INTERNATIONAL STANDARD

IEC 60748-23-3

QC 165000-3

First edition
2002-05

Semiconductor devices – Integrated circuits –

Part 23-3: Hybrid integrated circuits and film structures – Manufacturing line certification – Manufacturers' self-audit checklist and report

Dispositifs à semiconducteurs –
Circuits intégrés –

Partie 23-3:
Circuits intégrés hybrides et structures par films –
Certification de la ligne de fabrication –
Liste de contrôle et rapport d'évaluation interne pour fabricants

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SEMICONDUCTOR DEVICES – INTEGRATED CIRCUITS –

Part 23-3: Hybrid integrated circuits and film structures – Manufacturing line certification – Manufacturers' self-audit checklist and report

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60748-23-3 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices.

The text of this standard is based on the European standard EN 165000-3 and the following documents:

FDIS	Report on voting
47A/640/FDIS	47A/651/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

IEC 60748-23-3 should be read in conjunction with Parts 23-1, 23-2 and 23-4.

The QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

This set of specifications prescribes a set of procedures to be used by users and manufacturers for the production and delivery of high-quality, special requirement hybrid integrated circuits and film structures with a specified level of quality and reliability.

This set of specifications prescribes reference criteria for the establishment, control, maintenance and development of a certified manufacturing line and represents a manufacturing line certification methodology.

The targeted level of quality and reliability is to be achieved by using best design and manufacturing practices. Examples of quality and reliability best practices for elimination of potential failure mechanisms and achievement of a targeted quality and reliability level include: material characterization for derivation of process design rules, in-process control, continuous improvement, etc.

Assessment (estimation) of the targeted quality and reliability level may be accomplished by:

a) using data obtained from the material characterization, design and process control and improvement activities; or

b) through the use of product assessment level schedule (PALS) tests.

Part 23-1 of this set of specifications provides general information.

Part 23-2 of this set of specifications provides guidance to 'users' of hybrids in terms of the 'visual inspection standards' to be expected.

Part 23-4 of this set of specifications provides a blank detail specification, which provides guidance to 'users' of hybrids for procurement purposes.

Part 23-5 of this set of specifications provides a means of quality assessment on the basis of qualification approval.

SEMICONDUCTOR DEVICES – INTEGRATED CIRCUITS –

Part 23-3: Hybrid integrated circuits and film structures – Manufacturing line certification – Manufacturers' self-audit checklist and report

1 Scope

This part of IEC 60748 applies to a high quality approval system for hybrid integrated circuits and film structures.

This checklist is intended for the use of a hybrid microcircuit manufacturer's internal assessment team.

It will provide the hybrid manufacturer and the National Supervising Inspectorate (NSI) with ongoing information on process control demonstrating compliance with IEC 60748-23-1. It is not intended to include quality system requirements.

2 Document information

2.1 General

The checklist and subsequent report is for submission to the NSI in support of an application for approval to IEC 60748-23-1, or as a demonstration of continuing compliance at intervals not exceeding 1 year. Each item in clauses 3 to 7 shall be completed or marked “not applicable”; items which invoke mandatory process or inspection requirements are shown in ***bold italics***.

It should be noted that it is not the requirement or the intention that each item has to be answered with an affirmative, excepting mandatory requirements. The objective of the report is for the manufacturer to demonstrate that all manufacturing processes are under control by whatever means this is achieved.

Where supporting evidence is included, for example engineering reports, statistical process control (SPC) data, etc., it should be appended to the report.

The manufacturer may use his own style of typeface to reproduce this document and produce his report.

The NSI may subsequently validate any part of the submission as a process assessment.

2.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary*

IEC 60068-2-20:1979, *Basic environmental testing procedures – Part 2: Tests – Test T: Soldering*

IEC 60695-2-2:1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test*
Amendment 1 (1994)

IEC 60748-1, *Semiconductor devices – Integrated circuits – Part 1: General*

IEC 60748-23-1:2002, *Semiconductor devices – Integrated circuits – Part 23-1: Hybrid integrated circuits and film structures – Manufacturing line certification – Generic specification*

IEC 60748-23-2:2002, *Semiconductor devices – Integrated circuits – Part 23-2: Hybrid integrated circuits and film structures – Manufacturing line certification – Internal visual inspection and special tests*

IEC 60748-23-4:2002, *Semiconductor devices – Integrated circuits – Part 23-4: Hybrid integrated circuits and film structures – Manufacturing line certification – Blank detail specification*

IEC 61340-5-1:1998, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*

IECQ 001002-3:1998, *IEC Quality Assessment System for Electronic Components (IECQ) – Rules of Procedure – Part 3: Approval procedures*

3 Definitions

For the purpose of this part of IEC 60748, the definitions given in IEC 60050, IEC 60748-1, IEC 60748-23-1 and IEC 60748-23-2 shall apply.

4 General requirements

The following subclauses contain:

4.1 Self-audit checklist and report for thick and thin film hybrid integrated circuit manufacturers

4.2 Description of report/company structure

4.3 Approval information

4.4 Summary of testing

4.5 Analytical methods

4.6 Control of procurement sources and incoming material

4.7 Control of procurement sources and incoming material, continued

4.8 Environmental control and static handling

4.9 Change notification requirements

4.10 Hybrid design

4.1 Self-audit checklist and report for thick and thin film hybrid integrated circuit manufacturers

Report No: Date:

Previous report No: Date:

Approval: application/periodic review/extension/major change *

Company name:

Address:

Postcode:

Telephone: Telex: Facsimile:

Company declaration

The information contained herein is a true and accurate record of appraisals carried out between / / and / / .

Report compiled by: Signed: Date: / /

Report approved by: Signed: Date: / /

NSI counter-signature

The information supplied in this report fully supports the application/periodic review/extension/major change* as detailed.

The following items of this report have been subject to subsequent evaluation by the NSI:

For NSI: Signed: Date: / /

* Delete as appropriate.

4.2 Description of report/company structure

Provide a description for the purpose of this report.

a. For a new approval application – State the extent of the technology sought in terms of materials, complexity, packaging, etc. together with the maximum screening/test level applied for from IEC 60748-23-1, annex A.

b. For an extension/major change – Nature of technology extension required, or details of process/equipment change.

Senior management:

Name:	Position:	Location:
Name:	Position:	Location:
Name:	Position:	Location:
Name:	Position:	Location:
Name:	Position:	Location:
Name:	Position:	Location:
Name:	Position:	Location:
Name:	Position:	Location:

Quality department:

Name: Position: Quality Manager Reports to:
Name: Position: Deputy Quality Manager
Number of quality engineers:
Number of inspectors per shift:

Number of employees engaged in hybrid production:

Total:
Administration:
Production engineers:
Production operators:
Production inspection:
Design engineers:
Reliability engineers:
Supervisors:

Production:

Thick film substrate production:	YES/NO *	Number of shifts:
Thin film substrate production:	YES/NO *	Number of shifts:
Solder assembly:	YES/NO *	Number of shifts:
Chip and wire:	YES/NO *	Number of shifts:
Test and environmental:	YES/NO *	Number of shifts:
Quality engineering:	YES/NO *	Number of shifts:
Quality inspection:	YES/NO *	Number of shifts:
Production supervision:	YES/NO *	Number of shifts:

* Delete as appropriate.

Production line (space allocations):

Design: area in m^2
Development: area in m^2
Production: area in m^2
Test and environmental: area in m^2

Market:

Space: % Military: % Telecom: % Automotive: % Others: %

4.3 Approval information

Approved quality system to IEC QC 001002-3: YES/NO * Approval No: Assessed: / /

Approved to IEC 60748-23-1: YES/NO * Approval No: Assessed: / /

Other national/international approvals held:

Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /

Commercial approvals (e.g. Ford, IBM, etc.) held:

Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /
Approval Type: Approval No: Assessed: / /

Notes

* Delete as appropriate.

Example of abstract of capability approval

IEC 60748-23-1 approval number ABC123

Thick film technology:

General:

In 1937 Welwyn was set up to manufacture high grade resistors primarily for use by the telecommunications industries. During 1962 the company began production of custom electronic hybrid integrated circuits for industrial, telecommunications and military customers.

Today Welwyn uses the latest technology to design and produce high reliability hybrids conforming to the most exacting requirements of customer applications, for customers requiring a wide range of electronic circuit complexity/density and for quantities of hybrids ranging from small batch production to high volume production. In addition 100 % screening tests and customer design evaluation testing programmes are also available to provide the highest level of quality assurance required by any customer.

Current levels of release available:

	Maximum	IEC 60748-23-1, annex A
	Dimensions	Reference
Surface-mount, non-hermetic technology	50,8 mm × 25,4 mm	PALS 5
Surface-mount, hermetic technology	54,5 mm × 29,2 mm	PALS 8
Chip and wire, non-hermetic technology	50,8 mm × 25,4 mm	PALS 5
Chip and wire, hermetic technology	54,5 mm × 29,2 mm	PALS 8

Sub-contracted processes: None.

Address:

Welwyn Microcircuits
Factory D
BEDLINGTON
Northumberland
NE22 7AA
UNITED KINGDOM
Tel: +44 1670 822181
Fax: +44 1670 530123
Telex: 53514

Contacts:

Commercial Manager: Mr G Thompson, Ext. 421

Quality Manager: Mr D Oliver, Ext. 430

4.4 Summary of testing

The product testing record example shown below and overleaf is for guidance as to the required information. The manufacturer's own records may provide this information without amendment. Prior agreement should be reached with the NSI as to the form and content of supplied records.

PRODUCT TESTING RECORD				
MANUFACTURER'S NAME AND ADDRESS	Product type No: PALS release level: Package type: Technology description:			
DESIGN EVALUATION				
TEST	No. tested	No. failed	Date	Structural similarity claimed type No(s)
Endurance				
Damp heat				
Resistance to soldering heat				
Termination robustness				
Acceleration				
Vibration				
Shock				
Solderability				
Flammability				
Resistance to solvents				
Internal moisture content				
Radiographic inspection				
Salt mist				
Others				

Summary of testing *(continued)*

DEVICE SCREENING			
BATCH No.	BATCH SIZE	No. FAILED	TEST/FAILURE

DEVICE SAMPLE TESTING				
TEST	INSP. LOT	BATCH(es)	SAMPLE SIZE	FAILURE AND CAUSE

4.5 Analytical methods

Is an SPC system involving critical or key process nodes defined?	YES/NO *	Document No.	Issue No.
Are analytical tools used to determine the appropriate characteristics to be measured for critical or key nodes e.g. failure mode and effects analysis (FMEA), etc.?	YES/NO *	Document No.	Issue No.
Do these include:			
Minimum inspections?	YES/NO *		
Result distribution?	YES/NO *		
Relation to other product?	YES/NO *		
Corrective action?	YES/NO *		
Are SPC process controls in place for:			
Film pattern registration?	YES/NO *	Document No.	Issue No.
Film thickness			
Wet?	YES/NO *	Document No.	Issue No.
Dry?	YES/NO *	Document No.	Issue No.
Fired?	YES/NO *	Document No.	Issue No.
Film track width and separation?	YES/NO *	Document No.	Issue No.
Fired resistor value (pre-trim)?	YES/NO *	Document No.	Issue No.
Printed or film adhesive thickness pre-cure (including solder paste) for add-on components?	YES/NO *	Document No.	Issue No.
Wire bond strength test for bare die interconnect?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Provide achieved process capability indices:

4.6 Control of procurement sources and incoming material

4.6.1 Added components procured to an IEC specification

Where added components are procured to an IEC specification are they procured to normal release procedures?	YES/NO *	Document No.	Issue No.

4.6.2 Added components not procured to an IEC specification

Does a procurement specification controlled by the hybrid manufacturer exist or each added component?	YES/NO *	Document No.	Issue No.
Does an approved test and evaluation programme controlled by the hybrid manufacturer exist for each added component?	YES/NO *	Document No.	Issue No.
Is the approval test programme carried out on each added component from each manufacturing source?	YES/NO *	Document No.	Issue No.
Do the above procedures ensure that all added components are subject to testing and screening equivalent to components released to IECQ?	YES/NO *	Document No.	Issue No.

4.6.3 Part finished added components or subcontracted processes

Are part finished components or processes subject to the procurement controls detailed in 3.6.1 or 3.6.2 above?	YES/NO *	Document No.	Issue No.
Are parts stored and handled such that they are not subject to deterioration or damage?	YES/NO *	Document No.	Issue No.
Do all dies conform to the relevant IEC visual criteria?	YES/NO *	Document No.	Issue No.

4.7 Control of procurement sources and incoming material, continued

4.7.1 Other materials and components

Do procurement specifications exist for all other materials and components used in the hybrid manufacture?	YES/NO *	Document No	Issue No.
Do these specifications ensure that the hybrid manufacturer is made aware of any change to these materials and which components might effect hybrid manufacturing quality, yield or reliability?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

4.7.2 Continuous assessment of procurement sources

For components or materials not procured to an IEC specification, is a continuous vendor rating system of suppliers maintained?	YES/NO *	Document No.	Issue No.
Are suppliers regularly informed of their vendor rating?	YES/NO *	Document No	Issue No.

4.7.3 Traceability

Are the circuits, their added components, piece parts and materials traceable to original manufacturers' lot numbers?	YES/NO *	Document No.	Issue No.

Notes

4.8 Environmental control and static handling

Are there procedure(s) for controlling the environment?	YES/NO *	Document No.	Issue No.
		Document No.	Issue No.
		Document No.	Issue No.

Do these procedures include:

Compliance with IEC 61340-5-1:	***YES/NO*** *
Facility cleaning:	
1. Control	YES/NO *
2. Review	YES/NO *
Prevention of human contamination:	
1. Use of finger cots or gloves	YES/NO *
2. Suitable clothing	YES/NO *
3. Spittle control	YES/NO *
4. Gowning procedure	YES/NO *
5. Personnel property	YES/NO *
6. Cosmetics	YES/NO *

* Delete as appropriate.

Defined limits and monitoring of:

1. Temperature	YES/NO *		
2. Humidity	YES/NO *		
3. Particle count	YES/NO *		
4. Positive pressure	YES/NO *		
5. Field intensity	YES/NO *		
Facility shut down procedure:	YES/NO *		
Material storage and access:	YES/NO *		

4.9 Change notification requirements

Is there a procedure for controlling change notification?	YES/NO *	Document No.	Issue No.
Does this change procedure identity when a report is required by the NSI in accordance with 6.5.2 of IEC 60748-23-1?	YES/NO *		
Have any notifications of change been made during the period of this report?	YES/NO *		

Please provide report identities and dates:

4.10 Hybrid design

Are there separate design rules for each technology?	YES/NO *		
Technology type		Document No.	Issue No.
Technology type		Document No.	Issue No.
Technology type		Document No.	Issue No.
Technology type		Document No	Issue No.
Technology type		Document No.	Issue No.

Do these design rules include:

Internal materials types and usage?	YES/NO *		
Package materials types and usage?	YES/NO *		
Electrical design, including current Densities, track resistance and Capacitance, tolerance, stability, etc.?	YES/NO *		
Thermal design?	YES/NO *		
Environmental design i.e. package type, stress, shock, vibration, temperature, etc.?	YES/NO *		
Are design rules formally issued and controlled?	***YES/NO** *	***Document No.***	***Issue No.***

* Delete as appropriate.

Do the design rules include all aspects of the visual criteria of IEC 60748-23-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Is a periodic review carried out to ensure that new materials, processes and components are incorporated?	YES/NO *	Document No.	Issue No.
Are design layout checks performed by:			
1. Engineering?	YES/NO *	Document No.	Issue No.
2. Customer?	YES/NO *	Document No.	Issue No.
3. Others (specify)?		Document No.	Issue No.
Are formal design reviews carried out prior to production?	YES/NO *	Document No.	Issue No.
Does this review include:			
The fact that the design is within the scope of approval?	YES/NO *		
Customer requirements?	YES/NO *		
Electrical functionality?	YES/NO *		
Thermal considerations?	YES/NO *		
Environmental conditions?	YES/NO *		
Device screening requirements?	YES/NO *		
Reliability e.g. material combinations?	YES/NO *		
Safety e.g. materials, failure mode?	YES/NO *		
Static e.g. handling, bonding order?	YES/NO *		
Delivery requirements, packaging?	YES/NO *		

Notes

* Delete as appropriate.

5 Thick film processing

The following subclauses contain:

5.1 Artwork and screen fabrication
5.2 Substrates
5.3 Substrate saw or scribe and break and substrate hole drilling
5.4 Thick film pastes and printing
5.5 Drying and firing
5.6 Resistor trimming
5.7 Inspection and test of processing
5.8 Rework

5.1 Artwork and screen fabrication

Is artwork prepared in-house?	YES/NO *	Document No.	Issue No.
Is screen manufacture in-house?	YES/NO *	Document No.	Issue No.
Are quality assurance checks carried out before use?	YES/NO *	Document No	Issue No.
Is there evaluation of new screen materials?	YES/NO *	Document No.	Issue No.
Is screen tension measured before use?	YES/NO *	Document No.	Issue No.
Limits:	Min.	Max.	
Do screens have unique reference and revision control?	***YES/NO ****	***Document No.***	***Issue No.***
Is screen storage:			
Catalogued?	YES/NO *	Document No.	Issue No.
Access/segregation controlled?	YES/NO *	Document No.	Issue No.
In a controlled environment?	YES/NO *	Class	
Screen usage:			
Is the number of prints/or wear allowed per screen monitored and recorded?	YES/NO *	Document No.	Issue No.
Is screen tension periodically measured throughout screen life?	YES/NO *	Document No.	Issue No.
Limits:	Min.	Max.	period
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No***	***Issue No***

* Delete as appropriate.

5.2 Substrates

Substrates used:	Manufacturer	Types		
	Manufacturer	Types		
	Manufacturer	Types		
	Manufacturer	Types		
Incoming checks:	Dimensions	YES/NO *		
	Camber	YES/NO *		
	Bow	YES/NO *		
	Material	YES/NO *		
	Surface	YES/NO *	Document No.	Issue No.
Are substrates cleaned?		YES/NO *		
Chemical and method:				
Chemical purity checked		YES/NO *		
Routine replacement		YES/NO		
Calibration		YES/NO *		
Is substrate storage controlled between cleaning and use?		YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?		***YES/NO ****	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

5.3 Substrate saw or scribe and break and substrate hole drilling

Enter all equipment used, or new/refurbished equipment since last report.

Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Are there unique references for substrate profile drawings?	YES/NO *	Document No.	Issue No.
Is the registration side of the substrate clearly identified?	YES/NO *		
Is this also the registration for the pattern marking?	YES/NO *		
Are there procedures covering power/speed setting?	YES/NO *	Document No.	Issue No.
Is there a formal maintenance procedure for the cutting equipment?	YES/NO *	Document No.	Issue No.
If substrates are procured prescribed or drilled, is there a detailed procurement specification?	YES/NO *	Document No.	Issue No.
Are quality assurance checks made on dimensions?	YES/NO *	Document No.	Issue No.
Are the substrates cleaned prior to returning to stores?	YES/NO *	Document No.	Issue No.
Chemical and method:			
Is chemical purity checked?		YES/NO *	
Is there a routine replacement programme?		YES/NO *	
Is there calibration of the method?		YES/NO *	
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

* Delete as appropriate.

5.4 Thick film pastes and printing

Conductor inks:

Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use

NOTE Use = Minimum dimension /No. layers/termination, etc.

Resistor inks:

Manufacturer	Series No.	Compatible conductor type	Range
Manufacturer	Series No.	Compatible conductor type	Range
Manufacturer	Series No.	Compatible conductor type	Range
Manufacturer	Series No.	Compatible conductor type	Range
Manufacturer	Series No.	Compatible conductor type	Range

Dielectric and print protect inks:

Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use

Overglaze/covercoats:

Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Is lot traceability maintained for all ink usage?	***YES/NO*** *	***Document No.***	***Issue No.***
Is age control and storage control within paste manufacturers' limits?	***YES/NO*** *	***Document No.***	***Issue No.***
Are evaluation and viscosity measurements carried out on each batch?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Have adhesion tests been carried out on all substrate/ink combinations?	YES/NO *	Document No.	Issue No.
Are paste combinations from different manufacturers used on the same substrate or are combinations other than recommended used?	YES/NO *		
Have these combinations been fully evaluated?	YES/NO *	Document No.	Issue No.
Is there control on the blending of resistor inks?	YES/NO *	Document No.	Issue No.
Is each batch checked with a process test vehicle?	YES/NO *	Document No.	Issue No.

Printing machines:

Enter all machines used, or new/refurbished equipment since last report.

Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No

* Delete as appropriate.

Is there a formal procedure for print machine maintenance including squeegee wear, screen usage, mechanical set-up, etc?	YES/NO *	Document No.	Issue No.
Is printing carried out in a controlled environment?	YES/NO *	Class	
Are there restrictions regarding human contamination in the area?	YES/NO *	Document No.	Issue No.
Does the area have controlled cleaning procedures?	YES/NO *	Document No.	Issue No.
Are there instructions regarding each type of paste for operators/supervisors?	YES/NO *	Document No.	Issue No.
Is there a procedure controlling screen cleaning/paste retention. Does this procedure guard against paste contamination and dilution?	YES/NO *	Document No.	Issue No.
Are there restrictions on machine settings speed, standoff, pressure, etc.			
– for operators?	YES/NO *	Document No.	Issue No.
– for supervisors?	YES/NO *	Document No.	Issue No.
Are machine controls protected against accidental movement?	YES/NO *		
Is a usage log kept per machine?	YES/NO *	Document No.	Issue No.
Are visual checks carried out on each print layer?	YES/NO *		
By production	YES/NO *	Document No.	Issue No.
Sample by quality assurance	YES/NO *	Document No.	Issue No.
Do these visual checks conform to a written procedure?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

* Delete as appropriate.

Are thickness measurements made?		YES/NO *	Document No.	Issue No.
Conductor type Nos.	Wet	Dried	Fired	Min/Max
Conductor type Nos.	Wet	Dried	Fired	Min/Max
Conductor type Nos.	Wet	Dried	Fired	Min/Max
Dielectric type Nos.	Wet	Dried	Fired	Min/Max
Dielectric type Nos.	Wet	Dried	Fired	Min/Max
Dielectric type Nos.	Wet	Dried	Fired	Min/Max
Resistor type Nos.	Wet	Dried	Fired	Min/Max
Resistor type Nos.	Wet	Dried	Fired	Min/Max
Resistor type Nos.	Wet	Dried	Fired	Min/Max

Notes

* Delete as appropriate.

5.5 Drying and firing

Drying:

Enter all ovens/belts used, or new/refurbished equipment since last report.

Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Is dwell time, before drying, controlled and to manufacturer's recommendations?	YES/NO *	Document No.	Issue No.
Is drying carried out at paste manufacturer's recommended time/temperature profiles for all ink types used?	YES/NO *	Document No.	Issue No.
Are drying ovens/belts profiled at maximum load and usage?	YES/NO *	Document No.	Issue No.
At what periodicity are the drying ovens/belts profiled?			
Is a usage log with time/batch information kept per oven/belt?	YES/NO *	Document No.	Issue No.
Are there restrictions on multiple loading of ovens, i.e. door opening during curing cycle?	YES/NO *	Document No	Issue No.
Are machine controls protected against accidental movement?	YES/NO *		
Is there a maintenance procedure for the ovens and belts?	YES/NO *	Document No.	Issue No

* Delete as appropriate.

Firing:

Enter all furnaces used, or new/refurbished equipment since last report.

Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Is the firing profile and atmosphere to the paste manufacturers' recommended time/ temperature profiles for all ink types used?	YES/NO *	Document No.	Issue No.
Are furnaces profiled at maximum load and usage?	YES/NO *	Document No.	Issue No.
If furnaces are pre-loaded to carry out the profile, is this pre-load specified during use?	YES/NO *	Document No.	Issue No.
At what periodicity are the furnaces profiled?			
Is a usage log with time/batch information kept per furnace?	YES/NO *	Document No.	Issue No.
Are air flow/zone settings checked prior to furnace loading?	YES/NO *	Document No.	Issue No.
Are machine controls protected against accidental movement?	YES/NO *		
Is there a maintenance procedure for the furnaces used?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

5.6 Resistor trimming

Enter all air/laser trimmers, or new/refurbished equipment since last report.

Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.
Manufacturer	Type No.	Serial/Plant No.

* Delete as appropriate.

Are there procedures to ensure that the visual criteria specified in IEC 60748-23-2 are met?	***YES/NO*** *	***Document No.***	***Issue No.***
Are both electrical and visual checks carried out on each batch run:			
– by production?	YES/NO *	Document No.	Issue No.
– by inspection?	YES/NO *	Document No.	Issue No.
Is a stabilization bake and recheck carried out?	YES/NO *	Document No.	Issue No.
Is the software under controlled issue and storage?	YES/NO *	Document No.	Issue No.
Is there control on probe card/test-box and drawing revision status?	YES/NO *	Document No.	Issue No.
Are the probe cards periodically checked under calibration control?	YES/NO *	Document No.	Issue No.
Are the test boxes and equipment used for active trim periodically checked under calibration control?	YES/NO *	Document No.	Issue No.
Is the area isolated to avoid contamination in other areas?	YES/NO *		
Is there a maintenance procedure for the air/laser trimmers?	YES/NO *	Document No.	Issue No.
Is there evaluation and control on the power/time profile for each material type used?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

5.7 Inspection and test of processing

Are quality checks carried out on each printed layer?	YES/NO *	Document No.	Issue No.
Do they include:			
– wet thickness?	YES/NO *		
– dried thickness?	YES/NO *		
– fired thickness?	YES/NO *		
Are sample resistor value checks performed on each batch?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Are there procedures for checking:

a) solderability?	YES/NO *	Document No.	Issue No.
b) adhesion?	YES/NO *	Document No.	Issue No.
c) wire bondability?	YES/NO *	Document No.	Issue No.
Are process test vehicles used?	YES/NO *		
Are they subject to formal controls?	YES/NO *	Document No.	Issue No.
Are there procedures in the event of a process test vehicle failure?	YES/NO *	Document No.	Issue No.
Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

5.8 Rework

Are there formal procedures for controlling rework?	YES/NO *	Document No.	Issue No.
Definitive statements on what is/is not reworkable?	YES/NO *		
Visual criteria?	YES/NO *		
Traceability?	YES/NO *		
Number/area of permissible reworks per substrate?	YES/NO *		
Are rework limitations in accordance with 6.1.5 of IEC 60748-23-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

6 Thin film processing

The following subclauses contain:

6.1 Artwork and mask fabrication
6.2 Substrates
6.3 Substrate saw or scribe and break and substrate hole drilling
6.4 Thin film processing materials and pattern forming
6.5 Drying and stabilization
6.6 Resistor trimming
6.7 Rework

6.1 Artwork and mask fabrication

Is artwork prepared in-house?	YES/NO *	Document No.	Issue No.
Is mask manufacture in-house?	YES/NO *	Document No.	Issue No.
Are quality assurance checks carried out before use?	YES/NO *	Document No.	Issue No.
Is there evaluation of new mask materials?	YES/NO *	Document No.	Issue No.
Do masks have unique reference and revision control?	***YES/NO*** *	***Document No.***	***Issue No.***
Is mask storage:			
– catalogued?	YES/NO *	Document No.	Issue No.
– access/segregation controlled?	YES/NO *	Document No.	Issue No.
– in a controlled environment?	YES/NO *	Class	
		Limits: Min. Max.	period.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

6.2 Substrates

Substrates used:	Manufacturer	Types		
	Manufacturer	Types		
	Manufacturer	Types		
	Manufacturer	Types		
Incoming checks:	Dimensions	YES/NO *		
	Camber	YES/NO *		
	Bow	YES/NO *		
	Material	YES/NO *		
	Surface	YES/NO *	Document No.	Issue No.
Are substrates cleaned?		YES/NO *		
Chemical and method:				
Chemical purity checked?		YES/NO *		
Routine replacement?		YES/NO *		
Calibration?		YES/NO *		
Is substrate storage controlled between cleaning and use?		YES/NO *	Document No.	Issue No.
Are the basic layer thin films produced in-house?		YES/NO *		
Which method of thin film preparation is used:				
Sputtering		YES/NO *		
Vacuum deposition		YES/NO *		
Chemical deposition		YES/NO *		

List the equipment used:	Manufacturer	Types
	Manufacturer	Types
	Manufacturer	Types
	Manufacturer	Types
	Manufacturer	Types

* Delete as appropriate.

Are thickness measurements made:			
During processing?	YES/NO *	Document No.	Issue No.
After each film has been produced?	YES/NO *	Document No.	Issue No.
Are substrates cleaned?	YES/NO *		
Chemical and method:			
Chemical purity checked?	YES/NO *		
Routine replacement?	YES/NO *		
Calibration?	YES/NO *		
Is substrate storage controlled between cleaning and use?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

6.3 Substrate saw or scribe and break and substrate hole drilling

Enter all equipment used, or new/refurbished equipment since last report.

Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Are there unique references for substrate drawings?	YES/NO *	Document No.	Issue No.
Is the registration side of the substrate clearly identified?	YES/NO *		
Is this also the registration for the pattern marking?	YES/NO *		
Are there procedures covering power/speed?	YES/NO *	Document No.	Issue No.
Is there a maintenance procedure for the cutting equipment?	YES/NO *	Document No.	Issue No.
If substrates are procured pre-scribed or drilled, is there a detailed procurement specification?	YES/NO *	Document No.	Issue No.
Are quality assurance checks made on dimensions?	YES/NO *	Document No.	Issue No.
Are the substrates cleaned prior to returning to stores?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

6.4 Thin film processing materials and pattern forming

Where chemicals are prepared in house, state INTERNAL and for the type state control document number, also state composition as requested.

Photo-resist:	Manufacturer	Type No.	Composition.
Developer:	Manufacturer	Type No.	Composition.
Resist stripper:	Manufacturer	Type No.	Composition.
Electroplate solution:	Manufacturer	Type No.	Composition.

* Delete as appropriate.

Gold and palladium etchant:	Manufacturer	Type No.	Composition.
Titanium etchant:	Manufacturer	Type No.	Composition.
Ni-chrome etchant:	Manufacturer	Type No.	Composition.
Others:	Manufacturer	Type No.	Composition.
Others:	Manufacturer	Type No.	Composition.

Is lot traceability maintained for all processing materials?	YES/NO *	Document No.	Issue No.
Is age control and storage control within the processing material manufacturers' limits?	YES/NO *	Document No.	Issue No.
Is evaluation carried out on each batch of material?	YES/NO *	Document No.	Issue No.
Are adhesion tests carried out?	YES/NO *	Document No.	Issue No.

Mask aligners

List the equipment used:

Manufacturer	Types
Manufacturer	Types
Manufacturer	Types

Is there a procedure for the mask aligner maintenance and set-up?	YES/NO	Document No.	Issue No.
Is the substrate fabrication carried out in a controlled environment?	YES/NO	Class.	
Is there a procedure controlling mask cleaning?	YES/NO	Document No.	Issue No.
Are visual checks carried out after each stage of chemical processing?	YES/NO	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

6.5 Drying and stabilization

Drying:

Enter all ovens/belts used, or new/refurbished equipment since last report.

Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Are the profiles used in accordance with the material manufacturers' recommendations?	YES/NO *	Document No.	Issue No.
Are drying ovens/belts profiled at maximum load and usage?	YES/NO *	Document No.	Issue No.
At what periodicity are the drying ovens/belts profiled?			
Is a usage log with time/batch information kept per oven/belt?	YES/NO *	Document No.	Issue No.
Are there restrictions on multiple loading of ovens i.e. door opening during curing cycle?	YES/NO *	Document No.	Issue No.
Are machine controls protected against accidental movement?	YES/NO *		
Is there a maintenance procedure for the drying ovens/belts used?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

* Delete as appropriate.

6.6 Resistor trimming

Enter all air/laser trimmers, or new/refurbished equipment since last report.

Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Manufacturer	Type No.		Serial/Plant No.
Are there procedures to ensure that the visual criteria specified in IEC 60748-23-2 are met?	***YES/NO*** *	***Document No.***	***Issue No.***
Are both electrical and visual checks carried out on each batch run:			
by production?	YES/NO *	Document No.	Issue No.
by inspection?	YES/NO *	Document No.	Issue No.
Is a stabilization bake and recheck carried out?	YES/NO *	Document No.	Issue No.
Is the software under controlled issue and storage?	YES/NO *	Document No.	Issue No.
Is there control on probe card/test-box and drawing revision status?	YES/NO *	Document No.	Issue No.
Are the probe cards periodically checked under calibration control?	YES/NO *	Document No.	Issue No.
Are the test boxes and equipment used for active trim periodically checked under calibration control?	YES/NO *	Document No.	Issue No.
Is the area isolated to avoid contamination in other areas?	YES/NO *		
Is there a maintenance procedure for the air/laser trimmers?	YES/NO *	Document No.	Issue No.
Is there evaluation and control on the power/time profile for each materiel type used?	YES/NO *	Document No.	Issue No.
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

* Delete as appropriate.

6.7 Rework

Are there formal procedures for controlling rework?	YES/NO *	Document No. Document No.	Issue No. Issue No.
Do they include:			
Definitive statement on what is/is not reworkable?	YES/NO *		
Visual criteria?	YES/NO *		
Traceability?	YES/NO *		
Number/area of permissible reworks per substrate?	YES/NO *		
Are rework limitations in accordance with 6.1.5 of IEC 60748-23-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

7 Hybrid assembly

The following subclauses contain:

7.1 Solder assembly
7.1.1 Kitting
7.1.2 Cleaning
7.1.3 Component placement
7.1.4 Substrate attach
7.1.5 Soldering
7.1.6 Encapsulation
7.1.7 Rework
7.1.8 Marking
7.2 Chip and wire assembly
7.2.1 Kitting
7.2.2 Cleaning
7.2.3 Component placement
7.2.4 Substrate attach
7.2.5 Wire-bonding
7.2.6 Package seal
7.2.7 Rework
7.2.8 Marking

7.1 Solder assembly

7.1.1 Kitting

Is traceability maintained to incoming inspection lots?	***YES/NO ****	***Document No.***	***Issue No.***
Is drawing and substrate revision status recorded?	YES/NO *	Document No.	Issue No.
Is there a procedure to ensure that any surplus parts are returned to the bonded stores?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Do Electrostatically Sensitive Device (ESD) precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

7.1.2 Cleaning

List the equipment used:

Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.

What are the controlling documents?

Method	Document No.	Issue No.
Method	Document No.	Issue No.
Method	Document No.	Issue No.

Are all cleaning stages identified within the manufacturing sequence?	YES/NO *

* Delete as appropriate.

Are there controls for:

Chemical contamination?	YES/NO *	Document No.	Issue No.
Time/frequency (ultrasonic)?	YES/NO *	Document No.	Issue No.
Power/time/gas (plasma)?	YES/NO *	Document No.	Issue No.
Calibration?	YES/NO *	Document No.	Issue No.
Prevention of accidental adjustment?	YES/NO *		
Is there a maintenance procedure for the cleaning equipment?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.1.3 Component placement

List the main items of equipment used:

Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.

* Delete as appropriate.

Are substrates printed with solder paste?	YES/NO *	Document No.	Issue No.
Do screens have unique reference and revision control?	YES/NO *	Document No.	Issue No.
Is the number of prints/or wear allowed per screen monitored and recorded?	YES/NO *	Document No.	Issue No.
Is a usage log kept per machine?	YES/NO *	Document No.	Issue No.
Are there procedures for restricting adjustments by the operator?	YES/NO *	Document No.	Issue No.
Is lot traceability maintained on solder paste used?	YES/NO *	Document No.	Issue No.
Are thickness measurements carried out?	YES/NO *	Document No.	Issue No.
Are components tinned prior to placement?	YES/NO *		
Are there controls for:			
Time/temperature?	YES/NO *	Document No.	Issue No.
Calibration?	YES/NO *	Document No.	Issue No.
Contamination?	YES/NO *	Document No.	Issue No.
Prevention of accidental adjustment?	YES/NO *		
Is automatic pick and place employed and are parameters defined (collet, vacuum, pressure, etc.)?	YES/NO *	Document No.	Issue No.
Are pick and place machines regularly maintained?	YES/NO *	Document No.	Issue No.
Does this include vacuum pick-up nozzles?	YES/NO *		
Is software revision controlled?	YES/NO *		
Is there a quality assurance check on component orientation?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

* Delete as appropriate.

7.1.4 Substrate attach

Are substrates attached to hardware (e.g. heatsinks) with epoxy preforms?	YES/NO *		
Are there controls for:			
Lot traceability?	YES/NO *	Document No.	Issue No.
Cure temperature/time?	YES/NO *	Document No.	Issue No.
Are temperature settings protected from accidental adjustment?	YES/NO *		
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Are substrates soldered into packages?	YES/NO *		
Are there controls for:			
Lot traceability?	YES/NO *	Document No.	Issue No.
Reflow time/temperature?	YES/NO *	Document No.	Issue No.
Are temperature settings protected from accidental adjustment?	YES/NO *		
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
If flux is used, is cleaning performed in segregated cleaner?	YES/NO *	Document No.	Issue No.
Are products not actively being worked on stored under dry conditions?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are visual inspections performed to IEC 60748-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No***	***Issue No.***

* Delete as appropriate.

7.1.5 Soldering

List equipment and type used:

Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.

List solders used:

Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use
Manufacturer	Type No.	Composition	Use

Are there controls for the following:

Materials?	YES/NO *	Document No.	Issue No.
Contamination?	YES/NO *	Document No.	Issue No.
Temperature/time?	YES/NO *	Document No.	Issue No.
Stress evaluation?	YES/NO *	Document No.	Issue No.
Component limitations?	YES/NO *	Document No.	Issue No.
Is a usage log kept per equipment?	YES/NO *	Document No.	Issue No.
Prevention of accidental adjustment?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.1.6 Encapsulation

List encapsulation equipment:

Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.

* Delete as appropriate.

Manufacturer	Type		Serial/Plant No.
List encapsulants used:			
Manufacturer	Type No.		Use.
Manufacturer	Type No.		Use.
Manufacturer	Type No.		Use.
Manufacturer	Type No.		Use.
Are there controls for lot traceability?	YES/NO *	Document No.	Issue No.
Are there controls for storage?	YES/NO *	Document No.	Issue No.
Do they include:			
Temperature range?	YES/NO *		
Expiration date?	YES/NO *		
Freezing limitations?	YES/NO *		
Do you mix encapsulants?	YES/NO *	Document No.	Issue No.
Does this include a new expiration date?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are visual inspections performed in accordance with IEC 60784-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.1.7 Rework

List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Are there procedures for controlling rework?	YES/NO *	Document No. Document No.	Issue No. Issue No.

* Delete as appropriate.

Do they include:

Definitive statement on what is/is not reworkable?	YES/NO *		
Visual criteria?	YES/NO *		
Traceability?	YES/NO *		
Number/area of permissible reworks per substrate?	YES/NO *		
Restriction of heat to localized areas?	YES/NO *		
Are rework limitations in accordance with 6.1.5 of IEC 60748-23-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.1.8 Marking

List equipment used:

Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Are there controls for the materials used?	YES/NO *	Document No.	Issue No.

Do they include:

Storage conditions?	YES/NO *		
Expiration date?	YES/NO *		
Cure temperature/time?	YES/NO *		
Are resistance to solvents evaluations performed?	YES/NO *	Document No.	Issue No.
Do screens have unique reference and revision control?	YES/NO *	Document No.	Issue No.
Is the number of prints/wear allowed per screen monitored and recorded?	YES/NO *	Document No.	Issue No.
Is a usage log kept per machine?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Is laser marking employed?	YES/NO *		
Is software revision controlled?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.2 Chip and wire assembly

7.2.1 Kitting

Is traceability maintained to incoming Inspection lots?	***YES/NO*** *	***Document No.***	***Issue No.***
Is drawing and substrate revision status recorded?	YES/NO *	Document No.	Issue No.
Is there a procedure to ensure that any surplus parts are returned to the bonded stores?	YES/NO *	Document No.	Issue No.
Are there procedures for handling bare dies?	YES/NO *	Document No.	Issue No.
Do they include:			
Opening of waffle packs?	YES/NO *		
Protection from human contamination?	YES/NO *		
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.2.2 Cleaning

List the equipment used:

Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.

* Delete as appropriate.

What are the controlling documents?

Method	Document No.		Issue No.
Method	Document No.		Issue No.
Method	Document No.		Issue No.
Are all cleaning stages identified within the manufacturing sequence?	YES/NO *		
Are there controls for:			
Chemical contamination?	YES/NO *	Document No.	Issue No.
Time/frequency (ultrasonic)?	YES/NO *	Document No.	Issue No.
Precludes bonded devices?	YES/NO *	Document No.	Issue No.
Power/time/gas (plasma)?	YES/NO *	Document No.	Issue No.
Calibration?	YES/NO *	Document No.	Issue No.
Are equipment controls protected from accidental adjustment?	YES/NO *		
Is there a maintenance procedure for the cleaning equipment?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO*** *	***Document No.***	***Issue No.***

7.2.3 Component placement

List the main items of equipment used:

Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.

* Delete as appropriate.

Manufacturer	Type		Serial/Plant No.
Are components epoxy attached?	YES/NO *		
List epoxies used:			
Type No.	Conductive/Non conductive *		
Type No.	Conductive/Non conductive *		
Type No.	Conductive/Non conductive *		
Type No.	Conductive/Non conductive *		
Is epoxy screen printed?	YES/NO *	Document No.	Issue No.
Do screens have unique reference and revision control?	YES/NO *	Document No.	Issue No.
Is the number of prints or wear allowed per screen monitored and recorded?	YES/NO *	Document No.	Issue No.
Is a usage log kept per machine?	YES/NO *	Document No.	Issue No.
Are there restrictions on adjustments by the operator?	YES/NO *	Document No.	Issue No.
Is lot traceability maintained on epoxy used?	YES/NO *	Document No.	Issue No.
Are thickness measurements carried out?	YES/NO *	Document No.	Issue No.
Is epoxy dispensed on to substrate?	YES/NO *	Document No.	Issue No.
Are there clear guidelines for pattern/quantity per component type?	YES/NO *		
Are there controls for the storage/use of epoxy?	YES/NO *	Document No.	Issue No.
Do they include:			
Temperature range?	YES/NO *		
Expiration date?	YES/NO *		
Freezing limitations?	YES/NO *		
Do you mix epoxy?	YES/NO *	Document No.	Issue No.
New expiration date?	YES/NO *		
Cure time/temperature within manufacturer's recommendations?	YES/NO *	Document No.	Issue No.
Are settings protected from accidental adjustment?	YES/NO *		

* Delete

Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is a die shear test performed?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Is automatic pick and place employed and are parameters defined (collet, vacuum, pressure, etc.)?	YES/NO *	Document No.	Issue No.
Are pick and place machines regularly maintained?	YES/NO *	Document No.	Issue No.
Does this include vacuum pick-up nozzles?	YES/NO *		
Is software revision controlled?	YES/NO *		
Are components eutectically attached?	YES/NO *		
Are there controls for:			
Gas flow/temperature scrub time?	YES/NO *	Document No.	Issue No.
Collet selection?	YES/NO *	Document No.	Issue No.
Are settings protected from accidental adjustment?	YES/NO *		
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is a die shear test performed?	YES/NO *	Document No.	Issue No.
Are components solder attached?	YES/NO *		
Are there controls for:			
Solder preforms?	YES/NO *	Document No.	Issue No.
Reflow temperature/time?	YES/NO *	Document No.	Issue No.
Are settings protected from accidental adjustment?	YES/NO *		
Are furnaces profiled at max load and usage?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

At what periodicity are the furnaces profiled?

Is a usage log kept per furnace?	YES/NO *	Document No.	Issue No.
Are air flow/zone settings checked prior to furnace loading?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is a die shear test performed?	YES/NO *	Document No.	Issue No.
If flux is used, is cleaning performed in a segregated cleaner?	YES/NO *	Document No.	Issue No.

Notes

7.2.4 Substrate attach

Are substrates attached with epoxy preforms?	YES/NO *		
Are there controls for:			
Lot traceability?	YES/NO *	Document No.	Issue No.
Cure temperature/time?	YES/NO *	Document No.	Issue No.
Are temperature settings protected from accidental adjustment?	YES/NO *		
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Are substrates soldered into packages?	YES/NO *		
Are there controls for:			
Lot traceability?	YES/NO *	Document No.	Issue No.
Reflow time/temperature?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Are temperature settings protected from accidental adjustment?	YES/NO *		
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
If flux is used, is cleaning performed in a segregated cleaner?	YES/NO *	Document No.	Issue No.
Are products not actively being worked on stored under dry conditions?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are visual inspections performed in accordance to IEC 60748-23-2?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No.***

7.2.5 Wire-bonding

Procedures for bonding:

Ultrasonic?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Thermosonic?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.

Thermocompression?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Is a destructive bond pull test carried out, before operating the bonder following change of wire, of shift, etc?	YES/NO *	Document No.	Issue No.
Number and position of bonds to be tested specified?	YES/NO *	Document No.	Issue No.
Are ageing tests carried out?	YES/NO *	Document No.	Issue No.
Is the bonding wire traceable per batch?	YES/NO *	Document No.	Issue No.
Is software revision controlled?	YES/NO *	Document No.	Issue No.
Is bond and preheat stage temperature verified?	YES/NO *	Document No.	Issue No.
Is the order of bonding specified (ESD)?	YES/NO *	Document No.	Issue No.
Are bonding parameters controlled and recorded?	YES/NO *	Document No.	Issue No.
Is a usage log kept per machine?	YES/NO *	Document No.	Issue No.
Are there procedures and parameter limitations for adjustments by the operator?	YES/NO *	Document No.	Issue No.
Is wire evaluation performed?	YES/NO *	Document No.	Issue No.
Are devices protected from human contamination?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***

* Delete as appropriate.

Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No.***

7.2.6 Package seal

List equipment used:

Manufacturer		Type	Serial/Plant No.
Manufacturer		Type	Serial/Plant No.
Manufacturer		Type	Serial/Plant No.
Manufacturer		Type	Serial/Plant No.
Is package seal carried out under control?	YES/NO *	Document No.	Issue No.
Is a pre-seal vacuum bake performed?	YES/NO *	Document No.	Issue No.
Time, vacuum and temperature specified and calibrated?	YES/NO *		
Procedure in the event of an interruption?	YES/NO *		
Is the sealing atmosphere controlled?	YES/NO *	Document No.	Issue No.
Does this include dew point monitoring?	YES/NO *		
If seam weld, are package nests identified for each package type?	YES/NO *	Document No.	Issue No.
Is software / firmware revision controlled?	YES/NO *	Document No.	Issue No.
Are there procedures for speed/power control per package?	YES/NO *	Document No.	Issue No.
Are there defined limits for adjustment by the operator?	YES/NO *	Document No.	Issue No.
Is there a procedure for reseal?	YES/NO *	Document No.	Issue No.
Does this procedure include minimum spacing of:			
– components to lid?	YES/NO *		
– lid to glass bead?	YES/NO *		

* Delete as appropriate.

If solder seal, are there controls for:

Solder material/preform?	YES/NO *	Document No.	Issue No.
Reflow temperature/time?	YES/NO *	Document No.	Issue No.
Are controls protected from accidental adjustment?	YES/NO *	Document No.	Issue No.
Are furnaces profiled at max load and usage?	YES/NO *	Document No.	Issue No.
At what periodicity are the furnaces profiled?			
Is a usage log kept per furnace?	YES/NO *	Document No.	Issue No.
Are air flow / zone settings checked prior to furnace loading?	YES/NO *	Document No.	Issue No.
Are set-up checks performed on first off devices?	YES/NO *	Document No.	Issue No.
Is there a quality assurance check?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

7.2.7 Rework

List main equipment used:

Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.
Manufacturer	Type	Serial/Plant No.

Are there procedures for controlling rework?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Do they include:

Definitive statement on what is/is not reworkable?	YES/NO *		
Visual criteria?	YES/NO *		
Traceability?	YES/NO *		
Number/area of permissible reworks reworks per substrate?	YES/NO *		
Restriction of heat to localized areas?	YES/NO *		
Are rework limitations in accordance with 6.1.5 of IEC 60748-23-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are visual inspections performed in accordance with IEC 60748-23-2?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No***

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7.2.8 Marking

List equipment used:

Manufacturer	Type		Serial/Plant No
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Are there controls for the materials used?	YES/NO *	Document No.	Issue No.

Do they include:

Storage conditions?	YES/NO *		
Expiration date?	YES/NO *		
Cure temperature/time?	YES/NO *		
Are resistance to solvents evaluations performed?	YES/NO *	Document No.	Issue No.
Do screens have unique reference and revision control?	YES/NO *	Document No.	Issue No.
Is the number of prints/wear allowed per screen monitored and recorded?	YES/NO *	Document No.	Issue No.
Is a usage log kept per machine?	YES/NO *	Document No.	Issue No.

* Delete as appropriate.

Is laser marking employed?	YES/NO *		
Is software revision controlled?	YES/NO *	Document No.	Issue No.
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures, equipment and visual standards?	***YES/NO ****	***Document No.***	***Issue No.***

* Delete as appropriate.

8 Test and dispatch

The following subclauses contain:

8.1 Electrical tests
8.2 Burn-in
8.3 Endurance
8.4 Dry heat (stabilization bake)
8.5 Change of temperature
8.6 Damp heat testing
8.7 Particle impact noise detection
8.8 Fine leak test
8.9 Gross leak test
8.10 Resistance to soldering heat
8.11 Termination robustness
8.12 Acceleration
8.13 Vibration
8.14 Shock
8.15 Dimensions
8.16 Bond-pull testing
8.17 Salt mist
8.18 Flammability
8.19 Solderability
8.20 Resistance to solvents
8.21 Internal visual inspection
8.22 External visual inspection
8.23 Radiographic inspection
8.24 Acceptance to dispatch

8.1 Electrical tests

Are electrical tests carried out under control?	YES/NO *	Document No.	Issue No.
List the main pieces of equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Review of tested parameters to ensure compliance with the customer detail specification?	YES/NO *		
Test fixtures have unique reference and revision level?	YES/NO *		
Use of suitable, calibrated test equipment?	YES/NO *		
Detailed test procedure including set-up verification for each product type?	YES/NO *		
Review and verification of measurement uncertainties?	YES/NO *		
Including fixtures?	YES/NO *		
Verification of test revision, software revision, etc?	YES/NO *		

* Delete as appropriate.

Use, where possible, of a known "good" verification device?	YES/NO *		
Recording of equipment and fixtures used, times, temperatures, revisions, method, etc. per batch?	YES/NO *		
Clear indication and recording of sample sizes, percent defects allowed (PDA) tolerances, etc?	YES/NO *		
Sequence of testing is specified and followed?	YES/NO *		
Verification of temperature testing i.e. adequate dwell time, T_{case} or T_{amb} devices measurement point, etc.?	YES/NO *		
Formal procedure for device or set-up verification failure?	YES/NO *		
No rework carried out at test station?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO **	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO **	***Document No.***	***Issue No.***

8.2 Burn-in

Is the burn-in carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Oven profiled per specification?	YES/NO *	Frequency?	
Worse case load evaluation and loading requirements?	YES/NO *		
Calibrated indication of time, temperature and environment?	YES/NO *		
Time does not start until part reaches temperature?	YES/NO *		

* Delete as appropriate.

Burn-in boards/fixtures have unique reference and revision level?	YES/NO *		
Monitoring of all fixtures for continuity supply signals, etc?	YES/NO *	Frequency?	
Specified bias procedure including purge and auto shut down/power up?	YES/NO *		
Procedure in the event of test interruption?	YES/NO *		
Precautions such that for t_{amb} devices, fixtures do not provide heat removal?	YES/NO *		
Testing carried out at max rated operating temperature?	YES/NO *		
Correct ratio of pre-seal to post-seal testing times specified?	YES/NO *		
Pre-seal burn-in carried out in the correct environment?	YES/NO *		
Additional time to be added in event of test interruption specified?	YES/NO *		
Bias removal and recovery conditions are specified and followed?	YES/NO *		
Recording of equipment and fixtures used, times, temperatures, method, etc. per batch?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	YES/NO *	Document No	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

* Delete as appropriate.

8.3 Endurance

Is the endurance carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Oven profiled per specification?	YES/NO *	Frequency?	
Worst case load evaluation and loading requirements?	YES/NO *		
Calibrated indication of time and temperature?	YES/NO *		
Time starts when part reaches temperature?	YES/NO *		
Endurance boards/fixtures have unique reference and revision level?	YES/NO *		
Monitoring of all fixtures for continuity of supply and signals?	YES/NO *	Frequency?	
Specified bias procedure including auto shut down/power up?	YES/NO *		
Procedure in the event of test interruption?	YES/NO *		
Precautions such that for t_{amb} devices, the fixtures do not provide heat removal?	YES/NO *		
Testing carried out at max rated operating temperature?	YES/NO *		
Additional time to be added in event of test interruption specified?	YES/NO *		
Bias removal and recovery conditions are specified and followed?	YES/NO *		
Recording of equipment and fixtures used, times, temperatures, method, etc. per batch?	YES/NO *		

* Delete as appropriate.

Are their formal procedures in the event of an endurance test failure?	***YES/NO ****	***Document No.***	***Issue No.***
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

8.4 Dry heat (stabilization bake)

Is the stabilization bake carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Oven profiled per specification?	YES/NO *	Frequency?	
Worse case load evaluation and loading requirements?	YES/NO *		
Calibrated indication of time and temperature?	YES/NO *		
Time does not start until part reaches temperature?	YES/NO *		
Recovery time is specified and recorded?	YES/NO *		

* Delete as appropriate.

Recording of equipment used, times, temperatures, method, etc. per batch?	YES/NO *		
Procedure in the event of test interruption?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.5 Change of temperature

Is change of temperature carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Oven profiled per specification?	YES/NO *	Frequency?	
Worse case load evaluation and loading requirements?	YES/NO *		
Maximum dwell time before part reaches temperature?	YES/NO *		
Maximum transfer time if applicable?	YES/NO *		
Recording of equipment used, times, temperatures, method, etc. per batch?	YES/NO *		
Procedure in the event of test interruption?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

* Delete as appropriate.

8.6 Damp heat testing

Is damp heat testing carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Chambers profiled under calibration control, and within specified tolerances?	YES/NO *	Frequency?	
Worse case load evaluation and loading requirements?	YES/NO *		
Condensed water is not re-used unless purified?	YES/NO *		
Water resistivity within specified limits (if applicable)?	YES/NO *		
Procedures regarding pre-heating to avoid condensation?	YES/NO *		
Precautions to prevent surface moisture (if applicable)?	YES/NO *		
Testing starts when all conditions have stabilized? (i.e. temperature, humidity, etc.)	YES/NO *		
Continuous monitoring of temperature, humidity, bias, etc within chamber?	YES/NO *		
Recording of equipment used, times, temperatures, humidity, bias, method, etc. per batch?	YES/NO *		
Procedure in the event of test interruption?	YES/NO *		
Recovery conditions, including continuing bias (if applicable), are as specified?	YES/NO *		
Post tests are carried out within specified time?	YES/NO *		

* Delete as appropriate.

Power effects quantified if bias used. Intermittent testing carried out if power below specified cannot be achieved?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

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8.7 Particle impact noise detection

Is particle impact noise detection carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
In-process calibration check?	YES/NO *		
Unit free from extraneous noise?	YES/NO *		
Procedure for stimulus set-up?	YES/NO *		
Clear criteria for failure?	YES/NO *		
No retest of failed devices?	YES/NO *		
Sensitivity test unit (STU) under calibration control?	YES/NO *		
Clear controls over PDA requirements?	YES/NO *		
Machine, test conditions and fixtures recorded per batch?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

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* Delete as appropriate.

8.8 Fine leak test

Is fine leak testing carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Cleaning and drying of parts before leak testing?	YES/NO *		
Evaluation of highest possible pressure per package type?	YES/NO *		
Leak rates identified as either helium or air equivalent?	YES/NO *		
Helium 95 % purity minimum?	YES/NO *		
Calibrated verification of pressure, time and leak rate?	YES/NO *	Frequency?	
Time does not start until part reaches pressure?	YES/NO *		
Alternative procedure when immersion pressure <200 kPa?	YES/NO *		
Recovery <30 min or effect taken into account?	YES/NO *		
Clear information for operator regarding maximum pressure/volume/leak rate per package type?	YES/NO *		
Fine leak test carried out before gross leak?	YES/NO *		
Original atmosphere taken into account or purged?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

* Delete as appropriate.

8.9 Gross leak test

Is gross leak testing carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Evaluation of an adequate overlap between fine and gross tests?	YES/NO *		
Temperature of liquid 125 °C $^{+5}_{0}$ °C, unless otherwise specified?	YES/NO *		
Immersion depth at least 10 mm?	YES/NO *		
Time does not start until part reaches pressure?	YES/NO *		
All seals tested in uppermost position?	YES/NO *		
Adequate lighting and at least 3× magnification provided. Or auto detection used?	YES/NO *		
Immersion time >10 min?	YES/NO *		
Clear information for operator regarding immersion orientation/temperature/pass fail criteria per package type?	YES/NO *		
Specimens between 15 °C and 25 °C before test?	YES/NO *		
Calibrated verification of temperature and time?	YES/NO *	Frequency?	
Volume of liquid >10× that of specimen?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

* Delete as appropriate.

8.10 Resistance to soldering heat

Is resistance to solder heat carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Use of calibrated equipment for time, temperature?	YES/NO *		
Solder bath > 40 mm depth and 300 ml volume?	YES/NO *		
Correct immersion rate, depth and duration?	YES/NO *		
Correct flux is specified?	YES/NO *		
Machine, test conditions and fixtures recorded per batch?	YES/NO *		
Method 1A with immersion of 10 s or method 1B of test Tb of IEC 60068-2-20 used?	YES/NO *		
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.11 Termination robustness

Is termination robustness carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Correct method used for package type?	YES/NO *		
Use of calibrated equipment for time, force, angle?	YES/NO *		
All terminations on at least three devices assessed?	YES/NO *		
Clear guidance as to force, weight, etc. to use per package type?	YES/NO *		

* Delete as appropriate.

Devices are correctly pre-conditioned to specification?	YES/NO *		
Machine, test conditions and fixtures recorded per batch?	YES/NO *		
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.12 Acceleration

Is acceleration carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Method of restraining the package?	YES/NO *		
Use of calibrated equipment?	YES/NO *		
Diameter measured to substrate plane?	YES/NO *		
Specified acceleration carried out for minimum of 1 min?	YES/NO *		
Machine, test conditions and fixtures recorded per batch?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.13 Vibration

Is vibration carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Method of restraining in accordance with specification?	YES/NO *		
Use of calibrated equipment?	YES/NO *		

* Delete as appropriate.

Machine, test conditions and fixtures recorded per batch?	YES/NO *		
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

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8.14 Shock

Is shock carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Evaluation of waveform?	YES/NO *	Frequency?	
Method of mounting to prevent movement of body/leads?	YES/NO *		
Accelerometer position to assess stress on part?	YES/NO *		
Calibration of equipment?	YES/NO *		
Machine, test conditions and fixtures recorded per batch?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.15 Dimensions

Are dimensions measured under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.

* Delete as appropriate.

Do the controls include:

Equipment specified per measurement?	YES/NO *		
Calibration of equipment?	YES/NO *		
Measurements to be made under revision control?	YES/NO *		
Equipment, revision and results recorded per batch?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.16 Bond-pull testing

Are the bond-pull measurements carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Certified equipment accuracy: ± 2,5 mN for 0 mN to 100 mN; or ± 5 mN for 100 mN to 500 mN?	YES/NO *		
Suitable hook profile which does not damage wire being pulled?	YES/NO *		
Correct centre of wire located and pulled within 5° of parallel?	YES/NO *		
Correct rate and maximum load of pull set?	YES/NO *		
Failure categories specified and recorded?	YES/NO *		
Absolute and action limits set and evaluated?	YES/NO *		
Equipment, revision and results recorded per batch?	YES/NO *		
If test coupon used, required to be bonded on same material/equipment as production part?	YES/NO *		

* Delete as appropriate.

Adequate lighting and at least 10× magnification provided?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.17 Salt mist

Is the salt mist test carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Equipment material is not effected by the salt solution?	YES/NO *		
Salt used within purity rating and certified?	YES/NO *		
Concentration and pH value of solution within the required limits?	YES/NO *		
Specimens mounted so that results are not influenced?	YES/NO *		
Correct humidity, temperature and flow maintained and monitored?	YES/NO *		
Equipment, revision and results recorded per batch?	YES/NO *		
Pre-evaluation of chamber for chambers not used continuously?	YES/NO *		
Recovery conditions are as specified in the specification?	YES/NO *		
Adequate lighting and at least 10× magnification provided?	YES/NO *		
Clear information for operators on pass/fail criteria?	YES/NO *		
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

* Delete as appropriate.

8.18 Flammability

Is flammability carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Is the flame duration in accordance with the detail specification for each device type?	YES/NO *		
Do the controls ensure that the requirements of IEC 60695-2-2 are met?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

8.19 Solderability

Is solderability carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.

* Delete as appropriate.

Do the controls include:

Parts have undergone normal processing and any ageing called up in the detail specification?	YES/NO *
Calibration of equipment?	YES/NO *
No additional cleaning of parts prior to test?	YES/NO *
Solder bath >40 mm depth and 300 ml volume?	YES/NO *
Clear pass/fail criteria available to operator?	YES/NO *
Correct type of flux and solder available and certified?	YES/NO *
Method 1:	
235 °C ± 5 °C?	YES/NO *
Immersion 25 mm/s ± 2,5 mm/s?	YES/NO *
Immersed for 2 s ± 0,5 s?	YES/NO *
Method 2:	
Correct tip size?	YES/NO *
350 °C ± 10 °C initial?	YES/NO *
Tip applied for 2 s $^{+1}_{0}$ s?	YES/NO *
Method 3:	
235 °C ± 2 °C (iron pin)?	YES/NO *
260 °C ± 5 °C (bath)?	YES/NO *
Correct pellet weight used?	YES/NO *
Immersion 5 mm/s ± 2 mm/s?	YES/NO *
Immersed for 5 s ± 0,5 s?	YES/NO *
Test carried out twice?	YES/NO *
Adequate lighting and at least 4× to 10× magnification provided?	YES/NO *
Method and conditions clearly shown per part and recorded?	YES/NO *

* Delete as appropriate.

Do ESD precautions conform with IEC 61340-5-1 (if applicable)?	***YES/NO*** *	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO****	***Document No.***	***Issue No.***

Notes

8.20 Resistance to solvents

Is solvent testing carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Fluid used in accordance with the detail specification and certified?	YES/NO *		
Calibrated equipment for time and temperature?	YES/NO *		
Immersion time specified if less than 2 h?	YES/NO *		
Cotton wool used as a rubbing medium if a rubbing is test employed?	YES/NO *		
Clear pass/fail criteria available to operator?	YES/NO *		

* Delete as appropriate.

Do ESD precautions conform with IEC 61340-5-1 (if applicable)?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

Notes

8.21 Internal visual inspection

Is internal visual examination carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Adequate lighting and inspection equipment with the correct magnification?	YES/NO *		
No rework carried out at inspection station?	YES/NO *		
Correct class of environment provided?	YES/NO *	class.	
Review of rework limitations and batch card carried out?	YES/NO *		
Drawing/part revision checked and recorded?	YES/NO *		
Clear pass/fail criteria available to operator?	YES/NO *		
Internal inspection is last operation before sealing?	YES/NO *		

* Delete as appropriate.

Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.22 External visual inspection

Is external visual examination carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Adequate lighting and suitable inspection equipment provided?	YES/NO *		
Rework restrictions (lead straightening, etc.)?	YES/NO *		
100 % inspection if sample failure?	YES/NO *		
Drawing/part revision checked and recorded?	YES/NO *		
Clear pass/fail criteria available to operator?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.23 Radiographic inspection

Is radiographic inspection carried out under control?	YES/NO *	Document No.	Issue No.
List equipment used:			
Manufacturer	Type		Serial/Plant No.
Manufacturer	Type		Serial/Plant No.

* Delete as appropriate.

Manufacturer	Type		Serial/Plant No.
Do the controls include:			
Compliance with clause 20 of IEC 60748-23-2?	***YES/NO ****		
Compliance with 7.5.19 of IEC 60748-23-1	***YES/NO ****		
Drawing/part revision checked and recorded?	YES/NO *		
Clear pass/fail criteria available to operator?	YES/NO *		
Do ESD precautions conform with IEC 61340-5-1?	***YES/NO ****	***Document No.***	***Issue No.***
Are the appropriate staff formally trained on procedures and equipment?	***YES/NO ****	***Document No.***	***Issue No.***

8.24 Acceptance to dispatch

Are there procedures controlling acceptance to dispatch?	YES/NO *	Document No.	Issue No.
Do these procedure include:			
Drawing/part/specification revisions checked for correct issues?	YES/NO *		
Batch cards complete, routing sequence checked?	YES/NO *		
PDA calculations (if applicable) correct?	YES/NO *		
Review of rework, within defined limits and customer requirements?	YES/NO *		
Were capability indices for all specified processes within defined limits? (if applicable)	YES/NO *		
Required quantity of parts pass/fail checked through process flow?	YES/NO *		
Traceability of materials and equipment complete?	YES/NO *		
Certificate of conformity meets system requirements?	YES/NO *		

_____

* Delete as appropriate.

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The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

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Switzerland

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Fax to: **IEC**/CSC at +41 22 919 03 00

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A Prioritaire

RÉPONSE PAYÉE

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Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

.....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

purchasing agent ❑
librarian ❑
researcher ❑
design engineer ❑
safety engineer ❑
testing engineer ❑
marketing specialist ❑
other.....

Q3 I work for/in/as a: *(tick all that apply)*

manufacturing ❑
consultant ❑
government ❑
test/certification facility ❑
public utility ❑
education ❑
military ❑
other.....

Q4 This standard will be used for: *(tick all that apply)*

general reference ❑
product research ❑
product design/development ❑
specifications ❑
tenders ❑
quality assessment ❑
certification ❑
technical documentation ❑
thesis ❑
manufacturing ❑
other.....

Q5 This standard meets my needs: *(tick one)*

not at all ❑
nearly ❑
fairly well ❑
exactly ❑

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date ❑
standard is incomplete ❑
standard is too academic ❑
standard is too superficial ❑
title is misleading ❑
I made the wrong choice ❑
other .....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

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