19-4303; Rev 0; 10/08

MAX6956 Evaluation Kit

Evaluates: MAX6956

General Description

The MAX6956 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB that contains a MAX6956 IC. The MAX6956 is a 28-port LED driver and I/O expander. The EV kit also includes Windows® 2000/XP- and Windows Vista®-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX6956.

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Features

- **Windows 2000/XP- and Windows Vista (32-Bit)-Compatible Software**
- **USB-PC Connection (Cable Included)**
- **USB Powered**
- **Lead-Free and RoHS Compliant**
- **Proven PCB Layout**
- **Surface-Mount Components**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX6956EVKIT+	EV Kit

+Denotes lead-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C5–C9, C12, C17, C18, C37	10	0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C2	0	Not installed, ceramic capacitor (0603)
C3, C11, C38, C40	4	10µF ±20%, 16V X5R ceramic capacitors (1206) Murata GRM31CR61C106M
C4	1	0.033µF ±10%, 16V X5R ceramic capacitor (0603) Taiyo Yuden EMK107BJ333KA
C10, C39	2	1µF 10%, ±16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K
C15, C16	2	10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J
C30, C31	2	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
H1–H4	4	10-pin headers
J1	1	USB type-B, right-angle PC-mount receptacle
J3	0	Not installed

DESIGNATION	QTY	DESCRIPTION
JU1, JU3	2	Dual-row (2 x 4) vertical headers
JU2, JU4, JU7, JU8	4	3-pin headers
JU5, JU6, JU9–JU13	0	Not installed, 2-pin headers
JU14	1	2-pin header
L1	1	Ferrite bead TDK MMZ1608R301A (0603)
LED1, LED3–LED14	13	Red LEDs (0805)
LED2	1	Dual-digit 0.56in, 7-segment display
Q1, Q2	0	Not installed, 2N7002 (SOT23)
R1, R2	2	27Ω ±5% resistors (0603)
R3	1	1.5kΩ ±5% resistor (0603)
R4	1	470Ω ±5% resistor (0603)
R5	1	2.2kΩ ±5% resistor (0603)
R6	1	10kΩ ±5% resistor (0603)
R7, R8	2	4.7kΩ ±5% resistors (0603)
R11	1	100kΩ ±5% resistor (0603)
R12, R14	0	Not installed, 10kΩ ±5% resistors (0603)
R13	1	150kΩ ±5% resistor (0603)
R15, R16, R18, R24–R48	28	0Ω resistors (0603)

**EP = Exposed pad.*

MAX6956 Evaluation Kit

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R17	1	330Ω ±5% resistor (0603)
R19–R23	0	Not installed, resistors (0402)
SW1	1	Momentary 6mm pushbutton switch
U1	1	28-port LED driver and I/O expander (40 TQFN-EP*) Maxim MAX6956ATL+
U2	1	2.5V LDO regulator (5 SC70) Maxim MAX8511EXK25+ (Top Mark: ADV)
U3	1	3.3V LDO regulator (5 SC70) Maxim MAX8511EXK33+ (Top Mark: AEI)
U4	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U5	1	USB-to-UART converter (32 TQFP) FTDI FT232BL
U6	1	93C46 type 3-wire EEPROM (8 SO) Atmel AT93C46A-10SU-2.7
Y2	1	16Hz crystal (HCM49) Hong Kong X'tals SSM1600000E18FAF
Y3	0	Not installed, crystal
Y4	1	6MHz crystal (HCM49) Hong Kong X'tals SSL6000000E18FAF
—	7	Shunts
—	1	USB high-speed A-to-B cables, 6ft
—	1	PCB: MAX6956 Evaluation Kit+

**EP = Exposed pad.*

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 MAX6956 when contacting these component suppliers.*

MAX6956 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs EV kit files on your computer
MAX6956.EXE	Application program
FTD2XX.INF	USB device driver file
USB_Driver_Help.PDF	USB driver installation help file

Quick Start

Recommended Equipment

Before beginning, the following equipment is needed:

- MAX6956 EV kit (USB cable included)
- A user-supplied Windows 2000/XP- and 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 MAX6956 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) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 6956Rxx.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 jumper settings (see 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 30 seconds, 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.
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\MAX6956** (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 for additional information.
6) Start the MAX6956 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) Press function key F1 to configure all of the ports for LED output and enter display test mode. Verify that all of the LEDs light up. Click **OK** to end display test mode.

Jumper Selection

Table 1. Jumper Selection (JU1–JU14)

JUMPER	FUNCTION	SHUNT POSITION	DESCRIPTION
JU1	AD0	1-2*	I^2C address selection (see Table 2)
		3-4	
		5-6	
		7-8	
JU2	V+	1-2*	U1 V+ powered by VDDIO 3.3V
		2-3	U1 V+ from external power EXT_V+
JU3	AD1	1-2*	I^2C address selection (see Table 2)
		3-4	
		5-6	
		7-8	
JU4	VLED	1-2*	VLED powered by VDDIO 3.3V
		2-3	VLED from external power EXT_VLED
JU5	Level translator	Not installed*	SDA connects directly to MAXQ2000
		PCB trace cut open	See the *Operation with External 2.5V to 5.5V Supply* section
JU6	Level translator	Not installed*	SCL connects directly to MAXQ2000
		PCB trace cut open	See the *Operation with External 2.5V to 5.5V Supply* section
JU7	P31	1-2*	U1 P31 port connected to LED2 right decimal point
		2-3	U1 P31 port connected to interrupt input and LED15
JU8	P30	1-2*	U1 P30 port connected to LED2 left decimal point; pushbutton switch is not used
		2-3	U1 P30 port connected to switch SW1

**Default position.*

Table 1. Jumper Selection (JU1–JU14) (continued)

JUMPER	FUNCTION	SHUNT POSITION	DESCRIPTION
JU9	INT	Not installed*	INT connected to MAXQ2000
		PCB trace cut open	MAXQ2000 INT not connected
JU10	SDA	Not installed*	SDA connected to on-board I²C bus
		PCB trace cut open	SDA must be connected to an external I²C bus
JU11	SCL	Not installed*	SCL connected to on-board I²C bus
		PCB trace cut open	SCL must be connected to an external I²C bus
JU12	SDA	Not installed*	SDA pullup resistor R7 connected
		PCB trace cut open	SDA pullup must be user-supplied
JU13	SCL	Not installed*	SCL pullup resistor R8 connected
		PCB trace cut open	SCL pullup must be user-supplied
JU14	P30/SW1 pullup	1-2*	R11 pulls up P30 pushbutton switch
		Open	R11 not connected; SW1 pulls down only

**Default position.*

I²C Device Address

Table 2. U1 MAX6956 I²C Device Address

JU3	AD1	JU1	AD0	I²C ADDRESS
1-2 *	GND	1-2*	GND	1000 000 r/w
1-2	GND	5-6	V+	1000 001 r/w
1-2	GND	7-8	SDA	1000 010 r/w
1-2	GND	3-4	SCL	1000 011 r/w
5-6	V+	1-2	GND	1000 100 r/w
5-6	V+	5-6	V+	1000 101 r/w
5-6	V+	7-8	SDA	1000 110 r/w
5-6	V+	3-4	SCL	1000 111 r/w
7-8	SDA	1-2	GND	1001 000 r/w
7-8	SDA	5-6	V+	1001 001 r/w
7-8	SDA	7-8	SDA	1001 010 r/w
7-8	SDA	3-4	SCL	1001 011 r/w
3-4	SCL	1-2	GND	1001 100 r/w
3-4	SCL	5-6	V+	1001 101 r/w
3-4	SCL	7-8	SDA	1001 110 r/w
3-4	SCL	3-4	SCL	1001 111 r/w

**Default position.*

Detailed Description of Software

The MAX6956 EV kit software provides a graphical user interface (GUI) to configure the EV kit hardware. See Figures 1–4.

The **Interrupt pin status** group box indicates MAX6956 INT output pin status.

Interface History Tab

The **Interface History** tab sheet provides a list of the I²C and other commands generated by the MINIQUSB.

Advanced User Interface

The menu item **Options | Interface (Advanced User)** brings up the **Advanced User Interface** window shown in Figure 5. This window allows sending arbitrary commands on the I²C bus.

Transisiton Detection

Follow the steps below to verify transition-detection operation:

1) Set EV kit jumpers JU7 = 2-3, JU8 = 2-3, and JU14 = 1-2.
2) Select the **Port Configuration** tab (Figure 2). In the **0x09 .. 0x0F Port Configuration** group box, set P30 = **10 GPIO Input (no pullup)**, set P31 = **01 GPIO Output (push-pull)**, and press the **Write** button.
3) Select the **Main Configuration** tab (Figure 1). In the **0x06 Transition Detect** group box, check **P30 mask** and press the **Write** button.
4) In the **0x04 Configuration** group box, set **1 - transition detection enabled** and press the **Write** button.
5) On the EV kit, press and release momentary push-button switch SW1. The MAX6956 detects the transition on pin P30 and drives pin P31 high. The MAX6956 EV kit software **Interrupt pin status** group box indicates **INT pin: 1 active**.
6) Select the **Main Configuration** tab. In the **0x06 Transition Detect** group box, press the **Read** button. Verify that **INT = 1** appears. After the read operation, the MAX6956 drives P31 low. The MAX6956 EV kit software **Interrupt pin status** group box indicates **INT pin: 0 inactive**.
7) To detect another transition, repeat steps 4, 5, and 6.

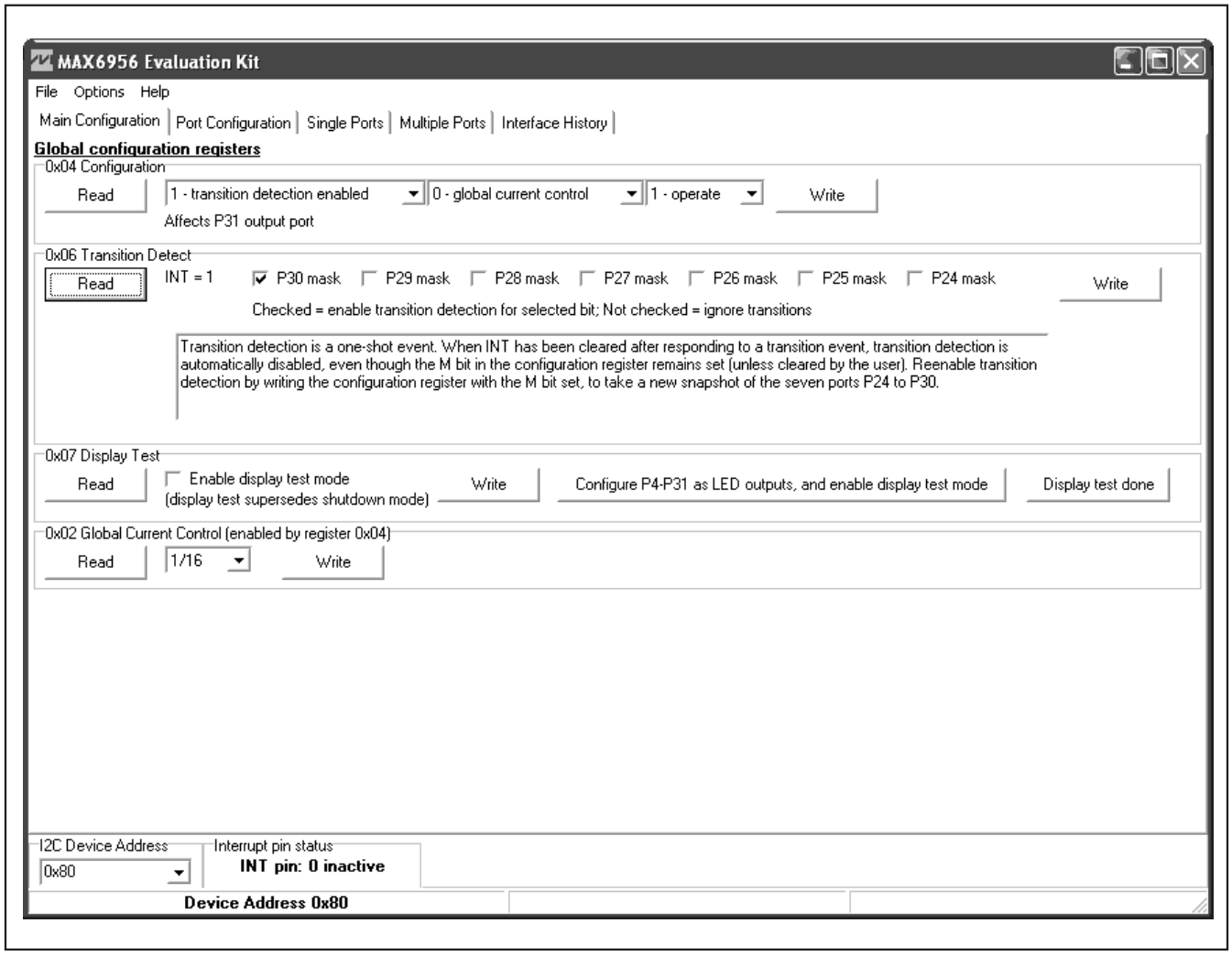

Figure 1. MAX6956 EV Kit Software Main Window (Main Configuration Tab)

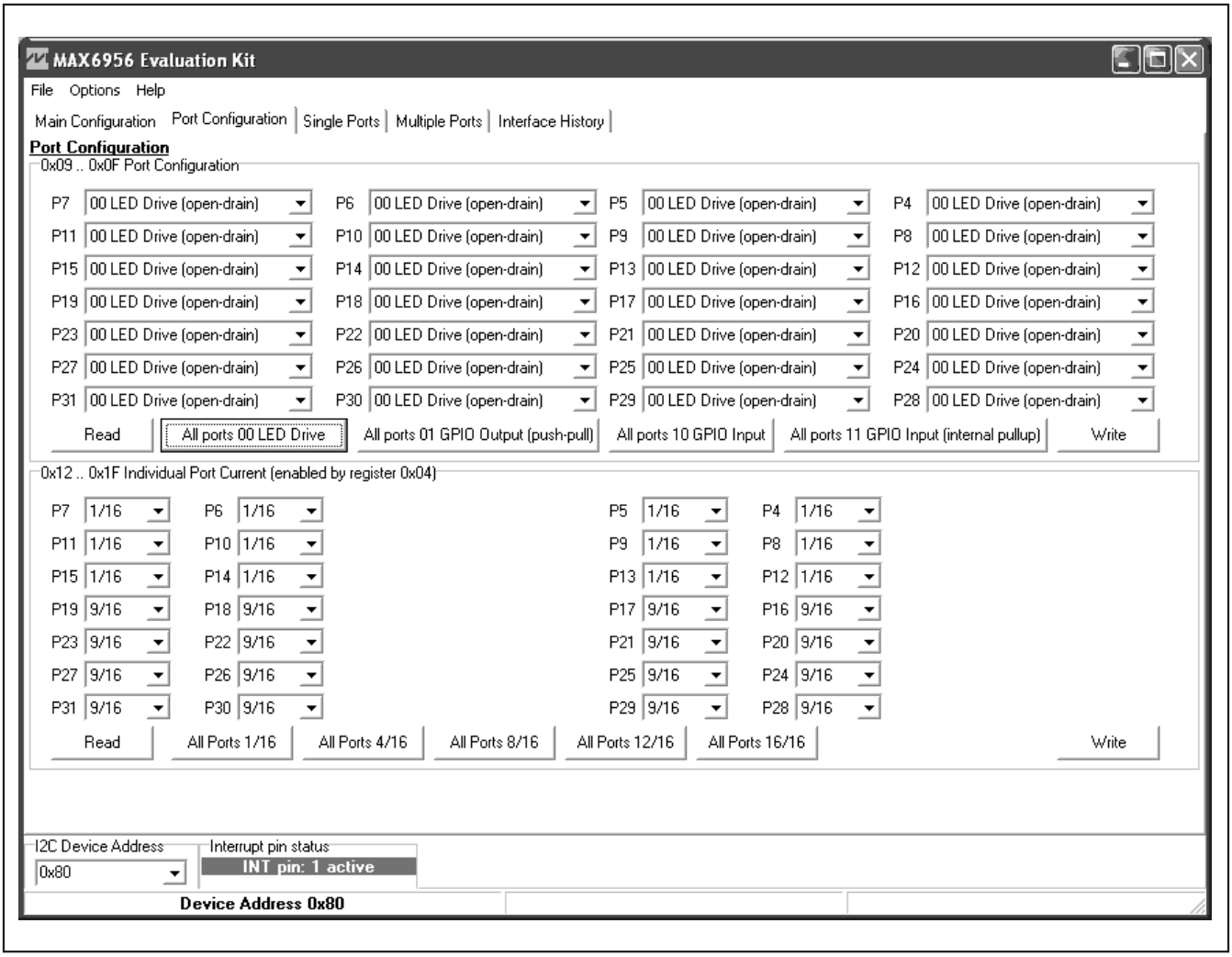

Figure 2. MAX6956 EV Kit Software Main Window (Port Configuration Tab)

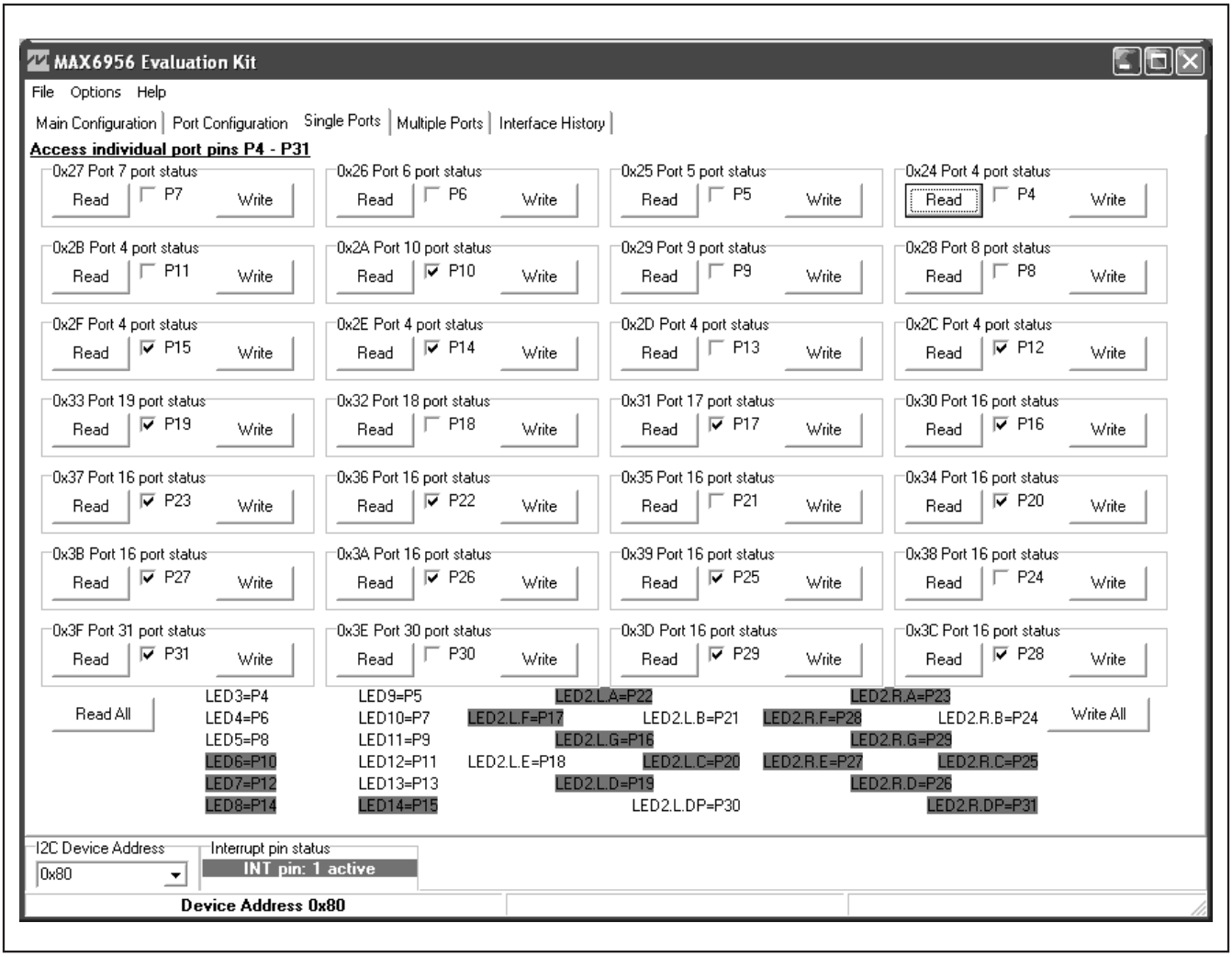

Figure 3. MAX6956 EV Kit Software Main Window (Single Ports Tab)

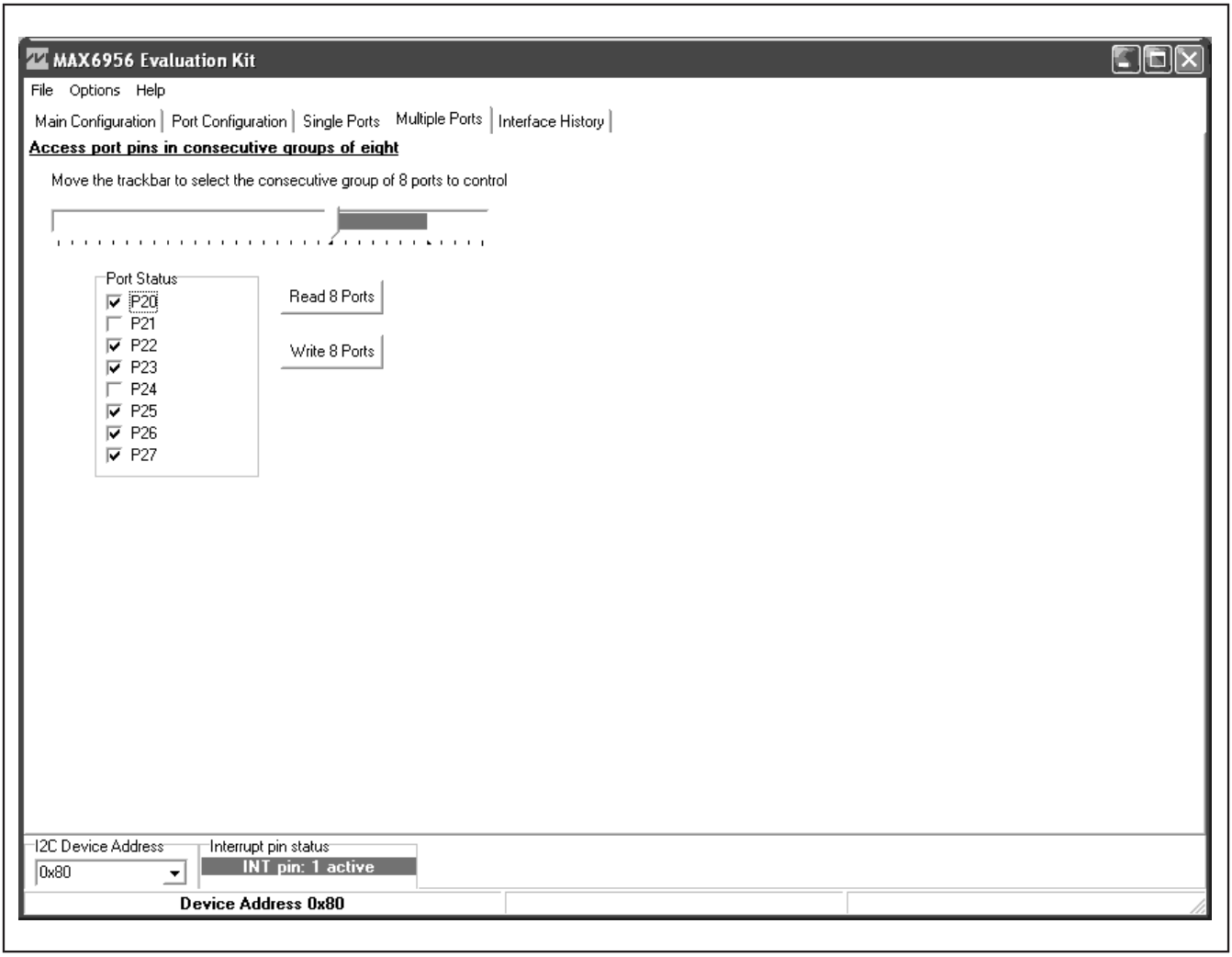

Figure 4. MAX6956 EV Kit Software Main Window (Multiple Ports Tab)

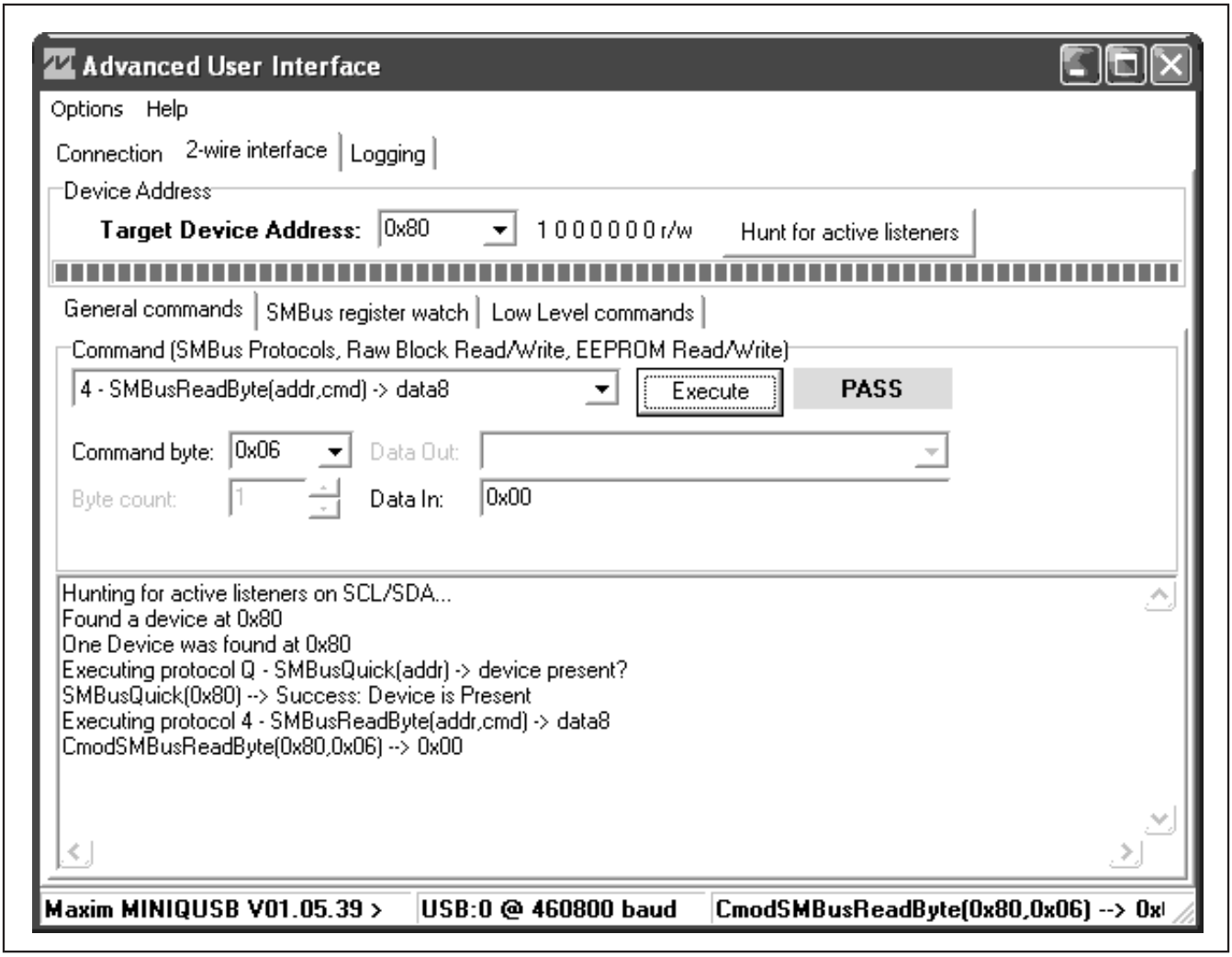

Figure 5. Advanced User Interface Window (2-Wire Interface Tab)

_Detailed Description of Hardware

The MAX6956 EV kit is a fully assembled and tested surface-mount PCB that contains a MAX6956 IC. The MAX6956 is a 28-port LED driver and I/O expander.

The microcontroller circuitry (U2–U6) is equivalent to Maxim's MAXQ2000-based MINIQUSB board.

User-Supplied I²C Interface

To use the MAX6956 EV kit with a user-supplied I²C interface, first cut the JU5 and JU6 default traces, disconnecting SDA and SCL from the on-board microcontroller. If the user-supplied I²C bus provides its own SCL/SDA pullup resistors, disable on-board pullup resistors R7 and R8 by cutting the JU12 and JU13 default traces. Next, apply your own 2.5V to 5.5V power supply between the EXT V+ and GND pads. Lastly, connect your SCL and SDA signals to the corresponding SDA and SCL test points on header H4 on the MAX6956 EV kit board.

Operation with External 2.5V to 5.5V Supply

As shipped from the factory, the V+ supply voltage is connected to the on-board 3.3V regulator by jumper JU2.

Configuring the EV kit to accept user-supplied power between 2.5V and 5.5V requires cutting traces and mounting additional components, as listed below. The Absolute Maximum Rating of the MAXQ2000 microcontroller is 3.6V. **Warning: If SCL or SDA ever exceed 3.6V, the microcontroller will be damaged.** To protect the MAXQ2000 against high voltage, a level-translation circuit can be mounted on the board.

1) Obtain the following parts (Maxim does not supply these components):

DESIGNATION	QTY	DESCRIPTION
Q1, Q2	2	2N7002 (SOT23) Central Semiconductor 2N7002FC Diodes, Inc. 2N7002-7-F Fairchild 2N7002_NL Vishay/General Semiconductor 2N7002-E3
R12, R14	2	10kΩ ±5% resistors (0603)

2) Cut the PCB trace that shorts across JU5 and JU6.

3) Mount components Q1, Q2, R12, and R14.

4) Connect external power supply between the EXT V+ oval pad and the GND oval pad.

5) Move JU2 shunt to 2-3 position.

To restore the EV kit, remove Q1 and Q2. Then install shunts at JU5 and JU6. If Q1 and Q2 are not removed, the 2N7002's body diode will be forward-biased, which may prevent the SCL and SDA signals from meeting minimum logic-high threshold V_{IH}(min).

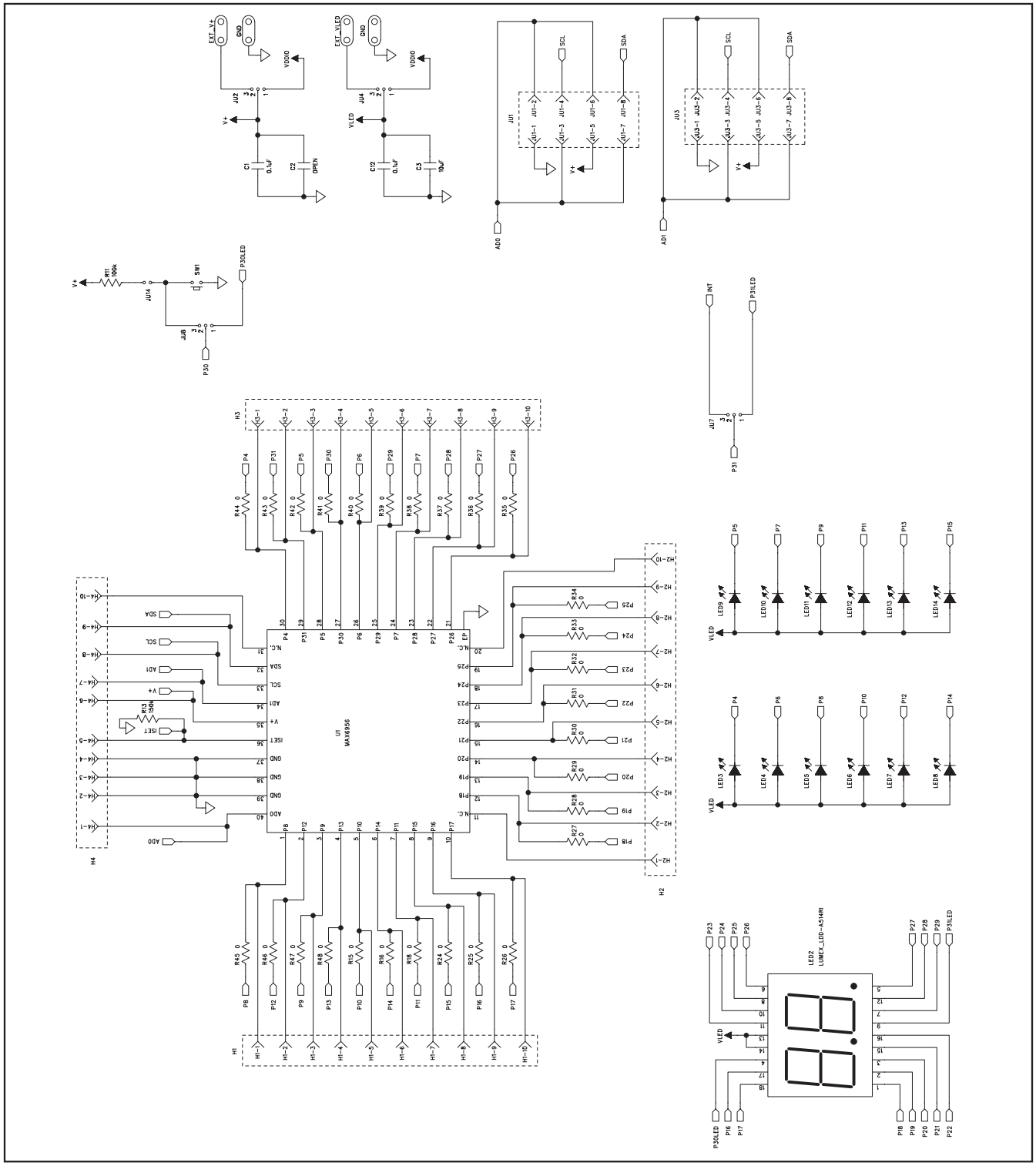

Figure 6a. MAX6956 EV Kit Schematic (Sheet 1 of 2)

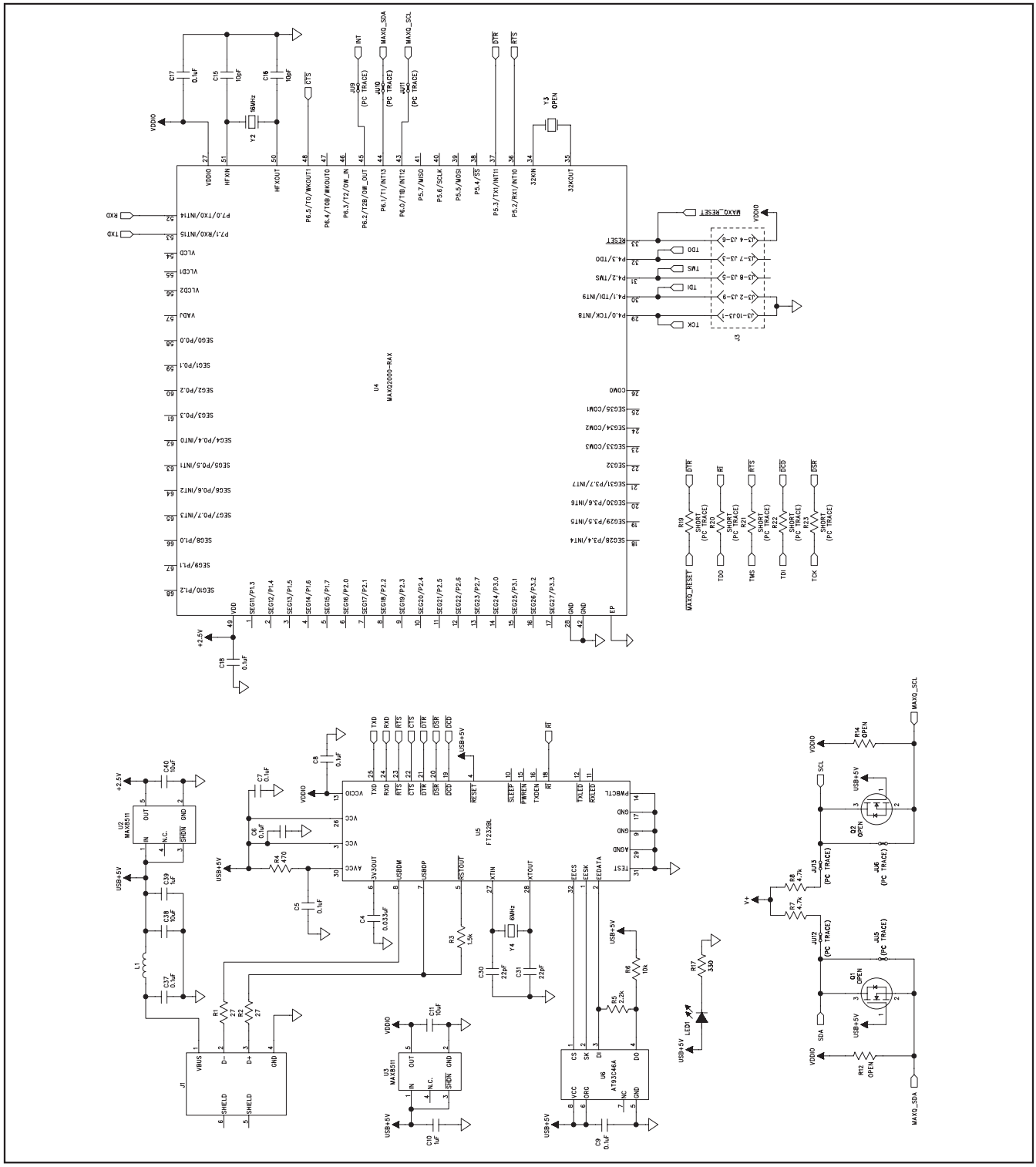

Figure 6b. MAX6956 EV Kit Schematic (Sheet 2 of 2)

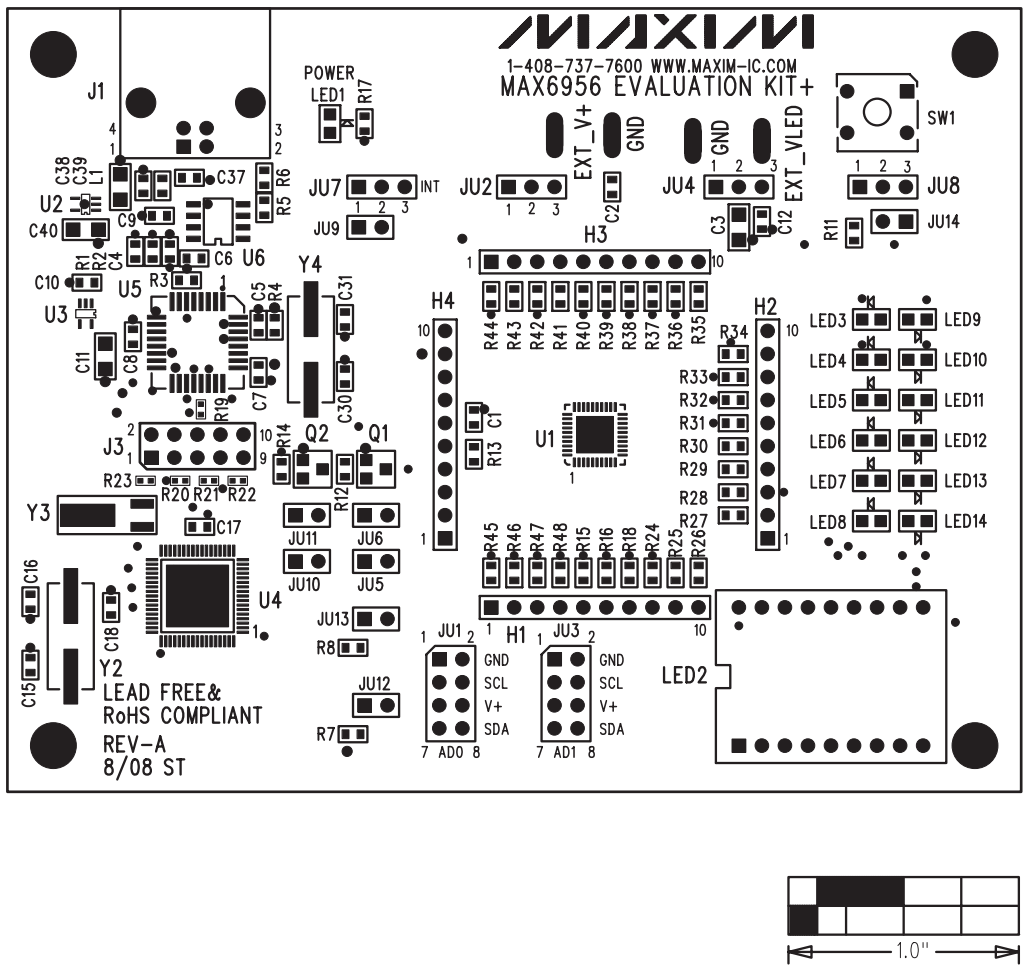

Figure 7. MAX6956 EV Kit Component Placement Guide—Component Side

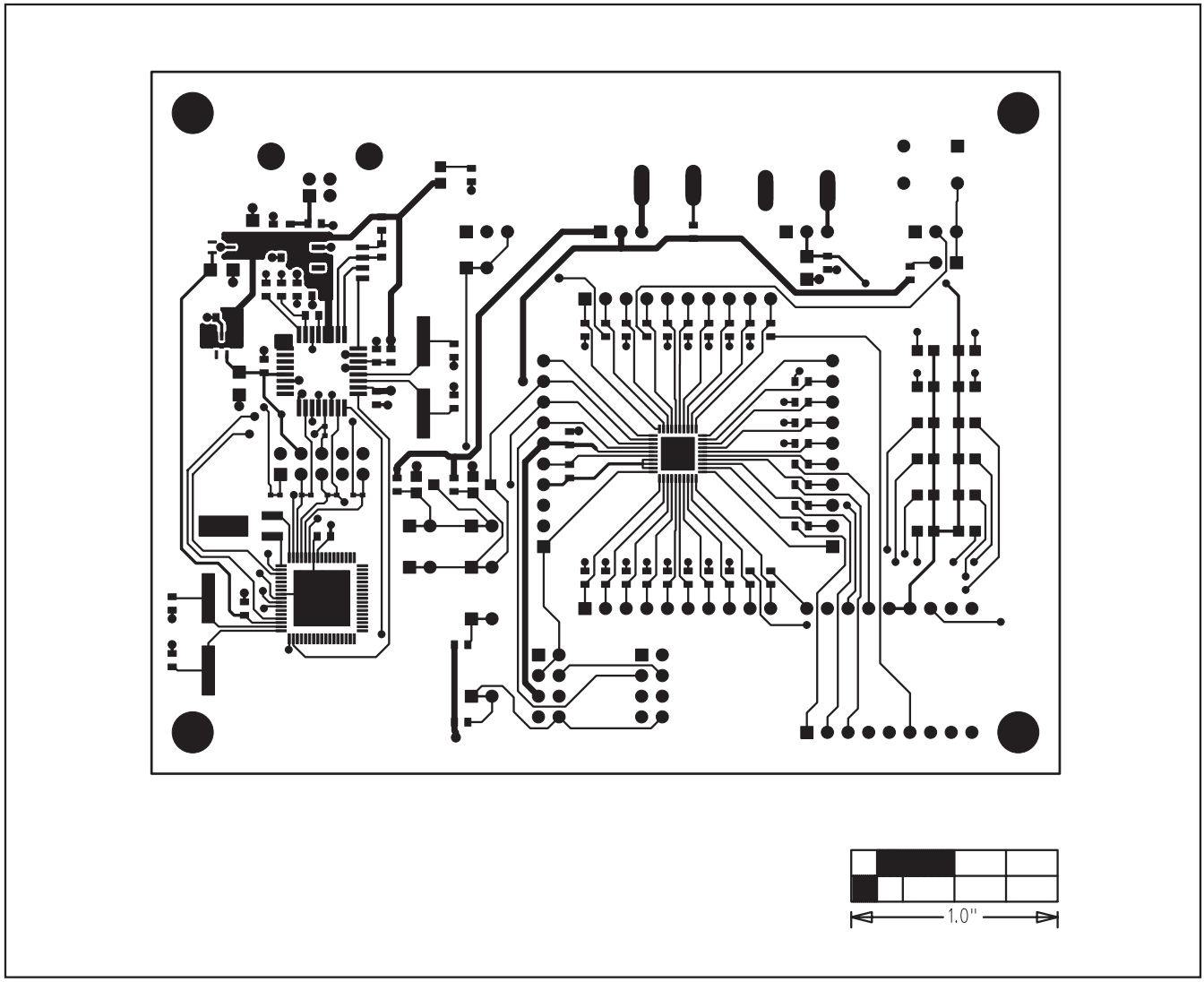

Figure 8. MAX6956 EV Kit PCB Layout—Component Side

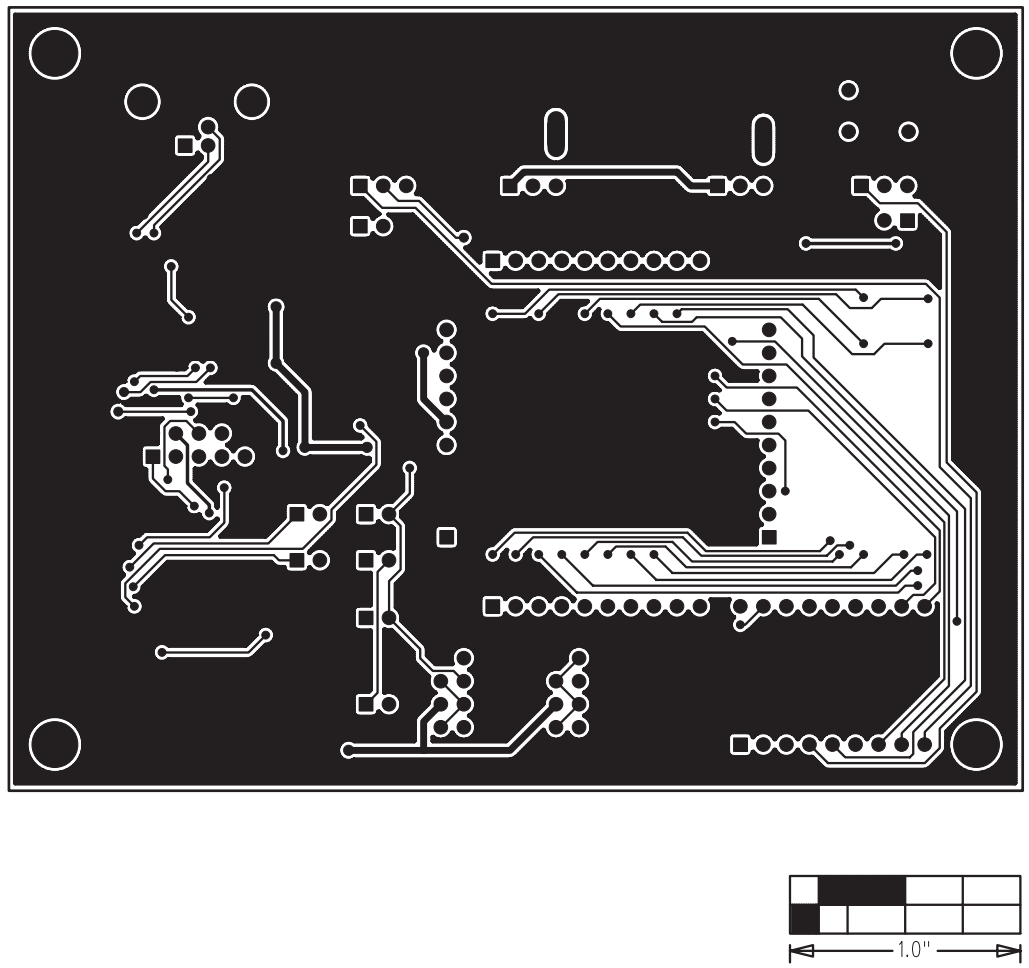

Figure 9. MAX6956 EV Kit PCB Layout—Solder Side