

High Voltage Multi-Topology LED Driver

General Description

The RT8450 is a current mode PWM regulator for LED driving applications. With an 1.5A switch on board and wide input (4.5V to 40V) and/or output (up to 60V) ranges the RT8450 can operate in any of the three common topologies : Buck, Boost or Buck-Boost. With a 1MHz operating frequency, the external PWM inductor and input/output capacitors can all be small. High efficiency is achieved with a 190mV current sensing. Dimming can be either analog or PWM signal, an unique built-in clamping comparator and filtering resistor allow easy low noise analog dimming conversion from PWM signal with only one external capacitor.

IC Part Number	RT8450
Board Number	RT8450_D3-12_V2
Board Number	RT8450_D3-12_V3

Features

- ◆ High Voltage : V_{IN} Up to 40V, V_{OUT} Up to 60V
1.5A Switch Current
- ◆ Buck, Boost or Buck-Boost Operation
- ◆ Current Mode PWM with 1MHz Switching Frequency
- ◆ Easy Dimming : Analog, PWM Digital or PWM Converting to Analog with One External Capacitor
- ◆ Programmable Soft Start to Avoid Inrush Current
- ◆ Programmable Over Voltage Protection to Limit Output Voltage

Application

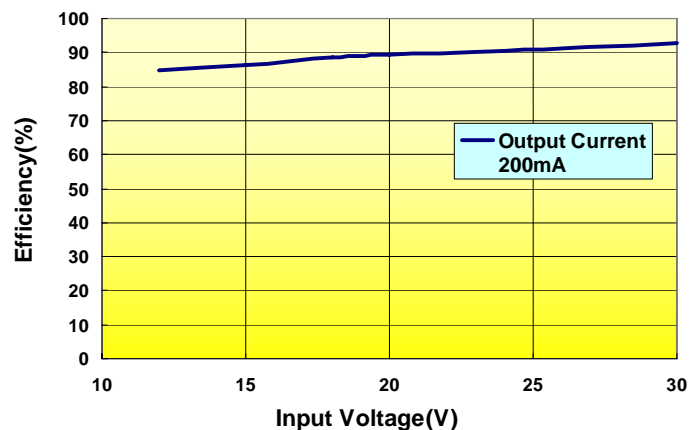
- ◆ Desk Lights and Room Lighting
- ◆ Industrial Display Backlight
- ◆ GPS, Portable DVD Backlight

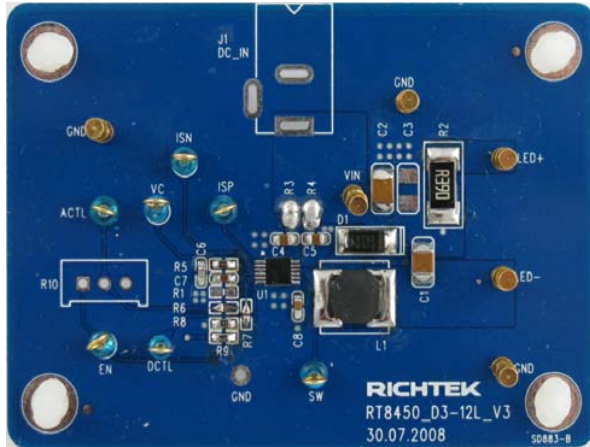
Evaluation Board



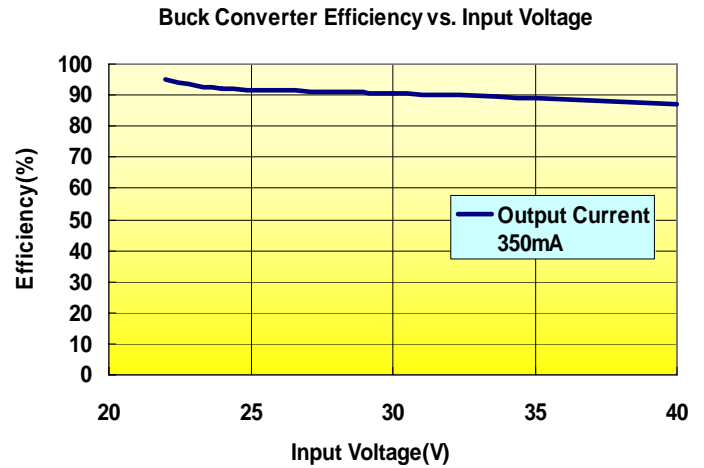
RT8450_D3-12_V2 : Boost Converter

Boost Converter Efficiency vs. Input Voltage





RT8450_D3-12_V3 : Buck Converter

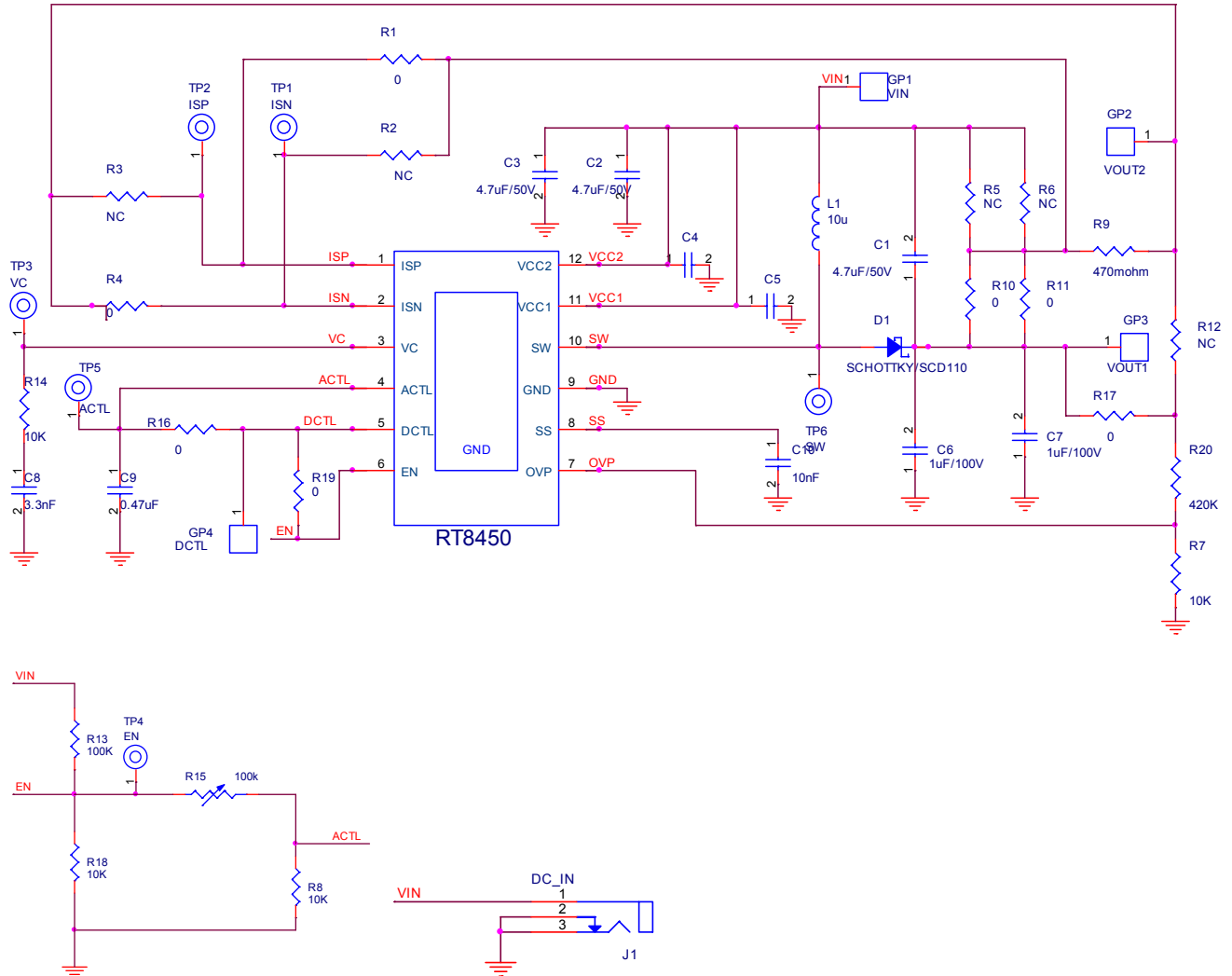


Specification

Parameter	Symbol	Min	Typ	Max	Units
Operation voltage Range	V _{IN}	12	24	40	V
Enable Threshold voltage	V _{EN}	-	1.4	-	V
LED current (R _{SENS} =0.47Ω)	I _{LED}			400	mA
V _{ACTL} Threshold voltage	V _{ACTL}	-	300	-	mV
Current Sense Amplifier Input Threshold Voltage	V(I _{SP} -I _{SN})		190		mV
Regulated V _{LED}	V _{LED}	-	0.6	-	V
OVP Threshold voltage	V _{OVP}	-	1.2	-	V
Operation Frequency	F _{OSC}	-	1M	-	Hz
Boost OCP (I _{SW} peak)	I _{SW}	-	1.5	-	A

1. RT8450_D3-12_V2 : Boost Converter Application

Schematic

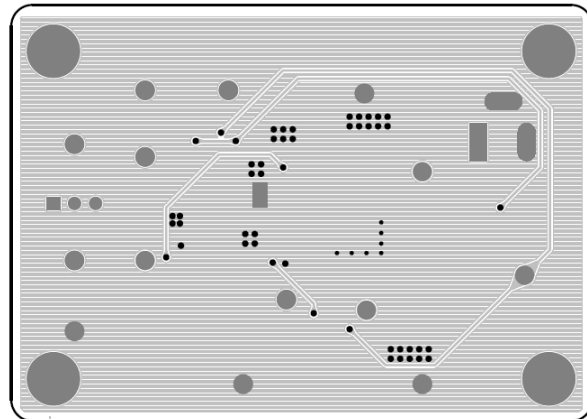
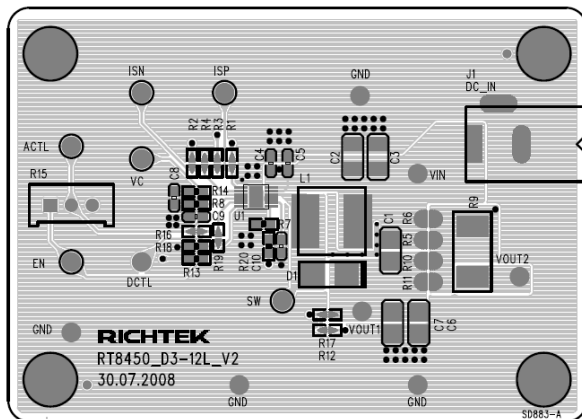


Bill of Materials

Reference	Qty.	Part Number	Description	Package	Manufacture
U1	1	RT8450	High Voltage Multi-Topology LED Driver	WDFN-12L 3x3	RichTek
C1,C2,C3	3	GRM32ER71H475KA88	4.7uF/50V/X7R	1210	Murata

C6,C7	2	GRM32ER72A105KA35	1uF/100V	1210	Murata
C8	1	GRM188R71H333K	3.3nF/16V/X7R	0603	Murata
C9	1	GRM188R71C474K	0.47uF/16V/X7R	0603	Murata
C10	1	GRM188R71H103K	10nF/50V/X7R	0603	Murata
D1	1	SCD110	Schottky Barrier Rectifiers	DO-214C	ZOWIE
L1	1	NR8040T150M	10uH, 2.7A	8*8	TAIYO YUDEN
R9(RSENS)	1	CS12FTE470	470mohm	2512	Viking
R13, R15	2	WR06X1002F	100k	0603	Walsin
R7,R8,R14,R18	4	WR06X1002F	10K	0603	Walsin
R20	1	WR06X4303F	430K	0603	Walsin

PCB Layout



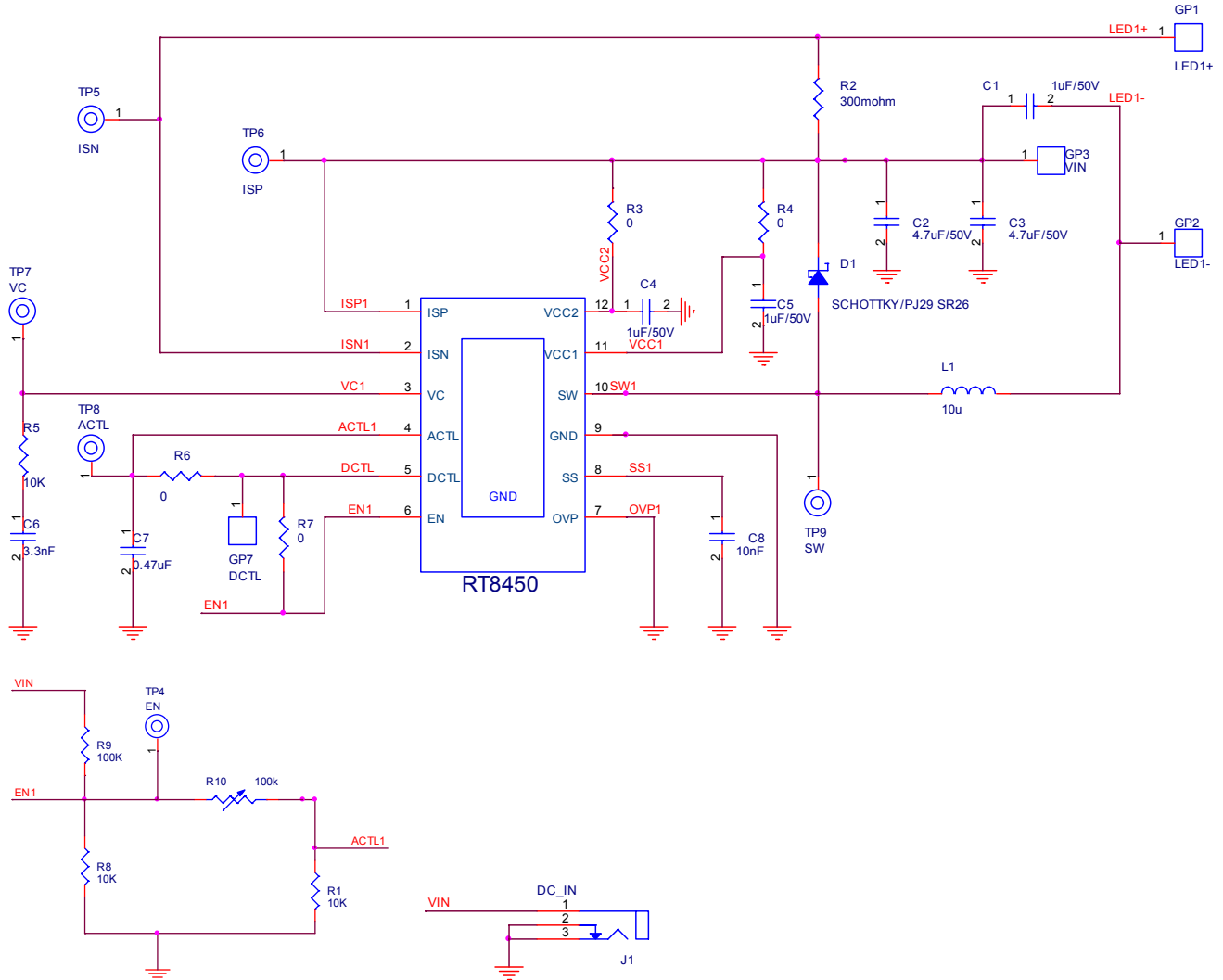
Operating Guideline

1. For driving 12 pieces of LED in the Boost converter application, connect input power ($12V < V_{IN} < 30V$) and input ground to VIN and GND pins respectively.
2. Connect control voltage to EN pin to enable the LED driver.
3. Connect control voltage or PWM signal to ACTL pin to control LED brightness.
4. Connect LED strings positive and negative to VOUT2 and GND respectively.
5. The maximum output current of LED strings can be set by RSENS.

$$I_{LED} = (190mV / R_{SENS})$$

2. RT8450_D3-12_V3 : Buck Converter Application

Schematic

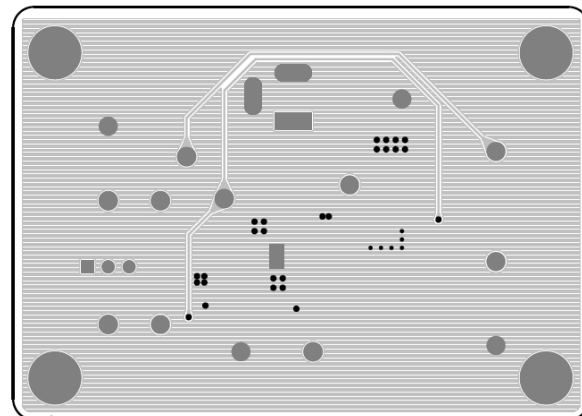
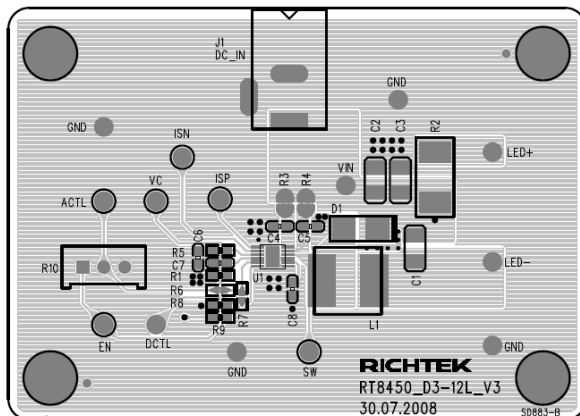


Bill of Materials

Reference	Qty.	Part Number	Description	Package	Manufacture
U1	1	RT8450	High Voltage Multi-Topology LED Driver	WDFN-12L 3x3	RICHTEK
C1,C4,C5	3	C3216X7R1H105K	1uF/50V/X7R	1206	TDK
C2,C3	2	GRM32ER71H475KA88	4.7uF/50V/X7R	1210	Murata

C6	1	GRM188R71H333K	3.3nF	0603	Murata
C7	1	GRM188R71C474K	0.47uF/16V/X7R	0603	Murata
C8	1	GRM188R71H103K	10nF/50V/X7R/0603	0603	Murata
D1	1	SR26	Schottky Barrier Rectifiers	DO-214C	PANJIT
L1	1	NR8040T150M	10uH, 2.7A	8*8	TAIYO YUDEN
R1,R5,R8	3	WR06X1002F	10K	DO-214C	WALSIN
R2	1	CS12FTE470	470mohm	2512	Viking
R9	1	WR06X1003F	100k	0603	WALSIN

PCB Layout



Operating Guideline

1. For driving 6 pieces of LED in Buck converter application, connect input power ($20V < V_{IN} < 40V$) and input ground to VIN and GND pins respectively.
2. Connect control voltage to EN pin to enable the LED driver.
3. Connect control voltage or PWM signal to ACTL pin to control LED brightness.
4. Connect LED strings positive and negative to LED+ and LED- respectively.
5. The maximum output current of LED strings can be set by RSENS.

$$I_{LED} = (190\text{mV} / R_{SENS})$$

More Information

For more information, please find the related datasheet or application notes from Richtek website:

<http://www.richtek.com>

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