

3-CH, 18V, Synchronous Step-Down Converter

Purpose

The RT7273 features three synchronous wide input range high efficiency Buck converters. The converters are designed to simplify its application while giving the designer the option to optimize their usage according to the target application. This document explains the function and use of the RT7273 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 RT7273 features three synchronous wide input range high efficiency Buck converters. The converters are designed to simplify its application while giving the designer the option to optimize their usage according to the target application. The converters can operate in 5V, 9V or 12V systems and have integrated power transistors. The output voltage can be set externally using a resistor divider to any value between 0.8V and the input supply minus 1V. Each converter features an enable pin that allows a delayed start-up for sequencing purposes, a soft-start pin that allows adjustable soft-start time by choosing the softstart capacitor, and a current limit pin (RLIMx) to adjust current limit by selecting an external resistor. The COMP pin allows optimizing transient versus dc accuracy response with a simple RC compensation. The switching frequency of the converters can either be set with an external resistor connected to ROSC pin or be synchronized to an external clock connected to SYNC pin if needed. The switching converters are designed to operate from 300kHz to 2.2MHz. The converters operate with 180° phase between CH 1 and CH 2, CH 3 (CH 2 and CH 3 ran in phase) to minimize the input filter requirements. The RT7273 also features a low power mode enabled by an external signal, which allows for a reduction on the input power supplied to the system when the host processor is in stand-by (low activity) mode.

Product Feature

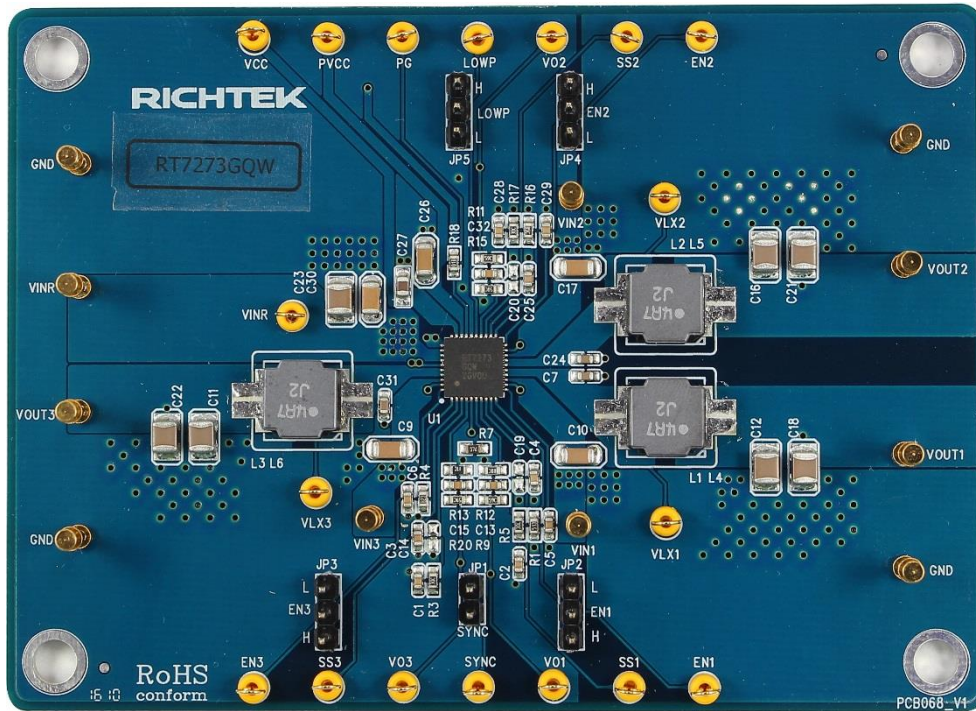
- **Wide Input Supply Voltage Range : 4.5V to 18V**
- **Output Range : 0.8V to (VIN – 1V)**
- **Fully Integrated Triple-Buck**
 - ▶ **Maximum Current 3.5A/2.5A/2.5A**
 - ▶ **Continuous Operation 3A/2A/2A**
- **High Efficiency**
- **Switching Frequency**
 - ▶ **300kHz to 2.2MHz Set by External Resistor**
- **External Synchronization Pin for Oscillator**
- **External Enable/Sequencing Pins**
- **Adjustable Cycle-By-Cycle Current Limit Set by External Resistor**
- **Soft-Start**
- **Current Mode Control with Simple Compensation Circuit**
- **Power Good Indicator**
- **Discontinuous Operating Mode at Light Load when LOWP = High**

Key Performance Summary Table

Key Features	Evaluation Board Number : PCB068_V1
Input Voltage Range	4.5V to 18V
Max Output Current (CH1/CH2/CH3)	3.5A/2.5A/2.5A
Default Output Voltage (CH1/CH2/CH3)	1.2V/1.8V/3.3V
Default Marking & Package Type	RT7273GQW, WQFN-40L 6x6
Operation Frequency	Set by resistor connected with ROSC pin, with 383kΩ setting for 500kHz switching frequency.

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.

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)
VIN	Input voltage	Power input.
EN	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.
GND	Ground	The exposed pad must be soldered to a large PCB and connected to GND for maximum power dissipation.
VINR	Internal Control Circuit Power	Supply Voltage Input for Internal Control Circuit.
PVCC	5V Internal Regulator Output	Connect a capacitor 10 μ F between this pin and GND.
VCC	4.6V Internal Regulator Output	Connect a capacitor 3.3 μ F between this pin and GND.
SS	Soft-Start Control	Connect an external capacitor between this pin and GND to set the soft-start time.
PG	Power good test point	Output of power good indicator.
LOWP	Discontinuous Operation Mode Input	Discontinuous Operating Mode at Light Load when LOWP = High (Active High).
VLX	Switch node test point	Switch Output for CH 1/2/3.
SYNC	Synchronous Clock Input	Connect to GND if not used.

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 JP2/JP3/JP4 to connect terminals to H pin, connecting EN to enable operation.
3. Set the jumper at JP1 to short with GND, disable the frequency synchronous function.
4. Verify the output voltage ($V_{OUT1} = 1.2V$, $V_{OUT2} = 1.8V$, $V_{OUT3} = 3.3V$).

Output Voltage Setting

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

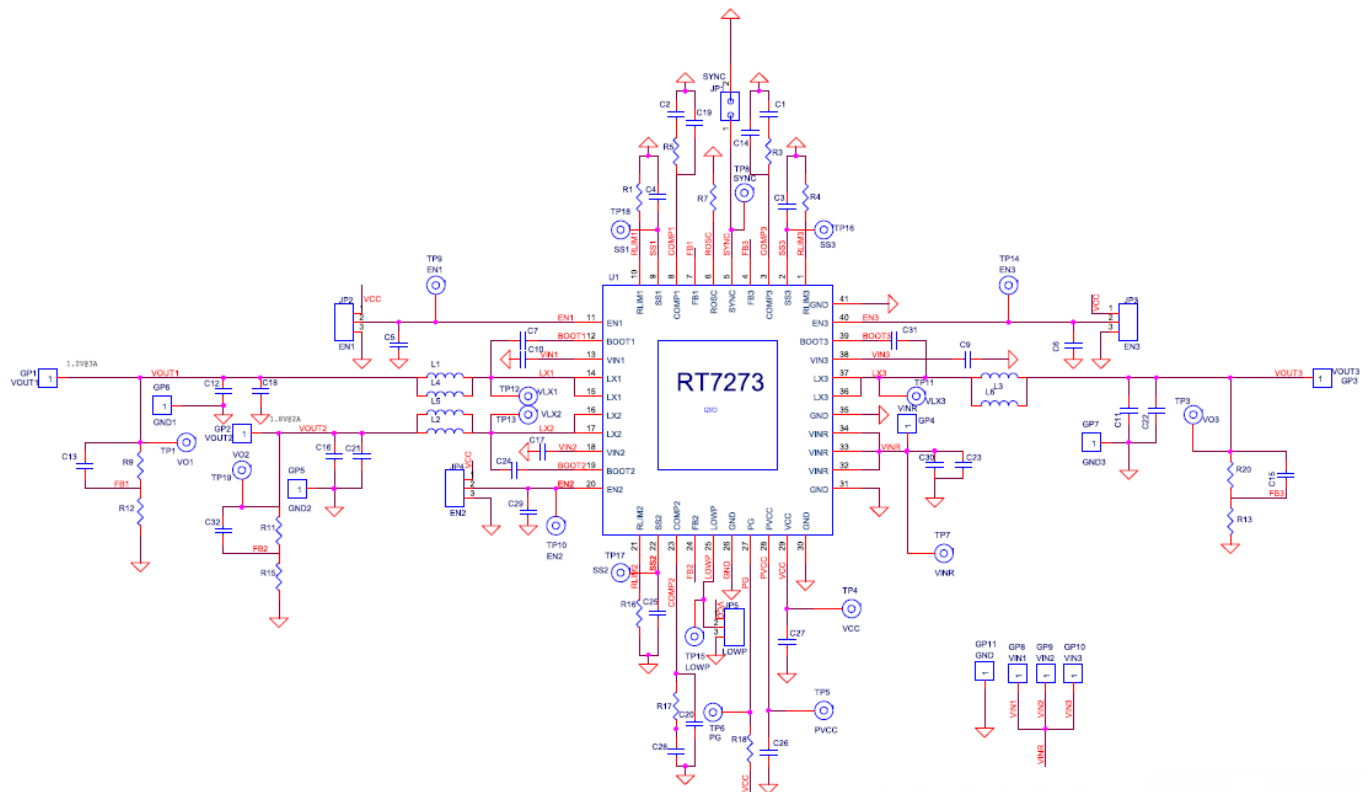
$$V_{OUT1} = 0.8 \times \left(1 + \frac{R9}{R12} \right)$$

$$V_{OUT2} = 0.8 \times \left(1 + \frac{R11}{R15} \right)$$

$$V_{OUT3} = 0.8 \times \left(1 + \frac{R20}{R13} \right)$$

Schematic, Bill of Materials & Board Layout

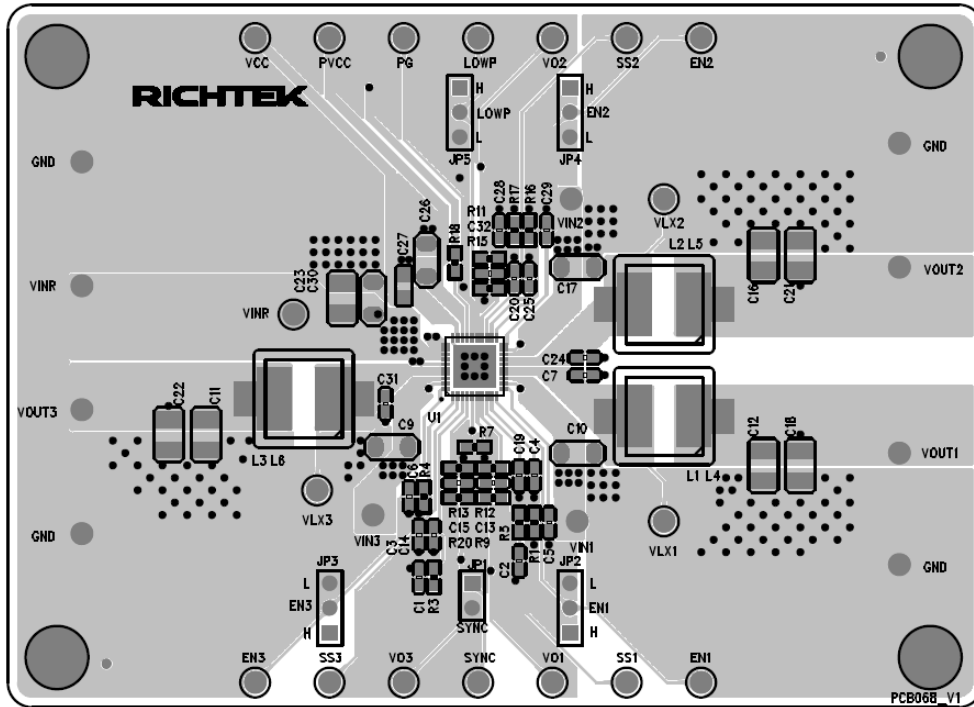
EVB Schematic Diagram



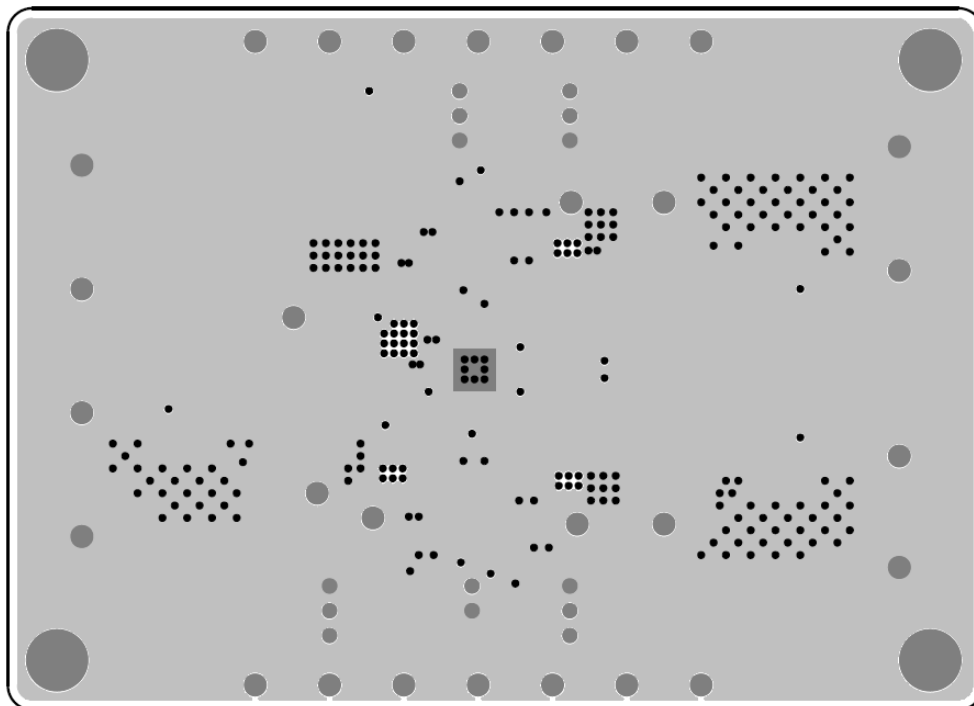
Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacture
U1	1	RT7273GQW	DC/DC Converter	WQFN-40L 6x6	RICHTEK
C1, C2, C3, C4, C5, C6, C25, C28, C29	9	0603B472K500	4.7nF/50V/X7R	C0603	WALSIN
C7, C24, C31	3	C1608X7R1H104KT000N	0.1µF/50V/X7R	C0603	TDK
C9, C10, C17, C26, C30	5	GRM31CR71E106KA12L	10µF/25V/X7R	C-1206	muRata
C11, C12, C16, C18, C21, C22, C23	7	GRM32ER61C226KE20L	22µF/16V/X5R	C-1210	muRata
C13, C15, C32	3	0603B471K200	470pF/50V/X7R	C0603	WALSIN
C14, C19, C20	3		NC	C0603	
C27	1	C2012X5R1A335KT000N	3.3µF/10V/X5R	C-0805	TDK
L1, L2, L3	3	NR8040T4R7N	4.7µH/4.1A	8 x 8 x 4 mm	TAIYO YUDEN
R1	1		51k	R-0603	
R3, R5, R17	3		20k	R-0603	
R4	1		82k	R-0603	
R7	1		383k	R-0603	
R9, R11, R20	3		40.2k	R-0603	
R12	1		80.8k	R-0603	
R13	1		12.7k	R-0603	
R15	1		32.4k	R-0603	
R16	1		75k	R-0603	
R18	1		100k	R-0603	
R1	1		51k	R-0603	
R3, R5, R17	3		20k	R-0603	

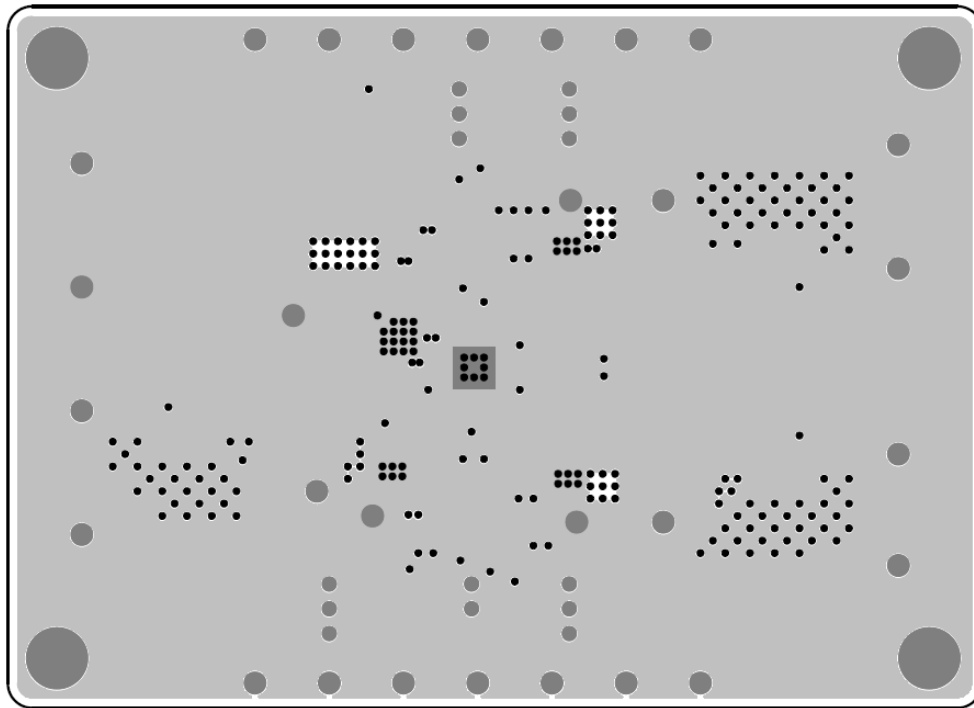
PCB Layout



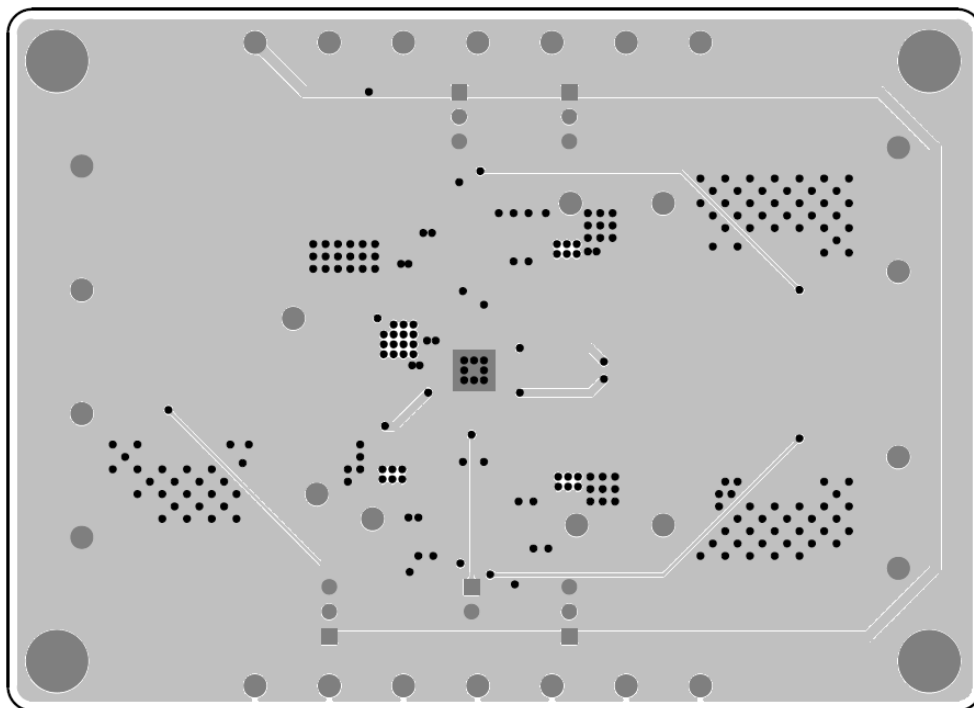
Top View (1st layer)



PCB Layout—Inner Side (2nd Layer)



PCB Layout—Inner Side (3rd Layer)



Bottom View (4th Layer)

More Information

For more information, please find the related datasheet or application notes from Richtek website <http://www.richtek.com>.

Important Notice for Richtek Evaluation Board

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