

DESCRIPTION

The EV4473-L-00A is an evaluation board for the MPQ4470, a high-efficiency step-down regulator with integrated power MOSFETs.

MPQ4470 offers a very compact solution to achieve a 5A, continuous-output current over a wide input-supply range with excellent load and line regulation. It also provides fast transient response and good stability for wide input-supply and load range.

The EV4473-L-00A is a fully assembled and tested evaluation board. It generates a +3.3V output voltage at load current up to 5A from an 4.5V to 36V input range. Switching frequency is set at 500kHz.

This evaluation board is available for both EV4473 and EVQ4473

ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|----------------|-----------|----------|-------|
| Input Voltage | V_{IN} | 4.5 – 36 | V |
| Output Voltage | V_{OUT} | 3.3 | V |
| Output Current | I_{OUT} | 3.5 | A |

FEATURES

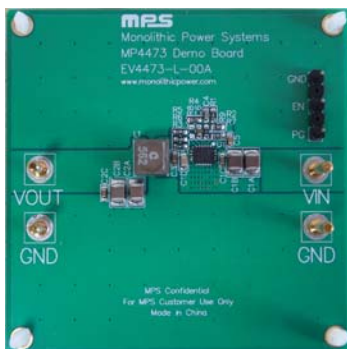
- Wide 4.5V-to-36V Operating Input Range
- Guarantee 5A, Continuous Output Current
- Internal 40mΩ High-Side, 20mΩ Low-Side Power MOSFETs
- Proprietary Switching-Loss-Reduction Technology
- 1% Reference Voltage
- Programmable Soft-Start Time
- Low Drop-out Mode
- SCP, OCP, OVP, UVP and Thermal Shutdown

APPLICATIONS

- Notebook Systems and I/O Power
- Automotive Systems
- Networking Systems
- Industrial Supplies
- Optical Communications Systems
- Distributed Power and POL Systems

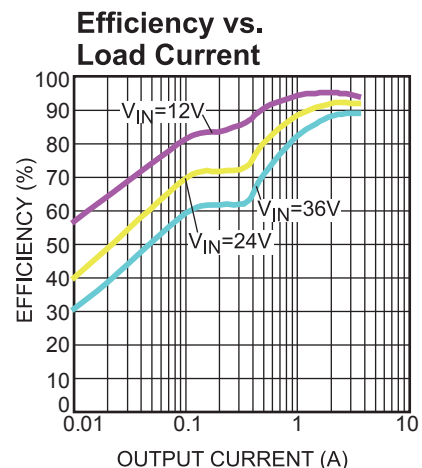
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EV4473-L-00A EVALUATION BOARD

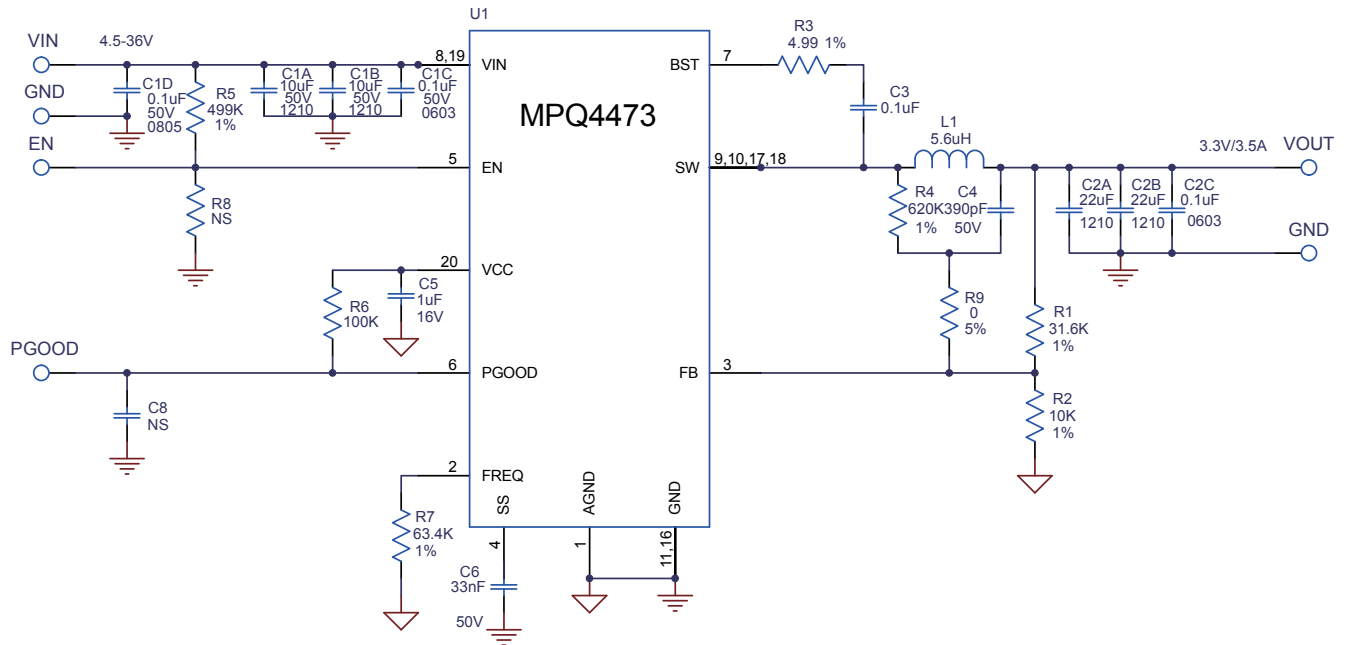


(L x W x H) 2.5" x 2.5" x 0.4"
(6.4cm x 6.4cm x 1.0cm)

| Board Number | MPS IC Number |
|--------------|---------------|
| EV4473-L-00A | MPQ4473GL |



EVALUATION BOARD SCHEMATIC



EV4473-L-00A BILL OF MATERIALS

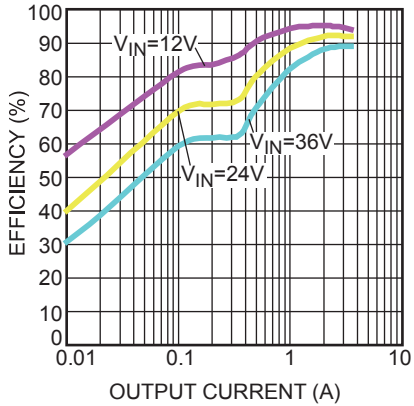
| Qty | RefDes | Value | Description | Package | Manufacturer | Manufacturer_P/N |
|-----|----------------|---------------|------------------------------|---------------|--------------|--------------------|
| 2 | C1A,C1B | 10 μ F | Ceramic Cap., 50V, X7R | 1210 | muRata | GRM32ER71H106KA12L |
| 3 | C1C,C2C, C3 | 0.1 μ F | Ceramic Cap., 50V, X7R | 0603 | TDK | C1005X7R1C104K |
| 1 | C1D | 0.1 μ F | Ceramic Cap., 50V, X7R | 0805 | muRata | GRM21BR72A104KAC4L |
| 2 | C2A,C2B | 22 μ F | Ceramic Cap., 16V, X7R | 1210 | muRata | GRM32ER71C226KE79 |
| 1 | C4 | 390pF | Ceramic Cap., 50V, C0G | 0402 | muRata | GRM1885C1H391JA01D |
| 1 | C5 | 1 μ F | Ceramic Cap., 25V, X7R | 0402 | muRata | GRM188R71C105KA12D |
| 1 | C6 | 33nF | Ceramic Cap., 16V, X7R | 0402 | muRata | GRM188R71H333KA61D |
| 1 | L1 | 5.6 μ H | Inductor, 15mOhm DCR, 10A | SMD | Coilcraft | XAL6060-562ME |
| 1 | R1 | 31.6k | Film Res., 1% | 0402 | Yageo | RC0603FR-0731K6L |
| 1 | R2 | 10k | Film Res., 1% | 0402 | Yageo | RC0603FR-0710KL |
| 1 | R3 | 4.99 Ω | Film Res., 1% | 0402 | Yageo | RC0603FR-074R99L |
| 1 | R4 | 620k | Film Res., 1% | 0402 | Yageo | RC0603FR-07620KL |
| 1 | R5 | 499k | Film Res., 1% | 0402 | Yageo | RC0603FR-07499KL |
| 1 | R6 | 100k | Film Res., 5% | 0402 | Yageo | RC0603FR-07100KL |
| 1 | R7 | 63.4k | Film Res., 1% | 0402 | Yageo | RC0603FR-0763K4L |
| 1 | R9 | 0 Ω | Film Res., 5% | 0402 | Yageo | RC0603FR-070RL |
| | R8 | NS | | | | |
| 1 | U1 | MPQ4473 | Step-Down Regulator | QFN20- 3x4 | MPS | MPQ4473GL |

EVB TEST RESULTS

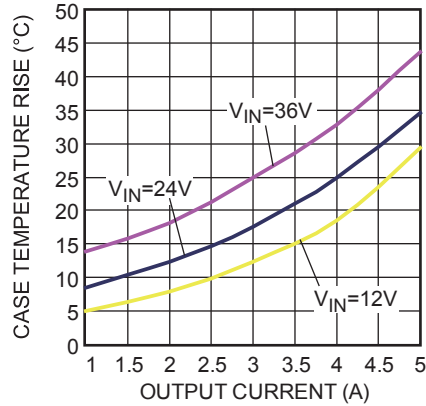
Performance waveforms are tested on the evaluation board.

$V_{IN} = 24V$, $V_{OUT} = 3.3V$, $T_A = 25^\circ C$, unless otherwise noted.

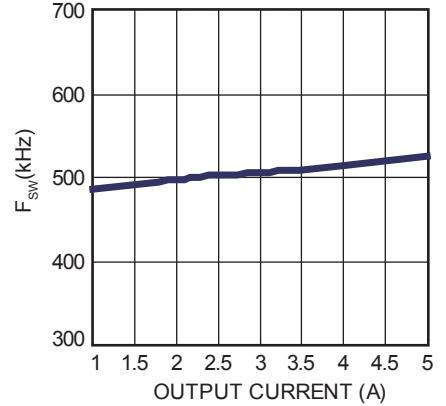
Efficiency vs. Load Current



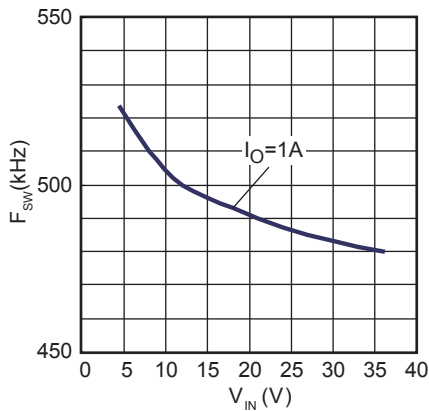
Case Temperature Rise vs. Output Current



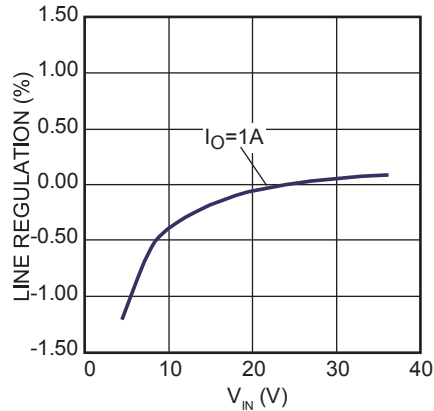
F_{sw} vs. Output Current



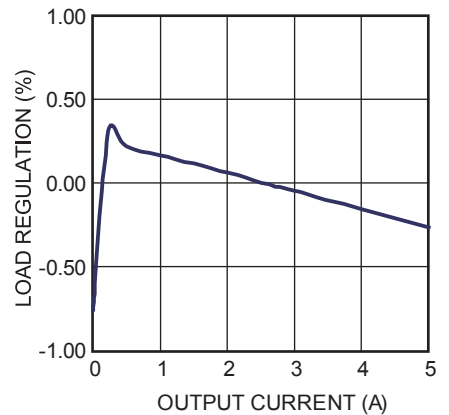
F_{sw} vs. V_{IN}



Line Regulation



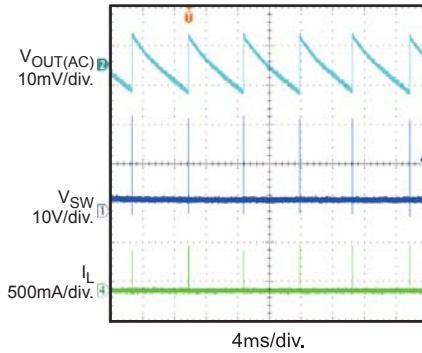
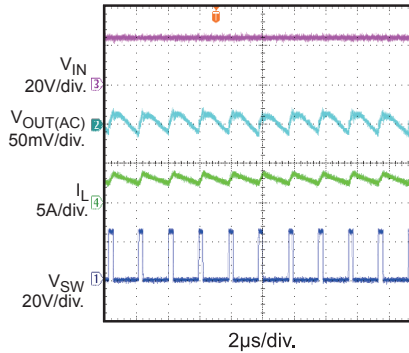
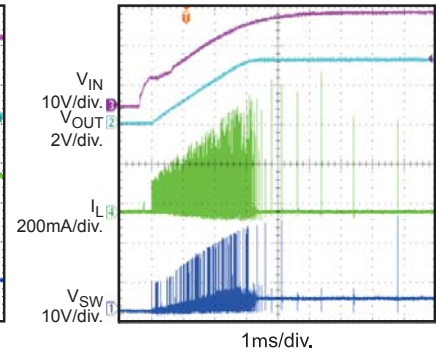
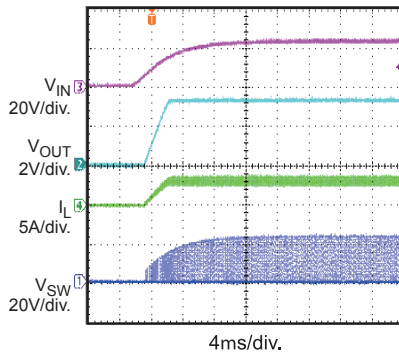
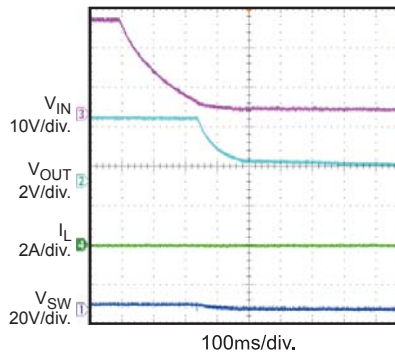
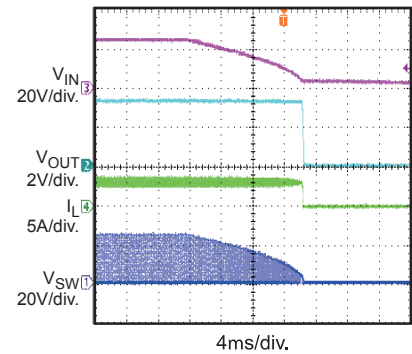
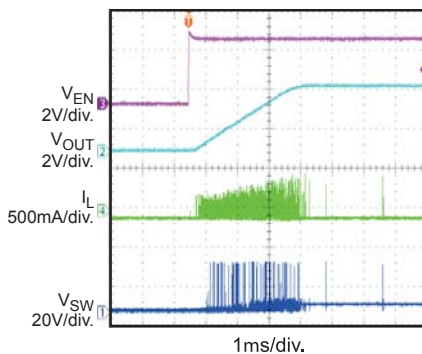
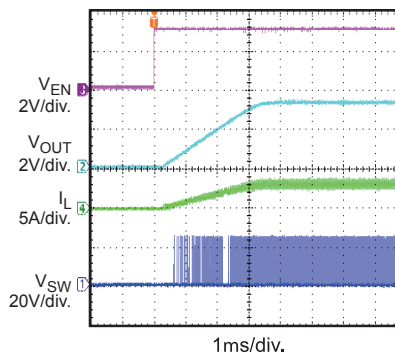
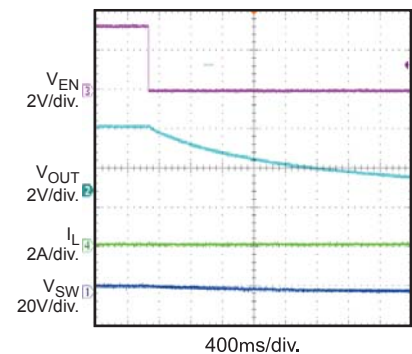
Load Regulation



EVB TEST RESULTS (continued)

Performance waveforms are tested on the evaluation board.

 $V_{IN} = 24V$, $V_{OUT} = 3.3V$, $T_A = 25^\circ C$, unless otherwise noted.

Output Voltage Ripple
 $I_{OUT} = 0A$

Output Voltage Ripple
 $I_{OUT} = 3A$

Start-up Through V_{IN}
 $I_{OUT} = 0A$

Start-up Through V_{IN}
 $I_{OUT} = 3A$

Shutdown Through V_{IN}
 $I_{OUT} = 0A$

Shutdown Through V_{IN}
 $I_{OUT} = 3A$

Start-up Through EN
 $I_{OUT} = 0A$

Start-up Through EN
 $I_{OUT} = 3A$

Shutdown Through EN
 $I_{OUT} = 0A$


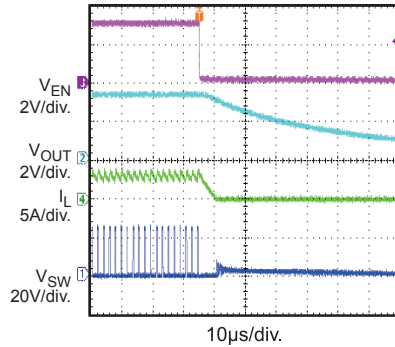
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 24V$, $V_{OUT} = 3.3V$, $T_A = 25^\circ C$, unless otherwise noted.

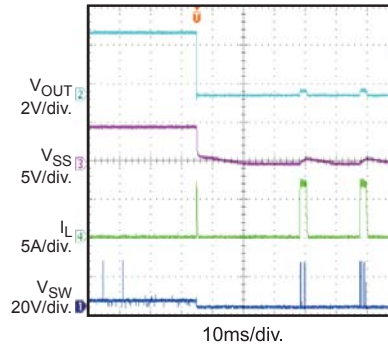
Shutdown Through EN

$I_{OUT} = 3A$



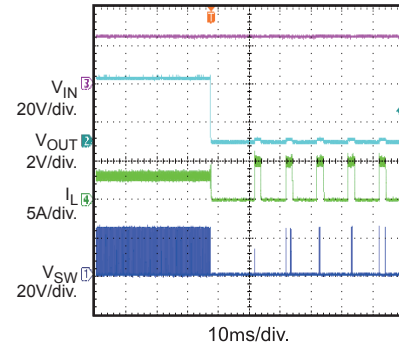
Short Circuit Entry

$I_{OUT} = 0A$

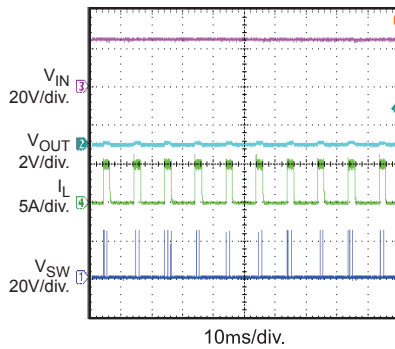


Short Circuit Entry

$I_{OUT} = 3A$

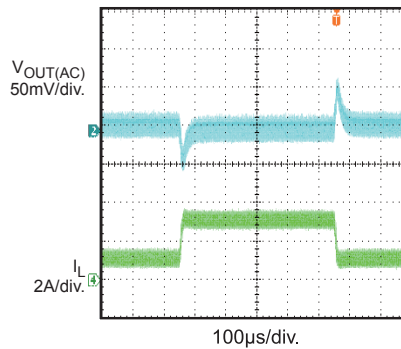


Short Circuit Steady State



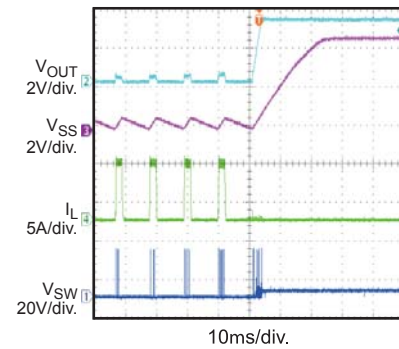
Load Transient

$I_{OUT} = 1A-3A$



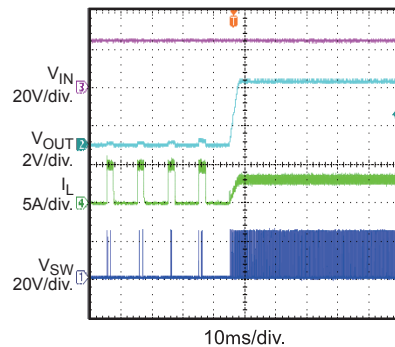
Short Circuit Recovery

$I_{OUT} = 0A$

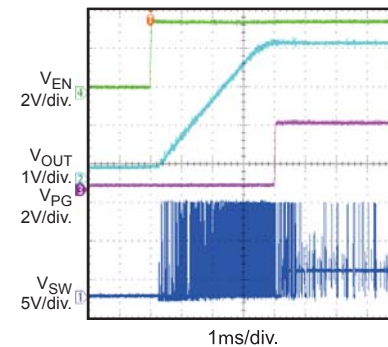


Short Circuit Recovery

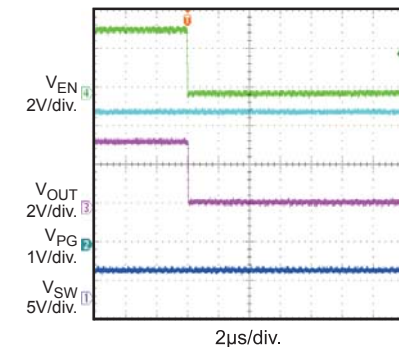
$I_{OUT} = 3A$



Power Good Through EN Start-up



Power Good Through EN Shutdown



PRINTED CIRCUIT BOARD LAYOUT

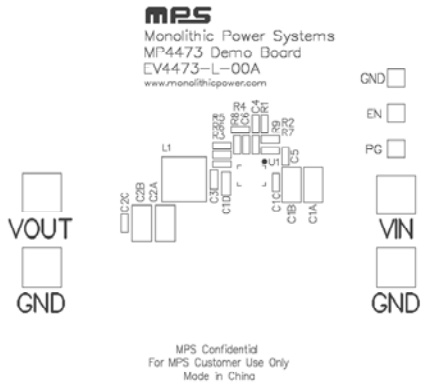


Figure 1—Top Silk Layer

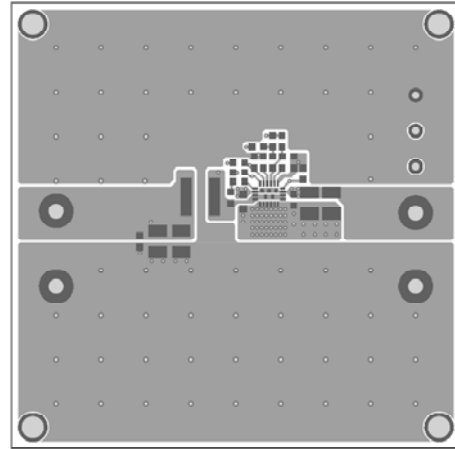


Figure 2—Top Layer

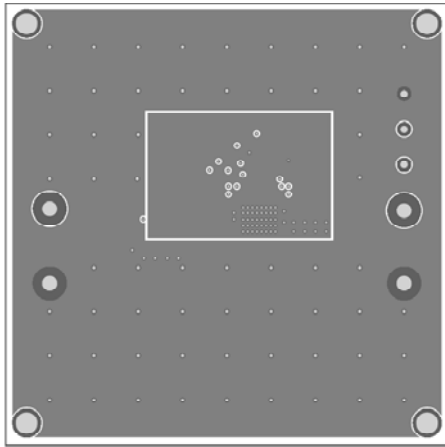


Figure 3—Inner1 Layer

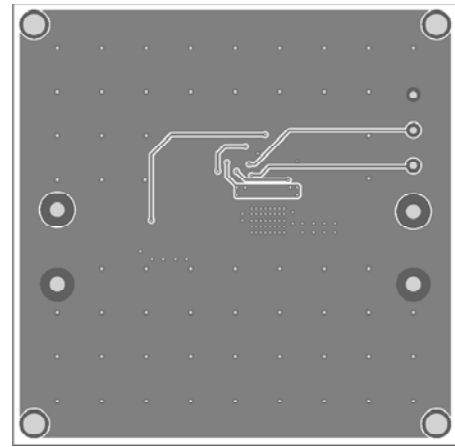


Figure 4—Inner2 Layer

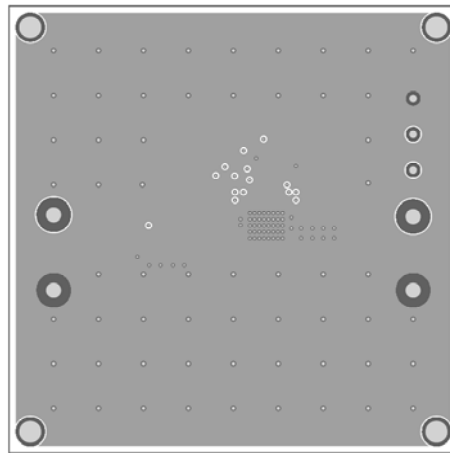


Figure 5—Bottom Layer

QUICK START GUIDE

1. Connect the positive and negative terminals of the load to the VOUT and GND pins, respectively.
2. Preset the power supply output to between 4.5 and 36V, and then turn it off.
3. Connect the positive and negative terminals of the power supply output to the VIN and GND pins, respectively.
4. Turn the power supply on. The MPQ4473GL will automatically startup.
5. To use the Enable function, apply a digital input to the EN pin. Drive EN higher than 1.25V to turn on the regulator, drive EN less than 0.86V to turn it off.
6. An input under voltage lockout (UVLO) function is implemented by the addition of a resistor divider R5 and R8. The EN threshold is 0.86V (falling edge), so V_{IN} UVLO threshold is.
$$0.86 \times \left(1 + \frac{R5}{R8}\right)$$
7. Use R1 and R2 to set the output voltage with $V_{FB} = 0.815V$. For $R2 = 10k\Omega$, R1 can be determined by: $R1 = 12.27 \times (V_{OUT} - 0.815)$ (k Ω). Follow the Application Information section in the device datasheet to recalculate the compensation, inductor and output capacitor values when output voltage is changed.

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