JEDEC PUBLICATION

Requirements for Microelectronic Screening and Test Optimization

JEP121B

(Revision of JEP121, April 1995, Reaffirmed September 2003, Reaffirmed October 2006)

SEPTEMBER 2020

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

NOTICE

JEDEC standards and publications contain material that has been prepared, reviewed, and approved through the JEDEC Board of Directors level and subsequently reviewed and approved by the JEDEC legal counsel.

JEDEC standards and publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for use by those other than JEDEC members, whether the standard is to be used either domestically or internationally.

JEDEC standards and publications are adopted without regard to whether or not their adoption may involve patents or articles, materials, or processes. By such action JEDEC does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the JEDEC standards or publications.

The information included in JEDEC standards and publications represents a sound approach to product specification and application, principally from the solid state device manufacturer viewpoint. Within the JEDEC organization there are procedures whereby a JEDEC standard or publication may be further processed and ultimately become an ANSI standard.

No claims to be in conformance with this standard may be made unless all requirements stated in the standard are met.

Inquiries, comments, and suggestions relative to the content of this JEDEC standard or publication should be addressed to JEDEC at the address below, or refer to www.jedec.org under Standards and Documents for alternative contact information.

Published by
©JEDEC Solid State Technology Association 2020
3103 North 10th Street
Suite 240 South
Arlington, VA 22201-2108

PRICE: Contact JEDEC

Printed in the U.S.A.

REQUIREMENTS FOR MICROELECTRONIC SCREENING AND TEST OPTIMIZATION

(From JEDEC Board Ballot, JCB-20-41, formulated under the cognizance of the JC-13.2 Subcommittee on Microelectronic Devices.)

1 Scope

This document defines the methodology for the optimization (elimination, reduction, or alternative approach) of the screening and testing requirements for MIL-PRF-38535 Microcircuits. Inherent in this methodology is the application of "In-line Process Controls" and "SPC" techniques to the applicable manufacturing processes. This document includes the process for initial approval and subsequent maintenance of the testing and screening optimizations.

The purpose of this document provides the basis for the optimization of 100% screening operations and sample inspection test activities. This document is designed to assist the manufacturer in optimizing the test flow while maintaining and/or improving assurance of providing high quality and reliable product in an efficient manner. This will allow for optimization of testing that is not adding value, hence, reducing cycle time and costs.

2 Referenced documents

2.1 Military specifications

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

2.2 Military Standards

MIL-STD-883, *(Test Method Standard Microcircuits)*

2.3 Industry Documents/publications

EIA Standard No. EIA557, *Statistical Process Control Systems*

JEDEC Standard No. JESD625, *Requirements for Handling Electrostatic- Discharge-Sensitive (ESDS) Devices*

JEDEC Publication No. JEP132, *Process Characterization Guideline*

3 General Requirements

3.1 Test Optimization Foundation

The manufacturer has to establish the foundation for "Test Optimization" before implementing these optimizations into the manufacturing and/or test flow. The manufacturing flow should have an SPC system in place and an underlying philosophy that assures continuous improvement. Each critical operation relative to optimization of test should have controls sufficient to ensure product meets the Technology Conformance Inspection (TCI) requirements of MIL-PRF-38535. The applicable quality characteristics' controls defined herein should be evaluated and documented as to impacts for the test to be eliminated. A facility granted approval for optimization of tests should pursue efforts toward continuous improvement. This assumes changes to the approved system and associated critical operations will occur. The manufacturer should assure that sufficient evaluations have been performed to prevent the generation of defects that would result in degradation in product performance at a test that has been optimized. The manufacturer's control system should be sensitive to detrimental trends or shifts in the process that may appear in the product. Changes in the quality characteristics control system should be communicated to the qualifying activity in accordance with the Qualified Manufacturer List (QML) specified change notification requirements.

This publication primarily focuses on the required controls to eliminate, reduce, or simplify screens and/or tests. The manufacturer may use other approaches to detect potential quality and reliability issues, such as; modify manufacturing flow to minimize handling and reduce risk of potential product damage, use in-process controls or tests for earlier detection, develop alternative sampling plans, or develop alternative test techniques to effectively identify and/or screen defective product. These alternative approaches should consider the quality characteristics described herein, and understand the potential causes and detection of process quality or reliability defects as applicable in establishing the alternative test plans.

3.2 Statistical Process Control (SPC) System

An SPC system must be fully implemented in accordance with MIL-PRF-38535. JEDEC Publication JEP132 can be used as a guideline to assist the manufacturer in characterizing processes.

3.3 Quality characteristics

Once the SPC system is fully implemented, the manufacturer can start the optimization of screens and or tests. The first step in this process is the identification of the primary quality characteristics that are to be controlled. The "Quality Characteristics" are those measurable product parameters identified and defined by the manufacturer as critical to the device operation or function.

3.4 Reinstitution of tests/screens

A plan must be in place to reinstitute the tests/screens if process controls, monitor tests, TCI, or periodic qualification indicate that control is lost. A system must be in place for validating the integrity of the product when special cause signals occur.

3.5 Reliable product characteristics

Manufacturers should document a plan to demonstrate periodically that their manufacturing and quality systems ensure reliable performance in accordance with MIL-PRF-38535 technology conformance inspections. The manufacturer should define in their Quality Management (QM) Plan the frequency and sample plans for the performance of periodic re-validations of the Technology Conformance Inspection (TCI) requirements and optimized tests/inspections.

The frequency and sample size depend on whether; the screen and/or test had been eliminated, accomplished by an alternative method, or moved to a different point in the flow.

3.6 Military specifications/standards changes

Any changes to military specifications/standards that may impact any elimination or optimization of test conditions installed at any manufacturer should be cause for the following:

The responsibility lies with the manufacturer to perform an assessment to determine the impact of any specification changes on the test screen optimization program and the ability of the manufacturer to maintain test optimization.

This assessment for specification changes and any changes to the manufacturer's test screen optimization program should be provided to the qualifying activity.

3.7 Deviations from established procedures

If product is exposed to additional or non-standard processing (examples include additional handling resulting in ESD or foreign material exposure, or special tests) outside of established practices, then the manufacturer will apply appropriate actions to ensure product quality and/or reliability had not been compromised.

3.8 Test and field failures.

When a test failure occurs during in-coming inspection, in-process monitor, end of line/TCI testing, or a confirmed field failure, and an associated screen or test has been optimized, then the following must be addressed.

1) The failure should be analyzed to establish root cause.

2) If the failure analysis determines the cause of the failure is not related to the optimized test conditions, then corrective actions should be taken in accordance with MIL-PRF-38535 requirements.

3) If the failure analysis determines the presence of the failure is associated with an optimized test, then the following actions must be taken.

   a) Product(s) for the optimized manufacturing flow should not be processed using the affected optimization, but can use un-optimized processing until the following actions are successfully completed.
   b) Determine if the product quality and/or reliability is acceptable to the quality and/or reliability levels established for the implementation of test optimization. The defect rate can be determined by either using probability analysis to calculate the defect rate, or perform the standard TCI test to confirm product acceptance.
   c) If the quality and/or reliability levels are determined unacceptable then action must be taken to identify affected product(s) for rescreen or retest, and notify affected customers.
   d) The affected screen or test must be modified to address the failure to achieve acceptable quality and/or reliability levels, and be submitted to the qualifying activity for test optimization approval. If acceptable quality and/or reliability levels cannot be achieved, then the standard screening or TCI test must be reinstated.
   e) The qualifying activity should be notified and provided the information on the actions taken.
   f) The identified actions should be documented and retained in accordance with record retention procedure requirements.

4 Streamlining matrix

Table 1 compares the relationship associated with a given process and the associated tests. If there is a relationship between the process and the test, then process controls are required to satisfy the matrix. If there is no relationship between the two, then no process control is required.

In some cases, the result of a process may be an incoming quality characteristic of another process. In those cases, the control of the incoming quality characteristic is called "DI" (Direct Impact). For example, backside preparation is not considered as a quality characteristic for the elimination of centrifuge, but it is an incoming quality characteristic which must be considered for die attach.

Table 1 — Streamlining matrix Screening (See Notes 4 and 5)

Relationship between Process \ Test	Low Power Visual (LP) M2010	High Power Visual (HP) M2010	Post saw Visual M2010	Scanning Acoustic Microscopy (SAM) J-STD-035 (Note 6)	Centrifuge (CENT) M2001	Thermal Cycle (TC/TS) M1010 / M1011	Fine leak (FL) M1014	Gross Leak (GL) M1014	Non-Destructive Bond Pull M2023	Particle Impact Noise Detection M2020	X-ray M2012 (Note 1)	Burn-In (BI) M1015	Elect Test (ET) (Note 2)	External Visual (EV) M2009
Wafer fab		X	X		DI	DI			DI	DI		X	X	
Backside prep					DI	DI				DI	DI	X	X	
Wafer probe		X										X	X	
Saw	X	X	X						DI	X		X		
Flip-Chip Attach	X			X		X				X (no underfill)		X	X	Class Y
Die Attach Eutectic, Silver glass, JM7000, epoxy	X	X		X	X	X	X	X	DI	X	X	X	X	
Wire type, bond	X	X			X	X			X	X	X	X	X	
Lead finish							X	X				X	X	X
Mark				X		X							X	X
Solder seal					X	X	X	X		X	X	X	X	X
Glass frit seal					X	X	X	X			X	X		X
Weld seal					X	X	X	X		X	X		X	X
Lead trim							X	X		DI (Note 3)				X
Solder dip							X	X						X

NOTE 1 X-ray does not apply for aluminum wire bonded product.

NOTE 2 Two out of three electrical tests may be eliminated (e.g. cold and room temperature). The most critical temperature test cannot be eliminated. The evaluation must be made in relation to the applicable requirements in Standard Military Drawings (SMDs).

NOTE 3 Trimmed leads of flatpack packages may cause false failures.

NOTE 4 Test methods referenced in the header (e.g. MXXX) are the applicable test methods as defined in MIL-STD-883.

NOTE 5 DI = Direct Impact (See section 4)

NOTE 6 SAM only required for molded and flip-chip packages

Table 1A — Streamlining matrix Class Q, V, Y Group A, B, C Tests

Relation-ship between Process \ Test	Group A Electrical	Group B1 Resistance to solvents	Group B2 Wire Bond strength	Group B2 Die shear, stud pull, flip chip pull-off, substrate attach strength	Group B3 Solderability	Group B4 Ball shear, column pull test	Group C Steady state life
Wafer fab	X		X	X			X
Backside prep	X			X			
Wafer probe	X		X				X
Saw				X			
Flip-Chip Attach				X			X
Die Attach Eutectic, Silver glass, JM7000, epoxy				X			X
Wire type or bond			X				X
Termination (lead, ball, column) finish					X	X	
Mark		X			X		
Solder seal							
Glass frit seal							
Weld seal							
Lead trim					X		
Ball/column process					X	X	
Solder dip		X			X		
Electrical final test	X						X

NOTE 1 Test methods referenced in the header (e.g., MXXX) are the applicable test methods as defined in MIL-STD-883.

Table 1B — Streamlining matrix Class Q, V, Y Group D Tests

Relationship between Process \ Test	Group D1 Physical dimension	Group D2 Lead integrity ball shear	Group D3 Thermal and humidity	Group D4 Mechanical shock and vibration	Group D5 Salt Atmosphere	Group D6 Internal water vapor	Group D7 Lead finish	Group D8 Lid Torque	Group D9 Solderability
Wafer fab			X						
Backside prep			X	X					
Wafer probe									
Saw			X	X					
Flip-Chip Attach			X	X		N/A			X
Die Attach Eutectic, Silver glass, JM7000, epoxy			X	X		X			X
Wire type, bond			X	X					
Lead finish	X	X			X		X		X
Mark			X		X				
Solder seal			X	X	X	X			
Glass frit seal			X	X	X	X		X	X
Weld seal			X	X	X	X			
Lead trim	X	X			X		X		X
Ball/column process	X	X			X		X		X
Solder dip	X	X			X		X		X

NOTE 1 Test methods referenced in the header (e.g. MXXX) are the applicable test methods as defined in MIL-STD-883.

4.1 Risk considerations (Annex A)

This set of tables compares the Quality Characteristics directly to the screen to be eliminated. If a check is present, this quality characteristic must be considered for the elimination of the screen. The process capability data must meet the characteristic defect rates and confidence levels specified below. The process capability study should include evaluating lot to lot process variation. The number of lots and sample size depend on whether variables or attributes data are used. Data should be collected on multiple lots over an extended period to ensure consistent process capability. Process maturity should be considered. The capability requirements are expressed as maximum allowable (device level, fully processed) product defect rates.

The following definitions provide a means of differentiating characteristics that dramatically influence product performance from those that bear minimal influence. Test optimization requirements vary accordingly.

The level of demonstrated control is based on the P, S or T associated with each row. The risk charts has abbreviated "Primary", "Secondary", and "Tertiary" as P, S, and T, respectively.

P or Primary defect level is a defect, which in and of itself will cause a device failure. The manufacturer must demonstrate that the defect rate is less than or equal to 500 ppm with a 99% confidence (Beta error, probability of shipping non-compliant product = 5% at 600 ppm defect rate.).

S or Secondary defect level is a defect which, when combined with another defect, will cause a device failure. The manufacturer must demonstrate that the defect rate is less than or equal to 3% with a 95% confidence level (Beta error = 10% @ 4 % defect rate).

T or Tertiary defect level is a defect that must interact with 2 or more defects to cause a device failure. The manufacturer must demonstrate that the defect rate is less than or equal to 4% with a 90% confidence level (Beta error = 15% @ 5% defect rate).

Requirements by process (Annex B)

These tables describe the quality characteristics for a given process.

5 Conditions for deletion of control levels

5.1 Deletion of quality characteristic monitors

Control of quality characteristics should be verified via statistically sound process monitors in order to support optimization of screens related to that quality characteristic. Upon documented agreement with the qualifying activity, a process monitor may be determined unnecessary to ensure control of a quality characteristic based upon any of the following factors:

- Adequate controls of other parameters sufficient to maintain capability.
- The variable is inapplicable to the technology or the screen being eliminated (e.g. X-ray for Al Wedge Bond).
- Sound Engineering rationale confirms that variation in the characteristic has been reduced to a low level and the unlikely incidence of an occurrence of a failure has been reduced to meet the specified defect rate and confidence level for the given characteristic as a result of robust product/process design.

5.2 Sequence of optimization

5.2.1 Non-value added processes

Optimization of some screening operations warrant concurrent (or prior) optimization of upstream stressing operations (e.g. tightening electrical test at one temperature eliminates the value of testing at other temperatures).

5.2.2 Upstream optimization influence on previously optimized downstream screens

Optimization of screens early in the process flow may require re-assessment of characteristics associated with previously optimized screens (e.g. optimization of low power pre-cap visual after optimization of X-Ray warrants reassessment of quality characteristics associated with X-Ray).

Annex A –Risk Considerations

Risk Considerations
Process: Saw

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Characteristics	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Visual (M2010/ 883):														
Scribing and die defects - Separation/Alignment	S			X										
Scribing and die defects - Chips & Cracks	T			X	X			X						
Scribing and die defects - Cracks > 3.0Mils, etc	S			X										
Scribing and die defects - Semicircular Cracks (Condition A Only)	T			X				X						
Scribing and die defects - Attached Die	T			X	X			X						
Crack Pointed at Active Circuit	T			X		X				X	X			
Foreign Material - F/M on Bonding Pad	T			X	X					X	X			
Flip chip Bumps (on die)	P				X	X					X			
Flip Chip Underfill void			X											

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Die Attach Silver glass, JM7000 and Epoxy

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Attachment Strength	P					X	X			X	X			
Morphology (Voids)	S		X			X	X	X	X	X	X			
Visual (per M2010/883):														
Die mounting noneutectic - Mat. On or Above Die	T				X			X	X	X	X			
Die mounting noneutectic Wetting/Fillet	T				X									
Die mounting noneutectic - Flaking/Peeling/Lifting	T				X	X	X	X						
Die mounting noneutectic - Cracks & Fissures	T				X			X						
Die mounting noneutectic - Crazing	T				X									
Die mounting noneutectic - Bridging	T				X					X	X			
Die mounting noneutectic - Bridging within 1 mil	T				X									
Metallization scratches	S			X						X	X			
Scribing and die defects - Clearance	S			X						X	X			
Scribing and die defects - Chipout/Crack to Active Circuit	T			X		X				X	X			
Scribing and die defects - Crack > 3.0 mil, etc.	S			X		X								
Scribing and die defects - Semicircular Cracks	T			X		X	X							
Scribing and die defects - Crack > 1 mil Points Toward Metal or Active Circuit	T			X		X				X	X			

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Eutectic Die Attach

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Attachment Strength	P					X	X	X		X	X			
Morphology (Voids)	S		X			X	X		X	X	X			
Visual (per M2010/883):														
Die mounting eutectic - Build-Up	T				X				X		X			
Die mounting eutectic - Wetting	T				X	X	X	X	X	X	X			
Die mounting Eutectic - Flaking	T				X	X	X	X						
Die mounting eutectic - Balling/Buildup	T				X	X	X	X	X					
Metallization scratches	S			X	X					X	X			
Scribing and die defects - Clearance	S			X	X					X	X			
Scribing and die defects - Chipout/Crack in Active Circuit	T			X	X	X				X	X			
Scribing and die defects - Crack > 3.0 Mil., etc	S			X		X								
Scribing and die defects - Semicircular Crack	T			X		X		X						
Scribing and die defects - Crack > 1 mil points Toward Metal or Active Circuit	T			X		X				X	X			

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Flip Chip Attach

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Attachment Integrity	P		X			X	X			X	X			
Underfill voids	S		X			X	Class Q&V only	Class Q&V only		X	X			

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Wire Bond

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY (non-aluminum)	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Attachment Strength (Wire Pull)	P	X				X	X			X	X			
Visual (per M2010/883):														
Ball Bonds	S	X			X	X	X				X			
Wedge Bonds	S	X			X	X	X				X			
General (Ball, wedge, and tailless) - Placement	T	X			X	X	X		X	X	X			
General (Ball, wedge, and tailless) - Tails	T				X					X	X			
General (Ball, wedge, and tailless) – foreign material	S	X			X		X			X	X			
Internal wires - separation	S				X			X	X		X			
General (Ball, wedge, and tailless) - Intermetallics	P				X	X		X		X	X			
Internal wires - nicks & cuts	T	X			X									
Internal wires - Tearing	S	X			X	X	X	X		X	X			
Internal wires - Loop	T				X	X					X			
Internal wires - Crossing Wires	T				X	X		X			X			
Internal wires - does not match diagram	P				X						X			
Die Orientation	P				X						X			
Metallization bridging – displaced metal, (shooting metal)	T			X	X						X			

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Seal

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	Internal Gas Analysis	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Lid Adhesion	P					X	X					X	X	
Morphology of Sealing Material	S					X	X		X			X	X	
Seal Integrity	S	X	X									X	X	
Non-Design Sealing Material Flow	T					X	X	X	X		X			
Internal Gas	S	X								X	X	X	X	
Visual (per M2009/883):														
General – evidence of nonconformance with detail drawing	S											X	X	X
Glass seals - Crazing of Sealing Glass	T					X						X		X
Glass seals - Radial Cracks	S					X	X					X		X
Glass seals - Radial/Circular Cracks	S					X	X					X		X
Glass seals - Circumferential Cracks	S					X	X					X		X
Glass seals - Meniscus Cracks	S					X	X					X		X
Glass seals - Re-Entrant Seals	S											X	X	X
Glass seals - Voids/Bubbles	T					X			X			X	X	X
Foreign/displaced material	T										X			X

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Lead Finish

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Package Integrity:														
Hermeticity M1014, Fine and Gross leak per requirements	P											X	X	
Cracks (M2009, leads, glass seals)	S											X	X	X
Pin-To-Pin Electrical Leakage	P									X	X			
Visual Criteria:														
Solderability - M2003	S													X
Bridging (M2003, Para. 4.5.1c & M2009 - construction defects; metallization not intended,	P										X			X
Tails (M2009, ?	T													X
F/M (M2009, – foreign/displaced material, leads; metallization that reduces lead separation,	S													X

Annex A –Risk Considerations (cont'd)

Risk Considerations
Process: Lead Trim and Form

		Dependency of Test Elimination on Deliverable Quality Characteristic												
Quality Characteristic	Defect Type	1 Non Destructive Wire Pull	Scanning Acoustic Microscopy	2 High Power visual	3 Low Power Visual	4 Temp Cycle, Thermal Shock	5 Centrifuge	6 Particle Impact Noise Detection	7 XRAY	8 Burn In	9 Electrical Test	10 Fine Leak	11 Gross Leak	12 External Visual
Lead Dimension	P													X
Hermeticity Method 1014 as applicable for package	P											X	X	
Visual (Per M2009/883)														
Leads - Bent or Broken Leads	S										X	X	X	X
Package body/lid – leaded devices & leadless devices - Broken/Cracked Pkgs	P											X	X	X
Package body/lid – leaded devices & leadless devices - Chip Outs	T													X
Leads - Scratch/Mar	S													X
Leads - Burrs	T													X

Annex B - Considerations by process

CONSIDERATIONS FOR "BACKSIDE PREPARATION" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
	NO QUALITY CHARACTERISTICS CAN BE IDENTIFIED	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE TABLE 1	MONITOR DIE ATTACH OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE LEVEL II, OR III CONTROLS

CONSIDERATIONS FOR "BACKSIDE PREPARATION" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	THICKNESS - WAFER - GOLD	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS)	EQUIPMENT (BACK GRIND) SET UP CHUCK FLATNESS
2	THICKNESS VARIATION UNIFORMITY FLATNESS	OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	GRIND WHEEL CONFIGURATION GRIT SIZE WEAR
3	SURFACE ROUGHNESS		

CONSIDERATIONS FOR "BACKSIDE PREPARATION" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	WAFERS	PHOTORESIST COAT/WAX or TAPE: UNIFORMITY CLEANLINESS	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	ENVIRONMENT	WATER TEMPERATURE	

CONSIDERATIONS FOR "100% PROBE" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	PRODUCT/REV VERIFICATION	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A	MONITOR WAFER PROBE OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	ELECTRIC SCREENING TO PROGRAM PARAMETERS		
3	VISUAL SAMPLE (PER M2010/883)		

Annex B - Considerations by process (cont'd)

CONSIDERATIONS FOR "100% PROBE" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	ELECTRICAL PARAMETERS: (ELECTRICAL TESTING ON WAFER TEST PATTERNS, FED BACK TO FAB FOR STATISTICAL ANALYSIS)	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE LEVEL CONTROLS.	LIMITS SET BY FAB PROCESS ENGINEERING FOR THE DEVICE TECHNOLOGY/PROCESS LIMITS BASED ON HISTORIAL DEVICE/TECHNOLOGY DATA.
2	LIMITS ESTABLISHED FOR CERTAIN PARAMETERS TO ENSURE SOUND ELECTRICAL CONTACT AND GENERAL WAFER INTEGRITY. PROBE OVERDRIVE CONTROL (Z-CONTROL FOR PROBE PRESSURE)		OVERDRIVE TO SPECIFIED LEVEL (EG., 3 MILS) MACHINE SETUP/OPERATION:
3	INKER STATION CONTROL		INK CARTRIDGE ALIGNMENT CONTROL TO PREVENT CLOGGING/SPLATTERING
4			REFERENCE POINT VERIFIED BETWEEN PROBER AND INKER

CONSIDERATIONS FOR "100% PROBE" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	PROBE CARD DESIGN	PROBE DESIGN PROBE GRAM FORCE GRAMS/MIL OVERDRIVE	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	PROBE CARD: MAINTENANCE PREPARATION	 PROBE PLANARITY INSPECTION TO +/– 0.5 MIL PROBE ALIGNMENT CONTACT RESISTANCE (REMOVE OXIDES)	
3	DIE (BONDING PADS)	METALLIZATION: COMPOSITION DOPANTS HARDNESS THICKNESS CONTAMINATION ADHERENCE MULTILAYER GLASSIVATION: RESIDUAL GLASS RESIDUAL PHOTORESIST CONTAMINATION	
4	DESIGN CONSIDERATIONS	BONDING PAD DIMENSIONS SPACING OF OTHER METALLIZATION	
5	TEST PROGRAMS	TEST TECHNIQUES GUARDBANDING	

Annex B - Requirements by process (cont'd)

LEVEL I CONSIDERATIONS FOR "SAWING" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	VISUAL (PER M2010/883): Scribing and die defects - separation Scribing and die defects – chipouts and cracks Scribing and die defects – cracks > 3.0 mils Scribing and die defects – semicircular cracks Scribing and die defects – attached portions of other active area Scribing and die defects – cracks pointing to active circuitry Foreign material	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.1.	MONITOR SAW OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS

CONSIDERATIONS FOR "SAWING" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1 2 3 4	KERF WIDTH: CHIPPING SAW ALIGNMENT DEPTH CONTAMINATION	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	WAFER MOUNTING SYSTEM (I.E. CURE TIME AND TEMP) WAFER SAW: SAW FEED RATE AND CUT DEPTH BLADE THICKNESS SPINDLE SPEED (RPM) WATER PRESSURE INDEX PARAMETERS VIBRATION AND ALIGNMENT WAFER CLEANER: • WATER PRESSURE, JET DIRECTION • CHUCK OR BRUSH RPM • CLEAN TIME • WAFER HOLDING TIME (BETWEEN SAW AND CLEANING) IR DRYING TIME, TEMPERATURE CLEANING METHOD (BRUSH, HIGH PRESSURE, ETC.)

Annex B - Requirements by process (cont'd)

LEVEL III CONSIDERATIONS FOR "SAWING" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	SAW BLADES	BLADE EXPOSURE BLADE THICKNESS DIAMOND SIZE AND DISTRIBUTION VENDOR	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	WAFER MOUNTING TAPE	THICKNESS TACKINESS VENDOR	
3	DI WATER	PURITY/RESISTIVITY	
4	WAFER	SAW STREET WIDTH STREET COMPOSITION (i.e. METAL, GLASS, OXIDES, NITRIDES) WAFER THICKNESS INTERNAL WAFER STRESS BACKSIDE METALLIZATION BACKSIDE TESTURE	

CONSIDERATIONS FOR SILVER GLASS JM7000 AND EPOXY DIE ATTACH PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	ATTACHMENT DIE SHEAR OR STUD PULL	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.1.	MONITOR DIE ATTACH OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR
2	MORPHOLOGY (VOIDS, ETC.)		DEMONSTRATE CONTROLS
3	VISUAL (PER M2010/883): Die mounting noneutectic – adhesive material on die Die mounting noneutectic – wetting and fillet Die mounting noneutectic – flaking, peeling, lifting of adhesive Die mounting noneutectic – cracks or fissures Die mounting noneutectic - crazing Die mounting noneutectic bridging, bridging within 1 mil Metallization scratches Scribing and die defects – line of separation Scribing and die defects – chipouts or cracks Scribing and die defects – cracks > 3.0 mils Scribing and die defects – cracks > 1 mil pointing to metal or active circuit		

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR SILVER GLASS, JM7000 AND EPOXY DIE ATTACH PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	ATTACHMENT STRENGTH: DIE SHEAR OR STUD PULL	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED	DIE PLACEMENT: Z FORCE/ SPEED/ LOCATION/ FLATNESS
2	MORPHOLOGY (VOIDS)		CURE PROFILE: TEMP/ZONES
3	VISUAL CHARACTERISTICS (PER M2010/883)	MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	BELT SPEED
4	TILT		FURNACE ATMOSPHERE: MOISTURE OXYGEN LEVEL
5	THICKNESS: WET DRY		FLOW DISPENSE CONTROL: TIME/PRESSURE/VOLUME/DESIGN/SPEED/METHOD PROCESS TIME LINE: PAST DISPENSE TO DIE PLACEMENT DIE PLACEMENT TO CURE

CONSIDERATIONS FOR SILVER GLASS, JM7000 AND EPOXY DIE ATTACH PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	SILVER GLASS AND JM7000	VISCOSITY % SOLIDS COMPOSITION/PURITY	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	DIE/WAFER	BACKSIDE METALLIZATION TEXTURE CLEAN	
3	PACKAGE	STORAGE CONDITIONS DIE STRESS OXIDES	
4	DESIGN CONSIDERATIONS	 TEXTURE CLEAN MATERIAL COLLET SIZE DIE SIZE DIE ATTACH AREA	

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "EUTECTIC DIE ATTACH" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	ATTACHMENT STRENGTH DIE SHEAR OR STUD PULL	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.1.	MONITOR DIE ATTACH OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	MORPHOLOGY (VOIDS/AU DIFF.)		
3	VISUAL (PER M2010/883): Die Mounting Eutectic – material build-up Die Mounting Eutectic – wettingDie Mounting Eutectic – flakingDie Mounting Eutectic – balling or buildupMetallization scratches Scribing and die defects – line of separation Scribing and die defects – chipouts or cracks Scribing and die defects – cracks > 3.0 mils Scribing and die defects – semicircular cracks Scribing and die defects – cracks > 1 mil pointing to metal or active circuit		

CONSIDERATIONS FOR “EUTECTIC DIE ATTACH" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	ATTACHMENT STRENGTH: STRENGTH DIE SHEAR STUD PULL	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO	DIE ATTACH MACHINE/PROCESS: TEMPERATURE/TIME COLLET FORCE SCRUB PARAMETERS DIE PLACEMENT
2	MORPHOLOGY	DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR	HEADER RETENTION COVER GAS
3	VISUAL (PER M2010/883)	DEMONSTRATE APPROPRIATE LEVEL II OR III CONTROLS.	MEASUREMENT SYSTEMS: CALIBRATION % R&R

CONSIDERATIONS FOR "EUTECTIC DIE ATTACH" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	DIE	BACKSIDE ROUGHNESS CONTAMINATION VISUALS OXIDE THICKNESS	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	PACKAGE	CAVITY MATERIAL: COMPOSITION THICKNESS	
3	COVER GAS	COMPOSITION/PURITY	
4	PREFORMS	COMPOSITION SIZE	
5	DESIGN CONSIDERATIONS	COLLET SIZE DIE SIZE DIE ATTACH AREA	

Annex B - Requirements by process (cont'd)

LEVEL I CONSIDERATIONS FOR "WIRE BOND ATTACH" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	ATTACHMENT STRENGTH (WIRE PULL)	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.2.2.	MONITOR WIRE BOND OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	VISUAL (PER M2010/883):		
3	Metallization bridging – displaced metal, (shooting metal) Gold Ball Bonds Wedge Bonds General (Gold ball, wedge, and tailless) - PlacementGeneral (Gold ball, wedge, and tailless) - TailsGeneral (Gold ball, wedge, and tailless) – foreign material General (Gold ball, wedge, and tailless) - IntermetallicsInternal wires - separationInternal wires - nicks & cutsInternal wires - TearingInternal wires - LoopInternal wires - Crossing WiresInternal wires - does not match diagramDie Orientation		

CONSIDERATIONS FOR "WIRE BOND ATTACH" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	ATTACHMENT STRENGTH (BOND PULL AT PRE-SEAL)	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED FOR LEVEL I. MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	<u>MACHINE SETUP:</u> POWER TIME FORCE OTHER CRITICAL MACHINE SPECIFIC PARAMETERS LOOP HEIGHT PRS (PATTERN RECOGNITION SYSTEM) TOOL CALIBRATION (CROSS HAIR OFFSET SYSTEM & THETA CALIBRATION) TOOL DESIGN CLAMP/WIRE FEED SETUP <u>MISC ISSUES:</u> WIRE DIAMETER BOND STYLE (FORWARD OR REVERSE) WIRE GEOMETRY <u>SEALING:</u> TEMPERATURE TIME ATMOSPHERE
2	ATTACHMENT STRENGTH (BOND PULL AT POST-SEAL)		
3	VISUAL (PER M2010/883)		

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "WIRE BOND" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	WIRE	DOPANT(S) (% AND DISPERSION) HARDNESS: ELONGATION TENSILE STRENGTH INTERNAL STRESSES SPOOLING TECHNIQUES CONTAMINATION WIRE DIAMETER SHELF LIFE	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	PACKAGE (WITH DIE ATTACH)	MATERIAL (BONDING POST METALLIZATION) MATERIAL TEXTURE (BONDING POST) FLATNESS (BOWED BONDING POST SURFACE) COPLANARITY LEAD EMBEDMENT CONTAMINATION DIE FLATNESS DIE ATTACH FLOW ON BONDING POSTS EXCESSIVE DIE ATTACH MATERIAL (REFLECTIVITY) DIE PLACEMENT DOWN BOND CRITERIA	
3	DIE (BONDING PADS)	METALLIZATION: COMPOSITION DOPANT(S) (% AND DISPERSION) HARDNESS THICKNESS CONTAMINATION ADHERENCE(LIFTING) MULTILAYER SURFACE TEXTURE PROBE MARKS GLASSIVATION: RESIDUAL GLASS RESIDUAL PHOTORESIST CONTAMINATION PASSIVATION: (UNDERLYING MATERIAL) COMPOSITION NUMBER OF LAYERS	
4	TOOLS (E.G. WEDGE)	TOOL DESIGN	
5	DESIGN CONSIDERATIONS	DIE REFLECTIVE/COLOR BONDING PAD DIMENSIONS WIRE LENGTH SPACING OF OTHER METALLIZATION	
	TEST CONDITIONS	PACKAGE DESIGN WIRE DRESS	

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "FLIP CHIP ATTACH" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1 2 3 4 5	ATTACHMENT STRENGTH: DIE SHEAR OR DIE PULL MORPHOLOGY (VOIDS) VISUAL CHARACTERISTICS TILT THICKNESS: WET DRY	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	DIE PLACEMENT: Z FORCE/ SPEED/ LOCATION/ FLATNESS CURE PROFILE: TEMP/ZONES BELT SPEED FURNACE ATMOSPHERE: MOISTURE OXYGEN LEVEL FLOW DISPENSE CONTROL: TIME/PRESSURE/VOLUME/DESIGN/SPEED/METHOD PROCESS TIME LINE: PAST DISPENSE TO DIE PLACEMENT DIE PLACEMENT TO CURE

CONSIDERATIONS FOR "FLIP CHIP ATTACH" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1 2 3 4	UNDERFILL MATERIAL DIE/WAFER PACKAGE DESIGN CONSIDERATIONS	VISCOSITY % SOLIDS COMPOSITION/PURITY SOLDER BUMP CONDITION CLEAN STORAGE CONDITIONS DIE STRESS OXIDES BUMP SPACING BUMP SIZE	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "LID SEAL" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	LID ADHESION	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.2.2.	MONITOR SEALING OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	MORPHOLOGY OF SEALING MATERIAL		
3	HERMETIC SEAL		
4	RGA		
5	NON-DESIGN SEALING MATERIAL FLOW		
6	<u>VISUAL (PER M2009/883):</u> General – evidence of nonconformance with detail drawing Glass seals - Crazing of Sealing Glass Glass seals - Radial Cracks Glass seals - Radial/Circular Cracks Glass seals - Circumferential Cracks Glass seals - Meniscus Cracks Glass seals - Re-Entrant Seals Glass seals - Voids/Bubbles Foreign/displaced material		

CONSIDERATIONS FOR "LID SEAL" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	SEAL PROFILE	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE LEVEL II OR III CONTROLS.	ZONE SETTINGS AS FLOWS BELT SPEED TIME AT TEMPERATURE THERMOCOUPLE REPEATABILITY ATMOSPHERE CLIPPING MEHTODOLOGY (AS APPLICABLE) LOADING CONFIGURATION LID ALIGNMENT FORCE, CURRENT, TIME ATMOSPHERE TOOL CONDITION PLANARITY PRE-CONDITIONING
2	LID MOUNTING		
3	WELDING		

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "LID SEAL" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	PREFORM/FRIT	PURITY COMPOSITION THICKNESS TACK WELDS	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	INCOMING GAS	COMPOSITION MOISTURE CONTAMINATION	
3	LID/PKG CLEAN	LEVEL OF CLEANING	
4	FIXTURES	BOATS/CLIPS/ETC. ALIGNMENT FIXTURES	
5	PACKAGE	LID/PACKAGE DESIGN DESIGNS RULES	

CONSIDERATIONS FOR "MARKING" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	LEGIBILITY	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.1.	MONITOR LEAD FINISH OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	DEGREE OF CURE		
3	ADHESION		
4	ESTHETIC/PLACEMENT		

CONSIDERATIONS FOR "MARKING" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	<u>INK:</u> SHELF LIFE STORAGE POT LIFE LEVEL OF CONTAMINATION	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	UNIFORMITY CONTAMINATION
2	<u>SURFACE CONDITION:</u> GOLD CERAMIC METAL		SURFACE ENERGY CLEANLINESS/WASHING/DRYING
3	CURE		<u>MACHINE SETUP:</u> CONTROL OF TEMPERATURE TIMING CONTROL OF OVEN CONTAMINANT OVEN PROFILE
4	OVEN UNLOAD INTEGRITY		

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "MARKING" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	ENVIRONMENT	TEMPERATURE	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	PRODUCT	PACKAGE SURFACE CONDITION PACKAGE CLEANLINESS PACKAGE SURFACE ENERGY	

CONSIDERATIONS FOR "LEAD TRIM/FORM" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	LEAD DIMENSION SHAPE/FORM TRUE POSITIONING COPLANARITY	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.1.	MONITOR SEALING OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	HERMETICITY		
3	<u>VISUAL (PER M2009/883):</u> Leads - Bent or Broken Leads Package body/lid – leaded devices & leadless devices - Broken/Cracked Pkgs Package body/lid – leaded devices & leadless devices - Chip Outs Leads - Scratch/Mar Leads - Burrs		

CONSIDERATIONS FOR "LEAD TRIM/FORM" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	LEAD DIMENSION (PROCESS MONITOR)	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS)	<u>MACHINE SETUP:</u> APPROPRIATE BARS, CUTTERS, SPREADERS, ETC. HANDLING PROCEDURES DIE SETS
2	VISUAL CRITERIA PER M2009	OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "LEAD TRIM/FORM" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1 2 3	PACKAGE TOOLS CARRIERS	CLEAN, UNDAMAGED MATERIAL TYPE: LEAD THICKNESS COPLANARITY DESIGN CONDITION CARRIER DESIGN	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS

LEVEL I CONSIDERATIONS FOR "HOT SOLDER DIP LEAD FINISH (A)" PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1 2 3	SOLDER THICKNESS SOLDERABILITY (PER M2009/883) VISUAL (PER M2009/883): General – illegible marking Leads – broken, not intact or aligned Package body/lid – leaded and leadless devices – broken package, chipout, cracks, delamination, separation. Leads – isolation reduced Leads - scratches Leads - burrs	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.2.2.	MONITOR LEAD FINISH OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "HOT SOLDER DIP LEAD FINISH (A)" PROCESSING OPERATION			
ATT #	PROCESS QUALITY CHARACTERISTIC	CAPABILITY	PROCESS CONDITIONS
1	SOLDER THICKNESS	TO BE SPECIFIED BY THE MANUFACTURER IN ORDER TO ACHIEVE THE CAPABILITIES NEEDED MONITOR (PROCESS) OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE APPROPRIATE CONTROLS.	MACHINE PARAMETERS: SOLDER TEMPERATURE WAVE SPEED DWELL TIME ENTRANCE/EXIT SPEED IMMERSION ANGLE FLUX: DENSITY, TEMPERATURE, PURITY, AMOUNT SOLDER: TRACE ELEMENTS, COMPOSITION POST-CLEAN PARAMETERS: SOLUTION, TEMPERATURE, DURATION, ELAPSED TIME, EFFECTIVENESS XRF REPEATABILITY: CALIBRATED THICKNESS CAMERA ALIGNMENT LEAD GEOMETRY HANDLING PROCEDURES HEAT (INTERMETALLICS GROWTH) CONTAMINATION (HUMAN) HANDLING (LEAD DAMAGE) HERMETICITY: FIXTURING, PROCESS CONTROL
2	VISUAL CRITERIA PER M2009: LEAD TO LEAD PART TO PART LOT TO LOT		
3	VISUAL CRITERIA: PER M2009/883		
4	POST-SOLDER DIP SOLDERABILITY		
5	HERMETICITY PER M1014/883		

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "HOT SOLDER DIP LEAD FINISH (A)" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	SOLDER	<u>INCOMING INSPECTION:</u> VIRGIN METALS TRACE ELEMENTS FOREIGN MATERIAL <u>PROCESS:</u> TRACE ELEMENTS COMPOSITION	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	FLUX	ACTIVITY pH DENSITY	
3	LEAD MATERIAL	<u>PREPLATED:</u> PLATING THICKNESS SHELF LIFE PACKAGE TYPE PITCH <u>UNPLATED:</u> PRE-DIP CLEAN PROCESS PACKAGE TYPE PITCH <u>HANDLING:</u> TRUE POSITION COPLANARITY <u>CLEANLINESS:</u> PRE-SOLDER DIP CLEAN HEAT (Ni MIGRATION)	

Annex B - Requirements by process (cont'd)

CONSIDERATIONS FOR "GOLD LEAD FINISH PROCESSING OPERATION			
ATT #	QUALITY CHARACTERISTIC	CAPABILITY	VARIABLE RELATIONSHIP
1	SOLDERABILITY (PER M2009/883)	PER DEFECT TYPE (PRIMARY, SECONDARY OR TERTIARY), SEE ANNEX A AND PARA. 4.1.	MONITOR LEAD FINISH OUTPUT TO DEMONSTRATE NO VIOLATION OF CAPABILITY REQUIREMENTS OR DEMONSTRATE CONTROLS
2	VISUAL (PER M2009/883): General – illegible marking Leads – broken, not intact or aligned Package body/lid – leaded and leadless devices – broken package, chipout, cracks, delamination, separation. Leads – isolation reduced Leads - scratches Leads - burrs PACKAGE DAMAGE: HERMETICITY (PER M1014/883)		
3			

CONSIDERATIONS FOR "GOLD LEAD FINISH" PROCESSING OPERATION			
ATT #	PRE-PROCESS INPUTS (INCOMING)	PROCESS PARAMETERS	REQUIREMENTS
1	GOLD PLATING	THICKNESS COVERAGE PURITY ADHESION Ni MIGRATION/OXIDATION	TO BE SPECIFIED BY MANUFACTURER TO ACHIEVE THE QUALITY CHARACTERISTICS
2	PACKAGE	TYPE LEAD PITCH HANDLING TRUE POSITION COPLANARITY SCRATCHES FOREIGN MATERIAL	

Annex C (informative) Diffences between revisions

At time of publication a change revision for JEP121B was not provided.

Standard Improvement Form JEDEC _____

The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

If you can provide input, please complete this form and return to:

JEDEC
Attn: Publications Department
3103 North 10th Street
Suite 240 South
Arlington, VA 22201-2107

Fax: 703.907.7583

1. I recommend changes to the following:

☐ Requirement, clause number _____

☐ Test method number _____ Clause number _____

The referenced clause number has proven to be:

☐ Unclear ☐ Too Rigid ☐ In Error

☐ Other _____

2. Recommendations for correction:

_____

_____

_____

_____

3. Other suggestions for document improvement:

_____

_____

_____

_____

Submitted by

Name: _____ Phone: _____

Company: _____ E-mail: _____

Address: _____

City/State/Zip: _____ Date: _____


JEDEC®