6A, 18V, 500kHz, ACOT™ Step-Down Converter

Purpose

The RT6257A is a synchronous step-down converter with Advanced Constant On-Time (ACOT™) mode control. with the input voltage range from 4.5V to 18V and provides 6A output current. This document explains the function and use of the RT6257A 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 RT6257A is a high-efficiency, monolithic synchronous step-down DC-DC converter that can deliver up to 6A output current from a 4.5V to 18V input supply.The RT6257A 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 and thermal shutdown.

Product Features

- **4.5V to 18V Input Voltage Range**
- **6A Output Current**
- **Constant-On-Time Mode to Enables Fast Transient Response**
- **Low Output Ripple and Allows Ceramic Output Capacitor**
- **500kHz Switching Frequency**
- **High Efficient Internal Power MOSFET Switch Optimized for Lower Duty Cycle Applications**
- **Integrated 30mΩ/20mΩ MOSFETs**
- **Adjustable Output Voltage from 0.6V to 5V**
- **Internal Soft-Start (1.5ms typ.)**
- **Built-In UVP/OTP**
- **Input Under-Voltage Lockout**
- **TSOT23-6 (FC) Packages**

Key Performance Summary Table

Key Features	Evaluation Board Number : PCB074_V1
Default Input Voltage	12V
Max Output Current	6A
Default Output Voltage	5V
Default Marking & Package Type	RT6257AHGJ6F, TSOT-23-6 (FC)
Operation Frequency	Steady 500kHz at all loads

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)
FB	Feedback Voltage Input	This pin is used to set the desired output voltage via an external resistive divider. The feedback reference voltage is 0.6V typically.
VIN	Input Voltage	Power input. Supplies the power switches of the device.
GND	Ground	This is the power return for the IC.
BOOT	Bootstrap	Bootstrap supply for high-side gate driver. Connect a 0.1µF ceramic capacitor from SW to BOOT to power the high-side switch.
SW	Switch Node	Connect the output LC filter from SW to the output load.
EN	Enable Control Input	Floating this pin or connecting this pin to logic high can enable the device and connecting this pin to GND can disable the device.

Power-Up & Measurement Procedure

1. Apply a 12V nominal input power supply (4.5V < V_{IN} < 18V) to the VIN and GND terminals.
2. Set the jumper at JP1 to connect terminals 2 and 3, connecting EN to VIN through resistor R30, to enable operation.
3. Verify the output voltage (approximately 5V) between VOUT and GND.
4. Connect an external load up to 6A to the VOUT and GND terminals and verify the output voltage and current.

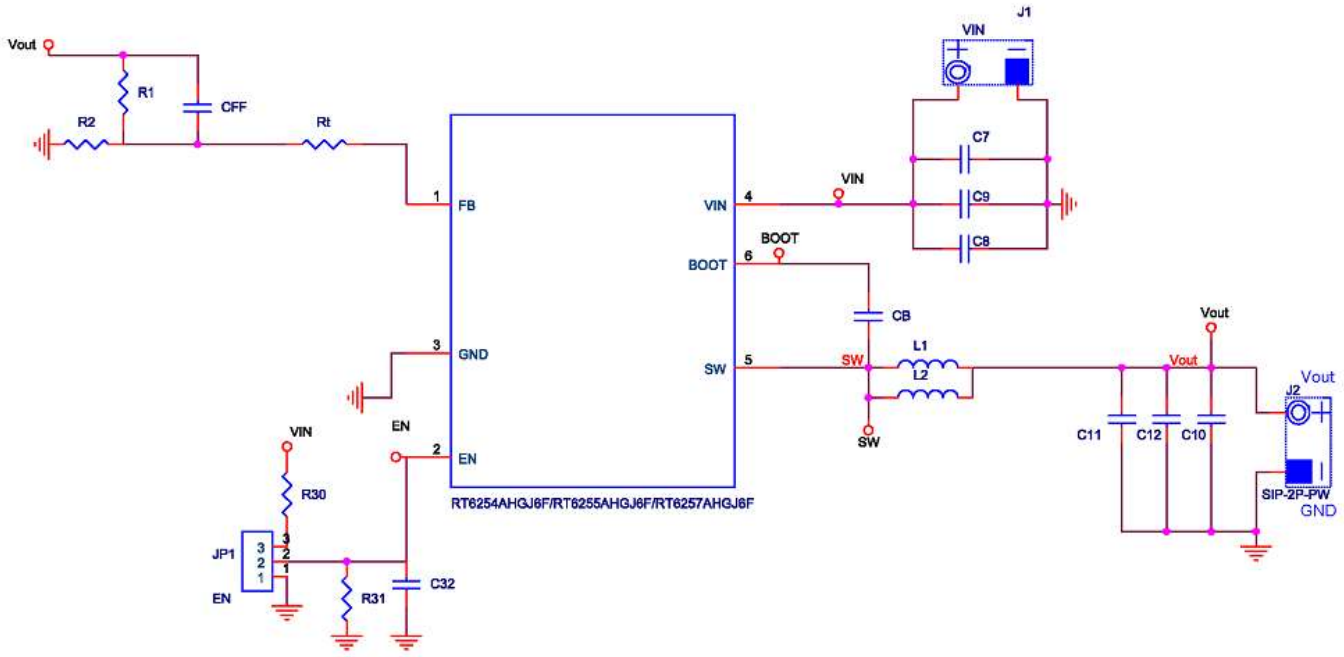
Output Voltage Setting

Set the output voltage with the resistive divider (R1, R2) between VOUT and GND with the midpoint connected to FB. The output is set by the following formula :

$V_{OUT} = V_{FB} \times (1 + R1 / R2)$

Schematic, Bill of Materials & Board Layout

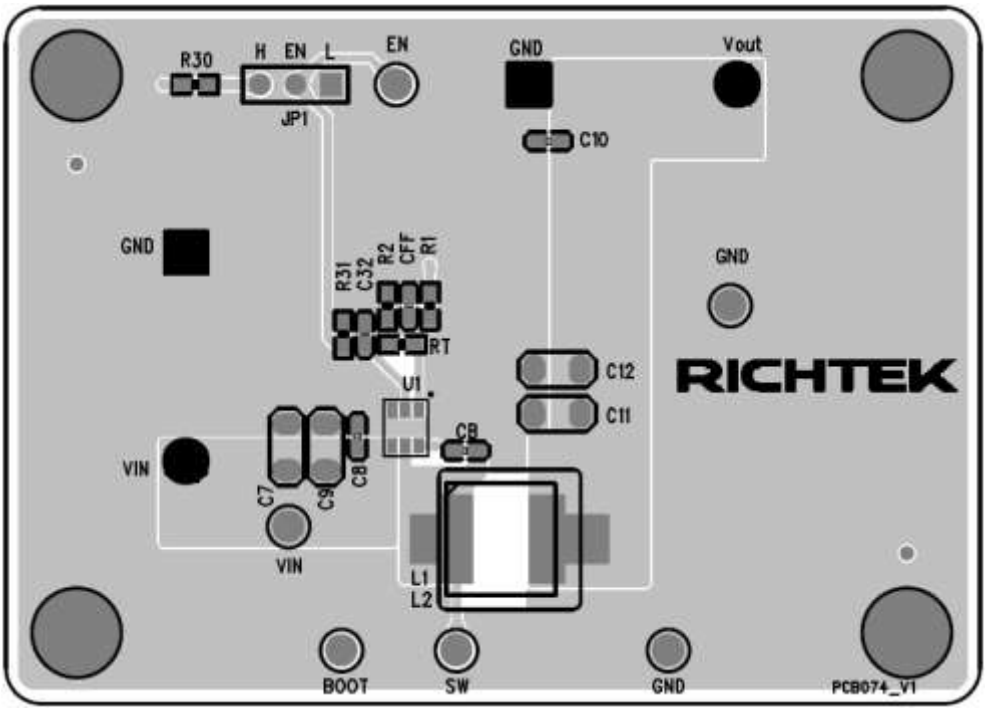
EVB Schematic Diagram



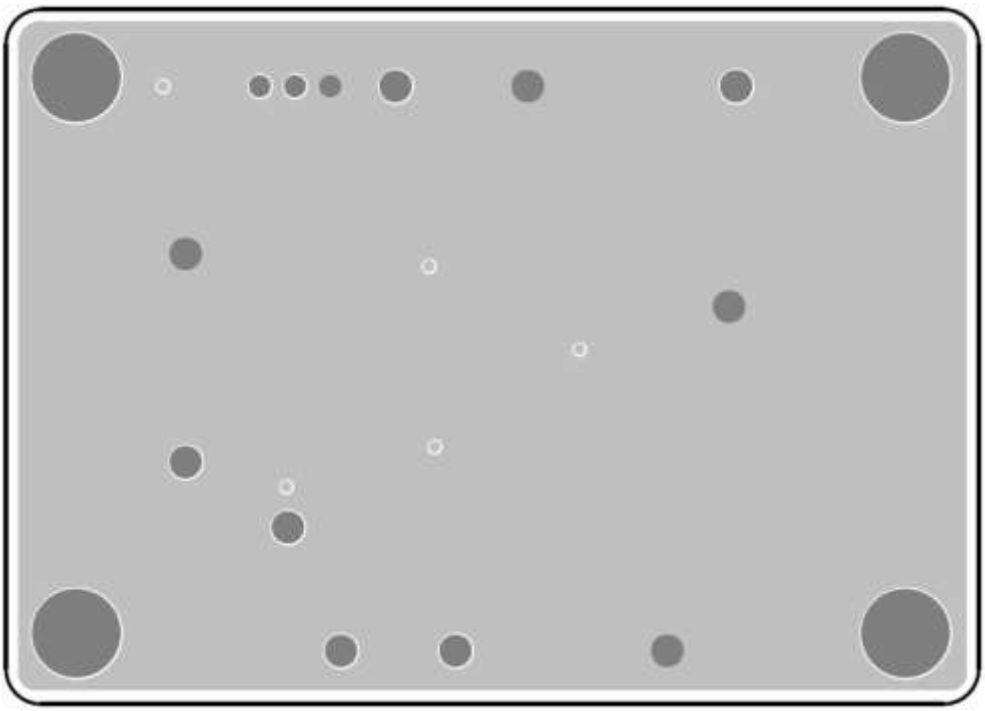
Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacturer
U1	1	RT6257AHGJ6F	DC-DC Converter	TSOT-23-6 (FC)	RICHTEK
C7, C9	2	C3216X5R1H106KT000N	10µF/50V/X5R/1206	C-1206	TDK
C8, C10, CB	3	C1608X7R1H104KT000N	0.1µF/50V/X7R/0603	C-0603	TDK
CFF	1	0603N470J500	47pF/50V/X7R/0603	C-0603	WALSIN
C11, C12	2	C3225X5R1E226MT	22µF/25V/X5R/1210	C-1210	TDK
C32	1		NC	C-0603	
L1	1	74437368033	3.3µH	L-GSC104	Wurth Electronics
L2	1		NC	L-8040	
R1	1	0603T-1-147K	147k/0603	R-0603	旺詮
R2	1	0603T-1-20K	20k/0603	R-0603	旺詮
Rt	1	0603 5K10 1%	5k1/0603	R-0603	WALSIN
R30	1	0603 100K 1%	100k/0603	R-0603	
R31	1		NC	R-0603	

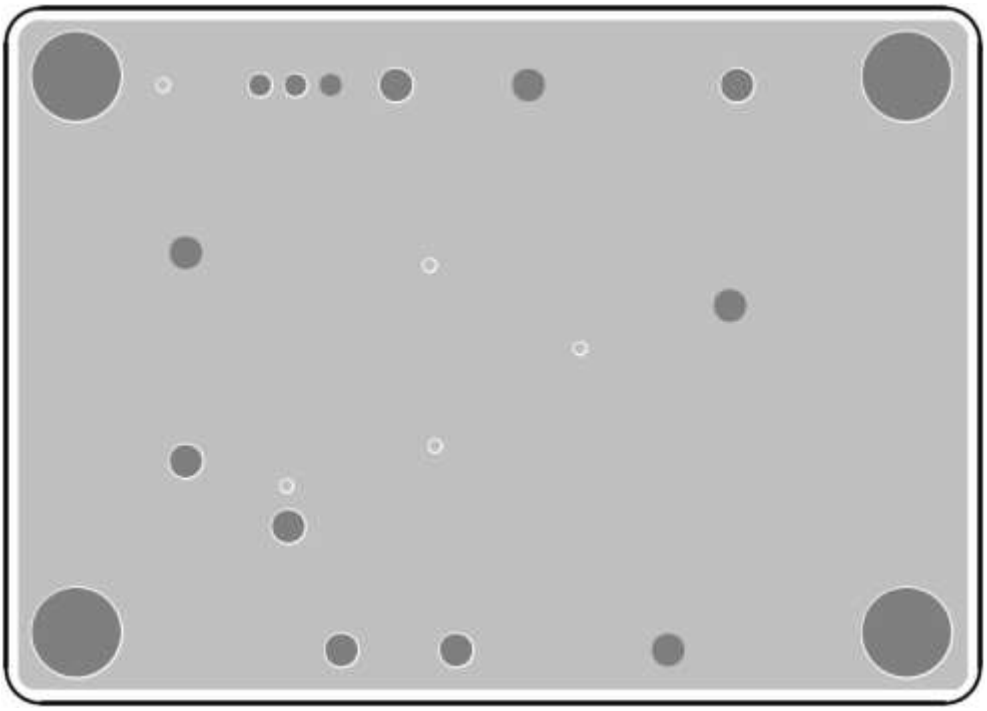
PCB Layout



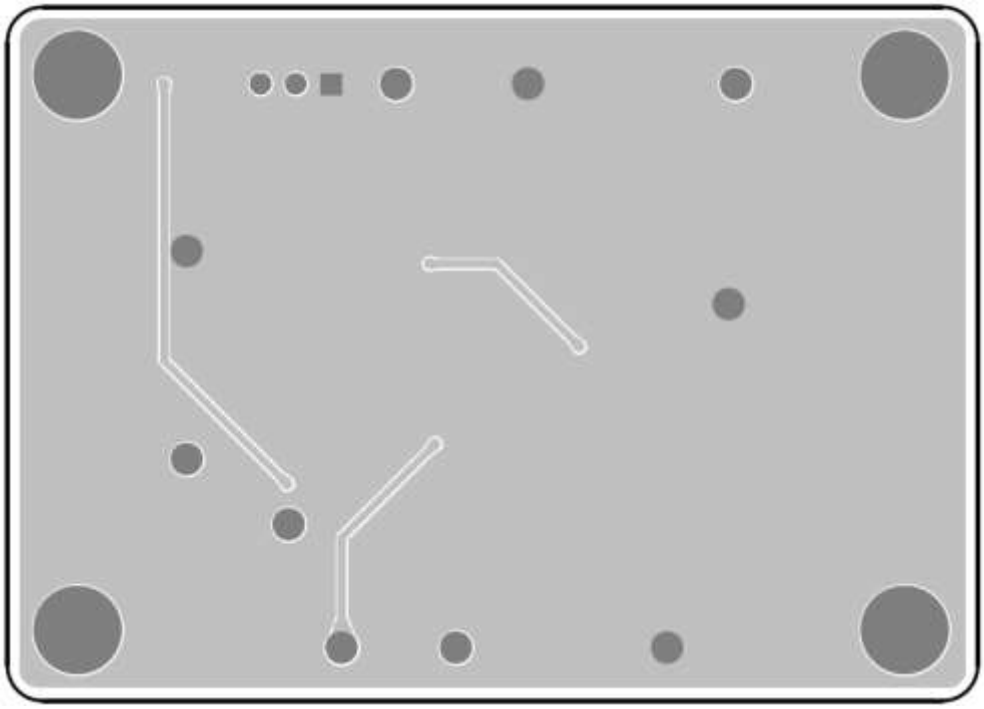
Top View (1st layer)



PCB Layout—Inner Side (2nd Layer)



PCB Layout—Inner Side (3rd Layer)



Bottom View (4th Layer)

More Information

For more information, please refer to the related datasheets or application notes from Richtek website http://www.richtek.com.

Important Notice for Richtek Evaluation Board