Application Report
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# Extending Voltage Range of Current Shunt Monitor

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**ABSTRACT**

This application report briefly describes extending the voltage range of current shunt monitor integrated circuits such as the Texas Instruments INA168.

Although the current shunt monitor ICs such as TI's INA168 can be connected to current shunt resistors at supply voltages up to 60 V, the circuit in Figure 1 enables current sensing at even higher voltages. This method can be extended to any voltage that a suitable MOSFET for Q1 can be found.

Zener diode DZ1 regulates the supply voltage that the current shunt monitor operates within, and this voltage *floats* relative to the supply voltage. DZ1 is chosen to provide sufficient operating voltage for the combination of IC1 and Q1 over the expected power-supply range (typically from 5.1 V to 56 V). Select R1 to set the bias current for DZ1 at some value greater than the maximum quiescent current of IC1. The INA168 shown in Figure 1 is specified at 45 μA maximum. The bias current in DZ1 is approximately 500 μA at 200 V, well in excess of IC1's maximum current (the bias current value was selected to limit dissipation in R1 to less than 0.1 W).

Connect a P-channel MOSFET, Q1, as shown to cascode the output current of IC1 down to or below ground level. Transistor Q1's voltage rating should exceed the difference between the total supply and DZ1 by several volts because of the upward voltage swing on Q1's source. Select R2, IC1's load resistor, as if IC1 were used alone.

The cascode connection of Q1 enables using IC1 well in excess of its normal 60-V rating. The example circuit shown in Figure 1 was specifically designed to operate from 160 V to 200 V, and sense up to 1 A of current at a 1-V full-scale output.

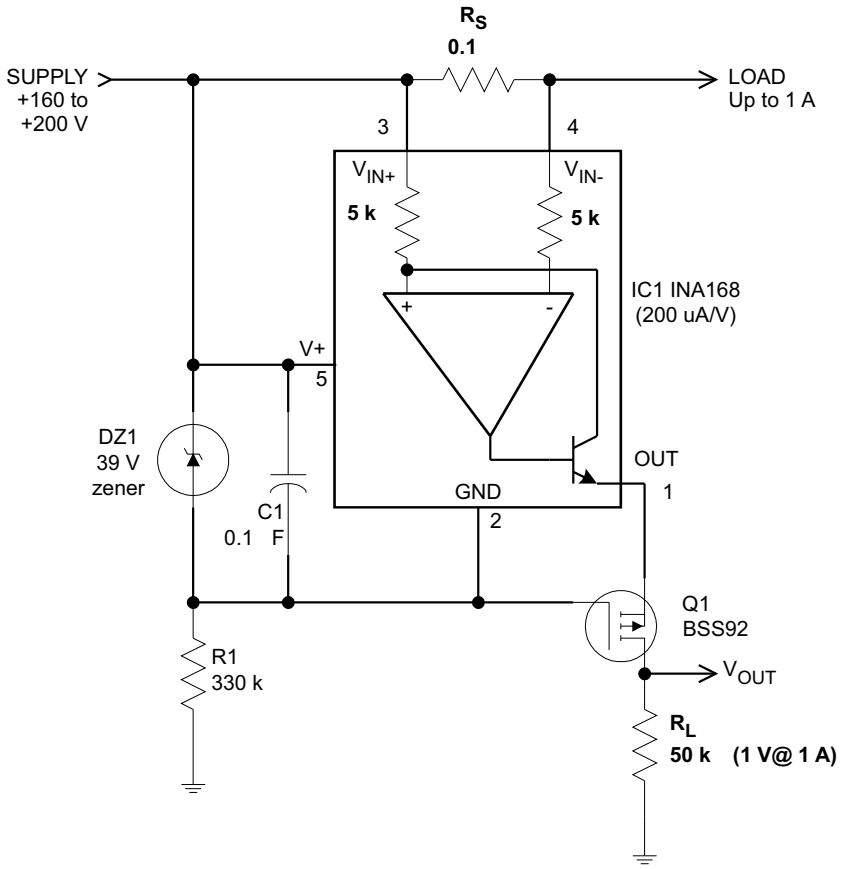


**Figure 1. Example Circuit That Extends Voltage Range of INA168**

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