19-4387; Rev 0; 11/08

# MAX9675 Evaluation Kit

Evaluates: MAX9675

## General Description

The MAX9675 evaluation kit (EV kit) provides a proven design to evaluate the MAX9675 nonblocking 16 x 16 video crosspoint switch with buffered inputs and outputs. The EV kit provides access to all of the inputs and outputs. 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 MAX9675.

The MAX9675 EV kit PCB comes with a MAX9675ECQ+ installed.

## Features

- **BNC Connectors for All Inputs and Outputs**
- **Windows 2000/XP- and Windows Vista (32-Bit)-Compatible Software**
- **USB-PC Connection (Cable Included)**
- **Lead-Free and RoHS Compliant**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

## Ordering Information

| PART | TYPE |
|---|---|
| MAX9675EVKIT+ | EV Kit |

*+Denotes lead-free and RoHS compliant.*

## Component List

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C1, C12, C14 | 3 | 10µF ±20%, 16V X5R ceramic capacitors (1206) Murata GRM31CR61C106M |
| C2, C3 | 2 | 22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J |
| C4 | 1 | 0.033µF ±10%, 16V X5R ceramic capacitor (0603) Taiyo Yuden EMK107BJ333KA |
| C5–C10 , C17, C18, C19–C38 | 28 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K |
| C11, C13, C39–C46 | 10 | 1µF ±10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K |
| C15, C16 | 2 | 10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J |
| C47, C48 | 2 | 10µF ±20% 10V tantalum capacitors (B case) AVX TAJB106M010 |
| IN00–IN15, OUT00–OUT15 | 32 | 75Ω BNC female jacks, 4 pins, 0.250in spacing (top mount) |
| J1 | 1 | USB type-B right-angle PC-mount receptacle |
| J2 | 1 | 5-position terminal block |
| J16 | 1 | Dual-row (2 x 8) 16-pin header |
| JU1–JU4, JU6–JU13 | 12 | 3-pin headers |
| L1 | 1 | Ferrite bead TDK MMZ1608R301A (0603) |
| 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 | 1 | 169kΩ ±1% resistor (0603) |
| R8 | 1 | 100kΩ ±1% resistor (0603) |
| R9–R13, R46 | 0 | Not installed, resistors (0603) R9–R13 are short (PC trace); R46 is open |
| R14–R45 | 32 | 75Ω ±1% resistors (0603) |
| U1 | 1 | Video crosspoint switch (100 TQFP) Maxim MAX9675ECQ+ |
| U2 | 1 | Adjustable output LDO regulator (5 SC70) Maxim MAX8512EXK+T |
| U3 | 1 | +2.5V LDO regulator (5 SC70) Maxim MAX8511EXK25+T |
| U4 | 1 | USB-to-UART converter (32 TQFP) |
| U5 | 1 | 93C46 type 3-wire EEPROM (8 SO) |

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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.**

## Component List (continued)

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| U6 | 1 | Low-power microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+ |
| U7–U10 | 4 | Level translators (10 µMAX®) Maxim MAX1840EUB+ |
| Y1 | 1 | 16MHz crystal Hong Kong X'tals SSM1600000E18FAF |
| Y2 | 1 | 6MHz crystal Hong Kong X'tals SSL6000000E18FAF |
| Y3 | 0 | Not installed, crystal |
| — | 12 | Shunts |
| — | 1 | USB high-speed A-to-B cable, 6ft |
| — | 1 | PCB: MAX9675 Evaluation Kit+ |

**EP = Exposed pad.*

## Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|---|---|---|
| AVX Corporation | 843-946-0238 | www.avxcorp.com |
| 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 MAX9675 when contacting these component suppliers.*

## MAX9675 EV Kit Files

| FILE | DESCRIPTION |
|---|---|
| INSTALL.EXE | Installs the EV kit files on your computer |
| MAX9675.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 |

## Quick Start

### Required Equipment

Before beginning, the following equipment is needed:

- MAX9675 EV kit (USB cable included)
- One +5V/250mA analog power supply
- One -5V/250mA analog power supply
- One +5V/50mA digital power supply
- A user-supplied Windows 2000/XP- or Windows Vista-compatible PC with a spare USB port
- Video signal generator (e.g., Tektronix TG-700 or similar)
- The appropriate video measurement equipment (e.g., Tektronix VM700 or similar)

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**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 MAX9675 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, 9675Rxx.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) Turn off all power supplies.
4) Connect the ground terminal of the +5V digital power supply to pin 4 of the J2 connector.
5) Connect the positive terminal of the +5V digital power supply to pin 5 of the J2 connector.
6) Connect the ground terminal of the +5V analog power supply to pin 2 of the J2 connector.
7) Connect the positive terminal of the +5V analog power supply to pin 1 of the J2 connector.

8) Connect the ground terminal of the -5V analog power supply to pin 2 of the J2 connector.
9) Connect the negative terminal of the -5V analog power supply to pin 3 of the J2 connector.
10) Verify that all jumpers are in their default positions, as shown in Table 1.
11) Connect the output of the video signal generator to the IN00 connector on the MAX9675 EV kit.
12) Connect the OUT00 connector of the MAX9675 EV kit to the input of the video measurement equipment.
13) Turn on all power supplies.
14) Turn on the video signal generator.
15) Connect the USB cable from the PC to the EV kit board. A **New Hardware Found** window pops up 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.
16) 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\MAX9675** (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.
17) Start the MAX9675 EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window appears, as shown in Figure 1.
18) Check the **Output Enable** checkbox in the **Individual Output Setting** group box.
19) Press the **Program** button.
20) On the video measurement equipment, verify that the output signal matches the input signal.

## Table 1. Jumper Settings (JU1–JU4, JU6–JU13)

| JUMPER | SHUNT POSITION | DESCRIPTION |
|---|---|---|
| JU1–JU4 | 1-2 | Connects the address pin to VDD |
| | 2-3* | Connects the address pin to ground |
| JU6 | 1-2* | MISO signal connected to on-board microcontroller |
| | 2-3 | Connect external MISO signal to pin 1 of the J16 connector |
| JU7 | 1-2* | MOSI signal connected to on-board microcontroller |
| | 2-3 | Connect external MOSI signal to pin 3 of the J16 connector |
| JU8 | 1-2* | SCLK signal connected to on-board microcontroller |
| | 2-3 | Connect external SCLK signal to pin 5 of the J16 connector |
| JU9 | 1-2* | $\overline{CE}$ signal connected to on-board microcontroller |
| | 2-3 | Connect external $\overline{CE}$ signal to pin 7 of the J16 connector |
| JU10 | 1-2* | $\overline{AOUT}$ signal connected to on-board microcontroller |
| | 2-3 | Connect external $\overline{AOUT}$ signal to pin 9 of the J16 connector |
| JU11 | 1-2* | MODE signal connected to on-board microcontroller |
| | 2-3 | Connect external MODE signal to pin 11 of the J16 connector |
| JU12 | 1-2* | $\overline{RESET}$ signal connected to on-board microcontroller |
| | 2-3 | Connect external $\overline{RESET}$ signal to pin 13 of the J16 connector |
| JU13 | 1-2* | $\overline{UPDATE}$ signal connected to on-board microcontroller |
| | 2-3 | Connect external $\overline{UPDATE}$ signal to pin 15 of the J16 connector |

**Default position.*

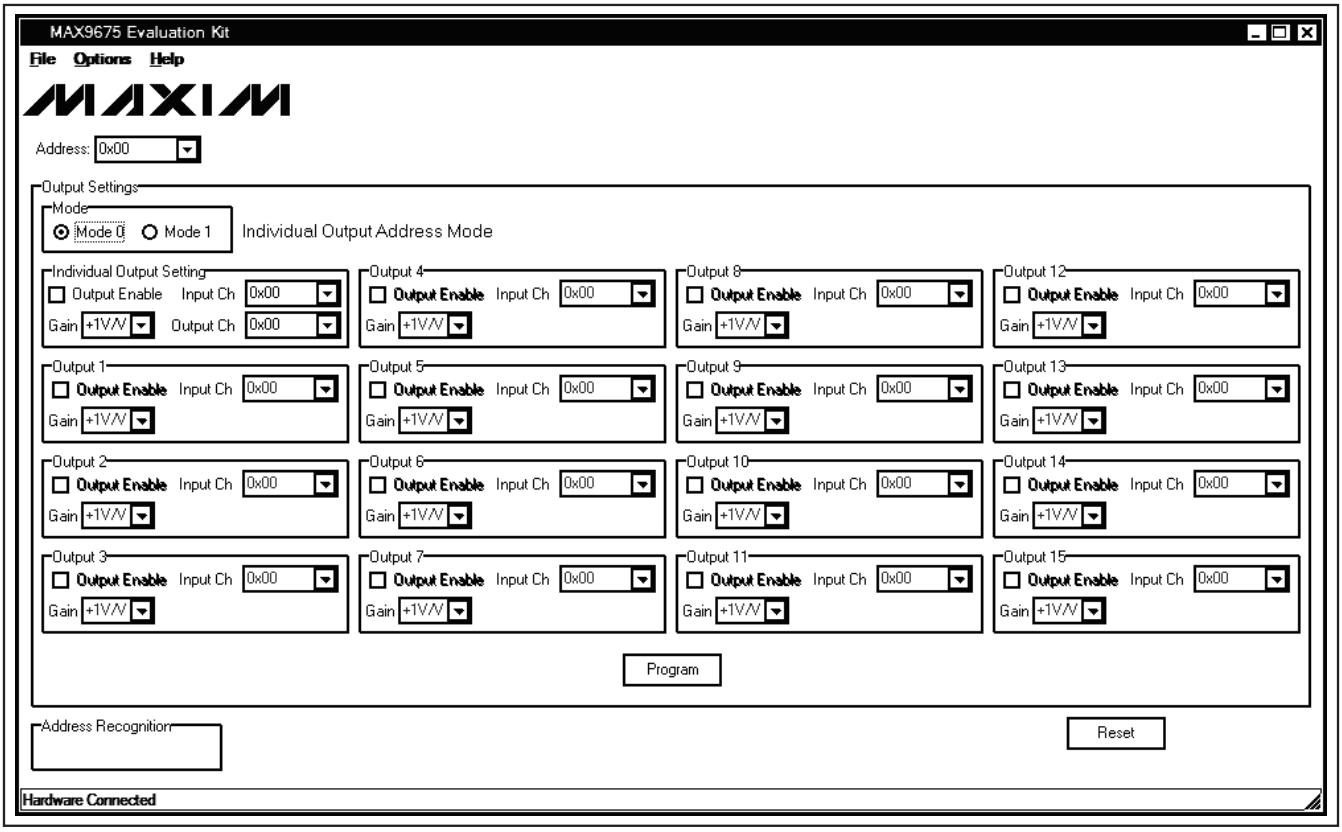



*Figure 1. MAX9675 EV Kit Software Main Window (Individual Output Address Mode)*

## Detailed Description of Software

The MAX9675 EV kit software main window shown in Figure 1 contains a device **Address** drop-down list, an **Output Settings** group box, an **Address Recognition** group box, and a device **Reset** button.

### Device Address

Select the appropriate device address in the **Address** drop-down list according to the jumper settings on JU1–JU4. Jumpers JU1–JU4 configure the logic levels on the address pins of the MAX9675.

### Output Settings

The **Output Settings** group box has all of the functions to configure the outputs of the MAX9675.

In the **Mode** group box, click on the **Mode 0** radio button to select the individual output address mode. Click on the **Mode 1** radio button to select the complete matrix mode. In the individual output address mode, only one output is configured at a time. In the complete matrix mode, all outputs are configured in one SPI™ command.

When the **Mode 0** radio button is selected, use the **Individual Output Setting** group box to configure an output. In the **Individual Output Setting** group box, use the **Output Ch** drop-down list to select the target output channel. Use the **Input Ch** drop-down list to select the input channel. A 1V/V or 2V/V gain can be set by the **Gain** drop-down list. Check the **Output Enable** checkbox to enable the selected output channel. After the **Individual Output Setting** group box is configured, press the **Program** button to send the SPI command to the MAX9675. The $\overline{\text{UPDATE}}$ pin of the MAX9675 will also be pulled low to transfer data from the mode registers to the switch matrix in the MAX9675.

*SPI is a trademark of Motorola, Inc.*

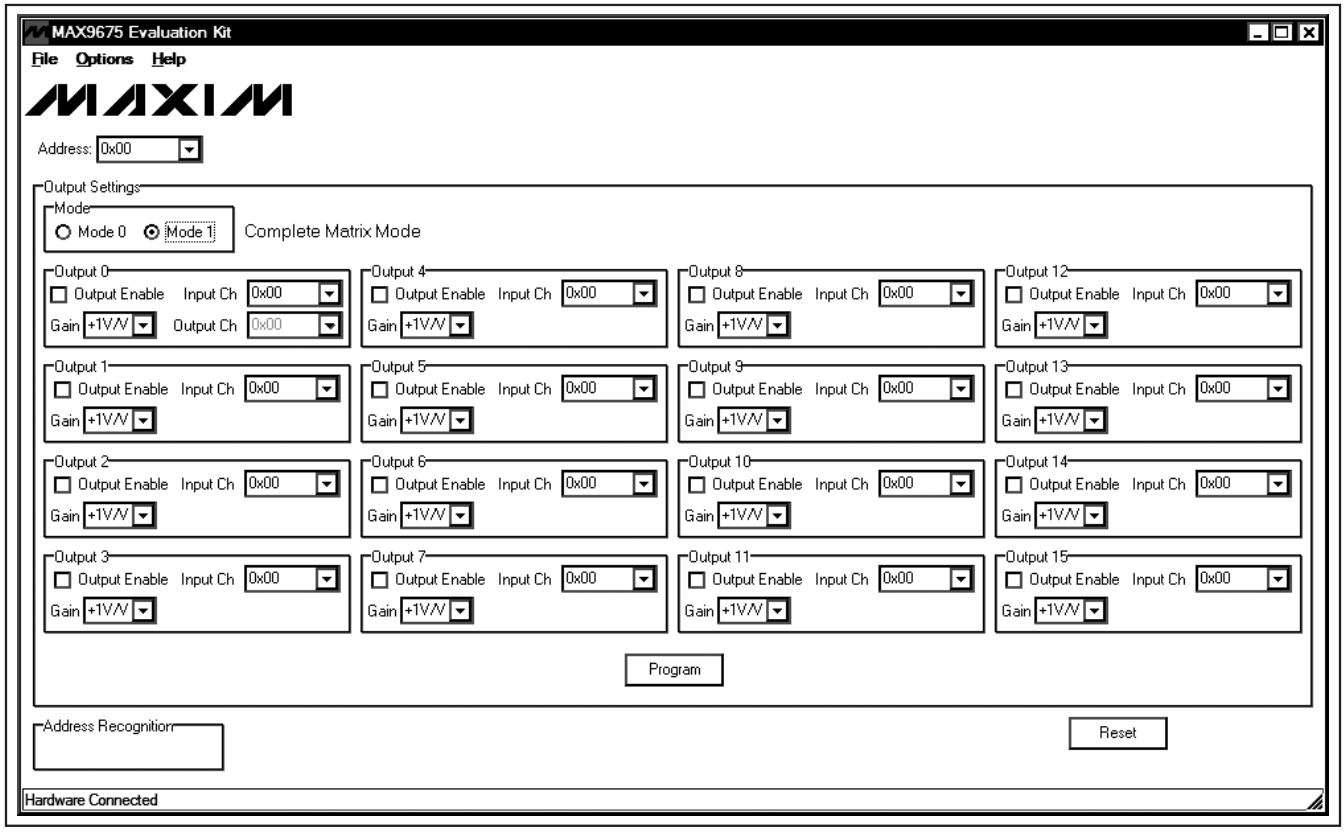



*Figure 2. MAX9675 EV Kit Software Main Window (Complete Matrix Mode)*

When the **Mode 1** radio button is selected, as shown in Figure 2, the **Individual Output Setting** group box becomes the **Output 0** group box, which is used to configure output channel 0. All other output group boxes are used to configure their corresponding output channels. Use the **Input Ch** drop-down list to select the input channel for the corresponding output channel. Check the appropriate **Output Enable** checkbox to enable the corresponding output channel. A 1V/V or 2V/V gain can be set using the **Gain** drop-down list. After all of the output group boxes are configured, press the **Program** button to send the 96-bit SPI command to the MAX9675. The $\overline{\text{UPDATE}}$ pin of the MAX9675 will be pulled low to transfer data from the mode registers to the switch matrix in the MAX9675.

After the **Program** button is pressed and the SPI command is sent to the MAX9675, and if the device address in the **Address** drop-down list is correct, the address recognition output ($\overline{\text{AOUT}}$) will assert low. In addition, the **AOUT Asserted** label in the **Address Recognition** group box will appear.

Press the **Reset** button to pull the $\overline{\text{RESET}}$ pin of the MAX9675 low to reset the device.

## Detailed Description of Hardware

The MAX9675 is a nonblocking 16 x 16 video crosspoint switch with buffered inputs and outputs. The MAX9675 EV kit has BNC connectors for all of the inputs and outputs.

### User-Supplied SPI Interface

To use the MAX9675 EV kit with a user-supplied SPI interface, move the shunts of JU6–JU13 to the 2-3 position. Connect the user-supplied SPI signals to the appropriate pins on J16. See Table 2 for the pin description of header J16.

### Device Address

JU1–JU4 set the logic levels of the address programming input pins A0–A3, respectively. Place the shunt in the 1-2 position to drive the corresponding address programming input pin high. Place the shunt in the 2-3 position to drive the corresponding address programming input pin low.

**Table 2. Pin Description of the User-Interface Header (J16)**

| PIN | DESCRIPTION |
|---|---|
| 1 | MISO |
| 2, 4, 6, 8, 10, 12, 14, 16 | Digital ground |
| 3 | MOSI |
| 5 | SCLK |
| 7 | $\overline{CE}$ |
| 9 | $\overline{AOUT}$ |
| 11 | MODE |
| 13 | $\overline{RESET}$ |
| 15 | $\overline{UPDATE}$ |

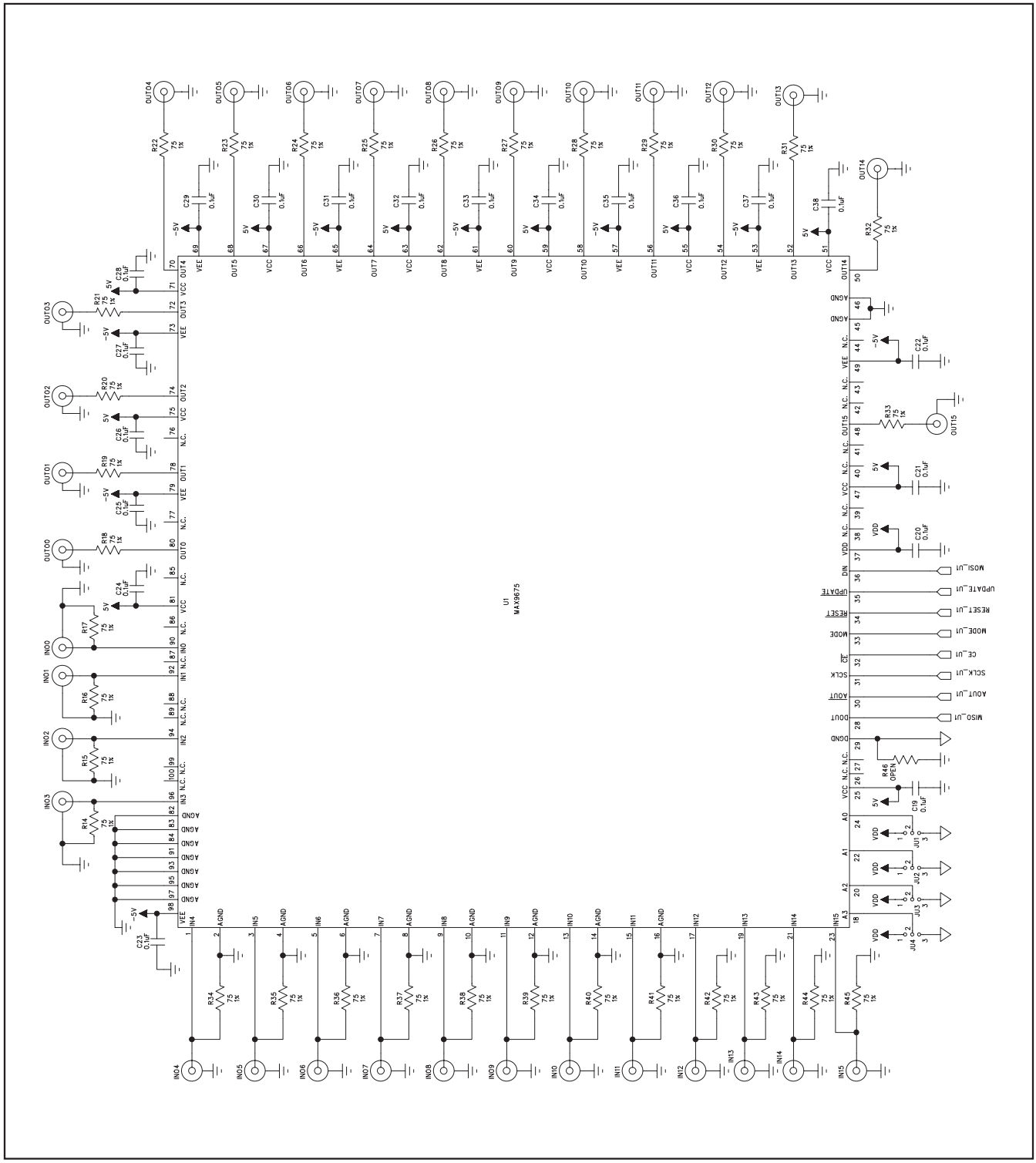


Figure 3a. MAX9675 EV Kit Schematic (Sheet 1 of 3)

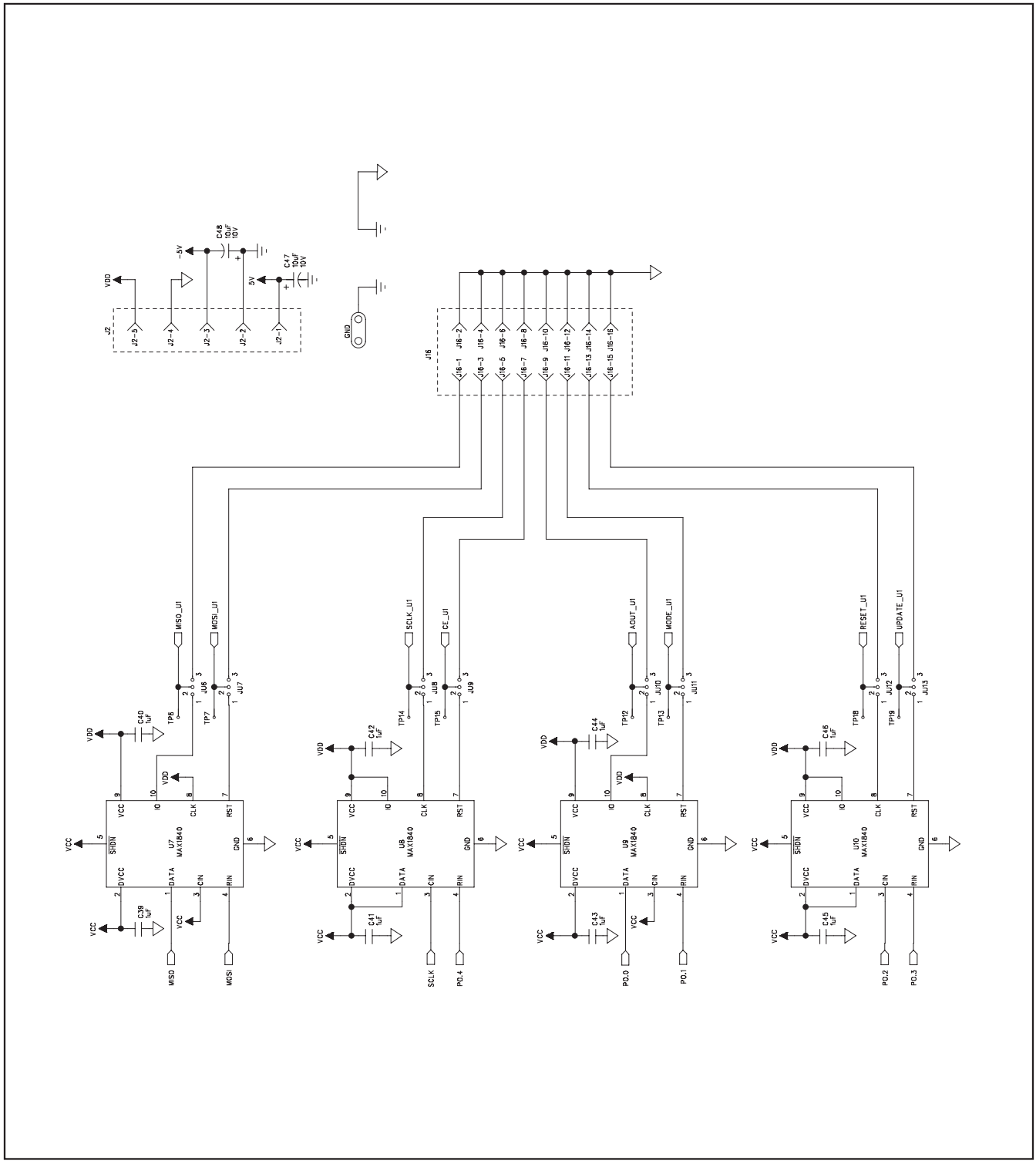



*Figure 3b. MAX9675 EV Kit Schematic (Sheet 2 of 3)*

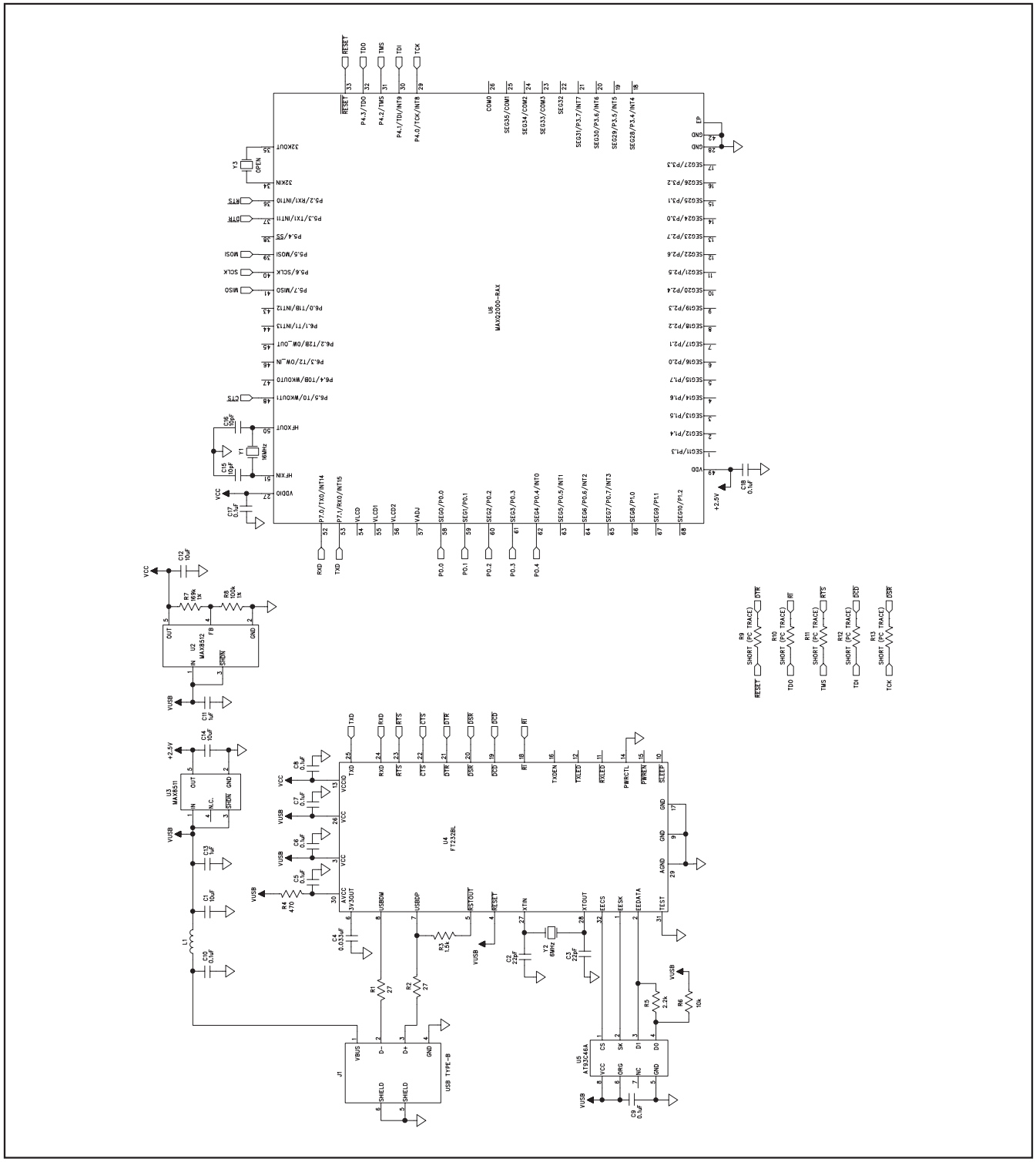


Figure 3c. MAX9675 EV Kit Schematic (Sheet 3 of 3)

# MAX9675 Evaluation Kit

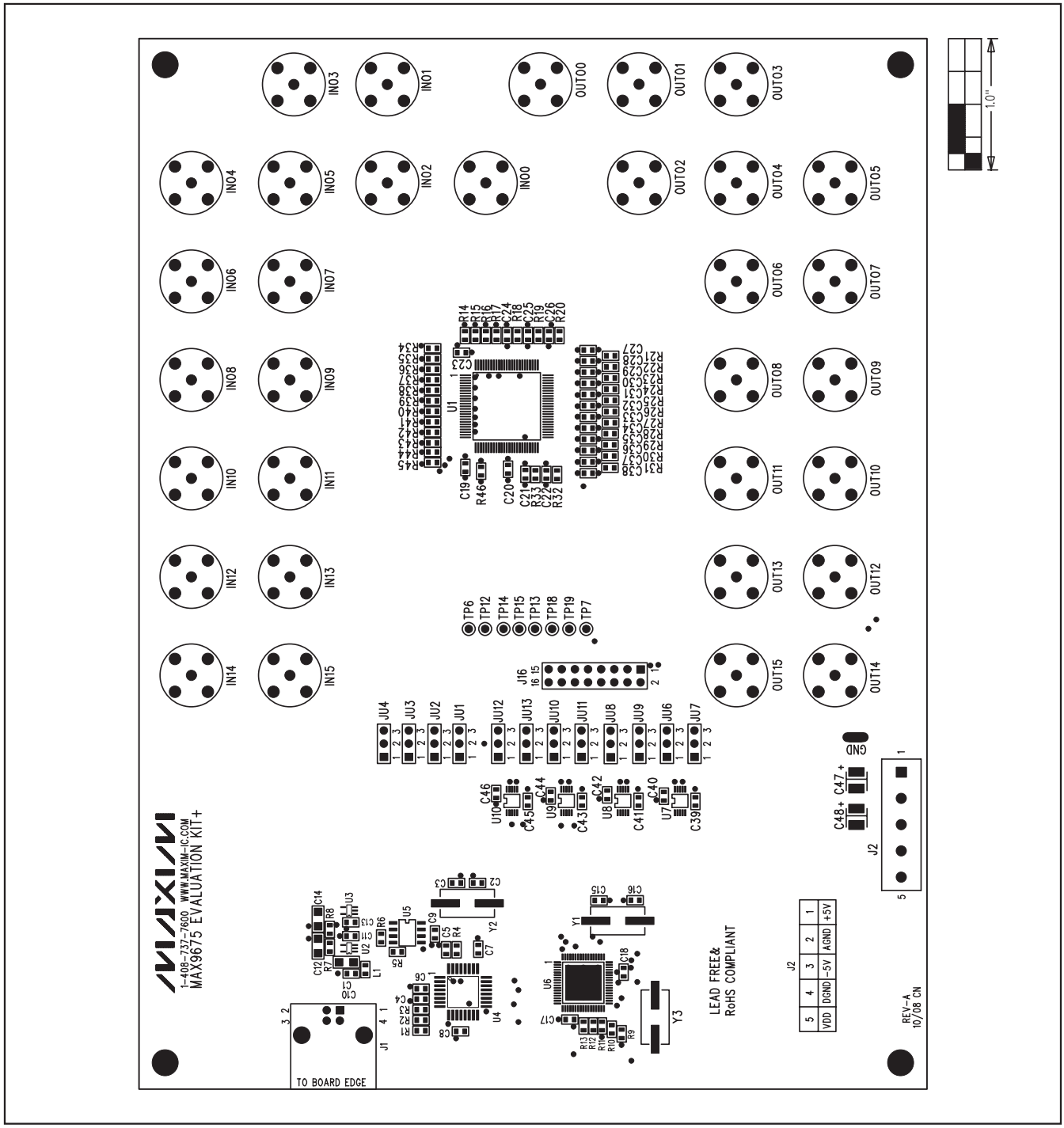



*Figure 4. MAX9675 EV Kit Component Placement Guide—Component Side*

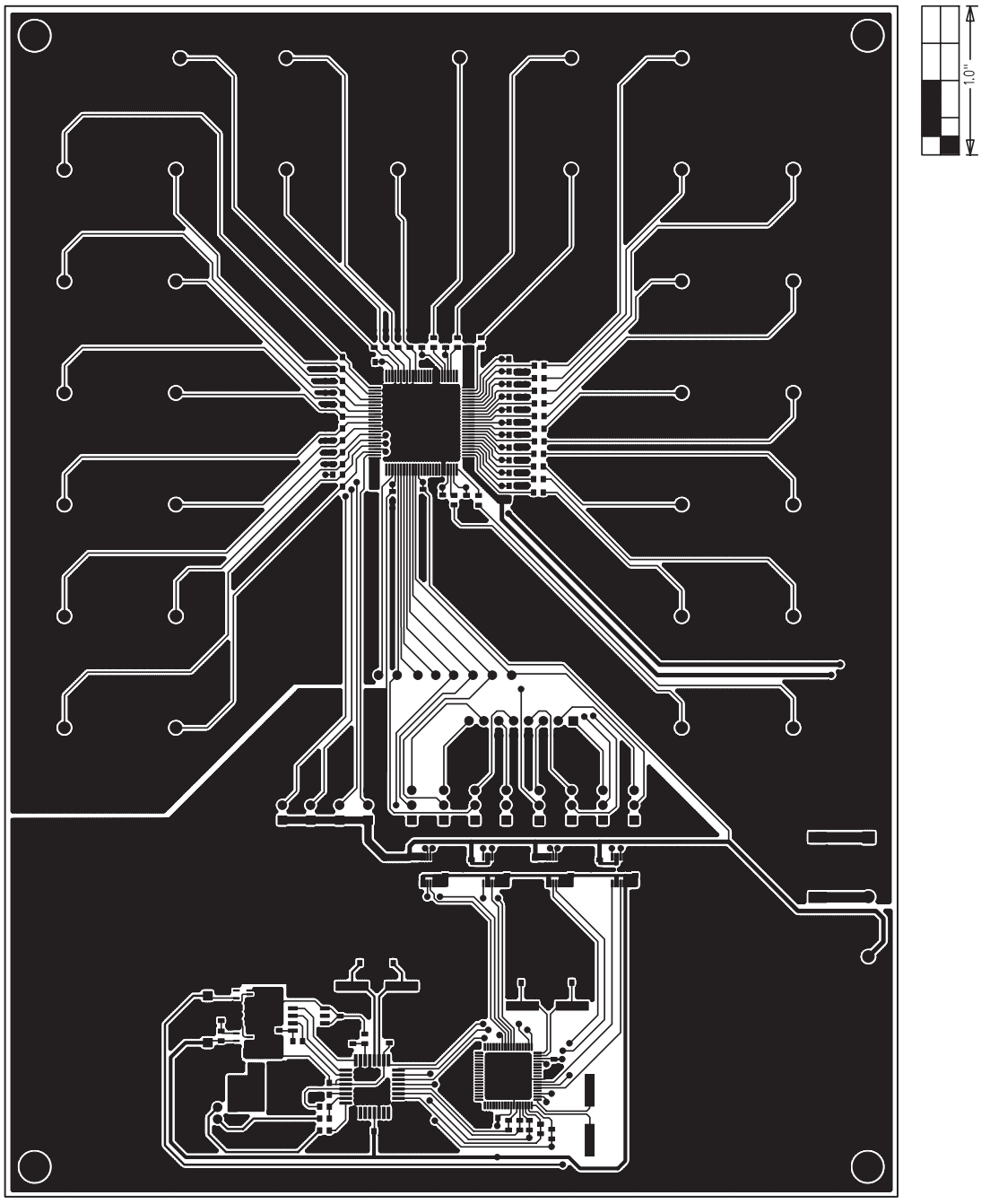



*Figure 5. MAX9675 EV Kit PCB Layout—Component Side*

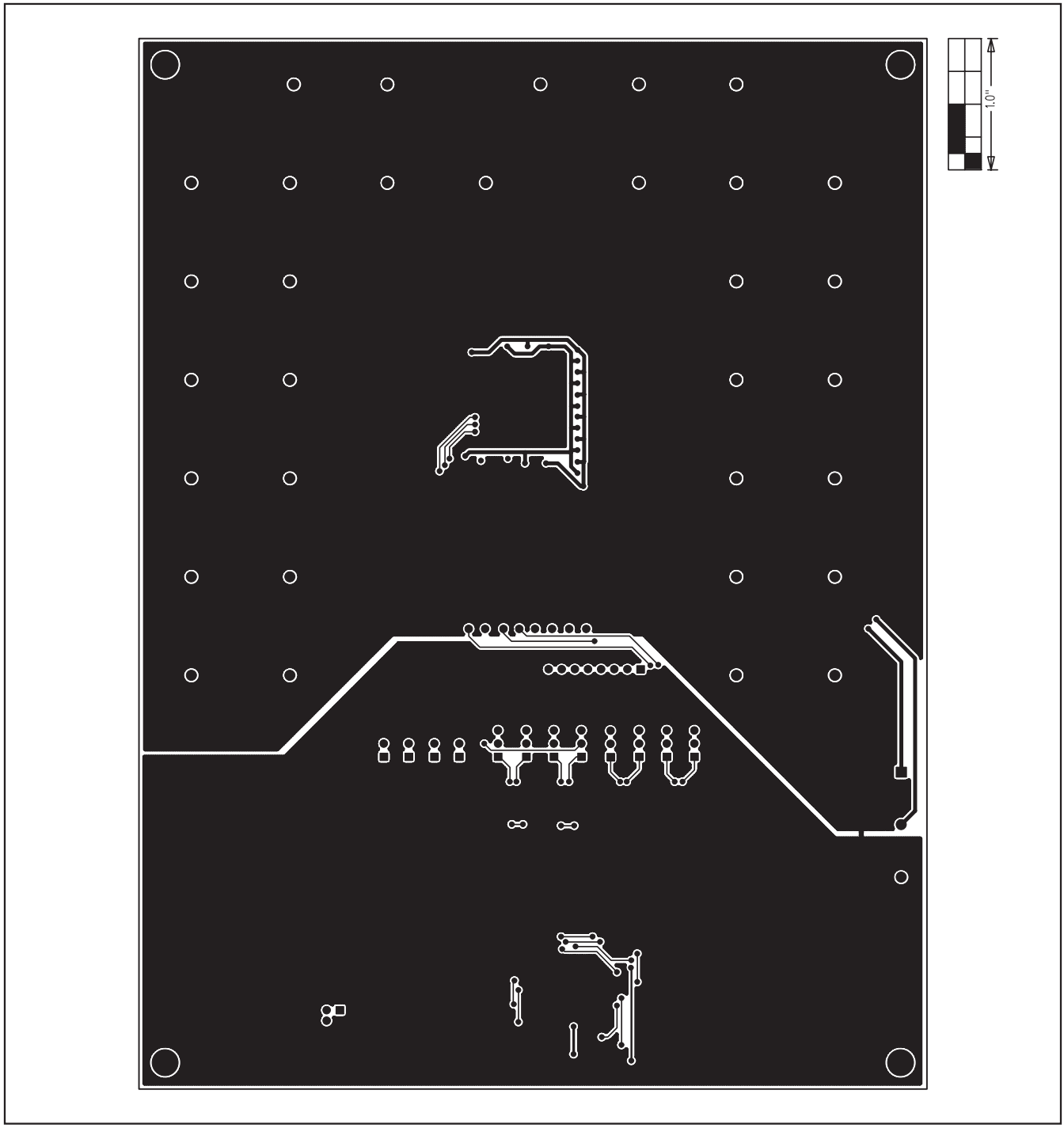



*Figure 6. MAX9675 EV Kit PCB Layout—Solder Side*

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