EVM User's Guide: BQ25185EVM

BQ25185 Evaluation Module

Description

The BQ25185 evaluation model (EVM) is designed to evaluate and test various operating modes of the BQ25185. The EVM is designed for a complete test friendly evaluation with visual indicators. The BQ25185 is an integrated battery charge management IC that integrates most common functions for solar based industrial devices with rechargeable batteries: linear charging, regulated output, Factory mode, and battery tracking VINDPM.

Features

- 1-A linear battery charger
- Resistor configurable battery regulation voltage with 0.5% accuracy
- Thermal charging profile with configurable Hot, and Cold thresholds
- Power Path management for powering the system and charging the battery
- 4-uA Factory mode for maximizing battery shelf life
- Resistor programmable pins VSET/ILIM and ISET
- Status Pins, STAT1 and STAT2 to show device status
- Test points for easy probing
- On-board resistances for minimal test setup

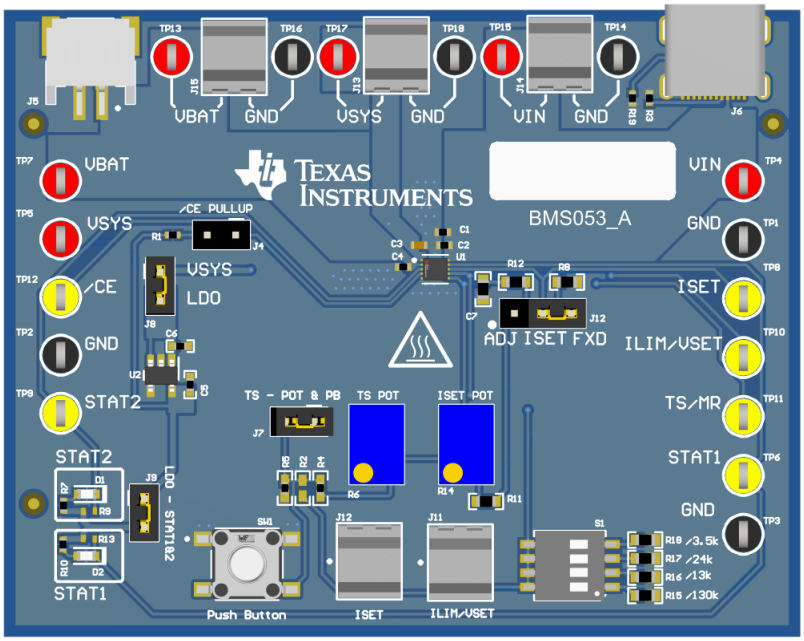

Figure 1-1. BQ25185EVM Hardware Board

	**Caution**	**Caution hot surface** **Contact can cause burns** **Do not touch!** Some components may 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 may be present.

1 Evaluation Model Overview

1.1 Introduction

The BQ25185EVM is an evaluation kit for the BQ25185 battery charge management IC. The BQ25185 is a resistor controlled, wide-input operating range 1-A linear battery charger with Power Path in a small QFN package with a thermal pad. The BQ25185 integrates the most common functions for industrial and personal electronics applications and provides ultra-low IQ, integrated protections, resistor configurability, TS monitoring, and best thermal performance in a small solution size.

The BQ25185EVM can be evaluated using a micro-USB input and a battery with a 2-pin JST connector. The EVM contains pin headers are provided to connect with power supplies to simulate charging operation. With on-board potentiometers, jumpers, switches, and terminal blocks, different battery charger parameters can be configured. For specific parameters, review the datasheet for how to configure the device.

1.2 Kit Contents

This EVM kit includes:

- 1 x BQ25185EVM

1.3 Specifications

The BQ25185 EVM has the following features:

- 1 cell battery charging with power path management
- Up to 1A charging
- Input voltage operating range from 3.6 V to 18 V

1.4 Device Information

This user's guide provides detailed testing instructions for the BQ25185 evaluation module (EVM). Also included are descriptions of the necessary equipment, equipment setup, procedures, the printed-circuit board layouts, schematics, and the bill of materials (BOM).

Throughout this user's guide, the abbreviation *EVM, BQ25185EVM,* and the term evaluation module are synonymous with the BQ25185 evaluation module, unless otherwise noted.

2 Hardware

2.1 EVM Setup

Table 2-1 lists the jumper connections and the jumper description.

Table 2-1. Jumper Descriptions

Jumper Name	Description	Factory Setting
J1	VIN and GND connector. Input voltage from external power supply. Recommended voltage is 5 V and OVP is 18.5 V. Max input voltage is 25 V while in OVP.	Not installed
J2	VBAT and GND connector. Battery connection using jumper for easy access.	Not installed
J3	VSYS and GND connector.	Not installed
J4	/CE connector. Connects /CE pin to higer if populated. Leave floating for low.	Installed
J5	Battery pack connector. Battery connection using JST header.	N/A
J6	Micro-USB connector (optional for VIN)	N/A
J7	TS potentiometer connector. Connects TS potentiometer to TS pin. Leaving this jumper will leave the TS pin open.	Installed

Table 2-1. Jumper Descriptions (continued)

Jumper Name	Description	Factory Setting
J8	SYS to LDO connection. Populating this jumper will power the LDO by the BQ25185 SYS pin	Not installed
J9	STAT1 and STAT2 pull-up connection. Populating this jumper will pull STAT1 and STAT2 to an on-board 3V3 LDO.	Installed
J12	Connects the ISET pin. Connect to FXD setting for a 750 Ω connection. Connect to ADJ to connect the ISET pin to the ISET potentiometer R14	FXD

Figure 2-1 shows the various connections and features on the device.

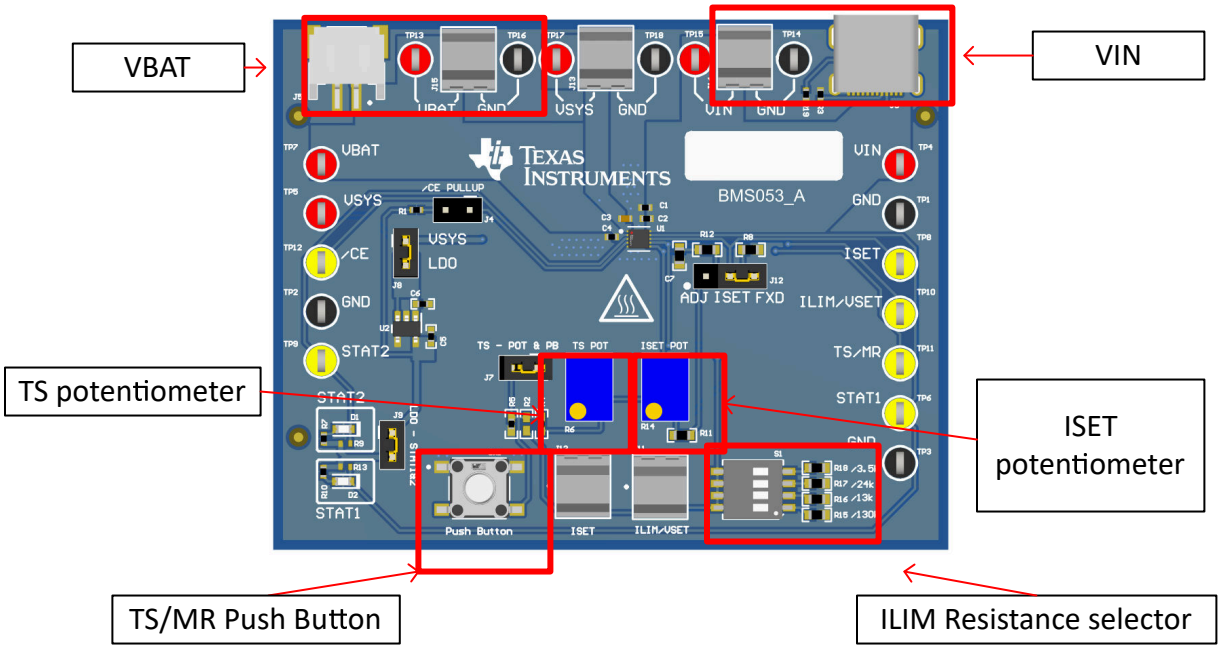

Figure 2-1. EVM Connections

Table 2-2 lists the recommended operating conditions.

Table 2-2. Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
VBAT	Battery voltage range	2.2		4.6	V
VIN	Input voltage range	3.3		18	V
IIN	Input current range (IN to SYS)			1.1	A
IBAT	Battery discharge current (BAT to SYS)		3.125		A
T_A	Operating ambient temperature range	-40		85	°C
T_J	Operating junction temperature range	-40		125	°C

2.2 EVM Connectors and Test Points

Table 2-3 describes the test points available on the board for easy access measurement.

Table 2-3. Test Point Descriptions

Test Point	Description
TP1, TP2, TP3, TP14, TP16, TP18	IC GND test point

Table 2-3. Test Point Descriptions (continued)

Test Point	Description
TP4, TP15	IC VIN test point
TP5, TP17	IC VSYS test point
TP6	IC STAT1 test point
TP7, TP13	IC VBAT test point
TP8	IC ISET test point
TP9	IC STAT2 test point
TP10	IC VSET/ILIM test point
TP11	IC TS/MR test point
TP12	IC /CE test point

3 Testing Procedures

3.1 Equipment

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

1. *Two Power Supplies:* Keithley 2400 Power Supply or equivalent
   a. Power Supply #1 (PS #1) will be used as input voltage
   b. Power Supply #2 (PS #2) will be used as battery voltage
2. *Four Channel Oscilloscope:* To monitor voltages at VIN, VBAT, and VSYS at least
   a. Channel 1 (SC #1) will be used to probe VIN
   b. Channel 2 (SC #2) will be used to probe VBAT
   c. Channel 3 (SC #3) will be used to probe VSYS

3.2 Charge Mode

Connect the equipment as follows:

- Power Supply PS #1: VIN of the BQ25185EVM at 5 V
- Power Supply PS #2: VBAT of the BQ25185EVM at 3.7 V
- Scope Channel SC#1: VIN at TP4
- Scope Channel SC#2: VBAT at TP7
- Scope Channel SC#3: VSYS at TP5

Procedure:

1. Connect 13 kOhm resistor using S1 switch box. Verify that the resistance from VSET/ILIM pin to GND is 13kOhm
   a. This sets the battery regulation voltage to 4.2 V and the input current limit to 1100 mA
2. Measure the resistance from ISET to GND.
   a. The resulting fast charge current will follow the equation:
3. Power on PS #1
   a. Verify that the voltage at VSYS is about 4.5 V
4. Power on PS #2
   a. Verify that current going into PS#2 is the configured charge current
   b. Another method is to use the voltage at the ISET pin. The voltage at the ISET pin

To change the charge current:

1. Use the equation Ichg = 300/R_{Iset} (AΩ/Ω)
2. Measure the Resistance on the Iset pin
3. Adjust the R14 potentiometer to get the right R_{Iset} for your desired I_{CHG}

4. Move the jumper on JP1 to the ADJ position

Note

The ISET resistance should only be measured when the device is powered off but the ISET potentiometer can be adjusted during operation.

To adjust the charge voltage (V_{SET}) and input current limit (I_{Lim}):

1. Refer to the VSET and IILIM table in the datasheet to see how the resistance on the IILIM pin affects the V_{BATREG} and I_{Lim}
2. Adjust R15-R18 on S1 to set the correct resistance for your desired V_{SET} and I_{Lim}
3. Turn off and on PS#1

Note

The device will change the VSET/ILIM setting each time a new charge cycle is started (when VIN is plugged in and when /CE is pulled low).

3.3 Factory Mode Entry and Exit

To enter the Factory Mode state, connect the equipment as follows:

- Power Supply PS#1: VIN for the BQ25185EVM at 5V
- Power Supply PS #2: VBAT of the BQ25185EVM at 3.7 V
- Scope Channel SC #1: VIN at TP4
- Scope Channel SC #2: VBAT at TP7
- Scope Channel SC #3: VSYS at TP5
- Scope Channel SC #4: TS/MR at TP11

Procedure

1. Power on PS#2. VSYS should rise to about 3.7 V
2. Power on PS#1. VSYS should rise to 4.5V
3. Press SW1 (the pushbutton on the EVM) for at least 10 seconds
4. Release SW1
5. Disconnect or power off PS#1 from the BQ25185EVM.
6. Observe VSYS pulldown to 0 V
7. After confirming 0 V on VSYS, you may exit Factory mode by inserting VIN (> V_{UVLO})

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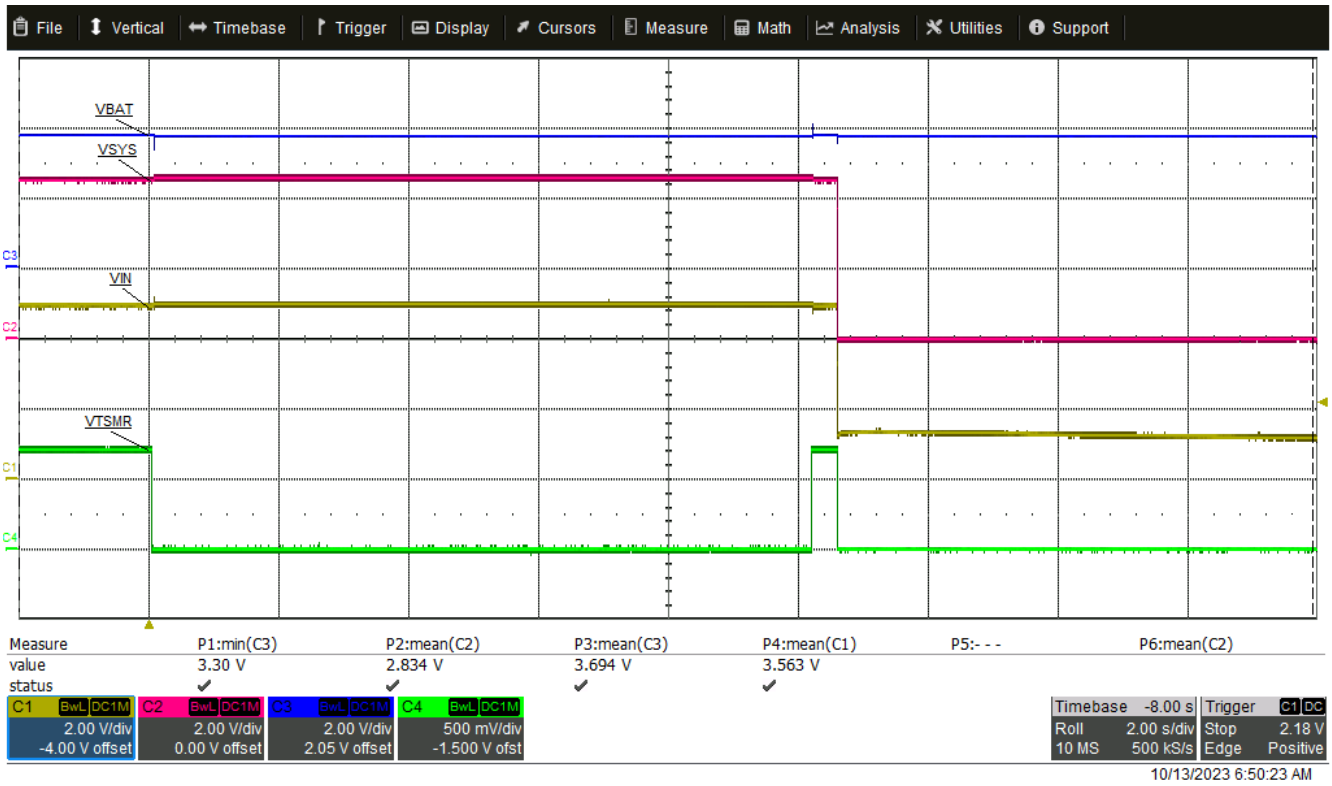

Figure 3-1. Enter Factory Mode on VIN removal

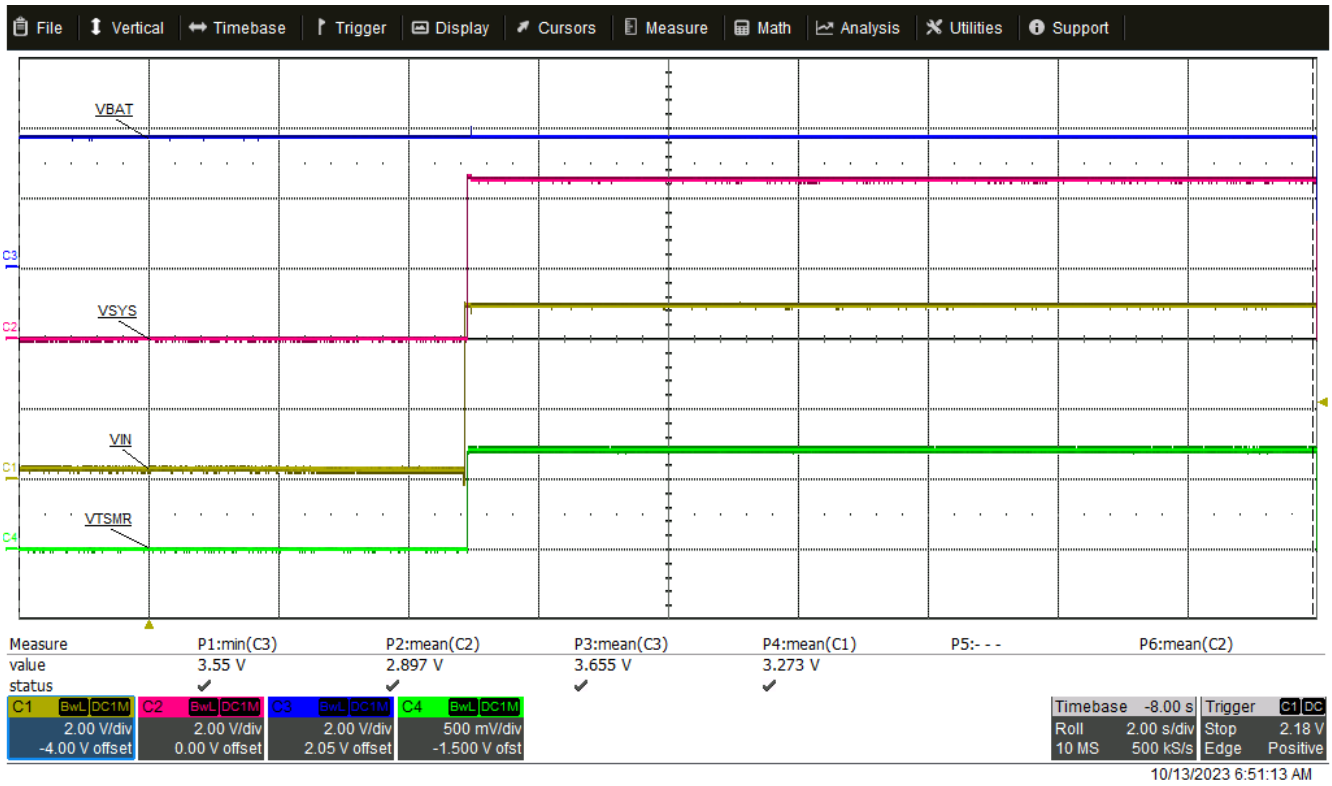

Figure 3-2. Exit Factory Mode with VIN insertion

4 Hardware Design Files

4.1 Schematics

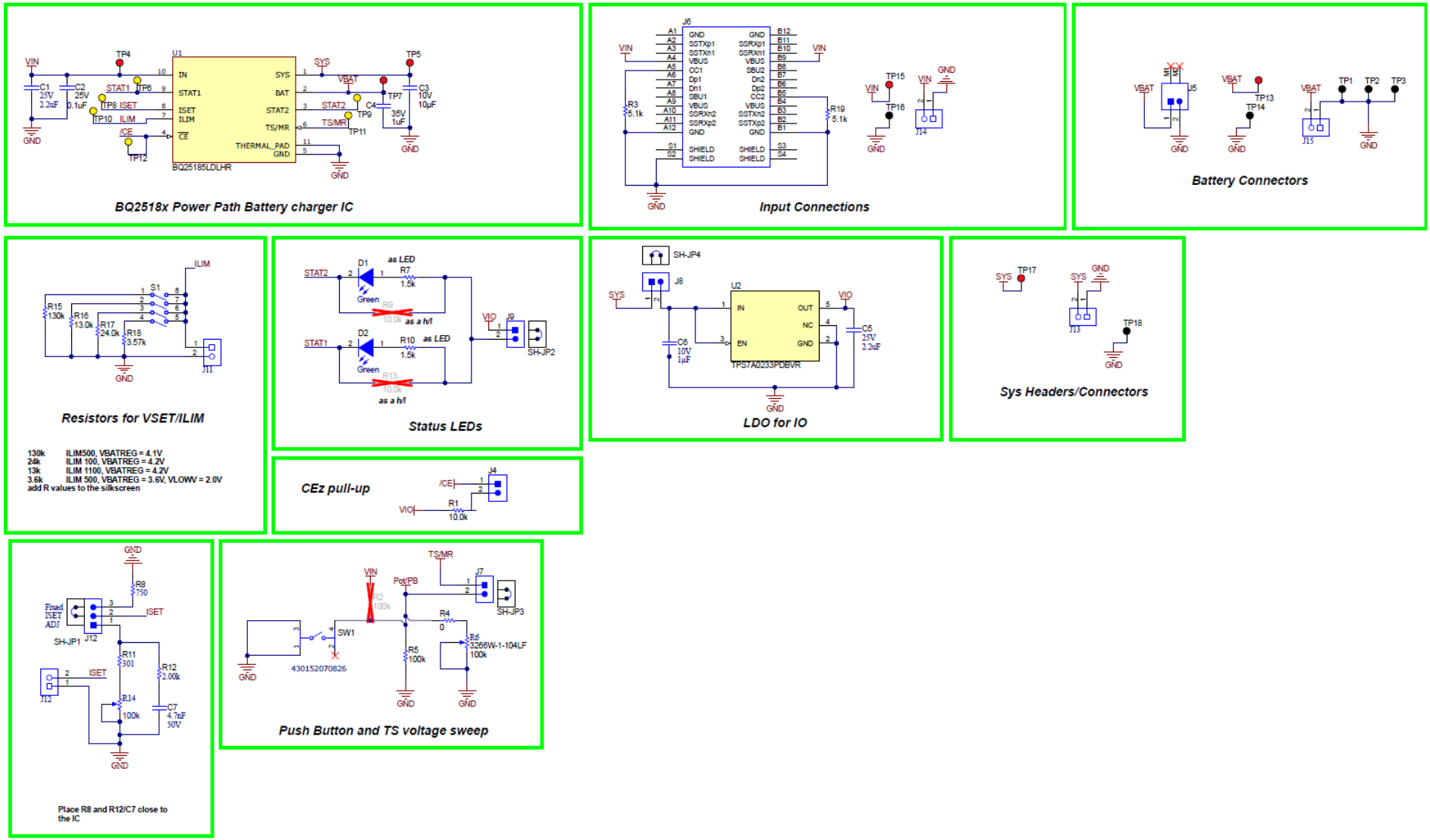

Figure 4-1. BQ25185EVM Schematic

4.2 Layout

Figure 4-2 through Figure 4-7 show the EVM PCB layout images.

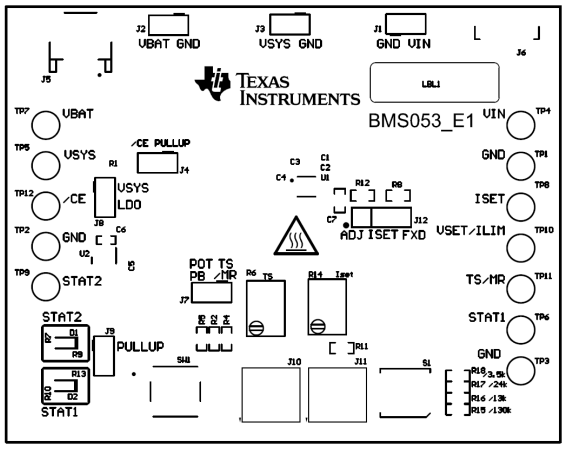

Figure 4-2. Top Overlay

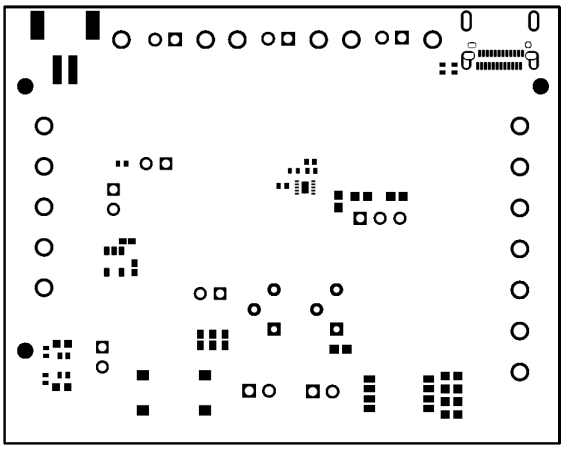

Figure 4-3. Top Solder

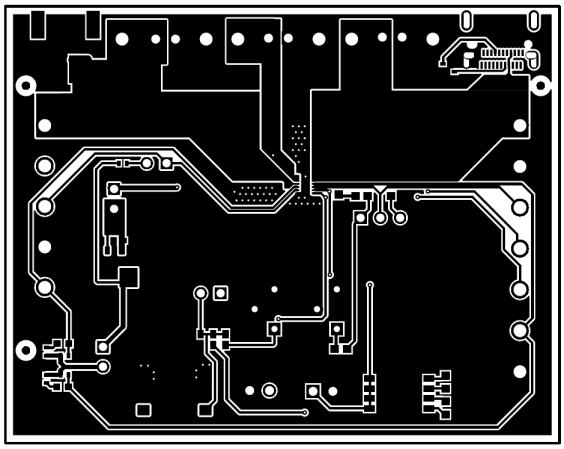

Figure 4-4. Top Layer

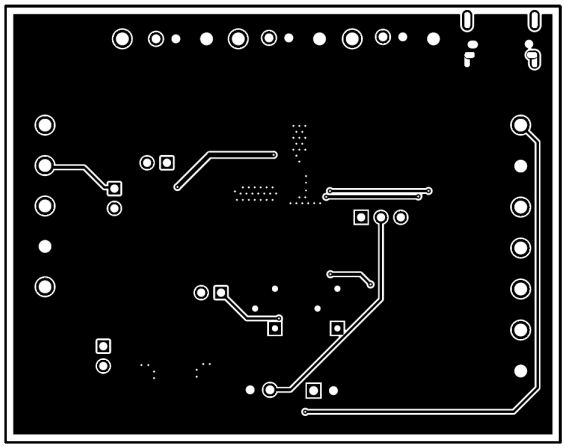

Figure 4-5. Bottom Layer

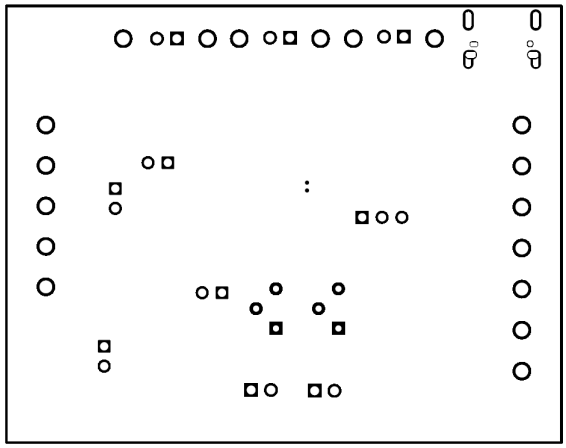

Figure 4-6. Bottom Solder

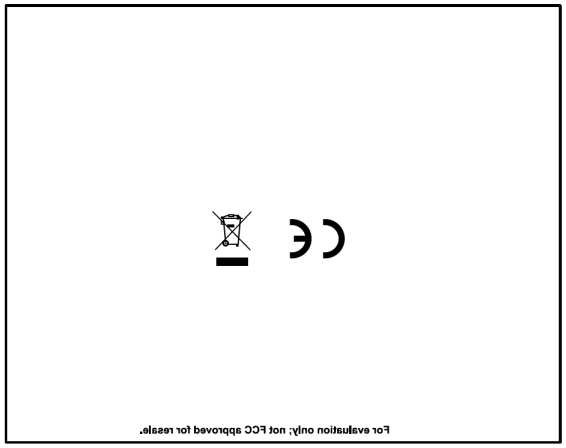

Figure 4-7. Bottom Overlay

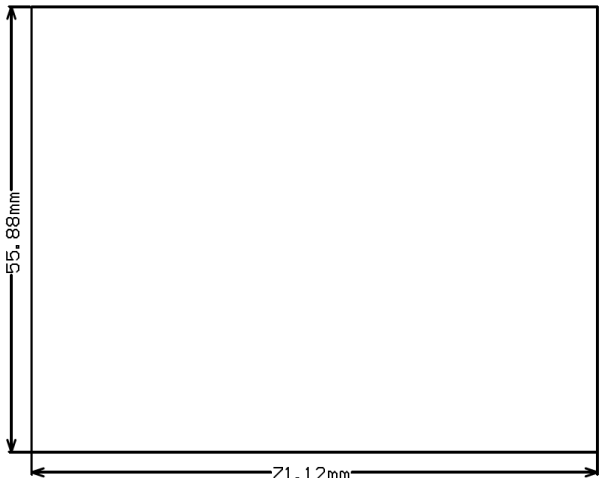

Figure 4-8. Board Dimensions

4.3 Bill of Materials

The Bill of Materials is shown in the following table.

Table 4-1. Bill of Materials

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer
C1, C5	2	2.2uF	CAP, CERM, 2.2 uF, 25 V, +/- 10%, X5R, 0402	402	C1005X5R1E225K050BC	TDK
C2	1	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X5R, 0402	402	GRM155R61E104KA87D	MuRata
C3	1	10uF	CAP, CERM, 10 µF, 10 V,+/- 20%, X5R, 0402	402	CL05A106MP8NUB8	Samsung Electro-Mechanics
C4	1	1uF	CAP, CERM, 1 uF, 35 V, +/- 10%, JB, 0402	402	C1005JB1V105K050BC	TDK
C6	1	1uF	CAP, CERM, 1 µF, 10 V,+/- 20%, X5R, 0402	402	CC0402MRX5R6BB105	Yageo America
C7	1	4700pF	CAP, CERM, 4700 pF, 50 V, +/- 5%, X7R, 0603	603	C0603C472J5RACTU	Kemet
D1, D2	2	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On
J4, J7, J8, J9	4		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
J5	1		Header (shrouded), 2mm, 2x1, R/A, SMT	Header, 2x1, 2mm, R/A	S2B-PH-SM4-TB(LF)(SN)	JST Manufacturing
J6	1		Receptacle, USB 3.1 Type C, R/A, Gold, SMT	Receptacle, USB 3.1 Type C, R/A, SMT	DX07S024JJ2R1300	JAE Electronics
J11, J12, J13, J14, J15	5		Terminal Block, 2x1, 2.54mm, TH	Terminal Block, 2x1, 2.54mm, TH	282834-2	TE Connectivity
J12	1		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	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-14-423-10	Brady
R1	1	10.0k	RES, 10.0 k, 1%, 0.063 W, 0402	402	RC0402FR-0710KL	Yageo America

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer
R3, R19	2	5.1k	RES, 5.1 k, 5%, 0.063 W, 0402	402	CRCW04025K10JNED	Vishay-Dale
R4	1	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	402	ERJ-2GE0R00X	Panasonic
R5	1	100k	RES, 100 k, 1%, 0.0625 W, AEC-Q200 Grade 0, 0402	402	AC0402FR-07100KL	Yageo America
R6, R14	2	100k	Trimmer, 100k ohm, 0.25W, TH	4.5x8x6.7mm	3266W-1-104LF	Bourns
R7, R10	2	1.5k	RES, 1.5 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	402	CRCW04021K50JNED	Vishay-Dale
R8	1	750	RES, 750, 1%, 0.1 W, 0603	603	RC0603FR-07750RL	Yageo
R11	1	301	RES, 301, 1%, 0.1 W, 0603	603	CRCW0603301RFKEA	Vishay-Dale
R12	1	2.00k	RES, 2.00 k, 1%, 0.1 W, 0603	603	CRCW06032K00FKEA	Vishay-Dale
R15	1	130k	RES, 130 k, 1%, 0.1 W, 0603	603	RC0603FR-07130KL	Yageo
R16	1	13.0k	RES, 13.0 k, 1%, 0.1 W, 0603	603	RC0603FR-0713KL	Yageo
R17	1	24.0k	RES, 24.0 k, 1%, 0.1 W, 0603	603	RC0603FR-0724KL	Yageo
R18	1	3.57k	RES, 3.57 k, 1%, 0.1 W, 0603	603	RC0603FR-073K57L	Yageo
S1	1		DIP Switch, SPST 4Pos, Slide, SMT	6.2x2.0x6.2mm	TDA04H0SB1	C&K Components
SH-JP1, SH-JP2, SH-JP3, SH-JP4	4	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
SW1	1		Tactile Switch SPST-NO Top Actuated Surface Mount	SMT_TACT	4.30152E+11	Wurth Electronics

Table 4-1. Bill of Materials (continued)

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer
TP1, TP2, TP3, TP14, TP16, TP18	6		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone
TP4, TP5, TP7, TP13, TP15, TP17	6		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone
TP6, TP8, TP9, TP10, TP11, TP12	6		Test Point, Multipurpose, Yellow, TH	Yellow Multipurpose Testpoint	5014	Keystone
U1	1		BQ25183DLHT	WSON10	BQ25185LDLHR	Texas Instruments
U2	1		1-uA IQ, 200-mA, Ultralow IQ Low-Dropout Regulator, DBV0005A (SOT-23-5)	DBV0005A	TPS7A0233PDBVR	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
R2	0	100k	RES, 100 k, 1%, 0.0625 W, AEC-Q200 Grade 0, 0402	402	AC0402FR-07100KL	Yageo America
R9, R13	0	10.0k	RES, 10.0 k, 1%, 0.063 W, 0402	402	RC0402FR-0710KL	Yageo America

5 Additional Information

5.1 Trademarks

All trademarks are the property of their respective owners.

6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
October 2023	*	Initial Release

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

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

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

NOTE:

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

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

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

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

CAUTION

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

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

FCC Interference Statement for Class A EVM devices

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

FCC Interference Statement for Class B EVM devices

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

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

3.2 *Canada*

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

Concerning EVMs Including Radio Transmitters:

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

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

Concernant les EVMs avec appareils radio:

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

Concerning EVMs Including Detachable Antennas:

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

Concernant les EVMs avec antennes détachables

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

3.3 *Japan*

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

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

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

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

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

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

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

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東京都新宿区西新宿 6 丁目 2 4 番 1 号

西新宿三井ビル

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

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:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

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