LINEAR TECHNOLOGY

DESIGN NOTES

Power Supplies for Subscriber Line Interface Circuits

Design Note 130

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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.

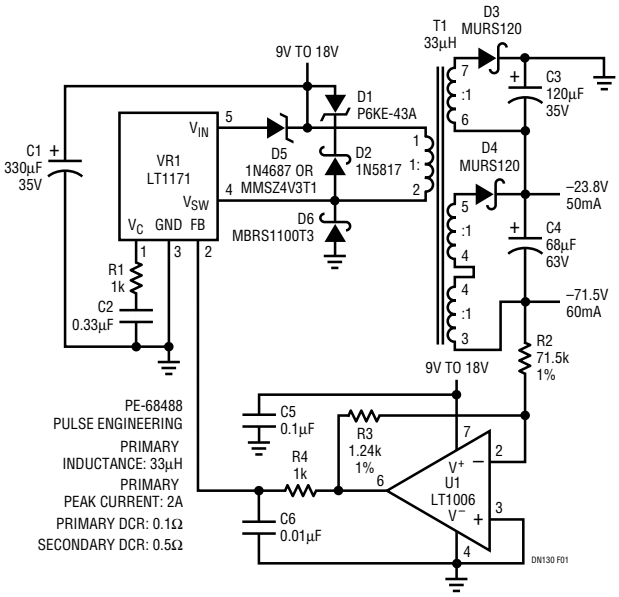

Figure 1

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.

Figure 1 Bill of Materials

REFERENCE DESIGNATOR	QUANITITY	PART NUMBER	DISCRIPTION	VENDOR	TELEPHONE
C1*	1	ECA-1VFQ331	Capacitor, 330µF, 35V HFQ	Panasonic	
C2, C5	1	0805	Capacitor, 0.33µF Ceramic		
C3	1	UPL1V121MPH	Capacitor, 120µF, 35V Plastic	Nichicon	(708) 843-7500
C4	1	UPL1J680MPH	Capacitor, 68µF, 63V Plastic	Nichicon	
C6	2	0805	Capacitor, 0.01µF		
D1	1	P6KE-43A (MOT), TGL41-43A (GI)	Diode, 0.5W Zener	Motorola or Equiv	
D2	1	1N5817	Diode, 1A Schottky	Motorola or Equiv	
D3, D4	2	MURS120	Diode, Ultrafast	Motorola or Equiv	
D5	1	1N4687, MMSZ4V3T1	Diode, Zener	Motorola or Equiv	
D6	1	MBRS1100T3	Diode	Motorola or Equiv	
R1, R4	2	0805	Resistor, 1k, 5% SMT		
R2	1	0805	Resistor, 71.5k, 1% SMT		
R3	1	0805	Resistor, 1.24k, 1% SMT		
T1*	1	PE-68488	Transformer	Pulse Eng	
U1	1	LT1006S8	IC	LTC	(408) 432-1900
VR1*	1	LT1171CQ	IC	LTC	(408) 432-1900
***Changes and Additions for Figure 2's Circuit**					
C1	1	205A100M	Capacitor, 100µF, 20V OS-CON	Sanyo	(619) 661-6835
D5, D7	2	1N4001	Diode		
R5, R6	2		Resistor, 50k 0.25W SMT or Through Hole		
T1	1	HM00-96553	Transformer	BI Technology	(714) 447-2656
VR1	1	LT1269CQ	IC	LTC	(408) 432-1900

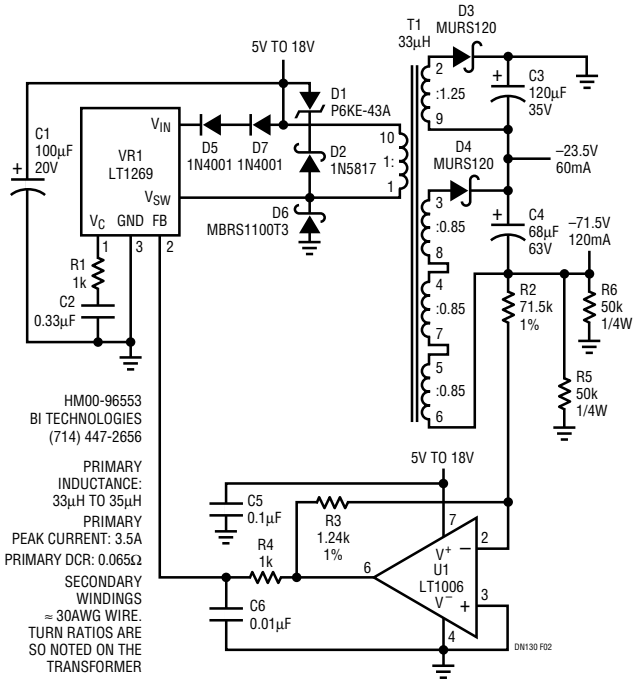

Figure 2

LAYOUT AND THERMAL CONSIDERATIONS

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 V_{SW} 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.

For literature on our Power Products, call **1-800-4-LINEAR**. For applications help, call (408) 432-1900, Ext. 2361

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