![Texas Instruments logo]

IWR1443BOOST Evaluation Module mmWave Sensing Solution

Contents

1 Getting Started ⁽¹⁾⁽²⁾⁽³⁾

1.1 Introduction

The IWR1443 BoosterPack™ is an easy-to-use evaluation board for the single-chip IWR1443 mmWave sensing device from TI, with direct connectivity to the TI MCU LaunchPad™ ecosystem. The evaluation board contains everything needed to start developing on a low-power ARM®-R4F controller. The evaluation board includes onboard emulation for programming and debugging, onboard buttons, and LEDs, for quick integration of a simple user interface. The standard 20-pin BoosterPack headers make the evaluation board compatible with a wide variety of TI MCU LaunchPads and enables easy prototyping.

1.2 Key Features

- 40-pin LaunchPad standard that leverages the LaunchPad ecosystem
- XDS110-based JTAG emulation with serial port, for onboard QSPI flash programming
- Backchannel UART through USB to PC, for logging purposes
- Onboard antenna
- 60-pin high density (HD) connector, for raw ADC data over CSI, or the high-speed debug interface
- Onboard CAN transceiver
- One button and two LEDs, for user interaction
- 5-V power jack, to power the board

1.3 What is Included

1.3.1 Kit Contents

- IWR1443BOOST
- Mounting brackets, screws, and nuts, to allow placing the PCB vertical
- Micro USB cable to connect to the PC

> **NOTE:** *Not* included: 5 V, >2.5-A supply brick with 2.1-mm barrel jack (center positive). TI recommends using an external power supply that complies with applicable regional safety standards such as UL, CSA, VDE, CCC, PSE, and so on. The cable length of the power cord must be < 3 m.

1.3.2 mmWave Proximity Demo

TI provides sample demo codes to easily get started with the IWR1443 evaluation module and experience the functionality of the IWR1443 mmWave sensor. For details on getting started with these demos, see the mmWave SDK User Guide.

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⁽²⁾ ARM is a registered trademark of ARM Limited.
⁽³⁾ Windows is a registered trademark of Microsoft Corporation.

2   Hardware

Figure 1 and Figure 2 show the front and rear views of the evaluation board, respectively.
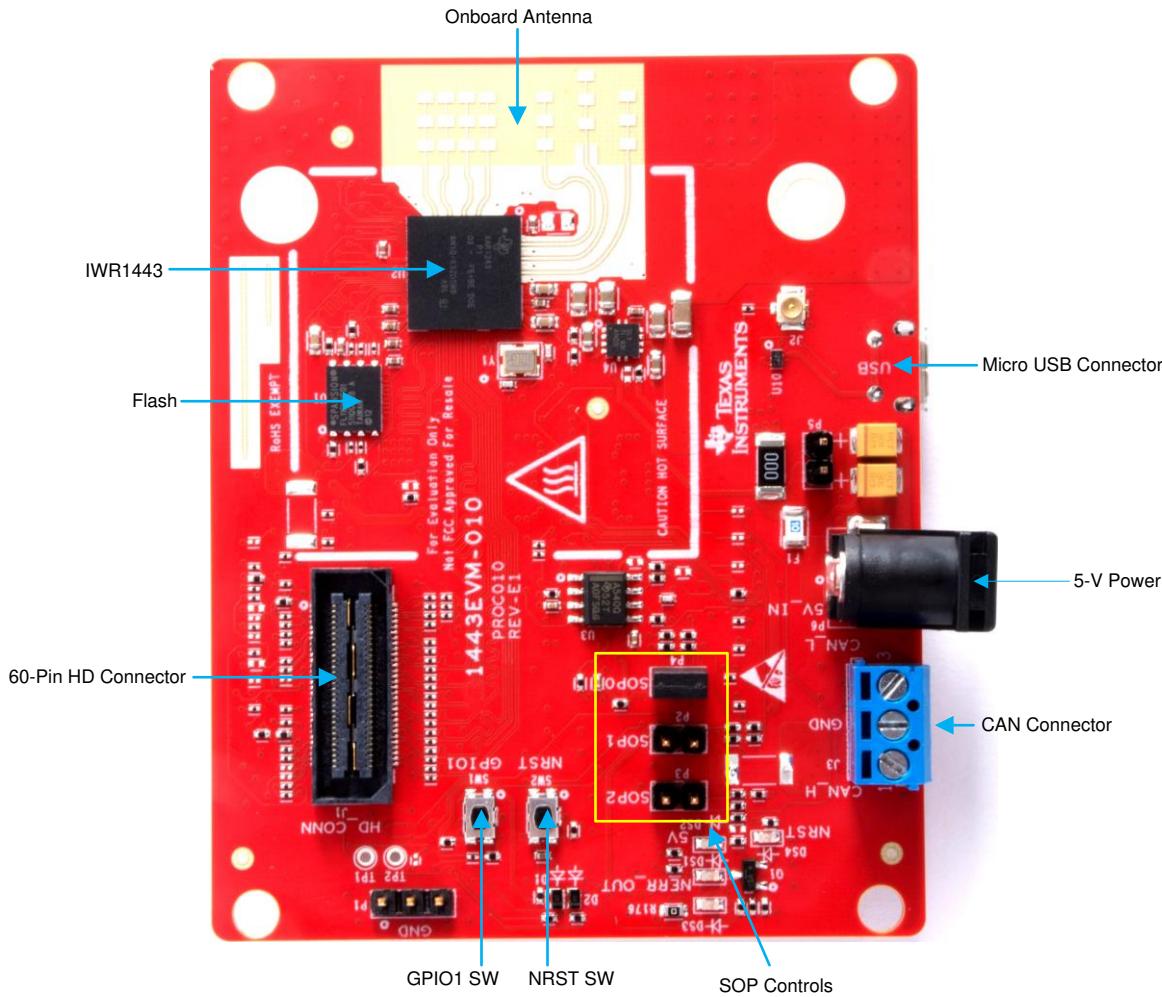
Figure 1. EVM Front View
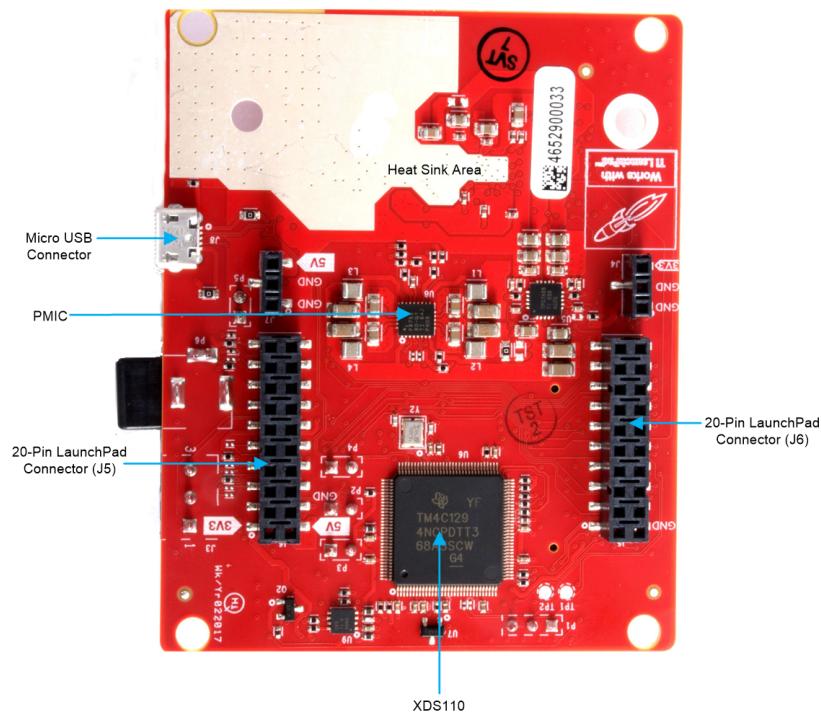
Figure 2. EVM Rear View

2.1 Block Diagram
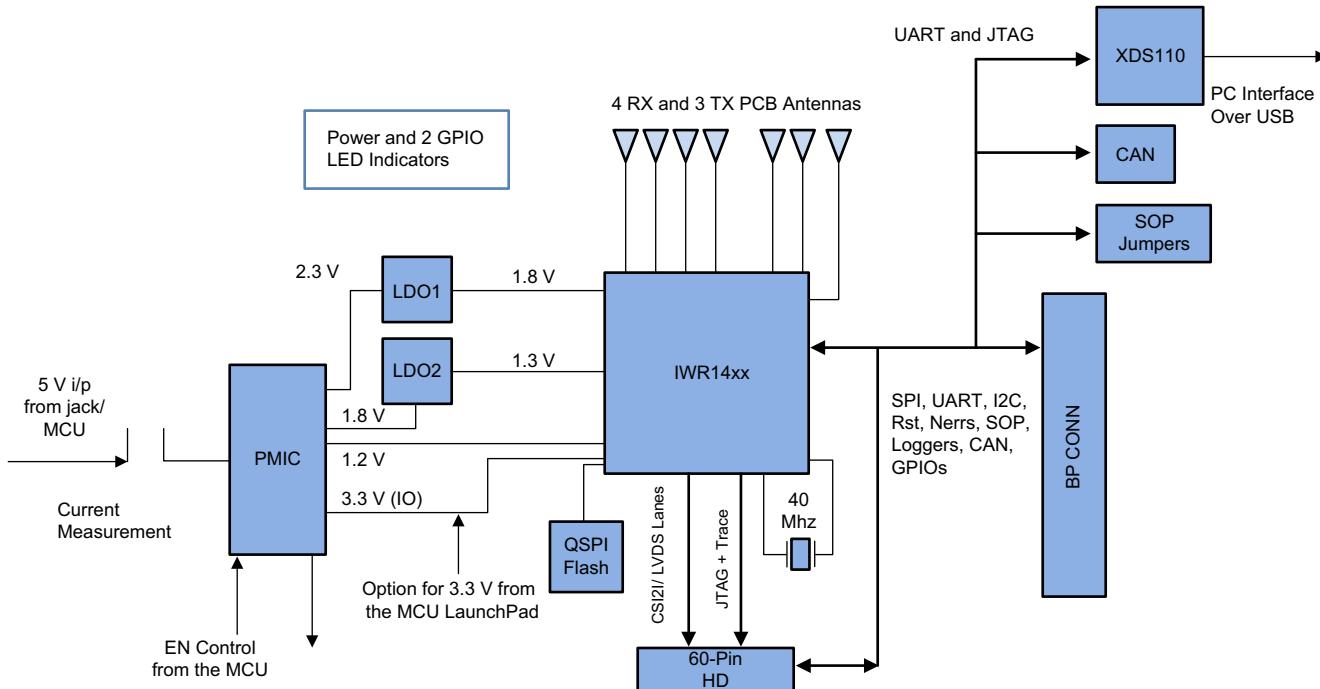
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Figure 3. IWR14xxBOOST Block Diagram

2.2 Connecting BoosterPack™ to LaunchPad™ or MMWAVE-DEVPACK

This BoosterPack can be stacked on top of the Launchpad, or the MMWAVE-DEVPACK, using the two 20-pin connectors. The connectors do not have a *key* to prevent the misalignment of the pins or reverse connection. Therefore, ensure reverse mounting does not take place. On the IWR1443 BoosterPack, we have provided 3V3 marking near pin 1 (see Figure 4). This same marking is provided on compatible LaunchPads which must aligned before powering up the boards.
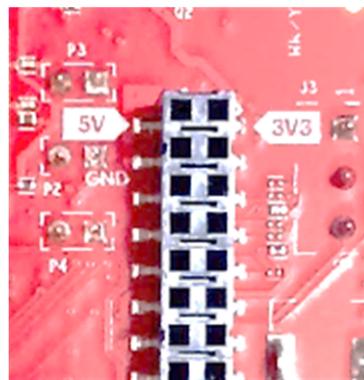
Figure 4. 3V3 and 5-V Mark on the LaunchPad™ (White Triangle)

2.3 Power Connections

The BoosterPack is powered by the 5-V power jack (5-A current limit). As soon as the power is provided, the NRST and 5-V LEDs glow, indicating that the board is powered up (see Figure 5).
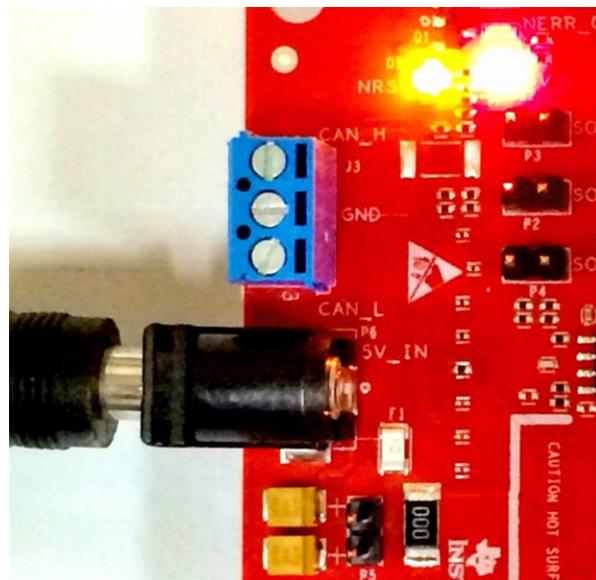
Figure 5. Power Connector

> **NOTE:** After the 5-V power supply is provided to the EVM, TI recommends pressing the NRST switch (SW2) once to ensure a reliable boot up state.

2.4 Connectors

2.4.1 20-Pin BoosterPack™ Connectors

The BoosterPack has the standard LaunchPad connectors (J5 and J6) which enable the BoosterPack to be directly connected to all TI MCU LaunchPads (see Table 1). While connecting the BoosterPack to other LaunchPads, ensure the pin 1 orientation is correct by matching the 3V3 and 5-V signal marking on the boards (see Figure 6).
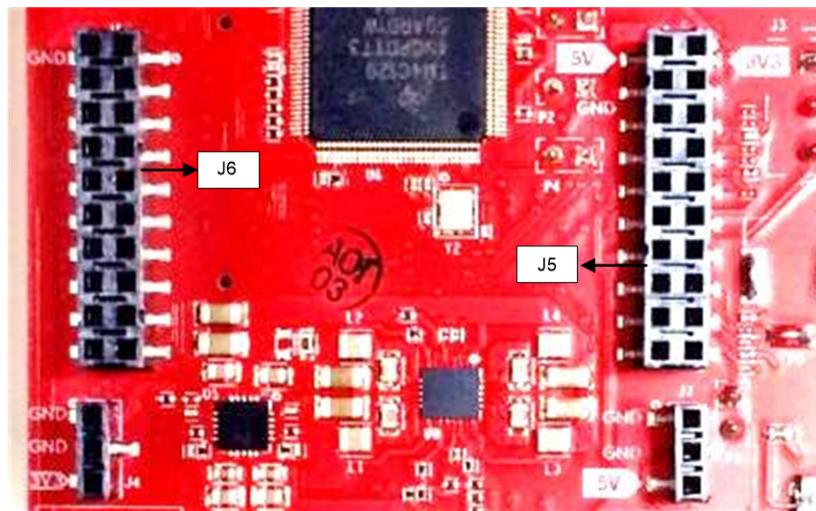
Figure 6. 20-Pin BoosterPack™ Connectors (J5 and J6)

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Table 1. 20-Pin Connector Definition (J6)

Pin Number	Description	Pin Number	Description
1	AR_NERR_OUT	2	GND
3	AR_NERRIN	4	NC
5	AR_MCUCLKOUT	6	AR_CS1
7	NC	8	AR_GPIO_1
9	AR_MSS_LOGGER	10	AR_NRST_MCU
11	AR_WARMRST	12	AR_MOSI1
13	AR_BSS_LOGGER	14	AR_MISO1
15	MCU_SOP2	16	AR_HOSTINTR1
17	MCU_SOP1	18	AR_GPIO_2
19	MCU_SOP0	20	NC

Table 2. 20-Pin Connector Definition (J5)

| Pin Number	Description	Pin Number	Description
1	MCU_3V3	2	MCU_5v (5V_IN)
3	NC	4	GND
5	AR_RS232TX	6	AR_ANATEST1
7	AR_RS232RX	8	AR_ANATEST2
9	AR_SYNC_IN	10	AR_ANATEST3
11	NC	12	AR_ANATEST4
13	AR_SPICLK1	14	PGOOD (onboard VIO)
15	AR_GPIO_0	16	PMIC_EN1
17	AR_SCL	18	AR_SYNC_OUT_SOP1
19	AR_SDA	20	AR_PMIC_CLKOUT_SOP2

- PGOOD – This signal indicates the state of the onboard VIO supply for the IWR device coming from the onboard PMIC. A high on the PGOOD signal (3.3 V) indicates that the supply is stable. Because the IOs are not failsafe, the MCU must ensure that it does not drive any IO signals to the IWR device before this IO supply is stable. Otherwise, there could be leakage current into the IOs.
- PMIC Enable – This signal goes onboard PMIC enable. The MCU can use this signal to completely shut down the PMIC and IWR device to save power. The power up of the PMIC takes approximately 5 ms once the Enable signal is released.

> **NOTE:** To enable this feature, the R102 resister must be populated on the EVM.

- ANA1/2/3/4 – These are inputs to the GPADCs (general purpose ADC) available on the IWR1443 device.

2.4.2   60-Pin High Density (HD) Connector

The 60-pin HD connector provides high speed CSI/LVDS data, and controls signals (SPI, UART, I2C, NRST, NERR, and SOPs) and JTAG debug signals (see Table 3). This connector can be connected to the MMWAVE-DEVPACK board and interface with the TSW1400 (see Figure 7).
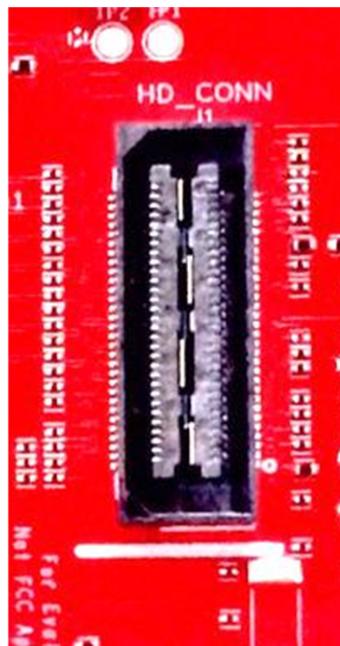
Figure 7. High Density Connector (60 Pin)

Table 3. HD Connector Pin Definition

Pin Number	Description	Pin Number	Description
1	5 V	2	5V_IN
3	5 V	4	AR_TDO_SOP0
5	AR_TDI	6	AR_TCK
7	AR_CS1	8	AR_TMS
9	AR_SPICLK1	10	AR_HOSTINTR1
11	AR_MOSI1	12	AR_MISO1
13	PGOOD (onboard VIO)	14	AR_NERR_OUT
15	NC	16	AR_SYNC_IN
17	NC	18	GND
19	NC	20	AR_LVDS_VALIDP
21	NC	22	AR_LVDS_VALIDM
23	NC	24	GND
25	NC	26	AR_LVDSSCSI_FRCLKP
27	NC	28	AR_LVDSSCSI_FRCLKM
29	NC	30	GND
31	NC	32	AR_LVDSSCSI_3P
33	NC	34	AR_LVDSSCSI_3M
35	NC	36	GND
37	NC	38	AR_LVDSSCSI_2P
39	NC	40	AR_LVDSSCSI_2M
41	NC	42	GND
43	NC	44	AR_LVDSSCSI_CLKP

Table 3. HD Connector Pin Definition (continued)

Pin Number	Description	Pin Number	Description
45	NC	46	AR_LVDSSCSI_CLKM
47	NC	48	GND
49	NC	50	AR_LVDSSCSI_1P
51	AR_SDA	52	AR_LVDSSCSI_1M
53	AR_SCL	54	GND
55	AR_RS232RX	56	AR_LVDSSCSI_0P
57	AR_RS232TX	58	AR_LVDSSCSI_0M
59	AR_NRST_MCU	60	GND

PGOOD – This signal indicates that the state of the onboard VIO supply for the IWR device coming from the onboard PMIC. A high on the PGOOD signal (3.3 V) indicates the supply is stable. Because the I/Os are not failsafe, the MCU must ensure that it does not drive any I/O signals to the IWR device before this I/O supply is stable, to avoid leakage current into the I/Os.

2.4.3 CAN Interface Connector

The J3 connector provides the CAN_L and CAN_H signals (see Figure 8) from the onboard CAN transceiver (SN65HVDA540). These signals can be directly wired to the CAN bus.

Because the digital CAN signals (TX and RX) are muxed with the SPI signals on the IWR device, one of the two paths must be selected. To enable the CAN interface, the R11 and R12 resisters muct be populated with 0 Ω, and the R4, R6, R28, and R63 resisters must be removed to disconnect the SPI path.
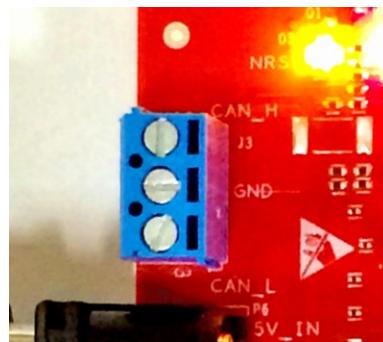

Figure 8. CAN Connector

2.5   PC Connection

Connectivity is provided using the micro USB connector over the onboard XDS110 (TM4C1294NCPDT) emulator. This connection provides the following interfaces to the PC:

- JTAG for CCS connectivity
- Control UART for flashing the onboard serial flash, downloading FW using RADAR studio, and getting application data sent over the UART
- MSS logger UART, which can be used to get MSS code logs on the PC

When the USB is connected to the PC the device manager recognizes the following COM ports, as shown in Figure 9:

- XDS110 Class Application/User UART → the control UART port
- XDS110 Class Auxiliary Data port → the MSS logger port
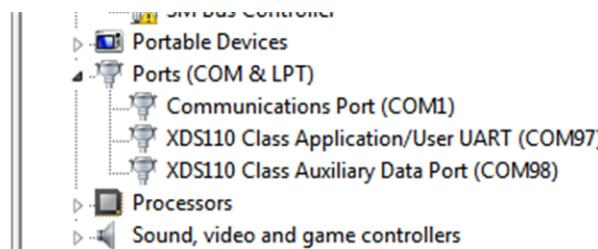
Figure 9. XDS110 Ports

If Windows® is unable to recognize the COM ports previously shown, install the emupack available here

Table 4 lists the UART ports corresponding pin names on IWR1443 package.

Table 4. Pin Names

	Pin Name	Pin Number	Signal Name in Data Sheet	EVM Signal Reference
Control UART port TX	RS232_TX	N6	RS232_TX	AR_RS232TX
Control UART port RX	RS232_RX	N5	RS232_RX	AR_RS232RX
MSS logger port	SPI_CLK_2	R5	MSS_UARTB_TX	AR_MSS_LOGGER

2.5.1   Erasing Onboard Serial Flash

Before loading the code to the serial flash or connecting the board to RADAR Studio, TI recommends completely erasing the onboard serial flash. The instructions to erase the onboard serial flash are in the *mmWave SDK User Guide*.

2.5.2   Connection With MMWAVE-DEVPACK

Users may be required to use the DevPack along with the BoosterPack for the following use cases:

- Connecting to RADAR studio. This tool provides capability to configure the mmWave front end from the PC. This tool is available in the DFP package.
- Capturing high-speed LVDS data using the TSW1400 platform from TI. This device allows the user to capture raw ADC data over the high-speed debug interface and post process it in the PC. The RADAR Studio tool provides an interface to the TSW1400 platform as well, so that the front end configurations and data capture can be done using a single interface. Details on this board can be found at http://www.ti.com/tool/tsw1400evm

For details on these use cases, see the mmWave-DevPack User Guide.

Mmwave SDK out-of-box demos do not require DevPack. For other labs, check the hardware requirements of the lab user guide.

2.6 Antenna

The BoosterPack includes onboard etched antennas for the four receivers and three transmitters, which enables tracking multiple objects with their distance and angle information. This antenna design enables estimation of both azimuth and elevation angles, which enables object detection in a 3-D plane (see Figure 10).

In the mmwave SDK, the antenna configuration is selected using bitmask. For example, 2 transmit antennas can be enabled through bitmask 0b101 (such as tx1 and tx3). The corresponding physical location of rx1 to rx4 and tx1 to tx3 and are labeled in Figure 10.
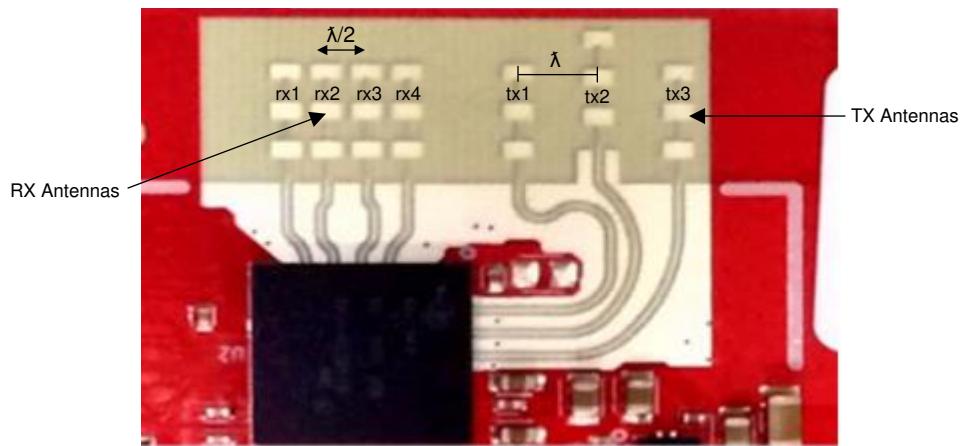

Figure 10. PCB Antenna

The antenna peak gain is > 10.5 dBi across the frequency band of 76 to 81 GHz. The radiation pattern of the antenna in the horizontal plan (H-plane) and elevation plan (E-plane) is as shown in Figure 11 and Figure 12.

The beamwidth of the antenna design can be determined from the radiation patterns. For example, at 78 GHz, based on 3-dB drop in the gain as compared to bore sight, the horizontal 3dB-beamwidth is approximately ±28 degrees (see Figure 11), and elevation 3dB-beamwidth is approximately ±14 degrees (see Figure 12). Similarly, the horizontal 6dB-beamwidth is approximately ±50 degrees (see Figure 11) and the elevation 6dB-beamwidth is approximately ±20 degrees (see Figure 12).
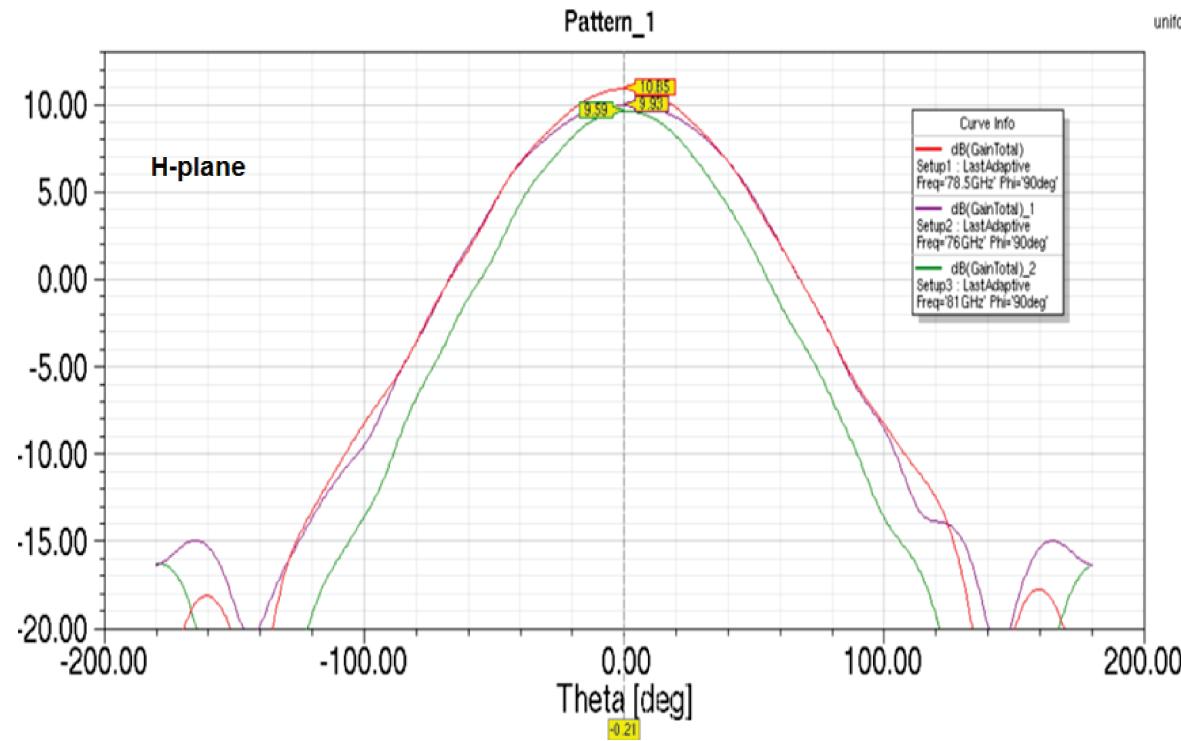
**Figure 11. Antenna Pattern in H-Plane**
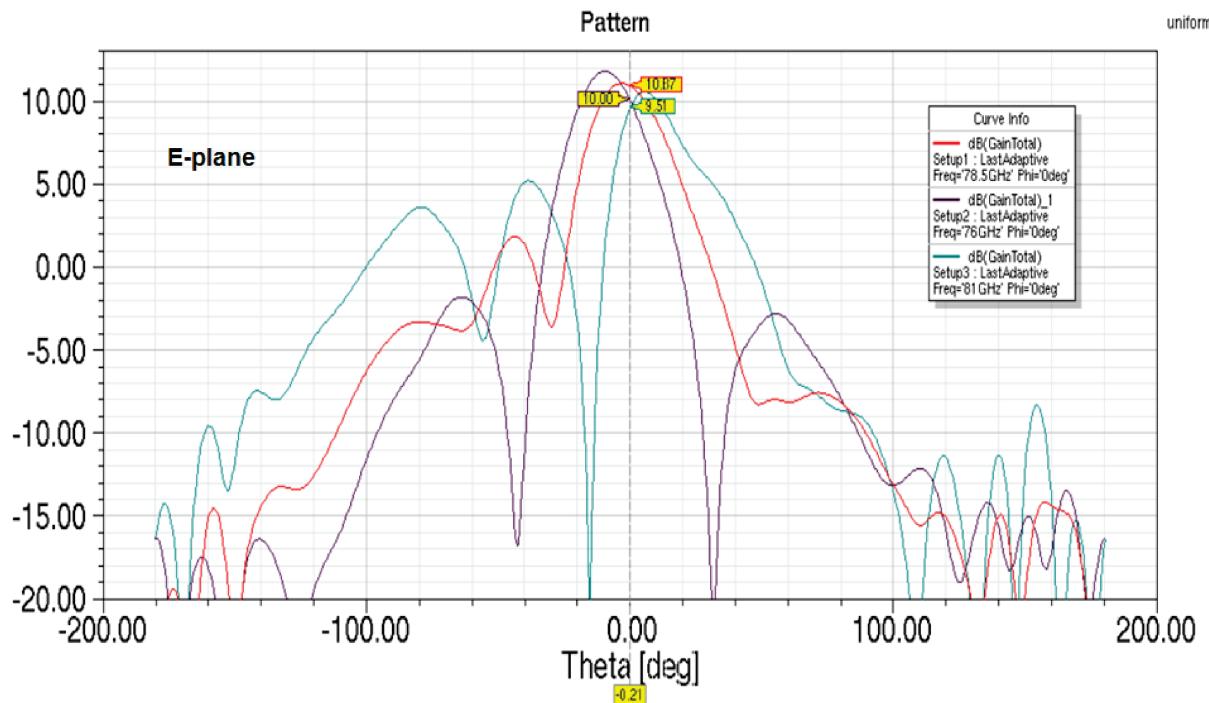
**Figure 12. Antenna Pattern in E-Plane**

2.7 Jumpers, Switches, and LEDs

2.7.1 Sense On Power Jumpers

The IWR1443 device can be set to operate in three different modes, based on the state of the SOP (sense on power) lines (see Figure 13). These lines are *only* sensed during boot up of the IWR device. The state of the device is described by Table 5.

A closed jumper refers to a *1* and an open jumper refers to a *0* state of the SOP signal going to the IWR device.

Table 5. SOP Modes

Reference	Use	Comments
P3 (SOP 2)	SOP[2:0]	101 (SOP mode 5) = Flash programming 001 (SOP mode 4) = Functional mode 011 (SOP mode 2) = Dev mode
P2 (SOP 1)		
P4 (SOP 0)		
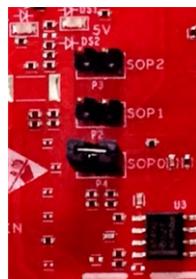
Figure 13. SOP Jumpers

2.7.2 Current Measurement

The P5 jumper enables measurement of the current being consumed by the reference design (IWR device + PMIC + LDOs) at the 5-V level.

To measure the current, R118 must be removed and a series ammeter can be put across the P5 pins (see Figure 14).

Figure 14. Current Measurement Point

2.7.3 Push Buttons and LEDs

Table 6 and Table 7 list the push button and LED uses, respectively.

Table 6. Push Buttons

Reference	Use	Comments	Image
SW2	RESET	This button is used to reset the IWR1443 device. This signal is also brought out on the 20-pin connector and 60-pin HD connector, so that an external processor can control the IWR device. The onboard XDS110 can also use this reset.	
SW1	GPIO_1	When this button is pushed, the GPIO_1 is pulled to V_{cc}.	
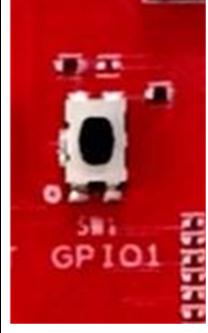
Table 7. LEDs

Reference	Color	Use	Comments	Image
DS2	Red	5-V supply indication	This LED indicates the presence of the 5-V supply.	
DS4	Yellow	nRESET	This LED is used to indicate the state of nRESET pin. If this LED is on, the device is out of reset. This LED glows only after the 5-V supply is provided.	
DS1	Red	NERR_OUT	This LED turns on if there is any hardware error in the IWR device.	
DS3	Yellow	GPIO_1	This LED turns on when the GPIO is logic-1.	

3 Design Files and Software Tools

The schematics, assembly, and BOM are available here. The design and layout database files are available here.

> **NOTE:** Boards with a Rev 'C' sticker have had capacitor C56 (VBGAP decoupling capacitor) changed from 0.22 µF to 0.047 µF (part number CGA2B3X7R1H473K050BB). TI recommends that customers incorporate this change with an equivalent capacitor in their designs.

3.1 Software, Development Tools, and Example Codes

To enable quick development of an end application on the R4F core in the IWR1443, TI provides a software development kit (SDK) which includes demo codes, software drivers, an emulation package for debug, and so on. The SDK is available at mmwave-sdk.

4 Mechanical Mounting of PCB

The field of view of the radar sensor is orthogonal to the PCB. The L-brackets provided with the IWR1443 EVM kit, along with the screws and nuts help in the vertical mounting of the EVM. Figure 15 shows how the L-brackets can be assembled.
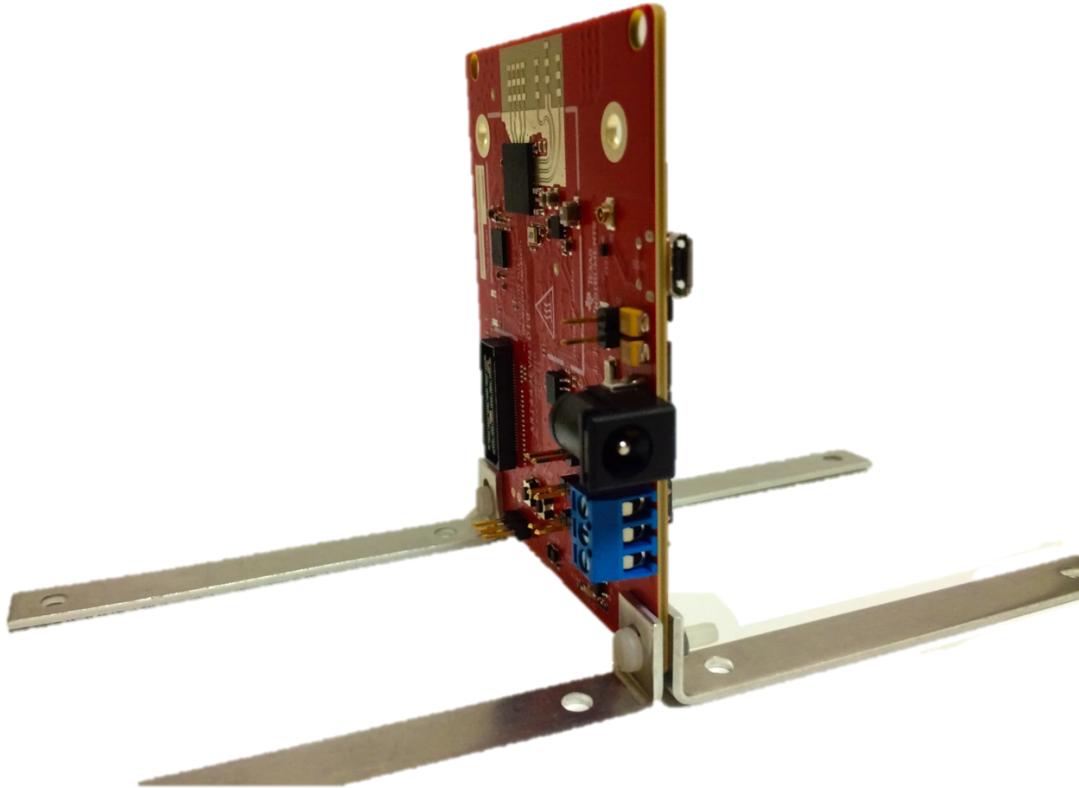
**Figure 15. Vertical Assembly of the EVM**

5   PCB Storage and Handling Recommendations

The immersion silver finish of the PCB provides a better high-frequency performance but is also prone to oxidation in an open environment. This oxidation causes the surface around the antenna region to blacken. To avoid this effect, store the PCB in an ESD cover and keep it at controlled room temperature with low humidity conditions. All ESD precautions must be taken while using and handling the EVM.

6   Regulatory Information

The IWR1443 evaluation module (IWR1443BOOST) is in compliance with Directive 2014/53/EU. The full text of TI's EU Declaration of Conformity is available here.

The compliance has been verified in the operating bands 76 – 77 GHz and 77 – 81 GHz. Should the user choose to configure the EVM to operate outside the test conditions, it should be operated inside a protected or controlled environment, such as a shielded chamber. This evaluation board is intended only for development, and is not for use in an end product or part of an end product. Developers and integrators that incorporate the chipset in any end products are responsible for obtaining applicable regulatory approvals for such an end product.

The European RF exposure radiation limit is fulfilled if a minimum distance of 5 cm between the users body and the radio transmitter is respected.

> **NOTE:**   The EUT has been tested in the 76 – 77 GHz band (2 Tx at a time) at a maximum peak power of 26 dBm EIRP, and in the 77 – 81 GHz band (1 Tx at a time) with maximum peak power of 21 dBm EIRP across the temperature range of –20ºC to 60ºC.

7   Troubleshooting

EVM board power-up failure: refer to Section 2.2 for desired power connections. Both the NRST and 5-V LEDs should glow brightly. When a non-functional or non-sufficient current capacity power supply is used with this EVM, the EVM LEDs do not turn on. Refer to Section 2.7.3 for LED information.

Revision History

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

Changes from April 1, 2018 to May 30, 2020 **Page**

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.

<u>WARNING</u>

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。

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。 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.

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:*

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