

INTERNATIONAL STANDARD

IEC
60747-14-2

First edition
2000-11

Semiconductor devices –

Part 14-2:

Semiconductor sensors – Hall elements

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Dispositifs à semiconducteurs –

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Partie 14-2:

Capteurs à semiconducteurs – Éléments à effet de Hall

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Reference number
IEC 60747-14-2:2000(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

N

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES –

Part 14-2: Semiconductor sensors – Hall elements

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.
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International Standard IEC 60747-14-2 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

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

| FDIS | Report on voting |
|--------------|------------------|
| 47E/158/FDIS | 47E/171/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 the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

A bilingual version of this standard may be issued at a later date.

INTRODUCTION

This part of IEC 60747 should be read in conjunction with IEC 60747-1. It provides basic information on semiconductor

- terminology;
- letter symbols;
- essential ratings and characteristics;
- measuring methods;
- acceptance and reliability.

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SEMICONDUCTOR DEVICES –

Part 14-2: Semiconductor sensors – Hall elements

1 General

1.1 Scope

This part of IEC 60747 provides standards for packaged semiconductor Hall elements which utilize the Hall effect.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60747. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60747 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

IEC 61340-5-1:1998, *Electrostatics – Part 5-1: Protection of electronic devices from electrostatic phenomena – General requirements*

1.3 Definitions

For the purpose of this International Standard, the following definitions apply.

1.3.1

semiconductor Hall element

semiconductor device that generates the voltage upon application of a magnetic field with magnetic flux density, being proportional to the control voltage (see below) and the magnetic flux density

1.3.2

Hall mobility

electron mobility measured with the usage of the Hall effect

1.3.3

control current

current to be applied continuously to the input terminals of the device when the output terminals are not connected to external circuit

1.3.4

control voltage

voltage to be applied continuously to the input terminals of the device when the output terminals are not connected to external circuit

1.3.5

offset voltage (or residual voltage)

voltage to be derived between the output terminals when a specified current or voltage is applied to the input terminals of the device without magnetic field

1.3.6

output Hall voltage

the difference between the voltage, which is derived across the output terminals when a specified current or voltage is applied to the input terminals of the device in a specified magnetic field, and the offset voltage

1.3.7

residual ratio

the ratio of the offset voltage to the output Hall voltage

1.3.8

input resistance

resistance between the input terminals of the device when the output terminals are not connected to external circuit

1.3.9

output resistance

resistance between the output terminals of the device when the input terminals are not connected to external circuit

1.3.10

temperature coefficient of output Hall voltage

relative change in output Hall voltage referred to the change in temperature

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1.3.11

temperature coefficient of input resistance

relative change in input resistance referred to the change in temperature

1.4 Symbols

1.4.1 Clauses 2,3 and 4 of IEC 60747-1, chapter V, apply.

For the field of packaged Hall elements, the following additional special subscripts are recommended:

- c control
- o offset
- H Hall
- in input
- out output

Table 1 – Letter symbols

| Name and designation | Letter symbol | Remarks |
|--|----------------|---------|
| Hall mobility | μ_H | |
| Control current | I_c | |
| Control voltage | V_c | |
| Offset voltage or residual voltage | V_o | |
| Output Hall voltage | V_H | |
| Residual ratio | V_o/V_H | |
| Input resistance | R_{in} | |
| Output resistance | R_{out} | |
| Temperature coefficient of output Hall voltage | α_{VH} | |
| Temperature coefficient of input resistance | α_{Rin} | |

1.4.2 Terminals

The terminal numbers and their designation for packaged Hall elements are shown in figure 1 and table 2. The designation of the terminals is listed below. The (+) and (-) signs of the output terminals assume that the magnetic line of force passes through from the top to the bottom of the Hall element.

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Table 2 – Terminal numbers

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| Terminal number | Voltage/current |
|-----------------|----------------------|
| 1 | $V_c(+)$ or $I_c(+)$ |
| 2 | $V_H(+)$ |
| 3 | $V_c(-)$ or $I_c(-)$ |
| 4 | $V_H(-)$ |

2 Essential ratings and characteristics

2.1 General

2.1.1 Element materials

Useful materials for Hall elements are semiconductor materials like GaAs, InSb, InAs, Si, etc. Ratings of Hall elements depend on the element materials.

2.1.2 Handling precautions

Due to a rather thin layer of semiconductor sensing region, the devices may be irreversibly damaged if an excessive voltage is allowed to build up, for example due to contact with electrostatically charged persons, leakage currents from soldering irons, etc.

When handling the devices, the handling precautions given in IEC 60747-1, chapter IX, clause 1, shall therefore be observed.