Obsolete Military Marked Component Risks

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What are the Risks

- Why are the components obsolete?
- The builder of the electronics did not react to OCM EOL to find a substitute for the BOM.
- The OEM or CM uses open market (non AD/AAM) supplier
- The open market (ID) may provide legitimate (but no traceability) or counterfeit/reclaimed components.
- A great percent of open market military marked parts are reclaimed from scrap electronics – est. 80% or more.
- Reclaimed parts frequently have damage from reclaiming stresses which result in early failures, less reliable than new parts.
- The NDAA DFARS can make the CAS Contractor responsible for all costs and damages caused by counterfeit component failures.
- After leaving control of the OSM there is no way to reestablish QML compliance.

CAS = Cost Accounting Standards

Obsolete Military Components

Acronyms in this presentation

AD – Authorized OCM distributors

AAM – Authorized aftermarket manufacturers

BOM – Bill of material

CAS - Cost Accounting Standards, for costs on negotiated procurement

CM – Contract manufacturer

CO – Contracting Officer

DFARS – Defense Federal Acquisition Regulations

EOL – End of life/production announcement by OCM

FSC – Federal stock category

ID – Independent distributor

NDAA – National Defense Authorization Act

OCM – Original component manufacturer

OEM – Original equipment manufacturer

QML – Qualified manufacturers list

QMS – Quality management system

QTSL - Qualified Testing Suppliers List (by DLA)

Issues with Obsolete Mil Components

- Authentic Military Marked Components are:
  - From designs and processes qualified to the Military Spec.
  - Built to the qualified materials and process standards
  - Constructed by OCM, inspected and screened to the specification standards.
  - OCM C of C proves they are authentic – Passing QTSL will not prove this.
- MIL parts without traceability that pass counterfeit detection tests,
  - Does not prove them authentic, only they meet physical & electrical specs.
  - Commercial and reclaimed parts are frequently marked with military markings.
  - Without the OCM C of C parts cannot be verified to be authentic as QML.
- All Parts found to be counterfeit or suspect (per QTSL and AS6081)
  - Must be reported to DLA/CO, GIDEP and other services
  - Quarantine, do not return to seller or supply chain.
- The OEM/Designer of the electronics should react to OCM EOL to find a substitute or emulated part for the BOM.
- Components passing QTSL should shield CAS Contractors from costs and associated damages caused by counterfeit escapes.

CAS = Cost Accounting Standards

DFARs – Defense Acquisition Regulations

- DFARs were created by NDAA in response to the Congressional Investigation on Counterfeit Components found in DoD electronics 2012.
- DFAR 252.246-7007 Contractor Counterfeit Electronic Part Detection and Avoidance System*
  - Definitions of terms related to counterfeits
  - Objective is to detect and remove counterfeit components from supply
  - Promote supply by OCM and their ADs- difficult when obsolete
  - Establish & maintain acceptable avoidance system (AS6081, etc.).
  - Contractor may use Government or industry recognized standards.
  - Flow down DFAR requirements to subcontractors
  - Report counterfeit findings to GIDEP and other industry programs.
  - Quarantine counterfeit and suspect parts.
  - Do not return counterfeit or suspect parts to seller or supply chain.
  - Constant awareness of industry counterfeiting information, trends & upgrade detection process.
  - Have system to address and provide for components that become obsolete; stockpiling after EOL, substitutions, design mods, requalification, etc.

* Condensed and paraphrased

DFARs – Defense Acquisition Regulations

- DFAR 252.246-7008 Sources of Electronic Parts*:
- First obtain parts in production by OCM or AAM or their authorized suppliers.
- If parts are not available from OCM supply chain, the contractor assumes responsibility for selecting suppliers and processes to verify authenticity.
- Perform tests and inspections to prove the parts are authentic in accordance with DLA-QTSL- 5961/5962 or CO Approved Alternatives:
  - The distributor/supplier QMS conforms to the JESD31 standard.
  - Counterfeit mitigation inspection and testing performed to Levels A, B and C of AS6081
  - Electrical testing per AS6081:
  - FSC 5961: QML 19500 and non-QML: Pass Group A2 tests or data sheet as applicable
  - FSC 5962: QML 38535/38534: Pass Groups A1, A4, A7 & A9 of SMD, and non-QML pass all 25^0C tests per OCM data sheet.
  - Distributors and test labs must be approved and listed in QSLD
  - The QMS shall accurately inventory all parts that meet QTSL Program.

* Condensed and paraphrased

Semiconductor Components Used by DoD

Classes and Standards

- Military Spec (-55°C to +125°C)
  - QML, MIL-PER- 19500 = JAN, JANTX, JANTXV, JANS
  - QPL, MIL-M-38510 = Class B and S
  - QML, MIL-PRF-38535 = Class: Q, V, M, N, T, Y
  - MIL -STD-883 Compliant = M
  - SMD = Mostly M
  - Non hermetic ICs = Class N, T, Y.
- Enhanced Plastics (EPEMS)
  - Various temperatures up to Military – *see OCM data sheet*
- Commercial (COTS) – *see OCM data sheet*

  C = 0^0 C to 70^0C

  I = - 40^0C to 85^0C

  Up-rating has risks

Military Marked Components

Types of qualified MIL semiconductors:

ICs

QPL – M-38510 - Class S & B (Change over 7/27/1990)

SMD - Class - M (B only, not for S)

883 Compliant - Class M or B (para 1.2.1) no S

QML – PRF-38535 - Class Q (B), V (S), N (PEMS)*, T*, Y**

What is difference between Class N and COTS

Discrete – Diodes & Transistors

QPL – S-19500 - JAN, JANTX, TXV & JANS

QML – PRF-19500 - JAN, JANTX, TXV & JANS

* Recently Qualified Suppliers, T is for commercial Space use.

** Non Hermetic, new listing.

Military Marked Components

- QPL, QML, SMD, 883C marked components require OCM **Certificate of Conformance and Traceability.**
- Required by MIL-PRF-19500 (3.7) and MIL-PRF-38535 (3.2.1)
- Manufacturers and **distributors** who offer the products as described in this specification shall **provide written certification signed by the company or corporate official who has management responsibility for the production of the products, (1) that the product being supplied has been manufactured and shall be capable of passing the tests in accordance with this specification and conforms to all of the requirements as specified herein**, - - Manufacturers and **distributors** who offer the products as described in this specification shall provide **written certification** signed by the company or corporate official who has management **responsibility for the production of the products, (1) that the product being supplied has been manufactured and shall be capable of passing the tests in accordance with this specification and conforms to all of the requirements as specified herein**. - **-** In no case shall the manufacturer's certificate be altered or show signs of alteration.

QML Military Marked Components

OCM - Certification of conformance and acquisition traceability

- The certification shall be confirmed by documentation to the Government or to users with Government contractors or subcontractors, regardless of whether the QML microcircuits are acquired directly from the manufacturer or from another source such as a authorized distributor.
- The OCM certificate shall include the following information:

  a. Manufacturer documentation:

  (1) Manufacturer's name and address.

  (2) Customer's or distributor's name and address.

  (3) Device type.

  (4) Date code and latest re-inspection date, if applicable.

  (5) Quantity of devices in shipment from manufacturer.

  (6) Statement certifying QML microcircuit conformance and traceability.

  (7) Solderability re-inspection date, if applicable.

  (8) Signature and date of transaction.

  (9) If applicable, the certificate shall include a statement indicating that alternate die/fab requirements are being used (”QD” certification mark, see 3.6.3).

AS6081 Summary

Test/Inspection	Minimum Sample Size		Level
	Lot Size 200 or greater Devices	Lot Size 1-199 Devices (See NOTE 1)	
Minimum Required Tests			**Level A**
Documentation and Packaging			**A1**
Documentation and Packaging Inspection (4.2.6.4.1) (non-destructive)	All devices	All devices	
External Visual Inspection			**A2**
a. General (4.2.6.4.2.1) (non-destructive)	All devices	All devices	
b. Detailed (4.2.6.4.2.2) (non-destructive)	122 devices	122 or all devices, whichever is less	
Remarking & Resurfacing (destructive)	See NOTE 2	See NOTE 2	**A3**
Solvent Test for Remarking (4.2.6.4.3 A) (destructive)	3 devices	3 devices	
Solvent Test for Resurfacing (4.2.6.4.3 B) (destructive)	3 devices	3 devices	
Radiological (X-Ray) Inspection			**A4**
X-Ray Inspection (4.2.6.4.4) (non-destructive)	45 devices	45 devices or all devices, whichever is less	
Lead Finish Evaluation (XRF or EDS/EDX)	See NOTE 3	See NOTE 3	**A5**
XRF (non-destructive) or EDS/EDX (destructive) (4.2.6.4.5) (Appendix C.1)	3 devices	3 devices	
Delid/Decapsulation Internal Analysis (destructive)	See NOTE 4	See NOTE 4	**A6**
Delid/Decapsulation (4.2.6.4.6) (destructive)	3 devices	3 devices	
Additional Tests (as agreed between Customer and Organization)			
Remarking & Resurfacing (destructive)	See NOTE 2	See NOTE 2	**A3 Option**
Scanning Electron Microscope (4.2.6.4.3 C) (destructive)	3 devices	3 devices	
Quantitative Surface Analysis (4.2.6.4.3 D) (non-destructive)	5 devices	5 devices	
Thermal Testing			**Level B**
Thermal Cycling Test (Appendix C.2)	All devices	All devices	
Electrical Testing			**Level C**
Electrical Testing (Appendix C.3)	116 devices	All devices	
Burn-In			**Level D**
Burn-In (Pre & Post) (Appendix C.4)	45 Devices	45 devices or all devices, whichever is less	
Hermeticity Verification (Fine and Gross Leak)			**Level E**
Hermeticity Verification (Fine and Gross Leak) (Appendix C.5)	All devices	All devices	
Scanning Acoustic Microscopy (SAM)			**Level F**
Scanning Acoustic Microscopy (SAM) (Appendix C.6)	As specified	As specified	
Other			**Level G**
Other test/inspections	As specified	As specified	

Obsolete Components for Military Use

The electrical testing per AS6081 shall be as follows:

A. For FSC 5961:

1. QML-19500 products - Group A2 electrical tests (DC static tests at 25°C) listed on the performance specification sheet.

2. All non-QML-19500 products - DC parameters at 25°C tested per performance specification sheet, data sheet, manufacturer's drawing, VID, etc.).

B. For FSC 5962:

1. QML-38535/38534 products - Groups A1, A4, A7, and A9 electrical tests listed on the applicable standard microcircuit drawing (SMD).

2. All non-QML-38535/38534 products - parameters at 25°C tested per the applicable slash sheet, data sheet, manufacturer's drawing, SMD, etc.

Obsolete Components in Military Equipment

- Continued use of obsolete electronic components in new builds of military electronics represents a hazard to availability and reliability.
- The most effective solution is stockpiling when an EOL notice is received from OCM. The issues include:
  - Making parts substitutions, emulation or circuit redesign has cost and time impact
  - Funding to stock pile for future production
  - Cost of storage and inventory taxes on stock
  - Quantities needed, who in DoD knows future quantity needs for equipment.
  - Does each OEM equipment supplier manage their own parts need?
- Negotiate arrangements with Authorized Aftermarket Distributors to stock.
- Finding new and unused stock to process to QTSL for counterfeit detection.
- Parts passing QTSL does not fully establish them as QML authentic
- After EOL, new and unused parts availability decline until there are none left.
- Best solution: Change design to accept OCM/AD available components.