



# MAX7320 Evaluation Kit

## General Description

The MAX7320 evaluation kit (EV kit) provides a proven design to evaluate the MAX7320 I<sup>2</sup>C port expander with eight push-pull outputs. The EV kit also includes Windows 2000/XP/Vista<sup>®</sup>-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX7320. The MAX7320 EV kit printed-circuit board (PCB) comes with a MAX7320ATE+ installed.

## Features

- ◆ Wide 1.71V to 5.5V Supply Range
- ◆ Windows 2000/XP/Vista (32-Bit)-Compatible Software
- ◆ USB-PC Connection (Cable Included)
- ◆ USB Powered
- ◆ Lead-Free and RoHS-Compliant
- ◆ Labeled Test Points
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

## Ordering Information

PART	TYPE
MAX7320EVKIT+	EV Kit

+Denotes lead-free and RoHS-compliant.

## Component List

DESIGNATION	QTY	DESCRIPTION
C1, C5–C9, C17, C18, C37	9	0.1 $\mu$ F $\pm$ 10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C2	0	Not installed, capacitor (0603)
C4	1	0.033 $\mu$ F $\pm$ 10%, 16V (min) X5R ceramic capacitor (0603) Taiyo Yuden EMK107BJ333KA
C10, C39	2	1 $\mu$ F $\pm$ 10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K
C11, C38, C40	3	10 $\mu$ F $\pm$ 20%, 16V X5R ceramic capacitors (1206) Murata GRM31CR61C106M
C15, C16	2	10pF $\pm$ 5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J
C30, C31	2	22pF $\pm$ 5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
H1, H2	2	8-pin headers
J1	1	USB type-B right-angle female receptacle
J3	0	Not installed
JU1, JU3	2	2 x 4 dual-row vertical headers

DESIGNATION	QTY	DESCRIPTION
JU2	1	3-pin header
JU4	1	2 x 8 dual-row vertical header
JU5, JU6, JU10–JU13	0	Not installed
L1	1	Ferrite bead TDK MMZ1608R301A (0603)
LED1	1	Red LED (T1-3/4)
LED2–LED9	8	Red LEDs (PLCC4)
Q1, Q2	0	Not installed, 2N7002 (SOT23)
R1, R2	2	27 $\Omega$ $\pm$ 5% resistors (0603)
R3	1	1.5k $\Omega$ $\pm$ 5% resistor (0603)
R4	1	470 $\Omega$ $\pm$ 5% resistor (0603)
R5	1	2.2k $\Omega$ $\pm$ 5% resistor (0603)
R6	1	10k $\Omega$ $\pm$ 5% resistor (0603)
R7, R8	2	4.7k $\Omega$ $\pm$ 5% resistors (0603)
R9, R10, R16, R18	4	150 $\Omega$ $\pm$ 5% resistors (0603)
R11	1	33k $\Omega$ $\pm$ 5% resistor (0603)
R12, R14	0	Not installed, resistors (0603)
R17	1	330 $\Omega$ $\pm$ 5% resistor (0603)
R19–R23	0	Not installed, resistors (0402)
R24–R27	4	82 $\Omega$ $\pm$ 5% resistors (0603)

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**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](http://www.maxim-ic.com).**

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## Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U1	1	I <sup>2</sup> C port expander (16-pin TQFN, 3mm x 3mm x 0.5mm) Maxim MAX7320ATE+ (Top Mark: ADB)
U2	1	2.5V regulator (5-pin SC70) Maxim MAX8511EXK25+ (Top Mark: ADV)
U3	1	3.3V regulator (5-pin SC70) Maxim MAX8511EXK33+ (Top Mark: AEI)
U4	1	Microcontroller (68-pin QFN-EP*, 10mm x 10mm) Maxim MAXQ2000-RAX+
U5	1	UART-to-USB converter (32-pin TQFP-L, 7mm x 7mm) FTDI FT232BL
U6	1	93C46 type 3-wire EEPROM (8-pin SO) 16-bit architecture Atmel AT93C46A-10SU-2.7
Y2	1	16MHz crystal (HCM49) Hong Kong X'tals SSM1600000E18FAF
Y3	0	Not installed, crystal
Y4	1	6MHz crystal (HCM49) Hong Kong X'tals SSL6000000E18FAF

DESIGNATION	QTY	DESCRIPTION
—	11	Shunts
—	1	USB high-speed A-to-B cables, 6ft
—	1	PCB: MAX7320 Evaluation Kit+

\*EP = Exposed pad.

## Component Suppliers

SUPPLIER	PHONE	WEBSITE
Hong Kong X'tals Ltd.	+852-35112388	www.hongkongcrystal.com
Murata Mfg. Co., Ltd.	770-436-1300	www.murata.com
TDK Corp.	847-803-6100	www.component.tdk.com
Taiyo Yuden	800-348-2496	www.t-yuden.com

**Note:** Indicate that you are using the MAX7320 when contacting these component suppliers.

## MAX7320 EV Kit Files

FILE	DESCRIPTION
MAX7320.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:

- MAX7320 EV kit (USB cable included)
- A user-supplied Windows 2000/XP/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 MAX7320 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,

7320Rxx.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 7320Rxx.msi 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–JU13) are in their default 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 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/Vista.

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- 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\Maxim MAX7320EVKIT** (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 MAX7320 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 write pins O0–O7 to logic-high outputs, check the corresponding **Drive O0 High–Drive O7 High** checkboxes and then press the **Write One Byte** button.

## Detailed Description of Software

The main window of the evaluation software is shown in Figure 1.

To write pins O0–O7 to logic-high outputs, check the corresponding **Drive O0 High–Drive O7 High** checkboxes and then press the **Write One Byte** button.

Pressing **Read One Byte** updates **O0–O7** from the logic levels driven at each output pin.

The **AutoRead** checkbox makes the GUI automatically read approximately every 300ms.

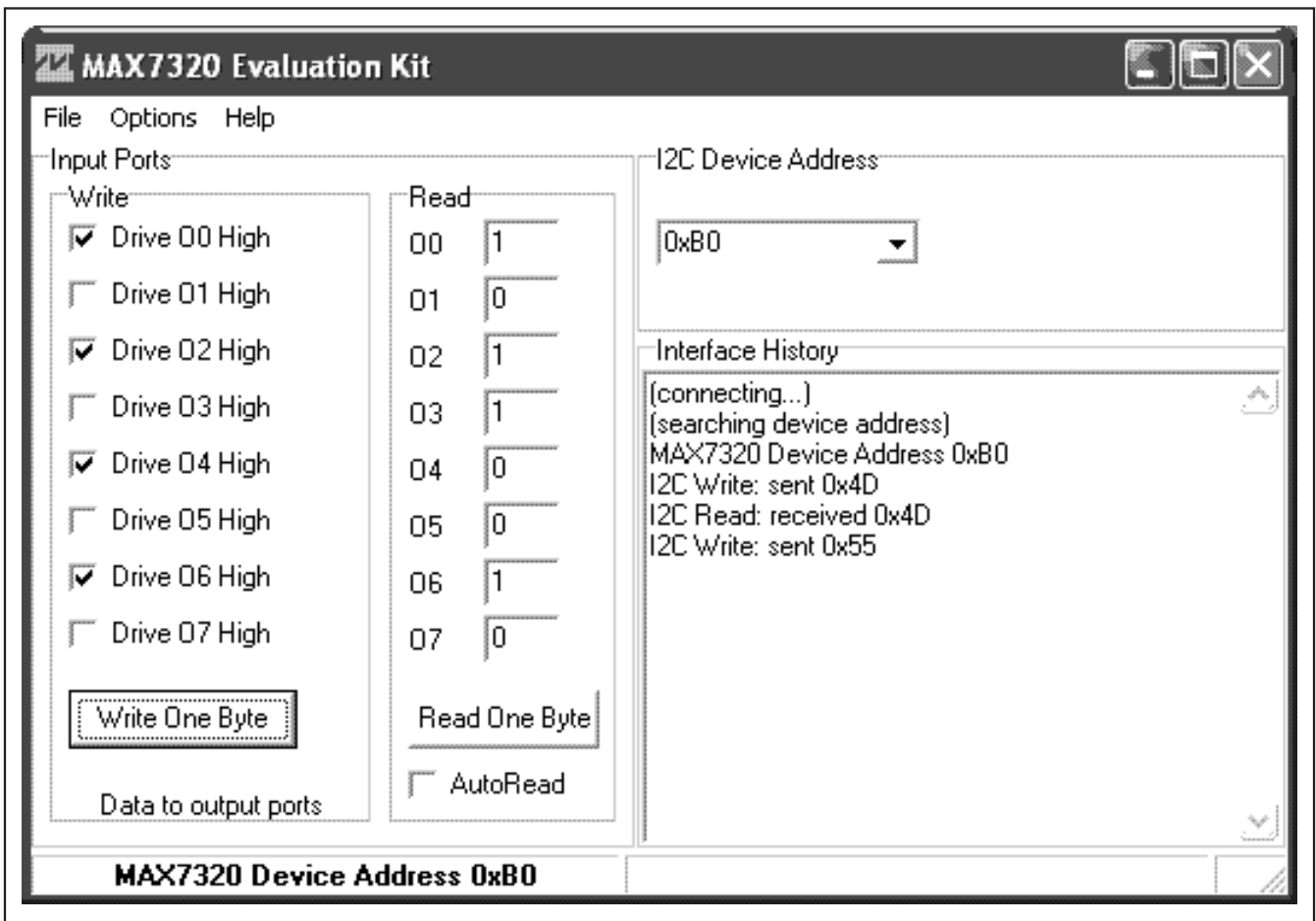


Figure 1. MAX7320 EV Kit Software Main Window

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## Detailed Description of Hardware

The MAX7320 EV kit provides a proven layout for the MAX7320. The microcontroller circuitry (U2, U3, U4, U5, and U6) is equivalent to Maxim's MAXQ2000-based MINIQUSB board. Jumper blocks JU1 and JU3 select the I<sup>2</sup>C device address (see Table 2). Headers H1 and H2 provide labeled test points for all of the MAX7320 pins.

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

To use the MAX7320 EV kit with a user-supplied I<sup>2</sup>C interface, first cut the JU5 and JU6 default traces, disconnecting SCL and SDA from the on-board microcontroller. If the user-supplied I<sup>2</sup>C bus provides its own SCL/SDA pullup resistors, then disable on-board pullup resistors R7 and R8 by cutting the JU12 and JU13 default traces. Next, apply your own 1.71V 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 H2 on the MAX7320 EV kit board.

### **Operation with External 1.71V to 3.6V Supply**

The MAX7320 EV kit is powered completely from the USB port by default.

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

To configure the EV kit to accept user-supplied power between 1.71V and 3.6V:

- 1) Remove shunts from JU4 (if present).
- 2) Connect external power supply between the EXT V+ oval pad and the GND oval pad.
- 3) Move JU2 shunt to the 2-3 position.

### **Operation with External 1.8V 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.

To configure the EV kit to accept user-supplied power between 1.8V and 5.5V requires cutting traces and mounting additional components. The absolute maximum rating of the MAXQ2000 microcontroller is 3.6V—if SCL or SDA ever exceed 3.6V, the microcontroller may be damaged. To protect the MAXQ2000 against high voltage, a level translation circuit can be mounted on the board.

- 1) Obtain the following parts listed below (Maxim does not supply these components).
- 2) Cut the PCB trace that shorts across JU5 and JU6.
- 3) Mount components Q1, Q2, R12, and R14.
- 4) Remove shunts from JU4 (if present).
- 5) Connect external power supply between the EXT V+ oval pad and the GND oval pad.
- 6) Move JU2 shunt to the 2-3 position.

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

**To restore the EV kit, remove Q1 and Q2 and 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  $V_{IH}(\min)$ .

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**Table 1. MAX7320 EV Kit Jumper Descriptions (JU1–JU13)**

JUMPER	SIGNAL	SHUNT POSITION	DESCRIPTION
JU1	AD0	1-2*	AD0 = GND.
		3-4	AD0 = SCL.
		5-6	AD0 = V+.
		7-8	AD0 = SDA.
JU2	V+	1-2*	U1 V+ = VDDIO (3.3V).
		2-3	U1 V+ = external user-provided power. Remove all shunts from JU4 before applying external power.
JU3	AD2	1-2*	AD2 = GND.
		3-4	AD2 = SCL.
		5-6	AD2 = V+.
		7-8	AD2 = SDA.
JU4	Factory Test	Open*	Normal operation.
		1-2	O0 connects to MAXQ2000 GPIO pin for factory test.
		3-4	O1 connects to MAXQ2000 GPIO pin for factory test.
		5-6	O2 connects to MAXQ2000 GPIO pin for factory test.
		7-8	O3 connects to MAXQ2000 GPIO pin for factory test.
		9-10	O4 connects to MAXQ2000 GPIO pin for factory test.
		11-12	O5 connects to MAXQ2000 GPIO pin for factory test.
		13-14	O6 connects to MAXQ2000 GPIO pin for factory test.
JU5	Level Translator	Not installed*	SCL connects directly to MAXQ2000.
		PCB trace cut open	See the <i>Operation with External 1.8V to 5.5V Supply</i> section.
JU6	Level Translator	Not installed*	SDA connects directly to MAXQ2000.
		PCB trace cut open	See the <i>Operation with External 1.8V to 5.5V Supply</i> section.
JU10	SDA	Not installed*	SDA connected to on-board I <sup>2</sup> C bus.
		PCB trace cut open	SDA must be connected to an external I <sup>2</sup> C bus.
JU11	SCL	Not installed*	SCL connected to on-board I <sup>2</sup> C bus.
		PCB trace cut open	SCL must be connected to an external I <sup>2</sup> C bus.
JU12	SDA	Not installed*	SDA connected to on-board pullup resistor.
		PCB trace cut open	SDA pullup resistor must be provided externally.
JU13	SCL	Not installed*	SCL connected to on-board pullup resistor.
		PCB trace cut open	SCL pullup resistor must be provided externally.

\*Default position.

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Table 2. MAX7320 Device Address Selection and Default Power-Up Output State

JU3	AD2	JU1	AD0	DEVICE ADDRESS	POWER-UP DEFAULT O7–O4	POWER-UP DEFAULT O3–O0
3-4	SCL	1-2	GND	0xA0 = 1010 000 R/W	1111	0000
3-4	SCL	5-6	V+	0xA2 = 1010 001 R/W	1111	1111
3-4	SCL	3-4	SCL	0xA4 = 1010 010 R/W	1111	1111
3-4	SCL	7-8	SDA	0xA6 = 1010 011 R/W	1111	1111
7-8	SDA	1-2	GND	0xA8 = 1010 100 R/W	1111	0000
7-8	SDA	5-6	V+	0xAA = 1010 101 R/W	1111	1111
7-8	SDA	3-4	SCL	0xAC = 1010 110 R/W	1111	1111
7-8	SDA	7-8	SDA	0xAE = 1010 111 R/W	1111	1111
1-2	GND	1-2	GND	0xB0 = 1011 000 R/W	0000	0000
1-2	GND	5-6	V+	0xB2 = 1011 001 R/W	0000	1111
1-2	GND	3-4	SCL	0xB4 = 1011 010 R/W	0000	1111
1-2	GND	7-8	SDA	0xB6 = 1011 011 R/W	0000	1111
5-6	V+	1-2	GND	0xB8 = 1011 100 R/W	1111	0000
5-6	V+	5-6	V+	0xBA = 1011 101 R/W	1111	1111
5-6	V+	3-4	SCL	0xBC = 1011 110 R/W	1111	1111
5-6	V+	7-8	SDA	0xBE = 1011 111 R/W	1111	1111

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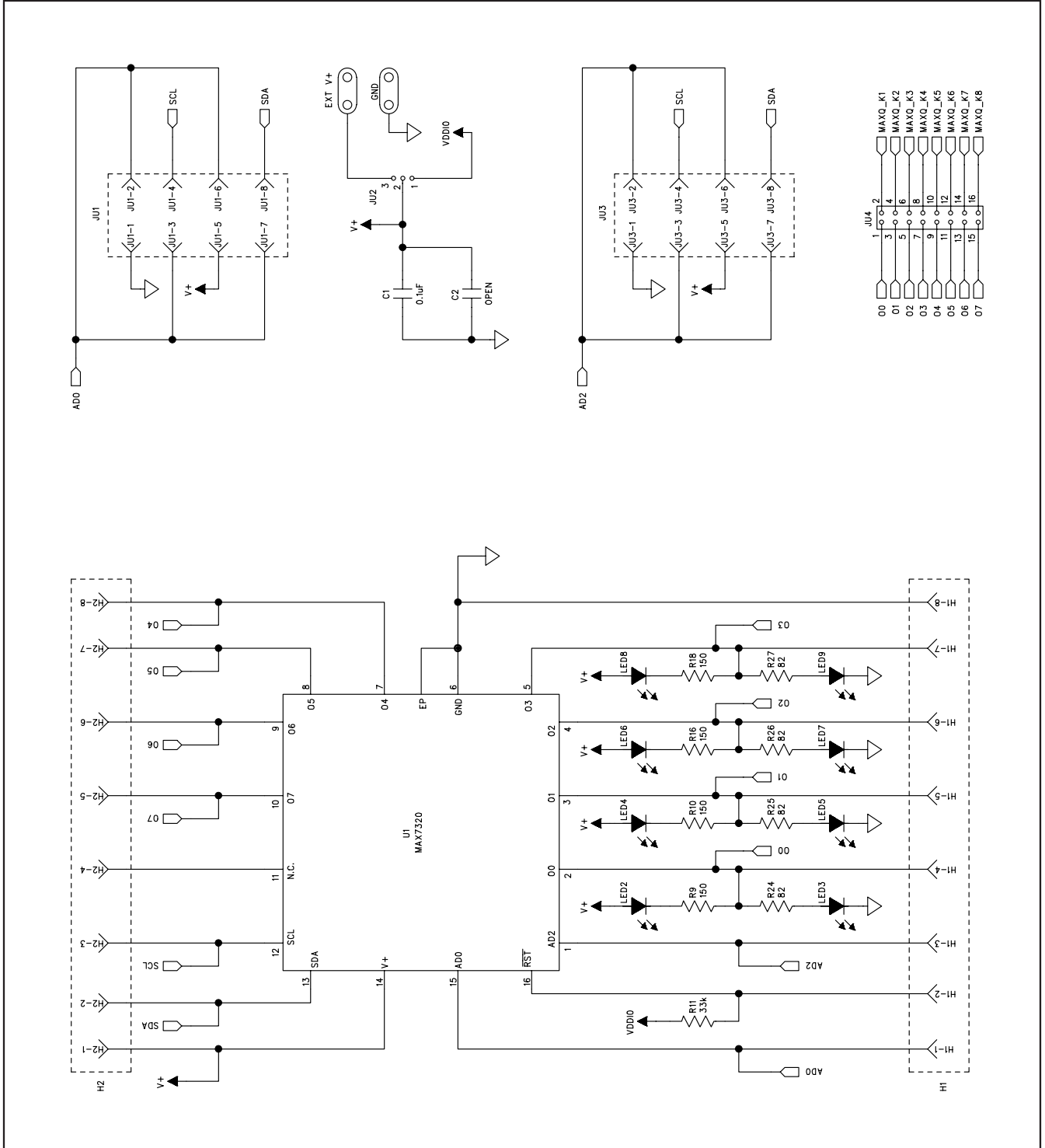


Figure 2a. MAX7320 EV Kit Schematic (Sheet 1 of 2)

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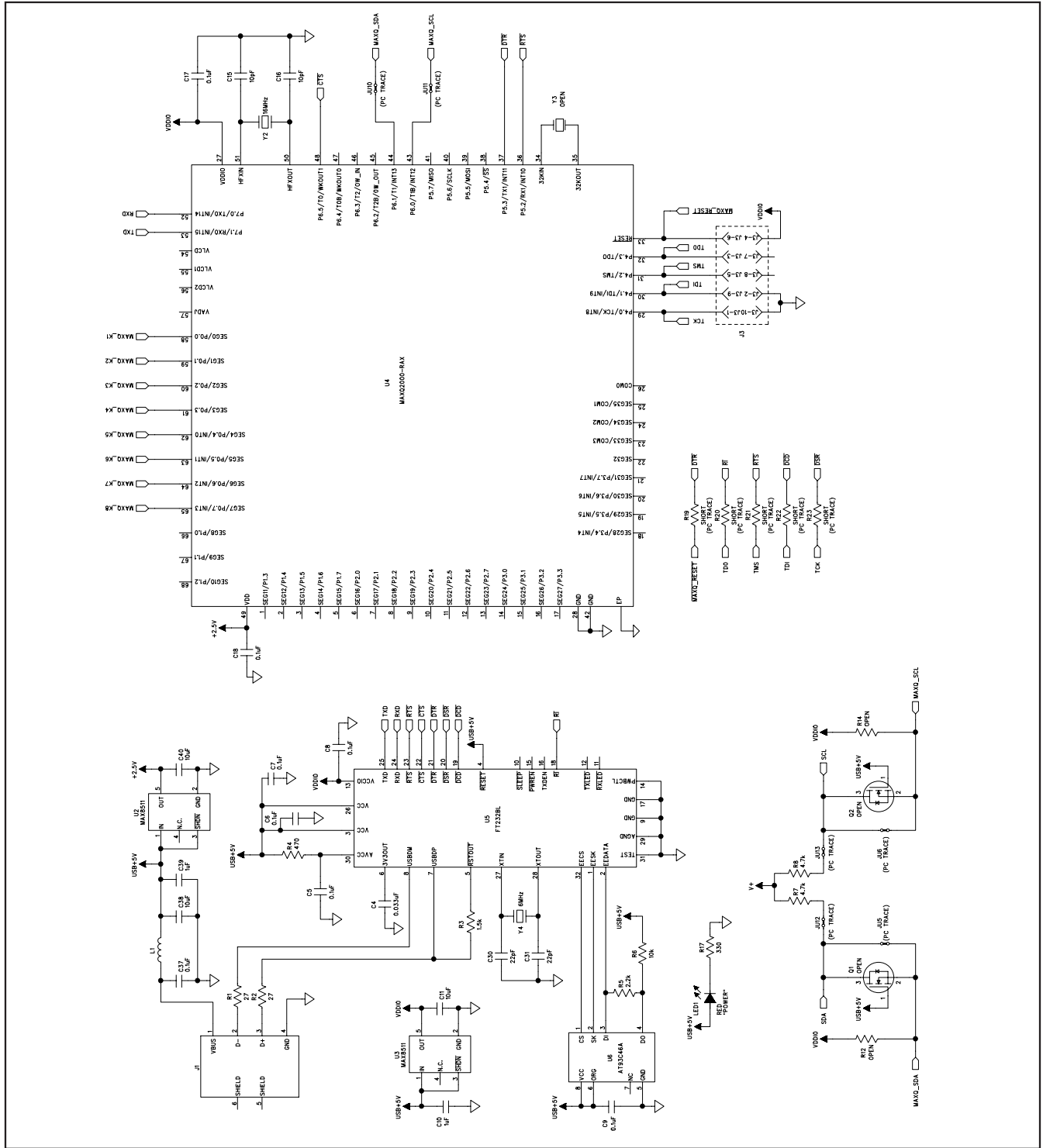


Figure 2b. MAX7320 EV Kit Schematic (Sheet 2 of 2)



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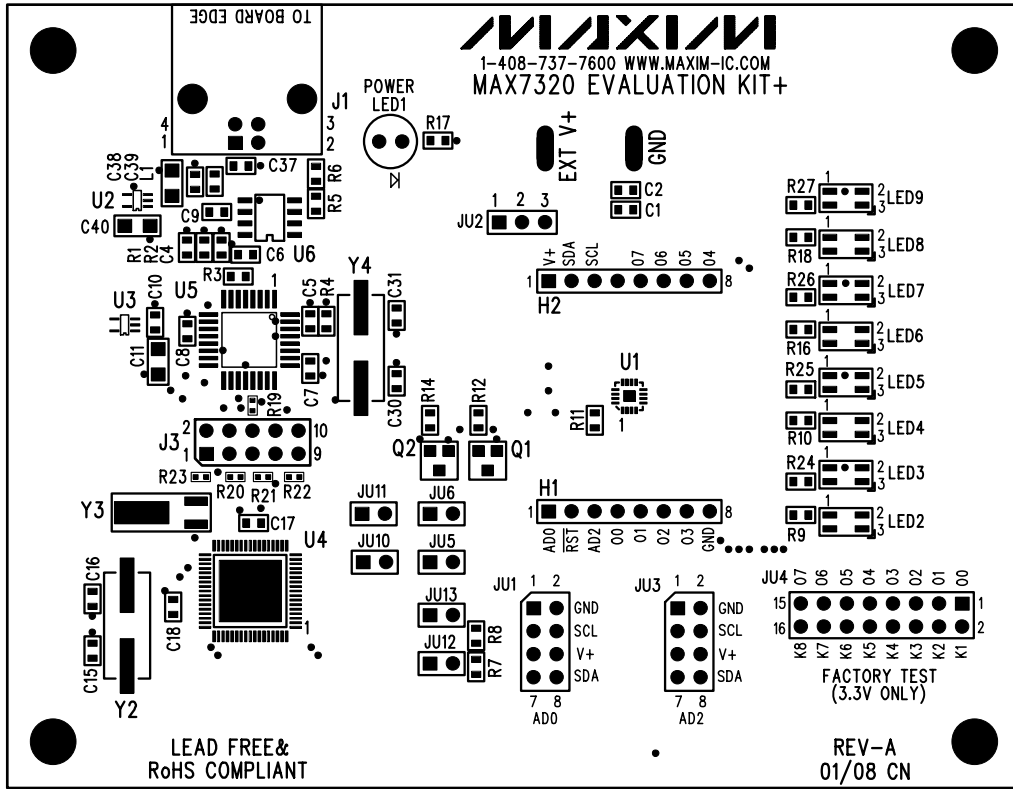


Figure 3. MAX7320 EV Kit Component Placement Guide—Component Side

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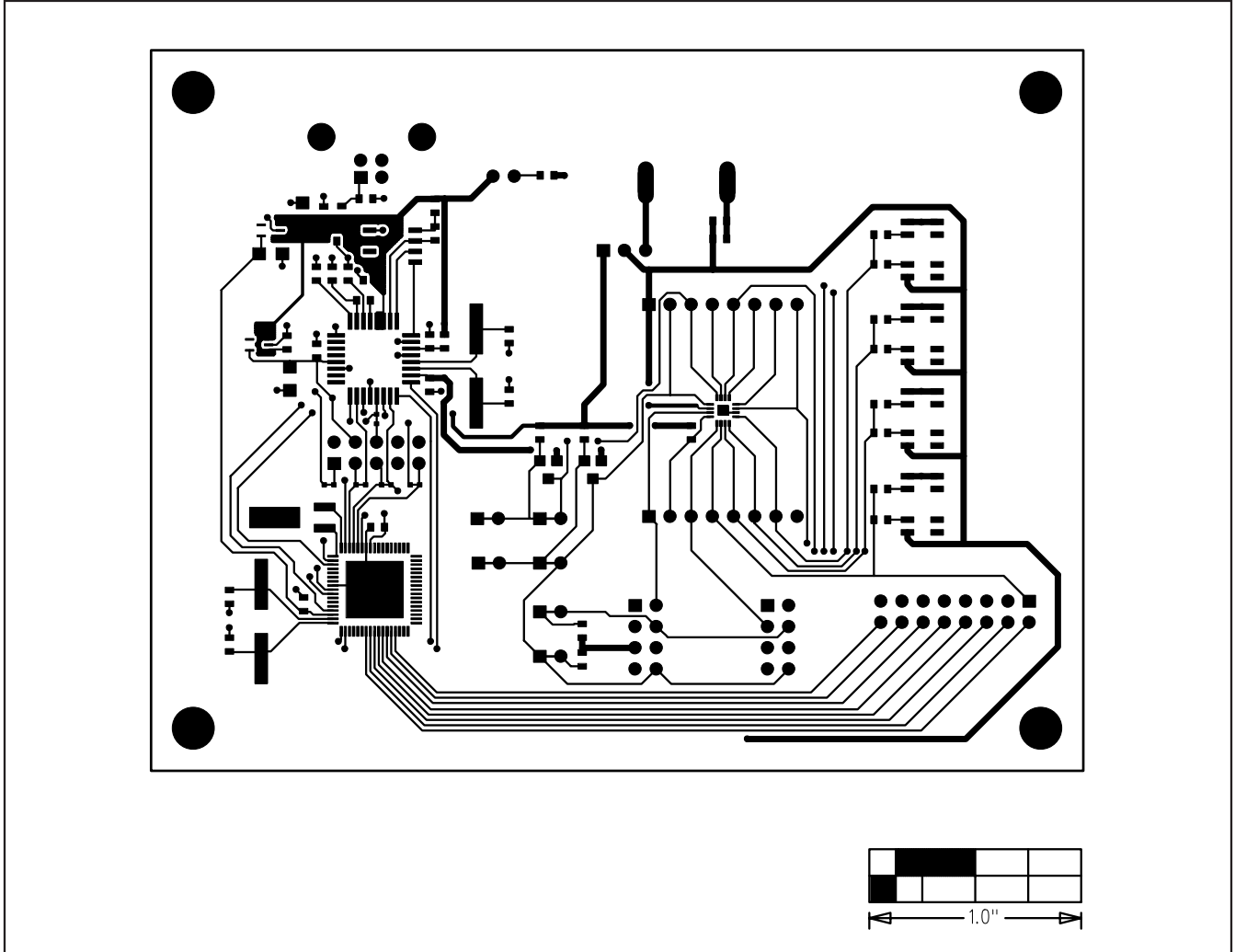


Figure 4. MAX7320 EV Kit PCB Layout—Component Side

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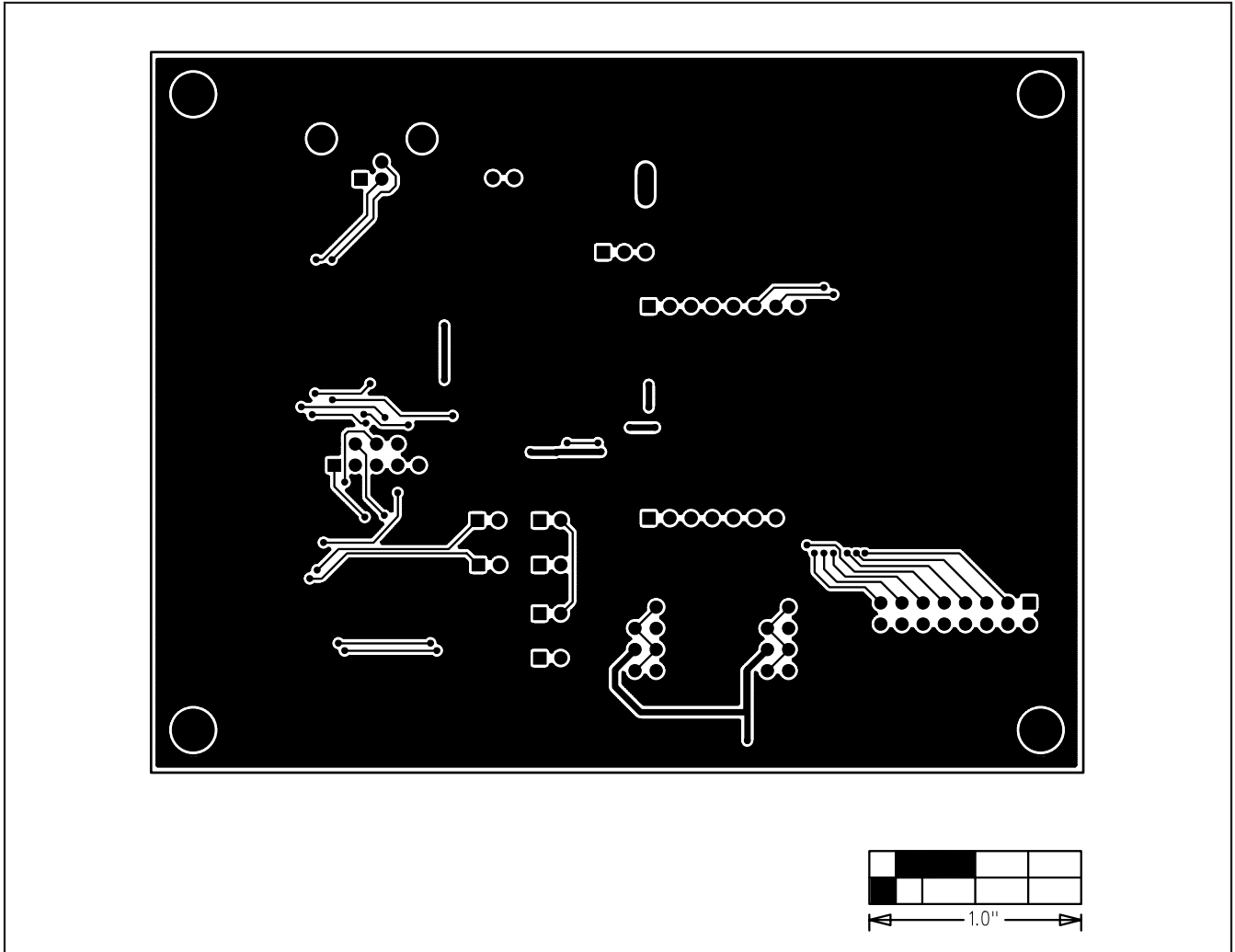


Figure 5. MAX7320 EV Kit PCB Layout—Solder Side

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