EVL4423C-L-00A

6A, 36V, Step-Down Converter for Automotive Evaluation Board

DESCRIPTION

The EVL4423C-L-00A evaluation board is designed to demonstrate the capabilities of the MP4423C, a high-frequency, synchronous, rectified, step-down switch-mode converter with built-in power MOSFETs. The device offers a very compact solution to achieve up to 6A of peak output current (I_{OUT}), with excellent load and line regulation across a wide input supply voltage (V_{IN}) range. The MP4423C features synchronous mode operation for higher efficiency across the I_{OUT} load range.

Current mode operation provides fast transient response and eases loop stabilization.

Fault protections include hiccup mode current limiting, output over-voltage protection (OVP), and thermal shutdown (TSD).

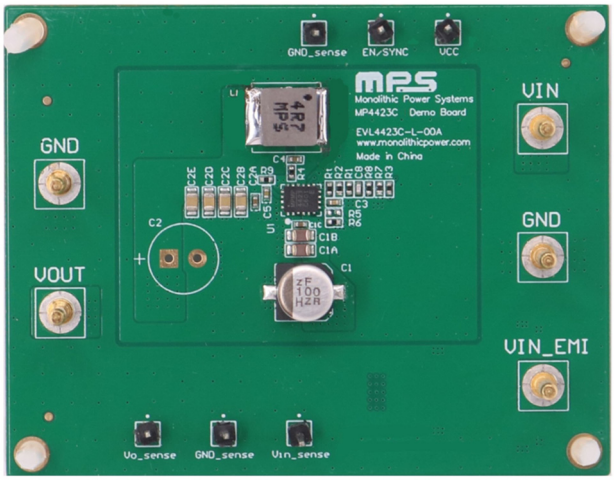
The MP4423C requires a minimal number of readily available, standard external components, and is available in a QFN-16 (3mmx4mm) package.

PERFORMANCE SUMMARY

Parameters	Conditions	Value
Typical input voltage		12V
Output voltage		5V
Maximum output current		6A

MPL Optimized Performance with MPS Inductor MPL-AY1050-4R7 Series

EVL4423C-L-00A EVALUATION BOARD



LxWxH (7cmx5.5cmx1.3cm)

Board Number	MPS IC Number
EVL4423C-L-00A	MP4423CGLE

Note:

1) The efficiency is measured from the VIN pin. The input EMI filter's power loss is not included.

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QUICK START GUIDE

The EVL4423C-L-00A evaluation board is easy to set up and use to evaluate the performance of the MP4423C. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
2. Preset the power supply output to 12V, then turn off the power supply.
3. Connect the power supply output terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND

   VIN_EMI is the MP4423C's input if there is an EMI filter.
4. Turn on the power supply. The board should start up automatically.

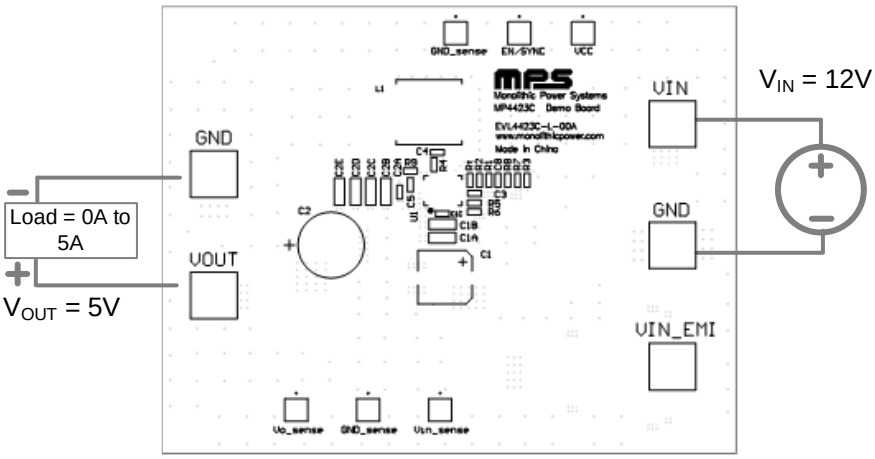

Figure 1: Measurement Equipment Set-Up

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EVALUATION BOARD SCHEMATIC

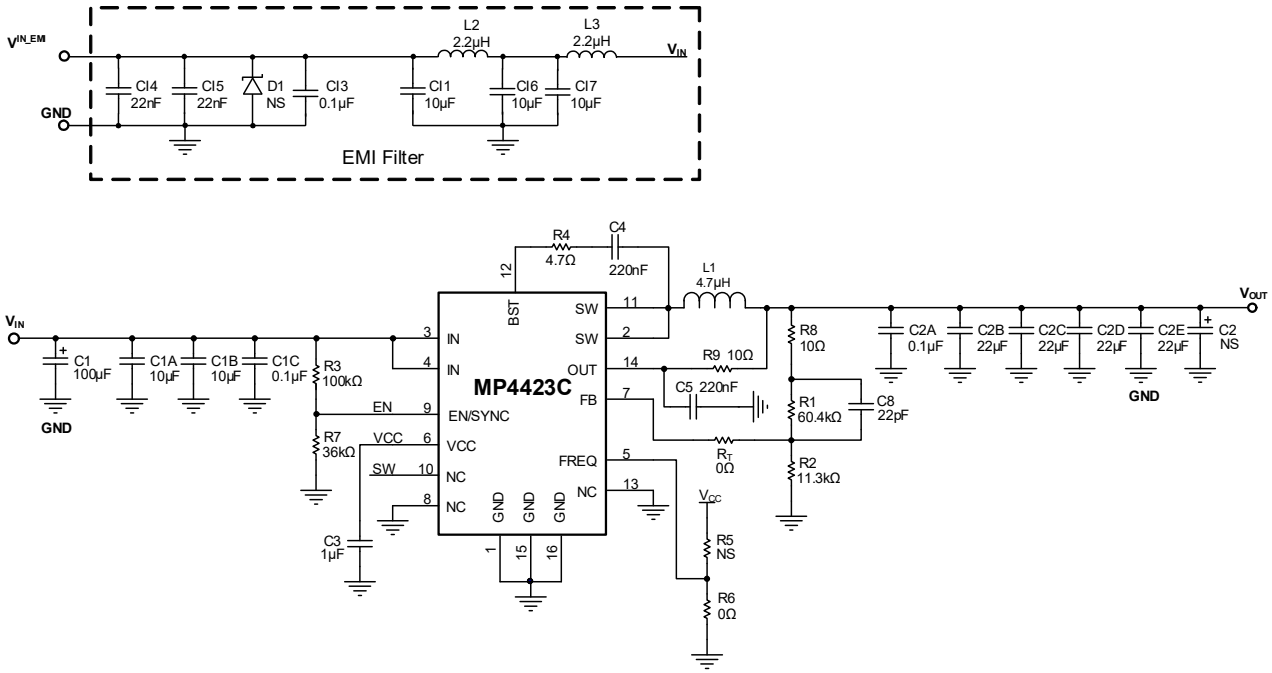

Figure 2: Evaluation Board Schematic (2) (3) (4)

Notes:

2) If FREQ = GND, then the device operates at 420kHz with frequency spread spectrum (FSS) in forced PWM (FPWM) mode.
3) FREQ = floating, then the devices operates at 420kHz with FSS in automatic PFM/PWM mode.
4) If FREQ = VCC, then the device operates at 2.2MHz with FSS in FPWM mode.

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EVL4423C-L-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
3	CI1, CI6, CI7	10µF	Ceramic capacitor, 50V, X5R	0805	Murata	GRM21BR61H106KE43L
1	CI3	0.1µF	Ceramic capacitor, 50V, X7R	0805	Murata	GRM21BR71H104KA01L
2	CI4, CI5	22nF	Ceramic capacitor, 50V, X5R	0603	Murata	GRM188R71H223KA01D
1	C1	100µF	100µF/50V	SMD	Nippon Chemi-Con	EMZR500ARA101MF80G
2	C1A, C1B	10µF	Ceramic capacitor, 50V, X5R	0805	Murata	GRM21BR61H106KE43L
4	C2B, C2C, C2D, C2E	22µF	Ceramic capacitor, 10V, X5R	0805	Murata	GRM21BR61A226ME51L
2	C1C, C2A	0.1µF	Ceramic capacitor, 100V, X5R	0402	Murata	GRM155R62A104KE14D
1	C3	1µF	Ceramic capacitor, 10V, X5R	0402	Wurth	885012105012
2	C4, C5	220nF	Ceramic capacitor, 50V, X5R	0402	Taiyo	UMK105BJ224KV-F
1	C8	22pF	Ceramic capacitor, 50V, C0G	0402	Murata	GRM1555C1H220JA01D
2	L2, L3	2.2µH	Inductor, R_{DC} = 35mΩ, I_{SAT} = 6.2A	SMD	Wurth	74438356022
Optional	L2, L3	2.2µH	Inductor, R_{DC} = 38.7mΩ, I_{SAT} = 6A	SMD	Superworld	PIFQ0402A2R2MN
1	R1	60.4kΩ	Film resistor,1%	0402	Yageo	RC0402FR-0760K4L
1	R2	11.3kΩ	Film resistor,1%	0402	Yageo	RC0402FR-0711K3L
1	R3	100kΩ	Film resistor,1%	0402	Yageo	RC0402FR-07100KL
1	R4	4.7Ω	Film resistor,1%	0402	Yageo	RC0402FR-074R7L
1	R7	36kΩ	Film resistor,1%	0402	Yageo	RC0402FR-0736KL
2	R8, R9	10Ω	Film resistor,1%	0402	Yageo	RC0402FR-0710RL
2	R6, R_T	0Ω	Film resistor,1%	0402	Yageo	RC0402FR-070RL
0	R5, C2, D1	NS				
1	L1	4.7µH	Inductor, R_{DC} = 13mΩ, I_{SAT} = 15.2A	SMD	Coilcraft	XAL7070-472MEC
Optional	L1	4.7µH	Inductor, R_{DC} = 9.5mΩ, I_{SAT} = 15A	SMD	MPS	MPL-AY1050-4R7
1	U1	MP4423C	6A, 26V, step-down switch-mode converter	QFN-16 (3mmx 4mm)	MPS	MP4423CGLE

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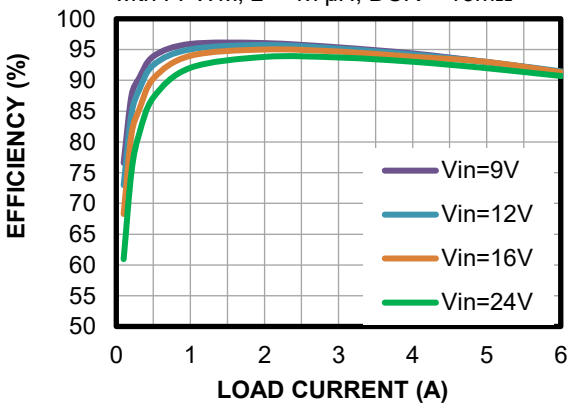
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board, V_{IN} = 12V, V_{OUT} = 5V, L = 4.7µH, forced PWM (FPWM) mode, T_A = 25°C, unless otherwise noted.

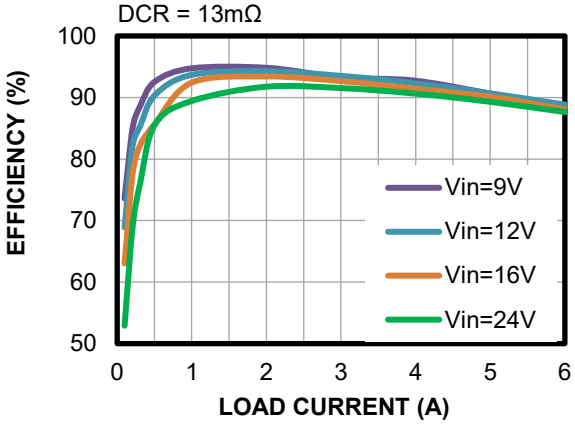
Efficiency vs. Load Current

V_{OUT} = 5V, FREQ = GND, f_{SW} = 420kHz with FPWM, L = 4.7µH, DCR = 13mΩ



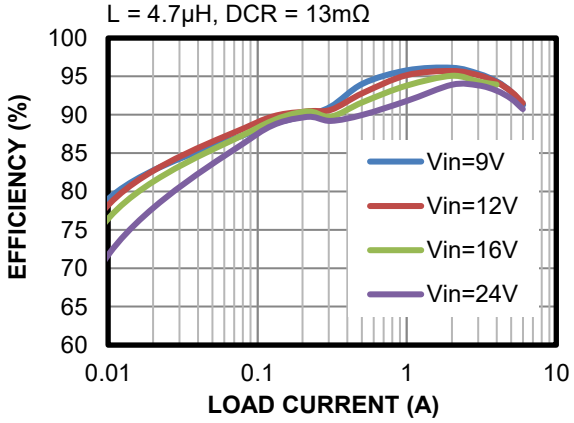
Efficiency vs. Load Current

V_{OUT} = 3.3V, FREQ = GND, f_{SW} = 420kHz with FPWM, L = 4.7µH, DCR = 13mΩ



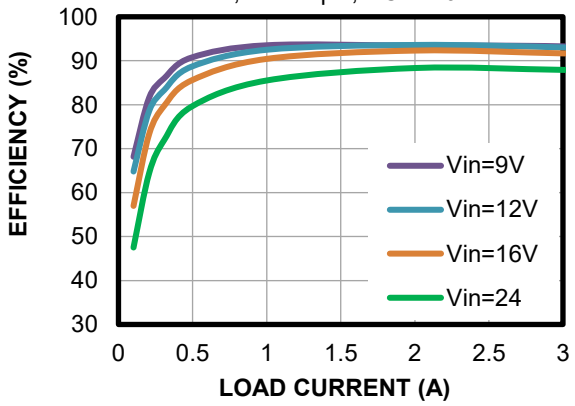
Efficiency vs. Load Current

V_{OUT} = 5V, FREQ = floating, f_{SW} = 420kHz with automatic PFM/PWM, L = 4.7µH, DCR = 13mΩ



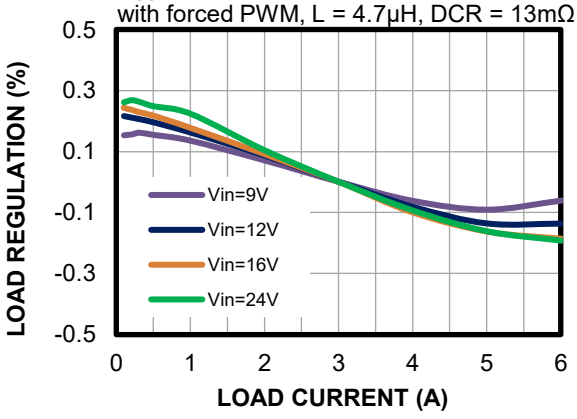
Efficiency vs. Load Current

V_{OUT} = 5V, FREQ = VCC, f_{SW} = 2.2MHz with FPWM, L = 2.2µH, DCR = 6mΩ



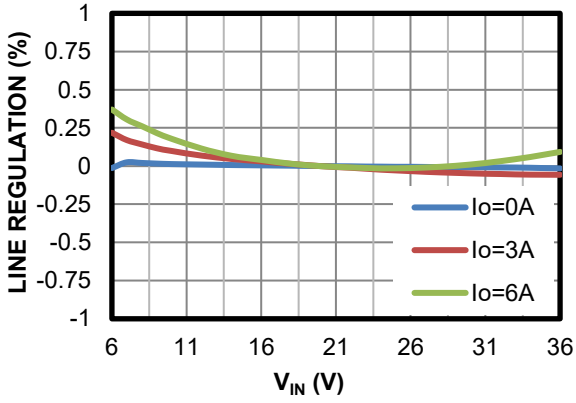
Load Regulation vs. Load Current

V_{OUT} = 5V, FREQ = GND, f_{sw} = 420kHz with forced PWM, L = 4.7µH, DCR = 13mΩ



Line Regulation vs. Input Voltage

V_{OUT} = 5V, FREQ = GND, f_{SW} = 420kHz with FPWM, L = 4.7µH, DCR = 13mΩ



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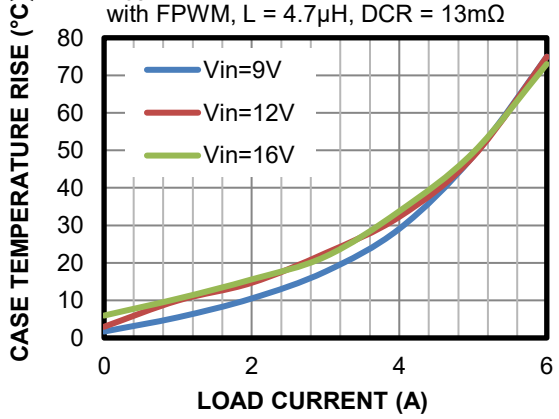
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board, V_{IN} = 12V, V_{OUT} = 5V, L = 4.7µH, FPWM mode, T_A = 25°C, unless otherwise noted.

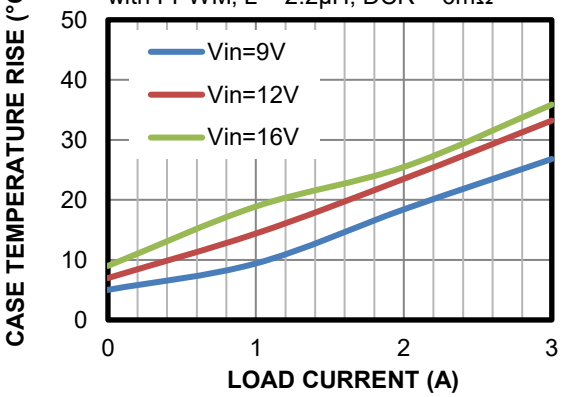
Case Temperature Rise vs. Load Current

V_{OUT} = 5V, FREQ = GND, f_{SW} = 420kHz with FPWM, L = 4.7µH, DCR = 13mΩ



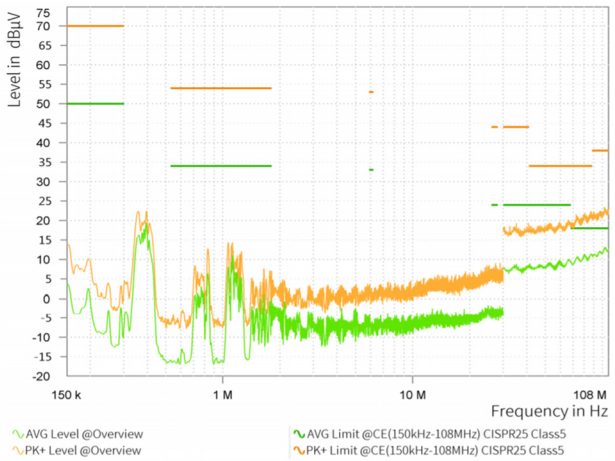
Case Temperature Rise vs. Load Current

V_{OUT} = 5V, FREQ = VCC, f_{SW} = 2.2MHz with FPWM, L = 2.2µH, DCR = 6mΩ



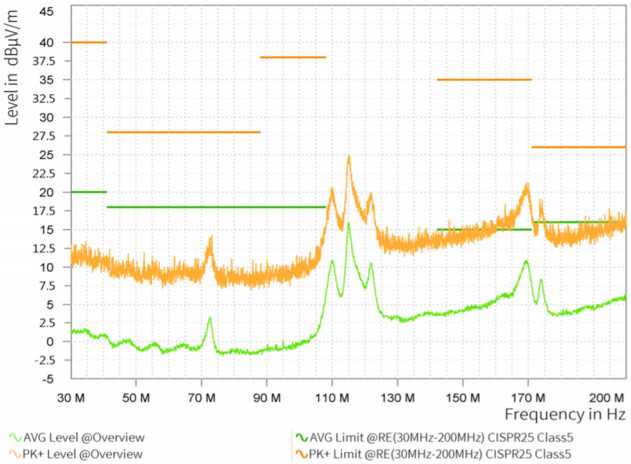
Conducted EMI

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, L = 4.7µH, FREQ = GND, f_{SW} = 420kHz with FPWM mode



Radiated EMI

V_{IN} = 12V, V_{OUT} = 5V, I_{OUT} = 3A, L = 4.7µH, FREQ = GND, f_{SW} = 420kHz with FPWM mode



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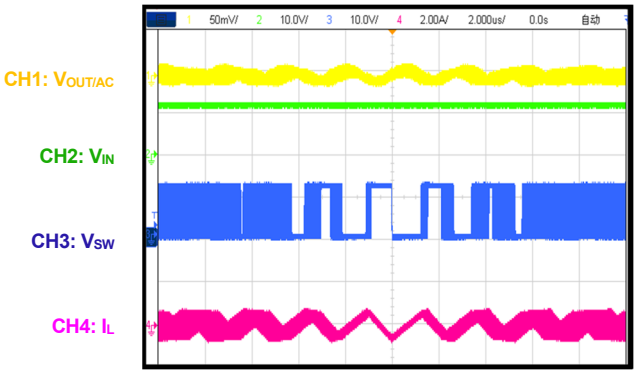
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 5V, L = 4.7µH, FPWM mode, T_A = 25°C, unless otherwise noted.

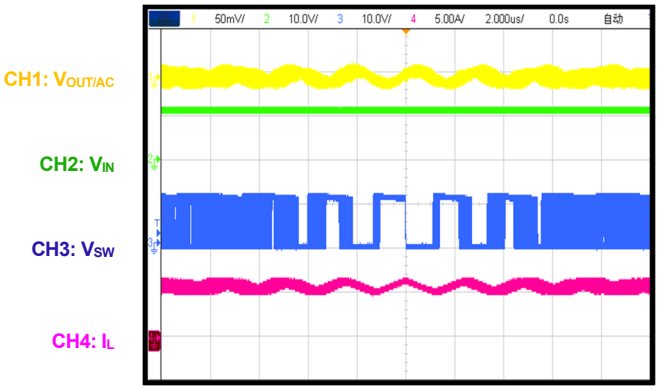
Steady State

FREQ = GND, f_{SW} = 420kHz with FPWM mode, I_{OUT} = 0A



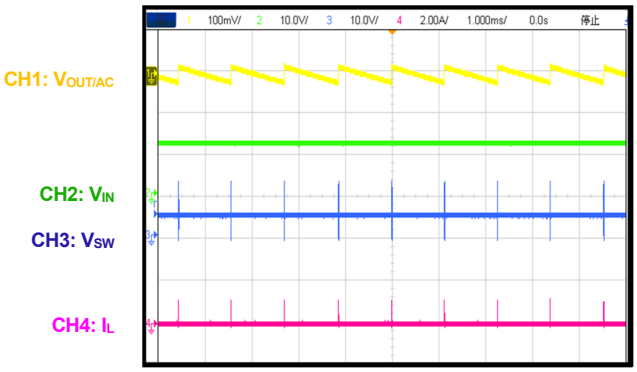
Steady State

FREQ = GND, f_{SW} = 420kHz with FPWM mode, I_{OUT} = 6A



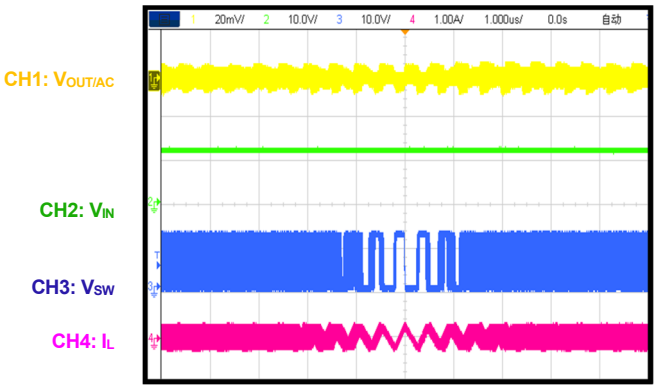
Steady State

FREQ = floating, f_{SW} = 420kHz with automatic PFM/PWM mode, I_{OUT} = 0A



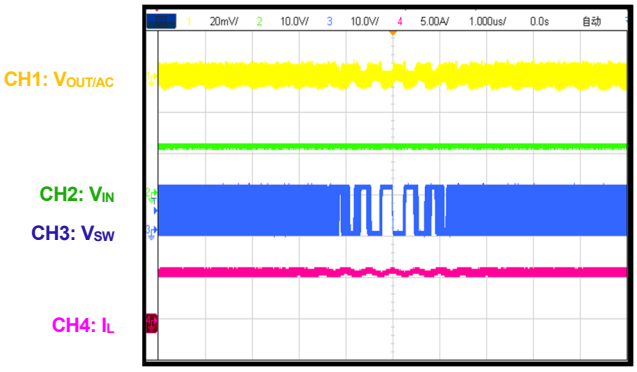
Steady State

FREQ = VCC, L = 2.2µH, f_{SW} = 2.2MHz with FPWM mode, I_{OUT} = 0A



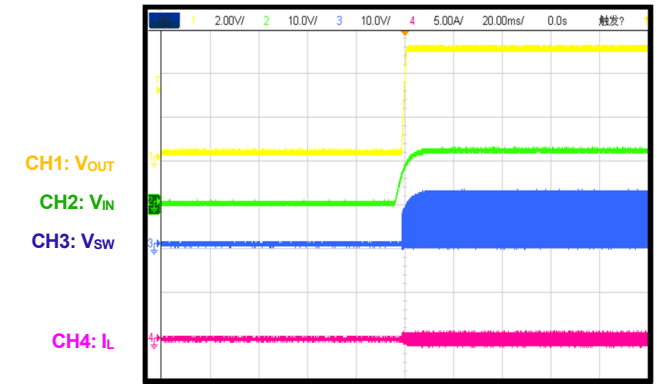
Steady State

FREQ = VCC, L = 2.2µH, f_{SW} = 2.2MHz with FPWM mode, I_{OUT} = 6A



Start-Up

I_{OUT} = 0A



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EVB TEST RESULTS

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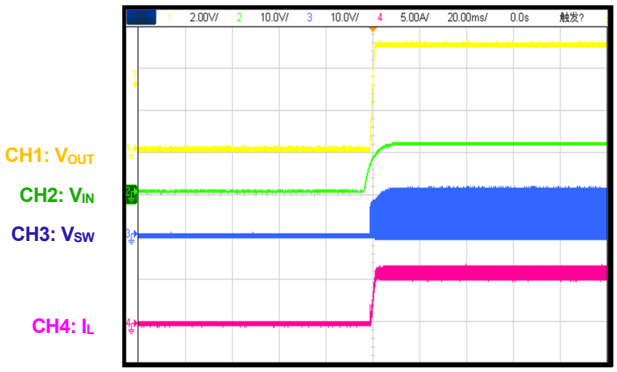
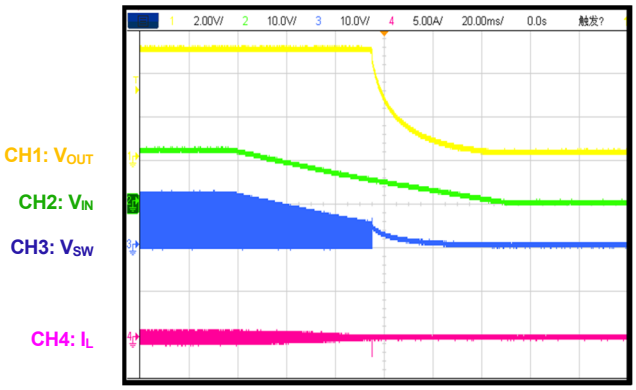
Start-Up

I_{OUT} = 6A



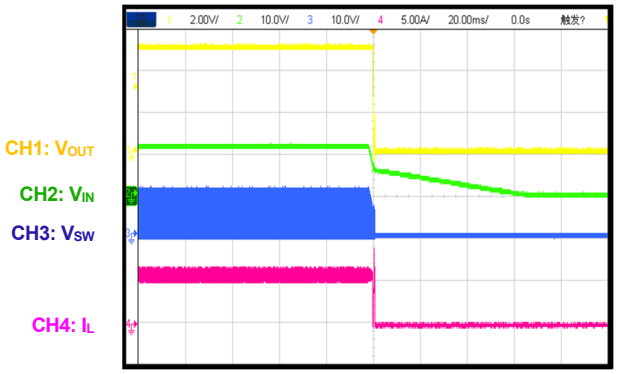
Shutdown

I_{OUT} = 0A



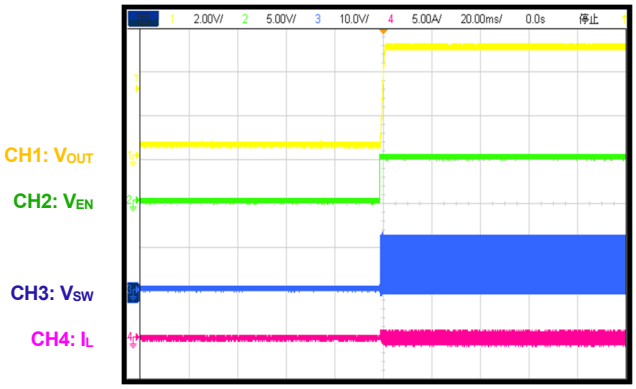
Shutdown

I_{OUT} = 6A



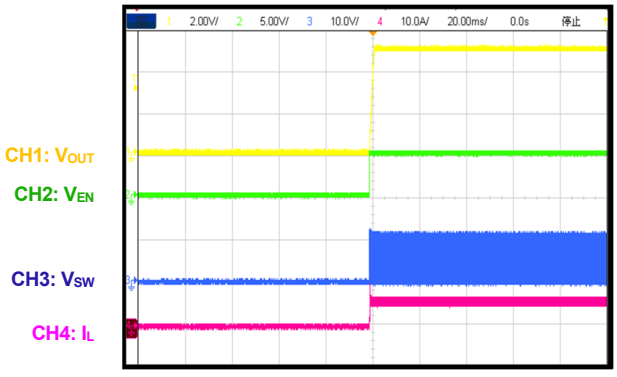
Start-Up through EN

I_{OUT} = 0A



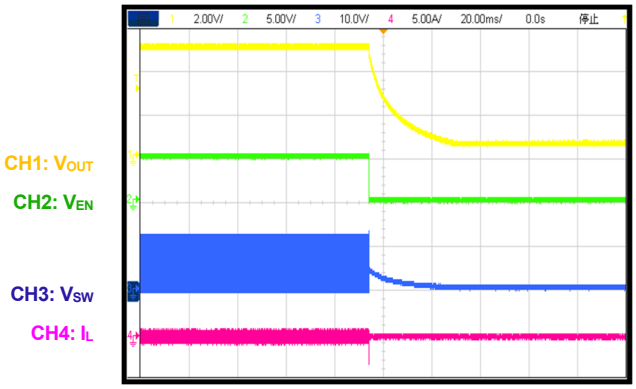
Start-Up through EN

I_{OUT} = 6A



Shutdown through EN

I_{OUT} = 0A



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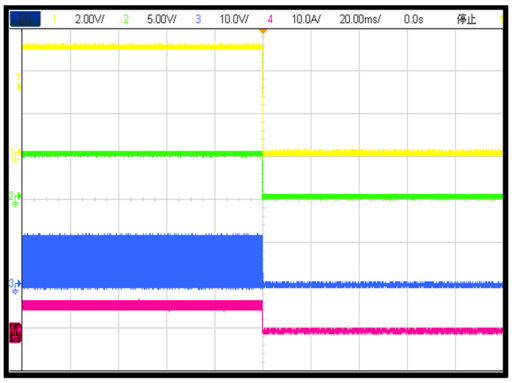
EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 5V, L = 4.7µH, FPWM mode, T_A = 25°C, unless otherwise noted.

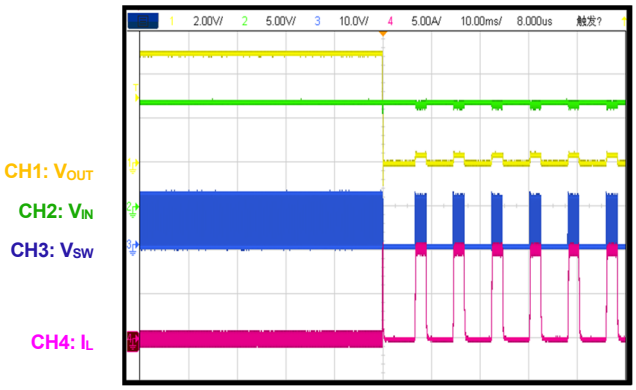
Shutdown through EN

I_{OUT} = 6A



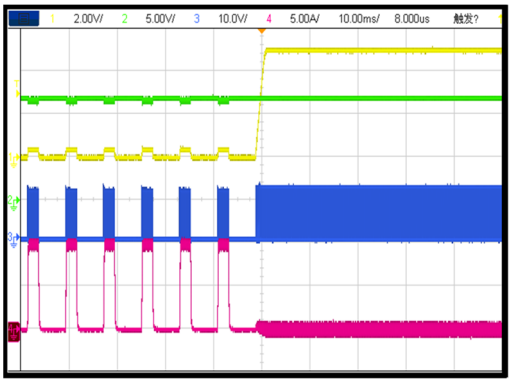
SCP Entry

I_{OUT} = 0A



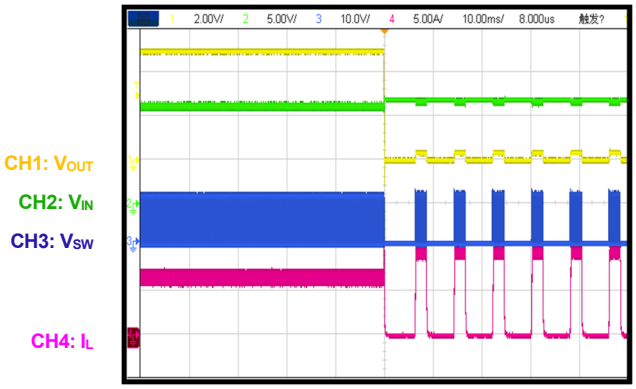
SCP Recovery

I_{OUT} = 0A



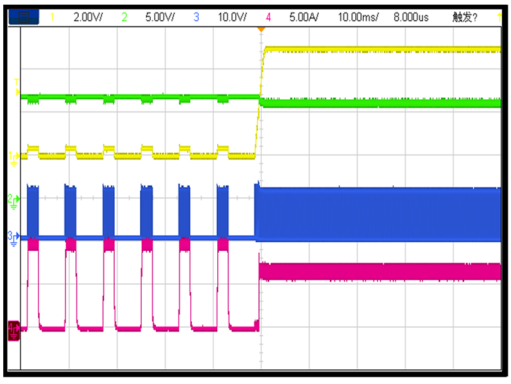
SCP Entry

I_{OUT} = 6A

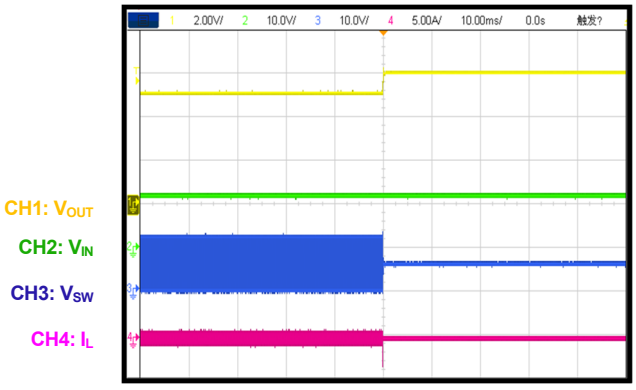


SCP Recovery

I_{OUT} = 6A



OVP Entry



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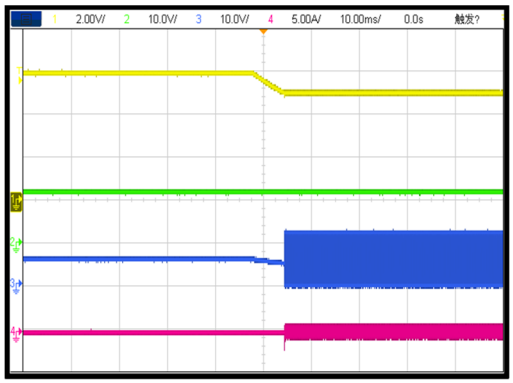
EVB TEST RESULTS

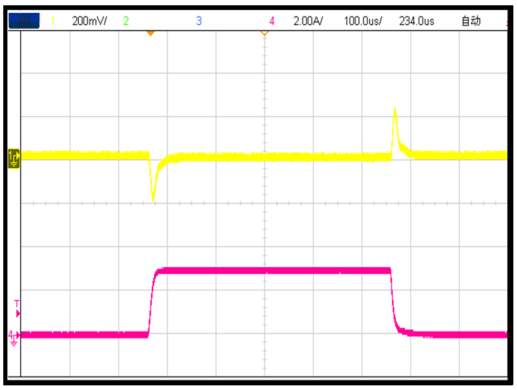
Performance curves and waveforms are tested on the evaluation board. V_{IN} = 12V, V_{OUT} = 5V, L = 4.7µH, FPWM mode, T_A = 25°C, unless otherwise noted.

OVP Recovery



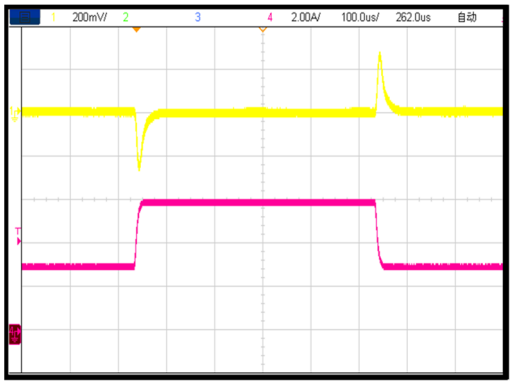
Load Transient

I_{OUT} = 0A to 3A, slew rate = 0.4A/µs

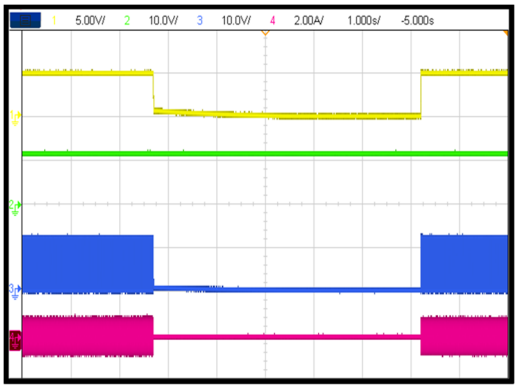


Load Transient

I_{OUT} = 3A to 6A, slew rate = 0.4A/µs

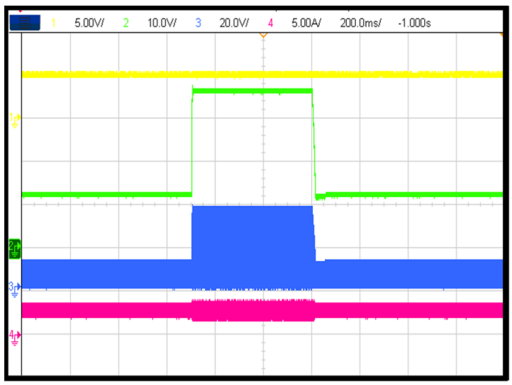


OTP Entry and Recovery



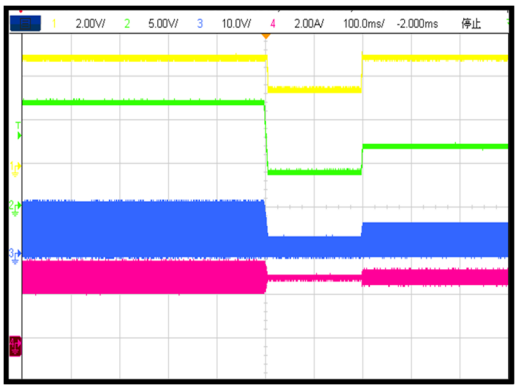
Load Dump

V_{IN} = 12V to 36V, I_{OUT} = 3A



Cold-Crank Conditions

V_{IN} = 12V to 4V to 7V, I_{OUT} = 3A



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PCB LAYOUT

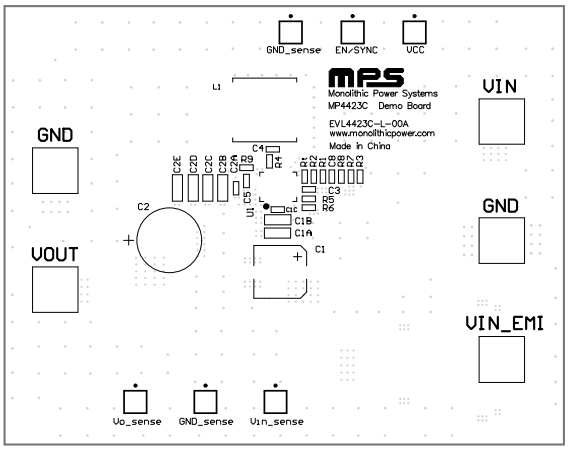

Figure 3: Top Silk

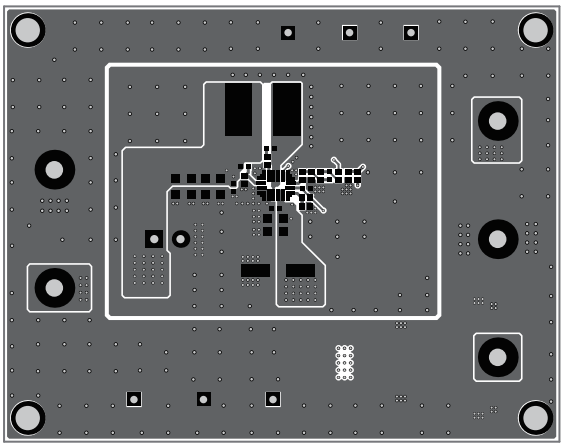

Figure 4: Top Layer

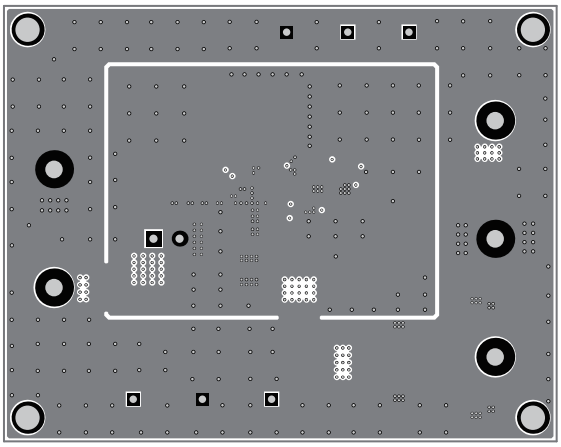

Figure 5: Mid-Layer 1

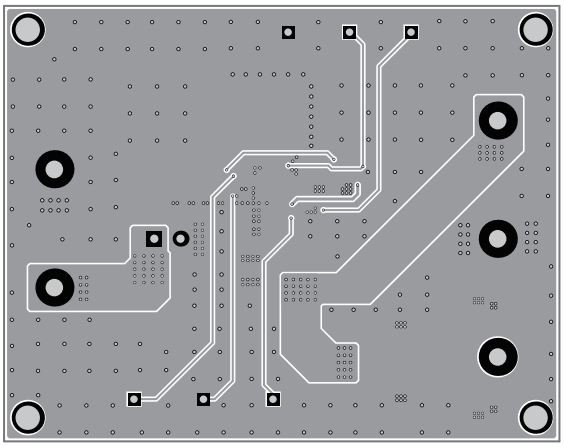

Figure 6: Mid-Layer 2

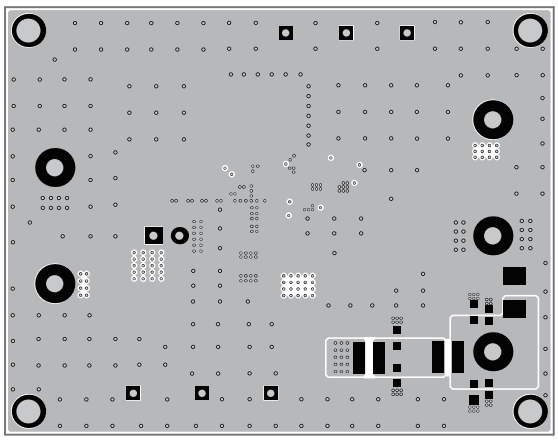

Figure 7: Bottom Layer

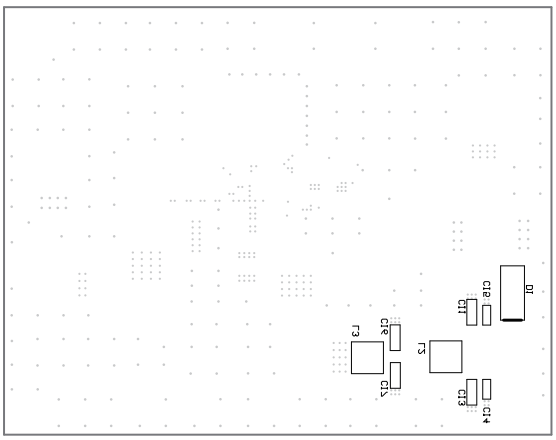

Figure 8: Bottom Silk

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REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	7/11/2025	Initial Release	-

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