



## MAX5550 Evaluation Kit

### General Description

The MAX5550 evaluation kit (EV kit) provides a proven design to evaluate the MAX5550 dual, 10-bit, programmable, 30mA, high-output-current DACs. The EV kit also includes Windows 2000/XP/Vista®-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX5550.

The MAX5550 EV kit printed-circuit board (PCB) comes with a MAX5550ETE+ installed. Contact the factory for free samples of the pin-compatible MAX5548ETE+.

### Ordering Information

PART	TYPE
MAX5550EVKIT+	EV Kit

+Denotes lead-free and RoHS-compliant.

### Features

- ◆ Windows 2000/XP/Vista (32-Bit)-Compatible Software
- ◆ Supports SPI™ or I<sup>2</sup>C interface
- ◆ USB-PC Connection (Cable Included)
- ◆ USB Powered
- ◆ 4-Pin DAC Output Signal Header
- ◆ Accepts Through-Hole Current-Setting Resistors
- ◆ Optional 1.25V On-Board Reference (MAX6161)
- ◆ Proven PCB Layout
- ◆ Lead-Free and RoHS-Compliant
- ◆ Fully Assembled and Tested

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3–C10, C17, C21, C23–C26	15	0.1μF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C2, C13, C15, C22, C27	5	10μF ±20%, 6.3V X5R ceramic capacitors (0805) TDK C2012X5R0J106M
C11, C12	2	10pF ±5%, 50V C0G ceramic capacitors (0603) TDK C1608C0G1H100J
C14, C16	2	1μF ±20%, 6.3V X5R ceramic capacitors (0603) TDK C1608X5R0J105K
C18, C19	2	22pF ±5%, 50V C0G ceramic capacitors (0603) TDK C1608C0G1H220J
C20	1	3300pF ±10%, 50V X7R ceramic capacitor (0603) TDK C1608X7R1H332K
D1	1	Green LED (0603)
FB1	1	0Ω ±5% resistor (0603)
H1	0	Not installed
H2	1	Dual-row (2 x 2) 4-pin header

DESIGNATION	QTY	DESCRIPTION
H3	1	Dual-row (2 x 5) 10-pin header
JUA–JUE	0	Not installed
JU1–JU4	4	3-pin headers
JU5, JU6, JU7	3	5-pin headers
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, R10, R11	3	2.2kΩ ±5% resistors (0603)
R5	1	1.5kΩ ±5% resistor (0603)
R6, R7	2	27Ω ±5% resistors (0603)
R8, R9	2	20kΩ ±1% resistors (through hole)
R12, R13	0	Not installed, resistors (0603)
R16	0	Not installed, resistor (0402)
U1	1	Dual high-output-current DAC (16 TQFN-EP*, 3mm x 3mm x 0.8mm) Maxim MAX5550ETE+
U2	1	Microcontroller (68 QFN-EP*, 10mm x 10mm) Maxim MAXQ2000-RAX+

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SPI is a trademark of Motorola, Inc.



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## Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U3	1	93C46 type 3-wire EEPROM 16-bit architecture (8 SO) Atmel AT93C46A-10SU-2.7
U4	1	UART-to-USB converter (32 TQFP-32L, 7mm x 7mm) FTDI FT232BL
U5	1	3.3V regulator (5 SC70) Maxim MAX8511EXK33+T (Top Mark: AEI)
U6	1	2.5V regulator (5 SC70) Maxim MAX8511EXK25+T (Top Mark: ADV)

DESIGNATION	QTY	DESCRIPTION
U7	1	Dual SPDT (10 $\mu$ MAX <sup>®</sup> ) Maxim MAX4636EUB+
U8	1	1.25V reference (8 SO) Maxim MAX6161AESA+
Y1	1	16MHz crystal (HCM49)
Y2	1	6MHz crystal (HCM49)
—	7	Shunts
—	1	USB high-speed A-to-B cable, 6ft
—	1	PCB: MAX5550 Evaluation Kit+

\*EP = Exposed pad.

## Component Supplier

SUPPLIER	PHONE	WEBSITE
TDK Corp.	847-803-6100	www.component.tdk.com

**Note:** Indicate that you are using the MAX5550 or MAX5548 when contacting this component supplier.

## MAX5550 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX5550.EXE	Application program
FTD2XX.INF	USB device driver file
UNINST.INI	Uninstalls the EV kit software
USB_Driver_Help.PDF	USB driver installation help file

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# MAX5550 Evaluation Kit

## Quick Start

### Required Equipment

Before beginning, the following equipment is needed:

- MAX5550 EV kit (USB cable included)
- A user-supplied Windows 2000/XP/Vista-compatible PC with a spare USB port
- Two digital multimeters (DMMs) for current measurement
- Optional external power supply for enhanced performance (USB powered)

**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 MAX5550 EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Visit [www.maxim-ic.com/evkitsoftware](http://www.maxim-ic.com/evkitsoftware) to download the latest version of the EV kit software, 5550Rxx.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 (JU1–JU7) are in their default 1-2 positions, as shown in Table 1.
- 4) 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.
- 5) 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\MAX5550** (default installation directory) using the **Browse** button. During device driver installation, Windows might 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 for additional information.
- 6) Start the MAX5550 EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 1.
- 7) To measure the OUTA current, connect the first DMM between H2-1 (OUTA) and H2-2 (GND).
- 8) To measure OUTB current, connect the second DMM between H2-3 (OUTB) and H2-4 (GND).
- 9) Enter 0x200 into the **D9 – D0 (Shift Register Data Bits)** edit box.
- 10) Press the lowest **Load DACA and DACB** button located at the bottom of the EV kit software main window. This will load DACA and DACB input and output DAC registers from the shift register.
- 11) Verify that the current shown on both DMMs is approximately 1mA.

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Table 1. MAX5550 EV Kit Jumper Descriptions (JU1–JU7)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	MAX5550 SCLK/SCL signal connected to on-board microcontroller
	2-3	MAX5550 SCLK/SCL signal connected to on-board header H3
JU2	1-2*	MAX5550 DIN/SDA signal connected to on-board microcontroller
	2-3	MAX5550 DIN/SDA signal connected to on-board header H3
JU3	1-2*	MAX5550 VDD is set to the on-board 3.3V supply powered from the USB port
	2-3	Connect an external 2.7V to 5.25V supply to the VCC pad. <b>See the User-Supplied Power Supply section.</b>
JU4	1-2*	REFIN = 1.25V from the on-board external reference (MAX6161)
	2-3	REFIN = external voltage applied to the on-board REFIN pad
	Open	Use when in internal reference mode
JU5	1-2*	MAX5550 $\overline{CS}/A0$ signal connected to on-board microcontroller
	1-3	MAX5550 $\overline{CS}/A0$ signal connected to GND
	1-4	MAX5550 $\overline{CS}/A0$ signal connected to H3-5 of header H3
	1-5	MAX5550 $\overline{CS}/A0$ signal connected to VDD
JU6	1-2*	MAX5550 DOUT/A1 signal connected to on-board microcontroller
	1-3	MAX5550 DOUT/A1 signal connected to GND
	1-4	MAX5550 DOUT/A1 signal connected to H3-9 of header H3
	1-5	MAX5550 DOUT/A1 signal connected to VDD
JU7	1-2*	MAX5550 SPI/ $\overline{I2C}$ signal connected to on-board microcontroller
	1-3	MAX5550 SPI/ $\overline{I2C}$ signal connected to GND
	1-4	MAX5550 SPI/ $\overline{I2C}$ signal connected to H3-7 of header H3
	1-5	MAX5550 SPI/ $\overline{I2C}$ signal connected to VDD

\*Default position.

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## Detailed Description of Software

The main window of the evaluation software (Figure 1) displays the current and code for all DAC input and output registers. In addition, the main window has two

tabs. The **Load DACs** tab controls all the DAC loading features of the MAX5550. The **Operating Modes** tab (Figure 2) controls all the DAC modes of the MAX5550. The **Load Setting(s)** buttons must be pressed in order to write the corresponding mode settings to the DAC(s).

Evaluates: MAX5550/MAX5548

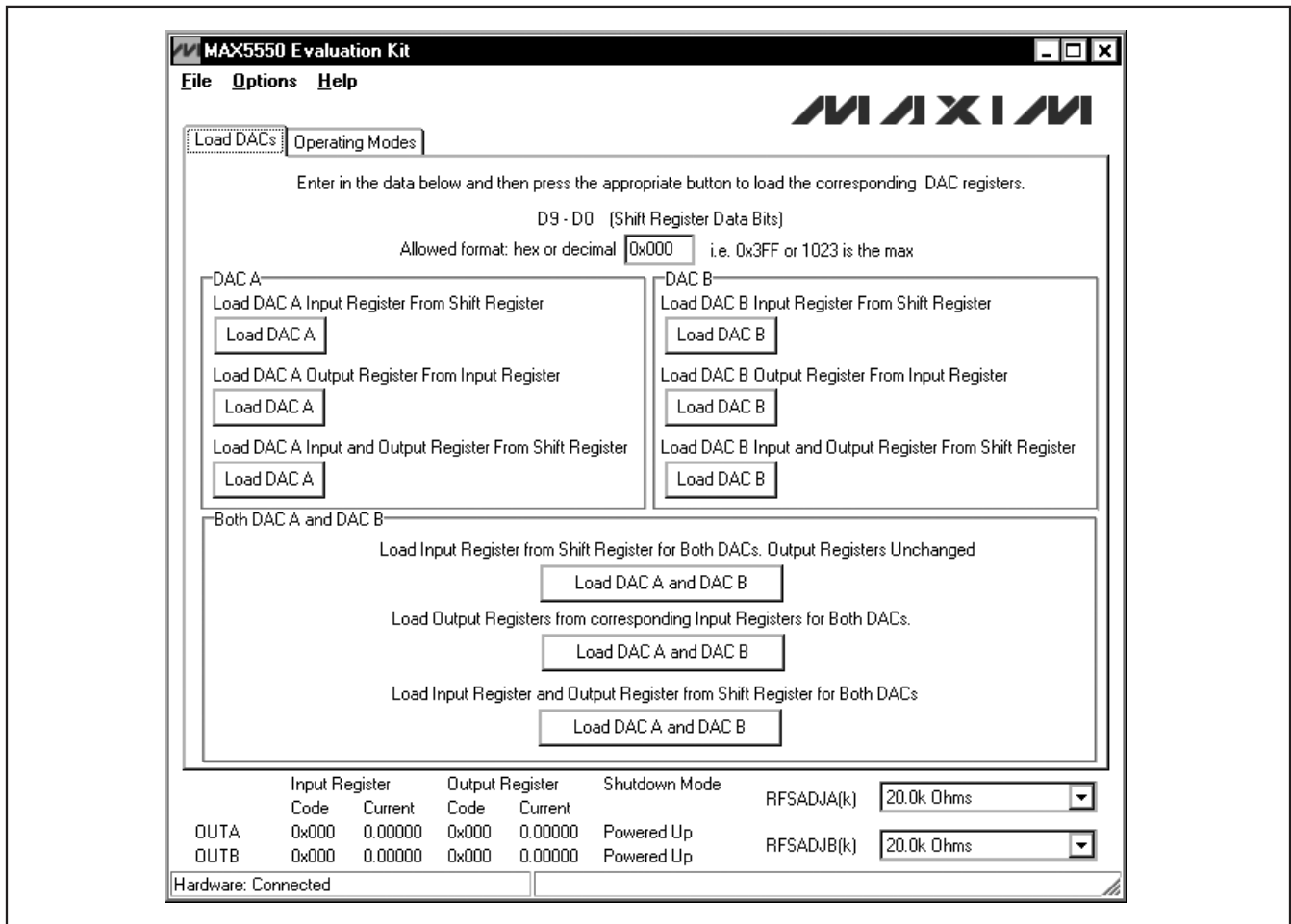


Figure 1. MAX5550 EV Kit Software Main Window (Load DACs Tab)

# MAX5550 Evaluation Kit

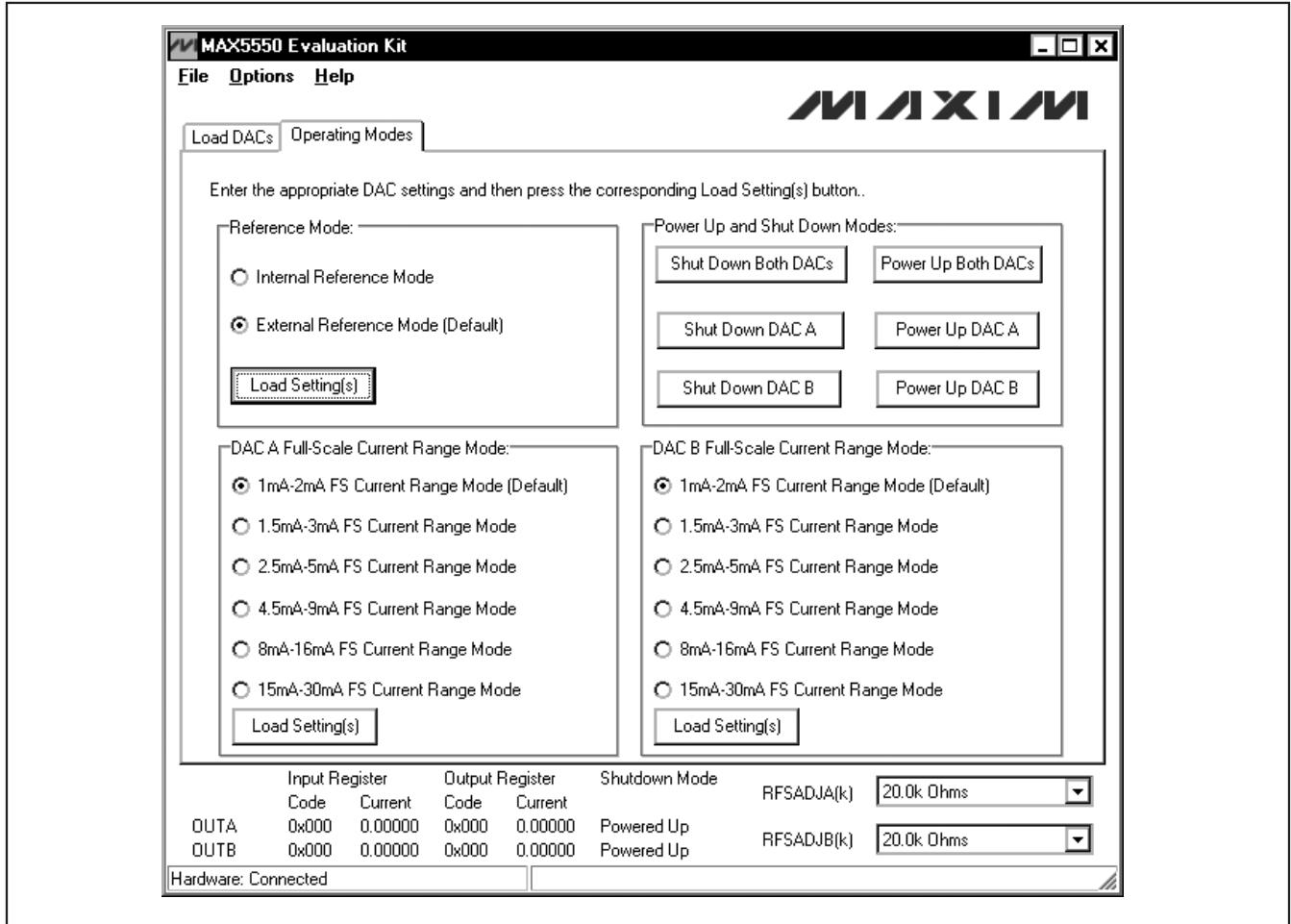


Figure 2. MAX5550 EV Kit Software Main Window (Operating Modes Tab)

## Evaluating with Both SPI and I2C Interfaces

Click on **Options | Switch Interface SPI/I2C** to change the interface type. Press the appropriate **SPI** or **I2C** button located on the **Interface Selection** window (Figure 3) to configure the EV kit for the desired interface. When using and selecting the **I2C** option, verify that there is a valid address in the **I2C Slave Address** combo box before pressing the **Close** button.

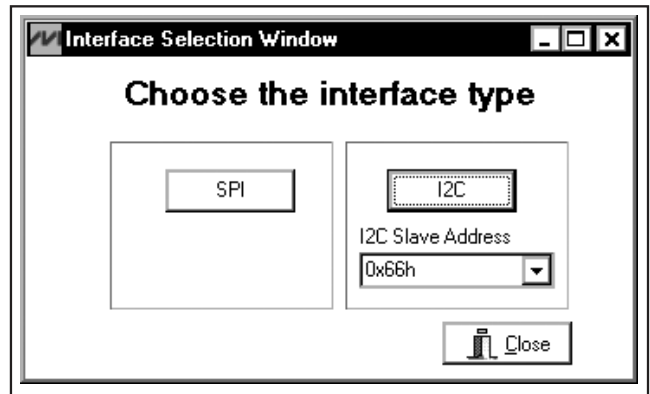


Figure 3. MAX5550 EV Kit Interface Selection Window

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### Resetting Registers to the Power-On-Reset (POR) State

Click on **Options | Reset Registers to POR State** to reset the MAX5550's registers and GUI to the POR state. This can be done at any time and is highly recommended after the advanced user interface is used.

### Advanced User Interface

A serial interface can be used by advanced users by clicking **Options | Interface (Advanced Users)**.

For SPI, 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.

For I<sup>2</sup>C, click on the **2-wire interface** tab shown in Figure 5. Press the **Hunt for active listeners** button to obtain the current MAX5550 slave address in the **Target Device Address:** combo box. In the **General commands** tab, select **1 – SMBusWriteByte(addr,cmd,data8)** in the **Command** drop-down list. Enter the desired values into the **Command byte** and **Data Out** combo boxes and then press the **Execute** button.

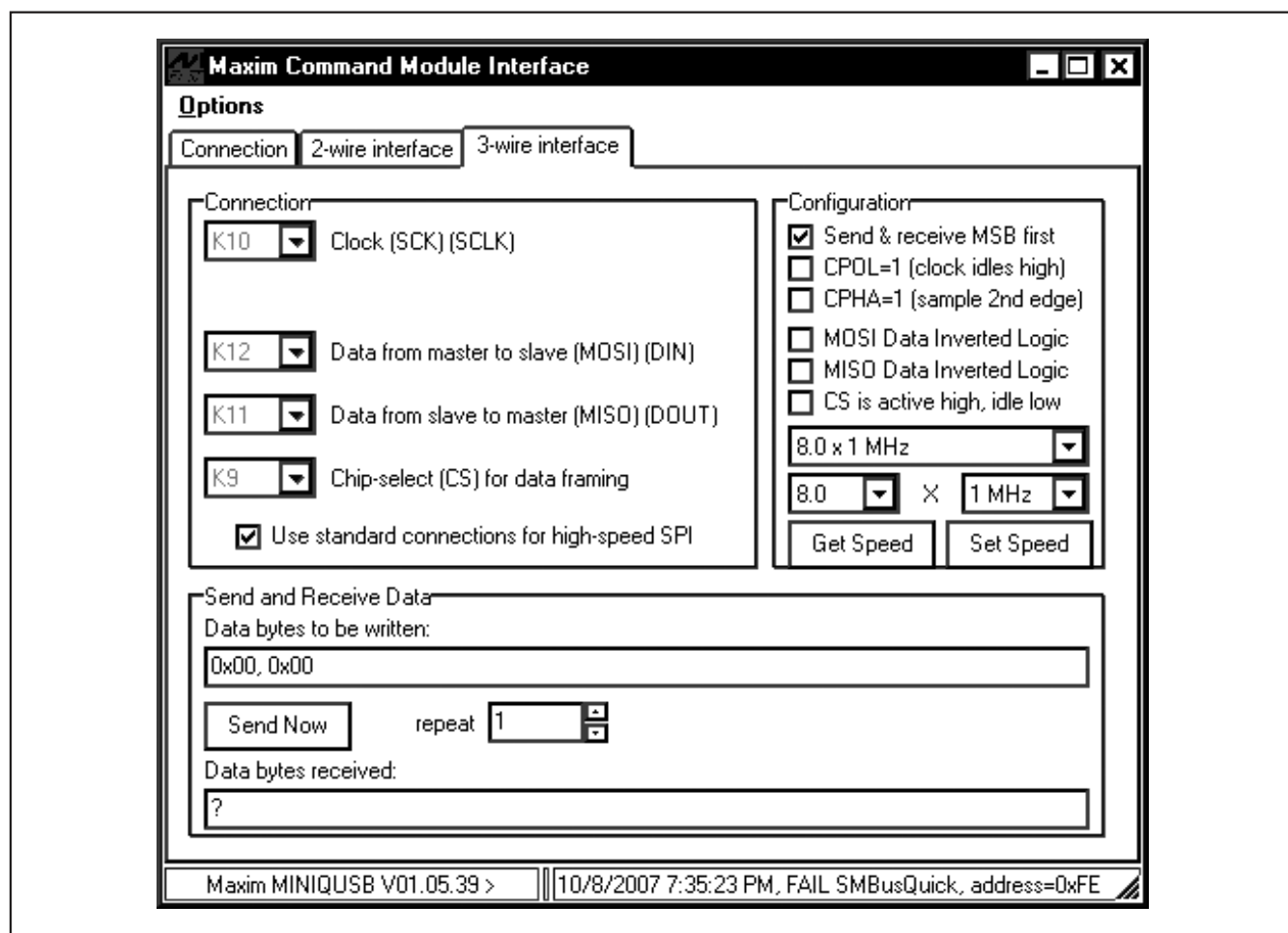


Figure 4. Advanced SPI User Interface Window (3-Wire Interface Tab)

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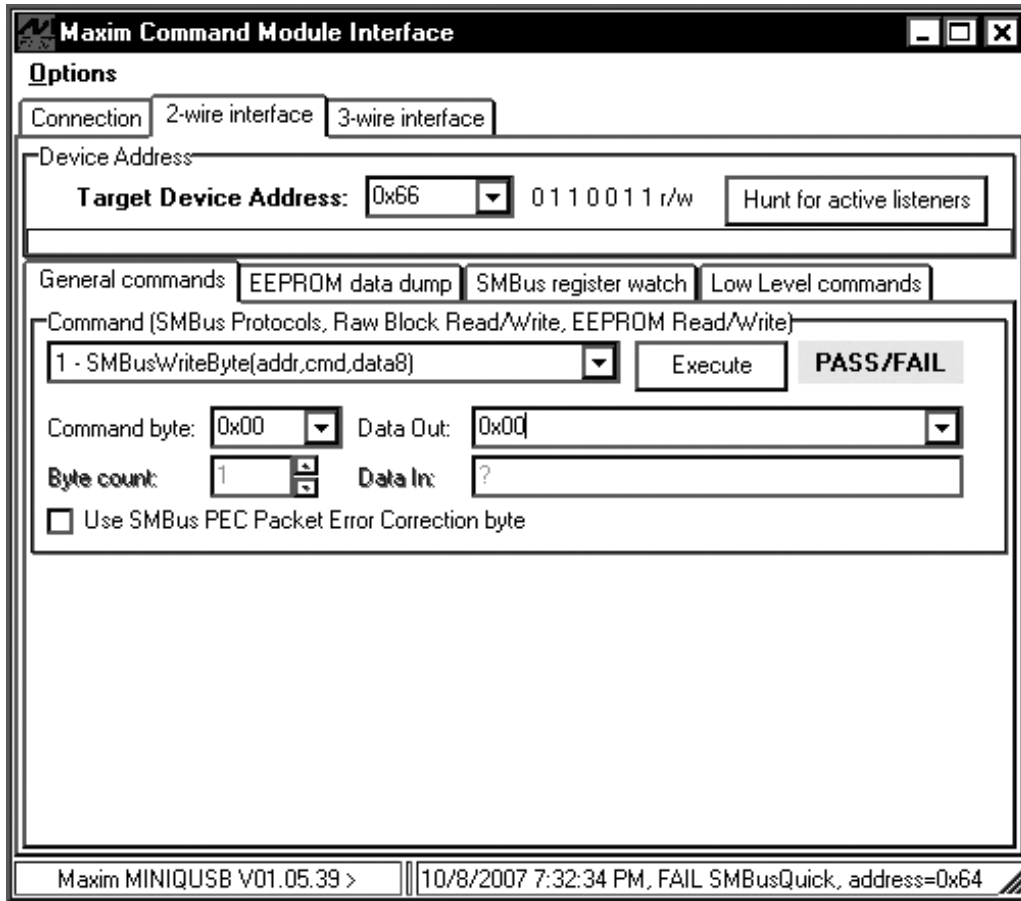


Figure 5. Advanced I<sup>2</sup>C User Interface Window (2-Wire Interface Tab)



# MAX5550 Evaluation Kit

## **Detailed Description of Hardware**

The MAX5550 EV kit provides a proven layout for the MAX5550. An on-board reference (MAX6161), USB-PC connection circuitry, and jumpers to disconnect the on-board microcontroller are included in the EV kit.

### **Reference**

At power-up, the MAX5550 EV kit defaults to using the on-board external 1.25V reference (MAX6161).

To use the internal reference, remove the shunt on jumper JU4, select the **Internal Reference Mode** radio button (Figure 2) and press the **Load Setting(s)** button.

For off-board external references, connect a 1.25V reference voltage to the REFIN pad and move the shunt on jumper JU4 to the 2-3 position.

### **User-Supplied SPI Interface**

To use the MAX5550 EV kit with a user-supplied SPI interface, first move the shunts of JU1, JU2, and JU3 to the 2-3 position. Next, move the shunts of JU5, JU6, and JU7 to the 1-4 position. Then apply an external 2.7V to 5.25V power supply at the VCC pad. Lastly, connect  $\overline{CS}$ , SCLK, DIN, DOUT, and GND signals to the corresponding  $\overline{CS}$ , SCLK, DIN, DOUT, and GND pins of header H3.

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

To use the MAX5550 EV kit with a user-supplied I<sup>2</sup>C interface, first move the shunts of JU1, JU2, and JU3 to the 2-3 position. Next, move the shunts of JU5, JU6, and JU7 to the 1-4 position. Then apply an external 2.7V to 5.25V power supply at the VCC pad. Lastly, connect SCL, SDA, and GND signals to the corresponding SCL, SDA, and GND pins of header H3. Resistors R12 and R13 might need to be installed depending on the I<sup>2</sup>C master used and the application.

### **User-Supplied Power Supply**

The MAX5550 EV kit is powered completely from the USB port by default. To power the MAX5550 with a user-supplied power supply, the on-board microcontroller has to be disconnected first. To disconnect the microcontroller, move the shunts of JU1, JU2, and JU3 to the 2-3 position. Next, move the shunts of JU5, JU6, and JU7 to the 1-4 position. Then apply an external 2.7V to 5.25V power supply at the VCC pad. Lastly, see the appropriate *User-Supplied SPI Interface* or *User-Supplied I<sup>2</sup>C Interface* sections for interface connections.

Evaluates: MAX5550/MAX5548





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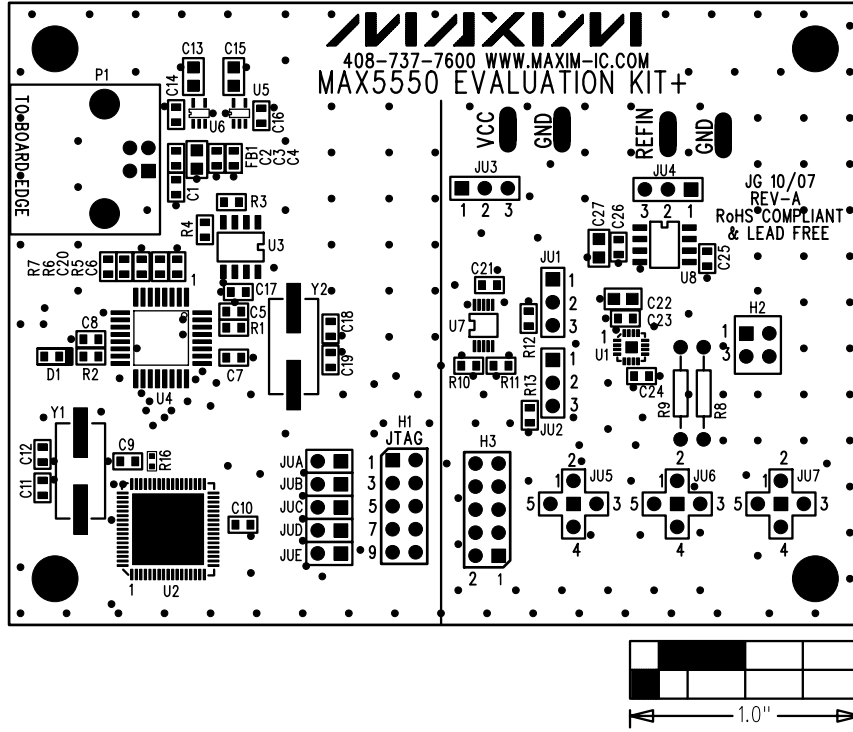


Figure 7. MAX5550 EV Kit Component Placement Guide—Component Side

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Evaluates: MAX5550/MAX5548

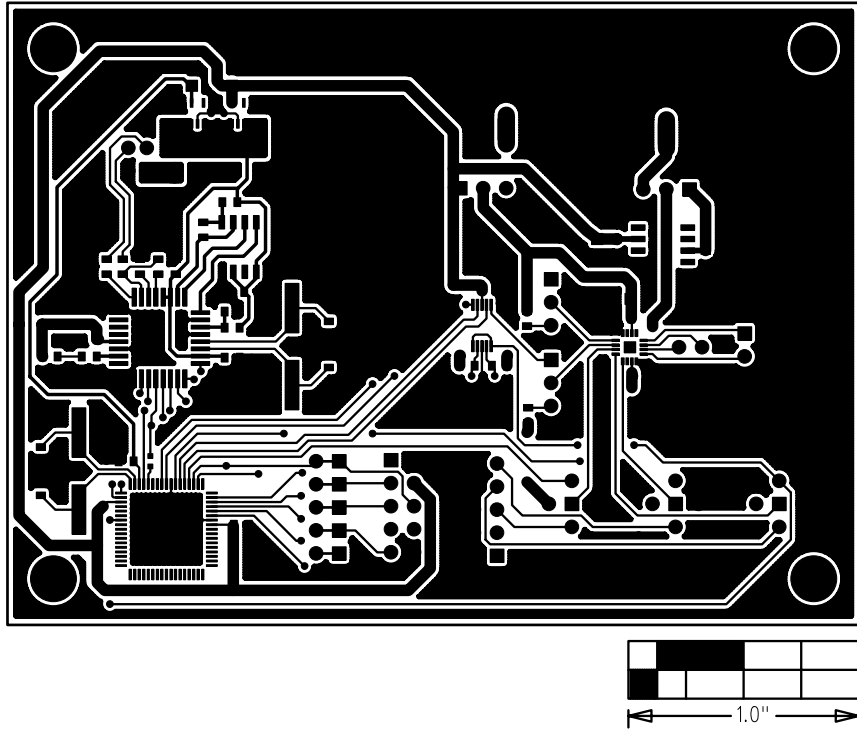


Figure 8. MAX5550 EV Kit PCB Layout—Component Side

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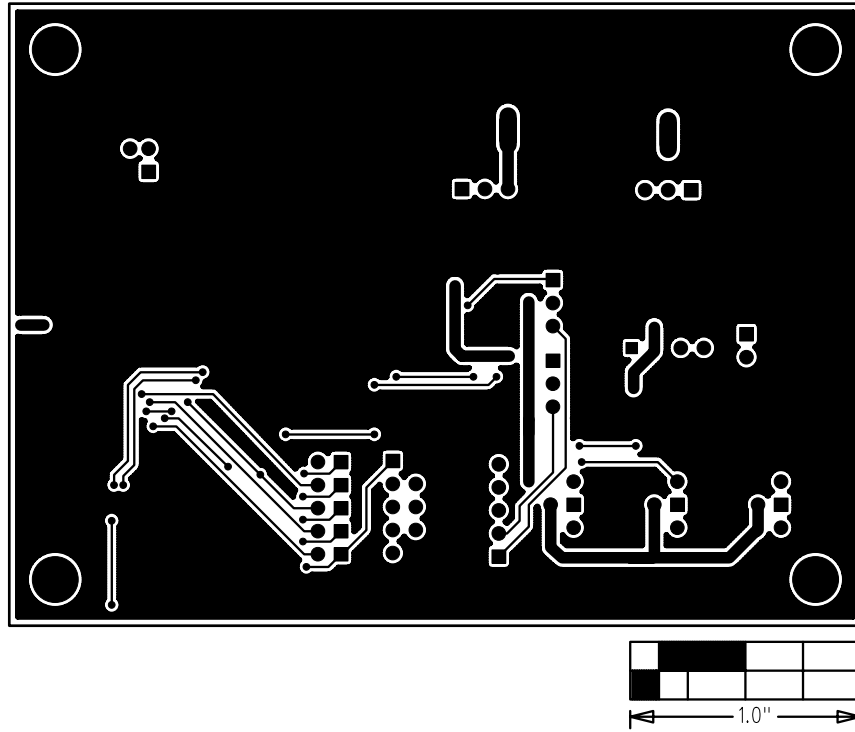


Figure 9. MAX5550 EV Kit PCB Layout—Solder Side

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