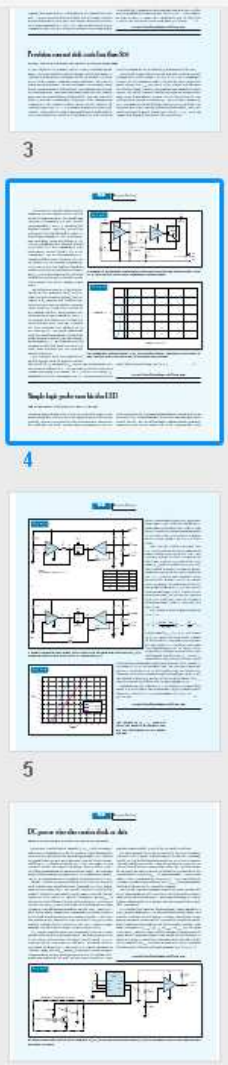


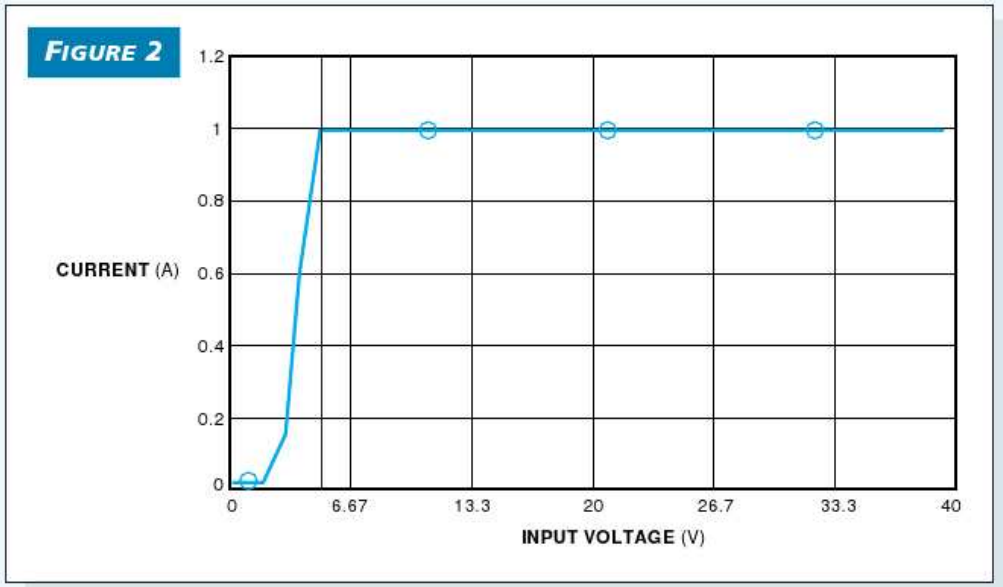
or within 0.001% tolerance (Figure 2). You could lower the initial regulation point by one diode junction by removing D_1, whose sole purpose is to prevent destruction of the active circuitry when you connect the power supply backward.

The principal sources of error in the circuit are the amplifier offset, the tolerance of the reference voltage, the tolerance of R_4, and the fact that the current includes various branch currents other than the controlled current in the sensing resistor. These branch currents add up to approximately 400 µA, or roughly five times lower than the offset-voltage error. You can consider the error negligible for settings of 10 mA and above. The most important issue for long-term stability is efficient heat removal from the current-regulating transistor, Q_1. The transistor needs an appropriate heat sink; the choice of heat sink depends on the current ranges you need.

The element that encounters the largest voltage drop at a given current is the hottest. Q_1 dissipates V_{IN}–1W for any given input voltage when operating at 1A. If you plan to use the load on a continuous basis, for example at 1A, with a 30V input, Q_1 dissipates 29W; R_4 consumes 1W. Q_1 would thus need a hefty extruded heat sink. (DI #2171)

To Vote For This Design, Circle No. 408

A handful of inexpensive parts builds a precision current sink that provides 1-mA to 1A sink current over a wide compliance-voltage range.



For compliance voltages above 4.9V, the circuit in Figure 1 provides a rock-solid 1A sink current, with less than 0.001% variation with voltage.