bq25871 and bq25872 PWR813 Evaluation Module

This user's guide provides detailed testing instructions for the bq25871 and bq25872 evaluation modules (EVM). Also included are descriptions of the necessary equipment, equipment setup, and procedures. The reference documentation contains the printed-circuit board layouts, schematics, and the bill of materials (BOM).

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1 Introduction

1.1 EVM Features

For detailed features and operation, refer to the device data sheet as listed in Table 1.

Table 1. Device Data Sheets

Device	Datasheet	EVM Label	Variant
bq25871	SLUSCN1	BQ25871EVM-813	001
bq25872	SLUSCN1	BQ25872EVM-813	002

The bq2587x evaluation module (EVM) is a complete charger module for evaluating the highly-integrated battery switch in WCSP package for 1 cell Li-Ion and Li-polymer battery in a wide range of smartphones and tablets.

This EVM does not include the EV2300 or EV2400 (EV2x00) interface board. To evaluate the EVM, a EV2x00 interface board must be ordered separately.

1.2 I/O Descriptions

Table 2 lists the jumper connections available on this EVM.

Table 2. PWR813 EVM Header Jx Connections

Jack	Description	bq25871 Setting	bq25872 Setting
J1 – VBUS/VUSB	VBUS short to VUSB if installed.	Installed	Not installed
J2 – VBUS/VUSB	VBUS short to VUSB if installed.	Installed	Not installed
J4 – VBUS/PGND	Input terminal, use without external OVP FET	for bq25871 only	Not applicable
J3 – VUSB/PGND	Input terminal, use with external OVP FET	Not applicable	for bq25872 only
J5 – VOUT(PACK+)/GND(PACK-)	Output terminal	To battery	To battery
J6 – I^2C	EV2x00 I^2C 4-pin connector	To host	To host
J7 - SRP/SRN	External battery current sensing connection: Positive (SRP) and Negative (SRN). Use with JP4 and JP6 uninstalled.	To external battery current sense	To external battery current sense

Table 3 lists the EVM jumper connections.

Table 3. EVM Jumper JPx Shunt Installation

Jack	Description	bq25871 Setting	bq25872 Setting
JP1	VUSB pin connection selection	(2) short to (1) VUSB	(2) short to (1) VUSB
JP2	ADDR/CHGSTAT selection	(2) short to (3) CHGSTAT	(2) short to (3) CHGSTAT
JP3	EN pin condition selection	(2) short to (1) 1.8V	(2) short to (1) 1.8V
JP4	SRP sense resistor high/low side selection, default to low side.	(2) short to (1)	(2) short to (1)
JP5	OVPSET pin condition selection	(2) short to (1) PGND	(2) short to (1) PGND
JP6	SRN sense resistor high/low side selection, default to low side.	(2) short to (1)	(2) short to (1)
JP7	ADDR pin condition selection	(2) short to (1) PGND	(2) short to (1) PGND
JP8	1.8-V power supply to TS_BUS	installed	installed
JP9	1.8-V power supply to TS_BAT	installed	installed
JP10	$\overline{\text{INT}}$ LED indicator	installed	installed
JP11	1.8-V power supply selection. Default to VBUS.	(2) short to (1)	(2) short to (1)
JP12	I^2C pullup selection. Default to 1.8 V.	installed	installed
JP13	TS_BUS connection to voltage source	installed	installed
JP14	TS_BAT connection to voltage source	installed	installed
JP15	TS_BUS voltage adjustment	installed	installed
JP16	TS_BAT voltage adjustment	installed	installed
JP17	$\overline{\text{CHGSTAT}}$ LED indicator	installed	installed

Table 4 lists the recommended operating conditions for this EVM.

Table 4. Recommended Operating Conditions(1)

		MIN	MAX	UNIT
VUSB	EN = low, or CHG_EN = '0'	2.8	14	V
VBUS	EN = high, or CHG_EN = '1'	0	6	V
VOUT		2.8	6	V
BATP, BATN		0	6	V
SRP – SRN	Differential voltage between SRP and SRN	–0.2	0.2	V
TS_BAT, TS_BUS	TS pin voltage range	0	3	V
SDA, SCL, ADDR ($\overline{\text{CHGSTAT}}$), /INT, EN, OVPSET		0	5	V
IVOUT	Max current from VBUS to VOUT	–3	7	A
TA	Operating free-air temperature range	–40	85	°C

(1) Over operating free-air temperature range (unless otherwise noted)

2 Test Summary

2.1 Equipment

2.1.1 Specify Equipment Needed to Perform Tests

1. **Power Supplies (PS)**

   One power supply capable of supplying 5 V at 1.5 A (or above) is required. While this part can handle larger voltage and current, it is not necessary for this procedure.

   NOTE: If there is no display of current and voltage in this power supply, a separate current meter and a separate voltage meter are required to measure the input current and input voltage, respectively.

2. **Load** (4-quadrant supply, constant voltage < 4.5 V)

   A 0–20 V / 0–6 A, > 30-W system, DC electronic load and setting as constant voltage load mode.

   or:

   A Kepco load: BOP 20–5 M, DC 0 to ±20 V, 0 to ±5 A (or higher), or equivalent.

   NOTE: If there is no display of current and voltage in this electronic load, a separate current meter and a separate voltage meter are required to measure the output current and output voltage, respectively.

3. **Meters**

   Six Fluke 75 multimeters, (equivalent or better)

   or:

   Four equivalent voltage meters and two equivalent current meters. The current meters must be capable of measuring 5 A+ current.

   NOTE: Only needed if required as described in Power Supplies (PS) and Load.

4. **Computer**

   A computer with at least one USB port and a USB cable. The bq2587xEVM evaluation software must be properly installed (bqStudio).

5. **EV2x00 Communication Kit**

   The EV2x00 USB-based PC interface board.

2.1.2 Specify Software Needed for Testing

Download bqstudio from http://www.ti.com/tool/bqstudio. Follow the installation steps to install the tool. The software supports the Microsoft® Windows® XP and Windows 7 operating systems.

2.2 Equipment Setup

Set up the equipment using the following steps:

1. Set PS for 5-V DC output, 1.5 A or above current limit and then turn off the supply.
2. Connect the output of PS#1 to J4 (VBUS and GND) (connect to J3 VUSB for BQ25872) as shown in Figure 2.
3. Turn on the load, set to constant voltage mode and output to 3.6 V. Turn off (disable) the load. Connect load to J5 (VOUT and GND) as shown in Figure 2.
4. Connect the EV2x00 USB interface board to the computer with a USB cable and from I^2C port to J6 with the 4-pin cable. The connections are shown in Figure 1.

Figure 1. Connections of the EV2300 Kit

5. Install shunts as shown in Figure 2.

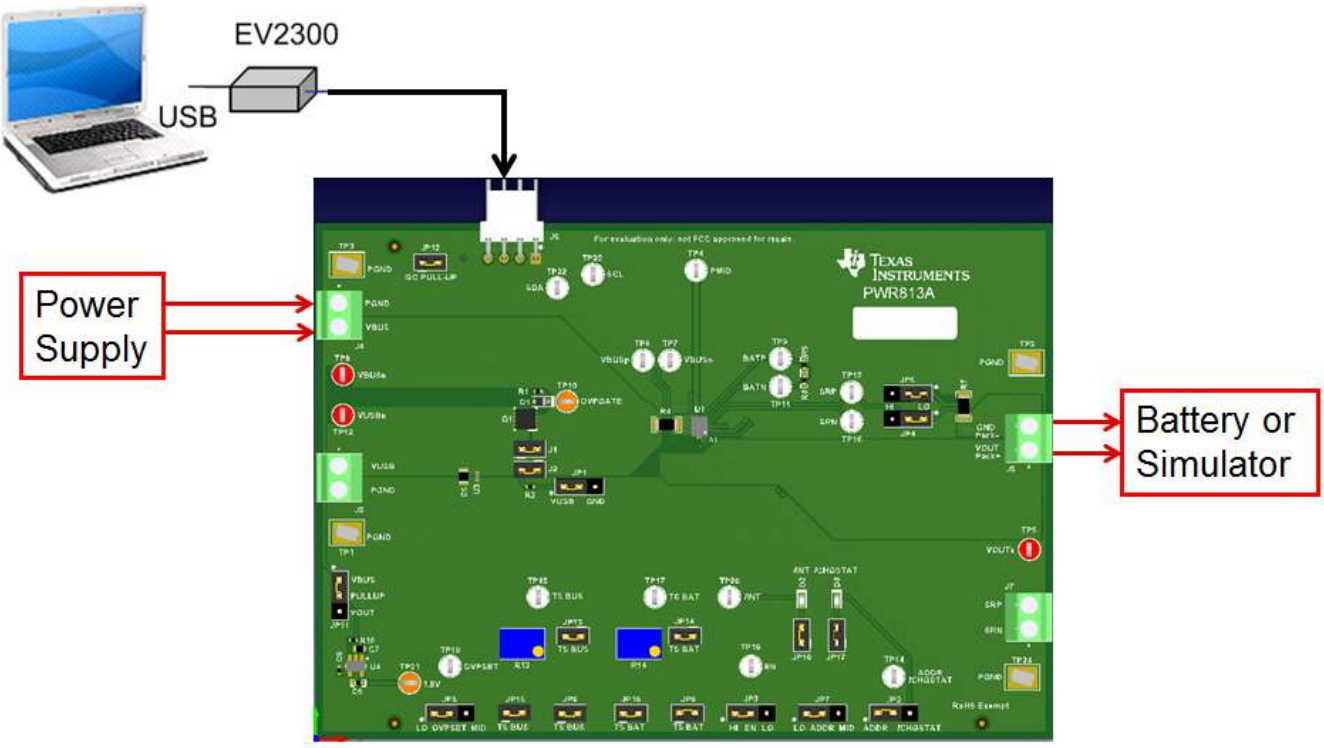


Figure 2. Test Setup for BQ25871

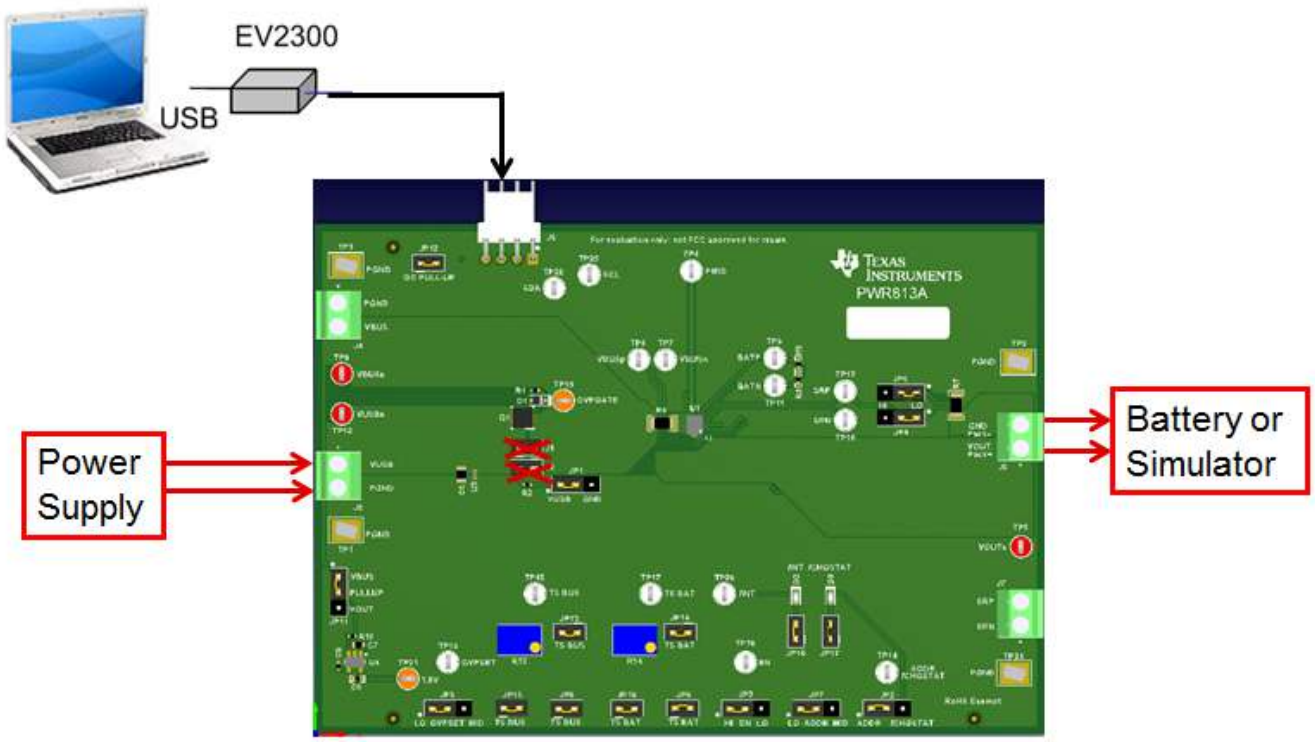


Figure 3. Test Setup for BQ25872 (with J1 and J2 Removed)

6. Turn on the computer. Launch *Battery Management Studio* (bqStudio). Select *Charger* and bq25871(or bq25872 accordingly) evaluation software. The main window of the software is shown in Figure 4.

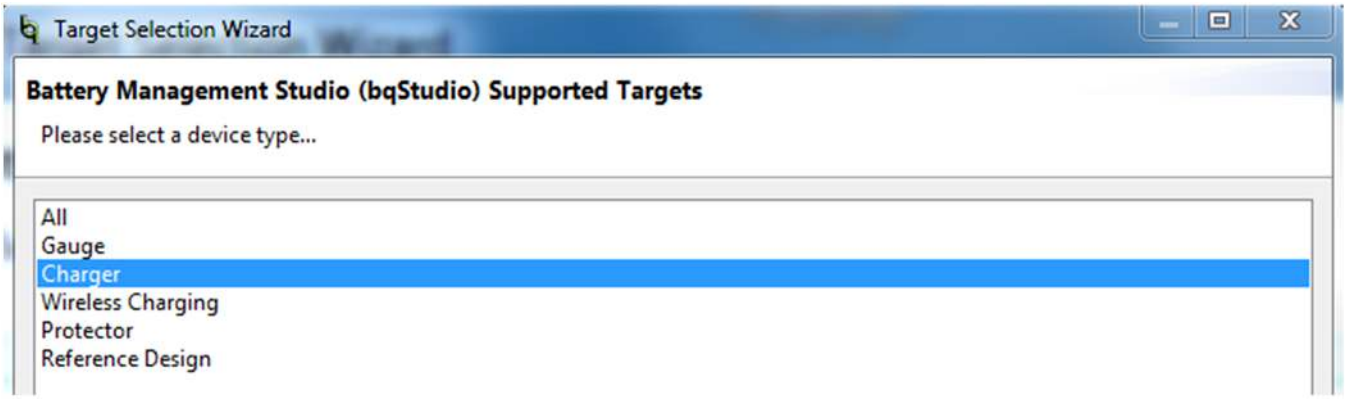


Figure 4. Select "Charger" in bqStudio Window

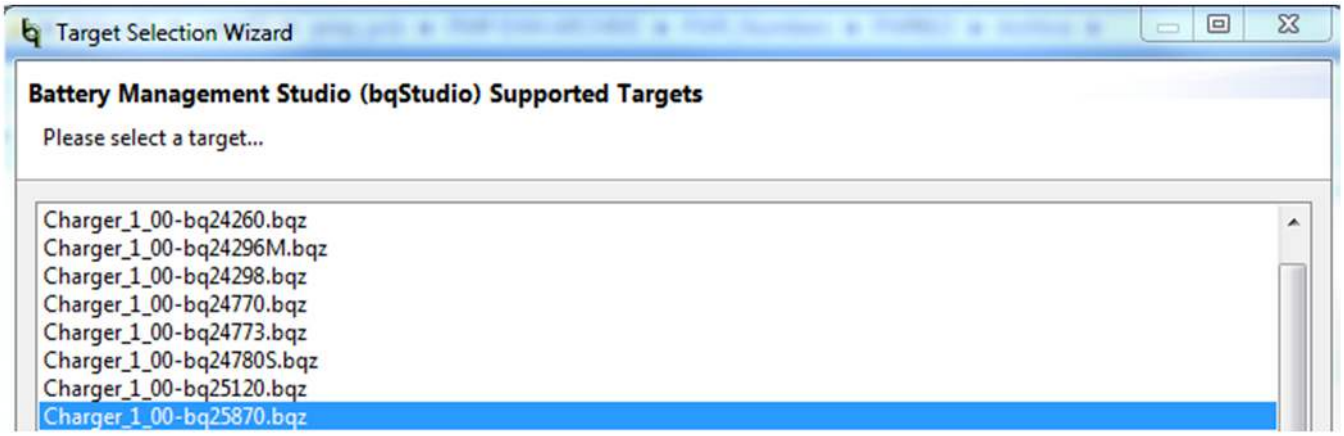


Figure 5. Select "bq25870" in bqStudio Window

2.3 Test Procedure

The steps for the test procedure follow:

1. Power up the device.
2. Ensure equipment setup steps are followed.
3. Launch the bq25870x EVM GUI software, if not already done.
4. Turn on PS.
   Measure → TP21(1.8 V) vs. GND = 1.8 V ±0.2 V
5. Turn on electronic load.
   Measure → Input:
   VBUSs(TP8) = 5.0 V ±0.2 V, I_VBUS = 0 A (bq25871)
   VUSBs(TP12) = 5.0 V ±0.2 V, I_VBUS = 0 A (bq25872)
   Measure → Output:
   VOUTs(TP5) = 3.6 V ±0.2 V, I_VOUT = 0 A

2.4 Communication Verification

Use the following steps for communication verification:

1. In the EVM software, select *Field View*, specify correct device "I2C Address" as defined in the datasheet, such as CA(65) for bq25871 and bq25872, and so forth.

2. Click the **Read** button, *Device ACK OK* should appear.

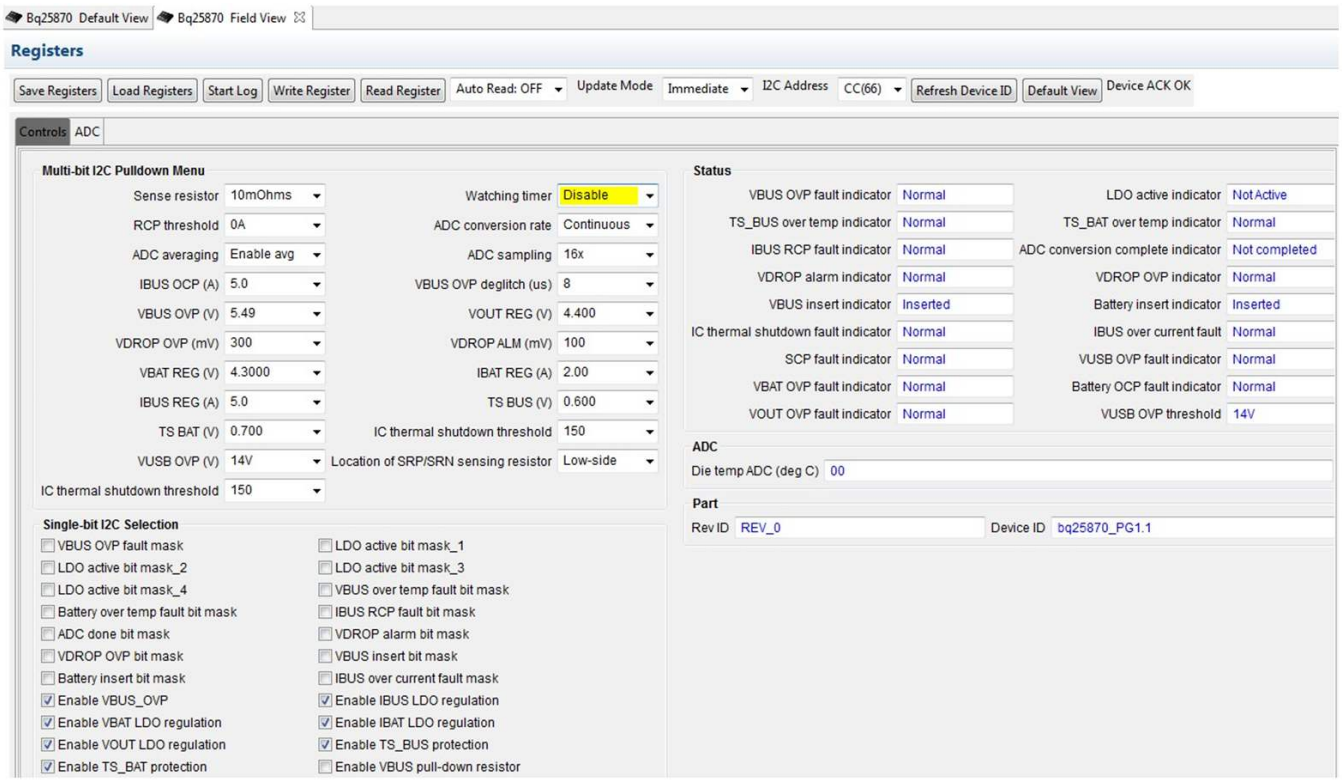


Figure 6. Sample Register Map After Device is ACK'ed

3. In the EVM software, make the following changes as necessary:
   - Select *Disable* for the *Watchdog Timer*

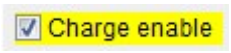
   - Set *IBUS REG(A)* to 1.0 A

4. Click the **Read** button.
   Observe → Everything *normal* at Fault box

2.5 Charger Mode Verification

Use the following steps for charger mode verification:

1. Select *Charge Enable*



2. Measure input voltage/current:
   Measure → Input:
   VBUSs(TP8) = 5.0 V ±0.2 V, I_VBUS = 1.0 A ±0.2 A (bq25871)
   VUSBs(TP12) = 5.0 V ± 0.2 V, I_VBUS = 1.0 A ± 0.2 A (bq25872)
3. Set *IBAT REG(A)* to 0.8 A
4. Measure output voltage/current:
   Measure → Input:
   VOUTs(TP5) = 3.6 V ±0.2 V, I_VOUT = 0.8 A ±0.3 A
5. Unselect *Charge Enable* (→ disable charge)
6. Measure the current at J3 and J5, both should go to zero amps.
   Measure → Input:
   VBUSs(TP8) = 5.0 V ±0.2 V, I_VBUS = 0 A ±0.1 A (bq25871)
   VUSBs(TP12) = 5.0 V ±0.2 V, I_VBUS = 0 A ±0.1 A (bq25872)
   Measure → Input:
   VOUTs(TP5) = 3.6 V ±0.2 V, I_VOUT = 0 A ±0.1 A
7. Turn off and disconnect load
8. Turn off and disconnect PS

3 PCB Layout Guideline

The bq2587x supports up to a 7-A charge current. It is critical to maximize the BUS and VOUT Cu trace. TI recommends following the PCB layout guidelines:

1. Use a Cu trace of at least 110 mil (2.794 mm) wide for VBUS and VOUT, respectively. This allows current flow evenly through all 7 WCSP solder balls (see Figure 7).
2. The Cu trace of VBUS and VOUT should run at least 150 mil (3.81 mm) straight (perpendicular to the WCSP ball array) before making turns (see Figure 7).
3. Use the largest possible Cu pour for VBUS and VOUT trace elsewhere.
4. Use the largest possible Cu pour for PGND.
5. Place decoupling capacitors of VBUS and VOUT as close as possible to the IC.

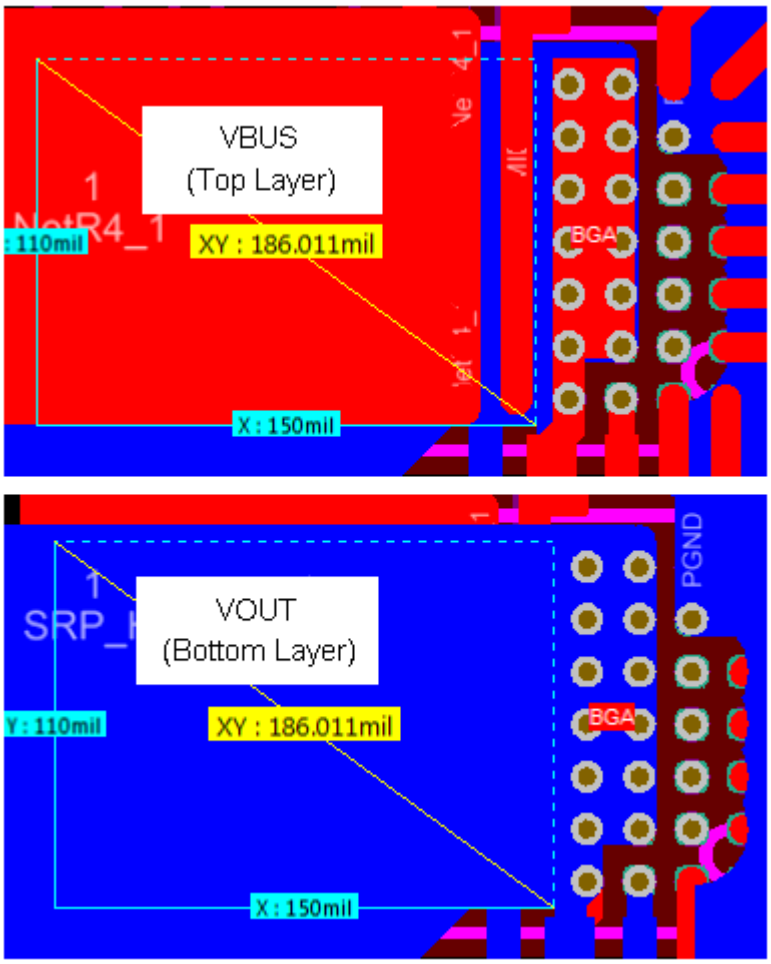


Figure 7. Top and Bottom Layer Layout Guideline for VBUS and VOUT

4 Board Layout, Schematic, and Bill of Materials

4.1 Board Layout

Figure 8 through Figure 13 illustrate the board layouts for this EVM.

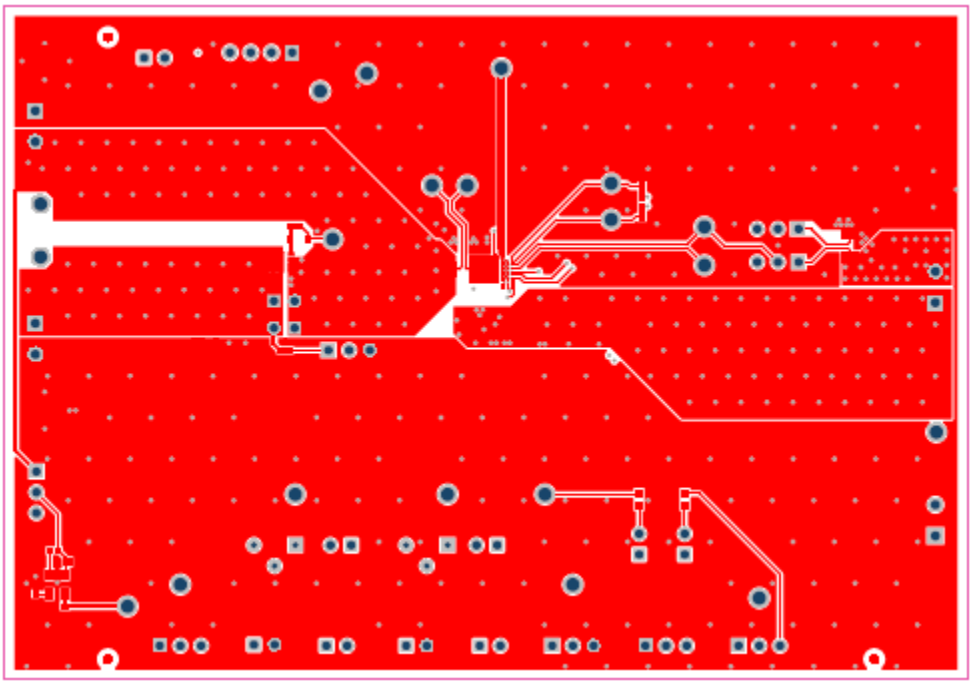


Figure 8. bq2587xEVM-813 Top Layer

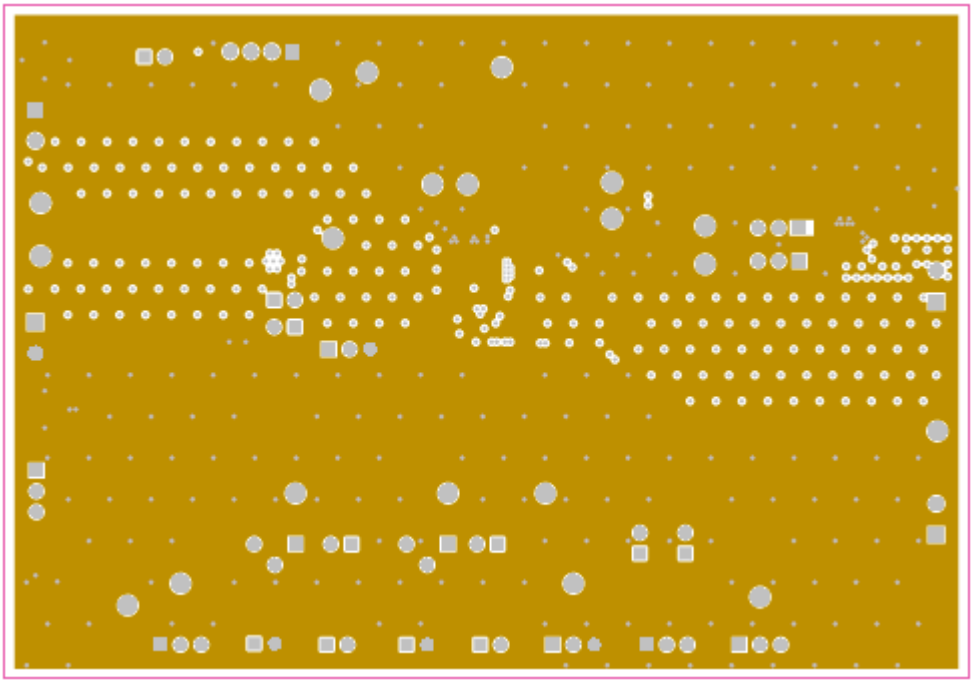


Figure 9. bq2587xEVM-813 Mid Layer 1

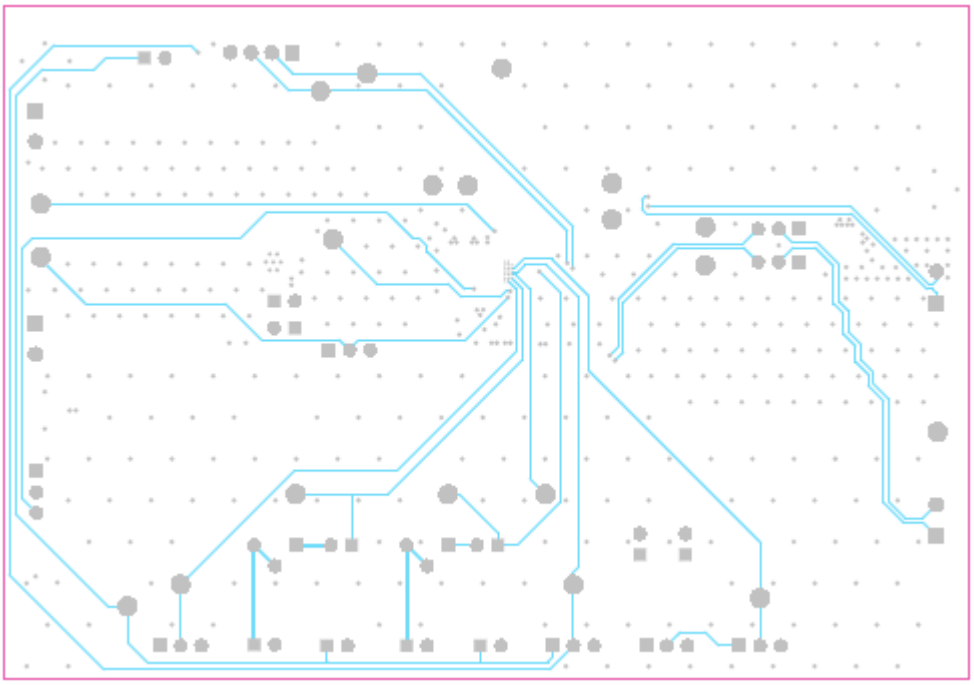


Figure 10. bq2587xEVM-813 Mid Layer 2

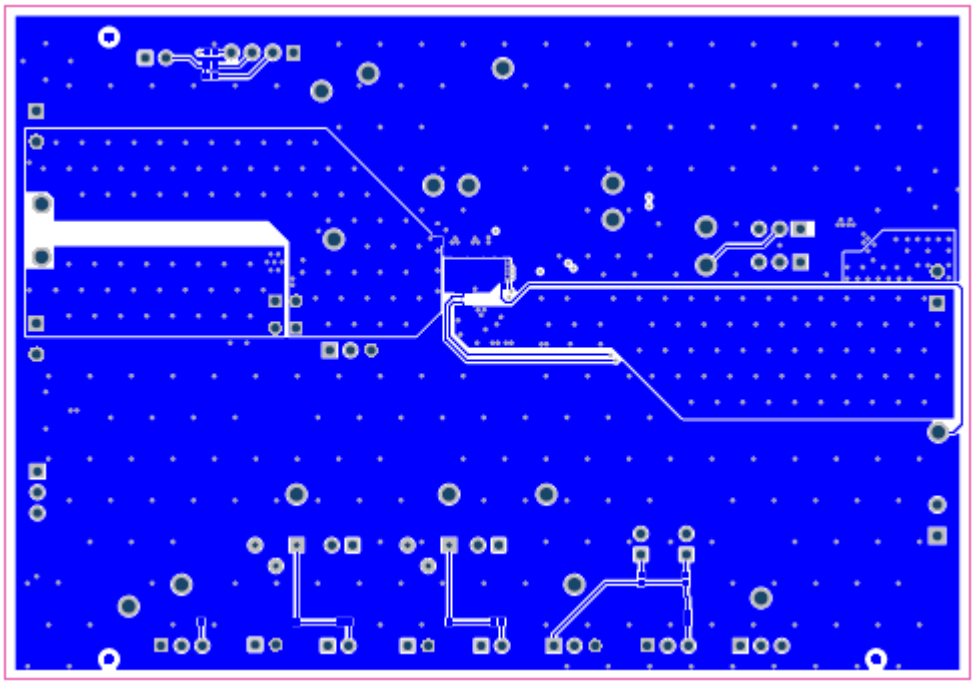


Figure 11. bq2587xEVM-813 Bottom Layer

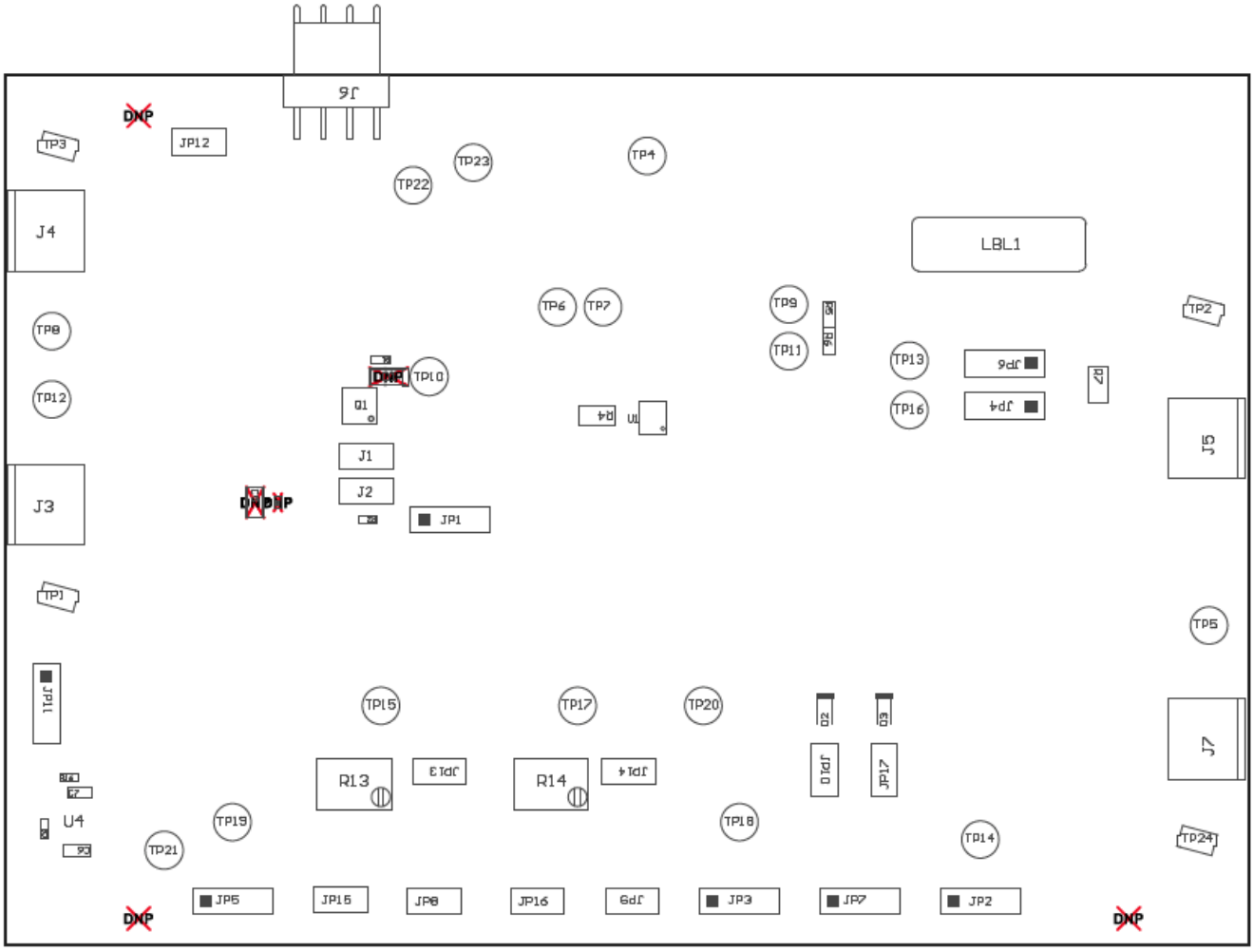


Figure 12. bq2587xEVM-813 Top Layer Assembly

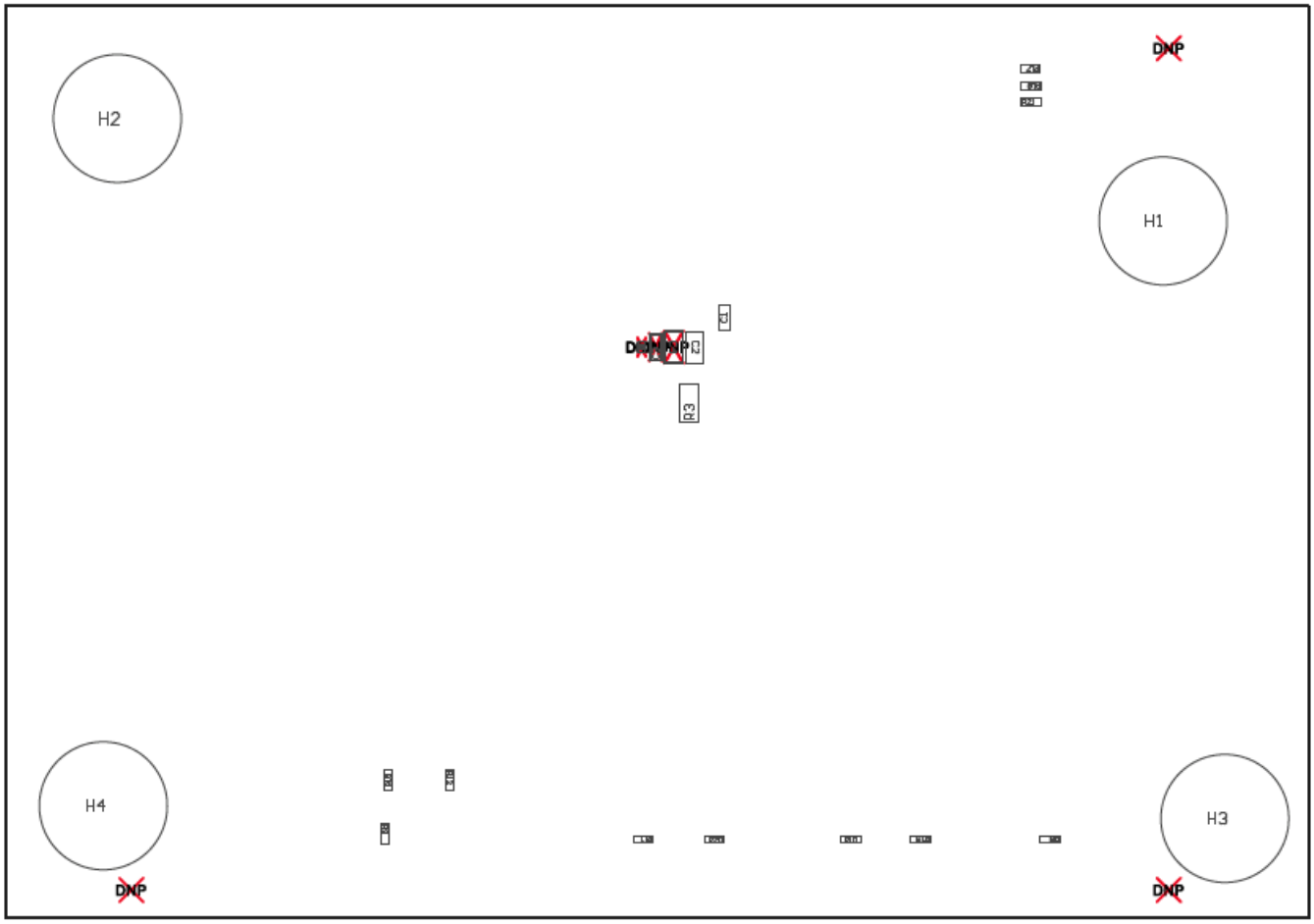


Figure 13. bq2587xEVM-813 Bottom Layer Assembly

4.2 Schematic

Figure 14 illustrates the schematic for this EVM.

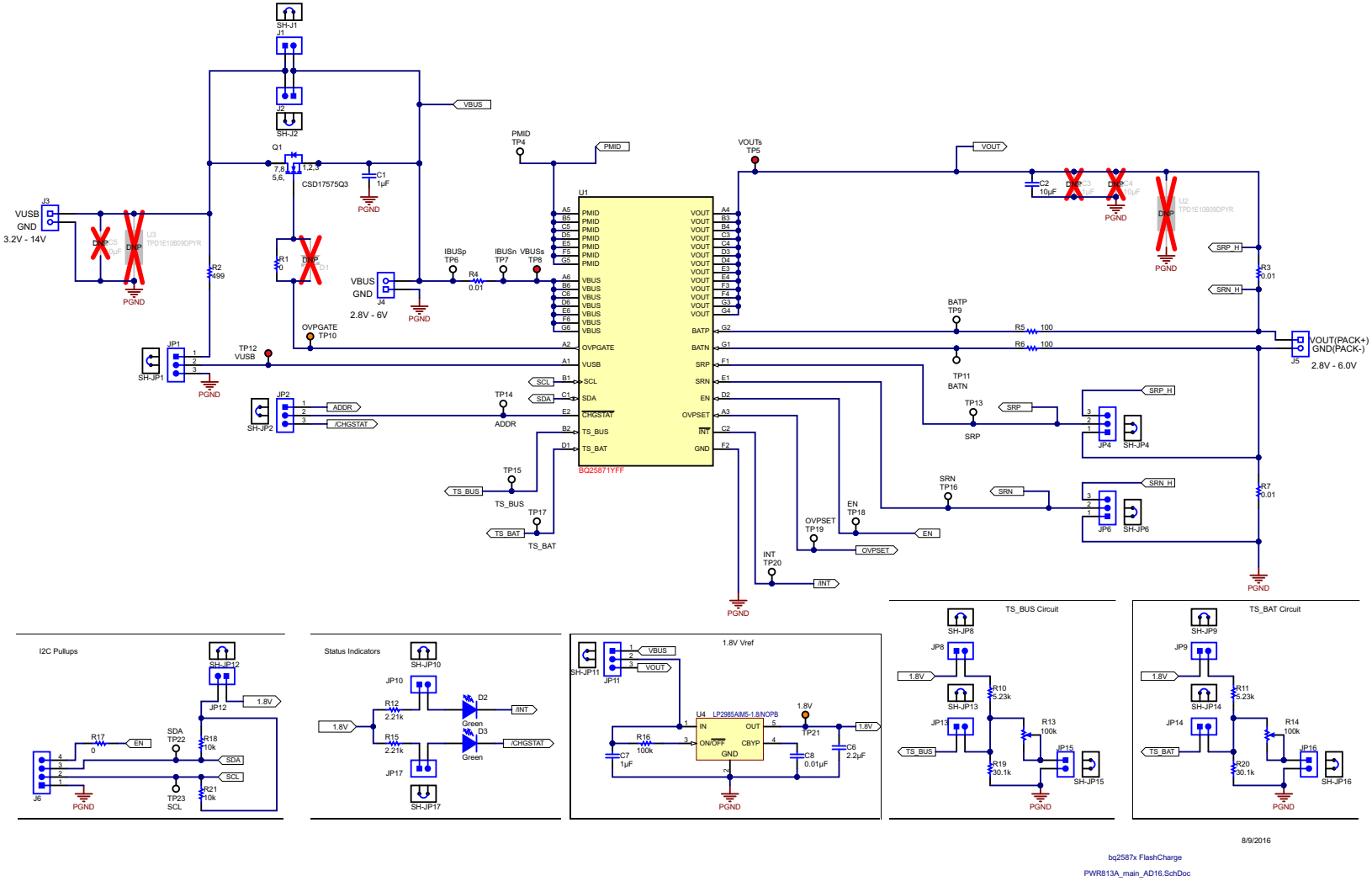


Figure 14. bq2587xEVM-813 Schematic

4.3 Bill of Materials

Table 5 lists the BOM.

Table 5. Bill of Materials for BQ2587xEVM-813

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB1	1		Printed Circuit Board		PWR813	Any	-	-
C1, C7	2	1uF	CAP, CERM, 1 µF, 25 V, +/- 10%, X7R, 0603	0603	GRM188R71E105KA12D	Murata		
C2	1	10uF	CAP, CERM, 10 µF, 10 V, +/- 10%, X7R, 0805	0805	GRM21BR71A106KE51L	Murata		
C6	1	2.2uF	CAP, CERM, 2.2uF, 10V, +/-10%, X5R, 0402	0402	C1005X5R1A225K050BC	TDK		
C8	1	0.01uF	CAP, CERM, 0.01uF, 25V, +/-10%, X7R, 0402	0402	C1005X7R1E103K	TDK		
D2, D3	2	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On		
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
J1, J2, JP8, JP9, JP10, JP12, JP13, JP14, JP15, JP16, JP17	11		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions		
J3, J4, J5, J7	4	2x1	Conn Term Block, 2POS, 3.81mm, TH	2POS Terminal Block	1727010	Phoenix Contact		
J6	1		Header, 100mil, 4x1, R/A, TH	4x1 R/A Header	22-05-3041	Molex		
JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP11	8		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"H x 0.200"W	THT-14-423-10	Brady	-	-
Q1	1	30V	MOSFET, N-CH, 30 V, 60 A, DQG0008A	DQG0008A	CSD17575Q3	Texas Instruments		None
R1, R17	2	0	RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale		
R2	1	499	RES, 499, 1%, 0.063 W, 0402	0402	CRCW0402499RFKED	Vishay-Dale		
R3, R4, R7	3	0.01	RES, 0.01, 1%, 1 W, 1206	1206	WSLP1206R0100FEA	Vishay-Dale		
R5, R6	2	100	RES, 100, 1%, 0.1 W, 0402	0402	ERJ-2RKF1000X	Panasonic		
R8	1	22k	RES, 22 k, 5%, 0.063 W, 0402	0402	CRCW040222K0JNED	Vishay-Dale		
R9, R18, R21	3	10k	RES, 10 k, 5%, 0.063 W, 0402	0402	CRCW040210K0JNED	Vishay-Dale		
R10, R11	2	5.23k	RES, 5.23k ohm, 1%, 0.063W, 0402	0402	CRCW04025K23FKED	Vishay-Dale		
R12, R15	2	2.21k	RES, 2.21k ohm, 1%, 0.063W, 0402	0402	CRCW04022K21FKED	Vishay-Dale		
R13, R14	2	100k	Trimmer, 100k ohm, 0.25W, TH	4.5x8x6.7mm	3266W-1-104LF	Bourns		
R16	1	100k	RES, 100 k, 1%, 0.063 W, 0402	0402	CRCW0402100KFKED	Vishay-Dale		
R19, R20	2	30.1k	RES, 30.1k ohm, 1%, 0.063W, 0402	0402	CRCW040230K1FKED	Vishay-Dale		
SH-J1, SH-J2, SH-JP1, SH-JP2, SH-JP3, SH-JP4, SH-JP5, SH-JP6, SH-JP7, SH-JP8, SH-JP9, SH-JP10, SH-JP11, SH-JP12, SH-JP13, SH-JP14, SH-JP15, SH-JP16, SH-JP17	19	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec
TP1, TP2, TP3, TP24	4	SMT	Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone		
TP4, TP6, TP7, TP9, TP11, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP22, TP23	15	White	Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone		
TP5, TP8, TP12	3	Red	Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone		
TP10, TP21	2		Test Point, Compact, Orange, TH	Orange Compact Testpoint	5008	Keystone		

Table 5. Bill of Materials for BQ2587xEVM-813 (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
U1	1		BQ25871, YFF0042AJAU	YFF0042AJAU	BQ25871YFF	Texas Instruments		Texas Instruments
U4	1		Micropower 150 mA Low-Noise Low-Dropout Regulator for Applications with Output Voltages =2.0V, 5-pin SOT-23, Pb-Free	MF05A	LP2985AIM5-1.8/NOPB	Texas Instruments		
C3	0	1uF	CAP, CERM, 1uF, 16V, +/-10%, X7R, 0603	0603	C1608X7R1C105K	TDK		
C4, C5	0	10uF	CAP, CERM, 10 µF, 10 V, +/- 10%, X7R, 0805	0805	GRM21BR71A106KE51L	Murata		
D1	0	20V	Diode, Schottky, 20 V, 2 A, SOD-323F	SOD-323F	PMEG2020EJ,115	NXP Semiconductor		
FID1, FID2, FID3, FID4, FID5, FID6	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A		
U2, U3	0		ESD Protection in 0402 Package with 10 pF Capacitance and 9 V Breakdown, 1 Channel, -40 to +125 degC, 2-pin X2SON (DPY), Green (RoHS & no Sb/Br)	DPY0002A	TPD1E10B09DPYR	Texas Instruments	Equivalent	Texas Instruments
Notes:	Unless otherwise noted in the Alternate Part Number or Alternate Manufacturer columns, all parts may be substituted with equivalents.							

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including 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 and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

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

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

2 *Limited Warranty and Related Remedies/Disclaimers*:

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

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

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

3 *Regulatory Notices:*

   3.1 *United States*

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

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

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

      CAUTION

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

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

      FCC Interference Statement for Class A EVM devices

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

FCC Interference Statement for Class B EVM devices

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

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

3.2 *Canada*

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

Concerning EVMs Including Radio Transmitters:

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

Concernant les EVMs avec appareils radio:

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

Concerning EVMs Including Detachable Antennas:

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

Concernant les EVMs avec antennes détachables

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

3.3 *Japan*

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

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

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, 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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2. 実験局の免許を取得後ご使用いただく。
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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。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

4 *EVM Use Restrictions and Warnings:*

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

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

4.3 *Safety-Related Warnings and Restrictions:*

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

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

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

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

6. *Disclaimers:*

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

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

8. *Limitations on Damages and Liability:*

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

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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.

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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