NASA-STD-8739.11 Tutorial

M3 – Non-hermetic Hybrids

Prepared by Pete Majewicz, NEPP PM
NASA Goddard Space Flight Center
August 11, 2025

Acronyms [*modify as needed*]

AEC	Automotive Electronics Council
COTS	Commercial-Off-The-Shelf
Cpk	Process Capability Index
DLA	Defense Logistics Agency
DoD	Department of Defense
DPPM	Defective Parts Per Million
EEEE	Electrical, Electronic, Electromechanical, Electro-Optical
EOL	End-Of-Line
ETW	Electronics Technology Workshop
FIT	Failure-In-Time
FMEA	Failure Mode and Effects Analysis
GSFC	Goddard Space Flight Center
IL	In-Line
ILPM	Industry Leading Parts Manufacturer
JEDEC	Joint Electron Device Engineering Council

MEAL	Mission Environment, Application, and Lifetime
MIL-SPEC	Military Specification
NASA	National Aeronautics and Space Administration
NEPP	NASA Electronic Parts & Packaging (Program)
NESC	NASA Engineering & Safety Center
NSC	NASA Safety Center
PPAP	Production Part Approval Process
PSW	Part Submission Warrant
QML	Qualified Manufacturers List
QPL	Qualified Product List
RHA	Radiation Hardness Assurance
SMA	Safety and Mission Assurance
SMD	Standard Microcircuit Drawing
SME	Subject Matter Expert
SPC	Statistical Process Control

Changes from EEE-INST-002

- Completely new section.
- Screening and Qualification Tables are from MIL-PRF-38534 (Appendix D)

Definitions

Non-hermetic device - A device which has all or some of the elements not hermetically sealed

a. **Cavity non-hermetic device** - A cavity device having construction utilizing non-hermetic (polymeric) seals.

b. **Non-cavity non-hermetic device** – A non-cavity device having construction utilizing molding compounds or other materials encapsulation the internal elements.

c. **Open non-hermetic device** – A open device having construction with minimal or no protection of the internal elements.

d. **Open architecture device (OA)** – A single substrate with hermetically sealed hybrid or multichip cavity(s) in which all bare die, chip and wire, or flip chip are mounted in the hermetically sealed area. Non-hermetic packaged components integral to the substrate (resistors, capacitors, coils, transformers, and transistors) which are typically mounted on printed circuit boards are not hermetically sealed.

Classes

Non-hermetic device - A device which has all or some of the elements not hermetically sealed

a. **Cavity non-hermetic device** - A cavity device having construction utilizing non-hermetic (polymeric) seals.

b. **Non-cavity non-hermetic device** – A non-cavity device having construction utilizing molding compounds or other materials encapsulation the internal elements.

c. **Open non-hermetic device** – A open device having construction with minimal or no protection of the internal elements.

d. **Open architecture device (OA)** – A single substrate with hermetically sealed hybrid or multichip cavity(s) in which all bare die, chip and wire, or flip chip are mounted in the hermetically sealed area. Non-hermetic packaged components integral to the substrate (resistors, capacitors, coils, transformers, and transistors) which are typically mounted on printed circuit boards are not hermetically sealed.

Definitions

Class L:

- Highest quality class provided for in this appendix.
- Temperature range of -55oC to +125oC or as specified in the device specification.

Class F:

- Standard quality class provided for in this appendix.
- Temperature range of -55ºC to +125ºC, or a lesser range as specified by the acquisition document, e.g. SMD, SCD, or catalog.

Compliant RHA devices will meet the additional performance requirements of appendix G.

Table 1. Hybrid Non-Hermetic Microcircuit

Table 1. HYBRID NON-HERMETIC MICROCIRCUIT REQUIREMENTS 1/

Assurance Level	Monolithic Microcircuit Type	Specification	Use As Is	Element Evaluation 3/	Screening 4/	LAT 5/	DPA
Level 1	QML Class L	MIL-PRF-38534				X	X
	QML Class F 2/	MIL-PRF-38534			X	X	X
	SCD	VICD, SCD		X	X	X	X
Level 2	QML Class L and F	MIL-PRF-38534			X 6/		X
	Commercial, Automotive, SCD	VICD, SCD, AEC-Q104		X	X	X	X
Level 3	QML Class L, F	MIL-PRF-38534					X
	Commercial, Automotive, SCD	VICD, SCD, AEC-Q104		R	R		X

Table 1. Hybrid Non-Hermetic Microcircuit - DPA

Table 1. HYBRID NON-HERMETIC MICROCIRCUIT REQUIREMENTS 1/

Assurance Level	Monolithic Microcircuit Type	Specification	Use As Is	Element Evaluation 3/	Screening 4/	LAT 5/	DPA
Level 1	QML Class L	MIL-PRF-38534				X	X
	QML Class F 2/	MIL-PRF-38534			X	X	X
	SCD	VICD, SCD		X	X	X	X
Level 2	QML Class L and F	MIL-PRF-38534			X 6/		X
	Commercial, Automotive, SCD	VICD, SCD, AEC-Q104		X	X	X	X
Level 3	QML Class L, F	MIL-PRF-38534					X
	Commercial, Automotive, SCD	VICD, SCD, AEC-Q104		R	R		X

Send email to address below for questions

peter.Majewicz@nasa.gov