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1 Introduction

The CC2564MODNEM evaluation board contains the CC2564MODN device. TI intends the board for evaluation and design purposes. For a complete evaluation solution, the CC2564MODNEM board plugs directly into the following TI hardware development kits:

- MSP-EXP430F5529
- MSP-EXP430F5438
- DK-TM4C123G
- DK-TM4C129X
- Other MCU

A certified and royalty-free TI Bluetooth stack (TIBLUETOOTHSTACK-SDK) is available for the MSP430™ and TM4C12x MCUs. The CC2564MODNEM hardware design files (schematics, layout, and bill of materials [BOM]) are provided as a reference to aid in the implementation of the CC2564MODN device.

The CC2564MODN device is a complete Bluetooth BR/EDR/LE HCI solution based on TI's CC2564B dual-mode Bluetooth single-chip device, which reduces design effort and enables fast time to market. The CC2564MODN device includes TI's seventh-generation Bluetooth core and provides a product-proven solution that is Bluetooth 4.1 compliant. The CC2564MODN device provides best-in-class RF performance with a transmit power and receive sensitivity that provides range of about 2× compared to other BLE-only solutions. TI’s power-management hardware and software algorithms provide significant power savings in all commonly used Bluetooth BR/EDR/LE modes of operation.

2 Features

- Features a CC2564MODN device (MOE package)
- Supports Bluetooth Specification v4.1
- Supports dual-mode – Bluetooth + Bluetooth low energy
- Offers class 1.5-transmit power (+10 dBm)
- Offers high sensitivity (–93 dBm typical)
- Offers a 32.768-kHz oscillator
- Offers a UART interface – control and data
- Offers a PCM/I2S interface – voice and audio
- Offers 4-layer PCB design
- Offers 1.8 LDO (LP2985-18)
- Offers three voltage level translators (SN74AVC4T774)
- Offers a chip antenna (LTA-5320-2G4S3-A1)
- Offers a RF connector (U.FL-R-SMT-1)
- Offers EM connectors that plug directly into the following TI hardware development kits:
  - MSP-EXP430F5529
  - MSP-EXP430F5438
  - DK-TM4C123G
  - DK-TM4C129X
  - Other MCU
• Offers COM connectors that plug directly into the TI hardware development kits
• Features Certified and royalty-free TI dual-mode Bluetooth stack (TIBLUETOOTHSTACK-SDK):
  – MSP430™ (CC256XMSPBITLESW)
  – TM4C (CC256XM4BTBLESW)
  – Other MCU (CC256XSTBTBLESW)

3 CC2564MODNEM Board Applications
Example embedded wireless applications include the following:
• Cable replacement
• Printer adapters
• Personal digital assistants (PDAs)
• Printers and canners
• Computers and peripherals
• Wireless sensors
• Industrial control applications
• Low-power medical

4 Introduction to CC2564MODNEM Board
TI intends this user's guide for use with TI's Bluetooth development platform, the CC2564MODNEM board. This guide will help you quickly get started with this board and integrate it with TI's evaluation platforms and software SDKs. This user's guide describes the components and configurations of this board to quickly get started with using this board for various Bluetooth applications. This guide provides information about the module so you can apply the board specifics to your application. Module information and capabilities, including pin descriptions, available software, and tools, enhance your out-of-box experience.

5 Kit Contents
• One CC2564MODNEM board with TI dual-mode Bluetooth CC2564 module
• One block jumper for MSP-EXP430F5438 board
• Four jumpers for MSP-EXP430F5529 board
6 Requirements

The following hardware and software tools are required for a complete evaluation:

Hardware

• One MSP430 experimenter board – sold separately
  – MSP-EXP430F5529 board
  – MSP-EXP430F5438 board

• One TM4C Development Kit – sold separately
  – DK-TM4C123G Development Kit
  – DK-TM4C129X Development Kit

Software

• TI dual-mode Bluetooth stack
  – On MSP430 MCUs: CC256XMPBTBLESW
  – On TM4C MCUs: CC256XM4BTBLESW

• Other MCU
  – On STM32F4 MCUs: CC256XSTBTBLESW

Tools

• TI dual-mode Bluetooth Service Pack for CC256x (optional)
• CC256x Bluetooth Hardware Evaluation Tool (optional)

• IDE Versions – Platform Dependent
  – Code Composer Studio (CCS)
  – IAR 7.2/7.3 for ARM
  – Keil µVision 4.70.0.0
Figure 2. MSP430 Hardware Setup Examples

Figure 3. TM4C Hardware Setup Examples

Figure 4. Other MCU Hardware Setup Examples
Overview

The CC2564MODNEM board is the development environment for the CC2564MODN module and plugs directly into TI’s MSP430 and TM4C experimenter boards with EM connectors that simplify prototype wiring and field trials.

This module is based upon TI’s CC2564B device and uses a host controller interface (HCI); this module is a cost-effective and flexible way to implement a Bluetooth network. The HCI reduces the cost of the BOM by giving designers the flexibility to choose a controller and eliminating redundant processing capacity while the Bluetooth stack resides and executes on the host processor of the application.

The CC2564MODNEM board has two connectors: EM and COM. The I/Os for the EM are at 3.3 V, which is the default assembly configuration. The I/Os for the COM are at 1.8 V and require hardware modification.

TI intends the CC2564MODNEM board for evaluation purposes and to work with TI’s Hardware Development Kit. Refer to Section 9 for further details.

To implement this reference design, schematic and layout files are available on the CC2564MODN product page.
Figure 6. CC2564MODNEM Board Back Connectors
8 Hardware Description

8.1 Overview

Figure 7 is the high-level block diagram of the CC2564MODNEM board. The oscillator is the default clock with a frequency accuracy of 32.768 kHz ± 250 ppm. The signals from the dual-mode Bluetooth CC2564 module include UART, PCM, nSHUTD, and slow clock. The CC2564MODNEM board has the following connectors:

- **EM** (default)
- **COM**

The connectors can supply power to the CC2564MODN through either VBAT_EDGE or VBAT_MCU. For the EM connector, the signals are controlled through level shifters. The hardware can be configured and modified to use the slow clock from the connectors. The third connector, the debug header, can be used for testing. The I/Os of the EM connector are at 3.3 V. The I/Os of the COM connector are at 1.8 V and require hardware modification. The I/Os for the debug header connector are at 1.8 V and require hardware modification.

![Figure 7. CC2564MODNEM Block Diagram](image)

8.2 Connectors

8.2.1 The EM Connector

The EM connectors can mount a variety of TI MCU platforms such as the MSP430 (MSP-EXP430F5529 and MSP-EXP430F5438) and TM4C (DK-TM4C123G and DK-TM4C129X). The EM I/Os are at 3.3 V. The pin assignments are for the CC2564MODN side. For example, MODULE_UART_RX refers to the receiving UART RX pin on the CC2564MODN that connects to the UART TX pin on the MCU. Figure 6 shows the EM connector on the board. Table 1 shows the standard pinout.
### Table 1. EM1 Connector Standard Pinout

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>EM Adaptor Assignment</th>
<th>Pin Number</th>
<th>EM Adaptor Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>2</td>
<td>N/C</td>
</tr>
<tr>
<td>3</td>
<td>MODULE_UART_CTS</td>
<td>4</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>SLOW_CLK</td>
<td>6</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>MODULE_UART_RX</td>
<td>8</td>
<td>N/C</td>
</tr>
<tr>
<td>9</td>
<td>MODULE_UART_TX</td>
<td>10</td>
<td>N/C</td>
</tr>
<tr>
<td>11</td>
<td>N/C</td>
<td>12</td>
<td>N/C</td>
</tr>
<tr>
<td>13</td>
<td>N/C</td>
<td>14</td>
<td>N/C</td>
</tr>
<tr>
<td>15</td>
<td>N/C</td>
<td>16</td>
<td>N/C</td>
</tr>
<tr>
<td>17</td>
<td>N/C</td>
<td>18</td>
<td>N/C</td>
</tr>
<tr>
<td>19</td>
<td>GND</td>
<td>20</td>
<td>N/C</td>
</tr>
</tbody>
</table>

### Table 2. EM2 Connector Standard Pinout

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>EM Adaptor Assignment</th>
<th>Pin Number</th>
<th>EM Adaptor Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/C</td>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>4</td>
<td>N/C</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>6</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>3.3V</td>
<td>8</td>
<td>MODULE_AUDIO_DATA_OUT</td>
</tr>
<tr>
<td>9</td>
<td>3.3V</td>
<td>10</td>
<td>MODULE_AUDIO_DATA_IN</td>
</tr>
<tr>
<td>11</td>
<td>MODULE_AUDIO_FSINK</td>
<td>12</td>
<td>N/C</td>
</tr>
<tr>
<td>13</td>
<td>N/C</td>
<td>14</td>
<td>N/C</td>
</tr>
<tr>
<td>15</td>
<td>N/C</td>
<td>16</td>
<td>N/C</td>
</tr>
<tr>
<td>17</td>
<td>MODULE_AUDIO_CLK</td>
<td>18</td>
<td>MODULE_UART_RTS</td>
</tr>
<tr>
<td>19</td>
<td>nSHUTD</td>
<td>20</td>
<td>N/C</td>
</tr>
</tbody>
</table>
8.2.2 The COM Connector

The COM connector interfaces with TI's MPU platforms such as AM335x evaluation module (TMDXEVM3358). I/Os of the COM connector are at 1.8 V. Some components must not be installed (DNI) to use the COM connector. See Section 8.3 for further details. Table 3 shows the pinout for the COM connector.

Table 3. COM Connector Pinout

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Relevant COM Connector Pin Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SLOW_CLK_EDGE</td>
</tr>
<tr>
<td>8</td>
<td>1V8_IN</td>
</tr>
<tr>
<td>52</td>
<td>AUD_CLK_1V8</td>
</tr>
<tr>
<td>54</td>
<td>AUD_FSYNC_1V8</td>
</tr>
<tr>
<td>56</td>
<td>AUD_IN_1V8</td>
</tr>
<tr>
<td>58</td>
<td>AUD_OUT_1V8</td>
</tr>
<tr>
<td>66</td>
<td>HCI_TX_1V8</td>
</tr>
<tr>
<td>68</td>
<td>HCI_RX_1V8</td>
</tr>
<tr>
<td>70</td>
<td>HCI_CTS_1V8</td>
</tr>
<tr>
<td>72</td>
<td>HCI_RTS_1V8</td>
</tr>
<tr>
<td>76</td>
<td>TX_DEBUG_1V8</td>
</tr>
<tr>
<td>89</td>
<td>nSHUTDOWN_1V8</td>
</tr>
<tr>
<td>3, 9, 19, 37, 47, 63, 77, 83, 87, 95, 97</td>
<td>GND</td>
</tr>
<tr>
<td>2, 6, 18, 22, 42, 60, 64, 92</td>
<td>GND</td>
</tr>
</tbody>
</table>

(1) All other pins are N/C.

8.2.3 Debug Header

The debug header enables important signals in the design such as power, ground, debug, UART, and audio signals for testing and debugging. The I/Os are at 1.8 V. Table 4 lists the physical location of the pin numbers.

Table 4. Debug Header Pinout

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>EM Adapter Pin Assignment</th>
<th>Pin Number</th>
<th>EM Adapter Pin Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td>2</td>
<td>VBAT</td>
</tr>
<tr>
<td>3</td>
<td>VIO_HOST</td>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>AUD_FSYNC_1V8</td>
<td>6</td>
<td>AUD_CLK_1V8</td>
</tr>
<tr>
<td>7</td>
<td>AUD_OUT_1V8</td>
<td>8</td>
<td>AUD_IN_1V8</td>
</tr>
<tr>
<td>9</td>
<td>CLK_REQ_OUT_1V8</td>
<td>10</td>
<td>SLOW_CLK_EDGE</td>
</tr>
<tr>
<td>11</td>
<td>HCI_TX_1V8</td>
<td>12</td>
<td>HCI_RX_1V8</td>
</tr>
<tr>
<td>13</td>
<td>HCI_CTS_1V8</td>
<td>14</td>
<td>HCI_RTS_1V8</td>
</tr>
<tr>
<td>15</td>
<td>TX_DEBUG_1V8</td>
<td>16</td>
<td>nSHUTDOWN_1V8</td>
</tr>
<tr>
<td>17</td>
<td>VDD_1V8</td>
<td>18</td>
<td>GND</td>
</tr>
</tbody>
</table>
8.3 Board Configurations

8.3.1 Power Supplies Configuration

The CC2564MODN device requires the following power sources:

- VDD_IN: the main power supply for the module
- VDD_IO: the power source for the 1.8-V I/O ring

The HCI module includes several on-chip voltage regulators for increased noise immunity and can be connected directly to the battery.

8.3.1.1 Jumper Configuration

The CC2564MODNEM board has four jumpers that can be configured to control power on the board. The power supply can be enabled through either the COM or EM connector through the VBAT_MCU or VBAT_EDGE jumper. VBAT_EDGE and VBAT_MCU are the power supply to the entire board. VDD_1V8 is the power supply jumper to the pins going in and out of the module, while the VBAT_CC jumper is the main default power supply to the CC2564. Ensure to place jumpers to connect power to the device.

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDD_1V8 (J1)</td>
<td>Supplies power to CC2564 I/Os</td>
</tr>
<tr>
<td>VBAT_CC (J2)</td>
<td>Main power supply for CC2564</td>
</tr>
<tr>
<td>VBAT_EDGE (J3)</td>
<td>Enable power supply through the COM connector</td>
</tr>
<tr>
<td>VBAT_MCU (J4)</td>
<td>Enable power supply through EM connectors</td>
</tr>
</tbody>
</table>

Table 5. Jumper Configurations

Figure 8 shows the default settings for the jumpers on the CC2564MODNEM board. The configuration for the board can be found in Table 5.

8.3.1.2 Measuring Current Consumption

These jumpers can measure the current consumption by placing current sense resistors on R10 for VBAT_CC and R7 for VDD_1V8. Both of these resistors are 0.10 Ω, 1/4 W. The VBAT_CC jumper (J2) can measure the power consumed by the CC2564 including the RF TX and RF RX while the VDD_1V8 jumper (J1) can measure power consumed by the digital VDD_IO.

8.3.2 RF Interface

The board can be configured to route the radio frequency (RF) output from the CC2564MODN to the onboard chip antenna or the onboard U.FL connector. This configuration is done by placing the resistor in either R29 or R30 position which has negligible resistance of 0 Ω. R30 connects the RF output to the U.FL while R29 connects to the chip antenna. The U.FL connector is for testing. The Bluetooth Hardware Evaluation Tool (BHET) can be used to test the basic RF functionality of this board.
8.3.3 Slow Clock

8.3.3.1 Clock Inputs

The slow clock can come from an internal or external source. The CC2564MODNEM lets you place the slow clock on the board (the default setting) or source it from an external source. The CC2564MODN connects to the SLOW_CLK_IN and can be a digital signal in the range of 0 V to 1.8 V. The frequency accuracy of the slow clock must be 32.768 kHz ± 250 ppm for Bluetooth use (according to the Bluetooth specification).
8.3.4 UART Configuration

The UART for the CC2564MODNEM board can be routed to the EM or COM connector. The signals are also available to the debug header to probe the signals. Figure 11 shows the EM connector as the default UART configuration, where the dotted line shows that the COM connector is not connected. To configure the COM connector for UART, remove or unpopulate the U3 level shifter as shown in Figure 12, where the level shifter is dotted to represent the unpopulated level shifter.

Figure 11. UART Default Configuration

Figure 12. UART COM Connector Configuration
8.3.5 PCM Configuration

For voice and assisted audio features, the PCM signals from CC2564MODN (master) must be connected to an external audio host (slave). This relationship signifies that the CC2564MODN board provides the FSYNC and slow clock signals to the codec.

The PCM configuration is required for the following profiles:

- HFP
- HSP
- A3DP

Two configurations are available for the two connectors: EM and COM. Figure 13 demonstrates the default configuration and the following sections show how to set up each connector.

**Figure 13. PCM Connector Configuration**
8.3.5.1 EM Configuration

The EM connector allows configuration of the CC2564MODN as either the master or slave. The default configuration is a master role for the module through the EM connectors.

To change the direction of the PCM so the module is configured as the slave, do the following:
2. Remove resistor R19 on the U4 level shifter. (See Figure 14 for the positions of the resistors.)

![Figure 14. Resistors to Change the Direction of PCM](image)

The board can also be set up to use audio features. To use audio features, the R11 resistor must be disconnected (DNI) on the U4 level shifter. (See Figure 15 for the positions of the resistors.)

![Figure 15. R11 DNI to Enable Audio Features](image)

8.3.5.2 COM Configuration

To configure the COM connector, pull the resistors connected to U4 high to switch the direction on the level shifter. The signal in the COM connector can be configured to run in either direction without any changes to the board components.
9 Software Tools

9.1 TI Dual-Mode Bluetooth Stack

TI’s dual-mode Bluetooth stack enables Bluetooth + Bluetooth low energy and is comprised of single-mode and dual-mode offerings implementing the Bluetooth 4.0 specification. The Bluetooth stack provides simple command line sample applications to speed development.

The stack works with the following:

- Any MSP430 MCU with flash equal to or greater to 128KB and RAM equal or greater than 8KB (CC256XMSPBTBLESW)
- Any TM4C MCU with flash equal to or greater than 128KB (CC256XM4BTBLESW)
- Other MCUs (CC256XSTBTBLESW)

For detailed documentation, see the Bluetooth Demo APPS page.

9.2 TI Dual-Mode Bluetooth Service Pack for CC256x

The CC256x Bluetooth Service Packs (SP) are mandatory initialization scripts that contain bug fixes and platform specific configurations. The scripts must be loaded into the corresponding CC256x device after every power cycle. The CC256x SPs are delivered as a Bluetooth Script (BTS) file. A BTS file is a scripted binary file that contains the embedded HCI commands and HCI events.

9.3 Bluetooth Hardware Evaluation Tool

The CC256x Bluetooth Hardware Evaluation Tool is a program that can be downloaded as a complete package from TI. The program is an intuitive, user-friendly tool to test TI’s Bluetooth chips including this CC256xQFNEM board. This tool tests RF performance and modifies the service packs of our Bluetooth chips.
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3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:
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.
STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES (continued)

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. Canada

3.2 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

Concerning EVMs Including Radio Transmitters:
This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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

3.3 Japan

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

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

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:
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,
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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2. 実験局の免許を取得後ご使用いただく。
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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

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

4 EVM Use Restrictions and Warnings:

4.1 EVM 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 WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (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 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 AND CONDITIONS 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 MADE, CONCEIVED OR ACQUIRED PRIOR TO OR AFTER DELIVERY OF THE EVM.**

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 AND CONDITIONS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. **Limitations on Damages and Liability:**

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

8.2 **Specific Limitations.** IN NO EVENT SHALL TI’S AGGREGATE LIABILITY FROM ANY WARRANTY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS, OR ANY USE OF ANY TI EVM PROVIDED HEREUNDER, EXCEED THE TOTAL AMOUNT PAID TO TI FOR THE PARTICULAR UNITS SOLD UNDER THESE TERMS AND CONDITIONS. THE EXISTENCE OF MORE THAN ONE CLAIM AGAINST THE PARTICULAR UNITS SOLD TO USER UNDER THESE TERMS AND CONDITIONS SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

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

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