Produce current from positive or negative high-voltage supplies

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You sometimes need a current source for supply voltages as high as 1000V or more. This current source can be useful for ripple-voltage reduction when the current source's high-impedance node feeds an electrolytic capacitor to effectively short the ripple voltage. The circuit in **Figure 1** does the job with a temperature-stable and exact-output current. The circuit uses N-channel MOSFET Q_1, which has a drain-to-source voltage of 1000V. Zener diode D_2, a ZR431LF01 shunt regulator, stabilizes and regulates the output current. The threshold voltage of Q_1 must be higher than D_2's 1.25V reference voltage.

R_1 and the voltage across it determine the output current. In this case, 1.25V/220Ω=5.6 mA. D_2 regulates the MOSFET's gate-to-source voltage until the voltage across R_1 equals D_2's reference voltage, which is temperature stable and accurate, making the current source stable and accurate, as well. Zener diode D_1 protects Q_1's gate and limits the gate-to-source voltage if no load connects to the current source.

You can use a similar circuit to get constant current from negative high-voltage supplies even if a P-channel MOSFET with a high drain-to-source voltage is unavailable. To make the circuit work with negative supplies with an N-channel MOSFET, you must modify the circuit in **Figure 1**. You can use the N-channel MOSFET by changing the source and drain connections of MOSFET Q_1 in **Figure 2** (pg 55). The function of the current regulation with zener diode D_2 is the same as for positive voltages. EDN

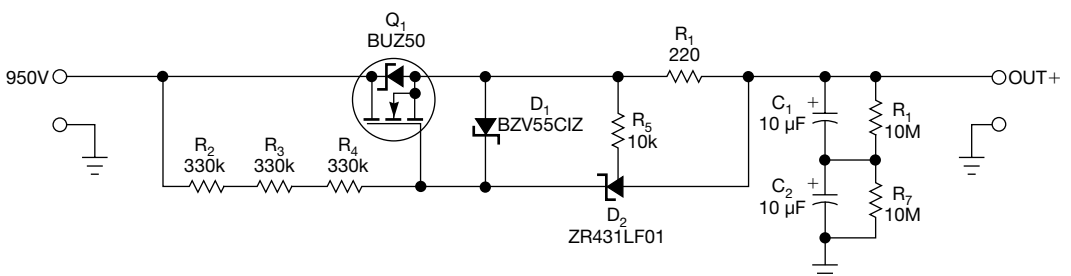

Figure 1 This circuit produces current using positive voltages.

Figure 2 This modified version of the circuit in Figure 1 produces current using negative voltages.