# EVL3435-L-00A

## 19A, 22V, Fixed-Frequency, High-Efficiency, Fully Integrated, Synchronous Boost Converter Evaluation Board

## DESCRIPTION

The EVL3435-L-00A is an evaluation board designed to demonstrate the capabilities of the MP3435, a 600kHz, fixed-frequency, high-efficiency, fully integrated synchronous boost converter with 22V of output voltage across a wide input supply range (3V to 20V). The MP3435 features input disconnect to provide additional protection during an output short or shutdown by isolating the input from the output. For battery-operated applications, the input disconnect also prevents battery depletion.

The MP3435 features a 10mΩ low-side MOSFET (LS-FET) and a 15mΩ synchronous high-side MOSFET (HS-FET) for high efficiency and low cost. The MP3435's fault protections include under-voltage lockout (UVLO), current limiting, and thermal shutdown (TSD).

The MP3435 is available in a low-profile QFN-20 (3mmx4mm) package.

## ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Input voltage | $V_{IN}$ | 3 to 10 | V |
| Output voltage | $V_{OUT}$ | 12 | V |
| Output current | $I_{OUT}$ | 0 to OCP (1) | A |

**Note:**

1) The maximum output current depends on the current limit, permitted temperature rising, and input voltage.

## FEATURES

- Wide 3V to 20V Operating Input Range
- Up to 22V Output Voltage
- Integrated 10mΩ LS-FET and 15mΩ Synchronous HS-FET
- 19A Internal Switch Current Limit or External Configurable Input Current Limit
- Input Disconnect and Output Short-Circuit Protection (SCP)
- External Soft Start (SS) and Compensation
- Configurable UVLO and Hysteresis
- <1μA Shutdown Current
- Thermal Shutdown (TSD) at 150°C
- Available in a QFN-20 (3mmx4mm) Package

MPL Optimized Performance with MPS Inductor MPL-AY1050 Series

## APPLICATIONS

- Thunderbolt Interfaces
- Notebooks and Tablets
- Bluetooth Audio
- Power Banks
- Fuel Cells
- Point-of-Sale (POS) Systems
- Other Electronic Accessories



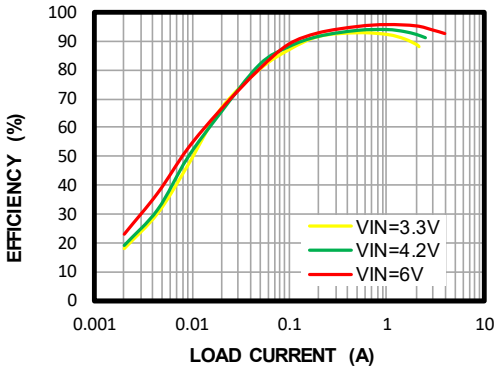
## EVL3435-L-00A EVALUATION BOARD

**LxWxH (6.4cmx6.4cmx0.6cm)**

| Board Number | MPS IC Number | MPS Inductor |
|---|---|---|
| EVL3435-L-00A | MP3435GL | MPL-AY1050-1R5 |

**Efficiency**

Input MOSFET, $V_{OUT}$ = 12V



## QUICK START GUIDE

The output voltage ($V_{OUT}$) of the evaluation board is 12V. The board layout accommodates most commonly used components.

1. Preset the power supply between 3V and 10V.
2. Turn off the power supply.
3. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
4. Connect the load terminals to:
   a. Positive (+): VOUT
   b. Negative (-): GND
5. After making the connections, turn on the power supply.
6. Once the input voltage ($V_{IN}$) is applied, the MP3435 is enabled on the evaluation board.
7. $V_{OUT}$ can be changed by modifying the R2 resistor's value. The new $V_{OUT}$ can be calculated with Equation (1):

$$V_{OUT} = V_{FB} \times (1 + \frac{R1}{R2}) \quad (1)$$

   Where $V_{FB}$ is 1.225V, and R1 is 300kΩ.
8. The default configuration of the evaluation board uses an external sense resistor. To use the internal sense resistor, follow steps 9 through 11 to modify the evaluation board.
9. Connect the GATE pin to GND via a 0Ω resistor (R7).
10. Set the external sense resistor ($R4_A$, $R4_B$, $R4_C$, and $R4_D$) to 0Ω.
11. Short the input MOSFET (Q1) drain to source.
12. After modifying the evaluation board, follow steps 1 through 5. The MP3435 should automatically use the internal sense resistor.

# EVALUATION BOARD SCHEMATIC

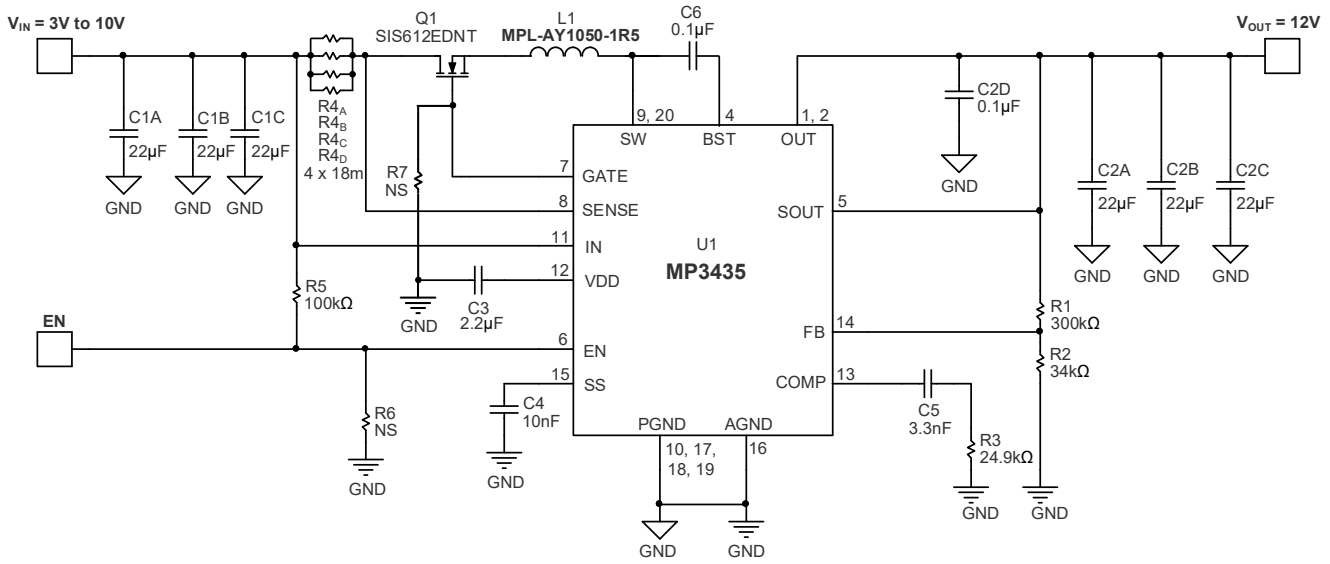



**Figure 1: Evaluation Board Schematic**

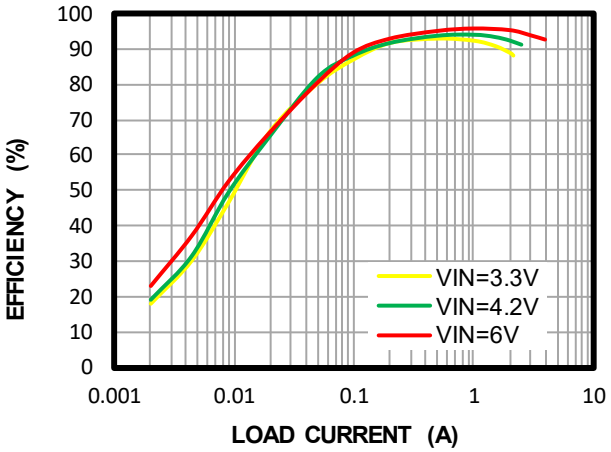
## EVL3435-L-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer P/N |
|---|---|---|---|---|---|---|
| 1 | L1 | 1.5µH | 3.4mΩ, 17A inductor | SMD (11mmx10mm) | MPS | MPL-AY1050-1R5 |
| 6 | C1A, C1B, C1C, C2A, C2B, C2C | 22µF | Ceramic capacitor, 25V, X5R | 1210 | Murata | GRM32R71E226KL |
| 2 | C2D, C6 | 0.1µF | Ceramic capacitor, 25V, X5R | 0603 | Murata | GRM188R71E104KA9 |
| 1 | C3 | 2.2µF | Ceramic capacitor, 10V, X5R | 0805 | Murata | GRM21AR71A225KL |
| 1 | C4 | 10nF | Ceramic capacitor, 50V, X5R | 0603 | Murata | GRM188R71H103KL |
| 1 | C5 | 3.3nF | Ceramic capacitor, 50V, X5R | 0603 | Murata | GRM188R71H332KL |
| 1 | Q1 | 20V | 20V, 3.2mΩ, 19A N-channel MOSFET | PowerPAK 1212-8 | Vishay | SiS612EDNT-T1-GE3 |
| 1 | R1 | 300kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-07300KL |
| 1 | R2 | 34kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0734KL |
| 1 | R3 | 24.9kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-0724K9L |
| 4 | $R4_A$, $R4_B$, $R4_C$, $R4_D$ | 18mΩ | Low-resistance film resistor, 1% | 0805 | Yageo | PR0805FKF070R018L |
| 1 | R5 | 100kΩ | Film resistor, 1% | 0603 | Yageo | RC0603JR-07100KL |
| 0 | R6, R7 | NS | | | | |
| 1 | U1 | MP3435 | 22V, 19A boost converter | QFN-20 (3mmx4mm) | MPS | MP3435GL |

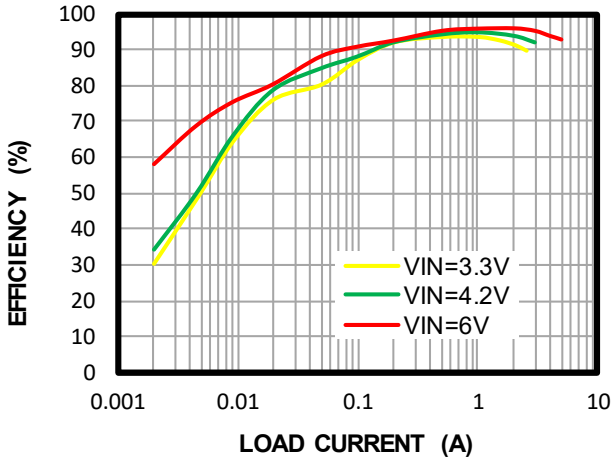
# EVB TEST RESULTS

**$V_{IN}$ = 3.3V, $V_{OUT}$ = 12V, L = 1.5µH, $I_{OUT}$ = 2A, $T_A$ = 25°C, unless otherwise noted.**

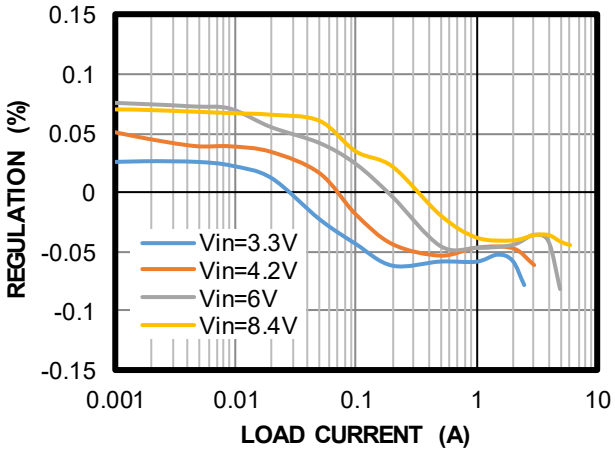
### Efficiency vs. Load Current
Input MOSFET



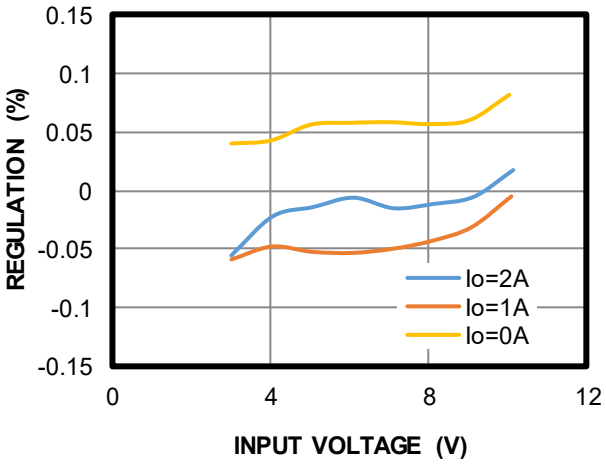

### Efficiency vs. Load Current
No input MOSFET, GATE = GND



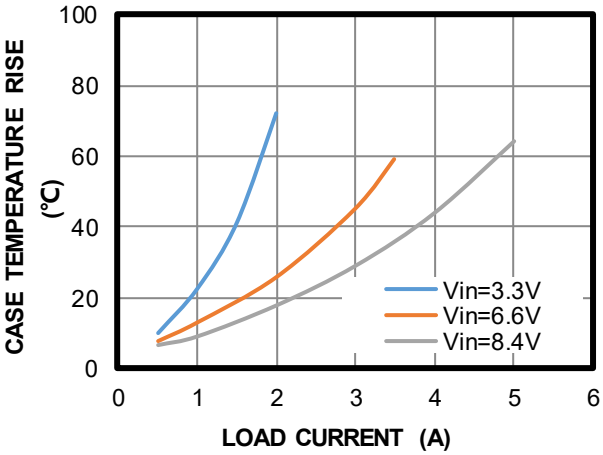

### Load Regulation



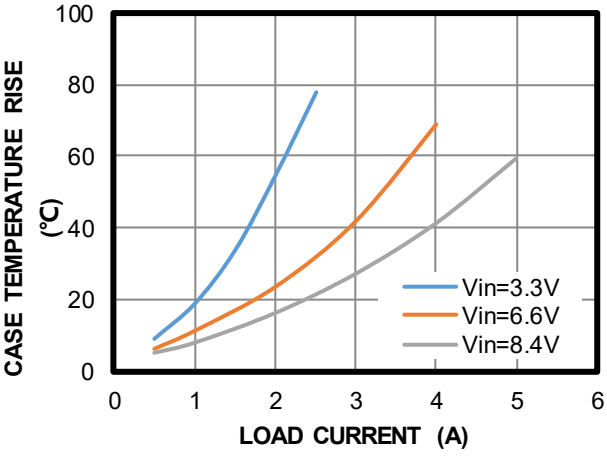

### Line Regulation




### Case Temperature Rise
Input MOSFET



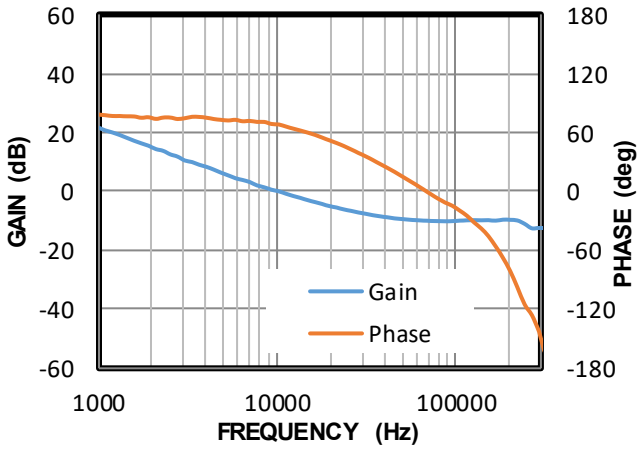

### Case Temperature Rise
No input MOSFET, GATE = GND



## EVB TEST RESULTS *(continued)*

**$V_{IN}$ = 3.3V, $V_{OUT}$ = 12V, L = 1.5µH, $I_{OUT}$ = 2A, $T_A$ = 25°C, unless otherwise noted.**

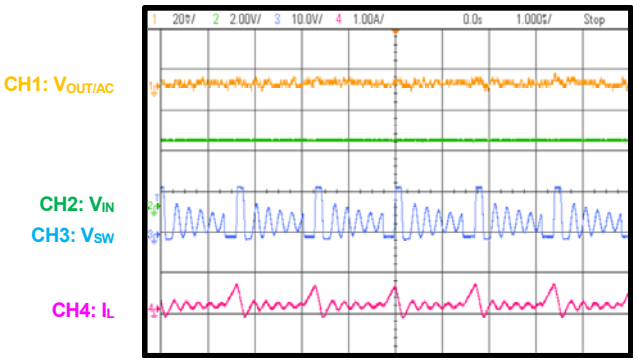
**Bode Plot**



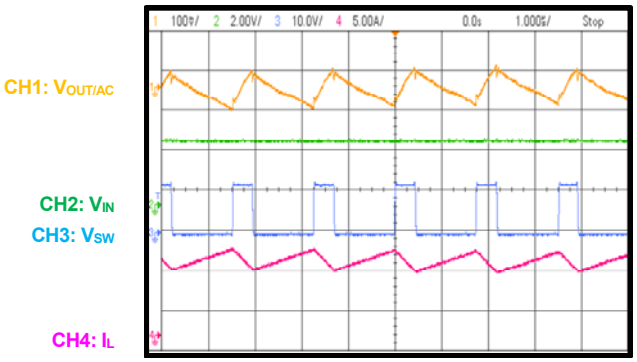
## EVB TEST RESULTS *(continued)*

**$V_{IN}$ = 3.3V, $V_{OUT}$ = 12V, L = 1.5µH, $I_{OUT}$ = 2A, $T_A$ = 25°C, unless otherwise noted.**

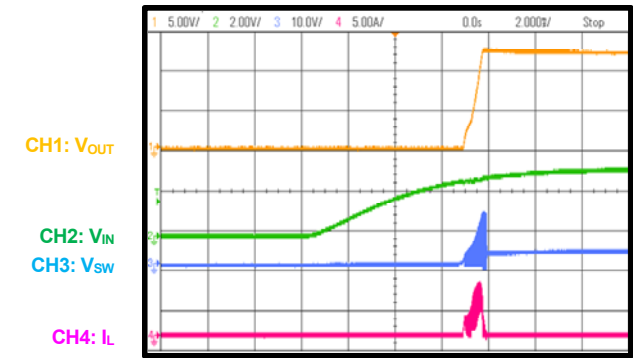
### Steady State
$I_{OUT}$ = 0A



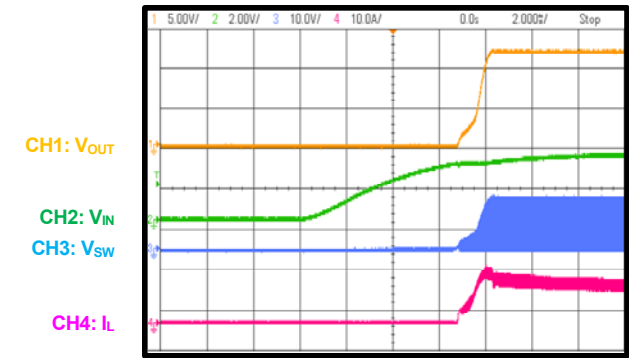

### Steady State
$I_{OUT}$ = 2A



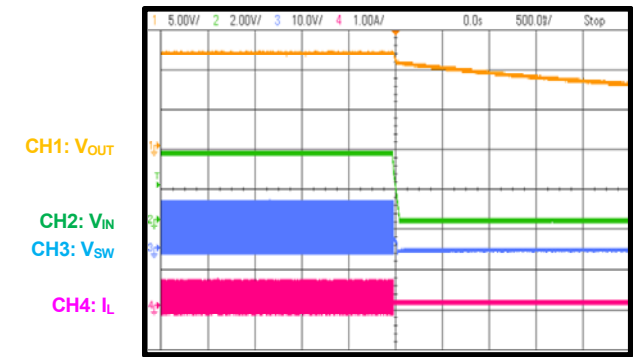

### Start-Up through VIN
$I_{OUT}$ = 0A



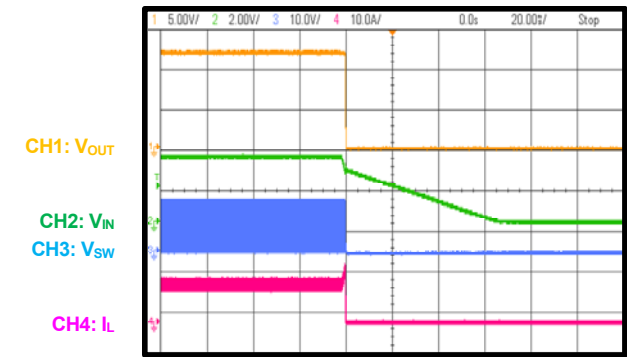

### Start-Up through VIN
$I_{OUT}$ = 2A




### Shutdown through VIN
$I_{OUT}$ = 0A




### Shutdown through VIN
$I_{OUT}$ = 2A

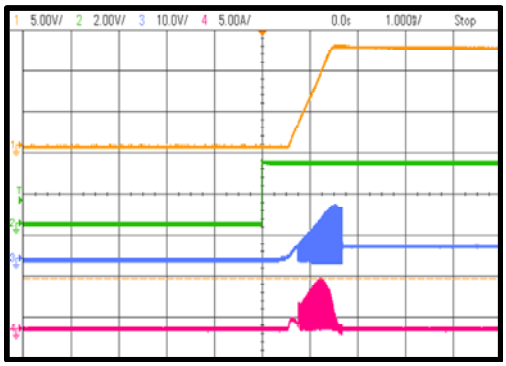


## EVB TEST RESULTS *(continued)*

**$V_{IN}$ = 3.3V, $V_{OUT}$ = 12V, L = 1.5µH, $I_{OUT}$ = 2A, $T_A$ = 25°C, unless otherwise noted.**

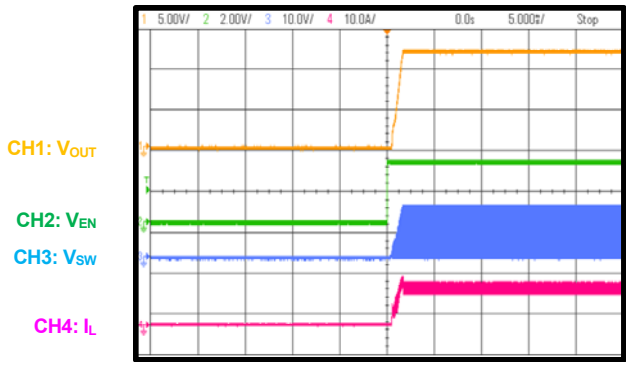
### Start-Up through EN

$I_{OUT}$ = 0A



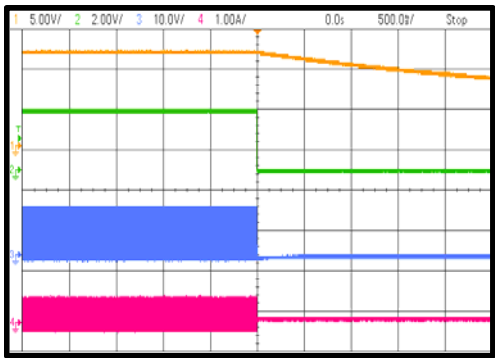

### Start-Up through EN

$I_{OUT}$ = 2A



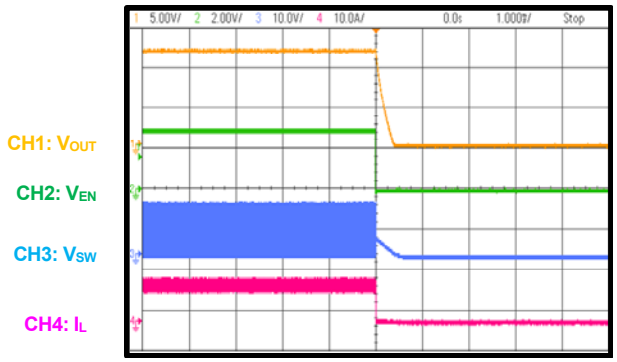

### Shutdown through EN

$I_{OUT}$ = 0A



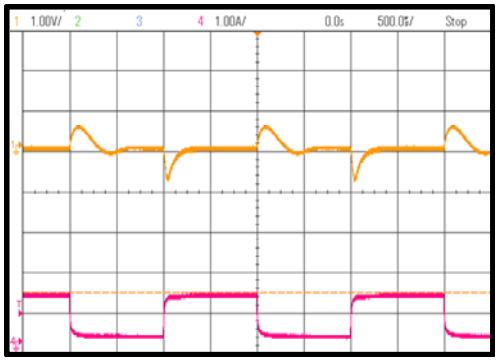

### Shutdown through EN

$I_{OUT}$ = 2A



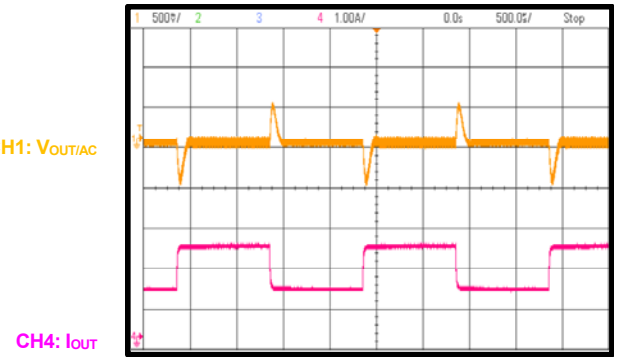

### Load Transient

$I_{OUT}$ = 0A to 1A, $I_{RAMP}$ = 25mA/µs




### Load Transient

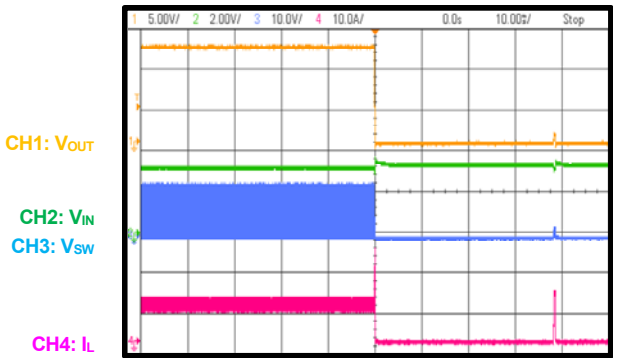
$I_{OUT}$ = 1A to 2A, $I_{RAMP}$ = 25mA/µs



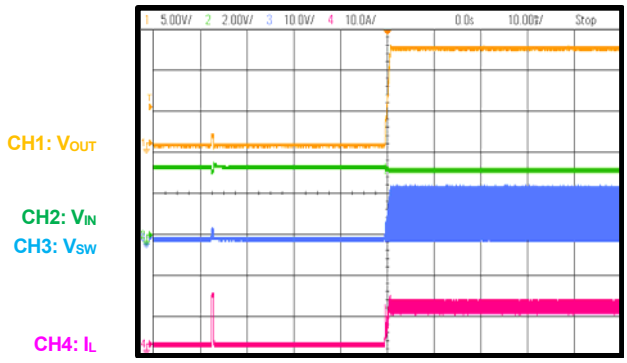
## EVB TEST RESULTS *(continued)*

**$V_{IN}$ = 3.3V, $V_{OUT}$ = 12V, L = 1.5µH, $I_{OUT}$ = 2A, $T_A$ = 25°C, unless otherwise noted.**

### SCP Entry




### SCP Recovery



# PCB LAYOUT

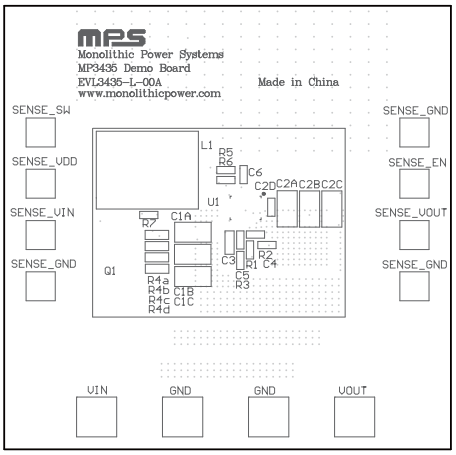



**Figure 1: Top Silk**

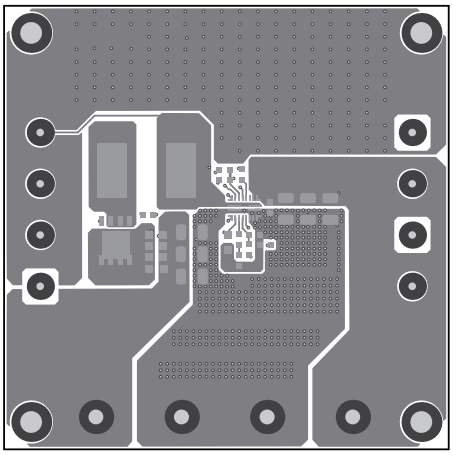


**Figure 2: Top Layer**

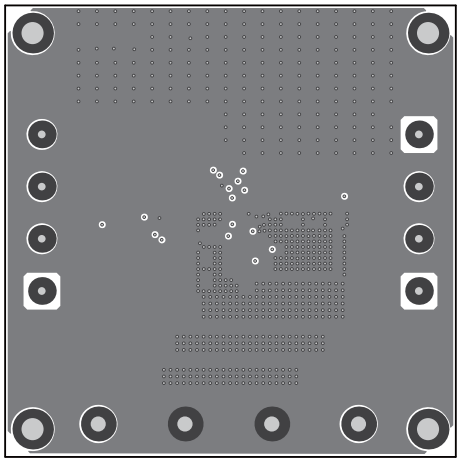


**Figure 3: Mid-Layer 1**

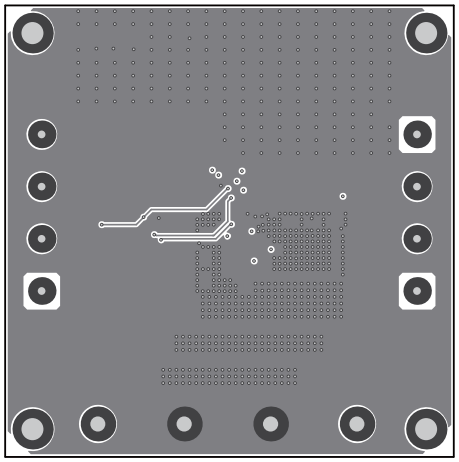


**Figure 4: Mid-Layer 2**

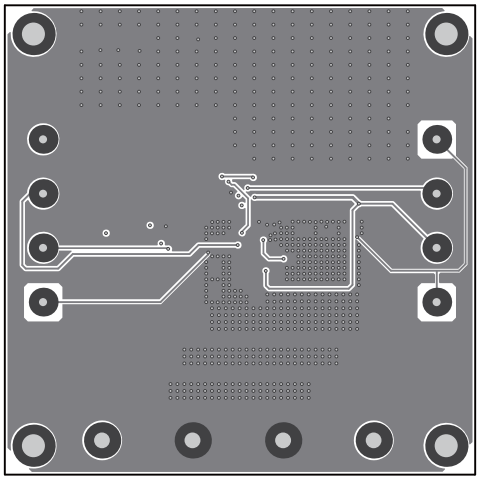


**Figure 5: Bottom Layer**

## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 2/4/2021 | Initial Release | - |