

Rarely Asked Questions

Strange stories from the call logs of Analog Devices

Looking for savings in all the wrong places

Q. I'm trying to save cost and printed-circuit board space. Can I use an amplifier's internal ESD diodes as clamping diodes?

A. In this design, the input signal periodically went above the supply voltage, so this customer wanted to use the amplifier's internal ESD diodes to clamp the signal. While this sounds like a good idea, it's really not. Like anyone, the designer wanted to save money and PCB area, but he was looking in the wrong place to save. In the end, his solution would end up costing him more time and money, as he'd have to keep replacing amplifiers that acted like fuses.

Why is that? In our amplifiers, ESD diodes are connected between the input and output terminals and the supply terminals. The ESD diodes protect the amplifier by routing energy from an ESD event away from the amplifier and to the supply rails. ESD diodes are only designed to operate for short periods of time. Running them continuously could damage or destroy the diode, or the bond wires, or the amplifier itself. Even if the amplifier wasn't destroyed, excessive heat generated due to sustained operation of the ESD diodes could degrade the amplifier performance, which could cause latent defects.

A second problem with using the internal ESD diodes as clamps is that the inputs of the amplifier would have to go above the supply rails for the diodes to conduct. This would exceed the Absolute Maximum Ratings for the amplifier's



input voltage. This is another no-no, as discussed in RAQ #50, "What's the big deal about ABSOLUTE MAXIMUM RATINGS?" Stay away from Absolute Maximum Ratings; nothing good can come from operating near them, even for just a little while.

A better way to protect the amplifier is to use a set of external diodes, with a current limiting resistor tied to a lower supply voltage than the recommended maximum input voltage of the amplifier.

Another option, fairly new to the market, is to use an amplifier with built in Overvoltage Protection (OVP). Analog Devices offers several amplifiers with OVP, including the ADA4091-2, ADA4092-4, and ADA4096-2. In the long run, these options provide a safer, more cost effective solution to protecting the amplifier and downstream circuitry.



Contributing Writer
John Ardizzoni is a Senior Application Engineer at Analog Devices in the High Speed Linear group. John joined Analog Devices in 2002, he received his BSEE from Merrimack College in N. Andover, MA and has over 30 years experience in the electronics industry.

Have a question involving a perplexing or unusual analog problem? Submit your question to:
www.analog.com/askjohn

For Analog Devices' Technical Support, Call 800-AnalogD

To Learn More About Input Protection

<http://dn.hotims.com/34938-100>

SPONSORED BY

