TECHNICAL SPECIFICATION

IEC TS 62228

First edition
2007-02

Integrated circuits – EMC evaluation of CAN transceivers

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTEGRATED CIRCUITS – EMC EVALUATION OF CAN TRANSCEIVERS

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IEC 62228, which is a technical specification, has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices.

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The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
47A/747/DTS	47A/761/RVC

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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INTEGRATED CIRCUITS – EMC EVALUATION OF CAN TRANSCEIVERS

1 Scope

This document specifies test and measurement methods, test conditions, test setups, test procedures, failure criteria and test signals for the EMC evaluation of CAN transceivers concerning:

- the immunity against RF common mode disturbances on the signal lines,
- the emissions caused by non-symmetrical signals regarding the time and frequency domain,
- the immunity against transients (function and damage), and
- the immunity against electrostatic discharges – ESD (damage).

All measurements and functional tests except ESD are performed in a small (three transceiver) network. For ESD damage tests a single transceiver configuration on a special test board is used.

External protection circuits are not applied during the tests in order to get results for the transceiver IC only.

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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 (all parts), *Integrated circuits – Measurement of electromagnetic emissions, 150 kHz to 1 GHz*

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 (all parts), *Integrated circuits – Measurement of electromagnetic immunity, 150 kHz to 1 GHz*

IEC 62132-1, *Integrated circuits – Measurement of electromagnetic immunity, 150 kHz to 1 GHz – 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 61000-4-2:1995, *Electromagnetic compatibility – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test*[1)]
Amendment 1 (1998)
Amendment 2 (2000)

ISO 7637-2: 2004, *Road vehicles – Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only*

———————

[1)] A consolidated edition 1.2 exists, including IEC 61000-4-2:1995 and its Amendment 1 (1998) and Amendment 2 (2000)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61967 and IEC 62132 apply.

4 Measurements and tests

4.1 General

For evaluation of the EMC characteristic of CAN transceivers different test conditions and test set-ups are used:

– configuration of three powered transceivers in a CAN network for:
  - evaluation of narrowband emission at the bus lines and
  - evaluation of RF and transient immunity at the bus lines, voltage supply line V_{Bat} and the wake-up line;

– configuration of single unpowered transceiver for testing the damage immunity against ESD of the pins for bus lines, V_{Bat} and wake-up on a test board with functional required external components.

An overview of the requested measurements and tests is given in Table 1.

Table 1 – Overview of requested measurements and tests

Transceiver state	Required test	Test method	Evaluation	Transceiver mode
Active (powered)	RF emission	150 Ω direct coupling (IEC 61967-4)	Spectrum and asymmetry	Normal
	RF immunity	DPI (IEC 62132-4)	Function	Normal
				Stand by
				Sleep
	Transient immunity	Supply lines- direct galvanic coupling I/O lines- capacitive coupling Test pulse wave forms (ISO 7637-2)	Function	Normal
				Stand by
				Sleep
			Damage	Normal
Passive (unpowered)	ESD	Contact discharge (IEC 61000-4-2)	Damage	Normal

In order to reduce the effort for the characterization and to increase the compatibility of the results of different transceiver types, the number of test methods is defined to a necessary minimum. The 150 Ω direct coupling, DPI and direct galvanic and capacitive coupling methods are chosen for the evaluation of the EMC characteristic of active transceivers in a network configuration with three CAN nodes. While using a conductive decoupling and coupling, these three test methods are based on the same approach. Thus it is possible to use the same PCB for all required active/functional tests and measurements. These tests can be performed on the same test board in a common test configuration and set-up.

To get more reproducible test results, all measurement and tests should be done with soldered transceivers.

The described test conditions, configurations and test procedures are based on present stand-alone CAN transceivers. In case of ASICs with an integrated CAN transceiver, the test conditions cannot be defined completely for any type of IC. If it is possible, the test conditions

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of stand-alone CAN transceivers should be used. The configuration of the physical layer of the CAN bus should be the same.

4.2 RF and transient tests

4.2.1 General test conditions and configurations

4.2.1.1 Test conditions

The general test conditions are given in Table 2:

Table 2 – General test conditions

Parameter	Value
Voltage supply V_{Bat}	(14 ± 0,2) V
Voltage supply V_{CC}	(5 ± 0,1) V (default)
Voltage supply V_{IO}	(5 ± 0,1) V (default)
Test temperature	(23 ± 5) °C

The ambient noise floor for emission measurements shall be below the expected signal noise and shall be documented in the test report.

4.2.1.2 Test configuration

For the transceiver EMC analysis, a minimum network of three bus nodes has to be set up according to Figure 1.

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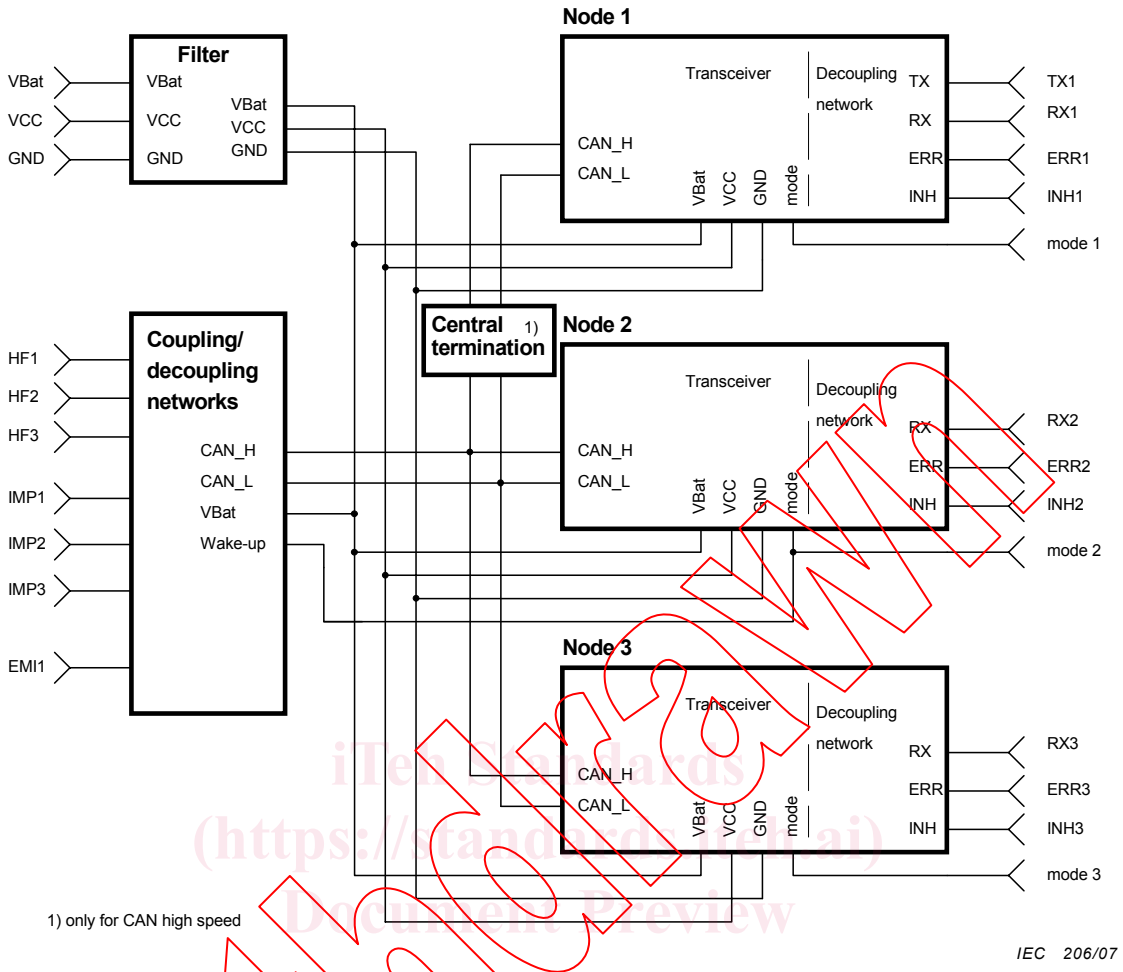

Figure 1 – Overview of a minimum configuration of a CAN system for emission and immunity tests against transient and RF disturbances

An example of a test circuit diagram for filter and the transceiver network for CAN high speed systems is given in Figure 2 and for CAN low speed systems in Figure 3.

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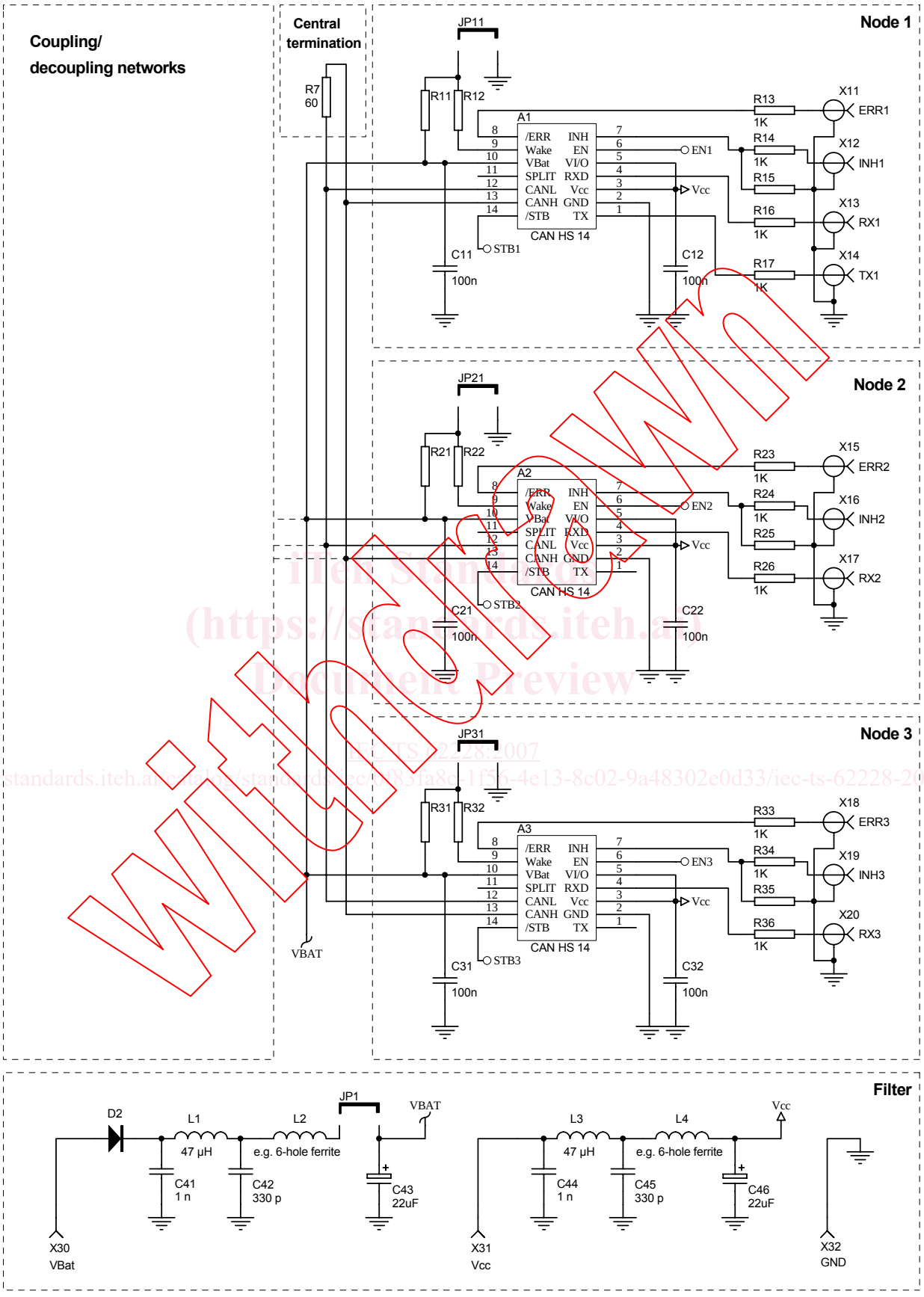

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Figure 2 – Example of the circuit diagram of the minimum network for a CAN high speed system for measuring emission and immunity in respect to RF disturbances and transients

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