

## RT7250BZSP Evaluation Board

### *Purpose*

The RT7250B is a high-efficiency current mode synchronous step-down regulator that can deliver up to 2A output current from a wide input voltage range of 4V to 17V. This document explains the function and use of the RT7250B 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 Information

The RT7250B is a high efficiency, monolithic synchronous step-down DC/DC converter that operates at 800kHz and delivers up to 2A output current from a 4V to 17V input supply. The RT7250B's current mode architecture allows the transient response to be optimized. Cycle-by-cycle current limit provides protection against shorted outputs and soft-start eliminates input current surge during start-up. Fault conditions also include output under voltage protection, output over voltage protection, and thermal shutdown. The low current (<5 $\mu$ A) shutdown mode provides output disconnect, enabling easy power management in battery-powered systems. The RT7250B is available in a SOP-8 (Exposed Pad) package.

### Product Feature

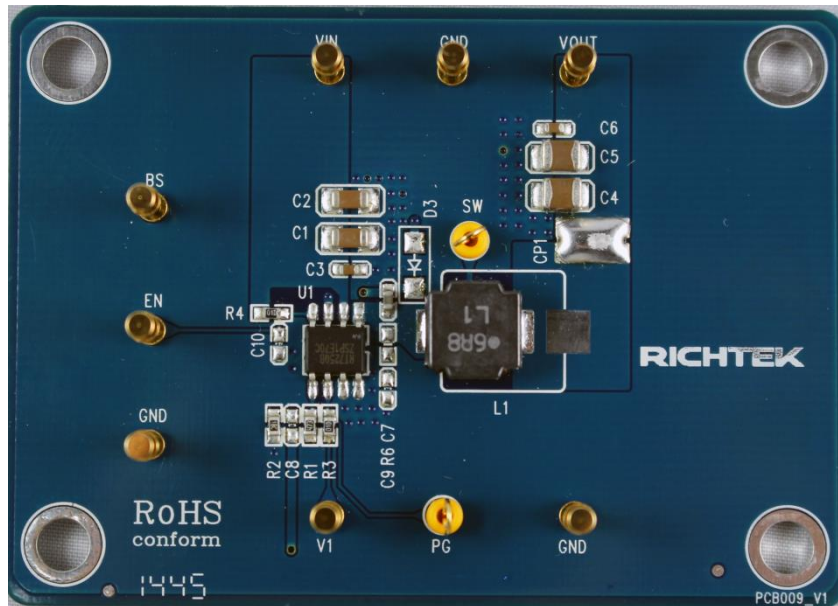
- 4V to 17V Input Voltage Range
- 2A Output Current
- Internal N-MOSFETs
- Current Mode Control
- Fixed Frequency Operation : 800kHz
- Output Adjustable from 0.8V to 12V
- Up to 95% Efficiency
- Internal Compensation
- Stable with Low ESR Ceramic Output Capacitors
- Cycle-by-Cycle Over Current Protection
- Input Under Voltage Lockout
- Output Under Voltage Protection
- Output Over Voltage Protection
- Power Good Indicator
- Thermal Shutdown Protection
- RoHS Compliant and Halogen Free

### Key Performance Summary Table

Key Features	Evaluation Board Number: PCB009_V1
Default Input Voltage	12V
Max Output Current	2A
Default Output Voltage	3.3V
Default Marking & Package Type	RT7250BZSP (SOP-8 (Exposed Pad))
Operation Frequency	Steady 800kHz at all load currents
Other Key Features	4V to 17V Input Voltage Range Power Good Indicator
Protection	Over Current Protection Hiccup Mode Output Under-Voltage & Over-Voltage Protection Thermal Shutdown

## 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](mailto: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)
<b>VIN</b>	Input voltage	Input voltage range= 4V to 17V
<b>VOUT</b>	Output voltage	Default output voltage = 3.3V Output voltage range= 0.8V to 12V (see " Output Voltage Setting" section for changing output voltage level)
<b>SW</b>	Switching node test point	SW waveform
<b>EN</b>	Enable test point	Enable signal. EN is automatically pulled high (by R4) to enable operation. Connect EN low to disable operation.
<b>BS</b>	Boot strap supply test point	Floating supply voltage for the high-side N-MOSFET switch
<b>PG</b>	Power Good test point	Power Good Indicator
<b>V1</b>	External Voltage for PG	External voltage terminal for PG pull-up voltage.
<b>GND</b>	Ground	Ground

### Power-up & Measurement Procedure

1. Apply a 12V nominal input power supply ( $4V < V_{IN} < 17V$ ) to the VIN and GND terminals.
2. The EN voltage is pulled to logic high by R4 ( $100k\Omega$  to VIN) to enable operation. Drive EN high ( $>2.5V$ ) to enable operation or low ( $<0.4V$ ) to disable operation.
3. Verify the output voltage (approximately 3.3V) between VOUT and GND.
4. Connect an external load up to 2A to the VOUT and GND terminals and verify the output voltage and current.

**Output Voltage Setting**

Set the output voltage with the resistive divider (R1, R2) between V<sub>OUT</sub> and GND with the midpoint connected to FB. The output is set by the following formula:

$$V_{OUT} = 0.8 \times \left(1 + \frac{R1}{R2}\right)$$

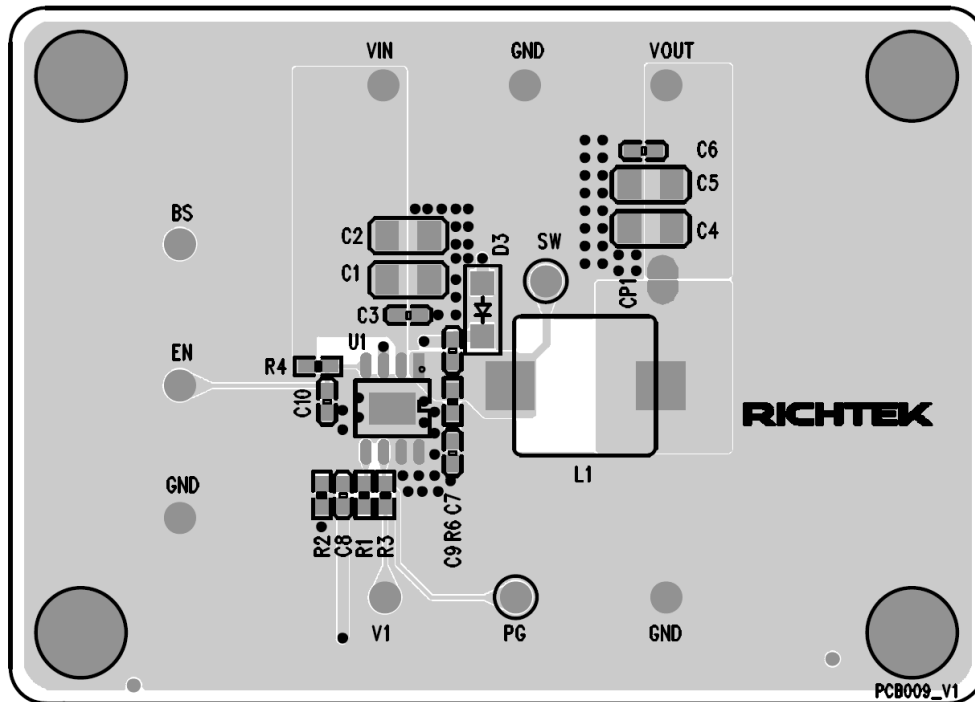
The installed V<sub>OUT</sub> capacitors (C4, C5) are 22μF, 16V X5R ceramic types. Do not exceed their operating voltage range and consider their voltage coefficient (capacitance vs. bias voltage) and ensure that the capacitance is sufficient to maintain stability and provide sufficient transient response for your application. This can be verified by checking the output transient response as described in the RT7250 IC datasheet.



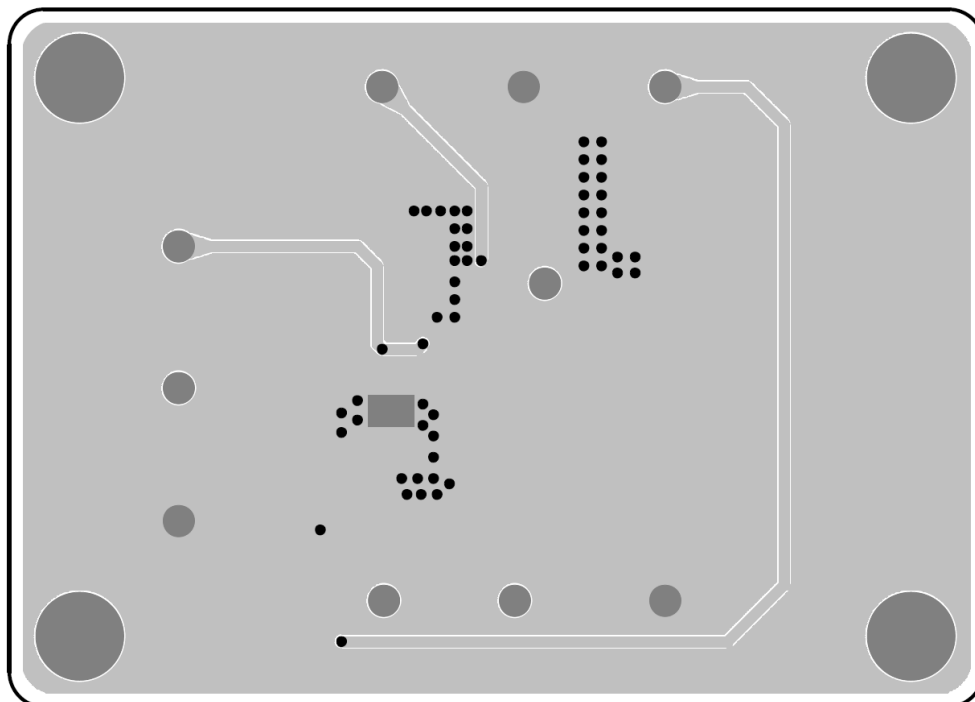
**Bill of Materials**

Reference	Qty	Part number	Description	Package	Manufacture
<b>U1</b>	1	RT7250BZSP	DC-DC Converter	SOP-8 (Exposed Pad)	Richtek
<b>C1, C2</b>	2	C3216X5R1H106K160AB	10 $\mu$ F/ $\pm$ 10%/50V/X5R Ceramic Capacitor	1206	TDK
<b>C4, C5</b>	2	GRM32ER61C226KE20#	22 $\mu$ F/ $\pm$ 10%/16V/X5R Ceramic Capacitor	1210	Murata
<b>C7</b>	1	GRM32MR71H103KA01#	10nF/ $\pm$ 10%/50V/X7R Ceramic Capacitor	0603	Murata
<b>C3, C6</b>	2	C1608X7R1H104K080AA	0.1 $\mu$ F/ $\pm$ 10%/50V/X7R Ceramic Capacitor	0603	TDK
<b>C8, C9, C10</b>	0		Not Installed	0603	
<b>L1</b>	1	NR8040T6R8N	6.8uH/3.7A/ $\pm$ 30%, DCR=25m $\Omega$ , Inductor	8mmx8mmx4mm	TAIYO YUDEN
<b>R1</b>	1		47k $\Omega$ / $\pm$ 1%, Resistor	0603	
<b>R2</b>	1		15k $\Omega$ / $\pm$ 1%, Resistor	0603	
<b>R3, R4</b>	1		100k $\Omega$ / $\pm$ 1%, Resistor	0603	
<b>CP1</b>	1		Short		
<b>D3, R6</b>	0		Not Installed		
<b>TP</b>	4		Test Pin		
<b>GP</b>	6		Golden Pin		

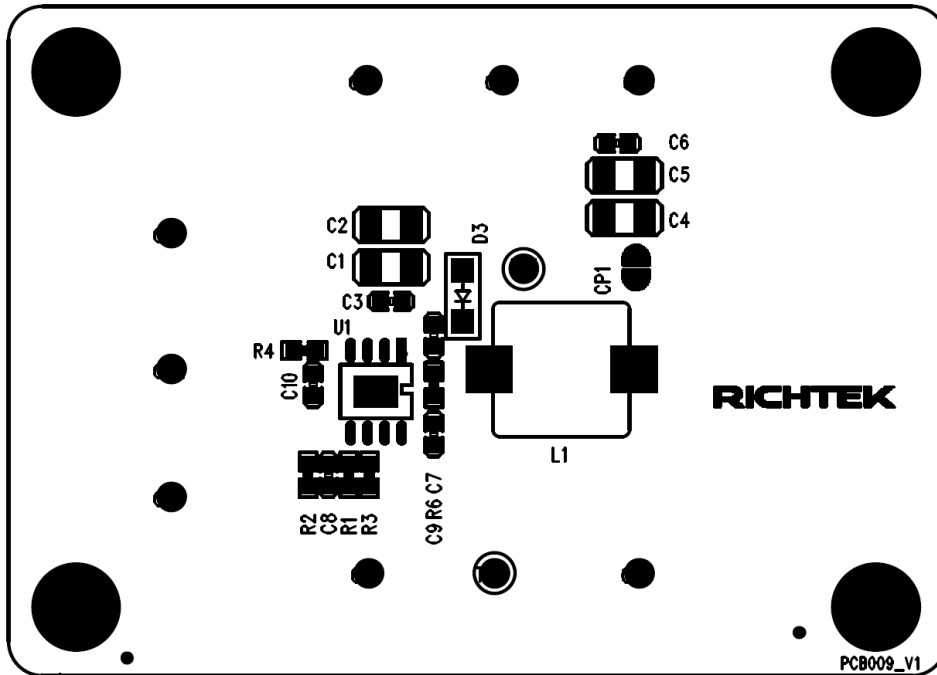
**EVB Layout**



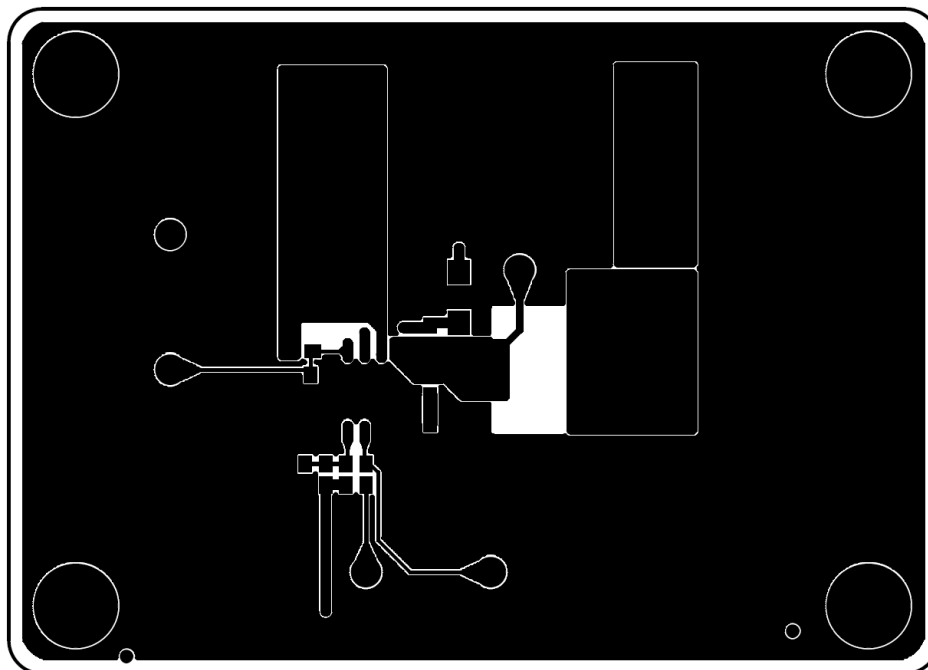
Top View (1<sup>st</sup> layer)



Bottom View (4<sup>th</sup> Layer)

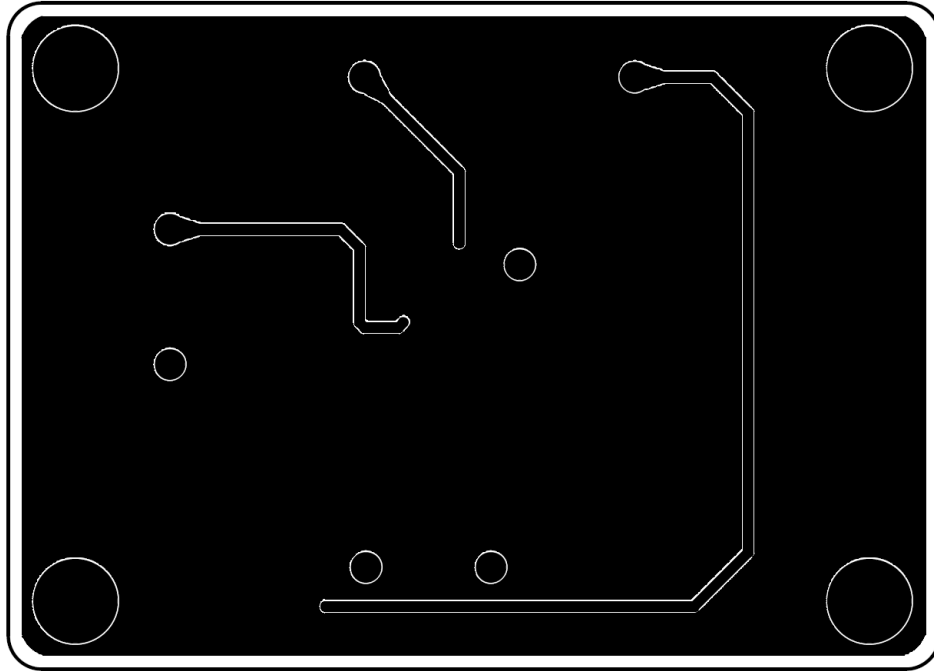


Component Placement Guide—Component Side (1<sup>st</sup> layer)



PCB Layout—Component Side (1<sup>st</sup> Layer)





PCB Layout—Bottom Side (4<sup>th</sup> 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 Reference Designs***

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