Improved Overvoltage Protection for TPS61040/1

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Like many boost converters, the TPS6104x does not have internal overvoltage protection (OVP). Therefore, if the feedback loop opens suddenly, e.g., when a WLED burns out and opens or a series switch used to turn off the WLED is opened, there is a risk that the open-loop converter will boost the output above its 28-V maximum rating. As recommended in the TPS6104x data sheet (SLVS413), a Zener diode from V_{OUT} to ground is one method of providing overvoltage protection. However, this method can result in significant current flow through the Zener diode to ground. This application report presents an improved overvoltage protection circuit using a Zener diode.
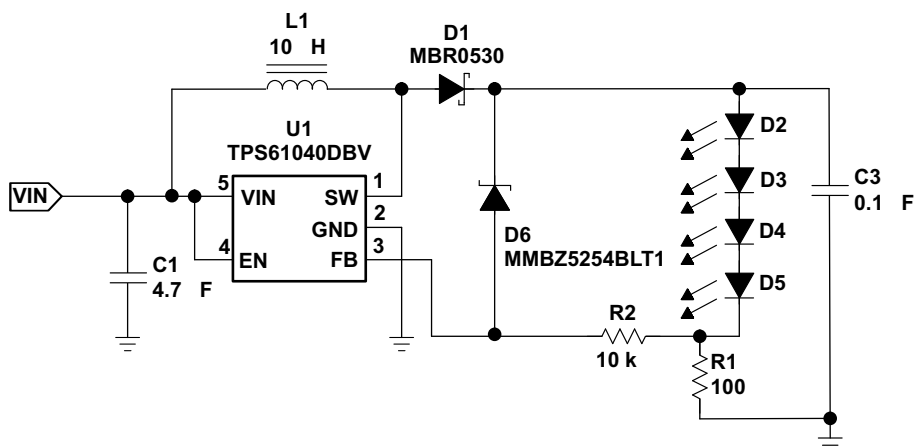

Figure 1. Improved OVP Circuit in WLED Application

As seen in Figure 1, adding a 28-V or less rated Zener diode from the cathode of D1 to the FB pin prevents the output voltage from increasing in the event of an LED failure. The Zener clamps the output voltage once the voltage drop across it exceeds its breakdown voltage. When using the circuit shown, care must be taken to choose a proper value for R2. If the value of R2 is too high, then the ±1- µA leakage current into the FB pin will alter the feedback voltage and reduce regulation accuracy. If the value of R2 is too low, then the TPS61040 outputs a large amount of current in the event of an open-loop condition, because R2 does not significantly impede the Zener avalanche current. Values of R2 between 10 kΩ and 100 kΩ are generally acceptable.

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