

Asynchronous Boost Converter for 10 WLEDs

General Description

The RT4533 is a highly integrated LED driver IC capable of driving 10 WLEDs in series. It is composed of a current mode Boost converter integrated with a 36.5V/1.2A power switch. The RT4533 supports a wide input voltage range from 2.5V to 5.5V, and runs at a fixed frequency of 1.1MHz. The LED current is set via an external resistor and the feedback voltage is regulated to 200mV. For brightness dimming, the RT4533 supports PWM dimming which determines the feedback reference voltage.

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Performance Specification Summary

Summary of the RT4533GJ6 Evaluation Board performance specification is provided in Table 1. The ambient temperature is 25°C.

Table 1. RT4533 Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range		2.5	--	5.5	V
Output Current		0	--	20	mA
Default Output Voltage		--	36.5	--	V
Operation Frequency		--	1.1	--	MHz

Power-up Procedure

Suggestion Required Equipments

- RT4533GJ6 Evaluation Board
- DC power supply capable of at least 6V and 2A
- Function Generator
- Oscilloscope

Proper measurement equipment setup and follow the procedure below.

1. Apply 3.6V nominal input power supply ($2.5V < V_{IN} < 5.5V$) to the VIN and GND terminals.
2. The EN voltage is pulled to logic high by internal circuit to enable operation. Drive EN high ($> 1.4V$) to enable operation or low ($< 0.4V$) to disable operation. Pull EN pin to High pin that make EN voltage equal to VIN.
3. There is a 3-pin header JP5 "EN" for enable control. To use a jumper at "H" option to tie EN test pin to input power VIN for enabling the device. Inversely, to use a jumper at "L" option to tie EN test pin and ground GND for disabling the device. The JP5 is also the PWM control pin.
4. The ILED setting supports PWM dimming as below.

Output ILED Setting

1. PWM Brightness Dimming

The EN pin is used for the control input for both PWM dimming mode and digital dimming mode. Shutdown delay when the EN voltage is logic low for more than specific time, the driver will be shut down.

2. OCP

The driver provides cycle-by-cycle current limit function to control the current on power switch. The boost switch turns off when the inductor current reaches this current threshold and it remains off until the beginning of the next switching cycle. This protects the RT4533 and external component under overload conditions.

3. OVP

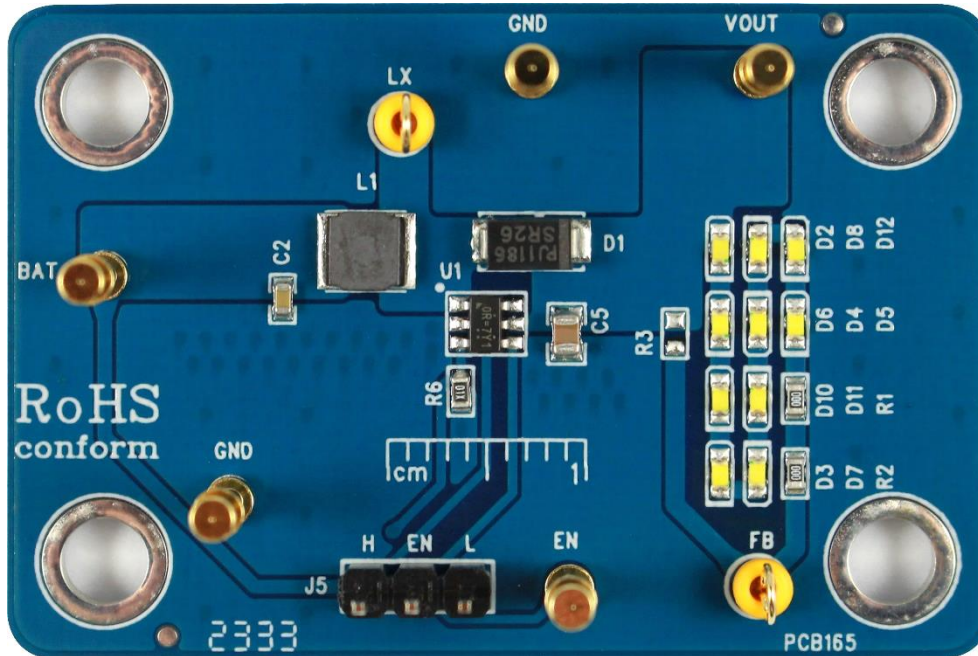
The Over Voltage Protection is detected by a resistor divider circuit from VOUT. Once VOUT goes over the OVP voltage, LX pin stops switching and the power N-MOSFET will be turned off. Then, the VOUT will be discharged by external resistor. OVP will be released until EN goes from Lo to Hi again.

4. OTP

As the die temperature is higher than 160°C, the chip also will enter protection mode. The power MOSFET will be turned off during protection mode to prevent abnormal operation. The device is released from shutdown automatically when the junction temperature decreases by 15°C.

Detailed Description of Hardware

Headers Description and Placement



Carefully inspect all the components used in the EVB according to the following Bill of Materials table, and then make sure all the components are undamaged and correctly installed. If there is any missing or damaged component, which may occur during transportation, please contact our distributors or e-mail us at evb_service@richtek.com.

Test Points

The EVB is provided with the test points and pin names listed in the table below.

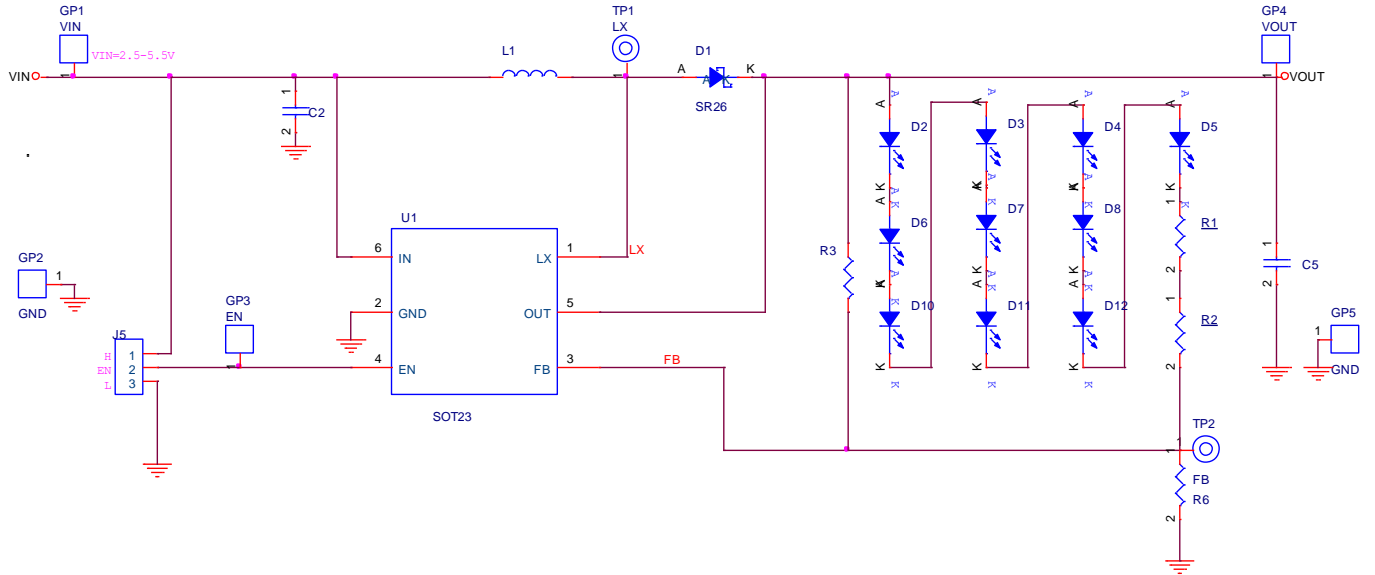
Test Point/ Pin Name	Signal Name	Description
LX	Switch Node	This is the switching node of the IC. Connect the switched side of the inductor to LX.
GND	Ground	Ground.
FB	Feedback Voltage Input	Connect the sense resistor from FB to GND.
EN	Enable Control Input	Control pin of the boost converter. It is a multifunctional pin which can be used for enable control and PWM dimming.
VOUT	Output Voltage	The output supply pin for the IC. It is used to sense the output voltage for open LED protection.
BAT	Supply Voltage Input	The input supply pin for the IC. Support 2.5V to 5.5V input voltage.

Bill of Materials

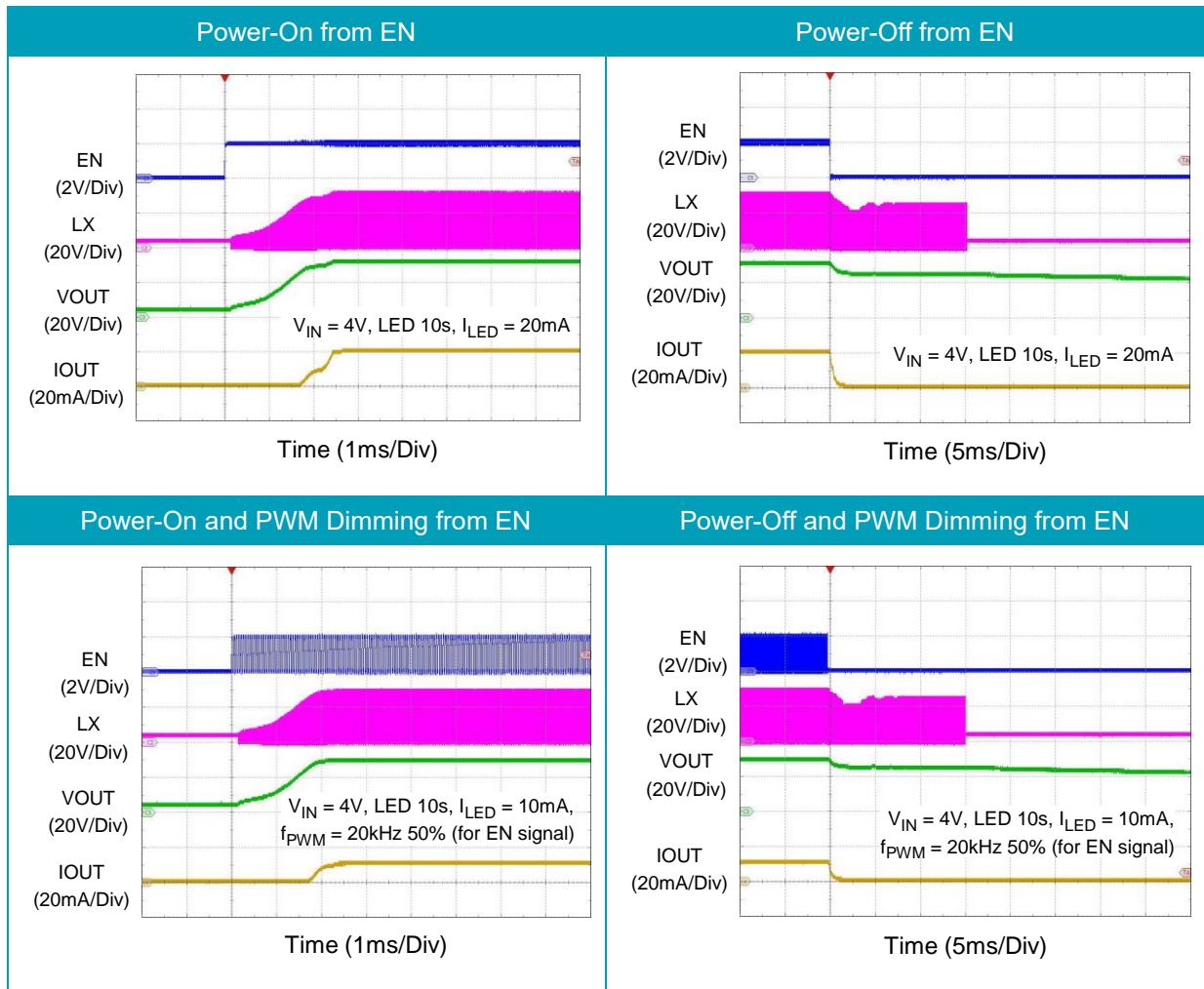
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U1	1	RT4533GJ6	RT4533GJ6	DC-DC Converter	TSOT-23-6	RICHTEK
L1	1	NR4018T220M	22 μ H	Inductor	L-SH4018	TAIYO YUDEN
C2	1	GRM188R61C225KE15D	2.2 μ F	Capacitor Ceramic, 16V/X5R	C-0603	MURATA
C5	1	UMK212ABJ105KD-T	1 μ F	Capacitor Ceramic, 50V/X5R	C-0805	TAIYO YUDEN
D1	1	SR26		Schottky Diode	D-1206	PANJIT
R6	1	WR06X10R0FTL	10	Resistor, 1%	R-0603	WALSIN
D9, D13	2	WR06X000 PTL	0	Resistor, Jumper	R-0603	WALSIN
D2, D3, D4, D5, D6, D7, D8, D10, D11, D12	10	LNL-190UW-4H		WLED	D-0603	LighTop

Typical Applications

EVB Schematic Diagram



Measure Result



Evaluation Board Layout

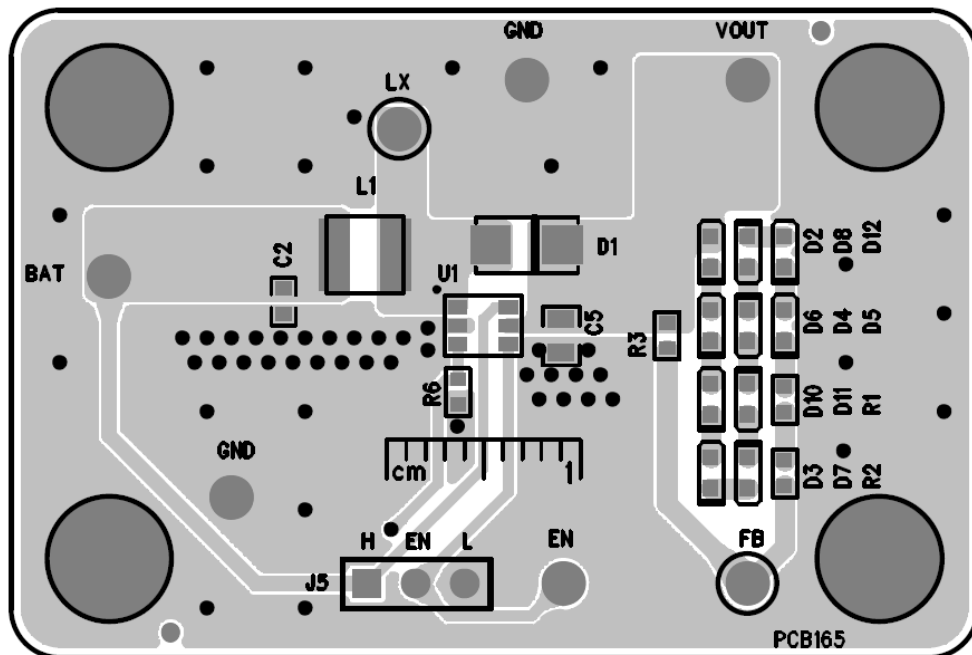


Figure 1. Top View (1st layer)

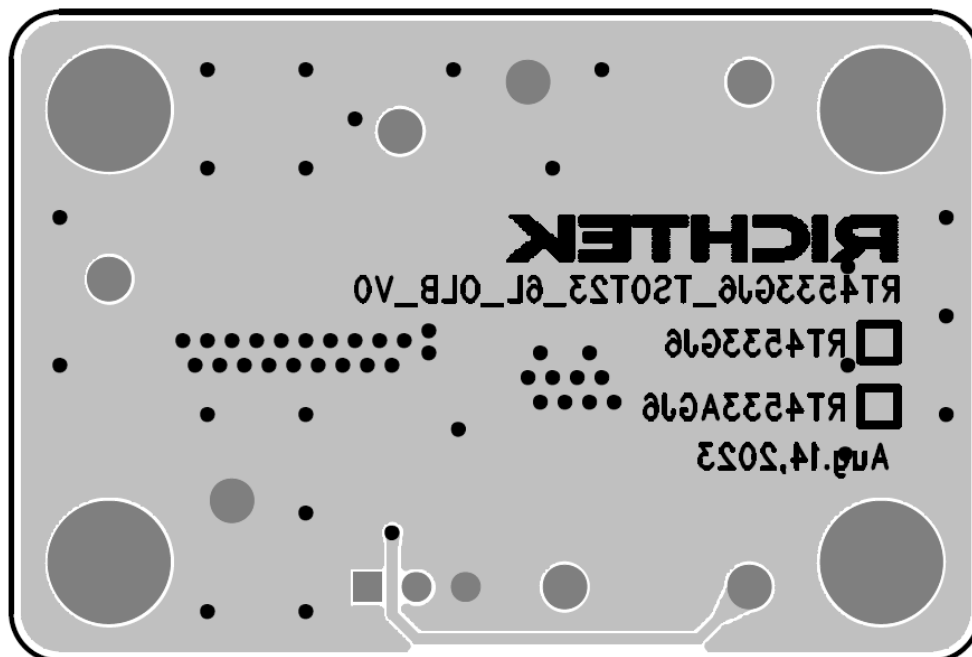


Figure 2. Bottom View (2nd Layer)

More Information

For more information, please refer to the related datasheets or application notes from Richtek website <http://www.richtek.com>.

Important Notice for Richtek Evaluation Board

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