19-2994; Rev 0; 9/03

MAXIM

MAX1168 Evaluation Kit/Evaluation System

Evaluates: MAX1068/MAX1168

General Description

The MAX1168 evaluation system (EV system) is a complete 8-channel, 16-bit data-acquisition system that is comprised of a MAX1168 evaluation kit (EV kit) and a Maxim 68HC16MODULE-DIP microcontroller (µC) module.

Order the complete EV system (MAX1168EVC16) for a comprehensive evaluation of the MAX1168 using a personal computer (PC). Order the EV kit (MAX1168EVKIT) separately if the 68HC16MODULE-DIP module has been purchased with a previous Maxim EV system, or for custom use in other µC-based systems.

Ordering Information

PART	IC PACKAGE	INTERFACE TYPE
MAX1168EVKIT	24 QSOP	User-supplied
MAX1168EVC16	24 QSOP	Windows software

Note: *The MAX1168 software is included with the MAX1168 EV kit but is designed for use with the complete EV system. The EV system includes a µC module and the EV kit. If the Windows software is not required, the EV kit board can be purchased by itself, without the µC module.*

Note: *To evaluate the MAX1068, request a free sample of the MAX1068_CEG when ordering the MAX1168 EV kit.*

Features

- **Proven PC Board Layout**
- **Windows® 95/98/2000/XP-Compatible Evaluation Software**
- **Convenient On-Board Test Points**
- **Fully Assembled and Tested**

MAX1168EVC16 System Component List

PART	QTY	DESCRIPTION
MAX1168EVKIT	1	MAX1168 EV Kit
68HC16MODULE-DIP	1	68HC16 µC Module

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
TDK	847-803-6100	www.component.tdk.com

Note: *Please indicate you are using the MAX1168 when contacting these component suppliers.*

MAX1168EVKIT Component List

DESIGNATION	QTY	DESCRIPTION
C1–C18, C21, C22	20	0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104KT
C19, C20	2	10µF ±20%, 16V X5R ceramic capacitors (1210) TDK C3225X5R1C106M
C23	1	1µF ±20%, 10V X5R ceramic capacitor (0805) TDK C2012X5R1A105M
C24–C31	8	100pF ceramic capacitors (0603) TDK C1608C0G1H101J
C32–C39	8	0.22µF ±10%, 10V X7R ceramic capacitors (0603) TDK C1608X7R1A224K
FB1, FB2	2	Surface-mount ferrite beads (0603) TDK MMZ1608B601C
R1–R8	8	100Ω ±5% resistors (0603)
R9–R16	8	4.7kΩ ±5% resistors (0603)
R17–R24	8	10Ω ±5% resistors (0603)
U1	1	16-bit ADC (24-pin QSOP) Maxim MAX1168CCEG
U2	1	Logic buffer (5-SOT23) Fairchild Semiconductor NC7SZ125
U3–U10	8	Op amps (SOT23-5) Maxim MAX4430EUK
J1	1	2 x 20 right-angle female connector Samtec SSW-120-02-S-D-RA
TB0	1	2-circuit terminal block
JU1	1	2-pin header
JU2	1	3-pin header
None	2	Shunts
None	1	PC board, MAX1168 EV kit
None	1	MAX1168 EV kit software, CD-ROM

Windows is a registered trademark of Microsoft Corp.

MAX1168EV Kit Files

FILE NAME	FUNCTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX1168.EXE	Application program
HELPFILE.HTM	MAX1168 EV kit help file
UNINST.INI	Uninstalls the EV kit software
KIT1168.C16	Software loaded into the 68HC16 µC

Quick Start

Recommended Equipment

- MAX1168EVC16 (MAX1168EVKIT board and 68HC16MODULE-DIP)
- Three DC power supplies:
  +8V to +20V at 0.25A
  +5V at 0.2A
  -5V at 0.2A
- Analog signal source:
  0 to 4.096V
- Windows 95/98/2000/XP-compatible computer with an available serial (COM) port
- 9-pin I/O extension cable (straight-through female-to-male)

Procedure

Do not turn on the power until all connections are complete:

1) Verify jumper JU1 is ON, disabling DSP mode.
2) Verify jumper JU2 is connected to pins 2–3, enabling an 8-bit-wide data-transfer mode.
3) Carefully connect the boards by aligning the 40-pin connector of the MAX1168 EV kit with the 40-pin header of the 68HC16MODULE-DIP module. Gently press them together. The two boards should be flush against one another.
4) Ensure that the µC module's SW1 switch is in the OFF position.
5) Connect the +8V to +20V power supply to the µC module's terminal block (J2), located next to the ON/OFF switch (SW1) along the top edge of the µC module. Observe the polarity marked on the board.
6) Connect the +5V power supply to the VDD pad (with respect to the GND pad) on the MAX1168 EV kit board.
7) Connect the -5V power supply to the VEE pad (with respect to the GND pad) on the MAX1168 EV kit board.
8) Connect the 9-pin serial cable from the computer's serial port to the µC module's DB9 connector (J3).
9) Install the MAX1168 EV kit software on your computer by running the INSTALL.EXE program on the CD-ROM. The program files are copied and icons are created in the **Programs** section within the Windows **Start** menu.
10) Turn on the +5V power supply. Next, turn on the -5V power supply. Finally, turn on the +8V to +20V power supply and turn on the µC module's slide switch SW1 to the ON position.
11) Start the MAX1168 EV kit program by clicking on its icon in the **Programs** section within the Windows **Start** menu.
12) The Windows program will prompt you to click **OK** for **Automatic** serial port selection. When you click **OK**, the Windows program automatically downloads the file KIT1168.C16 to the module. Please wait approximately 25 seconds for the download to complete.
13) Apply an input signal (0 to +4.096V) between AIN0 and GND. Observe the AIN0 label on the running Windows program.

Detailed Description of Software

The evaluation software's main window shown in Figure 1 displays the voltage and code of the analog-input signals AIN0–AIN7. The software supports manual read or automatic read operations. Separate comboboxes allow quick modifications to the MAX1168's control byte. The SPI™ serial clock frequency is adjustable from 4.19MHz to 33kHz, and the software's reference value can be changed to match the applied external reference. The provided Windows-compatible software supports SPI mode (not DSP mode) and also only supports the MAX1168 EV kit when configured in 8-bit-wide data-transfer mode. Table 1 describes all the controls on the evaluation software's main window.

SPI is a trademark of Motorola, Inc

Table 1. Software Control Descriptions

CONTROL	DESCRIPTION
View	The **View** menu makes the COM port debug form visible
BlockSample	The **BlockSample** menu is an EV kit software feature that allows a single channel to be sampled and stored. The data block length is selectable and the data can be saved to a file. Block sampling is limited to single-channel read modes only. SCAN[1:0] = 01 or 11 modes are not supported. For multiple-channel reads, use the **Read ADC** button or the **AutoRead** checkbox.
Device	The **Device** menu allows the user to evaluate either the MAX1168 or MAX1068
Help	The **Help** menu allows the user to view the help file or the software's about box
Control Byte: 0xE9	The **Control Byte** label shows the current control byte setting in hexadecimal
CS[2:0] 111 CS2 CS1 CS0	The **CS[2:0]** combobox selects the channel below: 000 CS2 CS1 CS0 = Channel 0 001 CS2 CS1 CS0 = Channel 1 010 CS2 CS1 CS0 = Channel 2 011 CS2 CS1 CS0 = Channel 3 100 CS2 CS1 CS0 = Channel 4 101 CS2 CS1 CS0 = Channel 5 110 CS2 CS1 CS0 = Channel 6 111 CS2 CS1 CS0 = Channel 7
SCAN[1:0] 01 SCAN1 SCAN0	The **SCAN[1:0]** combobox selects the scan mode below: 00 SCAN1 SCAN0 = Single channel, no scan 01 SCAN1 SCAN0 = Sequentially scans channel 0 to CS[2:0] 10 SCAN1 SCAN0 = Sequentially scans channel 4 to CS[2:0]; CS[2:0] ≥ 4 11 SCAN1 SCAN0 = Scan channel CS[2:0] eight times
SEL[1:0] 00 SEL1 SEL0	The **SEL[1:0]** combobox selects the reference mode below: 00 SEL1 SEL0 = Internal reference mode 01 SEL1 SEL0 = EV kit software does not support this mode 10 SEL1 SEL0 = EV kit software does not support this mode 11 SEL1 SEL0 = External reference mode
CLK 1 INT CLK	The **CLK** combobox selects the clock mode below: 0 EXT CLK 1 INT CLK
SPI SCLK Frequency 02: 4.19MHz	The **SPI SCLK Frequency** combobox selections are: 02: 4.19MHz 04: 2.10MHz . . . FF: 33kHz

Table 1. Software Control Descriptions (continued)

CONTROL	DESCRIPTION
Set Vref 4.096	The **Set Vref** button allows the user to specify the actual reference voltage. The evaluation software assumes a +4.096V reference voltage, unless otherwise specified. To override the default +4.096V software reference value, measure the actual reference voltage at the terminal block (TB0) on the MAX1168 EV kit board and enter the new reference voltage, without the volt unit. Finally, press the **Set Vref** button. The EV kit software uses the value typed in the Vref field to translate the digital code to a voltage.
Read ADC	Pressing the **Read ADC** button performs the conversion(s) specified by the control byte and reads back the result(s).
* AutoRead	Checking the **AutoRead** checkbox performs the conversion(s) specified by the control byte and reads back the result(s) every 500ms. A blinking asterisk indicates AutoRead is active.
Exit	The **Exit** button closes the program

_Detailed Description of Hardware

MAX1168 EV System

The MAX1168 EV system is a complete 8-channel, 16-bit data-acquisition system consisting of a MAX1168 EV kit and a Maxim 68HC16MODULE-DIP µC module. The MAX1168 EV system is used to evaluate the MAX1168 8-channel, 16-bit serial ADC. See the *Quick Start* section for setup and operating instructions. See Table 1 for more information on the provided Windows software.

MAX1168 EV Kit

The MAX1168 EV kit board provides a proven layout for evaluating the MAX1168 8-channel, 16-bit ADC and can be obtained separately without the µC module for use with an existing µC. The MAX1168 EV kit contains two different types of buffers. U2 is a logic buffer to limit the load capacitance that is seen by the DOUT line of the MAX1168. U3–U10 are 16-bit accurate analog buffers connected in the unity-gain configuration. U1 is powered from V_{DD} and U3–U10 are powered from V_{DD} and V_{EE}. U3 is powered from the µC module (J1-7, J1-8). A terminal block (TB0) has also been provided on the MAX1168 EV kit board for evaluating external reference mode. Refer to the MAX1167/MAX1168 or MAX1067/ MAX1068 data sheets to ensure all interface timing specifications are met.

The MAX1168 and MAX1168 EV kit board support DSP and 16-bit-wide data-transfer mode. Jumpers JU1 and JU2 can be configured for these modes; however, the supplied EV kit Windows-compatible software does not support these two modes. Please refer to the MAX1167/MAX1168 or MAX1067/MAX1068 data sheets for more information.

Table 2. DSP Frame Sync Receive Input (DSPR)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	ON*	DSP mode disable
	OFF	DSP mode enable (the supplied Windows software does not support this mode)

**Default configuration.*

Table 3. Data Bit Transfer Select Input (DSEL)

JUMPER	SHUNT POSITION	DESCRIPTION
JU2	1–2	16-bit-wide data-transfer mode (the supplied Windows software does not support this mode)
	2–3*	8-bit-wide data-transfer mode

**Default configuration.*

Caution: Do not connect an external controller to the DSEL pad while a shunt is on jumper JU2.

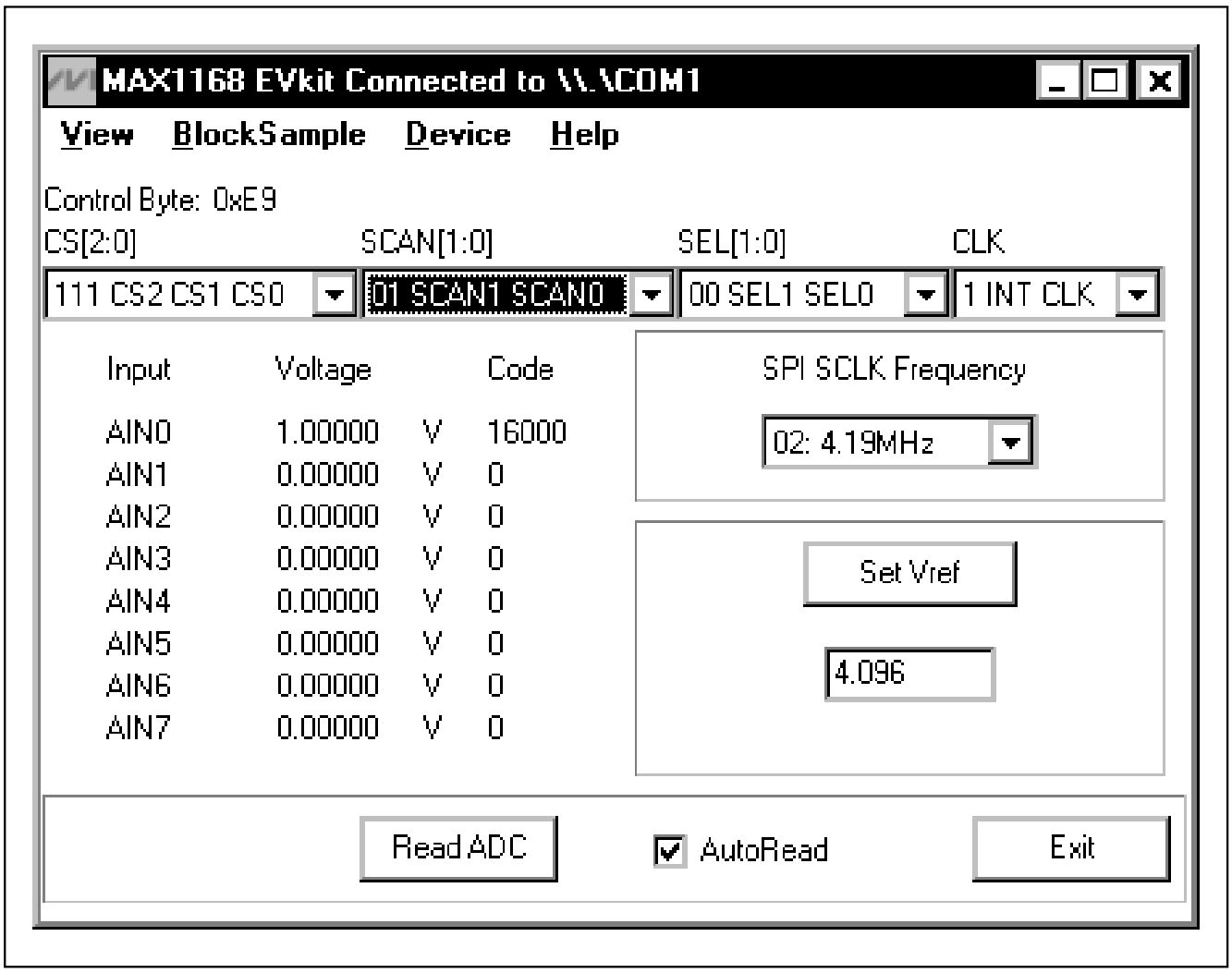

Figure 1. MAX1168 Evaluation Software's Main Window

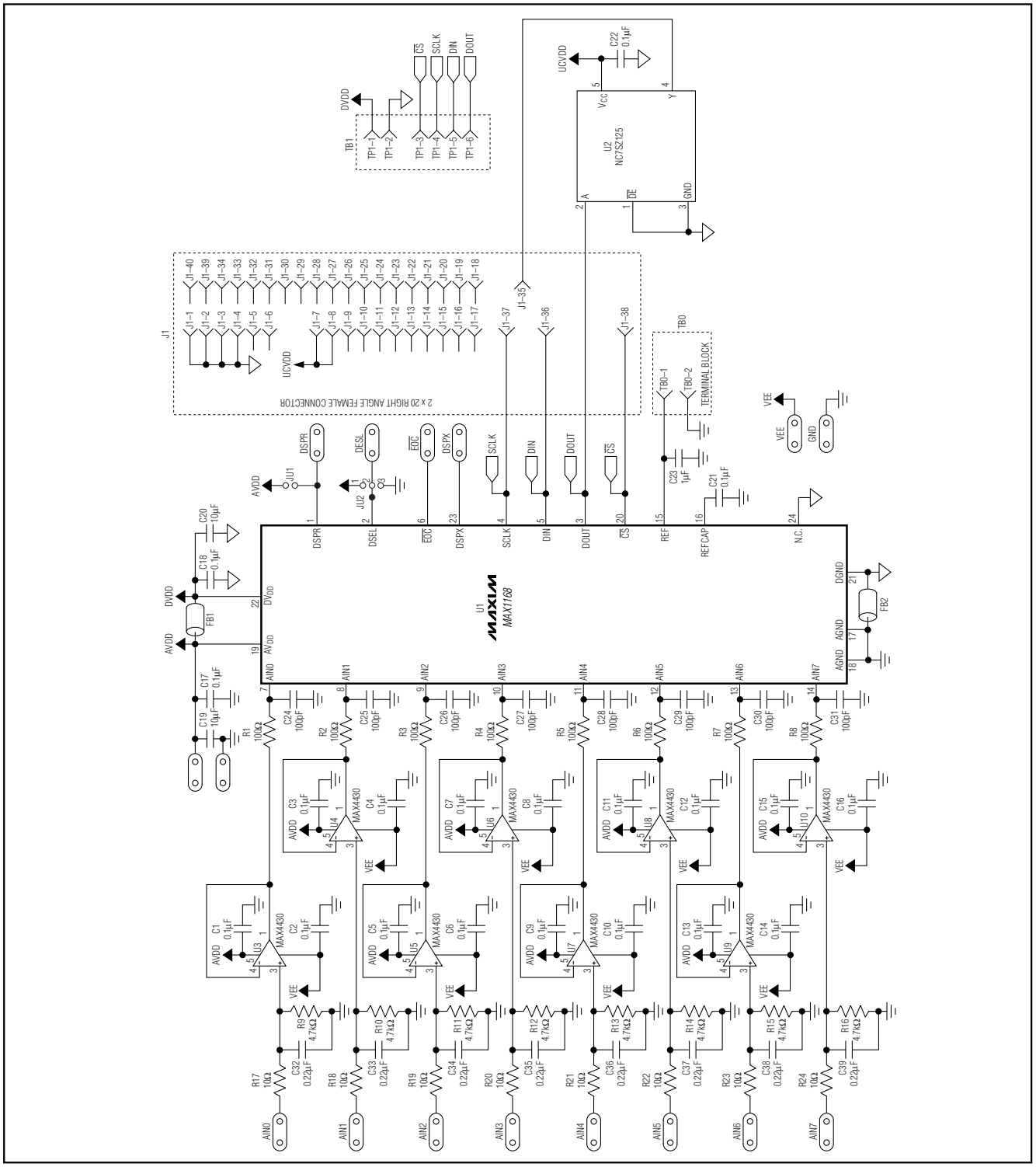

Figure 2. MAX1168 EV Kit Schematic

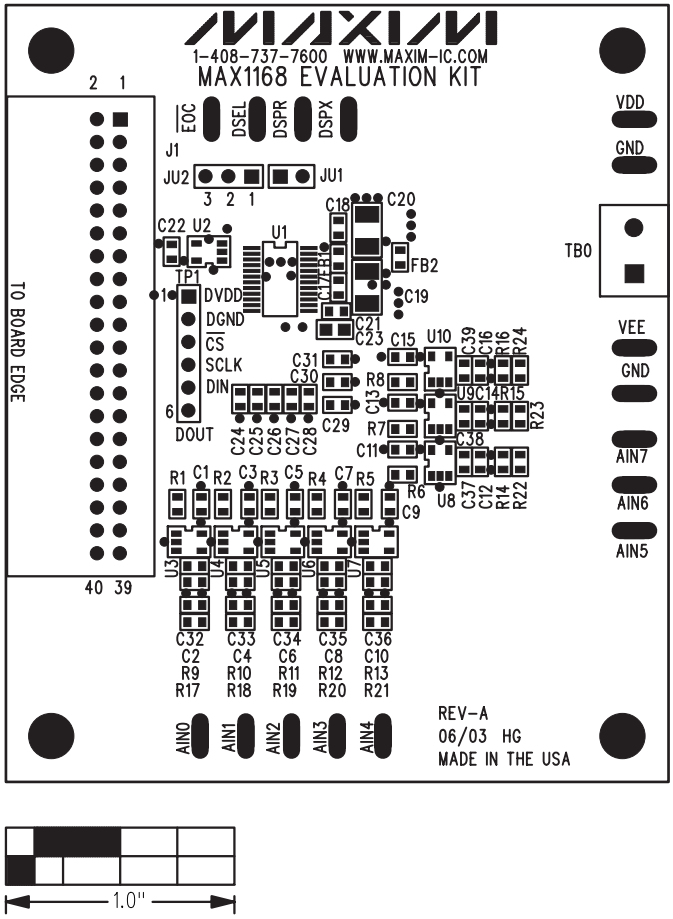

Figure 3. MAX1168 EV Kit Component Placement Guide—Component Side

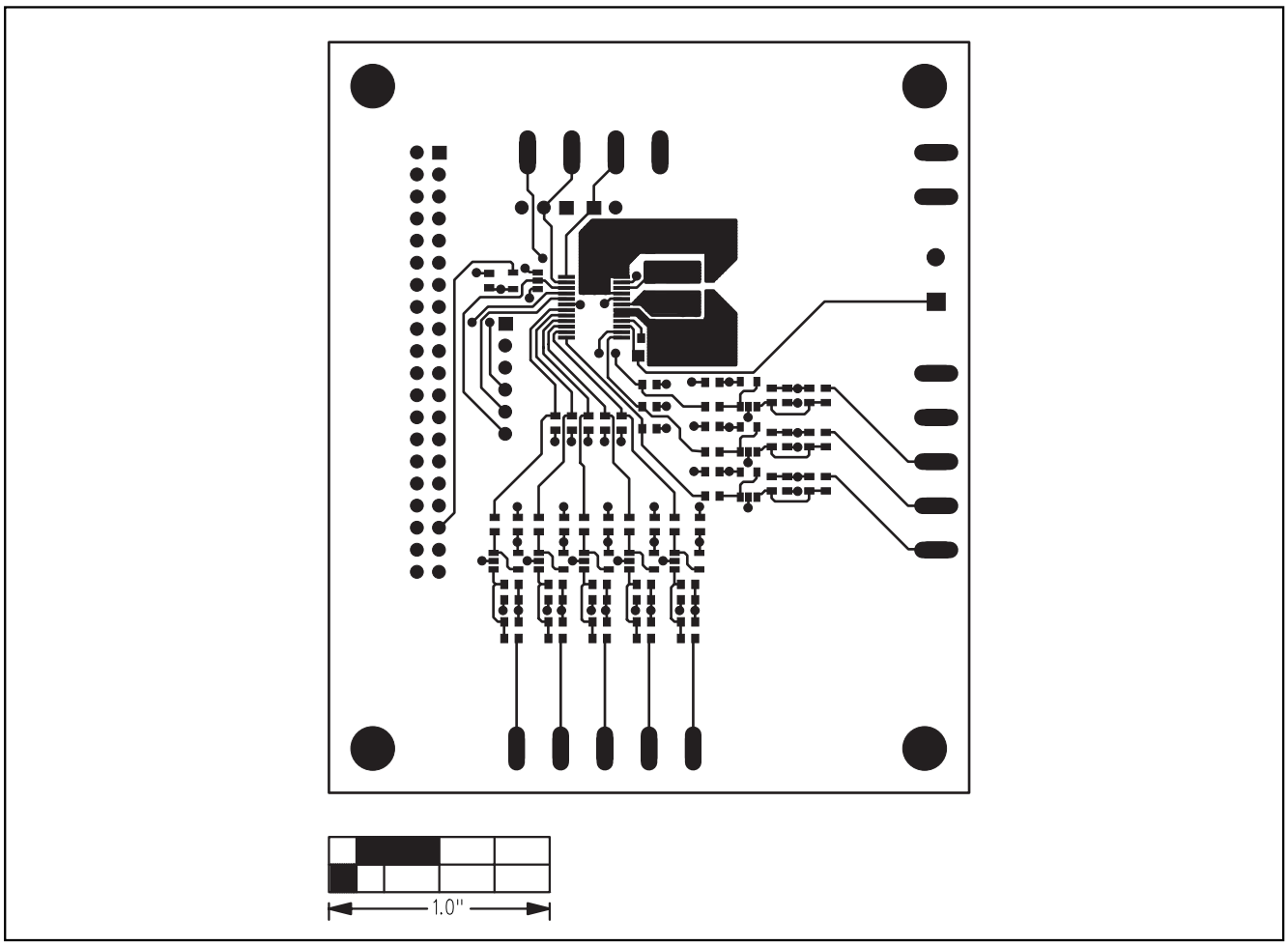

Figure 4. MAX1168 EV Kit PC Board Layout—Component Side

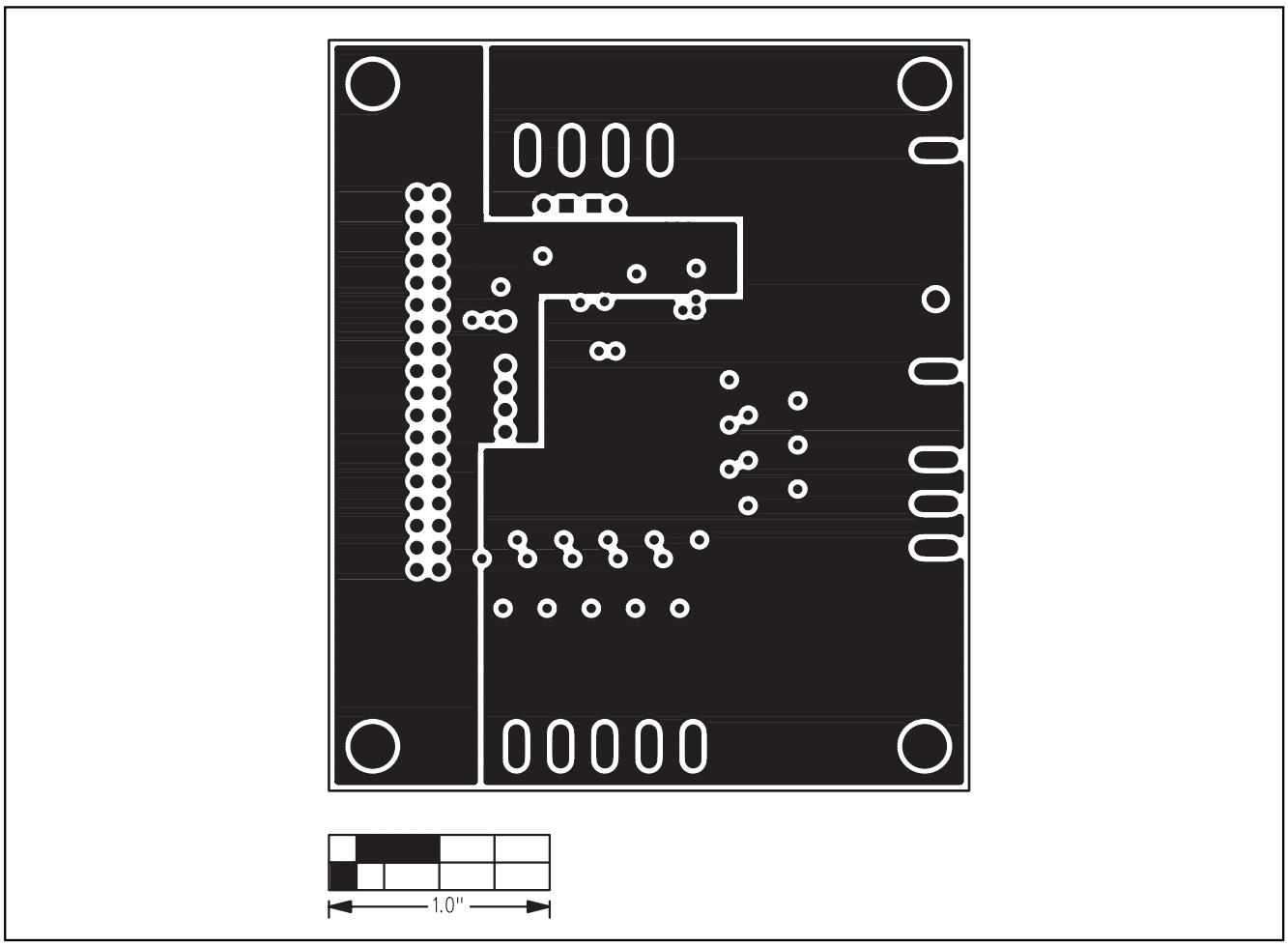

Figure 5. MAX1168 EV Kit PC Board Layout—Inner Layer 2 (GND)

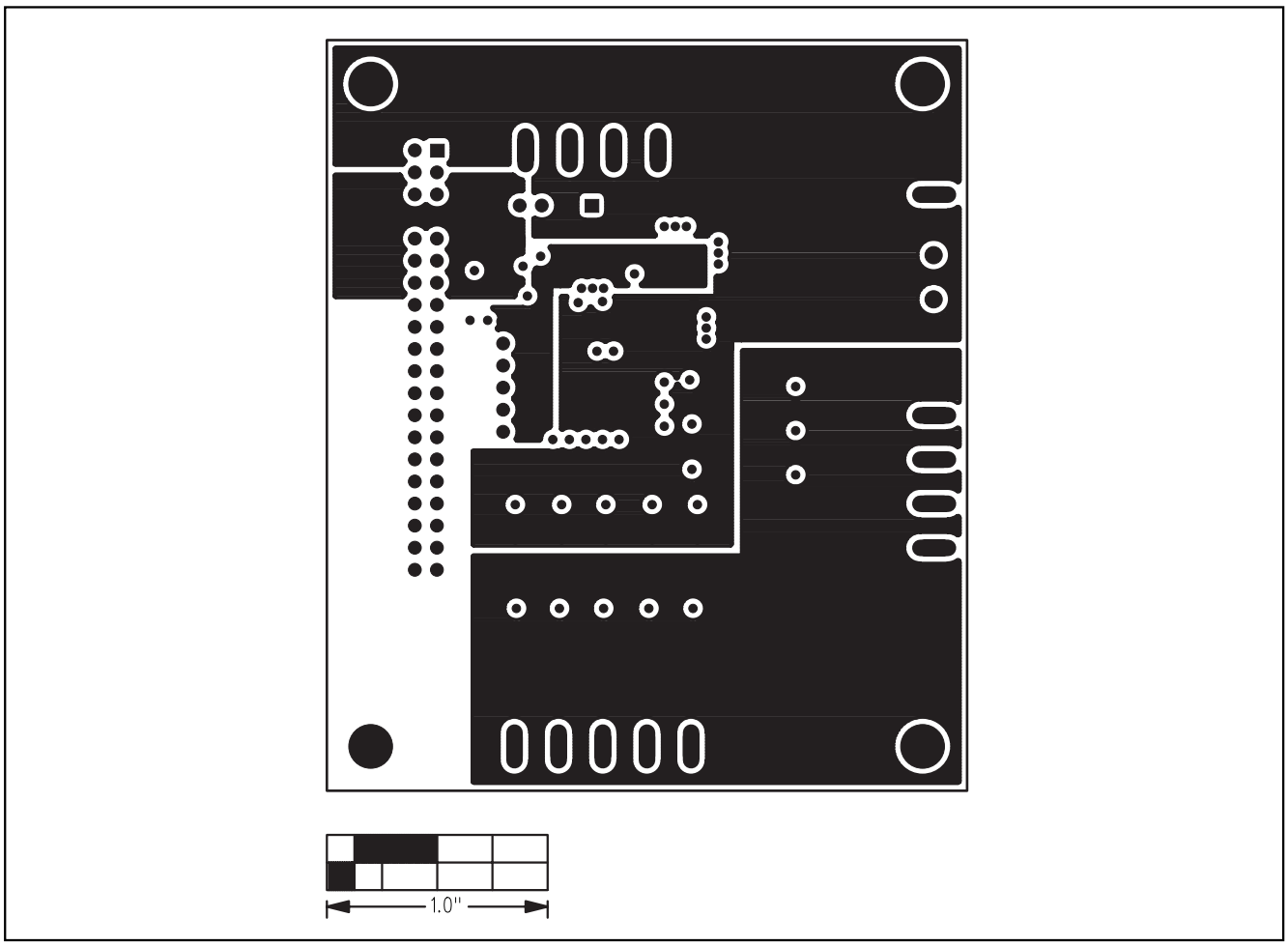

Figure 6. MAX1168 EV Kit PC Board Layout—Inner Layer 3 (VDD)

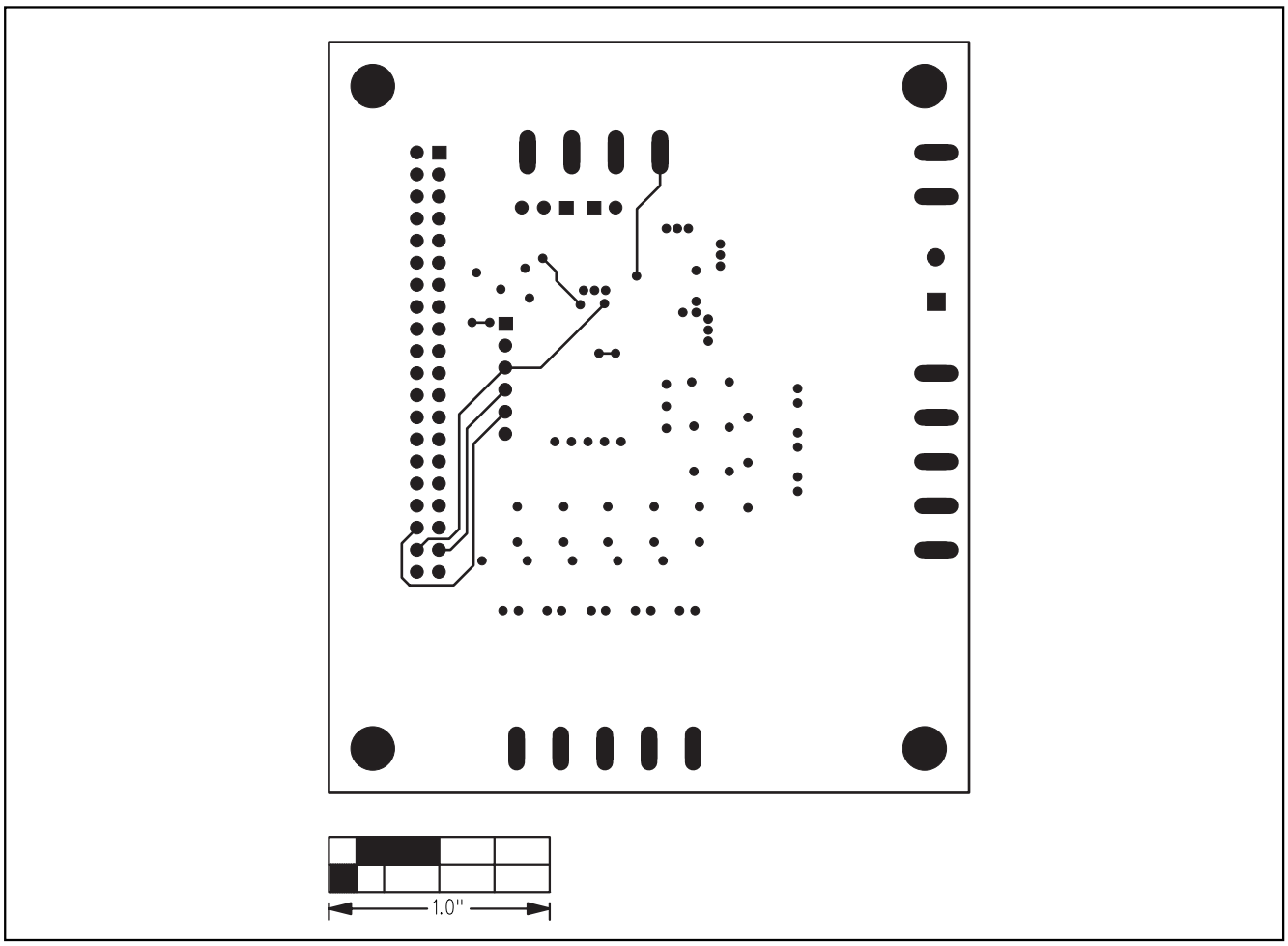

Figure 7. MAX1168 EV Kit PC Board Layout—Solder Side