EV8861-L-00A

High Efficiency,6A,18V, Synchronous Step-Down Converter with I²C Interface

DESCRIPTION

The EV8861-L-00A is used for demonstrating the performance of MPS's MP8861. MP8861 is a highly integrated and high frequency synchronous step-down switcher with I^2C control interface. It offers a fully integrated solution that achieves 6A of continuous output current with excellent load and line regulation over a wide input supply range.

COT control operation provides fast transient response and eases loop stabilization. In I^2C control loop, the output voltage level can be controlled, on-the fly through an I^2C serial interface. Output voltage range can be adjusted from 0.6V to 1.108V in 4mV steps. Voltage scaling slew rate, enable and power saving mode are also selectable through the I^2C interface. Full protection features include over voltage, over-current protection and thermal shut down.

The MP8861 is available in QFN-14(3mmx4mm) package.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	2.85– 18	V
Output Voltage	V_{OUT}	1	V
Continuous Output Current	I_{OUT}	6	A

FEATURES

- Wide 2.85V-to-18V Operating Input Range
- 6A Continuous Output Current
- 1% Internal Reference Accuracy
- I^2C Programmable Output Range from 0.6V to 1.108V in 4mV Steps with Slew Rate Control
- 5% Accuracy Output Voltage and Output Current Read Back Via I^2C
- Selectable PFM/PWM Mode and Adjustable Frequency & Current Limit Through I^2C
- 4 Different I^2C Address Selectable
- External Soft Start
- Open Drain Power Good Indication
- Output Over Voltage Protection
- Hiccup/Latch off OCP Protection
- QFN-14(3mmx4mm) Package

APPLICATIONS

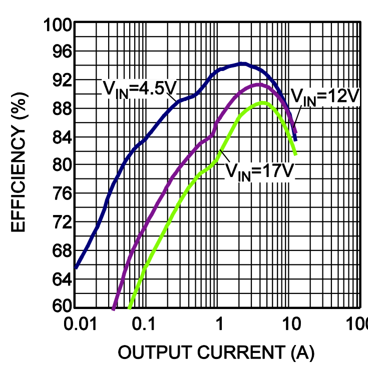
- Solid State Driver (SSD)
- Flat-Panel Television and Monitors
- Digital Set-Top Boxes
- Distributed Power Systems

EV8861-L-00A EVALUATION BOAR

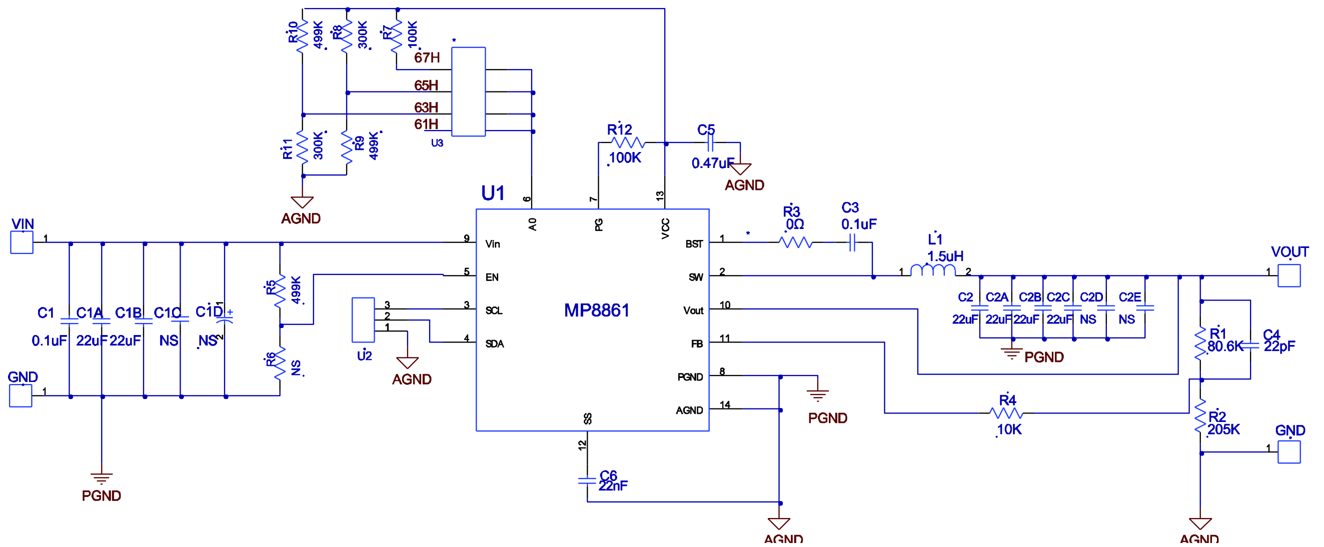
(4 layer PCB, 8.5cmx8.5cm)

Board Number	MPS IC Number
EV8861-L-00A	MP8861GL

Efficiency vs. Output Current
V_{OUT}=1V, L=1.5µH, DCR=2.1mΩ



EVALUATION BOARD SCHEMATIC



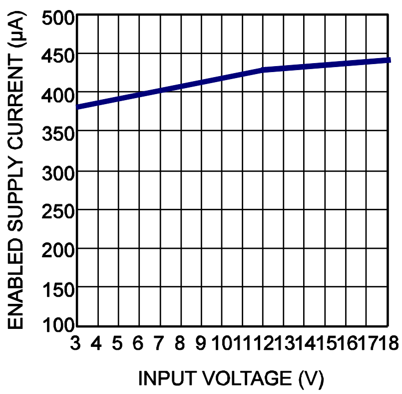
EV8861-L-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	R1	80.6k	Film Res,1%	0603	ROYAL	RC0603FR-0780K6L
1	R2	205k	Film Res,1%	0603	ROYAL	RL0603FR-07205KL
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	Wurth	7443320150
1	U1	MP8861	Step-Down Converter with I2C Interface	QFN14 (3*4)	MPS	MP8861GL
1	U2	Jumper	3 pin jumper	DIP	any	
1	U3	Switch-4	Switch-4	SMD	Wurth	416 131 160 804

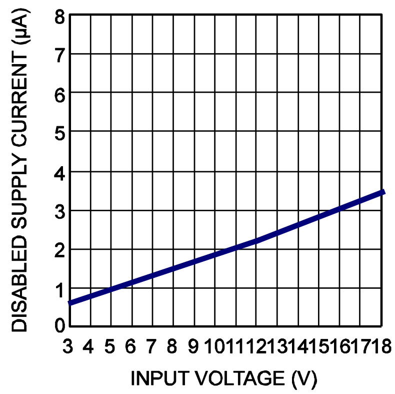
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN} = 12V, V_{OUT} = 1V, L = 1.5µH, F_S = 500kHz, Auto PFM/PWM mode, T_A = 25°C, unless otherwise noted.

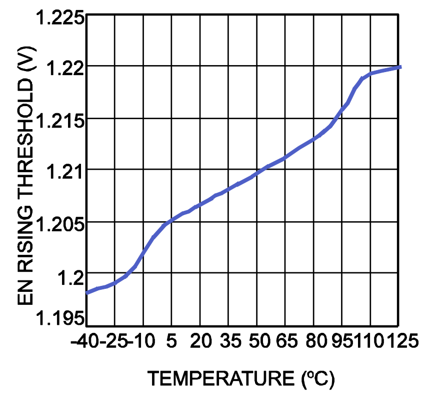
Enabled Supply Current vs. Input Voltage



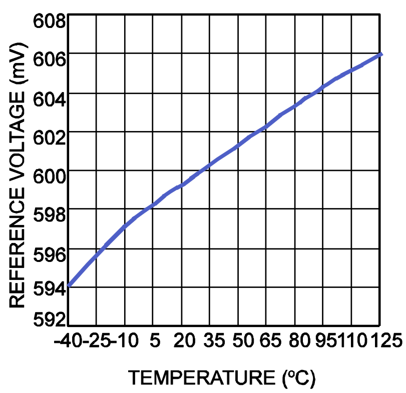
Disabled Supply Current vs. Input Voltage



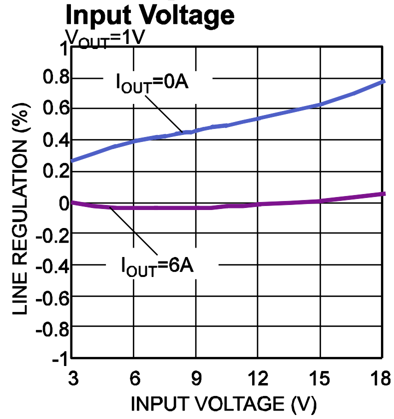
EN Rising Threshold vs. Temperature



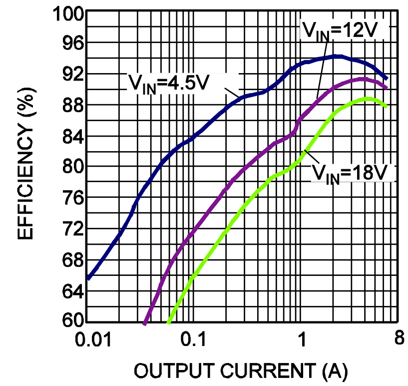
Reference Voltage vs. Temperature



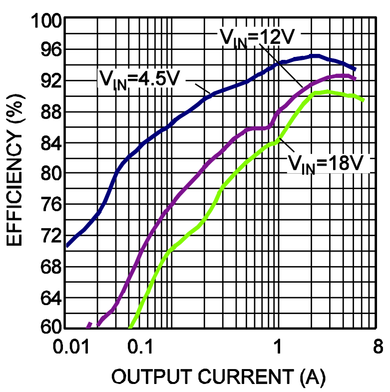
Line Regulation vs. Input Voltage



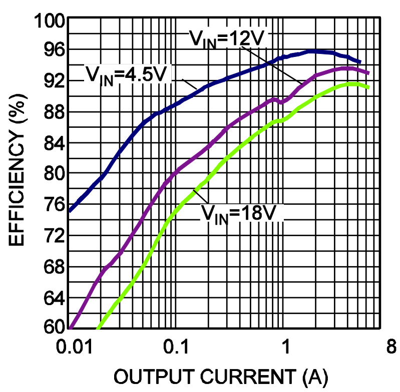
Efficiency vs. Output Current
V_{OUT}=1V, L=1.5µH, DCR=2.1mΩ



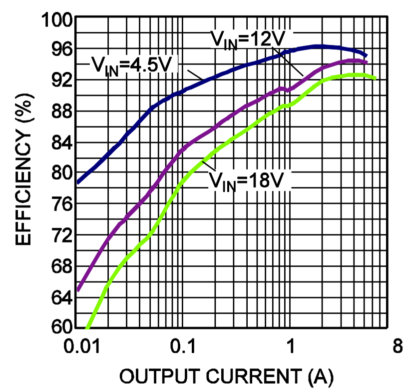
Efficiency vs. Output Current
V_{OUT}=1.2V, L=1.5µH, DCR=2.1mΩ



Efficiency vs. Output Current
V_{OUT}=1.5V, L=1.5µH, DCR=2.1mΩ



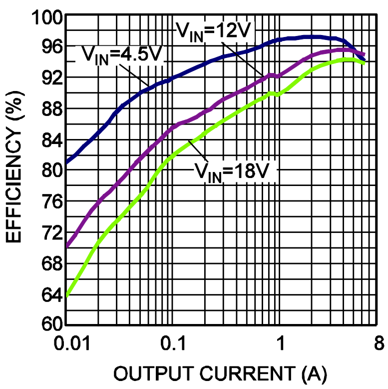
Efficiency vs. Output Current
V_{OUT}=1.8V, L=1.5µH, DCR=2.1mΩ



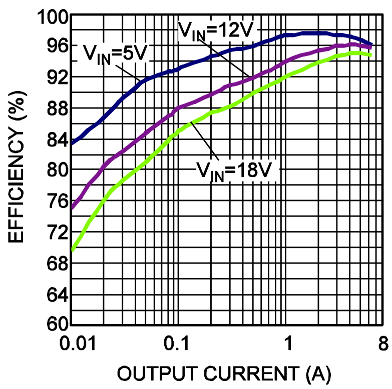
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 12V, V_{OUT} = 1V, L = 1.5µH, F_S = 500kHz, Auto PFM/PWM mode, T_A = 25°C, unless otherwise noted.

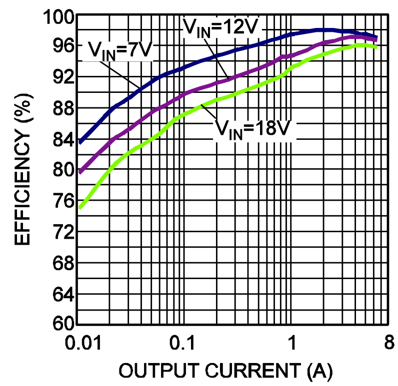
Efficiency vs. Output Current
V_{OUT}=2.5V, L=2.2µH, DCR=3mΩ



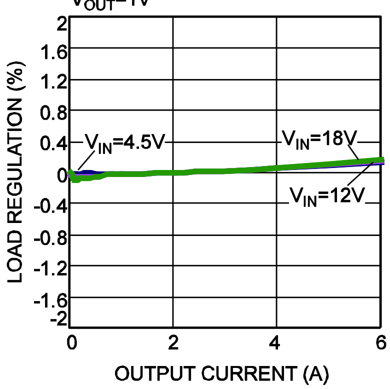
Efficiency vs. Output Current
V_{OUT}=3.3V, L=2.2µH, DCR=3mΩ



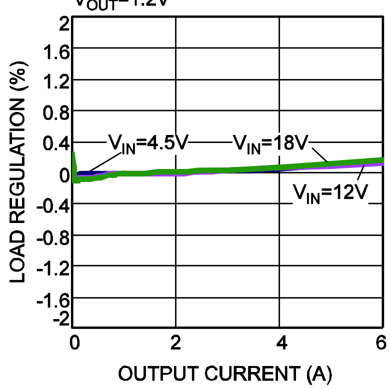
Efficiency vs. Output Current
V_{OUT}=5V, L=3.3µH, DCR=4.4mΩ



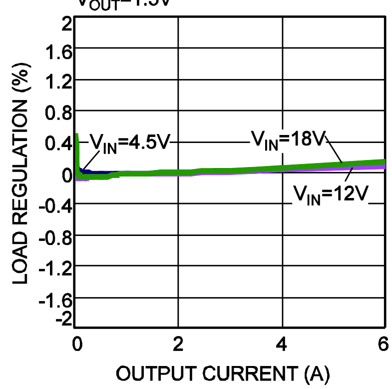
Load Regulation vs. Output Current
V_{OUT}=1V



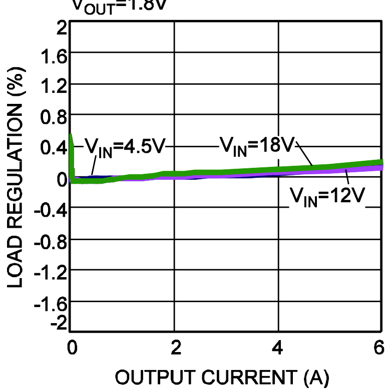
Load Regulation vs. Output Current
V_{OUT}=1.2V



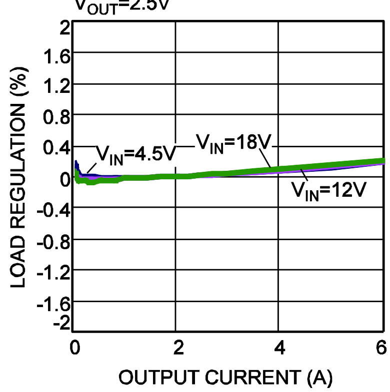
Load Regulation vs. Output Current
V_{OUT}=1.5V



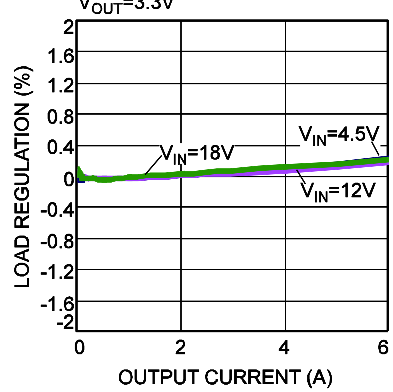
Load Regulation vs. Output Current
V_{OUT}=1.8V



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

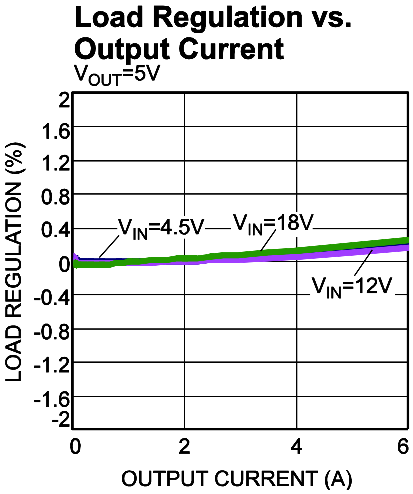


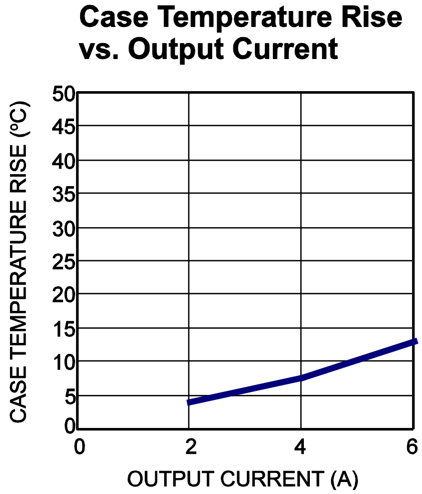
Load Regulation vs. Output Current
V_{OUT}=3.3V



EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 12V, V_{OUT} = 1V, L = 1.5µH, F_S = 500kHz, Auto PFM/PWM mode, T_A = 25°C, unless otherwise noted.

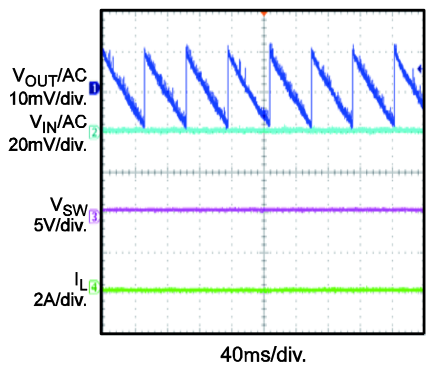




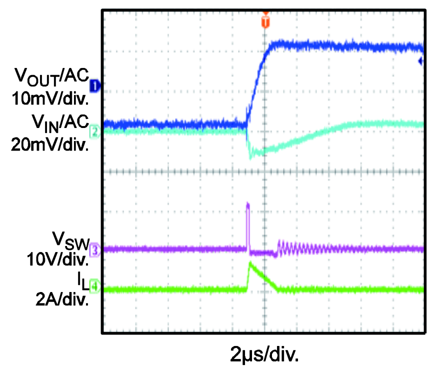
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 12V, V_{OUT} = 1V, L = 1.5μH, F_S = 500kHz, Auto PFM/PWM mode, T_A = 25°C, unless otherwise noted.

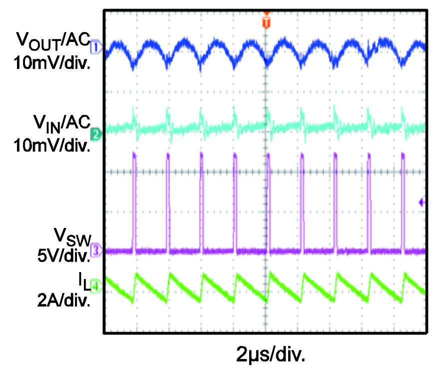
Input/Output Ripple
I_{OUT} = 0A



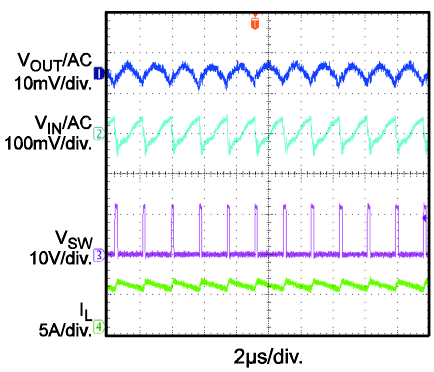
Input/Output Ripple
I_{OUT} = 0A



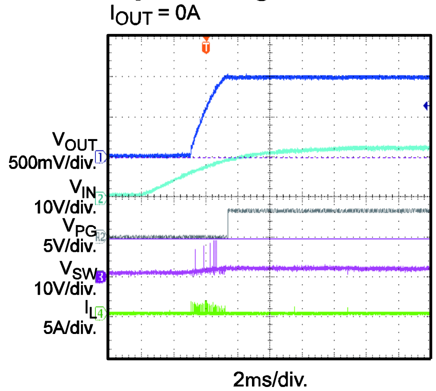
Input/Output Ripple
I_{OUT} = 0A, Forced PWM Mode



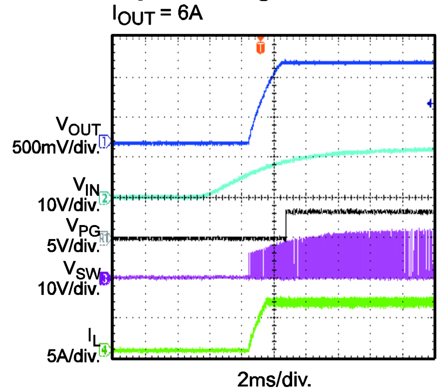
Input/Output Ripple
I_{OUT} = 6A



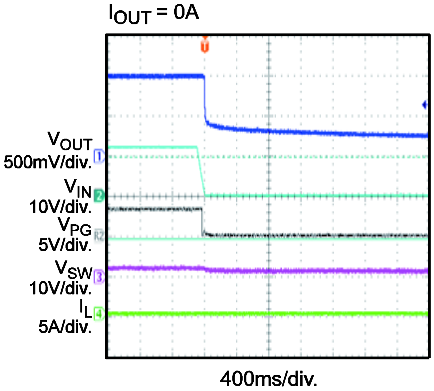
Start-Up through Input Voltage
I_{OUT} = 0A



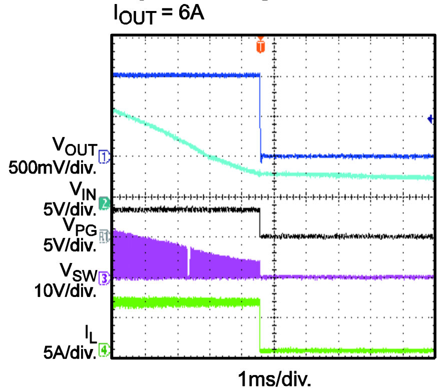
Start-Up through Input Voltage
I_{OUT} = 6A



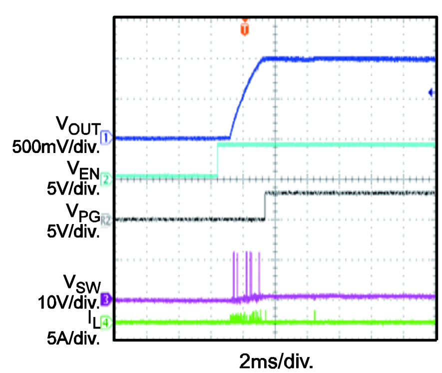
Shutdown through Input Voltage
I_{OUT} = 0A



Shutdown through Input Voltage
I_{OUT} = 6A



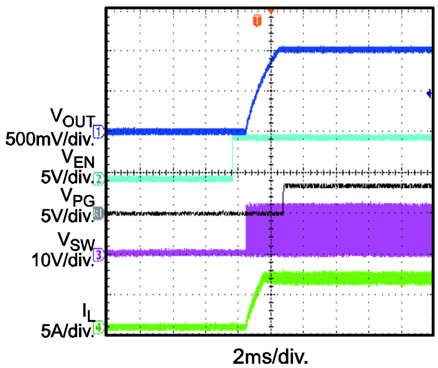
Start-Up through EN
I_{OUT} = 0A



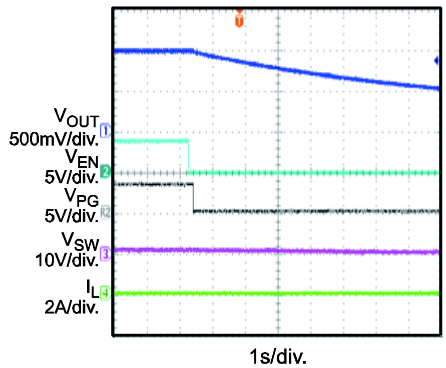
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN} = 12V, V_{OUT} = 1V, L = 1.5µH, F_S = 500kHz, Auto PFM/PWM mode, T_A = 25°C, unless otherwise noted.

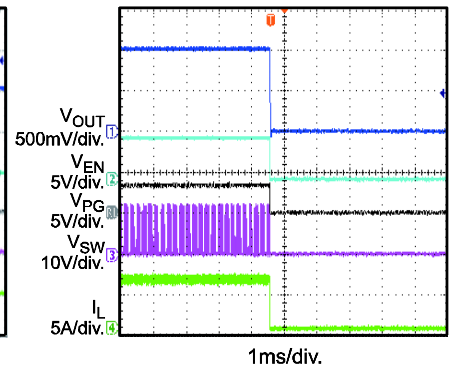
Start-Up through EN
I_{OUT} = 6A



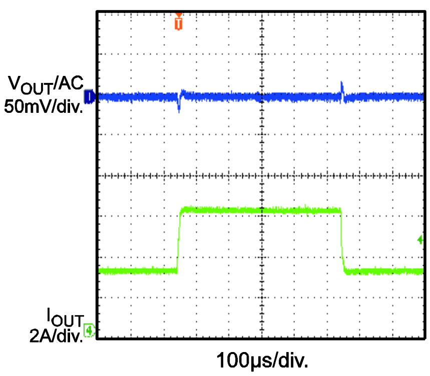
Shutdown through EN
I_{OUT} = 0A



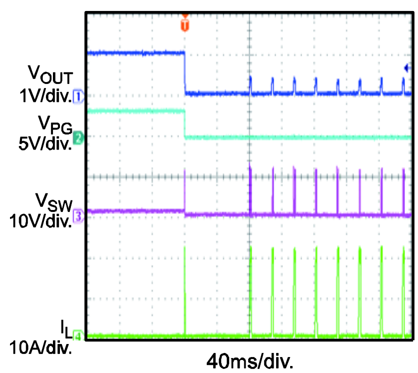
Shutdown through EN
I_{OUT} = 6A



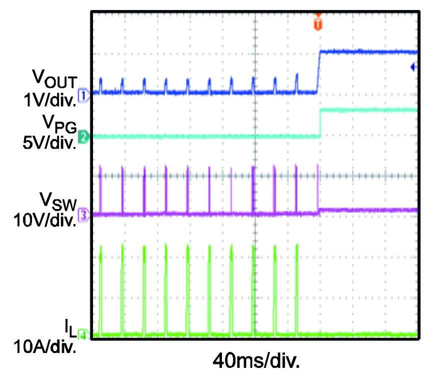
Load Transient
I_{OUT} = 3A-6A



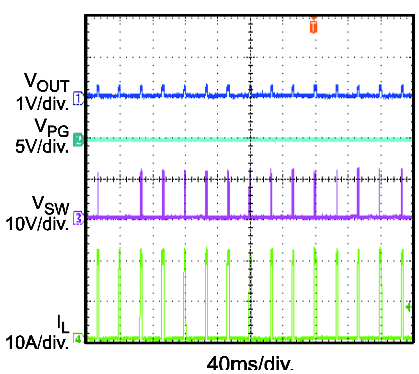
Short-Circuit Protection Entry
I_{OUT} = 0A



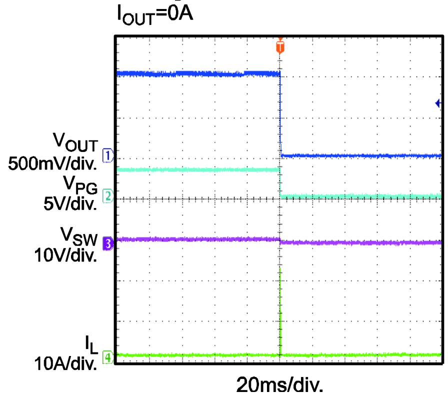
Short-Circuit Protection Recovery
I_{OUT} = 0A



Short-Circuit Protection Steady State
Short Output to GND



Short-Circuit Protection Entry, Latch Off Mode
I_{OUT}=0A



PRINTED CIRCUIT BOARD LAYER

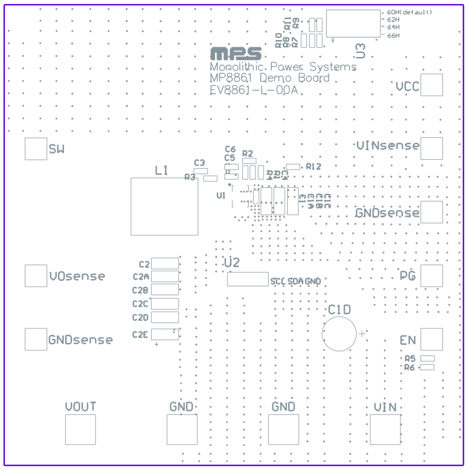


Figure 1: Top Silk Layer

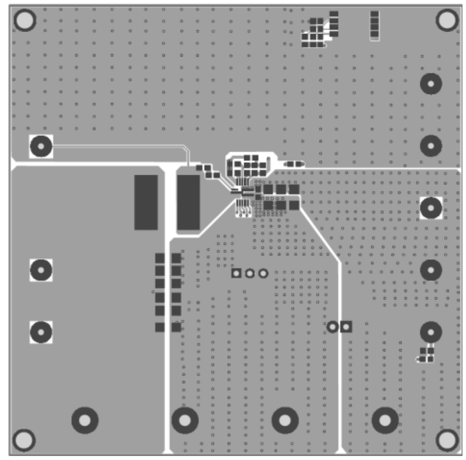


Figure 2: Top Layer

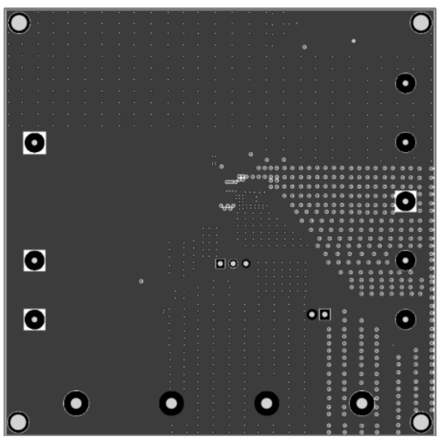


Figure 3: Inner 1 Layer

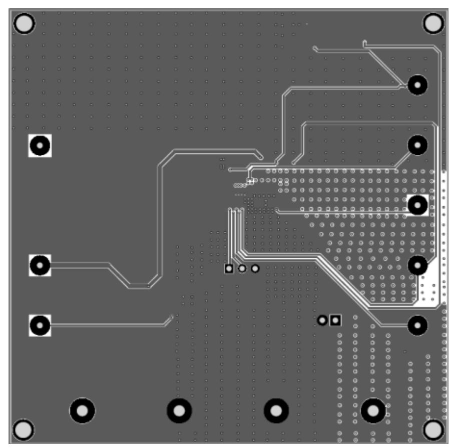


Figure 4: Inner 2 Layer

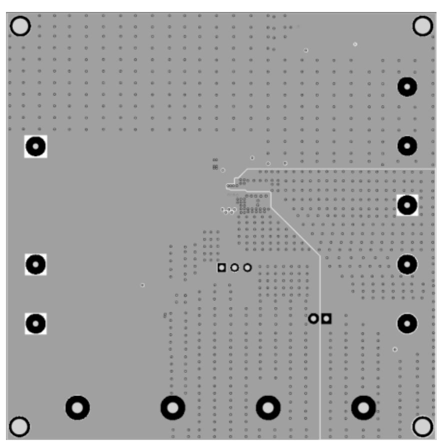


Figure 5: Bottom Layer

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 2.85V 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 1.3V to turn on the regulator, or less than 0.99V to turn it off.
6. To program I^2C function, connect SCL, SDA and GND to I^2C start kit board. Connect I^2C start kit board to computer and run MP8861 GUI software to program MP8861 I^2C register.