

Bergquist HeatSeal Withstands Electrostatic Discharge (ESD)

Total Sealed Integrity All In A Single Layer

Electrostatic Discharge (ESD)

ESD is the rapid, spontaneous transfer of electrostatic charge induced by a high electrostatic field. Usually the charge flows through a spark (an ESD event) between two bodies at different electrostatic potentials as they approach one another. In a membrane switch application, ESD events can be facilitated by the construction of the switch and the materials used in the switch construction.

Standard Membrane Construction

In membrane switches, most ESD events are surface events: where the ESD potential runs along the surface of the switch seeking out a place to organize and discharge. Typically, in switches built with pressure sensitive adhesive (PSA), the ESD wraps around the edge of the switch and passes directly through the PSA to find an active circuit with an opposite electrical potential.

The graphic overlay and top circuit layer are made with polyester film, which has a dielectric strength of 3000 volts per mil. With a 7 mil graphic, there is 21Kv of dielectric withstand making it is easier for the ESD

charge to move along the surface than to punch through the material. Once the ESD event moves to the edge of the part the ESD finds virtually no resistance to move through the PSA layer to find circuitry of an opposite electrical potential enabling the rapid discharge.

Historically, membrane switch companies and end users have overcome this problem by incorporating an ESD shield on the top surface of the top circuit. This additional shield layer acts as an antenna to grab the ESD event and move the discharge voltage safely to an isolated electrical ground, away from the sensitive electronic components.

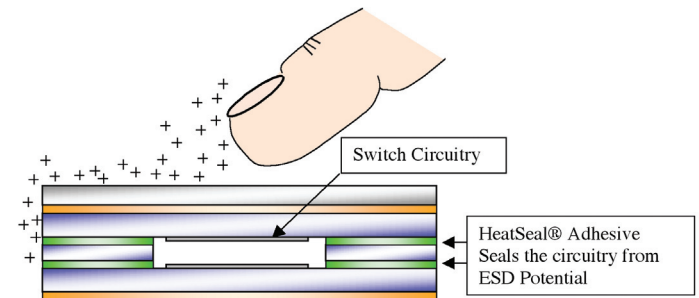
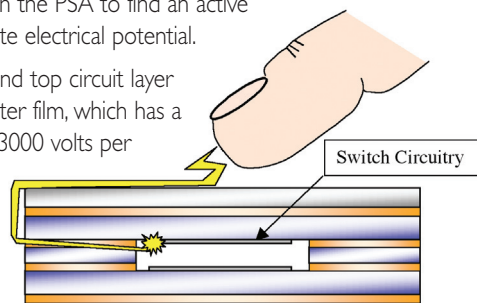
The weak link for ESD events in membrane switches is the PSA material. Pressure sensitive adhesive provides its entire adhesive properties through mechanical bonding. When PSA's are manufactured the surface is rough to provide the maximum amount of mechanical bonding sites available for any surface encountered. This creates a microscopic network of fissures throughout the adhesive that allows for the passing of ESD events. The second issue with PSA material

is the lack of dielectric strength, the dielectric withstand for PSA is estimated to be below 100 volts per mil. Even if the microscopic fissures were not present, the distance from the edge of the part to the first circuit trace would need to exceed .150" just to provide a minimum of 15Kv withstand protection. In some applications there is not room available for adequate spacing.

How do Bergquist HeatSeal Switches withstand ESD events?

Bergquist HeatSeal is a proprietary polyester resin system specifically designed to protect the electrical integrity of membrane switch circuitry from attacks by ESD, thermal stress, solvent exposure, and pressure changes. The chemical and physical nature of HeatSeal is based upon the same resin structure used in the polyester substrates used for membrane switch circuits. When Bergquist HeatSeals the switch assembly together, the adhesive interface is created with both mechanical and chemical bonding of the materials leaving no air tracks, no microscopic fissures, or any ingress points to the circuitry.

The base polyester resin used in HeatSeal has a dielectric withstand of



900 volts per mil. At a minimum the dielectric withstand of HeatSeal is nine times greater than the breakdown voltage of PSA. When an electro-statically charged object approaches a Bergquist HeatSeal switch the charge seeks out an oppositely charged source, but the dielectric protection provided by HeatSeal will not allow the electrical potential to organize and dissipate in an ESD event.

The cross-sectional ESD withstand for a HeatSeal switch with traces within .150" of the edge is 135kV...9 times stronger than a similarly constructed PSA switch.

There are clear differences between Bergquist HeatSeal membrane switches and switches manufactured with off the shelf pressure sensitive adhesives, please call 1-800-347-4572 to obtain samples you can test for yourself. Or visit www.bergquistcompany.com to learn more about our products.