

## Switching Regulator Series

# Step-Down DC/DC Converter BD9E303EFJ-LB Evaluation Board

## BD9E303EFJ-EVK-001

BD9E303EFJ-EVK-001 Evaluation board delivers an output 5.0 volts from an input 7.0 to 36 volts using BD9E303EFJ-LB, a synchronous rectification step-down DC/DC converter integrated circuit, with output current rating of maximum 3A. The output voltage can be set by changing the external parts of circuit and the loop-response characteristics also can be adjusted by the phase compensation circuit.

## Performance specification

These are representative values, and it is not a guaranteed against the characteristics.

$V_{IN} = 24V$ ,  $V_{OUT} = 5.0V$ , Unless otherwise specified.

Parameter	Min	Typ	Max	Units	Conditions
Input Voltage Range	7.0		36	V	
Output Voltage		5.0		V	R1=30k $\Omega$ , R2=7.5k $\Omega$
Output Voltage Setting Range	$V_{IN} \times 0.06$ (NOTE1)		$V_{IN} \times 0.8$	V	
Output Current Range	0		3	A	
Loop Band Width		18.2		kHz	
Phase Margin		70.8		degrees	
Input Ripple Voltage		300		mVpp	$I_o = 3A$
Output Ripple Voltage		30		mVpp	$I_o = 3A$
Output Rising Time		2.2		ms	
Operating Frequency		300		kHz	
Maximum Efficiency		91.1		%	$I_o = 1.2A$

(NOTE1) However,  $(V_{IN} \times 0.06) \geq 1.0V$

## Operation Procedures

### 1. Necessary equipments

- (1) DC power-supply of 7.0V to 36V/3A
- (2) Maximum 3A load
- (3) DC voltmeter

### 2. Connecting the equipments

- (1) DC power-supply presets to 24V and then the power output turns off.
- (2) The maximum load should be set at 3A and over it will be disabled.
- (3) Check Jumper pin of SW1 is short, between intermediate-terminal and OFF-side terminal.
- (4) Connect positive-terminal of power-supply to VIN+ terminal and negative-terminal to GND-terminal with a pair of wires.
- (5) Connect load's positive-terminal to VOUT+ terminal and negative-terminal to GND-terminal with a pair of wires.
- (6) Connect positive-terminal of DC voltmeter 1 to TP1 and negative-terminal to TP2 for input-voltage measurement.
- (7) Connect positive-terminal of DC voltmeter 2 to TP3 and negative-terminal to TP4 for output-voltage measurement.
- (8) DC power-supply output is turned ON.
- (9) IC is enable (EN) by shorting Jumper-pin of SW1 between intermediate-terminal and ON-side terminal.
- (10) Check DC voltmeter 2 displays 5.0V.
- (11) The load is enabled.
- (12) Check at DC voltmeter 1 whether the voltage-drop (loss) is not caused by the wire's resistance.

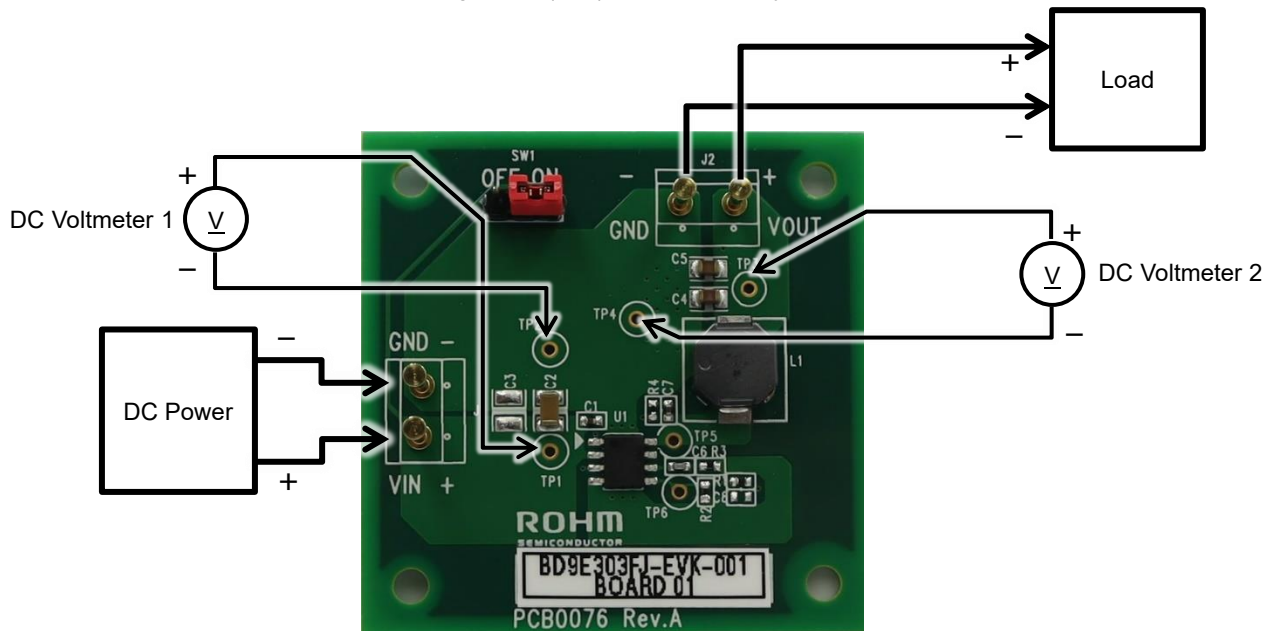


Figure 1. Connection Diagram

### Enable-Pin

To minimize current consumption during standby-mode and normal operation, Enable-mode can be switched by controlling EN pin (3pin) of the IC. Standby-mode is enabled by shorting Jumper-pin of SW1 between intermediate-terminal and OFF-side terminal and normal-mode operation by shorting between intermediate-terminal and ON-side terminal.

It also can be switched between standby-mode and normal-mode operation by removing Jumper-pin and controlling the voltage between EN and GND-terminal. Standby-mode is enabled when the voltage of EN is under 0.8V, and normal-mode operation when it is over 2.5V.

Circuit Diagram

$V_{IN} = 7.2V$  to  $36V$ ,  $V_{OUT} = 5.0V$

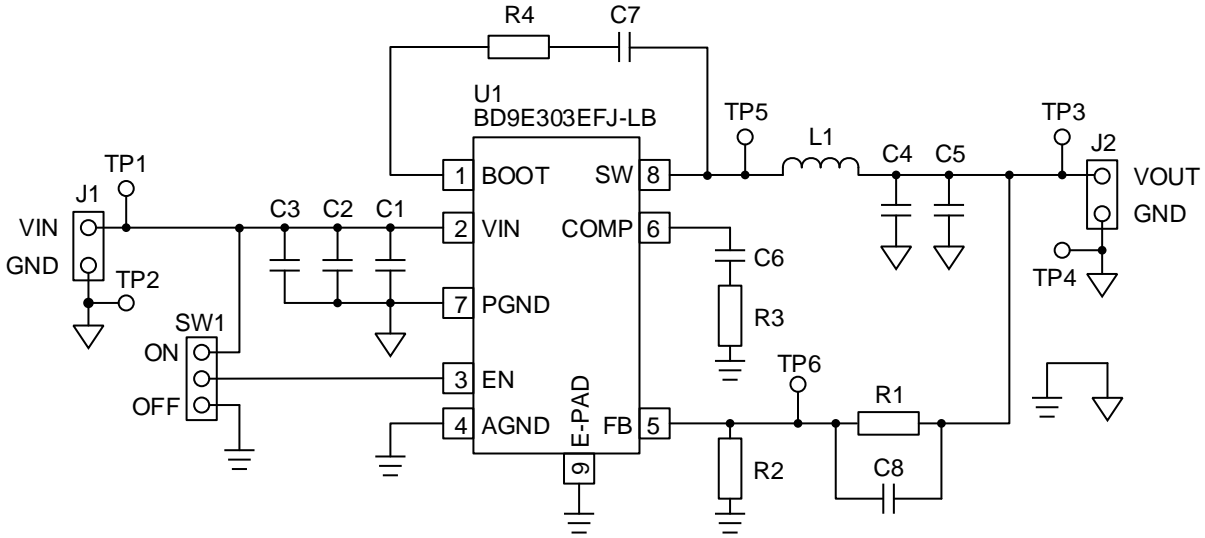


Figure 2. BD9E303EFJ-EVK-001 Circuit Diagram

Bill of Materials

Count	Reference Designator	Type	Value	Description	Manufacturer Part Number	Manufacturer	Configuration (mm)
2	C1, C7	Ceramic Capacitor	0.1 $\mu$ F	50V, X7S, $\pm$ 10%	GRM155C71H104KE19	MURATA	1005
1	C2	Ceramic Capacitor	10 $\mu$ F	50V, X7T, $\pm$ 10%	GRM31CD71H106KE11	MURATA	3216
0	C3	Ceramic Capacitor	-	-	-	-	-
2	C4, C5	Ceramic Capacitor	22 $\mu$ F	10V, X7T, $\pm$ 20%	GRM21BD71A226ME44	MURATA	2012
1	C6	Ceramic Capacitor	6800pF	50V, C0G, $\pm$ 5%	GRM1555C1H682JE01	MURATA	1005
0	C8	Ceramic Capacitor	-	-	-	-	-
1	L1	Inductor	10 $\mu$ H	$\pm$ 20%, 4.3A	1217AS-H-100M	MURATA	8080
1	R1	Resistor	30k $\Omega$	1/16W, 1%	MCR01 series	ROHM	1005
1	R2	Resistor	7.5k $\Omega$	1/16W, 1%	MCR01 series	ROHM	1005
1	R3	Resistor	15k $\Omega$	1/16W, 1%	MCR01 series	ROHM	1005
1	R4	Resistor	0 $\Omega$	Jumper	MCR01 series	ROHM	1005
1	SW1	Pin header	-	-	-	-	-
1	U1	IC	-	Buck DC/DC Converter	BD9E303EFJ-LB	ROHM	HTSOP-J8
2	J1, J2	Terminal Block	-	-	-	-	-
1	-	Jumper	-	-	-	-	-

(Note) The parts used may have been changed from the part numbers listed in the User's Guide due to reasons such as discontinuation of production.

Layout

PCB size: 50mm×50mm×1.6mm

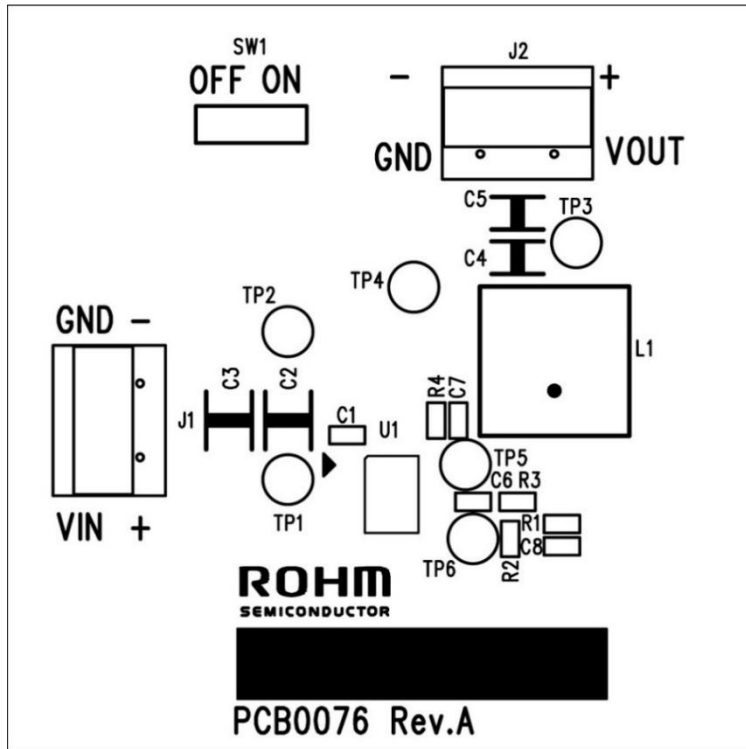


Figure 3. Top Silk Screen (Top view)

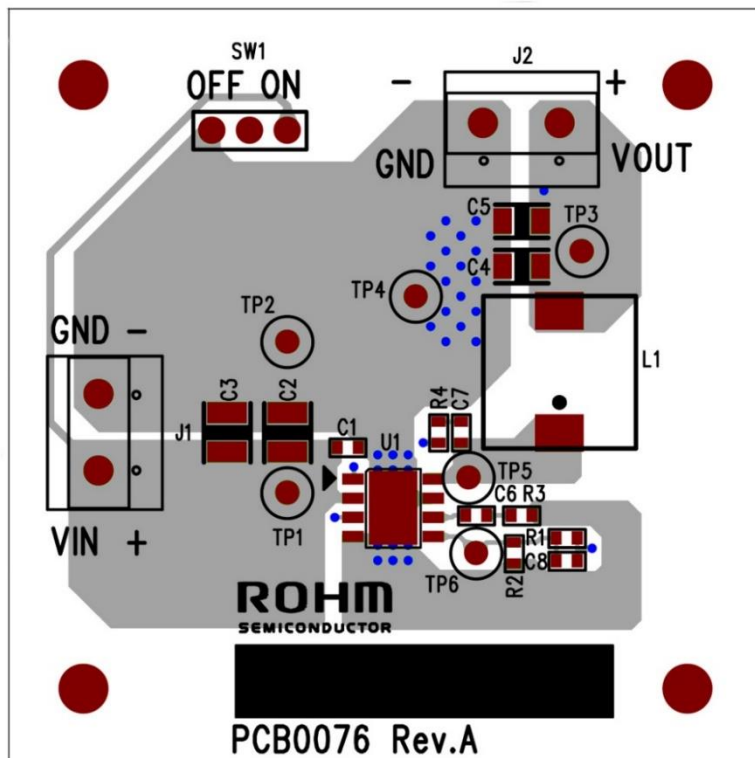


Figure 4. Top Silk Screen and Layout (Top view)

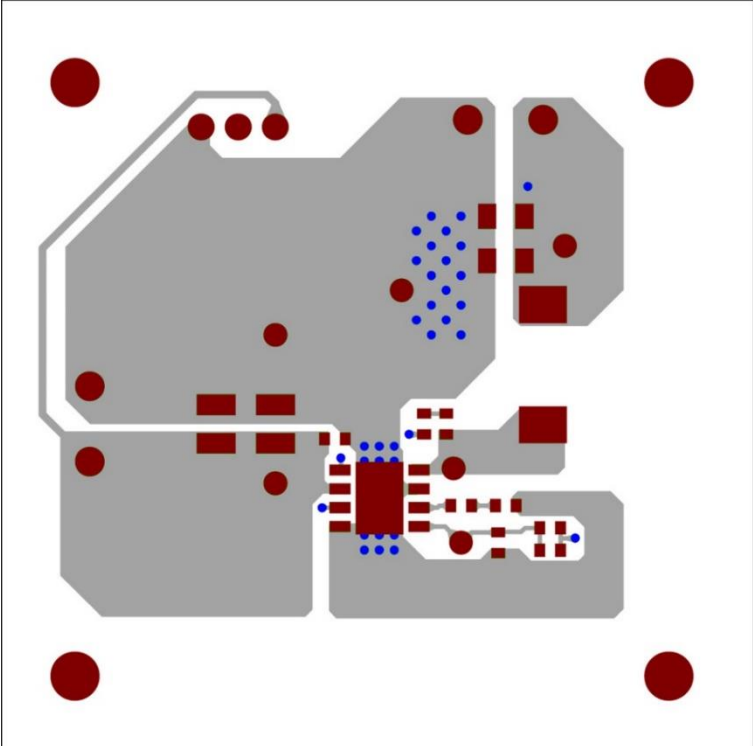


Figure 5. Top Side Layout (Top view)

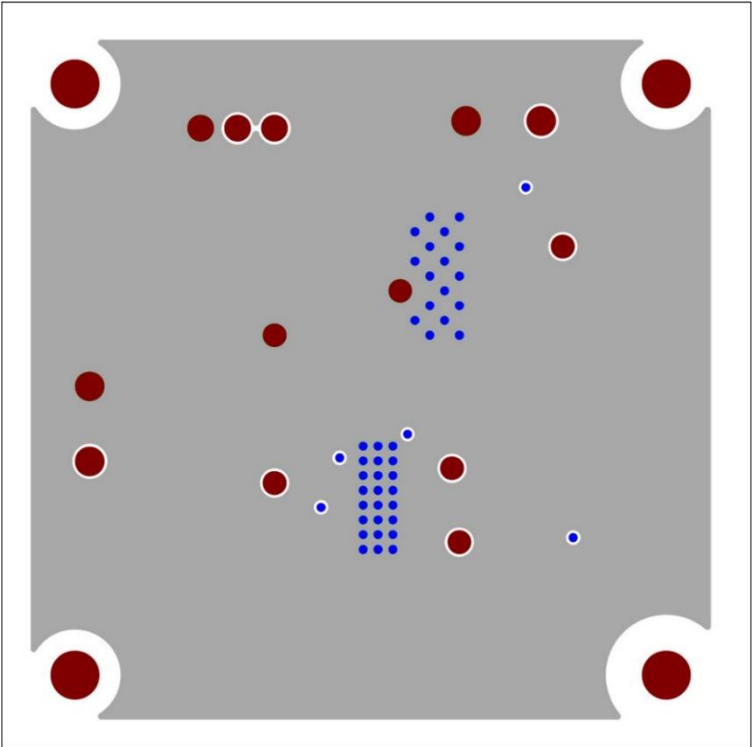


Figure 6. L2 Layout (Top view)

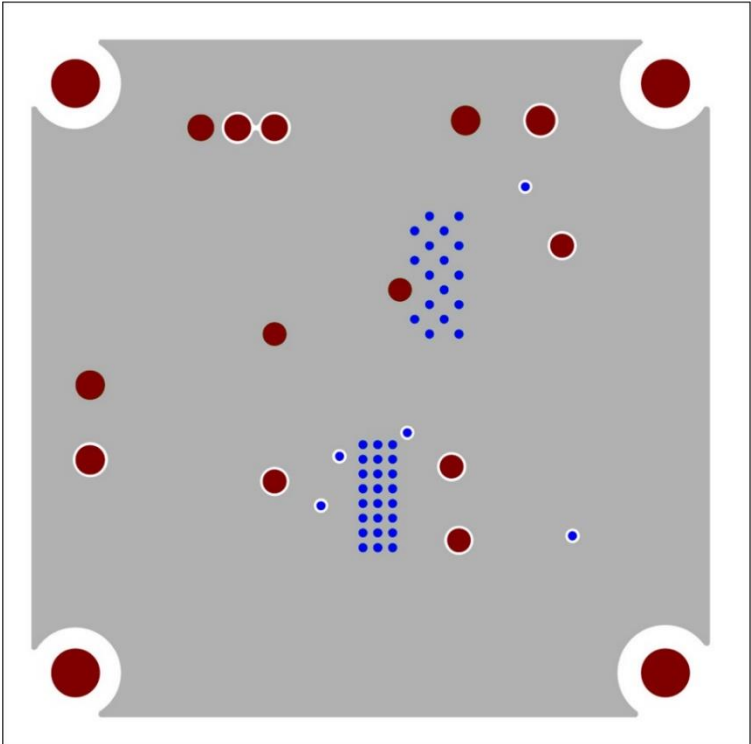


Figure 7. L3 Layout (Top view)

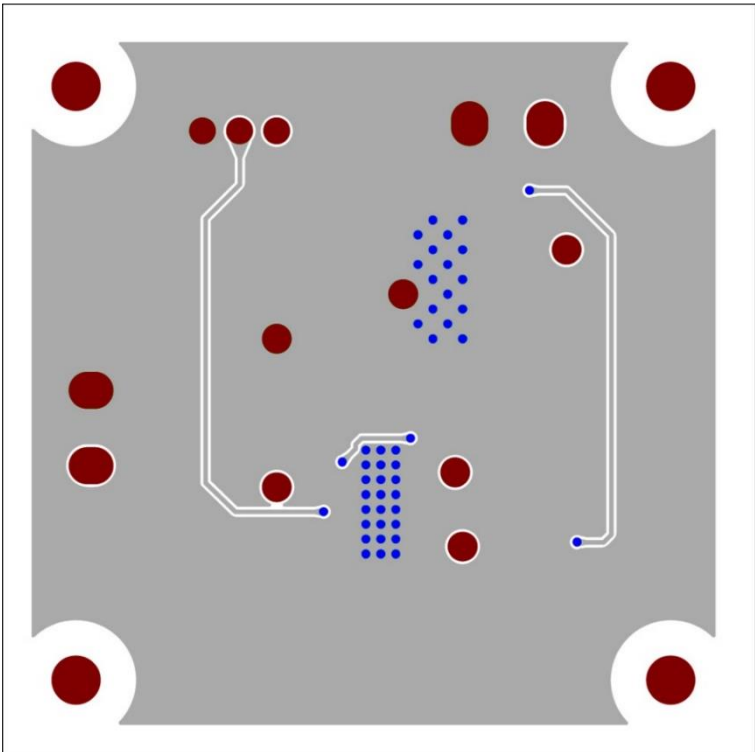


Figure 8. Bottom Side Layout (Top view)

**Revision History**

Date	Revision	Changes
11.Apr.2024	Rev. 003	Parts list changed. Application data has been removed as it can be referenced in the datasheet.

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