

# Rarely Asked Questions

Strange stories from the call logs of Analog Devices

## Considerations on High-Speed Converter PCB Design, Part 3: The E-Pad Low Down

**Q.** What are some important PCB layout rules when using a high-speed converter?

**A.** Part 1 discussed why splitting AGND and DGND is not necessary unless circumstances within the design force that choice. Part 2 discussed the power delivery system (PDS), and how squeezing the power and ground planes together provides additional capacitance. Part 3 discusses the exposed pad (E Pad), another overlooked item that is essential for getting the best performance and most heat out of your PCB design.

The E-Pad (pin 0), is the paddle found underneath most modern high-speed ICs. An important connection, it ties all internal grounds from the die to a central point under the device. The E-Pad is responsible for the lack of ground pins in many converters and amplifiers. The key is to solder this pad to the PCB, making a robust electrical and thermal connection. If not, havoc can occur in your system.

Three steps help to achieve the best electrical and thermal connection to the E-Pad. First, if possible, replicate the E-Pad on each PCB layer. This creates a thick thermal connection to all grounds, allowing heat to dissipate quickly, and is especially important for high-power parts. Electrically, this gives a nice equal connection to all the ground layers. Replicating the E-Pad on the bottom layer allows it to serve as a ground point for decoupling and a place to attach a heat sink or thermal relief.



Second, partition the E-Pad into equal segments. A checkerboard pattern works best, and can be implemented by a silk-screen crosshatch or solder mask. There is no guarantee as to how solder paste will flow to connect the device to the PCB during the reflow assembly process, so the connection might be present but not evenly distributed or, worse yet, it might be small and positioned in a corner. Dicing the E-Pad into smaller partitions places a connection point in each separate area, ensuring a robust, even connection between the device and the PCB.

Finally, make sure that each partition has via connections to ground. The partition is usually big enough so that several vias can be placed. Make sure each of these vias are filled with solder paste or epoxy before assembly. This important step will ensure that the E-Pad solder paste won't reflow into the via voids, which would otherwise lower the chance of obtaining a proper connection.

**To Learn More About  
High-Speed Layout**

<http://dn.hotims.com/34932-100>



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