Wide Input and Ultra-Low Quiescent Current Boost Converter with High Efficiency and I²C Flexible Control

General Description

The RT4822 is a boost regulator designed to provide a minimum output voltage from a single-cell Li-Ion battery or two alkaline battery series, even when the battery voltage is below system minimum. Quiescent current in shutdown mode is less than 1μA, which maximizes battery life.

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Performance Specification Summary

The boost conveter has an input voltage range from 1.8V to 5.5V, and the output voltage range is from 3.15V to 5.5V. It can operate in force bypass mode and boost mode. And the power-on inrush current and current limit are implemented serval setting for difference application. The RT4822 is available in a WL-CSP-9B 1.3x1.2 (BSC) package.

Table 1. RT4822WSC Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range		1.8	--	5.5	V
Output Current	V_{IN} > 3V, V_{OUT} = 5V	0	--	1.5	A
Default Output Voltage		--	5	--	V
Operation Frequency		3	3.5	4	MHz
Output Ripple Voltage	V_{IN} = 3.6V, V_{OUT} = 5V, I_{OUT} = 0.5A	--	40	--	mVp-p
Line Regulation	I_{OUT} = 0.5A, V_{IN} = 1.8V to 4.8V, V_{OUT} = 5V	--	±1	--	%
Load Regulation	V_{IN} = 3.6V, I_{OUT} = 0.2A to 1A, V_{OUT} = 5V	--	±1	--	%
Load Transient Response	V_{IN} = 3.6V, V_{OUT} = 5V ,I_{OUT} = 50mA to 500mA	--	±3	--	%
Maximum Efficiency	V_{IN} = 3.6V, V_{OUT} = 5V, I_{OUT} = 0.6A	--	93	--	%

Power-up Procedure

1. Connect input voltage (1.8V < V_{IN} < 5.5V) to VIN pin.
2. Setting BOOST enable selection by CHIP_EN. (setting 0x05[0] by I^2C)
3. Setting BOOST pre-charge current and BOOST_LIMIT for power on inrush current. (setting 0x00 by I^2C)
4. To enable Boost converter by external EN pin or 0x05[5].
5. To connect an external load to output and verify the output voltage versus applied current.

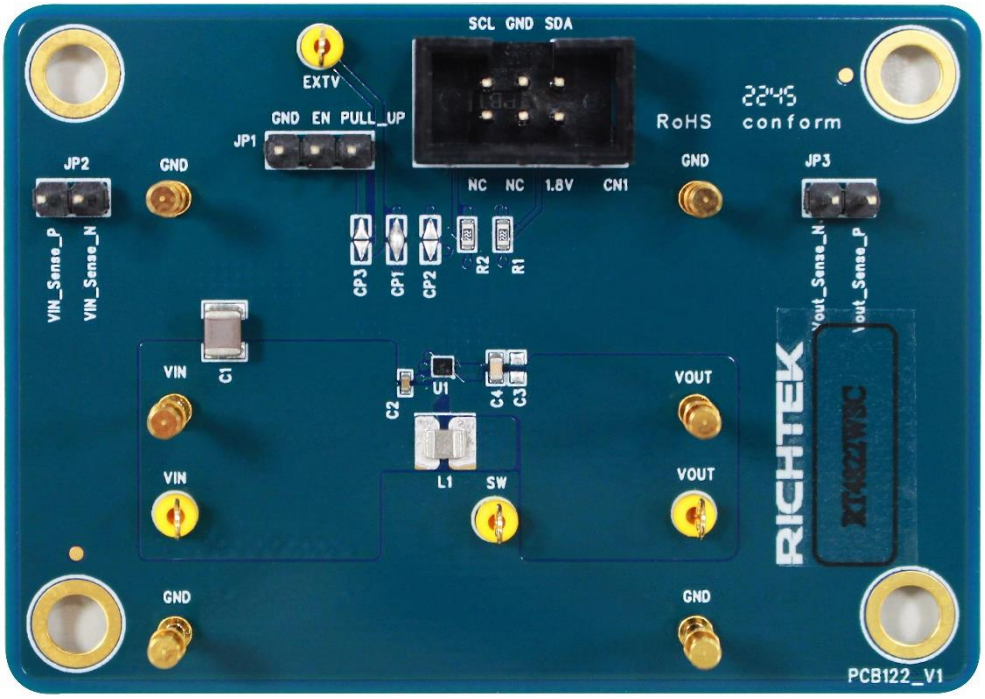
Output Voltage Setting

The output voltage set by internal register in the following I^2C table.

Addr	Reg Name	Bit	Bit Name	Default	Type	Description
0x02	BOOST_VOUT	7	Reserved	0	RW	Reserved
		6:0	BOOST_VOUT	1101011	RW	Boost output voltage can be set voltage from 3.15V to 5.5V with 25mV/step. 0000000 to 0100001: 3.15V … 1101011: 5V (default) … 1111111: 5.5V

Detailed Description of Hardware

Headers Description and Placement



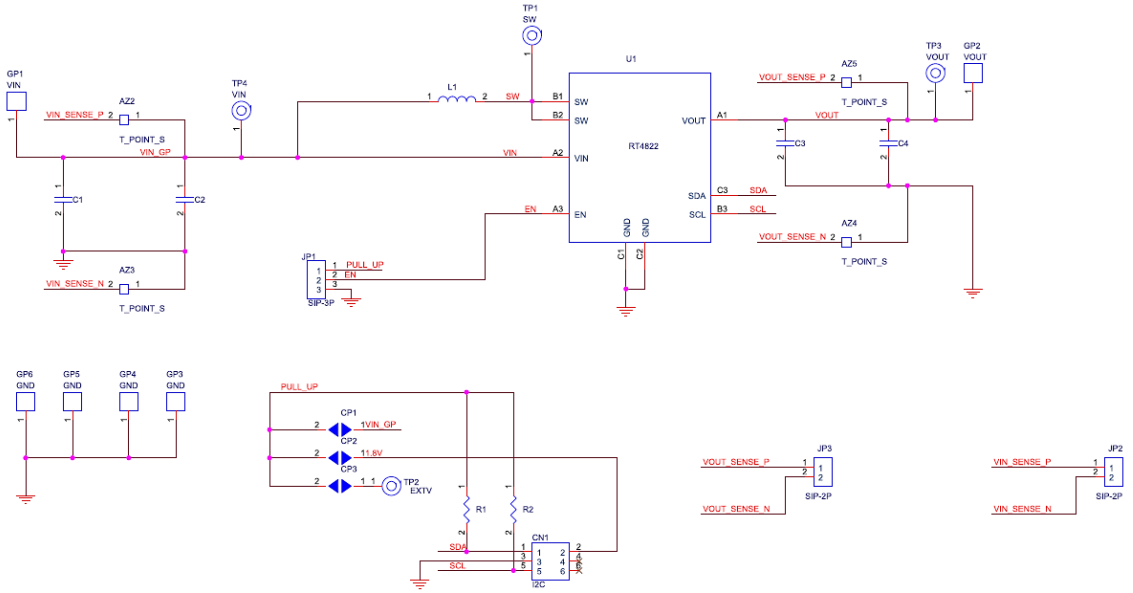
Carefully inspect all the components used in the EVB according to the following Bill of Materials table, and then make sure all the components are undamaged and correctly installed. If there is any missing or damaged component, which may occur during transportation, please contact our distributors or e-mail us at evb_service@richtek.com.

Bill of Materials

Reference	Count	Part Number	Description	Package	Manufacture
CN1	1	CHEB254S006-CF1043	I^2C		Cherng Weei
C1	1	EMK325BJ476KM-T	47µF/16V/X5R	1210	TAIYO YUDEN
C2	1	GRM155R60J475ME47	4.7µF/6.3V/X5R	0402	Murata
C4	1	0603X106M6R3CT	10µF/6.3V/X5R	0603	WALSIN
L1	1	DFE252012F-1R0M=P2	1.0µH/3.3A	2.5x2.0x1.2mm	Murata
R1, R2	2	WR06X2201FTL	22k/0603	0603	WALSIN
U1	1	RT4822WSC	Step-Up DC-DC Converter	WL-CSP-9B 1.3x1.2 (BSC)	RICHTEK

Typical Applications

EVB Schematic Diagram

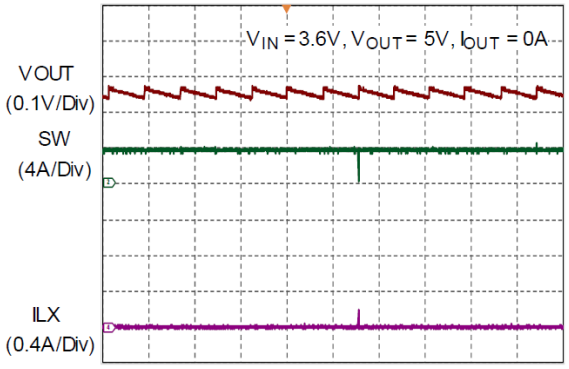


1. C1 is placed on input side, and the capacitors are design for long wire effect. If input source is close RT4822 then the capacitors are optional.
2. C4 is placed on output side, and the capacitor is optional for output voltage ripple improvement.

Measure Result

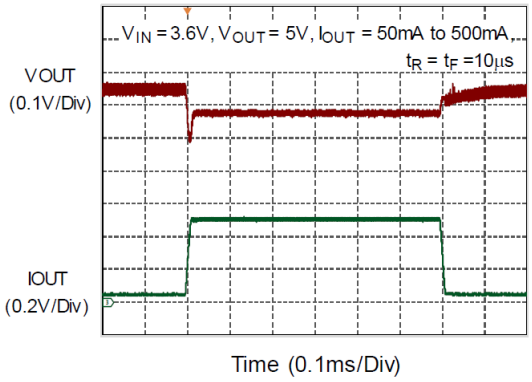
Output Ripple Measurement

PFM Output Ripple



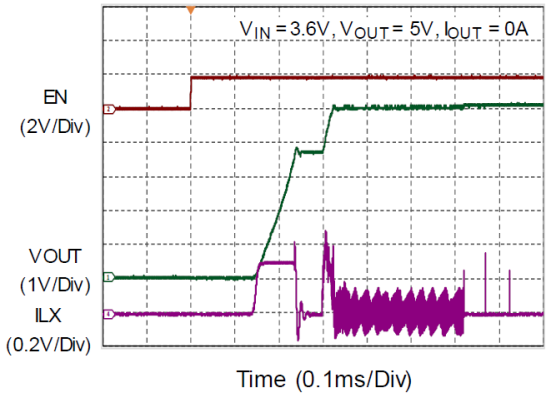
Load Transient Response

Load Transient



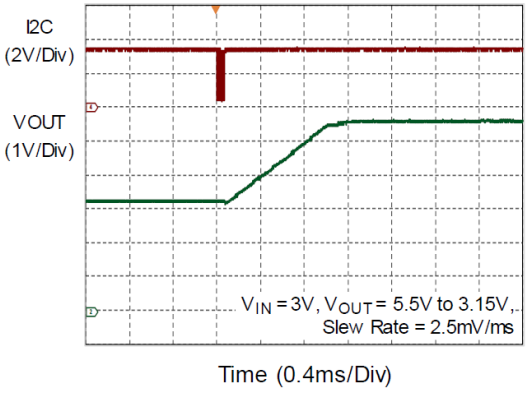
Power On from EN

Power-On



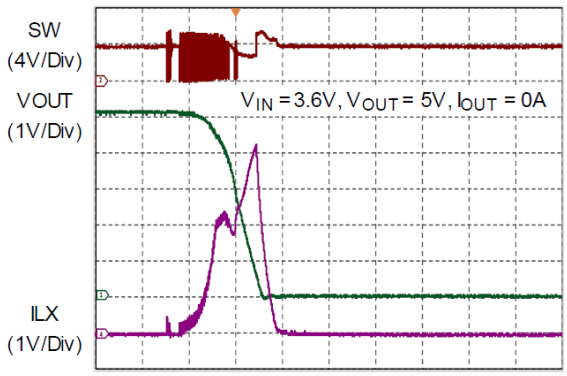
DVS up

DVS Up



Short Circuit Response

Boost Short Circuit



Sine Waveform Stability

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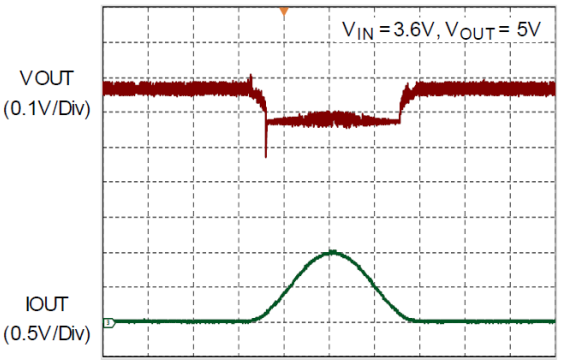

Evaluation Board Layout

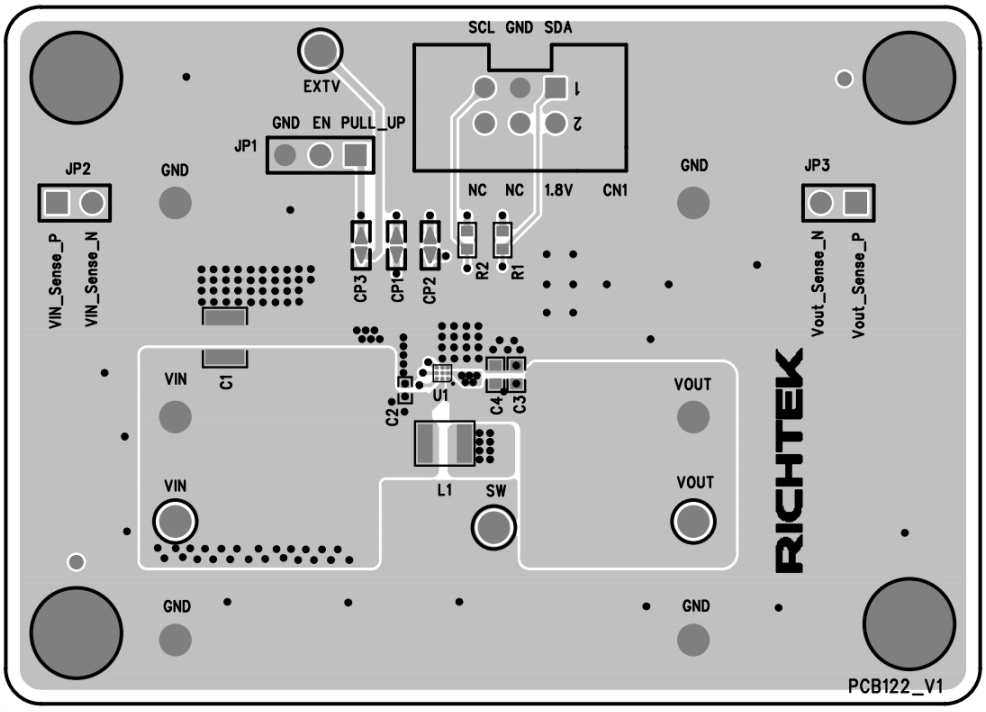

Figure 1. Top View (1st layer)

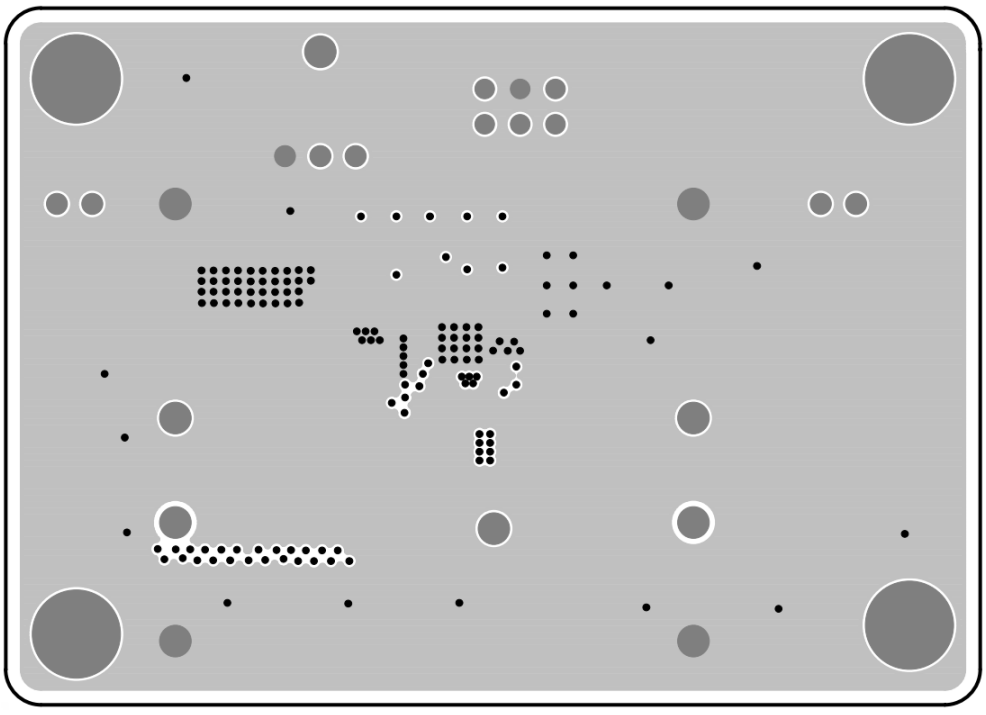

Figure 2. PCB Layout—Inner Side (2nd Layer)

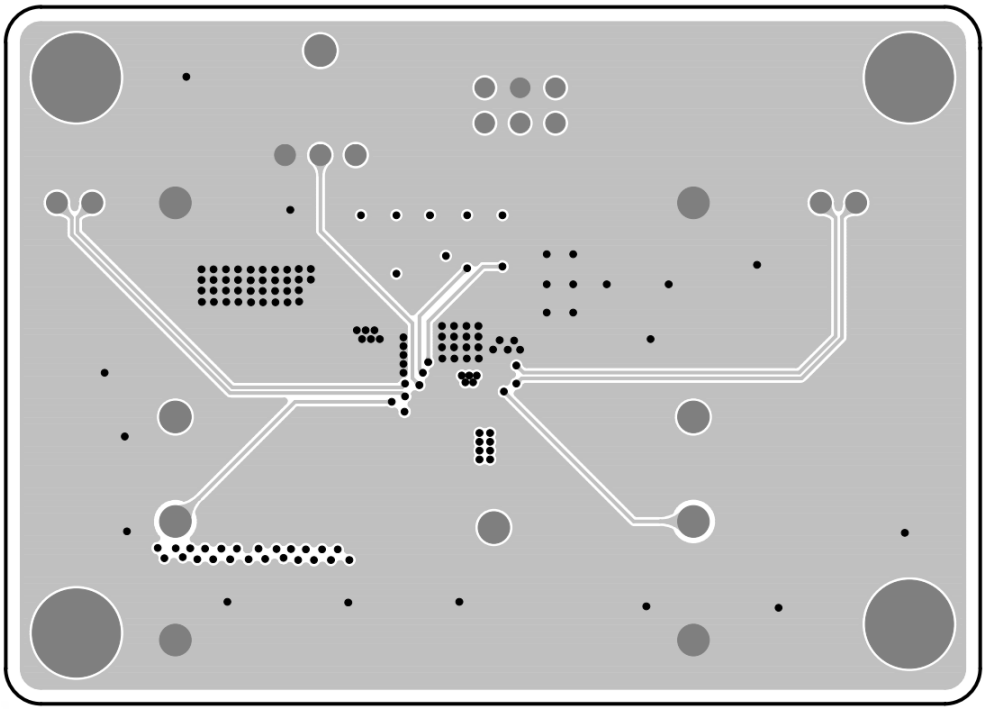

Figure 3. PCB Layout—Inner Side (3rd Layer)

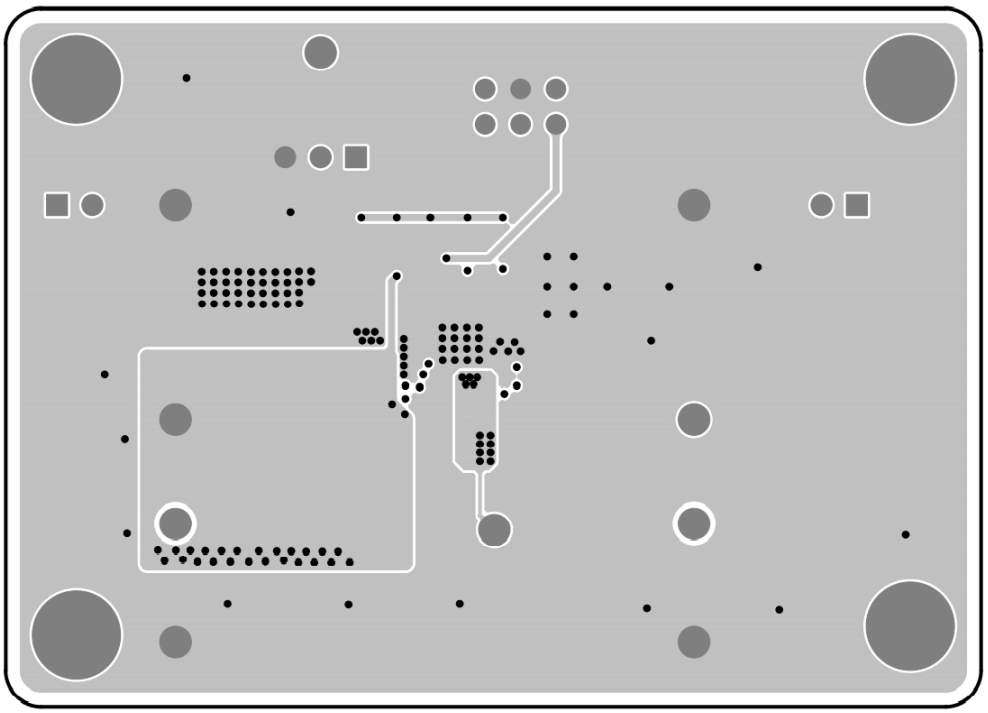

Figure 4. Bottom View (4th Layer)

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