

Triple-Output Telecom Housekeeping Converter Small Enough for a Postage Stamp Board

by Goran Perica

Many telecom applications require a small DC/DC converter that can deliver a few watts of output power to housekeeping circuitry. Small size and high efficiency are primary concerns in any converter design because telecom system boards are densely packed with circuitry. The problem is that these two requirements are often at odds in a DC/DC converter. A high switching frequency minimizes the size of the transformer and filter capacitors, but a low switching frequency keeps switching losses low, and efficiency high.

The converter shown in Figure 1 solves this problem by operating at 200kHz, which is high enough to keep the circuit small, but sufficiently low to keep efficiency high. The control

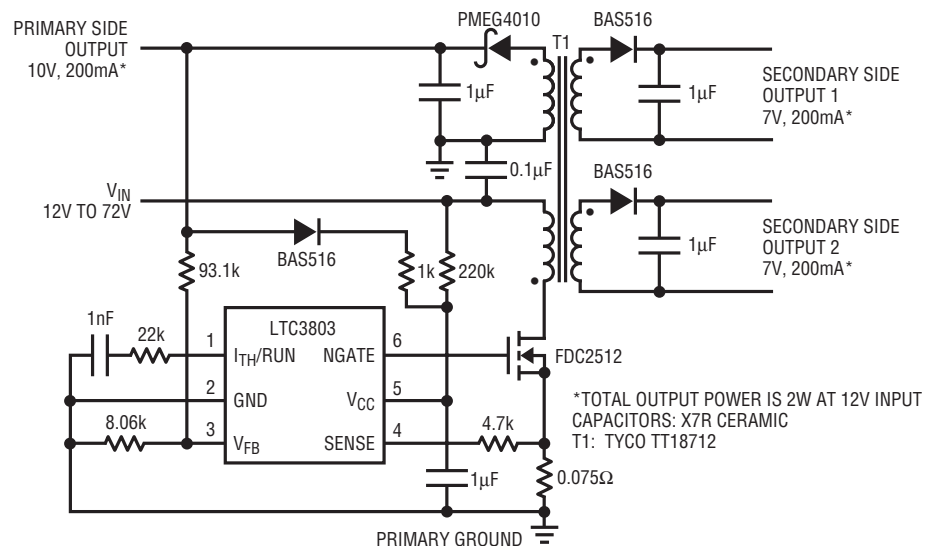



Figure 1. Small and efficient telecom DC/DC converter

circuit of the LTC3803 provides current mode control with programmable current slope compensation, which allows the smallest ceramic output capacitors to be used. The switching components shown here (the MOSFET and diodes) were carefully selected to optimize the conduction and switching losses. The trick is to balance the conduction losses against the switching losses, based on the desired power level. Large MOSFETs and Schottkys reduce conduction losses but increase the switching losses.

The efficiency of the converter, shown in Figure 2, is as high as 84% at 48V input and 5W of output power. The power dissipated by the circuit is only 0.99W, which is spread between the MOSFET, transformer and the output diodes. The power consumption of LTC3803 circuit is only 20mW. The low power dissipation allows the circuit to be laid out in only 0.8" by 0.8" of PCB space, which is smaller than a typical postage stamp.

This circuit can also be used for higher output voltages simply by changing the value of FB pin resistor

divider. The output rectifier diodes, BAS516, can handle up to 200mA of output current. For output currents up to 1A, use a Philips PMEG4010 Schottky diode.

The two secondary-side 7V outputs are semi-regulated via transformer windings. The output regulation of the 7V outputs depends on both the primary and secondary side loading. With the primary side loading between 15mA and 500mA, and the secondary side loading between 15mA to 100mA, the 7V output voltage tolerance is within 13%. The 7V output can be post-regulated by a low dropout linear regulator or a switching converter to provide other output voltages. 

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