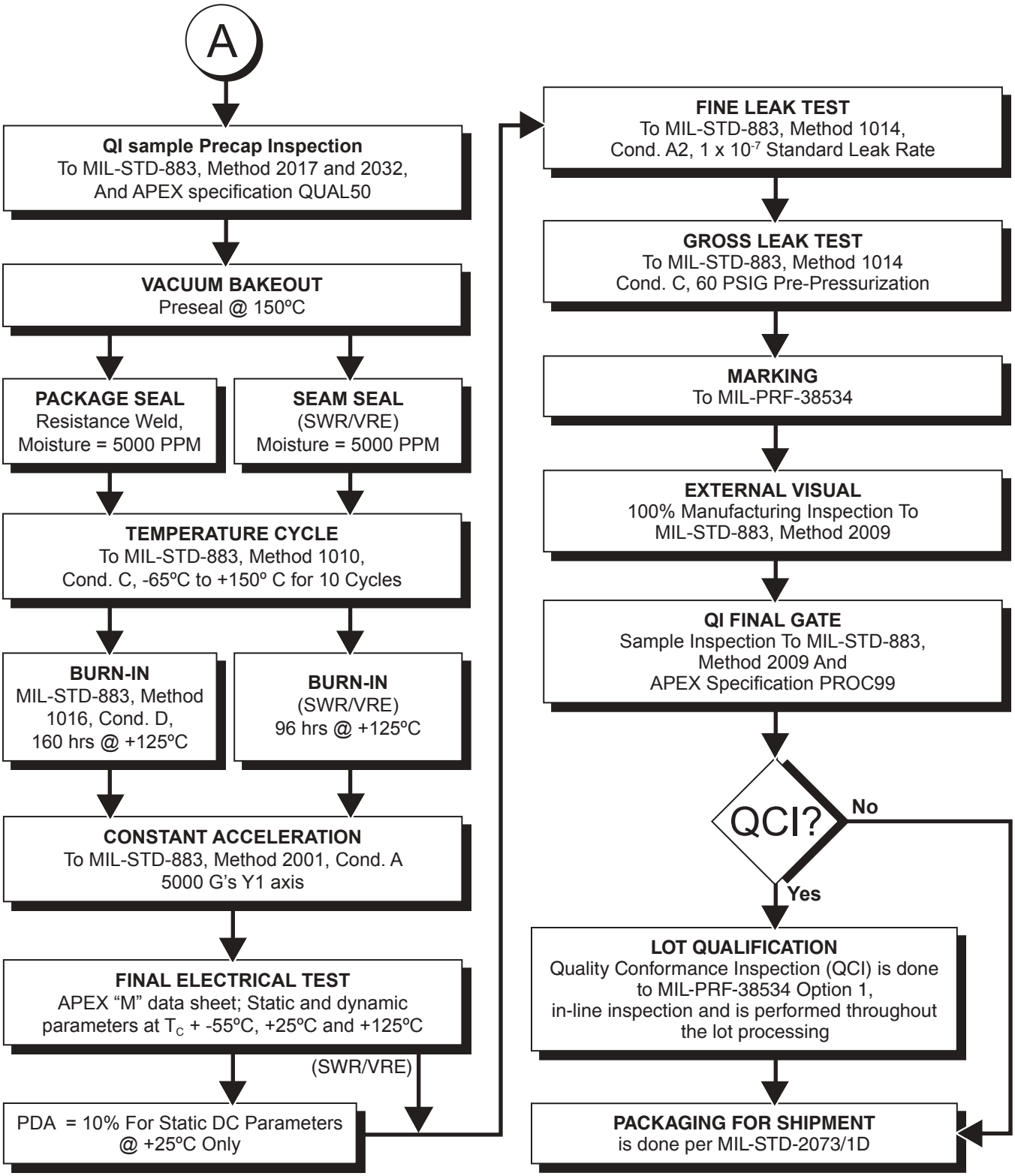
FIGURE 1: APEX MICROTECHNOLOGY PRODUCT MILITARY PROCESS FLOW