Using LMZ31520EVM-001, LMZ31530EVM-002 Evaluation Module

User's Guide

Literature Number: SNVU283A
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LMZ31520EVM-001 & LMZ31530EVM-002, 20-A & 30-A Simple Switcher® Power Module

The LMZ31520/30 EVM is designed as an easy to use platform that facilitates evaluation of the features and performance of the Simple Switcher® power module. The LMZ31520 and LMZ31530 devices provide output currents of 20A and 30A, respectively. This guide provides information on the correct usage of the EVM and an explanation of the various test points found on the board.

1 Description

The EVM features a LMZ31520 (20A) or LMZ31530 (30A), synchronous buck Simple Switcher® power module configured for operation with typical 5-V and 12-V input bus applications. The output voltage can be set to one of six popular values by using a configuration jumper. In similar fashion, the switching frequency can be set to one of four values with a jumper. The full 20-A / 30-A rated output current can be supplied by the EVM. Input and output capacitors are included on the board to accommodate the entire range of input and output voltages. Monitoring test points are provided to allow measurement of efficiency, power dissipation, input ripple, output ripple, line and load regulation, and transient response. Control test points are provided for use of the PWRGD and Inhibit features of the power module along with a selector for Eco-Mode or FCCM. The EVM uses a recommended PCB layout that maximizes thermal performance and minimizes output ripple and noise.

2 Getting Started

Figure 1 highlights the user interface items associated with the EVM. The polarized *PVin Power* terminal block (J8) is used for connection to the host input supply and the polarized *Vout Power* terminal block (J11) is used for connection to the load. These terminal blocks can accept up to 16-AWG wire. The polarized VBIAS terminal block (J12) is used along with the VIN SELECT jumper (J4) when optional split power supply operation is desired. Refer to the LMZ31520/30 datasheet for further information on split power supply operation.

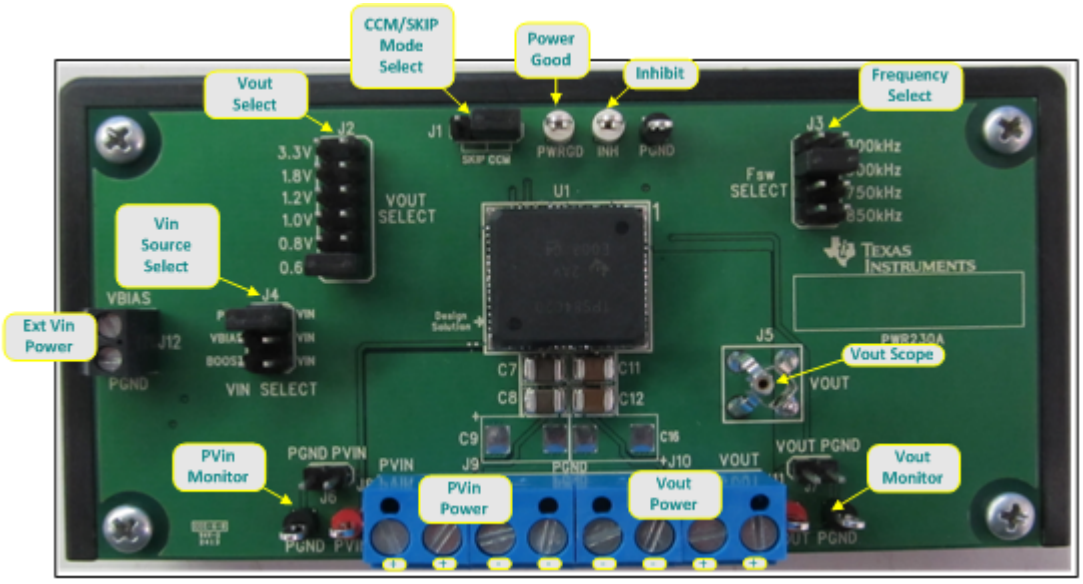

Figure 1. LMZ31520/30EVM User Interface

The *PVin Monitor* (TP1) and *Vout Monitor* (TP3) test points located near the power terminal blocks are intended to be used as voltage monitoring points where voltmeters can be connected to measure PVin and Vout. The voltmeter references should be connected to the PGND test points (TP4 & TP2). Do *not* use these PVin and Vout monitoring test points as the input supply or output load connection points. The PCB traces connecting to these test points are not designed to support high currents.

The PVin Scope (J6) and Vout Scope (J7) test points can be used to monitor PVin and Vout waveforms with an oscilloscope. These test points are intended for use with un-hooded scope probes outfitted with a low-inductance ground lead (ground spring) mounted to the scope barrel. The two sockets of each test point are on 0.1 inch centers. The scope probe tip should be connected to the socket labeled PVin or Vout, and the scope ground lead should be connected to the socket labeled PGND.

The Vout Scope (J5) test point can be used to monitor the Vout waveform with an oscilloscope. This test point is intended for use with an un-hooded scope probe with a 3.5 mm ground barrel.

The control test points located directly above the device are made available to test the features of the device. Refer to the Test Points Descriptions section of this guide for more information on the individual control test points.

The *Vout Select* jumper (J2) and *Fsw Select* jumper (J3) are provided for selecting the desired output voltage and appropriate switching frequency. Before applying power to the EVM, ensure that the jumpers are present and properly positioned for the intended output voltage. Always remove input power before changing the jumper settings.

3 Test Point Descriptions

Seven wire-loop test points and three scope probe test points have been provided as convenient connection points for digital voltmeters (DVM) or oscilloscope probes to aid in the evaluation of the device. A description of each test point follows:

Table 1. Test Point Descriptions(1)

PVIN	Input voltage monitor. Connect DVM to this point for measuring efficiency.
VOUT	Output voltage monitor. Connect DVM to this point for measuring efficiency, line regulation, and load regulation.
PGND	Input and output voltage monitor grounds. Reference the above DVMs to the corresponding ground point.
PVIN Scope (J6)	Input voltage scope monitor. Connect an oscilloscope to this set of points to measure input ripple voltage.
VOUT Scope (J7)	Output voltage scope monitor. Connect an oscilloscope to this set of points to measure output ripple voltage and transient response.
VOUT Scope (J5)	Output voltage scope monitor. Insert an oscilloscope into the test point adapter to measure output ripple voltage and transient response.
PWRGD	Monitors the power good signal of the device. A 100-kΩ pullup resistor is included internal to the device and is tied to 5V. PWRGD is high if the output voltage is within 95% to 110% of its nominal value.
INH	Connect this point to control ground to inhibit the device. Allow this point to float to enable the device.

(1) Refer to the product datasheet for absolute maximum ratings associated with above features.

4 Operation Notes

In order to operate the EVM using a single power supply, the Vin Select jumper (J4) must be in the default PVIN-VIN position shown in Figure 1. In this position, the PVin and Vin pins of the device are connected together. The UVLO threshold of the EVM is approximately 4.2 V with 0.25 V of hysteresis. The input voltage must be above the UVLO threshold in order to startup the device. After startup, the minimum input voltage to the device must be at least 4.5 V or (Vout + 1.0 V), whichever is greater. The maximum operating input voltage for the device is 15 V. Refer to the product datasheet for further information on the input voltage range, and optional split power supply operation for operating with PVin as low as 3.0 V when using an external Vbias supply.

After application of the proper input voltage, the output voltage of the device will ramp to its final value in approximately 0.7 ms. If desired, this soft-start time can be increased by increasing the value of the Rss resistor (R6). Refer to the LMZ31520/30 datasheet for further information on adjusting the soft-start time.

The EVM includes input and output capacitors to accommodate the entire range of input and output voltage conditions. The actual capacitance required will depend on the input and output voltage conditions of the particular application, along with the desired transient response. In most cases, the required output capacitance will be less than that supplied on the EVM. Refer to the LMZ31520/30 datasheet for further information on the minimum required I/O capacitance and transient response.

The LMZ31520/30 can be operated in either Auto-skip Eco-Mode or in Forced Continuous Conduction Mode (FCCM) by selecting the desired mode using J1. Refer to the LMZ31520/30 datasheet for further information on selecting the mode of operation.

5 Performance Data

Figure 2 through Figure 8 demonstrate the TPS84A20EVM performance with Vout = 1.8 V and Fsw = 500 kHz

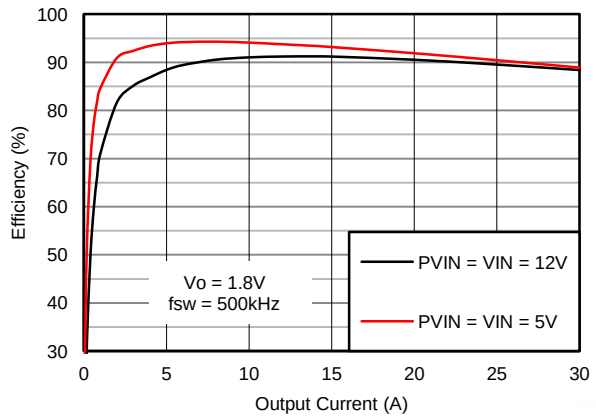

Figure 2. LMZ31530EVM Efficiency

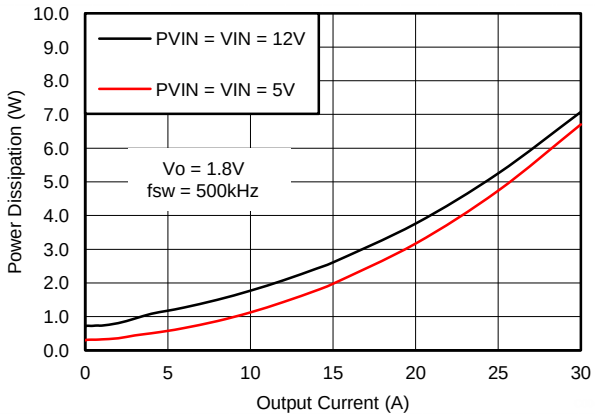

Figure 3. LMZ31530EVM Power Dissipation

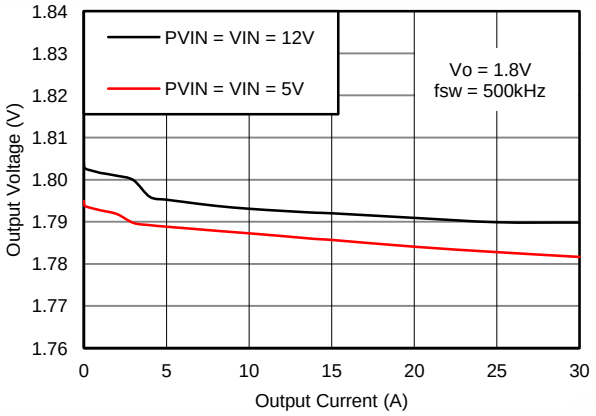

Figure 4. LMZ31530EVM Load Regulation

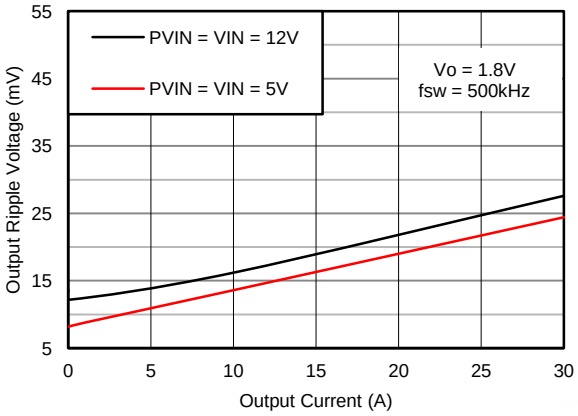

Figure 5. LMZ31530EVM Output Ripple

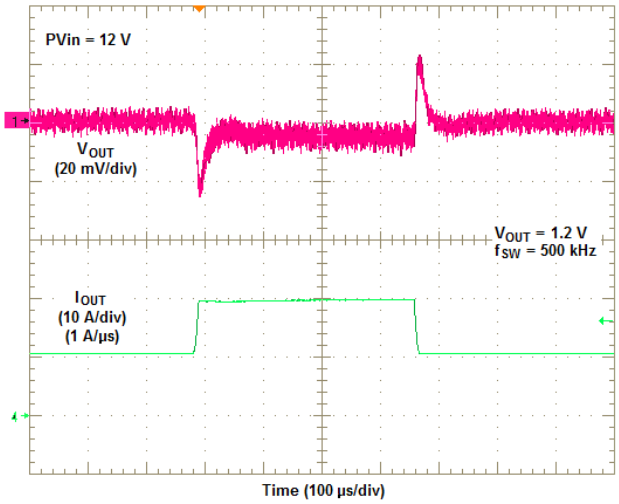

Figure 6. LMZ31530EVM Transient Response Waveforms

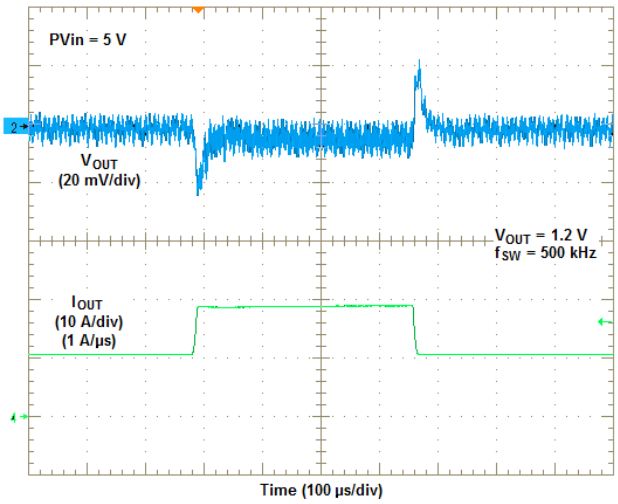

Figure 7. LMZ31530EVM Transient Response Waveforms

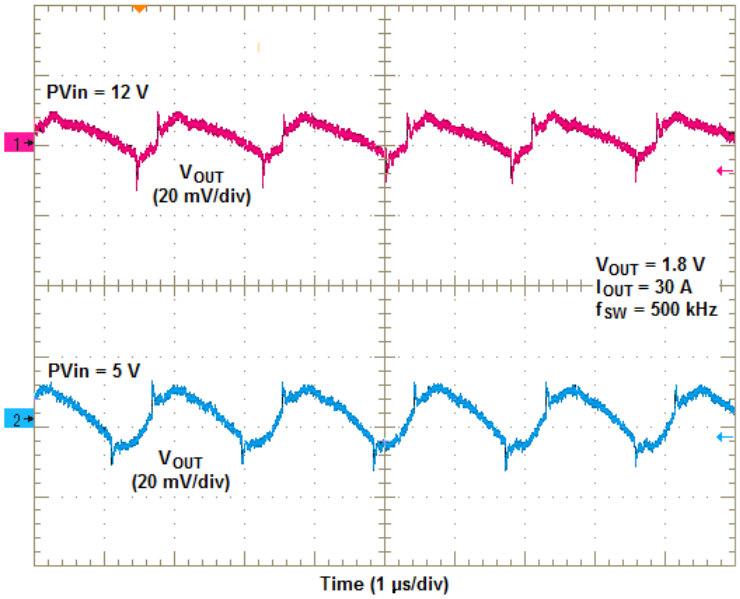

Figure 8. LMZ31530EVM Output Ripple Waveforms

6 Schematic

Figure 9 is the schematic for this EVM.

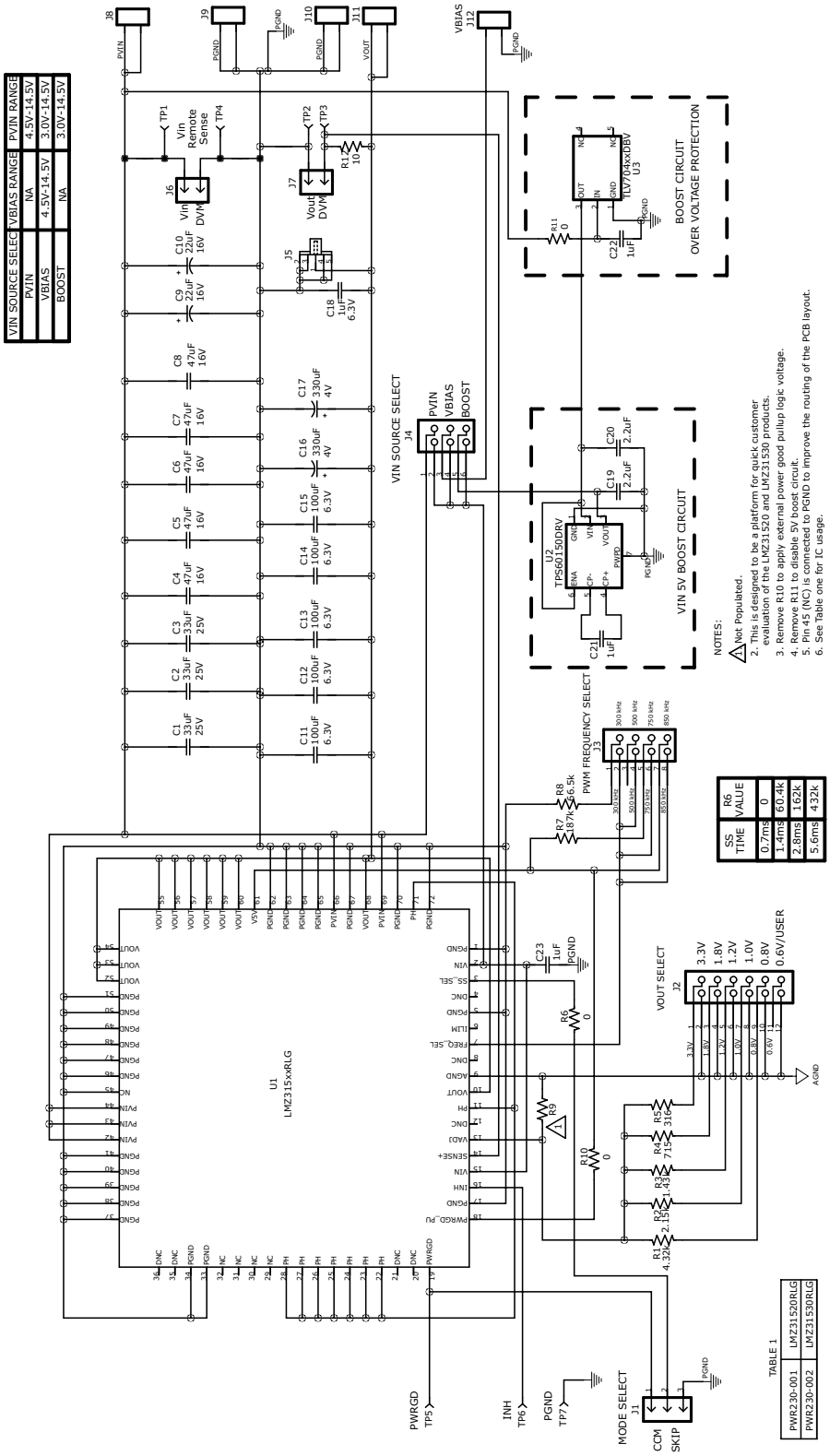

Figure 9. LMZ315xxEVM Schematic

7 Bill of Materials

Figure 10 is the BOM for the EVM.

COUNT							
-002	-001	RefDes	Value	Description	Size	Part Number	Mfr
3	3	C1, C2, C3	33uF	Capacitor, Ceramic, 25V, X5R, 20%	1206	C3216X5R1E336M160AC	TDK Corporation
5	5	C4, C5, C6, C7, C8	47uF	Capacitor, Ceramic, 16V, X5R, 10%	1210	EMK325BJ476MM-T	Taiyo Yuden
2	2	C9, C10	22uF	Capacitor, Polymer, 16V, 20%	2917	A700D226M016ATE018	Kemet
5	5	C11, C12, C13, C14, C15	100uF	Capacitor, Ceramic, 6.3V, X5R, 20%	1210	C3225X5R0J107M250AC	TDK Corporation
2	2	C16, C17	330uF	Capacitor, Polymer, 4V, 20%	2917	EEF-UE0G331R	Panasonic
1	1	C18	1uF	Capacitor, Ceramic, 6.3V, X5R, 10%	0603	C1608X5R0J105K	TDK Corporation
2	2	C19, C20	2.2uF	Capacitor, Ceramic, 6.3V, X5R, 10%	0805	C2012X5R0J225M085AA	TDK Corporation
1	1	C21	1uF	Capacitor, Ceramic, 6.3V, X5R, 10%	0805	C0805C105K9PACTU	Kemet
2	2	C22, C23	1uF	Capacitor, Ceramic, 25V, X5R, 10%	0805	C2012X5R1E105K085AC	TDK Corporation
1	1	J1	PEC03SAAN	Header, Male, 1x3 pin, 0.1" centers	0.100 inch x 1 x 3	PEC03SAAN	Sullins
1	1	J2	PEC06DAAN	Header, Male, 2x6 pin, 0.1" centers	0.100 inch x 2 x 6	PEC06DAAN	Sullins
1	1	J3	PEC04DAAN	Header, Male, 2x4 pin, 0.1" centers	0.100 inch x 2 x 4	PEC04DAAN	Sullins
1	1	J4	PEC03DAAN	Header, Male, 2x3 pin, 0.1" centers	0.100 inch x 2 x 3	PEC03DAAN	Sullins
1	1	J5	131-5031-00	CB TEST POINT ADAPTER, 5mm	0.690 x 0.690 inch	131-5031-00	Tektronix
2	2	J6, J7	PEC02SAAN	Header, Male, 1x2 pin, 0.1" centers	0.100 inch x 1 x 2	PEC02SAAN	Sullins
4	4	J8, J9, J10, J11	ED120/2DS	Terminal Block, 2-pin, 15A, 5.1mm	0.40 x 0.35 inch	ED120/2DS	On Shore Technology
1	1	J12	ED555/2DS	Terminal Block, 2-pin, 6-A, 3.5mm	3.5 mm x 1 x 2	ED555/2DS	On Shore Technology
1	1	R1	4.32k	Resistor, Chip, 1/16W, 1%	0603	CRCW06034K32FKEA	Vishay Dale
1	1	R2	2.15k	Resistor, Chip, 1/16W, 1%	0603	CRCW06032K15FKEA	Vishay Dale
1	1	R3	1.43k	Resistor, Chip, 1/16W, 1%	0603	CRCW06031K43FKEA	Vishay Dale
1	1	R4	715	Resistor, Chip, 1/16W, 1%	0603	CRCW0603715RFKEA	Vishay Dale
1	1	R5	316	Resistor, Chip, 1/16W, 1%	0603	CRCW0603316RFKEA	Vishay Dale
3	3	R6, R10, R11	0	Resistor, Chip, 1/16W, 1%	0603	ERJ-3GEY0R00V	Panasonic
1	1	R7	187k	Resistor, Chip, 1/16W, 1%	0603	CRCW0603187KFKEA	Vishay Dale
1	1	R8	66.5k	Resistor, Chip, 1/16W, 1%	0603	CRCW060366K5FKEA	Vishay Dale
0	0	R9	optional (user-defined)	Resistor, Chip, 1/16W, 1%	0402	optional (user-defined)	optional (user-defined)
1	1	R12	10	Resistor, Chip, 1/16W, 1%	0603	CRCW060310R0FKEA	Vishay Dale
2	2	TP1,TP3	5010	Test Point, Red, Wire Loop, Thru Hole	0.125 x 0.125 inch	5010	Keystone
3	3	TP2, TP4, TP7	5011	Test Point, Black, Wire Loop, Thru Hole	0.125 x 0.125 inch	5011	Keystone
2	2	TP5, TP6	5012	Test Point, White, Wire Loop, Thru Hole	0.125 x 0.125 inch	5012	Keystone
0	1	U1	LMZ31520RLG	IPS, Sync Buck, 3 to 14.5V Input, 30A Output	15x16x5.8 mm QFN	LMZ31520RLG	TI
1	0	U1	LMZ31530RLG	IPS, Sync Buck, 3 to 14.5V Input, 20A Output	15x16x5.8 mm QFN	LMZ31530RLG	TI
1	1	U2	TPS60150DRV	150mA 5V charge pump	2x2x0.8 mm QFN	TPS60150DRV	TI
1	1	U3	TLV70450DBV	24-V Input, 150 mA, 5.0V LDO Regulator	3x3x1.45 mm SOT-23	TLV70450DBV	TI
4	4	---	---	Shunt, Black	0.100 inch x 1 x 2	929950-00	3M
4	4	---	---	Bumpon, Hemisphere, Black	0.44 Dia. x 0.20 inch	SJ-5003	3M
1	1	---	---	PCB, 2" x 4" x 0.062"	2 x 4 x 0.062 inch	PWR203	Any
1	1	---	---	Label	1.25 x 0.25 inch	THT-13-457-10	Brady

Figure 10. LMZ315x0EVM BOM

8 PCB Layout

Figure 11 through Figure 18 show the PCB layout layers of the EVM.

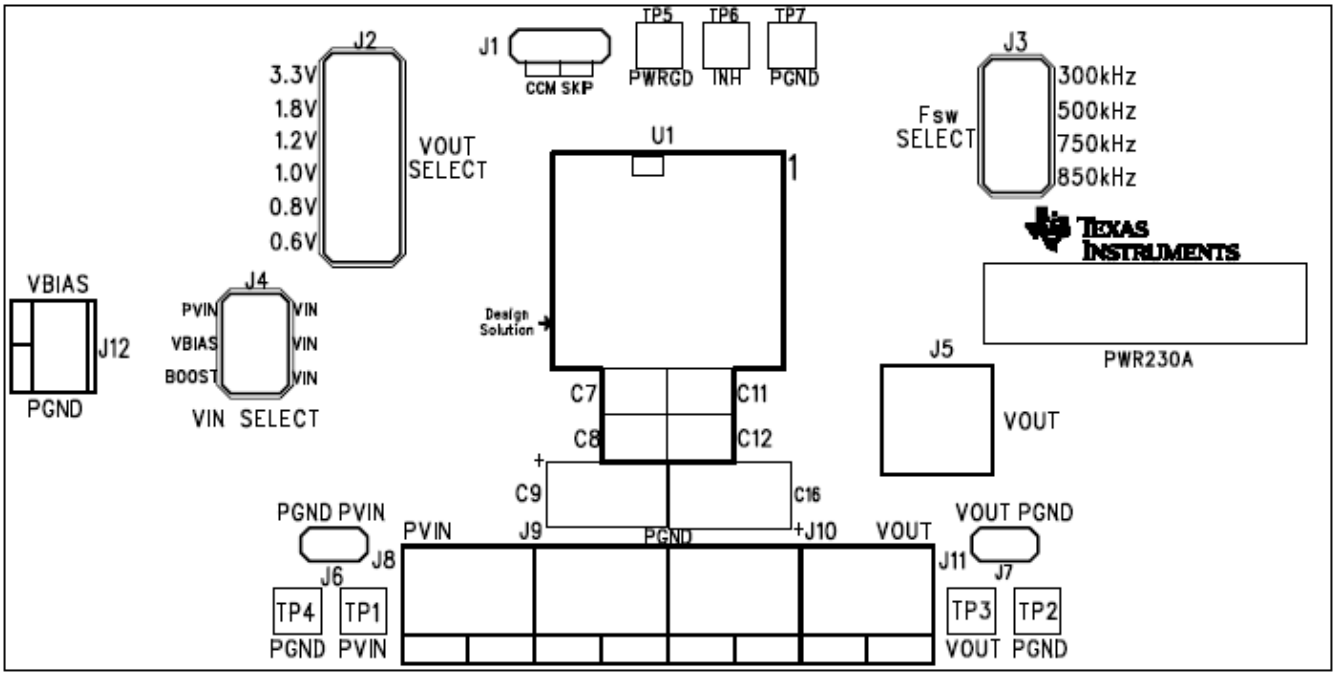

Figure 11. EVM Topside Component Layout

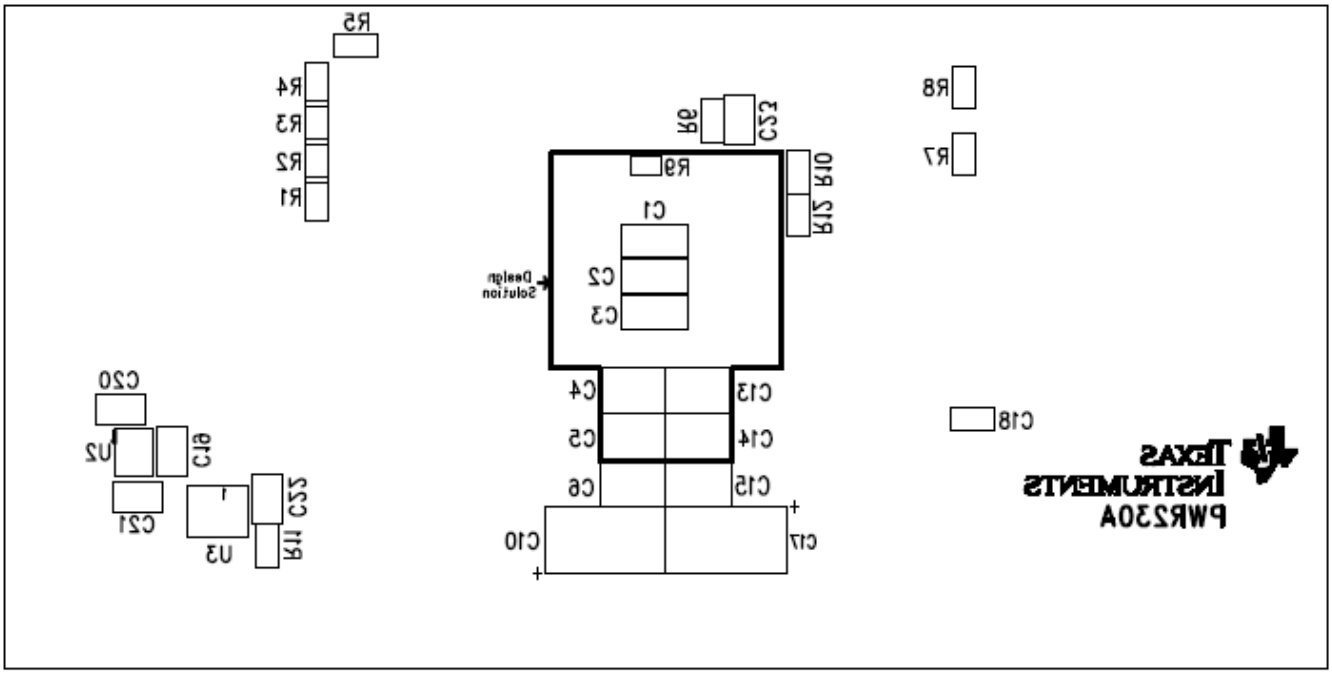

Figure 12. EVM Bottom-Side Component Layout

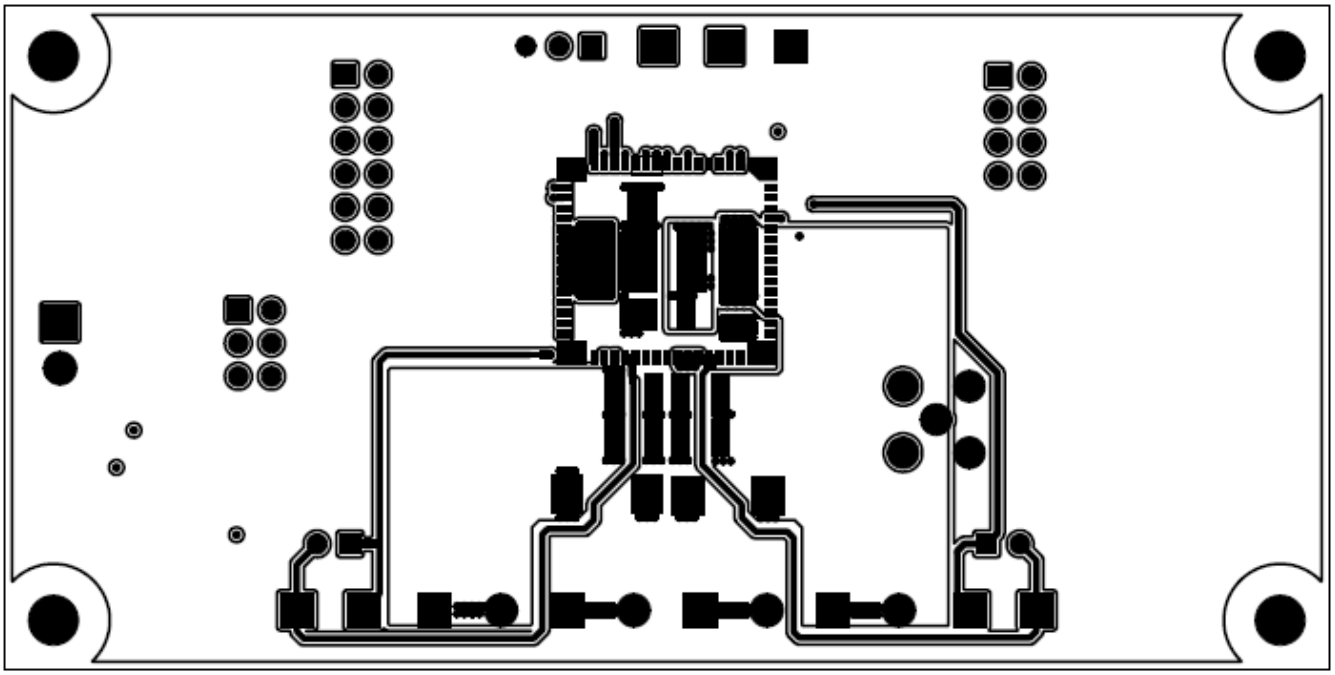

Figure 13. EVM Top Side Copper

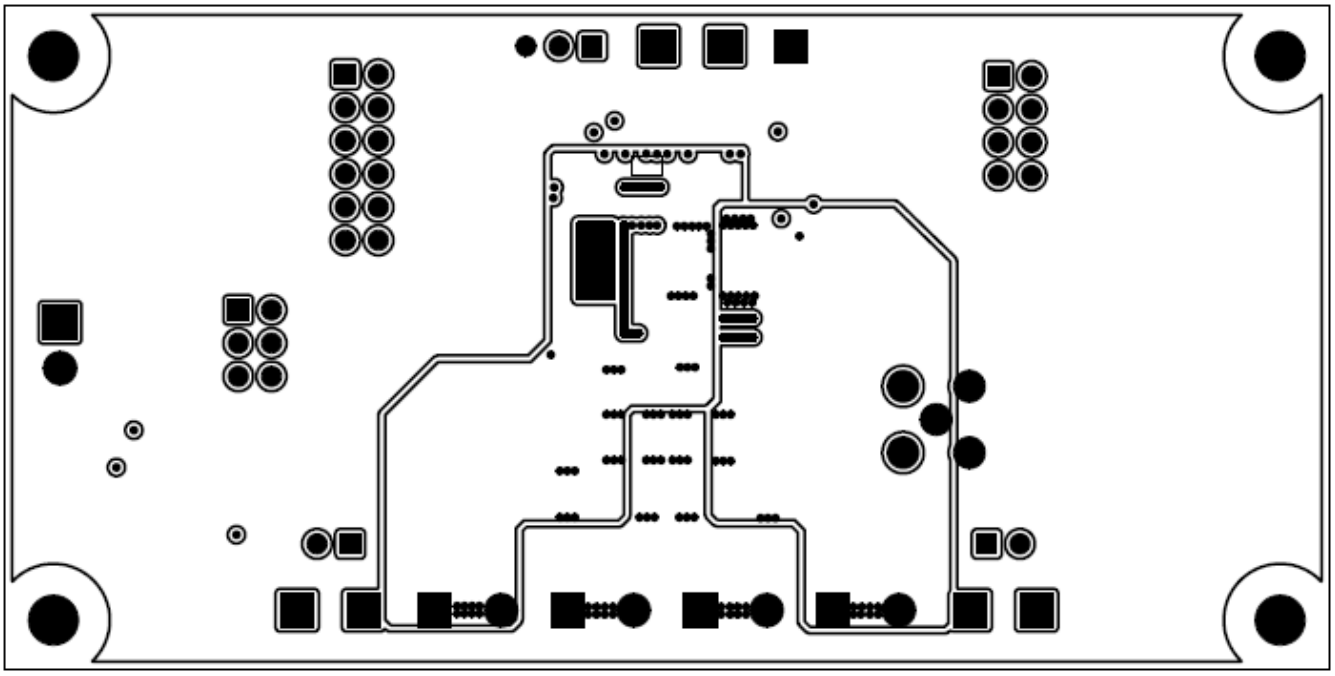

Figure 14. EVM Layer 2 Copper

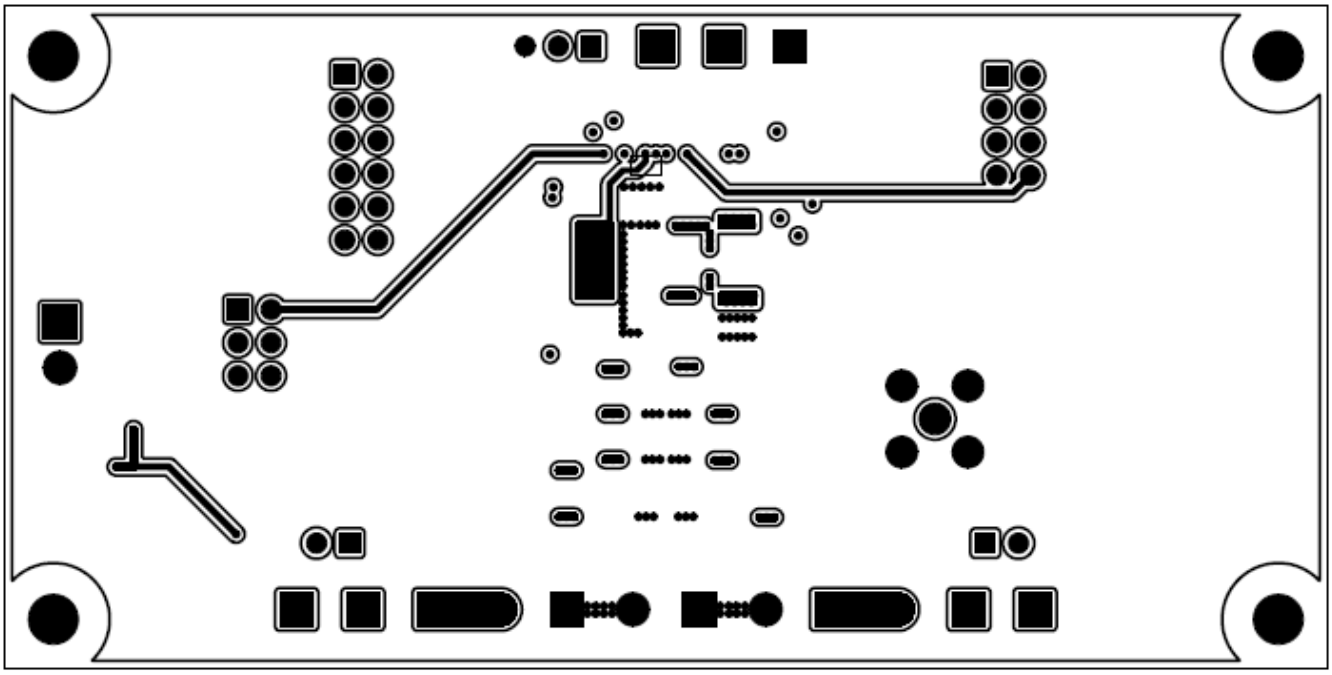

Figure 15. EVM Layer 3 Copper

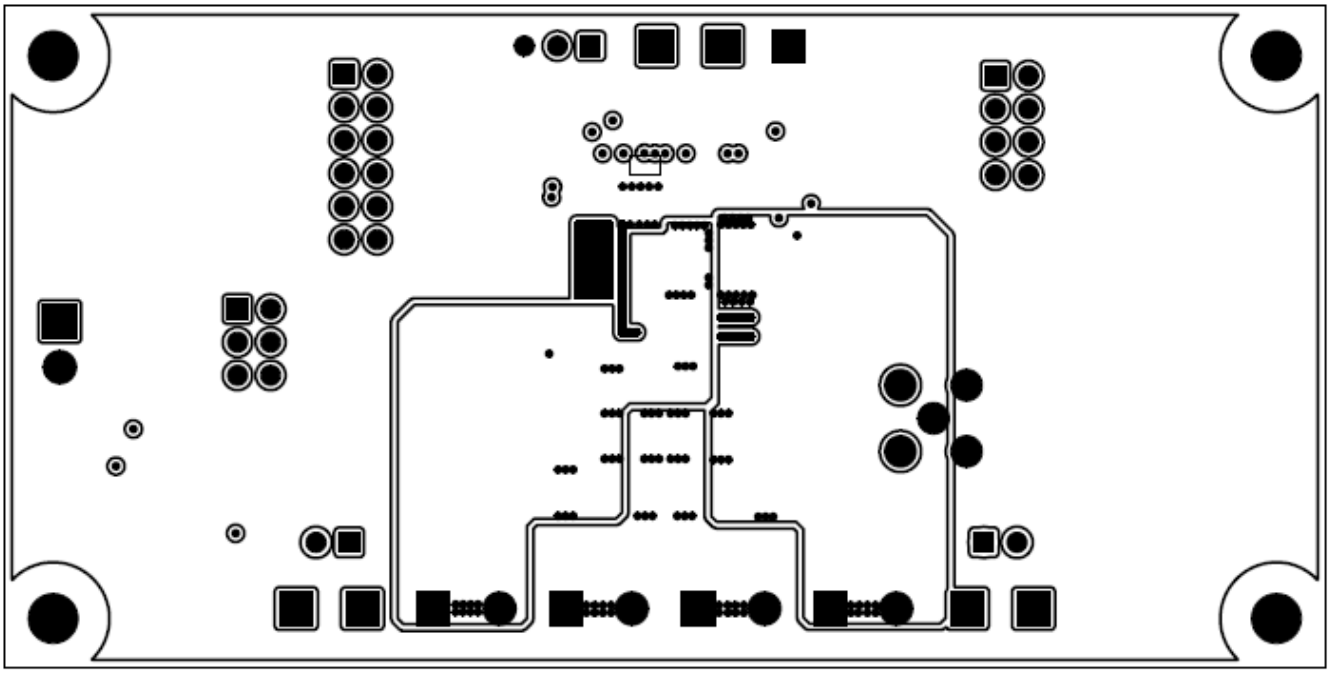

Figure 16. EVM Layer 4 Copper

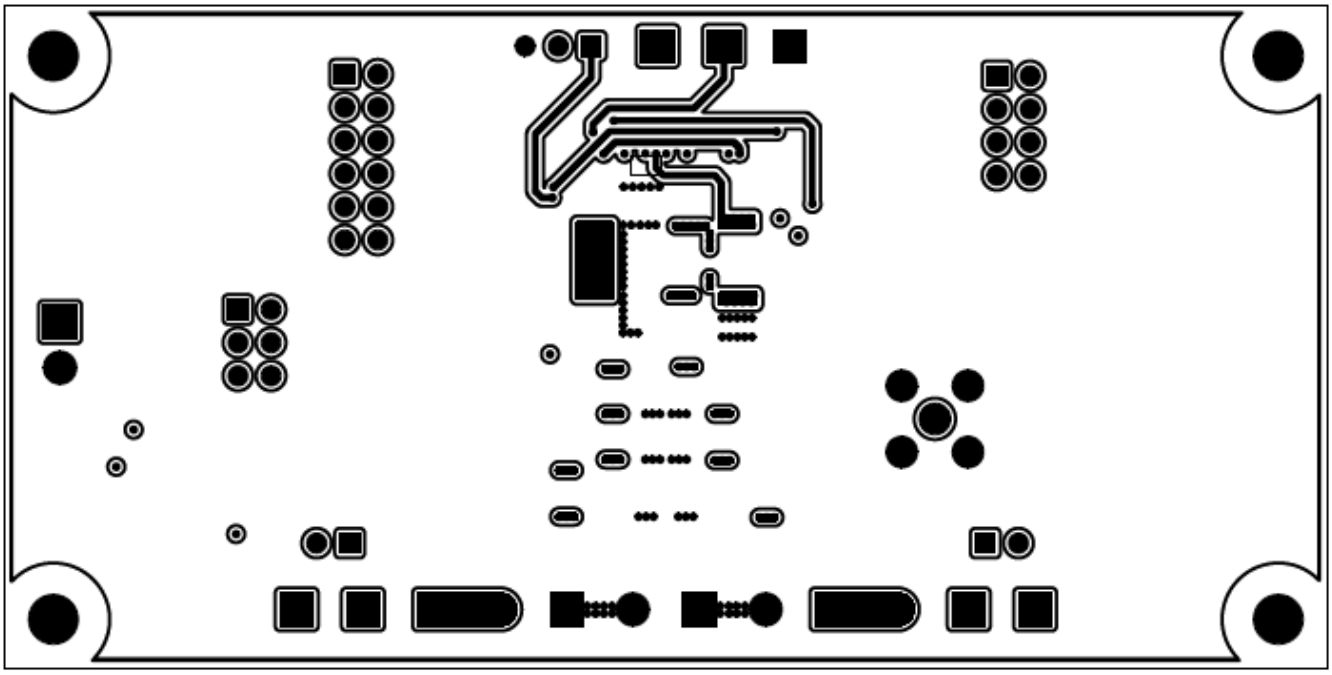

Figure 17. EVM Layer 5 Copper

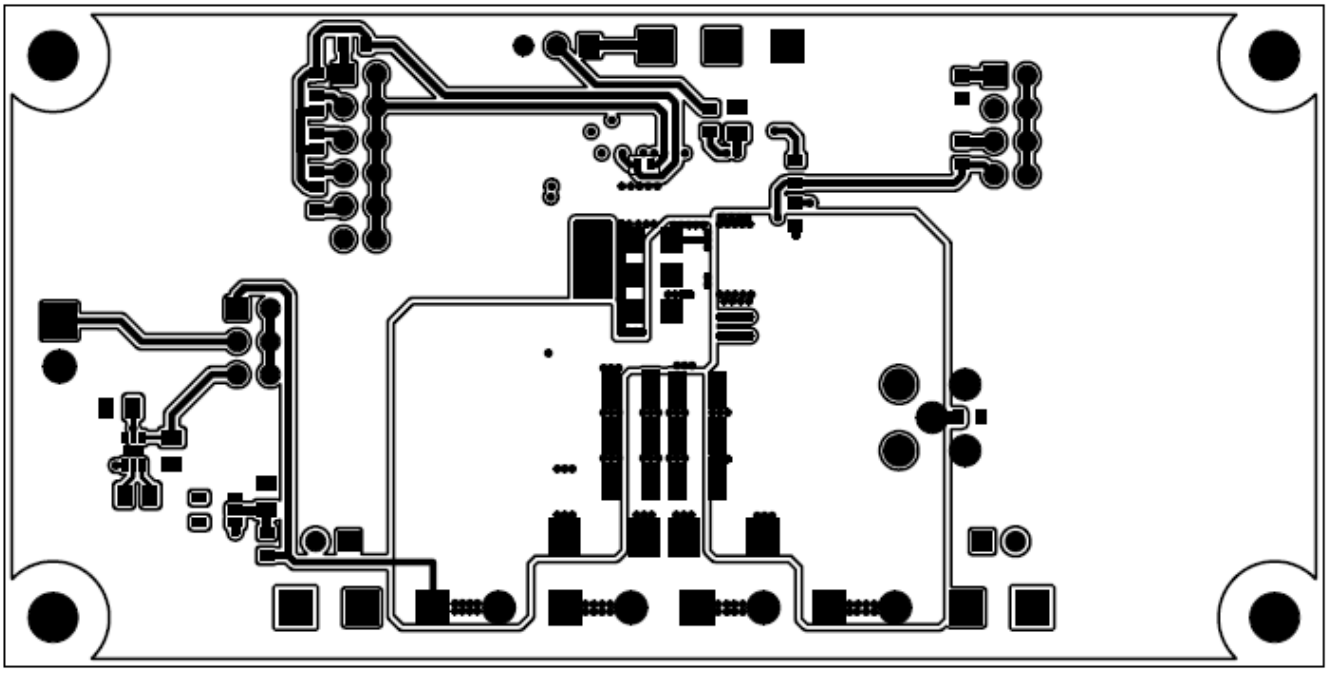

Figure 18. EVM Bottom Side Copper

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

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

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

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

2 *Limited Warranty and Related Remedies/Disclaimers*:

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

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

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

3 *Regulatory Notices:*

   3.1 *United States*

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

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

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

      CAUTION

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

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

      FCC Interference Statement for Class A EVM devices

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

FCC Interference Statement for Class B EVM devices

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

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

3.2 *Canada*

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

Concerning EVMs Including Radio Transmitters:

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

Concernant les EVMs avec appareils radio:

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

Concerning EVMs Including Detachable Antennas:

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

Concernant les EVMs avec antennes détachables

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

3.3 *Japan*

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

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

4 *EVM Use Restrictions and Warnings:*

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

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

4.3 *Safety-Related Warnings and Restrictions:*

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

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

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

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

6. *Disclaimers:*

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8. *Limitations on Damages and Liability:*

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