

Using Digital Isolators as Level Shifters in Nonisolated Applications

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iCoupler[®] digital isolators are widely used to transfer digital signals across an isolation barrier. In some situations, digital isolators are useful in nonisolated applications as well.

-48 V DC-to-DC Power Supply

In communication power supply applications, the standard power rail is -48 V dc with primary side control signals referenced to that power rail. The secondary side control signals are typically ground referenced low voltage I/O (e.g., +5 V, +3.3 V CMOS). The primary and secondary grounds are connected together, so the entire system is nonisolated. A digital isolator is a good choice to provide a level-shifting function for the feedback signal in such a dc-to-dc power supply. As shown in Figure 1, the high level input voltage on the secondary side is 5 V, and the low level voltage is 0 V; the high level voltage on the primary side is -43 V, and the low level is -48 V. The primary side ground of the digital isolator is connected to the -48 V power rail with the VDD supply connected to -43 V. Each side of the isolator operates within an independent voltage domain due to the built-in isolation barrier, providing a level-shifting functionality. Using *iCoupler* digital isolators can also protect the secondary side circuitry from faults such as overvoltages or shorts.

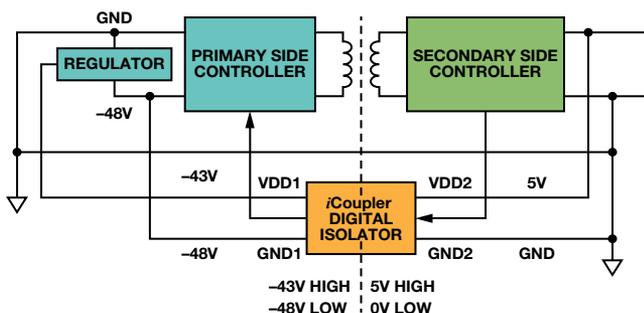


Figure 1. -48 V to 5 V dc-to-dc power supply with feedback based on a digital isolator.

Systems with Multiple Power Supplies

For systems with multiple power supply domains, one or more of the supplies may be shut down while others remain operational. In this case, if there are any data lines connecting between the two power areas, the shutdown area can be powered parasitically by the voltage and current on the data line. Figure 2 shows this application case. To avoid the leakage current, the digital lines must be set to low level output or high impedance mode.

When an *iCoupler* digital isolator is used to replace the direct connection between the two power supply domains, leakage currents between the domains are blocked (Figure 3). The protection hardware and software design will be simplified since the output states don't need to be controlled.

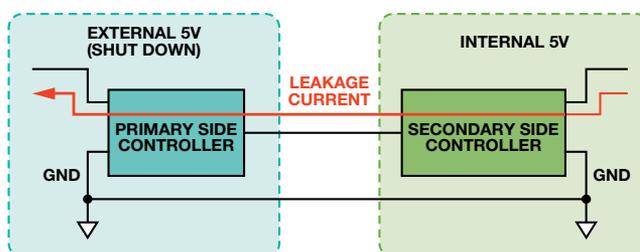


Figure 2. Leakage between two power supply domains.

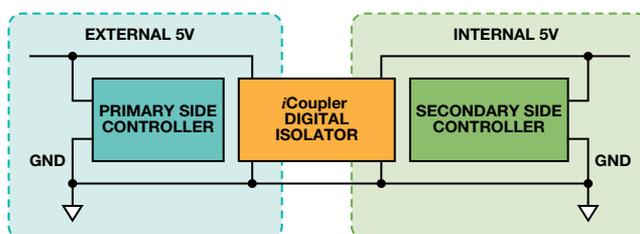


Figure 3. Connecting two power supply areas using a digital isolator.

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