



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.

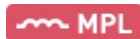
Current mode operation provides fast transient response and eases loop stabilization.

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

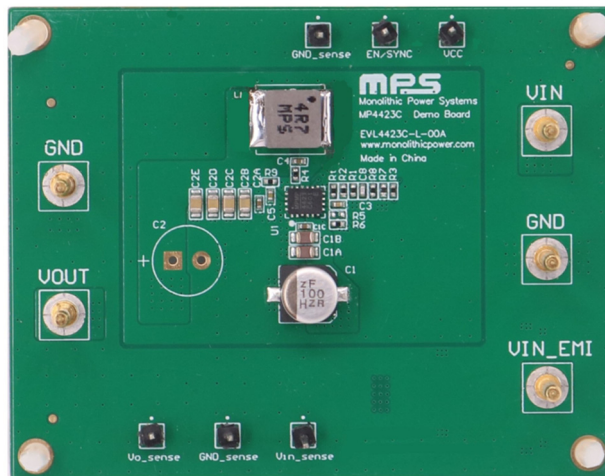
The MP4423C requires a minimal number of readily available, standard external components, and is available in a QFN-16 (3mmx4mm) package.

PERFORMANCE SUMMARY

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

 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.

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.

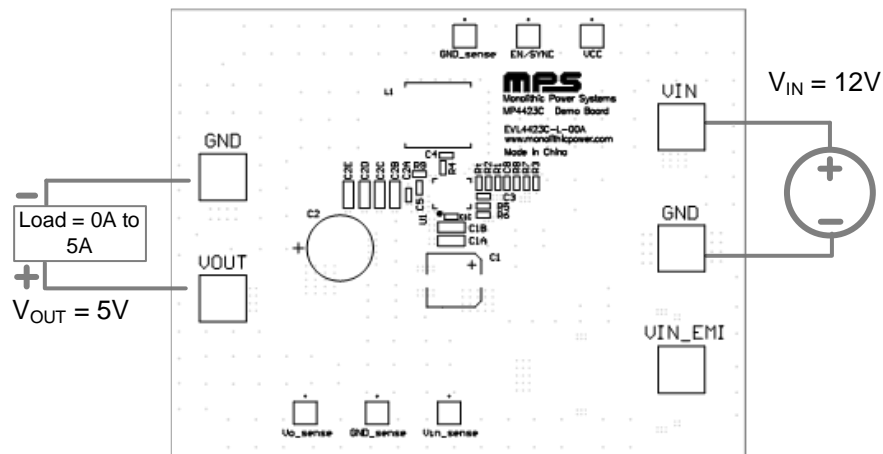


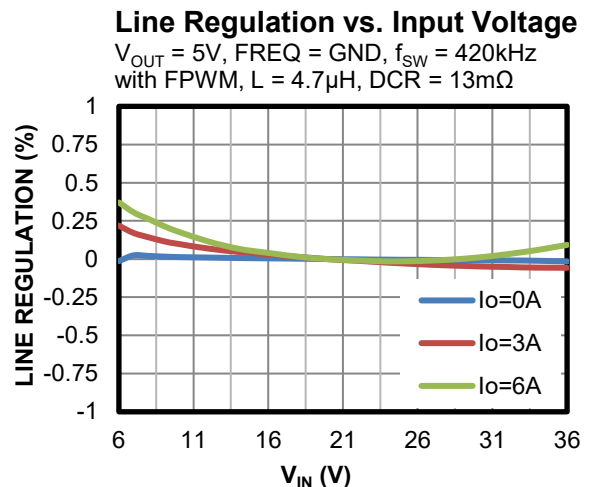
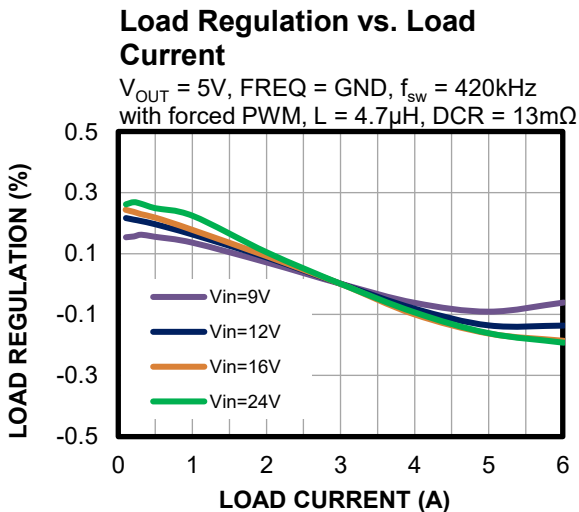
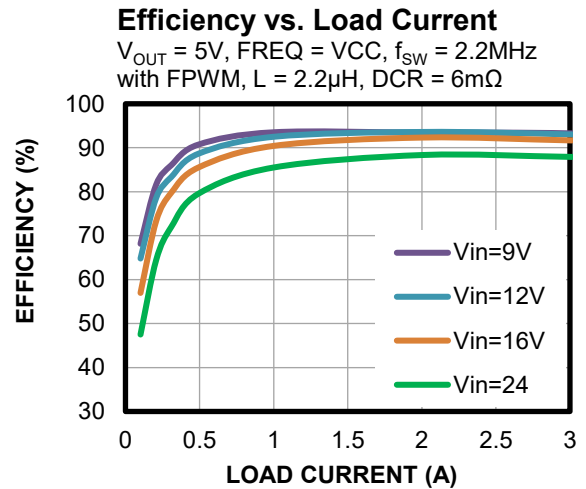
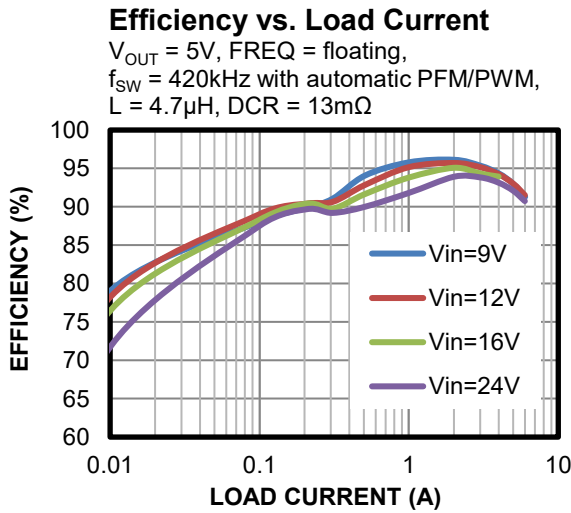
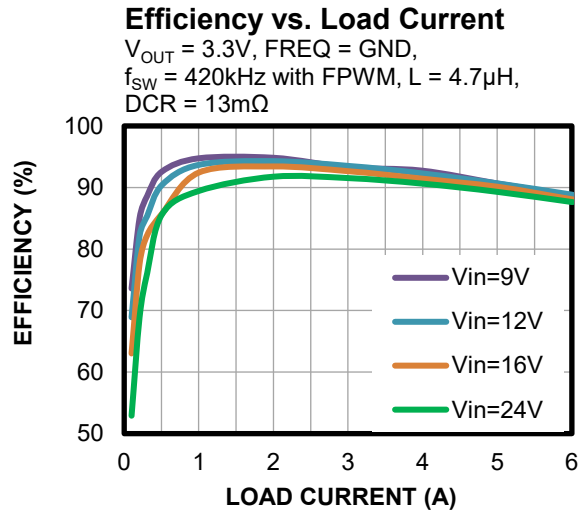
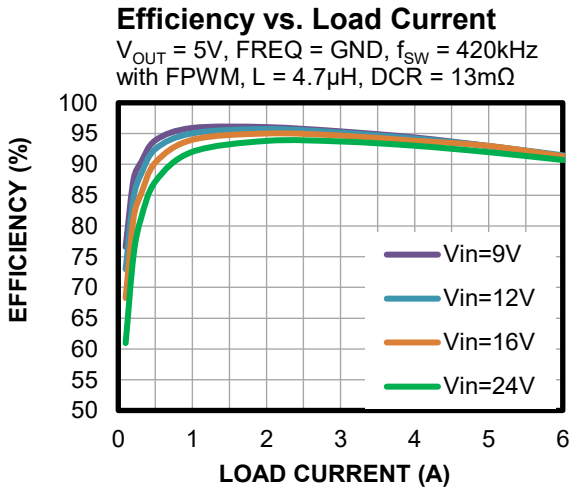
Figure 1: Measurement Equipment Set-Up

EVL4423C-L-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|----------|--------------------|----------------|---|------------------|------------------|--------------------|
| 3 | C11, C16, C17 | 10 μ F | Ceramic capacitor, 50V, X5R | 0805 | Murata | GRM21BR61H106KE43L |
| 1 | C13 | 0.1 μ F | Ceramic capacitor, 50V, X7R | 0805 | Murata | GRM21BR71H104KA01L |
| 2 | C14, C15 | 22nF | Ceramic capacitor, 50V, X5R | 0603 | Murata | GRM188R71H223KA01D |
| 1 | C1 | 100 μ F | 100 μ F/50V | SMD | Nippon Chemi-Con | EMZR500ARA101MF80G |
| 2 | C1A, C1B | 10 μ F | Ceramic capacitor, 50V, X5R | 0805 | Murata | GRM21BR61H106KE43L |
| 4 | C2B, C2C, C2D, C2E | 22 μ F | Ceramic capacitor, 10V, X5R | 0805 | Murata | GRM21BR61A226ME51L |
| 2 | C1C, C2A | 0.1 μ F | Ceramic capacitor, 100V, X5R | 0402 | Murata | GRM155R62A104KE14D |
| 1 | C3 | 1 μ F | Ceramic capacitor, 10V, X5R | 0402 | Würth | 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 | 2.2 μ H | Inductor, R _{DC} = 35m Ω , I _{SAT} = 6.2A | SMD | Würth | 74438356022 |
| Optional | L2, L3 | 2.2 μ H | Inductor, R _{DC} = 38.7m Ω , I _{SAT} = 6A | SMD | Superworld | PIFQ0402A2R2MN |
| 1 | R1 | 60.4k Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-0760K4L |
| 1 | R2 | 11.3k Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-0711K3L |
| 1 | R3 | 100k Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-07100KL |
| 1 | R4 | 4.7 Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-074R7L |
| 1 | R7 | 36k Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-0736KL |
| 2 | R8, R9 | 10 Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-0710RL |
| 2 | R6, R _T | 0 Ω | Film resistor, 1% | 0402 | Yageo | RC0402FR-070RL |
| 0 | R5, C2, D1 | NS | | | | |
| 1 | L1 | 4.7 μ H | Inductor, R _{DC} = 13m Ω , I _{SAT} = 15.2A | SMD | Coilcraft | XAL7070-472MEC |
| Optional | L1 | 4.7 μ H | Inductor, R _{DC} = 9.5m Ω , I _{SAT} = 15A | SMD | MPS | MPL-AY1050-4R7 |
| 1 | U1 | MP4423C | 6A, 26V, step-down switch-mode converter | QFN-16 (3mmx4mm) | MPS | MP4423CGLE |

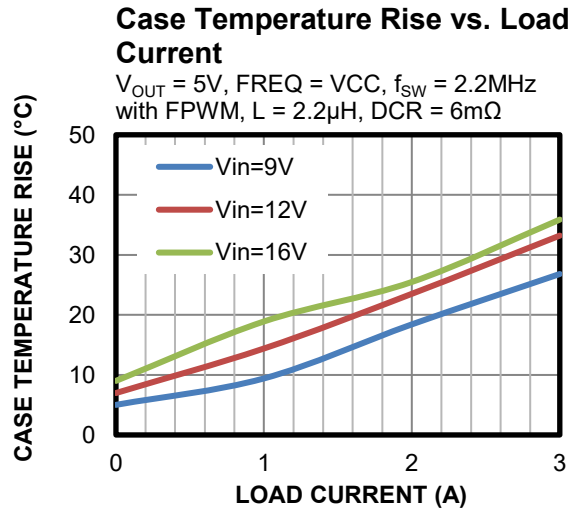
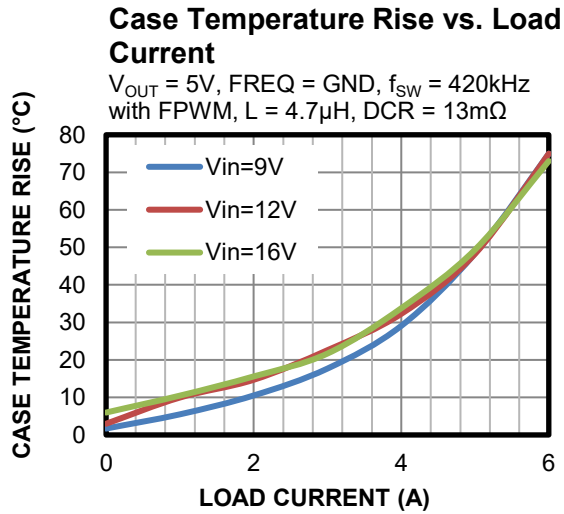
EVB TEST RESULTS

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



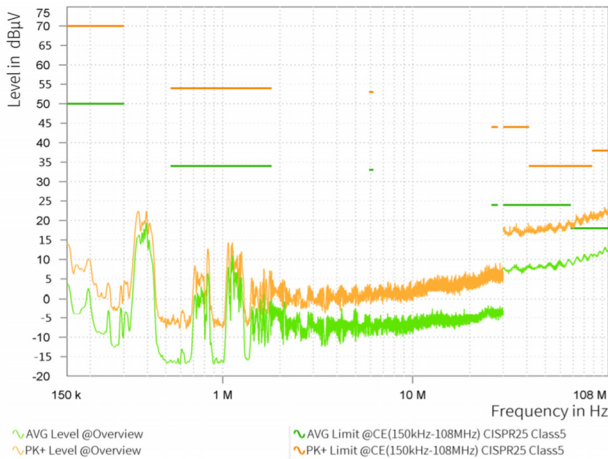
EVB TEST RESULTS

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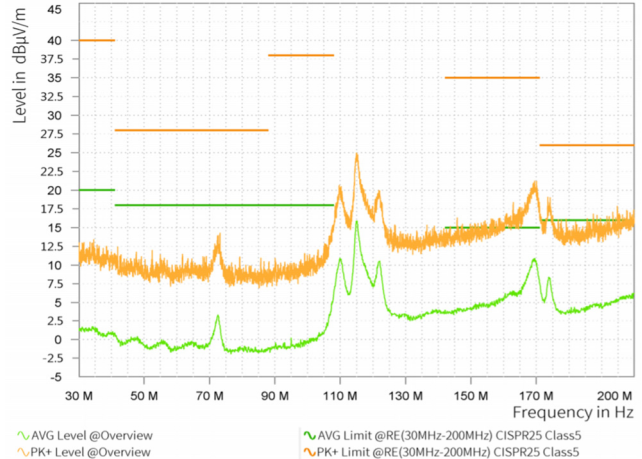
Conducted EMI

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



Radiated EMI

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

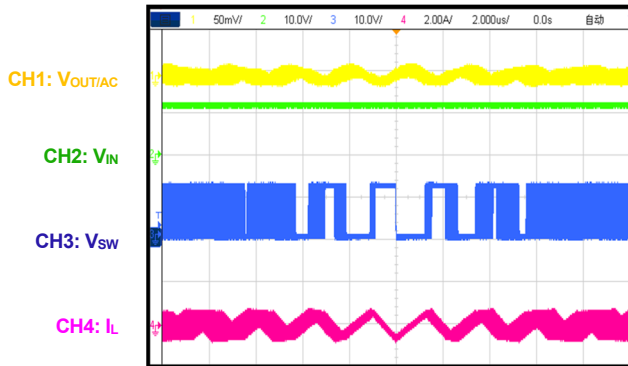


EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 12V$, $V_{OUT} = 5V$, $L = 4.7\mu H$, FPWM mode, $T_A = 25^\circ C$, unless otherwise noted.

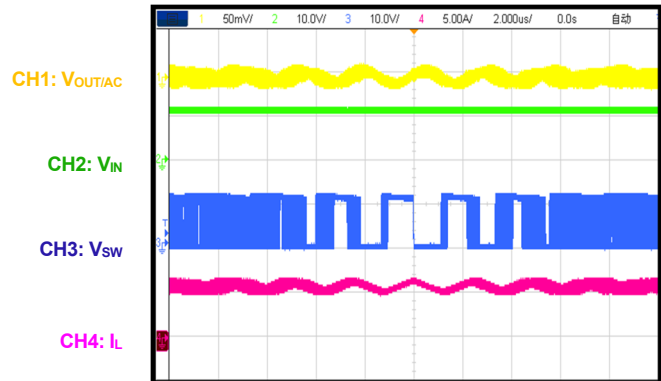
Steady State

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



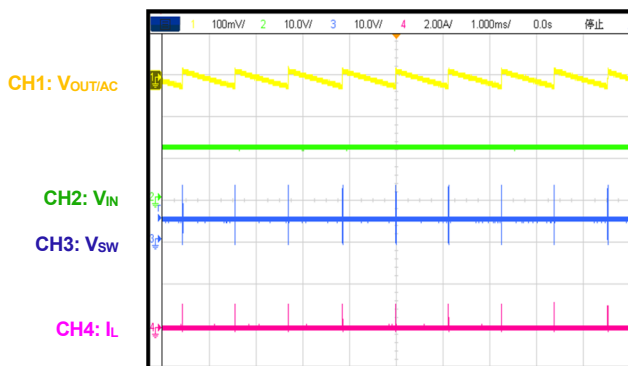
Steady State

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



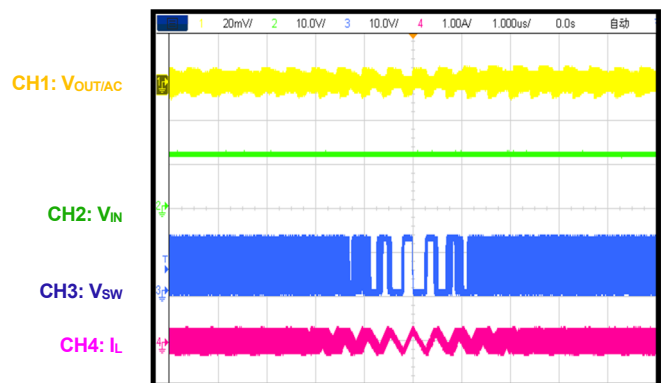
Steady State

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



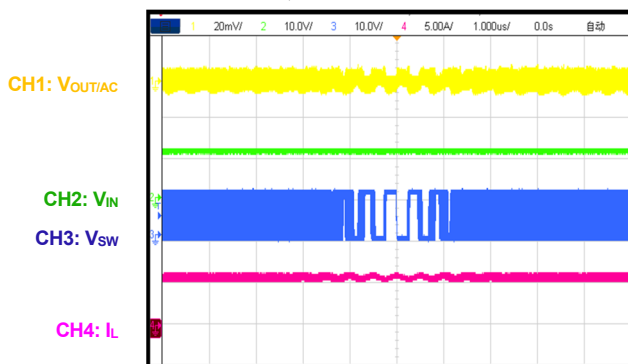
Steady State

FREQ = VCC, $L = 2.2\mu H$, $f_{sw} = 2.2MHz$ with FPWM mode, $I_{OUT} = 0A$



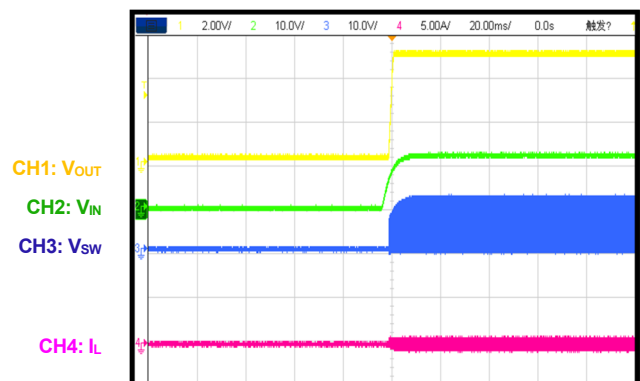
Steady State

FREQ = VCC, $L = 2.2\mu H$, $f_{sw} = 2.2MHz$ with FPWM mode, $I_{OUT} = 6A$



Start-Up

$I_{OUT} = 0A$

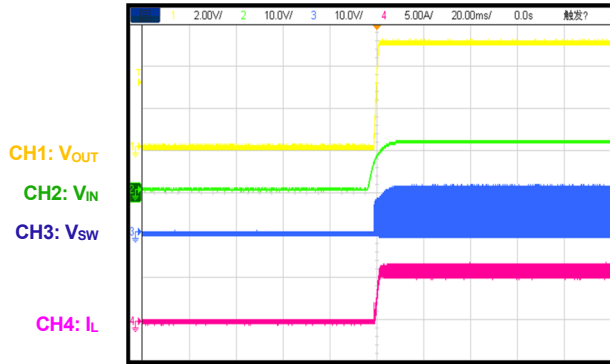


EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 12V$, $V_{OUT} = 5V$, $L = 4.7\mu H$, FPWM mode, $T_A = 25^\circ C$, unless otherwise noted.

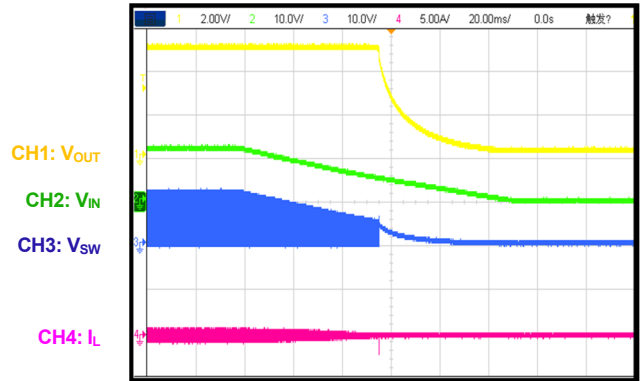
Start-Up

$I_{OUT} = 6A$



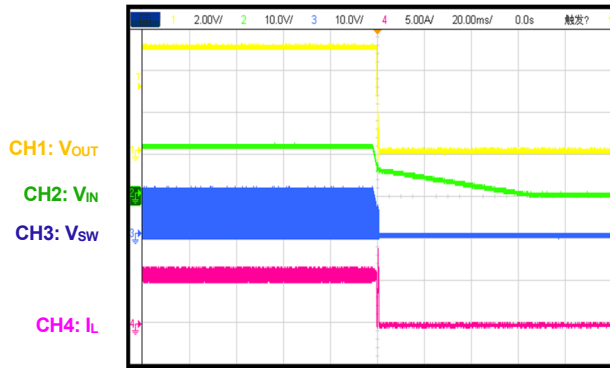
Shutdown

$I_{OUT} = 0A$



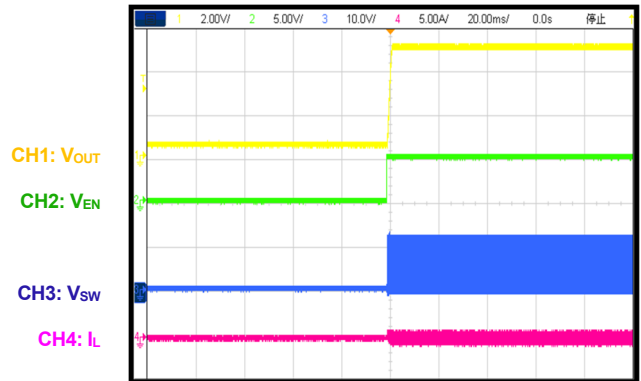
Shutdown

$I_{OUT} = 6A$



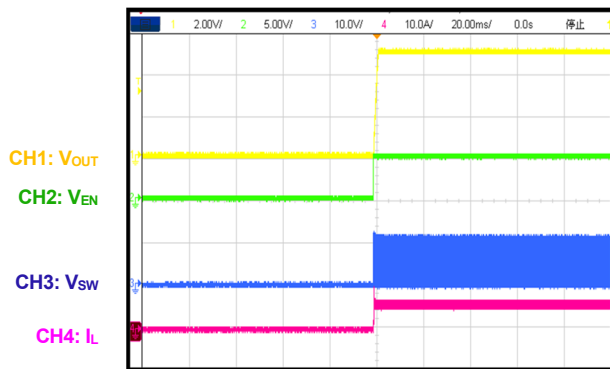
Start-Up through EN

$I_{OUT} = 0A$



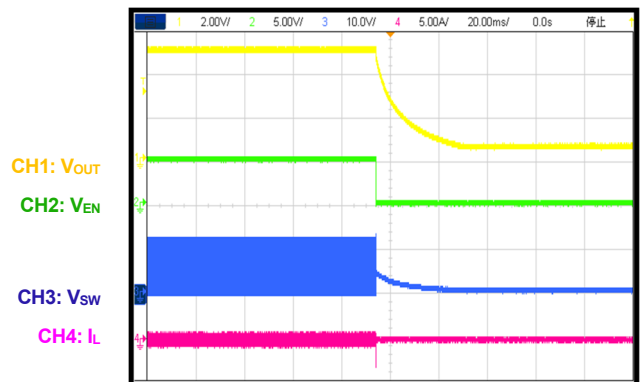
Start-Up through EN

$I_{OUT} = 6A$



Shutdown through EN

$I_{OUT} = 0A$

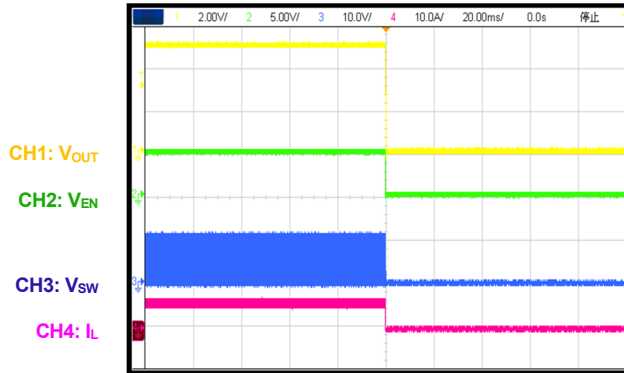


EVB TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 12V$, $V_{OUT} = 5V$, $L = 4.7\mu H$, FPWM mode, $T_A = 25^\circ C$, unless otherwise noted.

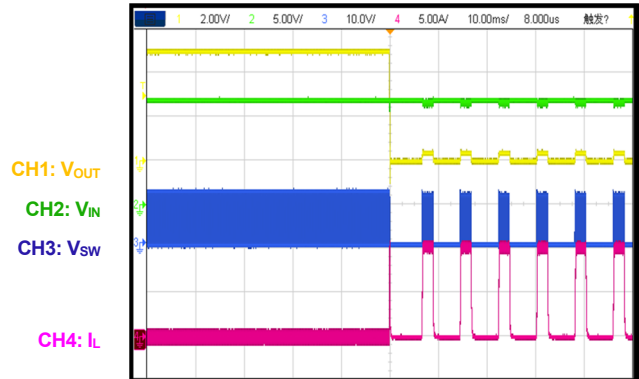
Shutdown through EN

$I_{OUT} = 6A$



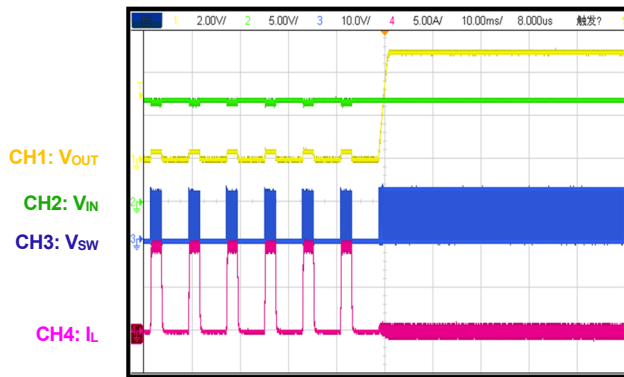
SCP Entry

$I_{OUT} = 0A$



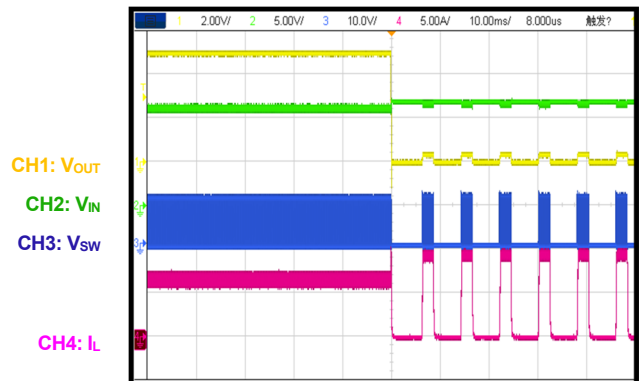
SCP Recovery

$I_{OUT} = 0A$



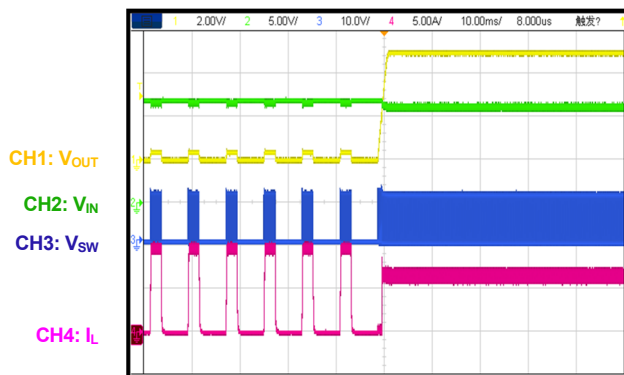
SCP Entry

$I_{OUT} = 6A$

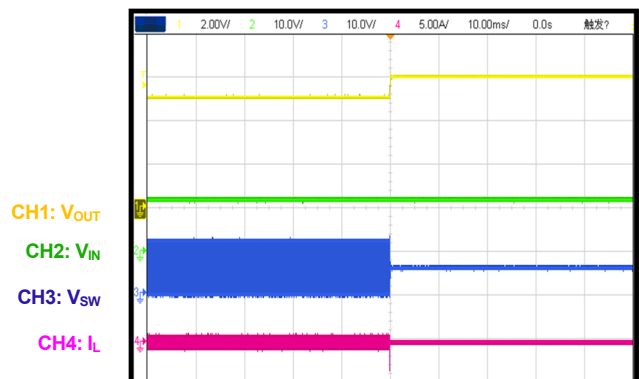


SCP Recovery

$I_{OUT} = 6A$



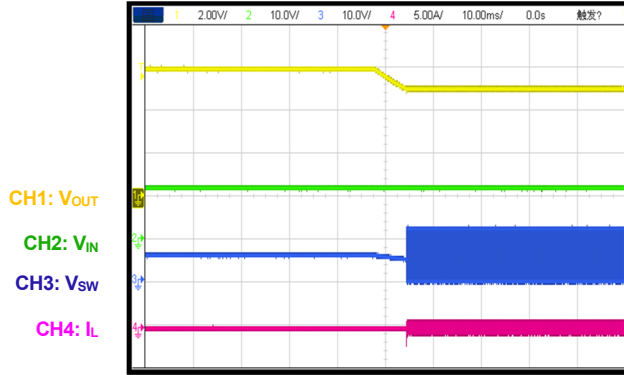
OVP Entry



EVB TEST RESULTS

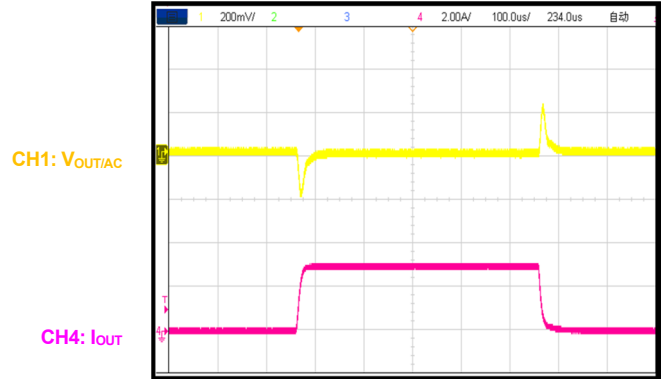
Performance curves and waveforms are tested on the evaluation board. $V_{IN} = 12V$, $V_{OUT} = 5V$, $L = 4.7\mu H$, FPWM mode, $T_A = 25^\circ C$, unless otherwise noted.

OVP Recovery



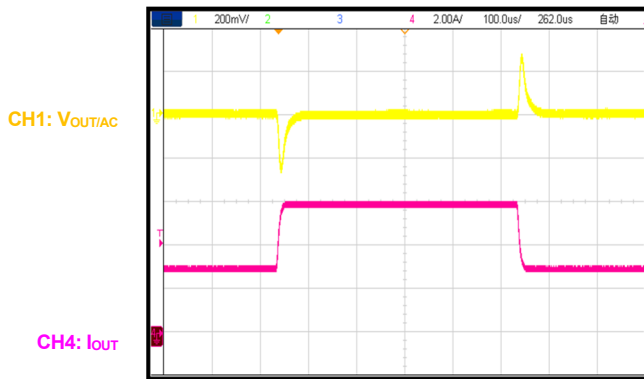
Load Transient

$I_{OUT} = 0A$ to $3A$, slew rate = $0.4A/\mu s$

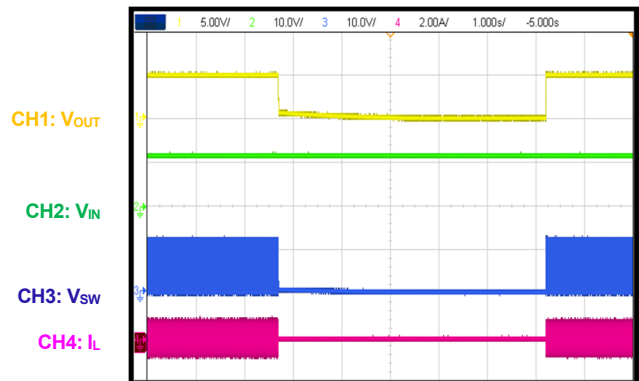


Load Transient

$I_{OUT} = 3A$ to $6A$, slew rate = $0.4A/\mu s$

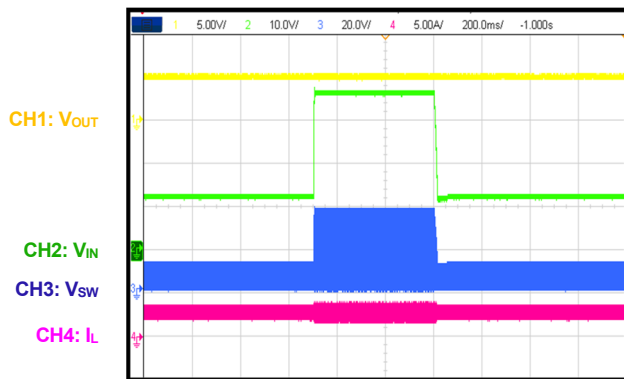


OTP Entry and Recovery



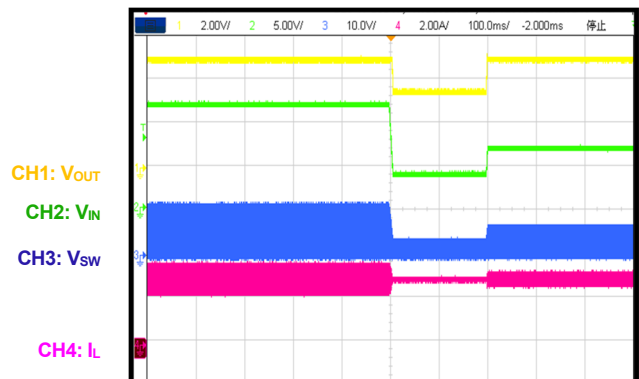
Load Dump

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



Cold-Crank Conditions

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



PCB LAYOUT

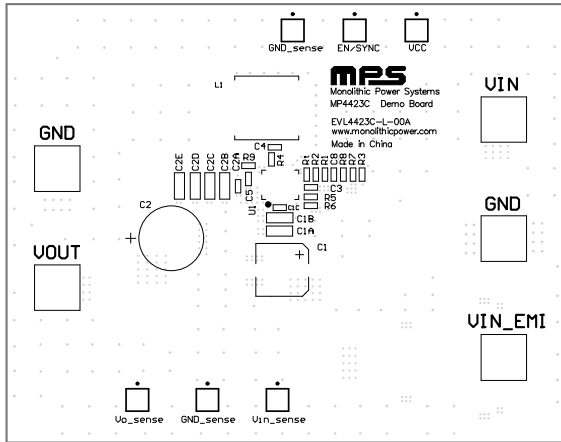


Figure 3: Top Silk

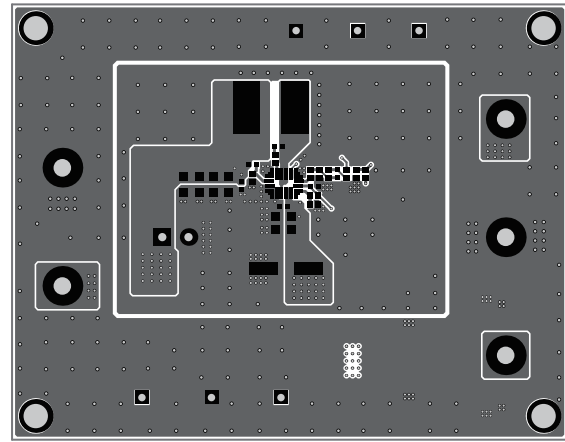


Figure 4: Top Layer

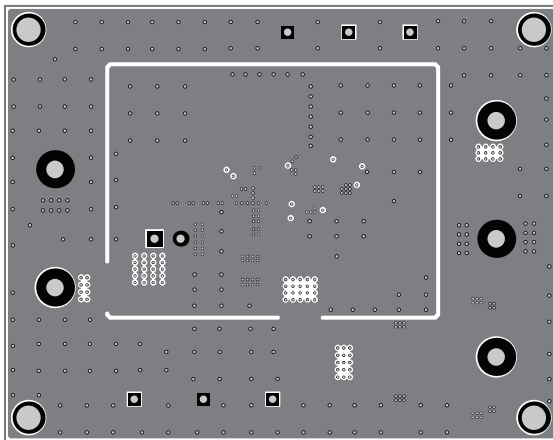


Figure 5: Mid-Layer 1

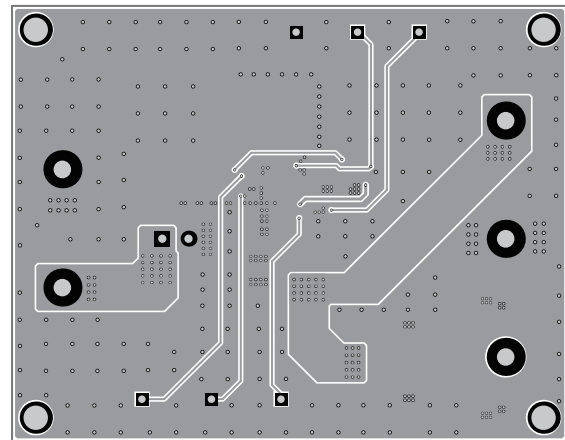


Figure 6: Mid-Layer 2

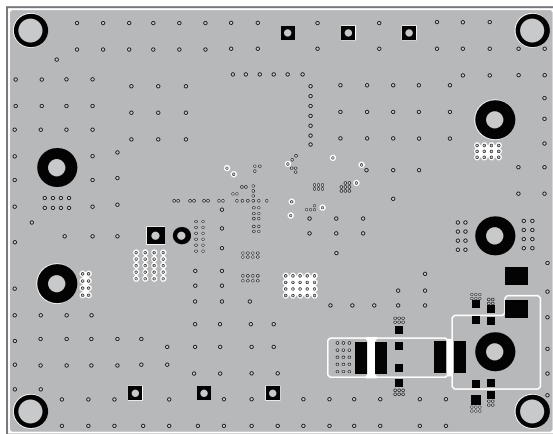


Figure 7: Bottom Layer

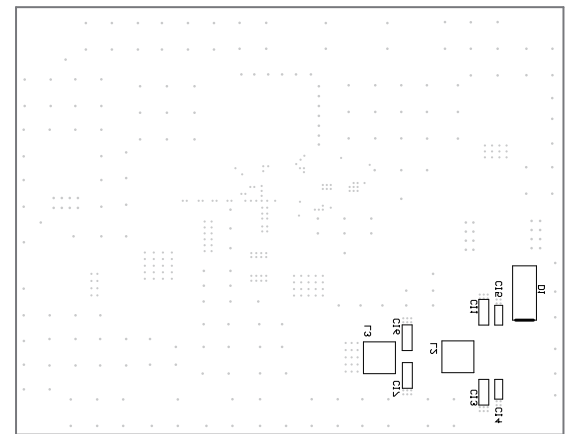


Figure 8: Bottom Silk

REVISION HISTORY

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

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