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CONSOLIDATED VERSION

# INTERNATIONAL STANDARD



**Semiconductor devices – Discrete devices –  
Part 8: Field-effect transistors**



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**SEMICONDUCTOR DEVICES –  
DISCRETE DEVICES –****Part 8: Field-effect transistors**

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**IEC 60747-8 edition 3.1 contains the third edition (2010-12) [documents 47E/398/FDIS and 47E/406/RVD] and its amendment 1 (2021-06) [documents 47E/726/CDV and 47E/744/RVC].**

**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.**

International Standard IEC 60747-8 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

This third edition constitutes a technical revision.

The main changes with respect to the previous edition are listed below.

- a) "Clause 3 Classification" was moved and added to Clause 1.
- b) "Clause 4 Terminology and letter symbols" was divided into "Clause 3 Terms and definitions" and "Clause 4 Letter symbols" was amended with additions and deletions.
- c) Clause 5, 6 and 7 were amended with necessary additions and deletions.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Part 8 should be used in conjunction with IEC 60747-1:2006.

A list of all the parts in the IEC 60747 series, under the general title *Semiconductor devices – Discrete devices*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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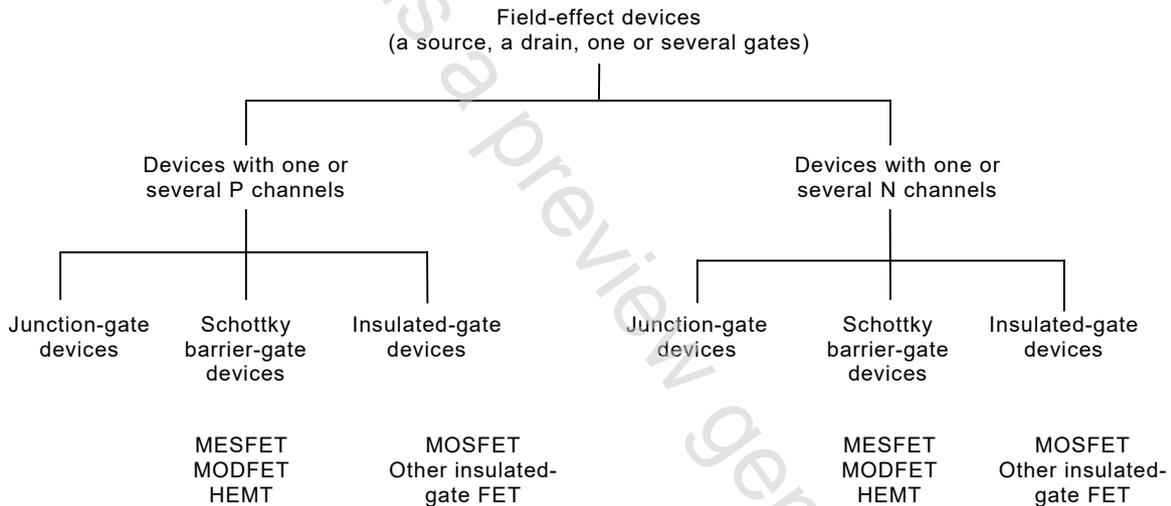
## Part 8: Field-effect transistors

### 1 Scope

This part of IEC 60747 gives standards for the following categories of field-effect transistors:

- type A: junction-gate type;
- type B: insulated-gate depletion (normally on) type;
- type C: insulated-gate enhancement (normally off) type.

Since a field-effect transistor may have one or several gates, the classification shown below results:



NOTE 1 Schottky barrier-gate and insulated gate devices include depletion type devices and enhancement type devices.

NOTE 2 MOSFETs for some applications may not have inverse diode characteristics in the data sheet. Special circuit element structures to eliminate body diode are under development for such applications. MOSFET applications such as motor control equipment need to specify the inverse diode characteristics in the MOSFET to use the inverse diode as a free wheeling diode.

NOTE 3 The graphical symbol only for type C is used in this standard. The standard equally applies for P-channel and for type A and B devices.

### 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 61340 (all parts), *Electrostatics*

IEC 60747-1:2006, *Semiconductor devices – Part 1: General*

### 3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

#### 3.1 Types of field-effect transistors

##### 3.1.1

##### **N-channel field-effect transistor**

field-effect transistor that has one or more N-type conduction channels

##### 3.1.2

##### **P-channel field-effect transistor**

field-effect transistor that has one or more P-type conduction channels

##### 3.1.3

##### **junction-gate field-effect transistor**

##### **JFET**

field-effect transistor in which

- the source and drain regions are connected with each other by the channel region, all three being of the same conductivity type;
- a gate region adjacent to the channel has the opposite conductivity type, thus forming with source, channel and drain region a PN junction

NOTE The gate-source voltage controls the conductivity of the conduction channel in the channel region by controlling the width of the gate space-charge region and hence also the remaining cross-section of the conduction channel.

##### 3.1.4

##### **insulated-gate field-effect transistor**

##### **IGFET**

field-effect transistor in which

- one or more gate electrodes are electrically insulated from the body;
- the conductivity type of both the source and drain regions is opposite from that of the semiconductor body in which they are located;
- the principal current flows in a channel that is formed by an inversion layer connecting source and drain regions

NOTE The inversion layer is either already present at zero gate-source voltage or produced within the body at sufficiently high forward gate-source voltage by accumulation of the minority charge carriers of the body material. The conductance of the channel is controlled by the gate-source voltage, which controls the electric field between gate electrode and the body and hence the amount of accumulated minority charge carriers.

##### 3.1.5

##### **metal-oxide-semiconductor field-effect transistor**

##### **MOSFET**

insulated-gate field-effect transistor in which the insulating layer between each gate electrode and the channel is oxide material