EV8774H-Q-00A

High-Efficiency, 1400kHz, 12A, 18V Step-Down Converter Evaluation Board

DESCRIPTION

The EV8774H-Q-00A Evaluation Board is designed to demonstrate the capabilities of MPS' MP8774H, 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 MP8774H 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 MP8774H requires a minimal number of readily-available, standard, external components and is available in a space-saving QFN-16 (3mmx3mm) package.

ELECTRICAL SPECIFICATION (1)

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 1400kHz 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

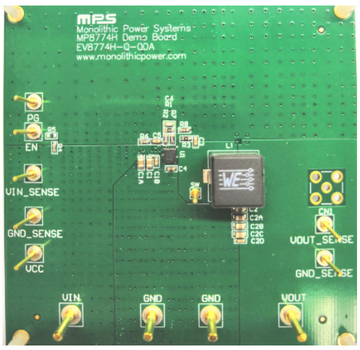
APPLICATIONS

- 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

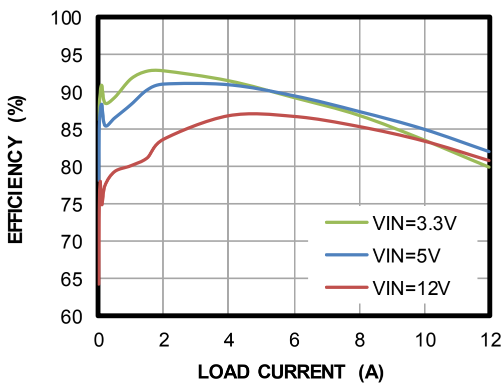
EV8774H-Q-00A EVALUATION BOARD



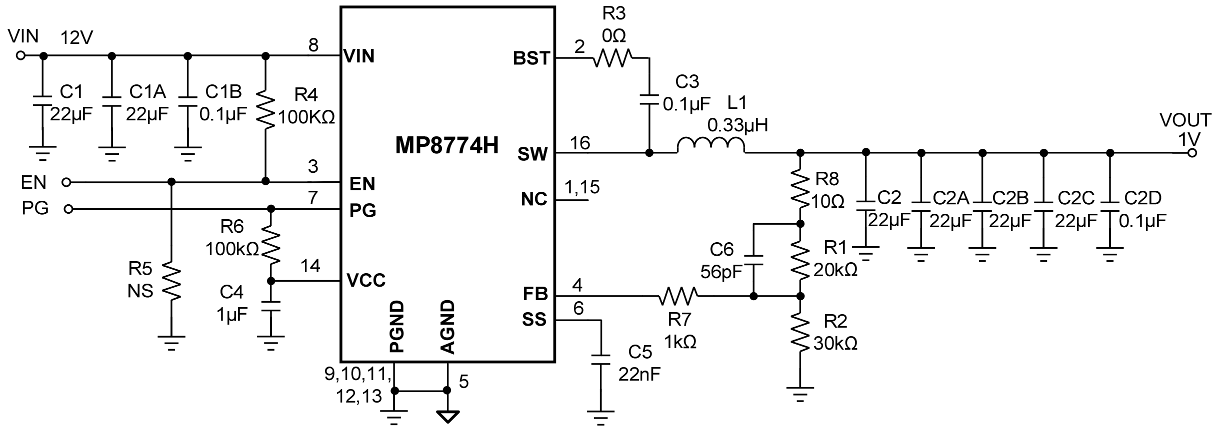
Board Number	MPS IC Number
EV8774H-Q-00A	MP8774HGQ

Efficiency vs. Load Current

V_{OUT}=1V, L=0.33µH, DCR=1.1mΩ



EVALUATION BOARD SCHEMATIC



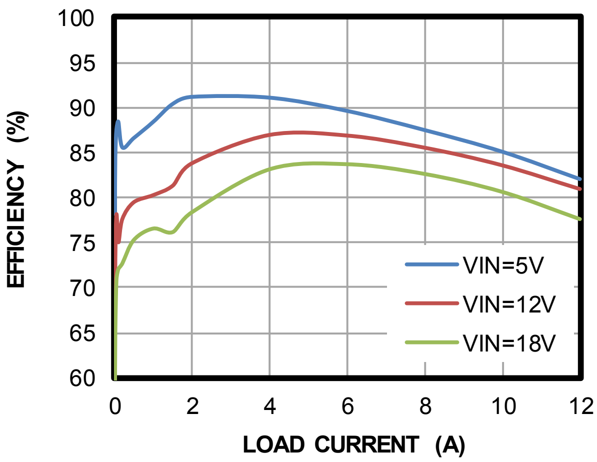
EV8774H-Q-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
6	C1,C1A, C2,C2A, C2B,C2C	22µF	Ceramic Cap., 25V, X5R	0805	muRata	GRM21BR61E226ME44L
3	C1B,C2D 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	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	0.33µH	Inductor,DCR=1.1mΩ	SMD	Wurth	7443320033
1	U1	MP8774HGQ	Synchronous Step-Down Convert	QFN-16 (3mmx3mm)	MPS	MP8774HGQ

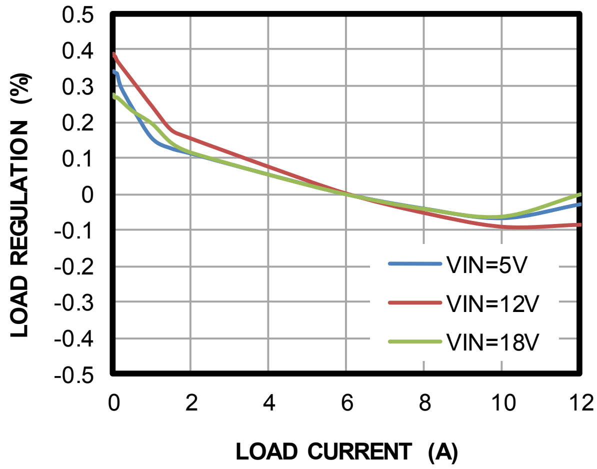
EVB TEST RESULTS

V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, T_A = +25°C, unless otherwise noted.

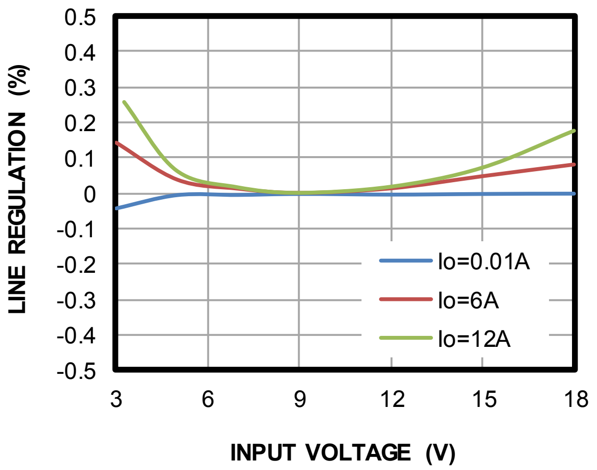
Efficiency vs. Load Current
V_{OUT}=1V, L=0.33µH, DCR=1.1mΩ



Load Regulation vs. Load Current
V_{OUT}=1V



Line Regulation vs. Input Voltage



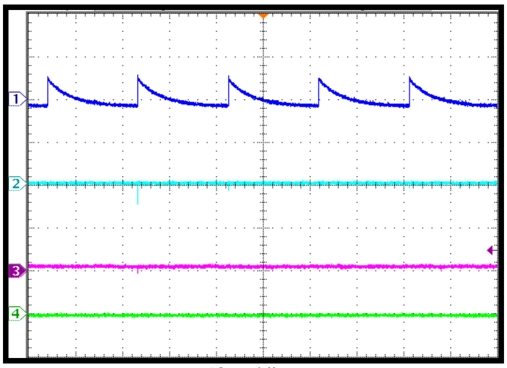
EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, T_A = 25°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} 10V/div.
CH4: I_L 2A/div.

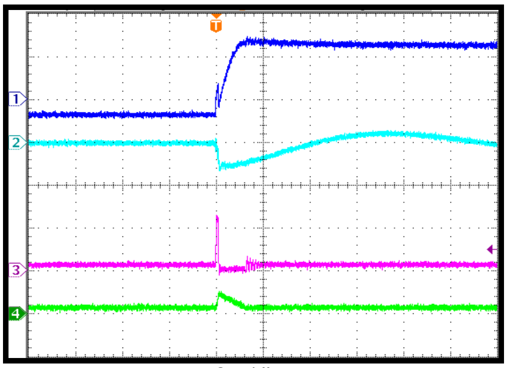


40ms/div.

Input/Output Ripple

I_{OUT} = 0A

CH1: V_{OUT}/AC 20mV/div.
CH2: V_{IN}/AC 50mV/div.
CH3: V_{SW} 10V/div.
CH4: I_L 10A/div.

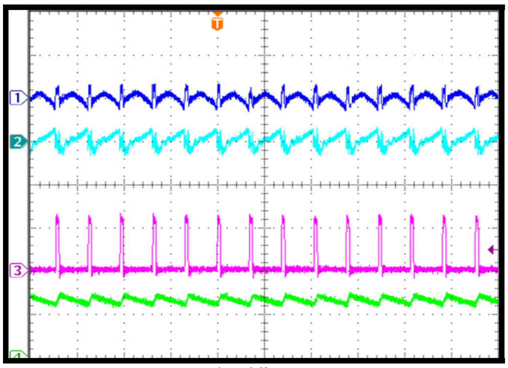


2µs/div.

Input/Output Ripple

I_{OUT} = 12A

CH1: V_{OUT}/AC 10mV/div.
CH2: V_{IN}/AC 200mV/div.
CH3: V_{SW} 10V/div.
CH4: I_L 10A/div.

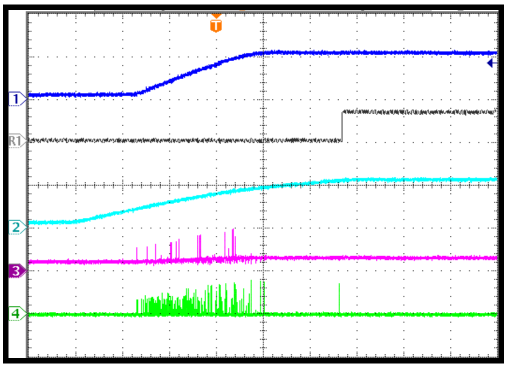


1µs/div.

Start-Up through Input Voltage

I_{OUT} = 0A

CH1: V_{OUT} 1V/div.
CHR1: V_{PG} 5V/div.
CH2: V_{IN} 10V/div.
CH3: V_{SW} 10V/div.
CH4: I_L 2A/div.

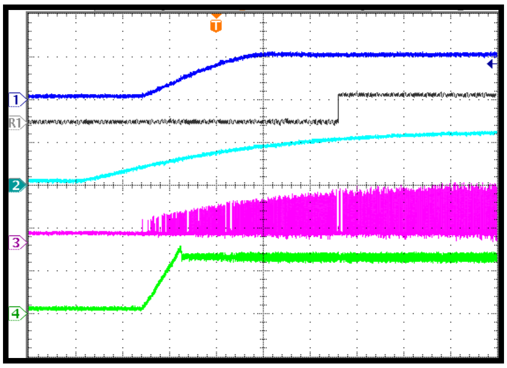


1ms/div.

Start-Up through Input Voltage

I_{OUT} = 12A

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

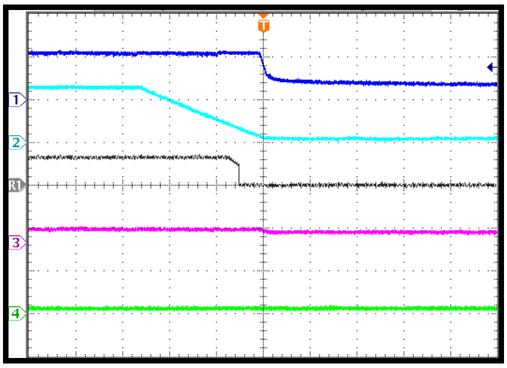


1ms/div.

Shutdown through Input Voltage

I_{OUT} = 0A

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



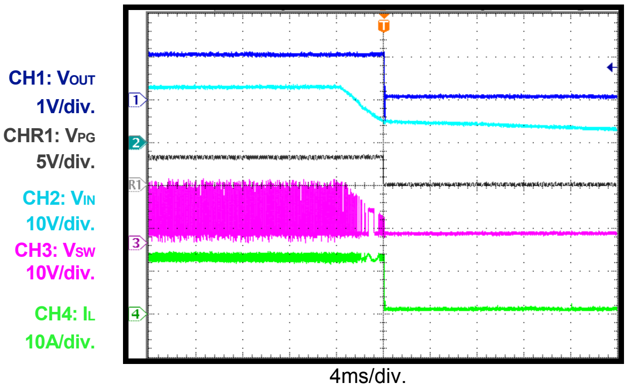
40ms/div.

EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, T_A = 25°C, unless otherwise noted.

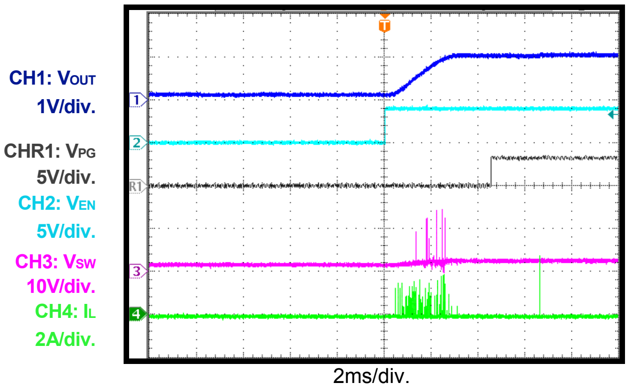
Shutdown through Input Voltage

I_{OUT} = 12A



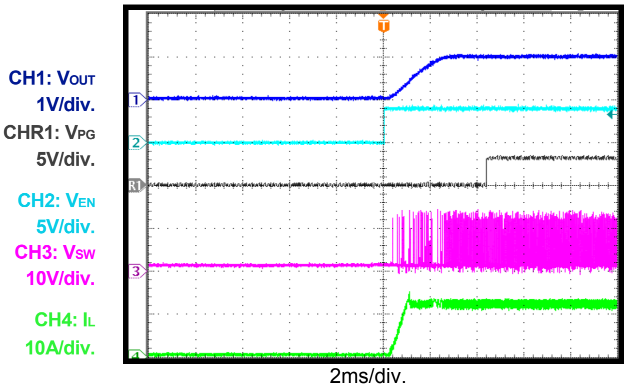
Start-Up through EN

I_{OUT} = 0A



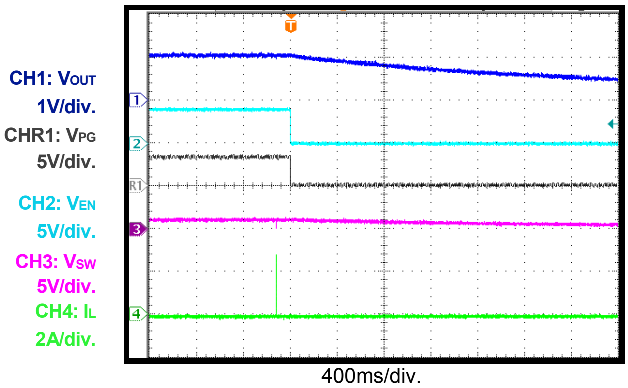
Start-Up through EN

I_{OUT} = 12A



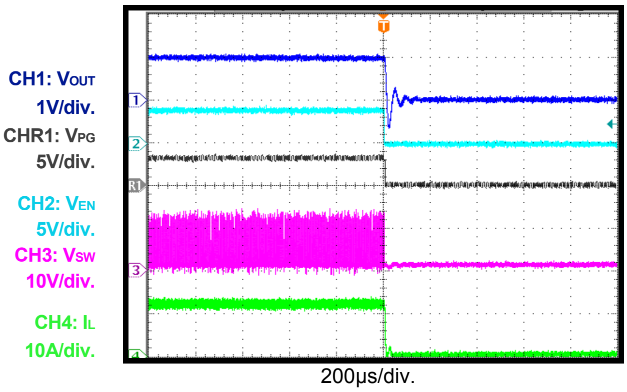
Shutdown through EN

I_{OUT} = 0A



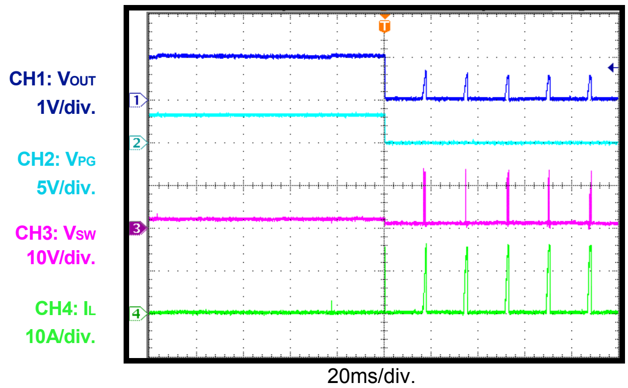
Shutdown through EN

I_{OUT} = 12A



Short-Circuit Protection Entry

I_{OUT} = 0A

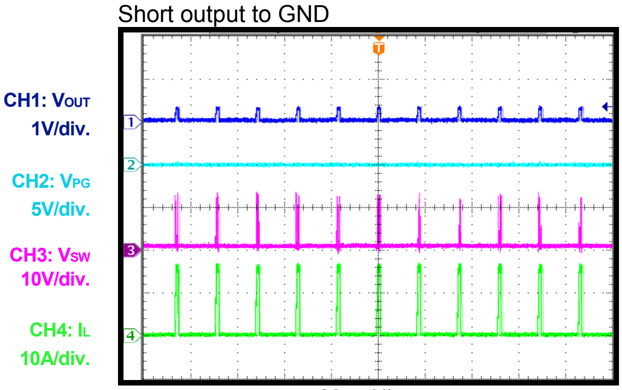


EVB TEST RESULTS *(continued)*

V_{IN} = 12V, V_{OUT} = 1V, L = 0.33µH, T_A = 25°C, unless otherwise noted.

Short-Circuit Protection Steady State

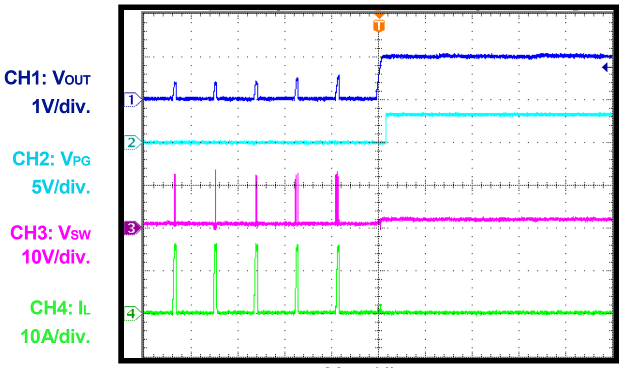
Short output to GND



20ms/div.

Short-Circuit Protection Recovery

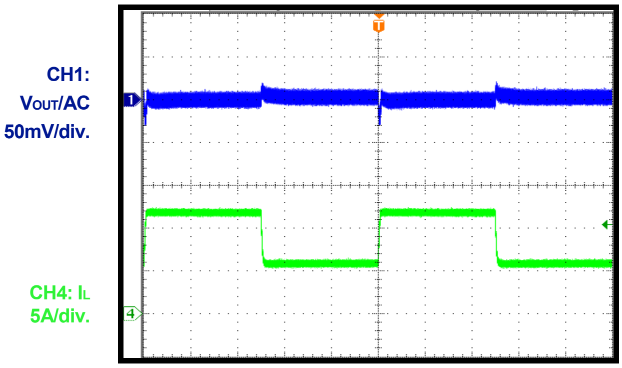
I_{OUT} = 0A



20ms/div.

Load Transient

I_{OUT} = 6 - 12A



200µs/div.

PRINTED CIRCUIT BOARD LAYOUT

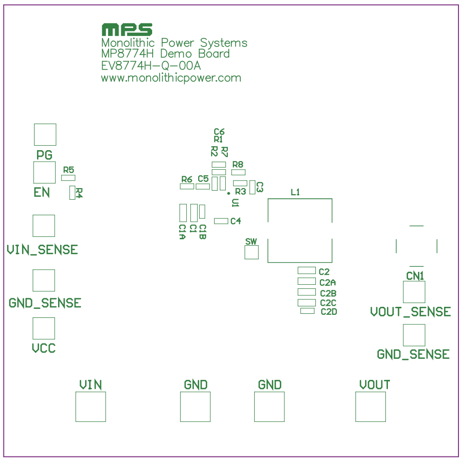


Figure 1: Top Silk Layer

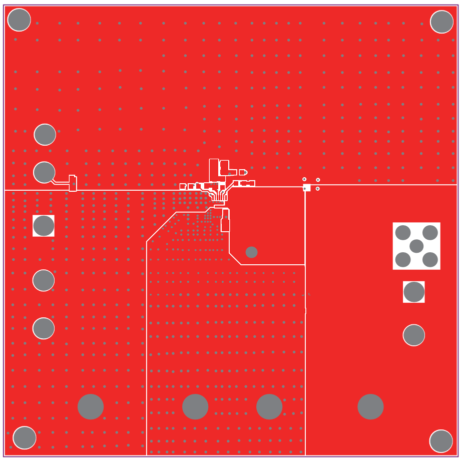


Figure 2: Top Layer

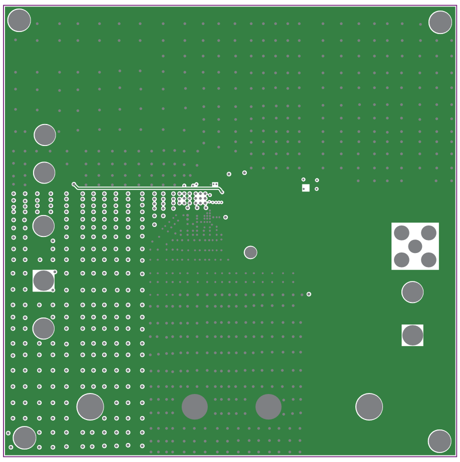


Figure 3: Inner Layer 1

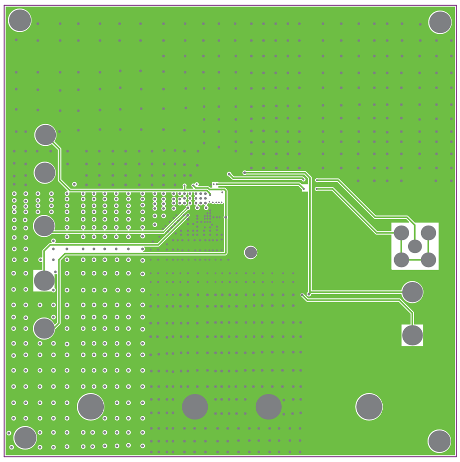


Figure 4: Inner Layer 2

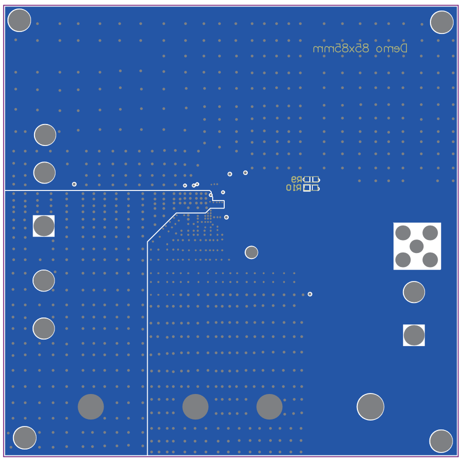


Figure 5: Bottom Layer

QUICK START GUIDE

1. Preset Power Supply to12V.
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.