



DESIGN NOTES

Number 18 in a series from Linear Technology Corporation

December, 1988

A Battery Powered Lap Top Computer Power Supply

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Most battery powered lap top computers require regulated multiple output potentials. Problems associated with such a supply include magnetic and snubber design, loop compensation, short circuit protection, size and efficiency. Typical output power requirements include 5V @ 1A for memory and logic circuitry and $\pm 12V$ @ 300mA to drive the analog components. Primary power may be either a 6V or 12V battery. The circuit in Figure 1 meets all these requirements. The LT1071 simplifies the power supply design by integrating most of the switching regulator building blocks. Also, the off-the-self transformer eliminates all the headaches associated with the magnetic design.

The circuit is a basic flyback regulator. The transformer transfers the energy from the 12V input to the 5V and $\pm 12V$ outputs. Figure 2 shows the voltage (trace A) and the current (trace B) waveforms at the V_{SW} pin. The V_{SW} output is a collector of a common emitter NPN, so current flows through it when it is low. The circuit's 40kHz repetition rate is set by the LT1071's internal oscillator. During the V_{SW} (trace A) "on" time, the input voltage is applied across the primary winding. Notice that the current in the primary (trace C) rises slowly as

the magnetic field builds up. The magnetic field in the core induces a voltage on the secondary windings. This voltage is proportional to the input voltage times the turns ratio. However, no power is transferred to the outputs because the catch diodes are all reversed biased. The energy is stored in the magnetic field. The amount of energy stored in the magnetic field is a function of the current level, how long the current flows, the primary inductance and the core material. When the switch is turned "off" energy is no longer transferred to the core, causing the magnetic field to collapse. The voltage on the transformer windings is proportional to time-rate-of-change of the magnetic field. Hence, the collapsing magnetic field causes the voltages on the windings to change. Now the catch diodes are forward biased and the energy is transferred to the outputs. Trace D is the voltage seen on the 5V secondary and trace E is the current flowing through it. The energy transfer is controlled by the LT1071's internal error amplifier, which acts to force the feedback (FB) pin to a 1.24V reference. The error amplifiers high impedance output (V_C pin) uses an RC damper for stable loop compensation. If a 6V input is desired, use just one primary winding and an LT1070.

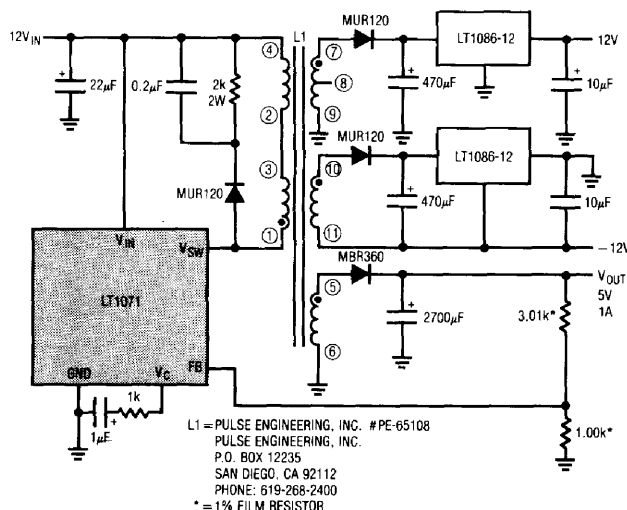


Figure 1. Multi-Output Flyback Converter

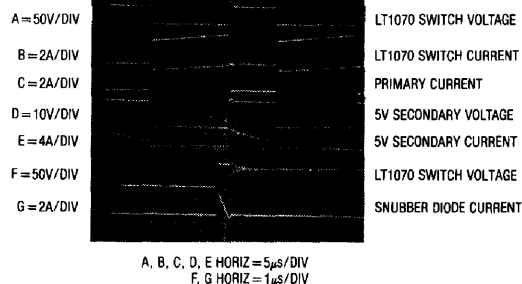


Figure 2. Waveforms for Continuous Mode Operation

