

DESCRIPTION

The EV4415M-QB-00A is an evaluation board for the MP/MPQ4415MGQB.

MP/MPQ4415MGQB is a synchronous, rectified, step-down, switch-mode convertor with built-in power MOSFETs and one input bypass capacitor. It offers a very compact solution to achieve a 1.5A of continuous output current with excellent load and line regulation over a wide input supply range. The MP/MPQ4415M uses synchronous mode operation to achieve high efficiency over the output current load range.

The EV4415M-QB-00A is a fully assembled and tested evaluation board, it generates 3.3V output voltage at load current up to 1.5A from a 4V to 36V input range.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	4 – 36	V
Output Voltage	V_{OUT}	3.3	V
Output Current	I_{OUT}	1.5	A

FEATURES

- Wide 4V to 36V Operating Input Range
- 1.5A Continuous Load Current
- 90mΩ High-Side, 50mΩ Low-Side Internal Power MOSFETs
- High-Efficiency Synchronous Mode Operation
- Default 2.2MHz Switching Frequency
- 450kHz to 2.2MHz Frequency Sync
- Forced Continuous Conduction Mode (CCM)
- Internal Soft Start (SS)
- Power Good (PG) Indicator
- Over-Current Protection (OCP) with Valley-Current Detection and Hiccup
- Thermal Shutdown
- Output Adjustable from 0.8V
- Available in a QFN-13 (2.5mmx3mm) Package
- CISPR25 Class 5 Compliant
- AEC-Q100 Grade-1

APPLICATIONS

- Automotive
- Industrial Control Systems
- Medical and Imaging Equipment
- Telecom Applications
- Distributed Power Systems

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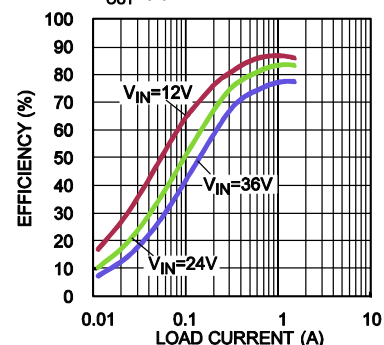
EVALUATION BOARD



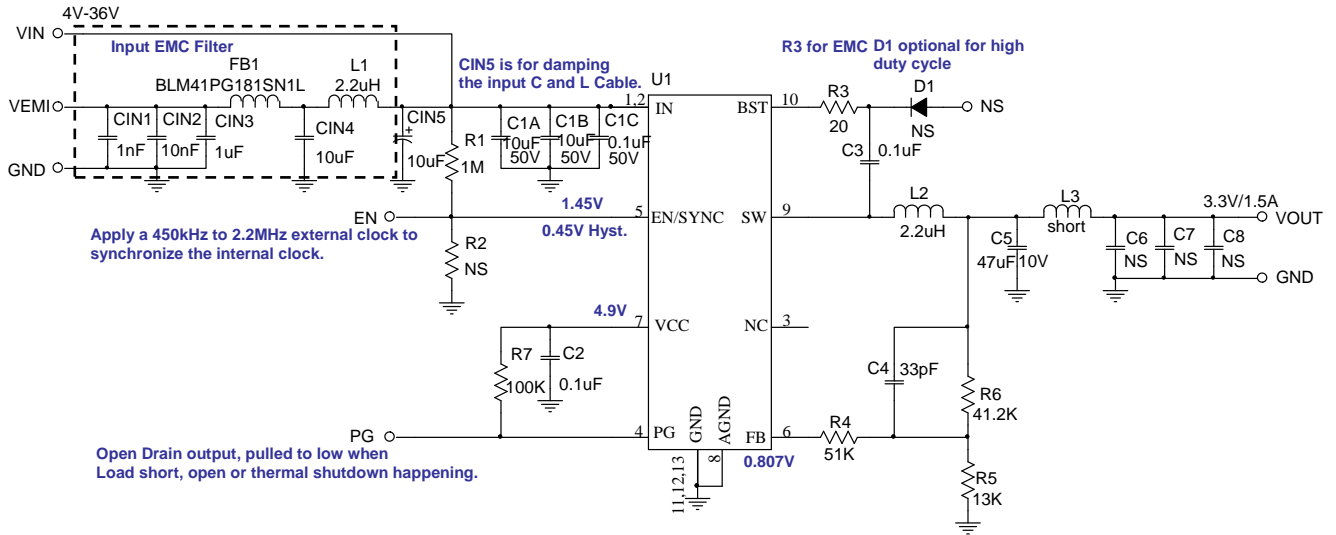
(L x W x H) 2.5" x 2.5" x 0.4"
(6.4cm x 6.4cm x 1.0cm)

Board Number	MPS IC Number
EV4415M-QB-00A	MP/MPQ4415MGQB

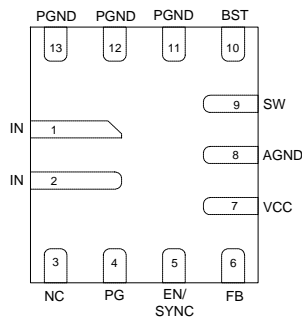
Efficiency vs. Load Current
 $V_{OUT}=3.3V$



EVALUATION BOARD SCHEMATIC



Package reference



Reference for FB divider selection

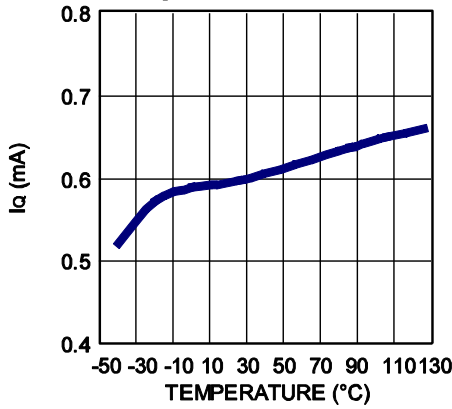
Vo(V)	R6(kΩ)	R5(kΩ)
5	41.2(1%)	7.68(1%)
2.5	41.2(1%)	19.6(1%)
1.8	41.2(1%)	33.5(1%)

EV4415M-QB-00A BILL OF MATERIALS

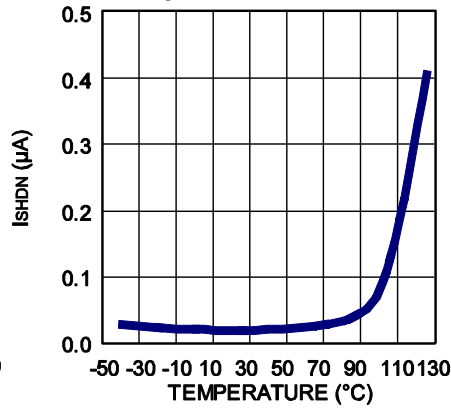
Qty	Ref	Value	Description	Package	Manufacturer	Part Number
5	CIN1,CIN5	NS				
2	C1A, C1B	10 μ F	Ceramic Cap., 50V, X5R	1206	muRata	GRM31CR61H106KA12L
1	C1C	0.1 μ F	Ceramic Cap., 50V, X7R	0603	muRata	GRM188R71H104KA93D
2	C2, C3	0.1 μ F	Ceramic Cap., 16V, X7R	0603	muRata	GRM188R71C104KA01D
1	C4	33pF	Ceramic Cap., 50V, C0G	0603	muRata	GRM1885C1H330JA01D
1	C5	47 μ F	Ceramic Cap., 10V, X5R	1210	muRata	GRM32ER61A476KE20L
3	C6, C7, C8	NS				
1	D1	NS				
1	FB1	NS				
1	L1	NS				
1	L2	2.2 μ H	Inductor, 82mOhm DCR, 3.3A	SMD	TOKO	DFE252012F-2R2MP2
1	L3	Short				
1	R1	1M	Film Res., 5%	0603	Yageo	RC0603JR-071ML
1	R3	20	Film Res., 1%	0603	Yageo	RC0603FR-0720RL
1	R4	51k	Film Res., 1%	0603	Yageo	RC0603FR-0751KL
1	R5	13k	Film Res., 1%	0603	Yageo	RC0603FR-0713KL
1	R6	41.2k	Film Res., 1%	0603	Yageo	RC0603FR-0741K2L
1	R7	100k	Film Res., 1%	0603	Yageo	RC0603FR-07100KL
1	R2	NS				
1	U1		Step-Down Regulator	QFN13(2X3)	MPS	MPQ4415MGQB
5	VIN, VEMI, GND, GND, VOUT		2.0 Golden Pin		HZ	
4	PG, GND, EN/ SYNC, GND		2.54mm Test Pin		HZ	

TYPICAL CHARACTERISTICS

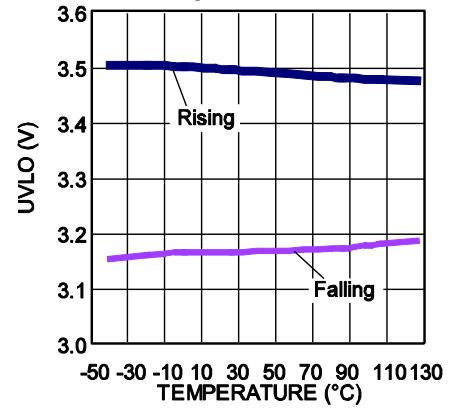
Quiescent Current vs. Temperature



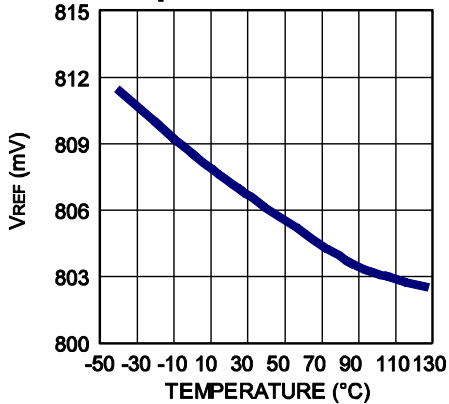
Shutdown Current vs. Temperature



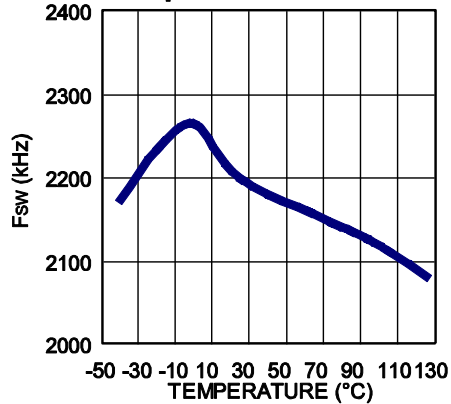
V_{IN} UVLO Threshold vs. Temperature



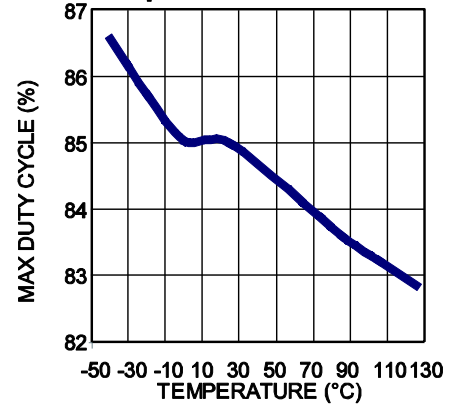
Feedback Reference vs. Temperature



Switching Frequency vs. Temperature



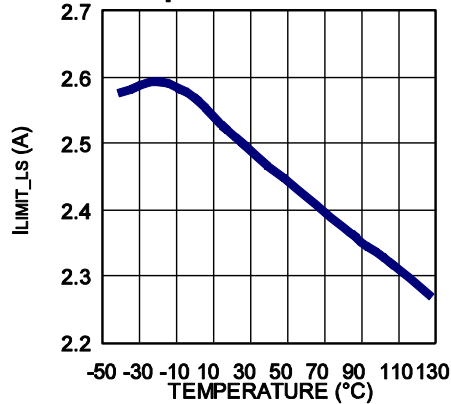
Max Duty Cycle vs. Temperature



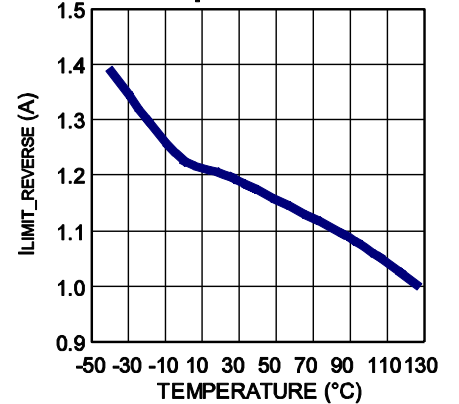
Current Limit vs. Temperature

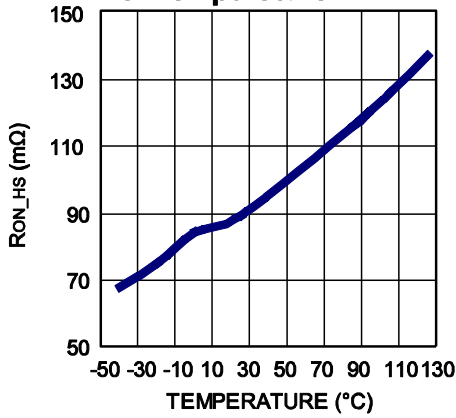
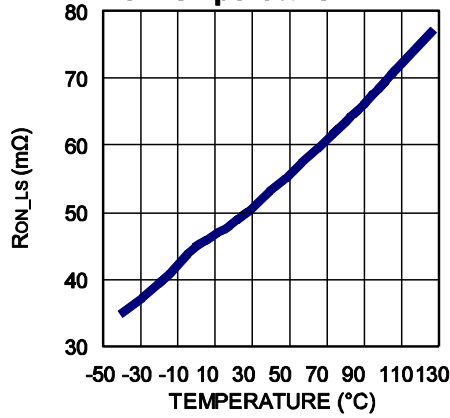
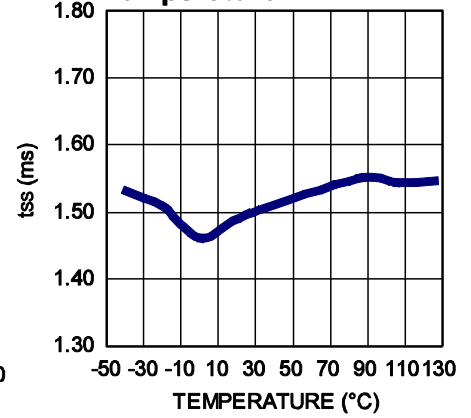
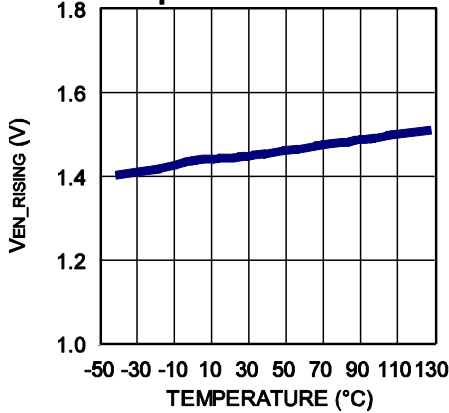
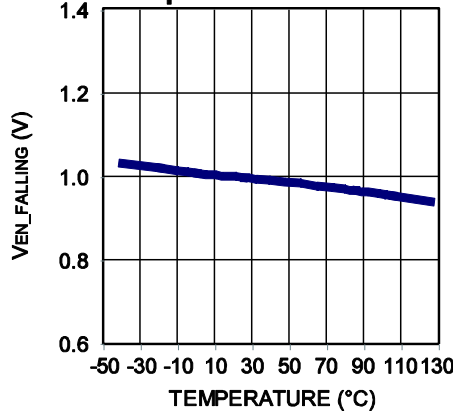
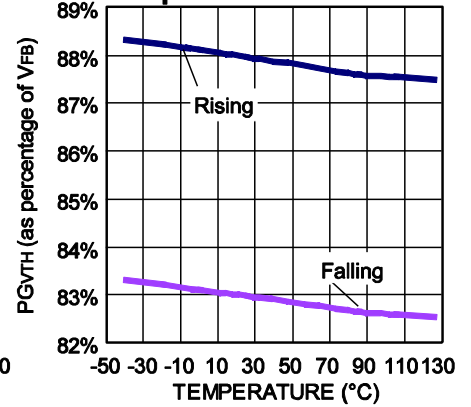
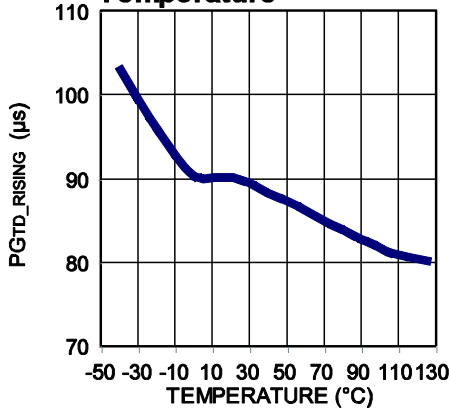
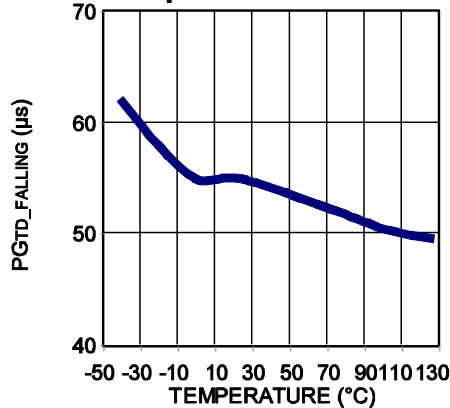


Valley Current Limit vs. Temperature



Reverse Current Limit vs. Temperature

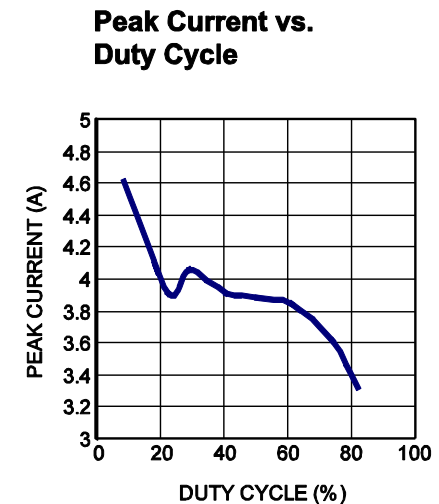
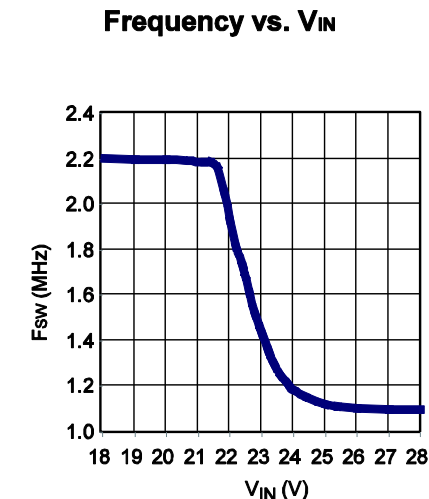
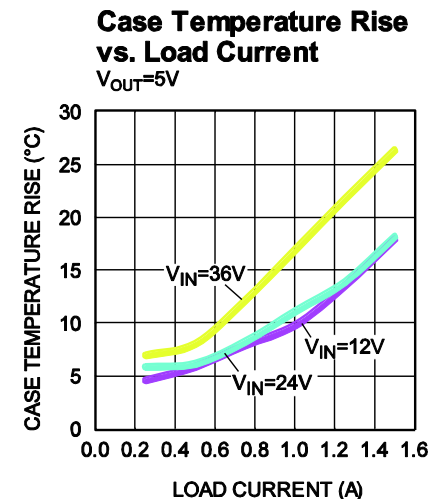
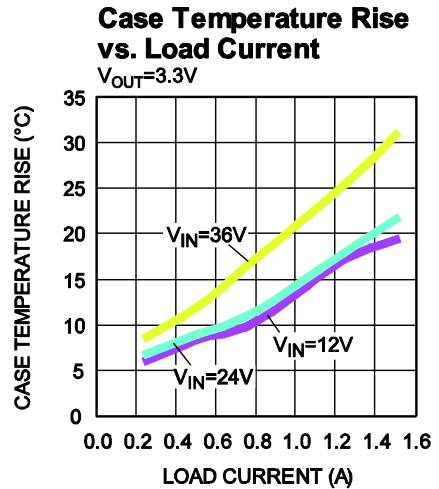
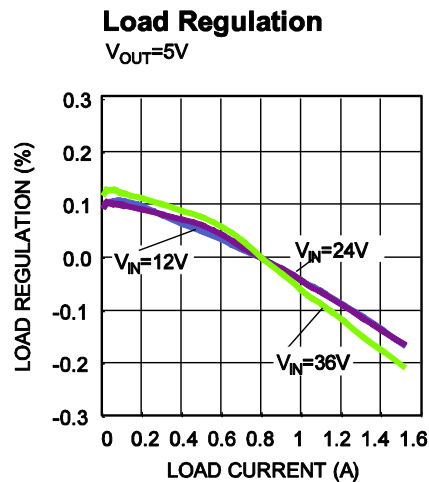
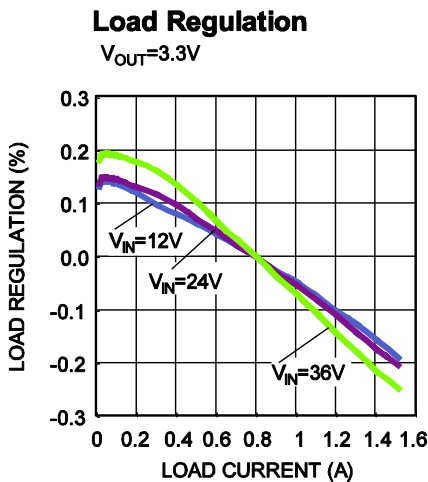
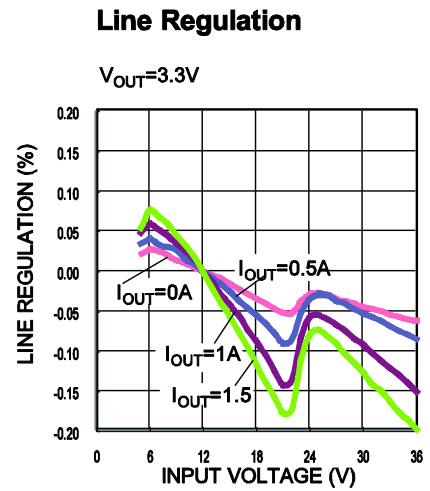
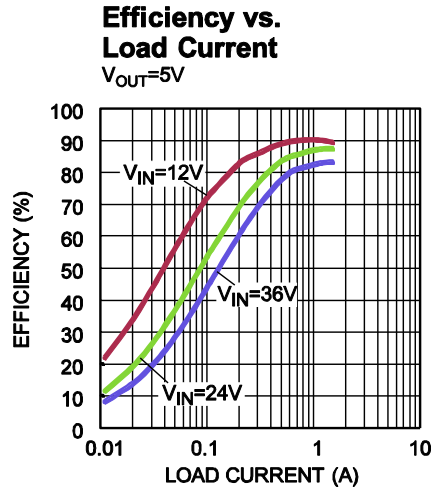
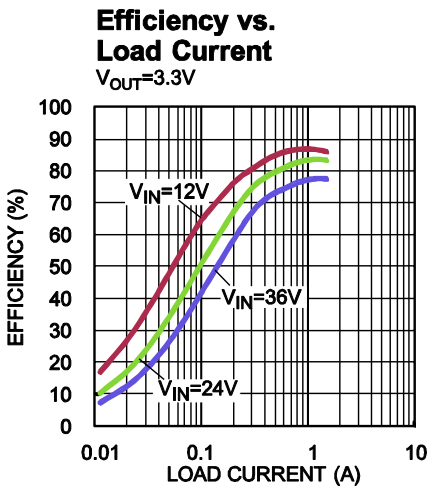


TYPICAL CHARACTERISTICS *(continued)*
HS-FET On Resistance vs. Temperature

LS-FET On Resistance vs. Temperature

Soft-Start Time vs. Temperature

EN Rising Threshold vs. Temperature

EN Falling Threshold vs. Temperature

PG Threshold vs. Temperature

PG Rising Delay vs. Temperature

PG Falling Delay vs. Temperature


EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

$V_{IN} = 12V$, $V_{OUT} = 3.3V$, $L = 2.2\mu H$, $F_{SW} = 2.2MHz$, $T_A = +25^\circ C$, unless otherwise noted.

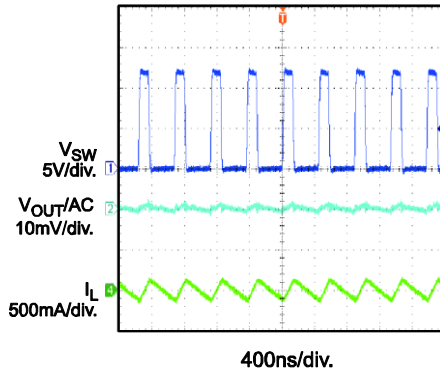


EVB TEST RESULTS (continued)

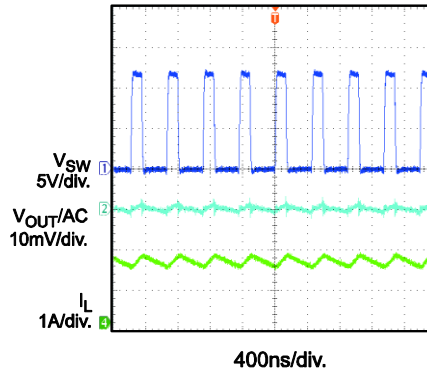
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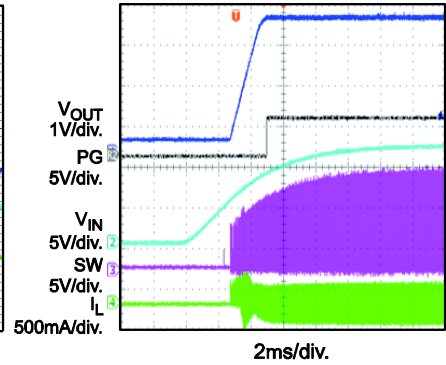
Steady State
 $I_{OUT} = 0A$



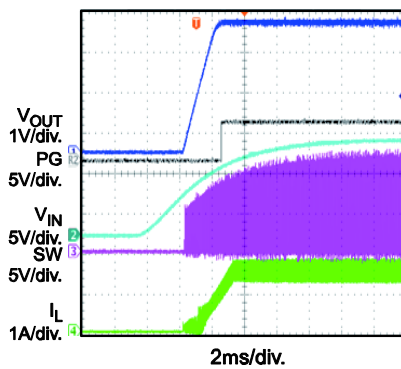
Steady State
 $I_{OUT} = 1.5A$



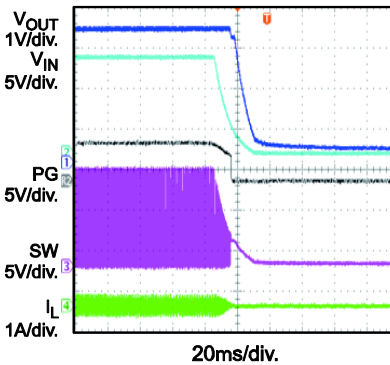
Start-Up through Input Voltage
 $I_{OUT} = 0A$



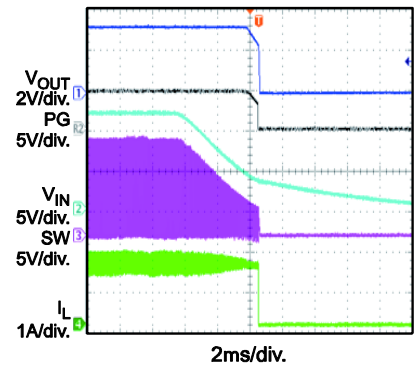
Start-Up through Input Voltage
 $I_{OUT} = 1.5A$



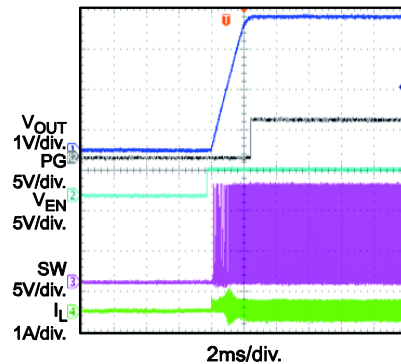
Shutdown through Input Voltage
 $I_{OUT} = 0A$



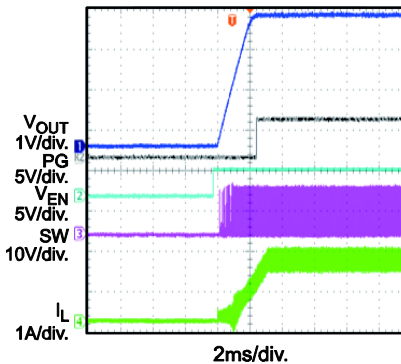
Shutdown through Input Voltage
 $I_{OUT} = 1.5A$



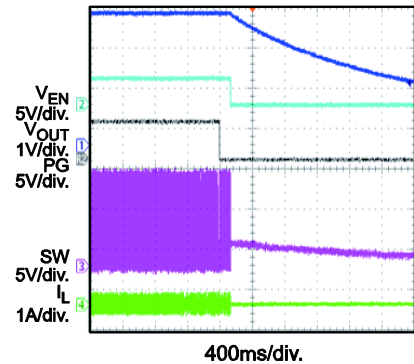
Start-Up through Enable
 $I_{OUT} = 0A$



Start-Up through Enable
 $I_{OUT} = 1.5A$



Shutdown through Enable
 $I_{OUT} = 0A$

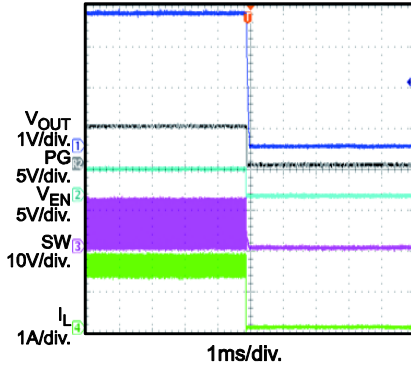


EVB TEST RESULTS *(continued)*

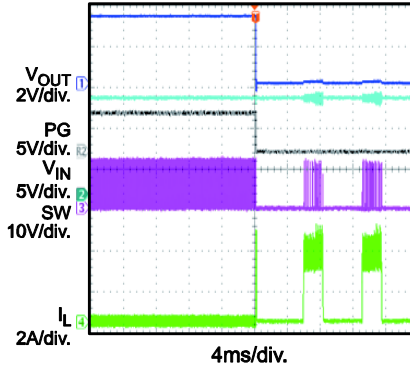
Performance waveforms are tested on the evaluation board.

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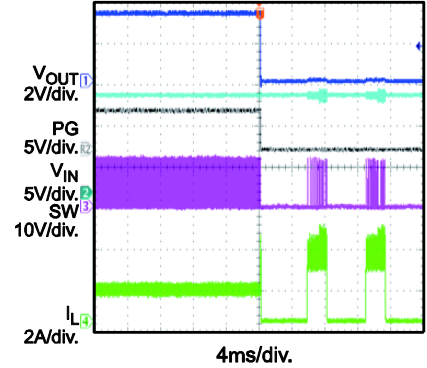
Shutdown through Enable
 $I_{OUT} = 1.5A$



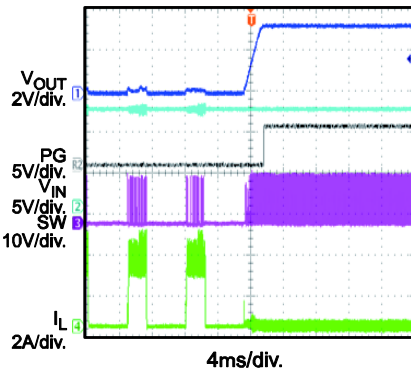
SCP Entry
 $I_{OUT} = 0A$



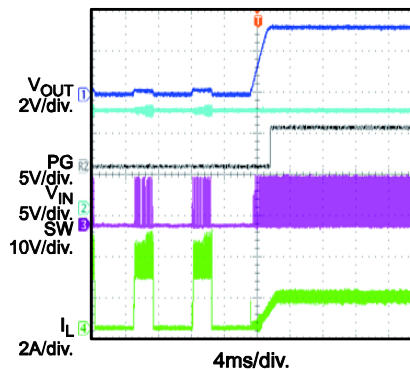
SCP Entry
 $I_{OUT} = 1.5A$



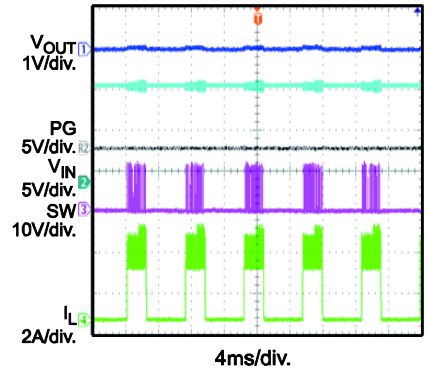
SCP Recovery
 $I_{OUT} = 0A$



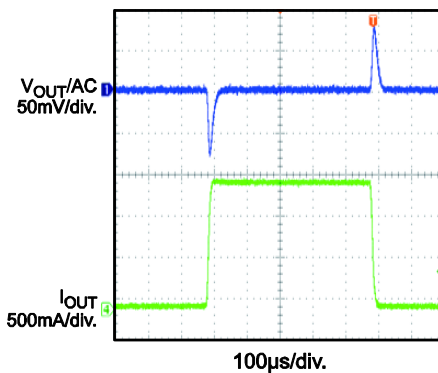
SCP Recovery
 $I_{OUT} = 1.5A$



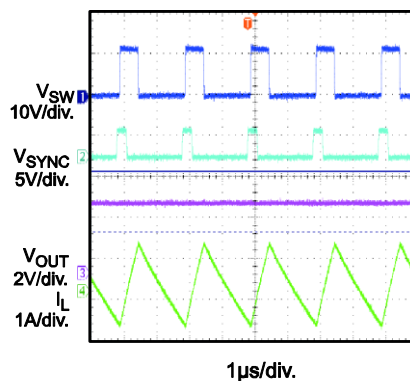
SCP Steady State



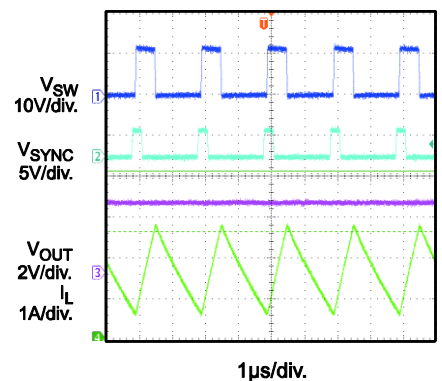
Load Transient
 $I_{OUT} = 0A-1.5A$



SYNC Operation
 $f_{SYNC} = 500kHz$, $D = 15\%$, $I_{OUT} = 0A$



SYNC Operation
 $f_{SYNC} = 500kHz$, $D = 15\%$, $I_{OUT} = 1.5A$



PRINTED CIRCUIT BOARD LAYOUT

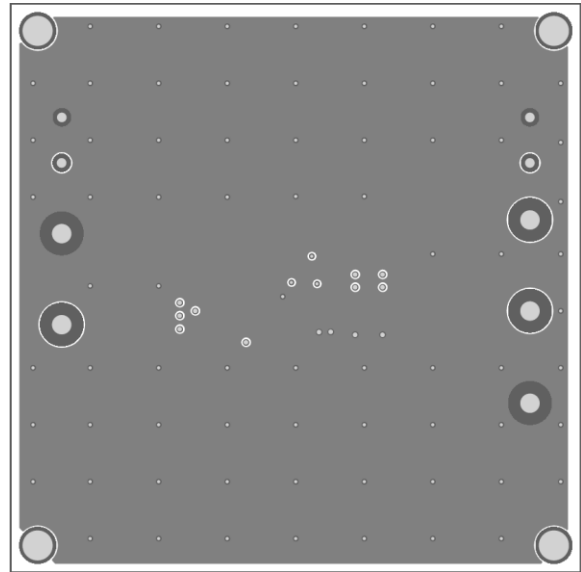
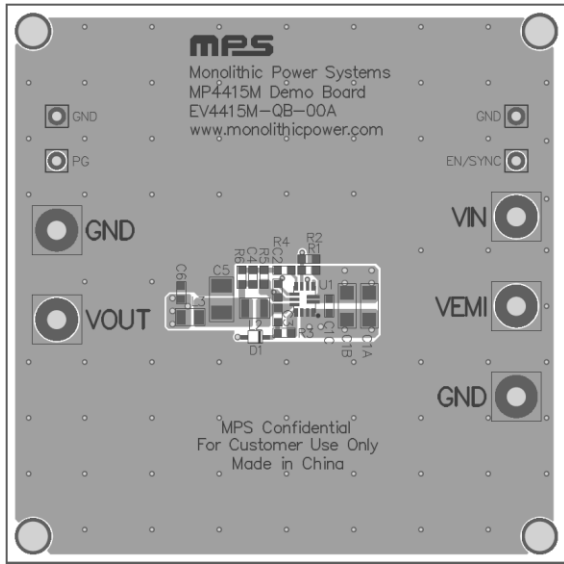


Figure 1—Top Silk Layer and Top Layer

Figure 2—Inner1 Layer

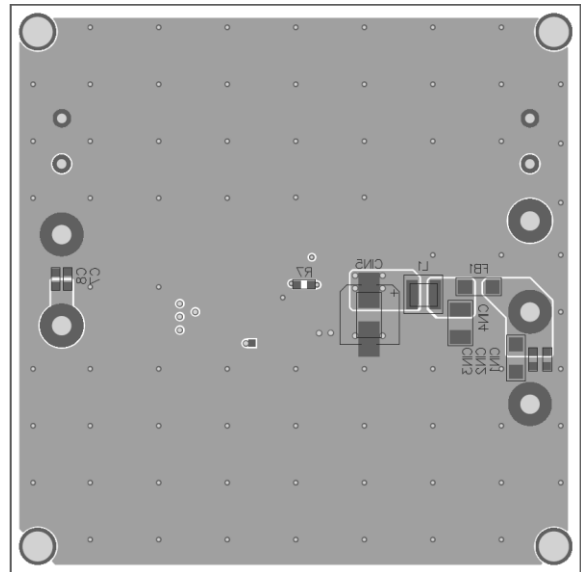
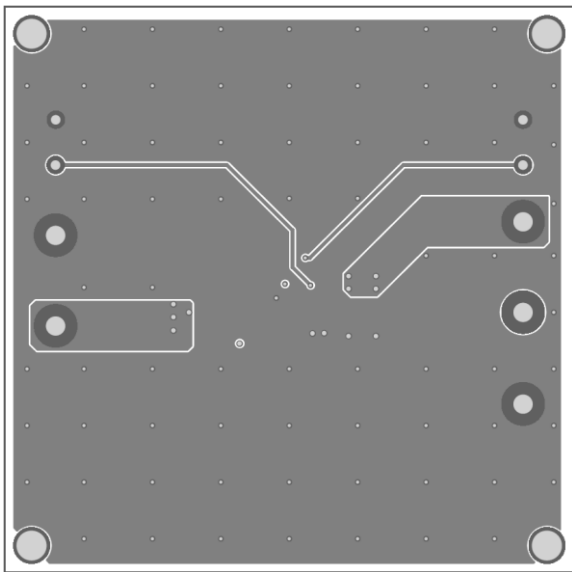


Figure 3—Inner2 Layer

Figure 4—Bottom Silk Layer and Bottom Layer