Generating Low Cost, Low Noise, Dual-Voltage Supplies

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Some sensitive electronic applications, such as telecommunication and data acquisition, require both 5V and –5V low noise supplies, which may have to be generated from a single high voltage positive supply. The circuit in Figure 1 shows a cost-effective way to generate 5V and –5V from a single 10V–28V supply by using the low noise LT1777 and a few off-the-shelf components.

The LT1777 is a step-down regulator specially designed for low noise applications. In order to achieve low noise, the LT1777 is equipped with dI/dt limiting circuitry, which is programmed via a small external inductor in the power path. It also contains internal circuitry to limit the dV/dt turn-on and turn-off ramp rates. Figure 2 shows the V_{SW} node voltage and the V_{SW} node current for the low noise LT1777. Figure 3 shows the V_{SW} node voltage and V_{SW} node current for the high voltage LT1676 buck regulator under the same test conditions. It can be seen from Figures 2 and 3 that the

continued on page 29

Table 1. Allowable load current on the –5V supply vs input voltage and 5V load current

5V I_{LOAD} (mA)	Maximum allowed current on the –5V supply (mA)
V_{IN} = 10V	
50	40
100	70
200	110
300	130
350	140
V_{IN} = 18V	
50	90
100	150
200	200
300	230
350	200
V_{IN} = 28V	
50	130
100	180
200	260
300	270
350	230

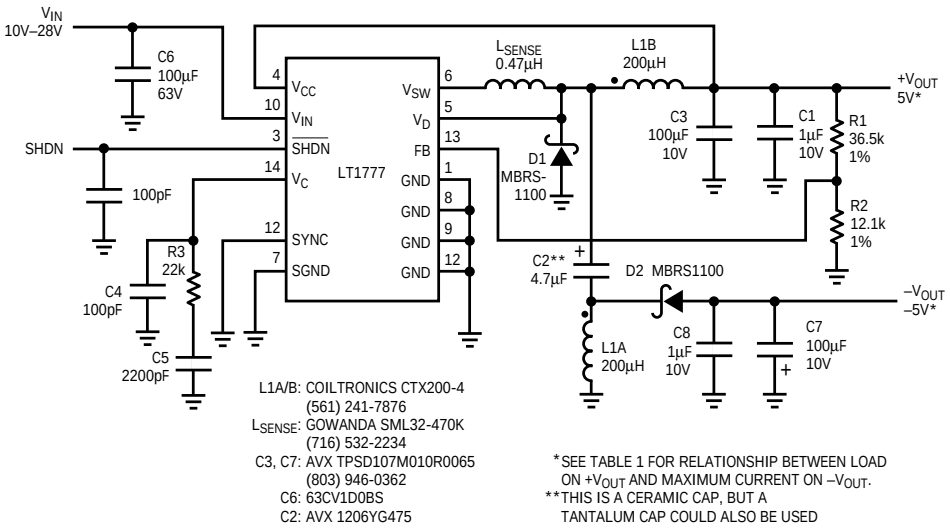

Figure 1. This cost-effective supply generates ±5V from a 10V–28V input.

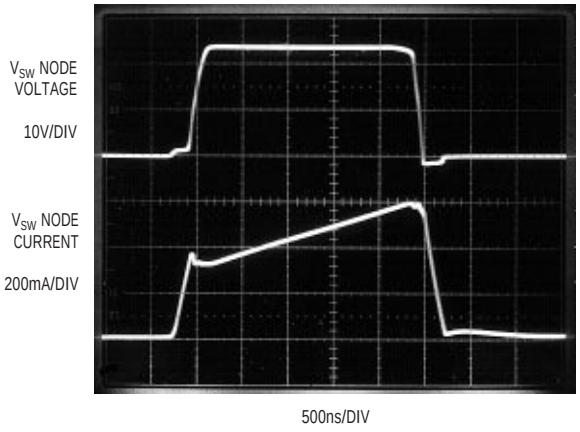

Figure 2. V_{SW} node voltage and node current for the LT1777

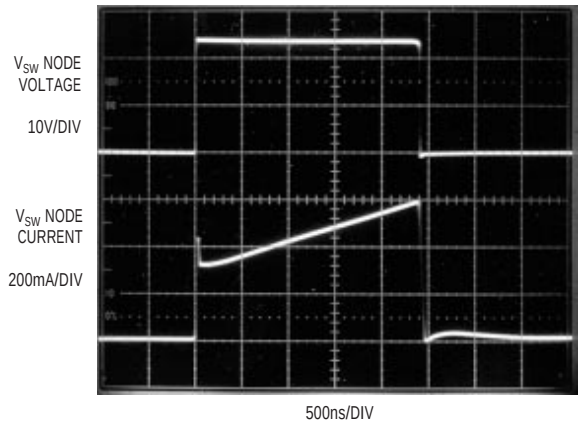

Figure 3. V_{SW} node voltage and node current for the LT1676

LT1777, continued from page 27

switch node voltage and current waveforms for the LT1777 are more controlled and rise and fall more slowly than those of the LT1676 regulator. By slowing down the sharp edges during turn-on and turn-off for the power switch, conducted and radiated EMI are reduced.

The circuit in Figure 1 shows three inductors: L1A, L1B and L_{SENSE}. L1A and L1B are two windings on a single core to generate ±5V. C2 has been added to minimize coupling mismatches between the two windings (L1A and L1B); this forces the winding potentials to be equal and improves cross-regulation. This creates the dual SEPIC (single-ended primary inductance converter) topology. L_{SENSE} is a user-selectable sense inductor to program the dI/dt ramp rate (see the LT1777 Data Sheet for more information). Table 1 summarizes the allowable load current on the –5V supply as a function of input supply voltage and the load current on the 5V supply. Note that 5V and –5V supplies are allowed to droop by 0.25V, which corresponds to 5% load regulation.