TPS65552A powers portable photoflash

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Portable Power DC/DC Applications

Upper-end equipment for film-based or digital photography requires Xenon flash tubes to photograph in low-light conditions. Xenon flash tubes provide a burst of high-intensity light that is essential for photography of objects at a distance, moving at high speeds, or in low-light conditions. The light spectrum generated by a Xenon gas-discharge tube closely replicates that of the sun, providing very accurate color reproduction.

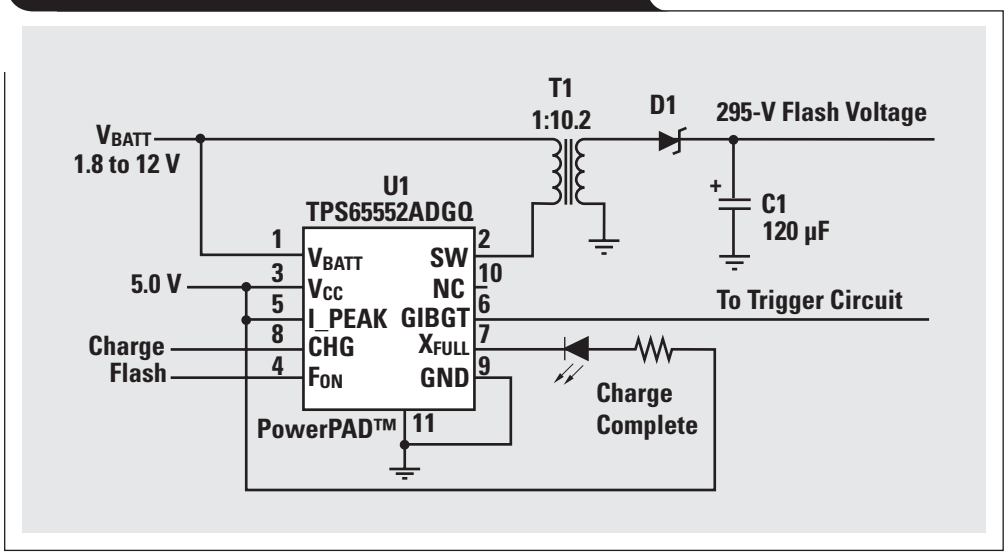
Xenon flash tubes require a high voltage across their electrodes to flash once a trigger signal is applied. This voltage is typically around 300 V. All of the energy needed to flash the lamp is stored in a bulk capacitor called a photoflash capacitor. Once the lamp is triggered, all of the energy stored in the photoflash capacitor is discharged through the flash tube to produce light. The stored energy in the photoflash capacitor is provided by a specialized boost converter that charges the photoflash capacitor up to 300 V from a much lower battery-input voltage. In the past, this converter was built of bulky discrete components that were difficult to incorporate into the space available in small devices such as cameras.

The Texas Instruments (TI) TPS65552A greatly simplifies and reduces the size of the photoflash charger circuit. Figure 1 shows a photoflash capacitor charger based on this device. The TPS65552A provides all the necessary charging controls, output feedback, charge completion status, insulated gate bipolar transistor (IGBT) driver, and circuit protections necessary to implement a small, efficient photoflash charger.

The TPS65552A is based on a flyback topology. The output voltage is sensed during the off period of the internal switch, at which time the output voltage is reflected back to the input through the transformer. This eliminates the need for a bulky, high-voltage feedback network on the output and also provides electrical isolation from the input to the output. Once the output voltage reaches its target value, the TPS65552A automatically stops charging and an open-collector output goes low, thus signaling a "ready to flash" condition. This output can drive a status-indicating LED or an input to a microcontroller.

The I_PEAK pin of the TPS65552A controls the peak current that flows through the primary of the flyback transformer, T1, during each switch cycle. To adjust the capacitor charging time, the primary current can be dynamically adjusted from 0.9 to 1.8 A by changing the voltage applied to the I_PEAK pin. This feature allows a microcontroller to dynamically control the current draw of the charger for power management. For example, in a digital still camera,

Figure 1. TPS65552A photoflash capacitor charger



a microcontroller can reduce the charger current when a high-current zoom motor is operating, so that both the zoom motor and charger can function at the same time without exceeding the maximum current capability of the camera's battery (see Figure 2). This feature can also be used to extend battery run time. Reducing the peak currents during charging reduces the average current consumption so that a weak battery can still charge the photoflash capacitor.

Historically, the flash has been triggered with a push-button switch or a silicon-controlled rectifier (SCR). However, newer flash modes such as red-eye reduction use multiple bursts of the Xenon lamp. The lamp is triggered for a short flash that does not fully discharge the photoflash capacitor. Then, after a short delay, the lamp is retriggered for the main flash. The push button and SCR cannot reliably start and stop the lamp midflash. The IGBT is capable of handling the currents, which are typically 150 A during a flash. However, like a MOSFET, the IGBT gate requires a large current pulse to quickly turn on; so a high-current driver is required.

The TPS65552A has an integrated high-current buffer to drive the IGBT gate used in the trigger circuit. The IGBT can be driven on and off during flashes to support flash modes such as red-eye reduction or evaluated through the lens (E-TTL).

Reference

For more information related to this article, you can download an Acrobat Reader file at www-s.ti.com/sc/techlit/*litnumber* and replace *"litnumber"* with the **TI Lit. #** for the materials listed below.

Document Title **TI Lit. #**

1. "Integrated Photo Flash Charger and IGBT Driver," TPS65552A Datasheet slvs567

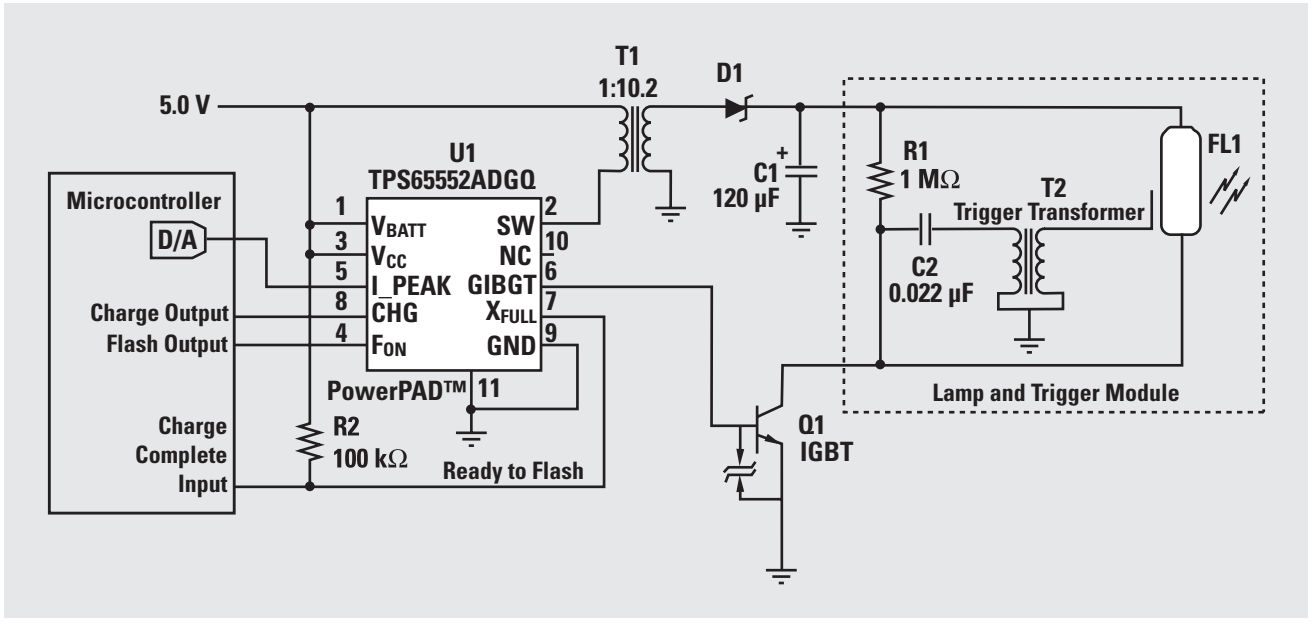
Related Web sites

power.ti.com
www.ti.com/sc/device/TPS65552A

Table 1. Typical parts list for circuit in Figure 2

DEVICE	DESIGNATOR	DESCRIPTION	MANUFACTURER
330 FW 120A	C1	Capacitor, aluminum, 120 µF, 330 VDC, ±20%	Rubycon
C3216X7R2J223KT	C2	Capacitor, ceramic, 0.022 µF, 630 V, X7R, 10%	TDK
ES1G	D1	Diode, rectifier, 1 A, 400 V	Diodes Inc.
36FT050	FL1	Flash tube, 400 V max	Xicon
SSM25G45EM	Q1	Transistor, N-channel IGBT, 450 V, 150 A	Silicon Standard
CTX16-17360	T1	Transformer, flyback, 1:10.2	Coiltronics
422-2304	T2	Transformer, trigger	Xicon

Figure 2. Complete photoflash module with power and flash management



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