19-5146; Rev 1; 5/10

MAX5392 Evaluation System

Evaluates: MAX5387/MAX5392

General Description

The MAX5392 evaluation kit (EV kit) is an assembled and tested PCB that features two MAX5392M 50kΩ dual digital potentiometer ICs. The MAX5392M IC features dual volatile 50kΩ 256-tap potentiometers and communicates through an I²C-compatible serial interface (or through a stand-alone 2-wire serial interface).

The MAX5392EVMINIQU+ evaluation system (EV system) includes the EV kit and a MINIQUSB+ interface board. The MINIQUSB+ interface board can be used to enable PC communication through the 2-wire serial interface. Windows® 2000- , Windows XP®-, and Windows Vista®-compatible software provides a professional user interface for exercising the MAX5392 features. The program is menu-driven and offers a graphical user interface (GUI) complete with buttons, track bars, and edit boxes. The EV kit software can also be used to evaluate the MAX5387. The EV kit can also be interfaced directly to a user-supplied 2-wire system.

The MAX5392 IC can be powered from a 1.7V, 2.6V, 3.3V, or 5V source generated from the MINIQUSB+ interface board and EV kit circuitry, or from a user-supplied external 1.7V to 5.25V DC power supply. Order the EV system (MAX5392EVMINIQU+) for a complete PC-based evaluation of the MAX5392.

The EV kit can also be used to evaluate the MAX5392L (10kΩ) and MAX5392N (100kΩ). The EV kit contains PCB footprints for two MAX5387 ICs, which allows the user to independently control up to eight potentiometers. To evaluate the MAX5387, order samples and install the ICs on U1 and/or U2 PCB pads.

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

Features

- **1.7V to 5.25V Single-Supply Operation**
- **Controls Up to Eight Potentiometers**
- **Configurable and Fixed Device Addresses**
- **I²C-Compatible Serial Interface or Stand-Alone 2-Wire Serial-Interface Operation**
- **Easy-to-Use Menu-Driven Software**
- **Includes Windows 2000- , Windows XP-, and Windows Vista-Compatible Software**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX5392EVMINIQU+	EV System

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

Component Lists

MAX5392 EV System (MAX5392EVMINIQU+)

PART	QTY	DESCRIPTION
MAX5392EVKIT+	1	EV kit
MINIQUSB+	1	Maxim command module

MAX5392 EV Kit

DESIGNATION	QTY	DESCRIPTION
C1, C2, C3, C5, C7, C11, C13, C17–C20	11	1µF ±10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K Murata GRM188R61C105K
C4, C8, C9 C12, C14, C15	6	0.1µF ±10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H104K TDK C1608X7R1H104K
C6	1	10µF ±10%, 6.3V X5R ceramic capacitor (0805) Murata GRM21BR60J106K TDK C2012X5R0J106K
C10, C16, C21, C22	0	Not installed, capacitors (0603)
J1	1	2 x 3-pin header
J2	1	2 x 8-pin header
J3	1	8-pin female receptacle

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 Lists (continued)

MAX5392 EV Kit (continued)

DESIGNATION	QTY	DESCRIPTION
JU1	1	4-pin header
JU2–JU6, JU11–JU14, JU18–JU21, JU23–JU26	17	2-pin headers
JU7–JU10, JU15, JU16, JU17, JU22	8	3-pin headers
R1	1	40.2kΩ ±1% resistor (0603)
R2, R11, R12	3	100kΩ ±1% resistors (0603)
R3, R4, R5, R8	0	Not installed, resistors (0603)
R6, R9	2	0Ω ±5% resistors (0603)
R7, R10	2	4.7kΩ ±1% resistors (0603)
U1, U2	0	Not installed, digital potentiometers (14 TSSOP)

DESIGNATION	QTY	DESCRIPTION
U3, U4	2	Dual 50kΩ potentiometers (16 SSOP) Maxim MAX5392MAUE+
U5	1	Adjustable output LDO regulator (5 SC70) Maxim MAX8512EXK+ (Top Mark: ADW)
U6	1	2.6V LDO regulator (5 SC70) Maxim MAX8511EXK26+ (Top Mark: AEG)
U7, U8	2	Logic-level translators (6 µMAX®) Maxim MAX1840EUB+
—	26	Shunts (JU1–JU26)
—	1	PCB: MAX5387/MAX5392 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 MAX5387 or MAX5392 when contacting these component suppliers.*

MAX5392 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on the computer
MAX5392.EXE	Application program
FTD2XX.INF	USB driver file
UNINST.INI	Uninstalls the EV kit software
USB_Driver_Help.PDF	USB driver installation help file

µMAX is a registered trademark of Maxim Integrated Products, Inc.

Quick Start

Required Equipment

- MAX5392 EV system

  MAX5392 EV kit

  MINQUSB+ command module (USB cable included)

- User-supplied Windows 2000, Windows XP, or Windows Vista PC with a spare USB port
- Up to four multimeters

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) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 5392Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
2) Install the EV kit software on the 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 shunts are configured in the EV kit default state (see Table 1) for proper startup operation of the EV kit software.
4) Connect the multimeters to measure voltage across the MAX5392M (U3, U4) WA and LA PCB pads and WB and LB PCB pads.
5) Connect the MINIQUSB+ interface board to the EV kit J2 and J3 connectors.
6) Connect the included USB cable from the PC to the MINIQUSB+ interface 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 a window is not seen 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, Windows XP, and Windows Vista.
7) 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\MAX5392** (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 USB_Driver_Help.PDF document included with the software if you have problems during this step.
8) Start the EV kit software by opening its icon in the **Start | Programs** menu.
9) Observe as the program automatically detects the USB connection and starts the main program.
10) The main program appears with the **U3_MAX5392** tab sheet active.
11) Press the **Default** button.
12) Click on the **U4_MAX5392** tab sheet and then press the **Default** button.
13) Click on the **U3_MAX5392** tab sheet.
14) The EV kit software main window appears, as shown in Figure 1.
15) The EV kit is now ready for additional testing.

Table 1. Jumper Configuration for MAX5392 EV Kit Operation

JUMPER	SHUNT POSITION	EV KIT FUNCTION
JU1	1-2	VPOWER = 5V
	1-3*	VPOWER = 3.3V
	1-4	VPOWER = 2.6V
JU2	Installed*	1.7V supply enabled
	Not installed	1.7V supply disabled
JU10	1-2*	U3 VDD = 1.7V
	2-3	U3 VDD dependent on jumper JU1 configuration
JU11	Not installed	MAX5392 HA disconnected from the U3 VDD voltage source
	Installed*	MAX5392 HA connected to the U3 VDD voltage source
JU12	Not installed	MAX5392 LA disconnected from GND
	Installed*	MAX5392 LA connected to GND
JU13	Not installed	MAX5392 HB disconnected from the U3 VDD voltage source
	Installed*	MAX5392 HB connected to the U3 VDD voltage source
JU14	Not installed	MAX5392 LB disconnected from GND
	Installed*	MAX5392 LB connected to GND
JU15	1-2*	U3 device address = 0x58 (see Table 7)
JU16	2-3*	
JU17	2-3*	
JU22	1-2*	U4 VDD voltage connected to the U3 VDD voltage source
	2-3	U4 VDD voltage dependent on jumper JU1 configuration
JU23	Not installed	MAX5392 HA disconnected from the U4 VDD voltage source
	Installed*	MAX5392 HA connected to the U4 VDD voltage source
JU24	Not installed	MAX5392 LA disconnected from GND
	Installed*	MAX5392 LA connected to GND
JU25	Not installed	MAX5392 HB disconnected from the U4 VDD voltage source
	Installed*	MAX5392 HB connected to the U4 VDD voltage source
JU26	Not installed	MAX5392 LB disconnected from GND
	Installed*	MAX5392 LB connected to GND

**Default position.*

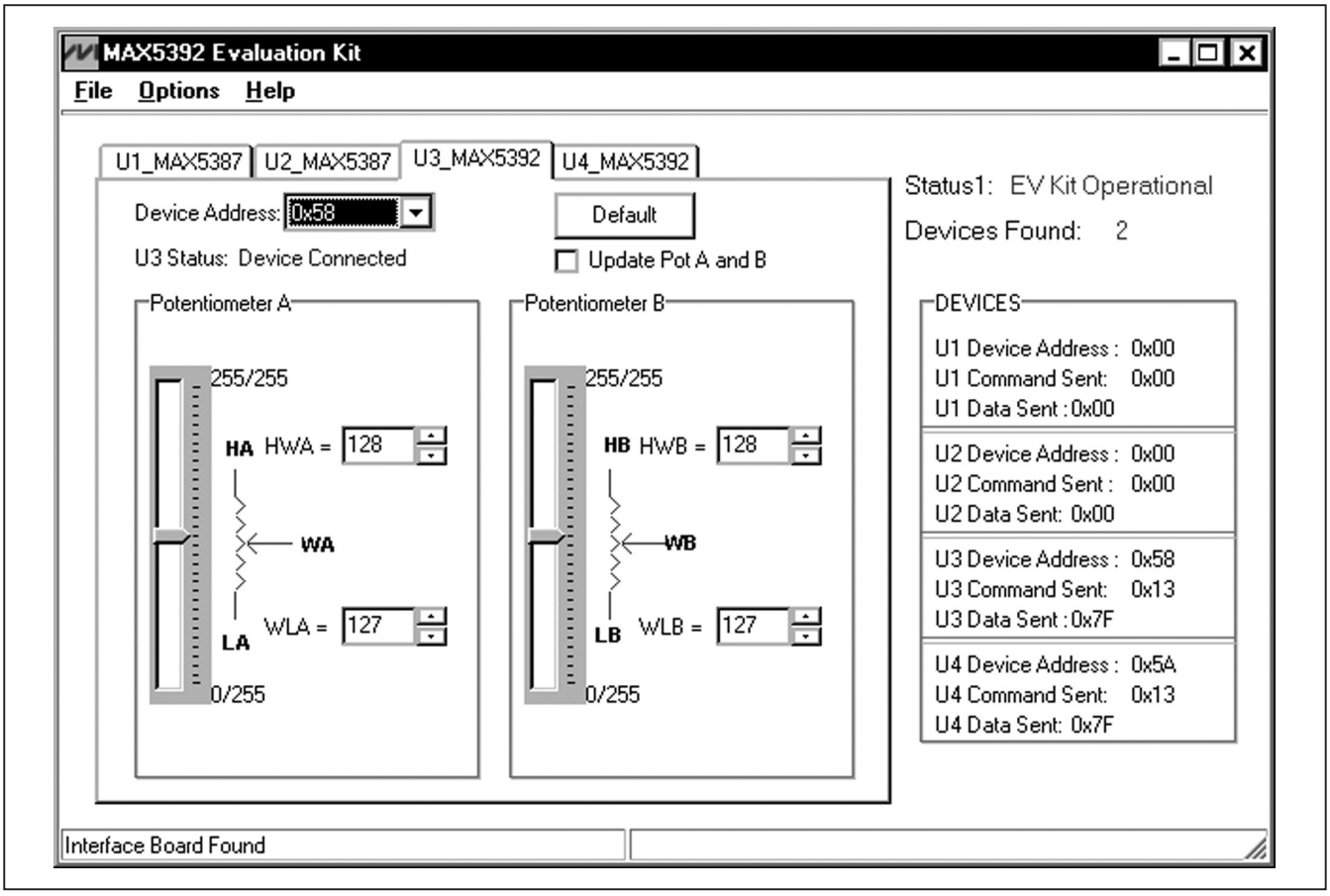


Figure 1. MAX5392 Evaluation Kit Software Main Window

Detailed Description of Software

Graphical User Interface (GUI) Panel

The MAX5392 EV kit software GUI shown in Figure 1 is a Windows program that provides a convenient means to control two MAX5392M dual potentiometers. Use the mouse or press the Tab key to navigate through the GUI controls. The correct SMBus/I²C write operations are generated to update the MAX5392M internal memory registers when any of these controls are executed.

The EV kit software GUI features four window tab sheets to select and control two MAX5392 ICs (**U3_MAX5392, U4_MAX5392**), dual on-board digital potentiometers, and two unpopulated MAX5387 ICs (**U1_MAX5387, U2_MAX5387**). The software also provides status indicators (**Status1** and **Devices Found**) to indicate that the EV kit is operational and the total number of valid MAX5387 and MAX5392 devices populated on the EV kit, respectively. The **DEVICES** group box indicates components U1–U4 current device address and the last write operation **Command Sent** and **Data Sent** indicators.

A few more available software features can be evaluated by using the menu bar. The software has a demo mode, which is available by selecting the **Options | Demo Mode** menu item. When in demo mode, all software communication to the EV kit hardware is disabled and most of the software's GUI is functional. This feature enables a user to evaluate the software without hardware connectivity.

The EV kit software configures the MINIQUSB+ interface board's 2-wire communication speed to 400kHz by default. The speed can be reduced to 100kHz, if required, by selecting the **Options | 2-Wire Speed | 100kHz** menu item. This configuration may be required if slower 2-wire devices are connected to the EV kit's SCL and SDA J1 header.

Software Startup

Upon startup, the EV kit software automatically searches for the USB interface board's circuit connection. The EV kit software searches for U3 set 0x58 address and U4 fixed 0x5A address and places the addresses in **U3_MAX5392** and **U4_MAX5392 Device Address** combo boxes, respectively. Upon detecting U4 fixed 0x5A address, **U4_MAX5392 Device Address** combo box is disabled. **U4_MAX5392 Device Address** combo box remains enabled if the address is not detected.

The EV kit software continuously polls to find valid addresses and updates the **Devices Found** status indicator. If U1 and U2 are populated on the EV kit, the user can then navigate to the **U1_MAX5387** and **U2_MAX5387** tab sheets and choose the device addresses according to jumpers JU7, JU8, and JU9 shunt positions, and U2 fixed 0x52 address.

Demo Mode

The EV kit software enters the demo mode—when the USB connection is not detected or when valid MAX5387 or MAX5392 ID addresses are not found—by selecting **Cancel** on the **MAX5392 Evaluation Kit** popup windows (Figures 2 and 3). The software can also enter demo mode at any time from the main window by selecting the **Options | Demo Mode** menu item. Demo mode allows the user to evaluate the software without hardware connectivity. To exit demo mode, deselect the **Options | Demo Mode** menu item.

Potentiometer Tab Sheet Controls

Tab sheets **U3_MAX5392 and U4_MAX5392** are used for controlling two MAX5392 ICs. Tab sheets **U1_MAX5387** and **U2_MAX5387** are used for controlling two unpopulated MAX5387 ICs. Each tab sheet contains a **Device Address** combo box to select a valid address and a status indicator to indicate that the address is valid. An **Update Pot A and B** checkbox is available for updating potentiometers A and B simultaneously. A **Default** button resets the potentiometer's A and B wiper positions to the factory-default midscale position.

Device Address

Each tab sheet contains a **Device Address** combo box and a **U_ Status** indicator. **U1_MAX5387** and **U3_MAX5392 Device Address** combo boxes store up to eight addresses found by the EV kit software. The eight possible addresses are shown in Table 7. Use the **Device Address** combo box to select between different devices that share the same bus. Before selecting U1 and U3 addresses, verify jumpers JU7, JU8, JU9 (U1) and JU15, JU16, JU17 (U3) settings and then select the correct addresses using the **U1_MAX5387** and **U3_MAX5392** tab sheets' **Device Address** combo

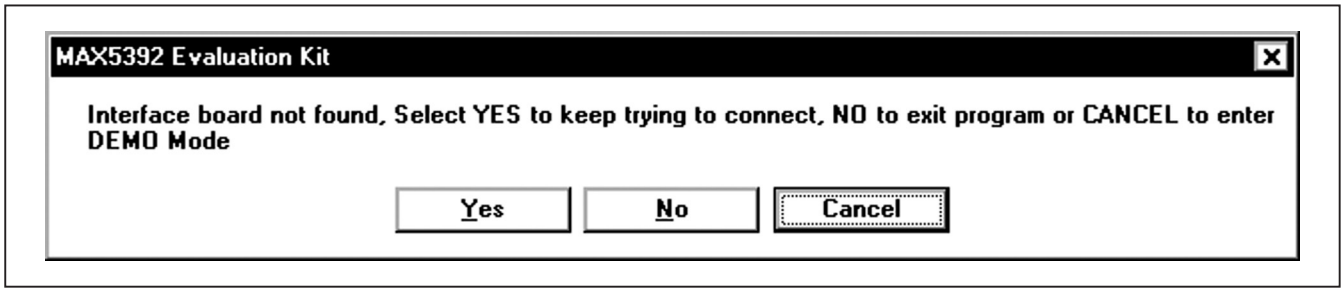


Figure 2. MAX5392 Evaluation Kit Popup Window (Interface Board Not Found)

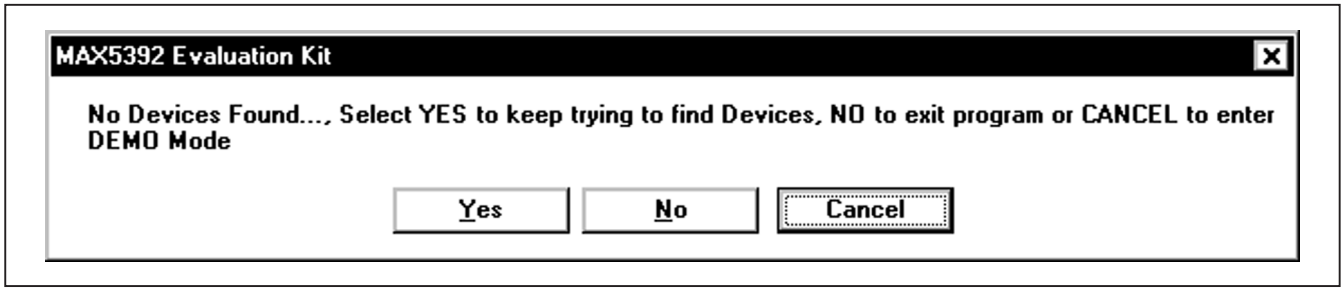


Figure 3. MAX5392 Evaluation Kit Popup Window (No Devices Found)

boxes. **U2_MAX5387** and **U4_MAX5392 Device Address** combo boxes store addresses 0x52 and 0x5A, respectively.

U_ Status displays **Device Connected** when the selected address is found or **No Connection** when the selected address is not found. When selecting an address currently in use, the **Device Address** combo box is set to **??** and **U_ Status** also displays **No Connection**.

Factory Default

Pressing the **Default** buttons resets potentiometer A and B wiper positions to the factory-default midscale position.

Potentiometer A and B Wiper Positions

The wiper position track bars (WA, WB) in the **Potentiometer A** and **Potentiometer B** group boxes are used to change the wiper position between the H_ and L_ end points. Use the mouse or keyboard arrow keys to move the wiper position between the 256 position points. The wiper position can also be changed by entering the desired integer value in the edit boxes, or by pressing the up or down edit box arrows. A change in the **W_** wiper position track bars or **HW_**/**WL_** edit boxes writes to the volatile memory and the wiper position is updated with the data sent. The wiper position is shown in the **HW_** and **WL_** edit boxes. The **HW_** edit box shows the wiper position with respect to the H_ end point, and the **WL_** edit box shows the wiper position with respect to the potentiometer L_ end point.

Potentiometers A and B can be updated simultaneously by checking the **Update Pot A and B** checkbox. When enabled, the **Potentiometer A** group box sends the same data to both digital potentiometers and enables control of both digital potentiometers together.

Command Sent Indicator

The **U_ Command Sent** indicators in the **DEVICES** group box displays the last command sent from the master (software) to the MAX5392. There are three MAX5392 commands available in the MAX5392 IC, which are described in Table 2.

Data Sent Indicator

The **U_ Data Sent** indicator in the **DEVICES** group box displays the last data sent from the master (software) to the MAX5392. The **U_ Data Sent** indicator displays the last data sent for the write to potentiometer A (0x11), potentiometer B (0x12), or both potentiometer (0x13) commands.

The MAX5392 IC uses an 8-bit (MSBs, D7:D0) data byte to set the wiper position. Refer to the MAX5392 IC data sheet for additional information.

Keyboard Navigation

Press the Ctrl + Tab keys to navigate to the tab sheets. The selected tab sheet is indicated by a dotted outline. Press the Tab key to select each GUI control. The selected control is indicated by a dotted outline. Pressing Shift + Tab moves the selection to the previously selected control. Buttons respond to the keyboard's space bar and some controls respond to the keyboard's up-and-down arrow keys. Activate the program's menu bar by pressing the F10 key and then press the letter of the desired menu item. Most menu items have one letter underlined, indicating their shortcut key.

When a number is entered into the edit boxes, it can be sent to the device by pressing the Enter key. It is also sent when Tab or Shift + Tab is pressed.

Table 2. MAX5392 I²C Commands

MAX5392 REGISTER	COMMAND		DESCRIPTION
	BINARY	HEX	
VREGA	00010001	0x11	I²C data is written to potentiometer A. Wiper WA position updates with I²C data.
VREGB	00010010	0x12	I²C data is written to potentiometer B. Wiper WB position updates with I²C data.
VREGAB	00010011	0x13	I²C data is written to potentiometers A and B. Wipers WA and WB position updates with I²C data.

MAX5392 Evaluation System

Simple I²C Commands

There are two methods for communicating with the EV kit, through the normal user-interface panel (Figure 1), or through the I²C commands available by using low-level SMBus™ or by selecting the **2-Wire Interface** (Figure 4) utility from the main program's **Options | Advanced Users Interface** menu bar. A window is displayed that allows I²C operations, such as **SMBusReadByte** and **SMBusWriteByte**. Do not use the **SMBusReadByte** operation because the MAX5392 does not send data to the master.

Note: The I²C dialog boxes accept numeric data in binary, decimal, or hexadecimal. Hexadecimal numbers must be prefixed by $ or 0x. Binary numbers must be exactly eight binary digits. Figure 4 shows a simple SMBus write-byte operation using the included 2-wire interface diagnostics tool. In this example, the software is writing data 0xFF to command byte 0x13 to the device with the device address 0x5A. The data sequence sets the MAX5392 (U4) wiper positions WLA and WLB to 255.

Refer to Application Note 476: *Comparing the I²C Bus to the SMBus* available on the Maxim website for information and differences between the SMBus and I²C protocols.

General Troubleshooting

Problem: Software reports it cannot find the interface circuit

- Is the USB cable connected to the MINIQUSB+ board?
- Has Windows plug-and-play detected the board? Bring up **Control Panel->System->Device Manager**, and look at what device nodes are indicated for USB. If there is an **Unknown device node** attached to the USB, uninstall it—this forces plug-and-play to try again.
- If using an off-board I²C interface, is the power ground connected to the EV kit ground (GND) at one of header J1 pin connections (J1-2, J1-4 or J1-6)?

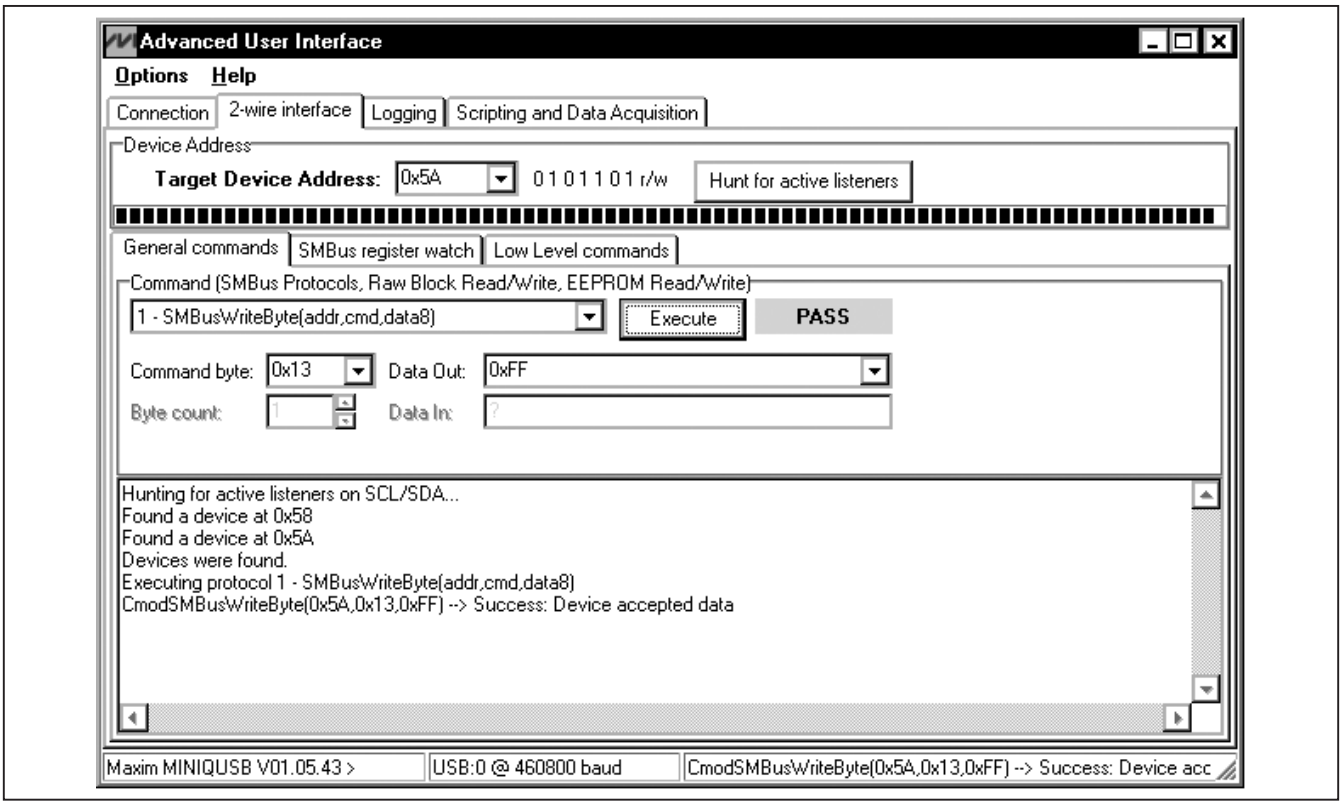


Figure 4. Simple Low-Level 2-Wire Interface

SMBus is a trademark of Intel Corp.

Problem: Software reports no devices found

- Are shunts installed at jumpers JU1, JU2, JU10, and JU22 (power sources for MAX5392)?
- Are the SCL and SDA signals pulled up to VPOWER (resistors R6, R7, R9, and R10 installed)?
- Are shunts installed at jumpers JU15, JU16, and JU17 (set device address)?
- If using an external power supply, verify that power is applied to the EV kit VDD and GND PCB pads.
- If using an off-board 2-wire interface, is the power ground connected to the EV kit ground (GND) at one of the header J1 pin connections (J1-2, J1-4, or J1-6)?

_Detailed Description of Hardware

The MAX5392 evaluation kit (EV kit) is an assembled and tested PCB that features two MAX5392M 50kΩ dual digital potentiometers. The potentiometers have end-to-end resistance of 50kΩ and each wiper can be programmed independently among 256 tap positions. The EV kit uses two MAX5392M ICs (U3, U4) in 16-pin TSSOP packages on a proven two-layer PCB design.

The MAX5392 ICs can be powered from a 2.6V, 3.3V, or 5V source generated from the MINIQUSB+ interface board and EV kit circuitry (applied at the EV kit VPOWER rail), or from a user-supplied external 1.7V to 5.25V DC power supply applied at the VDD and GND PCB pads.

U3 can be powered from the VPOWER rail or from a 1.7V source (U5) using jumpers JU2 and JU10. U4 can be powered from U3 VDD input or from the VPOWER rail using jumper JU22.

The EV kit provides connector J1 to interface the MAX5392 SDA and SCL signals directly to a user-supplied 2-wire system. Connector J1 also provides a connection for the MAX5392 EV kit's 1.7V to 5.25V VPOWER power-supply rail.

The EV kit is typically used with a MINIQUSB+ interface board for communicating with a PC through the SMBus/I²C serial interface. Logic-level translators U7 and U8 provide proper interface translation when using 1.7V to 5.25V to power the MAX5392 VDD inputs.

The EV kit can also be used to evaluate the MAX5392L (10kΩ) and MAX5392N (100kΩ). The MAX5392 EV kit contains PCB footprints for two MAX5387 ICs, which allows the user to independently control up to eight potentiometers. To evaluate the MAX5387, order samples and replace the parts in U1 and/or U2.

EV Kit VDD Input Sources

The VPOWER rail is typically supplied as 3.3V or 5V by the MINIQUSB+ interface board circuitry and 2.6V using LDO regulator U6. LDO regulator U5 output is set to 1.7V and is powered from the VPOWER rail. The VPOWER rail and U5 set the MAX5392 VDD inputs to 5V, 3.3V, 2.6V, or 1.7V.

Regulator U5 has an adjustable output that can be configured to a different voltage by replacing resistor R1. Use the following equation to set U5 output voltage:

$$R1 = 10^5 \times \left(\frac{VOUT}{1.225} - 1\right)$$

where R1 is in ohms and VOUT is the desired U5 output voltage.

Jumper JU1 selects the source for the EV kit circuit VPOWER rail. See Table 3 for proper JU1 configuration for setting VPOWER rail.

Jumper JU2 enables/disables U5 output. Install a shunt across JU2 to enable U5's 1.7V output. Remove the shunt at JU2 to disable U5 output. See Table 4 for proper JU2 configuration.

Alternatively, the EV kit VDD and GND PCB pads can be used to supply an external 1.7V to 5.25V to the EV kit's VPOWER rail by removing the shunt at jumper JU1.

Table 3. VPOWER Rail (JU1)

SHUNT POSITION	VPOWER SOURCE
1-2	5V (MINIQUSB+ circuitry)
1-3	3.3V (MINIQUSB+ circuitry)
1-4	2.6V (LDO U6)
Not installed	External source applied at the EV kit VDD and GND PCB pads

Table 4. U5 LDO Function (JU2)

SHUNT POSITION	U5 1.7V OUTPUT
Installed*	Enabled
Not installed	Disabled

**Default position.*

MAX5392 U3 VDD Input Configuration

Jumper JU10 selects the power source for U3 VDD input. Install a shunt across pins 1-2 of JU10 to operate the MAX5392 extended VDD input power-supply rail to 1.7V. Install a shunt across pins 2-3 to operate the MAX5392M VDD input from the VPOWER rail. See Table 5 for proper jumper configuration for U3 VDD power-supply input.

MAX5392 U4 VDD Input Configuration

Jumper JU22 selects the power source for U4 VDD input. Install a shunt across pins 1-2 of JU22 to connect U4 VDD to U3 VDD input voltage. Install a shunt across pins 2-3 to operate the U4 VDD input from the VPOWER rail. See Table 6 for proper JU22 configuration.

Address Selection for the MAX5392 (U3)

The EV kit circuit features three jumpers that pull the MAX5392 (U3) A2, A1, and A0 address pins to VDD or GND to set the MAX5392 slave address. See Table 7 for jumpers JU15 (A2), JU16 (A1), and JU17 (A0) settings to set the U3 slave address.

Note: The first 7 bits shown are the address. The Y bit in Table 7 is the I²C read/write bit. The I²C protocol states that this bit is a 1 for a read operation or a 0 for a write operation. The Y bit is always set to 0 (write only) because these digital potentiometers do not transmit data to the master device.

Table 5. MAX5392 U3 VDD Input (JU10, JU2, JU1)

SHUNT POSITION			U3 VDD PIN
JU10	JU2	JU1	
1-2*	Installed*	X	1.7V
	Not installed	X	Not powered
2-3	X	1-2	5V
		1-3	3.3V
		1-4	2.6V
		Not installed	External source applied at the EV kit VDD and GND PCB pads

**Default position.*

X = Don't care.

Table 6. MAX5392 U4 VDD Power Source (JU22)

SHUNT POSITION	U4 VDD POWER SOURCE	U4 VDD PIN
1-2	Connected to U3 VDD power source	Connected to U3 VDD (see Table 5)
2-3	Dependent on jumper JU1 configuration	See Table 3

Table 7. Device Address Configuration (JU15, JU16, JU17)

SHUNT POSITION			MAX5392 ADDRESS	
JU15	JU16	JU17	BINARY	HEXADECIMAL
2-3	2-3	2-3	0101 000Y	0x50
2-3	2-3	1-2	0101 001Y	0x52
2-3	1-2	2-3	0101 010Y	0x54
2-3	1-2	1-2	0101 011Y	0x56
1-2	2-3	2-3	0101 100Y	0x58
1-2	2-3	1-2	0101 101Y	0x5A
1-2	1-2	2-3	0101 110Y	0x5C
1-2	1-2	1-2	0101 111Y	0x5E

Note: *If U2 or U4 is installed on the EV kit, the U3 device address should not be set to 0x52 or 0x5A, respectively.*

I²C Clock and Data Inputs

The MAX5392 features a clock and data input pins for I²C-compatible communication to control the MAX5392M wiper position. The clock and data input pins can be driven by the MINIQUSB+ interface circuit or the PCB header (J1), along with a user-supplied external I²C-compatible controller. An external I²C-compatible controller can be connected to SDA (J1-3), SCL (J1-5), and GND (J1-2, J1-4, J1-6) on header J1 to communicate with the MAX5392 ICs. When using an external I²C-compatible controller, verify that the MINIQUSB+ interface board has been disconnected from the EV kit J2 and J3 headers. See Table 8 for header J1 pin assignment.

The EV kit requires minor alterations when using an external I²C-compatible controller connected at J1:

1) Disconnect the MINIQUSB+ interface board from the EV kit.
2) Remove resistors R6 and R9, located at level translators U7 and U8 I/0 inputs.

Potentiometer, Voltage-Divider or Variable Resistor, with Ground Reference

The EV kit provides an option to configure the MAX5392 as a potentiometer or voltage-divider, open end or with ground reference, respectively. Use jumpers JU11 and JU12 for potentiometer A and jumpers JU13 and JU14 for potentiometer B configuration when evaluating U3. See Tables 9 and 10 for jumper options for configuring U3 potentiomers A and B. Use jumpers JU23 and JU24 for potentiometer A and jumpers JU25 and JU26 for potentiometer B configuration when evaluating U4. See Tables 11 and 12 for the jumper options for configuring U4 potentiometers A and B.

The MAX5392M IC can also be configured as a variable resistor by shorting the H_ and W_ pads using a wire. When operating as a variable resistor, any power source connected to the H_, W_, or L_ pad must be voltage and current limited to the maximum conditions stated in the MAX5392 IC data sheet.

Note: To test the device in resistor mode, the ohmmeter must be GND referenced to the MAX5392. This can be accomplished by connecting the L_ pin to GND or the H_ pin to U3 and U4 respective VDD inputs. Resistance can then be measured between W_ and L_ or W_ and H_PCB pads.

Table 8. Header J1 Pin Assignment

PIN	SIGNAL
J1-1	VDD
J1-2, J1-4, J1-6	GND
J1-3	SDA
J1-5	SCL

Table 9. JU11 and JU12 Jumper Functions (U3 Potentiometer A)

SHUNT POSITION		HA PAD	LA PAD	MAX5392 FUNCTION
JU11	JU12			
Not installed	Not installed	Not connected	Not connected	Potentiometer open ended
	Installed		Connected to GND	Potentiometer with GND reference
Installed*	Not installed	Connected to VDD	Not connected	Voltage-divider open ended
	Installed*		Connected to GND	Voltage-divider with GND reference

**Default position.*

Table 10. JU13 and JU14 Jumper Functions (U3 Potentiometer B)

SHUNT POSITION		HB PAD	LB PAD	MAX5392 FUNCTION
JU13	JU14			
Not installed	Not installed	Not connected	Not connected	Potentiometer open ended
	Installed		Connected to GND	Potentiometer with GND reference
Installed*	Not installed	Connected to VDD	Not connected	Voltage-divider open ended
	Installed*		Connected to GND	Voltage-divider with GND reference

**Default position.*

Evaluating the MAX5392L/MAX5392N and MAX5387 ICs

The EV kit can also evaluate the MAX5392L and MAX5392N. Remove either U3 and/or U4 and replace them with the desired IC. The MAX5392 EV kit is populated with additional PCB footprints (U1, U2) and various jumpers to evaluate two MAX5387 ICs. See Table 13 for proper jumper configurations when evaluating the MAX5387 ICs. Also, refer to the MAX5387 EV system data sheet for additional information.

Table 11. JU23 and JU24 Jumper Functions (U4 Potentiometer A)

SHUNT POSITION		HA PAD	LA PAD	MAX5392 FUNCTION
JU23	JU24			
Not installed	Not installed	Not connected	Not connected	Potentiometer open ended
	Installed		Connected to GND	Potentiometer with GND reference
Installed*	Not installed	Connected to VDD	Not connected	Voltage-divider open ended
	Installed*		Connected to GND	Voltage-divider with GND reference

**Default position.*

Table 12. JU25 and JU26 Jumper Functions (U4 Potentiometer B)

SHUNT POSITION		HB PAD	LB PAD	MAX5392 FUNCTION
JU25	JU26			
Not installed	Not installed	Not connected	Not connected	Potentiometer open ended
	Installed		Connected to GND	Potentiometer with GND reference
Installed*	Not installed	Connected to VDD	Not connected	Voltage-divider open ended
	Installed*		Connected to GND	Voltage-divider with GND reference

**Default position.*

Table 13. Jumper Configuration

JUMPER	SHUNT POSITION	EV KIT FUNCTION
JU1	1-2	VPOWER = 5V
	1-3*	VPOWER = 3.3V
	1-4	VPOWER = 2.6V
JU2	Not installed	1.7V supply disabled
	Installed*	1.7V supply enabled
JU3	Not installed	MAX5387 HA disconnected from the U1 VDD voltage source
	Installed*	MAX5387 HA connected to the U1 VDD voltage source
JU4	Not installed	MAX5387 LA disconnected from GND
	Installed*	MAX5387 LA connected to GND
JU5	Not installed	MAX5387 HB disconnected from the U1 VDD voltage source
	Installed*	MAX5387 HB connected to the U1 VDD voltage source
JU6	Not installed	MAX5387 LB disconnected from GND
	Installed*	MAX5387 LB connected to GND
JU7	2-3*	U1 device address = 0x50 (refer to Table 4 in the MAX5387 EV system data sheet)
JU8	2-3*	
JU9	2-3*	

**Default position.*

Table 13. Jumper Configuration (continued)

JUMPER	SHUNT POSITION	EV KIT FUNCTION
JU10	1-2	U3 VDD = 1.7V (JU2 installed)
	2-3*	U3 VDD dependent on jumper JU1 configuration
JU11	Not installed	MAX5392 HA disconnected from the U3 VDD voltage source
	Installed*	MAX5392 HA connected to the U3 VDD voltage source
JU12	Not installed	MAX5392 LA disconnected from GND
	Installed*	MAX5392 LA connected to GND
JU13	Not installed	MAX5392 HB disconnected from the U3 VDD voltage source
	Installed*	MAX5392 HB connected to the U3 VDD voltage source
JU14	Not installed	MAX5392 LB disconnected from GND
	Installed*	MAX5392 LB connected to GND
JU15	1-2*	U3 device address = 0x58 (see Table 7)
JU16	2-3*	
JU17	2-3*	
JU18	Not installed	MAX5387 HA disconnected from the U2 VDD voltage source
	Installed*	MAX5387 HA connected to the U2 VDD voltage source
JU19	Not installed	MAX5387 LA disconnected from GND
	Installed*	MAX5387 LA connected to GND
JU20	Not installed	MAX5387 HB disconnected from the U2 VDD voltage source
	Installed*	MAX5387 HB connected to the U2 VDD voltage source
JU21	Not installed	MAX5387 LB disconnected from GND
	Installed*	MAX5387 LB connected to GND
JU22	1-2*	U4 VDD voltage connected to the U3 VDD voltage source
	2-3	U4 VDD voltage dependent on jumper JU1 configuration
JU23	Not installed	MAX5392 HA disconnected from the U4 VDD voltage source
	Installed*	MAX5392 HA connected to the U4 VDD voltage source
JU24	Not installed	MAX5392 LA disconnected from GND
	Installed*	MAX5392 LA connected to GND
JU25	Not installed	MAX5392 HB disconnected from the U4 VDD voltage source
	Installed*	MAX5392 HB connected to the U4 VDD voltage source
JU26	Not installed	MAX5392 LB disconnected from GND
	Installed*	MAX5392 LB connected to GND

**Default position.*

MAX5392 Evaluation System

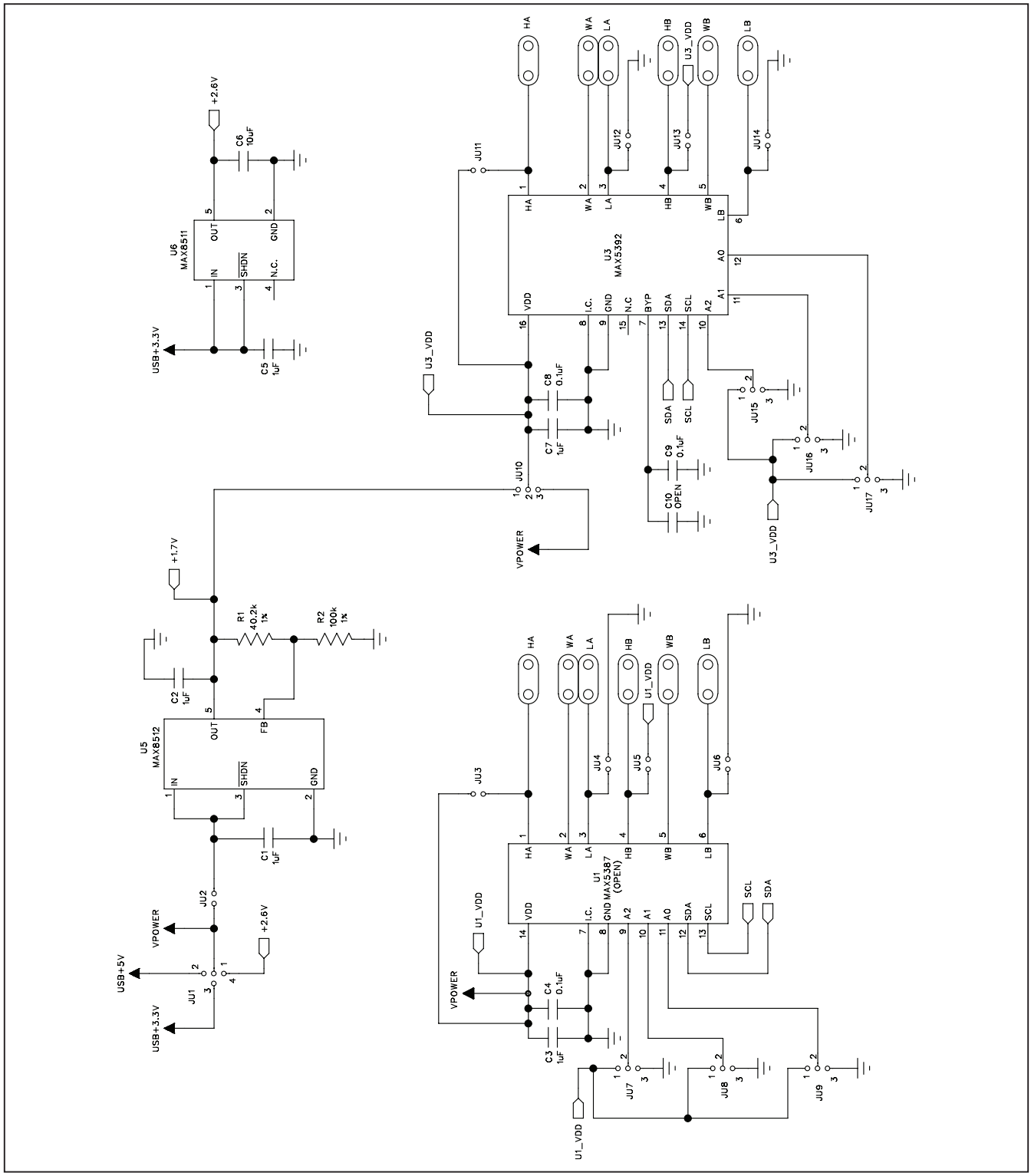


Figure 5a. MAX5392 EV Kit Schematic—Potentiometers U1, U3 (Sheet 1 of 3)

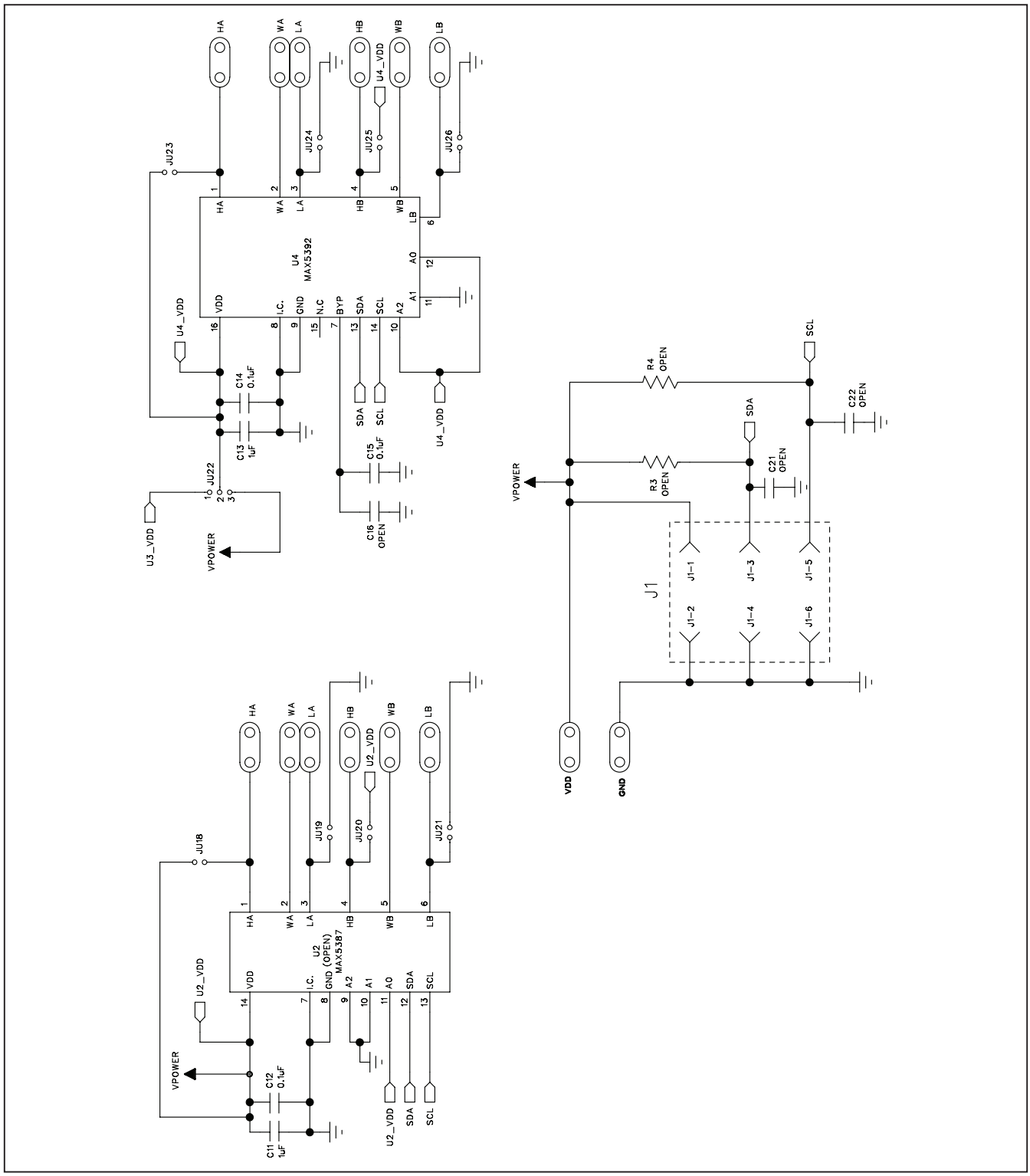


Figure 5b. MAX5392 EV Kit Schematic—Potentiometers U2, U4 (Sheet 2 of 3)

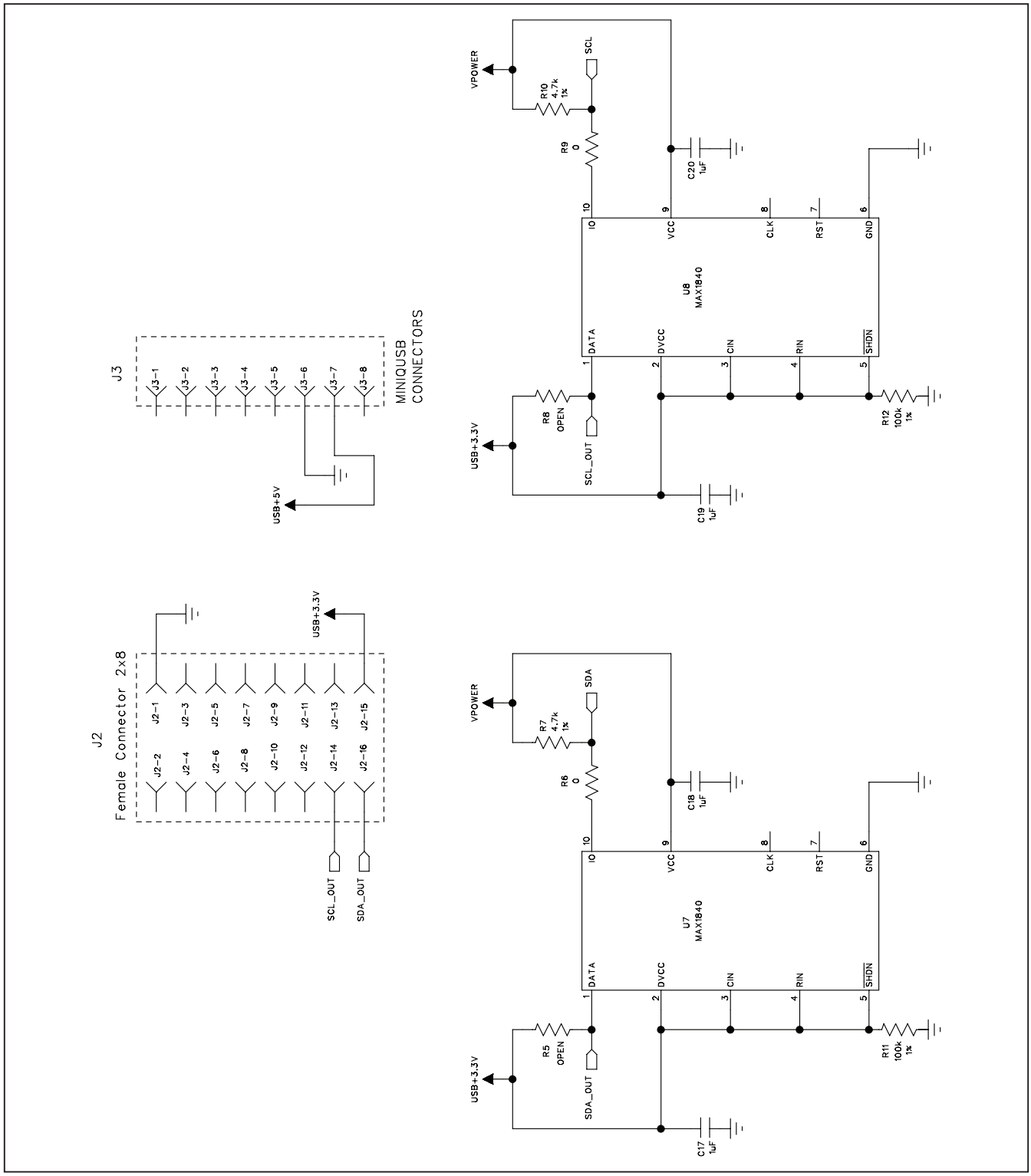


Figure 5c. MAX5392 EV Kit Schematic—Level Translators (Sheet 3 of 3)

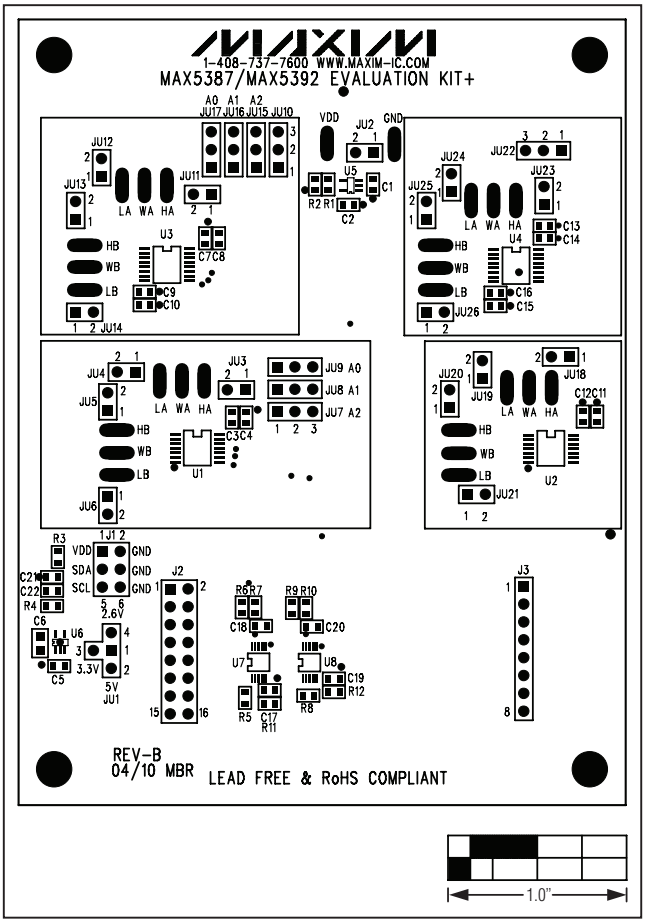


Figure 6. MAX5392 EV Kit Component Placement Guide—Component Side

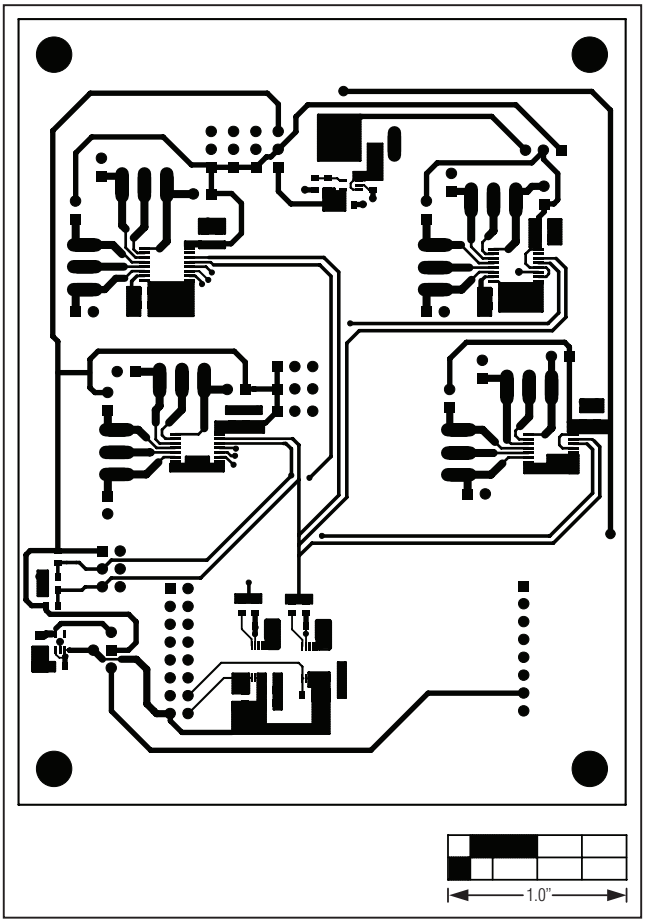


Figure 7. MAX5392 EV Kit PCB Layout—Component Side

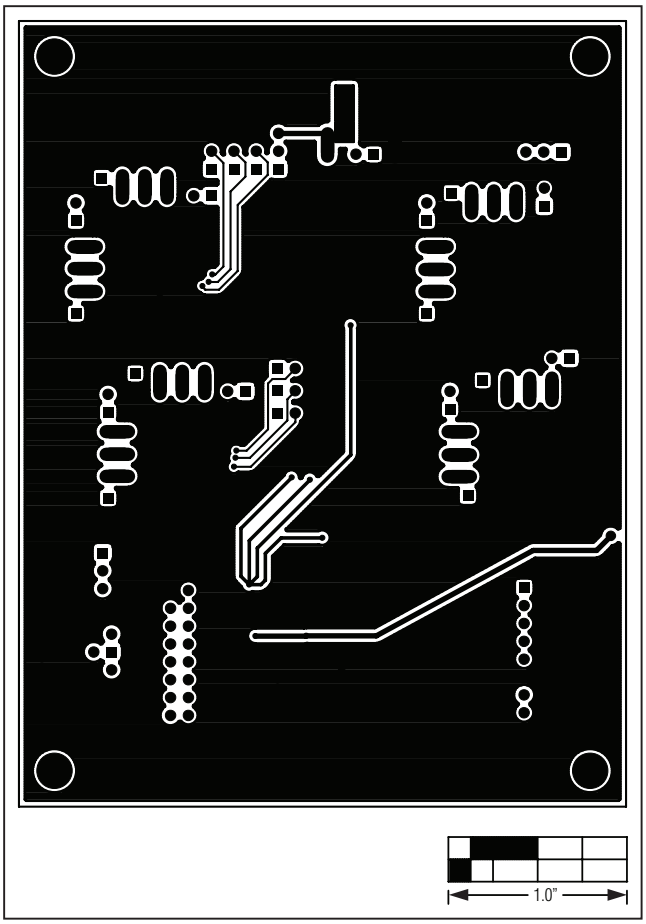


Figure 8. MAX5392 EV Kit PCB Layout—Solder Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/10	Initial release	—
1	5/10	Replaced Figures 6 and 7	17

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

© 2010 Maxim Integrated Products Maxim is a registered trademark of Maxim Integrated Products, Inc.