EV9486A-N-00A

3.5A Switching Current Limit, 100V Wide Input Buck Converter EV Board

The Future of Analog IC Technology®

DESCRIPTION

The EV9486A-N-00A Evaluation Board is designed to demonstrate the performances of MPS' MP9486A which is a 4.5V-to-100V-input step-down converter.

The MP9486A employs hysteresis voltage control method to provide fast response to line or load transient. It integrates a high-side high voltage power MOSFET with a current limit of typical 3.5A. MPS's proprietary feedback control scheme minimizes the number of external components.

This board is configured for 5V step-down application. It can support 1A continuous load or 2A pulse load. The circuit requires only a minimal number of readily-available, standard, external components.

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Supply Voltage	V_{IN}	8 – 95	V
Output Voltage	V_{OUT}	5	V
Output Current	I_{OUT}	0-1	A

FEATURES

- 8V-to-95V Wide Input Range(1)
- Hysteretic Control: Simple Compensation
- Up to 1MHz Switching Frequency
- Hiccup mode Short Circuit Protection
- Thermal Shut Down
- 170μA Quiescent Current
- Available in SOIC8 with Exposed Pad Package

Note: 1) MP9486A can support 4.5V-to-95V DC input, 8V minimum voltage is needed when V_{OUT} sets to 5V. MP9486A can support up to 100V input spike voltage.

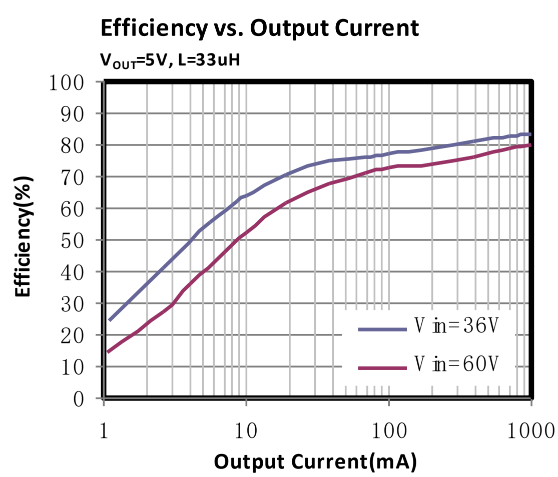
APPLICATIONS

- Scooter, E-bike Control Power Supply
- Solar Energy System
- Automotive System Power
- Industrial Power Supply

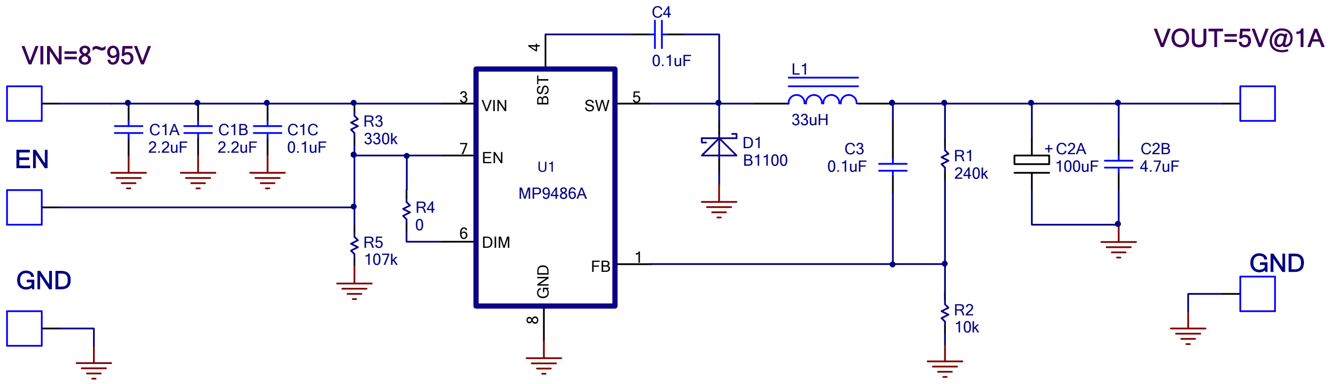
EV9486A-N-00A EVALUATION BOARD

(L × W × H) 6.3cm × 6.3cm × 1.3cm

Board Number	MPS IC Number
EV9486A-N-00A	MP9486AGN



EVALUATION BOARD SCHEMATIC



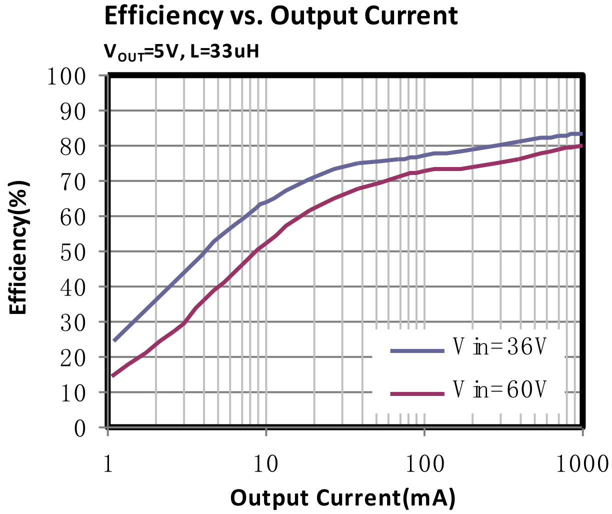
EV9486A-N-00A BILL OF MATERIALS

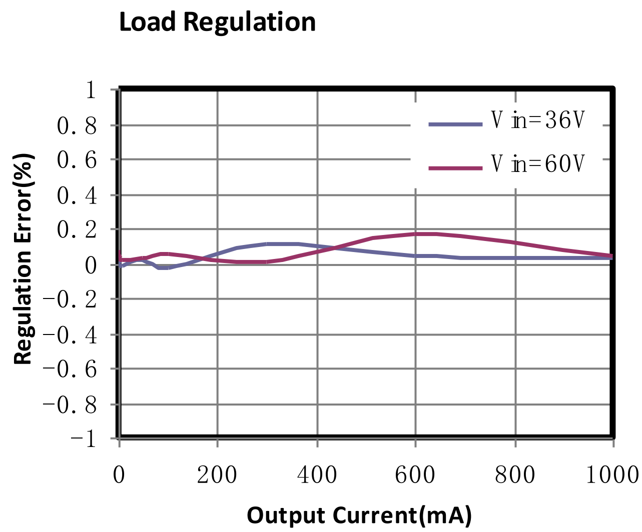
Qty	Ref	Value	Description	Package	Manufacturer	Part Number
2	C1A, C1B	2.2µF	Ceramic Cap., 100V, X7R	1210	muRata	GRM32ER72A225K
1	C1C	0.1µF	Ceramic Cap., 100V, X7R	0805	muRata	GCM21BR72A104K
1	C2A	100µF	10V, 0.74A solid tantalum capacitor, ESR=200mΩ	SMD (3.2x6.0)	VISHAY	TR3C107M010C0200
1	C2B	4.7µF	25V X7R Ceramic Capacitor	0805	muRata	GRM21AR71E475KL
2	C3,C4	0.1µF	25V Ceramic Capacitor	0603	muRata	GRM188R71E104KL
1	D1	B1100	100V,1A,schottky diode	SMA	DIODES	B1100-LS
1	L1	33µH	66 mΩ, Isat=2.9A inductor	SMD (10X10)		744771433
1	R1	240k	Film resistor, 1%	0603	YAGEO	RC0603FR-07240KL
1	R2	10k	Film resistor, 1%	0603	YAGEO	RC0603FR-0710KL
1	R3	330k	Film resistor, 1%	0603	YAGEO	RC0603FR-07330KL
1	R4	0	Film resistor, 5%	0603	YAGEO	RC0603JR-070RL
1	R5	107k	Film resistor, 1%	0603	YAGEO	RC0603FR-07107KL
1	U1	MP9486A	100V INPUT, 3.5A STEP-DOWN CONVERTER	SOIC8	MPS	MP9486AGN

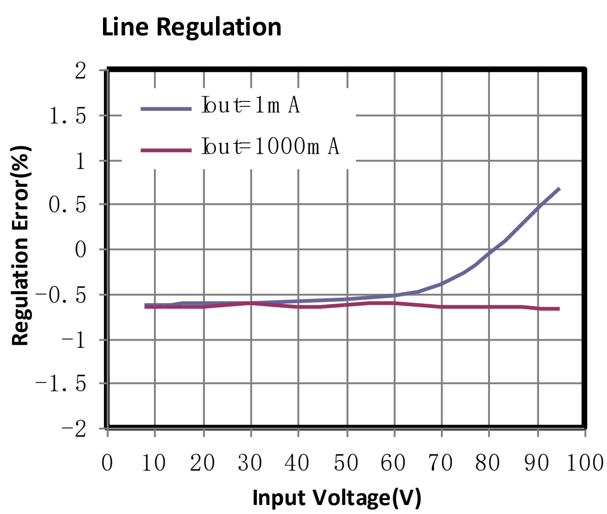
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

V_{IN} = 60V, V_{OUT} = 5V, I_{OUT} = 1A, L=33µH, C_{OUT} = 100µF, T_A= +25°C, unless otherwise noted.







EVB TEST RESULTS *(continued)*

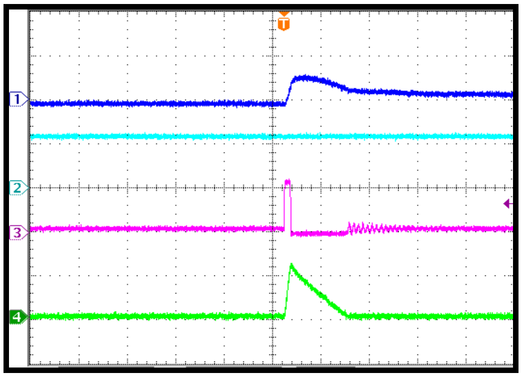
Performance waveforms are tested on the evaluation board.

V_{IN} = 60V, V_{OUT} = 5V, I_{OUT} = 1A, L=33µH, C_{OUT} = 100µF, T_A= +25°C, unless otherwise noted.

Steady State

I_{OUT}=0A

CH1: V_{OUT}/AC 100mV/div.
CH2: V_{IN} 50V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

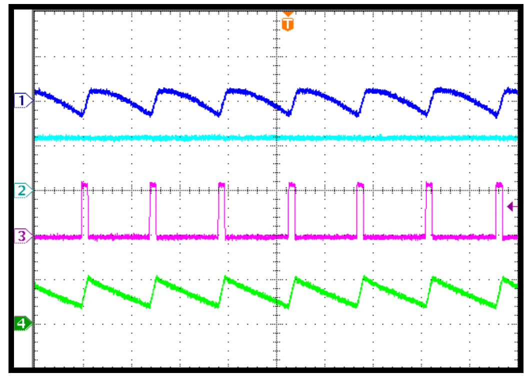


4µs/div.

Steady State

I_{OUT}=1A

CH1: V_{OUT}/AC 100mV/div.
CH2: V_{IN} 50V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 2A/div.

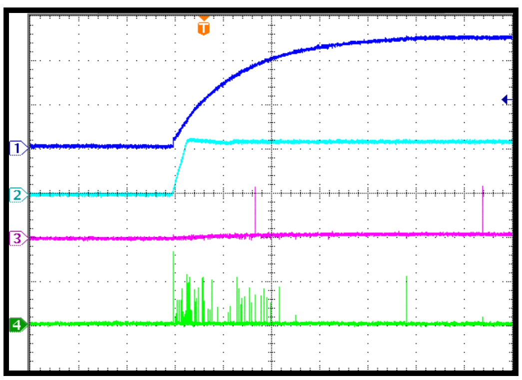


4µs/div.

Power On

I_{OUT}=0A

CH1: V_{OUT} 2V/div.
CH2: V_{IN} 50V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

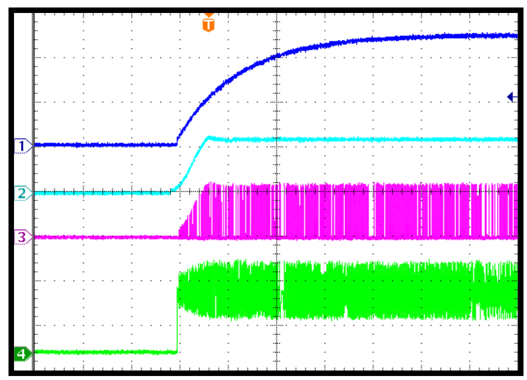


20ms/div.

Power On

I_{OUT}=1A

CH1: V_{OUT} 2V/div.
CH2: V_{IN} 50V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

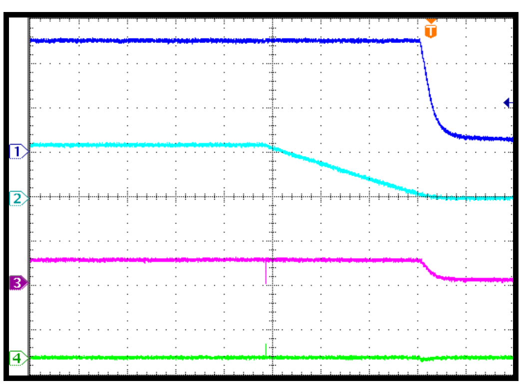


20ms/div.

Power Off

I_{OUT}=0A

CH1: V_{OUT} 2V/div.
CH2: V_{IN} 50V/div.
CH3: V_{SW} 10V/div.
CH4: I_L 500mA/div.

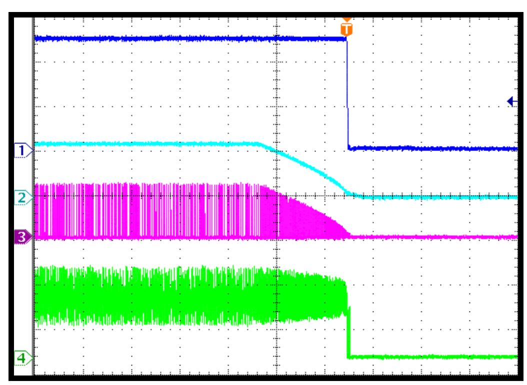


100ms/div.

Power Off

I_{OUT}=1A

CH1: V_{OUT} 2V/div.
CH2: V_{IN} 50V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.



20ms/div.

EVB TEST RESULTS *(continued)*

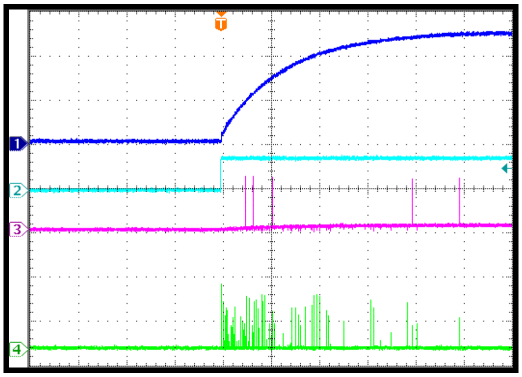
Performance waveforms are tested on the evaluation board.

V_{IN} = 60V, V_{OUT} = 5V, I_{OUT} = 1A, L=33µH, C_{OUT} = 100µF, T_A= +25°C, unless otherwise noted.

EN Start-Up

I_{OUT}=0A

CH1: V_{OUT} 2V/div.
CH2: V_{EN} 5V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

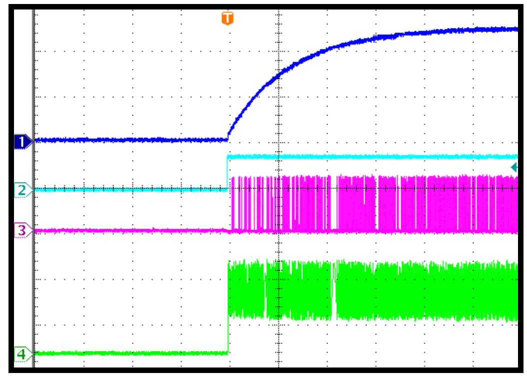


20ms/div.

EN Start-Up

I_{OUT}=1A

CH1: V_{OUT} 2V/div.
CH2: V_{EN} 5V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

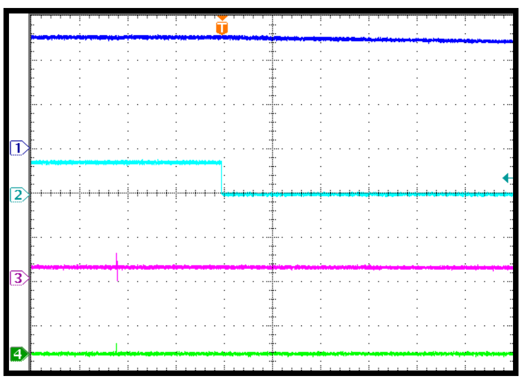


20ms/div.

EN Shutdown

I_{OUT}=0A

CH1: V_{OUT} 2V/div.
CH2: V_{EN} 5V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

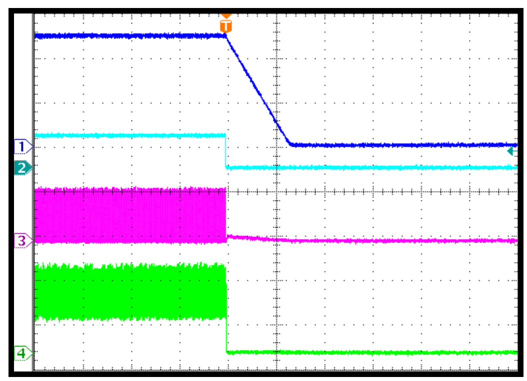


100ms/div.

EN Shutdown

I_{OUT}=1A

CH1: V_{OUT} 2V/div.
CH2: V_{EN} 5V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 1A/div.

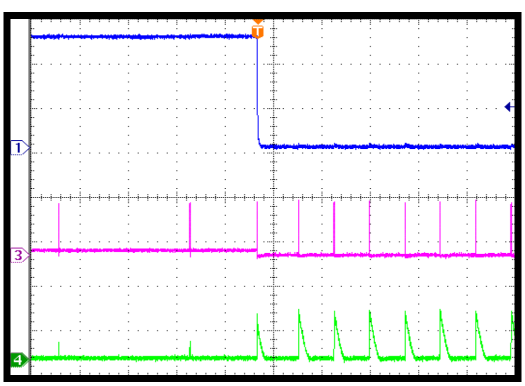


400µs/div.

SCP Entry

I_{OUT}=0A

CH1: V_{OUT} 2V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 2A/div.

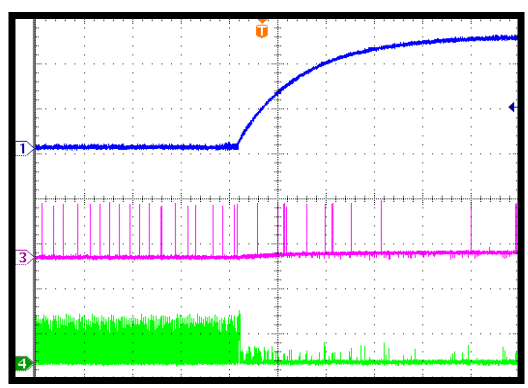


400µs/div.

SCP Recovery

I_{OUT}=0A

CH1: V_{OUT} 2V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 2A/div.



20ms/div.

EVB TEST RESULTS *(continued)*

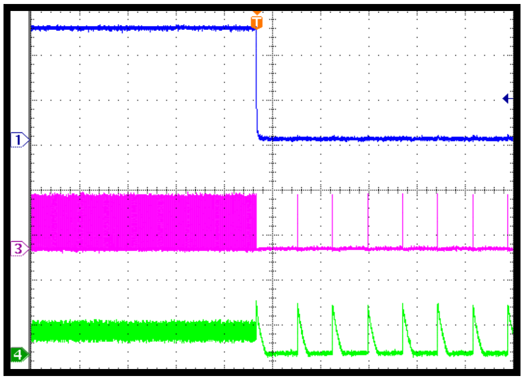
Performance waveforms are tested on the evaluation board.

V_{IN} = 60V, V_{OUT} = 5V, I_{OUT} = 1A, L=33µH, C_{OUT} = 100µF, T_A= +25°C, unless otherwise noted.

SCP Entry

I_{OUT}=1A

CH1: V_{OUT} 2V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 2A/div.

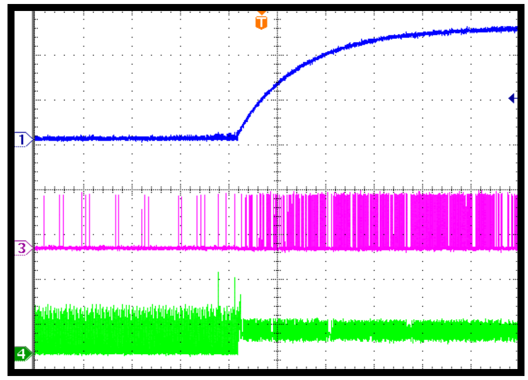


400µs/div.

SCP Recovery

I_{OUT}=1A, E-load turn-on Threshold=0.32V

CH1: V_{OUT} 2V/div.
CH3: V_{SW} 50V/div.
CH4: I_L 2A/div.

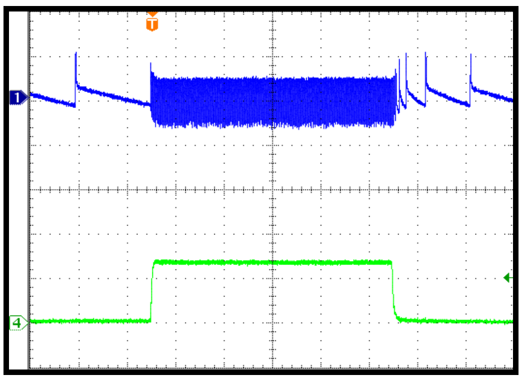


20ms/div.

Load Transient

I_{OUT}=0A-->1A@70mA/µs

CH1: V_{OUT}/AC 50mV/div.
CH4: I_{LOAD} 1A/div.

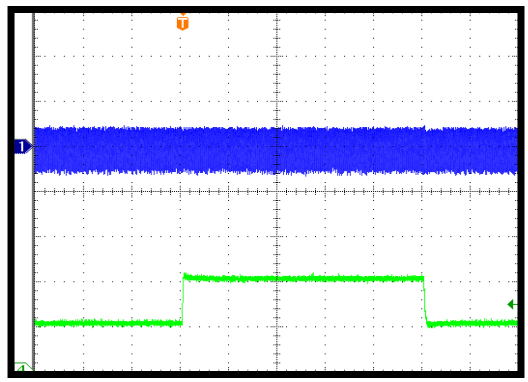


400µs/div.

Load Transient

I_{OUT}=1A-->2A@70mA/µs

CH1: V_{OUT}/AC 50mV/div.
CH4: I_{OUT} 1A/div.



400µs/div.

PRINTED CIRCUIT BOARD LAYOUT

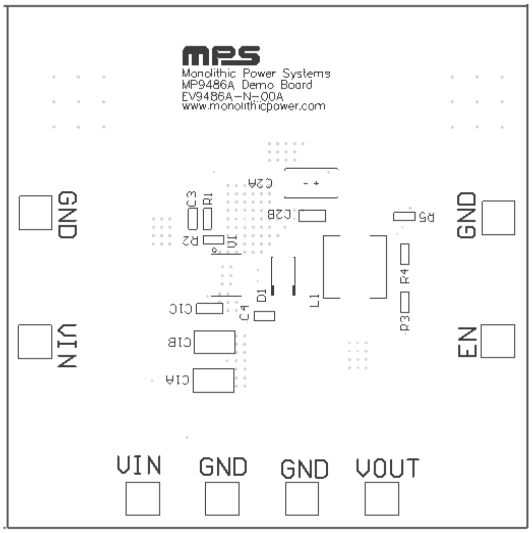


Figure 1: Top Silkscreen Layer

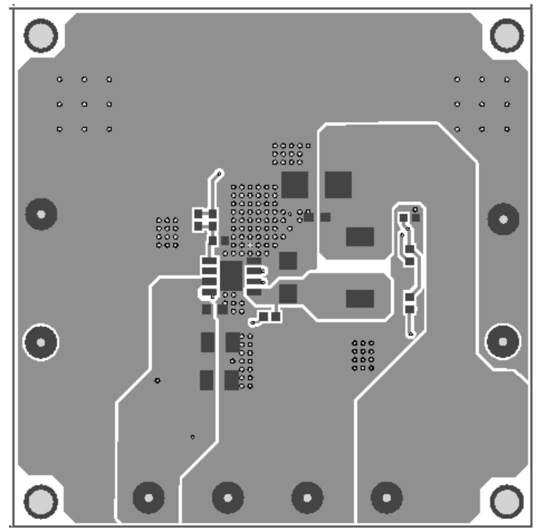


Figure 2: Top Layer

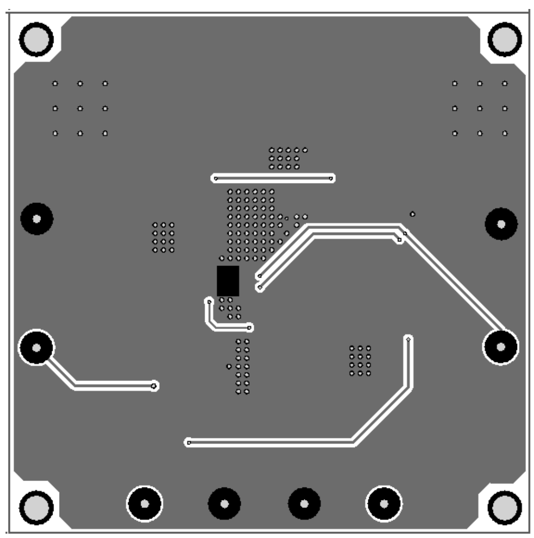


Figure 3: Bottom Layer

QUICK START GUIDE

The output voltage of this board is set to 5V. With an input ranging from 8V (lower input may causes insufficient BST voltage) to 95V, this board can provide load with 1A continuous current or 2A pulse current. To use this EVB for evaluation, you can do as below:

1. Preset Power Supply to between 8V and 95V.
2. Turn Power Supply off.
3. Preset Load to a value not greater than 1A. Note that due to the SCP mechanism MP9486A may startup into SCP mode if the load is on during startup and the turn-on threshold of the E-load is below 0.3V. To improve the startup capability C3's value should be greater.
4. Connect Power Supply terminals to:
    a. Positive (+): VIN
    b. Negative (–): GND
5. Connect Load to:
    a. Positive (+): VOUT
    b. Negative (–): GND
6. Turn Power Supply on after making connections. The MP9486A will automatically startup to work.

The output voltage VOUT can be programmed by changing R2. And the value of R2 can be calculated by the following formula:

$$R_2 = R_1 \times \frac{V_{FB}}{V_{OUT} - V_{FB}}$$

Where R1=240kΩ, and V_{FB}=0.2V.

7. If EN functions is preferred, apply a high level (>1.7V) turns on MP9486A, low level (<1V) turns off MP9486A. After being turned off, output voltage will be discharged to 0V due to load.