Switching Regulator Series

Step-Down DC/DC Converter BD9A100MUV Evaluation Board

BD9A100MUV-EVK-001

Description

This evaluation board has been developed for ROHM's synchronous buck DC/DC converter customers evaluating BD9A100MUV. While accepting a power supply of 2.7-5.5V, an output of 1.8V can be produced. The IC has internal 60mΩ high-side N-channel MOSFET and 60mΩ low-side N-channel MOSFET and a synchronization frequency is of 1MHz. A Soft Start circuit prevents in-rush current during startup. An EN pin allows for simple ON/OFF control of the IC to reduce standby current consumption. A MODE pin allows the user to select fixed frequency PWM mode or enables the Deep-SLLM control and the mode is automatically switched between the Deep-SLLM control and fixed frequency PWM mode. Include OCP (Over Current Protection) and SCP (Short Circuit Protection).

Evaluation Board Operating Limits and Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Limit			Unit	Conditions
		MIN	TYP	MAX		
Supply Voltage	V_{CC}	2.7	-	5.5	V	
Output Voltage / Current	V_{OUT}	-	1.8	-	V	
	I_{OUT}	-	-	1	A	

Evaluation Board

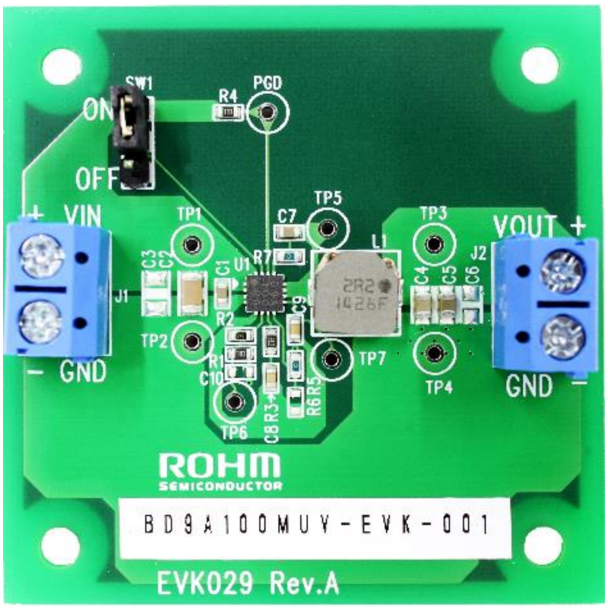

Figure 1. BD9A100MUV-EVK-001 Evaluation Board

Operation Procedures

1. Necessary equipments
   - (1) DC power-supply of 2.7V to 5.5V/1A
   - (2) Maximum 1A load
   - (3) DC voltmeter

2. Connecting the equipments
   - (1) DC power-supply presets to 5.0V and then the power output turns off.
   - (2) The max. load should be set at 1A 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 1.8V.
   - (11) The load is enabled.
   - (12) Check at DC voltmeter 1 whether the voltage-drop (loss) is not caused by the wire's resistance.

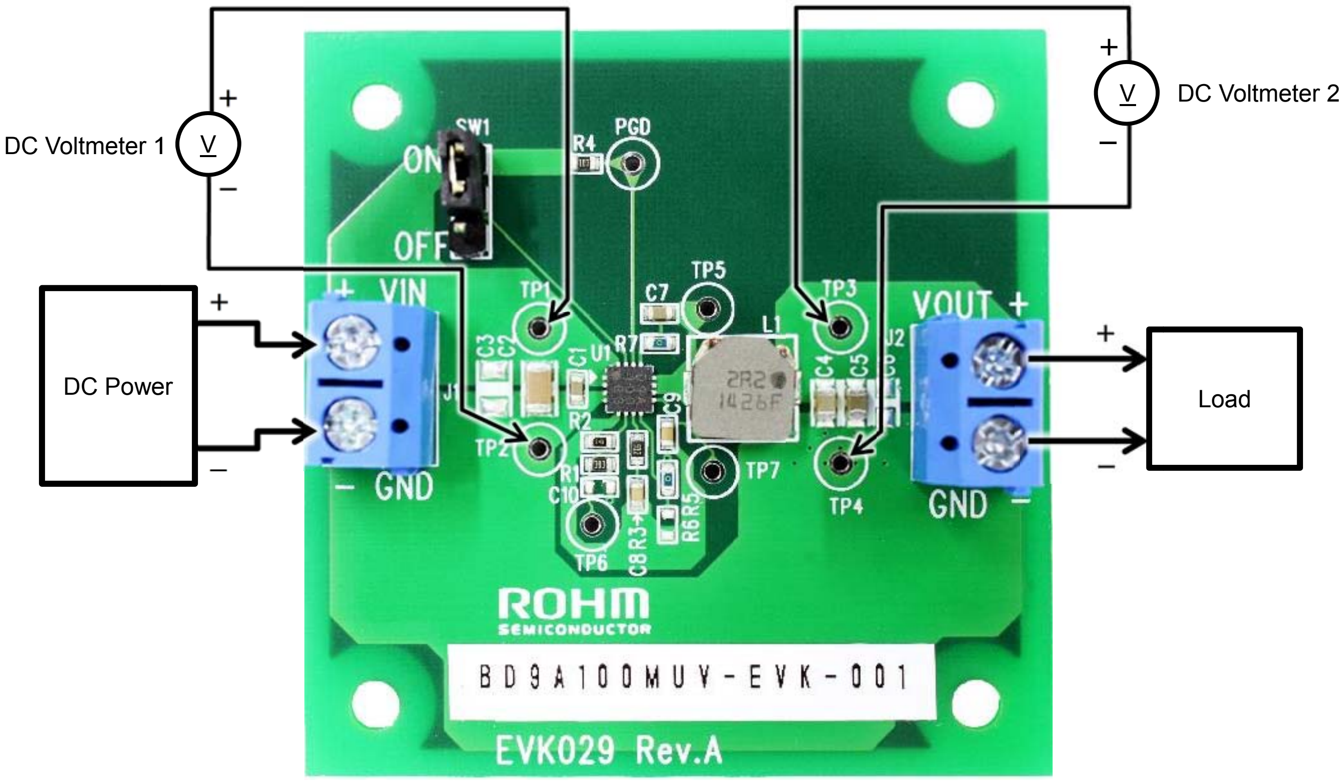

Figure 2. Connection Diagram

Enable-Pin

To minimize current consumption during standby-mode and normal operation, Enable-mode can be switched by controlling EN pin(15pin) 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 swithed 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 0.5V, and normal-mode operation when it is over 2.0V.

Cricuit Diagram

V_{IN} = 2.7V～5.5V, V_{OUT} = 1.8V

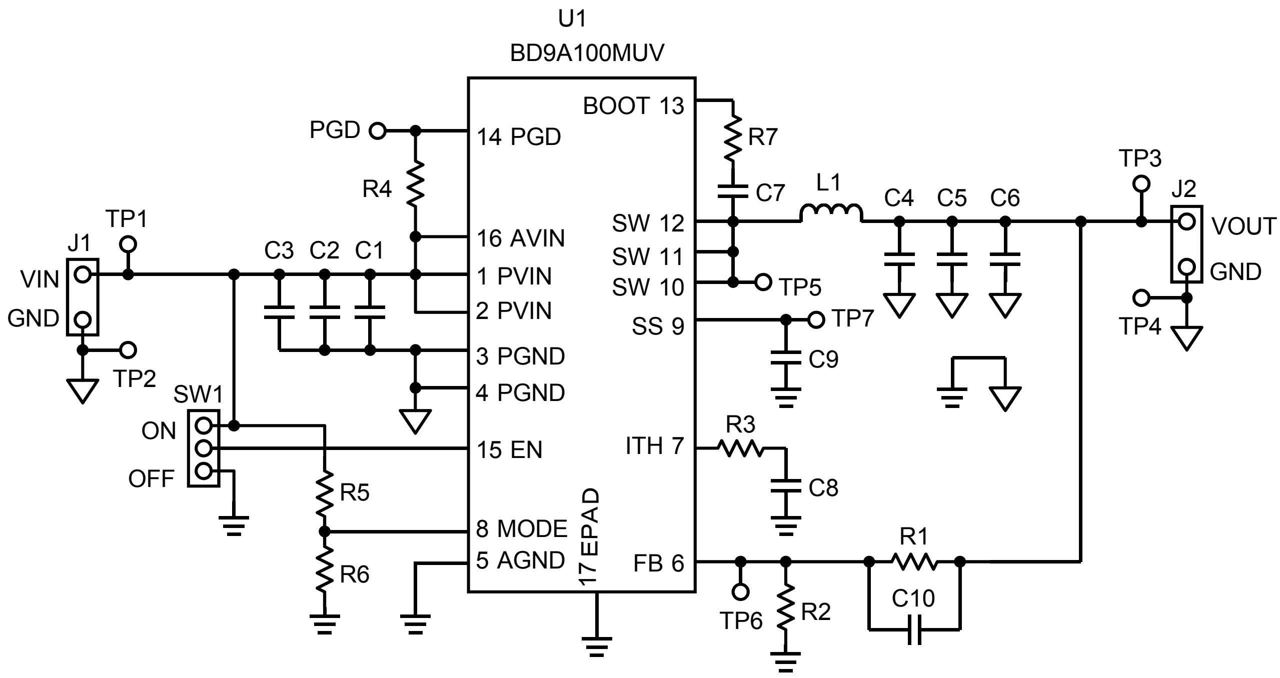

Figure 3. BD9A100MUV-EVK-001 Circuit Diagram

Bill of Materials

Count	Reference Designator	Type	Value	Description	Manufacturer Part Number	Manufacturer	Configuration (mm)
2	C1, C7	Ceramic Capacitor	0.1µF	50V, B, ±10%	GRM188B31H104KA92D	MURATA	1608
1	C2	Ceramic Capacitor	10µF	16V, B, ±10%	GRM31CB31C106KA88L	MURATA	3216
0	C3	Ceramic Capacitor	-	Not installed	-	-	3216
2	C4, C5	Ceramic Capacitor	22µF	6.3V, B, ±20%	GRM21BB30J226ME38L	MURATA	2012
0	C6	Ceramic Capacitor	-	Not installed	-	-	2012
1	C8	Ceramic Capacitor	2700pF	50V, B, ±10%	GRM188B11H272KA01D	MURATA	1608
1	C9	Ceramic Capacitor	0.01µF	50V, B, ±10%	GRM188B11H103KA01D	MURATA	1608
0	C10	Ceramic Capacitor	-	Not installed	-	-	1608
1	L1	Inductor	2.2µH	±20%, DCR=17mΩmax, 8.1A	FDSD0630-H-2R2M	TOKO	7066
1	R1	Resistor	30kΩ	1/10W, 50V, ±1%	MCR03ERPF3002	ROHM	1608
1	R2	Resistor	24kΩ	1/10W, 50V, ±1%	MCR03ERPF2402	ROHM	1608
1	R3	Resistor	9.1kΩ	1/10W, 50V, ±1%	MCR03ERPF9101	ROHM	1608
1	R4	Resistor	10kΩ	1/10W, 50V, ±1%	MCR03ERPF1002	ROHM	1608
2	R5, R7	Resistor	0Ω	Jumper	MCR03ERPJ000	ROHM	1608
0	R6	Resistor	-	Not installed	-	-	1608
1	SW1	Pin header	-	2.54mm × 3 contacts	PH-1x03SG	USECONN	-
1	U1	IC	-	Buck DC/DC Converter	BD9A100MUV	ROHM	VQFN016V3030
2	J1, J2	Terminal Block	-	2 contacts, 15A, 14 to 22AWG	TB111-2-2-U-1-1	Alphaplus Connectors & Cables	-
1	-	Jumper	-	Jumper pin for SW1	MJ254-6BK	USECONN	-

Layout

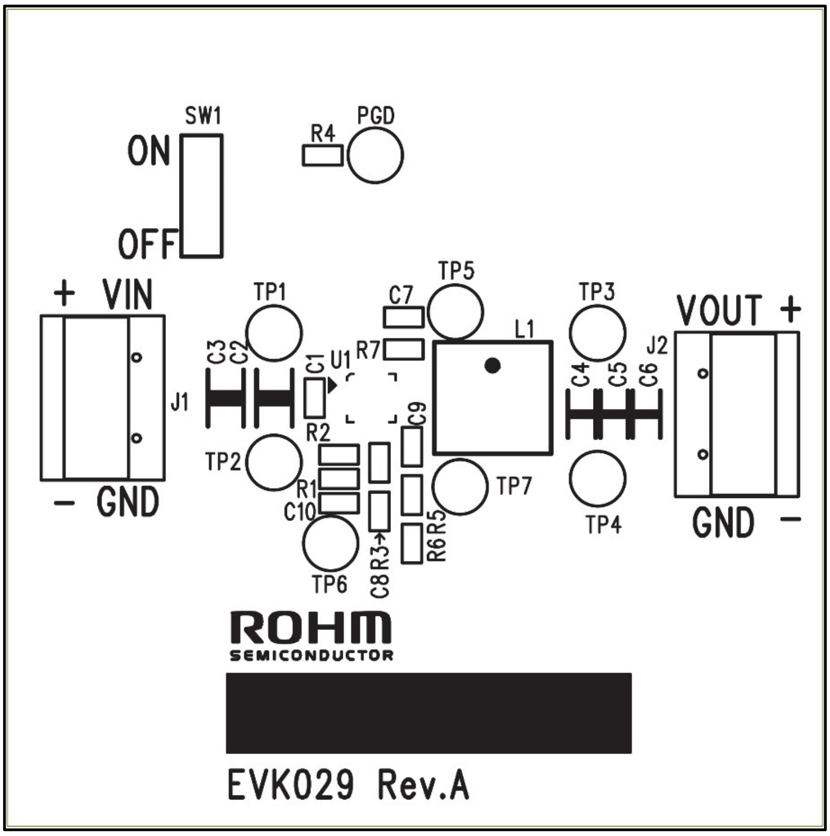

Figure 4. Top Silk Screen (Top view)

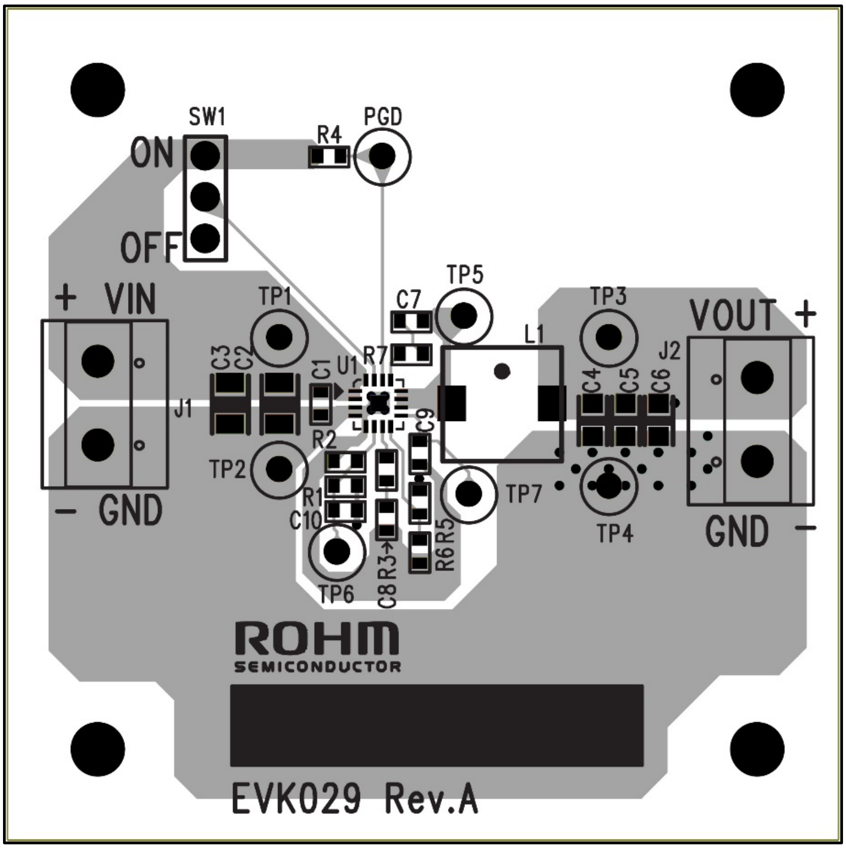

Figure 5. Top Silk Screen and Layout (Top view)

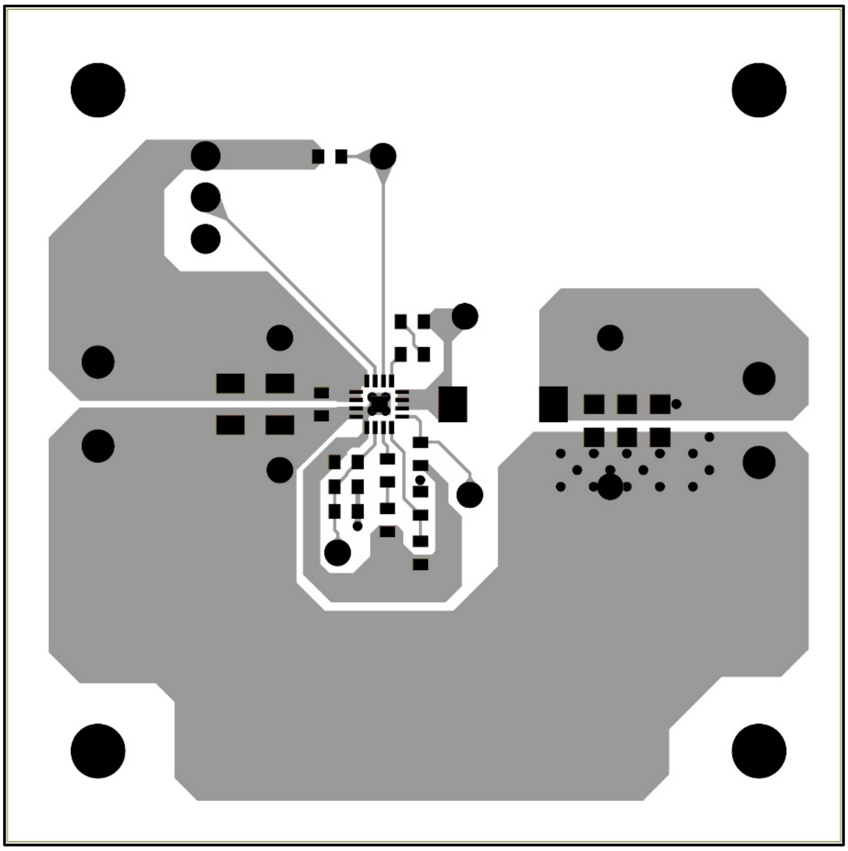

Figure 6. Top Side Layout (Top view)

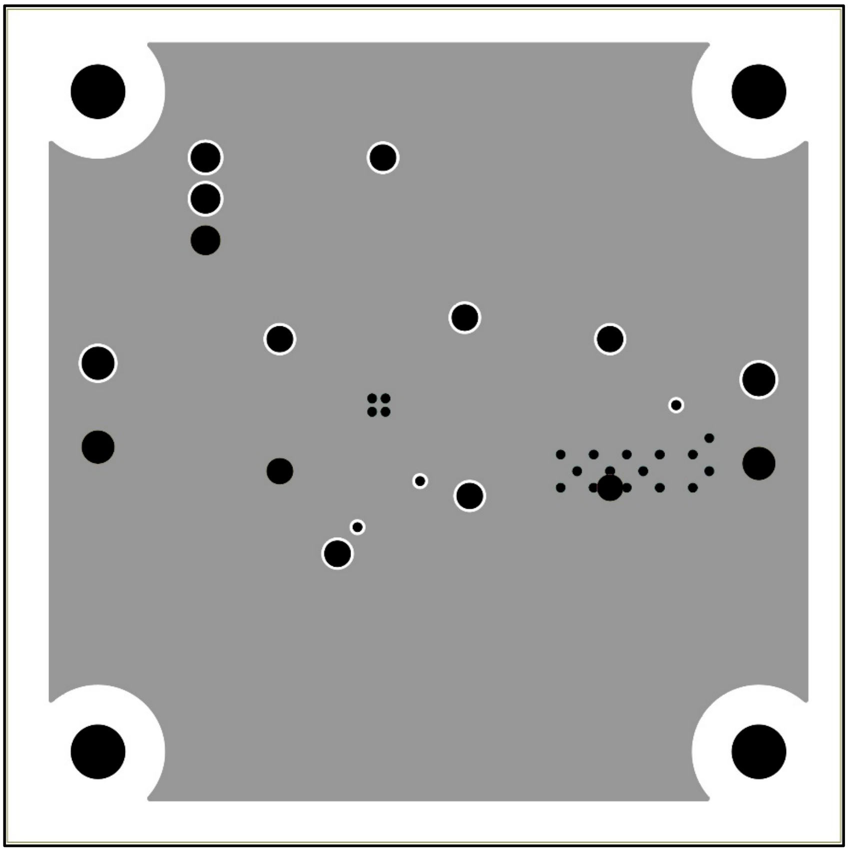

Figure 7. L2 Layout (Top view)

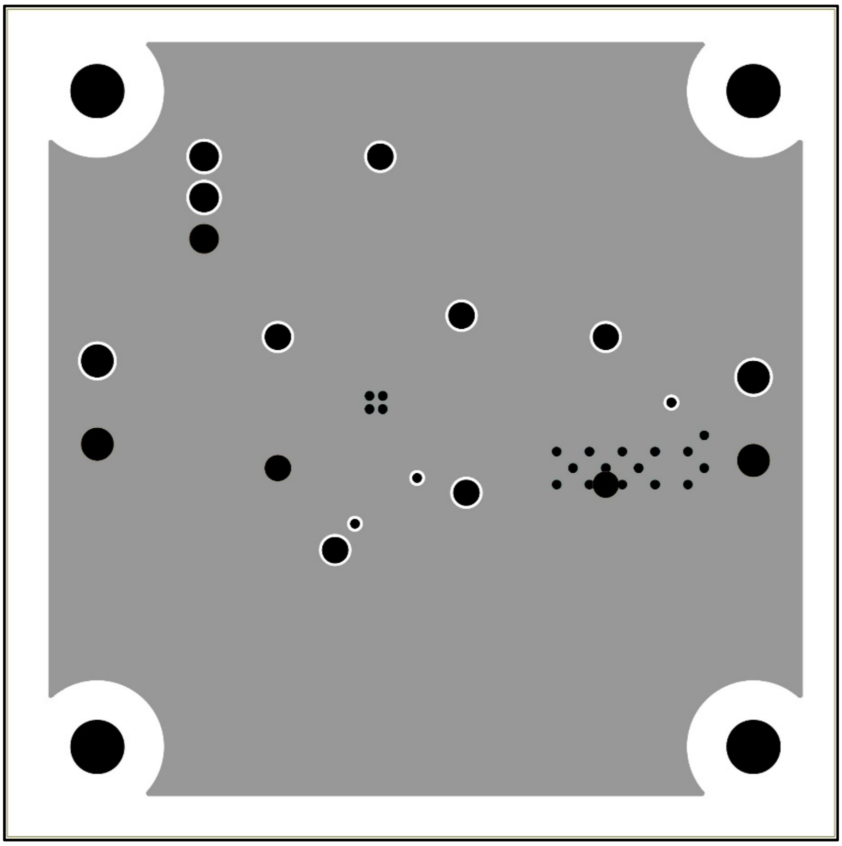

Figure 8. L3 Layout (Top view)

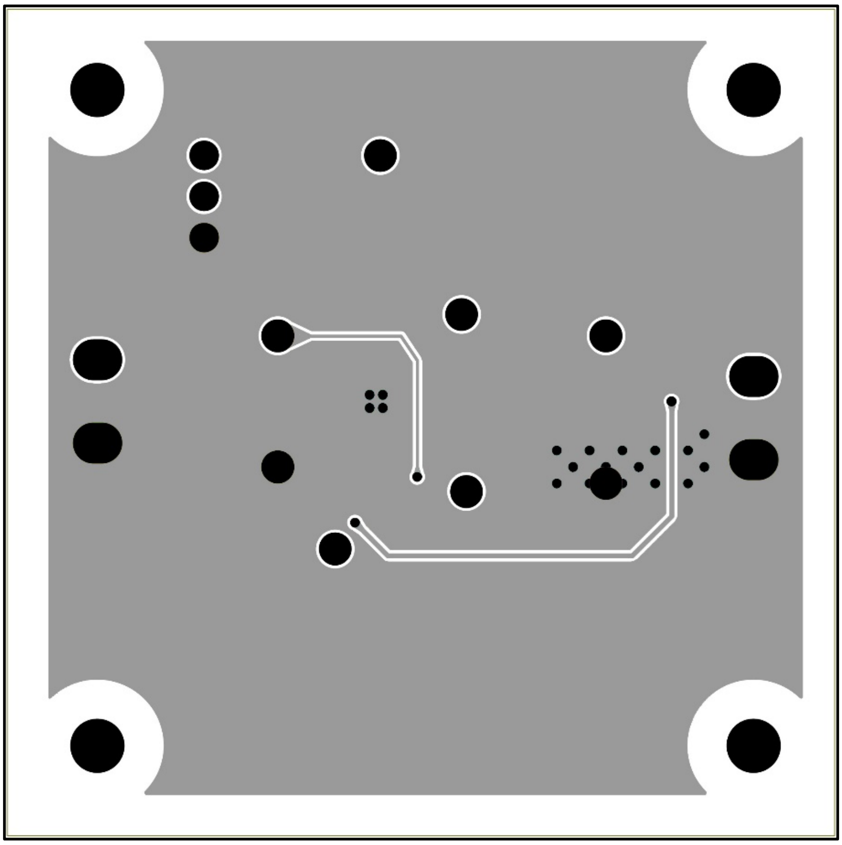

Figure 9. Bottom Side Layout (Top view)

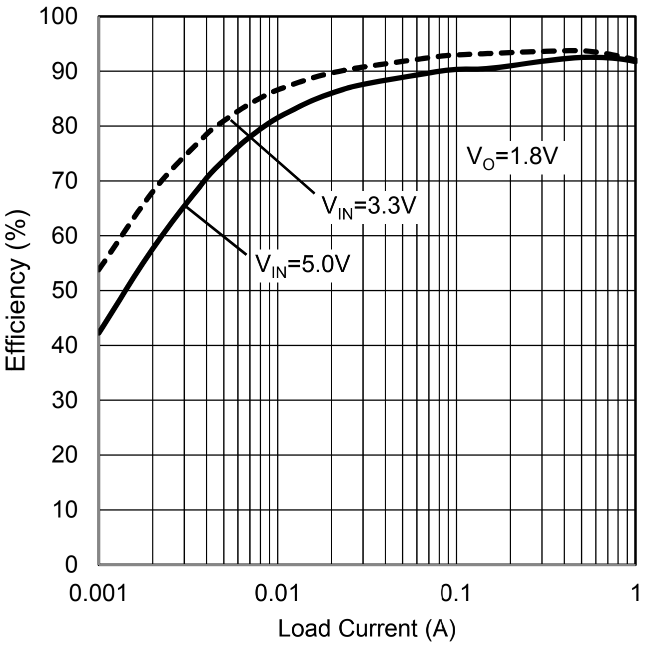

Figure 10. Efficiency vs Load Current

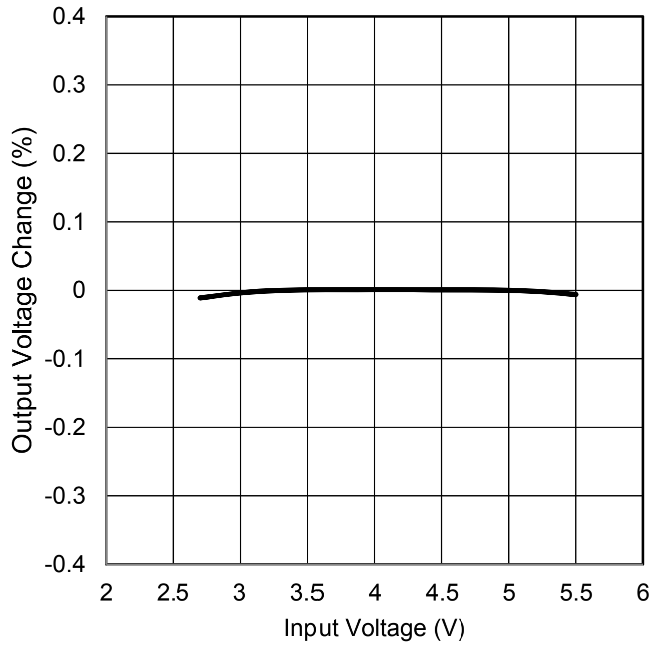

Figure 11. Line Regulation

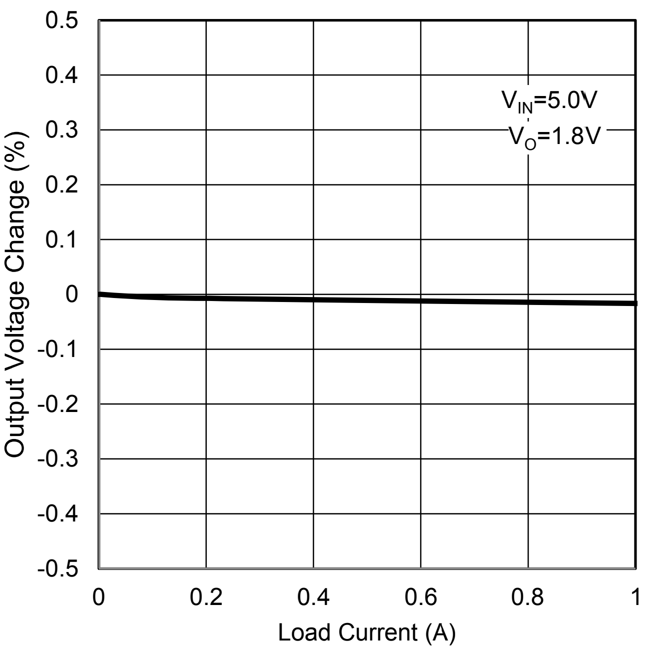

Figure 12. Load Regulation

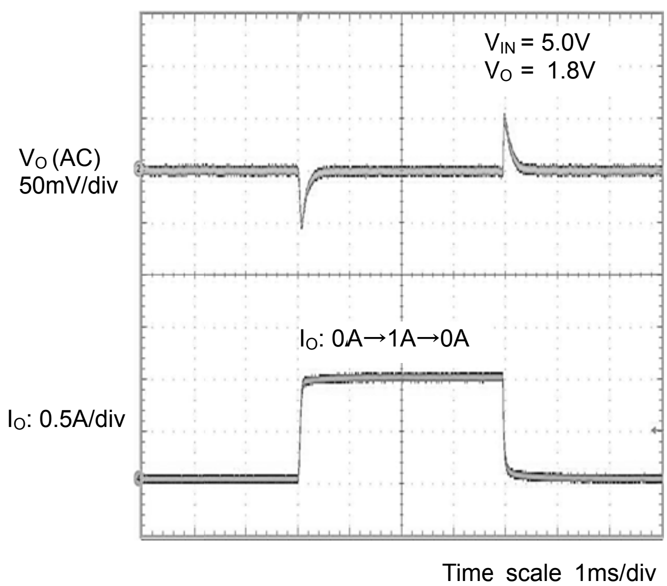

Figure 13. Load Transient Characteristics

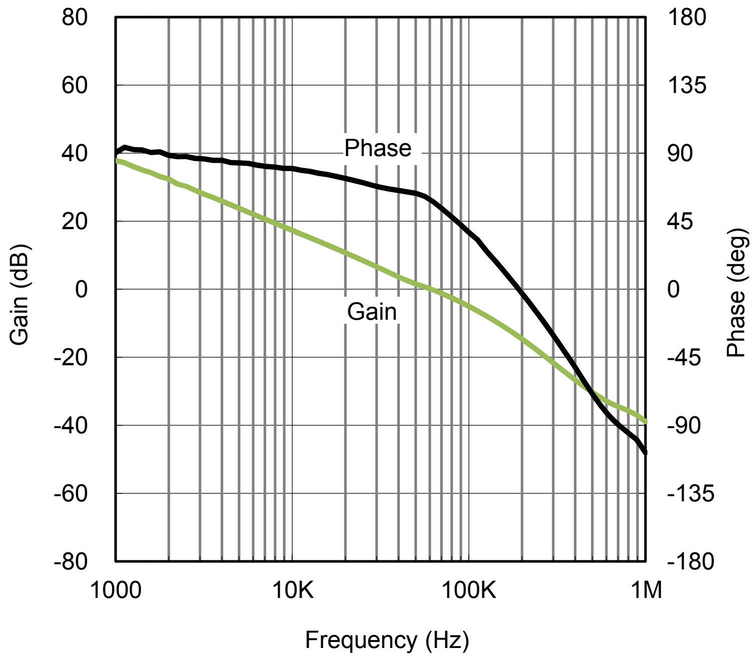

Figure 14. Loop Response V_{IN} = 5.0V, V_O = 1.8V, I_O = 1.0A

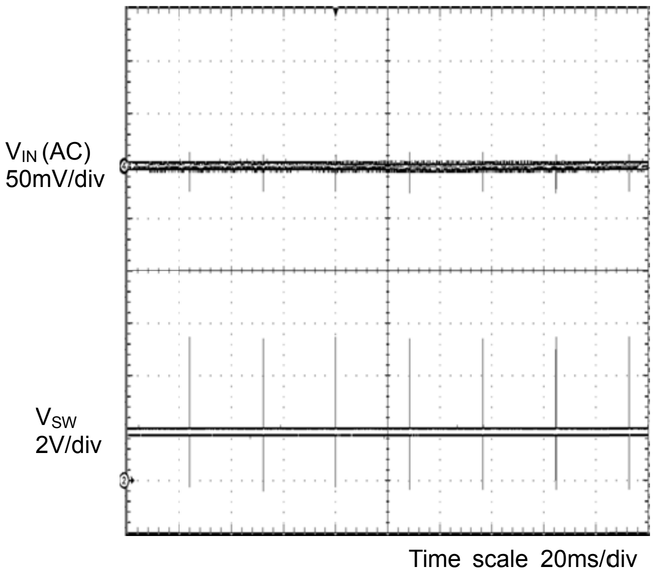

Figure 15. Input Voltage Ripple Wave
V_{IN} = 5.0V, V_O = 1.8V, I_O=0A

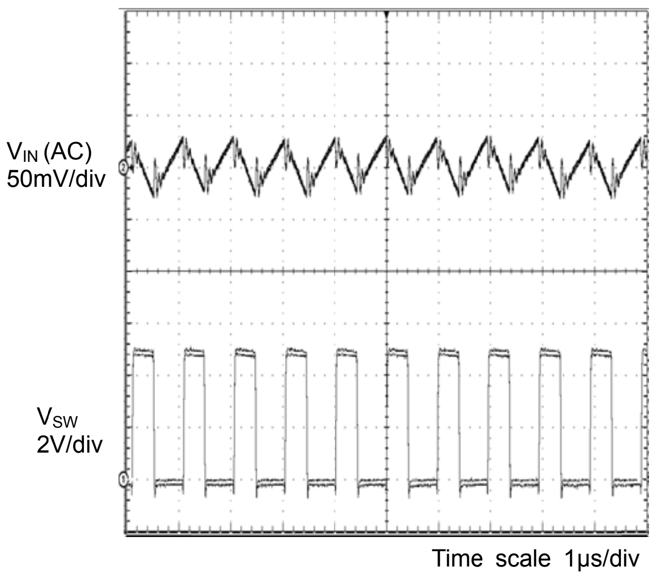

Figure 16. Input Voltage Ripple Wave
V_{IN} = 5.0V, V_O = 1.8V, I_O=1A

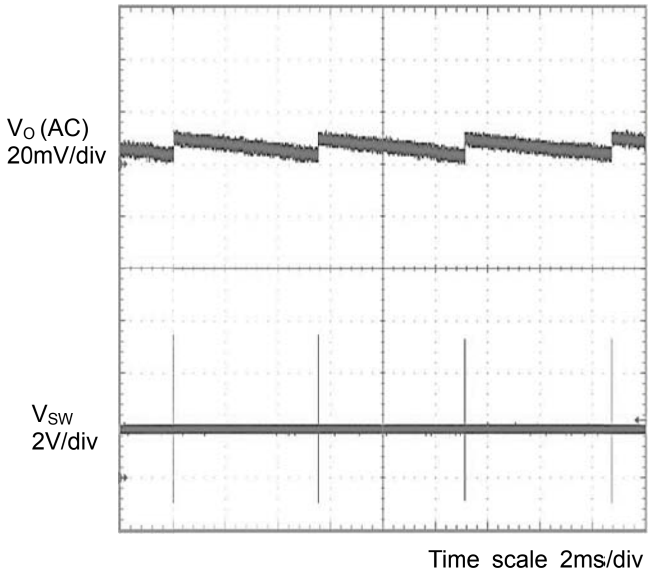

Figure 17. Output Voltage Ripple Wave
V_{IN} = 5.0V, V_O = 1.8V, I_O=0A

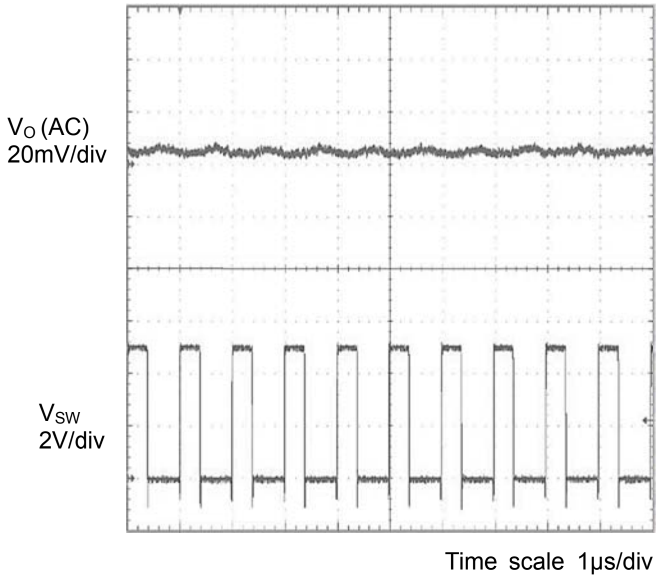

Figure 18. Output Voltage Ripple Wave
V_{IN} = 5.0V, V_O = 1.8V, I_O=1A

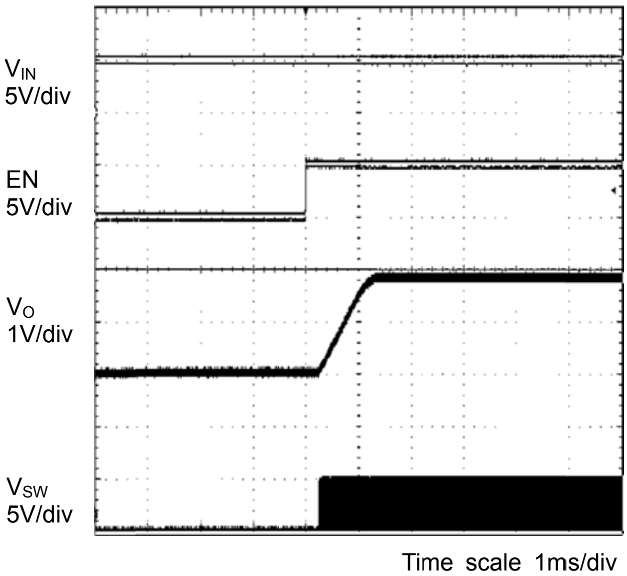

Figure 19. Start-up by EN
V_{IN} = 5.0V, V_O = 1.8V

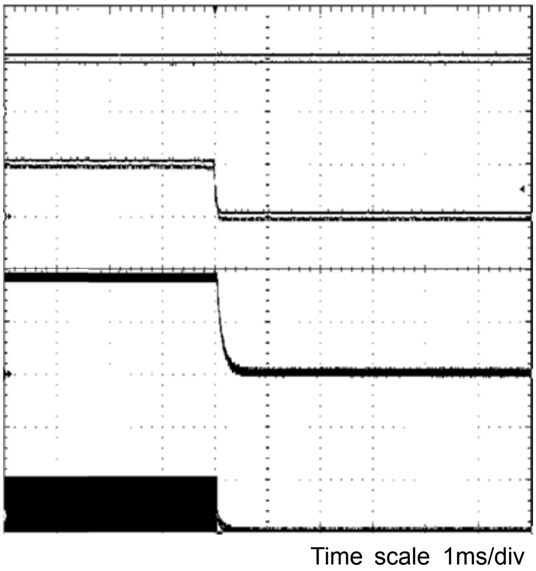

Figure 20. Power-down by EN
V_{IN} = 5.0V, V_O = 1.8V

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