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British Standard

Harmonized system of quality assessment for electronic components. Semiconductor devices

Part 0. Generic specification

[IEC title. Semiconductor devices

Part 10: Generic specification for discrete devices and integrated circuits]

Système harmonisé d'assurance de la qualité des composants électroniques
Dispositifs à semiconducteurs
Partie 0. Spécification générique

Harmonisiertes Gütebestätigungssystem für Bauelemente der Elektronik
Halbleiterbauelemente
Teil 0. Fachgrundspezifikation

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National foreword

This Part of BS 9970 has been prepared under the direction of the Electronic Components Standards Committee. It is identical with IEC Publication 747-10 [QC 700000] 'Semiconductor devices. Part 10: Generic specification for discrete devices and integrated circuits', published in 1984 by the International Electrotechnical Commission (IEC).

This standard is a harmonized specification within the IECQ system of quality assessment for electronic components.

Terminology and conventions. The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Cross-references. The British Standard harmonized with QC 001001 and QC 001002 is BS 9000 'General requirements for a system for electronic components of assessed quality' Part 1 : 1981 'Specification for basic rules and procedures'.

International standards	Corresponding British Standards
ISO 1000-1981	BS 5555 : 1981 Specification for SI units and recommendations for the use of their multiples and of certain other units (Identical)
ISO 2015-1976	BS 4760 : 1971 Numbering of weeks (Technically equivalent)
ISO 2859-1974	BS 6000 : 1972 Guide to the use of BS 6001. Sampling procedures and tables for inspection by attributes (Technically equivalent)
IEC 68	BS 2011 Basic environmental testing procedures
IEC 68-1 : 1982	BS 2011 : Part 1.1 : 1983 General and guidance (Identical)
IEC 68-2	BS 2011 : Part 2.1 Tests
IEC 410-1973	BS 6001 : 1972 Sampling procedures and tables for inspection by attributes (Technically equivalent)

The IEC 147 and 148 series of publications are being superseded by the parts of the technically equivalent IEC 747, 748 and 749 series, which are classified by component type and which are being implemented in the BS 6493 series.

There are no corresponding British Standards for IEC 27, IEC 50 and IEC 191. Certain parts of IEC 27 are technically equivalent to BS 5775 'Specification for quantities, units and symbols' and certain parts of IEC 50 are technically equivalent to BS 4727 'Glossary of electrotechnical, power, telecommunication, electronics, lighting and colour terms'. BS 3934 'Dimensions of semiconductor devices' is a related standard to IEC 191.

The Technical Committee has reviewed the provisions of IEC 617, for which there is no corresponding British Standard, and has decided that they are acceptable for use in conjunction with this standard.

NOTE. In line 5 of the note to 3.9, for 'that' read 'than'. The IEC Secretariat has been advised of this error.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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British Standard

Harmonized system of quality assessment for electronic components. Semiconductor devices

Part 0. Generic specification

1. Scope

This publication forms part of the IEC Quality Assessment System for Electronic Components (IECQ).

This publication is a generic specification for semiconductor devices: discrete devices and integrated circuits, including multichip integrated circuits, but excluding optoelectronic devices and hybrid circuits.

It defines general procedures for quality assessment to be used in the IECQ System and gives general rules for:

- measuring methods of electrical characteristics;
- climatic and mechanical tests;
- endurance tests.

Note. — This publication must be supplemented by the approved sectional, family and blank detail specifications, where they exist, appropriate to the specific individual type or types.

2. General

2.1 Order of precedence

Where there are conflicting requirements, documents shall rank in the following order of authority:

- 1) the detail specification;
- 2) the family specification, if any;
- 3) the blank detail specification;
- 4) the sectional specification;
- 5) the generic specification;
- 6) the basic specification;
- 7) the IECQ Rules of Procedure;
- 8) any other international (e.g. IEC) document to which reference is made;
- 9) a national document.

The same order of precedence shall apply to equivalent national documents.

2.2 Related documents

The detail specification shall indicate the applicable documents:

IEC publications:

- | | |
|-----------------|---|
| Publication 27: | Letter Symbols to be Used in Electrical Technology. |
| Publication 50: | International Electrotechnical Vocabulary (IEV). |



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Publication 68:	Basic Environmental Testing Procedures.
Publication 68-1: (1982)	Part 1: General and Guidance.
Publication 68-2:	Part 2: Tests.
Either:	
Publication 147:	Essential Ratings and Characteristics of Semiconductor Devices and General Principles of Measuring Methods.
Publication 147-0 (1966) and supplements:	Part 0: General and Terminology.
Publication 147-1 (1972) and supplements:	Part 1: Essential Ratings and Characteristics.
Publication 147-2 (1963) and supplements:	Part 2: General Principles of Measuring Methods.
Publication 147-4: (1976)	Acceptance and Reliability.
Publication 148 (1969) and supplements:	Letter Symbols for Semiconductor Devices and Integrated Microcircuits.
Publication 147-5 (1977) and supplement:	Part 5: Mechanical and Climatic Test Methods.
or:	
Publications 747:	Semiconductor devices. Discrete Devices and Integrated Circuits.
Publication 747-1: (1983)	Part 1: General.
Publications 748:	Semiconductor Devices. Integrated Circuits.
Publication 749:	Mechanical and Climatic Test Methods.
Publication 191:	Mechanical Standardization of Semiconductor Devices.
Publication 191-1 (1966) and supplements:	Part 1: Preparation of Drawings of Semiconductor Devices.
Publication 191-2 (1966) and supplements:	Part 2: Dimensions.
Publication 191-3 (1974) and supplements:	Part 3: General Rules for the Preparation of Outline Drawings of Integrated Circuits.
Publication 410: (1973)	Sampling Plans and Procedures for Inspection by Attributes.
Publication 617:	Graphical Symbols for Diagrams.
Publication QC 001002 (1981):	Rules of Procedure of the IEC Quality Assessment System for Electronic Components (IECQ).

ISO publications:

ISO Standard 1000: (1973)	SI Units and Recommendations for the Use of their Multiples and of Certain Other Units.
ISO Standard 2015: (1976)	Numbering of Weeks.
ISO Standard 2859: (1974)	Sampling Procedures and Tables for Inspection by Attributes.

2.3 Units, symbols and terminology

Units, graphical symbols, letter symbols and terminology shall, wherever possible, be taken from the following publications:

ISO Standard 1000
IEC Publication 27
IEC Publication 50
IEC Publication 617

Any other units, symbols or terminology peculiar to one of the semiconductor devices covered by this generic specification shall be taken from the relevant IEC or ISO documents (see Sub-clause 2.2) or derived in accordance with the principles of the documents listed above.

2.4 Preferred values of voltages, currents and temperatures

Preferred values of voltages, currents and temperatures for the measurement of characteristics, for tests and for operating conditions, are given in IEC Publications 747-1 and 748-1.

2.5 Marking*a) On the device*

Where space permits, the following information shall be marked on the device:

- 1) Index point for terminal identification (see Sub-clause 2.5.1).
- 2) Type designation (see Sub-clause 2.5.2), categories of assessed quality (see Sub-clause 2.6) and, where appropriate, screening sequence (see Sub-clause 2.7).
- 3) Manufacturer's name, initial or trade mark and, where appropriate, factory identification code (see Sub-clause 2.5.3).
- 4) Inspection lot identification code (see Sub-clause 2.5.4).
- 5) Mark of conformity, unless a certificate of conformity is used.
- 6) Reference to special handling precautions, where appropriate.

Where space does not permit full marking, the detail specification shall give the minimum requirement in the above order of precedence.

b) On the primary packaging

The following information shall appear on the primary packaging used as initial protection or wrapping for delivery:

- 1) all the information listed in Item a) of Sub-clause 2.5, except the terminal marking:

- 2) the detail specification reference;
- 3) any special handling precautions, for example, caution labels.

2.5.1 *Terminal identification* (reference: IEC Publication 747-1, Chapter VI, Clause 8).

The terminals shall be identified in the detail specification by reference to the specified outline or base drawing.

2.5.2 *Type designation*

When the type designation is marked on the component, it shall be given preferably in letters and figures or with a colour code when specified in the detail specification. Colour codes may be given in the sectional specification.

2.5.3 *Manufacturer's name or trade mark*

If the manufacturer's name or trade mark does not enable traceability to the manufacturing factory, a factory identification code shall also be used.

2.5.4 *Inspection lot identification code*

This is given in ISO Standard 2015 for the week, preceded by the last two digits of the year (example: 8345 = 45th week of 1983). When marking space on the device is restricted, the first digit of the year may be omitted (example: 345 = 45th week of 1983) when specified in the detail specification. It is the date that the lot was submitted for inspection. When more than one lot of a type is submitted for inspection within the same week, an inspection lot identification suffix, such as a letter, shall be used to identify each successive lot.

2.6 *Categories of assessed quality*

This specification provides for three categories of assessed quality. The devices are grouped in an identified and date-coded inspection lot, which is tested to the specified quality categories. The AQLs or LTPDs associated with the same inspection group may vary for each category and shall be as specified in the detail specification.

The minimum requirements of the categories are as follows:

- Category I – In which the type meets the requirements of qualification approval to categories II or III. Each lot meets the inspection requirements of Group A which includes functional tests. Every three months, one lot meets the inspection requirements for solderability. Annually, one lot meets the Group B and C inspection requirements.
- Category II – In which the lot meets the inspection requirements of Group A and Group B on a lot-by-lot basis and of Group C on a periodic basis.
- Category III – In which the lot is 100% screened and meets the inspection requirements of Group A and Group B on a lot-by-lot basis and of Group C on a periodic basis.

The sectional specifications shall define the minimum requirements for each category. A detail specification may contain additional requirements, including screening, to those given in the generic, sectional or blank detail specification.

2.7 Screening

A screen is an examination or test applied to all devices in a lot.

When required by the detail specification, all devices in the lot shall be screened by submitting them to one of the sequences given in the relevant table of the sectional specification and all defectives removed. Other sequences not specified herein are applicable only in case the above sequences are not correlated with or are in contradiction with recognized failure mechanisms. When a part of the screening process as given in the relevant table of the sectional specification forms part of the manufacturing process in the prescribed sequence, these procedures need not be repeated. For the purpose of this specification, burn-in is defined as thermal and electrical stress applied to all devices in a lot for a specified period of time for the purpose of detecting and removing potential early failures.

3. Quality assessment procedures

Quality assessment comprises the procedure for obtaining qualification approval as defined in Sub-clause 3.5, followed by quality conformance inspection on a lot-by-lot basis (including screening if required) and on a periodic basis as specified in the detail specification.

The quality assessment tests are subdivided into Group A, B and C tests; these are performed lot-by-lot or periodically (as defined in Sub-clause 2.6). In some cases, Group D tests may also be specified, for example, for qualification approval.

3.1 Eligibility for qualification approval

A type is eligible for qualification approval when Rule of Procedure of IEC Publication QC 001002, Clause 11, is satisfied.

3.1.1 Primary stage of manufacture

The primary stage of manufacture is defined in the sectional specification.

3.2 Commercially confidential information

If any part of the manufacturing process is commercially confidential, this shall be suitably identified, and the Chief Inspector shall demonstrate to the satisfaction of the National Supervising Inspectorate (NSI) that the requirements of Rule of Procedure of IEC Publication QC 001002, Sub-clause 10.2.2, have been complied with.

3.3 Formation of inspection lots

See Rules of Procedure of IEC Publication QC 001002, Sub-clause 12.2.

3.4 Structurally similar devices

See Rules of Procedure of IEC Publication QC 001002, Sub-clause 8.5.3.

Details concerning grouping are given in the relevant sectional specification.

3.5 *Granting of qualification approval*

See Rules of Procedure of IEC Publication QC 001002, Sub-clause 11.3.1.

Either methods *a)* or *b)* of Rules of Procedure, Sub-clause 11.3.1 may be used at the manufacturer's option following inspection requirements given in the sectional specification. Samples may be composed of appropriate structurally similar devices. In some cases, Group D tests are required for qualification approval.

All variable measurements called for as post test end-points in the detail specification shall be recorded as variable data.

The qualification report shall include a summary of all the test results for each group and sub-group, including number of devices tested and number of devices failed. This summary shall have been derived from variables and/or attributes data.

Manufacturers shall retain all data for provision to the NSI on demand.

3.6 *Quality conformance inspection*

Quality conformance inspection shall consist of the examinations and tests of Groups A, B, C and D, as specified.

For Group B and C inspection, samples may be composed of structurally similar devices.

Samples for periodic tests shall be drawn from one or more lots which shall have passed Groups A and B inspection. Individual devices shall have passed the Group A measurements called for in the detail specification.

3.6.1 *Division into groups and sub-groups*

The following guidelines are to be used in the preparation of detail specifications.

3.6.1.1 *Group A inspection (lot by lot)*

This group prescribes the visual inspection and the measurements to be made on a lot-by-lot basis to assess the principal properties of a device. Unless otherwise specified, structural similarity groupings are not permitted.

Group A inspection is divided into appropriate sub-groups as follows:

Sub-group A1: This sub-group comprises external visual examination as specified in Sub-clause 5.1.

Sub-group A2: This sub-group comprises measurements of primary characteristics of the device.

Sub-groups A3 and A4: These sub-groups may not be required. They comprise measurements of secondary characteristics of the device. The correct requirements for each device category are given in the relevant sectional specification. The choice between sub-groups A3 or A4 for given measurements is essentially governed by the desirability of performing them at a given quality level.