Keywords: 5V Step-Down Converter Has Transformer-Isolated Feedback

Jul 09, 1998

APPLICATION NOTE 998

5V Step-Down Converter Has Transformer-Isolated Feedback

The circuit of **Figure 1** shows an alternative to opto-isolated feedback signals (the system shown is a 5V switching regulator). The zero (non-existent) line regulation of a push/pull, surface-mount transformer and driver (T2 and IC2) produces an isolated feedback signal (to pin 3 of IC1) proportional to the regulator's nominal 5V output. The result is a fully isolated dc-dc converter without the usual opto-isolator bandwidth constraints and aging characteristics.

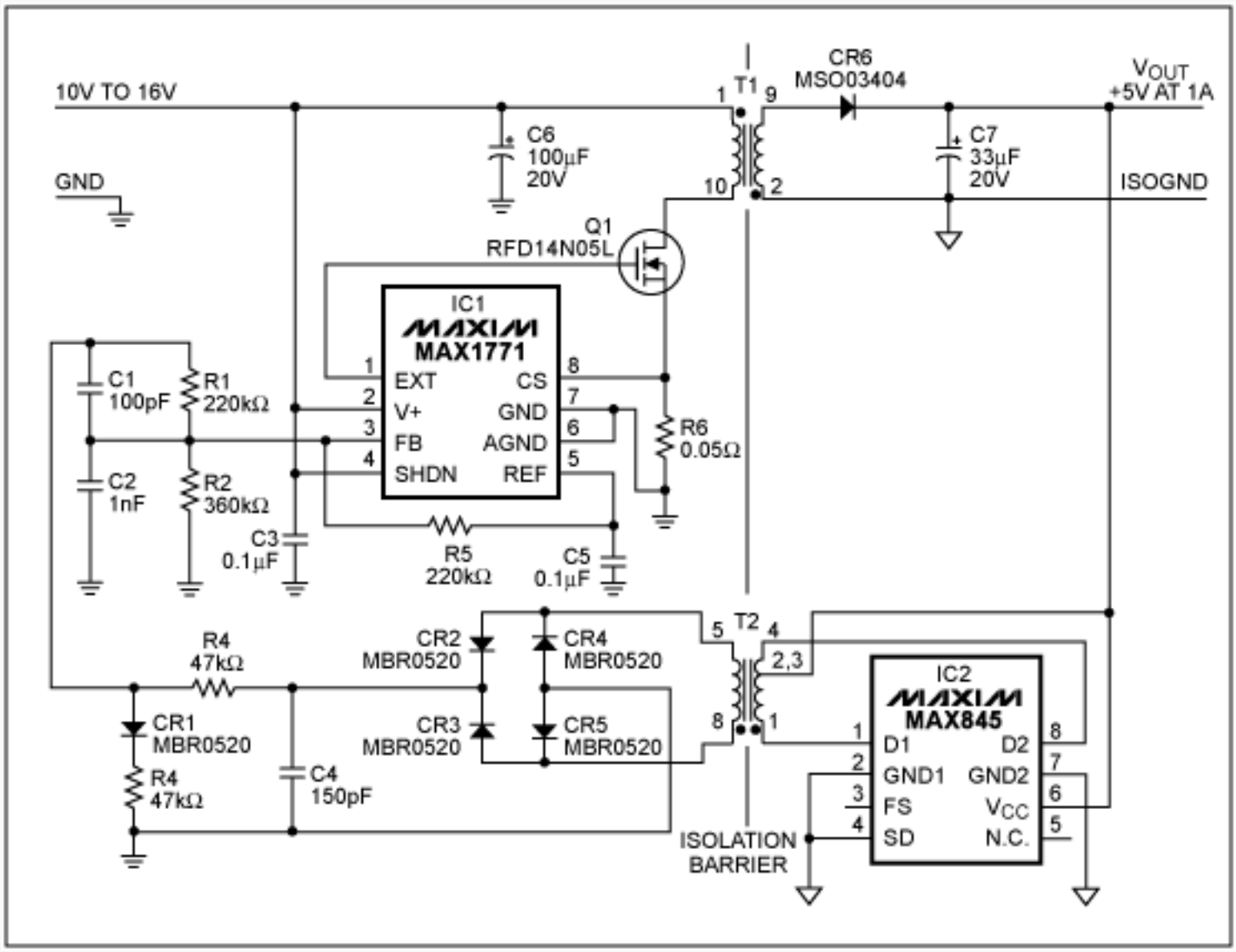

Figure 1. This fully isolated 5V switching regulator offers long-term reliability and ease of design.

By alternately grounding each end of T2's center-tapped primary, the transformer driver (IC2) generates an ac signal proportional to the desired 5V feedback voltage. A diode bridge (CR2–R5) and capacitor (C4) convert this transformer's output to dc, and a diode-resistor network (CR1, R3, R4) compensates for the diode bridge's temperature coefficient. (You can substitute silicon signal diodes, such as 1N4148s, for the Schottky diodes.) The

result is a zero-TC voltage slightly less than ½V_{OUT}. Transformer T1 isolates V_{OUT}.

In response to a 5V output, the feedback network produces an isolated 2.404V (at IC1, pin 3) and introduces about 250ns of delay at 100kHz—the equivalent of 9° of phase shift. This bandwidth is sufficient for the control loop in most switching converters. Supply current for IC2 and the temperature compensation network together is about 6mA.

Starting with a 5V, nonisolated transformer flyback converter in which V_{OUT} connects directly to the top of C1 and R1, you can insert the isolated-feedback circuit (bottom of Figure 1) between V_{OUT} and C1/R1. To accommodate this extra isolated-feedback circuit, simply reduce the value of R1 to ensure that the R1/R2 divider voltage is comparable to IC1's internal feedback reference (1.5V).

The isolated converter's performance is virtually identical to that of the nonisolated converter, except for isolated-feedback-circuit power consumption. T2 provides 500V_{RMS} isolation. (You can also get transformers with 1500V_{RMS} isolation.)

Related Parts

MAX1771: QuickView -- Full (PDF) Data Sheet -- Free Samples

MAX845: QuickView -- Full (PDF) Data Sheet -- Free Samples

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™.

Application note 998: www.maxim-ic.com/an998

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
