TAS5431-Q1EVM User's Guide

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1 Introduction

TheTAS5431-Q1 evaluation module (EVM) is intended to demonstrate the capabilities of the TAS5431-Q1 device. All the device features can be accessed through the hardware and the software graphical user interface (GUI) which is supplied. This user's guide contains a description of the EVM and the GUI. The schematic, bill of materials (BOM), and board layout are included.
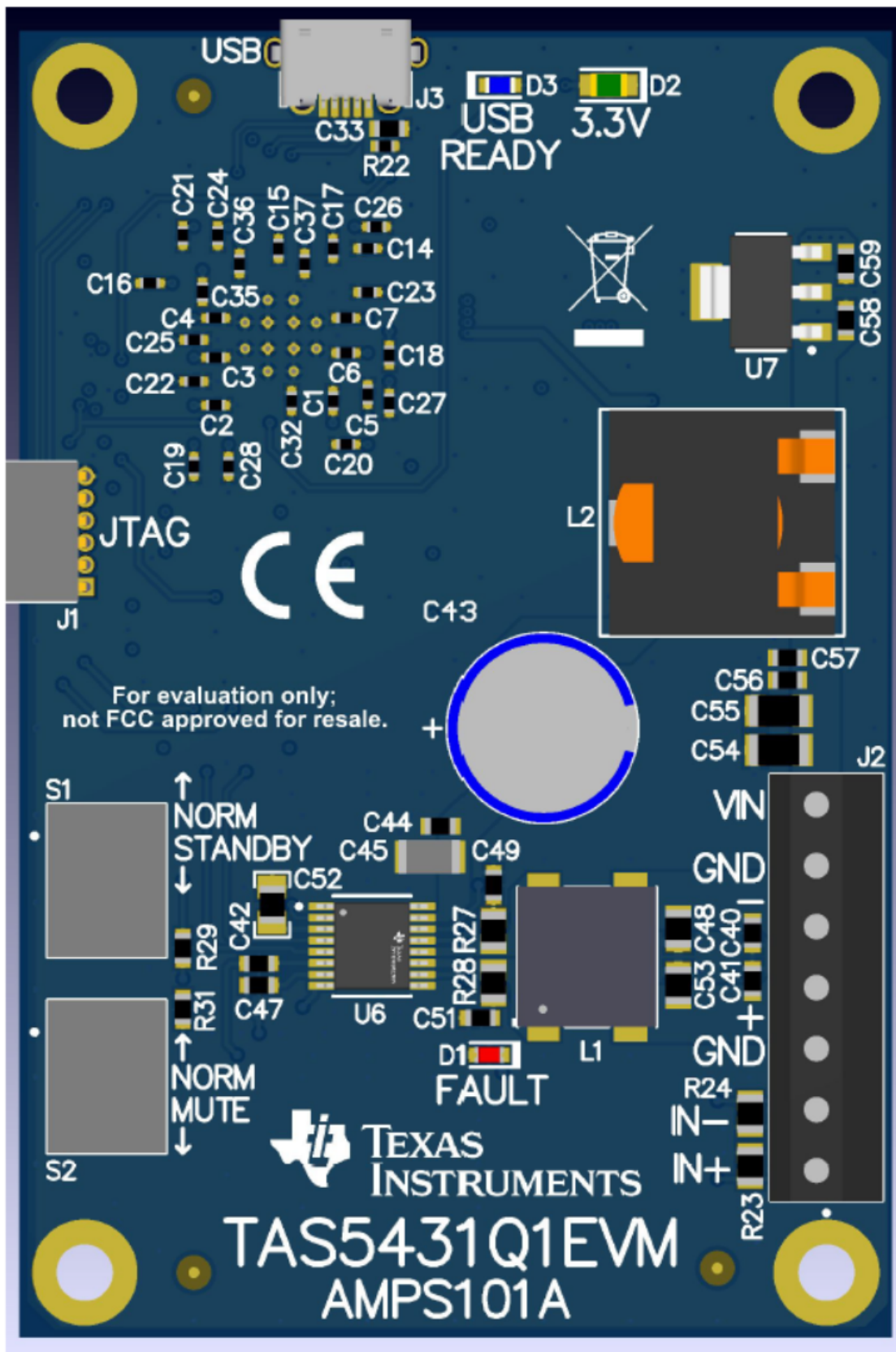
Figure 1. TAS5431-Q1 EVM

1.1 Features

- Runs without I2C initialization
- Has a control GUI via USB

1.2 Description

The TAS5431Q1EVM showcases the TI TAS5431-Q1 analog input class-D closed-loop mono amplifier. The EVM is usable as stand-alone platform with default I^{2}C register settings. The EVM runs in default I2C register settings, without the need of initialization The EVM can also work with the Purepath™ Console (PPC3) graphical user interface plug-in for programming the I2C register settings.

2 Settings Via I^{2}C

The default values in the I2C registers may not be appropriate for your system design. Use the PPC3 user interface to change the register settings to meet the system needs.

2.1 TAS5431-Q1 Gain

The gain setting for the device is I2C programmable. The four gain options are 20 dB, 26 dB, 32 dB, and 36 dB. Set the gain by modifying I2C control register 0x03. By default, the gain is 26 dB.

2.2 TAS5431-Q1PWM Switching Frequencies

The PWM switching frequency is I2C programmable. The two $f_{(SW)}$ options are 400 kHz and 500 kHz. Programming the frequency in control register 0x03 is via the GUI. By default, $f_{(SW)}$ is 400 kHz.

2.3 TAS5431-Q1SpeakerGuard™ Protection Circuitry

The SpeakerGuard™ protection circuitry is programmable for different voltage levels. Programming the levels in control register 0x03 via the PPC3 GUI. The control register shows the default value for the SpeakerGuard protection-circuitry voltage level.

Table 1. Control Register

D7	D6	D5	D4	D3	D2	D1	D0	Function
0	1	1	1	1	0	0	0	26dB gain, $f_{(sw)}$ set to 400 kHz, SpeakerGuard protection circuitry is set to maximum voltage
-	-	-	-	-	-	-	1	$f_{(sw)}$ set to 500 kHz
-	-	-	-	-	1	1	-	RESERVED
-	-	1	1	0	-	-	-	SpeakerGuard protection circuitry is set to 14 Vpeak output
-	-	1	0	1	-	-	-	SpeakerGuard protection circuitry is set to 11.8 Vpeak output
-	-	1	0	0	-	-	-	SpeakerGuard protection circuitry is set to 9.8 Vpeak output
-	-	0	1	1	-	-	-	SpeakerGuard protection circuitry is set to 8.4 Vpeak output
-	-	0	1	0	-	-	-	SpeakerGuard protection circuitry is set to 7V peak output
-	-	0	0	1	-	-	-	SpeakerGuard protection circuitry is set to 5.9 Vpeak output
-	-	0	0	1	-	-	-	SpeakerGuard protection circuitry is set to 5 Vpeak output
0	0	-	-	-	-	-	-	Set Gain to 20 dB
0	1	-	-	-	-	-	-	Set Gain to 32 dB
1	1	-	-	-	-	-	-	Set Gain to 36 dB

3   TAS5431Q1 EVM Setup

Hardware requirements

- Computer running Windows 7, 8, or 10
- Power supply: 5–18 VDC
- Speakers and cable (not-provided)
- USB cable (not-provided)
- Audio source: Differential audio source preferred, single ended input can be used.

4   Software Overview

4.1   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 install file. After login, the user will see a webpage with a list of software products available for download. Access the PurePath Console software and download it. Run the install program. Also, download the PPC3 User Manual (SLOU408). After signing into the PPC3, the user will see the Home Window, similar to the one shown in Figure 2

The proper plug-in needs to be installed. Click on the TAS5431 and TAS5441 box. The installation window pops up, then click "Install". It shows that it is loading.
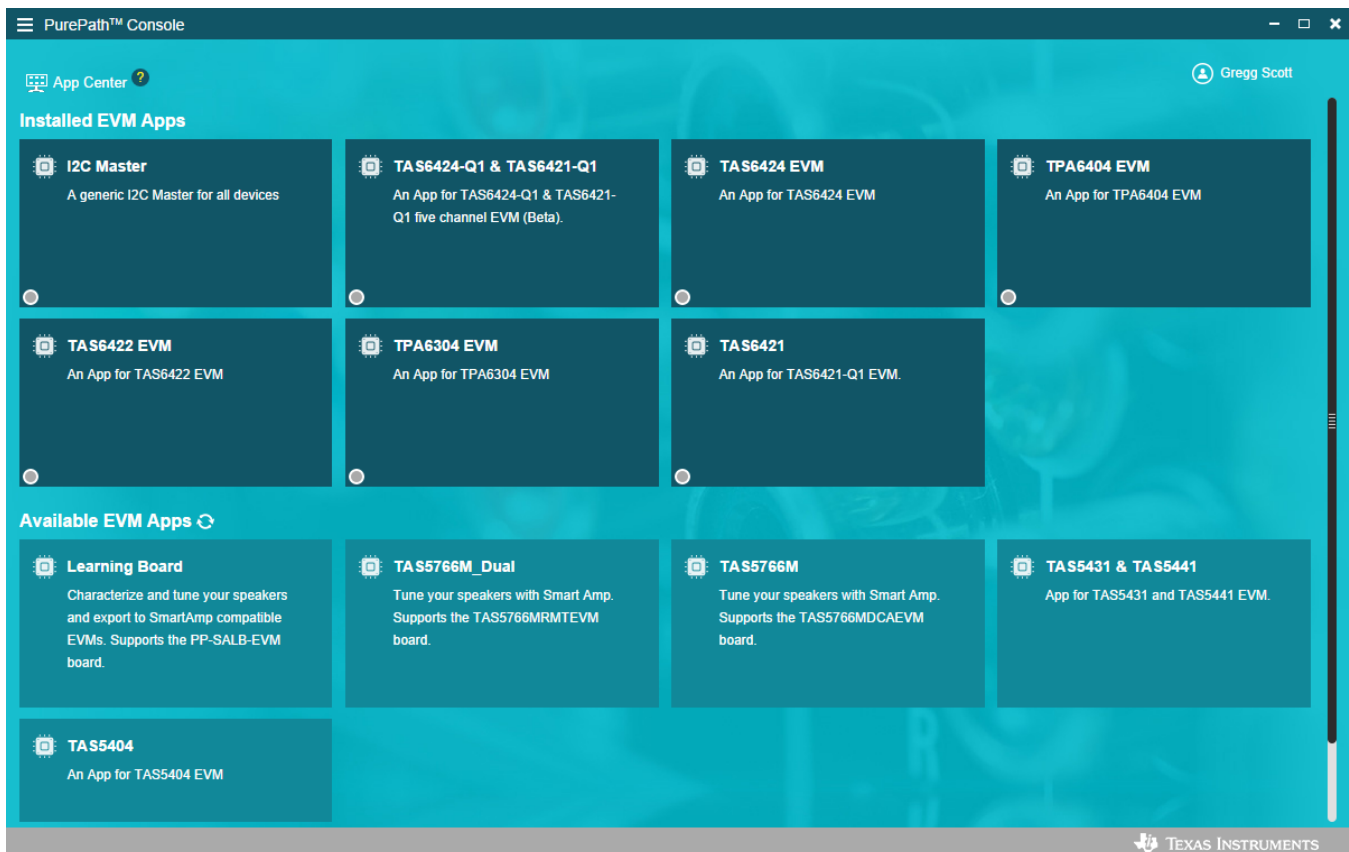

Figure 2. PPC3 Window

The TAS5431 and TAS5441 box moves to the Installed Apps section. Click on the box and the plugin loads.
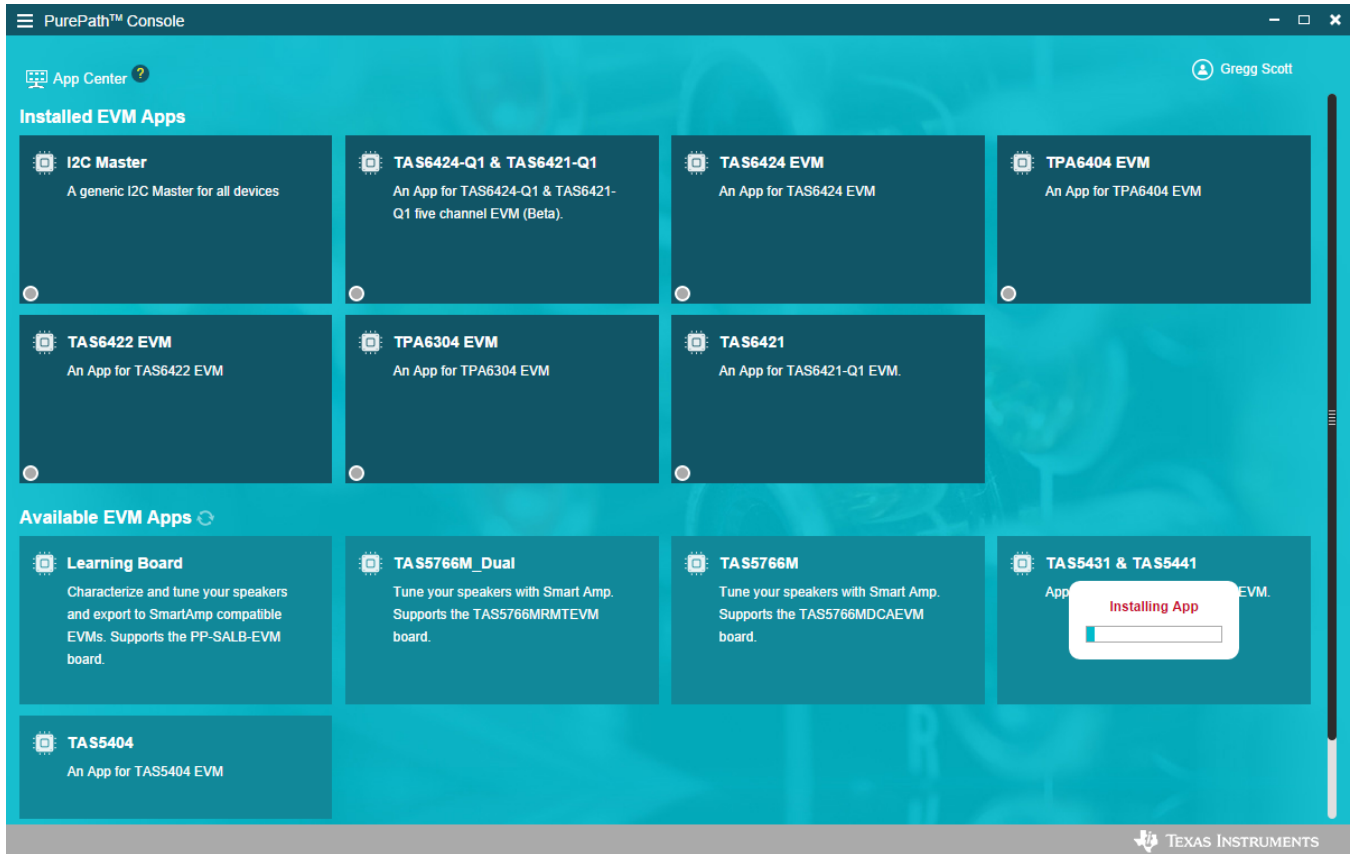

Figure 3. Installing the Plug-in or App

4.2 Using the PPC3 Plugin

When the TAS5431 and TAS5441 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 displays "Connect" box in the bottom left hand corner. If the EVM is not powered on or the USB is not connected, only "TAS5431 and TAS5441 – Offline" is displayed.
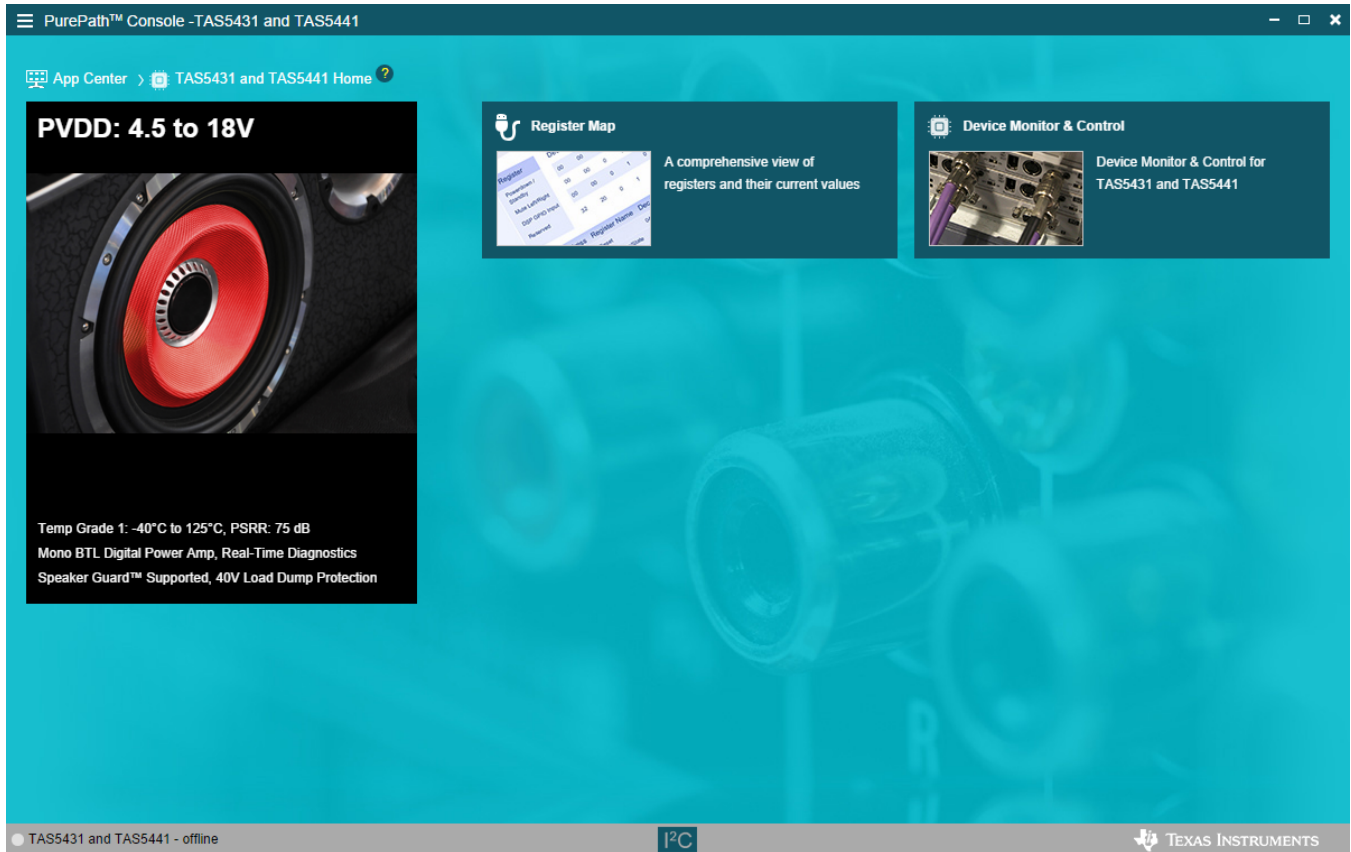

Figure 4. Home Window

There are two windows available with the TAS5431 and TAS5441 PPC3 Home Window: Register Map Window and Device Monitor and Control Window.

The Register Map window will indicate the current settings off all the registers in the TAS5431-Q1. The left pane show the individual registers. The right pane shows the description of each bit in the chosen register. The control register values can be changed from this window.
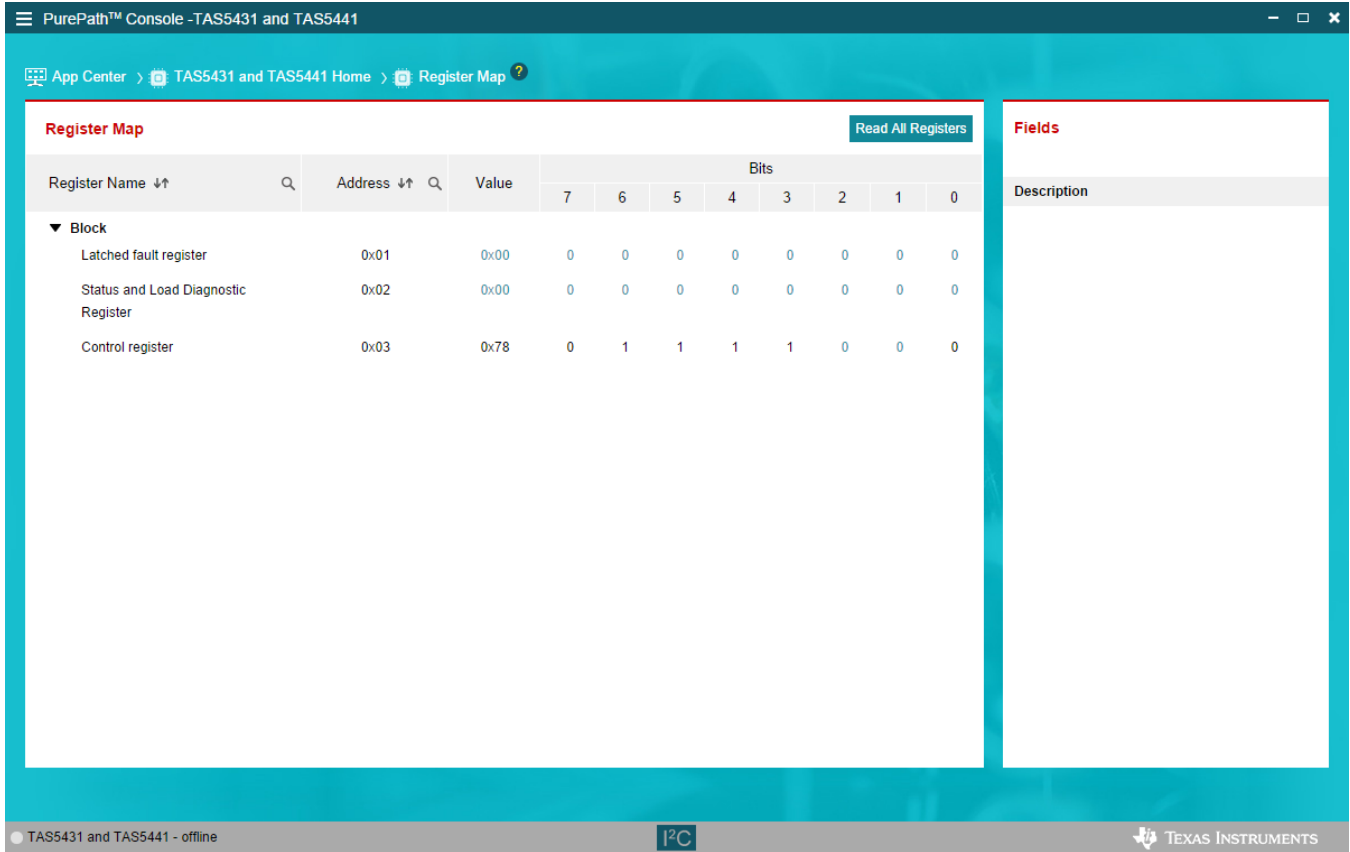

Figure 5. Register Map Window

Click on the Device Monitor and Control Box on the Home Window to display the Device Monitor and Control Window. This window is a graphical representation of the register map. The "Controls" panes can be changed and the other panes indicated the values in the registers. The Latch and Live toggle buttons will allow for the Output Status, Protection and Load Diagnostics to be static (Latch) or dynamic (Live). In Live mode the I2C registers are being read continuously to refresh the panes.
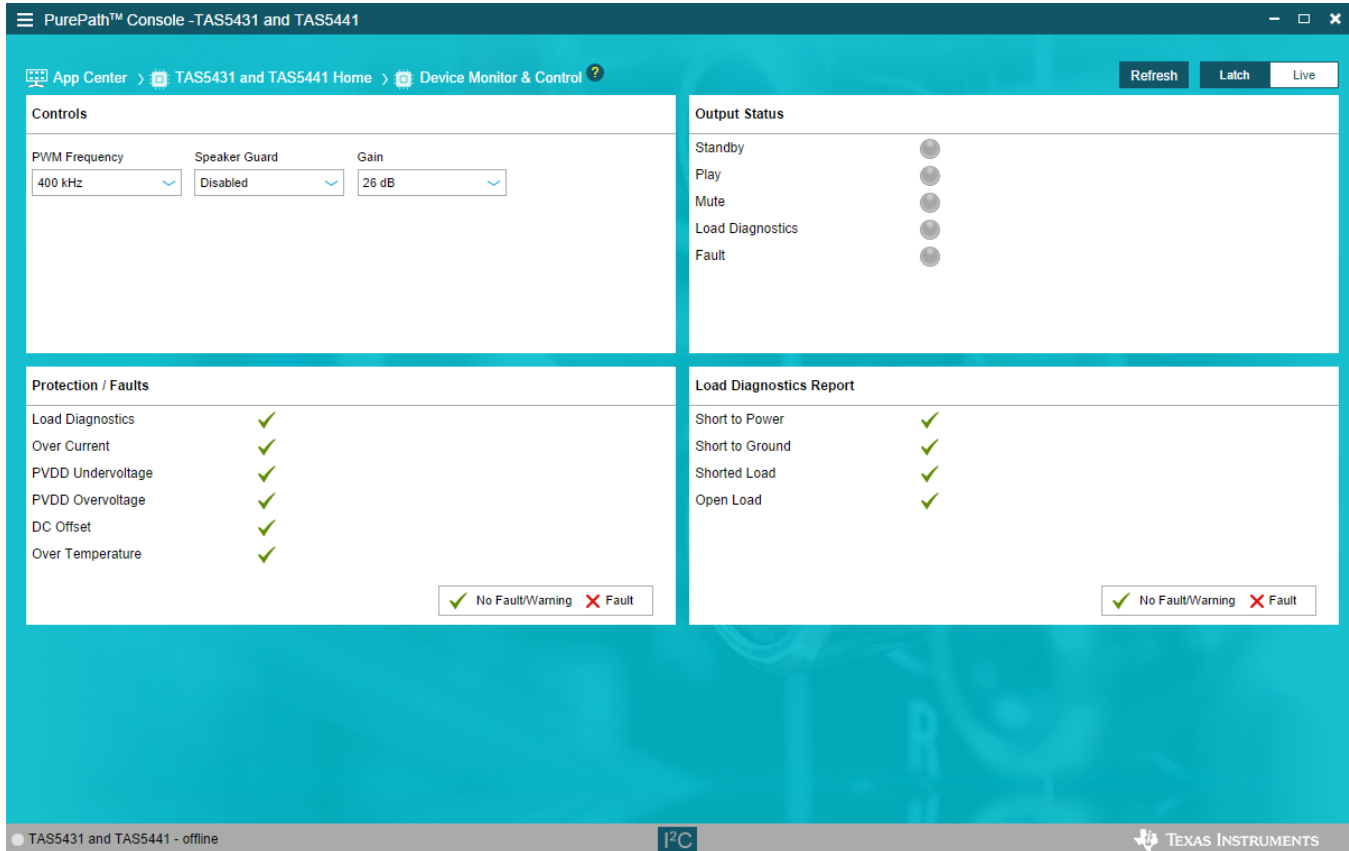

Figure 6. Device Monitor and Control Window

5   TAS5431Q1EVM Start Up

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

5.1   TAS5431Q1EVM Setup

Hardware and software connections:

- Desk top or laptop PC running Windows . Open PPC3 GUI.
- Connect 14.4 VDC PSU to TAS5431-Q1 EVM
- Connect speakers or resistive loads to TAS5431-Q1 EVM
- Connect USB micro cable from PC to the EVM
- Set the switches (STANDBY, MUTE) to normal positions
- Turn on the PSU
- Audio source:
- At this point, 3.3 V LED, and USB-LOCK LED are on.
- On the PPC3 window, launch TAS5441 and TAS5431 plugin
- The audio can be streamed now to the speakers.

6   Board Layouts, Bill of Materials, and Schematics
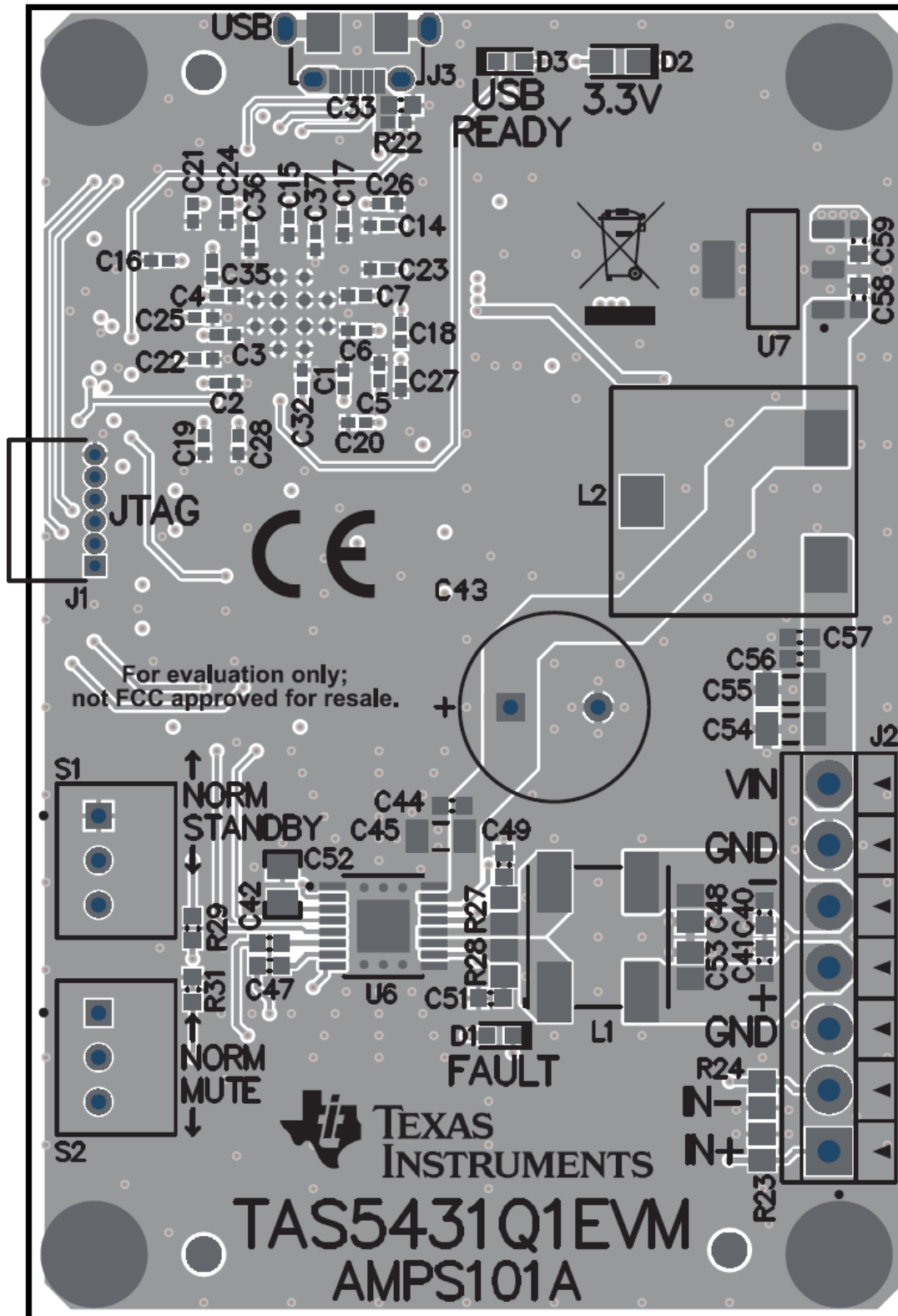
6.1   TAS5431Q1EVM Layouts

Figure 7. Top Side

Figure 8. Bottom Side
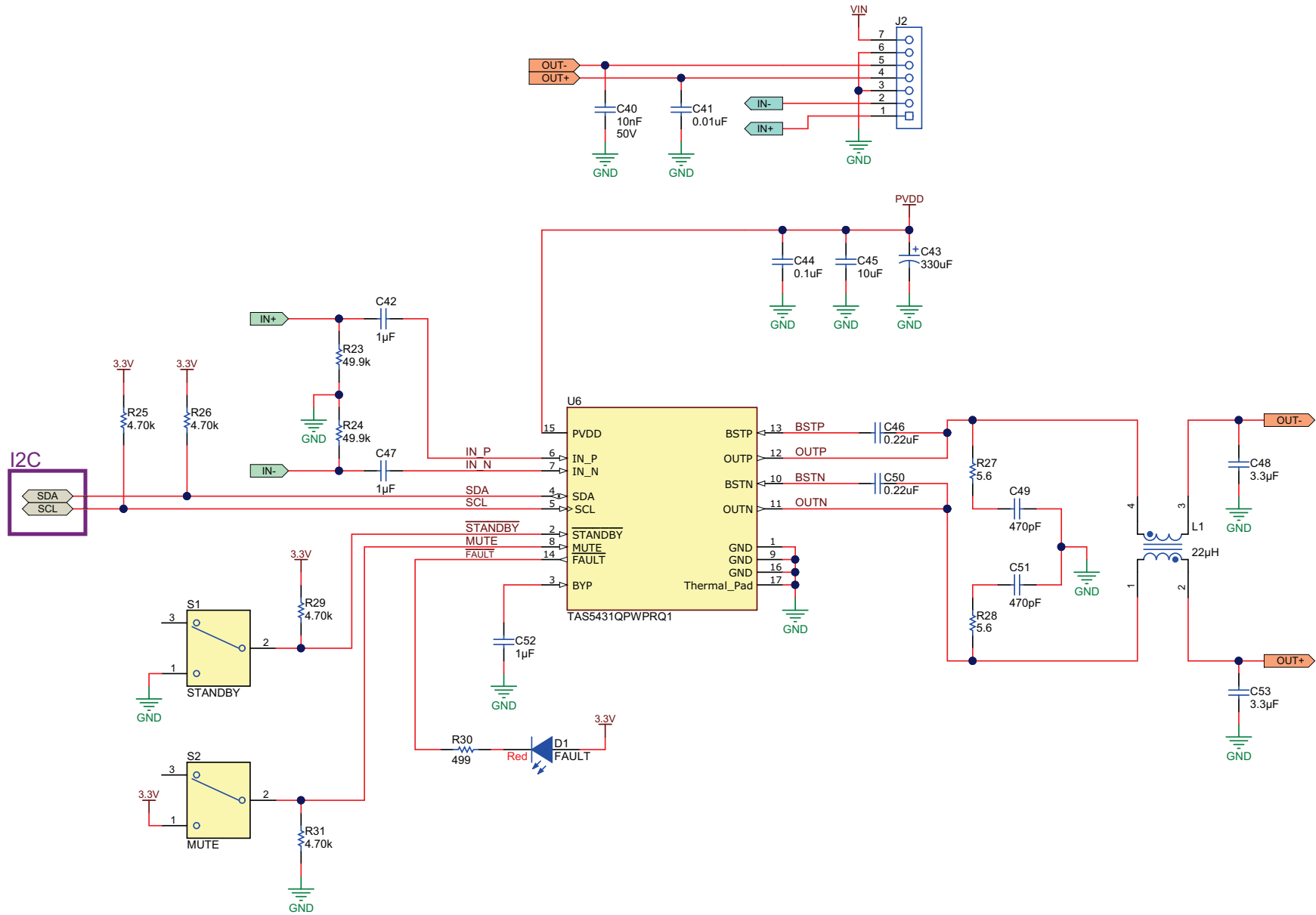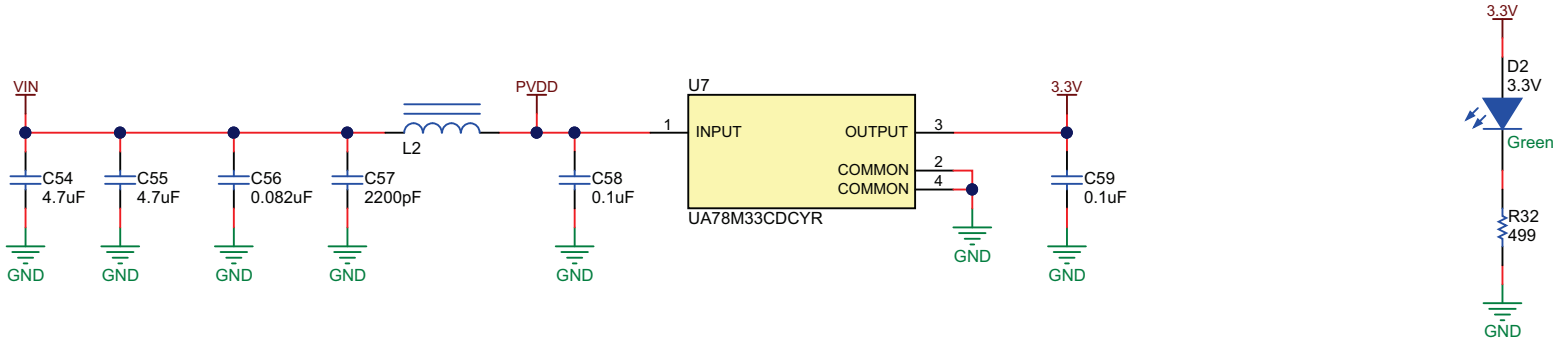
6.2 TAS5431Q1Schematics

Figure 9. Schematic XMOS Control
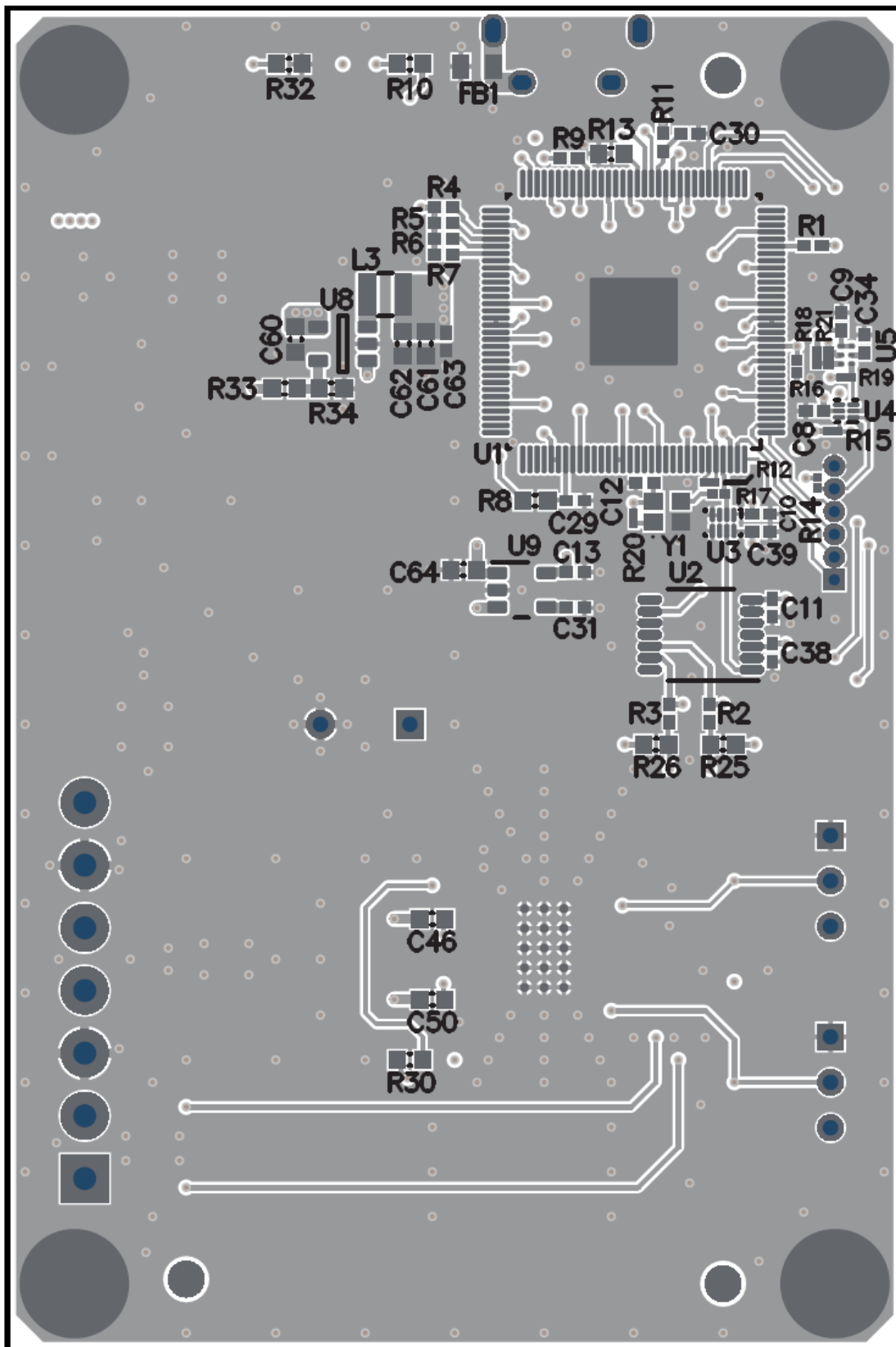
Figure 10. Schematic Power Amplifier

3.3V to 1.8V LDO
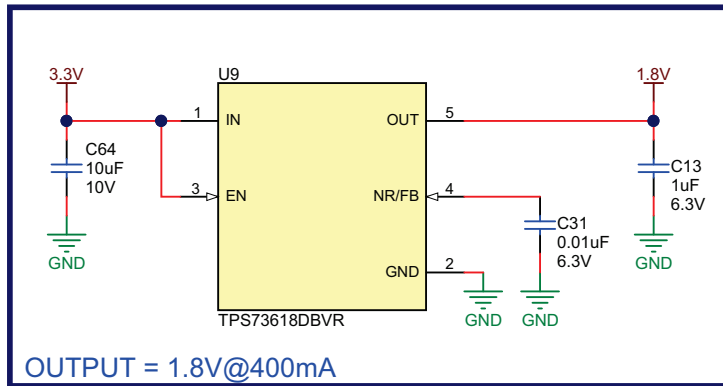
3.3V to 1V BUCK LDO for XMOS

OUTPUT = 1.8V@400mA
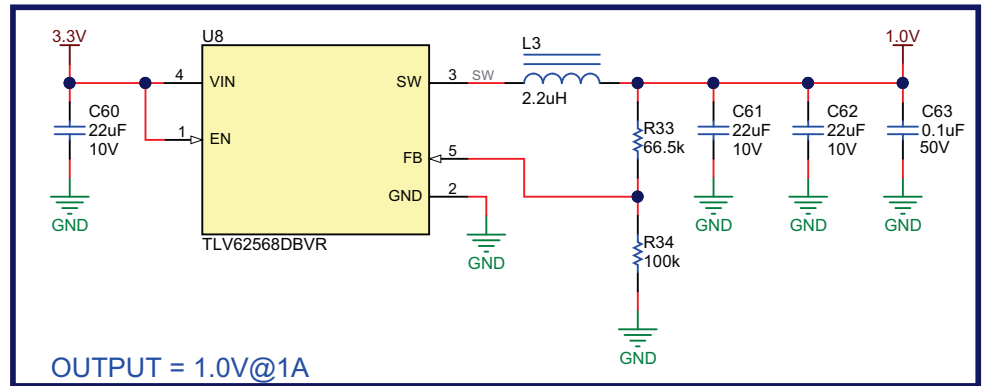
OUTPUT = 1.0V@1A

Figure 11. Schematic Power Supplies

6.3 Bill of Materials

Table 2. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		AMPS091	
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C32, C35, C36, C37, C38, C39	35	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X7R, 0402	0402	GRM155R71C104KA88D	MuRata
C13	1	1uF	CAP, CERM, 1 uF, 6.3 V, +/- 20%, X7R, 0402	0402	GRM155R70J105MA12D	MuRata
C31	1	0.01uF	CAP, CERM, 0.01 uF, 6.3 V, +/- 10%, X7R, 0402	0402	GRM155R70J103KA01D	MuRata
C33	1	2.2uF	CAP, CERM, 2.2 uF, 10 V, +/- 10%, X7R, 0603	0603	GRM188R71A225KE15D	MuRata
C34	1	470pF	CAP, CERM, 470 pF, 25 V, +/- 5%, C0G/NP0, 0402	0402	GRM1555C1E471JA01D	MuRata
C40, C41	2	0.01uF	CAP, CERM, 0.01 uF, 25 V, +/- 10%, X7R, 0603	0603	CL10B103KA8WPNC	Samsung Electro-Mechanics
C42, C47	2	1uF	CAP, CERM, 1 uF, 35 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	CGA3E1X7R1V105K080AC	TDK
C43	1	330uF	CAP, AL, 330 uF, 25 V, +/- 20%, 0.075 ohm, TH	CAP, 10x16mm	UBT1E331MPD1TD	Nichicon
C44, C58, C59	3	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0603	0603	GCJ188R71E104KA12D	MuRata
C45	1	10uF	CAP, CERM, 10 uF, 25 V, +/- 10%, X7R, 1206	1206	GRM31CR71E106KA12L	MuRata
C46, C50	2	0.22uF	CAP, CERM, 0.22 uF, 25 V, +/- 10%, X7R, 0603	0603	GRM188R71E224KA88D	MuRata
C48, C53	2	3.3uF	CAP, CERM, 3.3 uF, 25 V, +/- 10%, X7R, 0805	0805	C2012X7R1E335K125AB	TDK
C49, C51	2	470pF	CAP, CERM, 470 pF, 250 V, +/- 10%, X7R, 0603	0603	GRM188R72E471KW07D	MuRata
C52	1	1uF	CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0805	0805	GCM21BR71E105KA56K	MuRata
C54, C55	2	4.7uF	CAP, CERM, 4.7 uF, 25 V, +/- 10%, X7R, 1206	1206	GCJ31CR71E475KA12L	MuRata
C56	1	0.082uF	CAP, CERM, 0.082 uF, 25 V, +/- 10%, X7R, 0603	0603	C0603C823K3RACTU	Kemet
C57	1	2200pF	CAP, CERM, 2200 pF, 50 V, +/- 10%, X7R, 0603	0603	GCJ188R71H222KA01D	Murata
C60, C61, C62	3	22uF	CAP, CERM, 22 uF, 10 V, +/- 20%, X5R, 0603	0603	C1608X5R1A226M080AC	TDK
C63	1	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 0402	0402	C1005X7R1H104K050BB	TDK
C64	1	10uF	CAP, CERM, 10 uF, 10 V, +/- 20%, X5R, 0603	0603	C1608X5R1A106M080AC	TDK
D1	1	Red	LED, Red, SMD	Red LED, 1.6x0.8x0.8mm	LTST-C190CKT	Lite-On
D2	1	Green	LED, Green, SMD	0805 LED	LTST-C171GKT	Lite-On
D3	1	Blue	LED, Blue, SMD	LED_0603	150060BS75000	Wurth Elektronik

Table 2. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
FB1	1	600 ohm	Ferrite Bead, 600 ohm @ 100 MHz, 2 A, 0805	0805	MPZ2012S601AT000	TDK
J1	1		Receptacle, 50mil, 6x1, Gold, R/A, TH	6x1 Receptacle	LPPB061NGCN-RC	Sullins Connector Solutions
J2	1		Terminal Block, 3.5mm Pitch, 7x1, TH	24x.5x8.2x6.5mm	ED555/7DS	On-Shore Technology
J3	1		Connector, Receptacle, Micro-USB Type AB, R/A, Bottom Mount SMT	Connector, USB Micro AB	DX4R205JJAR1800	JAE Electronics
L1	1	22uH	Coupled inductor, 22 μH, 3 A, 69 ohm, SMD	SMD, 8x9x8mm	DBL8087H-220M	Sagami Elec Co Ltd
L2	1	10uH	Inductor, Shielded E Core, Ferrite, 10 μH, 7.2 A, 0.01081 ohm, AEC-Q200 Grade 3, SMD	SER1360	SER1360-103KLB	Coilcraft
L3	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
R1	1	1.00k	RES, 1.00 k, 1%, 0.0625 W, 0402	0402	RC0402FR-071KL	Yageo America
R2, R3	2	0	RES, 0, 5%, 0.063 W, 0402	0402	RC0402JR-070RL	Yageo America
R4, R5, R6, R7, R22	5	47.0k	RES, 47.0 k, 1%, 0.0625 W, 0402	0402	RC0402FR-0747KL	Yageo America
R8	1	4.75k	RES, 4.75, 1%, 0.1 W, 0603	0603	RC0603FR-074R75L	Yageo America
R9, R11	2	10.0k	RES, 10.0 k, 1%, 0.1 W, 0402	0402	ERJ-2RKF1002X	Panasonic
R10	1	680	RES, 680, 1%, 0.1 W, 0603	0603	RC0603FR-07680RL	Yageo America
R12	1	0	RES, 0, 5%, 0.05 W, AEC-Q200 Grade 1, 0201	0201	ERJ-1GE0R00C	Panasonic
R13	1	43.2	RES, 43.2, 1%, 0.1 W, 0603	0603	RC0603FR-0743R2L	Yageo America
R14, R15, R19, R20	4	10.0k	RES, 10.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0710KL	Yageo America
R16, R17	2	33.2	RES, 33.2, 1%, 0.05 W, 0201	0201	RC0201FR-0733R2L	Yageo America
R18	1	25.5k	RES, 25.5 k, 1%, 0.05 W, 0201	0201	RC0201FR-0725K5L	Yageo America
R21	1	51.0k	RES, 51.0 k, 1%, 0.05 W, 0201	0201	RC0201FR-0751KL	Yageo America
R23, R24	2	49.9k	RES, 49.9 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080549K9FKEA	Vishay-Dale
R25, R26, R29, R31	4	4.70k	RES, 4.70 k, 1%, 0.1 W, 0603	0603	RC0603FR-074K7L	Yageo America
R27, R28	2	5.6	RES, 5.6, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08055R60JNEA	Vishay-Dale
R30, R32	2	499	RES, 499, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603499RFKEA	Vishay-Dale
R33	1	66.5k	RES, 66.5 k, 1%, 0.1 W, 0603	0603	RC0603FR-0766K5L	Yageo America
R34	1	100k	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100KL	Yageo America
S1, S2	2		SWITCH TOGGLE SPDT 0.4VA 28V	6.8x23.1x8.8mm	B12AP	NKK Switches
U1	1		IC MCU 512KB RAM, 128TQFP	TQFP-128	XEF216-512-TQ128-C20	XMOS semiconductor

Table 2. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
U2	1		Programmable 1-PLL VCXO Clock Synthesizer with 2.5-V or 3.3-V LVCMOS Outputs, PW0014A (TSSOP-14)	PW0014A	CDCE913PWR	Texas Instruments
U3	1		Dual-Bit Dual-Supply Bus Transceiver, DQM0008A (X2SON-8)	DQM0008A	SN74AVC2T244DQMR	Texas Instruments
U4	1		Enhanced Product Dual Buffer/Driver with Open-Drain Output, DCK0006A (SOT-SC70-6)	DSF0006A	SN74LVC2G07DSFR	Texas Instruments
U5	1		Single-Channel Ultra-Small Adjustable Supervisory Circuit With Active-High Open-Drain Output, DRY0006A (USON-6)	DRY0006A	TPS3897ADRYR	Texas Instruments
U6	1		11-W Mono Automotive Digital-audio Amplifier with Load Dump and I2C Diagnostics	HTSSOP16	TAS5431-Q1	Texas Instruments
U7	1		500-mA, 25-V, Linear Voltage Regulators, DCY0004A (SOT-223-4)	DCY0004A	UA78M33CDCYR	Texas Instruments
U8	1		1-A High Efficiency Step-Down Converter in SOT23-5 Package, DBV005A, DBV0005A (SOT-5)	DBV0005A	TLV62568DBVR	Texas Instruments
U9	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
Y1	1		OSC, 24 MHz, 2.25 - 3.63 V, SMD	2x1.6mm	ASTMLPA-24.000MHZ-EJ-E-T	Abracon Corporation

Revision History

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

Changes from Original (April 2020) to A Revision **Page**

* Changed the document From: Advanced Information To: Production data 1

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 semiconductors 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 DEGREDATION 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/lsds/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。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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２４番１号

西新宿三井ビル

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

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.

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.

    4.3   *Safety-Related Warnings and Restrictions:*

        4.3.1   User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

        4.3.2   EVMs 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 assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

    4.4   User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5.   *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6.   *Disclaimers:*

    6.1   EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

    6.2   EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7.   *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

    8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

    8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

IMPORTANT NOTICE AND DISCLAIMER