TPS25772-Q1 Evaluation Module

TEXAS INSTRUMENTS

Description

The TPS25772DQ1EVM is designed to evaluate the TPS25772-Q1 for USB Type-C™ and Power Delivery (PD) applications. This EVM supports dual port PD charging and comes with three other variants: single port charging with DisplayPort™ over USB-C® (DP Alt Mode) (TPS25763Q1EVM), single port charging only (TPS25762DQ1EVM), and dual ports charging + USB 2.0 (TPS25772Q1EVM-CD-150). The EVM integrates a TIVA microcontroller, enabling online debugging and online EEPROM updates.

Device configuration settings are selected through an intuitive Application Customization Tool in the form of a graphical user interface (TPS257XX-Q1-GUI), reducing much of the complexity associated with competitive USB-PD designs.

Get Started

1. Read this TPS25772DQ1EVM user's guide (this document)
2. Start development with the Graphical User Interface (TPS257XX-Q1-GUI)

3. Refer to the data sheet or E2E for questions and support

Features

- TPS25772-Q1: USB–IF certification with PPS, TID: 9161
- Charging up to 65W on Port A
- Supports 60W charging on Port B with the TPS55289-Q1 if VIN is 12V
- Easy-to-use GUI with preconfigured firmware to configure device
- VBUS and CCx test points for both Type-C ports to monitor PD traffic
- MCU for EEPROM programming and system telemetry
- Jumper configuration of all system configurable pins

Applications

- Automotive USB charging
- Automotive media hub
- Automotive head unit
- Automotive rear seat entertainment
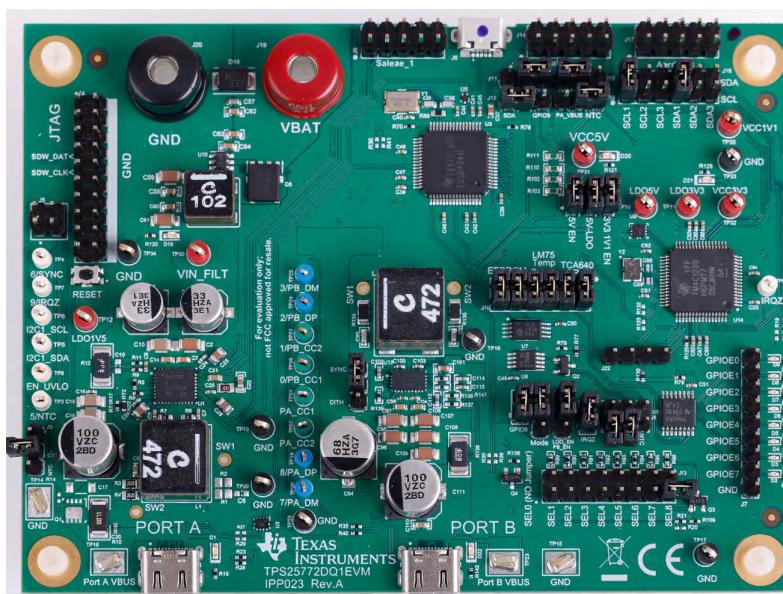
TPS25772DQ1EVM

1 Evaluation Module Overview

1.1 Introduction

The TPS25772-Q1 is a dual port USB PD controller that has a 65W capable buck boost converter integrated as well as the ability to control a second USB Type-C port and external buckboost converter.

The EVM is customizable through the (TPS257XX-Q1-GUI.) Additionally, the EVM is equipped with Aardvark connector to I2C interfaces and USB Micro-B interface and USB2ANY interface for debugging and development.

This user's guide describes how the TPS25772DQ1EVM can be used to test PD functions. This document includes descriptions of how to use the EVM, contents, schematics, printed circuit board (PCB) layouts, and bill of materials (BOM). Throughout this document the terms evaluation board, evaluation module, and EVM are synonymous with the TPS25772DQ1EVM.

1.2 Kit Contents

The EVM Kit contains the TPS25772DQ1EVM.

1.3 Specification
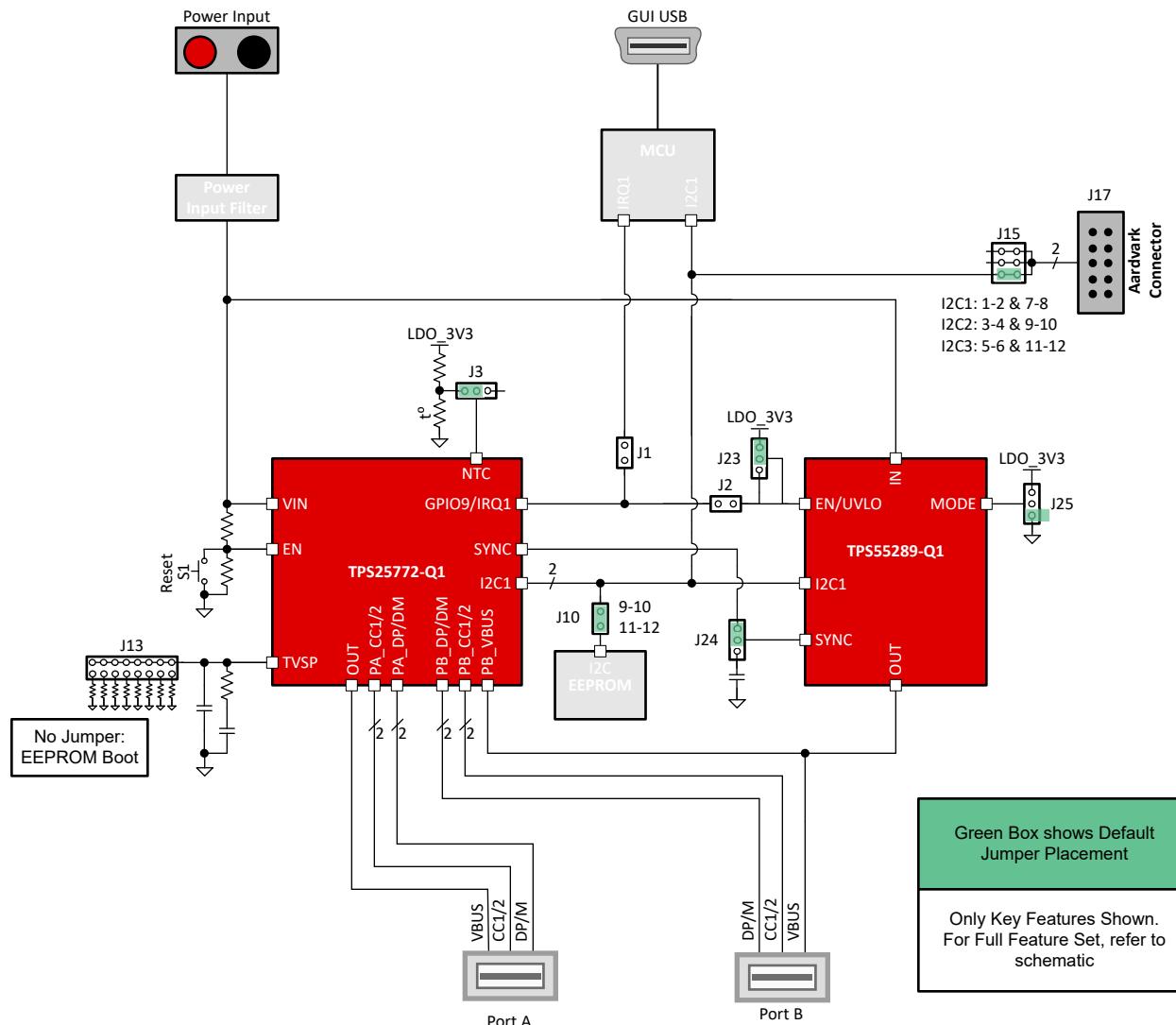
Figure 1-1. EVM Simplified Block Diagram

1.4 Device Information

The TPS25772-Q1 is a dual port Type-C controller that has a 65W capable buck boost converter for Port A and can interface with the TPS55289-Q1 via Port B, as demonstrated with the TPS25772Q1EVM for up to 60W PD charging depending on supply voltage level.

The TPS25772-Q1 implements intelligent System Power Management (SPM) to maximize delivered USB power while protecting the system from automotive battery transient and over-temperature conditions.

2 Hardware

2.1 Connections

Use the following connections to operate EVM successfully:

- Connect approximately 5.5V-18V DC power supply to the power input banana connectors.
- Connect Micro Type-B USB connector to PC to use GUI to program EEPROM.
- Interface to Aardvark connector to program EEPROM or observe I2C traffic between TPS25772-Q1 and TPS55289-Q1 during operation.
- Port A and Port B Type-C connectors are provided to connect to power delivery or Type-C sink devices or test equipment.

Table 2-1. Connections

Jumper	Connection	Description
J1	Installed	IRQ1 Connected to USB MCU used by GUI
J2	Not installed	GPIO9/IRQ1 not connected to TPS55289-Q1
J3	Jumper installed between pins 1-2	NTC connected to onboard PTC pin
J10	Jumpers installed between pins 9-10 and 11-12	PCB EEPROM connected to the TPS25772-Q1
J13	Jumper not installed	TPS25772-Q1 configured to boot from EEPROM
J15	Jumpers installed between pins 1-2 and 7-8	I2C1 connected to the Aardvark connector (J17)
J23	Jumper installed between pins 2-3	TPS55289-Q1 enabled when the TPS25772-Q1 is powered
J24	Jumper installed between pins 2-3	Sync pins of TPS25772-Q1 connected to the TPS55289-Q1
J25	Jumper installed between pins 2-3	The TPS55289-Q1 I2C address is set to 75h

2.2 Setup

Items Required for Operation

- TPS25772-Q1 Automotive Dual USB Type-C® Power Delivery Controller with BuckBoost Regulator data sheet
- TPS257XX-Q1-GUI
- Approximately 5.5V-18V DC power supply
- Type-C cables (1 per port)
- Each port needs a UFP (sink) or UFP emulator for operation
- USB Type-A to USB Micro-B cable
- Notebook with USB 2.0 capabilities
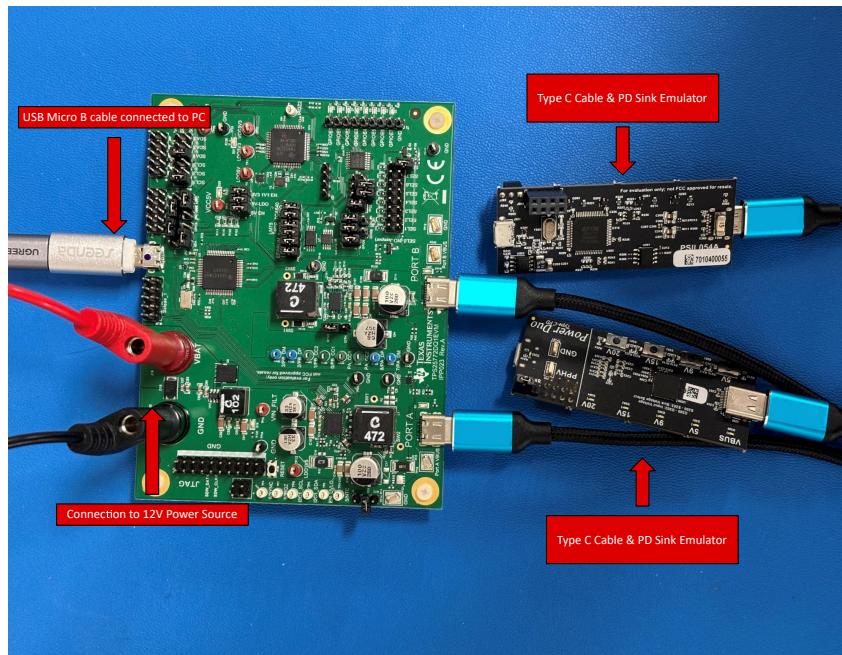
Figure 2-1. EVM Connections

2.3 Header Information

J17 Aardvark Connector and J15 I2C Selection Jumper

This connector is configured to allow the Total Phase Aardvark to connect directly to the EVM. One or more I2C bus can be connected to the Aardvark connector by connecting jumpers on J15. When making this connection, both the SCL1/2/3 and SDA1/2/3 must be selected by installing the jumper.

- I2C1 is connected to the I2C controller of the TPS25772-Q1
- I2C2 connects to I2C2 of the TPS25772-Q1 (dependent on EVM configuration) and the TIVA MCU
- I2C3 connects to the TIVA MCU
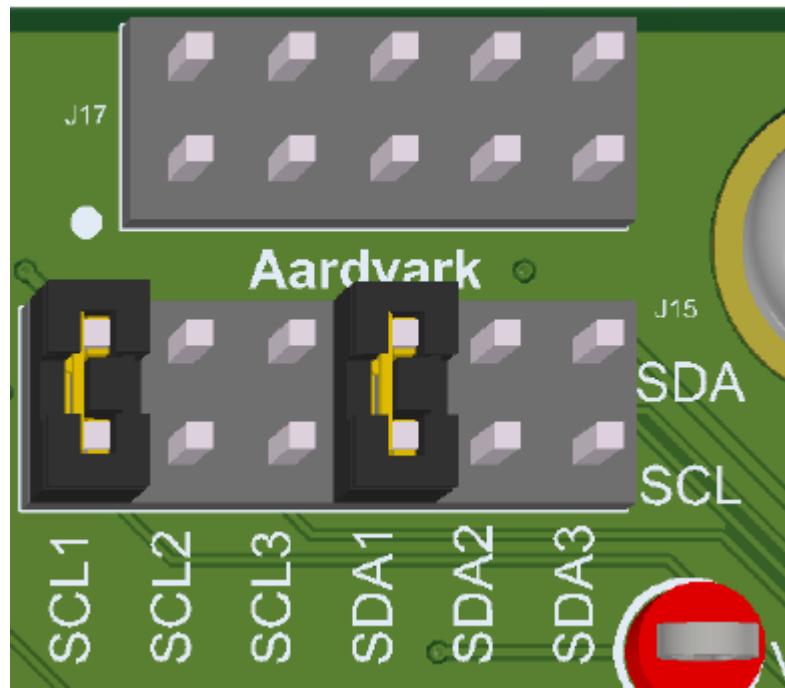
Figure 2-2. J17 Aardvark Connector

Table 2-2. J17 Aardvark Connector

Pin Number	Pin/Jumper			Description
1	J15	1:2	I2C_SCL1	Select between the 3 possible I2C connections on the EVM.
		3:4	I2C_SCL2	
		5:6	I2C_SCL3	
2	GND			Ground Reference
3	J15	7:8	I2C_SDA1	Select between the 3 possible I2C connections on the EVM.
		9:10	I2C_SDA2	
		11:12	I2C_SDA3	
4	Aard1_5V			5V Supply from the Aardvark connection. Not used on the EVM, but present for potential use in debug
5	No Connection			
6	Aard1_5V			5V Supply from the Aardvark connection. Not used on the EVM, but present for potential use in debug
7	No Connection			
8	No Connection			
9	No Connection			
10	GND			Ground Reference

J9 and J14 Debug Headers

These headers are included to allow the EVM to connect to a 10V digitizer for debug.
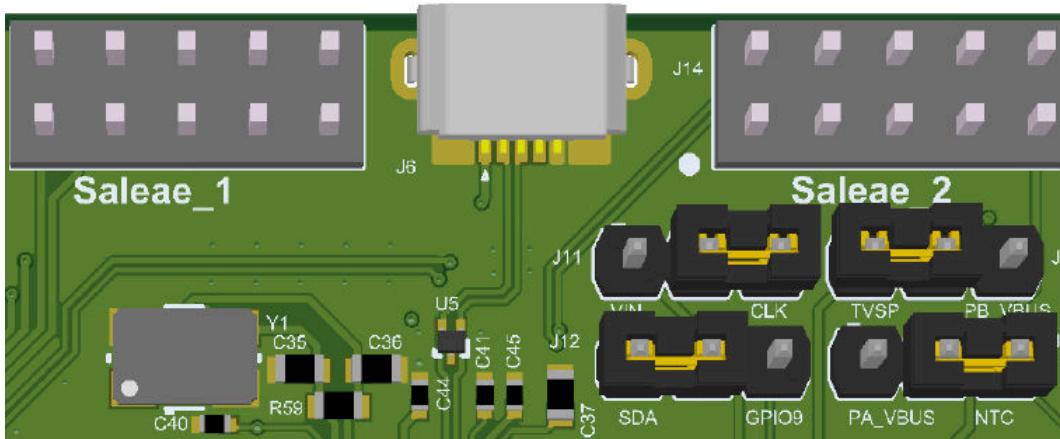
Figure 2-3. Digitizer Debug Headers

Table 2-3. J9 and J14 Debug Headers

Pin	J9	Description			J14	Description		
1	PA_CC1	Observe Port A CC1			PA_D_P	Observe Port A DP		
2	PA_CC2	Observe Port A CC2			PA_D_N	Observe Port A DN		
3	0.4*PA_VBUS	Observe Port A VBUS scaled to 40% of full scape to fit 10V input range of the digitizer			PB_D_P	Observe Port B DP		
4	PB_CC1	Observe Port B CC1			PB_D_N	Observe Port B DN		
5	GND	Ground Reference			GND	Ground Reference		
6	GND	Ground Reference			GND	Ground Reference		
7	PB_CC2	Observe Port B CC2			NTC or 0.4*PA_VBUS	J18	1:2	Observe Port A VBUS scaled to 40% of full scape to fit 10V input range of the digitizer
							2:3	Observe NTC pin of TPS25772DQ1
8	0.4*PB_VBUS	Observe Port B VBUS scaled to 40% of full scape to fit 10V input range of the digitizer			TVSP or 0.4*PB_VBUS	J16	1:2	Observe TVSP pin of TPS25772DQ1
							2:3	Observe Port B VBUS scaled to 40% of full scape to fit 10V input range of the digitizer
9	I2C1:SCL1 or VIN/2	J11	1:2	Observe Input Voltage scaled to 50% to fit input range of the digitizer	VIN_FILT/2	Observe Vin Input Filter voltage scaled to 50% to fit input range of the digitizer		
			2:3	Observe I2C_SCL1				
10	I2C_SDA1 or GPIO_9	J12	1:2	Observe I2C_SDA1	GPIO_9	Observe GPIO_9		
			2:3	Observe GPIO_9				

2.4 Jumper Information

J13 TVSP Jumper

This Jumper selects the Bootmode and I2C address for the TPS25772-Q1
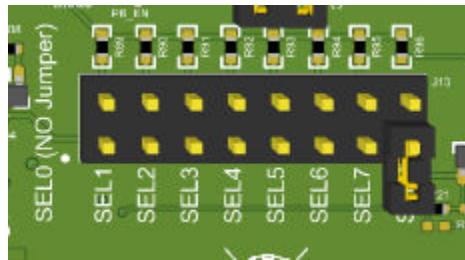
Figure 2-4. J13 TVSP Jumper

See the TPS25772-Q1 Automotive Dual USB Type-C® Power Delivery Controller with BuckBoost Regulator data sheet for selection description.

J21 Power Supply Control

This jumper is used to disable or select power supplies for the board

Figure 2-5. J21 Power Supply Control

Table 2-4. Power Supply Control

Pins	Label	Description
1-2	5V EN	Enable Buck Regulator to generate VCC5V
3-4	5V-LDO	Connect LDO_5V to VCC5V
5-6	3V3 1V1EN	Enable the LDO to generate VCC3V3 and VCC1V1 for Hub and MCU

J10 I2C Connection Jumper

This jumper block expands the I2C1 connections of TPS25772-Q1 and can connect to GPIO expander, I2C temperature sensor and EEPROM. Since I2C bus can support multiple targets, TI recommends to connect all pins.


**Figure 2-6. J10 I2C Connection Jumper**

Table 2-5. J10 I2C Connection Jumper

Pins	Label	Description
1-2 and 3-4	TCA640 GPIO	Connect the I2C1 Bus of the TPS25772-Q1 to the TCA640 GPIO Expander
4-5 and 7-8	LM75 Temp Sense	Connect the I2C1 Bus of the TPS25772-Q1 to LM75 Temperature Sensor
9-10 and 10-11	EEPROM	Connect the I2C1 Bus of the TPS25772-Q1 to the TCA640 EEPROM

J1, J2, J23, J24, and J25 TPS55289-Q1 Jumpers

The TPS55289-Q1 device has several connection options that are supported by the TPS25772-Q1. The five listed jumpers offer the following feature controls:

• IRQ connection
• Select between GPIO, TPS25772-Q1, and UVLO divider enable of TPS55289-Q1
• Dither vs sync selection
• I2C address selection
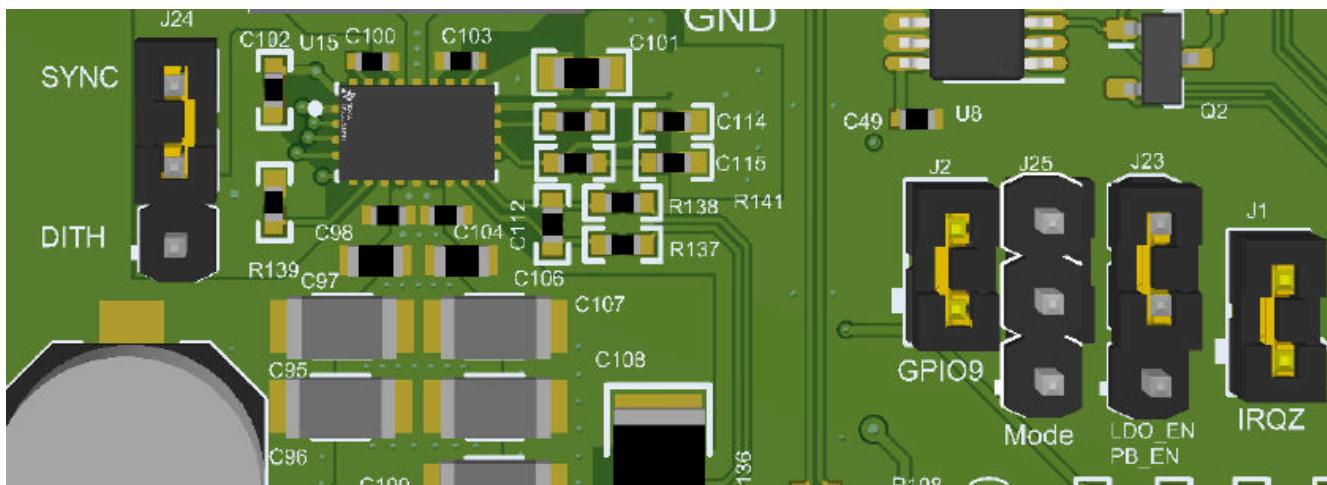
Figure 2-7. J1, J2, J24, J25, and J23: TPS55289-Q1 Jumpers

Table 2-6. J1: GPIO9 connect to IRQZ pin of MCU

Pins	Description
1-2	Connect GPIO9 of TPS25772-Q1 to the IRQ1 pin of the USB MCU
Open	Do Not connect GPIO9 of TPS25772-Q1 to the IRQ1 pin of the USB MCU

Table 2-7. J2: TPS55289 Enable Selection

Pins	Description
1-2	Connect GPIO9 to the EN/UVLO pin of the TPS55289-Q1
Open	Do not connect GPIO9 of TPS25772-Q1 to EN/UVLO pin of the TPS55289-Q1

Table 2-8. J23: TPS55289 Enable Selection

Pins	Description
1-2	Connect GPIO9 to the EN/UVLO pin of the TPS55289-Q1
2-3	Connect BJ_LDO_3V3 to the EN/UVLO pin of the TPS55289-Q1
Open	EN/UVLO controlled by resistor divider from VIN (This divider is DNP and must be populated to support this option)

Table 2-9. J24: Sync/Dither Selection

Pins	Description
1-2	Connect the dither capacitor to the DITH/SYNC pin of the TPS55289-Q1
2-3	Connect the sync pin of the TPS25772-Q1 to the DITH/SYNC pin of the TPS55289-Q1

Table 2-10. J25: I2C Address Selection

Pins	Description
1-2	TPS55289-Q1 I2C address 75h
2-3	TPS55289-Q1 I2C address 74h

J3 NTC Selection Jumper

The J3 header is used to verify the Thermal Foldback function. The NTC pin detects the voltage of an external NTC circuit and can be connected to a thermistor (NTC or PTC) divider or NTC_VAR. NTC_VAR is the output of TPL0102, which is a I2C digital potentiometer. The divider footprints allow the use of either PTC or NTC resistors to match what is used in the system represented. Another option is to remove the jumper and directly connect pin 2 of the J3 header to an external voltage. This combination is used to test the Thermal Foldback function. The thermistor assembled on the EVM is a positive temperature coefficient (PTC).
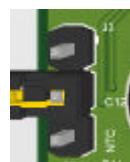
Figure 2-8. J3 NTC Selection Jumper

Table 2-11. J3 NTC Selection Jumper

| Pins	Label	Description
1-2	NTC	Connect NTC resistor to TPS25772DQ1 NTC pin
2-3	NTC VAR	Connect the digital Pot to the NTC pin

J8 TMP75B-Q1 Alert Connection Jumper
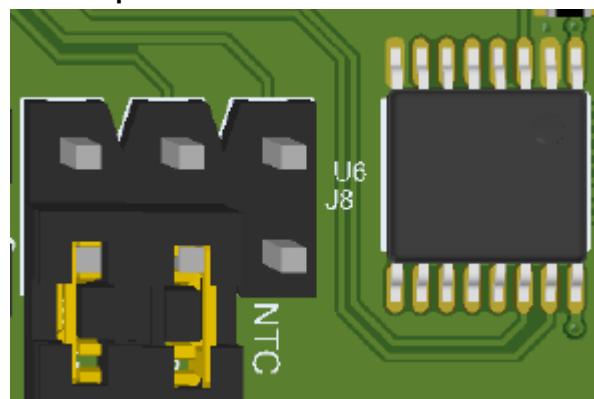
Figure 2-9. J8 TMP75BQ1 Alert Connection Jumper

Table 2-12. J8 TMP75BQ1 Alert Connection Jumper

Pins	Label	Description
1-2	IRQ	Connect the active low output of the TMP75B-Q1 pin to the IRQ pin (GPIO9 of the TPS25772-Q1)
3-4	NTC	Connect the Active Low output of the Alert pin of the TMP75B-Q1 to the NTC pin of the TPS25772-Q1
5-6	NTC	Connect the inverted (active high) output of the alert pin of the TMP75B-Q1 to the NTC pin of the TPS25772-Q1

2.5 Push Buttons

The TPS25772-Q1 can be reset using the RESET momentary button.
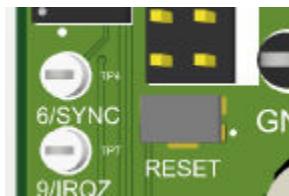
Figure 2-10. Reset Button

3 Software

3.1 WEB GUI Link

The TPS25772-Q1 device is configured using the TPS257XX-Q1-GUI. The TPS257XX-Q1-GUI Configuration Guide describes the features of the GUI and the process to program the resulting configuration into the EEPROM connected to the TPS25772-Q1.

4 Hardware Design Files

4.1 Schematics
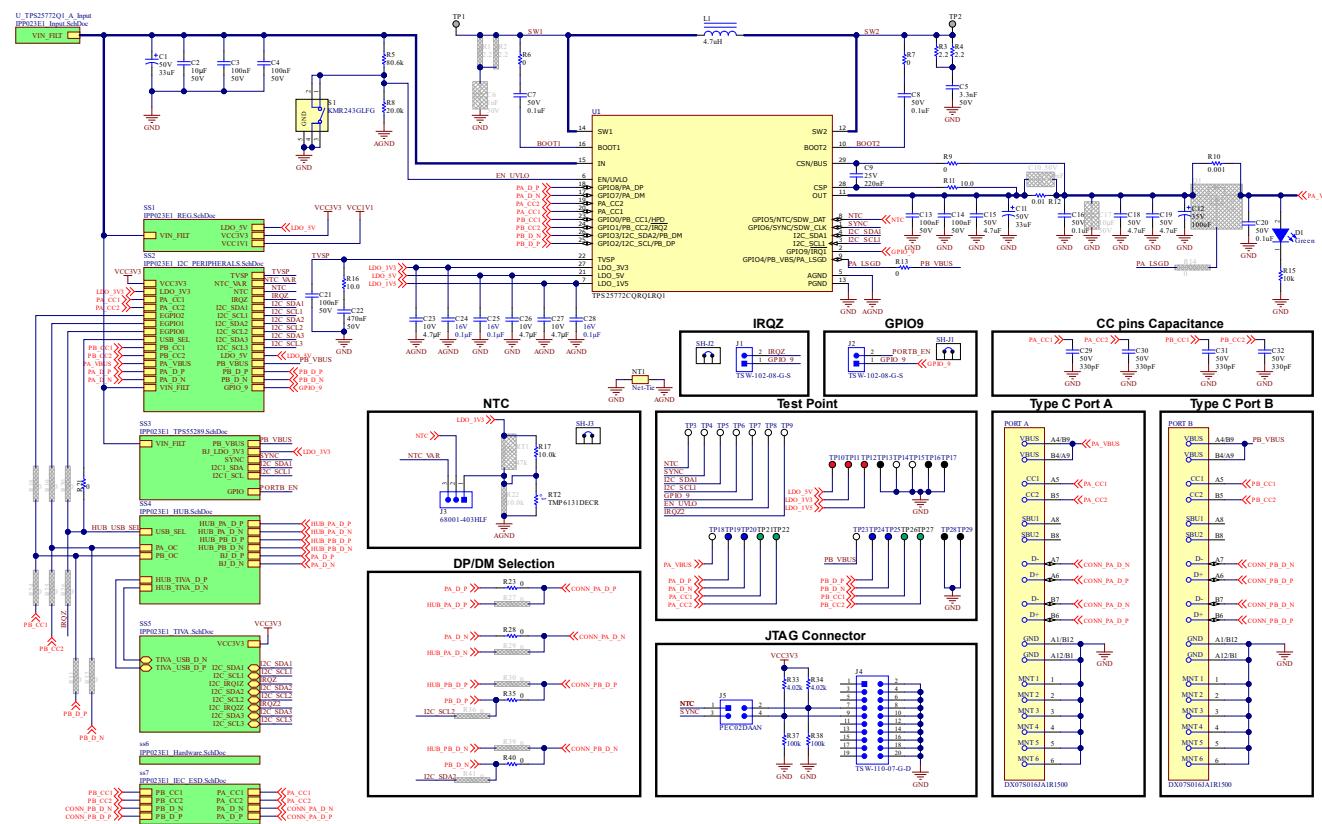
Figure 4-1. EVM Top Level Schematic
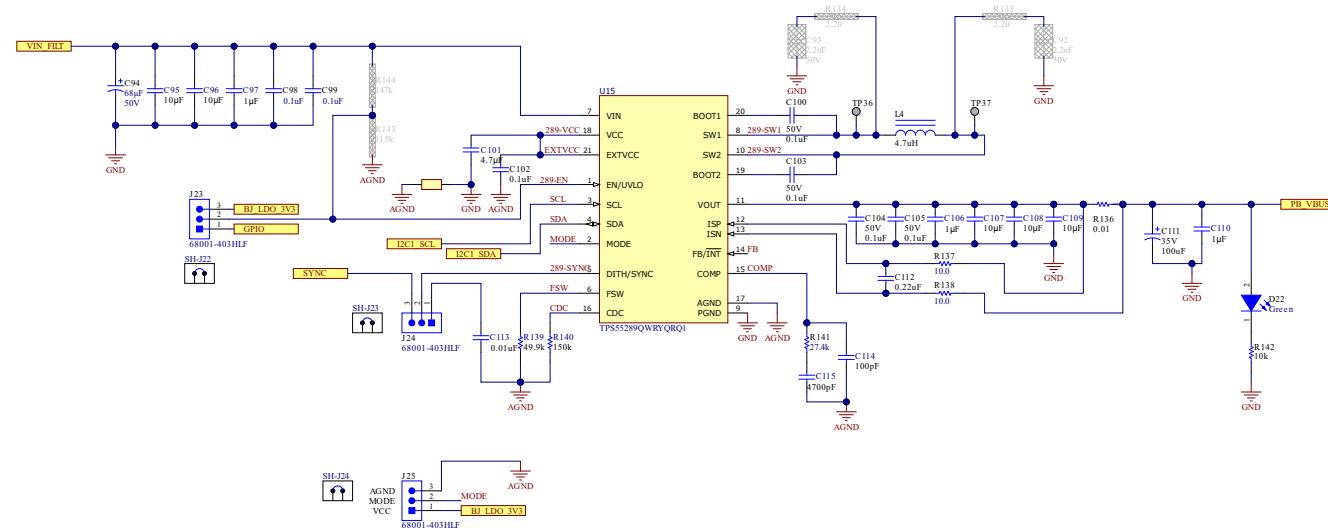
**Figure 4-2. TPS55289-Q1 Schematic**

Copyright © 2024 Texas Instruments Incorporated
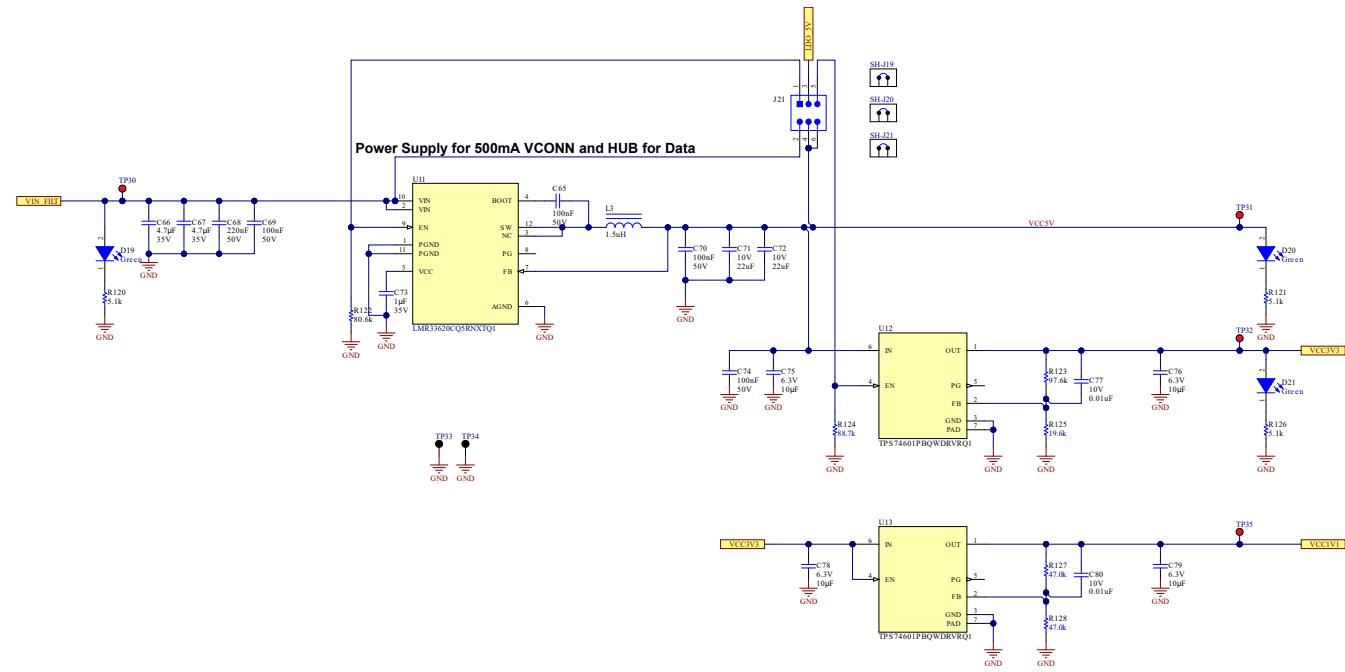
Figure 4-3. EVM Power System
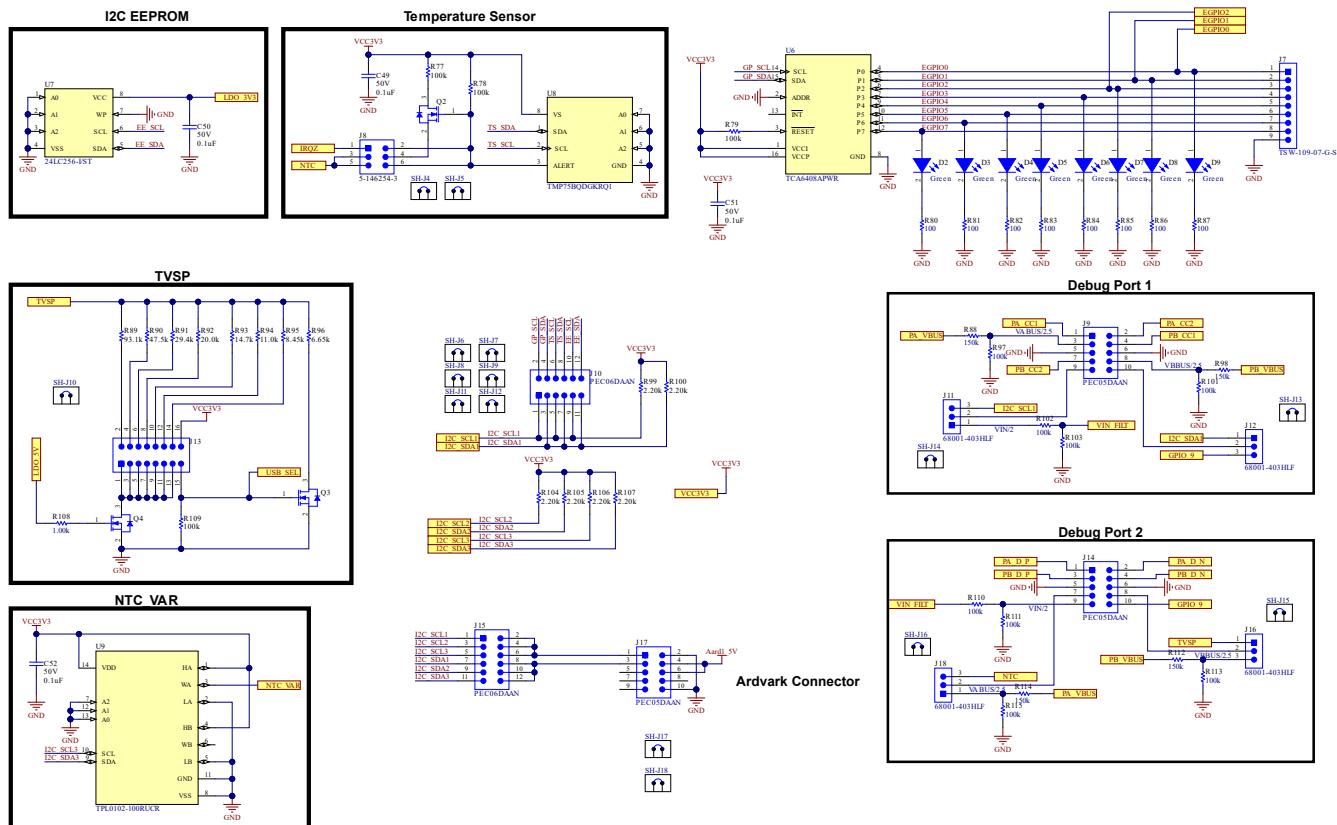
Figure 4-4. TPS25772-Q1 Schematic Peripherals

The EVM BOM can be updated to allow the type C ports to support Data connections, but this option is disabled by default BOM.
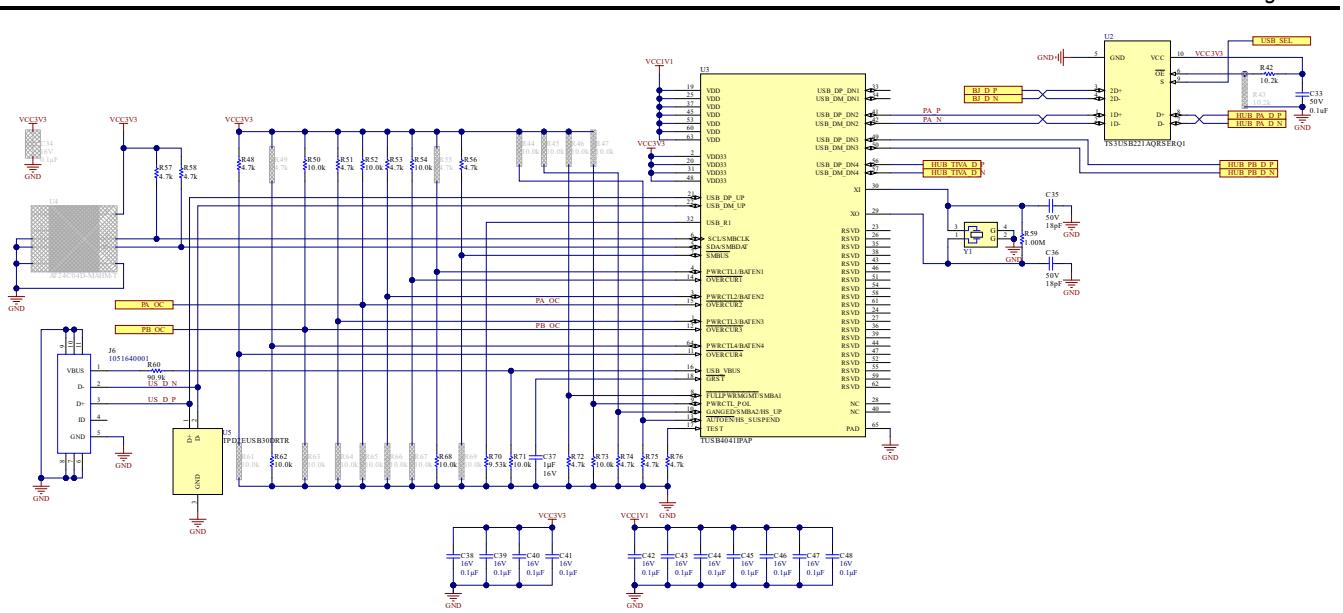
Figure 4-5. USB HUB
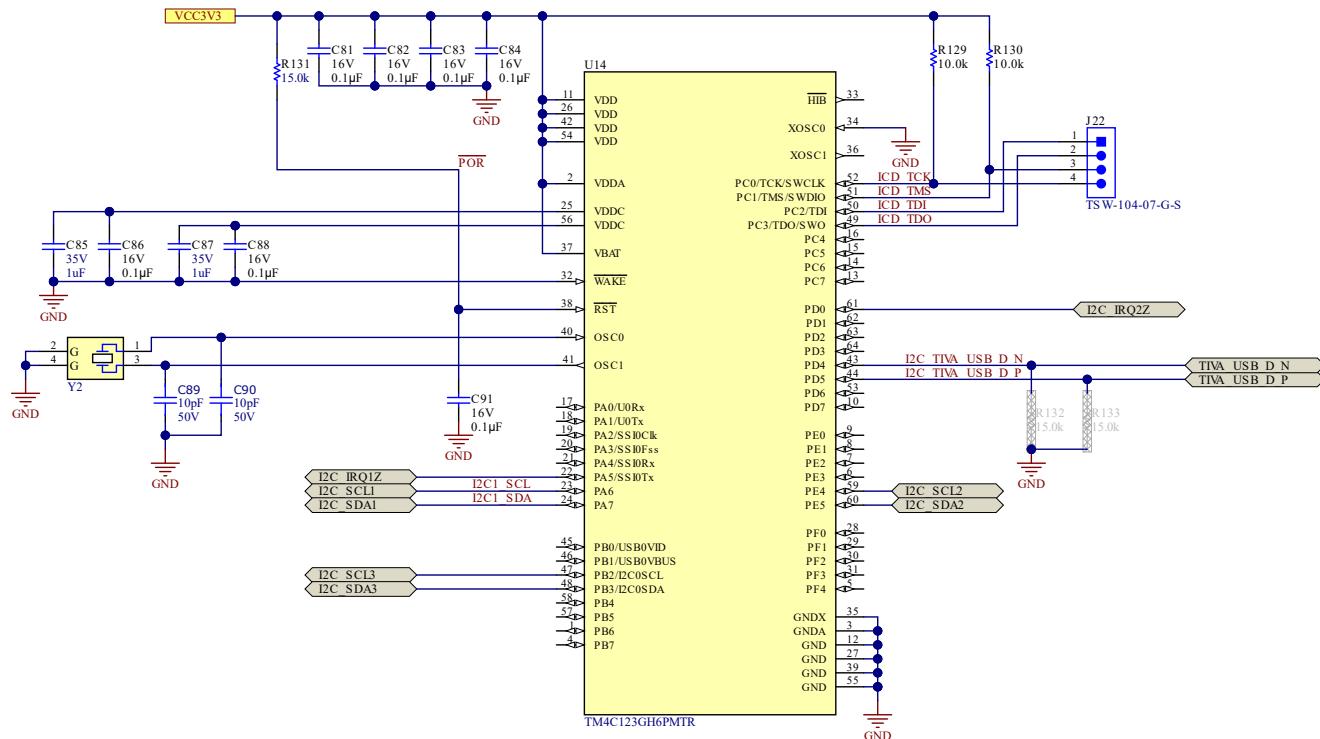
Figure 4-6. TIVA USB I2C MCU
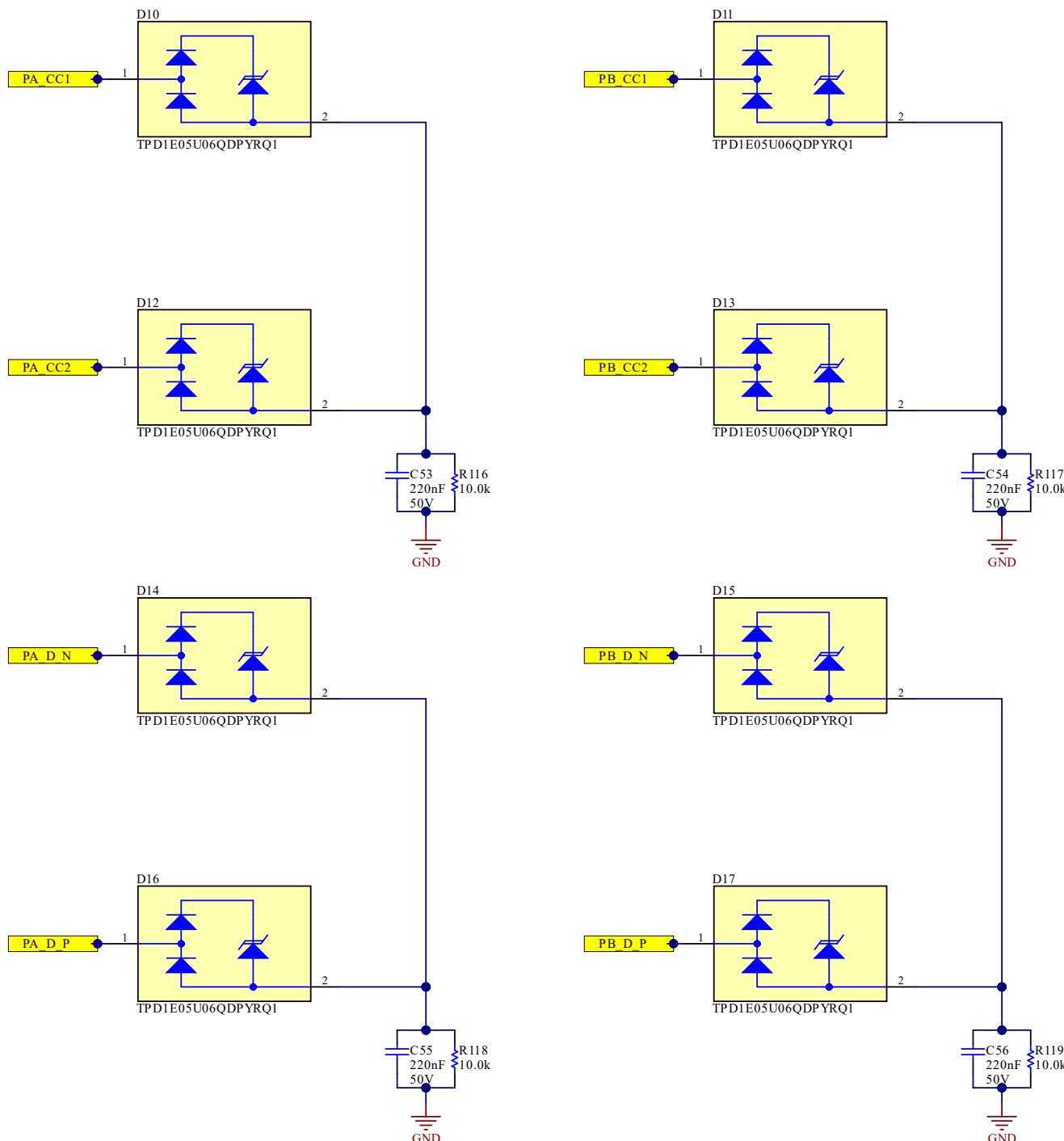
Figure 4-7. EVM IEC ESD Protection

Reverse Current, Reverse Connection, and EMC filter
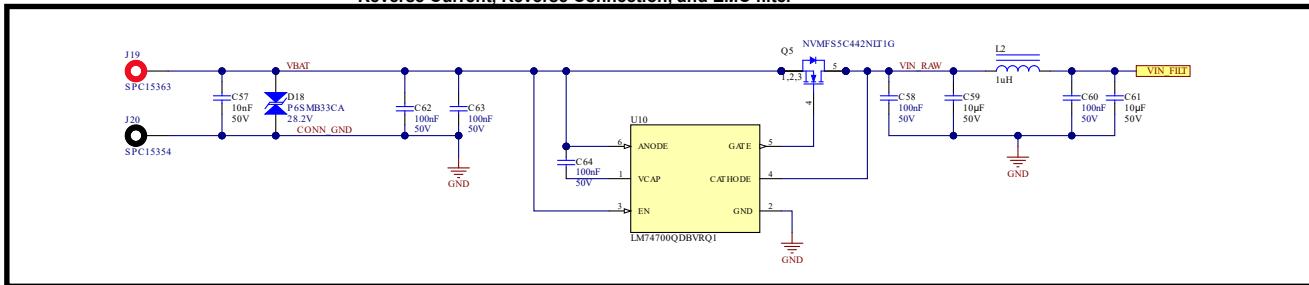
Figure 4-8. EVM 12V Input and EMC Power Filter

4.2 PCB Layouts
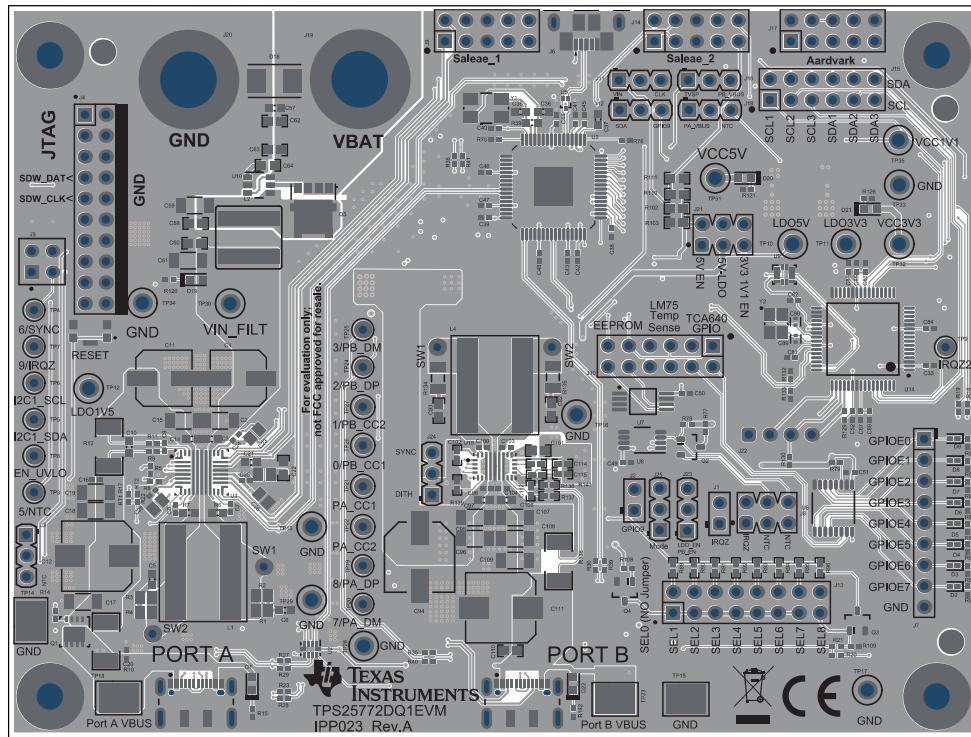
Figure 4-9. Top Composite View
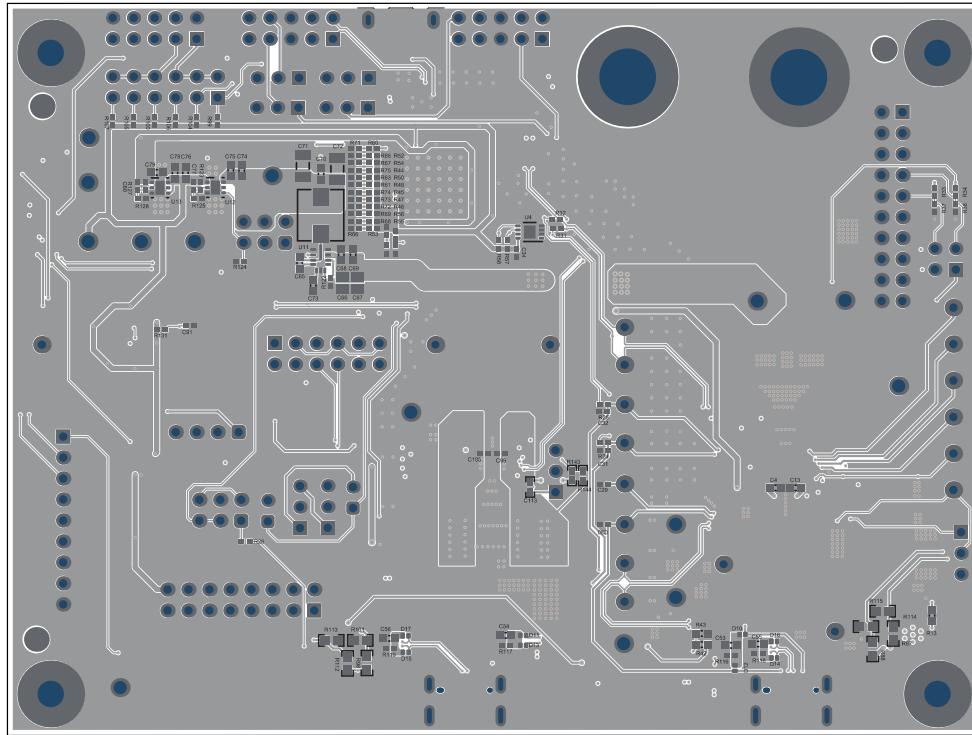
Figure 4-10. Bottom Composite View
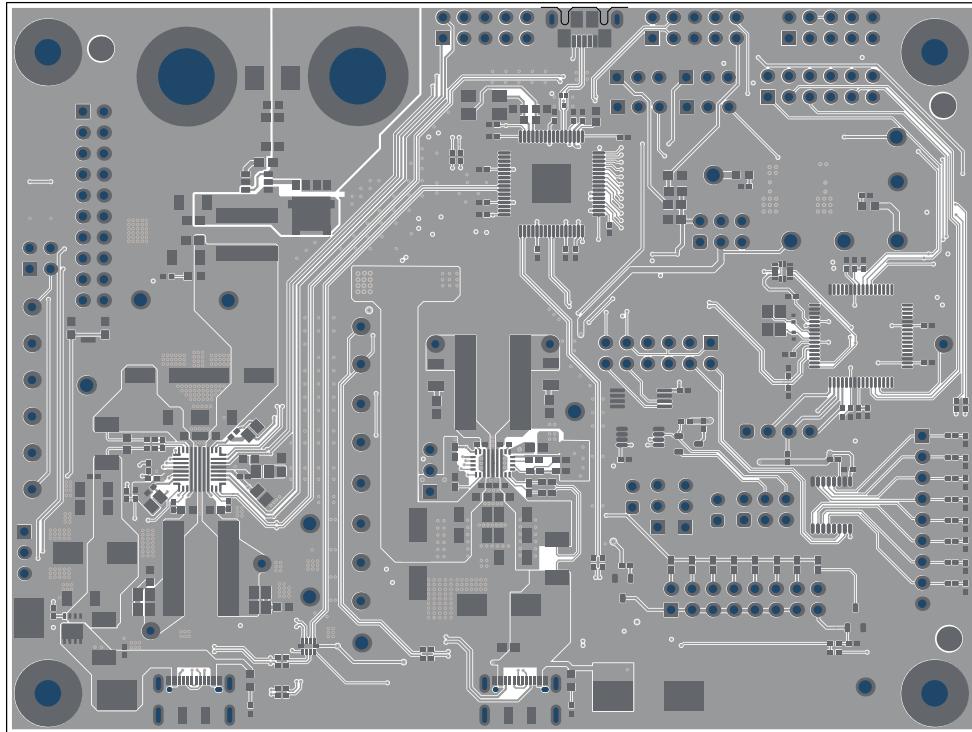
Figure 4-11. Top Solder Mask
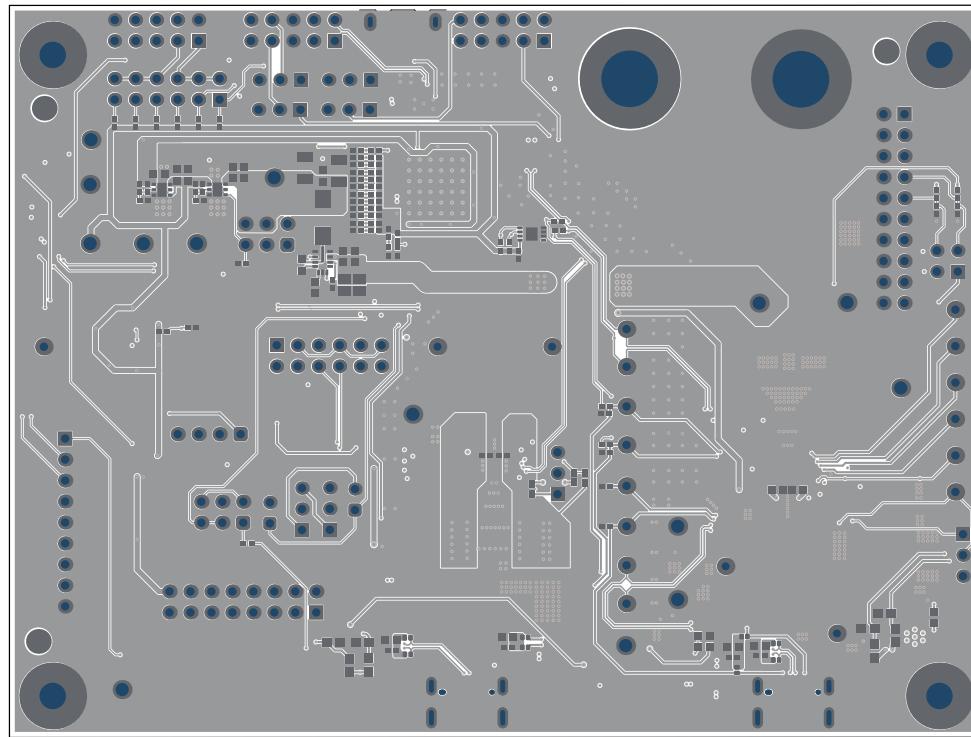
Figure 4-12. Bottom Solder Mask
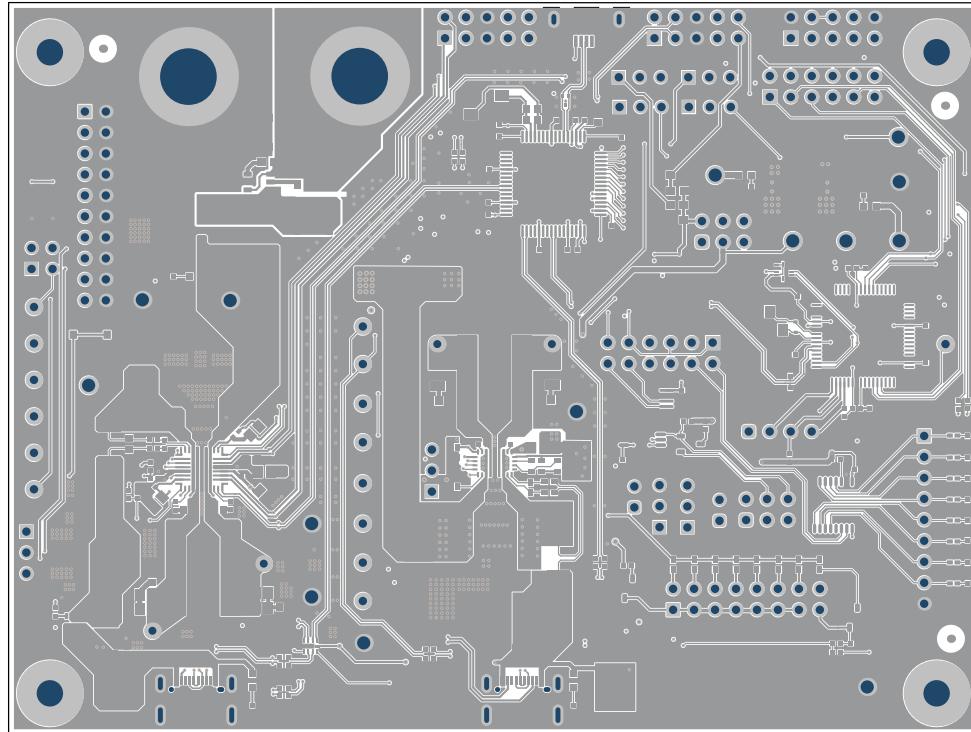
Figure 4-13. Top Layer(1)
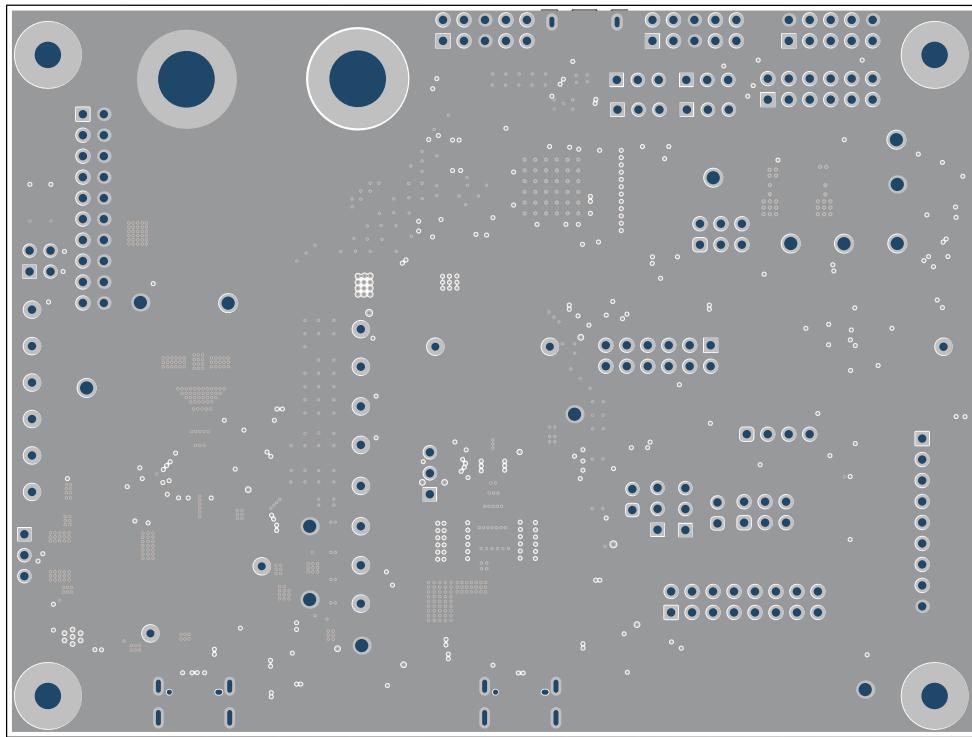
Figure 4-14. Signal Layer (2)
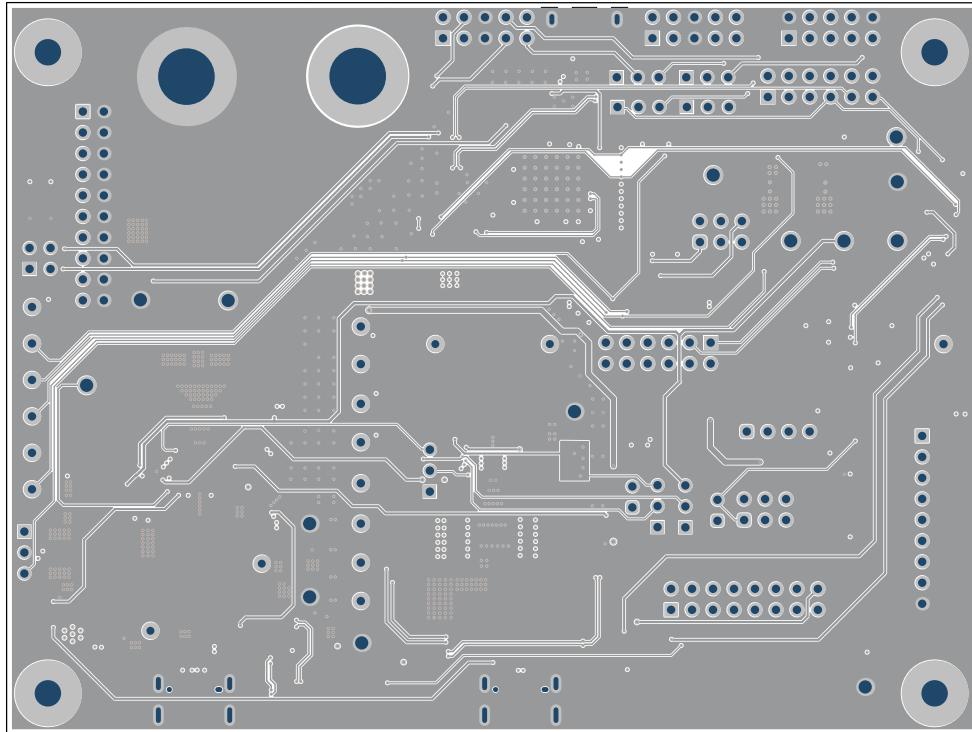
Figure 4-15. Signal Layer(3)
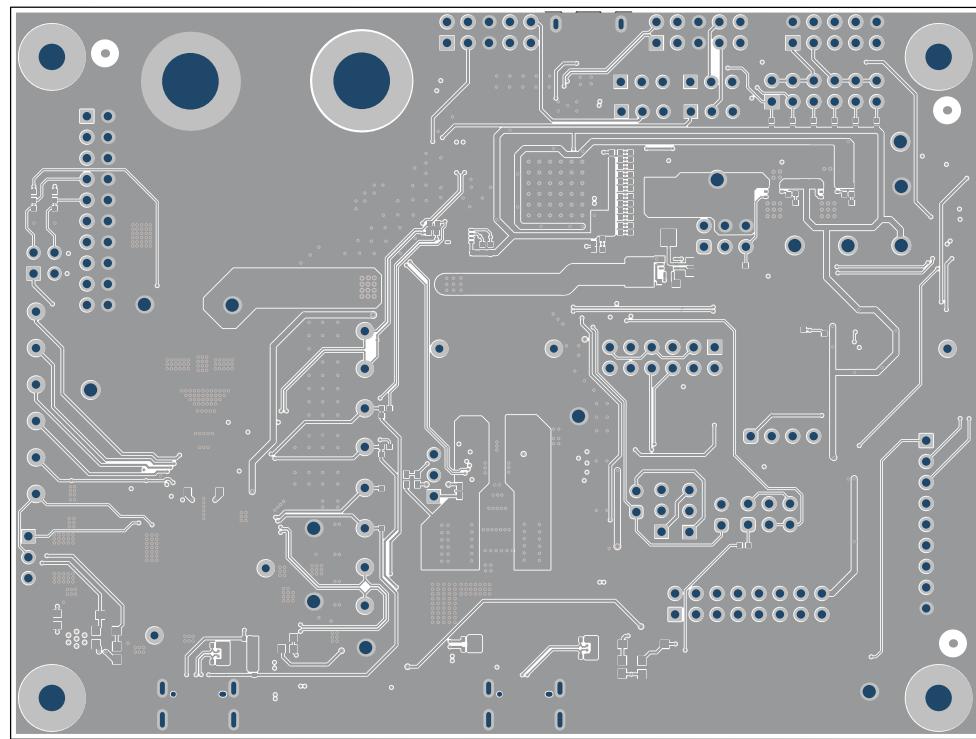
Figure 4-16. Bottom Layer (4)
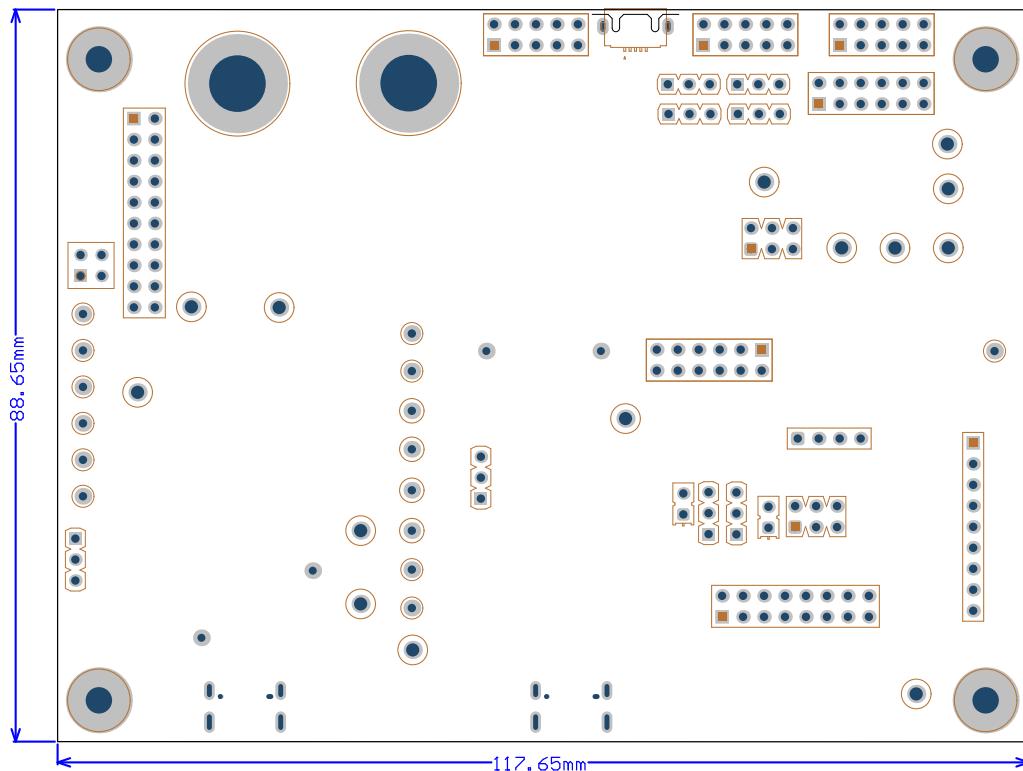
Figure 4-17. Board Dimensions

4.3 Bill of Materials (BOM)

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM)

| Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		IPP023	Any
C1, C11	2	33uF	CAP, Polymer Hybrid, 33uF, 50V, +/- 20%, 40 ohm, 6.3x7.7 SMD	6.3x7.7	EEH-ZA1H330XP	Panasonic
C2, C59, C61, C95, C96, C107, C108, C109	8	10uF	CAP, CERM, 10µF, 50V,+/- 10%, X7R, AEC-Q200 Grade 1, 1206	1206	CGA5L1X7R1H106K160AC	TDK
C3, C4, C13, C14, C21, C65, C69, C70, C74	9	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	CGA3E2X7R1H104K080AA	TDK
C5	1	3300pF	CAP, CERM, 3300pF, 50V,+/- 10%, X7R, 0603	603	8.85012E+11	Wurth Elektronik
C7, C8, C16, C20, C33, C49, C50, C51, C52, C100, C102, C103, C104, C105, C112	15	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	402	CGA2B3X7R1H104K050BB	TDK
C9	1	0.22uF	CAP, CERM, 0.22uF, 25V, +/- 20%, X5R, 0402	402	C1005X5R1E224M050BC	TDK
C12, C111	2	100uF	CAP, Polymer Hybrid, 100uF, 35V, +/- 20%, 27 mohm, 8x10 SMD	8x10	EEH-ZC1V101P	Panasonic
C15, C18, C19	3	4.7uF	CAP, CERM, 4.7uF, 50V, +/- 10%, X7R, 1206	1206	C3216X7R1H475K160AC	TDK
C22	1	0.47uF	CAP, CERM, 0.47uF, 50V, +/- 10%, X7R, 0603	603	C1608X7R1H474K080AC	TDK
C23, C26, C27	3	4.7uF	CAP, CERM, 4.7µF, 10V,+/- 10%, X7R, AEC-Q200 Grade 1, 0805	805	CGA4J3X7R1A475K125AB	TDK
C24, C25, C28, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C81, C82, C83, C84, C86, C88, C91	21	0.1uF	CAP, CERM, 0.1µF, 16V,+/- 5%, X7R, AEC-Q200 Grade 1, 0402	402	GCM155R71C104JA55D	MuRata
C29, C30, C31, C32	4	330pF	CAP, CERM, 330pF, 50V, +/- 10%, X7R, 0402	402	GRM155R71H331KA01D	MuRata
C35, C36	2	18pF	CAP, CERM, 18pF, 50V, +/- 5%, C0G/NP0, 0603	603	GRM1885C1H180JA01D	MuRata
C37	1	1uF	CAP, CERM, 1µF, 16V,+/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	EMK107B7105KAHT	Taiyo Yuden
C53, C54, C55, C56, C68	5	0.22uF	CAP, CERM, 0.22µF, 50V,+/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	GCJ188R71H224KA01D	MuRata
C57	1	0.01uF	CAP, CERM, 0.01uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	GCM188R71H103KA37D	MuRata
C58, C60, C62, C63, C64	5	0.1uF	CAP, CERM, 0.1µF, 50V,+/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	C0603C104K5RACAUTO	Kemet

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
C66, C67	2	4.7uF	CAP, CERM, 4.7uF, 35V, +/- 10%, X7R, AEC-Q200 Grade 1, 0805	805	CGA4J1X7R1V475K125AC	TDK
C71, C72	2	22uF	CAP, CERM, 22uF, 10V, +/- 10%, X7R, AEC-Q200 Grade 1, 1206	1206	GCM31CR71A226KE02L	MuRata
C73	1	1uF	CAP, CERM, 1uF, 35V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	CGA3E1X7R1V105K080AC	TDK
C75, C76, C78, C79	4	10uF	CAP, CERM, 10µF, 6.3V,+/- 20%, X7R, 0603	603	CL10B106MQ8NRNC	Samsung Electro-Mechanics
C77, C80	2	0.01uF	CAP, CERM, 0.01uF, 10V, +/- 10%, X5R, 0402	402	GRM155R61A103KA01D	MuRata
C85, C87	2	1uF	CAP, CERM, 1uF, 35V, +/- 10%, X5R, 0402	402	C1005X5R1V105K050BC	TDK
C89, C90	2	10pF	Cap Ceramic 10pF 50V NP0 0.5pF Pad SMD 0402 +150°C Automotive T/R	402	CGA2B2NP01H100D050BA	TDK Corporation
C94	1	68uF	CAP, Aluminum Polymer, 68µF, 50V,+/- 20%, 0.03 ohm, AEC-Q200 Grade 2, D8xL10.2mm SMD	D8xL10.2mm	EEH-ZA1H680P	Panasonic
C97, C106, C110	3	1uF	CAP, CERM, 1µF, 50V,+/- 20%, X5R, AEC-Q200 Grade 3, 0603	603	GRT188R61H105ME13D	MuRata
C98, C99	2	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 20%, X7R, 0402	402	GRM155R71H104ME14D	MuRata
C101	1	4.7uF	CAP, CERM, 4.7µF, 16V,+/- 10%, X5R, AEC-Q200 Grade 3, 0603	603	GRT188R61C475KE13D	MuRata
C113	1	0.01uF	CAP, CERM, 0.01uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	402	CGA2B3X7R1H103K050BB	TDK
C114	1	100pF	CAP, CERM, 100pF, 50V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0402	402	CGA2B2C0G1H101J050BA	TDK
C115	1	4700pF	CAP, CERM, 4700pF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	402	CGA2B2X7R1H472K050BA	TDK
D1, D19, D20, D21, D22	5	Green	LED, Green, SMD	LED_0603	150060GS75000	Wurth Elektronik
D2, D3, D4, D5, D6, D7, D8, D9	8	Green	LED, Green, SMD	402	APHHS1005CGCK	Kingbright
D10, D11, D12, D13, D14, D15, D16, D17	8		Automotive 1-Channel Ultra-Low-Capacitance IEC ESD Protection Diode, DPY0002A (X1SON-2)	DPY0002A	TPD1E05U06QDPYRQ1	Texas Instruments
D18	1	28.2V	Diode, TVS, Bi, 22V, 35.5 Vc, AEC-Q101, SMC	SMB	P6SMB33CA	Littelfuse
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
J1, J2	2		Header, 2.54mm, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	TSW-102-08-G-S	Samtec

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
J3, J11, J12, J16, J18, J23, J24, J25	8		Header, 2.54mm, 3x1, Tin, TH	Header, 2.54mm, 3x1, TH	68001-403HLF	FCI
J4	1		Header, 100mil, 10x2, Gold, TH	10x2 Header	TSW-110-07-G-D	Samtec
J5	1		Header, 100mil, 2x2, Tin, TH	Header, 2x2, 2.54mm, TH	PEC02DAAN	Sullins Connector Solutions
J6	1		Receptacle, USB 2.0, Micro B, 5 Position, R/A, SMT	Receptacle, USB 2.0, Micro B, 5 Pos, 0.65mm Pitch, R/A, SMT	1051640001	Molex
J7	1		Header, 100mil, 9x1, Gold, TH	9x1 Header	TSW-109-07-G-S	Samtec
J8, J21	2		Header, 100mil, 3x2, Tin, TH	Header, 100mil, 3x2, TH	5-146254-3	TE Connectivity
J9, J14, J17	3		Header, 100mil, 5x2, Tin, TH	Header, 5x2, 100mil, Tin	PEC05DAAN	Sullins Connector Solutions
J10, J15	2		Header, 100mil, 6x2, Tin, TH	Header, 6x2, 100mil, Tin	PEC06DAAN	Sullins Connector Solutions
J13	1		Header, 100mil, 8x2, Gold, TH	8x2 Header	TSW-108-07-G-D	Samtec
J19	1		BANANA JACK, SOLDER LUG, RED, TH	Red Insulated Banana Jack	SPC15363	Tenma
J20	1		BANANA JACK, SOLDER LUG, BLACK, TH	Black Insulated Banana Jack	SPC15354	Tenma
J22	1		Header, 100mil, 4x1, Gold, TH	4x1 Header	TSW-104-07-G-S	Samtec
L1, L4	2	4.7uH	Inductor, Shielded, Composite, 4.7uH, 24A, 0.01 ohm, SMD	Inductor, 11.3x10x10mm	XAL1010-472MEB	Coilcraft
L2	1	1uH	Inductor, Shielded, Composite, 1uH, 25A, 0.00255 ohm, SMD	7.2x7x7.5mm	XAL7070-102MEB	Coilcraft
L3	1	1.5uH	Inductor, Shielded, Ferrite, 1.5uH, 6A, 0.025 ohm, SMD	Inductor, 5.7x2.8x5.2mm	SRP5030T-1R5M	Bourns
PORT A, PORT B	2		CONN RCP USB2.0 TYP C 24P SMD RA	Receptacle, USB 2.0 Type C, R/A, SMT	DX07S016JA1R1500	JAE Electronics
Q2	1	60V	MOSFET, N-CH, 60V, 0.115A, AEC-Q101, SOT-23	SOT-23	2N7002Q-7-F	Diodes Inc.
Q3, Q4	2	60V	MOSFET, N-CH, 60V, 0.24A, SOT-23	SOT-23	2N7002E-T1-E3	Vishay-Siliconix
Q5	1	40V	MOSFET, N-CH, 40V, 27A, AEC-Q101, DFN5 5x6mm	DFN5 5x6mm	NVMFS5C442NLT1G	ON Semiconductor
R3, R4	2	2.2	RES, 2.2, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	805	ERJ-6GEYJ2R2V	Panasonic
R5, R122	2	80.6k	RES, 80.6 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040280K6FKED	Vishay-Dale
R6, R7, R13	3	0	RES, 0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	RMCF0603ZT0R00	Stackpole Electronics Inc

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R8	1	20.0k	RES, 20.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040220K0FKED	Vishay-Dale
R9, R21, R23, R28, R35, R40	6	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04020000Z0ED	Vishay-Dale
R10	1	0.001	RES, 0.001, 1%, 1 W, 2010	2010	PMR50HZPFV1L00	Rohm
R11	1	10	RES, 10.0, 1%, 0.063 W, 0402	402	CRCW040210R0FKED	Vishay-Dale
R12, R136	2	0.01	RES, 0.01, 1%, 1 W, 2010	2010	WSL2010R0100FEA18	Vishay-Dale
R15, R142	2	10k	RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	402	ERJ-2GEJ103X	Panasonic
R16	1	10	RES, 10.0, 1%, 0.25 W, 0805	805	RNCP0805FTD10R0	Stackpole Electronics Inc
R17, R50, R52, R54, R62, R68, R71, R73, R116, R117, R118, R119, R129, R130	14	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	AC0402FR-0710KL	Yageo America
R33, R34	2	4.02k	RES, 4.02 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04024K02FKED	Vishay-Dale
R37, R38, R77, R78, R79, R109	6	100k	RES, 100 k, 1%, 0.0625 W, AEC-Q200 Grade 0, 0402	402	AC0402FR-07100KL	Yageo America
R42	1	10.2k	RES, 10.2 k, 1%, 0.1 W, 0603	603	RC0603FR-0710K2L	Yageo
R48, R51, R53, R56, R57, R58, R72, R74, R75, R76	10	4.7k	RES, 4.7 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04024K70JNED	Vishay-Dale
R59	1	1.00Meg	RES, 1.00M, 1%, 0.1W, AEC-Q200 Grade 0, 0603	603	CRCW06031M00FKEA	Vishay-Dale
R60	1	90.9k	RES, 90.9 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040290K9FKED	Vishay-Dale
R70	1	9.53k	RES, 9.53 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04029K53FKED	Vishay-Dale
R80, R81, R82, R83, R84, R85, R86, R87	8	100	RES, 100, 1%, 0.063 W, 0402	402	MCR01MZPF1000	Rohm
R88, R98, R112, R114	4	150k	RES, 150 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	603	CRCW0603150KFKEA	Vishay-Dale
R89	1	93.1k	RES, 93.1 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040293K1FKED	Vishay-Dale
R90	1	47.5k	RES, 47.5 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040247K5FKED	Vishay-Dale
R91	1	29.4k	RES, 29.4 k, 1%, 0.063 W, 0402	402	CRCW040229K4FKED	Vishay-Dale
R92	1	20.0k	RES, 20.0 k, 1%, 0.063 W, 0402	402	CRCW040220K0FKED	Vishay-Dale

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R93	1	14.7k	RES, 14.7 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040214K7FKED	Vishay-Dale
R94	1	11.0k	RES, 11.0 k, 1%, 0.063 W, 0402	402	CRCW040211K0FKED	Vishay-Dale
R95	1	8.45k	RES, 8.45 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04028K45FKED	Vishay-Dale
R96	1	6.65k	RES, 6.65 k, 1%, 0.063 W, 0402	402	CRCW04026K65FKED	Vishay-Dale
R97, R101, R102, R103, R110, R111, R113, R115	8	100k	RES, 100 k, 0.1%, 0.1 W, AEC-Q200 Grade 1, 0603	603	TNPW0603100KBEEA	Vishay-Dale
R99, R100, R104, R105, R106, R107	6	2.20k	RES, 2.20 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	RMCF0402FT2K20	Stackpole Electronics Inc
R108	1	1.00k	RES, 1.00 k, 1%, 0.063 W, 0402	402	MCR01MZPF1001	Rohm
R120, R121, R126	3	5.1k	RES, 5.1 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04025K10JNED	Vishay-Dale
R123	1	97.6k	RES, 97.6 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040297K6FKED	Vishay-Dale
R124	1	88.7k	RES, 88.7 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040288K7FKED	Vishay-Dale
R125	1	19.6k	RES, 19.6 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040219K6FKED	Vishay-Dale
R127, R128	2	47.0k	RES, 47.0 k, 1%, 0.0625 W, 0402	402	RC0402FR-0747KL	Yageo America
R131	1	15.0k	RES, 15.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040215K0FKED	Vishay-Dale
R137, R138	2	10	RES, 10.0, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040210R0FKED	Vishay-Dale
R139	1	49.9k	RES, 49.9 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040249K9FKED	Vishay-Dale
R140	1	150k	RES, 150 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW0402150KFKED	Vishay-Dale
R141	1	27.4k	RES, 27.4 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040227K4FKED	Vishay-Dale
RT2	1		Thermistor, DEC0002A (X1SON-2)	DEC0002A	TMP6131DECR	Texas Instruments
S1	1		Switch, SPST-NO, Off-Mom, 0.01A, 32 VDC, SMD	4.2x2.8mm	KMR243GLFG	C&K Components

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11, SH-J12, SH-J13, SH-J14, SH-J15, SH-J16, SH-J17, SH-J18, SH-J19, SH-J20, SH-J21, SH-J22, SH-J23, SH-J24	24	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
TP3, TP4, TP5, TP6, TP7, TP8, TP9	7		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone
TP10, TP11, TP12, TP30, TP31, TP32, TP35	7		Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP13, TP16, TP17, TP28, TP29, TP33, TP34	7		Test Point, Compact, Black, TH	Black Compact Testpoint	5006	Keystone
TP14, TP15, TP18, TP23	4		Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone
TP19, TP20, TP24, TP25	4		Test Point, Miniature, Blue, TH	Blue Miniature Testpoint	5117	Keystone
TP21, TP22, TP26, TP27	4		Test Point, Miniature, Green, TH	Green Miniature Testpoint	5116	Keystone
U1	1		Automotive Dual USB Type-C Power Delivery Controller with Buck-Boost Regulator	VQFN-HR29	TPS25772CQRQLRQ1	Texas Instruments
U2	1		Automotive Catalog ESD Protected, High-Speed USB 2.0 (480Mbps) 1:2 Multiplexer / Demultiplexer Switch, 16 ohm RON, 2.5 to 3.3V, -40 to 125 degC, 10-Pin UQFN (RSE), Green (RoHS & no Sb/Br)	RSE0010A	TS3USB221AQRSERQ1	Texas Instruments
U3	1		Four-Port High-Speed 480Mbps USB 2.0 Hub, PAP0064K (HTQFP-64)	PAP0064K	TUSB4041IPAP	Texas Instruments
U5	1		ESD Solution for Super-Speed (6Gbps) USB 3.0 Interface, 2 Channels, -40 to +85 degC, 3-pin SOT (DRT), Green (Rohs and No Sb/Br)	DRT0003A	TPD2EUSB30DRTR	Texas Instruments
U6	1		Low-Voltage 8-Bit I2C and SMBus I/O Expander, 1.65 to 5.5V, -40 to 85 degC, 16-pin TSSOP (PW), Green (RoHS & no Sb/Br)	PW0016A	TCA6408APWR	Texas Instruments
U7	1		256K I2C CMOS Serial EEPROM, TSSOP-8	TSSOP-8	24LC256-I/ST	Microchip

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
U8	1		Automotive Grade, 1.4V-Capable Temperature Sensor with I2C/SMBus Interface in LM75 Pinout, DGK0008A (VSSOP-8)	DGK0008A	TMP75BQDGKRQ1	Texas Instruments
U9	1		256-Taps Dual-Channel Digital Potentiometer With I2C Interface and Nonvolatile Memory, RUC0014A (X2QFN-14)	RUC0014A	TPL0102-100RUCR	Texas Instruments
U10	1		Low Iq Always ON Smart Diode Controller, DBV0006A (SOT-23-6)	DBV0006A	LM74700QDBVRQ1	Texas Instruments
U11	1		Automotive 3.8V to 36V 2A Synchronous Step-Down Voltage Regulator, RNX0012B (VQFN-HR-12)	RNX0012B	LMR33620CQ5RNXTQ1	Texas Instruments
U12, U13	2		1A LDO With Power-Good, DRV0006A (WSON-6)	DRV0006A	TPS74601PBQWDRVRQ1	Texas Instruments
U14	1		Tiva C Series Microcontroller, 256 KB Flash, 32 KB SRAM, 12 Bit, 12 Channels, -40 to 105 degC, 64-Pin LQFP (PM), Green (RoHS & no Sb/Br), Tape and Reel	PM0064A	TM4C123GH6PMTR	Texas Instruments
U15	1		36V, 8A Buck-boost Converter with I2C Interface	VQFN21	TPS55289QWRYQRQ1	Texas Instruments
Y1	1		Crystal, 24MHz, 30ppm, 20pF, SMD	5x3.2mm	ECS-240-20-30B-AEN-TR	ECS Inc.
Y2	1		Crystal, 16MHz, 8pF, SMD	3.2x0.75x2.5mm	NX3225GA-16.000M-STD-CRG-1	NDK
C6	0	1000pF	CAP, CERM, 1000pF, 50V, +/- 10%, X7R, 0603	603	GRM188R71H102KA01D	MuRata
C10	0	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	603	CGA3E2X7R1H104K080AA	TDK
C17	0	10uF	CAP, CERM, 10µF, 50V,+/- 10%, X7R, AEC-Q200 Grade 1, 1206	1206	CGA5L1X7R1H106K160AC	TDK
C34	0	0.1uF	CAP, CERM, 0.1µF, 16V,+/- 5%, X7R, AEC-Q200 Grade 1, 0402	402	GCM155R71C104JA55D	MuRata
C92, C93	0	2200pF	CAP, CERM, 2200pF, 50V, +/- 10%, X7R, 0603	603	GRM188R71H222KA01D	MuRata
Q1	0	30V	MOSFET, N-CH, 30V, 60A, DQG0008A (VSON-CLIP-8)	DQG0008A	CSD17575Q3	Texas Instruments
R1, R2	0	2.2	RES, 2.2, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	805	ERJ-6GEYJ2R2V	Panasonic
R14	0	0	RES, 0, 5%, 0.063 W, 0402	402	RC0402JR-070RL	Yageo America
R18, R19, R20, R24, R25, R26, R27, R29, R30, R31, R32, R36, R39, R41	0	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04020000Z0ED	Vishay-Dale

Table 4-1. TPS25772DQ1EVM Bill of Materials (BOM) (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R22, R44, R45, R46, R47, R61, R63, R64, R65, R66, R67, R69	0	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	AC0402FR-0710KL	Yageo America
R43	0	10.2k	RES, 10.2 k, 1%, 0.1 W, 0603	603	RC0603FR-0710K2L	Yageo
R49, R55	0	4.7k	RES, 4.7 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04024K70JNED	Vishay-Dale
R132, R133	0	15.0k	RES, 15.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW040215K0FKED	Vishay-Dale
R134, R135	0	2.2	RES, 2.20, 1%, 0.25 W, AEC-Q200 Grade 0, 1206	1206	ERJ-8RQF2R2V	Panasonic
R143	0	115k	RES, 115 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW0402115KFKED	Vishay-Dale
R144	0	147k	RES, 147 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW0402147KFKED	Vishay-Dale
RT1	0	47k	Thermistor NTC, 47k ohm, 5%, 0402	402	NCP15WL473J03RC	MuRata
4	0		EEPROM 4KBIT 1MHZ,8UDFN	UDFN-8	AT24C04D-MAHM-T	Atmel

5 Additional Information

5.1 Trademarks

USB Type-C™ is a trademark of USB Implementers Forum.

DisplayPort™ is a trademark of Video Electronics Standards Association.

USB-C® is a registered trademark of USB Implementers Forum.

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 * (August 2024) to Revision A (September 2024)	Page
• Updated release status from private to public..	1
• Updated PB_D_N description from Port A to Port B in Table 2-3	4

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 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