

BS EN 62215-3:2013



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Integrated circuits — Measurement of impulse immunity

Part 3: Non-synchronous transient
injection method

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National foreword

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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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EUROPEAN STANDARD
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English version

**Integrated circuits -
Measurement of impulse immunity -
Part 3: Non-synchronous transient injection method
(IEC 62215-3:2013)**

Circuits intégrés -
Mesure de l'immunité aux impulsions -
Partie 3: Méthode d'injection de
transitoires non synchrones
(CEI 62215-3:2013)

Integrierte Schaltungen -
Messung der Störfestigkeit
gegen Impulse -
Teil 3: Asynchrones
Transienteneinspeisungs-Verfahren
(IEC 62215-3:2013)

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CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 47A/881/CDV, future edition 1 of IEC 62215-3, 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 62215-3:2013.

The following dates are fixed:

- latest date by which the document has to be (dop) 2014-05-21
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2016-08-21
standards conflicting with the
document have to be withdrawn

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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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050	Series	International Electrotechnical Vocabulary (IEV)	-	-
IEC 61000-4-4	2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2012
IEC 61000-4-5 + corr. October	2005 2009	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2006
IEC 62132-4	2006	Integrated circuits - Measurement of electromagnetic immunity, 150 kHz to 1 GHz - Part 4: Direct RF power injection method	EN 62132-4	2006
ISO 7637-2	2011	Road vehicles - Electrical disturbances from - conduction and coupling - Part 2: Electrical transient conduction along supply lines only	-	-

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INTEGRATED CIRCUITS – MEASUREMENT OF IMPULSE IMMUNITY –

Part 3: Non-synchronous transient injection method

1 Scope

This part of IEC 62215 specifies a method for measuring the immunity of an integrated circuit (IC) to standardized conducted electrical transient disturbances. The disturbances, not necessarily synchronized to the operation of the device under test (DUT), are applied to the IC pins via coupling networks. This method enables understanding and classification of interaction between conducted transient disturbances and performance degradation induced in ICs regardless of transients within or beyond the specified operating voltage range.

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 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at <<http://www.electropedia.org>>)

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 62132-4:2006, *Integrated circuits – Measurement of electromagnetic immunity 150 kHz to 1 GHz – Part 4: Direct RF power injection method*

ISO 7637-2:2011, *Road vehicles – Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-131 and IEC 60050-161, some of which have been added for convenience, as well as the following apply.

3.1

auxiliary equipment

equipment not under test but is indispensable for setting up all the functions and assessing the correct performance (operation) of the equipment under test (EUT) during its exposure to the disturbance

3.2

burst

sequence of a limited number of distinct impulses or an oscillation of limited duration

3.3

coupling network

electrical circuit for transferring energy from one circuit to another with well-defined impedance and known transfer characteristics

3.4

performance degradation

undesired departure in the operational performance of any device, equipment or system from its intended performance

Note 1 to entry: The term “degradation” can apply to temporary or permanent failure.

3.5

DUT

device under test

device, equipment or system being evaluated

Note 1 to entry: In this part of IEC 62215, it refers to a semiconductor device being tested.

Note 2 to entry: This note applies to the French language only.

3.6

EMC

electromagnetic compatibility

ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbance to anything in that environment

3.7

global pin

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

3.8

immunity

ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

3.9

jitter

short-term variations of the significant instants of a digital signal from their ideal positions in time

3.10

local pin

pin that carries a signal or power which does not leave the application board

Note 1 to entry: The signal or power remains on the application board as a signal between two components with or without additional EMC circuitry.

3.11

response signal

signal generated by the DUT for the purpose of monitoring for detecting performance degradation

3.12

electromagnetic ambient

totality of electromagnetic phenomena existing at a given location

3.13**transient**

pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval which is short compared with the time-scale of interest

3.14**surge voltage**

transient voltage wave propagating along a line or a circuit and characterized by rapid increase followed by a slower decrease of the voltage

3.15**VS**

power supply input

3.16**Z_L**

line impedance of a trace on the test board

4 General

Electrical transients are a common part of the EMC environment of electrical and electronic devices. These transients are generated often on power nets and are directly applied or coupled to the terminals of integrated circuits which may affect the functionality of the device. The knowledge about the impulse immunity level enables the optimization of the IC as well as the definition of application requirements.

The transient waveforms are dependent on the application area of the DUT. Typical transient waveforms are burst and surge voltages as specified in IEC 61000-4-4 and IEC 61000-4-5 for industrial and consumer applications and in ISO 7637-2 for automotive application to get reproducible and comparable results for different DUTs.

The impulse immunity measurement method as described in this standard uses impulses with different amplitude and rise times, duration, energy and polarity in a conductive mode to the IC. In this test method the test time or the number of the applied impulses has to be chosen in a way that statistical effects are covered.

This method is similar to immunity test method of integrated circuits in the presence of conducted RF disturbances defined in IEC 62132-4. As in IEC 62132-4, the disturbance signal can be injected into I/O pins, supply pins and into the PCB reference via defined coupling networks. The EMC test board for this method can be the same as the one specified in IEC 62132-4.

The pin injection test method evaluates the performance of individual IC pins or groups of them when subjected to a transient waveform. Both positive and negative polarity transients, referenced to ground are applied. The basic test implementation is shown in Figure 1 .

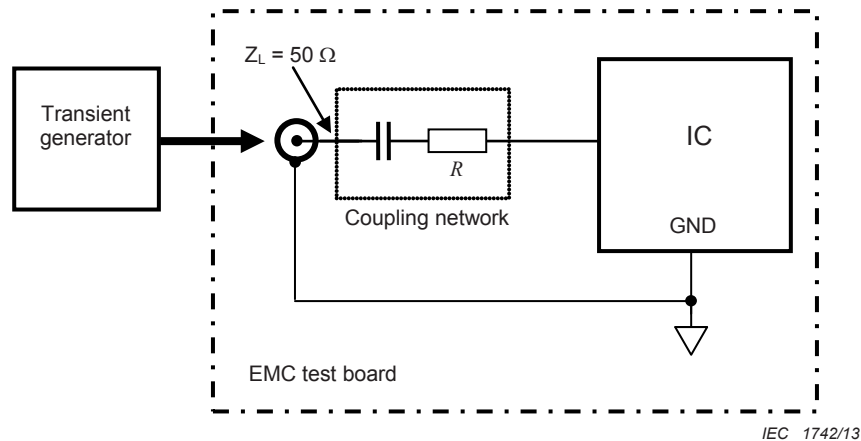


Figure 1 – Typical pin injection test implementation

5 Coupling networks

5.1 General on coupling networks

The transient disturbances are applied to the IC pin under test via defined coupling networks implemented on the PCB and connected to a device pin with respect to the pin functionality and the disturbance signal. Coupling networks are defined for:

- supply injection;
- input injection;
- output injection;
- multiple pin injection.

The coupling network shown in Figure 1 is identical to that used for RF immunity testing in IEC 62132-4. The series resistance (R) can be used to control the injected current, if required. The capacitance (C) is a DC block with a value selected to represent coupling effects in practice and to provide sufficient signal bandwidth while not excessively loading the connected pin (see Annex B). Default values of the series resistor and DC block capacitor are $0\ \Omega$ and $1\ \text{nF}$ (representing capacity of 10 m parallel lines), respectively. A different capacity value may be used if required for correct functionality. The actual value of resistor and capacitor, including the rationale for their selection, shall be documented in the test report.

5.2 Supply injection network

5.2.1 Direct injection

For supply pins directly connected to the power net a direct injection as shown in Figure 2 shall be used. For these tests the coupling and decoupling networks of the transient generators standardized in IEC 61000-4-4 and IEC 61000-4-5 for industrial or ISO 7637-2 for automotive applications are used.

Mandatory blocking capacitors (C_{BL}), filter or protection components at the supply pin have to be used as recommended by the manufacturer.