EVM3840-QV-00A

High Efficiency, 4A, 5.5V, 1.2MHz Synchronous Step-Down Converter with Integrated Inductor Evaluation Board

The Future of Analog IC Technology

DESCRIPTION

The MPM3840 is a monolithic step-down converter with built-in internal power MOSFETs and inductor. The DC-DC module is housed in a small surface QFN package which is sized 3mm width by 5mm length by 1.6mm height. It can provide 4A continuous output current from a 2.8V to 5.5V input voltage with excellent load and line regulation. The MPM3840 is ideal for powering portable equipment that runs with a single cell Lithium-Ion (Li+) Battery. The output voltage can be regulated as low as 0.6V. Only input, output capacitors and FB resistors are needed to complete the design.

The Constant-On-time (COT) control scheme provides fast transient response high light-load efficiency and easy loop stabilization. Fault condition protection includes cycle-by-cycle current limit and thermal shutdown.

The MPM3840 requires a minimum number of readily available standard external components and is available in an ultra-small QFN-20 (3mmx5mm) package.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	2.8– 5.5	V
Output Voltage	V_{OUT}	1.2	V
Output Current	I_{OUT}	4	A

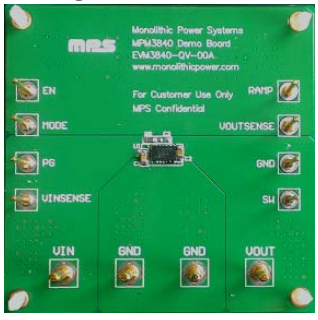
FEATURES

- Above 80% Light Load Efficiency
- Low IQ: 40μA
- Wide 2.8V to 5.5V Operating Input Range
- Output Voltage as Low as 0.6V
- 100% Duty Cycle in Dropout
- 4A Output Current
- 25mΩ and 12mΩ Internal Power MOSFET
- 1.2MHz Frequency
- EN and Power Good for Power Sequencing
- Available in a QFN-20 (3mmx5mmx1.6mm)
- Cycle-by-Cycle Over Current Protection
- 1.5ms Internal SS Time with Pre-Bias Startup
- Short Circuit Protection with Hiccup Mode
- Thermal Shutdown
- Stable with Low ESR Output Ceramic Capacitors

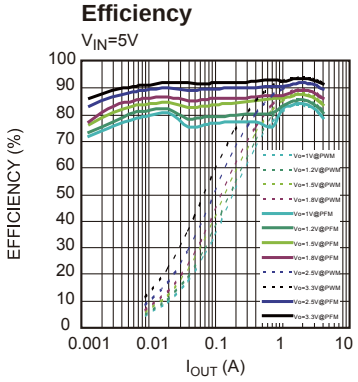
APPLICATIONS

- Wireless Card
- Smart Phone
- Noise Sensitive Application
- Low Voltage I/O System Power

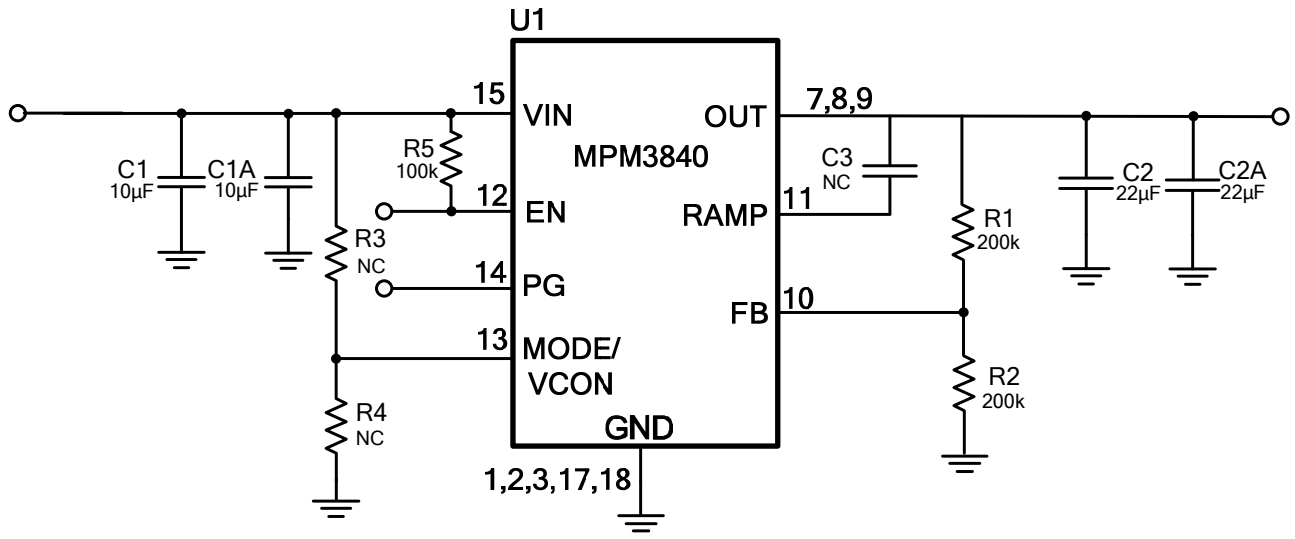
EVM3840-QV-00A EVALUATION BOARD



Board Number	MPS IC Number
EVM3840-QV-00A	MPM3840GQV



EVALUATION BOARD SCHEMATIC



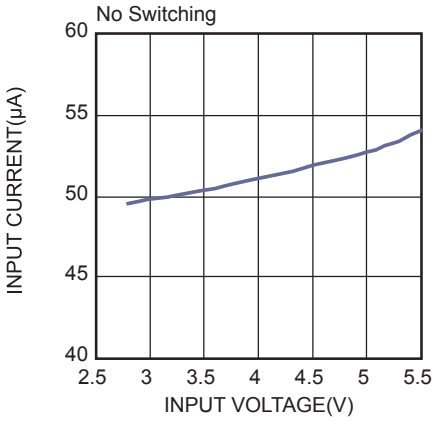
EVM3840-QV-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
2	R1, R2	200kΩ	Film Res,1%	0603	ROYAL	RL0603FR-07200K5L
0	R3,R4,C3	NC				
1	R5	100k	Film Res,1%	0603	ROYAL	RL0603FR-07100KL
2	C2A,C2	22µF	Ceramic Cap,10V,X5R	0805	muRata	GRM21BR61A226ME51L
2	C1,C1A	10µF	Ceramic Cap,10V,X5R	0805	muRata	GRM21BR61A106ME51L

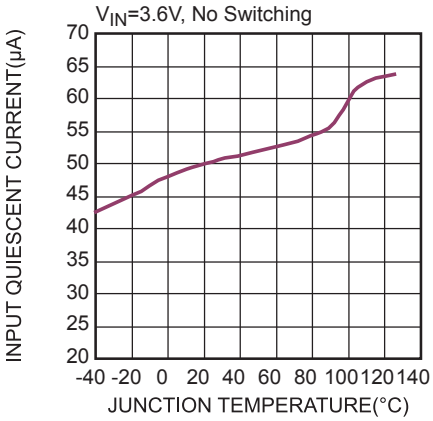
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.
V_{IN}=5V, V_{OUT}=1.2V, T_A = 25°C, unless otherwise noted.

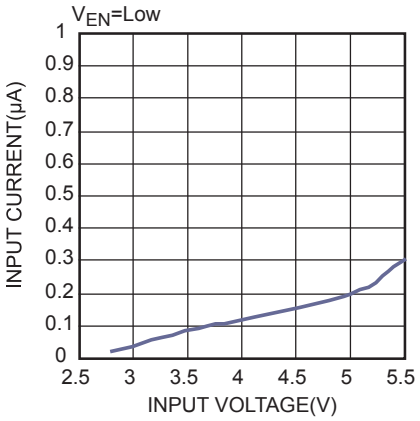
Quiescent Current vs. Input Voltage



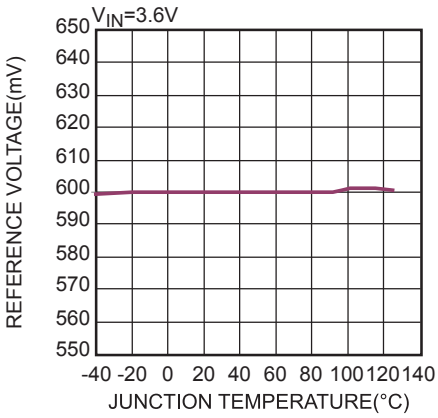
Quiescent Current vs. Temperature



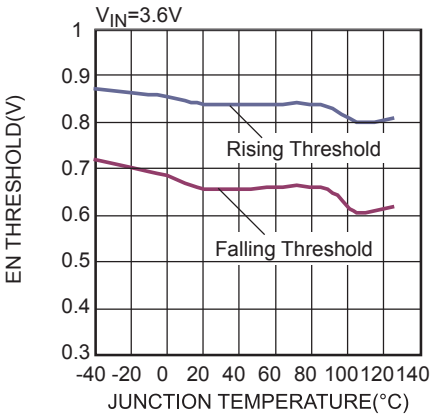
Shutdown Current vs. Input Voltage



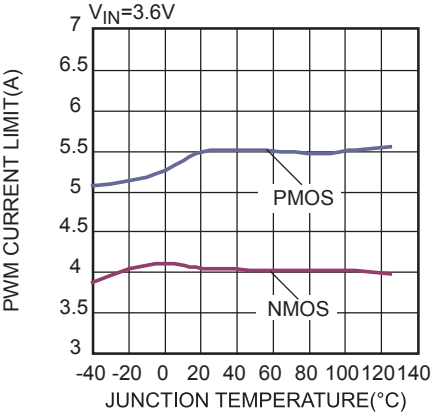
Reference Voltage vs. Temperature



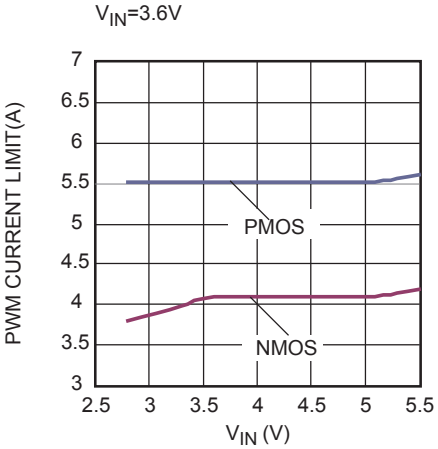
EN Threshold vs. Temperature



Current Limit vs. Temperature



Current Limit vs. VIN

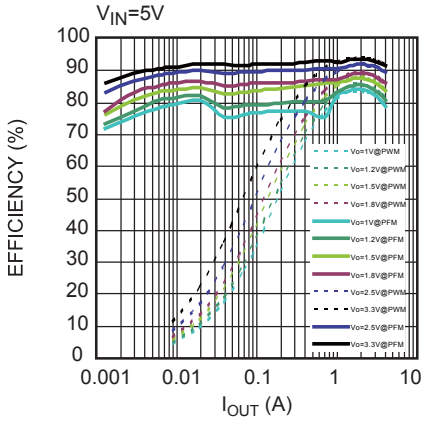


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=5V, V_{OUT}=1.2V, T_A = 25°C, unless otherwise noted.

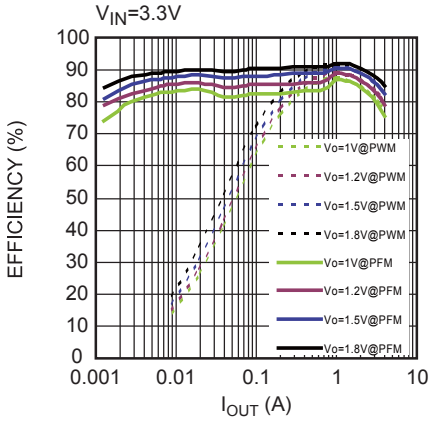
Efficiency

V_{IN}=5V

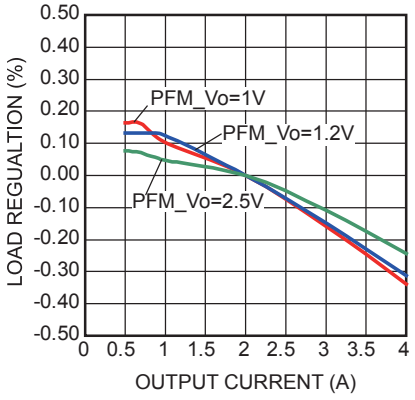


Efficiency

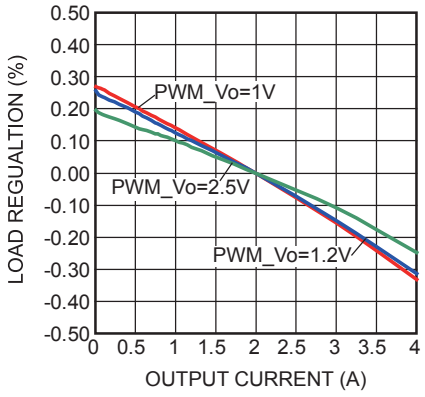
V_{IN}=3.3V



Load Regulation

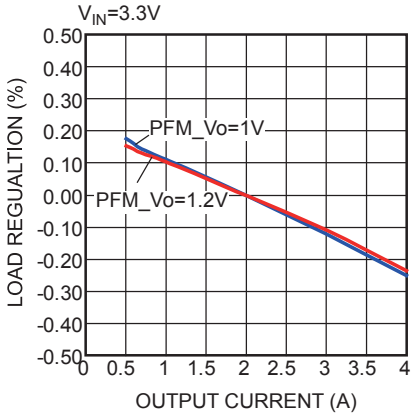


Load Regulation



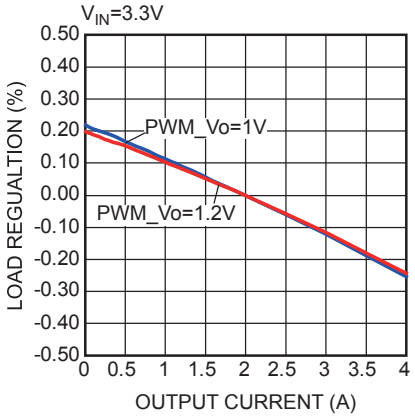
Load Regulation

V_{IN}=3.3V

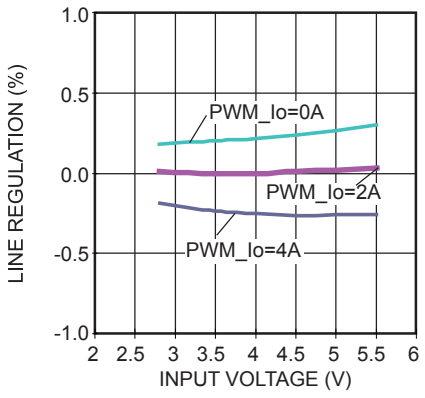


Load Regulation

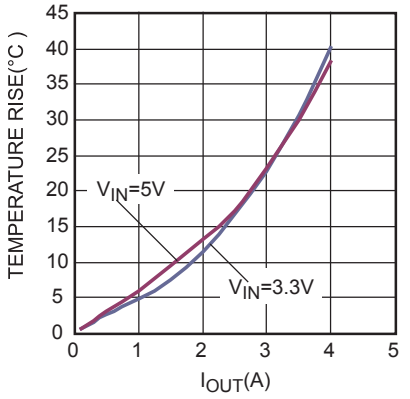
V_{IN}=3.3V



Line Regulation

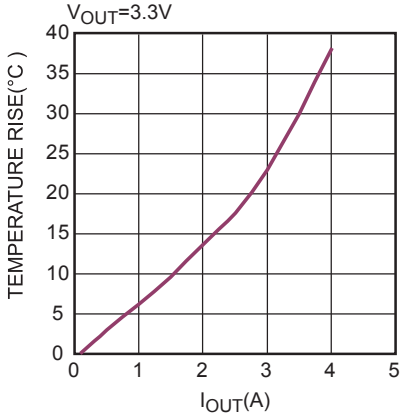


Case Temperature Rise



Case Temperature Rise

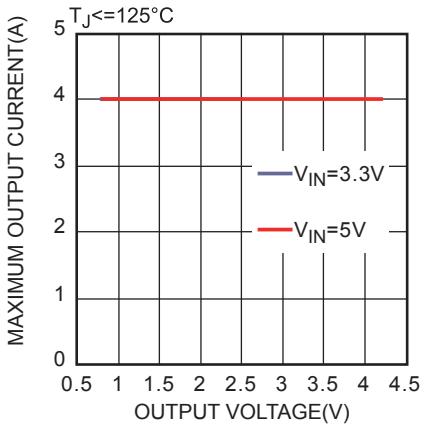
V_{OUT}=3.3V



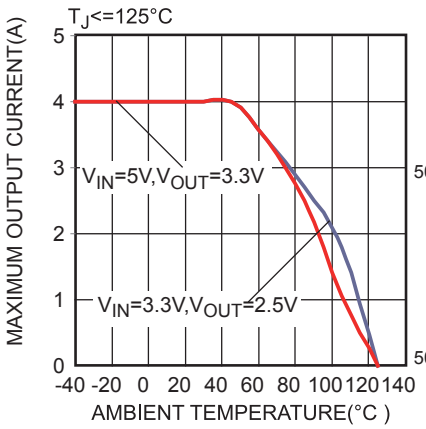
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=5V, V_{OUT}=1.2V, T_A = 25°C, unless otherwise noted.

Output Current Derating vs. Output Voltage

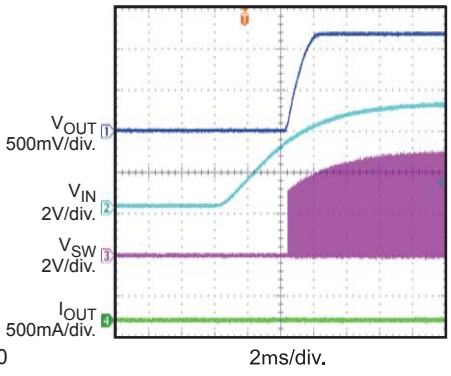


Output Current Derating vs. Ambient Temperature



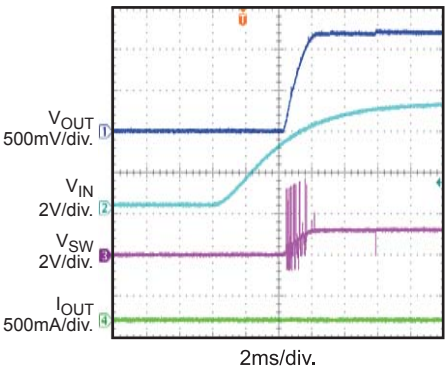
Power On

I_{OUT}=0A, PWM Mode



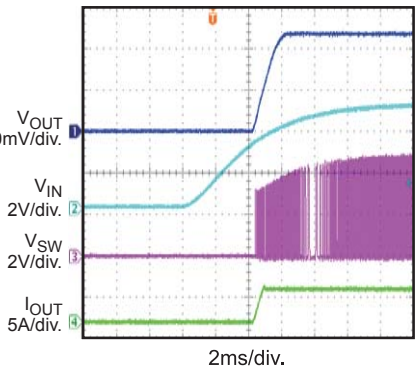
Power On

I_{OUT}=0A, PFM Mode



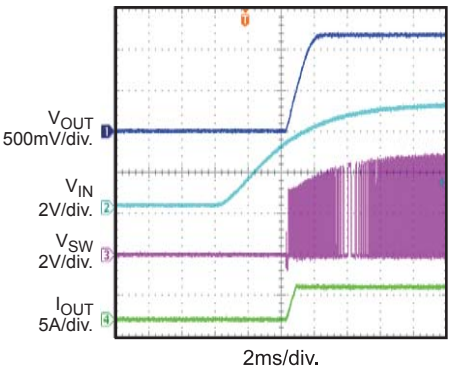
Power On

I_{OUT}=4A, PWM Mode



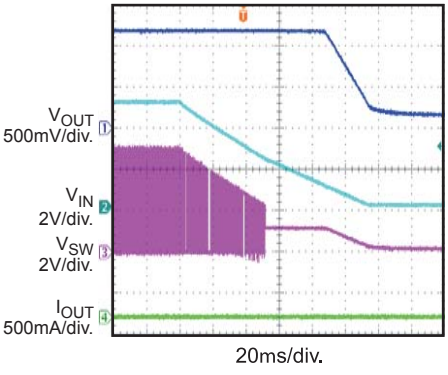
Power On

I_{OUT}=4A, PFM Mode



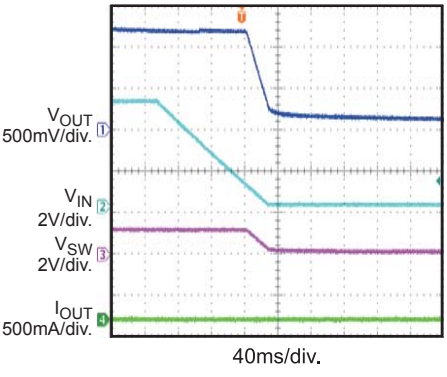
Power Off

I_{OUT}=0A, PWM Mode



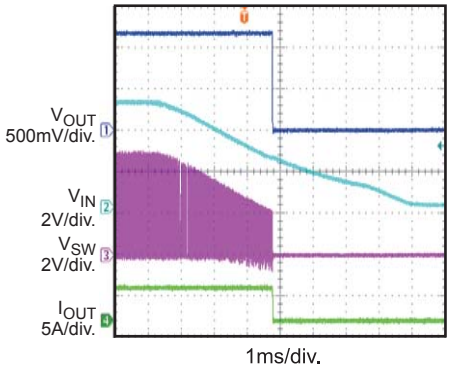
Power Off

I_{OUT}=0A, PFM Mode



Power Off

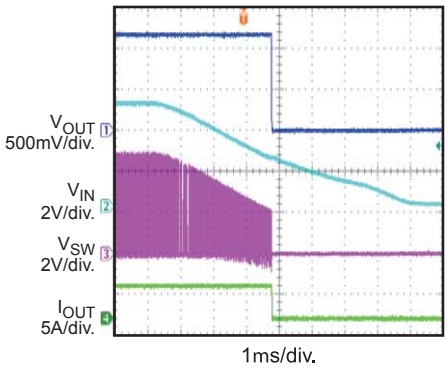
I_{OUT}=4A, PWM Mode



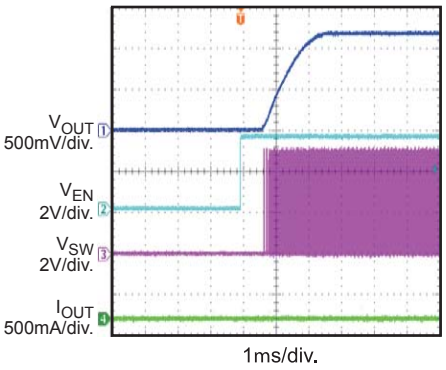
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=5V, V_{OUT}=1.2V, T_A = 25°C, unless otherwise noted.

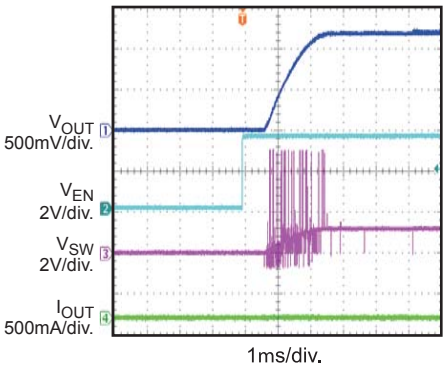
Power Off
I_{OUT}=4A, PFM Mode



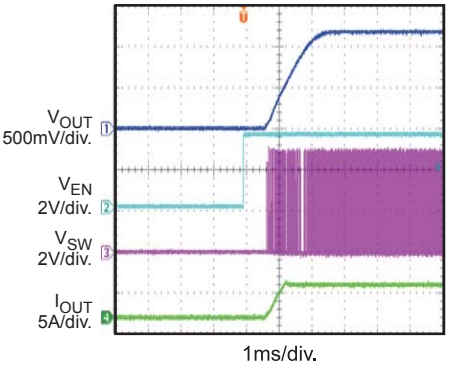
Enable Turn-On
I_{OUT}=0A, PWM Mode



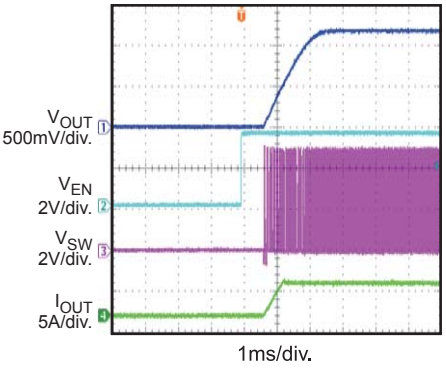
Enable Turn-On
I_{OUT}=0A, PFM Mode



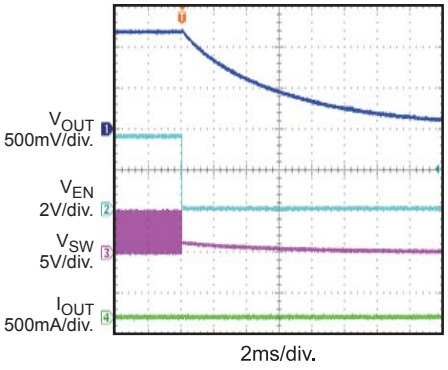
Enable Turn-On
I_{OUT}=4A, PWM Mode



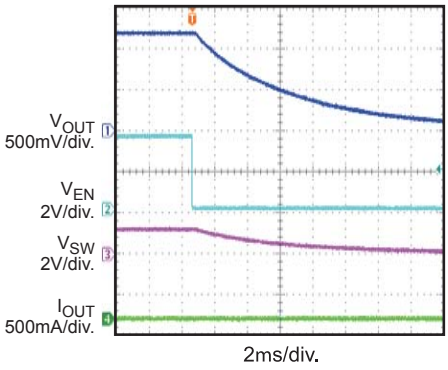
Enable Turn-On
I_{OUT}=4A, PFM Mode



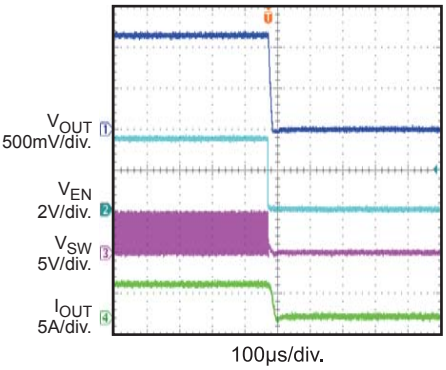
Enable Turn-Off
I_{OUT}=0A, PWM Mode



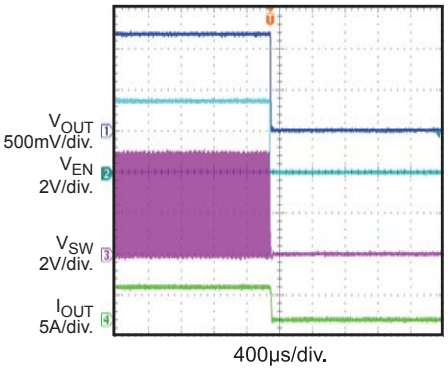
Enable Turn-Off
I_{OUT}=0A, PFM Mode



Enable Turn-Off
I_{OUT}=4A, PWM Mode



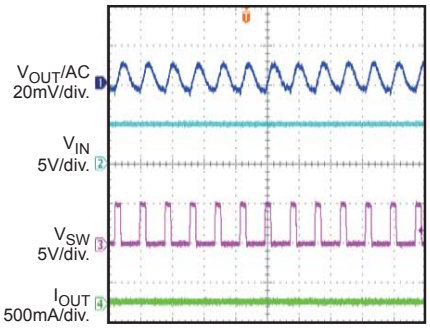
Enable Turn-Off
I_{OUT}=4A, PFM Mode



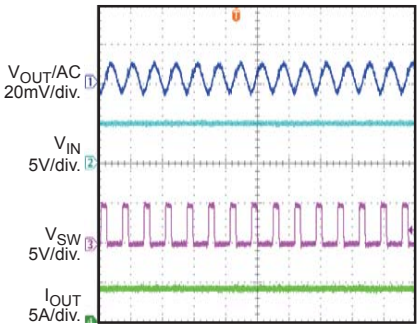
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=5V, V_{OUT}=1.2V, T_A = 25°C, unless otherwise noted.

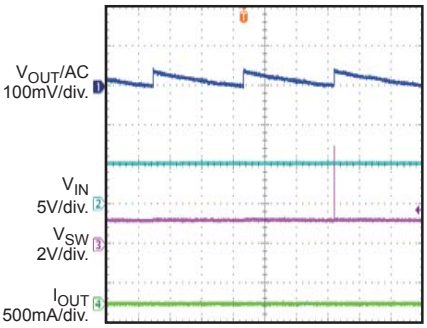
Steady State
I_{OUT}=0A, PWM Mode



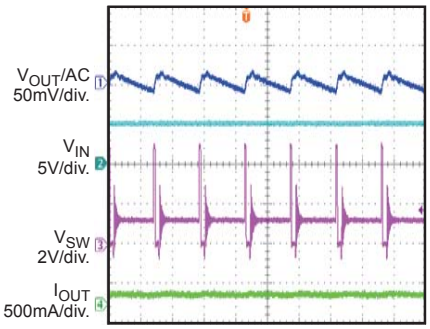
Steady State
I_{OUT}=4A, PWM/PFM Mode



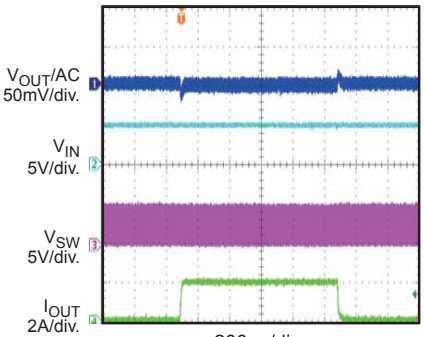
Steady State
I_{OUT}=0A, PFM Mode



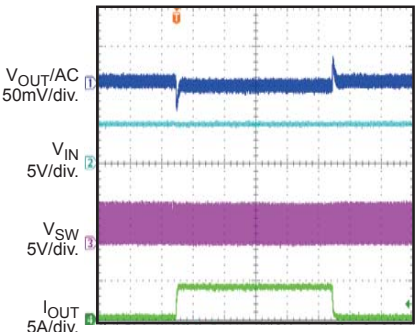
Steady State
I_{OUT}=0.1A, PFM Mode



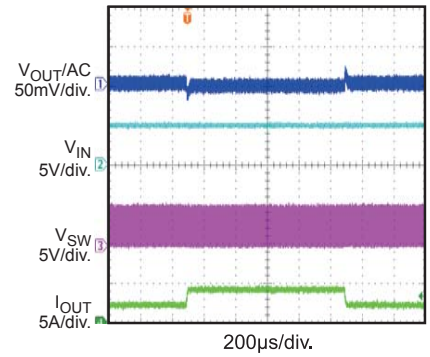
Response to Transient Load
I_{OUT}=0 to 2A, PWM Mode



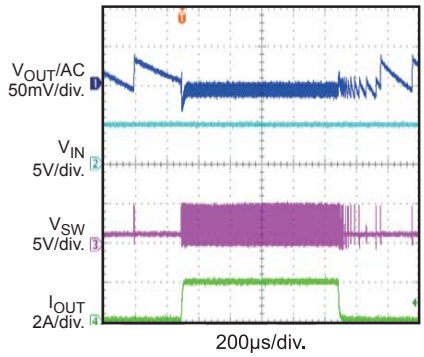
Response to Transient Load
I_{OUT}=0 to 4A, PWM Mode



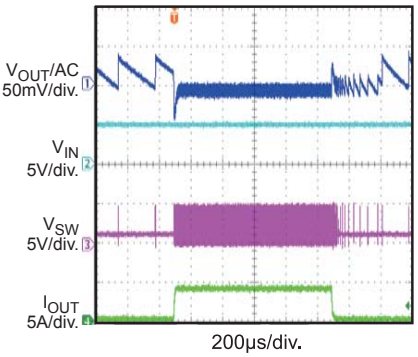
Response to Transient Load
I_{OUT}=2A to 4A, PWM/PFM Mode



Response to Transient Load
I_{OUT}=0 to 2A, PFM Mode



Response to Transient Load
I_{OUT}=0 to 4A, PFM Mode

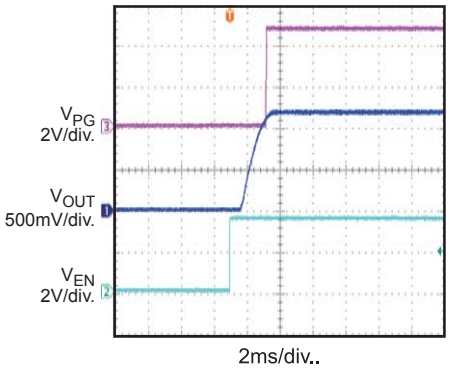


EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.
V_{IN}=5V, V_{OUT}=1.2V, T_A = 25°C, unless otherwise noted.

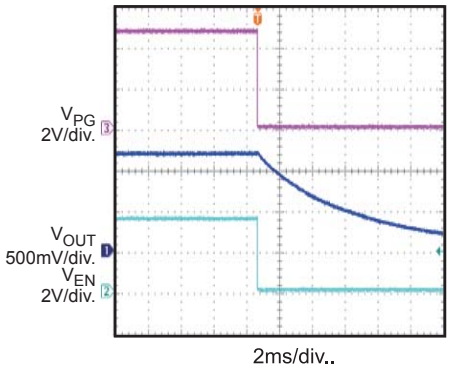
Power Good

I_{OUT}=0A



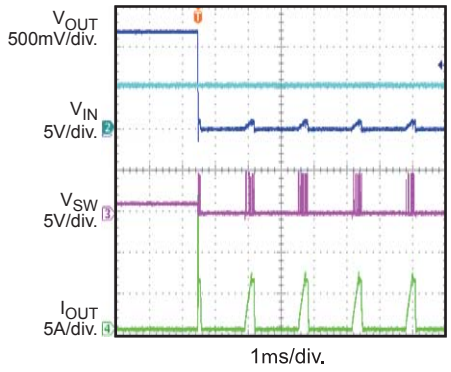
Power Bad

I_{OUT}=0A



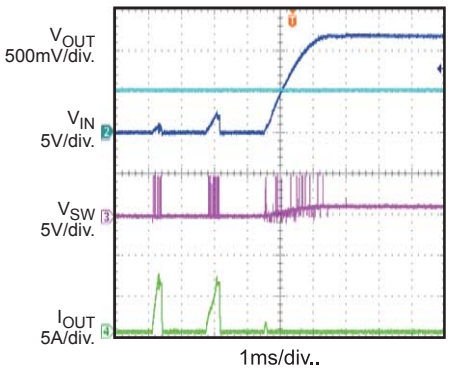
Output Short Entry

I_{OUT}=0A, PFM Mode



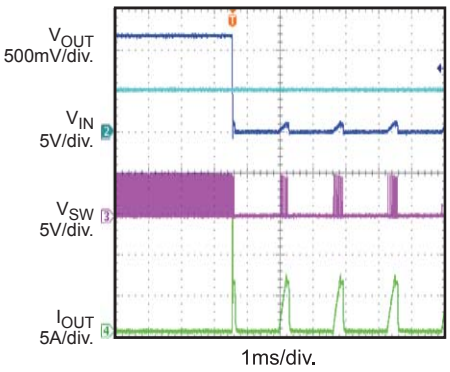
Output Short Recovery

I_{OUT}=0A, PFM Mode



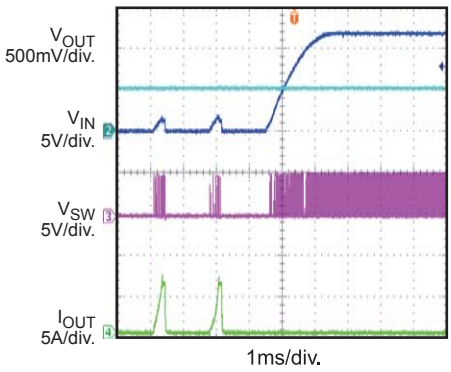
Output Short Entry

I_{OUT}=0A, PWM Mode



Output Short Recovery

I_{OUT}=0A, PWM Mode



PRINTED CIRCUIT BOARD LAYER

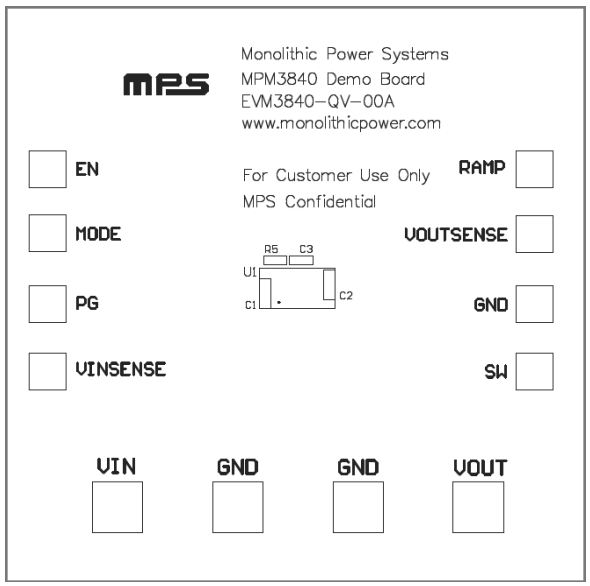


Figure 1: Top Silk Layer

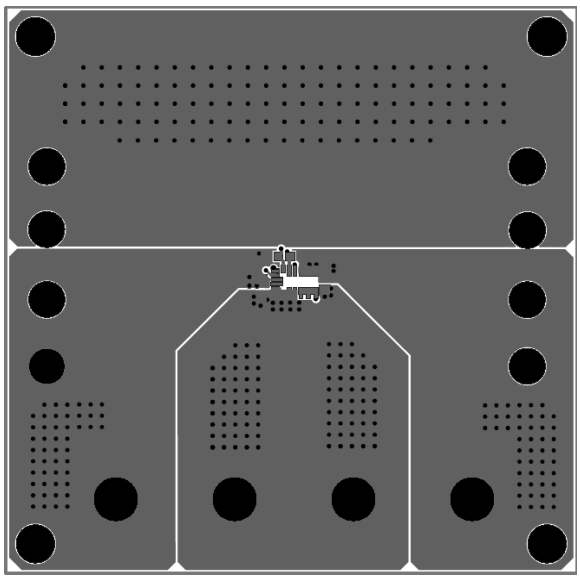


Figure 2: Top Layer

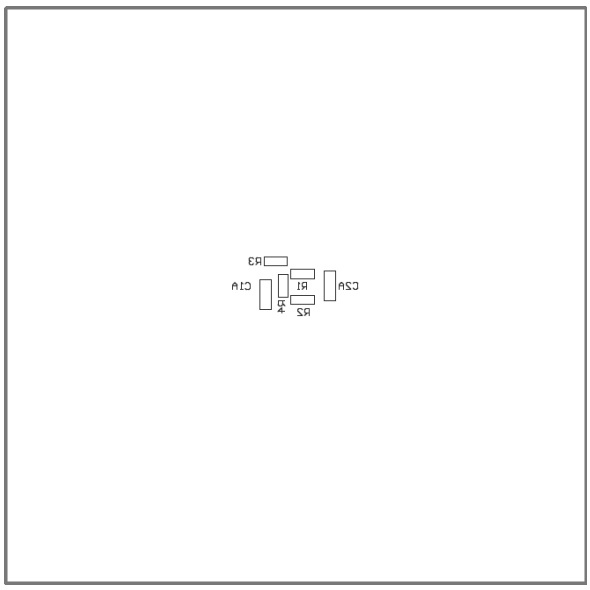


Figure 3: Bottom Silk Layer

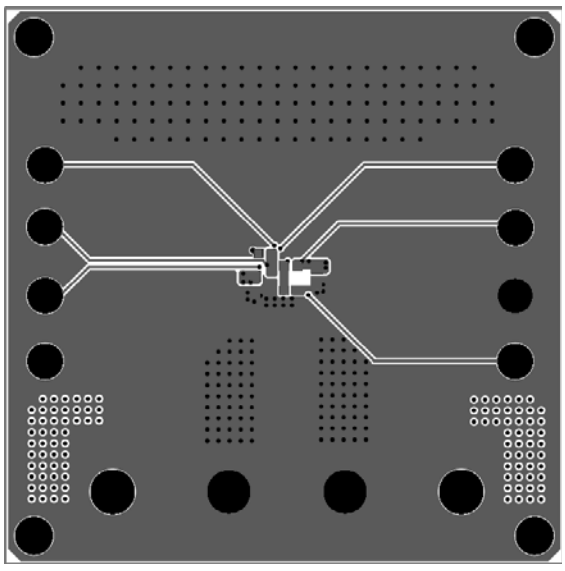


Figure 4: Bottom Layer

QUICK START GUIDE

The output voltage of this board is set externally which can be regulated as low as 0.6V by operating from +2.8V to +5.5V input. The default output voltage of this board is set to 1.2V.

1. Connect the positive and negative terminals of the load to the VOUT and GND pins, respectively.
2. Preset the power supply output between 2.8V and 5.5V, 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.