

JEDEC PUBLICATION

Obtaining and Accepting Material for Use in Hybrid/MCM Products

JEP142

MAY 2002 (Reaffirmed: September 2009, May 2023)

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION



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Published by
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Suite 240 South
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GUIDELINE FOR OBTAINING AND ACCEPTING MATERIAL FOR USE IN HYBRID / MCM PRODUCTS

CONTENTS

	Page
1 Scope	1
2 Applicable documents	1
2.1 Military / Government documents	1
2.2 Industry documents	2
2.3 Internet reference locations	3
3 Terms and definitions	3
4 Microcircuits and semiconductor die	3
4.1 Guidelines for establishing a procurement/acceptance plan for microcircuit and semiconductor die	3
4.2 Items to evaluate	7
4.2.1 Semiconductor element evaluation options	7
4.3 Microcircuit element evaluation options	9
5 Passive elements	12
5.1 Passive element evaluation options	12
5.2 Additional guidelines for passive element evaluation	14
6 Surface Acoustic Wave (SAW)	17
6.1 Design	17
6.2 Process control	17
6.3 Test	17
6.4 Statistical process control (SPC)	17
7 Substrate evaluation	18
7.1 Electrical performance	18
7.2 Construction and dimensions	18
7.2.1 Visual inspection	18
7.3 Bondability	18
7.4 Adhesion testing	19
7.5 Attachability	19
7.6 Design and procurement concerns	19
8 Package and lid evaluation	20
8.1 Electrical performance	20
8.2 Construction and dimensions	21
8.3 Bondability	21

GUIDELINE FOR OBTAINING AND ACCEPTING MATERIAL FOR USE IN HYBRID / MCM PRODUCTS

CONTENTS

	Page
8.4 Attachability	22
8.5 Design and procurement concerns	22
9 Adhesives	23
9.1 Adhesive evaluation	23
10 General guidelines	23
Annex A (informative)	24
A.1 Element evaluation summary	24

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(From JEDEC Board ballots JCB-01-67A and JCB-02-52, formulated under the cognizance of the JC-13.5 Subcommittee on Hybrid, RF/Microwave, and MCM Technology.)

1 Scope

This document provides guidance regarding design considerations, material assessment techniques, and recommendations for material acceptance prior to use in Hybrid / MCM Products. As part of the risk assessment process, both technical requirements and cost should be carefully considered with regard to testing / evaluating the elements of a hybrid microcircuit or Multi-chip Module (MCM) prior to material release for assembly. The intent of this document is to highlight various options that are available to the Hybrid / MCM manufacturer and provide associated guidance, not to impose a specific set of tests.

2 Applicable documents

The following documents may be used as guidelines for developing test plans or for performing testing. The revision of these referenced documents is that which best satisfies the user's requirements.

2.1 Military / Government documents

MIL-PRF-20, *Capacitor, Fixed Ceramic Dielectric (Temperature Compensating), Established Reliability and Non Established Reliability, General Specification for*

MIL-HDBK-103, *List of Standard Microcircuit Drawings*

MIL-PRF-123, *Capacitors, Fixed, Ceramic Dielectric, (Temperature Stable and General Purpose), High Reliability, General Specification for*

MIL-HDBK-179, *Microcircuit Acquisition Handbook*

MIL-HDBK-199, *Resistors, Selection and Use of*

MIL-STD-202, *Test Methods for Electronic and Electrical Component Parts*

MIL-STD-690, *Failure Rate Sampling Plans and Procedures*

MIL-STD-750, *Test Methods for Semiconductor Devices*

MIL-STD-790, *Established Reliability and High Reliability Qualified Products List (QPL) Systems for Electrical, Electronic and Fiber Optic Parts Specifications*

MIL-STD-883, *Test Methods for Microcircuits Devices*

2 Applicable documents (cont'd)

2.1 Military / Government documents (cont'd)

MIL-STD-1686, *Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (excluding electrically initiated explosive devices) (metric)*

MIL-PRF-19500, *Semiconductor Devices, General Specification for*

MIL-PRF-38534, *Hybrid Microcircuits, General Specification for*

MIL-PRF-38535, *Integrated Circuits (Microcircuits), Manufacturing, General Specification for*

MIL-PRF-39001, *Capacitors, Fixed, Mica Dielectric, Established Reliability and - Non-Established Reliability, General Specification for*

MIL-PRF-49470, *Capacitor, Fixed, Ceramic Dielectric, Switch Mode Power Supply (General Purpose and Temperature Stable), General Specification for*

MIL-PRF-55342, *Performance Specification, Resistors, Fixed, Film, Chip Non-Established Reliability, Established Reliability, General Specification for*

MIL-PRF-55365, *Capacitor, Fixed, Electrolytic (Tantalum), Chip, Non-Established Reliability, Established Reliability, General Specification for*

MIL-PRF-55681, *Capacitor, Chip, Multiple Layer, Fixed, Ceramic Dielectric, Established Reliability and Non-Established Reliability, General Specification for*

MIL-PRF-87164, *Capacitors, Fixed, Mica Dielectric, High Reliability, General Specification for*

2.2 Industry documents

JESD9, *Metal Package Specification for Microelectronic Packages and Covers*

JESD22-A104, *Temperature Cycling*

JESD22-A106, *Thermal Shock*

JESD22-A107, *Salt Atmosphere*

JESD22-A108, *Temperature, Bias, and Operating Life*

JESD22-A109, *Hermeticity*

JESD22-B102, *Solderability*

JESD22-B104, *Mechanical Shock*

JESD22-B107, *Marking permanency*

2 Applicable documents (cont'd)

2.2 Industry documents (cont'd)

JESD22-B116, *Wire Bond Shear Test*

JESD49, *Procurement Standard for Known Good Die*

EIA557, *Statistical Process Control System*

JESD27, *Ceramic Package Specification for Microelectronic Packages*

JEP135, *Guideline for Supplier Management*

JEP132, *Process Characterization Guideline*

JEP133, *Guide For the Production and Acquisition of Radiation-Hardness Assured Multichip Modules and Hybrid Microcircuits*

ANSI/EIA-469, *Standard Test Method for Destructive Physical Analysis (DPA) of Ceramic Monolithic Capacitors*

2.3 Internet reference locations

Defense Supply Center Columbus (DSCC), www.dsccols.com/offices/sourcing_and_qualification/

JEDEC Solid State Technology Association (JEDEC), www.jedec.org/

3 Terms and definitions

This section intentionally left blank.

4 Microcircuits and semiconductor die

4.1 Guidelines for establishing a procurement/acceptance plan for microcircuit and semiconductor die

The following guidelines should be considered when evaluating microcircuit and semiconductor die.

4.1.1 Built-in test

Fault testing (complex ASIC) devices have tests that are typically performed at the probe level that verify die performance.

4.1 Guidelines for establishing a procurement/acceptance plan for microcircuit and semiconductor die (cont'd)

4.1.2 Yield data

Wafer/wafer lot yield (electrical /mechanical / visual) may be used to determine product/manufacturing maturity thereby establishing inspection / test levels for new material lots. However, wafer/wafer lot yield data may be considered proprietary by the die manufacturer and therefore may not be obtainable.

4.1.3 Electrical test following assembly

a) Sample testing in monolithic form:

Electrical Testing – A sample of die may be packaged and subjected to electrical testing over temperature extremes. Burn-in, temperature cycling, mechanical shock or other testing may be performed to increase the manufacturer's confidence level of accepting the die for the intended functions.

Electrical components should not be operated outside of the component manufacturer recommended operating conditions.

b) Sample testing in production hardware:

A sample of die may be assembled into the Hybrid / MCM product. Validation that sample die meet electrical performance requirements in production hardware should increase the manufacturers confidence in the inspection lot of die and therefore the remaining die may not require additional element evaluation at the die level.

4.1.4 Die complexity

The level of testing for any particular die should consider the level of complexity required to fabricate the die and the user's expectations of the end item part.

4.1.5 Construction and dimensions

a) Visual inspection

Visual Criteria – MIL-STD-883 Method 2010 and MIL-STD-750 Methods 2073 and 2072 may be used for visual inspection criteria for microcircuits, diodes, and transistors respectively.

Suppliers may utilize visual inspection criteria developed internally. When procuring die, the visual inspection criteria should be identified.

b) Dimensions

Dimension verifications may be used where space limitations are critical. A lot to lot change in dimensions could be an indicator of nonconformances, i.e., wrong die, mask changes, etc. However, typically die of the same design from the same manufacturer are highly consistent regarding dimensions. Where die thickness is critical to the process, die thickness should be specified.