



BSI Standards Publication

## Semiconductor devices

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Part 16-1: Microwave integrated circuits - Amplifiers

## National foreword

This British Standard is the UK implementation of EN 60747-16-1:2002+A2:2017. It is identical to IEC 60747-16-1:2001, incorporating amendment 1:2007 and amendment 2:2018. It supersedes BS EN 60747-16-1:2002+A1:2007, which is withdrawn.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 A1 is indicated by A1 A1.

The text of IEC amendment 2:2018 has been provided in its entirety at the beginning of this document. BSI's policy of providing consolidated content remains unchanged; however, in the interest of expediency, in this instance BSI have chosen to collate the relevant content at the beginning of this document.

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 secretary.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 18 March 2002.

### Amendments/corrigenda issued since publication

Date	Text affected
30 April 2008	Implementation of IEC amendment 1:2007 with CENELEC endorsement A1:2007
30 April 2018	Implementation of IEC amendment 2:2017 with CENELEC endorsement A2:2017

ICS 31.080.99; 31.200

English Version

## Semiconductor devices – Part 16-1: Microwave integrated circuits – Amplifiers (IEC 60747-16-1:2001/A2:2017)

Dispositifs à semiconducteurs – Partie  
16-1: Circuits intégrés hyperfréquences –  
Amplificateurs (IEC 60747-16-1:2001/A2:2017)

Halbleiterbauelemente – Teil 16-1:  
Integrierte Mikrowellen-Verstärker  
(IEC 60747-16-1:2001/A2:2017)

This European Standard was approved by CENELEC on 2002-02-01. 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.

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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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

## European foreword

The text of document 47E/200/FDIS, future edition 1 of IEC 60747-16-1, 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 60747-16-1 on 2002-02-01.

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) | 2002-11-01 |
| — latest date by which the national standards conflicting with the EN have to be withdrawn   | (dow) | 2005-02-01 |

Annexes designated "normative" are part of the body of the standard. In this standard, annex ZA is normative.

### Endorsement notice

The text of the International Standard IEC 60747-16-1:2001 was approved by CENELEC as a European Standard without any modification.

## European foreword to amendment 1

The text of document 47E/305/FDIS, future amendment 1 to IEC 60747-16-1:2001, 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 amendment A1 to EN 60747-16-1:2002 on 2007-02-01.

The following dates were fixed:

- |   |       |            |
|---|-------|------------|
| — latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2007-11-01 |
| — latest date by which the national standards conflicting with the document have to be withdrawn  | (dow) | 2010-02-01 |

Annex ZA has been added by CENELEC.

### Endorsement notice

The text of amendment 1:2006 to the International Standard IEC 60747-16-1:2001 was approved by CENELEC as an amendment to the European Standard without any modification



EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

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**EN 60747-16-1:2002+A1**

February 2007

ICS 31.080.99

English version

**Semiconductor devices**  
**Part 16-1: Microwave integrated circuits -**  
**Amplifiers**  
(IEC 60747-16-1:2001)

Dispositifs à semiconducteurs  
Partie 16-1: Circuits intégrés  
hyperfréquences -  
Amplificateurs  
(CEI 60747-16-1:2001)

Halbleiterbauelemente  
Teil 16-1: Integrierte Mikrowellen-  
Verstärker  
(IEC 60747-16-1:2001)

This European Standard was approved by CENELEC on 2002-02-01. 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.

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CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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

## Foreword

The text of document 47E/200/FDIS, future edition 1 of IEC 60747-16-1, prepared by SC 47E, Discrete semiconductor devices, of IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60747-16-1 on 2002-02-01.

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) 2002-11-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-02-01

Annexes designated "normative" are part of the body of the standard. In this standard, annex ZA is normative.

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## Endorsement notice

The text of the International Standard IEC 60747-16-1:2001 was approved by CENELEC as a European Standard without any modification.

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## Foreword to amendment A1

The text of document 47E/305/FDIS, future amendment 1 to IEC 60747-16-1:2001, prepared by SC 47E, Discrete semiconductor devices, of IEC TC 47, Semiconductor devices, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60747-16-1:2002 on 2007-02-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-11-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2010-02-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of amendment 1:2006 to the International Standard IEC 60747-16-1:2001 was approved by CENELEC as an amendment to the European Standard without any modification.



EUROPEAN STANDARD

**EN 60747-16-1:2002/A2**

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2017

ICS 31.080.99

English Version

Semiconductor devices -  
Part 16-1: Microwave integrated circuits - Amplifiers  
(IEC 60747-16-1:2001/A2:2017)

Dispositifs à semiconducteurs -  
Partie 16-1: Circuits intégrés hyperfréquences -  
Amplificateurs  
(IEC 60747-16-1:2001/A2:2017)

Halbleiterbauelemente -  
Teil 16-1: Integrierte Mikrowellen-Verstärker  
(IEC 60747-16-1:2001/A2:2017)

This amendment A2 modifies the European Standard EN 60747-16-1:2002; it was approved by CENELEC on 2017-03-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## **European foreword**

The text of document 47E/500/CDV, future IEC 60747-16-1:2001/A2, 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 60747-16-1:2002/A2:2017.

The following dates are fixed:

- latest date by which the document has to be (dop) 2017-12-22  
implemented at national level by  
publication of an identical national  
standard or by endorsement
- latest date by which the national (dow) 2020-03-22  
standards conflicting with the  
document have to be withdrawn

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

## **Endorsement notice**

The text of the International Standard IEC 60747-16-1:2001/A2:2017 was approved by CENELEC as a European Standard without any modification.

**Annex ZA**  
(normative)

**Normative references to international publications  
with their corresponding European publications**

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.

NOTE 1 When 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](http://www.cenelec.eu)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
<b>Replace the existing references to IEC 60617, IEC 60747-1, IEC 60747-4, IEC 61340-5-1 and IEC 61340-5-2, including modifications done by A1 as follows:</b>				

IEC 60617-DB	-	Graphical symbols for diagrams	-	-
IEC 60747-1	2006	Semiconductor devices - Part 1: General	-	-
+A1	2010		-	-
IEC 60747-4	2007	Semiconductor devices - Discrete devices - Part 4: Microwave diodes and transistors	-	-
+A1	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	-

**Replace the existing reference to IEC 60748-3 as follows:**

IEC 60748-3	1986	Semiconductors devices - Integrated circuits -- Part 3: Analogue integrated circuits	-	-
+A1	1991		-	-
+A2	1994		-	-

**Delete the existing references to IEC 60747-7:2000, IEC 60747-16-2:2001 and IEC 60747-16-4:2004**

**Add the following new reference:**

IEC 60050-702	-	International electrotechnical vocabulary (IEV)- - Chapter 702: Oscillations, signals and related devices	-	-
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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

AMENDMENT 2  
AMENDEMENT 2

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**Semiconductor devices –  
Part 16-1: Microwave integrated circuits – Amplifiers**

**Dispositifs à semiconducteurs –  
Partie 16-1: Circuits intégrés hyperfréquences – Amplificateurs**

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## FOREWORD

This amendment has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices.

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

CDV	Report on voting
47E/500/CDV	47E/518/RVC

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

## CONTENTS

*Replace the titles of Clause 3, Subclauses 5.7 and 5.18 with the following new titles:*

- 3 Terms and definitions
- 5.7 Limiting output power ( $P_{o(ltg)}$ ) and limiting output power flatness ( $\Delta P_{o(ltg)}$ )
- 5.18 Power added efficiency ( $\eta_{add}$ )

*Replace the titles of Subclauses 5.11, 5.19, 5.21, including the amendments brought to them by Amendment 1, with the following new titles:*

- 5.11 Intermodulation distortion (two-tone) ( $P_n/P_1$ )
- 5.19  $n$ th order harmonic distortion ratio ( $P_{nth}/P_1$ )
- 5.21 Spurious intensity under specified load VSWR ( $P_{sp}/P_o$ )

*Replace the title of Subclause 5.22 added by Amendment 1 with the following new title:*

- 5.22 Adjacent channel power ratio ( $P_{adj}/P_{o(mod)}$ )

## 2 Normative references

*Replace the existing references IEC 60617, IEC 60747-1, IEC 60747-4, IEC 61340-5-1 and IEC 61340-5-2 including the amendments brought to them by Amendment 1 as follows:*

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

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*