EV8883-Q-00A

High-Efficiency, 45V, 3A, Digital Calibrated Synchronous Step-Down Converter

The Future of Analog IC Technology

DESCRIPTION

The EV8883-Q-00A Evaluation Board is designed to demonstrate the capabilities of MPS' MPQ8883. MPQ8883 is a high-frequency synchronous rectified, step-down converter with I²C control interface and a multipage one-time programmable memory. It can achieve up to 3A continuous output current with excellent load and line regulation over a wide input supply range.

The MPQ8883 integrates internal high-side and low-side power MOSFETs for high efficiency without an external Schottky diode and is available in a 16-pin QFN3x3 package. With internal compensation and feedback divider, the MPQ8883 can offer a very compact solution with a minimum number of readily available standard external components.

The MPQ8883 is designed to be very versatile. The output voltage level can be adjusted from 0.6V to 12V, on the fly through an I²C serial interface. Voltage slew rate, switching frequency, enable and power savings mode are also programmable via the I²C interface.

FEATURES

- Wide 3.5V to 45V Operation Input Range
- 3A Continuous Output Current
- High Efficiency Synchronous Mode Control
- Internal 80mΩ/40mΩ Low $R_{DS(ON)}$ MOSFETs
- Power Good and Fault Indications
- OVP, OCP and OTP
- Internal Soft-Start
- Programmable Address by Resistor
- Programmability via I²C Interface
- Multipage One-Time Programmable Memory for Permanent Storage
- Available in 16-pin QFN3x3 Package

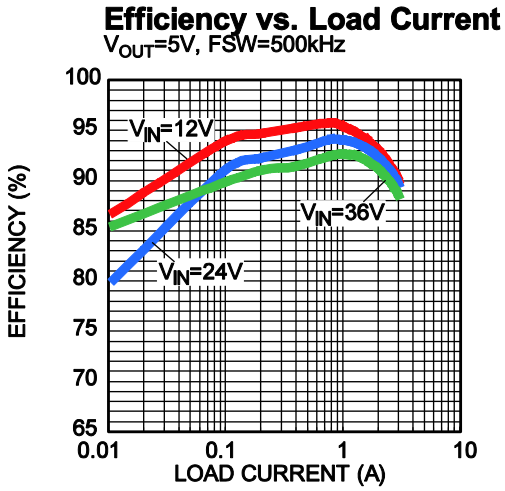
APPLICATIONS

- Industrial Power Systems
- Automotive Power Systems
- Telecommunication Systems

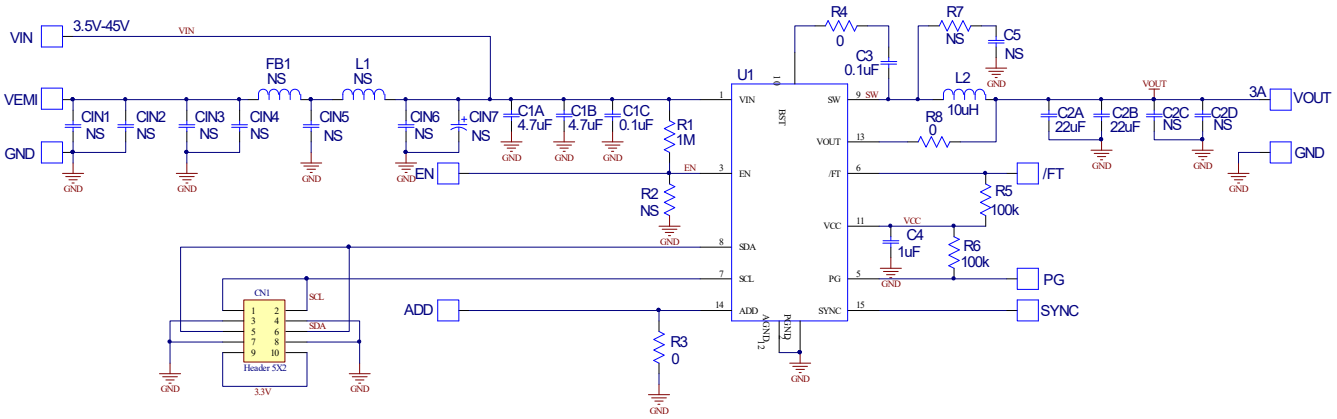
EV8883-Q-00A EVALUATION BOA

(L x W x H) 63.7mm x 63.7mm x 6.4mm

Board Number	MPS IC Number
EV8883-Q-00A	MPQ8883



EVALUATION BOARD SCHEMATIC



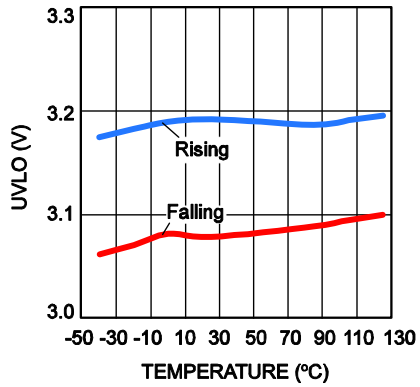
EV8883-Q-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
2	C1A, C1B	4.7μF	Ceramic Capacitor; 100V;X7S	1210	TDK	C3225X7S2A475K
1	C1C	0.1μF	Ceramic Capacitor; 100V;X7R	0603	muRata	GRM188R72A104KA35D
2	C2A,C2B	22μF	Ceramic Capacitor; 16V;X7R	1210	muRata	GRM32ER71C226KEA8L
1	C3	0.1μF	Ceramic Capacitor; 16V;X7R	0603	muRata	GRM188R71C104KA01D
1	C4	1μF	Ceramic Capacitor; 25V;X7R	0603	muRata	GRM188R71E105KA12D
10	CIN1-CIN7, C2C, C2D, C5	NS				
1	FB1	NS				
1	L1	NS				
1	L2	10μH	Inductor;7.6A; 27mohm DCR	SMD	Coilcraft	XAL6060-103MEB
1	R1	1M	Film Resistor,1%;	0603	Yageo	RC0603FR-071ML
3	R3, R4, R8	0	Film Resistor;1%;	0603	Yageo	RC0603FR-070RL
2	R5, R6	100K	Film Resistor;1%;	0603	Yageo	RC0603FR-07100KL
2	R2, R7	NS				
1	U1		Synchronous Step-Down Converter	QFN15(3*3)	MPS	MPQ8883GQ-R3
1	CN1		2*5 2.54mm 带边框插座 直针		Any	61201021621
4	VIN, GND, VOUT, GND		2.0 Golden Pin		Any	
6	EN, PG, GND, /FT, SYNC, GND,		1.0 Golden Pin		Any	
2	VEMI, ADD	NS				

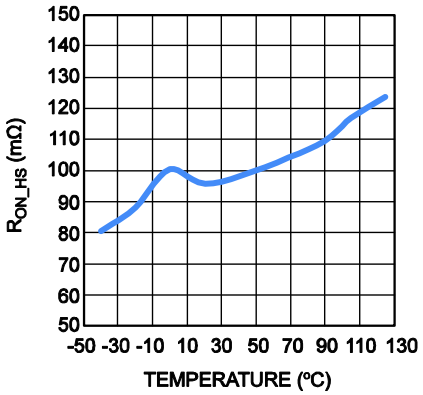
EVB TEST RESULTS

V_{IN} = 12V, V_{OUT}=3.3V, L=10µH, F_{SW}=500kHz, AAM mode, T_A = +25°C, unless otherwise noted.

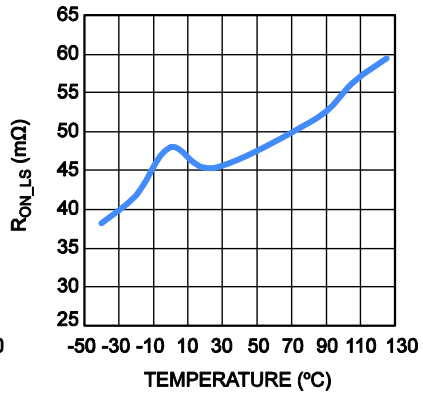
VIN UVLO Threshold vs. Temperature



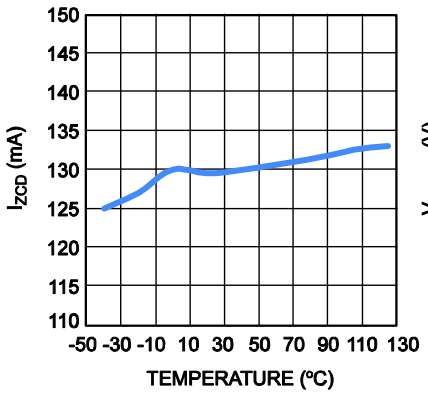
HS-FET On Resistance vs. Temperature



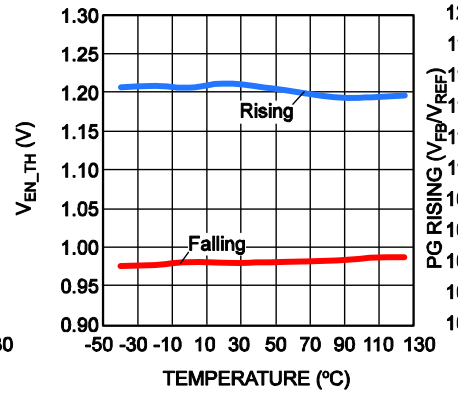
LS-FET On Resistance vs. Temperature



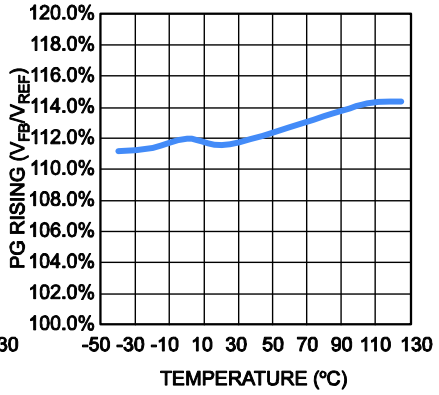
ZCD Current vs. Temperature



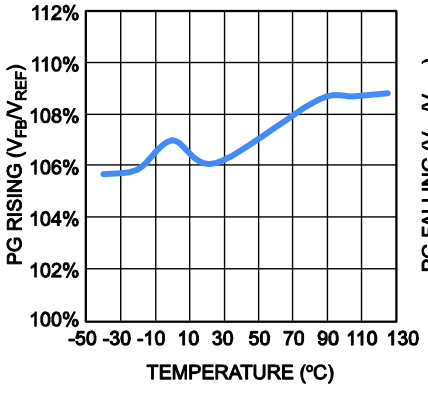
EN Threshold vs. Temperature



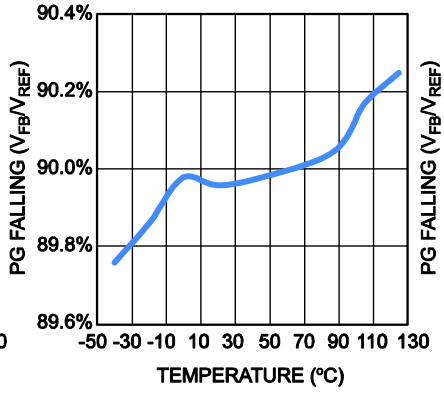
PG Rising Threshold (V_{FB} Rising) vs. Temperature



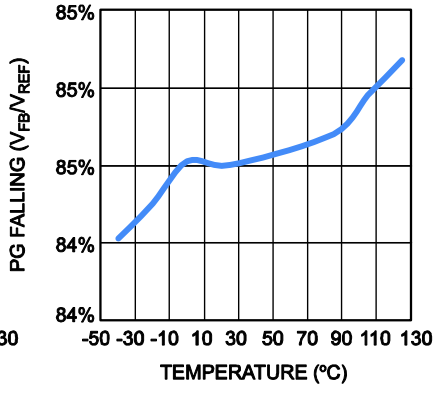
PG Rising Threshold (V_{FB} Falling) vs. Temperature



PG Falling Threshold (V_{FB} Falling) vs. Temperature



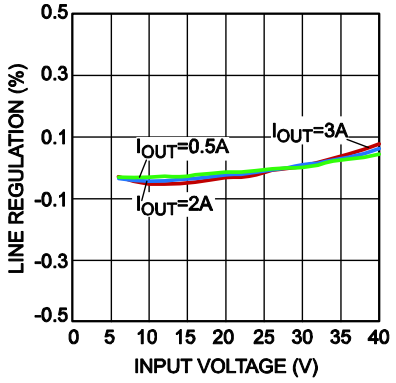
PG Falling Threshold (V_{FB} Rising) vs. Temperature



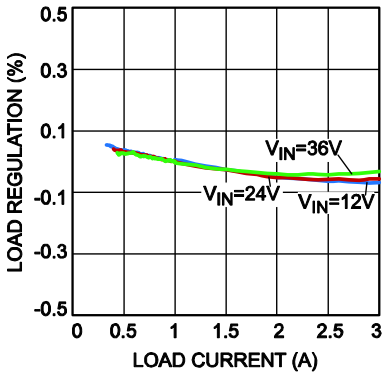
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT}=3.3V, L=10µH, F_{SW}=500kHz, AAM mode, T_A = +25°C, unless otherwise noted.

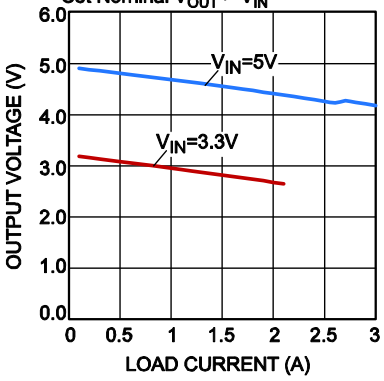
Line Regulation



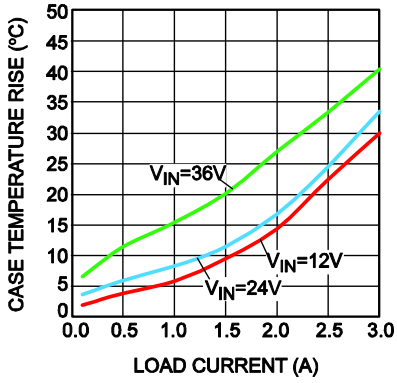
Load Regulation



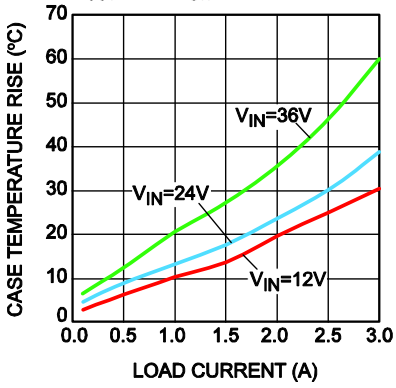
Output Voltage vs. Load Current
Dropout Performance
Set Nominal V_{OUT} > V_{IN}



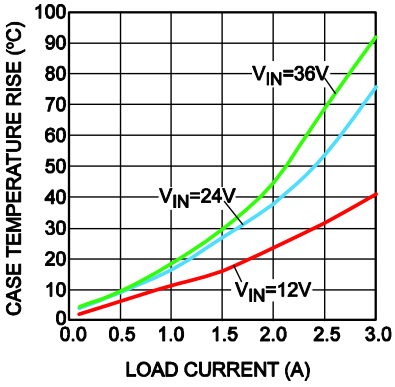
Case Temperature Rise vs. Load Current
V_{OUT}=3.3V, F_{SW}=500kHz



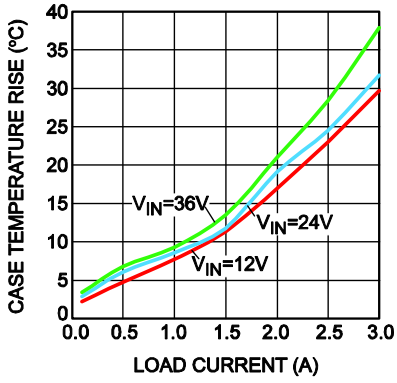
Case Temperature Rise vs. Load Current
V_{OUT}=3.3V, F_{SW}=1MHz



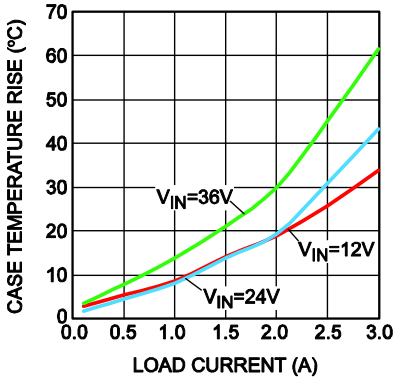
Case Temperature Rise vs. Load Current
V_{OUT}=3.3V, F_{SW}=2MHz



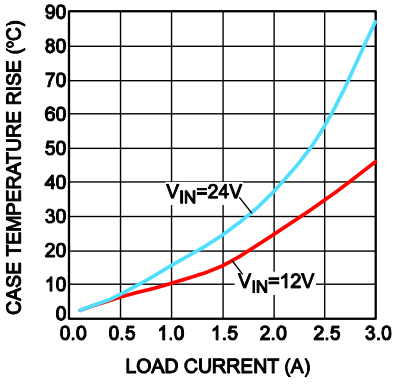
Case Temperature Rise vs. Load Current
V_{OUT}=5V, F_{SW}=500kHz



Case Temperature Rise vs. Load Current
V_{OUT}=5V, F_{SW}=1MHz



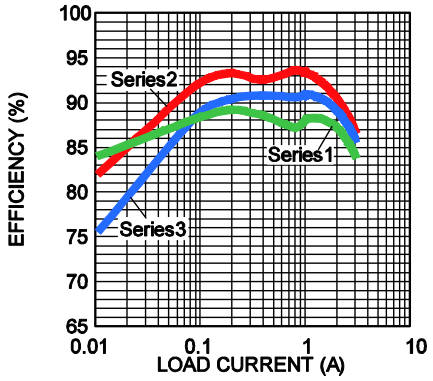
Case Temperature Rise vs. Load Current
V_{OUT}=5V, F_{SW}=2MHz



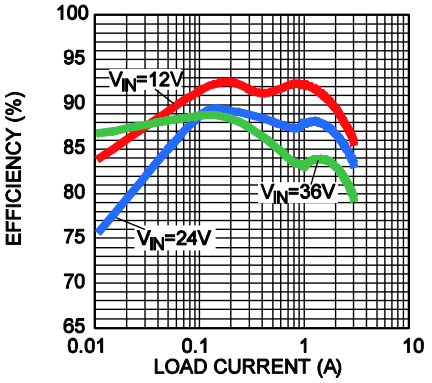
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT}=3.3V, L=10µH, F_{SW}=500kHz, AAM mode, T_A = +25°C, unless otherwise noted.

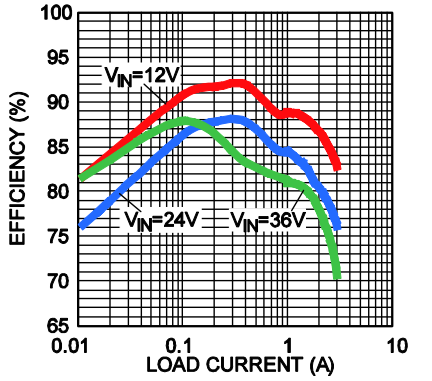
Efficiency vs. Load Current
V_{OUT}=3.3V, FSW=500kHz



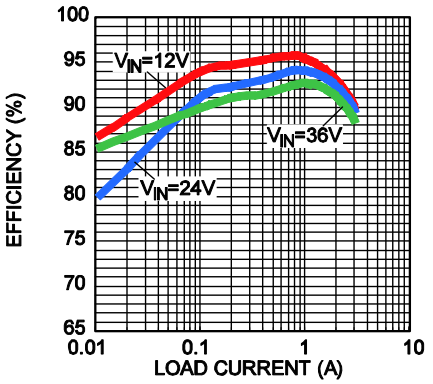
Efficiency vs. Load Current
V_{OUT}=3.3V, FSW=1MHz



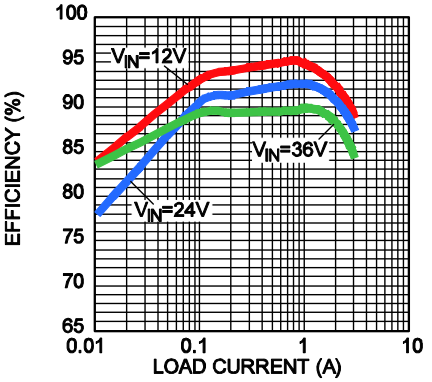
Efficiency vs. Load Current
V_{OUT}=3.3V, FSW=2.2MHz



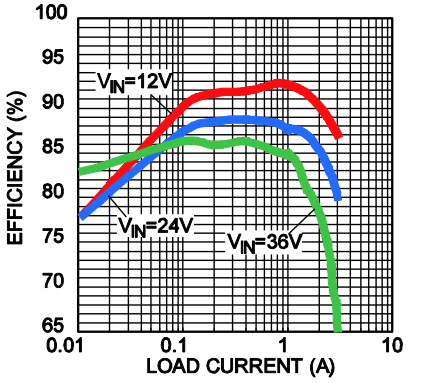
Efficiency vs. Load Current
V_{OUT}=5V, FSW=500kHz



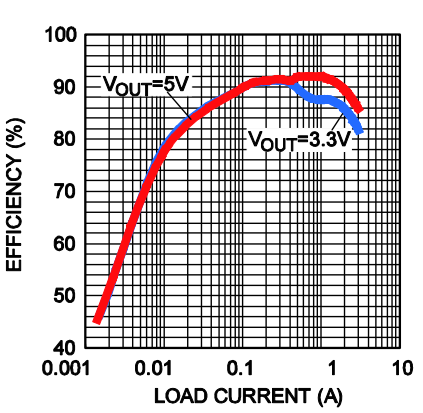
Efficiency vs. Load Current
V_{OUT}=5V, FSW=1MHz



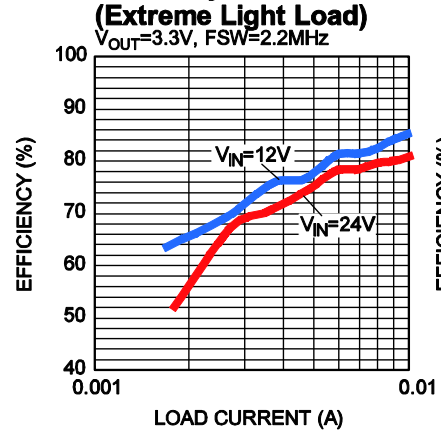
Efficiency vs. Load Current
V_{OUT}=5V, FSW=2.2MHz



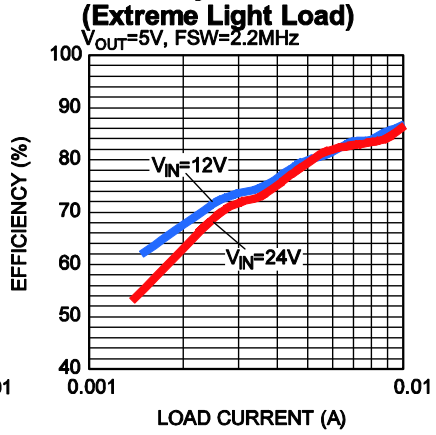
Efficiency vs. Load Current
V_{IN}=14V, FSW=2.2MHz



Efficiency vs. Load Current (Extreme Light Load)
V_{OUT}=3.3V, FSW=2.2MHz



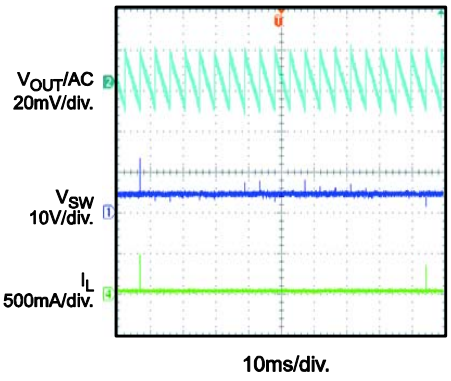
Efficiency vs. Load Current (Extreme Light Load)
V_{OUT}=5V, FSW=2.2MHz



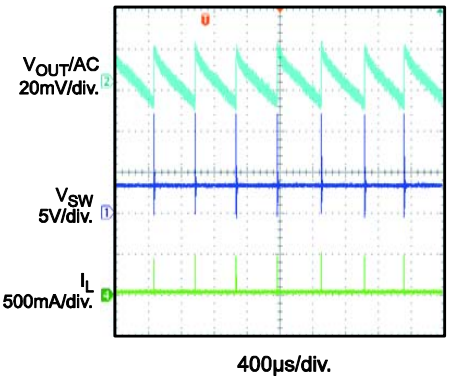
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT}=3.3V, L=10µH, F_{SW}=500kHz, AAM mode, T_A = +25°C, unless otherwise noted.

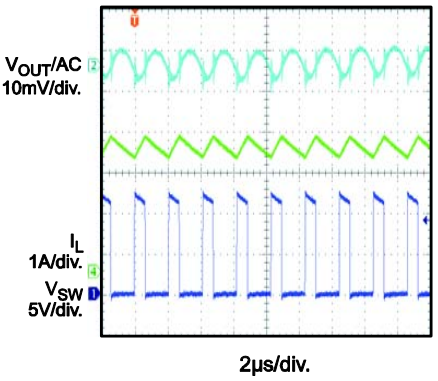
Steady State
I_{OUT}=0A, AAM mode



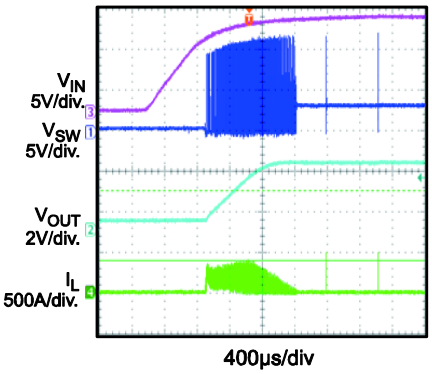
Steady State
I_{OUT}=1mA, AAM mode



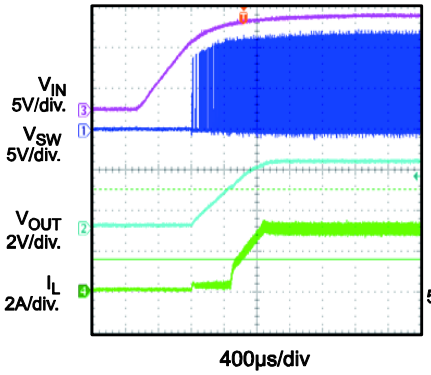
Steady State
I_{OUT}=3A



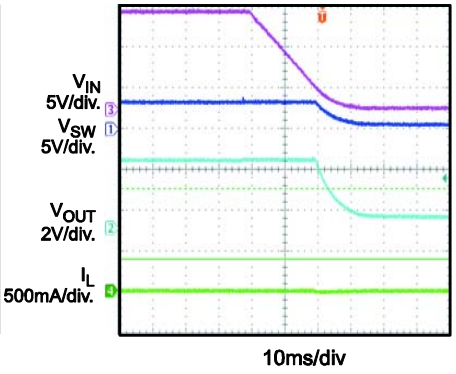
Start-up through VIN
I_{OUT}=0A



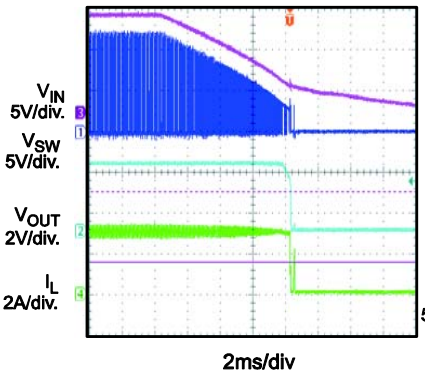
Start-up through VIN
I_{OUT}=3A



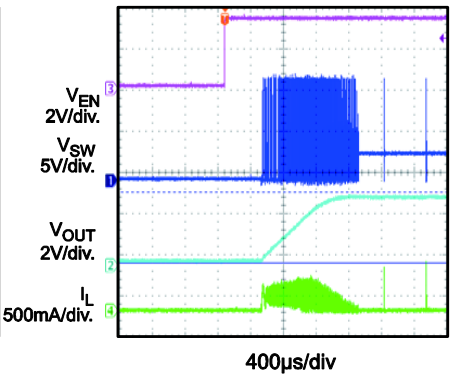
Shutdown through VIN
I_{OUT}=0A



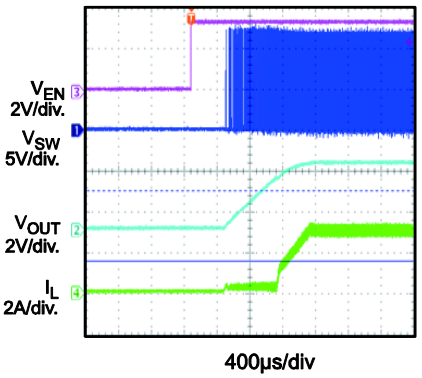
Shutdown through VIN
I_{OUT}=3A



VIN Power Off
Start-up through EN



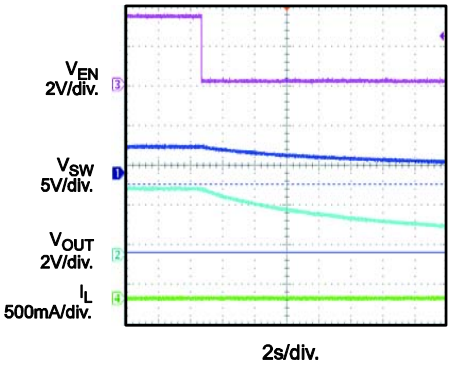
Start-up through EN
I_{OUT}=3A



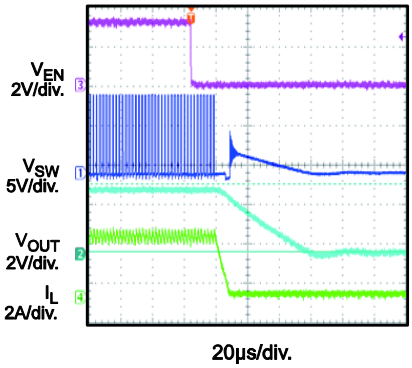
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT}=3.3V, L=10µH, F_{SW}=500kHz, AAM mode, T_A = +25°C, unless otherwise noted.

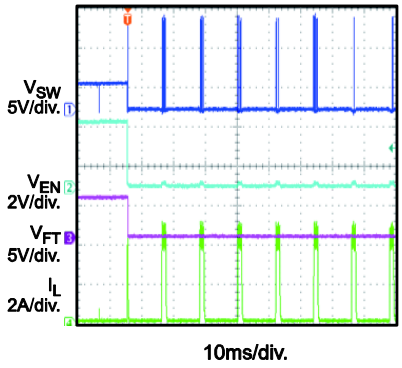
Shutdown through EN
I_{OUT}=0A



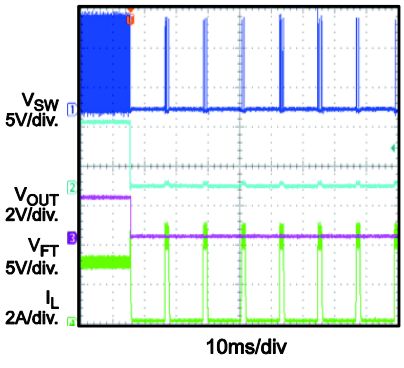
Shutdown through EN
I_{OUT}=3A



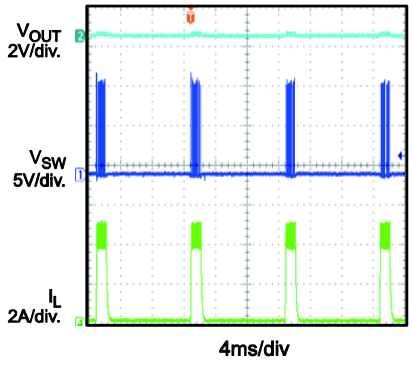
SCP Entry
I_{OUT}=0A to short circuit



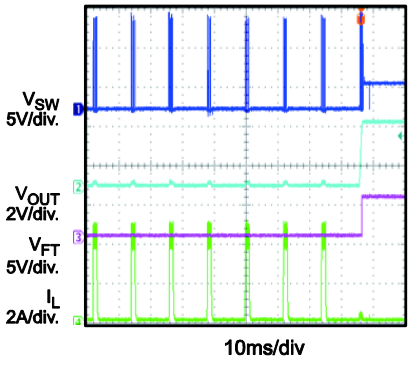
SCP Entry
I_{OUT}=3A to short circuit



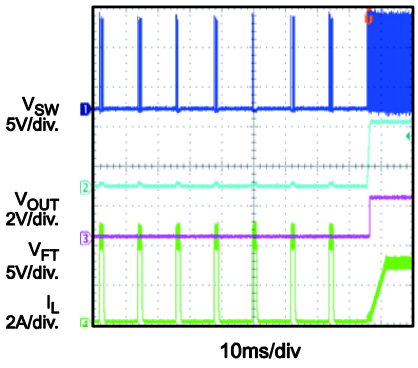
SCP Steady State



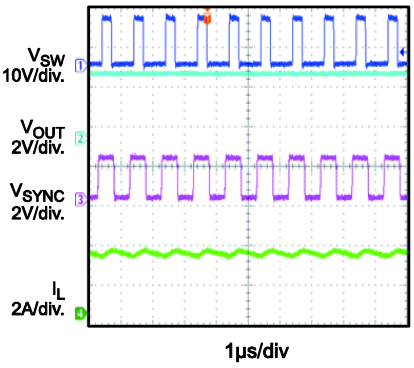
SCP Recovery
short circuit to I_{OUT}=0A



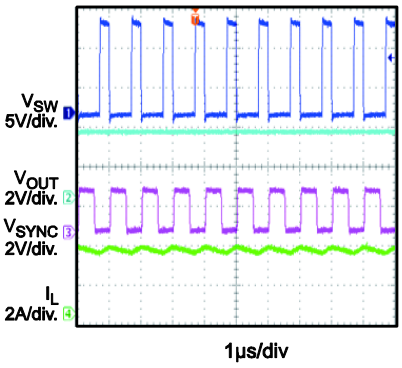
SCP Recovery
short circuit to I_{OUT}=3A



SYNC Operation (In-Phase)
drive PHASE high, I_{OUT}=3A



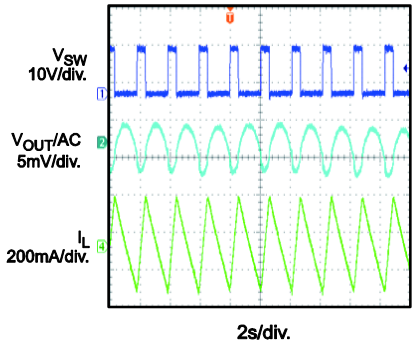
SYNC Operation (180° Out-of-Phase)
drive PHASE low, I_{OUT}=3A



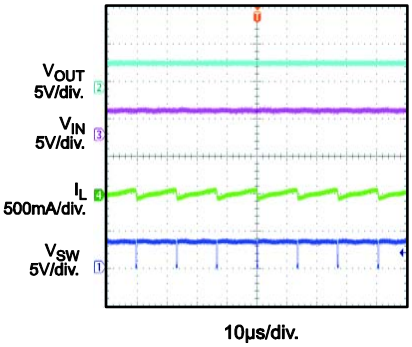
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT}=3.3V, L=10µH, F_{SW}=500kHz, AAM mode, T_A = +25°C, unless otherwise noted.

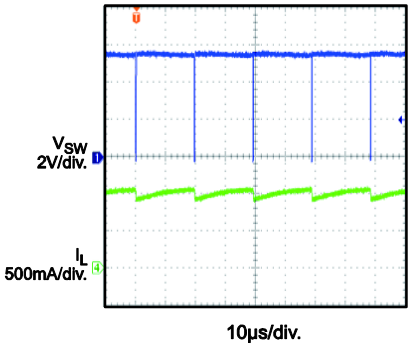
Forced CCM Operation
I_{OUT}=0A, forced CCM mode



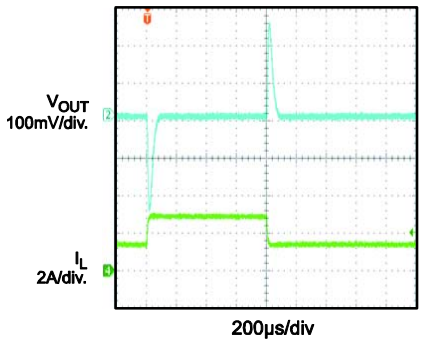
Dropout Operation
V_{IN}=3.3V, V_{OUT} set to 3.3V, I_{OUT}=0A



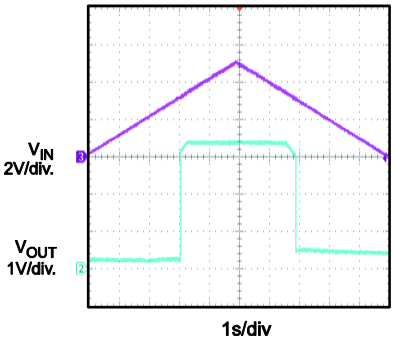
Dropout Operation
V_{IN}=6V, V_{OUT} set to 7V, I_{OUT}=3A



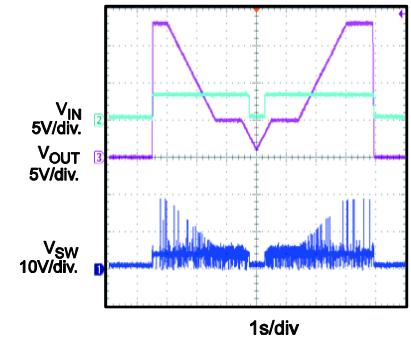
Load Transient
I_{OUT}=1.5A<->3A, 1.6A/µs



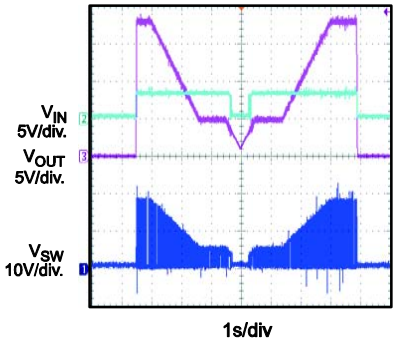
VIN Ramp Up and Down
I_{OUT}=0.1A



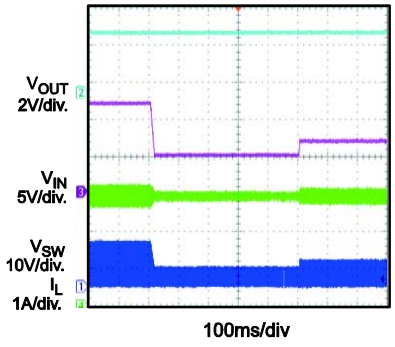
VIN Ramp Down and Up
I_{OUT}=10mA



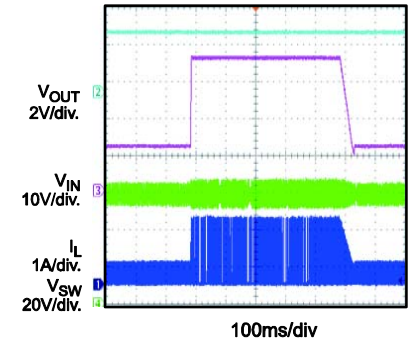
VIN Ramp Down and Up
I_{OUT}=3A



Cold-Crank
V_{IN}=12V->5V->7V, I_{OUT}=3A



Load Dump
V_{IN}=12V<->36V, I_{OUT}=3A



PRINTED CIRCUIT BOARD LAYOUT

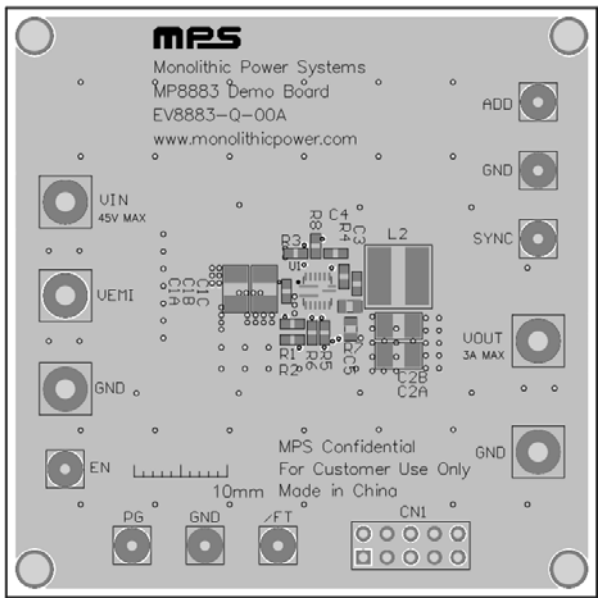


Figure 1: Top Silk & Top Layer

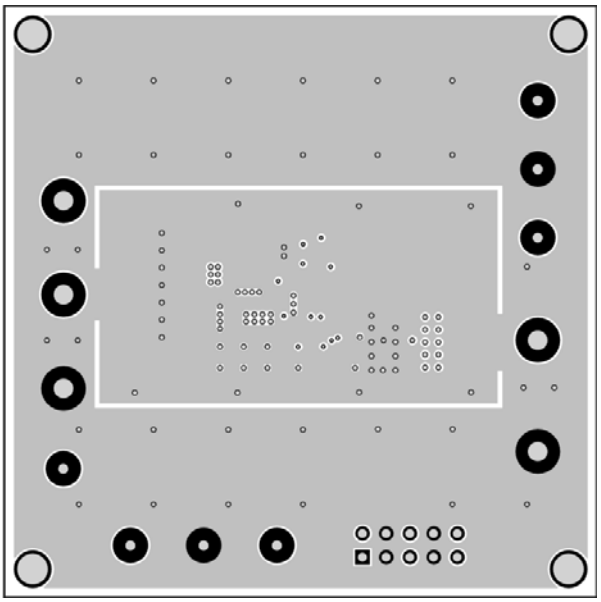


Figure 2: Inner 1 Layer

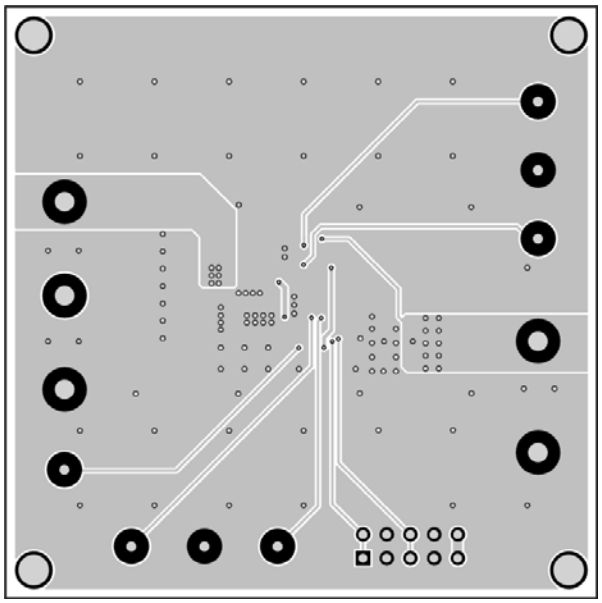


Figure 3: Inner 2 Layer

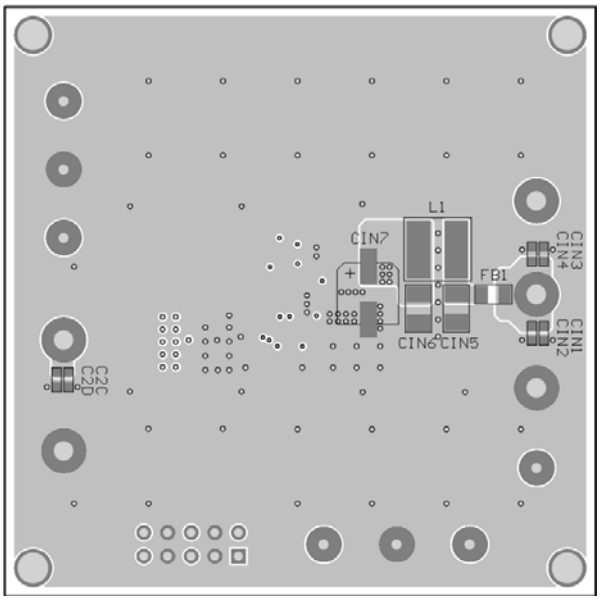


Figure 4: Bottom Silk & Bottom Layer

QUICK START GUIDE

1. Preset Power Supply to12V.
2. Turn Power Supply off.
3. Connect Power Supply terminals to:
    a. Positive (+): VIN
    b. Negative (–): GND
4. Connect Load to:
    a. Positive (+): VOUT
    b. Negative (–): GND
5. Turn Power Supply on after making connections. The board will automatically start up.
6. To use the Enable function, apply a digital input to the EN pin. Drive EN higher than 1.2V to turn on the regulator, or less than 1V to turn it off.

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