

## **TPA3130D2EVM Evaluation Module**

This User's Guide describes the operation of the TPA3130D2 evaluation module (EVM). The User's Guide also provides measurement data and design information including the schematic, bill of materials (BOM), and the printed circuit board (PCB) layout.

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## **1 Overview**

The TPA3130D2EVM demonstrates the TPA3130D2 integrated circuit (IC) from Texas Instruments (TI).

The TPA3130D2 is a 15 W per channel, efficient stereo digital amplifier power stage for driving 2 bridge-tied speakers or a single parallel bridge-tied load (BTL) and can drive a speaker with an impedance as low as 3.2  $\Omega$  (8- $\Omega$  typical). The TPA3130D2 is available in a 32-pin TSSOP.

**Table 1. TPA3130D2EVM Specification**

Key Parameters	
Power Supply Voltage:	4.5 V to 26 V
Number of Channels	2 BTL Stereo
Load Impedance:	3.2 $\Omega$ to 8 $\Omega$
Output Power BTL	15 W per channel



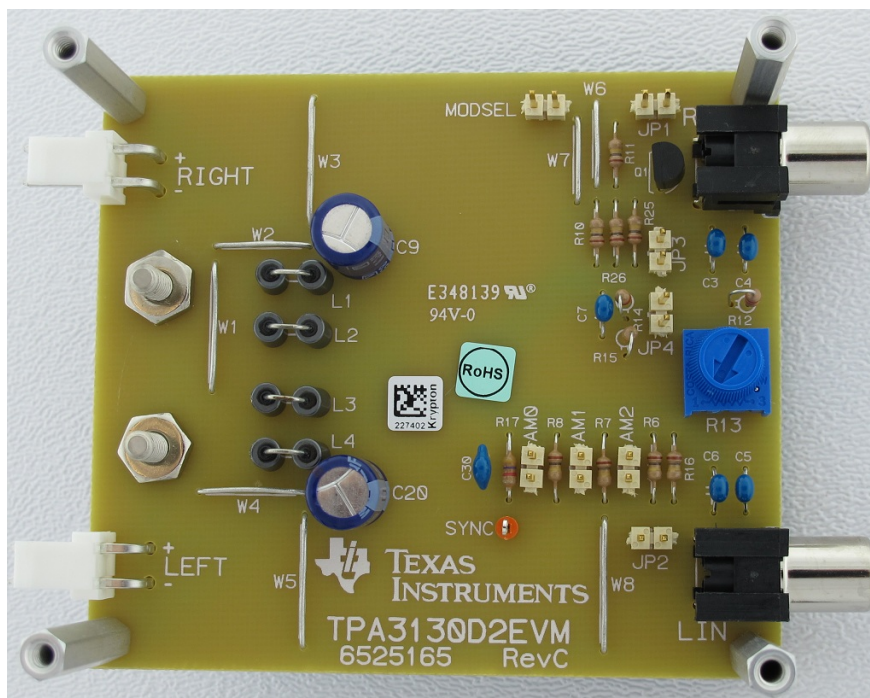


Figure 2. TPA3130D2EVM Bottom Photo

## 2.2 Power Supply Setup

A single power supply is required to power the EVM. Since most of the pins are PVCC compliant, the PVCC supply can power the analog supply (AVCC) and can pull up the logic pins for shutdown (SD) control, and fault detection (FAULT). GVDD is an internally-generated supply for the output FETs and is also used to power the PLIMIT voltage divider circuit on the EVM. PLIMIT is GVDD compliant, but not PVCC compliant. PLIMIT can be powered by an external supply connected to the PLIMIT pin.

Description	Voltage Range	Current Requirement	Minimum Wire Size
PVCC	4.5 V to 26 V	6 A	24 AWG

### CAUTION

Applying voltages above the limitations given in the table above may cause permanent damage to your hardware.

## **2.3 Evaluation Module Preparations**

1. Set the external power source to off.
2. Adjust the external regulated power supply from 4.5 V to 26 V and connect it to the module PVCC and GND banana jacks. The connection must follow the marked polarity.

## **2.4 Inputs and outputs**

1. For a BTL Configuration, connect a Load(s) across the outputs (LEFT+ and LEFT–) and (RIGHT+ and RIGHT–). For PBTL configuration, connect a single load from one of the left speaker jacks to one of the right speaker jacks, depending on how the filters are loaded.
2. Connect audio inputs, either differential or single-ended, to the LIN and RIN RCA phono plugs for BTL operation. For PBTL operation, apply a differential single input or single-ended single input to the RIN RCA phono plug and tie INPL and INNPL directly to GND (without capacitors).

## **2.5 Control Inputs**

1. Ensure the mode jumpers, AM0, AM1, AM2, R14 and R15 are set correctly, depending on the desired operating state.

## **2.6 Power Up**

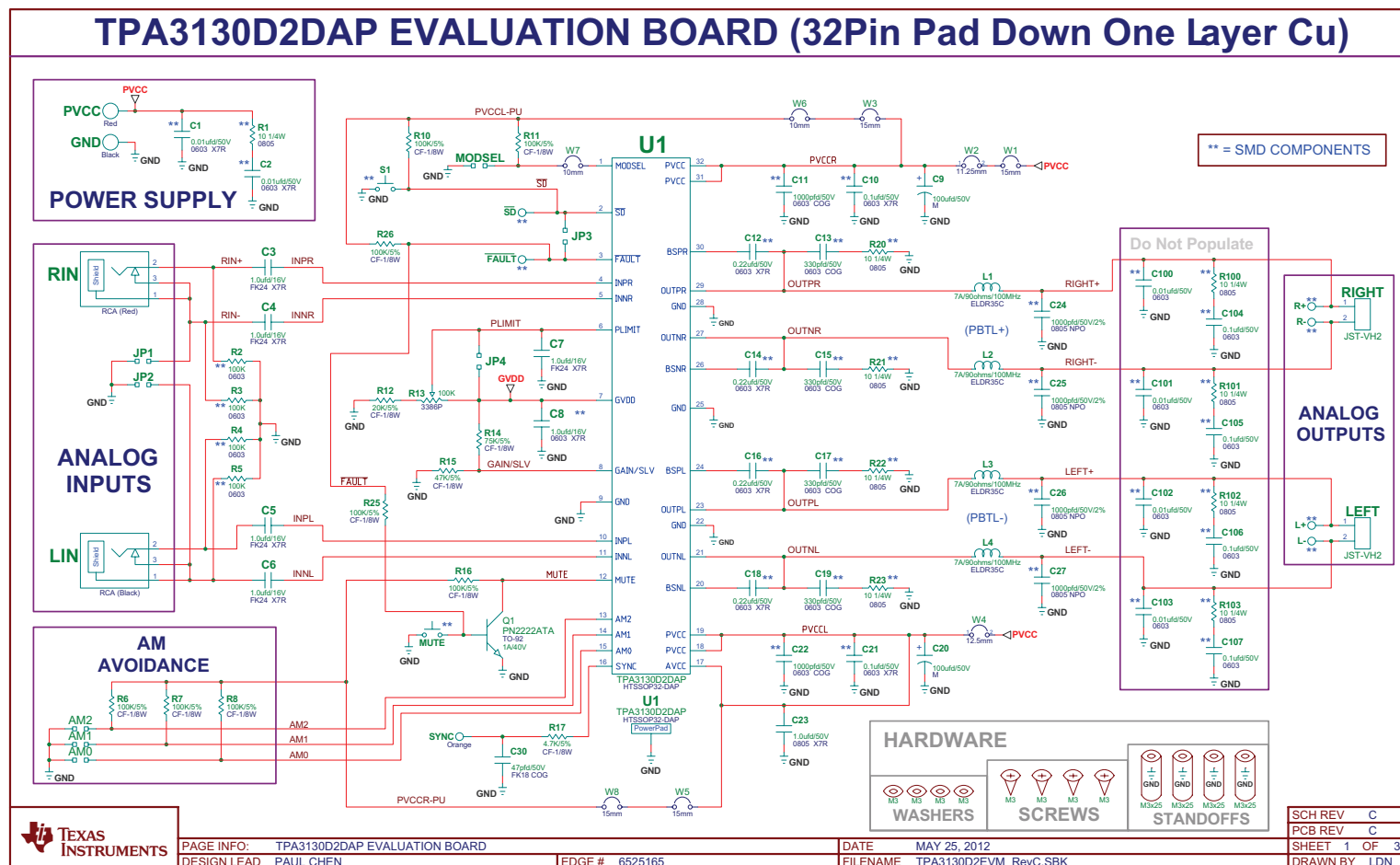
1. Verify the correct voltage and input polarity and turn the external power supplies on. The EVM should begin operation.
2. Adjust the audio source for the correct volume.

## 3 Design Documentation

This section contains the schematic, PCB layers, and BOM for this EVM.

### 3.1 TPA3130D2EVM Schematic

Figure 3 illustrates the schematic for this EVM.



Note: The output short to PVCC test is available in the [TPA31xxD2](#) data sheet.

**Figure 3. TPA3130D2EVM Schematic**

### 3.2 TPA3130D2EVM PCB Layers

Figure 4 and Figure 5 illustrate the PCB layers of this EVM.

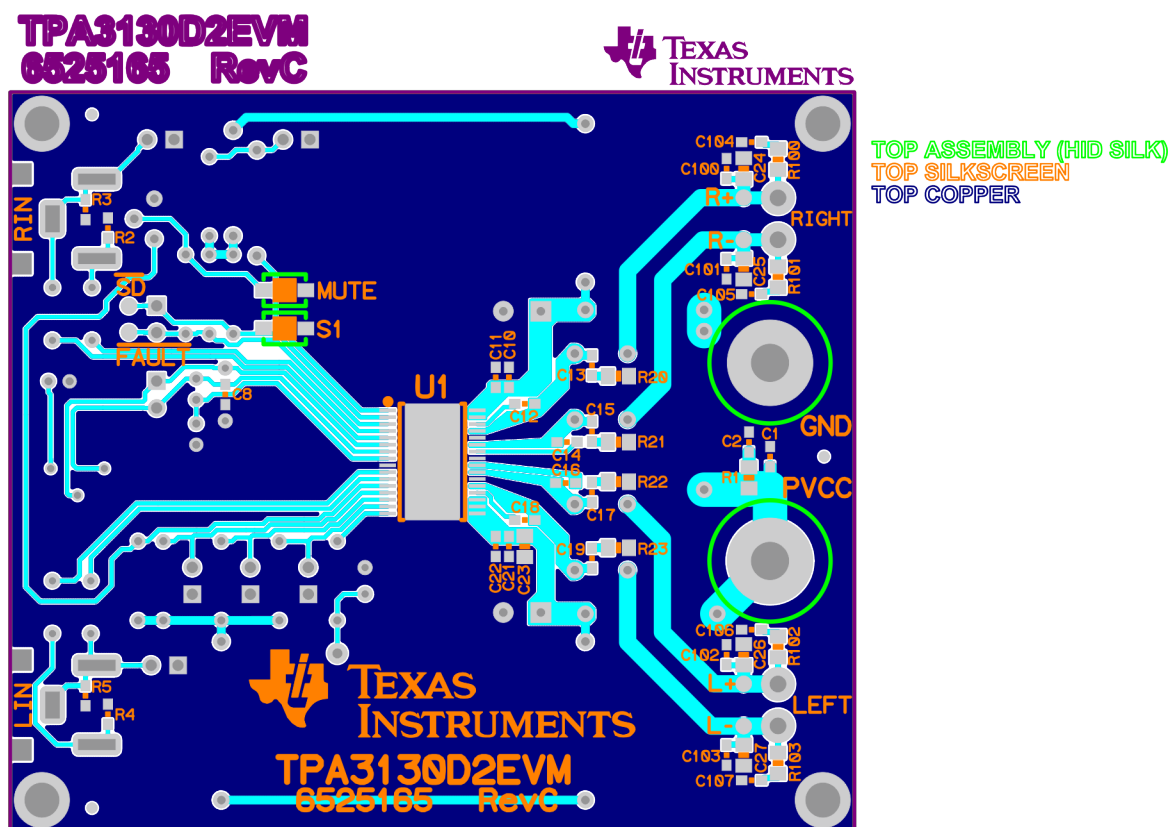


Figure 4. TPA3130D2EVM Top Side Layout



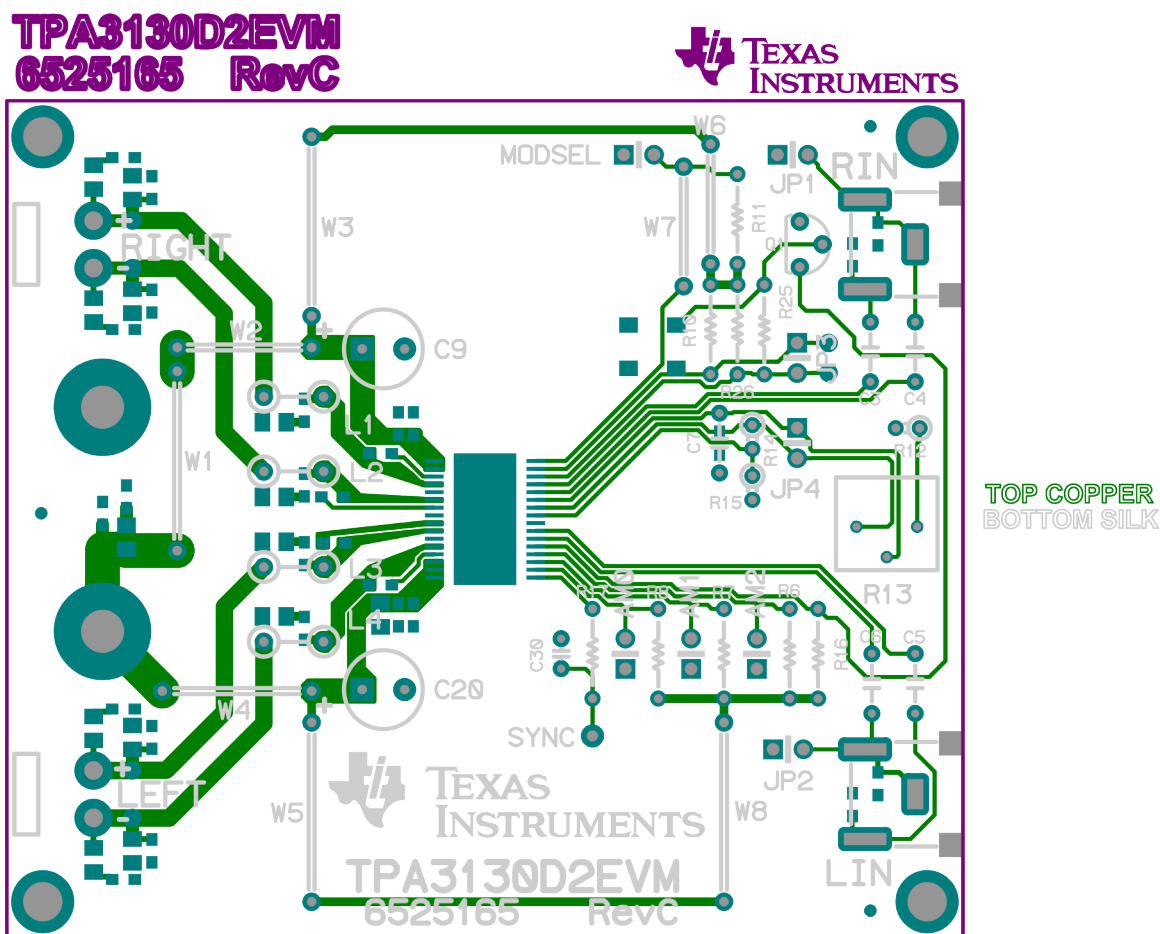


Figure 5. TPA3130D2EVM Bottom Side Layout

### 3.3 TPA3130D2EVM Bill of Materials

Table 2 lists the BOM for this EVM.

**Table 2. TPA3130D2EVM Bill of Materials**

Item	Manu Part Num	Manu	Qty	Ref Designators	Description
1	TPA3130D2DAP	TEXAS INSTRUMENTS	1	U1	2x15W CLASS D STEREO AMP HTSSOP32-DAP ROHS
2	PN2222ATA	FAIRCHILD SEMICONDUCTOR	1	Q1	TRANSISTOR NPN THRU 1A 40V TO-92 ROHS
3	GRM188R71H103MA01D	MURATA	2	C1, C2	CAP SMD0603 CERM 0.01UF 50V 20% X7R ROHS
4	FK24X7R1C105K	TDK CORP	5	C3, C4, C5, C6, C7	CAP THRU CERM 1.0ufd 16V X7R 10% ROHS
5	C1608X7R1C105K	TDK	1	C8	CAP SMD0603 CERM 1.0UF 16V 10% X7R ROHS
6	ECA-1HM101	PANASONIC	2	C9, C20	CAP ALUM ELEC M RADIAL 100UF 50V 20% ROHS
7	GRM188R71H104KA93D	MURATA	2	C10, C21	CAP SMD0603 CERM 0.1UF 50V 10% X7R ROHS
8	C1608C0G1H102J	TDK CORP.	2	C11, C22	CAP SMD0603 CERM 1000PFD 50V 5% COG ROHS
9	GCM188R71H224KA64D	MURATA	4	C12, C14, C16, C18	CAP SMD0603 CERM 0.22UF 50V 10% X7R ROHS
10	GRM1885C1H331JA01D	MURATA	4	C13, C15, C17, C19	CAP SMD0603 CERM 330PFD 50V 5% COG ROHS
11	GRM21BR71H105KA12L	MURATA	1	C23	CAP SMD0805 CERM 1.0UF 50V 10% X7R ROHS
12	08055A102GAT2A	AVX	4	C24, C25, C26, C27	CAP SMD0805 CERM 1000PFD 50V 2% NPO ROHS
13	FK18C0G1H470J	TDK CORP	1	C30	CAP THRU CERM 47pfd 50V SERIES FK18 COG 5% ROHS
14	ESR10EZPJ100	ROHM	5	R1, R20, R21, R22, R23	RESISTOR SMD0805 10 OHM 1% 1/4W ROHS
15	ERJ-3EKF1003V	PANASONIC	4	R2, R3, R4, R5	RESISTOR SMD0603 100K OHM 1% THICK FILM 1/10W ROHS
16	CF18JT100K	STACKPOLE ELECTRONICS	8	R6, R7, R8, R10, R11, R16, R25, R26	RESISTOR THRU 100K OHMS CARBON FILM 5% 1/8W ROHS
17	CF18JT20K0	STACKPOLE ELECTRONICS	1	R12	RESISTOR THRU 20K OHMS CARBON FILM 5% 1/8W ROHS
18	3386P-1-104TLF	BOURNS	1	R13	TRIMPOT TH 100K OHMS TOP ADJ W/KNOB 1 TURN 10% ROHS
19	CF18JT75K0	STACKPOLE ELECTRONICS	1	R14	RESISTOR THRU 75K OHMS CARBON FILM 5% 1/8W ROHS
20	CF18JT47K0	STACKPOLE ELECTRONICS	1	R15	RESISTOR THRU 47K OHMS CARBON FILM 5% 1/8W ROHS
21	CF18JT4K70	STACKPOLE ELECTRONICS	1	R17	RESISTOR THRU 4.7K OHMS CARBON FILM 5% 1/8W ROHS
22	EXC-ELDR35C	PANASONIC	4	L1, L2, L3, L4	FERRITE BEAD DUAL THRU 7A 90 OHMS@100MHz ROHS
23	PBC02SAAN	SULLINS	8	AM0, AM1, AM2, JP1, JP2, JP3, JP4, MODSEL	HEADER THRU MALE 2 PIN 100LS GOLD ROHS
24	B2PS-VH(LF)(SN)	JST	2	LEFT, RIGHT	JACK JST-VH RA 2-PIN 3.96mmLS ROHS
25	PJ-RAN1X1U013	SWITCHCRAFT	1	RIN	JACK, RCA 3-PIN PCB-RA RED ROHS
26	PJ-RAN1X1U01X	SWITCHCRAFT	1	LIN	JACK, RCA 3-PIN PCB-RA BLACK ROHS
27	5003	KEYSTONE ELECTRONICS	1	SYNC	PC TESTPOINT, ORANGE, ROHS
28	TL1015AF160QG	E-SWITCH	2	S1, MUTE	SWITCH, MOM, 160G SMT 4X3MM ROHS
29	94868A178	MCMaster-CARR	4	STANDOFFS	STANDOFF M3x25mm 4.5mm DIA HEX STAINLESS STEEL F-F ROHS
30	92148A150	MCMaster-CARR	4	STANDOFFS	WASHER SPLIT-LOCK M3 6.2mm OD 0.7mm THICK STAINLESS STEEL ROHS
31	92000A118	MCMaster-CARR	4	STANDOFFS	SCREW M3x8 PHILIPS PANHEAD STAINLESS STEEL ROHS
32	7006	KEYSTONE ELECTRONICS	1	PVCC	BINDING POST, RED, 15A ECONO ROHS
33	7007	KEYSTONE ELECTRONICS	1	GND	BINDING POST, BLACK, 15A ECONO ROHS
34	298 SV001 15MM	ALPHA WIRE COMPANY	4	W1, W3, W5, W8	BUS WIRE JUMPER 22AWG NON-INSULATED 25mm LENGTH ROHS
35	298 SV001 11.25MM	ALPHA WIRE COMPANY	1	W2	BUS WIRE JUMPER 22AWG NON-INSULATED 21.25mm LENGTH ROHS
36	298 SV001 12.5MM	ALPHA WIRE COMPANY	1	W4	BUS WIRE JUMPER 22AWG NON-INSULATED 22.5mm LENGTH ROHS
37	298 SV001 10MM	ALPHA WIRE COMPANY	2	W6, W7	BUS WIRE JUMPER 22AWG NON-INSULATED 20mm LENGTH ROHS



**Table 2. TPA3130D2EVM Bill of Materials (continued)**

Item	Manu Part Num	Manu	Qty	Ref Designators	Description
38	969102-0000-DA	3M	8	AM0, AM1, AM2, JP1, JP2, JP3, JP4, MODSEL	SHUNT BLACK AU FLASH 0.100LS OPEN TOP ROHS
		TOTAL	101		
X1	DO NOT POPULATE		12	C100, C101, C102, C103, C104, C105, C106, C107, R100, R101, R102, R103	

## Revision History

Changes from Original (March 2012) to A Revision	Page
• Changed board photos from Rev. B to Rev. C. ....	<a href="#">2</a>
• Changed schematic from Rev. B to Rev. C. ....	<a href="#">5</a>
• Changed PCB layout images from Rev. B to Rev. C. ....	<a href="#">6</a>
• Changed BOM from Rev. B to Rev. C. ....	<a href="#">8</a>

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

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### General Statement for EVMs including a radio

*User Power/Frequency Use Obligations:* This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

### 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

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**

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.

### **For EVMs annotated as IC – INDUSTRY CANADA Compliant**

This Class A or B digital apparatus complies with Canadian ICES-003.

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

### **Concerning EVMs including radio transmitters**

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

### **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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

### **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.

### **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.

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**This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan**

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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**For Feasibility Evaluation Only, in Laboratory/Development Environments.** Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

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2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure 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.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

**Certain Instructions.** It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please 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 result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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