

EVM User's Guide: TAS6684AQ1EVM

TAS6684A-Q1 Evaluation Module



Description

The TAS6684AQ1EVM showcases the TAS6684A-Q1 4 channel, digital input with integrated DSP, closed-loop class-D automotive audio amplifier. The EVM requires the use of the PurePath™ Console (PPC3) graphical user interface plug-in for programming the I2C registers settings. This EVM can also be used for development purposes using the PPC3 graphical user interface.

Get Started

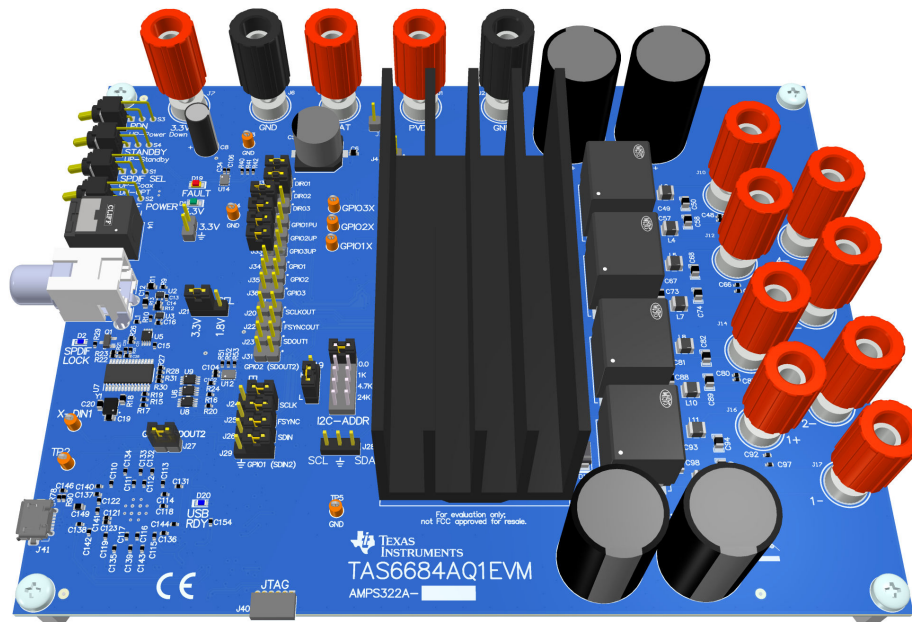
1. Request the EVM through PPC3 graphical user interface on the product page on ti.com.

Features

- Evaluate all the features of the TAS6684A-Q1
- Select from multiple inputs, optical, coax, USB, and direct digital
- PPC3 to aid in software development and evaluation

Applications

- High-powered external automotive audio amplifiers
- [Automotive head units](#)



1 Evaluation Module Overview

1.1 Introduction

This manual describes the operation of the TAS6684AQ1EVM. The TAS6684AQ1EVM 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
- TAS6684AQ1EVM operations, both hardware and software

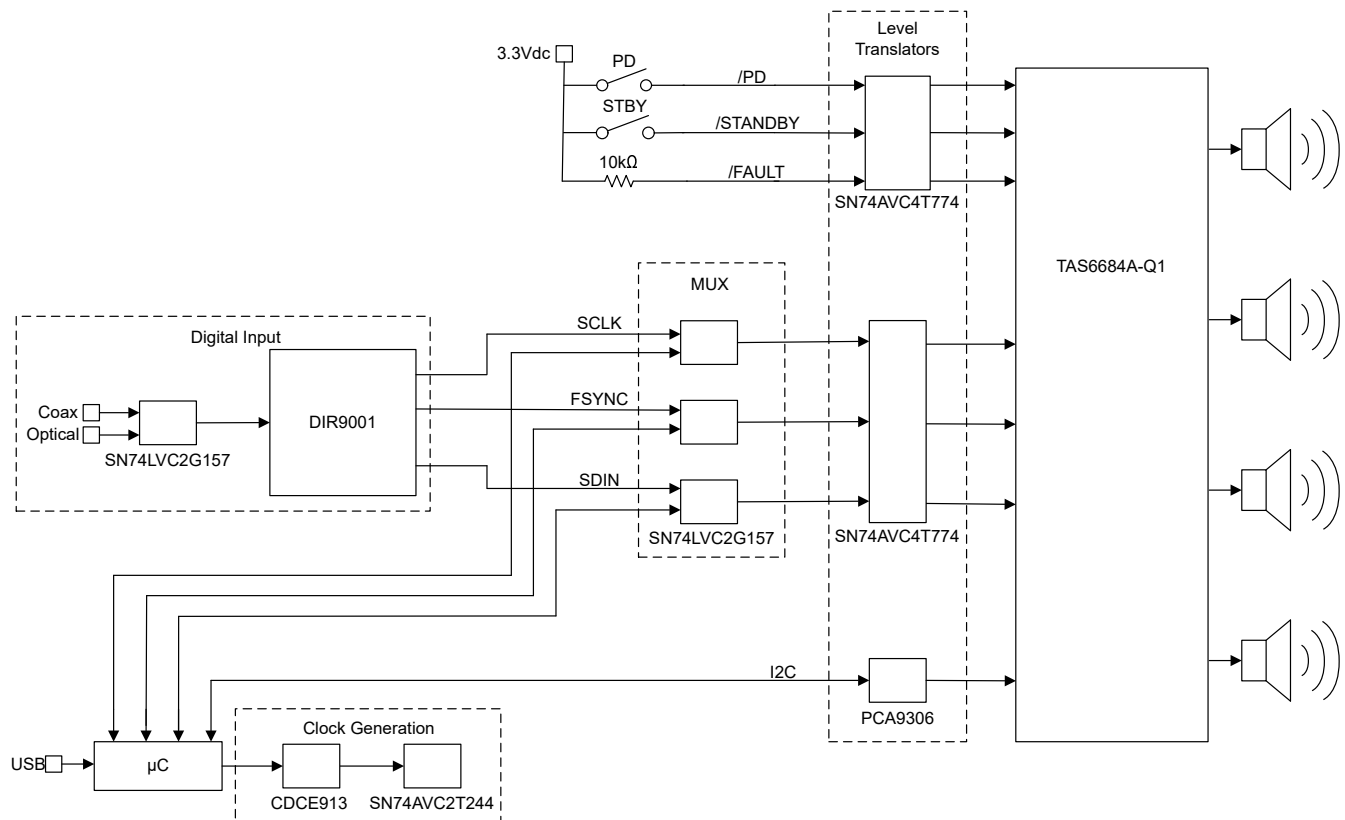
Required equipment and accessories:

1. TAS6684AQ1EVM
2. DVDD power supply of 3.3 Vdc
3. VBAT power supply of 12 Vdc (see data sheet for allowed voltage range)
4. PVDD (see data sheet for allowed voltage range)
5. USB A male to micro B male cable
6. 1 to 4 resistive loads or speaker loads
7. 2 to 6 pairs of wires, stripped at both ends
8. Optical audio source and cable (optional)
9. Coaxial digital audio source and cable (optional)
10. Directly connected I2S or TDM source (optional)
11. Desktop or laptop PC with Microsoft® Windows® 10 or above operating system

1.2 Kit Contents

This EVM kit contains one TAS6684AQ1EVM.

1.3 Specification



1.4 Device Information

TI devices used in this EVM

- TAS6684A-Q1: four channel automotive audio amplifier
- DIR9001-Q1: 24bit digital audio interface receiver
- SN74LVC2G157: series encoder/decoder
- CDCE913-Q1: programmable 1-PLL VCXO clock synthesizers
- SN74AVC2T244: unidirectional voltage level translator
- SN74AVC4T744: 4 bit dual-supply transceiver with configurable voltage level switching
- PCA9306: dual bidirectional I2C bus and SMBus voltage level translator

2 Hardware

2.1 Hardware Overview

2.1.1 TAS6684A Evaluation Module Description

The TAS6684A-Q1 EVM is a stand-alone EVM, and requires three power supplies, USB control via Purepath Control Console 3 (PPC3), and a digital audio input. The digital audio input can be provided through the USB, the optical input, the coaxial input, or directly through the I2S/TDM headers.

2.1.2 TAS6684A EVM Start Up

This section describes the TAS6684A-Q1 EVM start-up procedure. Have the equipment and accessories listed on the first page of this document available.

Hardware Connections:

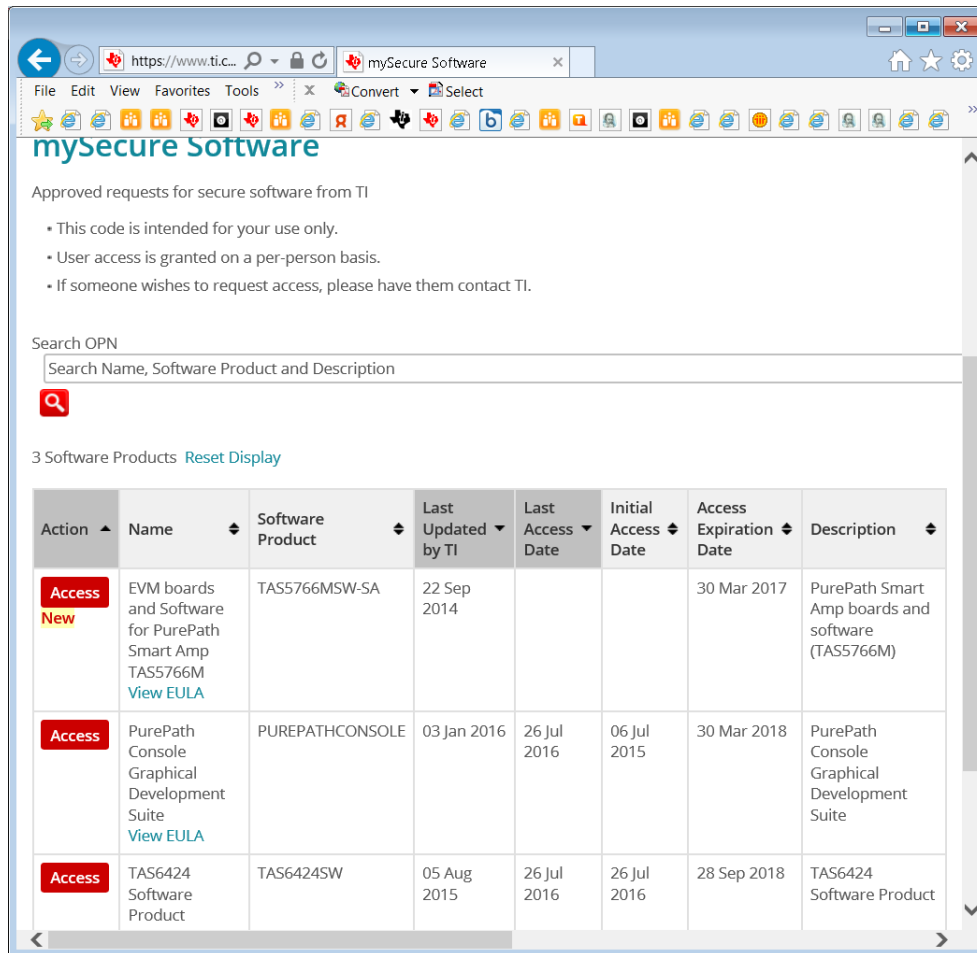
- Connect the three power supplies to 3.3Vdc, VBAT, and PVDD the 5-Way binding posts.
- Connect speakers or resistive loads to the 4 pairs of 5-way binding posts.
- Connect the USB micro cable from the PC to the EVM.
- Set the switches S1 through S4 as needed. Typically, all are down, except S2 is up for optical input. S1 is down for Coaxial input.
- Audio source: This can be a DVD player or audio test equipment with optical or coaxial SPDIF output or a media player from the PC.
- Turn on the 3.3Vdc power supply and then turn on the VBAT and PVDD power supplies
- If SPDIF is selected, then the SPDIF lock LED is illuminated with a valid SPDIF signal.
- Launch the TAS6684A-Q1 EVM PPC3 plugin on the PC.
- Set up the device appropriately and follow the screens.
- Click the *Connect* button in the bottom left of the Status bar if not already connected.
- Click on the Device Monitor and Control box and then click play at the top. Audio plays to all four speaker outputs.

3 Software

3.1 Software Overview

3.1.1 PurePath Console 3 (PPC3) Access and Description

The PPC3 is a server-based tool. Access must be requested on [PurePath Console](#). Once approval is given, go to [mySecure Software](#) to download the software. After login, the webpage in the figure below is shown with a list of software products that are available to download.



The screenshot shows the mySecure Software web application interface. At the top, there is a navigation bar with the title "mySecure Software". Below the navigation bar, there is a section titled "Approved requests for secure software from TI" with a list of bullet points:

- This code is intended for your use only.
- User access is granted on a per-person basis.
- If someone wishes to request access, please have them contact TI.

Below this section is a search bar labeled "Search OPN" with the placeholder text "Search Name, Software Product and Description". A search icon is visible to the right of the search bar.

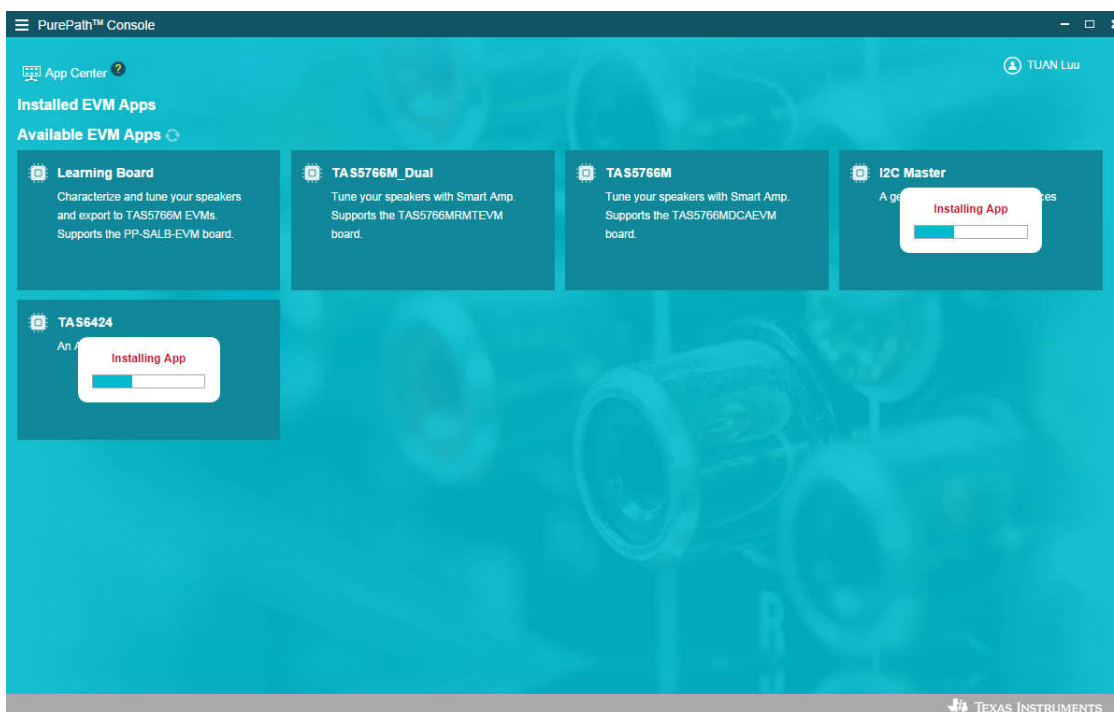
Below the search bar, there is a section titled "3 Software Products" with a link "Reset Display". Below this section is a table with the following columns: Action, Name, Software Product, Last Updated by TI, Last Access Date, Initial Access Date, Access Expiration Date, and Description.

Action	Name	Software Product	Last Updated by TI	Last Access Date	Initial Access Date	Access Expiration Date	Description
Access New	EVM boards and Software for PurePath Smart Amp TAS5766M View EULA	TAS5766MSW-SA	22 Sep 2014			30 Mar 2017	PurePath Smart Amp boards and software (TAS5766M)
Access	PurePath Console Graphical Development Suite View EULA	PUREPATHCONSOLE	03 Jan 2016	26 Jul 2016	06 Jul 2015	30 Mar 2018	PurePath Console Graphical Development Suite
Access	TAS6424 Software Product	TAS6424SW	05 Aug 2015	26 Jul 2016	26 Jul 2016	28 Sep 2018	TAS6424 Software Product

Run the installation program. Download the [PPC3 User Manual](#) for further instructions. The following window is displayed when first running PPC3.



Click on the *Sign in* button to see the TAS6684A/6884-Q1 application or plug-in. All the apps shown in the figure below may not be available.



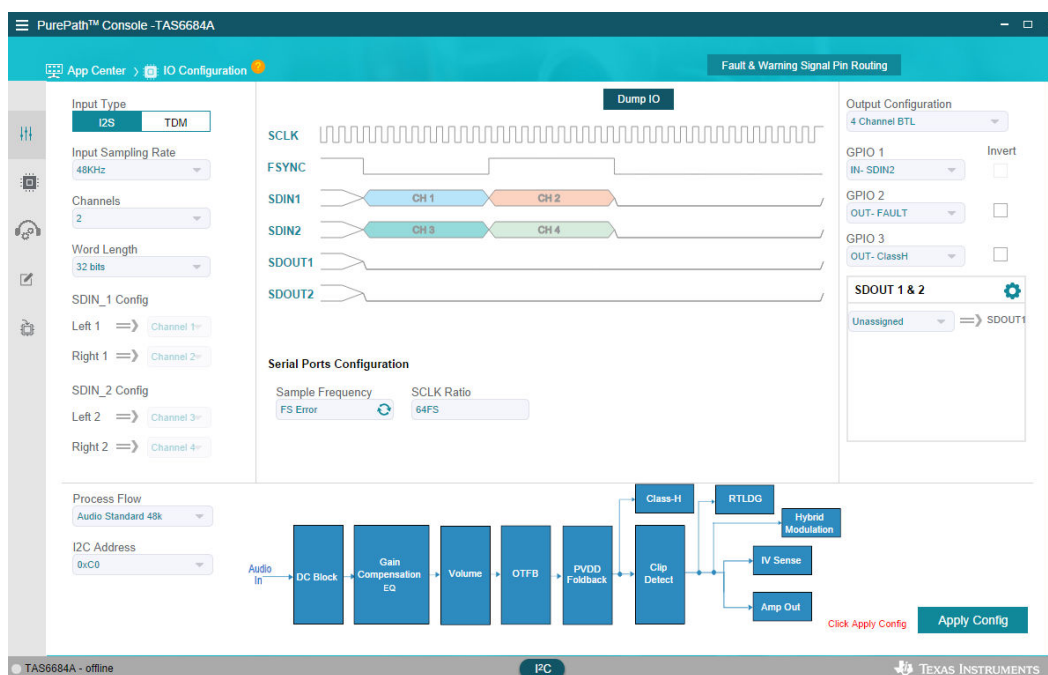
Click on TAS6684A/6884-Q1 Application box to download application. An installation window pops up. Click the *Install* button. The TAS6684A/6884-Q1 EVM box appears in *Installed EVM Apps* section. Click the TAS6684A/6884-Q1 box to start the TAS6684A-Q1 app.

3.1.2 PurePath Console – IO Configuration Entry Window

Launch the TAS6684A-Q1 EVM app and the IO Configuration window is shown. In the bottom left of the status bar, click the *Connect* button to connect to the device by I2C.

This window allows all the input and output settings for the device. I2S and TDM can be selected as well as the normal digital audio path and the low latency paths. The speaker connections and GPIO settings can be selected. Select the proper values for the setup. Once the setup is complete, click on the *Apply Config* button at the bottom right. Users can return to the page to make changes as needed as for use and development of the TAS6684A-Q1.

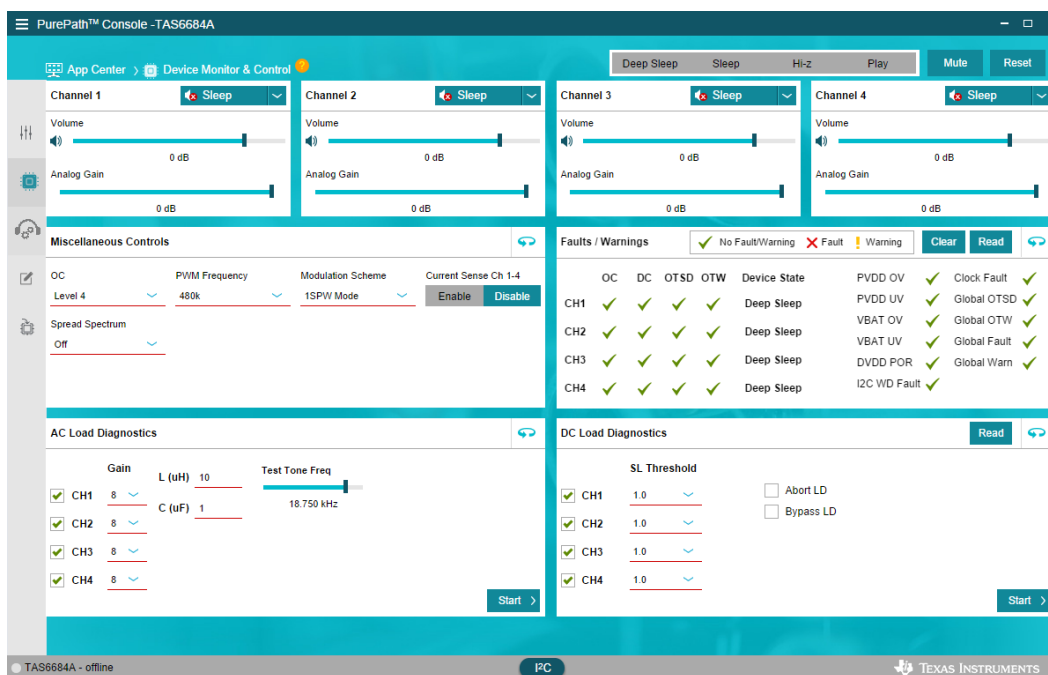
Utilize the gray toolbar at the left of the window to choose different pages of the PPC3 Graphical User interface.



3.1.3 Device Monitor and Control Window

The TAS6684A-Q1 Device and Control window provides the operational register controls after the device is set up.

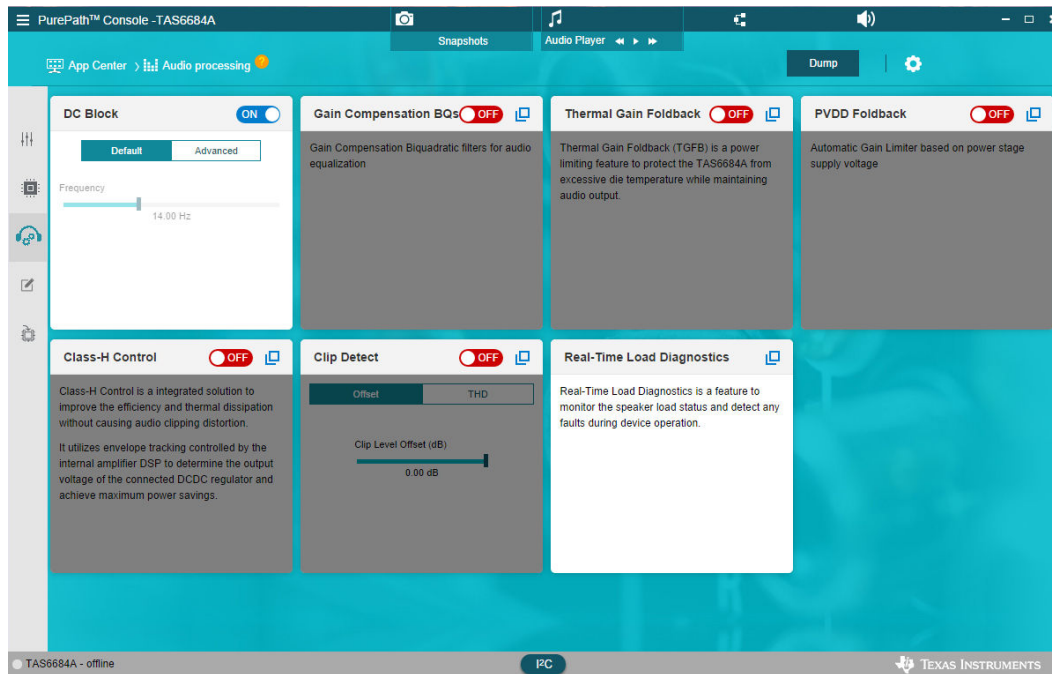
Click on the *Device Monitor & Control* icon in the vertical toolbar and the following window is displayed.



This window has 6 major sections: Global Control Section, Channel Control boxes, Miscellaneous Control box, Fault/Warnings box, AC Load Diagnostics box, and DC Load Diagnostics box.

3.1.4 Audio Processing Window

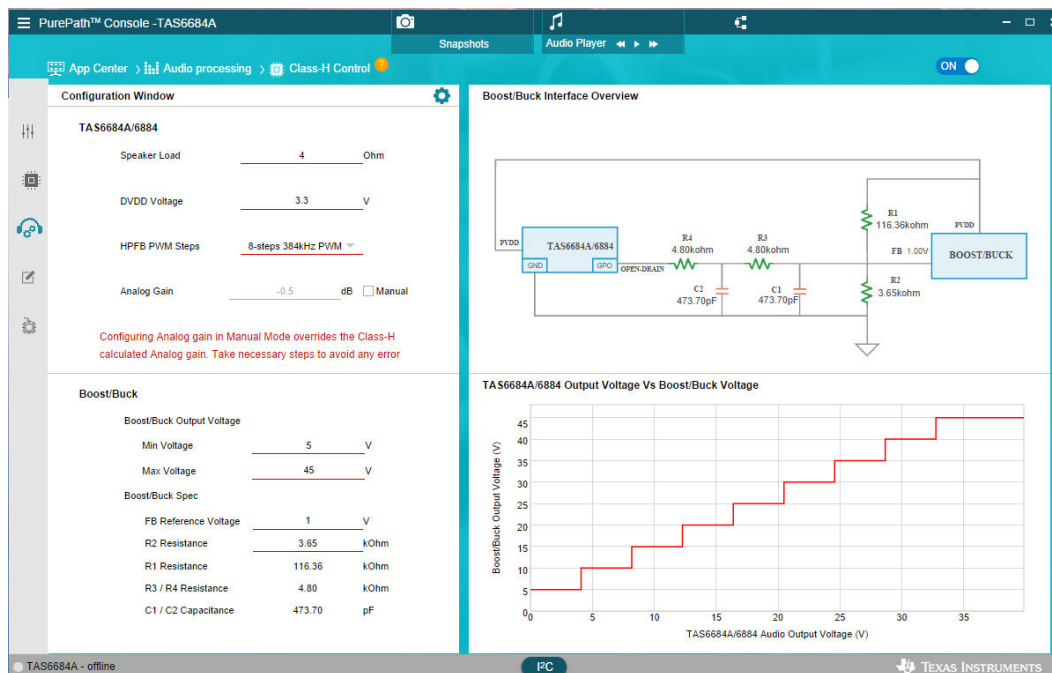
Click on the *Audio Processing Options* icon in the vertical toolbar and the following window is displayed.



Each box has a defined process. Click on the *on/off* slider to turn a process on or off. Each box can be opened to modify the process. The Clip Detect box is modified at the Audio Processing Window level.

3.1.5 Class-H Control Window

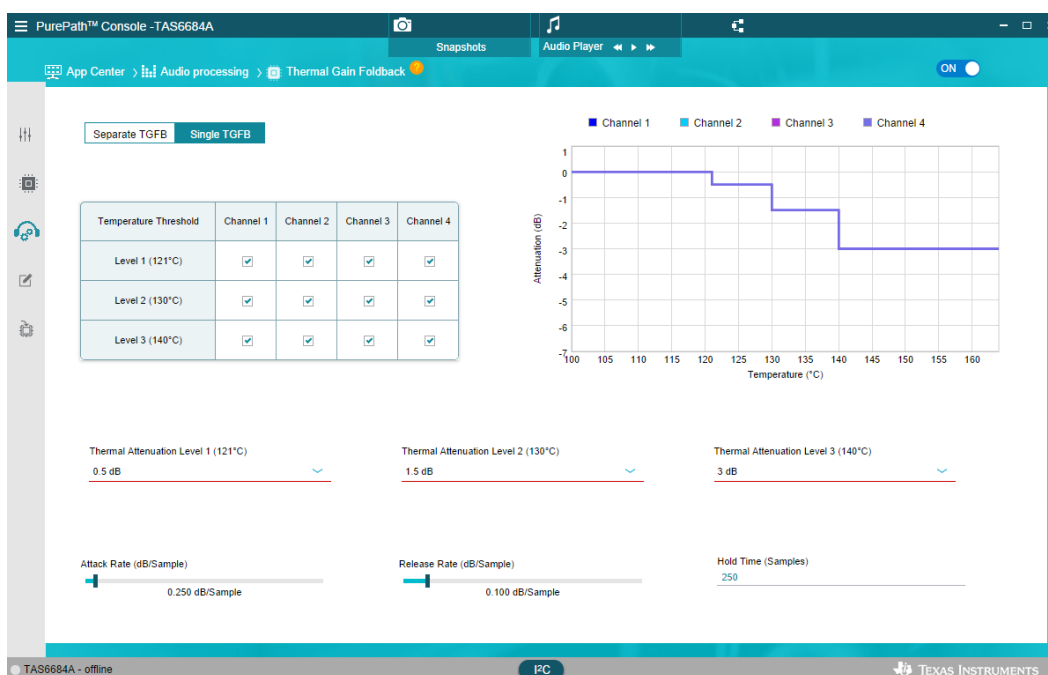
Click on the *Class-H Control* box in the Audio Processing Window and the following window is displayed.



This window is used to determine the values needed for proper Class-H values when the voltage feedback pin on the boost converter or controller are used. Insert the values for the system design as needed. The gear symbol at the top of the configuration window shows an advanced box to configure the Class-H control. The default values in the advanced box do not usually need to be changed.

3.1.6 Thermal Gain Foldback

Click on the *Thermal Gain Foldback* box in the *Audio Processing* window and the following window is displayed.



The settings for thermal gain foldback are made in this window. The graphical representation of the foldback temperatures can be seen. The attack and release times can be adjusted and the hold time. The default settings are typically good for a system design.

3.1.6.1 Gain Compensation Biquads

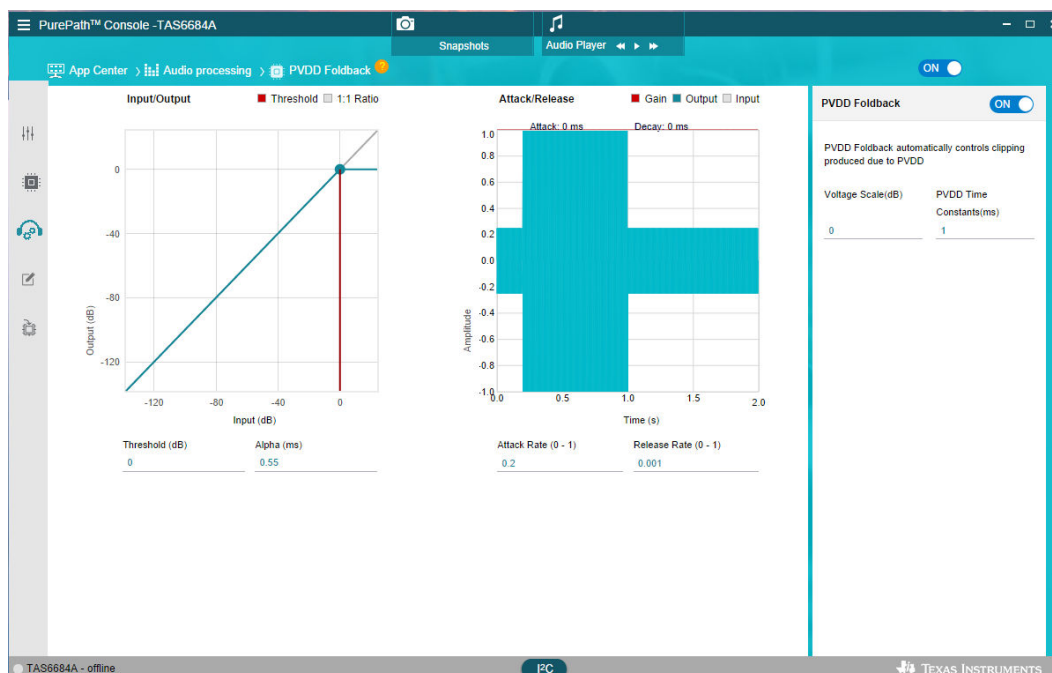
Click on the *Gain Compensation Biquads* box in the *Audio Processing* window and the following window is displayed.



There is one biquad per channel to address any gain compensation that is needed. There are 23 preconfigured filters and a custom filter available for each channel. The channels can be linked together or can be separated for a different compensation for each channel. The filter's gain and phase response can be seen on the graph.

3.1.6.1.1 PVDD Foldback

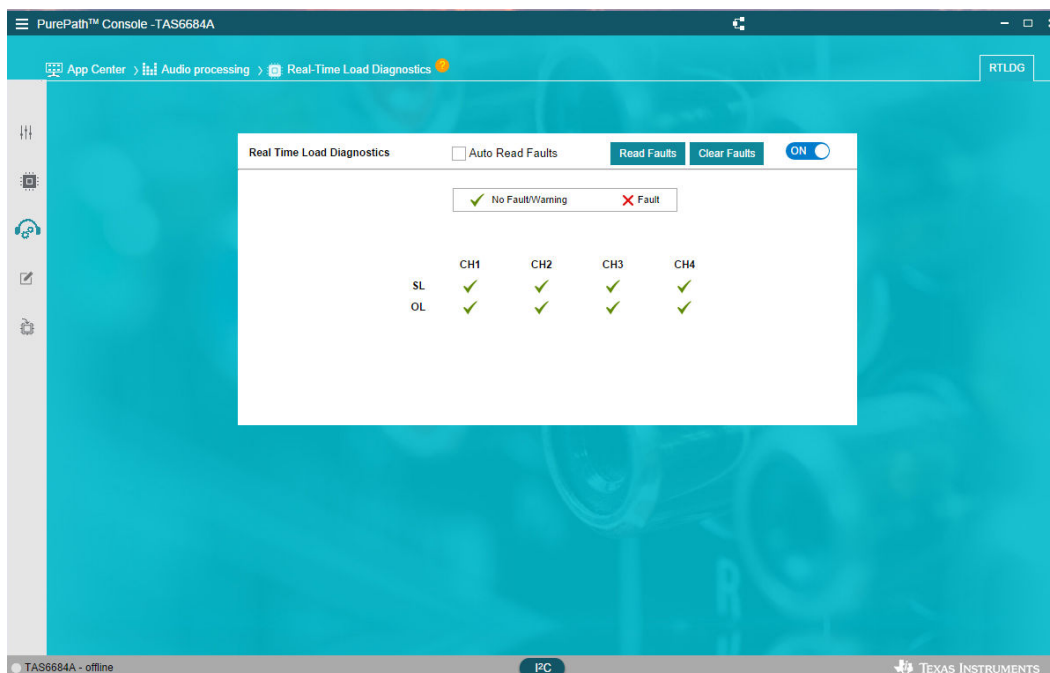
Click on the *PVDD Foldback* box in the Audio Processing window and the following window is displayed.



Apply a threshold, attack, and release rate to provide a gain reduction based on the PVDD voltage. This allows for the audio to be overdriven if the voltage drops.

3.1.7 Real Time Load Diagnostics

Click on the *on/off* button in the the Real-Time Measurement window and the following window is displayed.



Real-Time Load Diagnostics is the basic protection that is provided by real time load diagnostics. This only shows faults due to an open load, shorted load. These faults are enabled by the clicking on the slider switch labeled OFF. The switch turns blue and the label reads ON.

3.1.8 Register Map Window

Click on the *Register Map* box in the Home window and the following window is displayed.

Register Name	Address	Value	7	6	5	4	3	2	1	0
MODE_CTRL	0x01	0x00	0	0	0	0	0	0	0	0
DAMP_CTRL	0x02	0x01	0	0	0	0	0	0	0	1
STATE_CTRL0	0x03	0x22	0	0	1	0	0	0	1	0
STATE_CTRL1	0x04	0x22	0	0	1	0	0	0	1	0
CURRENT_SENSE	0x05	0x0f	0	0	0	0	1	1	1	1
DC_DET_CTRL	0x06	0x00	0	0	0	0	0	0	0	0
BD_soft	0x07	0x81	1	0	0	0	0	0	0	1
CLOCK_DET_CTRL	0x1E	0x00	0	0	0	0	0	0	0	0
ASL_CTRL0	0x20	0x00	0	0	0	0	0	0	0	0
ASL_CTRL1	0x21	0x00	0	0	0	0	0	0	0	0
ASL_CTRL3	0x23	0x0a	0	0	0	0	1	0	1	0
ASL_CTRL5	0x25	0x1a	0	0	0	1	1	0	1	0
ASL_CTRL7	0x27	0x00	0	0	0	0	0	0	0	0
ASL_CTRL8	0x28	0x00	0	0	0	0	0	0	0	0
ASL_CTRL9	0x29	0x60	0	1	1	0	0	0	0	0
ASL_CTRL12	0x2C	0xcf	1	1	0	0	1	1	1	1

The register map can be sorted either alphabetically or numerically (register number). When a register is selected, the hex value and the individual bit value is displayed. The name and description for each bit is shown

to the right in the *Fields* box. A bit changes state when double clicked. The state change is sent to the EVM at the end of the second click.

3.1.9 I2C Monitor and Configure Window

The PPC3 can monitor and configure direct I2C commands. The Direct I2C box can be selected or the I2C button in the status bar can be selected from any window.

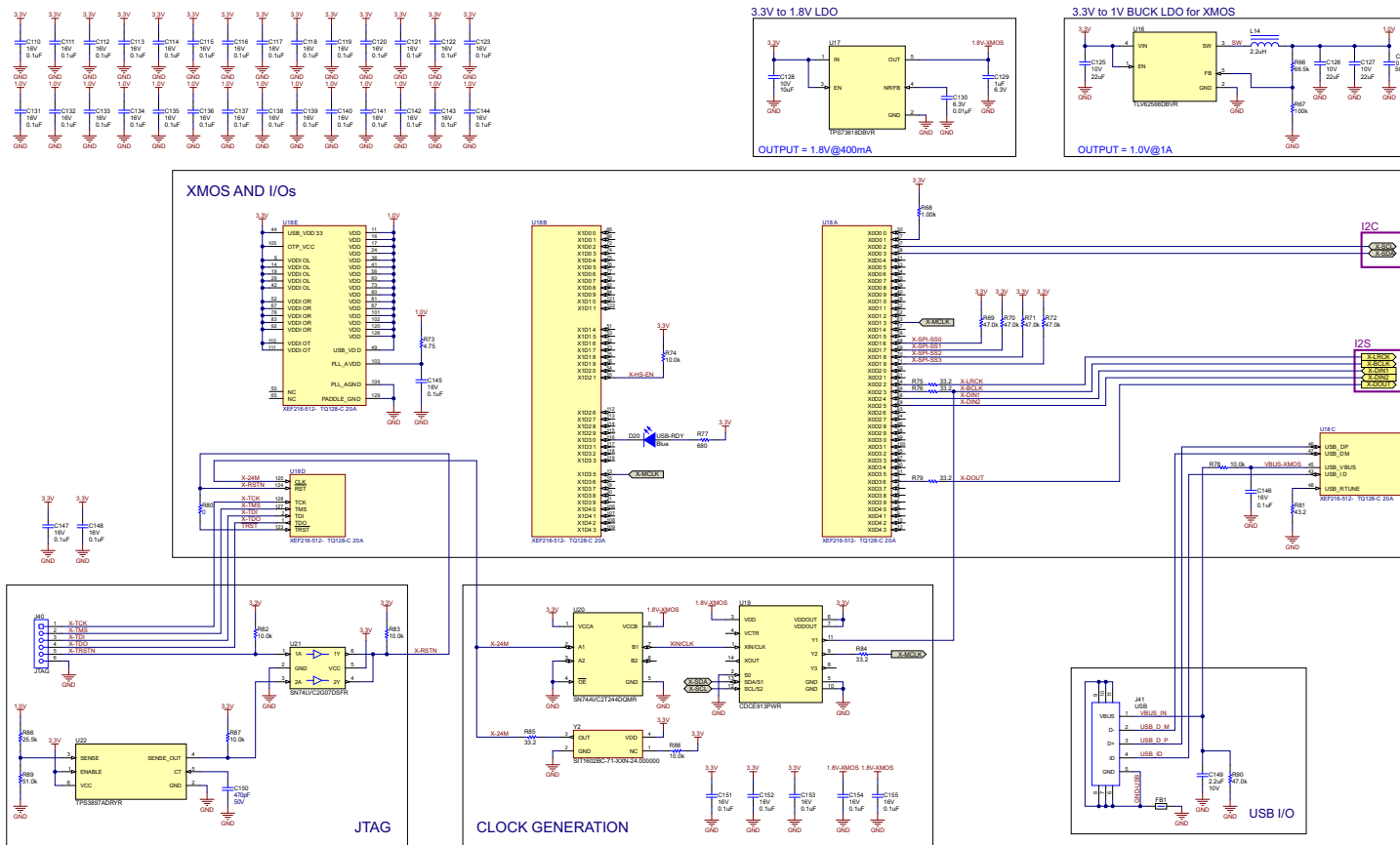
When this window is first opened, the round button is green. Click on this button to turn on recording and the button turns red. The recording can be saved for later use by clicking on the save icon. The I2C commands can also be copied to the clip board by clicking the copy icon. The monitor can be cleared by clicking the trash icon.

A set of I2C commands can be loaded and executed from this window. On the top right corner, click on *I/O* button to show the execution window. Write I2C commands or open an existing *.cfg* file then click the *Execute* button in the bottom left corner. The I2C commands are sent to the device and the results of the execution are shown in the bottom portion of the window.

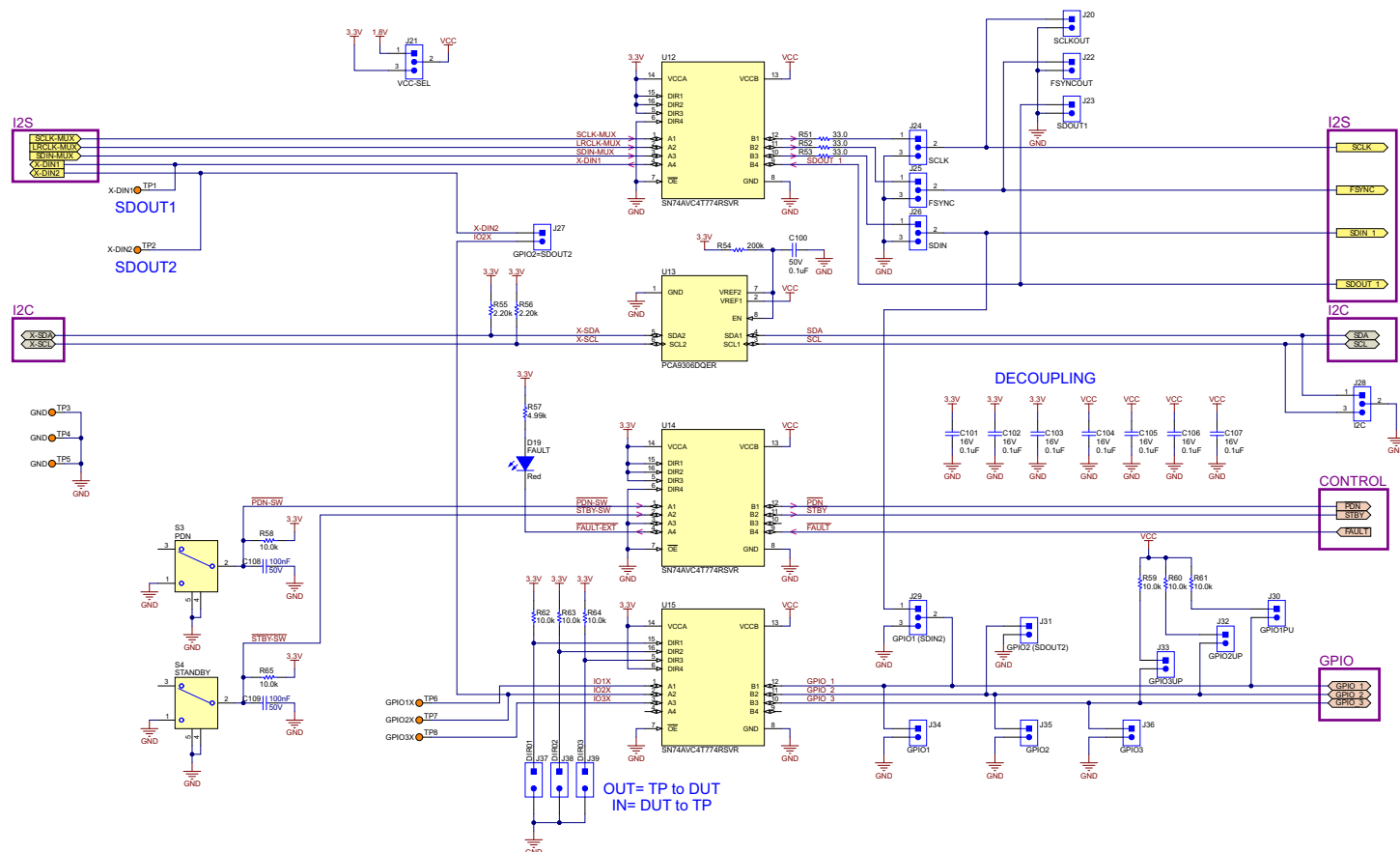
4 Hardware Design Files

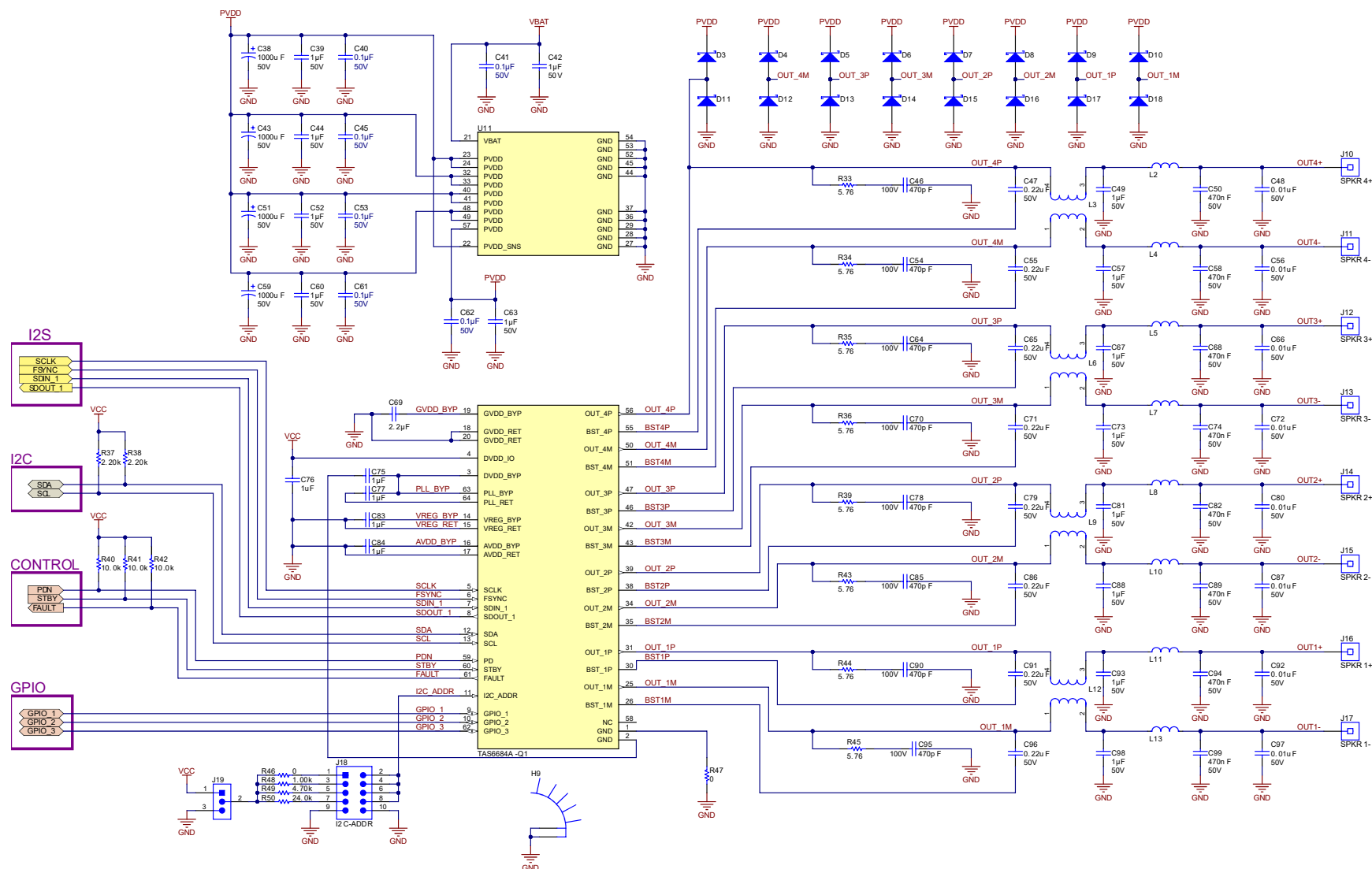
4.1 Schematics

Note that the application schematic in the data sheet always supersedes the schematic in this user's guide.

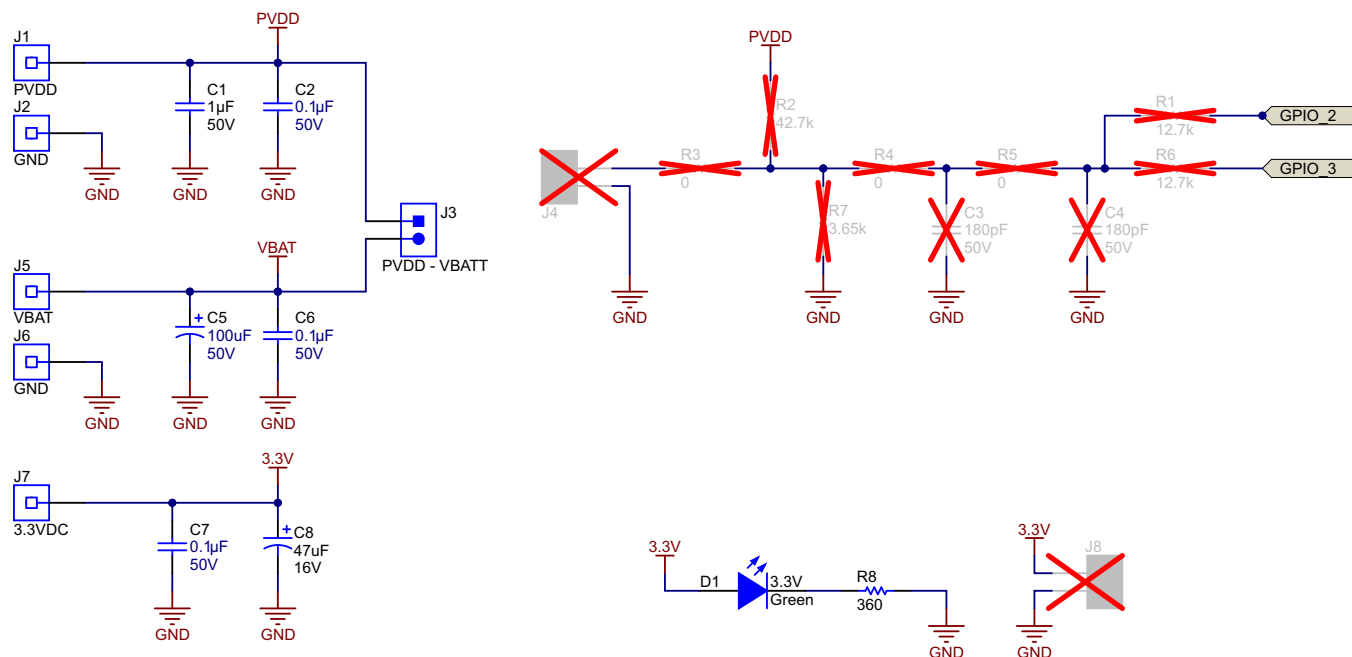




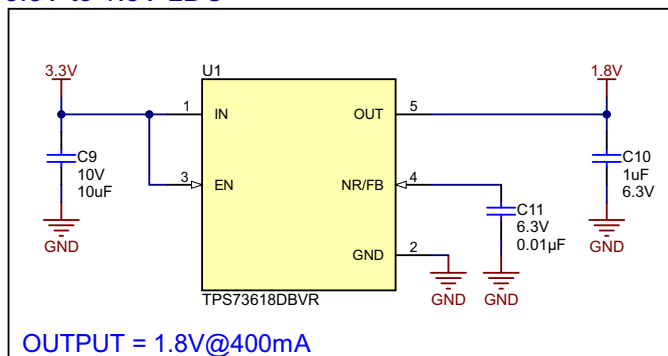




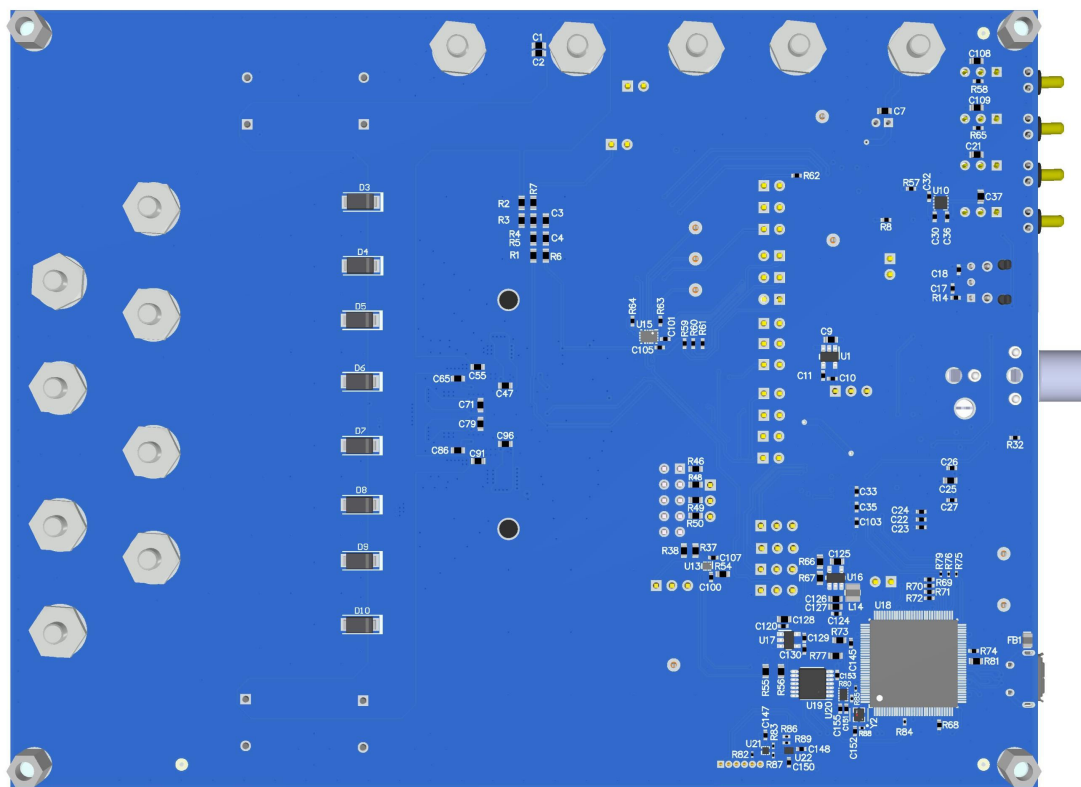
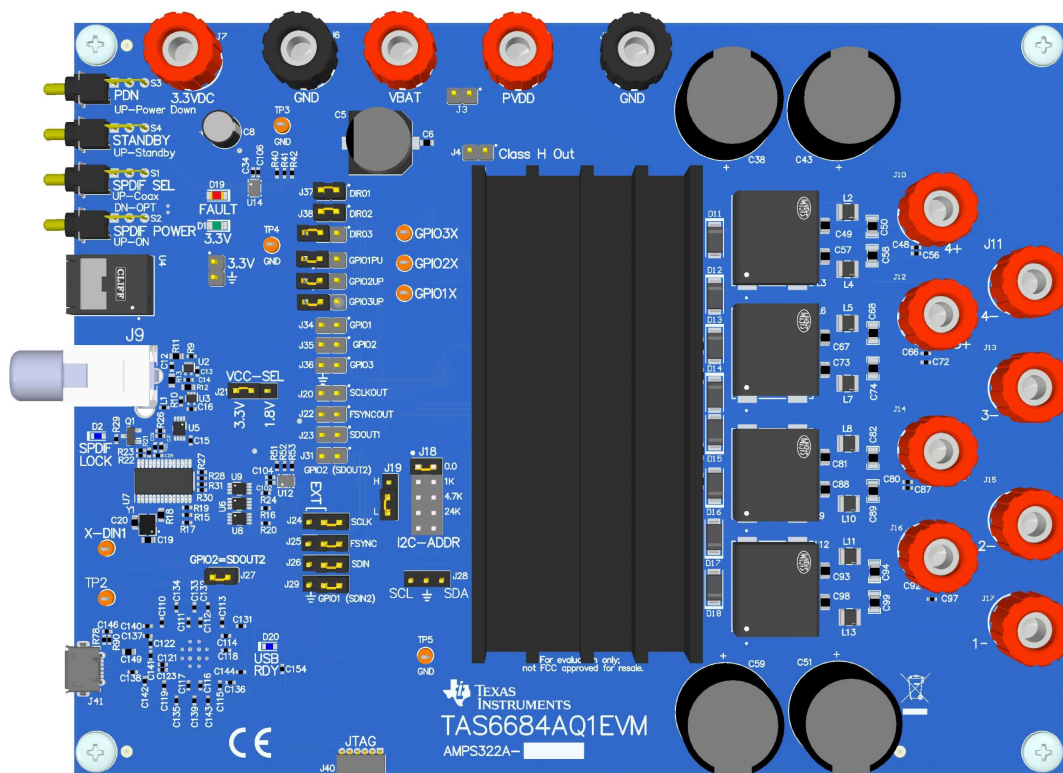
POWER SUPPLIES



3.3V to 1.8V LDO



4.2 Board Layout



4.3 Bill of Materials

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
PCB1	1		Printed Circuit Board		AMPS322	Any	
C1, C75, C77, C83, C84	5	1uF	CAP, CERM, 1uF, 50V, +/- 10%, X7R, 0603	0603	UMK107AB7105KA-T	Taiyo Yuden	
C2, C6, C7, C40, C41, C45, C53, C61, C62, C108, C109	11	0.1uF	CAP, CERM, 0.1μF, 50V, +/- 10%, X7R, AEC-Q200 Grade 0, 0603	0603	06035C104K4Z4A	AVX	
C5	1	100uF	CAP, Polymer Hybrid, 100uF, 50V, +/- 20%, 0.028 ohm, AEC-Q200 Grade 1, D10xL10.2mm SMD	D10xL10.2mm	EEH-ZC1H101P	Panasonic	
C8	1	47uF	CAP, AL, 47uF, 16V, +/- 20%, 0.8 ohm, AEC-Q200 Grade 2, TH	D5xL11mm	EEU-FC1C470	Panasonic	
C9, C21, C25, C37, C128	5	10uF	CAP, CERM, 10uF, 10V, +/- 20%, X5R, 0603	0603	GRM188R61A106MAALD	MuRata	
C10, C129	2	1uF	CAP, CERM, 1uF, 6.3V, +/- 20%, X7R, 0402	0402	GRM155R70J105MA12D	MuRata	
C11, C130	2	0.01uF	CAP, CERM, 0.01μF, 6.3V, +/- 10%, X7R, 0402	0402	0402B103K6R3CT	Walsin	
C12, C13	2	0.047uF	CAP, CERM, 0.047uF, 16V, +/- 10%, X7R, 0402	0402	GRM155R71C473KA01D	MuRata	
C14, C15, C16, C18, C26, C27, C30, C33, C34, C35, C101, C102, C103, C104, C105, C106, C107, C110, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C151, C152, C153, C154, C155	54	0.1uF	CAP, CERM, 0.1uF, 16V, +/- 10%, X7R, 0402	0402	GCM155R71C104KA55D	MuRata	
C17, C22, C23, C24	4		CAP 0402 10pF 5% C0G 100V 30ppm	0402 (1005M)	GRT1555C2A100JA02D	Murata	
C19, C20	2	18pF	CAP, CERM, 18pF, 50V, +/- 5%, C0G/ NP0, 0603	0603	C0603C180J5GACTU	Kemet	

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
C28	1	4700pF	CAP, CERM, 4700pF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	CGA2B2X7R1H472K050BA	TDK	
C29	1	0.068uF	CAP, CERM, 0.068uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	CGA2B3X7R1H683K050BB	TDK	
C31, C36	2	1uF	CAP, CERM, 1uF, 6.3V, +/- 20%, X5R, 0402	0402	GRM152R60J105ME15D	MuRata	
C32	1	100pF	CAP, CERM, 100pF, 50V, +/- 5%, C0G/NP0, 0402	0402	GRM1555C1H101JA01D	MuRata	
C38, C43, C51, C59	4	1000uF	CAP, AL, 1000uF, 50V, +/- 20%, 0.034 ohm, AEC-Q200 Grade 2, TH	D16xL25	EEU-FC1H102	Panasonic	
C39, C42, C44, C49, C52, C57, C60, C63, C67, C73, C81, C88, C93, C98	14	1uF	CAP, CERM, 1uF, 50V, +/- 10%, X7R, 0805	0805	8.85012E+11	Würth Elektronik	
C47, C55, C65, C71, C79, C86, C91, C96	8	0.22uF	CAP, CERM, 0.22uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	CGA3E3X7R1H224K080AB	TDK	
C48, C56, C66, C72, C80, C87, C92, C97	8	0.01uF	CAP, CERM, 0.01uF, 50V, +/- 10%, C0G/NP0, 0402	0402	GCM155R71H103KA55D	MuRata	
C69	1	2.2uF	CAP, CERM, 2.2uF, 50V, +/- 10%, X7R, 0805	0805	C2012X7R1H225K125AC	TDK	
C76	1	1uF	CAP, CERM, 1uF, 100V, +/- 10%, X7R, 1206	1206	C3216X7R2A105K160AA	TDK	
C100, C124	2	0.1uF	CAP, CERM, 0.1 uF, 50V, +/- 10%, X7R, 0402	0402	C1005X7R1H104K050BB	TDK	
C125, C126, C127	3	22uF	CAP, CERM, 22uF, 10V, +/- 20%, X5R, 0603	0603	GRM187R61A226ME15D	MuRata	
C149	1	2.2uF	CAP, CERM, 2.2uF, 10V, +/- 10%, X7R, 0603	0603	GRM188R71A225KE15D	MuRata	
C150	1	470pF	CAP, CERM, 470pF, 50V, +/- 5%, C0G, AEC-Q200 Grade 1, 0402	0402	GRT1555C1H471JA02D	MuRata	
D1	1	Green	LED, Green, SMD	LED_0805	LTST-C170KGKT	Lite-On	
D2, D20	2	Blue	LED, Blue, SMD	LED_0603	150060BS75000	Würth Elektronik	
D19	1	Red	LED, Red, SMD	Red 0805 LED	LTST-C170KRKT	Lite-On	
FB1	1	600 ohm	Ferrite Bead, 600 ohm at 100MHz, 2A, 0805	0805	MPZ2012S601AT000	TDK	
H1, H2, H3, H4	4		MACHINE SCREW PAN PHILLIPS M3	M3 Screw	RM3X8MM 2701	APM HEXSEAL	
H5, H6, H7, H8	4		Standoff, Hex, 12mm, M3, Aluminum	Aluminum M3 12mm Hex Standoff	24434	Keystone	

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
H9	1		Heat Sink, Vertical	Heatsink	ATS-TI1OP-519-C1-R3	Advanced Thermal Solutions	
J1, J5, J7, J10, J11, J12, J13, J14, J15, J16, J17	11		Binding Post, RED, TH	11.4x27.2mm	7006	Keystone	
J2, J6	2		Binding Post, BLACK, TH	11.4x27.2mm	7007	Keystone	
J3, J20, J22, J23, J27, J30, J31, J32, J33, J34, J35, J36, J37, J38, J39	15		Header, 100mil, 2x1, Gold, TH	Sullins 100mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions	
J9	1		RCA Jack, White, R/A, TH	PC Mount Phono Jack-White, TH	970	Keystone	
J18	1		Header, 100mil, 5x2, Tin, TH	Header, 5x2, 100mil, Tin	PEC05DAAN	Sullins Connector Solutions	
J19, J21, J24, J25, J26, J28, J29	7		Header, 100mil, 3x1, Gold, TH	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions	
J40	1		Receptacle, 50mil, 6x1, Gold, R/A, TH	6x1 Receptacle	LPPB061NGCN-RC	Sullins Connector Solutions	
J41	1		Connector, Receptacle, Micro-USB Type AB, R/A, Bottom Mount SMT	5.6x2.5x8.2mm	0475890001	Molex	
L1	1	120 ohm	Ferrite Bead, 120 ohm at 100MHz, 0.4A, 0402	0402	MMZ1005Y-121C	TDK	
L2, L4, L5, L7, L8, L10, L11, L13	8	1uH	1µH Shielded Wirewound Inductor 4.1A 22mOhm Max 1210 (3225 Metric)	1210 (3225)	DFE322520FD-1R0M=P2	Murata	
L3, L6, L9, L12	4		Fixed Inductor for digital amp. (Class-D)	SMD4	VAMV1009AA-100MM2	Cyntec	DBE1316HH-100M
L14	1	2.2uH	Inductor, Multilayer, Ferrite, 2.2uH, 1.3A, 0.08 ohm, SMD	SMD, Body 2.5x2mm, Height 1.2mm	LQM2HPN2R2MG0L	MuRata	
Q1	1	40V	Transistor, PNP, 40V, 0.2A, SOT-23	SOT-23	MMBT3906	Fairchild Semiconductor	
R8, R32	2	360	RES, 360, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402360RJNED	Vishay-Dale	
R9	1	1.00Meg	RES, 1.00M, 1%, 0.1W, 0402	0402	ERJ-2RKF1004X	Panasonic	
R10	1	7.50k	RES, 7.50 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04027K50FKED	Vishay-Dale	
R11	1	100	RES, 100, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603100RFKEA	Vishay-Dale	
R12	1	2.00k	RES, 2.00 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06032K00FKEA	Vishay-Dale	

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
R13	1	75	RES, 75.0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060375R0FKEA	Vishay-Dale	
R14, R15, R16, R17, R19, R20, R24	7	49.9	RES, 49.9, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040249R9FKED	Vishay-Dale	
R18	1	470	RES, 470, 1%, 0.1 W, 0603	0603	RC0603FR-07470RL	Yageo	
R21, R23, R28, R30, R57	5	4.99k	RES, 4.99 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04024K99FKED	Vishay-Dale	
R22	1	100	RES, 100, 1%, 0.1 W, 0402	0402	ERJ-2RKF1000X	Panasonic	
R25	1	681	RES, 681, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402681RFKED	Vishay-Dale	
R26	1	100k	RES, 100 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402100KFKEA	Vishay-Dale	
R29	1	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040210K0FKED	Vishay-Dale	
R37, R38, R55, R56	4	2.20k	RES, 2.20 k, 1%, 0.1 W, 0603	0603	RC0603FR-072K2L	Yageo	
R40, R41, R42, R58, R59, R60, R61, R62, R63, R64, R65	11	10.0k	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT10K0	Stackpole Electronics Inc	
R46	1	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo	
R47	1	0	RES, 0, 5%, 0.125 W, 0805	0805	RC0805JR-070RL	Yageo America	
R48	1	1.00k	RES, 1.00 k, 1%, 0.1 W, 0603	0603	ERJ-3EKF1001V	Panasonic	
R49	1	4.70k	RES, 4.70 k, 0.5%, 0.1 W, 0603	0603	RT0603DRE074K7L	Yageo America	
R50	1	24.0k	RES, 24.0 k, 1%, 0.1 W, 0603	0603	RC0603FR-0724KL	Yageo	
R51, R52, R53	3	33	RES, 33.0, 1%, 0.1 W, 0402	0402	ERJ-2RKF33R0X	Panasonic	
R54	1	200k	RES, 200 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603200KFKEA	Vishay-Dale	
R66	1	66.5k	RES, 66.5 k, 1%, 0.1 W, 0603	0603	RC0603FR-0766K5L	Yageo	
R67	1	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100KL	Yageo	
R68	1	1.00k	RES, 1.00 k, 1%, 0.0625 W, 0402	0402	RC0402FR-071KL	Yageo America	
R69, R70, R71, R72, R90	5	47.0k	RES, 47.0 k, 1%, 0.0625 W, 0402	0402	RC0402FR-0747KL	Yageo America	
R73	1	4.75	RES, 4.75, 1%, 0.1 W, 0603	0603	RC0603FR-074R75L	Yageo	
R74, R78	2	10.0k	RES, 10.0 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1002X	Panasonic	
R75, R76, R79, R84, R85	5	33.2	RES, 33.2, 1%, 0.05 W, 0201	0201	RC0201FR-0733R2L	Yageo America	
R77	1	680	RES, 680, 1%, 0.1 W, 0603	0603	RC0603FR-07680RL	Yageo	

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
R80	1	0	RES, 0, 5%, .05 W, AEC-Q200 Grade 0, 0201	0201	ERJ-1GN0R00C	Panasonic	
R81	1	43.2	RES, 43.2, 1%, 0.1 W, 0603	0603	RC0603FR-0743R2L	Yageo	
R82, R83, R87, R88	4	10.0k	RES, 10.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0710KL	Yageo America	
R86	1	25.5k	RES, 25.5 k, 1%, 0.05 W, 0201	0201	RC0201FR-0725K5L	Yageo America	
R89	1	51.0k	RES, 51.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0751KL	Yageo America	
S1, S2, S3, S4	4		Switch, SPDT, On-On, 1 Pos, 0.4A, 28 VDC, TH	5.6x5.4mm	FT1D-4M-Z	Copal Electronics	
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	14	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8		Test Point, Miniature, Orange, TH	Orange Miniature Test point	5003	Keystone	
U1, U17	2		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	
U2, U3	2		Single Inverter Gate, DRL0005A, LARGE T&R	DRL0005A	SN74LVC1GU04DRLR	Texas Instruments	
U4	1		Fiber Optic Receiver Digital Audio, Optical 16Mbps - 2.7V ~ 5.5V 10mA	CONN_FIBER_OPTI C	FCR684208R	Cliff	
U5, U6, U8, U9	4		Single 2-Line to 1-Line Data Selector/Multiplexer, DCU0008A, LARGE T&R	DCU0008A	SN74LVC2G157DCUR	Texas Instruments	SN74LVC2G157DCU T
U7	1		Automotive Catalog 96kHz 24-Bit Digital Audio Interface Receiver, 50ps Jitter, 3.3V, -40 to 85 degC, 28-Pin TSSOP (PW), Green (RoHS & no Sb/Br)	PW0028A	DIR9001IPWQ1	Texas Instruments	
U10	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
U11	1		200W Digital Input, Stereo, Closed-Loop Class-D Audio Amplifier with Enhanced Processing	QFP64-PHD	TAS6684AQ1PHD	Texas Instruments	

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
U12, U14, U15	3		4-Bit Dual-Supply Bus Transceiver With Configurable Voltage-Level Shifting and 3-State Outputs, RSV0016A (UQFN-16)	RSV0016A	SN74AVC4T774RSVR	Texas Instruments	
U13	1		Dual Bi-Directional I2C-Bus and SMBus Voltage Level-Translator, 0 to 5.5V, -40 to 85 degC, 8-pin X2SON (DQE), Green (RoHS & no Sb/Br)	DQE0008A	PCA9306DQER	Texas Instruments	
U16	1		1A High Efficiency Step-Down Converter in SOT23-5 Package, DBV005A, DBV0005A (SOT-5)	DBV0005A	TLV62568DBVR	Texas Instruments	TLV62568DBVT
U18	1		XCore XEF Microcontroller IC 32-Bit 16-Core 2000MIPs 2MB (2M x 8) FLASH 128-TQFP (14x14)	TQFP128	XEF216-512-TQ128-C20A	XMOS	
U19	1		Programmable 1-PLL VCXO Clock Synthesizer with 2.5V or 3.3V LVC MOS Outputs, PW0014A (TSSOP-14)	PW0014A	CDCE913PWR	Texas Instruments	CDCE913PW
U20	1		Dual-Bit Dual-Supply Bus Transceiver, DQM0008A (X2SON-8)	DQM0008A	SN74AVC2T244DQMR	Texas Instruments	
U21	1		Enhanced Product Dual Buffer/Driver with Open-Drain Output, DCK0006A (SOT-SC70-6)	DSF0006A	SN74LVC2G07DSFR	Texas Instruments	
U22	1		Single-Channel Ultra-Small Adjustable Supervisory Circuit With Active-High Open-Drain Output, DRY0006A (USON-6)	DRY0006A	TPS3897ADRYR	Texas Instruments	
Y1	1		Crystal, 12.288MHz, 18pF, SMD	Crystal, 2.5x1x3.2mm	ABM8G-12.288MHZ-18-D2Y-T	Abracon Corporation	
Y2	1		24MHz XO (Standard) HCMOS, LVC MOS Oscillator 2.25V ~ 3.63V - 4-SMD, No Lead	SMT_OSC_2MM0_1 MM6	SIT1602BC-71-XXN-24.000000	SiTime	
C3, C4	0	180pF	CAP, CERM, 180pF, 50V, +/- 5%, C0G/NP0, 0603	0603	06035A181JAT2A	AVX	
C46, C54, C64, C70, C78, C85, C90, C95	0	470pF	CAP, CERM, 470pF, 100V, +/- 10%, X7R, 0603	0603	06031C471KAT2A	AVX	
C50, C58, C68, C74, C82, C89, C94, C99	0	0.47uF	CAP, CERM, 0.47uF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0805	0805	GCM21BR71H474KA55L	MuRata	
D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, D18	0	60V	Diode, Schottky, 60V, 2A, SMA	SMA	B260A-13-F	Diodes Inc.	

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number ⁽¹⁾
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A	
J4, J8	0		Header, 100mil, 2x1, Gold, TH	Sullins 100mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions	
R1, R6	0	12.7k	RES, 12.7 k, 0.1%, 0.1 W, 0603	0603	RG1608P-1272-B-T5	Susumu Co Ltd	
R2	0	42.7k	RES, 42.7 k, 0.5%, 0.1 W, 0603	0603	RT0603DRE0742K7L	Yageo America	
R3, R4, R5	0	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo	
R7	0	3.65k	RES, 3.65 k, 0.1%, 0.1 W, 0603	0603	RG1608P-3651-B-T5	Susumu Co Ltd	
R27, R31	0	4.99k	RES, 4.99 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04024K99FKED	Vishay-Dale	
R33, R34, R35, R36, R39, R43, R44, R45	0	5.76	RES, 5.76, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08055R76FKEA	Vishay-Dale	

(1) Unless otherwise noted in the Alternate Part Number or Alternate Manufacturer columns, all parts can be substituted with equivalents.

5 Additional Information

5.1 Trademarks

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