Application Report
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Using the TPS61150 with V_{IN} > 6V

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ABSTRACT

This application note provides an example circuit of how to drive two strings of six wLEDs using the TPS61150 with a input voltage greater than the ICs 6-V absolute maximum voltage rating.

The TPS61150 is a boost converter used to regulate the current through wLEDs. In some applications needing wLEDS, a 3.0-V to 6.0-V voltage supply may be unavailable to power the TPS61150. In addition, reviewing equations 2 and 3 from the TPS61150 datasheet and recalling that boost converter efficiency improves as the input to output voltage differential decreases, it is apparent that higher output power, either as higher output current or higher output voltage (i.e., more wLEDS in series) is possible with a higher input voltage. Figure 1 shows a circuit that uses the TPS61150 power stage to drive two strings of six wLEDs from an input supply greater than 6V.

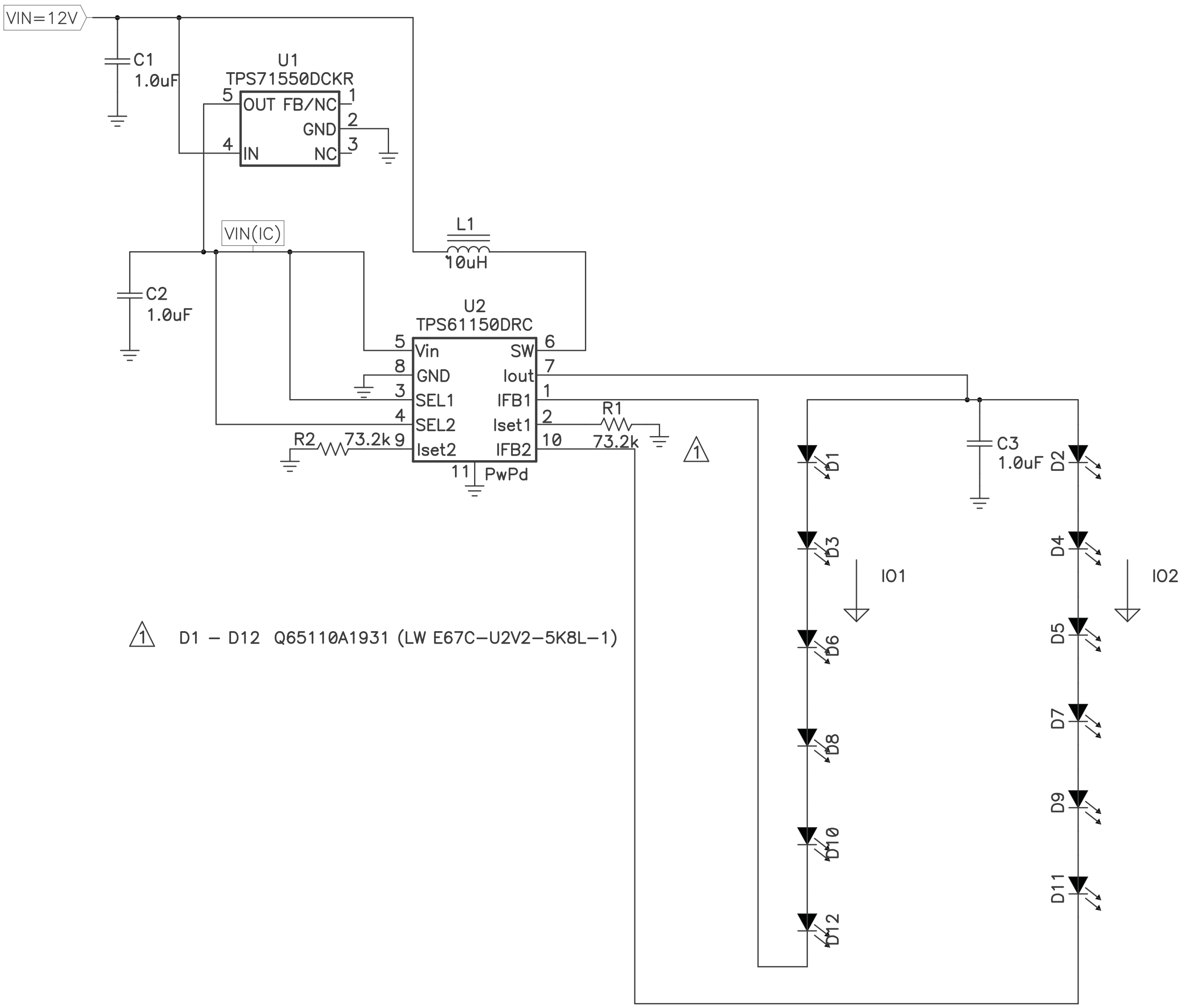

Figure 1. TPS61150 Driving 2 × 6 WLED Strings From V_{IN} = 12V

The TPS71550 linear regulator steps down the 12V input supply to power the TPS61150's control circuitry. Since the TPS61150 control circuitry operating current is typically 2 mA, power dissipation in the TPS71550 is not a concern up to V_{IN} = 24 V, the linear regulator's maximum input voltage. Figure 2 shows peak efficiency over load with TPS61150 powering both strings of WLEDs from various input voltages.

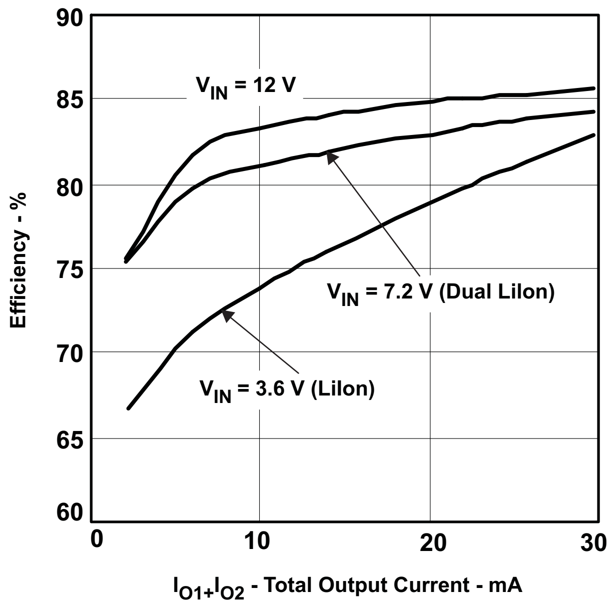

Figure 2. Both On Efficiency

The current through each wLED string is dimmed using PWM dimming at 1kHz on SEL1 and SEL2. Although the TPS61150 is capable of providing higher output currents, the maximum output current of the wLEDs used for the data inFigure 2 was limited to less than about 15 mA per string.

The TPS71550 can be replaced by the slightly lower cost, discrete linear regulator shown in Figure 3. However, most Zener diodes require current in the mA range to provide an accurate dc voltage so efficiency at light load suffers.

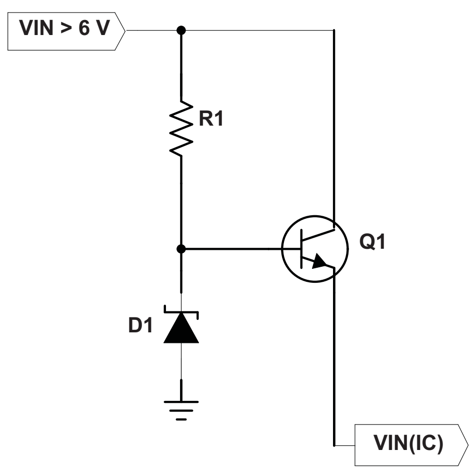

Figure 3. Discrete Linear Regulator

D1 should be a Zener diode with a clamp voltage of V_Z = 6V or less so that VIN(IC) = V_Z - V_{BE} < 6 V, where V_{BE} is typically 0.6 V - 0.7 V. R1 is sized to provide the appropriate amount of bias current for D1. Q1 should have a breakdown voltage slightly higher than the maximum input voltage.

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