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ESD TVS … DISCRETE SEMICONDUCTORS ON A MISSION

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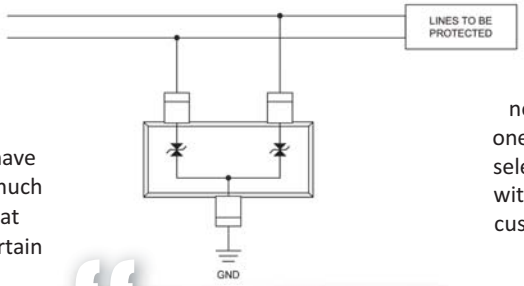
It is a cruel irony of electronics that as the sophistication of integrated circuits increases, the sensitivity of those devices to electrostatic discharge (ESD) also increases. So, the paradox: ICs are faster, have greater functionality and are more energy efficient, but they can be rendered useless with the casual touch of a finger. What's the remedy for this quandary?

ESD transient voltage suppressors (TVSs) are the fastest growing portion of the discrete semiconductor market, and it's easy to see why. As the 'intelligent' electronic content (narrow line-width ICs) of all electronic end products increases, so does the need for protection from harmful ESD. A recent tear-down of a smart phone identified 33 discrete semiconductors; of these, 17 were ESD protectors. This trend shows no signs of abating.

ESD TVSs come in many technologies, sizes and topologies. Technologies can include metal oxide varistors (MOVs), fuses, capacitors and silicon Zener types. Of these, MOVs are the lowest-cost solutions, while silicon Zener types provide the best combination of energy efficiency, reliability and precise performance. The decision of which type to use is a question of priorities. If cost is the only consideration, then MOV type devices might be the answer. If other factors come into play, as they usually do, the decision requires a little more thought.

Several end-market drivers are shaping the technology roadmap of ESD TVS devices. From a mechanical perspective, lower profile end products require lower profile semiconductor packages. In this regard, the ability to package a silicon Zener type die in a parallel configuration to the circuit board makes very thin device packages possible. Currently available products have package profiles down to 0.3mm, not much thicker than an unpackaged bare die that might be used in a hybrid assembly. Certain types of TVS technologies preclude the construction of low profile devices.



High-speed data line protection

Another driver is the need for energy efficiency. Throughout its life, an ESD TVS might never be called into service, assuming the ever-elusive ESD transient fails to make an appearance. Even when idle, however, the TVS is consuming power. Each of the aforementioned technologies has a different 'energy footprint.' As the number of TVSs in a system increases, this footprint becomes larger and the appropriate technology must be selected.

A final concern of great importance is the capacitance value of TVSs as specified on device data sheets. As data rates continue to increase in all end products, the capacitance value of TVS products must decrease accordingly. TVS devices with relatively high capacitance will compromise the integrity of the transmitted data and render the entire system inoperable. Hence, the term 'low cap TVS' is being used more and more these days. Some of the TVS technologies mentioned earlier are not suitable for high data rate applications. However one need not be an engineer to differentiate between 'low cap' and 'not so low cap'. A quick check of the junction capacitance on the data sheet will tell the story. High speed/high data rate applications require capacitance values in the single picofarads, maximum.

The best source for these products is a manufacturer that focuses on discretes, not a supplier that offers discretes simply as an afterthought to be 'bundled-in' with other products. The market drivers that necessitate the need for these products are irreversible and, one might argue, accelerating. As such, the selection of a manufacturer of discrete products with dynamic ESD TVS roadmaps is vital to customers' future product innovations.

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