TI Designs

USB Type-C Audio Adapter Accessory Mode Reference Design

TI Designs

TI Designs provide the foundation that you need including methodology, testing and design files to quickly evaluate and customize the system. TI Designs help *you* accelerate your time to market.

Design Resources

TIDA-00565	Tool Folder Containing Design Files
TS5USBA224	Product Folder
TS3A227E	Product Folder
TPS65982-EVM	Product Folder

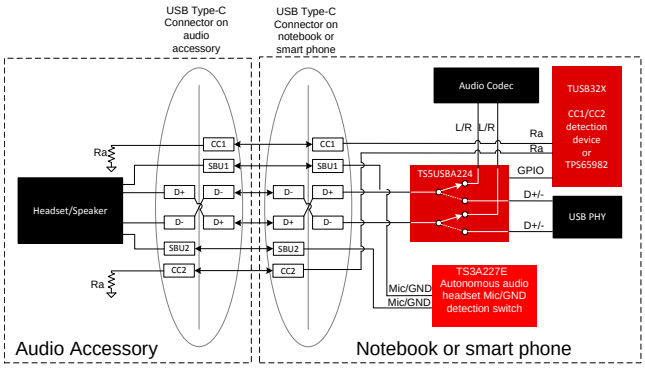
TI E2E™ Community — ASK Our E2E Experts

Design Features

- Replaces Large 3.5 mm Audio Jack With Smaller Type-C Connector
- Supports Analog Audio Through USB Type-C Connector
- Supports USB Power Delivery

Featured Applications

- USB-Type C™
- Portable Electronics
- PC Docking Station
- Smart Phone



1 Quick Start Guide

1.1 Getting Started Hardware

Required hardware for a demonstration of the audio adapter accessory mode:

- TIDA-00565 demo board.
- 19 V barrel jack power supply for the TIDA-00565 board.
- An audio source such as a PC or a smart phone.
- Cable with a 3.5 mm male jack to a 3.5 mm male jack to interface the audio source to the 3.5mm jack on the TIDA00565 board
- Pair of headphones or speaker
- USB Type-C audio adapter with a 3.5 mm female jack to a USB Type-C male connector. (not needed if an audio headset or speaker with a USB Type-C connector is available)

1.2 Getting Started Procedure

1. Plug in a 19 V power supply into the barrel jack of the TIDA-00565 board which provides power.
2. Plug in an audio source into the 3.5 mm jack of the TIDA-00565 board.
3. Plug in a pair of headphones and a speaker with a USB Type-C connector, or use the audio adapter board to interface the headphones and speaker with a 3.5 mm jack to USB Type-C Connector.

Figure 1 shows the TIDA-00565 with 19 V barrell jack power supply, 3.5mm male to male cable, headphones, and 3.5 mm jack to the USB Type-C adaptor board.

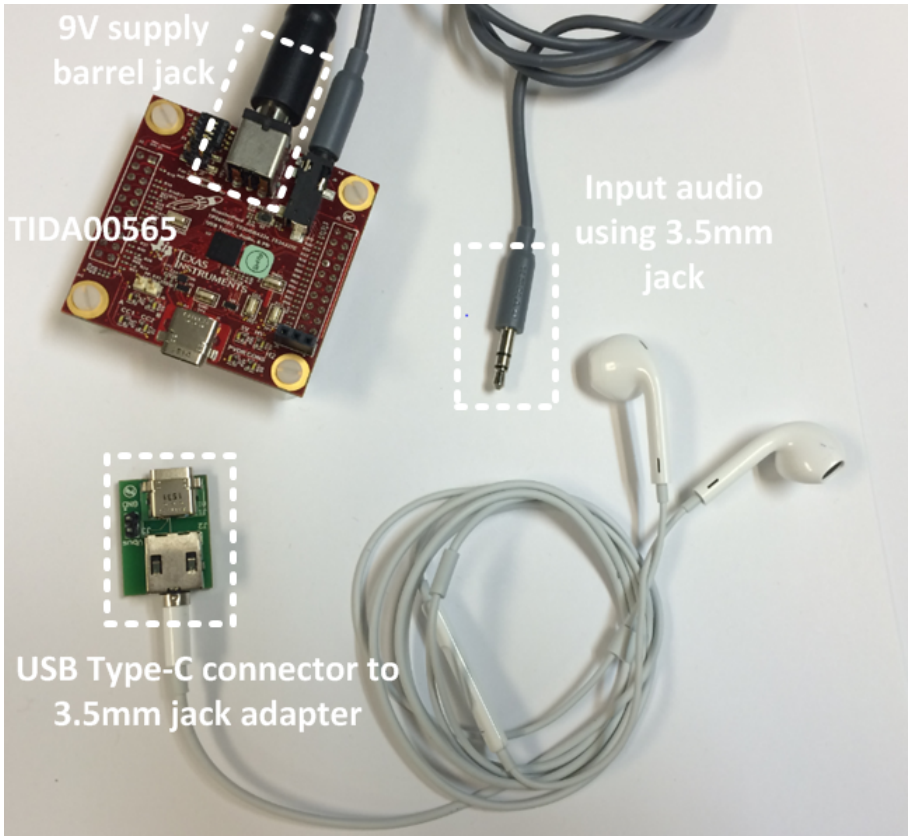


Figure 1. TIDA-00565 and 3.5 mm Jack to The USB Type-C Adaptor Board

Figure 2 shows the location of the key components on the TIDA-00565 board.

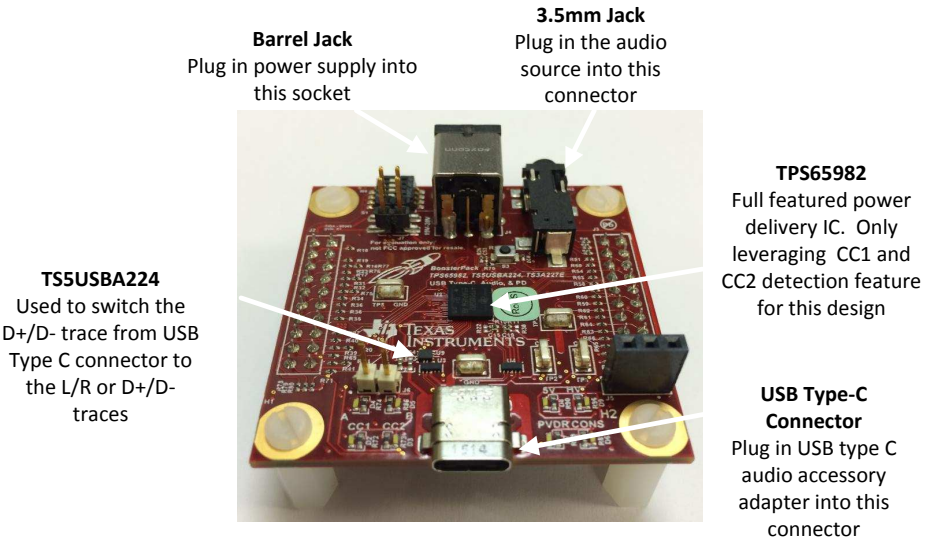


Figure 2. Location of Key Components on the TIDA-00565 Board

1.3 Purpose of TS5USBA224

The TS5USBA224 is used to multiplex between the USB 2.0 data and analog audio in order to protect the USB PHY from the negative voltage swings of the analog audio. The analog audio and USB data travel over the D+ and D- lines in the USB Type-C connector. When an analog audio signal is on the USB D+ and D- lines, the signal may swing up to –2 to 2 V_{pp}. This negative swing in voltage can cause damage to components in the signal chain that may not be able to handle a negative swinging signal.

The TS3A227E is used specifically to automatically detect and orient the MIC and GND signals of the 3.5 mm jack to support the function described in the USB Type-C standard above. Refer to the *TS3A227E Autonomous Audio Accessory Detection and Configuration Switch* datasheet (SCDS358B) for more details on the automated detection. The USB Type-C to 3.5 mm dongle is on the sink side of the system, therefore, the system user may connect speakers or a headphone set to listen to the audio. Headphones often come with a 4-pole jack, which means the MIC and GND of the jack must be routed properly.

1.4 Purpose of the TS3A227E

The USB Type-C standard states, “The system shall connect A6/B6, A7/B7, A8 and B8 to an appropriate audio codec upon entry into the audio adapter accessory mode. The connections for A8 (SBU1) and B8 (SBU2) pins are dependent on the adapter’s orientation. Depending on the orientation, the microphone and analog ground pins may be swapped. These pins are already reversed between the two major standards for headset jacks and support for this is built into the headset connection of many codecs, or may be implemented using an autonomous audio headset switch. The system works correctly with either configuration."

1.5 Purpose of the TUSB321X / TPS65982

The TUSB32X or TPS65982 device enables USB Type-C ports with the configuration channel (CC) logic needed for USB Type-C ecosystems. The TUSB32X/TPS65982 device use the CC pins to determine the type of device inserted into the USB Type-C connector. When the TUSB32X/TPS65982 device sees an audio accessory (by sensing the Ra 1k pull down resistors on the accessory) it can use one of its GPIOs to toggle the TS5USBA224 logic control pins to select the audio path of the TS5USBA224.

2 Design Overview

The USB Type-C™ audio adapter accessory mode reference design provides the solution for interfacing analog audio through the emerging USB Type-C interface. This reference design demonstrates how analog audio may be transmitted to system peripherals using the USB Type-C standard's audio adapter accessory mode. This allows designs to remove the large 3.5 mm jack, and replace it with an 85% smaller USB Type-C receptacle.

3 Key System Specifications

Table 1 shows the USB Type-C Analog Audio Pin Electrical Parameter Ratings.

Table 1. USB Type-C Analog Audio Pin Electrical Parameter Ratings

PLUG PIN	USB NAME	ANALOG AUDIO FUNCTION	MIN.	MAX.	UNITS	NOTES
A6/B6	Dp	Right	–3.0	3.0	V	A6 and B6 must be shorted together in the analog audio adapter.
A7/B7	Dn	Left	–3.0	3.0	V	A7 and B7 must be shorted together in the analog audio adapter.
A8	SBU1	Mic/AGND	–0.4	3.3	V	
B8	SBU2	AGND/Mic	–0.4	3.3	V	

4 System Description

The USB Type-C audio adapter accessory mode reference design is composed of two boards; a USB Type-C analog audio multiplexer board and a USB Type-C connector to a 3.5 mm jack adapter. The USB Type-C analog audio multiplexer board controls the switching between analog audio transferred through the USB Type-C connector and data transferred through the USB Type-C connector. The USB Type-C to 3.5 mm jack adapter board provides the required pull down resistors for the USB Type-C presence detect logic on CC1 and CC2 that signifies an audio adapter is being used. The adapter also allows users to test audio with existing audio devices that use the 3.5 mm jack interface.

5 Block Diagram

The USB-C Analog Audio TI Design allows for analog audio to be passed over USB Type-C connection while protecting the USB PHY from negative voltages swings from the analog audio. In Figure 3, the audio source may be produced through a computer, while the audio sink may be a speaker to listen to the audio. Figure 3 shows the TIDA00565 functional block diagram.

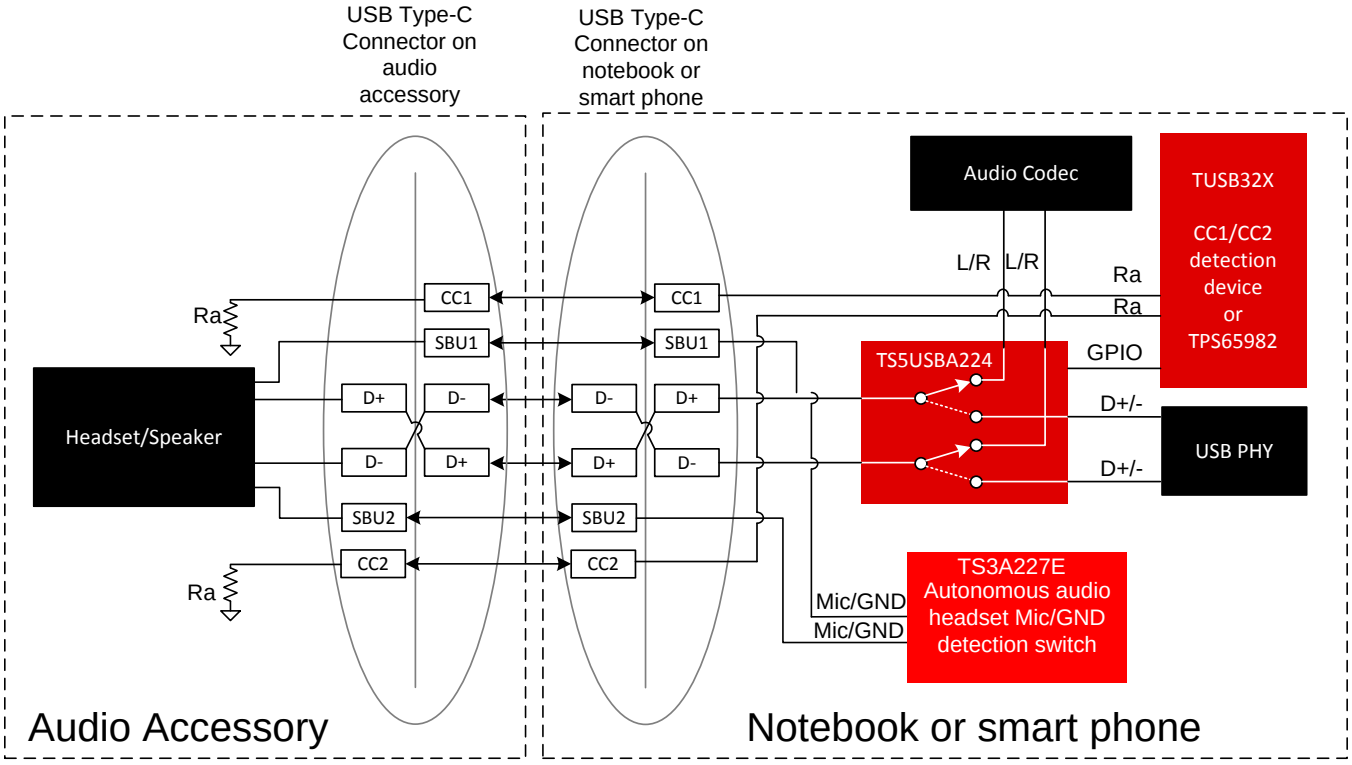


Figure 3. TIDA00565 Functional Block Diagram

6 System Design Theory

This TIDA00565 system is designed to prove in a simple demonstration how analog audio may be passed over USB Type-C connector. Left and right analog audio is passed through the USB-C connector through the D+ and D- lines of the USB Type-C connector. Simply passing audio through USB-C is possible without the use of ICs, but it is not practical as the negative signal swing of the audio signal can damage other components in the system. The TS5USBA224 provides the ability to pass analog audio without allowing the negative signal swing of the audio damage any other parts of the system

6.1 USB Type-C Audio Adapter Accessory Mode

Analog audio headsets are supported by multiplexing four analog audio signals onto pins on the USB Type-C ™connector when in the audio adapter accessory mode. The audio adapter accessory mode is declared to the host by placing two (Ra) pull down resistors on the CC1 and CC2 pins. These resistors on the CC lines are dictated by the USB Type-C specification.

The four analog audio signals are the same as those used by a traditional 3.5 mm headset jack. This adapter makes it possible to interface existing analog headsets with a 3.5 mm to USB Type-C adapter for this demonstration. The adapter also provides the two 1k ohm (Ra) pull down resistors.Figure 4 shows the example schematics of a passive 3.5 mm jack to the Type-C connector adapter.

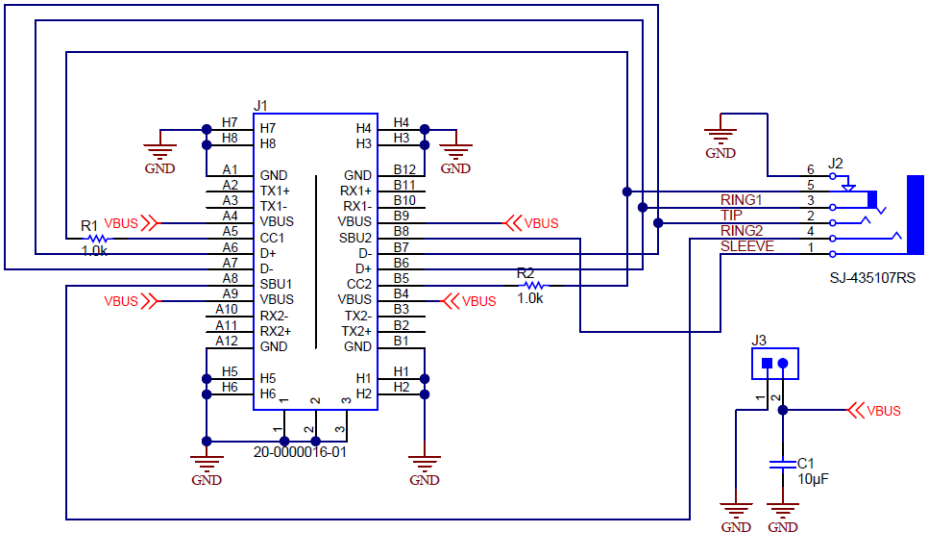


Figure 4. Example Schematic of a Passive 3.5 mm Jack to the USB Type-C Connector Adapter

Table 2 shows the analog audio pins to the USB-C pins.

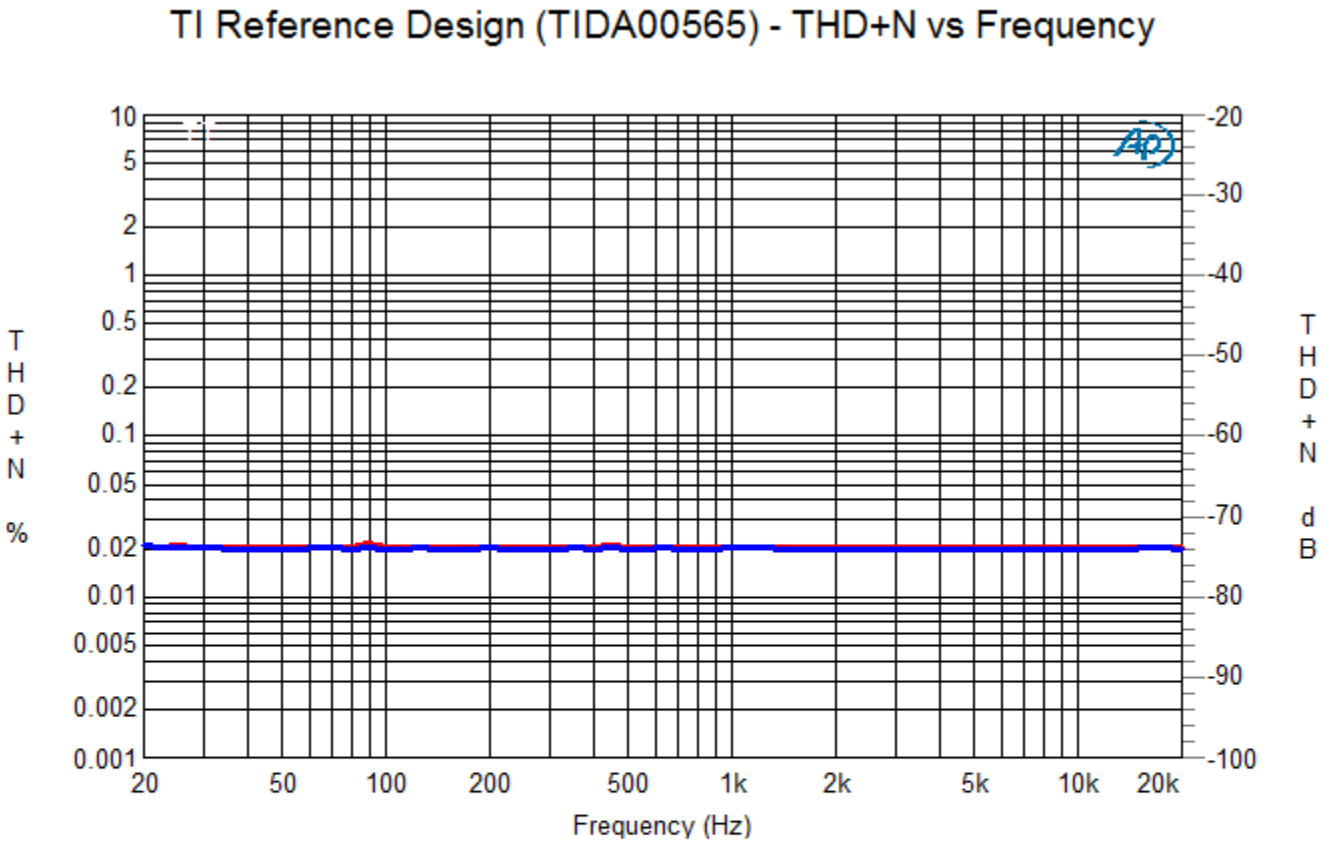
Table 2. Analog Audio Pins to the USB Type-C Pins

PIN NAME	USB NAME	ANALOG AUDIO FUNCTION	LOCATION ON 3.5 MM JACK	NOTES
A6 B6	D+	Right channel	Ring1	Analog audio right channel A6 and B6 are shorted together
A7 B7	D–	Left channel	Tip	Analog audio left channel A7 and B7 are shorted together
A8 B8	SBU1 SBU2	Mic or AGND	Ring 2 or Sleeve	Audio ground or microphone. Need an autonomous detection switch in the system such as the TS3A227E to route the signals appropriately.
A5 B5	CC			Connected to ground through 1 k resistors for adapter presence logic.
A2/A3 A10/All B2/B3 B10/B11	TX+/TX– RX+/RX–			Not used in audio accessory mode.
A4/ A9 B4/B9	VBUS			Not used unless audio adapter uses this for 5 V 500 mA charging.

7 Total Harmonic Distortion Measurement (THD+N)

The Total Harmonic Distortion (THD) for the TIDA-00565 was measured using SYS-2722 (192k) Audio Precision equipment. A 1-V pp sine wave was sent through the D+ and D- lines of the USB Type-C connector, while the TS5USBA224 device audio path was selected. A 600-Ω load was provided by the audio precision equipment as shown in Figure 34, the THD+N test set up screen shot in .

Figure 5 shows the test data.



Sweep	Trace	Color	Line Style	Thick	Data	Axis	Comment
1	1	Red	Solid	3	Anlr.THD+N Ratio	Left	Left Channel
2	2	Blue	Solid	3	Anlr.THD+N Ratio	Right	Right Channel

TI Reference Design --> TIDA00565
Measurement Setup --> 1Vpp signal on switch (TS5USBA224), 600 ohm, Vaudio=3.3V,
Logic --> VBUS=0V, ASEL=0V

Figure 5. Test Data

8 Design Files

8.1 Schematics

To download the schematics for each board, see the design files at http://www.ti.com/tool/TIDA-00565.

Figure 6 shows the TIDA-00565 power delivery schematic, Figure 7 shows the TIDA-00565 power path schematic, and Figure 8 shows the TIDA-00565 USB Type-C audio dongle schematic.

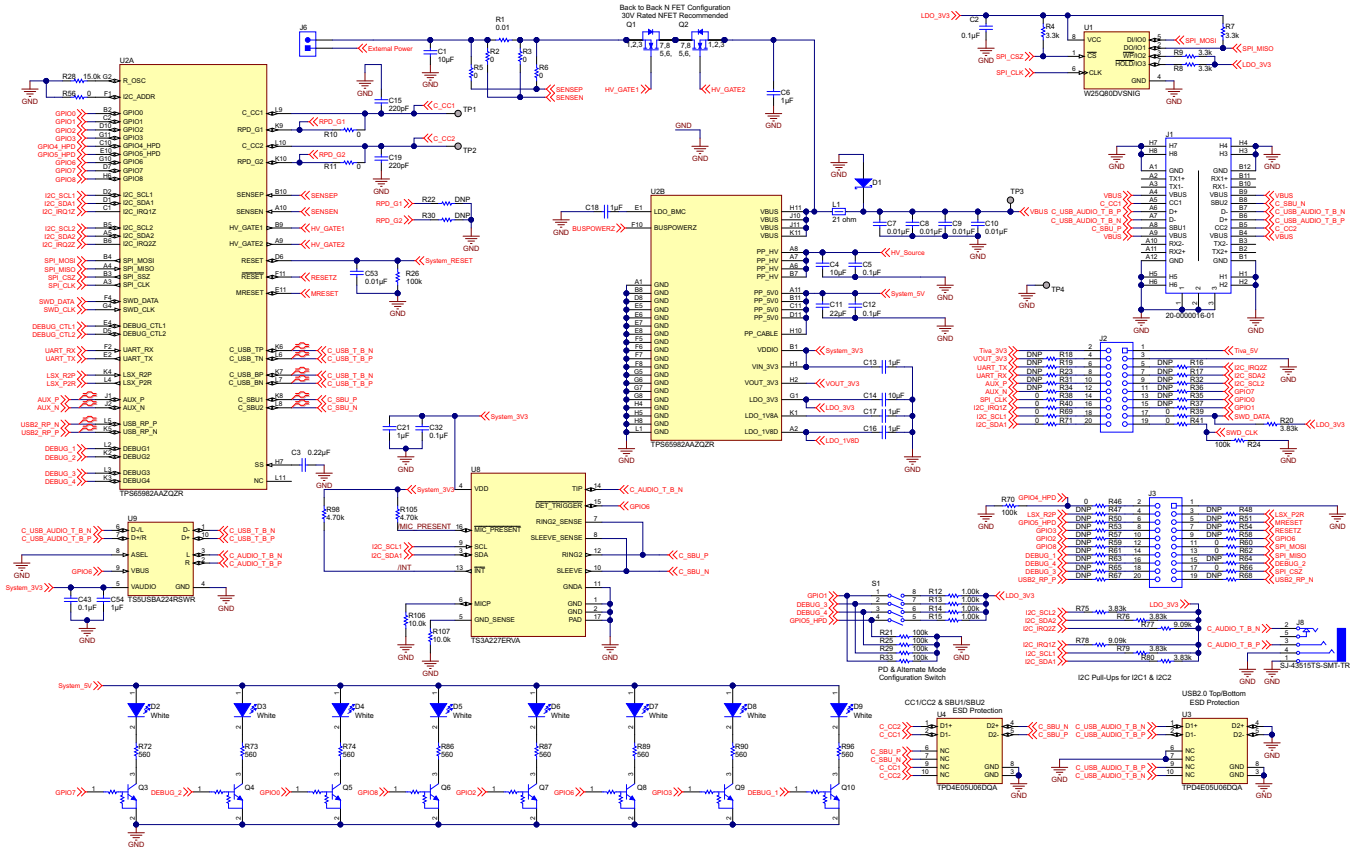


Figure 6. TIDA-00565 Power Delivery Schematics

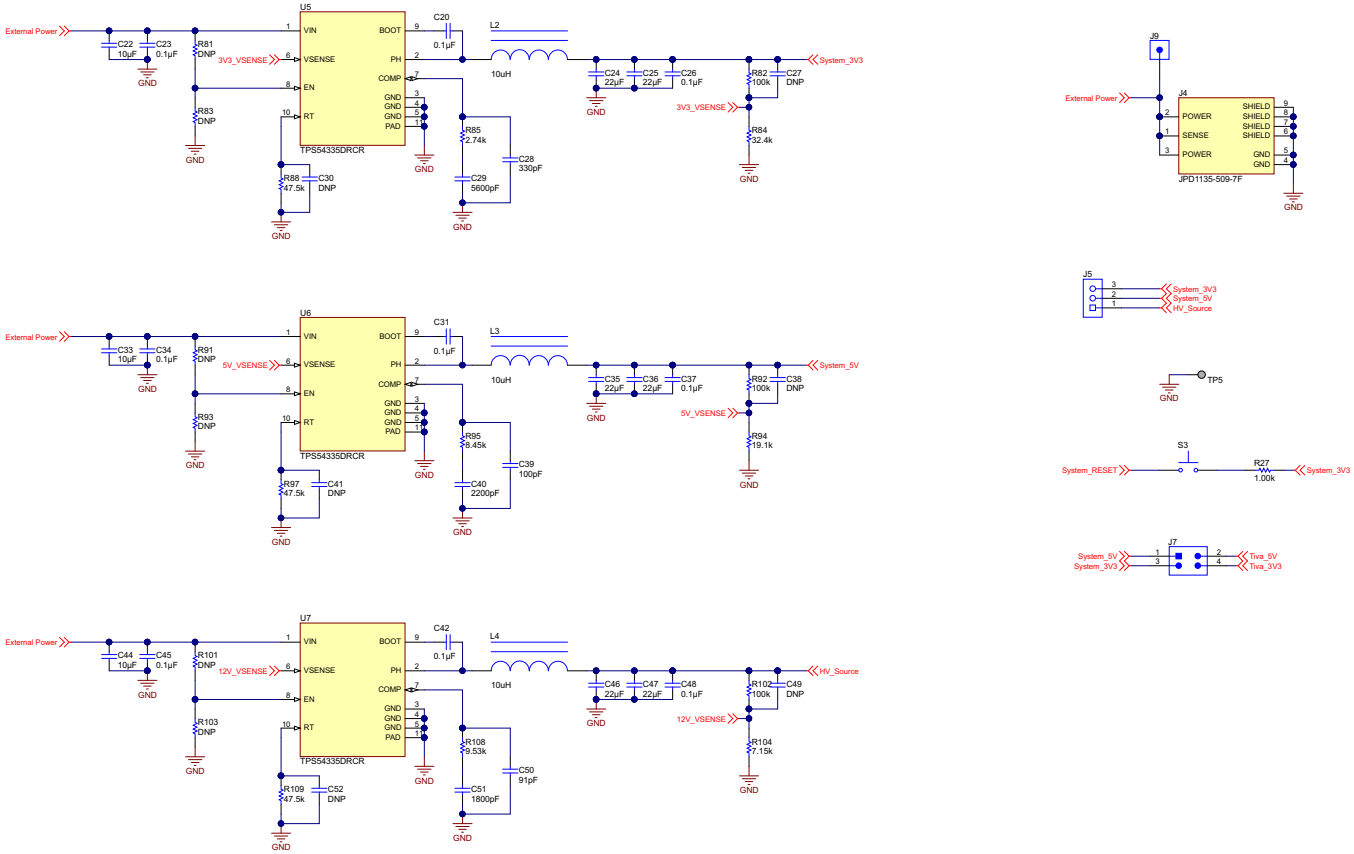


Figure 7. TIDA-00565 Power Path Schematic

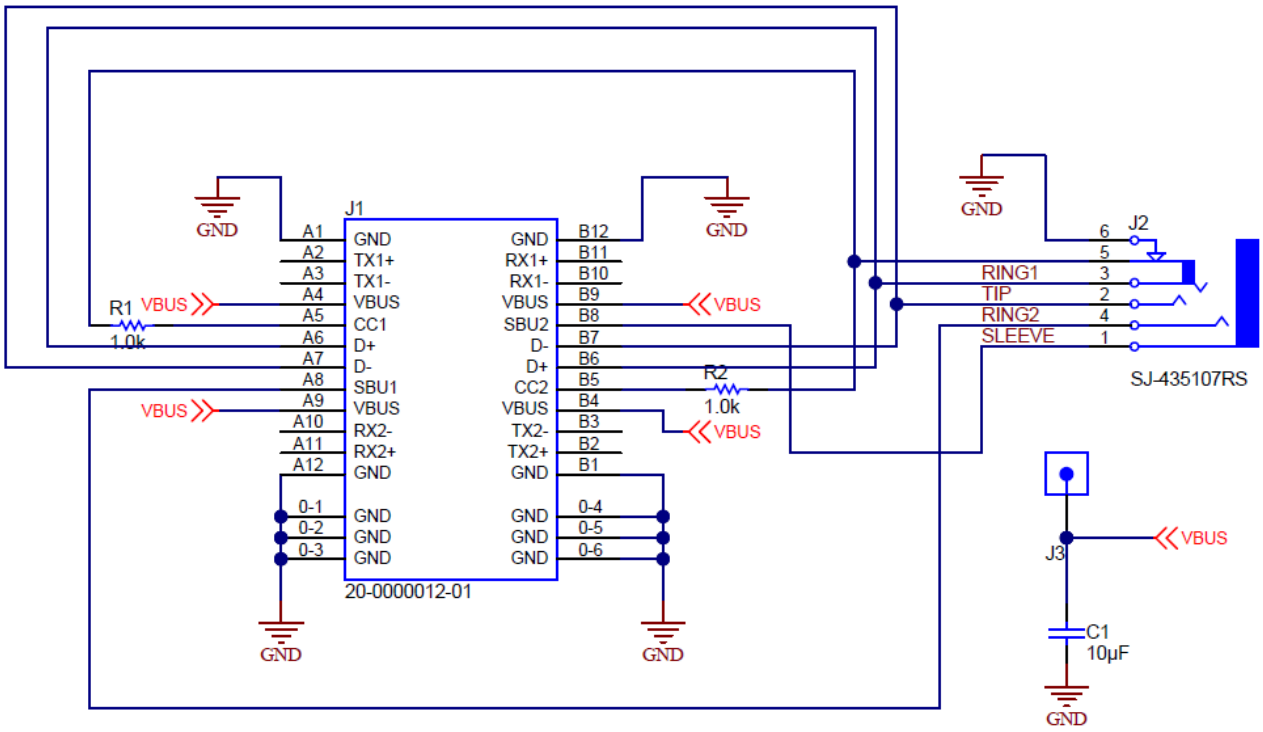


Figure 8. TIDA-00565 USB Type-C Audio Dongle Schematic

8.2 Bill of Materials (BOM)

To download the bill of materials (BOM), see the design files at TIDA-00565..

Table 3. Bill of Materials

DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER	QUANTITY
!PCB1	Printed Circuit Board	Any	TIDA-00565	1
C1, C4	CAP, CERM, 10 µF, 25 V, ±20%, X5R, 0603	MuRata™	GRM188R61E106MA73	2
C2, C12	CAP, CERM, 0.1 µF, 10 V, ±10%, X5R, 0201	Samsung™	CL03A104KP3NNNC	2
C3	CAP, CERM, 0.22 µF, 6.3 V, ±20%, X5R, 0201	MuRata	GRM033R60J224ME90	1
C5, C20, C23, C26, C31, C34, C37, C42, C45, C48	CAP, CERM, 0.1 µF, 50 V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1 uF, 50 V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1 uF, 50V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1 uF, 50V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1uF, 50 V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1uF, 50V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1 uF, 50V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1uF, 50V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1 uF, 50V, ±20%, C0G/NP0, 0402, CAP, CERM, 0.1 uF, 50 V, ±20%, C0G/NP0, 0402	TDK®	C1005X7R1H104M	10
C6	CAP, CERM, 1 µF, 35 V, ± 10%, JB, 0402	TDK	C1005JB1V105K050BC	1
C7–C10	CAP, CERM, 0.01 µF, 50 V, ±10%, X7R, 0402	MuRata	GRM155R71H103KA88D	4
C11	CAP, CERM, 22 µF, 10 V, ±20%, X5R, 0603	MuRata	GRM188R61A226ME15D	1
C13, C16–C18	CAP, CERM, 1 µF, 10 V, ±20%, X5R, 0201	Samsung	CL03A105MP3NSNC	4
C14	CAP, CERM, 10 µF, 10 V, ±20%, X5R, 0402	Samsung	CL05A106MP5NUNC	1
C15, C19	CAP, CERM, 220 pF, 25 V, ±10%, X7R, 0201	MuRata	GRM033R71E221KA01D	2
C21, C54	CAP, CERM, 1 µF, 6.3 V, ±20%, X5R, 0402	MuRata	GRM152R60J105ME15D	2
C22, C33, C44	CAP, CERM, 10 µF, 25 V, ±10%, X5R, 0805	TDK	C2012X5R1E106K125AB	3
C24, C25, C35, C36, C46, C47	CAP, CERM, 22 µF, 35 V, ±20%, X5R, 0805	TDK	C2012X5R1V226M125AC	6
C27, C30, C38, C41, C49, C52	CAP, CERM, 120 pF, 50 V, ±5%, C0G/NP0, 0402	MuRata	GRM1555C1H121JA01D	6
C28	CAP, CERM, 330 pF, 50 V, ±5%, C0G/NP0, 0402	TDK	C1005C0G1H331J	1
C29	CAP, CERM, 5600 pF, 50 V, ±10%, X7R, 0402	MuRata	'GRM155R71H562KA88D	1

Table 3. Bill of Materials (continued)

DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER	QUANTITY
C32, C43	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X7R, 0402	MuRata	GRM155R70J104KA01D	2
C39	CAP, CERM, 100 pF, 50 V, ±10%, X7R, 0402	Yageo America™	CC0402KRX7R9BB101	1
C40	CAP, CERM, 2200 pF, 50 V, ±10%, X5R, 0402	MuRata	GRM155R61H222KA01D	1
C50	CAP, CERM, 91 pF, 50 V, ±5%, C0G/NP0, 0402	MuRata	GRM1555C1H910JA01D	1
C51	CAP, CERM, 1800 pF, 50 V, ±10%, X7R, 0402	MuRata	GRM1555C1H910JA01D	1
C53	CAP, CERM, 0.01 µF, 10 V, ±10%, X5R, 0201	MuRata	GRM155R71H182KA01D	1
D1	Diode, Schottky, 40 V, 3 A, SMA	Diodes Inc.	B340A-13-F	1
D2–D9	LED, White, SMD	OSRAM™	LW QH8G-Q2S2-3K5L-1	8
FID1–FID4	Fiducial mark. There is nothing to buy or mount.	N/A	N/A	4
H1–H4	Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	B&F Fastener Supply	NY PMS 440 0025 PH	4
H5–H8	Standoff, Hex, 0.5"L #4-40 Nylon	Keystone™	1902C	4
J1	Connector, Receptacle, USB Type C, R/A, SMT	Lintes Technology™	20-0000016-01	1
J2, J3	Receptacle, 100 mil, 10×2, Gold, TH	Sullins Connector Solutions™	PPC102LFBN-RC	2
J4	Connector, DC Power Jack, R/A, 3 Pos, TH	Foxconn™	JPD1135-509-7F	1
J5	Receptacle, 100 mil, 3×1, Gold, TH	Sullins Connector Solutions	PPPC031LFBN-RC	1
J6	Header, 100 mil, 2×1, Tin, TH	Molex	90120-0122	1
J7	Header, 100 mil, 2×2, Tin, SMT	Molex	15-91-2040	1
J8	Audio Jack, 3.5 mm, Stereo, R/A, SMT	CUI Inc.	SJ-43515TS-SMT-TR	1
L1	Ferrite Bead, 21 Ω at 100 MHz, 6A, 0805	Taiyo Yuden™	FBMJ2125HM210NT	1
L2–L4		ABRACON™	ASPI-0630LR-100M-T15	3
Q1, Q2	MOSFET, N-CH, 30 V, 60 A, SON 3.3×3.3 mm	Texas Instruments	CSD17309Q3	2
Q3–Q10	Transistor, NPN, 50 V, 0.05 A, SOT-323	Rohm	DTC114EUAT106	8
R1	RES, 0.01 Ω, 1%, 0.25W, 0805	Vishay-Dale™	WSL0805R0100FEA18	1
R2–R6, R10, R11, R16–R19, R22, R23, R30–R32, R34–R41, R46–R48, R50, R51, R53, R54, R56, R57–R69, R71	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C	45

Table 3. Bill of Materials (continued)

DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER	QUANTITY
5	RES, 3.3 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04023K30JNED	4
R12–15, R27	RES, 1.00 k, 1%, 0.05 W, 0201	Vishay-Dale	CRCW02011K00FKED	5
R20, R75, R76, R79, R80	RES, 3.83 k, 1%, 0.05 W, 0201	Vishay-Dale	CRCW02013K83FKED	7
R21, R24–R26, R29, R33, R70	RES, 100 k, 1%, 0.05 W, 0201	Vishay-Dale	CRCW0201100KFKED	1
R28	RES, 15.0 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040215K0FKED	8
R72–R74, R86, R87, R89, R90, R96	RES, 560, 5%, 0.063 W, 0402	Vishay-Dale	CRCW0402560RJNED	2
R77, R78	RES, 9.09 k, 1%, 0.05 W, 0201	Vishay-Dale	CRCW02019K09FKED	3
R81, R91, R101	RES, 220 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW0402220KJNED	3
R82, R92, R102	RES, 100 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW0402100KFKED	3
R83, R93, R103	RES, 43.2 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040243K2FKED	3
R84	RES, 32.4 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040232K4FKED	1
R85	RES, 2.74 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW04022K74FKED	1
R88, R97, R109	RES, 47.5 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040247K5FKED	3
R94	RES, 19.1 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW040219K1FKED	1
R95	RES, 8.45 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW04028K45FKED	1
R98, R105	RES, 4.70 k, 1%, 0.1 W, 0402	Panasonic	ERJ-2RKF4701X	2
R104	RES, 7.15 k, 1%, 0.063 W, 0402	Vishay-Dale	CRCW04027K15FKED	1
R106, R107	RES, 10.0 k, 1%, 0.1 W, 0402	Vishay-Dale	ERJ-2PKF1002X	2
R108	RES, 9.53 k, 1%, 0.063 W, 0402	Panasonic	CRCW04029K53FKED	1
S1	DIP Switch, SPST 4Pos, Slide, SMT	C&K Components™	TDA04H0SB1	1
S3	SWITCH TACTILE SPST-NO 0.05A 12V	Omron Electronic Components™	B3U-1000P	1
TP1–TP5	Test Point, Miniature, SMT	Keystone	5019	5
U1	3V, 8Mbit, Serial Flash Memory with Dual and Qual SPI, SOIC-8	Winbond®	W25Q80DVSNIG	1
U2	TPS65982 Preview Specification, ZQZ0096A	Texas Instruments	TPS65982AAZQZR	1

Table 3. Bill of Materials (continued)

DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER	QUANTITY
U3, U4	1, 4, 6 CHANNEL PROTECTION SOLUTION FOR SUPER-SPEED (UP TO 6 GBPS) INTERFACE, DQA0010A	Texas Instruments	TPD4E05U06DQA	2
U5, U6, U7	4.5V to 28V Input, 3A Output, Synchronous SWIFT Step-Down DC-DC Converter, DRC0010J	Texas Instruments	TPS54335DRCR	3
U8	Autonomous Audio Accessory Detection and Configuration Switch, RVA0016A	Texas Instruments	TS3A227ERVA	1
U9	USB 2.0 High-Speed (480Mbps) and Audio Switches with Negative Signal Capability,3 / 4 Ω RON, -40 to 85 degC, 10-Pin UQFN (RSW), Green (RoHS & no Sb/Br)	Texas Instruments	TS5USBA224RSWR	1

8.3 Layout Prints

To download the layout prints for each board, see the design files at http://www.ti.com/tool/TIDA-00565..

8.4 Altium Project

To download the Altium project files for each board, see the design files at http://www.ti.com/tool/TIDA-00565..

8.5 Layout Guidelines

To download the layout guidelines, see the design files at http://www.ti.com/tool/TIDA-00565.

8.6 Gerber Files

To download the Gerber files, see the design files at http://www.ti.com/tool/TIDA-00565.

8.7 Assembly Drawings

To download the assembly drawings for each board, see the design files at http://www.ti.com/tool/TIDA-00565..

9 References

1. *Noise Analysis in Operational Amplifies Circuits*, (SLVA043A)
2. WEBENCH® Design Center, http://www.ti.com/webench.

Appendix A

A.1 TS5USBA224

The TS5USBA224 USB 2.0 and audio switch is used to multiplex between the USB 2.0 data and analog audio. The switch is a FET-based switch, which is optimized with low On-resistance to maintain signal integrity. The USB 2.0 path has a bandwidth of up to 650 MHz signals. The audio path features a THD+N of less than 0.05% and includes shunt resistors to reduce clicks and pops that may be heard when the audio switch is selected by dissipating residual charge that could be on the audio path. The TS5USBA224 switch is used to protect other components on the D+ and D- lines from analog audio signals that swing to a negative voltage. Figure 9 shows the functional block diagram of the TS5USBA224.

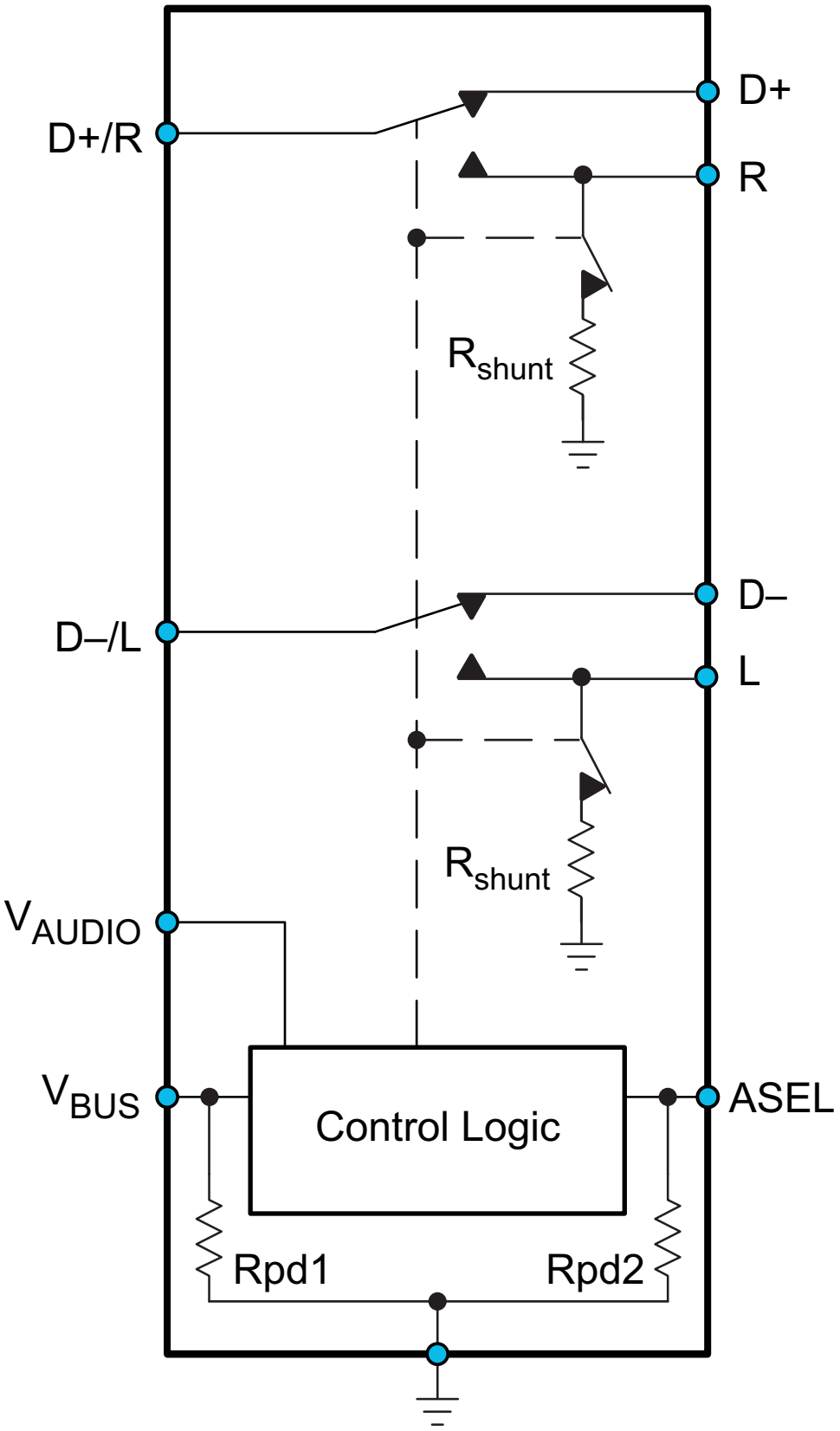


Figure 9. Functional Block Diagram of the TSUSBA224

A.2 TS3A227E

The TS3A227E audio jack switch is used to automatically route the MIC and GND signals appropriately. There are three types of audio jacks that may be inserted into the 3.5 mm audio jack. One of the three audio jacks is a 3-pole jack, containing left and right audio, and GND. Two of the three audio jacks are 4-pole jacks, containing the left and right audio, MIC, and GND. For the 4-pole jacks, the MIC and GND may potentially be swapped, depending on the manufacture of the audio jack. Thus, the TS3A227E detects the correct location of both MIC and GND on the 4-pole audio jack and routes the GND properly to GND and MIC to the desired location.

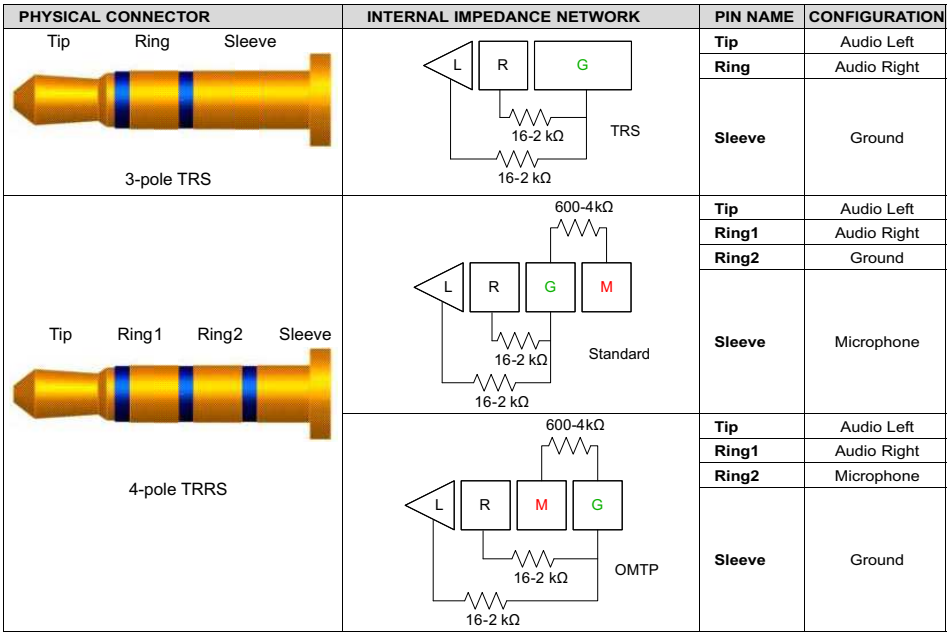


Figure 10. Functional Block Diagram of the TS3A227E

A.3 TPS65982

The TPS65982 function as a power delivery IC for USB Type-C. In the case of this USB Type-C analog audio TI Design, the TPS65982 is used for its accessory detection feature on the CC1 and CC2 pins of the USB Type-C connector. TI offers other smaller products that soley provide the accessory detection feature such as the TUSB32X series of devices. After the TPS65982 detects the impedance of Ra (800 Ω < Ra < 1.2 kΩ), a GPIO on the TPS65982 configures the TS5USBA224 to the audio pathway. If the TPS65982 detects the impedance not equal to Ra, the GPIO configures the TS5USBA224 to the USB pathway. When a non-audio peripheral is attached to the USB-C, the TPS65982 performs its full function as a power delivery IC. Figure 11 shows the functional block diagram of the TPS65982.

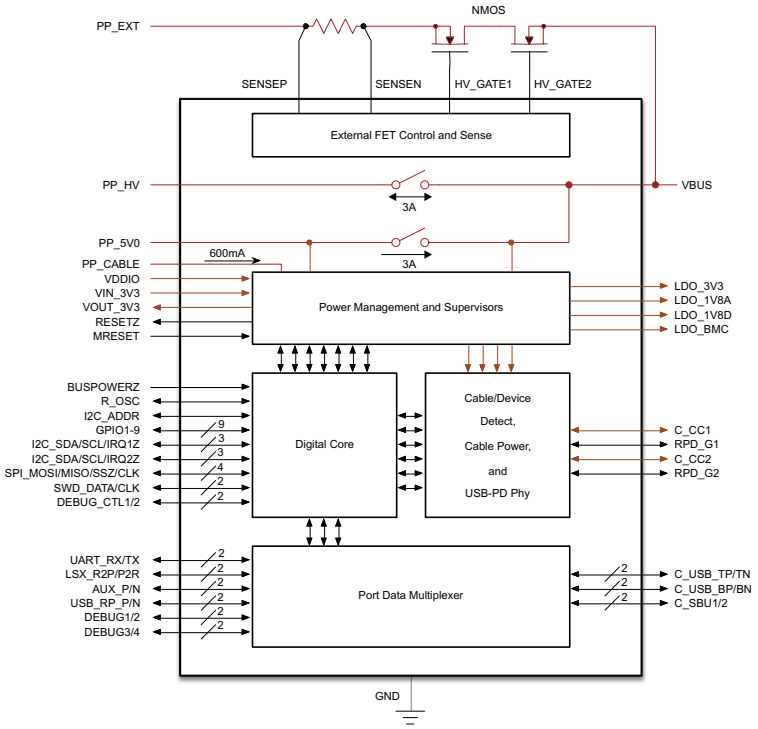


Figure 11. Functional Block Diagram of the TPS65982

Appendix B

B.1 Getting Started Firmware

B.1.1 TPS6598x Configuration Tool From TI.com

B.1.1.1 Downloading the TPS6598x Configuration Tool

1. Follow the TPS6598x configuration tool link from TI.com, as shown in Figure 12.

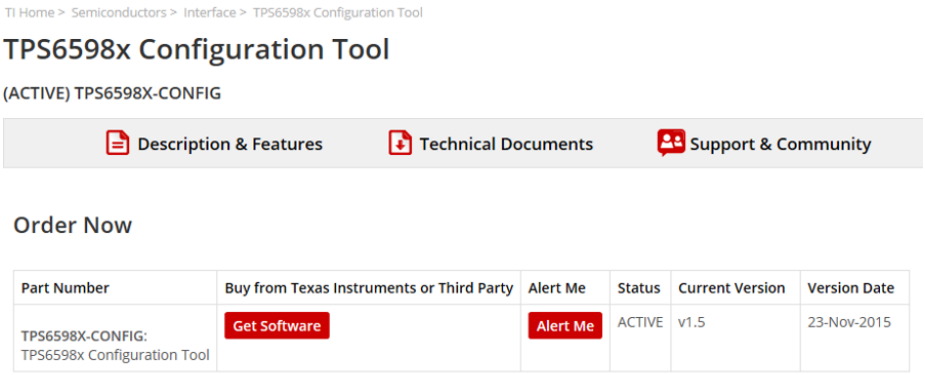


Figure 12. TPS6598x Configuration Tool Download Page

2. Log in to your myTI account, as shown in Figure 13.

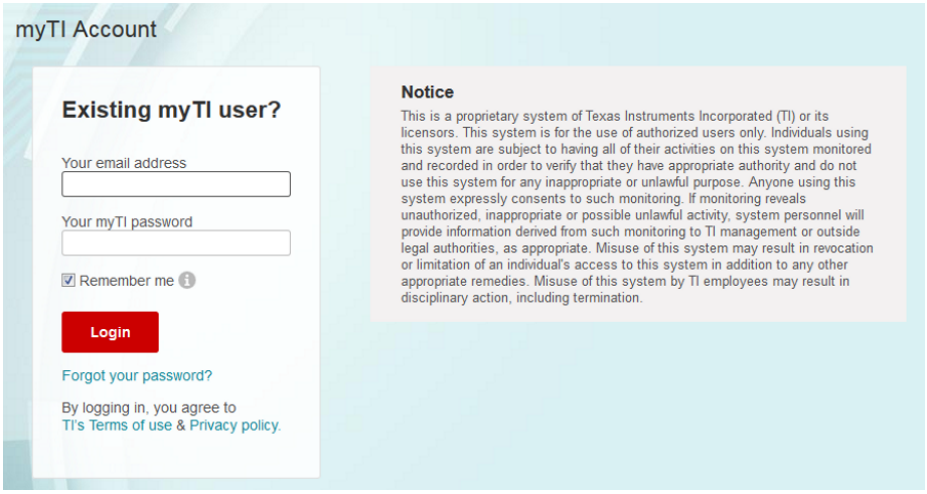


Figure 13. My TI Account Login Screen

3. Fill out the TI request form, as shown in Figure 14.

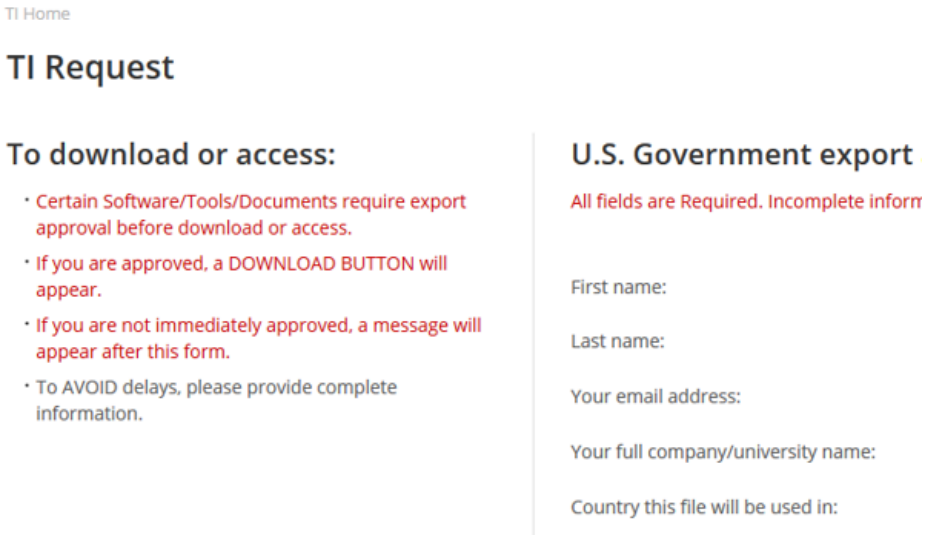


Figure 14. TI Request Screen

4. Once approved, download the configuration tool, as shown in Figure 15.

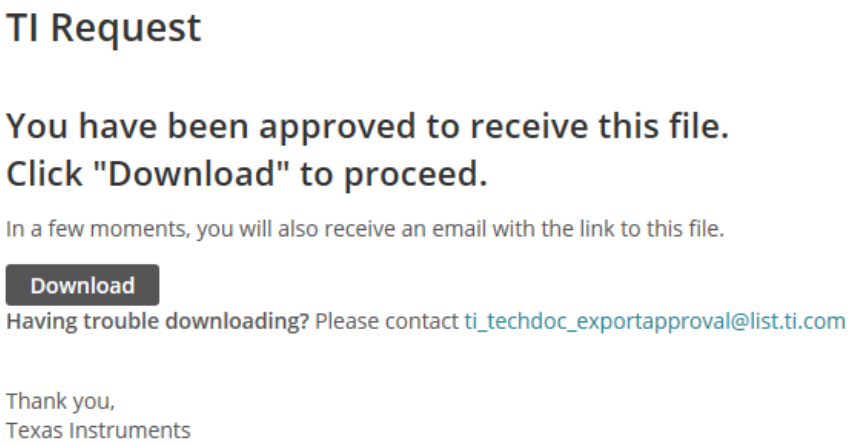


Figure 15. TI Request Approval Screen

5. Save the file, as shown in Figure 16.

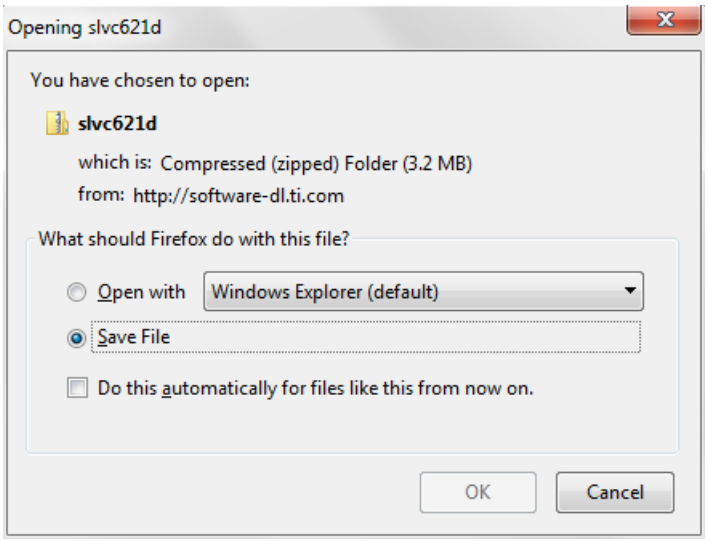


Figure 16. TPS6598x Configuration Tool Download

6. Extract all files, as shown in Figure 17.

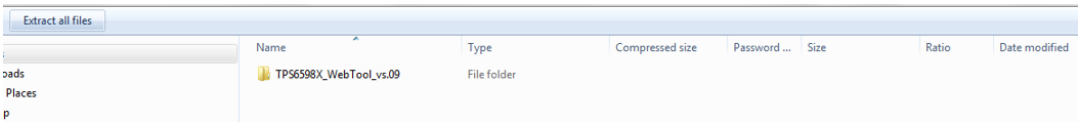


Figure 17. TPS6598x Configuration Image

B.1.1.2 Launching the TPS6598x Configuration Tool

The TPS6598x Configuration Tool is implemented using a combination of html and JavaScript files. Users are able to execute the tool on nearly any PC platform using the web browser of their choice. To use launch the tool, de-archive the package files to any desired file system location and browse to the *index.html* file located at:

<install_dir>\TPS6598x_WebTool_<version>\javascript\index.html

On a Windows® platform:

1. Navigate to the file within the windows.
2. Right-click and select *open with*.
3. Or, launch a web browser.
4. Enter as a *file* url: file:///<install_dir>/TPS6598x_WebTool_<version>/javascript/index.html.

The example URL (tested using the Chrome browser):

file:///C:TPS65982_WebTool_vs.TPS6598x_WebTool_vs.29/javascript/index.html

For more information about the TPS6598x, see the TPS65x Configuration Tool User Guide (SLVUAI9A).

B.1.1.3 Using the Configuration Tool to Set Up the TPS65982 for Audio Accessory Detection Mode

1. Click load defaults

   Figure 18 shows the TPS6598x configuration tool screen home screen.

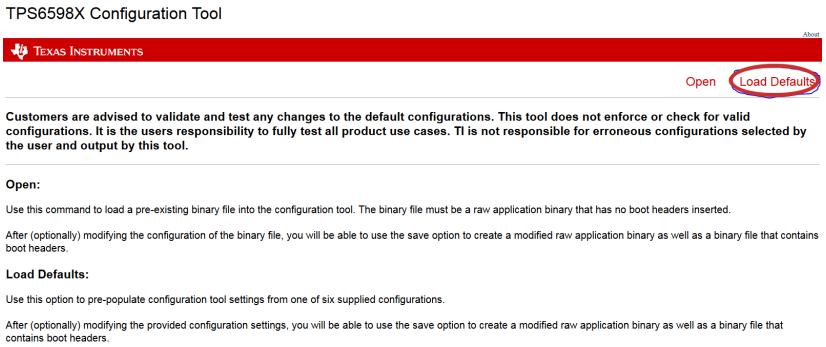


Figure 18. TPS6598x Configuration Tool Screen Home Screen

2. Select the second option TPS65982 *Dual-Role Port*.
3. Select *Power Agnostic*.
4. Select *Prefers Data Source*.
5. Click *Ok*.
6. Select *GPIO Mappings* from the menu on the left.

   Figure 19 shows the TPS6598x configuration tool GPIO mappings screen shot 1.

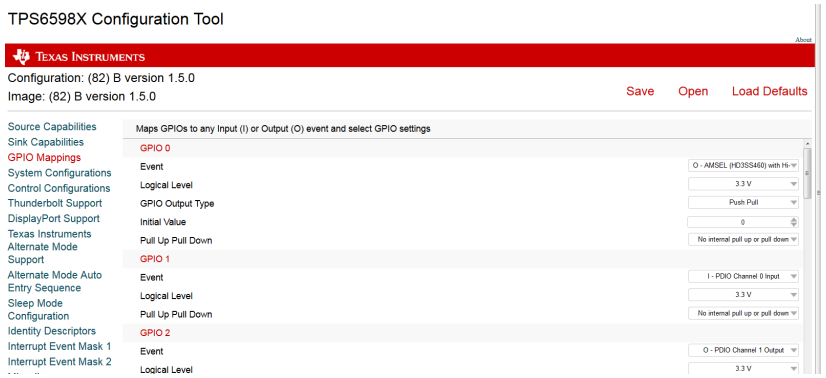


Figure 19. TPS6598x Configuration Tool GPIO Mappings Screen Shot 1

7. Navigate to *GPIO 6* using the scroll bar.

   Figure 20 shows the TPS6598x configuration tool GPIO mappings screen shot 2.

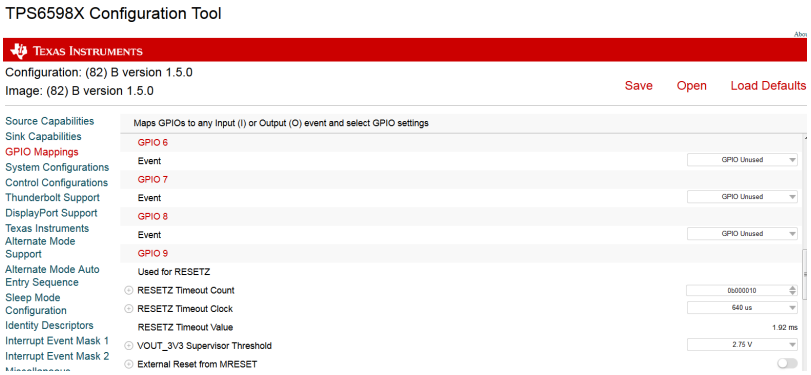


Figure 20. TPS6598x Configuration Tool GPIO Mappings Screen Shot 2

8. To configure the *GPIO 6* event, click the drop down menu on the right.
9. Select *Audio Enable Event*.
   Figure 21 shows the TPS6598x configuration tool GPIO screen shot 3.

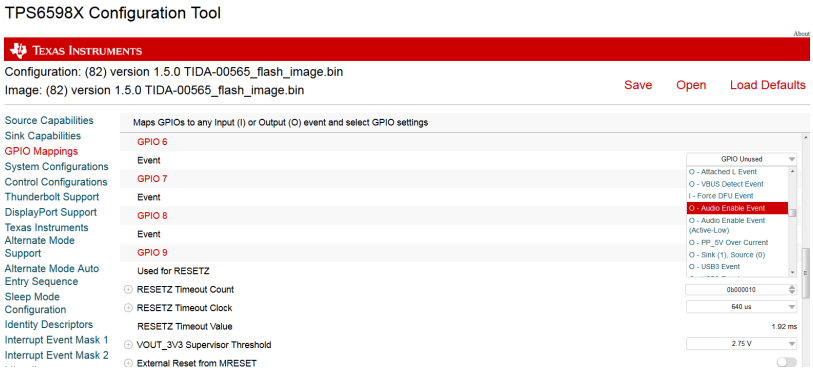


Figure 21. TPS6598x Configuration Tool GPIO Screen Shot 3

10. Click *Save* in the upper right corner to create the files, as shown in Figure 22 .

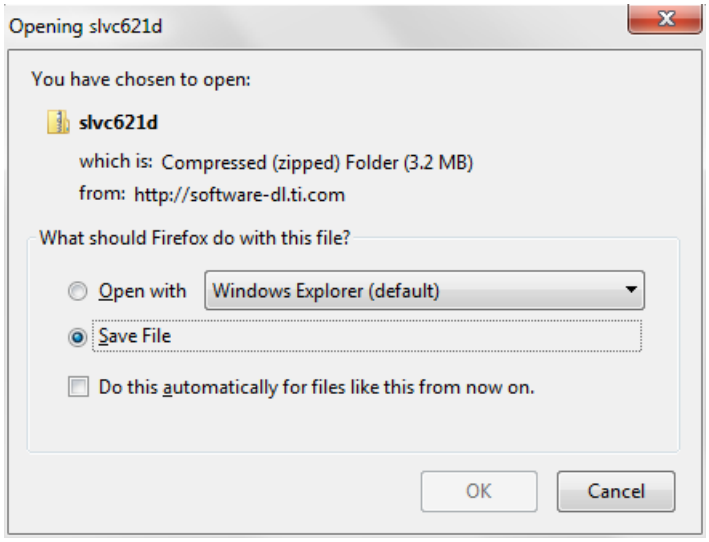


Figure 22. TPS6598x Configuration Tool Save

B.1.2 Flashing the TPS65982 With the Audio Accessory Adapter Detection Configuration

Download the *TIDA-00565-Flash-Imange.bin* file from TI.com, or follow the configuration tool instructions below.

You may flash the TPS65982 over a SPI interface through the J2 and J3 connectors on the TIDA00565 board.

Figure 23 and shows the TIDA-00565 pin out assignments for SPI communication. shows...

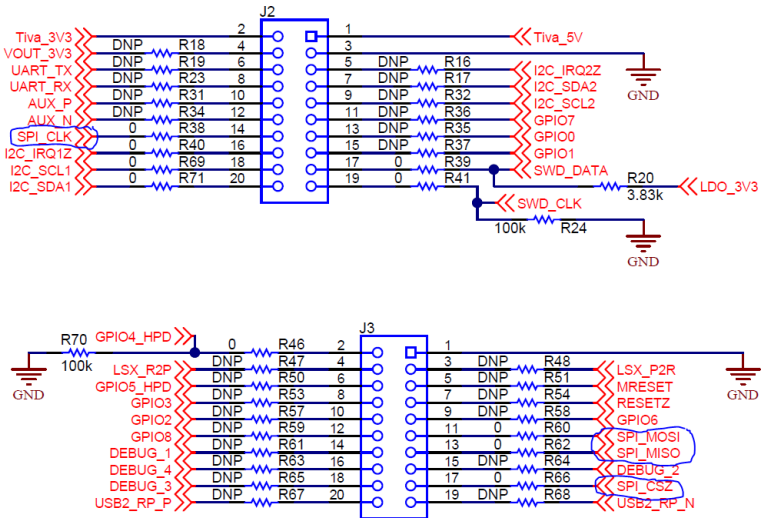


Figure 23. TIDA-00565 Pin Out Assignments for SPI Communication

The following procedure describes how to flash the WQ2580 IC of the TPS65982-EVM with firmware (1024kB .bin file) using an Aardvark SPI Programmer by connecting to the SPI pins of header J2.

The firmware file that must be used is TIDA-00565-Flash-Image.bin.

Writing a flash image using an Aardvark SPI Programmer:

In the following sections, there are images indicating additional information. Use the legend that appears before the image to understand what image corresponds to what action.

B.1.2.1 Wire Aardvark to SPI Pins for Flash on the TPS65982-EVM Board

Wire the Aardvark™ SPI pins to the corresponding SPI pins on the TPS65982-EVM J2 and K3 headers, as shown in Figure 24.

Figure 24 shows the TIDA-00565 pin connections to Aardvark for SPI communication.

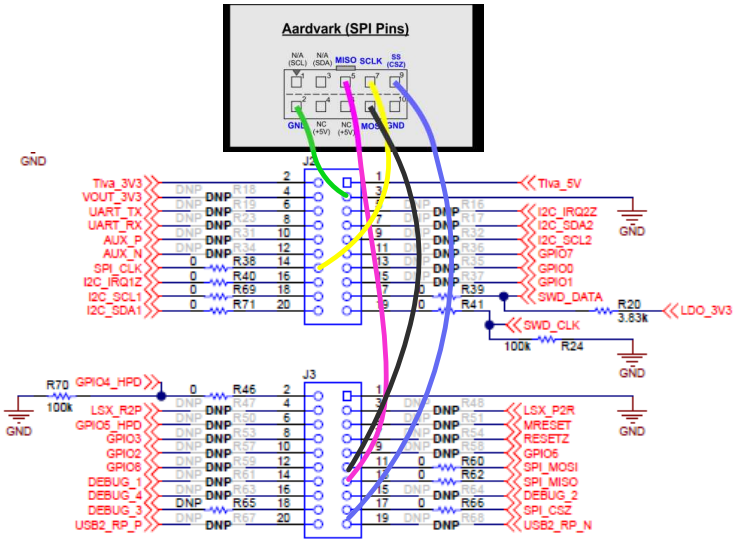


Figure 24. TIDA-00565 Pin Connections to Aardvark for SPI Communication

Run *Flash Center***.exe**

1. Connect the Dell™ power adapter to the TPS65982-EVM and connect the Aardvark USB cable to a PC.
2. Boot up the Flash Center software from the directory location where it was previously installed, as shown in Figure 25.

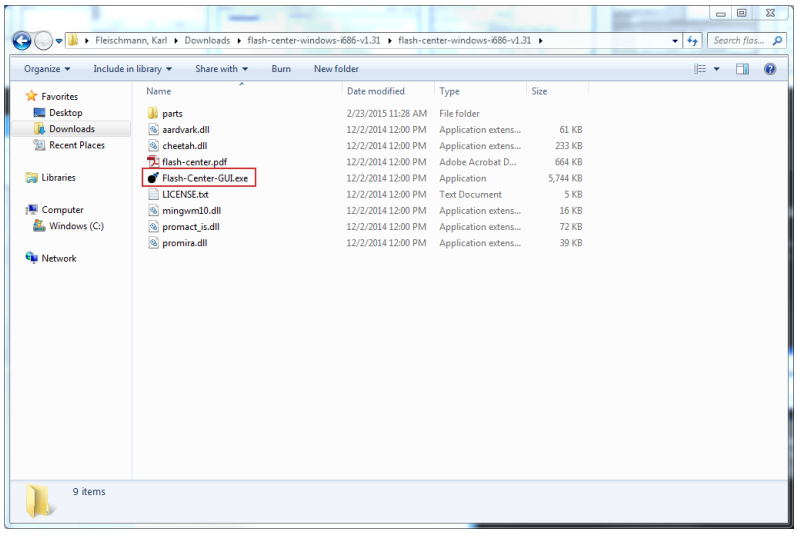


Figure 25. Open Aardvark Adapter Software

B.1.2.2 Add Adapter

The Flash Center application uses a variety of adapters. To use the Aardvark adapter, you must add it.

1. To add the adapter, click Add Adapters.
2. Select the Aardvark adapter, as shown in Figure 25.

NOTE: The Flash Center should automatically detect the Aardvark when adding the adapter. If the Flash Center does not automatically detect the Aardvark adapter, download the Aardvark drivers from Total Phase™, and follow the installation prompts.

B.1.2.3 Choose Target (Device Type)

For the Flash Center to flash the TPS65982-EVM, the user must select the proper flash or device type.

Click the *Choose Target* button to select the *Target Device* type. As shown in Figure 26, the *Target Device* type in this case is ***SPI Flash→Winbond/NexFlash→W25Q80***.

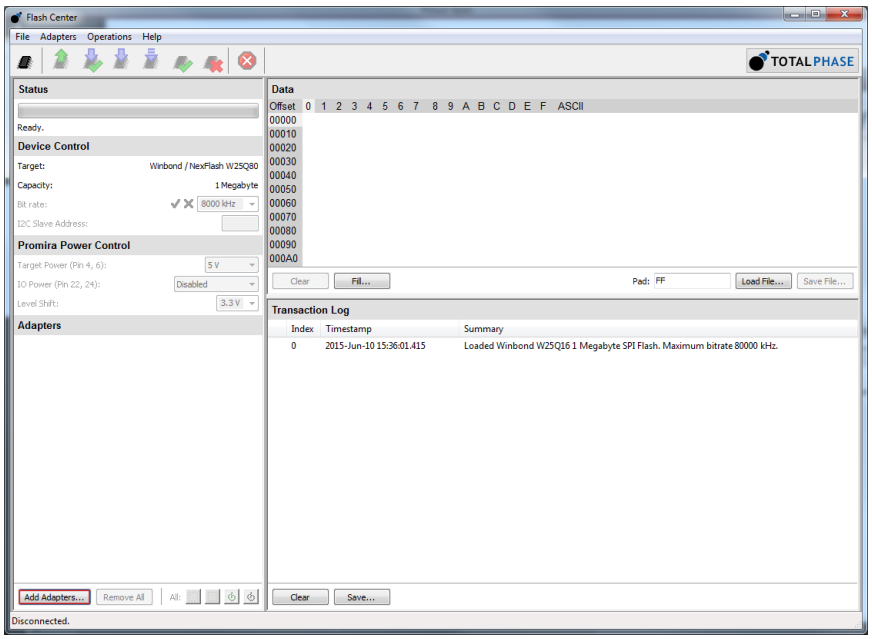


Figure 26. Aardvark Adapter Sofrware Screen Shot 1

B.1.2.4 Load Binary File

1. Select *load file* to load the binary file that will go onto the TPS65982-EVM.
2. Proceed to the directory where the binary file has been saved.
3. Click *open* after the binary file is selected.
4. If successful, the data section of the Flash Center will be full of values.

Figure 27 shows the Aardvark adapter software screen shot 2.

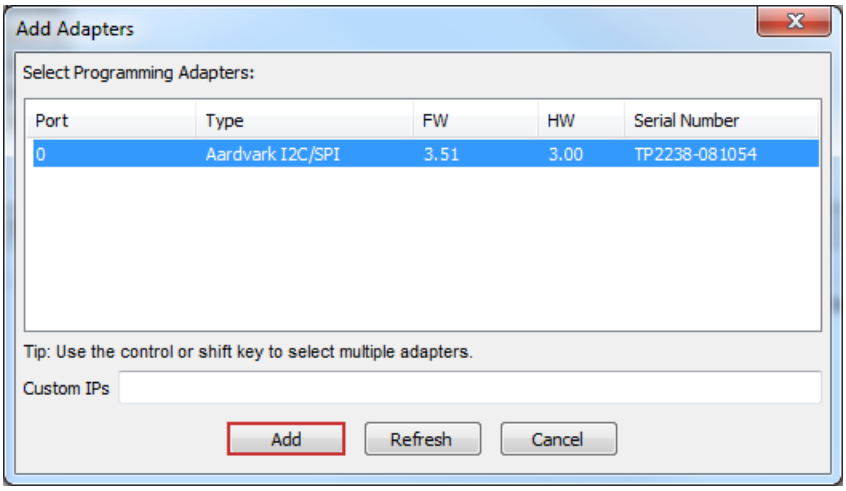


Figure 27. Aardvark Adapter Software Screen Shot 2

Figure 28 shows the Aardvark adapter software screen shot 3.

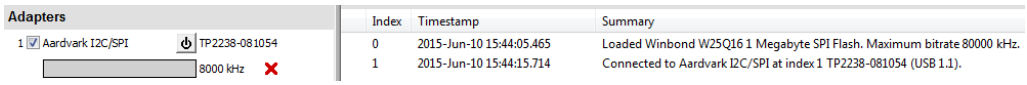


Figure 28. Aardvark Adapter Software Screen Shot 3

Figure 29 shows the Aardvark adapter software screen shot 4.

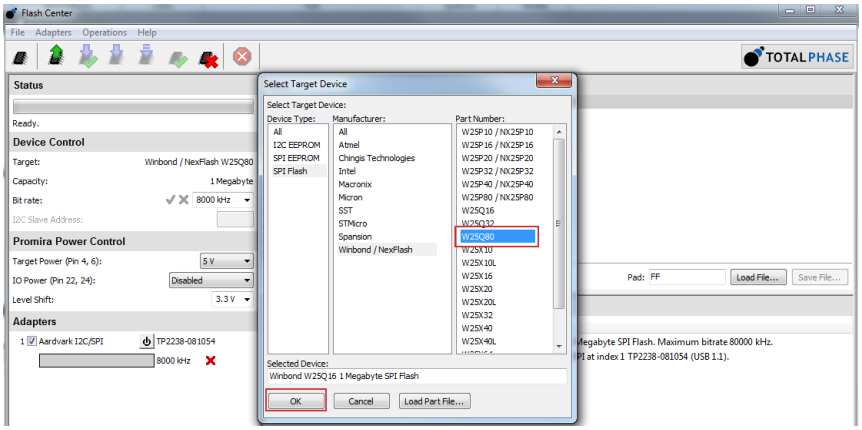


Figure 29. Aardvark Adapter Software Screen Shot 4

Figure 30 shows the Aardvark adapter software screen shot 6.

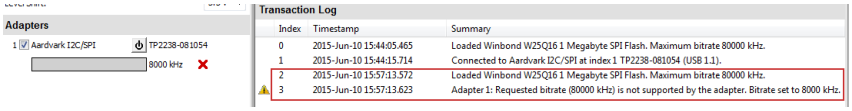


Figure 30. Aardvark Adapter Software Screen Shot 5

B.1.2.5 Verify (Optional)

To confirm that the loaded binary image matches the firmware installed on the TPS65982-EVM, click the *verify* button and see if it reports a success. Figure 31 shows the Aardvark adapter software screen shot 6.

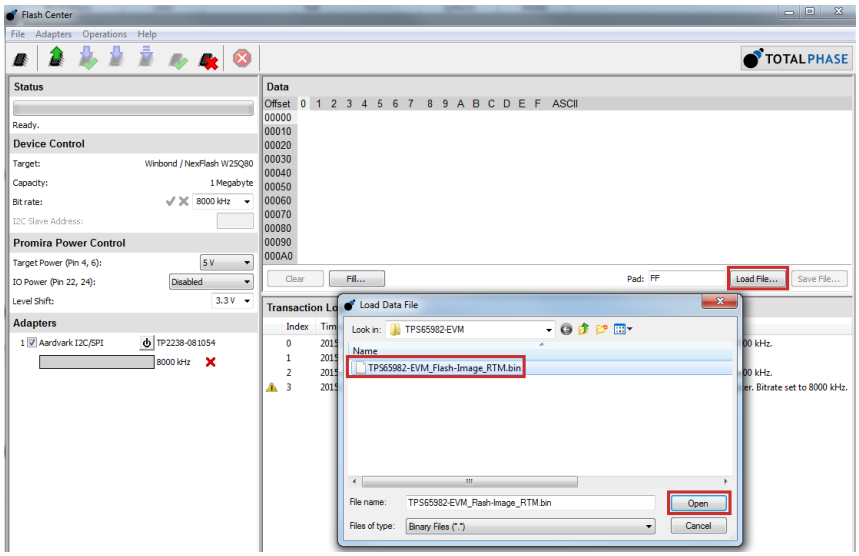


Figure 31. Aardvark Adapter Software Screen Shot 6

Figure 32 shows the Aardvark adapter software screen shot 7.

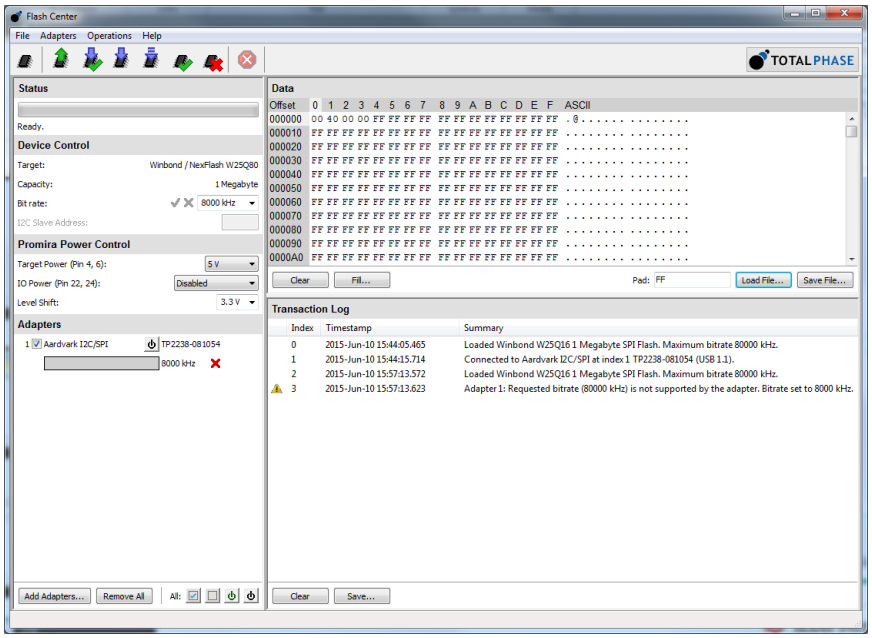


Figure 32. Aardvark Adapter Software Screen Shot 7

Figure 33 shows the Aardvark adapter software screen shot 8.

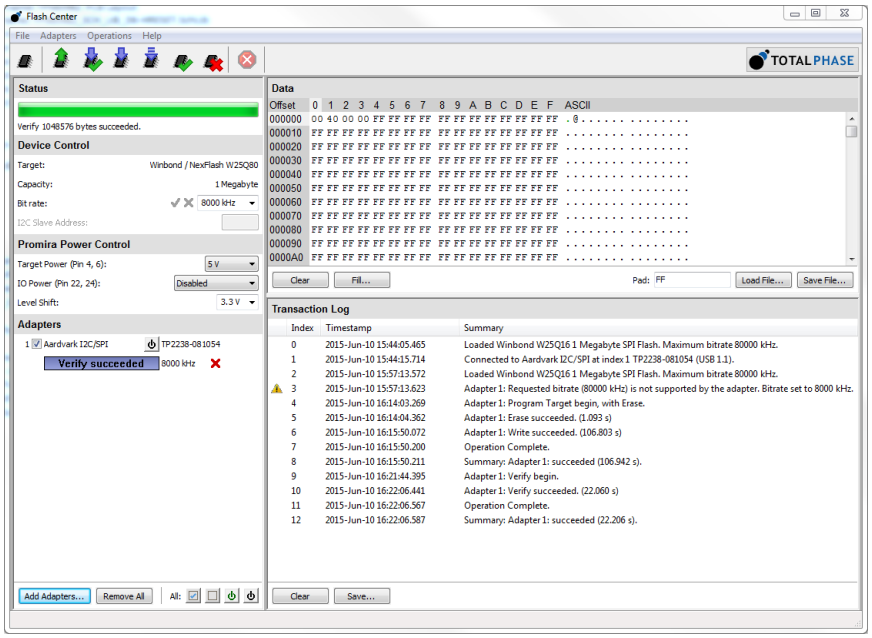


Figure 33. Aardvark Adapter Software Screen Shot 8

Figure 34 shows the THD + N audio precision test setup screen shot.

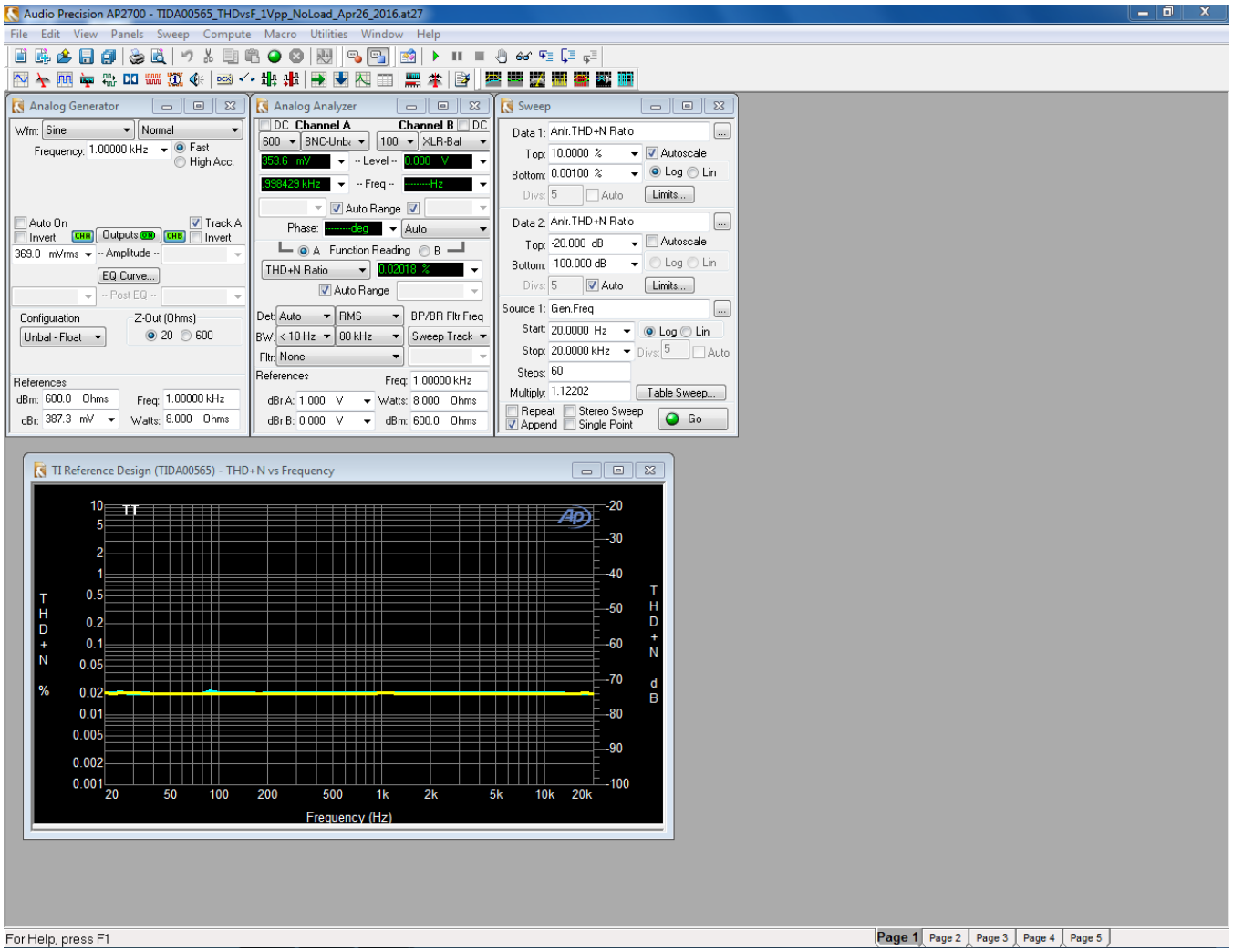


Figure 34. THD + N Audio Precision Test Setup Screen Shot

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