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MAX7500 Evaluation Kit

General Description

The MAX7500 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB that evaluates the MAX7500 digital temperature sensor. The MAX7500 accurately measures temperature and provides an overtemperature alarm/interrupt/shutdown output.

The EV kit is self-powered from the on-board USB interface and selects between the eight available I²C slave addresses of the MAX7500 IC. The MAX7500 EV kit can also evaluate the MAX7501–MAX7504 ICs. Request free IC samples from the factory when ordering the MAX7500 EV kit.

The MAX7500 EV kit provides an on-board I²C/SMBus™ interface and is connected to the computer through the universal serial bus (USB) port. The EV kit includes Windows® 2000/XP and Windows Vista®-compatible software that provides a graphical user interface (GUI) for control of the MAX7500's programmable features.

Features

- ◆ Self-Powered from USB source
- ◆ Optional 3V to 5.5V Single Power Supply
- ◆ Digital Temperature Sensor
- ◆ Also Evaluates MAX7501–MAX7504
- ◆ On-Board I²C/SMBus Interface Control Through USB
- ◆ Eight Available I²C Slave Addresses
- ◆ Windows 2000/XP and Windows Vista (32-Bit)-Compatible Software
- ◆ Lead(Pb)-Free and RoHS Compliant
- ◆ Fully Assembled and Tested

Ordering Information

PART	TYPE
MAX7500EVKIT+	EV Kit

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C41, C48–C53, C57	9	0.1µF ±10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H104K TDK C1608X7R1H104K
C2, C3, C11, C12, C36–C39, C42, C44	10	1µF ±10%, 16V X5R ceramic capacitors (0603) Murata GRM188R71C105K TDK C1608X5R1C105K
C40, C43, C45	3	10µF ±10%, 16V X5R ceramic capacitors (0805) KEMET C0805C106K4PACTU
C46, C47	2	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J or TDK C1608C0G1H220J
C54, C55	2	10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J TDK C1608C0G1H100J

DESIGNATION	QTY	DESCRIPTION
C56	1	0.033µF ±10%, 16V X5R ceramic capacitor (0603) Murata GRM188R71C333K Taiyo Yuden EMK107BJ333KA
D1	1	10mA green LED (0603)
D2	1	10mA red LED (0603)
H1	0	Not installed, 2 x 5-pin JTAG header
JU1, JU3, JU4, JU6, JU8, JU14	6	3-pin headers
JU2	1	4-pin header
JU5, JU11, JU12, JU13	0	Not installed, 2-pin headers
JU7, JU9, JU10	0	Not installed, 2-pin headers—PCB short
L2	1	Ferrite bead (0603) TDK MMZ1608R301A Murata BLM18SG700 TN1

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Windows and Windows Vista are registered trademarks of Microsoft Corp.



MAX7500 Evaluation Kit

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
P1	1	USB type-B right-angle PC-mount receptacle Assmann Electric AU-Y1007-R
R1, R2, R3, R10	4	4.7kΩ ±5% resistors (0603)
R4-R9, R11, R12, R32, R33, R34	0	Not installed, resistors (0603)
R35	1	169kΩ ±1% resistor (0603)
R36	1	100kΩ ±1% resistor (0603)
R37, R38	2	27Ω ±5% resistors (0603)
R39	1	1.5kΩ ±5% resistor (0603)
R40	1	2.2kΩ ±5% resistor (0603)
R41	1	470Ω ±5% resistor (0603)
R42	1	10kΩ ±5% resistor (0603)
R43-R47	0	Not installed, resistors—shorted by PCB trace (0402)
R48, R49	2	220Ω ±5% resistors (0603)
U1	1	Digital temperature sensor (8 μMAX [®]) Maxim MAX7500MUA+

DESIGNATION	QTY	DESCRIPTION
U2	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U3	1	2.5V LDO regulator (5 SO70) Maxim MAX8511EXK25+
U4	1	Adjustable output LDO regulator (5 SO70) Maxim MAX8512EXK+
U5	1	UART-to-USB converter (32 TQFP, 7mm x 7mm) FTDI FT232BL
U6	1	93C46 type (64k x 16) 3-wire EEPROM (8 SO) Atmel AT93C46EN-SH-B
U7-U10	4	Logic-level translators (10 μMAX) Maxim MAX1840EUB+
Y1	1	16MHz crystal
Y2	1	6MHz crystal
—	7	Shunts
—	1	PCB: MAX7500 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
Taiyo Yuden	800-348-2496	www.t-yuden.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: Indicate that you are using the MAX7500 when contacting these component suppliers.

MAX7500 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX7500.EXE	Application program
FTD2XX.INF	USB device driver file
UNINST.INI	Uninstalls the EV kit software
TROUBLESHOOTING_USB.PDF	USB driver installation help file

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MAX7500 Evaluation Kit

Evaluates: MAX7500-MAX7504

Quick Start

Recommended Equipment

- User-supplied Windows 2000/XP or Windows Vista-compatible PC with a spare USB port

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 MAX7500 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) Verify that shunts are installed across pins 1-2 of jumpers JU1 and JU2.
- 2) Verify that shunts are installed across pins 2-3 of jumpers JU3, JU4, JU6, and JU8.
- 3) Visit www.maxim-ic.com/evkitsoftware to download the latest version of the MAX7500 EV kit software, MAX7500Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
- 4) 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.

- 5) Connect the USB cable from the PC to the EV kit board. A **Building Driver Database** window pops up in addition to a **New Hardware Found** message 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 30s, remove the USB cable from the board and reconnect it. Administrator privileges are required to install the USB device driver on Windows 2000/XP and Windows Vista.
- 6) 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\MAX7500** (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 TROUBLESHOOTING_USB.PDF document included with the software for additional information.
- 7) Start the MAX7500 EV kit software by opening its icon in the **Start | Programs** menu.
- 8) Normal device operation is verified when **MAX7500 device connected** is displayed in the bottom-left status bar on the MAX7500 EV kit main window (Figure 1).

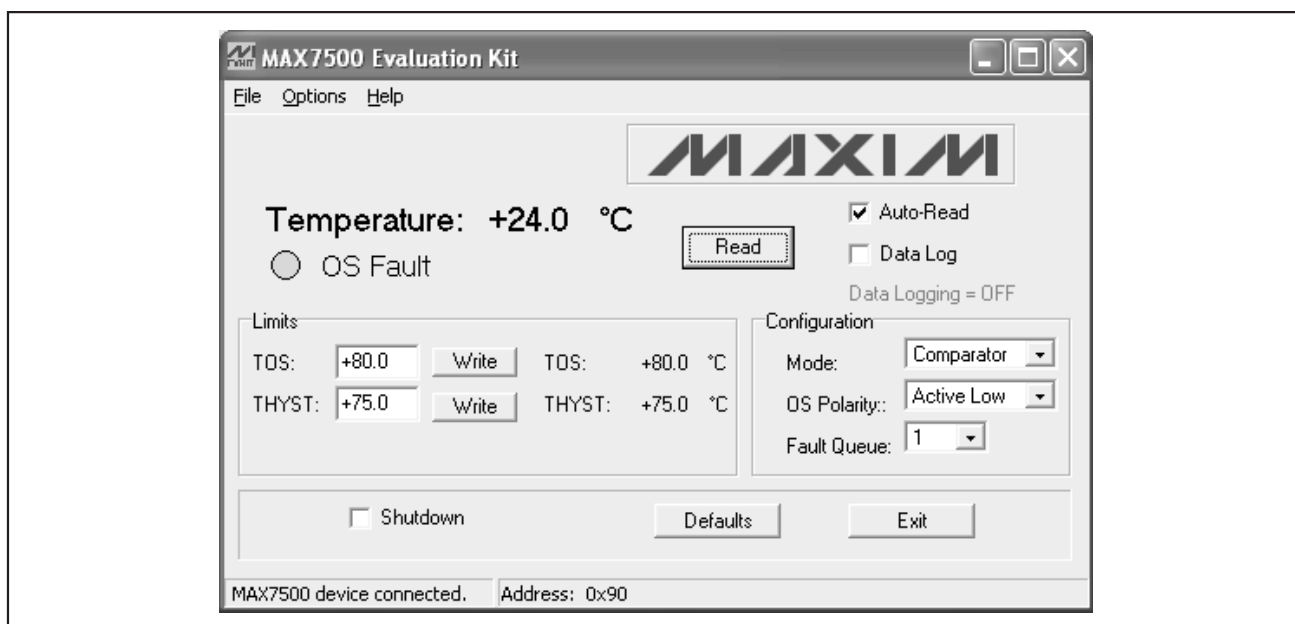


Figure 1. MAX7500 EV Kit Software Main Window

MAX7500 Evaluation Kit

Detailed Description of Hardware

The MAX7500 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB that evaluates the MAX7500 digital temperature sensor. The MAX7500 accurately measures temperature, provides an overtemperature alarm/interrupt/shutdown output, features three address select lines, and integrates a time-out feature that offers protection against I²C bus lockups.

The EV kit is self-powered from the on-board USB interface and requires no external power. The MAX7500 EV kit can also evaluate the MAX7501-MAX7504 ICs. Request free IC samples from the factory when ordering the MAX7500 EV kit.

The MAX7500 EV kit provides an on-board I²C/SMBus interface and is connected to the computer through the USB port. The EV kit includes Windows 2000/XP and Windows Vista-compatible software that provides a graphical user interface (GUI) for control of the MAX7500's programmable features and selects between the eight available slave addresses of the MAX7500 IC.

Power-Supply Options

Jumper JU1 selects between the MAX7500 EV kit's power-up options; either on-board through the USB interface or through an external user-supplied DC power supply. The voltage from the USB interface is stepped down to +3.3V through the MAX8512 LDO. To configure these options, set JU1 as desired (see Table 1).

Table 1. MAX7500 EV Kit Jumper Descriptions (JU1-JU4, JU6, JU8, JU14)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Connects the MAX7500 to the on-board +3.3V supply
	2-3	Connects the MAX7500 to the user-supplied (3V to 3.6V) supply
JU2	1-2*	Connects pin A2 of the MAX7500 to GND, logic-low
	1-3	MAX7501-MAX7504 only. Connects $\overline{\text{RESET}}$ input to either external signal or the on-board I ² C/SMBus interface.
	1-4	Connects pin A2 of the MAX7500 to VS, logic-high
JU3	1-2	Connects pin A1 of the MAX7500 to VS, logic-high
	2-3*	Connects pin A1 of the MAX7500 to GND, logic-low
JU4	1-2	Connects pin A0 of the MAX7500 to VS, logic-high
	2-3*	Connects pin A0 of the MAX7500 to GND, logic-low
JU6	1-2	Connects the MAX7500 to the user-supplied SCL
	2-3*	Connects the MAX7500 to the on-board SCL
JU8	1-2	Connects the MAX7500 to the user-supplied SDA
	2-3*	Connects the MAX7500 to the on-board SDA
JU14	1-2	Connects the MAX7501-MAX7504 to the user-supplied $\overline{\text{RESET}}$
	2-3*	Connects the MAX7501-MAX7504 to the on-board software-enabled $\overline{\text{RESET}}$

*Default position.

MAX7500 Evaluation Kit

Evaluates: MAX7500-MAX7504

Setting the I²C Slave Address (A2, A1, A0)

The MAX7500 has eight available slave addresses that can be selected by setting the A2, A1, and A0 pins either high or low. The EV kit provides jumpers JU2, JU3, and JU4 to set A2, A1, and A0, respectively. JU2 also provides an additional option useful for evaluating the MAX7501-MAX7504 that will be discussed in a later section. The default configuration of the EV kit sets A2, A1, and A0 low, resulting in a slave address of 0x90.

User-Supplied I²C/SMBus Interface

To use the MAX7500 EV kit with a user-supplied I²C/SMBus interface, first move the shunts of JU6 and JU8 to the 1-2 position. Then, connect the SDA and SCL signals to the corresponding SDA and SCL pads on the MAX7500 EV kit board. R6 and R7 footprints are provided for the option to add pullup resistors if needed.

Evaluating the MAX7501-MAX7504

The MAX7500 EV kit can also be configured to accept the MAX7501-MAX7504. To evaluate the MAX7501-MAX7504, replace the IC (U1) and set JU2 to pins 1-3 (RESET input).

To utilize the RESET input on the MAX7501-MAX7504, JU14 must also be set accordingly: Pins 1-2 for an external RESET input or pins 2-3 for software control of the RESET input. **Note:** To apply an external RESET signal, apply a low pulse with a duration of at least 1μs at the RESET pad. Refer to the MAX7501-MAX7504 IC data sheet for additional information.

Detailed Description of Software

The MAX7500 EV kit software accurately reads temperature data with a 0.5°C resolution, sets the upper and lower temperature threshold limits, and configures the behavior of the open-drain overtemperature shutdown (OS) output. The MAX7500 supports eight different I²C slave addresses; configure JU2, JU3, and JU4 to select between different addresses. Check the **Shutdown** checkbox (Figure 1) to shut down the MAX7500 internal blocks. By pressing the **Defaults** button, the device is restored to its power-on-reset (POR) state. Refer to the MAX7500-MAX7504 IC data sheet for further details.

Reading Temperature

Temperature data is displayed on the software main window (Figure 1). To read temperature, press the **Read** button and the sensor temperature is displayed on the software interface with a 0.5°C resolution. The **Auto-Read** checkbox is provided to continuously read and display the temperature and limit registers' data when checked.

The **OS Fault** indicator is displayed under the temperature data on the software's main GUI. The indicator asserts (turns red) when the OS is asserted. The indicator deasserts (turns green) when the OS is deasserted. Refer to the *T_{OS} and T_{HYST} Registers* section in the MAX7500-MAX7504 IC data sheet for more information.

Setting T_{OS} and T_{HYST} Registers

The T_{OS} and T_{HYST} registers can be set by writing the appropriate values in the **TOS** and **THYST** edit boxes and pressing their respective **Write** button. The current contents of the T_{OS} and T_{HYST} registers can be read by pressing on the **Read** button.

Configuration Register

The **Configuration** group box sets the fault queue, OS polarity, shutdown control, and whether the OS output functions in comparator or interrupt mode. The **Fault Queue** drop-down list determines the number of faults necessary to trigger an OS condition. The **OS Polarity** drop-down list forces the OS polarity to either active-low or active-high. The **Shutdown** checkbox, when checked, shuts down the internal blocks and drops the supply current to 3μA.

The **Mode** drop-down list selects between running the OS output in comparator or interrupt modes. In comparator mode, OS is asserted when the temperature rises above the T_{OS} value and is deasserted when the temperature drops below the T_{HYST} value. In interrupt mode, OS is asserted when the temperature rises above the T_{OS} value or falls below the T_{HYST} value and OS is deasserted only after performing a read operation.

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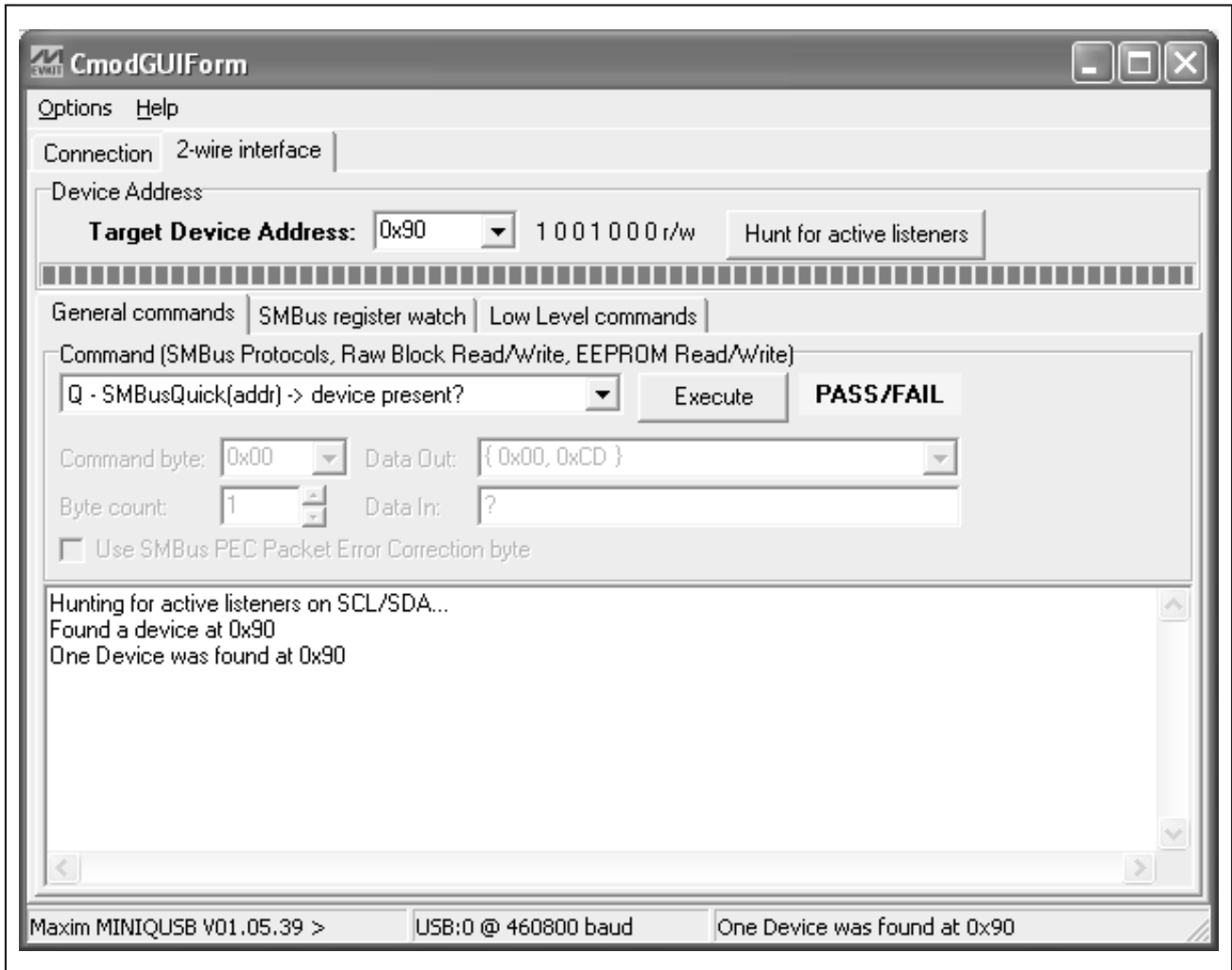


Figure 2. Command Module Interface Window

MAX7501-MAX7504 Software Reset

When using the optional MAX7501-MAX7504, the EV kit software gives the capability to send a reset pulse to the RESET pin on the IC. To reset the MAX7501-MAX7504, select the **Options | Reset I2C (7501-7504 Only)** menu item from the menu bar. JU14 must be set to pins 2-3 and jumper JU2 must be set to pins 1-3.

Simple SMBus Commands

There are two methods for communicating with the MAX7500, through the MAX7500 EV kit software main window (Figure 1), or through the interface window available by selecting the **Options | Interface Diagnostic Window** menu item from the menu bar. The Maxim command module interface window (Figure 2) includes a **2-wire interface** tab that allows for execution of the frequently used commands.

MAX7500 Evaluation Kit

Evaluates: MAX7500-MAX7504

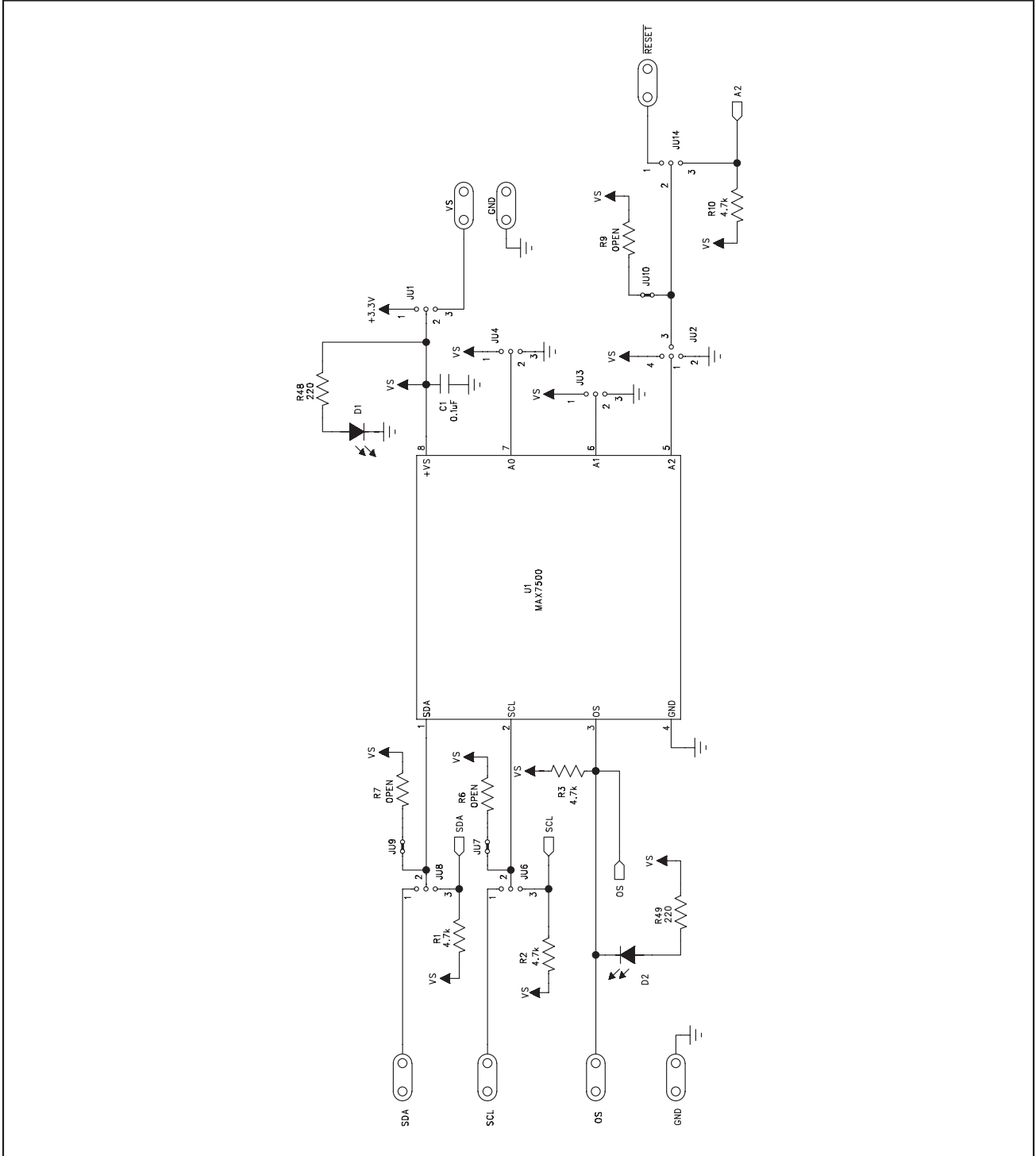


Figure 3a. MAX7500 EV Kit Schematic (Sheet 1 of 3)

Evaluates: MAX7500-MAX7504

MAX7500 Evaluation Kit

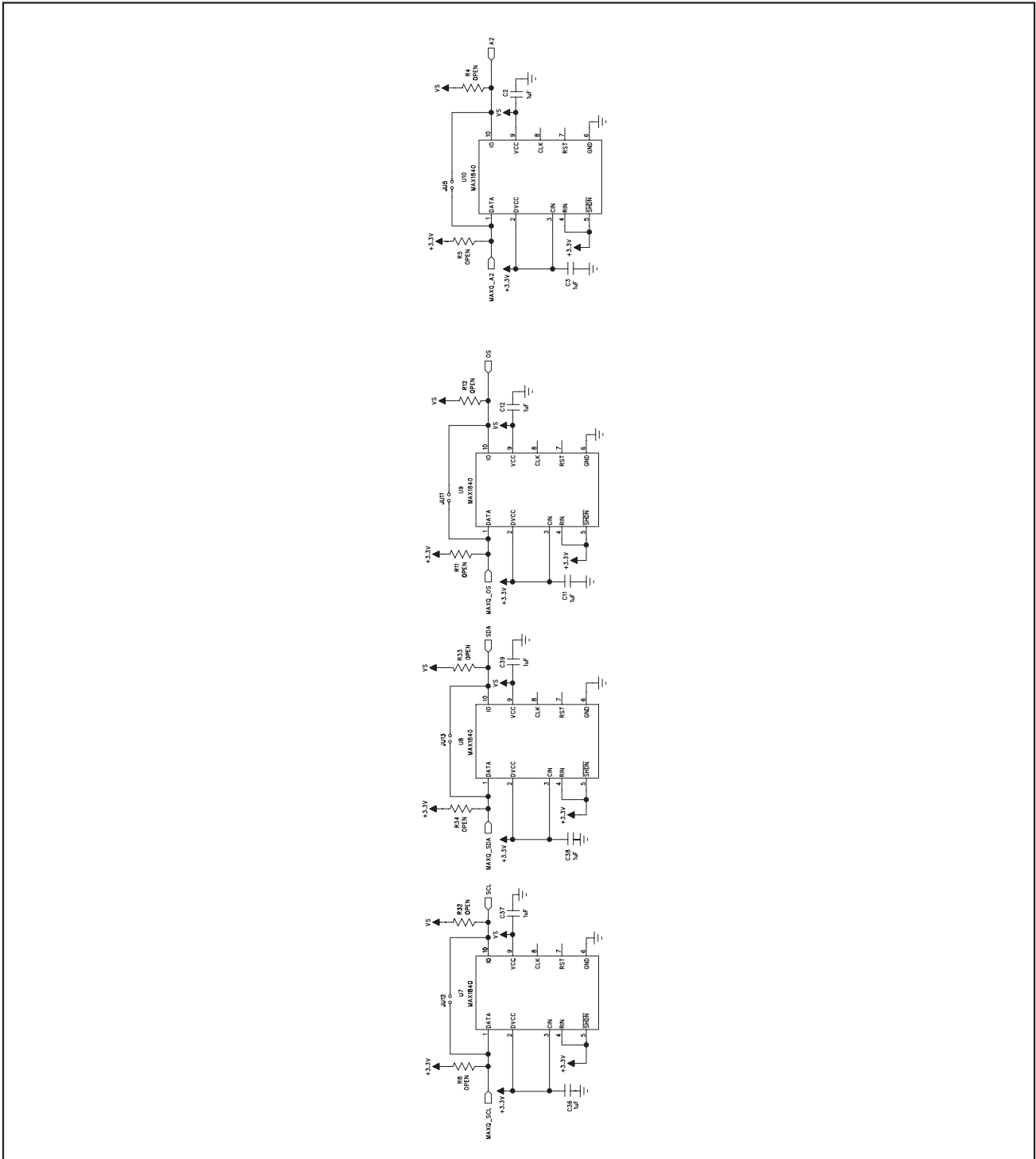


Figure 3b. MAX7500 EV Kit Schematic (Sheet 2 of 3)

MAX7500 Evaluation Kit

Evaluates: MAX7500-MAX7504

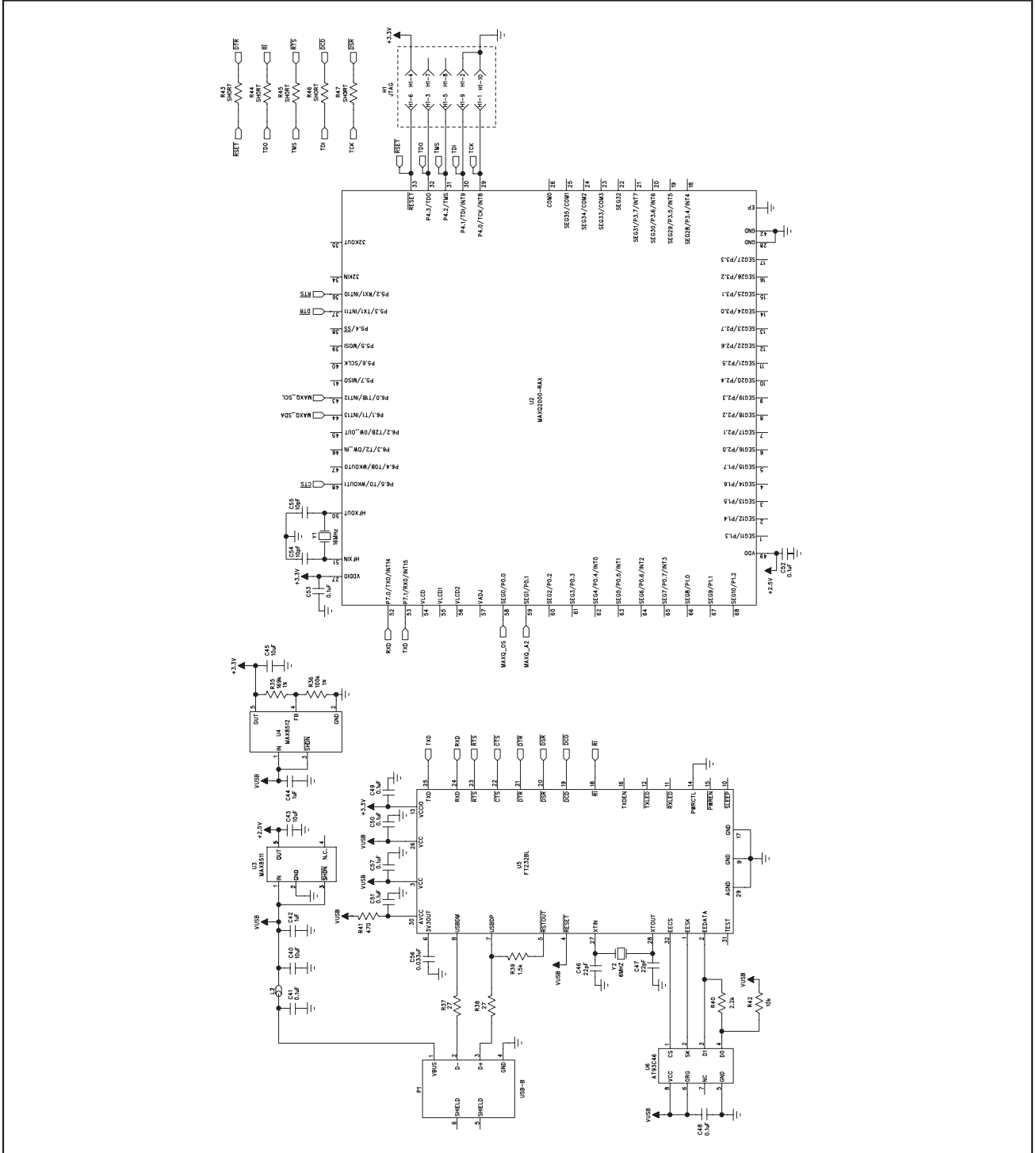


Figure 3c. MAX7500 EV Kit Schematic (Sheet 3 of 3)

MAX7500 Evaluation Kit

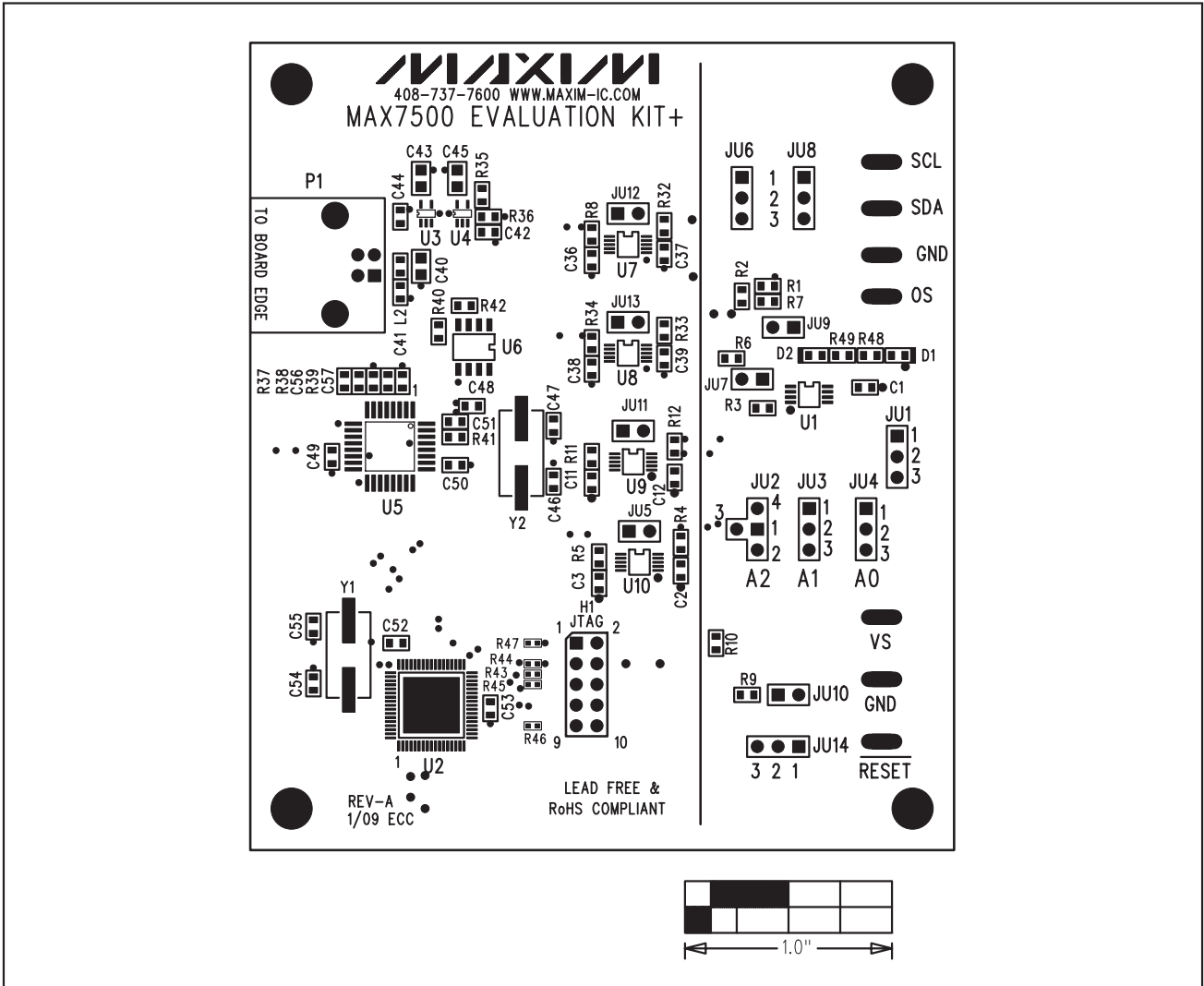


Figure 4. MAX7500 EV Kit Component Placement Guide—Component Side

MAX7500 Evaluation Kit

Evaluates: MAX7500-MAX7504

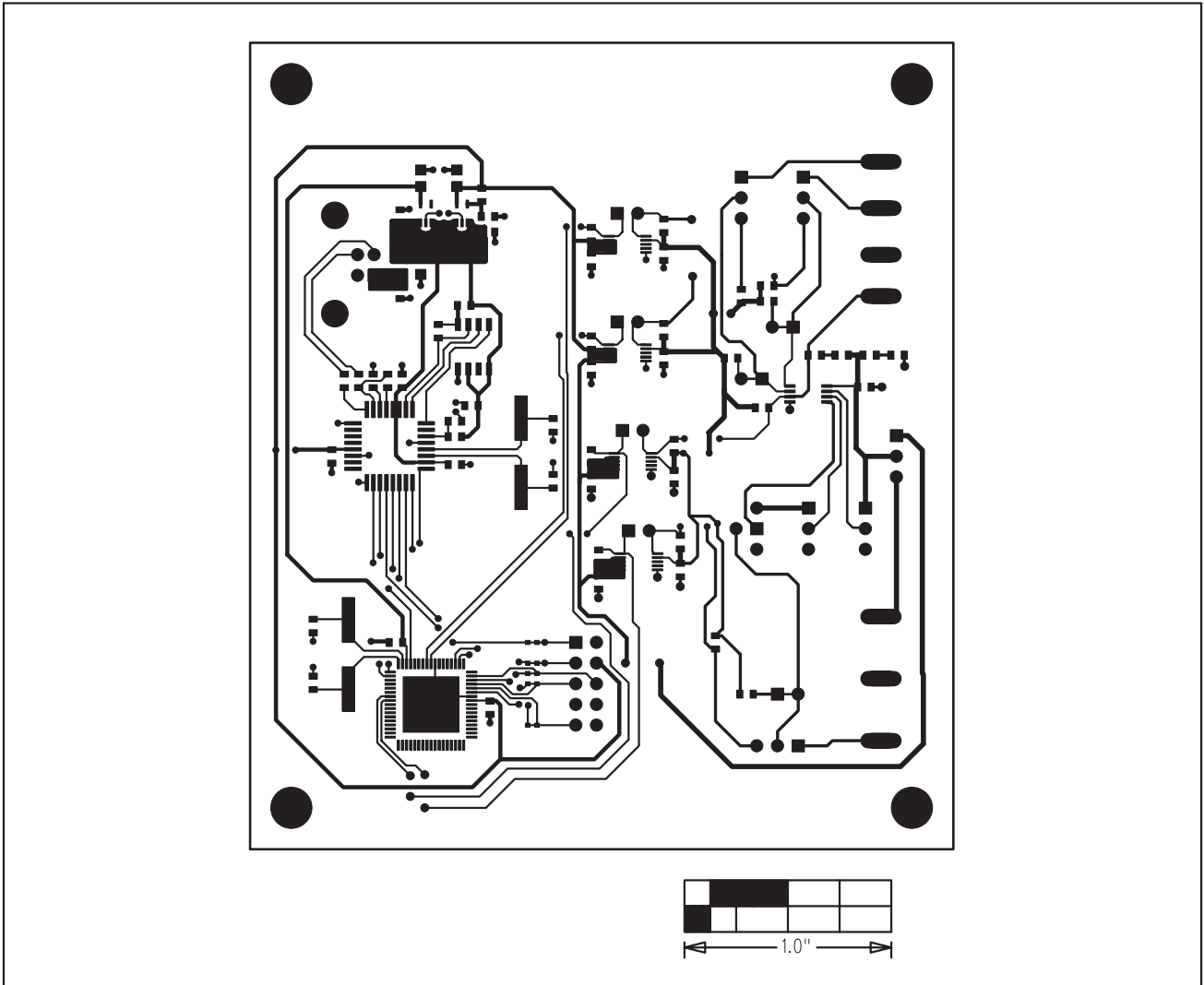


Figure 5. MAX7500 EV Kit PCB Layout—Component Side

Evaluates: MAX7500-MAX7504

MAX7500 Evaluation Kit

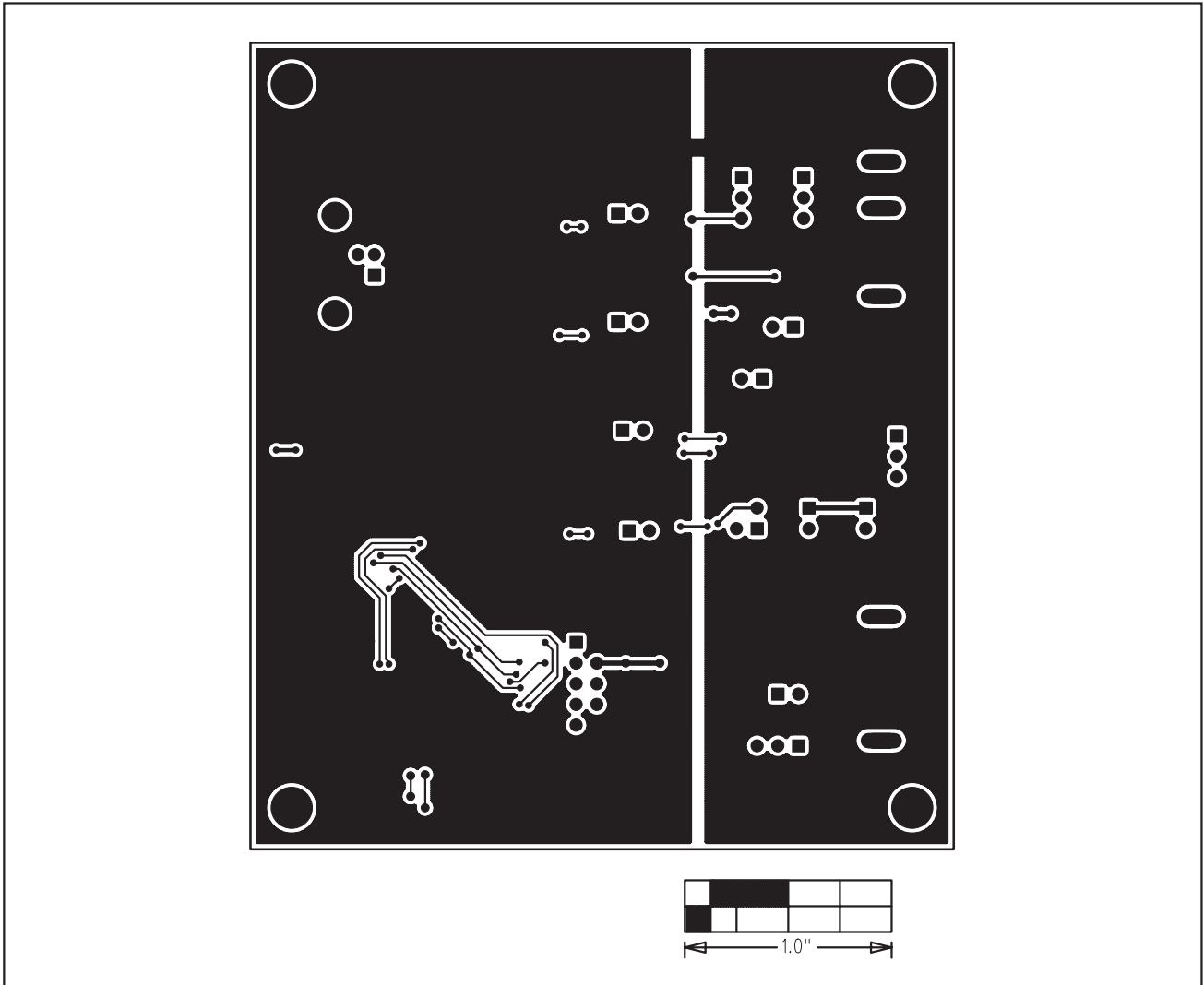


Figure 6. MAX7500 EV Kit PCB Layout—Solder Side

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