

**General Description**

The MAX5217 evaluation kit (EV kit) demonstrates the MAX5217, 16-bit, single-channel, low-power, buffered voltage-output DAC. The IC comes in an 8-pin  $\mu$ MAX<sup>®</sup> package. The EV kit provides controls to change the DAC output and power operations.

The DAC IC is controlled by an on-board MAXQ<sup>®</sup> microcontroller that provides an I<sup>2</sup>C interface. The EV kit features Windows XP<sup>®</sup>-, Windows Vista<sup>®</sup>-, and Windows<sup>®</sup> 7-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the device.

The EV kit comes with the MAX5217GUA+ (16-bit,  $\pm 4$  LSB INL (max)) installed. Contact the factory for samples of the pin-compatible MAX5215GUA+ (14-bit,  $\pm 1$  LSB INL (max)) and MAX5217BGUA+ (16-bit,  $\pm 8$  LSB INL (max)) versions.

**Features**

- Wide Input Supply Range: 2.7V to 5.5V
- Low-Power Consumption (80 $\mu$ A max)
- Rail-to-Rail Buffered Output
- Configurable  $\overline{\text{AUX}}$  Pin for Asynchronous CLR or LDAC Operation
- Selectable Output Termination: 1k $\Omega$ , 100k $\Omega$ , or High Impedance
- Supports 14-Bit and 16-Bit DACs
- Windows XP-, Windows Vista-, and Windows 7-Compatible Software
- USB Powered (Cable Included)
- Proven PCB Layout
- Fully Assembled and Tested

**Component List**

DESIGNATION	QTY	DESCRIPTION
ADDR, $\overline{\text{AUX}}$ , OUT, REF, SDA, SCL, VDD	7	Red test points
AGND, DGND, GNDS	3	Black test points
C1, C5–C7, C19–C22	8	1 $\mu$ F $\pm 10\%$ , 16V X7R ceramic capacitors (0603) Murata GRM188R71C105K
C2, C12–C14, C18, C27, C33	7	0.1 $\mu$ F 10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C4	1	200pF $\pm 5\%$ , 50V C0G ceramic capacitor (0603) Murata GRM1885C1H201J

DESIGNATION	QTY	DESCRIPTION
C25	1	100pF $\pm 5\%$ , 50V C0G ceramic capacitor (0603) Murata GQM1885C1H101J
C15, C16	2	18pF $\pm 5\%$ , 50V C0G ceramic capacitors (0603) Murata GRM1885C1H180J
C17	0	Not installed, ceramic capacitor (0603)
H1	0	Not installed, 4-pin header
H2	1	10-pin (2 x 5) dual-row header
JU1, JU2, JU4, JU5	4	2-pin headers
JU3, JU6, JU7	3	3-pin headers
JU_ID0– JU_ID3	0	Not installed, 2-pin headers

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

**Component List (continued)**

DESIGNATION	QTY	DESCRIPTION
L1	1	Ferrite bead (0603) TDK MMZ1608R301A
R1, R2	2	4.7kΩ ±5% resistors (0603)
R3	1	1MΩ ±5% resistor (0603)
R4–R6	3	1.5kΩ ±% resistors (0603)
R8	1	100Ω ±5% resistor (0603)
R9, R10	2	10kΩ ±5% resistors (0603)
U1	1	16-bit DAC (8 μMAX) Maxim MAX5217GUA+
U3	1	Voltage reference (8 μMAX) Maxim MAX6133A25+
U4	1	Level translator (10 μMAX) Maxim MAX1840EUB+

DESIGNATION	QTY	DESCRIPTION
U5	0	ESD protector Not Installed (6 SOT23)
U7	1	3.3V LDO (5 SC70) Maxim MAX8511EXK33+
U8	1	Microcontroller (64 LQFP) Maxim MAXQ622G-0000+
USB1	1	Mini-USB type-B right-angle PC-mount receptacle
Y1	1	12MHz crystal (HCM49)
—	1	MAX5217 EV kit CD
—	7	Shunts
—	1	USB high-speed A-to-Mini-B cable (6ft)
—	1	PCB: MAX5217 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 that you are using the MAX5217 when contacting these component suppliers.

**MAX5217 EV Kit Files**

FILES	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX5217.EXE	Application program
USBConverterDLL.DLL	Application library
UNINSTALL.EXE	Uninstalls the EV kit software

**Quick Start**

**Required Equipment**

- MAX5217 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–JU7 are in their default positions, as shown in Table 1.
- 2) Connect the GNDS PCB pad to the negative terminal of the DVM and connect the positive terminal to measure the voltage at the OUT test points.
- 3) Visit [www.maximintegrated.com/evkitsoftware](http://www.maximintegrated.com/evkitsoftware) to download the latest version of the EV kit software, 5217Rxx.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 to your PC and icons are created in the Windows **Start | Programs** menu.
- 5) Connect the USB cable from the PC to the EV kit board; the USB driver is installed automatically. If the USB connection was not found, a popup message appears, as shown in Figure 1. Follow the message to establish connection between the PC and the EV kit board.

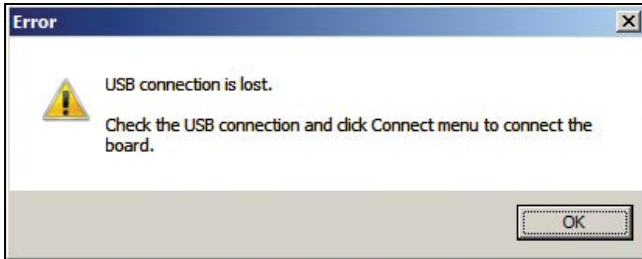


Figure 1. No USB Connection Message

- 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 2.
- 7) Within the **DAC** group box, select the **Code and Load** selection from the **Command** drop-down list and drag the scrollbar to the right until the data reaches 0xFFFF.
- 8) Verify that the DVM measured is 2.5V.

Table 1. Jumper Settings (JU1–JU7)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	Installed*	Connects SDA pin of the U1 IC to the on-board microcontroller.
	Not installed	Disconnects SDA pin of the U1 IC to the on-board microcontroller.
JU2	Installed*	Connects SCL pin of the U1 IC to the on-board microcontroller.
	Not installed	Disconnects SCL pin of the U1 IC to the on-board microcontroller.
JU3	1-2*	Connects ADDR pin of IC U1 to VDD to determine I <sup>2</sup> C address. See Table 2.
	2-3	Connects ADDR pin of IC U1 to DGND to determine I <sup>2</sup> C address. See Table 2.
	Not installed	ADDR pin of IC U1 is not connected to determine I <sup>2</sup> C address. See Table 2.
JU4	Installed*	Connects the AUX signal of the on-board microcontroller to the AUX pin of IC U1.
	Not installed	Disconnects the AUX signal of the on-board microcontroller to the AUX pin of IC U1.
JU5	Installed	Connects load capacitor C25 and resistor R10 to the DAC output of IC U1.
	Not installed*	Disconnects load capacitor C25 and resistor R10 to the DAC output of IC U1.
JU6	1-2*	Connects the VDD pins of IC U1 to the on-board +3.3V supply.
	1-3	Connects the VDD pins of IC U1 to a user-supplied power supply between +2.5V to +5.5V.
	Not installed	User-supplied VDD. The user must apply a voltage at the VDD test point.
JU7	1-2*	Connects the REF pin of IC U1 to the on-board 2.5V reference (MAX6133).
	2-3	Connects the REF pin of IC U1 to VDD.
	Not installed	User-supplied REF. The user must apply a voltage reference at the REF test point.

\*Default position.

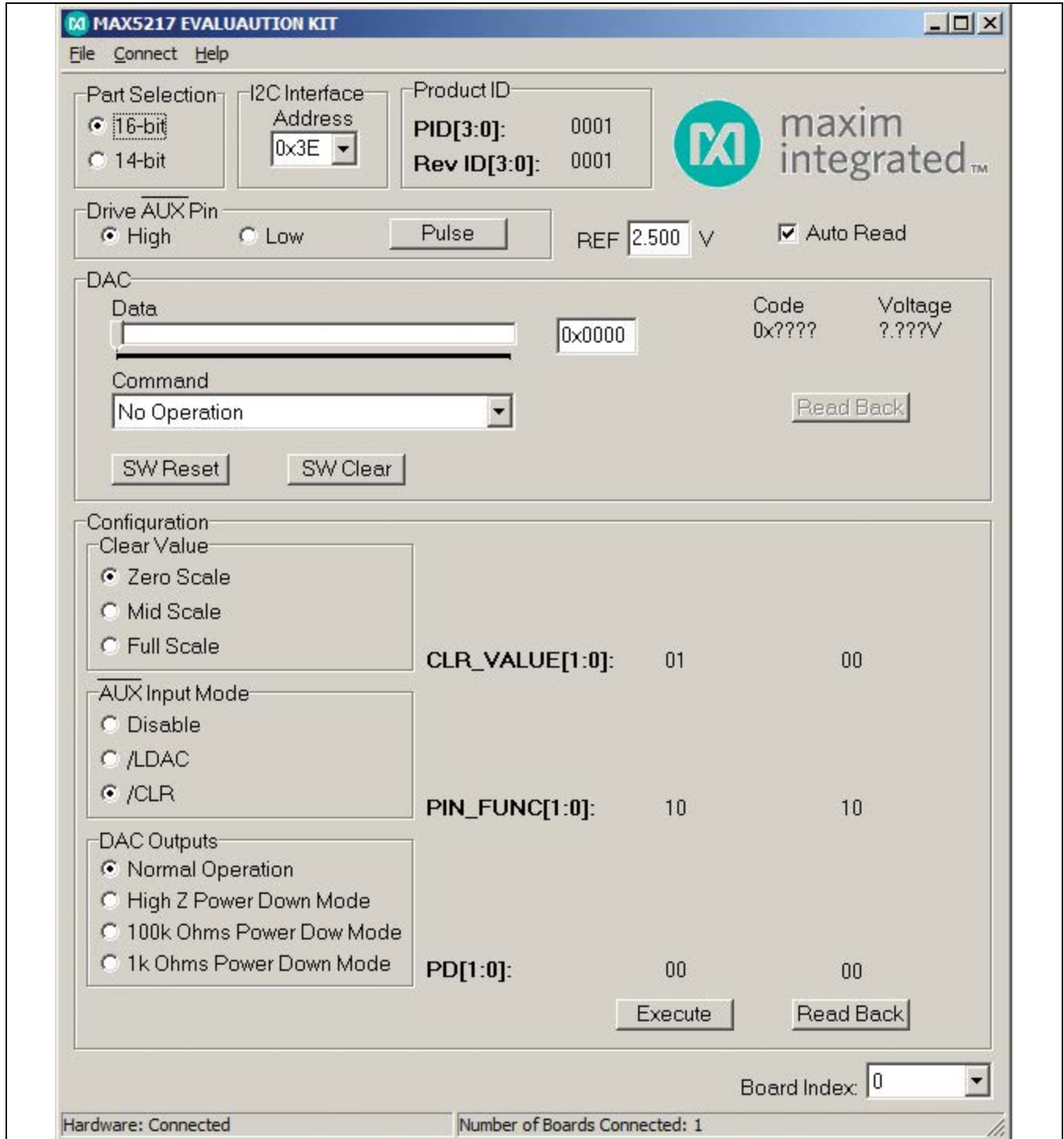


Figure 2. MAX5217 EV Kit Software Main Window

## Detailed Description of Software

The MAX5217 EV kit software controls the DAC code and output voltage. Other features include changing the operating modes and reference.

### Part Selection

In the upper-left corner of the GUI is a **Part Selection** group box. The user must select the appropriate radio button that corresponds to the installed Maxim IC DAC bits.

### I<sup>2</sup>C Interface

The software automatically detects the correct I<sup>2</sup>C address from the drop-down list. See Table 2 for a list of the I<sup>2</sup>C addresses.

### Reference

When setting the reference, confirm that the VDD supply is greater or equal to the voltage reference entered for proper operation. To use the external reference, the user must enter a valid voltage in the **REF** edit box.

### Command

Choose the appropriate **Command** from the drop-down list and drag the **Data** scrollbar to start writing data. Optionally, the user can enter the desired data in the **Data** edit box and press the Enter key on the keyboard. Refer to the MAX5215/MAX5217 IC data sheet for a list of possible commands.

### Software Reset

The **SW Reset** button allows the user to reset the CODE register, the DAC latch, and all the configuration commands to the POR default values.

### Software Clear

The **SW Clear** button allows the user to clear the CODE register and the DAC latch to the clear value selected in the **Clear Value** group box.

## Configuration

The **Configuration** group box includes the controls to the configuration register: clear values,  $\overline{\text{AUX}}$  input mode, and power-down mode of the device.

### Clear Values

The user can set the DAC values to zero, mid scale, or full scale when the **SW Clear** button is pressed.

### $\overline{\text{AUX}}$ Pin

The user can use the  $\overline{\text{AUX}}$  pin for  $\overline{\text{LDAC}}$  and  $\overline{\text{CLR}}$  operations. Once the appropriate selection is made, the  $\overline{\text{AUX}}$  pin can be driven high, low, or pulsed. Refer to the MAX5215/MAX5217 IC data sheet for a detailed description of  $\overline{\text{AUX}}$  pin functions.

### DAC Outputs

When the output of the DAC is not in normal operation, the output can be powered down with a 1k $\Omega$  termination to GND, 100k $\Omega$  termination to GND, or high impedance.

### Read Back

The product ID is read when an address is detected.

Within the **DAC** group box, press the **Read Back** button and the code and voltage of the DAC are displayed.

Within the **Configuration** group box, press the **Read Back** button and the clear values,  $\overline{\text{AUX}}$  pin, and DAC outputs are read back.

### Multiple EV Kits

The software can communicate to multiple MAX5217 EV kits connected to the USB ports on the PC. The status bar at the bottom of the GUI shows the number of boards that are connected. If all boards connected to the PC are not connected to the GUI, click the **Connect** menu item and the status bar should be updated. Use the **Board Index** drop-down list to select the appropriate EV kit for communication.

**Table 2. I<sup>2</sup>C Address Setting**

JU3 SHUNT POSITION (ADDR)	A6	A5	A4	A3	A2	A1	A0	R/W	WRITE ADDRESS (hex)	READ ADDRESS (hex)
1-2*	0	0	1	1	1	1	1	—	0x3E	0x3F
2-3	0	0	1	1	1	0	0	—	0x38	0x39
Not installed	0	0	1	1	1	0	1	—	0x3A	0x3B

\*Default position.

## Detailed Description of Hardware

The MAX5217 EV kit provides a proven layout for the MAX5217 DAC. An on-board MAXQ622 microcontroller and jumpers to disconnect the on-board microcontroller are included on the EV kit.

### I<sup>2</sup>C Address

The I<sup>2</sup>C address of the device is determined by the shunt settings of jumper JU3. See Table 2 for all possible hexadecimal addresses.

### User-Supplied Power Supply

The EV kit is powered completely from the USB port by default. To power the device with a user-supplied power supply, remove the shunt on jumper JU6 and apply a 2.7V to 5.5V power supply at the VDD test point and the nearest AGND test point on the EV kit.

### User-Supplied Reference

The user can apply a user-supplied voltage reference by removing the shunt on jumper JU7 and applying 2V to VDD at the REF test point on the EV kit.

### User-Supplied I<sup>2</sup>C

To evaluate the EV kit with a user-supplied I<sup>2</sup>C bus, remove shunts from jumpers JU1 and JU2. Apply the user-supplied I<sup>2</sup>C signals to the SCL and SDA test point and use the nearest DGND test point for the return ground on the EV kit. If pullup resistors are on the user-supplied interface, resistors R1 and R2 should be removed.

### User-Supplied $\overline{\text{AUX}}$

A user-supplied  $\overline{\text{AUX}}$  signal can be used by removing shunts from jumper JU4. Apply the user-supplied  $\overline{\text{AUX}}$  signal to the  $\overline{\text{AUX}}$  test point and use the nearest DGND test point for the return ground on the EV kit.

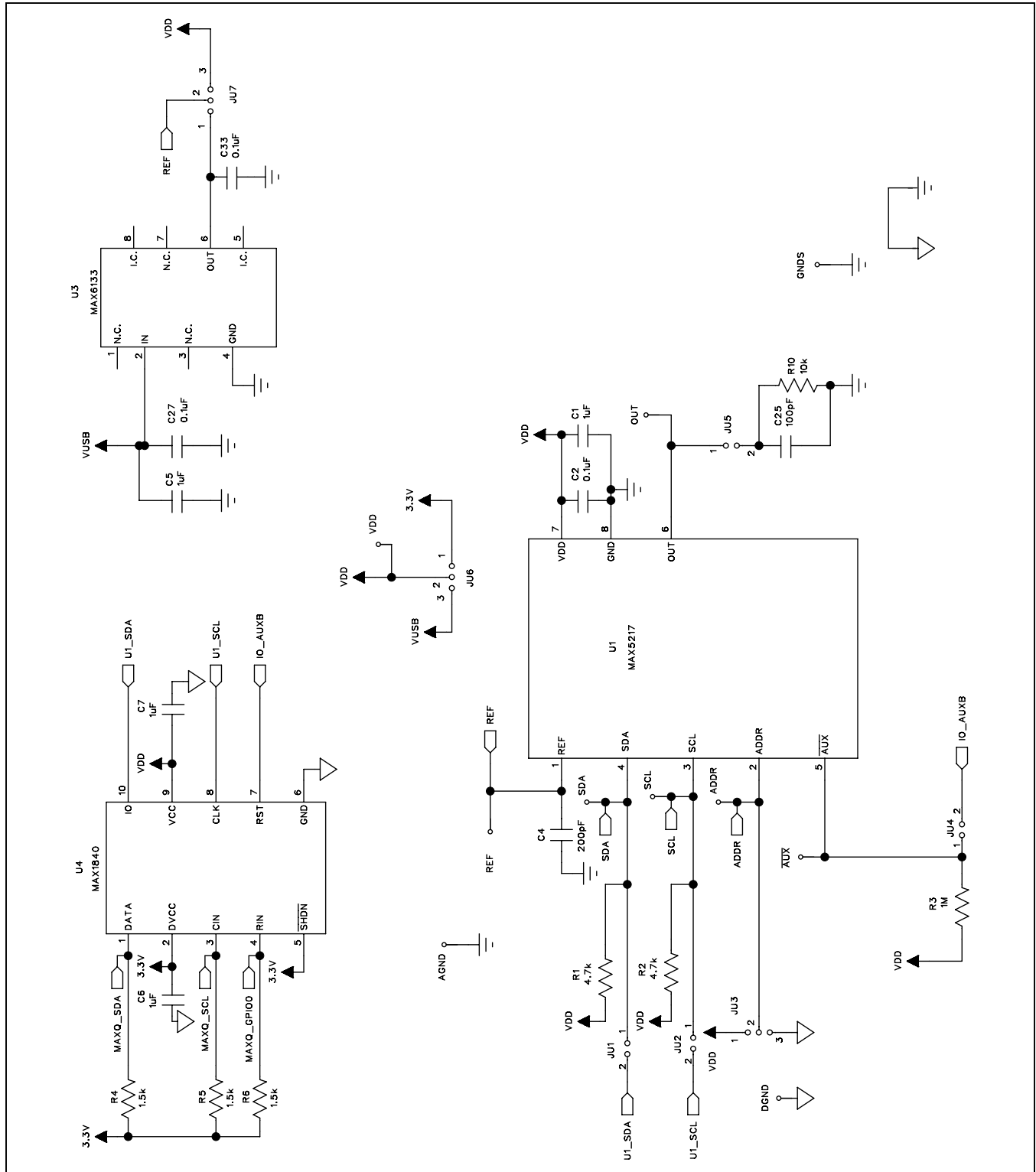


Figure 3a. MAX5217 EV Kit Schematic (Sheet 1 of 2)

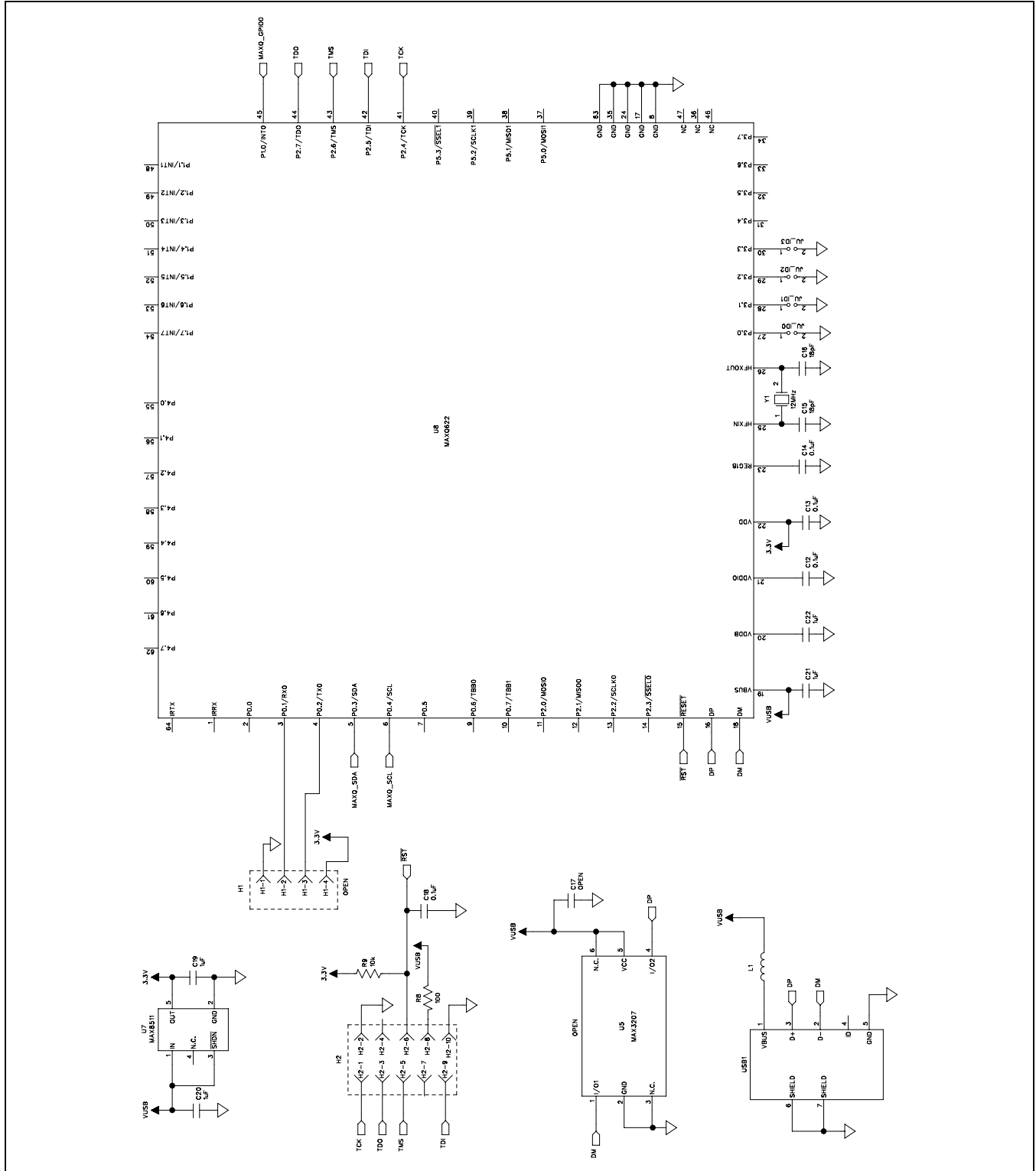


Figure 3b. MAX5217 EV Kit Schematic (Sheet 2 of 2)



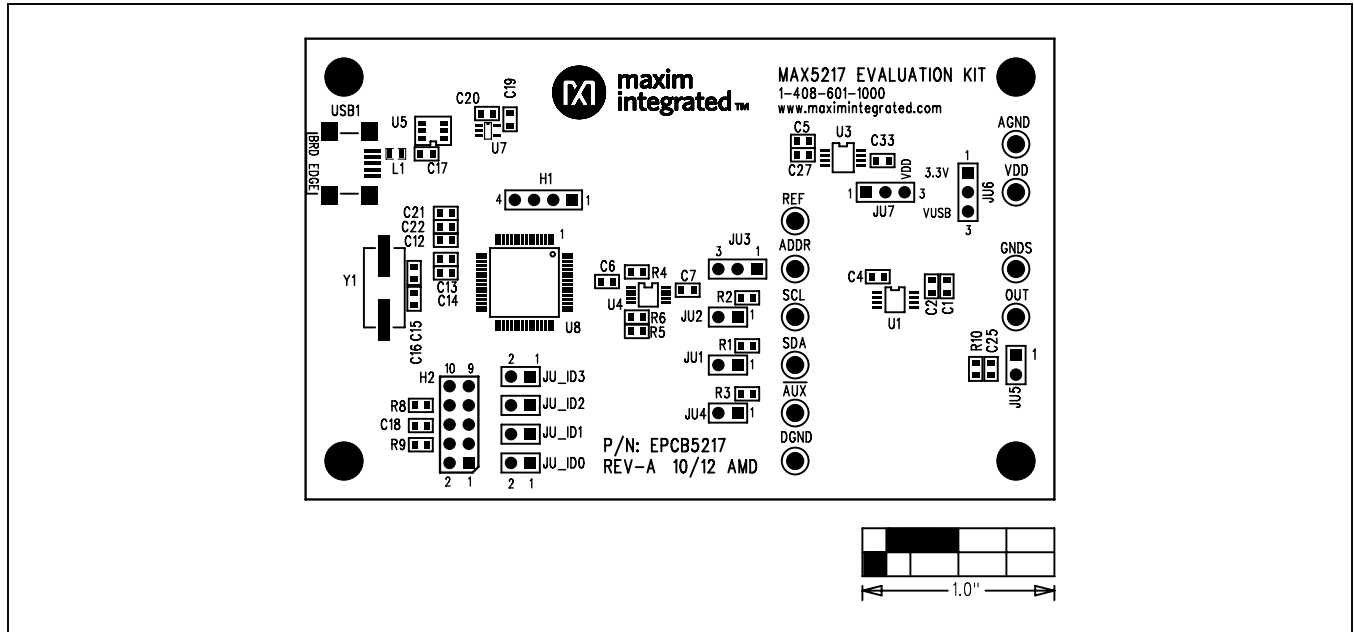


Figure 4. MAX5217 EV Kit Component Placement Guide—Component Side

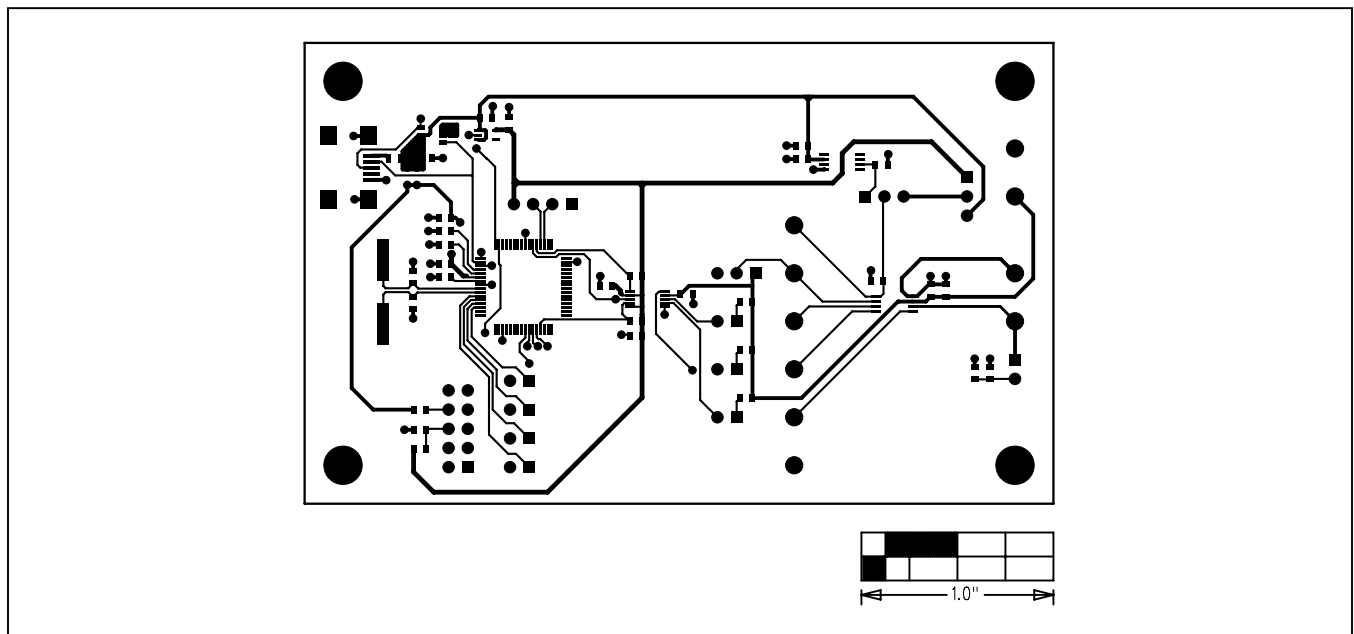


Figure 5. MAX5217 EV Kit PCB Layout—Component Side

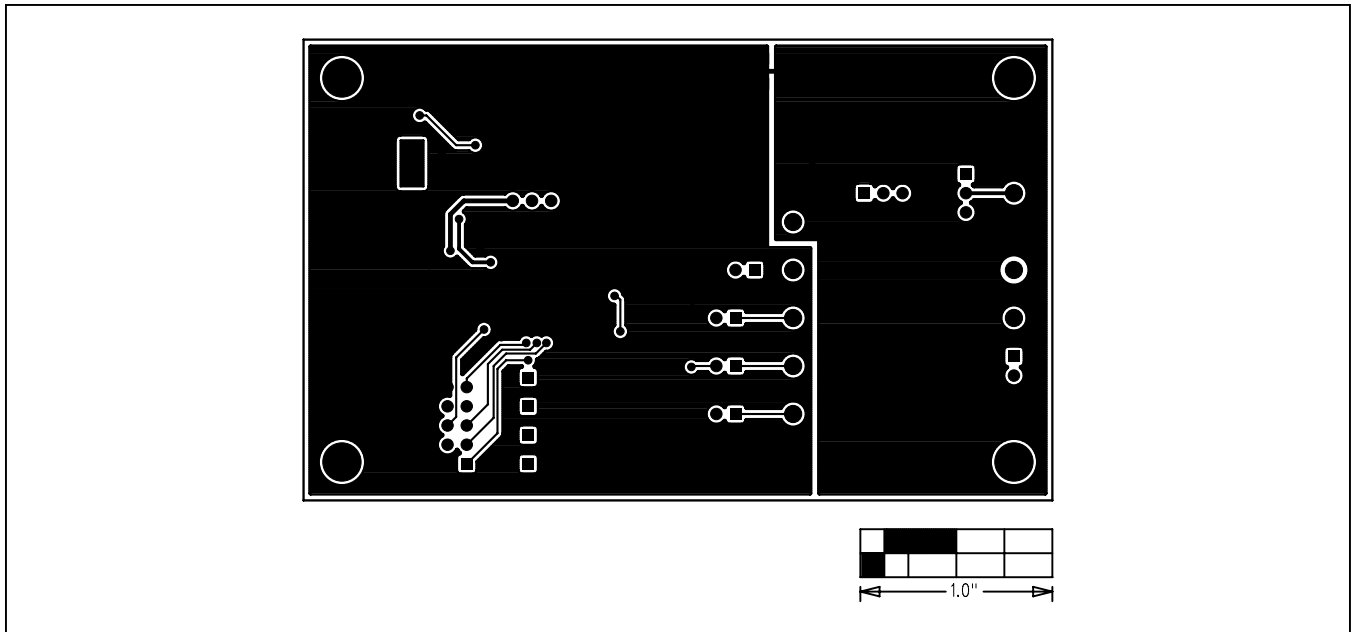


Figure 6. MAX5217 EV Kit PCB Layout—Solder Side

### Ordering Information

PART	TYPE
MAX5217EVKIT#	EV Kit

#Denotes RoHS compliant.

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/12	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

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