

## **5.5A, 18V, 650kHz, ACOT™ Synchronous Step-Down Converter**

### ***Purpose***

The RT6206BH is a synchronous step-down DC/DC converter with Advanced Constant On-Time (ACOT™) mode control. This document explains the function and use of the RT6206BH 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 RT6206BH is a synchronous step-down DC/DC converter with Advanced Constant On-Time (ACOT™) mode control. It achieves high power density to deliver up to 5.5A output current from a 4.5V to 18V input supply. The proprietary ACOT™ mode offers an optimal transient response over a wide range of loads and all kinds of ceramic capacitors, which allows the device to adopt very low ESR output capacitor for ensuring performance stabilization. In addition, RT6206BH keeps an excellent constant switching frequency under line and load variation and the integrated synchronous power switches with the ACOT™ mode operation provides high efficiency in whole output current load range. Cycle-by-cycle current limit provides an accurate protection by a valley detection of low side MOSFET and external soft-start setting eliminates input current surge during startup. Protection functions include thermal shutdown for RT6206BH.

### Product Feature

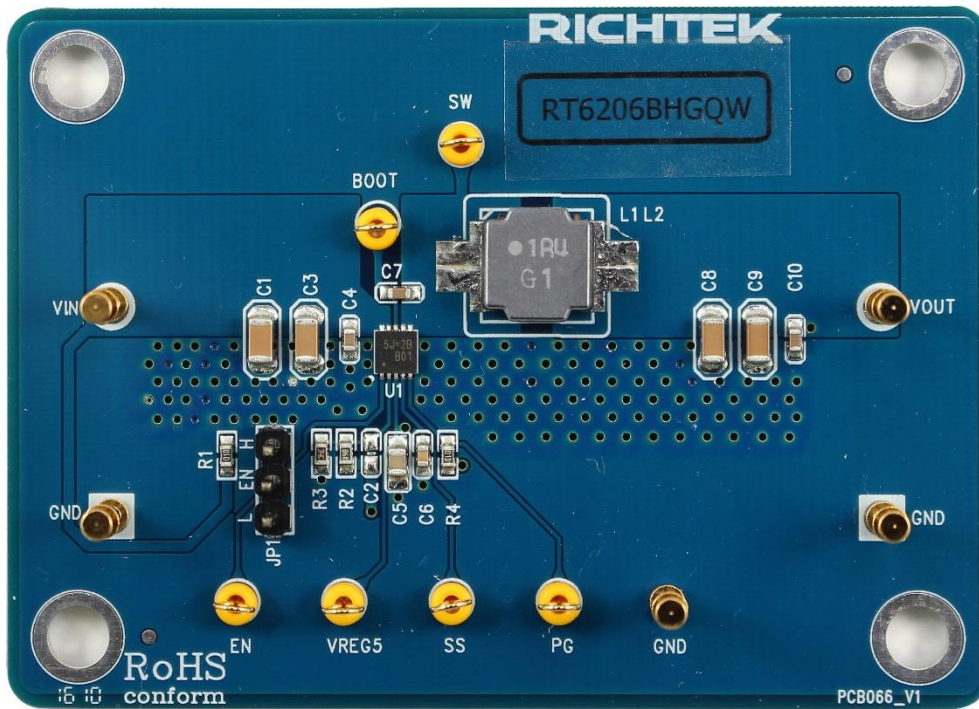
- ACOT™ Mode Enables Fast Transient Response
- 4.5V to 18V Input Voltage Range
- 5.5A Output Current
- 35mΩ Internal Low Side N-MOSFET
- Advanced Constant On-Time Control
- Support All Ceramic Capacitors
- Up to 95% Efficiency
- Discontinuous Operating Mode at Light Load
- Adjustable Output Voltage from 0.765V to 8V
- Adjustable Soft-Start
- Cycle-by-Cycle Current Limit
- Input Under-Voltage Lockout
- Thermal Shutdown

### Key Performance Summary Table

Key Features	Evaluation Board Number : PCB066_V1
Input Voltage Range	4.5V to 18V
Max Output Current	5.5A
Default Output Voltage	1.05V
Default Marking & Package Type	RT6206BHGQW, WDFN-10L 3x3
Operation Frequency	650kHz

**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	Power input.
<b>EN</b>	Enable test point	Externally pulled high to enable and pulled low to disable this chip. It is internally pulled up to high when the pin is floating.
<b>GND</b>	Ground	The exposed pad must be soldered to a large PCB and connected to GND for maximum power dissipation.
<b>VREG5</b>	Internal Regulator Output	Internal Regulator Output. Connect a 1 $\mu$ F capacitor to GND to stabilize output voltage.
<b>SS</b>	Soft-Start Control.	Connect an external capacitor between this pin and GND to set the soft-start time.
<b>PG</b>	Power good test point	Output of power good indicator.
<b>BOOT</b>	Bootstrap supply test point	Bootstrap supply for high-side gate driver. Connect a capacitor between the BOOT and SW pins.
<b>SW</b>	Switch node test point	Connect this pin to an external L-C filter.

### ***Power-up & Measurement Procedure***

1. Apply a 12V nominal input power supply ( $4.5 < V_{IN} < 18V$ ) to the VIN and GND terminals.
2. Set the jumper at JP1 to connect terminals 2 and 3, connecting EN to enable operation.
3. Verify the output voltage (approximately 1.05V) between VOUT and GND.
4. Connect an external load up to 5.5A to the VOUT and GND terminals and verify the output voltage and current.

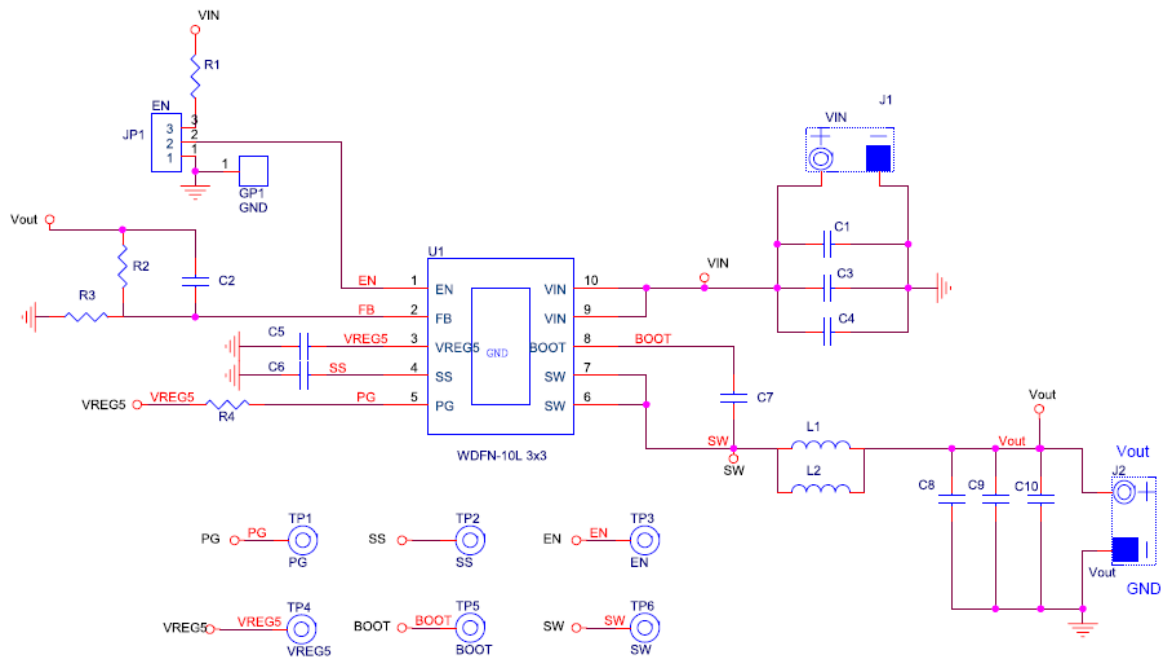
### ***Output Voltage Setting***

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 :

$$V_{OUT} = 0.765 \times \left( 1 + \frac{R2}{R3} \right)$$

**Schematic, Bill of Materials & Board Layout**

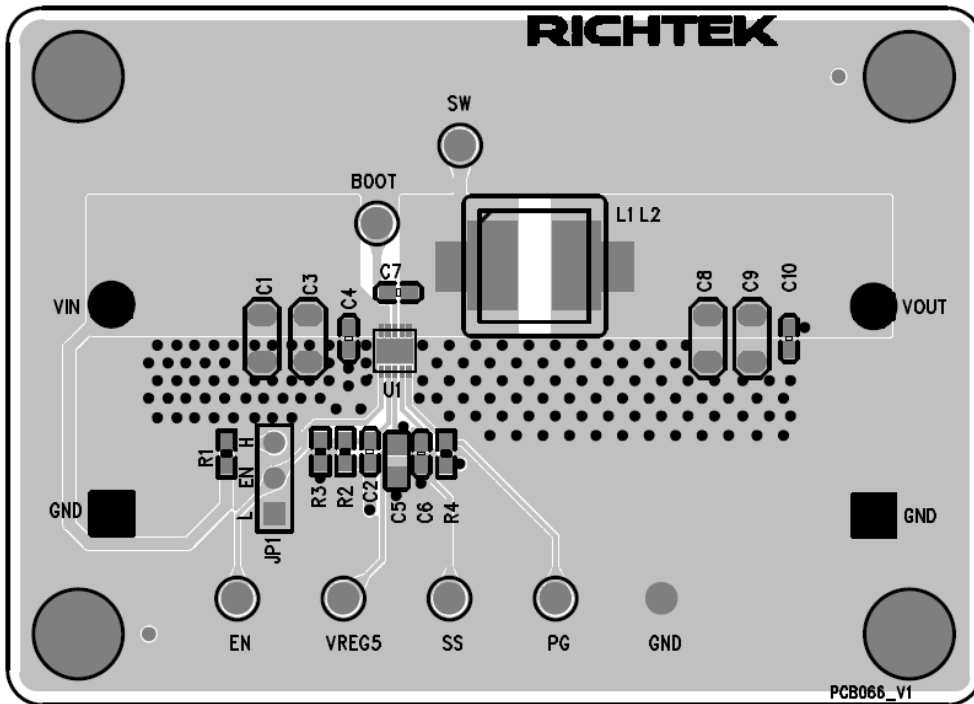
**EVB Schematic Diagram**



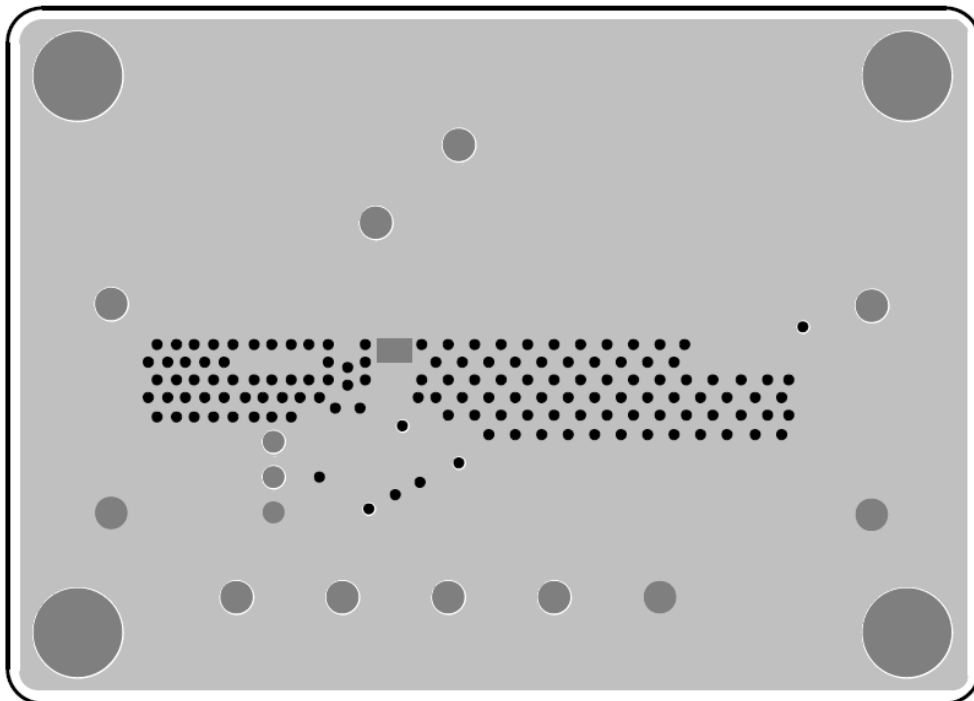
**Bill of Materials**

Reference	Qty	Part Number	Description	Package	Manufacture
U1	1	RT6206BHGQW	DC/DC Converter	WDFN-10L 3x3	RICHTEK
C1, C3	2	GRM31CR71E106KA12L	10 $\mu$ F/25V/X7R	C-1206	MURATA
C4, C10, C7	3	C1608X7R1H104KT000N	0.1 $\mu$ F/50V/X7R	C-0603	TDK
C8, C9	2	GRM31CR61A226KE19L	22 $\mu$ F/10V/X5R	C-1206	MURATA
C6	1	0603B332K500	3.3nF/50V/X7R	C-0603	WALSIN
C5	1	C2012X7R1E105KT	1 $\mu$ F/25V/X7R	C-0805	TDK
C2	1		NC		
L1	1	NR8040T1R4N	1.4 $\mu$ H/7A	8 x 8 x 4 mm	TAIYO YUDEN
R2	1		8.25k	R-0603	
R3	1		22.1k	R-0603	
R1, R4	2		100k	R-0603	

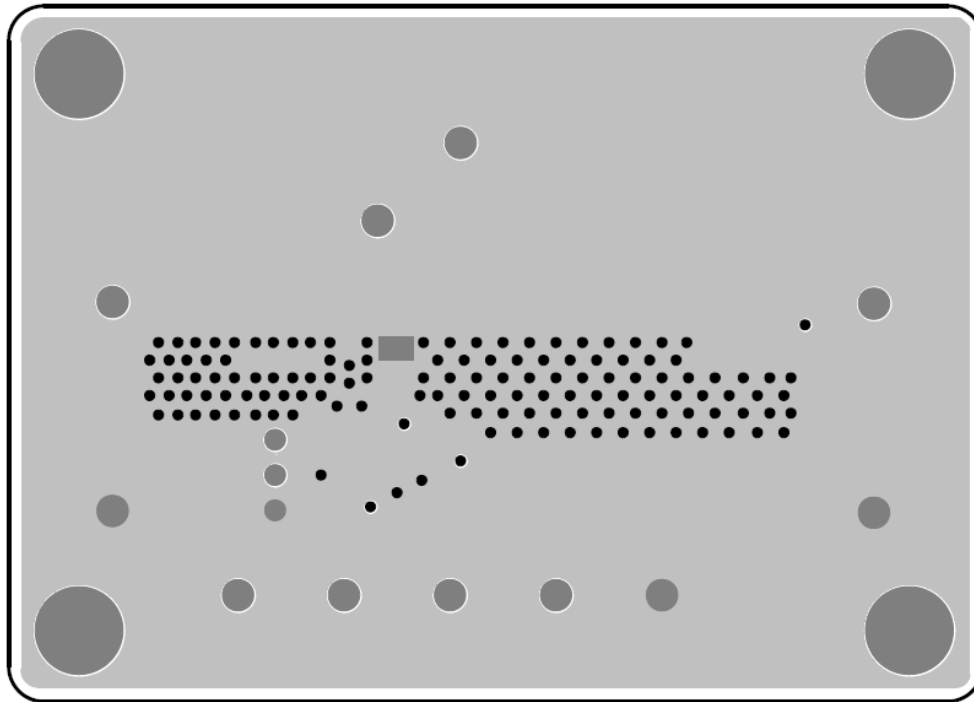
**PCB Layout**



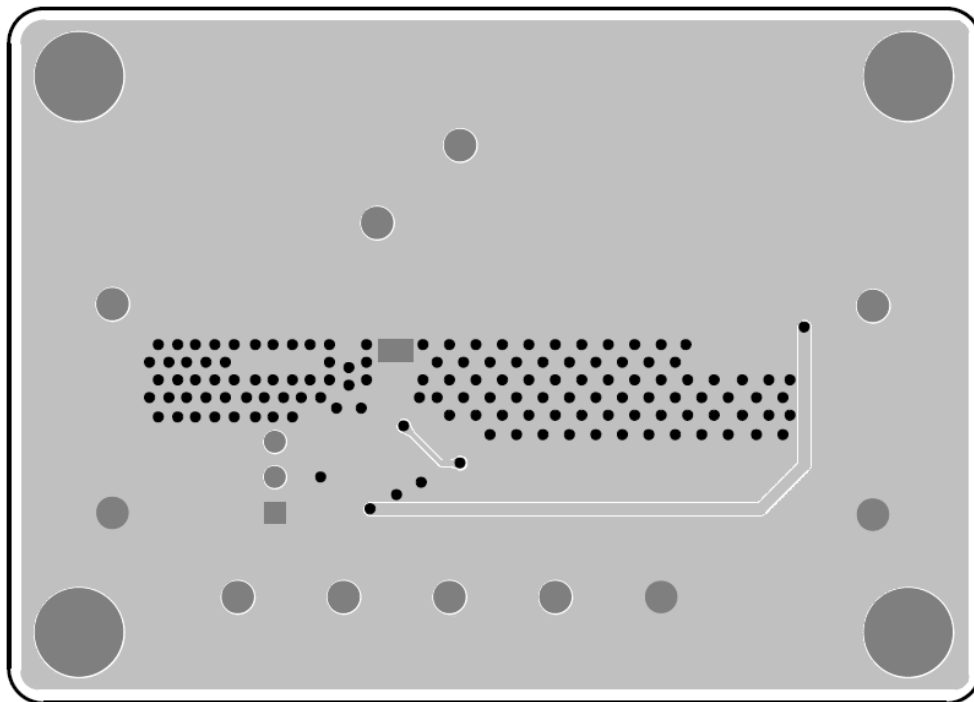
Top View (1<sup>st</sup> layer)



PCB Layout—Inner Side (2<sup>nd</sup> Layer)



PCB Layout—Inner Side (3<sup>rd</sup> Layer)



Bottom View (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 Evaluation Board***

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