

EVM User's Guide: TMUXS7614DEVM

TMUXS7614D Evaluation Module



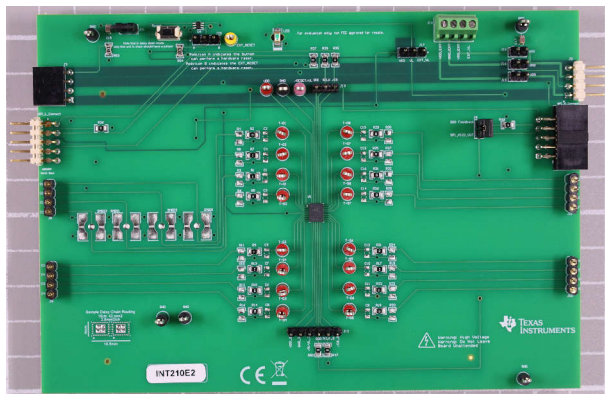
Description

The TMUXS7614DEVM is used to evaluate the performance of the TMUXS7614D. The evaluation module (EVM) comes with the TMUXS7614D device soldered on. The EVM allows for engineers to easily evaluate the TMUXS7614D for applications, such as test and measurement. The TMUXS7614DEVM connects to a [USB2ANY](#) controller (ordered separately on [ti.com](#)) through the SPI_L_Connect header. Users can choose to use an SPI with this header if desired. Headers are also provided for each of the source and drain pins. Multiple terminals provide power to the device with an option for the user

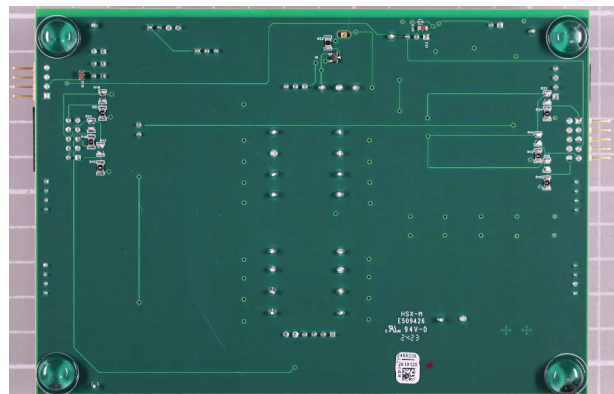
to provide a defined digital logic supply voltage. The digital logic supply voltage can be supplied from the USB2ANY as well.

Features

- TMUXS7614D pre-soldered on board
- 16 test points on I/Os
- Four SMB connectors
- LED indicator for VL supply
- Reset button
- External PC control in tandem with TI evaluation software
- SPI GUI



TMUXS7614DEVM (Top View)



TMUXS7614DEVM (Bottom View)

1 Evaluation Module Overview

1.1 Introduction

This user's guide describes the characteristics, operation, and recommended use cases of the TMUXS7614DEVM evaluation module (EVM) and the intended use. This board allows for the quick prototyping and characterization of TI's TMUXS7614D multiplexers in a 30-pin ZEM package. This EVM allows for evaluation of both the signal path and operating modes of the TMUXS7614D. Multiple boards can be connected to evaluate daisy chain operation. This document also includes schematics, printed circuit board (PCB) layouts, and a complete bill of materials (BOM).

1.2 Kit Contents

The EVM kit includes the following :

- TMUXS7614DEVM board

1.3 Specification

The EVM has two 10-pin headers denoted *SPI_L_Connect* and *SPI_R_Connect* for use with a SPI controller, such as USB2ANY available on ti.com. There are two more 4 pin headers denoted *J2* and *J3* to allow for connecting power to the device. All four of these headers are configured such that users can connect two or more EVMs in tandem for daisy chain mode. There is a reset button denoted *Reset* that allows for a manually hardware reset. The EVM has test points on each I/O for a total of sixteen total test points to support testing the TMUXS7614D.

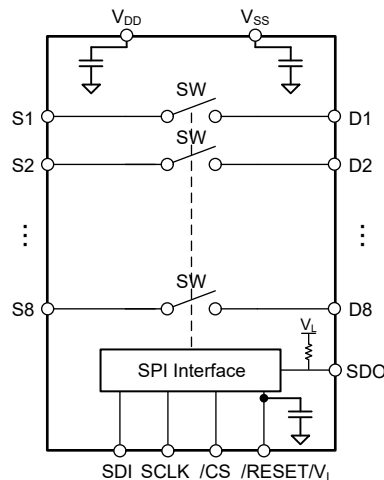


Figure 1-1. TMUXS7614D Block Diagram

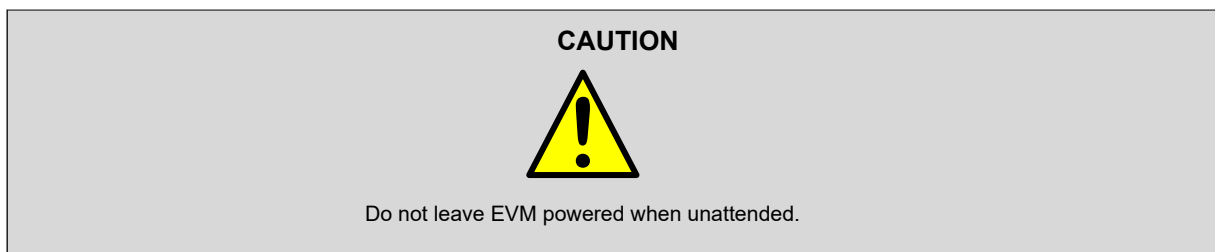
1.4 Device Information

The TMUXS7614D is a complementary metal-oxide semiconductor (CMOS) switch device with eight independently selectable 1:1, single-pole, single-throw (SPST) switch channels. The device works with a single supply (4.5V to 42V), dual supplies (± 4.5 V to ± 25 V), or asymmetric supplies (such as $V_{DD} = 37.5$ V, $V_{SS} = -12$ V). The TMUXS7614D supports bidirectional analog and digital signals on the source (S_x) and drain (D_x) pins ranging from V_{SS} to V_{DD} . The switches of the TMUXS7614D are controlled with a serial peripheral interface (SPI). The SPI interface has many error detection features, such as CRC, invalid read/write, and clock count error detection. The SPI also supports daisy chain mode. Coupled with the flow through routing of the SPI pins, this allows for increased channel density in the system. The TMUXS7614D is a part of the precision switches and multiplexers family of devices and have very low on and off leakage currents allowing them to be used in high precision measurement applications.

2 Hardware

2.1 Power Requirements

The TMUXS7614DEVM requires a single supply (4.5V to 42V), dual supplies ($\pm 4.5V$ to $\pm 25V$), or asymmetric supplies (such as $VDD = 3.75V$, $VSS = -12V$) provided either through the J3/J2 terminals or J14 terminal. The VDD supply can also be provided directly to the VDD test point in the center of the board. The green LED acts as a power indicator for the digital supply VL. On revision 1 boards, this LED can only be powered by the 3.3V supply from the USB2ANY. On revision 2 boards, the LED can be powered by either the USB2ANY interface or an external source via the EXT_VL path.



2.2 Header and Jumper Information

The TMUXS7614DEVM has various headers that provide various points of functionality on the board. From left to right:

1. J8, J9, J10 and J11 provide a means of accessing signal paths for S1-S8 and D1-D8.
2. J20 allows users to place a jumper to choose whether hardware reset is performed by the reset button (position A) or by an outside source (position B). If position B is chosen, then the device resets when a rising pulse is applied to EXT_RESET.
3. J13 provides an interface to tap into the SDL, SCLK and /CS pins.
4. J17 allows you to place a jumper to choose whether VL is driven by the USB2ANY (VIO) or an external source (EXT_VL)
5. J6 allows users to place a jumper to control whether the SPI_PICO_Out signal path propagates onto another EVM or device. No jumper on J6 allows for read back via the SDO feedback signal path.
6. Place a jumper across J15, J16 and J18 to utilize the J14 power block.
7. J12 provides a block to interface with the VDD_D, GND_D, /RESET/VL_D, SDO, SCLK_D and /CS_D pins.

2.3 Push Buttons

The TMUXS7614D EVM provides a physical hardware reset button labeled *Reset*. Note that Revision 1 of the board only allows for the reset button to be utilized in a single EVM mode. Revision 2 allows for use of this hardware reset button in daisy chain mode.

2.4 Test Points

The board has a total of 27 test points. 4 SMB, 4 GND, 1 /RESET/VL, 1 VDD, 1 EXT_RESET and 16 I/O.

Test Point ID	Description	Signal
D1, D2, S1, S2	Surface Mount SMB	D1, D2, S1, S2
GND x4	Black	Ground
/RESET/VL	Purple	/RESET/VL
VDD	Red	VDD
EXT_RESET	Yellow	EXT_RESET
T-Sx/T-Dx x16	Red	S1-S8/D1-D8

3 Software

3.1 GUI Software Installation

1. *Software Download* - live software from dev.ti.com. The live software currently works on Chrome®, Firefox®, and Safari® browsers. Internet Explorer® is not supported. Users can access the live version through the link a Texas Instruments' representative provides.
2. Click on the application icon within the gallery to launch the software. Click on the prompt to install the TI Cloud Agent Bridge browser plug-in.
3. *Offline Software* - users can access the latest version of the offline software by navigating to the live version as noted previously. Look for the download icon and download both the application and runtime for the operating system as shown in [Figure 3-1](#).
4. To be able to use the GUI properly, a USB2ANY needs to be connected to the computer by the USB cable and connected to the EVM via the 10-pin cable. For more information about the USB2ANY, see the [USB2ANY Interface Adapter User's Guide](#).

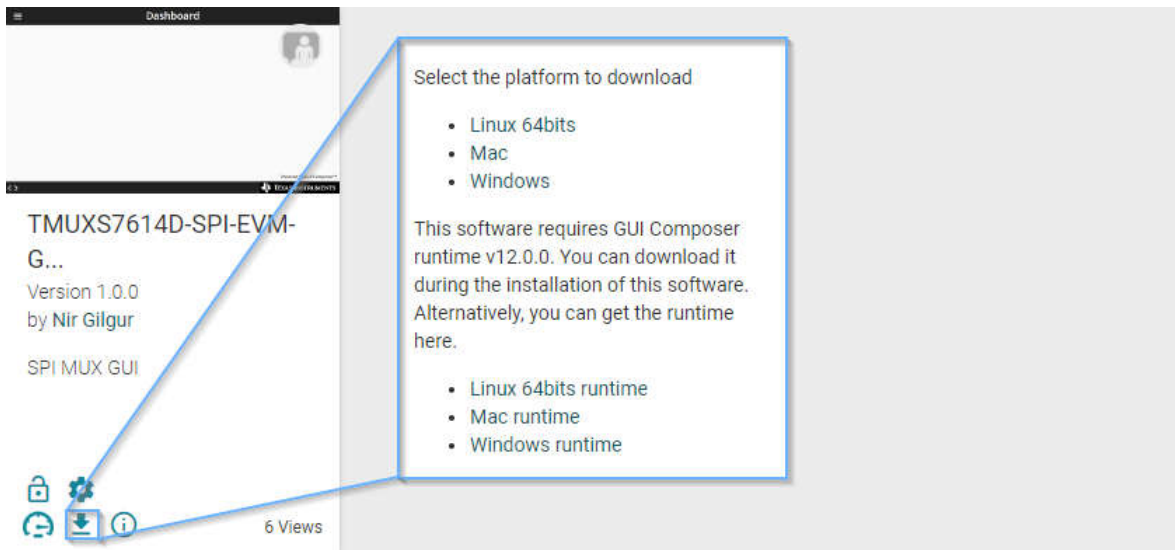
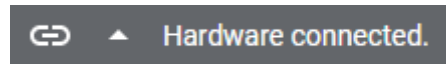


Figure 3-1. Download Icon for TMUX7614D-SPI-EVM GUI

3.2 GUI Software Quick Start

1. *Home Tab*
 - a. The *Home* tab is displayed when launching the hardware software. Make sure the USB2ANY is connected to the computer and connected with the notch down to the EVM before using the GUI. If there is a successful connection, then *Hardware connected* is shown at the bottom left corner of the GUI.



- b. The *Home* tab includes the SPI signal controls using eight toggle switches to control each channel individually. To send a SPI signal to close or open the switches, click on the toggle switch to turn on or off the channels.
- c. Address mode turns on automatically when a switch is toggled. This mode can also turn on when the checkbox for Address mode is selected. Please note, when enabling Address mode by clicking on the checkbox, the first switch closes.
- d. The *Home* tab also shows the error detection flags and features for the GUI, but are currently not operational and will be implemented in a future revision.
- e. From the *Home* tab, the user can go into *Daisy Chain* and *Registers* tabs. The *Info*, *Setup*, and *Data* tabs are currently not operational and will be implemented in a future revision.

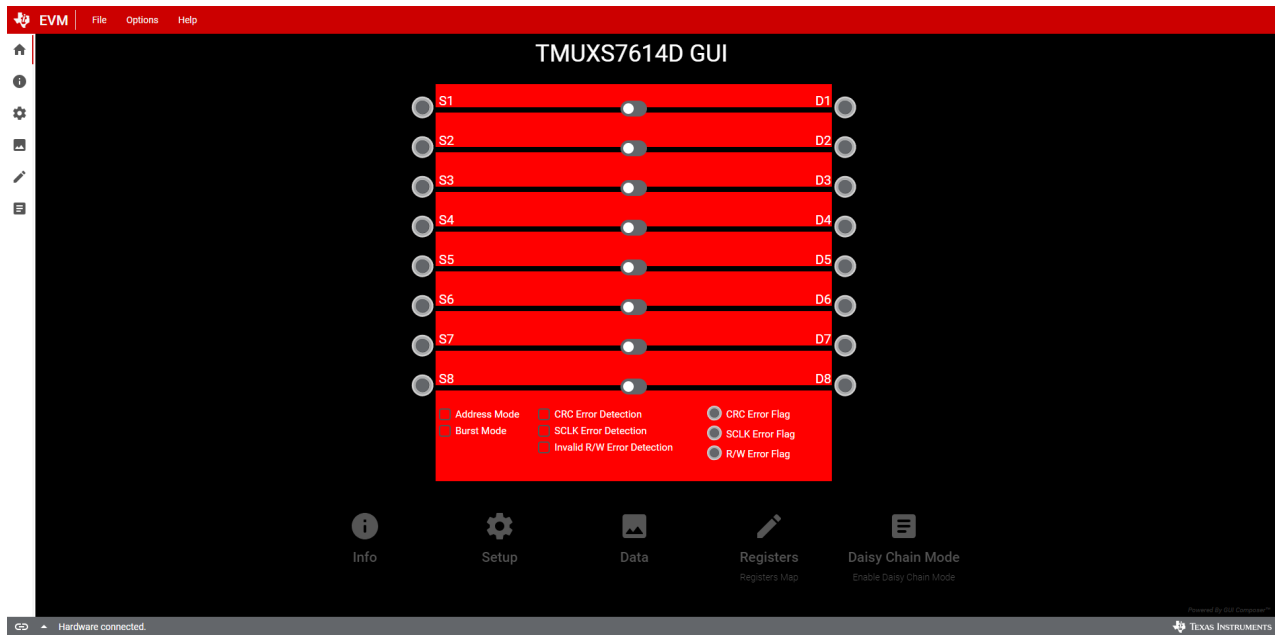


Figure 3-2. TMUXS7614D-SPI-EVM GUI Home Tab

2. *Daisy Chain Mode Tab*

- a. *Daisy Chain Mode* tab can be accessed from the *Home* tab, by clicking on the *Daisy Chain Mode* button.
- b. When opening the *Daisy Chain Mode* tab, the **Enable Daisy Chain** button is displayed, and when pressed, sends a 0x2500 signal to enable daisy chain mode.
- c. The select bar can select a number of devices to control on the daisy chain.
- d. To send signals to the devices on the daisy chain, click on the checkboxes correlated to the switch of the device.

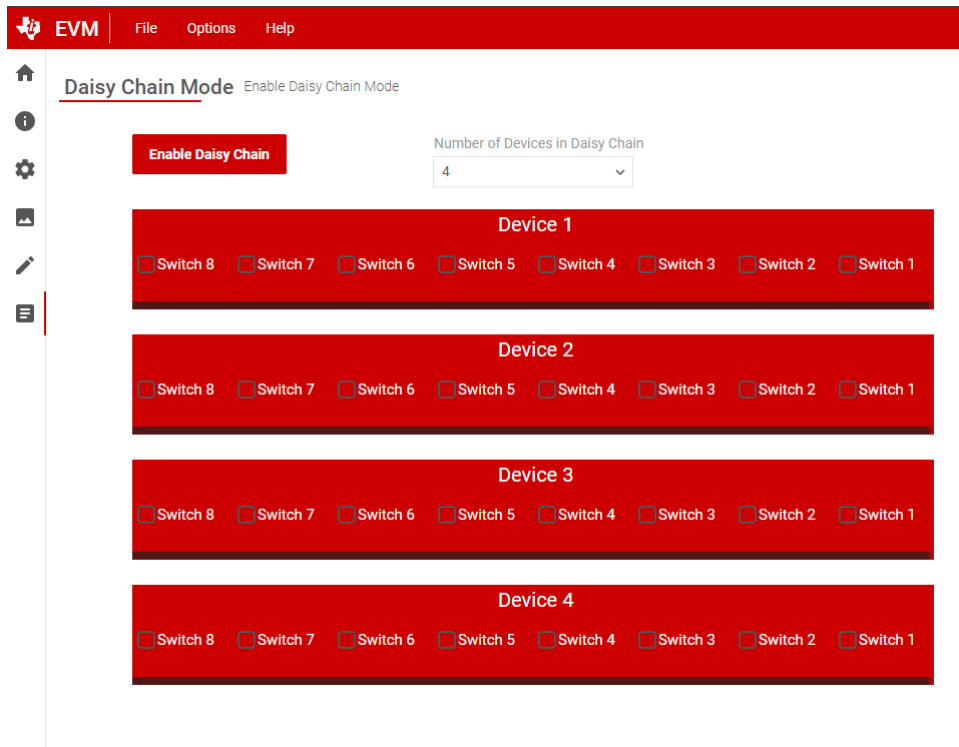


Figure 3-3. TMUXS7614D-SPI-EVM GUI Daisy Chain Mode Tab

3. *Registers Map Tab*

- Register Map* tab can be accessed from the *Home* tab, by clicking on the *Registers* button.
- The registers values are shown, with descriptions for what each bit is correlated to, in the *Field View* of the GUI.
- The *Register Map* tab allows the user to change autoread speed or completely disable. There is also an option to disable autowrite.
- When autoread and autowrite are disabled, the user has to press those buttons manually when users want to either write or read.

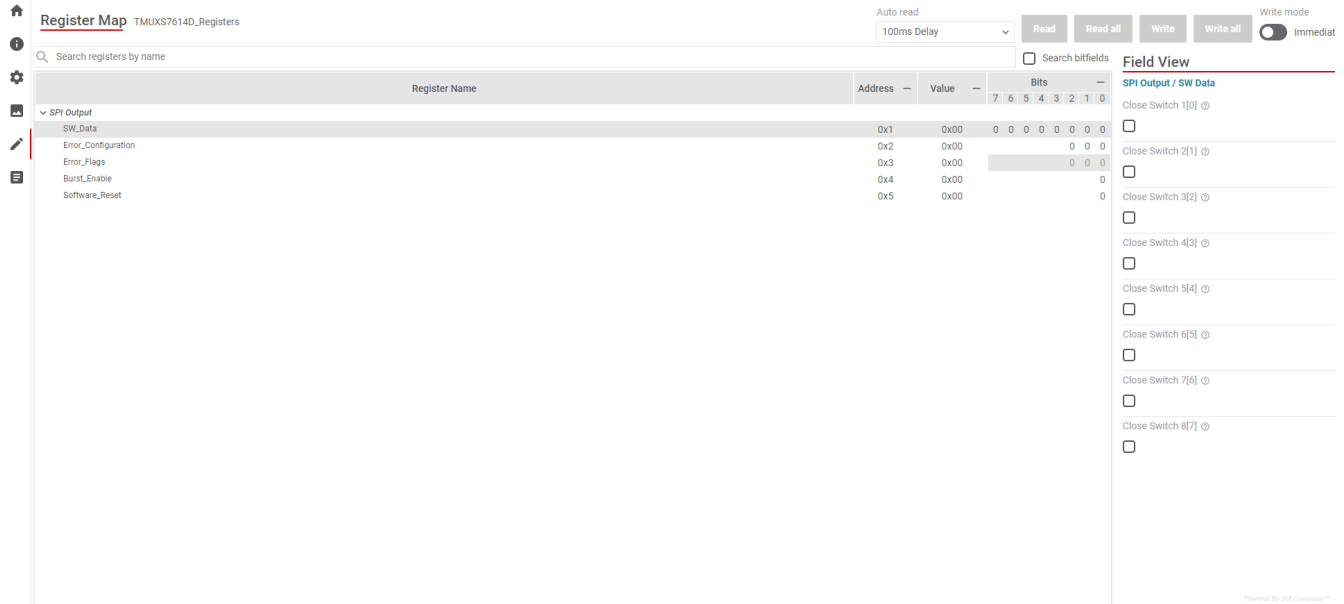
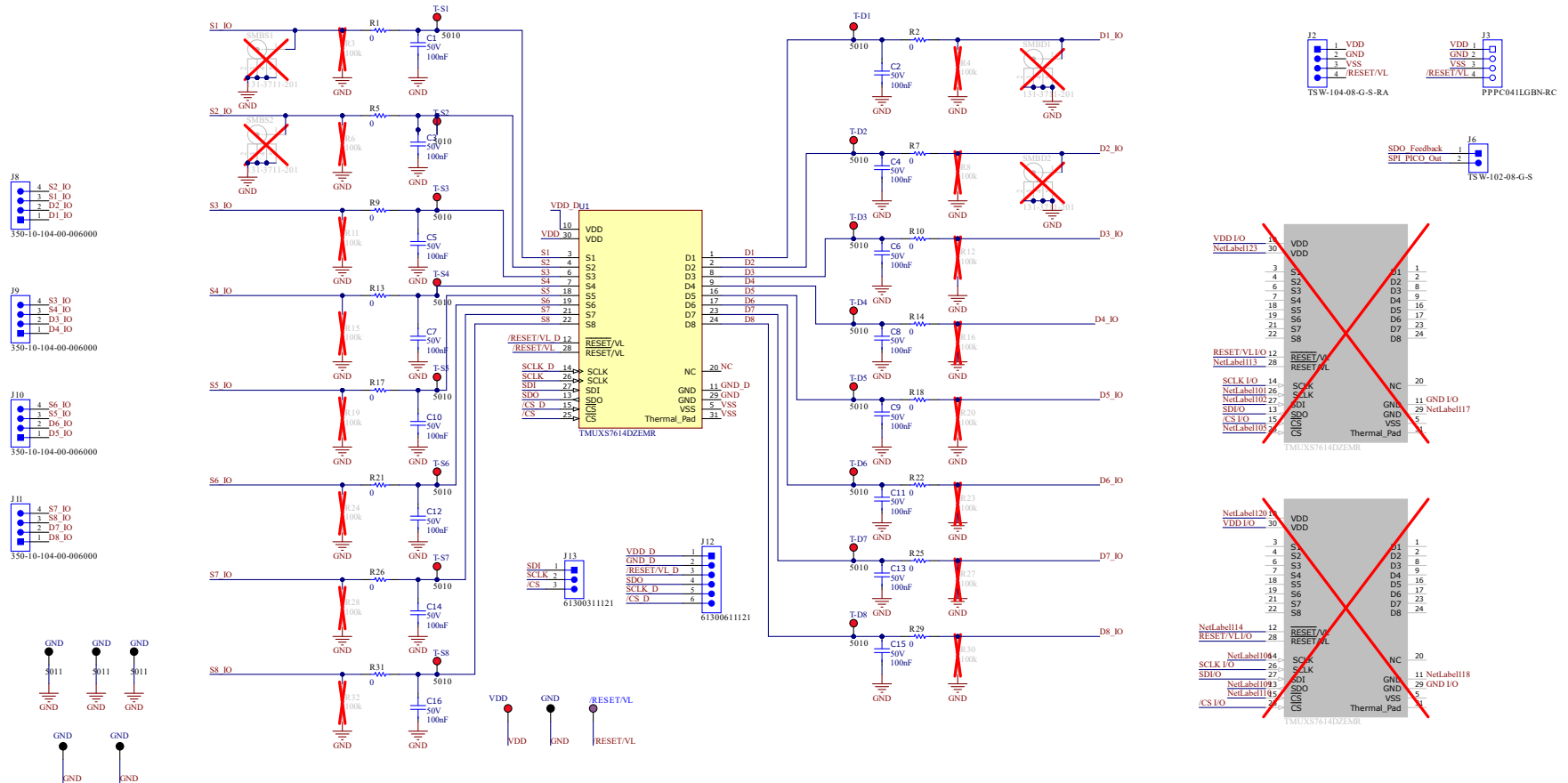
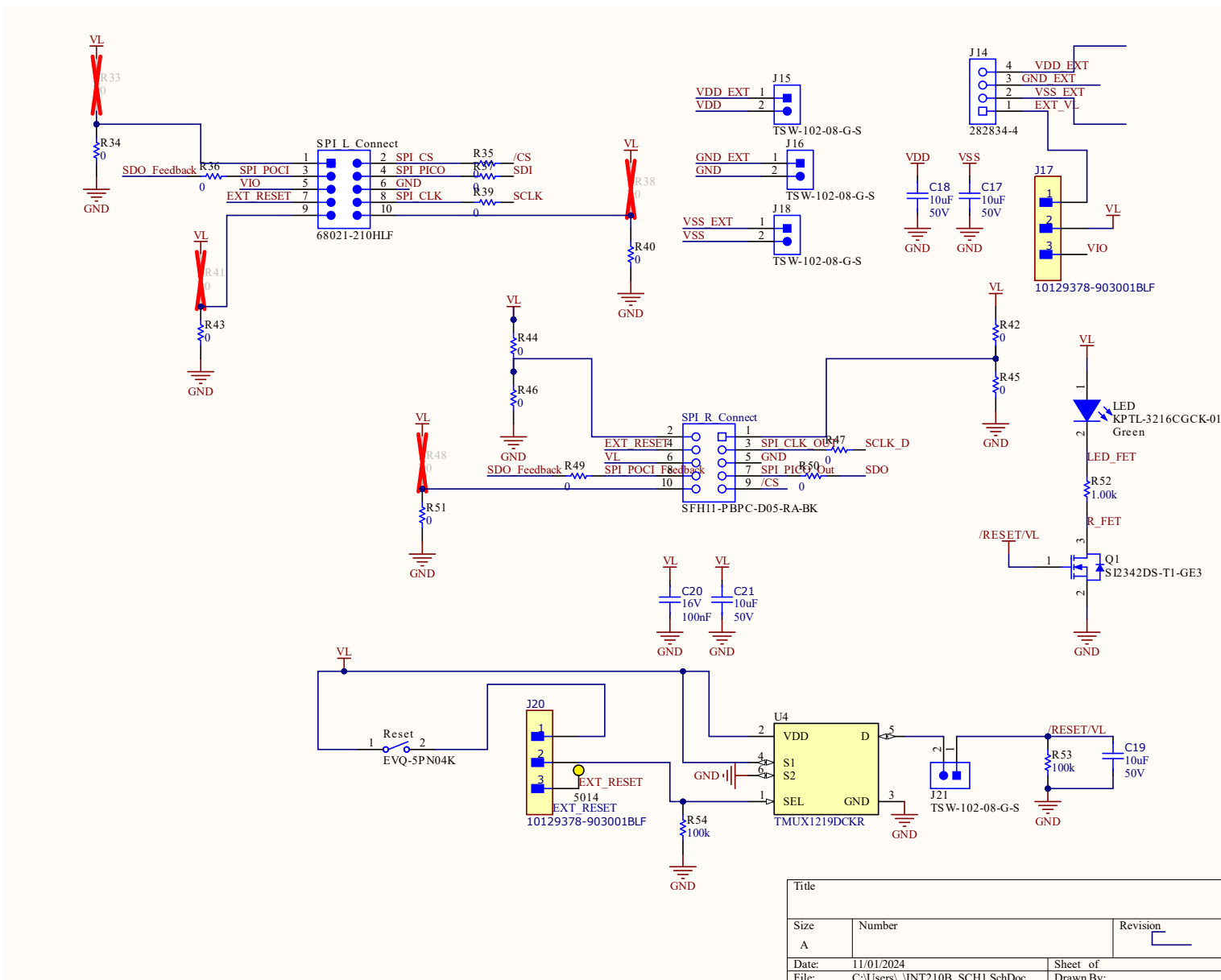


Figure 3-4. TMUXS7614D-SPI-EVM GUI Register Map Tab

4 Hardware Design Files

4.1 Schematics





Title		
Size	Number	Revision
A		1
Date:	11/01/2024	Sheet of
File:	CAUsers\MNT210B_SCH1.SchDoc	Drawn By:

Figure 4-2. TMUXS7614DEVM Schematic Page 2

4.2 PCB Layouts

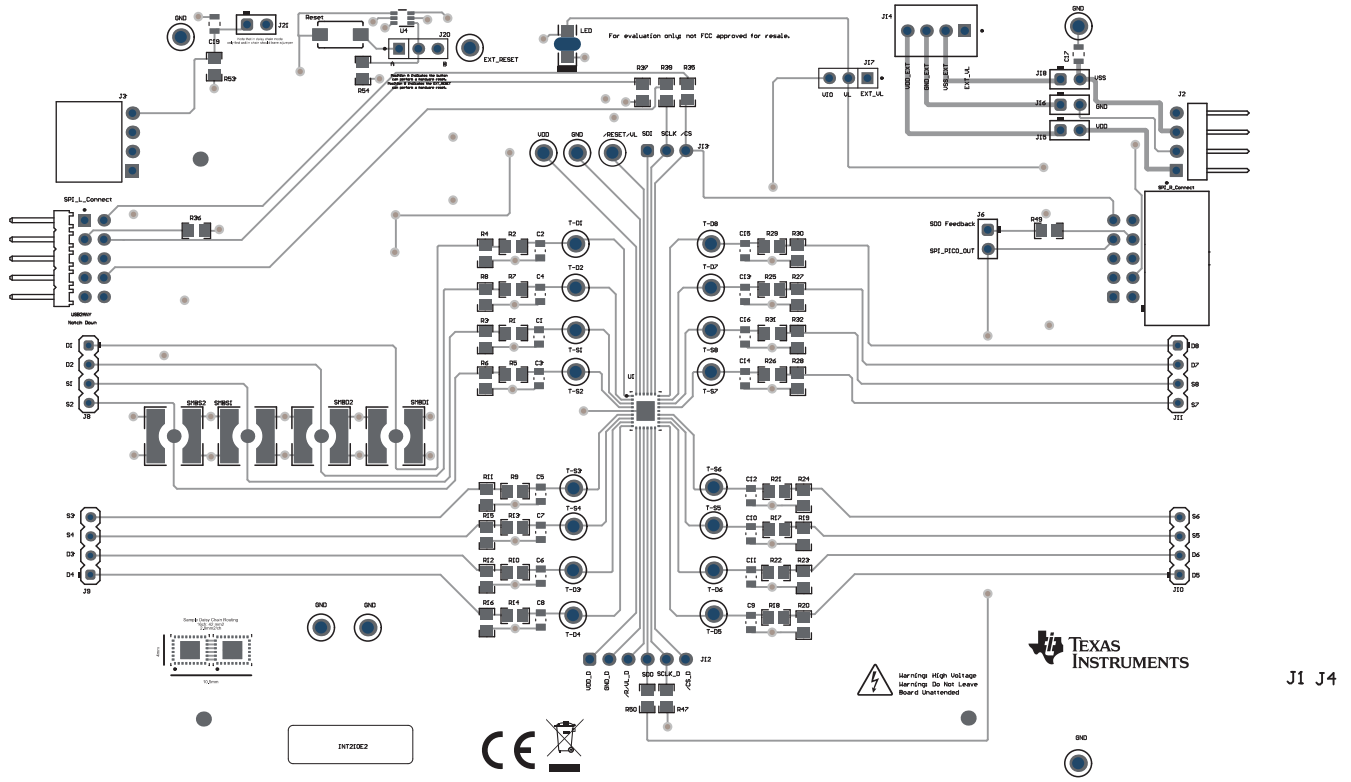


Figure 4-3. TMUXS7614DEVM Top Layer Layout

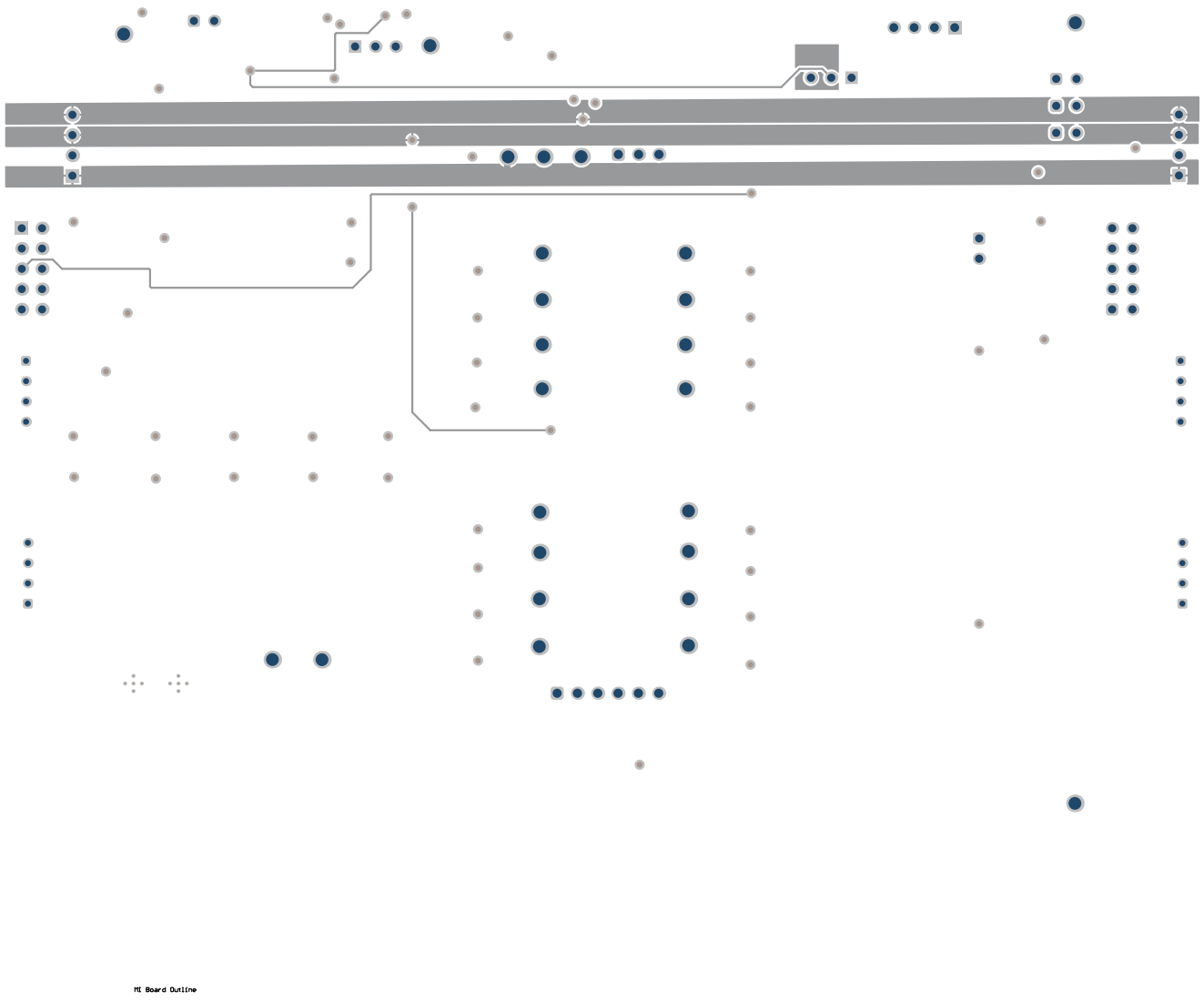
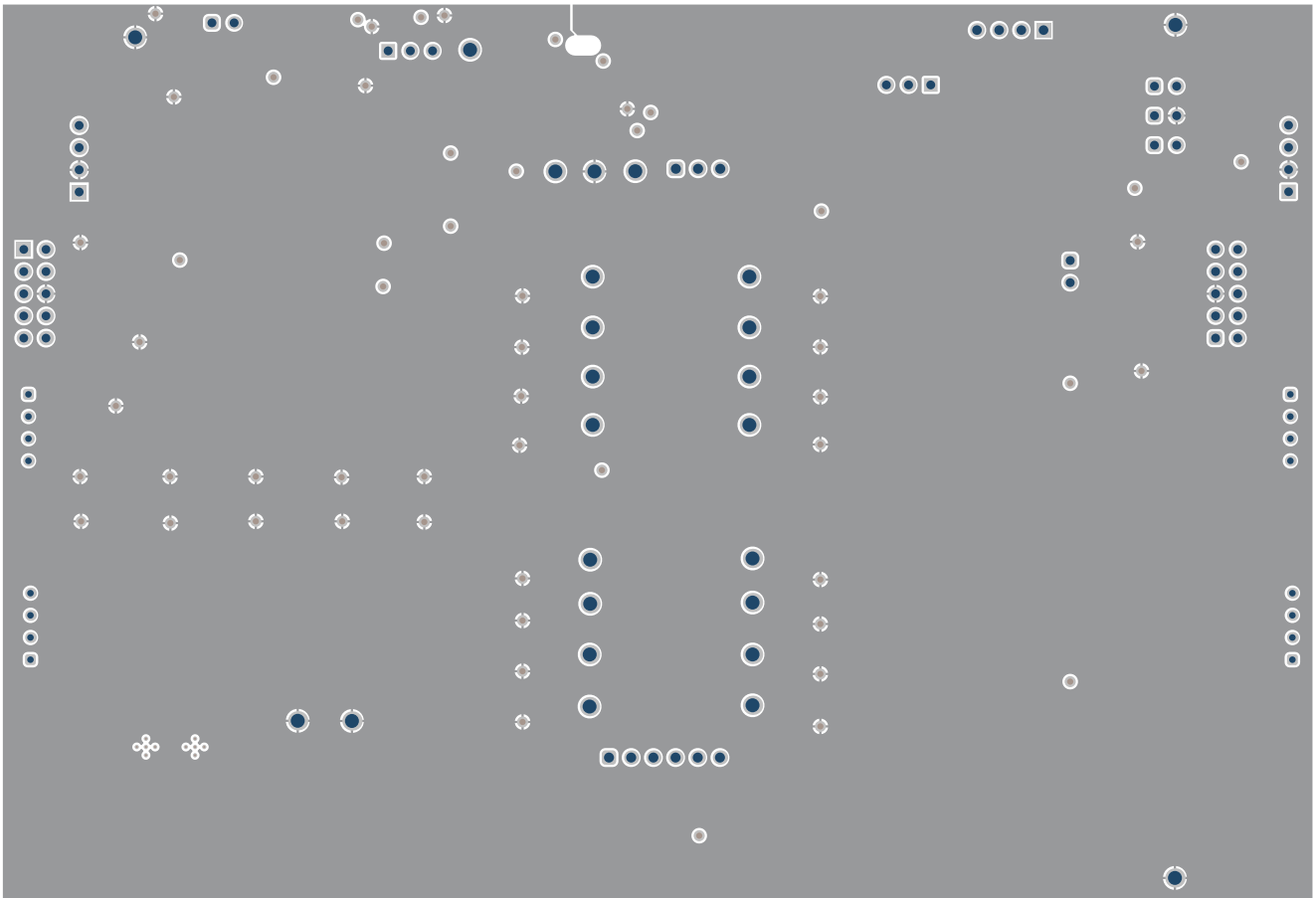
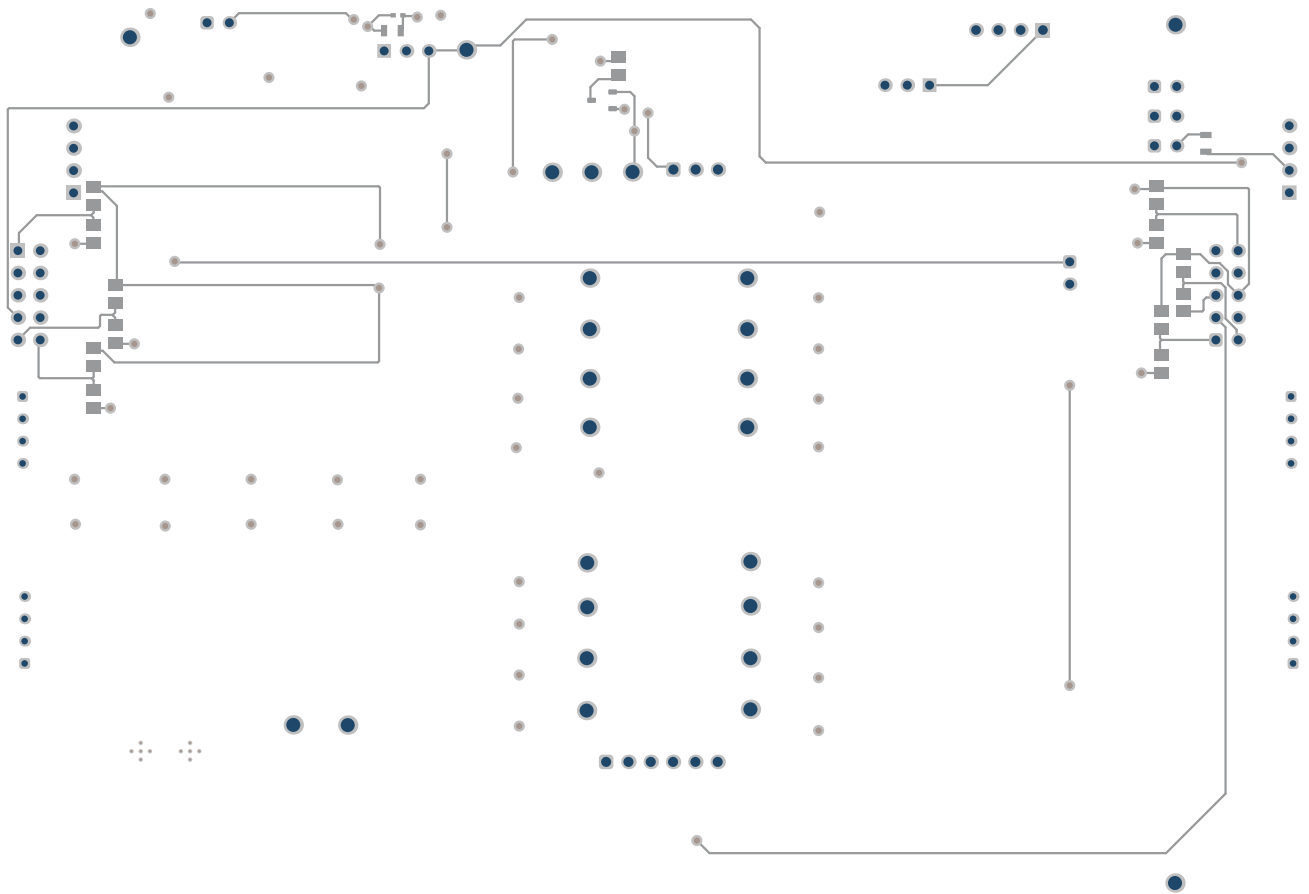


Figure 4-4. TMUXS7614DEVM Power Layer Layout



PC Board Outline

Figure 4-5. TMUXS7614DEVM Ground Layer Layout



TI Board Outline

Figure 4-6. TMUXS7614DEVM Bottom Layer Layout

4.3 Bill of Materials (BOM)

Table 4-1. Bill of Materials

/RESET/VL	1		Test Point, Multipurpose, Purple, TH	Purple Multipurpose Testpoint	5129	Keystone Electronics
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16	16	100nF	0.1µF ±10% 50V Ceramic Capacitor X7R 0805 (2012 Metric)	0805	8.85012E+11	Würth Elektronik
C17, C18, C19, C21	4	10µF	Chip Multilayer Ceramic Capacitors for General Purpose, 0805, 10µF, X5R, 15%, 20%, 50V	0805	GRM21BR61H106 ME43L	Murata
C20	1	100nF	0.1µF ±10% 16V Ceramic Capacitor X7R 0402 (1005 Metric)	0402	0402YC104KAT2 A	KYOCERA AVX A
EXT_RESET	1		Test Point, Multipurpose, Yellow, TH	Yellow Multipurpose Testpoint	5014	Keystone Electronics
GND	6		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone Electronics
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
INT210E2	1		Thermal Transfer Printable Labels, 0.650W x 0.200H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady
J1, J4	2		2 (1 x 2) Position Shunt Connector Black Open Top, Grip 0.100" (2.54mm) Gold	PLASTIC_SHUNT_CONN	6.09002E+11	Würth Electronics
J2	1		Header, 100mil, 4x1, Gold, R/A, TH	4x1 R/A Header	TSW-104-08-G-S-RA	Samtec
J3	1		Receptacle, 100mil, 4x1, Gold, R/A, TH	10.66x3.15x8.5mm	PPPC041LGBN-RC	Sullins Connector Solutions
J6, J15, J16, J18, J21	5		Header, 2.54mm, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	TSW-102-08-G-S	Samtec
J8, J9, J10, J11	4		Header, 2.54mm, 4x1, Gold, TH	Header, 2.54mm, 4x1, TH	350-10-104-00-00 6000	Mill-Max
J12	1		Header, 2.54mm, 6x1, Gold, TH	Header, 2.54mm, 6x1, TH	61300611121	Würth Elektronik
J13	1		Header, 2.54mm, 3x1, Gold, TH	Header, 2.54mm, 3x1, TH	61300311121	Würth Elektronik
J14	1		Terminal Block, 100mil, 4X1 TH	10.62 x 10 x 6.5mm	282834-4	TE Connectivity
J17, J20	2		Connector Header Through Hole 3 position 0.100" (2.54mm)	HDR3	10129378-903001 BLF	Amphenol ICC
LED	1	Green	LED, Green, SMD	3.2 x 1.6mm	KPTL-3216CGCK-01	Kingbright

Table 4-1. Bill of Materials (continued)

/RESET/VL	1		Test Point, Multipurpose, Purple, TH	Purple Multipurpose Testpoint	5129	Keystone Electronics
Q1	1	8V	MOSFET, N-CH, 8V, 6A, SOT-23	SOT-23	SI2342DS-T1-GE3	Vishay-Semiconductor
R1, R2, R5, R7, R9, R10, R13, R14, R17, R18, R21, R22, R25, R26, R29, R31, R34, R35, R36, R37, R39, R40, R42, R43, R44, R45, R46, R47, R49, R50, R51	31	0	RES, 0, 5%, 0.125W, 0805	0805	RC0805JR-070RL	Yageo America
R52	1	1.00k	RES, 1.00 k, 0.1%, 0.125W, 0805	0805	RT0805BRD071KL	Yageo America
R53, R54	2	100k	RES, 100 k, 0.1%, 0.125W, 0805	0805	RT0805BRD07100KL	Yageo America
Reset	1		Switch, SPST-NO, Off-Mom, 0.05A, 12 VDC, SMD	6 x 3.5mm	EVQ-5PN04K	Panasonic
SPI_L_Connect	1		Header, 100mil, 5x2, R/A, Gold, TH	Header, 100mil, 5x2, R/A, TH	68021-210HLF	FCI
SPI_R_Connect	1		Receptacle, 2.54mm, 5x2, Gold, R/A, TH	Receptacle, 2.54mm, 5x2, R/A, TH	SFH11-PBPC-D05-RA-BK	Sullins Connector Solutions
T-D1, T-D2, T-D3, T-D4, T-D5, T-D6, T-D7, T-D8, T-S1, T-S2, T-S3, T-S4, T-S5, T-S6, T-S7, T-S8, VDD	17		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone Electronics
U1	1		42V, SPI Enabled, Low-RON, 1:1 (SPST), 8-Channel Precision Switches with 1.8V Logic	FCLGA30	TMUXS7614DZEMR	Texas Instruments
	0		42V, SPI Enabled, Low-RON, 1:1 (SPST), 8-Channel Precision Switches with 1.8V Logic	FCLGA30	TMUXS7614DZEMR	Texas Instruments
	0		42V, SPI Enabled, Low-RON, 1:1 (SPST), 8-Channel Precision Switches with 1.8V Logic	FCLGA30	TMUXS7614DZEMR	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
R3, R4, R6, R8, R11, R12, R15, R16, R19, R20, R23, R24, R27, R28, R30, R32	0	100k	RES, 100 k, 0.1%, 0.125 W, 0805	0805	RT0805BRD07100KL	Yageo America
R33, R38, R41, R48	0	0	RES, 0, 5%, 0.125 W, 0805	0805	RC0805JR-070RL	Yageo America

Table 4-1. Bill of Materials (continued)

/RESET/VL	1		Test Point, Multipurpose, Purple, TH	Purple Multipurpose Testpoint	5129	Keystone Electronics
SMBD1, SMBD2, SMBS1, S MBS2	0		Connector, SMT, SMB Jack Assembly 50ohm	Connector, SMT, SMB Jack Assembly	131-3711-201	Cinch Connectivity

5 Additional Information

5.1 Trademarks

Chrome® is a registered trademark of Google LLC.

Firefox® is a registered trademark of Mozilla Foundation.

Safari® is a registered trademark of Apple Inc.

Internet Explorer® is a registered trademark of Microsoft Corporation.

All trademarks are the property of their respective owners.

6 Revision History

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

Changes from Revision * (May 2024) to Revision A (December 2024)	Page
• Updated hardware images.....	1
• Updated schematic.....	7
• Updated layouts.....	9
• Updated Bill of Materials table.....	13

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated