

# Toshiba Electronic Devices & Storage Corporation EMC testing laboratory receives ISO/IEC 17025 accreditation

Conformity to standards stipulated by laws and directives is required when selling products such as IoT and in-vehicle equipment, where performance, integration and miniaturization are advancing at a rapid pace. In recent years, compliance to EMC (Electromagnetic Compatibility) is also becoming a requirement in many countries. It is necessary to address the EMC from the design stage of the equipment, and the need to confirm the EMC performance of the semiconductor devices by themselves is increasing.

Toshiba Electronic Devices & Storage Corporation opened a semiconductor EMC testing laboratory in 2016. It recently received accreditation by Japan Accreditation Board (JAB) that it meets the "administrative requirements" and "requirements on technical capacity according to the type of tests" defined by the ISO/IEC 17025 standard.

Many countries in the world use ISO/IEC certification to determine technical capability. By acquiring ISO/IEC 17025 accreditation the results of our EMC laboratory test results will be recognized and accepted worldwide.

## 1. Overview

In recent years, systems are advancing in sophistication, performance and miniaturization. This leads to devices becoming more prone to malfunction due to electromagnetic noise, leading to safety issues. In order to ensure electromagnetic noise immunity, it is necessary to check the EMC performance of the semiconductor components from the initial design stage of the equipment.

In addition, with the adoption of EMC regulations in many countries and regions, it is necessary to satisfy these regulatory requirements to be able to distribute these products using these semiconductor integrated circuits.

For automobile and in-vehicle equipment in Japan, the EMC regulations are referred to in the "Safety Standards of the Road transportation Vehicles" derived from the "Regulation 10" defined by the United Nations European Economic Committee. In addition, laws and regulations in various fields such as the "Electrical Appliances and Materials Safety Act" for home appliances, the "Law on Securing Quality, Efficacy and Safety of Products including Pharmaceuticals and Medical Devices" in medical equipment and others are applicable.

EMC standards define the noise performance of electric and electronic systems such as automobiles, in-vehicle devices, consumer devices, and industrial devices. Specific standards are shown below:

CISPR (Comité International Spécial des Perturbations Radioélectriques, International Radio Interference Special Committee)

IEC (International Electrotechnical Commission)

ISO (International Organization for Standardization)

Also, since the 1990's, the SC 47 A (Subcommittee 47 A), WG 2 (Working Group 2) and WG 9 of IEC standardize the EMC modeling and measuring method of semiconductor integrated circuits. So far, the following has been standardized.

Emission standard - IEC 61967 series

Immunity standards - IEC 62132 and IEC 62215 series

Simulation modeling standard - IEC 62433 series

In recent years, the focus of discussion has shifted to the standardization of the IEC 62228 series which deals primarily with the evaluation of bus transceiver ICs operating in wired networks used by in-vehicle equipment. In the field of automobiles, it is necessary to have high reliability and real-time data transfer capability together with the ability to process large amounts of sensor, video and other data traffic for self-driving operation, such that ensuring EMC performance of an in-vehicle network cannot be avoided.

These standards do not define new measurement methods. Referring to already standardized procedures, tests for bus transceivers are specified in IEC 61967-4 (conducted emission 1Ω/150Ω method), similarly for IEC 62132-4 (conducted immunity DPI method), IEC 62215-3 (Conduct Impulse Immunity Non-synchronous Transient Pulse), and ISO 10605 (Electrostatic discharge).

On the other hand, modeling standards of semiconductors for equipment and system design and development are being standardized as IEC 62433 series.

Dealing with noise is becoming more difficult with recent systems due to functional complexity and miniaturization. The importance of reducing risk at the design stage by means of simulation is increasing, and standardization of semiconductor EMC models for implementation at the equipment level is called for.

## 2. Standard for EMC measurement methods and applications

The integrated circuit EMC measurement methods discussed and standardized by IEC to date are as follows:

Emission measurement method: IEC 61967 series

Immunity measurement method: IEC 62132 series

Impulse immunity measurement method: IEC 62215 series

Table 1: Emission measurement method - IEC 61967 series

Part	Class	Measurement method	Status
1	General	General conditions and definitions	IS, Ed2.0,2019
2	Radiated	TEM-cell method	IS, Ed1.0,2005
3	Radiated	Surface scan method	TS, Ed2.0,2014
4	Conducted	1 $\Omega$ / 150 $\Omega$ Direct coupling method	IS, Ed1.1,2006
5	Conducted	Workbench Faraday cage method	IS, Ed1.0,2003
6	Conducted	Magnetic probe method	IS, Ed1.1, 2010
8	Radiated	IC strip-line method	IS, Ed1.0, 2011

Table 2: Immunity measurement method - IEC 62132 series

Part	Class	Measurement method	Status
1	General	General conditions and definitions	IS, Ed2.0,2015
2	Radiated	TEM cell method	IS, Ed1.0,2010
3	Radiated	BCI method	IS, Ed2.0,2007
4	Conducted	DPI method	IS, Ed1.0,2006
5	Conducted	Workbench Faraday cage Method	IS, Ed1.0,2005
8	Radiated	IC stripline method	IS, Ed1.0, 2012
9	Radiated	Surface scan method	TS, Ed1.0, 2014

Table 3: Impulse immunity measurement method - IEC 62215 series

Part	Class	Measurement method	Status
2	Conducted	Synchronous transient injection method	TS, Ed2.0,2007
3	Conducted	Non-synchronous transient injection method	IS, Ed1.0,2013

In Japan, discussions and submissions of proposals to IEC are made by the semiconductor group of JEITA (Japan Electronics and Information Technology Industries Association) consisting of the semiconductor subcommittee of the product technology standardization committee / integrated circuit product technology committee.

Toshiba Electronic Devices & Storage Corporation participates in this subcommittee and provides experts to attend discussions at these IEC sessions.

Radiation: Noise transmitted through space surrounding the IC

Conduction: Noise transmitted through the mounting boards and wiring

TEM: Transverse Electro-Magnetic

BCI: Bulk Current Injection

DPI: Direct RF Power Injection

IS: International Standard

TS: Test Specification

Ed: Edition

In the European automotive field in particular, adoption of these standards is increasing.

Bosch/Infineon/Siemens VDO Generic IC EMC Test Specification (BISS) is widely accepted as the de-facto for semiconductor EMC testing, formulated by Robert Bosch GmbH / Infineon Technologies AG / Siemens VDO (now Continental Automotive GmbH). The sections referred as the standard measurement methods in this common specification are indicated below:

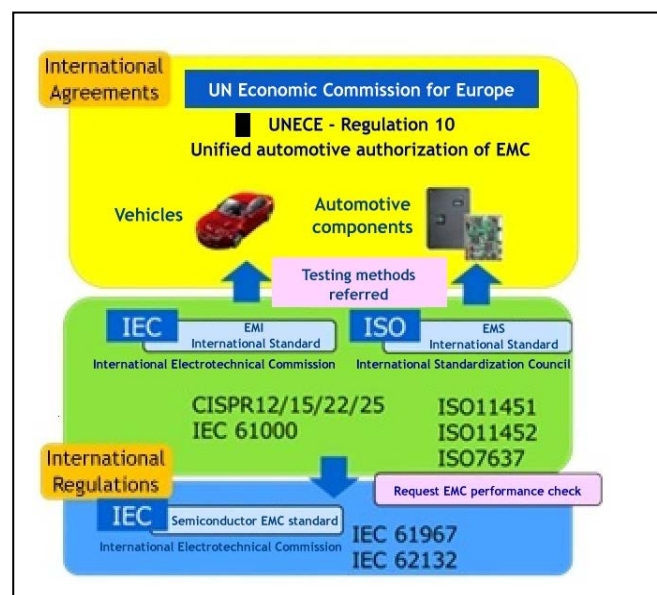


Figure 1 EMC test requirements for vehicles and automotive equipment

#### Conducted RF test method

##### IEC 61967-4 Conducted emission - 1Ω/150Ω method

- 1Ω method: Insert a 1Ω resistor in GND of IC and measure high frequency current
- 150Ω method: Measure high frequency current of output signal of IC with 150Ω coupled network.

##### IEC 62132-4 conduction immunity - DPI method

- Apply an interference signal directly to the board by capacitive coupling and note whether the IC malfunctions.

#### Radiated RF test method

##### IEC 61967-2 Radiation Emission - TEM Cell Method

- Mount the evaluation board on the side of a small TEM cell and measure direct radiation from the IC.

##### IEC 61967-8 Radiation Emission - IC Strip Line Method

- Place a stripline matched to characteristic impedance 50Ω on the top side of IC and measure radiation.

##### IEC 62132-2 Radiated immunity - TEM cell method

- Mount the evaluation board on the side of a small TEM cell and note whether the IC malfunctions at the time of radiation applied to the IC.

##### IEC 62132-8 Radiated immunity - IC Strip line method

- Place a stripline having a characteristic impedance of 50Ω on the top side of the IC and note whether the IC malfunctions when radiation noise is applied to the IC.

##### - Transient pulse test method

##### IEC 62215-3 transient immunity – non-synchronous transient injection method

- Insert interference pulse into the evaluation board and note whether the IC malfunction.

In Germany, ZVEI (Zentralverband Elektrotechnik und Elektronikindustrie eV) has issued the BISS specification as its own version of the Generic IC EMC Test Specification, where the latest version V 2.1 is on its website (\*).

(\*)[https://www.zvei.org/fileadmin/user\\_upload/Presse\\_und\\_Medien/Publikationen/2017/Juli/Generic\\_IC\\_EMC\\_Test\\_Specification/Generic\\_IC\\_EMC\\_Test\\_Specification\\_2.1\\_180713\\_ZVEI.pdf#search=%27ZVEI+EMC%27](https://www.zvei.org/fileadmin/user_upload/Presse_und_Medien/Publikationen/2017/Juli/Generic_IC_EMC_Test_Specification/Generic_IC_EMC_Test_Specification_2.1_180713_ZVEI.pdf#search=%27ZVEI+EMC%27)

## 3. Test laboratory accredited by ISO/IEC 17025

Toshiba Electronic Devices & Storage Corporation introduced test equipment in compliance with the above-mentioned international standards for semiconductor EMC testing and started operations from 2016. In order to provide reliable data to customers in a timely manner, the laboratory recently obtained accreditation from JAB.

Laboratory accreditation is a means to certify the technical competence of a laboratory conducting specific tests, not only as an official recognition of competency but also as validation that it satisfies customer needs. It demonstrates that reliable testing work can be performed.

ISO/IEC 17025 is an international standard of general requirements, established by ISO, concerning the capabilities of laboratories and calibration agencies. It is used and referenced by the accreditation bodies.

Certification logos can be attached to the measurement data and the test reports from the accredited laboratories which performed this certification testing. The results are accepted as reliable data. In the automobile quality management system IATF (International Automotive Task Force) 16949, as a requirement for a test laboratory, it is prescribed as follows: "When acquiring data from an external laboratory, the laboratory must be either accredited by ISO/IEC 17025 or an equivalent domestic standard by a

member of the ILAC MRA International Laboratory Accreditation Cooperation, Mutual Recognition Agreement, and the applicable examination is within the scope of the accreditation. The certificate of the test report shall include the mark of the national accreditation body."

For automobiles and automotive products, it is required to submit data taken by an ISO/IEC 17025 accredited laboratory together with a report having a certification mark. In other words, it is necessary to provide reliable test data satisfying the acceptance requirements for each country.

Although data from ISO/IEC 17025 accredited laboratory is not a requirement for EMC data for semiconductors, we will be able to provide highly reliable data to customers in a timely manner through this certification. The risks associated with noise issues can be avoided, facilitating product development and shortening the development period.

The current laboratory accreditation scope by JAB is as follows.

This time around, we obtained accreditation for conducted emission and immunity tests, which are the test items most requested, but we will continue to expand the scope of accreditation to be able to cater to a wide range of testing methods.

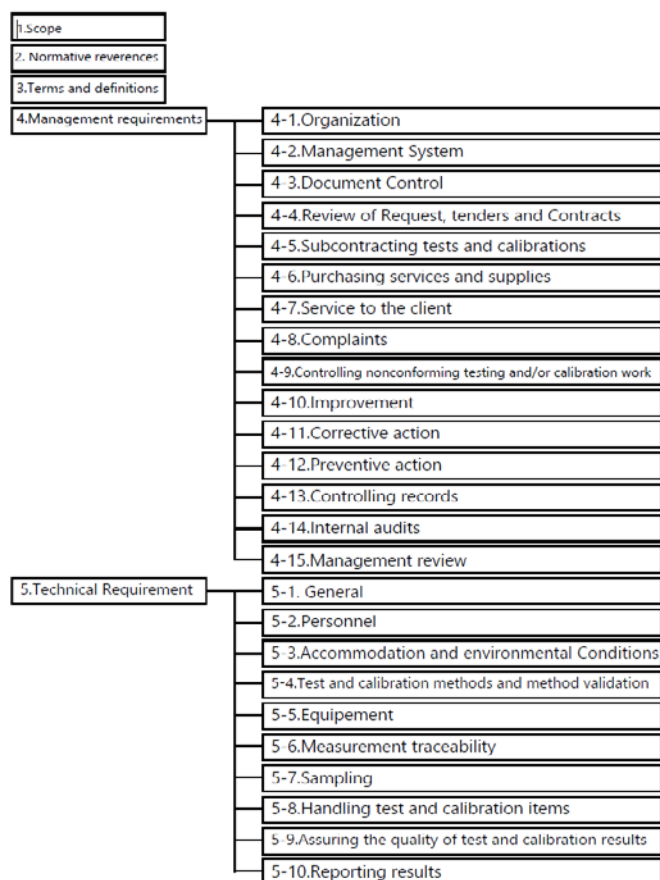


Figure 2 ISO/IEC 17025 structure

#### Accreditation overview

Laboratory name	Toshiba Electronic Devices & Storage Corporation Semiconductor EMC Laboratory
Location	1 Komukai Toshiba-cho, Saiwai-ku, Kawasaki-shi, Kanagawa
Accreditation number	RTL04560
Valid period	2018/9/19 ~ 2022/9/30

#### Accreditation scope

Area	M21 Electrical tests
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Area code & test name	Test standard
M21 Electrical M21.4 Electromagnetic compatibility M21.4.1 Continuous conduction disturbance	IEC 61967-1 IEC 61967-4 (excl. 1Ω)
M21 Electrical M21.4 Electromagnetic compatibility M21.4.18 RF conducted Interference Immunity	IEC 62132-1 IEC 62132-4