

# Positive-to-Negative Converter Powers -48V Telecom Circuits

by Mitchell Lee

If you're designing a system that interfaces to telecom equipment, chances are you'll need a -48V supply. The circuit in Figure 1 supplies up to 6W at -48V and scales to more than 12W with higher power components. Based on the Cúk topology, the converter exhibits excellent efficiency over a wide range of loading conditions (see Figure 2).

The LT1171's error amplifier is designed for positive-boost applications, and hence its gain and reference are of the wrong phase and polarity for sensing an inverted output. In this application, the error amplifier is sim-

ply bypassed and feedback is applied at the compensation ( $V_C$ ) pin. Zener diode D2 senses the output, pulling down on Q1 and the  $V_C$  pin, in response to small increases in output voltage. Pulling down on the  $V_C$  pin reduces peak switch current, and constitutes negative feedback. If the output is a little low, the Zener's diminished feedback signal is overcome by an internal  $200\mu\text{A}$  current source at the  $V_C$  pin, thereby increasing peak switch current and restoring the output voltage.

The combination of the LT1171 and the VP-2 series VERSA-PAC™

coil (CTX02-13836) are suited for 120mA output current as shown. For lighter loads of up to 60mA, use the LT1172 and a VP-1-series equivalent to the coil shown. For up to 15W, use the LT1171 and a VP-5 equivalent. High voltage versions of the LT1170 family (-HV) allow inputs of up to 20V without exceeding the peak switch-voltage rating.

This converter starts working at 2.7V and will regulate -48V at reduced power. You can add undervoltage lock-out by inserting a Zener diode ( $V_Z = V_{\text{LOCKOUT}} - 2.7\text{V}$ ) between the input supply and the LT1172's  $V_{\text{IN}}$  pin.

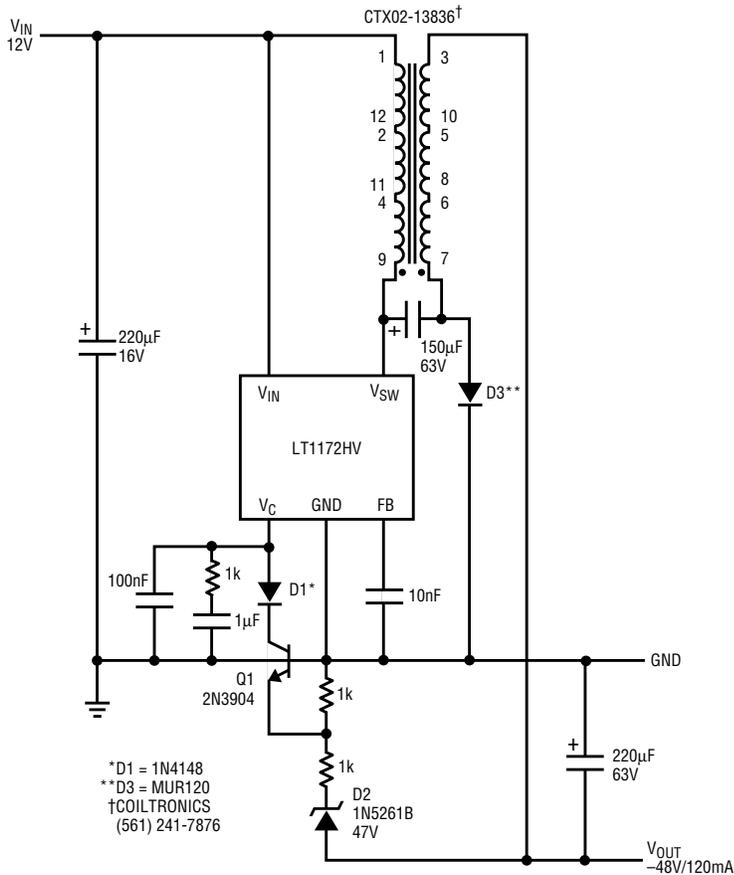


Figure 1. 12V to -48V features good efficiency over a wide range of loads.

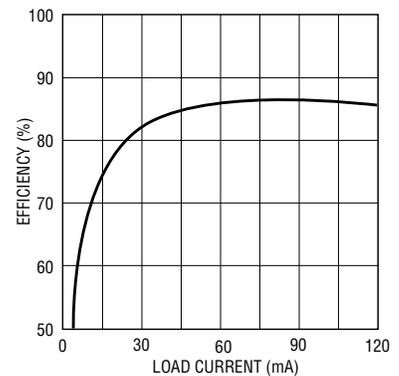


Figure 2. Converter efficiency rises to 80% at only 20mA load.

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