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# INTERNATIONAL STANDARD

**Semiconductor devices -**
**Part 16-11: Microwave integrated circuits - Power detectors**

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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# CONTENTS

FOREWORD ..... 4
1 Scope ..... 6
2 Normative references ..... 6
3 Terms and definitions ..... 6
4 Essential ratings and characteristics ..... 8
4.1 General requirements ..... 8
4.1.1 Circuit identification and types ..... 8
4.1.2 General function description ..... 8
4.1.3 Manufacturing technology ..... 8
4.1.4 Package identification ..... 8
4.2 Application description ..... 9
4.2.1 Conformance to system or interface information or both ..... 9
4.2.2 Overall block diagram ..... 9
4.2.3 Reference data ..... 9
4.2.4 Electrical compatibility ..... 9
4.2.5 Associated devices ..... 9
4.3 Specification of the function ..... 9
4.3.1 Detailed block diagram – Functional blocks ..... 9
4.3.2 Identification and function of terminals ..... 10
4.3.3 Function description ..... 10
4.4 Limiting values (absolute maximum rating system) ..... 11
4.4.1 Requirements ..... 11
4.4.2 Electrical limiting values ..... 11
4.4.3 Temperatures ..... 12
4.5 Operating conditions (within the specified operating temperature range) ..... 12
4.6 Electrical characteristics ..... 12
4.7 Mechanical and environmental ratings, characteristics and data ..... 13
4.8 Additional information ..... 13
5 Measuring methods ..... 14
5.1 General ..... 14
5.1.1 General precautions ..... 14
5.1.2 Characteristic impedance ..... 14
5.1.3 Handling precautions ..... 14
5.1.4 Types ..... 14
5.2 Tangential signal sensitivity ($P_{TSS}$) ..... 14
5.2.1 Purpose ..... 14
5.2.2 Circuit diagram ..... 14
5.2.3 Principle of measurement ..... 15
5.2.4 Circuit description and requirements ..... 16
5.2.5 Precautions to be observed ..... 16
5.2.6 Measurement procedure ..... 16
5.2.7 Specified conditions ..... 16
5.3 Input return loss ($L_{ret(in)}$) ..... 17
5.3.1 Purpose ..... 17
5.3.2 Measuring methods ..... 17

5.4 Output voltage ($V_O$) ..... 20
5.4.1 Purpose ..... 20
5.4.2 Circuit diagram ..... 20
5.4.3 Principle of measurement ..... 20
5.4.4 Circuit description and requirements ..... 21
5.4.5 Precautions to be observed ..... 21
5.4.6 Measurement procedure ..... 21
5.4.7 Specified conditions ..... 21
5.5 Voltage sensitivity ($\beta_V$) ..... 21
5.5.1 Purpose ..... 21
5.5.2 Circuit diagram ..... 21
5.5.3 Principle of measurement ..... 21
5.5.4 Circuit description and requirements ..... 22
5.5.5 Precautions to be observed ..... 22
5.5.6 Measurement procedure ..... 22
5.5.7 Specified conditions ..... 22
5.6 Current sensitivity ($\beta_i$) ..... 22
5.6.1 Purpose ..... 22
5.6.2 Circuit diagram ..... 22
5.6.3 Principle of measurement ..... 23
5.6.4 Circuit description and requirements ..... 23
5.6.5 Precautions to be observed ..... 23
5.6.6 Measurement procedure ..... 23
5.6.7 Specified conditions ..... 23
5.7 Frequency response flatness ($\Delta P_i$) ..... 23
5.7.1 Purpose ..... 23
5.7.2 Circuit diagram ..... 23
5.7.3 Principle of measurement ..... 23
5.7.4 Circuit description and requirements ..... 24
5.7.5 Precautions to be observed ..... 24
5.7.6 Measurement procedure ..... 24
5.7.7 Specified conditions ..... 24
5.8 Output slope ($k$) ..... 24
5.8.1 Purpose ..... 24
5.8.2 Circuit diagram ..... 24
5.8.3 Measuring methods ..... 25
5.9 Output intercept point ..... 27
5.9.1 Purpose ..... 27
5.9.2 Circuit diagram ..... 27
5.9.3 Measuring methods ..... 27
5.10 Dynamic range ..... 29
5.10.1 Purpose ..... 29
5.10.2 Circuit diagram ..... 29
5.10.3 Measuring methods ..... 29
5.11 Temperature sensitivity ($\beta_T$) ..... 32
5.11.1 Purpose ..... 32
5.11.2 Circuit diagram ..... 32

5.11.3 Principle of measurement ..... 32
5.11.4 Circuit description and requirements ..... 32
5.11.5 Precautions to be observed ..... 32
5.11.6 Measurement procedure ..... 33
5.11.7 Specified conditions ..... 33
5.12 Rise time ($t_{r(out)}$), fall time ($t_{f(out)}$), rising edge propagation delay ($t_{rd}$) and falling edge propagation delay ($t_{fd}$) ..... 33
5.12.1 Purpose ..... 33
5.12.2 Circuit diagram ..... 33
5.12.3 Principle of measurement ..... 34
5.12.4 Circuit description and requirements ..... 35
5.12.5 Precautions to be observed ..... 35
5.12.6 Measurement procedure ..... 35
5.12.7 Specified conditions ..... 35
Bibliography ..... 36

Figure 1 – Example block diagram ..... 10
Figure 2 – Circuit diagram for the measurement of tangential signal sensitivity ..... 15
Figure 3 – Waveform of output voltage relative to input power ..... 15
Figure 4 – Circuit diagram for the measurement of the input return loss (method 1) ..... 17
Figure 5 – Circuit diagram for the measurement of the input return loss (method 2) ..... 19
Figure 6 – Circuit diagram for the measurement of the output voltage ..... 20
Figure 7 – Circuit diagram for the measurement of current sensitivity ..... 22
Figure 8 – Circuit diagram for the measurement of response times ..... 33
Figure 9 – Input and output waveforms ..... 34

Table 1 – Function of terminals ..... 10
Table 2 – Electrical limiting values ..... 11
Table 3 – Electrical limiting values in detail specification ..... 12
Table 4 – Temperatures ..... 12
Table 5 – Electrical characteristics ..... 13

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# Semiconductor devices - Part 16-11: Microwave integrated circuits - Power detectors

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The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---|---|
| 47E/887/FDIS | 47E/891/RVD |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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– reconfirmed,

– withdrawn, or

– revised.

## 1 Scope

This part of IEC 60747 specifies the terminology, essential ratings and characteristics, and measuring methods of microwave integrated circuit power detectors.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60747-1:2006, *Semiconductor devices - Part 1: General*
IEC 60747-1:2006/AMD1:2010

IEC 60747-4:2007, *Semiconductor devices - Discrete devices - Part 4: Microwave diodes and* transistors
IEC 60747-4:2007/AMD1:2017

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

IEC TR 61340-5-2, *Electrostatics - Part 5-2: Protection of electronic devices from electrostatic phenomena - User guide*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60747-4 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

**3.1**
**output voltage**
$V_o$
voltage measured at the output port

**3.2**
**tangential signal sensitivity**
$P_{TSS}$
input power when the negative noise peak value of the *output voltage* (3.1) is equal to the positive noise peak value when there is no input signal

**3.3**
**input return loss**
$L_{ret(in)}$
ratio of the incident power at the input port to the reflected power at the input port

[SOURCE: IEC 60747-16-6:2019, 3.4]

**3.4**
**output current**
$I_o$
current measured at the output port

**3.5**
**voltage sensitivity**
$\beta_V$
ratio of the *output voltage* (3.1) to the input power

**3.6**
**current sensitivity**
$\beta_i$
ratio of the *output current* (3.4) to the input power

**3.7**
**frequency response flatness**
$\Delta P_i$
difference between the maximum input power and the minimum input power at the same *output voltage* (3.1)

**3.8**
**output slope**
$k$
slope of the *output voltage* (3.1) ideal response curve

**3.9**
**output intercept point**
intersection point of the extension line of the *output voltage* (3.1) ideal response curve and the horizontal axis which represents input power or input peak voltage

**3.10**
**dynamic range**
input power range in which the actual response curve follows the ideal response curve

**3.11**
**temperature sensitivity**
$\beta_T$
rate at which calculated input power varies with temperature at the same actual input power

**3.12**
**rise time**
$t_{r(out)}$
interval between the lower reference point on the leading edge of the *output voltage* (3.1) and the upper reference point on the leading edge of the *output voltage* (3.1)

Note 1 to entry: Usually the lower reference is 10 % of the amplitude, and the upper reference is 90 % of the amplitude.

**3.13**
**fall time**
$t_{f(out)}$
interval between the upper reference point on the trailing edge of the *output voltage* (3.1) and the lower reference point on the trailing edge of the *output voltage* (3.1)

Note 1 to entry: Usually the lower reference is 10 % of the amplitude, and the upper reference is 90 % of the amplitude.

**3.14**
**rising edge propagation delay**
$t_{rd}$
interval between the reference point on the leading edge of the envelope of the radio frequency input voltage and the reference point on the leading edge of the *output voltage* (3.1)

Note 1 to entry: Usually the reference is 50 % of the amplitude.

**3.15**
**falling edge propagation delay**
$t_{fd}$
interval between the reference point on the trailing edge of the envelope of the radio frequency input voltage and the reference point on the trailing edge of the *output voltage* (3.1)

Note 1 to entry: Usually the reference is 50 % of the amplitude.

# 4 Essential ratings and characteristics

## 4.1 General requirements

### 4.1.1 Circuit identification and types

The identification of type (device name), the category of circuit and technology applied shall be given in the detail specification.

Microwave power detectors comprise four categories:

– Type A: Detector diodes;
– Type B: Root mean square detectors;
– Type C: Logarithmic detectors;
– Type D: Envelope detectors and peak detectors.

### 4.1.2 General function description

A general description of the function performed by the microwave integrated circuit power detectors and the features for the application shall be made.

### 4.1.3 Manufacturing technology

The manufacturing technology, e.g. semiconductor monolithic integrated circuit, thin film integrated circuit, micro-assembly, shall be stated in the detail specification. This statement shall include details of the semiconductor technologies such as Schottky-barrier diode, metal-semiconductor field effect transistor (MESFET), Si bipolar transistor, etc.

### 4.1.4 Package identification

The following information shall be given in the detail specification:

a) chip or packaged form;
b) IEC or national reference number or both of the outline drawing, or drawing of non-standard package including terminal numbering;
c) principal package material, for example, metal, ceramic, plastic.