

Preventing Damage from Electrostatic Discharges to Electronic Assemblies

Lightning strikes are likely the most familiar and spectacular examples of electrostatic discharges. Less spectacular, but more annoying (and sometimes painful) are the midwinter sparks you get when you touch something or someone after walking on a carpeted floor when the humidity is really low. Less visible electrostatic discharges occur all the time and can quickly destroy modern semiconductor devices with their ultra-thin layers of oxide insulation and silicon compounds.

This technical note explores what causes these electrostatic discharges to build up and how to avoid them.

No matter where you are, a *layer* of any kind between two surfaces causes electrostatic charges to build up on the surfaces. The buildup continues until a discharge, the “spark,” equalizes the potential difference, and then the charges build up again. Let’s explore some of these “layers” and how to minimize any electrostatic discharges.

Footwear provides a layer of insulation between your body and the ground, and your body will then attempt to discharge any electrostatic buildup that tends to occur because of the insulating layer. Footwear with thinner soles made from natural as opposed to man-made materials can help, and you could cover it with aluminum foil. Grounding footstraps or ankle cuffs are more practical.

Clothing is a bit opposite to footwear in that your body serves as the insulating layer between the clothing and the ground. Natural fibers tend to allow less electrostatic buildup than synthetic fibers, but ultimately you should wear a smock that contains conductive filaments. You could also wear a grounding wrist strap.

Flooring also contributes to electrostatic buildup. Carpets made from synthetic fibers are the worst, but wood and plastic floors also provide some insulating effect and hence the possibility for electrostatic buildup. Cement floors should be regularly refreshed with an antistatic coating that makes their surface more conductive. Or you could replace carpet with *conductive carpeting*. Anti-static mats or grounded conductive mats can help, too.

Environment also affects electrostatic discharges. Most electrostatic discharges will vanish when the relative humidity is above 60%. Balanced-polarity air ionizers can help. Finally, grounding bars and stands should be readily available and used often.

Handling semiconductor devices subject to the ravages of electrostatic discharges can be minimized by using automated manufacturing processes. Semiconductor devices should be packaged and kept in electrostatically shielded bags. When you handle a semiconductor device, leave any protective items such as a mechanical grounding wire in place until the device has been soldered or otherwise installed.

International standards have been developed for an electrostatic protective area in manufacturing areas, and are available from the International Electrotechnical Commission (IEC) or the American National Standards Institute (ANSI).

The same handling precautions also apply when you are installing, servicing, or otherwise handling semiconductor devices

Common sense together with the mitigating steps described in this technical note will help you avoid electrostatic damage to your Rabbit-based products.

By the way, if you choose the simple solution to electrostatic-discharge mitigation by working outdoors on the ground, don't seek shelter under a tree if you see or hear a lightning storm approaching!

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