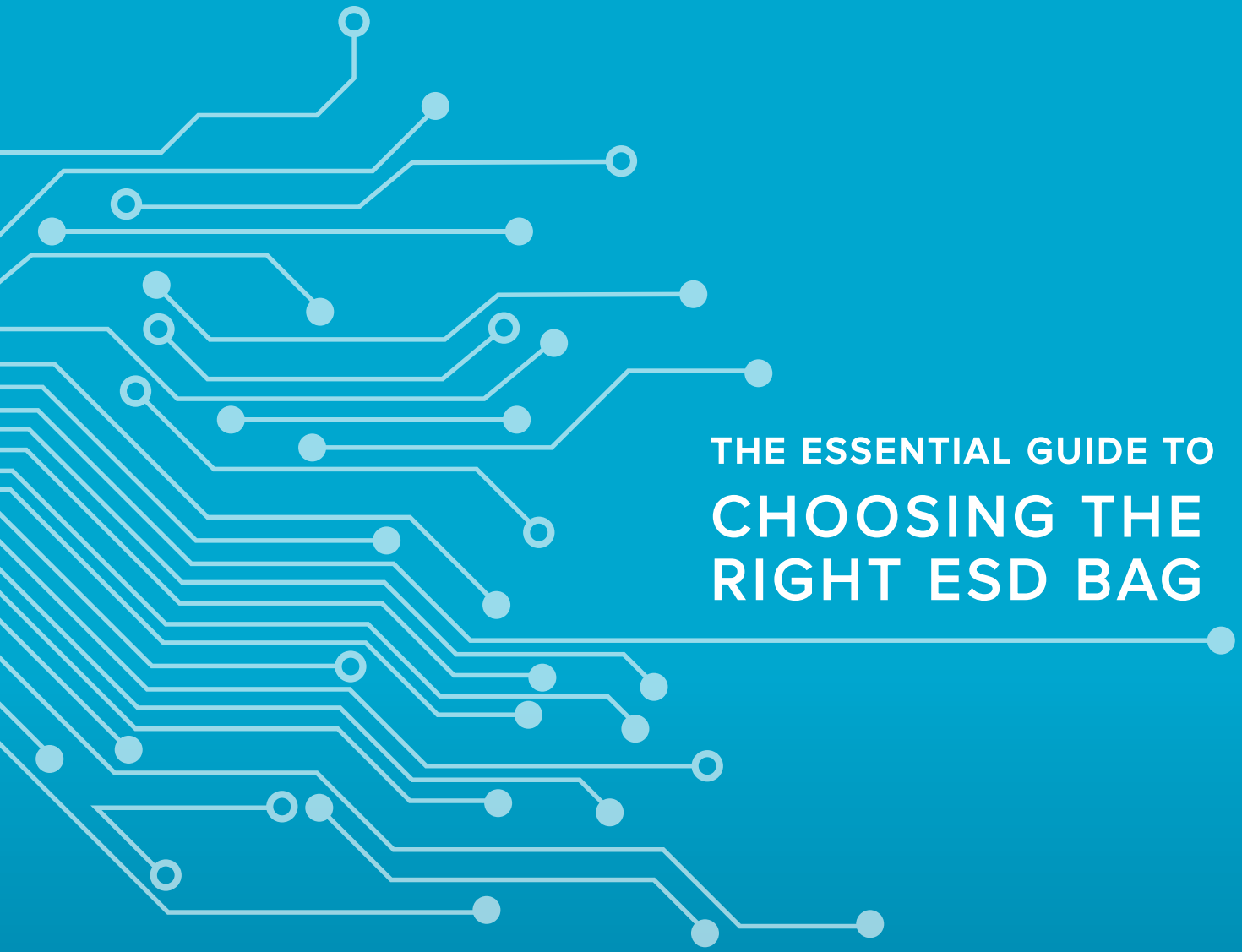

THE ESSENTIAL GUIDE TO CHOOSING THE RIGHT ESD BAG

ANTISTAT

ESD: NOT JUST FUN & FRIZZ

Most people have a general idea of the effects of static electricity: like how scuffing shoes on carpet and and touching a person or metal handle produces a small shock, for example. Or how a tumble dryer can cause “static cling” or balloon can cause frizzy hair.

But few people are aware of the damage that static electricity, no matter how common, can cause to modern electronic circuits and devices.

In fact, **electronic circuits’ susceptibility to damage has increased over the years**, as they have reduced in size.

Enter the ESD or anti static bag, one of the most common preventative measures used against electrostatic discharge.

ASSESSING THE (POTENTIAL) DAMAGE

Introduced in the 1970s for use in the military, but now used widely in Surface Mount Technology, static shielding bags help protect against:

- **Direct discharge (ESD)** — A discharge directly to a bag can subject the device inside to a very high current, melting or fusing the circuit.
- **Static fields** — Fields can induce destructive current in circuit conductors. Field differentials can break down the circuit dielectric.
- **Tribocharging** — Friction between the bag and device can produce damaging static voltage and fields.

HOW DO I KNOW IT'S WORKING?

There's not a lot of room for mistakes when you're working with electronic circuits so easily damaged by static. **To ensure that ESD bags work like they should, a direct discharge is applied to a bag in a standard static shielding test.**

Inside the bag, an oscilloscope connected to a sensor measures the amount of voltage that penetrates the bag. Because static fields are generated by discharge to the outside of the bag, The same test also assesses the threat of static fields by measuring the fields that penetrate the bag.

Tribocharging tests are difficult to perform and data from bag specs are only to be used as a benchmark, as they may not show how a material will perform in use.

Surface resistivity is an indication of a material's ability to allow static to move around/dissipate. It's important to note that this does not necessarily suggest low tribocharging.

HOW DO I CHOOSE?

Your choice of bag will likely depend on its use. Below are the different kinds of ESD bags alongside their corresponding uses:

‘PINK’ ANTI STATIC BAGS OR DISSIPATIVE POLY BAGS

Use these bags for items that have no static susceptibility.

In their primary application, they are used to package support or processing materials that will be in close proximity to static sensitive devices. This keeps static generating packaging materials away from sensitive areas.

BLACK CONDUCTIVE POLY BAGS

Black poly bags are normally used as the intermediary between pink poly and shielding bags because they are **slightly lower in cost and offer some static shielding**, as opposed to pink poly bags which offer none.

However, **because black poly bags are opaque in appearance, the bag’s contents must be removed for identification purposes** creating opportunities for static damage.

HOW DO I CHOOSE? (CONT.)

SHIELDING BAGS

Static shield bags should be used for all electronic components, boards, and assemblies.

MOISTURE BARRIER BAGS

Use these bags when barrier protection is needed or maximum shielding protection is desired without transparency being an issue.

In the following pages, we'll give you a more in-depth view of what each bag has to offer.

‘PINK’ ANTI STATIC BAGS OR DISSIPATIVE POLY BAGS

The pink anti static or poly bag dissipates static charge to keep it from building up on the package or device. The material is anti static and therefore should not charge up when rubbed against other materials. Pink poly’s resistivity is in the dissipative range and is usually around 10^9 to 10^{11}.

Please note that these bags have no shielding ability. A static field or discharge occurring outside the bag will penetrate the bag and damage electronics inside.

Pink poly bags are constructed from polyethylene that has been loaded or surface coated with a chemical antistat.

CHEMICAL ANTISTAT
POLYETHYLENE/LDPE
CHEMICAL ANTISTAT

The pink color these bags are known for is a colorant added to differentiate static control materials from standard packaging. The hue is not, as is sometimes incorrectly assumed, associated with a reactive form of amine type antistat that causes oxidation of some metals and stress cracks in some plastics. **Be aware that some manufacturers have made the switch to amide based antistats and removed the pink color in response to customer requests.**

BLACK CONDUCTIVE POLY BAGS

Black poly is very conductive, usually about 10^3 - 10^4 and dissipates quickly. Unfortunately the speed of this dissipation also means that a charged person or object can 'spark' to its surface.

The primary objective in static control is to transfer charges at a slow enough rate to avoid sparks, but not too slow so as to allow a buildup of static. **As black poly is conductive, it does provide a small measure of shielding (<30%), however there is no dielectric layer to isolate a device inside**. The charge may be transferred through the volume of the material to the device instead of around the material to ground.

Black poly bags are a polyethylene plastic that is volume loaded with a conductive form of carbon. The material is black and opaque in appearance.

CARBON LOADED POLYETHYLENE

SHIELDING BAGS

Shielding bags provide similar dissipative and antistatic properties of the poly bag but add a metal shield and polyester dielectric to stop static from entering the bag. The test for shielding demonstrates the difference between the various bags. Shield bags will generally stop 97% of a 1,000 volt pulse applied to the outside of the bag from reaching the inside and its contents whereas pink poly stops only about 10% and black poly about 30%.

Static shielding or metal shield bags consist of several layers. From the interior to the exterior the layers are:

- A dissipative poly laminated to aluminized polyester
- An outer dissipative layer with an antistat coating
- Metal which is vapour deposited in a vacuum chamber.

Aluminum is the most commonly used metal in the process, with nickel and copper also being used. This structure, with the metal between two layers of plastic, is called “buried metal” or “metal-in.”

SHIELDING BAGS (CONT.)

In a “surface metal” or “metal-out” structure, the poly is laminated to the polyester with the metal on top. There is an abrasion coating on the metal. The metal generally used is nickel and it is sputtered instead of vapour deposited.

Metal In Shield Bag

- OUTER SURFACE DISSIPATIVE LAYER
- ALUMINIZED POLYESTER
- POLYETHYLENE
- INNER SURFACE DISSIPATIVE LAYER

Metal Out Shield Bag

- ABRASION COATING
- ALUMINIZED POLYESTER
- POLYETHYLENE
- INNER SURFACE DISSIPATIVE LAYER

Our bags are manufactured from industry approved polyester and polyethylene laminates. The polyester dielectric works with the metal layer to provide a Faraday effect, the metal layer preventing penetration from damaging electrostatic fields. The specially processed polyethylene keeps tribocharging to a minimum.

The metal-in bag offers better protection of the transparent metal shield by placing it between two plastic layers. The metal-out bag has a conductive outer surface providing fast charge dissipation, however like the black poly bag, it can also be sparked.

MOISTURE BARRIER BAGS

Moisture barrier bags provide dissipation, antistatic properties, static shielding, and add a moisture vapor barrier protecting moisture sensitive items and improving long term storage.

Moisture barrier bags are similar in structure to the shield bags, but are typically much stronger. They are constructed two ways:

- With “foil and Tyvek”
- With “heavy metallization”

Structure of a **Foil Barrier Bag**

DISSIPATIVE TYVEK
ALUMINUM FOIL
STATIC DISSIPATIVE POLYETHYLENE

Structure of a **Metallized Barrier**

ANTISTATIC COATING
POLYESTER
ALUMINUM METALLIZATION
POLYESTER
ALUMINUM METALLIZATION
STATIC DISSIPATIVE POLYETHYLENE

The heavy metallization structure is essentially that of a shielding bag but with opaque, thick layers of metallization. Nylon is regularly used in place of Tyvek or polyester, providing the needed strength at a lower cost than Tyvek.

FOR MORE RESOURCES
OR **TO ORDER ESD BAGS:**

VISIT **ANTISTAT.COM**
CALL **512-243-5762**

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