User's Guide

Using the TPS8802EVM

ABSTRACT

This quick-start guide describes the operation and use of the TPS8802 evaluation module (EVM) and the accompaning EVM graphical user interface control software.

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1 Introduction

The TPS8802EVM is used to evaluate the TPS8802 smoke and CO alarm analog front end (AFE) and power management IC. The EVM allows for easy connection from the TPS8802 to a user-supplied photoelectric chamber and carbon monoxide sensor. The TPS8802 GUI interfaces with the EVM to quickly evaluate the photo amplifier, LED driver, and CO amplifier performance, system power consumption, and other blocks with the register map. For a more thorough evaluation, an external microcontroller can be connected to the TPS8802EVM to create a smoke detection system.

1.1 Applications

- 10-year battery smoke and CO alarms
- AC powered smoke and CO alarms

1.2 Features

- Dual LED drivers for blue and IR LEDs
- Wide bandwidth, low offset photodiode amplifier
- Ultra-low power CO transimpedance amplifier
- LDOs for internal analog blocks and external microcontroller
- Single buffered analog output AMUX for CO and photo signals
- Serial interface for configuring amplifiers, drivers, regulators
- Default-enabled boost converter for 2-V battery operation
- Horn driver with self-resonant and PWM modes
- Interconnect driver for multi-alarm connection
- Power-saving sleep mode with wake-up interrupt
- Battery test load
- Under-voltage, over-temperature fault monitors
- Wide input voltage range for flexible power supply configuration

1.3 Recommended Equipment

- 2-V to 15.5-V power supply capable of 100 mA
- USB2ANY™ interface adaptor
- TPS880x GUI software
  - Installation files are available in the TPS8802EVM product folder
- Multimeter for measuring supply current, regulator voltages and CO amplifier output
- Oscilloscope for measuring photodiode signal pulse shape

2 Setup

Specific connections on the TPS8802EVM board require configuration before starting the evaluation.

2.1 Sensor Connections

TI recommends connecting a photoelectric smoke chamber and CO sensor to the TPS8802EVM for the evaluation. The TPS8802EVM has a built-in photodiode (D7), blue LED (D8), and IR LED (D6) for functional testing. These components can be de-soldered in order to connect a photoelectric chamber photodiode, IR LED, and/or blue LED its place. Ensure the photodiode wires are kept short to preserve signal integrity.

The CO sensor is connected to J17 screw terminals with the sensor counter terminal tied to AGND.

2.2 Jumper and Switch Configurations

The S1 switch position determines the VMCU and VBST voltage at power-up. Ensure that only one S1 sub-switch is in the ON position. Table 2-1 displays the VMCU and VBST voltage corresponding with each S1 switch position. For proper operation with the USB2ANY adapter, set VMCU to 3.3 V with sub-switch 4.

Table 2-1. VMCU and VBST Power-up Voltage

S1 Switch Position	VMCU (V)	VBST (V)
1	1.5	3
2	1.8	3
3	2.5	4
4	3.3	5

The J2 jumper connects VBST to VCC. With the J2 jumper connected and the power supply connected to VBAT, the boost converter supplies power via VCC. This configuration allows the EVM to operate at a voltage level from 2 V to 11.5 V[1].

The J6 jumper selects the I^2C device address. Connect J6 to the AGND position to set the address to 0x3F. Connect J6 to the VMCU position to set the address to 0x2A. The GUI is compatible with both options and defaults to 0x2A.

[1] The J14 shunt connecting VBAT to DINB limits the VBAT voltage to 11.5 V. If the shunt is moved to J1 connecting LEDLDO to DINB, up to 15.5 V can be supplied on VBAT.

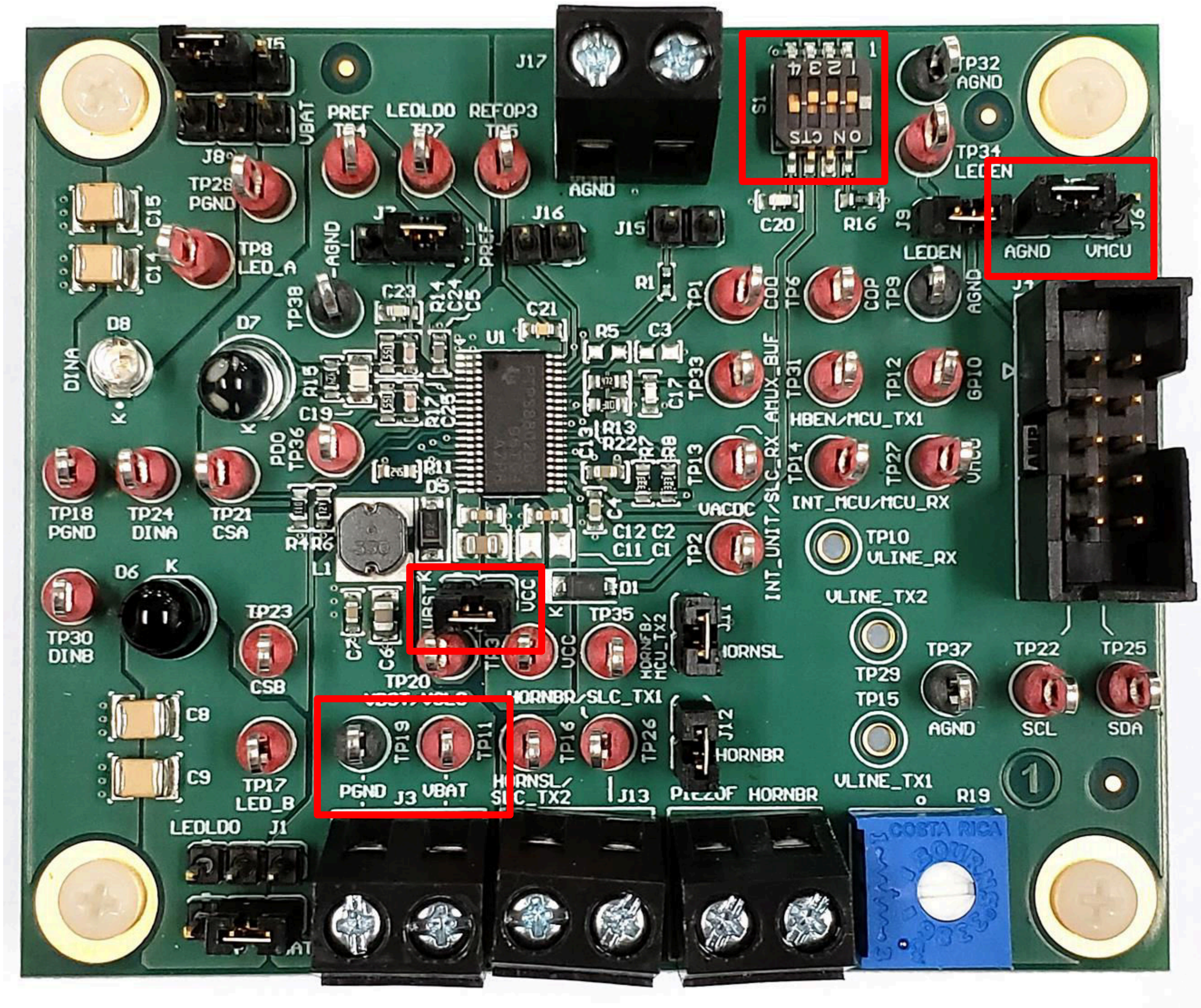


Figure 2-1. Switch, Jumper, and Power Connections

2.3 Power Connection

Connect the power supply to VBAT and PGND. Set the power supply to 2 V, 100 mA[2]. Enable the power supply and measure the voltage on VMCU (TP27) to ensure it is operating at the voltage option selected by S1:

- 1.5 V
- 1.8 V
- 2.5 V
- 3.3 V

Measure the voltage on VBST to ensure it is either 3 V, 4 V, or 5 V. See Table 2-1 for more information on the initial VMCU and VBST voltage.

[2] Peak current drawn from the supply is 600 mA for boost converter operation. If device does not power up with 100 mA current limit, increase the power supply current limit to 600 mA.

2.4 USB2ANY Connection

Use a USB cable to connect the USB2ANY adapter to a computer with the TPS880x GUI installed. Open the TPS880x GUI and verify the USB2ANY adapter is recognized (see Figure 2-2). With the EVM powered, connect the USB2ANY adapter to the EVM using the USB2ANY adapter 10-pin ribbon cable. Click **EXPLORE TPS8802EVM** then **QUICK START** and select the device address corresponding to the J6 jumper (see Section 2.2). Send the test command to verify the EVM, USB2ANY adapter, and GUI software are all connected.

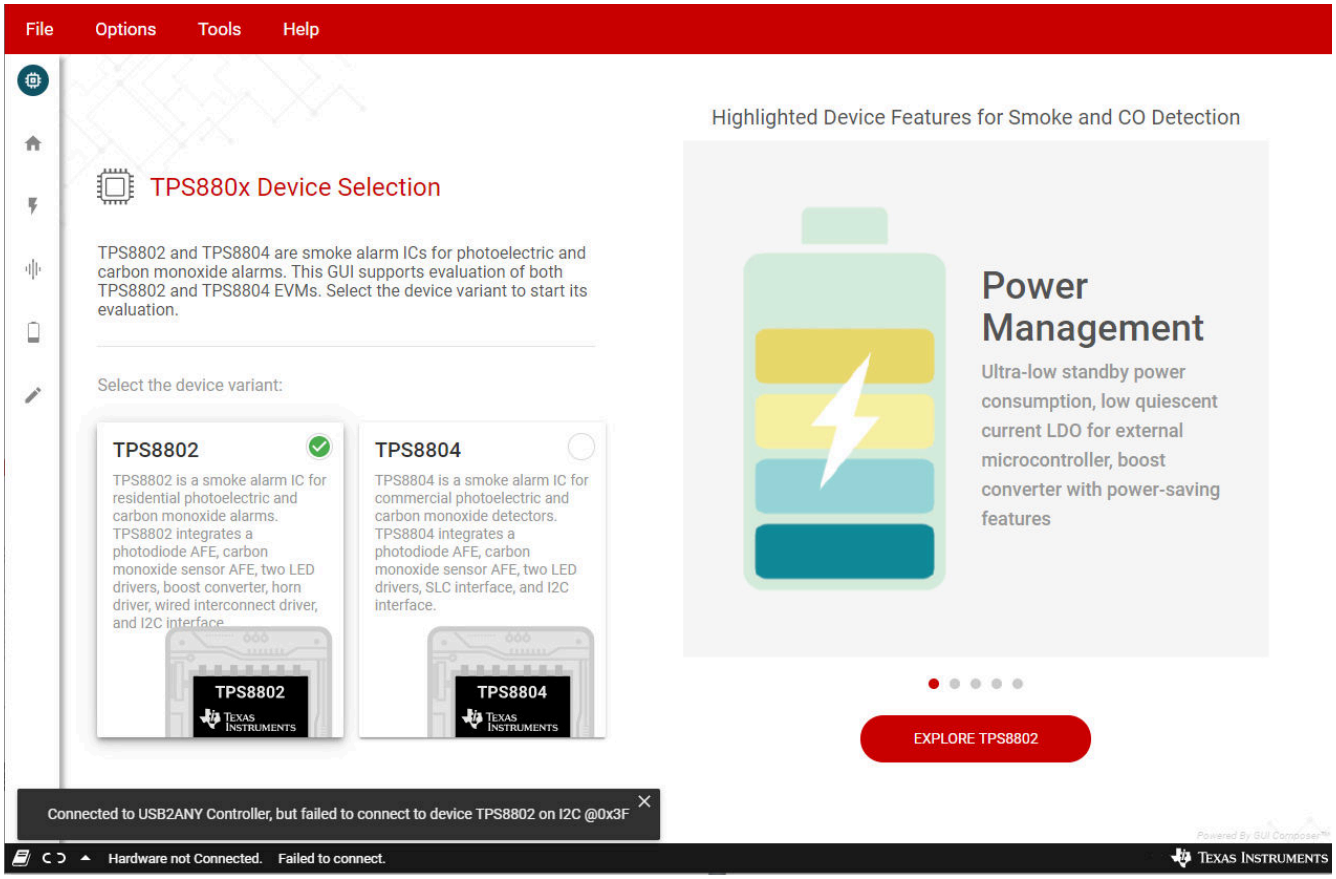


Figure 2-2. TPS880x GUI Connected to USB2ANY Adapter

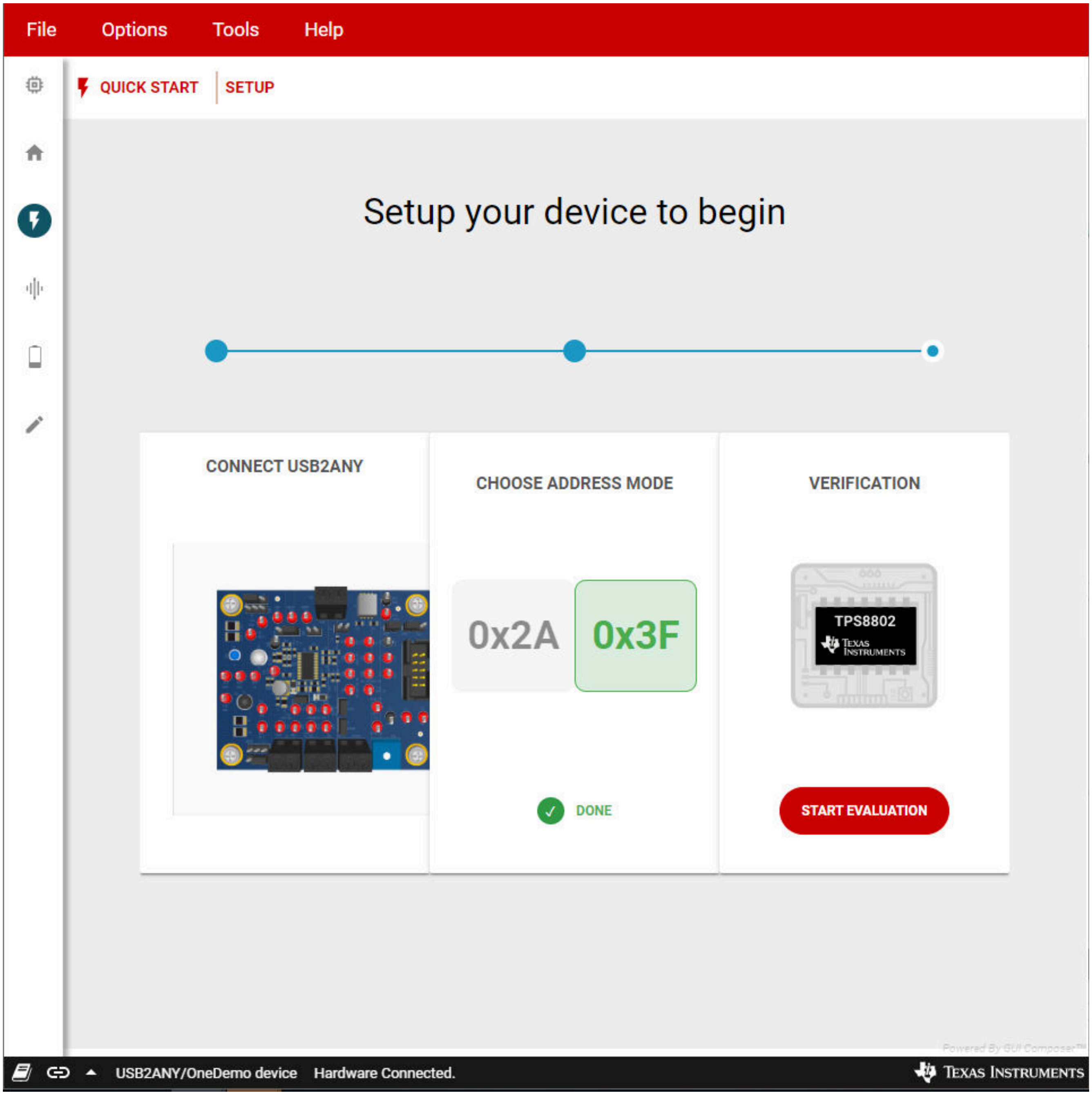


Figure 2-3. Test Command Successful

3 Analog Evaluation

Click **START EVALUATION** and select the feature to evaluate. The **Analog Front End** section guides the CO AFE and photo AFE evaluation, and the **Power Saving Mode** section guides the standby power consumption and sleep mode evaluation. Enter the register map to evaluate the other blocks in the TPS8802 device.

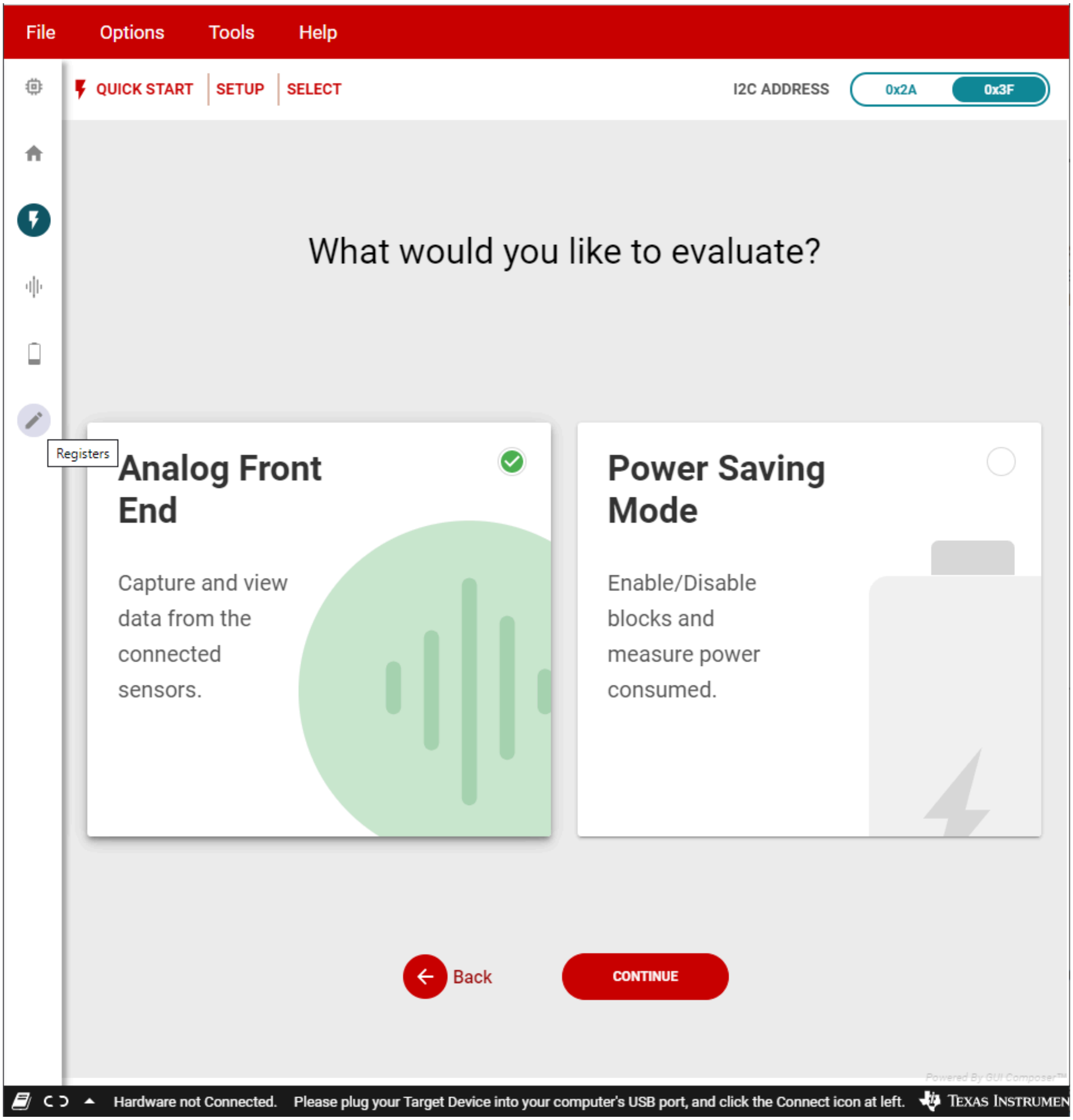


Figure 3-1. Evaluation Selection Menu

3.1 CO AFE Evaluation

If a CO sensor is available, connect it to the J17 terminal block. Select the feedback resistance and reference voltage in the GUI software. The TPS8802EVM default configuration uses the internal resistors and references. To use an external feedback resistor, solder a resistor to R5. To use an external input resistor, replace the R1 0-Ω resistor with the required input resistance. The output resistor filters the CO amplifier output when a capacitor is installed on C3.

Set the **AMUX SELECTION** to **CO AMPLIFIER**. Enable the CO amplifier and measure the voltage on AMUX_BUF.

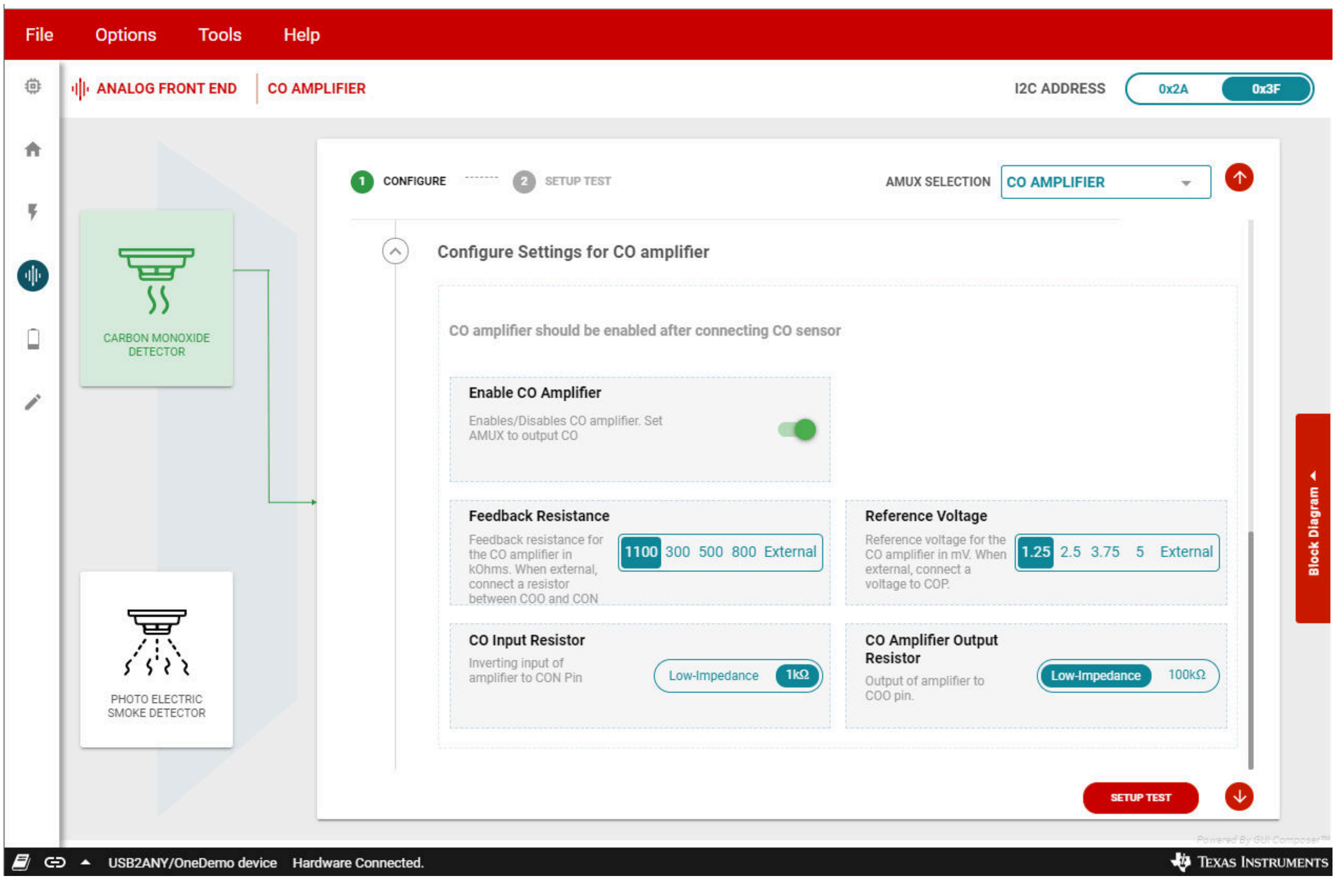


Figure 3-2. CO Amplifier Settings

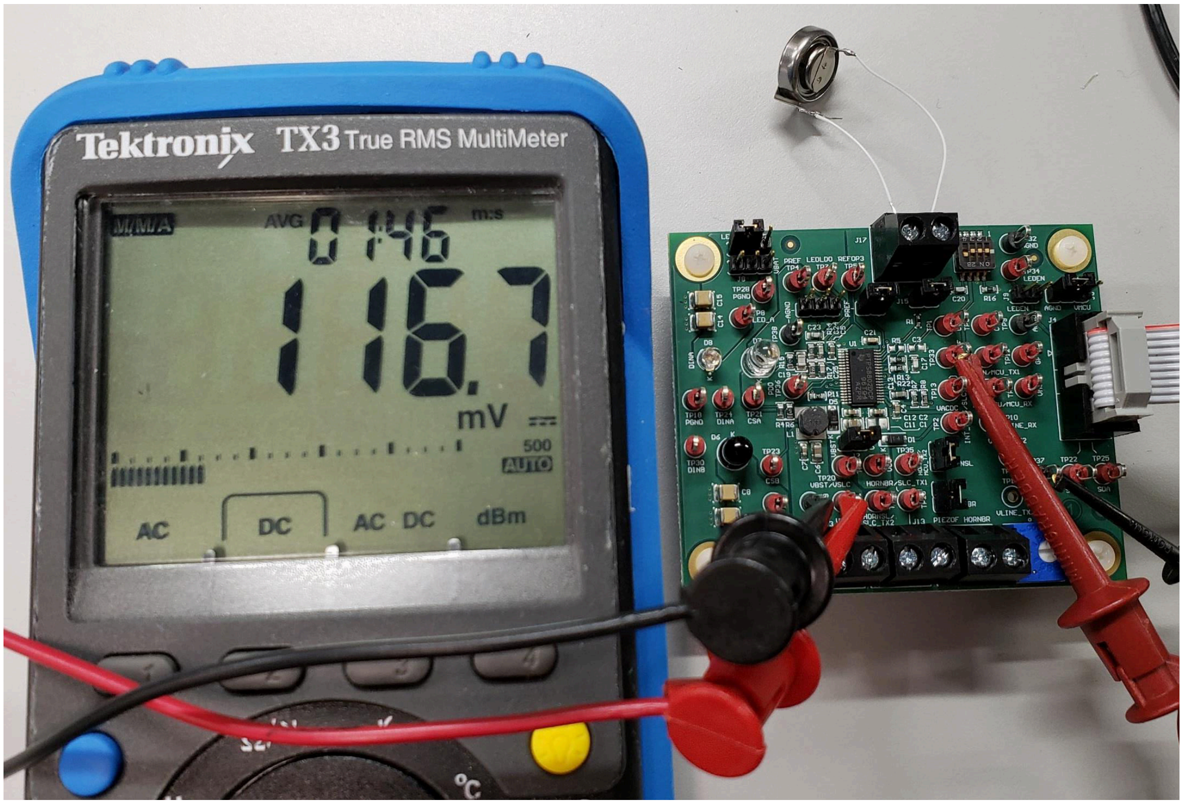


Figure 3-3. Clean Air CO Amplifier Output

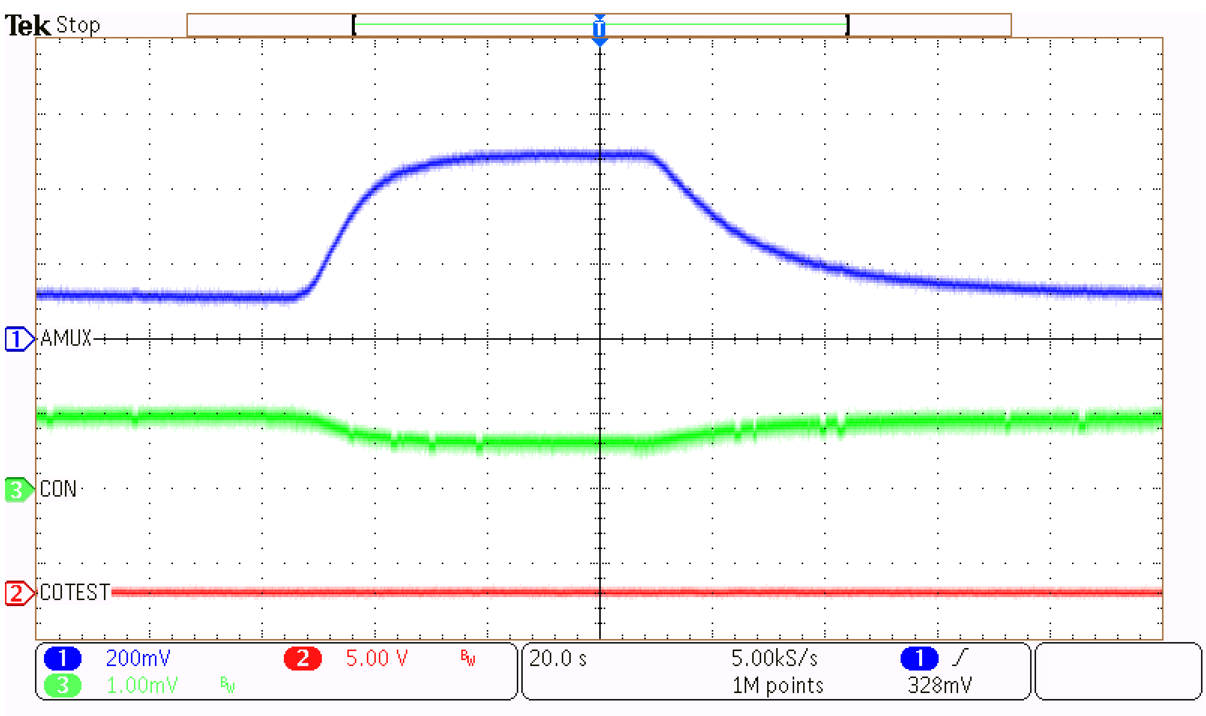
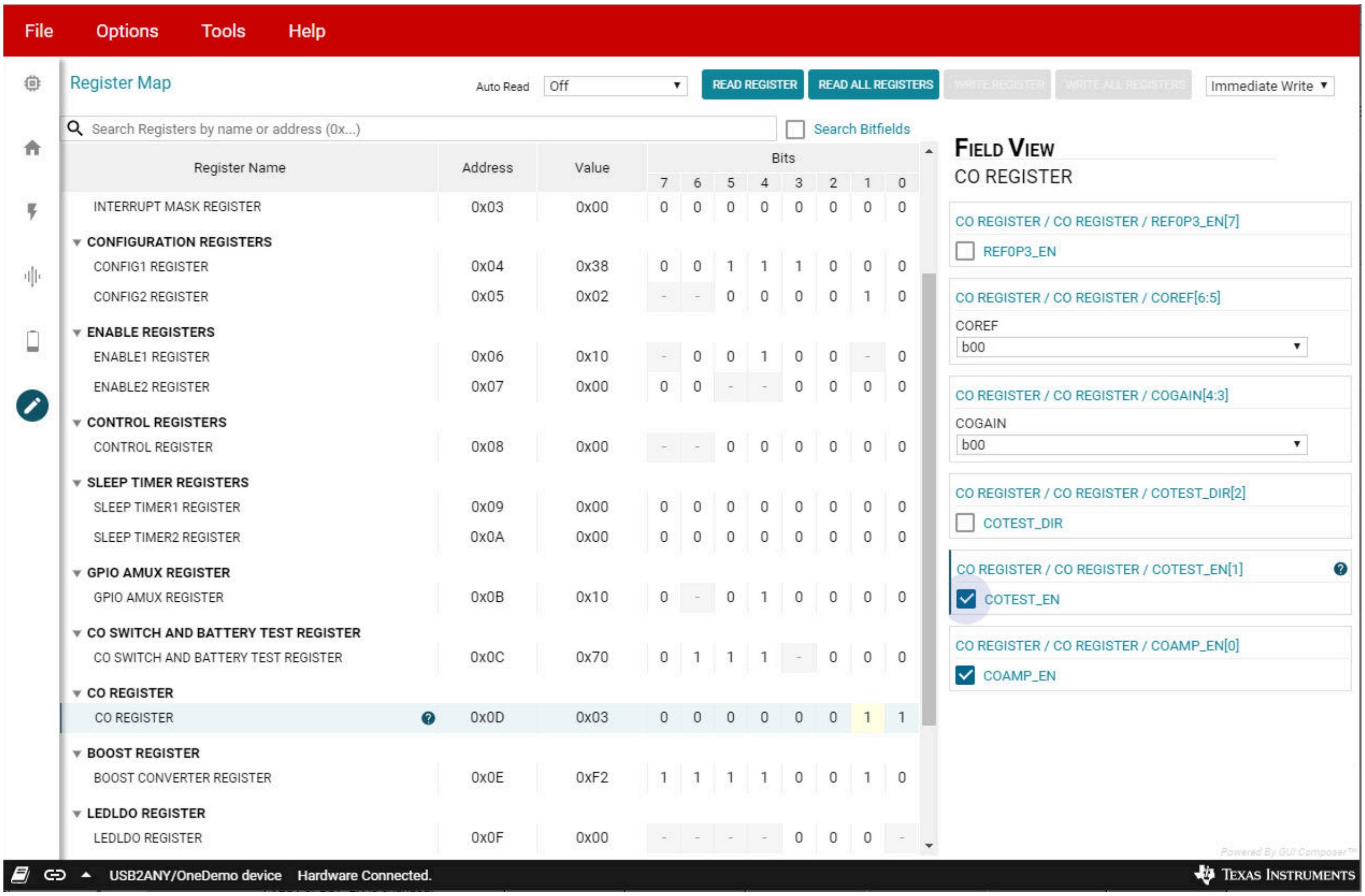


Figure 3-4. CO Amplifier Output with Sensor and Calibration Gas

3.1.1 CO Connectivity Test

A simple test confirms that the CO sensor is connected to the EVM. Remove the shunt connected to J7 and connect a shunt to J15 and J16. Write COTEST_EN = 1 and measure the pulse shape on AMUX_BUF using an oscilloscope. When COTEST_EN = 1, the PREF pin is pulled low and injects charge into the CO sensor and amplifier. The AMUX pulse shape is different if the CO sensor is disconnected. Write COTEST_EN = 0, remove the J15 and J16 shunts, and connect the J7 shunt when finished.



Register Name	Address	Value	7	6	5	4	3	2	1	0
INTERRUPT MASK REGISTER	0x03	0x00	0	0	0	0	0	0	0	0
CONFIGURATION REGISTERS										
CONFIG1 REGISTER	0x04	0x38	0	0	1	1	1	0	0	0
CONFIG2 REGISTER	0x05	0x02	-	-	0	0	0	0	1	0
ENABLE REGISTERS										
ENABLE1 REGISTER	0x06	0x10	-	0	0	1	0	0	-	0
ENABLE2 REGISTER	0x07	0x00	0	0	-	-	0	0	0	0
CONTROL REGISTERS										
CONTROL REGISTER	0x08	0x00	-	-	0	0	0	0	0	0
SLEEP TIMER REGISTERS										
SLEEP TIMER1 REGISTER	0x09	0x00	0	0	0	0	0	0	0	0
SLEEP TIMER2 REGISTER	0x0A	0x00	0	0	0	0	0	0	0	0
GPIO AMUX REGISTER										
GPIO AMUX REGISTER	0x0B	0x10	0	-	0	1	0	0	0	0
CO SWITCH AND BATTERY TEST REGISTER										
CO SWITCH AND BATTERY TEST REGISTER	0x0C	0x70	0	1	1	1	-	0	0	0
CO REGISTER										
CO REGISTER	0x0D	0x03	0	0	0	0	0	0	1	1
BOOST REGISTER										
BOOST CONVERTER REGISTER	0x0E	0xF2	1	1	1	1	0	0	1	0
LEDLDO REGISTER										
LEDLDO REGISTER	0x0F	0x00	-	-	-	-	0	0	0	-

Figure 3-5. COTEST_EN Register Bit

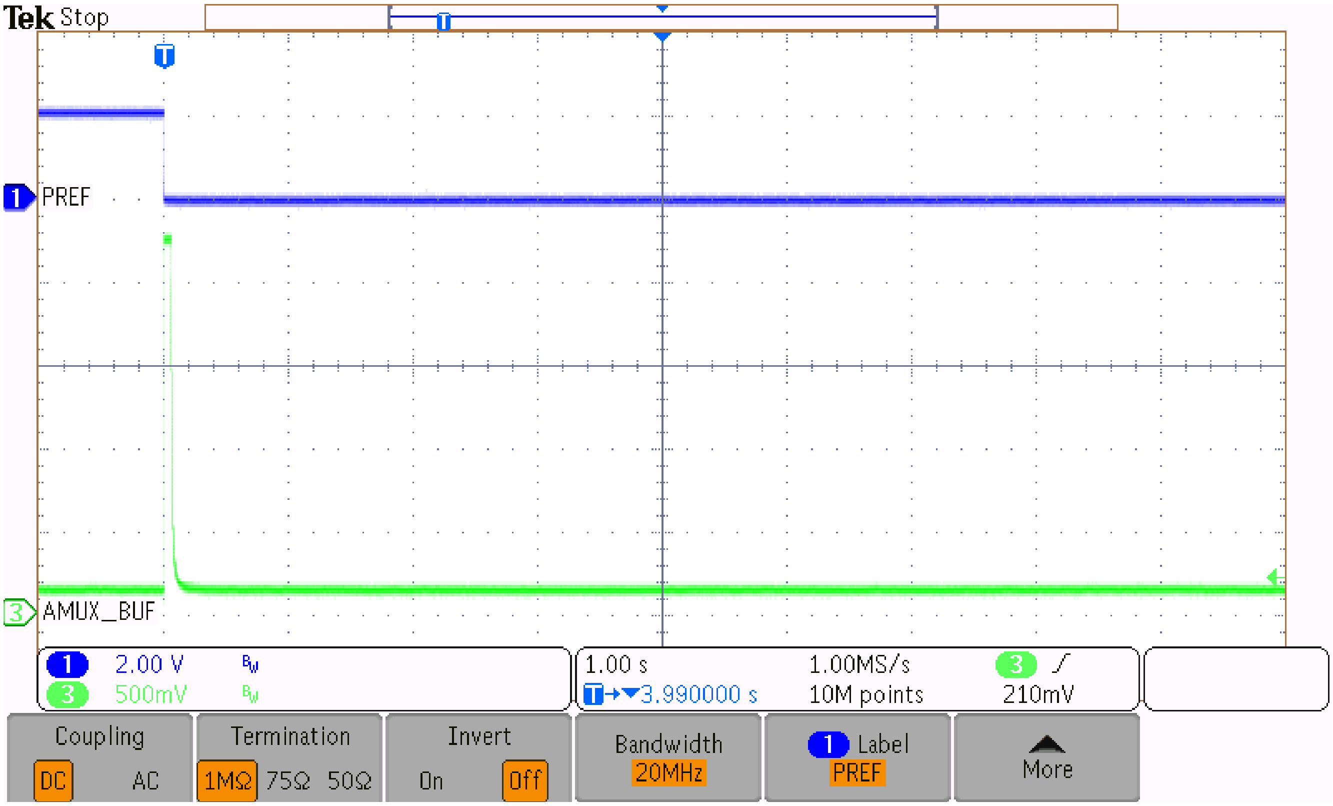


Figure 3-6. CO Connectivity Test without Sensor

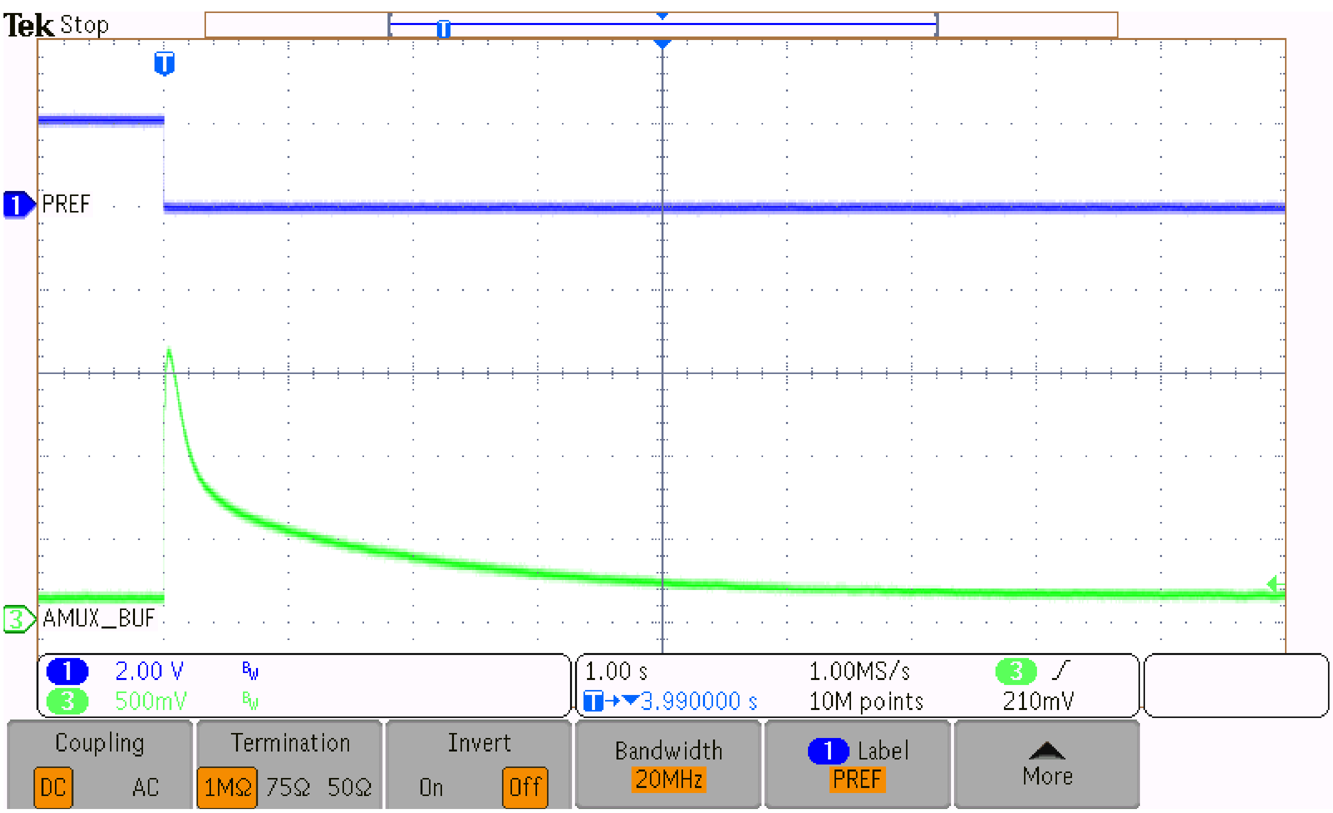


Figure 3-7. CO Connectivity Test with Sensor

3.2 Photo AFE Evaluation

Connect the photoelectric chamber to the EVM. If a photoelectric chamber is not available, place a box over the EVM to block ambient light and reflect the EVM LED light into the photodiode when testing the photo AFE.

Enable the photo amplifier, photo gain amplifier, and set the **AMUX SELECTION** to **PHOTO GAIN AMPLIFIER**. Select the photo reference on the EVM with jumper J7 and enable the photo reference voltage if the reference is set to PREF. Set the gain factor to the required value. If no extra gain is required, set the **AMUX SELECTION** to **PHOTO AMPLIFIER**.

It is recommended to install a 470 kΩ resistor connecting PREF to VINT if the photo gain is set to 11x, 20x, or 35x. The 470 kΩ resistor changes the PREF voltage to 70mV and prevents the gain stage output from dropping below 50 mV in worst-case conditions.

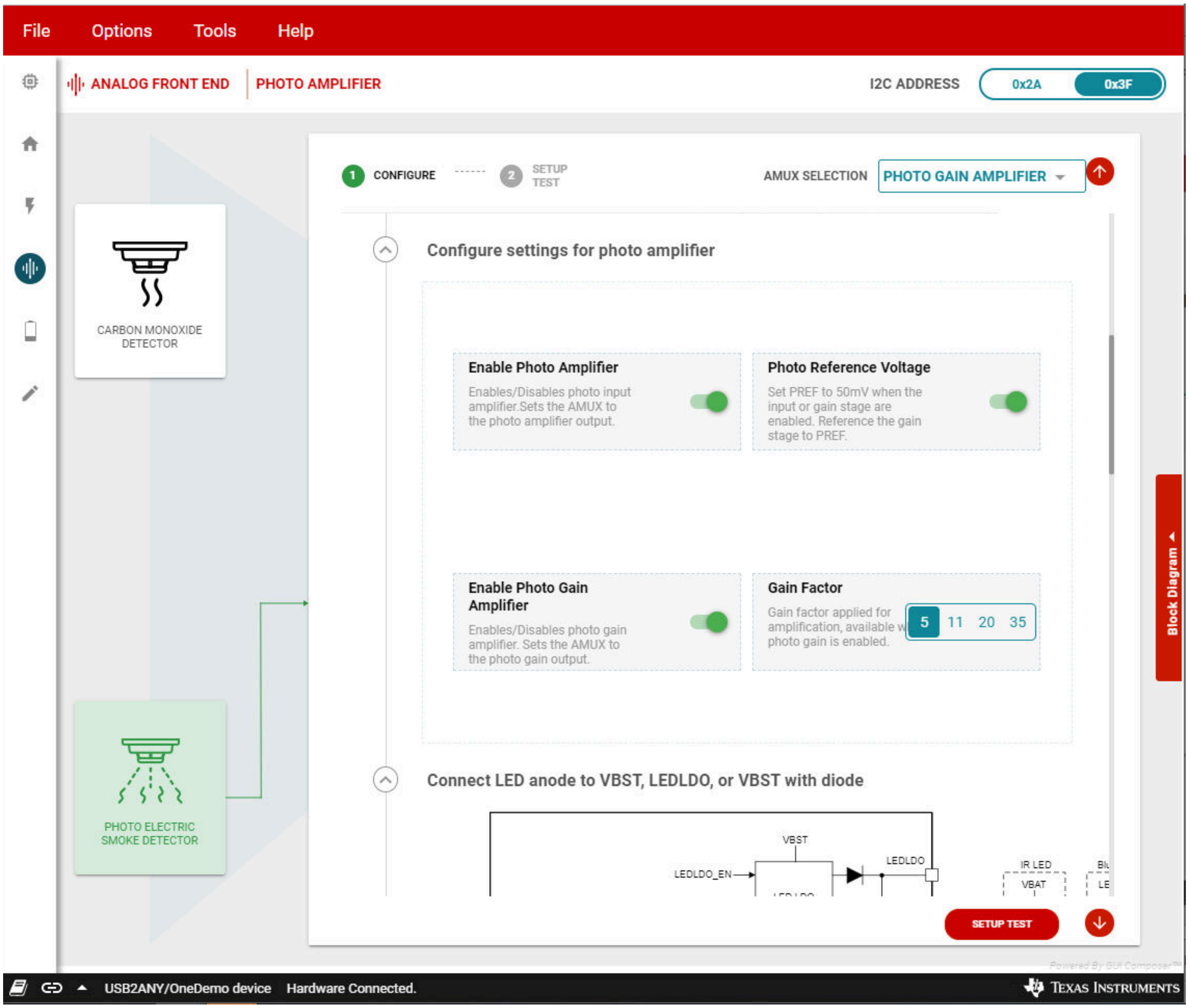


Figure 3-8. Photo Amplifier Settings

Configure the power to the LEDs. By default, LED A is connected to LEDLDO and LED B is connected to VBAT. Use the J1, J5, J8, and J14 jumpers to select which supply powers each LED. Enable the LEDLDO if it powers either LED.

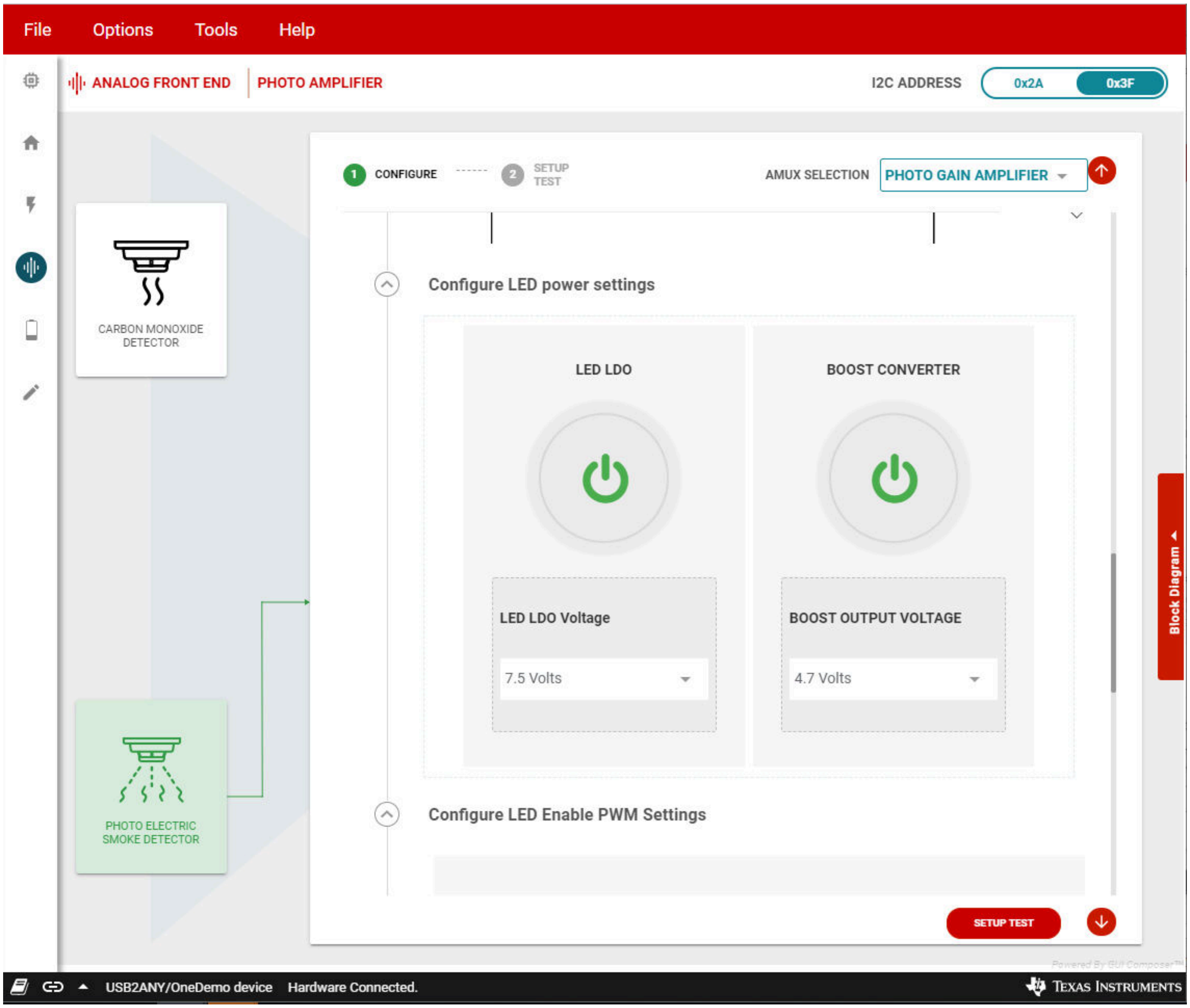


Figure 3-9. LED Power Supply Settings

Configure the PWM pulse settings for the LED driver. The default setting 201 ms pulse rate and 1 ms pulse width sufficiently tests the LED driver. This setting controls the PWM signal from the USB2ANY adapter to the EVM.

Configure the LED current for each driver. The default EVM CSA resistance is 10 Ω and the default EVM CSB resistance is 1.3 Ω. These resistors can be switched on the EVM to change the LED current and temperature compensation. Set the DAC voltage to fine tune the LED current. Set the temperature coefficient to the required setting. Click **SETUP TEST** after configuring the photo amplifier, LED power supply, and LED driver.

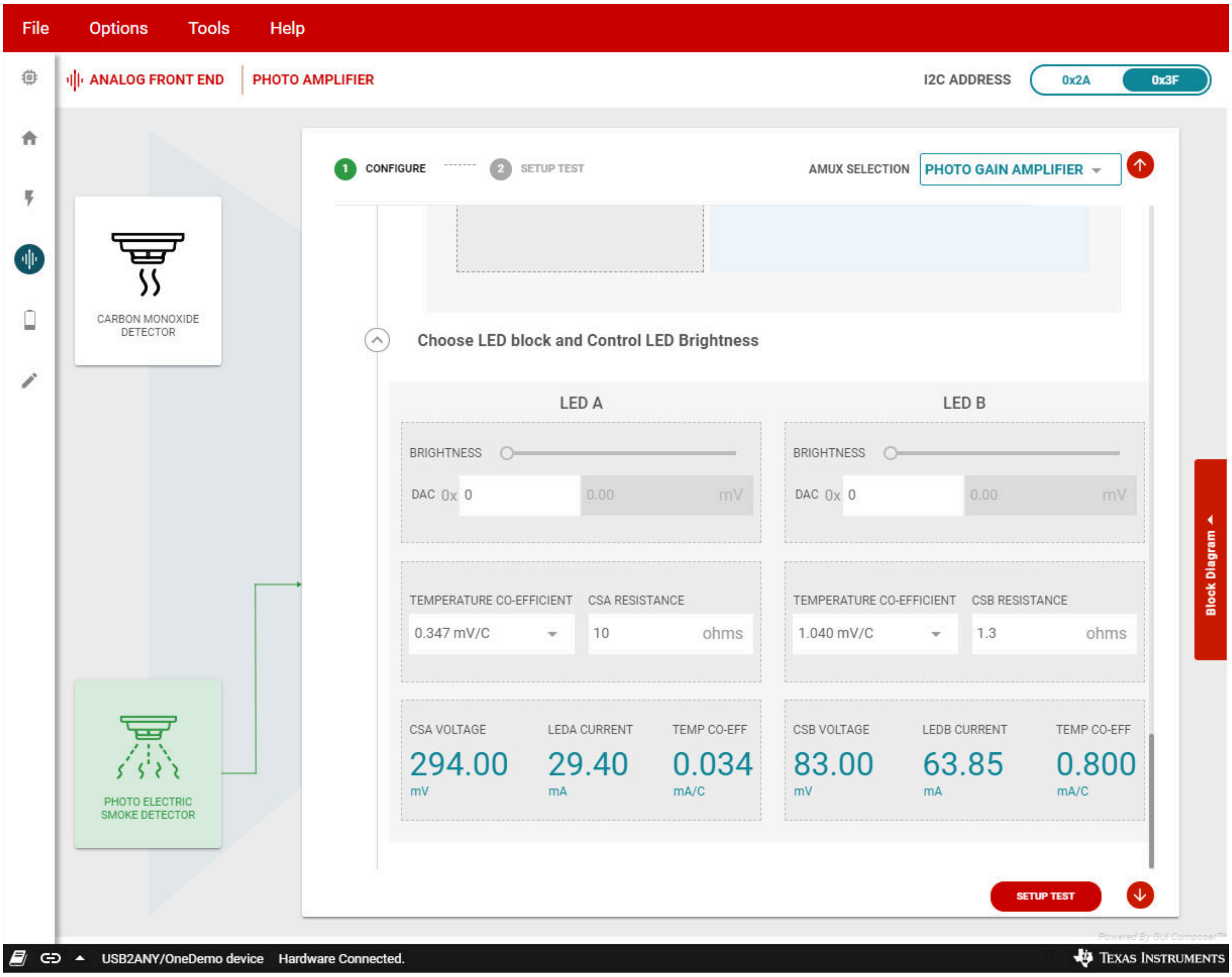


Figure 3-10. LED Driver Settings

Select the LED to be tested. Enable the LED PWM to send the PWM signal to the LEDEN pin. Enable LEDPIN_EN to control the LED driver using the LEDEN pin. Place a box over the EVM if the EVM LEDs and photodiode are used to block ambient light and reflect the LED light into the photodiode.

Use an oscilloscope to measure the LED current, photo input amplifier, and photo gain amplifier signals. Probe LEDEN to measure the LED control signal. Probe CSA or CSB to measure the LED driver current. Probe PDO to measure the photo input stage amplifier. Probe AMUX_BUF to measure the photo gain stage amplifier.

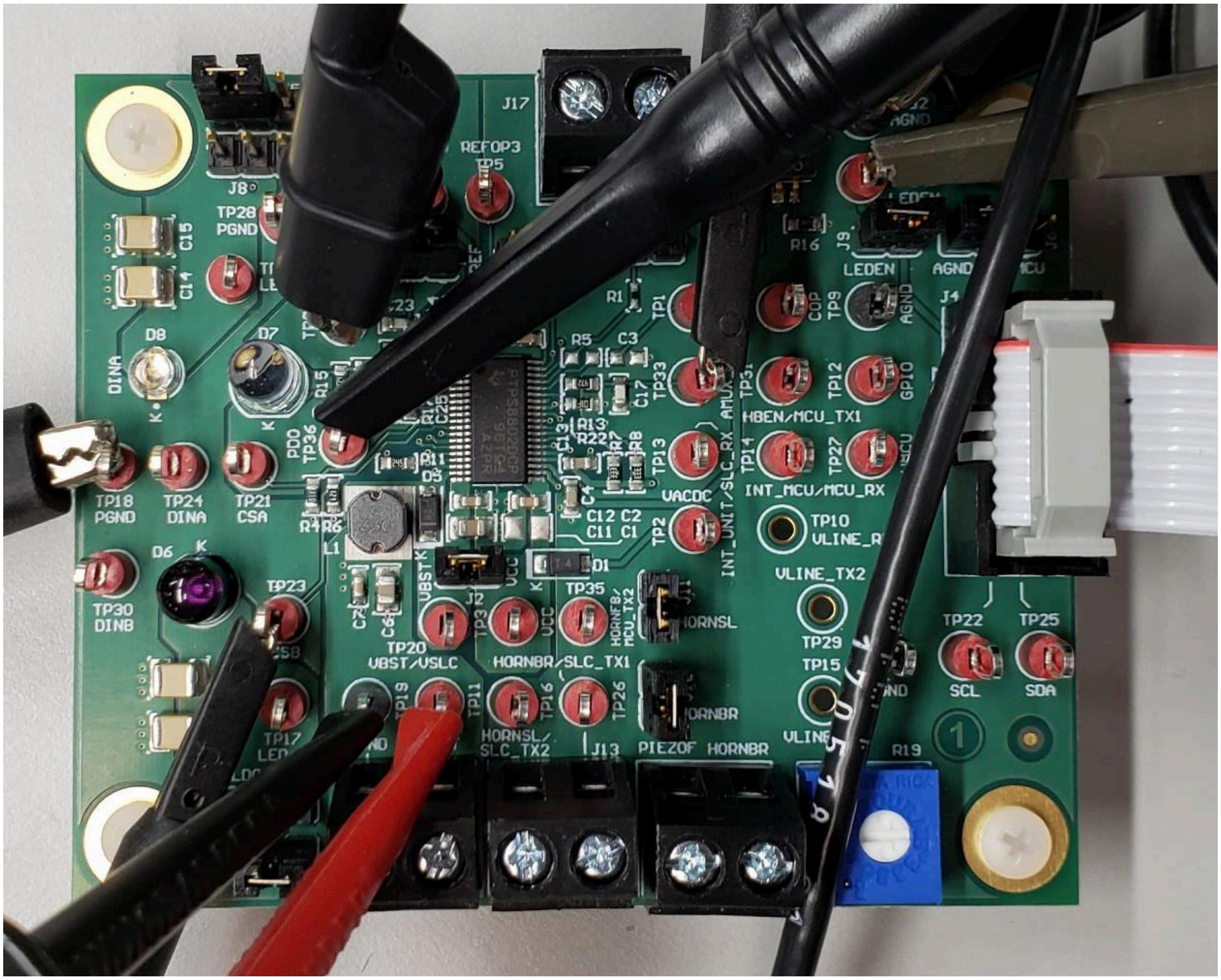


Figure 3-11. EVM Photo Measurement Probe Configuration

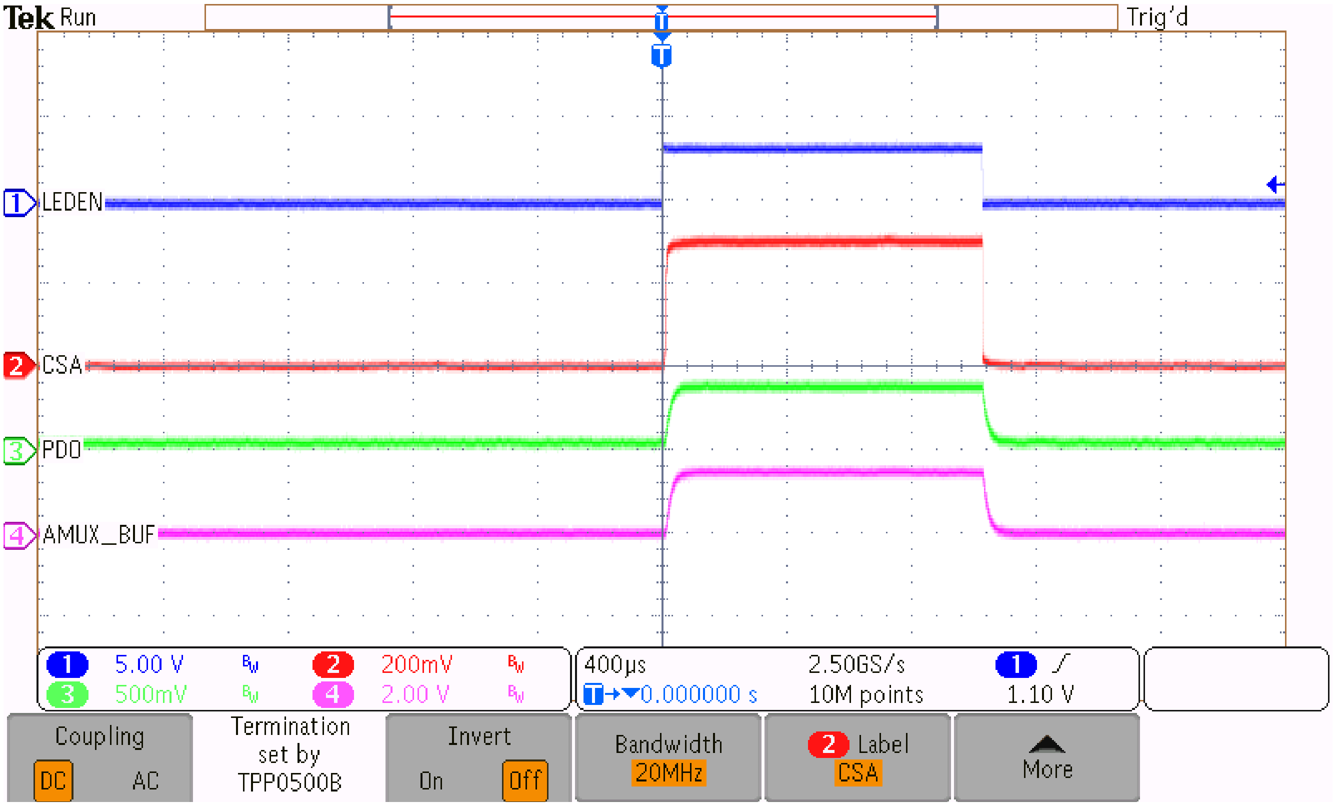


Figure 3-12. LED A Signals

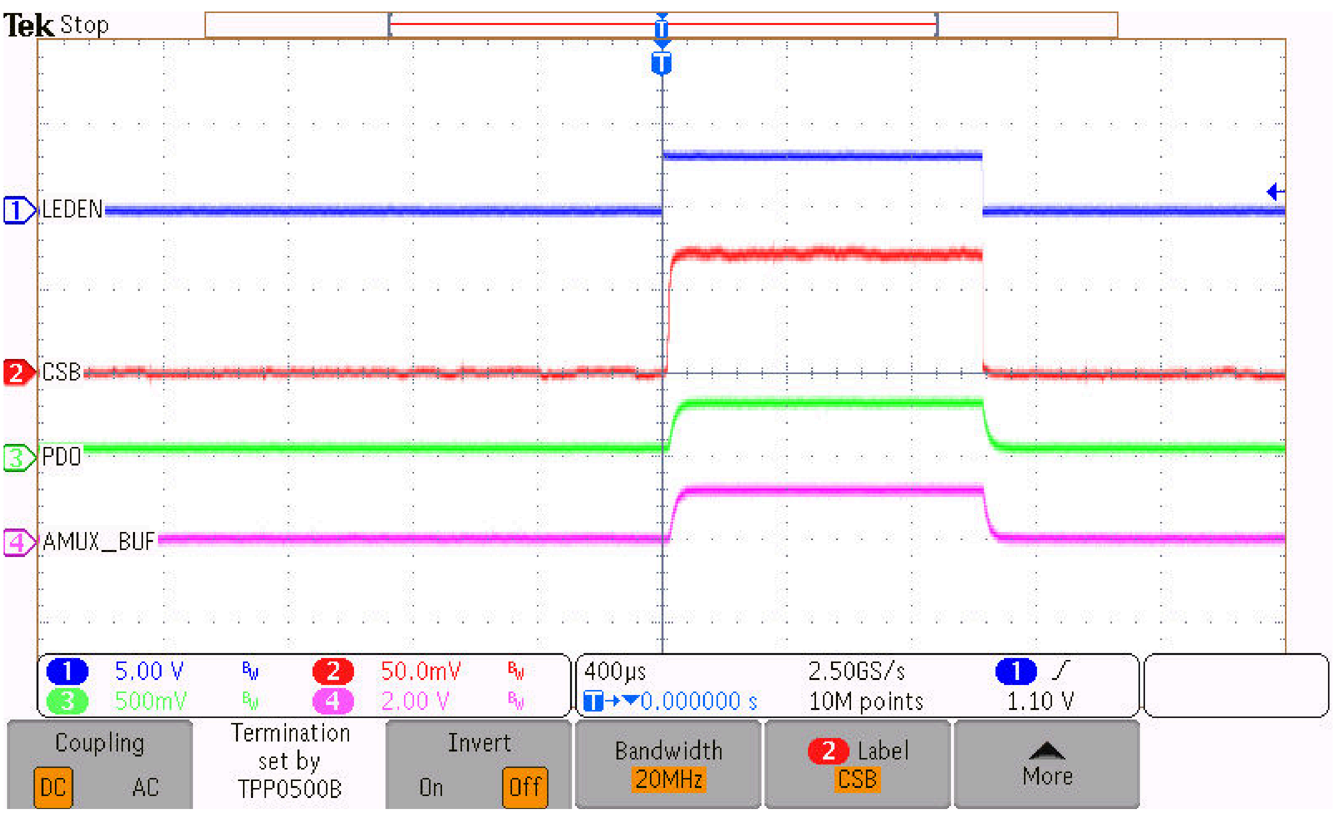


Figure 3-13. LED B Signals

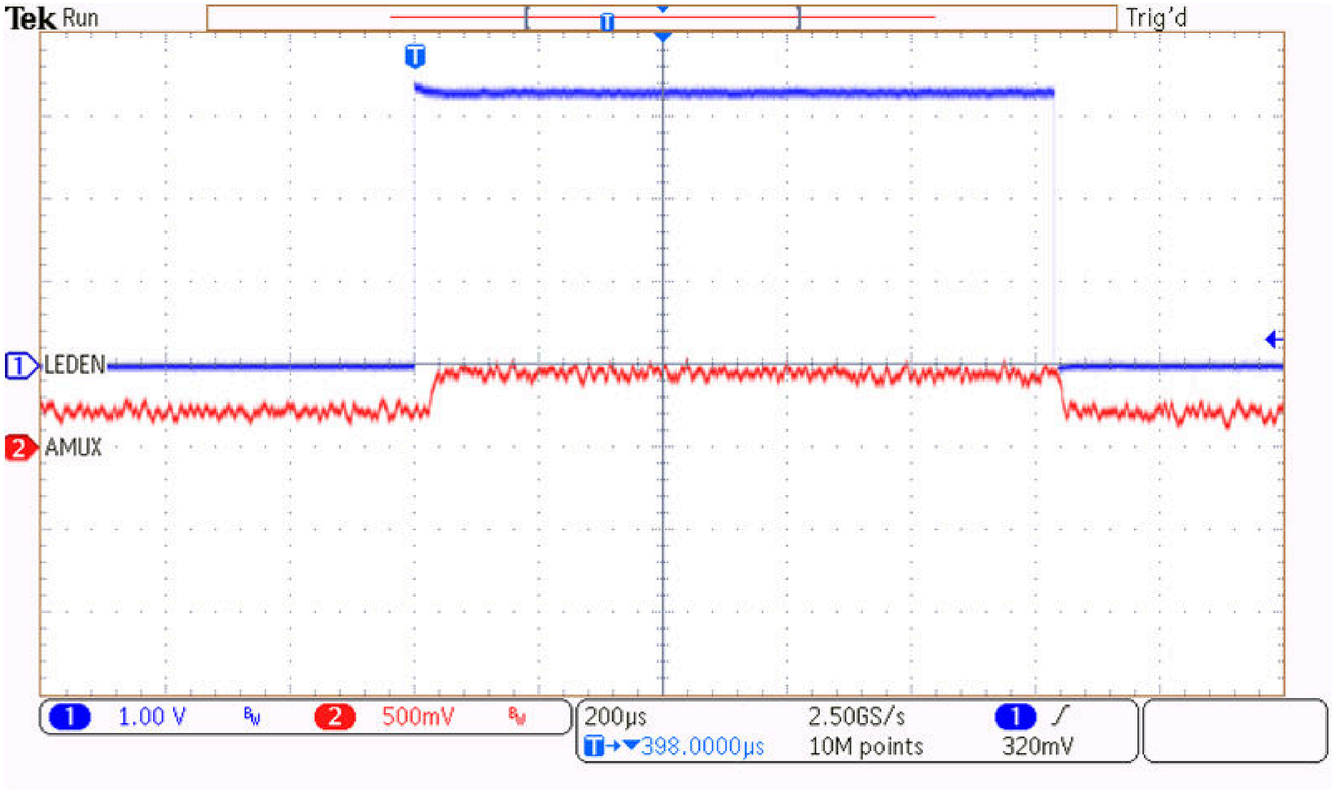


Figure 3-14. Photo Signal with Photo Chamber

3.3 Power Management and Sleep Mode

3.3.1 Power Management

The power management evaluation page allows the user to conveniently control many blocks that are critical for system power consumption. Use the interface to enable and disable each block. Connect a multimeter in series with the power supply to measure current. Remove the J4 USB2ANY adapter cable when performing critical measurements. Raise the VBAT voltage above VINT and VMCU if the boost converter is disabled. In Figure 3-16, the VBAT voltage is raised to 3.6 V to maintain regulation of the MCULDO.

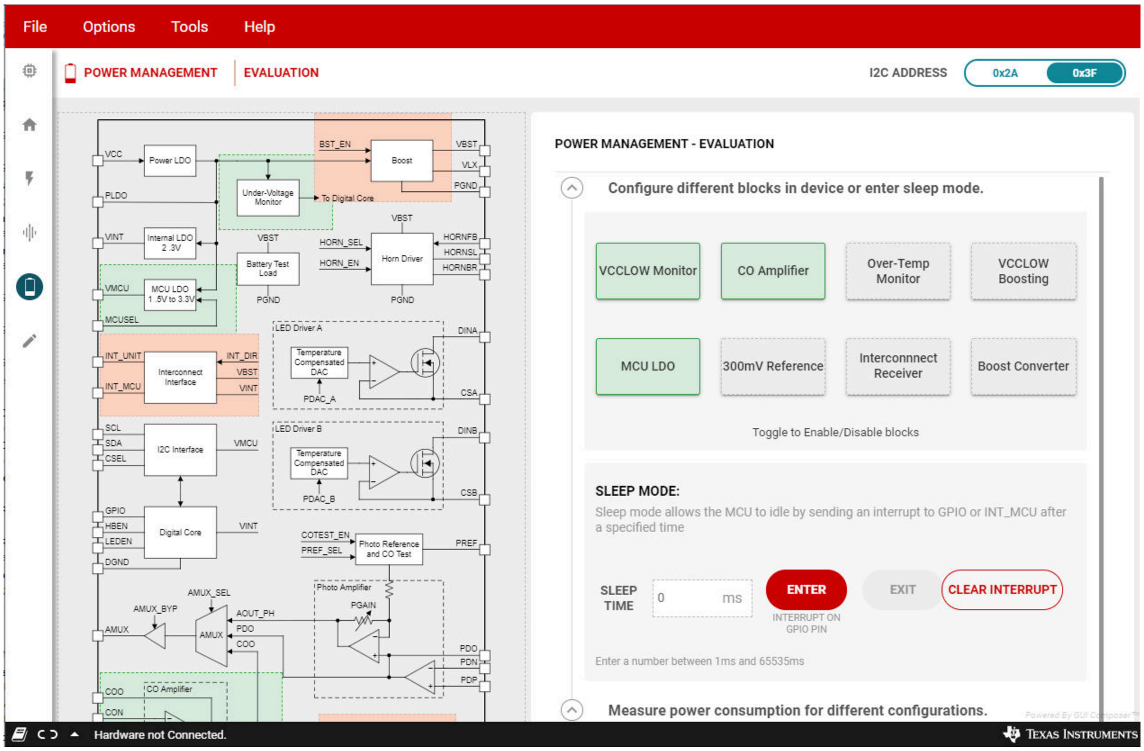


Figure 3-15. Power Management Evaluation

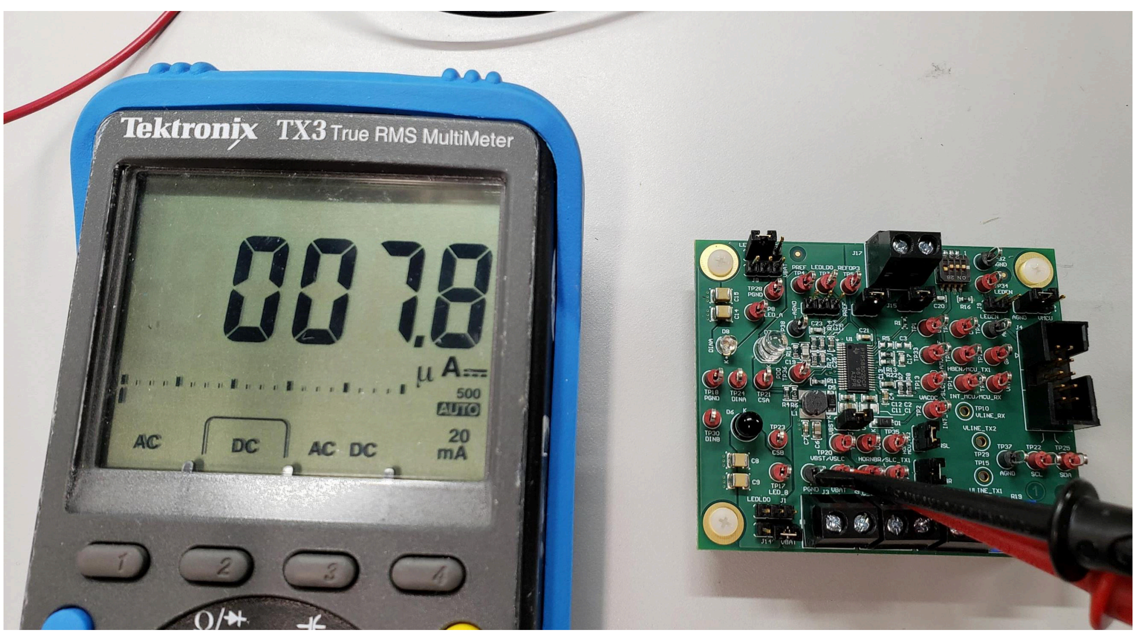


Figure 3-16. Power Management Measurement

3.3.2 Sleep Mode

Sleep mode disables blocks for a programmable amount of time and flags the MCU when sleep mode is exited. Enter the required amount of sleep time via the GUI and click **ENTER** to start the sleep timer. Click **EXIT** to exit sleep mode if the device is in sleep mode. Probe the GPIO pin to measure the interrupt signal that occurs when the sleep timer finishes.

CLEAR INTERRUPT resets the interrupt signal. The interrupt signal is reset whenever the STATUS1 register is read. By default, the GUI reads all registers every 5 seconds. Disable the automatic register reading by navigating to the **Register Map** page and changing the **Auto Read** setting to **Off**.

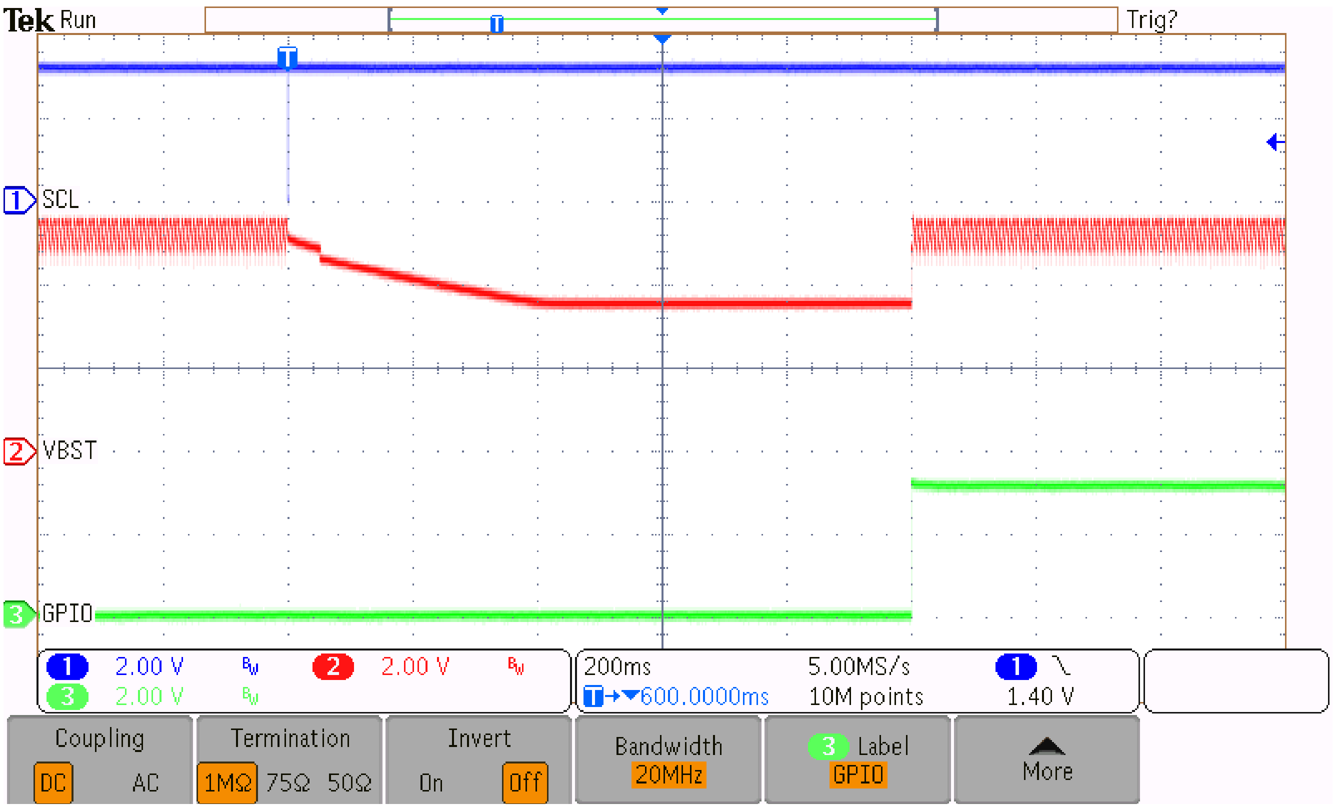


Figure 3-17. Sleep Mode with SLP_BST = 1

3.4 Horn Driver Evaluation

The TPS8802EVM supports direct connection with a piezo horn. The HBEN pin and HORN_EN register bit enables the integrated horn driver and operates independent of any smoke or CO condition. Connect the piezo horn terminal to the respective EVM terminal as shown in Figure 3-18. The silver (HORNSL, M) and brass (HORNBR, G) connect to the J13 terminal block. For a three-terminal piezo horn, connect the piezo feedback terminal to PIEZOF in the J10 terminal block. Additionally, populate jumpers at J11 and J12 for a three-terminal piezo configuration.

3.4.1 Three-Terminal Piezo Evaluation

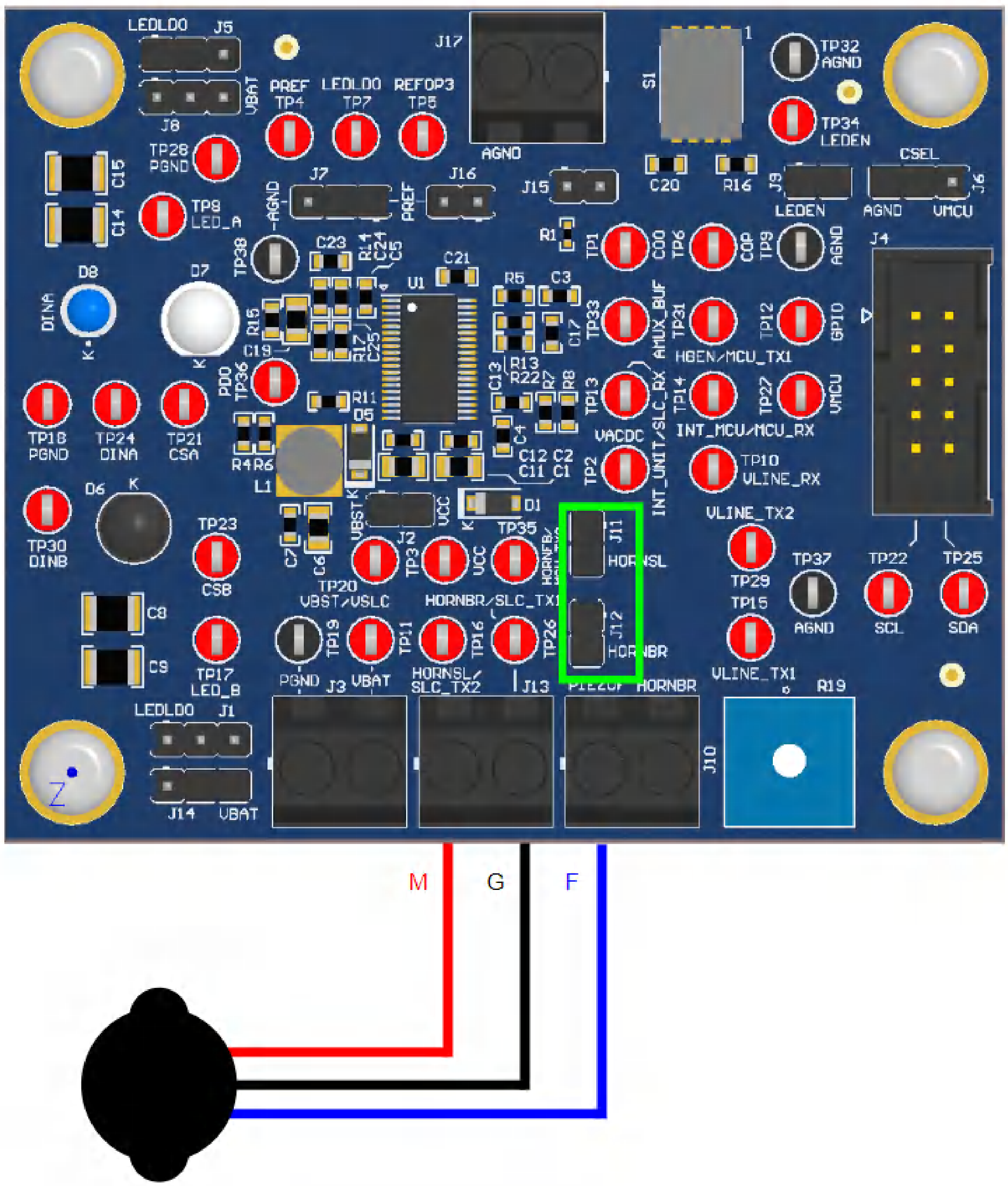


Figure 3-18. TPS8802EVM and Three-terminal Piezo Setup

In the TPS880x GUI navigate to the register map. The horn driver evaluation modifies the following registers: configuration register, enable register, and the boost converter register. The configuration register determines how the horn driver is configured.

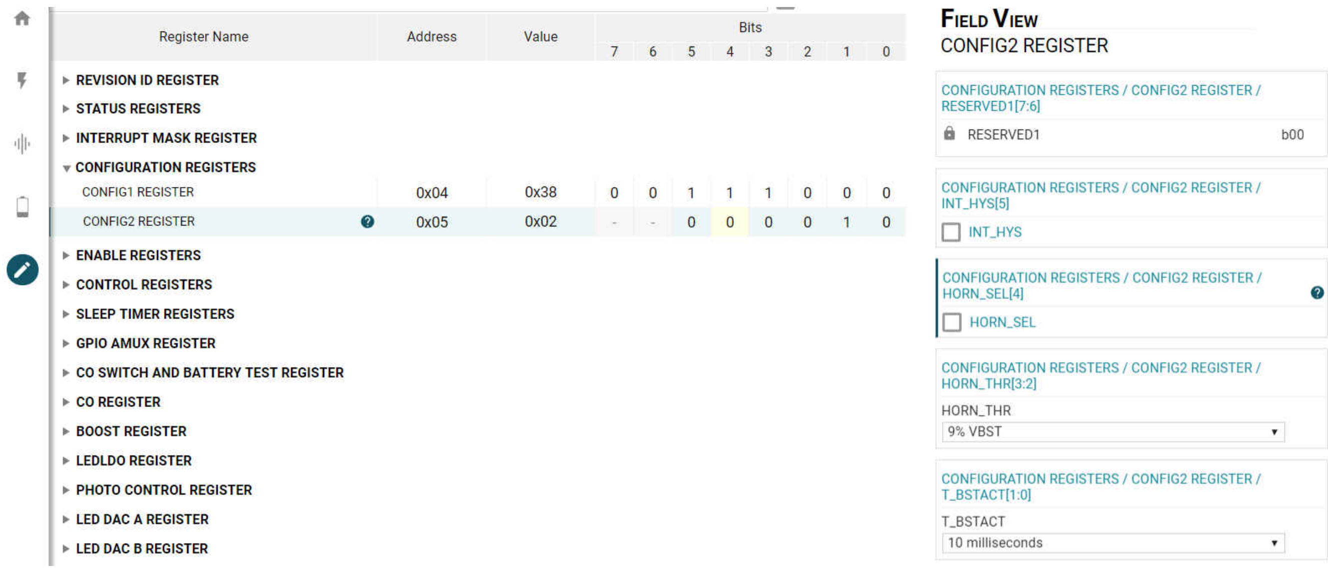


Figure 3-19. Register Map: CONFIG2 Register

- For two-terminal mode: HORNSEL = 0.
- For three-terminal mode: HORNSEL = 1.
- HORN_THR (relevant to three-terminal mode), see Section 3.4.2.

The enable register controls the horn driver circuit.

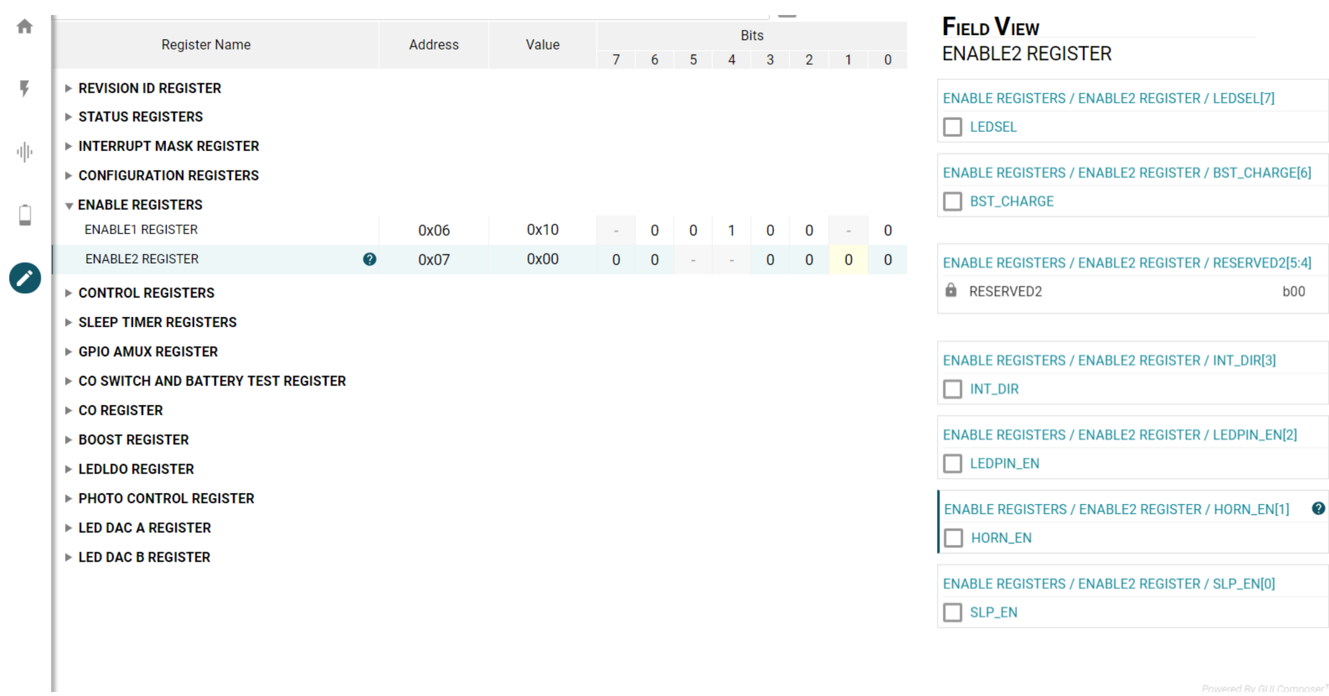


Figure 3-20. Register Map: ENABLE2 Register

- Set HORN_EN = 1.

Since the boost converter supplies the horn driver supply voltage, adjusting the booster converter registers affects the horn loudness.

Figure 3-21. Register Map: BOOST Register

- Set BST_CLIM = 30 mA to 500 mA.
- Set VBST = 2.7 V to 15 V.

Use an oscilloscope to probe the EVM test points: HORNSL (TP16), HORNBR (TP16), and HORNFB (TP35).

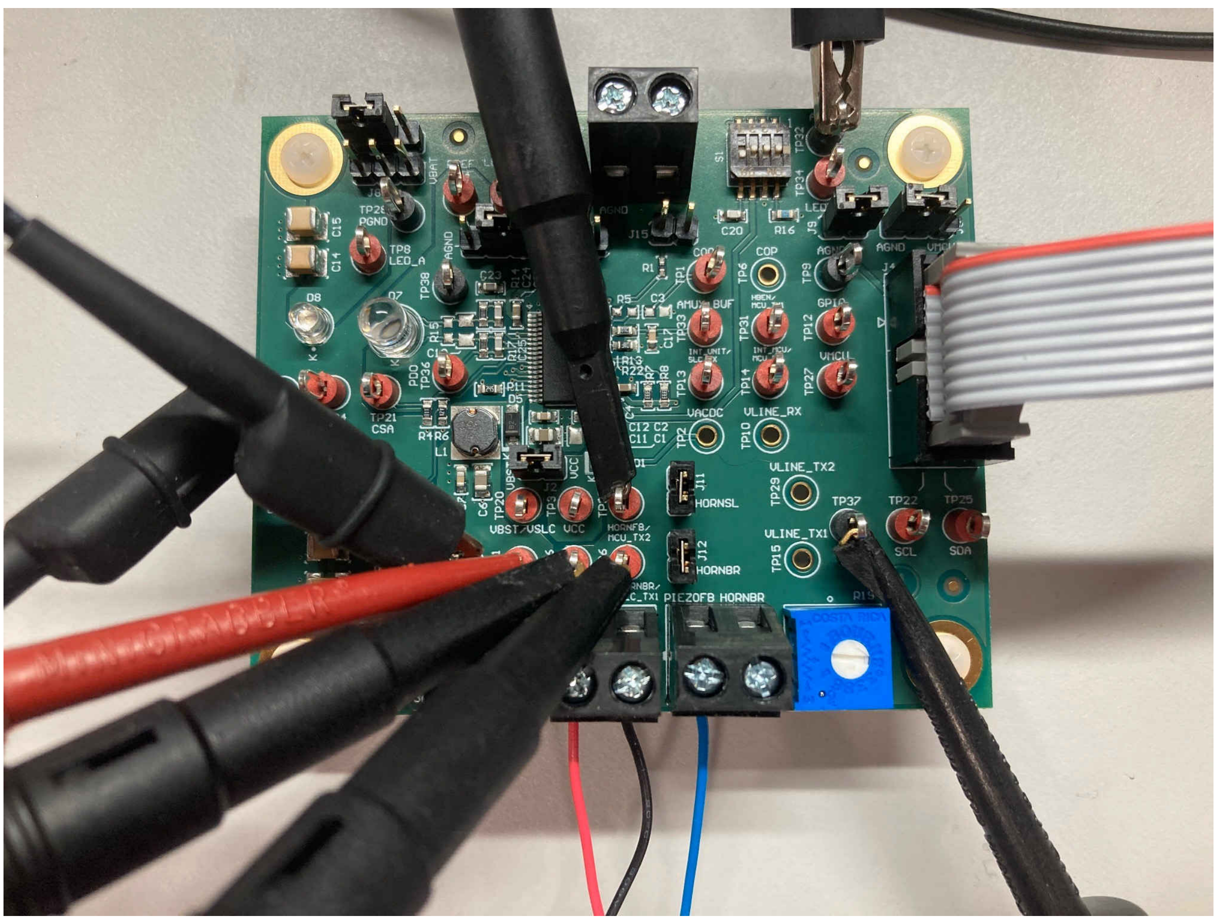


Figure 3-22. EVM Three-terminal Horn Driver Measurement Probe Configuration

3.4.2 Three-Terminal Piezo Tuning

Set the HBEN pin (TP31) high by connecting it to the VMCU voltage. An untuned piezo feedback network exhibits the following waveform.

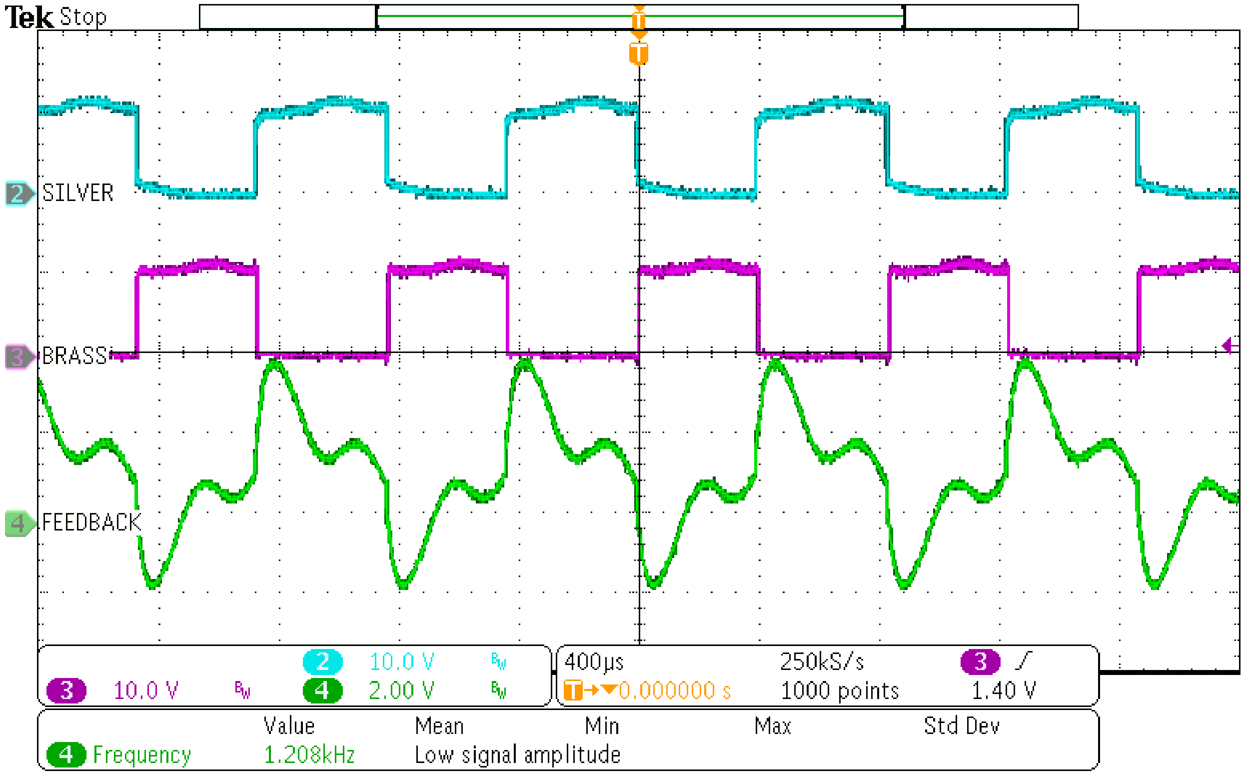


Figure 3-23. Untuned HORNSL, HORNBR, and HORNFB Waveforms

From the figure above, HORNSL, HORNBR, and HORNFB operate below the expected piezo rated frequency of 3.5 kHz. To tune the piezo, enable the horn driver circuit and adjust the potentiometer, see Figure 3-24. A current ammeter in series with the VBAT power supply will also assist with piezo tuning, tune the potentiometer to achieve the peak current draw for the system and the resonant oscillation observed in Figure 3-25.

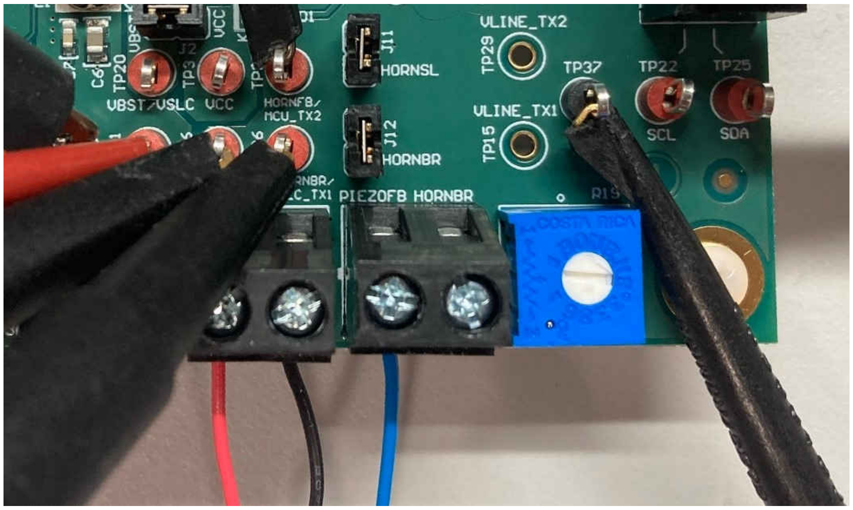


Figure 3-24. Feedback Potentiometer

Achieving resonance on the horn pins, the duty cycle can be further fine-tuned in the register map under the configuration registers: CONFIG2 register with the HORN_THR registers. To achieve maximum loudness, adjust the “HORN_THR” value that operates the horn driver circuit at approximately 50% duty cycle. A tuned piezo will generate the following waveforms.

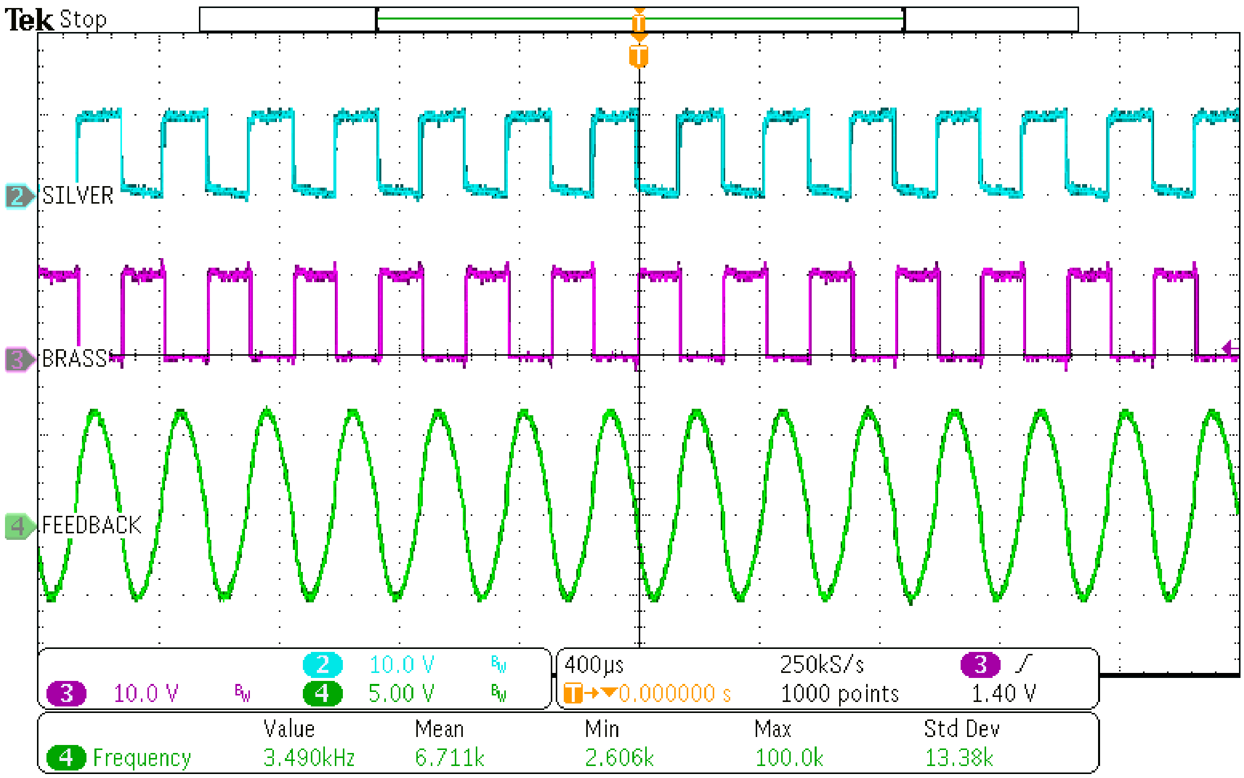


Figure 3-25. Tuned HORNSL, HORNBR, and HORNFB Waveforms

HORNSL and HORNBR are square waves out of phase by 180° with each other. Both waveforms operate near a 50% duty cycle. Additionally, HORNSL, HORNBR, and HORNFB oscillate at the piezo resonance frequency of 3.5 kHz.

3.4.3 Two-Terminal Piezo Evaluation

Connect a function generator or a microcontroller digital output pin to the HBEN test point: TP31 and connect HORNFB to ground. For an alternative configuration, feed the HORNFB pin with an inverse polarity waveform of HBEN square wave. To improve rise time and fall time of the output and reduces power dissipation, place a 1-mH inductor between the external piezo M wire and EVM HORNSL terminal. Additionally, remove jumper J11 and jumper J12 with PIEZOF terminal floating.

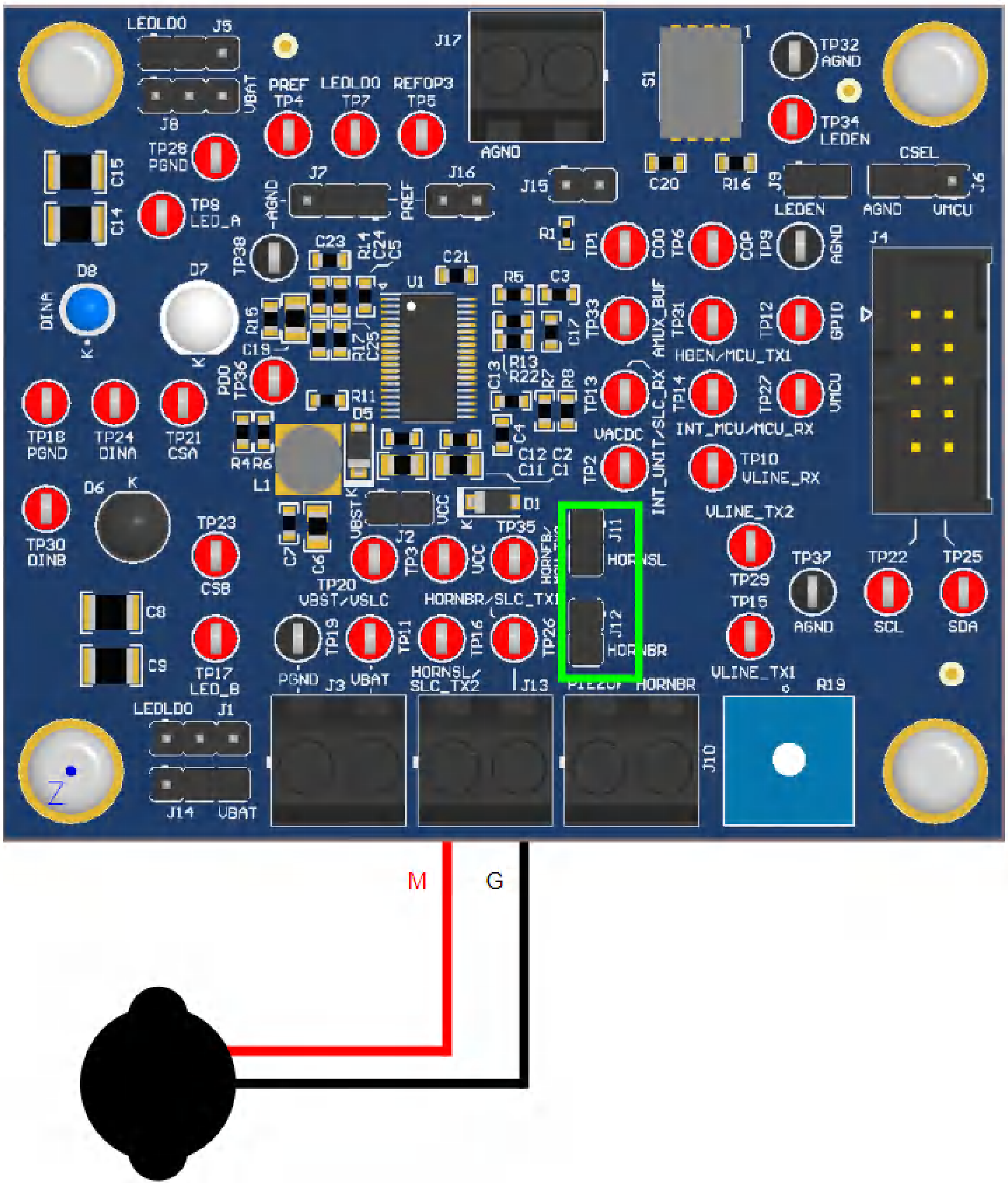


Figure 3-26. TPS8802EVM and Two-terminal Piezo Setup

In Figure 3-27, set a square wave with the piezo oscillation frequency on the HBEN test point and ground the HORNFB test point. Probe both the HORNBR test point and HORNSL test point to measure the piezo voltage waveforms.

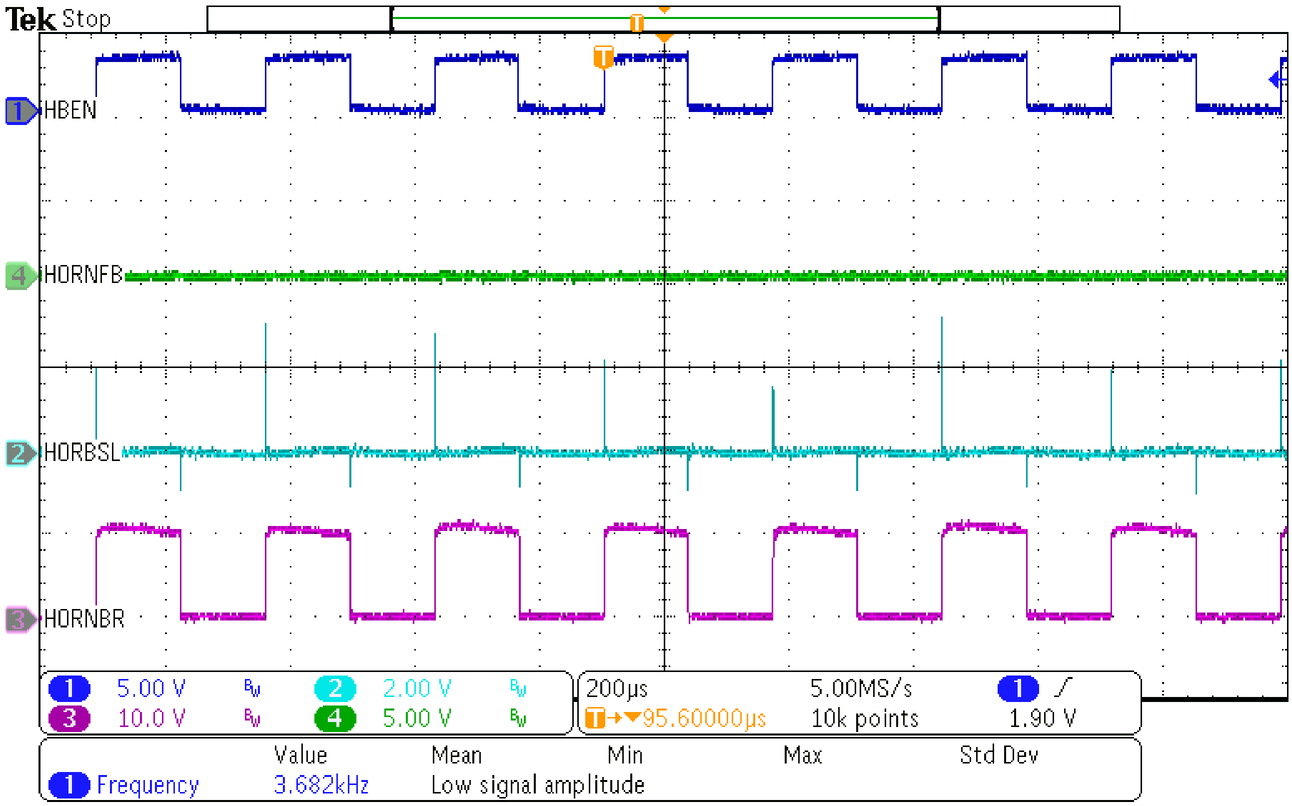


Figure 3-27. Two-terminal Piezo Waveforms (HORNFB to ground)

For Figure 3-28, set square waveforms is on both the HBEN test point and the HORNFB test point (equal but opposite polarity). Likewise, probe the piezo test points to observe the piezo voltage waveforms.

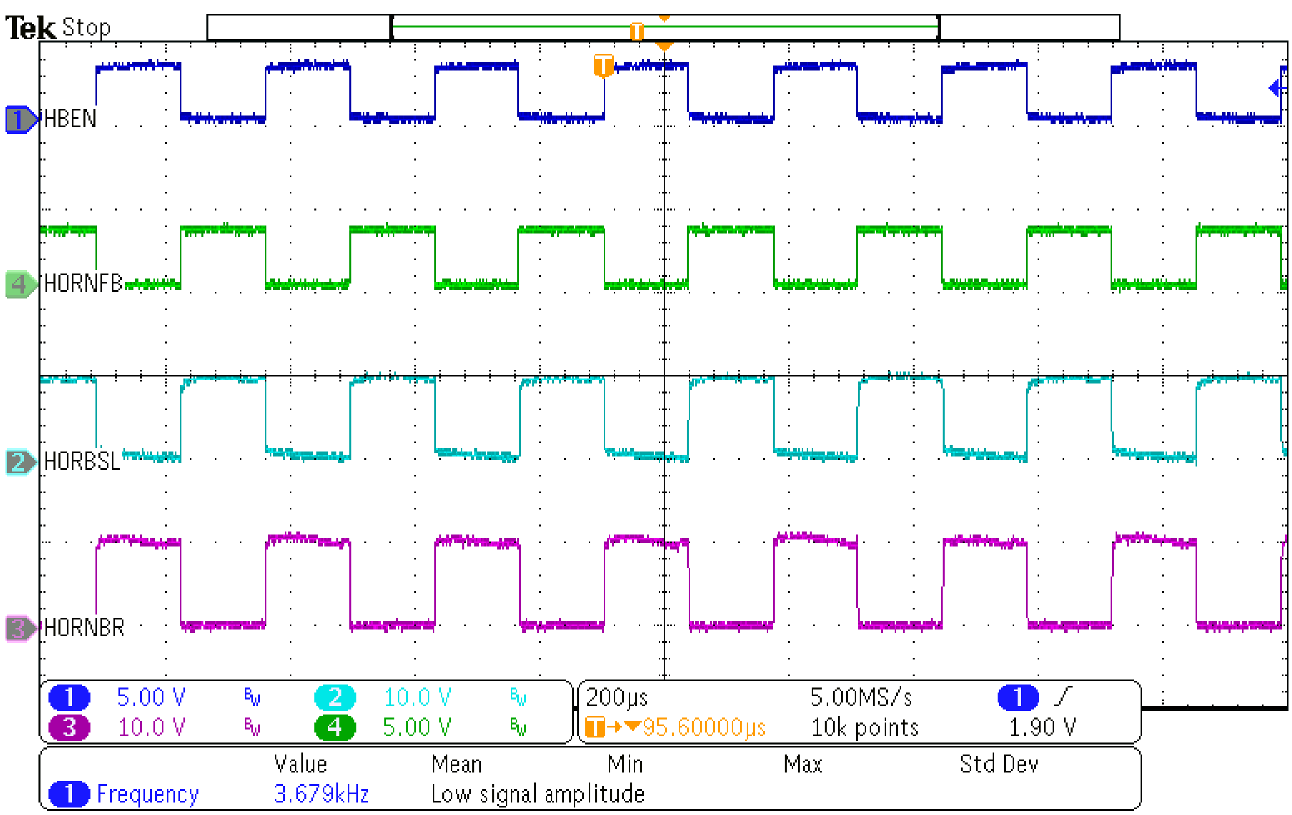


Figure 3-28. Two-terminal Piezo Waveforms (HORNFB to MCU)

3.5 Register Map

Use the register map to evaluate other blocks in the TPS8802. Use the search to find register bits that correspond to a certain block or function. Load and save register map configurations in the **File** menu. Click the question mark icon (**?**) to display more information about the selected register or bits.

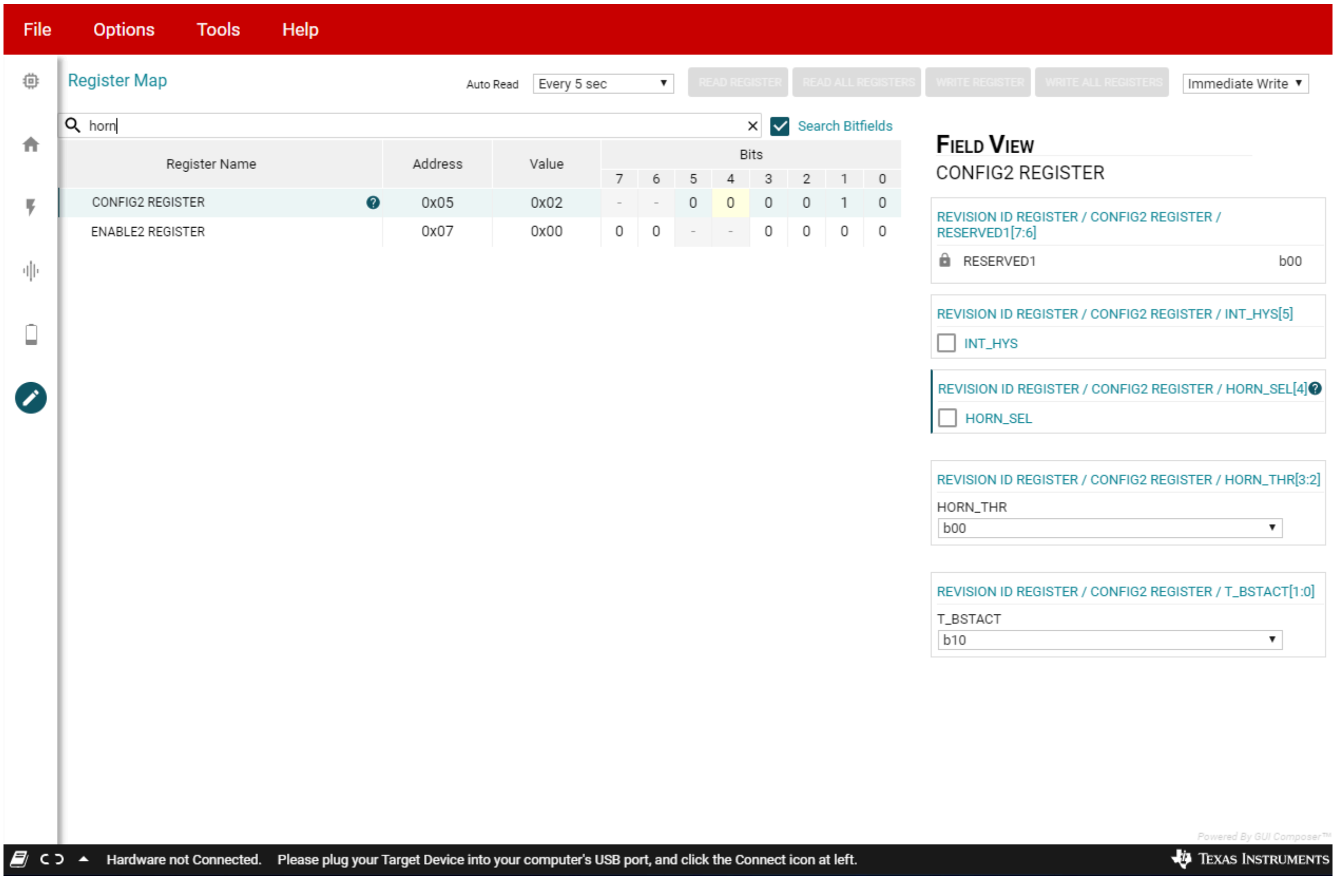


Figure 3-29. Register Map Search Function

4 Board Layout

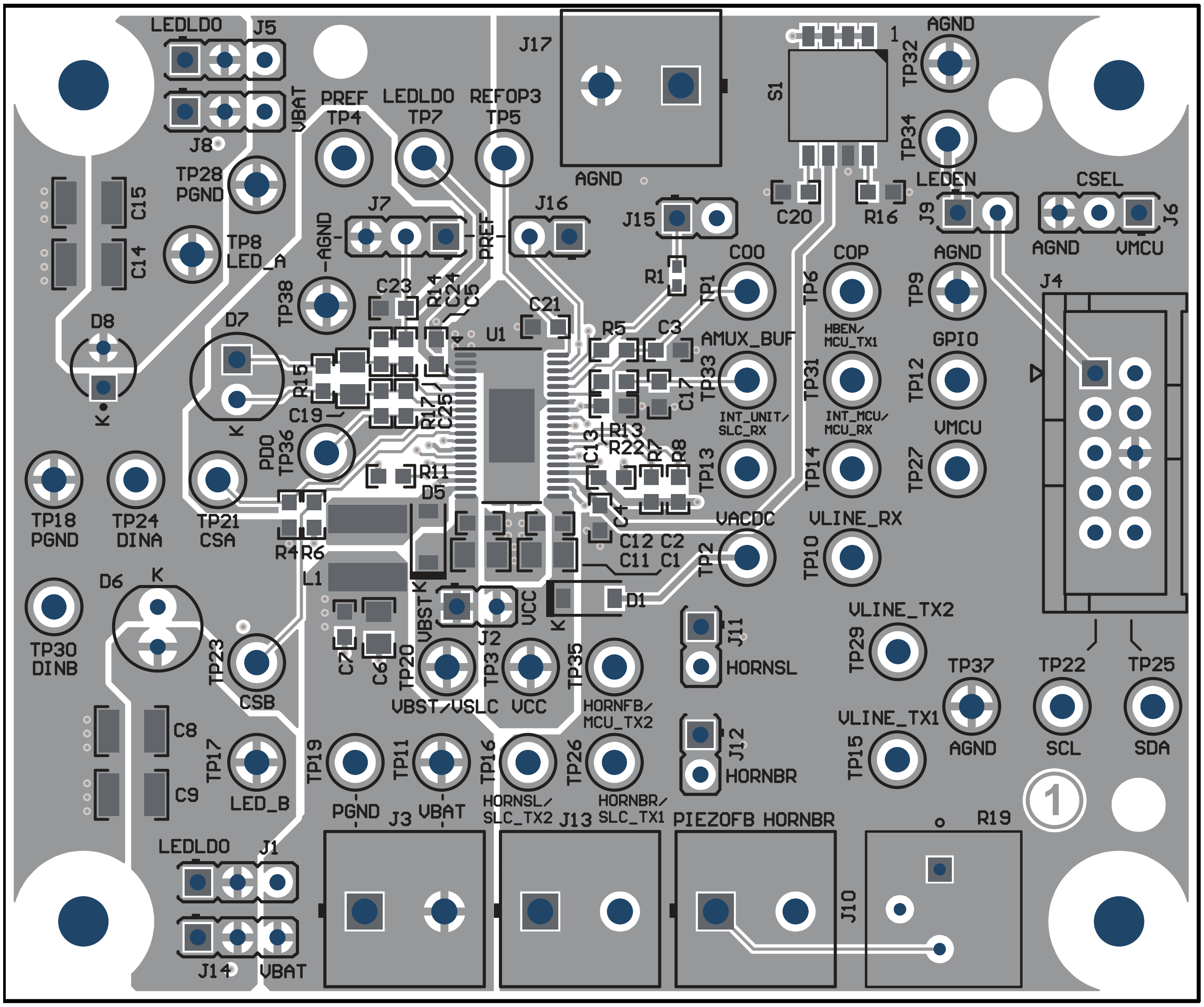


Figure 4-1. TPS8802EVM Top Layer PCB Layout

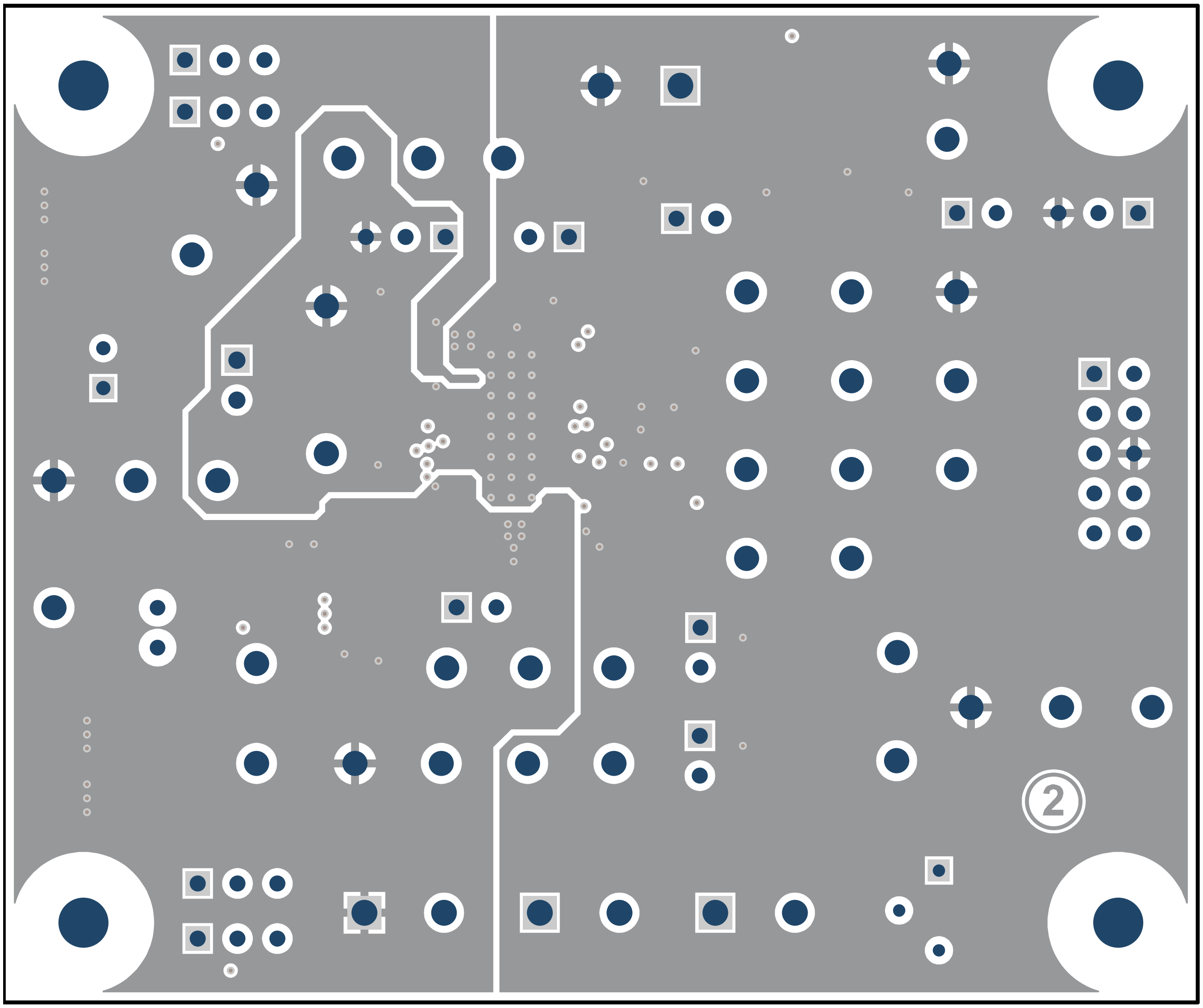


Figure 4-2. TPS8802EVM Ground Layer PCB Layout

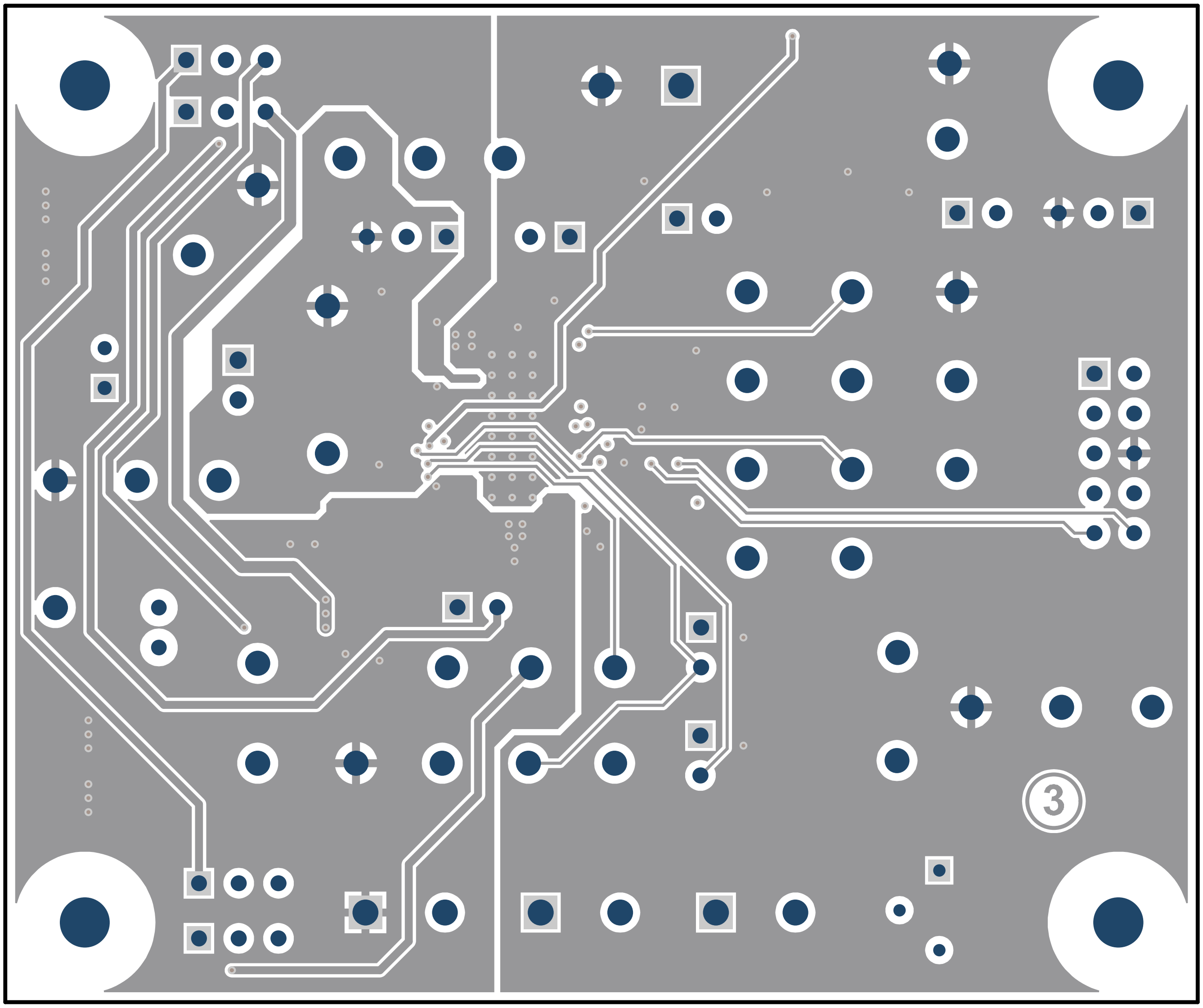


Figure 4-3. TPS8802EVM Power Layer PCB Layout

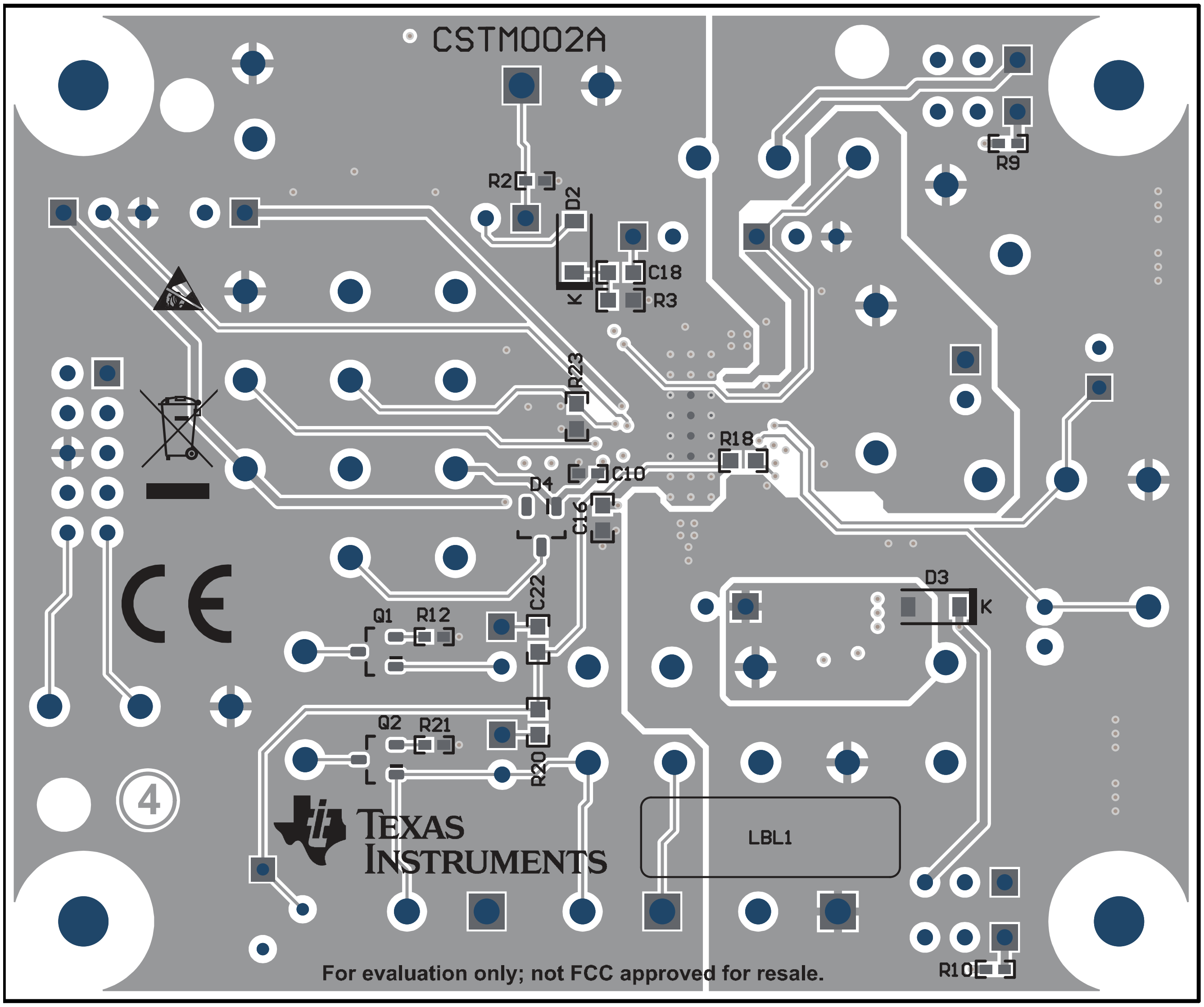
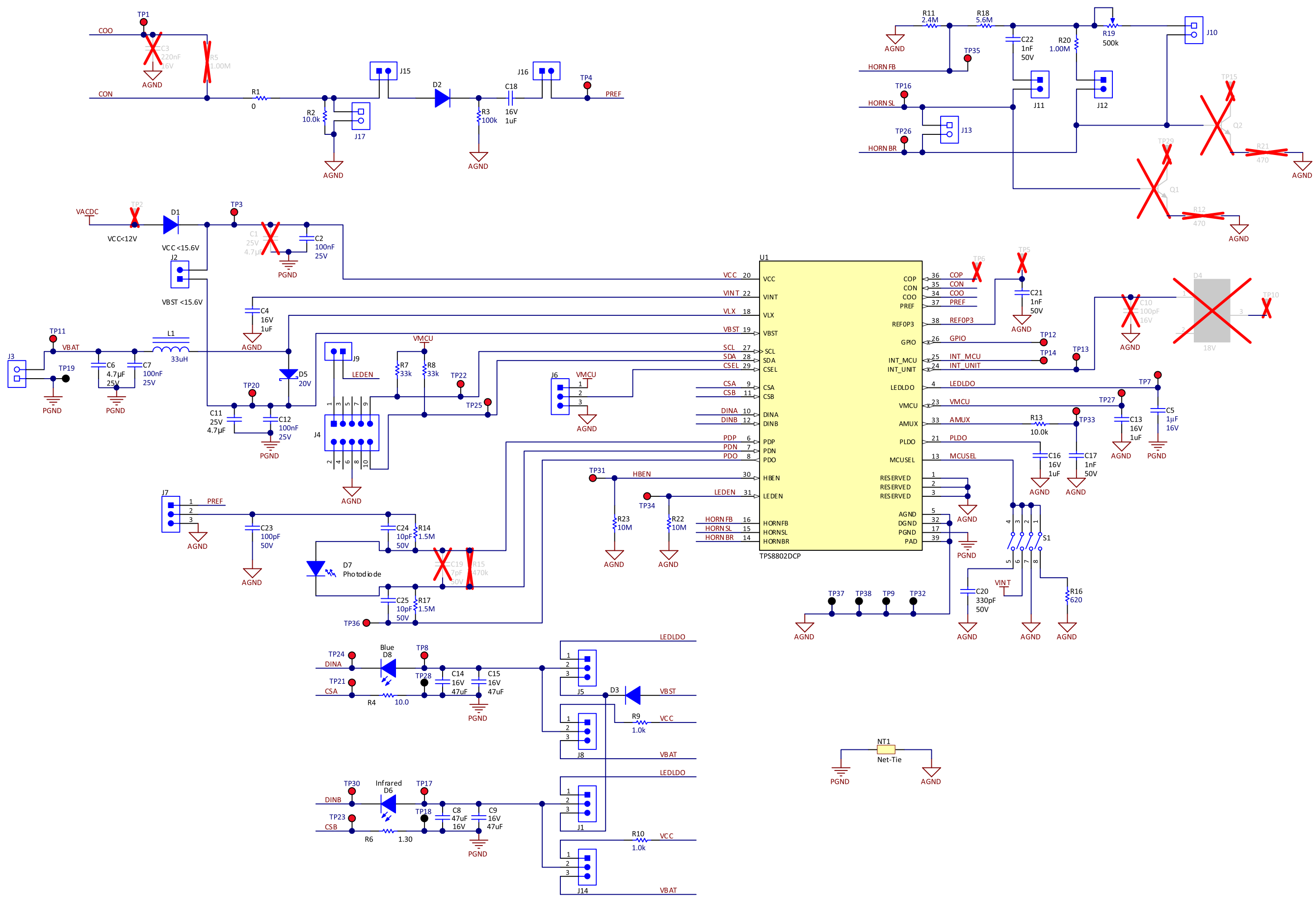


Figure 4-4. TPS8802EVM Bottom Layer PCB Layout

5 Schematic and Bill of Materials

5.1 Schematic



A. It is recommended to install a 470 kΩ resistor connecting PREF to VINT if the photo gain is set to 11x, 20x, or 35x. The 470 kΩ resistor changes the PREF voltage to 70 mV and prevents the gain stage output from dropping below 50 mV in worst-case conditions.

Figure 5-1. TPS8802EVM Schematic

5.2 Bill of Materials

Table 5-1. Bill of Materials

REF DES	QTY	VALUE	DESCRIPTION	SIZE	PART NUMBER
PCB1	1		Printed Circuit Board		TPS880x
C2, C7, C12	3	0.1 µF	Capacitor, ceramic, 0.1 µF, 25 V, ±5%, X7R, 0603	0603	06033C104JAT2A
C4, C13, C16, C18	4	1 µF	Capacitor, ceramic, 1 µF, 16 V, ±10%, X5R, 0603	0603	C0603C105K4PACTU
C5	1	1 µF	Capacitor, ceramic, 1 µF, 16 V, ±10%, X7R, 0603	0603	EMK107B7105KA-T
C6, C11	2	4.7 µF	Capacitor, ceramic, 4.7 µF, 25 V, ±10%, X7R, 0805	0805	C2012X7R1E475K125AB
C8, C9, C14, C15	4	47 µF	Capacitor, ceramic, 47 µF, 16 V, ±20%, X6S, 1210	1210	GRM32EC81C476ME15L
C17, C21, C22	3	1000 pF	Capacitor, ceramic, 1000 pF, 50 V, ±10%, X7R, 0603	0603	C0603X102K5RACTU
C20	1	330 pF	Capacitor, ceramic, 330 pF, 50 V, ±10%, X7R, 0603	0603	C0603C331K5RACTU
C23	1	100 pF	Capacitor, ceramic, 100 pF, 50 V, ±5%, C0G/NP0, 0603	0603	885012006057
C24, C25	2	10 pF	Capacitor, ceramic, 10 pF, 50 V, ±5%, C0G/NP0, 0603	0603	06035A100JAT2A
D1, D2, D3	3	100 V	Diode, Switching, 100 V, 0.15 A, SOD-123	SOD-123	1N4148W-TP
D5	1	20 V	Diode, Schottky, 20 V, 0.5 A, SOD-123	SOD-123	MBR0520LT1G
D6	1	Infrared	LED, Infrared, TH	D5.5 mm	SFH 4556
D7	1		Silicon PIN Photodiode, TH	D5.7×H9 mm	SFH 213
D8	1	Blue	LED, Blue, TH	D3.1 mm	LTL1CHTBK4
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 × 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C
J1, J5, J6, J7, J8, J14	6		Header, 2.54 mm, 3×1, Tin, TH	Header, 2.54 mm, 3×1, TH	22284033
J2, J9, J11, J12, J15, J16	6		Header, 2.54 mm, 2×1, Tin, TH	Header, 2.54 mm, 2×1, TH	22284023
J3, J10, J13, J17	4		Terminal Block, 5.08 mm, 2×1, TH	Terminal Block, 5.08 mm, 2×1, TH	039544-3002
J4	1		Header (shrouded), 100mil, 5×2, Gold, TH	5×2 Shrouded header	5103308-1
L1	1	33 µH	Inductor, Drum Core, Ferrite, 33 uH, 0.7 A, 0.38 ohm, SMD	5×3×4.8 mm	SDR0503-330KL
LBL1	1		Thermal Transfer Printable Labels, 0.650" W × 0.200" H - 10,000 per roll	PCB Label 0.650 × 0.200 inch	THT-14-423-10
R1	1	0	Resistor, 0, 5%, 0.063 W, 0402	0402	RC0402JR-070RL
R2	1	10.0 kΩ	Resistor, 10.0 k, .1%, .0625 W, 0402	0402	RT0402BRD0710KL
R3	1	100 kΩ	Resistor, 100 k, 0.1%, 0.1 W, 0603	0603	RG1608P-104-B-T5
R4	1	10.0 Ω	Resistor, 10.0, 0.5%, 0.1 W, 0603	0603	RT0603DRE0710RL
R6	1	1.30 Ω	Resistor, 1.30, 0.5%, 0.1 W, 0603	0603	RT0603DRE071R3L
R7, R8	2	33 kΩ	Resistor, 33 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060333K0JNEA
R9, R10	2	1.0 kΩ	Resistor, 1.0 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04021K00JNED
R11	1	2.4 MΩ	Resistor, 2.4 M, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06032M40JNEA
R13	1	10.0 kΩ	Resistor, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06034K70JNEA

Table 5-1. Bill of Materials (continued)

REF DES	QTY	VALUE	DESCRIPTION	SIZE	PART NUMBER
R14, R17	2	1.5 MΩ	Resistor, 1.5 M, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031M50JNEA
R16	1	620 Ω	Resistor, 620, 1%, 0.1 W, 0603	0603	RC0603FR-07620RL
R18	1	5.6 MΩ	Resistor, 5.6 M, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06035M60JNEA
R19	1	500 kΩ	Trimmer, 500 kΩ, 0.5W, TH	375×190×375mil	3386P-1-504LF
R20	1	1.00 MΩ	Resistor, 1.00 M, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031M00FKEA
R22, R23	2	10 MΩ	Resistor, 10 M, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310M0JNEA
S1	1		Switch, Slide, SPST 4 poles, SMT	SW, SMT Half Pitch 4SPST, 5.8×2.7×6.25 mm	218-4LPST
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8	8	1×2	Shunt, 100 mil, Flash Gold, Black	Closed Top 100mil Shunt	SPC02SYAN
TP1, TP3, TP4, TP7, TP8, TP11, TP12, TP13, TP14, TP16, TP17, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP30, TP31, TP33, TP34, TP35, TP36	25		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010
TP9, TP18, TP19, TP28, TP32, TP37, TP38	5		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011
U1	1		TPS8802DCP, DCP0038A (HTSSOP-38)	DCP0038A	TPS8802DCP

6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision A (May 2020) to Revision B (July 2022) **Page**

- Added Section Abstract 1
- Added Section Trademarks 2
- Updated the numbering format for tables, figures, and cross-references throughout the document..... 3
- Added Section 3.4 21
- Added Section 3.4.1 21
- Added Section 3.4.2 24
- Added Section 3.4.3 26

Changes from Revision * (October 2019) to Revision A (May 2020) **Page**

- Added Figure 3-4 9
- Added recommendation to install a 470 kΩ resistor connecting PREF to VINT in Section 3.2 13
- Updated silkscreen labels in Figure 4-1 29
- Added Figure 4-2 29
- Added Figure 4-3 29
- Updated PCB revision to CSTM002A in Figure 4-4 29
- Added recommendation to install a 470 kΩ resistor connecting PREF to VINT in Figure 5-1 33
- Changed R13 to 10.0 kΩ, changed C17 to 1nF, de-populated R15, C19, TP5, TP6 in Figure 5-1 33
- Changed C17 value to 1000 pF in Table 5-1 34
- Changed R13 value to 10.0 kΩ in Table 5-1 34
- Deleted R15, C19, TP5, TP6 in Table 5-1 34

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