EVM User's Guide: TPS389C0XEVM

TPS389C0xEVM Multichannel Voltage Supervisor with Watchdog and I²C Evaluation Module

Description

The TPS389C0XEVM is an evaluation module (EVM) for the TPS389C03-Q1 Multichannel Overvoltage and Undervoltage I2C Programmable Voltage Supervisor and Monitor with Q&A Watchdog.

The TPS389C0XEVM comes with TPS389C0300CRTERQ1 pre-populated on pad U1 or depending on availability TPS389C0XEVM can be fitted with socket J7 to house TPS389C0300CRTERQ1. This IC variant is configured for three integrated multichannel window inputs to monitor three distinct input voltage rails with three remote sense pins. Additionally, this IC variant offers a built in Q&A watchdog and Error Signal monitor with independent watchdog enable and watchdog output. The device also includes internal glitch immunity and noise filters to eliminate false resets resulting from erroneous signals. The TPS389C03-Q1 device does not require any external resistors for setting overvoltage and undervoltage reset thresholds which optimizes and improves the reliability for safety systems.

Get Started

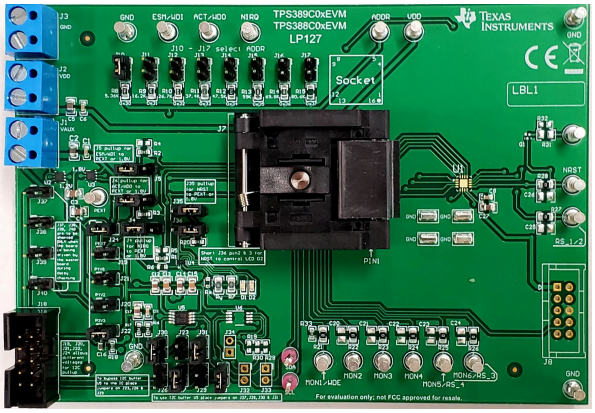
1. Order TPS389C0xEVM on ti.com.
2. Download the latest GUI software through the Fusion Digital Power Designer web page.

Features

- Q&A Watchdog to monitor SoC software operation
  - Programmable OPEN/CLOSE watchdog timing via I²C
  - Start-up delay for SoC boot up initialization
  - Programmable maximum violation count (up to 7) before WDO assertion
  - Watchdog disable pin (WDE)
- Monitor state-of-the art SOCs
  - 3 channels with 3 remote sense (TPS389C0300CRTERQ1)
  - Input voltage range: 2.6 V to 5.5 V
  - High threshold accuracy: ± 5 mV (–40°C to +125°C)
  - Built-in ADC for voltage readouts
- Designed for safety applications
  - Error Signal Monitoring (ESM)
  - Cyclic Redundancy Checking (CRC)
  - Packet Error Checking (PEC)
  - Active-low open-drain NIRQ, NRST, and WDO outputs

Applications

- Advanced Driver Assistance System (ADAS)
- Sensor fusion
- Medical robotics
- Industrial robotics



1 Evaluation Module Overview

1.1 Introduction

The TPS389C0xEVM allows users to evaluate the TPS389C03-Q1 Multichannel Overvoltage and Undervoltage I2C Programmable Voltage Supervisor and Monitor with Q&A Watchdog.

This device offers BIST, CRC error checking, and a built-in ADC for voltage readouts to provide redundant error checking. I^2C functionality gives flexibility in selecting thresholds, watchdog timing, watchdog error count, reset delays, glitch filters, error pin mapping, and pin functionality.

This user's guide describes the operational use of the TPS389C0XEVM evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the TPS389C03-Q1 Multichannel Overvoltage and Undervoltage I2C Programmable Voltage Supervisor and Monitor with Q&A Watchdog. If users need a different TPS389C03-Q1 variant, then the existing device must be removed from the board. The EVM board is designed to support all possible options by changing jumper configurations.

This guide contains the EVM schematic, bill of materials (BOM), assembly drawing, and top and bottom board layouts.

1.2 Kit Contents

Table 1-1 lists the contents of the EVM kit. Contact the nearest Texas Instruments Product Information Center if any component is missing.

Table 1-1. Kit Contents

ITEM	QUANTITY
TPS389C0XEVM	1

Utilize the Fusion Digital Power Designer GUI a USB2GPIO USB interface adapter is required and is sold separately.

1.3 Specification

Table 1-2. Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
VDD	Supply pin voltage	2.6		5.5	V
NIRQ, NRST,WDO, ESM, WDE	Pin voltage	0		5.5	V
MONx	Monitor Pins	0		5.5	V
SCL, SDA	Pin Voltage	0		VDD	V

1.4 Device Information

The TPS389C03-Q1 device is used to monitor rails for systems such as Advanced Driver Assistance Systems (ADAS) and sensor fusion.

TPS389C03-Q1 provides over and under voltage monitoring for up to 3 channels and is an excellent choice for systems that operate on low-voltage supply rails and have narrow margin supply tolerances. Thresholds can be factory configured as defined by the user and subsequently changed via I2C after power-up.

TPS389C03-Q1 offers additional safety features such internal glitch immunity and noise filters to eliminate false resets resulting from erroneous signals. An integrated Q&A watchdog meant to verify the SOC is functioning properly. A built-in ADC for voltage readouts to provide redundant error checking, CRC error checking, and error signal monitoring (ESM) used to monitor the error output of the SOC or microcontroller.

If a fault is recognized by TPS389C03-Q1 pin NIRQ, then high under normal operation are asserted low signaling a fault. NIRQ remains in the low state until the action causing the fault is no longer present and a 1-to-clear is written to the bit signaling the fault. The type of fault experienced by TPS389C03-Q1 can be determined by reading the value stored in the corresponding interrupt register under BANK 0. Additionally NRST, high under normal operation, asserts when MONx falls outside of the over-voltage or under-voltage threshold window if mapped to a monitor fault. NRST when asserted by a monitor fault stays asserted for the reset timeout period after MONx falls back within the window threshold. NRST can also be mapped to a Watchdog or ESM fault, when NRST is asserted due to Watchdog or ESM faults NRST stays asserted for the reset timeout period after the fault is detected. WDO, high under normal operation, asserts during a Watchdog fault and can be mapped to an ESM fault if desired. WDO can be latched or have an associated WDO delay based on the OTP setting. Pins NIRQ, NRST, and WDO are open drain outputs and require an external pull up resistance to supply voltage.

2 Hardware

2.1 Additional Images

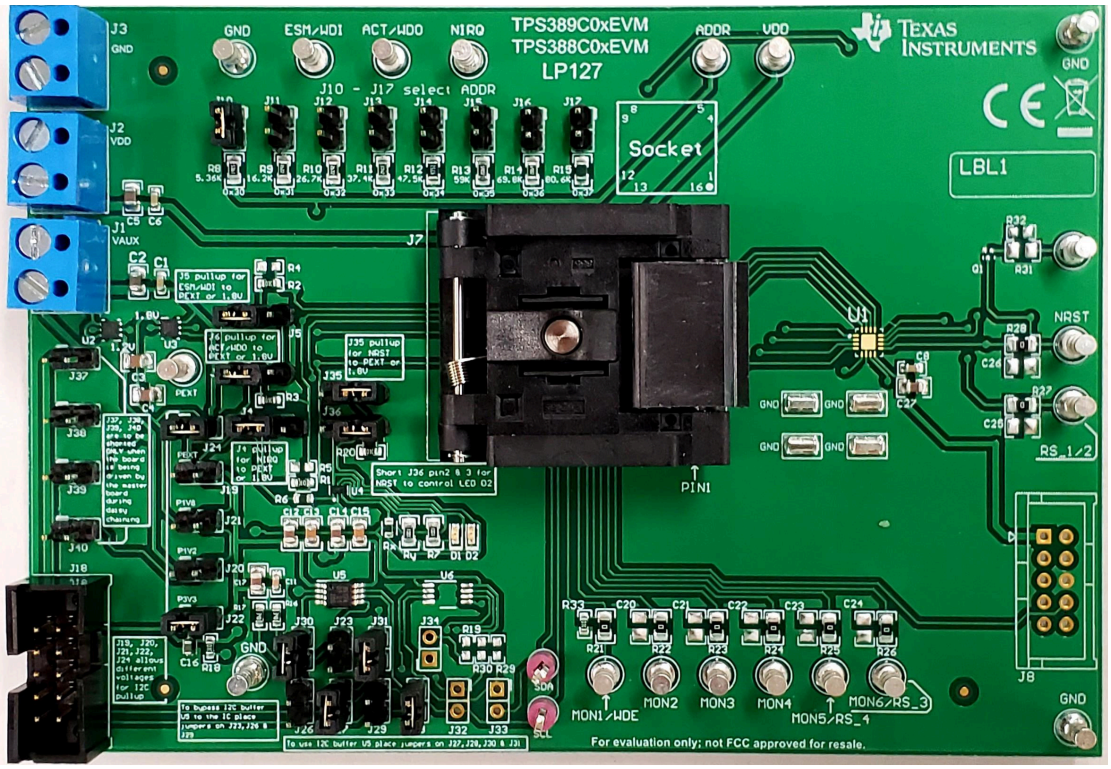


Figure 2-1. TPS389C0XEVM Board Front

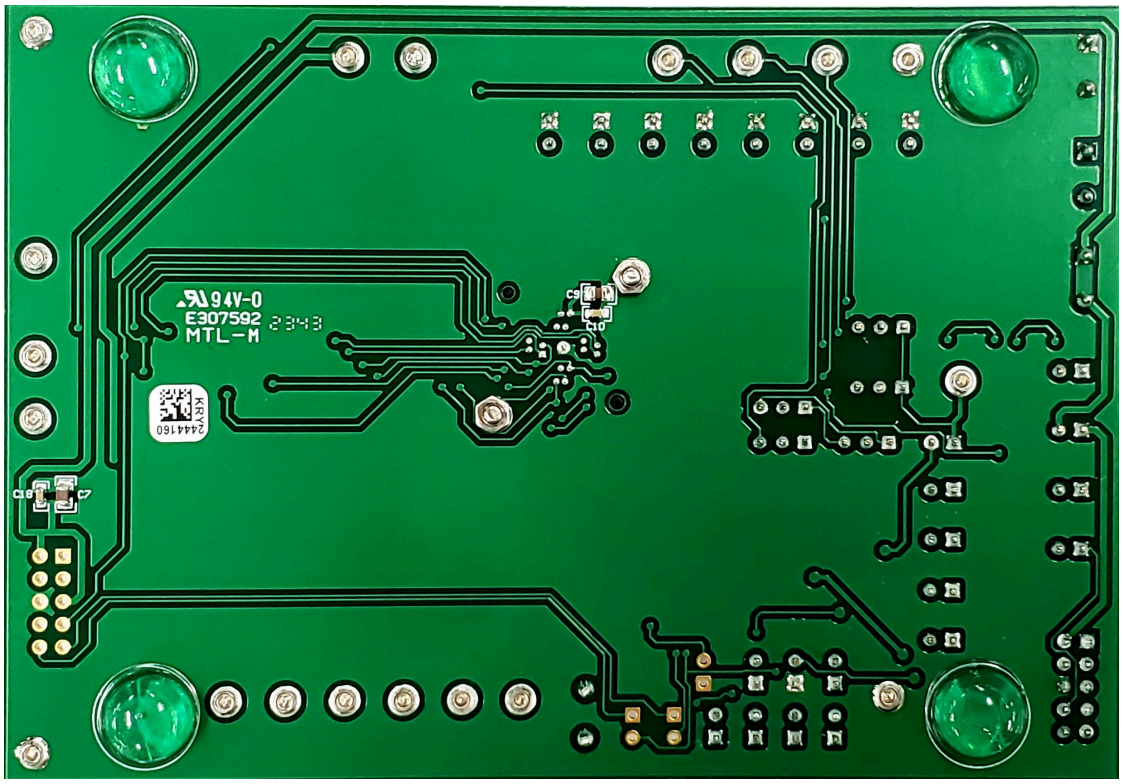


Figure 2-2. TPS389C0XEVM Board Back

2.2 TPS389C0XEVM Hardware Setup

Follow the steps below for TPS389C0XEVM hardware setup:

1. Connect VAUX (J1) and VDD (J2) to 3.3 V from the power supply.
2. Connect GND (J3) to ground from the power supply.
3. Make sure the jumpers are connected as per the guidelines in the Table 2-2.
4. Before allowing the output of the power supply to be engaged, check if the power supply voltage is set at 3.3 V and the power supply output current is limited to 10 mA.
5. Connect the TI's USB2GPIO USB Interface Adapter to J18 (USB2GPIO Connector) using a 10-pin ribbon cable.
6. Connect the TI's USB2GPIO USB Interface Adapter to the USB port of the computer.
7. Connect any voltage supply rail that needs monitoring to any of the voltage monitoring inputs (MON2 - MON6). A description of the connections needed when using TPS389C0300CRTERQ1 is provided in Section 2.4
8. If applicable, then connect any available remote sense to GND.
9. The description of the TPS389C0XEVM connections can be found in Figure 2-3.

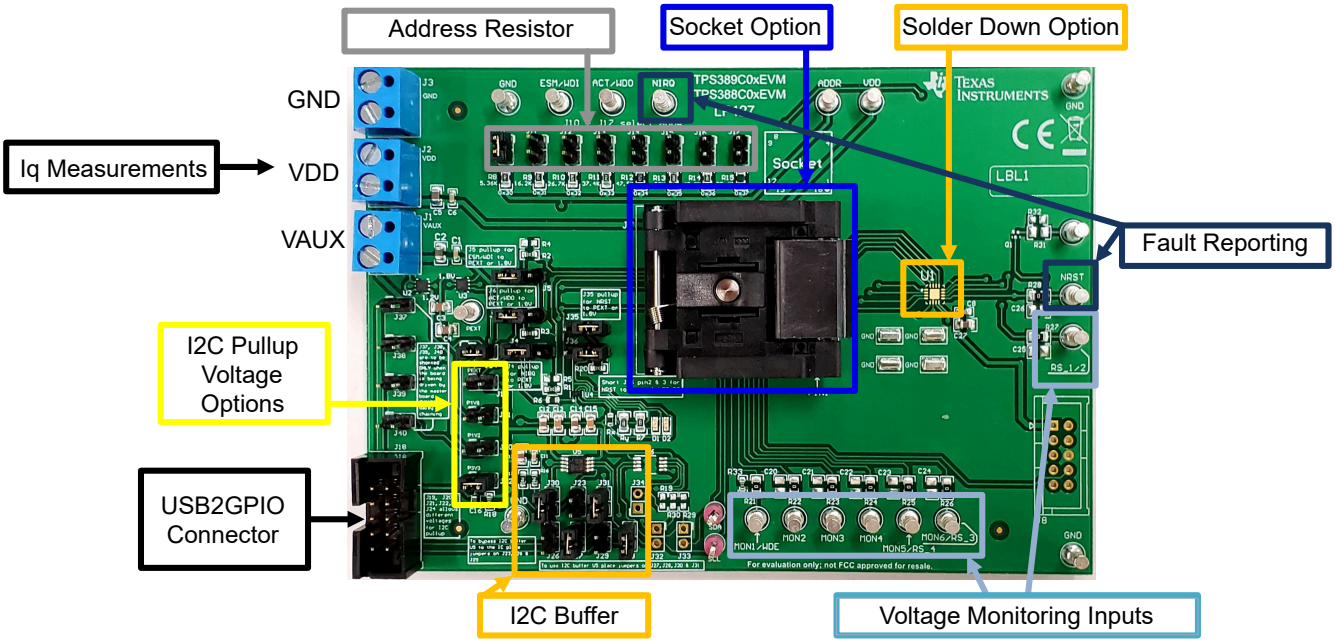


Figure 2-3. TPS389C0XEVM Connection Description

2.3 EVM Connectors

This section describes the connectors, jumpers, and test points on the EVM as well as how to connect, set up, and properly use the EVM. Each device has an independent supply connection, but all grounds are connected on the board.

2.3.1 EVM Test Points

Table 2-1 lists the EVM test points as well as their functional descriptions. All TPS389C03-Q1 pins have a corresponding test point on the EVM, these test points are located close to the pins for more accurate measurements. Additionally, multiple test-points offer dual functionality allowing for every possible variant of the TPS389C0X-Q1 device to be evaluated. In addition to the test points listed below, the EVM also has four additional GND test points.

Table 2-1. Test Points

TEST POINT SILKSCREEN LABEL	FUNCTION	DESCRIPTION (1)
MON1/WDE	Connection to MON1 pin or Watchdog Enable pin	Allows the user to monitor voltage rail #1 or control state of the watchdog enable pin.
MON2	Connection to MON2 pin	Allows the user to monitor voltage rail #2.
MON3	Connection to MON3 pin	Allows the user to monitor voltage rail #3.
MON4	Connection to MON4 pin	Allows the user to monitor voltage rail #4.
MON5/RS_4	Connection to MON5 pin or to RS_4 pin	Allows the user to monitor voltage rail #5 or allows the user to remote sense MON4.
MON6/RS_3	Connection to MON6 pin or to RS_3 pin	Allows the user to monitor voltage rail #6 or allows the user to remote sense MON3.
RS_1/2	Connection to RS_1/2 pin	Allows the user to remote sense MON1 or MON2.
NRST	Connection to NRST pin	Allows the user to monitor the reset (NRST) output.
ADDR	Connection to ADDR pin	Allows the user to measure the I^2C address voltage.
NIRQ	Connection to NIRQ pin	Allows the user to monitor the interrupt (NIRQ) output.
ACT/WDO	Connection to ACT pin or WDO pin	Allows the user to set the ACT input to VDD or GND. Alternatively allows the user to monitor the watchdog output (WDO) pin.
ESM/WDI	Connection to ESM or WDI pin	Allows the user to set the error signal monitor input or interact with the watchdog input pin.
SCL	Connection to SCL pin	Allows the user to monitor the clock signal input.
SDA	Connection to SDA pin	Allows the user to monitor the data signal input.
PEXT	External power supply	Allows the user to apply a power supply voltage that is not provided from the EVM.
GND	GND for EVM	GND for EVM.

(1) Test point functionality is dependent on TPS389C0x-Q1 variant used.

2.3.2 EVM Jumpers

Table 2-2 lists the jumpers on the TPS389C0XEVM. As ordered, the EVM has thirty-five (32) jumpers installed.

Table 2-2. List of On-board Jumpers

JUMPER	JUMPER CONFIGUATION	DESCRIPTION
J1	VAUX	For connecting VAUX power to the EVM
J2	VDD	For connecting VDD power to the EVM
J3	GND	For connecting GND to the EVM
J4	Shunted (default) Pin 1 to Pin 2	For connecting NIRQ to P1V8 or PEXT (Any external power)
J5	Shunted (default) Pin 1 to Pin 2	For connecting ESM to P1V8 or PEXT (Any external power)
J6	Shunted (default) Pin 1 to Pin 2	For connecting WDO to P1V8 or PEXT (Any external power)
J10, J11, J12, J13, J14, J15, J16, and J17	J10 shunted (default)	Shunting any one of J10-J17 jumpers selects the I^2C address for TPS389C03-Q1 IC on the EVM
J19, J20, and J21	Open	For connecting to the on-board I^2C buffer and pull-up voltage rail to either P1V8, PEXT or P1V2. Only shunt one of these jumpers at a time. Please remove the shunt of J22 when using one of these jumpers.
J22	Shunted	For connecting to the on-board, buffer I^2C and pull-up voltage rail to P3V3.
J23	Open	Disables (U5) I^2C buffer
J24	Shunted	Connects PEXT to VAUX
J26 and J29	Open	Shunting both J26 and J29 bypasses the I^2C (U5) buffer for SDA and SCL signal lines
J27, J28, J30, and J31	Shunted	Shunting these jumpers buffers SCL and SDA I^2C signal lines by using the on-board (U5) buffer.
J35	Shunted (default) Pin 2 to Pin 3	NRST pin is pulled up to PEXT
J36	Shunted (default) Pin 2 to Pin 3	Input to one of (U4) comparators to indicate the NRST pin has entered a fault condition
J37, J38, J39, J40	Open	If multiple EVMs are connected in a *daisy-chain* configuration, then the following EVM boards needs to have J37, J38, J39, and J40 all shunted. By shunting these jumpers, VDD, VAUX, SYNC, and NIRQ signals is provided as inputs from the primary EVM board. Also, J22 needs to be shunted and J19, J20, and J21 needs to be open on the secondary EVMs during *daisy-chain* configuration.

2.4 EVM Setup and Operation

This section describes the functionality and operation of the TPS389C0XEVM. Refer to the TPS389C03-Q1 Multichannel Overvoltage and Undervoltage I2C Programmable Voltage Supervisor and Monitor with Q&A Watchdog data sheet for details on the electrical characteristics of the device.

The TPS389C0XEVM comes with the TPS389C0300CRTERQ1 IC meaning the device is capable of monitoring up to 3 separate voltage rails and Q&A Watchdog capable. The EVM is capable of many different configurations to fully evaluate the functionality of all the TPS389C03-Q1 device variants. The default jumper configuration of the TPS389C0XEVM is mentioned in Table 2-2.

The TPS389C0XEVM comes with USB to GPIO connector, I^2C bus repeaters, comparators, two LDOs, socket and solder down footprints, and the ability to monitor up to six voltage rails. The TPS389C0XEVM also provides the ability for each monitored rail to be voltage divided down by resistor dividers on each of the monitored and input lines. The user must choose appropriately sized resistors such that the divided voltage is above, below or within the window of the voltage threshold depending on the type of input sensing topology is setup for each monitored input channel. Consult the Device Threshold Table in the TPS389C03-Q1 data sheet to verify proper voltage monitored values.

Equipment needed for TPS389C0XEVM evaluation:

- TPS389C0XEVM
- TI's USB2GPIO interface adapter (with ribbon cable) (not included with EVM)
- Power supply (3.3 V)
- Multimeters
- Multi-channel oscilloscope (review evaluation waveforms)
- Jumper wires/cables

2.4.1 Example Operation of TPS389C0X-Q1

The example below shows a TPS389C03-Q1 monitoring two voltage supply rails on the TPS389C0XEVM. Please follow the steps in Section 2.2 and Section 3.1.1 before evaluating the TPS389C0XEVM. Below, Figure 2-4 shows how the TPS389C0XEVM was setup to monitor two voltage supply rails.

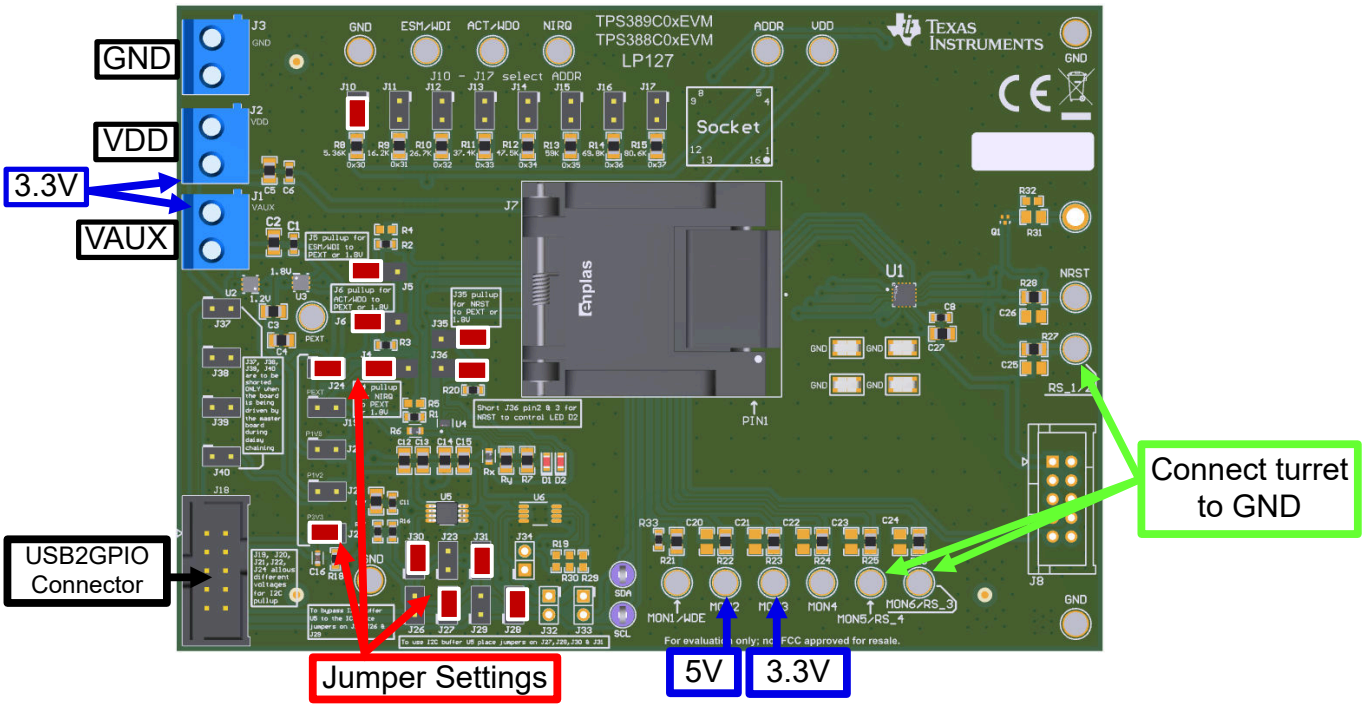


Figure 2-4. TPS389C0XEVM Monitoring Two Voltage Supply Rails

1. Connect 5 V to turret MON2 and 3.3 V to turret MON3 of TPS389C0XEVM.
2. Connect the TPS389C0XEVM VDD and VAUX inputs to a 3.3 V external power supply. Note that the voltage and current limits of the power supply must be set at 3.3 V and 10 mA.
3. Connect the TPS389C0XEVM with TI's USB2GPIO USB Interface Adapter ribbon to J18 (USB2GPIO connector). Connect the USB plug from the USB Interface Adapter to the USB port of the computer. The TI USB Interface Adapter communicates to the TPS389C03-Q1 IC via I^2C protocols.
4. Verify that the jumper settings, highlighted in red in Figure 2-4, are set on the TPS389C0XEVM.
5. Ground turrets *(RS_4, RS_3, RS_1/2)*.
6. Final Connections must look similar to Figure 2-4.
7. Note that the WDE pin of TPS389C03-Q1 is grounded due to pull down resistor R33, this disables the watchdog until a voltage is applied to the MON1/WDE turret.
8. Open up the Fusion Digital Power Designer GUI on the computer and follow Section 3.2.
9. Once the EVM is discovered and *Click to Configure* has been selected, the GUI is similar to Figure 3-12, Figure 3-13, Figure 3-14.
10. Once the GUI is open, press *Refresh All* (shown in the highlighted green-box). This commences a read operation of all the registers of TPS389C03-Q1 and updates the interface to reflect the most up to date information.
11. Press *Start Polling* (shown in the highlighted red-box) and both the Telemetry and the graphical waveform of the monitored inputs (shown in the highlighted orange-boxes) begin to display data in real time.
12. If one of the monitored inputs senses a fault, then an interrupt indicator is displayed (illumination of a red LED) on the TPS389C0XEVM. Also, one of the bit registers found in the *Status Registers* sub-window (shown in the highlighted blue-box) also shows a fault in red color.
13. To clear the fault interrupt, press *Stop Polling*, go to the *Status Registers* sub-window, locate the red color fault interrupt and click on *CLR*. Then click on *Write to Hardware*. This procedure clears the fault interrupt and allows the device to continue to monitor the input channels.
14. If the user wants to enable or disable monitoring, then scroll to the bottom of the *Interrupt Enable* sub-window and disable the desired monitoring inputs by clicking the boxes in the *Enable* row (shown in

the highlighted black-box). Once the desired monitors are enabled click *Write to Hardware* and the USB Interface Adapter communicates to the TPS389C03-Q1 IC.

15. If the user wants to adjust the under voltage (UV) and over voltage (OV) threshold values, then locate the *Voltage Range and Threshold* sub-window (shown in the highlighted yellow-box). Use the boxes located in this sub-window to select the desired voltage thresholds. One note is that any monitoring inputs that are higher than 1.5 V, select *4x* in the *Voltage Scaling (1Fh)* field. Once the desired monitor thresholds are set, press *Write to Hardware* and the USB Interface Adapter communicates to the TPS389C03-Q1 IC.
16. Steps 14 and 15 require that polling is halted to complete the desired I2C write operation.
17. Steps 10 through 15 refer to Figure 2-5 below.

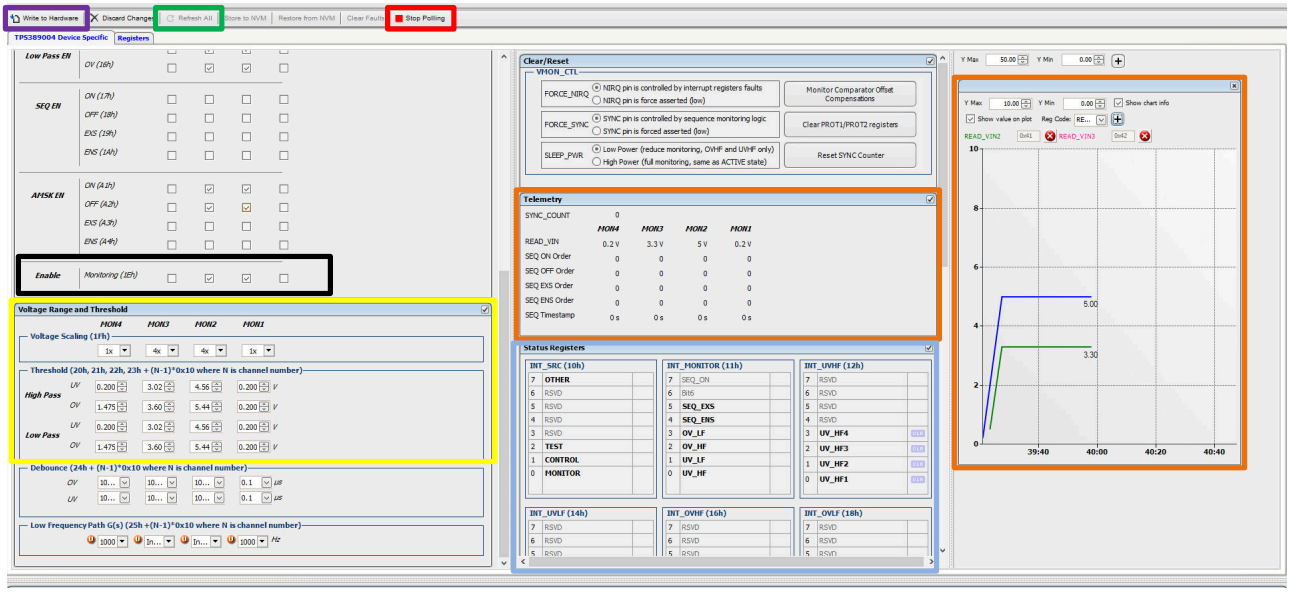


Figure 2-5. TPS389C0XEVM GUI Setup for Monitoring Two Voltage Supply Rails

3 Software

3.1 Setup and GUI Installations

3.1.1 TPS389C0XEVM Software Setup

Follow the steps below for TPS389C0XEVM GUI software installation:

1. Download the Fusion Digital Power Designer Platform GUI for TPS389C0XEVM.
2. Open the downloaded file.
3. In the Welcome Wizard window, click *Next*.
4. Accept the license agreement and then click *Next*.

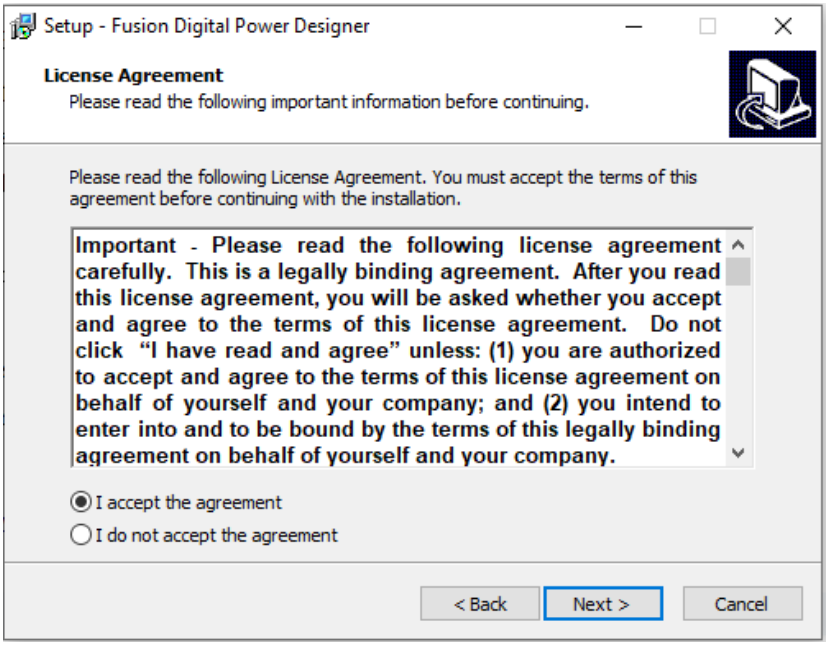


Figure 3-1. Setup License Agreement Window

5. The default destination folder works best. Click *Next*.

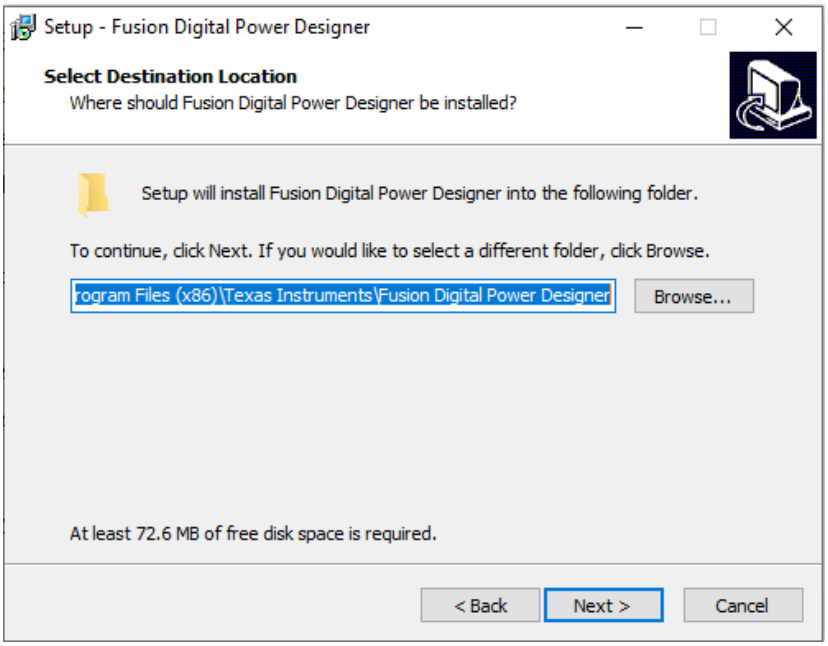


Figure 3-2. Setup Destination Window

6. Click *Next* for the Select Start Menu Folder option.

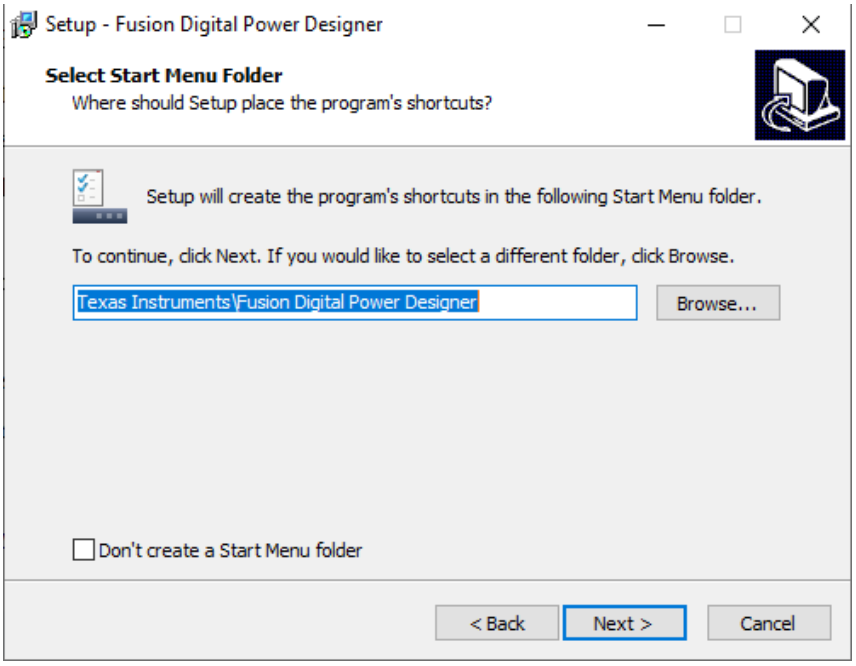


Figure 3-3. Setup Window - Start Menu Selection

7. There is no need to install additional options for this EVM. Click *Next*.

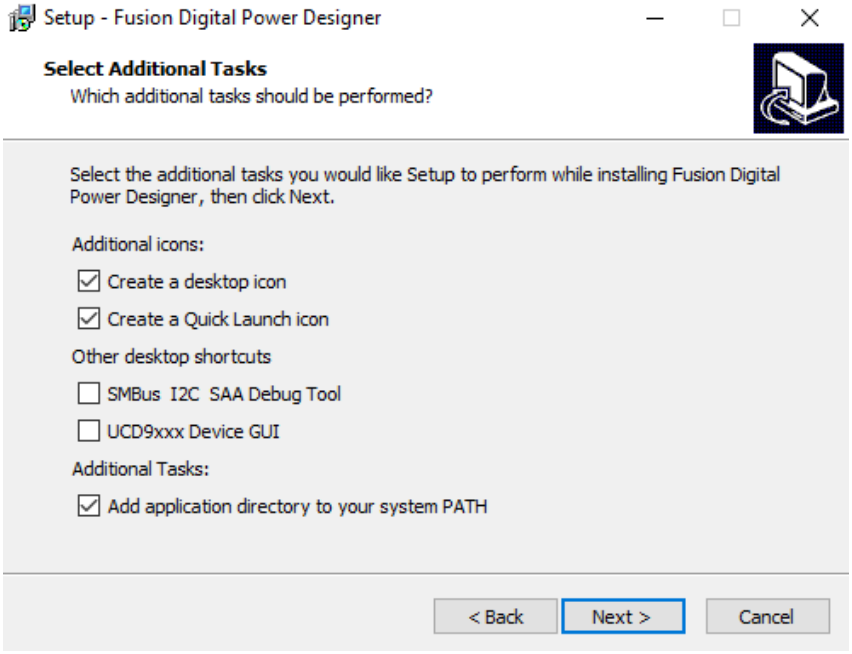


Figure 3-4. Setup Window - Additional Tasks

8. Finally click *Install* to install the Fusion software.

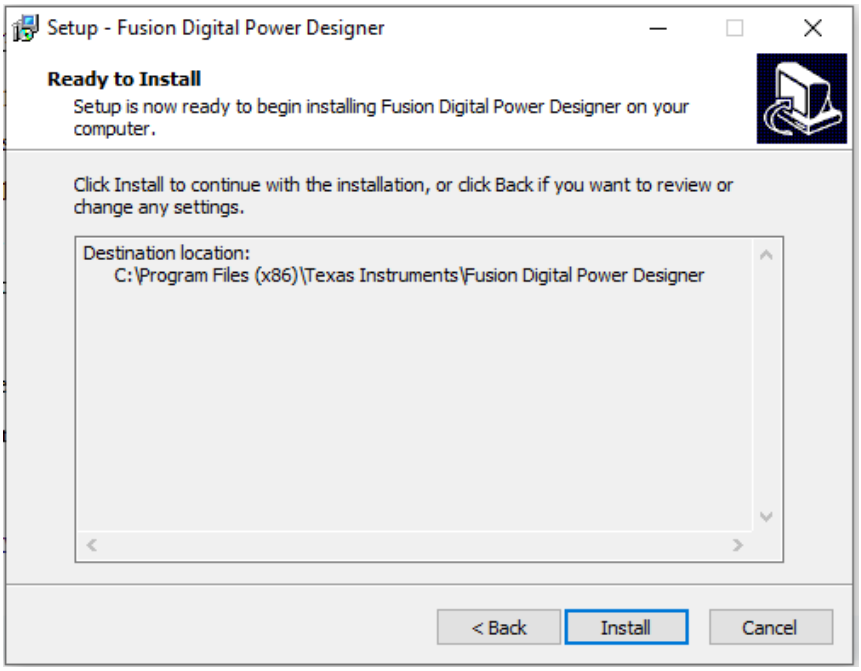


Figure 3-5. Setup Installation Window

9. Click on *Finish* to complete the installation setup and launch the software.

Figure 3-6. Installation Complete Window

3.2 Quick Start to TPS389C0XEVM GUI

Please follow the steps below precisely to quickly evaluate the TPS389C03-Q1. In this quick start, the TPS389C0XEVM is set up to monitor several power supply rails.

1. Make the hardware connections and software installation described in Section 3.1 have been completed. Feel free to skip the GUI installation if the *Fusion Digital Power Designer* for TPS389C0XEVM GUI has been installed already.
2. Power the EVM by turning on the power supply. Note that the voltage and current limits at the power supply is set at 3.3 V and 10 mA.
3. Once the TI's USB2GPIO USB Interface Adapter is connected to EVM and the laptop, launch the evaluation software *Fusion Digital Power Designer*.
4. Click on *I2C GUI* on the bottom right of GUI.

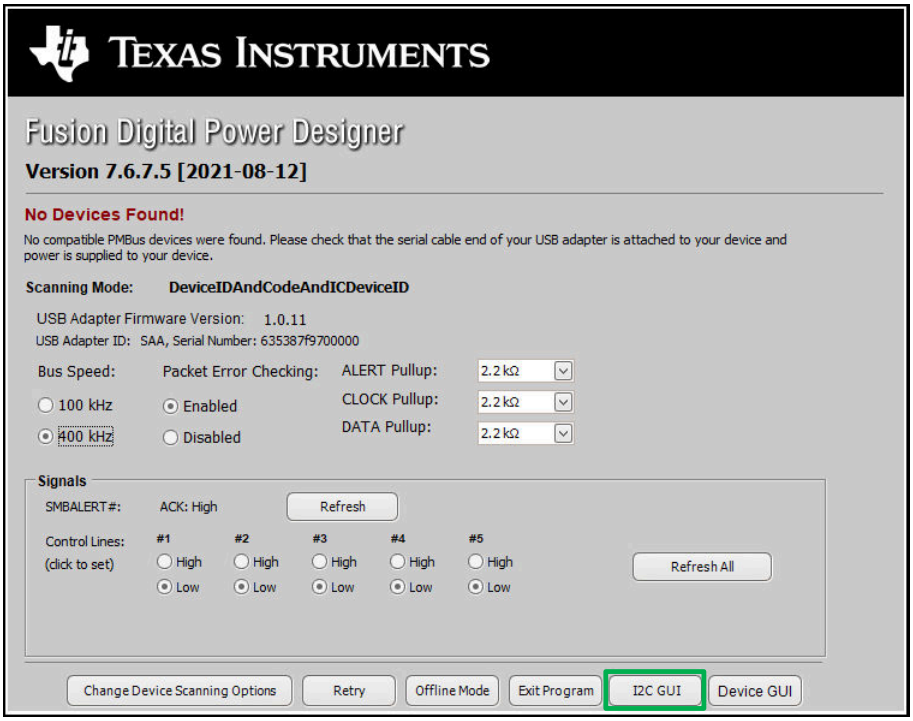


Figure 3-7. Fusion Welcome Window

5. Click on *Change Scan Mode* to select *TPS389xxx* and then click *OK*.

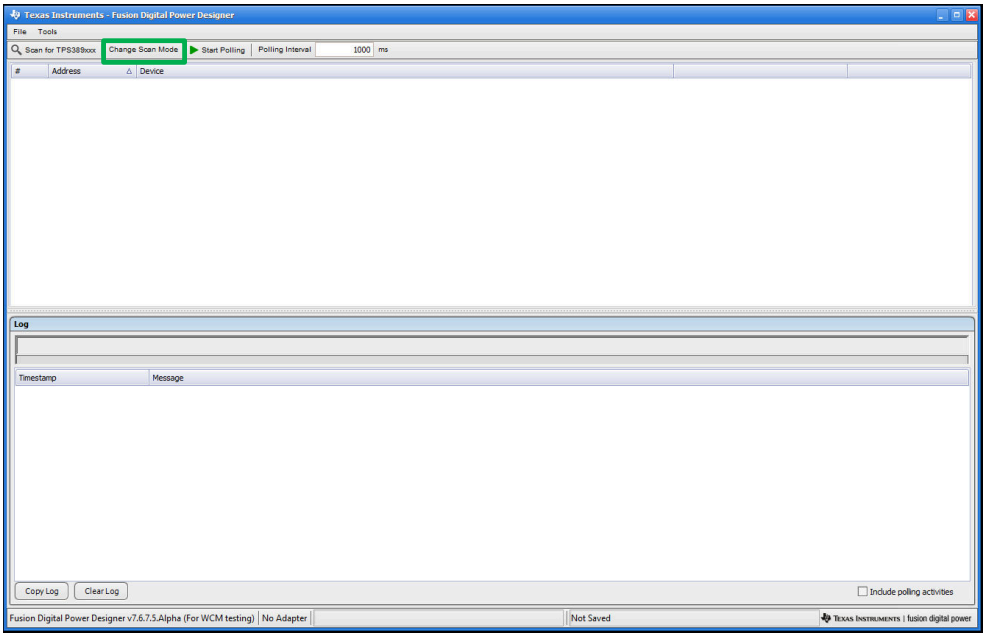


Figure 3-8. Fusion Scan Window

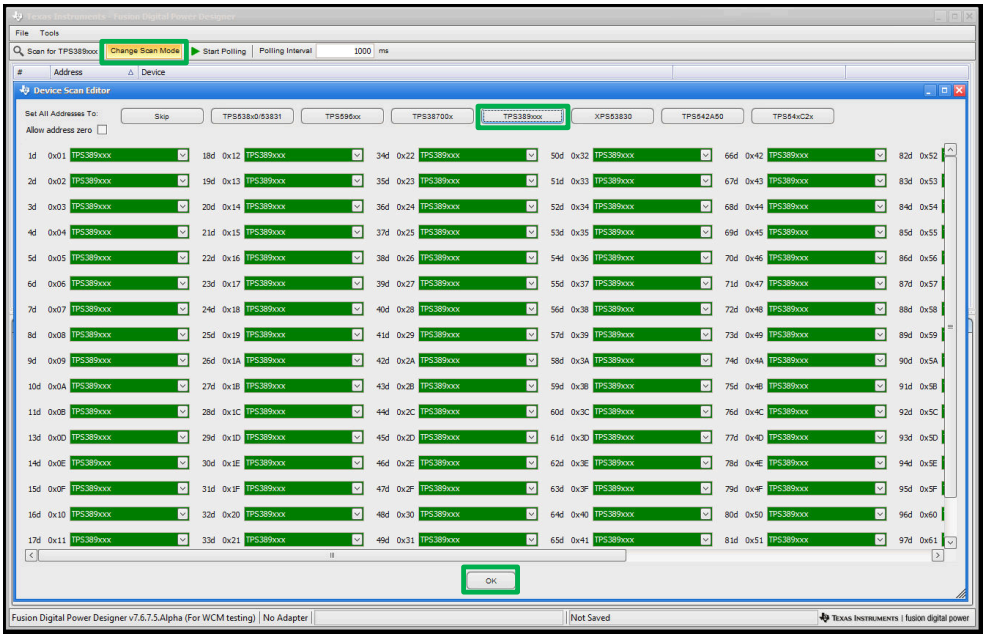


Figure 3-9. Fusion Scan Selection Window

6. Scan for the TPS389C0XEVM by clicking on *Scan for TPS389xxx* on top left of the window.

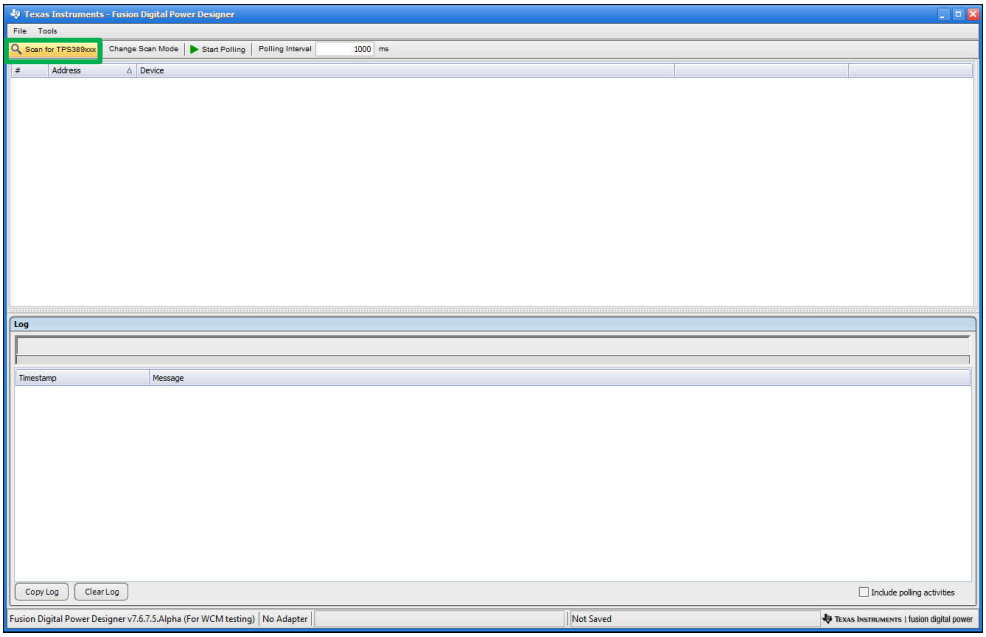


Figure 3-10. Fusion Scan Window - Scanning for TPS389C0XEVM

7. Once the EVM is discovered, select *Click to Configure*.

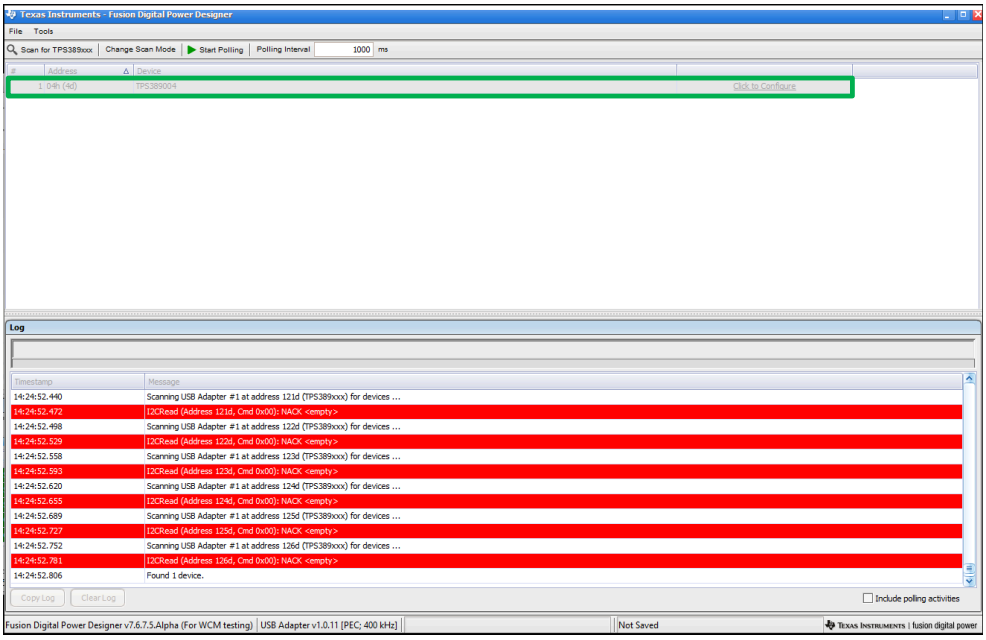


Figure 3-11. Fusion Scan Window - Scan for TPS389C0XEVM Completed

8. Once the *Click to Configure* box has been selected, the Fusion Digital Power Device GUI for the TPS389C03-Q1 appears as shown below. The GUI image shows the *General Config*, *Sequencing*, *Clear/Reset*, *Telmetry*, and Polling (Plotting the monitored voltage rails) sub-windows.

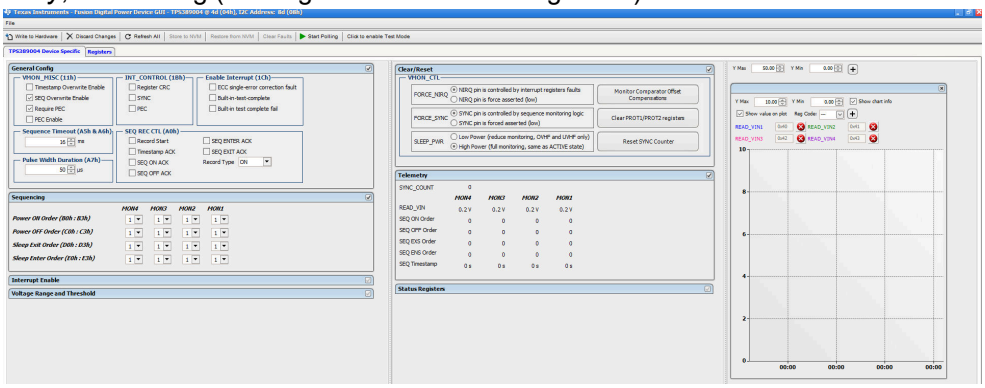


Figure 3-12. Fusion Digital Power Device GUI - TPS389C0XEVM (Image #1)

9. The GUI image below continues to show the additional sub-windows that are in the GUI for the TPS389C03-Q1. The GUI image includes the *Interrupt Enable*, *Voltage Range and Threshold*, *Status Registers*, and Polling (plotting the monitored voltage rails) sub-windows.

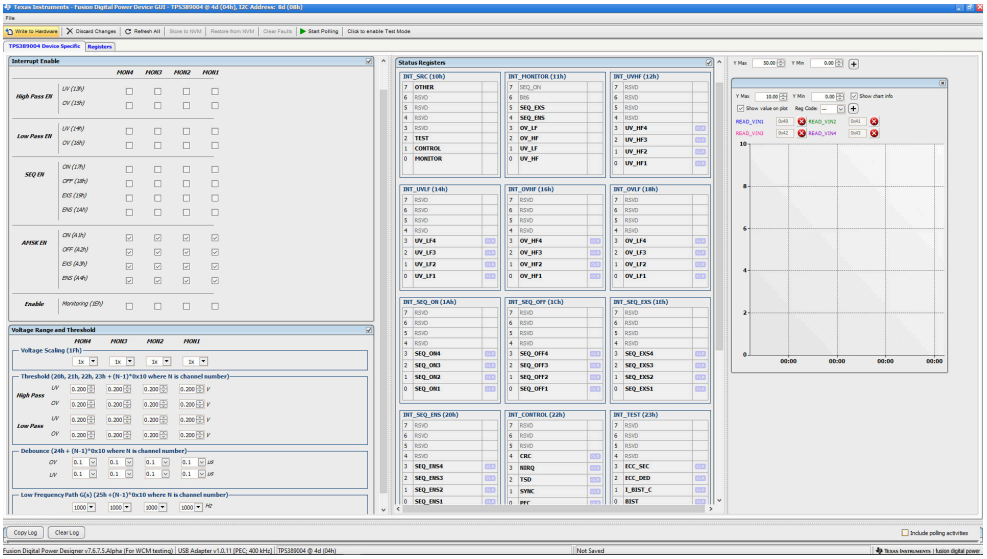


Figure 3-13. Fusion Digital Power Device GUI - TPS389C0XEVM (Image #2)

10. The last GUI image below shows the last five registers in the *Status Registers* sub-window.

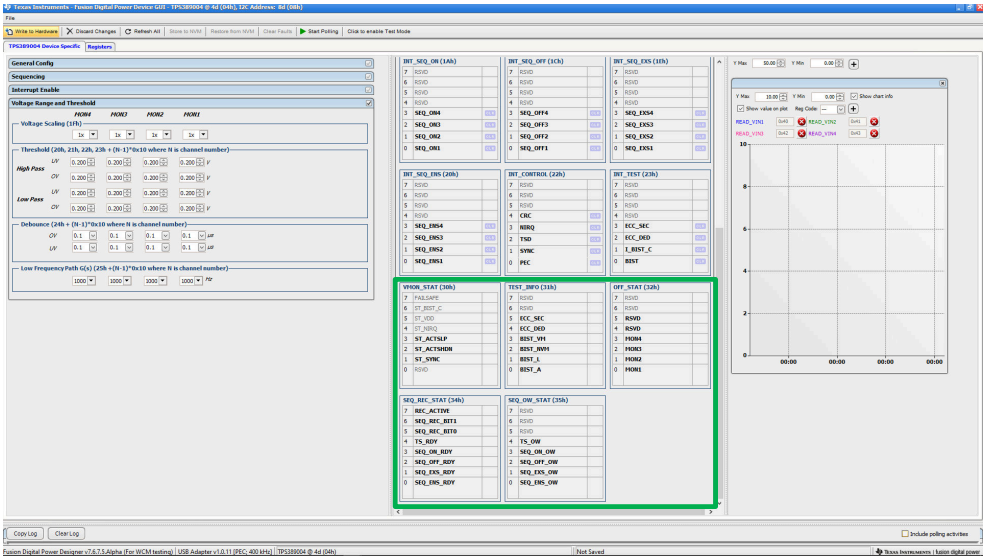


Figure 3-14. Fusion Digital Power Device GUI - TPS389C0XEVM (Image #3)

4 Hardware Design Files

4.1 TPS389C0XEVM Schematic

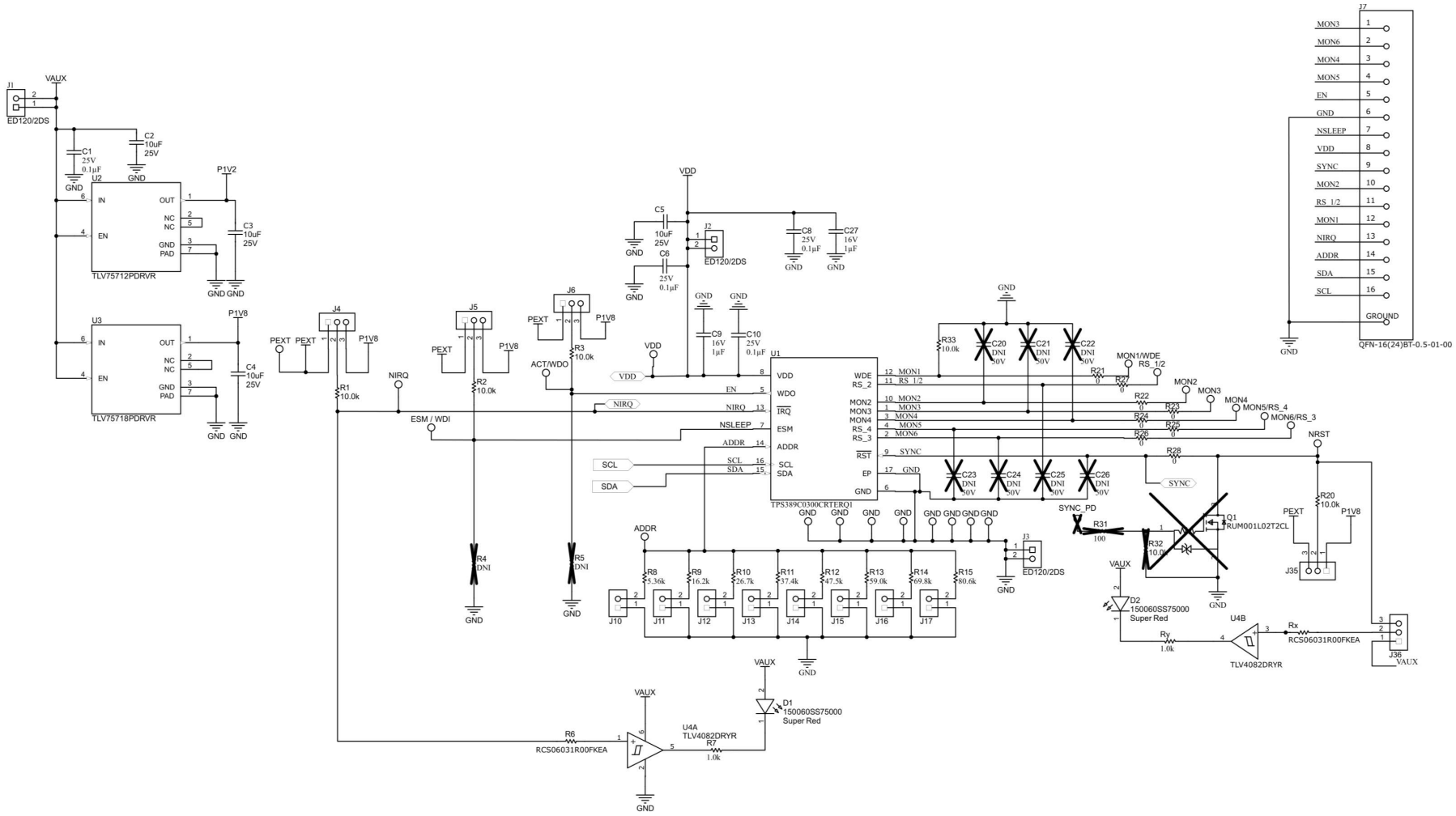


Figure 4-1. TPS389C0XEVM Main Schematic

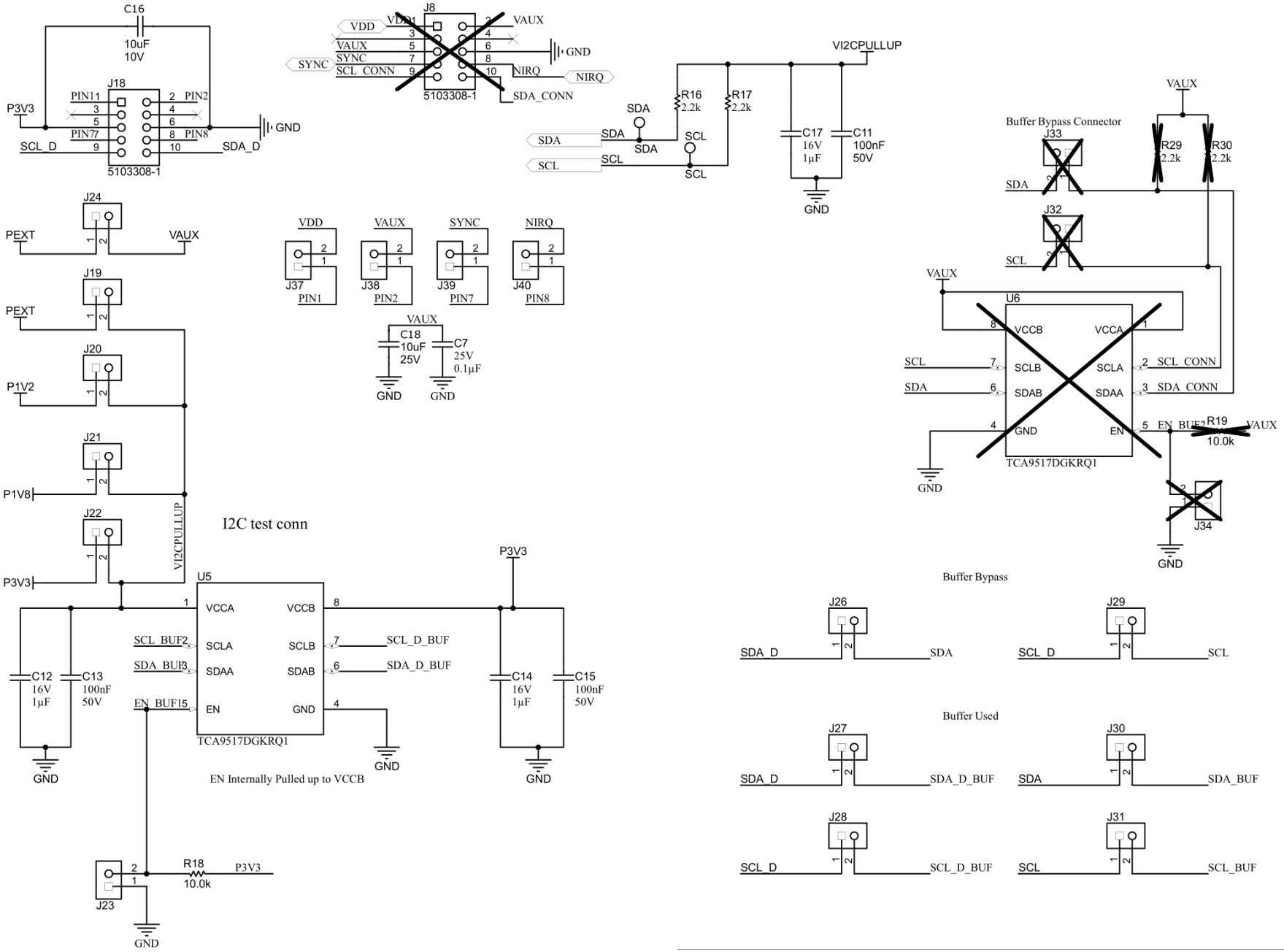


Figure 4-2. TPS389C0XEVM I²C Schematic with Buffers

4.2 Layout and Component Placement

Figure 4-3 and Figure 4-4 show the top and bottom assemblies of the printed circuit board (PCB) to show the component placement on the EVM.

Figure 4-5 and Figure 4-6 show the top and bottom layouts, Figure 4-7 and Figure 4-8 show the top and bottom layers, and Figure 4-9 and Figure 4-10 shows the top and bottom solder masks of the EVM.

4.2.1 Layout

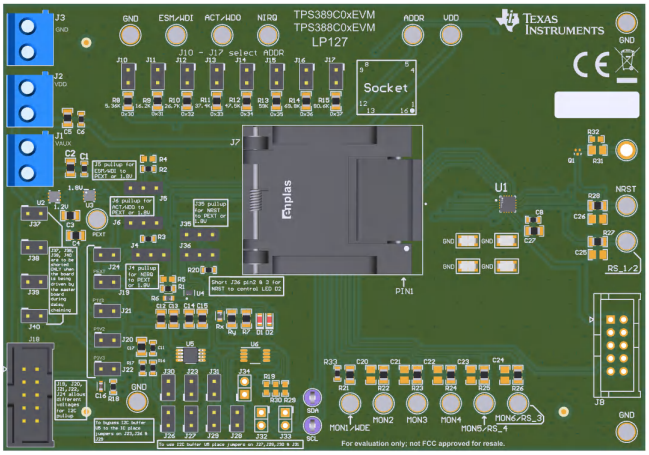


Figure 4-3. Component Placement—Top Assembly

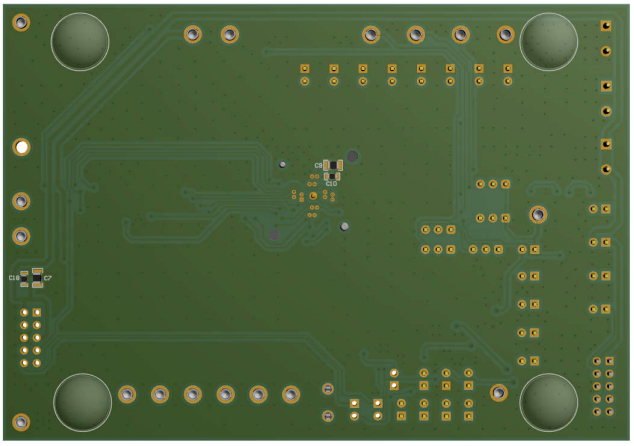


Figure 4-4. Component Placement—Bottom Assembly

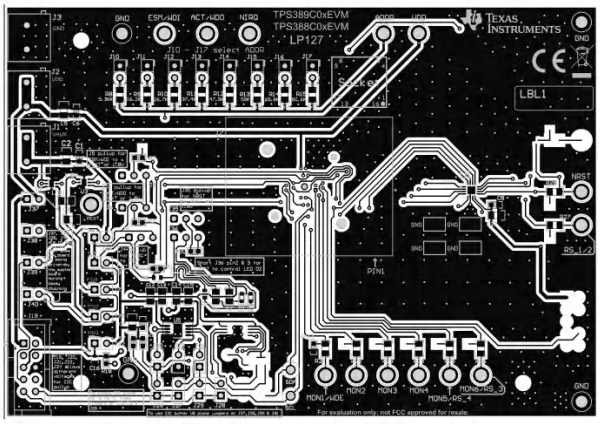


Figure 4-5. Layout—Top

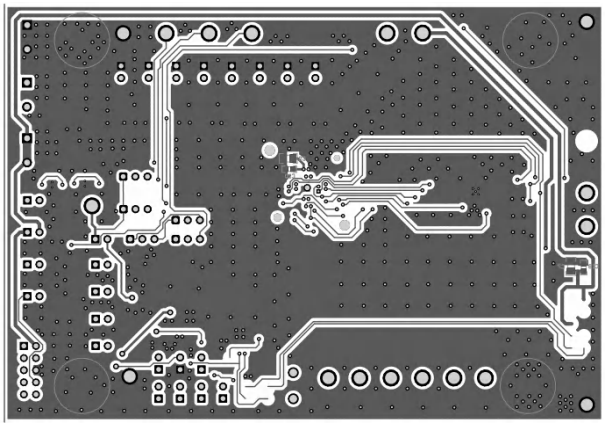


Figure 4-6. Layout—Bottom

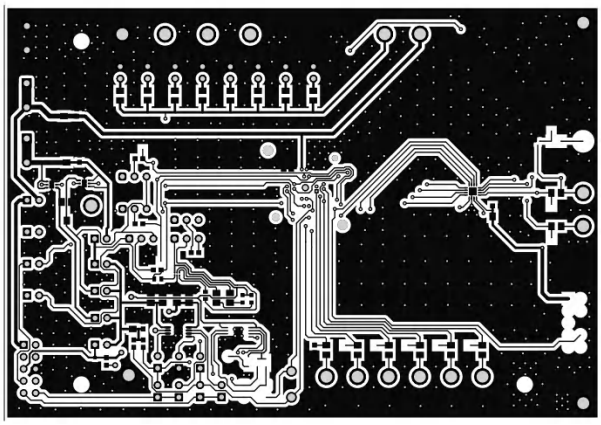


Figure 4-7. Top Layer

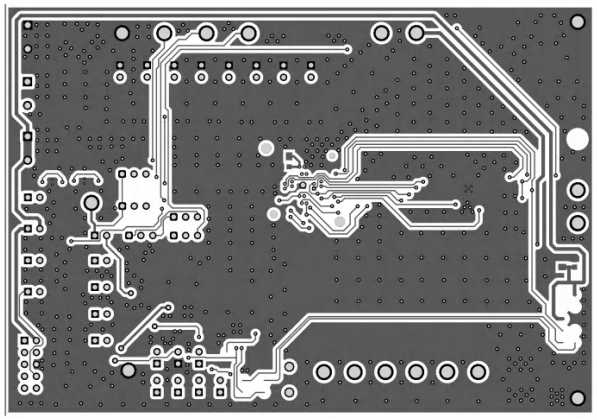


Figure 4-8. Bottom Layer

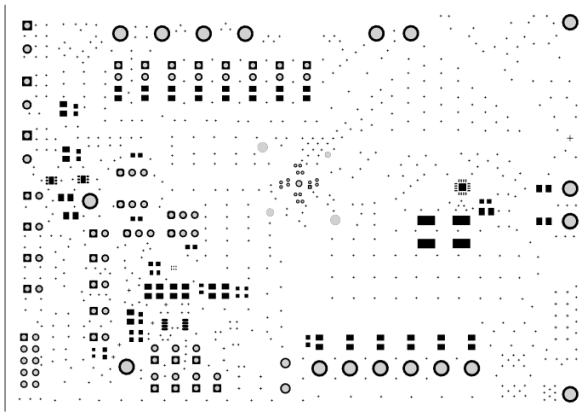


Figure 4-9. Top Solder Mask

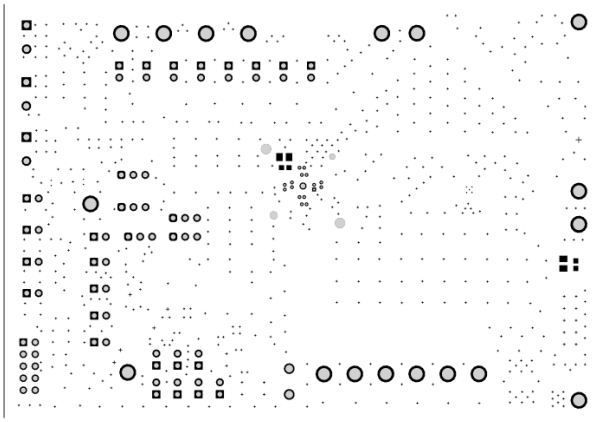


Figure 4-10. Bottom Solder Mask

4.3 Bill of Materials

Table 4-1. TPS389C0XEVM Bill of Materials

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURE
ACT/WDO, ESM / WDI,MON1/ WDE,MON2,MON3,MO N4,MON5/RS_4,MON6/ RS_3,NIRQ,NRST,RS_ 1/2,ADDR,PEXT,VDD,T P6a, TP6b, TP6c, TP6d,	18	Turret	Terminal, Turret, TH, Triple	Keystone1598-2	1598-2	Keystone
GND1, GND2, GND3, GND4	4	Test Point (SMD)	Test Point, Miniature, SMT	Miniature, SMT	5019	Keystone
C1, C6, C7, C8, C10	5	0.1uF	CAP, CERM, 0.1 µF, 25 V,+/- 10%, X5R, 0603	0603	CL10A104KA8NNNC	Samsung Electro-Mechanics
C11	1	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0603	0603	06035C104KAT2A	AVX
C13, C15	2	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0805	0805	C0805C104K5RACTU	Kemet
C16	1	10 µF	10 µF ±10% 10 V Ceramic Capacitor X5R 0603 (1608 Metric)	0603	C1608X5R1A106K080AC	TDK
C2, C3, C4, C5, C18	5	10 µF	10 µF ±10% 25 V Ceramic Capacitor X7S 0805 (2012 Metric)	0805	C2012X7S1E106K125AC	TDK
C9, C12, C14, C17, C27	5	1uF	CAP, CERM, 1 µF, 16 V,+/- 10%, X7R, AEC-Q200 Grade 1, 0805	0805	C0805C105K4RACAUTO	Kemet
D1, D2	2	Super Red	LED, Super Red, SMD	LED_0603	150060SS75000	Wurth Elektronik
H1, H2, H3, H4	4	Bumpon Pad	Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2, J3	3	Terminal Block	Terminal Block, 5.08 mm, 2x1, Brass, TH	2x1 5.08 mm Terminal Block	ED120/2DS	On-Shore Technology
J10, J11, J12, J13, J14, J15, J16, J17, J19, J20, J21, J22, J23, J24, J26, J27, J28, J29, J30, J31, J37, J38, J39, J40	24	Header	Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
J18	1	Shrouded Header	Header (shrouded), 100mil, 5x2, Gold, TH	5x2 Shrouded header	5103308-1	TE Connectivity
J4, J5, J6, J35, J36	5	Header	Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec
J7	1	Socket	QFN CLAMSHELL 16 PIN RTE THRU HOLE WITH CENTER GND	16-Pin Socket	QFN-16(24)BT-0.5-01-00	Enplas
PCB	1	LP127	Printed Circuit Board		TPS389C0XEVM	Any
R1, R18	2	10.0kΩ	RES, 10.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0710KL	Yageo
R10	1	26.7kΩ	RES, 26.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF2672V	Panasonic

Table 4-1. TPS389C0XEVM Bill of Materials (continued)

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURE
R11	1	37.4kΩ	RES, 37.4 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF3742V	Panasonic
R12	1	47.5kΩ	RES, 47.5 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF4752V	Panasonic
R13	1	59.0kΩ	RES, 59.0 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF5902V	Panasonic
R14	1	69.8kΩ	RES, 69.8 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF6982V	Panasonic
R15	1	80.6kΩ	RES, 80.6 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF8062V	Panasonic
R16, R17	2	2.2kΩ	RES, 2.2 k, 5%, 0.1 W, 0603	0603	RC0603JR-072K2L	Yageo
R2, R3, R33, R20	4	10.0kΩ	RES, 10.0 k, 1%, 0.1 W, 0603	0603	RCG060310K0FKEA	Vishay Draloric
R21, R22, R23, R24, R25, R26, R27, R28	8	0 Ω	RES, 0, 5%, 0.125 W, 0805	0805	RC0805JR-070RL	Yageo America
R6, Rx	2	1 Ω	1 Ohms ±1% 0.25W, 1/4W Chip Resistor 0603 (1608 Metric) Automotive AEC-Q200, Pulse Withstanding Thick Film	0603 (1608 Metric)	RCS06031R00FKEA	Vishay
R7, Ry	2	1.0kΩ	RES, 1.0 k, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6GEYJ102V	Panasonic
R8	1	5.36kΩ	RES, 5.36 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF5361V	Panasonic
R9	1	16.2kΩ	RES, 16.2 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF1622V	Panasonic
SCL,SDA	2	Test Points	Test Point, Multipurpose, Purple, TH	Purple Multipurpose Testpoint	5129	Keystone
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11, SH-J12	12	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
U1	1	IC	Multichannel Overvoltage and Undervoltage I2C Programmable Voltage Supervisor and Monitor with Q&A Watchdog	WQFN16	TPS389C0300CRTERQ1	TI
U2	1	IC	1 A Low-Quiescent-Current Low-Dropout (LDO) Regulator, DRV0006A (WSON-6)	DRV0006A	TLV75712PDRVR	TI
U3	1	IC	1 A Low-Quiescent-Current Low-Dropout (LDO) Regulator, DRV0006A (WSON-6)	DRV0006A	TLV75718PDRVR	TI
U4	1	IC	Dual-Channel, Low-Power Comparator with Integrated Reference	SON6	TLV4082DRYR	TI

Table 4-1. TPS389C0XEVM Bill of Materials (continued)

DESIGNATOR	QTY	VALUE	DESCRIPTION	PACKAGE REFERENCE	PART NUMBER	MANUFACTURE
U5	1	IC	Automotive, Level-Shifting I2C Bus Repeater, DGK0008A (VSSOP-8)	DGK0008A	TCA9517DGKRQ1	TI

5 Additional Information

Trademarks

All trademarks are the property of their respective owners.

6 Related Documentation

Data sheet: TPS389C03-Q1 Multichannel Overvoltage and Undervoltage I2C Programmable Voltage Supervisor and Monitor with Q&A Watchdog

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