



EV6637A-TL-00A

5.5V, 1.3A Peak, Three-Phase, Sensorless BLDC Motor Driver with Integrated MOSFETs Evaluation Board

DESCRIPTION

The EV6637A-TL-00A evaluation board is designed to evaluate the performance of the MP6637A, a three-phase, sensorless, brushless DC (BLDC) motor driver with integrated power MOSFETs. It features sinusoidal sensorless control for better efficiency and low vibration, with up to 1.3A of peak phase current. The input voltage (V_{IN}) ranges from 2.5V to 5.5V.

The MP6637A controls the motor speed through the pulse-width modulation (PWM) signal with a 1kHz to 100kHz PWM input frequency.

The MP6637A also features a rotational speed detector. The rotational speed detector is an open-drain output via the FG/RD pin.

Rich protection features include input over-voltage protection (OVP), under-voltage lockout (UVLO), locked-rotor protection, over-current protection (OCP), and thermal shutdown.

The MP6637A is available in an SOT583 package.

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		2.5V to 5.5V
Input PWM frequency		1kHz to 100kHz
Switching frequency (f_{sw})		30kHz

EVALUATION BOARD



LxWxH (5cmx5cmx2.2cm)

Board Number	MPS IC Number
EV6637A-TL-00A	MP6637AGTL-0000

QUICK START GUIDE

Quick Start without the Communication Kit

1. Preset the DC power supply, then turn off the power supply.
2. Connect the power supply outputs terminals to:
 - a. Positive (+): VIN_FAN
 - b. Negative (-): GND
3. Connect the BLDC motor phase terminals to:
 - a. Motor phase A: OUTA
 - b. Motor phase B: OUTB
 - c. Motor phase C: OUTC
4. Preset the function generator to pulse mode, such that the high is 3.3V and the low is 0V. The frequency should be between 1kHz and 100kHz.
5. Connect the function generator outputs terminals to:
 - a. Positive (+): PWM
 - b. Negative (-): GND
6. Turn on the power supply. The motor should start rotating.
7. Adjust the pulse-width modulation (PWM) duty cycle to change the motor rotation speed.
8. Adjust the soft start (SS) settings via R2, the variable resistor.

Figure 1 shows the equipment set-up without the communication kit.

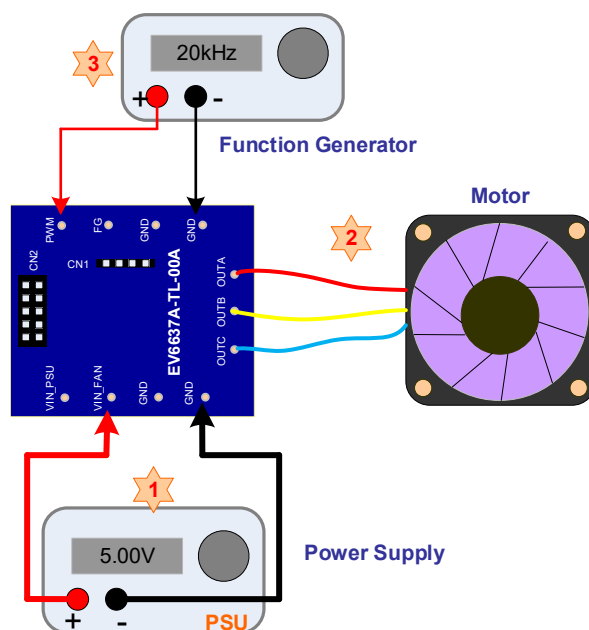


Figure 1: EVB Connection without Communication Kit

Quick Start Using the MPS Fan Driver Communication Kit

1. Preset the DC power supply, then turn off the power supply.
2. Connect the power supply output terminals to:
 - a. Positive (+): VIN_PSU
 - b. Negative (-): GND
3. Connect the BLDC motor phase terminals to:
 - a. Motor phase A: OUTA
 - b. Motor phase B: OUTB
 - c. Motor phase C: OUTC
4. Connect the MPS fan driver communication kit to CN2 via the 10-pin rainbow cable.
5. Connect the MPS fan driver communication kit to the PC via the USB cable.
6. Turn on the power supply.
7. Run the MPS BLDC Virtual Bench GUI and select the MP6637A. ⁽¹⁾
8. If the GUI is being used to adjust the SS settings, remove R2.

Figure 2 shows the equipment set-up with the communication kit.

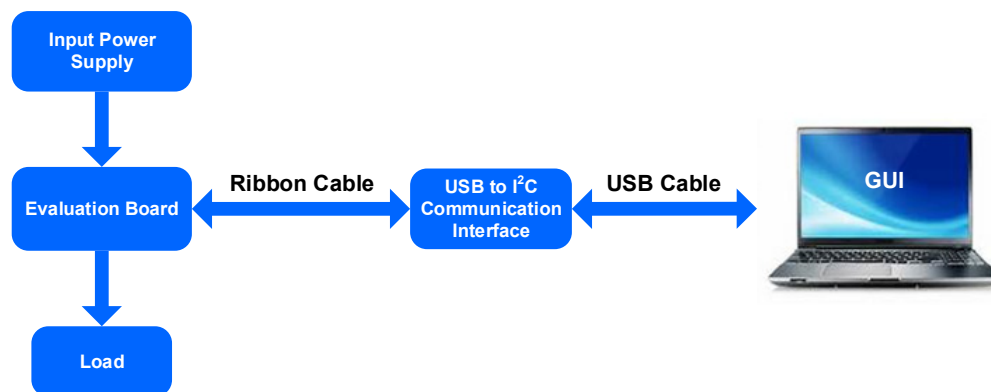


Figure 2: EVB Connection with Communication Kit

Note:

- 1) Contact an MPS FAE to obtain the MPS BLDC Virtual Bench GUI.

GUI Operation Guide

1. Install the MPS BLDC Virtual Bench GUI. ⁽²⁾
2. Double-click “MPS BLDC Virtual Bench” to launch the GUI, then click “Select Chip” (see Figure 3).

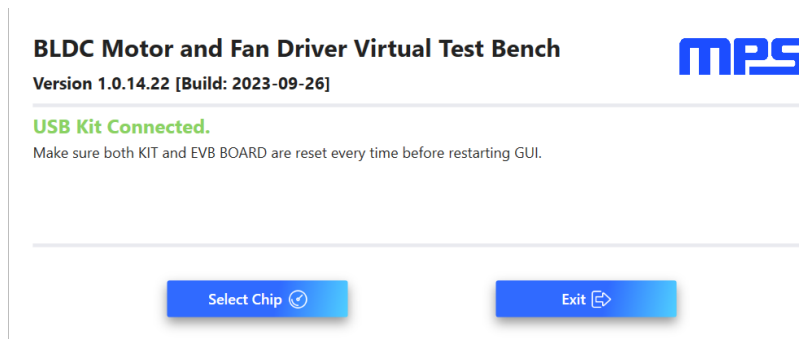


Figure 3: MPS Motor and Fan Driver Virtual Test Bench GUI

3. Click “Details” to enter test mode for register configuration (see Figure 4).

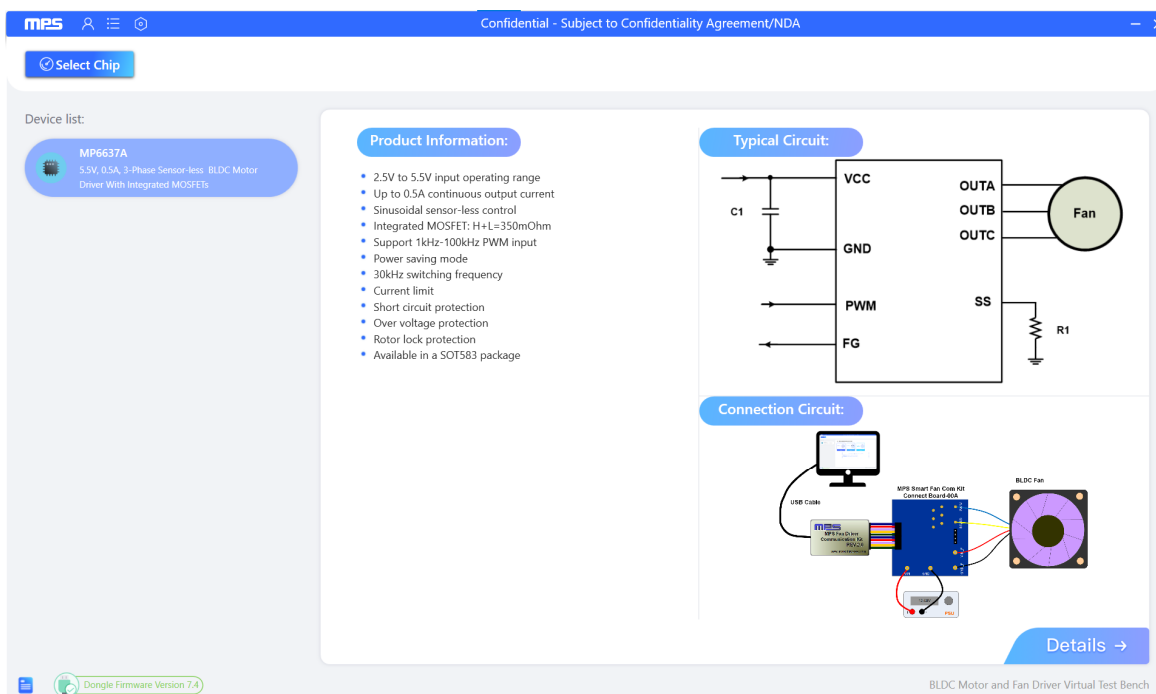


Figure 4: MPS BLDC Virtual Bench GUI Interface

Note:

- 2) Contact an MPS FAE to obtain the MPS BLDC Virtual Bench GUI.

EVALUATION BOARD SCHEMATIC

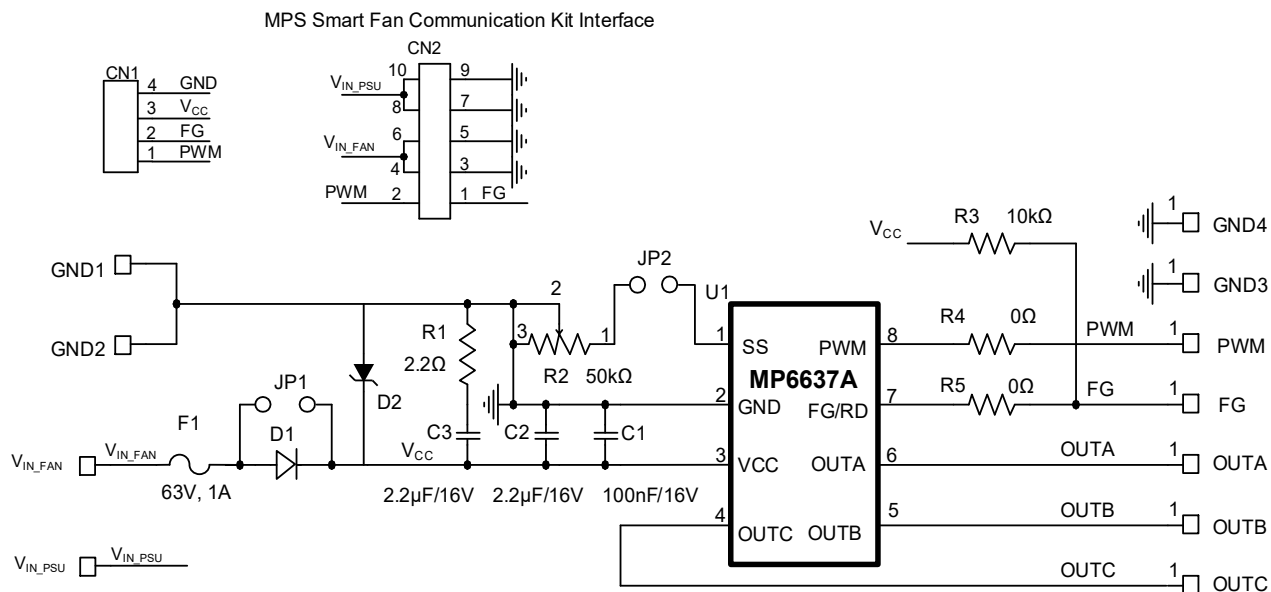


Figure 5: Evaluation Board Schematic

EV6637A-TL-00A BILL OF MATERIALS

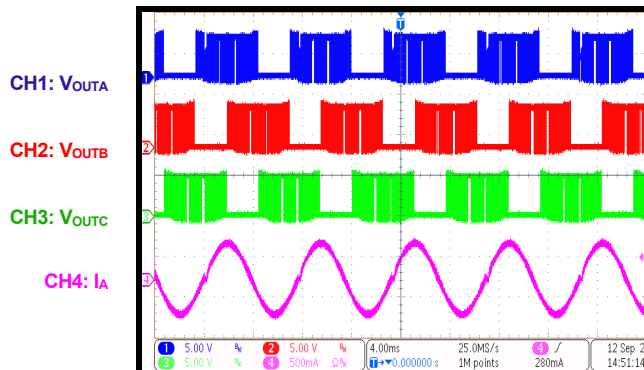
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	CN1	2.54mm	1-row, 4-pin connector	DIP	Any	1X4_180D
1	CN2	2.54mm	2-row, 10-pin connector	DIP	Any	2X5_180D
1	C1	100nF	Capacitor, 16V, X7R	C0402	Murata	GCM155R71C104KA55D
2	C2, C3	2.2μF	Capacitor, 16V, X7R	C0402	Murata	GRM155D71C225ME11D
1	R1	2.2Ω	Film resistor, 5%	R0603	Yageo	RC0603FR-072R2L
1	R2	50kΩ	Resistor	SMD	Panasonic	EVM3ESX50B54
1	R3	10kΩ	Film resistor, 1%	R0402	Yageo	RC0402FR-0710KL
2	R4, R5	0Ω	Film resistor, 1%	R0402	Yageo	RC0402FR-070RL
1	F1	63V	1A fuse	1206	Cooper	3216FF1-R
1	D1	40V	Schottky diode, 0.5A	SOD-123	Diodes, Inc.	B0540W-7-F
1	D2	5.1V	Zener diode	SOD-123	JSCJ	BZT52C5V1
1	JP1, JP2	2.54mm	2-pin jump	DIP	Any	
11	GND1, GND2, GND3, GND4, VIN_PSU, VIN_FAN, PWM, OUTC, OUTB, OUTA, FG	1mm	Male connector	DIP	Any	
1	U1	MP6637A	5.5V, three-phase, sensorless, brushless BLDC motor driver	SOT583	MPS	MP6637AGTL-0000

EVb TEST RESULTS

Performance curves and waveforms are tested on the evaluation board. SS pin floating, $V_{IN} = 5V$, $f_{PWM} = 20kHz$, 6S4P notebook fan, 5V/0.4A, 3800rpm, $T_A = 25^{\circ}C$, unless otherwise noted.

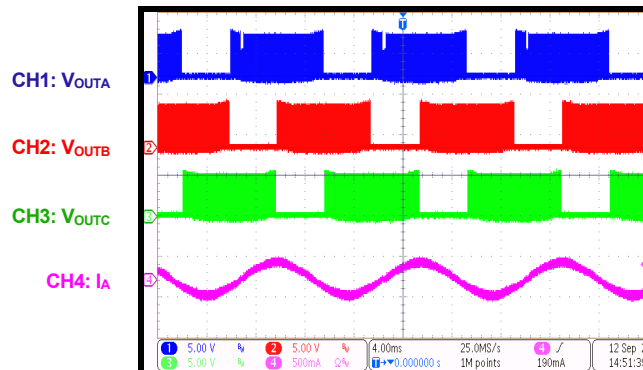
Steady State

PWM duty cycle = 100%



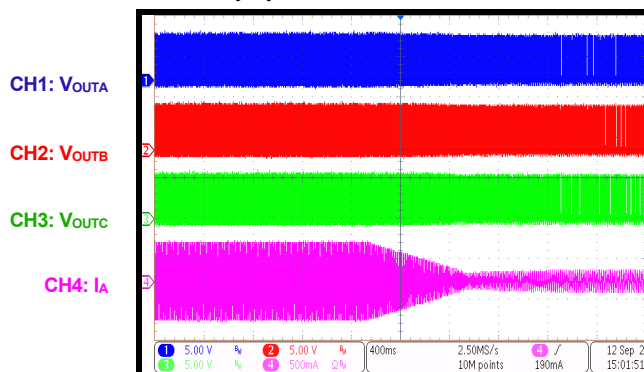
Steady State

PWM duty cycle = 50%



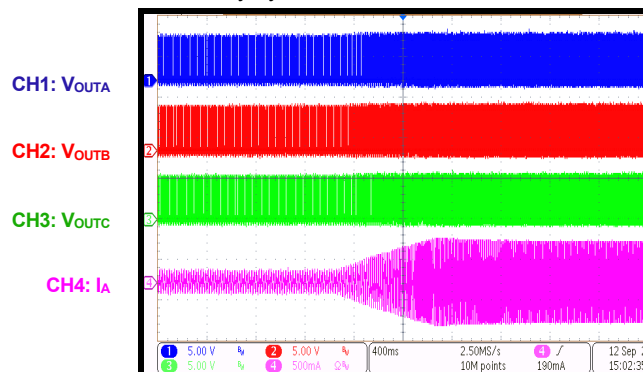
Load Transient Response

PWM duty cycle = 100% to 25%



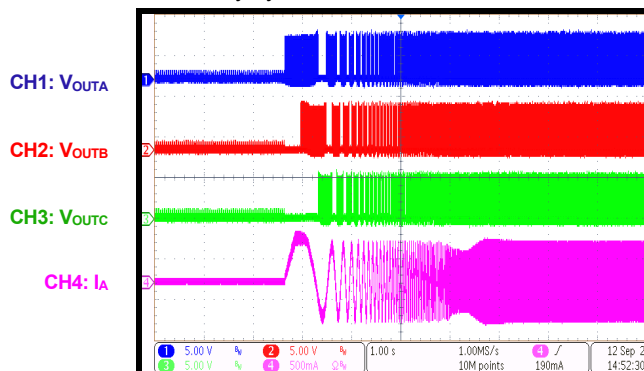
Load Transient Response

PWM duty cycle = 25% to 100%



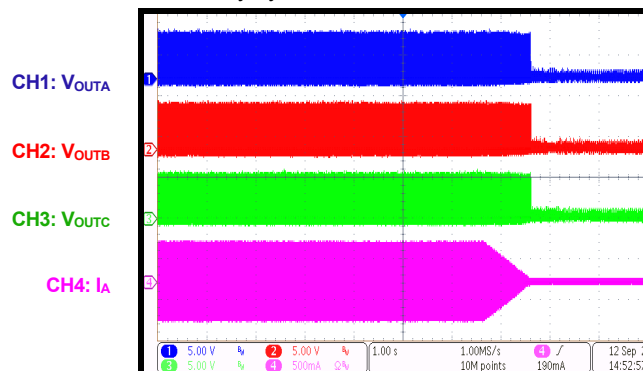
PWM On

PWM duty cycle = 1% to 100%



PWM Off

PWM duty cycle = 100% to 1%

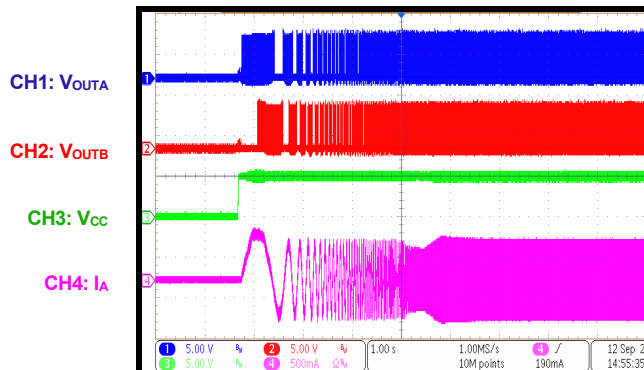


EVB TEST RESULTS *(continued)*

Performance curves and waveforms are tested on the evaluation board. SS pin floating, $V_{IN} = 5V$, $f_{PWM} = 20kHz$, 6S4P notebook fan, 5V/0.4A, 3800rpm, $T_A = 25^{\circ}C$, unless otherwise noted.

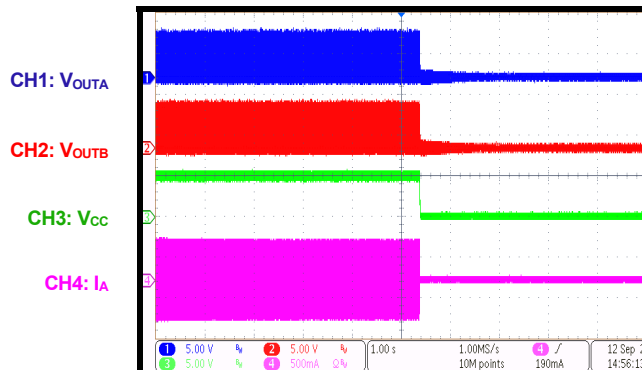
Start-Up through VCC

$V_{CC} = 0V$ to $5V$



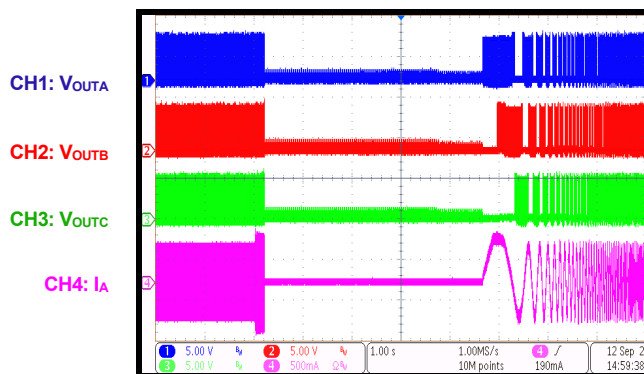
Shutdown through VCC

$V_{CC} = 5V$ to $0V$



Rotor Lock and Retry

Lock rotor, then release



PCB LAYOUT

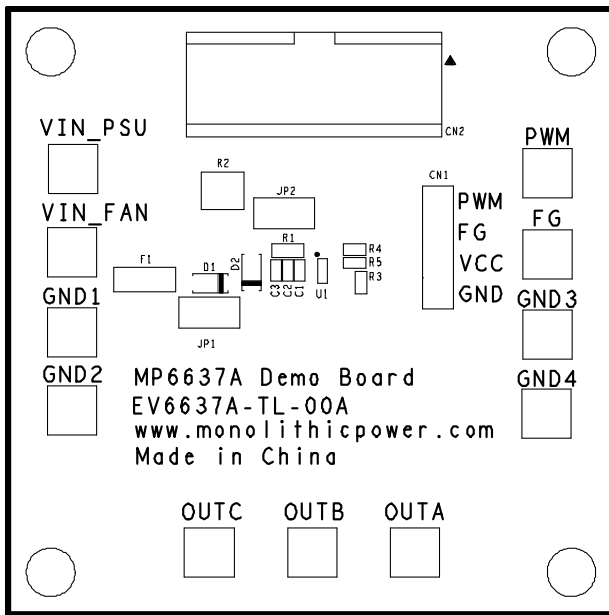


Figure 6: Top Silk

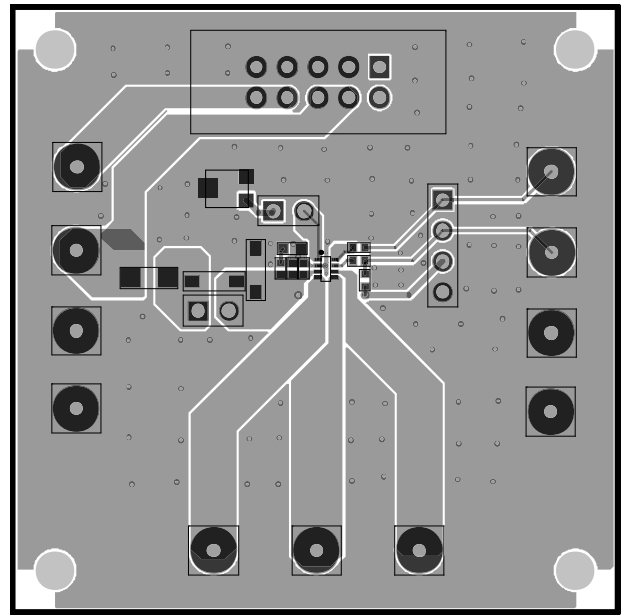


Figure 7: Top Layer

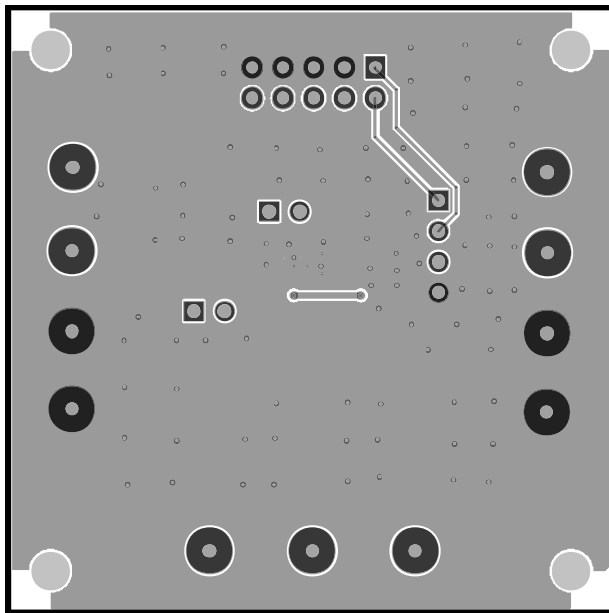


Figure 8: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/10/2024	Initial Release	-

Notice: The information in this document is subject to change without notice. Please contact MPS for current specifications. Users should warrant and guarantee that third-party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.