

Harmonized system of quality
assessment for electronic components

Semiconductor devices — Sectional specification for optoelectronic devices

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Components Standards Policy Committee (ECL/-) to Technical Committee ECL/24, upon which the following bodies were represented:

- British Telecommunications plc
- EEA (the Association of Electronics, Telecommunications and Business Equipment Industries)
- Electronic Components Industry Federation
- GAMBICA (BEAMA Ltd.)
- Ministry of Defence
- National Supervising Inspectorate
- Society of British Aerospace Companies Ltd.

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- UK Optical Sensors Collaborative Association

This British Standard, having been prepared under the direction of the Electronic Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 20 December 1991

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
1 Scope	1
2 General	1
2.1 Related document	1
2.2 Recommended values of temperatures (preferred values)	1
2.3 Recommended values of voltages and currents (preferred values)	1
2.4 Terminal identification	1
3 Quality assessment procedures	1
3.1 Primary stage of manufacture and subcontracting	1
3.2 Structurally similar devices	1
3.2.1 Grouping for electrical and optical characteristic tests in Groups A and/or B	2
3.2.2 Grouping for environmental and mechanical tests in Groups B and/or C	2
3.2.3 Grouping for endurance tests	3
3.3 Inspection requirements for qualification approval	3
3.4 Quality conformance inspection	3
3.4.1 Division into groups and sub-groups	3
3.5 Group D tests	5
3.6 Screening	5
3.7 Sampling requirements	6
4 Test and measurement procedures	7
4.1 Light emitting diodes, infrared emitting diodes, general measurements	7
4.2 Photocouplers	7
4.3 Laser diodes	8
4.4 Photodiodes and phototransistors	8
4.5 Other devices (under consideration)	8
Appendix A Structural similarity	9
Appendix B Dimensions	10
Appendix C Directions of applied forces for mechanical tests	10
Figure 1 — Orientation of a cylindrical device to direction of applied force	10
Figure 2 — Other type of package	11
Table I — Group A: Lot by lot	3
Table II — Group B: Lot by lot	4
Table III — Group C: Periodic	5
Table IV — Screening (under consideration)	6
Table V — Sampling requirements for Group A tests	6
Table VI — Sampling requirements for Group B and C tests, in which LTPD shall be used	6
Publication(s) referred to	Inside back cover

National foreword

This British Standard has been prepared under the direction of the Electronic Components Standards Policy Committee. It is identical with IEC Publication 747-12 [QC 720100]:1991 “*Semiconductor devices. Part 12: Sectional specification for optoelectronic devices*”, published by the International Electrotechnical Commission (IEC) and is a harmonized specification within the IECQ System of Quality Assessment for Electronic Components.

Cross-references

The British Standard which implements the IECQ basic rules given in BS QC 001002 is BS 9000 “*General Requirements for a system of electronic components of assessed quality*”. Part 3:1991 “*Specification for the national implementation of the IECQ system*”.

International Standard	Corresponding British Standard
IEC 68-2-14	BS 2011: <i>Environmental testing</i> Part 2.2 N:1985 <i>Test N. Change of temperature</i> (Identical)
IEC 191	BS 3934: <i>Mechanical standardization of semiconductor devices</i>
IEC 191-1	Part 1:1991 <i>Recommendations for the preparation of drawings of semiconductor devices</i> (Technically Equivalent)
IEC 191-2	Part 2:1991 <i>Schedule of international drawings giving dimensions of semiconductor devices</i> (Identical)
IEC 747	BS 6493 <i>Semiconductor devices</i>
IEC 747-1	Part 1 <i>Discrete devices</i> Section 1.1:1984 <i>General</i> (Identical)
IEC 747-2	Section 1.2:1984 <i>Recommendations for rectifier diodes</i> (Identical)
IEC 747-3	Section 1.3:1986 <i>Recommendations for signal (including switching) and regulator diodes</i> (Identical)
IEC 747-5	Section 1.5:1985 <i>Recommendations for optoelectronic devices</i> (Identical)
IEC 747-10 QC 700000	BS QC 700000:1991 <i>Semiconductor devices. General specification for discrete devices and integrated circuits</i> (Identical)

The International text makes reference to “IL”: Inspection Levels; “AQL”: Acceptable Quality Levels and “LTPD”: Lot Tolerance Percent Defective. IL and AQL values are specified in IEC 410:1973 which is technically equivalent to BS 6001 “*Sampling procedures for inspection by attribute — Part 1:1991 Specification sampling plans indexed by Acceptable Quality Level (AQL) for lot-by-lot inspection*”. The significance of the term “Lot Tolerance Percent Defective” (LTPD) is explained in clause 36 of BS 6000:1972 “*Guide to the use of BS 6001*”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This sectional specification applies to the following:

- semiconductor photoemitters:
 - optoelectronic displays;
 - light-emitting diodes (LED);
 - infrared-emitting diodes (IRED);
 - laser diodes.
- Semiconductor photosensitive devices:
 - photodiodes;
 - phototransistors;
 - photothyristors.
- Semiconductor imaging devices.
- Photocouplers, optocouplers.

2 General

This specification shall be read together with the generic specification to which it refers; it gives details of the quality assessment procedures, the inspection requirements, screening sequences, sampling requirements, test and measurement procedures required for semiconductor optoelectronic devices.

2.1 Related document

IEC 747-10/QC 700000, *Semiconductor devices — Part 10: Generic specification for discrete devices and integrated circuits*.

2.2 Recommended values of temperatures (preferred values)

See IEC 747-1, chapter VI, clause 5.

2.3 Recommended values of voltages and currents (preferred values)

See IEC 747-1, chapter VI, clause 6.

2.4 Terminal identification

The terminal identification shall be as given in the detail specification.

3 Quality assessment procedures

3.1 Primary stage of manufacture and subcontracting

The primary stage of manufacture is one of the following:

- for monocrystalline semiconductor devices
 - “The first process that changes the monocrystalline semiconductor material from being wholly P-type or N-type”;
- for polycrystalline semiconductor devices
 - “The deposition of a polycrystalline layer onto a substrate”.

3.2 Structurally similar devices

The crucial criterion for the grouping of types of devices as structurally similar is that the differences between the various types have no influence on the results of the test for which the group has been formed. For the purpose of this specification, structurally similar devices are produced by one manufacturer, essentially according to the same design, with the same materials, processes and methods. They only differ because of manufacturing variations usually resulting in their classification into types having different electrical, photometric or radio-metric characteristics.

For the purposes of obtaining samples both for qualification approval and for quality conformance testing, semiconductor optoelectronic devices may be grouped as described below.

The application of these rules is illustrated in the diagrams of Appendix A.

3.2.1 Grouping for electrical and optical characteristic tests in Groups A and/or B

Components having the same device design, manufactured on the same production line but differing only by a selection based on electrical and optical characteristic limits shall be grouped into sub-lots of types according to these different electrical and optical characteristic limits (that is divided into types).

Such components should preferably be included in the same detail specification but in any case the details of the grouping used shall be explained in the qualification approval test report.

3.2.1.1 Different electrical and optical characteristic limits

For those particular tests where different electrical and optical characteristic limits apply for the sub-lots, each sub-lot shall be sampled with a sample size appropriate to the number of components in each sub-lot.

Examples of such particular tests are:

- the selection of photosensitive devices into various sub-lots with different photo-sensitivities;
- the selection of photocouplers into various sub-lots with different output to input transfer ratio;
- the selection of light emitting devices into various sub-lots with different luminous or radiant intensity.

3.2.1.2 Identical electrical and optical characteristic limits

For those particular tests where the same electrical or optical characteristic limit and test conditions apply for all the sub-lots, then the total lot shall be assessed by testing either:

- a single sample, of a size appropriate to that for the total lot, comprising equal or proportionate quantities of all the sub-lots, or
- a single sample, of a size appropriate to that for the total lot, taken at random from the total lot.

3.2.2 Grouping for environmental and mechanical tests in Groups B and/or C

Components that have been encapsulated by the same method, have the same basic type of internal mechanical structure, have been made with identical piece parts and have been subjected to common sealing and finishing processes may be considered as structurally similar, as described below. A single sample, of a size appropriate to that of the total lot, may be taken to assess the total lot of such similar components.

NOTE “Identical piece parts” means that the piece parts have been manufactured or procured and accepted to the same drawing or specification.

3.2.2.1 Devices made on identical production lines

The tests to which the above grouping may apply are:

- a) visual inspection;
- b) dimensions;
- c) solderability and resistance to soldering heat;
- d) robustness of terminations;
- e) corrosion (for example damp heat, steady-state);
- f) change of temperature and damp heat, cyclic (or sealing);
- g) vibration;
- h) acceleration (steady-state);
- i) shock.

NOTE 1 “Identical production lines” means lines that have equivalent equipment, have identical process control drawings or specifications, use identical piece parts and materials, are located in the same geographical site and are capable of producing identical devices.

NOTE 2 Examples of such devices are those made on identical production lines and encapsulated in cases made with identical piece parts.