19-6014; Rev 1; 4/12

# MAX1231B/MAX11633/MAX11635 Evaluation Systems

# Evaluate: MAX1030/MAX1031/MAX1230/ MAX1231/MAX11624/MAX11625/ MAX11632–MAX11635/MAX11642/MAX11643

## General Description

The MAX1231B/MAX11633/MAX11635 evaluation systems (EV systems) include one master board and one of three daughter boards. The EV systems also include Windows XP®-, Windows Vista®-, and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the various ADCs. The master board (MAX116XXSPIMB) connects to a PC's USB port and allows the transfer of SPI commands to the corresponding daughter board.

The daughter boards are fully assembled and tested PCBs that demonstrate the capabilities of the MAX1030, MAX1031, MAX1230, MAX1231, MAX11624, MAX11625, MAX11632–MAX11635, MAX11642, and MAX11643 300ksps, 8-/10-/12-bit, 3V/5V, low-power, high-speed SPI ADCs with internal or external references.

Each EV kit daughter board evaluates different ADCs, but only the default ADC referenced in the EV kit daughter board is installed on the board. Contact the factory for free samples of the other pin-compatible ADCs to evaluate these devices or to order individual boards.

## Features

- **USB Powered (No External Power Supply Required)**
- **Daughter Board Powered by the Master Board**
- **4/16 ADC Channel Inputs**
- **10MHz SPI Interface**
- **Windows XP-, Windows Vista-, and Windows 7-Compatible Software**
- **Time Domain, Frequency Domain, and Histogram Plotting in the EV System Software**
- **Frequency, RMS, Min, Max, and Average DC Calculations in the EV System Software**
- **Collects Up to One Million Samples**
- **On-Board Voltage Reference**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

***Ordering Information/Selector Guide* appears at end of data sheet.**

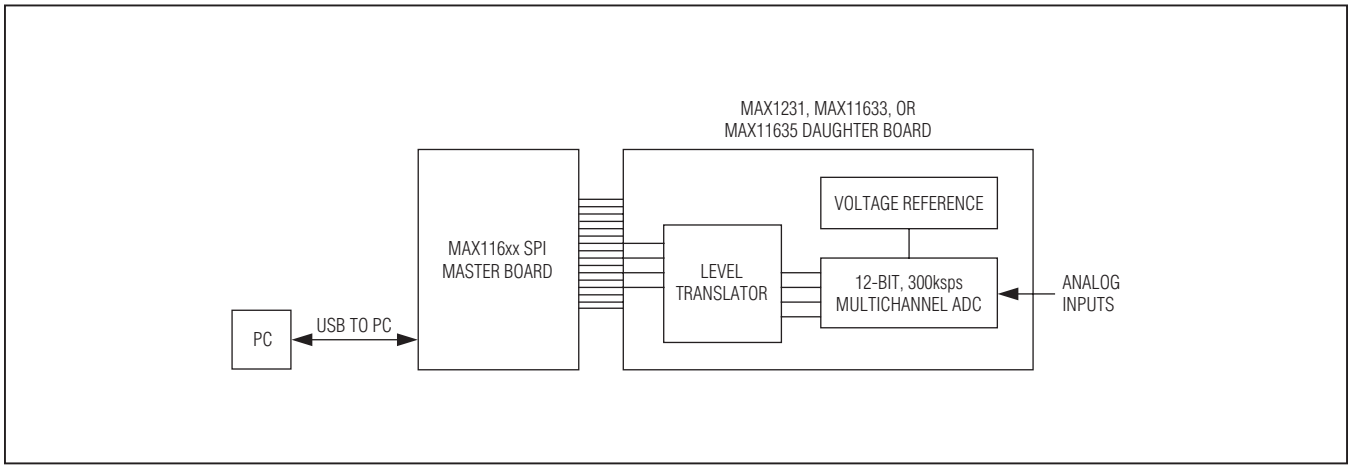


*Figure 1. EV System Block Diagram*

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



**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

### MAX116XX SPI Master Board

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C1–C17 | 17 | 47nF ±10%, 16V, X7R ceramic capacitors (0603) Murata GRM188R71C473K |
| C18–C33 | 16 | 1nF ±10%, 50V, X7R ceramic capacitors (0603) Murata GRM188R71H102K |
| C34, C52 | 2 | 1µF ±10%, 16V X5R ceramic capacitors (0603) Murata GRM188R61C105K |
| C35, C42, C46, C50, C53–C56, C60, C61, C62, C64, C65, C66 | 14 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K |
| C36, C39 | 2 | 0.01µF ±10%, 50V, X7R ceramic capacitors (0603) Murata GRM188R71H103K |
| C37, C44, C45 | 3 | 10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J |
| C38 | 1 | 15pF ±5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H150J |
| C40, C41 | 2 | 39pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H390J |
| C43, C49, C51, C63, C67, C68, C70 | 7 | 10µF ±10%, 25V, X5R ceramic capacitors (1206) Murata GRM31CR61E106K |
| C47, C48, C69 | 3 | 4.7µF ±10%, 25V X5R ceramic capacitors (1206) Murata GRM31CR71E475M |
| C57 | 1 | 0.033µF ±10%, 16V X5R ceramic capacitor (0603) Taiyo Yuden EMK107BJ333KA |
| C58, C59 | 2 | 22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J |
| C71, C72 | 2 | 47µF ±20%, 6.3V capacitors (B1) SANYO 6TPC47MB |
| DGND, DVDD | 2 | Uninsulated banana jacks |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| J1 | 1 | Dual-row, 20-pin (2 x 10) right-angle male header |
| J2 | 0 | Not installed, dual-row 24-pin (2 x 12) header |
| J3 | 1 | USB type-B right-angle PC-mount receptacle |
| JSPI | 0 | Not installed, 6-pin header |
| JTAG1 | 1 | 6-pin header |
| JTAG2 | 1 | Dual-row, 10-pin (2 x 5) header |
| JU1–JU4 | 0 | Not installed, 2-pin headers |
| JU5 | 0 | Not installed, 3-pin header |
| JU6–JU9 | 4 | 2-pin headers |
| JU10 | 1 | 3-pin header |
| L1 | 1 | Ferrite bead (0603) TDK MMZ1608R301A |
| L2 | 1 | 22µH, 0.11Ω, 300mA inductor Coilcraft DS1608C-223ML |
| LED1, LED2, LED3 | 3 | Red LEDs (0603) |
| R1, R3, R4, R19, R21, R22, R23, R24 | 8 | 4.7kΩ ±5% resistors (0603) |
| R2, R16, R17, R18 | 4 | 100Ω ±5% resistors (0603) |
| R5 | 1 | 390Ω ±5% resistor (0603) |
| R6, R7, R8, R27, R36 | 5 | 10kΩ ±5% resistors (0603) |
| R9, R10, R11 | 3 | 200Ω ±5% resistors (0603) |
| R12, R14, R25, R29 | 4 | 10Ω ±5% resistors (0603) |
| R13 | 1 | 150Ω ±5% resistor (0603) |
| R15 | 1 | 56Ω ±5% resistor (0603) |
| R20, R28 | 2 | 680Ω ±5% resistors (0603) |
| R26 | 1 | 1kΩ ±5% resistor (0603) |
| R30 | 1 | 18.7kΩ ±1% resistor (0603) |
| R31, R43, R44, R46, R50, R53 | 6 | 10kΩ ±1% resistors (0603) |
| R32, R33 | 2 | 27Ω ±5% resistors (0603) |
| R34 | 1 | 1.5kΩ ±5% resistor (0603) |
| R35 | 1 | 2.2kΩ ±5% resistor (0603) |

## Component Lists (continued)

### MAX116XX SPI Master Board (continued)

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| R37–R41 | 0 | Not installed, resistors—short (PC trace) |
| R42, R45, R51 | 3 | 100kΩ ±5% resistors (0603) |
| R47 | 1 | 20kΩ ±1% resistor (0603) |
| R48 | 1 | 470Ω ±5% resistor (0603) |
| R49 | 1 | 30kΩ ±1% resistor (0603) |
| R52 | 1 | 34kΩ ±1% resistor (0603) |
| R54 | 1 | 1MΩ ±5% resistor (0603) |
| S1 | 1 | 4-position switch |
| U1 | 1 | Spartan 3A FPGA (144 TQFP) Xilinx XC3S50A-4TQG144I |
| U2 | 1 | Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+ |
| U3 | 0 | Not installed, Xilinx PROM |
| U4 | 1 | Atmel SPI Flash (8 SO) Atmel AT45DB161D-SU |
| U5 | 1 | SRAM (48 TSOP) Cypress CY62167DV30LL-55ZXI |
| U6, U7, U11 | 3 | LDOs (16 TSSOP-EP*) Maxim MAX1793EUE50+ |
| U8 | 1 | USB-to-UART converter (32 TQFP) |
| U9 | 1 | 93C46-type 3-wire EEPROM (8 SO) |
| U10 | 1 | LDO (6 SOT23) Maxim MAX1983EUT+ |
| U12 | 1 | Step-up regulator (8 µMAX®) Maxim MAX1795EUA+ |
| Y1 | 1 | 50MHz oscillator |
| Y2 | 1 | 6MHz crystal Hong Kong X'tals SSL60000N1HK188F0-0 |
| Y3 | 0 | Not installed, crystal |
| Y4 | 1 | 16MHz crystal Hong Kong X'tals SSM16000N1HK188F0-0 |
| — | 1 | USB high-speed A-to-B cables, 6ft |
| — | 5 | Shunts |
| — | 1 | PCB: MAX116XX SPI MASTER BOARD |

**EP = Exposed pad.*

### MAX1231B EV Kit Daughter Board

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| AIN0–AIN15 | 16 | Yellow multipurpose test points |
| C1, C4 | 2 | 1µF ±10%, 10V X5R ceramic capacitors (0402) Murata GRM155R61A105K |
| C2, C3 | 2 | 10µF ±20%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106M |
| C5, C6, C7, C12 | 4 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K |
| C8–C11, C33 | 0 | Not installed, ceramic capacitors (0603) |
| C14–C29 | 16 | 0.01µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C103K |
| C30, C31, C32 | 3 | 0.1µF ±10%, 16V X7R ceramic capacitors (0402) Murata GRM155R71C104K |
| D1 | 1 | Red LED (0603) |
| GND | 3 | Black multipurpose test points |
| J1 | 1 | 20-pin (2 x 10) right-angle female header |
| J2, J3 | 2 | Dual-row, 16-pin (2 x 8) headers |
| JU1, JU2, JU4 | 3 | 3-pin headers |
| R1 | 1 | 470Ω ±5% resistor (0603) |
| R3–R18 | 16 | 10Ω ±5% resistors (0603) |
| REF+, REF-, VDD | 3 | Red multipurpose test points |

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## Component Lists (continued)

### MAX1231B EV Kit Daughter Board (continued)

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| SW1, SW2 | 2 | 8-channel SPST DIP switches |
| U1 | 1 | 12-bit, 16-channel ADC (24 QSOP) Maxim MAX1231BEEG+ |
| U2 | 1 | Voltage reference (8 SO) Maxim MAX6126AASA25+ |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| U3 | 0 | Not installed, voltage reference (8 SO) |
| U4 | 1 | Level translator (24 TSSOP) Maxim MAX3002EEUP+ |
| — | 3 | Shunts |
| — | 1 | PCB: MAX1231B EVALUATION KIT |

### MAX11633 EV Kit Daughter Board

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| AIN0–AIN15 | 16 | Yellow multipurpose test points |
| C1, C4 | 2 | 1µF ±10%, 10V X5R ceramic capacitors (0402) Murata GRM155R61A105K |
| C2, C3 | 2 | 10µF ±20%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106M |
| C5, C6, C7, C12 | 4 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K |
| C8–C11 | 0 | Not installed, ceramic capacitors (0603) |
| C14–C29 | 16 | 0.01µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C103K |
| C30, C31, C32 | 3 | 0.1µF ±10%, 16V X7R ceramic capacitors (0402) Murata GRM155R71C104K |
| D1 | 1 | Red LED (0603) |
| GND | 2 | Black multipurpose test points |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| J1 | 1 | 20-pin (2 x 10) right-angle female header |
| J2, J3 | 2 | Dual-row, 16-pin (2 x 8) headers |
| JU1, JU2, JU4 | 3 | 3-pin headers |
| R1 | 1 | 470Ω ±5% resistor (0603) |
| R3–R18 | 16 | 10Ω ±5% resistors (0603) |
| REF, VDD | 2 | Red multipurpose test points |
| SW1, SW2 | 2 | 8-channel SPST DIP switches |
| U1 | 1 | 12-bit, 16-channel ADC (24 QSOP) Maxim MAX11633EEG+ |
| U2 | 1 | Voltage reference (8 SO) Maxim MAX6126AASA25+ |
| U3 | 0 | Not installed, voltage reference (8 SO) |
| U4 | 1 | Level translator (24 TSSOP) Maxim MAX3002EEUP+ |
| — | 3 | Shunts |
| — | 1 | PCB: MAX11633 EVALUATION KIT |

### MAX11635 EV Kit Daughter Board

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| AIN0–AIN3 | 4 | Yellow multipurpose test points |
| C1, C4 | 2 | 1µF ±10%, 10V X5R ceramic capacitors (0402) Murata GRM155R61A105K |
| C2, C3 | 2 | 10µF ±20%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106M |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C5, C6, C7, C12, C18 | 5 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K |
| C8–C11 | 0 | Not installed, ceramic capacitors (0603) |
| C14–C17 | 4 | 0.01µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C103K |

## Component Lists (continued)

### MAX11635 EV Kit Daughter Board (continued)

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C30, C31, C32 | 3 | 0.1µF ±10%, 16V X7R ceramic capacitors (0402) Murata GRM155R71C104K |
| D1 | 1 | Red LED (0603) |
| GND | 3 | Black multipurpose test points |
| J1 | 1 | 20-pin (2 x 10) right-angle female header |
| J2 | 1 | Dual-row, 16-pin (2 x 8) header |
| JU1, JU2 | 2 | 3-pin headers |
| JU4 | 1 | 2-pin header |
| R1 | 1 | 470Ω ±5% resistor (0603) |
| R3–R6 | 4 | 10Ω ±5% resistors (0603) |
| REF+, REF-, VDD | 3 | Red multipurpose test points |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| SW1 | 1 | 8-channel SPST DIP switch |
| U1 | 1 | 12-bit, 4-channel ADC (16 QSOP) Maxim MAX11635EEE+ |
| U2 | 1 | Voltage reference (8 SO) Maxim MAX6126AASA25+ |
| U3 | 0 | Not installed, voltage reference (8 SO) |
| U4 | 1 | Level translator (24 TSSOP) Maxim MAX3002EEUP+ |
| — | 3 | Shunts |
| — | 1 | PCB: MAX11635 EVALUATION KIT |

## Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|---|---|---|
| Coilcraft, Inc. | 847-639-6400 | www.coilcraft.com |
| Hong Kong X'tals Ltd. | 852-35112388 | www.hongkongcrystal.com |
| Murata Electronics North America, Inc. | 770-436-1300 | www.murata-northamerica.com |
| SANYO Electric Co., Ltd. | 619-661-6835 | www.sanyo.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 MAX1231, MAX11633, or MAX11635 when contacting these component suppliers.*

## MAX1231B/MAX11633/MAX11635 EV System Files

| FILE | DESCRIPTION |
|---|---|
| INSTALL.EXE | Installs the EV system files on your computer |
| MAX116XXSPIMB.EXE | Application program |
| CDM20600.EXE | Installs the USB device driver |
| UNINSTALL.EXE | Uninstalls the EV system software |
| USB_Driver_Help_200.PDF | USB driver installation help file |

## Quick Start

### Required Equipment

- MAX1231B, MAX11633, or MAX11635 EV system
- MAX116XX SPI master board (USB cable included)
- One of the three EV kit daughter boards
- Function generator
- Windows XP, Windows Vista, or Windows 7 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 system software. Text in **bold and underlined** refers to items from the Windows operating system.

### Procedure

Each EV system 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 system software, 116XXSPIMBRxx.ZIP. Save the EV system software to a temporary folder and uncompress the ZIP file.
2) Install the EV system software and USB driver on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. During software installation, some versions of Windows may show a warning message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with installation. Administrator privileges are required to install the USB device driver on Windows.
3) Carefully connect the boards by aligning the daughter board's 20-pin connector with the 20-pin header on the MAX116XX SPI master board. Gently press them together.
4) Verify that all jumpers are in their default positions for the master board (Table 1) and the jumpers for the selected EV kit daughter board (Tables 2, 3, and 4).
5) Connect the positive terminal of the signal generator to the AIN0 connector on the EV kit daughter board. Connect the negative terminal of the signal generator to the GND connector on the EV kit daughter board.
6) Enable the signal generator. Set the signal source to generate a 1kHz, $1V_{P-P}$ sinusoidal wave with 1V offset.
7) Connect the USB cable from the PC to the master board. A Windows message appears when connecting the master board to the PC for the first time. Each version of Windows has a slightly different message. If you see a Windows message stating **ready to use**, then proceed to the next step. Otherwise, open the USB_Driver_Help_200.PDF document in the Windows **Start | Programs** menu to verify that the USB driver was installed successfully.
8) Start the MAX116XX SPI EV system software by opening its icon in the **Start | Programs** menu. The EV system software device selection window appears, as shown in Figure 2. Select the appropriate device from the **Select the ADC device** drop-down list. The EV system software main window appears, as shown in Figure 3.
9) Select **2048** from the **Number of Samples** drop-down list in the **Data Logging** group box.
10) Enter **300** into the **Sample Rate (ksps)** edit box to set the maximum sampling rate.
11) Check the **Remove DC** checkbox to remove the DC component of the sampled data.
12) Press the **Start Conversion** button.
13) Verify the **Frequency** of approximately 1kHz, the **RMS** value of 1.06V, the **MIN** value of 0.50V, the **MAX** value of 1.50V, and the **Avg DC** value of 1V are displayed in the **Calculation** group box.

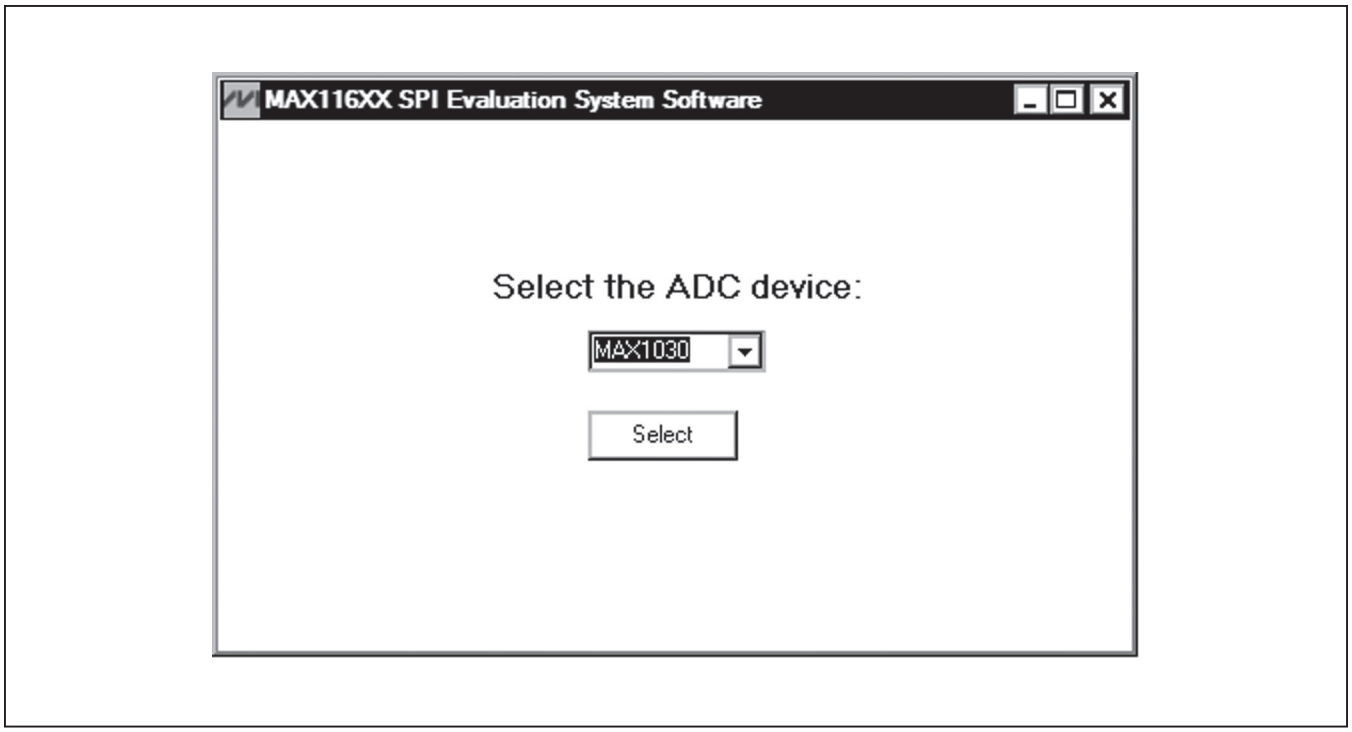



*Figure 2. MAX116XX SPI EV System Software Device Selection Window*

## Detailed Description of Software

The MAX116XX SPI EV system software supports the MAX1231/MAX11633/MAX11635 family of ADC devices. When the EV system software starts up, select the appropriate device from the **Select the ADC device** drop-down list shown in Figure 2. Press the **Select** button to bring up the main software window.

The main window of the evaluation software (Figure 3) contains a **Device Configuration** group box, a **Data Logging** group box, and four tab sheets to display the sampled data.

### Device Configuration

The **Device Configuration** group box is used to configure the selected ADC device.

Use the drop-down list in the **Ref Voltage and AIN_/REF Setting** group box to select the source of the voltage reference and configure the property of the AIN_/REF pin of the ADC device. If the source of the voltage reference is set to VDD or external reference, enter the actual voltage value in the **Reference Voltage** edit box. This value is used to calculate the voltage from the ADC code.

The drop-down list in the **Channel Select** group box configures the ADC's channel selection register that determines which analog input channels are to be used for conversion.

In the **Scan Mode** group box, use the drop-down list to select one of the four scan modes. Press the **Info** button to bring up a scanning configuration table for reference (Figure 4).

In the **Averaging Settings** group box, the user can enable the averaging mode, write to the averaging register to configure the ADC to average up to 32 samples for each requested result, and control the number of results requested for single-channel scans.

Select one of the four different clock modes in the **Clock Mode** group box. Press the **Info** button to bring up a clock mode selection table for reference (Figure 5).

All input channels are configurable for single-ended or differential inputs in unipolar or bipolar mode. The user can configure the input channels in the **Input Type** group box. If the selected ADC device has an internal temperature sensor, check the **Temperature Measurement** checkbox to enable the temperature reading.

Press the **Reset All Registers** button to reset the ADC registers to their default settings. Press the **Clear FIFO** button to clear the ADC FIFO buffer.

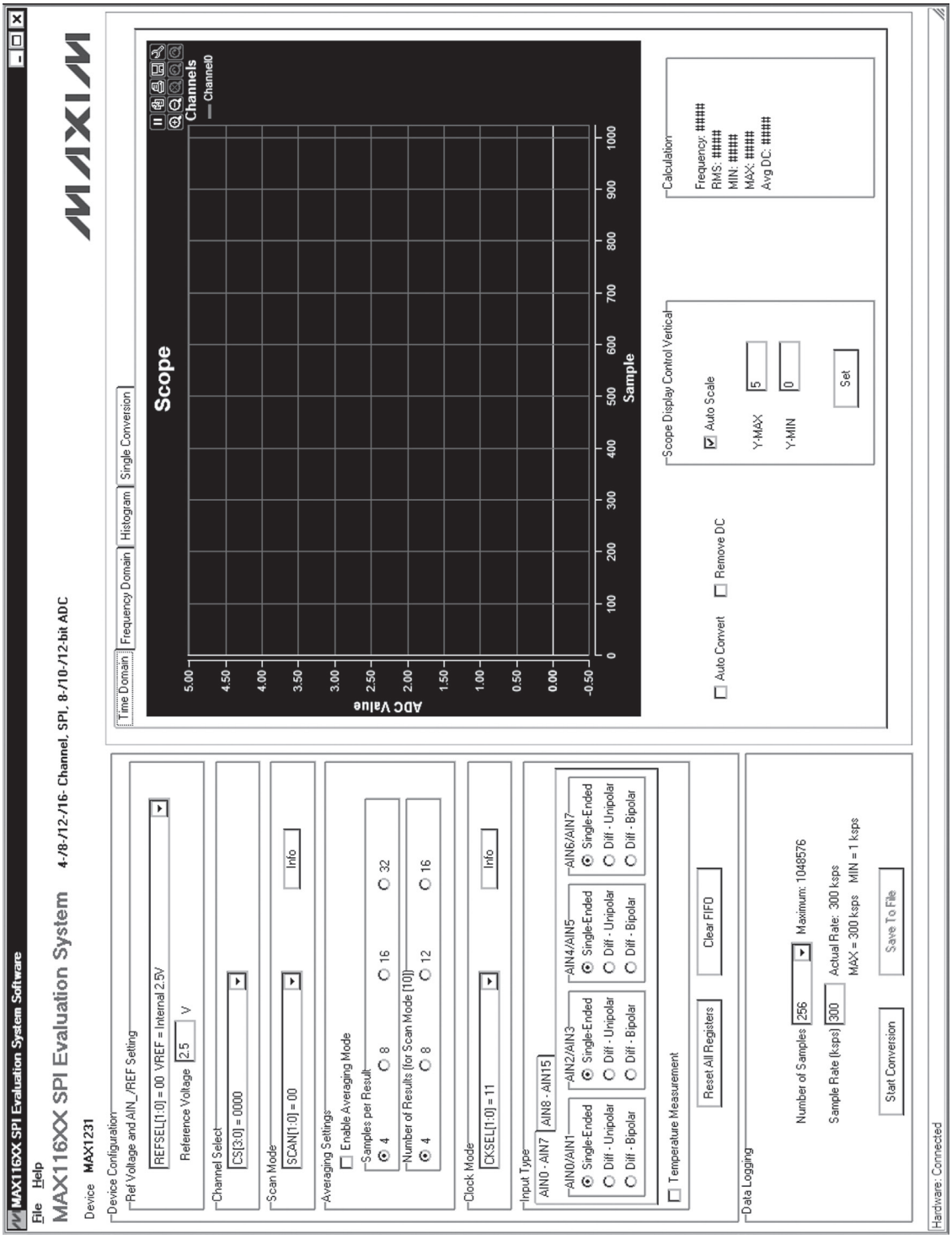
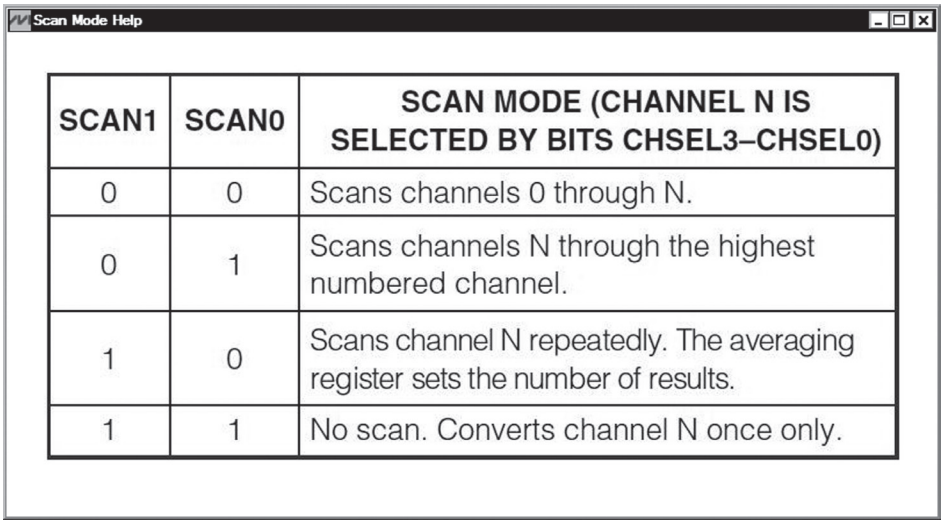



*Figure 3. MAX116XX SPI EV System Software Main Window*




| SCAN1 | SCAN0 | SCAN MODE (CHANNEL N IS SELECTED BY BITS CHSEL3–CHSEL0) |
|---|---|---|
| 0 | 0 | Scans channels 0 through N. |
| 0 | 1 | Scans channels N through the highest numbered channel. |
| 1 | 0 | Scans channel N repeatedly. The averaging register sets the number of results. |
| 1 | 1 | No scan. Converts channel N once only. |

*Figure 4. Scanning Configuration Reference Table*

### *Data Logging*

In the **Data Logging** group box, the user can select the desired number of conversions in the **Number of Samples** drop-down list. Enter the desired sampling rate in the **Sample Rate (ksps)** edit box. The actual sampling rate is displayed at the right of the **Sample Rate (ksps)** edit box. Press the **Start Conversion** button to start sampling. After sampling is finished, the user can save the data to a file by pressing the **Save To File** button. The **Save To File** button is not active until the sampling is done.

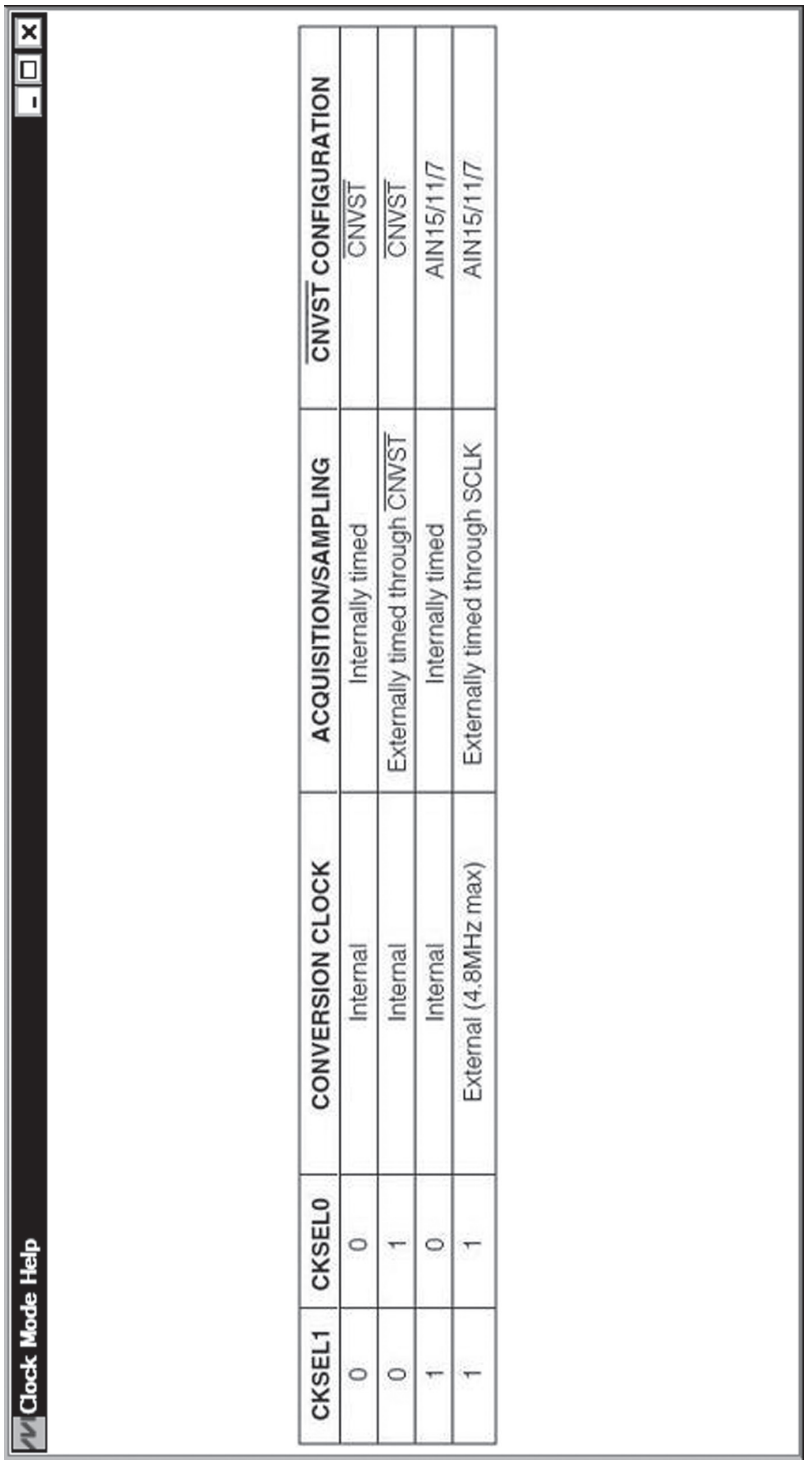
### *Time Domain, Frequency Domain, Histogram, and Single Conversion Tab Sheets*

After the **Start Conversion** button in the **Data Logging** group box is pressed, the sampled data in the time domain is plotted in the **Time Domain** tab sheet. The sampled data in the frequency domain is plotted in the **Frequency Domain** tab sheet. The histogram of the sampled signal is plotted in the **Histogram** tab sheet. The **Single Conversion** tab sheet displays one set of sampled data in any scan mode.

Check the **Auto Convert** checkbox to automatically and repeatedly do the ADC conversions and update the active tab sheet.

### *Time Domain Tab*

In the **Time Domain** tab sheet (Figure 6), check the **Remove DC** check box to remove the DC component of the sampled signal. In the **Scope Display Control Vertical** group box, when the **Auto Scale** checkbox is checked, the software automatically scales the vertical axis in the plot. If the **Auto Scale** checkbox is unchecked, enter the appropriate values into the **Y-MAX** and **Y-MIN** edit boxes and press the **Set** button to set the boundaries for the vertical axis. The software automatically calculates the **Frequency**, **RMS**, **MIN**, **MAX**, and **Avg DC** of the sampled signal and displays the calculated values in the **Calculation** group box. The frequency calculation is valid only when the **Remove DC** checkbox is checked.




| CKSEL1 | CKSEL0 | CONVERSION CLOCK | ACQUISITION/SAMPLING | CNVST CONFIGURATION |
|---|---|---|---|---|
| 0 | 0 | Internal | Internally timed | CNVST |
| 0 | 1 | Internal | Externally timed through CNVST | CNVST |
| 1 | 0 | Internal | Internally timed | AIN15/11/7 |
| 1 | 1 | External (4.8MHz max) | Externally timed through SCLK | AIN15/11/7 |

*Figure 5. Clock Mode Reference Table*

#### *Frequency Domain Tab*

The **Frequency Domain** tab sheet (Figure 7) displays the FFT plot of the signal shown in the **Time Domain** tab sheet.

#### *Histogram Tab*

The **Histogram** tab sheet (Figure 8) displays the histogram of the signal shown in the **Time Domain** tab sheet. The software automatically calculates the **Mean** and the **Std Dev** (standard deviation, sigma) and displays the calculated values in the **Calculation** group box.

The **Histogram Display Contro**l radio group box provides three options to scale the horizontal axis on the histogram. The options include **(Mean - 3 sigma) to (Mean + 3 sigma)**, **(Mean - 6 sigma) to (Mean + 6 sigma)**, and **User Define** range.

#### *Single Conversion Tab*

The **ADC Value Display for Single Conversion** group box in the **Single Conversion** tab sheet (Figure 9) displays the ADC **Codes** and the calculated **Voltage** values for a single sample of all the channels that associate with the selected scan mode. Pressing the **Start Conversion** button in the **Data Logging** group box updates the status of the **ADC Value Display for Single Conversion** group box. If the **Temperature Measurement** checkbox in the **Input Type** group box is checked, the temperature reading is displayed below the **ADC Value Display for Single Conversion** group box.

## Detailed Description of Hardware

### *MAX1231B/MAX11633/MAX11635 EV System*

Each MAX1231B/MAX11633/MAX11635 EV system is a complete data-acquisition system that consists of one master board and three daughter boards. The three daughter boards support the following parts: MAX1030, MAX1031, MAX1230, MAX1231, MAX11624, MAX11625, MAX11632–MAX11635, MAX11642, and MAX11643. The *Ordering Information/Selector Guide* shows the boards that are compatible with different parts.

### *MAX116XX SPI Master Board*

The MAX116XX SPI master board connects to a PC's USB port and allows the transfer of SPI commands to the EV kit daughter board.

#### *Power Supply*

By default, the master board is USB powered. The user can apply an external 5V supply to DVDD. The daughter board can be powered by the master board.

### *EV Kit Daughter Boards*

The EV kit daughter boards are fully assembled and tested PCBs that demonstrate the capabilities of the MAX1030, MAX1031, MAX1230, MAX1231, MAX11624, MAX11625, MAX11632–MAX11635, MAX11642, and MAX11643 4-/8-/12-/16-channel, 8-/10-/12-bit, 3V/5V, low-power, high-speed SPI ADCs with internal or external references.

There are three EV kit daughter boards that evaluate the various ADCs. Each daughter board comes with one ADC installed, but other pin-compatible ADCs can be installed by the user. See the *Ordering Information/Selector Guide* section to select the desired EV kit daughter board and ADC.

Carefully connect the EV kit daughter board to the master board by aligning the EV kit daughter board's 20-pin connector (J1) with the 20-pin header (J1) of the master board. Gently press them together.

#### *Voltage Reference*

An on-board 2.5V voltage reference (U2) is provided on the EV kit daughter board. U3 is a user-supplied reference and is not installed. To use a user-supplied reference voltage, install U3 with the desired reference voltage and change the shunt on jumper JU2 to the 1-2 position. Alternatively, the user can also supply the reference voltage to the REF+ or REF- test point after removing the shunt from JU2. For more information about the 4.096V reference voltage ADCs, refer to the individual IC data sheet.

#### *Power Supply*

By default, the EV kit daughter board is powered from the master board. Jumper JU1 selects between a 5V supply and a 3.6V supply. The output voltage can be monitored on the VDD test point. To use an external power supply, remove the shunt from JU1 and apply user-supplied power to the VDD test point. The power-supply range is between 3.6V and 5.5V.

When evaluating the 5V part, as shown on the *Ordering Information/Selector Guide*, see Tables 2, 3, and 4.

### *Evaluating the 5V Parts*

When evaluating the 5V parts (MAX1030, MAX1230, MAX11624, MAX11632, MAX11634, and MAX11642), see Tables 2, 3, and 4 to properly set jumpers JU1 and JU2.

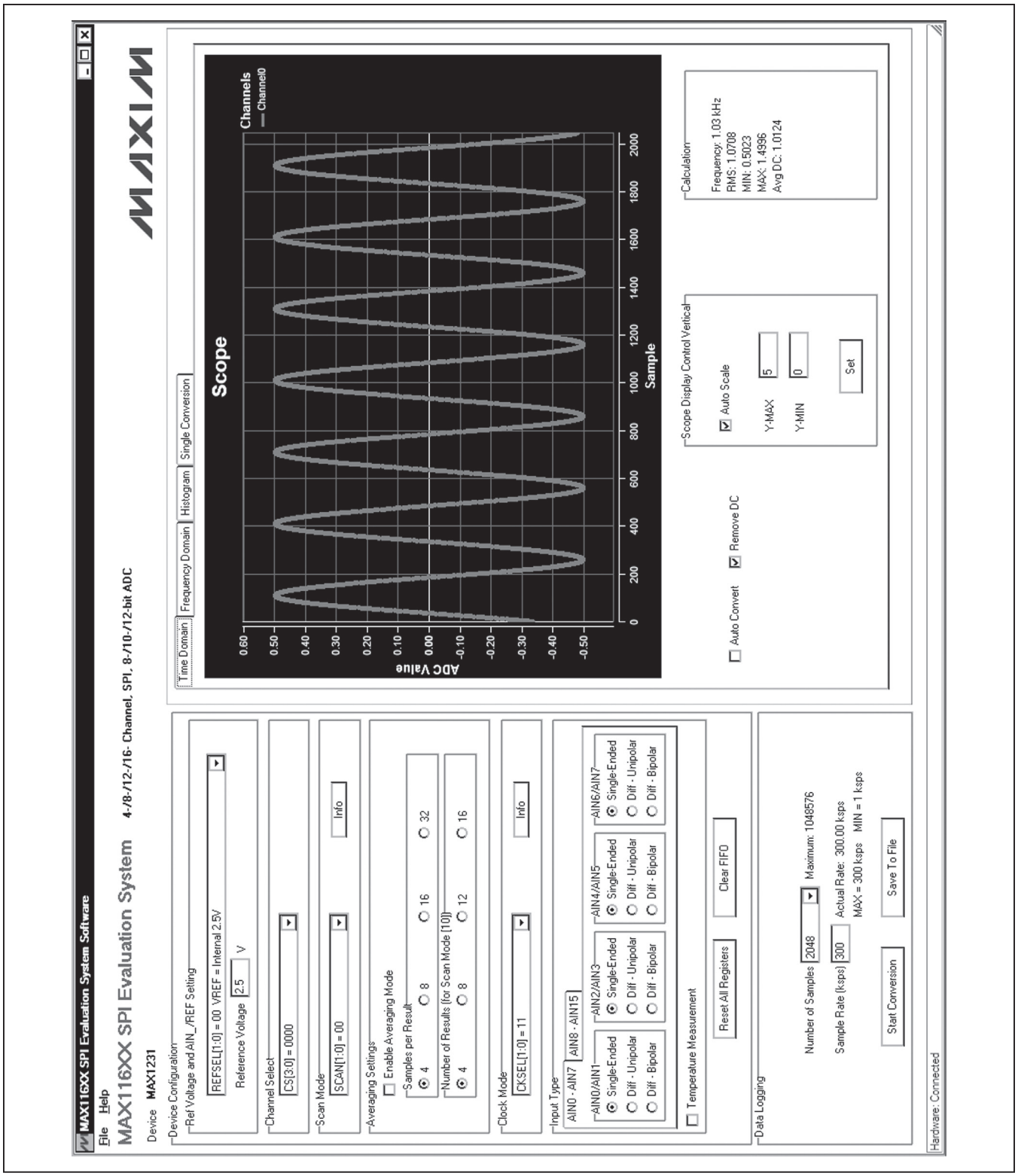



*Figure 6. Time Domain Tab*

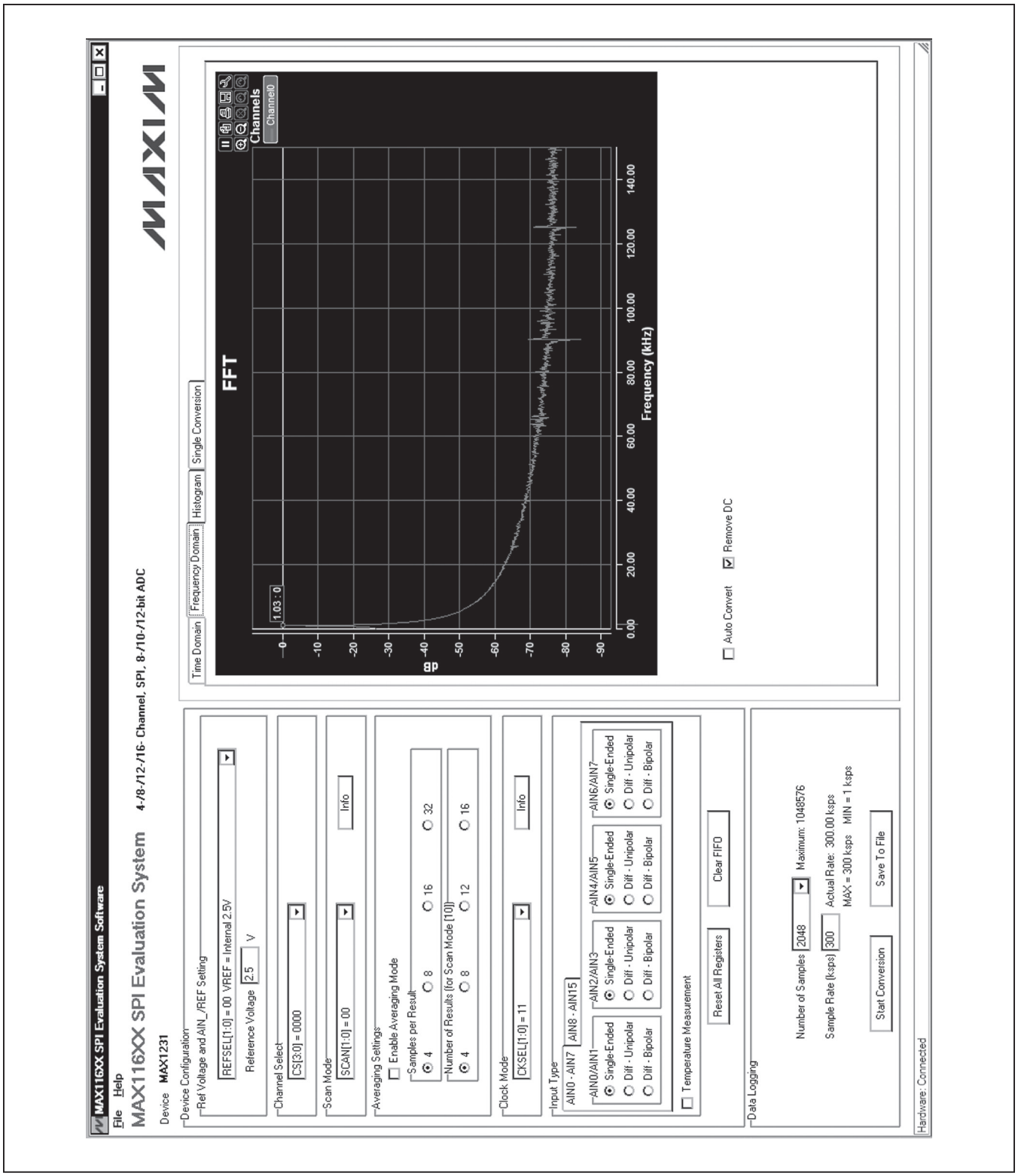



*Figure 7. Frequency Domain Tab*

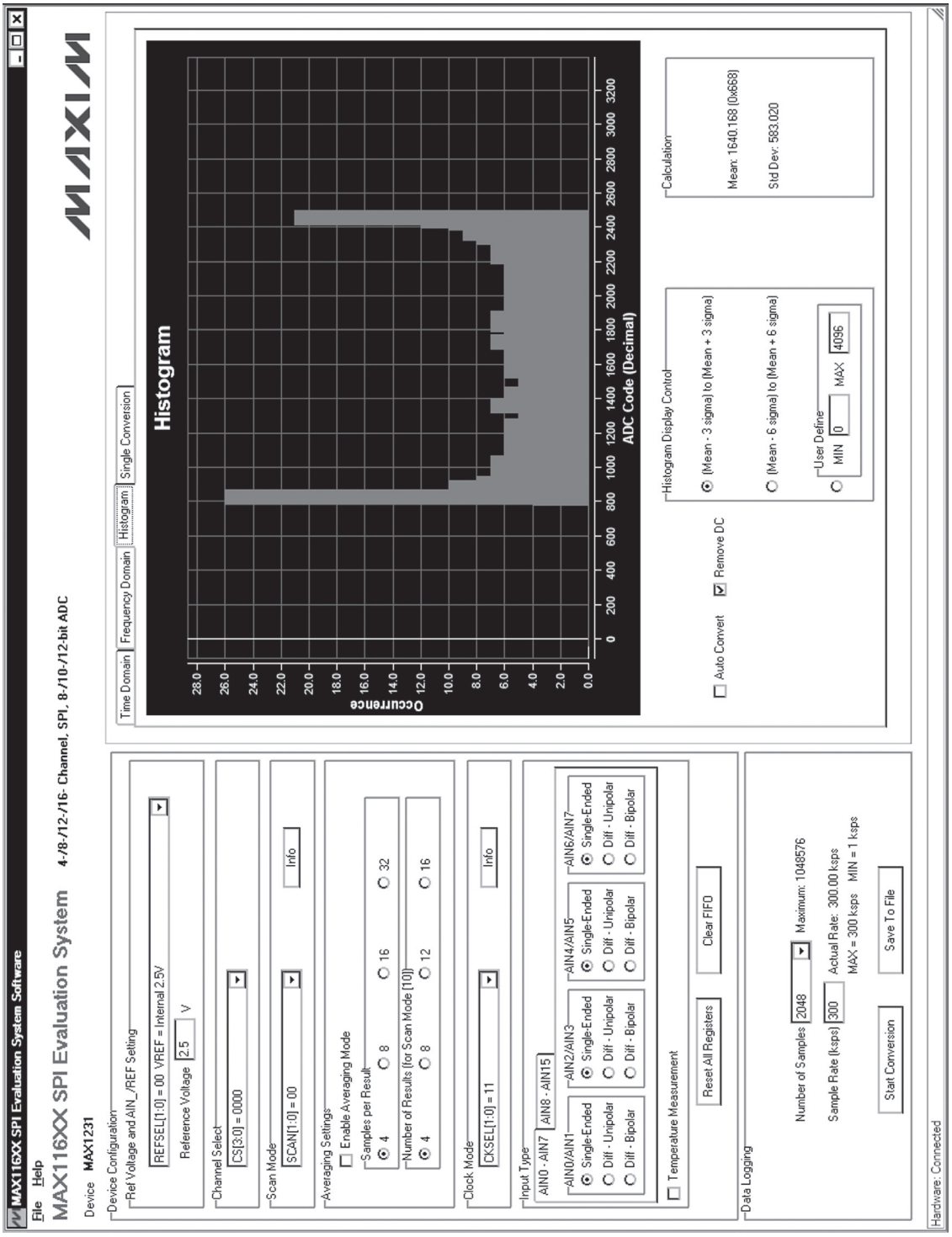



*Figure 8. Histogram Tab*

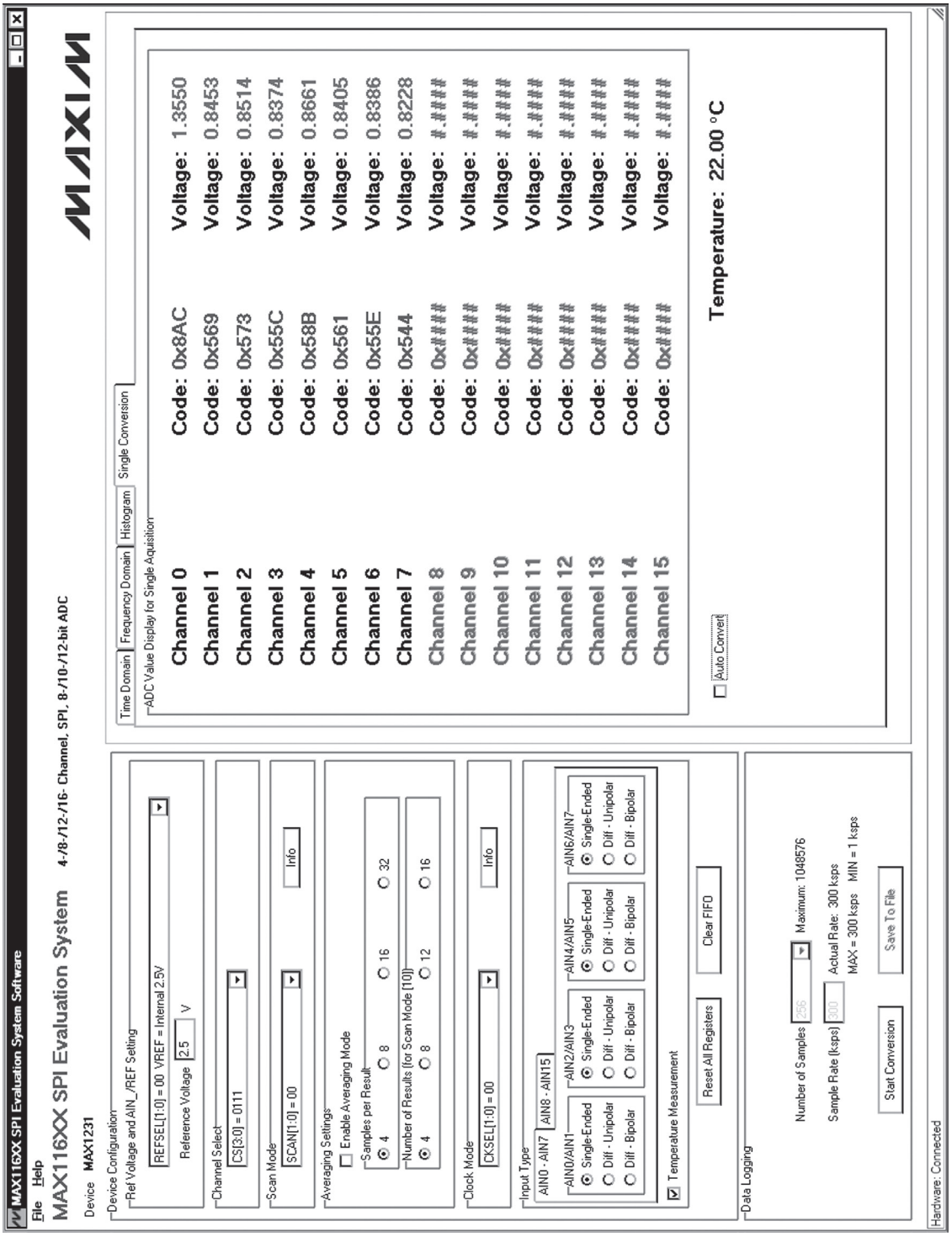



*Figure 9. Single Conversion Tab*

## Table 1. Master Board Jumper Settings (JU6–JU10)

| JUMPER | SHUNT POSITION | DESCRIPTION |
|---|---|---|
| JU6 | 1-2* | The on-board LDO (U6) provides 3.6V output to the EV system. |
| | Open | Disconnects the output of the on-board LDO (U6). |
| JU7 | 1-2* | The on-board LDO (U7) provides 2.5V output to the EV system. |
| | Open | Disconnects the output of the on-board LDO (U7). |
| JU8 | 1-2* | The on-board LDO (U8) provides 5V output to the EV system. |
| | 2-3 | Disconnects the output of the on-board LDO (U8). |
| JU9 | 1-2* | The on-board LDO (U9) provides 1.2V output to the EV system. |
| | Open | Disconnects the output of the on-board LDO (U9). |
| JU10 | 1-2* | The EV system is powered by the USB. |
| | 2-3 | The EV system is powered by an external power supply. Connect the power supply across the DVDD and DGND connectors. |

**Default position.*

## Table 2. MAX1231B EV Kit Daughter Board Jumper Settings (JU1, JU2, JU4)

| JUMPER | SHUNT POSITION | DESCRIPTION |
|---|---|---|
| JU1 | 1-2* | U1 powered by the 3.6V supply from the master board (MAX1031, MAX1231). |
| | 2-3 | U1 powered by the 5V supply from the master board (MAX1030, MAX1230). |
| | Open | Apply the desired supply voltage (3.6V to 5V) on the VDD test point. |
| JU2 | 1-2 | U3 provides the reference voltage to U1. U3 is not installed by default. For the 5V parts, install a 4.096V reference. |
| | 2-3* | U2 provides a 2.5V reference voltage to U1. |
| | Open | Apply the desired reference voltage on the REF+ test point. |
| JU4 | 1-2 | To use $\overline{\text{CNVSTAIN15}}$ as the analog input AIN15. |
| | 2-3* | To use $\overline{\text{CNVSTAIN15}}$ as the digital input $\overline{\text{CNVST}}$. |

**Default position.*

### Table 3. MAX11633 Daughter Board Jumper Settings (JU1, JU2, JU4)

| JUMPER | SHUNT POSITION | DESCRIPTION |
|---|---|---|
| JU1 | 1-2* | U1 powered by the 3.6V supply from the master board (MAX11625, MAX11633, and MAX11643). |
| | 2-3 | U1 powered by the 5V supply from the master board (MAX11624, MAX11632, and MAX11642). |
| | Open | Apply the desired supply voltage (3.6V to 5V)on the VDD test point. |
| JU2 | 1-2 | U3 provides the reference voltage to U1. U3 is not installed by default. For the 5V parts, install a 4.096V reference. |
| | 2-3* | U2 provides a 2.5V reference voltage to U1. |
| | Open | Apply the desired reference voltage on the REF+ test point. |
| JU4 | 1-2 | To use $\overline{\text{CNVST}}$/AIN15 as the analog input AIN15. |
| | 2-3* | To use $\overline{\text{CNVST}}$/AIN15 as the digital input $\overline{\text{CNVST}}$. |

**Default position.*

### Table 4. MAX11635 Daughter Board Jumper Settings (JU1, JU2, JU4)

| JUMPER | SHUNT POSITION | DESCRIPTION |
|---|---|---|
| JU1 | 1-2* | U1 powered by the 3.6V supply from the master board (MAX11635). |
| | 2-3 | U1 powered by the 5V supply from the master board (MAX11634). |
| | Open | Apply the desired supply voltage (3.6V to 5V) on the VDD test point. |
| JU2 | 1-2 | U3 provides the reference voltage to U1. U3 is not installed by default. For the 5V parts, install a 4.096V reference. |
| | 2-3* | U2 provides a 2.5V reference voltage to U1. |
| | Open | Apply the desired reference voltage on the REF+ test point. |
| JU4 | Closed* | Connects REF- to GND. |
| | Open | Externally supply a reference voltage to the REF- test point. |

**Default position.*

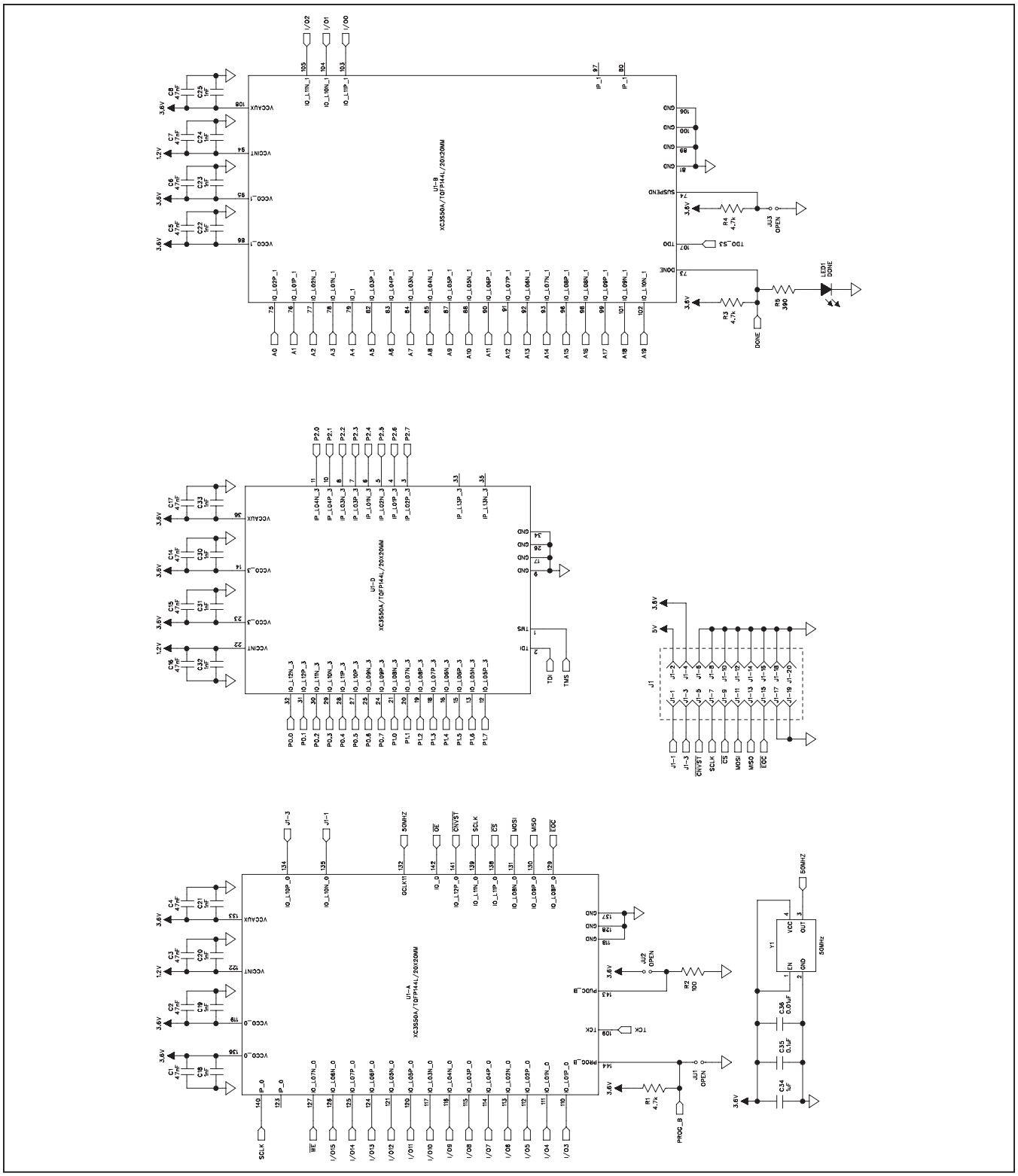


*Figure 10a. MAX116XX SPI Master Board Schematic (Sheet 1 of 4)*

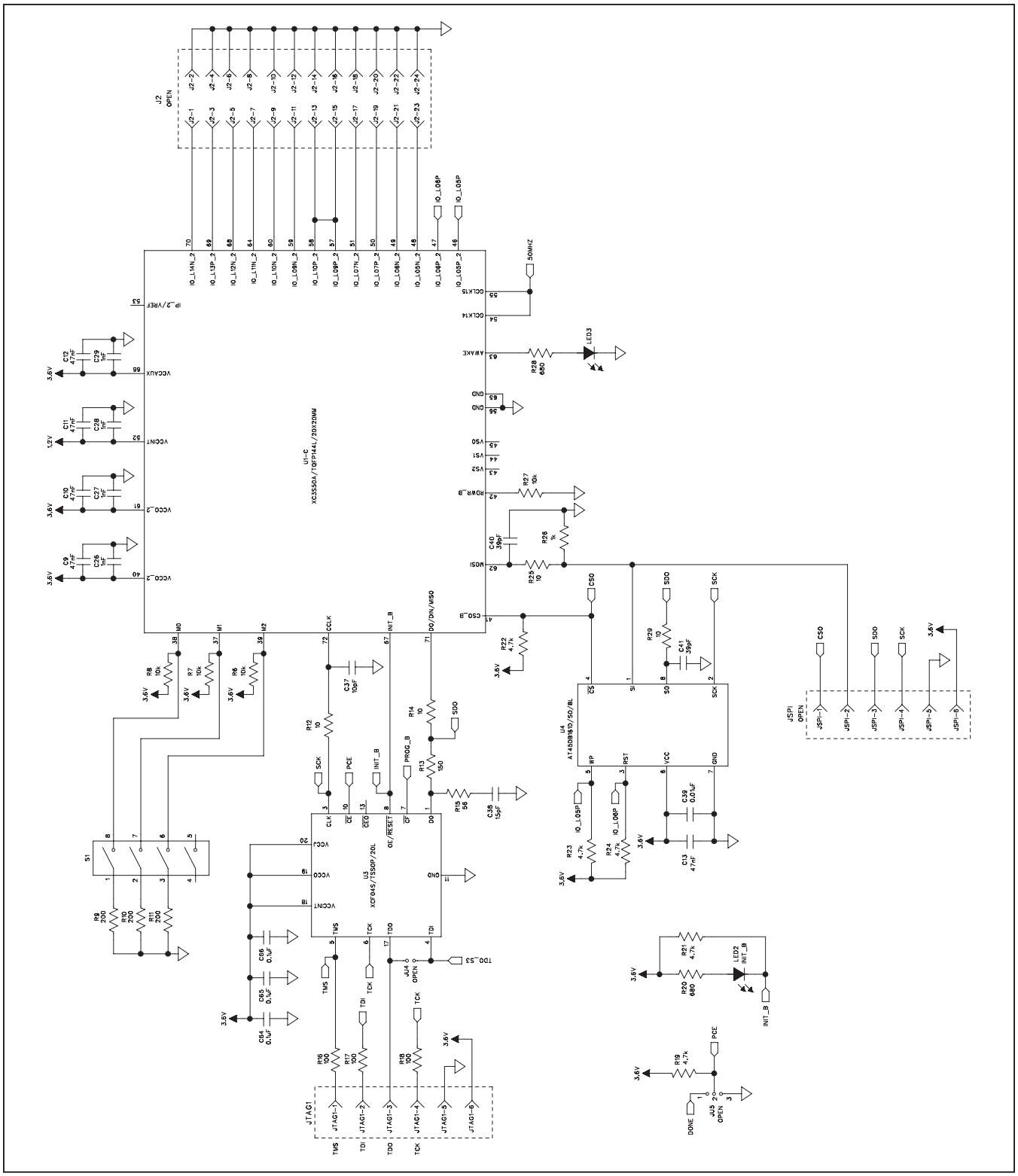


*Figure 10b. MAX116XX SPI Master Board Schematic (Sheet 2 of 4)*

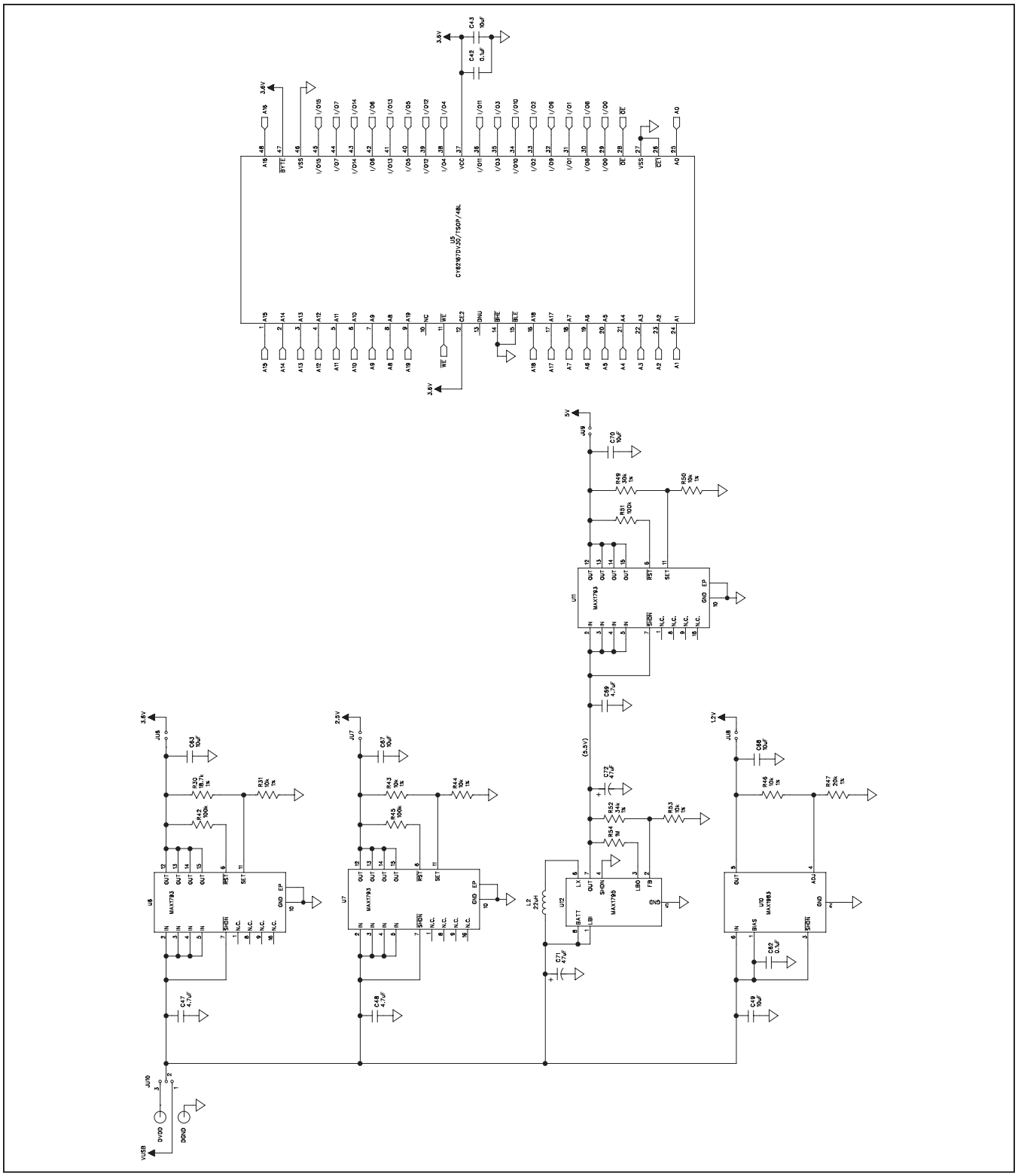


*Figure 10c. MAX116XX SPI Master Board Schematic (Sheet 3 of 4)*

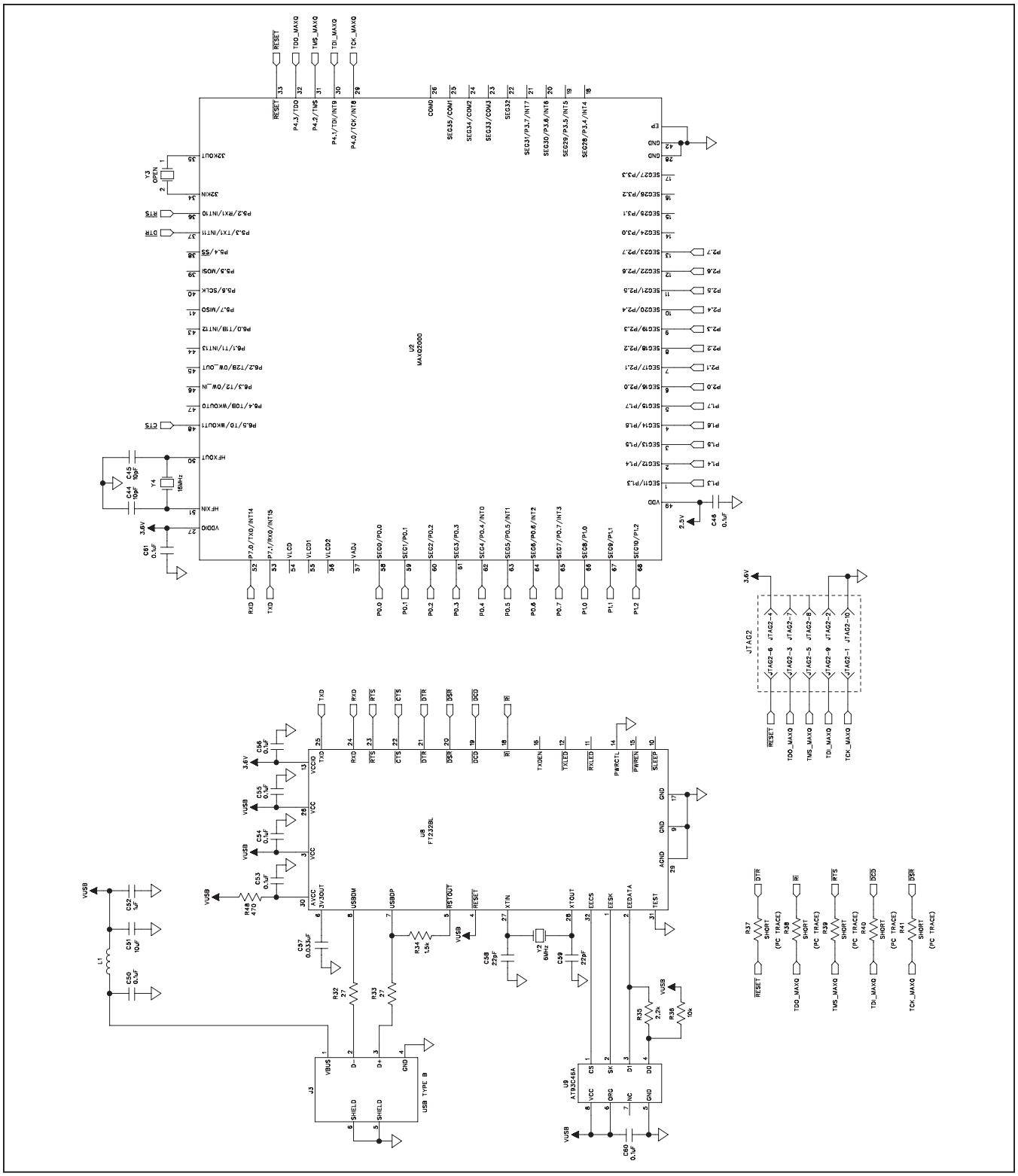


*Figure 10d. MAX116XX SPI Master Board Schematic (Sheet 4 of 4)*

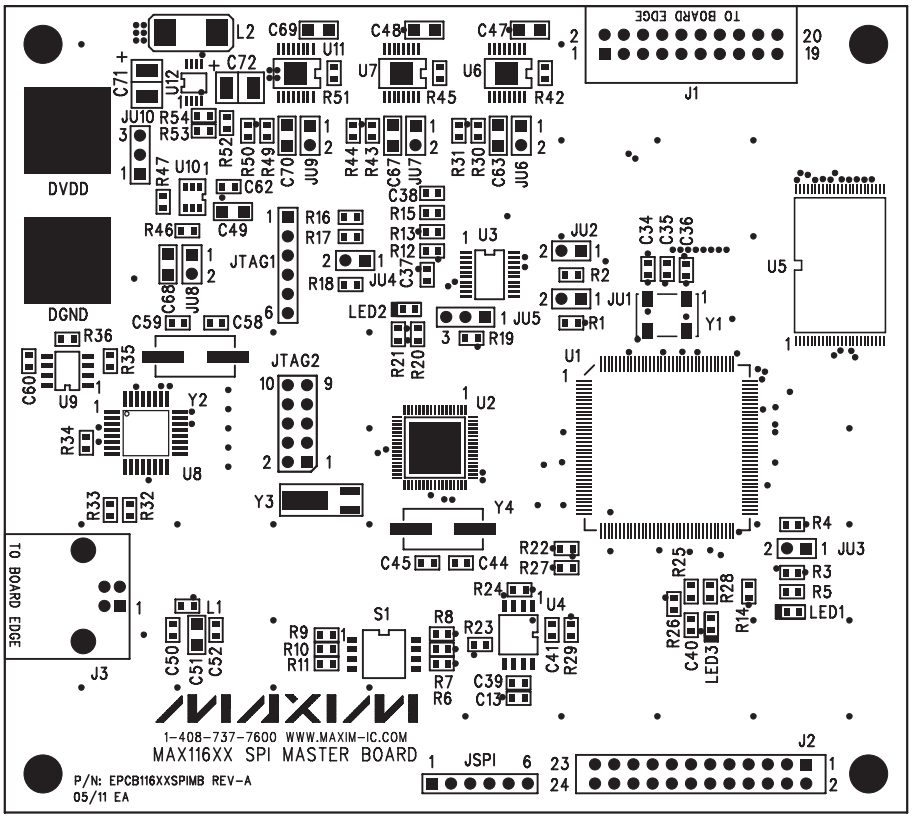



*Figure 11. MAX116XX SPI Master Board Component Placement Guide—Top*

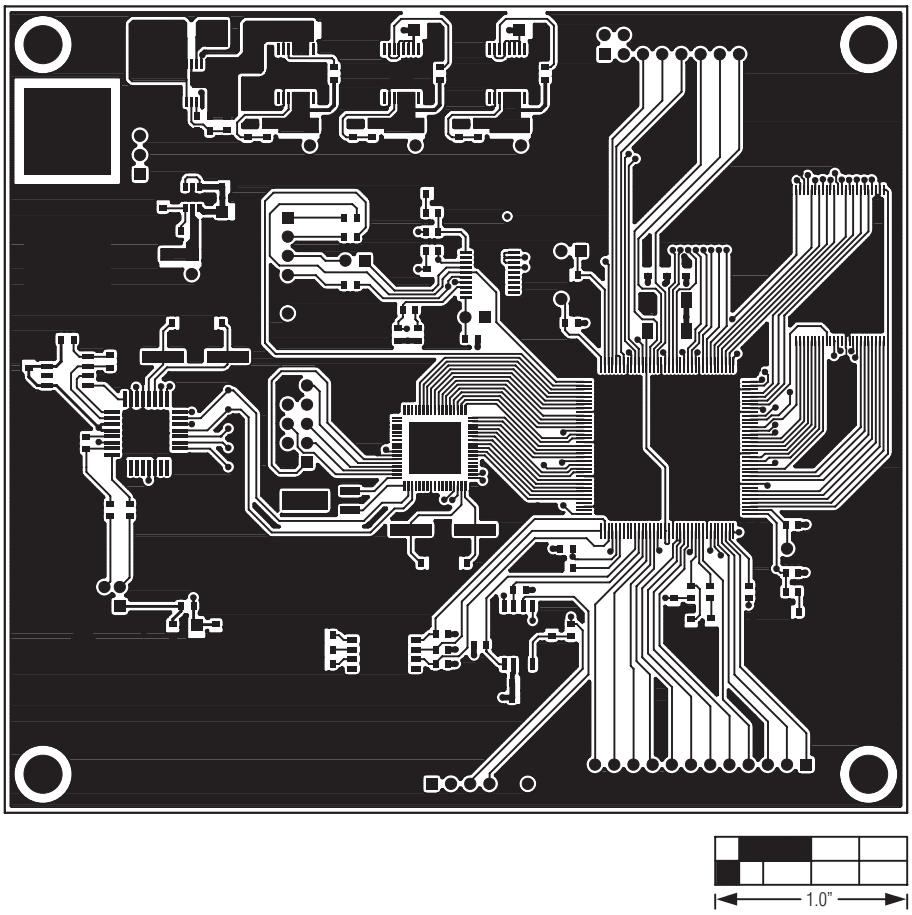



*Figure 12. MAX116XX SPI Master Board PCB Layout—Component Side*

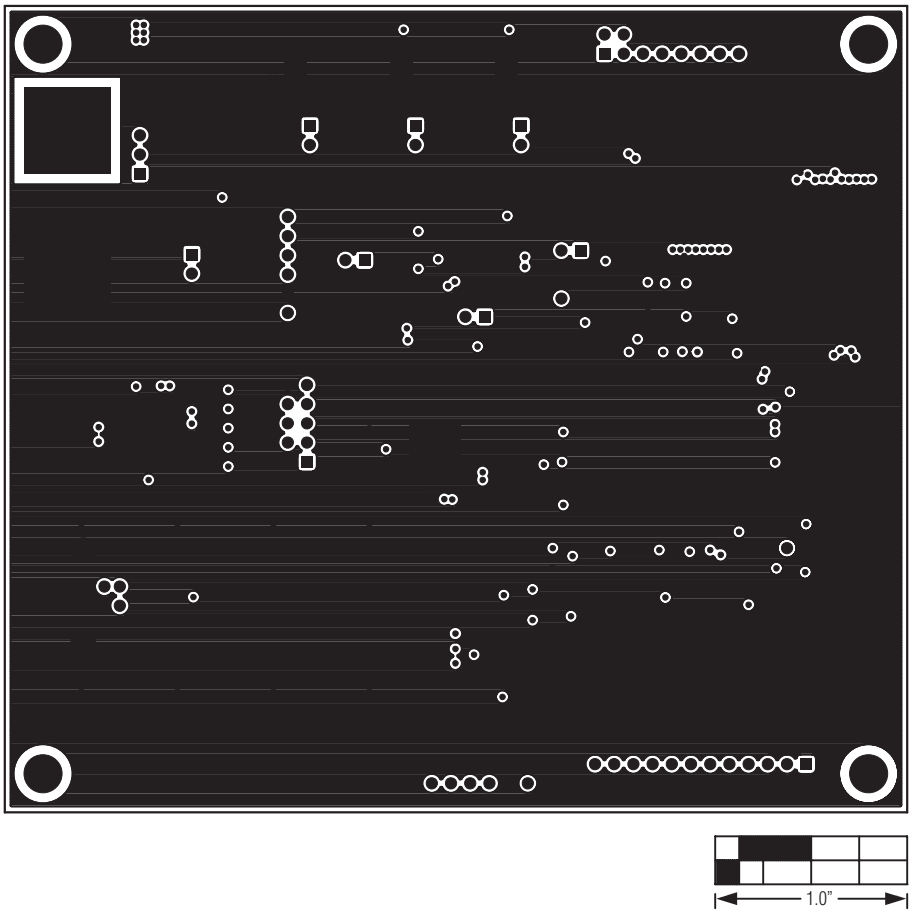



*Figure 13. MAX116XX SPI Master Board PCB Layout—Layer 2*

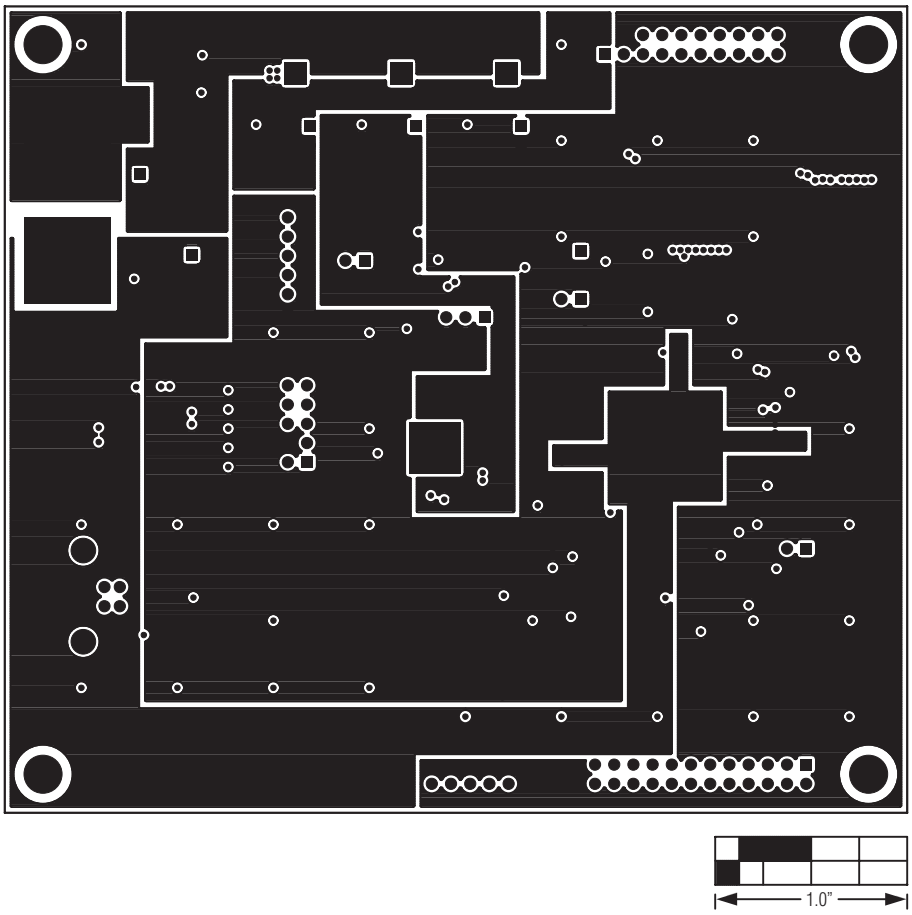



*Figure 14. MAX116XX SPI Master Board PCB Layout—Layer 3*

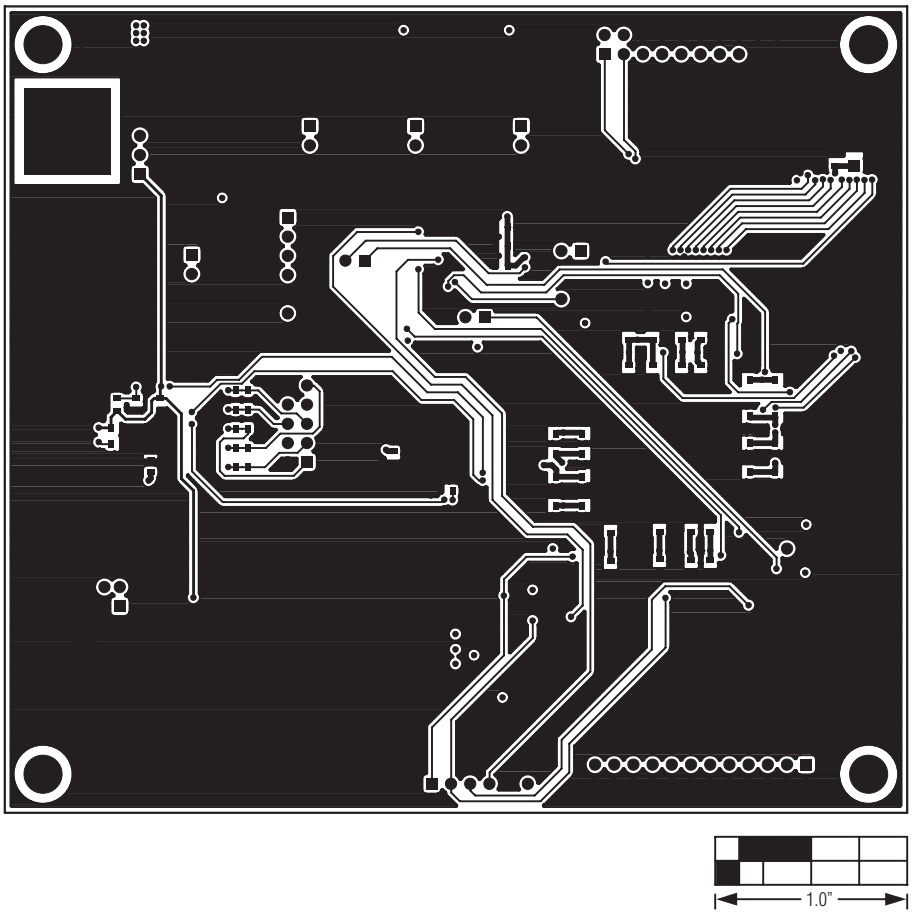



*Figure 15. MAX116XX SPI Master Board PCB Layout—Bottom Side*

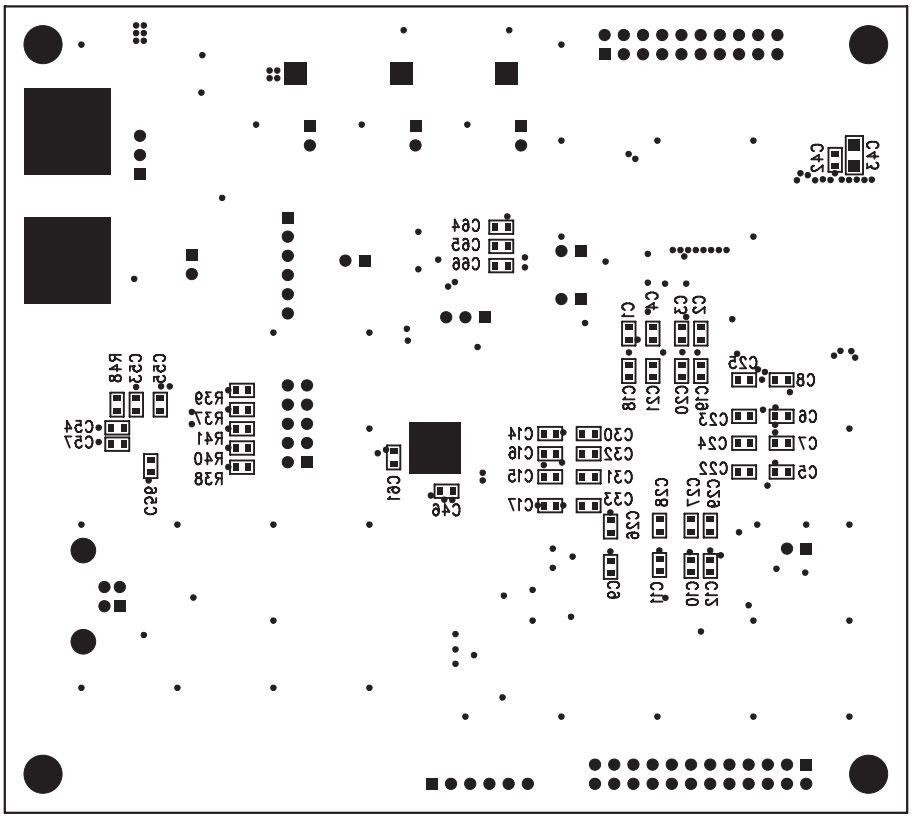



*Figure 16. MAX116XX SPI Master Board Component Placement Guide—Bottom*

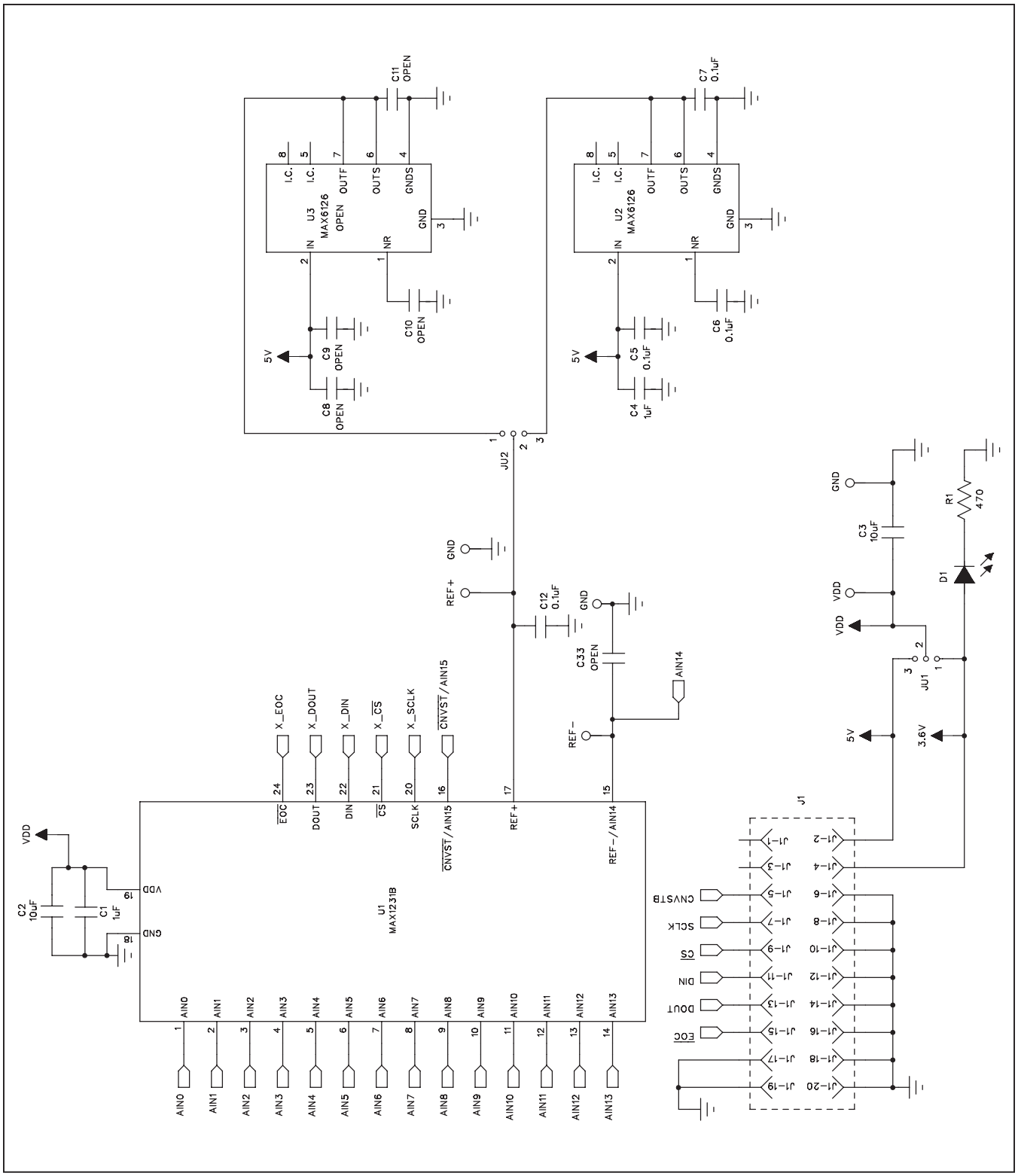



*Figure 17a MAX1231B EV Kit Daughter Board Schematic (Sheet 1 of 3)*

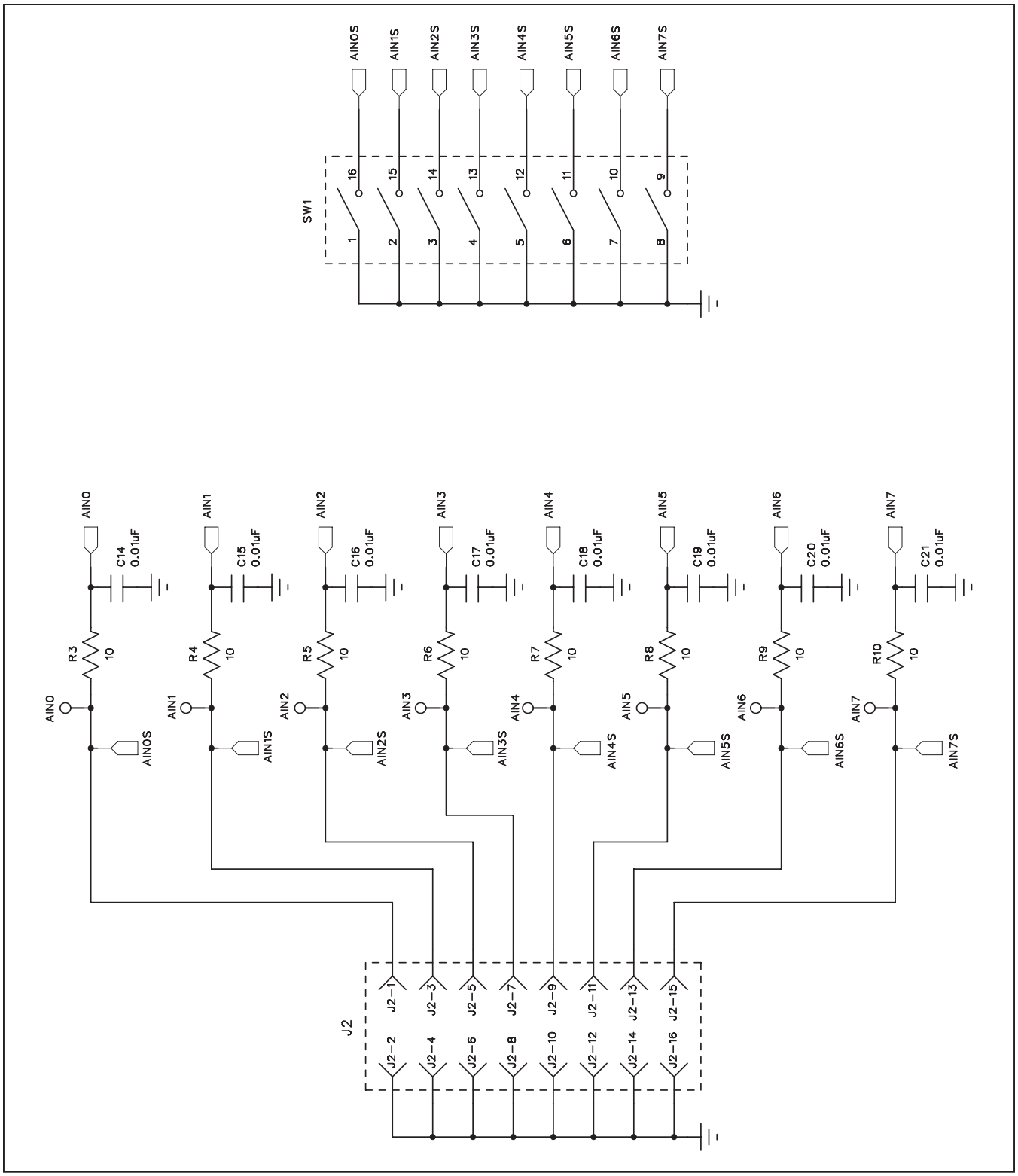



*Figure 17b. MAX1231B EV Kit Daughter Board Schematic (Sheet 2 of 3)*

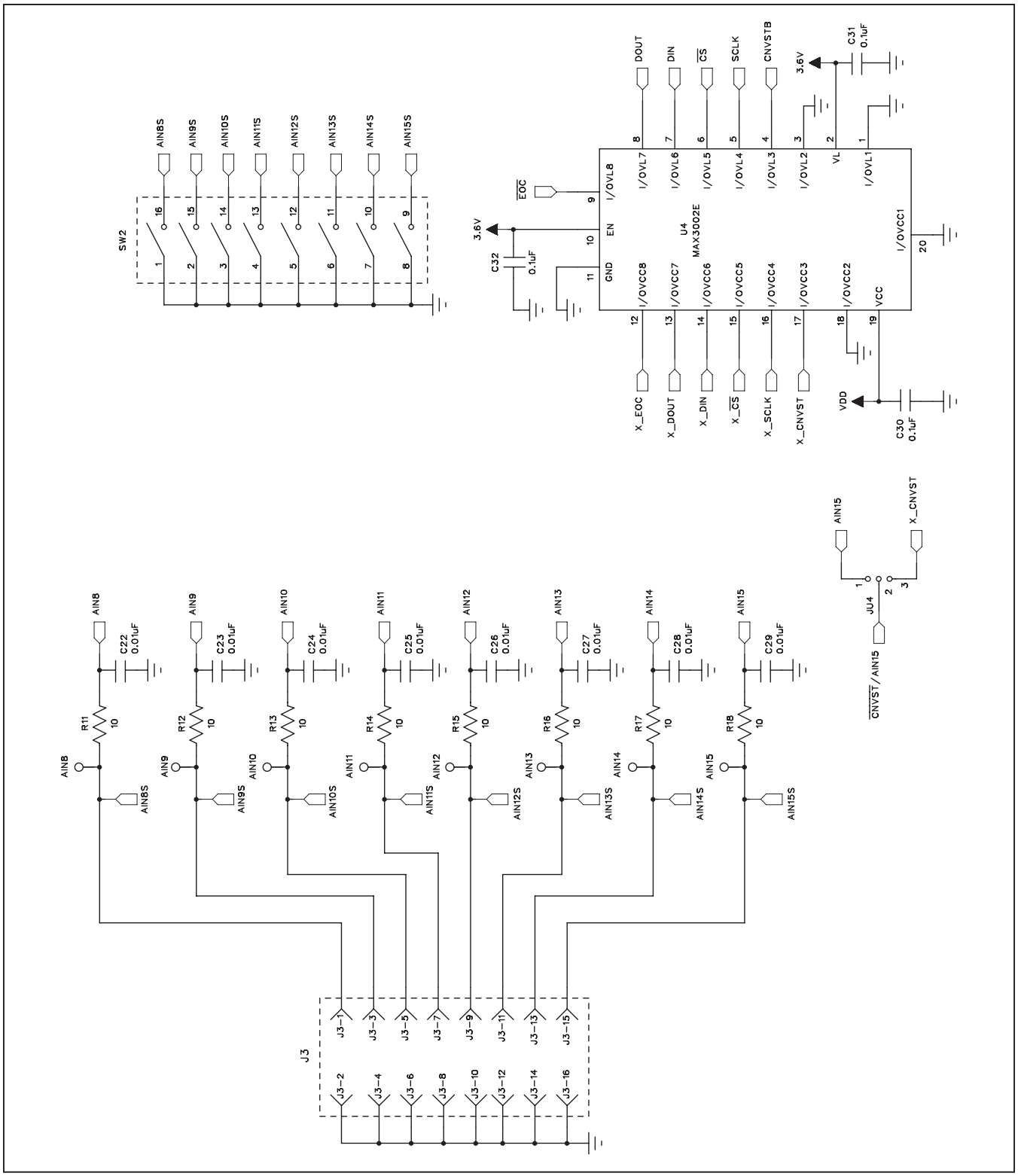



*Figure 17c. MAX1231B EV Kit Daughter Board Schematic (Sheet 3 of 3)*

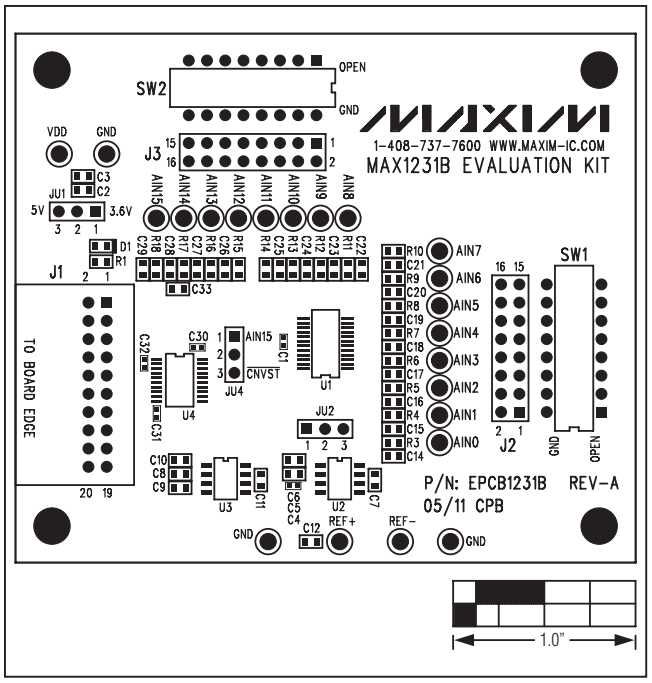



Figure 18. MAX1231B EV Kit Daughter Board Component Placement Guide

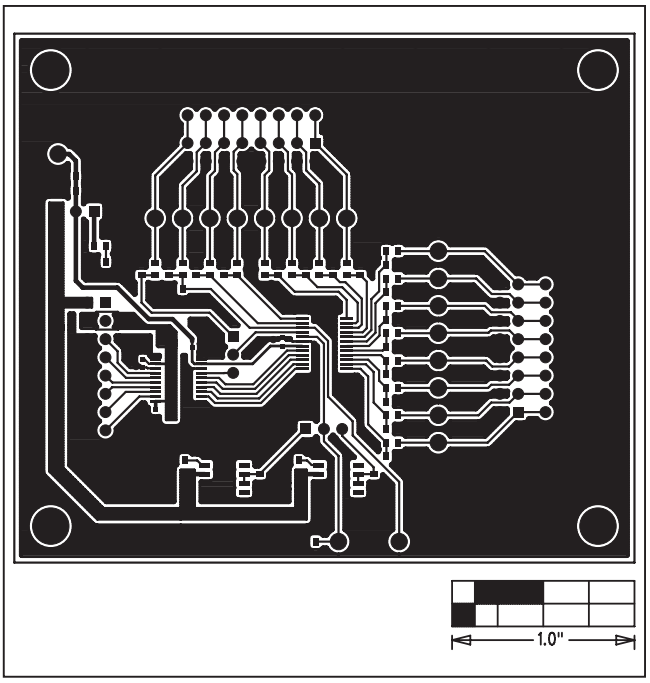



Figure 19. MAX1231B EV Kit Daughter Board PCB Layout—Top

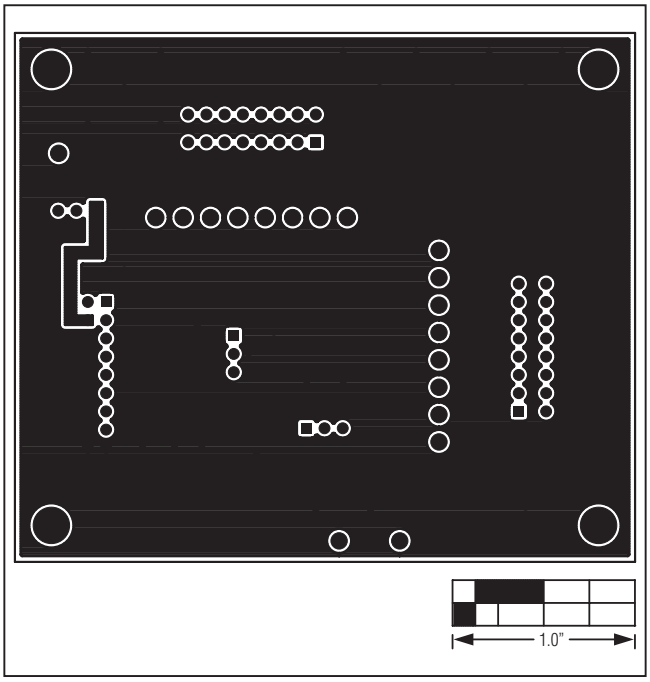



Figure 20. MAX1231B EV Kit Daughter Board PCB Layout—Bottom

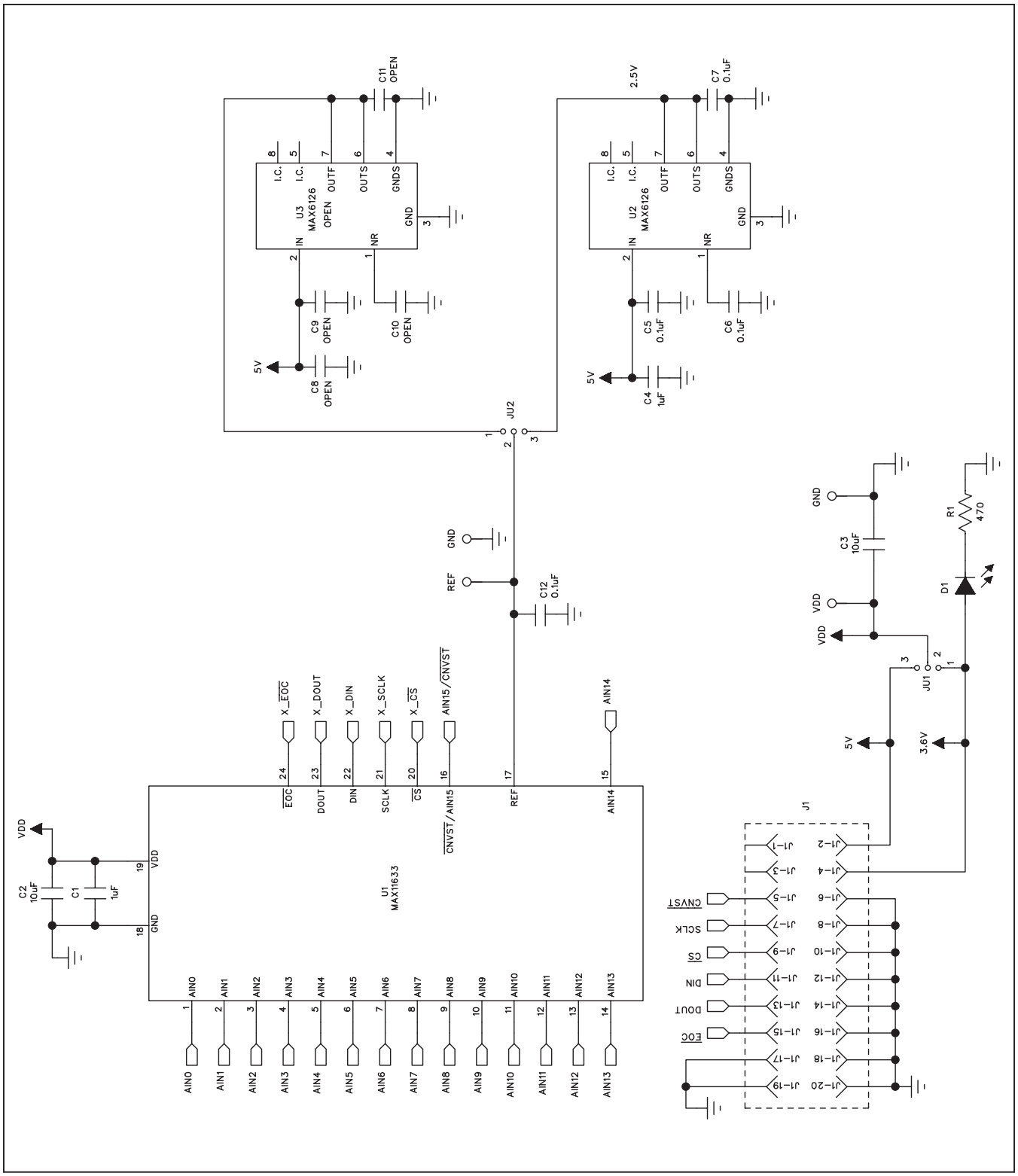



*Figure 21a. MAX11633 Daughter Board Schematic (Sheet 1 of 3)*

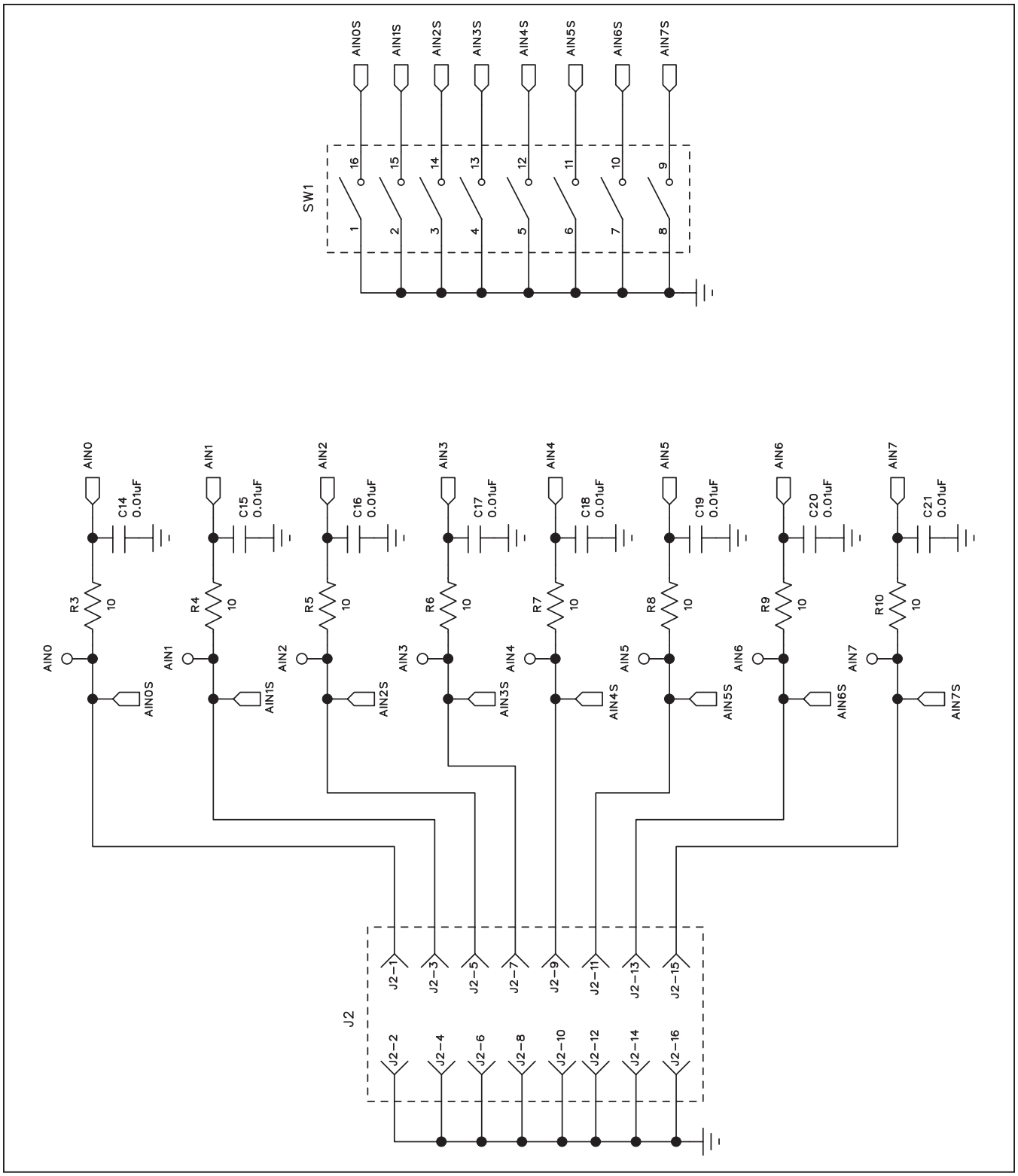



*Figure 21b. MAX11633 Daughter Board Schematic (Sheet 2 of 3)*

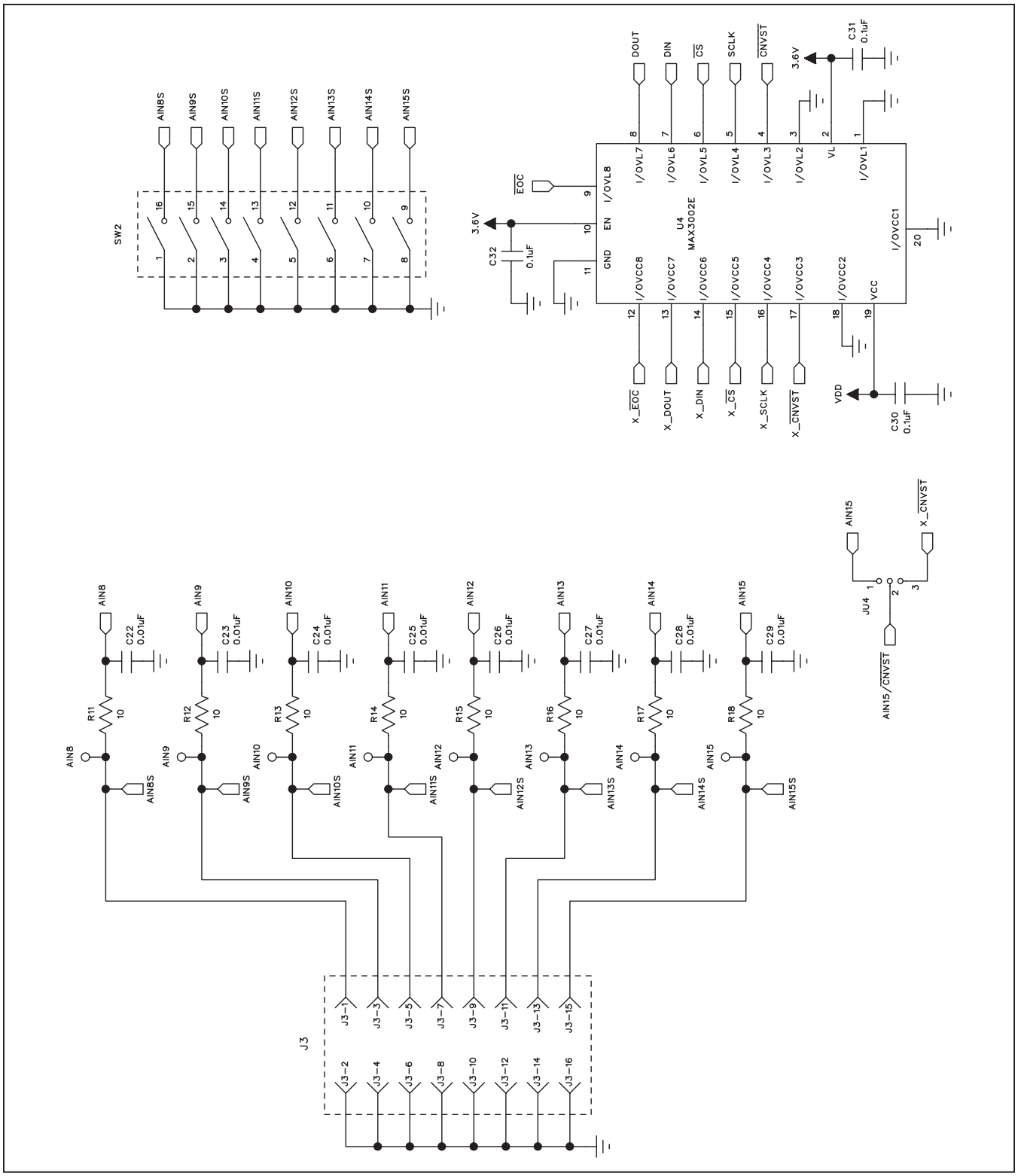



*Figure 21c. MAX11633 Daughter Board Schematic (Sheet 3 of 3)*

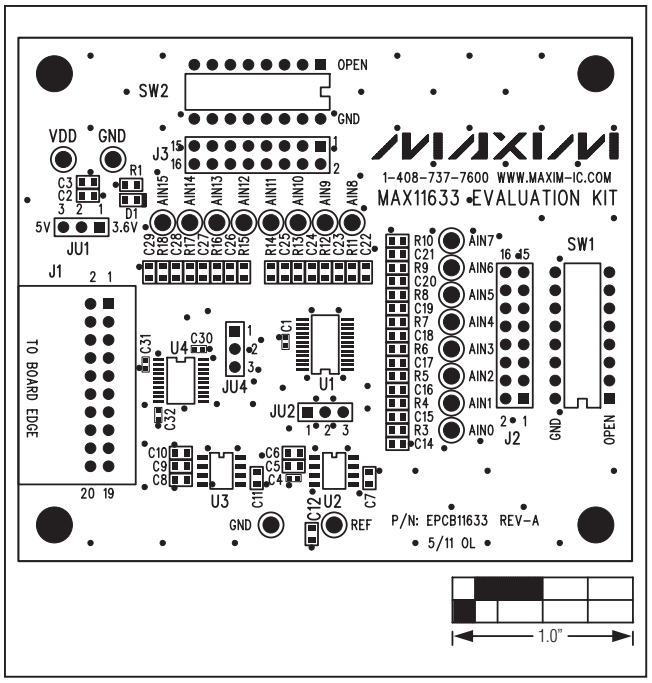



Figure 22. MAX11633 Daughter Board Component Placement Guide

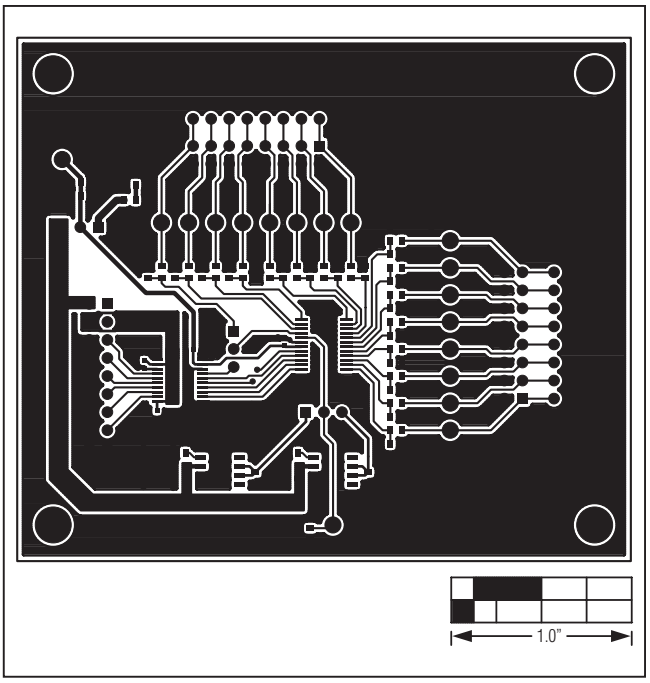



Figure 23. MAX11633 Daughter Board PCB Layout—Top

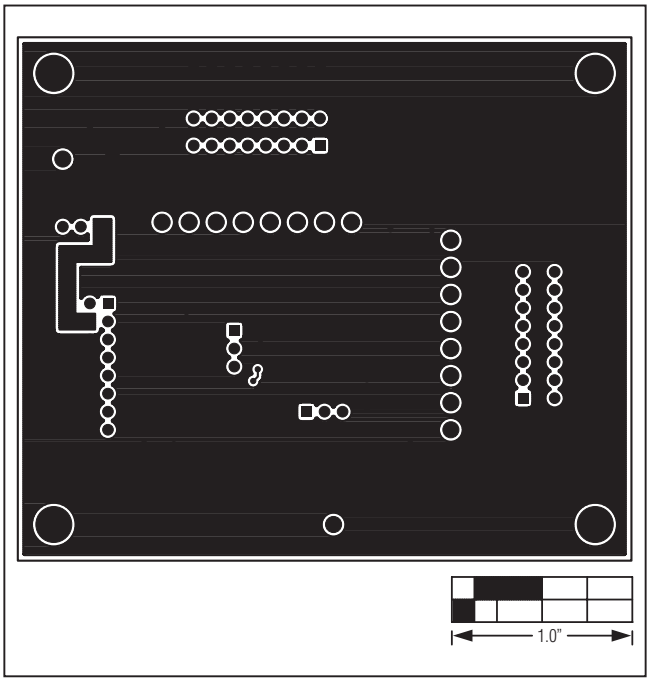



Figure 24. MAX11633 Daughter Board PCB Layout—Bottom

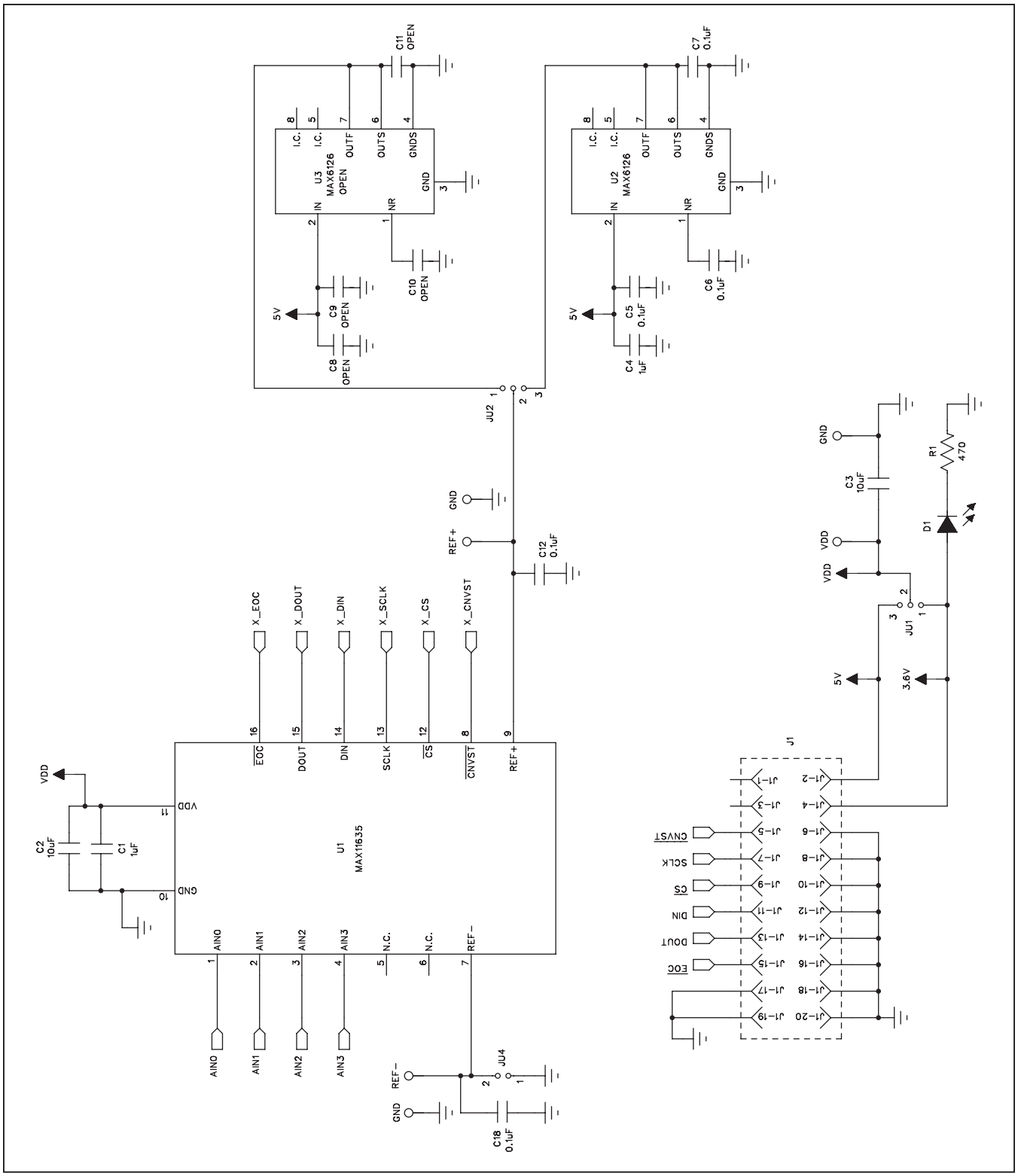



*Figure 25a. MAX11635 Daughter Board Schematic (Sheet 1 of 2)*

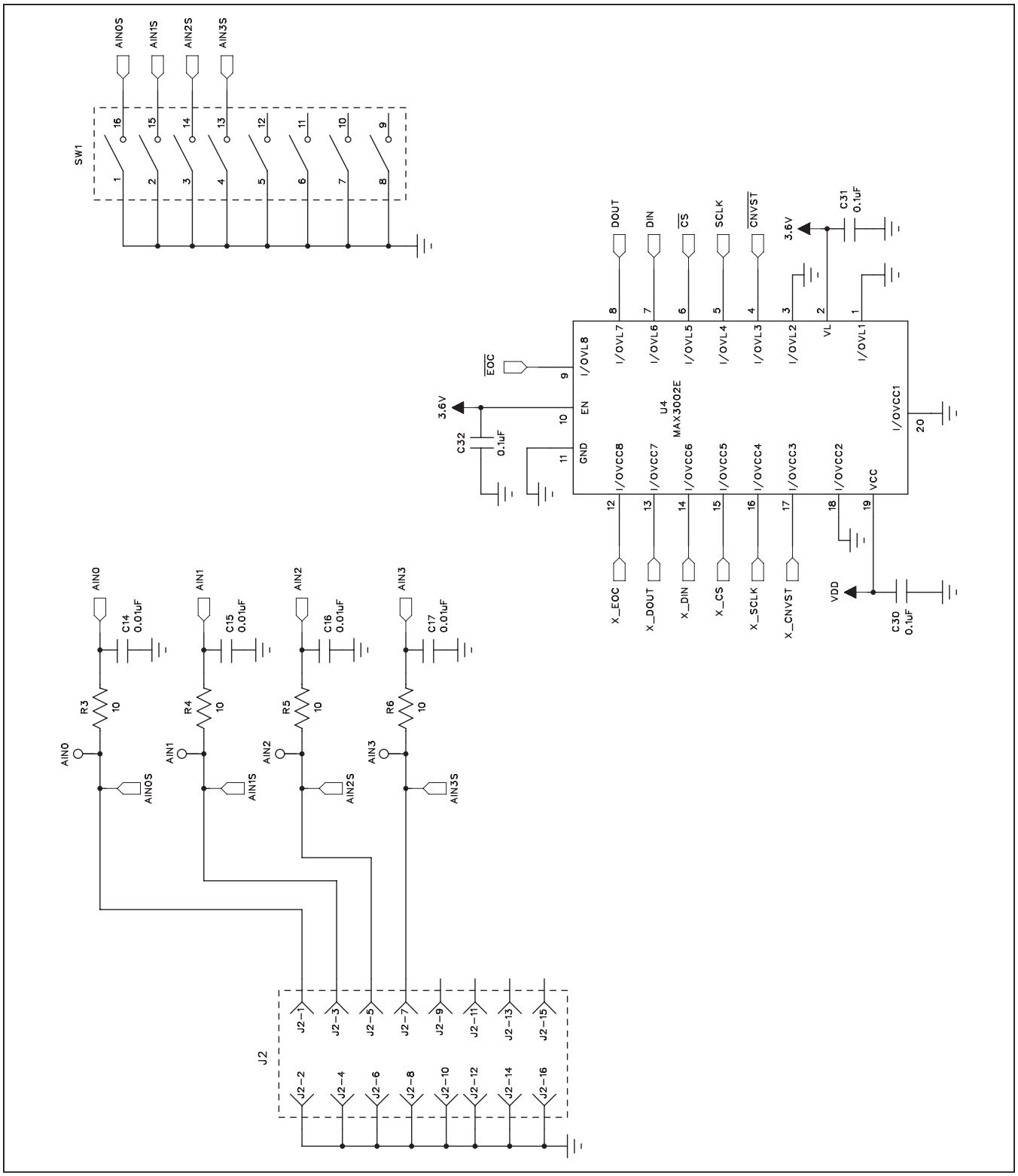



*Figure 25b. MAX11635 Daughter Board Schematic (Sheet 2 of 2)*

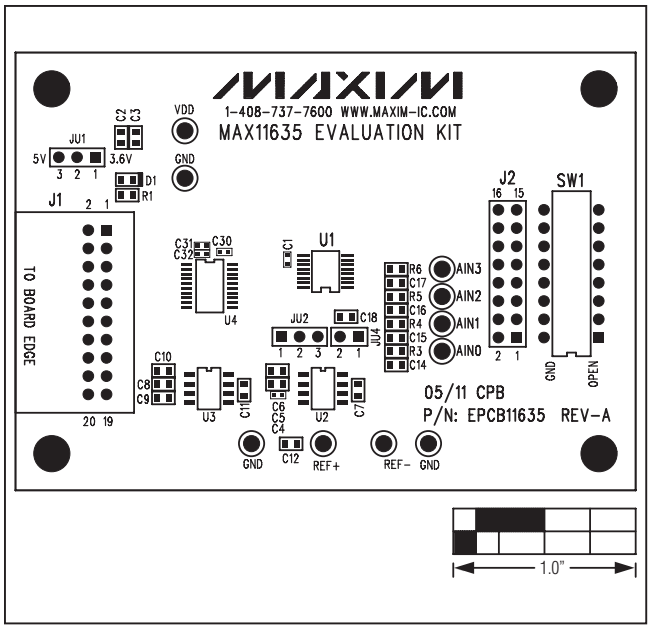



Figure 26. MAX11635 Daughter Board Component Placement Guide

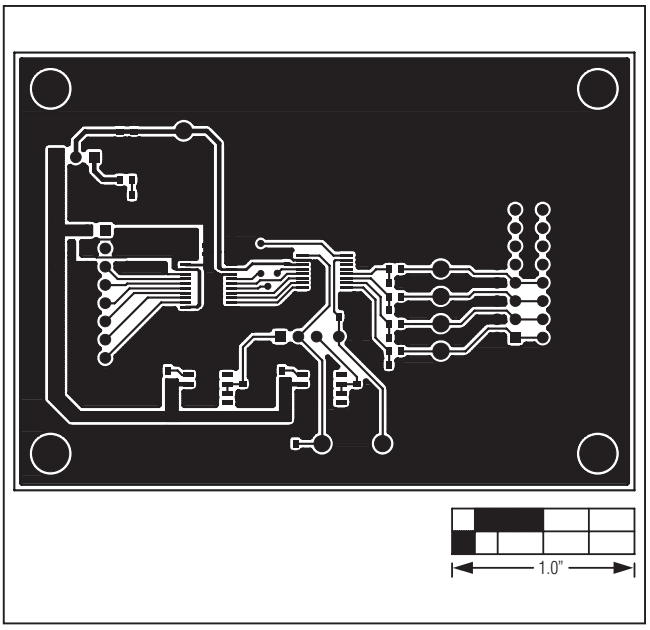



Figure 27. MAX11635 Daughter Board PCB Layout—Top

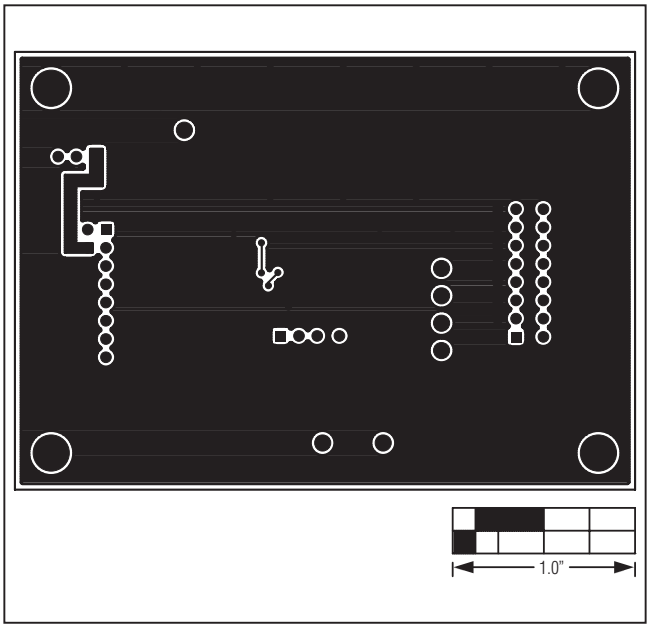



Figure 28. MAX11635 Daughter Board PCB Layout—Bottom

# MAX1231B/MAX11633/MAX11635 Evaluation Systems
# Evaluate: MAX1030/MAX1031/MAX1230/ MAX1231/MAX11624/MAX11625/ MAX11632–MAX11635/MAX11642/MAX11643

## *Ordering Information/Selector Guide*

| PART | COMPATIBLE ADC | DESCRIPTION |
|---|---|---|
| **MAX1231BEVSYS#** | MAX1030BEEG+ | 10-bit, 5V supply, 16-channel, 4.096V internal reference |
| | MAX1031BEEG+ | 10-bit, 3V supply, 16-channel, 2.5V internal reference |
| | MAX1230BEEG+ | 12-bit, 5V supply, 16-channel, 4.096V internal reference |
| | MAX1231BEEG+* | 12-bit, 3V supply, 16-channel, 2.5V internal reference |
| **MAX11633EVSYS#** | MAX11624EEG+ | 10-bit, 5V supply, 16-channel, 4.096V internal reference |
| | MAX11625EEG+ | 10-bit, 3V supply, 16-channel, 2.5V internal reference |
| | MAX11632EEG+ | 12-bit, 5V supply, 16-channel, 4.096V internal reference |
| | MAX11633EEG+* | 12-bit, 3V supply, 16-channel, 2.5V internal reference |
| | MAX11642EEG+ | 8-bit, 5V supply, 16-channel, 4.096V internal reference |
| | MAX11643EEG+ | 8-bit, 3V supply, 16-channel, 2.5V internal reference |
| **MAX11635EVSYS#** | MAX11634EEE+ | 12-bit, 5V supply, 4-channel, 4.096V internal reference |
| | MAX11635EEE+* | 12-bit, 3V supply, 4-channel, 2.5V internal reference |

**Default ADC installed on the daughter board.*
*#Denotes RoHS compliant.*
*#Denotes RoHS compliant.*
*+Denotes lead(Pb)-free and RoHS compliant.*

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 8/11 | Initial release | — |
| 1 | 4/12 | Changed ordering part numbers from lead(Pb)-free to RoHS compliant | 39 |

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