LM10507 User's Guide

1 General Description

The LM10507 is an advanced PMU providing four regulated outputs from three configurable high efficiency buck regulators and one LDO regulator. The device can operate in a stand-alone application but external inputs and an SPI serial interface provide the ability for an external system device to control the device outputs. The device has been designed to support ASIC and SOC power requirements for SSD and Flash drives.

2 Evaluation Kit Overview

LM10507 Evaluation Kit is a self-contained evaluation platform allowing access to the device outputs with software provided to test the device control functions. The EVM is designed to be connected to a computer via a USB cable and can be powered from this input or may be powered from an external supply. It may also be used as a stand-alone board (powered externally) to provide the pre-set default output values from the LM10507 device.

The evaluation kit consists of:

- LM10507 Evaluation board REV 1
- USB Interface cable
- CD including
  - Evaluation software
  - LM10507 datasheet
- Evaluation kit document

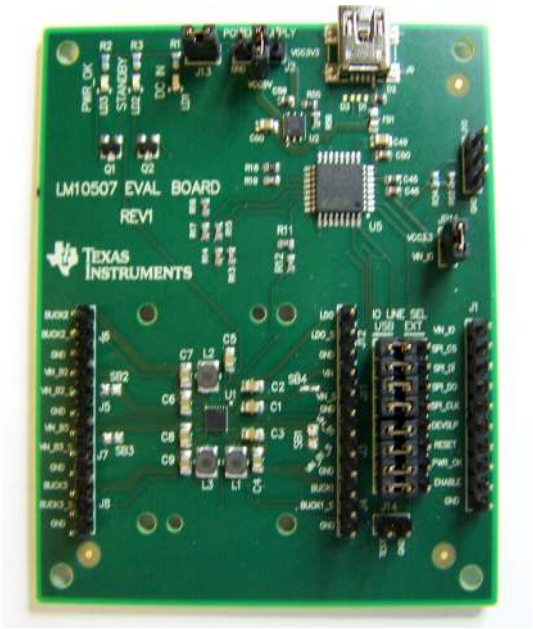

Figure 1. LM10507 Evaluation Board

3 Evaluation Software

LM10507 evaluation software is supplied together with documentation regarding the circuit. Copy the folder **"lm10507"** to your PC's hard disk. The software is run by double clicking the icon of lm10507.exe found in folder. The software does not require any installation.

The evaluation software allows control of all registers necessary to program the device. To simplify the use of the software, the registers are set by directly named controls. The user does not need the register value as this is taken care of by the software, e.g. to change BUCK3 output voltage to 1.0V, choose the value from the drop-down list and software will send the correct value to the BUCK3 control register. To observe any change in the device outputs, the Poll Status check box must be set.

From the menus there is a facility to enable direct register access should the user require this.

4 Hardware Set Up

Please use ESD protection when handling the evaluation boards to prevent any damage due to ESD events!

Connect the LM10507 Evaluation board to the USB port of a PC using the USB cable.

When the USB board is plugged in for the first time, the operating system prompts for "New hardware found" and installs the USB driver. If this does not happen, try unplugging and plugging in the cable again.

Always disconnect the USB cable from the computer when changing jumper settings.

If the evaluation board is not responding or the evaluation software hangs up, disconnect the USB cable for 5 seconds.

5 Using the Evaluation Software

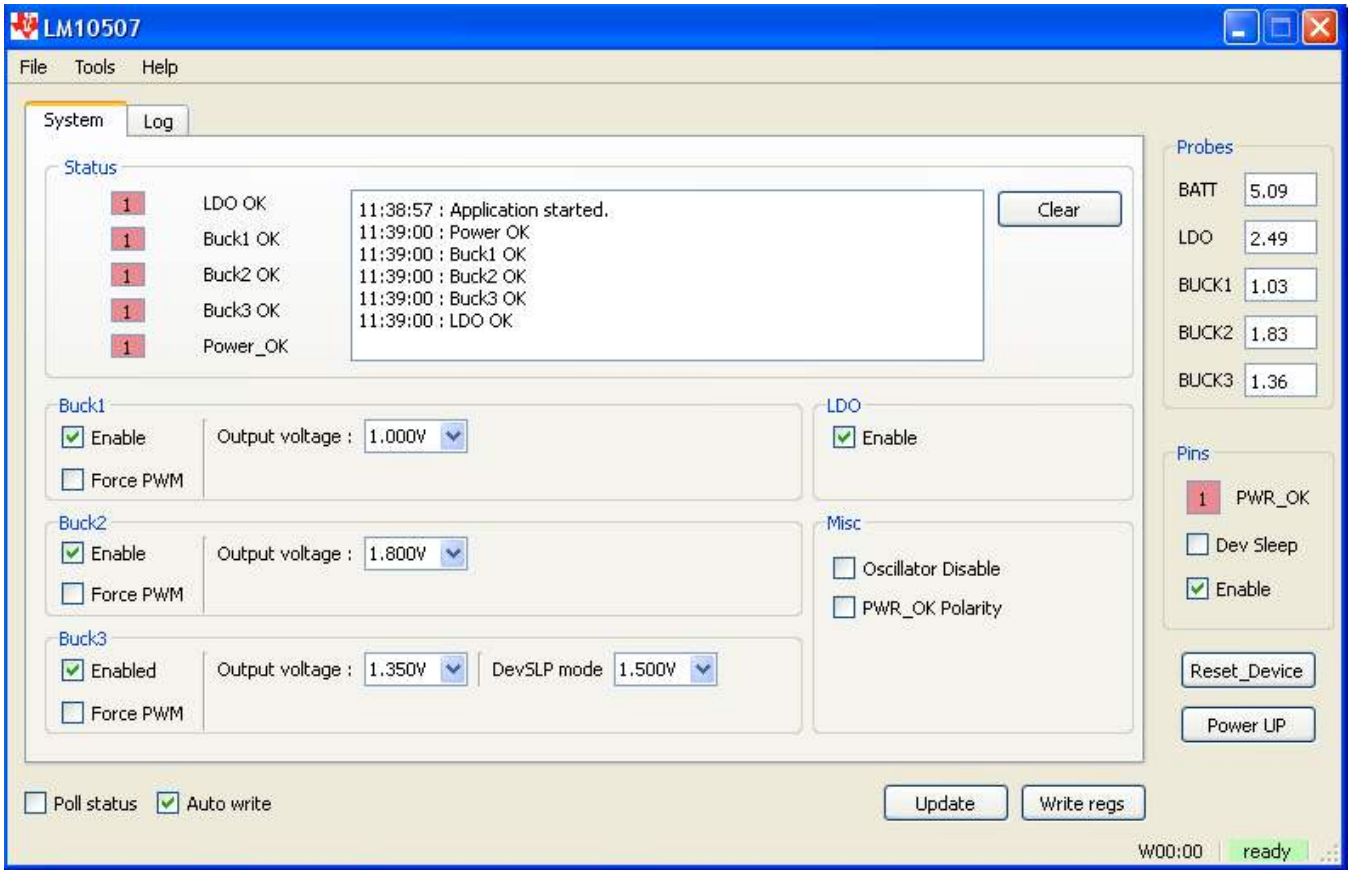

Figure 2. System Settings Tab

The graphical user interface has a main screen with 2 tab screens which allow control and indication for different functions of the device.

Once the evaluation board is connected to the PC, the device can be controlled via the software interface.

The LM10507 will become active as soon as the USB cable is plugged in and ‘Power UP’ is clicked.

When USB cable is plugged in, an orange led LD1 (DC IN) is illuminated. When the device starts up correctly, a green led LD1 (PWR_OK) is lit. A red led LD2 (STANDBY) is illuminated when the LM10507 dev_sleep mode is active. All the device functions can be accessed via the control buttons.

5.1 Main Screen (Figures 2 & 3)

The Main screen has a TAB section placed so that the right hand side and lower part of screen is visible as the background for either tab selection. Common functions can be controlled and monitored here.

5.2 Right Part of Screen

The 'Probe' frame contains results of voltage measurements using on-board ADC's. The input voltage and device outputs are shown here when the board is powered.

The 'Pins' frame shows the status of the PWR_OK pin. It also contains checkboxes to control DEVSLEEP and ENABLE signals.

Pressing the 'RESET_DEVICE' button causes 50 ms negative pulse in reset pin.

Pressing the ‘Power UP’ button enables the device outputs, forces the ENABLE pin to go high, and then updates the screen according to default register values.

5.3 Lower Part of Screen

This part of the screen contains following checkboxes and buttons

‘’Poll status’’ checkbox allows continuous reading of the evaluation chip status register, the state of the I/O pins and the voltage measurement results. The screen is updated accordingly.

‘’Auto write’’ checkbox. If this box is checked, any change to the registers will be written to the device immediately. Otherwise the user must press 'Write regs' button to send the update to the registers. In this way, the user can change values in several registers and update the changes in one communication burst.

"Update’’ button reads content of every register and updates the screen accordingly.

‘’Write regs’’ button. If the 'Auto write' checkbox is disabled, the user can press this button to update the content of every register.

There is a status bar at the bottom of the screen. It shows if the connection to the evaluation board is established, and displays information about the last register write/read operation. Register information is given in the format: ‘’R/WXX:YY’’, where the first letter indicates operation (read or write), XX is register address and YY is data.

5.4 System Settings Tab (Figure 2)

Selecting this tab allows access to the controls of Buck1, Buck2 and Buck3 regulators, LDO enable, Oscillator Disable and PWR_OK pin polarity. It also shows a log of occurred events.

In System 'Status' frame, the user can observe the device output status bits. Also the user can enable 'Poll status' checkbox at lower part of screen to get continuous status updates (1 update/sec).

In 'Buck1', 'Buck2' and 'Buck3' frames the user can set the output voltage of each buck regulator, enable the individual regulator, or force it into PWM mode. Additionally in 'Buck3', the user can set the output voltage for normal mode and DevSleep mode.

The 'Misc' frame contains controls for Oscillator disable bit and PWR_OK pin polarity.

5.5 Log tab (Figure 3)

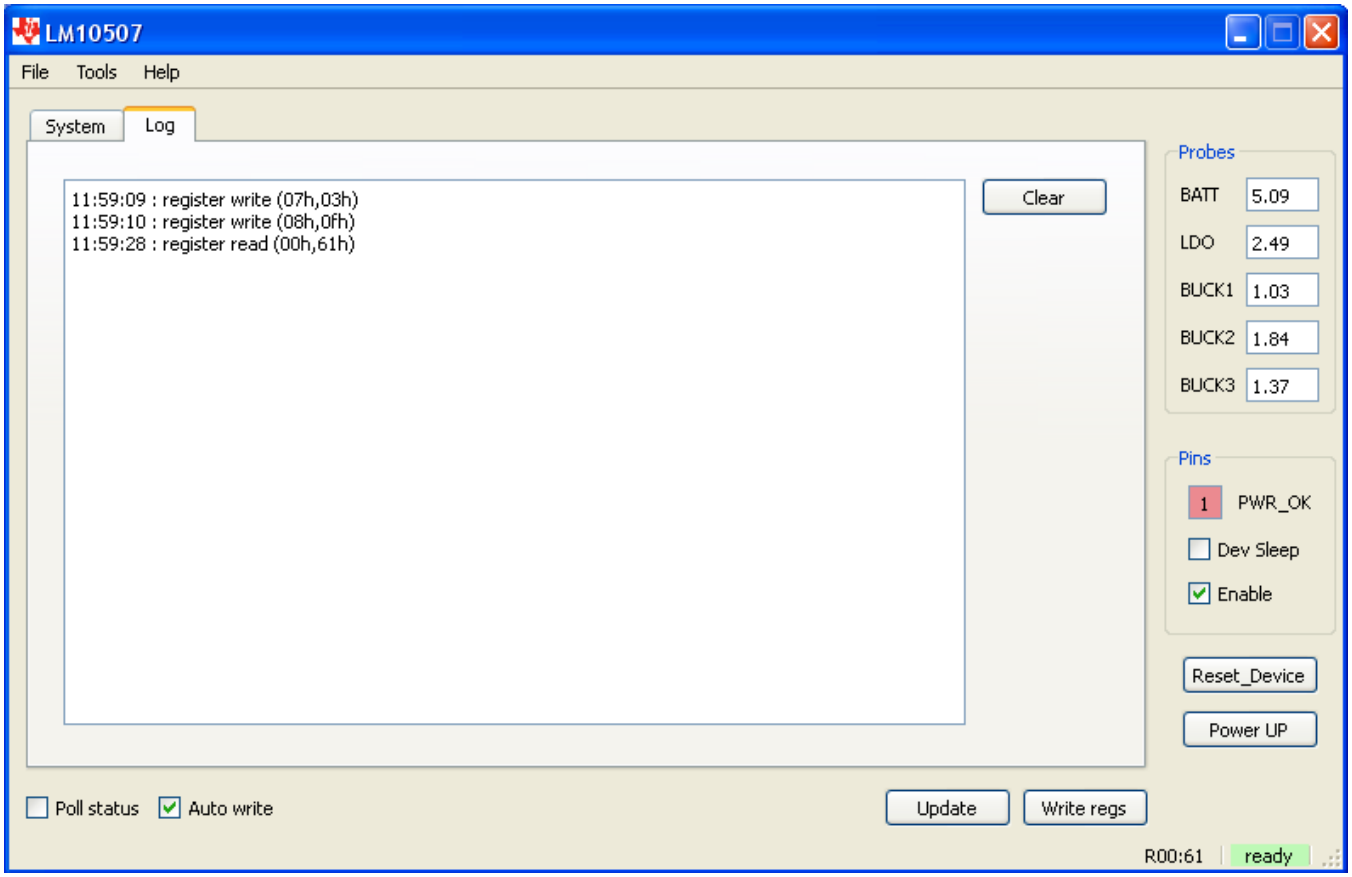

Figure 3. Log Tab

This tab records all SPI transfers. User can copy write or read sequences to clipboard. The log window can be cleared by pressing clear button.

6 Menus

Under “File” menu, the user can save and load contents of the device registers.

Under “Tools” menu the user can open “Direct Register Access” dialog, shown in figure 4.

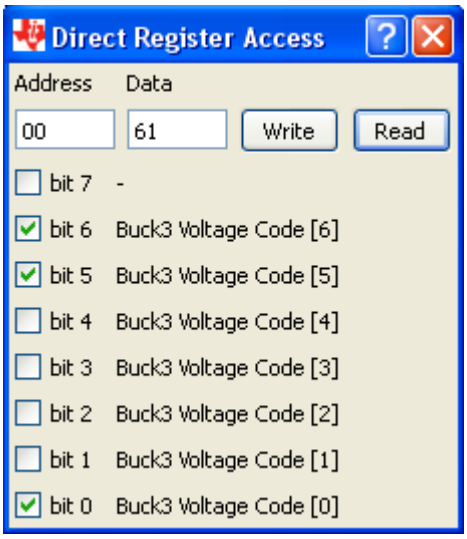

Figure 4. Direct Register access

Binary data may be written and read from the registers. Use hexadecimal values in address and data fields. Individual bits for the register set in 'Address' are shown with a brief description of their function in this dialog window. The Correct data value can also be created by setting and clearing these individual bit check boxes. The value is immediately written to the device by pressing ‘Write’ button and the register setting may be read from the device by pressing ‘Read’ button.

7 Using the Evaluation Hardware

Connectors are provided to allow a battery connection and to allow output voltage measurement. Jumpers allow user selectable or USB controlled settings for device functions.

7.1 Power Supply

The evaluation board may be powered from a battery connector or from the USB interface.

Set jumper between J2 pin2 and TP36 to use supply from USB. Maximum current available for the EVM when using the USB supply will be 500mA.

Table 1. Battery Connector Pins BATTERY CONNECTOR J2

Pin	Function
1	Battery (+) terminal
2	GND

8 Control

A green LED (PWR_OK) will be illuminated once the LM10507EVM has power applied and the device is enabled. JP11 and J13 should be set accordingly.

The logic signals can be controlled either by the evaluation software or externally through connector labeled ‘I/O LINE SEL’. Set the jumper block from JP2 to JP9 accordingly.

Table 2. User Connector Pins USER CONNECTOR J1

Pin	Function
1	VIN_IO
2	SPI_CS
3	SPI_DI

Table 2. User Connector Pins USER CONNECTOR J1 (continued)

Pin	Function
4	SPI_DO
5	SPI_CLK
6	DEVSLEEP
7	RESET
8	PWR_OK
9	ENABLE
10	GND

For accessing the signals externally via this connector, jumpers from JP2 to JP9 should be set to EXT position.

Table 3. Connector J3 Pins

Pin	Function
1	VIN_B1
2	VIN_B1 sense
3	GND

Table 4. Connector J4 Pins

Pin	Function
1	BUCK1
2	BUCK1 sense
3	GND

Table 5. Connector J5 Pins

Pin	Function
1	VIN_B2
2	VIN_B2 sense
3	GND

Table 6. Connector J6 Pins

Pin	Function
1	BUCK2
2	BUCK2 sense
3	GND

Table 7. Connector J7 Pins

Pin	Function
1	VIN_B3
2	VIN_B3 sense
3	GND

Table 8. Connector J8 Pins

Pin	Function
1	BUCK3
2	BUCK3 sense

Table 8. Connector J8 Pins (continued)

Pin	Function
3	GND

Table 9. Connector J11 Pins

Pin	Function
1	VIN
2	VIN sense
3	GND

Table 10. Connector J12 Pins

Pin	Function
1	LDO
2	LDO sense
3	GND

9 Schematics

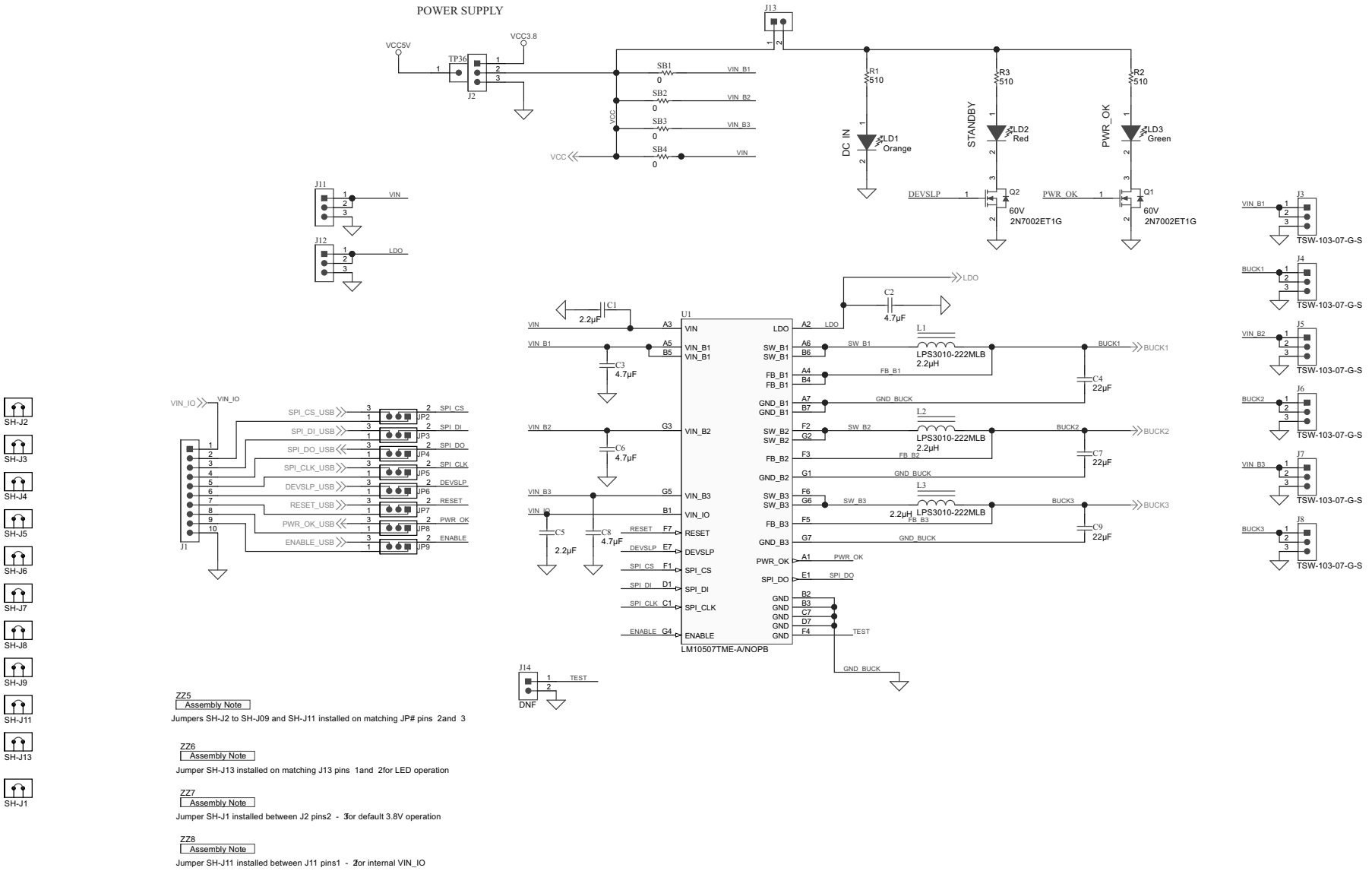

Figure 5. LM10507 Evaluation Board (sheet1)

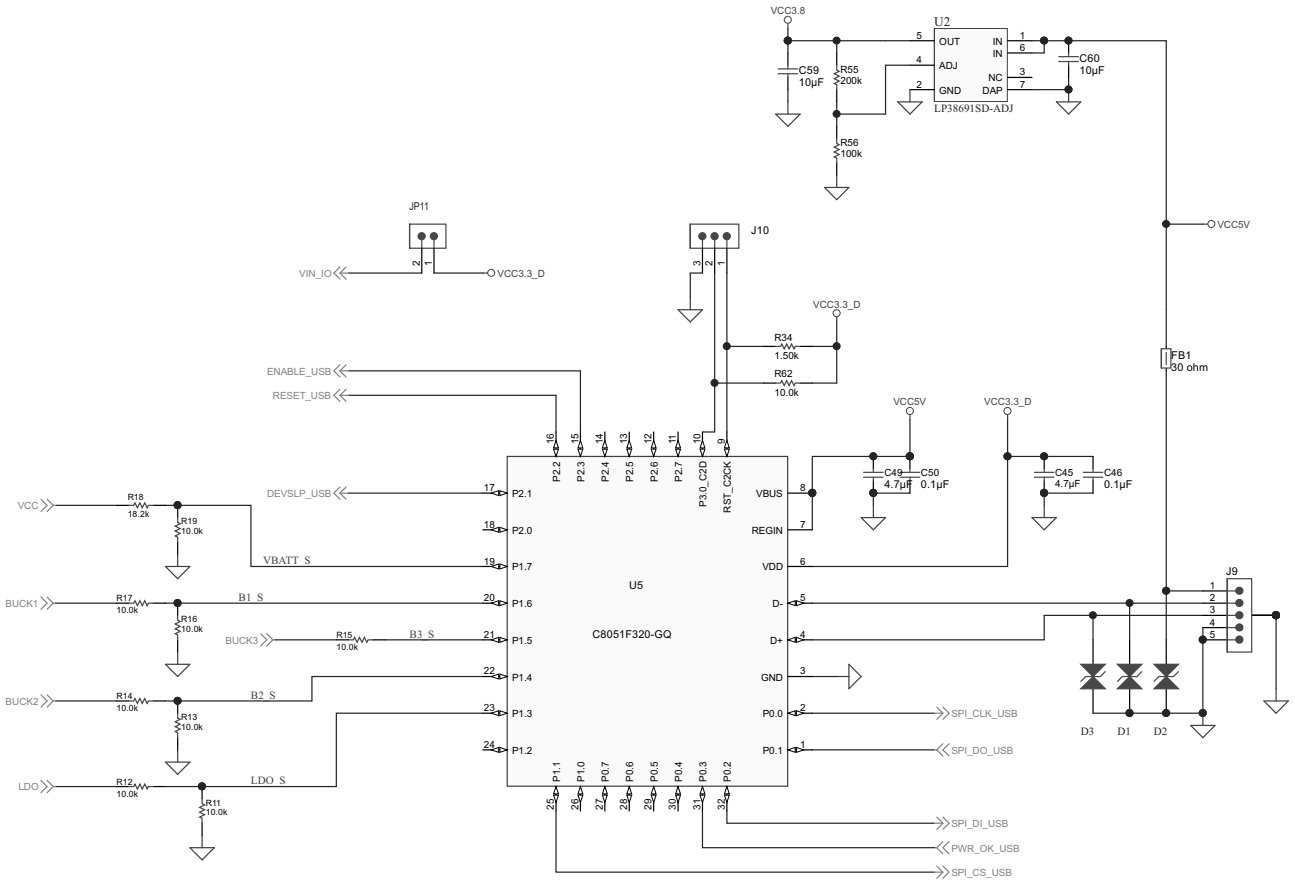

Figure 6. LM10507 Evaluation Board (sheet 2)

10 Evaluation Board Layer

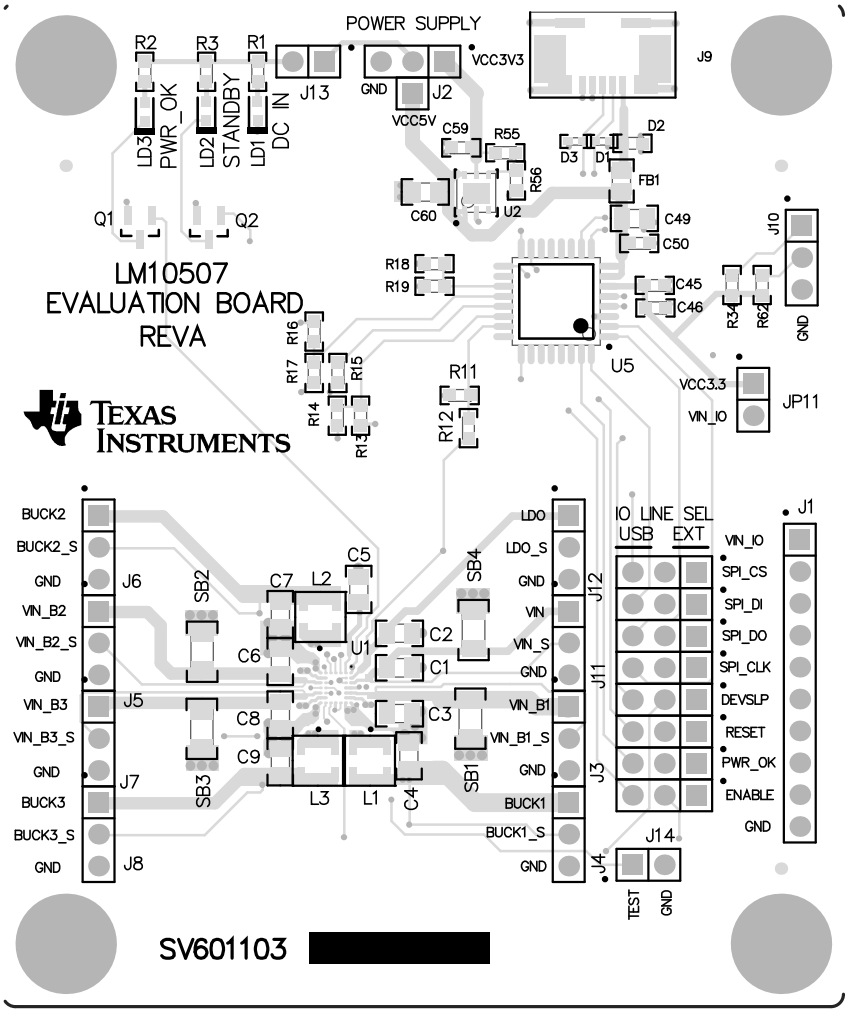

Figure 7. LM10507 Board Top Layer

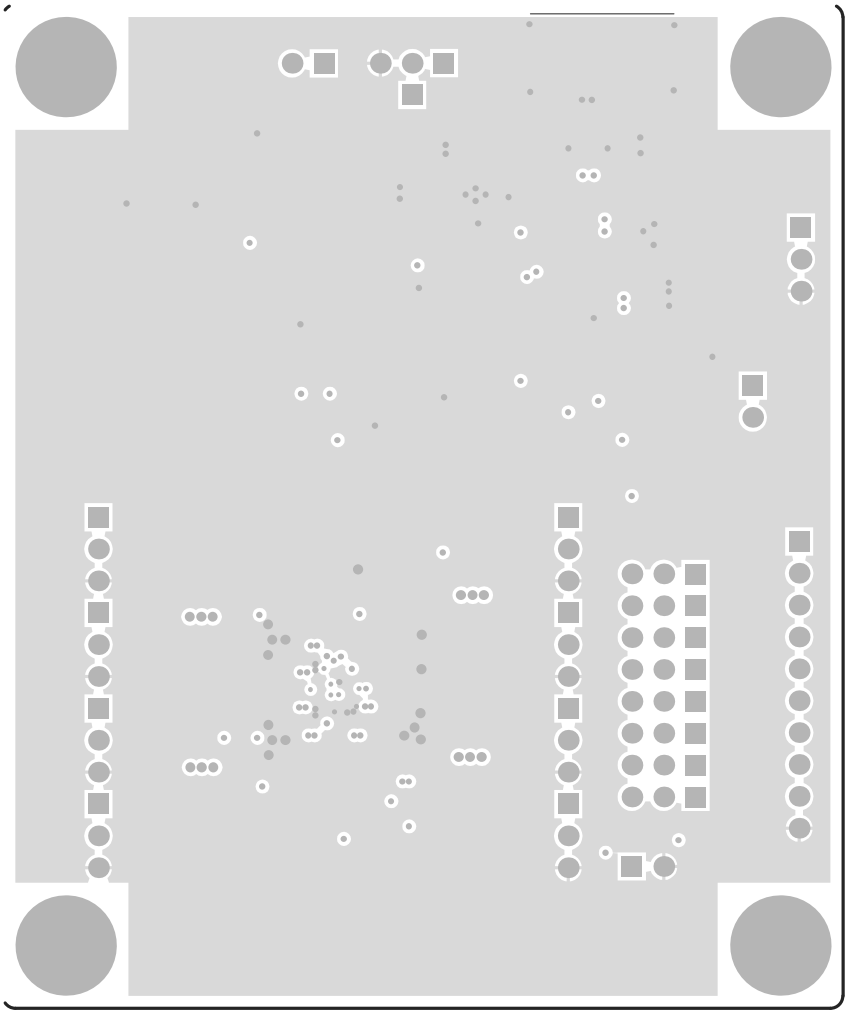

Figure 8. LM10507 Board Inner Layer 2

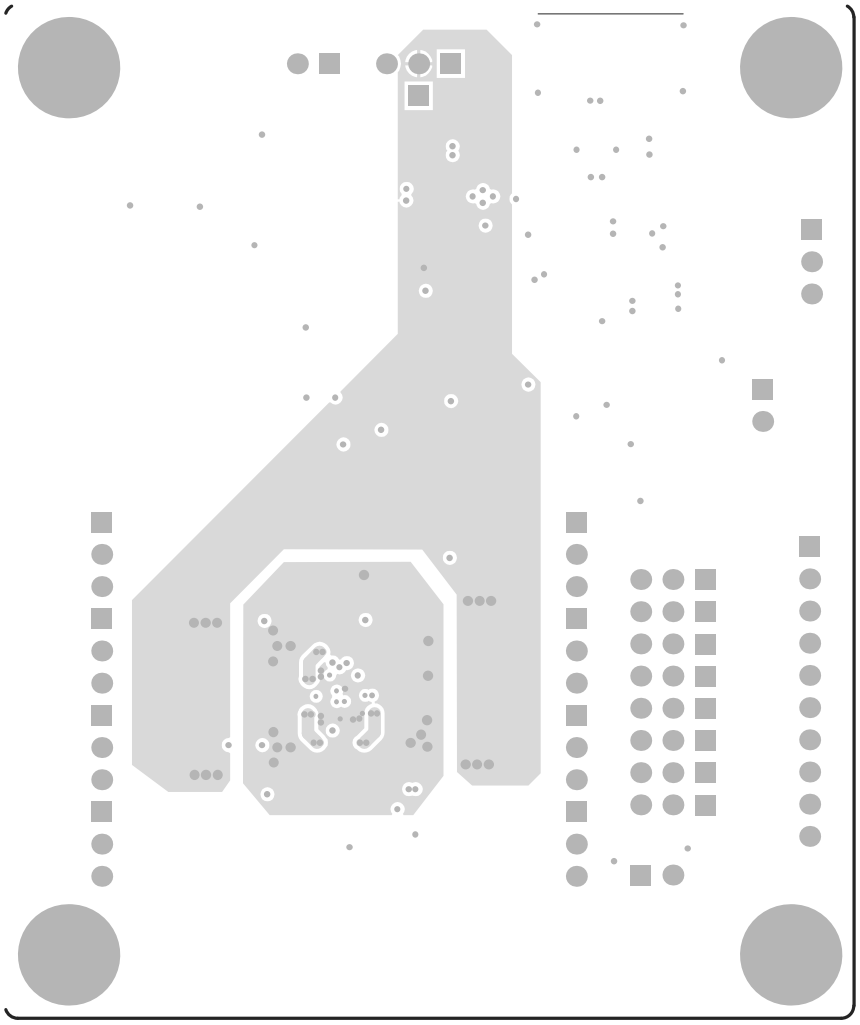

Figure 9. LM10507 Board Inner Layer 3

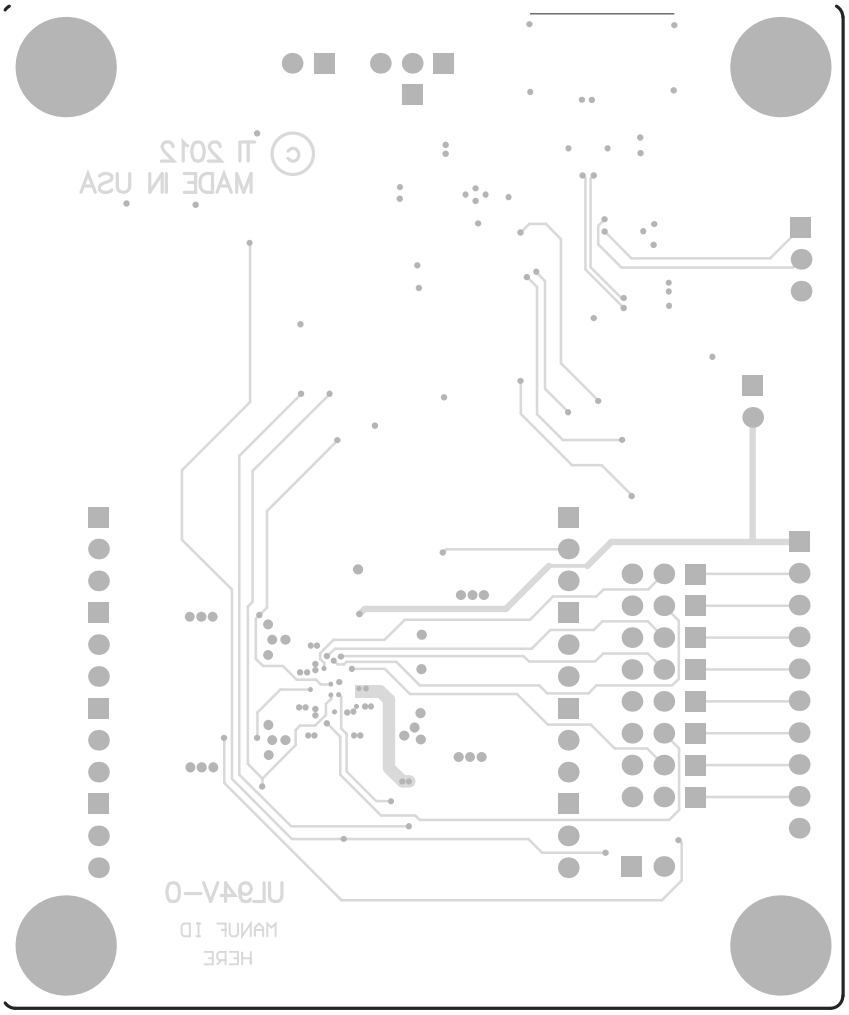

Figure 10. LM10507 Board Inner Layer 4

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      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

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- *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*

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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.

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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

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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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