

3A Single Cell Li-Ion Battery Slave Switching Charger

Purpose

The RT9465 is a switch-mode single cell li-Ion/Li-Polymer battery charger for portable applications. It intergrates a synchronous PWM controller, and high accuracy voltage regulation. Besides, the charging current is regulated through the integrated sensing resistors. This document explains the function and use of the RT9465 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 RT9465 is a switch-mode single cell li-Ion/Li-Polymer battery charger for portable applications. It integrates a synchronous PWM controller, and high accuracy voltage regulation. Besides, the charging current is regulated through the integrated sensing resistors.

Product Feature

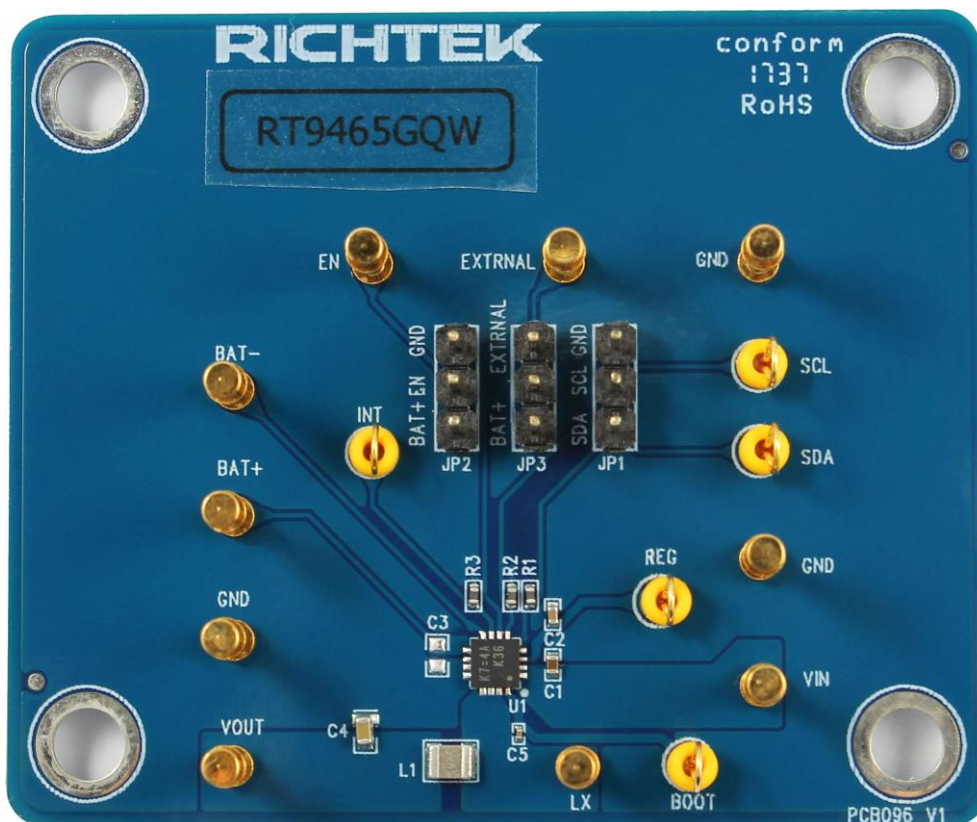
- Input Voltage Range : 3.9V to 14V
- Synchronous 1.5MHz/0.75MHz Switching Frequency 95% Max. Duty
- Up to 92%/94% Peak Efficiency at VIN = 9V/5V
- VIN Over-Voltage Protection : 14.5V
- VIN Under-Voltage Protection : 3.8V
- VIN Under-Voltage-Lock-Out : 3.3V
- Fault Detection (VIN and VBAT Monitoring)
- INT Output for Communication with I²C
- Programmable Minimum Input Voltage Range : 3.9V to 13.4V (0.1V/Step)
- Programmable Battery Voltage Regulation Range : 3.8V to 5.06V (0.02V/Step)
- Programmable End of Charge Range : 0.6A to 1.6A (0.1A/Step)
- Programmable Average Output Current Regulation Range : 0.6A to 3A (0.1A/Step)
- Junction Temperature Monitor : 60°C to 116°C (4°C/Step)
- VIN Minimum Input Voltage Regulation (MIVR) : ±3%
- Battery CV (Constant Voltage) Regulation : ±1%
- Output CC (Constant Current) Regulation, Output Current < 1A : ±100mA (VBUS = 9V/12V)
- Output CC (Constant Current) Regulation, Output Current > 1A : ±10% (VBUS = 9V/12V)
- Junction Temperature Monitor : ±3°C
- Thermal Shutdown : 160°C

Key Performance Summary Table

Key Features		Evaluation Board Number : PCB096_V1
Input Voltage	3.9V to 14V	
Output Voltage	3.8V to 5.06V	
Max Output Current	3A	
Package Type	RT9465GQW, WQFN-16L 3x3 (W-Type)	

Bench Test Setup Conditions

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	Comment (expected waveforms or voltage levels on test points)
VIN	Input Voltage	DC input power supply
VOUT	Output Voltage	Battery connection point to positive terminal of the battery pack.
GND	Ground	Ground.
BAT+	Positive Battery Voltage Sense	Positive battery voltage sense. Conect to battery connector.
BAT-	Negative Battery Voltage Sense	Negative battery voltage sense. Conect to battery connector.
EN	Enable Pin	Device enable control pin. Pull low to disable device. I ² C not available when disabled.
INT	Intterrupt	Open drain interrupt output. connect to pull-up voltage via 10kΩ pull-up resistor. Normally high, the INT pin sends an active low.

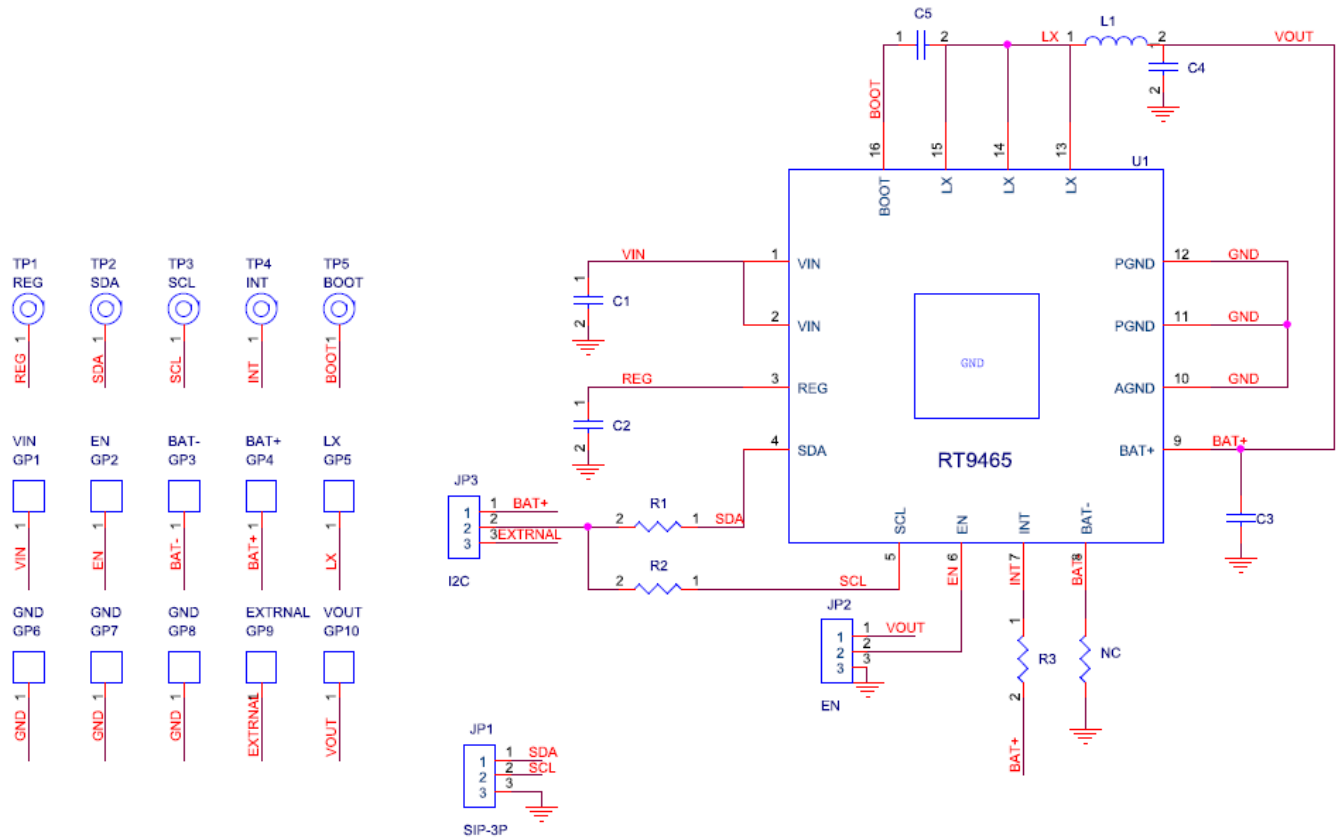
Test point/ Pin name	Signal	Comment (expected waveforms or voltage levels on test points)
SDA	SDA	I ² C interface data. Connect to pull-up voltage via 10kΩ pull-up resistor.
SCL	SCL	I ² C interface clock. Connect to pull-up voltage via 10kΩ pull-up resistor.
LX	Switch node	Switch node. Connect to an external inductor
EXTRNAL	External Pull Up Voltage	External pull up voltage. Connect to power supply
REG	REG	PWM low-side driver and bootstrap power supply.
BOOT	BOOT	Bootstrap supply for high-side MOSFET. Connect a capacitor between BOOT and LX.

Power-up & Measurement Procedure

1. Connect input power ($5V < V_{BUS} < 14V$) and input ground to VIN and GND test pins respectively.
2. Connect positive end and negative terminals of VBAT to VOUT and GND test pins respectively.
3. There is a 3-pin header (JP3) for pull-up control. To use a jumper at “EXTRNAL” option to tie pull up pin to external pull up voltage. Use a jumper at “BAT+” option to tie pull-up test pin to battery.
4. Connect EN pin to 3.3V to enable device and use I²C to enable charger.

Schematic, Bill of Materials & Board Layout

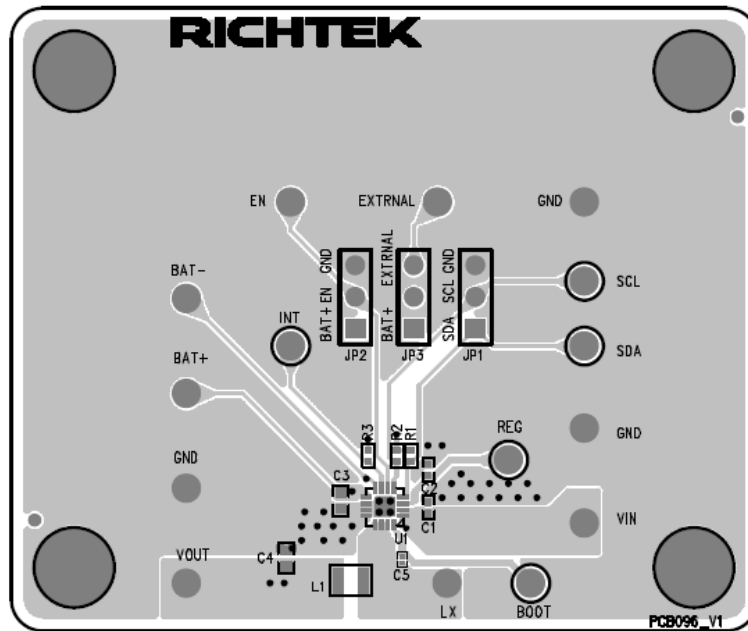
EVB Schematic Diagram



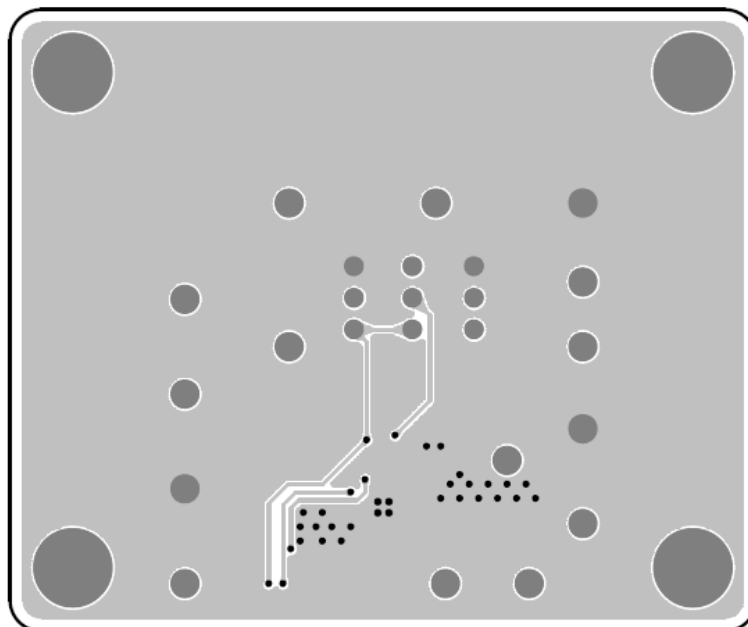
Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacturer
U1	1	RT9465GQW	Switching Charger	WQFN-16L 3x3	RICHTEK
C1	1	GRM155R61E225KE11	2.2 μ F/25V/X5R	C-0402	muRata
C2	1	GRM155R60J475ME47	4.7 μ F/6.3V/X5R	C-0402	muRata
C4	1	GRM188R61A106KE69	10 μ F/10V/X5R	C-0603	muRata
C5	1	GRM033R61C473KE84	47nF/16V/X5R	C-0201	muRata
L1	1	DFE252012F-1R0M	1 μ H	2.5x2.0x1.2mm	muRata
R1, R2, R3	3	NCP15XH103F03RC	10k	R-0402	muRata

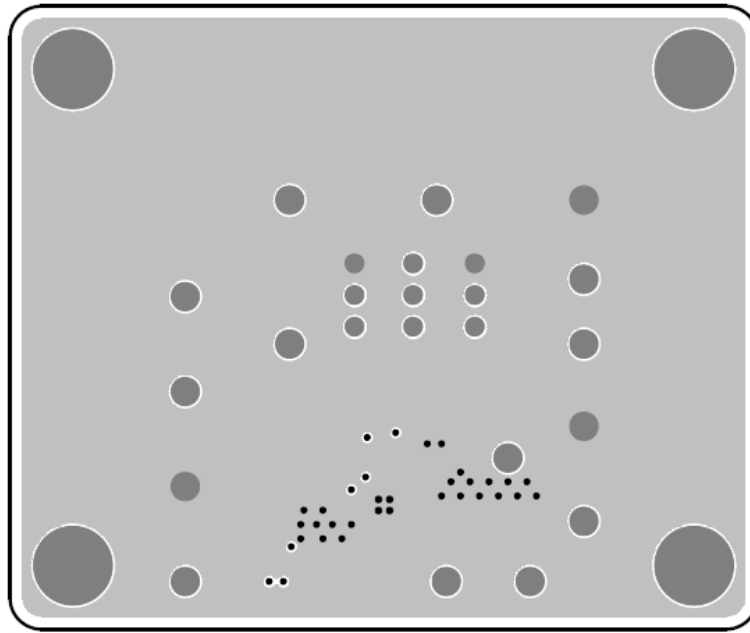
PCB Layout



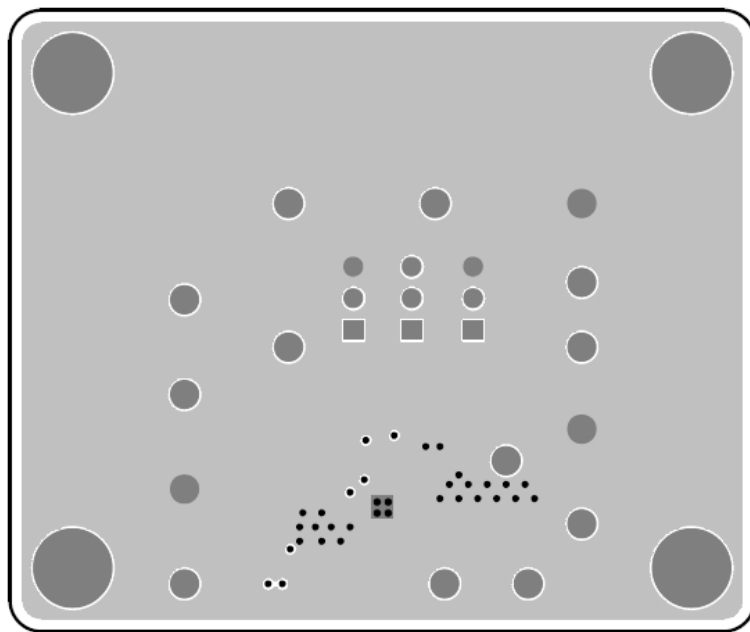
Top View (1st layer)



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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