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Integrated circuit - EMC Evaluation of transceivers - Part 6: PSI5 transceivers (IEC 62228-6:2022)

Integrierte Schaltungen - EMV-Bewertung von Transceivern - Teil 6: PSI5-Transceiver (IEC 62228-6:2022)

Circuits intégrés - Évaluation de la CEM des émetteurs-récepteurs - Partie 6: Émetteurs-récepteurs PSI5 (IEC 62228-6:2022)

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**Integrated circuit - EMC evaluation of transceivers - Part 6: PSI5
transceivers
(IEC 62228-6:2022)**

Circuits intégrés - Évaluation de la CEM des émetteurs-
récepteurs - Partie 6: Émetteurs-récepteurs PSI5
(IEC 62228-6:2022)

Integrierte Schaltungen - EMV-Bewertung von Transceivern
- Teil 6: PSI5-Transceiver
(IEC 62228-6:2022)

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EN IEC 62228-6:2022 (E)**European foreword**

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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

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<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 7637-2	-	Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only	-	-
ISO 10605	-	Road vehicles - Test methods for electrical disturbances from electrostatic discharge	-	-



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**Integrated circuit – EMC evaluation of transceivers –
Part 6: PSI5 transceivers**

**Circuits intégrés – Évaluation de la CEM des émetteurs-récepteurs –
Partie 6: Émetteurs-récepteurs PSI5**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INTEGRATED CIRCUIT –
EMC EVALUATION OF TRANSCEIVERS –**
Part 6: PSI5 transceivers**FOREWORD**

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IEC 62228-6 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices. It is an International Standard.

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

Draft	Report on voting
47A/1145/FDIS	47A/1147/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.

A list of all parts in the IEC 62228 series, published under the general title *Integrated circuit – EMC evaluation of transceivers*, can be found on the IEC website.

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

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INTEGRATED CIRCUIT – EMC EVALUATION OF TRANSCEIVERS –

Part 6: PSI5 transceivers

1 Scope

This part of IEC 62228 specifies test and measurement methods for EMC evaluation of peripheral sensor interface 5 (PSI5) transceiver integrated circuits (ICs) under network condition. It defines test configurations, test conditions, test signals, failure criteria, test procedures, test setups and test boards. It is applicable for PSI5 satellite ICs (e.g. sensors) and ICs with embedded PSI5 transceivers (e.g. PSI5 electronic control unit IC). The document covers

- the emission of RF disturbances,
- the immunity against RF disturbances,
- the immunity against impulses, and
- the immunity against electrostatic discharges (ESD).

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 61967-1, *Integrated circuits – Measurement of electromagnetic emissions – Part 1: General conditions and definitions*

IEC 61967-4, *Integrated circuits – Measurement of electromagnetic emissions – Part 4: Measurement of conducted emissions – 1 Ω / 150 Ω direct coupling method*

IEC 62132-1, *Integrated circuits – Measurement of electromagnetic immunity – Part 1: General conditions and definitions*

IEC 62132-4, *Integrated circuits – Measurement of electromagnetic immunity 150 kHz to 1 GHz – Part 4: Direct RF power injection method*

IEC 62215-3, *Integrated circuits – Measurement of impulse immunity – Part 3: Non-synchronous transient injection method*

IEC 62228-1, *Integrated circuits – EMC evaluation of transceivers – Part 1: General conditions and definitions*

ISO 7637-2, *Road vehicles – Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only*

ISO 10605, *Road vehicles – Test methods for electrical disturbances from electrostatic discharge*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC 61967-1, IEC 62132-1, IEC 62228-1, as well as 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 Terms and definitions

3.1.1

global pin

pin which carries a signal or power, which enters or leaves the application board without any active component in between

3.1.2

mandatory components, pl

components needed for proper function and/or technical requirements of IC as specified by the IC manufacturer

3.1.3

PSI5 satellite IC

PSI5 satellite or sensor transceiver with access to PSI5 signal

Note 1 to entry: A PSI5 satellite IC is a sensor device.

3.1.4

IC with embedded PSI5 transceiver

IC with integrated PSI5 transceiver cell and PSI5 protocol handler with access to PSI5 signal

Note 1 to entry: An IC with an embedded PSI5 is an ECU device.

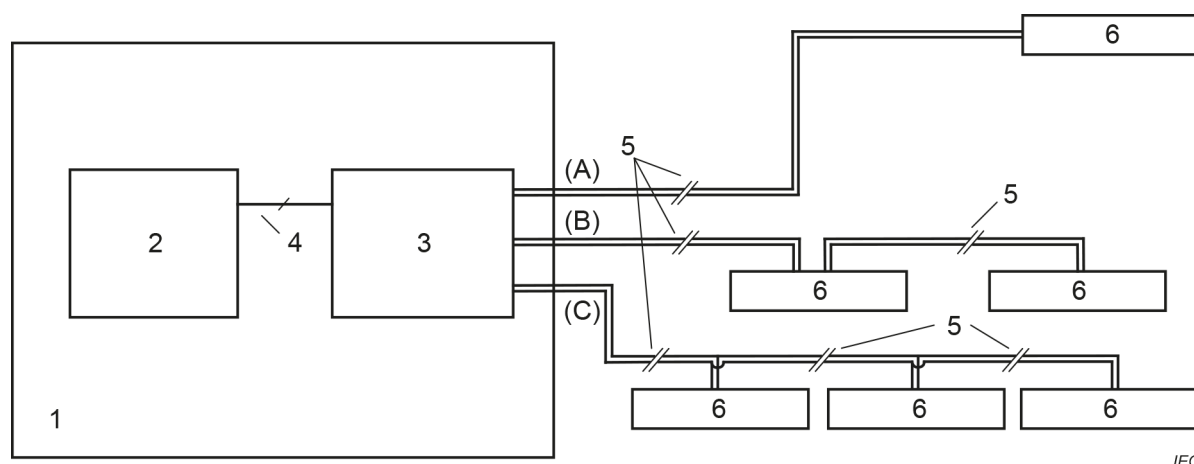
3.2 Abbreviated terms

ASIC	application specific integrated circuit
DPI	direct RF power injection
DUT	device under test
ECU	electronic control unit
PCB	printed circuit board
PSI5	peripheral sensor interface 5
TDMA	time division multiple access

4 General

The intention of this document is to evaluate the EMC performance of PSI5 transceiver ICs under application in minimal operating conditions (or in a minimal network). PSI5 transceiver ICs are in general available in two types: PSI5 satellite IC and IC with embedded PSI5 transceiver.

PSI5 transceiver system overview is shown in Figure 1.

**Key**

1	electronic control unit (ECU)	6	PSI5 Sensor ICs
2	microcontroller	(A)	point-to-point topology
3	IC with embedded PSI5	(B)	daisy-chain topology
4	digital interface	(C)	bus topology
5	two wire current interface (PSI5)		

Figure 1 – PSI5 system overview

The sensors are connected to the ECU with two wires, using the same lines for power supply and data transmission. The IC with embedded PSI5 (e.g. transceiver ASIC in the ECU) provides a pre-regulated voltage to the sensors and reads in the transmitted sensor data.

The physical layer of PSI5 for EMC evaluation shall have the following characteristics, as shown in Table 1.

Table 1 – PSI5 physical layer electrical characteristics

No.	Parameter	Variable	Minimum	Typical	Maximum	Unit
1	Supply voltage	V_{SSmax}, V_{CEmax}	4		16,5	V
2	Reverse polarity protection (standard)	$t < 80$ ms	-105			mA
3	Reverse polarity protection (extended)	$t < 50$ ms	-130			mA
4	Internal ECU resistance	R_{E1}	9		10	Ω
5	PSI5 ECU filter capacitor ^a	C_E	9	10	11	nF
6	PSI5 ECU filter resistor	R_{E2}	2	2,2	2,5	Ω
7	PSI5 ECU filter capacitor ^a	C_L	9	10	11	nF

^a Symmetrical values for C_E and C_L are proposed to have a balanced filter on PSI5.

An example of the typical PSI5 network, with a single sensor and the equivalent model, is shown in Figure 2. Most implementations will have a mandatory PSI5 ECU filter (PSI5 bus filter) used on the ECU side as shown in Figure 2. Sensor side may also have additional filter components as per the IC manufacturer specifications.