



The Future of Analog IC Technology®

# EV8869W-L-00A

High Efficiency, 12A, 17V, Synchronous Step-Down Converter with I<sup>2</sup>C Interface

**NOT RECOMMENDED FOR NEW DESIGNS, REFER TO EV8869S-L-00A**

## DESCRIPTION

The EV8869W-L-00A is used for demonstrating the performance of MPS's MP8869W. MP8869W is a highly integrated and high frequency synchronous step-down switcher with I<sup>2</sup>C control interface. It is optimized to support up to 12A continuous/15A peak output current over an input supply range from 3V to 18V with excellent load and line regulation.

COT control operation provides fast transient response and eases loop stabilization. In I<sup>2</sup>C control loop, the output voltage level can be controlled, on-the fly through an I<sup>2</sup>C serial interface. Output voltage range can be adjusted from 0.6V to 1.55V in 7.5mV steps. Voltage scaling slew rate, enable and power saving mode are also selectable through the I<sup>2</sup>C interface. Full protection features include over voltage, over-current protection and thermal shut down.

The MP8869W is available in QFN-14(3mmx4mm) package.

## ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V <sub>IN</sub>	3– 18	V
Output Voltage	V <sub>OUT</sub>	1	V
Continuous Output Current	I <sub>OUT</sub>	12	A
Peak Output Current	I <sub>OUT</sub>	15	A

## FEATURES

- Wide 3V-to-18V Operating Input Range
- 12A Continuous/15A Peak Output Current
- 1% Internal Reference Accuracy
- I<sup>2</sup>C Programmable Output Range from 0.6V to 1.55V in 7.5mV Steps with Slew Rate Control
- 5% Accuracy Output Voltage and Output Current Read Back Via I<sup>2</sup>C
- Selectable PFM/PWM Mode and Adjustable Frequency & Current Limit Through I<sup>2</sup>C
- 4 Different I<sup>2</sup>C Address Selectable
- External Soft Start
- Open Drain Power Good Indication
- Output Over Voltage Protection
- Hiccup/Latch off OCP Protection
- QFN-14(3mmx4mm) Package

## APPLICATIONS

- Solid State Driver (SSD)
- Flat-Panel Television and Monitors
- Digital Set-Top Boxes
- Distributed Power Systems

All MPS parts are lead-free, halogen free, and adhere to the RoHS directive. For MPS green status, please visit MPS website under Quality Assurance. "MPS" and "The Future of Analog IC Technology" are Registered Trademarks of Monolithic Power Systems, Inc.

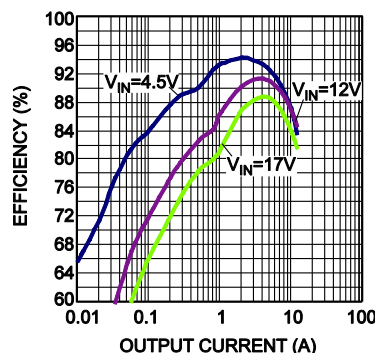
## EV8869W-L-00A EVALUATION BOAR



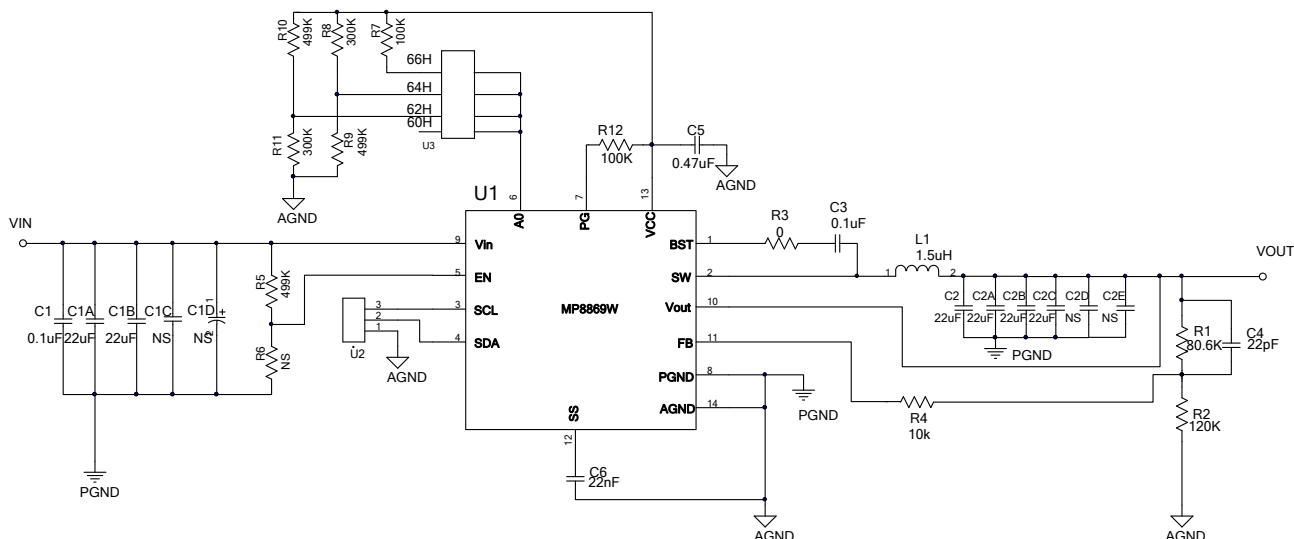
(4 layer PCB, 8.5cmx8.5cm)

Board Number	MPS IC Number
EV8869W-L-00A	MP8869WGL

**Efficiency vs. Output Current**  
V<sub>OUT</sub>=1V, L=1.5μH, DCR=2.1mΩ



## EVALUATION BOARD SCHEMATIC



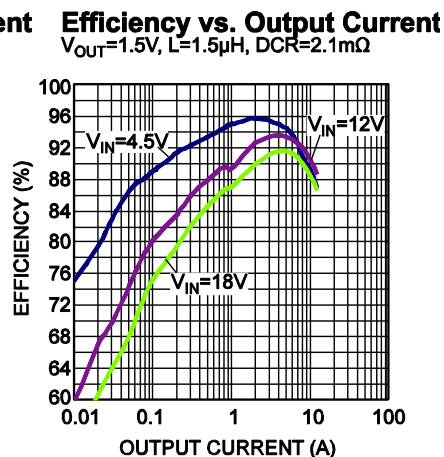
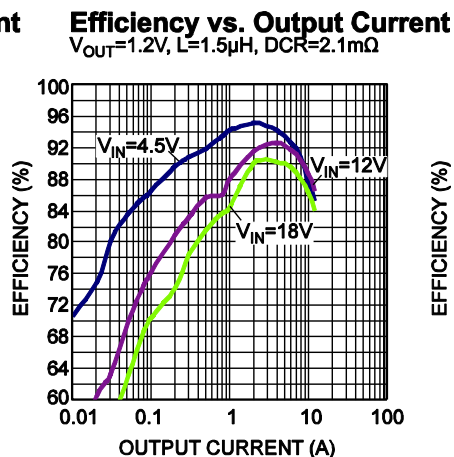
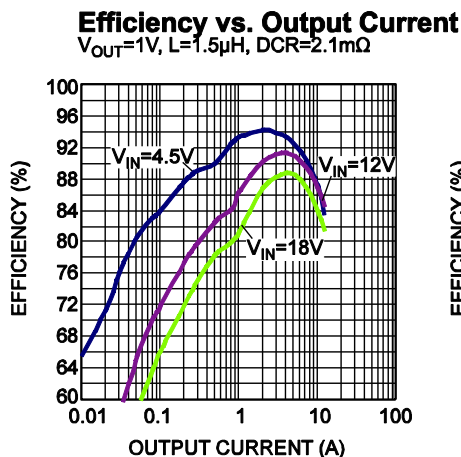
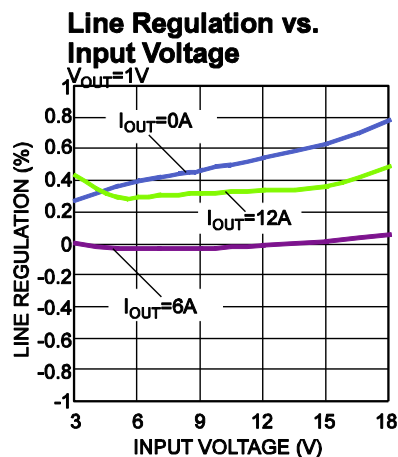
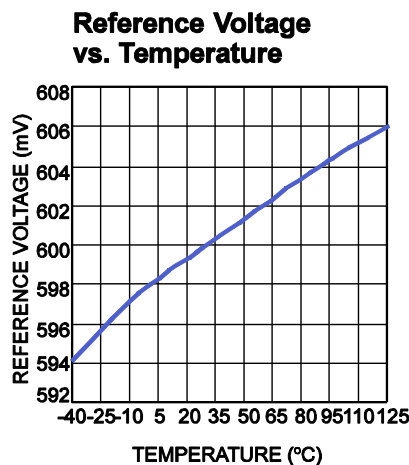
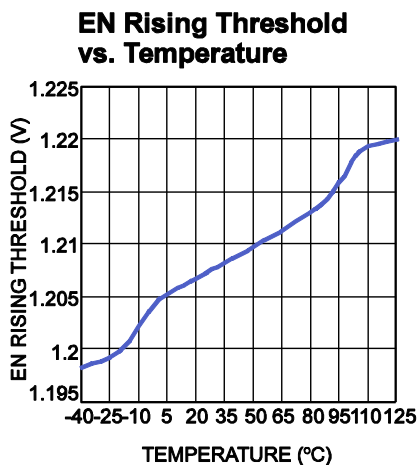
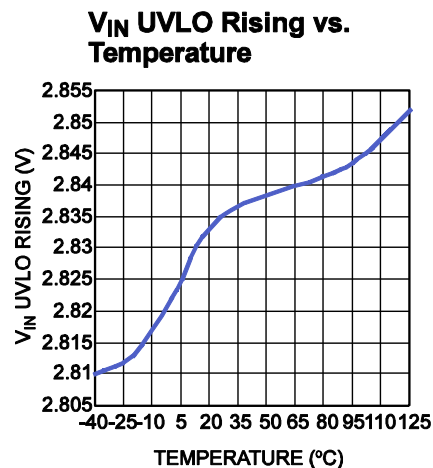
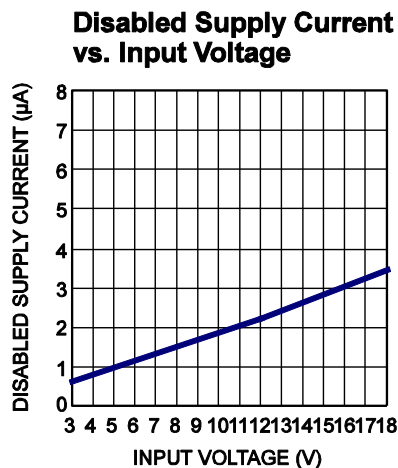
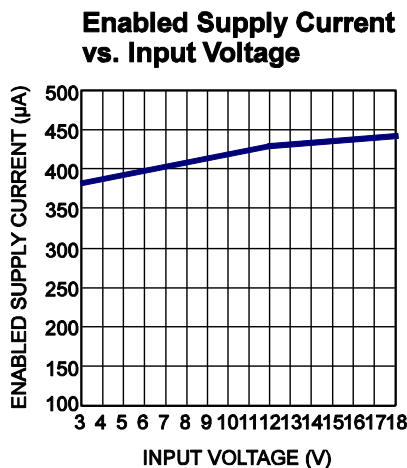
## EV8869W-L-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	R1	80.6k	Film Res,1%	0603	ROYAL	RC0603FR-0780K6L
1	R2	120k	Film Res,1%	0603	ROYAL	RL0603FR-07120KL
1	R3	0 Ω	Film Res,1%	0603	ROYAL	RC0603FR-070RL
1	R4	10k	Film Res,1%	0603	ROYAL	RL0603FR-0710KL
3	R5, R9, R10	499k	Film Res,1%	0603	ROYAL	RL0603FR-07499KL
0	R6	NS				
2	R7,R12	100k	Film Res,1%	0603	ROYAL	RL0603FR-07100KL
2	R8,R11	300k	Film Res,1%	0603	ROYAL	RL0603FR-07300KL
2	C1, C3	0.1µF	Ceramic Cap, 25V,X7R	0603	muRata	GRM188R71E104KA01D
2	C1A,C1B,	22µF	Ceramic Cap,25V,X5R	1206	muRata	GRM31CR61E226KE15L
4	C2,C2A, C2B,C2C	22µF	Ceramic Cap , 25V,X5R	0805	muRata	GRM21BR61E226ME44L
0	C1C,C1D, C2D,C2E	NS				
1	C4	22pF	Ceramic Cap, 50V, X7R	0603	muRata	GRM1885C1H220JA01D
1	C5	0.47µF	Ceramic Cap,16V,X7R	0603	muRata	GRM188R71C474KA88D
1	C6	22nF	Ceramic Cap,16V,X7R	0603	muRata	GRM188R71C223KA01D
1	L1	1.5µH	Inductor, DCR=2.1mΩ	SMD	Würth	7443320150
1	U1	MP8869W	Step-Down Converter with I2C Interface	QFN14 (3*4)	MPS	MP8869WGL
1	U2	Jumper	3 pin jumper	DIP	any	
1	U3	Switch-4	Switch-4	SMD	Würth	416 131 160 804

## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 1.5\mu H$ ,  $F_S = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.

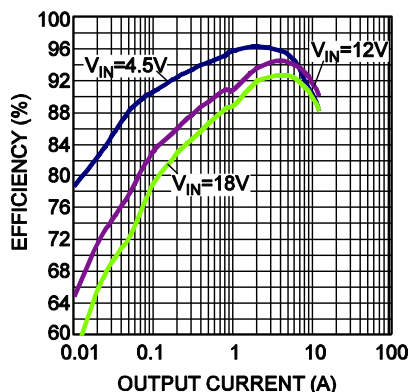


## EVB TEST RESULTS *(continued)*

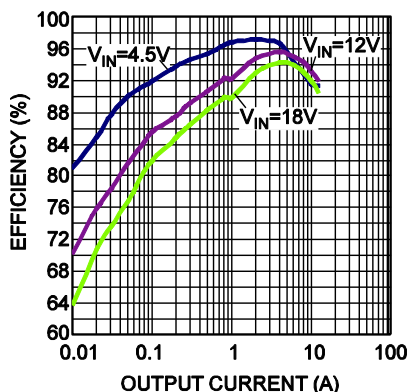
Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 1.5\mu H$ ,  $F_S = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.

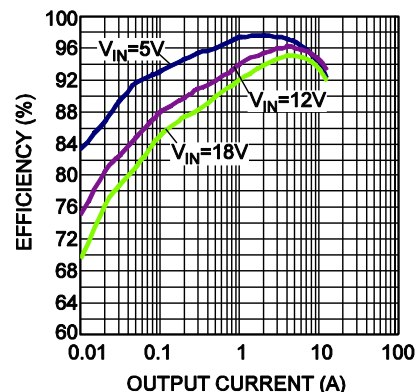
**Efficiency vs. Output Current**  
 $V_{OUT}=1.8V$ ,  $L=1.5\mu H$ ,  $DCR=2.1m\Omega$



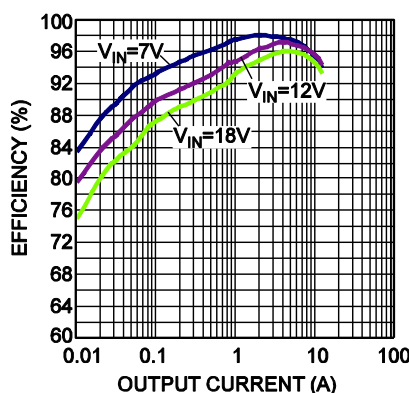
**Efficiency vs. Output Current**  
 $V_{OUT}=2.5V$ ,  $L=2.2\mu H$ ,  $DCR=3m\Omega$



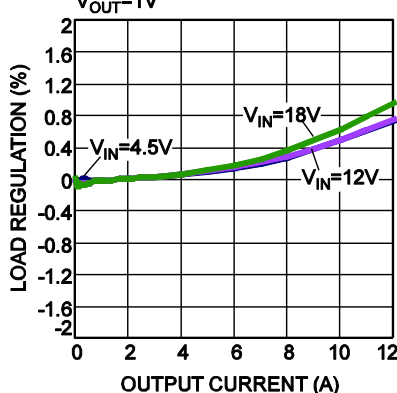
**Efficiency vs. Output Current**  
 $V_{OUT}=3.3V$ ,  $L=2.2\mu H$ ,  $DCR=3m\Omega$



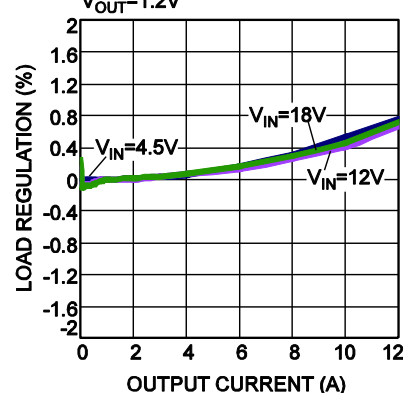
**Efficiency vs. Output Current**  
 $V_{OUT}=5V$ ,  $L=3.3\mu H$ ,  $DCR=4.4m\Omega$



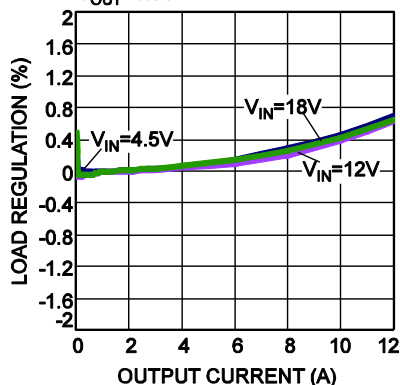
**Load Regulation vs. Output Current**  
 $V_{OUT}=1V$



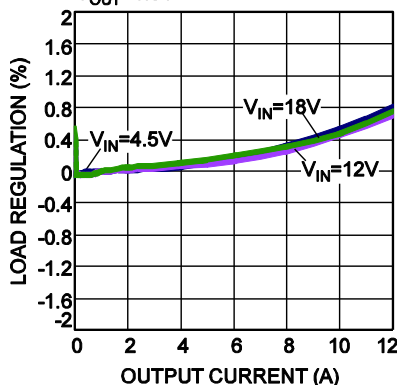
**Load Regulation vs. Output Current**  
 $V_{OUT}=1.2V$



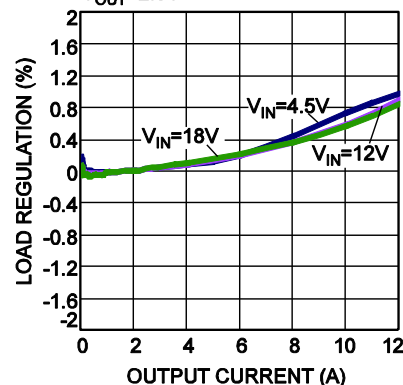
**Load Regulation vs. Output Current**  
 $V_{OUT}=1.5V$



**Load Regulation vs. Output Current**  
 $V_{OUT}=1.8V$



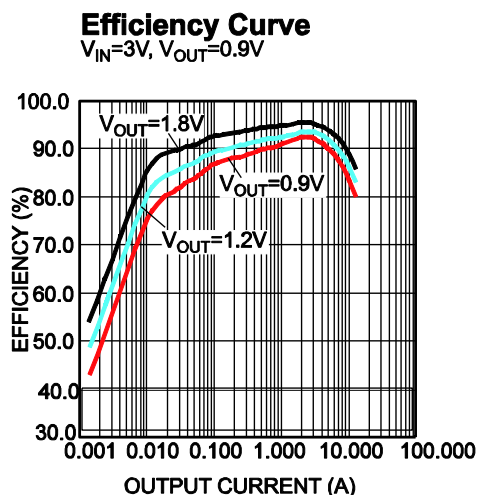
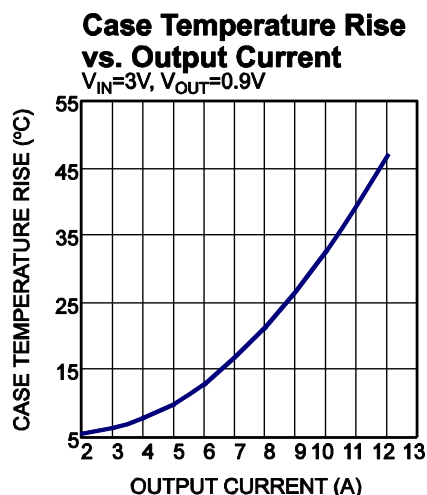
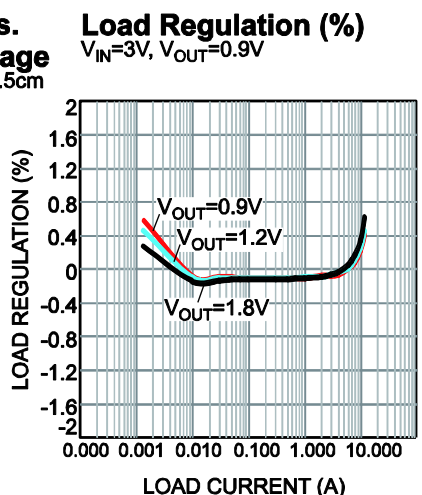
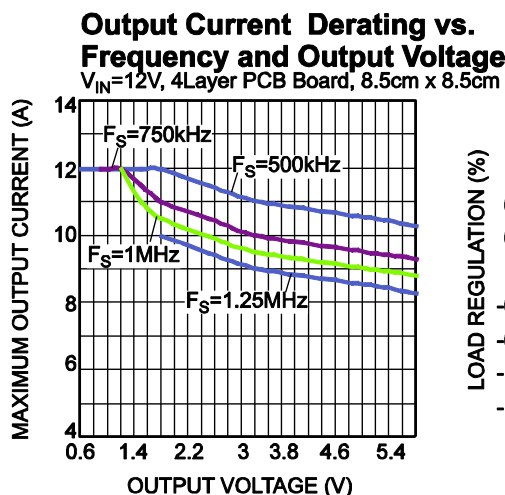
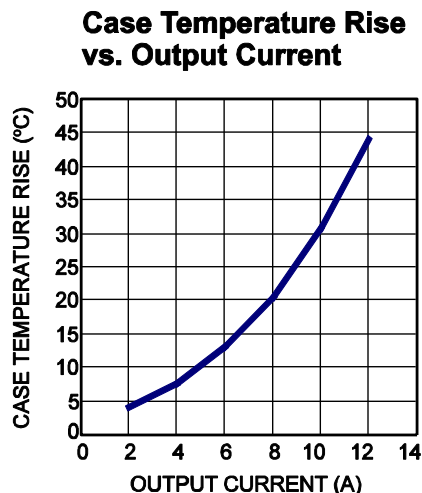
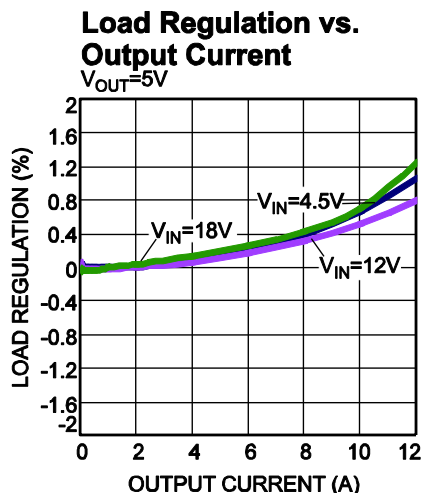
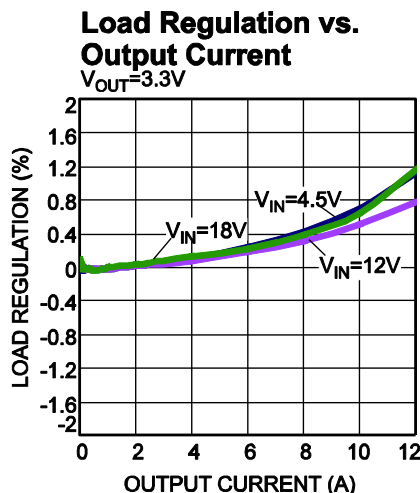
**Load Regulation vs. Output Current**  
 $V_{OUT}=2.5V$



## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 1.5\mu H$ ,  $F_S = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.



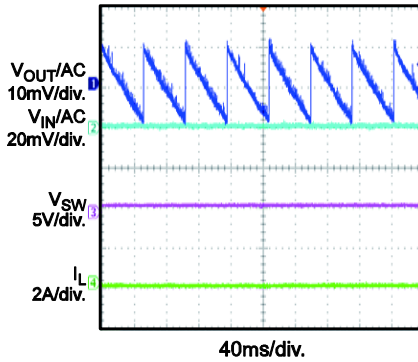
## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 1.5\mu H$ ,  $F_s = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.

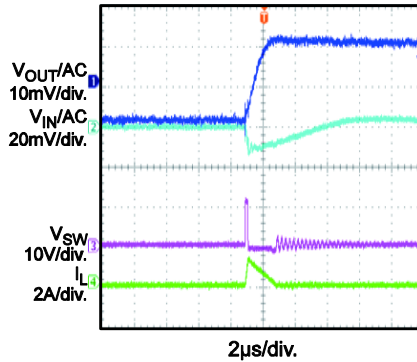
**Input/Output Ripple**

$I_{OUT} = 0A$



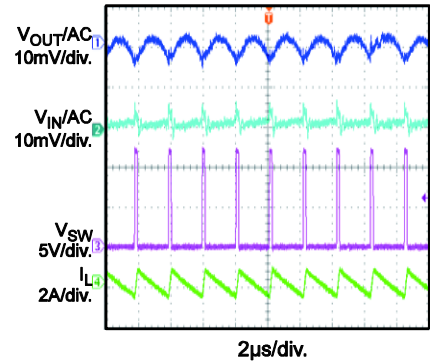
**Input/Output Ripple**

$I_{OUT} = 0A$



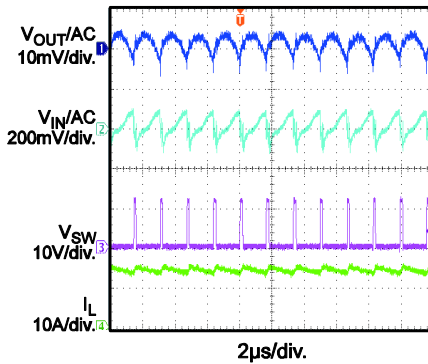
**Input/Output Ripple**

$I_{OUT} = 0A$ , Forced PWM Mode



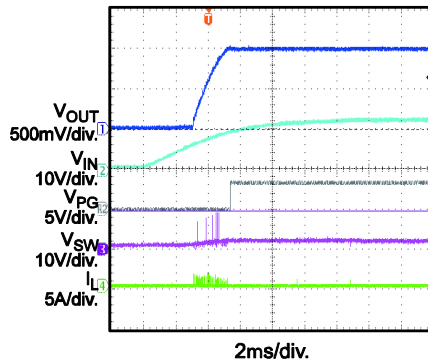
**Input/Output Ripple**

$I_{OUT} = 12A$



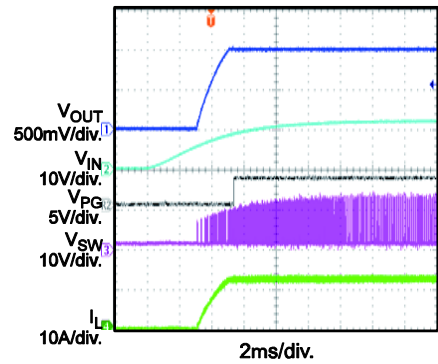
**Start-Up through Input Voltage**

$I_{OUT} = 0A$



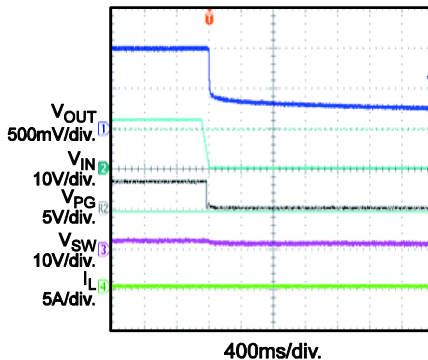
**Start-Up through Input Voltage**

$I_{OUT} = 12A$



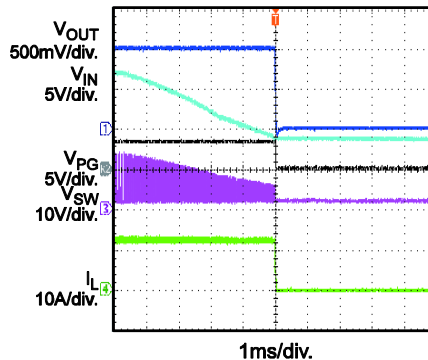
**Shutdown through Input Voltage**

$I_{OUT} = 0A$



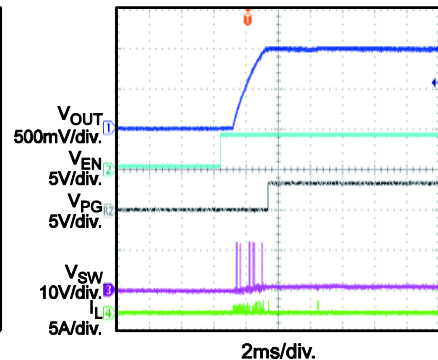
**Shutdown through Input Voltage**

$I_{OUT} = 12A$



**Start-Up through EN**

$I_{OUT} = 0A$





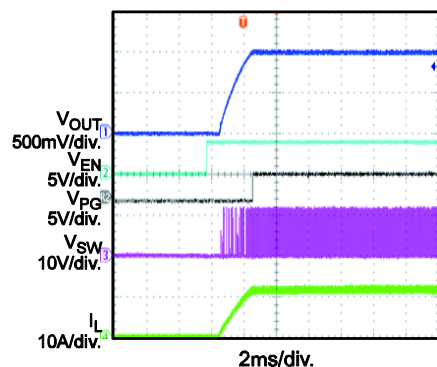
## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

V<sub>IN</sub> = 12V, V<sub>OUT</sub> = 1V, L = 1.5μH, F<sub>S</sub> = 500kHz, Auto PFM/PWM mode, T<sub>A</sub> = 25°C, unless otherwise noted.

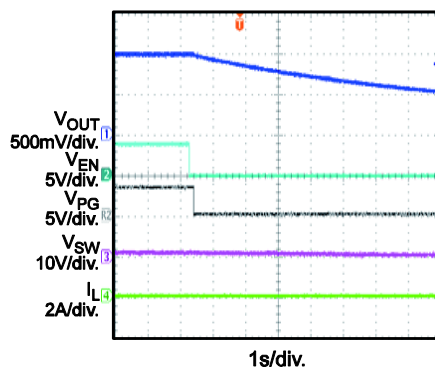
### Start-Up through EN

I<sub>OUT</sub> = 12A



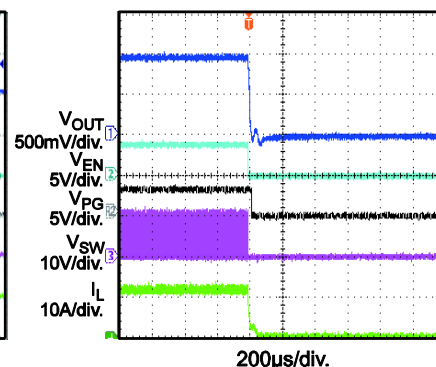
### Shutdown through EN

I<sub>OUT</sub> = 0A



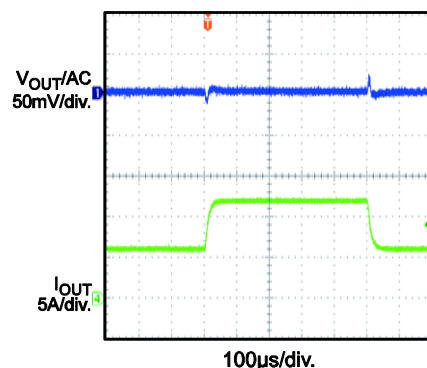
### Shutdown through EN

I<sub>OUT</sub> = 12A



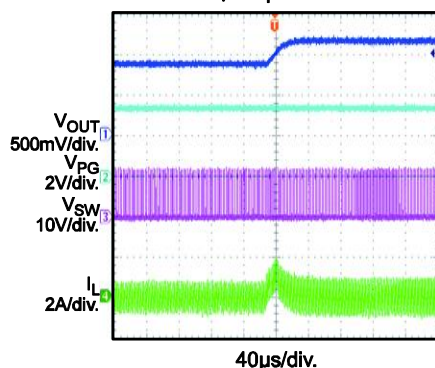
### Load Transient

I<sub>OUT</sub> = 6A-12A



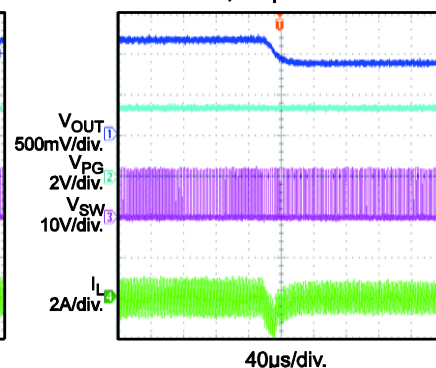
### I<sup>2</sup>C Control Slew Rate

I<sub>OUT</sub>=0A, Slew Rate=20mV/μs, PWM Mode, Output from 0.9V to 1.2V



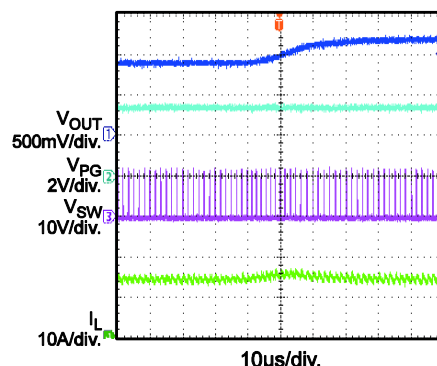
### I<sup>2</sup>C Control Slew Rate

I<sub>OUT</sub>=0A, Slew Rate=20mV/μs, PWM Mode, Output from 1.2V to 0.9V



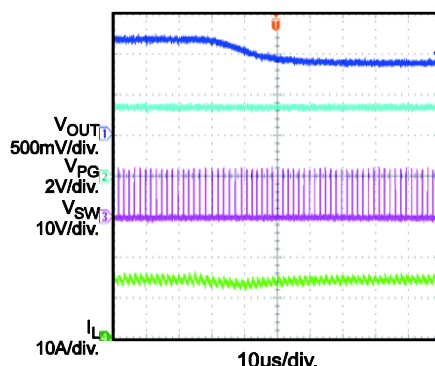
### I<sup>2</sup>C Control Slew Rate

I<sub>OUT</sub>=12A, Slew Rate=20mV/μs, PWM Mode, Output from 0.9V to 1.2V



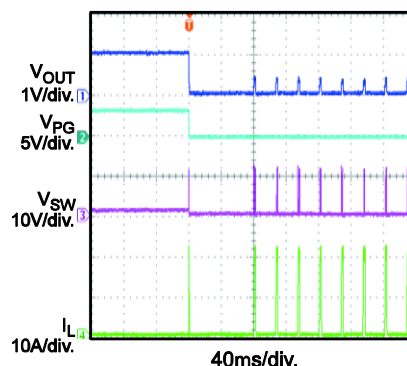
### I<sup>2</sup>C Control Slew Rate

I<sub>OUT</sub>=12A, Slew Rate=20mV/μs, PWM Mode, Output from 1.2V to 0.9V



### Short-Circuit Protection Entry

I<sub>OUT</sub> = 0A



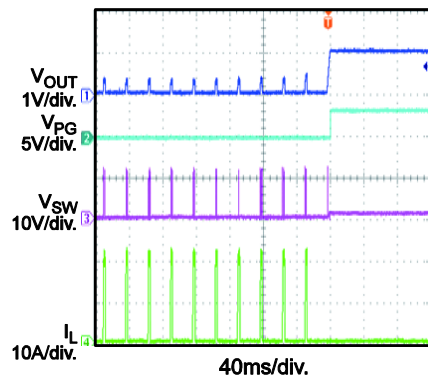
## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 1.5\mu H$ ,  $F_S = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.

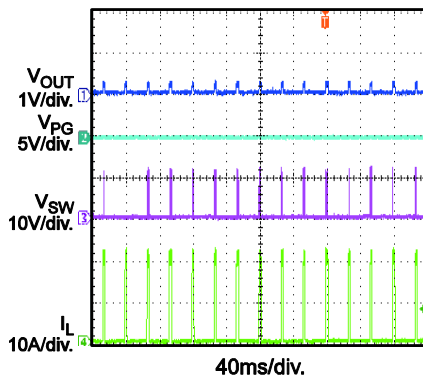
### Short-Circuit Protection Recovery

$I_{OUT} = 0A$



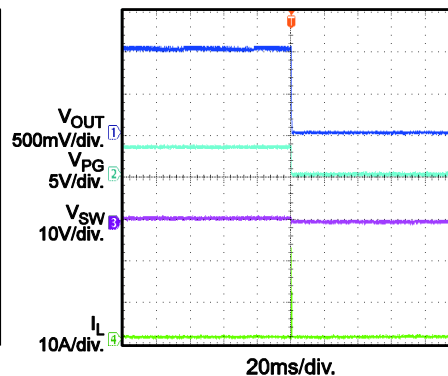
### Short-Circuit Protection Steady State

Short Output to GND



### Short-Circuit Protection Entry, Latch Off Mode

$I_{OUT} = 0A$





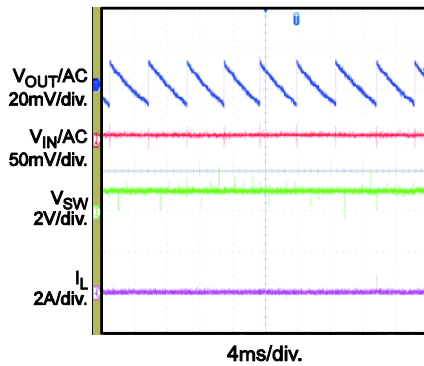
## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 3V$ ,  $V_{OUT} = 0.9V$ ,  $L = 0.47 \mu H$ ,  $F_s = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.

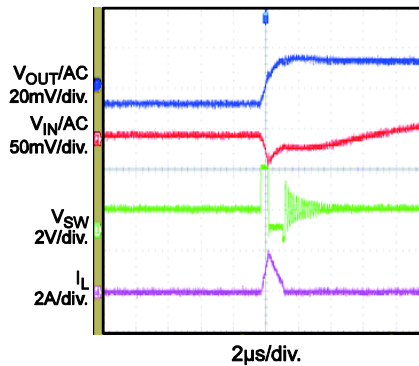
**Input/Output Ripple**

$I_{OUT} = 0A$



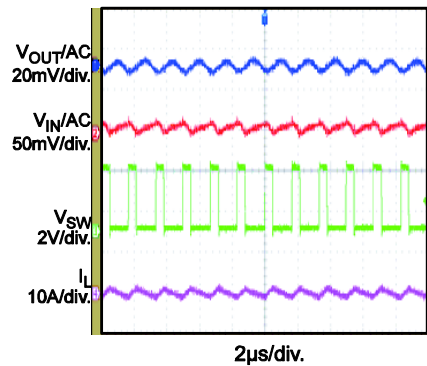
**Input/Output Ripple**

$I_{OUT} = 0A$



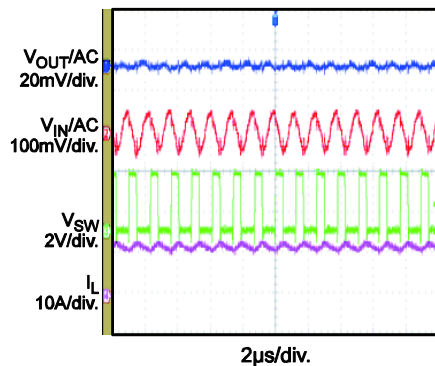
**Input/Output Ripple**

$I_{OUT} = 0A$ , Forced PWM Mode



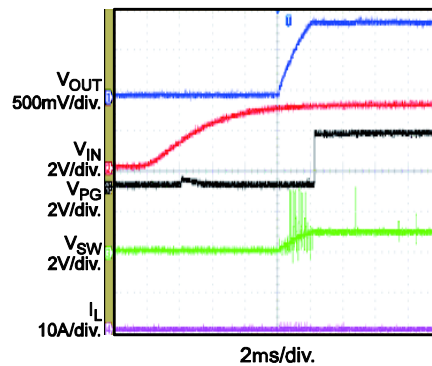
**Input/Output Ripple**

$I_{OUT} = 12A$



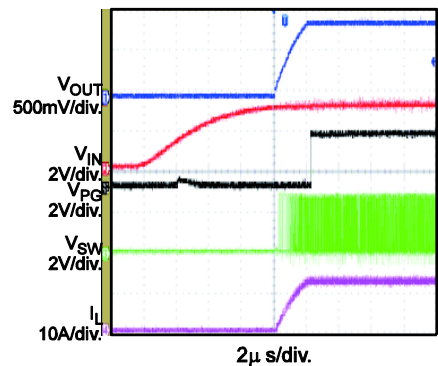
**Start-Up through Input Voltage**

$I_{OUT} = 0A$



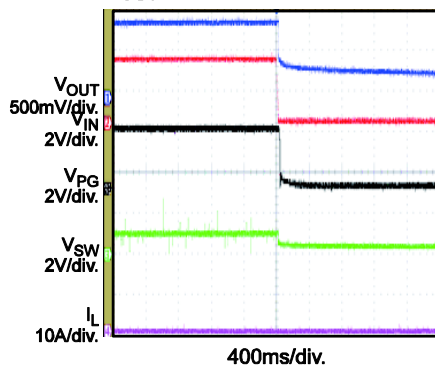
**Start-Up through Input Voltage**

$I_{OUT} = 12A$



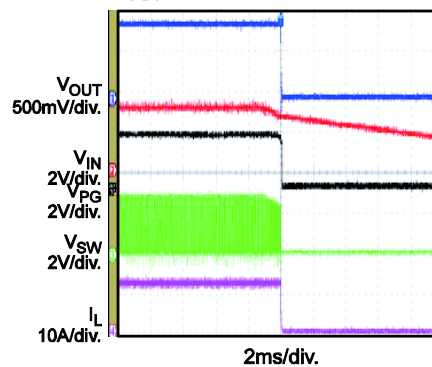
**Shutdown through Input Voltage**

$I_{OUT} = 0A$



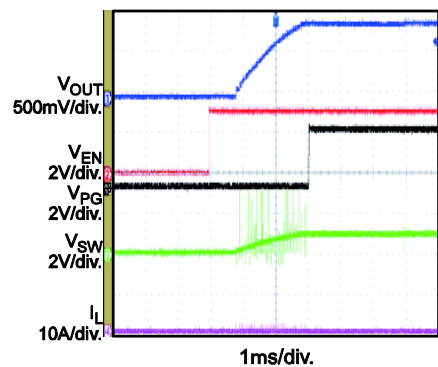
**Shutdown through Input Voltage**

$I_{OUT} = 12A$



**Start-Up through EN**

$I_{OUT} = 0A$



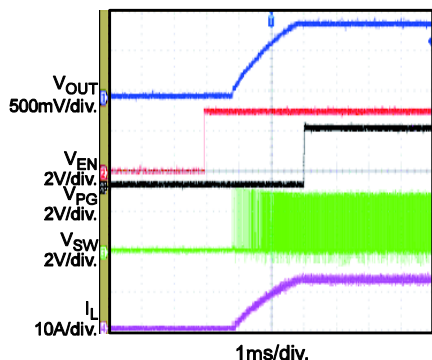
## EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 3V$ ,  $V_{OUT} = 0.9V$ ,  $L = 0.47\mu H$ ,  $F_s = 500kHz$ , Auto PFM/PWM mode,  $T_A = 25^\circ C$ , unless otherwise noted.

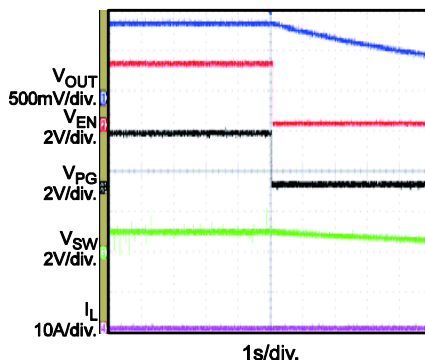
**Start-Up through EN**

$I_{OUT} = 12A$



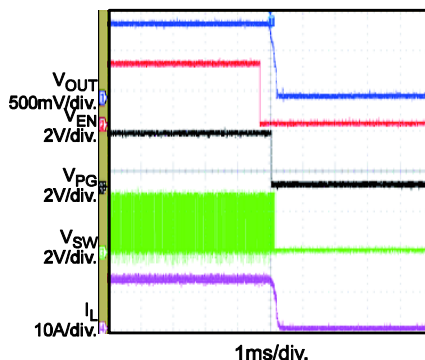
**Shutdown through EN**

$I_{OUT} = 0A$



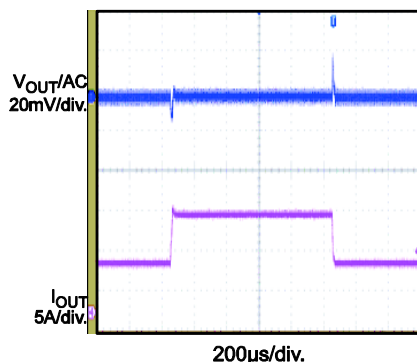
**Shutdown through EN**

$I_{OUT} = 12A$



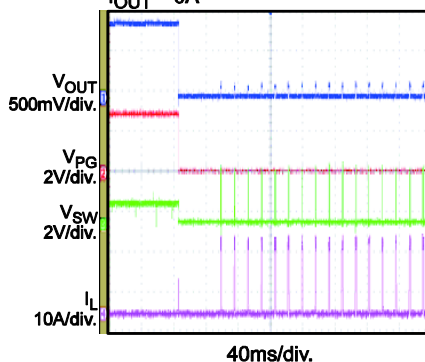
**Load Transient**

$I_{OUT} = 6A-12A$



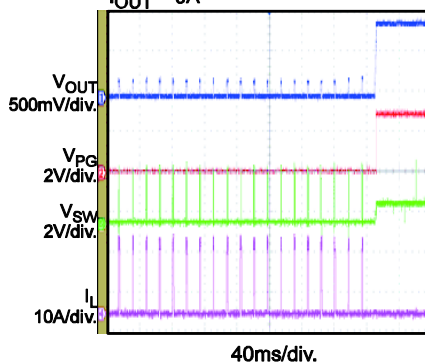
**Short-Circuit Protection Entry**

$I_{OUT} = 0A$



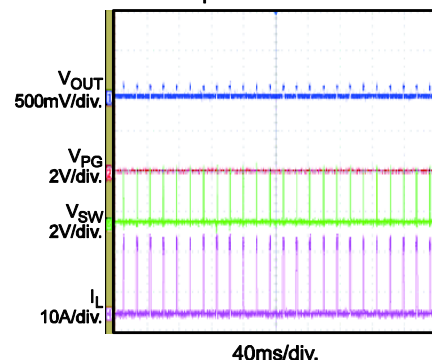
**Short-Circuit Protection Recovery**

$I_{OUT} = 0A$



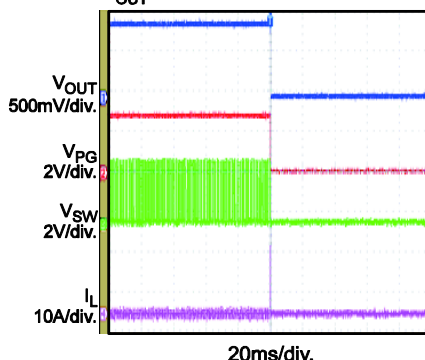
**Short-Circuit Protection Steady State**

Short Output to GND



**Short-Circuit Protection Entry, Latch Off Mode**

$I_{OUT} = 0A$



## PRINTED CIRCUIT BOARD LAYER

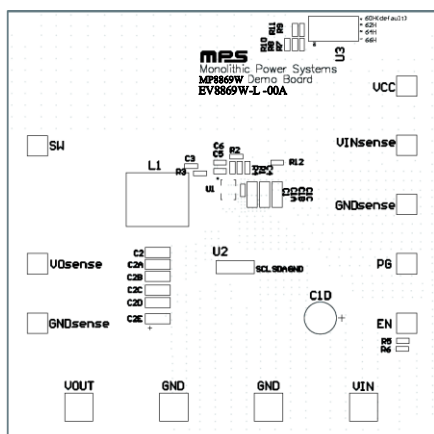


Figure 1: Top Silk Layer

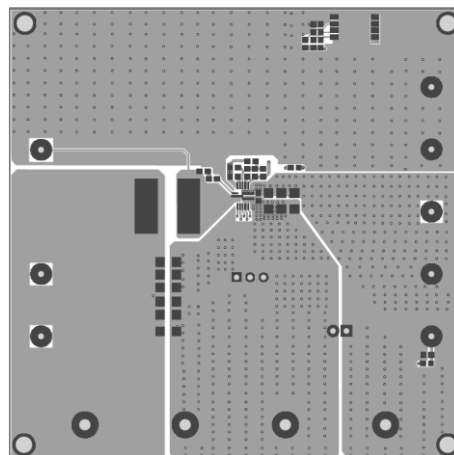


Figure 2: Top Layer

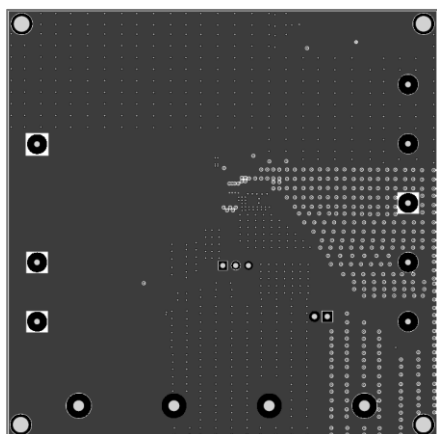


Figure 3: Inner 1 Layer

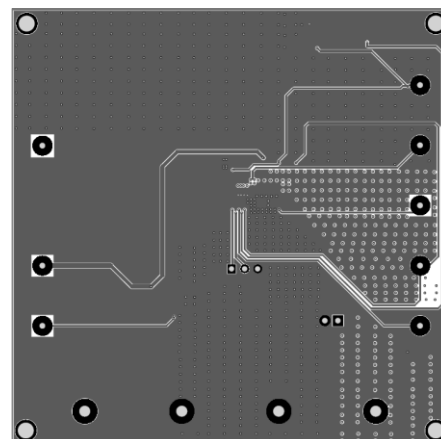


Figure 4: Inner 2 Layer

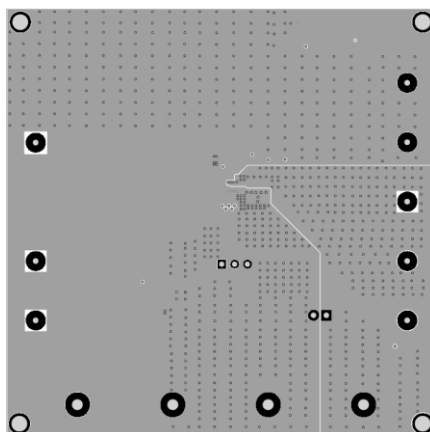


Figure 5: Bottom Layer

## QUICK START GUIDE

1. Connect the positive and negative terminals of the load to the VOUT and GND pins, respectively.
2. Preset the power supply output between 3V and 18V, and then turn off the power supply.
3. Connect the positive and negative terminals of the power supply output to the VIN and GND pins, respectively.
4. Turn the power supply on. The board will automatically start up.
5. To use the Enable function, apply a digital input to the EN pin. Drive EN higher than 1.5V to turn on the regulator, or less than 1.0V to turn it off.
6. To program I<sup>2</sup>C function, connect SCL, SDA and GND to I<sup>2</sup>C start kit board. Connect I<sup>2</sup>C start kit board to computer and run MP8869W GUI software to program MP8869W I<sup>2</sup>C register.

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