

12V High Efficiency Synchronous Buck PWM Controller

Purpose

The RT8130B is a high efficiency single phase synchronous Buck DC/DC controller with 5V/12V supply voltage. This document explains the function and use of the RT8130B evaluation board (EVB), and provides information to enable operation, modification of the evaluation board and circuit to suit individual requirements.

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Introduction

General Product Information

The RT8130B is a high efficiency single phase synchronous Buck DC/DC controller with 5V/12V supply voltage. The RT8130B has embedded MOSFET gate driver with high driving capability, supporting driving voltage up to 12V for high output current application. This device uses lossless low-side MOSFET $R_{DS(ON)}$ current sense technique for over-current protection with adjustable threshold set by the LGATE pin (LGOCS). Other features include power good indication, enable/disable control and internal soft-start. The RT8130B also provides fault protection functions to protect the power stage output. With above functions, the IC provides customers a cost-effective solution for high efficiency power conversion. The RT8130B is available in the WDFN-10L 3x3 package.

Product Feature

- High Light Load Efficiency
- Single 5V to 12V Driver Voltage
- Integrated High Driving Capability N-MOSFET Gate Drivers
- 300kHz Fixed Frequency Internal Oscillator
- 85% Maximum PWM Duty Cycle
- Power Good Indicator
- Enable/Disable Control
- Internal Soft-Start
- Lossless Low-Side MOSFET $R_{DS(ON)}$ Current Sensing for Over-Current Fault Monitoring
- LGATE Over-Current Setting (LGOCS)
- Dedicated Output Voltage Monitor
- OCP, UVP, OVP, OTP, UVLO

Key Performance Summary Table

Key Features	Evaluation Board Number : PCB048_V1
Input Voltage Range	19V
Max Output Current	7A
Default Output Voltage	12V
Default Marking & Package Type	RT8130BGQW, WDFN-10L 3x3
Operation Frequency	Steady 300kHz at all loads

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	Power input. Support 2.5V to 21V Input Voltage. Must bypass with a suitable large ceramic capacitor at this pin.
VCC	Internal Driver voltage	5V or 12V bias input supply. Connect a 2.2μF capacitor to ground.
GND	Ground	Ground.
BOOT	Bootstrap supply test point	Bootstrap supply for high-side gate driver. Connect a 0.1μF ceramic capacitor between the BOOT and SW pins.
PHASE	Switch node test point	Connect this pin to an external L-C filter.
UG	High-Side MOSFET Gate Driver Output	Connect this pin to the Gate of high-side MOSFET for floating drive.
LG	Low-Side MOSFET Gate Driver Output	Connect this pin to the Gate of low-side MOSFET. This pin is also used for Over-Current Protection (OCP) threshold setting. Connect a resistor (ROCSET) from this pin to the GND pin to set the OCP threshold.
PGOOD	Power Good Indicator Output	This pin provides an open-drain output. Connect this pin to a voltage source through a pull-up resistor.

Power-up & Measurement Procedure

1. Connect input power (2.5V < V_{IN} < 21V) to VIN test pin.
2. Connect positive end and negative terminals of load to VOUT and GND test pins respectively.
3. Connect 5V or 12V for VCC test pin.
4. Verify the output voltage (approximately 12V) between VOUT and GND.
5. Connect an external load up to 7A to the VOUT and GND terminals and verify the output voltage and current.

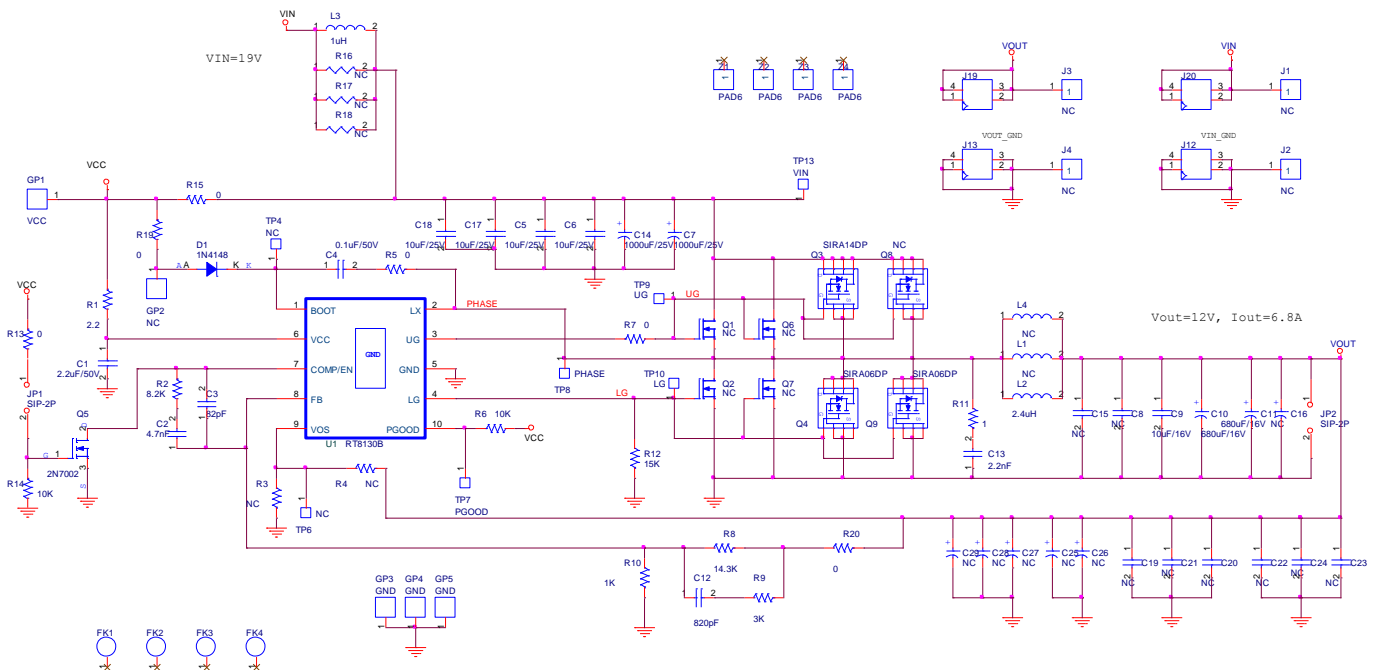
Output Voltage Setting

Set the output voltage with the resistive divider (R8, R10) between VOUT and GND with the midpoint connected to FB. The output is set by the following formula :

$$V_{OUT} = V_{FB} \cdot \left(1 + \frac{R_8}{R_{10}} \right)$$

Schematic, Bill of Materials & Board Layout

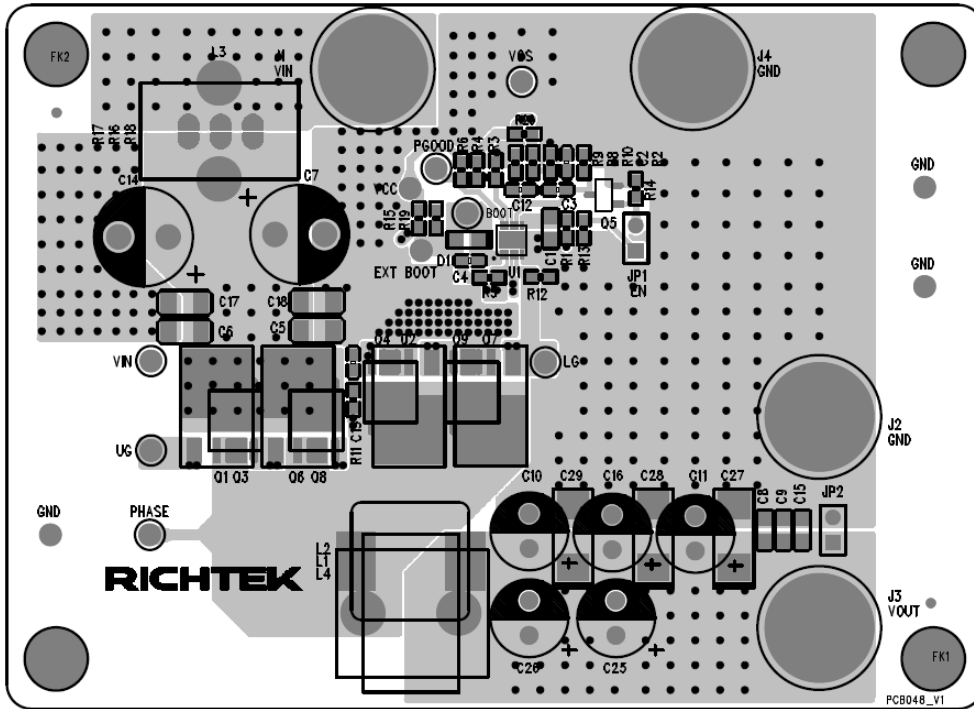
EVB Schematic Diagram



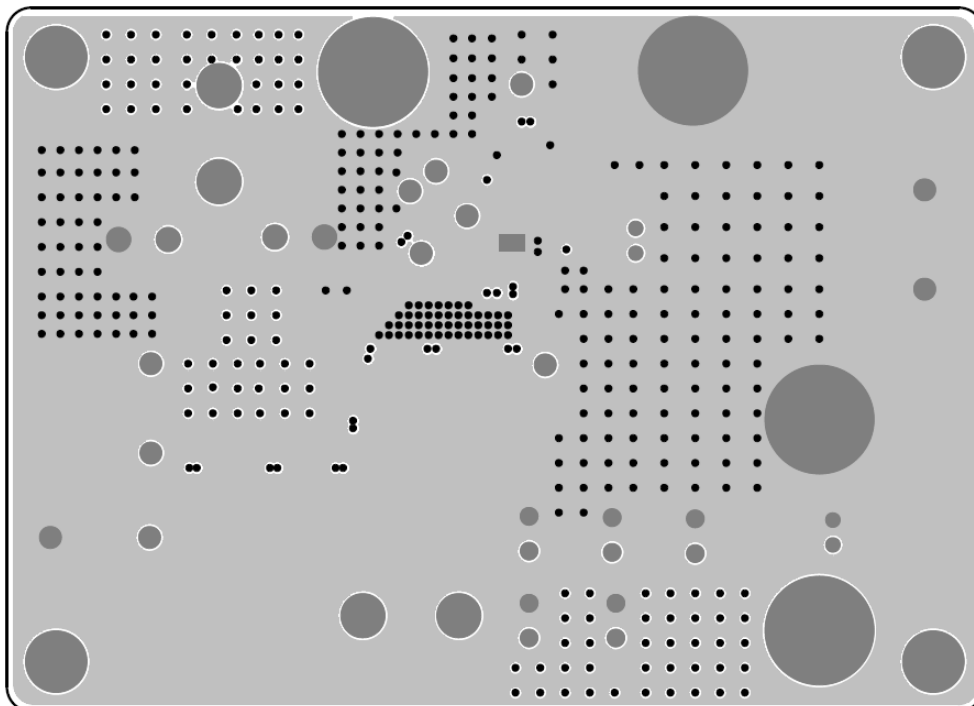
Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacture
U4	1	RT8130BGQW	DC/DC Controller	WDFN-10L 3x3	RICHTEK
C1	1	1206X7R 2200nF	2.2μF/50V	X7R/1206	TDK
C2	1	0603X7R 4700nF ±10% 50V	4.7nF	X7R/0603	TDK
C3	1	0603NPO 82pF ±5% 50V	82pF	NPO/0603	WALSIN
C4	1	C1608X7R1H104KT000N	0.1μF/50V	X7R/0603	TDK
C5, C6, C17, C18	4	C3216X5R1H106KT000N	10μF/25V	X5R/1206	TDK
C7, C14	1	1206X7R 2200nF ±10% 50V	1000μF/25V		
C9	1	C2012X5R1C106KTK0HN	10μF/16V		TDK
C10, C11, C16	1		470μF/16V		
C12	1		820pF	C0603	WALSIN
C13	1		2.2nF	C0603	WALSIN
D1	1	1N4148_R1_00001	1N4148		RANJIT
L2	1	MMD-10DZ-2R2M-X1	2.2μH		Mag.Layers
Q1	1	SIRA14DP			VISHAY
Q2, Q7	2	SIRA06DP			VISHAY
Q5	1	2N7002			RANJIT
R1	1		2.2	R0603	
R2	1		8.2K	R0603	
R5, R7, R13, R15, R19, R20	6		0	R0603	
R6, R14	2		10K	R0603	
R8	1		14.3K	R0603	
R9	1		3K	R0603	
R10	1		1K	R0603	
R11	1		1	R0603	
R12	1		15K	R0603	
R16, R17, R18	3		0	R0603	

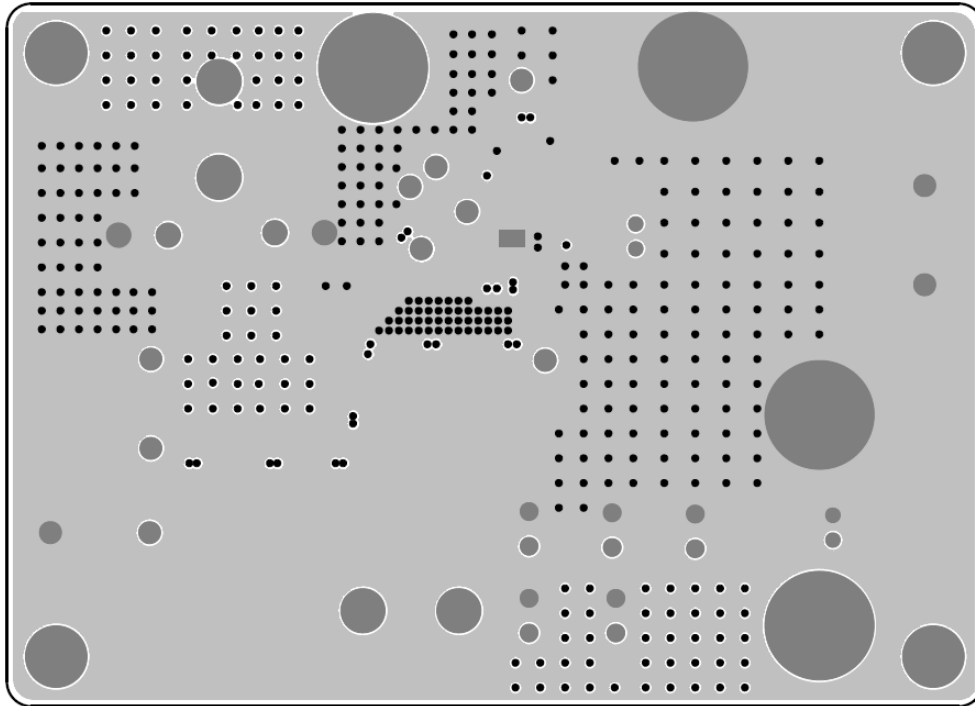
PCB Layout



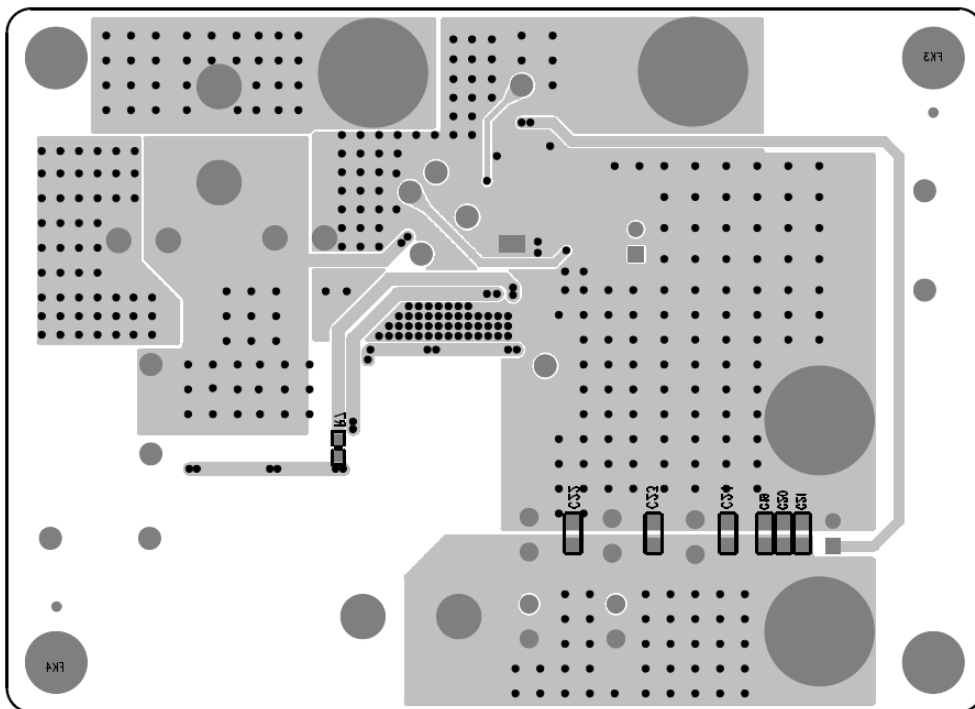
Top View (1st layer)



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>.

Important Notice for Richtek Evaluation Board

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