

**ABSTRACT**

This user's guide describes the TAS2780RYA evaluation module (TAS2780EVM). The TAS2780EVM allows for evaluation of the TAS2780RYA device with end products.

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1 Description

The TAS2780EVM is designed to demonstrate the performance of TAS2780 in a mono configuration. The design utilizes onboard controller to provide connection interface and supply voltages. TAS2780 is a mono, digital-input, Class-D audio amplifier optimized for efficiently driving high peak power into a variety of sizes in loudspeaker applications. Y-Bridge technique is implemented at the output stage of the amplifier so that it can change from two different voltage rails depending on the amount of power required at the output, improving efficiency significantly at lower power. The Class-D amplifier is capable of delivering 20 W of peak power into a 4 Ω load at source voltage of 16 V. Integrated speaker voltage and current sense provides real time monitoring of loud speakers. Up to eight devices can share a common bus via I²S/TDM + I²C interfaces.

TAS2780EVM supports evaluation and development with the TAS2780 device through the following interfaces:

- USB Interface
- Software control via PurePath™ Console 3 (PPC3) GUI, USB-HID
- USB-class audio device, compatible with Microsoft® Windows® 7+
- External 100-mil headers
- PSIA – I²S/TDM interface
- I²C
- Hardware Shutdown Control
- Interrupt Output

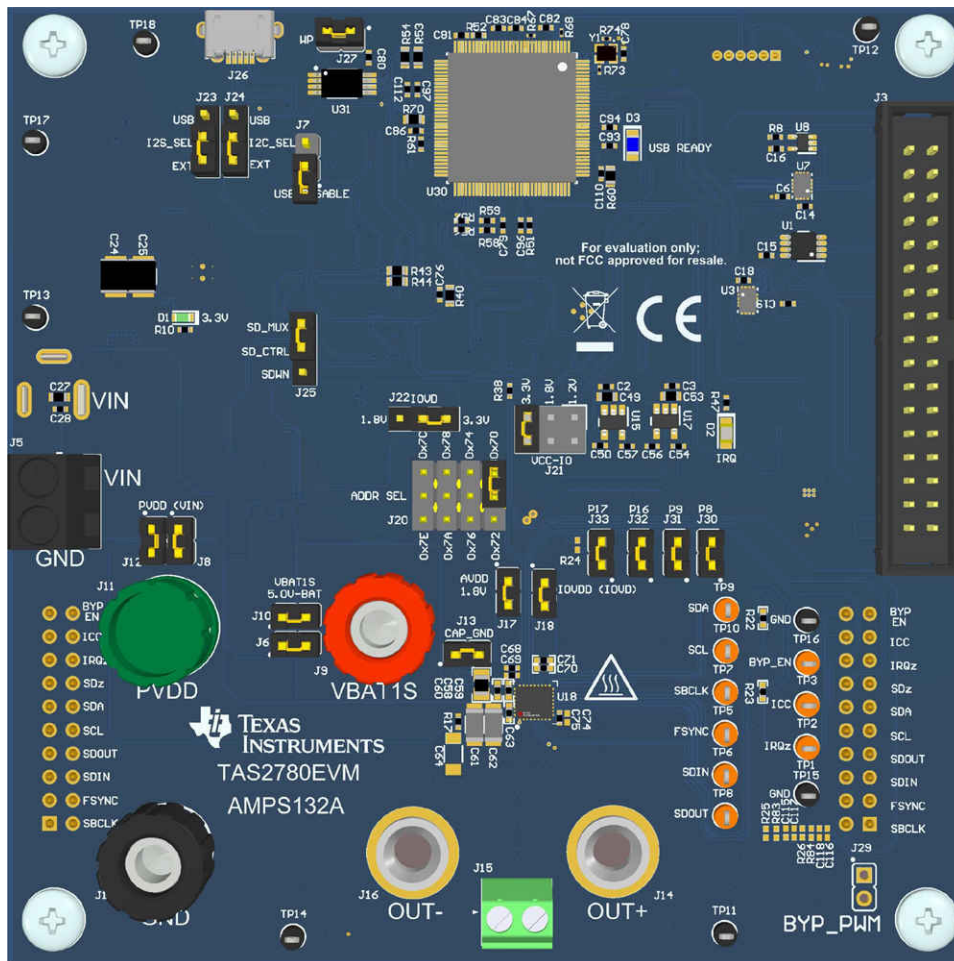


Figure 1-1. TAS2780EVM Top View (3D)

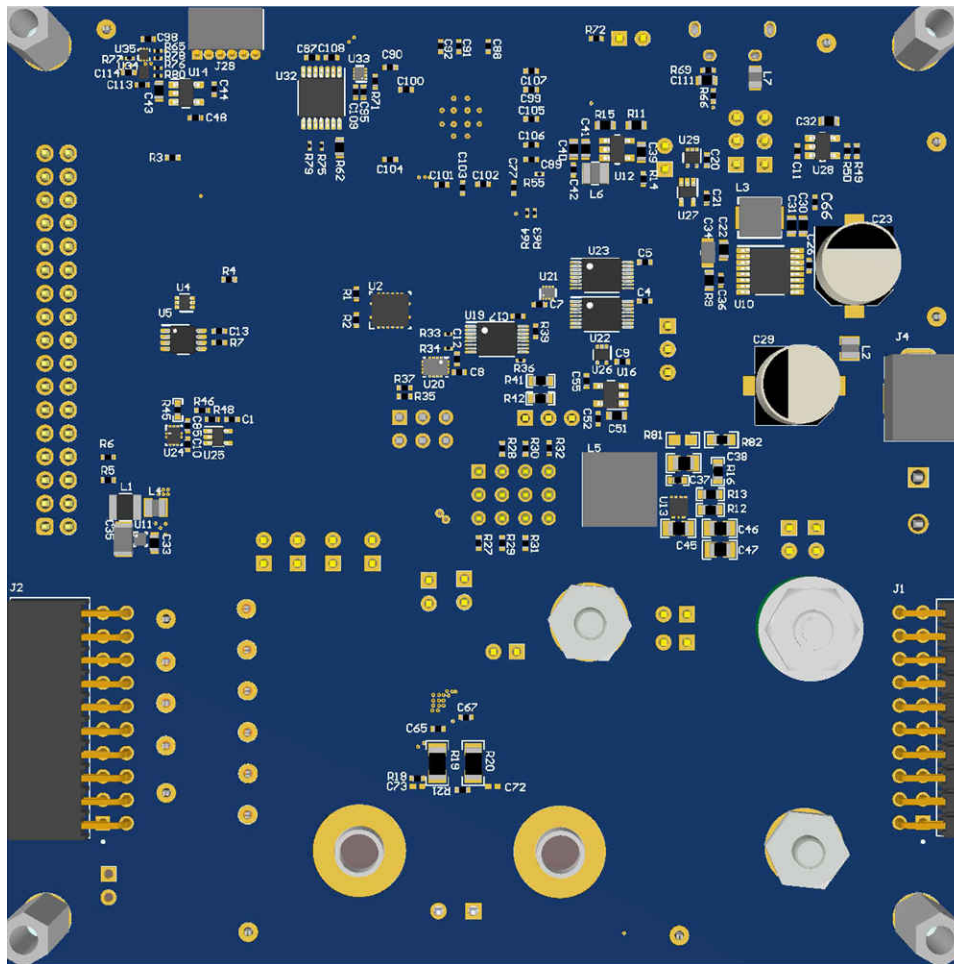


Figure 1-2. TAS2780EVM Bottom View (3D)

2 Specifications

Table 2-1 lists the supply, input, and output requirements for TAS2780.

Table 2-1. Specifications

Parameter	Value
Supply Voltage - VBAT1S	2.7 to 5.5 V
Supply Voltage - AVDD	1.65 to 1.95 V
Supply Voltage - IOVDD	1.65 to 1.95 V or 3 to 3.6 V
Supply Voltage - PVDD	VBAT (min 3 V) to 23 V
Input Logic	IOVDD
Output Power	25 W
USB, USB class-audio	Micro-USB

2.1 Power Supply Configurations

TAS2780EVM provides flexible power supply configurations for different performance tests and use cases.

By default, the board is completely supplied by VIN which can be supplied by J4 or J5 from 3.9 V to 23 V. This voltage is used to power PVDD pin on TAS2780 directly, as well as generate the rest of the voltage rails: 5 V for VBAT1S, 3.3 V, 1.8 V, 1.2 V and 1 V for the different logic levels.

Alternatively VBAT1S and PVDD can be supplied directly from an external supply using J9 and J11 connectors respectively. Remove J8 and J12 when using an external PVDD voltage on J11, make sure VIN is still being supplied as this voltage is used to generate the different lower voltage rails on the board. Remove J6 and J10 when using an external VBAT1S. Consider the voltage range for each supply rail as described in Table 2-1.

3 Software

The TAS2780 can be easily configured with PPC3 running the TAS2780 plug-in. To request access to the software, first request a myTI.com account [here](#).

After creating an account, navigate to the [TAS2780 product page](#) and follow the link in the information box to request access to the software.

3.1 PPC3 Overview

This section provides a general description of TAS2780 EVM PPC3 GUI control. There are three main panels you can access, these are listed and described in the following sections.

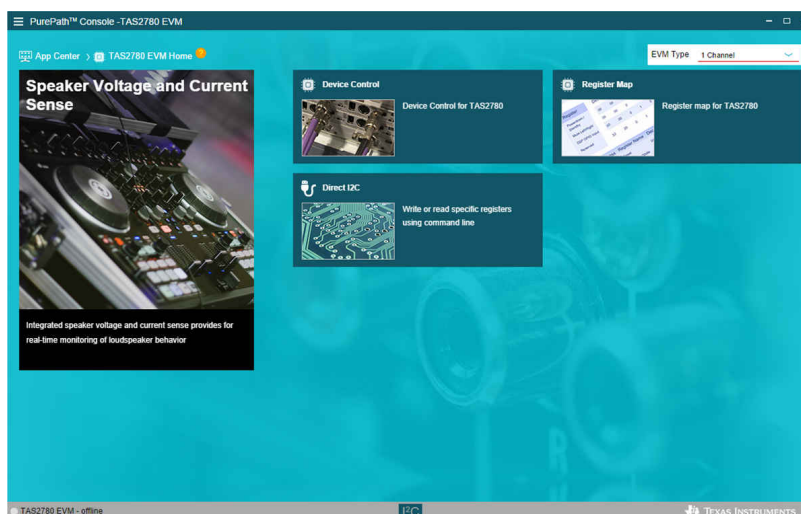


Figure 3-1. PPC3-TAS2780 EVM Main Panel

3.1.1 Device Control Panel

This panel can be used to control all the features included in TAS2780. Default settings are ready for device evaluation. For any details on each specific feature please refer to TAS2780 data sheet.

The controls are displayed in Basic mode by default, which provides all controls in a simple way to adjust, although it can be toggled to Advanced mode which provides specific parameter settings in some of the features for more specific test modes.

Some important controls are located on the navigation bar at the top right:

1. Data Read button shows a pop up window with the data obtained from internal SAR ADC conversion such as VBAT, PVDD and Die Temperature, as well as the Sample Rate detected from the digital audio interface.
2. IRQ button is a useful tool during debug, this pop up window shows all the interrupt flags for both Live and Latched status.
3. Power Up button on the far right must be used to toggle the device between shutdown mode and active mode. It is important to toggle the power state every time a change is done in the features panel.

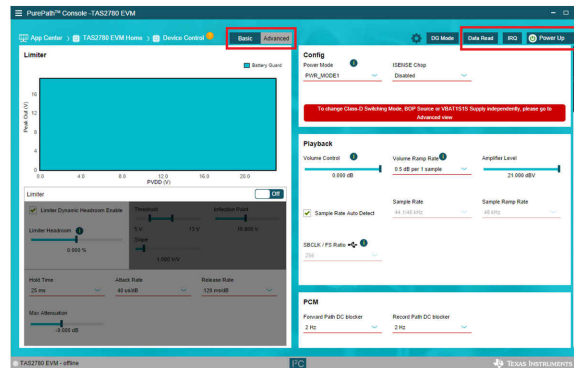


Figure 3-2. Device Control Panel

3.1.2 Register Map

This panel shows the register values from TAS2780. It is similar information to what is included in the data sheet and it provides the ability to read the current values of all registers. The list can be sorted based on the register name or address.

Detailed description of each register is displayed on the right side when any specific register is selected on the left side.

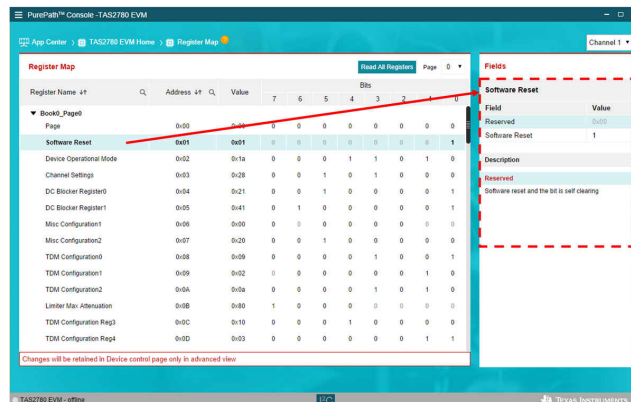


Figure 3-3. Register Map Panel

3.1.3 Direct I²C

There is a dedicated Direct I²C panel available which offers means to control the device on the evaluation board using configuration scripts in cfg format instead of GUI settings. The same panel also features a Log mode that can be used to record I²C transactions which is useful while debugging.

However the same panel is available in a pop up widow that can be used in any other panel by clicking the button in the bottom center of the PPC3 main window.

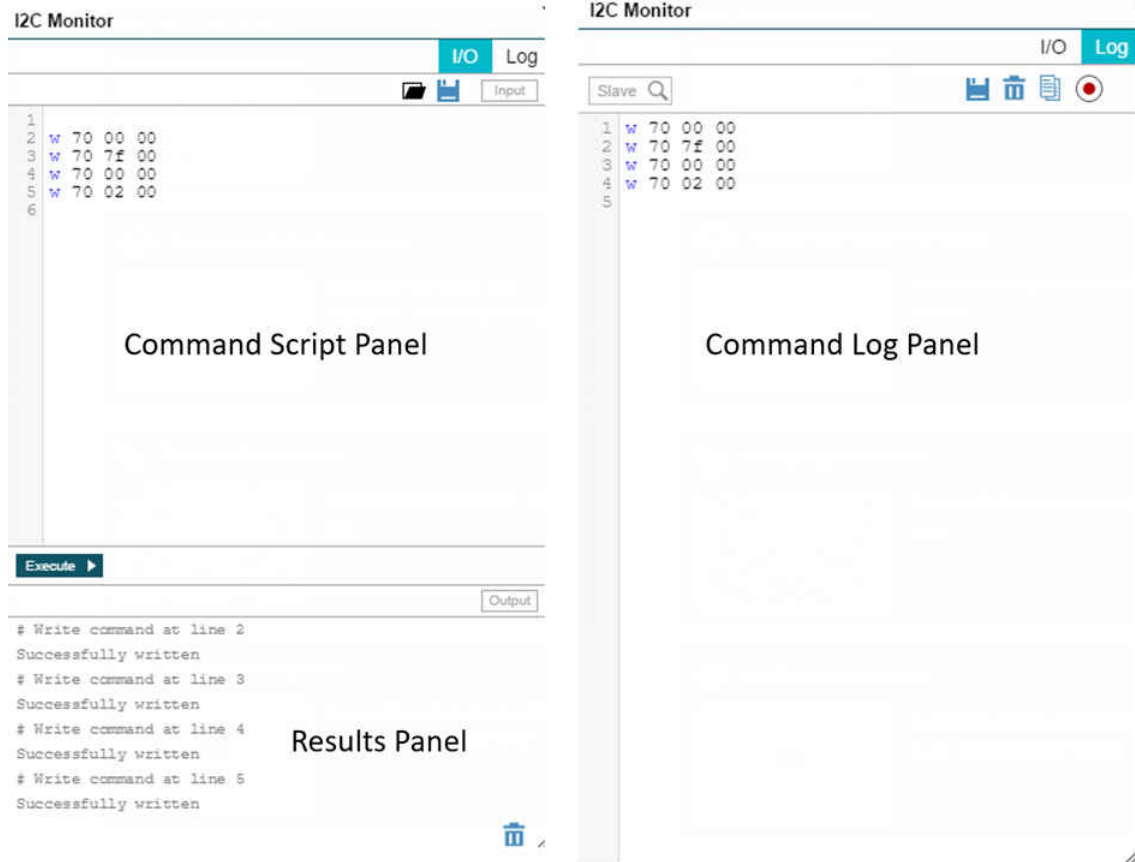


Figure 3-4. I²C Monitor

4 Device Configuration

The default configuration for the TAS2780 is described in [Table 4-2](#) and [Figure 4-1](#).

4.1 Test Points

TAS2780EVM provides several test points for debugging and analysis purposes, [Table 4-1](#) lists these test points along with a brief description of each signal.

Table 4-1. Test Points

Name	Signal Name	Description
TP1	IRQz	Interrupt signal, pull-down by TAS2780 for signaling
TP2	ICC	Inter-Chip Communication used for gain syncing in multiple amplifier applications
TP3	BYP_EN	Bypass enable pin that can be used to control an external boost based on power requirements
TP5	FSYNC	Frame sync for TDM interface
TP6	SDIN	Data in for TDM interface
TP7	SBCLK	Bit clock for TDM interface
TP8	SDOUT	Data out for TDM interface
TP9	SDA	Data for I ² C interface
TP10	SCL	Clock for I ² C interface
TP11 - TP18	GND	GND reference

4.2 Default Jumper Settings

Table 4-2. Default Jumper Settings

Jumper	Setting	Description
J23	USB	I ² S input from USB
J24	USB	I ² C input from USB
J25	SD_MUX	SD controlled by software
J22	3.3 V	TAS2780 IOVDD voltage
J21	3.3 V	Input signals voltage level
J13	Insert	Additional VBAT decoupling
J17	Insert	AVDD current sense
J18	Insert	IOVDD current sense
J10	Insert	VBAT current sense
J6	Insert	VBAT current sense
J12	Insert	PVDD current sense
J8	Insert	PVDD current sense
J27	Insert	EEPROM write protect
J20	0x70	Address select
J30	Insert	Pin 8 connection
J31	Insert	Pin 9 connection
J32	Insert	Pin 16 connection
J33	Insert	Pin 17 connection

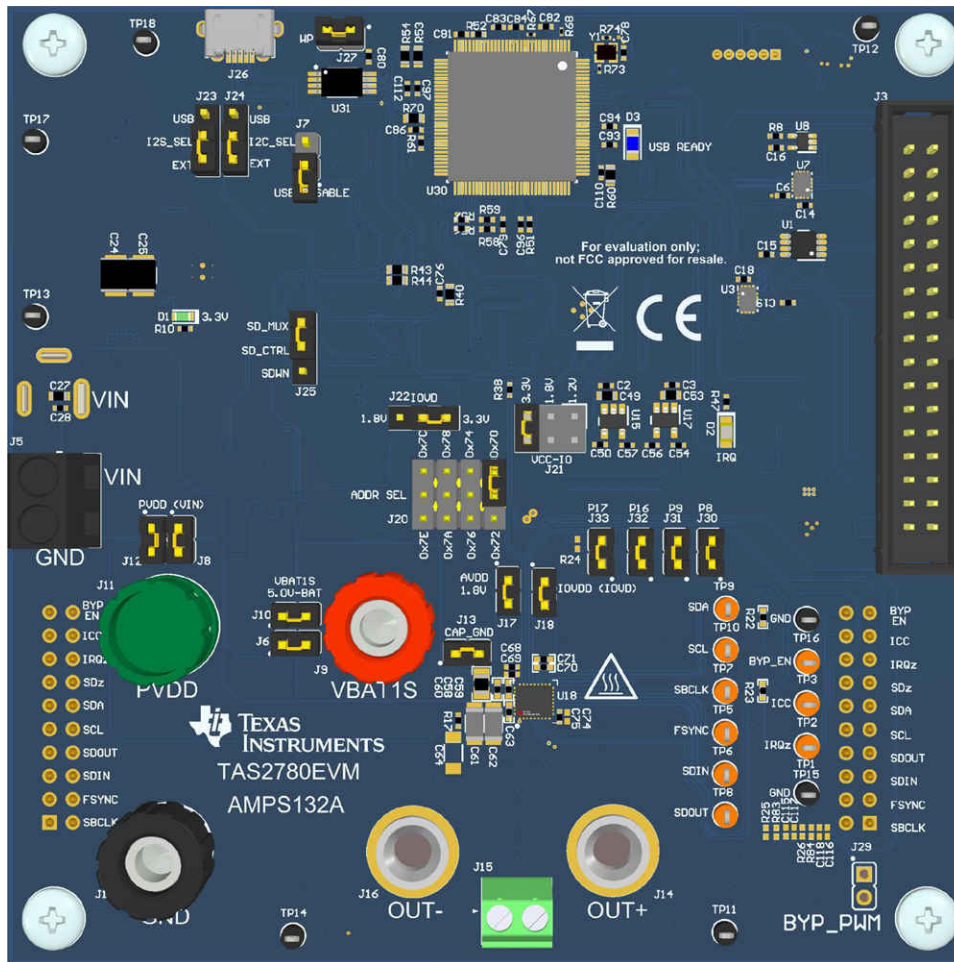


Figure 4-1. Default Jumper Settings

4.3 Mono Setup

Use the following instructions to complete a mono setup:

1. Install PPC3 with the TAS2780 plug-in.
2. Connect a speaker to J15.
3. Connect a 3.9 V to 23 V supply to connector J4 or J5.
4. Connect a Micro USB Cable from PC to TAS2780EVM.
5. Verify that TI USB Audio UAC2.0 is the default playback device by opening the sound dialog from the Windows Control Panel.

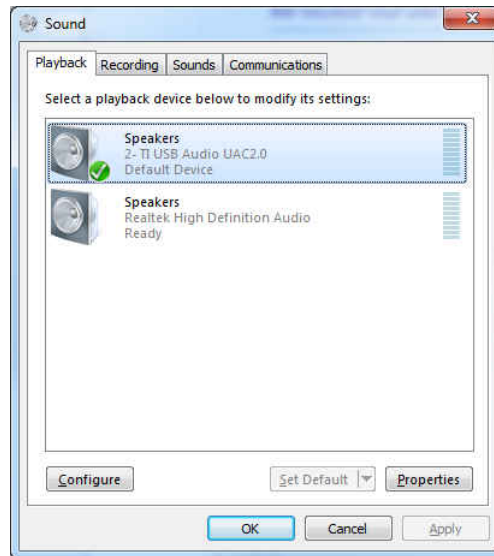


Figure 4-2. Windows Playback Devices

6. Set the maximum bit depth using the Texas Instruments USB Audio Device Control Panel found in the system tray.

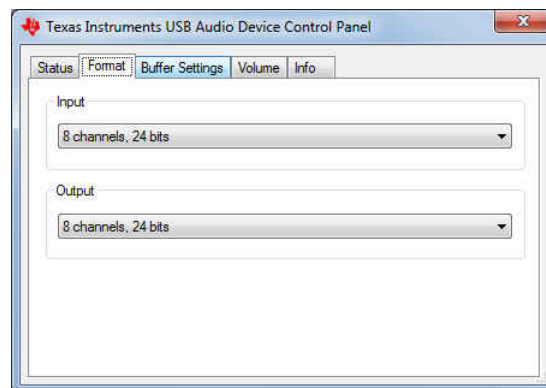


Figure 4-3. Texas Instruments USB Audio Device Control Panel

7. Set the sampling rate.
 - Right click TI USB AUdio UAC2.0
 - Select Properties
 - Click advanced tab
 - Select Rate

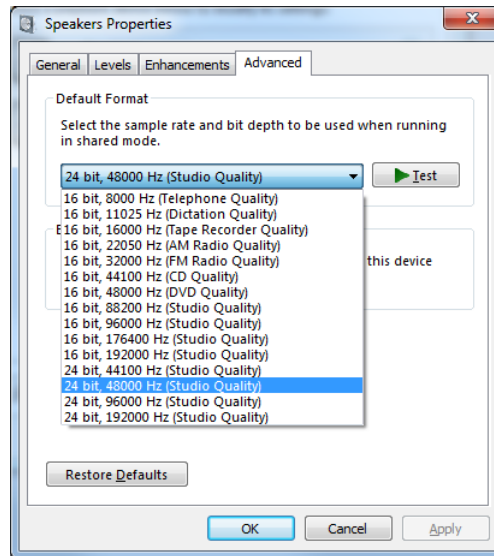


Figure 4-4. Windows Playback device Sample Rate

8. Open PPC3 and TAS2780 EVM plug in
9. Connect to EVM by clicking on the lower-left corner button
10. Open Device Control panel. At this point the device will be initialized to default settings.
11. Click on Power Up button on the upper-right corner to take the device out of shutdown mode. At this point the device is ready to play audio content through USB, for example, any sound card.

5 Digital Audio Interfaces

Select the various digital audio interfaces on the TAS2780EVM through hardware and software settings. J1 can be used to input signals from AP or other I2C and I2S signal sources, based on J23 and J24 configuration.

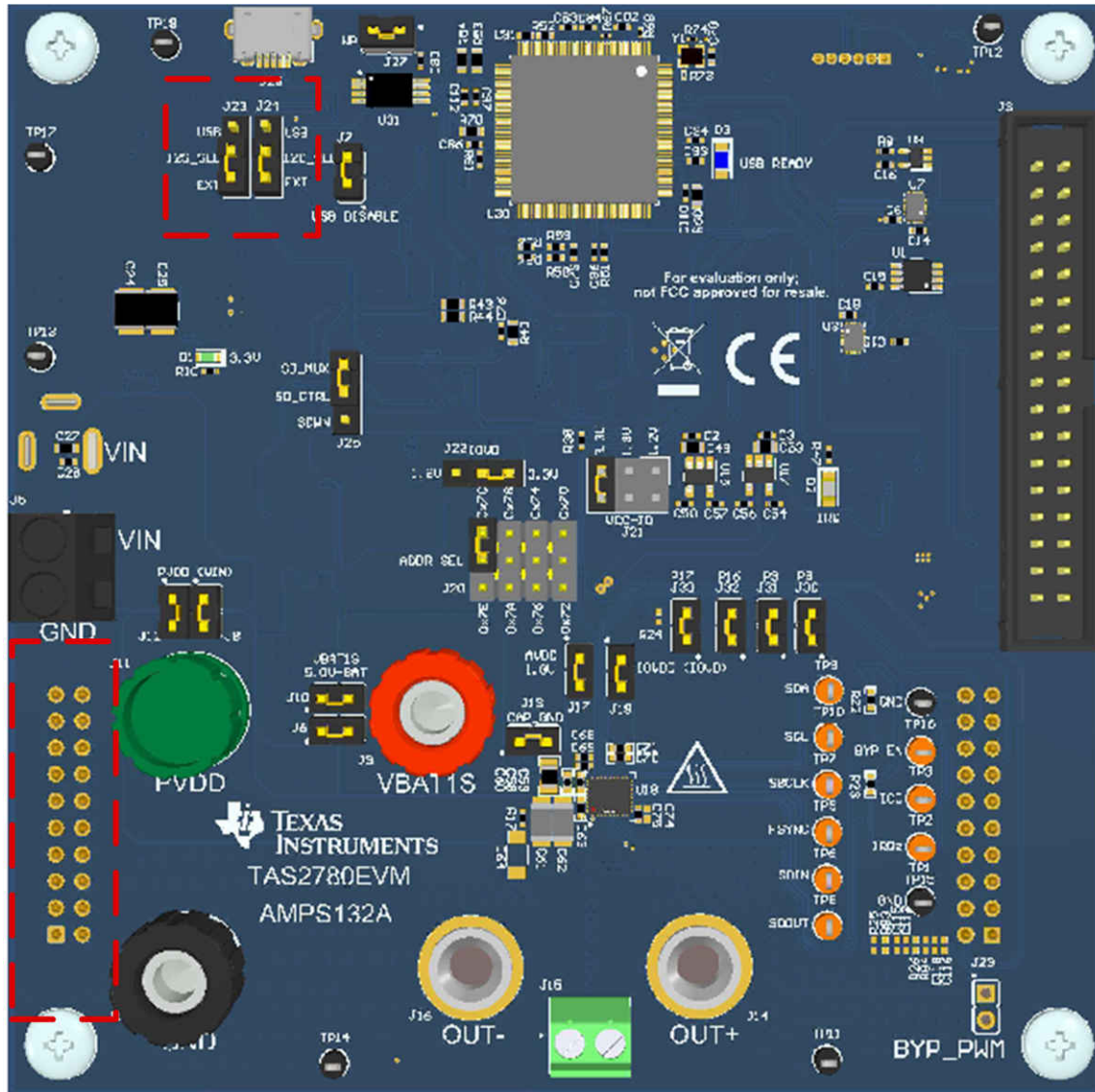


Figure 5-1. I²S/I²C Selector and Source

6 Multi-Channel Configuration

J2 output connector can be connected to J1 input connector from another TAS2780EVM to allow evaluation of multi-channel applications up to 8 different channels.

Each board must have a different I2C address configuration on J20.

Each board must be supplied on either J4 or J5.

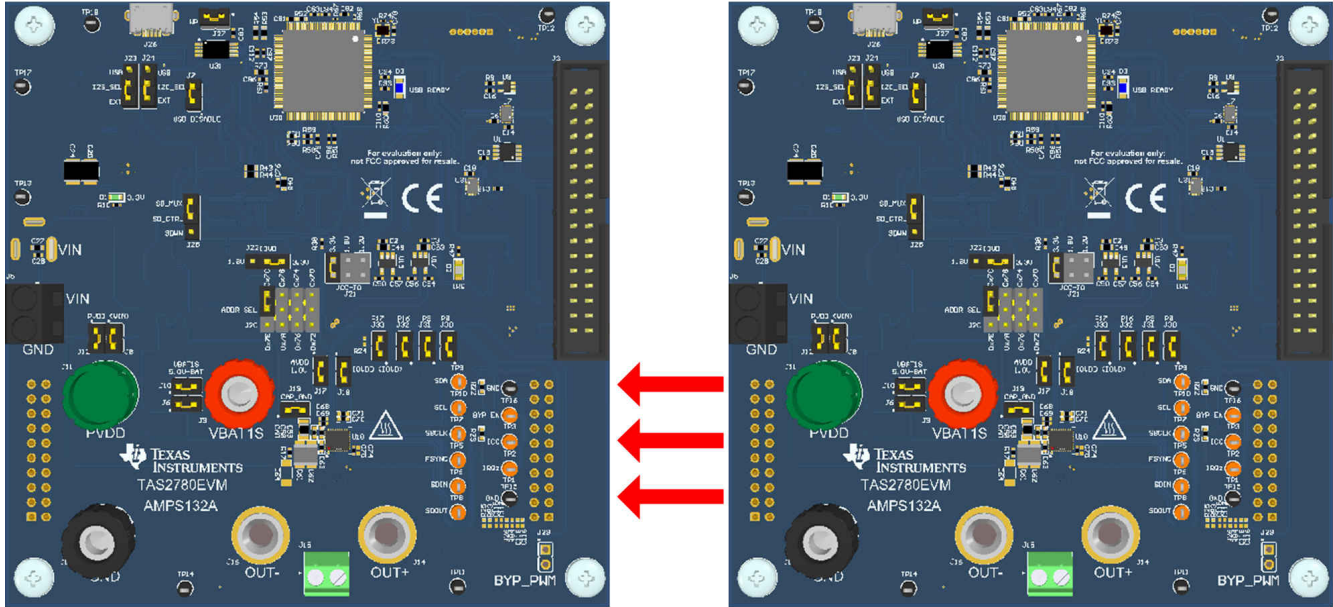


Figure 6-1. TAS2780EVM Multichannel Connection

7 Schematic and Layout Guidelines

This section provides a list of important items to consider during component selection as well as layout. Following these guidelines help for proper device performance and operation.

1. All supply rails should be bypassed by low-ESR ceramic capacitors. Consider capacitance derating due to DC as this is considerably critical for higher power rails, a good rule of thumb is to select capacitors with rated voltage 2 or 3 times the supply rail voltage.

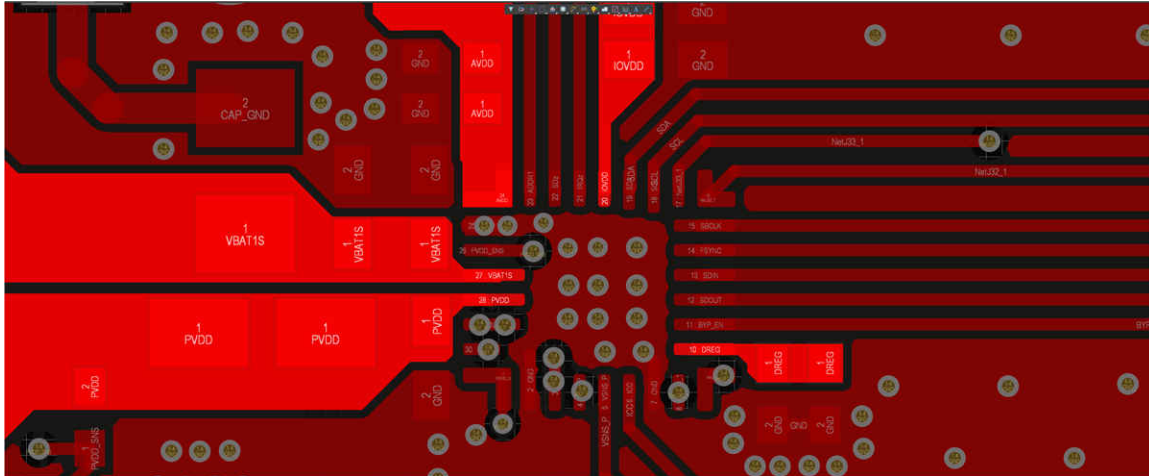


Figure 7-1. Supply Rails Layout

2. Use GND planes with multiple conductive epoxy filled vias to create a low impedance connection to PGND and GND, this also helps to minimize the GND noise.

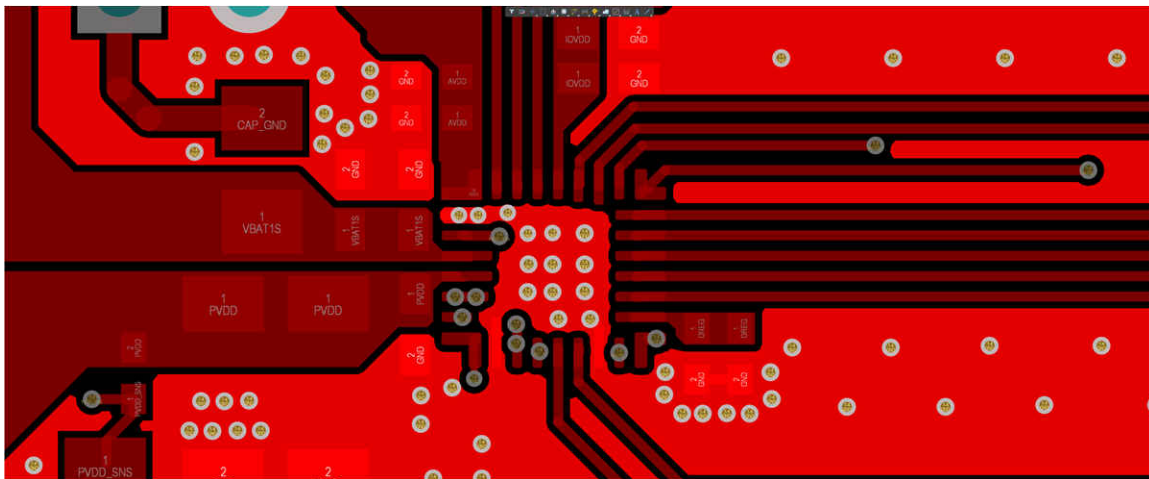


Figure 7-2. GND Layout

3. Do not use vias for traces that carry high current such as PVDD, VBAT1S, OUT_P and OUT_N.
4. Connect VSNS_P and VSNS_N as close as possible to the speaker.
5. VSNS_P and VSNS_N should be connected between the EMI ferrite filter and the speaker if EMI ferrites are used at the outputs.
6. VSNS_P and VSNS_N routing should be separated and shielded from switching signals such as interface signals, speaker outputs and bootstrap pins.
7. Place bootstrap capacitors as close as possible to the BST pin.

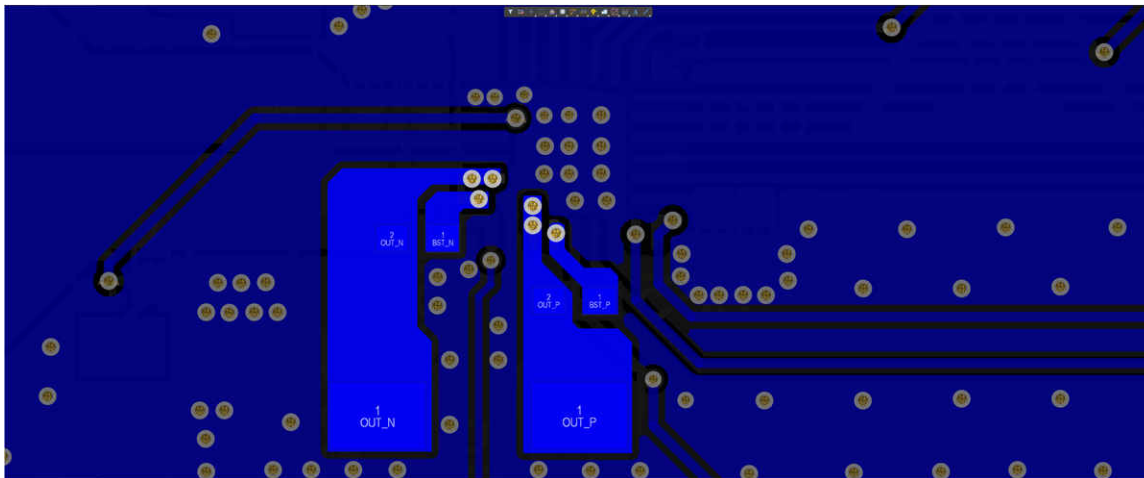


Figure 7-3. Bootstrap and Outputs Layout

8 EVM Schematics

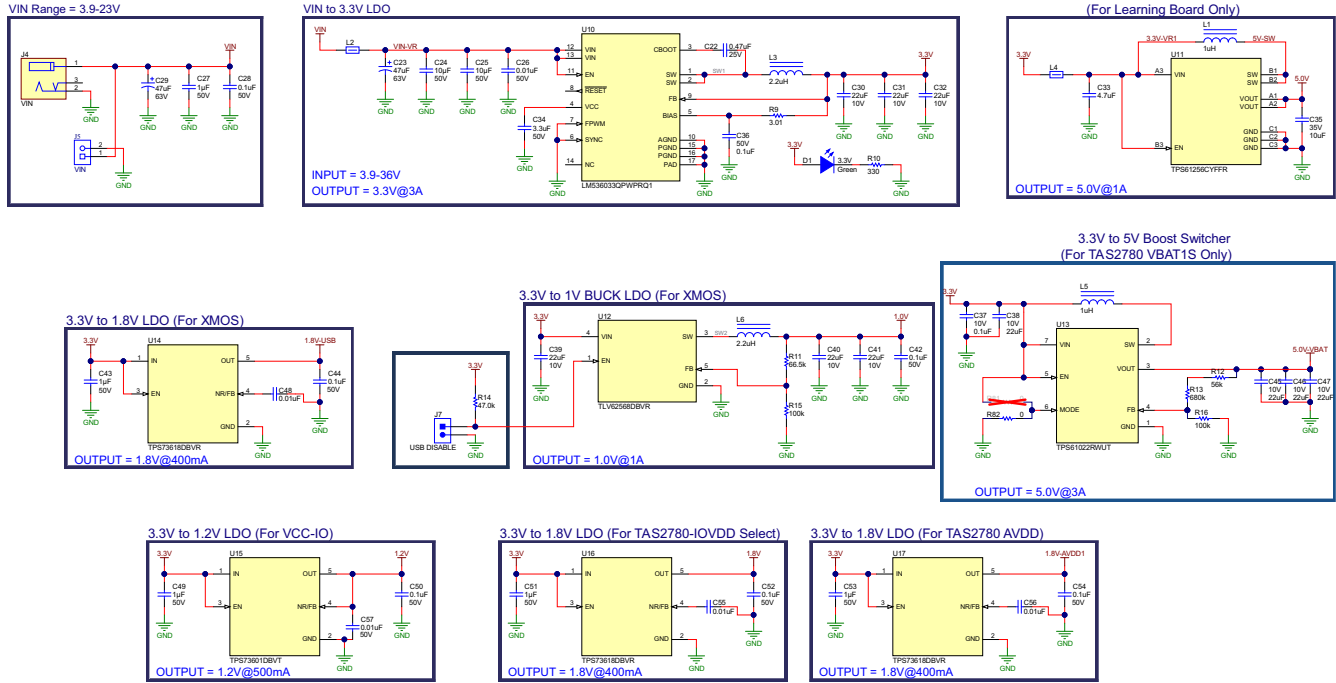


Figure 8-1. TAS2780EVM Schematic (Sheet 1 of 7)

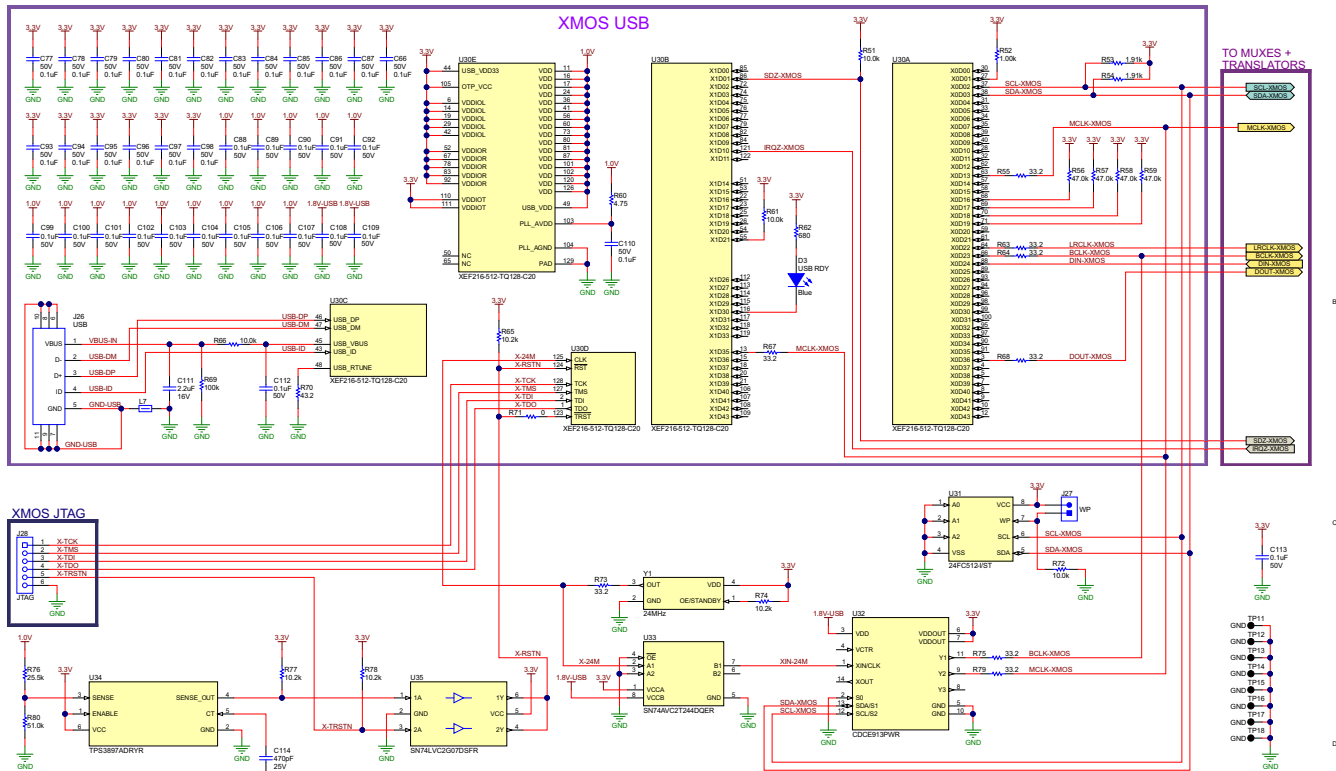


Figure 8-2. TAS2780EVM Schematic (Sheet 2 of 7)

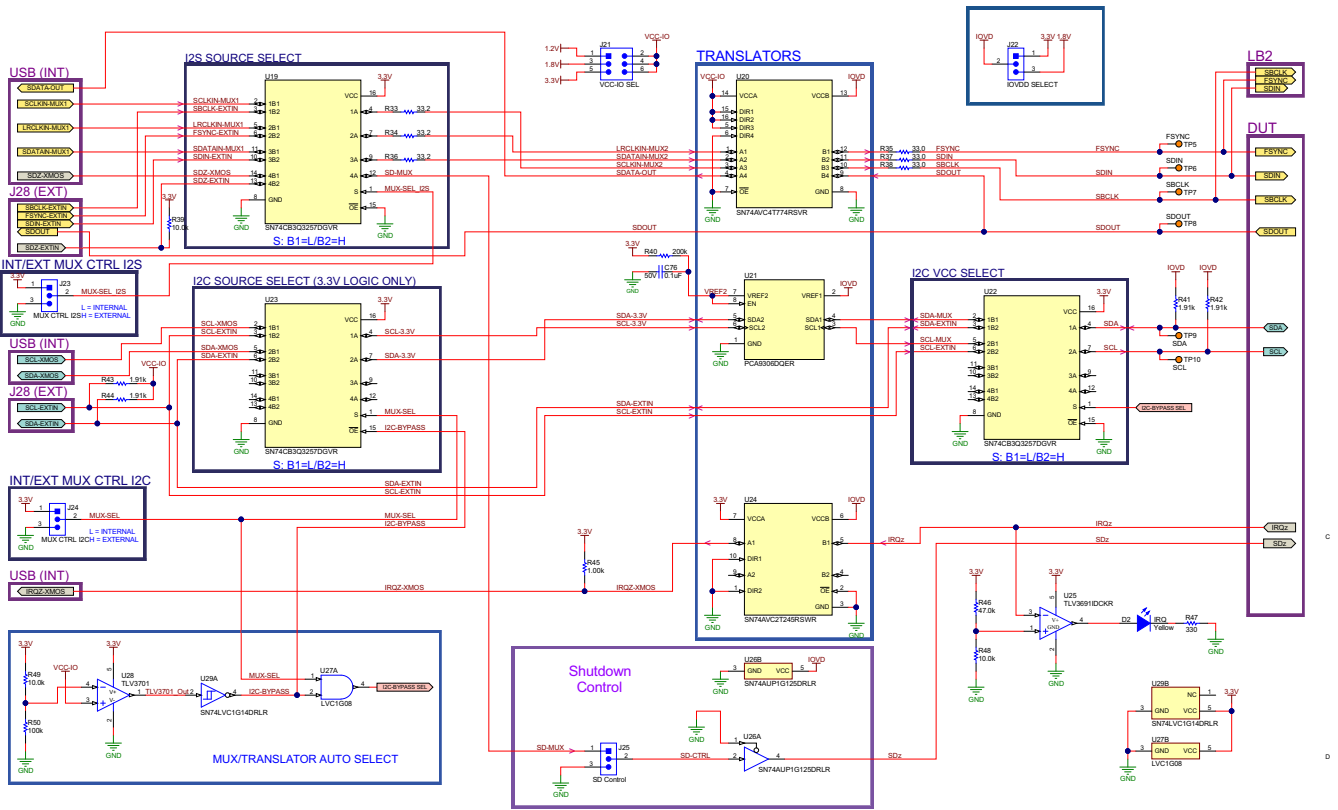


Figure 8-3. TAS2780EVM Schematic (Sheet 3 of 7)

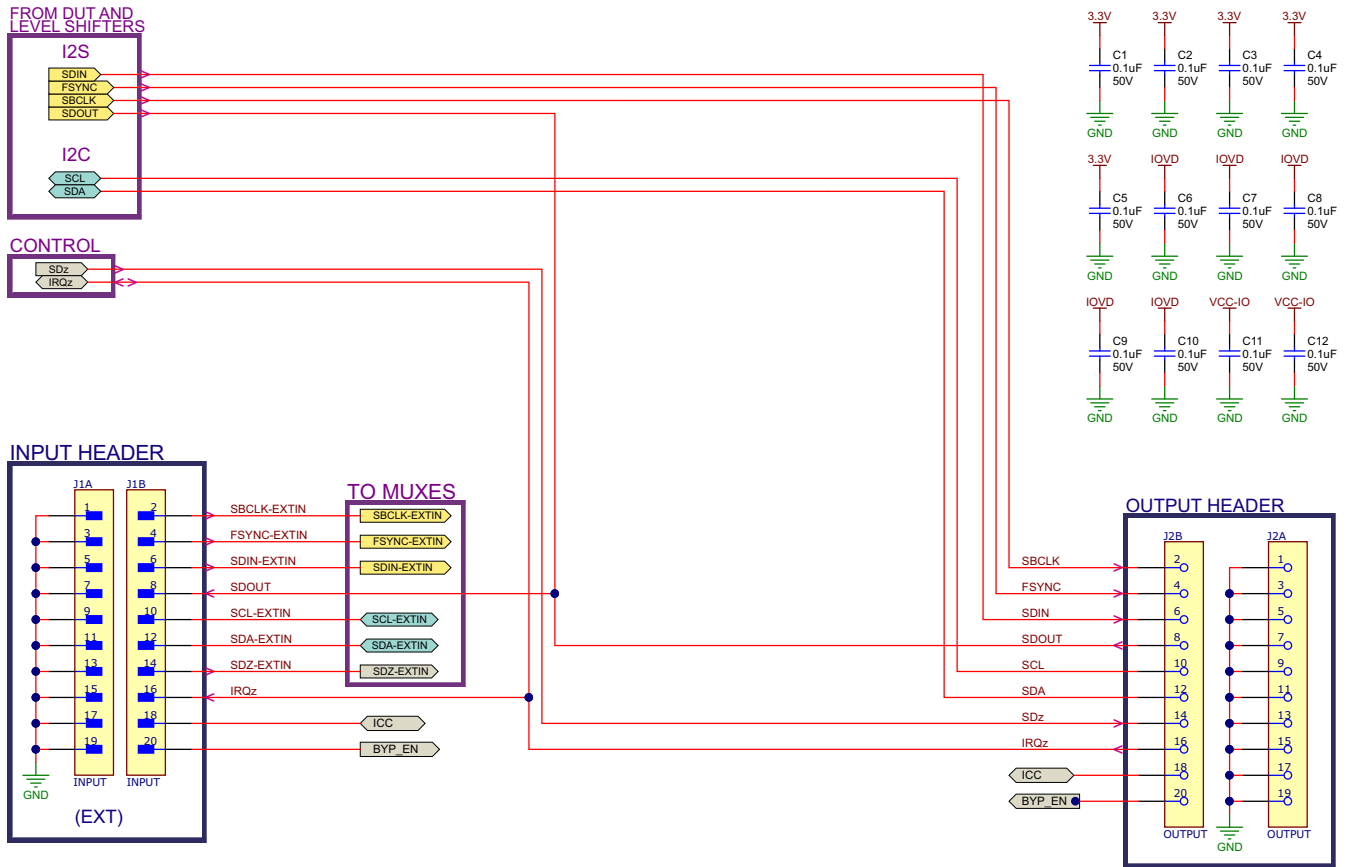


Figure 8-4. TAS2780EVM Schematic (Sheet 4 of 7)

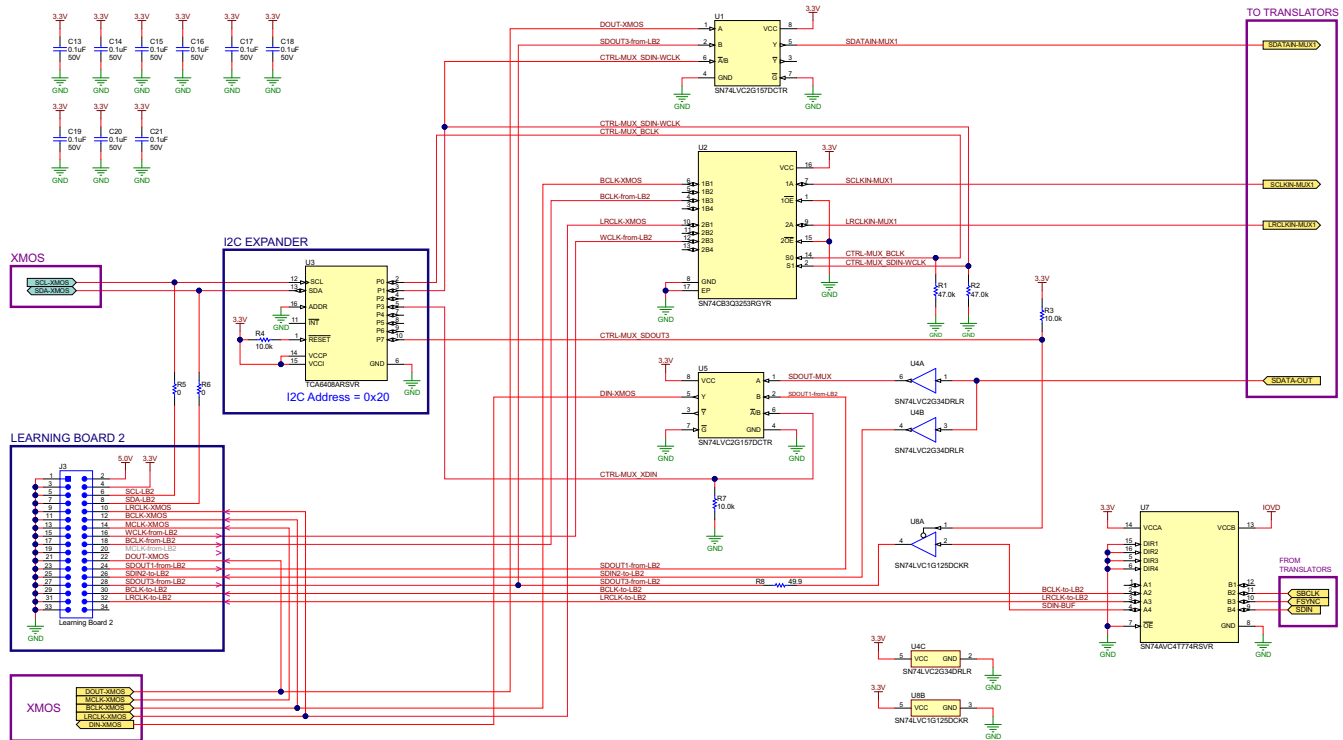


Figure 8-5. TAS2780EVM Schematic (Sheet 5 of 7)

2-Pin Headers to handle the PVDD and VBAT1S max current

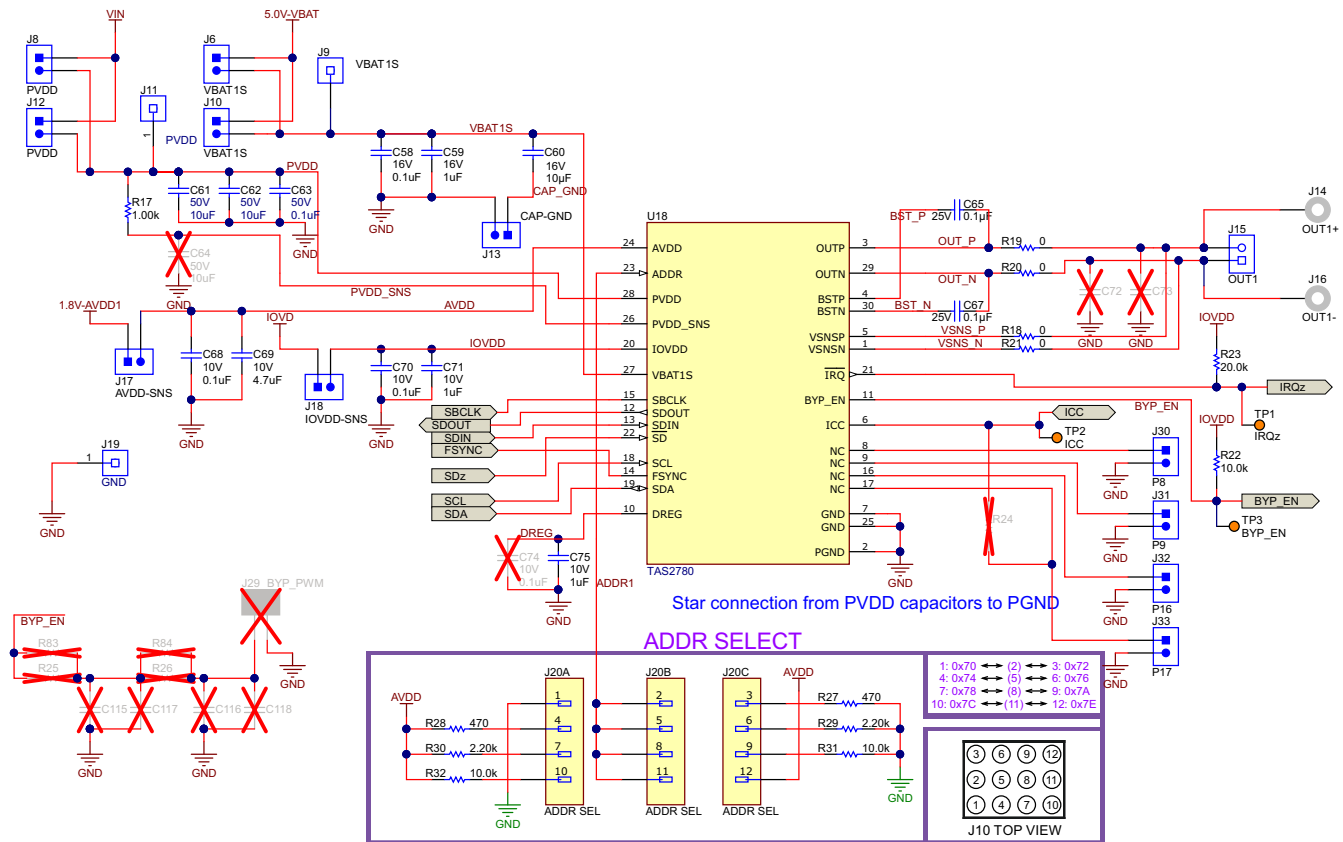


Figure 8-6. TAS2780EVM Schematic (Sheet 6 of 7)

9 EVM Layer Plots

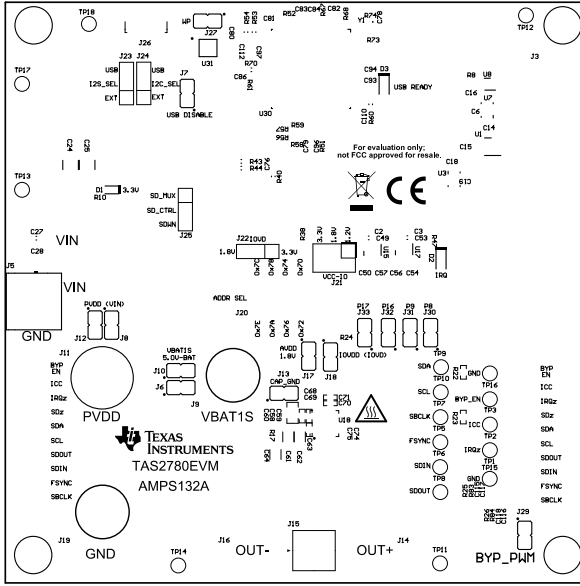


Figure 9-1. TAS2780EVM Top Overlay

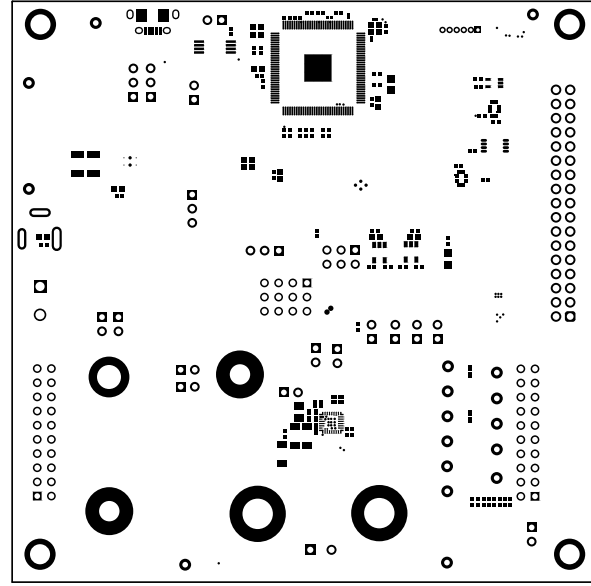


Figure 9-2. TAS2780EVM Top Solder Mask

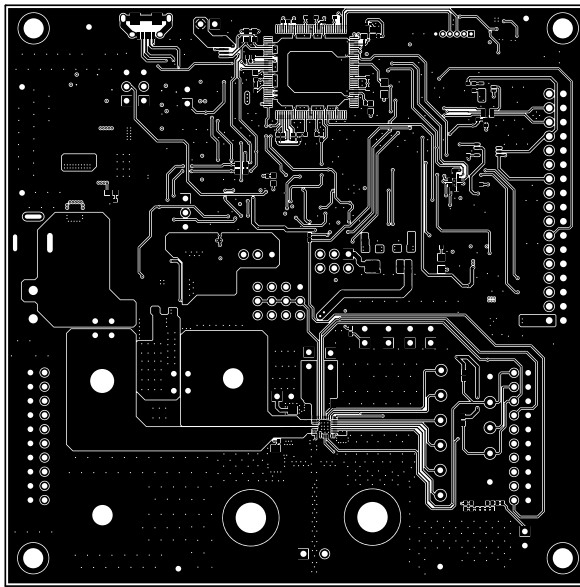


Figure 9-3. TAS2780EVM Top Layer

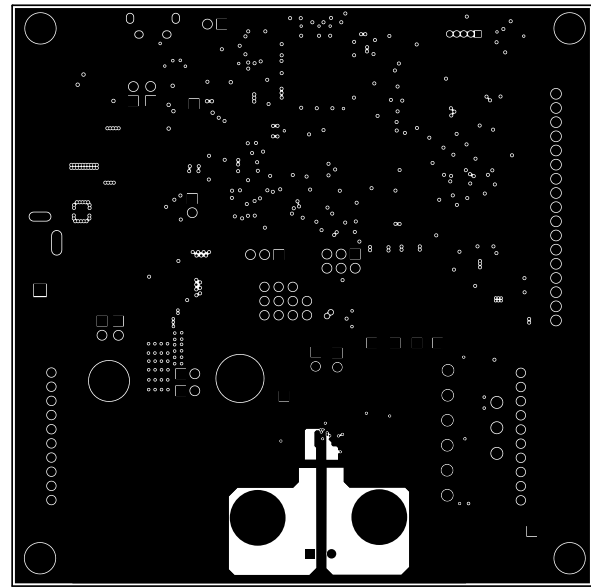


Figure 9-4. TAS2780EVM Signal Layer 1

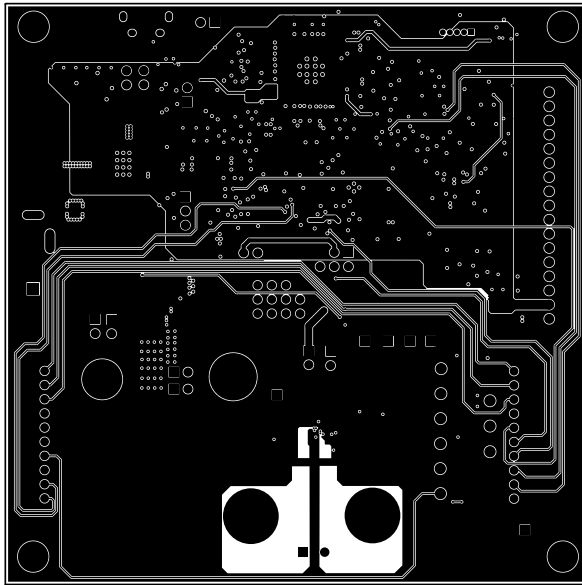


Figure 9-5. TAS2780EVM Signal Layer 2

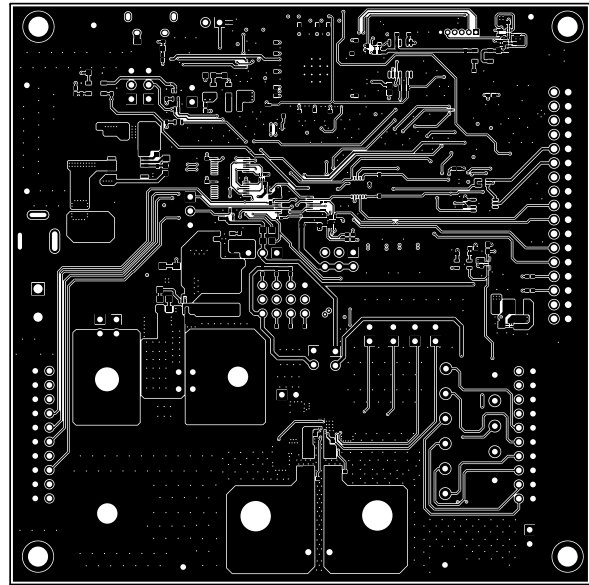


Figure 9-6. TAS2780EVM Bottom Layer

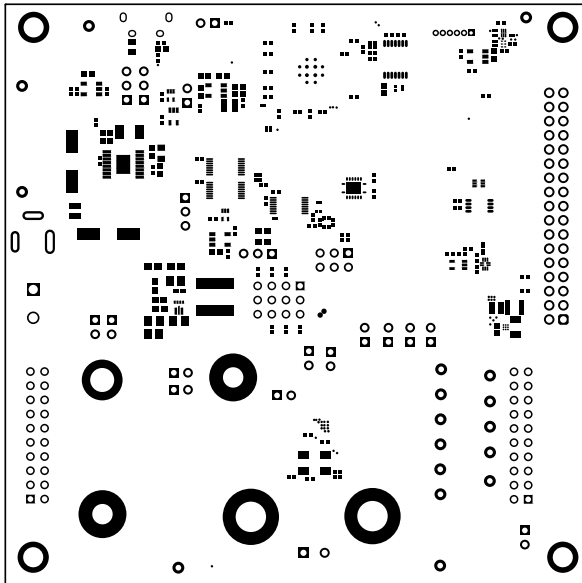


Figure 9-7. TAS2780EVM Bottom Solder Mask

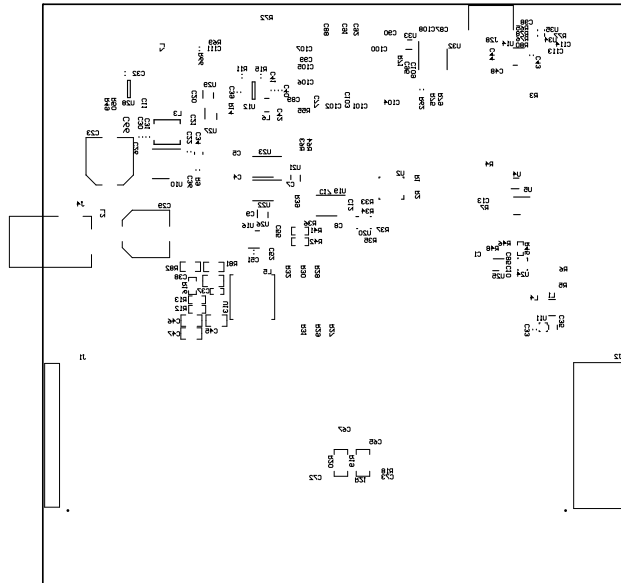


Figure 9-8. TAS2780EVM Bottom Overlay

10 Bill of Materials

Table 10-1. TAS2780EVM Bill of Materials

Designator	Quantity	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
!PCB1	1	Printed Circuit Board		AMPS132	Any		
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C28, C36, C42, C44, C50, C52, C54, C63, C66, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100, C101, C102, C103, C104, C105, C106, C107, C108, C109, C110, C112, C113	67	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0402	0402	C1005X7R1H104K050BB	TDK		
C22	1	CAP, CERM, 0.47 uF, 25 V, +/- 10%, X7R, 0603	0603	GRM188R71E474KA12D	MuRata		
C23, C29	2	CAP, AL, 47 uF, 63 V, +/- 20%, 0.65 ohm, AEC-Q200 Grade 2, SMD	SMT Radial F	EEE-FK1J470P	Panasonic		
C24, C25	2	CAP, CERM, 10 uF, 50 V, +/- 20%, JB, 1210	1210	C3225JB1H106M250AB	TDK		
C26, C48, C55, C56, C57	5	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	CGA2B3X7R1H103K050BB	TDK		
C27, C43, C49, C51, C53	5	CAP, CERM, 1 uF, 50 V, +/- 20%, X5R, AEC-Q200 Grade 3, 0603	0603	CGA3E3X5R1H105M080AB	TDK		
C30, C31, C32, C39, C40, C41	6	CAP, CERM, 22 uF, 10 V, +/- 20%, X5R, 0603	0603	C1608X5R1A226M080AC	TDK		
C33	1	CAP, CERM, 4.7 uF, 16 V, +/- 10%, X5R, 0603	0603	GRM188R61C475KAAJ	MuRata		
C34	1	CAP, CERM, 3.3 uF, 50 V, +/- 10%, X5R, 0805	0805	C2012X5R1H335K125AB	TDK		
C35	1	CAP, CERM, 10 uF, 35 V, +/- 10%, X7R, 1206_190	1206_190	GMK316AB7106KL-TR	Taiyo Yuden		
C37	1	CAP, CERM, 0.1 uF, 10 V, +/- 10%, X5R, 0402	0402	GRM155R61A104KA01D	MuRata		
C38, C45, C46, C47	4	CAP, CERM, 22 uF, 10 V, +/- 20%, X5R, 0805	0805	GRM21BR61A226ME44L	MuRata		
C58	1	CAP, CERM, 0.1 uF, 16 V, +/- 10%, Unknown, 0402	0402	550L104KCAT	AT Ceramics		
C59	1	CAP, CERM, 1 uF, 16 V, +/- 10%, X5R, 0402	0402	C1005X5R1C105K050BC	TDK		
C60	1	CAP, CERM, 10 uF, 16 V, +/- 10%, X7R, 0805	0805	CL21B106KOQNNNE	Samsung Electro-Mechanics		
C61, C62	2	CAP, CERM, 10 uF, 50 V, +/- 10%, X7R, 1206	1206	CL31B106KBHNNNE	Samsung		
C65, C67	2	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	0402	CGA2B3X7R1E104K050BB	TDK		
C68, C70	2	CAP, CERM, 0.1 uF, 10 V, +/- 10%, X7R, 0402	0402	GRM155R71A104KA01D	MuRata		
C69	1	CAP, CERM, 4.7 uF, 10 V, +/- 20%, X5R, 0402	0402	GRM155R61A475M	MuRata		

Table 10-1. TAS2780EVM Bill of Materials (continued)

Designator	Quantity	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
C71, C75	2	CAP, CERM, 1 uF, 10 V,+/- 10%, X6S, 0402	0402	GRM155C81A105KA12D	MuRata		
C111	1	CAP, CERM, 2.2 uF, 16 V,+/- 10%, X7R, 0603	0603	EMK107BB7225MA-T	Taiyo Yuden		
C114	1	CAP, CERM, 470 pF, 25 V, +/- 5%, COG/NP0, 0402	0402	GRM1555C1E471JA01D	MuRata		
D1	1	LED, Green, SMD	LED_0603	LTST-C191KGKT	Lite-On		
D2	1	LED, Yellow , SMD	0805 LED	LTST-C170KSKT	Lite-On		
D3	1	LED, Blue, SMD	LED_0805	LTST-C170TBKT	Lite-On		
H1, H2, H3, H4	4	MACHINE SCREW PAN PHILLIPS M3	M3 Screw	RM3X8MM 2701	APM HEXSEAL		
H5, H6, H7, H8	4	Standoff, Hex,25 mm Length, M3, Aluminum	Standoff M3	24438	Keystone		
J1	1		HDR20	TSW-110-08-G-D-RA	Samtec		
J2	1	20 Position Receptacle Connector Through Hole, Right Angle	HDR20	SSQ-110-02-G-D-RA	SAMTEC		
J3	1	Header(shrouded), 2.54 mm, 17x2, Gold, TH	Header(shrouded) , 2.54mm, 17x2, TH	302-S341	On-Shore Technology		
J4	1	Power Jack, mini, 2.5 mm OD, R/A, TH	Jack, 14.5x11x9mm	RAPC712X	Switchcraft		
J5	1	Terminal Block, 5.08 mm, 2x1, TH	Terminal Block, 5.08mm, 2x1, TH	0395443002	Molex		
J6, J7, J8, J10, J12, J13, J17, J18, J27, J30, J31, J32, J33	13	Header, 100 mil, 2x1, Gold, TH	Sullins 100 mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
J9	1	Binding Post, RED, TH	11.4x27.2mm	7006	Keystone		
J11	1	Binding Post, Bright Tin, Green, TH	Binding Post, Bright Tin, Green, TH	3760-5	Pomona Electronics		
J14, J16	2	Standard Banana Jack, Uninsulated, 5.5mm	Keystone_575-4	575-4	Keystone		
J15	1	Conn Term Block, 2POS, 3.81 mm, TH	2POS Terminal Block	1727010	Phoenix Contact		
J19	1	Binding Post, BLACK, TH	11.4x27.2 mm	7007	Keystone		
J20	1		HDR12	TSW-104-07-G-T	Samtec		
J21	1	Header, 100 mil, 3x2, Tin, TH	3x2 Header	PEC03DAAN	Sullins Connector Solutions		
J22, J23, J24, J25	4	Header, 100 mil, 3x1, Gold, TH	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions		
J26	1	Connector, Receptacle, Micro-USB Type AB, R/A, Bottom Mount SMT	Connector, USB Micro AB	DX4R205JJAR1800	JAE Electronics		
J28	1	Receptacle, 50 mil, 6x1, Gold, R/A, TH	6x1 Receptacle	LPPB061NGCN-RC	Sullins Connector Solutions		
L1	1	Inductor, Flat Wire, 1 uH, 3.1 A, 0.045 ohm, SMD	3.2x1.2x2.5 mm	1277AS-H-1R0M=P2	MuRata Toko		
L2, L4	2	Ferrite Bead, 300 ohm @ 100 MHz, 3.1 A, 0806	0806	NFZ2MSM301SN10L	MuRata		
L3	1	Inductor, Shielded, 2.2 uH, 4 A, 0.061 ohm, AEC-Q200 Grade 0, SMD	4.45x1.8x4.06 mm	SRP4020TA-2R2M	Bourns		
L5	1	Inductor, Shielded, Composite, 1 uH, 21.8 A, 0.00455 ohm, SMD	XAL7030	XAL7030-102MEB	Coilcraft		

Table 10-1. TAS2780EVM Bill of Materials (continued)

Designator	Quantity	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
L6	1	Inductor, Multilayer, Ferrite, 2.2 uH, 1.3 A, 0.08 ohm, SMD	SMD, Body 2.5x2 mm, Height 1.2 mm	LQM2HPN2R2MG0L	MuRata		
L7	1	Ferrite Bead, 30 ohm @ 100 MHz, 6 A, 0805	0805	MPZ2012S300AT000	TDK		
R1, R2, R14, R46, R56, R57, R58, R59	8	RES, 47.0 k, 1%, 0.0625 W, 0402	0402	RC0402FR-0747KL	Yageo America		
R3, R4, R7, R22, R31, R32, R39, R48, R51, R61, R66	11	RES, 10.0 k, 1%, 0.063 W, 0402	0402	RC0402FR-0710KL	Yageo America		
R5, R6, R18, R21, R71	5	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GE0R00X	Panasonic		
R8	1	RES, 49.9, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT49R9	Stackpole Electronics Inc		
R9	1	RES, 3.01, 1%, 0.1 W, 0603	0603	RC0603FR-073R01L	Yageo		
R10, R47	2	RES, 330, 1%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2RKF3300X	Panasonic		
R11	1	RES, 66.5 k, 1%, 0.1 W, 0603	0603	RC0603FR-0766K5L	Yageo		
R12	1	RES, 56 k, 5%, 0.1 W, 0603	0603	RC0603JR-0756KL	Yageo		
R13	1	RES, 680 k, 1%, 0.1 W, 0603	0603	RC0603FR-07680KL	Yageo		
R15	1	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100KL	Yageo		
R16	1	RES, 100 k, 1%, 0.1 W, 0603	0603	CRCW0603100KFKEA	Vishay-Dale		
R17, R45, R52	3	RES, 1.00 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1001X	Panasonic		
R19, R20	2	RES, 0, 5%, 0.25 W, 1206	1206	RC1206JR-070RL	Yageo America		
R23	1	RES, 20.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040220K0FKED	Vishay-Dale		
R27, R28	2	RES, 470, 1%, 0.063 W, 0402	0402	RC0402FR-07470RL	Yageo America		
R29, R30	2	RES, 2.20 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF2201X	Panasonic		
R33, R34, R36, R55, R63, R64, R67, R68, R73, R75, R79	11	RES, 33.2, 1%, 0.05 W, 0201	0201	RC0201FR-0733R2L	Yageo America		
R35, R37, R38	3	RES, 33.0, 1%, 0.1 W, 0402	0402	ERJ-2RKF33R0X	Panasonic		
R40	1	RES, 200 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603200KFKEA	Vishay-Dale		
R41, R42, R43, R44, R53, R54	6	RES, 1.91 k, 1%, 0.1 W, 0603	0603	RC0603FR-071K91L	Yageo		
R49	1	RES, 10.0 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1002X	Panasonic		
R50, R69	2	RES, 100 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1003X	Panasonic		
R60	1	RES, 4.75, 1%, 0.1 W, 0603	0603	RC0603FR-074R75L	Yageo		
R62	1	RES, 680, 1%, 0.1 W, 0603	0603	RC0603FR-07680RL	Yageo		
R65, R74, R77, R78	4	RES, 10.2 k, 1%, 0.05 W, 0201	0201	RC0201FR-0710K2L	Yageo America		

Table 10-1. TAS2780EVM Bill of Materials (continued)

Designator	Quantity	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
R70	1	RES, 43.2, 1%, 0.1 W, 0603	0603	RC0603FR-0743R2L	Yageo		
R72	1	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	RMCF0402FT10K0	Stackpole Electronics Inc		
R76	1	RES, 25.5 k, 1%, 0.05 W, 0201	0201	RC0201FR-0725K5L	Yageo America		
R80	1	RES, 51.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0751K1L	Yageo America		
R82	1	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEY0R00V	Panasonic		
SH1, SH2, SH3, SH4, SH5, SH6, SH7, SH8, SH9, SH10, SH11, SH12, SH13, SH14, SH15, SH16, SH17, SH18, SH19	19	Shunt, 100 mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-000 0-DA	3M
TP1, TP2, TP3, TP5, TP6, TP7, TP8, TP9, TP10	9	Test Point, Miniature, Orange, TH	Orange Miniature Testpoint	5003	Keystone		
TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18	8	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone		
U1, U5	2	Single 2-Line to 1-Line Data Selector/Multiplexer, DCT0008A, LARGE T&R	DCT0008A	SN74LVC2G157DCTR	Texas Instruments	SN74LVC2G157DCUT	Texas Instruments
U2	1	Dual 1-of-4 FET Multiplexer/Demultiplexer 2.5-V/3.3-V Low-Voltage High-Bandwidth Bus Switch, RGY0016A (VQFN-16)	RGY0016A	SN74CB3Q3253RGYR	Texas Instruments		Texas Instruments
U3	1	Low-Voltage 8-Bit I2C and SMBus I/O Expander, 1.65 to 5.5 V, -40 to 85 degC, 16-pin UQFN (RSV), Green (RoHS & no Sb/Br)	RSV0016A	TCA6408ARSVR	Texas Instruments		
U4	1	Dual Buffer Gate, DRL0006A, LARGE T&R	DRL0006A	SN74LVC2G34DRLR	Texas Instruments		Texas Instruments
U7, U20	2	4-Bit Dual-Supply Bus Transceiver With Configurable Voltage-Level Shifting and 3-State Outputs, RSV0016A (UQFN-16)	RSV0016A	SN74AVC4T774RSVR	Texas Instruments		Texas Instruments
U8	1	Single Bus Buffer Gate With 3-State Outputs, DCK0005A, LARGE T&R	DCK0005A	SN74LVC1G125DCKR	Texas Instruments		
U10	1	3.5 to 36 Vin, 3 Ampere Synchronous DC-DC Converter for Automotive Applications, PWP0016D (TSSOP-16)	PWP0016D	LM536033QPWPRQ1	Texas Instruments	LM536033QPWPTQ1	Texas Instruments
U11	1	3.5-MHz High Efficiency Step-Up Converter in Chip Scale Package, YFF0009ACAG (DSBGA-9)	YFF0009ACAG	TPS61256CYFFR	Texas Instruments	TPS61256CYFFT	Texas Instruments
U12	1	1-A High Efficiency Step-Down Converter in SOT23-5 Package, DBV005A, DBV0005A (SOT-5)	DBV005A	TLV62568DBVR	Texas Instruments	TLV62568DBVT	Texas Instruments

Table 10-1. TAS2780EVM Bill of Materials (continued)

Designator	Quantity	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
U13	1	8-A Boost Converter with 0.5-V Ultra-Low Input Voltage, RWU0007A (VQFN-HR-7)	RWU0007A	TPS61022RWUT	Texas Instruments	TPS61022R WUR	Texas Instruments
U14, U16, U17	3	Single Output LDO, 400 mA, Adj.(1.2 to 5.5 V), Cap free, Low Noise, Reverse Current Protection, DBV0005A (SOT-23-5)	DBV0005A	TPS73618DBVR	Texas Instruments		
U15	1	Single Output LDO, 400mA, Adj.(1.2 to 5.5V), Cap free, Low Noise, Reverse Current Protection, DBV0005A (SOT-23-5)	DBV0005A	TPS73601DBVT	Texas Instruments		
U18	1	TAS2780	VQFN-HR30	TAS2780	Texas Instruments		
U19, U22, U23	3	4-Bit One-of-2 FET Multiplexer/Demultiplexer 2.5-V/3.3-V Low-Voltage, High-Bandwidth Bus Switch, DGV0016A (TVSOP-16)	DGV0016A	SN74CB3Q3257DGVR	Texas Instruments		Texas Instruments
U21	1	Dual Bi-Directional I2C-Bus and SMBus Voltage Level-Translator, 0 to 5.5 V, -40 to 85 degC, 8-pin X2SON (DQE), Green (RoHS & no Sb/Br)	DQE0008A	PCA9306DQER	Texas Instruments		
U24	1	Dual-Bit, 2-DIR pin Dual-Supply Bus Transceiver w/ Configurable Voltage Translation, 3-State Output, UQFN-10, RSW0010A (UQFN-10)	RSW0010A	SN74AVC2T245RSWR	Texas Instruments		Texas Instruments
U25	1	0.9 V to 6.5 V, Nano-Power Comparator, DCK0005A (SOT-SC70-5)	DCK0005A	TLV3691IDCKR	Texas Instruments	TLV3691IDC KT	Texas Instruments
U26	1	Low-Power Single Bus Buffer Gate with 3-State Output, DRL0005A, LARGE T&R	DRL0005A	SN74AUP1G125DRLR	Texas Instruments		Texas Instruments
U27	1	Single 2-Input Positive-AND Gate, DCK0005A, LARGE T&R	DCK0005A	SN74LVC1G08DCKR	Texas Instruments		
U28	1	Single Nanopower Push-Pull Comparator, DBV0005A (SOT-23-5)	DBV0005A	TLV3701IDBVR	Texas Instruments	TLV3701IDB VT	Texas Instruments
U29	1	Single Schmitt-Trigger Inverter, DRL0005A, LARGE T&R	DRL0005A	SN74LVC1G14DRLR	Texas Instruments		Texas Instruments
U30	1	IC MCU 512KB RAM, 128TQFP	TQFP-128	XEF216-512-TQ128-C20	XMOS semiconductor		
U31	1	512K I2C Serial EEPROM, TSSOP	TSSOP-8	24FC512-I/ST	Microchip		
U32	1	Programmable 1-PLL VCXO Clock Synthesizer with 2.5-V or 3.3-V LVCMOS Outputs, PW0014A (TSSOP-14)	PW0014A	CDCE913PWR	Texas Instruments	CDCE913P W	Texas Instruments
U33	1	Dual-Bit Dual-Supply Bus Transceiver, DQE0008A, LARGE T&R	DQE0008A	SN74AVC2T244DQER	Texas Instruments		

Table 10-1. TAS2780EVM Bill of Materials (continued)

Designator	Quantity	Description	Package Reference	PartNumber	Manufacturer	Alternate PartNumber	Alternate Manufacturer
U34	1	Single-Channel Ultra-Small Adjustable Supervisory Circuit With Active-High Open-Drain Output, DRY0006A (USON-6)	DRY0006A	TPS3897ADRYR	Texas Instruments		
U35	1	Enhanced Product Dual Buffer/Driver with Open-Drain Output, DCK0006A (SOT-SC70-6)	DSF0006A	SN74LVC2G07DSFR	Texas Instruments		
Y1	1	OSC, 24 MHz, 2.25 - 3.63 V, SMD	2x1.6 mm	ASTMLPA-24.000MHZ-EJ-E-T	Abracon Corporation		
C64	0	CAP, CERM, 10 uF, 50 V, +/- 10%, X7R, 1206	1206	CL31B106KBHNNNE	Samsung		
C72, C73, C74, C115, C116, C117, C118	0	CAP, CERM, 0.1 uF, 10 V, +/- 10%, X7R, 0402	0402	GRM155R71A104KA01D	MuRata		
J29	0	Header, 100 mil, 2x1, Gold, TH	Sullins 100 mil, 1x2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
R24, R25, R26, R83, R84	0	RES, 20.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040220K0FKED	Vishay-Dale		
R81	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3GEY0R00V	Panasonic		

11 Revision History

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

Changes from Revision * (October 2021) to Revision A (November 2021)

Page

- Updated link to TAS2780 product page..... 5

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.
 - 1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductor products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software
 - 1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.
2. *Limited Warranty and Related Remedies/Disclaimers:*
 - 2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
 - 2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.
 - 2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

<https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html>

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・イ

ンスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

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3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。 <https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html>

3.4 European Union

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):*

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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- 4 *EVM Use Restrictions and Warnings:*
 - 4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.
 - 4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.
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