Add trimmable current limit to dc/dc supply

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You can add a simple, two-transistor circuit to a standard, step-down dc/dc converter to provide an adjustable limit for the output current (Figure 1). You can apply this method to most step-down converters that provide access to the feedback node. The circuit uses a PWM switch-mode regulator, IC1, to generate 9V from an input of 12 to 30V (a range that satisfies automotive applications). R4 senses the output current; the current limit is 0.65/R4, which in this case is 440 mA. The limiting current produces sufficient voltage across R4 to turn on Q2.

The current through R5 then turns on Q1, which throttles the output current by sourcing current to the feedback node on Pin 8. R6 protects Q2's base-emitter junction in the event of an output short circuit. Because R5 and R6 sense the output voltage downstream from the current-sense resistor, VOUT stays in regulation until the current reaches the limit. This regulation characteristic is useful in battery-charging applications. R5 and R6 set the regulated output level according to

\[ V_{\text{OUT}} = \frac{2.2 \times (V_T - R_L)}{R_6} \]

(DI #2062)

Figure 1

Adding two transistors allows this standard switch-mode buck regulator to limit the output current to 0.65/R4.