

Semiconductor devices — Integrated circuits —

Part 1: General

ICS 31.200

National foreword

This British Standard reproduces verbatim IEC 60748-1:2002 and implements it as the UK national standard. It supersedes BS 6493-2.1:1985 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the change over from one numbering system to the other, publications may contain identifiers from both systems.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

This British Standard, having been prepared under the direction of the Electrotechnical Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 30 July 2002

Summary of pages

This document comprises a front cover, an inside front cover, the IEC title page, pages 2 to 29, and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
14064 Corrigendum No.1	30 August 2002	Addition of supersession details to National foreword

© BSI 30 August 2002

ISBN 0 580 40152 9

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC**

60748-1

Deuxième édition
Second edition
2002-05

**Dispositifs à semiconducteurs –
Circuits intégrés –**

**Partie 1:
Généralités**

**Semiconductor devices –
Integrated circuits –**

**Part 1:
General**



Numéro de référence
Reference number
CEI/IEC 60748-1:2002

CONTENTS

FOREWORD	3
1 Scope and object	4
2 Normative references	4
3 Presentation and requirements of the IEC 60748 series	4
4 Terminology	4
4.1 General terms	5
4.2 Types of devices	6
4.3 Clamping characteristics of integrated circuits	8
4.4 Technological concepts	8
4.5 Particular device types of integrated circuits	9
5 Letter symbols	10
5.1 Basic letters	10
5.2 Subscripts for digital integrated circuits	10
5.3 Subscripts for analogue integrated circuits	12
6 Essential ratings and characteristics	12
6.1 Introduction	12
6.2 Standard format for the presentation of published data	12
6.3 Method for describing essential ratings and characteristics and function specification of integrated circuits	12
6.4 Definitions	14
6.5 Definitions of cooling conditions	14
6.6 List of preferred temperatures	14
6.7 List of preferred voltages	14
6.8 Mechanical ratings, characteristics and other data	15
6.9 Production spread and compliance	15
6.10 Printed wiring and printed circuits	15
6.11 General scheme for all types of integrated circuits	15
7 Measuring methods	23
7.1 Basic requirements	23
7.2 Specific requirements on the measuring methods	23
7.3 Numbering system for measuring methods	23
8 Acceptance and reliability of integrated circuits	26
8.1 General remarks	26
8.2 General principles	26
8.3 Electrical endurance tests	26
9 Electrostatic sensitive devices	29
Figure 1 – Examples showing the use of subscripts A and B	11
Figure 2 – Example of unitary functional blocks	13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES – INTEGRATED CIRCUITS –

Part 1: General

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 60748-1 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices.

This second edition cancels and replaces the first edition published in 1984, amendment 1 (1991), amendment 2 (1993), and amendment 3 (1995). This edition constitutes a technical revision.

This standard shall be read in conjunction with IEC 60747-1 and IEC 60050-521.

The text of this standard is based on the following documents:

FDIS	Report on voting
47A/637/FDIS	47A/648/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

The committee has decided that this publication remains valid until 2010. At this date, in accordance with the committees decision, the publication will be

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

SEMICONDUCTOR DEVICES – INTEGRATED CIRCUITS –

Part 1: General

1 Scope and object

This part of IEC 60748 gives general information on integrated circuits.

The object of this part of IEC 60748 is to provide information on the general principles or requirements applicable to the IEC 60748 series, which includes the standards for the various categories or sub-categories of integrated circuits.

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 60050-521, *International Electrotechnical Vocabulary (IEV) – Part 521: Semiconductor devices and integrated circuits*¹⁾

IEC 60319:1999, *Presentation and specification of reliability data for electronic components*

IEC 60617-12:1997, *Graphical symbols for diagrams – Part 12: Binary logic elements*

IEC 60617-13:1993, *Graphical symbols for diagrams – Part 13: Analogue elements*

IEC 60747-1:1983, *Semiconductor devices – Discrete devices and integrated circuits – Part 1: General*

IEC 60748 (all parts), *Semiconductor devices – Integrated circuits*

3 Presentation and requirements of the IEC 60748 series

Under consideration.

NOTE For the time being, chapter III of IEC 60747-1 applies as far as possible.

4 Terminology

For the purposes of this part of IEC 60748, the definitions relevant to integrated circuits given in chapter IV of IEC 60747-1, the definitions of IEC 60050-521 as well as the following definitions apply.

¹⁾ To be published.

4.1 General terms

4.1.1

terminal (of a semiconductor device)
conductive element provided for external connection
[IEV 521-05-02]

4.1.2

electrode (of a semiconductor device)
conductive element in electric contact with a semiconductor that performs one or more of the functions of emitting or collecting electrons or holes, or of controlling their movements
[IEV 521-05-01]

4.1.3

blank terminal

terminal that has no internal connection and that can be used as a support for external wiring without disturbing the function of the device, if the voltage applied to this terminal (by means of the wiring) does not exceed the highest supply voltage rating of the circuit

NOTE 1 The abbreviation should be NC (no internal connection).

NOTE 2 If higher voltages are acceptable, this should be stated.

4.1.4

non-usable terminal

terminal that is not used in normal applications and that may or may not have an internal connection

NOTE The abbreviation should be NU.

4.1.5

microelectronics

field of science and engineering that deals with highly miniaturized electronic circuits and their use

[IEV 521-10-01]

4.1.6

integrated electronics

art and technology of the design, fabrication and use of integrated circuits

4.1.7

latch-up characteristics of integrated circuits

NOTE The letter symbols given in the titles are examples only. They show how the letter symbol for a particular latch-up characteristic is composed by adding a standardized additional subscript to the subscript in the letter symbol for the particular voltage or current.

4.1.7.1

latch-up state

reversible state in which a low-impedance path has resulted from and persists following the current resulting from an input, output or supply overvoltage that triggers a parasitic four-layer bipolar structure

[IEV 521-10-11]

4.1.7.2

latch-up

process that results in a latch-up state

4.1.7.3

latch-up state (supply) current ($I_{CC(L)}$, $I_{DD(L)}$)

current flowing either in or out of a specified supply terminal of an integrated circuit when the integrated circuit is in the latch-up state

4.1.7.4

latch-up state holding current ($I_{CC(L)min}$, $I_{DD(L)min}$)

minimum latch-up state (supply) current necessary to hold an integrated circuit in the latch-up state

4.1.7.5

latch-up state (supply) voltage ($V_{CC(L)}$, $V_{DD(L)}$)

supply voltage between the relevant device terminals at a specified supply current when the integrated circuit is in the latch-up state

4.1.7.6

latch-up current (I_{Xlatch} , I_{latch})

lowest current of a specified duration flowing either in or out of a specified terminal of an integrated circuit that causes latch-up to occur

4.1.7.7

latch-up voltage (V_{Xlatch} , V_{latch})

lowest voltage of a specified duration applied to a specified terminal of an integrated circuit that causes latch-up to occur

4.1.7.8

latch-up supply current ($I_{CClatch}$, $I_{DDlatch}$)

lowest current of a specified duration flowing either into or out of a specified supply terminal of an integrated circuit that causes latch-up to occur

4.1.7.9

latch-up supply voltage ($V_{CClatch}$, $V_{DDlatch}$)

lowest value of a supply voltage of a specified duration applied to the relevant device terminals of an integrated circuit that causes latch-up to occur

4.1.8 Garbage

4.1.8.1

garbage data

data that are no longer needed

4.1.8.2

garbage collection

process that identifies the storage zones that can be reused

4.2 Types of devices

4.2.1

semiconductor device

device whose essential characteristics are due to the flow of charge carriers within a semiconductor

NOTE The definition includes devices whose essential characteristics are only in part due to the flow of charge carriers in a semiconductor but that are considered as semiconductor devices for the purpose of specification.

[IEV 521-04-01]

4.2.2**microcircuit**

electronic device that has a high circuit-element density and that is considered to be a single unit

[IEV 521-10-02]

4.2.3**integrated circuit**

microcircuit in which all or some of the circuit elements are inseparably associated and electrically interconnected so that it is considered to be indivisible for the purpose of construction and commerce

[IEV 521-10-03]

NOTE 1 IEC TC 47 standards on semiconductor integrated circuits generally refer to integrated circuits that are designed as microcircuits.

NOTE 2 To further define the nature of an integrated circuit, additional qualifiers may be prefixed. For example:

- single-chip integrated circuit;
- multi-chip integrated circuit;
- thin-film integrated circuit;
- thick-film integrated circuit;
- hybrid integrated circuit;
- hybrid semiconductor integrated circuit.

4.2.4**semiconductor integrated circuit**

semiconductor device designed as an integrated circuit

[IEV 521-10-05]

4.2.5**single-chip integrated circuit**

semiconductor integrated circuit containing only a single chip (die)

NOTE The use of the term “monolithic semiconductor integrated circuit” is deprecated.

4.2.6**multi-chip integrated circuit**

semiconductor integrated circuit containing two or more chips

[IEV 521-10-10]

NOTE The use of the term “polyolithic semiconductor integrated circuit” is deprecated.

4.2.7**film integrated circuit**

integrated circuit whose circuit elements, including the interconnections, are film elements formed on the surface of an insulating substrate

NOTE The film elements may be active or passive.

[IEV 521-10-06]

4.2.8**hybrid integrated circuit**

integrated circuit formed by a combination of two or more integrated components or discrete components or both

NOTE To identify a specific type of hybrid integrated circuit, additional qualifiers (for example, film) should be prefixed and a specific definition should be provided.

4.3 Clamping characteristics of integrated circuits

4.3.1

input clamping current I_{IK}

input current in a region of low differential input resistance that serves to limit the voltage excursion

4.3.2

output clamping current I_{OK}

output current in a region of low differential output resistance that serves to limit the voltage excursion

4.3.3

input clamping voltage V_{IK}

input voltage in a region of low differential input resistance that serves to limit the voltage excursion

4.3.4

output clamping voltage V_{OK}

output voltage in a region of low differential output resistance that serves to limit the voltage excursion

4.4 Technological concepts

4.4.1

film (of a film integrated circuit)

layer of solid material formed by any deposition process upon a substrate or upon other films deposited on a substrate

[IEV 521-10-07]

4.4.2

thin film (of a film integrated circuit)

film produced by an accretion process such as vapour phase deposition or vacuum sputtering

[IEV 521-10-08]

4.4.3

thick film (of a film integrated circuit)

film produced by a printing process or other related techniques

[IEV 521-10-09]

4.4.4

plated film

film obtained through chemical and/or electrochemical deposition

4.4.5

foil

layer of solid material that can be handled independently of a substrate

4.4.6

multilayer (connection) film circuit

circuit having more than one layer of film interconnections separated by at least one insulating film or gap

4.4.7

protective coating

layer of insulating material applied over the circuit elements for the purpose of mechanical and climatic protection and prevention of contamination