As the demand for world wide networking grows, so will the need for advanced data transmission products. In particular, ISDN services have become popular because of the recent development of the Internet. ISDN provides higher speed data transmission than standard modems used in PCs. Also, ISDN supports the standard telephone interface (voice and fax), which includes the Subscriber Line Interface Circuit. A Subscriber Line Interface Circuit requires a negative power supply for the interface and the ringer voltages. The power supplies described herein are designed for these applications. Specifically, these designs address the AMD79R79 SLIC device with on-chip ringing.

CIRCUIT DESCRIPTIONS

LT® 1171 Supplies – 23.8V at 50mA and –71.5V at 60mA

Figure 1 shows a current mode flyback power supply using the LT1171CQ device. This current mode device has a wide input voltage range of 3V to 60V, current limit protection and an on-chip 65V, 0.30Ω bipolar switch. The input voltage range for the circuit is 9V to 18V. This circuit is intended for small wall adapters that power ISDN boxes. The output voltages are –23.8V at 50mA and –71.5V at 60mA.

The circuit shown in Figure 1 uses the LT1171 in standard flyback topology. The transformer’s turns ratio is 1:1:1:1, where 23.8V appears across each secondary winding and the primary during the switch off time. The remaining secondary windings are stacked in series to develop –47V. The –47V section is then stacked onto the –23.8V section to get –71.5V. This technique provides very good cross regulation, lowers the voltage rating required on the output capacitors and lowers the RMS currents, allowing the use of cheaper output capacitors. Either the –23.8V output or the –71.5V output can be at full load without effecting the other corresponding output. The circuit’s step response is very good; no significant overshoot occurs after either output is shorted and released. Also, the transformer windings are all quadrafilar to lower the leakage inductance and cost.

LT1269 Supplies – 23.5V at 60mA and –71.5V at 120mA from 5V Input

Figure 2 shows a current mode flyback power supply using the LT1269CQ device. This current mode device has a wide input voltage range, current limit protection and an onboard 60V, 0.20Ω bipolar switch. The input voltage range for the circuit is 5V to 18V. This design provides a wider input voltage range and greater output power than that of Figure 1. The output voltages are –23.5V at 60mA and –71.5V at 120mA (8.6W). This circuit is designed to power two SLIC devices. The circuit operation is identical to Figure 1, except for a larger switching regulator device (VR1) and a different transformer (T1). These changes allow for 5V operation and higher output power. This circuit is designed for full load on the –71V or –23.5V output. This accommodates the ringing on two SLICs or off hook on two SLICs. R5 and R6 are preload resistors for maintaining an accurate –23.5V output at full load with the –71V output at minimum load.

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Printed circuit board layout is an important consideration in the design of switching regulator circuits. A good ground plane is required for all ground connections. The path from the input capacitor to the primary winding of the transformer is a high current path, and requires a short, wide copper trace (0.080" to 0.1"). The VSW pin connection also needs a short, wide copper trace. R1 and C2 need to be placed close to VR1. The secondary windings can be connected to their associated components with 0.025" to 0.030" traces. The feedback circuitry needs to be placed close to the FB pin of VR1. Place C5 close to U1 to decouple the op amp power supply. The LT1171CQ and LT1269CQ are surface mount devices that require about a 1" copper pad for heat sink mounting. Heat sinking is most critical for the LT1269CQ because of its high output power. Also, vias from the copper pad to the internal ground layers are highly recommended.

**BILL OF MATERIALS**

A bill of materials has been provided with each schematic.