



BSI Standards Publication

Semiconductor devices

Part 16-5: Microwave integrated circuits - Oscillators

National foreword

This British Standard is the UK implementation of EN 60747-16-5:2013+A1:2020. It is identical to IEC 60747-16-5:2013, incorporating amendment 1:2020 and corrigendum September 2020. It supersedes BS EN 60747-16-5:2013, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum September 2020 is indicated in the text by AC1 AC1.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors.

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

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Amendments/corrigenda issued since publication

Date	Text affected
30 September 2020	Implementation of IEC amendment 1:2020 with CENELEC endorsement A1:2020
30 September 2020	Implementation of IEC corrigendum September 2020

English Version

Semiconductor devices - Part 16-5: Microwave integrated
circuits - Oscillators
(IEC 60747-16-5:2013)

Dispositifs à semiconducteurs - Partie 16-5: Circuits
intégrés hyperfréquences - Oscillateurs
(IEC 60747-16-5:2013)

Halbleiterbauelemente - Teil 16-5: Integrierte
Mikrowellenschaltkreise - Oszillatoren
(IEC 60747-16-5:2013)

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Europäisches Komitee für Elektrotechnische Normung

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European foreword

The text of document 47E/452/FDIS, future edition 1 of IEC 60747-16-5, prepared by SC 47E, "Discrete semiconductor devices", of IEC TC 47, "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60747-16-5:2013.

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IEC 60679-1:2007 NOTE Harmonized as EN 60679-1:2007 (not modified).

Foreword to amendment A1

The text of document 47E/673/CDV, future IEC 60747-16-5/A1+COR1, prepared by SC 47E "Discrete semiconductor devices" of IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60747-16-5:2013/A1:2020.

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60617	Data base	Graphical symbols for diagrams	-	-
IEC 60747-1 + corr. August + A1	2006 2008 2010	Semiconductor devices - Part 1: General	-	-
IEC 60747-4 + A1	2007 2017	Semiconductor devices - Discrete devices - Part 4: Microwave diodes and transistors	- -	- -
IEC 60747-16-3 + A1 + A2	2002 2009 2017	Semiconductor devices - Part 16-3: Microwave integrated circuits - Frequency converters	EN 60747-16-3 + A1 + A2	2002 2009 2017
IEC 61340-5-1	-	Electrostatics - Part 5-1: Protection of electronic devices from electrostatic phenomena - General requirements	EN 61340-5-1	-
IEC/TR 61340-5-2	-	Electrostatics - Part 5-2: Protection of electronic devices from electrostatic phenomena - User guide	CLC/TR 61340-5-2	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES –

Part 16-5: Microwave integrated circuits – Oscillators

FOREWORD

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International Standard IEC 60747-16-5 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:

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47E/452/FDIS	47E/454/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 2.

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

The committee has decided that the contents of this publication 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

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

SEMICONDUCTOR DEVICES –

Part 16-5: Microwave integrated circuits – Oscillators

1 Scope

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

This standard is applicable to the fixed and voltage-controlled semiconductor microwave oscillator devices, except the oscillator modules such as synthesizers which require external controllers.

NOTE This document is not applicable to the quartz crystal controlled oscillators. They are specified by IEC 60679-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60617, *Graphical symbols for diagrams* (available from <<http://std.iec.ch/iec60617>>)

IEC 60747-1:2006, *Semiconductor devices – Part 1: General* ¹⁾
Amendment 1:2010

 IEC 60747-4:2007, *Semiconductor devices – Discrete devices – Part 4: Microwave diodes and transistors*
IEC 60747-4:2007/AMD 1:2017 

 IEC 60747-16-3:2002, *Semiconductor devices – Part 16-3: Microwave integrated circuits – Frequency converters*
IEC 60747-16-3:2002/AMD 1:2009
IEC 60747-16-3:2002/AMD 2:2017 

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*

¹⁾ A consolidated edition (2010) exists, including IEC 60747-1:2006 and its Amendment 1.

3 Terms and definitions

3.1 oscillation frequency

f_{osc}
frequency measured at the output port

3.2 output power

$P_{\text{o,osc}}$
power measured at the output port

3.3 phase noise

$\mathcal{S}(f)$
[A1] frequency-domain measure of the short-term frequency stability of an oscillator

Note 1 to entry: This phase noise is normally expressed as the power spectral density of the phase fluctuations, $S_{\phi}(f)$, where the phase fluctuation function is $\phi(t)=2\pi Ft-2\pi F_0t$. The spectral density of phase fluctuation can be directly related to the spectral density of frequency fluctuation by the following formula:

$$S_{\phi}(f) = \left(\frac{F_0}{f} \right) S_y(f) \text{ rad}^2/\text{Hz}$$

where

F is the oscillator frequency;
 F_0 is the average oscillator frequency;
 f is the Fourier frequency.

Note 2 to entry: $\mathcal{S}(f)$ is pronounced "script-ell of f".

[SOURCE: IEC 60050-561:2014, 561-03-22, modified – A symbol and Note 2 to entry have been added.] [A1]

3.4 tuning sensitivity

$S_{f,v}$
ratio of the change of oscillation frequency to the variation of the control voltage

3.5 frequency pushing

$f_{\text{osc,push}}$
change of the oscillation frequency with the variation of the bias voltage

3.6 frequency pulling

$f_{\text{osc,pull}}$
change of the oscillation frequency with all phase angles for constant load reflection coefficient

3.7 n-th order harmonic distortion ratio

P_{nth}/P_1
ratio of the power of the n-th order harmonic component at the output port to the output power at the oscillation frequency