

bq24745/7 EVM (HPA272) for Multi Cell Synchronous Switch-Mode Charger

Contents

| | | |
|---|--|----|
| 1 | Introduction | 2 |
| | 1.1 EVM Features | 2 |
| | 1.2 General Description | 2 |
| | 1.3 EVM Connection Descriptions | 2 |
| | 1.4 Controls and Key Parameters Setting | 3 |
| | 1.5 Recommended Operating Conditions | 3 |
| 2 | Test Summary | 3 |
| | 2.1 Test Procedure Naming Conventions | 4 |
| | 2.2 Required Equipment and Software | 4 |
| | 2.3 Software Installation | 4 |
| | 2.4 Equipment Setup | 5 |
| | 2.5 Test Procedures | 8 |
| 3 | PCB Layout Guidelines | 10 |
| 4 | Bill of Materials, Board Layout, and Schematic | 11 |
| | 4.1 Bill of Materials | 11 |
| | 4.2 Board Layout | 13 |
| | 4.3 Schematic | 20 |

List of Figures

| | | |
|----|---|----|
| 1 | EV2300 Kit Connections | 5 |
| 2 | bq24745/7 EVM Original Test Setup | 6 |
| 3 | bq24745/7 SMB Evaluation Software (Main Window) | 7 |
| 4 | bq24745/7 EVM (HPA272) Test Setup | 9 |
| 5 | Top Routing Layer..... | 14 |
| 6 | Second Routing Layer | 15 |
| 7 | Third Routing Layer | 16 |
| 8 | Bottom Routing Layer..... | 17 |
| 9 | Top Assembly..... | 18 |
| 10 | Bottom Assembly | 19 |
| 11 | Top Silkscreen | 19 |
| 12 | bq24745/7 EVM Schematic (Sheet 1 of 2)..... | 21 |
| 13 | bq24745/7 EVM Schematic (Sheet 2 of 2)..... | 21 |

List of Tables

| | | |
|---|--|----|
| 1 | bq24745/7 EVM Connections | 2 |
| 2 | Controls and Key Parameters | 3 |
| 3 | Recommended Operating Conditions | 3 |
| 4 | Required Equipment and Software | 4 |
| 5 | bq24745/7EVM Bill of Materials | 11 |

1 Introduction

1.1 EVM Features

- Evaluation Module For bq24745/7
- High Efficiency NMOS-NMOS Synchronous Buck Charger With 300 kHz Frequency
- User-selectable 2-cell, 3-cell, or 4-cell Li-ion Battery Voltage
- Programmable Battery Voltage, Charge Current, and AC Adapter Current via SBS-Like SMBus Interface
- AC Adapter Operating Range 18 V to 22 V
- LED Indication for Control and Status Signals.
- Test Points for Key Signals Available for Testing Purpose. Easy Probe Hook-up.
- Jumpers Available. Easy to Change Connections.

1.2 General Description

The bq24745/7 evaluation module is a complete charger module for evaluating a multi-cell synchronous notebook charge using the bq24745/7 devices. It is designed to deliver up to 8 A of charge current to Li-Ion or Li-Pol applications.

The bq24745/7 has a highly integrated battery charge controller designed to work with external host commands. The charge voltage, charge current, and input current are programmable using an SBS-like SMBus interface.

The dynamic power management (DPM) function modifies the charge current depending on system load conditions, avoiding ac adapter overload. High accuracy current sense amplifiers enable accurate measurement of the ac adapter current, allowing monitoring of overall system power.

For complete specifications and details, see bq24745 data sheet ([SLUS761](#)) and bq24747 data sheet ([SLUS988](#)).

1.3 EVM Connection Descriptions

Table 1. bq24745/7 EVM Connections

| Jack | Description | |
|----------|--|---------------|
| J1-ACPWR | AC adapter, positive output | |
| J1-GND | AC adapter, negative output | |
| J2-CE | CE pin output | |
| J2-SDA | SDA pin output, SMBus data line | |
| J2-SCL | SCL pin output, SMBus clock line | |
| J3-VEXT | External power supply, positive output | |
| J3-GND | External power supply, negative output | |
| J4-ACOK | ACOK pin | |
| J4-ICOUT | ICOUT pin | |
| J4-VICM | VICM pin | |
| J4-VREF | IC reference voltage VREF | |
| J5-1 | ACDRV | ACDRV signal |
| J5-2 | | LED drive |
| J6-1 | BATDRV | BATDRV signal |
| J6-2 | | LED drive |
| J7-1 | DIS CHG | CE pin |
| J7-2 | | GND |
| J8-HI | Pull-up voltage source | |

Table 1. bq24745/7 EVM Connections (continued)

| Jack | Description | |
|-----------|---------------------------------|---------------|
| J8-LEDPWR | LED Pull-up power line | |
| J9-VREF | IC reference voltage VREF | |
| J9-VDDSMB | VDDSMB pin | |
| J9-EXT | External voltage supply from J3 | |
| J10-GND | Ground | |
| J10-BAT | Connected to battery pack | |
| J10-SYS | Connected to system | |
| J11-1 | BYPASS | BYPASS signal |
| J11-2 | | LED drive |

1.4 Controls and Key Parameters Setting

Table 2. Controls and Key Parameters

| Jack | Description | Factory Setting |
|------|--|--------------------------------|
| J5 | Conduction of the AC MOSFET indicated when LED lights | Jumper On |
| J6 | Conduction of the battery MOSFET indicated when LED lights | Jumper On |
| J7 | Disable charge process when on | Jumper On |
| J8 | Pull-up power source supplies the LEDs when on LED has no power source when off | Jumper On |
| J9 | VDDSMB voltage source setting 1-2 : Connect VREF to VDDSMB 2-3 : Connect external voltage source to VDDSMB | Jumper on 2-3 (EXT and VDDSMB) |
| J11 | Conduction of the BYPASS MOSFET indicated when LED lights | Jumper On |

1.5 Recommended Operating Conditions

Table 3. Recommended Operating Conditions⁽¹⁾

| Parameter | Description | MIN | TYP | MAX | Unit |
|------------------|--------------------------------------|-----|-----------|-----|------|
| V _{IN} | Supply voltage | 18 | 19 | 22 | V |
| V _{BAT} | Battery voltage | 0 | 3 to 16.8 | 20 | V |
| I _{AC} | Supply current | 0 | | 4.5 | A |
| I _{chg} | Charge current | 2 | 3 to 4 | 8 | A |
| T _J | Operating junction temperature range | 0 | | 125 | °C |

⁽¹⁾ For complete specifications and details, see the bq24745 data sheet ([SLUS761](#)) and bq24747 data sheet ([SLUS988](#)).

2 Test Summary

This section describes how to configure the bq24745/7 evaluation board and provides:

- [Test Procedure Naming Conventions](#)
- [Required Equipment and Software](#)
- [Equipment Setup](#)
- [Software Installation](#)
- [Test Procedures](#)

2.1 Test Procedure Naming Conventions

See the [bq24745/7 schematic](#) for details. On the test procedure these naming conventions are used.

| | |
|---------------|--|
| VXXX | External voltage supply name (VADP, VBT, VSBT) |
| LOADW | External load name (LOADR, LOADI) |
| V(TPyyy) | Voltage at internal test point TPyyy. For example, V(TP12) means the voltage at TP12. |
| V(Jxx) | Voltage at jack terminal Jxx |
| V(TP(XXX)) | Voltage at test point "XXX". For example, V(ACDET) means the voltage at the test point which is marked as <i>ACDET</i> . |
| V(XXX, YYY) | Voltage across point XXX and YYY. |
| I(JXX(YYY)) | Current going out from the YYY terminal of jack XX |
| Jxx(BBB) | Terminal or pin BBB of jack xx |
| Jxx ON | Internal jumper Jxx terminals are shorted |
| Jxx OFF | Internal jumper Jxx terminals are open |
| Jxx (-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. |

[Assembly drawings](#) have the locations for jumpers, test points, and individual components.

2.2 Required Equipment and Software

Table 4. Required Equipment and Software

| CATEGORY | NUMBER | DESCRIPTION of REQUIRED ITEM |
|--------------------|--------------------------|--|
| Power Supplies | PS#1 | Can supply 20 V at 5 A |
| | PS#2 | Can supply 5 V at 1 A |
| | PS#3 | Can supply 20 V at 5 A |
| Loads | Number 1 | A 30 V (or greater), 5 A (or greater) electronic load that can operate at constant current mode |
| | Number 2 | An HP 6060B (3 to 60 V) / (0 to 60 A), 300 W system DC electronic load, or equivalent |
| Meters | Set #1 | Seven Fluke 75 multimeters, (equivalent or better) |
| | Alternative set | Four equivalent voltage meters and three equivalent current meters. Current meters must be capable of measuring 5 A current, or greater. |
| Computer | One | One USB port, with a USB cable Operating System: Windows 2000 or Windows XP |
| Communications Kit | One | EV2300 SMBUS Kit that supports SMB four-wire communications |
| Software | EV2300 USB driver | File: Driver(USB EV2300) Installer XP2K-Last updated Jan28-04.zip |
| | bq24745/7 SMB evaluation | File: bq24745bench_v141.zip |

2.3 Software Installation

To install the two software packages necessary to perform the test procedures, use this procedure:

1. Save and unzip the EV2300 USB driver, **Driver(USB EV2300) Installer XP2K-Last updated Jan28-04.zip** filename, to a temporary directory (*c:\temp* or another directory).
2. Double-click on the **setup.exe** installation file.
3. Follow steps displayed by the Installshield wizard that include license agreement, installation directory selection, and completion.
4. Save and unzip the bq24745/7 SMB evaluation, **bq24745bench_v141.zip** filename, to a temporary

directory (c:\temp or another directory).

5. Double-click on the **setup.exe** installation file.
6. Follow steps displayed by the Installshield wizard that include license agreement, installation directory selection, and completion.

2.4 Equipment Setup

1. Set power supply #1 to 0 V ± 100 mVDC, 5.0 ± 0.1 A current limit and then turn off the power supply.
2. Connect the output of power supply #1 in series with a current meter (multimeter) to J1 (VIN, GND).
3. Connect a voltage meter across J1 (VIN, GND).
4. Set power supply #2 to 3.3 V ± 100 mVDC, 1.0 ± 0.1 A current limit and then turn off the power supply.
5. Connect the output of the power supply #2 to J3 (VEXT, GND).
6. Turn off Load #1.
7. Turn off Load #2.
8. Connect a voltage meter across J10 (BAT, GND).
9. Connect a voltage meter across J10 (SYS, GND).
10. Connect J2 (SDA, SCL) and J3 (GND) to the EV2300 kit *SMB* port. Connect the USB port of the EV2300 kit to the USB port of the computer. The connections are shown in [Figure 1](#)

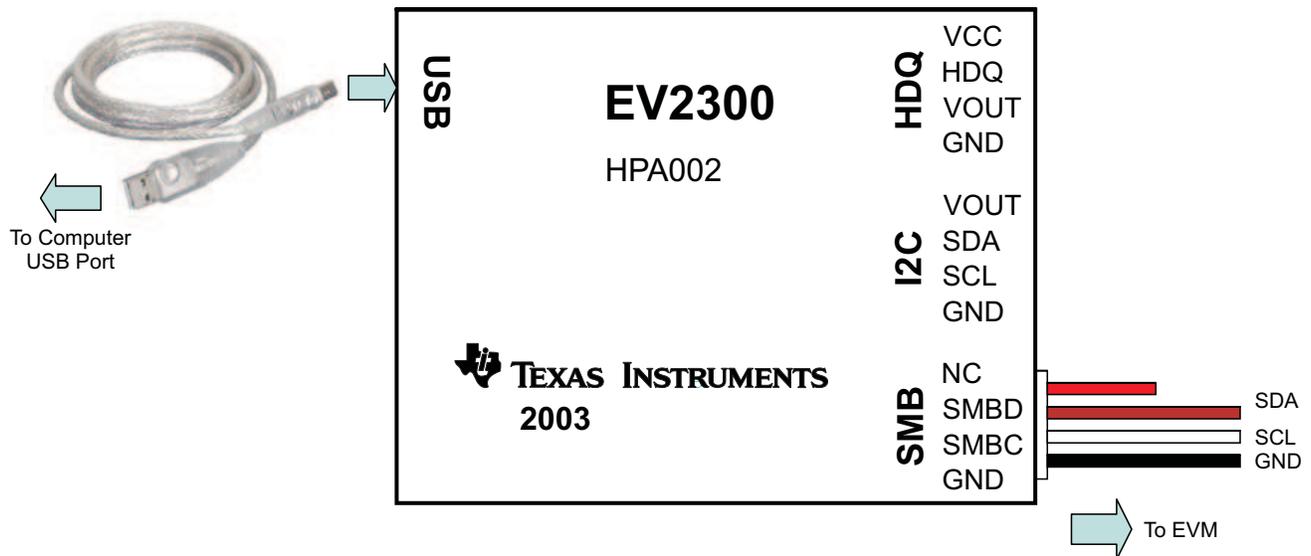


Figure 1. EV2300 Kit Connections

11. Ensure J5: ON, J6: ON, J7: ON, J8: ON, J9 (VDDSMB, EXT): ON, and J11: ON.

After these previous eleven steps, the test setup for bq24745/7EVM (HPA272) is shown in [Figure 2](#).

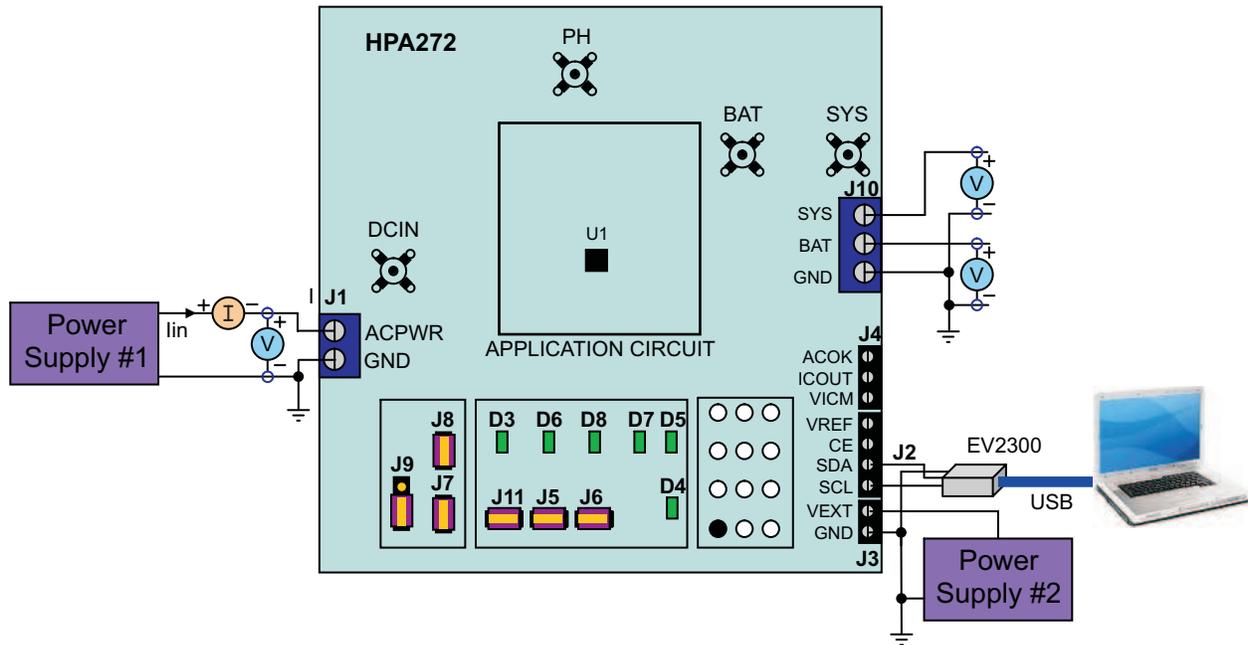


Figure 2. bq24745/7 EVM Original Test Setup

12. Start the host computer. Start the bq24745/7 evaluation software by using the cascading menus to select the **start** → **All Programs** → **Texas Instruments** → **bq24745 Evaluation Software** command. The EVM Software displays as shown in [Figure 3](#).

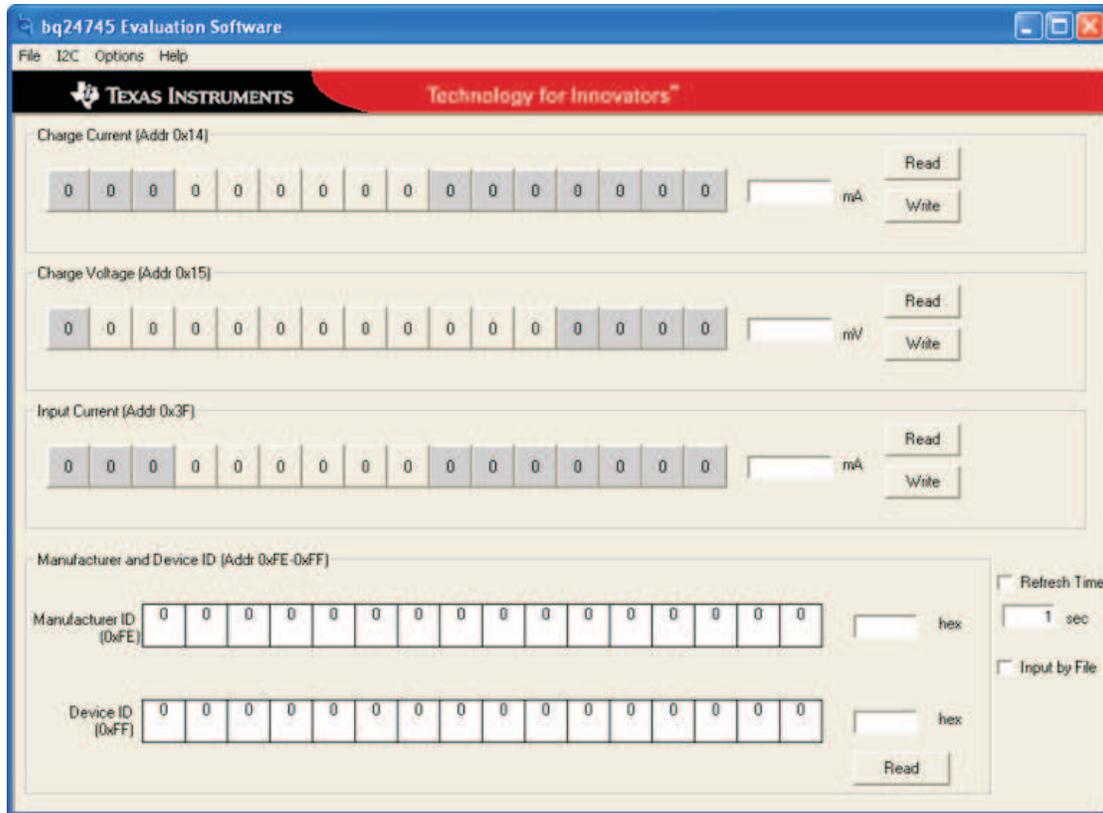


Figure 3. bq24745/7 SMB Evaluation Software (Main Window)

2.5 Test Procedures

AC Adapter Detection Threshold Procedure

1. Ensure that all [Equipment Setup](#) steps are completed.
2. Turn on power supply two.
3. Turn on power supply one.
4. Make these voltage measurements:
 - $V(J10(SYS)) = 0\text{ V} \pm 500\text{ mV}$
 - $V(TP(VREF)) = 0\text{ V} \pm 1000\text{ mV}$
 - $V(TP(VDDP)) = 0\text{ V} \pm 500\text{ mV}$
5. Increase the output voltage of power supply one until LED D5 (ACOK) lights without exceeding 20 V output limit.
6. Make these voltage measurements:
 - $V(TP(ACIN)) = 2.4\text{ V} \pm 200\text{ mV}$
 - $V(J1(VIN)) = 17.9\text{ V} \pm 1\text{ V}$
 - $V(J10(SYS)) = 17.9\text{ V} \pm 1\text{ V}$
 - $V(TP(VREF)) = 3.3\text{ V} \pm 200\text{ mV}$
 - $V(TP(VDDP)) = 0\text{ V} \pm 500\text{ mV}$
7. Observe that these LED diodes light:
 - D3 (BYPASS)
 - D6 (ACDRV)

Charger Parameters Setting Procedure

1. Increase the voltage of power supply one until you measure $V(J1(VIN)) = 19\text{ V} \pm 0.1\text{ V}$.
2. Measure the voltage $V(J10(BAT, GND)) = 0\text{ V} \pm 1\text{ V}$.
3. Go to the **bq24745/7 Evaluation Software** window and click all four **Read** buttons. Make sure no error information messages display.
4. To set the battery charge current regulation threshold, click in the **Charge Current** text field **mA**, type 512, and click the **Write** button.
5. Click in the **Charge Voltage** text field **mV**, type 12592, and click the **Write** button to set the battery voltage regulation threshold.
6. To set the input current regulation threshold, click in the **Input Current** text field **mA**, type 4608, and click the **Write** button.
7. Uninstall J7 to enable the charging.
8. Observe that the LED D4 (CHG EN) lights.
9. Make these voltage measurements:
 - $V(J10(BAT)) = 12.6\text{ V} \pm 200\text{ mV}$
 - $V(J4(ICOUT)) = 3.3\text{ V} \pm 300\text{ mV}$
 - $V(TP(VDDP)) = 6\text{ V} \pm 500\text{ mV}$

Charge Current and AC Current Regulation (DPM) Procedure

1. Install J7 to disable the charging.
2. Connect the Load Two in series with a current meter (multimeter) to J10 (BAT, GND). Make sure a voltage meter is connected across J10 (BAT, GND).
3. Turn on the Load Two using the constant voltage mode. .
4. Set the output voltage of to 10.5 V for Load Two
5. Connect the output of the Load One in series with a current meter (multimeter) to J10 (SYS, GND). Make sure a voltage meter is connected across J10 (SYS, GND).
6. Turn on the power of Load One.

7. Set the load current to $4.0\text{ A} \pm 50\text{ mA}$, but disable the Load One output.
8. Make sure $I_{\text{bat}} = 0\text{ A} \pm 10\text{ mA}$ and $I_{\text{sys}} = 0\text{ A} \pm 10\text{ mA}$. Your bq24745/7 (HPA272) test setup should look like Figure 4.

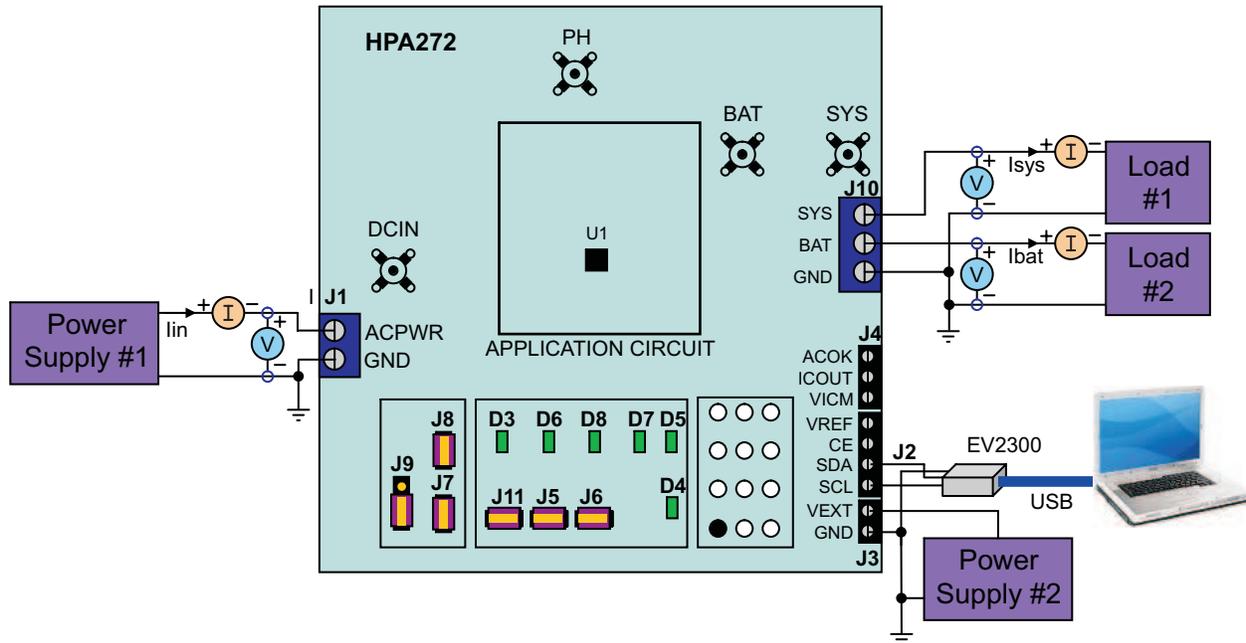


Figure 4. bq24745/7 EVM (HPA272) Test Setup

9. Uninstall J7 to enable the charging.
10. Observe that LED D4 (CHG EN) lights.
11. Set the battery charge current regulation threshold to 2.944 A by clicking in the **Charge Current** text field **mA**, type 2944, and click the **Write** button.
12. Make these current and voltage measurements:
 - $I_{\text{bat}} = 3000\text{ mA} \pm 300\text{ mA}$
 - $V(\text{TP}(\text{VICM})) = 350\text{ mV} \pm 100\text{ mV}$
 - $V(\text{J4}(\text{ICOUT})) = 3.3\text{ V} \pm 300\text{ mV}$
13. Observe that LED D7 (LO PWR MODE) lights.
14. Enable the output of Load One.
15. Make these current measurements:
 - $I_{\text{sys}} = 4000\text{ mA} \pm 200\text{ mA}$
 - $I_{\text{bat}} = 1000\text{ mA} \pm 500\text{ mA}$
 - $I_{\text{in}} = 4600\text{ mA} \pm 500\text{ mA}$
16. Make these voltage measurements:
 - $V(\text{TP}(\text{VICM})) = 920\text{ mV} \pm 100\text{ mV}$
 - $V(\text{J4}(\text{ICOUT})) = 0\text{ V} \pm 300\text{ mV}$
17. Observe that LED D7 (LO PWR MODE) turns off.
18. Disable Load One.
19. Make these current measurements:
 - $I_{\text{sys}} = 0\text{ mA} \pm 100\text{ mA}$
 - $I_{\text{bat}} = 3000\text{ mA} \pm 300\text{ mA}$

Power Path Selection Procedure

1. Install J7 to disable the charging.
2. Observe that LED D4 (CHG EN) turns off.
3. Replace Load Two and the current meter with Power Supply Three.
4. Connect a voltage meter across J10 (BAT, GND).
5. Enable the output of the Power Supply Three and ensure the output voltage is $10.5\text{ V} \pm 500\text{ mV}$.
6. Measure the voltage $V(\text{J10}(\text{SYS})) = 19\text{ V} \pm 1\text{ V}$ (adapter connected to system).
7. Observe these LED states:
 - D3 (BYPASS) lights
 - D6 (ACDRV) lights
 - D8 (BATDRV) turns off
8. Turn off Power Supply One.
9. Measure the voltage $V(\text{J10}(\text{SYS})) = 10.5\text{ V} \pm 1\text{ V}$ (battery connected to system).
10. Observe these LED states:
 - D3 (BYPASS) turns off
 - D6 (ACDRV) turns off
 - D8 (BATDRV) lights

3 PCB Layout Guidelines

1. It is critical that the exposed power pad on the backside of the bq24745/7 package be soldered to the PCB ground. Make sure there are sufficient thermal vias right underneath the IC, connecting to the ground plane on the other layers.
2. The control stage and the power stage *should be* routed **separately**. At each layer, the signal ground and the power ground are connected only at the power pad.
3. AC current sense resistor *must* be connected to CSSP and CSSN with a Kelvin contact. The area of this loop must be minimized. The decoupling capacitors for these pins should be placed as close to the IC as possible.
4. Charge current sense resistor must be connected to CSOP, CSON with a Kelvin contact. The area of this loop must be minimized. The decoupling capacitors for these pins should be placed as close to the IC as possible.
5. Decoupling capacitors for DCIN, VREF, VDDP should be placed underneath the IC (on the bottom layer) and make the interconnections to the IC as short as possible.
6. Decoupling capacitors for BAT, VICM *must* be placed close to the corresponding IC pins and make the interconnections to the IC as short as possible.
7. Decoupling capacitor(s) for the charger input *must* be placed very close to Q4 drain and Q5 source.

4 Bill of Materials, Board Layout, and Schematic

4.1 Bill of Materials

Table 5. bq24745/7EVM Bill of Materials

| -001 bq24745 | -002 bq24747 | RefDes | Value | Description | Size | Part Number | MFR |
|-----------------|-----------------|---|------------|---|---------------------|----------------------|------------------|
| 1 | 1 | C1 | 2.2μF | Capacitor, Ceramic, 25V, X5R, 10% | 1210 | Std | Std |
| 0 | 0 | C2, C10 | Open | Capacitor, Ceramic, 25V, X5R, 10% | 1210 | Std | Std |
| 0 | 0 | C3 | Open | Capacitor, Ceramic, 35V, X5R, 10% | 805 | Std | Std |
| 2 | 2 | C4, C11 | 10nF | Capacitor, Ceramic, 50V, X7R, 10% | 603 | Std | Std |
| 1 | 1 | C5 | 2000pF | Capacitor, Ceramic, 50-V, C0G, 5% | 603 | Std | Std |
| 1 | 1 | C6 | 51pF | Capacitor, Ceramic, 50-V, C0G, 5% | 603 | Std | Std |
| 7 | 7 | C7, C12, C13, C17, C20, C22, C28 | 0.1μF | Capacitor, Ceramic, 50V, X7R, 10% | 805 | Std | Std |
| 1 | 1 | C8 | 130pF | Capacitor, Ceramic, 50-V, C0G, 5% | 603 | Std | Std |
| 1 | 1 | C9 | 1μF | Capacitor, Ceramic, 25V, X5R, 10% | 603 | Std | Std |
| 1 | 1 | C14 | 100pF | Capacitor, Ceramic, 50V, C0G, 5% | 603 | Std | Std |
| 3 | 3 | C15, C19, C21 | 1uF | Capacitor, Ceramic, 25V, X5R, 10% | 805 | Std | Std |
| 4 | 4 | C16, C18, C23, C26 | 10uF | Capacitor, Ceramic, 25V, X5R, 10% | 1210 | Std | Std |
| 2 | 2 | C24, C30 | 10uF | Capacitor, Ceramic, 25V, X5R, 10% | 1206 | Std | Std |
| 0 | 0 | C25 | Open | Capacitor, Ceramic, 50V, X7R, 10% | 603 | Std | Std |
| 2 | 2 | C27, C29 | 0.1μF | Capacitor, Ceramic, 50V, X7R, 10% | 603 | Std | Std |
| 1 | 1 | D1 | BAT54 | Diode, Schottky, 200-mA, 30-V | SOT23 | BAT54 | Vishay-Liteon |
| 1 | 1 | D2 | BAT54C | Diode, Schottky, 200-mA, 30-V | SOT23 | BAT54C | Vishay-Liteon |
| 6 | 6 | D3, D4, D5, D6, D7, D8 | Green | Diode, LED, Green, 2.1-V, 20-mA, 6-mcd | LED603 | LTST-C190GKT | Lite On |
| 1 | 1 | J1 | D120/2DS | Terminal Block, 2-pin, 15-A, 5.1mm | 0.40 x 0.35 inch | D120/2DS | OST |
| 1 | 1 | J2 | ED555/3DS | Terminal Block, 3-pin, 6-A, 3.5mm | 0.41 x 0.25 inch | ED555/3DS | OST |
| 1 | 1 | J3 | ED555/2DS | Terminal Block, 2-pin, 6-A, 3.5mm | 0.27 x 0.25 inch | ED555/2DS | OST |
| 1 | 1 | J4 | ED555/4DS | Terminal Block, 4-pin, 6-A, 3.5mm | 0.55 x 0.25 inch | ED555/4DS | OST |
| 5 | 5 | J5, J6, J7, J8, J11 | PTC36SAAN | Header, 2-pin, 100mil spacing, (36-pin strip) | 0.100 inch x 2 | PTC36SAAN | Sullins |
| 1 | 1 | J9 | PTC36SAAN | Header, 3-pin, 100mil spacing, (36-pin strip) | 0.100 inch x 3 | PTC36SAAN | Sullins |
| 1 | 1 | J10 | D120/3DS | Terminal Block, 3-pin, 15-A, 5.1mm | 0.60 x 0.35 inch | D120/3DS | OST |
| 6 | 6 | | 929950-00 | Shorting jumpers, 2-pin, 100mil spacing, | | 929950-00 | 3M/ESD |
| 4 | 4 | | | 6-32 NYL nuts | | | |
| 4 | 4 | | 4816 | STANDOFF M/F HEX 6-32 NYL .500" | sf_thvt_325_rn d | 4816 | Keystone |
| 1 | 1 | L1 | 5.6μH | Inductor, SMT, 16A, 24.8mΩ | 0.51 x 0.51 inch | IHLP5050CE5R6M0 1 | Vishay |
| 3 | 3 | Q1, Q2, Q8 | Si4435DY | MOSFET, P-ch, 30-V, 8.0-A, 20-mΩ | SO8 | Si4435DY | Siliconix |
| 9 | 9 | Q3, Q6, Q10, Q11, Q13, Q14, Q15, Q17, Q18 | 2N7002DICT | MOSFET, N-ch, 60-V, 115-mA, 1.2-Ω | SOT23 | 2N7002DICT | Vishay-Siliconix |
| 2 | 2 | Q4, Q5 | FDS6680A | Transistor, MOSFET, NChan, 30V, 12.5A, Rds 9.5 mΩ | SO8 | FDS6680A | Fairchild |
| 1 | 1 | Q7 | NDS0605 | MOSFET, P-ch, -60 V, 180-mA, 5 Ω | SOT-23 | NDS0605 | Vishay |
| 3 | 3 | Q9, Q12, Q16 | TP0610K | Mosfet, P-Ch, 60V, Rds 6 Ω, Id 185 mA | SOT-23 | TP0610K | Vishay-Siliconix |
| 2 | 2 | R1,R40 | 3.9 Ω | Resistor, Chip, 1/2W, 5% | 1210 | Std | Std |
| 1 | 1 | R2 | 430K | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |
| 1 | 1 | R3 | 66.5K | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |

Table 5. bq24745/7EVM Bill of Materials (continued)

| -001 bq24745 | -002 bq24747 | RefDes | Value | Description | Size | Part Number | MFR |
|-----------------|-----------------|---|-------------|---|-----------------------|-------------|-----------|
| 11 | 11 | R4, R5, R8, R10, R11, R14, R16, R19, R20, R23, R24 | 10K | Resistor, Chip, 1/16W, 5% | 402 | Std | Std |
| 1 | 1 | R6 | 200K | Resistor, Chip, 1/16W, 1% | 402 | Std | Std |
| 1 | 1 | R7 | 49.9K | Resistor, Chip, 1/16W, 1% | 402 | Std | Std |
| 1 | 1 | R9 | 200K | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |
| 1 | 1 | R12 | 7.5K | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |
| 1 | 1 | R13 | 4.7K | Resistor, Chip, 1/16W, 1% | 603 | Std | Std |
| 1 | 1 | R15 | 1.40M | Resistor, Chip, 1/10W, 1% | 805 | Std | Std |
| 2 | 2 | R17, R21 | 0 | Resistor, Chip, 1/16W, 5% | 402 | Std | Std |
| 2 | 2 | R18, R26 | 0.01 | Resistor, Chip, 1/2W, 1% | 2010 | Std | Std |
| 1 | 1 | R22 | 1Meg | Resistor, Chip, 1/16W, 5% | 402 | Std | Std |
| 8 | 8 | R25, R27, R28, R29, R32, R33, R37, R38 | 100K | Resistor, Chip, 1/16W, 5% | 402 | Std | Std |
| 6 | 6 | R30, R31, R34, R35, R36, R39 | 2.2K | Resistor, Chip, 1/16W, 5% | 603 | Std | Std |
| 1 | 1 | R41 | 100 | Resistor, Chip, 1/16W, 5% | 603 | Std | Std |
| 2 | 2 | TP1, TP23 | 5001 | Test Point, Black, Thru Hole Color Keyed | 0.100 x 0.100 inch | 5001 | Keystone |
| 4 | 4 | TP2, TP18, TP19, TP20 | 131-4244-00 | Adaptor, 3.5-mm probe clip (or 131-5031-00) | 0.200 inch | 131-4244-00 | Tektronix |
| 11 | 11 | TP21, TP22, TP24, TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32 | 5002 | Test Point, White, Thru Hole Color Keyed | 0.100 x 0.100 inch | 5002 | Keystone |
| 1 | 0 | U1 | bq24745RHD | IC, SMBus-Controlled Level 2 Multi-Chem Battery Charger Controller | | bq24745RHD | TI |
| 0 | 1 | U1 | bq24747RHD | IC, SMBus-Controlled Level 2 Multi-Chem Battery Charger Controller | | bq24747RHD | TI |
| 1 | 1 | - | HPA272 | 4x4.25 inch 4 layer 2oz. PCB | 4x4.25 inch | PCB | Any |

4.2 Board Layout

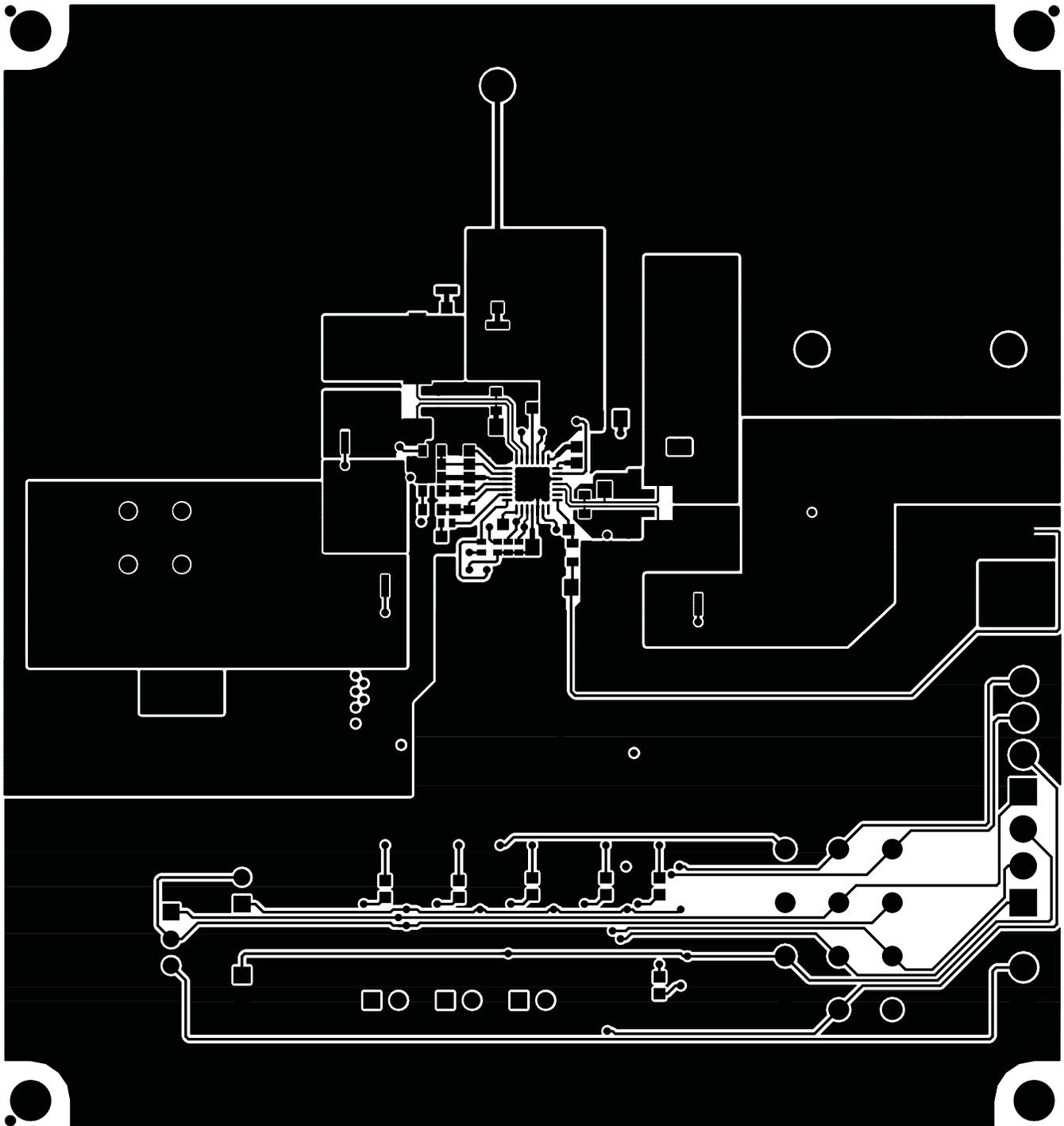


Figure 5. Top Routing Layer

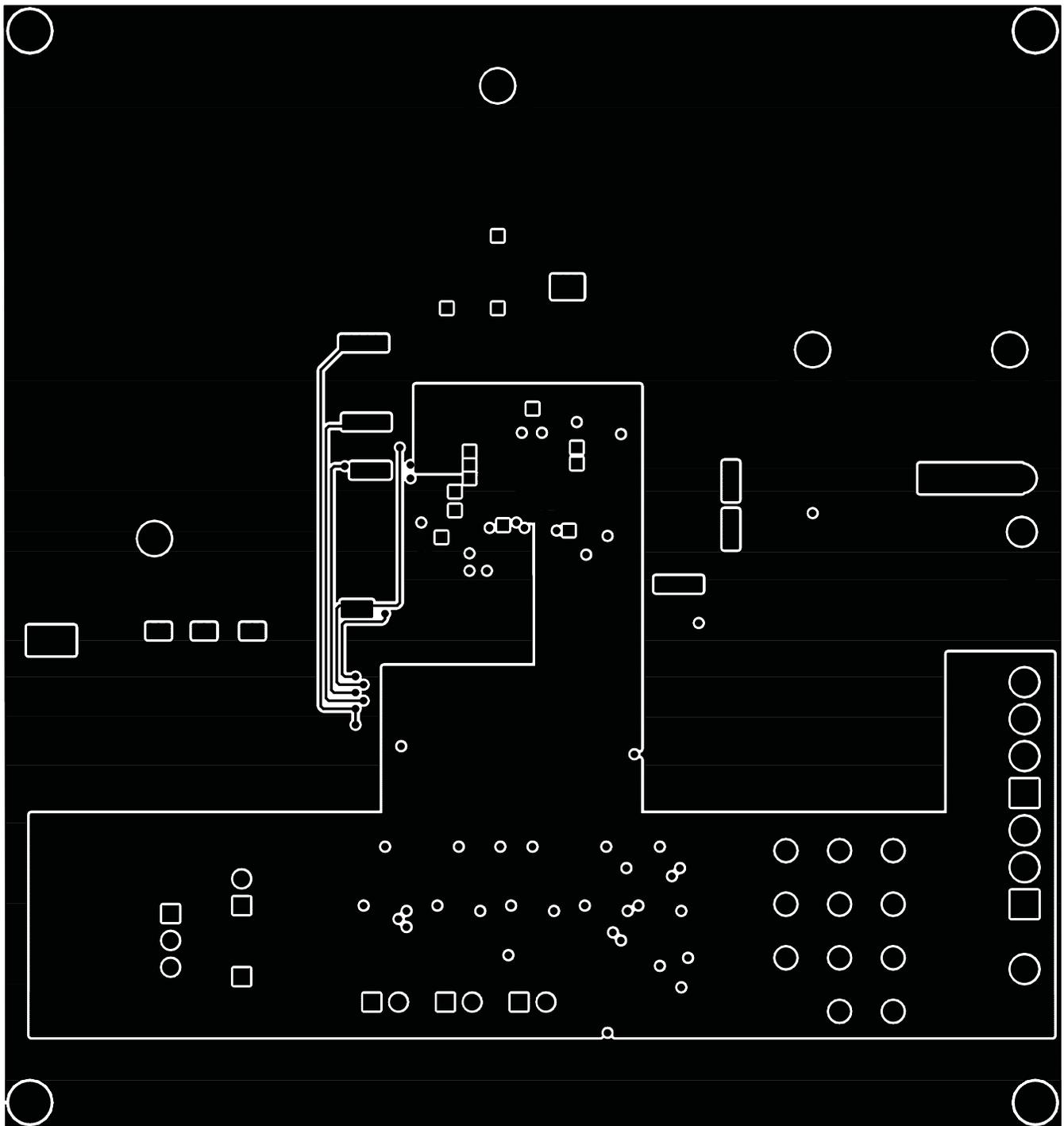


Figure 6. Second Routing Layer

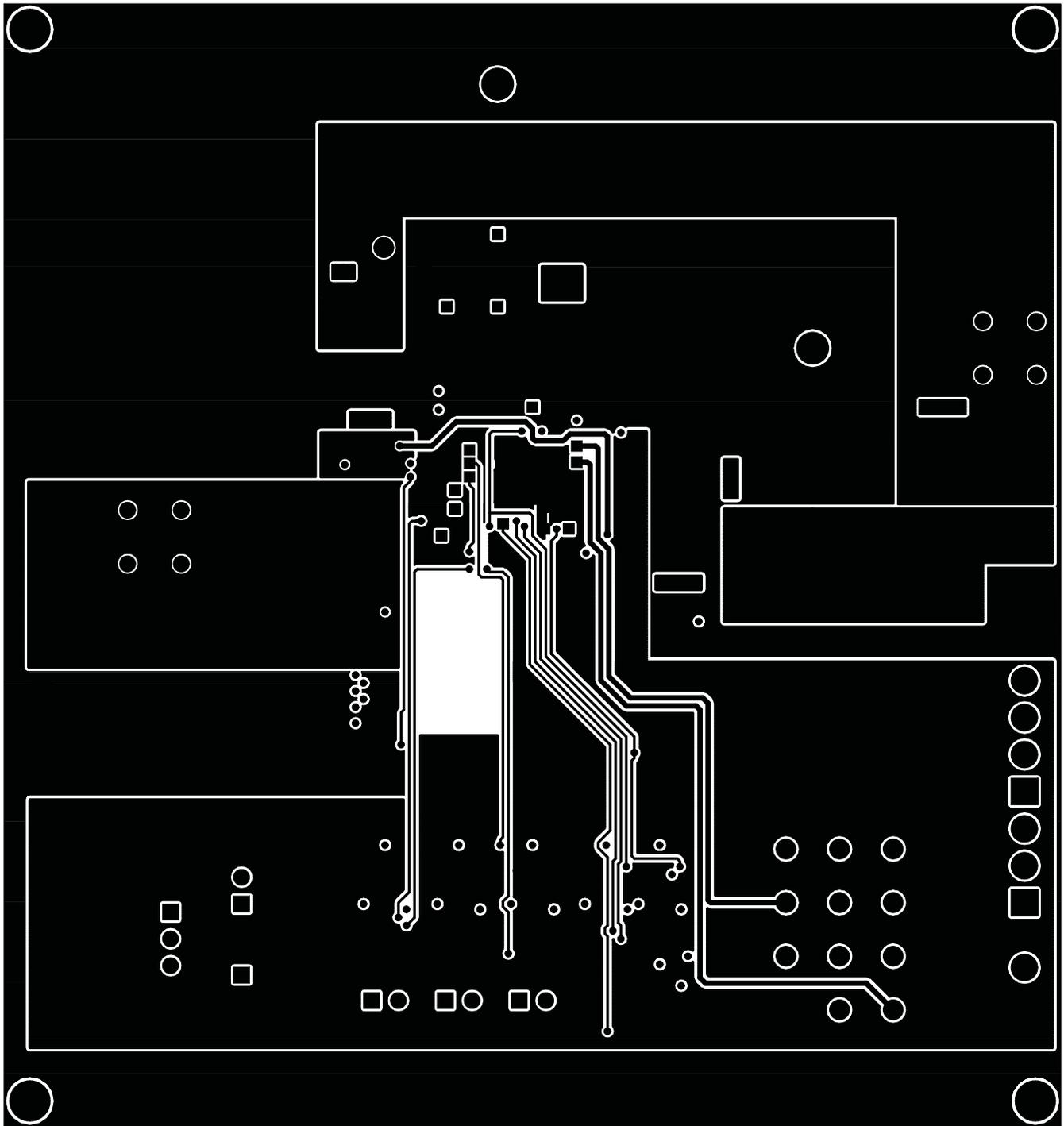


Figure 7. Third Routing Layer

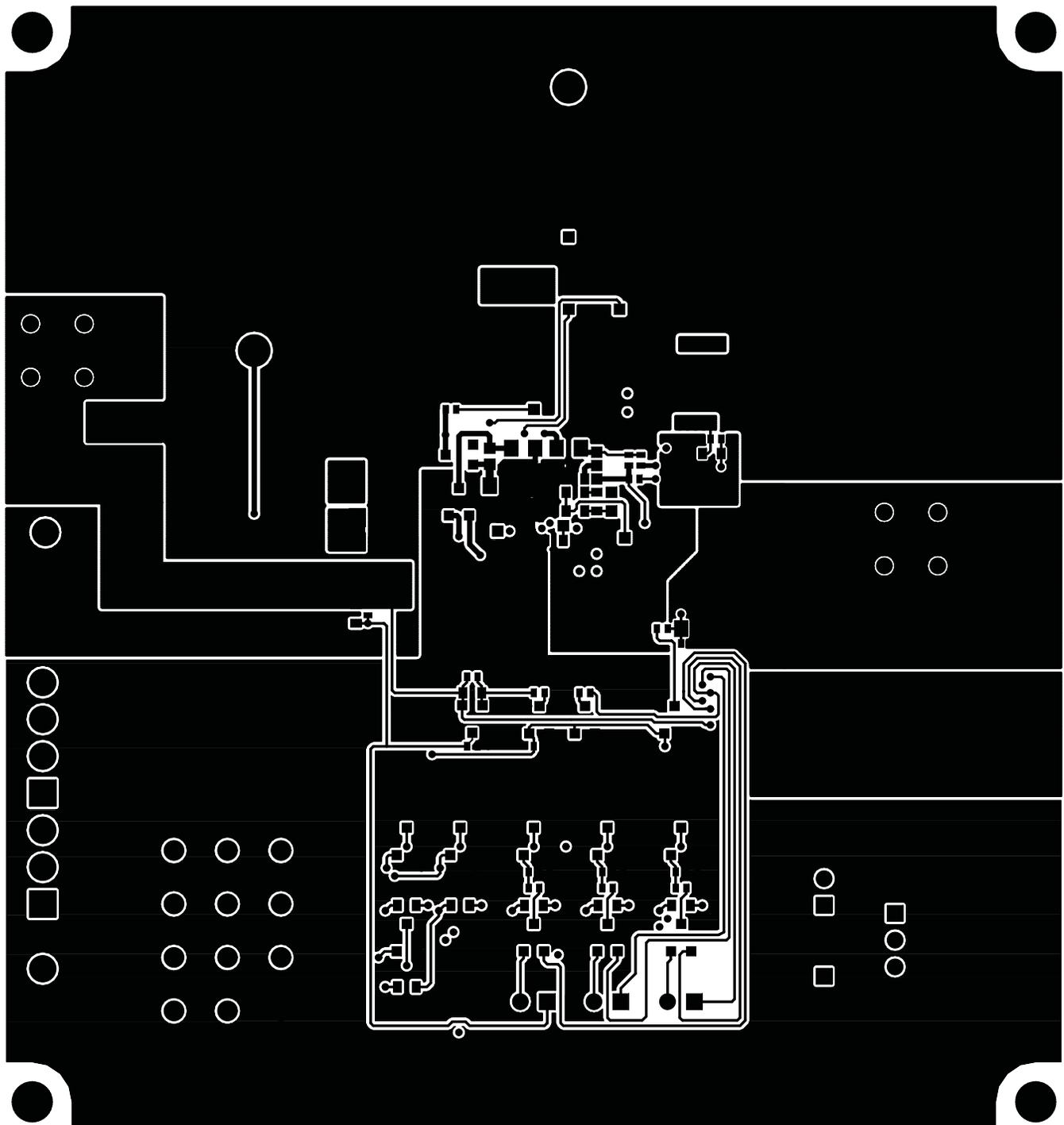


Figure 8. Bottom Routing Layer

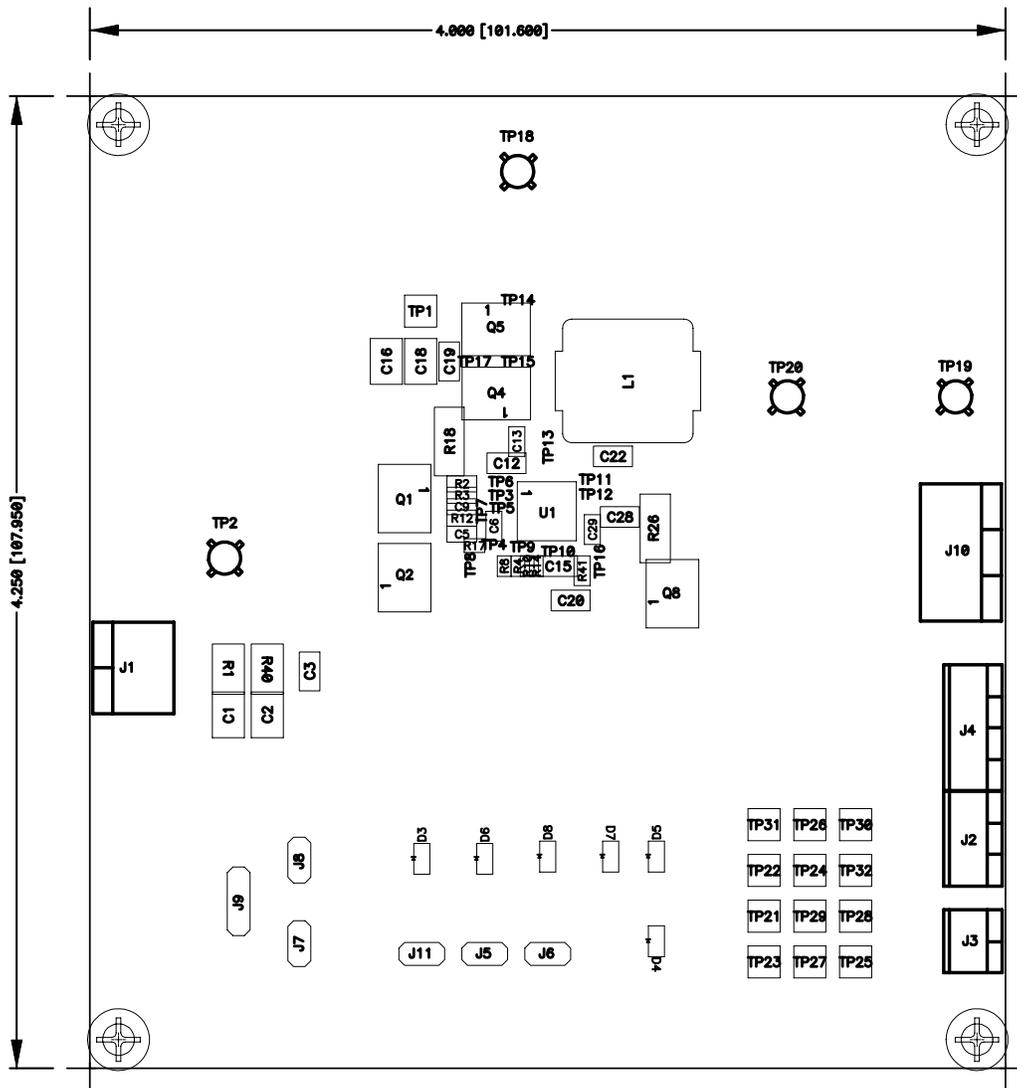


Figure 9. Top Assembly

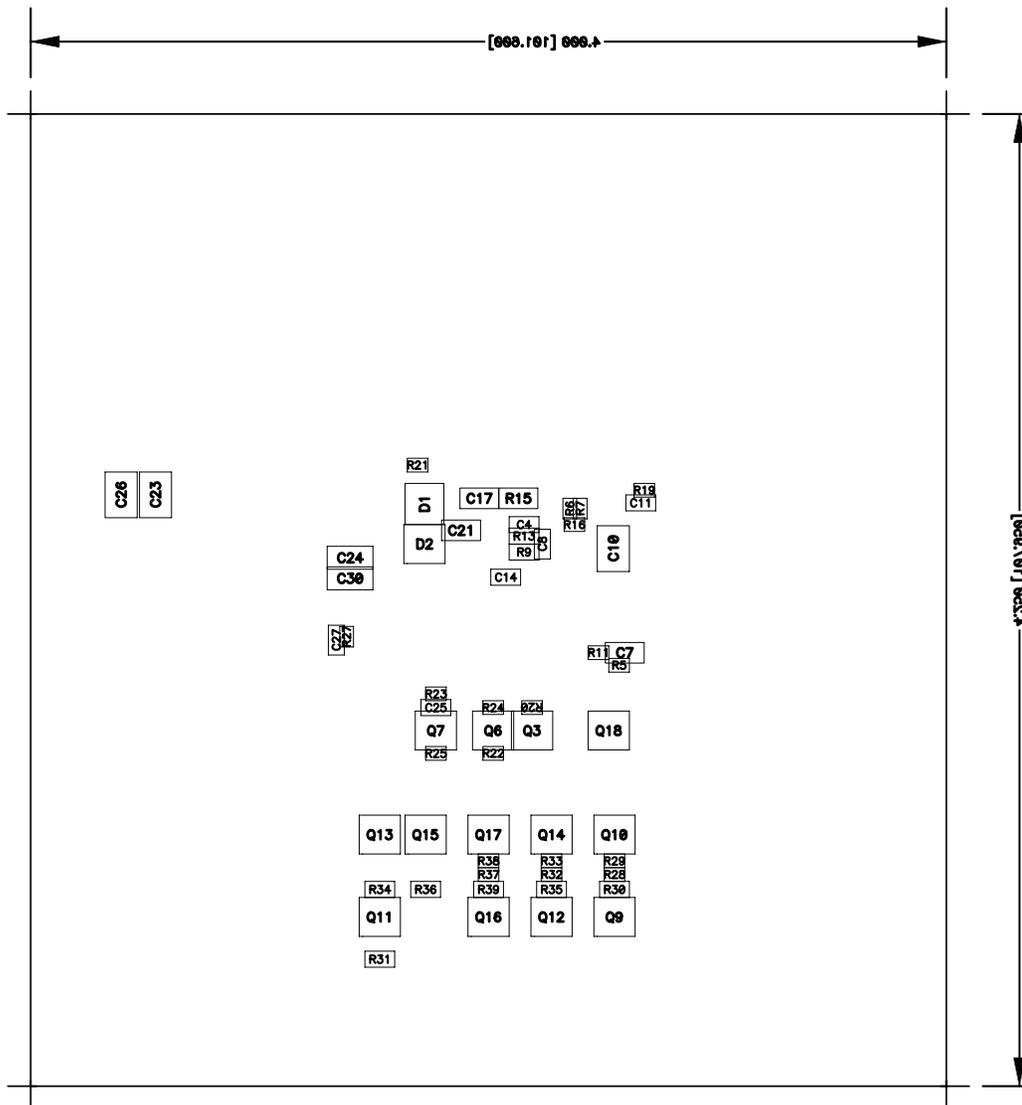


Figure 10. Bottom Assembly

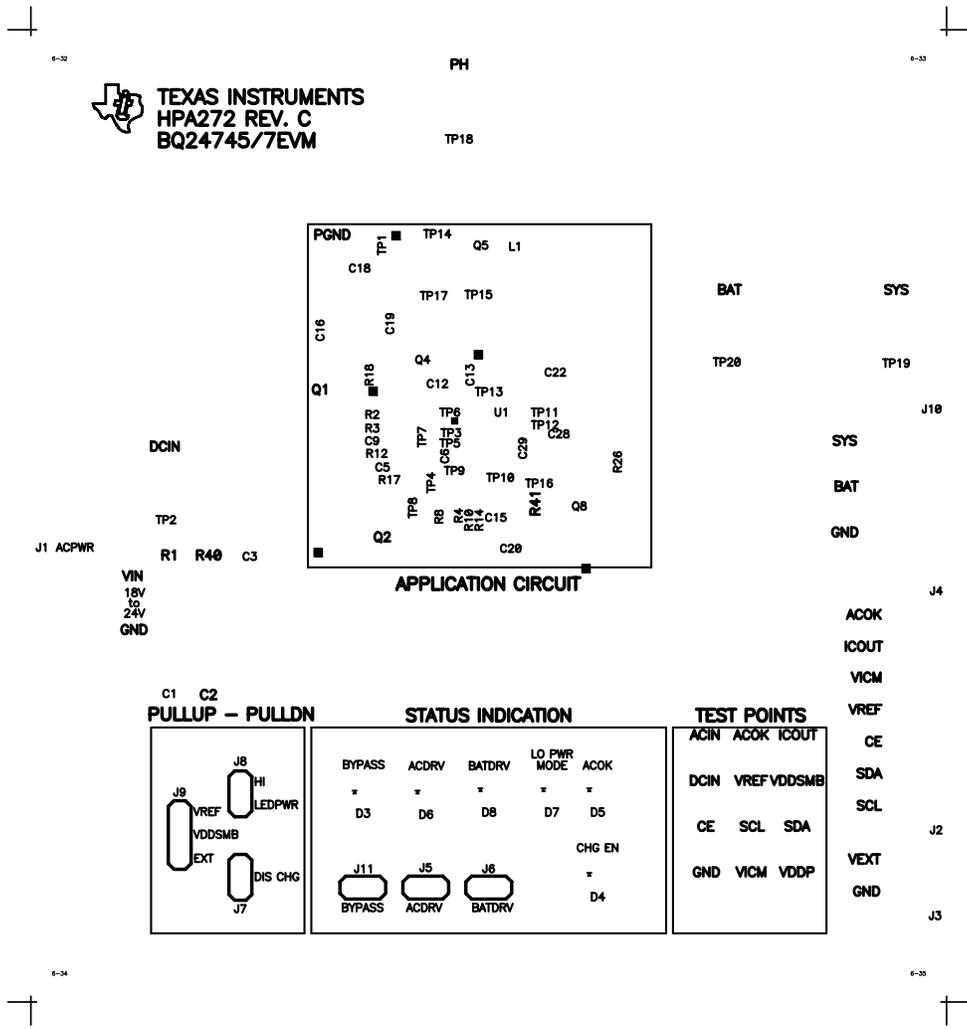


Figure 11. Top Silkscreen

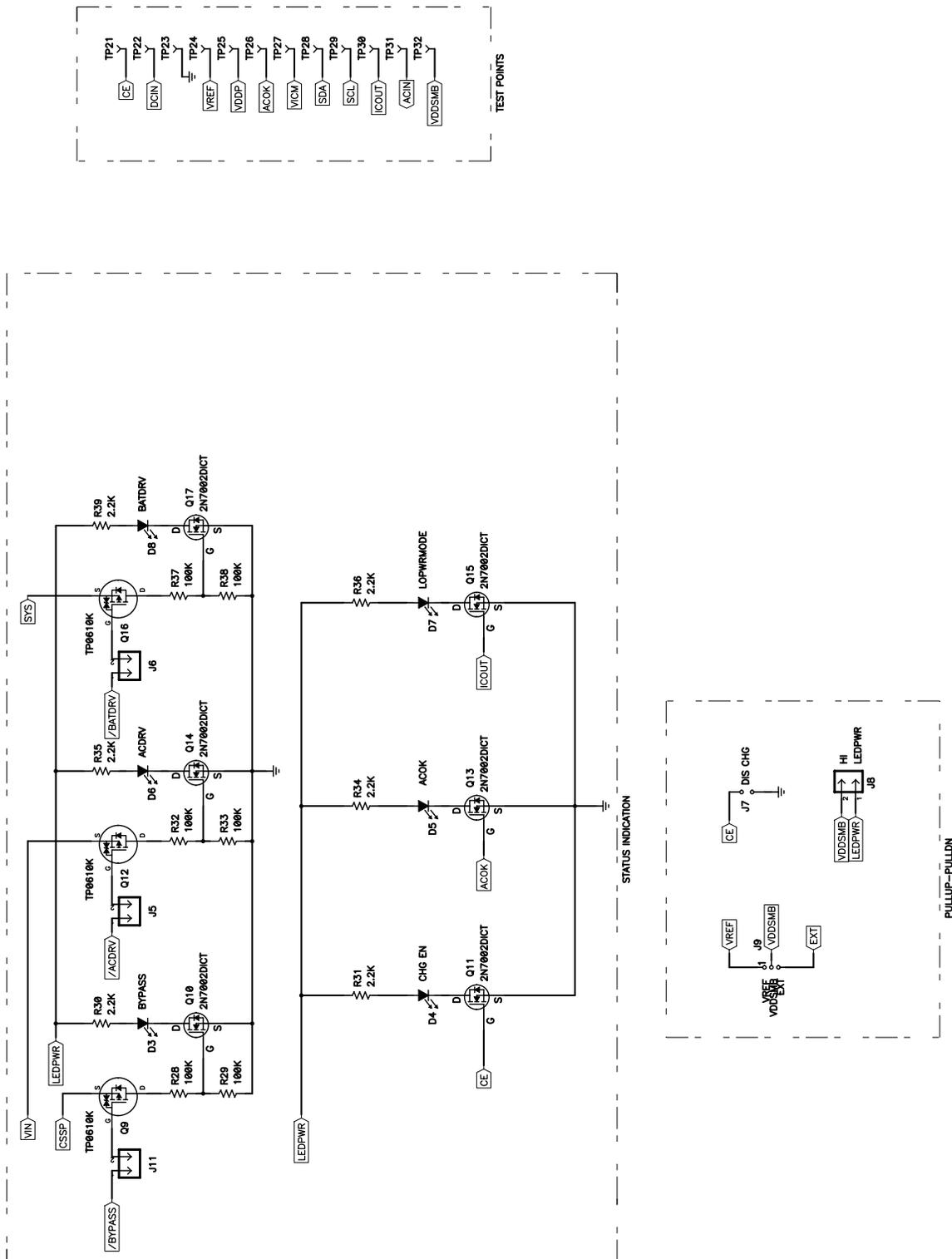


Figure 13. bq24745/7 EVM Schematic (Sheet 2 of 2)

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 22 V and the output voltage range of 0 V to 20 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 60°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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