Dual Output Power Bank Reference Design Using RT9480 EZPBS™ Integrated Chip

Purpose

The RT9480 is a high integration and this single chip includes a linear charger a synchronous Boost with dual output load management and a torch function support.This document explains the function and use of the RT9480 evaluation board (EVB) and provides information to enable operation and modification of the evaluation board and circuit to suit individual requirements.

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Introduction

General Product Description

The RT9480 is a high integration and easy to use power solution for Li-ion power bank and other powered handheld applications. We call it EZPBS™ (Easy to Use Power Bank Solution). This single chip includes a linear charger a synchronous Boost with dual output load management and a torch function support. The battery volume and the state of charging and discharging can be indicated by 4LEDs. The RT9480 is available in the WQFN-24L 4x4 package.

Product Features

EZPBS™ (Easy to Use Power Bank Solution)

- **Compact BOM Elements with EZPBS™ Single Chip**
- **Protection Functions (OTP, OVP, OCP, VBUS and Output Short Protection)**
- **Support Charging and Discharging at the same time by Smart Algorithm**

Charger

- **One Linear Charger up to 1.2A**
- **DPM Function (Dynamic Power Management)**
- **Thermal Regulation**
- **Auto-Recharge**
- **Support JEITA Function**

USB Output

- **Support Dual USB Output**
- **Auto and Button Control**
- **One Sync-Boost up to 2.5A**
- **Peak Efficiency 97%**

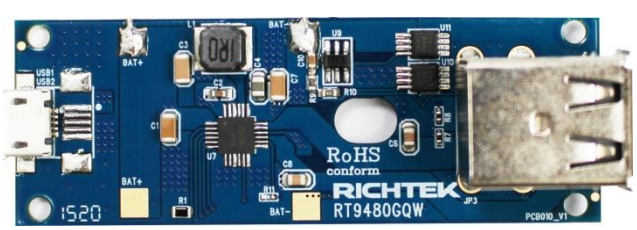
Battery State of Charge (SOC) Indicator

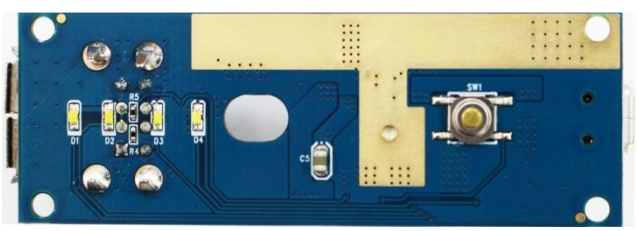
- **Battery SOC Detection**
- **Support NTC for Battery Temperature Sensing**
- **4 LEDs for Battery SOC Display**

Application

- **Li-ion Power Bank**

Evaluation Board





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)
VBAT	Input voltage	Input voltage range = 3V to 4.2V
USBOUT	Output voltage	Output voltage = 5.1V
VBUS	Input voltage	Input voltage range = 4.75V to 5.25V
GND	Ground	Ground

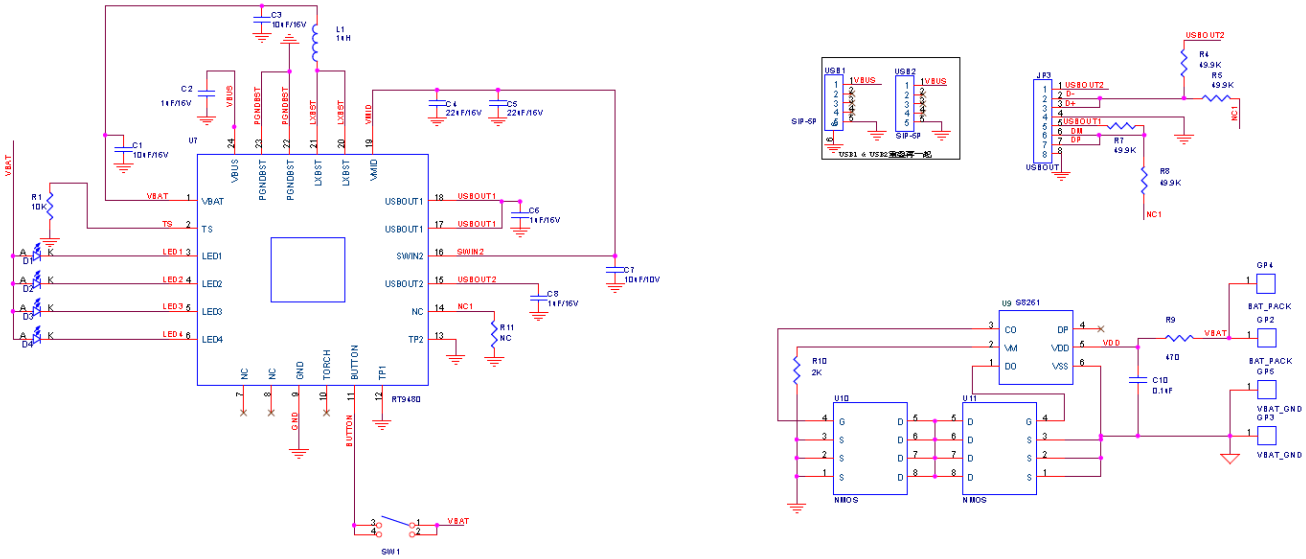
Power-up & Measurement Procedure

1. RT9480 starts work by provide VBAT voltage then plug-in VBUS.
2. Chargeing: Adapter or USB plug-in
3. Discharging: PD plug-in

Specification

Parameter	Symbol	Min	Typ.	Max	Units
VBUS Operation Voltage Range			5	5.5	V
Output Voltage	VOUTBST		5.1		V
Switching Frequency	F_{SW}		250		kHz
MAX Output Current	IOUT		2.5		A
Battery Quiescent Current for Standby_Auto Mode	IBAT_sdy		90		μA
Battery Quiescent Current for Standby_Button Mode	IBAT_sdy		30		μA

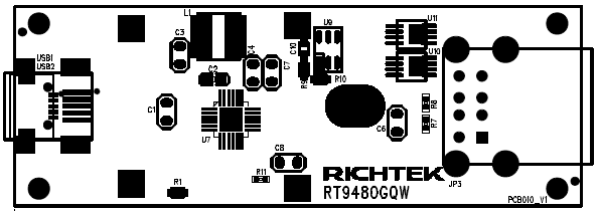
Schematic



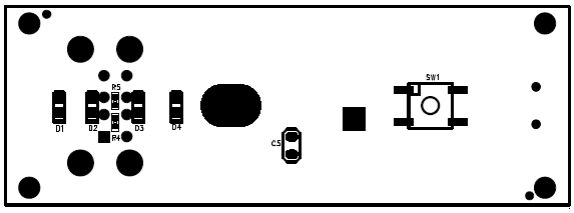
BOM

Reference	Q'ty	P/N	Description	Package	Manufacture
U7	1	RT9480	E2U Power Bank Solution	WQFN-24L 4x4	RICHTEK
U9	1	S-8261ACKMD-G4KT2x	Battery Protection IC	SOT-23-6	SEIKO
U10, U11	2	SIS438DN	NMOS	SIS438DN	VISHAY
C1, C3, C7	3	EMK212ABJ106KD-T	10 μF/16V/X5R	C-0805	TAIYO
C2, C6, C8	3	EMK212B7105KD-T	1 μF/16V/X7R	C-0805	TAIYO
C4, C5	2	LMK212BBJ226MD-T	22 μF/10V/X5R	C-0805	TAIYO
C10	1	UMR107B7104KA-T	0.1 μF/50V/X7R	C-0603	TAIYO
L1	1	LVS505040-1R0-N	Power Inductor	L-NR8040	CHILISIN
R1	1	RM06FTN1002	10K/0603/1%	R-0603	TA-I
R7, R8	2	RM04FTN4992	49.9K/0402/1%	R-0402	TA-I
R9	1	RM04FTN4700	470/0402/1%	R-0402	TA-I
R10	1	RM04FTN2001	2K/0402/1%	R-0402	TA-I
D1, D2, D3, D4	4		SMD LED	D-0603	
SW1	1	SW KEY-YM061	Switch		
USB2	1		USB-MICRO	USB-MICRO	
JP3	1		USB PortX2	USB-A	

PCB Layout



Top View



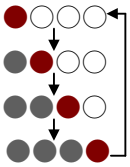
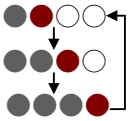
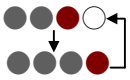
Bottom View

LED Indicator Function

About LED indicator, it will follow below table to show SOC. The LED current is 0.75mA.

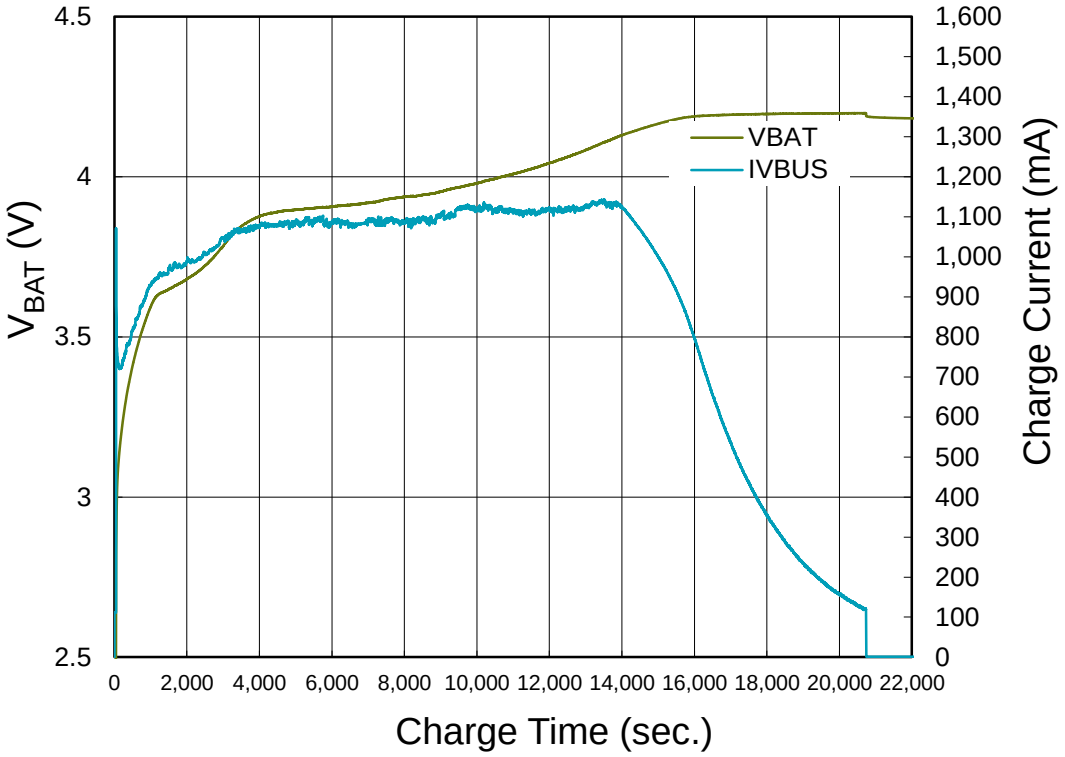
●●●●
Low→High

● : LED ON, ○ : LED OFF, ● : LED FLASH

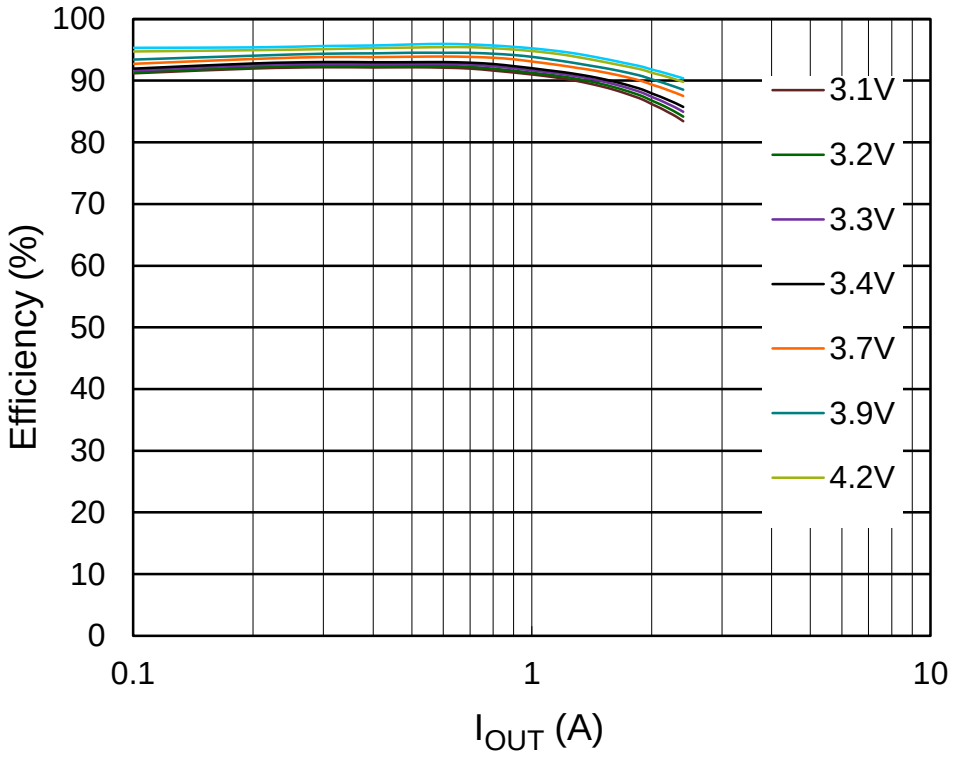
Battery Voltage	Operation of Charging
< 3700mV	
> 3700mV < 3940mV	
> 3940mV < 4100mV	
> 4100mV < 4200mV	
4200mV	

Battery Voltage	Operation of Discharging
< 4200mV > 3880mV	
< 3880mV > 3720mV	
< 3720mV > 3500mV	
< 3500mV > 3200mV	
< 3200mV > 2800mV	

Charging Test with 6000mAh



Boost Efficiency Test



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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