

Integrated circuits — Measurement of electromagnetic immunity 150 kHz to 1 GHz —

Part 4: Direct RF power injection method

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British Standard

ICS 31.200

National foreword

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

Circuits intégrés -
Mesure de l'immunité électromagnétique
150 kHz à 1 GHz
Partie 4: Méthode d'injection directe
de puissance RF
(CEI 62132-4:2006)

Integrierte Schaltungen -
Messung der elektromagnetischen
Störfestigkeit im Frequenzbereich
von 150 kHz bis 1 GHz
Teil 4: Verfahren direkter Einspeisung
der HF-Leistung
(IEC 62132-4:2006)

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

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Foreword

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Endorsement notice

The text of the International Standard IEC 62132-4:2006 was approved by CENELEC as a European Standard without any modification.

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INTEGRATED CIRCUITS – MEASUREMENT OF ELECTROMAGNETIC IMMUNITY 150 kHz TO 1 GHz –

Part 4: Direct RF power injection method

1 Scope

This part of IEC 62132 describes a method to measure the immunity of integrated circuits (IC) in the presence of conducted RF disturbances, e.g. resulting from radiated RF disturbances. This method guarantees a high degree of repeatability and correlation of immunity measurements.

This standard establishes a common base for the evaluation of semiconductor devices used in equipment functioning in an environment subject to unwanted radio frequency electromagnetic waves.

2 Normative references

The following referenced documents are indispensable for the application 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 61967-4, *Integrated circuits – Measurement of electromagnetic emissions, 150 kHz to 1 GHz – Part 4: Measurement of conducted emissions – 1 Ω / 150 Ω direct coupling method*

IEC 62132-1:2006, *Integrated circuits – Measurement of electromagnetic immunity, 150 kHz to 1 GHz – Part 1: General conditions and definitions*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus. Ancillary equipment. Conducted disturbances*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62132-1 apply.

4 General

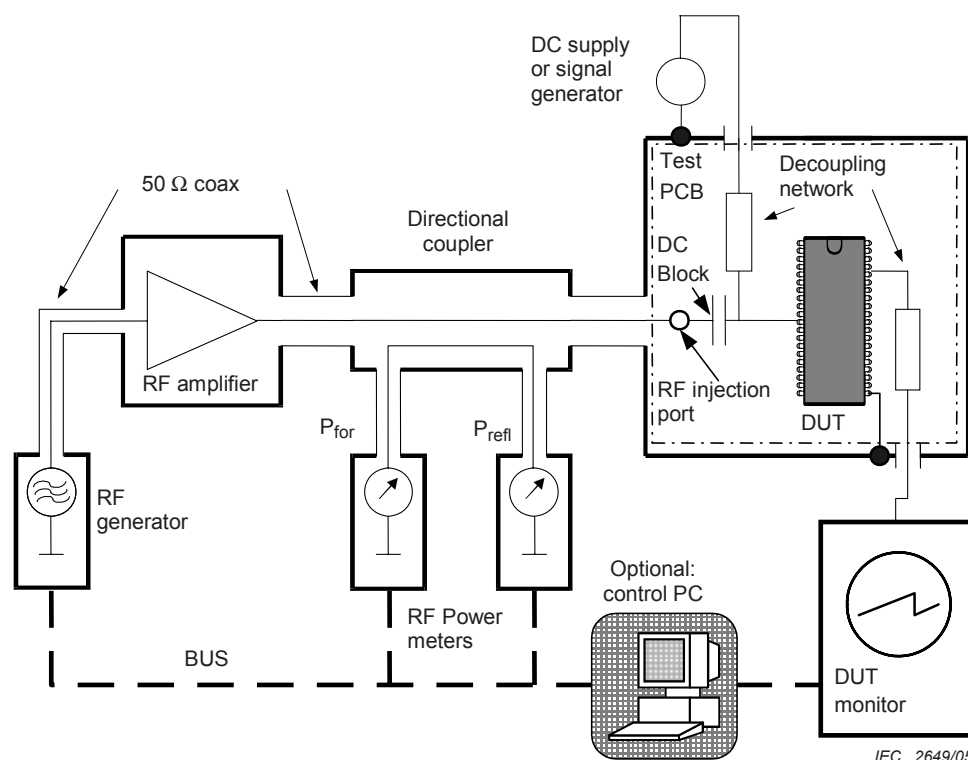
4.1 Measurement basics

The minimum electromagnetic immunity level required for an IC depends on the maximum permitted level of RF disturbance to which an electronic system can be submitted. The value of the immunity level is dependent on system and application specific parameters. To determine the immunity performance of an IC, a simple measurement procedure, and a measurement set-up in which resonances are avoided, is required to guarantee a high degree of repeatability. The following points out the base of this test.

The largest geometry found in an integrated circuit is the leadframe. The size of the leadframe is in the range of some centimetres or smaller. The dimensions of the structures on chip are even up to two magnitudes smaller than the dimension of the leadframe. For a frequency range below 1 GHz, this leadframe, as well as the structures on-chip, are not regarded as efficient antennas for the reception of unwanted RF energy. It is the cable harness and/or the traces of a printed circuit board which constitute efficient antennas. Thus, an IC receives the unwanted RF energy through the pins connected to the wires of such cables. Because of this, the electromagnetic immunity of an IC can be characterized by conducted RF disturbances (i.e. RF forward power) instead of field parameters as is usually the case in module and/or system testing.

For module and system tests, the forward power provided to a circuit by the cable harness or the traces on a printed circuit board (PCB) acting as antennas can be measured or estimated. This power is considered to be a forward power delivered to the circuit, no matter whether it will be reflected or absorbed. In fact it has been observed that many ICs are most susceptible to the disturbances at quite high reflections. This is due to the fact that in this case either injected RF currents or applied RF voltages reach the highest possible values. To characterize the immunity of an IC, the forward power needed to cause malfunction is measured. The malfunction may be classified from A to D according to the performance classes defined in IEC 62132-1.

Figure 1 shows the principal test hardware configuration with optional automatic control by the PC.



Key

P_{for} forward power
 P_{refl} reflected power

Figure 1 – Arrangement of a direct injection test set-up

The frequency variable RF generator provides the RF disturbance that is amplified by the connected RF amplifier. The directional coupler and the RF power meters are used to measure the actual forward power injected into the device under test (DUT). At the RF injection port the RF power is delivered to the test printed circuit board (PCB). The RF amplifier is decoupled by a DC block to avoid supplying DC into the amplifier output. The DC supply is prevented from getting RF power by a decoupling network that has a high RF impedance on the side that is connected to the RF injection path.

To monitor the behaviour of the DUT an oscilloscope, or other monitoring device preferably with a pass/fail function etc., can be used. To decouple the RF signal crosstalk of the DUT from the low frequency measurement performed by the oscilloscope, a second decoupling network is used. The measurement equipment can be optionally controlled by a computer, if desired.

Any function inside an IC can be affected even if it is not connected to the pin under test. Therefore the operation mode(s) of the IC shall be chosen in a way that all functions of the IC are used during the test.

ICs are often used in different configurations based on the application. In order to understand the influence of each individual pin, each pin that is expected to be exposed to RF disturbance should be tested individually. Multiple pin testing is permissible into pins of differential mode systems.