TPS62350EVM-201

This user's guide describes the characteristics, operation, and use of the TPS62350EVM-201 evaluation module (EVM). This EVM demonstrates the Texas Instruments TPS62350 800-mA, 3-MHz, synchronous, step-down converter with I^2C interface. This document includes setup instructions, a schematic diagram, a bill of materials, and PCB layout drawings for the evaluation module.

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1 Introduction

1.1 Requirements

To operate this EVM properly, connect and properly configure the following components:

A personal computer (PC) with a USB port is required to operate this EVM. The TPS62350 interface software runs on the PC and communicates with the EVM via the PC's USB port. Commands can be sent to the internal registers of the TPS62350 through the USB port.

Personal Computer Requirements

- Windows™ 2000 or Windows™ XP operating system

Windows is a trademark of Microsoft Corporation.
I^2C is a trademark of Philips Corporation.
VeriSign is a trademark of VeriSign, Inc..

- USB port
- Minimum of 30 MB of free hard disk space (100 MB recommended)
- Minimum of 256 MB of RAM

Printed-Circuit Board Assembly

The TPS62350EVM-201 PCB contains the TPS62350 IC and its required external components. This board contains several jumpers and connectors that enable the user to customize the board for specific operating conditions.

USB Interface Adapter

The USB interface adapter is the link that allows the PC and the EVM to communicate. One end of the USB interface adapter connects to the PC with the supplied USB cable; the other side of the USB interface adapter connects to the EVM with the supplied ribbon cable.

When a command is written to the EVM, the interface program running on the PC sends the commands to the PC USB port. The USB interface adapter receives the USB command, converts the signal to an I^2C protocol, and sends the I^2C signal to the TPS62350 EVM board

Software

Texas Instruments provides software to assist in evaluating this EVM. The software can be installed from the supplied CD or downloaded from the Texas Instruments Web site at www.ti.com.

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the TPS62350EVM-201.

2.1 Input/Output Connector Descriptions

2.1.1 J1 – VIN

This is the positive input supply voltage to the converter. The leads to the input supply should be twisted and kept as short as possible to minimize EMI transmission.

2.1.2 J2 – GND

This is the return connection for the input power supply of the converter.

2.1.3 J3 – I^2C Input

This connector is the I^2C input for the converter.

2.1.4 J4 – SYNC INPUT

This connector is used to synchronize the switching of the TPS62350 to an external clock source. Pin 1 of J4 connects to the SYNC pin of the TPS62350. Pin 2 of J4 is connected to the ground of the TPS62350. The SYNC input has a 1-MΩ pulldown resistor installed on the EVM board.

2.1.5 J5 – VOUT

This is the positive connection from the output of the converter. Connect this pin to the positive input of the load.

2.1.6 J6 – GND

This is the return connection for the output of the converter.

2.1.7 JP1 – SDA Converter 1

This jumper is used to tie the I^2C SDA pin of the TPS62350 to either a 10-kΩ pullup resistor to the input voltage or to short the SDA pin to ground. The shunt can be removed if the I^2C master has its own pullup or operates from a voltage that is different than the input voltage of the TPS62350. The Texas Instruments USB interface adapter provides an active pullup; therefore, do not install a jumper when using the adapter supplied with the EVM.

2.1.8 JP2 – SCL Converter 1

This jumper is used to tie the I^2C SCL pin of the TPS62350 to either a 10-kΩ pullup resistor to the input voltage or to short SCL to ground. The shunt can be removed if the I^2C master has its own pullup or operates from a voltage that is different than the input voltage of the TPS62350. The Texas Instruments USB interface adapter provides an active pullup; therefore, do not install a jumper when using the adapter supplied with the EVM.

2.1.9 JP4 – ENABLE Converter 1

This jumper enables or disables the converter. Connect the shorting jumper from the center ENABLE pin to either the ON or OFF position. Never leave this pin floating.

2.1.10 JP3 – VSEL Converter 2

This jumper is used to select the output voltage of the converter. Placing a shunt between pins 1 and 2 (HIGH and VSEL) sets the output voltage of the converter to the voltage defined by the internal VSEL1 register. Placing a shunt between pins 2 and 3 (VSEL and LOW) sets the output voltage of the converter to the voltage defined by the internal VSEL0 register.

2.2 Software Setup

If installing from a CD, insert the CD and run Setup.exe; follow all the prompts to install the software.

If installing from the TI Web site, go to the URL, www.ti.com

Note: This installation page is best viewed with Microsoft Internet Explorer browser (It may not work correctly with other browsers)

Click on the install button; your PC should give you a security warning and ask if you want to install this application. Select Install to proceed.

With both types of installation, the software attempts to install the Microsoft Dot Net Framework 2.0 (if it is not already installed) This framework is required for the software to run.

After installation, the software should automatically run.

During future use of the software, it may prompt you to install a new version if one becomes available on the Web.

Note: VeriSign™ Code Signing is used to prevent any malicious code from changing this application. If at any time in the future the binaries are modified, the code will no longer attempt to run.

2.3 Hardware Setup

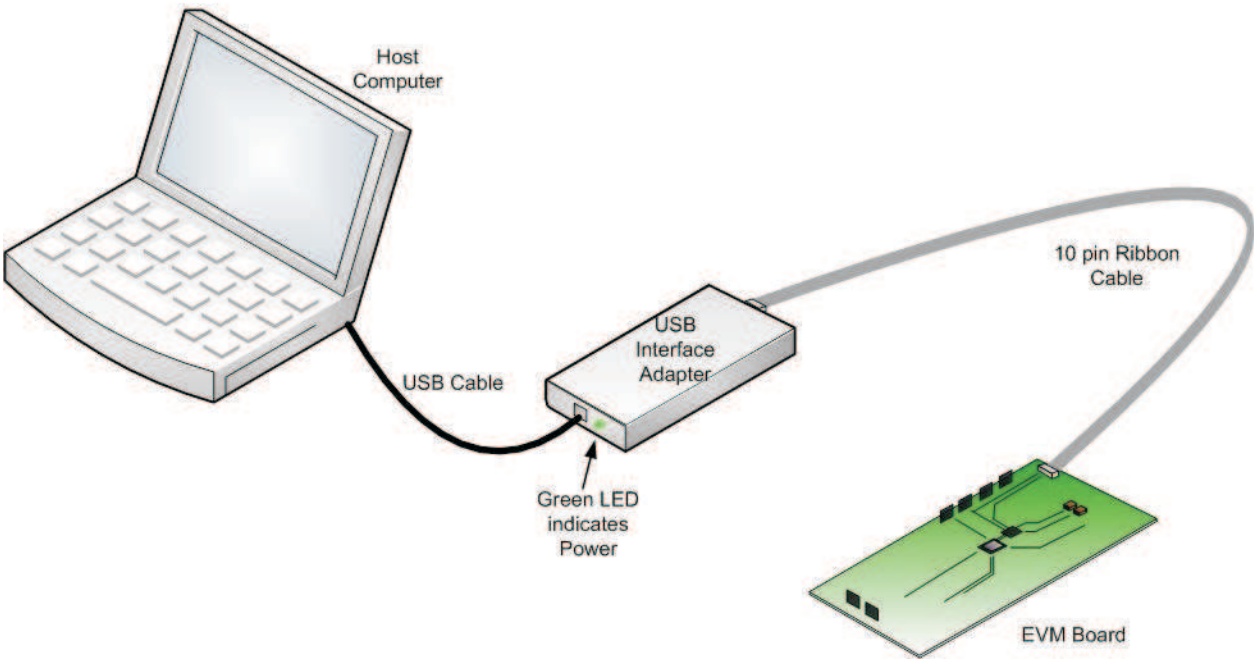
Configure JP1, JP2, JP3, and JP4 using a shorting block. These jumpers are used to connect the SDA and SCL lines of the I^2C interface to a pullup resistor to the input voltage. The USB interface adapter supplied with the EVM has its own internal pullup resistors; therefore, no additional pullup is required. No jumper is necessary if the Texas Instruments USB interface adapter is used to communicate with the TPS62350EVM board, and JP1 and JP2 should be left open.

Configure the jumper on JP3 to the desired setting. Shorting between VSEL and HIGH (pins 1 and 2) makes the TPS62350 power up with the output voltage set by the VSEL1 register. Shorting between VSEL and LOW (pins 2 and 3) makes the TPS62350 power up with the output voltage set by the VSEL0 register.

Configure JP4 as desired. Shorting between EN and ON (pins 1 and 2) enables the TPS62350. Shorting between EN and OFF (pins 2 and 3) disables the TPS62350.

Connect the USB interface adapter to your PC using the supplied USB cable. Connect the TPS62350EVM board to the USB interface adapter using the supplied 10-pin ribbon cable. The connectors on the ribbon cable are keyed to prevent incorrect installation.

Quick Connection Diagram USB Interface Adapter



Connect an input voltage supply to the TPS62350EVM board. The TPS62350 uses an input voltage between 2.7 V and 6 V. Connect the positive input voltage to J1. Connect the input voltage return (ground) connection to J2.

3 Operation

This section provides descriptions of the EVM software.

The supplied software is used to communicate with the TPS62350EVM. Click on the icon on the host computer to start the software. The software asks which version of the IC is on the board. Check the *TPS62350* box, and click the *continue* box. The software displays the main control panel for the user interface. When initialized, the host computer software automatically searches on the Internet (if connected) for updates. If a new update is available, the software notifies the user of the update and downloads it.

The main control panel for the user interface has three main page tabs, *EVM Configuration*, *Output Controls*, and *Preferences*. The software initializes with the *EVM Configuration* tab selected. This page can be used to set register values that correspond to the hardware configuration of the EVM. The EVM can be operated with the default values.

Figure 1 shows the user interface with the *Output Control* tab selected. This page is used to change the output voltage of the TPS62350 via the register settings. The page has two pulldown boxes, one for VSEL0 and one for VSEL1, with the available output voltage. The voltages listed in the boxes assume PWM mode of operation, so the actual output voltage of the EVM varies from the listed values at light loads.

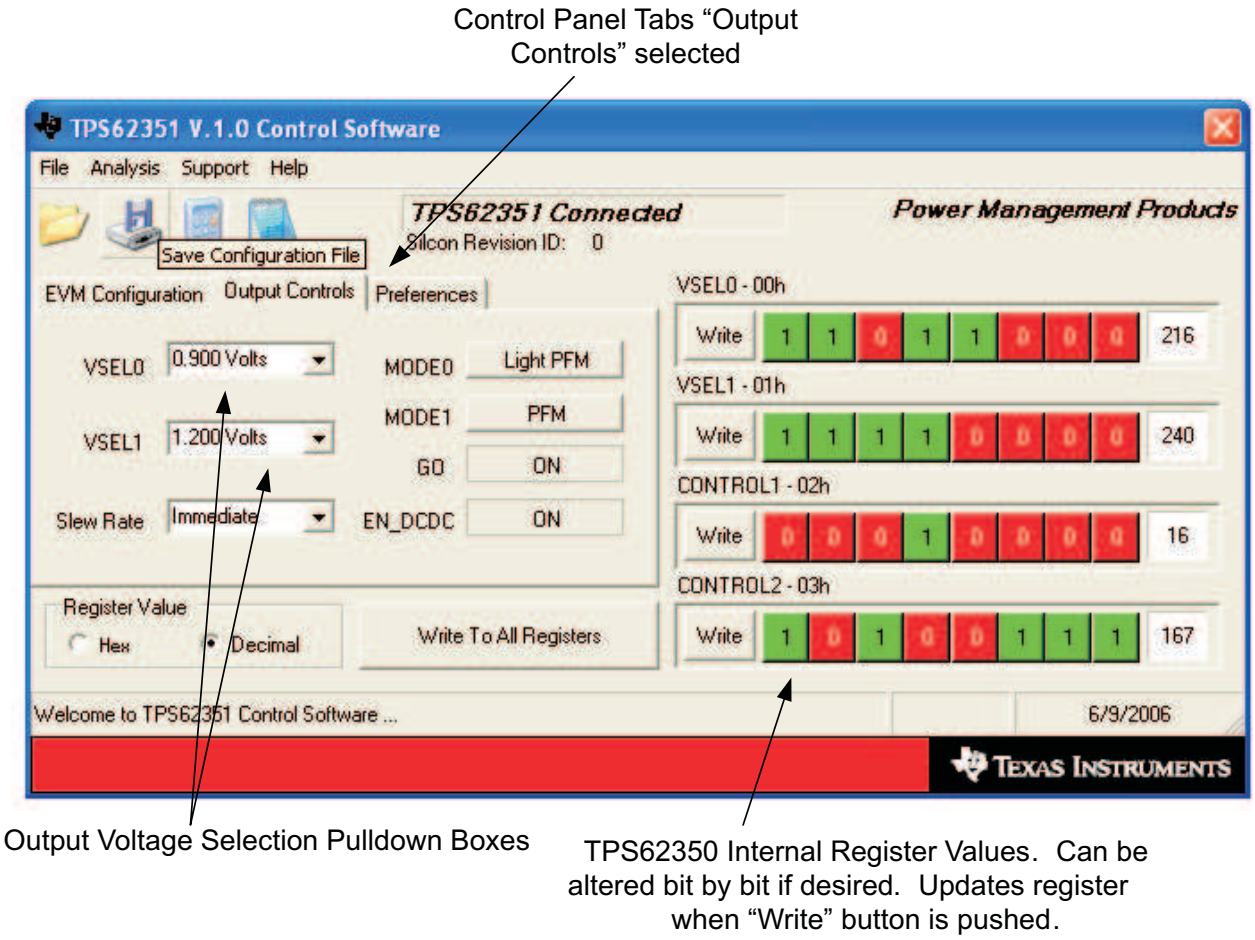


Figure 1. *Output Controls* Tab

Figure 2 shows the page of the *Preferences* tab. The *Preferences* page is used to change the look of the user interface such as the text color or the color of the boxes used to display a logic 1 or 0 in the register displays. The Preferences page also provides an option for cross-linking the values in the VSEL0 and VSEL1 registers within a selectable percentage. The default is no cross-linking. If cross-linking is enabled, then the difference between VSEL0 and VSEL1 cannot exceed the selected percentage. This feature provides a method to limit the ratio of voltages that can be selected. This can be used to avoid inadvertently selecting output voltages, in the output voltage pulldown boxes, that are too high for the application being tested.

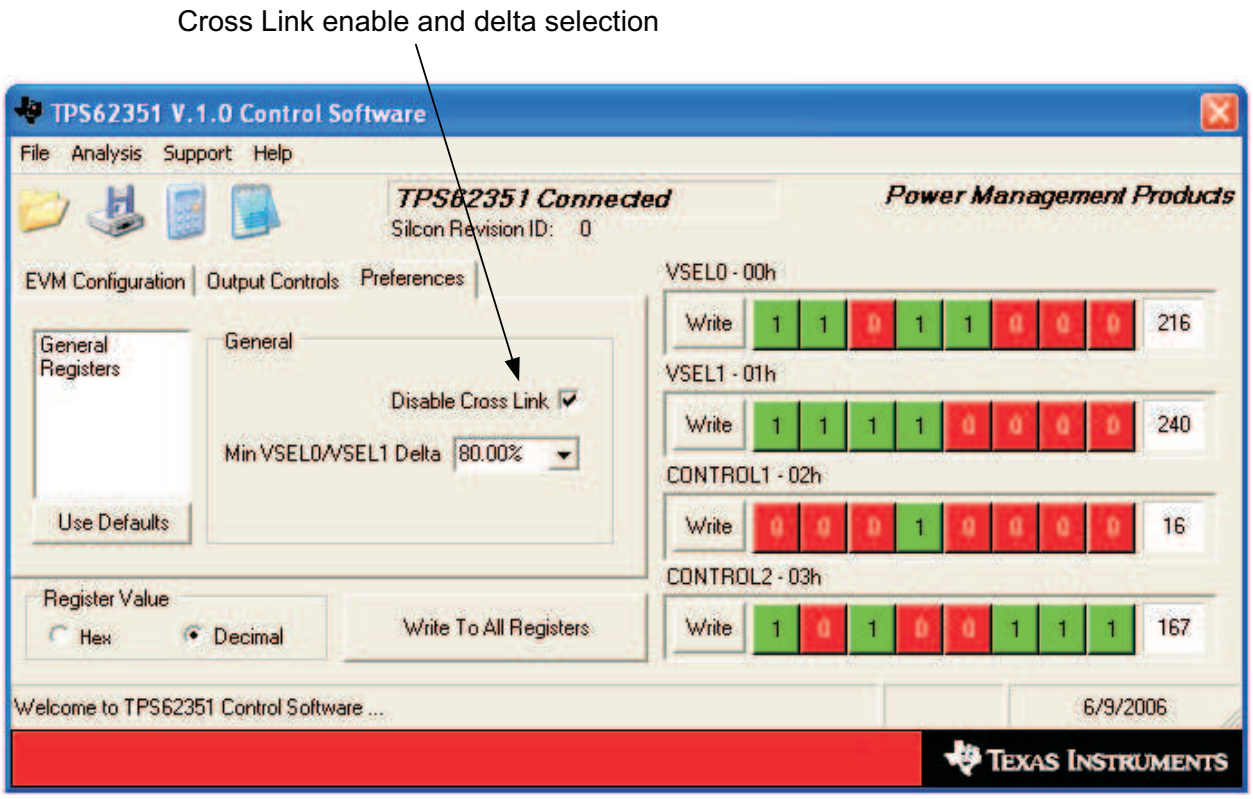


Figure 2. *Preferences* Tab

All three tabs show the bit representation of all four internal registers of the TPS62350. These bits can be individually altered by clicking on them. Clicking on a bit does not immediately change the register value of the IC. The *Write* button must be pushed to update the register with the newly selected bit values. Each register display has its own *Write* button that only updates the register that is displayed next to it. The *Write To All Registers* button updates all four registers with one push.

4 Test Results

This section provides typical performance waveforms for the TPS62350EVM-201 board.

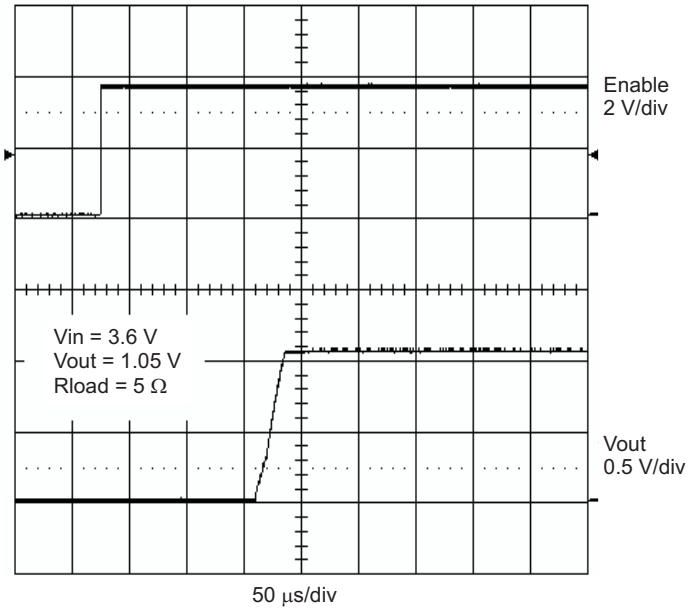


Figure 3. Start-up From Enable

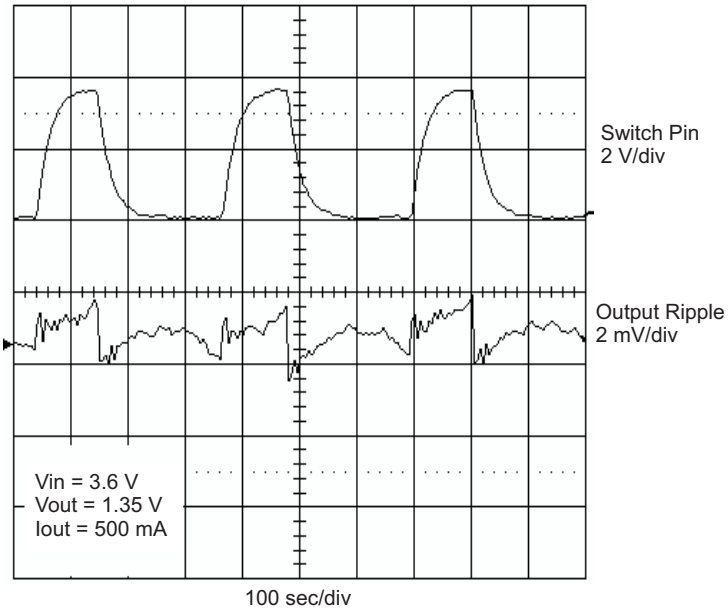


Figure 4. Output Ripple

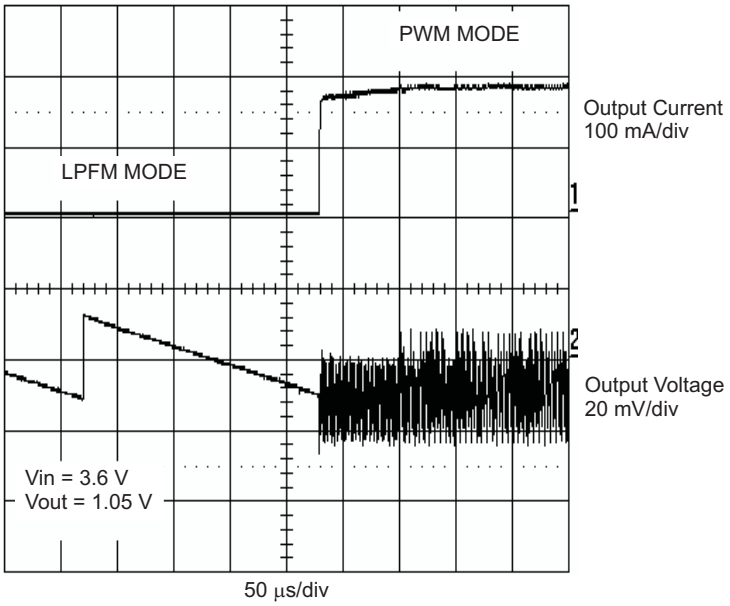


Figure 5. Load Transient, 1-mA to 180-mA Step

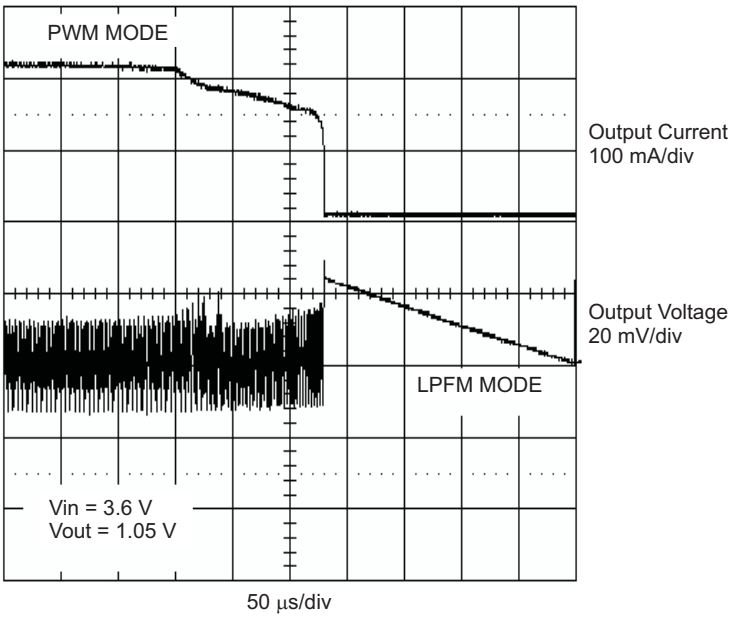


Figure 6. Load Transient, 210-mA to 1-mA Step

5 Board Layout

This section provides the TPS62350EVM-201 board layout and illustrations.

Board layout is critical for all high-frequency, switch-mode power supplies. Figure 7 through Figure 11 show the board layout for the TPS62350EVM-201 PCB. The nodes with high-switching frequencies and currents are kept as short as possible to minimize trace inductance. Careful attention has been given to the routing of high-frequency current loops and a single-point grounding scheme is used. See the data sheet for specific layout guidelines.

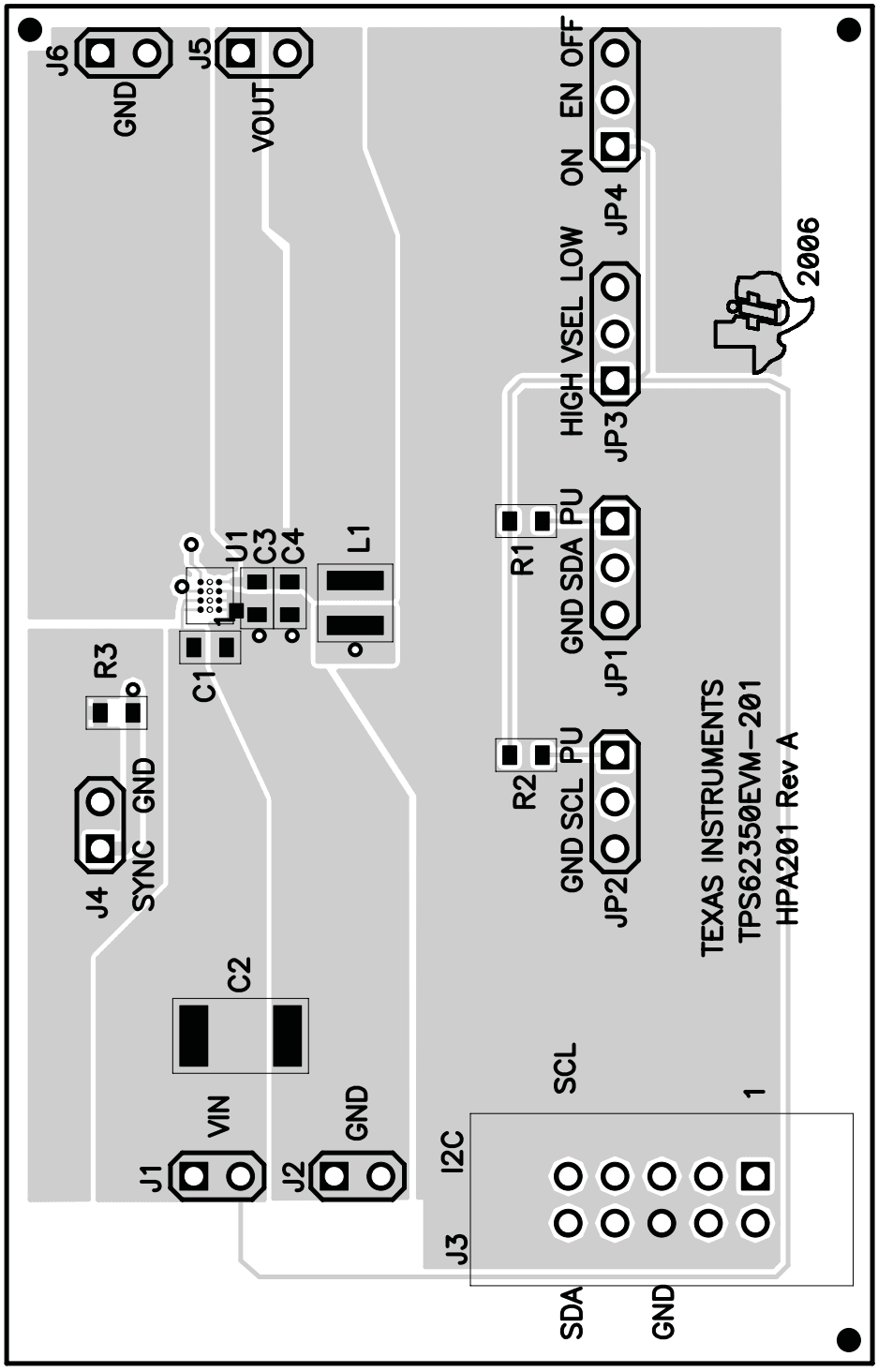


Figure 7. Assembly Layer

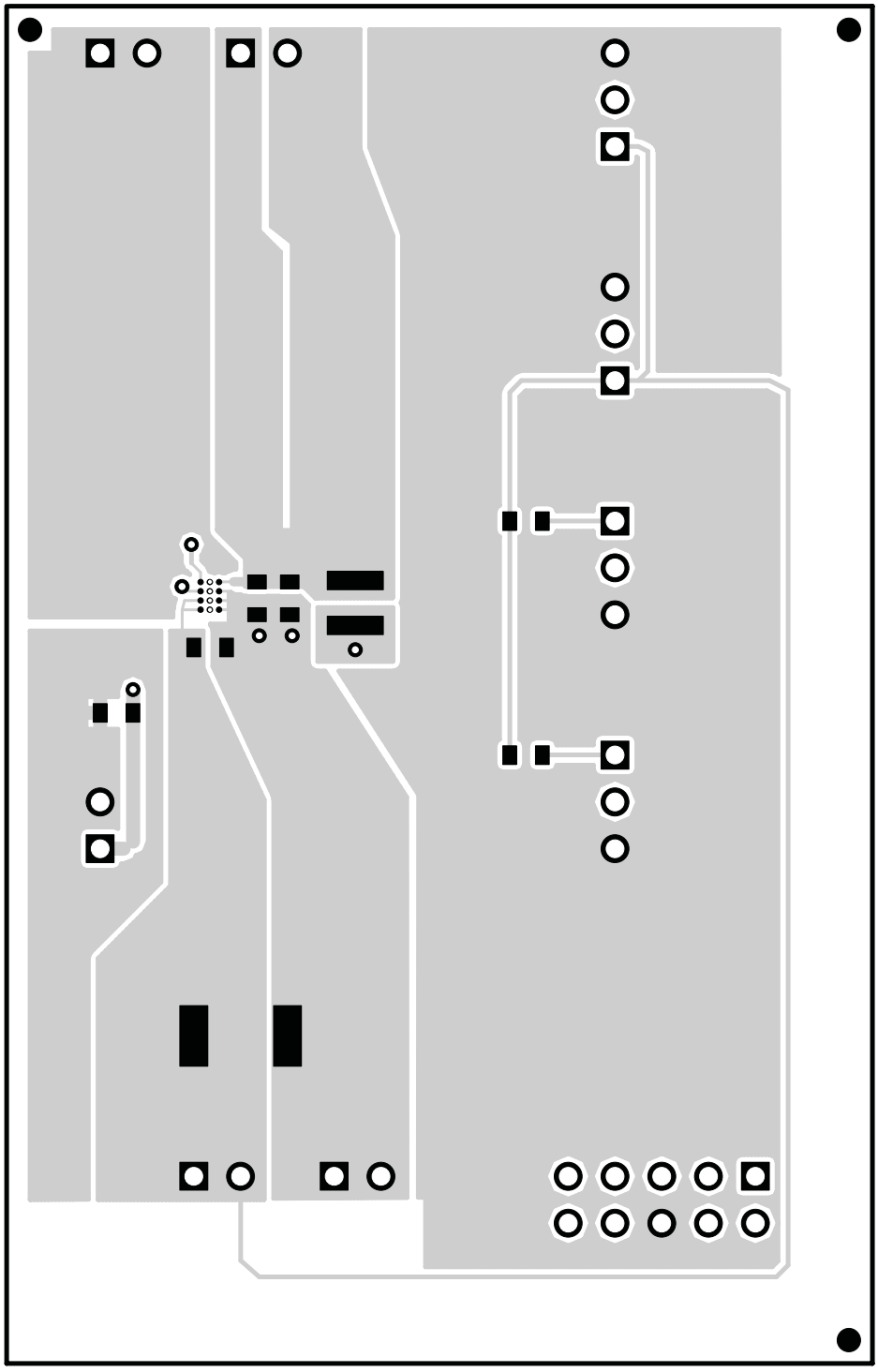


Figure 8. Top Layer Routing

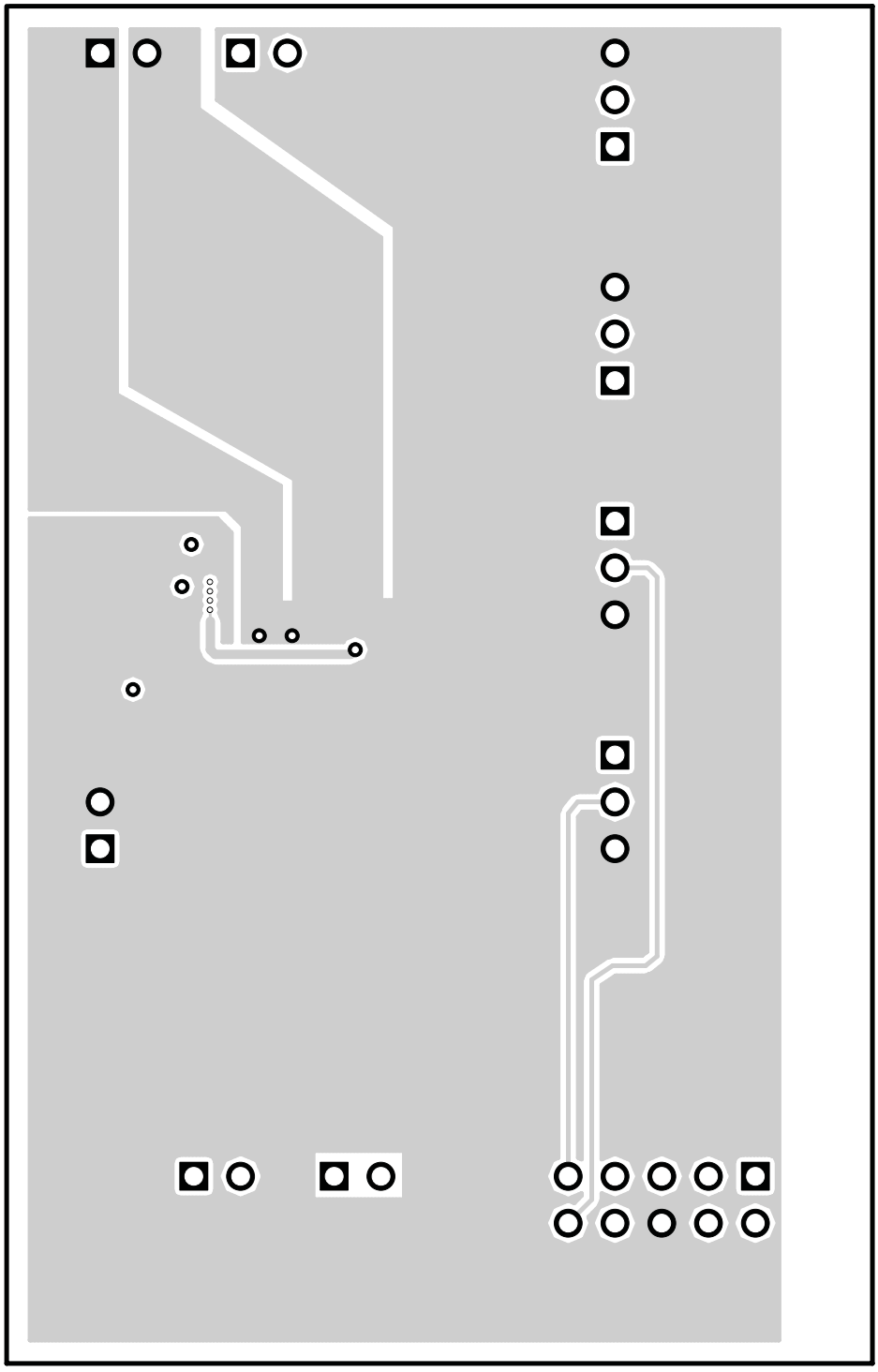


Figure 9. Bottom Layer Routing

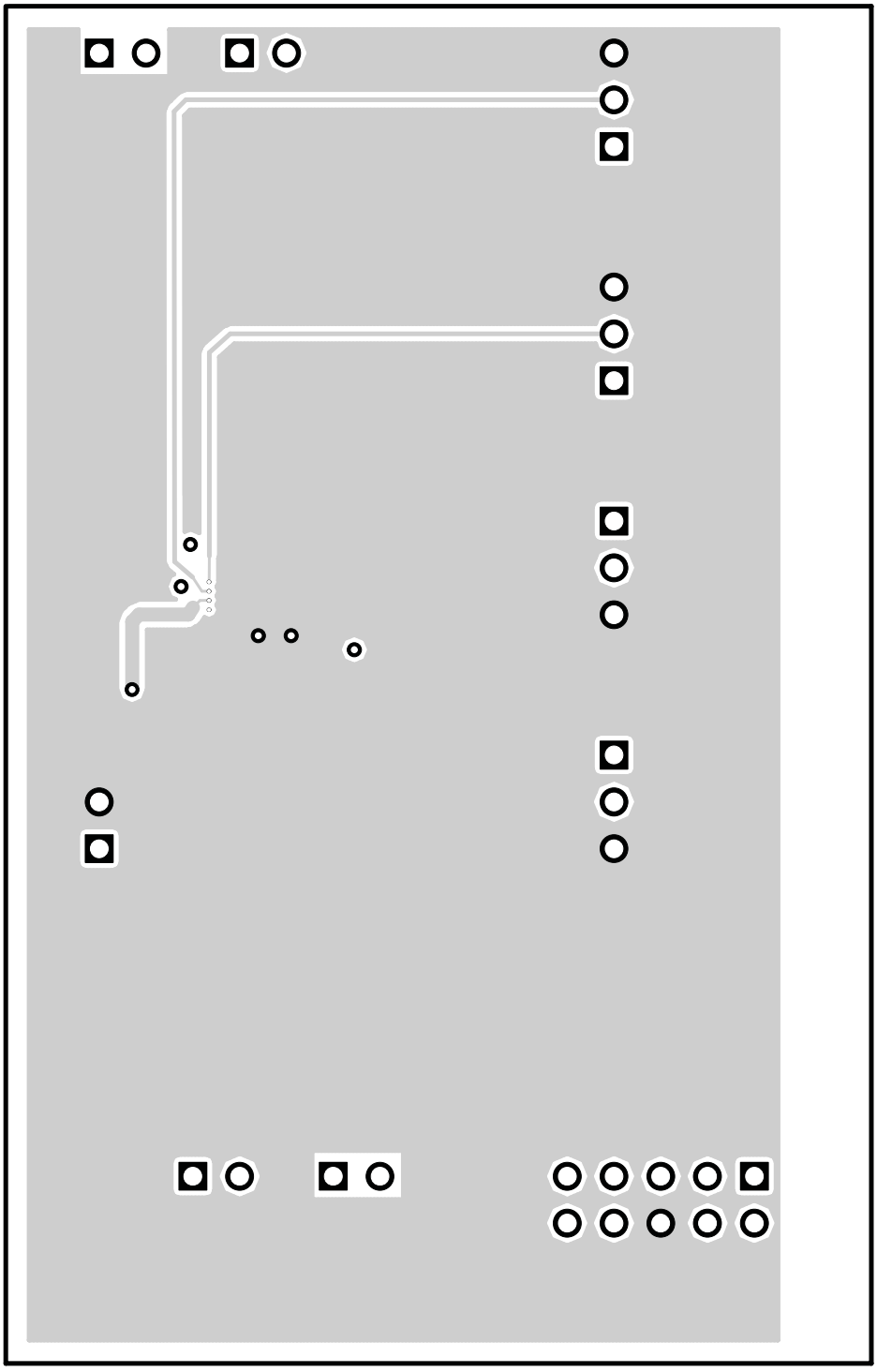


Figure 10. Layer 2 Routing

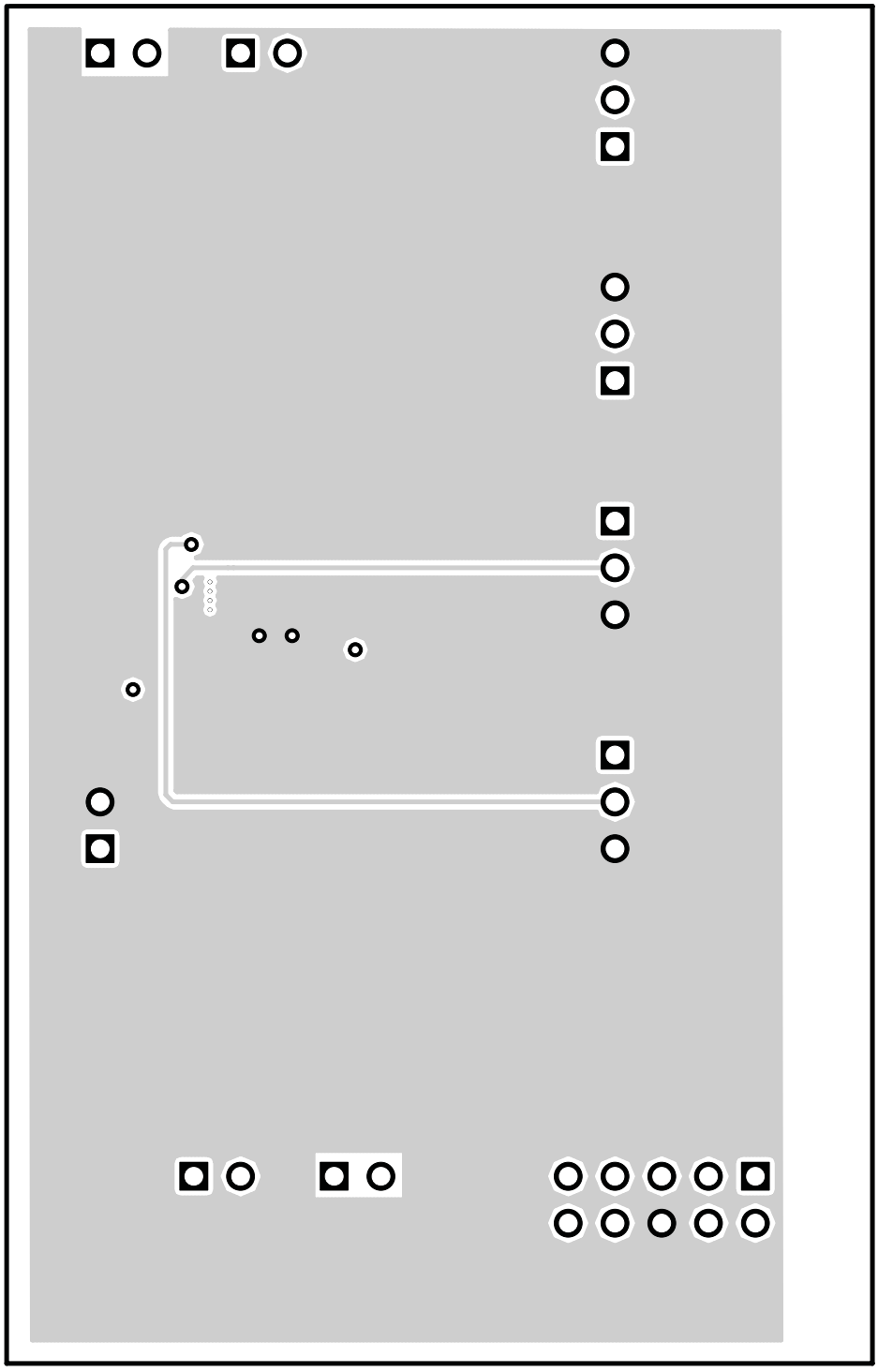


Figure 11. Layer 3 Routing

6 Schematic and Bill of Materials

This section provides the TPS62350EVM-201 schematic and bill of materials.

6.1 Schematic

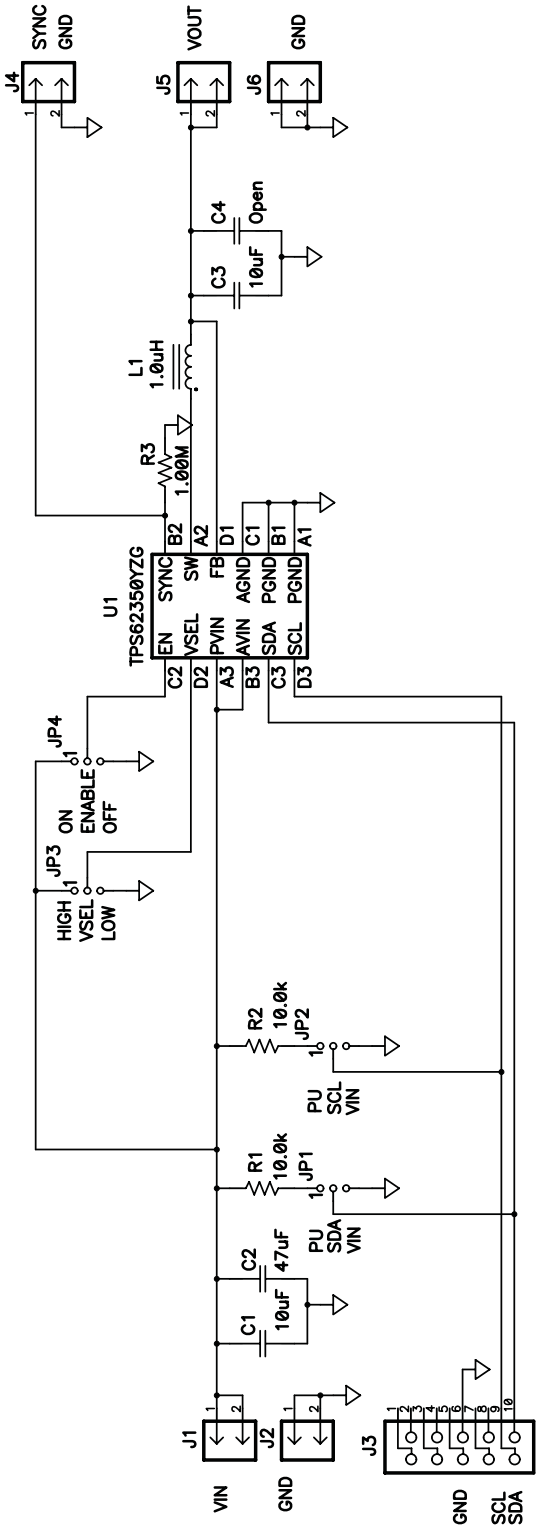


Figure 12. TPS62350EVM-201 Schematic

6.2 Bill of Materials

Table 1. HPA201A Bill of Materials

Count	Ref Des	Value	Description	Size	Part Number	MFR
2	C1, C3	10µF	Capacitor, ceramic, 6.3V, X5R, 10%	0603	C1608X5R0J106KT	TDK
1	C2	47µF	Capacitor, ceramic, 10V, X5R, 20%	1812	C4532X5R1A476M	TDK
0	C4	Open	Capacitor, ceramic, vvV	0603		
5	J1, J2, J4–J6		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100 × 2	PTC36SAAN	Sullins
1	J3		Connector, Male Straight 2×10 pin, 100 mil spacing, 4 Wall	0.338 × 0.788	2510-6002UB	3M
4	JP1–JP4		Header, 3 pin, 100 mil spacing, (36-mil strip)	0.100 × 3	PTC36SAAN	Sullins
1	R1, R2	1.0µF	Inductor, SMT, 1.6A, ±30%	0.118 × 0.118	LPS3010-102NLC	Coilcraft
2	R3	10.0µF	Resistor, Chip, 1/16W, 1%	0.603	Std	Std
1	U1	1.00M	Resistor, Chip, 1/16W, 1%	0.603	Std	Std
1	–		IC, 3MHz synchronous step down converter with I^2C, 800mA	CSP-12	TPS62350YZG	TI
1	–		PCB, 3.05 In × 1.85 In × 0.062 In		HPA201	Any
4			Shunt, 100 mil, Black	0.100	929950-00	3M

6.3 Related Documentation From Texas Instruments

TPS62350, TPS62351 800-mA, 3-MHz Synchronous Step-Down Converter With I^2C ™Compatible Interface in Chip Scale Packaging data sheet (SLVS540)

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2.7 V to 6 V and the output voltage range of 0.75 V to 1.5375 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 85°C. The EVM is designed to operate properly with certain components above 85°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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