

3A, 18V, 1.4MHz ACOT™ Synchronous Step-Down Converter

Purpose

The RT6224C is an ACOT control architecture step-down converter, which the input voltage range is from 4.3V to 18V and the output is adjustable from 0.6V to 8V. This document explains the function and use of the RT6224C evaluation board (EVB), and provides information to enable operation, modification of the evaluation board and circuit to suit individual requirements.

Table of Contents

Purpose.....	1
Introduction	2
Bench Test Setup Conditions.....	3
Schematic, Bill of Materials & Board Layout.....	5
More Information.....	8
Important Notice for Richtek Evaluation Board.....	8

Introduction

General Product Information

The RT6224C is a high-efficiency, monolithic synchronous step-down DC-DC converter that can deliver up to 3A output current from a 4.3V to 18V input supply. The RT6224C adopts ACOT™ architecture to allow the transient response to be improved and keep in constant frequency. 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.

Product Feature

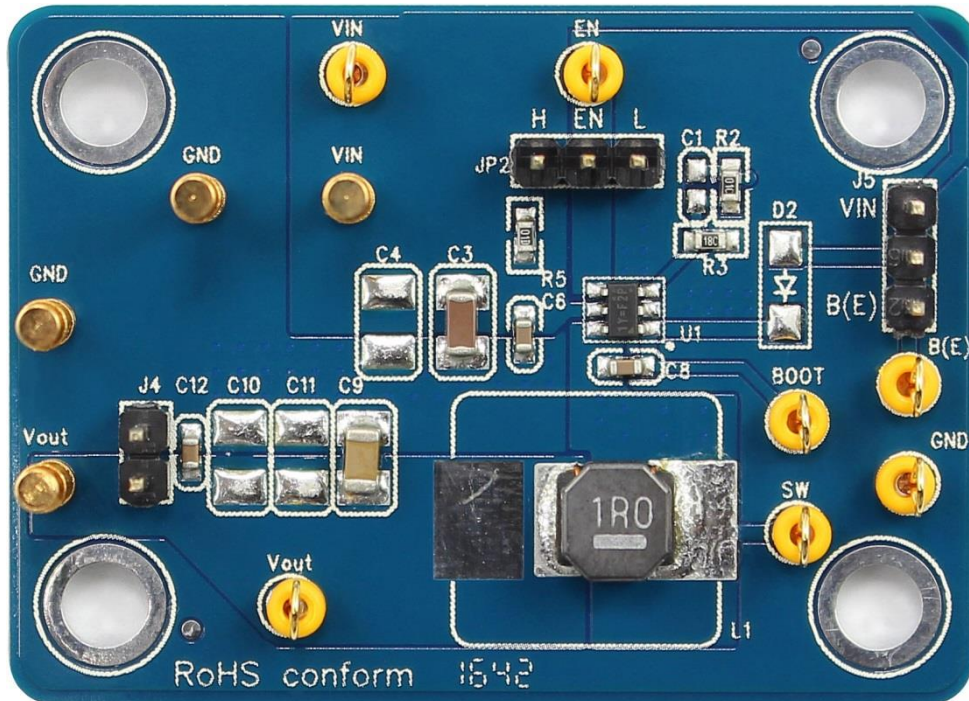
- Small Output Voltage at Light Load
- High-Side Over-Current Limit
- Integrated 90mΩ/45mΩ MOSFETs
- 4.3V to 18V Supply Voltage Range
- 1.4MHz Switching Frequency
- ACOT™ Control
- 0.6V±1.5% Voltage Reference
- Monotonic Start-Up into Pre-biased Outputs

Key Performance Summary Table

Key Features	Evaluation Board Number: PCB077_V1
Input Voltage Range	4.3V to 18V
Max Output Current	3A
Default Output Voltage	1.0V
Default Marking & Package Type	RT6224CHGJ6F, TSOT-23-6 (FC)
Operation Frequency	Steady 1.4MHz

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 Name	Description
BOOT	Bootstrap Supply	Bootstrap supply for high-side gate driver. Connect a 0.1 μ F ceramic capacitor between the BOOT and SW pins.
GND	Ground	Power ground.
FB	Feedback	Feedback voltage input. The pin is used to set the output voltage of the converter via a resistive divider. The converter regulates VFB to 0.6V.
EN	Enable	Enable control input. Connect EN to a logic-high voltage to enable the IC or to a logic-low voltage to disable. Do not leave this high impedance input unconnected.
VIN	Input Voltage	Power input. The input voltage range is from 4.3V to 18V. Must bypass with a suitable large ceramic capacitor at this pin.
SW	Switch node	Switch node. Connected to external L-C filter.

Power-up & Measurement Procedure

1. Apply a 12V nominal input power supply ($4.3V < V_{IN} < 18V$) to the VIN and GND terminals.
2. Set the jumper at JP2 to connect terminals 2 and 3, connecting EN to VIN through resistor R5, to enable operation.
3. Verify the output voltage (approximately 1V) between VOUT and GND.
4. Connect an external load up to 3A to the VOUT and GND terminals and verify the output voltage and current.

Output Voltage Setting

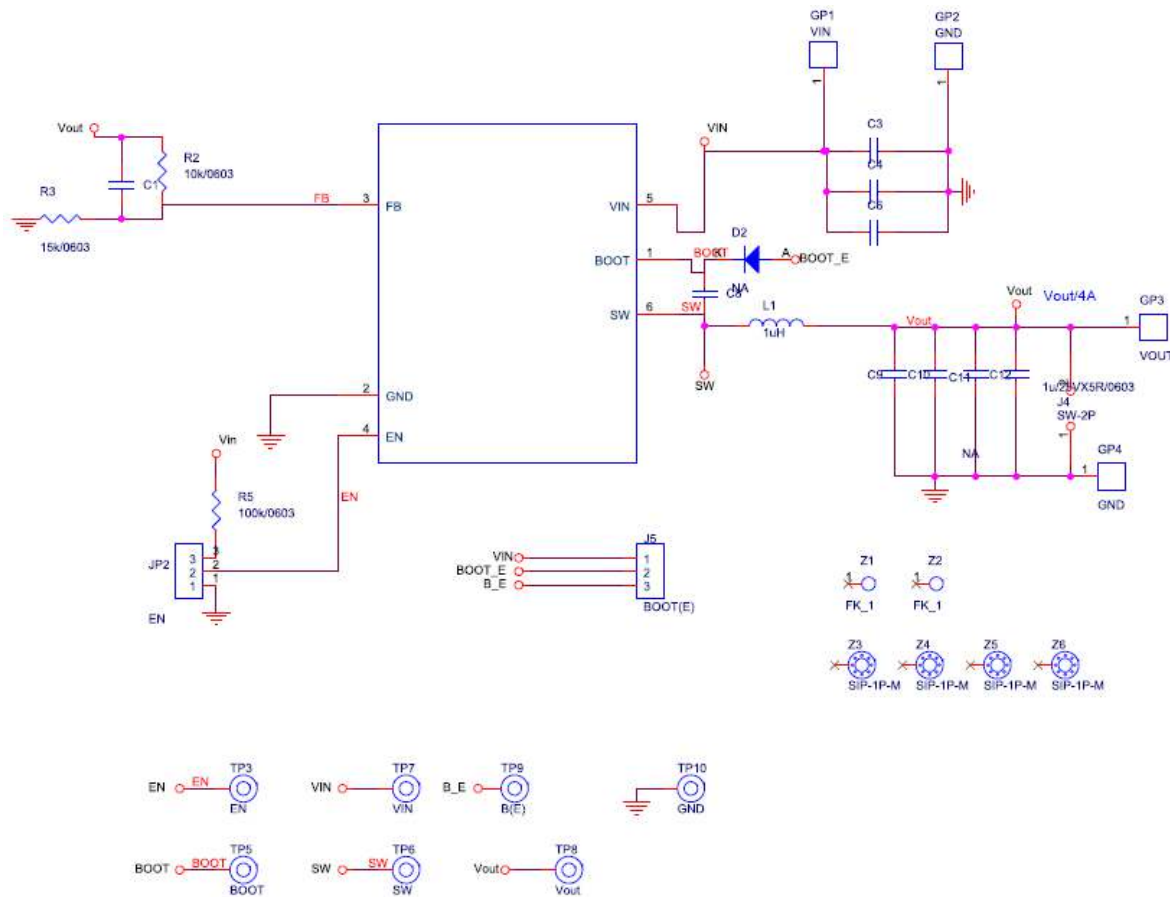
Set the output voltage with the resistive divider (R2, R3) between VOUT and GND with the midpoint connected to

FB. The output is set by the following formula :

$$V_{OUT} = 0.6 \times (1 + R2 / R3)$$

Schematic, Bill of Materials & Board Layout

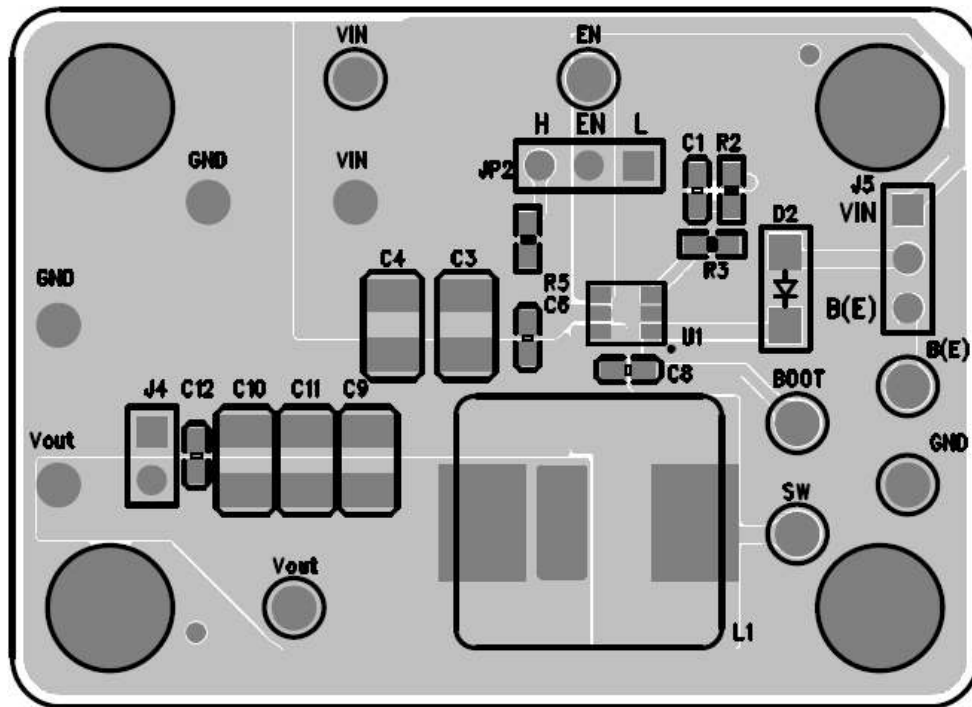
EVB Schematic Diagram



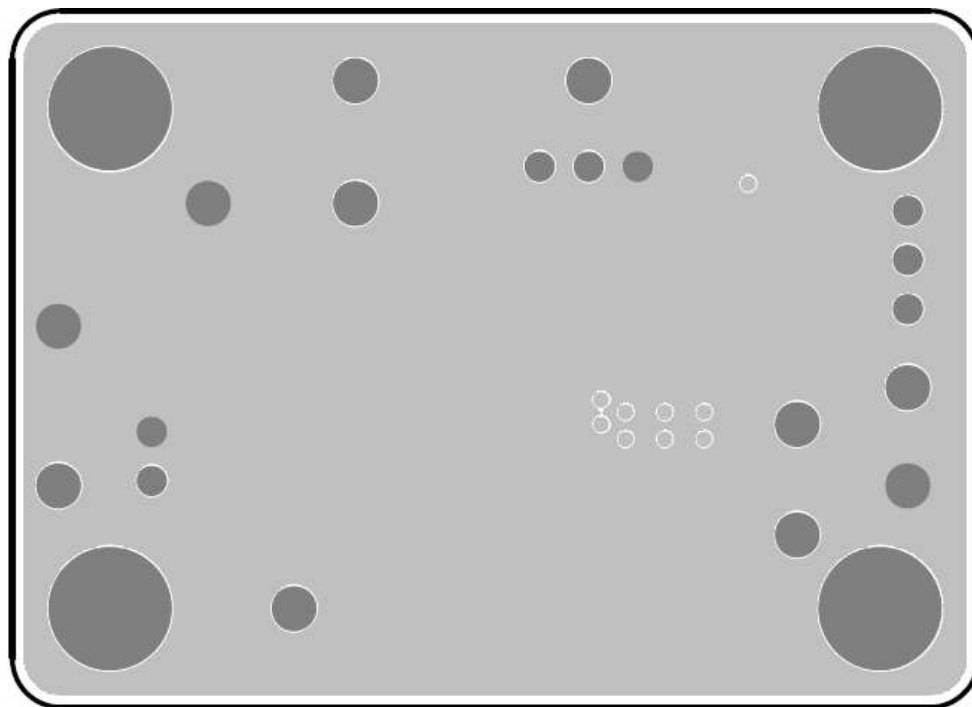
Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacturer
U1	1	RT6224CHGJ6F	DC-DC Converter	TSOT-23-6(FC)	RICHTEK
C1, C4, C10, C11, D2	5		NC		
C3	1	C3216X5R1H106KT000N	10 μ F/50V/X5R/1206	C-1210	TDK
C6, C8	2	C1608X7R1H104KT000N	0.1 μ F/50V/X7R/0603	C-0603	TDK
C9	1	GRM31CR61A226KE19L	22 μ F/10V/X5R/1206	C-1210	Murata
C12	1	C1608X5R1E105K080AC	1 μ /25VX5R/0603	C-0603	TDK
R2	1	WR06X1002FTL	10k/0603	R-0603	WALSIN/RALEC
R3	1	WR06X1502FTL	15k/0603	R-0603	WALSIN
R5	1	WR06X1003FTL	100k/0603	R-0603	WALSIN
L1	1	NR6045-1R0	1 μ H	L-GSTB135	TAIYO YUDEN

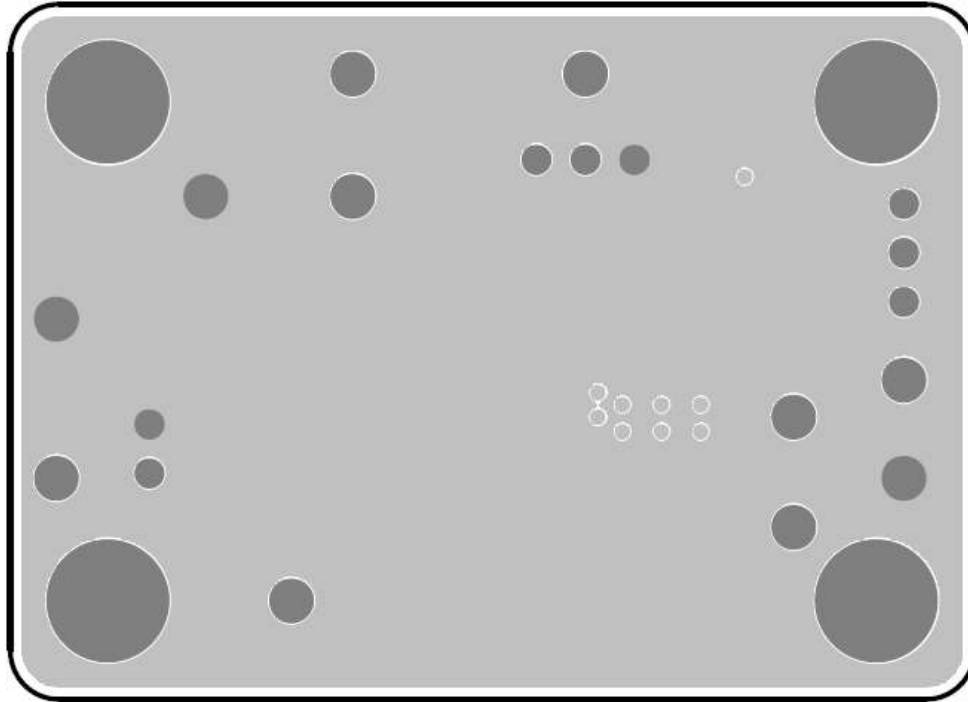
PCB Layout



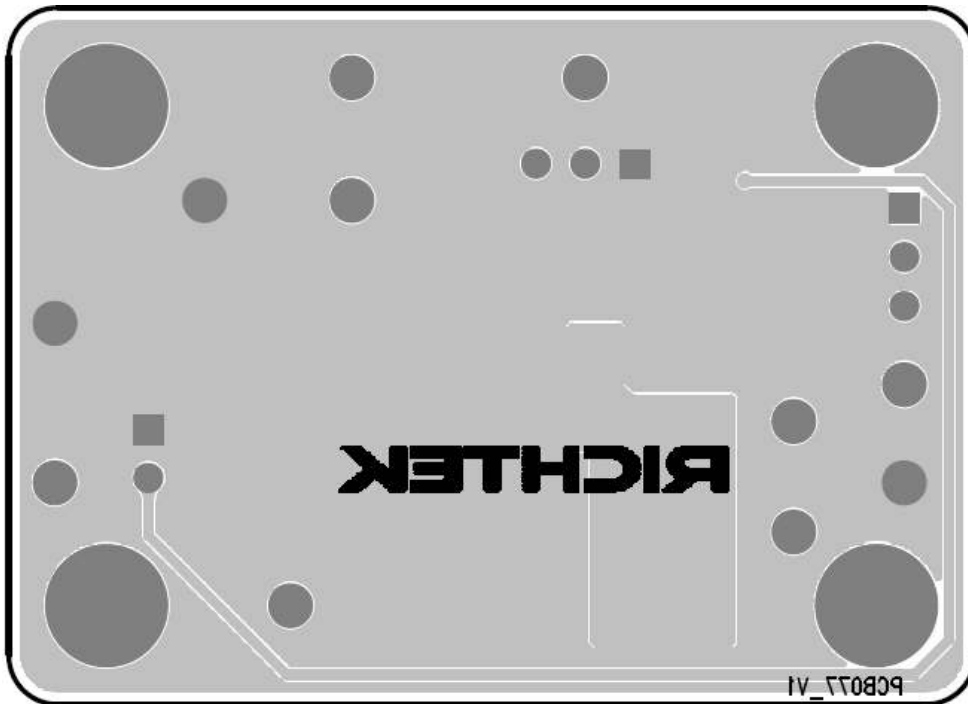
Top View (1st layer)



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

THIS DOCUMENT IS FOR REFERENCE ONLY, NOTHING CONTAINED IN THIS DOCUMENT SHALL BE CONSTRUED AS RICHTEK'S WARRANTY, EXPRESS OR IMPLIED, UNDER CONTRACT, TORT OR STATUTORY, WITH RESPECT TO THE PRESENTATION HEREIN. IN NO EVENT SHALL RICHTEK BE LIABLE TO BUYER OR USER FOR ANY AND ALL DAMAGES INCLUDING WITHOUT LIMITATION TO DIRECT, INDIRECT, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES.