

APPLICATION NOTE 260

Miniature Temperature Monitors Drive 3-Speed Fan Controller

Combining a switch-mode DC-DC controller with two low-cost temperature-monitor ICs produces a 3-speed fan controller (Figure 1). Useful in many applications, this circuit cuts noise and power consumption in computers, temperature controllers, and alarm systems.

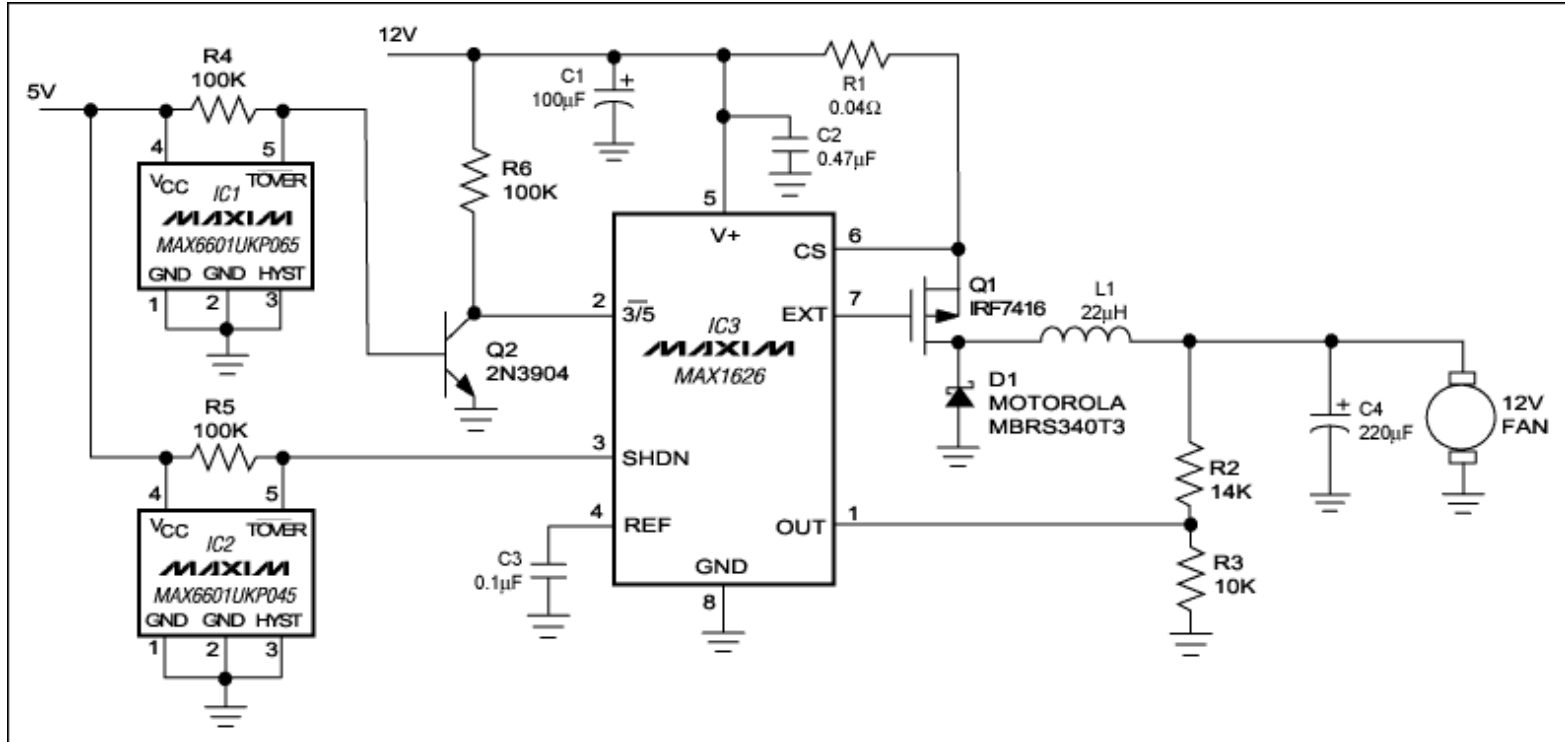


Figure 1. Controlled by the temperature monitors IC1 and IC2, this switch-mode DC-DC controller (IC3) applies either 0V, 8V, or 12V to the fan.

The idea is made possible by IC3's pin-selectable shutdown and output-voltage capabilities. The logic levels applied to those inputs (active-low 3/5 and SHDN), along with properly valued feedback resistors (R2 and R3) set the output-voltage levels (available one at a time) at 0V, 8V, and 12V. In general, the lower voltage (V_{OUT1} , which equals 8V in this case) is determined by the R2/R3 divider, and the higher voltage (V_{OUT2}) (which equals 12V in this case) is determined by the product of V_{OUT1} and an internal ratio:

$$V_{OUT1} = 3.3 [(R2+R3)/R3]$$

$$V_{OUT2} = V_{OUT1}(5/3.3)$$

The temperature monitors (IC1 and IC2) have open-drain outputs (active-low TOVER) that are pulled low when the ambient temperature exceeds a factory-programmed internal threshold. The monitors come in tiny SOT23-5 packages, with dedicated thresholds in the +35°C to +115°C range. When the temperature exceeds the threshold of IC2 (+45°C in this example), that device turns on IC3 by pulling its SHDN terminal low. IC3's active-low 3/5 input remains low, producing 3.3V at OUT (and 8V at the fan), until the temperature rises to +65°C. At that time, the IC1 output pulls low, turning off Q2 and allowing R6 to pull the active-low 3/5 input high, which applies 12V to the fan. Q2 is necessary for signal inversion and for meeting the active-low 3/5 input's logic-high threshold ($V+ - 0.5V$).

IC3's ability to produce 100% duty cycles enables a very low dropout voltage for this application—about 150mV at 1A load. The conversion efficiency is independent of output voltage but varies with output current, ranging from 85% and 96% for currents between 10mA and 1A. The average efficiency is 90%. At low temperatures for which a fan is not required (below +45°C), the switching regulator shuts down and lowers the supply current in this circuit to about 100µA.

A similar idea appeared in the February 22, 1999 issue of *Electronic Design*.

Application Note 260: www.maxim-ic.com/an260

More Information

For technical support: www.maxim-ic.com/support

For samples: www.maxim-ic.com/samples

Other questions and comments: www.maxim-ic.com/contact

Automatic Updates

Would you like to be automatically notified when new application notes are published in your areas of interest? [Sign up for EE-Mail™.](#)

Related Parts

MAX1626: [QuickView](#) -- [Full \(PDF\) Data Sheet](#) -- [Free Samples](#)

AN260, AN 260, APP260, Appnote260, Appnote 260

Copyright © by Maxim Integrated Products

Additional legal notices: www.maxim-ic.com/legal