

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

Table 1. Related TI Application Documents

| Document Number | Document Title | Relevancy |
|----------------------------|---|--|
| SBOA358 | Adjustable-gain, current-output, high-side current-sensing circuit | A circuit design that can be used to convert a voltage-output device into a current-output circuit so that it can be used with the circuit shown in Figure 1 . |
| TIDA-00332 | High Voltage 12 V – 400 V DC Current Sense Reference Design | A Reference Design using a similar circuit to the one shown in Figure 1 , but with the INA138. |
| TIDA-00313 | –48-V Telecom Current/Voltage/Power Sense with Isolation | A Reference Design showing how to use any common-mode voltage with a floating power supply and isolation for digital devices. |
| SBOA198 | Extending Beyond the Max Common-Mode Range of Discrete Current-Sense Amplifiers | An Application Brief covering different methods of extending the common-mode voltage range, including the example used in Figure 1 . |

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