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MAX54X Evaluation Kit

Evaluates: MAX541/MAX542

General Description

The MAX54X evaluation kit (EV kit) provides a proven design to evaluate the MAX541/MAX542 serial-input, voltage-output, 16-bit digital-to-analog convertors (DACs). The EV kit also includes Windows XP®-, Windows Vista®-, and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising the features of these devices.

The DACs are controlled by an on-board MAXQ® microcontroller, which provides two separate SPI control interfaces.

The EV kit provides an on-board +2.5V high-precision voltage reference (MAX6126). The EV kit also provides precision bipolar and ultra-precision unipolar op amps, the MAX9632 (single) and MAX44251 (dual), respectively.

The EV kit comes with the MAX541AESA+ and a MAX542AESD+ installed; however, it can also be used to evaluate other parts in the same family. Contact the factory for free samples of the pin-compatible devices shown in Table 1.

Features

♦ **Provides Both Bipolar and Unipolar Outputs**

♦ **On-Board +2.5V High-Precision Voltage Reference**

♦ **On-Board Bipolar and Unipolar High-Precision Op Amps**

♦ **Proven High-Performance 16-Bit DAC PCB Layout**

♦ **High-Speed USB 2.0 USB-PC Connection (Cable Included)**

♦ **Windows XP-, Windows Vista-, and Windows 7-Compatible Software**

♦ **RoHS Compliant**

♦ **Proven PCB Layout**

♦ **Fully Assembled and Tested**

Ordering Information *appears at end of data sheet.*

System Diagram
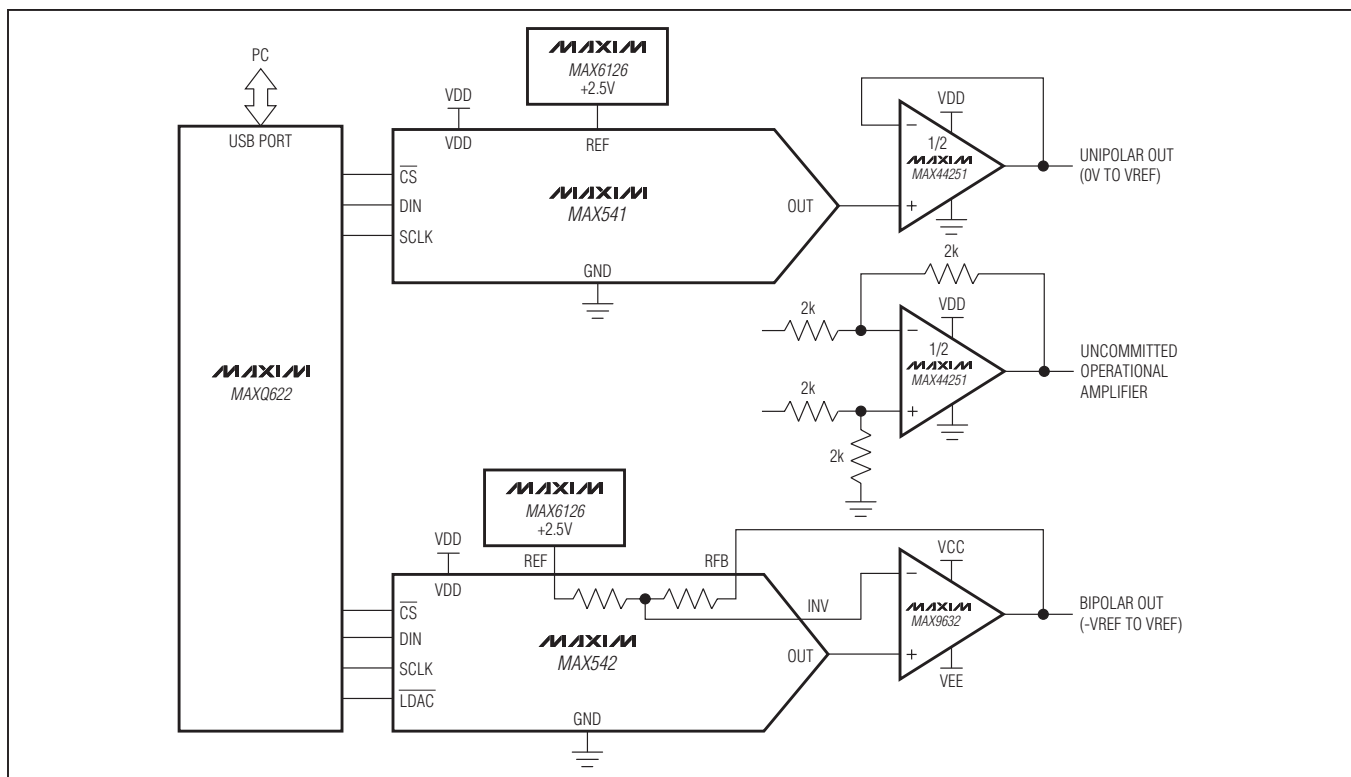
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Windows, Windows XP, and Windows Vista are registered trademarks of Microsoft Corp.

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

Component List

DESIGNATION	QTY	DESCRIPTION
AGND (x5), DGND (x2)	7	Black test points
BUF_OUT1, BUF_OUT2, CS0, CS1, DIN0, DIN1, INV, LDAC, OUT1, OUT2, SCLK0, SCLK1, U3_OUTB	13	White test points
C1, C5, C9, C10, C14, C18, C19–C22, C38	11	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata RM188R71C104K
C2, C6, C11, C15	4	0.01µF ±10%, 50V X7R ceramic capacitors (0603) Murata RM188R71H103K
C3, C7, C12, C16	4	1000pF ±10%, 50V X7R ceramic capacitors (0603) Murata RM188R71H102K
C4, C8, C13, C17	4	180pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H181J
C23–C33, C36, C37, C40, C41, C42	16	1µF ±10%, 16V X5R ceramic capacitors (0603) Murata RM188R61C105K
C34, C35	2	18pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H180J
C39	0	Not installed, ceramic capacitor (0603)
J1	1	USB type-B, right-angle PC-mount receptacle
J2	1	10-pin (2 x 5) dual-row header
J3	0	Not installed, 4-pin header
JU1–JU13	13	3-pin headers
JU14, JU15, JU16, JU_ID0–JU_ID3	7	2-pin headers

DESIGNATION	QTY	DESCRIPTION
L1	1	Ferrite bead (0603) TDK MMZ1608R301A
OP1+, OP2+, OP2-, REF, VDD	5	Red test points
R1, R7	2	10kΩ ±5% resistors (0603)
R2	1	100Ω ±5% resistor (0603)
R3–R6	4	2kΩ ±5% resistors (0603)
U1	1	+5V, unipolar, voltage-output, 16-bit DAC (8 SO) Maxim MAX541AESA+
U2	1	+5V, bipolar, voltage-output, 16-bit DAC (14 SO) Maxim MAX542AESD+
U3	1	Output buffer (8 SOT23) Maxim MAX44251AKA+T
U4	1	Output buffer (8 SO) Maxim MAX9632ASA+
U5	1	2.5V voltage reference (8 SO) Maxim MAX6126AASA25+
U6, U7, U8	3	Level translators (10 µMAX®) Maxim MAX1840EUB+
U11	1	Microcontroller (64 LQFP) Maxim MAXQ622G-0000+
U9	1	3.3V LDO (5 SC70) Maxim MAX8511EXK33+
U10	0	Not installed, ESD protector (6 SOT23)
Y1	1	12MHz crystal (HCM49)
—	1	USB high-speed A-to-B cable, 5ft (1.5m)
—	1	MAX54X EV kit CD
—	20	Shunts
—	1	PCB: MAX541/2 EVALUATION KIT

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 the specific Maxim part number you are using when contacting these component suppliers.

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MAX54X EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX54X.EXE	Application program
USBConverterDLL.DLL	Application library
UNINSTALL.EXE	Uninstalls the EV kit software

Quick Start

Required Equipment

- MAX54X EV kit
- MAX54X EV kit CD
- User-supplied Windows XP, Windows Vista, or Windows 7 PC with a spare USB port
- Voltmeter

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 EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on the power supply until all connections are completed.**

1) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 54XRxx.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 are in their default positions, as shown in Table 2.

4) Connect the USB cable from the PC to the EV kit board; the USB driver is installed automatically.

5) Connect the positive input of the voltmeter to the BUF_OUT1 connector. Connect the negative input of the voltmeter to the AGND connector.

6) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 1.

7) The main window should display **Hardware Connected** in the bottom-left corner.

8) In the **MAX541** group box, enter **FFFF** in the **DIN Register** edit box and press the **Enter** button.

9) The voltmeter should show a voltage value of approximately +2.5V.

10) Connect the positive input of the voltmeter to the BUF_OUT2 connector.

11) In the **MAX542** group box, click on the $\overline{\text{LDAC}}$ **low** radio button, enter **FFFF** in the **DIN Register** edit box, and press the **Enter** button.

12) The voltmeter should show a voltage value of approximately +2.5V.

Detailed Description of Software

In the main window of the evaluation software (Figure 1), the user can type in the reference voltage in the **REF Voltage** edit box. The software then calculates the DAC output voltages based on the reference voltage and the DAC input register value.

The **MAX541** group box controls the MAX541 unipolar DAC on the EV kit board. The **MAX542** group box controls the MAX542 bipolar DAC on the EV kit board.

To change the DAC input register value, type in the desired value in the **DIN Register** edit box and press the **Enter** button. The user can also move the track bar to change the DAC input register value. The DIN code and the target DAC output voltages are displayed for verification.

Selecting the $\overline{\text{LDAC}}$ **High** radio button in the **MAX542** group box sets the MAX542 /LDAC pin high; selecting the $\overline{\text{LDAC}}$ **Low** radio button sets the MAX542 $\overline{\text{LDAC}}$ pin low. When the $\overline{\text{LDAC}}$ **Low** radio button is selected, the output of the DAC updates immediately when the DAC input register is updated. Pressing the $\overline{\text{LDAC}}$ **Pulse** button generates a low pulse on the MAX542 $\overline{\text{LDAC}}$ pin and updates the output of the DAC.

For the MAX542, the target output voltages are calculated based on the selected mode in the **Output Mode** radio group box.

Click on the **Connect** menu item to connect the board to the software if the USB connection is lost.

Detailed Description of Hardware

The MAX54X EV kit provides a proven design to evaluate the installed MAX541/MAX542 serial-input, voltage-output, 16-bit DACs. The DACs are controlled by an on-board MAXQ microcontroller that provides two separate SPI control interfaces.

The EV kit provides on-board +2.5V high-precision voltage references. Use jumper JU2 to select from different reference sources.

The EV kit connects one precision bipolar buffer (MAX9632) to the MAX542 and one ultra-precision unipolar buffer (MAX44251) to the MAX541.

The EV kit comes with the MAX541AESA+ and MAX542AESD+ installed; however, it can also be used to evaluate other parts in the same family. Contact the factory for free samples of the pin-compatible devices shown Table 1.

Caution: Refer to the MAX44251/MAX44252 and the MAX9632 IC data sheets for detailed specifications. Pay special attention when using the USB power supply to power the devices. When the DAC output is beyond the op amp's guaranteed input common-mode voltage

range, use external power supplies instead. For better performance, use the ±15V power supply to power the MAX9632 op amp.

Bipolar Output Mode (MAX542 Only)
To allow the MAX542 to operate in bipolar mode, connect a +5V supply to the OP2+ connector, connect a -5V supply to the OP2- connector, install a shunt across pins 1-2 on jumper JU14, and across pins 2-3 on jumpers JU11, JU12, and JU13.
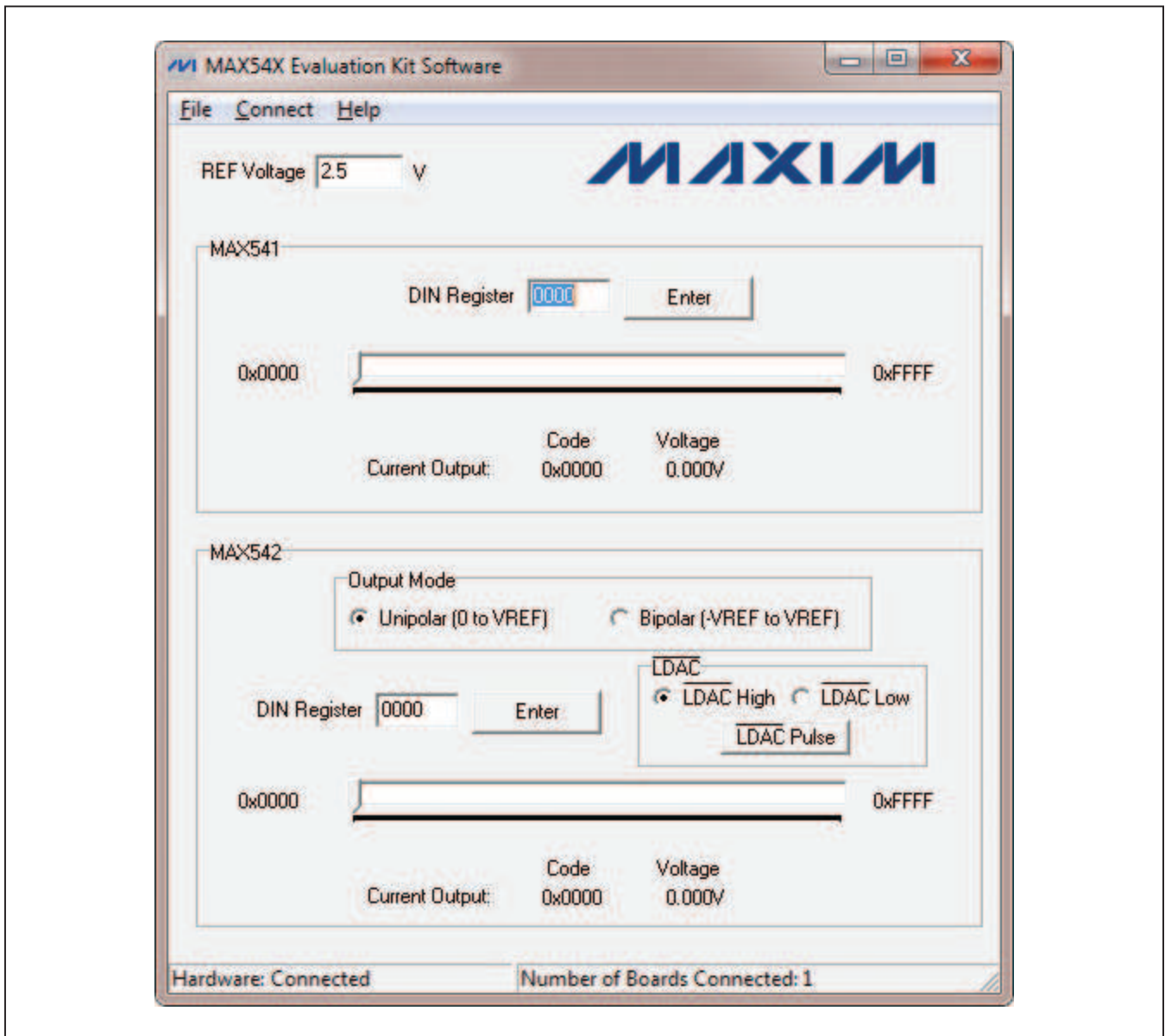
Figure 1. MAX54X Evaluation Kit Software (Main Window)

Table 1. Pin-Compatible Devices Selector Guide

PART	TEMP RANGE	PIN-PACKAGE	INL (LSB)
MAX541ACSA+	0°C to +70°C	8 SO	±1
MAX541BCSA+	0°C to +70°C	8 SO	±2
MAX541CCSA+	0°C to +70°C	8 SO	±4
MAX541AESA+	-40°C to +85°C	8 SO	±1
MAX541BESA+	-40°C to +85°C	8 SO	±2
MAX541CESA+	-40°C to +85°C	8 SO	±4
MAX542ACSD+	0°C to +70°C	14 SO	±1
MAX542BCSD+	0°C to +70°C	14 SO	±2
MAX542CCSD+	0°C to +70°C	14 SO	±4
MAX542AESD+	-40°C to +85°C	14 SO	±1
MAX542BESD+	-40°C to +85°C	14 SO	±2
MAX542CESD+	-40°C to +85°C	14 SO	±4

Table 2. Jumper Settings

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	MAX541/MAX542 VDD connected to the USB power supply.
	2-3	MAX541/MAX542 VDD connected to the external power supply on the EXT_VDD connector.
JU2	1-2*	REF input connected to the on-board +2.5V voltage reference.
	2-3	REF input connected to the external reference on the REF connector.
JU3	1-2*	MAX541 SCLK pin connected to the MAXQ622.
	2-3	MAX541 SCLK pin connected to the SCLK0 connector.
JU4	1-2*	MAX541 DIN pin connected to the MAXQ622.
	2-3	MAX541 DIN pin connected to the DIN0 connector.
JU5	1-2*	MAX541 $\overline{CS}$ pin connected to the MAXQ622.
	2-3	MAX541 $\overline{CS}$ pin connected to the CS0 connector.
JU6	1-2*	MAX44251 VDD connected to the USB power supply.
	2-3	MAX44251 VDD connected to the external power supply on the OP1+ connector.
JU7	1-2*	MAX542 SCLK pin connected to the MAXQ622.
	2-3	MAX542 SCLK pin connected to the SCLK1 connector.
JU8	1-2*	MAX542 DIN pin connected to the MAXQ622.
	2-3	MAX542 DIN pin connected to the DIN1 connector.
JU9	1-2*	MAX542 $\overline{CS}$ pin connected to the MAXQ622.
	2-3	MAX542 $\overline{CS}$ pin connected to the CS1 connector.
JU10	1-2*	MAX542 $\overline{LDAC}$ pin connected to the MAXQ622.
	2-3	MAX542 $\overline{LDAC}$ pin connected to the $\overline{LDAC}$ connector.
JU11	1-2*	MAX9632 VEE connected to the analog ground.
	2-3	MAX9632 VEE connected to the external power supply on the OP2- connector.
JU12	1-2*	MAX9632 IN- input connected to the OUT output of the MAX9632.
	2-3	MAX9632 IN- input connected to the INV signal of the MAX542.
JU13	1-2*	MAX9632 VCC connected to the USB power supply.
	2-3	MAX9632 VCC connected to the external power supply on the OP2+ connector.
JU14	1-2	MAX542 RFB input connected to the MAX9632 OUT output.
	Pin 1*	MAX542 RFB input disconnected from the MAX9632 OUT output.
JU15	1-2*	MAX44251 INB- input connected to the analog ground through a 2kΩ resistor.
	Pin 1	MAX44251 INB- input disconnected from the analog ground.
JU16	1-2*	MAX44251 INB+ input connected to the analog ground through a 2kΩ resistor.
	Pin 1	MAX44251 INB+ input disconnected from the analog ground.
JU_ID0–JU_ID3	1-2*	Factory test jumpers.
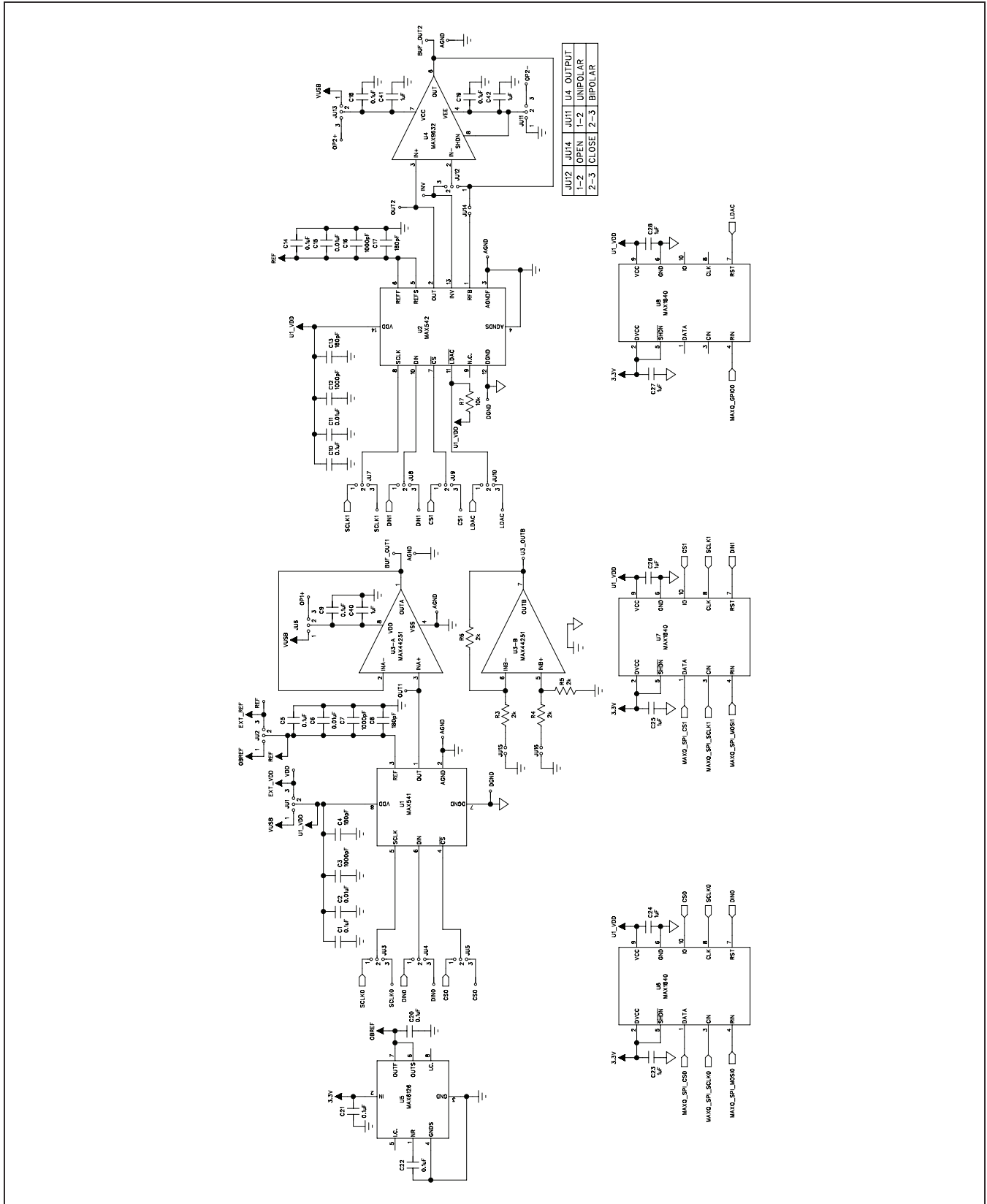
Figure 2a. MAX54X EV Kit Schematic (Sheet 1 of 2)
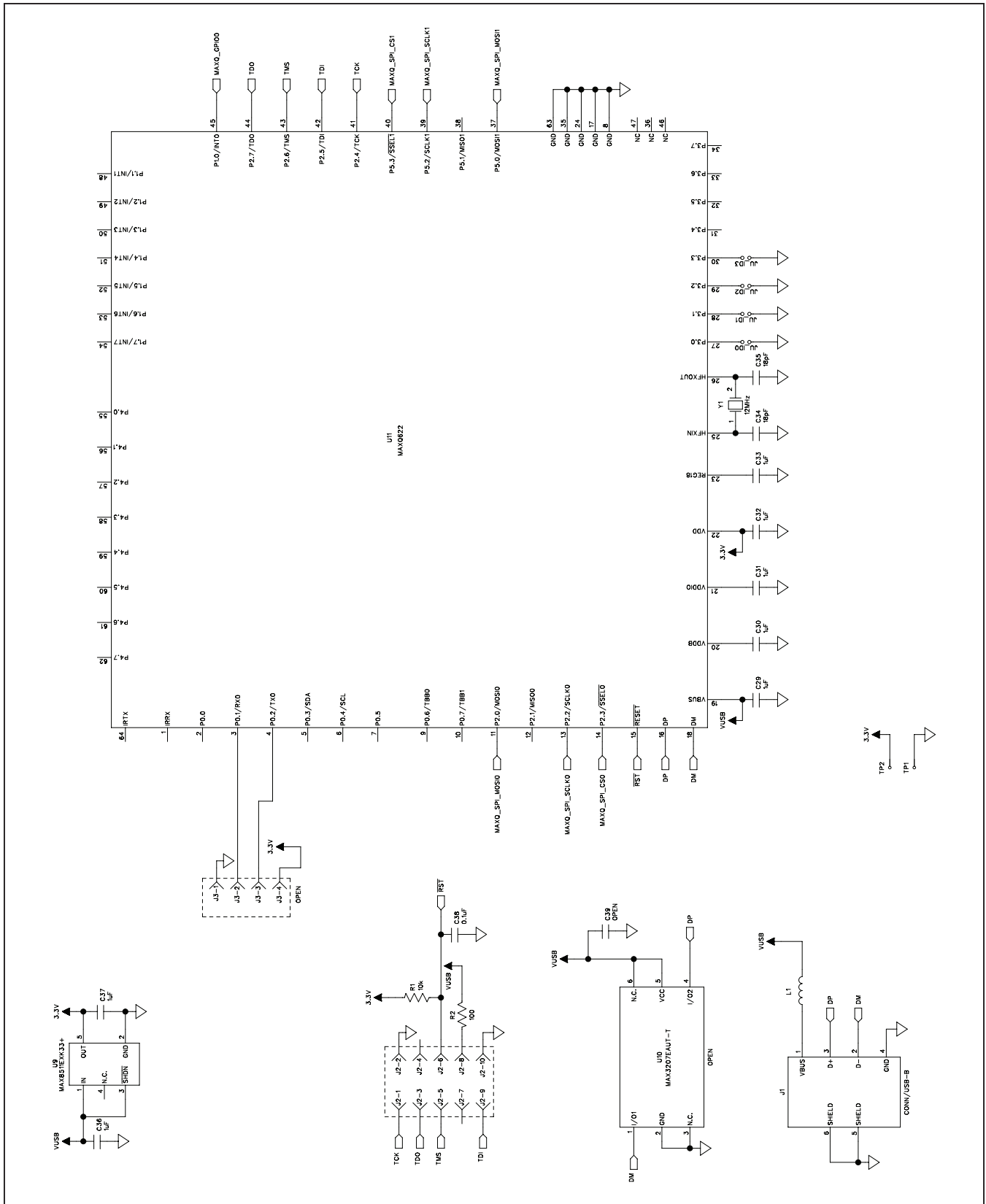
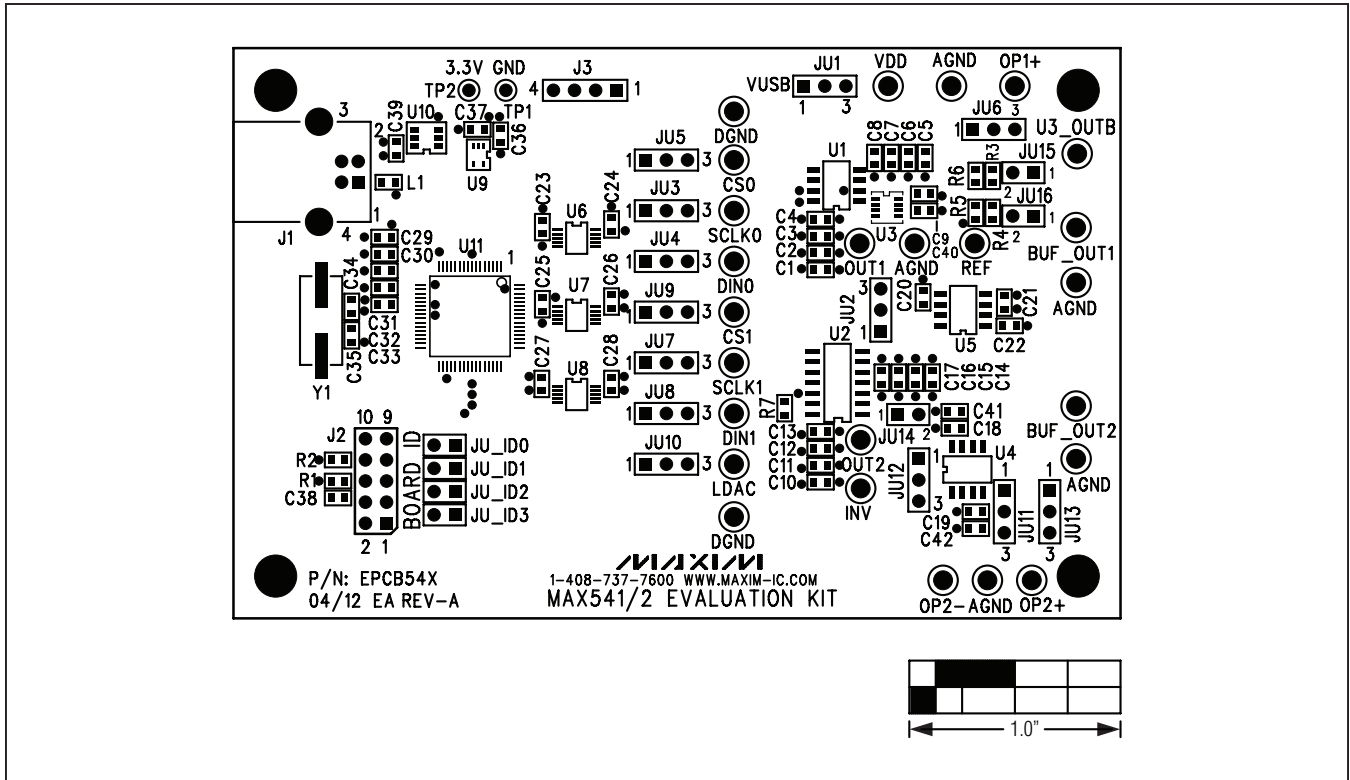*Figure 2b. MAX54X EV Kit Schematic (Sheet 2 of 2)*

Figure 3. MAX54X EV Kit Component Placement Guide—Component Side
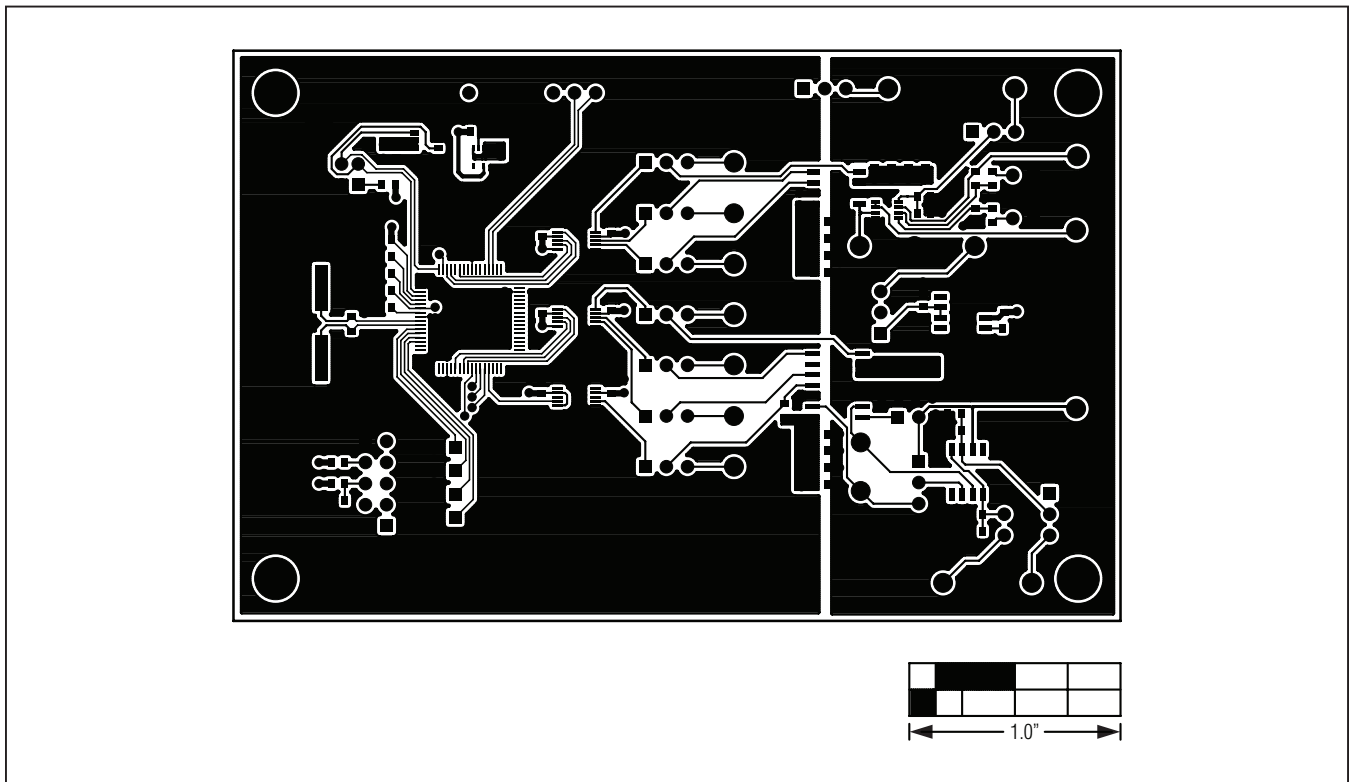
Figure 4. MAX54X EV Kit PCB Layout—Component Side Figure 4. MAX54X EV Kit PCB Layout—Component Side
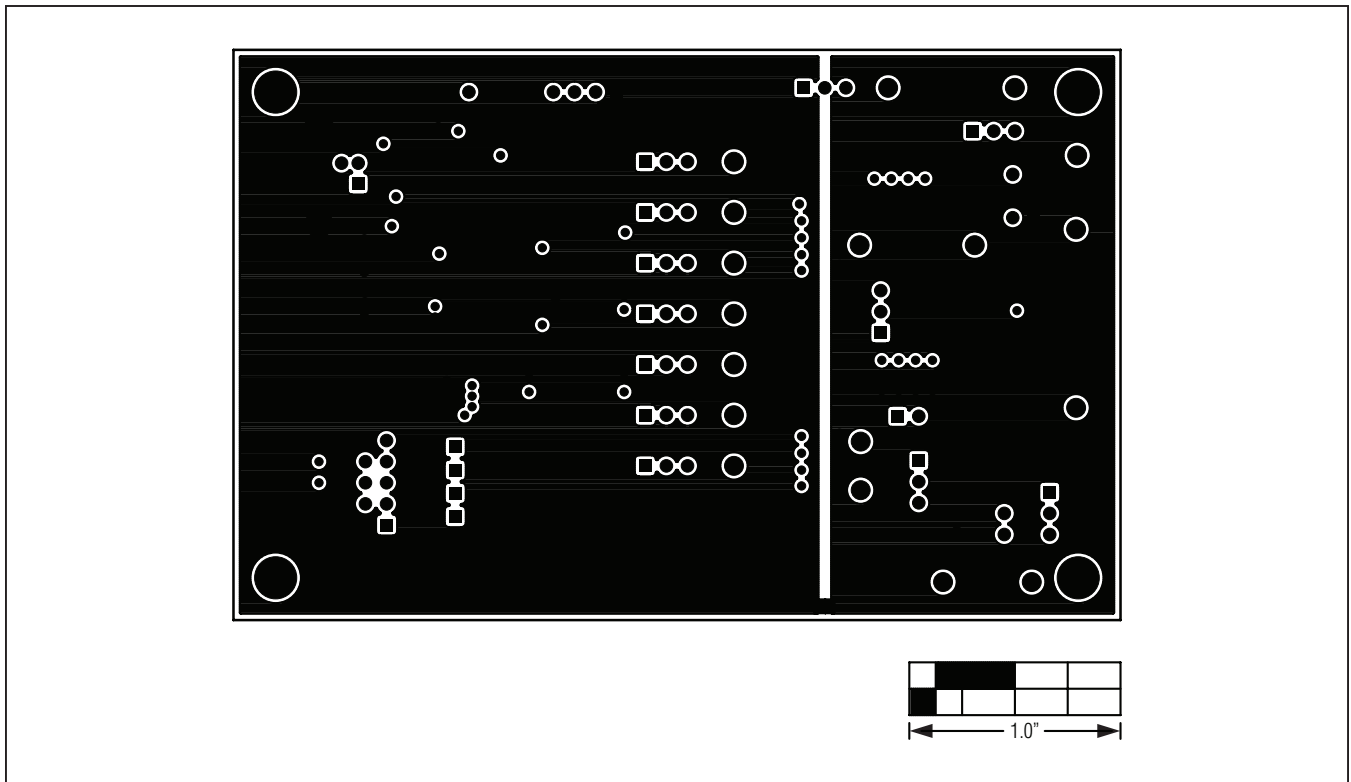
Figure 5. MAX54X EV Kit PCB Layout—Ground Layer 2
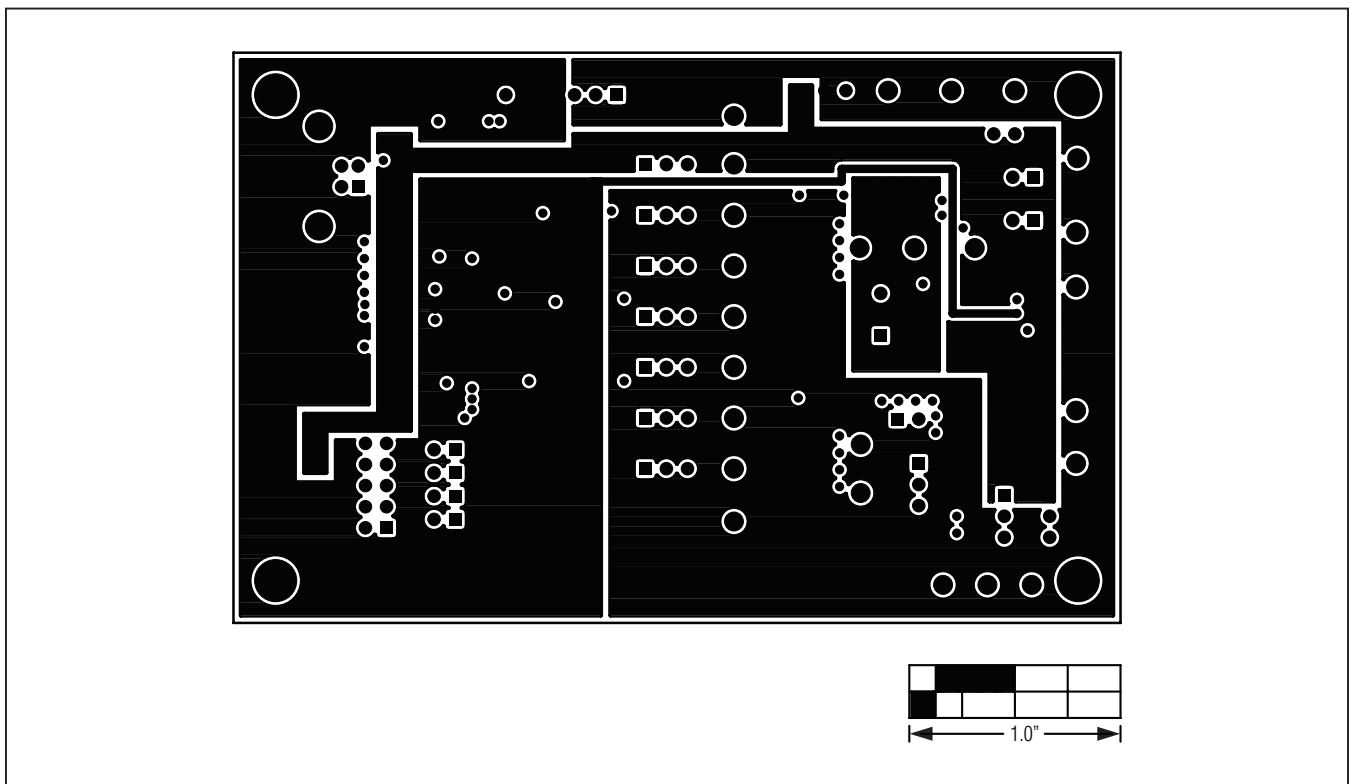
Figure 6. MAX54X EV Kit PCB Layout—Power Layer 3
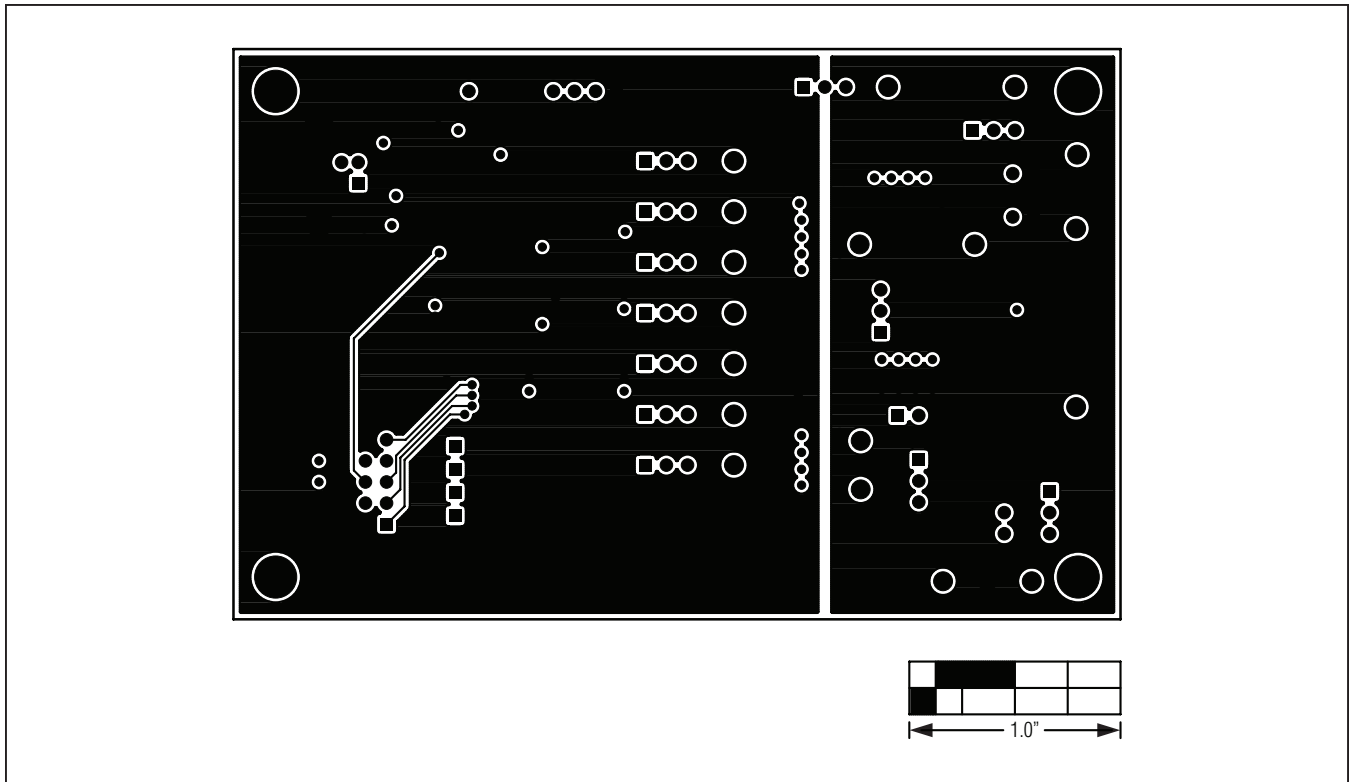
Figure 7. MAX54X EV Kit PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAX54XEVKIT#	EV Kit

#Denotes RoHS-compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/12	Initial release	—