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## Testing and Inspection Of QML Class Q Ceramic Devices

### Introduction

Texas Instruments is certified and listed by the Defense Supply Center Columbus (DSCC) as a manufacturer of QML Class Q and Class V microcircuits (integrated circuits) in accordance with MIL-PRF-38535 (General Specification For Manufacturing Integrated Circuits). The Quality System utilized by Texas Instruments in the manufacture of these microcircuits is fully compliant to the requirements of MIL-PRF-38535 and ISO9001.

### Assembly Lot Processing

TI processes QML products per MIL-PRF-38535. All processing, screening, and Quality Conformance Inspection (QCI) of QML Class Q products is performed to Level B in compliance with the test methods of MIL-STD-883, Microcircuits Test Method Standard, with exceptions as allowed by Paragraph 1.1 of MIL-PRF-38535. The Texas Instruments typical processing flows for QML Class Q ceramic devices are attached.

### Configuration Control and Governing Documents

Testing of QML product is performed in accordance with MIL-PRF-38535 and the applicable SMD, (or TI military data sheet if an SMD does not exist), or JAN Slash Sheet as appropriate. Configuration control of an SMD is provided by DSCC. Registered users of the SMD are notified of pending changes for comment.

Please note that some TI QML Class Q parts do not have an associated DSCC SMD. These parts have been "grand-fathered" and do not require an SMD to be considered QML approved.

### Electrical Testing and Electrical Test Variations

For QML products, testing is warranted to meet the DSCC SMD. Per MIL-PRF-38535, all testing specified in the SMD must be performed unless sufficient data exists to reduce or eliminate specific tests. Test modifications require approval of the TI Technical Review Board (TRB).

### Quality Conformance Inspection

QML devices are subjected to Quality Conformance Inspection (QCI) in accordance with MIL-STD-883 Method 5005 as specified for QML manufacturers by MIL-PRF-38535.

### Lot Traceability

An individual QML device is traceable by date code to the specific assembly lot and wafer fabrication lot used in the manufacture of the device in accordance with MIL-PRF-38535.

### Part Marking

Please see the Texas Instruments Military Semiconductor Selection Guide for marking details on TI products. Please note that TI-Unitrode devices will retain their existing grandfathered nomenclature. For Unitrode devices, the suffix /883 or /883B designates product manufactured in accordance with MIL-PRF-38535 as a QML Class Q QML device.

## One Part – One Part Number System

DSCC allows marking of microcircuits under the One Part - One Part Number system. Following is an excerpt from a DSCC Standard Microcircuit Drawing (SMD):

*One Part - One Part Number System: The one part - one part number system described below has been developed to allow for transitions between identical generic devices covered by the four major microcircuit requirements documents (MIL-H-38534, MIL-I-38535, and 1.2.1 of MIL-STD-883) without the necessity for the generation of unique PIN's. The three military requirements documents represent different class levels, and previously when a device manufacturer upgraded military product from one class level to another, the benefits of the upgraded product were unavailable to the Original Equipment Manufacturer (OEM), that was contractually locked into the original unique PIN. By establishing a one part number system covering all three documents, the OEM can acquire to the highest class level available for a given generic device to meet system needs without modifying the original contract parts selection criteria."*

In marking a microcircuit, the part identification number (PIN) is formatted as follows,

JAN Slash-Sheet Number						
JM38510	/	001	01	B	E	X
Military designator	RHA designator	Device Spec	Device type	Device class designator	Case outline	Lead finish

DSCC SMD Drawing Number						
5962	-	12345	01	Q	E	X
Federal stock class designator	RHA designator	Drawing Designator	Device type	Device class designator	Case outline	Lead finish

### Device Class Designators:

- Class M - Items which have been subjected to and passed all applicable requirements of MIL-PRF-38535 appendix A and are documented on an SMD.
- Class N\* - Items which have been subjected to and passed all applicable requirements of MIL-PRF-38535 including qualification testing, screening testing, and TCI/QCI inspections, and are encapsulated in plastic.
- Class Q\* - Items which have been subjected to and passed all applicable requirements of MIL-PRF-38535 including qualification testing, screening testing, and TCI/QCI inspections.
- Class V\* - Items that meet all the class Q requirements, and have been subjected to, and passed all applicable requirements of MIL-PRF-38535 appendix B.
- Class B - Items which have been subjected to and passed all applicable requirements of MIL-PRF-38535 including qualification testing, screening testing, and TCI/QCI inspections and are documented on a MIL-M-38510 slash sheet.
- Class S - Items that meet all the class B requirements, and have been subjected to, and passed all applicable requirements of MIL-PRF-38535 appendix B and are documented on a MIL-M-38510 slash sheet.

\* Supplied By Texas Instruments

For example, under the provisions of one part - one part number, PIN 5962-9474601MEA and 5962-9474601QEA are the same device. The example device is certified by Texas Instruments as meeting MIL-PRF-38535 and is listed as QML compliant. Process and test modifications as allowed under MIL-PRF-38535 for QML certified manufacturers could therefore be made to both device types.

### Process Optimizations

Under MIL-PRF-38535, a QML certified manufacturer is permitted to modify, substitute, or delete tests that do not improve the quality and/or reliability of the finished device as defined by the applicable device specification. Therefore the end user of a microcircuit should not assume that all screening detailed in MIL-STD-883 Method 5004 and all quality conformance inspection detailed in Method 5005 is performed. Following is an excerpt from MIL-PRF-38535 authorizing the removal or modification of non-value added processes, screens, and inspections:

*1.1 Scope. This specification establishes the general performance requirements for integrated circuits or microcircuits and the quality and reliability assurance requirements which must be met for their acquisition. The intent of this specification is to allow the device manufacturer the flexibility to implement best commercial practices to the maximum extent possible while still providing product which meets the military performance needs. ... If sufficient quality and reliability data is available, the manufacturer, through the QM program and the manufacturer's review system, may modify substitute or delete tests.*

Texas Instruments has qualified the modification and/or elimination of several screens and tests as approved by the Texas Instruments Technology Review Board (TRB). These include, but are not limited, to:

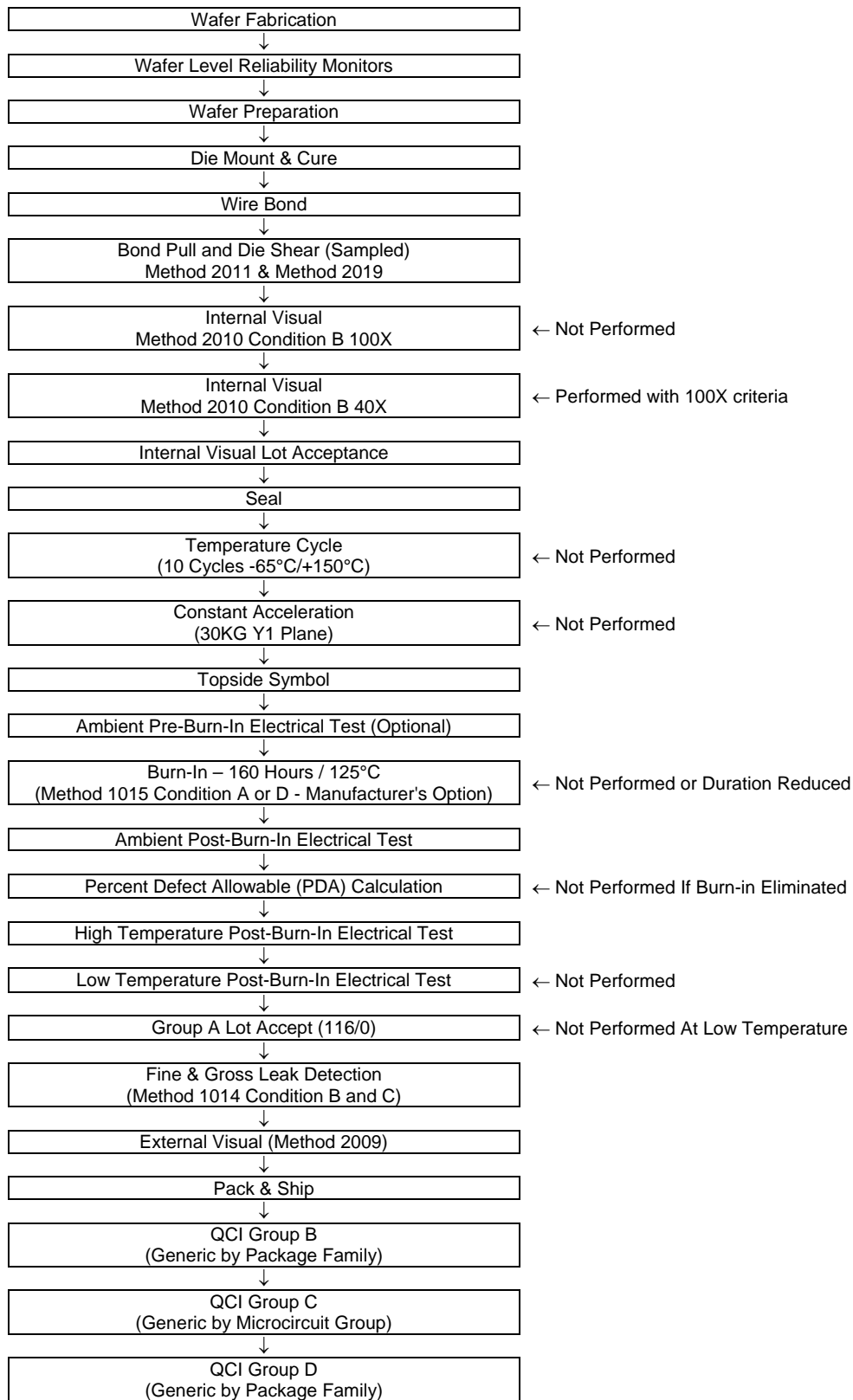
- Elimination of -55°C testing on multiple logic products including the TTL, LS, S, HC, AHC, AHCT, ALS, AS, F, ABT, AC, ACT, and BCT families.
- Elimination of -55°C testing on specific mixed signal products including the majority of CMOS technology based product families.
- Elimination of burn-in or replacing 100% burn-in with lot acceptance on multiple product technologies.
- Elimination of Group A acceptance testing on specific DSP and logic product families.
- Elimination of 100% temperature cycle and centrifuge for all low pin count ceramic devices (28 pin and below).
- Replace 100X pre-cap inspection with 40X pre-cap inspection using the 100X criteria for all product families.

The elimination of screens and test is reflected on the Texas Instruments Processing Conformance Report attached to the Certificate of Conformance provided with each QML ceramic device lot. Approvals for these optimizations are granted by the QML manufacturer's Technology Review Board. Please note that under the QML program, only changes to Form, Fit, or Function are detailed in the DSCC Standard Microcircuit Drawing (SMD). As a courtesy to our customers, Texas Instruments provides notification of optimizations via the Government Industry Data Exchange Program (GIDEP) Process Change Notification system.

The following chart illustrates the MIL-STD-883 process flow of a Class M or Class B devices with example TI Class Q process optimizations noted.

**Class M and Class B**

**Example TI Class Q Optimization**



It should be noted that DSCC considers QML Class Q and Class V products to be superior to Class M and Class B level products even when process optimizations are taken into account. Almost all military programs will accept QML catalog products in lieu of Class M or Class B. This is because QML is a performance based specification which requires a QML certified manufacture to ensure the final quality and reliability of the product rather than just screening to specification.

For additional information or technical questions please contact your local Texas Instruments sales representative or the TI Support Line at [support.ti.com](http://support.ti.com).

Please visit our HiRel Products web page on [www.ti.com/hirel](http://www.ti.com/hirel)

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