

---

**Integrirana vezja - Vrednotenje elektromagnetne združljivosti (EMC) oddajnikov-sprejemnikov - 5. del: Ethernet oddajniki-sprejemniki (IEC 62228-5:2021)**

Integrated circuits - EMC evaluation of transceivers - Part 5: Ethernet transceivers (IEC 62228-5:2021)

Integrierte Schaltungen - Bewertung der elektromagnetischen Verträglichkeit von Sende-Empfangsgeräten - Teil 5: Ethernet-Sende-Empfangsgerät (IEC 62228-5:2021)

Circuits intégrés - Évaluation de la CEM des émetteurs-récepteurs - Partie 5 : Émetteurs-récepteurs (IEC 62228-5:2021)

[SIST EN IEC 62228-5:2021](https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054eb91773/sist-en-iec-62228-5-2021)

<https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054eb91773/sist-en-iec-62228-5-2021>

**Ta slovenski standard je istoveten z: EN IEC 62228-5:2021**

---

**ICS:**

31.200	Integrirana vezja, mikroelektronika	Integrated circuits. Microelectronics
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

**SIST EN IEC 62228-5:2021****en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN IEC 62228-5:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aaf4-65054ab91773/sist-en-iec-62228-5-2021>

EUROPEAN STANDARD

**EN IEC 62228-5**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2021

ICS 31.200

English Version

**Integrated circuits - EMC evaluation of transceivers - Part 5:  
Ethernet transceivers  
(IEC 62228-5:2021)**

Circuits intégrés - Évaluation de la CEM des émetteurs-  
récepteurs - Partie 5 : Émetteurs-récepteurs  
(IEC 62228-5:2021)

Integrierte Schaltungen - Bewertung der  
elektromagnetischen Verträglichkeit von Sende-  
Empfangsgeräten - Teil 5: Ethernet-Sende-Empfangsgerät  
(IEC 62228-5:2021)

This European Standard was approved by CENELEC on 2021-05-31. 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 CEN-CENELEC Management Centre or to any CENELEC member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

[SIST EN IEC 62228-5:2021](#)

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**EN IEC 62228-5:2021 (E)****European foreword**

The text of document 47A/1115/FDIS, future edition 1 of IEC 62228-5, prepared by SC 47A "Integrated circuits" of IEC/TC 47 "Semiconductor devices" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62228-5:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-02-28 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-05-31 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 62228-5:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

CISPR 16-1-1	NOTE	Harmonized as EN IEC 55016-1-1
IEC 61000-4-2	NOTE	Harmonized as EN 61000-4-2
IEC 61000-4-4	NOTE	Harmonized as EN 61000-4-4
IEC 61000-4-5	NOTE	Harmonized as EN 61000-4-5
IEC 61967-2	NOTE	Harmonized as EN 61967-2
IEC 61967-8	NOTE	Harmonized as EN 61967-8
IEC 62132-2	NOTE	Harmonized as EN 62132-2
IEC 62132-8	NOTE	Harmonized as EN 62132-8

## 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](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61967-1	-	Integrated circuits - Measurement of electromagnetic emissions - Part 1: General conditions and definitions	EN IEC 61967-1	-
IEC 61967-4	-	Integrated circuits - Measurement of electromagnetic emissions - Part 4: Measurement of conducted emissions - 1 ohm/150 ohm direct coupling method	EN IEC 61967-4	-
IEC 62132-1	-	Integrated circuits - Measurement of electromagnetic immunity - Part 1: General conditions and definitions	EN 62132-1	-
IEC 62132-4	-	Integrated circuits - Measurement of electromagnetic immunity 150 kHz to 1 GHz - Part 4: Direct RF power injection method	EN 62132-4	-
IEC 62215-3	-	Integrated circuits - Measurement of impulse immunity - Part 3: Non-synchronous transient injection method	EN 62215-3	-
IEC 62228-1	-	Integrated circuits – EMC evaluation of transceivers – Part 1: General conditions and definitions	EN IEC 62228-1	-
ISO 10605	-	Road vehicles - Test methods for electrical disturbances from electrostatic discharge	-	-
ISO 21111-2	-	Road vehicles - In-vehicle Ethernet - Part 2: Common physical entity requirements	-	-
ISO 7637-2	-	Road vehicles - Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only	-	-

**EN IEC 62228-5:2021 (E)**

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC/IEEE 8802-3	2017	Information technology Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Standard for Ethernet	-	-
+A1	2017		-	-
+A4	2017		-	-
EIA-198-1	-	Electronic Components Industry Association - Ceramic Dielectric Capacitors Classes I, II, III and IV	-	-

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 62228-5:2021](https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054ab91773/sist-en-iec-62228-5-2021)

<https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054ab91773/sist-en-iec-62228-5-2021>



IEC 62228-5

Edition 1.0 2021-04

# INTERNATIONAL STANDARD



---

**Integrated circuits – EMC evaluation of transceivers –  
Part 5: Ethernet transceivers**

**ITh STANDARD PREVIEW  
(standards.iteh.ai)**

[SIST EN IEC 62228-5:2021](https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054ab91773/sist-en-iec-62228-5-2021)

<https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054ab91773/sist-en-iec-62228-5-2021>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 31.200

ISBN 978-2-8322-9697-4

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	8
1 Scope.....	10
2 Normative references .....	10
3 Terms, definitions and abbreviated terms .....	11
3.1 Terms and definitions.....	11
3.2 Abbreviated terms.....	12
4 General .....	13
5 Test and operating conditions.....	14
5.1 Supply and ambient conditions.....	14
5.2 Test operation modes .....	14
5.2.1 General .....	14
5.2.2 Transceiver configuration for normal operation mode.....	15
5.2.3 Transceiver configuration for low power mode .....	15
5.3 Definition of BIN.....	15
5.4 Test configuration .....	16
5.4.1 General configuration for transceiver network .....	16
5.4.2 General configuration for single transceiver .....	18
5.4.3 Transceiver network tests – coupling ports and networks for conducted tests .....	18
5.4.4 Single transceiver tests – coupling ports and networks .....	21
5.5 Test communication and signals .....	22
5.5.1 General .....	22
5.5.2 Test signals for normal operation mode .....	22
5.5.3 Test signals for low power mode .....	23
5.6 Evaluation criteria .....	23
5.6.1 General .....	23
5.6.2 Evaluation criteria for functional operation modes.....	23
5.6.3 Evaluation criteria in unpowered condition after exposure to disturbances .....	24
5.6.4 Status classes .....	25
5.7 DUT specific information .....	26
6 Test and measurement .....	26
6.1 Emission of conducted RF disturbances.....	26
6.1.1 Test method .....	26
6.1.2 Test setup .....	26
6.1.3 Test procedure and parameters .....	27
6.2 Immunity to conducted RF disturbances.....	28
6.2.1 Test method .....	28
6.2.2 Test setup .....	28
6.2.3 Test procedure and parameters .....	29
6.3 Immunity to impulses .....	33
6.3.1 Test method .....	33
6.3.2 Test setup .....	33
6.3.3 Test procedure and parameters .....	34
6.4 Electrostatic Discharge (ESD).....	36
6.4.1 Test method .....	36
6.4.2 Test setup .....	36



6.4.3	Test procedure and parameters .....	41
7	Test report.....	43
Annex A (normative)	Ethernet test circuits .....	44
A.1	General.....	44
A.2	Test circuit for Ethernet transceivers for functional tests .....	44
A.3	Test circuit for Ethernet transceivers for ESD test.....	46
Annex B (normative)	Test circuit boards.....	49
B.1	Test circuit board for transceiver network configuration.....	49
B.2	Test circuit board for single transceiver configuration.....	51
Annex C (informative)	Test of Ethernet transceiver for radiated RF emission and RF immunity .....	53
C.1	General.....	53
C.2	General configuration for transceiver network .....	53
C.3	Tests .....	54
C.3.1	General .....	54
C.3.2	Emission of radiated RF disturbances.....	58
C.3.3	Immunity to radiated RF disturbances.....	59
Annex D (informative)	Examples for test limits for Ethernet transceiver in automotive application .....	63
D.1	General.....	63
D.2	Emission of conducted RF disturbances.....	63
D.3	Immunity to conducted RF disturbances.....	64
D.4	Immunity to impulses .....	68
D.5	Electrostatic discharge (ESD).....	68
D.6	Emission of radiated RF disturbances.....	69
D.7	Immunity to radiated RF disturbances.....	70
Annex E (informative)	Characterization of common mode chokes for EMC evaluation of Ethernet transceivers .....	72
E.1	General.....	72
E.2	Test .....	72
E.2.1	General .....	72
E.2.2	S-parameter measurement mixed mode.....	73
E.2.3	ESD damage .....	80
E.2.4	Saturation test at RF disturbances.....	82
E.2.5	Saturation test at ESD .....	85
E.2.6	TDR measurement of differential mode impedance.....	87
Annex F (informative)	Characterization of ESD suppression devices for EMC evaluation of Ethernet transceivers .....	89
F.1	General.....	89
F.2	Test .....	90
F.2.1	General .....	90
F.2.2	S-parameter measurement mixed mode.....	91
F.2.3	ESD damage .....	97
F.2.4	ESD discharge current measurement.....	100
F.2.5	Test of unwanted clamping effect at RF immunity tests.....	104
Bibliography.....		108
Figure 1 – Minimum MDI interface test network (Min-BIN).....		16
Figure 2 – Standard MDI interface test network (Std-BIN).....		16

Figure 3 – Optimized MDI interface test network (Opt-BIN) .....	16
Figure 4 – General test configuration for tests in transceiver network for conducted tests .....	17
Figure 5 – General test configuration for unpowered ESD test .....	18
Figure 6 – Transceiver network tests – coupling ports and networks .....	19
Figure 7 – Coupling ports and networks for unpowered ESD tests .....	22
Figure 8 – Principle drawing of the maximum deviation on an I-V characteristic .....	25
Figure 9 – Test setup for measurement of conducted RF disturbances .....	27
Figure 10 – Test setup for DPI tests .....	29
Figure 11 – Test setup for impulse immunity tests .....	33
Figure 12 – Test setup for powered ESD tests – principle arrangement .....	36
Figure 13 – Test setup for powered ESD tests – stimulation and monitoring .....	37
Figure 14 – Test setup for unpowered ESD tests – principle arrangement .....	38
Figure 15 – Test setup for unpowered ESD tests – stimulation and monitoring for function validation pre and post ESD test .....	40
Figure A.1 – General drawing of the circuit diagram of test network for 100BASE-T1 and 1000BASE-T1 Ethernet transceivers for functional test using conducted test methods .....	45
Figure A.2 – General drawing of the circuit diagram of test network for 100BASE-TX Ethernet transceivers for functional test using conducted test methods .....	46
Figure A.3 – General drawing of the circuit diagram for ESD tests of Ethernet transceivers in powered mode .....	47
Figure A.4 – General drawing of the circuit diagram for ESD tests of Ethernet transceivers in unpowered mode .....	48
Figure B.1 – Example of functional conducted test board for Ethernet transceiver ICs (100BASE-T1) .....	49
Figure B.2 – Example of powered ESD test board for Ethernet transceivers ICs (100BASE-T1) .....	50
Figure B.3 – Example of unpowered ESD test board for Ethernet transceivers ICs (100BASE-T1), top layer .....	51
Figure B.4 – Example of unpowered ESD test board for Ethernet transceivers ICs (100BASE-T1), bottom layer .....	51
Figure C.1 – General test configuration for tests in transceiver network used for radiated tests .....	53
Figure C.2 – General drawing of the circuit diagram of test network for 100BASE-T1 and 1000BASE-T1 Ethernet transceivers for functional test using radiated RF test methods .....	55
Figure C.3 – Example of functional radiated test board for Ethernet transceiver ICs (100BASE-T1), top layer (DUT side) .....	56
Figure C.4 – Example of functional radiated test board for Ethernet transceiver ICs (100BASE-T1), bottom layer (external circuitry side) .....	57
Figure C.5 – Test setup for measurement of radiated RF emission .....	58
Figure C.6 – Test setup for radiated RF immunity tests .....	60
Figure D.1 – Example of limits for conducted RF emission – MDI Opt-BIN, $V_{BAT}$ and WAKE .....	63
Figure D.2 – Example of limits for conducted RF emission – local supplies .....	64
Figure D.3 – Example of limits for conducted RF immunity for functional status class A <sub>1C</sub> – MDI Opt-BIN .....	65

Figure D.4 – Example of limits for conducted RF immunity for functional status class A <sub>IC</sub> – V <sub>BAT</sub> and WAKE.....	65
Figure D.5 – Example of limits for conducted RF immunity for functional status class C <sub>IC</sub> or D <sub>IC</sub> – MDI Opt-BIN .....	67
Figure D.6 – Example of limits for conducted RF immunity for functional status class C <sub>IC</sub> or D <sub>IC</sub> – V <sub>BAT</sub> and WAKE .....	67
Figure D.7 – Example of limits for radiated RF emission for IC stripline with 6,7 mm active conductor height.....	69
Figure D.8 – Example of limits for radiated RF immunity .....	70
Figure E.1 – General electrical drawing of a CMC .....	72
Figure E.2 – Test setup for S-parameter measurements at CMC.....	73
Figure E.3 – Example of test board 4-port S-parameter measurement at CMC – mixed mode, top layer.....	74
Figure E.4 – Example of test board 3-port S-parameter measurement at CMC – single ended, top layer.....	74
Figure E.5 – Recommended characteristics for $S_{dd11}$ , $S_{dd22}$ (RL) for CMC.....	77
Figure E.6 – Recommended characteristics for $S_{dd21}$ (IL) for CMC.....	78
Figure E.7 – Recommended characteristics for $S_{cc21}$ (CMR) for CMC .....	78
Figure E.8 – Recommended characteristics for $S_{dc11}$ , $S_{dc22}$ (LCL) for CMC .....	79
Figure E.9 – Recommended characteristics for $S_{sd21}$ , $S_{sd12}$ (DCMR) and $S_{ds21}$ , $S_{ds12}$ (CDMR) for CMC .....	79
Figure E.10 – Test setup for ESD damage tests at CMC.....	80
Figure E.11 – Example of ESD test board for CMC, top layer.....	81
Figure E.12 – Test setup for RF saturation measurements at CMC .....	83
Figure E.13 – Example of RF saturation / S-parameter test board for CMC, top layer.....	83
Figure E.14 – Test setup for ESD saturation measurements at CMC.....	85
Figure E.15 – Example of ESD saturation test board for CMC, top layer .....	85
Figure E.16 – Example of ESD saturation tests results for CMC.....	87
Figure E.17 – Test setup for TDR measurement at CMC .....	87
Figure E.18 – Example of TDR test board for CMC, top layer.....	88
Figure F.1 – Arrangement of ESD suppression device within the 100BASE-T1 and 1000BASE-T1 MDI interface .....	90
Figure F.2 – Test setup for S-parameter measurements at ESD suppression device .....	91
Figure F.3 – Example of test board 4-port S-parameter measurement for ESD suppression device – mixed mode, top layer.....	92
Figure F.4 – Example of test board 3-port S-parameter measurement for ESD suppression device – single ended, top layer.....	92
Figure F.5 – Recommended characteristics for $S_{dd11}$ (RL) for ESD suppression device .....	95
Figure F.6 – Recommended characteristics for $S_{dd21}$ (IL) for ESD suppression device.....	95
Figure F.7 – Recommended characteristics for $S_{sd21}$ (DCMR) for ESD suppression device.....	96
Figure F.8 – Test setup for ESD damage tests at ESD suppression device .....	97
Figure F.9 – Example of ESD test board for ESD suppression device, top layer.....	98
Figure F.10 – Test setup for ESD discharge current measurement at ESD suppression device.....	100

Figure F.11 – Example of ESD discharge current test board for ESD suppression device, top and bottom layer .....	101
Figure F.12 – Example of test results and recommended limits for remaining ESD discharge current after the MDI test network for ESD suppression device .....	103
Figure F.13 – Test setup for RF clamping test at ESD suppression device .....	104
Figure F.14 – Example of test board RF clamping test at suppression device, top layer .....	105
Figure F.15 – Recommended test power levels for RF clamping tests at ESD suppression device .....	107
Table 1 – Overview of measurements and tests .....	13
Table 2 – Supply and ambient conditions for functional operation .....	14
Table 3 – Definition for transceiver configuration for normal operation mode .....	15
Table 4 – Definition for transceiver mode configuration for low power mode .....	15
Table 5 – Selection recommendation of MII interfaces for transceiver network configuration .....	18
Table 6 – Transceiver network tests – component value definitions of coupling ports and networks .....	20
Table 7 – Definitions of coupling ports for unpowered ESD tests .....	22
Table 8 – Definition for transceiver mode configuration for normal operation mode .....	23
Table 9 – Evaluation criteria for Ethernet transceiver .....	24
Table 10 – Definition of functional status classes .....	25
Table 11 – Settings of the conducted RF measurement equipment .....	27
Table 12 – Conducted emission measurements .....	28
Table 13 – Specifications for DPI tests .....	30
Table 14 – DPI tests for functional status class A <sub>IC</sub> evaluation of Ethernet transceivers .....	31
Table 15 – DPI tests for functional status class C <sub>IC</sub> or D <sub>IC</sub> evaluation of Ethernet transceivers .....	32
Table 16 – Specifications for impulse immunity tests .....	34
Table 17 – Parameters for impulse immunity test .....	34
Table 18 – Impulse immunity tests for functional status class A <sub>IC</sub> evaluation of Ethernet transceivers .....	35
Table 19 – Impulse immunity tests for functional status class C <sub>IC</sub> or D <sub>IC</sub> evaluation of Ethernet transceivers .....	35
Table 20 – Specifications for ESD tests .....	41
Table 21 – ESD tests in powered mode for functional status class A <sub>IC</sub> , C <sub>IC</sub> and D <sub>IC</sub> evaluation of Ethernet transceivers .....	42
Table 22 – ESD tests in unpowered mode for functional status class D <sub>IC</sub> evaluation of Ethernet transceiver ICs .....	43
Table B.1 – Parameter ESD test circuit board .....	52
Table C.1 – Settings of the radiated RF measurement equipment .....	59
Table C.2 – Radiated RF emission measurements .....	59
Table C.3 – Specifications for radiated RF immunity tests .....	61
Table C.4 – Radiated RF immunity tests for functional status class A <sub>IC</sub> evaluation of Ethernet transceivers .....	62
Table D.1 – Example of limits for conducted RF emission – test cases with recommended limit classes .....	64

Table D.2 – Example of limits for conducted RF immunity – test cases with recommended limit classes for functional status class A <sub>1C</sub> .....	66
Table D.3 – Example of limits for conducted RF immunity – test cases with recommended limit classes for functional status class C <sub>1C</sub> or D <sub>1C</sub> .....	68
Table D.4 – Example of limits for impulse immunity – Class I .....	68
Table D.5 – Example of limits for impulse immunity – test cases with recommended limit classes for functional status class C <sub>1C</sub> or D <sub>1C</sub> .....	68
Table D.6 – Example of limits for powered and unpowered ESD tests – test cases with recommended limits for functional status class A <sub>1C</sub> , A <sub>2C</sub> , A <sub>3C</sub> , C <sub>1C</sub> or D <sub>1C</sub> .....	69
Table D.7 – Example of limits for radiated RF emission – test cases with recommended limit classes .....	70
Table D.8 – Example of limits for radiated RF immunity – test cases with recommended limit classes .....	71
Table E.1 – Test procedure and parameters for 3-port test board characterization for CMC .....	75
Table E.2 – Test procedure and parameters for S-parameter measurements at CMC .....	76
Table E.3 – Required S-parameter measurements for CMC .....	77
Table E.4 – Test parameters for ESD damage tests at CMC .....	81
Table E.5 – Required ESD tests for damage for CMC .....	82
Table E.6 – Test procedure and parameters for RF saturation tests at CMC .....	84
Table E.7 – Required RF saturation tests for CMC .....	84
Table E.8 – Test procedure and parameters for ESD saturation tests at CMC .....	86
Table E.9 – Required ESD saturation tests for CMC .....	86
Table E.10 – ESD saturation break down voltage classes for CMC .....	86
Table E.11 – Test procedure and parameters for TDR measurement at CMC .....	88
Table E.12 – Required TDR measurements for CMC .....	88
Table F.1 – Specification of ESD suppression device .....	89
Table F.2 – Test procedure and parameters for 3-port test board characterization for ESD suppression device .....	93
Table F.3 – Test procedure and parameters for S-parameter measurements at ESD suppression device .....	94
Table F.4 – Required S-parameter measurements for ESD suppression device .....	94
Table F.5 – Test parameters for ESD damage tests at ESD suppression device .....	99
Table F.6 – Required ESD tests for damage for ESD suppression device .....	99
Table F.7 – Test parameters for ESD discharge current measurement at ESD suppression device .....	102
Table F.8 – Required current measurement for ESD suppression device .....	102
Table F.9 – Recommended limits for remaining ESD discharge current after the MDI test network for ESD suppression device .....	103
Table F.10 – Limit classes and related applied ESD test voltages .....	104
Table F.11 – Test procedure and parameters for RF clamping tests at ESD suppression device .....	106
Table F.12 – Required RF clamping tests for ESD suppression device .....	107

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

**INTEGRATED CIRCUITS –  
EMC EVALUATION OF TRANSCEIVERS –**
**Part 5: Ethernet transceivers****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62228-5 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices.

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

Draft	Report on voting
47A/1115/FDIS	47A/1117/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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

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

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 62228-5:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/14586cb7-34cf-4741-aa4f-65054ab91773/sist-en-iec-62228-5-2021>