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How to Design a "Power Good" Signal that is Drain Referenced

Alan Ball, ON Semiconductor

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Hot swap controllers used in 48 V telecommunication applications generally offer a Power Good signal to inhibit the operation of the load circuit until the initial inrush current into the input filter capacitor has reduced to zero. For a low side controller, this signal is referenced to the lower supply rail due to limitations of the silicon process. It is desirable to have this signal referenced to the drain of the controller since this is the ground node of the load. This design idea describes a simple and inexpensive method of generating a Power Good signal that is drain referenced.

Figure 1 shows a typical hot swap controller and FET in a low side configuration. This type of controller can be purchased from a number of different companies including Linear Technology, Maxim and SuperTex. ON Semiconductor offers an integrated device that includes the power FET and gate biasing network.
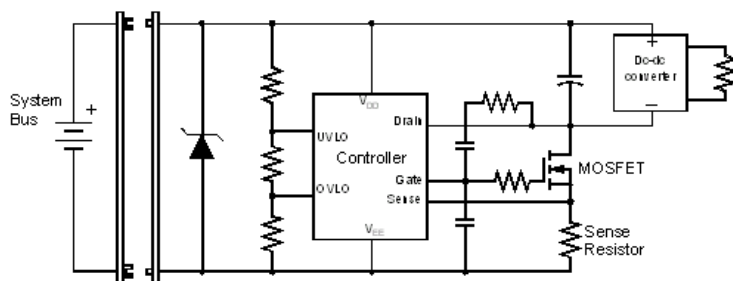
Low-Side Hot-Swap Controller

Regardless of the manufacturer, the power good signal is an open drain signal, referenced to the negative supply rail of the controller. From Figure 1 it can be seen that the ground side of the dc-dc converter will be essentially at the high side system bus voltage when the controlling MOSFET is off and at the negative system bus voltage when the system is on. It is necessary to have a signal to control the converter that is connected to the drain pin. A common method of level shifting this signal is the use of an external opto-coupler and medium voltage FET. This circuit can also be designed more efficiently

using a FET, resistor and zener diode clamp. All three of these components are integrated in to the NUD3048. It is also rated at 100 volts, which is an ideal voltage for telecom applications.

Figure 2 shows an application of this device. By adding an external 1.2k-ohm resistor to the NUD3048, the Power Good signal can be level shifted and floated at the drain potential. Since this circuit inverts the signal, the Power Good signal from the controller turns into a Power Good signal at the dc-dc converter.
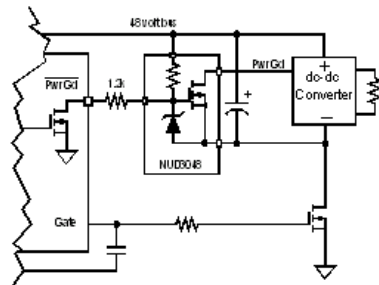
Power Good Referenced to Drain with 1.2 k-ohm resistor

A second NUD3048 (Figure 3)can be added to invert a second time if a Power Good signal is required at the converter. The controller should have the Power Good signal available because in this polarity, the internal FET is off when the drain voltage is high. Otherwise there is a high current drain when the hot swap controller is not applying power to the load.
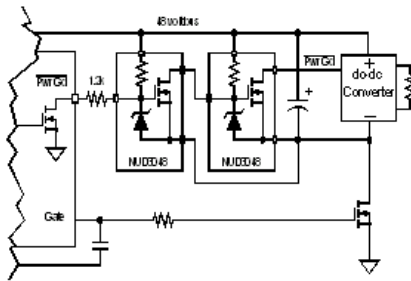
Power Good Referenced to Drain with second 1.2 k-ohm resistor

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