

Evaluates: MAX5134–MAX5137

General Description

The MAX5134 evaluation kit (EV kit) provides a proven design to evaluate the MAX5134 quad, 16-bit, low-power digital-to-analog converter (DAC). The EV kit also includes Windows® 2000/XP/Vista®-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX5134.

The MAX5134 EV kit PCB comes with a MAX5134AGTG+ installed. Contact the factory for free samples of the pin-compatible MAX5135GTG+ (quad, 12-bit DAC), MAX5136AGTG+ (dual, 16-bit DAC), and MAX5137GTG+ (dual, 12-bit DAC) to evaluate these devices.

Features

- ◆ Windows 2000/XP/Vista (32-Bit)-Compatible Software
- ◆ Supports Standard SPI™ Interface
- ◆ USB-PC Connection (Cable Included)
- ◆ USB Powered
- ◆ 8-Pin DAC Output Signal Header
- ◆ Proven PCB Layout
- ◆ Lead-Free and RoHS Compliant
- ◆ Fully Assembled and Tested

Ordering Information

| PART | TYPE |
|---------------|--------|
| MAX5134EVKIT+ | EV Kit |

+Denotes lead-free and RoHS compliant.

Component List

| DESIGNATION | QTY | DESCRIPTION |
|---------------------------|-----|---|
| C1, C3–C10, C17, C21, C23 | 12 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K |
| C2, C13, C15, C22, C24 | 5 | 10µF ±20%, 6.3V X5R ceramic capacitors (0805) TDK C2012X5R0J106M |
| C11, C12 | 2 | 10pF ±5%, 50V C0G ceramic capacitors (0603) TDK C1608C0G1H100J |
| C14, C16 | 2 | 1µF ±20%, 6.3V X5R ceramic capacitors (0603) TDK C1608X5R0J105M |
| C18, C19 | 2 | 22pF ±5%, 50V C0G ceramic capacitors (0603) TDK C1608C0G1H220J |
| C20 | 1 | 3300pF ±10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H332K |
| C25 | 0 | Not installed, ceramic capacitor (0603) |

| DESIGNATION | QTY | DESCRIPTION |
|------------------------|-----|---|
| C26 | 1 | 39pF ±5%, 50V C0G ceramic capacitor (0402) Murata GRM1555C1H390G |
| D1 | 1 | Green LED (0603) |
| FB1 | 1 | 0Ω ±5% resistor (0603) |
| H1 | 0 | Not installed, header |
| H2 | 1 | Dual-row (2 x 4) 8-pin header |
| H3 | 1 | Dual-row (2 x 6) 12-pin header |
| JUA–JUE | 0 | Not installed |
| JU1–JU5, JU7, JU8, JU9 | 8 | 3-pin headers |
| JU6 | 1 | 5-pin header |
| P1 | 1 | USB type-B right-angle female receptacle |
| R1, R8 | 2 | 0Ω ±5% resistors (0603) |
| R2 | 1 | 220Ω ±5% resistor (0603) |
| R3 | 1 | 10kΩ ±5% resistor (0603) |
| R4 | 1 | 2.2kΩ ±5% resistor (0603) |
| R5 | 1 | 1.5kΩ ±5% resistor (0603) |
| R6, R7 | 2 | 27Ω ±5% resistors (0603) |

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SPI is a trademark of Motorola, Inc.

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at www.maximintegrated.com.

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Component List (continued)

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|--|
| R16 | 0 | Not installed, resistor (0402) |
| U1 | 1 | Quad, 16-bit DAC (16 TQFN-EP*) Maxim MAX5134AGTG+ |
| U2 | 1 | Low-power microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+ |
| U3 | 1 | 93C46 type 3-wire EEPROM 16-bit architecture (8 SO) |
| U4 | 1 | UART-to-USB converter (32 TQFP) |
| U5 | 1 | 3.3V regulator (5 SC70) Maxim MAX8511EXK33+T (Top Mark: AEI) |

| DESIGNATION | QTY | DESCRIPTION |
|-------------|-----|--|
| U6 | 1 | 2.5V regulator (5 SC70) Maxim MAX8511EXK25+T (Top Mark: ADV) |
| Y1 | 1 | 16MHz crystal |
| Y2 | 1 | 6MHz crystal |
| — | 9 | Shunts |
| — | 1 | USB high-speed A-to-B cable |
| — | 1 | PCB: MAX5134 Evaluation Kit+ |

*EP = Exposed pad.

Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|--|--------------|-----------------------------|
| Murata Electronics North America, Inc. | 770-436-1300 | www.murata-northamerica.com |
| TDK Corp. | 847-803-6100 | www.component.tdk.com |

Note: Indicate that you are using the MAX5134 when contacting these component suppliers.

MAX5134 EV Kit Files

| FILE | DESCRIPTION |
|---------------------|--|
| INSTALL.EXE | Installs the EV kit files on your computer |
| MAX5134.EXE | Application program |
| FTD2XX.INF | USB device driver file |
| UNINST.INI | Uninstalls the EV kit software |
| USB_Driver_Help.PDF | USB driver installation help file |

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Quick Start

Required Equipment

Before beginning, the following equipment is needed.

- MAX5134 EV kit (USB cable included)
- A user-supplied Windows 2000/XP/Vista-compatible PC with a spare USB port
- Two digital voltmeters (DVMs)
- USB powered (use optional external power supply for enhanced performance)

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The MAX5134 EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Visit www.maximintegrated.com/evkitsoftware to download the latest version of the EV kit software, 5134Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
- 2) Install the EV kit software on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied and icons are created in the Windows **Start | Programs** menu.
- 3) Verify that all jumpers (JU1–JU9) are in their default positions, as shown in Table 1.
- 4) Connect the USB cable from the PC to the EV kit board. A **New Hardware Found** window pops up when installing the USB driver for the first time. If you do not see a window that is similar to the one described above after 30 seconds, remove the USB cable from the board and reconnect it. Administrator privileges are required to install the USB device driver on Windows.
- 5) Follow the directions of the **Add New Hardware Wizard** to install the USB device driver. Choose the **Search for the best driver for your device** option. Specify the location of the device driver to be **C:\Program Files\MAX5134** (default installation directory) using the **Browse** button. During device driver installation, Windows may show a warning message indicating that the device driver Maxim uses does not contain a digital signature. This is not an error condition and it is safe to proceed with installation. Refer to the USB_Driver_Help.PDF doc-

ument included with the software for additional information.

- 6) Start the MAX5134 EV kit software by opening its icon in the **Start | Programs** menu.
- 7) When the **Power Up State Of DAC Outputs** window appears, verify that the JU6 shunt is in the proper location on the board and press the corresponding radio button. Next, the EV kit software main window appears, as shown in Figure 1.
- 8) To measure the OUT0 voltage, connect the first DVM between H2-1 (OUT0) and H2-2 (GND).
- 9) To measure the OUT1 voltage, connect the second DVM between H2-3 (OUT1) and H2-4 (GND).
- 10) Verify that the voltage on both DVMs is approximately 1.22V.
- 11) In the **Shift to Input and Output** group box, check the **DAC A** and **DAC B** checkboxes.
- 12) Enter **0x68EB** into the **D15 - D0 (Shift Register Data Bits)** edit box.
- 13) In the **Shift to Input and Output** group box, press the **Load Selected DAC(s)** button.
- 14) Verify that the voltage shown on both DVMs is approximately 1V.

Detailed Description of Software

The main window of the evaluation software (Figure 1) displays the voltage and code for all DAC input and output registers. In addition, the main window has two tabs. The **Load DACs** tab sheet controls all of the DAC loading features of the MAX5134. The **Operating Modes** tab sheet (Figure 2) controls all of the DAC modes of the MAX5134. The **Load Setting(s)** button must be pressed to write the corresponding mode settings to the DAC(s).

Software Reset

Press the **Reset All Registers** button to reset the MAX5134's registers and GUI to the power-on reset (POR) state. This can be done at any time and is highly recommended after using the advanced user interface.

Advanced User Interface

A manual serial interface can be used by advanced users by clicking **Options | Interface (Advanced Users)**.

For SPI, click on the **3-wire interface** tab shown in Figure 3. Enter data in to the **Data bytes to be written:** edit box and press the **Send Now** button.

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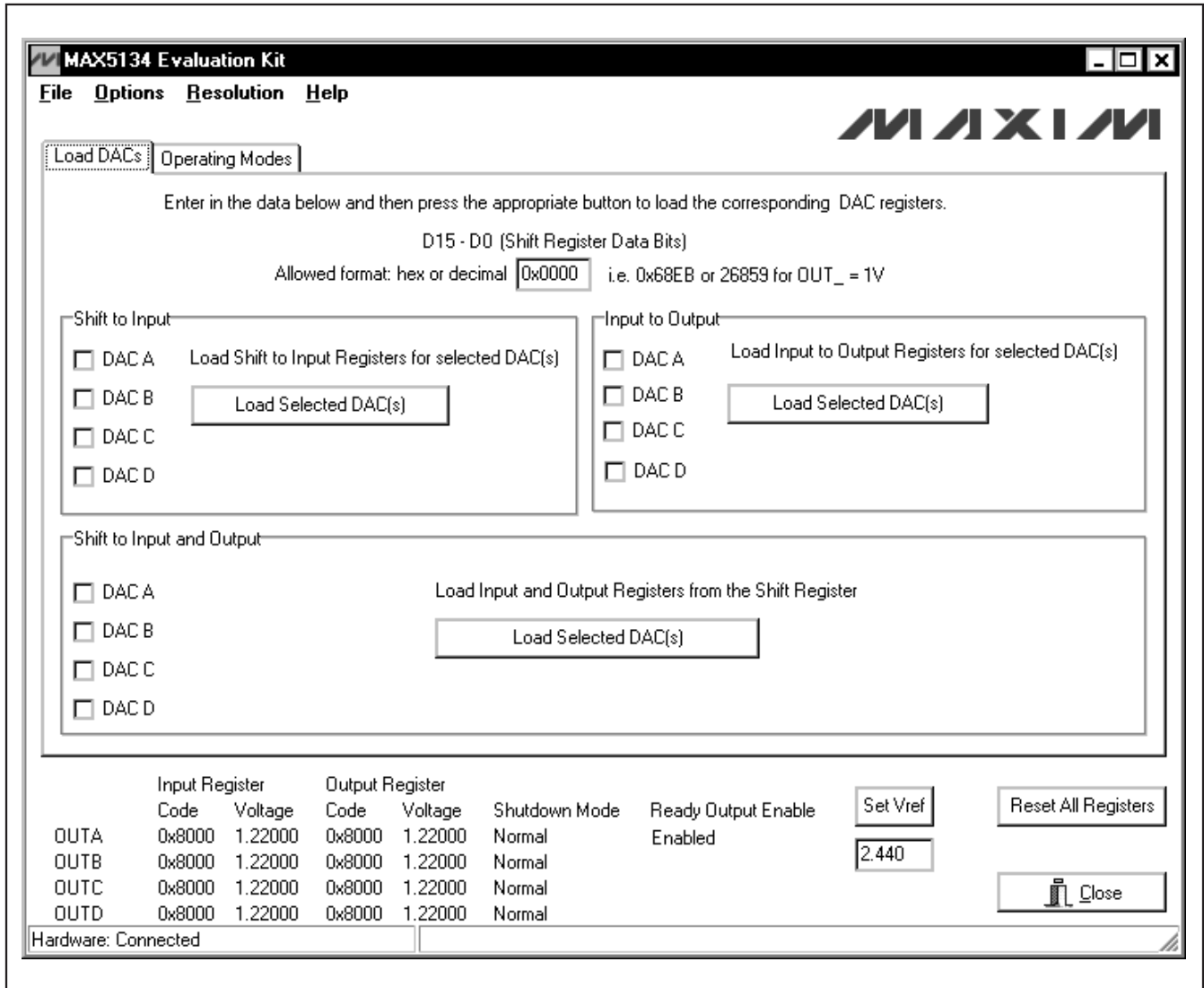


Figure 1. MAX5134 EV Kit Software Main Window (Load DACs Tab)

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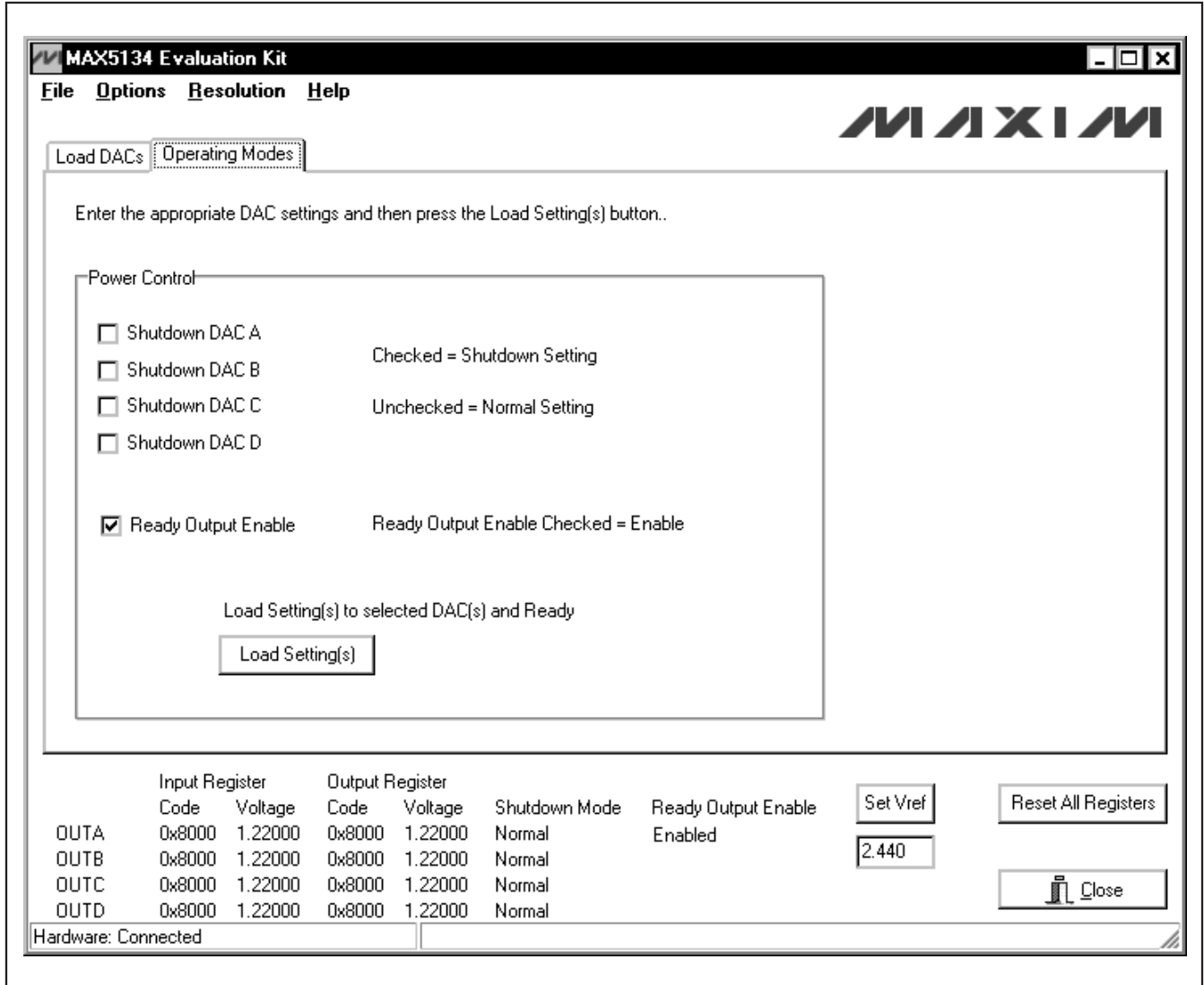


Figure 2. MAX5134 EV Kit Software Main Window (Operating Modes Tab)

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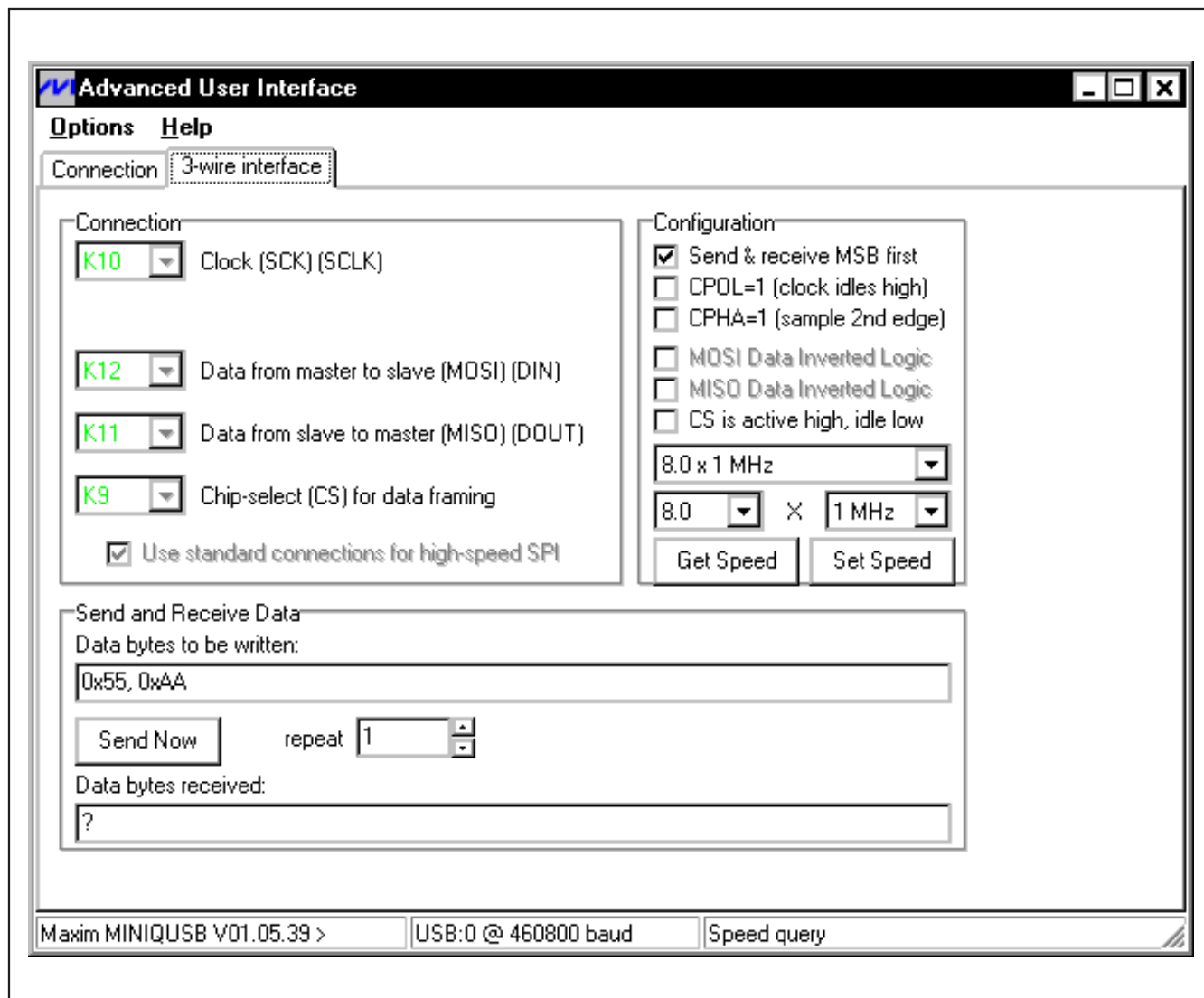


Figure 3. Advanced SPI User Interface Window (3-Wire Interface Tab)

Detailed Description of Hardware

The MAX5134 EV kit provides a proven layout for the MAX5134. An on-board analog output signal header (H2), an on-board digital input/output signal header (H3), and jumpers to disconnect the on-board micro-controller are all included on the EV kit.

Reference

At power-up, the MAX5134 EV kit defaults to using the internal 2.440V reference.

To use AVDD as the reference, place a shunt on jumper JU9 in the 2-3 position. For off-board external references, connect a user-supplied reference voltage to REFIN and remove the shunt on jumper JU9. Type in the reference voltage value in the **Set Vref** edit box and press the **Set Vref** button. The MAX5134 EV kit software uses the value in the **Set Vref** edit box to calculate the input and output register voltage values and does not affect any commands to the part.

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User-Supplied SPI Interface

To use the MAX5134 EV kit with a user-supplied SPI interface, first move the shunts of JU1–JU5 to the 2-3 position and JU6 to the 1-3 position. Next, move the shunt of JU7 to the 2-3 position. Then apply an external 2.7V to 5.25V power supply to DVDD. Lastly, connect \overline{CS} , SCLK, DIN, and GND signals to the corresponding pins of header H3.

User-Supplied Power Supplies

The MAX5134 EV kit is powered completely from the USB port by default. Before connecting a user-supplied power supply > 3.6V on DVDD, the on-board microcontroller must be disconnected. To disconnect the microcontroller, move the shunts of JU1–JU5 to the 2-3 position and JU6 to the 1-3 position. Next, move the shunts of JU7 and JU8 to the 2-3 position. Then apply an external 2.7V to 5.25V power supply to the corresponding DVDD and AVDD pads. For optimum performance, use separate supplies. Lastly, see the *User-Supplied SPI Interface* section for interface connections if applicable.

Table 1. MAX5134 EV Kit Jumper Descriptions (JU1–JU9)

| JUMPER | SHUNT POSITION | DESCRIPTION |
|--------|----------------|---|
| JU1 | 1-2* | The MAX5134 \overline{CS} signal is connected to the on-board microcontroller. |
| | 2-3 | The MAX5134 \overline{CS} signal is connected to the on-board header H3. |
| JU2 | 1-2* | The MAX5134 SCLK signal is connected to the on-board microcontroller. |
| | 2-3 | The MAX5134 SCLK signal is connected to the on-board header H3. |
| JU3 | 1-2* | The MAX5134 DIN signal is connected to the on-board microcontroller. |
| | 2-3 | The MAX5134 DIN signal is connected to the on-board header H3. |
| JU4 | 1-2 | Factory Use Only. The MAX5134 EV kit software and MAXQ2000 microcontroller do not read the MAX5134 \overline{READY} signal. |
| | 2-3* | The MAX5134 \overline{READY} signal is connected to the on-board header H3. |
| JU5 | 1-2* | The MAX5134 \overline{LDAC} signal is connected to the on-board microcontroller. |
| | 1-3 | The MAX5134 \overline{LDAC} signal is connected to the on-board header H3. |
| JU6 | 1-2 | Factory Use Only. The MAX5134 EV kit software and MAXQ2000 microcontroller do not drive the MAX5134 M/\overline{Z} signal. |
| | 1-3 | The MAX5134 M/\overline{Z} signal is connected to GND. DAC outputs are set to 0V after power-up or power-on reset (POR). |
| | 1-4 | The MAX5134 M/\overline{Z} signal is connected to H3-11 of header H3. |
| | 1-5* | The MAX5134 M/\overline{Z} signal is connected to AVDD. DAC outputs are set to midscale after power-up or power-on reset (POR). |
| JU7 | 1-2* | DVDD is connected to the on-board regulated 3.3V supply. |
| | 2-3 | Connect an external 2.7V to 3.6V supply to the DVDD pad. The on-board microcontroller must be disconnected before connecting an external supply to DVDD > 3.6V. See the <i>User-Supplied Power Supplies</i> section for more information. |
| JU8 | 1-2* | AVDD is connected to the on-board regulated 3.3V supply. |
| | 2-3 | Connect an external 2.7V to 5.25V supply to the AVDD pad. |
| JU9 | 1-2* | The MAX5134 REFI pin is connected to the internal 2.440V reference. REFI is connected to REFO. |
| | 2-3 | The MAX5134 reference is equal to AVDD. |
| | Open | Connect an external reference voltage on the REFIN pad in the range of 2V to AVDD. |

*Default position.

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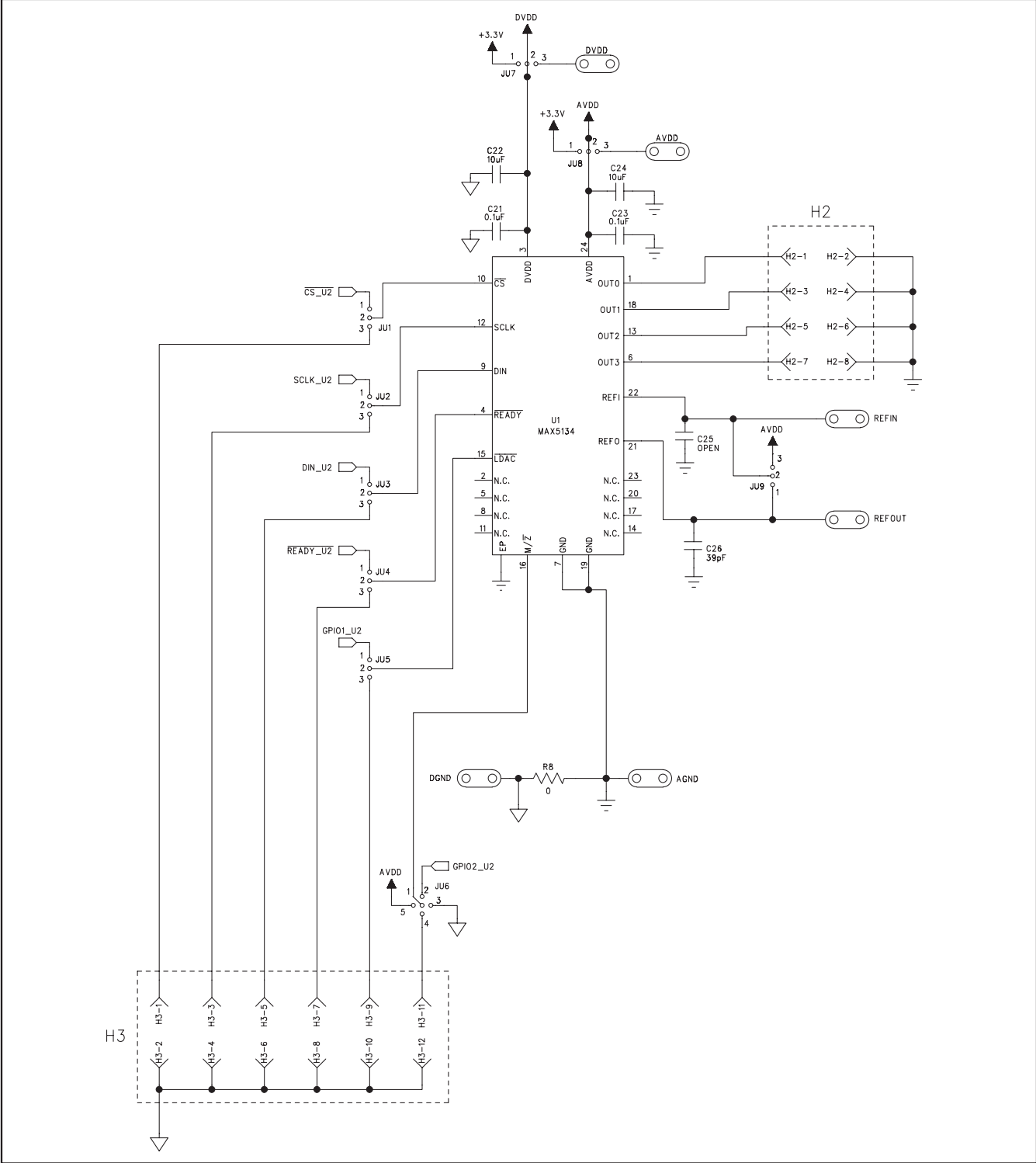


Figure 4a. MAX5134 EV Kit Schematic (Sheet 1 of 2)

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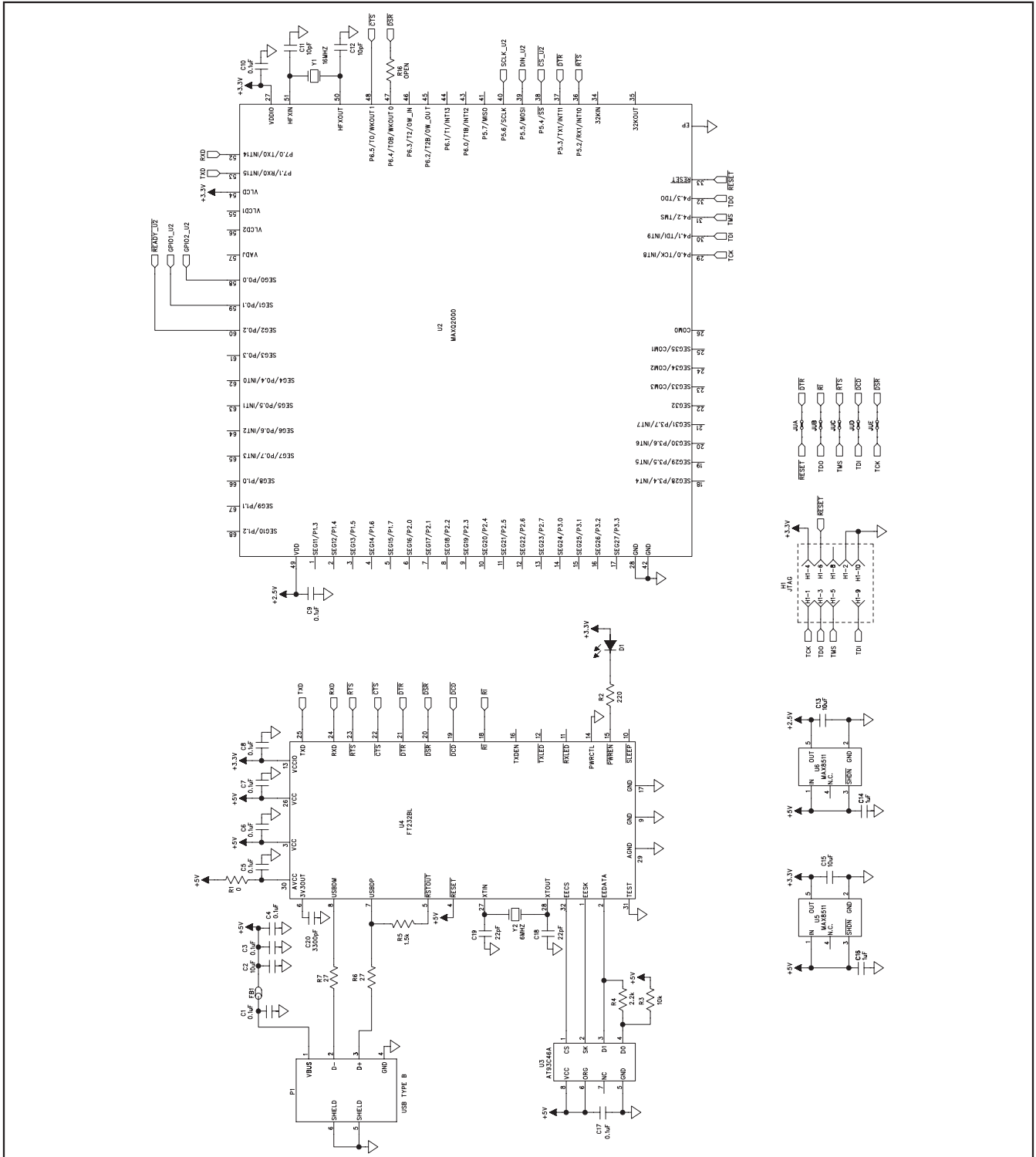


Figure 4b. MAX5134 EV Kit Schematic (Sheet 2 of 2)

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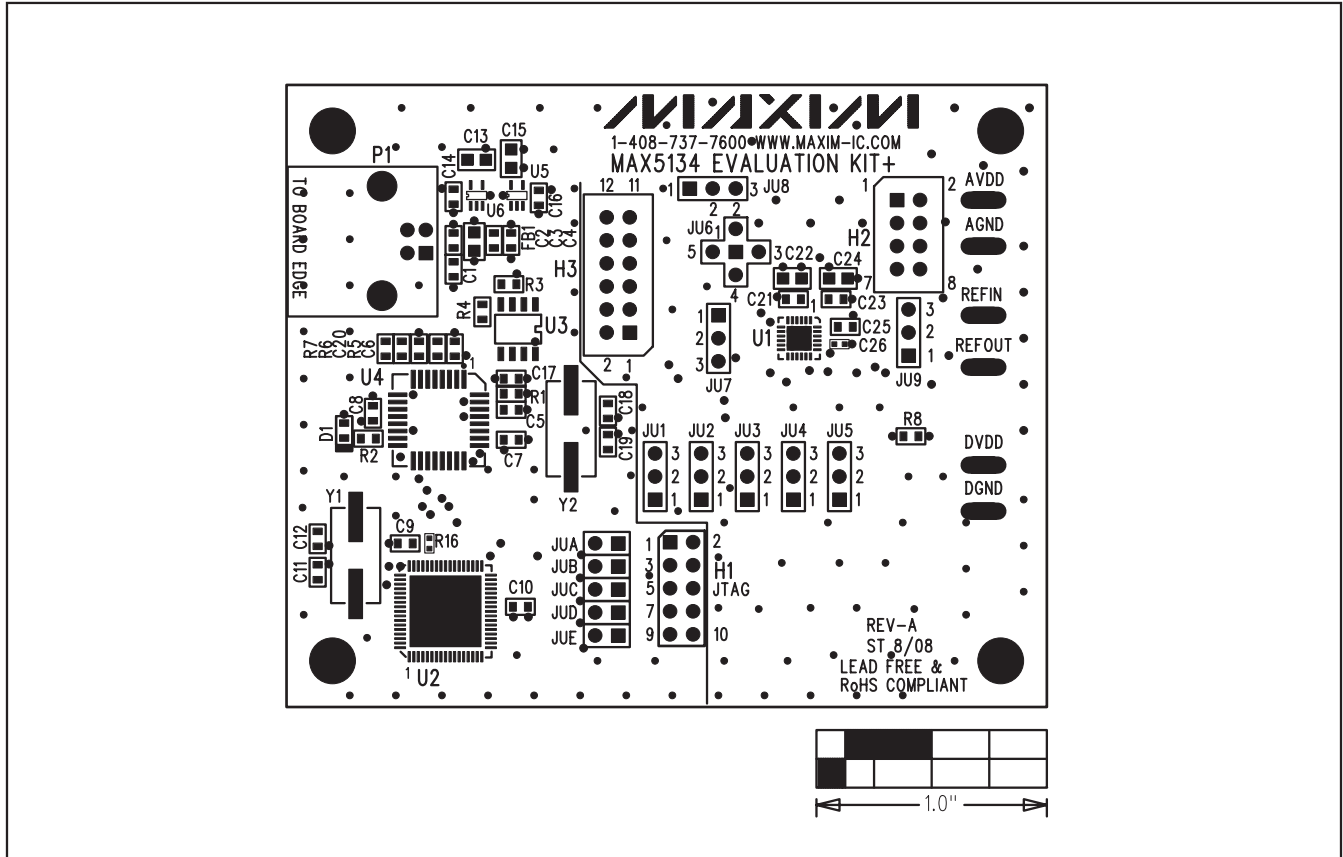


Figure 5. MAX5134 EV Kit Component Placement Guide—Component Side

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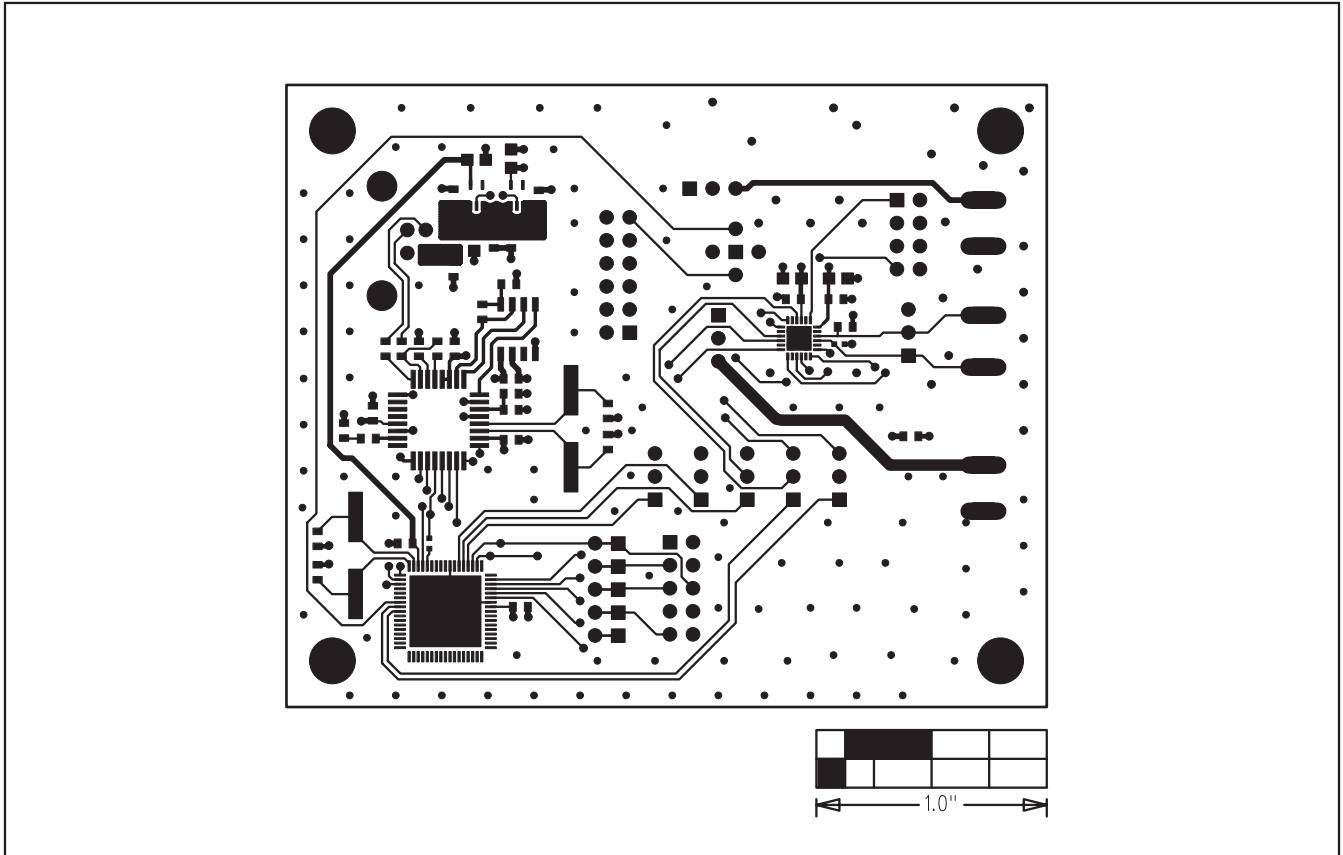


Figure 6. MAX5134 EV Kit PCB Layout—Component Side

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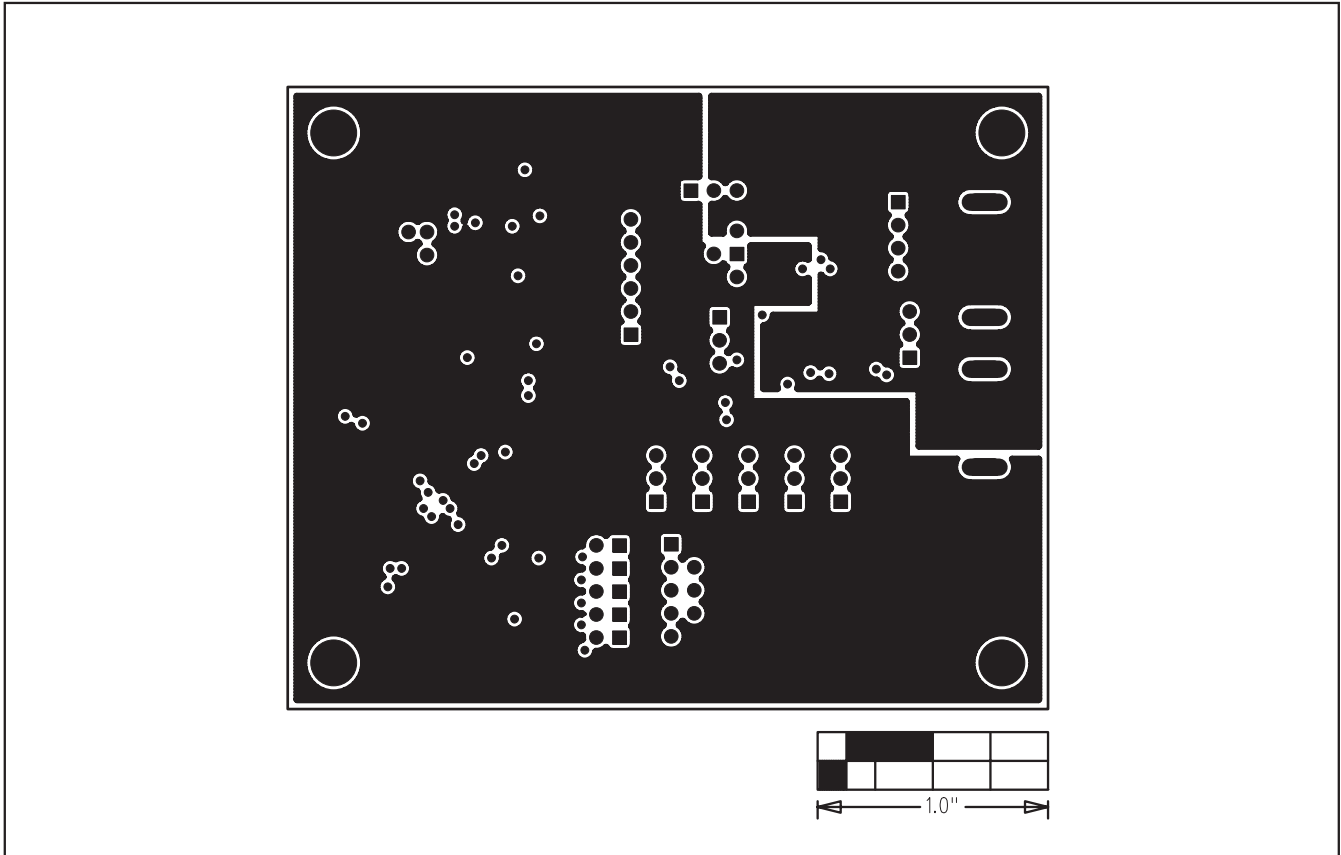


Figure 7. MAX5134 EV Kit PCB Layout—Inner Layer 2 (GND)

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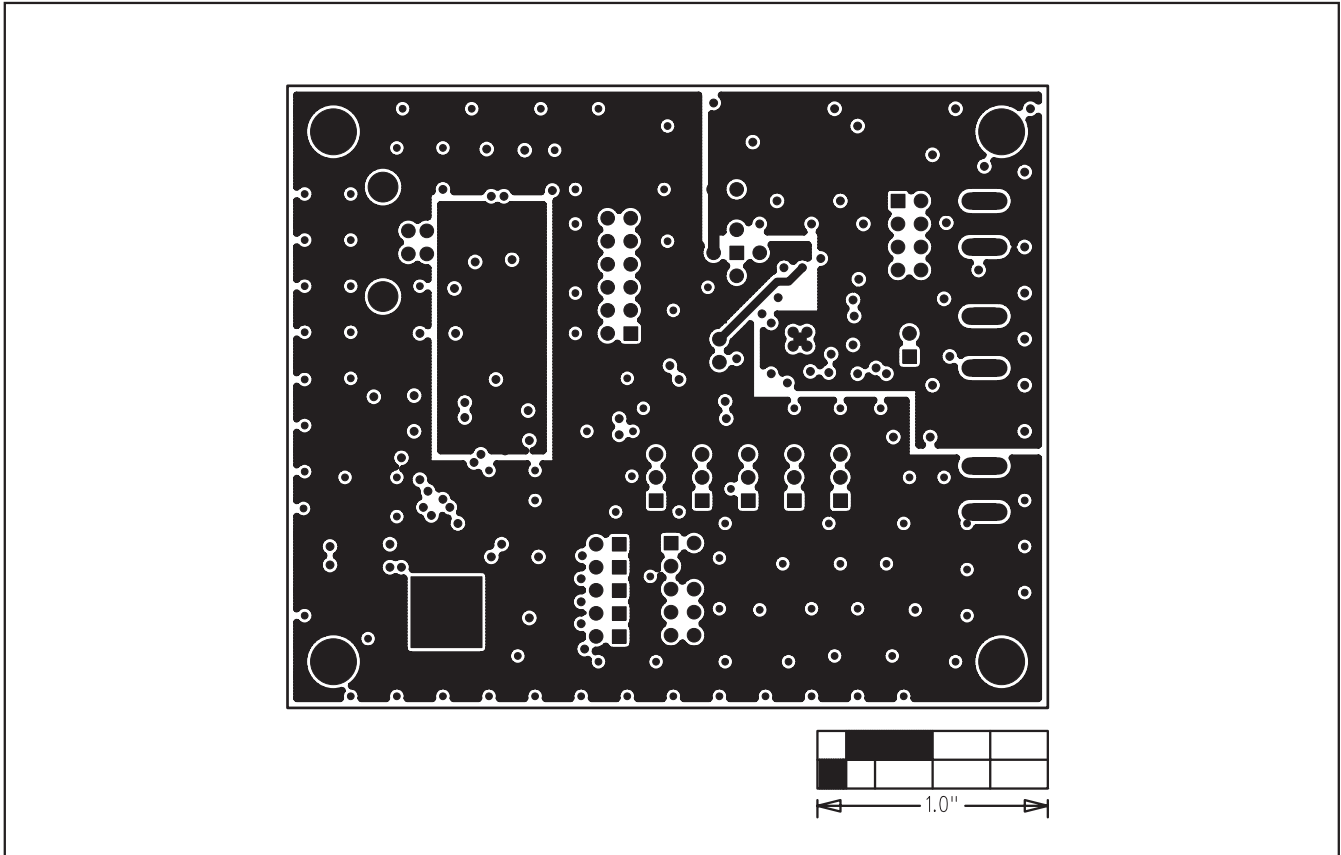


Figure 8. MAX5134 EV Kit PCB Layout—Inner Layer 3 (VDD)

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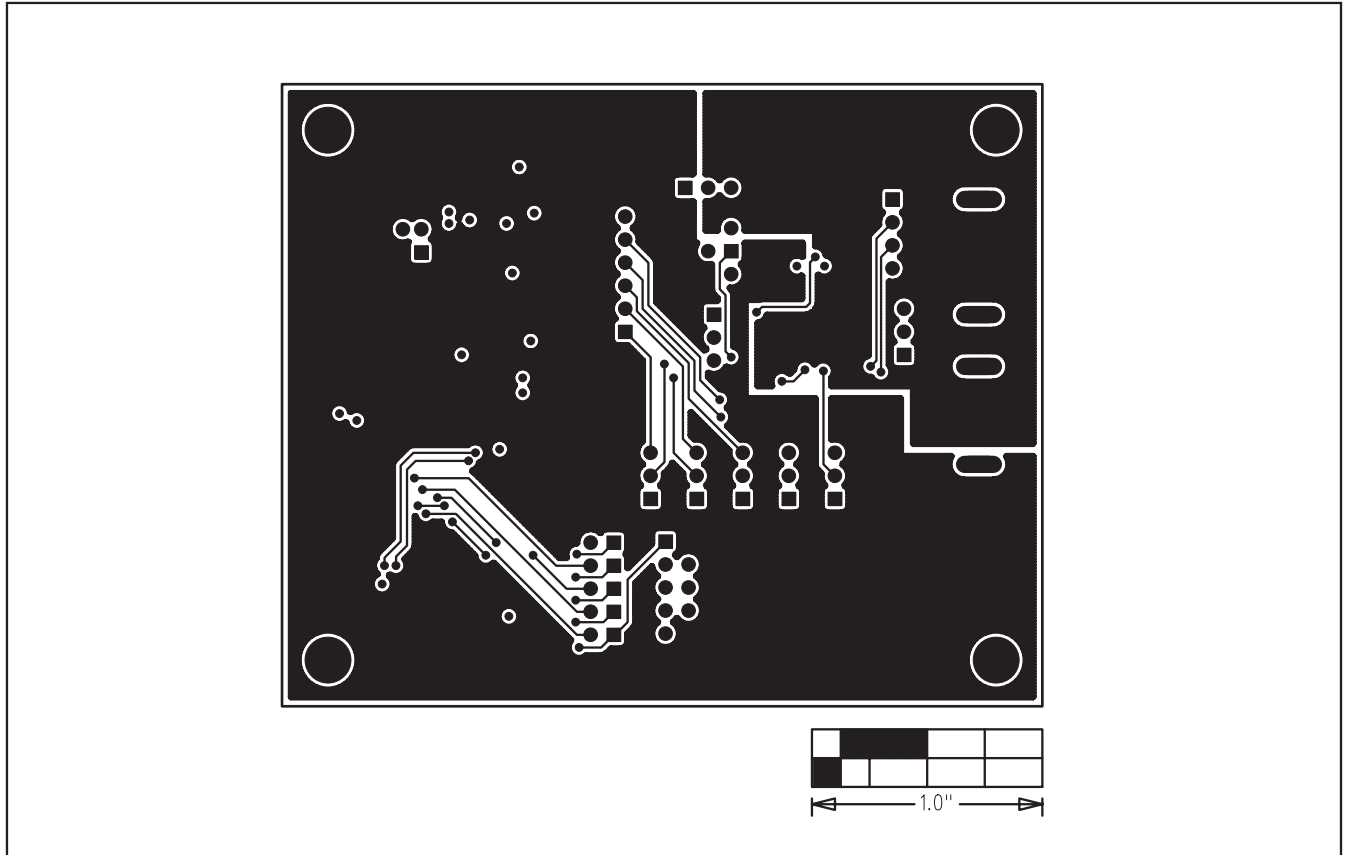


Figure 9. MAX5134 EV Kit PCB Layout—Solder Side



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