User's Guide

TAS6424E-Q1 EVM

Gregg Scott

ABSTRACT

This manual describes the operations of the TAS6424EQ1EVM. The TAS6424EQ1EVM is a stand-alone EVM. The PurePath™ Control Console 3 GUI (PPC3) is used to initialize and operate the EVM. The main topics of this document are:

- Hardware implementation and descriptions
- Software implementation and descriptions
- TAS6424E-Q1 EVM operations (hardware and software)

Required equipment and accessories:

1. TAS6424E-Q1 EVM
2. USB A male to micro B male cable
3. Power Supply Unit (PSU) up to 26.4 V, > 6 A capable, if J12 is removed and 12 V is provided. If J12 is in, limit the input voltage to 18 V.
4. 1-4 resistive loads or speaker loads
5. 2-6 pair of wires stripped both ends
6. 2-mm slotted screwdriver
7. Optical audio source (optional)
8. Optical SPDIF cable (optional)
9. Desktop or laptop PC with Microsoft® Windows® 7 operating system

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1 Trademarks

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2 Hardware Overview

2.1 TAS6424E-Q1 Evaluation Module Description

The TAS6424E-Q1 EVM is a stand-alone EVM. It has single power supply input, USB control via PurePath Control Console 3 (PPC3) and two digital (I2S) audio input options. See the EVM block diagram in Figure 2-1.

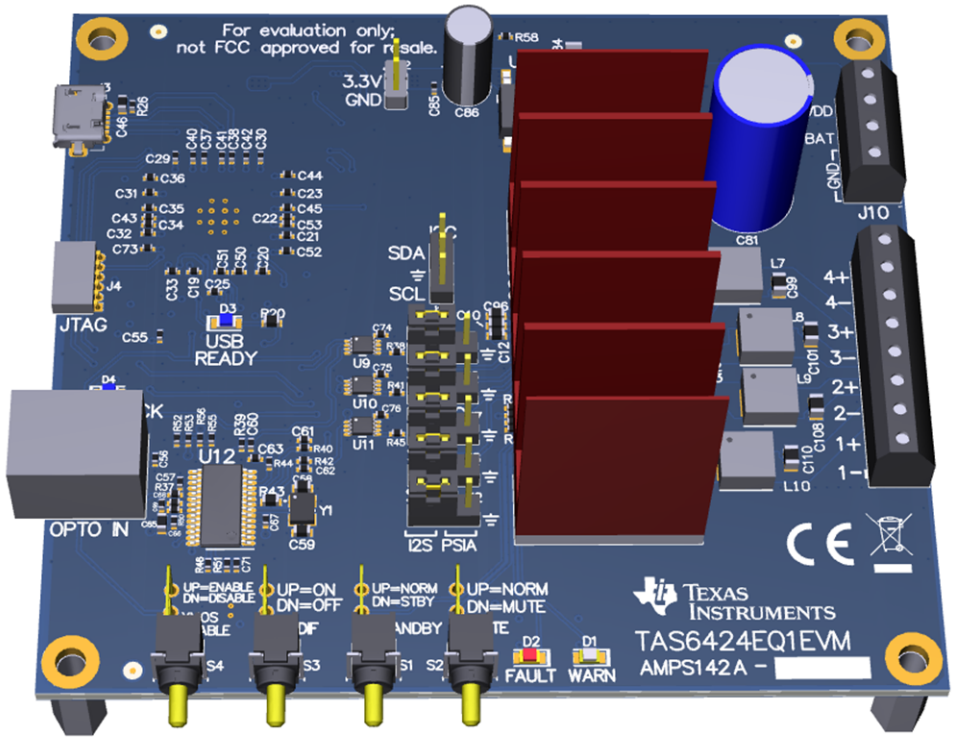

Figure 2-1. TAS6424E-Q1 EVM

The block diagram shows the TAS6424E-Q1 EVM signal flow.

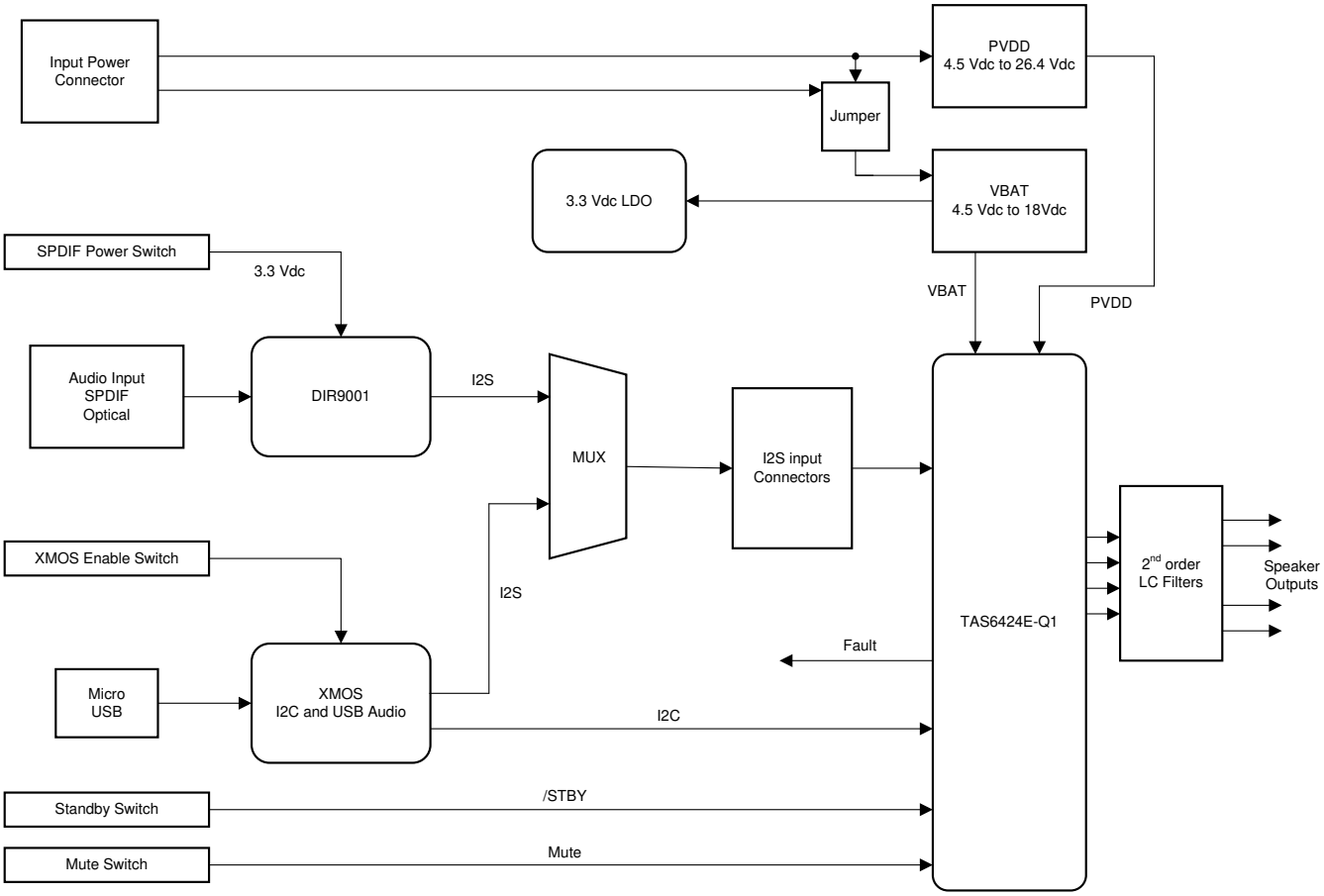

Figure 2-2. EVM Block Diagram

3 Software Overview

3.1 PurePath™ Console 3 (PPC3) Access and Description

The PPC3 is a server-based tool. Access can be requested on http://www.ti.com/tool/PUREPATHCONSOLE.

Once approval is given, go to www.ti.com/mysecuresoftware to download the software. After login, the user will see this web page with a similar list of software products available for download.

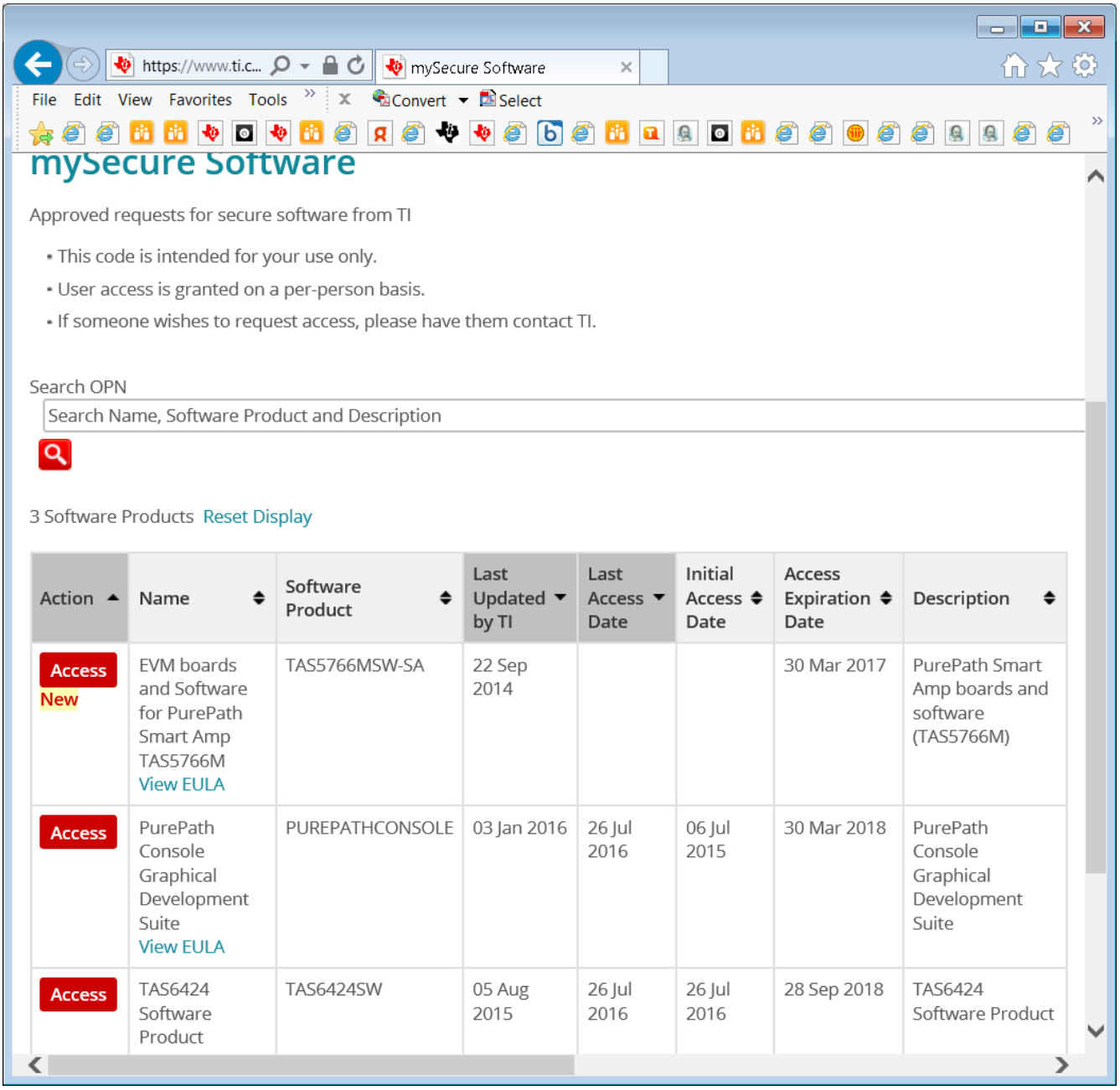

Figure 3-1. PPC3 Download Window

Run the installation program. Also download the PPC3 User Manual (SLOU408) for further instructions. The following window is displayed when first running PPC3.

Figure 3-2. PPC3 Window

When the window in Figure 3-2 is displayed, click on “sign in” to see TAS6424E EVM application. All of the apps shown below may not be displayed for the user.

Click on TAS6424E App box to download TAS6424E application. Installation window will pop up, then click “Install”.

TAS6424E EVM box will appear in “Installed EVM Apps” section, see Figure 3-3. Click on TAS6424E box to launch TAS6424E App.

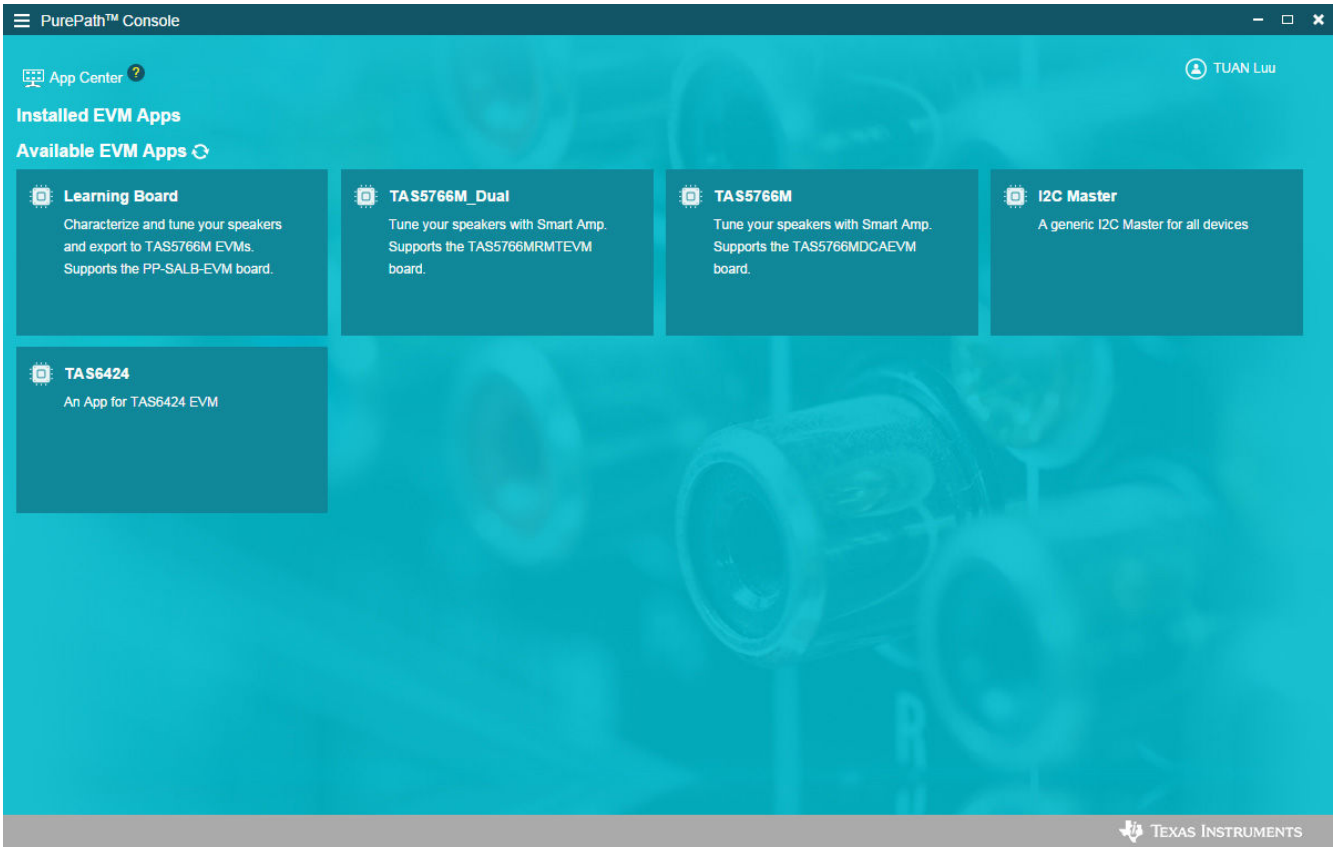

Figure 3-3. Available Apps Window

3.2 PurePath™ Console 3 – TAS6424E EVM Home Window

When the TAS6424E EVM PPC3 is launched, the Home Window is shown. If the EVM is powered on and the USB is connected to the PC, the Home Window will display “Connect” box in the bottom right hand corner. If the EVM is not powered on or the USB is not connected, only “TAS6424E EVM – Offline” is displayed.

Figure 3-4 shows the downloading progress of TAS6424E-Q1 applications.

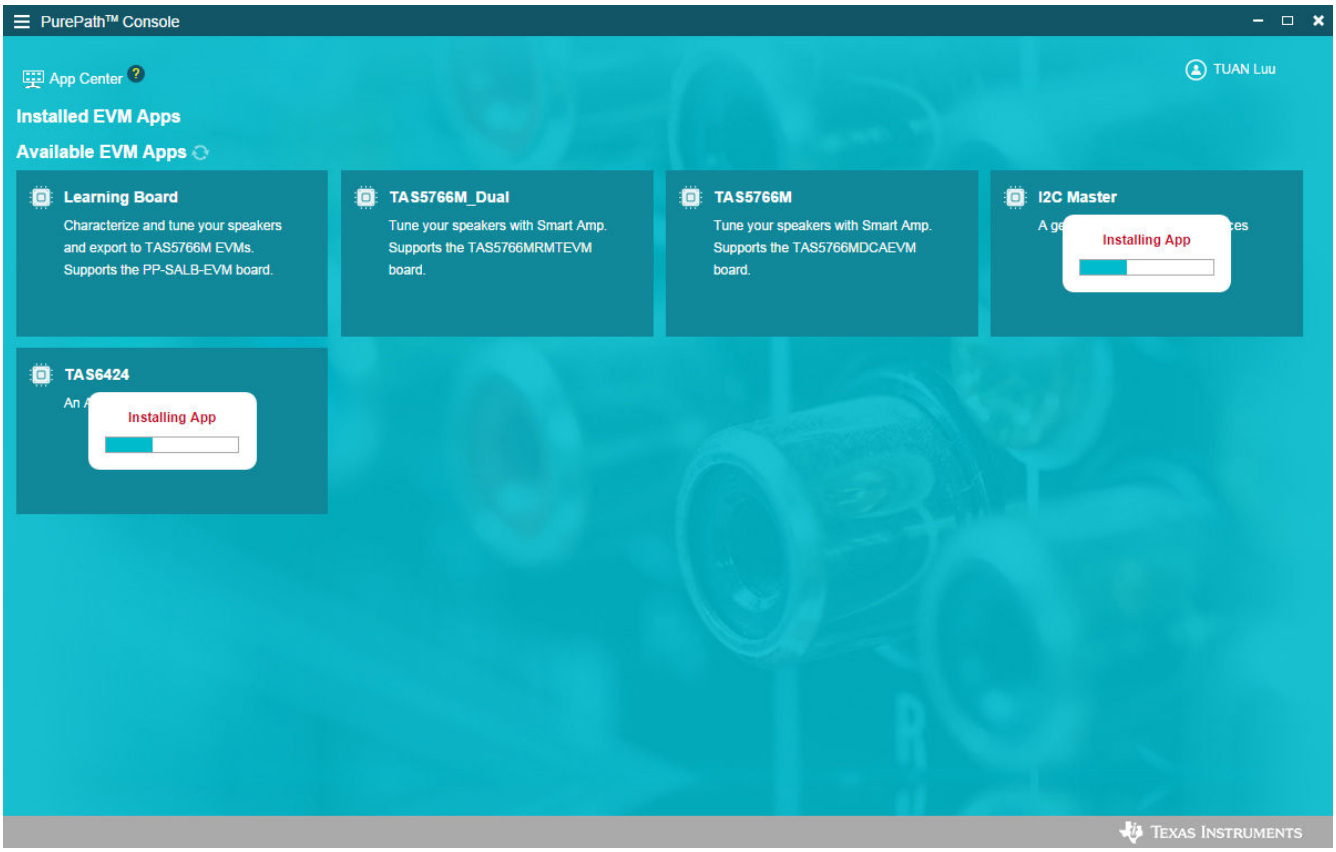

Figure 3-4. PPC3 Window

There are three windows available with the TAS6424E EVM PPC3: Home Window, Register Map Window and Device Monitor and Control Window.

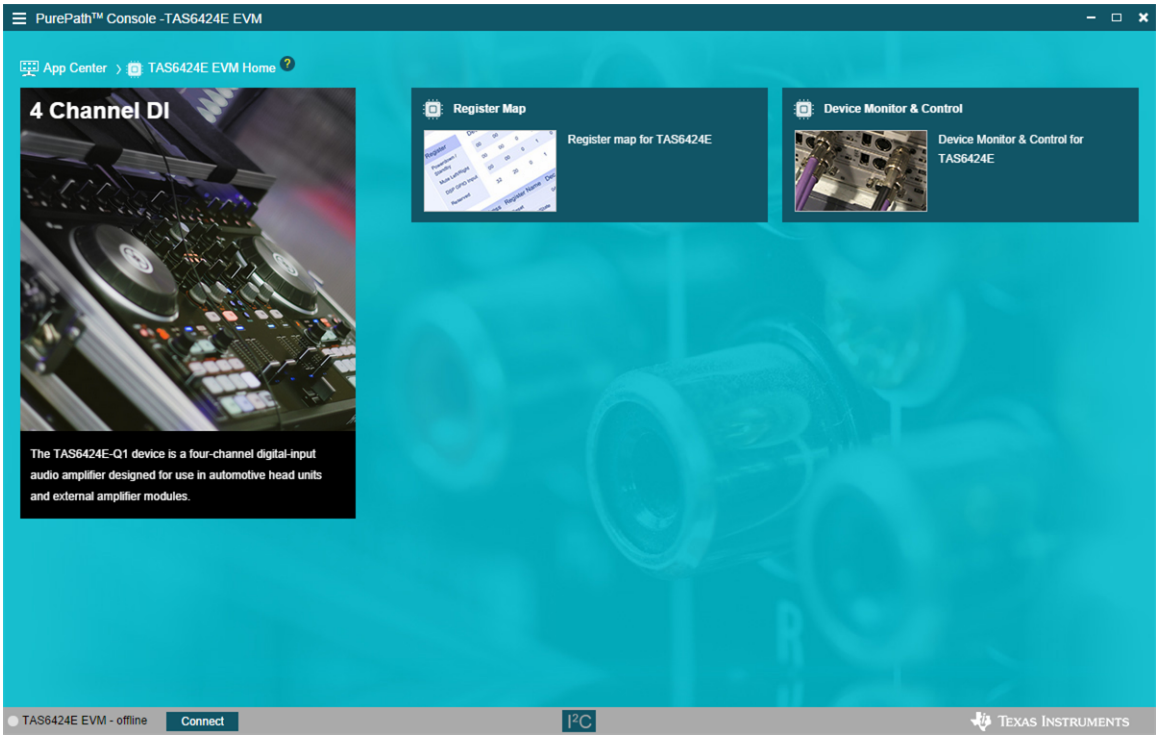

Figure 3-5. TAS6424E EVM Home Window

3.3 PurePath™ Console 3 – TAS6424E EVM Register Map Window

When click on Register Map Box on the Home Window, the Register Map Window is displayed. The Register Map indicates the current setting of all the registers in TAS6424E-Q1.

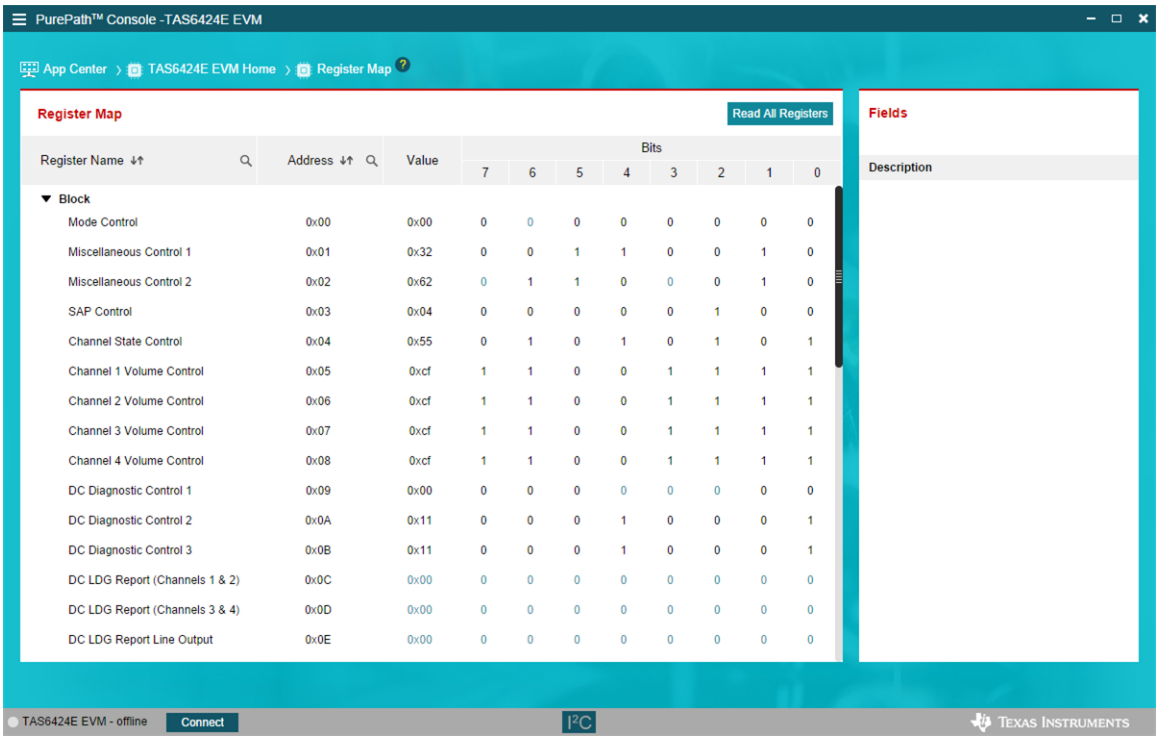

Figure 3-6. TAS6424E EVM Register Map Window

3.4 PurePath™ Console 3 – TAS6424E EVM Monitor and Control Window

When click on Device Monitor and Control Box on the Home Window, the Device Monitor and Control Window is displayed.

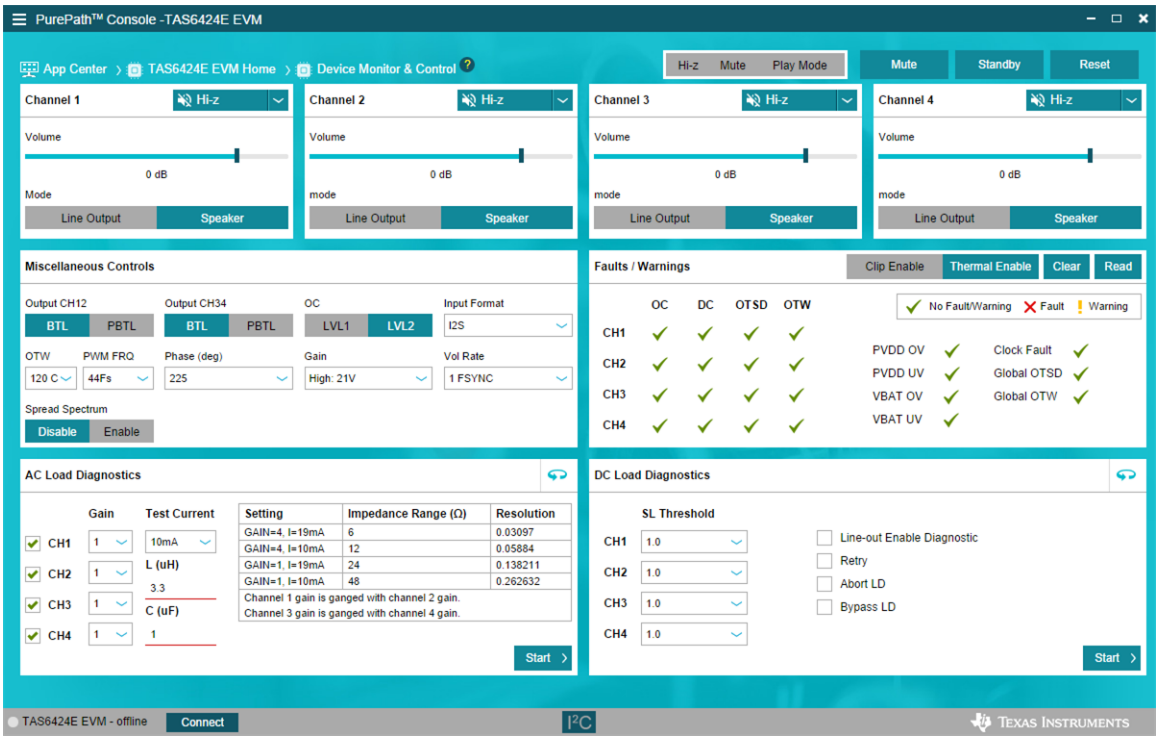

Figure 3-7. TAS6424E EVM Device Monitor and Control Window

3.5 TAS6424E-Q1 EVM Start Up

This section describes the TAS6424E-Q1 start-up procedure. Have the equipment and accessories listed on the first page of this document available.

3.5.1 TAS6424E-Q1 EVM Setup

Hardware and software connections:

- Desk top or laptop PC running Windows 7. Open PPC3 GUI.
- Connect 14.4 VDC PSU to TAS6424E-Q1 EVM
- Connect speakers or resistive loads to TAS6424E-Q1 EVM
- Connect USB micro cable from PC to the EVM
- Set the switches (SPDIF, STANDBY, MUTE) to up positions
- Turn on the PSU
- Audio source: This can be a DVD player with optical SPDIF cable or Windows Media Player from PC
- At this point, 3.3 V LED, USB-LOCK LED and SPDIF-LOCK LED (if optical SPDIF is used) are on.
- If the SPDIF LED is not on, the default I2S input is the USB audio source.
- On the PPC3 window, launch TAS6424E EVM application
- The audio can be streamed now to the speakers. Go to the GUI and click on “Device Monitor & Control” box. Click on play button located on the top right of the window.
- The following sections describe in detail the register settings of TAS6424E-Q1.

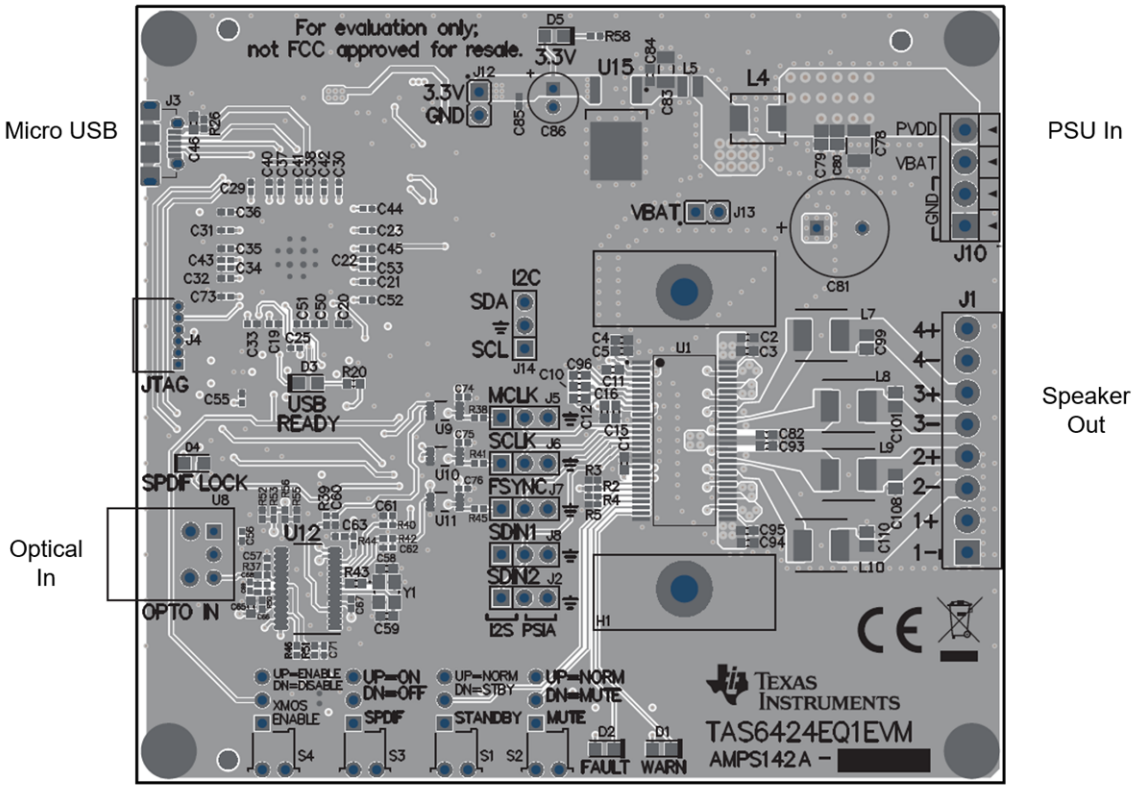

Figure 3-8. TAS6424E-Q1 EVM Connection

3.5.2 TAS6424E-Q1 Settings on Device Monitor and Control Window

The TAS6424E Register Map window is for reference. Most of the register settings are done on the Device Monitor and Control window

Click on “CONNECT” button on the bottom left corner of the TAS6424E EVM application window, see Figure 3-9. The LED next to the TAS6424E EVM changes from gray to green and the “CONNECT” button changes to “DISCONNECT” button.

Click on the TAS6424E Device Monitor and Control box. The following window is displayed.

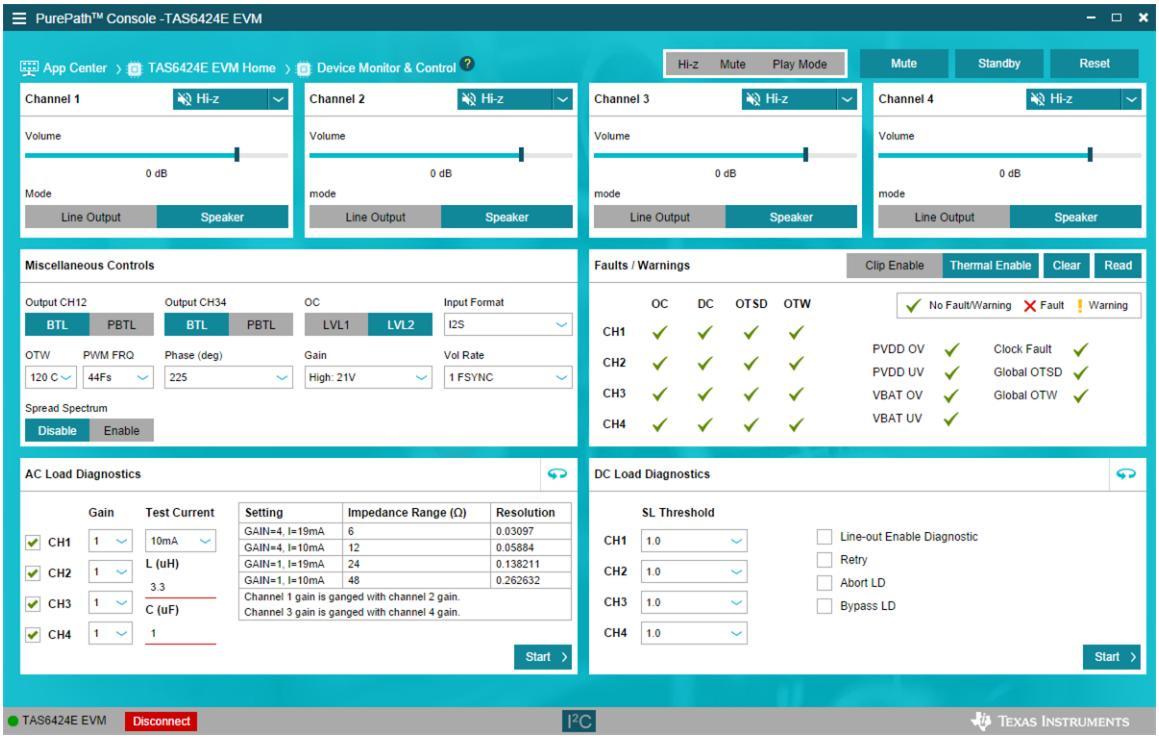

Figure 3-9. Device Monitor and Control Window

This window has 6 major sections: global control section, channel control section, other control section, faults and warnings section, AC load diagnostics section and DC load diagnostics section.

3.5.2.1 Global Control Section

The Hi-Z, Mute and Unmute buttons with the gray background controls all 4 channels at the same time. When Hi-Z is selected, all 4 channels are put in Hi-Z. The display for each channel in the channel control section will reflect these buttons selections.

The Mute Pin button is the GPIO pin controlling the mute function of the device.

The Standby button is the GPIO pin controlling the standby function of the device.

The Reset button is software reset. This will put the device back in default settings.

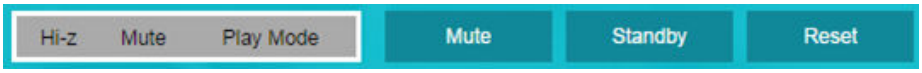

Figure 3-10. Global Control Section

3.5.2.2 Channel Control Section

Each channel has the same setting selections: Hi-Z, Mute, Unmute, Volume, Line-out mode and Speaker mode.

The drop down menu allows user to select either Hi-Z, Mute or Unmute state of each channel.

The volume slide controls the digital gain of each channel.

The default setting for each channel is speaker mode. If line-out is used, select Line Output button.

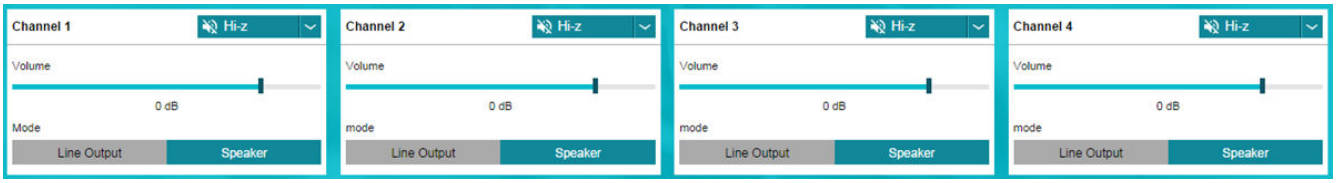

Figure 3-11. Channel Control Section

3.5.2.3 Miscellaneous Control Section

There are miscellaneous settings that are available on the GUI for easy access.

OSR is oversampling bit. For lower idle noise 64X OSR is set as default. For wider bandwidth, 128X OSR can be used. 64X OSR is recommended.

TAS6424E-Q1 supports parallel Bridge-Tied Load. Channels 1 and 2 can be one PBTL channel and channels 3 and 4 can be the other. Before setting a set of channels to PBTL mode, connect the (+) terminals as PBTL channel (+) and the (-) terminals as PBTL channel (-). Then connect the speaker (+) to the PBTL channel (+) and connect the speaker (-) to the PBTL channel (-).

The over-current has two levels. The lower level is 1. The default is level 2. When running at lower output current, OC level can be set to 1. I2S and TDM are automatically detected. Use the pull down menu from “Input Format” box to manually select the audio format.

If sampling frequency is greater than 48 kHz, select 96 kHz from the “Input FS” pull down.

Over-temperature warning can be programmable, use the pull down menu to choose the OTW temperature. The default setting is 120°C.

The output switching frequency (FSW) or Pulse Width Modulation frequency (PWM) is set at 2.1 MHz. The pull-down menu on the PWM FRQ box is used to choose a lower FSW. LC value should be adjusted when FSW is changed.

The offset phase for each channel is set at 45 degrees. This helps lower the ripple current on the power supply as not all the channels switch at the same time. To choose a different phase offset, use the pull-down menu on the “Phase” box.

There are four gain settings in TAS6424E-Q1: low, normal, high and maximum. The default setting is high. However, the recommended setting is normal for lower noise performance for driving speakers at 14.4 VDC. The gain setting is selectable via the drop down menu in the ”Gain” box.

The volume slew rate is measured with sampling frequency. The default setting is 1 period of sampling frequency (FSYNC or FS). This rate is selectable from 1 to 8 sampling periods with the drop down menu under “Vol Rate” box.

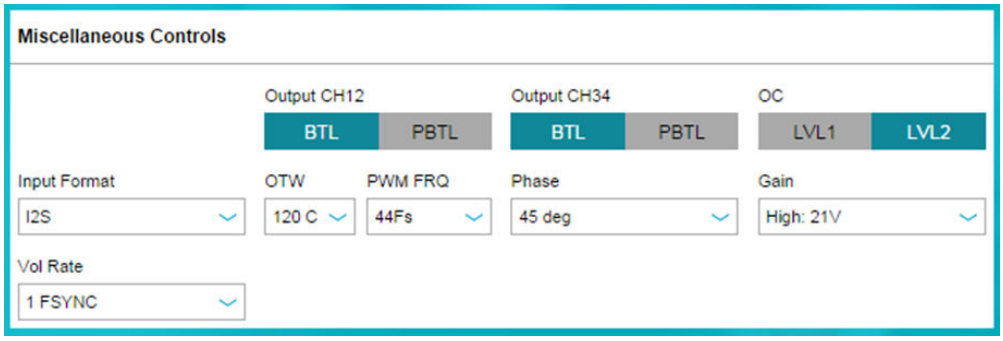

Figure 3-12. Miscellaneous Control Section

3.5.2.4 Faults and Warnings Section

The top right buttons on this box serve as controlling and monitoring faults.

Clip enable route the clip detection bit to the warning pin. This is displayed as yellow LED on the EVM.

Thermal enable route the over-temperature warning bit to the warning pin. This is display as the same yellow LED on the EVM.

Clear button clears all the faults and warnings.

Read button manually read the faults and warnings.

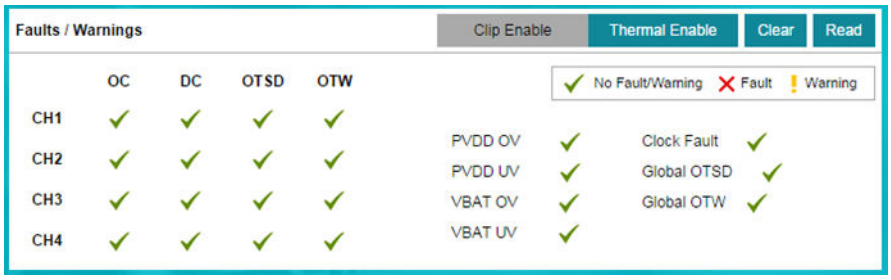

Figure 3-13. Faults and Warnings Section

3.5.2.5 AC Load Diagnostics Section

AC load diagnostics report speaker impedance and phase. The diagnostics can be performed with one or all four channels.

Select the correct output impedance and click start. Follow the pop up instructions to complete the load diagnostics run.

Note

Make sure to set the digital input to 0 dBFS (100% full-scale). If the sine wave is provided from the USB audio, turn the audio media volume and PC sound card volume to maximum.

Click on the “flip” icon located on the top right of the AC load diagnostics box to see the results.

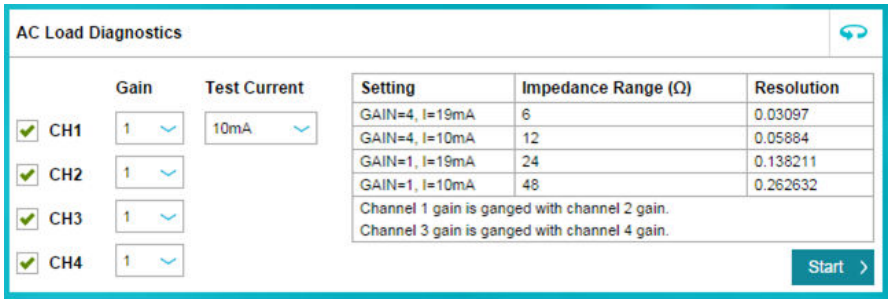

Figure 3-14. AC Load Diagnostics Section

3.5.2.6 DC Load Diagnostics Section

The DC load diagnostics report if a channel is short to power, short to ground, short to load or open.

Select the impedance of the load from 0.5 to 5 Ω. Click start and then click the “flip” on the top right of the box to view results.

If a channel is selected as a line-out, click on “LO ENA LD” to enable line-out load diagnostics.

“Retry” box is used when DC load diagnostics are run more than one time.

DC load diagnostics can be aborted by click on the “Abort LD” box.

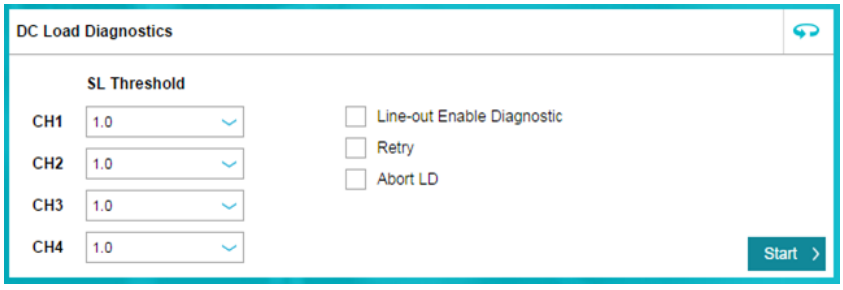

Figure 3-15. DC Load Diagnostics Section

3.5.3 TAS6424E-Q1 Settings on Register Map Window

The register map can be sorted either alphabetically or numerically (register number).

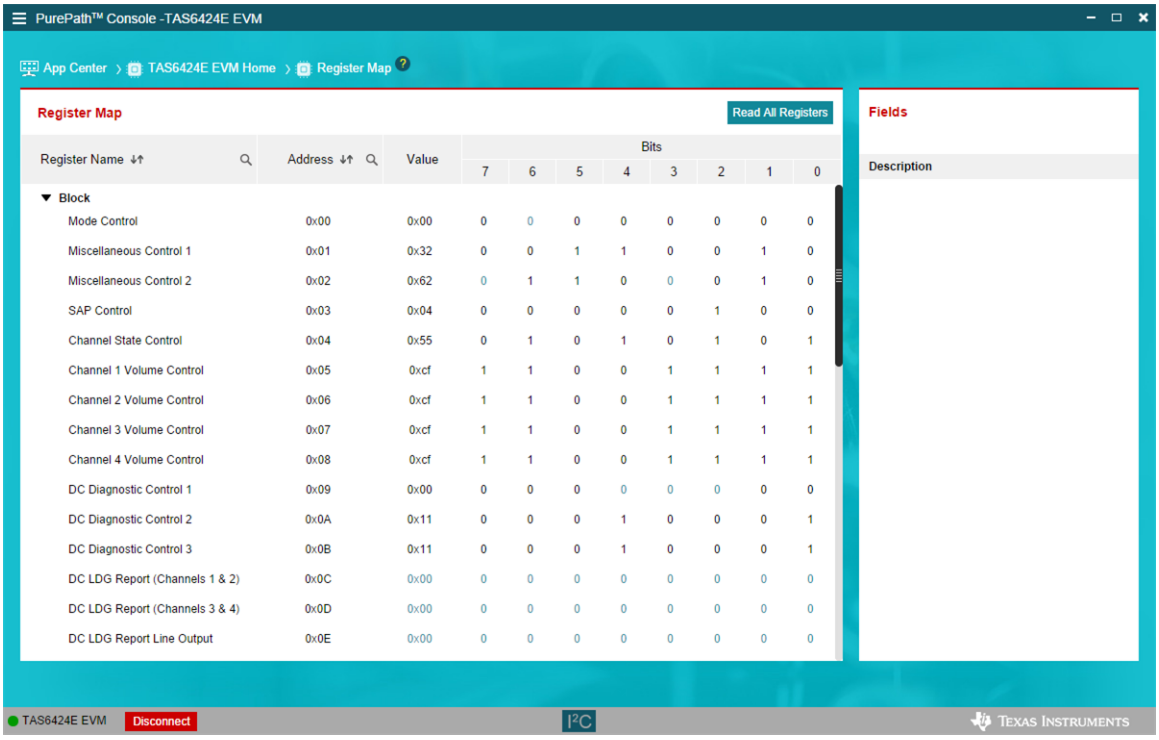

Figure 3-16. Register Map Window

When a register is selected, the hex value along with the individual bit value is displayed. The name and description for each bit are shown to the right in the "Fields" box.

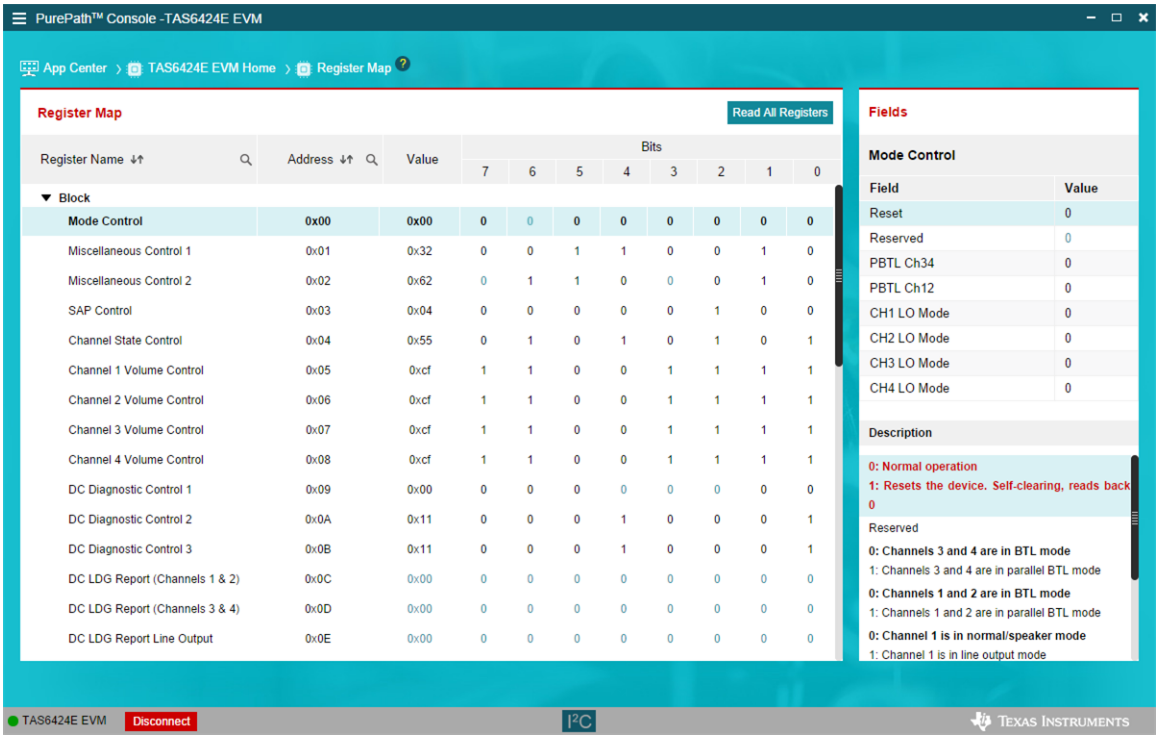

Figure 3-17. Register Map Window - Expanding

Double click on any bit, the bit will change state. This state is executed at the end of the click.

3.5.4 I2C Window

The PPC3 has an I2C monitor and also configuration program options.

When this window is first open, the round button is green. To record I2C commands, click on this button and it will turn red. The recording can be saved for later used by clicking the save icon.

The I2C commands can also be copied to clip board by clicking the icon next to trash bin icon.

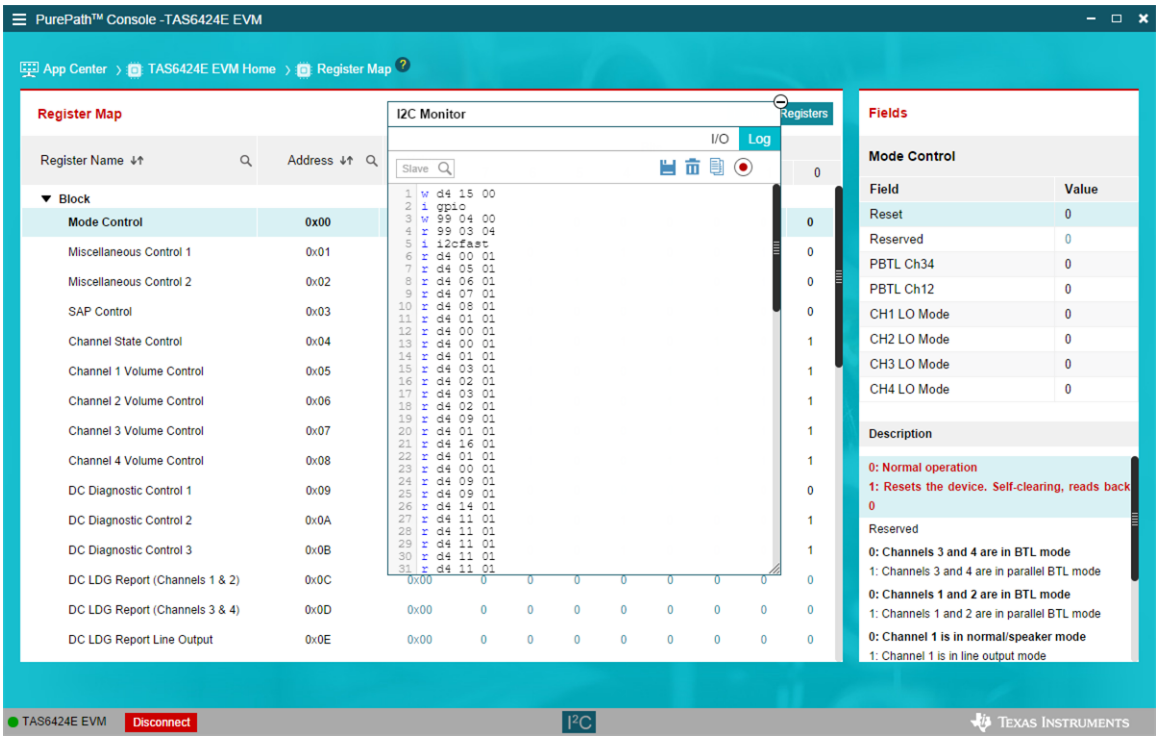

Figure 3-18. I2C Window – I2C Logging

A set of I2C commands can be loaded and executed from this window. On the top right corner, click on “I/O” button to display the above window. Write I2C commands here or open an existing *.cfg file then click “Execute” button on the bottom left corner. The I2C commands are sent to the device when the “Execute” button is pressed.

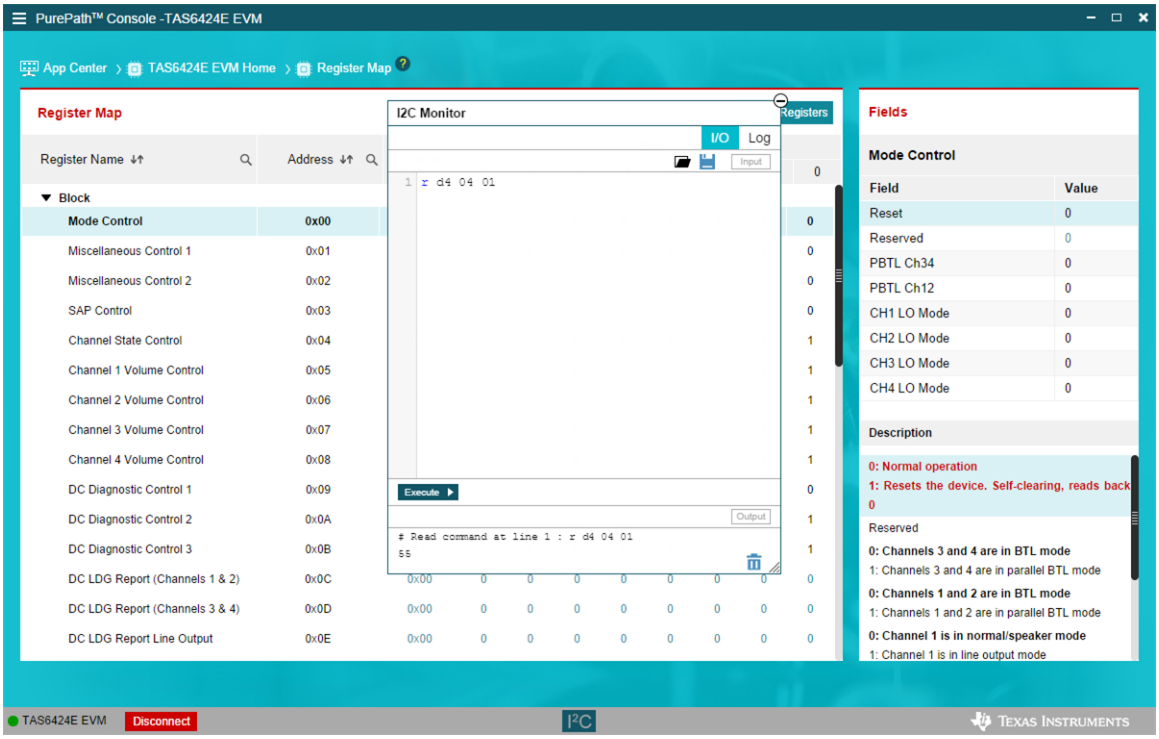

Figure 3-19. I2C Window – Sending I2C Commands

4 Board Layouts, Bill of Materials, and Schematic

4.1 TAS6424E-Q1 EVM Layouts

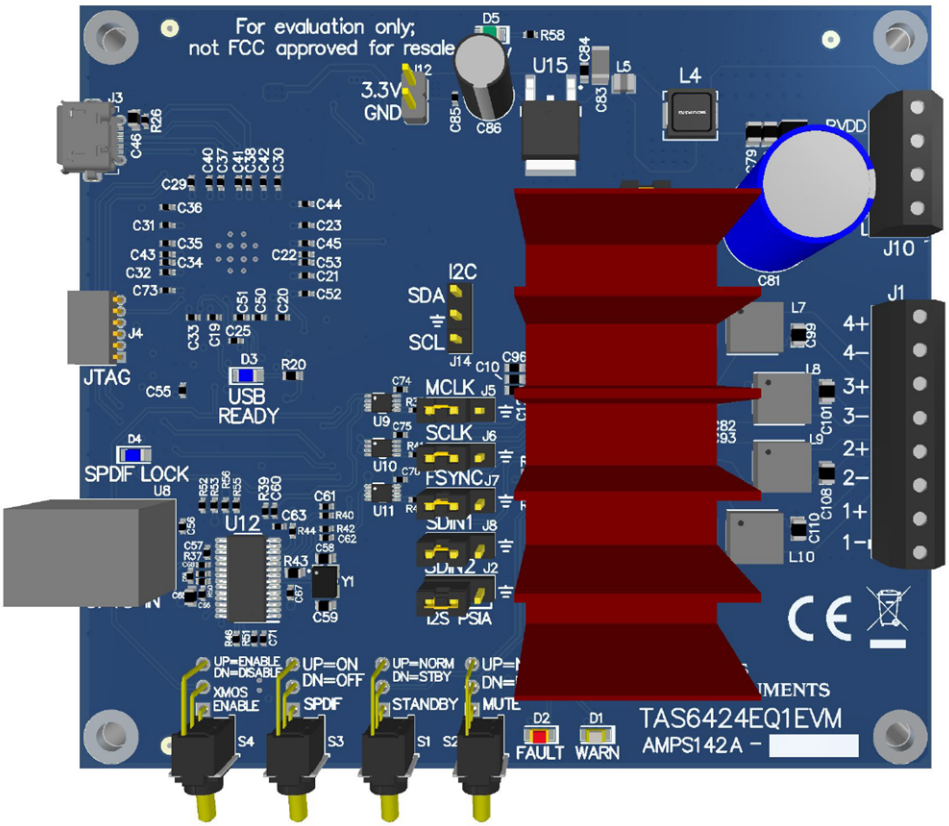

Figure 4-1. TAS6424E-Q1 EVM Top

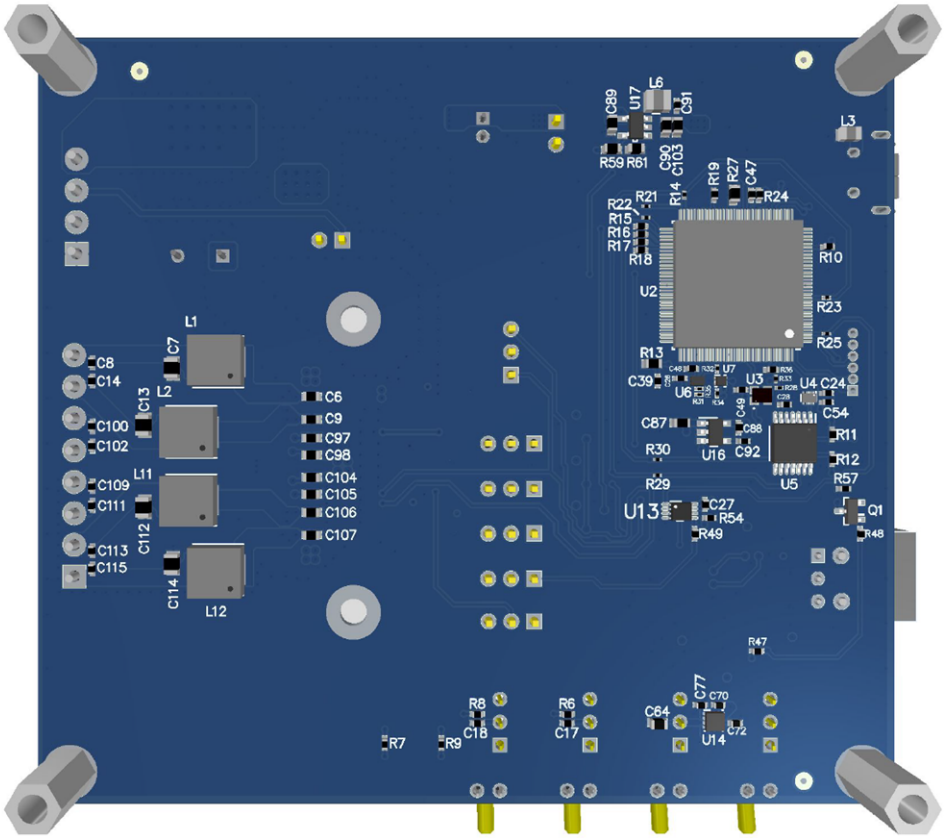

Figure 4-2. TAS6424E-Q1 EVM Bottom

4.2 TAS6424E-Q1 EVM Schematic

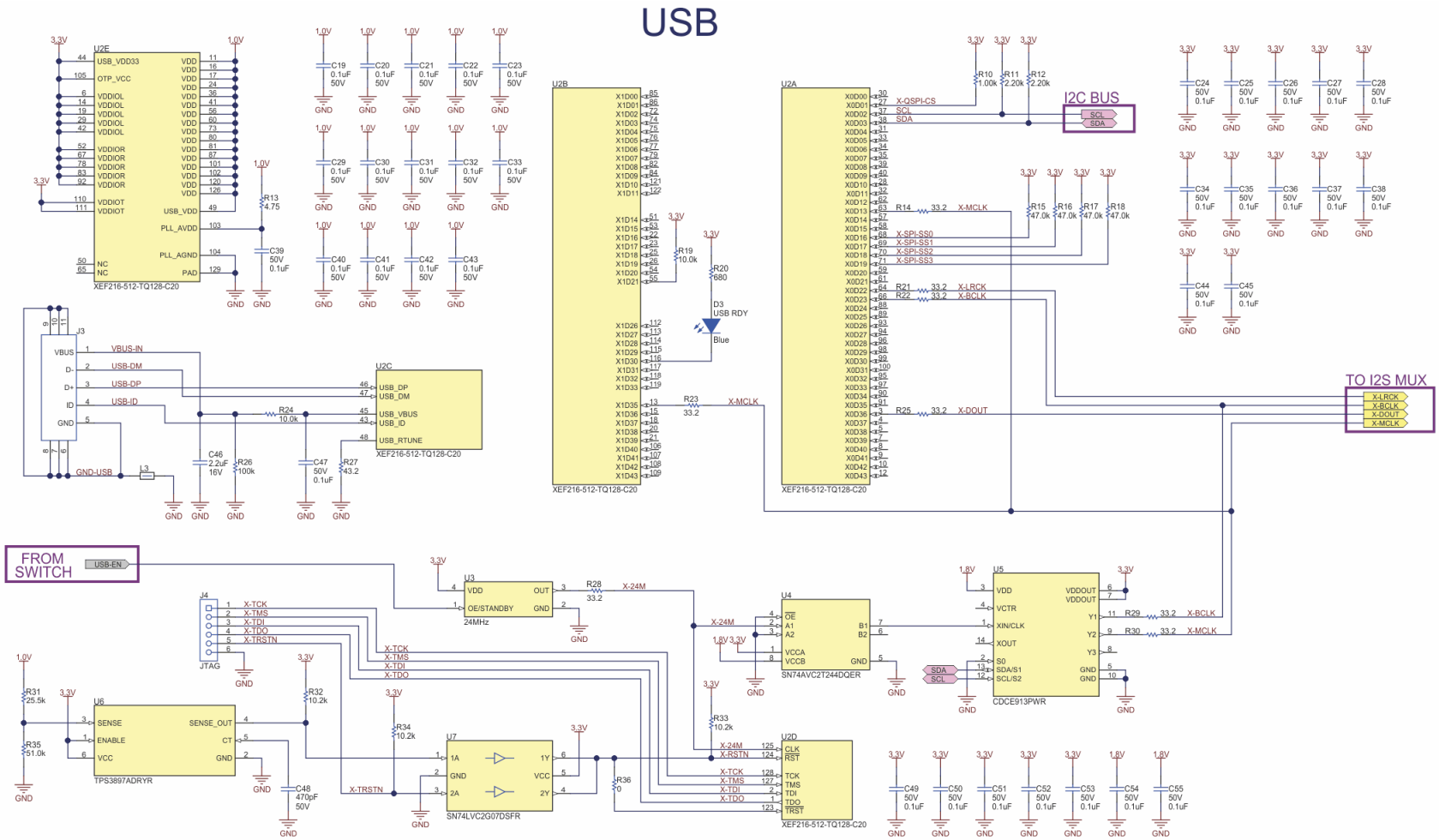

Figure 4-3. Schematic (Page 1)

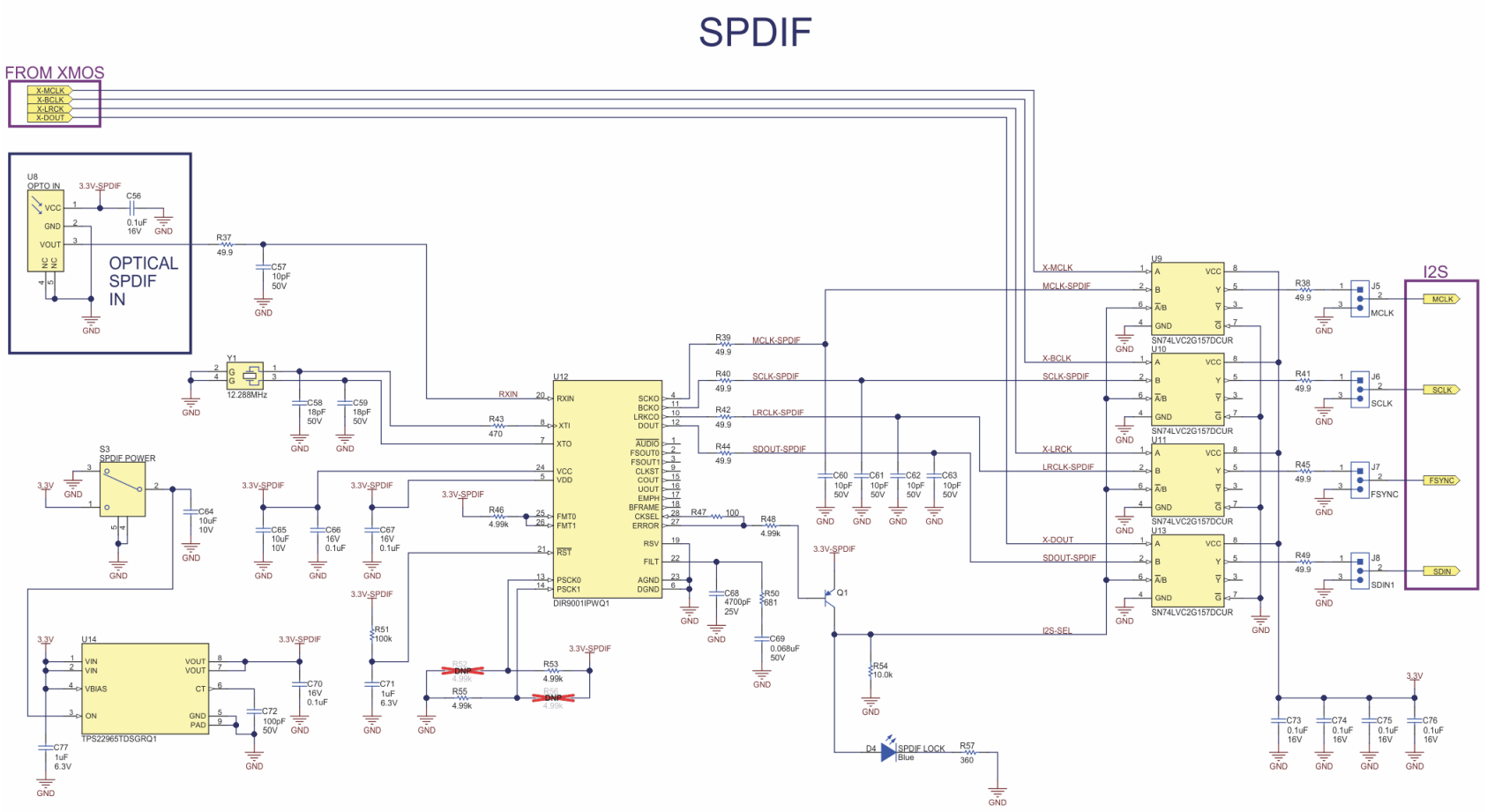

Figure 4-4. Schematic (Page 2)

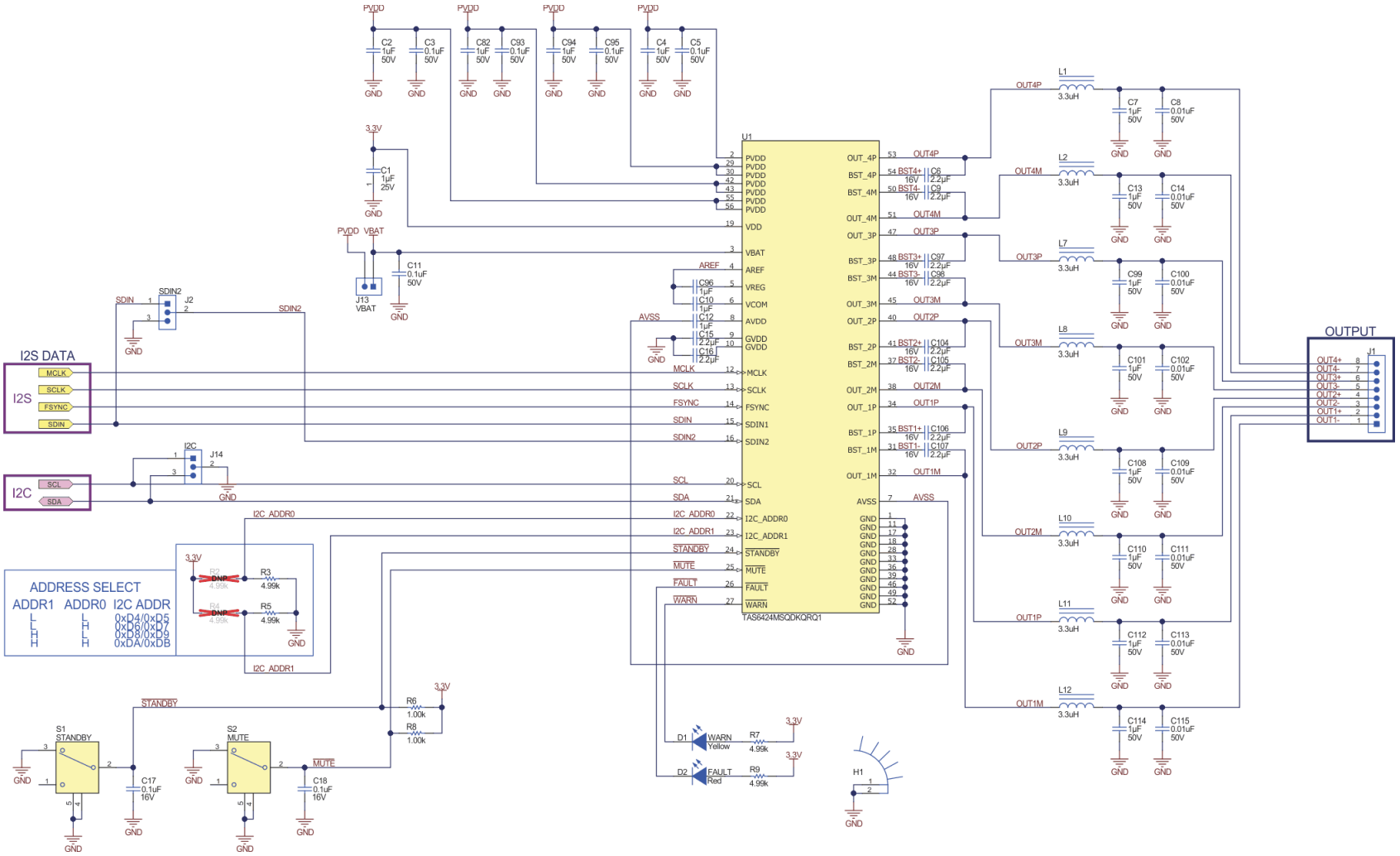

Figure 4-5. Schematic (Page 3)

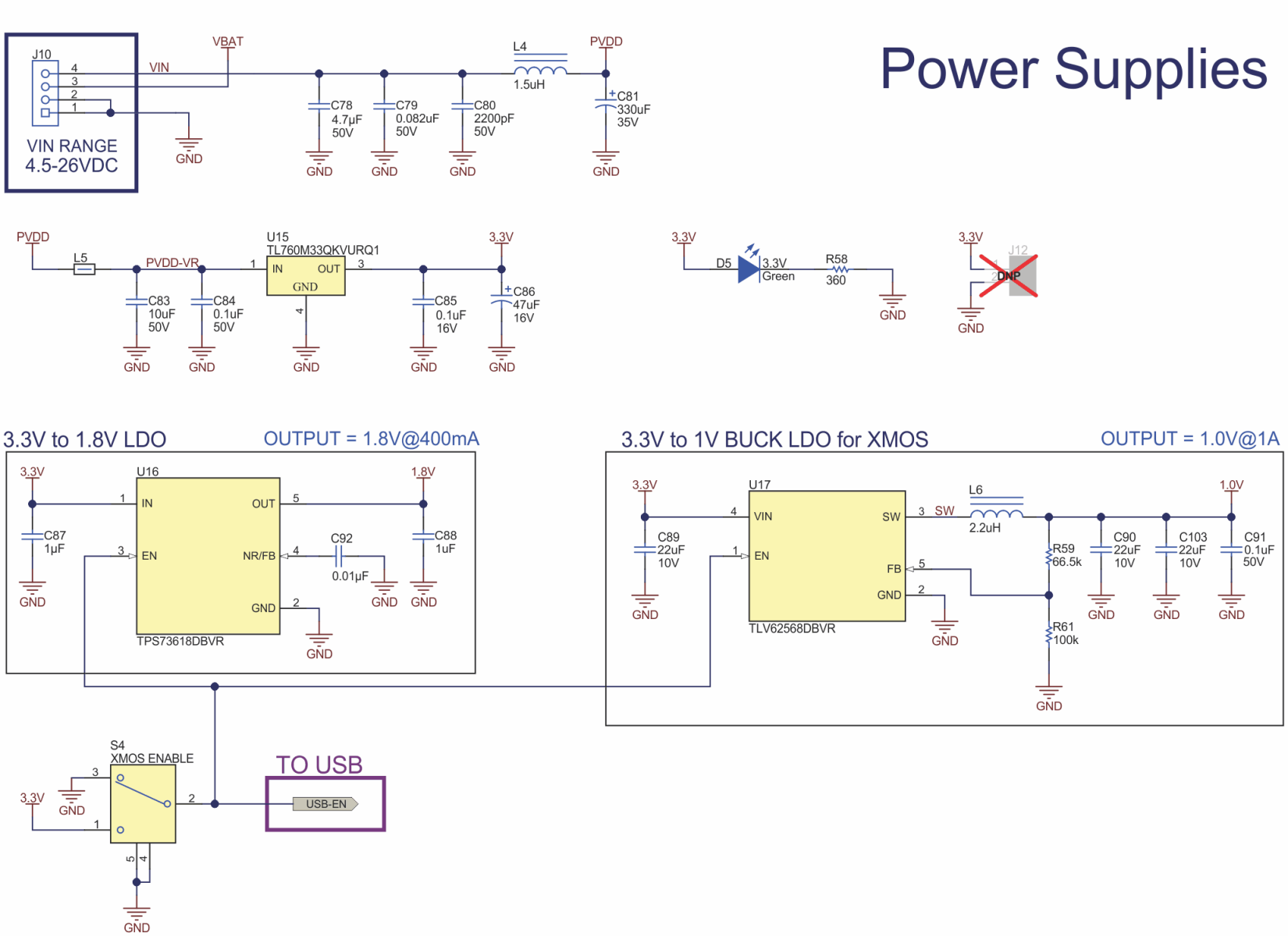

Figure 4-6. Schematic (Page 4)

4.3 Bill of Materials

TAS6424EQ1EVM Bill of Materials.

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
PCB1	1		Printed Circuit Board		AMPS142	Any		
C1, C10, C12, C96	4	1uF	CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0603	0603	C0603C105K3RACTU	Kemet		
C2, C4, C82, C94	4	1uF	CAP, CERM, 1 uF, 50 V, +/- 10%, X7R, 0603	0603	UMK107AB7105KA-T	Taiyo Yuden		
C3, C5, C11, C93, C95	5	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0603	0603	C0603C104K5RACTU	Kemet		
C6, C9, C15, C16, C97, C98, C104, C105, C106, C107	10	2.2uF	CAP, CERM, 2.2 uF, 16 V, +/- 10%, X7R, 0603	0603	EMK107BB7225KA-T	Taiyo Yuden		
C7, C13, C99, C101, C108, C110, C112, C114	8	1uF	CAP, CERM, 1 uF, 50 V, +/- 10%, X7R, 0805	0805	C0805C105K5RACTU	Kemet		
C8, C14, C100, C102, C109, C111, C113, C115	8	0.01uF	CAP, CERM, 0.01 uF, 50 V, +/- 10%, C0G/NP0, 0402	0402	GCM155R71H103KA55D	MuRata		
C17, C18, C56, C66, C67, C70, C73, C74, C75, C76, C85	11	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	C0402C104K4RACAUTO	Kemet		
C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C47, C49, C50, C51, C52, C53, C54, C55, C91	36	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0402	0402	C1005X7R1H104K050BB	TDK		
C46	1	2.2uF	CAP, CERM, 2.2 uF, 16 V,+/- 10%, X7R, 0603	0603	EMK107BB7225MA-T	Taiyo Yuden		
C48	1	470pF	CAP, CERM, 470 pF, 50 V,+/- 5%, C0G, AEC-Q200 Grade 1, 0402	0402	GRT1555C1H471JA02D	MuRata		
C57, C60, C61, C62, C63	5	10pF	CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0, 0402	0402	885012005055	Wurth Elektronik		

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
C58, C59	2	18pF	CAP, CERM, 18 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603	C0603C180J5GACTU	Kemet		
C64, C65	2	10uF	CAP, CERM, 10 uF, 10 V, +/- 20%, X5R, 0603	0603	C1608X5R1A106M080AC	TDK		
C68	1	4700pF	CAP, CERM, 4700 pF, 25 V,+/- 10%, X7R, 0402	0402	CC0402KRX7R8BB472	Yageo		
C69	1	0.068uF	CAP, CERM, 0.068 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	CGA2B3X7R1H683K050BB	TDK		
C71, C77, C88	3	1uF	CAP, CERM, 1 uF, 6.3 V, +/- 20%, X5R, 0402	0402	GRM152R60J105ME15D	MuRata		
C72	1	100pF	CAP, CERM, 100 pF, 50 V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0402	0402	CGA2B2C0G1H101J050BA	TDK		
C78	1	4.7uF	CAP, CERM, 4.7 µF, 50 V,+/- 10%, X7R, AEC-Q200 Grade 1, 1210	1210	C1210C475K5RACAUTO	Kemet		
C79	1	0.082uF	CAP, CERM, 0.082 uF, 50 V, +/- 10%, X7R, 0805	0805	08055C823KAT2A	AVX		
C80	1	2200pF	CAP, CERM, 2200 pF, 50 V, +/- 5%, C0G/NP0, 0805	0805	08055A222JAT2A	AVX		
C81	1	330uF	CAP, AL, 330 uF, 35 V, +/- 20%, AEC-Q200 Grade 1, TH	D10xL20mm	UBT1V331MPD1TD	Nichicon		
C83	1	10uF	CAP, CERM, 10 µF, 50 V,+/- 10%, X5R, 1206	1206	UMK316BBJ106KL-T	Taiyo Yuden		
C84	1	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 5%, X7R, 0603	0603	C0603C104J5RACTU	Kemet		
C86	1	47uF	CAP, AL, 47 uF, 16 V, +/- 20%, 0.8 ohm, AEC-Q200 Grade 2, TH	D5xL11mm	EEU-FC1C470	Panasonic		
C87	1	1uF	CAP, CERM, 1 µF, 16 V,+/- 20%, X7R, 0603	0603	CL10B105MO8NNWC	Samsung		
C89, C90, C103	3	22uF	CAP, CERM, 22 uF, 10 V, +/- 20%, X5R, 0603	0603	C1608X5R1A226M080AC	TDK		
C92	1	0.01uF	CAP, CERM, 0.01 µF, 6.3 V,+/- 10%, X7R, 0402	0402	0402B103K6R3CT	Walsin		
D1	1	Yellow	LED, Yellow , SMD	0805 LED	LTST-C170KSKT	Lite-On		
D2	1	Red	LED, Red, SMD	Red 0805 LED	LTST-C170KRKT	Lite-On		
D3, D4	2	Blue	LED, Blue, SMD	LED_0805	LTST-C170TBKT	Lite-On		
D5	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On		

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
H1	1		Heat Sink for DKQ Packages, 41.4x20 mm	Heat Sink for DKQ Packages, 41.4x20 mm	HS-DKQ56_20X41.4X32.77	Any		
H2, H3, H4, H5	4		MACHINE SCREW PAN PHILLIPS M3	M3 Screw	RM3X8MM 2701	APM HEXSEAL		
H6, H7, H8, H9	4		Standoff, Hex, 12mm, M3, Aluminum	Aluminum M3 12mm Hex Standoff	24434	Keystone		
H10	1		Arctic Silver 5 Thermal Paste		ARCTIC SILVER 5	ARTIC SILVER, INC.		
J1	1		Terminal Block, 3.5mm, 8-Pos, TH	Terminal Block, 3.5mm, 8-Pos, TH	ED555/8DS	On-Shore Technology		
J2, J5, J6, J7, J8, J14	6		Header, 100mil, 3x1, Gold, TH	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions		
J3	1		Connector, Receptacle, Micro-USB Type AB, R/A, Bottom Mount SMT	5.6x2.5x8.2 mm	475890001	Molex		
J4	1		Receptacle, 50mil, 6x1, Gold, R/A, TH	6x1 Receptacle	LPPB061NGCN-RC	Sullins Connector Solutions		
J10	1		Terminal Block, 3.5mm Pitch, 4x1, TH	14x8.2x6.5 mm	ED555/4DS	On-Shore Technology		
J13	1		Header, 100mil, 2x1, Gold, TH	Sullins 100mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
L1, L2, L7, L8, L9, L10, L11, L12	8	3.3uH	Inductor, 3.3 uH, 4.5 A, 0.038 ohm, AEC-Q200 Grade 0, SMD	5.45x5.25x3.0mm	VCMT053T-3R3MN5	Cyntec		
L3	1	30 ohm	Ferrite Bead, 30 ohm @ 100 MHz, 6 A, 0805	0805	MPZ2012S300AT000	TDK		
L4	1	1.5uH	Inductor, 1.5 uH, 5.5 A, 0.017 ohm, AEC-Q200 Grade 0, SMD	5.45x5.25x3.0mm	VCMT053T-1R5MN5	Cyntec		
L5	1	180 ohm	Ferrite Bead, 180 ohm @ 100 MHz, 3.4 A, 0806	0806	NFZ2MSM181SN10L	MuRata		

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
L6	1	2.2uH	Inductor, Multilayer, Ferrite, 2.2 uH, 1.3 A, 0.08 ohm, SMD	SMD, Body 2.5x2mm, Height 1.2mm	LQM2HPN2R2MG0L	MuRata		
Q1	1	40 V	Transistor, PNP, 40 V, 0.2 A, SOT-23	SOT-23	MMBT3906-7-F	Diodes Inc.		
R3, R5, R7, R9, R46, R48, R53, R55	8	4.99k	RES, 4.99 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04024K99FKED	Vishay-Dale		
R6, R8	2	1.00k	RES, 1.00 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04021K00FKED	Vishay-Dale		
R10	1	1.00k	RES, 1.00 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1001X	Panasonic		
R11, R12	2	2.20k	RES, 2.20 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF2201X	Panasonic		
R13	1	4.75	RES, 4.75, 1%, 0.1 W, 0603	0603	RC0603FR-074R75L	Yageo		
R14, R21, R22, R23, R25, R28, R29, R30	8	33.2	RES, 33.2, 1%, 0.05 W, 0201	0201	RC0201FR-0733R2L	Yageo America		
R15, R16, R17, R18	4	47.0k	RES, 47.0 k, 1%, 0.0625 W, 0402	0402	RC0402FR-0747KL	Yageo America		
R19, R24	2	10.0k	RES, 10.0 k, 1%, 0.063 W, 0402	0402	RC0402FR-0710KL	Yageo America		
R20	1	680	RES, 680, 1%, 0.1 W, 0603	0603	RC0603FR-07680RL	Yageo		
R26	1	100k	RES, 100 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1003X	Panasonic		
R27	1	43.2	RES, 43.2, 1%, 0.1 W, 0603	0603	RC0603FR-0743R2L	Yageo		
R31	1	25.5k	RES, 25.5 k, 1%, 0.05 W, 0201	0201	RC0201FR-0725K5L	Yageo America		
R32, R33, R34	3	10.2k	RES, 10.2 k, 1%, 0.05 W, 0201	0201	RC0201FR-0710K2L	Yageo America		
R35	1	51.0k	RES, 51.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0751KL	Yageo America		
R36	1	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GE0R00X	Panasonic		
R37, R38, R39, R40, R41, R42, R44, R45, R49	9	49.9	RES, 49.9, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040249R9FKED	Vishay-Dale		
R43	1	470	RES, 470, 1%, 0.1 W, 0603	0603	RC0603FR-07470RL	Yageo		
R47	1	100	RES, 100, 1%, 0.1 W, 0402	0402	ERJ-2RKF1000X	Panasonic		
R50	1	681	RES, 681, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402681RFKED	Vishay-Dale		
R51	1	100k	RES, 100 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402100KFKED	Vishay-Dale		
R54	1	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0FKED	Vishay-Dale		

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
R57, R58	2	360	RES, 360, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402360RJNED	Vishay-Dale		
R59	1	66.5k	RES, 66.5 k, 1%, 0.1 W, 0603	0603	RC0603FR-0766K5L	Yageo		
R61	1	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100KL	Yageo		
S1, S2, S3, S4	4		Switch, SPDT, On-On, 1 Pos, 0.4A, 28 VDC, TH	5.6x5.4mm	FT1D-4M-Z	Copal Electronics		
SH1, SH2, SH3, SH4, SH5, SH6	6	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
U1	1		45-W, 2-MHz Digital Input 4-Channel Automotive Class-D Audio Amplifier with Load Dump Protection and I 2C Diagnostics	HSSOP56	TAS6424EQDKQRQ1	Texas Instruments		
U2	1		IC MCU 512KB RAM, 128TQFP	TQFP-128	XEF216-512-TQ128-C20	XMOS semiconductor		
U3	1		OSC, 24 MHz, 2.25 - 3.63 V, SMD	2x1.6mm	ASTMLPA-24.000MHZ-EJ-E-T	Abracon Corporation		
U4	1		Dual-Bit Dual-Supply Bus Transceiver, DQE0008A, LARGE T&R	DQE0008A	SN74AVC2T244DQER	Texas Instruments		
U5	1		Programmable 1-PLL VCXO Clock Synthesizer with 2.5-V or 3.3-V LVCMOS Outputs, PW0014A (TSSOP-14)	PW0014A	CDCE913PWR	Texas Instruments	CDCE913PW	Texas Instruments
U6	1		Single-Channel Ultra-Small Adjustable Supervisory Circuit With Active-High Open-Drain Output, DRY0006A (USON-6)	DRY0006A	TPS3897ADRYR	Texas Instruments		
U7	1		Enhanced Product Dual Buffer/ Driver with Open-Drain Output, DCK0006A (SOT-SC70-6)	DSF0006A	SN74LVC2G07DSFR	Texas Instruments		
U8	1		Photolink- Fiber Optic Receiver, TH	13.5x10x9.7 mm	PLR135/T10	Everlight		
U9, U10, U11, U13	4		Single 2-Line to 1-Line Data Selector/Multiplexer, DCU0008A, LARGE T&R	DCU0008A	SN74LVC2G157DCUR	Texas Instruments	SN74LVC2G157DCUT	Texas Instruments
U12	1		Automotive Catalog 96-kHz 24-Bit Digital Audio Interface Receiver, 50 ps Jitter, 3.3V, -40 to 85 degC, 28-Pin TSSOP (PW), Green (RoHS & no Sb/Br)	PW0028A	DIR9001IPWQ1	Texas Instruments		

Designator	Quantity	Value	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
U14	1		5.5V, 4A, 16mΩ Automotive Load Switch With Adjustable Rise Time and Optional Quick Output Discharge, DSG0008B (WSON-8)	DSG0008B	TPS22965TDSGRQ1	Texas Instruments	TPS22965TDSGTQ1	Texas Instruments
U15	1		Single Output Automotive LDO, 500 mA, Fixed 3.3 V Output, 3.8 to 26 V Input, 3-pin PFM (KVU), -40 to 125 degC, Green (RoHS & no Sb/Br)	KVU0003A	TL760M33QKVURQ1	Texas Instruments		
U16	1		Single Output LDO, 400mA, Adj.(1.2 to 5.5V), Cap free, Low Noise, Reverse Current Protection, DBV0005A (SOT-23-5)	DBV0005A	TPS73618DBVR	Texas Instruments		
U17	1		1-A High Efficiency Step-Down Converter in SOT23-5 Package, DBV005A, DBV0005A (SOT-5)	DBV0005A	TLV62568DBVR	Texas Instruments	TLV62568DBVT	Texas Instruments
Y1	1		Crystal, 12.288 MHz, 18pF, SMD	Crystal, 2.5x1x3.2mm	ABM8G-12.288MHZ-18-D2Y-T	Abracon Corporation		
J12	0		Header, 100mil, 2x1, Gold, TH	Sullins 100mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
R2, R4, R52, R56	0	4.99k	RES, 4.99 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04024K99FKED	Vishay-Dale		

5 Revision History

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

DATE	REVISION	NOTES
May 2021	*	Initial release

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