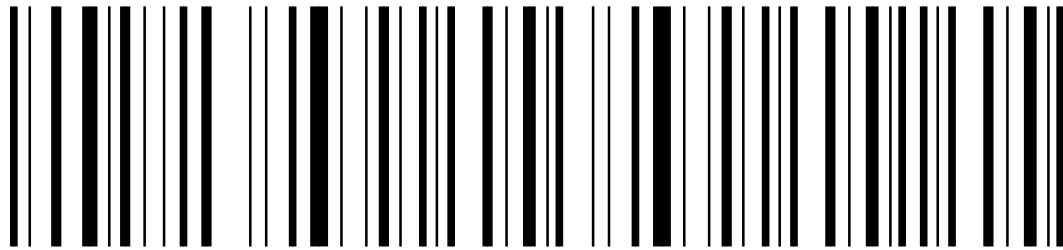


# The Shocking Truth About Electrostatic Discharge... And How to Reduce the Damage



APPLICATION WHITE PAPER

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**Zebra Technologies**



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# Executive Summary

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Damage from electrostatic discharge (ESD) in the electronics industry resulting in rework, repair and scrapped products is estimated at billions of dollars annually. Potential ESD dangers have led electronics manufacturers to develop special clean room and component handling procedures that make it difficult to achieve production efficiencies enjoyed in other industries. Using bar codes to track components has been especially challenging because bar code labels represent a potential source of static and are unwelcome in the production environment.

A new label printing solution enables electronics manufacturers to take advantage of the tracking accuracy and efficiency of bar coding without adding the risk of electrostatic discharge. The solution features special label material that dissipates static and can withstand the high temperatures, cleaning processes and wave soldering used in electronics manufacturing. This white paper explains the special qualities of the label material, including its ESD dissipating performance, and describes how the high-performance bar code printer used with the label material meets the high-resolution, small-label printing needs of the electronics industry.

## Overview

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### **Electrostatic Discharge is a Significant and Costly Problem for the Electronics Industry**

In the electronics industry, the simplest action on the production floor can create an electrostatic charge that can damage circuit boards and other delicate electronic components. Damage can be immediate, resulting in melting, junction breakdown or oxidation. Testing before shipment can usually detect such failures. A perhaps even worse scenario, however, is that an electronic device that is partially degraded may at first function normally for the end-user, only to halt operation long before its expected lifespan. Current technology is insufficient to prove or detect these failures, particularly in products already assembled.

Damage caused by electrostatic discharge has significant repercussions beyond the cost of the electronic component or assembly itself. Electronics manufacturers experience lower production yields, and they must increase their warranty calls—as well as replacement inventory—in response to more field failures. They may also develop a reputation for product unreliability with end-users who have suffered lost data, time and productivity due to damaged computers, cell phones or other electronic devices.

When costs of repair and rework, shipping, labor and overhead are factored in, money lost in the electronics industry can be in the billions of dollars in the U.S. alone, estimates the Electrostatic Discharge Association ([www.esda.org](http://www.esda.org)).

### **General Causes of Electrostatic Discharge**

Static electricity is the electrical charge caused by an imbalance of electrons on the surface of a material. An electrostatic charge is most commonly created by the contact and separation of two similar or dissimilar materials. For example, the soles of your shoes contact and separate from the floor, generating static electricity as you walk.

Electrostatic discharge occurs when electrons on one surface transfer to another. After walking across a carpet, for instance, a series of electrons jump from your hand to a doorknob, resulting in a spark or shock that you feel (and sometimes see).

In the electronics industry, electrostatic discharge can occur at any point during manufacturing, testing, shipping, and handling. Any number of actions, such as sliding a product into a plastic bag, can create the surprisingly low voltages sufficient to debilitate an electronic component: less than 100 volts in many cases, and less than 10 volts for some disk drive components. See the chart below for typical voltage levels generated by simple actions.

<b>Examples of Static Generation-Typical Voltage Levels</b>		
Means of Generation	65-90% Relative Humidity	10-25% Relative Humidity
Worker at bench	100V	6,000V
Walking across vinyl tile	250V	12,000V
Removing bubble wrap from PCBs	1,500V	18,000V
Walking across carpet	1,500V	35,000V
Picking up poly bag from bench	5,000V	26,000V
<i>From the Electrostatic Discharge Association's Web site, <a href="http://www.esda.org">www.esda.org</a></i>		

## **Protect Your Components from ESD Damage with Static Control Measures**

<b>ESD CAUSES</b>	<b>ESD SOLUTIONS</b>
People	Grounded wrist straps ESD-protective floor mats and finishes Insulating shoes ESD-protective clothing, particularly for clean rooms and very dry environments ESD-protective workstations and work surfaces
Carts and other wheeled equipment	Insulating casters or wheels
Production and test equipment	Grounding
Production aids (hand tools, soldering irons, tapes, adhesives)	Grounding—3-prong grounded-type AC plug for electrical tools, grounding of work surfaces and personnel, ESD-protective labels such as Zebra® Electrostatic Dissipating Labels
Material handling	ESD-protective packaging and material handling containers—preferably materials that are antistatic and provide discharge protection and electric field suppression
Semiconductor manufacturing (quartz, glass, plastic, ceramic are inherently charge generating)	Clean room ionization; protective clothing and flooring/footwear systems (Note: static control materials contain particulates often restricted in clean rooms, and clean room garments restrict use of wrist straps.)
<i>For detailed advice, consult the Electrostatic Discharge Association, <a href="http://www.esda.org">www.esda.org</a></i>	

## Labeling Creates Static

Labels applied during or after assembly help electronics manufacturers track parts inventory, work-in-process, and finished goods, and enable them to display confirmation that components have been quality inspected and comply with industry standards. However, peeling a label from its adhesive backing creates an electrostatic charge that is temporarily stored on and possibly discharged from the label surface, damaging the product to which it has been applied.

## Zebra's Electronics Printing Solution Combats Component Damage

Zebra offers a complete label printing solution that meets electronic component manufacturers' stringent requirements for less static and allows for recording more information in small spaces. The solution pairs the Zebra® Electrostatic Dissipating (ESD) label, which dissipates static to reduce component damage, and the Zebra 110XiIIIPlus™ printer, which delivers readable, extremely high-resolution images, text and bar codes on a small scale.

## Labels Designed to Dissipate Static

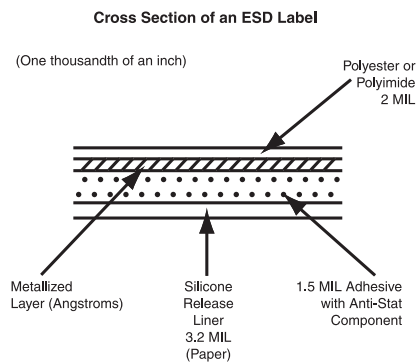
Zebra offers two thermal transfer labels that contain a modified facestock and anti-static adhesive designed to prevent static:

- **Z-Ultimate 3000 White ESD™ label.**  
Printable polyester, 2.0 mil caliper, service temperature range from -40° F to 302° F.
- **Z-Supreme 6000 White ESD™ label.**  
Printable polyimide (Kapton®), 1.5 mil caliper, service temperature range from -40° F to 392° F.

Both ESD labels are available in several stock sizes, as well as in custom sizes.

## Zebra ESD Labels Offer Other Advantages for Electronics Manufacturers

- Smudge resistant. High-resolution logos, text, graphics and bar codes print clearly and resist smearing.
- Ideal for high-temperature applications up to 392° F. Z-Supreme 6000 ESD labels resist wave soldering, IR reflow and cleaning, so they're perfect for top- and bottom-side PCB labeling. Z-Ultimate 3000 ESD labels are recommended for top-side applications only.
- Certified under the ESD S11.11 Surface Test (by the ESD Association). Certification is proof that Zebra ESD labels are static dissipating.
- Durable. Tested to withstand heat, harsh outdoor environments and UV light. Tested for tear resistance and peel adhesive performance.





## **110XiIIIPlus Printer Packs Precise Detail onto Small Labels**

The Zebra ESD label and Zebra 110XiIIIPlus printer are a complete labeling solution to the challenges faced by electronics manufacturers. Not only do ESD labels solve static problems, but their smudge-resistant surface is also the perfect canvas for the 110XiIIIPlus printer's 600 dpi, high-resolution printing. Together, these ideal companions deliver crisp detail on the small-size labels electronics manufacturers require.

Only the 110XiIIIPlus delivers the highest resolution available—600 dpi—as a standard feature. That means users can print highly readable, scannable, extremely small type, graphics and bar codes even on the tiny labels (.25" x .5" or smaller) applied to PCBs.

## **Zebra's 110XiIIIPlus Printer Offers Extra Benefits Beyond High Resolution**

- Rugged, reliable, 24/7 performance in mission-critical environments.
- Remote monitoring and configuration from anywhere with available ZebraLink™ Solutions.
- Automatic notification via email, pager, cell phone or PDA when pre-set conditions are reached (such as a printer running out of media or ribbon) with productivity-boosting "Alert" feature.
- Proven performance—Zebra printers are installed in more than 90 percent of Fortune 500 companies and in leading firms in more than 95 other countries.

## **For More Information...**

Or to purchase Zebra products, call +1 800 423 0442.





Notes

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GSA#: GS-35F-0268N  
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13021L Rev. 3 (9/05)