

### DESCRIPTION

The EV8774-Q-00A Evaluation Board is designed to demonstrate the capabilities of MPS' MP8774, a fully-integrated high-frequency, synchronous rectified, step-down, switch-mode converter with internal power MOSFETs. It offers a very compact solution to achieve a 12A continuous output current over a wide input range, with excellent load and line regulation. The MP8774 has synchronous-mode operation for higher efficiency over the output current-load range.

Constant On-Time control operation provides very fast transient response and easy loop design as well as very tight output regulation.

Full protection features include SCP, OCP, UVP, and thermal shutdown.

The MP8774 requires a minimal number of readily-available, standard, external components and is available in a space-saving QFN-16 (3mmx3mm) package.

### ELECTRICAL SPECIFICATION <sup>(1)</sup>

| Parameter      | Symbol    | Value | Units |
|----------------|-----------|-------|-------|
| Input Voltage  | $V_{IN}$  | 12    | V     |
| Output Voltage | $V_{OUT}$ | 1     | V     |
| Output Current | $I_{OUT}$ | 12    | A     |

### Features

- Wide 3V-to-18V Operating Input Range
- 16mΩ/5.5mΩ Low- $R_{DS(ON)}$  Internal Power MOSFETs
- 100μA Low IQ Current
- High-Efficiency Synchronous-Mode Operation
- Pre-biased Startup
- Fixed 700kHz Switching Frequency
- External Programmable Soft Startup Time
- EN and Power Good for Power Sequencing
- Over-Current Protection and Hiccup
- Thermal Shutdown
- Available in a QFN-16 (3mmx3mm) package

### APPLICATIONS

- Security Camera
- Portable Device, XDSL Device
- Digital Set-Top Boxes
- Flat-Panel Television and Monitors
- General Purposes

#### Notes:

1) For different Input/output voltage specs and different output capacitor/inductor may need change the application circuit parameters

All MPS parts are lead-free, halogen free, and adhere to the RoHS directive. For MPS green status, please visit MPS website under Quality Assurance.

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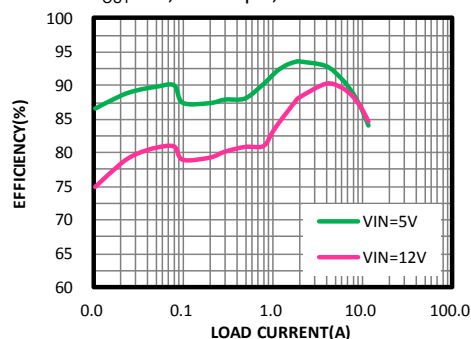
## EV8714-LE-00A EVALUATION BOARD



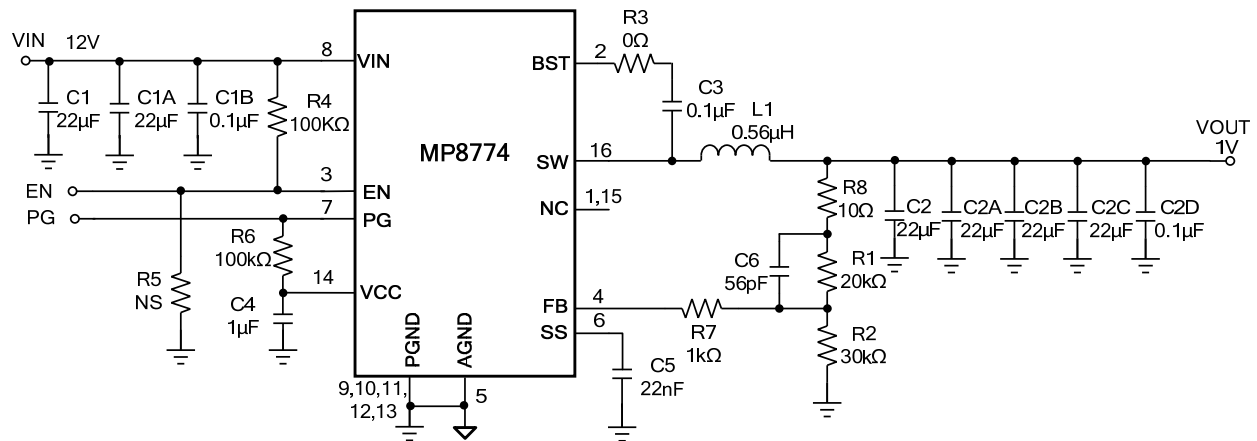
| Board Number | MPS IC Number |
|--------------|---------------|
| EV8774-Q-00A | MP8774GQ      |

### Efficiency vs. Load Current

$V_{OUT}=1V$ ,  $L=0.56\mu H$ ,  $DCR=1.5m\Omega$



# EVALUATION BOARD SCHEMATIC



## EV8774-Q-00A BILL OF MATERIALS

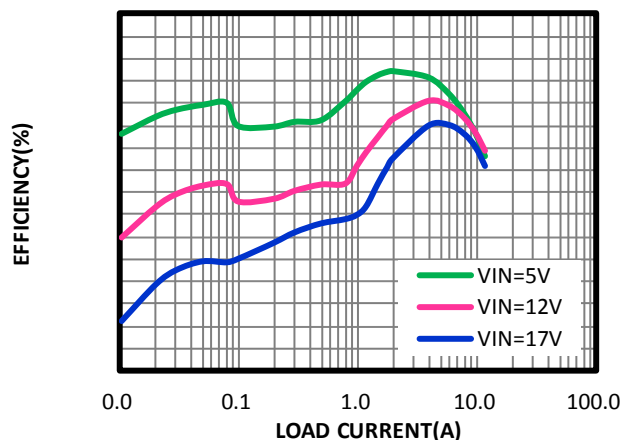
| Qty | Ref                           | Value  | Description                      | Package             | Manufacturer | Part Number        |
|-----|-------------------------------|--------|----------------------------------|---------------------|--------------|--------------------|
| 6   | C1,C1A,<br>C2,C2A,<br>C2B,C2C | 22μF   | Ceramic Cap., 25V, X5R           | 0805                | muRata       | GRM21BR61E226ME44L |
| 3   | C1B,C2D<br>C3                 | 0.1μF  | Ceramic Cap., 25V, X7R           | 0603                | muRata       | GRM188R71E104KA01D |
| 1   | C4                            | 1μF    | Ceramic Cap., 25V, X7R           | 0603                | muRata       | GRM188R71E105KA12D |
| 1   | C5                            | 22nF   | Ceramic Cap., 16V, X7R           | 0603                | muRata       | GRM188R71C223KA01D |
| 1   | C6                            | 56pF   | Ceramic Cap., 50V, C0G           | 0603                | muRata       | GRM1885C1H560JA01D |
| 1   | R1                            | 20k    | Thick Film Res., 1%              | 0603                | Yageo        | RC0603FR-0720KL    |
| 1   | R2                            | 30k    | Thick Film Res., 1%              | 0603                | Yageo        | RC0603FR-0730KL    |
| 1   | R3                            | 0Ω     | Thick Film Res., 1%              | 0603                | Yageo        | RC0603FR-070RL     |
| 1   | R4                            | 100k   | Thick Film Res., 1%              | 0603                | Yageo        | RC0603FR-07100KL   |
| 0   | R5,R9,<br>R10                 | NS     |                                  | 0603                |              |                    |
| 1   | R6                            | 100k   | Thick Film Res., 1%              | 0603                | Yageo        | RC0603FR-07100KL   |
| 1   | R7                            | 1k     | Thick Film Res., 1%              | 0603                | Yageo        | RC0603FR-071KL     |
| 1   | R8                            | 10Ω    | Thick Film Res., 1%              | 0603                | Yageo        | RC0603JR-0710RL    |
| 1   | L1                            | 0.56μH | Inductor,<br>DCR=1.5mΩ,Is=30A    | SMD                 | Würth        | 744355256          |
| 1   | U1                            | MP8774 | Synchronous Step-Down<br>Convert | QFN-16<br>(3mmx3mm) | MPS          | MP8774GQ           |

## EVB TEST RESULTS

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 0.56\mu H$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

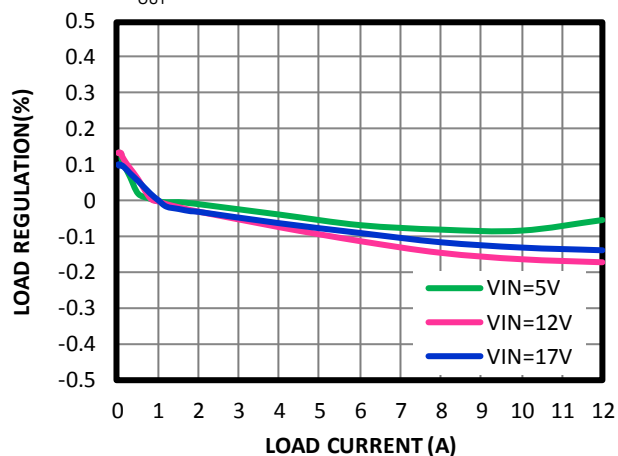
Efficiency vs. Load Current

$V_{OUT}=1V$ ,  $L=0.56\mu H$ ,  $DCR=1.5m\Omega$

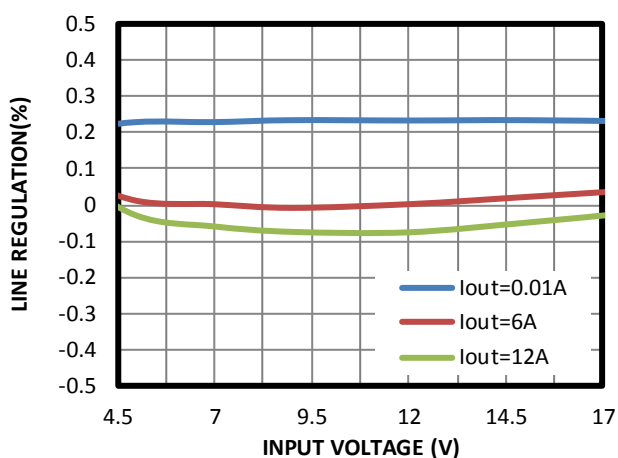


Load Regulation vs. Load Current

$V_{OUT}=1V$



Line Regulation vs. Input Voltage



## EV8774-Q-00A 17V, 700kHz, 12A, STEP-DOWN CONVERTER

### EVB TEST RESULTS (continued)

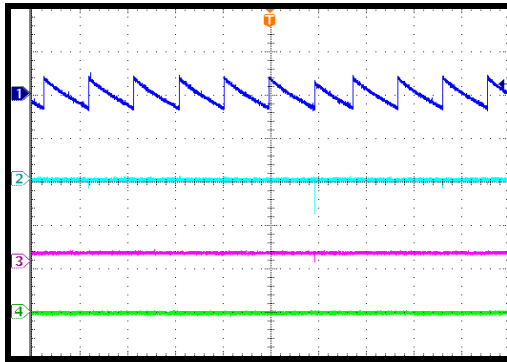
$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 0.56\mu H$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

Input/Output Ripple

$I_{OUT}=0A$

CH1:  
 $V_{OUT}/AC$   
50mV/div.  
CH2:  $V_{IN}/AC$   
50mV/div.

CH3:  $V_{SW}$   
5V/div.  
CH4:  $I_L$   
2A/div.



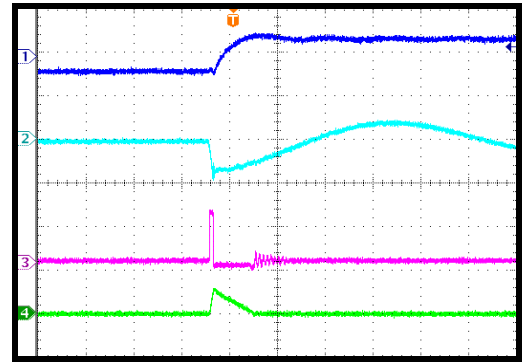
100ms/div.

Input/Output Ripple

$I_{OUT}=0A$

CH1:  
 $V_{OUT}/AC$   
50mV/div.  
CH2:  
 $V_{IN}/AC$   
100mV/div.

CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
5A/div.



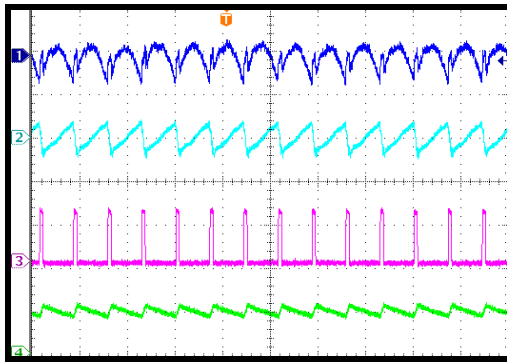
2μs/div.

Input/Output Ripple

$I_{OUT}=12A$

CH1:  
 $V_{OUT}/AC$   
10mV/div.  
CH2:  $V_{IN}/AC$   
500mV/div.

CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
10A/div.



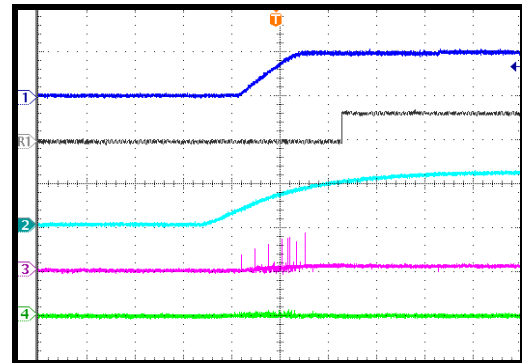
2μs/div.

Start-Up through Input Voltage

$I_{OUT}=0A$

CH1:  $V_{OUT}$   
1V/div.  
CH2:  $V_{IN}$   
10V/div.

CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
10A/div.



2ms/div.

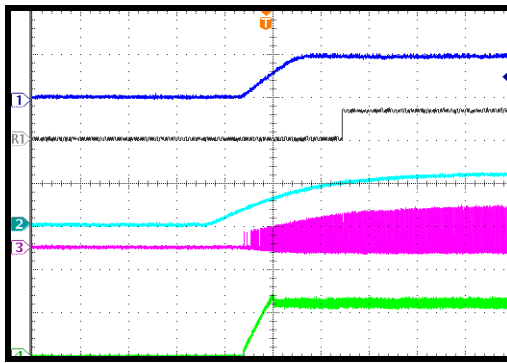
Start-Up through Input Voltage

$I_{OUT}=12A$

CH1:  $V_{OUT}$   
1V/div.  
CH2:  $V_{IN}$   
10V/div.

CH3:  $V_{SW}$   
200mV/div.

CH4:  $I_L$   
10A/div.



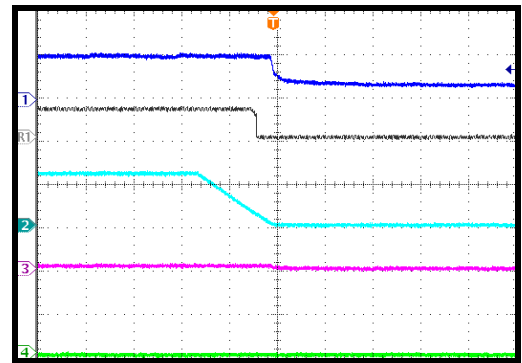
2ms/div.

Shutdown through Input Voltage

$I_{OUT}=0A$

CH1:  $V_{OUT}$   
1V/div.  
CH2:  $V_{IN}$   
10V/div.

CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
10A/div.



40ms/div.

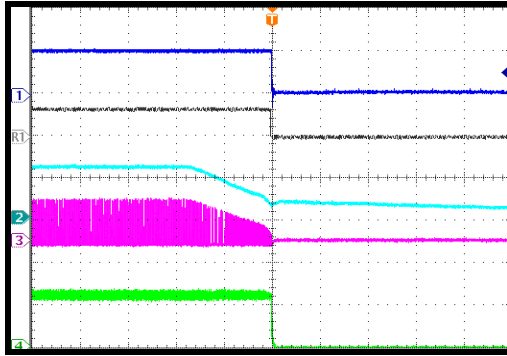
## EV8 TEST RESULTS *(continued)*

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 0.56\mu H$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

### Shutdown through Input Voltage

$I_{OUT}=12A$

CH1:  $V_{OUT}$   
1V/div.  
CHR1:  $V_{PG}$   
5V/div.  
CH2:  $V_{IN}$   
10V/div.  
CH3:  $V_{SW}$   
200mV/div.  
CH4:  $I_L$   
10A/div.

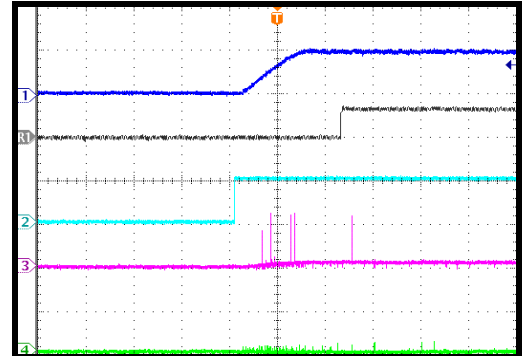


2ms/div.

### Start-Up through EN

$I_{OUT}=0A$

CH1:  $V_{OUT}$   
1V/div.  
CHR1:  $V_{PG}$   
5V/div.  
CH2:  $V_{EN}$   
5V/div.  
CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
10A/div.

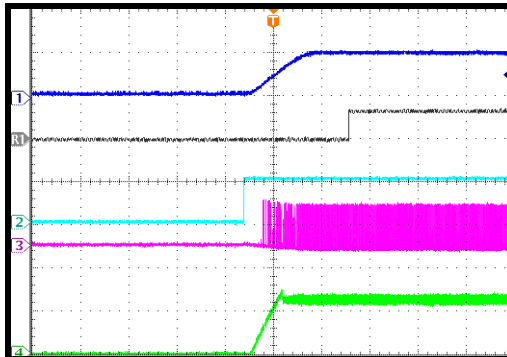


2ms/div.

### Start-Up through EN

$I_{OUT}=12A$

CH1:  $V_{OUT}$   
1V/div.  
CHR1:  $V_{PG}$   
5V/div.  
CH2:  $V_{EN}$   
5V/div.  
CH3:  $V_{SW}$   
200mV/div.  
CH4:  $I_L$   
10A/div.

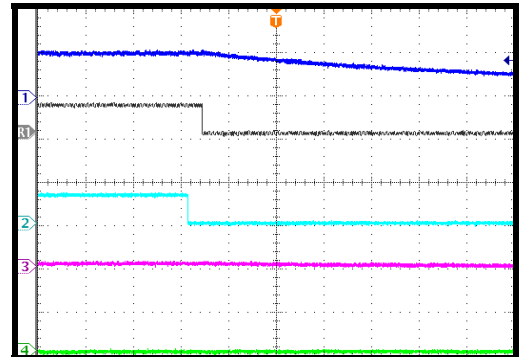


2ms/div.

### Shutdown through EN

$I_{OUT}=0A$

CH1:  $V_{OUT}$   
1V/div.  
CHR1:  $V_{PG}$   
5V/div.  
CH2:  $V_{EN}$   
5V/div.  
CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
10A/div.

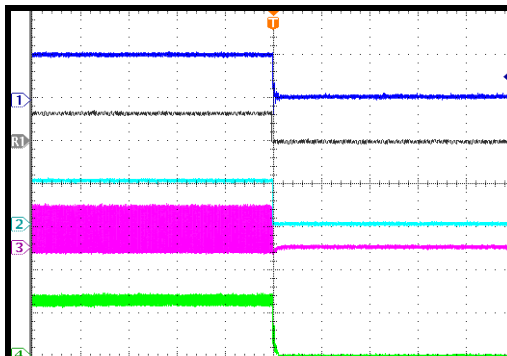


400ms/div.

### Shutdown through EN

$I_{OUT}=12A$

CH1:  $V_{OUT}$   
1V/div.  
CHR1:  $V_{PG}$   
5V/div.  
CH2:  $V_{EN}$   
5V/div.  
CH3:  $V_{SW}$   
20mV/div.  
CH4:  $I_L$   
10A/div.

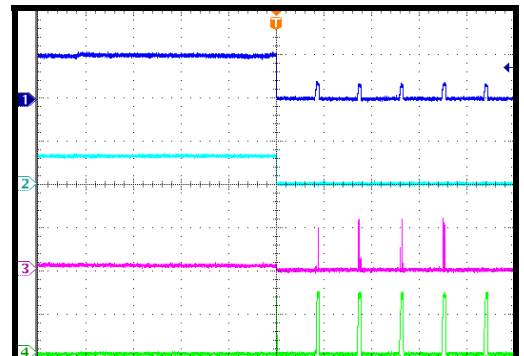


1ms/div.

### Short Circuit Protection Entry

$I_{OUT}=0A$

CH1:  $V_{OUT}$   
1V/div.  
CH2:  $V_{PG}$   
5V/div.  
CH3:  $V_{SW}$   
10V/div.  
CH4:  $I_L$   
10A/div.

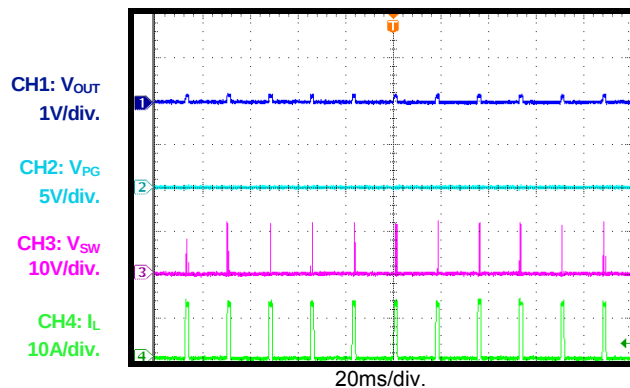


20ms/div.

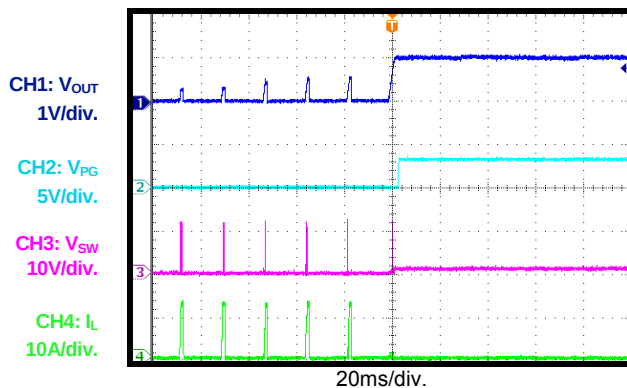
## EVB TEST RESULTS *(continued)*

$V_{IN} = 12V$ ,  $V_{OUT} = 1V$ ,  $L = 0.56\mu H$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

**Short Circuit Protection Steady State**  
Short Output to GND

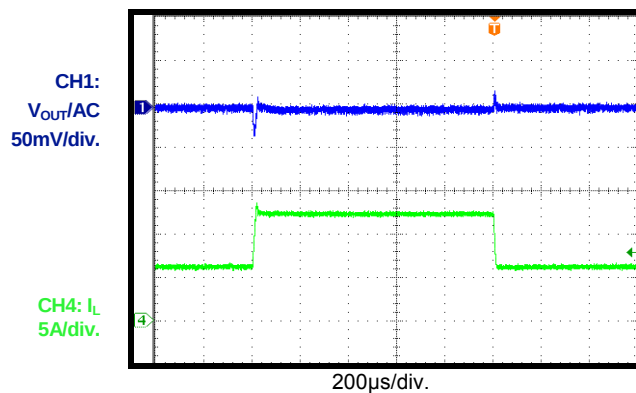


**Short Circuit Protection Recovery**  
 $I_{OUT}=0A$



**Load Transient**

$I_{OUT}=6A-12A$



## PRINTED CIRCUIT BOARD LAYOUT

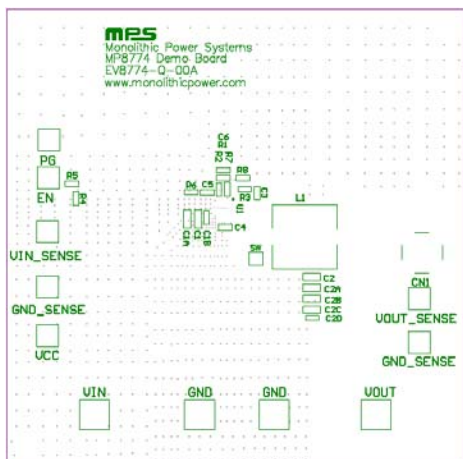


Figure 1—Top Silk Layer

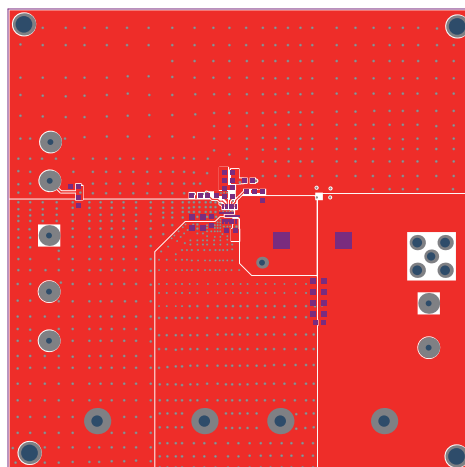


Figure 2—Top Layer

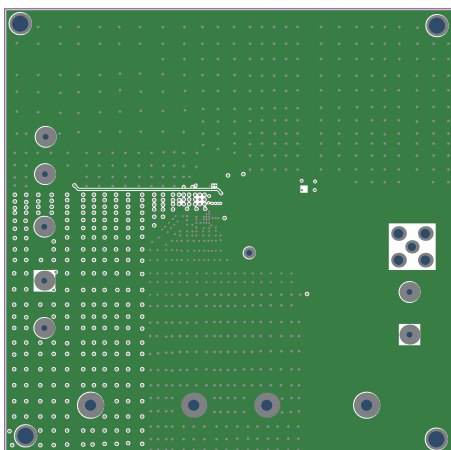


Figure 3—Inner Layer 1

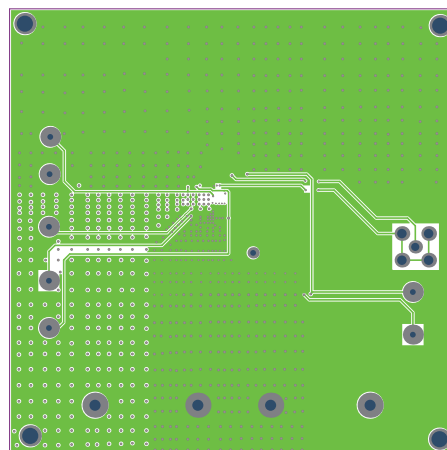


Figure 4—Inner Layer 2

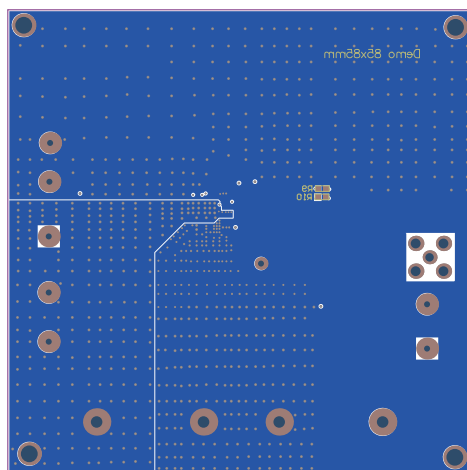


Figure 5—Bottom Layer

## QUICK START GUIDE

1. Preset Power Supply to 12V.
2. Turn Power Supply off.
3. Connect Power Supply terminals to:
  - a. Positive (+): VIN
  - b. Negative (-): GND
4. Connect Load to:
  - a. Positive (+): VOUT
  - b. Negative (-): GND
5. Turn Power Supply on after making connections. The board will automatically start up.
6. To use the Enable function, apply a digital input to the EN pin. Drive EN higher than 1.4V to turn on the regulator, or less than 0.9V to turn it off.

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