

Re: Some ESD protection questions (spark gaps, earth/ground connection issues)

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On Aug 27, 2:20 pm, Christian Walter <[wo...@xxxxxx](mailto:wo...@xxxxxx)> wrote:

... I want to improve some ESD aspects of the board because we had some problems in this area in the past. I have to protect some I/O ports and an USB interface.

The next question I would like to ask what you people think about spark gaps as a cheap alternative

What I have also read is that a small guard ring at the edges of the PCB (connected to ground) can help

Another question is how I can verify my ESD protection without having to go to a special laboratory because of costs.

Surely USB has a grounded shell and provision that the ground connection mates first, then the power connections, then the signal? There's no real threat of high potentials/spark/currents there, unless your shield melts in a lightning strike. If you're canny about the other I/O ports, they can be pretty robust, too, and NOT because of TVS diodes or other addons.

Spark gaps (commercially available ones, look like disk capacitors but with a little saw-cut slot) will take a lot of current and don't often fail, BUT they're intended for rather high breakdown thresholds. Unless you expect high currents at high voltages (like an isolated power supply that floats at a few hundred volts from ground), the spark gap is going to be too

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insensitive, won't protect delicate circuitry well. Low-pressure gas has better breakdown thresholds, and a Ne lamp can be a very effective clamp if you can tolerate the (about 100V) turnon threshold.

Grounded-track-surround is a variant of a guard ring. Multiple guard rings connected to successive potentials is the hallmark of HV circuitry.

Guard rings are effective if you expect tracking (conduction through foreign substances after your PC boards get dirty), and I'd expect to see them used a LOT where a circuit board is expected to have hundreds of volts per cm kinds of gradients. USB and 'I/O ports' isn't really in that range, usually. With multiple guard rings, connected with spark gaps, you can make your printed circuit board REALLY intimidating, even without international warning symbols. Techs will quake every time they open the box...

Typical ESD testing is at low event energy, with voltages (2 kV) that can be handled with minor precautions. But, any controlled, safe environment for such testing IS a laboratory, by definition. If you don't want to 'go out' to a laboratory, you build one for yourself.

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