User's Guide
SLUUAV8A – February 2014 – Revised August 2014

User's Guide for QFN Packaged bq24260, bq24261, and bq24262 3-A Battery Charger Evaluation Module

The bq24260, bq24261, and bq24262 evaluation module on the printed-circuit board (PCB) PWR611 is a complete charger module for evaluating a compact, flexible, high-efficiency, USB-friendly, switch-mode charge management solution for single-cell, Li-ion and Li-polymer batteries used in a wide range of portable applications.

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1 Introduction

1.1 bq2416x IC Features

The bq24260, bq24261, and bq24262 family integrates a synchronous PWM controller, power MOSFETs, input-current sensing, high-accuracy current and voltage regulation, charge termination, and power path management into a QFN package. The charge parameters can be programmed through an I^2C interface. Key IC features include:

- High-efficiency, fully-integrated, NMOS-NMOS, synchronous buck charger with 1.5-MHz frequency
- Charge time optimizer
- Integrated power FETs for up to a 3-A charge rate
- 5-V, 1-A USB On-the-Go (OTG) VBUS supply
- Power path management between battery and system voltages

For details, see the bq24260, bq24261, and bq24262 data sheet (SLUSBA2).

1.2 bq24260, bq24261, bq24262 EVM Features

The bq24260, bq24261, and bq24262 evaluation modules (EVM) provide a complete charger module for evaluating compact, flexible, high-efficiency, USB-friendly, switch-mode battery charge, and power path management solution for single-cell, Li-ion and Li-polymer battery-powered systems used in a wide range of portable applications. Key EVM features include:

- Terminal blocks and standard headers for IN, SYS, BAT, TS; USB connector for IN
- Programmable battery voltage, charge current, input current, and status via I^2C
- PC-based GUI for reading/writing to internal parameter setting and status reporting registers
- IN operating up to 10.5 V for bq24260, 14 V for bq24261 and 6.5 V for bq24262
- LED indication for status signals
- Test points for key signals available for easy test probe hook-up

1.3 Schematic

The bq24260, bq24261, and bq24262 EVM schematic is shown in Figure 1.

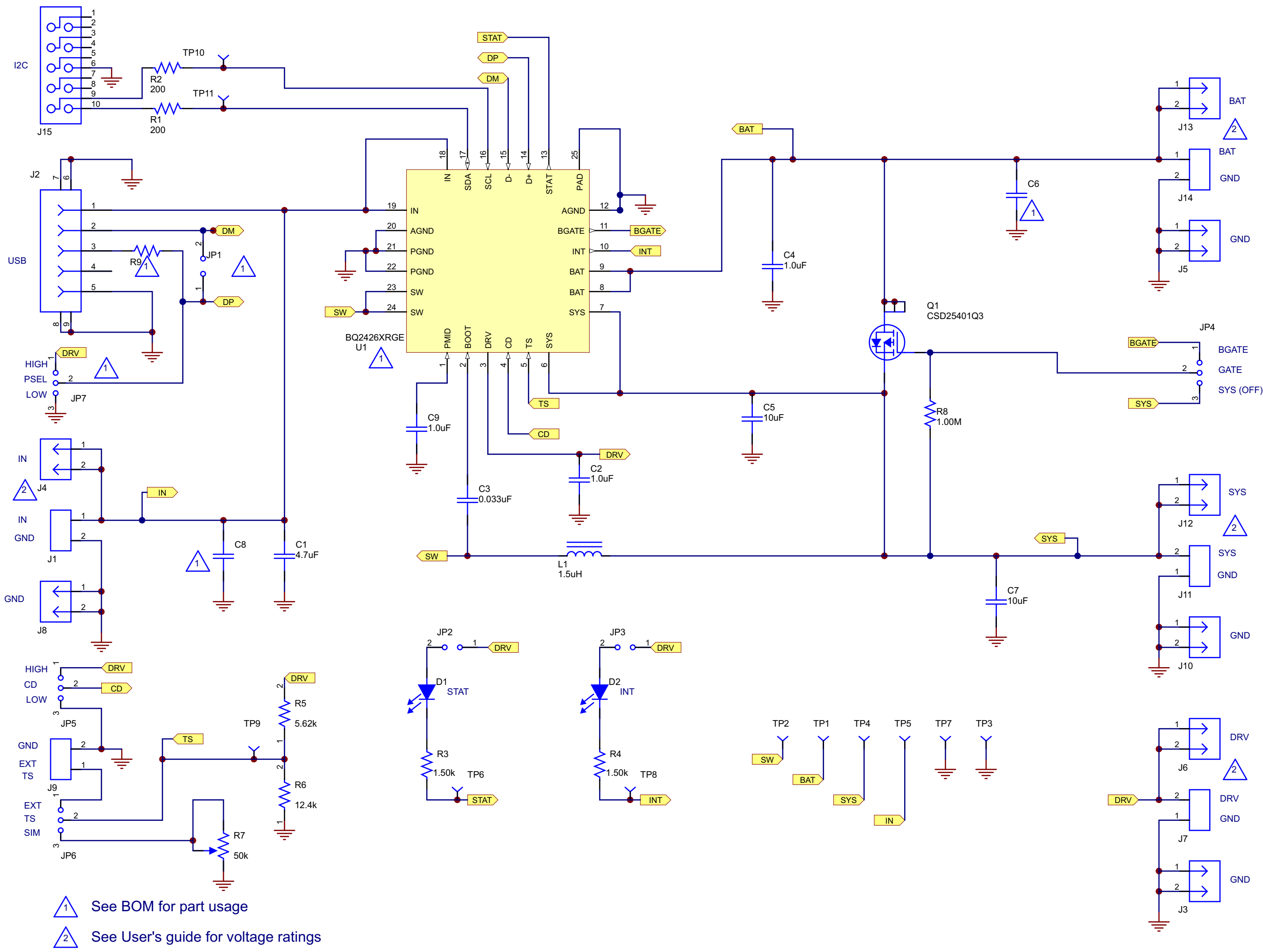

Figure 1. bq24260, bq24261, bq24262EVM Schematic

1.4 I/O Description

Header/Terminal Block	Description
J1– IN/GND	Input power positive and negative terminal
J2 – USB	USB mini-connector
J3 - GND	DRV linear regulator negative header
J4 - IN	Input power positive header
J5 - GND	Battery negative header
J6 - DRV	DRV linear regulator positive output
J7 - DRV/GND	DRV linear regulator positive and negative terminals
J8 - GND	Input power negative header
J9 - EXT TS/GND	External thermistor terminal
J10 - GND	SYS output negative header
J11 - SYS/GND	SYS output positive and negative terminal
J12 - SYS	SYS output positive header
J13 - BAT	Battery positive header
J14 - BAT/GND	Battery positive and negative header
J15 - USB-to-GPIO	USB-to-GPIO box keyed connector

1.5 Test Points

Test Point	Description
TP1	BAT
TP2	SW
TP3	GND
TP4	SYS
TP5	IN
TP6	STAT
TP7	GND
TP8	INT
TP9	TS
TP10	SCL
TP11	SDA

1.6 Control and Key Parameters Setting

Jumper	Description	Default Factory Setting
JP1	BQ24260 only: Shorting jumper for USB data lines DM (D-) and DP (D+). When shorted, USB input current limit defaults to 1.5 A. Otherwise, USB100 mode is selected.	SHORTED
JP2	Shorting jumper to connect DRV to anode of D1 STAT LED	SHORTED
JP3	Shorting jumper to connect DRV to anode of D1 INT LED	SHORTED
JP4	GATE = SYS: External PFET's gate tied to SYS and therefore disabled. GATE = BGATE: External PFET's gate tied to BGATE pin and therefore controlled by IC.	GATE = BGATE
JP5	CD = LO: Charge disable low for normal operation CD = HI: Charge disable high to disable the buck converter and enter Hi-Z mode	CD = LO
JP6	TS = SIM(INT): Connects a potentiometer to the TS pin so that the potentiometer can simulator a thermistor (that is, an internal, on-board thermistor). The potentiometer has been preset per R5 and R6 so that the TS voltage is 0.5 x V (DRV). TS = EXT: Connects the TS pin to an external thermistor through J9. The resistor divider formed by R5 and R6 has been sized to accommodate a 10-kΩ thermistor. If a different thermistor is used, R5 and R6 must be resized.	TS = SIM(INT)
JP7	bq24261 and bq24262 only PSEL = LO: Input current limit is set to 1.5 A until changed by I2C. PSEL = HI: For bq24261, input current limit is set to USB100 until changed by I2C. For bq24262, input current limit is set to USB500 until changed by I2C.	PSEL = HI

1.7 Recommended Operating Conditions

		Min	Typ	Max	Unit
Supply voltage, V_{IN}	Input voltage from ac adapter (bq24260)	4.2		10.0	V
Supply voltage, V_{IN}	Input voltage from ac adapter (bq24261)	4.2		13.2	
Supply voltage, V_{IN}	Input voltage from ac adapter (bq24262)	4.2		6.0	V
System voltage, V_{SYS}	Voltage output at SYS terminal ; depends on VBAT voltage and status of V_{INDPM})	3.4		VBATREG +3%	V
Battery voltage, V_{BAT}	Voltage output at VBAT terminal (registers set via I2C communication)	1.9	4.2	4.44	V
Supply current, $I_{IN(MAX)}$	Maximum input current from ac adapter input (registers set via I2C communication)	0.1		2.5	A
Fast charge current, $I_{CHRG(MAX)}$	Battery charge current (registers set via I2C communication)	0.500		3.0	A
Operating junction temperature range, T_J		-40		125	°C

2 Test Summary

This procedure describes one test configuration of the bq2426XEVM-611 evaluation board for bench evaluation.

2.1 Definitions

The following naming conventions are followed.

VXXX :	External voltage supply name (VADP, VBT, VSBT)
LOADW:	External load name (LOAD1, LOAD2)
V(TPyyy):	Voltage at internal test point TPyyy. For example, V(TP12) means the voltage at TP12.
V(Jxx):	Voltage at header Jxx
V(TP(XXX)):	Voltage at test point XXX. For example, V(ACDET) means the voltage at the test point which is marked as ACDET.
V(XXX, YYY):	Voltage across point XXX and YYY
I(JXX(YYY)):	Current going out from the YYY terminal of header XX
Jxx(BBB):	Terminal or pin BBB of header xx
JPx ON :	Internal jumper Jxx terminals are shorted
JPx OFF:	Internal jumper Jxx terminals are open
JPx (-YY-)	ON: Internal jumper Jxx adjacent terminals marked as YY are shorted
Measure: → A,B	Check specified parameters A,B. If measured values are not within specified limits, the unit under test has failed.
Observe → A,B	Observe if A,B occur. If they do not occur, the unit under test has failed.

The assembly drawings (Section 4.2) show locations for jumpers, test points, and individual components.

2.2 Recommended Test Equipment

2.2.1 Power Supplies

1. Power supply #1 (PS #1) capable of supplying 6 V at 3 A is required.
2. If not using a battery as the load, then power supply #2 (PS #2) capable of supplying up to 5 V at 5 A is required to power the circuit shown in Figure 2.

2.2.2 Load #1 Between BAT and GND

Testing with an actual battery is the best way to verify operation in the system. If a battery is not available, then a circuit similar to the one shown in Figure 2 can simulate a battery when connected to a power supply.

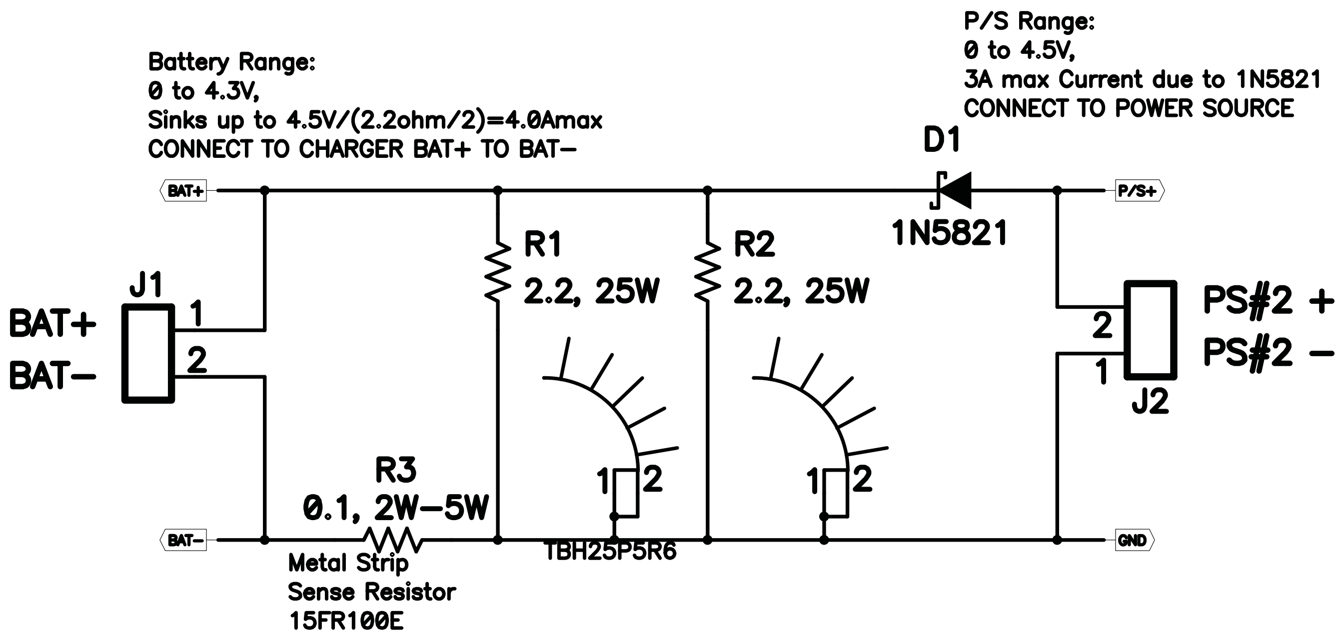

Figure 2. BAT_Load (PR1010) Schematic

2.2.3 Load #2 Between SYS and GND

Although not required, a resistive load capable of sinking up to 3 A can be used.

2.2.4 Meters

Four equivalent voltage meters (VM #) and two equivalent current meters (CM #) are required. The current meters must be able to measure 3-A current.

2.2.5 Computer

A computer with at least one USB port and a USB cable is required. The bq2416x evaluation software must be properly installed.

2.2.6 HPA172 Communication Kit (USB to GPIO)

An HPA172 USB-to-I^2C communication kit is required.

2.2.7 Software

Download BQ2416xSW.zip from the charger's product folder, unzip the file, and double-click on the SETUP.EXE file. Follow the installation steps.

Because the bq24260 and bq24261 have the watchdog timers enabled, it is recommended that you set the software's **Reset Watchdog Timer** to reset every 5 seconds. Otherwise, after 30 seconds of operation, the IC enters Default mode. Note that the 27-minute safety timer is not reset by this function and eventually times out if charging does not complete, unless the **Safety Timer Time Limit** is expanded or disabled via the GUI. One way to reset the safety timer is to allow the 30-second watchdog timer to expire. See Figure 3 in the data sheet (SLUSBA2) for more information about the timers.

Also, it is generally helpful to activate the **Write On Change** functions, in the upper left of the GUI window, to ON. The Write On Change function writes any changes to the GUI's check boxes, drop-down boxes, and registers to the IC. Otherwise, click the **WRITE** button to write changes to the software. It is recommended to periodically click the **READ** button to find the IC's instantaneous status. Alternatively, the **AutoRead** function can be activated to periodically update the GUI with the IC's status.

2.3 Recommended Test Equipment Setup

1. For all power connections, use short, twisted-pair wires of appropriate gauge wire for the amount of the current.
2. Set PS #1 for 6-V, 3-A current limit and then turn off the supply.
3. If BAT_Load as shown in Figure 1 is used, connect PS #2 set to approximately 3.6 V to the input side (PS #2±) of BAT_Load, then turn off PS #2.
4. Connect the output side of the battery or BAT_Load in series with the current meter (multimeter) #2 (CM #2) to J2 and J6 or J3 (BAT, GND). Ensure that a voltage meter is connected across J2 or TP3 and J6 or TP9 (BAT, GND).
5. Connect VM #3 across J10 or TP7 and J14 or TP9 (SYS, GND).
6. Connect VM #4 across J15 or TP5 and J14 or TP9 (DRV, GND).
7. Connect J17 to the HPA172 kit with the 10-pin ribbon cable. Connect the USB port of the HPA172 kit to the USB port of the computer. The connections are shown in Figure 3.

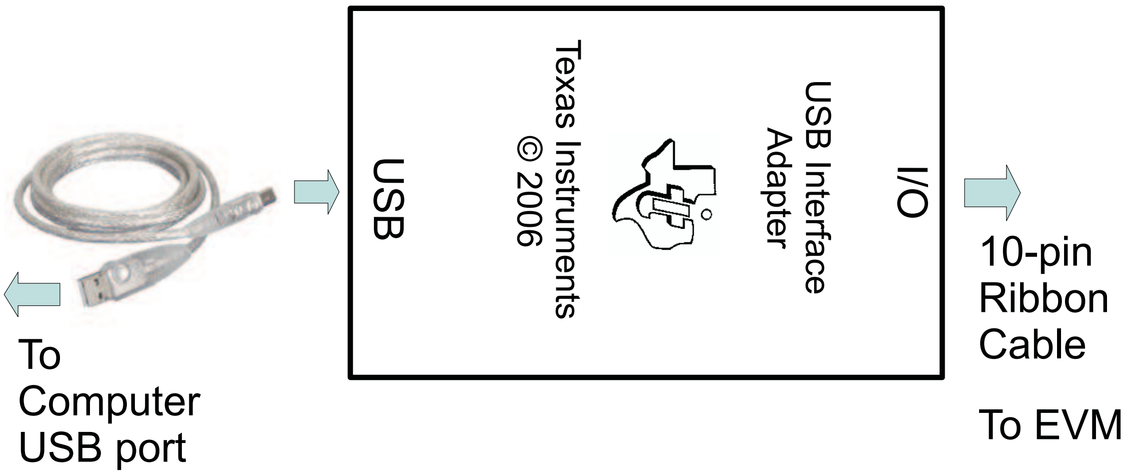

Figure 3. Connections of HPA172 Kit

8. Ensure jumpers are at the default factory settings per Section 1.6.

9. After the preceding steps have been performed, the test setup for bq2426XEVM-611 is configured as shown in Figure 4.

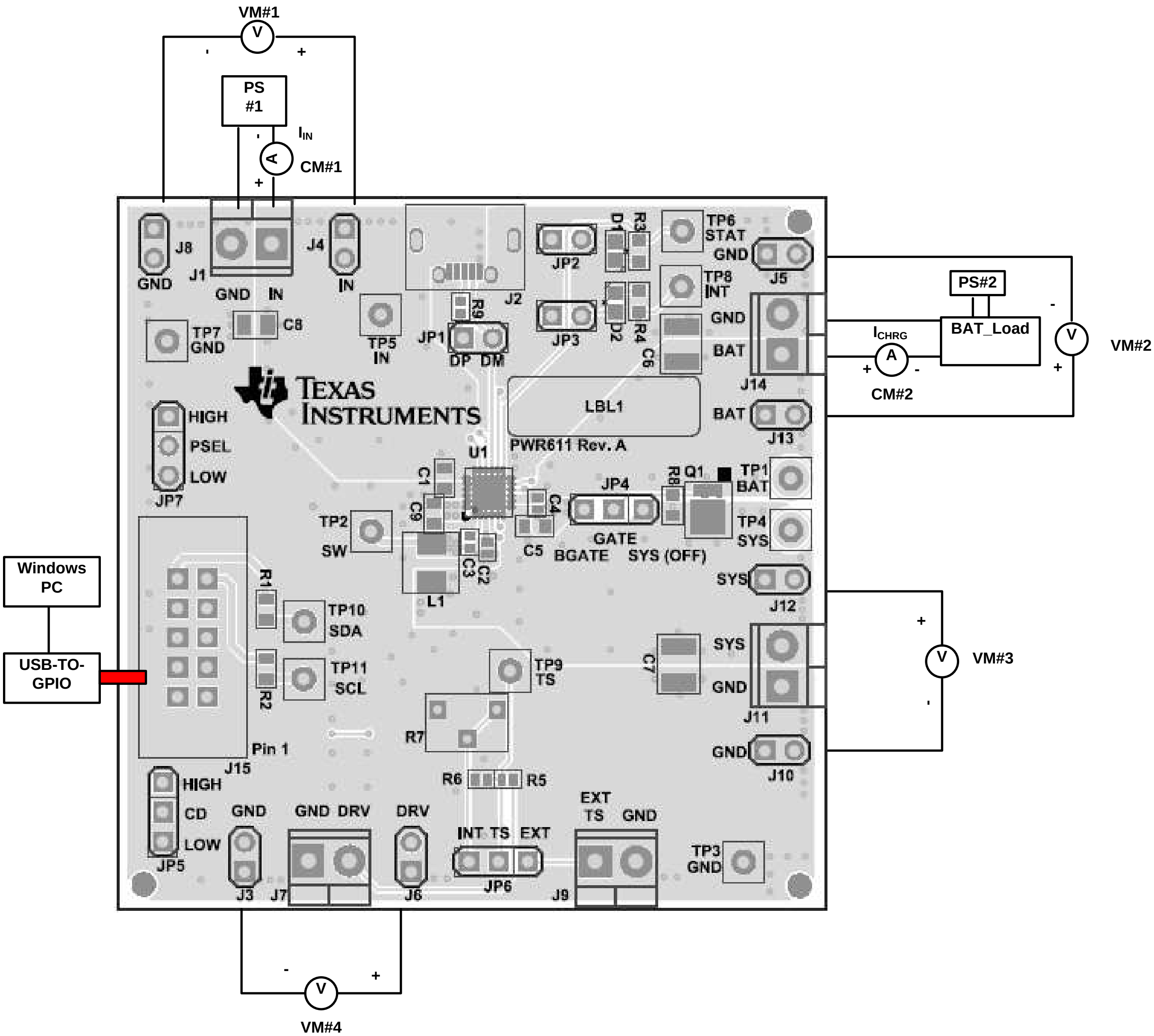

Figure 4. Original Test Setup for bq24260, bq24261, bq24262 EVM

10. Turn on the computer. Open the bq2426x evaluation software. The main window of the software is shown in Figure 5.

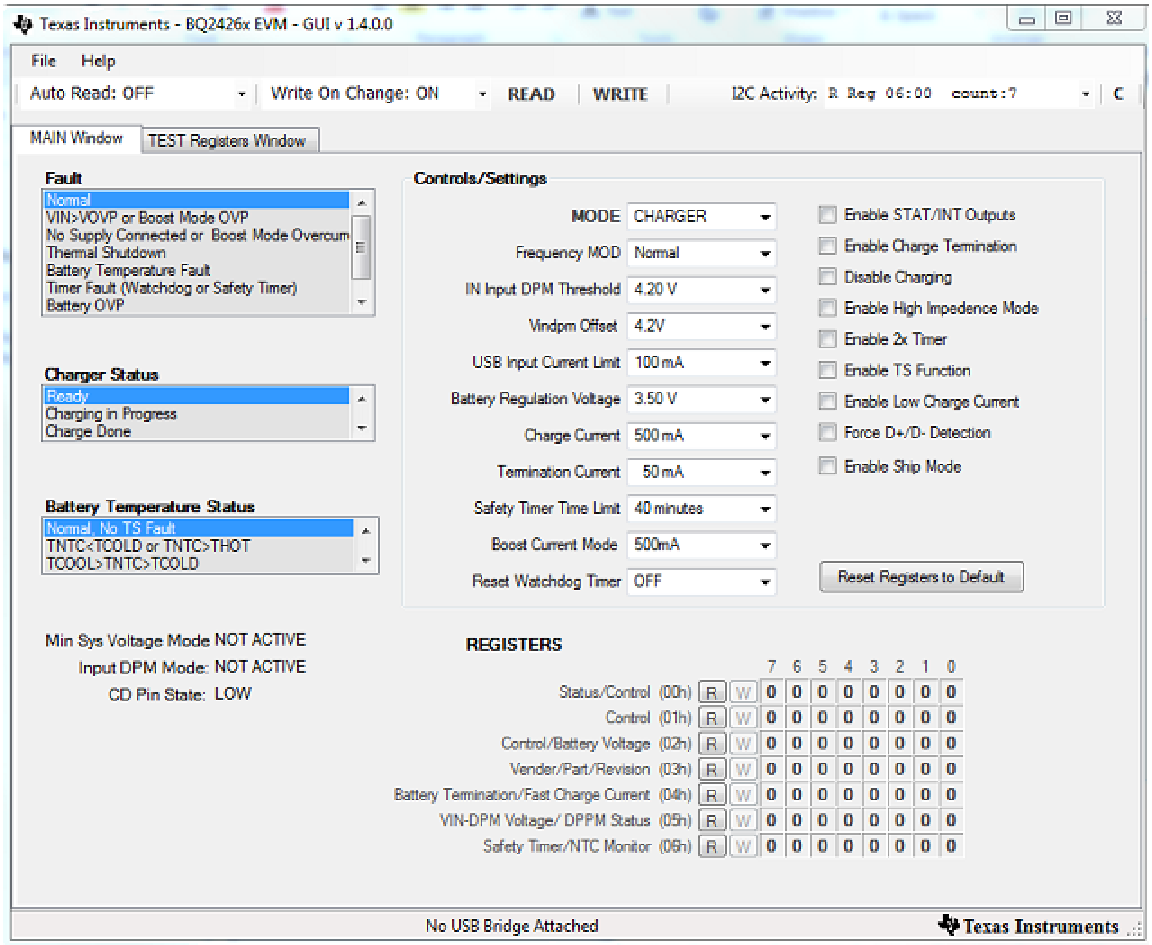

Figure 5. Main Window of the bq2426xSW Evaluation Software

2.4 Recommended Test Procedure

It is best to evaluate the IC with a real battery attached to the BAT pin. If no battery is available, the following test procedure, with explanation on how to simulate a battery with a second power supply and load board previously presented, may be useful for evaluating the charger IC.

2.4.1 Charge Voltage and Current Regulation of IN in HOST mode

1. Ensure that the steps listed in Section 2.3 are followed.
2. Ensure that the shunts are installed to the default values per Section 1.6.
3. Connect the output of PS #1, with at least a 4-A current limit setting, in series with CM #1 to J1 as shown in Figure 4.
4. Connect VM #1 across J4 and J3 or TP5 and/or TP7 (IN, GND).
5. Connect either a real single-cell lithium ion battery or battery simulator across J14 or J13/J5 (BAT, GND) with CM #2 in series as shown in Figure 4. If using a battery simulator like the one shown in Figure 2 and referred to as BAT_LOAD in Figure 4, configure PS #2 with at least 4-A current limit for 3.4 V.
6. Install VM #1 across J4 and J3 or TP5 and TP7 (IN and GND).
7. Install VM #2 across J13 and J5 or TP1 and TP7 (BAT and GND).
8. Install VM #3 across J12 and J10 or TP4 and TP7 (SYS and GND).

9. VM #4 is optional.
10. Turn on PS #1 and PS #2, if used.
11. Software setup:
    - Press the **READ** button to obtain the current settings.
    - Set **Write On Change** to ON, if not already set.
    - Set **Reset Watchdog Timer** to reset every 5 seconds.
    - Uncheck **Disable Charging**, if checked.
    - Check **Enable STAT/INT Outputs**.
    - Set **Battery Regulation Voltage** to 4.20 V.
    - Set **Input Current Limit** to 2.5 A.
    - Set **Charge Current** to 2000 mA.
    - Click the **READ** button at the top of the window and confirm that the previous settings remain.
12. Test the charge current regulation by adjusting the PS #1 power supply so that VM #1 still reads 5 V and PS #2 so that the voltage measured by VM #2 is 3.6 V.

    Measure on CM #2 → I_{CHRG} = 2000 mA ±100 mA.

    Measure on CM #1 → I_{IN} < 1600 mA.
13. Test the input current limit by lowering the software's **Input Current Limit** setting to 900 mA then readjusting PS #1 so that VM #1 reads 5 V and PS #2 reads 3.6 V.

    Measure on CM #2 → I_{CHRG} < 2000 mA.

    Measure on CM #1 → I_{IN} = 800 mA – 900 mA.
14. Test the minimum system voltage and DPPM by returning the software's **Input Current Limit** setting to 2500 mA then lowering PS #2 until VM #2 reads 3.3 V. Add an external resistive or constant current load across J13 and J5 that does not draw more than 2.5 A from SYS.

    Measure on VM #3 → 3.44 V – 3.55 V.

    Measure on CM #2 → I_{CHRG} = 2000 mA ±100 mA minus the load current on SYS.
15. Test the V_{INDPM} function by removing the load on SYS, adjusting PS #1 so that VM #1 reads 5 V, adjusting PS# 2 so that VM #2 reads 3.6 V and then lowering the current limit setting on PS #1 to below the software's **Charge Current** setting.

    Measure on VM #1 → V_{IN} = software's V_{INDPM} level (default of 4.2 V).

    Measure on CM #2 → I_{CHRG} < 2000 mA.
16. Test battery regulation and charge termination by returning the PS #1 current limit to 4-A and confirming that the software's **Enable Termination** box is checked, then, slowly increase PS #2 until VM #2 reaches 4.2 V.

    Measure on CM #2 → I_{CHRG} slowly tapers to the software's I_{TERM} setting (default of 150 mA) and then drops to zero.

    Observe → LEDs turn off.
17. Test battery supplement mode by lowering PS #2 until VM #2 reads 3.6 V. Add an external resistive or constant current load across J13 and J5 that draws more than 3 A from SYS.

    Measure on VM #4 → 3.6 V – $I_{BATSUP} \times R_{DS(ON)(BATFET)}$.

    Measure on #2 → $I_{CHRG} = -I_{BATSUP}$.
18. Turn off PS #1 and PS #2.

2.4.2 Helpful Hints

1. The leads and cables to the various power supplies have resistance. The current meters also have series resistance. Therefore, voltmeters must be used to measure the voltage as close to the IC pins as possible instead of relying on each supply's digital measurement.
2. When using a sourcemeter that can source and sink current as your battery simulator, it is highly recommended to add a large (1000 µF+) capacitor at the EVM BAT and GND connectors in order to prevent oscillations at the BAT pin due to mismatched impedances of the charger output and sourcemeter input within their respective regulation loop bandwidths. Configuring the sourcemeter for 4-wire sensing eliminates the need for a separate voltmeter to measure the voltage at the BAT pin. When using 4-wire sensing, always ensure that the sensing leads are connected first in order to prevent accidental overvoltage by the power leads.
3. For precise measurements of charge current and battery regulation near termination, remove the current meter in series with the battery or battery simulator. An alternate method for measuring charge current is to either use an oscilloscope with hall effect current probe or place a 1% or better, thermally capable (for example, 0.010 Ω in 1206 or larger footprint) resistor in series between the BAT pin and battery and measure the voltage across that resistor.

3 Printed-Circuit Board Layout Guideline

Use the following guidelines for PCB layout:

1. To obtain optimal performance, the power input capacitors, connected from the PMID input to PGND, must be placed as close as possible to the IC.
2. Place 4.7-µF input capacitor as close to PMID pin and PGND pin as possible to make the high-frequency current loop area as small as possible. Place 1-µF input capacitor GNDs as close to the respective PMID capacitor GND and PGND pins as possible to minimize the ground difference between the input and PMID.
3. The local bypass capacitor from SYS to GND must be connected between the SYS pin and PGND of the IC. The intent is to minimize the current path loop area from the SW pin through the LC filter and back to the PGND pin.
4. Place all decoupling capacitors close to their respective IC pins and as close as possible to PGND (do not place components such that routing interrupts power stage currents). All small control signals must be routed away from the high-current paths.
5. The PCB must have a ground plane (return) connected directly to the return of all components through vias (two vias per capacitor for power-stage capacitors, one via per capacitor for small-signal components). It is also recommended to put vias inside the PGND pads for the IC, if possible. A star ground design approach is typically used to keep circuit block currents isolated (high-power/low-power small-signal) which reduces noise-coupling and ground-bounce issues. A single ground plane for this design gives good results. With this small layout and a single ground plane, no ground-bounce issue exists, and having the components segregated minimizes coupling between signals.
6. The high-current charge paths into IN, USB, BAT, SYS, and from the SW pins must be sized appropriately for the maximum charge current in order to avoid voltage drops in these traces. The PGND pins must be connected to the ground plane to return current through the internal low-side FET.
7. For high-current applications, the balls for the power paths must be connected to as much copper in the board as possible. This allows better thermal performance because the board conducts heat away from the IC.

4 Bill of Materials and Board Layout

4.1 Bill of Materials

Table 1 contains the bill of materials for this EVM.

Table 1. Bill of Materials - PWR611

-001	-002	-003	Designator	Description	Manufacturer	PartNumber
1	1	1	!PCB	Printed Circuit Board	Any	PWR611
1	1	1	C1	Capacitor, Ceramic, 25V, X5R, 20%	TDK	C1608X5R1E475M
1	1	1	C2	Capacitor, Ceramic, 6.3V, X5R, 10%	TDK	C1005X5R0J105K
1	1	1	C3	Capacitor, Ceramic, 25V, X5R, 10%	TDK	C1005X5R1E333K
1	1	1	C4	Capacitor, Ceramic, 6.3V, X5R, 10%	TDK	C1005X5R0J105K
1	1	1	C5	Capacitor, Ceramic, 10V, X5R, 20%	TDK	C1608X5R1A106M
0	0	0	C6	Capacitor, Ceramic Chip,	Std	Std
1	1	1	C7	Capacitor, Ceramic, 10V, X5R, 20%	Taiyo Yuden	LMK325BJ106MD-T
0	0	0	C8	Capacitor, Ceramic Chip	STD	STD
1	1	1	C9	Capacitor, Ceramic, 25V, X5R, 10%	TDK	C1608X5R1E105K080AC
1	1	1	D1	Diode, LED, Green, 2.1-V, 20-mA, 6-mcd	Lite On	LTST-C190GKT
1	1	1	D2	Diode, LED, Red, 2.1-V, 20-mA, 6-mcd	Lite On	LTST-C190CKT
1	1	1	J1	Terminal Block, 2-pin, 6-A, 3.5mm	OST	ED555/2DS
1	1	1	J10	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J11	Terminal Block, 2-pin, 6-A, 3.5mm	OST	ED555/2DS
1	1	1	J12	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J13	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J14	Terminal Block, 2-pin, 6-A, 3.5mm	OST	ED555/2DS
1	1	1	J15	Connector, Male Straight 2x5 pin, 100mil spacing, 4 Wall	3M	N2510-6002RB
1	1	1	J2	Connector, USB Micro, Type AB	Hirose	ZX62D-AB-5P8
1	1	1	J3	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J4	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J5	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J6	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J7	Terminal Block, 2-pin, 6-A, 3.5mm	OST	ED555/2DS
1	1	1	J8	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	J9	Terminal Block, 2-pin, 6-A, 3.5mm	OST	ED555/2DS
1	0	0	JP1	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	JP2	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	JP3	Header, Male 2-pin, 100mil spacing,	Sullins	PEC02SAAN
1	1	1	JP4	Header, Male 3-pin, 100mil spacing,	Sullins	PEC03SAAN

Table 1. Bill of Materials - PWR611 (continued)

-001	-002	-003	Designator	Description	Manufacturer	PartNumber
1	1	1	JP5	Header, Male 3-pin, 100mil spacing,	Sullins	PEC03SAAN
1	1	1	JP6	Header, Male 3-pin, 100mil spacing,	Sullins	PEC03SAAN
0	1	1	JP7	Header, Male 3-pin, 100mil spacing,	Sullins	PEC03SAAN
1	1	1	L1	Inductor, I_R=3.1A, I_{SAT}=3.5A, 59 mΩ typ Inductor, I_R=3.3A, I_{SAT}=4.1A, 64 mΩ typ Inductor, I_R=3.0A, I_{SAT}=4.0A, 55 mΩ typ	TDK Toko Wurth Elektronik	SPM4012T-1R5M/ Alt: FDSD0415-H-1R5M Alt:S13100073
1	1	1	Q1	MOSFET, PChan, -20V, 60A, 8.7 milliOhm	TI	CSD25401Q3
1	1	1	R1	Resistor, Chip, 1/16W, 1%	Vishay	CRCW0603200RFKEA
1	1	1	R2	Resistor, Chip, 1/16W, 1%	Vishay	CRCW0603200RFKEA
1	1	1	R3	Resistor, Chip, 1/16W, 5%	Vishay	CRCW06031K50FKEA
1	1	1	R4	Resistor, Chip, 1/16W, 5%	Vishay	CRCW06031K50FKEA
1	1	1	R5	Resistor, Chip, 1/16W, 1%	Vishay	CRCW04025K62FKED
1	1	1	R6	Resistor, Chip, 1/16W, 1%	Vishay	CRCW040212K4FKED
1	1	1	R7	Potentiometer, 3/8 Cermet, Single-Turn	Bourns	3266W-1-503LF
1	1	1	R8	Resistor, Chip, 1/16W, 1%	Vishay	CRCW06031M00FKEA
1	0	0	R9	Resistor, Chip, 1/16W, 1%	Vishay	CRCW04020000Z0ED
1	0	0	SH-JP1	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
1	1	1	SH-JP2	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
1	1	1	SH-JP3	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
1	1	1	SH-JP4	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
1	1	1	SH-JP5	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
1	1	1	SH-JP6	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
0	1	1	SH-JP7	Shunt, 100mil, Gold plated, Black	3M	969102-0000-DA
1	1	1	TP1	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP10	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP11	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP2	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP3	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP4	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP5	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP6	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP7	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP8	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	1	1	TP9	Test Point, White, Thru Hole Color Keyed	Keystone	5002
1	0	0	U1	3A, 30V, Host-Controlled Single-Input, Single Cell Switchmode Li-Ion Battery Charger with Power Path Management and USB-OTG Support, RGE0024H	Texas Instruments	BQ24260RGE
0	1	0	U1	3A, 30V, Host-Controlled Single-Input, Single Cell Switchmode Li-Ion Battery Charger with Power Path Management and USB-OTG Support, RGE0024H	Texas Instruments	BQ24261RGE

Table 1. Bill of Materials - PWR611 (continued)

-001	-002	-003	Designator	Description	Manufacturer	PartNumber
0	0	1	U1	3A, 30V, Host-Controlled Single-Input, Single Cell Switchmode Li-Ion Battery Charger with Power Path Management and USB-OTG Support, RGE0024H	Texas Instruments	BQ24262RGE

4.2 Board Layout

Figure 6 through Figure 10 illustrate the PCB layouts for this EVM.

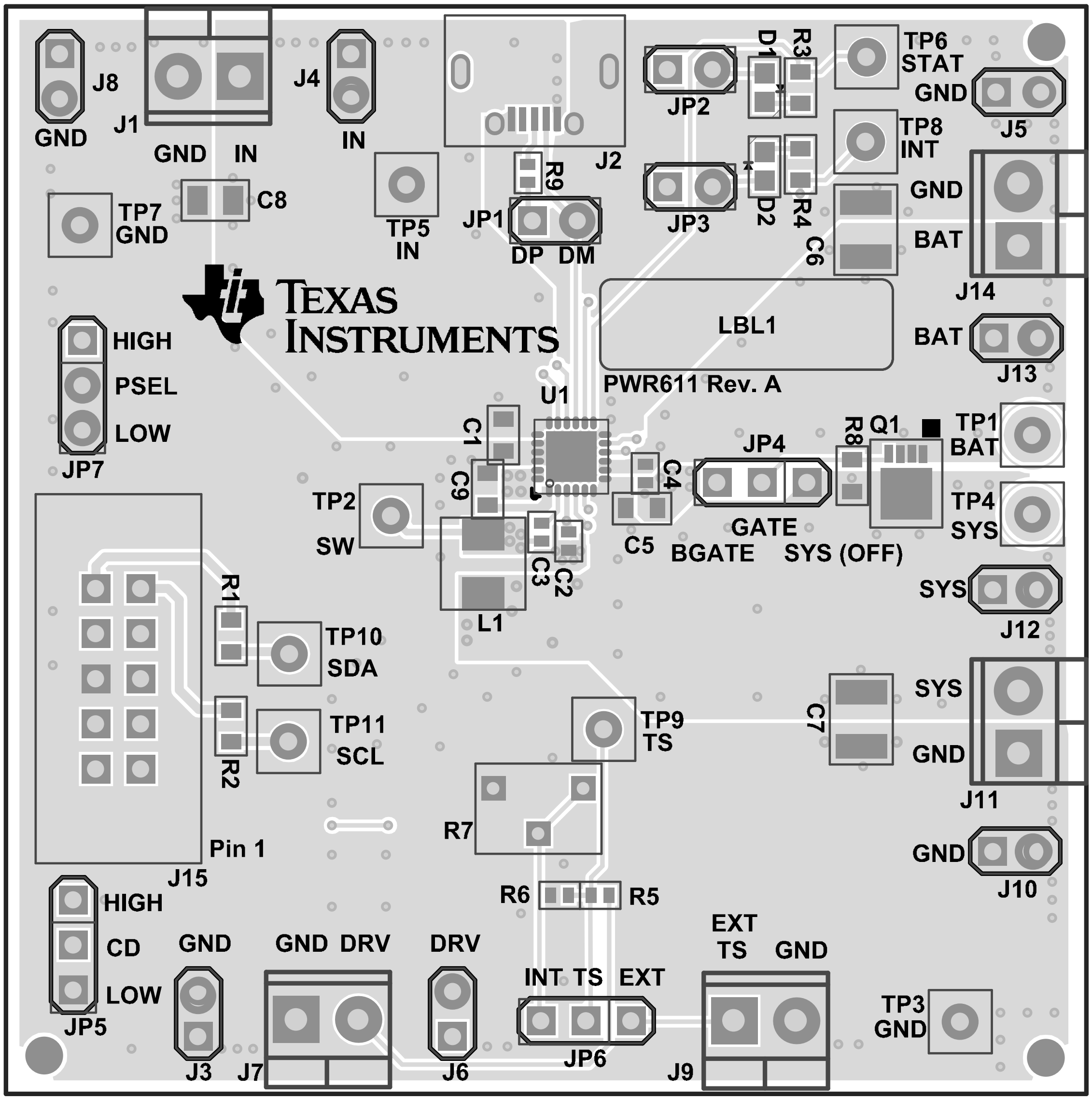

Figure 6. Top Assembly Layer

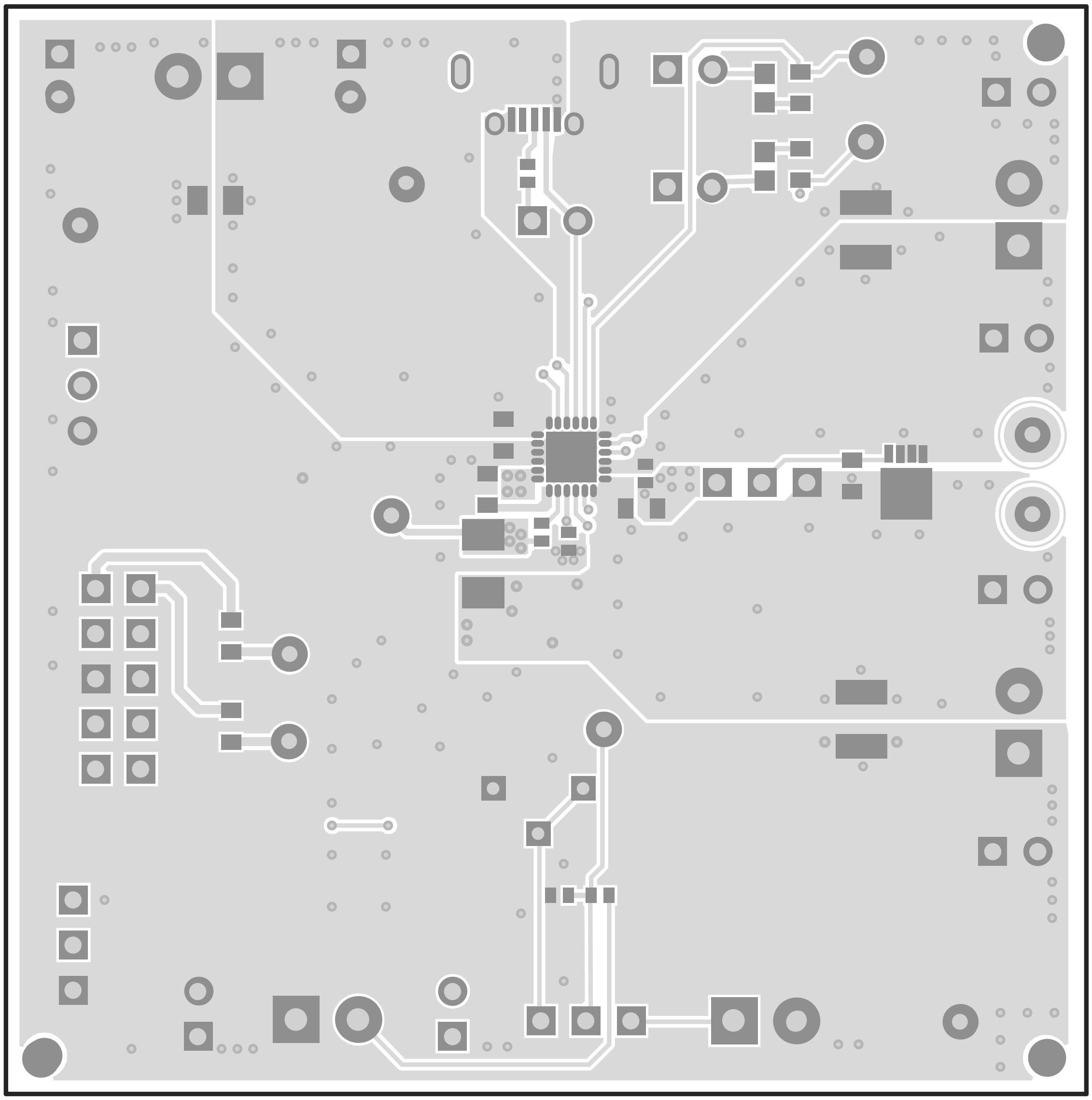

Figure 7. Top Layer

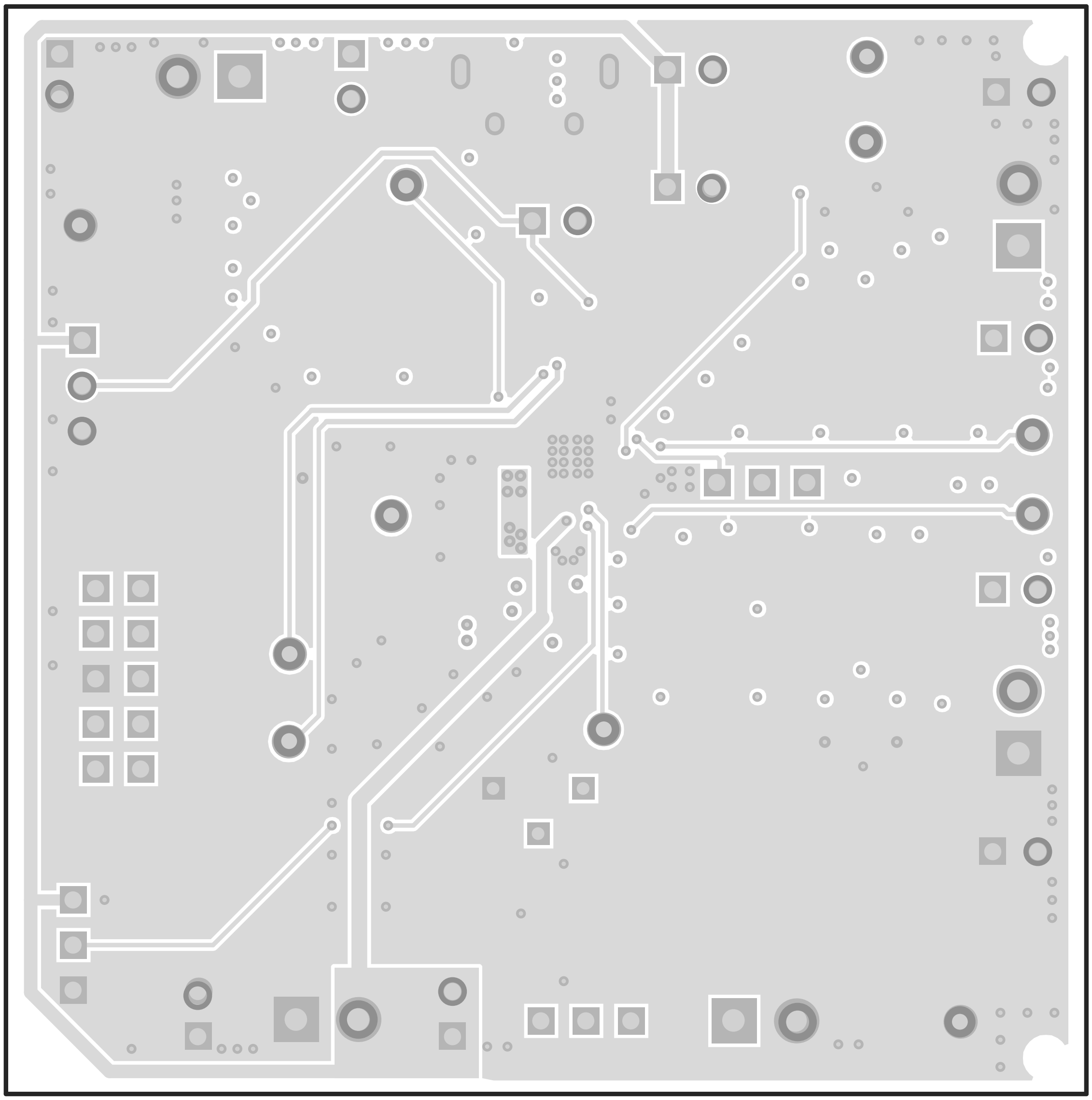

Figure 8. First Internal Layer

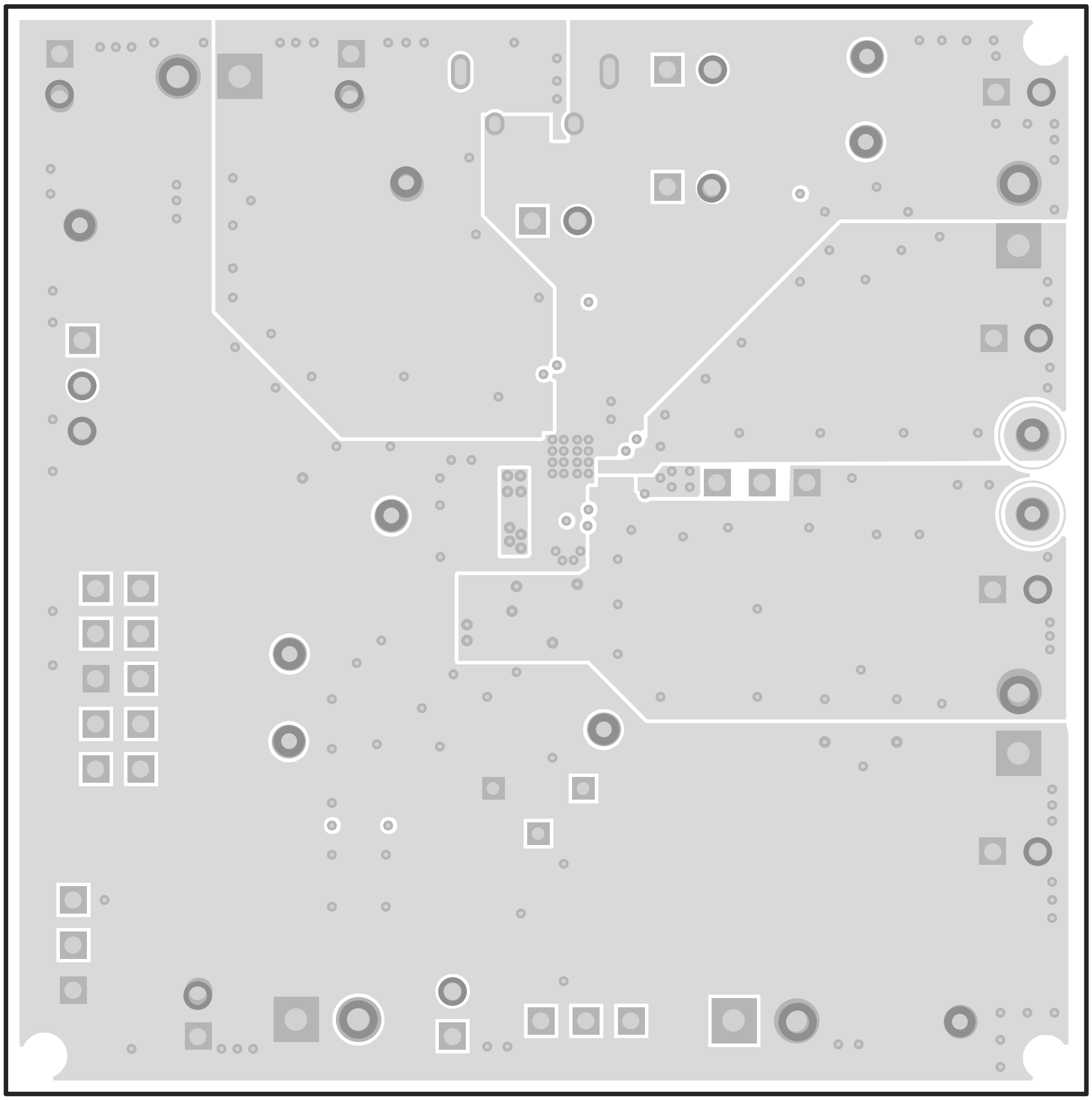

Figure 9. Second Internal Layer

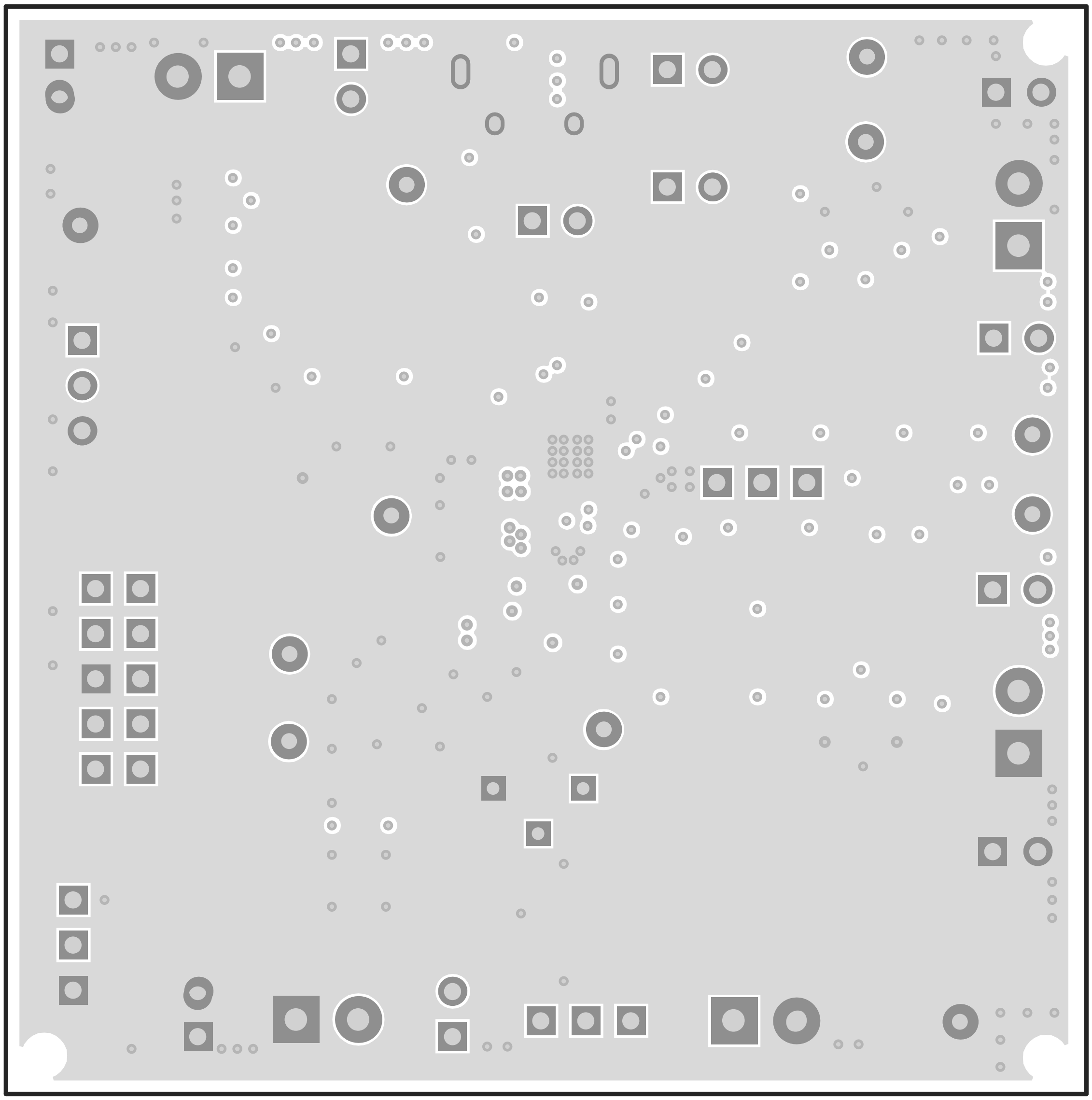

Figure 10. Bottom Layer

Revision History

Changes from Original (February 2014) to A Revision	Page
• Changed content in the bill of materials.	13

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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10. User has sole responsibility to ensure the safety of any activities to be conducted by it and its employees, affiliates, contractors or designees, with respect to handling and using EVMs. Further, user is responsible to ensure that any interfaces (electronic and/or mechanical) between EVMs 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.
11. User shall employ reasonable safeguards to ensure that user’s use of EVMs will not result in any property damage, injury or death, even if EVMs should fail to perform as described or expected.
12. User shall be solely responsible for proper disposal and recycling of EVMs consistent with all applicable federal, state, and local requirements.

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Safety-Critical or Life-Critical Applications. If user intends to use EVMs in evaluations of safety critical applications (such as life support), and a failure of a TI product considered for purchase by user for use in user’s product would reasonably be expected to cause severe personal injury or death such as devices which are classified as FDA Class III or similar classification, then user must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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General Statement for EVMs including a radio

User Power/Frequency Use Obligations: For EVMs including a radio, the radio included in such EVMs is intended for development and/or professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability in such EVMs and their development application(s) must comply with local laws governing radio spectrum allocation and power limits for such EVMs. It is the user’s sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by TI unless user has obtained appropriate experimental and/or development licenses from local regulatory authorities, which is the sole responsibility of the user, including its acceptable authorization.

U.S. Federal Communications Commission Compliance

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 could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

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 its own expense.

FCC Interference Statement for Class B EVM devices

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.

Industry Canada Compliance (English)

For EVMs Annotated as IC – INDUSTRY CANADA Compliant:

This Class A or B digital apparatus complies with Canadian ICES-003.

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

Concerning EVMs Including Radio Transmitters

This device complies with Industry Canada licence-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.

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.

Canada Industry Canada Compliance (French)

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

Important Notice for Users of EVMs Considered "Radio Frequency Products" in Japan

EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If user uses EVMs in 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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