BQ25173-Q1 Evaluation Module
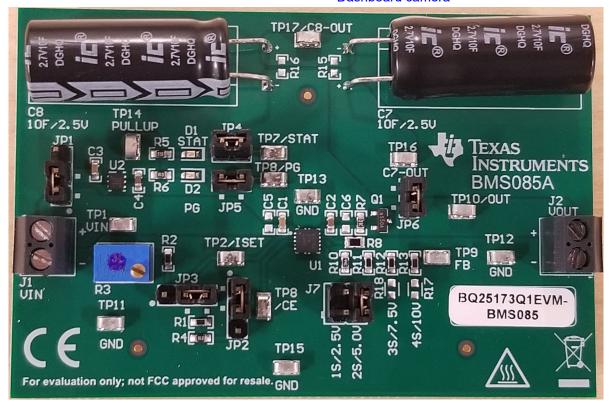
TEXAS INSTRUMENTS

Description

The BQ25173-Q1 EVM contains the BQ25173-Q1 IC, LDO TPS7B8133 and support circuits needed operate the evaluation board. Only external power supply is needed for 2.5 and 5 V setting, which corresponds to 1S and 2S. Charge Voltage VREG can be set to 4 values, 2.5V and 5 V with J7 and 7.5V and 10 V with R18 and R17. Charge current is set by R3 (ISET) value from 10 mA to 800 mA. A fix value of 400 mA is selected by JP3.

Features

- Support 1 to 4 cell super capacitors
- Supports charging from 0 V
- Input voltage up to 40 V tolerant
- External resistor programmable operation
  - FB pin to adjust super capacitor regulation voltage
  - ISET to set charge current from 10 mA to 800 mA

Applications

- Smart meter
- Bar code scanner
- Portable medical equipment
- Dashboard camera

1 Evaluation Module Overview

1.1 Introduction

The Texas Instruments BQ25173-Q1 is a linear charger IC for 1- to 4-cell super capacitor. Charging voltage can be adjusted using external resistor divider between OUT and FB. Charging current can be set from 10 mA to 800 mA with external resistor on ISET.

This user's guide describes the characteristics, operation, and use of the BQ25173-Q1EVM evaluation module (EVM). This EVM is designed to help the user evaluate and test the various operating modes of the BQ25173-Q1. This user's guide includes setup instructions for the hardware, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module.

Throughout this user's guide, the abbreviations *EVM*, *BQ25173-Q1EVM, BMS085-002*, and the term *evaluation module* are synonymous with the BMS085 evaluation module, unless otherwise noted.

1.2 Kit Contents

The package includes:
1. BQ25173-Q1 evaluation module (EVM) that has BQ25173-Q1 and supporting circuits.

1.3 Specification

The BQ25173-Q1EVM PCB contains the BQ25173-Q1 IC, LDO TPS7B8133 and support circuits. This board contains several jumpers and connectors. R3 can be used to adjust charge current (ISET) value from 10 mA to 800 mA. Charge Voltage VREG can be set to 4 values, 2.5V and 5 V with J7 and 7.5V and 10 V with R18 and R17. See Section 2.2.

Parameter	Specifications
Input Voltage (operating)	3 V to 18 V
Output Voltage	0 V to 10 V
Output Current	800 mA
Capacitor Bank	5 F at 5 V
Housekeeping Voltage	3.3V

1.4 Device Information

The board has two 10F super capacitors, C8 & C7 connected in series for equivalent value of 5F at 5 V. Charge voltage can be set to 2.5V or 5 V with JP7, 1S and 2S configuration. For 3S and 4S, 7.5V and 10 V configuration resistor position R17 and R18 are used. External capacitors are required and C8 & C7 are disconnected using Jumper JP6.

2 Hardware

2.1 I/O Descriptions

Table 2-1 lists the input and output connections available on this EVM and their respective descriptions.

Table 2-1. EVM I/O Connections

I/O Connector	Description
J1 – VIN / GND	Input voltage from external power supply. Max operating input voltage is 18 V, OVP trip point. Abs max input voltage is 40 V while in OVP.
J2 – OUT (+) / GND (-)	Output connection - capacitor connection.
JP1 – OUT / REG / IN	Source voltage for housekeeping regulator, U2. Provides pull-up voltage for digital I/O. LDO input (REG) rated up to 40 V.
JP2 - CE	Charge enable. Default setting is ON.
JP3 – Fixed / ISET / ADJ	Sets fast charge current. fixed = 400 mA ADJ= R3 range 10 mA to 800 mA.
JP4 - STAT LED	Default setting is ON.
JP5 – PG (Power Good) LED	Default setting is ON.
JP-6 – C8 & C7 Disconnect	Install to use Connect Onboard Capacitor.
JP-7 – 1S / 2S Voltage Select	Set voltage to 2.5V or 5 V.

2.2 Printed Circuit Board Assembly

The BQ25173-Q1EVM PCB contains the BQ25173-Q1 IC, LDO TPS7B8133 and support circuits. This board contains several jumpers and connectors. R3 can be used to adjust charge current (ISET) value from 10 mA to 800 mA. Charge Voltage V_{REG} can be set to 4 values, 2.5V and 5 V with J7 and 7.5V and 10 V with R18 and R17.

The board has two 10 F super capacitors, C8 & C7 connected in series for equivalent value of 5F at 5 V. Jumper JP6 can be used to disconnect capacitors from output. Charge voltage can be set to 2.5V or 5 V with JP7, 1S and 2S configuration. For 3S and 4S, 7.5V and 10 V configuration resistor position R17 and R18 are used. External capacitors are required and C8 & C7 are disconnected.

2.3 Best Practices

<table>
<tr><td>⚠️</td><td>

WARNING

Hot surface! Contact can cause burns. Do not touch!

Some components can reach high temperatures >55°C when the board is powered on. The user must not touch the board at any point during operation or immediately after operating, as high temperatures can be present.

</td></tr>
</table>

2.4 Test Summary

This section describes the jumpers and connectors on the EVM as well as how to properly connect, setup, and use the BQ25173-Q1EVM. Note that the default jumper setting of headers and switches are marked with two dots to indicate the shorting jumper position.

2.4.1 Equipment

This section includes a list of supplies required to perform tests on this EVM.

1. Battery simulator such as Keithley 2400 or equivalent. Or a 1- to 4-cell super capacitor. Maximum recommend OUT regulation voltage is 10.5V. Abs max rating on OUT is 13 V.
2. Input power supply that can supply up to 40 V and 1 A. Note that charging can occur between 3 V to 18 V input. Device is in OVP between 18 V to 40 V.
3. Voltage meter and current meter.

2.4.2 Cautions

Care must be taken to not charge the super capacitor higher than the voltage rating specified by the manufacturer. For setting the max charging voltage, refer to the *Super capacitor Regulation Voltage* section of the BQ25173-Q1 800-mA Linear Charger for 1- to 4-Cell Super capacitor data sheet (SLUSF68).

The BQ25173-Q1EVM has two series super capacitors installed on the board, C7 & C8. The super capacitors support V_{REG} up to 5 V. The regulation voltage is set by JP7 to 2.5V or 5 V. For higher voltage C7 & C8 must be disconnected using JP6 and external super capacitors or test equipment used. Higher voltage, 7.5V or 10 V can be set installing R18 or R17.

The device enters thermal regulation at too high an input to output voltage drop and current. Thermal regulation begins reducing current at 125 °C; at 150 °C device shuts off. For thermal calculation, refer to the *Thermal Package* section of the BQ25173-Q1 800-mA Linear Charger for 1- to 4-Cell Super capacitor data sheet (SLUSF68).

The device can get hot during high input-to-output voltage drop and high current conditions. Use caution when handling the board.

2.4.3 Test Instructions

For this EVM to operate properly, the following components must be connected and properly configured.

1. Set input power supply to 6 V with current limit greater than 400 mA. Set battery simulator to 4.8V with compliance to support 400 mA. Turn off supply and battery simulator.
2. Connect input voltages to J1 and battery simulator to J2 on the EVM.
3. Configure all EVM jumpers to factory setting, refer to table below.
4. Disconnect JP6 Jumper, this disconnects C7 & C8.
    a. This test set up uses external load, disconnect on board super capacitors.
5. Turn on battery simulator.
6. Turn on input power supply.
    a. OUT voltage must be 4.8V and charge current 400 mA.
    b. PG LED D1 is ON.
    c. STAT LED D2 is OFF.
7. Raise input power supply to 20 V.
    a. Charging stops and STAT pin flashes at 1 Hz.
    b. PG LED D1 is OFF.
    c. Lower input voltage to 6 V to clear fault.
8. Simulate charge complete by increasing battery simulator voltage to 5 V.
    a. Current tapers to 0 mA.
    b. STAT LED D2 switches to ON.

Table 2-2. Jumper Factory Setting

I/O Connector	Factory Setting
JP1	IN – Input voltage
JP2	ON – Enable
JP3	Fixed – 400 mA setting
JP4	Installed – STAT LED Connected
JP5	Installed -- /PG LED Connected
JP6	Installed – C8 & C7 Connected
JP7	2S / 5 V – V_{REG} 5 V

3 Hardware Design Files

3.1 Schematic

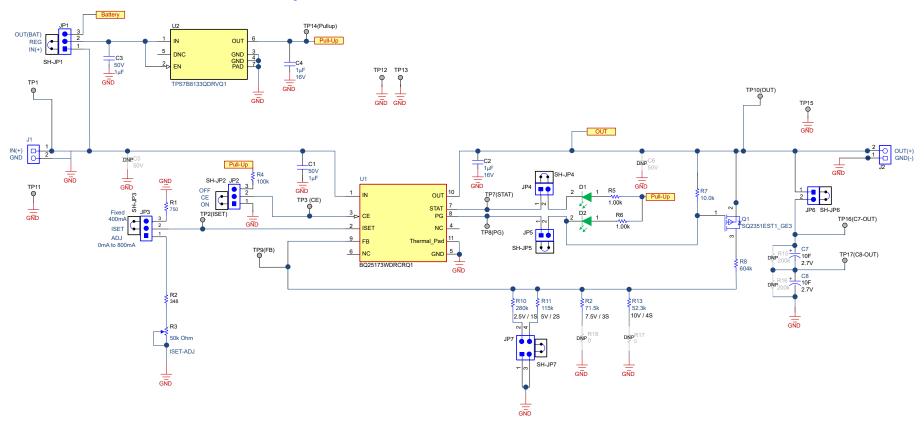The BQ25173-Q1EVM schematic is shown in Figure 3-1.

Figure 3-1. BQ25173-Q1EVM Schematic

3.2 Board Layout
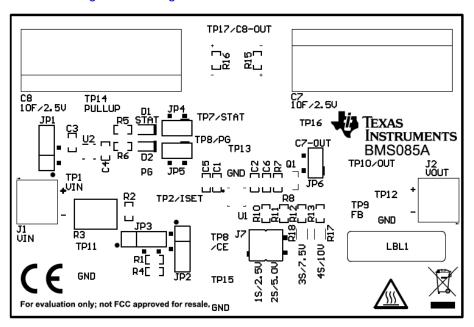
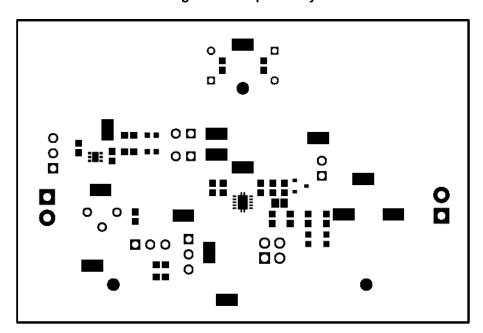The board layout is shown in Figure 3-2 to Figure 3-10.

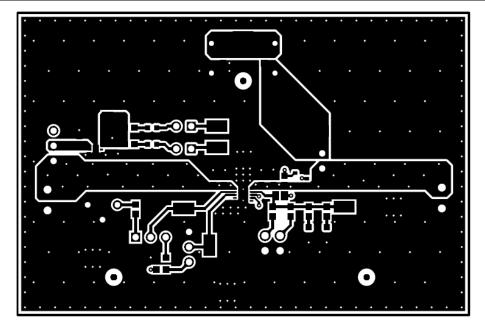**Figure 3-2. Top Overlay**

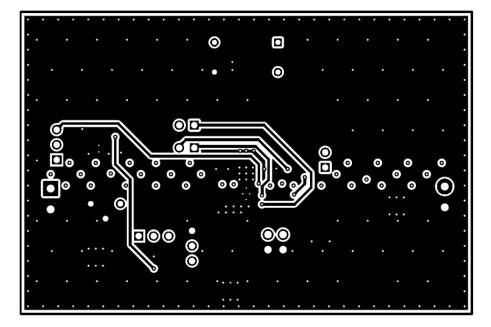**Figure 3-3. Top Solder**

Figure 3-4. Top Layer
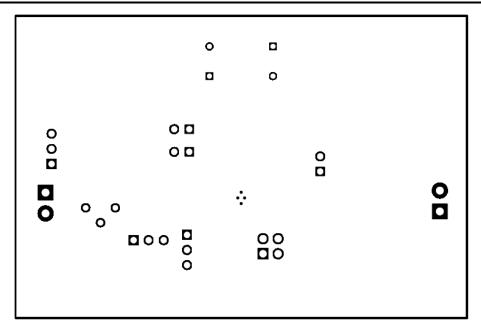
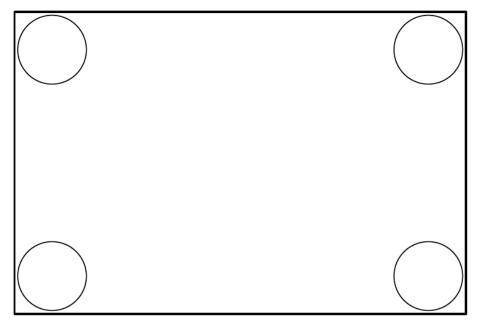

Figure 3-5. Bottom Layer

Figure 3-6. Bottom Solder
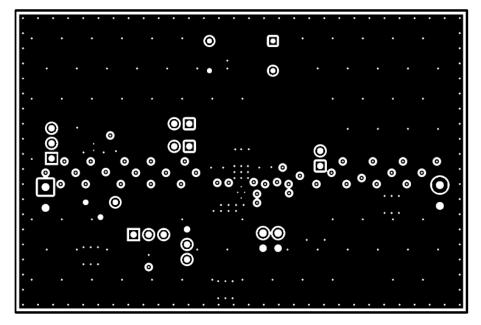

Figure 3-7. Bottom Overlay
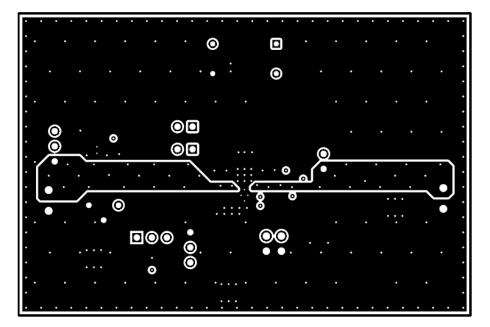
Figure 3-8. Signal Layer 1

Figure 3-9. Signal Layer 2

Symbol	Quantity	Finished Hole Size	Plated	Hole Type	Drill Layer Pair	Hole Tolerance
◇	6	7.87mil (0.200mm)	PTH	Round	Top Layer - Bottom Layer	
⋈	260	12.00mil (0.305mm)	PTH	Round	Top Layer - Bottom Layer	
✿	4	31.50mil (0.800mm)	PTH	Round	Top Layer - Bottom Layer	
✚	3	35.43mil (0.900mm)	PTH	Round	Top Layer - Bottom Layer	+/-3.94mil
□	15	40.00mil (1.016mm)	PTH	Round	Top Layer - Bottom Layer	
○	4	47.24mil (1.200mm)	PTH	Round	Top Layer - Bottom Layer	
▽	4	50.00mil (1.270mm)	PTH	Round	Top Layer - Bottom Layer	
	296 Total					

Figure 3-10. Drill Drawing

3.3 Bill of Materials

lists the bill of materials.

Table 3-1. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB?	1		Printed Circuit Board		BMS085	Any		
C1, C3	2	1uF	CAP, CERM, 1 µF, 50 V,+/- 20%, X5R, AEC-Q200 Grade 3, 0603	0603	GRT188R61H 105ME13D	MuRata		
C2, C4	2	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	GCM188R71C 105KA64D	MuRata		
C7, C8	2	10 F	10 F (EDLC) Supercapacitor 2.7 V Radial, Can 40mOhm @ 1 kHz 1500 Hrs @ 85°C	RADIAL_HO Z	DGH106Q2R7 C_HOZ	Cornell Dubilier		
D1, D2	2	Green	LED, Green, SMD	Body1.6x0.8 mm	LTST-C193TGKT-5A	Lite-On		
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
J1, J2	2		Terminal Block, 3.5mm Pitch, 2x1, TH	7.0x8.2x6.5m m	ED555/2DS	On-Shore Technology		
J7	1		Header, 2.54mm, 2x2, Gold, TH	Header, 2.54mm, 2x2, TH	PBC02DAAN	Sullins Connector Solutions		
JP1, JP2, JP3	3		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	Sullins Connector Solutions		
JP4, JP5, JP6	3		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-1 0	Brady		
Q1	1		MOSFET P-Channel 20 V 3.2A (Tc) 2W (Tc) Surface Mount SOT-23-3 (TO-236)	SOT23	SQ2351ES-T1_GE3	Vishay Siliconix		
R1	1	750	RES, 750, 1%, 0.1 W, 0603	0603	RC0603FR-07 750RL	Yageo		
R2	1	348	RES, 348, 1%, 0.1 W, 0603	0603	RC0603FR-07 348RL	Yageo		
R3	1	50k Ohm	Trimmer Potentiometer, Lead Sealed Type Multiturn PV37 Series, TH	6.71x4.5mm	PV37W503C0 1B00	Bourns		
R4, R5, R6	3	1.00k	RES, 1.00 k, 1%, 0.1 W, 0603	0603	RC0603FR-07 1KL	Yageo		
R7	1	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310 K0FKEA	Vishay-Dale		
R8	1	604k	RES, 604 k, 0.1%, 0.125 W, 0805	0805	RT0805BRD0 7604KL	Yageo America		
R10	1	280k	RES, 280 k, 1%, 0.1 W, 0603	0603	RC0603FR-07 280KL	Yageo		
R11	1	115k	RES, 115 k, 1%, 0.1 W, 0603	0603	RC0603FR-07 115KL	Yageo		

Table 3-1. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R12	1	71.5k	RES, 71.5 k, 1%, 0.1 W, 0603	0603	RC0603FR-07 71K5L	Yageo		
R13	1	52.3k	RES, 52.3 k, 1%, 0.1 W, 0603	0603	RC0603FR-07 52K3L	Yageo		
SH-JP1, SH-JP2, SH-JP3, SH-JP4, SH-JP5, SH-JP6, SH-JP7	7	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1 (Vin), TP2 (ISET), TP3 (CE), TP7 (STAT), TP8 (PG), TP9 (FB), TP10 (OUT), TP11, TP12, TP13, TP14 (Pullup), TP15, TP16 (C7-OUT), TP17 (C8-OUT)	14		Test Lead clips and hooks, SMT	Test Point, Body 3.25x1.65mm	S1751-46	Harwin		
U1	1		Automotive 800-mA Linear Charger for 1- to 4-Cell Supercapacitor	VSON10	BQ25173WDRCRQ1	Texas Instruments		
U2	1		Automotive 150-mA high-voltage ultra-low-IQ low-dropout (LDO) linear regulator, DRV0006A (WSON-6)	DRV0006A	TPS7B8133QDRVRQ1	Texas Instruments		
C5, C6	0	1uF	CAP, CERM, 1 µF, 50 V,+/- 20%, X5R, AEC-Q200 Grade 3, 0603	0603	GRT188R61H 105ME13D	MuRata		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
R15, R16	0	200k	RES, 200 k, 1%, 0.1 W, 0603	0603	RC0603FR-07 200KL	Yageo		
R17, R18	0	0uΩ	0 Ohms Jumper 0.1W, 1/10W Chip Resistor 0603 (1608 Metric) - Thick Film	0603	CR0603-10W-000T	Venkel		

4 Additional Information

Trademarks

All trademarks are the property of their respective owners.

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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けて

いないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの

措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用 いただく。

2. 実験局の免許を取得後ご使用いただく。

3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。 上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・イ

ンスツルメンツ株式会社

東京都新宿区西新宿６丁目２４番１号

西新宿三井ビル

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

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

3.4 *European Union*

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

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

4   *EVM Use Restrictions and Warnings:*

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

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

   4.3   *Safety-Related Warnings and Restrictions:*

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

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

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

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

6.   *Disclaimers:*

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8. *Limitations on Damages and Liability:*

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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 components(s), excluding any postage or packaging costs.

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