

Switch-Mode Single Cell Li-Ion Battery Charger with USB-OTG

Purpose

The RT9458 is a switch-mode single cell Li-Ion/Li-Polymer battery charger for portable applications. It integrates a synchronous PWM controller, power MOSFETs, input current sensing, high accuracy voltage regulation and charge termination circuits. The RT9458 also features USB On-The-Go (OTG). This document explains the function and use of the RT9458 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 RT9458 is a switch-mode single cell Li-Ion/Li-Polymer battery charger for portable applications. It integrates a synchronous PWM controller, power MOSFETs, input current sensing, high accuracy voltage regulation and charge termination circuits. The RT9458 also features USB On-The-Go (OTG).

Product Feature

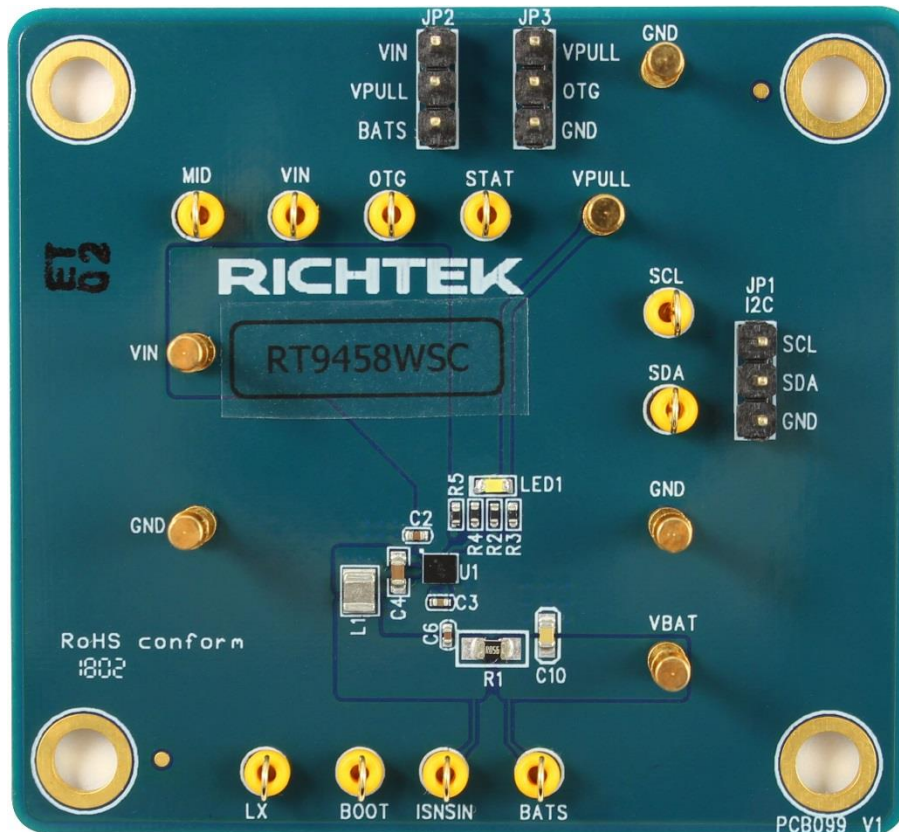
- Support Quick Start for Charger
- High Accuracy Voltage/Current Regulation
- Input Current Regulation : 100mA/500mA/700mA/1A
- Minimum Input Voltage Regulation : 4.1V to 4.7V Per 0.1V Step
- Charge Voltage Regulation Accuracy : $\pm 1\%$ (0 to 85°C)
- Charge Current Regulation Accuracy : $\pm 5\%$
- Built-In Input Current Sensing and Limiting
- Integrated Power MOSFETS for Up to 1.55A Charge Rate
- Integrated Sensing Resistors for Charging Current Sensing
- Synchronous 1.5MHz Fixed Frequency PWM Controller with Up to 95% Duty Cycle
- Reverse Leakage Protection to Prevent Battery Drainage
- Thermal Regulation and Protection
- Over-Temperature Protection
- Input Over-Voltage Protection
- IRQ Output for Communication with I²C
- Automatic Charging
- RoHS Compliant and Halogen Free

Key Performance Summary Table

Key Features		Evaluation Board Number : PCB099_V1
Input Voltage	4.3V to 6V	
Output Voltage	3.5V to 4.44V	
Max Output Current	1.55A	
Package Type	RT9458WSC, WL-CSP-20B 2.1x1.87 (BSC)	

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	Power input.
STAT	Interrupt	IRQ output node. Open-drain output. Connect a 10kΩ pull up resistor.
MID	VMID	Connection point between reverse blocking MOSFET and high-side MOSFET.
OTG	OTG	Boost mode control input or current regulation setting for average input current.
ISNSIN	ISNSIN	Charge current sense input.
LX	LX	Switch node.
SCL	SCL	Clock input for I ² C. Open-drain output. Connect a 10kΩ pull-up resistor.

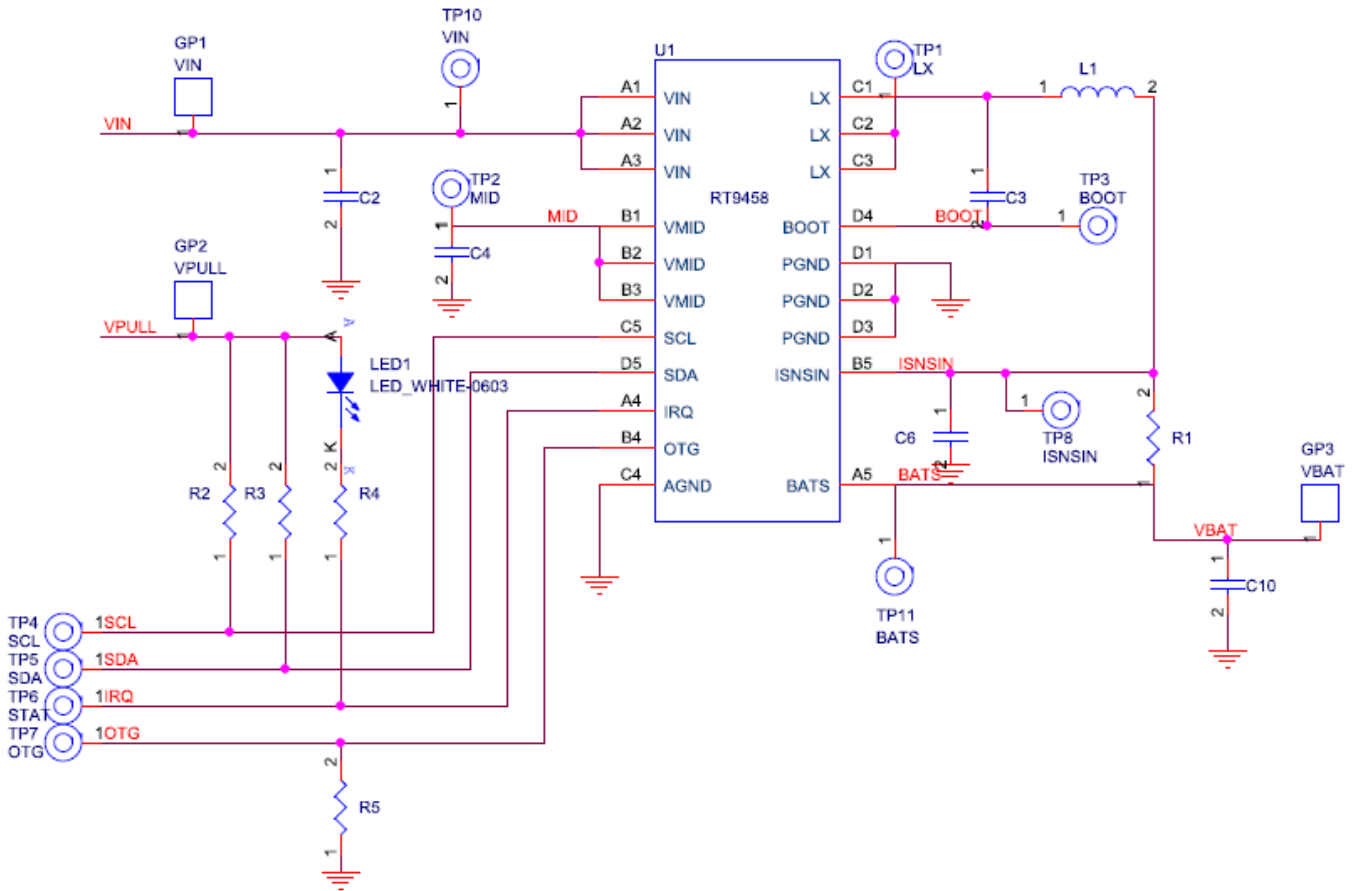
Test point/ Pin name	Signal	Comment (expected waveforms or voltage levels on test points)
BOOT	BOOT	Bootstrap supply for high-side MOSFET. Connect a capacitor between BOOT and LX.
SDA	SDA	Data input for I ² C. Open-drain output. Connect a 10kΩ pull-up resistor.
VPULL	Pull high voltage	Pull high voltage source for SDA, SCL and IRQ.
VBAT	VBAT	Feedback voltage input for battery.
BATS	BATS	Test pin for measure battery voltage.
GND	GND	Ground.

Power-up & Measurement Procedure

1. Connect power supply termination to VIN Pin and GND Pin respectively.
2. Set PSU Voltage 4.3 to 6V and then power on PSU.
3. Check VBAT = 4.2V ±1% on EVB.
4. Switch charger work normally.

Schematic, Bill of Materials & Board Layout

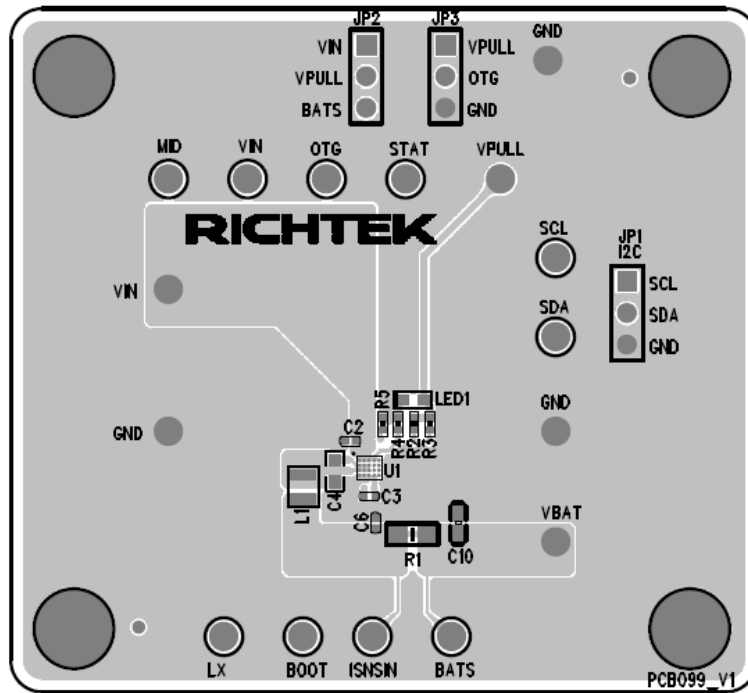
EVB Schematic Diagram



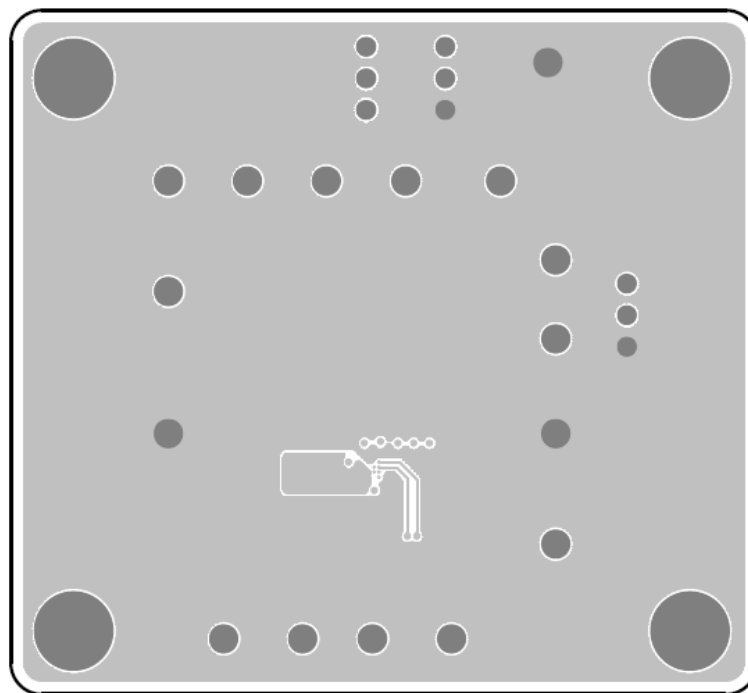
Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacturer
U1	1	RT9458WSC	Switching Charger	WL-CSP-20B 2.1x1.87 (BSC)	RICHTEK
C2	1	GRM155R61E474KE01	0.47μF/25V/X5R	0402	muRata
C3	1	GRM155R71E473KA88D	47nF/25V/X7R	0402	muRata
C4	1	GRM188R61C106KAAL	10μF/16V/X5R	0603	muRata
C6	1	C1005X7R1C104K050BC	100nF/16V/X7R	0402	TDK
C10	1	GRM185R60J106ME15	10μF/6.3V/X5R	0603	muRata
L1	1	DFE252012F-1R0M	1μH	2.5x2mm	muRata
R1	1	RL10FTNR056	56mΩ	0805	TA-I
R2, R3, R4, R5	4	WR04X1002FTL	10kΩ	0402	WALSIN

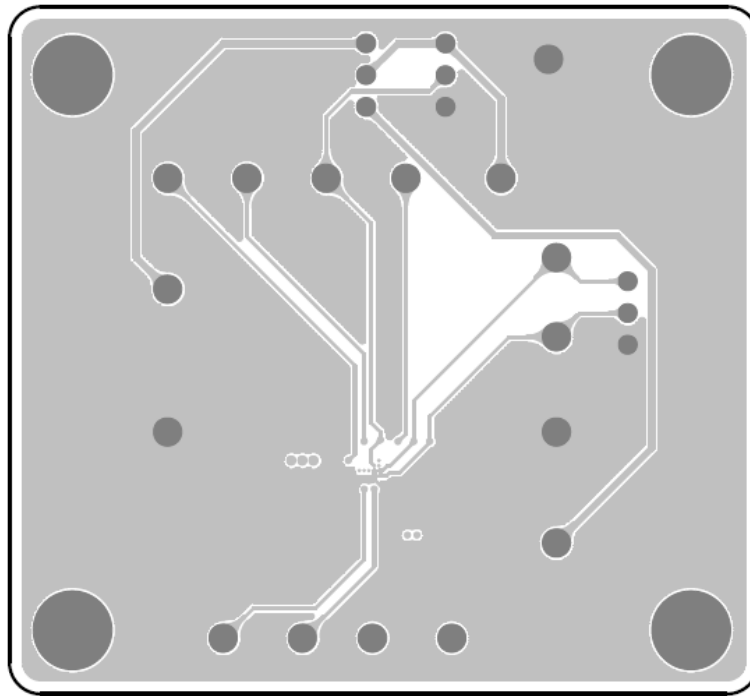
PCB Layout



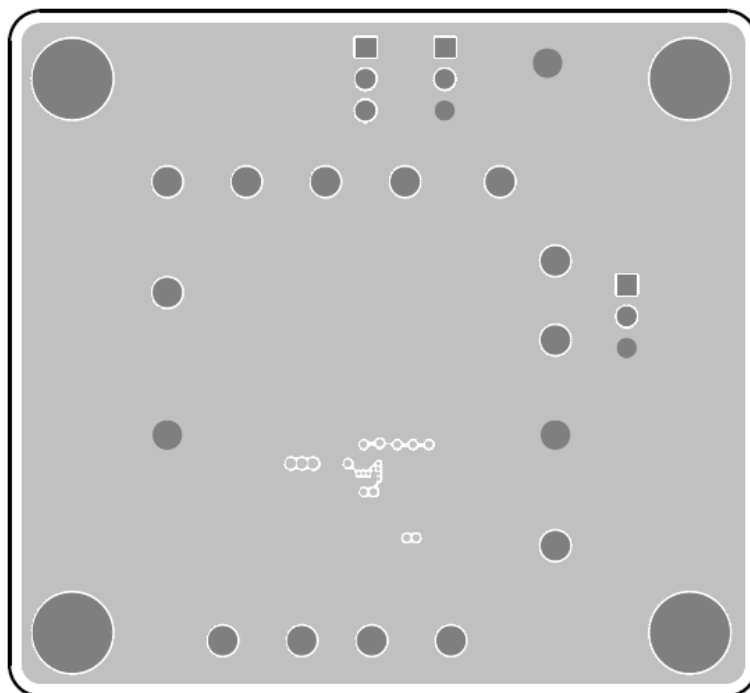
Top View (1st layer)



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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