Wide-Input-Range, Low Voltage Flyback Regulator

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Many new switching regulators are designed with a specific application or topology in mind. If your requirements happen to fall within these parameters, all is well. Unfortunately, when faced with unusual requirements, the designer is often forced to choose bare-bones, universal regulators. The LTC1624 overcomes these issues by providing a full featured regulator that can operate in the step-down (buck), step-up (boost), buck-boost or flyback mode.

The functional diagram in Figure 1 reveals the flexibility of this device.

This constant-frequency current mode controller includes a high-side differential current sense amplifier and a floating high current N-Channel MOSFET driver. In the buck mode, an external bootstrap capacitor between the BOOST and SW pins works in conjunction with the internal 5.6V regulator and diode to provide a regulated supply for a high-side driver. In the boost, buck-boost or flyback mode, the SW pin is grounded, providing drive for a low-side MOSFET.

An example of a wide-input-range flyback is shown in Figure 2. The circuit provides ±50V at 75mA from a 4.75 to 24V source. The sum of line-, load- and cross-regulation is better than ±5%. The SW pin voltage is controlled by the internal 5.6V regulator, allowing the input voltage to be above Q1's 16V maximum gate-to-source voltage rating. 200kHz fixed frequency operation minimizes the size of T1. The R-C snubber formed by C1 and R1 in combination with T1's low leakage inductance keeps Q1's drain voltage well below its 100V rating. To improve cross-regulation, Q2, R2 and R3 were included to disable continued on page 31
Experimental Results

Figure 7, curve A, shows the amplitude response of the filter hardware illustrated in Figure 8. No attempt was made to adjust any component. Both notches are fully resolved, but due to the tolerances of the components and the finite bandwidth of the active circuitry, the stopband attenuation, although impressive, is 2dB above the theoretical value. Subsequently, the value of $R_{Q1}$ was lowered to 16.2k (curve B) to better define the first notch. The filter reaches attenuation levels beyond 85dB all the way up to 0.5MHz input frequencies. The measured attenuation at 1MHz was still better than 78dB. The dynamic range of the circuit is quite impressive: the measured wideband noise was 40µV RMS and the THD for 1V RMS and 50kHz input signal was better than –80dB.