EVM User's Guide: EV2500

EV2500 User's Guide

Description

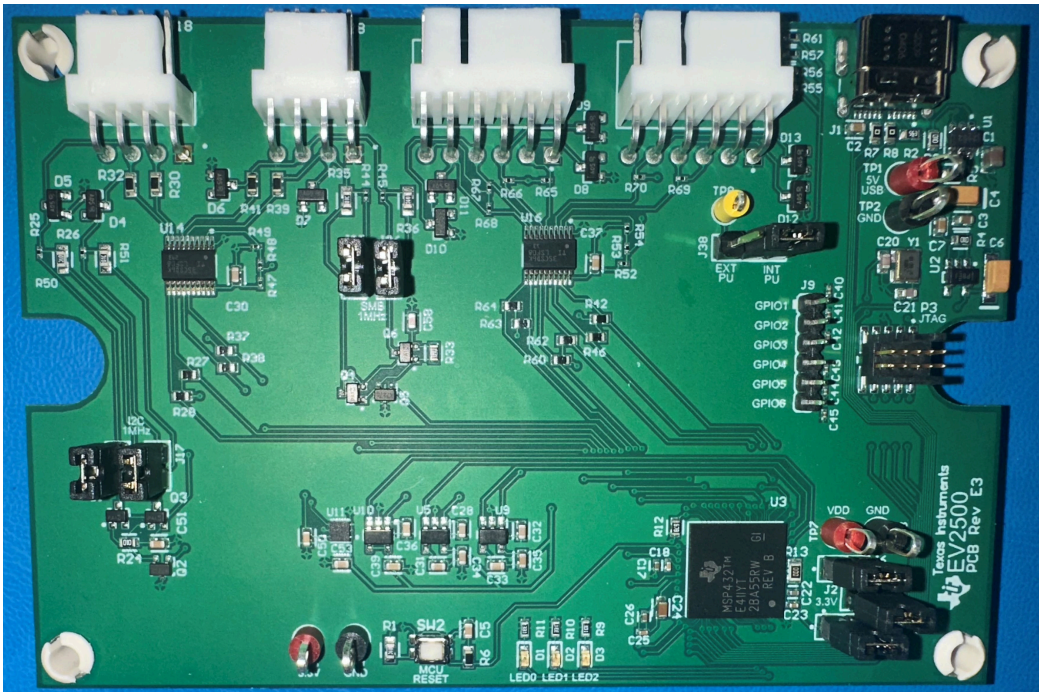
The EV2500 EVM interface board enables a PC running Microsoft Windows with compatible Human Interface Device (HID) driver to communicate with TI SMBus and I^2C interface gas gauges via a Universal Serial Bus Type C (USB-C) port. SPI and UART functionality will be provided in a future firmware update. In addition to this board, PC software is required to interpret the gas gauge data to complete the evaluation system.

Features

- Fully powered from USB-C port.
- Complete interface between the USB and SMBus/I^2C interfaces using a simple API.
- Allows for full voltage translation for devices using 1.2V to 5V.
- Allows for 1MHz I^2C and SMBus communication.

Applications

- Laptops
- Smartphones
- Wireless speakers



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1 Evaluation Module Overview

1.1 Introduction

The EV2500 EVM interface board enables the user to communicate to TI gas gauges using SMBus and I^2C interfaces (SPI/UART will be supported in a future update). This allows the user to change configurations, log data, and other features when using in tandem with the Battery Management Studio GUI. The EV2500 is an upgraded version of the previous EV2400 that allows for 1MHz communication speed on I^2C and SMBus, different voltage pullup options, and other new features.

This board is intended for evaluation purposes only, and does not support production.

1.2 Kit Contents

- EV2500 circuit module
- 4-pin Socket to Socket Connector

1.3 Specifications

The EV2500 uses a MSP432E411Y controller as the main host for communication. The controller firmware is stored in flash memory and is executed by the core at power-up.

1.4 Device Information

The EV2500 sends and receives information from the device and host via a MSP432E411, while using the LSF0108DGS for level translation between the controller and device attached. The internal LDO system is created using the TPS73618DBVR for 1.8V, TPS73633DBVR for 3.3V, TPS73601DBVR for 1.2V, and TLV76750DRVT for 5V.

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2 Hardware

2.1 Power Requirements

The EV2500 is powered via the USB-C port that is connected to the host computer.

2.2 Setup

Figure 2-1 shows a typical setup for communication between a computer and a TI battery gauge using the EV2500. The following sections describe each of the jumper options available on the EV2500.

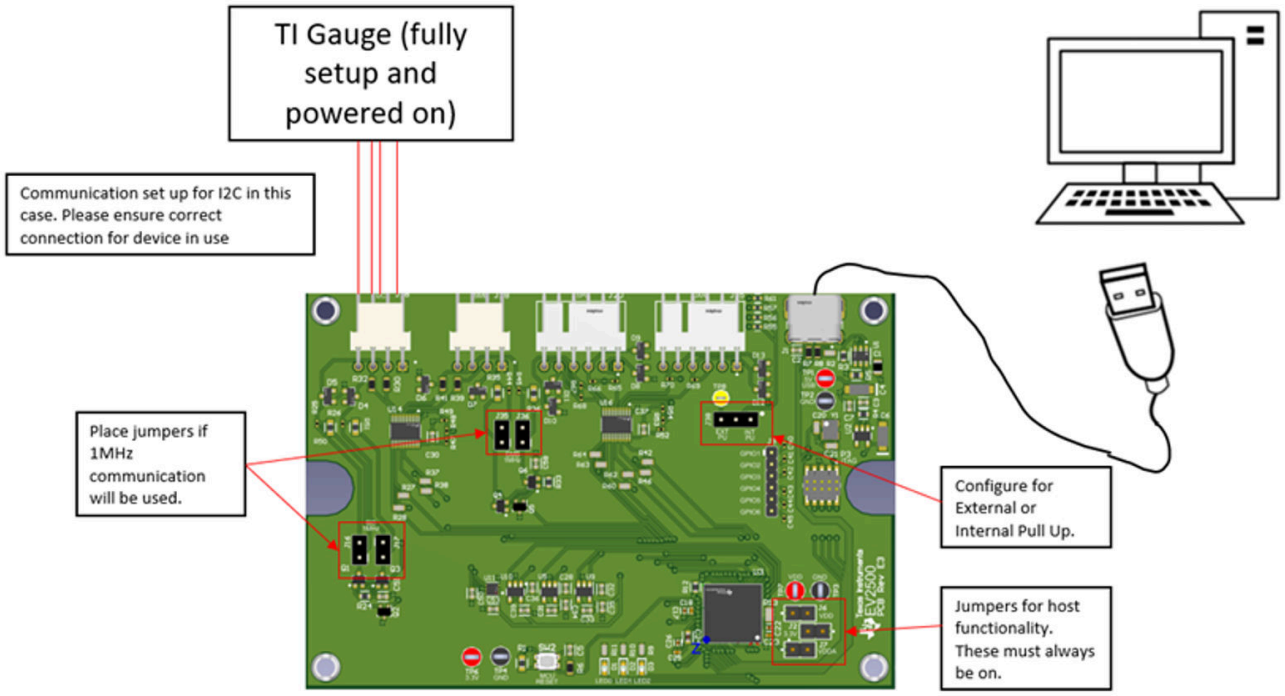


Figure 2-1. Setup and Configuration

2.3 Header Information

2.3.1 USB Interface

The interface board connects to a USB port on a host computer and is powered from the port. All communication over the USB is human Interface device (HID) class.

2.3.2 Communication Interfaces

The EV2500 interfaces are described in Table 2-1.

Table 2-1. Communication Interfaces

Reference Designator	Function	Function
J18: I^2C	I^2C Interface Port	Terminal block for connecting to a target I^2C device
J28: SMBus	SMBus Interface Port	Terminal block for connecting to a target SMBUS device
J20: SPI	SPI Interface Port	Terminal block for connecting to a target SPI device
J15: UART	UART Interface Port	Terminal block for connecting to a target UART device

2.3.3 GPIO Interface (Future Implementation)

The EV2500 has 6 programmable GPIO pins connected to the EV2500 host. For the user to program these pins, the MSP432 host needs to be programmed using the JTAG connection (P3) or programmed using the bootloader. GPIO support will be enabled in future firmware updates.

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2.4 Jumper Information

2.4.1 Pull-Up Interface

The EV2500 has two options for the pull-up voltages connected to the communication lines, internal and external. The orientation of the J38 header determines which option is selected.

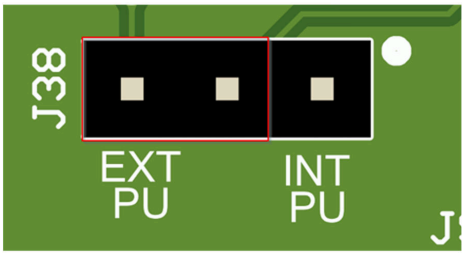


Figure 2-2. External Pull Up Configuration

If the external pull up is configured, any voltage between 1.2V to 5V can be chosen. The voltage needs to be externally supplied by either TP8, the test point connected to EXT PU, or by the connection to the target device at the VVOD pin of each connection. Confirm the header configuration of J28 is correct before supplying the external voltage.

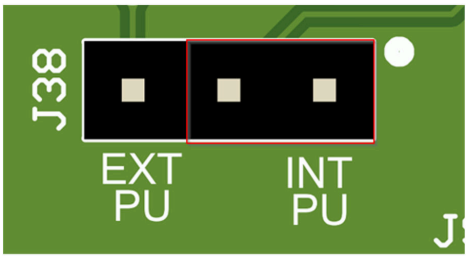


Figure 2-3. Internal Pull-Up Configuration

If the internal pull up option is chosen, the EV2500 pulls the voltage up to 1.2V, 1.8V, 3.3V, or 5V using the LDO system on the board. These options can be changed using commands to the host via bqStudio. If the LDO system is used, confirm that the J38 header is configured correctly for this option.

2.4.2 1MHz Pull-Up Interface

The EV2500 has configurable options that allow for a stronger pull-up resistor when 1MHz communication speed is in use for I^2C or SMBus communication. Jumpers must be placed on the respective jumpers anytime 1MHz communication is used.

On this board, J16 and J17 are for the I^2C pull-up options, J35 and J36 are for the SMBus pull-up options as shown in Figure 2-4.

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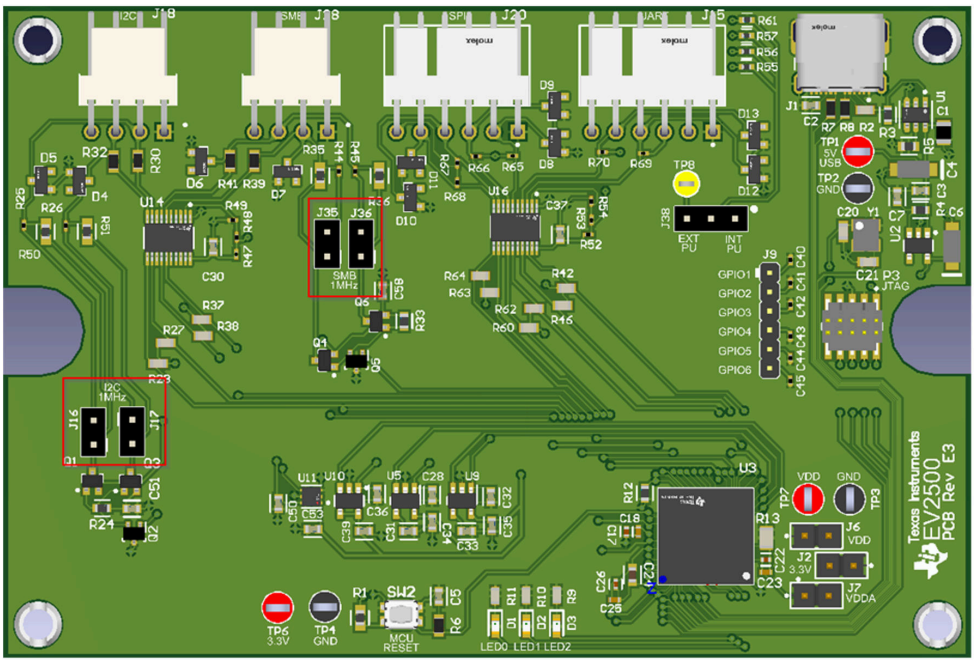


Figure 2-4. SMBus and I2C 1MHz Pull-Up Header Location

2.4.3 MCU Power Headers

Next to the MCU are three headers that allow for the MCU to be properly powered. The J2, J6, and J7 header options should have jumpers connected at all times.

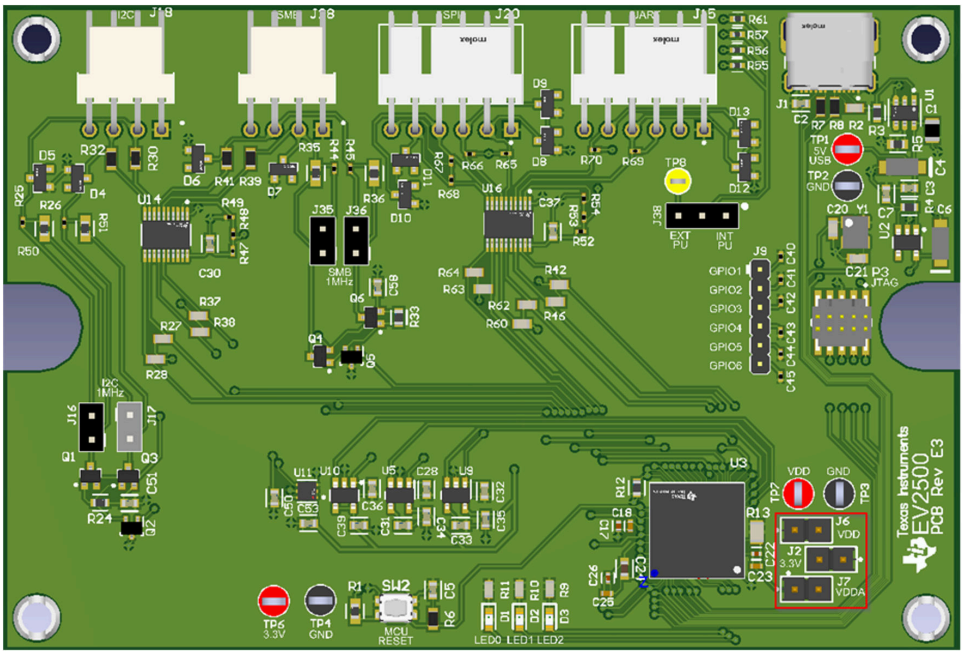


Figure 2-5. MCU Power Header Location

2.5 Push Buttons

The single push button on the board is SW2, which is the reset for the MCU. Pressing this causes the MCU to reset.

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2.6 Interfaces

2.6.1 Overview

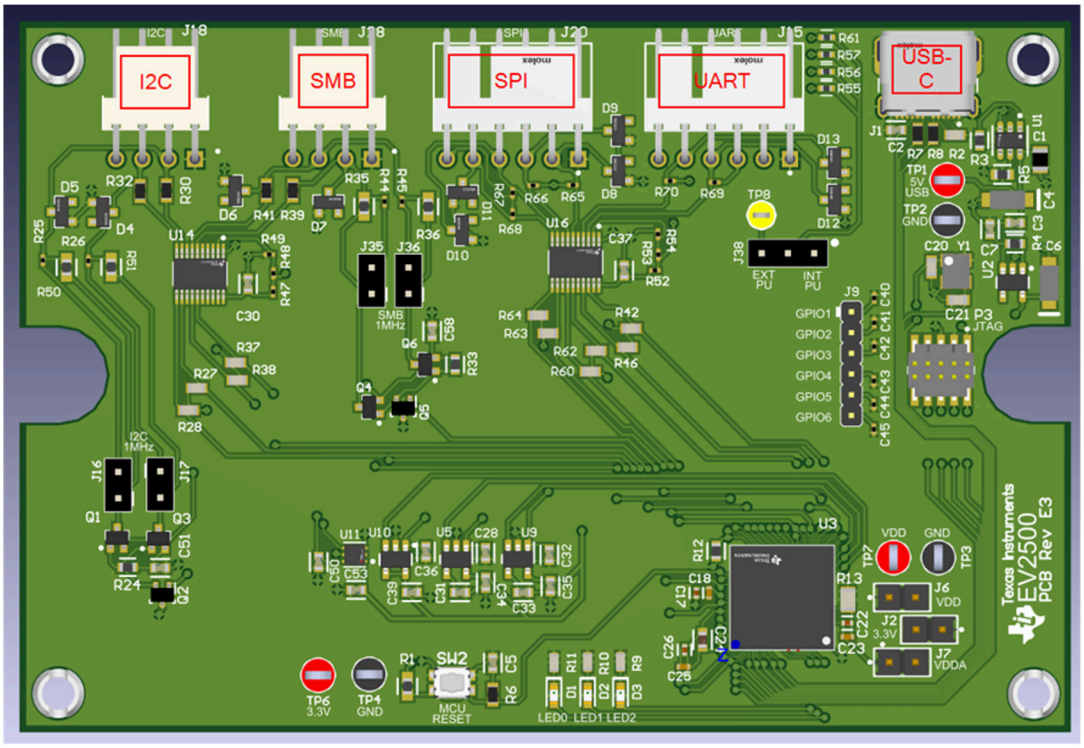


Figure 2-6. EV2500 Interface Connection Overview

2.6.2 I²C Interface

The I²C interface allows a host computer to interact with I²C interfaces, such as a battery monitor device and EEPROM through a 2-wire I²C interface with nodes on an I²C bus. Connect the SCL, SDA, and GND to a target device. If the target is using a voltage not supplied by the EV2500's LDO system, VVOD can be used to externally pull up the lines. Pin reference is located on the back of the board.

Table 2-2. I²C Interface

Pin	Name	Description
1	VSS	Ground for I²C interface.
2	SCL	I²C clock connection. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally. Communication speed can be varied between 100kHz, 400kHz, and 1MHz.
3	SDA	I²C data connection. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally. Communication speed can be varied between 100kHz, 400kHz, and 1MHz.
4	VVOD	Optional Voltage connection. If external PU is chosen, this pin can supply the pull ups. If internal PU is chosen, please ensure no voltage is present on this line.

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2.6.3 SMBus Interface

The SMBus interface allows a host computer to interact with nodes implementing the SMBUS protocol. Connect the SCL, SDA, and GND to a target device. If the target is using a voltage not supplied by the EV2500's LDO system, VVOD can be used to externally pull up the lines. Pin reference is located on the back of the board.

Table 2-3. SMBus Interface

Pin	Name	Description
1	VSS	Ground for SMBus interface.
2	SCL	SMBus clock connection. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally. Communication speed can be varied between 100kHz, 400kHz, and 1MHz.
3	SDA	SMBus data connection. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally. Communication speed can be varied between 100kHz, 400kHz, and 1MHz.
4	VVOD	Optional Voltage connection. If external PU is chosen, this pin can supply the pull ups. If internal PU is chosen, please ensure no voltage is present on this line.

2.6.4 SPI Interface (Future Implementation)

The SPI interface allows a host computer to interact with SPI interfaces, such as a battery monitor device through a 4-wire SPI interface. Connect the VSS, SPICS, SPICLK, SPIDO, and SPIDI to the target device. There are pull ups attached to these lines for signal integrity, confirm the pull up voltage is set correctly. If the target is using a voltage not supplied by the EV2500's LDO system, VVOD can be used to externally pull up the lines.

Table 2-4. SPI Interface

Pin	Name	Description
1	VSS	Ground for SPI interface.
2	SPICS	SPI chip select connection. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally.
3	SPICLK	SPI clock data connection. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally.
4	SPIDO	SPI data out connection. This line contains the information being sent from the EV2500 host. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally.
5	SPIDI	SPI data in connection. This line contains the information being received from the target device. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally.
6	VVOD	Optional Voltage connection. If external PU is chosen, this pin can supply the pull ups. If internal PU is chosen, please ensure no voltage is present on this line.

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2.6.5 UART Interface (Future Implementation)

The UART interface allows a host computer to interact with UART interfaces, such as a battery monitor device through a 2-wire UART interface. Connect the VSS, TXD, and RXD to the target device. There are pull ups attached to these lines for signal integrity, confirm the pull up voltage is set correctly. If the target is using a voltage not supplied by the EV2500's LDO system, VVOD can be used to externally pull up the lines.

Table 2-5. UART Interface

Pin	Name	Description
1	VSS	Ground for UART interface.
2	Open	Open port, can be left floating and disconnected.
3	VVOD	Optional Voltage connection. If external PU is chosen, this pin can supply the pull ups. If internal PU is chosen, please ensure no voltage is present on this line.
4	TXD	UART target package connection line. This line contains the information being sent from the EV2500 host. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally.
5	RXD	UART receive package connection line. This line contains the information being sent from the target device. This line can be pulled up to 1.2V, 1.8V, 3.3V, or 5V by the EV2500, or any voltage between 1.2V to 5V externally.
6	Open	Open port, can be left floating and disconnected.

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3 Software

3.1 Software Description

The EV2500 comes pre-programmed with the necessary firmware to begin testing immediately. Programming instructions for future updates is found in Section 3.5.

3.2 Software Installation

3.3 GUI Installation

Please visit the Battery Management Studio page for installation instructions. https://www.ti.com/tool/BQSTUDIO

3.4 Software Development

3.5 Programming Options

For future implementations, the EV2500 can be programmed using TI's LMFLASHPROGRAMMER. Download this tool before moving to the next step.

First, put the EV2500 into ROM mode. This is done by removing power from the device and placing a jumper across the SCL and GND of the I2C interface as shown in Figure 3-1.

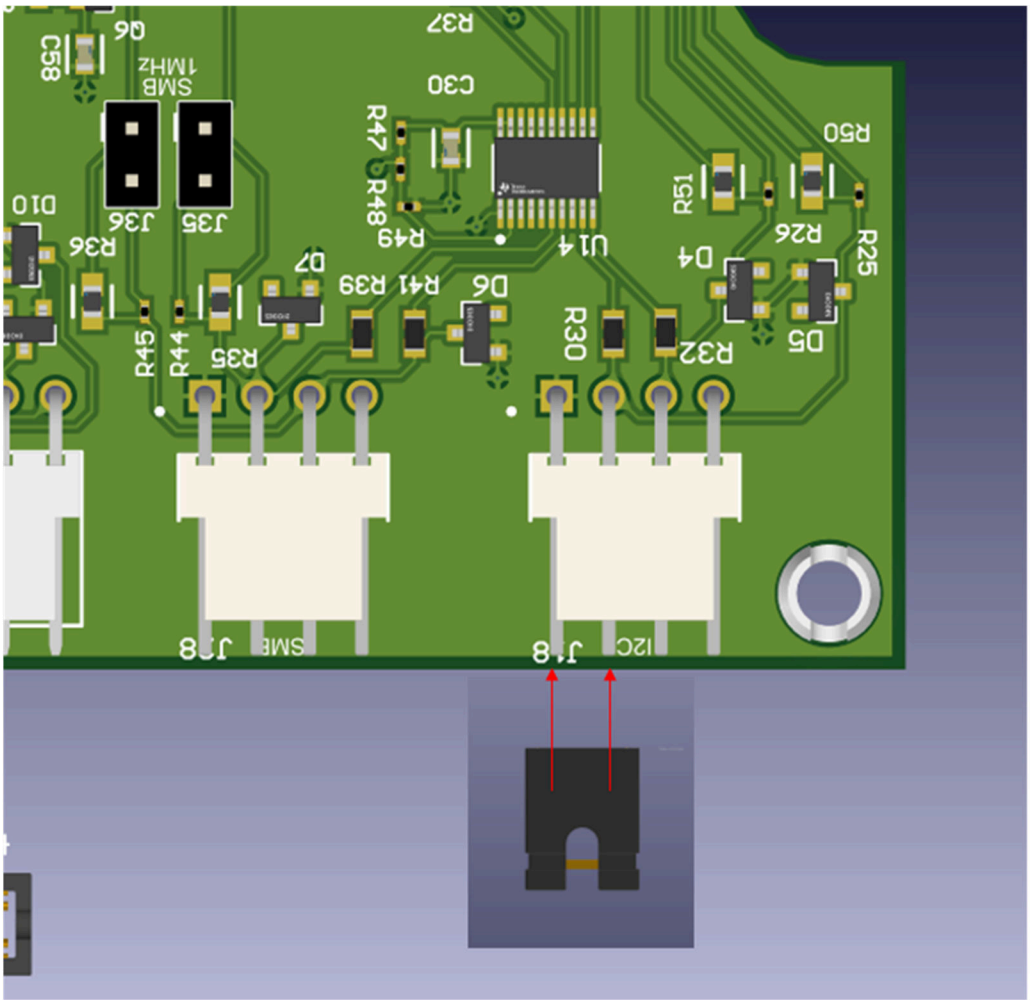


Figure 3-1. Bootloader Jumper Placement

Once the jumper has been placed, connect to the USB-C port to power the EV2500. The user knows the EV2500 is in ROM mode, when the LEDs are off even when powered. If the LEDs are still on, try this process again.

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Open the LMFLASHPROGRAMMER application and navigate to the Configuration Tab. In the Interface dropdown, choose USB DFU and press refresh. If the device is in ROM mode, the “Tiva Device Firmware Update” option is visible. Once this is observed, remove the SCL/GND jumper from the I2C interface as shown in Figure 3-2.

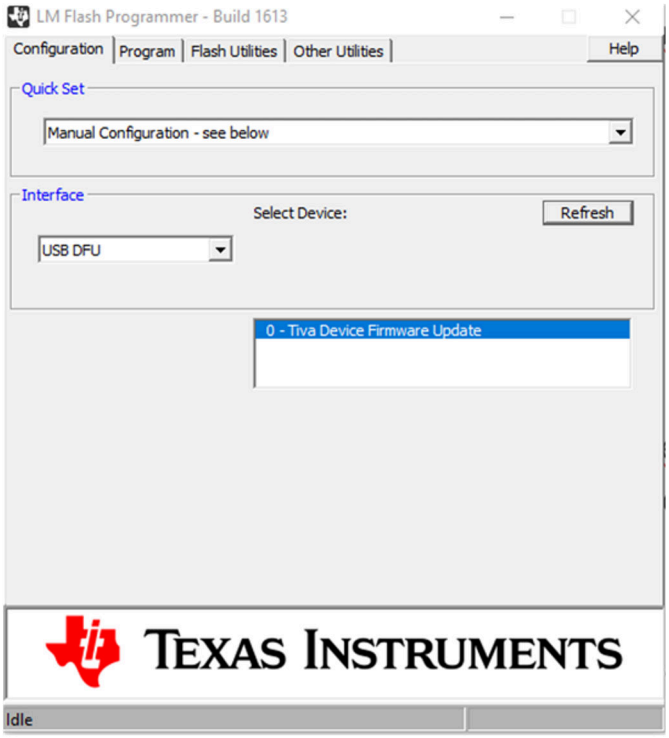


Figure 3-2. LMFLASHPROGRAMMER Configuration

Next, click the Program Tab, choose the .bin file with the updated firmware, and press Program. If this is completed successfully, the LEDs turn back on once programming has been completed.

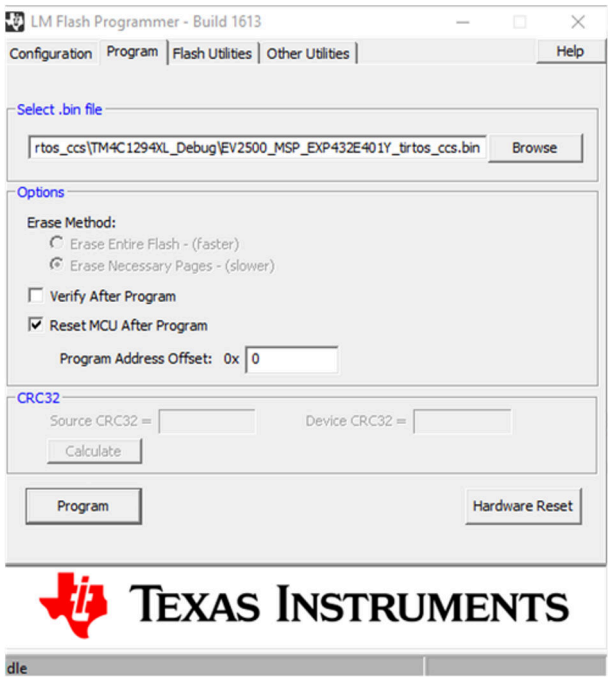


Figure 3-3. LMFLASHPROGRAMMER Programming

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4 Hardware Design Files

4.1 Schematics

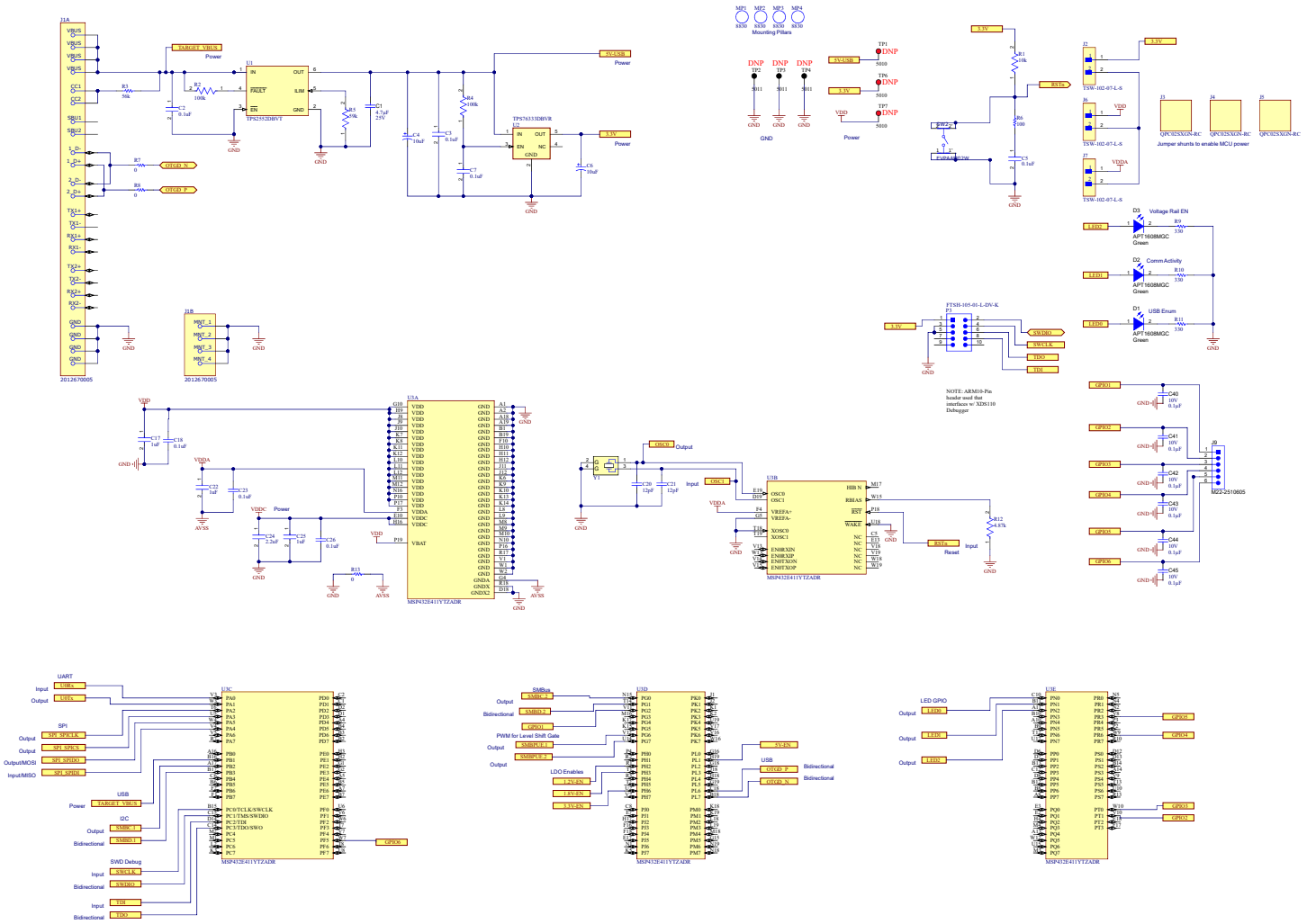


Figure 4-1. BMS061 MCU and Peripherals

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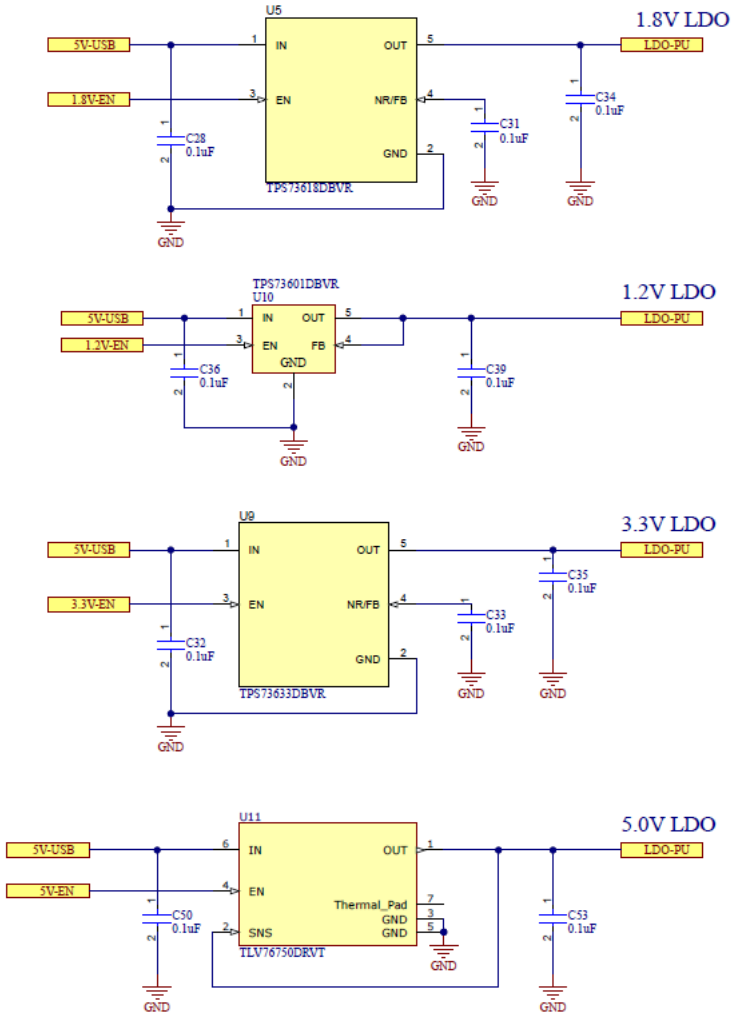


Figure 4-2. BMS061 Bias Supplies

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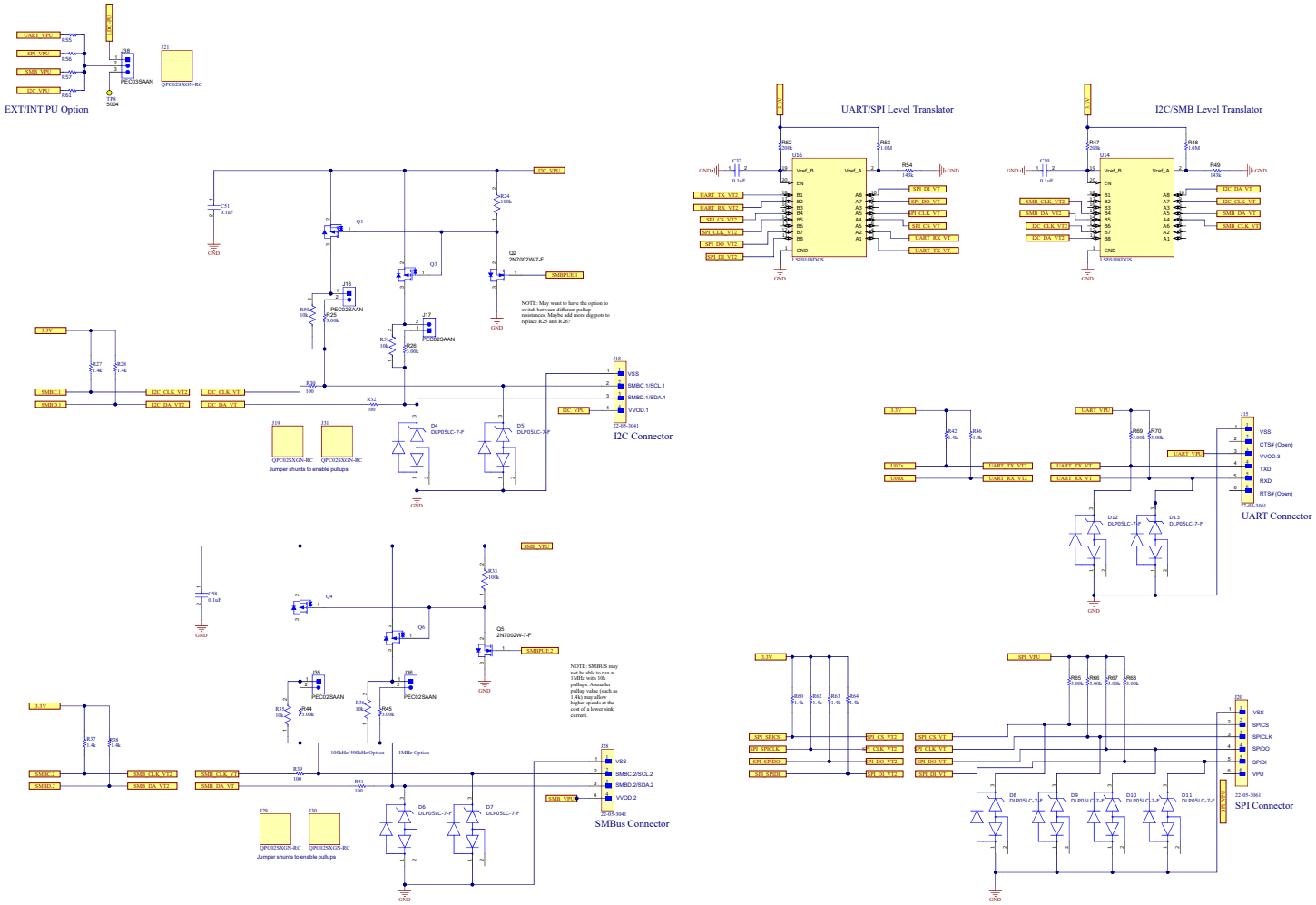


Figure 4-3. BMS061 Serial Bus Interfaces

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4.2 PCB Layouts

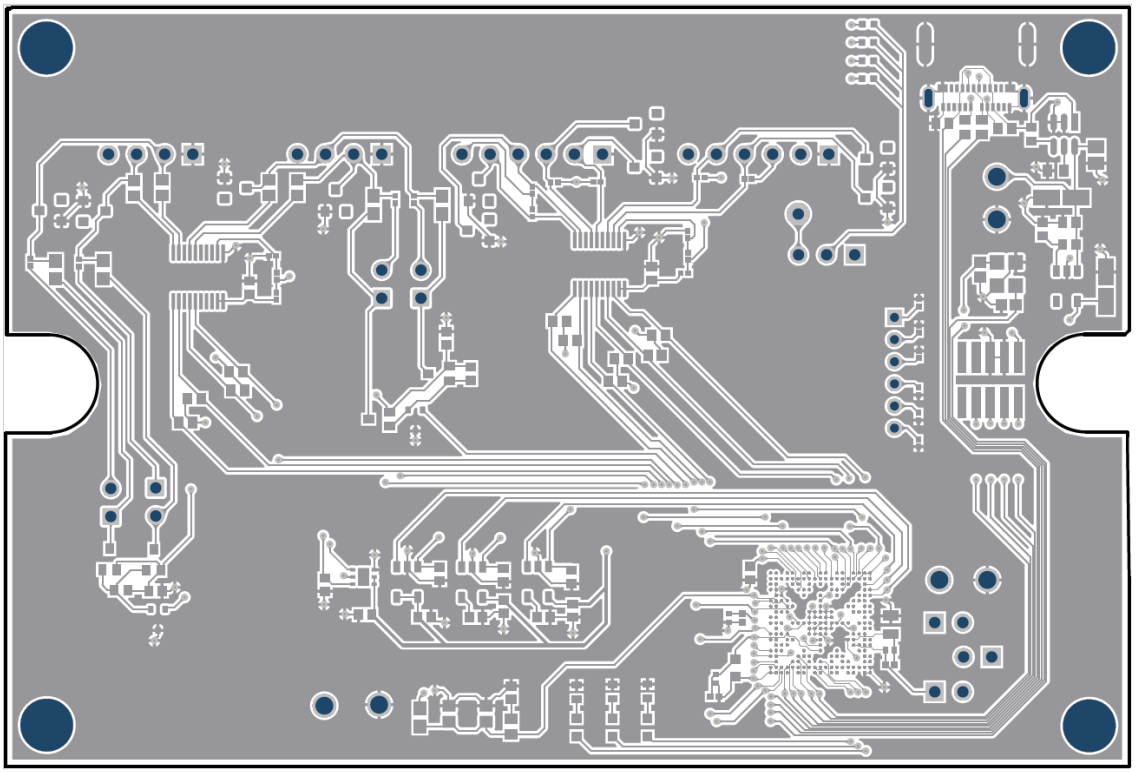


Figure 4-4. EV2500E3 Top Layer

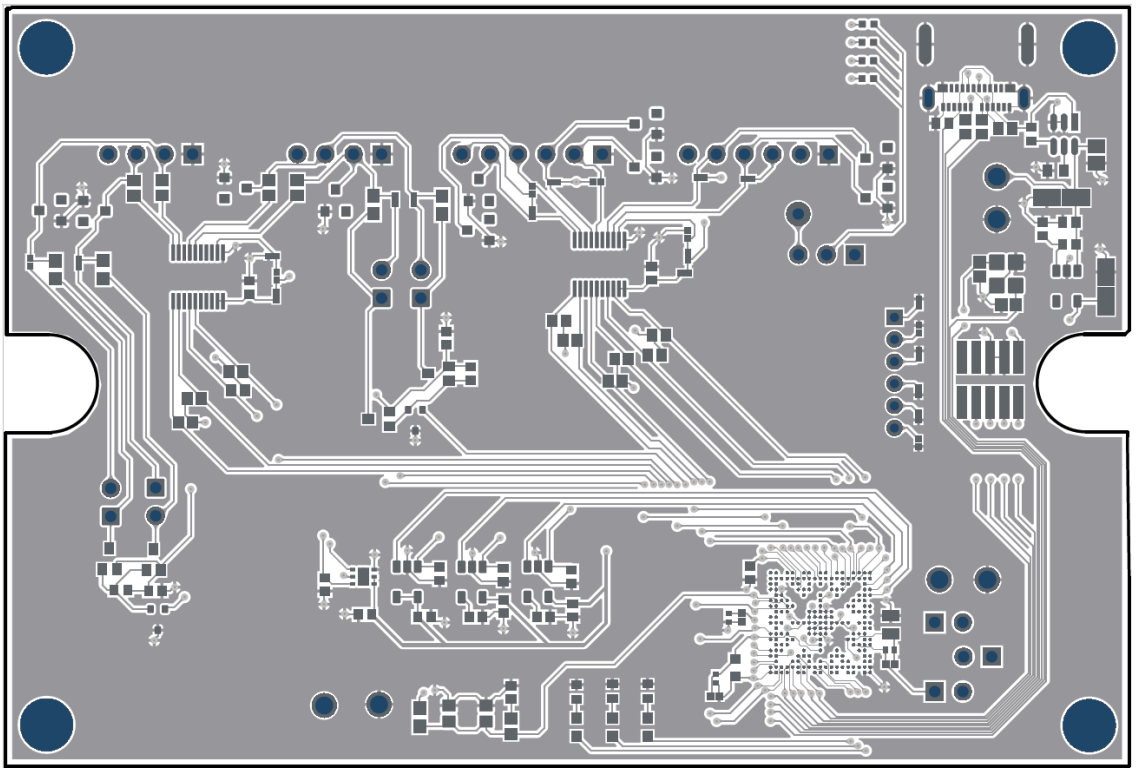


Figure 4-5. EV2500E3 Top Layer Mask

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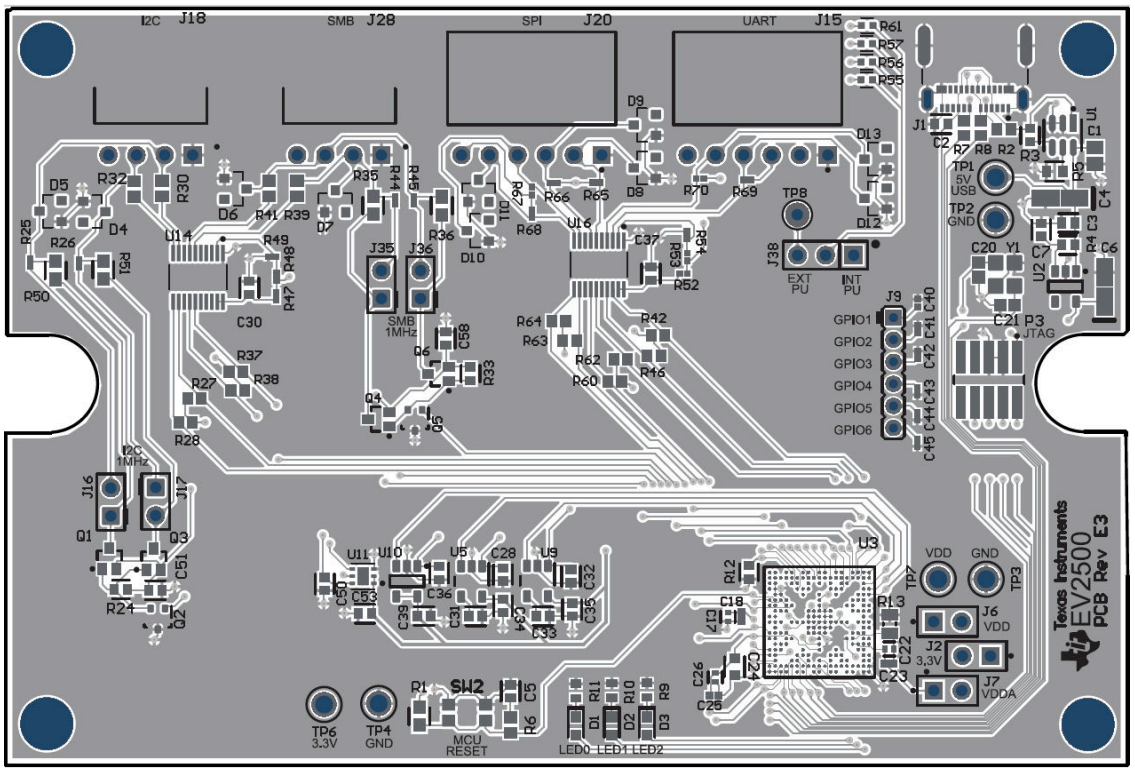


Figure 4-6. EV2500E3 Top View Composite

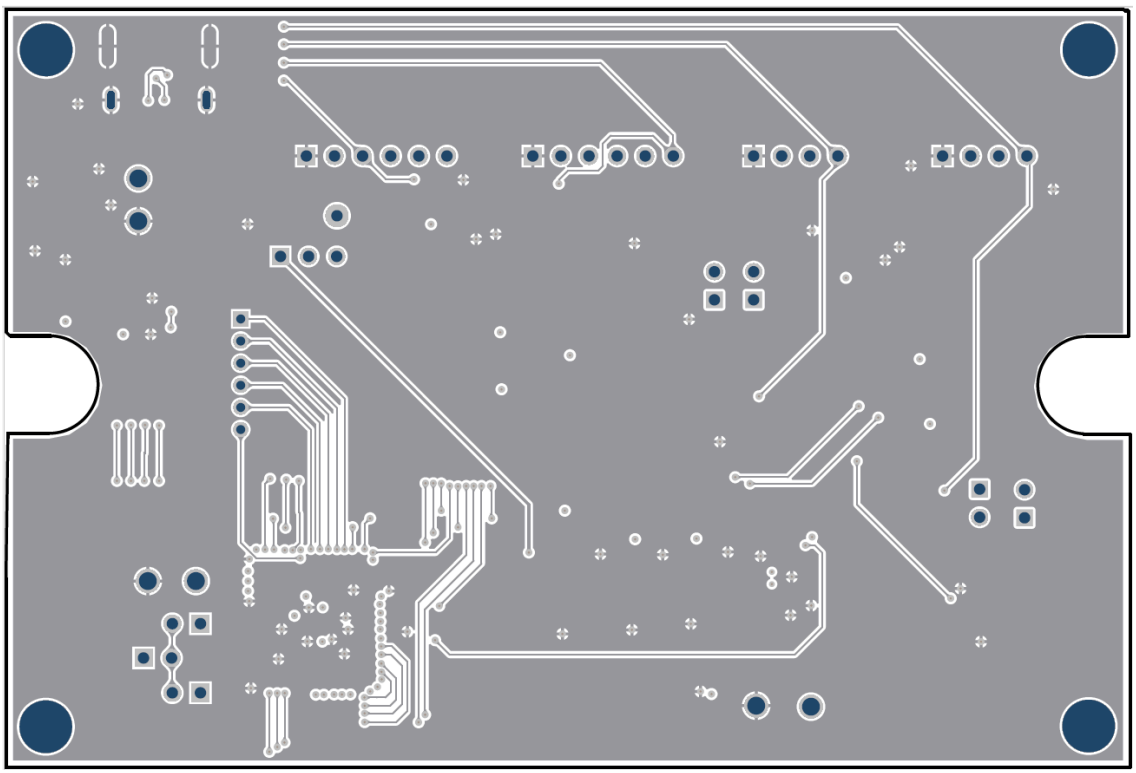


Figure 4-7. EV2500E3 Bottom Layer

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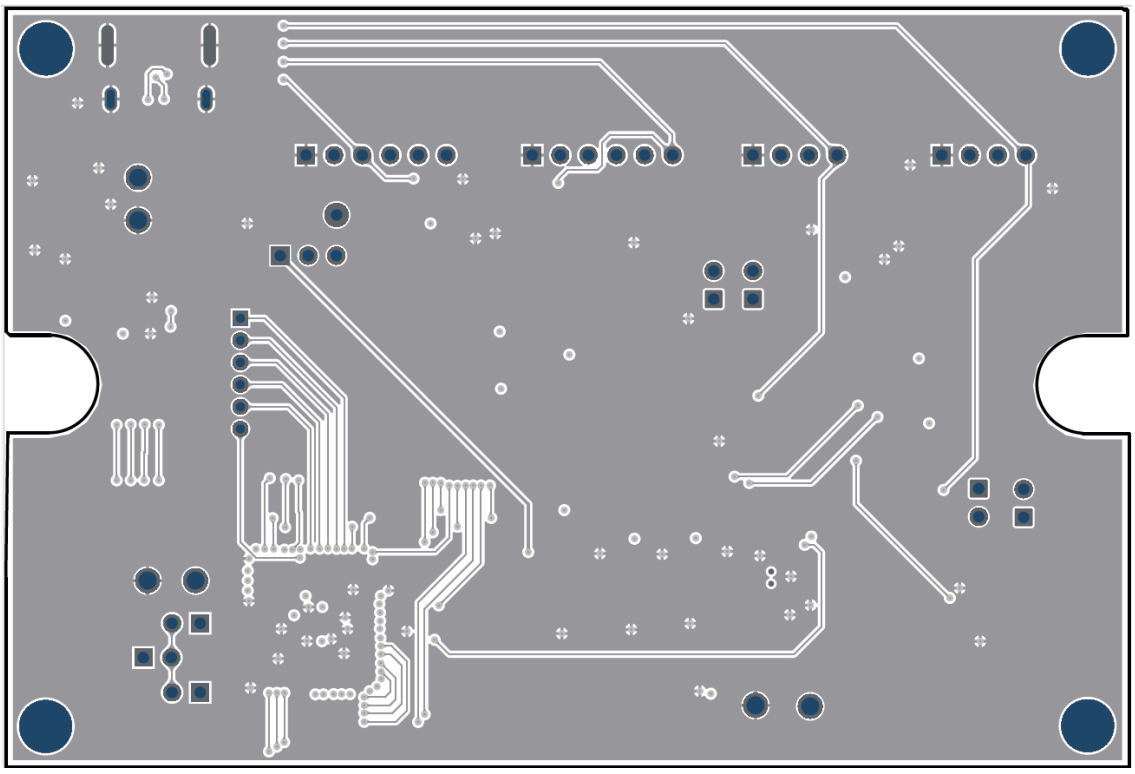


Figure 4-8. EV2500E3 Bottom Layer Mask

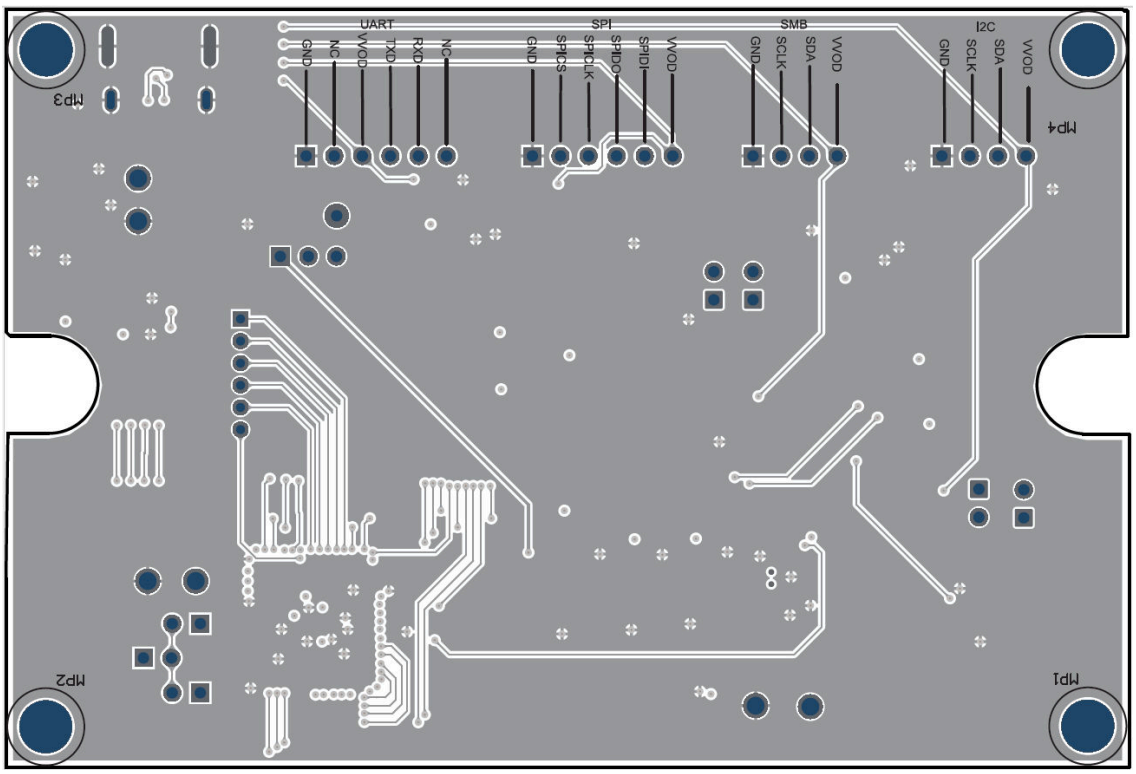


Figure 4-9. EV2500E3 Bottom View Composite

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4.3 Bill of Materials (BOM)

Table 4-1. EV2500 REV E3 Bill of Materials

Item	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
1	C1	1	4.7uF	CGA4J1X7R1E475K125AC	TDK	CAP, CERM, 4.7 µF, 25 V,+/- 10%, X7R, AEC-Q200 Grade 1, 0805	0805
2	C2, C3, C5, C7, C28, C30, C31, C32, C33, C34, C35, C36, C37, C39, C50, C51, C53, C58	18	0.10 µF	C0603C104K5RACTU	KEMET	CAP CER 0.1UF 50V X7R 0603 C0603C104K5RACTU	
3	C4, C6	2		T491A106K010AT	Kemet	Capacitor, Tantalum, 10 uF, +/- 10%, 10 V, -55 to 125 degC, 2-Pin SMD (1206), RoHS, Tape and Reel T491A106K010AT	
4	C17, C22, C25	3		GRM155R70J105KA12D		Chip Multilayer Ceramic Capacitors for General Purpose, 0402, 1.0uF, X7R, 15%, 10%, 6.3V GRM155R70J105KA12D	
5	C18, C23, C26	3		GRM155R71A104KA01D	Murata	Chip Capacitor, 0.1 uF, +/- 10%, 10 V, -55 to 125 degC, 0402 (1005 Metric), RoHS, Tape and Reel GRM155R71A104KA01D	
6	C20, C21	2		VJ0603A120JXACW1BC	Vitramon	VJ0603A120JXACW1BC	
7	C24	1		GRM188Z71C225KE43D		Chip Multilayer Ceramic Capacitors for General Purpose, 0603, 2.2uF, X7R, 15%, 10%, 16V GRM188Z71C225KE43D	
8	C40, C41, C42, C43, C44, C45	6	0.1uF	GRM033R61A104KE84D	MuRata	CAP, CERM, 0.1 µF, 10 V,+/- 10%, X5R, 0201	0201
9	D1, D2, D3	3	Green	APT1608MGC	Kingbright	LED, Green, SMD	0603(1608)
10	D4, D5, D6, D7, D8, D9, D10, D11, D12, D13	10		DLP05LC-7-F	Diodes Inc	11V Clamp 17A (8/20µs) Ipp Tvs Diode Surface Mount SOT-23-3	SOT-23-3
11	J1	1		2012670005	Molex	USB-C (USB TYPE-C) USB 3.2 Gen 2 (USB 3.1 Gen 2, Superspeed + (USB 3.1)) Receptacle Connector 24 Position Surface Mount, Right Angle; Through Hole	CONN_USB_9MM39_8MM21
12	J2, J6, J7	3		TSW-102-07-L-S		CONN HEADER VERT 2POS 2.54MM	
13	J3, J4, J5, J19, J21, J29, J30, J31	8		QPC02SXGN-RC	Sullins	CONN JUMPER SHORTING .100" GOLD	

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Table 4-1. EV2500 REV E3 Bill of Materials (continued)

Item	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
14	J9	1		M22-2510605	Harwin	Header, 2mm, 6x1, Gold, TH	Header, 2mm, 6x1, TH
15	J15, J20	2		22053061		CONN HEADER R/A 6POS 2.54MM	
16	J16, J17, J35, J36	4		PEC02SAAN	Sullins Connector Solutions	Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin
17	J18, J28	2		22053041	Molex	CONN HEADER R/A 4POS 2.54MM	
18	J38	1		PEC03SAAN	Sullins Connector Solutions	Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin
19	MP1, MP2, MP3, MP4	4		36-8830-ND	Keystone Electronics	BRD SPT SNAP FIT SCREW MNT 3/16	
20	P3	1		FTSH-105-01-L-DV-K	Samtec	Male Header, Pitch 1.27 mm, 2 x 5 Position, Height 6.25 mm	
21	Q1, Q3, Q4, Q6	4		DMG1013UW-7	Diodes Inc	P-Channel Enhancement Mode MOSFET, 310 mW, 20 V, -55 to 150 degC, 3-Pin SOT-323, RoHS, Tape and Reel	
22	Q2, Q5	2	60V	2N7002W-7-F	Diodes Inc.	MOSFET, N-CH, 60 V, 0.115 A, SOT-323	SOT-323
23	R1, R35, R36, R50, R51	5		CRCW060310K0FKEC		RES Thick Film, 10kΩ, 1%, 0.1W, 100ppm/°C, 0603 CRCW060310K0FKEC	
24	R2, R4, R24, R33	4		CRCW0603100KFKEA		RES Thick Film, 100kΩ, 1%, 0.1W, 100ppm/°C, 0603 CRCW0603100KFKEA	
25	R3	1		CRCW060356K0FKEA	Vishay Dale	CRCW060356K0FKEA	
26	R5	1		CRCW060359K0FKEA		RES Thick Film, 59kΩ, 1%, 0.1W, 100ppm/°C, 0603 CRCW060359K0FKEA	
27	R6, R30, R32, R39, R41	5		CRCW0603100RFKEA	Vishay Semiconductor	Chip Resistor, 100 Ohm, +/- 1%, 100 mW,-55 to 155 degC, 0603 (1608 Metric), RoHS, Tape and Reel CRCW0603100RFKEA	0603
28	R7, R8	2		CRCW06030000Z0EA	Vishay Semiconductor	Chip Resistor, 0 Ohm, Jumper, 100 mW, -55 to 155 degC, 0603 (1608 Metric), RoHS, Tape and Reel CRCW06030000Z0EA	0603
29	R9, R10, R11	3		RC0603JR-07330RL	Yageo	Chip Resistor, 330 Ohm, +/- 5%, 50 V, -55 to 155 degC, 0603 (1608 Metric), -40 to 155 degC, RoHS, Tape and Reel RC0603JR-07330RL	

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Table 4-1. EV2500 REV E3 Bill of Materials (continued)

Item	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
30	R12	1		CRCW06034K87FKEA		RES Thick Film, 4.87kΩ, 1%, 0.1W, 100ppm/°C, 0603 CRCW06034K87FKEA	
31	R13	1		CRCW08050000Z0EA	Vishay Dale	CRCW08050000Z0EA	
32	R25, R26, R44, R45, R65, R66, R67, R68, R69, R70	10	3.00k	RC0201FR-7D3KL	Yageo America	RES, 3.00 k, 1%, 0.05 W, 0201	0201
33	R27, R28, R37, R38, R42, R46, R60, R62, R63, R64	10		CRCW06031K40FKEA	Vishay Dale	CRCW06031K40FKEA	
34	R47, R52	2	200k	RC0201DR-07200KL	Yageo America	RES, 200 k, 0.5%, 0.05 W, 0201	0201
35	R48, R53	2	1.0Meg	RC0201JR-071ML	Yageo America	RES, 1.0 M, 5%, 0.05 W, 0201	0201
36	R49, R54	2	143k	RC0201FR-07143KL	Yageo America	RES, 143 k, 1%, 0.05 W, 0201	0201
37	R55, R56, R57, R61	4	0	CRCW04020000Z0EDHP	Vishay Dale	RES Thick Film, 0Ω, 0.2W, 0402	0402
38	SW2	1		EVPAAM02W	Panasonic	SWITCH TACTILE SPST-NO 0.02A 15V	SMT_SW_3MM5_2MM9
39	TP1, TP6, TP7	3		36-5010-ND	Keystone	Test Point, Red, Through Hole, RoHS, Bulk	5010
40	TP2, TP3, TP4	3		36-5011-ND	Keystone	Test Point, Black, Through Hole, RoHS, Bulk	5011
41	TP8	1		5004	Keystone Electronics	Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint
42	U1	1		TPS2552DBVT		IC PWR SWITCH N-CHAN 1:1 SOT23-6	
43	U2	1		TPS76333DBVR	Texas Instruments	Single Output LDO, 150 mA, Fixed 3.3 V Output, 2.7 to 10 V Input, with Low IQ, 5-pin SOT-23 (DBV), -40 to 125 degC, Green (RoHS & no Sb/Br)	DBV0005A
44	U3	1		MSP432E411YTZADR		IC MCU 32BIT 1MB FLASH 212NFBGA	
45	U5	1		TPS73618DBVR	Texas Instruments	Single Output LDO, 400mA, Adj.(1.2 to 5.5V), Cap free, Low Noise, Reverse Current Protection, DBV0005A (SOT-23-5)	DBV0005A
46	U9	1		TPS73633DBVR	Texas Instruments	Single Output Low Noise LDO, 400 mA, Fixed 3.3 V Output, 1.7 to 5.5 V Input, with Reverse Current Protection, 5-pin SOT-23 (DBV), -40 to 85 degC, Green (RoHS & no Sb/Br)	DBV0005A

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Table 4-1. EV2500 REV E3 Bill of Materials (continued)

Item	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
47	U10	1		TPS73601DBVR	Texas Instruments	Single Output Low Noise LDO, 400 mA, Adjustable 1.2 to 5.5 V Output, 1.7 to 5.5 V Input, with Reverse Current Protection, 5-pin SOT-23 (DBV), -40 to 85 degC, Green (RoHS & no Sb/Br)	DBV0005A
48	U11	1		TLV76750DRVT	Texas Instruments	Linear Voltage Regulator IC 1 Output 1A 6-WSON (2x2)	WSON6
49	U14, U16	2		LSF0108DGS	Texas Instruments	Automotive 8-Channel Multi-Voltage Level Translator	VSSOP20
50	Y1	1		603-25-261	Fox Electronics	Crystal, 25 MHz, 20 ppm, 8 pF, SMD	Body 3.2x2.5mm
51		1		2177961042	Molex	4 Position Cable Assembly Rectangular Socket to Socket 0.984' (300.00mm, 11.81")	

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5 Additional Information

5.1 Trademarks

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6 Related Documentation

- Texas Instruments, BQSTUDIO
- Texas Instruments, LMFLASHPROGRAMMER

7 Revision History

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

Changes from Revision * (April 2025) to Revision A (July 2026)	Page
• Updated Figure 4-1 and Figure 4-3 to increase readability	11

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1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

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   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

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