

Graphical symbols for diagrams

Part 5. Semiconductors and electron tubes

The European Standard EN 60617-5 : 1996 has the status of a
British Standard

ICS 01.080.30; 31.080.99; 31.100

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GEL/3, Documentation and graphical symbols, upon which the following bodies were represented:

- British Photographic Association
- Consumer Policy Committee of BSI
- Federation of the Electronics Industry
- GAMBICA (BEAMA Ltd.)
- Transmission and Distribution Association (BEAMA Ltd.)

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	2
Text of EN 60617-5 : 1996	3

National foreword

This British Standard has been prepared by Technical Committee GEL/3. It is the English language version of EN 60617-5 : 1996, *Graphical symbols for diagrams Part 5: Semiconductors and electron tubes* published by the European Committee for Electrotechnical Standardization (CENELEC). It is identical with IEC 617-5 : 1996 published by the International Electrotechnical Commission (IEC).

This British Standard replaces BS 3939 : Part 5 : 1985 which is withdrawn.

NOTE. The French language version of the alphabetic index has not been included.

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

ICS 01.080.30

Descriptors: Semiconductor device, electric diagram, electrical symbol, electron tube

English version

Graphical symbols for diagrams Part 5: Semiconductors and electron tubes

(IEC 617-5 : 1996)

Symboles graphiques pour schémas
Partie 5: Semiconducteurs et tubes électroniques
(CEI 617-5 : 1996)

Graphische Symbole für Schaltpläne
Teil 5: Schaltzeichen für Halbleiter und
Elektronenröhren
(IEC 617-5 : 1996)

This European Standard was approved by CENELEC on 1996-03-05. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

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Foreword

The text of document 3A/383/FDIS, future edition 2 of IEC 617-5, prepared by SC 3A, Graphical symbols for diagrams, of IEC TC 3, Documentation and graphical symbols, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60617-5 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-03-01

Contents

	Page
Introduction	3
Chapter I: Semiconductor devices	
Section 1 Symbol elements	4
Section 2 Qualifying symbols particular to semiconductor devices	8
Section 3 Examples of semiconductor diodes	9
Section 4 Examples of thyristors	11
Section 5 Examples of transistors	14
Section 6 Examples of photo-sensitive and magnetic field sensitive devices	18
Chapter II: Electron tubes	
Section 7 Symbol elements, general	20
Section 8 Symbol elements mainly applicable to cathode-ray tubes and television camera tubes	22
Section 9 Symbol elements mainly applicable to microwave tubes	24
Section 10 Symbol elements applicable to miscellaneous tubes, including mercury arc rectifiers	27
Section 11 Examples of electronic tubes	28
Section 12 Examples of cathode-ray tubes	30
Section 13 Examples of microwave tubes	31
Section 14 Examples of miscellaneous tubes including mercury arc rectifiers	37
Chapter III: Radiation detectors and electrochemical devices	
Section 15 Examples of ionizing radiation detectors	40
Section 16 Electrochemical devices	42
Annex A (informative) Older symbols	43
Annex B (informative) English alphabetic index	44

INTRODUCTION

This part of IEC 617 forms an element of a series which deals with graphical symbols for diagrams.

The series consists of the following parts:

- Part 1: General information, general index. Cross-reference tables
- Part 2: Symbol elements, qualifying symbols and other symbols having general application
- Part 3: Conductors and connecting devices
- Part 4: Basic passive components
- Part 5: Semiconductors and electron tubes
- Part 6: Production and conversion of electrical energy
- Part 7: Switchgear, controlgear and protective devices
- Part 8: Measuring instruments, lamps and signalling devices
- Part 9: Telecommunications: Switching and peripheral equipment
- Part 10: Telecommunications: Transmission
- Part 11: Architectural and topographical installation plans and diagrams
- Part 12: Binary logic elements
- Part 13: Analogue elements

The scope and the normative references for this series are given in IEC 617-1.

Symbols have been designed in accordance with requirements given in the future ISO 11714-1*. The module size $M = 2,5$ mm has been used. For better readability smaller symbols in this standard have been enlarged to double size and are marked "200 %" in the symbol column. To save space larger symbols have been reduced to half size and are marked "50 %" in the symbol column. In accordance with the future ISO 11714-1, clause 7, symbol dimensions (for instance height) may be modified in order to make space for a greater number of terminals or for other layout requirements. In all cases, whether the size is enlarged or reduced, or dimensions modified, the thickness of the original line should be maintained without scaling.

The symbols in this standard are laid out in such a way that the distance between connecting lines is a multiple of a certain module. The module 2M has been chosen to provide enough space for a required terminal designation. The symbols have been drawn to a size convenient for comprehension, using the same grid consistently in the representation of all symbols.

All symbols are designed within a grid in a computer-aided draughting system. The grid which was used has been reproduced in the background of the symbols.

The older symbols which were included in appendix A of the first edition of IEC 617-5 for a transitional period, are no longer part of this second edition, as they will definitely be withdrawn from use.

The indexes in Annex B and C include an alphabetic list of symbol names and their corresponding number. The symbol names are based on the description of the symbols of this part. A general index including an alphabetic list of symbols of all parts is given in IEC 617-1.

* At present, at the stage of Draft International Standard (document 3/563/DIS).

SYMBLES GRAPHIQUES POUR SCHÉMAS

Cinquième partie: Semiconducteurs et tubes électroniques

GRAPHICAL SYMBOLS FOR DIAGRAMS

Part 5: Semiconductors and electron tubes

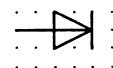
CHAPITRE I: DISPOSITIFS À SEMICONDUCTEURS

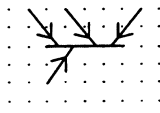
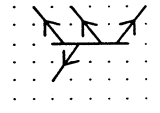
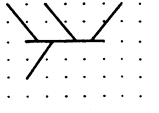
SECTION 1 – ÉLÉMENTS DE SYMBOLES

CHAPTER I: SEMICONDUCTOR DEVICES

SECTION 1 – SYMBOL ELEMENTS

No.	Symbole Symbol	Légende	Description
05-01-01		Région de semiconducteur avec une connexion Le trait horizontal représente la région de semiconducteur et le trait perpendiculaire la connexion	Semiconductor region with one ohmic connection The horizontal line is the semiconductor region and the vertical line is the ohmic connection
05-01-02		Région de semiconducteur avec plusieurs connexions, figurée avec exemples à deux connexions	Semiconductor region with several ohmic connections, shown with examples with two ohmic connections
05-01-03			
05-01-04			
05-01-05		Canal conducteur pour dispositifs à déplétion	Conduction channel for depletion devices
05-01-06		Canal conducteur pour dispositifs à enrichissement	Conduction channel for enhancement devices

No.	Symbole	Symbol	Légende	Description
05-01-07			Jonction redresseuse	Rectifying junction
05-01-08			Transféré à Annexe A: 05-A-01	Transferred to Annex A: 05-A-01
05-01-09			Jonction influençant une région semiconductrice par un champ électrique, par exemple dans un transistor à effet de champ	Junction which influences a semiconductor layer by means of an electric field, for example in a junction field effect transistor
05-01-10			Région P influençant une région N	P-region which influences an N-layer
			Région N influençant une région P	N-region which influences a P-layer
05-01-11			Indication du type de la conductivité du canal pour transistors à effet de champ à grille isolée (IGFET)	Indication of the conductivity type of the channel for insulated gate field effect transistors (IGFET)
05-01-12			Canal de type N avec substrat de type P, figuré pour un dispositif à déplétion	N-type channel on P-type substrate, shown for a depletion type IGFET
			Canal de type P avec substrat de type N, figuré pour un dispositif à enrichissement	P-type channel on an N-type substrate, shown for an enhancement type IGFET
05-01-13			Grille isolée Comme exemple avec plusieurs grilles, voir symbole 05-05-17.	Insulated gate For an example with multiple gates see symbol 05-05-17.

No.	Symbole Symbol	Légende	Description
05-01-14		Emetteur sur une région dont le type de conductibilité est différent Le trait oblique avec flèche représente l'émetteur. Emetteur P sur région N	Emitter on a region of dissimilar conductivity type The slanting line with arrow represents the emitter. P emitter on N region
05-01-15		Plusieurs émetteurs P sur région N	Several P emitters on N region
05-01-16		Emetteur N sur région P	N emitter on P region
05-01-17		Plusieurs émetteurs N sur région P	Several N emitters on P region
05-01-18		Collecteur sur une région dont le type de conductivité est différent Le trait oblique représente le collecteur.	Collector on a region of dissimilar conductivity type The slanting line represents the collector.
05-01-19		Plusieurs collecteurs sur une région dont le type de conductivité est différent	Several collectors on a region of dissimilar conductivity type

No.	Symbole	Symbol	Légende	Description
05-01-20			Transition entre régions de types de conductivité différentes: de P à N, ou de N à P Le trait oblique court indique le point de passage de P à N ou de N à P le long de la ligne horizontale. Aucune connexion ne doit être faite au trait oblique court.	Transition between regions of dissimilar conductivity types, either P to N, or N to P The short slanting line indicates the point of change along the horizontal line from P to N, or from N to P. No ohmic connection shall be made to the short slanting line.
05-01-21			Région intrinsèque entre deux régions de type de conductivité différente formant une structure PIN ou NIP L'intervalle entre les traits obliques pontés représente la région intrinsèque. Toute connexion à la région I doit être faite entre les traits obliques courts et non sur ces traits	Intrinsic region separating regions of dissimilar conductivity type thus giving either a PIN or NIP structure The intrinsic region lies between the linked slanting lines. Any ohmic connection to the region I shall be made between the short slanting lines and not to them
05-01-22			Région intrinsèque entre deux régions du même type de conductivité formant une structure soit PIP soit NIN	Intrinsic region between regions of similar conductivity type giving either a PIP or NIN structure
05-01-23			Région intrinsèque entre un collecteur et une région de type de conductivité différente formant une structure PIN ou NIP La connexion au collecteur est faite sur le trait oblique long	Intrinsic region between a collector and a region of dissimilar conductivity type giving either a PIN or NIP structure The connection to the collector is made to the long slanting line
05-01-24			Région intrinsèque entre un collecteur et une région du même type de conductivité formant une structure soit PIP soit NIN La connexion au collecteur est faite sur le trait oblique long	Intrinsic region between a collector and a region of similar conductivity type giving either a PIP or NIN structure The connection to the collector is made to the long slanting line

SECTION 2 – SYMBOLES DISTINCTIFS PARTICULIERS AUX
DISPOSITIFS À SEMICONDUCTEURS

SECTION 2 – QUALIFYING SYMBOLS PARTICULAR TO
SEMICONDUCTOR DEVICES

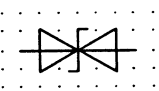
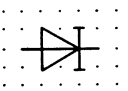
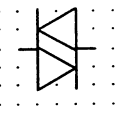
2.1 Si nécessaire, on peut représenter une fonction spéciale ou une propriété essentielle destinée au fonctionnement du circuit par un symbole distinctif placé à proximité ou formant partie du symbole du dispositif. 2.1 If necessary, a special function or property essential for circuit operation may be indicated by a qualifying symbol placed adjacent to, or forming part of the symbol of the device.

No.	Symbole	Symbol	Légende	Description
05-02-01		Effet Schottky	Effet Schottky	Schottky effect
05-02-02		Effet tunnel	Effet tunnel	Tunnel effect
05-02-03		Effet de claquage dans un seul sens Effet Zener	Effet de claquage dans un seul sens Effet Zener	Unidirectional breakdown effect Zener effect
05-02-04		Effet de claquage symétrique	Effet de claquage symétrique	Bidirectional breakdown effect
05-02-05		Effet unitunnel	Effet unitunnel	Backward effect (unitunnel effect)

SECTION 3 – EXEMPLES DE DIODES À SEMICONDUCTEUR

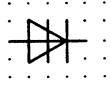
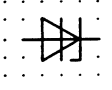
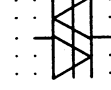
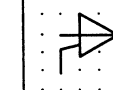
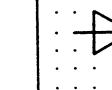
SECTION 3 – EXEMPLES DE DIODES À SEMICONDUCTEUR

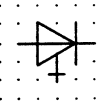
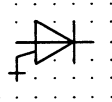
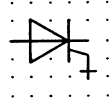
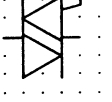
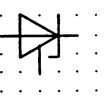
No.	Symbole	Symbol	Légende	Description
05-03-01			Diode à semiconducteur, symbole général	Semiconductor diode, general symbol
05-03-02			Diode électroluminescente (LED), symbole général	Light emitting diode (LED), general symbol
05-03-03			Diode à dépendance thermique	Temperature sensing diode
05-03-04			Diode à capacité variable Varactor	Variable capacitance diode Varactor
05-03-05			Diode tunnel Diode Esaki	Tunnel diode Esaki diode
05-03-06			Diode à effet de claquage, unidirectionnelle Diode régulatrice de tension Diode Zener	Breakdown diode, unidirectional Voltage regulator diode Zener diode

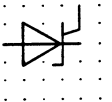
No.	Symbole Symbol	Légende	Description
05-03-07		Diode à effet de claquage dans les deux sens	Breakdown diode, bidirectional
05-03-08		Diode unitunnel	Backward diode (unitunnel diode)
05-03-09		Diode bidirectionnelle	Bidirectional diode

SECTION 4 – EXAMPLES OF THYRISTORS

SECTION 4 – EXAMPLES DE THYRISTORS

No.	Symbole	Symbol	Légende	Description
05-04-01			Thyristor diode, bloqué en inverse	Reverse blocking diode thyristor
05-04-02			Thyristor diode passant en inverse	Reverse conducting diode thyristor
05-04-03			Thyristor diode bidirectionnelle Diac	Bidirectional diode thyristor Diac
05-04-04			Thyristor triode, type non spécifié Ce symbole est utilisé pour représenter un thyristor bloqué en inverse s'il n'est pas nécessaire de préciser le type de gâchette.	Triode thyristor, type unspecified This symbol is used to represent a reverse blocking triode thyristor, if it is not necessary to specify the type of gate.
05-04-05			Thyristor triode bloqué en inverse, gâchette N (commandé côté anode)	Reverse blocking triode thyristor, N-gate (anode-side controlled)
05-04-06			Thyristor triode bloqué en inverse, gâchette P (commandé côté cathode)	Reverse blocking triode thyristor, P-gate (cathode-side controlled)

No.	Symbole	Symbol	Légende	Description
05-04-07			Thyristor triode blocable, gâchette non spécifiée	Turn-off thyristor, gate not specified
05-04-08			Thyristor triode blocable par la gâchette N (commandé côté anode)	Turn-off triode thyristor, N-gate (anode-side controlled)
05-04-09			Thyristor triode blocable par la gâchette P (commandé côté cathode)	Turn-off triode thyristor, P-gate (cathode-side controlled)
05-04-10			Thyristor tétrode bloqué en inverse	Reverse blocking thyristor tetrode type
05-04-11			Thyristor triode symétrique Triac	Bidirectional triode thyristor Triac
05-04-12			Thyristor triode passant en inverse, gâchette non spécifiée	Reverse conducting triode thyristor, gate not specified

No.	Symbole	Symbol	Légende	Description
05-04-13			Thyristor triode passant en inverse, gâchette N (commandé côté anode)	Reverse conducting triode thyristor, N-gate (anode-side controlled)
05-04-14			Thyristor triode passant en inverse, gâchette P (commandé côté cathode)	Reverse conducting triode thyristor, P-gate (cathode-side controlled)