

EVM User's Guide: TMUXS7614DEVM

TMUXS7614D Evaluation Module



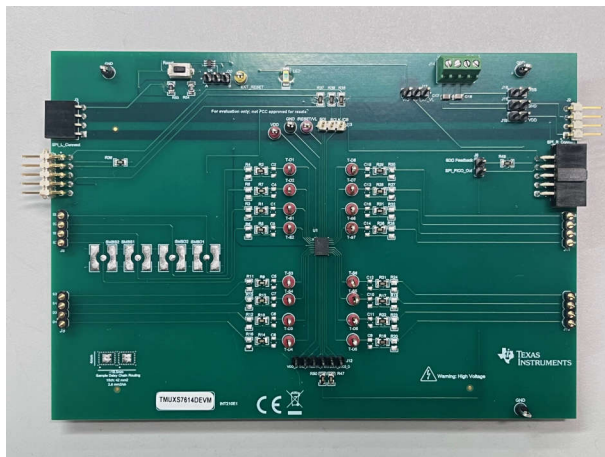
Description

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

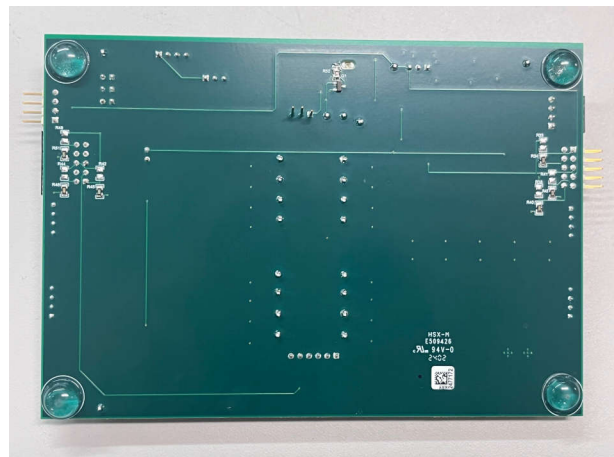
to provide a defined digital logic supply voltage. The digital logic supply voltage can be supplied from the USB2ANY as well.

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.

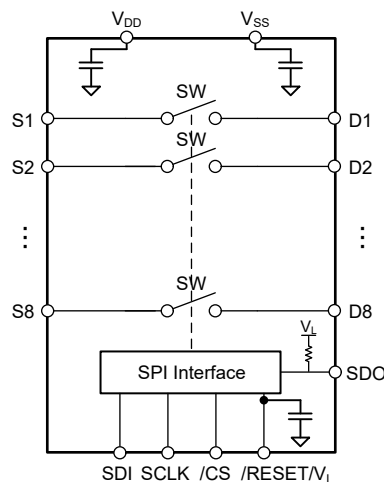


Figure 1-1. TMUXS7614D Block Diagram

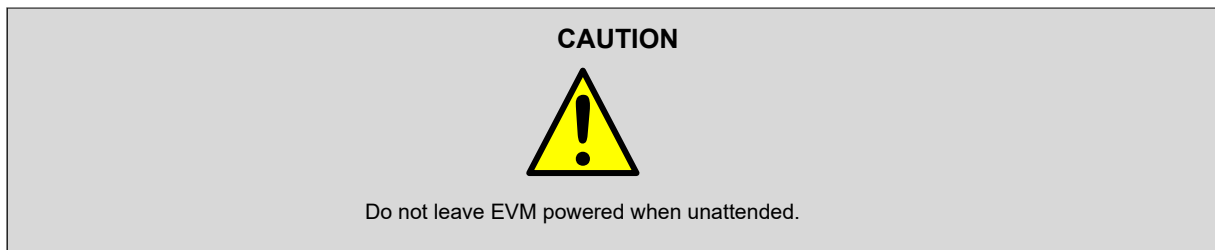
1.4 Device Information

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 [SNAU228](#).

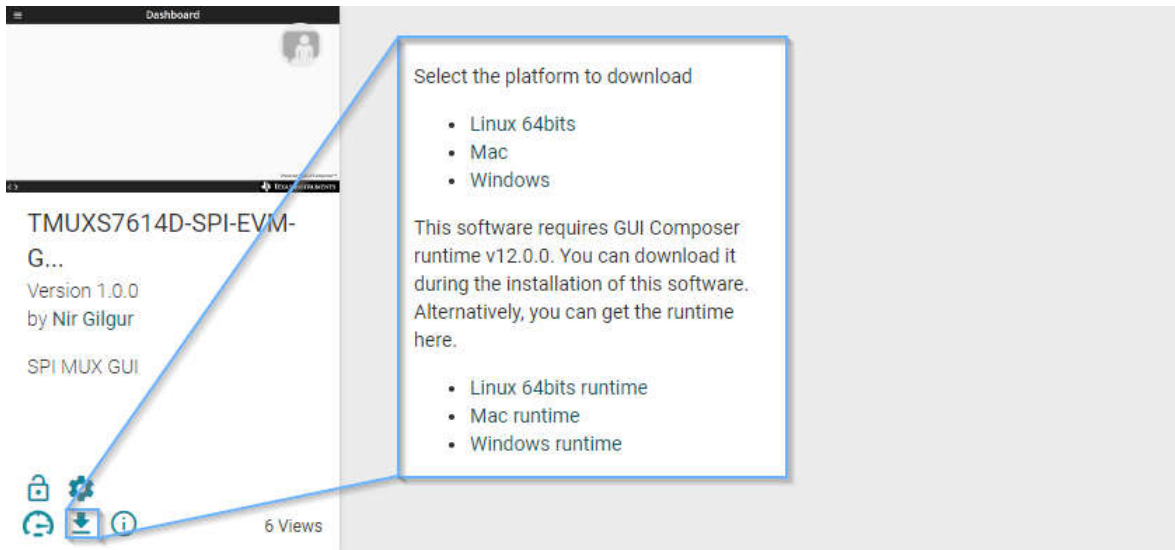
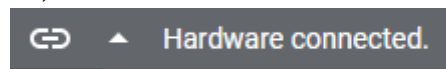


Figure 3-1. Download Icon for TMUX7614D-SPI-EVM GUI

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.

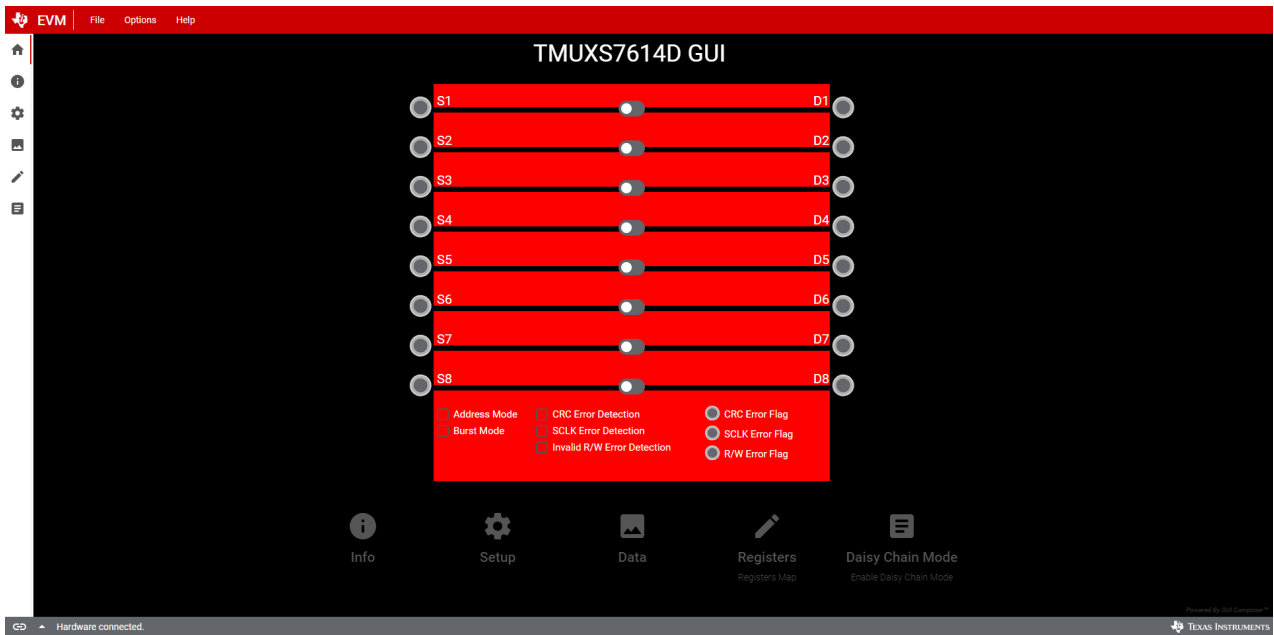


Figure 3-2. TMUXS7614D-SPI-EVM GUI Home Tab

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.

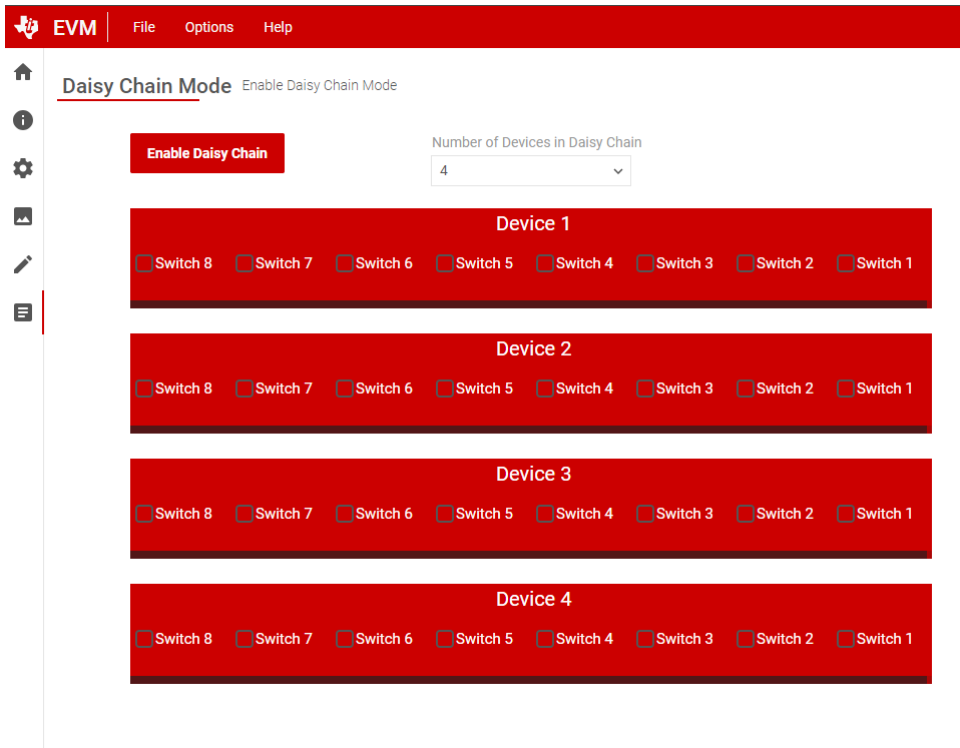


Figure 3-3. TMUXS7614D-SPI-EVM GUI Daisy Chain Mode Tab

3. Registers Map Tab

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

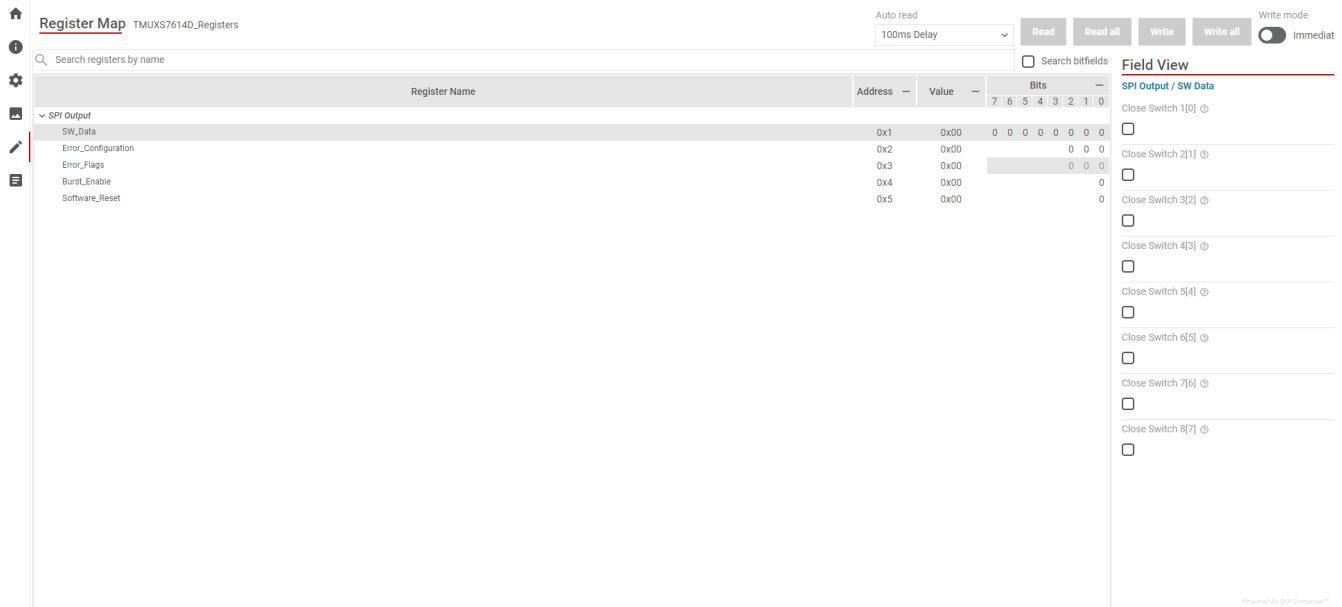


Figure 3-4. TMUXS7614D-SPI-EVM GUI Register Map Tab

4 Hardware Design Files

4.1 Schematics

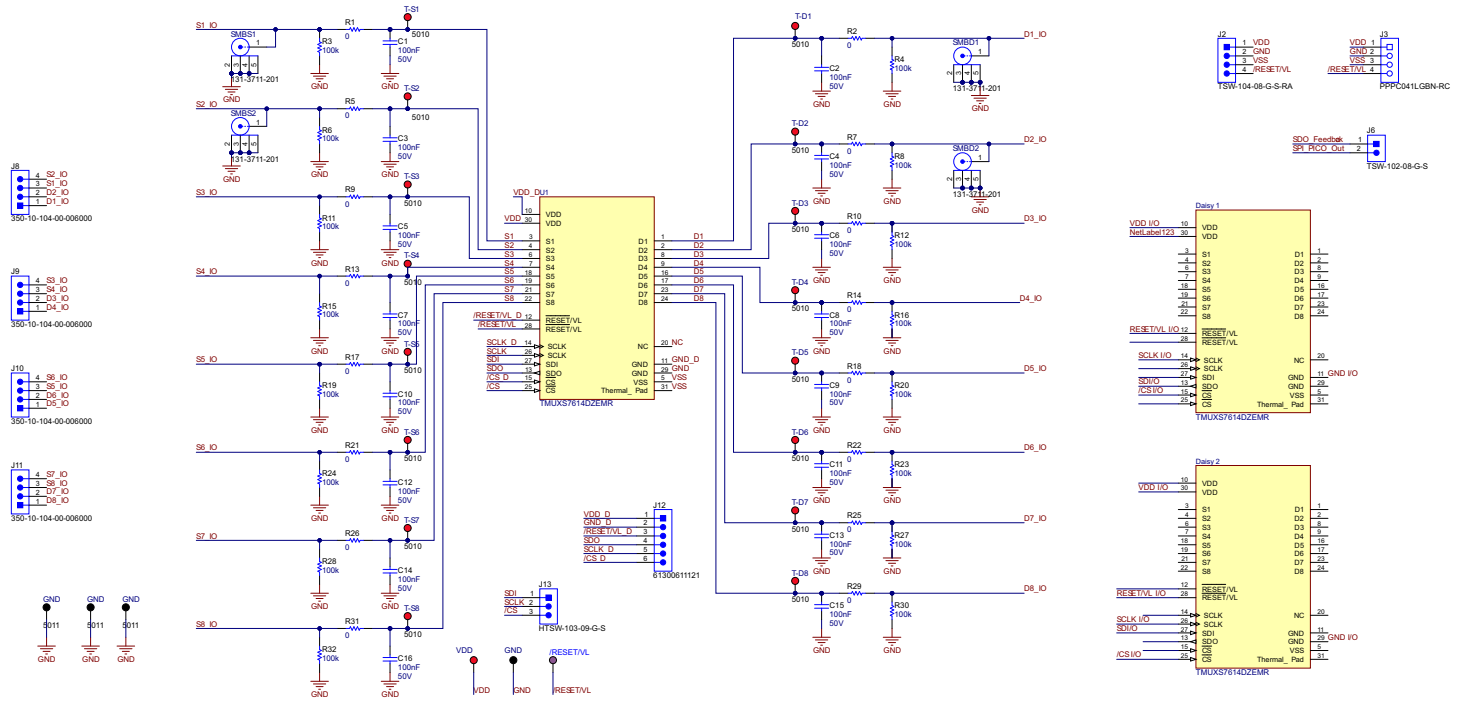


Figure 4-1. TMUXS7614DEVM Schematic Page 1

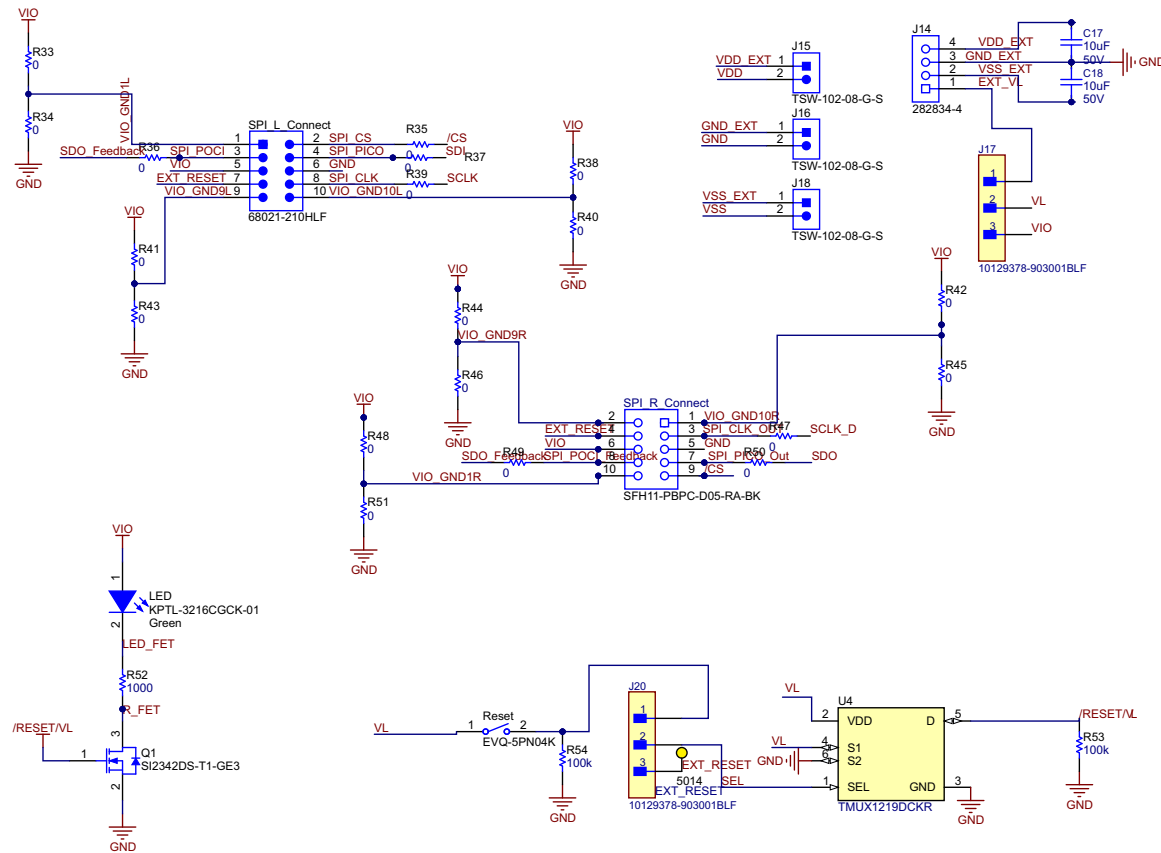


Figure 4-2. TMUXS7614DEVM Schematic Page 2

4.2 PCB Layouts

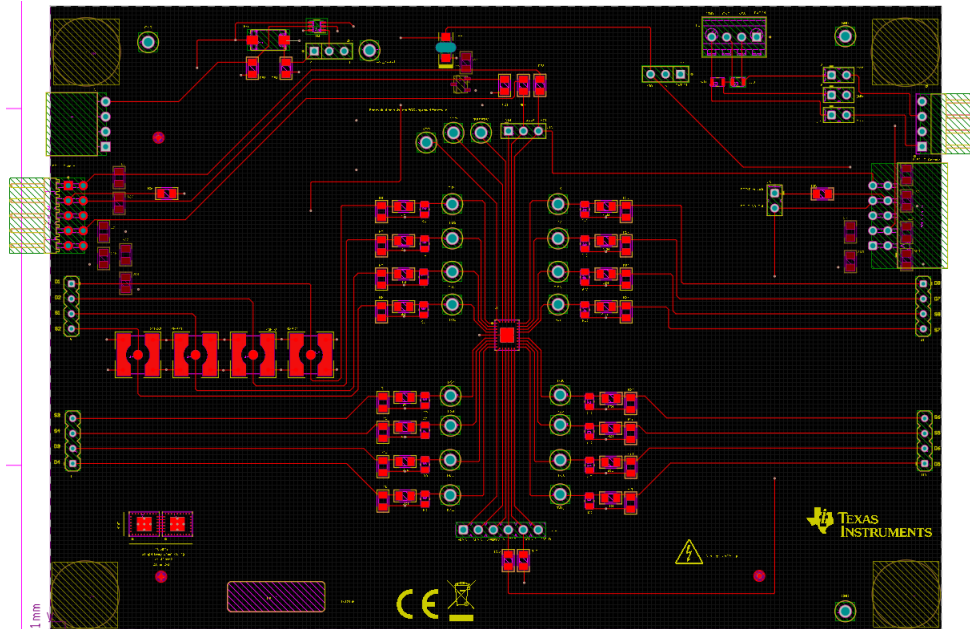


Figure 4-3. TMUXS7614DEVM Top Layer Layout

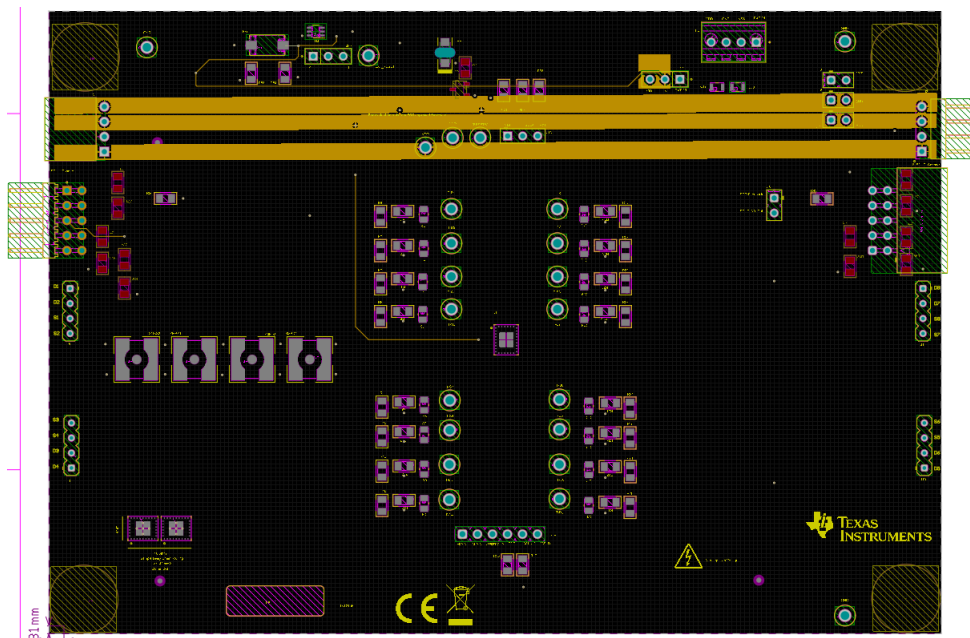


Figure 4-4. TMUXS7614DEVM Power Layer Layout

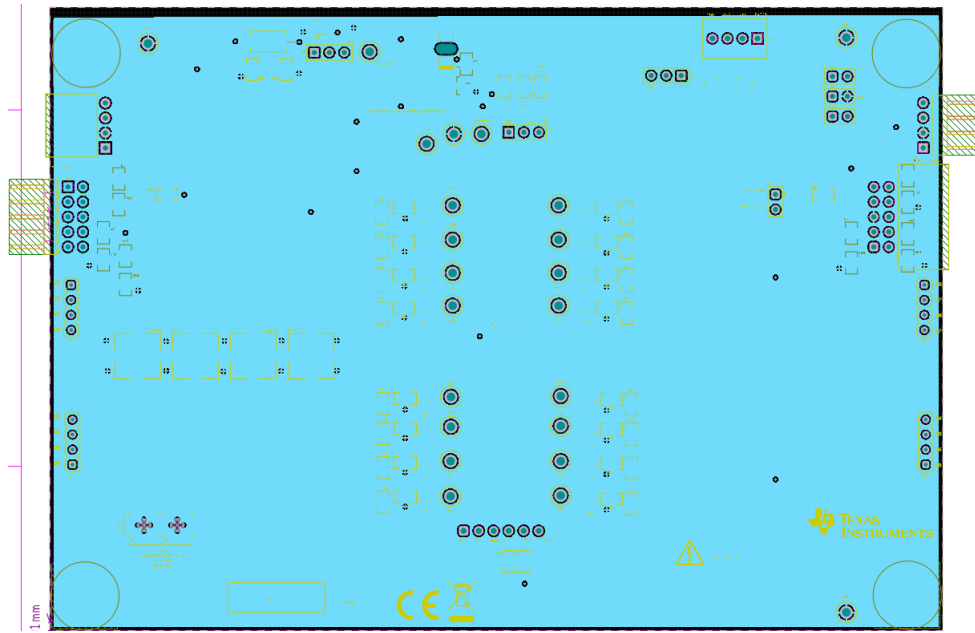


Figure 4-5. TMUXS7614DEVM Ground Layer Layout

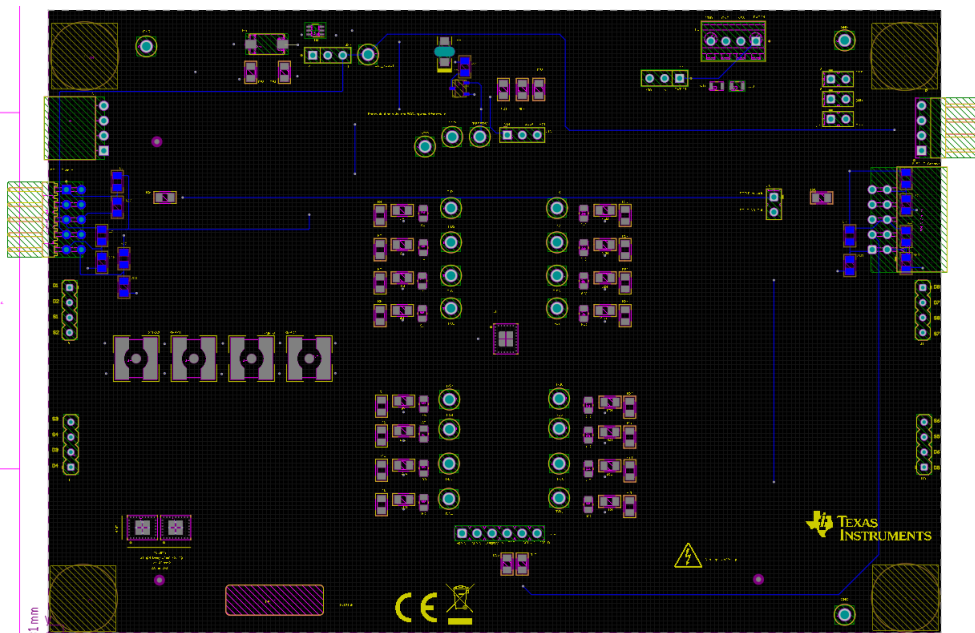


Figure 4-6. TMUXS7614DEVM Bottom Layer Layout

4.3 Bill of Materials (BOM)

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	Part Number	Manufacturer
/RESET/VL1	1		Test Point, Multipurpose, Purple, TH	5129	Keystone Electronics
C17, C18	2	10µF	Chip Multilayer Ceramic Capacitors for General Purpose, 0805, 10uF, X5R, 15%, 20%, 50V	GRM21BR61H106ME43L	Murata
EXT_RESET1	1		Test Point, Multipurpose, Yellow, TH	5014	Keystone Electronics
GND1, GND2, GND3, GND4	4		Test Point, Multipurpose, Black, TH	5011	Keystone Electronics
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	SJ-5303 (CLEAR)	3M
J1	1		Header, 100mil, 4x1, Gold, R/A, TH	TSW-104-08-G-S-RA	Samtec
J2	1		Receptacle, 100mil, 4x1, Gold, R/A, TH	PPPC041LGBN-RC	Sullins Connector Solutions
J3, J11, J12, J14	4		Header, 2.54mm, 2x1, Gold, TH	TSW-102-08-G-S	Samtec
J4, J5, J6, J7	4		Header, 2.54mm, 4x1, Gold, TH	350-10-104-00-006000	Mill-Max
J8	1		Header, 2.54mm, 6x1, Gold, TH	61300611121	Würth Elektronik
J9	1		Header, 100mil, 3x1, Gold, TH	HTSW-103-09-G-S	Samtec
J10	1		Terminal Block, 100mil, 4X1 TH	282834-4	TE Connectivity
J13, J15	2		Connector Header Through Hole 3 position 0.100" (2.54mm)	10129378-903001BLF	Amphenol ICC
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	THT-14-423-10	Brady
LED1	1	Green	LED, Green, SMD	KPTL-3216CGCK-01	Kingbright
Q1	1	8V	MOSFET, N-CH, 8V, 6A, 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, R43, R45, R46, R47, R49, R50, R51	29	0	RES, 0, 0%, W, AEC-Q200 Grade 0, 0805	PMR10EZPJ000	Rohm
R52	1	1.00k	RES, 1.00 k, 0.1%, 0.125 W, 0805	RG2012P-102-B-T5	Susumu Co Ltd
R53, R54	2	100k	RES, 100 k, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	CRCW0805100KJNEA	Vishay-Dale
Reset1	1		Switch, SPST-NO, Off-Mom, 0.05A, 12 VDC, SMD	EVQ-5PN04K	Panasonic
SPI_L_Connect1	1		Header, 100mil, 5x2, R/A, Gold, TH	68021-210HLF	FCI
SPI_R_Connect1	1		Receptacle, 2.54mm, 5x2, Gold, R/A, TH	SFH11-PBPC-D05-RA-BK	Sullins Connector Solutions

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Part Number	Manufacturer
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, VDD1	17		Test Point, Multipurpose, Red, TH	5010	Keystone Electronics
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16	0	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0805	CEU4J2X7R1H104K125AE	TDK
Daisy1, Daisy2, U1	1		42V, SPI Enabled, Low-RON, 1:1 (SPST), 8-Channel Precision Switches with 1.8V Logic	TMUXS7614DZEMR	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	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, 5%, 0.125 W, AEC- Q200 Grade 0, 0805	CRCW0805100KJNEA	Vishay-Dale
R33, R38, R41, R42, R44, R48	0	0	RES, 0, 0%, W, AEC-Q200 Grade 0, 0805	PMR10EZPJ000	Rohm
SMBD1, SMBD2, SMBS1, SMBS2	0		Connector, SMT, SMB Jack Assembly 50 ohm	131-3711-201	Cinch Connectivity

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