

ANSI/ESD STM5.1-2007

ESD Association Standard Test Method

ANSI/ESD STM5.1-2007

Revision of ANSI/ESD STM5.1-2001

*For Electrostatic Discharge
Sensitivity Testing –*

*Human Body Model (HBM)
Component Level*



*Electrostatic Discharge Association
7900 Turin Road, Bldg. 3
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***ESD Association Standard Test Method
for Electrostatic Discharge Sensitivity Testing –
Human Body Model (HBM)
Component Level***

ESD Association
Approved September 16, 2007



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FOREWORD

The ANSI/ESD STM5.1-2001 document has been reviewed and updated in 2006. The basic specifications in the document have not changed. A list of the edits made to this document is shown in Annex F, titled “ANSI/ESD STM5.1-2007 Revision History.”

The most significant changes to the document include new definitions of different measurement terms that define the HBM peak current, I_{ps}. A new definition for the “No Connect Pin” has been added and the requirements to HBM stress this family of pins has been removed. The other changes to the document include the requirement to verify the peak current waveform for each independent “pulse generation circuit,” slight edits to how I_{ps} peak current can be verified in Section 7.0, relaxation of the 2 ohm requirement to 3 ohm requirement for the bus resistance between like name power and/or ground supply pins, optional check for “trailing current pulse,” and another optional check for the “voltage before the pulse.”

The removal of the HBM stressing of the No Connect Pin was made because the HBM Work Group believes the existing HBM simulators cannot correctly test these pins. New research has shown that the testing of this type of pin is more difficult due to the interaction of the HBM simulator tester parasitics. Until a better test procedure can be defined, the Work Group believes the best option at this time is to stop HBM stressing the No Connect Pin.

This revision includes two new optional measurements that address newly discovered HBM test equipment parasitic artifacts. They include an optional check for a “trailing current pulse” and an optional check for the “voltage before the pulse.” Two recent HBM research papers have demonstrated that HBM sensitivity levels can be falsely classified due to the parasitic artifacts unintentionally built into the HBM simulators. Two new sections, Annex C and D, have been added so that the user can determine if their HBM simulator has these artifacts. Not all semiconductor components are sensitive to these tester artifacts, but the Work Group wanted the ESD user community to know that these artifacts exist and can potentially influence the HBM sensitivity levels of semiconductor components. If a user suspects that the tester artifacts are a factor, the best option to prove or disprove this affect is to repeat the exact fail pin HBM stress combination using a two-pin manual HBM simulator. If the failures cannot be reproduced using the non-relay type HBM simulator, then the HBM failures may be due to the relay matrix simulator tester artifacts. The ESD equipment manufactures have developed equipment repairs to fix some of the existing HBM simulators. The user is advised to contact their ESD equipment manufacturer for further information.

Historically, this document's test procedures were derived from MIL-STD-883D and MIL-STD-STD-750 Notice A (see Annex E). As a living document, updates and changes will be made to this document as they are required.

This document was originally designated EOS/ESD S5.1-1991 and approved on June 6, 1991. ANSI/EOS/ESD 5.1-1993 was a revision of EOS/ESD S5.1-1991 and was approved on June 9, 1993. ESD STM5.1-1998 was a revision and redesignation of ANSI/EOS/ESD S5.1-1993 and was approved on February 8, 1998. ANSI/ESD STM5.1-2001 was a revision of ESD STM5.1-1998 and was approved on May 20, 2001. ANSI/ESD STM5.1-2007 is a revision of ANSI/ESD STM5.1-2001 and was approved by the ESD Association Standards Committee on September 16, 2007. All documents were prepared by the 5.1 Device Testing (HBM) Subcommittee.

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ESD Association Standard Test Method for Electrostatic Discharge Sensitivity Testing Human Body Model (HBM) – Component Level

1.0 SCOPE AND PURPOSE

1.1 Scope

This document establishes the procedure for testing, evaluating, and classifying the electrostatic discharge (ESD) sensitivity of components to the defined human body model (HBM).

1.1.1 Existing Data

Data previously generated with testers meeting all waveform criteria of this standard shall be considered valid test data.

1.2 Purpose

The purpose of this document is to establish a test method that will replicate HBM failures and provide reliable, repeatable results from tester to tester, regardless of component type. Repeatable data will allow accurate comparisons of HBM ESD sensitivity levels.

2.0 REFERENCED PUBLICATIONS

Unless otherwise specified, the following documents of the latest issue, revision or amendment form a part of this standard to the extent specified herein:

ESD ADV1.0, ESD Association Glossary of Terms¹

ANSI/ESD STM5.2, Machine Model – Component Level¹

3.0 DEFINITIONS

The following definitions are consistent with those in the ESD Association Glossary of Terms.

Component. An item such as a resistor, diode, transistor, integrated circuit or hybrid circuit.

Component failure. A condition in which a tested component does not meet one or more specified static or dynamic data sheet parameters.

Data sheet parameters. The static and dynamic component performance data supplied by the component manufacturer or user.

Discrete component. An elementary electronic device constructed as a single unit.

Dynamic parameters. Parameters measured with the component in an operating condition. These may include, but are not limited to full functionality, output rise and fall times under a specified load condition, and dynamic current consumption.

Electrostatic discharge sensitivity (ESDS). The ESD level that causes component failure.

ESD withstand voltage. The maximum ESD level that does not cause component failure.

Human body model (HBM) ESD. An ESD event meeting the waveform criteria specified in this standard, approximating the discharge from the fingertip of a typical human being.

Ips_{max}. The peak current maximum value is the highest current value measured. This value includes the overshoot or ringing components due to internal test simulator RLC parasitics. (See Figure 2A.)

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