ESD Open Forum

Conformity—2008
Provided by the ESD Association
June 2008

Q: Should I be using the IEC 61000-4-2 test to characterize devices or components?

A: The short answer to this question is no. The IEC 61000-4-2 was expressly developed to test ESD robustness of consumer products in the field. However, OEMs have begun asking the IC and component manufacturers to supply IEC test results to give them some level of confidence that the exposed pins will meet the specified IEC requirements in the final system. The IEC standard does not specify the test conditions for stressing an integrated circuit or a component. Questions such as how the IC should be mounted during the test, how the IC should be grounded, how the ESD gun's ground should be connected, and pin combinations to stress are not addressed in the IEC standard because the standard is not intended for the testing of components. Without detailed specifications for the testing of a component there are too many variables left to the test engineer. Test results, even from very qualified test engineers, are likely to vary widely between different testing laboratories.

Q: So what tests should be used to give customers some degree of confidence in their system level test results?

A: At the ESD Association, we are developing a Standard Practice document defining the Human Metal Model (HMM) test in the Working Group 5.6. The same IEC waveform is used for this testing procedure as is used in the IEC 61000-4-2 test. However, the test bench is different. The IEC system test setup consists of a wood table on a metal ground plane. A metallic horizontal coupling plane (HCP) and an insulator cover the table. The system under test is placed on the table. One of the main changes that will probably be done for HMM testing is the removal of the coupling planes and

their associated capacitances. While this is expected to deliver a more severe current waveform to the DUT, it means that all HMM testing will follow a Standard Practice.

In the HMM test the full IEC waveform stress is delivered to the IC. In a system test the amount of the stress current, and the wave shape will vary depending on the system design. Thus, differences between the HMM and final system IEC results are still expected. However, using the HMM test as a common test method does allow comparison of results for particular devices from different suppliers.

Q: Can the HMM test method be used for air discharge or is it intended for contact discharge only?

A: The HMM test procedure is specified for *contact discharge testing only*. Indeed, air discharge testing should not be done on devices outside the final system. The results from air discharge testing are almost completely dominated by such factors as shielding in the final system, grounding of the circuit boards in the system and even the system packaging itself. Since none of these factors can be controlled by the device manufacturer, any results from air discharge testing would be meaningless for the final system. Consequently, air discharge test results from devices would either provide the customer with a false sense of security or send the supplier on a costly quest for ESD protection that would likely be superfluous or ineffective.

Q: Are the devices powered down during HMM testing or can they be powered up and functioning?

A. This is a good question and it highlights the differences between HMM testing and such tests as HBM and CDM. HBM and CDM are designed to test against ESD events happening during the die test and packaging process. Once the devices are assembled in the final system, HBM and CDM test models are no longer applicable. Thus it is reasonable to do all of these tests with the devices *NOT* powered up. This is not true for HMM. The HMM test is intended to highlight potential problems in the field, long after

the system has left the factory. Consequently, it does make sense to test devices in both un-powered and powered states. For testing the device in powered states, active states should be set using a battery or other methods that will not be destroyed by the ESD pulse. These states are set by applying biases to the appropriate pins. Normally, operational signals are not supplied to the device during testing. RF equipment, wave generators, and network analyzers are too expensive to replace each time an ESD test is done.

Q: When will this Standard Practice be released to the industry?

A: The *HMM Standard Practice DSP-5.6* is in the final stages of completion. We intend to submit this document for industry review late this year. At that point in time, it can be implemented. Following the release of the Standard Practice, a round robin will be conducted to verify the method.

About the author

This article was prepared on behalf of the ESD Association by Dr. Nathaniel (Nate) Peachey. Dr. Peachey is the Chairman of the ESDA work group 5.6 developing the HMM standard practice. He is currently the engineering manager of the ESD development and I/O design group for RF Micro Devices located in Greensboro, NC. He received his B.S. in chemistry from Grace College (Winona Lake, IN) and his PhD in physical chemistry at the University of Nebraska-Lincoln. Dr. Peachey was also a postdoctoral fellow at the Los Alamos National Laboratory in Los Alamos, NM. He can be reached by phone at 336-678-5728 (office) or 336-491-8105 (mobile) or by email at npeachey@rfmd.com .

About the ESD Association

Founded in 1982, the ESD Association is a not for profit, professional organization dedicated to furthering the technology and understanding of electrostatic discharge. The Association sponsors educational programs, develops ESD standards, holds an annual technical symposium, and fosters

the exchange of technical information among its members and others. Additional information may be obtained by contacting the ESD Association, 7900 Turin Rd., Bldg. 3, Rome, NY 13440-2069 USA. Phone: 315-339-6937. Fax: 315-339-6793. Email: info@esda.org. Website: http://www.esda.org.