

DLP® LightCrafter™ Display 160CP Evaluation Module



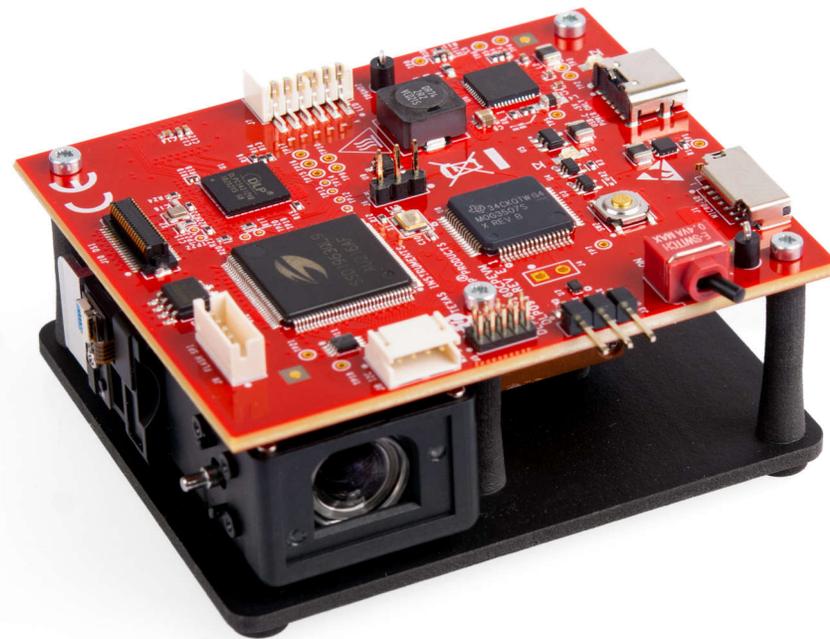
Description

The DLP® LightCrafter™ Display .16 nHD Evaluation Module (EVM) is designed to enable microcontroller (MCU) generated graphics display without the need of a video processor, opening new possibilities for affordable DLP free-form on-demand display implementations in industrial and personal electronic applications such as appliances, human machine interface, robotics, and toys. This EVM features [DLP160CP](#) chipset including [DLPC3421](#), .16 nHD

(360x640) optical engine, and [MSPM0G3507](#) MCU for image generation out of the box.

Features

- Small form factor (66 mm x 56 mm)
- First DLP display EVM capable of displaying MCU generated content
- Easily evaluate image display from Micro SD card
- MSPM0G MCU family compatible (JTAG, UART supported)



1 Evaluation Module Overview

1.1 Introduction

This user's guide presents an overview of the DLP® LightCrafter™ Display 160CP evaluation module (EVM) (DLPCLCR160CPEVM) and a general description of the main features and functions. The guide explains the first steps to get started, and shows a detailed description of onboard LEDs, connectors, and overall EVM assembly.

The EVM can be used by itself to display nHD (640x360) resolution graphics or images either generated by the DLPC3421 display controller or the MSPM0G3507 MCU (microcontroller). Images can also be added from a Micro-SD card through the MSPM0 MCU.

This guide provides the user with further information on how to successfully operate the EVM and get content projected on the wall.

1.2 Kit Contents

The DLPDLCR160CPEVM is shipped as a fully assembled unit. The only component required to power up the unit is a compatible power adapter (not included).

A 5 V power adapter with a 1 A minimum output and a USB-C connector is required.

1.3 DLPDLCR160CPEVM Subsystems

The DLP LightCrafter Display module consists of two subsystems:

- **Formatter Board:** includes the DLP chipset (DLPC3421 display controller and DLPA2005 PMIC/LED driver). The MSPM0G3507 MCU, SSD1963 video interface driver, and Micro-SD card connector are also included.
- **Light Engine:** includes optics, RGB LEDs, and DLP160CP DMD displaying 640 × 360 pixels (nHD) on screen.

The DLPDLCR160CPEVM is designed to operate at a maximum ambient temperature of 30°C. A block diagram of the DLPDLCR160CPEVM is shown in [Figure 1-1](#).

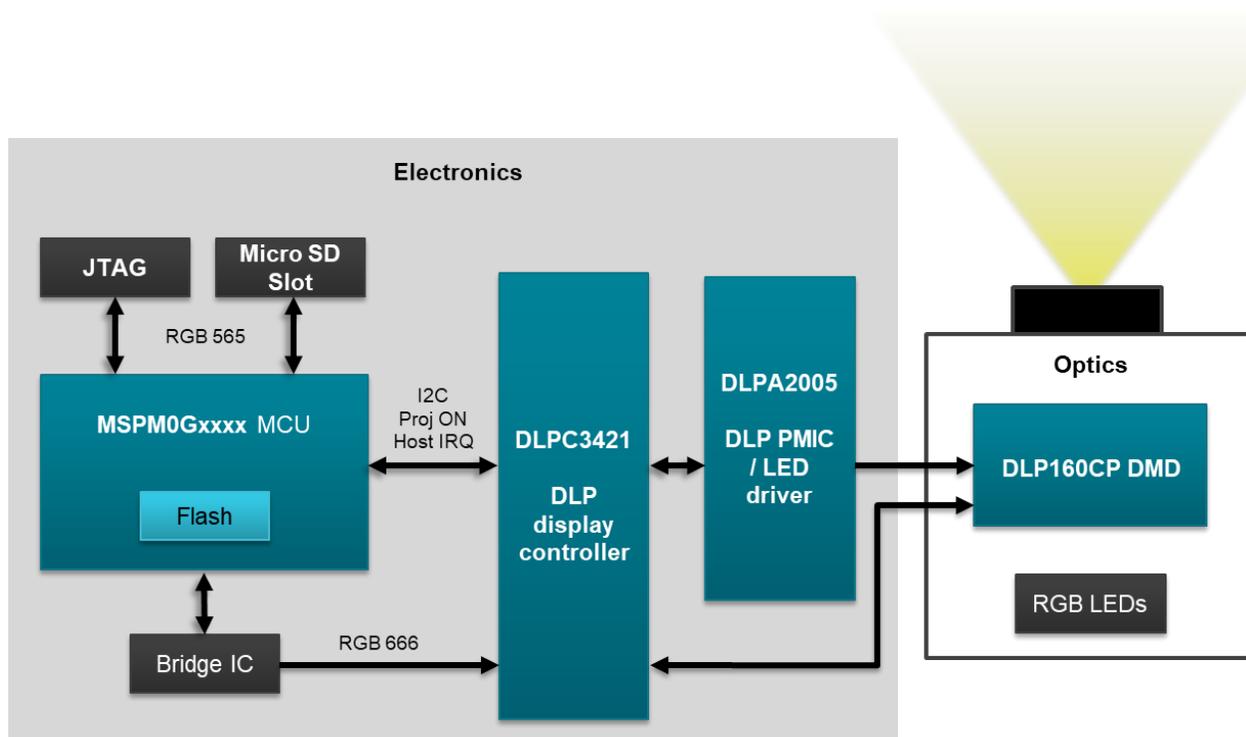


Figure 1-1. DLPDLCR160CPEVM Block Diagram

1.4 Device Information

- **DLPC3421** (Figure 2-1): display controller controls the DLPA2005 (Figure 2-1) PMIC/RGB illumination driver and the DLP160CP DMD (digital micromirror device).
- **DLP160CP** DMD is assembled with an Elephant optical module using SFM-03X-CG and SFM-03X-RAB LEDs from Luminus with a brightness of 20L out of the box (the module is capable to deliver 50L, but requires additional thermal designs for proper operation).
- **MSPM0G3507** (Figure 2-1): MCU provides control application, nHD image generation through the SSD1963 (Figure 2-1), and UART (Universal Asynchronous Receiver/ Transmitter) (Figure 2-1) communication programmable capabilities. The MCU can be programmed using ARM® SWD (Serial Wire Debug) interface through the JTAG (Joint Test Action Group) connector (Figure 2-1).
- **SSD1963** (Bridge IC) video interface driver gets 8080 commands from the MCU and outputs RGB666 parallel interface signals to the DLPC3421 DLP display controller.
- **DSI input** (Figure 2-1): to the DLPC4321 controller provided through an external interface connector. Video can be input through an external interface connector over the DSI interface. (Not tested)
- **Power button** (Figure 2-1) is used to gently power up and power down the DLP display system.
- **Programmable push button** (Figure 2-1) is used to provide user input controlled by the MCU.
- **MicroSD card slot** (Figure 2-1) is provided to add custom images controlled by the MCU (MicroSD card not included).
- **USB Type-C power supply interface** (Figure 2-1) is used to power the EVM unit (USB Type-C cable and power supply not included).

This DLP chipset is combined with illumination, projection optics, and RGB LEDs to create a projector that offers brightness of approximately 20 lumens out of the box for image or informational video display in a very small volume form factor.

The DLPDLCR160CPEVM is not a production design, and is intended for evaluation only.

2 Hardware

2.1 EVM Images

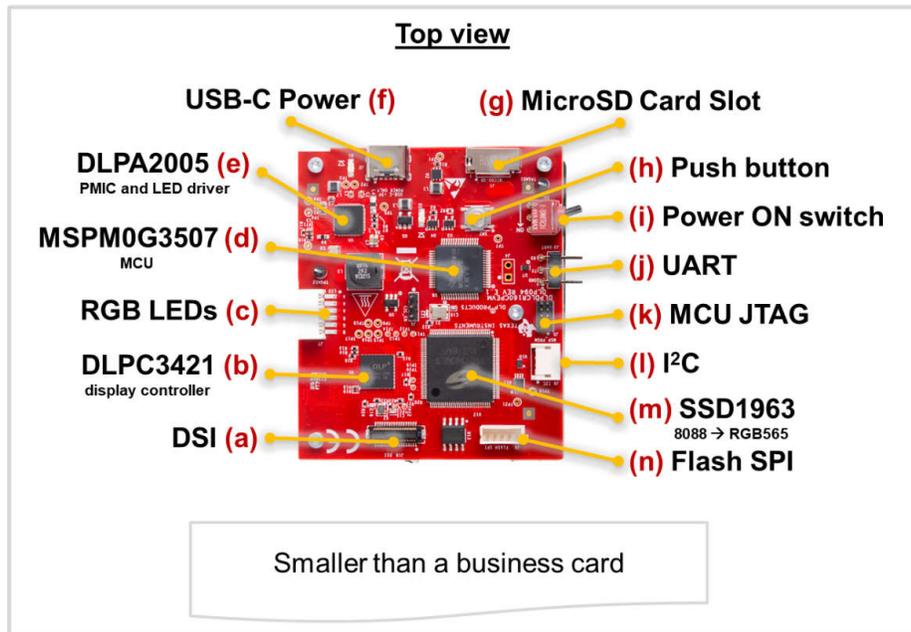


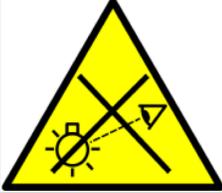
Figure 2-1. DLPDL160CPEVM Unit (top view)



Figure 2-2. DLPDL160CPEVM Unit (perspective view)

2.2 Safety Instructions

Cautions and Warnings

	<p>WARNING</p> <p>Observe handling precautions. Electrostatic sensitive devices.</p>
	<p>CAUTION</p> <p>Do not stare into operating LED.</p>
	<p>CAUTION</p> <p>Do not leave EVM powered when unattended.</p>
	<p>CAUTION</p> <p>Caution hot surface. Contact may cause burns. Do not touch.</p>

2.3 Setup

Use the following instructions to set up and run the DLPDLCR160CPEVM.

A 5 V power adapter with a 1 A minimum output and a USB-C connector is required.

Table 2-1. Steps to Use the EVM

Step	Action	Comments
Power switch (J1) at OFF position	Power switch (Figure 2-1), J1, needs to be in the OFF position before power is turned ON to the board. Toggle lever to the OFF position, opposite direction of the arrow shown on the board.	TI does not recommend to pull out the power cable or turn off the input power while the EVM is running. The J1 switch is also used to turn off the EVM before the input power is turned off.  OFF
Connect power supply	Connect a USB-C power supply supporting 5 V at 1 A.	Note Do not use a multi-voltage output USB-C power adapter.
LED D1 turns on	The green LED, D1, lights up to indicate the board is receiving power.	
Power switch (J1) ON	Power switch (J1) to the ON position in the direction of the arrow on the board.	 ON
LED D2 turns on	The green LED, D2, lights up to indicate the board is in operational mode.	The RGB LEDs in the Optical Engine (OE) is turned on.
Splash Screen	The EVM shows a DLP Logo as a quick power up splash screen for approximately 1 second.	
DLP logo animation	A DLP Logo animation using graphics generated by the MCU plays for approximately 5 seconds.	
Main menu	A user selectable main menu is displayed.	 A description for each menu can be found in Section 2.3.1 .
Change menu selection	Quick button (J2) press to cycle through all the menus. Selected menu button changes to yellow to confirm menu selection change.	There are 4 main menu options: View images in SD card, View images in Flash, Control panel demo, and Reserved. Menu selections are explained below.
Confirm menu selection	Long (>2 sec) button (J2) press to confirm the menu selection.	The user action results in a button press animation to confirm selection.

2.3.1 Main Menu

After initial powerup and demo display, the push-button switch, SW2, can be used to cycle through the following four main input/display selections. See [Table 2-2](#) for reference.

Table 2-2. Main Input/Display Selections

Option	Description	Instructions
MicroSD card	Display images from MicroSD card (not included).	Load content in the MicroSD card per Section 2.3.2 . Insert MicroSD card before selecting the menu. Images on the MicroSD are cycled on screen. Quick button (J2) press after images start displaying to pause the images. Long press button to return to the main menu.
Images from Flash memory	Display pre-loaded images from display controller Flash memory.	8 images stored in Flash memory shown individually. Quick button (J2) press after images start displaying to pause the images. Long press button to return to the main menu.
Smart Home demo	Smart Home user interface demo. MCU generated images using media library.	Cycle through the Smart Home menus with a quick button press. Select each menu by long pressing the button. Select the home icon to return the main menu. 
Reserved	Reserved space for future capabilities	

2.3.2 MicroSD Card Image

Images stored on a MicroSD card can be displayed by the EVM. Images must be stored in an uncompressed, RGB565 format with nHD (640 x 360) resolution on the card from a computer before inserting in J1, MicroSD card slot. Images are read out by the MSPM0G3507 MCU before being displayed. Each image is read out by the MCU and displayed until the new image is transferred. The images on the card are cycled through while in this mode.

3 Software

3.1 Programming Instructions

Use the following instructions to program the MSPM0 or the DLPC3421 flash memory.

3.1.1 UART Communication Section

The UART interface is the main communication interface to the EVM through the J3 connector to the MSPM0G3507. The EVM commands and control can be sent by computer over a terminal interface, or the DLP EVM GUI program. Please refer to the DLPC3421 Software Programmer's Guide command and programming info.

3.1.2 Programming MSPM0 MCU

The MSPM0G3507 MCU can be reprogrammed using either the Uniflash programming tool or the Code Composer Studio: Theia IDE.

Refer to the following documentation links for more detailed information:

- [MSPM0 MCUs Quick Reference Guide](#)
- [Code Composer Studio](#)
- [MSPM0 SDK](#)
- [UniFlash Guide for MSPM0](#)
- [UniFlash Quick Start Guide](#)

Refer to [Appendix](#) for more detailed EVM MSPM0 programming instructions.

3.1.3 Programming DLPC3421 Display Controller Flash

The DLPC3421 Display Controller flash memory is pre-programmed with a control program binary file.

The EVM GUI can be used to generate a new binary file for programming based on selected options provided in the GUI. The new binary file can be programmed using the GUI over the UART interface (Not available on pre-production units). GUI not available on ti.com, to download files needed please request access to MySecure by writing an email to: p16EVM_MySecure@list.ti.com.

Refer to the following documentation links for more detailed information:

- [DLPC3421 Software Programmer's Guide](#)

3.2 Appendix

1. Program MSPM0 Controller

- a. Items needed (*not included with EVM)
 - i. XDS110 Debug Probe (TMDSEMU110-U) kit (with included cables & adapters) or LP-XDS110 and 10-pin 2x5 Socket 1.27mm IDC (SWD) cable, purchased separately.*
 - ii. TI UniFlash programming application.*
 - iii. MSPM0 software or programming file.*
 - iv. EVM UUT
 - v. 5 V Power supply for EVM.*
 - vi. Computer.*
- b. If using the XDS110 Debug Probe, then connect to the computer with USB cable (USB-A to Micro USB cable included in kit).
- c. Connect the 20-pin debug cable to 20-pin debug header on the XDS110 Debug Probe.
- d. Connect the ARM® Cortex®-M 10-pin (CM10) adapter to the other end of the debug cable.
- e. Connect the CM10 adapter to J1 on the EVM (MSPM0 JTAG connector).

Note

See example of LP-XDS110 and XDS110 Debug Probe Assembly in [Figure 3-1](#), [Figure 3-2](#), and [Figure 3-3](#).

- f. Connect power supply to board.
- g. Turn on power to board.

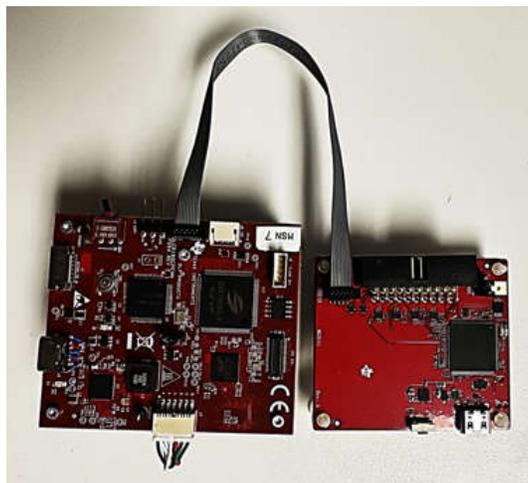


Figure 3-1. LP-XDS110 Debug Probe and EVM

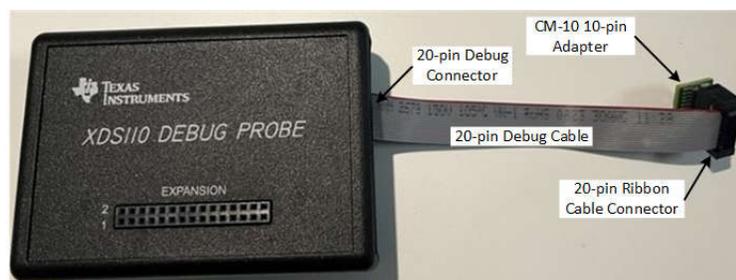


Figure 3-2. XDS110 Debug Probe Assembly



Figure 3-3. XDS110 Debug Probe and Board Assembly

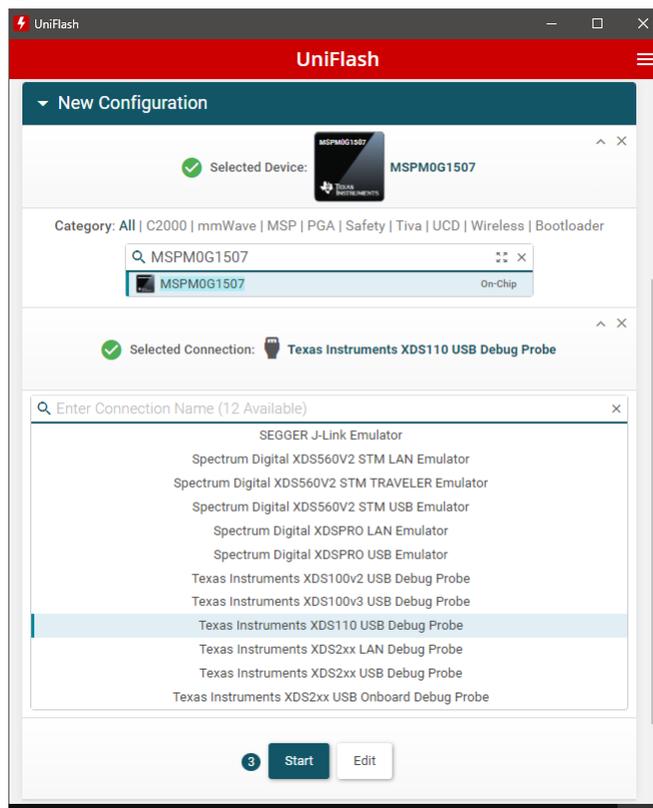
2. UniFlash Programming

- a. Download and install the TI UniFlash flash programming tool (version 8.4.0 or later) from TI.com at <https://www.ti.com/tool/UNIFLASH>.
- b. Launch the UniFlash.exe

Note

The XDS110 firmware must be updated to v3.0.0.26 (or newer) to support the MSPM0 devices. The XDS firmware can be updated using the UNIFLASH programming tool.

- c. In the New Configuration tab, select the *MSPM0G3507* device, and *Texas Instruments XDS110 USB Debug Probe* connection:



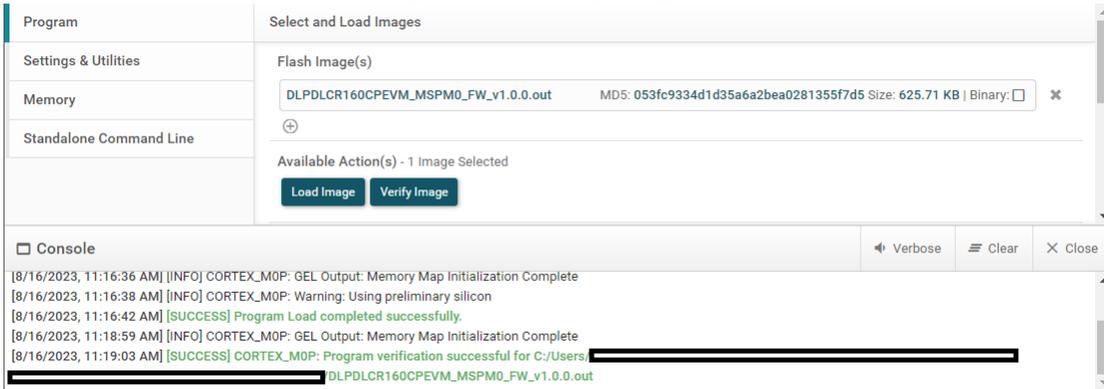
- d. Click the Start button.
- e. Browse for and select the *DLPDLCR160CPEVM_RevE15.out* (or later) image.



- f. Click the *Load image* button, and wait for the Load Program routine to complete.



- g. Once the Load is completed successfully, click the *Verify Image* button.



- h. If the verification is reported successful in the Console, then the flash programming of the MSPM0 is complete. If verification fails, then recheck setup and connections and retry programming.
- i. Procedure complete.
- j. Power down and disconnect cables.
- k. References:
 - i. XDS110 Debug Probe User's Guide ([SPRUI94](#)).
 - ii. XDS110 web page, www.ti.com/xds110.

4 Additional Information

4.1 Trademarks

LightCrafter™ is a trademark of Texas Instruments.

E2E™ is a trademark of Texas Instruments.

DLP® is a registered trademark of Texas Instruments.

ARM® and Cortex® are registered trademarks of Arm Limited.

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5 Related Documentation

The following documents are applicable to the DLPDLCR160CPEVM and are available at TI.com (www.ti.com).

- [DLP160CP \(0.16 nHD\) DMD Data Sheet](#)
- [DLPA2005 Power Management and LED Driver IC Data Sheet](#)
- [DLPC3421 Display Controller Data Sheet](#)
- [DLPC3421 Software Programmer's Guide](#)

For additional documentation including Gerber files, schematics, BOM, and more; please request access to MySecure by sending an email to: p16evm_mysecure@list.ti.com.

For further assistance, see the [DLP Products and MEMS TI E2E™ community support forums](#).

STANDARD TERMS FOR EVALUATION MODULES

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

WARNING

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

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

NOTE:

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

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

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

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

CAUTION

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

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

FCC Interference Statement for Class A EVM devices

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

FCC Interference Statement for Class B EVM devices

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

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

3.2 Canada

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

Concerning EVMs Including Radio Transmitters:

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

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

Concernant les EVMs avec appareils radio:

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

Concerning EVMs Including Detachable Antennas:

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

Concernant les EVMs avec antennes détachables

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

3.3 Japan

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

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

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

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

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

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

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

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

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

3.4 European Union

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

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

-
- 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.
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