# EV8865-Q-00A

## 6A High Efficient Synchronous Step-Down Converter with I²C Interface

The Future of Analog IC Technology

## DESCRIPTION

The EV8865-Q-00A is used for demonstrating the performance of MPS's MP8865. MP8865 is a highly integrated and high frequency synchronous step-down switcher with I2C control interface. It is optimized to support up to 6A load current over an input supply range from 4.5V to 21V with excellent load and line regulation.

Current-Mode operation provides fast transient response and eases loop stabilization. The output voltage level can be controlled, on-the fly through a 3.4Mbps I2C serial interface. Voltage range can be adjusted from 0.6V to 1.87V in 10mV steps. Voltage slew rate, switching frequency and power savings mode are also selectable through the I2C interface. Fully protection features includes over current protection, over voltage protection and over temperature protection.

MP8865 is available in QFN15 (3mmx3mm) package.

## ELECTRICAL SPECIFICATION

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | 4.5– 21 | V |
| Output Voltage | $V_{OUT}$ | 1.2 | V |
| Output Current | $I_{OUT}$ | 6 | A |

## FEATURES

- Wide 4.5V-to-21V Operation Input Range
- 45mΩ/18mΩ Low $R_{DS(ON)}$ Internal Power MOSFETs
- 1% VOUT Accuracy
- $I^2C$ Programmable Output Range from 0.6V to 1.87V in 10mV Steps with Slew Rate Control
- $I^2C$ Selectable Switching Frequency. Default 600kHz Switching Frequency.
- Programmable Default Output Voltage
- Power Saving Mode, OTP and OCP Via $I^2C$
- Power Good Indication
- 1 bit $I^2C$ Address Set pin
- OCP Protection and Hiccup
- External Soft Start
- Available in QFN3x3 Package

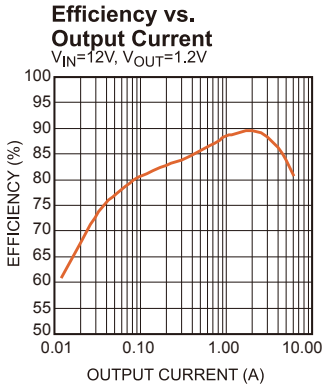
## APPLICATIONS

- Flat-Panel Television and Monitors
- Digital Set-Top Boxes
- Distributed Power Systems

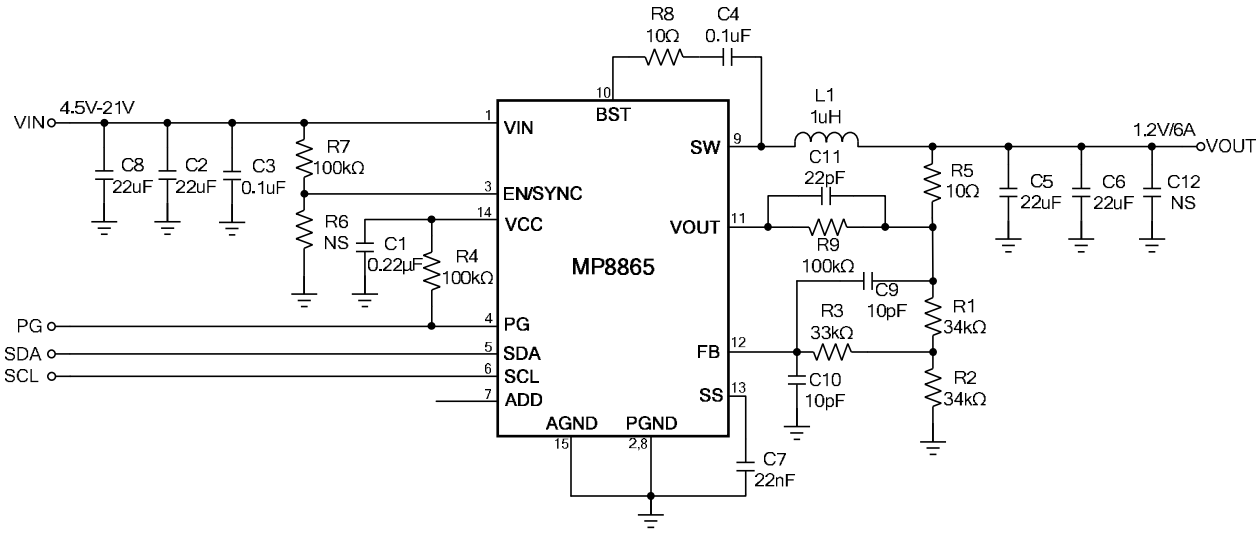


## EV8865-Q-00A EVALUATION BOARD

| Board Number | MPS IC Number |
|---|---|
| EV8865-Q-00A | MP8865GQ |



## EVALUATION BOARD SCHEMATIC




## EV8865-Q-00A BILL OF MATERIALS

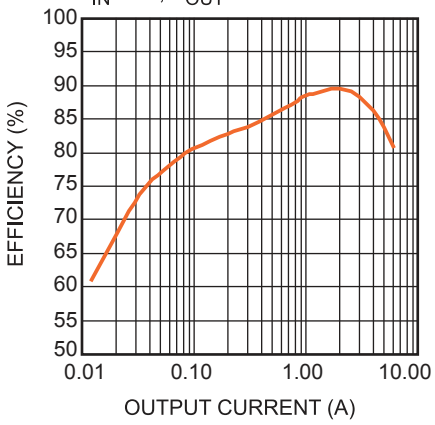
| Qty | RefDes | Value | Description | Package | Manufacturer | Manufacturer P/N |
|---|---|---|---|---|---|---|
| 1 | C1 | 0.22μF | Ceramic Cap., 16V, X7R | 0603 | muRata | GRM188R71C224KA01D |
| 2 | C2,C8 | 22μF | Ceramic Cap., 25V, X5R | 1206 | muRata | GRM31CR61E226KE15L |
| 2 | C3,C4 | 0.1μF | Ceramic Cap., 25V, X7R | 0603 | muRata | GRM188R71C104KA01D |
| 2 | C5,C6 | 22μF | Ceramic Cap., 10V, X7R | 1206 | muRata | GRM31CR70A226KE19L |
| 1 | C7 | 22nF | Ceramic Cap., 50V, X7R | 0603 | muRata | GRM188R71H223KA01D |
| 2 | C9,C10 | 10pF | Ceramic Cap., 50V, C0G | 0603 | muRata | GRM1885C1H100JA01D |
| 1 | C11 | 22pF | Ceramic Cap., 50V, C0G | 0603 | muRata | GRM1885C1H220JA01D |
| 0 | C12 | NS | | | | |
| 1 | R1 | 34k | Thick Film Res., 1% | 0603 | Yageo | 9C06031A3402FKHFT |
| 1 | R2 | 34k | Thick Film Res., 1% | 0603 | Yageo | 9C06031A3402FKHFT |
| 1 | R3 | 33k | Thick Film Res., 1% | 0603 | Yageo | 9C06031A3302FKHFT |
| 3 | R4,R7,R9 | 100k | Thick Film Res., 1% | 0603 | Yageo | 9C06031A1003FKHFT |
| 1 | R5,R8 | 10Ω | Thick Film Res., 5% | 0603 | Yageo | 9C06031A10R0JLHFT |
| 0 | R6 | NS | | | | |
| 1 | L1 | 1μH | Inductor,DCR=4.6mΩ, Is=19A | 6.9×6.9×3.8mm | Wurth | 744311100 |
| 1 | U1 | MP8865GQ | Synchronous Step-Down Convert | QFN3*3 | MPS | MP8865GQ |

# EVB TEST RESULTS

**Performance waveforms are tested on the evaluation board.**
**$V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, L = 1µH, $T_A$ = 25°C, unless otherwise noted.**

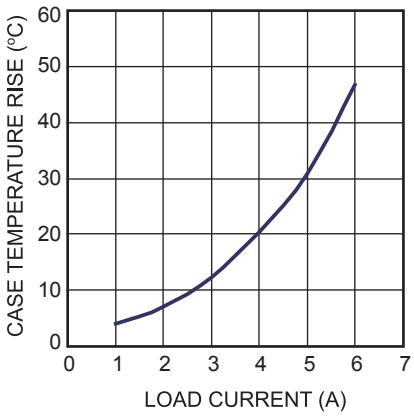
### Efficiency vs. Output Current

$V_{IN}$=12V, $V_{OUT}$=1.2V

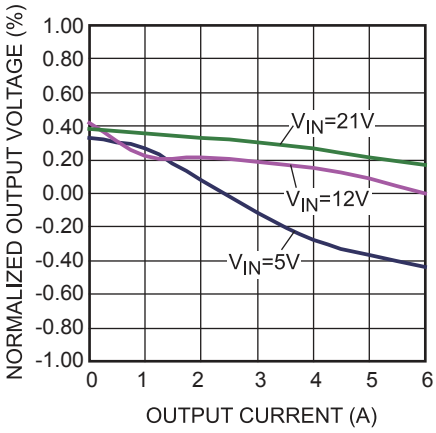



### Case Temperature Rise vs. $I_{OUT}$

$V_{OUT}$=1.2V

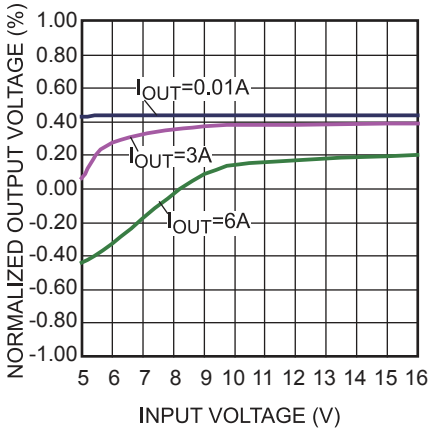



### Load Regulation




### Line Regulation

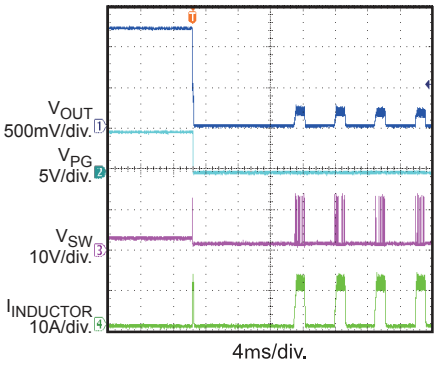
$V_{IN}$=5V-21V



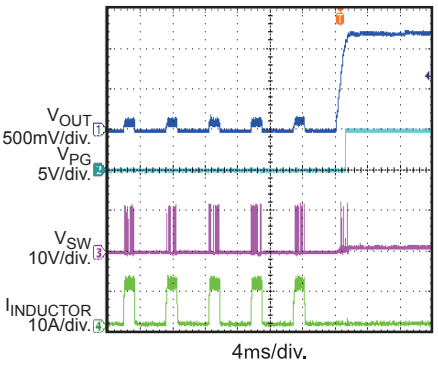
## EVB TEST RESULTS *(continued)*

**Performance waveforms are tested on the evaluation board.**
**$V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, L = 1µH, $T_A$ = 25°C, unless otherwise noted.**

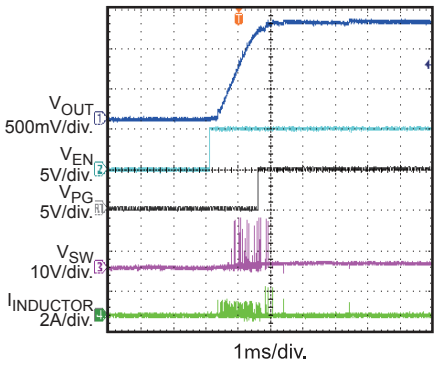
### Short Entry
$I_{OUT}$ = 0A



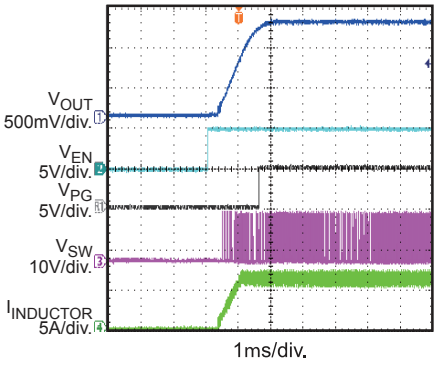

### Short Recovery
$I_{OUT}$ = 0A



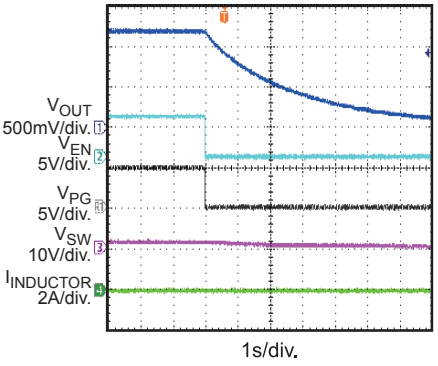

### Startup through Enable
$I_{OUT}$ = 0A



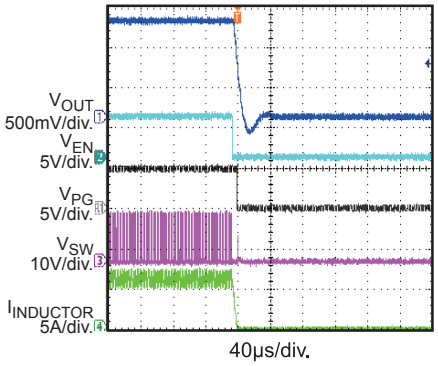

### Startup through Enable
$I_{OUT}$ = 6A



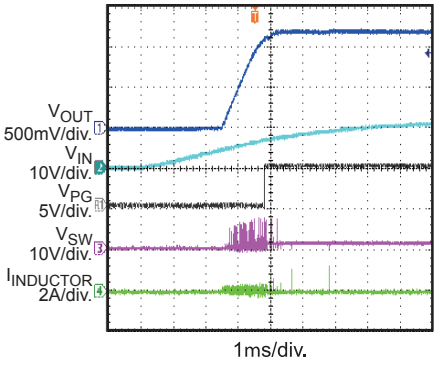

### Shutdown through Enable
$I_{OUT}$ = 0A



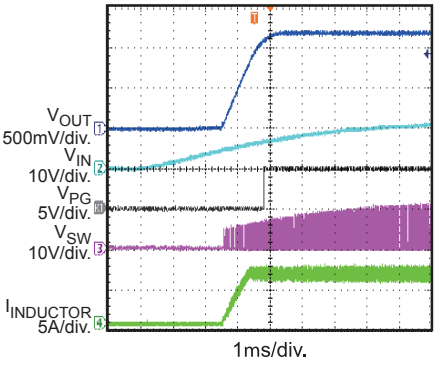

### Shutdown through Enable
$I_{OUT}$ = 6A



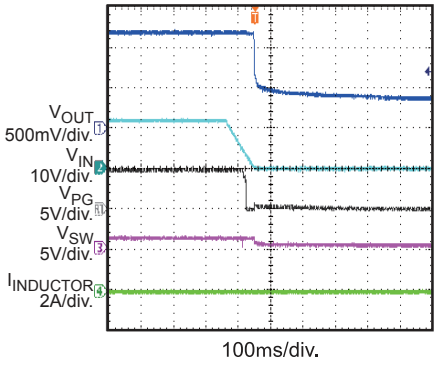

### Startup through Input Voltage
$I_{OUT}$ = 0A




### Startup through Input Voltage
$I_{OUT}$ = 6A



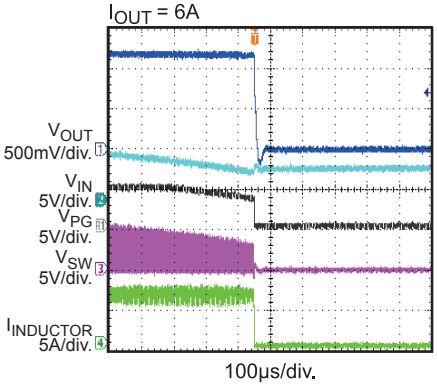

### Shutdown through Input Voltage
$I_{OUT}$ = 0A



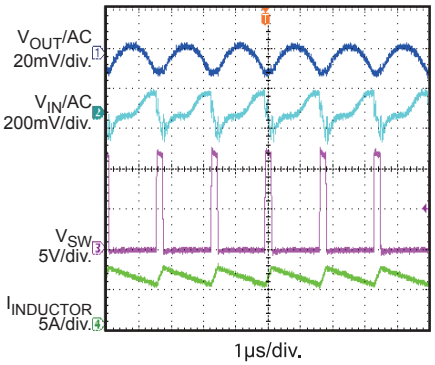
## EVB TEST RESULTS *(continued)*

**Performance waveforms are tested on the evaluation board.**
**$V_{IN}$ = 12V, $V_{OUT}$ = 1.2V, L = 1µH, $T_A$ = 25°C, unless otherwise noted.**

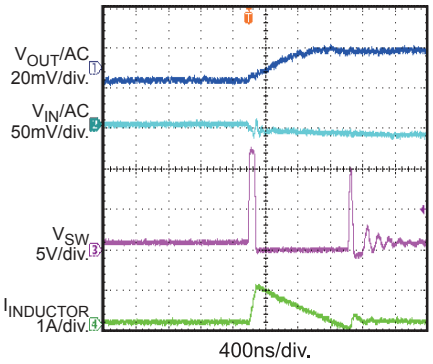
### Shutdown through Input Voltage
$I_{OUT}$ = 6A



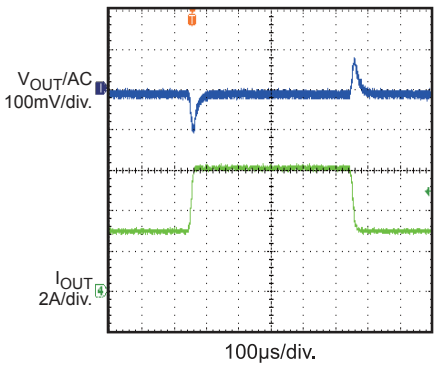

### Input/Output Ripple
$I_{OUT}$ = 6A



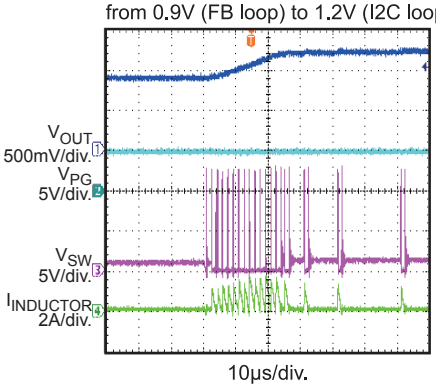

### Input/Output Ripple
$I_{OUT}$ = 0A



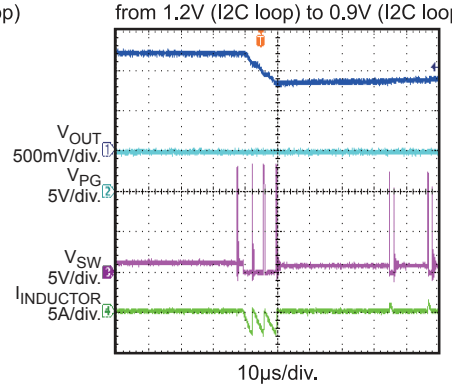

### Load Transient Response
$I_{OUT}$ = 3A to 6A



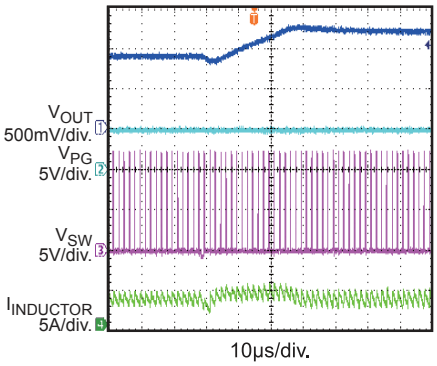

### I2C Control Slew Rate
Slew rate=16mV/µs, $I_{OUT}$ = 0A,
from 0.9V (FB loop) to 1.2V (I2C loop)



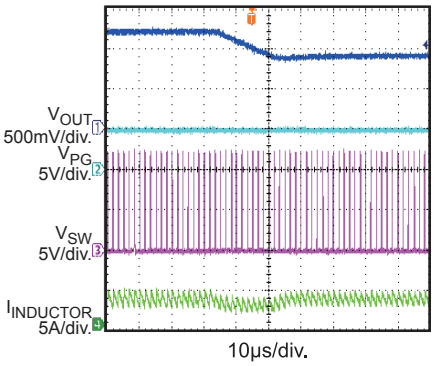

### I2C Control Slew Rate
Slew rate=16mV/µs, $I_{OUT}$ = 0A,
from 1.2V (I2C loop) to 0.9V (I2C loop)




### I2C Control Slew Rate
Slew rate=16mV/µs, $I_{OUT}$ = 3A,
from 0.9V (FB loop) to 1.2V (I2C loop)




### I2C Control Slew Rate
Slew rate=16mV/µs, $I_{OUT}$ = 3A,
from 1.2V (I2C loop) to 0.9V (I2C loop)



## PRINTED CIRCUIT BOARD LAYER

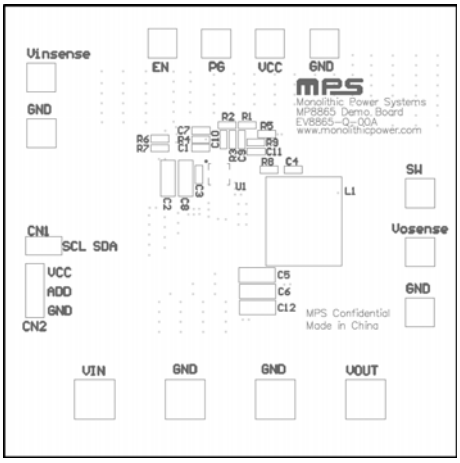



**Figure 1: Top Silk Layer**

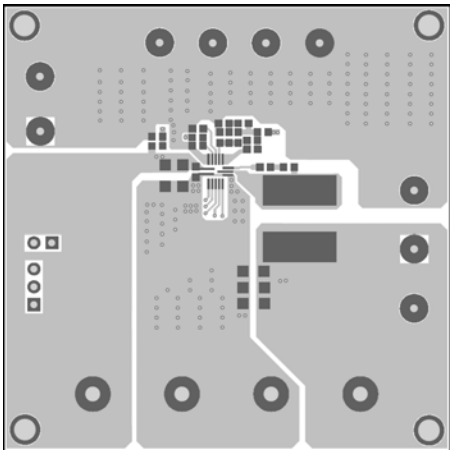


**Figure 2: Top Layer**

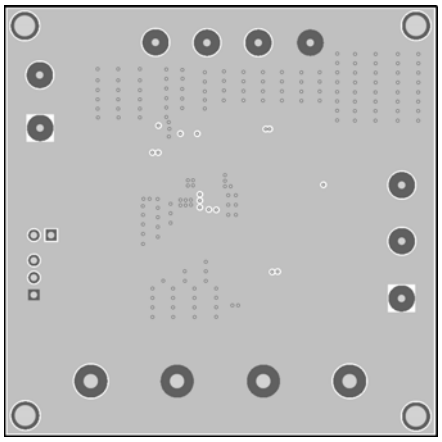


**Figure 3: Inner 1 Layer**

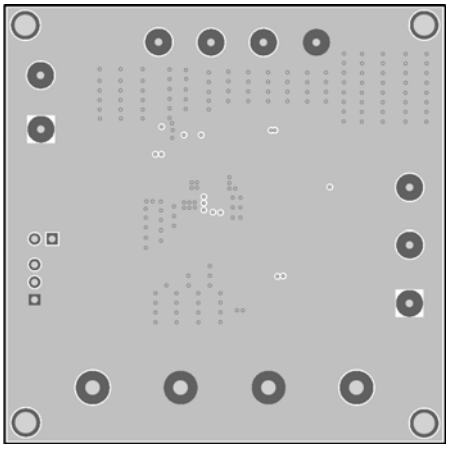


**Figure 4: Inner 2 Layer**

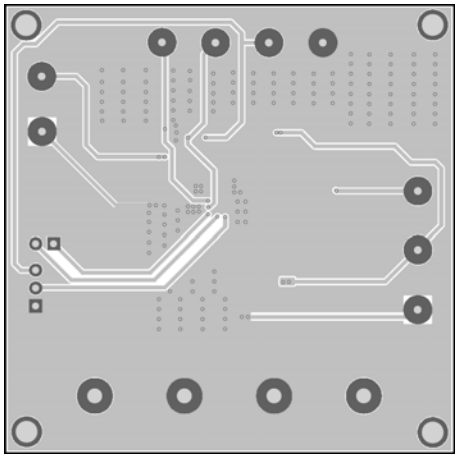


**Figure 5: Bottom Layer**

## 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 between 4.5V and 21V, and then turn off the power supply.
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 board will automatically start up.
5. 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 1.25V to turn it off.