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## Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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|                  |                        |
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| 1  | 2                                          | (3)                          | 4               | 5                                                                                                                                  | (6)                                                                      | 7                                                  |
|----|--------------------------------------------|------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------|
| MB | Clause No./ Subclause No./Annex (e.g. 3.1) | Paragraph/Figure/ Table/Note | Type of comment | Commend (justification for change) by the MB                                                                                       | Proposed change by the MB                                                | Secretariat observations on each comment submitted |
|    | 3.1                                        | Definition 1                 | ed              | Definition is ambiguous and needs clarifying.                                                                                      | Amend to read '...so that the mains connector to which no connection...' |                                                    |
|    | 6.4                                        | Paragraph 2                  | te              | The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK. | Delete reference to UV photometer.                                       |                                                    |



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SECRETARIAT:

Japan

SECRETARY:

Mr Yoshinori FUKUBA

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☒ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

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TITLE:

**Integrated circuits - EMC evaluation of transceivers – Part 7: CXPI transceivers**

NOTE FROM TC/SC OFFICERS:

The document was reviewed at SC 47A / WG9 meeting in Toulouse, France on 2019-05-23 and it was decided to distribute it as CD.

The comments on this CD will be reviewed at the meeting of SC 47A / WG9 in October.

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# CONTENTS

|    |                                                                            |    |
|----|----------------------------------------------------------------------------|----|
| 1  |                                                                            |    |
| 2  |                                                                            |    |
| 3  | FOREWORD.....                                                              | 5  |
| 4  | 1 Scope.....                                                               | 7  |
| 5  | 2 Normative references .....                                               | 7  |
| 6  | 3 Terms, definitions and abbreviated terms .....                           | 7  |
| 7  | 3.1 Terms and definitions.....                                             | 8  |
| 8  | 3.2 Abbreviated terms.....                                                 | 8  |
| 9  | 4 General .....                                                            | 8  |
| 10 | 5 Test and operating conditions .....                                      | 9  |
| 11 | 5.1 Supply and ambient conditions .....                                    | 9  |
| 12 | 5.2 Test operation modes .....                                             | 10 |
| 13 | 5.3 Test configuration .....                                               | 10 |
| 14 | 5.3.1 General test configuration for functional test.....                  | 10 |
| 15 | 5.3.2 General test configuration for unpowered ESD test.....               | 11 |
| 16 | 5.3.3 Coupling ports and coupling networks for functional tests .....      | 11 |
| 17 | 5.3.4 Coupling ports and coupling networks for unpowered ESD tests .....   | 12 |
| 18 | 5.3.5 Power supply with decoupling network.....                            | 13 |
| 19 | 5.4 Test signals .....                                                     | 13 |
| 20 | 5.4.1 General .....                                                        | 13 |
| 21 | 5.4.2 Test signals for normal operation mode .....                         | 13 |
| 22 | 5.4.3 Test signal for wanted wake-up from sleep mode.....                  | 14 |
| 23 | 5.5 Evaluation criteria .....                                              | 14 |
| 24 | 5.5.1 General .....                                                        | 14 |
| 25 | 5.5.2 Evaluation criteria in functional operation modes during exposure to |    |
| 26 | disturbances.....                                                          | 14 |
| 27 | 5.5.3 Evaluation criteria in unpowered condition after exposure to         |    |
| 28 | disturbances .....                                                         | 15 |
| 29 | 5.5.4 Status classes .....                                                 | 15 |
| 30 | 6 Test and measurement.....                                                | 15 |
| 31 | 6.1 Emission of RF disturbances.....                                       | 15 |
| 32 | 6.1.1 Test method .....                                                    | 15 |
| 33 | 6.1.2 Test setup .....                                                     | 15 |
| 34 | 6.1.3 Test procedure and parameters .....                                  | 16 |
| 35 | 6.2 Immunity to RF disturbances.....                                       | 17 |
| 36 | 6.2.1 Test method .....                                                    | 17 |
| 37 | 6.2.2 Test setup .....                                                     | 17 |
| 38 | 6.2.3 Test procedure and parameters .....                                  | 19 |
| 39 | 6.3 Immunity to impulses .....                                             | 20 |
| 40 | 6.3.1 Test method .....                                                    | 20 |
| 41 | 6.3.2 Test setup .....                                                     | 20 |
| 42 | 6.3.3 Test procedure and parameters .....                                  | 21 |
| 43 | 6.4 Electrostatic Discharge (ESD).....                                     | 23 |
| 44 | 6.4.1 Test method .....                                                    | 23 |
| 45 | 6.4.2 Test setup .....                                                     | 23 |
| 46 | 6.4.3 Test procedure and parameters .....                                  | 25 |
| 47 | 7 Test report.....                                                         | 25 |
| 48 | Annex A (normative) CXPI test circuits .....                               | 26 |

|    |                                                                                               |                                                                                  |    |
|----|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----|
| 49 | A.1                                                                                           | General.....                                                                     | 26 |
| 50 | A.2                                                                                           | CXPI test circuit for functional tests on standard CXPI transceiver ICs.....     | 26 |
| 51 | A.3                                                                                           | CXPI test circuit for unpowered ESD test on a standard CXPI transceiver IC ..... | 29 |
| 52 | Annex B (normative)                                                                           | Test circuit boards .....                                                        | 30 |
| 53 | B.1                                                                                           | Test circuit board for functional tests .....                                    | 30 |
| 54 | B.2                                                                                           | ESD test .....                                                                   | 30 |
| 55 | Annex C (informative)                                                                         | Examples for test limits for CXPI transceiver in automotive                      |    |
| 56 |                                                                                               | application.....                                                                 | 32 |
| 57 | C.1                                                                                           | General.....                                                                     | 32 |
| 58 | C.2                                                                                           | Emission of RF disturbances.....                                                 | 32 |
| 59 | C.3                                                                                           | Immunity to RF disturbances.....                                                 | 33 |
| 60 | C.4                                                                                           | Immunity to impulse .....                                                        | 35 |
| 61 | C.5                                                                                           | Electrostatic Discharge (ESD).....                                               | 35 |
| 62 | Annex D (informative)                                                                         | Example of a test setup and procedure for mode transitions.....                  | 36 |
| 63 | D.1                                                                                           | General.....                                                                     | 36 |
| 64 | D.2                                                                                           | An example of the timing chart of the mode transition .....                      | 36 |
| 65 | Annex E (informative)                                                                         | Points to note for impulse immunity measurement.....                             | 38 |
| 66 | E.1                                                                                           | General.....                                                                     | 38 |
| 67 | E.2                                                                                           | Points to note when testing Pulse 1 .....                                        | 38 |
| 68 | Bibliography.....                                                                             |                                                                                  | 40 |
| 69 |                                                                                               |                                                                                  |    |
| 70 | Figure 1 – General test configuration for tests in functional operation modes .....           |                                                                                  | 10 |
| 71 | Figure 2 – General test configuration for unpowered ESD test .....                            |                                                                                  | 11 |
| 72 | Figure 3 – Coupling ports and networks for functional tests .....                             |                                                                                  | 11 |
| 73 | Figure 4 – Coupling ports and networks for unpowered ESD tests .....                          |                                                                                  | 12 |
| 74 | Figure 5 – Principal drawing of the maximum deviation in the I-V characteristic .....         |                                                                                  | 15 |
| 75 | Figure 6 – Test setup for measurement of RF disturbances .....                                |                                                                                  | 16 |
| 76 | Figure 7 – Test setup for DPI tests .....                                                     |                                                                                  | 18 |
| 77 | Figure 8 – Test setup for impulse immunity tests .....                                        |                                                                                  | 21 |
| 78 | Figure 9 – Test setup for direct ESD tests.....                                               |                                                                                  | 24 |
| 79 | Figure A.1 General drawing of the circuit diagram of the test network for standard CXPI       |                                                                                  |    |
| 80 | transceiver ICs for functional tests .....                                                    |                                                                                  | 28 |
| 81 | Figure A.2 – A general drawing of the test circuit diagram for testing direct ESD of          |                                                                                  |    |
| 82 | CXPI transceiver in unpowered mode .....                                                      |                                                                                  | 29 |
| 83 | Figure B.1 – Example of IC interconnections of CXPI signal .....                              |                                                                                  | 30 |
| 84 | Figure B.2 – Example of ESD test board for CXPI transceivers .....                            |                                                                                  | 31 |
| 85 | Figure C.1 – Example of limits for RF emission - CXPI.....                                    |                                                                                  | 32 |
| 86 | Figure C.2 – Example of limits for RF emission - VBAT.....                                    |                                                                                  | 32 |
| 87 | Figure C.3 – Example of limits for RF immunity for functional status class AIC – CXPI .....   |                                                                                  | 33 |
| 88 | Figure C.4 – Example of limits for RF immunity for functional status class AIC – VBAT.....    |                                                                                  | 33 |
| 89 | Figure C.5 – Example of limits for RF immunity for functional status class CIC or DIC -       |                                                                                  |    |
| 90 | CXPI.....                                                                                     |                                                                                  | 34 |
| 91 | Figure C.6 – Example of limits for RF immunity for functional status class CIC or DIC -       |                                                                                  |    |
| 92 | VBAT .....                                                                                    |                                                                                  | 34 |
| 93 | Figure D.1 – Example of timing chart for mode transition in 2 transceiver configuration ..... |                                                                                  | 36 |
| 94 | Figure E.1 – Relationship between ISO 7637-2 Pulse 1 and transceiver VBAT supply .....        |                                                                                  | 38 |
| 95 | Figure E.2 – Transceiver VBAT supply image when t2 time is shortened.....                     |                                                                                  | 39 |

|     |                                                                                                |    |
|-----|------------------------------------------------------------------------------------------------|----|
| 96  |                                                                                                |    |
| 97  | Table 1 – Overview of required measurement and tests .....                                     | 9  |
| 98  | Table 2 – Supply and ambient conditions for functional operation .....                         | 9  |
| 99  | Table 3 – Definition of coupling ports and coupling network component for functional           |    |
| 100 | tests .....                                                                                    | 12 |
| 101 | Table 4 – Definitions of coupling ports for unpowered ESD tests.....                           | 13 |
| 102 | Table 5 – Communication test signal TX1 .....                                                  | 13 |
| 103 | Table 6 – Evaluation criteria for standard CXPI transceiver ICs in functional operation        |    |
| 104 | modes.....                                                                                     | 14 |
| 105 | Table 7 – Parameters for emission measurements.....                                            | 17 |
| 106 | Table 8 – Settings for the RF measurement equipment.....                                       | 17 |
| 107 | Table 9 – Specifications for DPI tests .....                                                   | 19 |
| 108 | Table 10 – Required DPI tests for functional status class AIC evaluation of standard           |    |
| 109 | CXPI transceiver ICs .....                                                                     | 20 |
| 110 | Table 11 – Required DPI tests for functional status class CIC, D1IC or D2IC evaluation         |    |
| 111 | of standard CXPI transceiver ICs .....                                                         | 20 |
| 112 | Table 12 – Specifications for impulse immunity tests .....                                     | 22 |
| 113 | Table 13 – Parameters for impulse immunity tests .....                                         | 22 |
| 114 | Table 14 – Required impulse immunity tests for functional status class AIC evaluation          |    |
| 115 | of standard CXPI transceiver ICs .....                                                         | 23 |
| 116 | Table 15 – Required impulse immunity tests for functional status class CIC, D1IC or            |    |
| 117 | D2IC evaluation of standard CXPI transceiver ICs .....                                         | 23 |
| 118 | Table 16 – Recommendations for direct ESD tests .....                                          | 25 |
| 119 | Table B.1 – Parameter ESD test circuit board.....                                              | 31 |
| 120 | Table C.1 – Example of limits for impulse immunity for functional status class CIC or DIC .... | 35 |
| 121 |                                                                                                |    |
| 122 |                                                                                                |    |
| 123 |                                                                                                |    |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TITLE INTEGRATED CIRCUITS -  
EMC EVALUATION OF TRANSCEIVERS -  
Part 7: CXPI transceivers****FOREWORD**

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International Standard IEC 62228-7 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:

|             |                  |
|-------------|------------------|
| FDIS        | Report on voting |
| 47A/XX/FDIS | 47A/XX/RVD       |

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

- 178 • reconfirmed,
- 179 • withdrawn,
- 180 • replaced by a revised edition, or
- 181 • amended.

182

183 The National Committees are requested to note that for this document the stability date is  
184 2026.

185 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE  
186 DELETED AT THE PUBLICATION STAGE.

187

# INTEGRATED CIRCUITS – EMC EVALUATION OF TRANSCEIVERS –

## Part 7: CXPI transceivers

### 1 Scope

This part of IEC 62228 specifies test and measurement methods for EMC evaluation of CXPI transceiver 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 standard CXPI transceiver ICs and 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, 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 61967-1, *Integrated circuits – Measurement of electromagnetic emissions, 150 kHz to 1 GHz – Part 1: General conditions and definitions*
- IEC 61967-4, *Integrated circuits – Measurement of electromagnetic emissions, 150 kHz to 1 GHz – Part 4: Measurement of conducted emissions – 1  $\Omega$ /150  $\Omega$  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 Power 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*
- ISO 20794-4, *Road vehicles – Clock extension peripheral interface (CXPI) – Part 4: Data link layer and physical layer*
- Electronic Components Industry Association, *EIA-198, Ceramic Dielectric Capacitors Classes I, II, III and IV*

### 3 Terms, definitions and abbreviated terms

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1 Terms and definitions

#### 3.1.1

##### global pin

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

#### 3.1.2

##### standard CXPI transceiver IC

standalone CXPI transceiver according to ISO 20794 or IC with integrated CXPI transceiver cell with access to CXPI Rx/D and Tx/D signal

#### 3.1.3

##### mandatory components, pl

components needed for proper function of IC as specified by the IC manufacturer

### 3.2 Abbreviated terms

CXPI          Clock Extension Peripheral Interface

IBS          Inter-Byte-Space

## 4 General

The intention of this document is to evaluate the EMC performance of CXPI transceiver ICs under application conditions in a minimal network.

The evaluation of the EMC characteristics of CXPI transceivers shall be performed in functional operation modes under network condition for RF emission, RF immunity and impulse immunity tests, and on a single unpowered transceiver IC for electrostatic discharge tests.

The aim of these tests is to determine the EMC performance on dedicated global pins of the CXPI transceiver, which are considered as EMC relevant in the application. For a standard CXPI transceiver IC, these pins are VBAT and CXPI.

The test methods used for the EMC characterization are based on the international standards for IC EMC tests and are described in Table 1.

264

**Table 1 – Overview of required measurement and tests**

| Transceiver mode     | Required test          | Test method                                       | Evaluation | Functional operation mode |
|----------------------|------------------------|---------------------------------------------------|------------|---------------------------|
| Functional (powered) | RF emission (EMI)      | 150 $\Omega$ direct coupling (IEC 61967-4)        | Spectrum   | Normal                    |
|                      | RF immunity (RF)       | DPI (IEC 62132-4)                                 | Function   | Normal                    |
|                      |                        |                                                   |            | Sleep                     |
|                      | Impulse immunity (IMP) | Non-synchronous transient injection (IEC 62215-3) | Function   | Normal                    |
|                      |                        |                                                   |            | Sleep                     |
| Passive (unpowered)  | ESD                    | Contact discharge (ISO 10605)                     | Damage     | Off                       |

265

266 The RF emission, RF immunity and impulse immunity test methods are chosen for the  
 267 evaluation of the EMC characteristic of transceivers in functional (powered) modes. These  
 268 three test methods are based on the same approach using conductive coupling. Therefore it is  
 269 possible to use the same test board for all tests in functional operation mode, which reduces  
 270 the effort required and increases the reproducibility and comparability of test results.

271 The ESD test is performed on passive (unpowered) transceiver IC on a separate test board.

272 All measurements and tests should be done with soldered transceivers on special test boards  
 273 as described in Annex B, to ensure application like conditions and avoid setup effects by  
 274 sockets.

## 275 5 Test and operating conditions

### 276 5.1 Supply and ambient conditions

277 For all tests and measurements under operating conditions, the settings are based on  
 278 systems with a 12 V power supply, which is the main application for CXPI transceivers. If a  
 279 transceiver is designed or targeted for a higher power supply voltage, the test conditions and  
 280 test targets shall be adapted and documented accordingly. The defined supply and ambient  
 281 conditions for functional operation are given in Table 2. Although the standard voltage of  
 282  $V_{CC_{ext}}$  is 5 V, other voltages such as 3,3 V may be supplied depending on the product.

283

**Table 2 – Supply and ambient conditions for functional operation**

| Parameter                      | Value                                        |
|--------------------------------|----------------------------------------------|
| Voltage supply $V_{BAT_{ext}}$ | (14 $\pm$ 0,2) V (default)                   |
| Voltage supply $V_{CC_{ext}}$  | (5 $\pm$ 0,1) V (default), (3,3 $\pm$ 0,1) V |
| Test temperature               | (23 $\pm$ 5) °C                              |

284

285 For RF emission measurements the ambient noise floor shall be at least 6 dB below the  
 286 applied target limit and documented in the test report.

287 Unpowered ESD tests shall be carried out without any supply voltage, and the requirements  
 288 of ISO 10605 climatic environmental conditions shall be applied.

## 5.2 Test operation modes

The CXPI transceiver ICs shall be tested in powered functional operation modes and passive in the unpowered off mode. The functional operation modes are normal mode and sleep mode.

## 5.3 Test configuration

### 5.3.1 General test configuration for functional test

The test configuration in general consists of CXPI transceivers with mandatory external components and components for filtering and decoupling (CXPI<sub>ext</sub> node) in a minimal test network, where filtered power supplies, signals, monitoring probes and coupling networks are connected as shown in Figure 1.

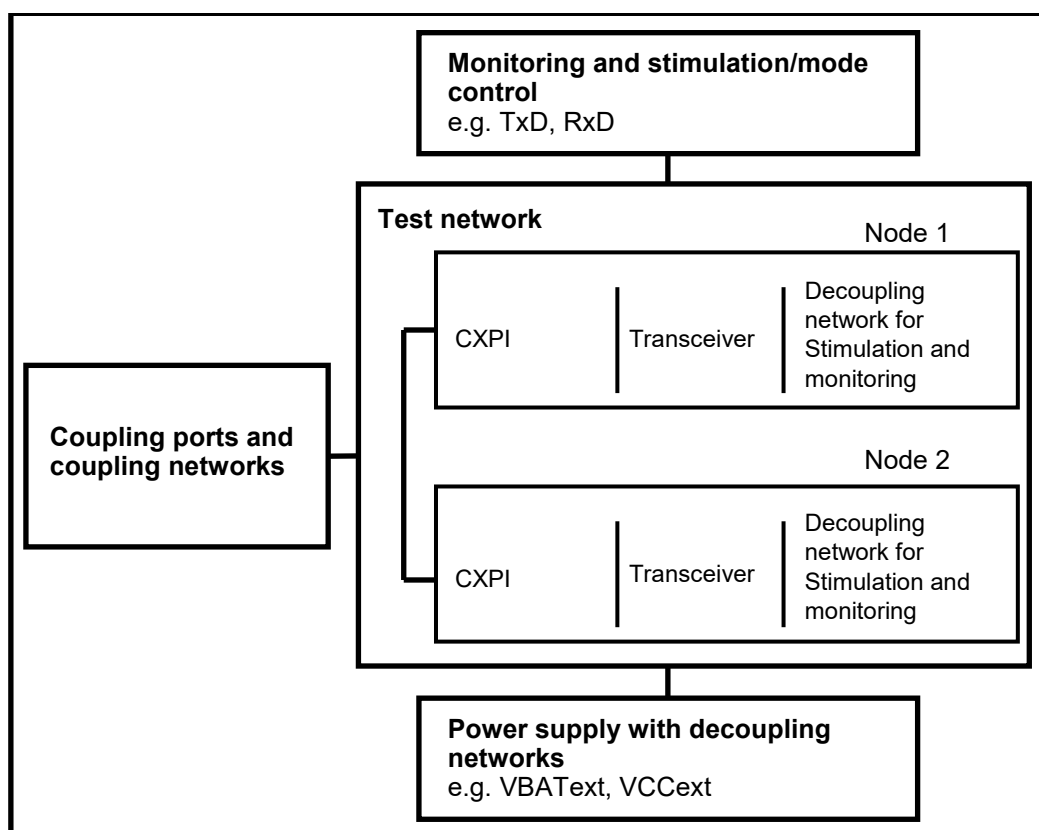


Figure 1 – General test configuration for tests in functional operation modes

The time constant adjusting bus filter shall be used to comply with the CXPI bus time constant defined in ISO 20794-4, in addition to the bus filters for the two transceivers.

For evaluation of RF emissions, RF immunity and the impulse immunity characteristics of a CXPI transceiver in functional operation mode, a minimal CXPI test network consisting of two CXPI transceiver ICs of the same type shall be used.

NOTE In specific cases or for analyses, a deviation from this setup can be agreed between the users of this document and will be noted in the test report.

A general drawing of a schematic with more details of the CXPI transceiver test network is given in Annex A.

### 5.3.2 General test configuration for unpowered ESD test

The general test configuration for unpowered ESD test of CXPI transceiver ICs consists of a single CXPI transceiver IC with mandatory external components and components for filtering on a test board with discharge coupling networks as shown in Figure 2.

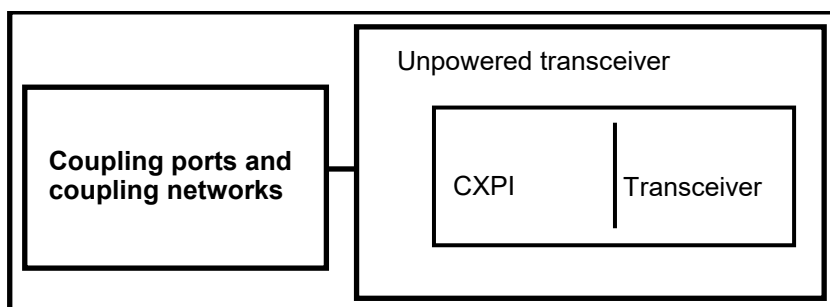


Figure 2 – General test configuration for unpowered ESD test

### 5.3.3 Coupling ports and coupling networks for functional tests

The coupling ports and coupling networks are used to transfer disturbances to or from the test network with a defined transfer characteristic. The schematic of the coupling ports, networks and pins are shown in Figure 3. The basic measurement pins are CXPI and VBAT, but other pins connected to the ECU connector shall also be measured. The values of the components are depending on the test method and are defined in Table 3. The tolerance of the components should be 1 % or less.

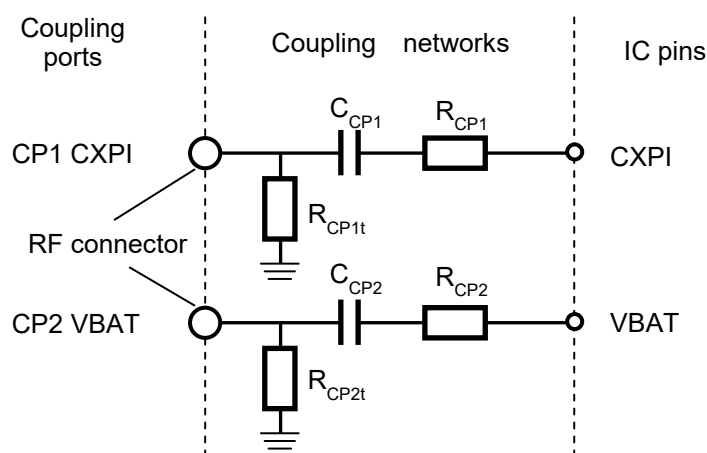


Figure 3 – Coupling ports and networks for functional tests