19-4318; Rev 0; 11/08

MAX14502 Evaluation Kit

Evaluates: MAX14502

General Description

The MAX14502 evaluation kit (EV kit) provides a proven design to evaluate the MAX14502 Hi-Speed USB-to-SD card reader. The EV kit includes Windows® 2000/XP- and Windows Vista®-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX14502.

The MAX14502 EV kit has a built-in USB-to-I²C bridge, allowing a PC to access the internal I²C registers of the MAX14502, as well as providing the power for the EV kit.

The MAX14502 EV kit PCB comes with a MAX14502AETL+ installed. The EV kit can also be used to evaluate the MAX14500AETL+, MAX14501AETL+, and MAX14503AETL+ by replacing the MAX14502AETL+, and changing the crystal oscillator frequency according to the device used or by applying an appropriate external clock on the SMA connector. Contact the factory for free samples of the MAX14500AETL+, MAX14501AETL+, and MAX14503AETL+.

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Features

- **Simple and I²C Control Modes**
- **On-Board SD Card Socket, USB Type-A, and USB Type-B Connectors**
- **Default 19.2MHz Input Clock, Alternative Input Clock Connector Provided**
- **External Microprocessor Connections Provided**
- **Windows 2000/XP- and Windows Vista (32-Bit)-Compatible Software**
- **On-Board USB-to-I²C Bridge**
- **USB Powered (Cable Included)**
- **Lead(Pb)-Free and RoHS Compliant**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX14502EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1–C9, C13, C14, C16–C19, C22, C23, C30	18	1µF ±10%, 10V X5R ceramic capacitors (0603) Murata GRM188R61A105K
C10, C11, C15	3	47µF ±10%, 10V tantalum capacitors (Size D) KEMET B45197A2476K409
C12, C26–C29	5	4.7µF ±10%, 10V X5R ceramic capacitors (0805) Murata GRM219R61A475K
C20, C21, C24, C25	4	18pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H180J
C31	1	0.01µF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C103K
C32	1	0.1µF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C104K
D1, D2	2	Green LEDs (0603)
D3	1	Red LED (0603)
D4	1	Yellow LED (0603)

DESIGNATION	QTY	DESCRIPTION
FB1–FB8	8	120 at 100MHz, 200mA ferrite beads (0603) Murata BLM18RK121SN1
J1	1	SD memory card standard connector
J2, J6	2	USB type-B right-angle receptacles
J3	1	USB type-A right-angle receptacle
J4	1	Dual-row (2 x 15) 30-pin header
J5	1	SMA PC-mount connector
J7	0	Not installed, dual-row (2 x 5) 10-pin header
JU1, JU5, JU6, JU9–JU16	11	2-pin headers
JU2, JU17, JU18	3	3-pin headers
JU3, JU4, JU7, JU8	4	4-pin headers
JU19–JU24	0	Not installed, 3-pin headers
Q1, Q2	2	n-channel low-threshold-voltage FETs (3 SOT23)

MAX14502 Evaluation Kit

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R1, R5, R6, R7, R13, R18, R19, R22	8	10kΩ ±5% resistors (0603)
R2	1	68.1kΩ ±1% resistor (0603)
R3	1	27.4kΩ ±1% resistor (0603)
R4	1	6.19kΩ ±1% resistor (0603)
R8, R14–R17	5	300Ω ±5% resistors (0603)
R9, R25	2	10.5kΩ ±1% resistors (0603)
R10, R26	2	6.49kΩ ±1% resistors (0603)
R11, R12, R27, R28	4	100kΩ ±5% resistors (0603)
R20, R21	2	3.9kΩ ±5% resistors (0603)
R23, R24	2	33.2Ω ±1% resistors (0603)
R29	0	Not installed, resistor (0603)
R30–R41	12	0Ω ±5% resistors (0603)
R42, R43	0	Not installed, resistors (0402)
SW1	1	SPDT slide switch
SW2	1	Momentary pushbutton switch
TP1	1	Test point, red
TP2	1	Test point, black
U1	1	Hi-Speed USB-to-SD card reader (40 TQFN-EP*) Maxim MAX14502AETL+
U2, U7	2	200mA adjustable output LDO regulators (6 SOT23) Maxim MAX8880EUT+
U3	1	Single CMOS switch debouncer (4 SOT143) Maxim MAX6816EUS+
U4	1	USB peripheral controller (24 TQFN-EP*) Maxim MAX3420EETG+
U5	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U6	1	2.5V LDO regulator (5 SC70) Maxim MAX8511EXK25+
U8	1	3.0V LDO regulator (5 SC70) Maxim MAX8510EXK30+
U9	1	Dual buffer with Schmitt trigger inputs (6 SC70)
VCC, VIO, VIO_U1, VOSC, VSD, VSD_C, VTM	7	Test points, white
Y1	1	19.2MHz crystal oscillator
Y2	1	12MHz crystal
Y3	1	20MHz crystal
—	18	Shunts
—	1	PCB: MAX14502 Evaluation Kit+

**EP = Exposed pad.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
KEMET Corp.	864-963-6300	www.kemet.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

Note: *Indicate that you are using the MAX14502 when contacting these component suppliers.*

MAX14502 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX14502.EXE	Application program
UNINST.INI	Uninstalls the EV kit software

Quick Start

Required Equipment

Before beginning, the following equipment is needed:

- MAX14502 EV kit (USB cables included)
- A user-supplied Windows 2000-/XP-/Vista-compatible PC with two spare USB ports
- A user-supplied SD card
- A user-supplied USB mouse (or other low-/full-speed USB device)

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 MAX14502 EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 14502Rxx.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 1.
4) Move slider switch SW1 to the on position.
5) Insert the SD card into the SD card socket (J1).
6) Connect the USB type-B connector (J6) to one of the PC USB ports.
7) Verify that the D2 green LED and the D4 yellow LED on the EV kit board are lit.
8) Connect the USB mouse to the type-A USB connector (J3).
9) Connect the USB type-B connector (J2) to another PC USB port.
10) Verify that the PC recognizes the USB mouse.
11) Start the MAX14502 EV kit software by opening its icon in the **Start | Programs** menu.
12) The EV kit software main window appears, as shown in Figure 1. Verify that **Hardware: Connected** is displayed on the status bar at the bottom of the software main window.
13) In the **Bridge Mode** group box, select the **Pass Thru** radio button to set the MAX14502 in pass thru mode. Verify that **MAX14502: Simple Control/Pass Thru Mode** is displayed on the status bar.
14) In the **Bridge Mode** group box, select the **Card Reader** radio button to set the MAX14502 in card reader mode. Verify that **MAX14502: Simple Control/Card Reader Mode** is displayed on the status bar.
15) Verify that the PC recognizes the SD card.
16) On the EV kit board, verify that the D1 green LED is lit, indicating that the internal microcontroller in the MAX14502 is activated in card reader mode.

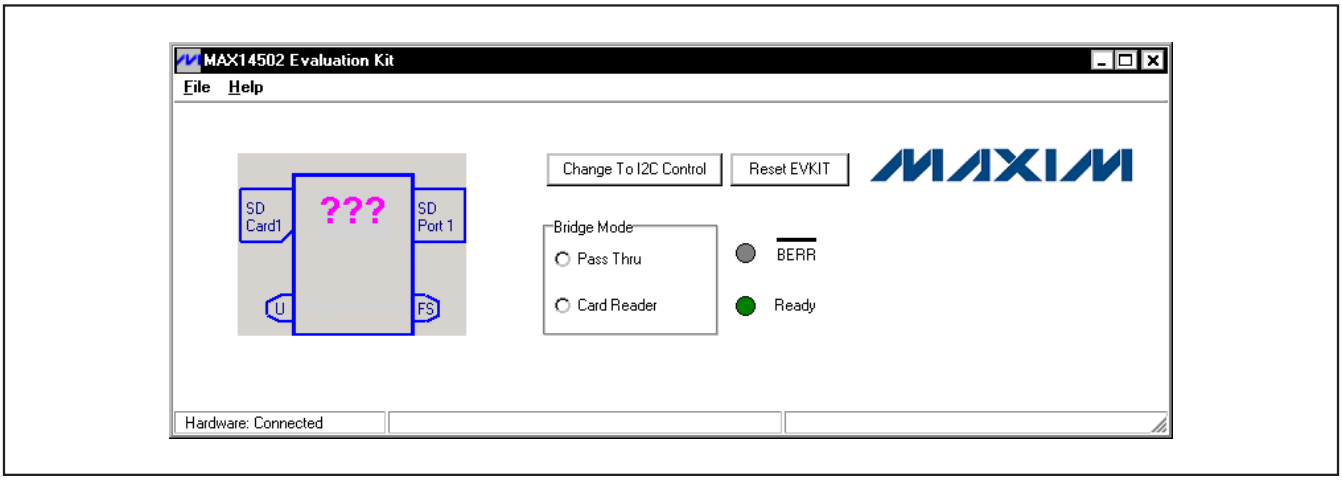

Figure 1. MAX14502 Software Main Window (Simple Control Mode)

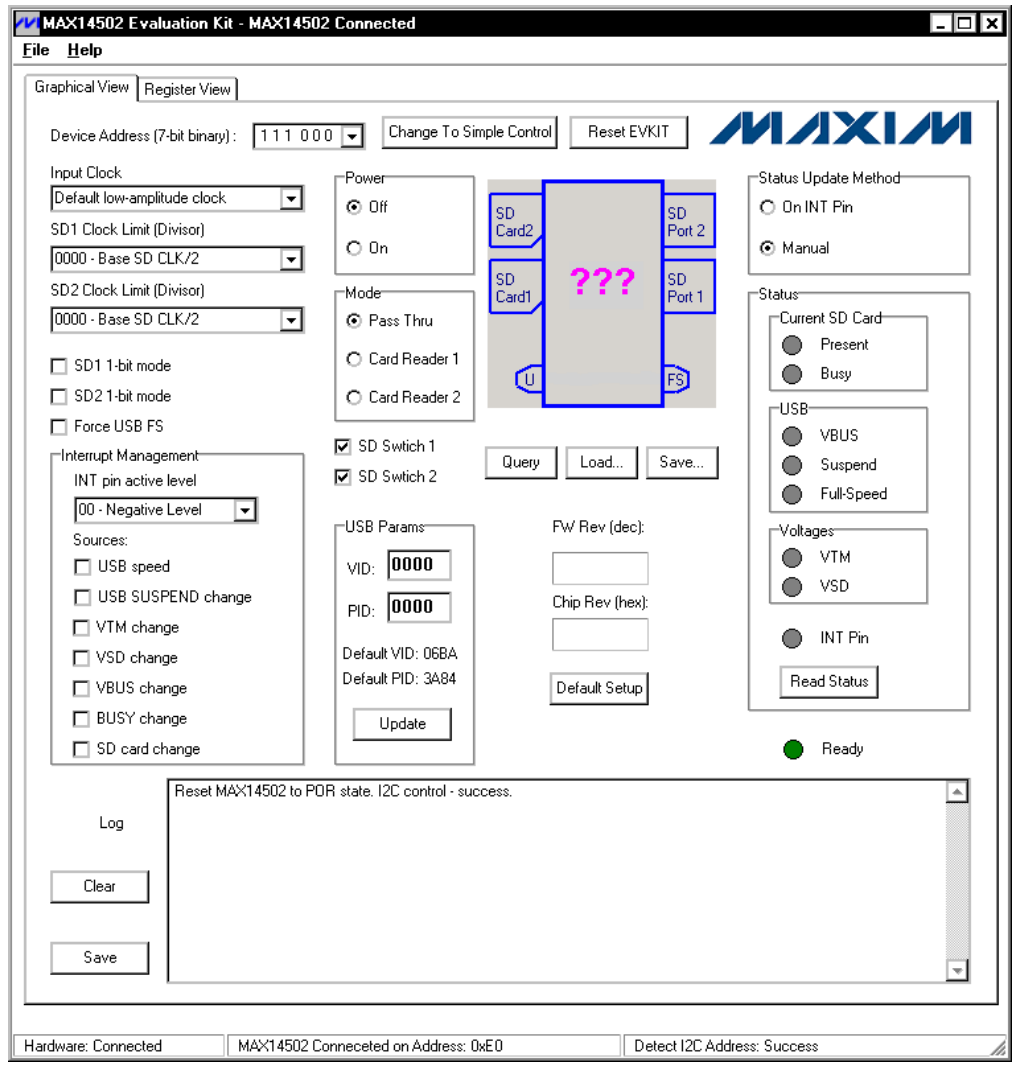

Figure 2. MAX14502 Software Main Window (Graphical View Tab)

17) Press the **Change To I2C Control** button to set the MAX14502 in I²C control mode. Verify that **MAX14502 Connected on Address: 0xE0** is displayed on the status bar. All the I²C register controls are available on the GUI, as shown in Figure 2.

18) Verify that the PC recognizes the USB mouse.

Detailed Description of Software

The software sets the MAX14502 in either simple or I²C control mode.

In simple control mode, the user can set the device in either pass thru or card reader mode. When the EV kit is connected correctly, the software automatically monitors the status of the $\overline{BERR}$ pin.

There are two tabs when the software works in I²C control mode.

Graphical View Tab

When the **Graphical View** tab (Figure 2) is selected, a user has access to all of the I²C registers through the on-board USB-to-I²C bridge.

The embedded picture shows the current mode of the device. A command log window displays the read and write operations on the MAX14502.

The status register (0x12) bit values are displayed in the **Status** group box. When the solid circle is green, it indicates a value of 1. When the solid circle is gray, it indicates a value of 0.

When the INT pin is asserted, the solid circle beside the **INT Pin** label turns red. Otherwise, it is gray.

When the on-board USB-to-I²C bridge detects the presence of the MAX14502, the solid circle beside the **Ready** label turns green. If the EV kit is not connected correctly, the circle is gray.

Press the **Query** button to read all the register values.

Press the **Load...** button to load the register settings from a text file.

Press the **Save...** button to save the current register settings to a text file.

Press the **Reset EVKIT** button to reset the EV kit, including the USB re-enumeration on J6. The MAX14502 is reset to its power-on-reset (POR) state.

Register View Tab

On the **Register View** tab (Figure 3), detailed names and values of the registers are displayed.

Refer to the MAX14500–MAX14503 IC data sheet for the detailed descriptions of all the registers available in I²C control mode.

Software Menu Bar

Select **File | Exit** to exit the application.

The **Help** menu item gives information about this EV kit software.

Detailed Description of Hardware

The MAX14502 operates in pass thru and card reader mode. The device can be controlled in two ways: simple control method and I²C control method.

The MAX14502 EV kit board provides a proven layout for evaluating the device. The EV kit comes with one MAX14502AETL+ installed.

Power Supplies

By default, the EV kit is powered by USB (J6). The different power supplies for the MAX14502 can be applied according to user requirements. See Table 1 for possible power-supply configurations.

Alternative Input Clock

By default, the MAX14502 uses the on-board 19.2MHz crystal oscillator output as the input clock. The user can apply alternative clocks on the SMA connector (J5) and set the shunt of jumper JU2 in the 2-3 position.

Reset MAX14502

The MAX14502 is reset by pressing and releasing switch SW2.

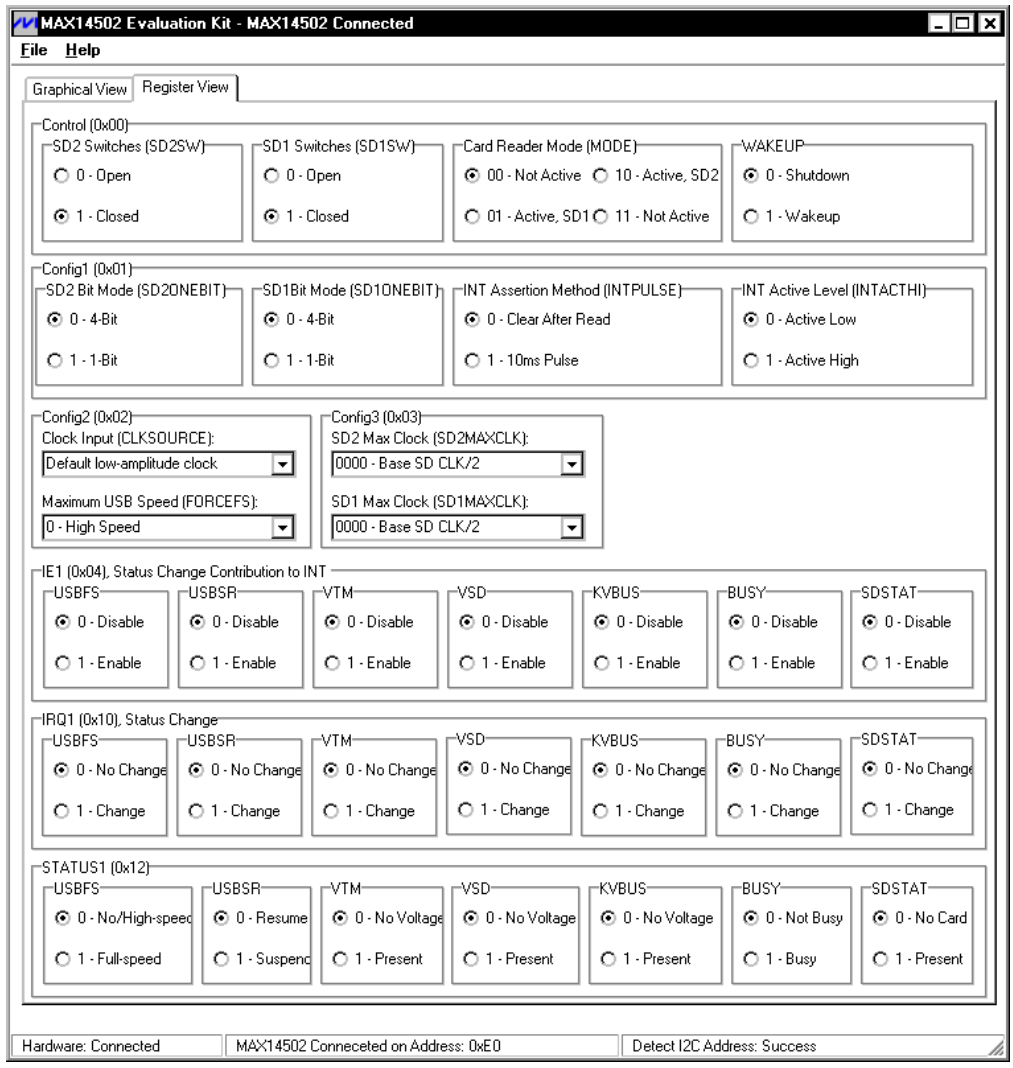

Figure 3. MAX14502 Software Main Window (Register View Tab)

Table 1. MAX14502 EV Kit Jumper Descriptions (JU1–JU18)

JUMPER	SHUNT	DESCRIPTION
JU1	1-2*	CCRD_PRST pin pulled up to VSD by R1
	Open	CCRD_PRST pin has no pullup resistor
JU2	1-2*	Input clock is on-board 19.2MHz crystal oscillator output
	2-3	Input clock is applied on SMA connector
JU3	1-2	EV kit powered by EXT_5V power supply
	1-3*	EV kit powered by USB power supply on J6
	1-4	EV kit powered by USB power supply on J2
JU4	1-2	I2C_SEL pin connected to GND
	1-3	I2C_SEL pin connected to VIO
	1-4*	I2C_SEL pin controlled by MAXQ2000 GPO pin
JU5	1-2*	SCL pin connected to the on-board USB-to-I^{2}C bridge
	Open	SCL pin disconnected from the on-board USB-to-I^{2}C bridge
JU6	1-2*	SDA pin connected to the on-board USB-to-I^{2}C bridge
	Open	SDA pin disconnected from the on-board USB-to-I^{2}C bridge
JU7	1-2	ADD pin connected to GND
	1-3	ADD pin connected to VIO
	1-4*	ADD pin controlled by MAXQ2000 GPO pin
JU8	1-2	MODE pin connected to GND
	1-3	MODE pin connected to VIO
	1-4*	MODE pin controlled by MAXQ2000 GPO pin
JU9	1-2*	$\overline{\text{BERR}}$/INT pin connected to MAXQ2000 GPI pin
	Open	$\overline{\text{BERR}}$/INT pin disconnected from MAXQ2000 GPI pin
JU10	1-2*	$\overline{\text{BUSY}}$ pin connected to MAXQ2000 GPI pin
	Open	$\overline{\text{BUSY}}$ pin disconnected from MAXQ2000 GPI pin
JU11	1-2*	$\overline{\text{RST}}$ pin controlled by MAXQ2000 GPO pin
	Open	$\overline{\text{RST}}$ pin disconnected from MAXQ2000 GPO pin
JU12	1-2*	VCC connected to on-board +3.3V power supply
	Open	VCC applied externally on the VCC test point
JU13	1-2*	VTM connected to on-board +3.3V power supply
	Open	VTM applied externally on the VTM test point
JU14	1-2*	On-board crystal oscillator powered by on-board +3V power supply
	Open	On-board crystal oscillator powered externally on the VOSC test point
JU15	1-2*	VSD connected to on-board +3.3V power supply
	Open	VSD applied externally on the VSD test point
JU16	1-2*	SD card powered by on-board +3.3V power supply
	Open	SD card powered externally on the VSD_C test point
JU17	1-2*	VIO connected to on-board +3.3V power supply
	2-3	VIO connected to MAXQ2000 VDDIO
	Open	VIO applied externally on the VIO test point
JU18	1-2*	VIO_U1 connected to on-board +3.3V power supply
	2-3	VIO_U1 connected to MAXQ2000 VDDIO
	Open	VIO_U1 applied externally on the VIO_U1 test point

**Default position.*

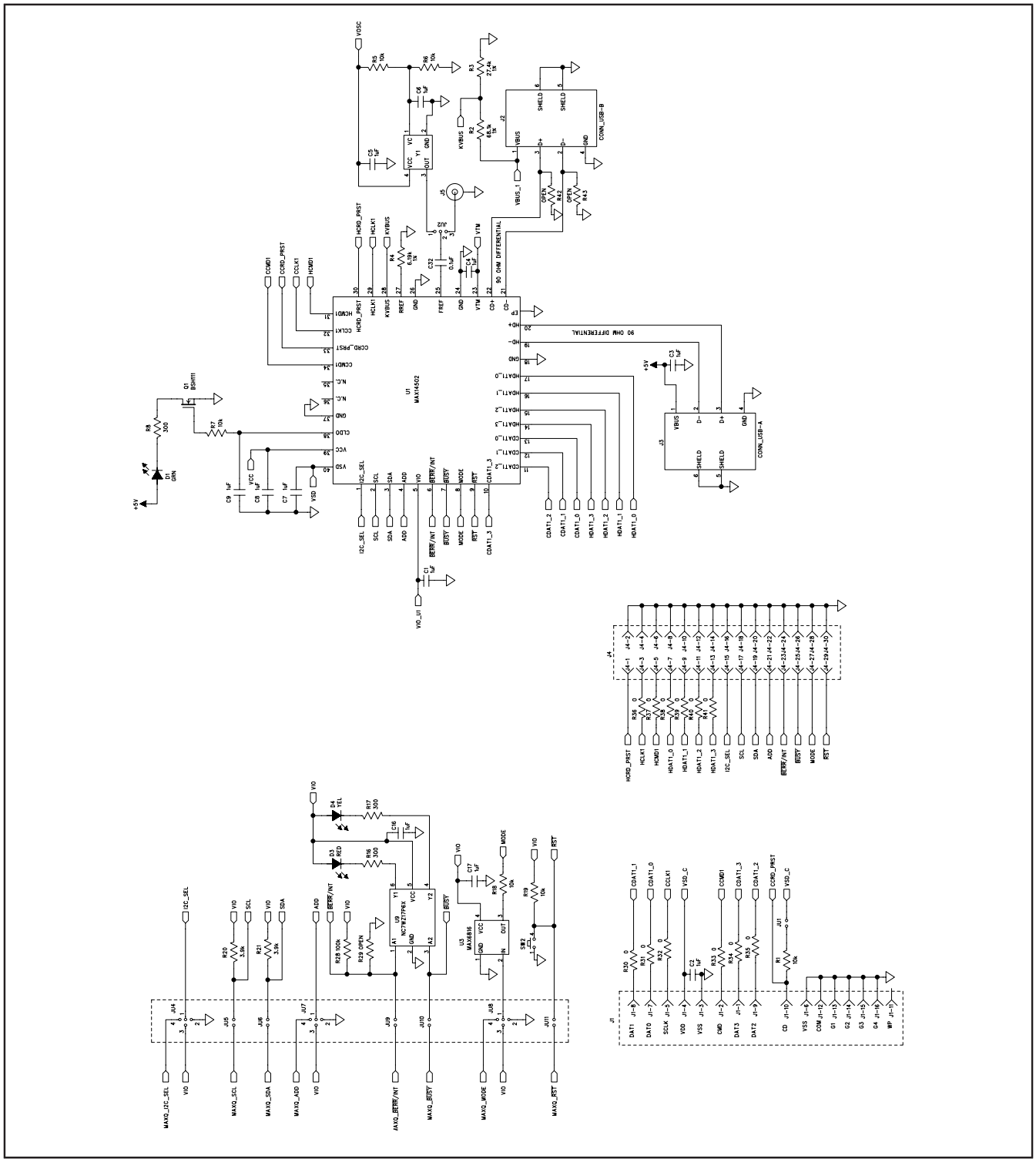

Figure 4a. MAX14502 EV Kit Schematic (Sheet 1 of 3)

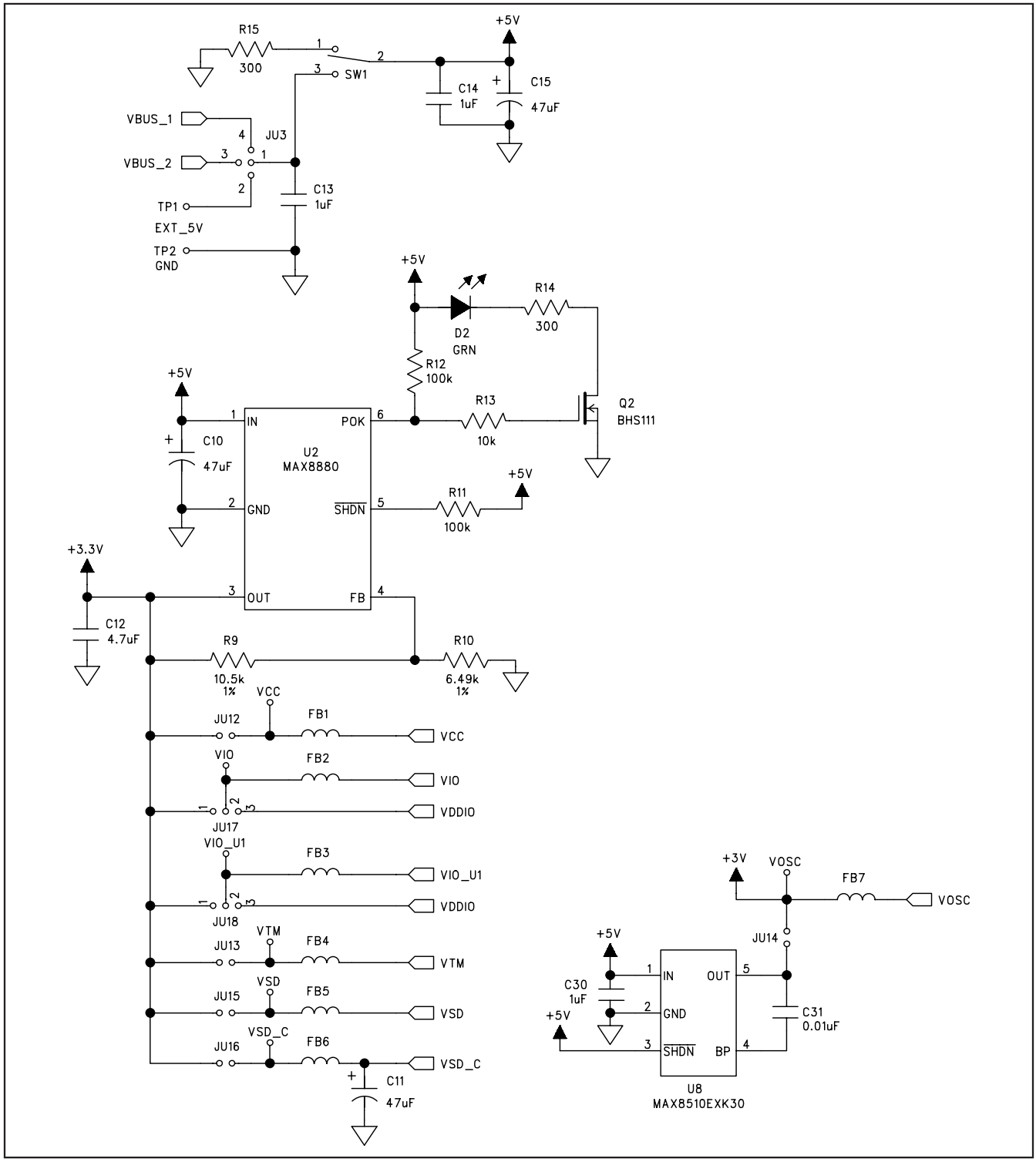

Figure 4b. MAX14502 EV Kit Schematic (Sheet 2 of 3)

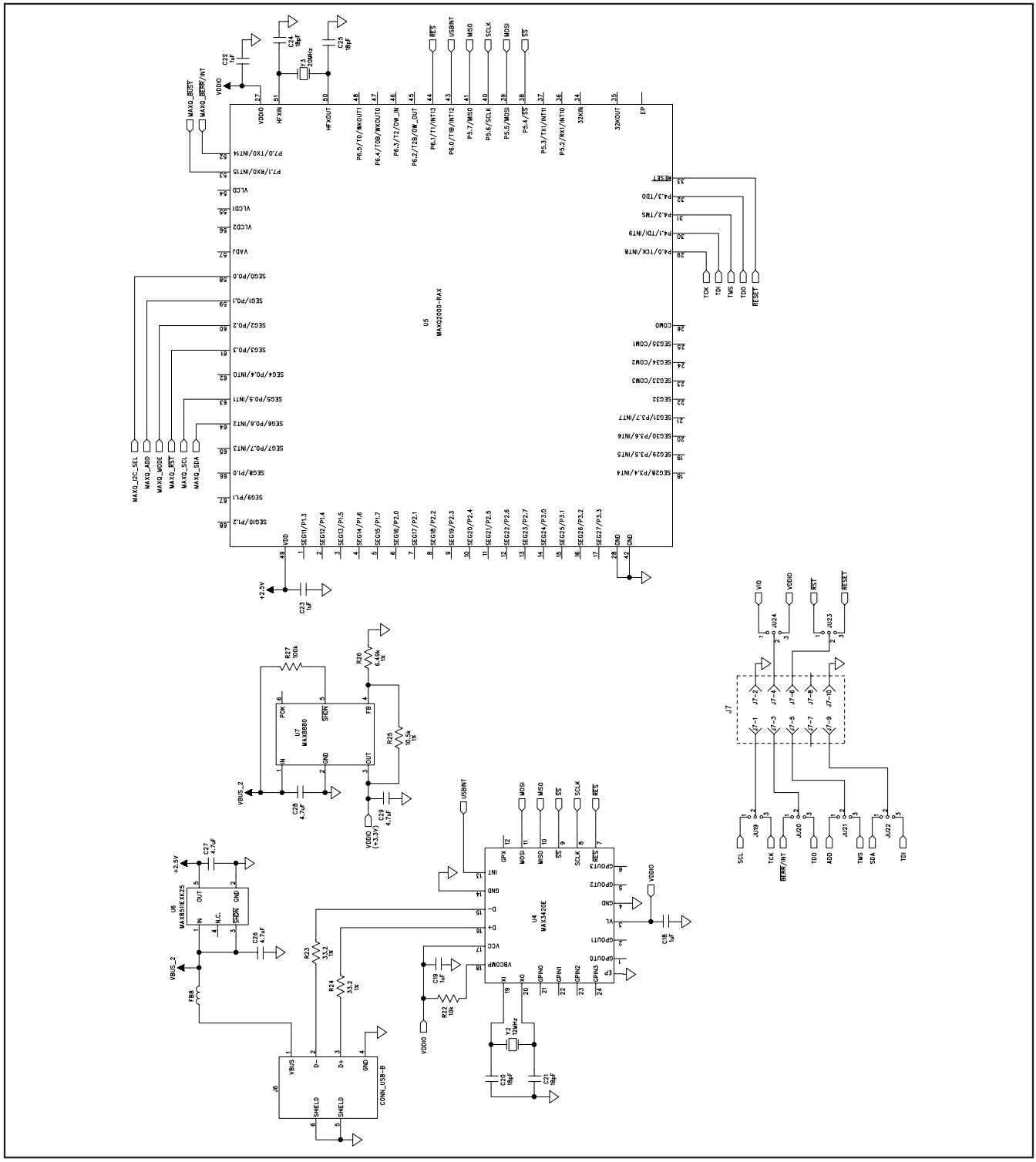

Figure 4c. MAX14502 EV Kit Schematic (Sheet 3 of 3)

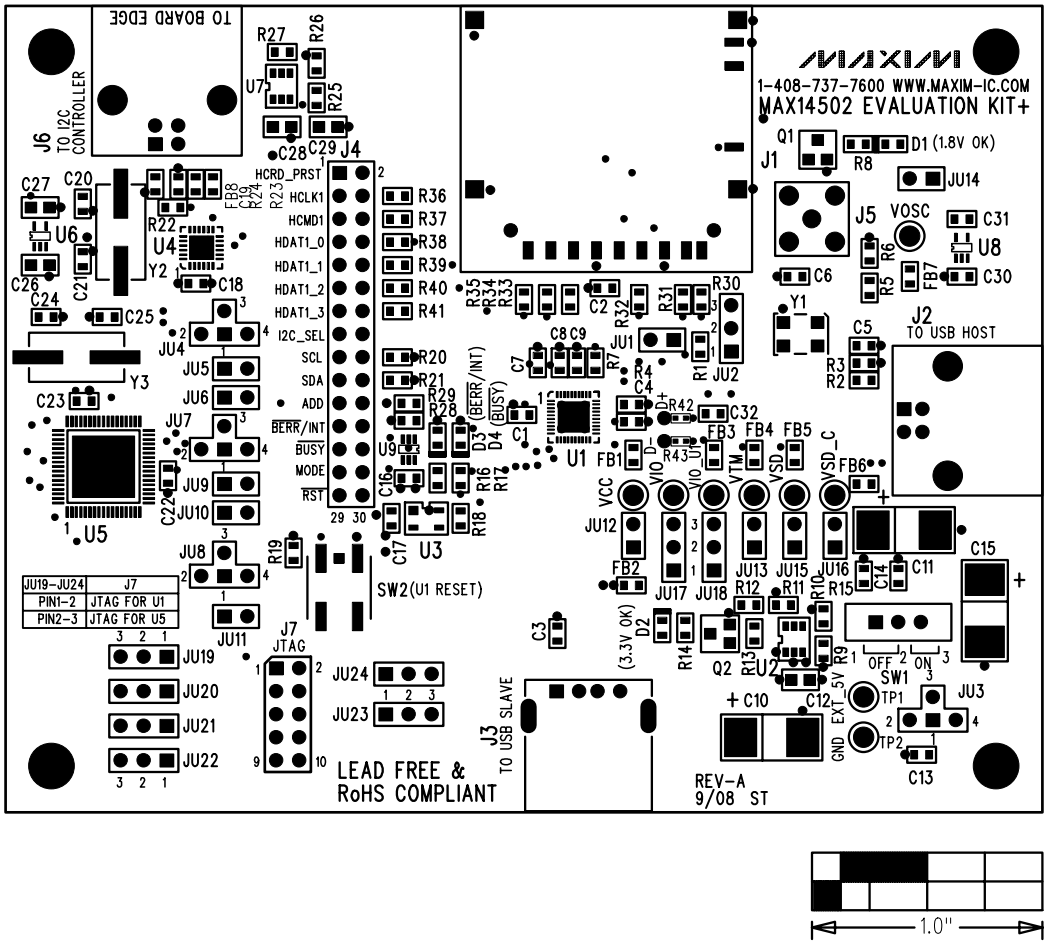

Figure 5. MAX14502 EV Kit Component Placement Guide—Component Side

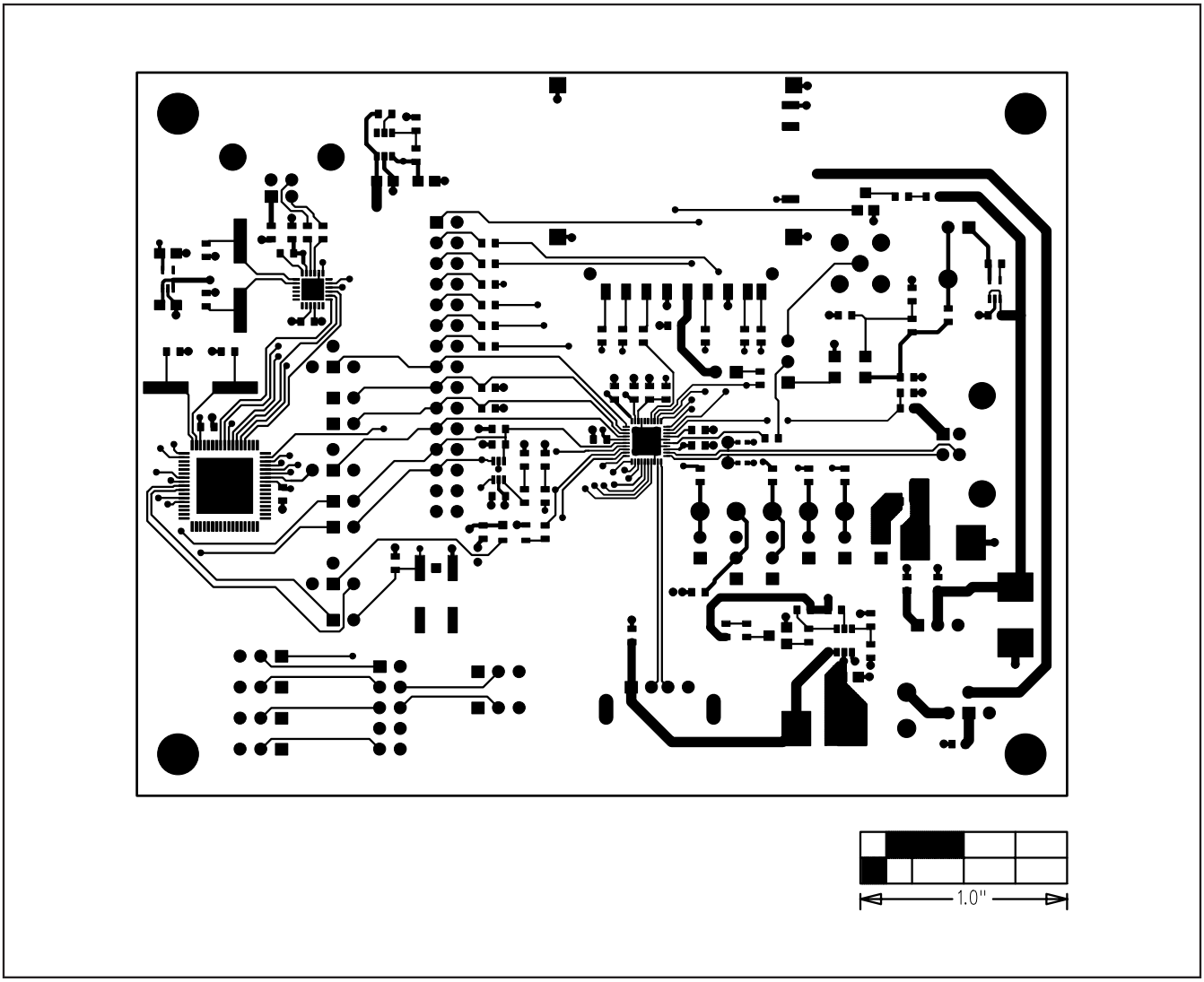

Figure 6. MAX14502 EV Kit PCB Layout—Component Side

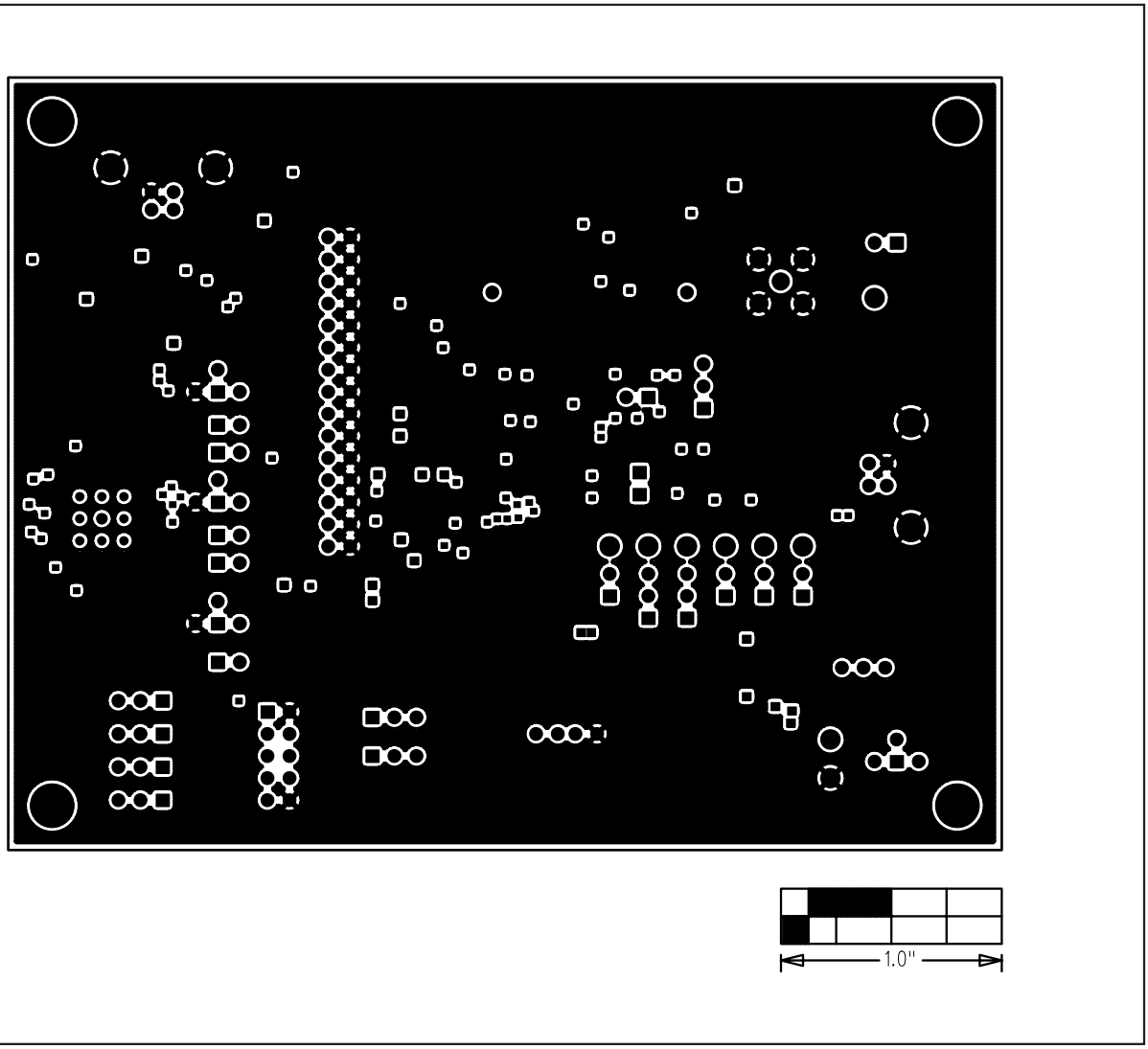

Figure 7. MAX14502 EV Kit PCB Layout—Inner Layer 2

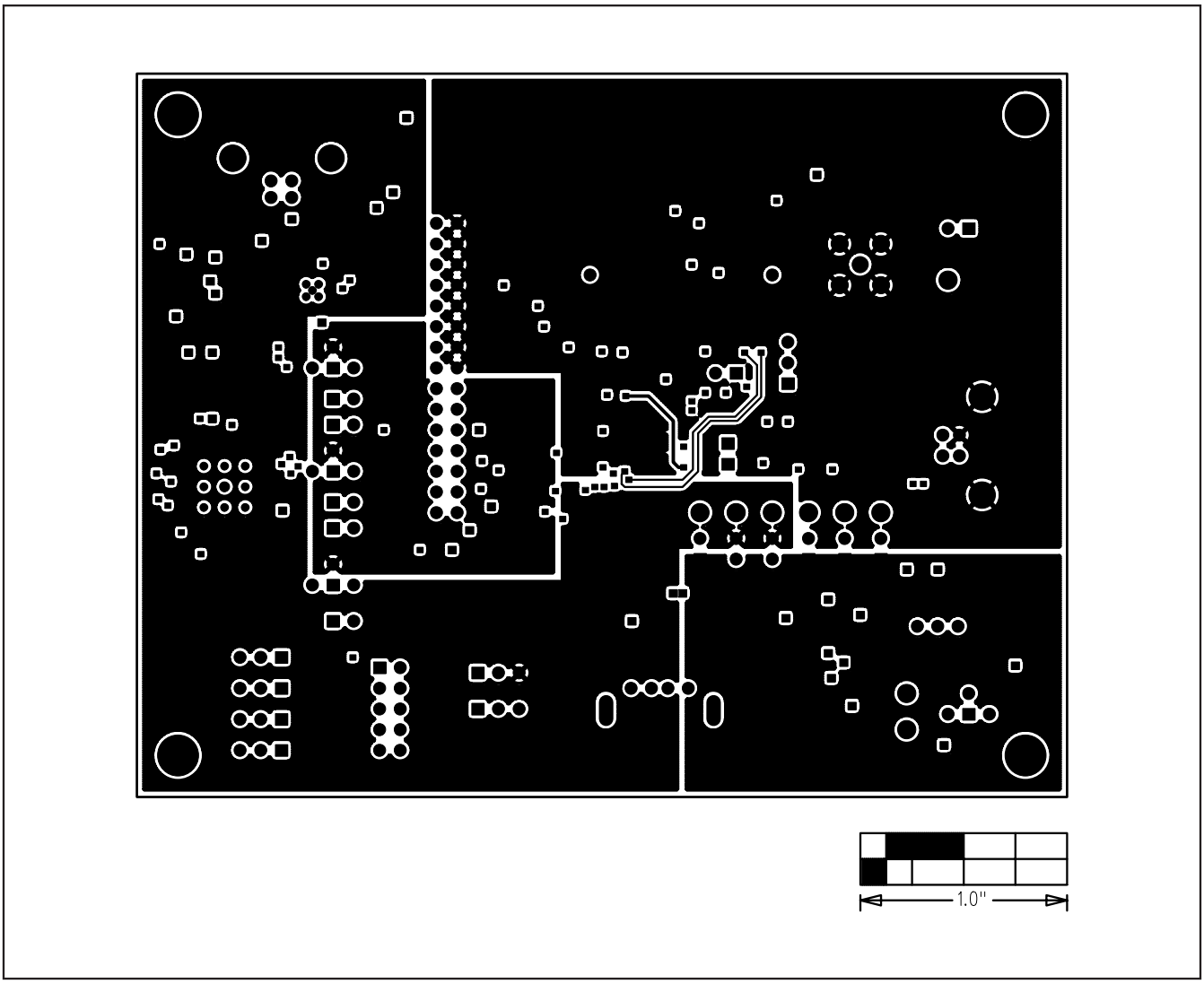

Figure 8. MAX14502 EV Kit PCB Layout—Inner Layer 3

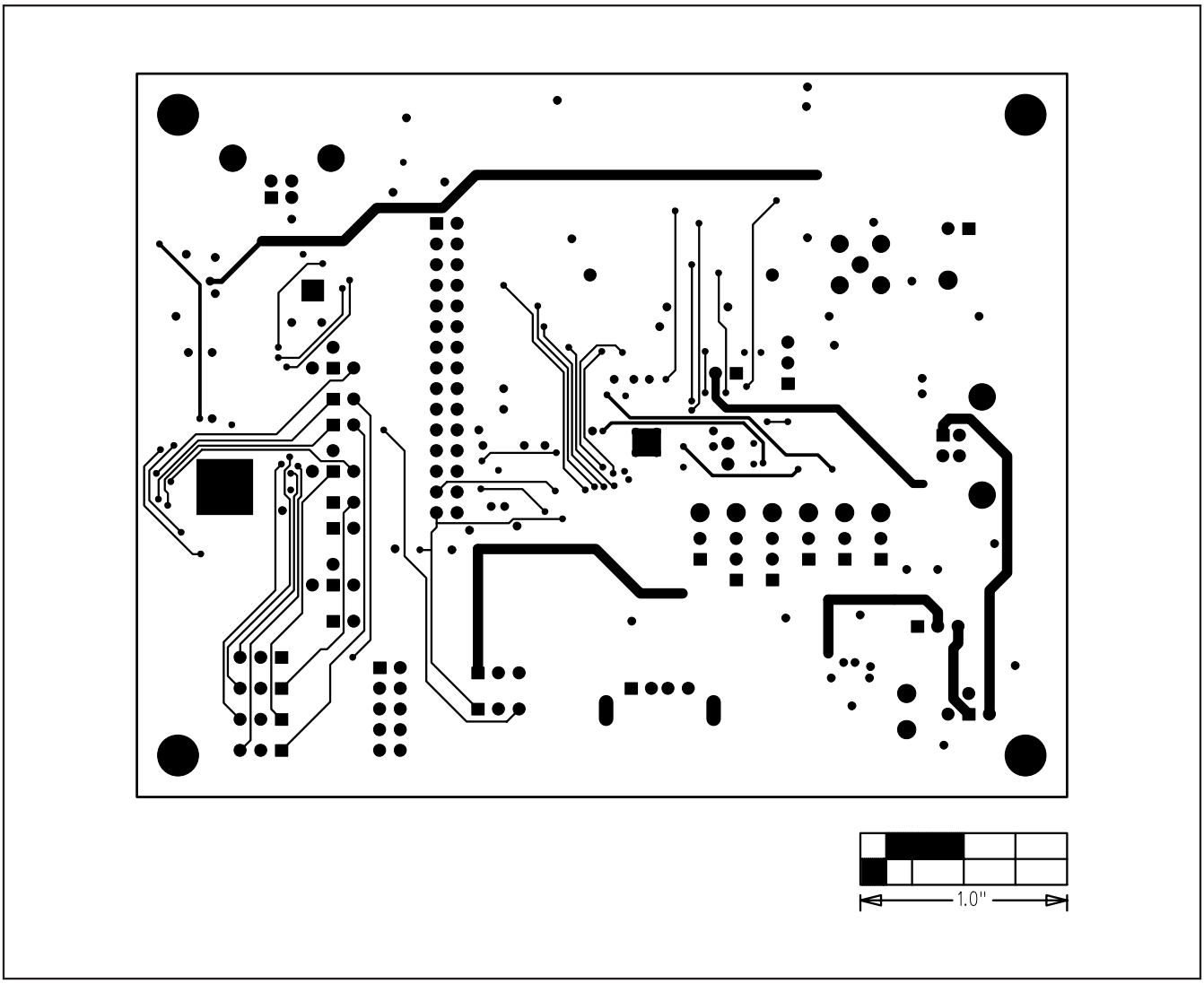

Figure 9. MAX14502 EV Kit PCB Layout—Solder Side