

Using the LP3907TLEVM Evaluation Module

1 Introduction

The Texas Instrument LP3907TIEVM evaluation module (EVM) helps designers evaluate the operation and performance of the LP3907 dual high-current step-down DC-DC and dual linear regulators with I²C interface.

The EVM contains one LP3907 device (see [Table 1](#)):

Table 1.

PART NUMBER	PACKAGE	BODY SIZE
LP3907TL-JJ11	DSBGA (25)	2.49 mm × 2.49 mm

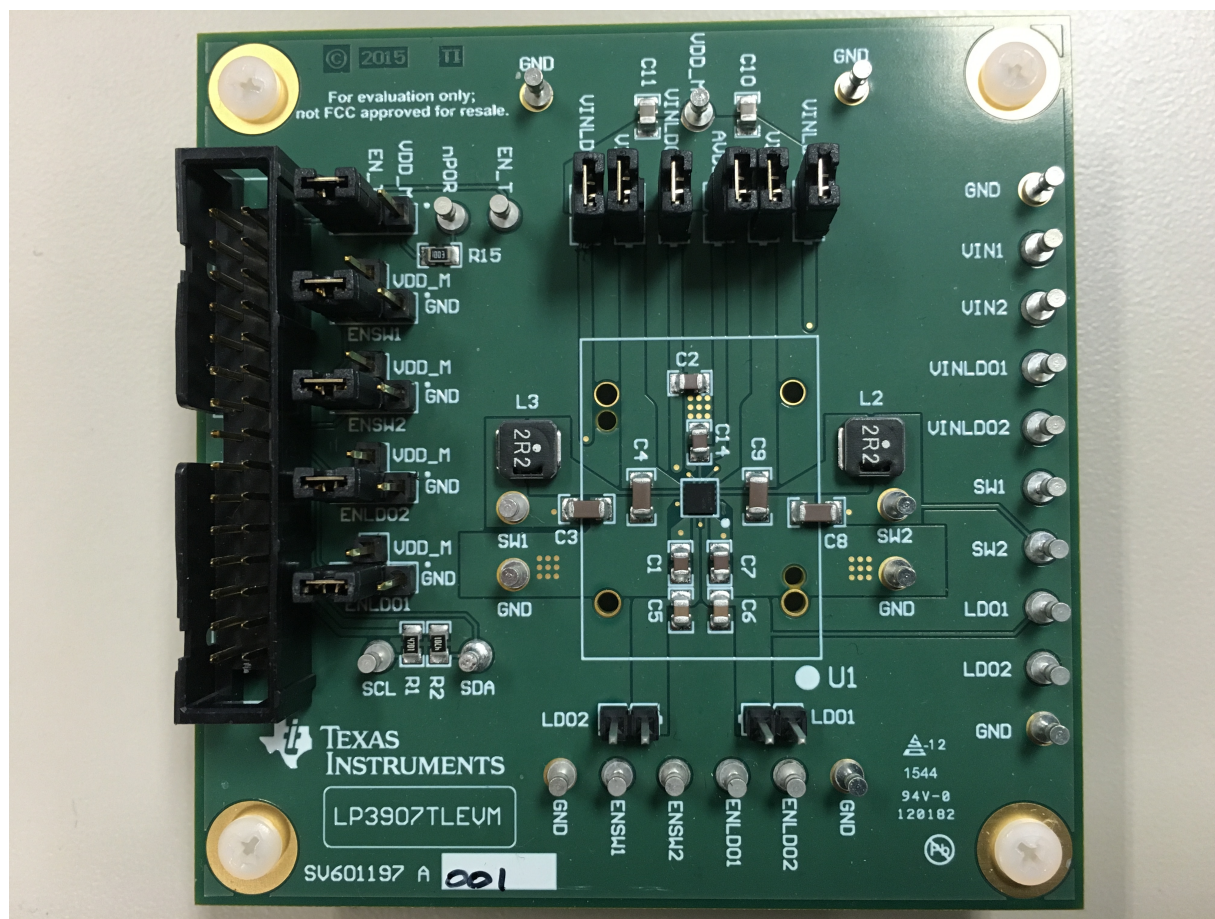
2 Hardware Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the LP3907TLEVM.

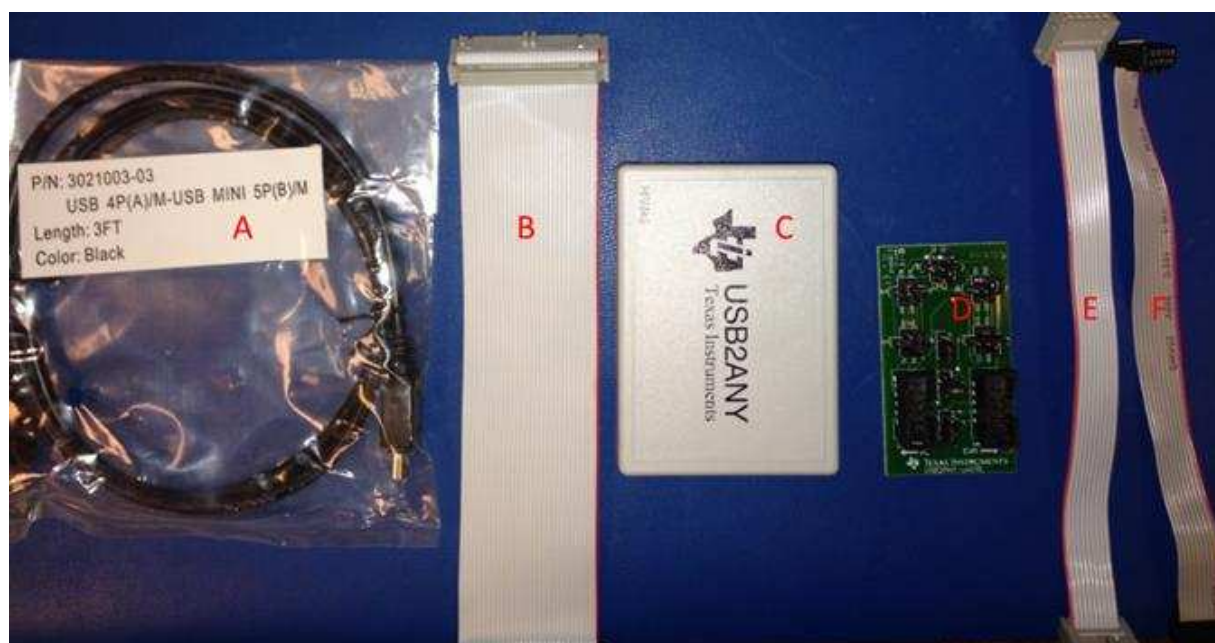
The LP3907TIEVM package includes: one LP3907TLEVM and one USB2ANY box set. As [Contents of LP3907TLEVM Kit](#) shows, the USB2ANY box set contains six (A - F) parts; only three parts (A, B, C) are required for LP3907TIEVM evaluation.

2.1 Connect USB2ANY Box to LP3907TLEVM

1. Connect USB cable (A) and one side of 30-pin ribbon cable (B) to USB2ANY box (C).
2. Connect another side of the 30-pin ribbon cable(B) to the LP3907EVM.

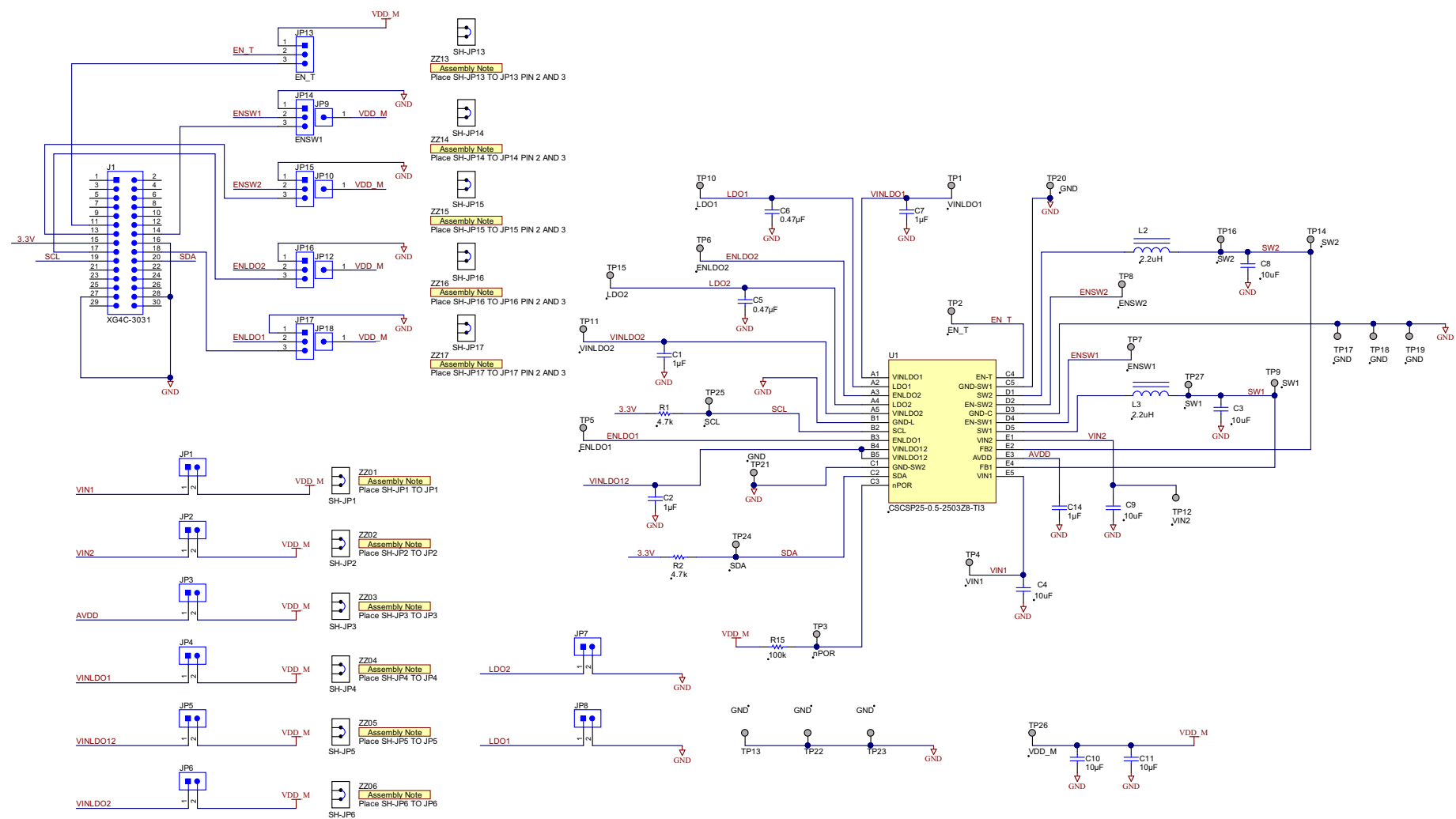


LP3907 Evaluation Board



Contents of LP3907TLEVM Kit

3 Schematic



4 Bill of Materials (BOM)

ITEM	DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER
1	PCB	Printed Circuit Board	Any	SV601197
2	C1, C2, C7, C14	CAP, CERM, 1 μ F, 50 V, +/- 10%, X7R, 0805	AVX	08055C105KAT2A
3	C3, C4, C8, C9	CAP, CERM, 10 μ F, 16 V, +/- 10%, X7R, 1206	MuRata	GRM31CR71C106KAC7L
4	C5, C6	CAP, CERM, 0.47 μ F, 16 V, +/- 10%, X7R, 0805	AVX	0805YC474KAT2A
5	C10, C11	CAP, CERM, 10 μ F, 16 V, +/- 20%, X7R, 0805	Taiyo Yuden	EMK212BB7106MG-T
6	H1, H2, H3, H4	Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	BF Fastener Supply	NY PMS 440 0025 PH
7	H5, H6, H7, H8	Standoff, Hex, 0.5"L #4-40 Nylon	Keystone	1902C
8	J1	Connector, 15x2, 3A 300V STRT DIP, TH	Omron Electronic Components	XG4C-3031
9	JP1, JP2, JP3, JP4, JP5, JP6, JP7, JP8	Header, 2.54 mm, 2x1, Tin, TH	Samtec	TSW-102-07-T-S
10	JP9, JP10, JP12, JP18	Header, 100mil, 1pos, Gold, TH	Samtec	TSW-101-07-G-S
11	JP13, JP14, JP15, JP16, JP17	Header, 100mil, 3x1, Gold, TH	Samtec	TSW-103-07-G-S
12	L2, L3	Inductor, Shielded, Ferrite, 2.2 μ H, 2.62 A, 0.071 ohm, SMD	TDK	VLCF5020T-2R2N2R6-1
13	LP3907TLEVM	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	Brady	THT-14-423-10
14	R1, R2	RES, 4.7k ohm, 5%, 0.125W, 0805	Vishay-Dale	CRCW08054K70JNEA
15	R15	RES, 100k ohm, 1%, 0.125W, 0805	Vishay-Dale	CRCW0805100KFKEA
16	SH-JP1, SH-JP2, SH-JP3, SH-JP4, SH-JP5, SH-JP6, SH-JP13, SH-JP14, SH-JP15, SH-JP16, SH-JP17	Shunt, 2mm, Gold plated, Black	Samtec	2SN-BK-G
17	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27	Terminal, Turret, TH, Double	Keystone	1593-2
18	U1	Dual High-Current Step-Down DC/DC and Dual Linear Regulator with I2C Compatible Interface, 25-pin Micro SMD, Pb-Free	Texas Instruments	LP3907TL-JJ11/NOPB

5 Layout

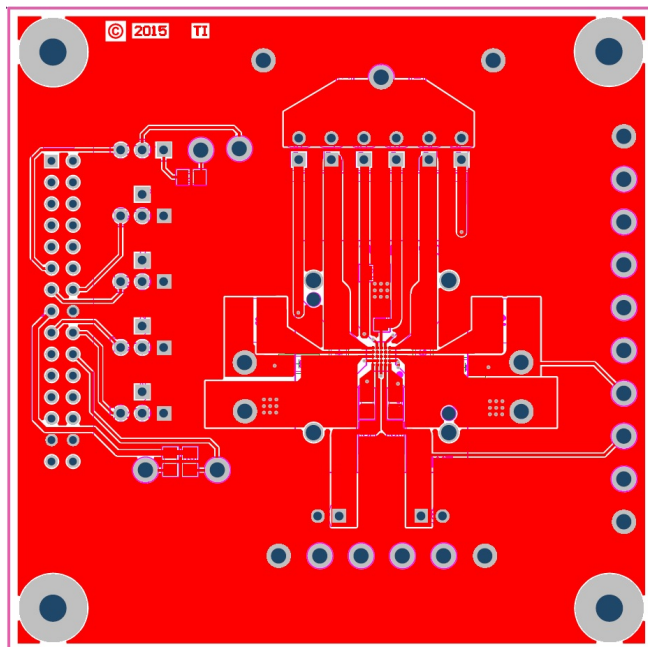


Figure 1. Top Layer

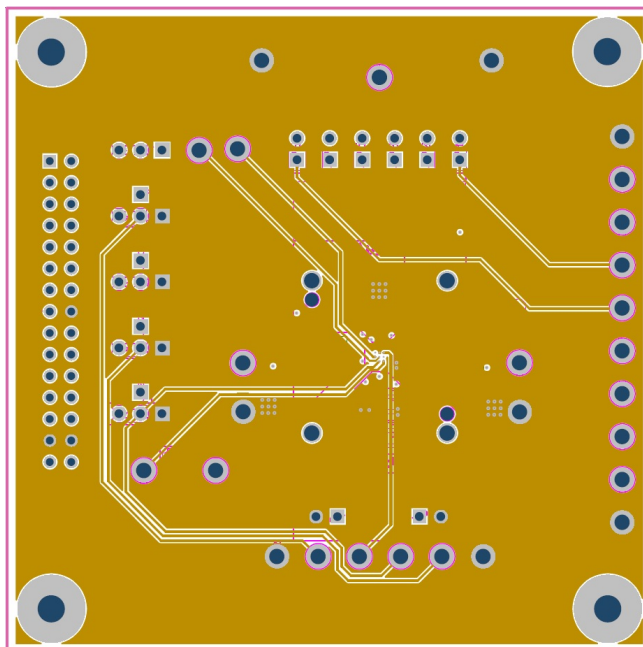


Figure 2. Mid-Layer1

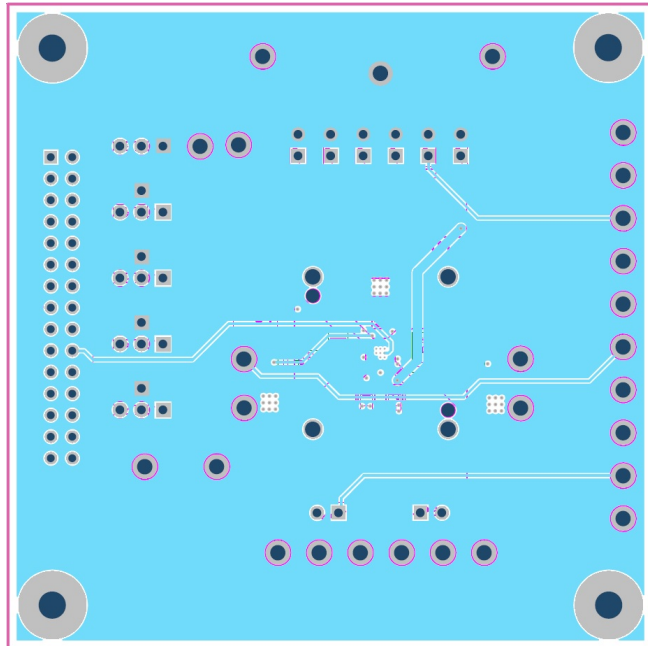


Figure 3. Mid-Layer2

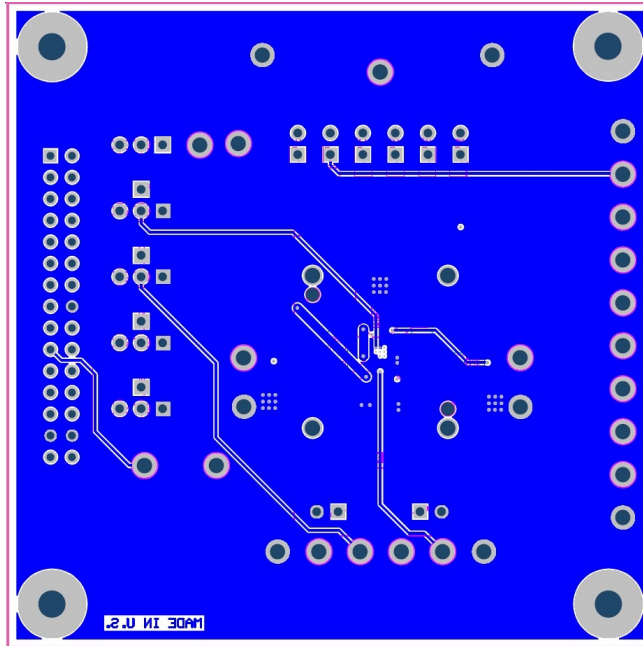


Figure 4. Bottom Layer

6 Graphic User Interface (GUI)

Texas Instruments has created a graphic user interface (GUI) and USB2ANY box that can help exercise the part in a simple way. This section describes how to use the GUI to communicate with the LP3907TIEVM.

6.1 PC Requirement

Windows® 7 and 10

6.2 Start-Up

- Download the "Install the GUI" software package (setup_LP3907_EVM_v1.0.0.exe), and follow the setup wizard to install the GUI.
- Complete the hardware setup discussed in [Section 2](#).
- Apply recommended voltage (see datasheet link for detail) to LP3907TIEVM.
- Launch the GUI by double clicking the icon (see [Figure 5](#):



Figure 5.

- The GUI launches as shown in [Figure 6](#).
 - Note: At the first time use, the USB2ANY firmware update message window pops up, please simply follow the screen instruction to complete the update.

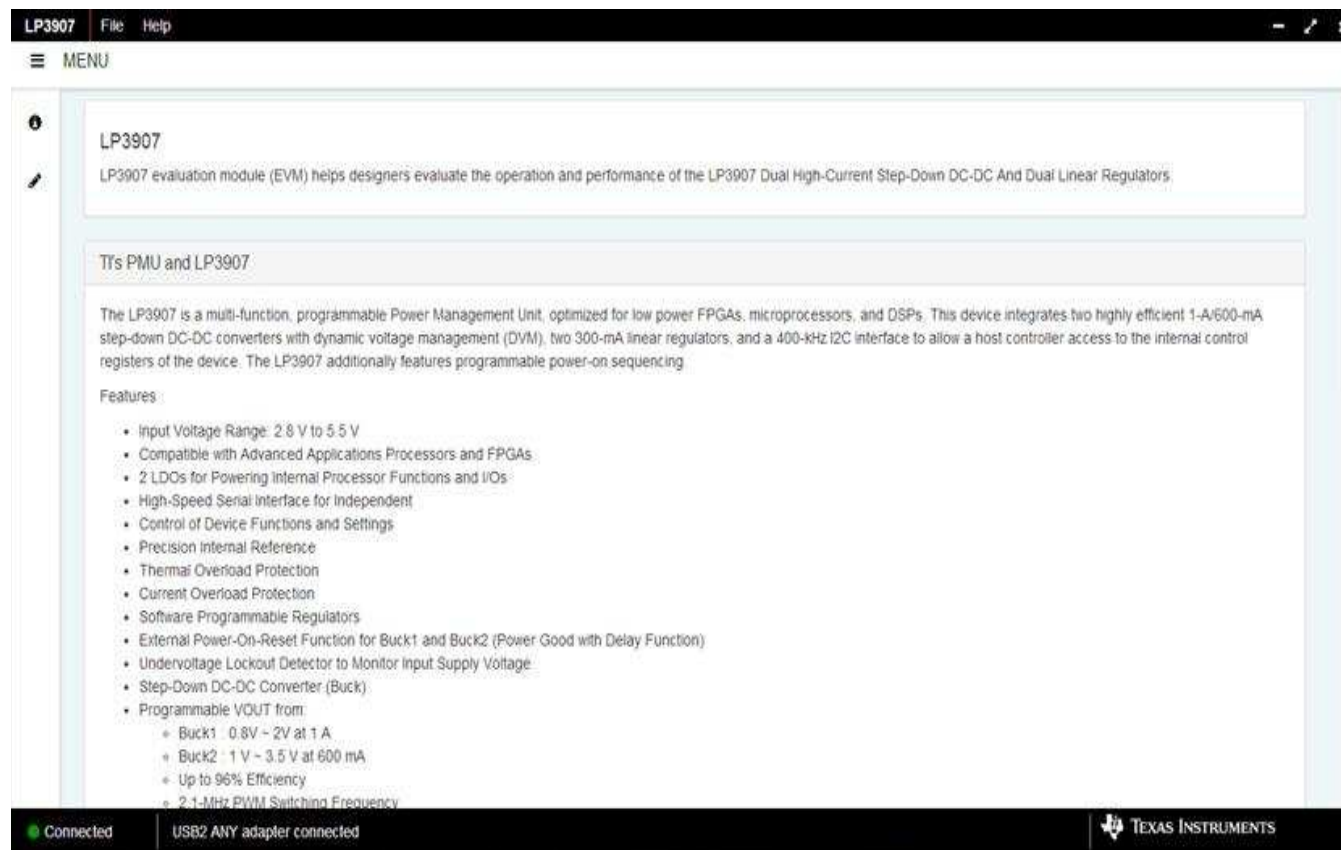


Figure 6.

6.3 Main Menu Page

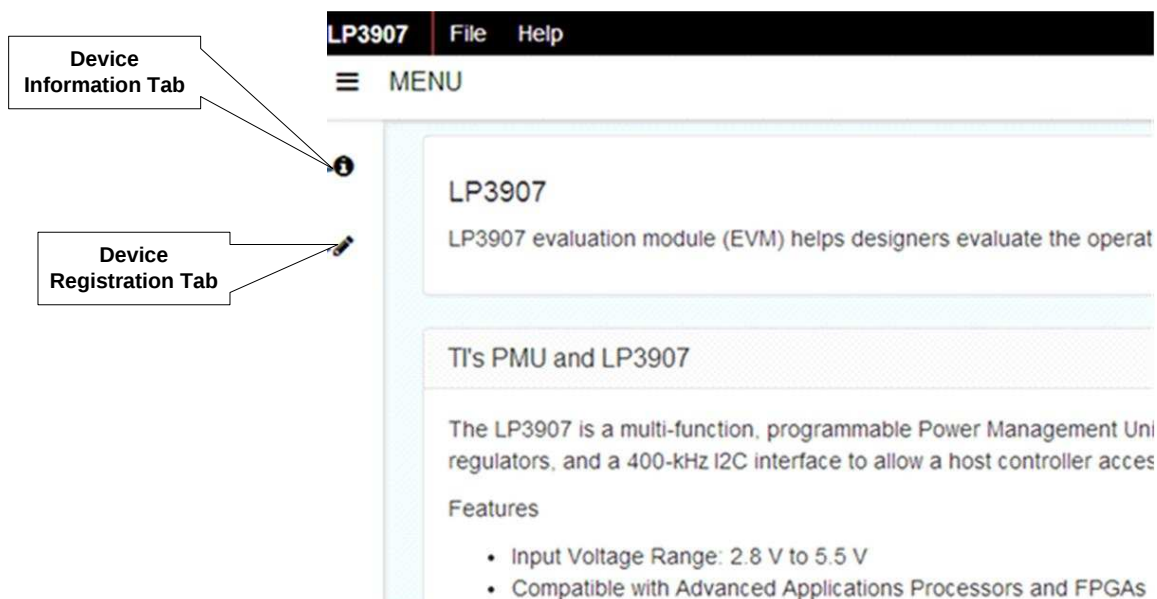


Figure 7.

6.4 Device Information Page

This is the default GUI page after launch, which includes the basic description of the device/EVM operational condition and key specs.

6.5 Device Register Tab

Click on this tab, which allows user to switch to the device register page — see [Figure 8](#) for more details.

6.6 Device Register Page

The register page is divided into two parts — the left-hand side is the register map; the right-hand side is the control interface which has five tabs: USB2ANY, LDO1, LDO2, Buck1, Buck2 and Log.

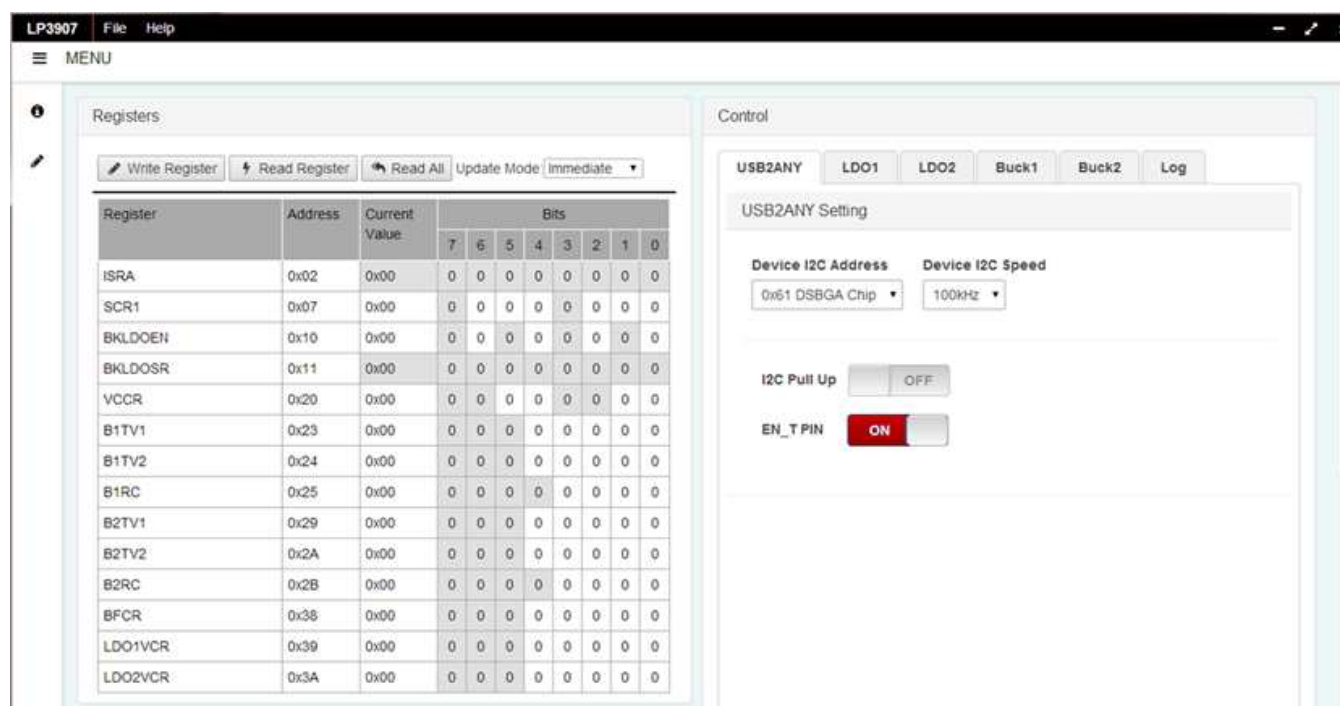


Figure 8.

6.7 USB2ANY Tab

As shown in [Figure 9](#) below, this tab allows user to access and control the following:

- I2C address (0x60 or 0x61) — default is 0x61 DSBGA package.
- I2C Speed (10 KHz, 100 KHz, or 400 KHz) — default is 100 KHz.
- USB2ANY box internal pullup —default is OFF state.
- EN_T pin logic, default is ON/Logic high

Control

USB2ANY

LDO1

LDO2

Buck1

Buck2

Log

USB2ANY Setting

Device I2C Address

0x61 DSBGA Chip ▼

Device I2C Speed

100kHz ▼

I2C Pull Up

OFF

EN_T PIN

ON

Figure 9.

6.8 LDO1 Tab

As shown in [Figure 10](#) below, this tab allows user to access and control the following (see the LP3907 data sheet ([SNVS511](#)) *Register Maps* for detailed information):

- LDO1 GPIO enable pin logic control (ENLDO1 pin) — default is OFF state.
- LDO1 enable register control (0x10) — default is ON state.
- Preset EN Delay Sequence register Control (0x07) — default setting is 010.
- LDO1 output voltage register control (0x23 & 0x24) — default setting is 2.8 V.

Control

USB2ANY

LDO1

LDO2

Buck1

Buck2

Log

PIN CONTROL

ENLDO1 PIN

OFF

Enable Output CONTROL(0x10)

Enable LDO1

ON

Preset EN Delay Sequence(0x07)

Preset EN Delay Sequence

2 - Buck1-1.5ms, Buck2-2ms, LDO1-3ms, LDO2-6ms ▼

LDO 1 Voltage Control

LDO Control(0x39) - (1.0~3.5V)

2.8

Write

Read

Figure 10.

6.9 LDO2 Tab

As shown in [Figure 11](#) below, this tab allows user to access and control the following (see the LP3907 data sheet ([SNVS511](#)) *Register Maps* for detailed information):

- LDO2 GPIO enable pin logic control (ENLDO2 pin) — default is OFF state.
- LDO2 enable register control (0x10) — default is ON state.
- Preset EN Delay Sequence register Control (0x07) — default setting is 010.
- LDO2 output voltage register control (0x3A) — default setting is 2.8 V.

Control

USB2ANY

LDO1

LDO2

Buck1

Buck2

Log

PIN CONTROL

ENLDO2 PIN

OFF

Enable Output CONTROL(0x10)

Enable LDO2

ON

Preset EN Delay Sequence(0x07)

Preset EN Delay Sequence

2 - Buck1-1.5ms, Buck2-2ms, LDO1-3ms, LDO2-6ms ▼

LDO 2 Voltage Control

LDO Control(0x3A) - (1.0~3.5V)

2.8

Write

Read

Figure 11.

6.10 Buck1 Tab 1

As shown in [Figure 12](#) below, this tab allows user to access and control the following (see the LP3907 data sheet ([SNVS511](#)) *Register Maps* for detailed information):

- Buck1 GPIO enable pin logic control (ENBUCK1 pin) — default is OFF state.
- Buck1 enable register control (0x10) — default is ON state.
- Preset EN Delay Sequence register Control (0x07) — default setting is 010.
- Buck1 output voltage register control (0x3A) — default setting is 1.2 V.

Control

USB2ANY
LDO1
LDO2
Buck1
Buck2
Log

Enable CONTROL

ENBUCK1 PIN
OFF
Enable BUCK1
ON

BUCK 1 Output Control (0.8~2.0V)

BUCK1 Target1(0x23)
1.200000
Write
Read

BUCK1 Target2(0x24)
1.200000
Write
Read

Preset EN Delay Sequence(0x07)

Preset EN Delay Sequence
2 - Buck1-1.5ms, Buck2-2ms, LDO1-3ms, LDO2-6ms

Figure 12.

6.11 Buck1 Tab 2

As shown in [Figure 13](#) below, this tab allows user to access and control the following (see the LP3907 data sheet ([SNVS511](#)) *Register Maps* for detailed information):

- Buck1 Operation Mode (Auto or Forced PWM mode) — default is Auto Mode
- Buck1 output voltage ramp rate — default is 8 mV/μs.
- Buck1 output voltage ramp control — default setting is Target 1 setting.
- Bypass UVLO — default is enabled.
- nPOR Delay setting — default is 50 ms.
- Spread Spectrum Frequency setting —default is 2 kHz triangle wave.
- Spread Spectrum Function control — default is disabled.

BUCK1 Setting

Buck1 Operation Mode

0: Auto ▼

Buck1 Ramp Rate

8: 8 mV/us ▼

Buck1 Ramp Control

0: No Change ▼

Buck1 Target Voltage

0: Use Target1 setting ▼

BUCK Function

Bypass UVLO

0: Enabled ▼

nPOR Delay

1: 50ms ▼

Spread Spectrum Frequency

1: 2kHz Triangular wave ▼

Spread Spectrum Function

0: Disabled ▼

Figure 13.

6.12 Buck2 Tab 1

As shown in [Figure 14](#) below, this tab allows user to access and control the following (see the LP3907 data sheet ([SNVS511](#)) *Register Maps* for detailed information):

- Buck2 GPIO enable pin logic control (ENBUCK1 pin) — default is OFF state.
- Buck2 enable register control — default is ON state.
- Preset EN Delay Sequence register Control (0x07) — default setting is 010.
- Buck2 output voltage register control — default setting is 1.8 V.

Control

USB2ANY

LDO1

LDO2

Buck1

Buck2

Log

Enable CONTROL

ENBUCK2 PIN

OFF

Enable BUCK2

ON

BUCK 2 Output Control (0.8875~1.6750V)

BUCK2 Target1(0x29)

1.8

Write

Read

BUCK2 Target2(0x2A)

1.8

Write

Read

Preset EN Delay Sequence(0x07)

Preset EN Delay Sequence

2 - Buck1-1.5ms, Buck2-2ms, LDO1-3ms, LDO2-6ms

Figure 14.

6.13 Buck2 Tab 2

As [Figure 15](#) shows below, this tab allows user to access and control the following (see the LP3907 data sheet ([SNVS511](#)) *Register Maps* for detailed information):

- Buck2 Operation Mode (Auto or Forced PWM mode) — default is Auto Mode
- Buck2 output voltage ramp rate — default is 8 mV/μs.
- Buck2 output voltage ramp control — default is no change.
- Buck2 output voltage ramp control — default setting is Target 1 setting.
- Bypass UVLO — default is enabled.
- nPOR Delay setting — default is 50 ms.
- Spread Spectrum Frequency setting — default is 2 kHz triangle wave.
- Spread Spectrum Function control — default is disabled.

BUCK2 Setting

Buck2 Operation Mode

0: Auto ▼

Buck2 Ramp Control

0: No Change ▼

Buck2 Ramp Rate

8: 8 mV/us ▼

Buck2 Target Voltage

0: Use Target1 setting ▼

BUCK Function

Bypass UVLO

0: Enabled ▼

Spread Spectrum Frequency

1: 2kHz Trianglar wave ▼

nPOR Delay

1: 50ms ▼

Spread Spectrum Function

0: Disabled ▼

Figure 15.

6.14 Log Tab

As shown in [Figure 16](#), this tab keeps a record of all the I²C communication.



Figure 16.

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/lstds/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/lstds/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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

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

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3.3.3 *Notice for EVMS for Power Line Communication:* Please see http://www.tij.co.jp/lstds/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/lstds/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.

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