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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



RT8555WSC Evaluation Board

Purpose

The RT8555 is a 36V High Efficiency Boost Converter with I²C Controlled 6-CH LED Driver. This document explains the function and use of the RT8555 evaluation board (EVB) and provides information to enable operation and modification of the evaluation board and circuit to suit individual requirements.

Table of Contents

Purpose	1
Introduction.....	2
Key Performance Summary Table	2
Bench Test Setup Conditions	2
Schematic, Bill of Materials & Board Layout	4
More Information.....	8
Important Notice for Richtek Evaluation Board	8

Introduction

General Product Information

The RT8555 is a high efficiency driver for white LEDs. It is suitable for single/two cell battery input to drive LED light bars which contains six strings in parallel and up to 10 WLEDs per string. The internal current sinks support a maximum of $\pm 2\%$ current mismatching for excellent brightness uniformity in each string of LEDs. To provide enough headroom for current sink operation, the Boost controller monitors the minimum voltage of the feedback pins and regulates an optimized output voltage for power efficiency.

The RT8555 has a wide input voltage operating range from 2.7V to 24V and contains I²C interface for controlling the dimming mode, operating frequency and the LED current. The internal 100m Ω , 36V power switch with current-mode control provides over-current protection. The switching frequency of the RT8555 is adjustable from 300kHz to 2MHz, which allows flexibility between efficiency and component size.

The RT8555 is available in the WL-CSP-20B 1.65 x 2.05 (BSC), with pitch 0.4mm package.

Product Feature

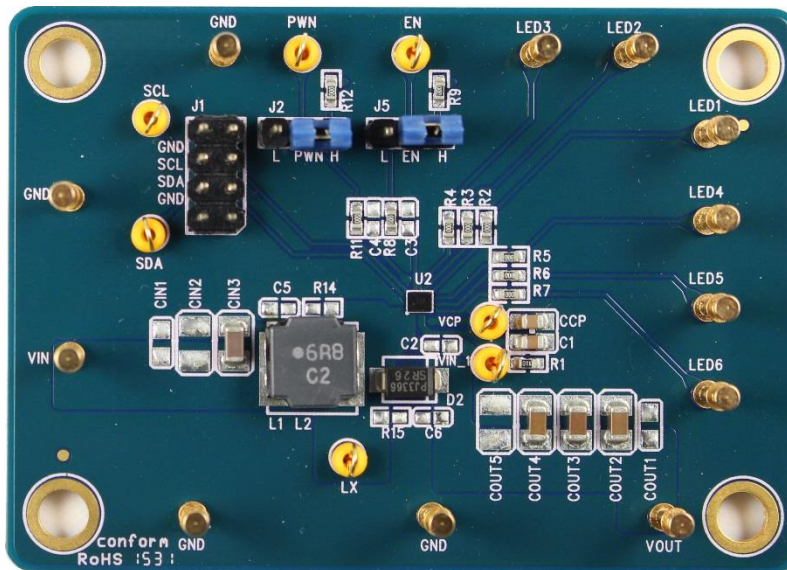
- **Wide Operating Input Voltage : 2.7V to 24V**
- **High Output Voltage : Up to 36V**
- **Programmable Channel Current : 10mA to 35mA**
- **Channel Current Regulation with Accuracy $\pm 3\%$ and Matching $\pm 2\%$**
- **Dimming Controls**
 - ▶ **Direct PWM Dimming up to 20kHz and Minimum On-Time to 400ns**
 - ▶ **PWM to Analog Dimming up to 20kHz with 8-bit**
- **I²C Programs LED Current, Switching Frequency, Dimming Mode**
- **Switching Frequency : 300kHz to 2MHz**
- **Current Limit, Over-Temperature Protection and Over-Voltage Protection**
- **Input Under-Voltage Lockout**
- **RoHS Compliant and Halogen Free**

Key Performance Summary Table

Key Features		Evaluation Board Number : PCB025_V1
Default Input Voltage	3.8V	
Default OVP	36V	
Default Per Channel Output Current	20mA	
Default Marking & Package Type	RT8555WSC, WL-CSP-20B 1.65 x 2.05 (BSC)	
Operation Frequency	900kHz	
Other Key Features	2.7V to 24V Input Voltage Range Programmable LED Current, Switching Frequency, Dimming Mode Output Over-Voltage Protection, Current Limit, Thermal Shutdown 20-Ball WL-CSP, with pitch 0.4mm Package	

Bench Test Setup Conditions

Headers Description and Placement



Please carefully inspect the EVB IC and external components, comparing them to the following Bill of Materials, to ensure that all components are installed and undamaged. If any components are missing or damaged during transportation, please contact the distributor or send e-mail to evb_service@richtek.com

Test Points

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

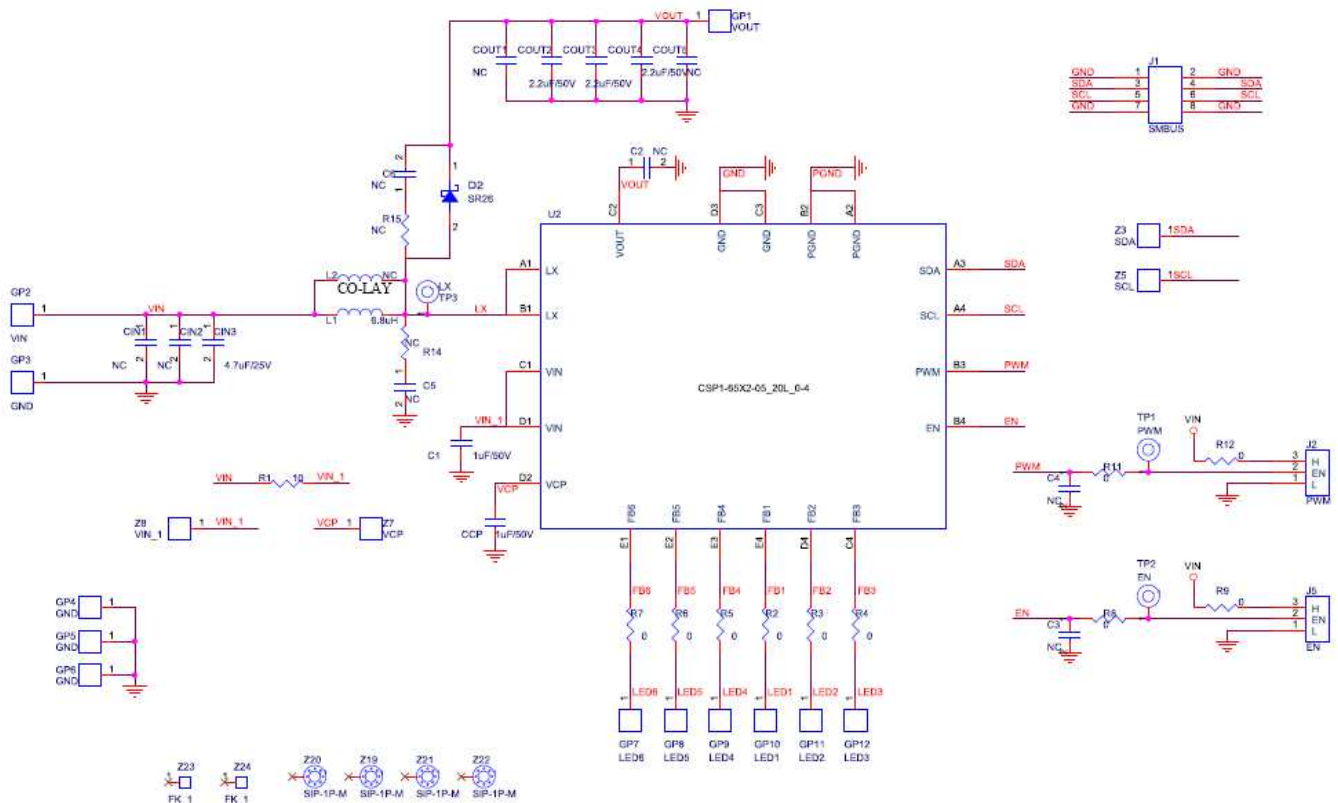
Test point/ Pin name	Signal	Comment (expected waveforms or voltage levels on test points)
VIN	Input voltage	Boost converter input voltage.
VIN_1	Input voltage	RT8555 VIN input voltage. Connected to VIN through R1.
VOUT	Output voltage	Output voltage up to 36V. Drive LED light bars by VOUT connect to FB1 ~ FB6.
LX	Switching node test point	LX waveform
EN	Enable input	Enable signal. Connecting this pin to pull high enable operation; floating this EN pin or connecting this pin to GND can disable the device.
PWM	PWM input	PWM Dimming Control Input.
FB1 ~ FB6	FB pin	Current Sink for LED1 ~ LED6. Drive LED light bars by VOUT connect to FB1 ~ FB6.
VCP	Internal regulator	LDO Output of Internal Regulator.
GND	Ground	Ground.
SDA	Data signal	Data Signal Input of I ² C Interface.
SCL	Clock signal	Clock Signal Input of I ² C Interface.
JP2	Chip enable control	Install jumper or drive EN directly to enable or disable operation.
JP5	PWM control	Install jumper or drive PWM signal directly to operation.

Power-up & Measurement Procedure

1. Connect input power and input ground to VIN and GND test pins respectively.
2. Connect LED light bars to VOUT and FB1 ~ FB6 test pins respectively.
3. There is a 3- pin header “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.
4. There is a 3- pin header “PWM” for PWM dimming control. To use a jumper at “H” option to tie PWM test pin to input power VIN for PWM = 100% dimming the device. Inversely, to use a jumper at “L” option to tie PWM test pin and ground GND for PWM = 0% dimming the device.
5. Usually use Function Generator to produce PWM signal to PWM dimming RT8555 ILED current.
6. Input PWM frequency about 200Hz ~ 20kHz.
7. For detailed RT8555 function operation, please reference RT8555 datasheet.

Schematic, Bill of Materials & Board Layout

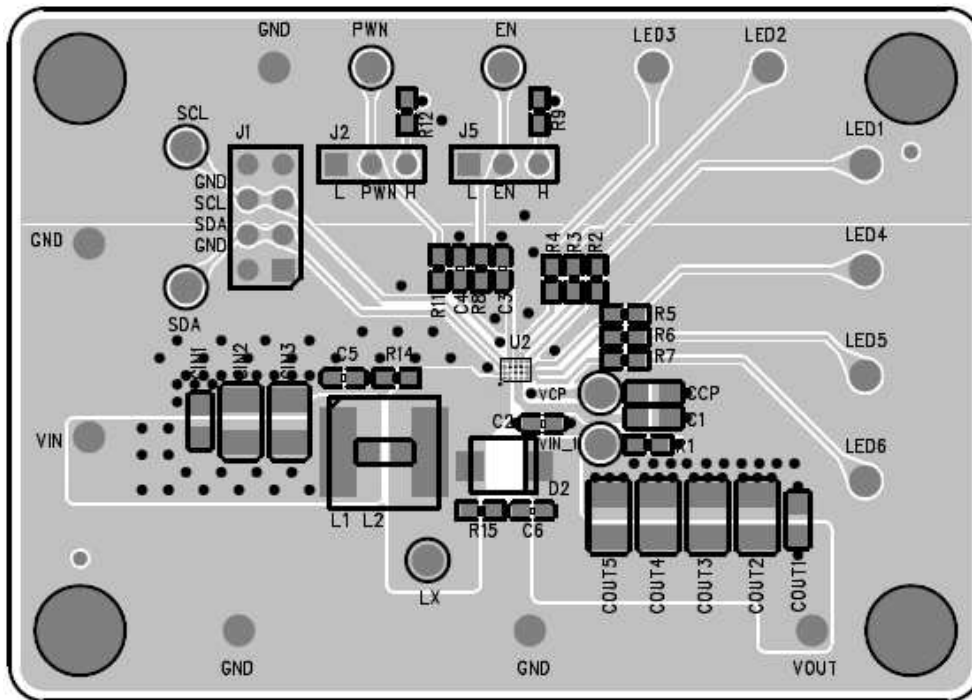
EVB Schematic Diagram



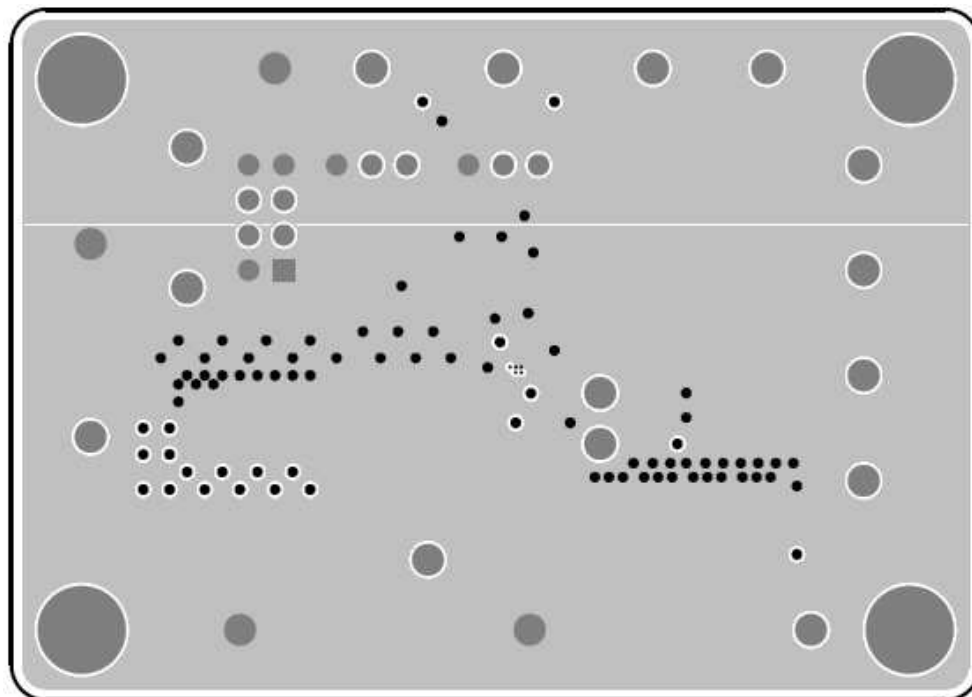
Bill of Materials

Reference	Qty	Part number	Description	Package	Manufacture
U2	1	RT8555	LED Driver	WL-CSP-20B 1.65 x 2.05 (BSC)	RICHTEK
C1, CCP	1	C2012X7R1E105KT	1 μ F/50V/X7R Ceramic Capacitor	0805	TDK
CIN3	1	GRM31CR71H475KA12L	4.7 μ F/50V/X7R Ceramic Capacitor	1210	MURATA
COU2, COU3, COU4	3	UMK316BJ225KD-T	2.2 μ F/50V/X5R Ceramic Capacitor	1206	TAIYO
D2	1	SR26	Schottky diodes	SMB/DO-214	PANJIT
L1	1	NR8040T6R8N	6.8 μ H/3.4A DCR = 25m Ω , Inductor	L-NR8040	TAIYO
R1	1		10 Ω /±1%, Resistor	0603	
R2, R3, R4, R5, R6, R7, R8, R9, R11, R12	10		0 Ω , Resistor	0603	
COU1, CIN1, CIN2, COU5, C2, C3, C4, C5, C6, L2, R14, R15	0		Not Installed		
J1	1		4 x 2 Pin Header		
J2, J5	2		3- Pin Header		
TP1, TP2, TP3, Z3, Z5, Z7, Z8	7	PWM, EN, LX, SDA, SCL, VCP, VIN_1	Test Pin		
GP1, GP2, GP3, GP4, GP5, GP6, GP7, GP8, GP9, GP10, GP11, GP12	12	VOUT, VIN, GND, LED1, LED2, LED3, LED4, LED5, LED6	Golden Pin		

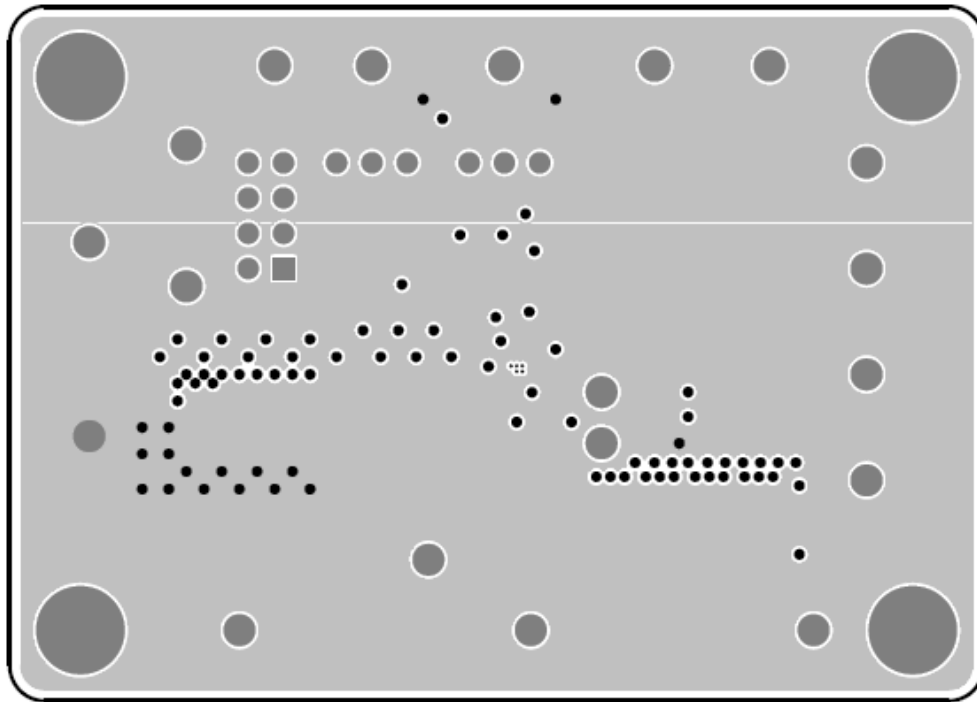
EVB Layout



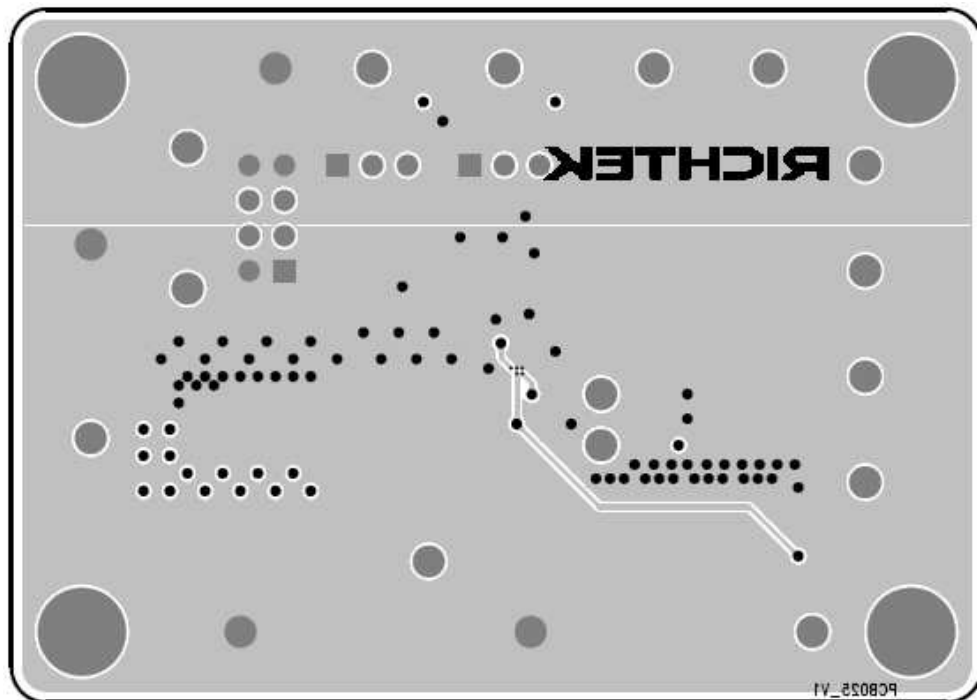
Top View (1st layer)



PCB Layout—Inner Side (2nd Layer)



PCB Layout—Inner Side (3rd Layer)



Bottom View (4th Layer)

More Information

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

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