BQ2515xEVM Evaluation Module

This user's guide provides detailed testing instructions for the BQ2515x 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 abbreviations *EVM*, *BQ2515xEVM*, and the term *evaluation module* are synonymous with the BQ2515x evaluation module, unless otherwise noted.

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1 Introduction

The BQ2515xEVM is an evaluation kit for the BQ2515x integrated battery charge management IC. The BQ2515x is an integrated battery charge management IC that integrates the most common functions for wearable devices: Linear charger, regulated output/ load switch, manual reset with timer, ADC and ship mode function.

1.1 EVM Features

Key features of this EVM include:

- 500mA Linear battery charger
- I2C Configurable Battery Regulation Voltage with 0.5% Accuracy
- Configurable Termination Current down to 0.5mA
- Programmable thermal charging profile with configurable Hot, Warm, Cool and Cold thresholds
- Power Path Management for powering the system and charging the battery
- 10nA Ship Mode battery Iddq for longest shelf life
- One I2C Configurable Load Switch or 150mA LDO Output
- One Button Wake-up and Reset Input with Adjustable Timers
- ADC Monitoring of Input voltage, Battery voltage, Charge current, Battery Thermistor
- I2C Communication Control

See the device data sheet (SLUSD04) for detailed features and operation of the integrated circuit (IC).

Table 1. Device Data Sheet

Device	Data Sheet
BQ25150	SLUSD04
BQ25155	SLUSDO1

1.2 I/O Descriptions

Table 2 lists the jumper connections available on this EVM.

Table 2. Jumper Connections

Jumper Name	Description	Setting
J1	Micro USB connector (optional for VIN)	NA
J2, J3	Board connector to other modules	NA
J4	External LDO ON	Not Connected
J5	TS potentiometer connector	Connected
J6	VIN and GND connector	NA
J7	VBAT and GND connector	NA
J8	EV2400 Connector	NA
J9	ADC potentiometer connector	Connected
J10	Battery Pack Connector	NA

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Table 2. Jumper Connections (continued)

J11	VIO connector to VDD or 3p3V	Connect VDD to VIO
J12	/LP connector to GPIO or VIO	Connect /LP to VIO
J13	/CE connector ro GPIO or VIO	Connect /CE to VIO
J14	Display connector for other modules	NA
J15	PMID to VINLS connector	Connected
J16	On board LED pullup to VDD or PMID	Connected to PMID
J17	I2C Pullup	Connected

Table 3 lists the recommended operating conditions for this EVM.

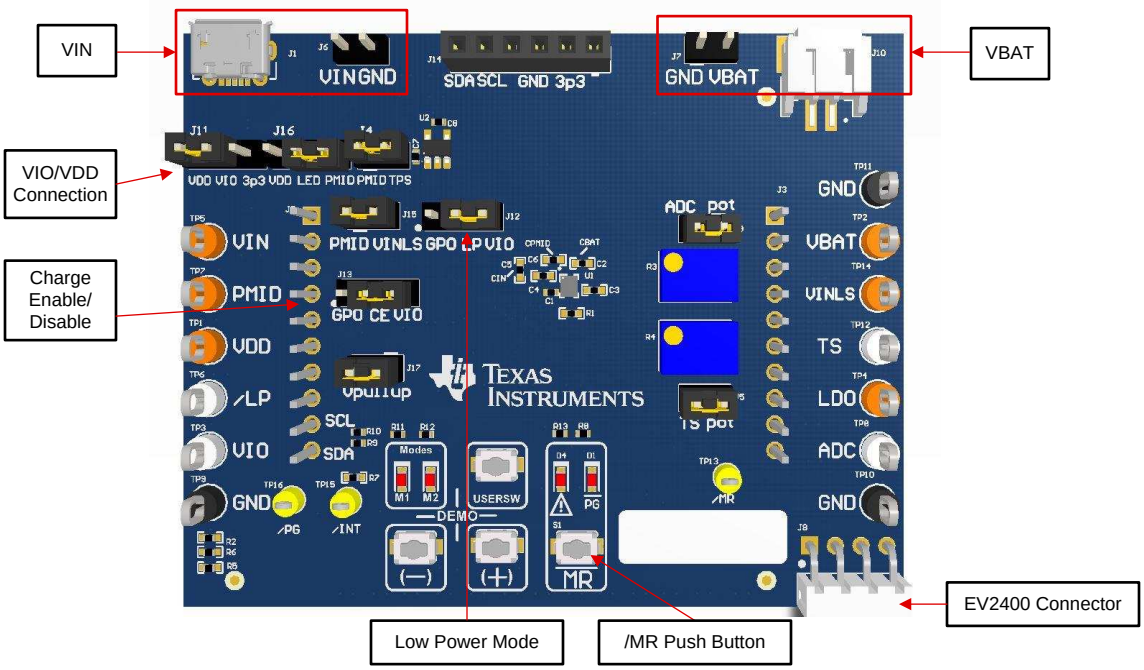


Figure 1. BQ2515xEVM Connections

Table 3. Recommended Operating Conditions

Symbol	Description	MIN	TYP	MAX	Unit
Supply voltage, V_{VBUS}	Input voltage from AC adapter		5	20	V
Battery voltage, V_{BAT} in charge mode	Voltage applied at V_{BAT} terminal		4.2		V
I_{BAT}	Fast charging current		0.5		A
	Discharging current through internal MOSFET		1		A
Supply current, I_{IN}	Maximum input current from AC adapter input		0.6		A

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2 Test Summary

2.1 Equipment

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

1. *Powersupply (PS#1), Powersupply (PS#2)*: Keithley 2400 Powersupply or equivalent
2. SC#1- SC#3: 4 channel Oscilloscope
3. *Computer:* A computer with at least one USB port and a USB cable
4. *PC communication interface:*
5. *Software:* Download bqStudio from Texas Instruments
   Double click the *Battery management studio* installation file and then follow the installation steps. The software supports Microsoft® Windows® 7 and Windows 10 operating systems.

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2.2 Charge Mode

Connect the equipment as following:

Power supply PS#1: VIN of the BQ2515x at 5V

Power supply PS#2: VBAT of the BQ2515x at 3.7V

Scope channel SC#1: VIN

Scope channel SC#2: VPMID

Scope channel SC#3: VBAT

Turn ON the supply PS#2, then turn ON the supply PS#1. The VPMID will rise to the level of VIN. The device will begin to charge as long as /CE pin jumper is disconnected(J13 being pulled off will result in the pulldown internal to the device, charge enabled) ,the TS is left at default configuration and there are no other faults.

To adjust the charge current or change other parameters, connect the EV2400 to the EVM and then startup BQStudio.

Select the Charger_ 1_00-bq25150.bqz from the Charger selection for the BQ25150EVM or charger_1_00-bq25155.bqz from the charger selection for the BQ25155EVM. Click “Read Register” to read all the registers and navigate to the Field View to make changes.

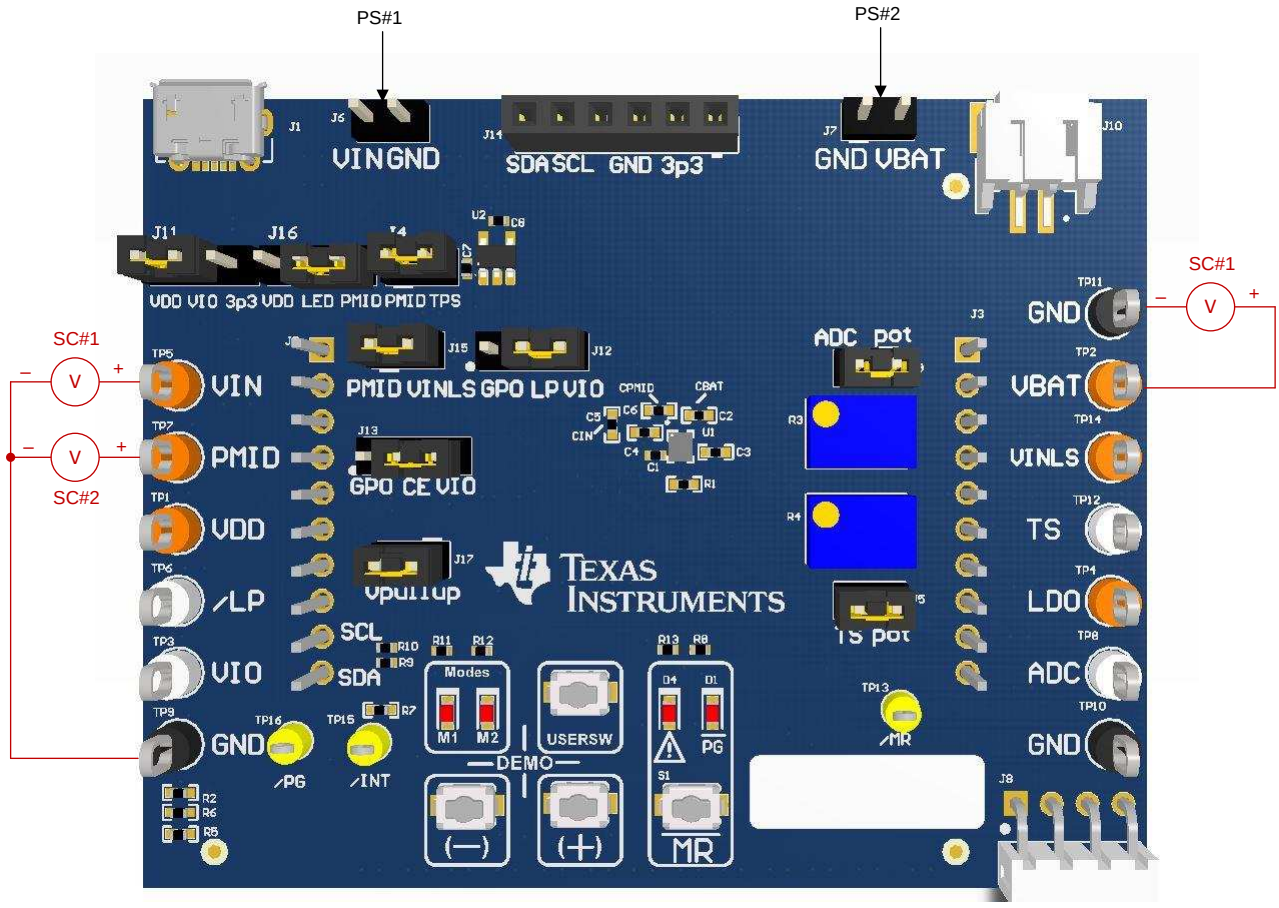


Figure 2. Connections for Test Setup

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2.3 Ship Mode

To go to Ship Mode, turn OFF VIN (PS#1). Make sure /LP pin is connected to VIO(J12) and VIO is connected to VDD through J11. Read all the registers and click the Shipmode Enable checkbox (Bit B7 on register 0x35) to go to Ship Mode. You can know that you are in Ship Mode as the voltage on PMID (SC#2) will fall to 0V.

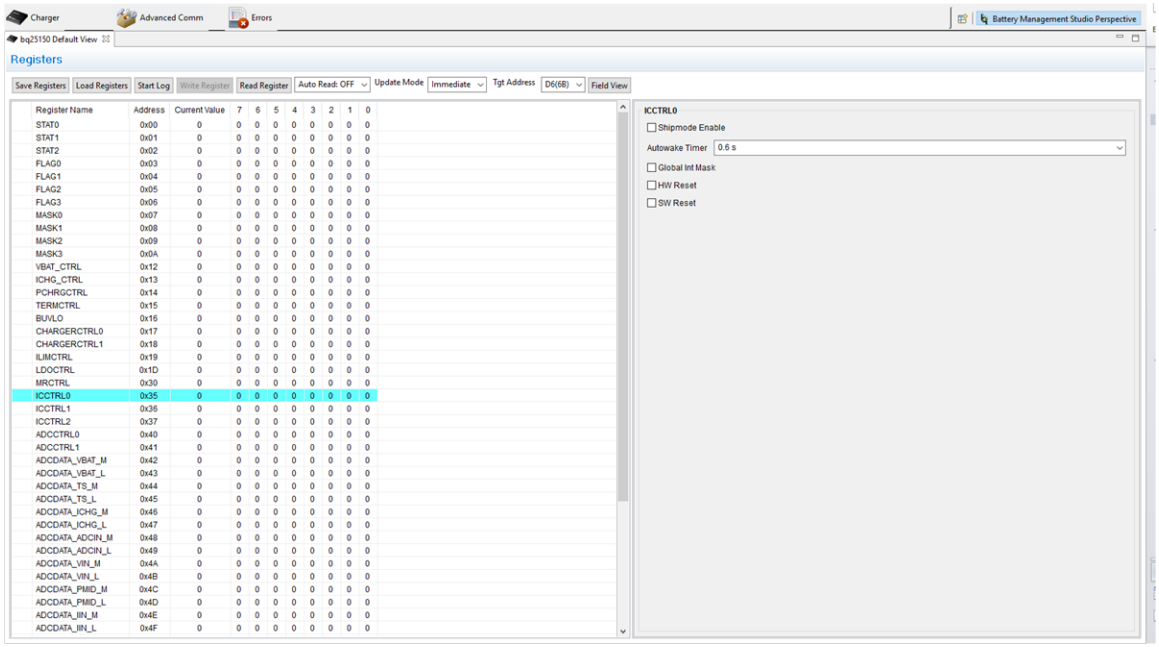


Figure 3. BQStudio Software Tool

2.4 Warning

The warning label indicates when there is a fault during communication with the MCU.

2.5 Comparison Table

Refer to the data sheet for detailed information on register defaults.

Table 4. Comparison Table

	BQ25150	BQ25155
Default PMID voltage when adapter is present	VIN level	4.5 V (can be adjusted through I2C)
Input current limit default	100 mA	500 mA
VINDPM	Enabled	Disabled
Warm battery discharge	Yes (up to 5 mA)	Yes (up to 20 mA)
IMAX limiting	Yes	No, saves area
Wake from Shipmode timer	2s	125 ms
VINUVLO (battery present)	3.4 V	3.15 V
Device ID	0x20	0x35

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3 Board Layouts, Schematics, and Bill of Materials

3.1 Board Layouts

Figure 4 through Figure 12 show the PCB board layouts.

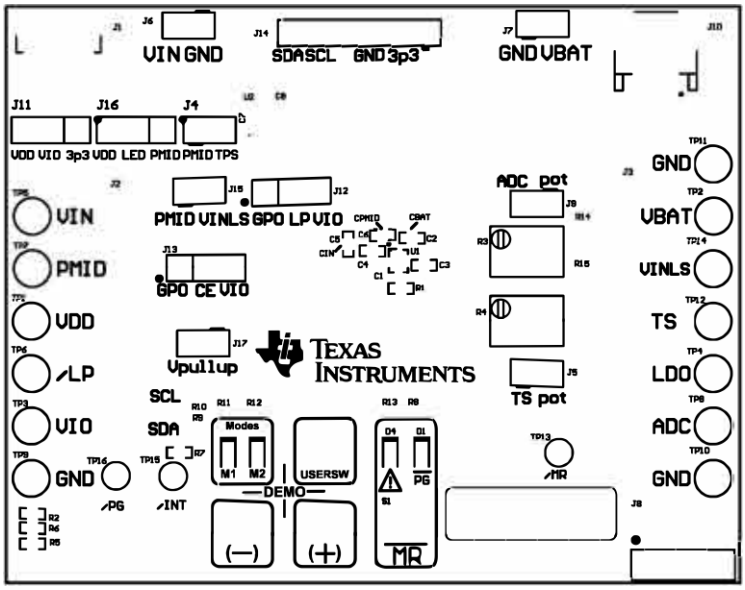


Figure 4. Top Overlay

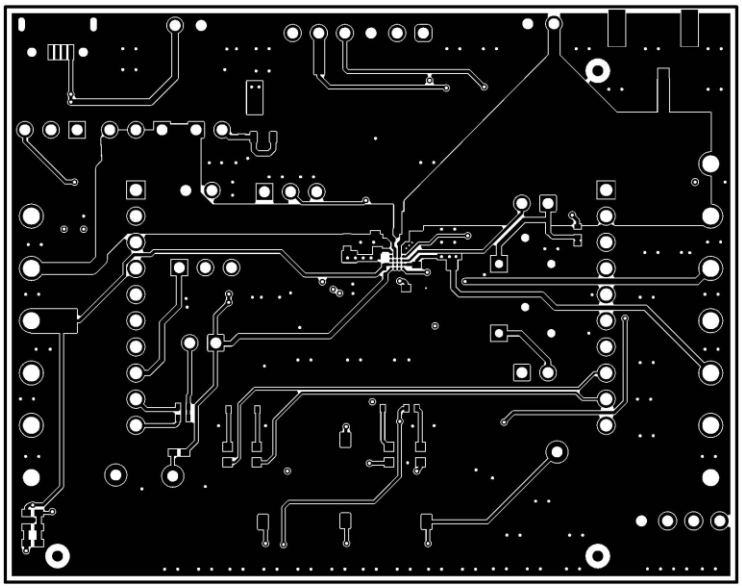


Figure 5. Top Layer

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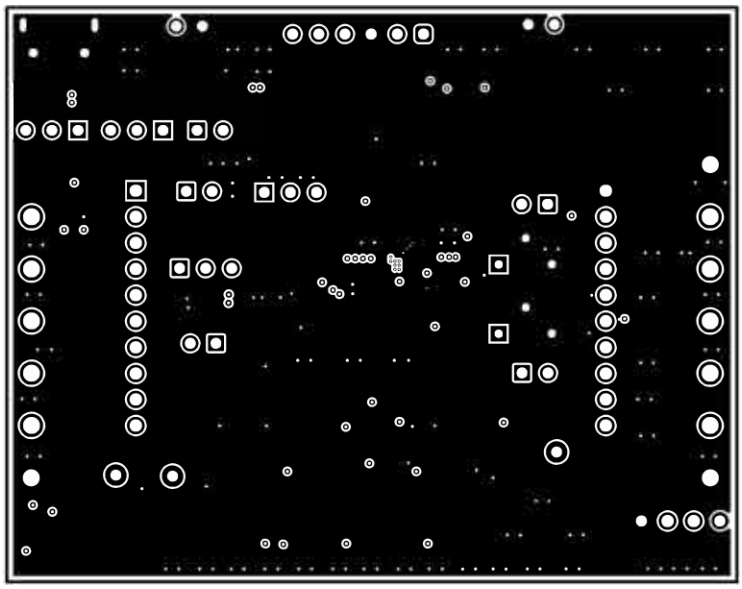


Figure 6. Signal Layer 1

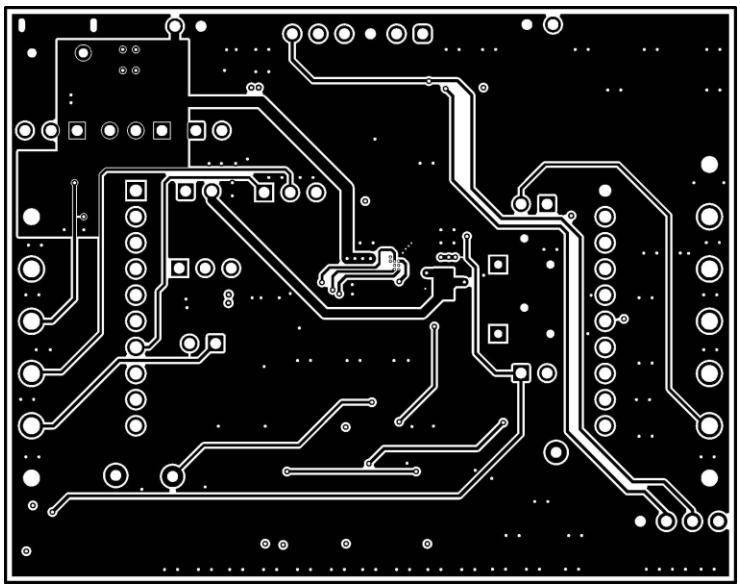


Figure 7. Signal Layer 2

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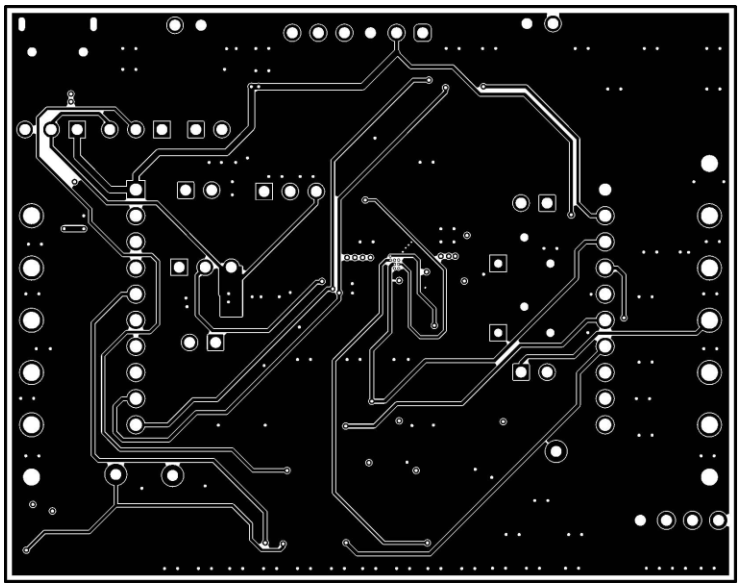


Figure 8. Bottom Layer

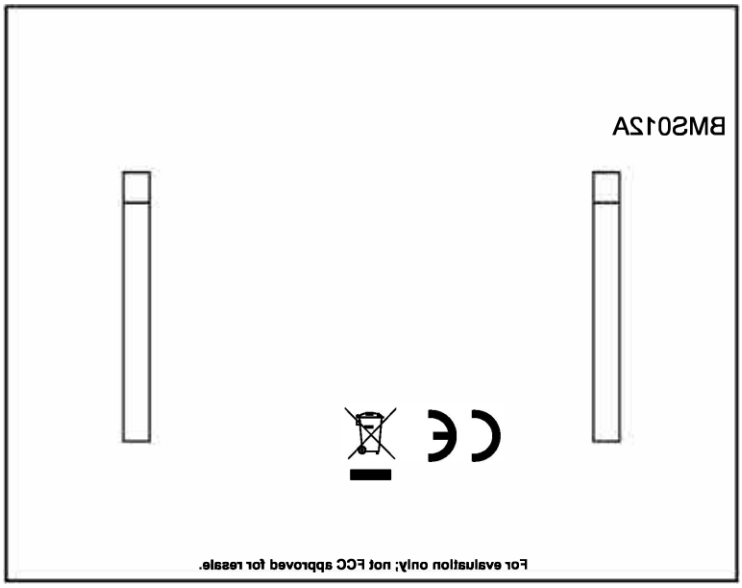


Figure 9. Bottom Overlay

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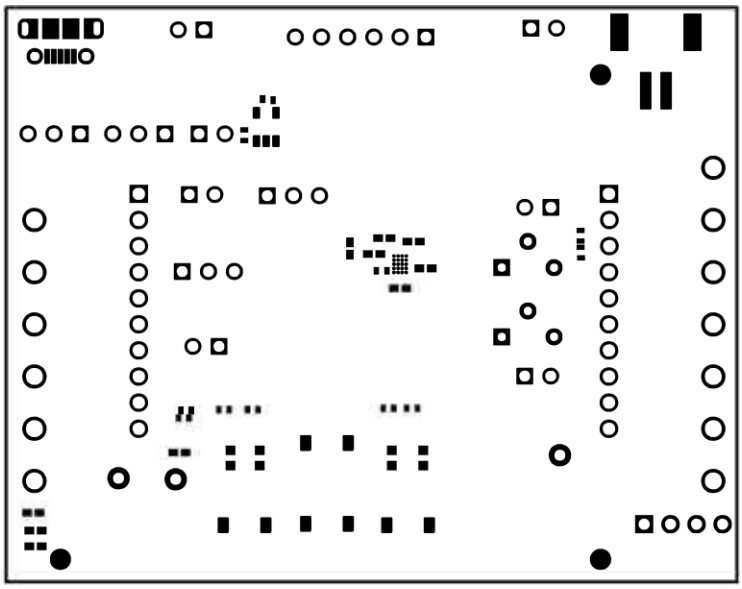


Figure 10. Top Solder Mask

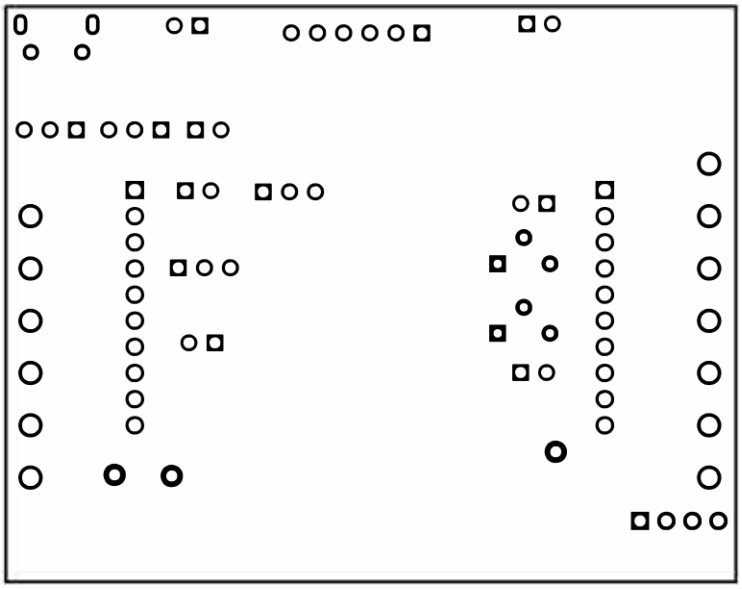


Figure 11. Bottom Solder Mask

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Symbol	Count	Hole Size	Plated	Hole Type	Drill Layer Pair	Via/Pad	Pad Shape	Template	Description	Hole Tolerance (+)	Hole Tolerance (-)	Hole Length	Routed Path Length
▼	2	23.62mil (0.600mm)	PTH	Slot	Top Layer - Bottom Layer	Pad	Rounded	r190_120h60_130r100				51.18mil (1.300mm)	27.56mil (0.700mm)
○	2	33.47mil (0.850mm)	PTH	Round	Top Layer - Bottom Layer	Pad	Rounded	c149h85				-	-
●	4	40.16mil (1.020mm)	PTH	Round	Top Layer - Bottom Layer	Pad	(Mixed)	(Mixed)				-	-
⋔	6	29.53mil (0.750mm)	PTH	Round	Top Layer - Bottom Layer	Pad	(Mixed)	(Mixed)				-	-
⊠	6	40.16mil (1.020mm)	PTH	Round	Top Layer - Bottom Layer	Pad	(Mixed)	(Mixed)		1.97mil (0.050mm)	1.97mil (0.050mm)	-	-
□	13	6.00mil (0.152mm)	PTH	Round	Top Layer - Bottom Layer	Via	Rounded	(Mixed)				-	-
✲	13	63.00mil (1.600mm)	PTH	Round	Top Layer - Bottom Layer	Pad	Rounded	c221h160				-	-
✖	20	45.28mil (1.150mm)	PTH	Round	Top Layer - Bottom Layer	Pad	(Mixed)	(Mixed)				-	-
▽	29	40.00mil (1.016mm)	PTH	Round	Top Layer - Bottom Layer	Pad	(Mixed)	(Mixed)				-	-
○	189	10.00mil (0.254mm)	PTH	Round	Top Layer - Bottom Layer	Via	Rounded	(Mixed)				-	-
	284 Total												

Slot definitions : **Routed Path Length** = Calculated from tool start centre position to tool end centre position.
Hole Length = Routed Path Length + Tool Size = Slot length as defined in the PCB layout

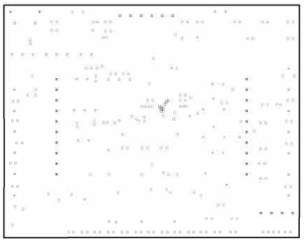


Figure 12. Drill Drawing

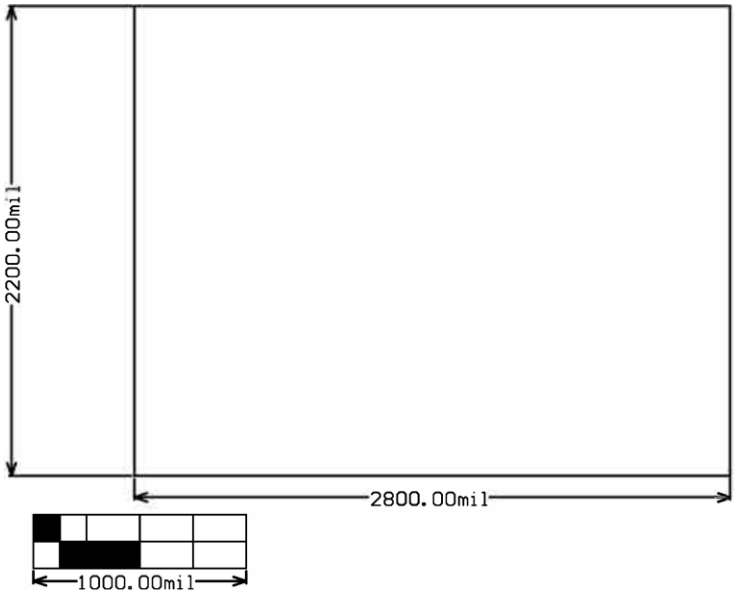


Figure 13. Board Dimensions

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3.2 Schematics

Figure 14 and Figure 16 show the schematics for the BQ2515x EVM.

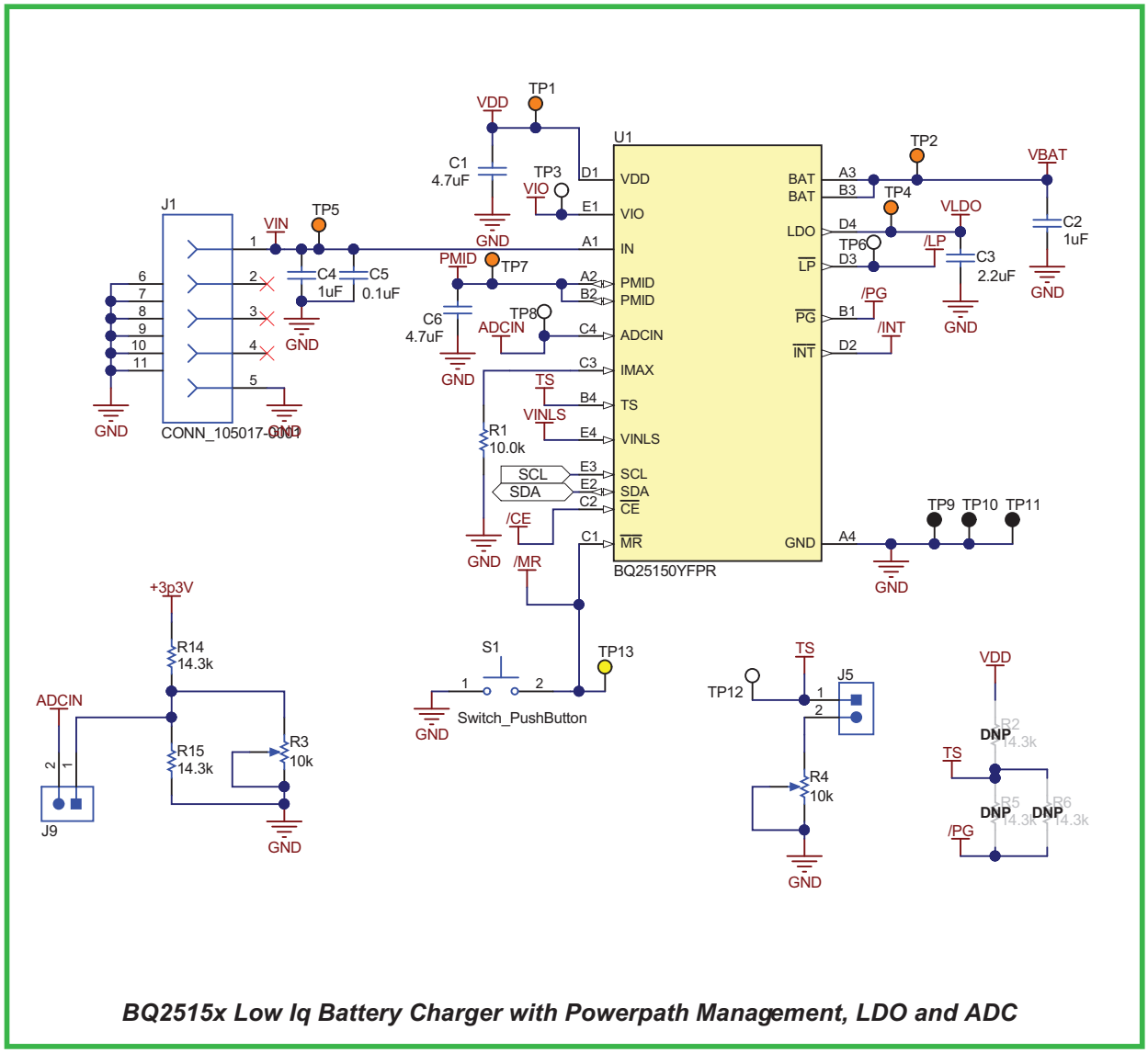


Figure 14. BQ2515xEVM Schematic

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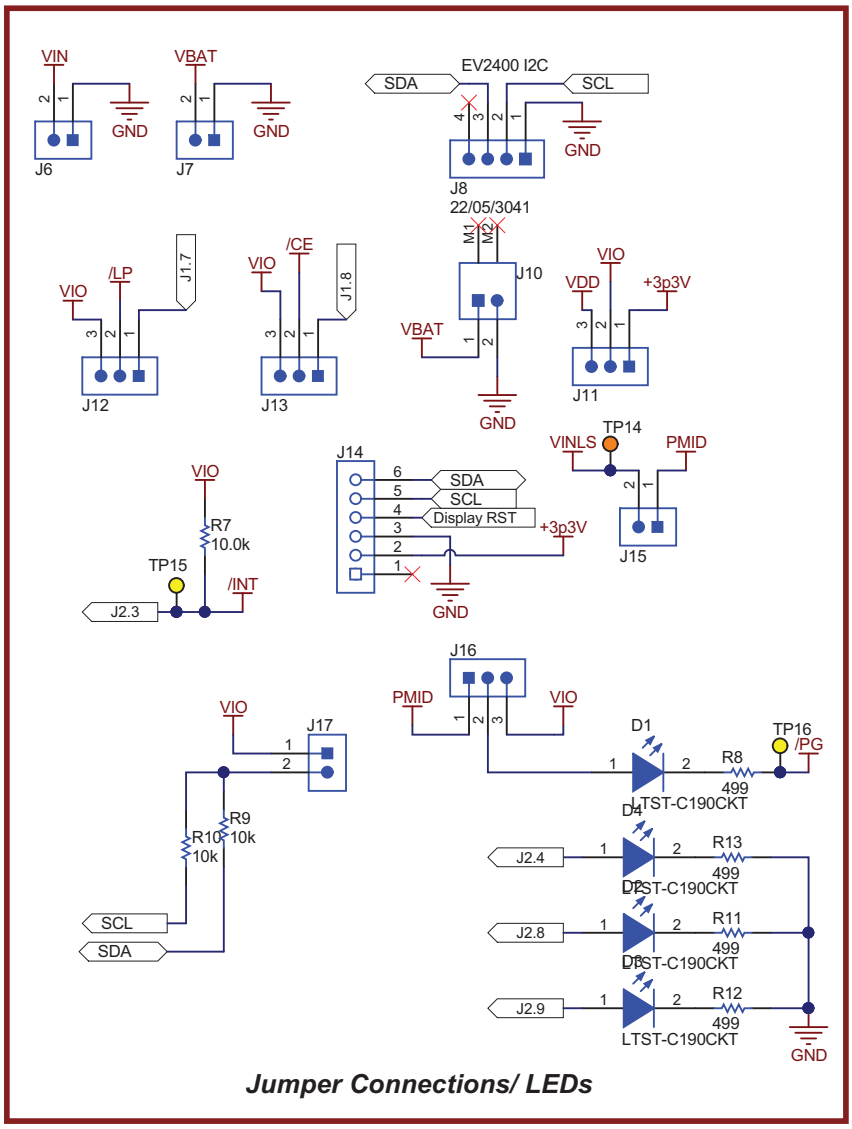


Figure 15. BQ2515xEVM Jumper Connectors

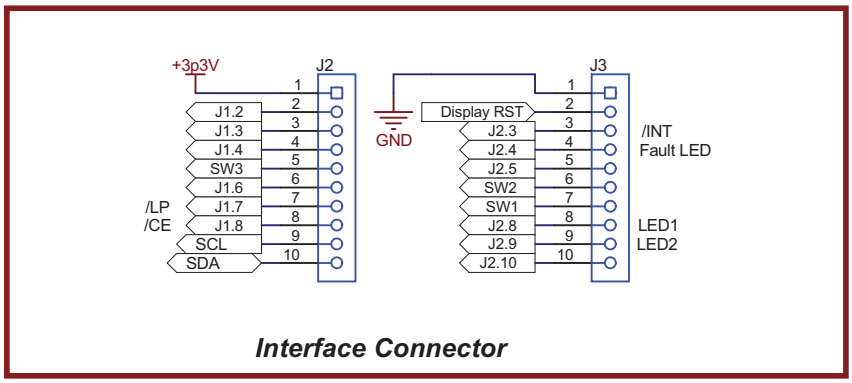


Figure 16. BQ2515xEVM Interface Connector

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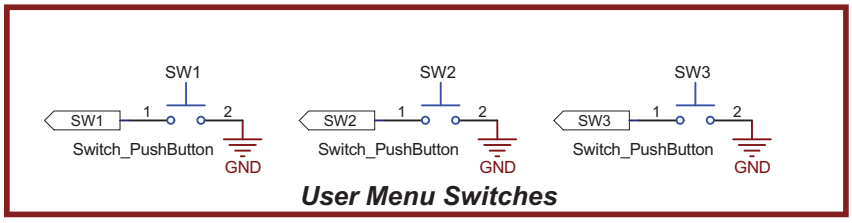


Figure 17. User Menu Switches

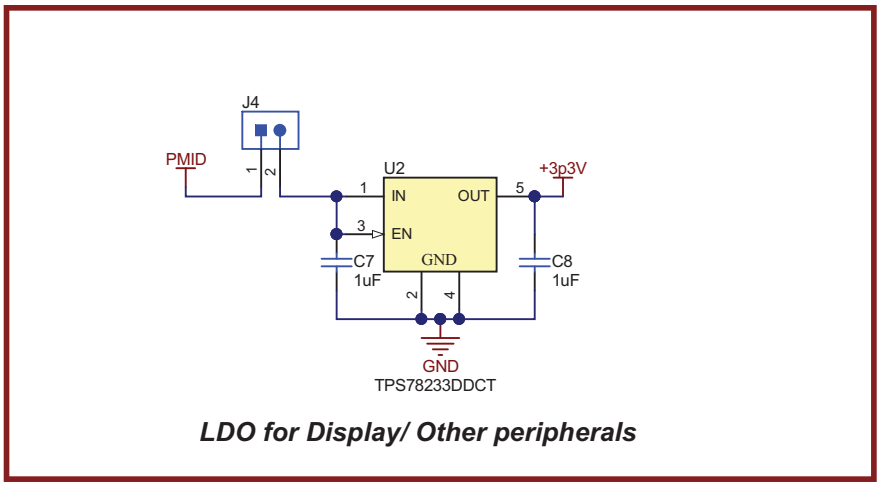


Figure 18. LDO for Display/Other Peripherals

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3.3 Bill of Materials

The bill of materials is shown in the following table.

Table 5. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number[1]	Alternate Manufacturer[1]
C1,	1	4.7uF	CAP, CERM, 4.7 µF, 10 V, +/- 20%, X5R, 0402	0402	GRM155R61A475MEAAD	MuRata		
C2, C4, C7, C8	4	1uF	CAP, CERM, 1 µF, 25 V, +/- 10%, X5R, 0402	0402	C1005X5R1E105K050BC	TDK		
C3	1	2.2uF	CAP, CERM, 2.2 uF, 10 V, +/- 10%, X7S, 0402	0402	C1005X7S1A225K050BC	TDK		
C5	1	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0402	0402	GRM155R71E104KE14D	MuRata		
C6 (BQ25150EVM)	1	4.7uF	CAP, CERM, 4.7 µF, 10 V, +/- 20%, X5R, 0402	0402	GRM155R61A475MEAAD	MuRata		
C6 (BQ25155EVM)	1	10uF	CAP, CERM, 10 µF, 10 V,+/- 20%, X5R, 0402	0402	0402ZD106MAT2A	AVX		
D1, D2, D3, D4	4	Red	LED, Red, SMD	Red LED, 1.6x0.8x0.8mm	LTST-C190CKT	Lite-On		
J1	1		Receptacle, Micro-USB-B, Right Angle, SMD	Micro USB receptacle	105017-0001	Molex		
J2, J3	2		Connector, Receptacle, 100mil, 10x1, Gold plated, TH	10x1 Receptacle	SSW-110-23-F-S	Samtec		
J4, J5, J6, J7, J9, J15, J17	7		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions		
J8	1		Header (friction lock), 100mil, 4x1, R/A, TH	4x1 R/A Header	22-05-3041	Molex		
J10	1		Header (shrouded), 2mm, 2x1, R/A, SMT	Header, 2x1, 2mm, R/A	S2B-PH-SM4-TB(LF)(SN)	JST Manufacturing		
J11, J12, J13, J16	4		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	Sullins Connector Solutions		
J14	1		Receptacle, 2.54mm, 6x1, Gold, TH	Receptacle, 2.54mm, 6x1, Gold, TH	PPPC061LFBN-RC	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"W	THT-14-423-10	Brady	-	-

[1] Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

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Table 5. Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number(1)	Alternate Manufacturer(1)
R1, R7	2	10.0kΩ	RES, 10.0 k, 1%, 0.2 W, AEC-Q200 Grade 0, 0402	0402	ERJPA2F1002X	Panasonic		
R3, R4	2	10kΩ	Trimmer, 10k ohm, 0.25W, TH	4.5x8x6.7mm	3266W-1-103LF	Bourns		
R8, R11, R12, R13	4	499Ω	RES, 499, 1%, 0.063 W, 0402	0402	CRCW0402499RFKED	Vishay-Dale		
R9, R10	2	10kΩ	RES, 10 k, 5%, 0.063 W, 0402	0402	CRCW040210K0JNED	Vishay-Dale		
S1, SW1, SW2, SW3	4		Switch, Tactile, SPST-NO, 0.05A, 12V, SMT	Switch, 4.4x2x2.9 mm	TL1015AF160QG	E-Switch		
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9	9	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1, TP2, TP4, TP5, TP7, TP14	6		Test Point, Multipurpose, Orange, TH	Orange Multipurpose Testpoint	5013	Keystone		
TP3, TP6, TP8, TP12	4		Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone		
TP9, TP10, TP11	3		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone		
TP13, TP15, TP16	3		Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone		
U1 (BQ25150EVM)	1		BQ25150YFP, YFP0020ACAC (DSBGA-20)	YFP0020ACAC	BQ25150YFPR	Texas Instruments	BQ25150YFPT	Texas Instruments
U1 (BQ25155EVM)	1		BQ25155, YFP0020ACAC (DSBGA-20)	YFP0020ACAC	BQ25155YFPR	Texas Instruments	BQ25155YFPT	Texas Instruments
U2	1		Single Output LDO, 150 mA, Fixed 3.3 V Output, 2.2 to 5.5 V Input, with 0.5 uA Quiescent Current, 5-pin SOT (DDC), -40 to 125 degC, Green (RoHS and no Sb/Br)	DDC0005A	TPS78233DDCT	Texas Instruments		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A		
R2, R5, R6	0	14.3k	RES, 14.3 k, 1%, 0.063 W, 0402	0402	CRCW040214K3FKED	Vishay-Dale		

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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。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required 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。

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東京都新宿区西新宿 6 丁目 2 4 番 1 号
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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
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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.

8. *Limitations on Damages and Liability:*

   8.1 *General Limitations*. IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

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

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

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