

Secondary Side Synchronous Rectification Controller IC Series

BM1R00147F Evaluation Board

BM1R00147F-EVK-002 (Low Side Type)

This evaluation board has provided the secondary-side synchronous rectification circuit using BM1R00147F. This evaluation board assumes that the primary side controller of insulated type with PWM flyback converter operates in DCM and set to 5V for output voltage. The secondary-side MOSFET uses ROHM's RX1L16BGN. The secondary-side MOSFET can be located on Low Side. (When the secondary-side MOSFET is located on High Side, see "User's Guide BM1R00147F-EVK-001 (No.60UG021E)".)

Performance specification

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

Parameter	Min	Typ	Max	Units	Conditions
Output Voltage		5		V	
Output Current			10	A	
MOSFET for secondary side synchronous rectification Drain – Source Voltage			60	V	M2=RX1L16BGN (ROHM)

Evaluation Board

PCB size : 30mm×30mm×1.6mm



Figure 1. BM1R00147F-EVK-002 Evaluation Board

Top View



Figure 2. BM1R00147F-EVK-002 Evaluation Board

Bottom View

Operation Procedures

1. Necessary equipments

(1) Insulated type with PWM flyback converter (DCM operation)

VOUT 5V

IOUT Maximum load is 10A or smaller

(2) Maximum 10A load

(3) DC voltmeter

(4) Oscilloscope

2. Connecting the evaluation board to flyback converter

< Synchronous rectification circuit >

(1) The reverse voltage V_R is generated in the rectifying diode DOUT should be checked before replacement. Absolute maximum rating of the DRAIN – SOURCE voltage of the ROHM's MOSFET "RX1L16BGN" is 60V ($T_a=25^\circ\text{C}$). Check that the voltage applied to the DRAIN – SOURCE does not exceed the absolute maximum rating.

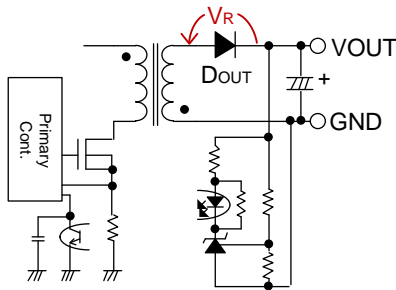


Figure 3. Connecting the Evaluation Board (1)

(2) Remove the secondary-side rectifying diode and short the trace. Cut the connection of transformer terminal and output ground.

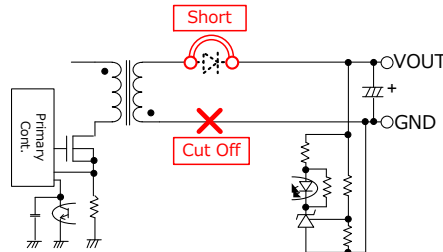


Figure 4. Connecting the Evaluation Board (2)

(3) Connect SOURCE to terminal A and DRAIN to terminal B.

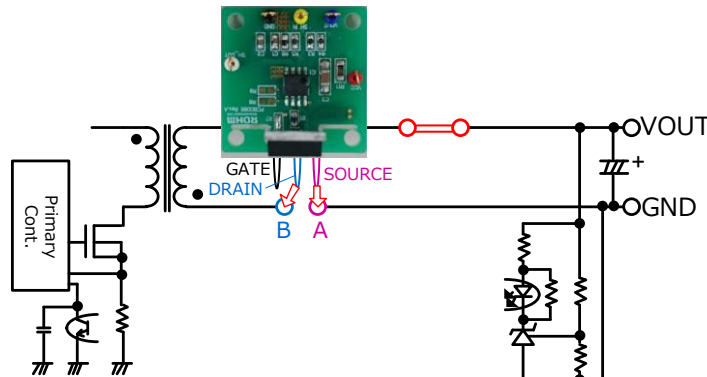


Figure 5. Connecting the Evaluation Board (3)

< Shunt regulator circuit >

(4) Remove the shunt regulator and the resistor for output voltage setting.

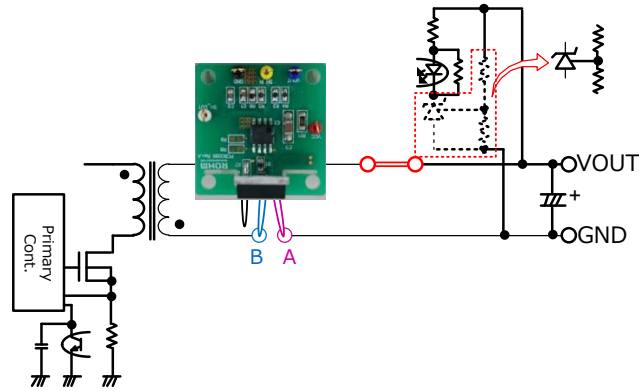


Figure 6. Connecting the Evaluation Board (4)

(5) Connect SH_OUT terminal to terminal C, VOUT terminal to terminal D, GND terminal to terminal E and VCC terminal to terminal F.

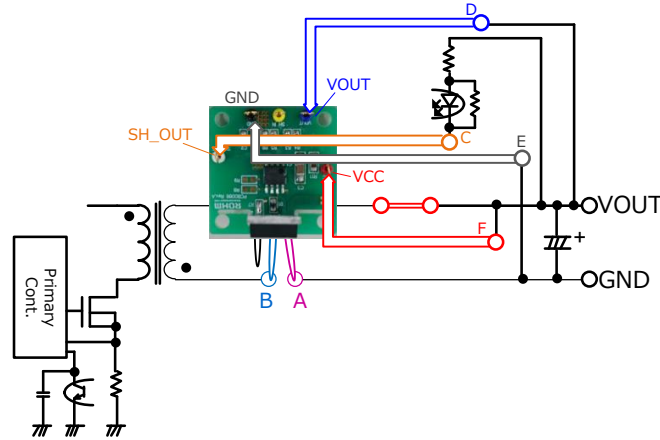


Figure 7. Connecting the Evaluation Board (5)

[Reference] When the IC's built-in shunt regulator is not used

VOUT terminal, SH_OUT terminal and GND terminal should be open and connect VCC terminal to VOUT.

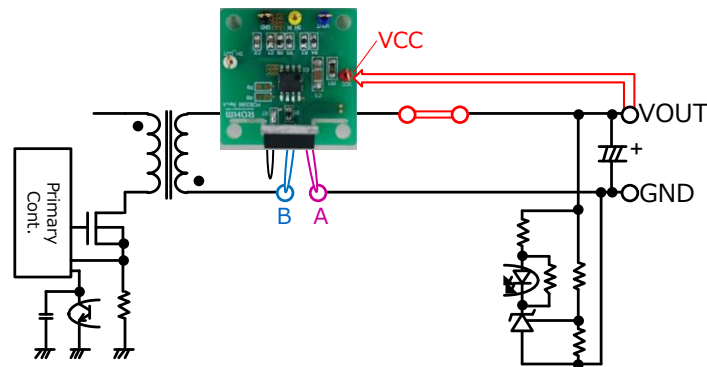


Figure 8. When the IC's built-in Shunt Regulator is not used

[Reference] IC's built-in shunt regulator

IC's built-in shunt regulator can be used in the protection circuit. (For example, the overvoltage protection circuit.)

3. Check the operation

- (1) Connect load's and DC voltmeter positive-terminals to VOUT+ terminal and negative-terminals to GND-terminal.
(The load should be set at 10A and lower. It is disabled.)
- (2) Power of flyback converter is supplied.
- (3) Check DC voltmeter displays 5V.
- (4) The load is enabled. Check DC voltmeter displays and the waveform V_{DS2} , V_{GS2} and I_{FET2} with oscilloscope.

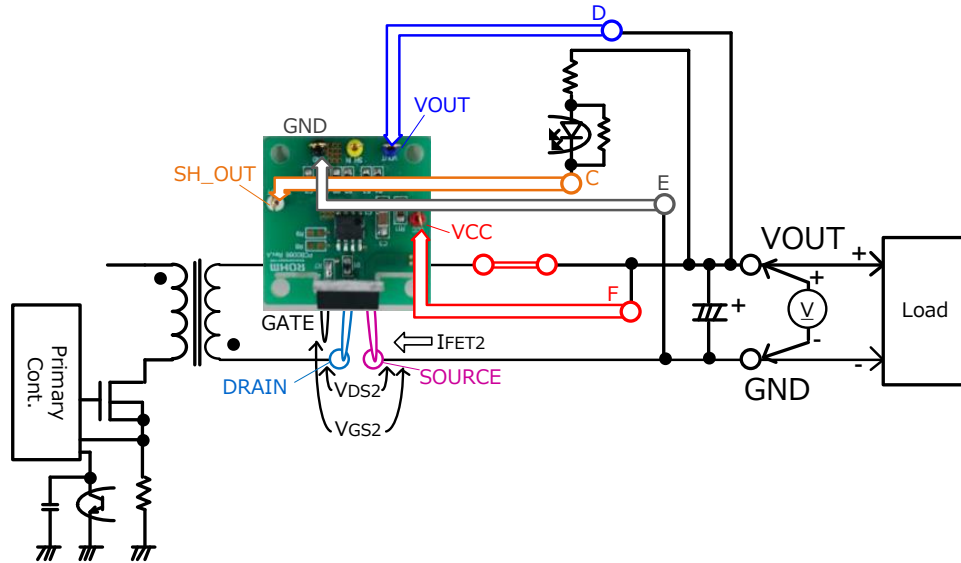


Figure 9. Connection Diagram

Notes

- Because of a noise generated by DRAIN pin voltage, the secondary-side MOSFET may be turned OFF as shown in Figure 11. In this case, adjust the circuit of evaluation board. For the method to adjust, see “BM1R001xxF series Application Note (No.60AN020E)”.

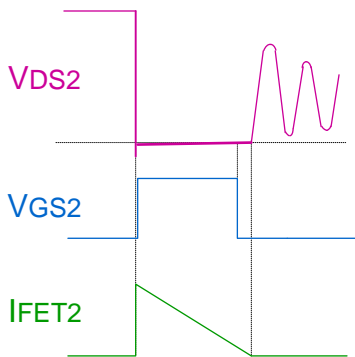


Figure 10. Waveform at normal operation

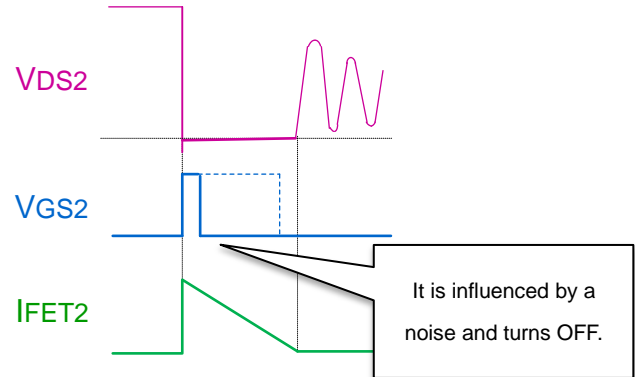


Figure 11. Waveform at abnormal operation

- This evaluation board assumes that the primary side controller operates in DCM. When the primary side controller operates in CCM, it becomes possible to prevent the simultaneous ON operation of the primary side and the secondary side in continuous mode by adjusting the circuit of evaluation board. For the method to adjust, see “BM1R001xxF series Application Note (No.60AN020E)”.

Circuit Diagram

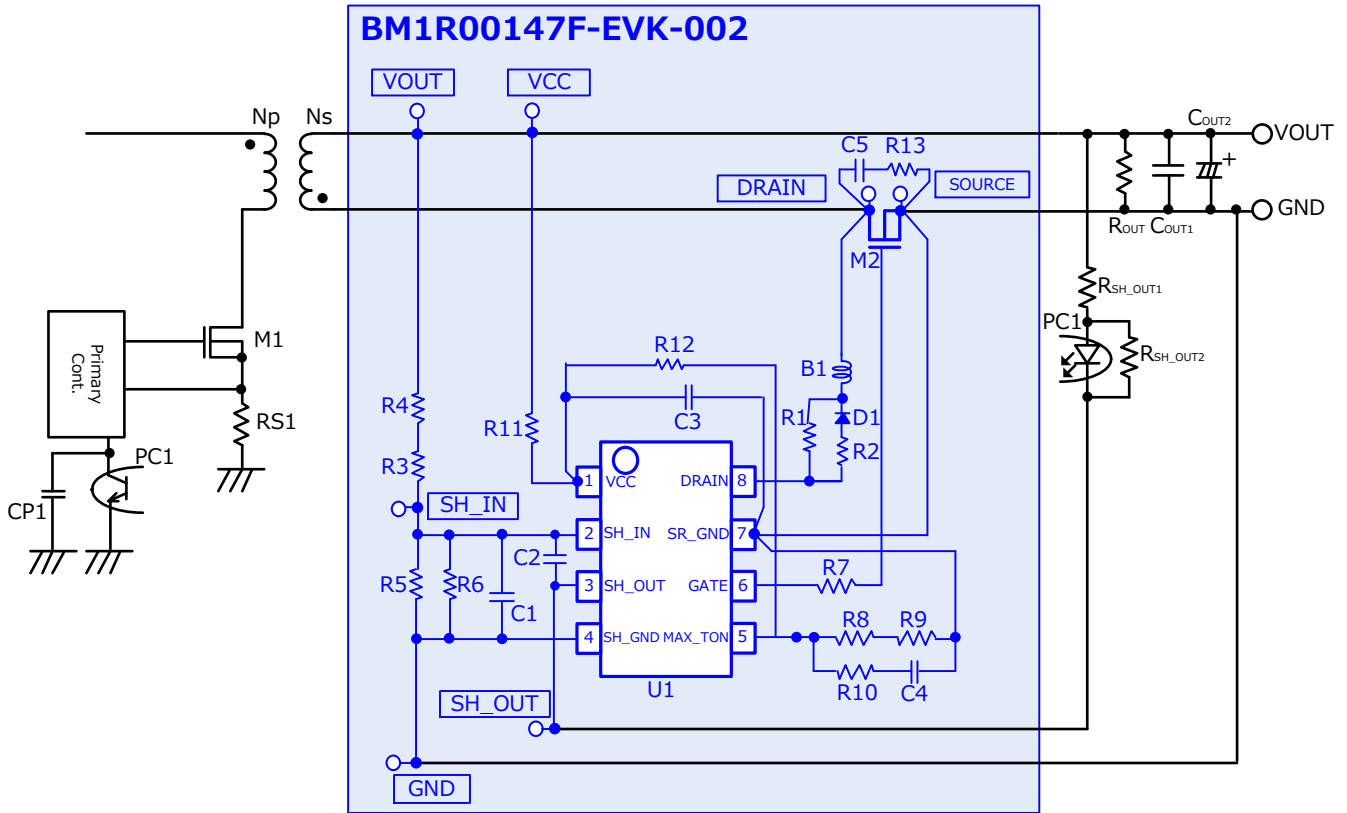


Figure 12. BM1R00147F-EVK-002 Circuit Diagram

Bill of Materials

Symbol	Qty.	Type	Value	Rating	Part Number	Manufacturer
C1	1	Capacitor	220pF	50V	GRM188R71H221KA01D	MURATA
C2	1	Capacitor	1000pF	50V	GRM188R71H102KA01D	MURATA
C3	1	Capacitor	10uF	50V	GRM31CB31H106KA12L	MURATA
C4	0	Capacitor	OPEN	-	-	-
C5	1	Capacitor	2200pF	250V	GRM21AR72E222KW01D	MURATA
D1	1	Diode	-	40V / 30mA	RB751VM-40	ROHM
B1	1	Ferrite Bead	-	0.3Ω / 0.8A	MPZ1608S102AT	TDK
M2	1	MOSFET	-	60V	RX1L16BGN	ROHM
R1	1	Resistor	1kΩ	1/10W	MCR03EZPFX1001	ROHM
R2	1	Resistor	270Ω	1/10W	MCR03EZPFX2700	ROHM
R3	1	Resistor	150kΩ	1/10W	MCR03EZPD1503	ROHM
R4	1	Resistor	270kΩ	1/10W	MCR03EZPD2703	ROHM
R5	1	Resistor	160kΩ	1/10W	MCR03EZPD1603	ROHM
R6	1	Resistor	160kΩ	1/10W	MCR03EZPD1603	ROHM
R7	0	Resistor	SHORT	-	-	-
R8	0	Resistor	OPEN	-	-	-
R9	0	Resistor	OPEN	-	-	-
R10	0	Resistor	OPEN	-	-	-
R11	1	Resistor	10Ω	1/4W	MCR18EZPF10R0	ROHM
R12	0	Resistor	SHORT	-	-	-
R13	1	Resistor	10Ω	1/2W	ESR25JZPF10R0	ROHM
U1	1	IC	-	-	BM1R00147F	ROHM

Layout

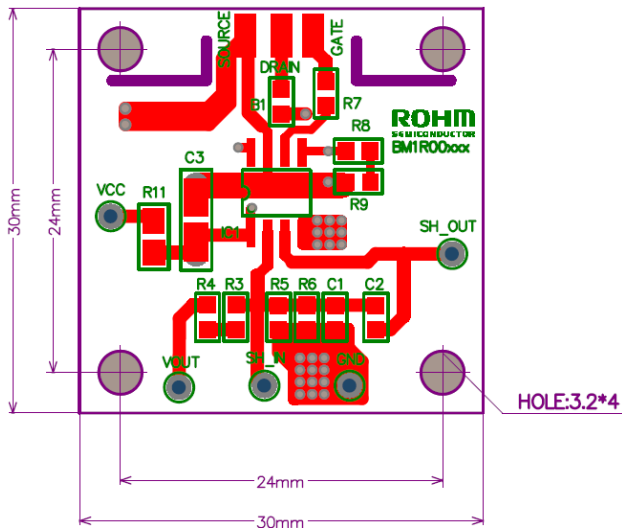


Figure 13. BM1R00147F-EVK-002 Layout
Top View

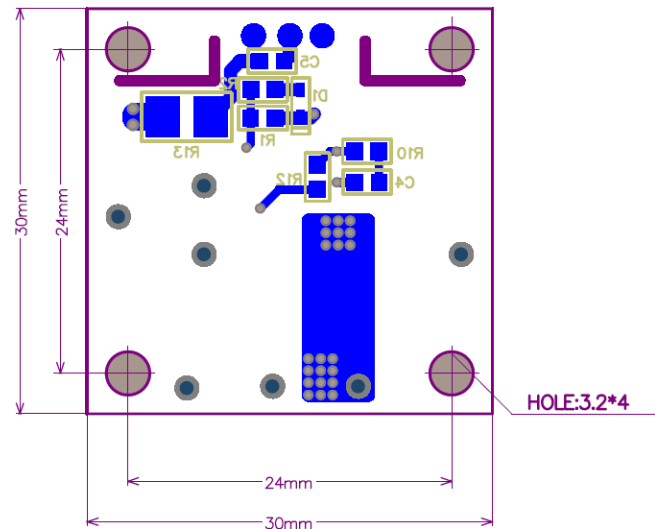


Figure 14. BM1R00147F-EVK-002 Layout
Bottom View

Notes

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