The Texas Instruments TPS65320EVM evaluation module (EVM) helps designers evaluate the operation and performance of the TPS65320-Q1 device, a switch-mode DC-DC step-down converter with an integrated low-dropout voltage regulator (LDO). This document describes how to set up and configure the EVM for operation. The document also includes the board layout, schematic, and bill of materials (BOM) for the EVM.

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1 Introduction

The TPS65320EVM is a fully assembled PCB design for evaluation the TPS65320-Q1 device (revision C, TPS65320BQPWPRQ1) which contains a DC-DC step-down converter and a low-dropout voltage regulator.

NOTE: This document is the user's guide for revision C of the TPS65320EVM. The user's guides for revision B (TPS65320QPWPRQ1) and revision C (TPS65320BQPWPRQ1) has some minor differences. For access to the revision B user's guide, review the following forum to find the user's guide for revision B or request the PDF:
https://e2e.ti.com/support/applications/automotive.
2 Schematic, BOM, and Layout

This section provides a more detailed description of the Schematic, BOM, and Layout.

2.1 Schematic

![Schematic Diagram](image)

Figure 1. TPS65320EVM Schematic

2.2 Bill of Materials

<table>
<thead>
<tr>
<th>Designator</th>
<th>Quantity</th>
<th>Description</th>
<th>Footprint</th>
<th>PartNumber</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPCB</td>
<td>1</td>
<td>Printed circuit board</td>
<td>HVL032</td>
<td>Any</td>
<td></td>
</tr>
<tr>
<td>Buck_Gnd, Buck_Out, LDO_Gnd, LDO_Out, VBAT, VBAT_Gnd</td>
<td>6</td>
<td>PCB pin, swage mount, TH</td>
<td>2505-2-00-44-00-00-07-0</td>
<td>Mill-Max</td>
<td></td>
</tr>
<tr>
<td>C1, C9</td>
<td>2</td>
<td>Capacitor, ceramic, 0.1 µF, 100 V, ±10%, X7R, 0805</td>
<td>0805_HV</td>
<td>C0805C104K1RACTU</td>
<td>Kemet</td>
</tr>
<tr>
<td>C2</td>
<td>1</td>
<td>Capacitor, ceramic, 2.2 µF, 100 V, ±10%, X7R, 1210</td>
<td>1210</td>
<td>C1210C225K1RACTU</td>
<td>Kemet</td>
</tr>
<tr>
<td>C3</td>
<td>1</td>
<td>Capacitor, aluminum, 100 µF, 63 V, ±20%, 0.35 Ω, SMD</td>
<td>SM_RADIAL_G</td>
<td>EEE-FK1J101P</td>
<td>Panasonic</td>
</tr>
<tr>
<td>C4, C14</td>
<td>2</td>
<td>Capacitor, ceramic, 1 µF, 50 V, ±10%, X7R, 0805</td>
<td>0805_HV</td>
<td>GRM21BR71H105KA12L</td>
<td>MuRata</td>
</tr>
<tr>
<td>C5</td>
<td>1</td>
<td>Capacitor, aluminum, 47 µF, 80 V, ±20%, 0.7 Ω, SMD</td>
<td>SM_RADIAL_G</td>
<td>EEE-FK1K470P</td>
<td>Panasonic</td>
</tr>
</tbody>
</table>
Table 1. TPS65320EVM Bill of Materials (continued)

<table>
<thead>
<tr>
<th>Designator</th>
<th>Quantity</th>
<th>Description</th>
<th>Footprint</th>
<th>PartNumber</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>C6, C7</td>
<td>2</td>
<td>Capacitor, ceramic, 47 µF, 25 V, ±20%, X7S, 6x5x5mm</td>
<td>CKG57N</td>
<td>CKG57NX7S1E476M500JH</td>
<td>TDK</td>
</tr>
<tr>
<td>C8</td>
<td>1</td>
<td>Capacitor, ceramic, 10 µF, 16 V, ±10%, X5R, 0805</td>
<td>0805_HV</td>
<td>EMK212BJ106KG-T</td>
<td>Taiyo Yuden</td>
</tr>
<tr>
<td>C10</td>
<td>1</td>
<td>Capacitor, ceramic, 4700 pF, 50 V, ±5%, X7R, 0603</td>
<td>0603</td>
<td>C0603C472J6RACTU</td>
<td>Kemet</td>
</tr>
<tr>
<td>C11</td>
<td>1</td>
<td>Capacitor, ceramic, 100 pF, 50 V, ±5%, C0G/NP0, 0603</td>
<td>0603</td>
<td>C0603C101J6GAC</td>
<td>Kemet</td>
</tr>
<tr>
<td>C12</td>
<td>1</td>
<td>Capacitor, ceramic, 2200 pF, 100 V, ±5%, X7R, 0603</td>
<td>0603</td>
<td>06031C22JAT2A</td>
<td>AVX</td>
</tr>
<tr>
<td>C13</td>
<td>1</td>
<td>Capacitor, ceramic, 10 pF, 50 V, ±5%, C0G/NP0, 0603</td>
<td>0603</td>
<td>C0603C100J5GACTU</td>
<td>Kemet</td>
</tr>
<tr>
<td>D1, D2</td>
<td>2</td>
<td>Diode, Schottky, 40 V, 4 A, SMC</td>
<td>SMC</td>
<td>SL44-E3/57T</td>
<td>Vishay-Semiconductor</td>
</tr>
<tr>
<td>FID1, FID2, FID3</td>
<td>3</td>
<td>Fiducial mark. There is nothing to buy or mount.</td>
<td>Fiducial10-20</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>H9, H10, H11, H12</td>
<td>4</td>
<td>Bumpon, Hemisphere, 0.44 × 0.20, clear</td>
<td>Bumpon_J5003Transparent</td>
<td>SJ-5303 (CLEAR)</td>
<td>3M</td>
</tr>
<tr>
<td>J1, J2</td>
<td>2</td>
<td>Header, 2.54 mm, 3 × 1, gold, TH</td>
<td>Sullins_Gxx03SAAN</td>
<td>GBC03SAAN</td>
<td>Sullins Connector Solutions</td>
</tr>
<tr>
<td>J3, J6</td>
<td>2</td>
<td>Header, 2.54 mm, 2 × 1, gold, TH</td>
<td>WURTH_61300211121</td>
<td>61300211121</td>
<td>Wurth Elektronik eiSos</td>
</tr>
<tr>
<td>J4</td>
<td>1</td>
<td>Header, 100 mil, 4 × 2, gold, SMT</td>
<td>Molex_0015910080</td>
<td>0015910080</td>
<td>Molex</td>
</tr>
<tr>
<td>L1</td>
<td>1</td>
<td>Inductor, Shielded, Ferrite, 10 µH, 5.8 A, 0.019 Ω, SMD</td>
<td>B82477P4</td>
<td>B82477P4103M000</td>
<td>TDK</td>
</tr>
<tr>
<td>R1, R4</td>
<td>2</td>
<td>Resistor, 49.9 Ω, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW060349R9FKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R2</td>
<td>1</td>
<td>Resistor, 316 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW0603316KFKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R3, R6</td>
<td>2</td>
<td>Resistor, 100 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW0603100KFKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R5</td>
<td>1</td>
<td>Resistor, 523 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW0603523KFKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R7</td>
<td>1</td>
<td>Resistor, 20 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW060320K0FKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R8</td>
<td>1</td>
<td>Resistor, 3.9 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW060333K9FKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R9</td>
<td>1</td>
<td>Resistor, 1.2 MΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW060312M0FKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R10</td>
<td>1</td>
<td>Resistor, 300 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW0603300KFKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>R11</td>
<td>1</td>
<td>Resistor, 49.9 kΩ, 1%, 0.1 W, 0603</td>
<td>0603</td>
<td>CRCW060349K9FKEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>SH-BUCK, SH-J6, SH-J8, SH-LDO, SH-VIN</td>
<td>5</td>
<td>Shunt, 2 mm, gold plated, black</td>
<td>2SN-BK-G</td>
<td>2SN-BK-G</td>
<td>Samtec</td>
</tr>
<tr>
<td>TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16</td>
<td>16</td>
<td>Test point, miniature, SMT</td>
<td>Testpoint_Keystone_Minature</td>
<td>5015</td>
<td>Keystone</td>
</tr>
<tr>
<td>U1</td>
<td>1</td>
<td>40-V step-down converter with Eco-mode™ and LDO regulator, PWP0014E</td>
<td>PWP0014E_N</td>
<td>TPS65320BQPWPRQ1</td>
<td>Texas Instruments</td>
</tr>
</tbody>
</table>

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2.3 Layout and Component Placement

Figure 2 shows the top and Figure 3 shows the bottom component placement for the EVM. Two additional solder pads are added to Buck_Out, between C6 and C7. Those pads allow the user to change the output capacitor configuration from the original setup with two ceramic capacitors (C6 and C7) to two electrolytic capacitors (C5 and solder pads). Also C14 is used if additional capacitance is needed at VIN_LDO.

Figure 2. Component Placement, Top Overview

Figure 3. Component Placement, Bottom Overview
Figure 4 and Figure 5 show the top and bottom layout of the EVM. Although the TPS65320-Q1 device is a highly efficient converter a good connection between the heat sink and ground plane is important. Therefore ensuring that the thermal pad has a good connection to the copper landing is important. To improve the thermal performance of the board the thermal pad in this case is connected to ground with multiple vias to the bottom ground plane.

**NOTE:** The feedback trace from Buck_out to the feedback of the device is shielded with a ground plane which minimizes noise on the feedback node.
3 Setup and Operation

This section describes the connectors, jumpers, and test points on the EVM as well as how to connect, set up, and properly use the EVM. An example of the EVM operation is also included.

3.1 Input and Output Connectors

The EVM has three pairs of connectors: 1 input and 2 outputs. Table 2 lists the connectors along with a function description. The description also includes the electrical specifications.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VBAT and VBAT_GND</td>
<td>Input</td>
<td>This terminal is the supply voltage for the device, the device and the design is capable of handling a input voltage between 4 to 40 V.</td>
</tr>
<tr>
<td>BUCK_Out and BUCK_Out_GND</td>
<td>Output</td>
<td>Buck is the output voltage of the buck regulator and are designed to deliver 5 V and capable to deliver a maximum output current of 3.2 A. This output is also the supply for the LDO.</td>
</tr>
<tr>
<td>LDO_Out and LDO_Out_GND</td>
<td>Output</td>
<td>LDO is the output voltage of the LDO and are able to deliver 0.28 A. In this design the output voltage set to 3.3 V.</td>
</tr>
</tbody>
</table>

3.2 Jumper Settings and Configuration

**J8 = RT/CLK**—This jumper is used to select the switching frequency for the switch-mode regulator. The jumper places a pulldown resistor to set the frequency to approximately 110 kHz, 400 kHz, or 2.1 MHz. If applying an external clock, use the pin closest to the label EXT_CLK.

**Figure 6. RT Jumper Settings**

**BUCK_EN and LDO_EN**—These jumpers are used to enable or disable the buck converter and the LDO. Setting either jumper high enables respective rail; a low setting or a floating disables respective rail. Manual installation of the jumper may cause ringing, potentially asserting nRST low.

**Figure 7. Enable Jumper Setting**

**VIN_LDO**—This jumper should always be installed to supply the LDO for BUCK_Out. The jumper can also be used for current measurements from BUCK_Out to VIN_LDO.

**J6**—This jumper can be used to short the protection diode D1 and avoid the diode voltage drop at the input of the device.
3.3 Test Point Description
The test points and descriptions are as follows:

- **TP_Vin** and **TP_Vin_Gnd** — Used to measure the voltage on the Vin pin of the device.
- **TP_Buck_Out** and **TP_Gnd_Buck_Out** — Used to measure the output voltage of the buck regulator.
- **TP_LDO_Out** and **TP_Gnd_LDO_Out** — Used to measure the output voltage of the LDO.
- **TP_Buck_SW** — Used to measure the switching of the buck converter.
- **TP_Buck_PM** — Allows easy access for gain and phase analysis of the buck regulator.
- **TP_Buck_FB** — Used to measure the feedback of the buck.
- **TP_LDO_PM** — Allows easy access for gain and phase analysis of the LDO.
- **TP_LDO_FB** — Used to measure the feedback of the LDO.
- **TP_COMP** — Compensation network for the feedback of the buck regulator.
- **TP_SS** — Used to measure the voltage drop over the soft start capacitor of the buck regulator.
- **TP_nRST** — Used to measure when the LDO begins to regulate.
- **TP_Gnd1 and 2** — Additional ground points close to the device.

3.4 Basic Operation
The input voltage range for the converter is 4 to 40 V.

For proper operation of the TPS65320EVM, configure BUCK_EN, LDO_EN, and RT properly, using the jumper terminals as follows:

- **BUCK_EN** — enabled
- **LDO_EN** — enabled
- **RT** — 400 kHz

In this configuration, both regulators turn on when power is applied. Disable the regulators using the enable jumpers.

With the BUCK disabled, the LDO supply comes from VIN. Consider the power dissipation at high VIN. TP_VIN_LDO is at GND level in this condition.

To change the switching frequency, power down the device before moving the jumper. If an external clock is applied, remove any jumper installed on RT; however, if the external clock is missing without a jumper installed, the buck does not regulate.

<table>
<thead>
<tr>
<th>Regulator</th>
<th>Output Voltage</th>
<th>Maximum Output Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCK</td>
<td>5 V</td>
<td>3.2 A</td>
</tr>
<tr>
<td>LDO</td>
<td>3.3 V</td>
<td>0.28 A</td>
</tr>
</tbody>
</table>

The output capacitors of the BUCK regulator are 25-V types, supporting up to 18 V of the output voltage, \( V_o \). In case of higher output voltage, TI recommends replacing these with capacitors having higher voltage ratings.

Low switching frequencies, high load transients, or limited allowed deviation of \( V_o \), may require larger capacitance values. If needed, use the footprints of the unassembled electrolytic capacitor C5. Low-ESR capacitors also further reduce the coupled noise from the buck to the LDO.

On the EVM, a soft-start capacitor (C12) of 2.2 nF is installed, setting the time to approximately 700 µs. For other soft-start-times, the capacitor may be replaced.
# Revision History

## Changes from Original (February 2013) to A Revision

<table>
<thead>
<tr>
<th>Change Description</th>
<th>Page</th>
</tr>
</thead>
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<tr>
<td>Changed TPS65320QPWPRQ1 to TPS65320BQPWPRQ1 and updated the schematic, PCB and BOM for revision C of the board</td>
<td>1</td>
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</tbody>
</table>
STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. **Delivery:** TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

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 and conditions 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 and conditions 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 any defects that are 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. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, 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.

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.
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

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. 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/labs/it/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/labs/it/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, 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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3.3.3 Notice for EVMs for Power Line Communication: Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

4  EVM Use Restrictions and Warnings:

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 Safety-Related Warnings and Restrictions:

4.3.1 User shall operate the EVM within TI’s recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User’s handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. Accuracy of Information: To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
6. **Disclaimers:**

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