19-5924; Rev 0; 6/11

MAX5216 Evaluation Kit

Evaluates: MAX5214/MAX5216

General Description

The MAX5216 evaluation kit (EV kit) demonstrates the MAX5216 16-bit low-power, high-performance, buffered digital-to-analog converter (DAC). The EV kit includes Windows XP®-, Windows Vista®-, and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX5216.

The EV kit comes with the MAX5216GUA+ installed. Contact the factory for samples of the pin-compatible MAX5214GUA+ (14-bit, low-power version).

Features

- **Windows XP-, Windows Vista-, and Windows 7-Compatible Software**
- **Supports 14-Bit and 16-Bit DACs**
- **On-Board Microcontroller to Generate SPI™ Commands**
- **USB Powered (Cable Included)**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

***Ordering Information* appears at end of data sheet.**

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3–C10, C21–C24	13	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C2, C13, C15	3	10µF ±10%, 16V X5R ceramic capacitors (0805) Murata GRM188R71C104K
C11, C12	2	10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J
C14, C16	2	1µF ±10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K
C17, C18	2	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
C19	1	10µF ±10%, 10V X7R ceramic capacitor (0805) Murata GRM21BR71A106K
C20	1	0.033µF ±10%, 16V X5R ceramic capacitor (0603) Taiyo Yuden EMK107BJ333KA
D1	1	Green LED (0603)
H1	0	Not installed, 10-pin (2 x 5) JTAG header
H2	1	2-pin header
H3	1	8-pin (2 x 4) header
JUA–JUE	0	Not installed, 2-pin headers—short (PC trace)
JU1–JU6	6	3-pin headers
L1	1	Ferrite bead (0603) TDK MMZ1608R301A
P1	1	USB type-B right-angle female receptacle
R1	1	0Ω ±5% resistor (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)
R8	0	Not installed, resistor (0603)
U1	1	16-bit DAC (8 µMAX®) Maxim MAX5216GUA+
U2	1	Microcontroller (68 QFN-EP) Maxim MAXQ2000-RAX+
U3	1	93C46-type 3-wire EEPROM (8 SO)
U4	1	UART-to-USB converter (32 TQFP)
U5	1	LDO regulator (5 SC70) Maxim MAX8511EXK33+

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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.maxim-ic.com.

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U6	1	LDO regulator (5 SC70) Maxim MAX8511EXK25+
U7	1	Voltage reference (8 µMAX) Maxim MAX6133A25+
Y1	1	16MHz crystal (HCM49) Hong Kong X'tals SSM16000N1HK188F0-0
Y2	1	6MHz crystal (HCM49) Hong Kong X'tals SSL60000N1HK188F0-0

DESIGNATION	QTY	DESCRIPTION
—	1	USB high-speed A-to-B cables, 6ft
—	6	Shunts
—	1	PCB: MAX5216 EVALUATION KIT+

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.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 MAX5216 when contacting these component suppliers.*

MAX5216 EV Kit Files

FILES	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX5216.EXE	Application program
CDM20600.EXE	Installs the USB device driver
UNINSTALL.EXE	Uninstalls the EV kit software
USB_Driver_Help_200.PDF	USB driver installation help file

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Quick Start

Required Equipment

- MAX5216 EV kit (USB cable included)
- Windows XP, Windows Vista, or Windows 7 PC with a spare USB port
- Digital voltmeter (DVM)

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:

1) Verify that jumpers JU1–JU6 are in their default positions, as shown in Table 1.
2) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 5216Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
3) Install the EV kit software on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. During software installation, some versions of Windows may show a warning message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with installation. Administrator privileges are required to install the USB device driver on Windows.
4) Connect the USB cable from the PC to the EV kit board. A Windows message appears when connecting the EV kit board to the PC for the first time. Each version of Windows has a slightly different message. If you see a Windows message stating **ready to use**, then proceed to the next step. Otherwise, open the USB_Driver_Help_200.PDF document in the Windows **Start | Programs** menu to verify that the USB driver was installed successfully.
5) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software (Figure 1) prompts the user to select the installed part on the the EV kit. Once selected, the EV kit software main window appears (Figure 2).
6) Enter the desired code in the edit box and press the **Enter** button or move the scroll bar within the **DAC** group box.
7) Using the DVM, measure the voltage at H2-1 (the OUT pin of the DAC). Verify that the voltage is also displayed at the bottom of the main software window.

Table 1. Jumper Descriptions (JU1–JU6)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Connects the VDD pin of the DAC to the on-board +3.3V supply.
	2-3	Connects the VDD pin of the DAC to a user-supplied supply between +2.7V to +5.25V.
JU2	1-2*	Connects the $\overline{CS}$ pin of the DAC to the on-board microcontroller.
	2-3	Connects the $\overline{CS}$ pin of the DAC to a user-supplied $\overline{CS}$ signal.
JU3	1-2*	Connects the SCLK pin of the DAC to the on-board microcontroller.
	2-3	Connects the SCLK pin of the DAC to a user-supplied SCLK signal.
JU4	1-2*	Connects the DIN pin of the DAC to the on-board microcontroller.
	2-3	Connects the DIN pin of the DAC to a user-supplied DIN signal.
JU5	1-2*	Connects the $\overline{CLR}$ pin of the DAC to the on-board microcontroller.
	2-3	Connects the $\overline{CLR}$ pin of the DAC to a user-supplied $\overline{CLR}$ signal.
JU6	1-2*	Connects the REF pin of the DAC to the voltage at VDD.
	2-3	Connects the REF pin of the DAC to the on-board MAX6133 voltage reference.

**Default position.*

Detailed Description of Software

The main window of the MAX5216 EV kit software displays the DAC code and output voltage. Other features include changing the operating modes and reference.

16-Bit and 14-Bit Part Selection

When the program first starts up, the user must select the correct part installed on the EV kit (Figure 1). Once the selection has been made, press the **Enter** button and the main software window appears (Figure 2).

Operation

Within the **Operation** group box, the user can select between **No Operation**, **Write**, and **Power Down**. Select the **Write** radio button when writing to the DAC. Select the **Power Down** radio button and the **Power Down Mode** group box appears (Figure 3).

DAC Output

The user can enter or scroll to the desired code within the **DAC** group box and press **Enter**. The DAC code and output voltage appear at the bottom of the software's main window.

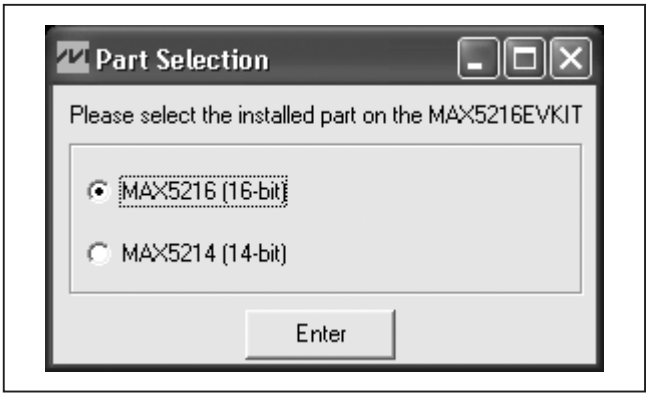

Figure 1. MAX5216 EV Kit Part Selection Window

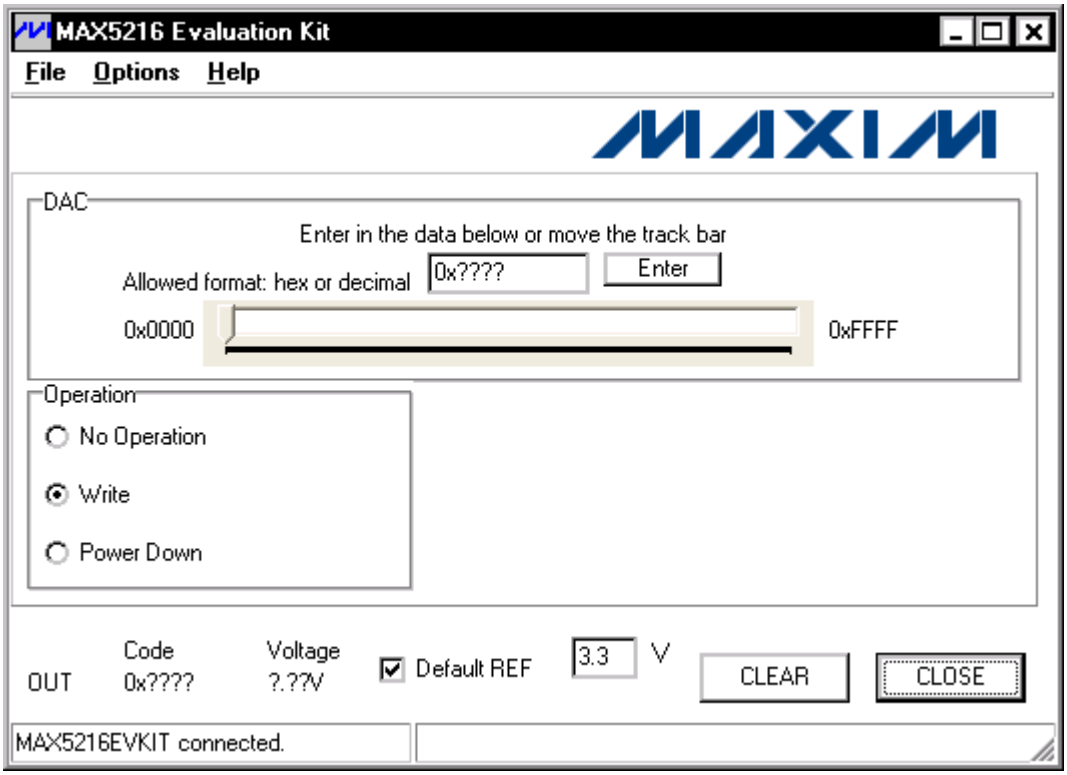

Figure 2. MAX5216 EV Kit Software Main Window

Setting the Reference

The reference is set to 3.3V by default. Uncheck the **Default REF** checkbox and enter the new reference voltage in the corresponding edit box. The user must apply the same voltage at the board for proper operation (see the *Reference* section). The voltage entered in the edit box does not affect the operation of the part.

CLEAR ($\overline{CLR}$)

Press the CLEAR button to drive $\overline{CLR}$ low and reset the DAC code to 0.

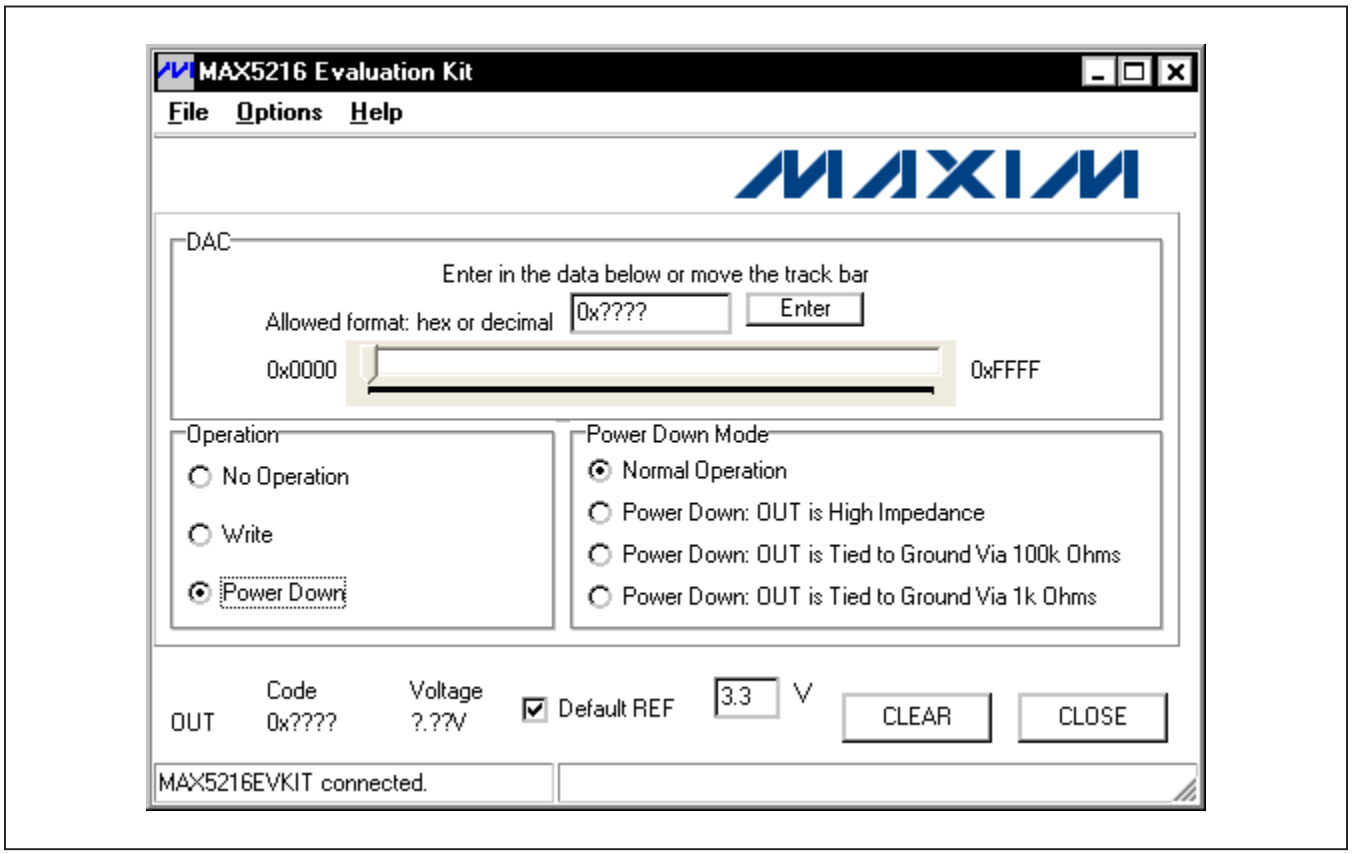

Figure 3. MAX5216 EV Kit Software Main Window (Power-Down Mode)

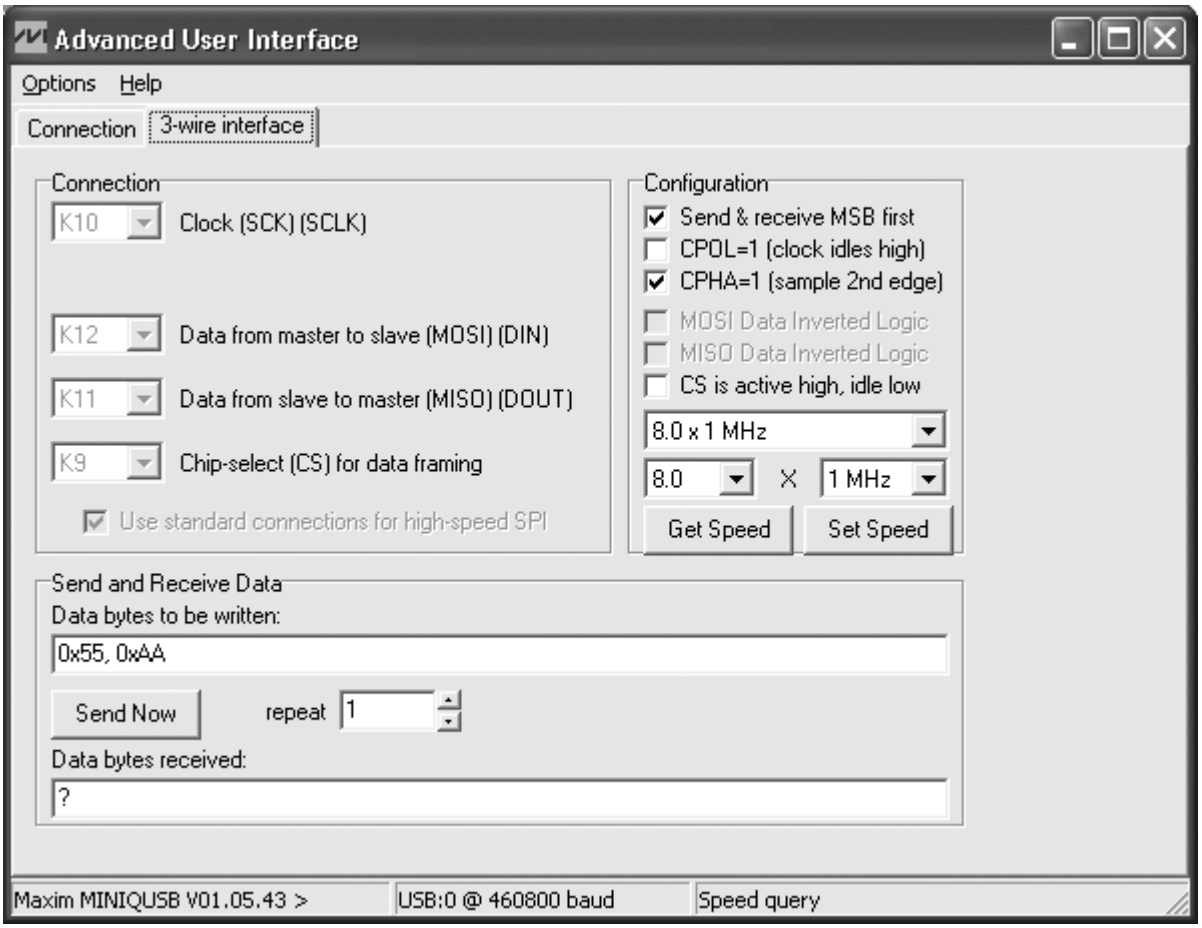

Figure 4. Advanced SPI User Interface Window (3-Wire Interface Tab)

Advanced User Interface

A serial interface can be used by advanced users by clicking **Options | Interface (Advance Users)**. Click on the **3-wire interface** tab shown in Figure 4. Enter data into the **Data bytes to be written** edit box and press the **Send Now** button.

Detailed Description of Hardware

The MAX5216 EV kit provides a proven layout for the MAX5216 16-bit low-power, high-performance, buffered DAC. An on-board reference (MAX6133), USB-PC connection circuitry, and jumpers to disconnect the on-board microcontroller are included on the EV kit.

Reference

The EV kit default configuration is with the reference connected to VDD (see Table 1). To use the on-board external 2.5V reference (MAX6133), move the shunt on jumper JU6 to the 2-3 position and apply 2.7V to 12.6V between the REF_SUP and GND PCB pads on the EV kit. Optionally, the shunt on JU6 can be removed and an external 2V to VDD reference applied at the REF loop on the EV kit.

User-Supplied SPI Interface and Power Supply

To use the EV kit with a user-supplied SPI interface, first move the shunts on jumpers JU1–JU5 to the 2-3 position. Next, apply a 2.7V to 5.25V power supply at the EXT_VDD PCB pad on the EV kit. Lastly, connect the $\overline{CS}$, SCLK, DIN, $\overline{CLR}$, and GND signals to the corresponding pins of header H3.

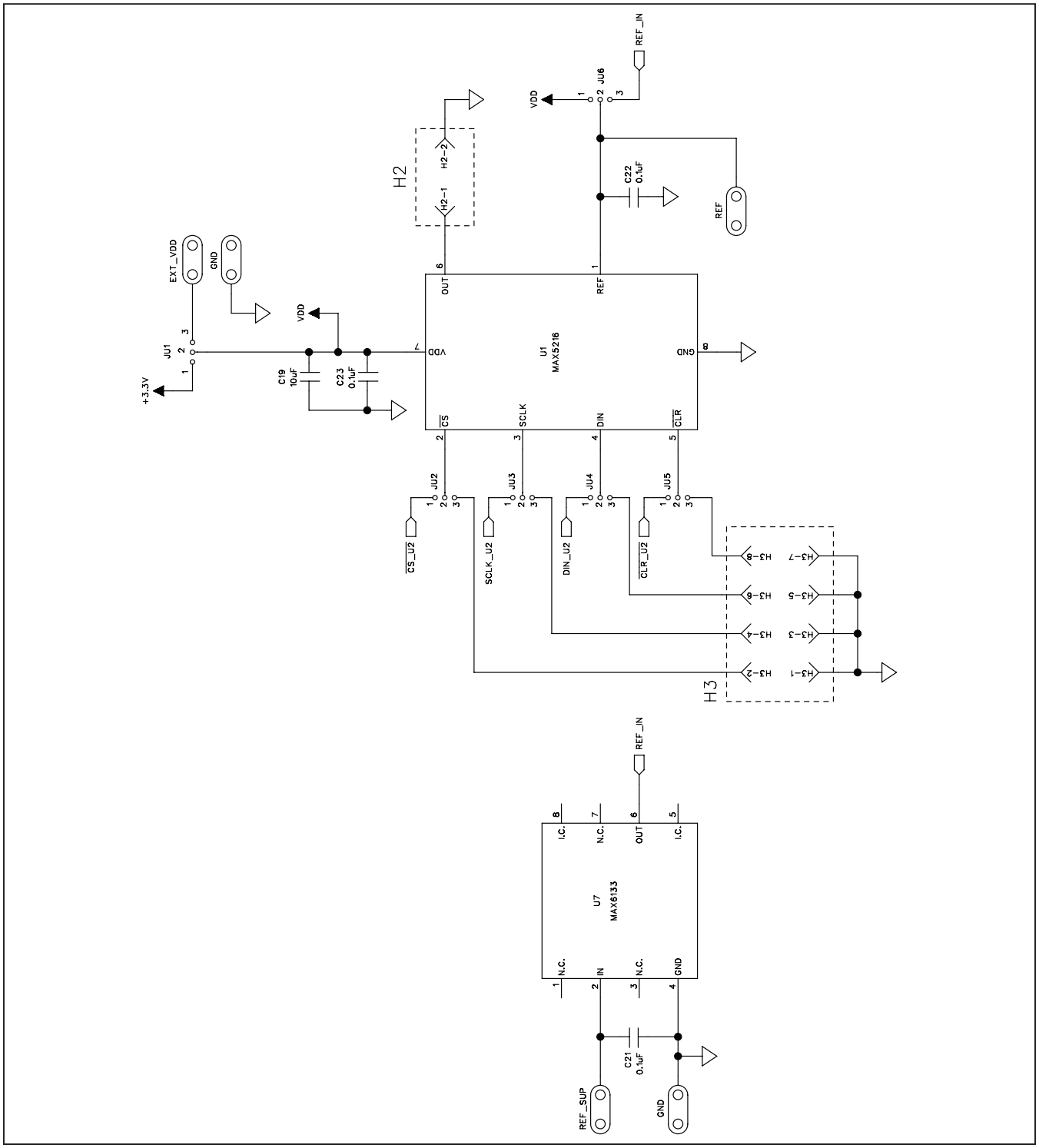

Figure 5a. MAX5216 EV Kit Schematic (Sheet 1 of 2)

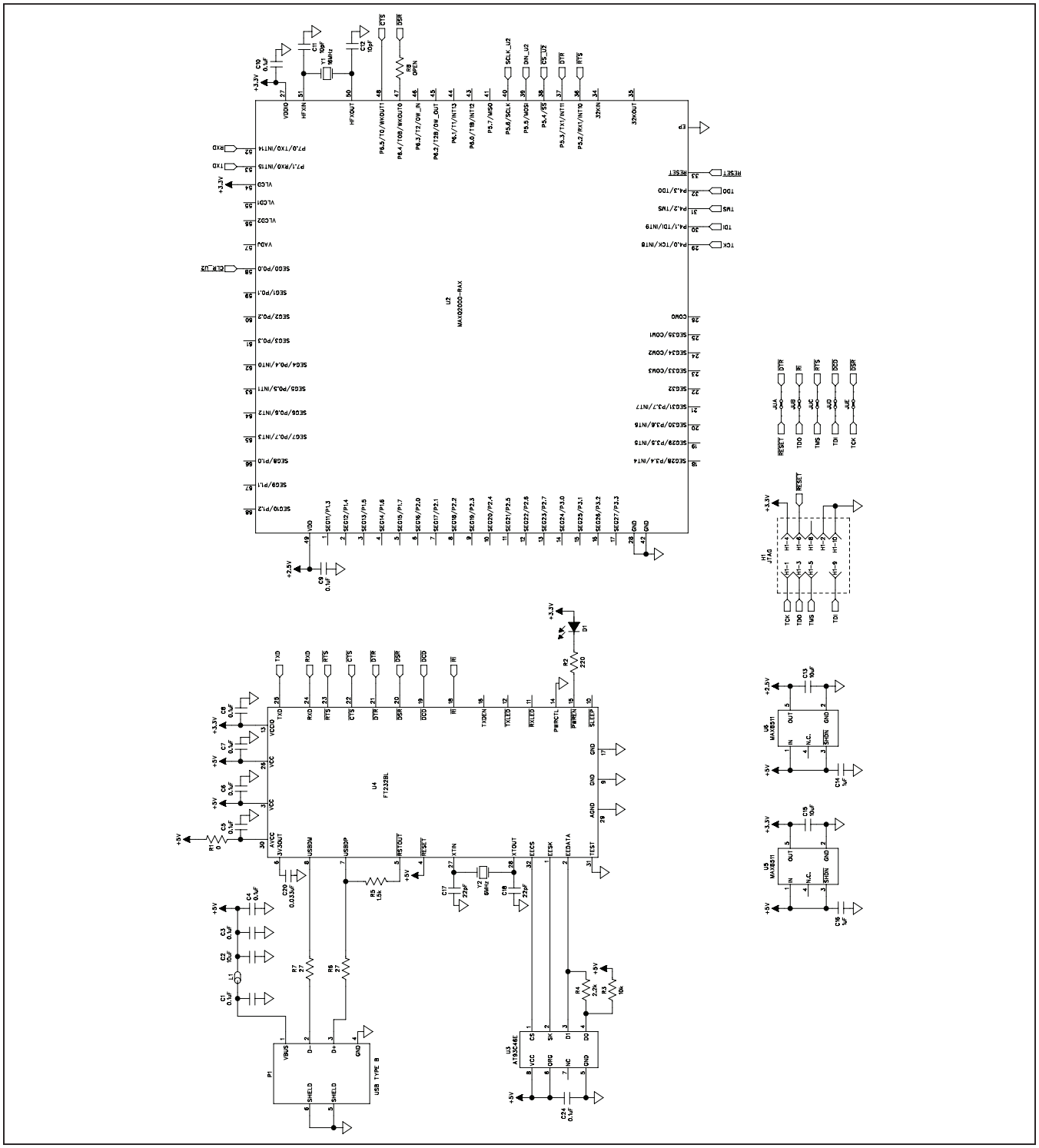

Figure 5b. MAX5216 EV Kit Schematic (Sheet 2 of 2)

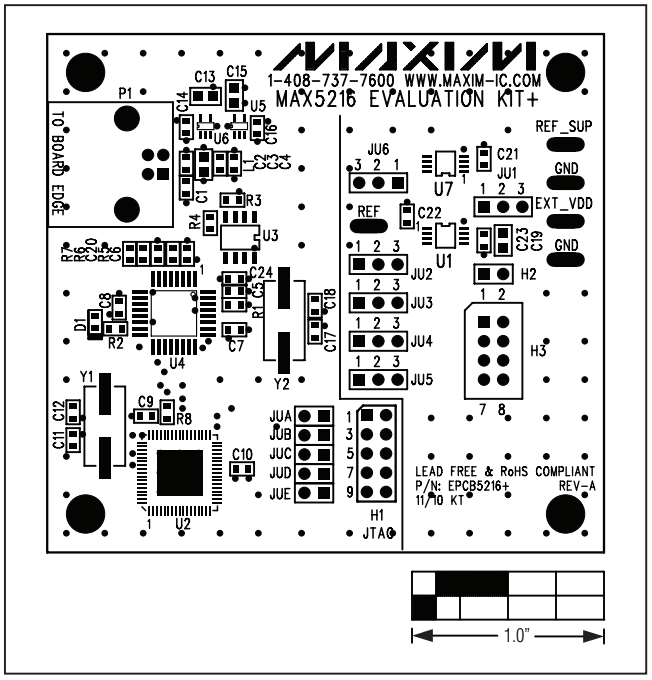

Figure 6. MAX5216 EV Kit Component Placement Guide—Component Side

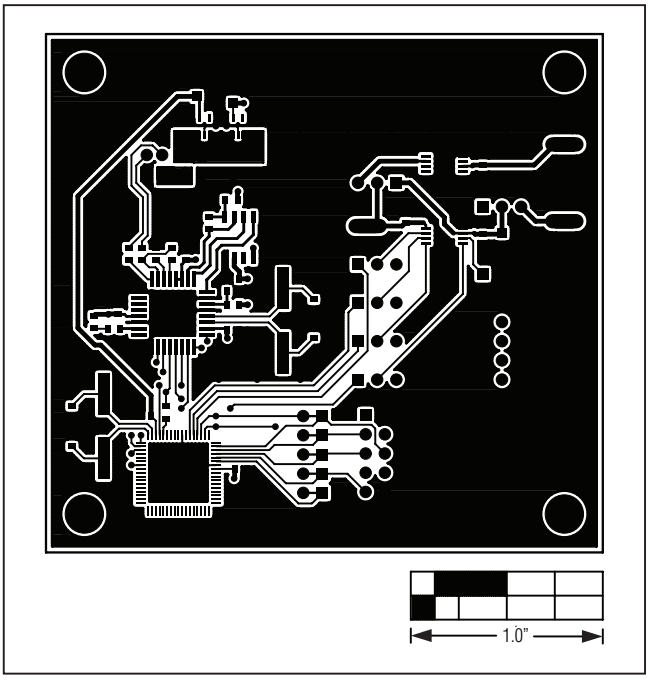

Figure 7. MAX5216 EV Kit PCB Layout—Component Side

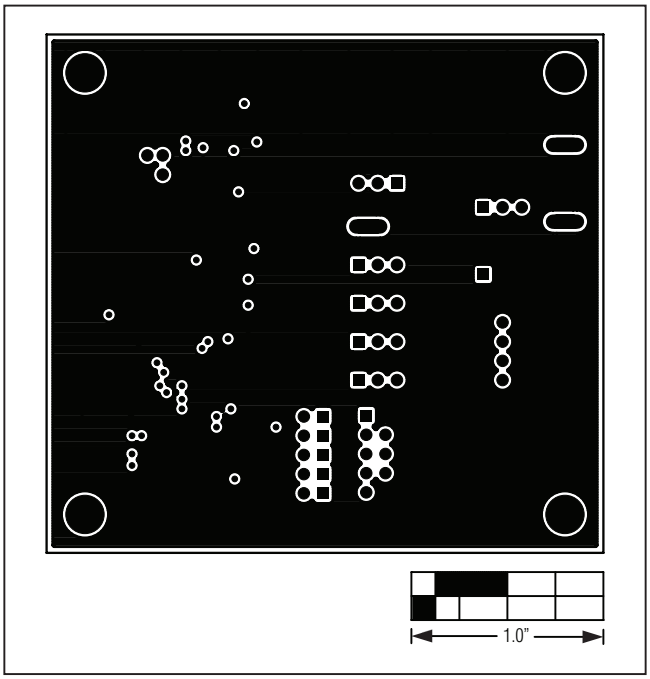

Figure 8. MAX5216 EV Kit PCB Layout—Inner Layer 2

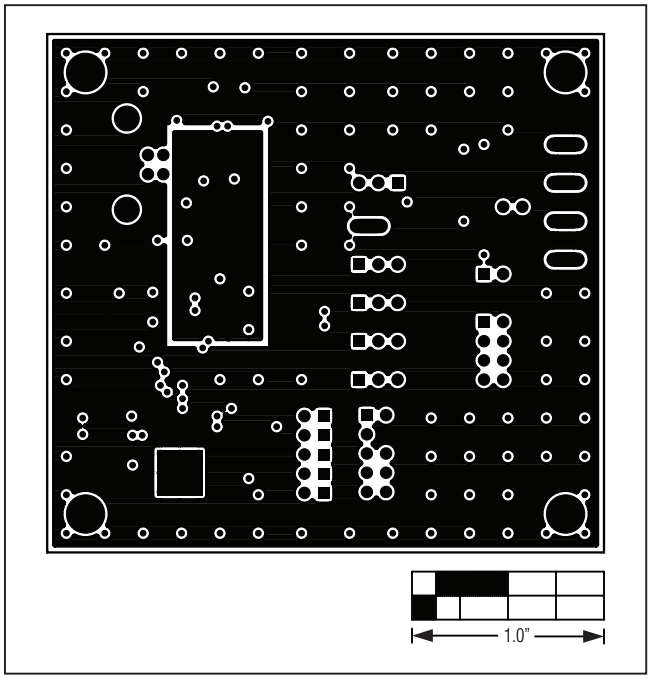

Figure 9. MAX5216 EV Kit PCB Layout—Inner Layer 3

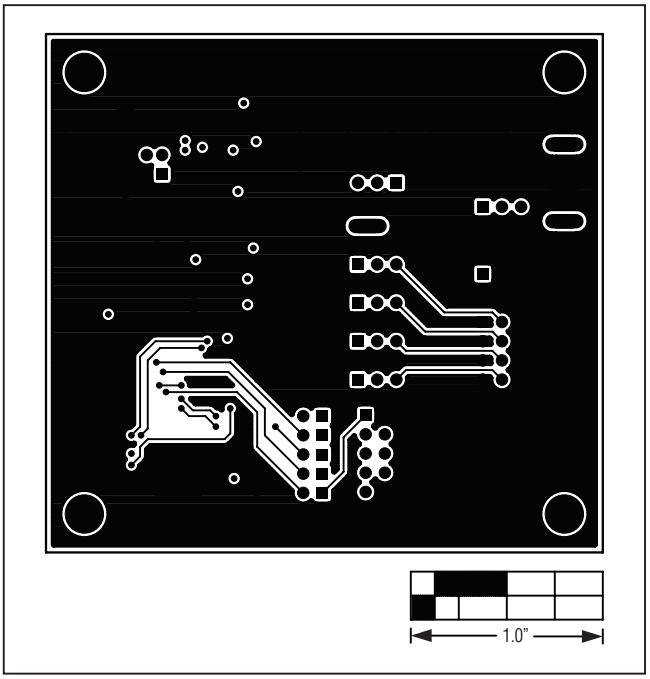

Figure 10. MAX5216 EV Kit PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAX5216EVKIT+	EV Kit

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

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/11	Initial release	—

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