

Keywords: high-voltage supplies, magnetic isolation, toroidal-core multiwinding transformers,

APPLICATION NOTE 4510

Simple High-Voltage Supply Features Single IC and Small Size

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Abstract: This circuit includes magnetic isolation that allows you to configure a positive, negative, or floating output. The floating output is enabled by a separate winding that generates a feedback voltage proportional to, but lower than the output voltage, thereby eliminating the need for large-valued resistors in a resistive feedback divider.

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Certain sensors, electrostatic traps, and other applications require a regulated high-voltage power supply that delivers a modest amount of output current. Simplicity, low quiescent current, and small size are desirable in such supplies. The circuit of **Figure 1** meets these requirements, and its magnetically isolated output allows you to configure a positive, negative, or floating output.

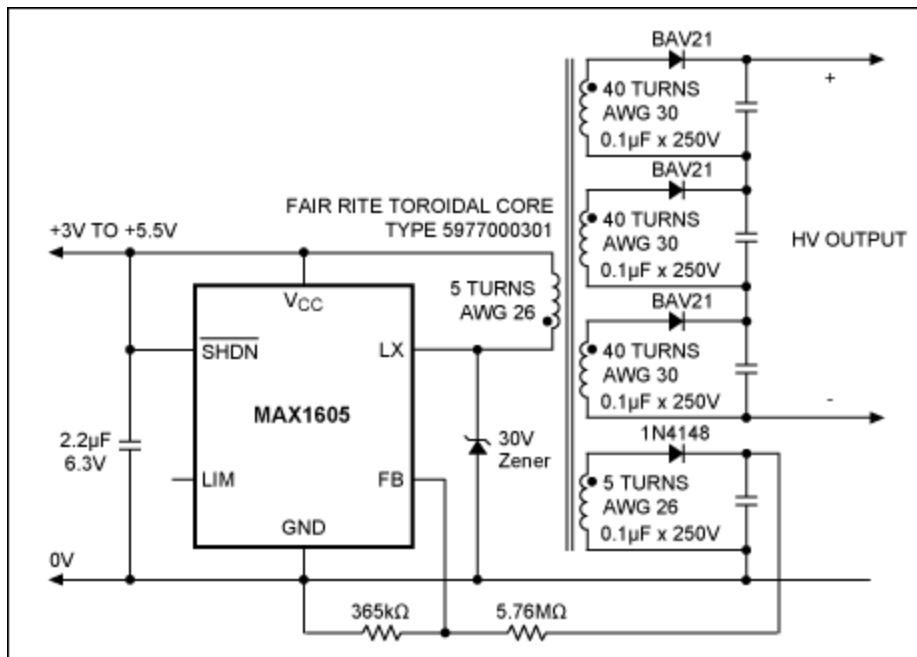


Figure 1. Obtaining feedback from a low-voltage secondary winding, this high-voltage supply generates 500V with low quiescent current.

The floating output is enabled by a separate winding that generates a feedback voltage proportional to the output voltage, but lower. That arrangement eliminates the need for large-valued resistors in a resistive feedback divider, which is otherwise required if the high-voltage (HV) output is sampled directly. As shown, the low-voltage divider contains resistors with much lower values, which dissipate much less power.

A single IC ([MAX1605](#)) contains the necessary switching regulator, modulator, error amplifier, and power switches. It drives the primary of a toroidal transformer that includes a feedback secondary and several output windings. With component values as shown, the circuit can generate 500V. You can vary the output voltage $\pm 30\%$ by adjusting the ratio of the resistive feedback divider. You can also increase or decrease the output voltage in steps, by adding or removing the rectifier/capacitor/ output-winding modules (BAV21). Input current and output voltage vary as shown with input voltage (**Figure 2**) and load current (**Figure 3**).

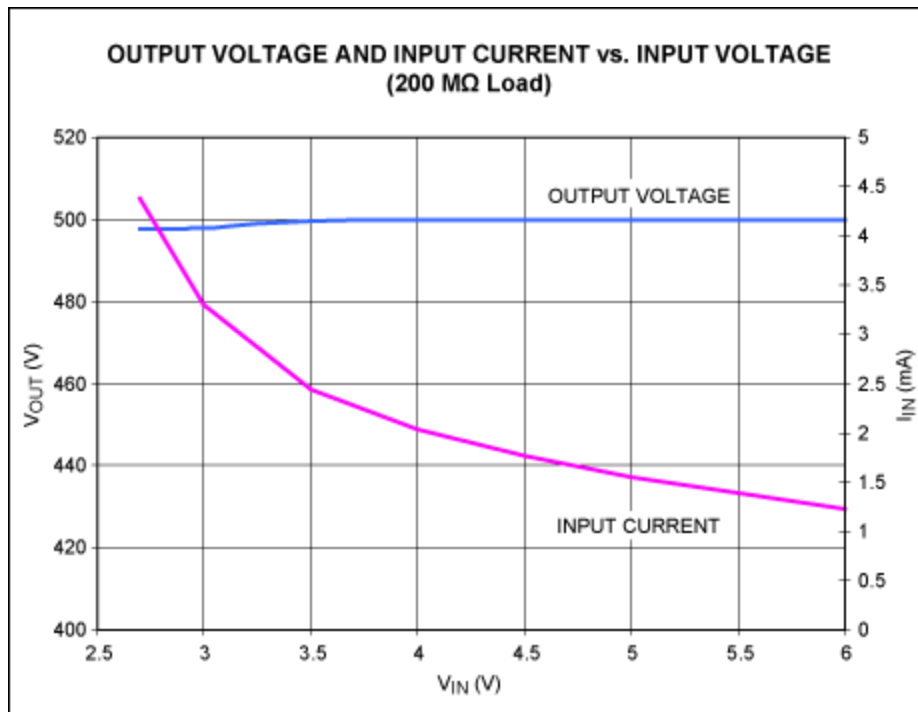


Figure 2. Output voltage (upper trace) and input current (lower trace) vs. input voltage for the Figure 1 circuit.

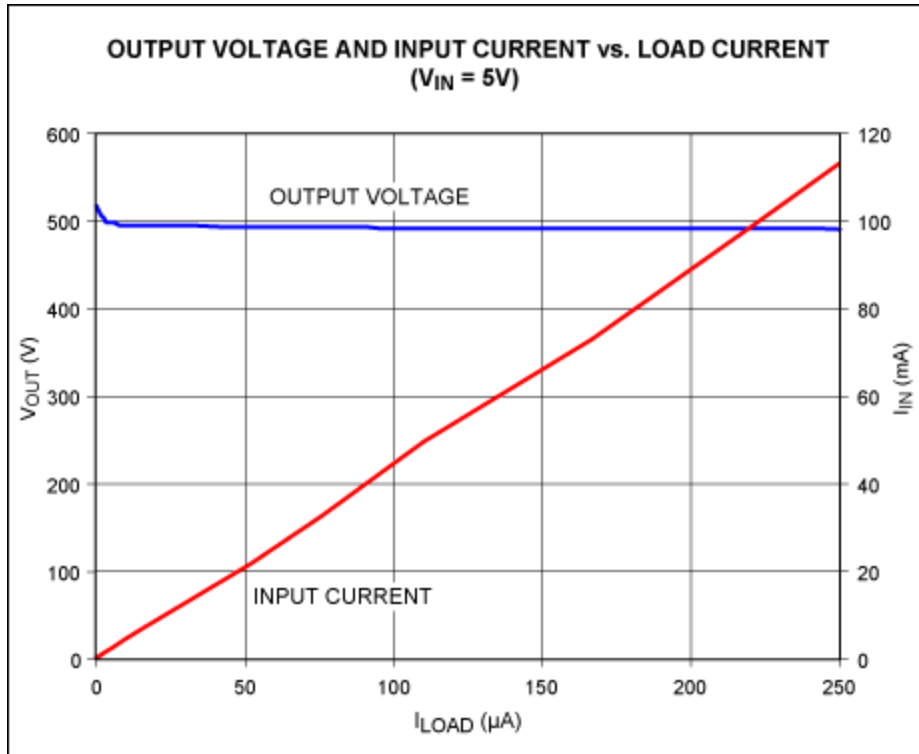


Figure 3. Output voltage (upper trace) and input current (lower trace) vs. load current for the Figure 1 circuit.

As for all switching converters, EMI and circuit parasitics can present problems. The circuit needs careful board layout, along with filtering, decoupling, and shielding as required. The HV output has about 1% ripple. You can add an RC or LC filter in series with the output to achieve lower output ripple.

Related Parts

[MAX1605](#)

30V Internal Switch LCD Bias Supply

[Free Samples](#)

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