

ANSI/ESD S541-2008

ESD Association Standard

ANSI/ESD S541-2008

Reaffirmation of ANSI/ESD S541-2003

***For the Protection of Electrostatic
Discharge Susceptible Items***

***Packaging Materials for
ESD Sensitive Items***



***Electrostatic Discharge Association
7900 Turin Road, Bldg. 3
Rome, NY 13440-2069***

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Approved September 29, 2008***

***ESD Association Standard
for the Protection of Electrostatic Discharge Susceptible Items –
Packaging Materials for ESD Sensitive Items***

Approved June 8, 2008
ESD Association, Inc.



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FOREWORD

Packaging is necessary to protect electronic items from physical and environmental damage during manufacture, transportation, and storage. While most types of packaging (not for static sensitive items) provide physical and environmental protection, it also may harm static sensitive electronic items by allowing the accumulation or the discharge of static electricity. (See Annex B for device damage information.)

Packaging for ESD sensitive items is commonly derived by modifying existing packaging to prevent the packaging itself from causing static damage. The packaging generally retains its physical and environmental protective qualities. ESD protective packaging has been modified further to prevent other sources of static electricity from damaging a packaged item.

This can be illustrated by considering bags. Polyethylene bags are useful packages for containing items and providing protection from physical and environmental damage. However, polyethylene bags accumulate potentially damaging amounts of static electricity. Chemicals (antistats) are added to the polyethylene bag to render it low charging. The result is a low charging (antistatic) polyethylene bag that is less likely to damage static sensitive items. By adding a conductive layer to the low charging polyethylene bag, an ESD shielding bag is created. This shielding bag is low charging, and shields packaged items from ESD and the electric field generated by other items.

Other standard packaging including paper corrugate and plastic boxes, trays, and clamshells have, or are presently, following similar paths.

A complete ESD control program, as defined by ANSI/ESD S20.20, requires the use of ESD protective packaging to properly manufacture, transport, and store ESD sensitive devices. This Standard provides requirements for ESD protective packaging that must be included inside and outside an Electrostatic Protected Area (EPA).

Because most physical and environmental considerations can be left to traditional packaging design and testing methodologies, only the material properties that provide reduction or prevention of damage from static electricity need be addressed.

This standard describes the packaging material properties needed to protect electrostatic discharge (ESD) sensitive electronic items, and references the testing methods for evaluating packaging and packaging materials for those properties. Where possible, performance limits are provided. Guidance for selecting the types of packaging with protective properties appropriate for specific applications is provided. Other considerations for protective packaging are also provided.

This document is a substantial refinement of the discontinued Electronic Industries Association Standard EIA-541-1988. Updates include the adoption of surface resistance (ohms) in place of surface resistivity (ohms/square), volume resistance (ohms) in place of volume resistivity (ohm-cm), a shielding test that allows penetrating energy (nanoJoules) to be calculated in place of a voltage measurement (volts), and limits the use of static decay testing. Resistance is no longer the only property that is used to classify ESD packaging. Low Charging, Electric Field Shielding and Direct Discharge Shielding have been added.

This standard was originally designated ANSI/ESD S541-2003 and was approved on February 9, 2003. Standard ANSI/ESD S541-2008 is a reaffirmation of ANSI/ESD S541-2003 and was approved on June 8, 2008. Both documents were prepared by the 11.0 Packaging Subcommittee.

At the time the 2003 version was prepared, the 11.0 Packaging Subcommittee has the following members:

Brent Beamer, Chairman Static Control Components, Inc.		
Joe Blanchard Bradford Company	Walt Gately Gately & Associates, Inc.	Kyung J. Kim BF Goodrich SCP
Rick Knight Ranger Plastic Extrusions, Inc.	Stephen Koehn 3M	William Metz Hewlett Packard
Carl Newberg River's Edge Technical Service / Microstat Labs	Dale Parkin IBM	Charles Perry Monroe Electronics
Robert Vermillion RMV Technology Group, LLC		Stan Weitz Electro Tech Systems

The following individuals made significant contributions to this document:

Ryne Allen ESD Systems	Ben Baumgartner ESD West	Steve Fowler U.S. Air Force
Larry Fromm Finisar	Steve Gerken U.S. Air Force	Ron Gibson Celestica
David E. Swenson Affinity Static Control Consulting		

At the time the 2008 version was prepared, the 11.0 Packaging Subcommittee has the following members:

Brent Beamer, Chairman 3M		
Donald Boehm Dou Yee Enterprises	Jay Hamlin Medtronic	Rick Knight Ranger Plastic Extrusions, Inc.
Thomas Larson Trek, Inc.	James Ludlow Lubrizol Corporation	Carl Newberg River's Edge Technical Service / Microstat Labs
Elaine Olson Intel Corporation	Dale Parkin Seagate	Tim Prass Raytheon
Jeff Salisbury Flextronics	Julius Turangan Western Digital	Robert Vermillion RMV Technology Group, LLC
	Stanley Weitz Electro-Tech Systems, Inc.	

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ESD Association Standard for the Protection of Electrostatic Discharge Susceptible Items – Packaging Materials for ESD Sensitive Items

1.0 PURPOSE

This standard defines the packaging properties needed to protect electrostatic discharge susceptible (ESDS) electronic items through all phases of production, transport and storage. Application requirements are defined that support the intent and purpose of the packaging requirements stated in ANSI/ESD S20.20. Test methods are referenced to evaluate packaging and packaging materials for these product and material properties. Performance limits are provided.

2.0 SCOPE

This document applies to packaging used to store, transport, and protect ESDS electronic items during all phases of production and distribution. This document does not address protection from EMI/RFI/EMP or protection of volatile materials. ESD protective packaging is a requirement of the overall ESD control program ANSI/ESD S20.20.

3.0 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:

ANSI/ESD S8.1, Symbols – ESD Awareness¹

ANSI/ESD STM11.11, Surface Resistance Measurement of Static Dissipative Planar Materials¹

ANSI/ESD STM11.12, Volume Resistance Measurement of Static Dissipative Planar Materials¹

ANSI/ESD STM11.13, Two-Point Resistance Measurement of Static Dissipative Materials¹

ANSI/ESD STM11.31, Evaluating the Performance of Electrostatic Discharge Shielding Materials – Bags¹

ANSI/ESD S20.20, Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)¹

MIL-STD-2073, Standard Practice for Military Packaging²

4.0 DEFINITIONS

The following definitions are in addition to those found in the ESD Association Glossary of Terms:

ESD Protected Area (EPA). A defined location with the necessary materials, tools and equipment capable of controlling static electricity to a level that minimizes damage to ESD susceptible items.

NOTE: Refer to ANSI/ESD S20.20 for a discussion of safeguards.

¹ ESD Association, 7900 Turin Road, Bldg. 3, Rome, NY 13440; Ph: 315-339-6937; FAX: 315-339-6793; www.esda.org

² Naval Air Warfare Center Aircraft Division, Highway 547, Lakehurst, NJ 08733-5100