EV6634-LTE-00A

35V, 2A Peak, Three-Phase, Sensorless BLDC Motor Driver Evaluation Board

DESCRIPTION

The EV6634-LTE-00A is an evaluation board designed to demonstrate the capabilities of the MP6634, a three-phase, sensorless, brushless DC (BLDC) motor driver with integrated power MOSFETs. The MP6634 provides sensorless field-oriented control (FOC) to achieve improved efficiency and low vibration, with up to 2A of peak current. The input voltage (V_{IN}) range is 4.5V to 35V.

The MP6634 controls the motor speed through the pulse-width modulation (PWM) signal with a 50Hz to 20kHz PWM input frequency. The device supports DC input speed control. It also provides open/closed-loop speed control and a built-in configurable speed curve function.

The MP6634 features rotational speed detection. The rotational speed detector is an open-drain output via the FG/RD pin. The motor direction is controlled via the DIR pin.

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

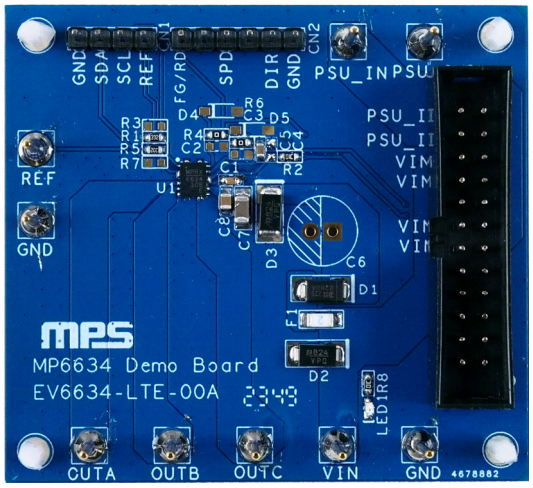
The MP6634 is available in a TQFN-12 (3mmx4mm) package with wettable flanks.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		4.5V to 35V
Peak phase current		Maximum 2A
Input PWM frequency (f_{PWM})	Configured to pulse-width modulation (PWM) mode	50Hz to 20kHz
PWM voltage range	Configured to DC mode	0V to 3.3V
Switching frequency (f_{SW})		24kHz

EVALUATION BOARD



LxWxH (6cmx5.5cmx2.2cm)

Board Number	MPS IC Number
EV6634-LTE-00A	MP6634GLTE-0000

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QUICK START GUIDE

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 (+): PSU_IN
   b. Negative (-): PSU_GND
3. Connect the MPS Fan Driver communication kit to the EV6634-LTE-00A via CN3.
4. Connect the motor phase terminals to:
   a. Motor phase A: OUTA
   b. Motor phase B: OUTB
   c. Motor phase C: OUTC
5. Connect the 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 MP6634. (1)

Figure 1 shows the equipment set-up with the communication kit.

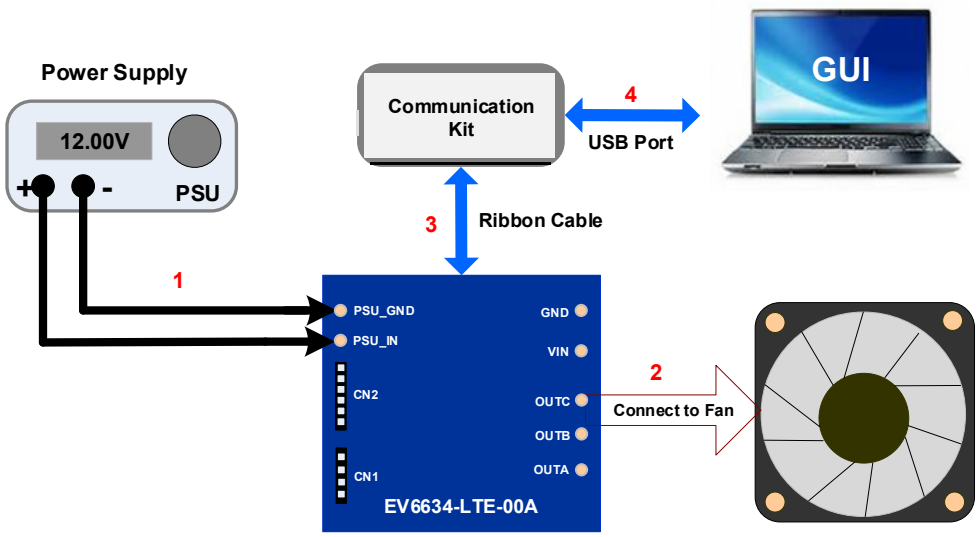

Figure 1: EVB Connection with the MPS Fan Driver Communication Kit

Note:

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

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Quick Start without the MPS Fan Driver Communication Kit

1. Ensure that the IC code is the configured code based on the fan to be tested.
2. Connect the power supply output terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Connect the motor phase terminals to:
   a. Motor phase A: OUTA
   b. Motor phase B: OUTB
   c. Motor phase C: OUTC
4. Turn the power supply on. The motor should begin working.
5. Set the function generator to pulse mode, such that the high level is 3.3V and the low level is 0V. Adjust the pulse duty cycle to control the motor's speed.

Figure 2 shows the equipment set-up without the communication kit.

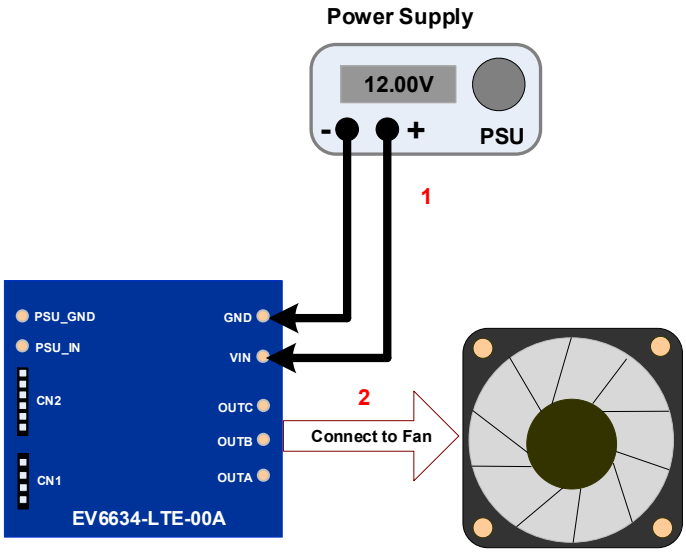

Figure 2: EVB Connection without Communication Kit

Measuring the Motor Parameters

The motor phase resistance and phase inductance are two important parameters for sensorless field-oriented control (FOC), and refer to the resistance and inductance from the phase output to the center tap, respectively.

To determine the phase resistance, measure the resistance between the two phase terminals via the multimeter or LCR meter, then divide the resistance by 2.

To determine the phase inductance, measure the inductance between the two phase terminals via the LCR meter, then divide the inductance by 2. The LCR frequency is 1kHz, and the LCR voltage is 1V.

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GUI Operation Guide

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

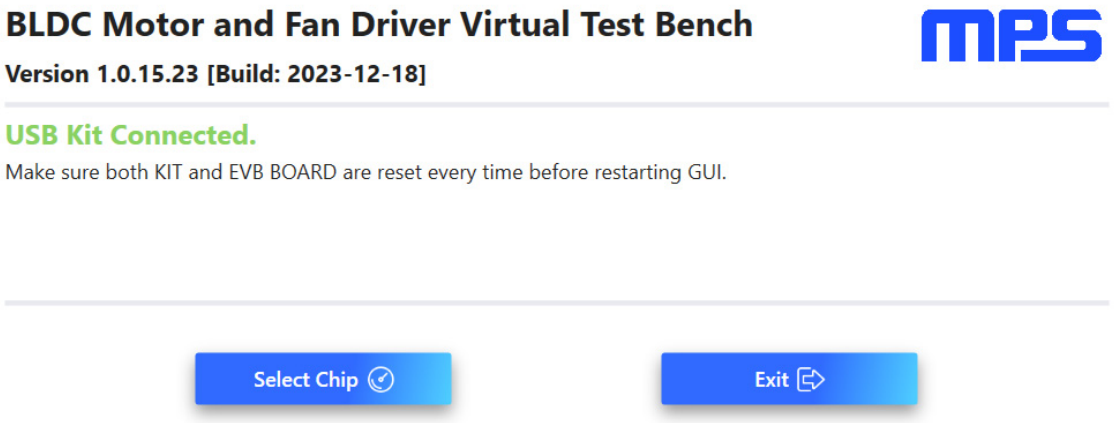

Figure 3: MPS BLDC Virtual Test Bench GUI

3. Click “Details” on the bottom-right corner to enter test mode (see Figure 4).

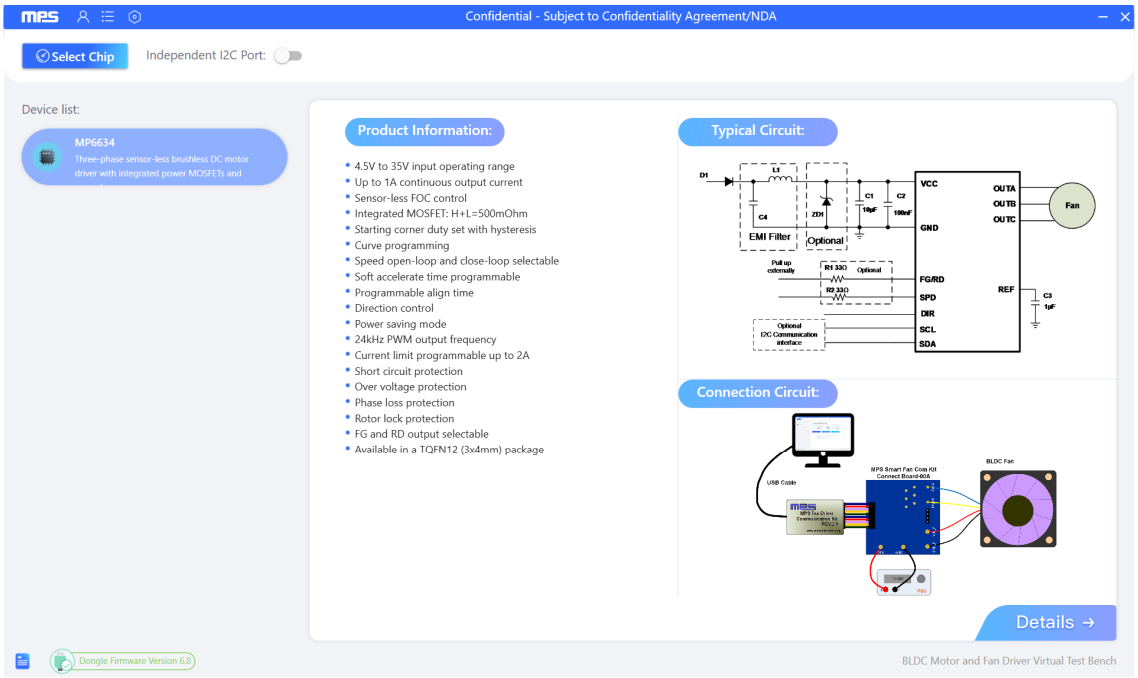

Figure 4: MPS BLDC Virtual Bench GUI Interface

Note:

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

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EVALUATION BOARD SCHEMATIC (1)

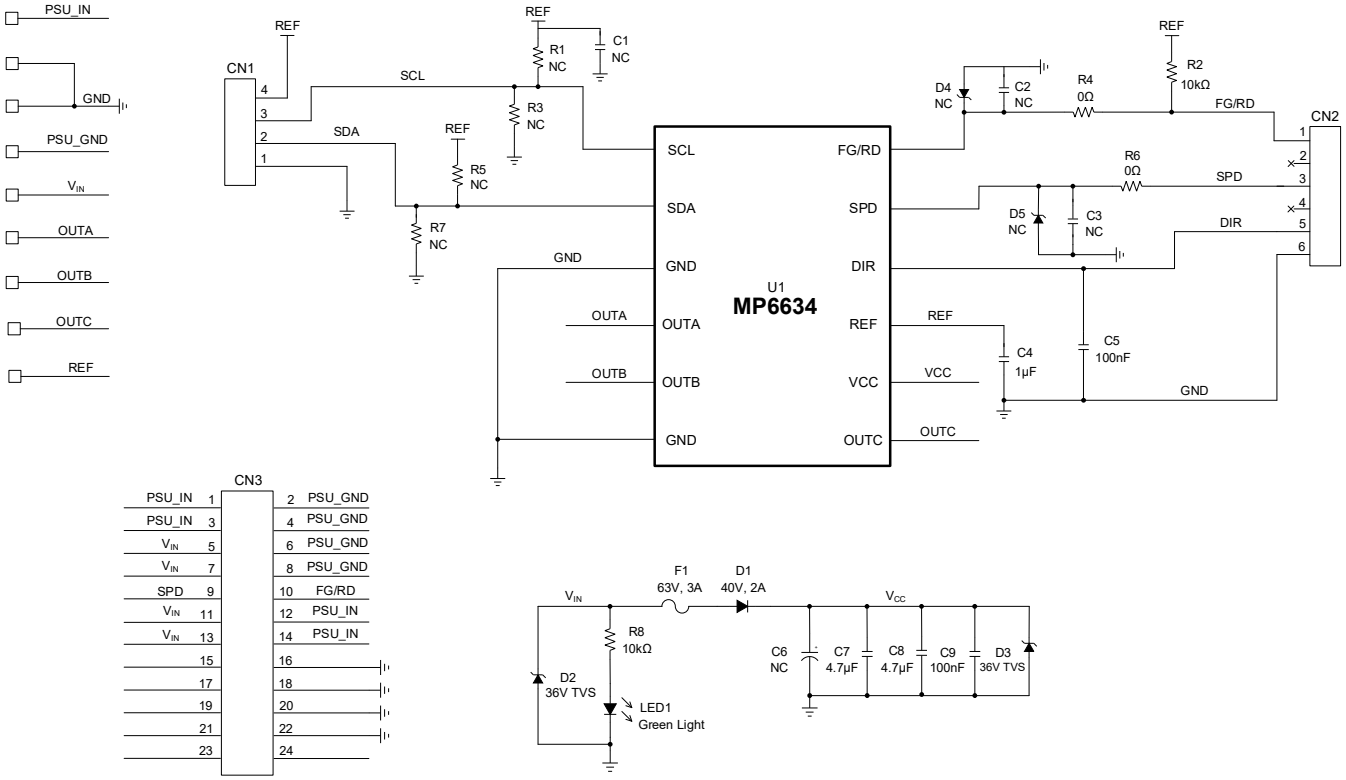

Figure 5: Evaluation Board Schematic

Note:

1) REF refers to the reference voltage (V_{REF}).

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EV6634-LTE-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
2	CN1, CN2	2.54mm	Connector, 1 x 40-pin	DIP	Any	
1	CN3	2.54mm	Socket with frame, 180°, 2 x 12-pin	DIP	Any	
3	C1, C2, C3	NC				
1	C4	1µF	Ceramic capacitor, 16V, X7R	0603	Wurth	885012206052
1	C5	100nF	Ceramic capacitor, 16V, X7R	0603	Murata	GRM188R71C104KA01D
1	C6	NC				
1	C7	4.7µF	Ceramic capacitor, 50V, X7R	1206	TDK	C3216X7R1H475K
1	C8	4.7µF	Ceramic capacitor, 50V, X5R	0805	Murata	GRM21BR61H475KE51L
1	C9	100nF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H104KA93D
1	D1	2A	Schottky diode, 60V	SMA	Diodes, Inc.	B260A-13-F
2	D2, D3	36V	TVS diode	DO-214AC	Bourns	SMAJ36CA-Q
2	D4, D5	NC				
1	F1	2A	Surface-mount fuse, 63V	1206	Cooper Bussmann	3216FF2-R
9	VIN, REF, PSU_IN, OUTA, OUTB, OUTC, GND1, GND2, PSU_GND	1mm	Connector	DIP	Any	
1	LED1	Green	LED	0603	Baihong	BL-HGE36A-AV-TRB
4	R1, R3, R5, R7	NC	Film resistor, 1%	0603		
2	R2, R8	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
2	R4, R6	0Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
1	U1	MP6634	35V, 2A peak, three-phase, sensorless, brushless DC (BLDC) motor driver	TQFN-12 (3mmx 4mm)	MPS	MP6634GLTE-0000

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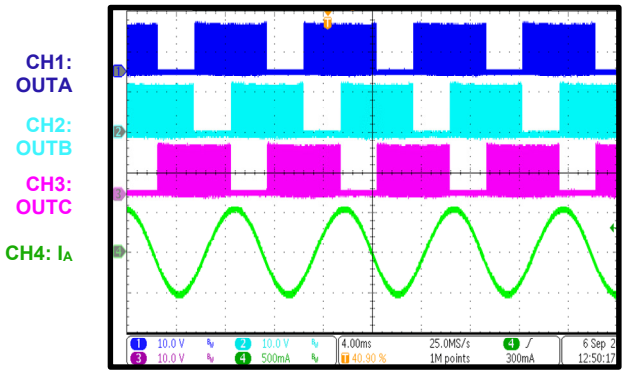
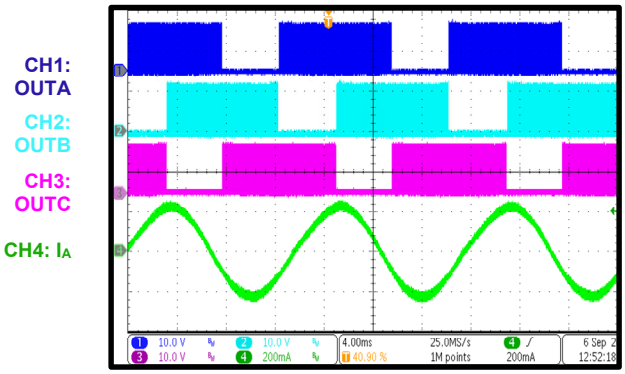
EVB TEST RESULTS

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, f_{PWM} = 100Hz, load = seat fan, unless otherwise noted.

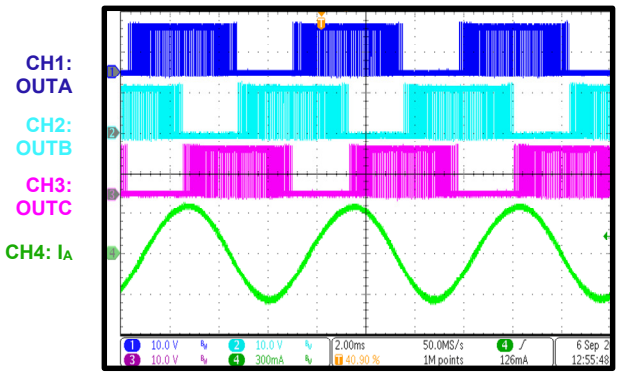
Steady State
PWM duty = 100%, DIR = low



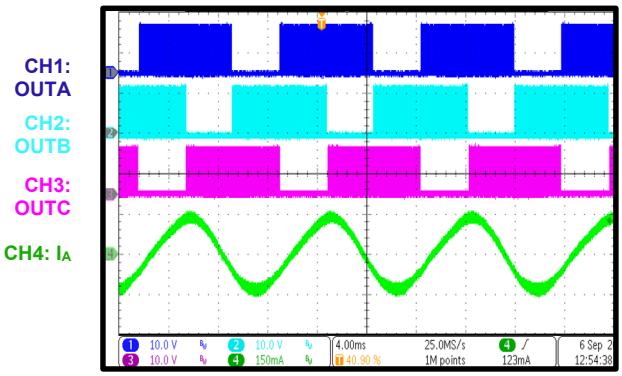
Steady State
PWM duty = 50%, DIR = low



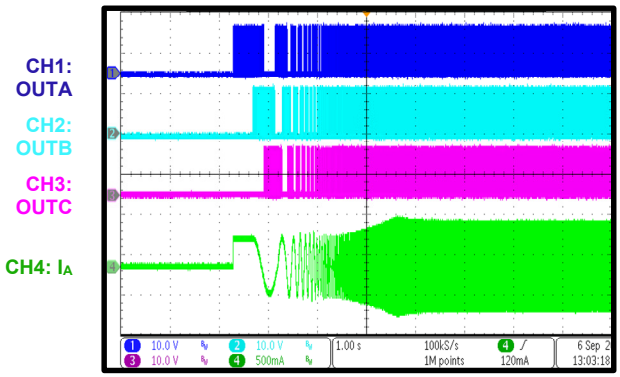
Steady State
PWM duty = 100%, DIR = high



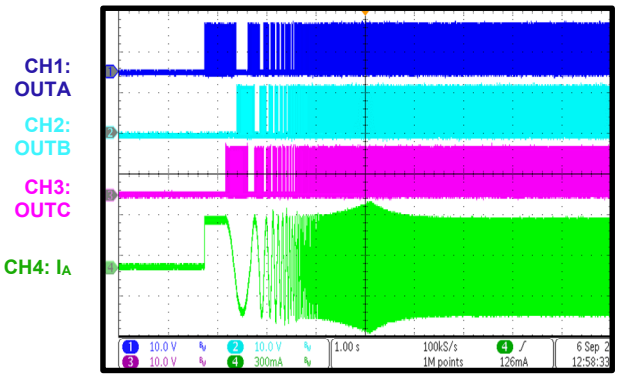
Steady State
PWM duty = 50%, DIR = high



PWM On
PWM duty = 0% to 100%, DIR = low



PWM On
PWM duty = 0% to 100%, DIR = high



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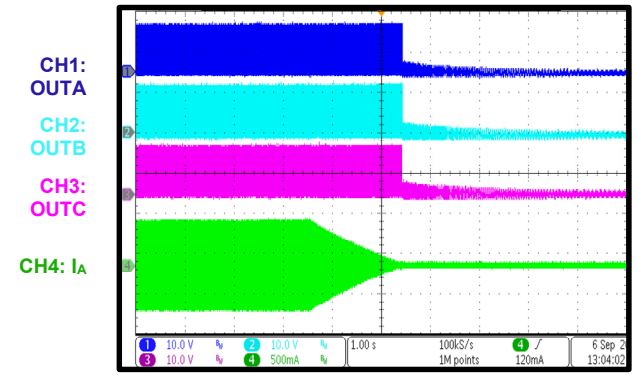
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, f_{PWM} = 100Hz, load = seat fan, unless otherwise noted.

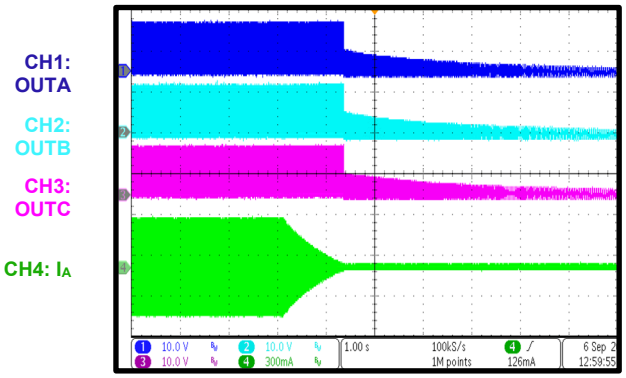
PWM Off

PWM duty = 100% to 0%, DIR = low



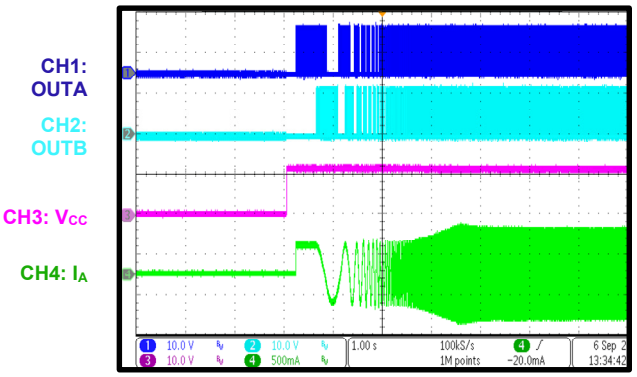
PWM Off

PWM duty = 100% to 0%, DIR = high



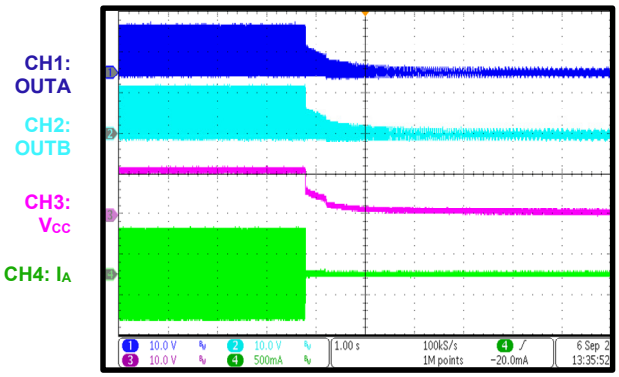
Start-Up through VCC

V_{CC} = 0V to 12V, PWM duty = 100%, DIR = low



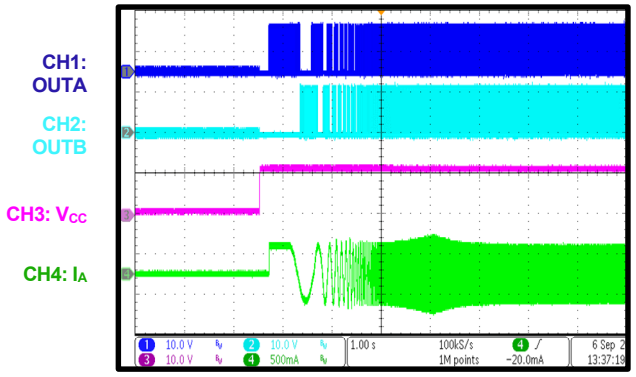
Shutdown through VCC

V_{CC} = 12V to 0V, PWM duty = 100%, DIR = low



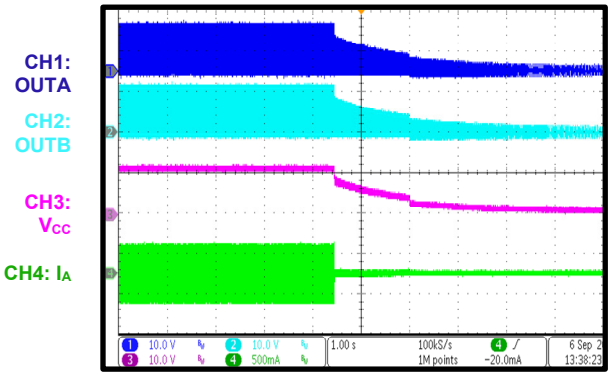
Start-Up through VCC

V_{CC} = 0V to 12V, PWM duty = 100%, DIR = high



Shutdown through VCC

V_{CC} = 12V to 0V, PWM duty = 100%, DIR = high



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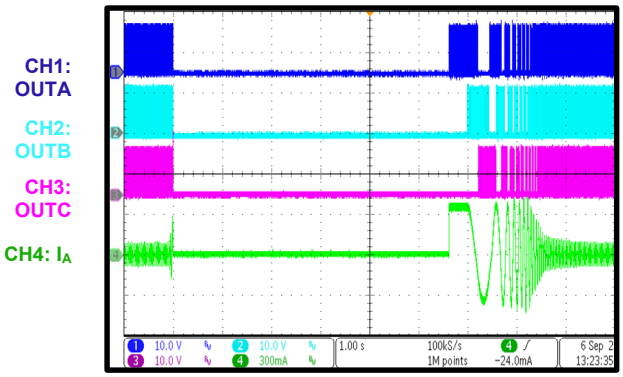
EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board. V_{IN} = 12V, f_{PWM} = 100Hz, load = seat fan, unless otherwise noted.

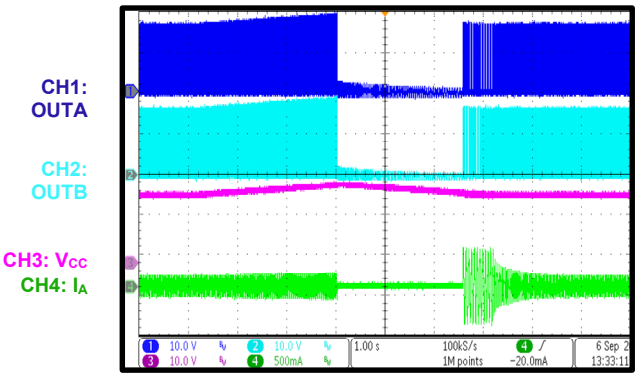
Rotor Lock and Retry

PWM duty = 20%, enable RD_MODE1 and RD_MODE2



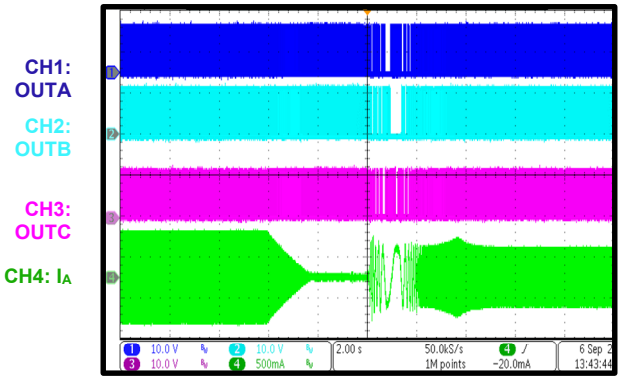
Over-Voltage Protection

PWM duty = 20%, UIN_SEL = 0



Direction Change

PWM duty = 100%, enable soft shutdown, DIR = low to high



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PCB LAYOUT

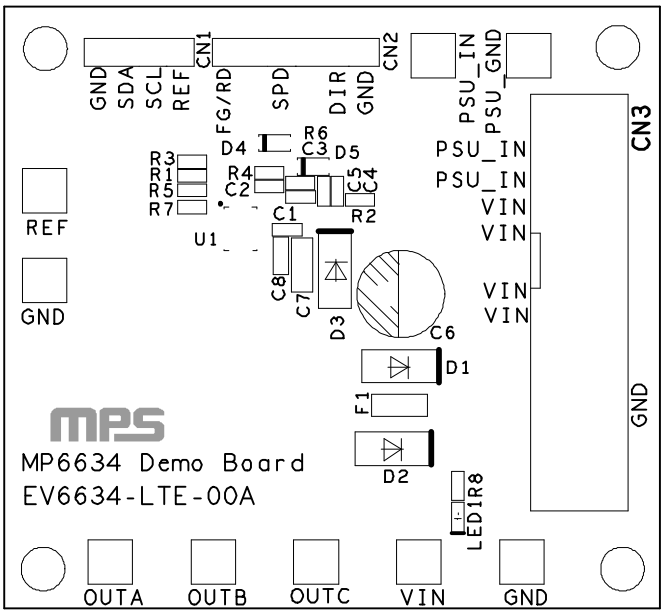

Figure 6: Top Silk

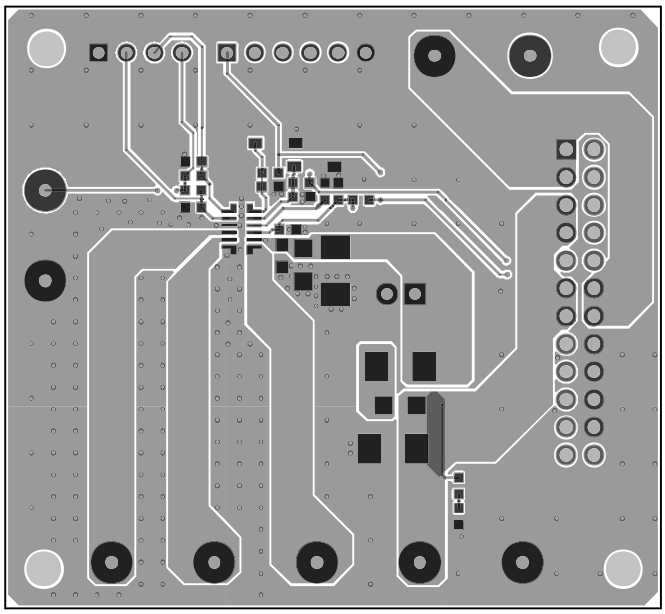

Figure 7: Top Layer

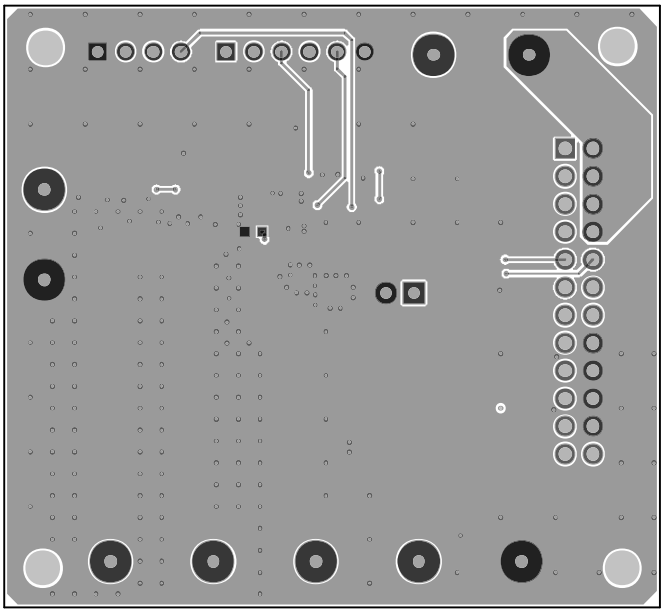

Figure 8: Bottom Layer

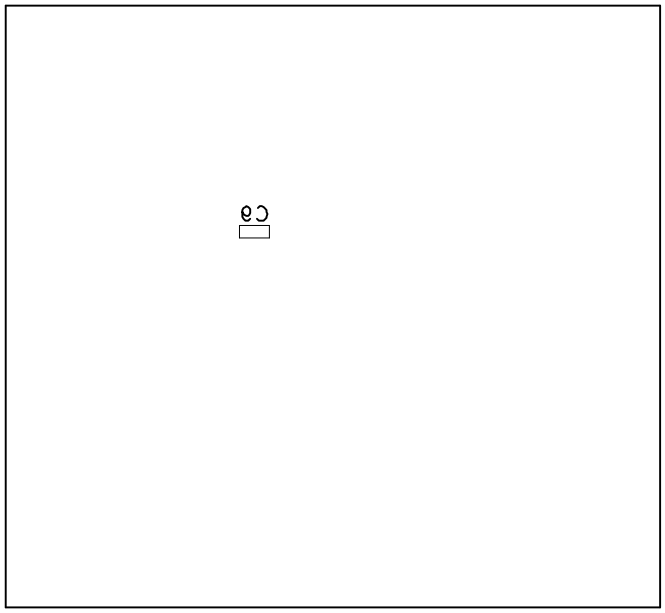

Figure 9: Bottom Silk

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REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	7/8/2024	Initial Release	-

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