19-3309; Rev 0; 6/04

MAX5734 Evaluation System/Evaluation Kit

General Description

The MAX5734 evaluation system (EV system) consists of a MAX5734 evaluation kit (EV kit) and a Maxim 68HC16MODULE-DIP microcontroller (µC) module. The MAX5734 EV kit demonstrates the operation of the MAX5734 32-channel, 16-bit, voltage-output digital-to-analog converter (DAC). It has a QSPI™-programmable -2.5V to +7.5V output voltage range. Windows® 95-/98-/2000-/XP-compatible software provides a handy user interface to exercise the features of the MAX5734.

The MAX5734 EV kit can also evaluate the MAX5733 and the MAX5735. The MAX5733 has a 0 to +10V range, and the MAX5735 has a -5V to +5V range. Order free samples of the MAX5733ACTN or MAX5735ACTN through Maxim's website. Order the complete EV system (MAX5734EVC16) for a comprehensive evaluation of the MAX5734 using a PC. Order the EV kit (MAX5734EVKIT) if the 68HC16MODULE-DIP module has already been purchased with a previous Maxim EV system, or for custom use in other µC-based systems.

MAX5734EVC Component List

PART	QTY	DESCRIPTION
MAX5734EVKIT	1	MAX5734 EV kit
68HC16MODULE-DIP	1	68HC16 µC module

Features

- **32 Individual DACs**
- **Compatible with 0 to +10V, ±5V, and -2.5V to +7.5V Output Range**
- **Glitch-Free Power-Up**
- **SPI™/QSPI/MICROWIRE™ Interface**
- **Easy-to-Use Menu-Driven Software**
- **Includes Windows 95-/98-/2000-/XP-Compatible Software and Demo PC Board**
- **Surface-Mount Construction**
- **Fully Assembled and Tested**

Ordering Information

PART	TEMP RANGE	INTERFACE TYPE
MAX5734EVKIT	0°C to +70°C	Not included
MAX5734EVC16	0°C to +70°C	68HC16MODULE-DIP

Note: *The MAX5734 software is designed for use with the complete MAX5734EVC16 EV system (includes 68HC16MODULE-DIP module together with MAX5734EVKIT). If the MAX5734 evaluation software will not be used, the MAX5734EVKIT board can be purchased without the µC module.*

Component List

DESIGNATION	QTY	DESCRIPTION
C1–C6, C17, C18, C19, C21	10	1µF, 10V, X5R ceramic capacitors (0603) Murata GRM188R61A105K TDK C1608X5R1A105K
C7–C10	4	10µF, 16V, X5R ceramic capacitors (1210) Taiyo Yuden EMK325BJ106MN TDK C3325X5R1C106M
C11–C14	0	Not installed (0603)
C15	1	47pF, 50V, C0G ceramic capacitor (0603) Murata GRM1885C1H470J Taiyo Yuden UMK107CG470JZ TDK C1608C0G1H470J
C16	1	100pF, 50V, C0G ceramic capacitor (0603) Murata GRM1885C1H101J TDK C1608C0G1H101J
C20	1	0.1µF, 16V, X7R ceramic capacitor (0603) Murata GRM188R71C104KA01 Taiyo Yuden EMK107BJ104KA TDK C1608X7R1C104K
J1	1	2 x 20 right-angle female receptacle
JU1	1	2 x 12 straight header
JU2, JU3	2	2 x 13 straight headers
JU4	1	3-pin header
JU5	1	8-pin header
JU6, JU7	0	Not installed, 2-pin headers
JU8	1	2-pin header
L1, L2, L3	3	Ferrite chip beads (0805) Murata BLM21AH102SN1
R1–R4	0	Not installed (0603)
R5	1	200kΩ ±5% resistor (0603)
R6	1	20kΩ ±5% resistor (0603)
U1	1	MAX5734BCTN
U2	1	MAX6163AESA

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Windows is a registered trademark of Microsoft Corp.
MICROWIRE is a trademark of National Semiconductor Corp.

MAX5734 Evaluation System/Evaluation Kit

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
Murata	770-436-1300	770-436-3030	www.murata.com
Taiyo Yuden	800-348-2496	847-925-0899	www.t-yuden.com
TDK	847-803-6100	847-390-4405	www.component.tdk.com

Note: *Indicate you are using the MAX5734 when contacting these manufacturers.*

MAX5734 Stand-Alone EV Kit

The MAX5734EVKIT provides a proven PC board layout to evaluate the MAX5734. It must be interfaced to appropriate timing signals for proper operation. Connect +5V across DVDD and DGND, and connect the digital signals to JU5. See Figure 3 and the MAX5734 EV Kit Schematic (Figure 4). Refer to the MAX5734 data sheet for timing requirements.

MAX5734 EV System

The MAX5734EVC16 EV system operates from a user-supplied 7VDC to 20VDC power supply. Windows 95-/98-/2000-/XP-compatible software running on a PC interfaces to the EV system board through the computer's serial communications port. The 68HC16 module communicates with the MAX5734 through a 4.19MHz QSPI port. See the *Quick Start* section for setup and operating instructions.

Quick Start

Recommended Equipment

Before beginning, the following equipment is recommended:

- +5VDC power supply for AVDD
- +8.0VDC power supply for AVCC
- -3.0VDC power supply for VSS
- DC power supply capable of supplying a voltage between +7V to +28V for the 68HC16 module board
- Voltmeter
- Computer running Windows 95, 98, 2000, or XP
- 9-pin serial extension cable
- Maxim 68HC16 module board

Procedure

The MAX5734 EV kit is a fully assembled and tested surface-mount board. Follow the steps below to verify board operation. **Do not turn on the power supply until all connections are completed.**

1) Carefully connect the boards by aligning the 40-pin connector of the MAX5734 EV kit with the 40-pin header of the 68HC16 module board. Gently press them together.
2) Connect a cable from the computer's 9-pin serial port to the 68HC16 module board. Use a straight-through, 9-pin, female-to-male cable.
3) Install the software by running the INSTALL.EXE program. The install program copies the files and creates icons for them in the Windows 95/98/2000/XP Start menu. (To remove the software at any time, click on the UNINSTALL icon.)
4) Install a shunt on JU4 (pins 1-2) to place the MAX5734 in SPI interface mode.
5) Install a shunt on JU8 to connect the ground sense (GS) to the header, JU2.
6) Connect the +7VDC to +28VDC power supply to J2 on the 68HC16 module board.
7) Connect +5V between AVDD and GND on the MAX5734 EV kit.
8) Connect +8V between AVCC and GND on the MAX5734 EV kit.
9) Connect -3V between VSS and GND on the MAX5734 EV kit.
10) Turn on the power supplies.
11) Start the MAX5734 program by opening its icon in the Start menu.
12) Click **OK** after the Maxim Evaluation Kit Serial Interface form (shown in Figure 1) opens. The computer downloads code to the 68HC16 module to program the QSPI port.
13) The MAX5734 EV kit form (shown in Figure 2) opens after the download to the 68HC16 module is complete.
14) Verify the output voltage is approximately -2.5V.

Detailed Description of Software

The MAX5734 has 32 channels. Each channel consists of an input register and a DAC register. The input and DAC registers can be loaded simultaneously by using the write-thru command. Alternatively, the input register can be loaded and the DAC register loaded later by using either the load DAC command or asserting the load DAC ($\overline{LDAC}$) pin. The output voltage on the MAX5734 changes after loading the DAC register.

User-Interface Panel

The user interface (shown in Figure 2) is easy to operate; use the mouse, or press the tab and arrow keys to navigate.

Note: Words in boldface are user-selectable features in the software.

Input/DAC Registers

Select the desired channel by choosing it from the **Active Channel** pulldown menu or by clicking on the name in the register table. Set the output voltage by either entering the desired voltage in the Voltage edit field, or by entering the DAC code into the Hex edit field or Decimal edit field.

The voltage for the 32 DACs is given by the following equation:

$$V_{OUT} = \frac{Gain \times V_{REF} \times (DAC\ Code - Offset\ DAC\ Code)}{2^{16}} + V_{GS}$$

where Gain = 10/3, V_{REF} is the reference voltage, and V_{GS} is the ground-sense voltage.

Offset DAC

The offset DAC is configured like the other 32 channels. The offset voltage is given by the following equation:

$$V_{OFFSET} = -\frac{Gain \times V_{REF} \times Offset\ DAC\ Code}{2^{16}} + V_{GS}$$

Write-Thru

Write-thru loads both the input register and DAC register at the same time. If write-thru is not used, the DAC register must be loaded by sending either the load DAC command or pulling the $\overline{LDAC}$ pin low.

Table 1. Configuration Register Settings

NAME	DESCRIPTION
ERRF	Error flag; ERRF goes logic high when an invalid command is attempted. ERRF is cleared each time the configuration register is read back to DOUT. Clear register commands C2, C1, and C0 = 111 resets ERRF. Conditions that trigger ERRF include: • Attempted read of address bits A5–A0 = 111111 (all 32 DACs) • Access to reserved addresses • Access to the configuration register (address bits A5–A0 = 100001 when used with control bits C2, C1, and C0 = 010 and 011) Default is logic low (no error flags); ERRF is read only.
SING	Single device; SING determines the manner in which data is output to DOUT. A logic high sets the device to operate in stand-alone mode or in parallel; only the 16 data bits are output to DOUT. A logic low sets the device to operate in a daisy chain of devices. In this case, the entire 32-bit command word is output to DOUT. Default is logic low (daisy-chain mode); SING is read/write.
GLT	Glitch-suppression enable; the MAX5733/MAX5734/MAX5735 feature glitch-suppression circuitry on the analog outputs that minimizes the output glitch during a major carry transition. A logic low disables the internal glitch-suppression circuitry, which improves settling time. A logic high enables glitch suppression, suppressing up to 120nV•s glitch impulse on the DAC outputs. Default is logic low (glitch suppression disabled); GLT is read/write.
DT	Digital output enable; a logic low enables DOUT. A logic high disables DOUT. Disabling DOUT reduces power consumption and digital noise feedthrough to the DAC outputs from the DOUT output buffer. Default is logic low (DOUT enabled); DT is read/write.
SHDN	Shutdown; a logic high shuts down all 32 DACs. The logic interface remains active, and the data is retained in the input and DAC registers. Read/write operations can be performed while the device is disabled; however, no changes can occur at the device outputs. A logic low powers up all 32 DACs if the device was previously in shutdown. Upon waking up, the DAC outputs return to the last stored value in the DAC registers. Default is logic low (normal operation); SHDN is read/write.

Read DAC

Read DAC reads the DAC register for the active channel (OUT0–OUT31 or OFFSET). **Note:** The ALL register is write only.

Clear DAC

Clear DAC clears both the input register and DAC register for the active channel (OUT0–OUT31, OFFSET, or ALL). **Note:** ALL does not include OFFSET.

Configuration Register

The configuration register controls the operating mode of the MAX5734, and communicates the status during a read command. Table 1 defines the settings of the configuration register.

MAX5734 $\overline{LDAC}$ and $\overline{CLR}$

The MAX5734 features a load DAC ($\overline{LDAC}$) pin. Driving this pin low (deselecting **/LDAC High** on the software) causes all DAC outputs to update simultaneously.

The MAX5734 features a clear ($\overline{CLR}$) pin. Driving this pin low (deselecting **/CLR High** on the software) sets all channels and the offset to 0V and the input and DAC registers to 0 code.

Detailed Description of Hardware

Reference Voltage

U2, a MAX6163 3.00V voltage reference, supplies the MAX5734's reference input (REF). To use a different voltage reference, cut the trace shorting JU7 and connect the reference to the pad labeled REF. The voltage must be between 2.90V and 3.10V. The MAX5734 EV kit software assumes a reference voltage of 3.00V. To change this value between 2.90V and 3.10V, enter the value into the Reference Voltage field and press enter.

Jumper JU1

Jumper JU1 provides ground (GND) and output connections to OUT0–OUT9. Figure 3 shows the pinout.

Jumper JU2

Jumper JU2 provides GND and output connections to OUT10–OUT20. Figure 3 shows the pinout.

Jumper JU3

Jumper JU3 provides GND and output connections to OUT21–OUT31. Figure 3 shows the pinout.

Jumper JU4

Connect jumper JU4 to position 1-2 to place the MAX5734 in SPI mode. Connect it to position 2-3 to place the MAX5734 in DSP mode.

Table 2. Jumper Selection

JUMPER	JUMPER POSITION	FUNCTION
JU1	N/A	Connections for OUT0–OUT9.
JU2	N/A	Connections for OUT10–OUT20.
JU3	N/A	Connections for OUT21–OUT31.
JU4	1-2*	Places the MAX5734 in SPI mode.
	2-3	Places the MAX5734 in DSP mode.
JU5	N/A	Connections for the digital signals, DGND, and DVDD.
JU6	Open*	VSS not connected to GND. Connect a negative supply voltage to VSS.
	Closed	VSS connected to GND.
JU7	Open	Drive MAX5734's reference input (REF) with an external reference voltage between 2.90V and 3.10V.
	Closed (shorted by PC board trace)	The MAX5734's reference input (REF) is supplied by U2 (MAX6163, 3.00V, voltage reference).
JU8	Open	Connect the MAX5734's ground-sense input (GS) to a remote location.
	Closed*	The MAX5734's ground-sense input (GS) to the GND of jumper JU2.

**Default position.*

Jumper JU5

Jumper JU5 provides a location to monitor the digital signals, digital ground (DGND), and digital VDD (DVDD). Figure 3 shows the pinout. The digital signals are chip select ($\overline{CS}$), master-in slave-out (MISO), serial clock (SCK), master-out slave-in (MOSI), load DAC ($\overline{LDAC}$), and clear ($\overline{CLR}$).

Jumper JU6

When evaluating the MAX5733, solder a short across JU6 to connect VSS to GND. Remove the short for the MAX5734 or MAX5735 when VSS is connected to a negative supply voltage.

Jumper JU7

Jumper JU7 connects the MAX5734's reference input (REF) to the onboard, MAX6163, 3.00V, voltage reference (U2). To use a different voltage reference between 2.90V and 3.10V, cut the short across JU7 and apply the reference voltage to the pads labeled REF and GND.

Jumper JU8

Jumper JU8 connects the MAX5734's ground-sense input (GS) to the GND of jumper JU2. To sense ground at a different location, remove the shunt on JU8 and connect a wire from the pad label GS to that location.

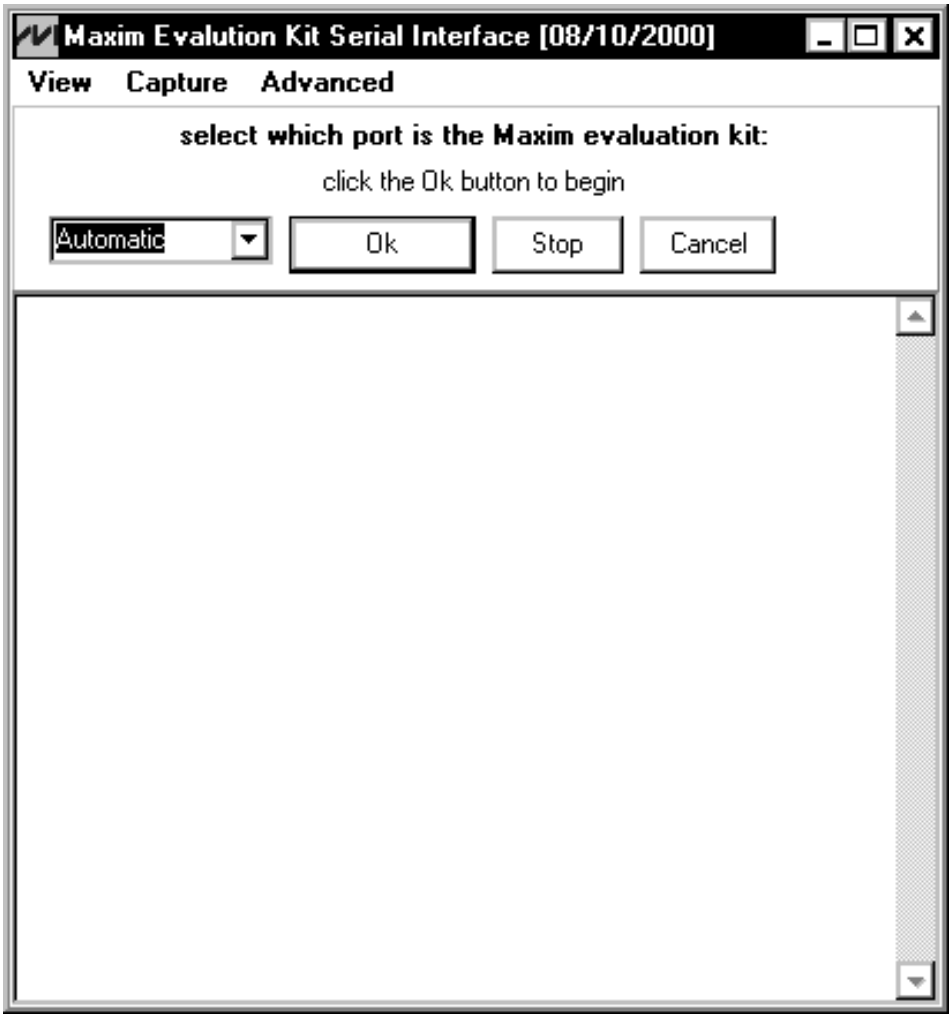

Figure 1. Maxim Evaluation Kit Serial Interface Form

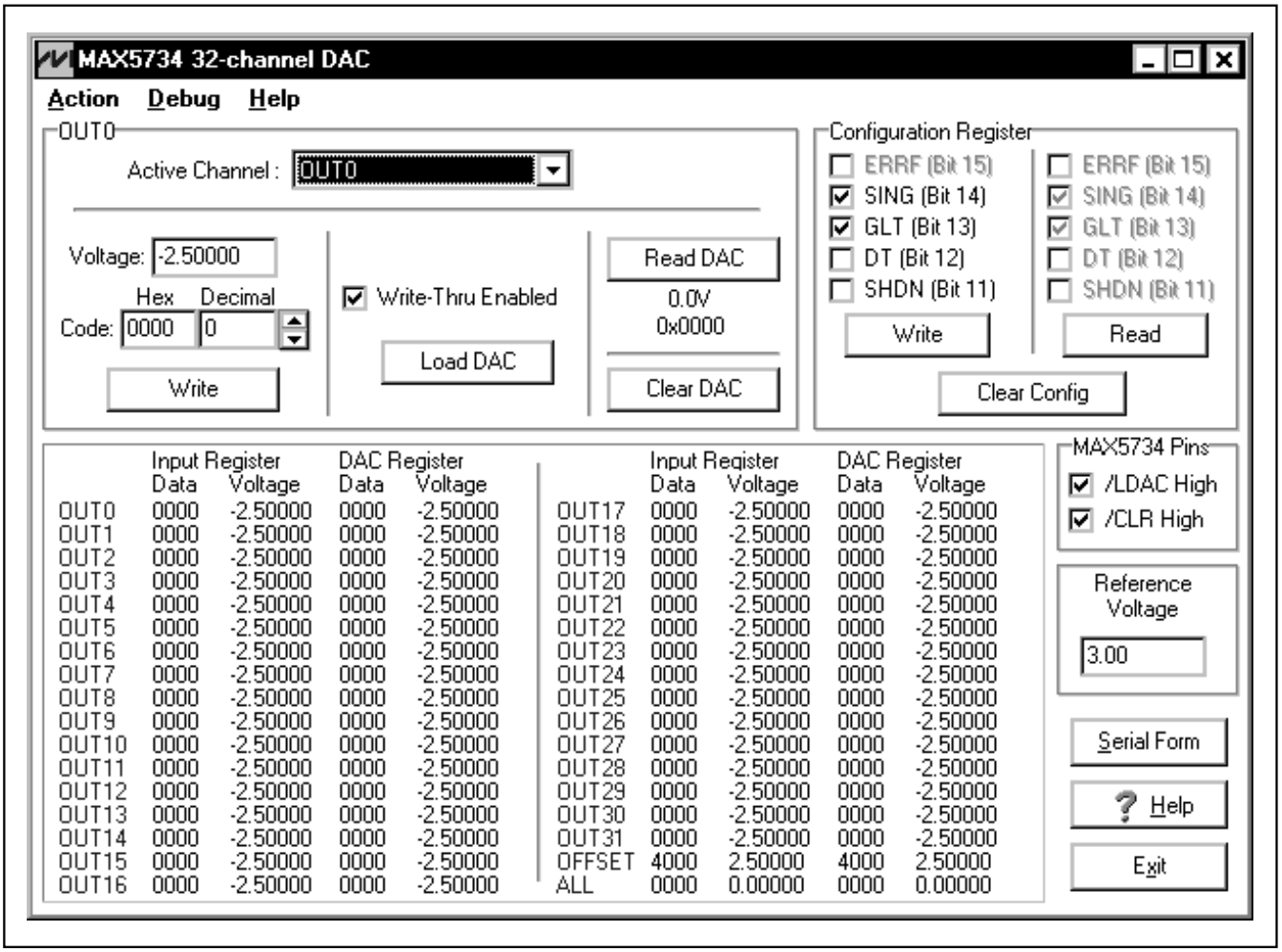

Figure 2. MAX5734 Evaluation Kit Main Form

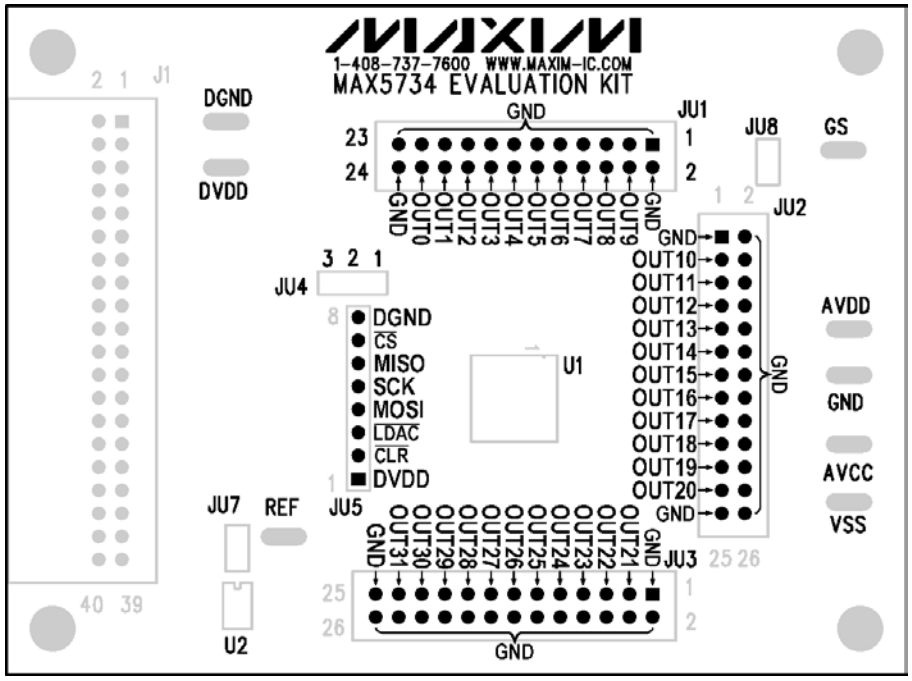

Figure 3. DAC and Digital Signal Connections

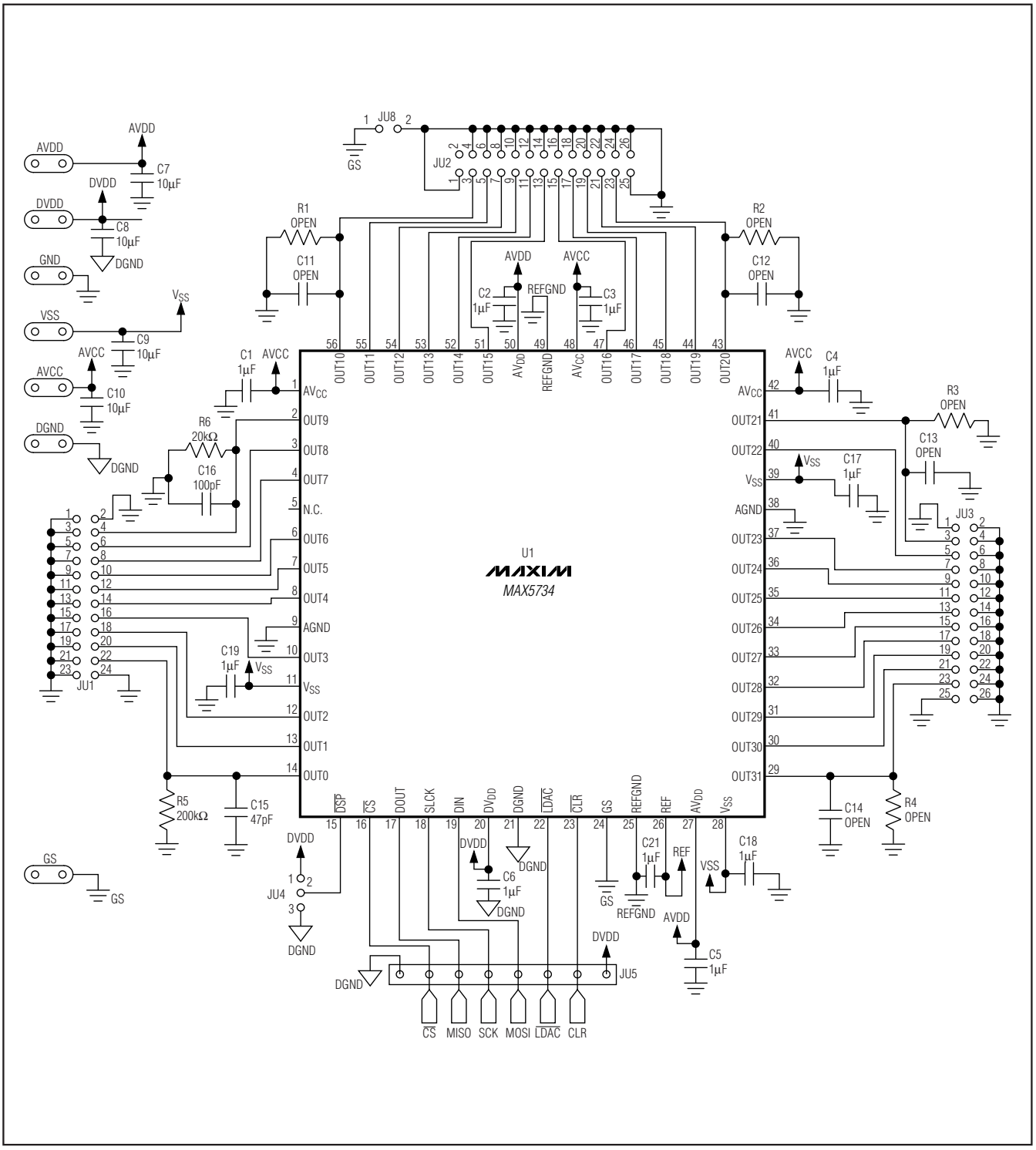

Figure 4. MAX5734 EV Kit Schematic

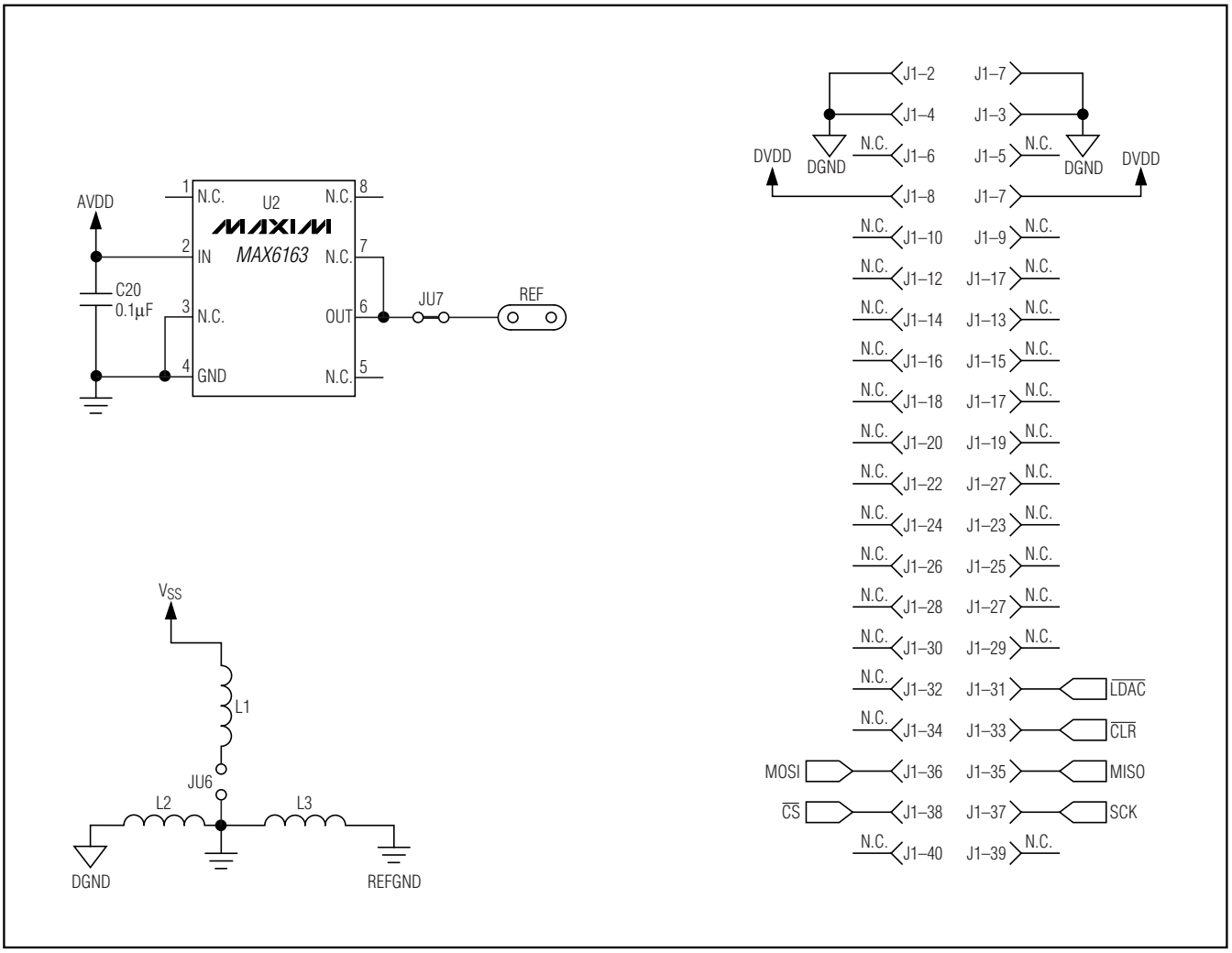

Figure 5. MAX5734 EV Kit Schematic—Voltage Reference, GND Connection, and Digital Signal

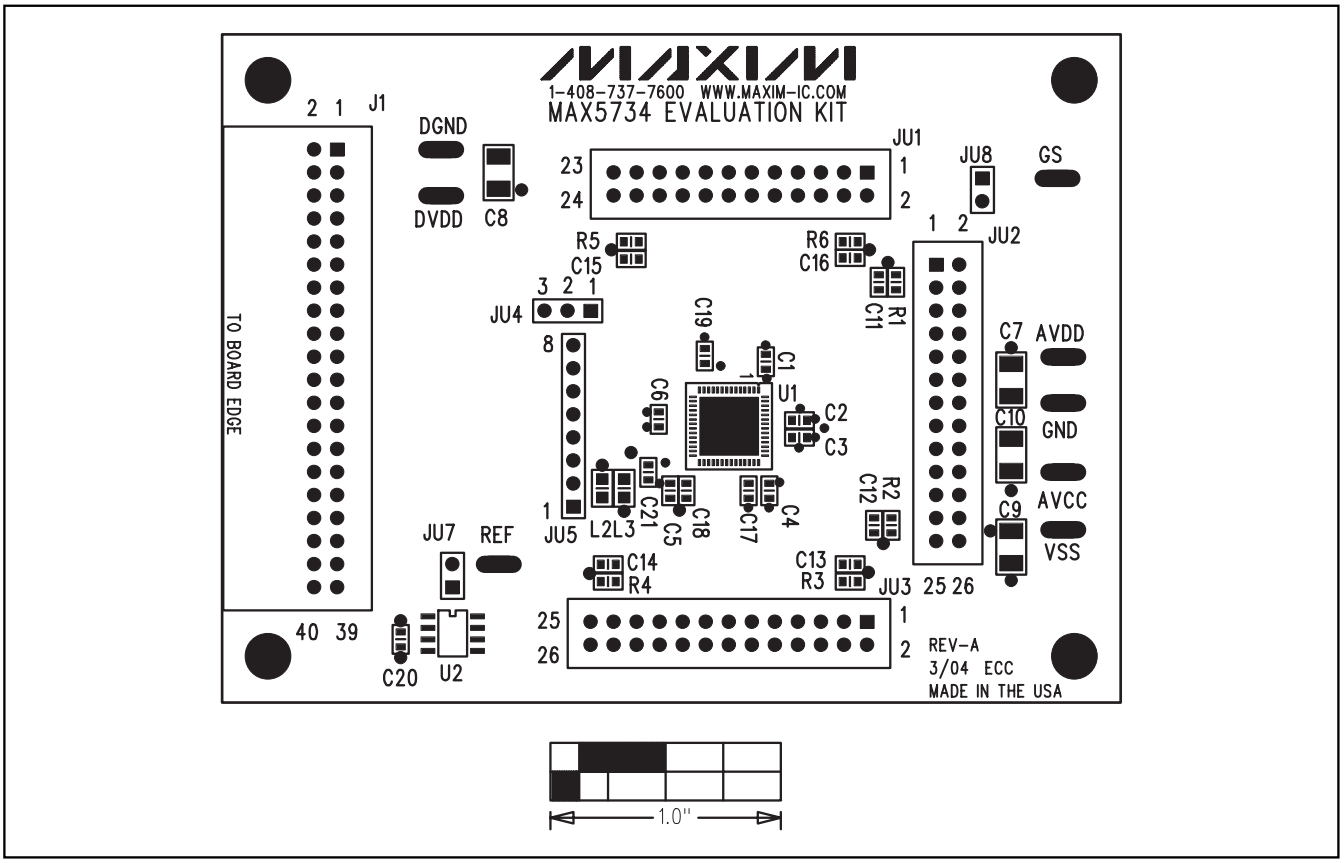

Figure 6. MAX5734 EV Kit Component Placement Guide—Component Side

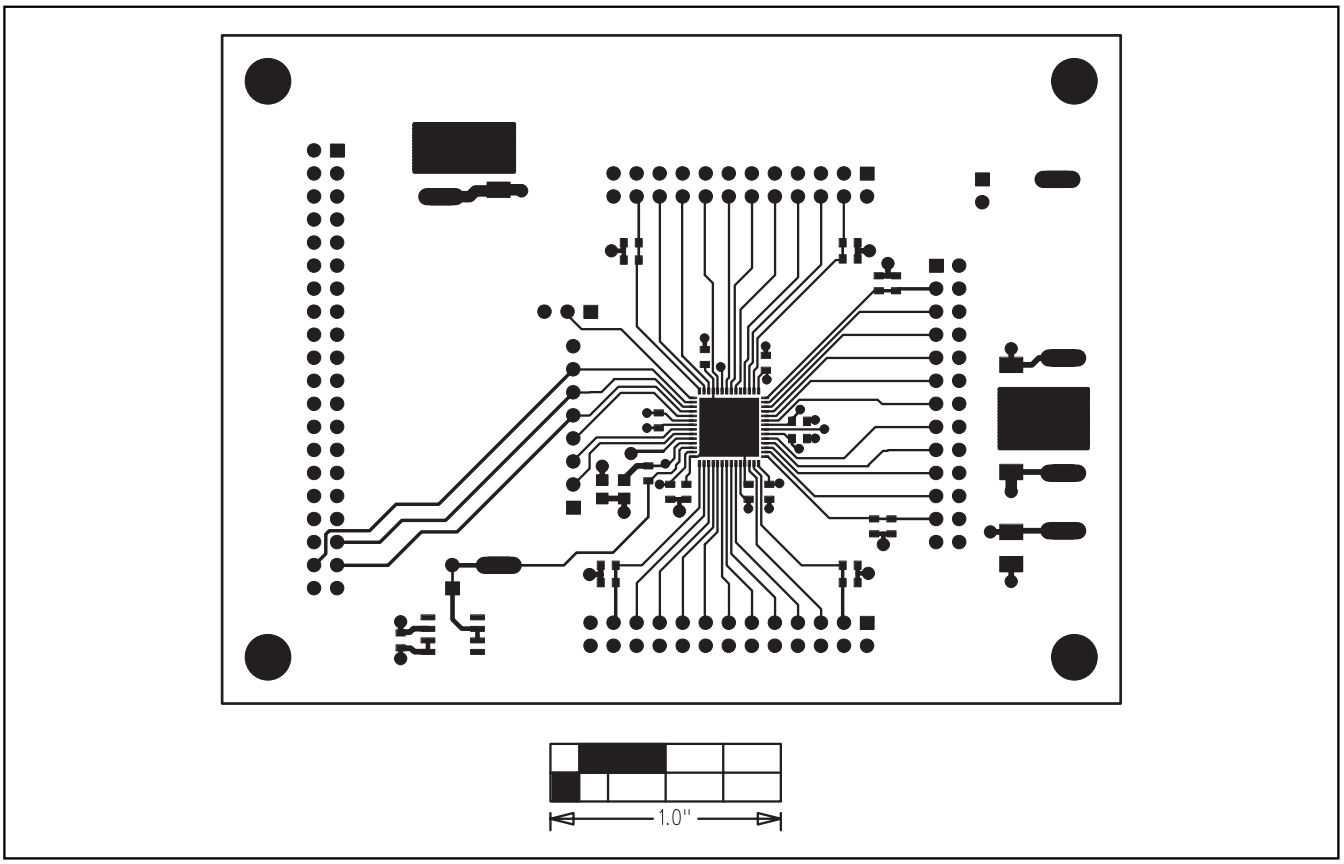

Figure 7. MAX5734 EV Kit PC Board Layout—Component Side

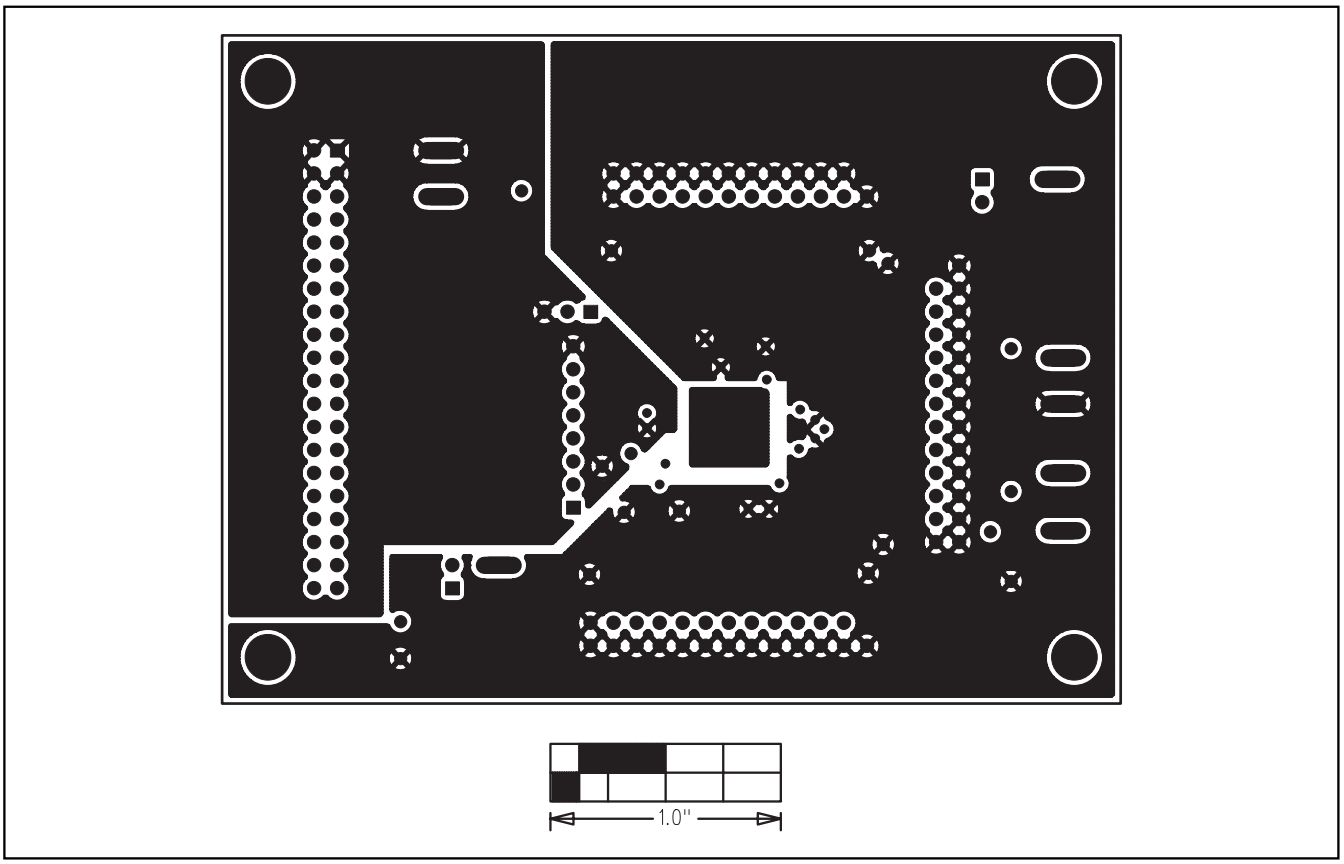

Figure 8. MAX5734 EV Kit PC Board Layout—Ground Layer

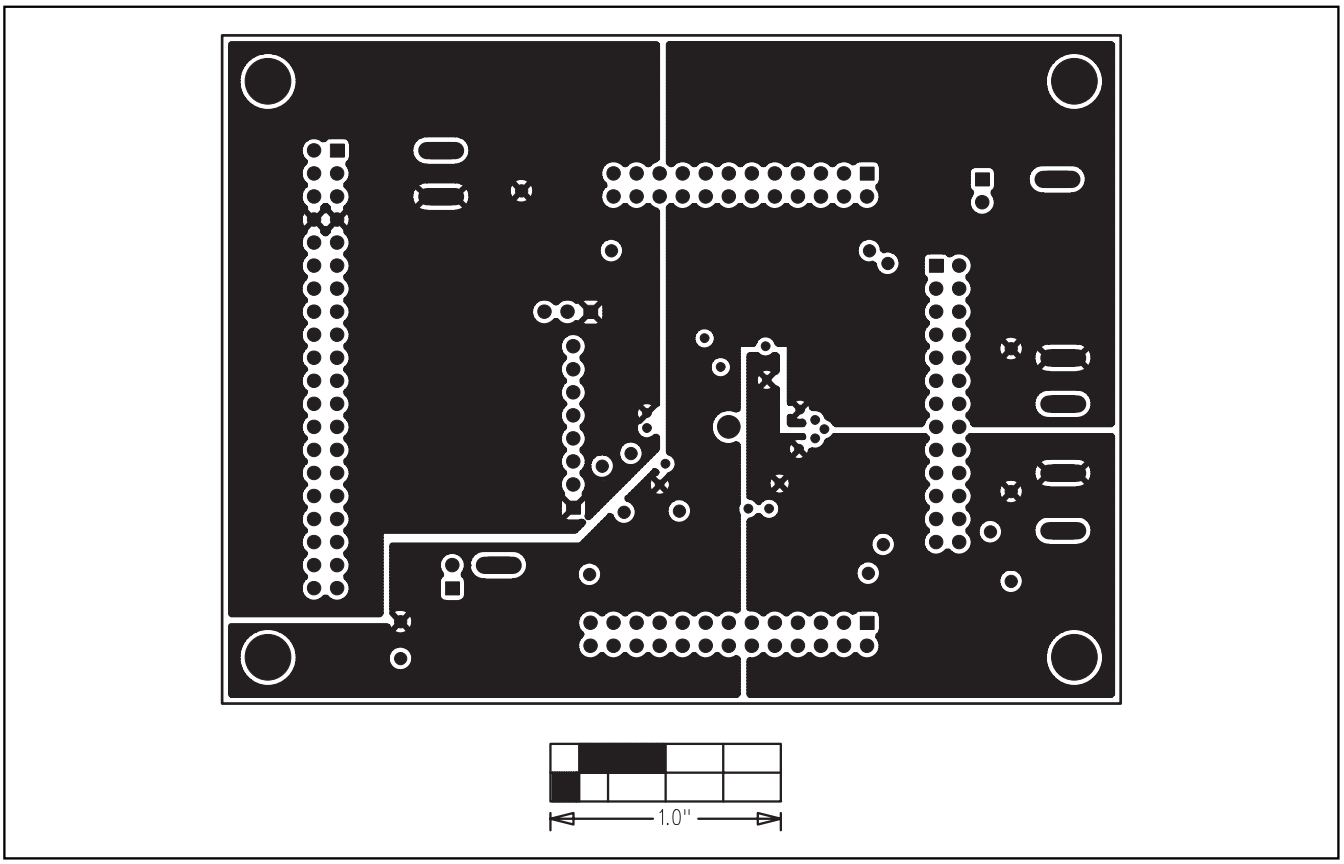

Figure 9. MAX5734 EV Kit PC Board Layout—Power Layer

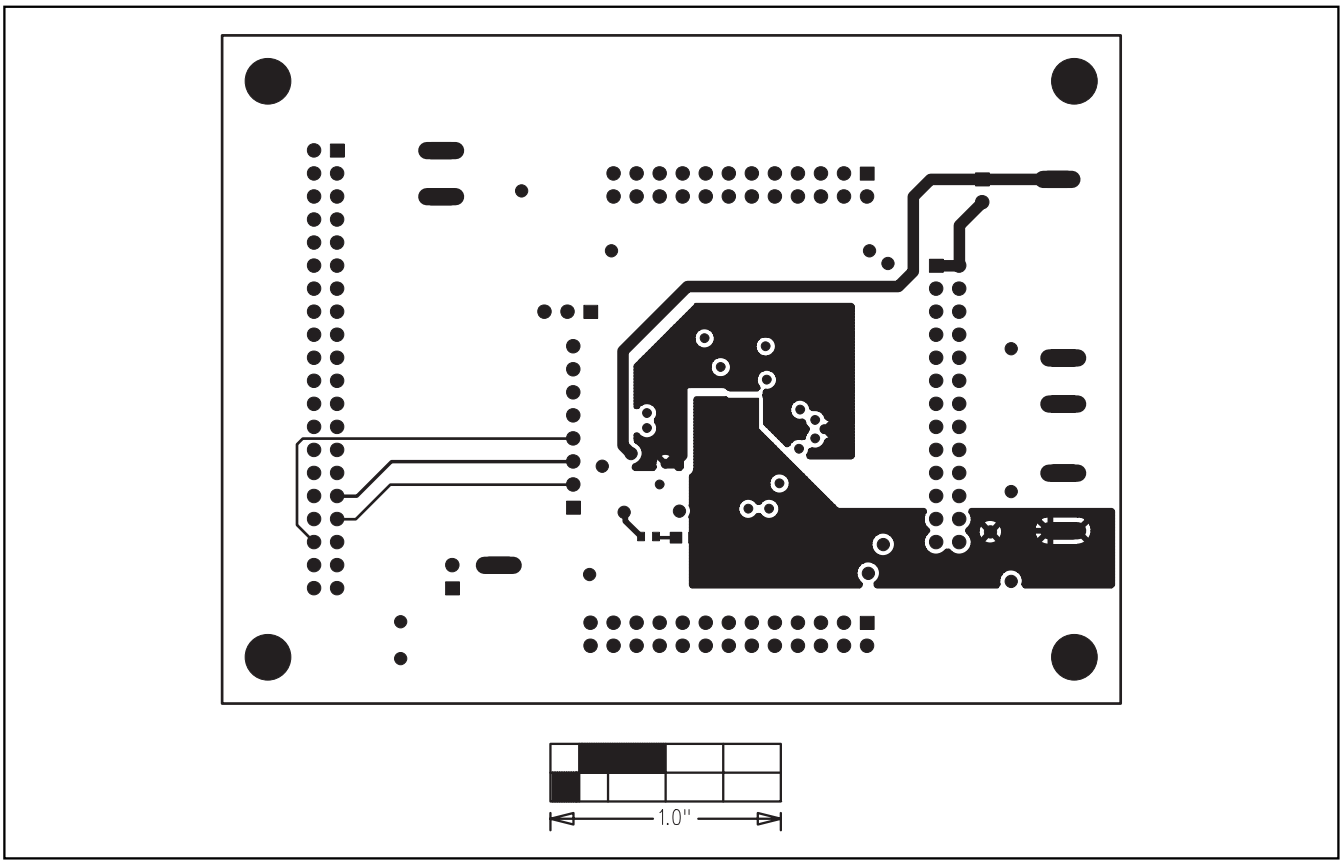

Figure 10. MAX5734 EV Kit PC Board Layout—Solder Side

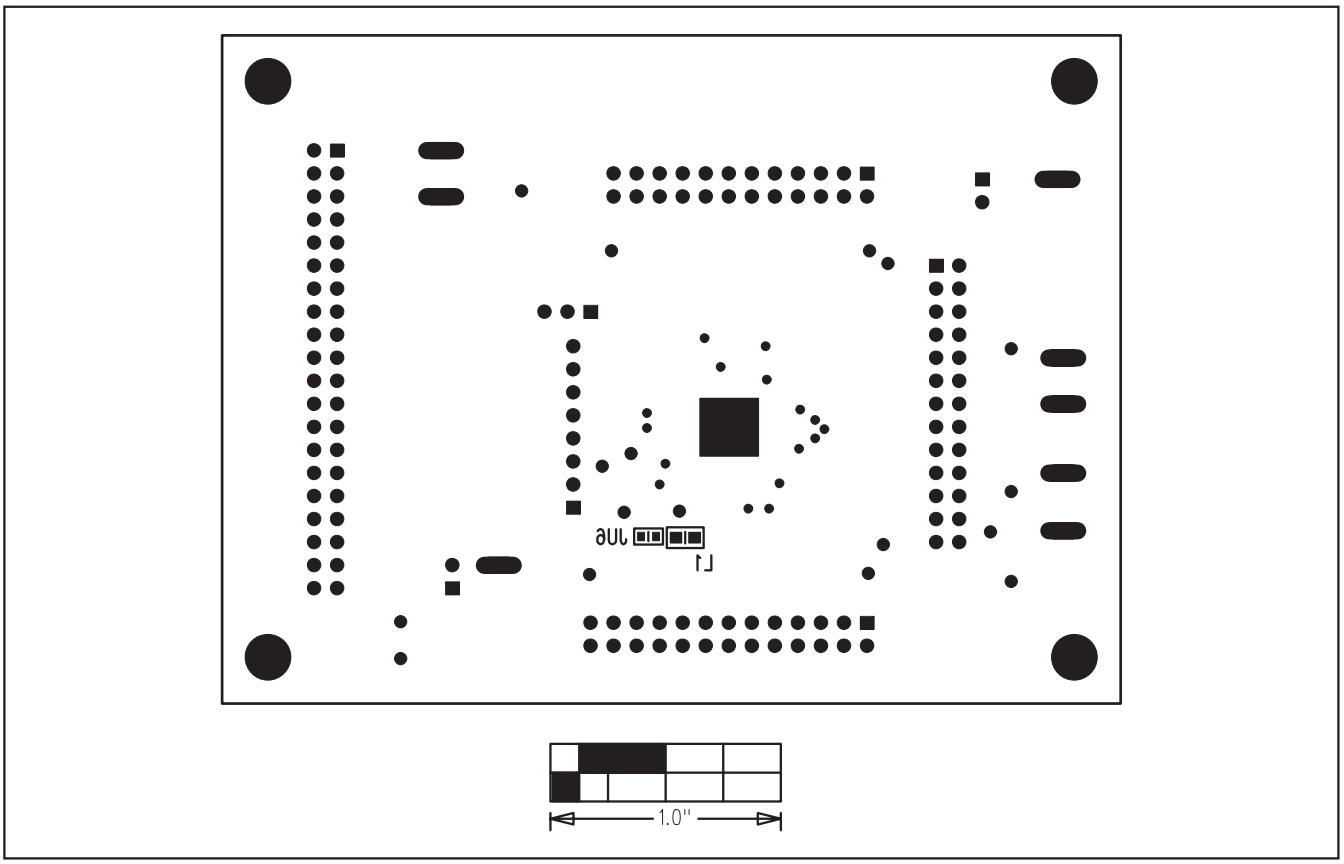

Figure 11. MAX5734 EV Kit Component Placement Guide—Solder Side