User's Guide

IWR6843L EVM

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ABSTRACT

The IWR6843LEVM from Texas Instruments is an easy-to-use low cost FR4-based evaluation board for the XWR6843 mmWave sensing device, with direct connectivity to the MMWAVEICBOOST and DCA1000EVM development kits. This EVM contains everything required to start developing software for on-chip C67x DSP core and low power Arm® Cortex®-R4F controllers

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Trademarks

1 Getting Started

1.1 Key Features

- FR4-based PCB substrate
- Wide field of view antenna: Azimuth FOV 120°, Elevation FOV 80°
- Discrete DCDC power management solution
- Relaxed PCB rules: Lower manufacturing cost
  - No micro vias, only through via
  - No vias on the BGA pads
- Serial port for onboard QSPI flash programming
- 60-pin, high-density (HD) connectors for raw analog-to-digital converter (ADC) data over LVDS
- Onboard CAN-FD transceiver
- USB powered standalone mode of operation

1.2 Kit Contents

The following items are included in the IWR6843LEVM:

- IWR6843LEVM Evaluation board
- Micro USB

1.3 mmWave Out of Box Demo

TI provides sample demo codes to easily get started with the IWR6843LEVM evaluation module (EVM) and to experience the functionality of the IWR6843 radar sensor. For details on getting started with these demos, see www.ti.com/tool/mmwave-sdk.

CAUTION

- Caution Hot Surface
- Contact May Cause Burn
- Do Not Touch

2 Hardware

The IWR6843LEVM includes four receivers and three transmitters wide field of antennas on the FR4 PCB substrate.

The IWR6843 operates at a 4-GHz bandwidth from 60 to 64 GHz. The IWR6843LEVM has an antenna gain of ~5-6 dBi across different antenna pairs.

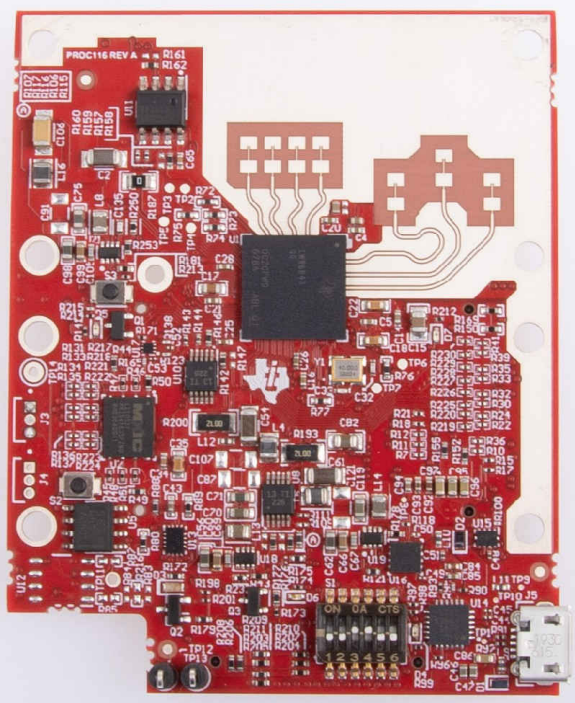

Figure 2-1. IWR6843LEVM Top View

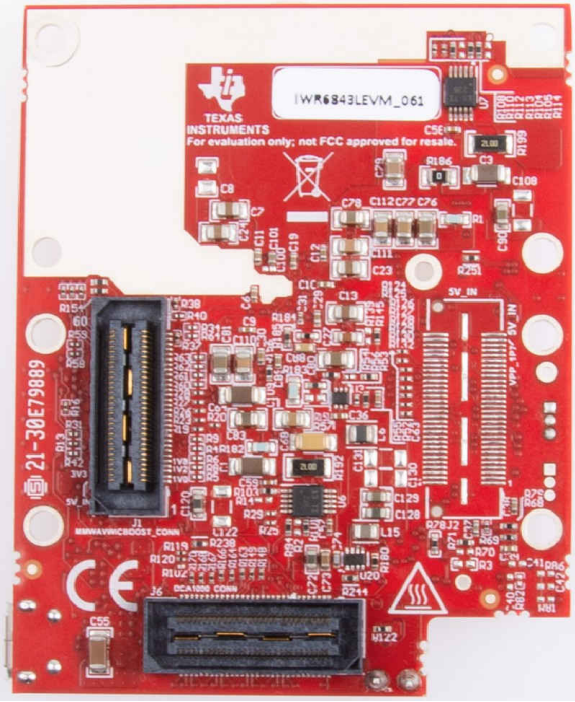

Figure 2-2. IWR6843LEVM Bottom View

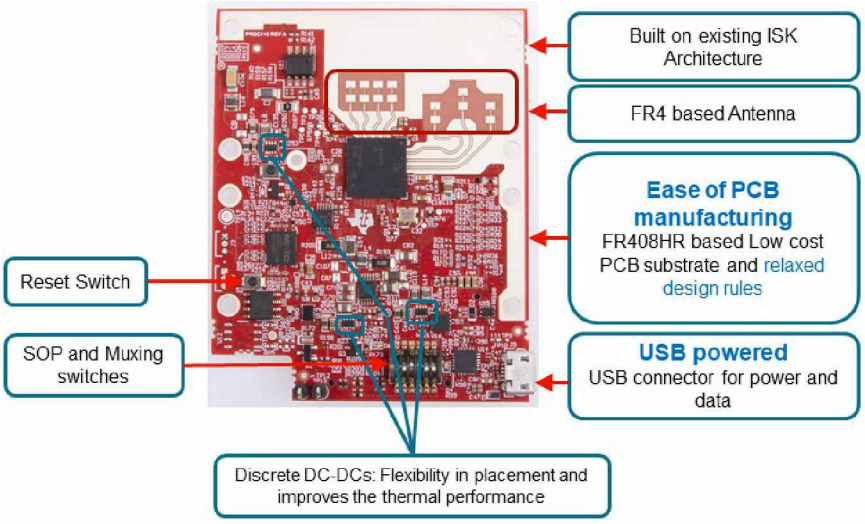

Figure 2-3. Salient features of EVM (top side)

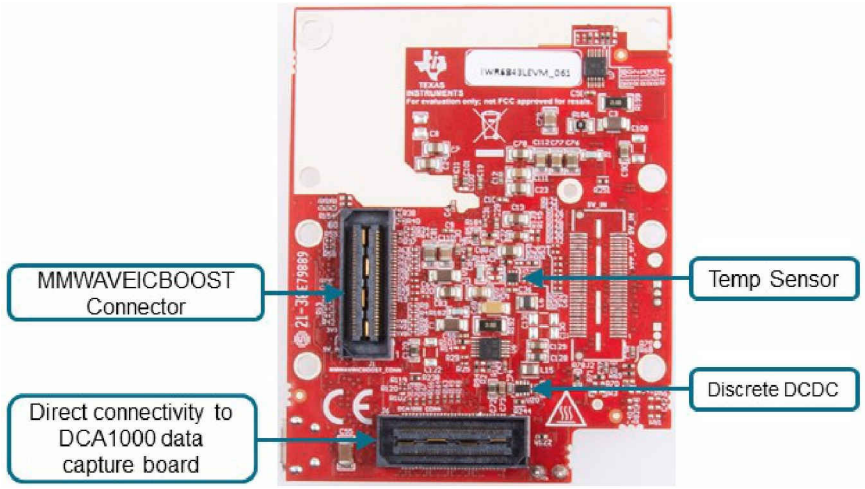

Figure 2-4. Salient features of EVM (bottom side)

2.1 Block Diagram

Figure 2-5 shows the functional block diagram. The EVM contains the essential components for the TI mmWave radar system, DCDC, SFLASH, SOP configuration, Filter, TI mmWave Radar chip, and a USB to universal asynchronous receiver/transmitter (UART) converter, two 60-pin Samtec connectors for interfacing with the DCA1000 and MMWAVEICBOOST.

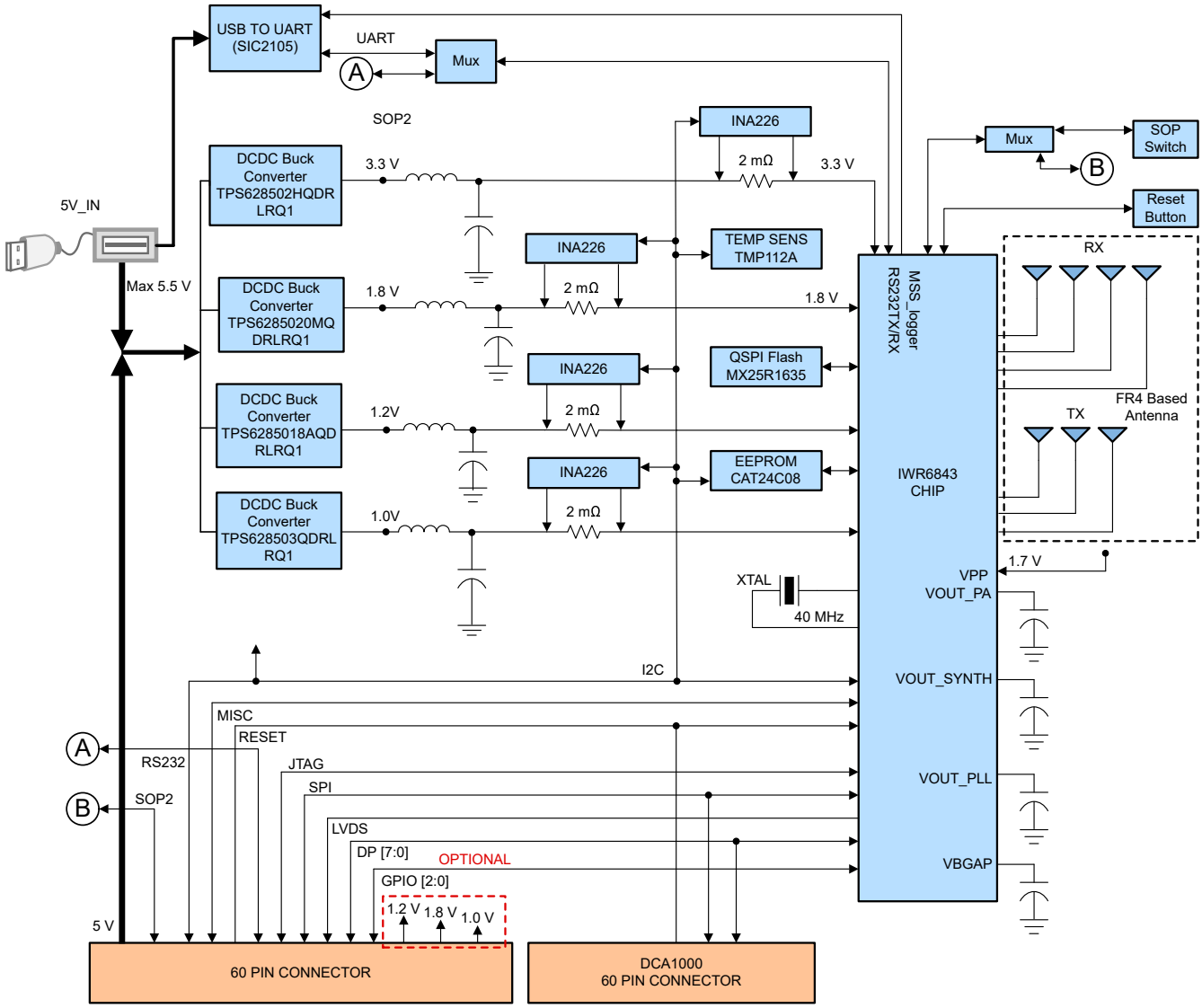

Figure 2-5. Functional Block Diagram

3 PCB Storage and Handling Recommendations

This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. For more information on proper handling, see *Electrostatic Discharge (ESD)*.

3.1 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 open environment. This oxidation causes the surface around the antenna region to blacken however mmWave Radar performance would be intact. To avoid oxidation, the PCB should be stored in an ESD cover and kept at a controlled room temperature with low humidity conditions. All ESD precautions must be taken while using and handling the EVM.

3.2 Higher Power Demanding Applications

For higher power applications, which single USB-port cannot supply, for example simultaneous 3 Tx operation MMWAVEICBOOST board could be used which has external power adapter to power the entire board.

4 IWR6843LEVM Antenna

The IWR6843LEVM includes four receivers and three transmitters FR4 based antennas on the PCB. Figure 4-1 shows the Antenna configuration.

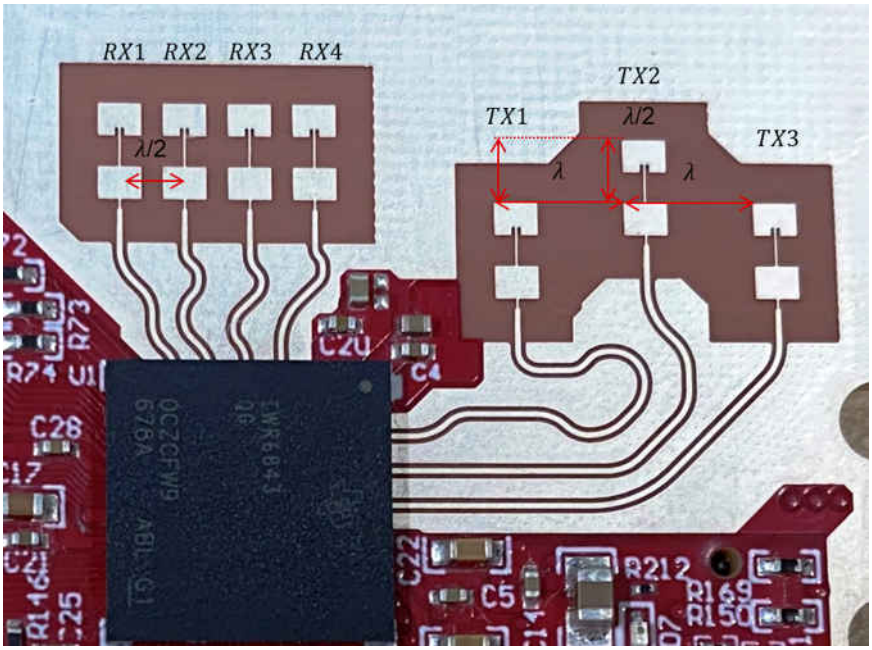

Figure 4-1. TX and Rx Antennas of the EVM

4.1 Transmitter and Receiver Virtual Array

The transmitter and receiver antenna's positions form a virtual array of 12 transmitter and receiver pairs (as shown in Figure 4-2). This allows the object detections finer azimuthal angular resolution (15°) and coarse elevation angular resolution (58°). Receiver antennas are spaced at distance D (Lambda/2) and Transmitter antenna Tx1 and Tx2 spaced at 2D (lambda) in azimuthal plane and D (Lambda/2) in elevation plane. Tx2 and Tx3 are placed at D (lambda/2) in the elevation and 2D (Lambda) in azimuth plane.

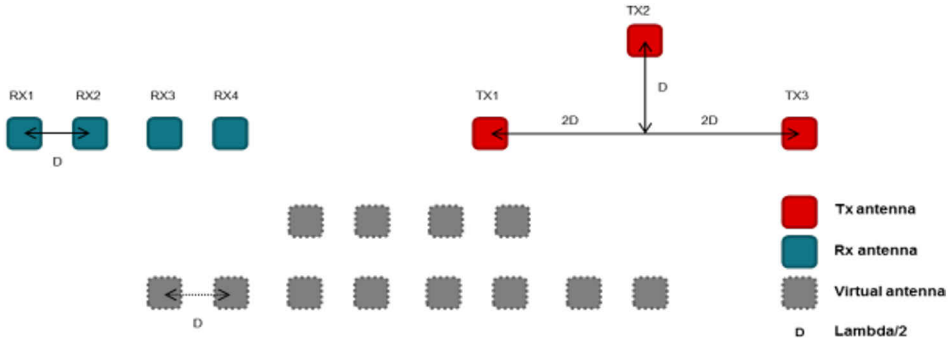

Figure 4-2. Virtual Antenna Array

Figure 4-3 shows the antenna radiation pattern with regard to azimuth. Figure 4-4 shows the antenna radiation pattern with regard to elevation for TX1, TX2, and TX3. Both show the radiation pattern for TX1, TX2, and TX3 and RX1, RX2, RX3, and RX4 together. All of the measurements were done with a Tx and Rx combination together. Thus, for the -6dB beam width, you must see a -12db (Tx (-6dB) + Rx(-6dB)) number from the boresight.

Note

Wavelength (Lambda) is computed based on a 62 GHz frequency. Antenna placements are done according to this frequency.

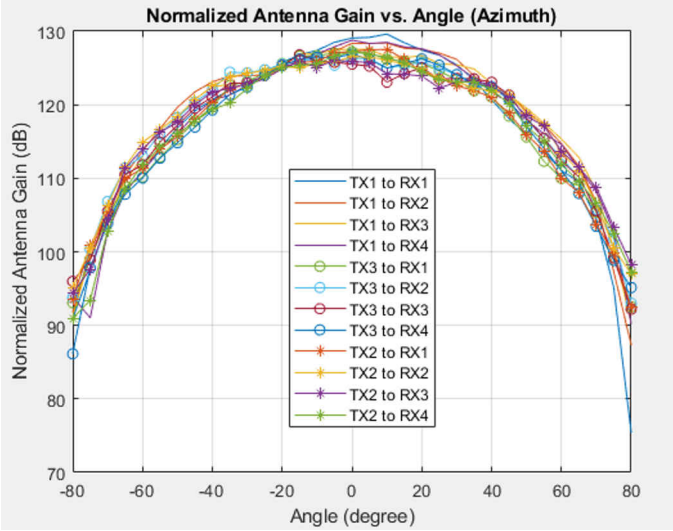

Figure 4-3. Azimuth Antenna Radiation Patterns

Measured azimuthal radiation pattern for all Tx to Rx Pairs (Corner Reflector Placed at approximately 4 meters with a 2- GHz Bandwidth Chirp starting at 62 GHz).

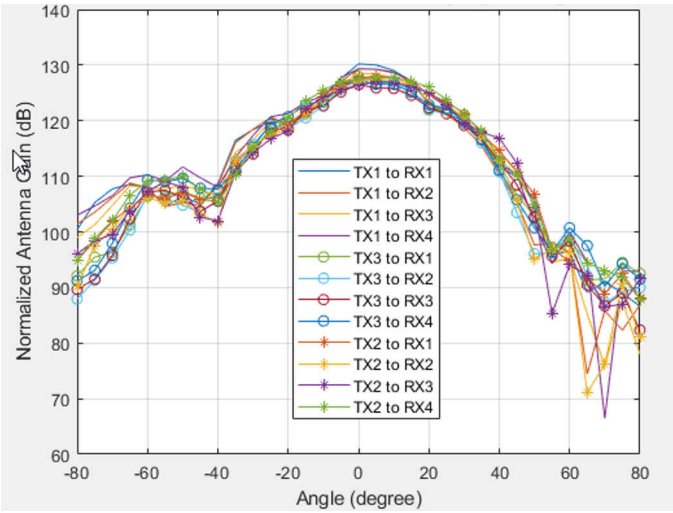

Figure 4-4. Elevation Antenna Radiation Patterns

Note

In accordance to the EN 62311 RF exposure test, a minimum separation distance of 20 centimeters should be maintained between the user and the EVM during operation.

5 Hardware Details

5.1 Switch Settings

Figure 5-1 shows the part designators and positions of the switches on the IWR6843LEVM.

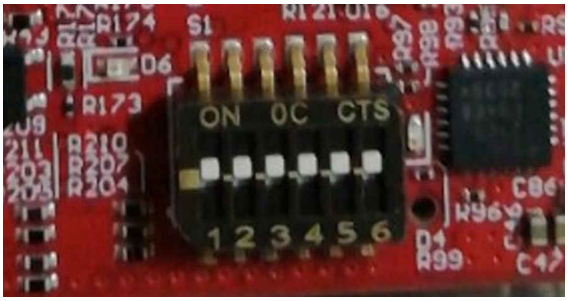

Figure 5-1. Part Designators and Positions of the Switches on the IWR6843LEVM

Table 5-1. Switches, Buttons and Muxes

Reference Designator	Switch On	Switch Off
S1.1	SOP2 pulled up	SOP2 pulled down
S1.2	SOP1 pulled up	SOP1 pulled down
S1.3	SOP0 pulled up	SOP0 pulled down
S1.4	Muxes to CAN connector J3, J4	Muxes to serial peripheral interface (SPI) on 60 pin connector, J1, J6
S1.5	Muxes USER UART to 60 pin header J1	Muxes USER UART to USB connector J5
S1.6	-	-
S2	Reset switch	
S3	GPIO1 toggle switch	

5.2 LEDs

Table 5-2 contains the list of LEDs on the IWR6843LEVM.

Table 5-2. List of LEDs

Reference Designator	Color	Usage	Comment
D3	Orange	Power good	This LED is used to indicate the PGOOD. If this LED is glowing, it means that all of the voltage rails are in limits.
D4	Green	USB enumeration LED	Turns on while enumerating the USB
D5	Green	Reset	Toggles when reset button is depressed
D6	Green	5 V indicator	Indicates the application of 5 V power
D7	Green	GPIO 2	Connected to GPIO2 can be used when GPIO is set as an output.

5.3 Connectors

Higher current support: When using the EVM with the MMWAVEICBOOST, the 5-V supply is provided by the MMWAVEICBOOST board, so power over the USB connector is not required.

Note

After the 5-V power supply is provided to the EVM, TI recommends pressing the NRST switch one time to ensure a reliable boot-up state.

Note

All digital IO pins of the device (except NERROR IN, NERROR_OUT, and WARM_RESET) are non-failsafe; hence, care needs to be taken that they are not driven externally without the VIO supply being present to the device.

5.4 USB Connector

The USB connector provides a 5-V supply input to power the device; additionally, the PC interface is brought out on this connector:

- UART for flashing the onboard serial flash, downloading FW through Radar Studio, and getting application data sent through the UART
- MSS logger UART (can be used to get MSS code logs on the PC)

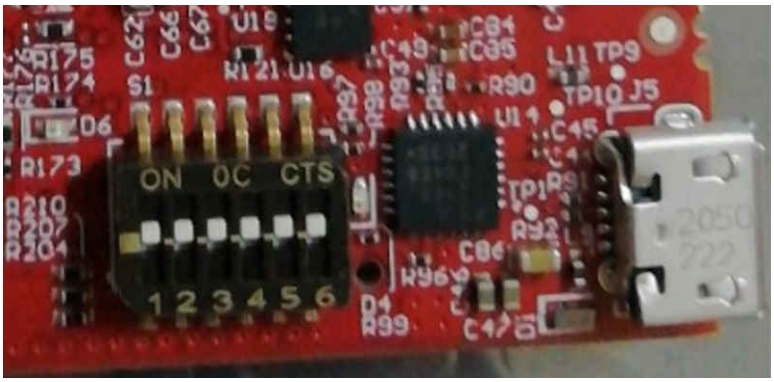

Figure 5-2. USB Connector (J5)

5.5 DCA1000 HD Connector

The 60-pin HD connector shown in Figure 5-3 provides the high-speed LVDS data, and controls signals (SPI, UART, Inter-Integrated Circuit (I2C), NRST, NERROR, and SOPs) to the DCA1000.

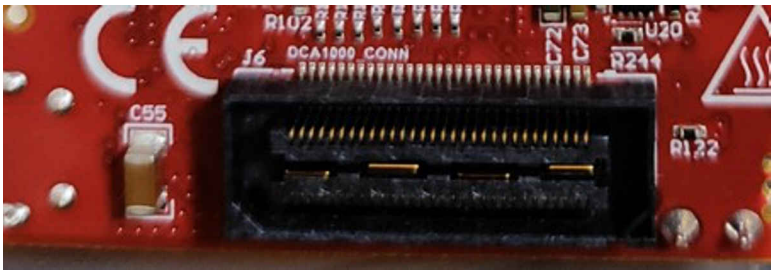

Figure 5-3. DCA1000 HD Connector

5.6 MMWAVEICBOOST HD Connector

The 60-pin HD connector shown in Figure 5-4 provides the high-speed LVDS data, controls signals (SPI, UART, I2C, NRST, NERR, and SOPs) and JTAG debug signals to the MMWAVEICBOOST. The Trace and DMM interface lines are also available through this connector (not connected by default).

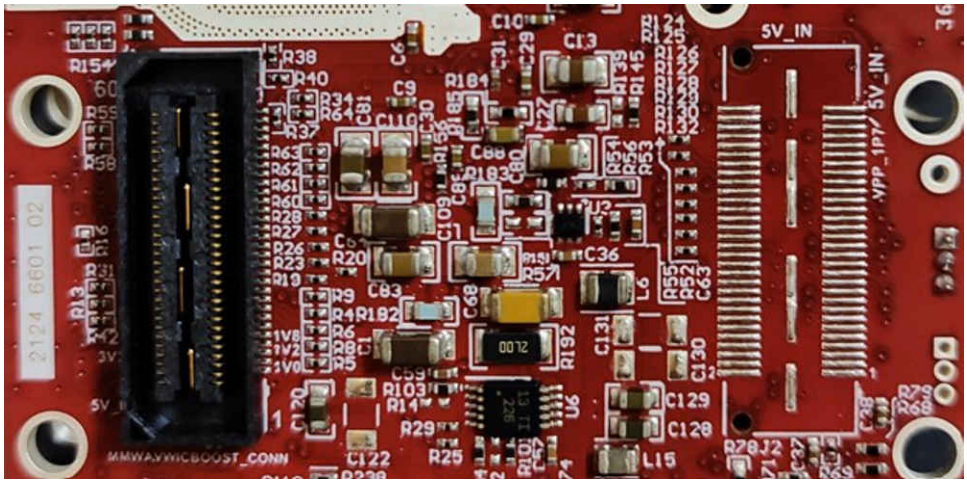

Figure 5-4. MMWAVEICBOOST HD Connector

5.7 CANFD Connector

The CAN connector provides access to the two CAN_FD interfaces (CAN_L and CAN_H signals) from the onboard CAND-FD transceivers. These signals can be directly wired to the CAN bus.

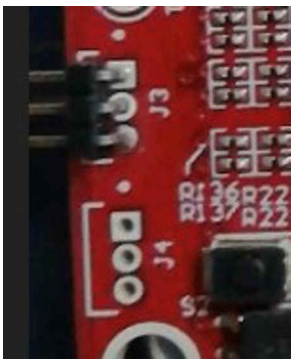

Figure 5-5. CANFD Connector

Table 5-3 shows the J3 and J4 connectors that provide the CAN_L and CAN_H signals from the 2 onboard CAND-FD transceivers (TCAN1042HGVDRQ1). These signals are wired to the CAN bus after muxing with the SPI interface signals; one of the two paths must be selected. Two CANs are selected by closing the switch S1.4 (1st position of switch to be ON).

Table 5-3. CAN Pin Assignment

Pin Description	Device Interface	Connector on Board
SPI_CS1	CAN2_TX	J4.1 - CANL, J4.2 - GND, J4.3 - CANH
SPI_CLK1	CAN2_RX	
MISO_1	CAN1_TX	J3.1 - CANL, J3.2 - GND, J3.3 - CANH
MOSI_1	CAN1_RX	

5.8 I2C Connections

The board features an EEPROM, current sensor, and temperature sensor for measuring on-board temperature. These are connected to the I2C bus and can be isolated using the zero Ω provided on the hardware.

5.9 EEPROM

The board features an EEPROM for storing the board specific IDs (for the identification of the starter kit connected to the MMWAVEICBOOST).

5.10 Default I2C Address

Table 5-4 provides the list of I2C devices and its address.

Table 5-4. List of I2C Device and Addresses

Sensor Type	Designator	Part Number	Slave Address
Temperature sensor	U3	TMP112AQDRLRQ1	100 1011
EEPROM	J11	CAT24C08W1-GT3	101 00XX (1)
Current sensor 1	U6	INA226AIDGST	100 0000
Current sensor 2	U7	INA226AIDGST	100 0101
Current sensor 3	U8	INA226AIDGST	100 0001
Current sensor 4	U10	INA226AIDGST	100 0100
PMIC	U4	LP87702DRHBRQ1	110 0000

1. XX means 00,01,10,11

5.11 Modular Mode

When used in modular mode as shown in Figure 5-7, the power is supplied through a single USB connector; the same USB connector J5 is also used for data transfer through the CP2015 USB to UART converter. When enumerated correctly, the 2 UART ports are displayed on the device manager as a Virtual COM Port, similar to that shown in Figure 5-6.

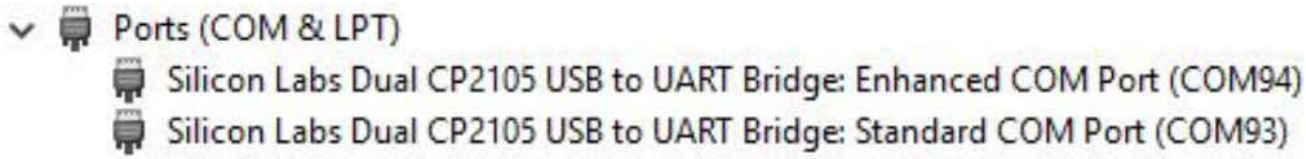

Figure 5-6. Virtual COM Port

The SICP2105 drivers must be installed to access the UART port. Download and install the drivers here.

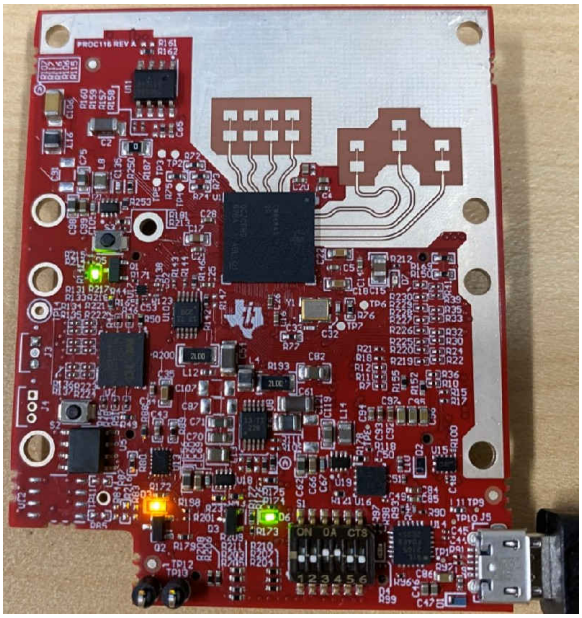

Figure 5-7. EVM in Functional Mode Using Standalone Operation

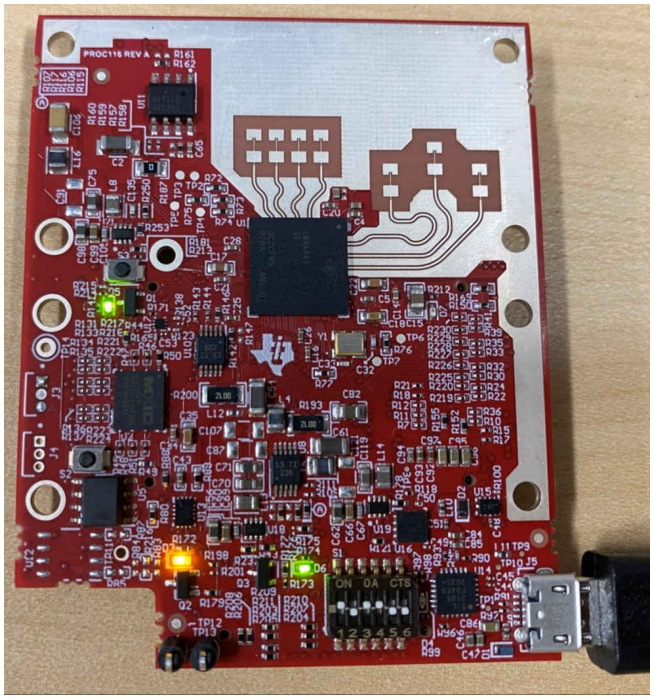

Figure 5-8. EVM in Flashing Mode Using Standalone Operation

The enhanced COM port is the application/user UART and the standard COM port is the data port.

The S1 switch setting for functional and flashing mode is shown in Table 5-5.

Table 5-5. S1 Swtch Setting for Functional and Flashing Mode

	S1.1	S1.2	S1.3	S1.4	S1.5	S1.6
Flashing	On	Off	On	On	Off	-
Functional	Off	Off	On	On	Off	-

5.12 Flashing the Board

1. Ensure the drivers have been successfully installed and COM ports enumerated.
2. Configure the SOP to flashing mode.
3. Run the UniFlash tool.
4. Press the reset switch to ensure that the board boots up in the right mode.
5. Enter the Enhanced COM Port in UniFlash interface.
6. Load image to serial flash. For running out of box demos, see the mmWave SDK for the flash binary.

For running the demo applications please refer training videos from training.ti.com link provided below:

- Hardware Setup for IWR6843ISK and IWR6843ISK-ODS | TI.com Video
- Hardware Setup for MMWAVEICBOOST and antenna module | TI.com Video

5.13 DCA1000EVM Mode

The setup for raw data capture using DCA1000EVM is shown in Figure 5-9.

Figure 5-9. DCA1000EVM Mode

S1 switch settings for this mode is shown in Table 5-6.

Table 5-6. S1 Configuration for DCA1000EVM Mode

	S1.1	S1.2	S1.3	S1.4	S1.5	S1.6
DCA1000EMV mode	Off	On	On	Off	Off	-

5.14 MMWAVEICBOOST Mode

In this mode the boards are setup as shown in Figure 5-10, UART is routed to the 60 pin connector to the XDS110 USB. This mode enables access to debugging tools available on the MMWAVEICBOOST such as the JTAG, RAW ADC capture through MMWAVEICBOOST camera-mount option, CAN, Launchpad connector, and so forth.

Note

In MMWAVEICBOOST mode, the IWR6843LEVM is mounted on the MMWAVEICBOOST and the SOP mode is set by the MMWAVEICBOOST.

More on the mmWAVEICBOOST, setup and features it provides can be found in the *MMWAVEICBOOST* section of MMWAVEICBOOST EVM userguide.

Figure 5-10. MMWAVEICBOOST Mode

5.15 Raw ADC Data Capture Using MMWAVEICBOOST and DCA1000 EVMs

This mode enables raw data capture using the DCA1000 EVM via MMWAVEICBOOST. MMWAVEICBOOST supports higher current and camera mount options.

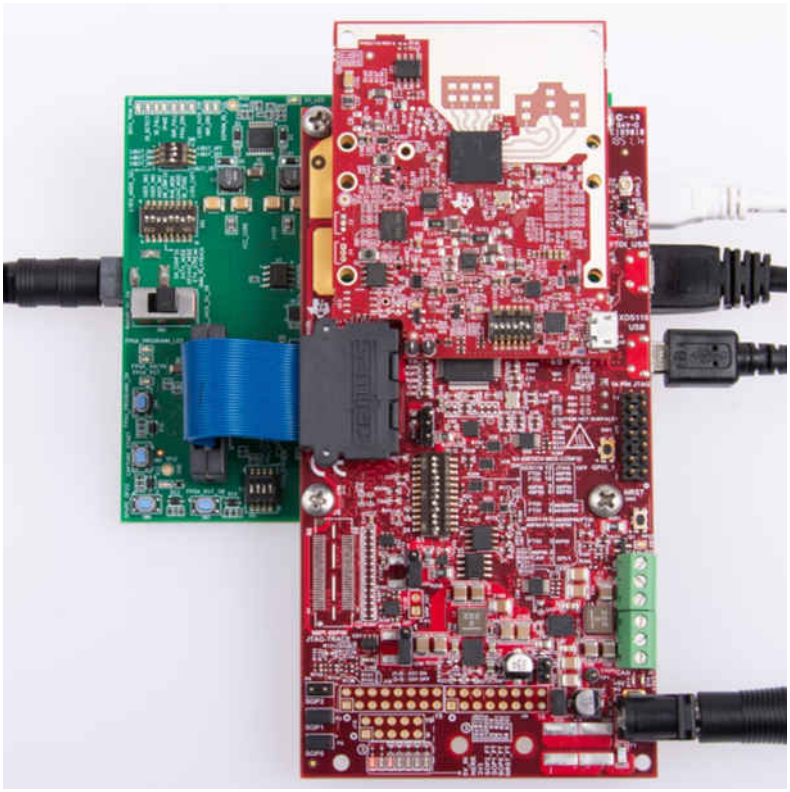

Figure 5-11. mmWAVEICBOOST With DCA1000 Mode

5.16 Muxing Scheme

The IWR6843LEVM UART RX/TX can be routed to the Samtec 60-pin connector, USB to UART (SICP2105) using S1.5 switch.

6 Software, Development Tools, and Example Code

To enable quick development of end applications on the C67x DSP and Arm Cortex R4F core in the IWR6843, TI provides a software development kit (SDK) that includes demo codes, software drivers, emulation packages for debug, and more. These can be found at mmwave-sdk.

You can also visit the TI resource explorer for the mmWave product from here. You will find Toolbox for mmWave Sensors, experiments, labs, and various demo examples.

7 TI E2E Community

Search the forums at e2e.ti.com. If you cannot find your answer, post your question to the community.

8 References

- Texas Instruments: *DCA1000EVM Data Capture Card User's Guide*
- Texas Instruments: *MMWAVEICBOOST & 60GHz EVM User's Guide*
- Hardware Setup for IWR6843ISK and IWR6843ISK-ODS | TI.com Video
- Hardware Setup for MMWAVEICBOOST and antenna module | TI.com Video
- mmwave-sdk
- USB to UART Drivers for the CP2105

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。

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.

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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。

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東京都新宿区西新宿 6 丁目 2 4 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

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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.

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