



MAX1587A Evaluation Kit/ Evaluation System

Evaluates: MAX1587A

General Description

The MAX1587A evaluation system (EV system) consists of a MAX1587A evaluation kit (EV kit) and a companion Maxim CMAXQUSB board.

The MAX1587A evaluation kit (EV kit) is a fully assembled and tested surface-mount printed circuit board (PCB) that evaluates the MAX1587A power-management IC (PMIC). The IC is optimized for microprocessor-based applications. The MAX1587A integrates three high-performance synchronous step-down DC-DC power supplies, two low-dropout (LDO) regulators, a battery backup supply, and various power-management functions.

The Maxim SMBus interface board (CMAXQUSB) allows a PC to use its USB port to emulate an SMBus/I²C-compatible 2-wire interface. Windows® 98SE/2000/XP-compatible software provides a professional interface to exercise the features of the MAX1587A. The program is menu driven and offers a graphical user interface (GUI) with control buttons and a status display.

The MAX1587A EV system (MAX1587AEVCMAXQU) includes both the EV kit and the CMAXQUSB interface board. Order the MAX1587A EV kit if you already have an SMBus interface.

SMBus is a trademark of Intel Corp.

Windows is a registered trademark of Microsoft Corp.

Component Lists

MAX1587A EV System

PART	QTY	DESCRIPTION
MAX1587AEVKIT	1	MAX1587A EV kit
CMAXQUSB+	1	Serial interface board

+Denotes lead-free and RoHS compliance.

MAX1587A EV Kit

DESIGNATION	QTY	DESCRIPTION
C1	0	Not installed (0805)
C2–C5	0	Not installed (0603)
C6, C7, C8	0	Not installed (0402)
C9, C13, C14, C15 C26, C27, C29	7	10µF ±20%, 6.3V X5R ceramic capacitors (0805) TDK C2012X5R0J106M
C10, C11, C12, C28	4	4.7µF ±20%, 6.3V X5R ceramic capacitors (0805) TDK C2012X5R0J475M

Features

- ◆ 2.6V to 5.5V Single-Supply Operation
- ◆ Six-Output Power Supply
 - 3.3V at 1.3A (VCC_I/O)
 - 2.5V at 900mA (VCC_MEM)
 - 0.7V to 1.475V at 500mA (VCC_CORE),
Software Adjustable
 - 1.3V at 35mA (VCC_PLL)
 - 1.1V at 40mA (VCC_SRAM)
 - Backup Battery Supply (30mA)
- ◆ 1MHz Switching Frequency
- ◆ On-Board Manual Reset Switch
- ◆ Optional On-Board Power-Sequencing Circuitry
- ◆ Power-OK Output
- ◆ Low-Profile Components
- ◆ SMBus/I²C-Compatible 2-Wire Serial Interface
- ◆ Easy-to-Use Menu-Driven Software
- ◆ Software-Controlled Core Voltage Adjustment
- ◆ Fully Assembled and Tested
- ◆ Includes Windows 98SE/2000/XP-Compatible Software
- ◆ EV System Includes USB Connectivity

Ordering Information

PART	TEMP RANGE	IC PACKAGE	SMBus INTERFACE TYPE
MAX1587AEVKIT	0°C to +70°C	40 QFN	Not included
MAX1587AEVCMAXQU	0°C to +70°C	40 QFN	CMAXQUSB

Note: The MAX1587AEVCMAXQU includes both the EV kit and the CMAXQUSB interface board. The MAX1587A EV kit software is provided with the MAX1587AEVKIT; however, the CMAXQUSB board is required to interface the EV kit to the computer when using the included software.

DESIGNATION	QTY	DESCRIPTION
C16	1	1500pF ±10%, 50V X7R ceramic capacitor (0402) TDK C1005X7R1H152K
C17	1	0.1µF ±20%, 6.3V X5R ceramic capacitor (0402) TDK C1005X5R0J104M
C18	1	0.01µF ±20%, 25V X7R ceramic capacitor (0402) TDK C1005X7R1E103M



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Component Lists (continued)

DESIGNATION	QTY	DESCRIPTION
C19–C22	4	1.0 μ F \pm 20%, 10V X5R ceramic capacitors (0603) TDK C1608X5R1A105M
C24	1	270pF \pm 5%, 50V C0G ceramic capacitor (0603) TDK C1608C0G1H271J
C23, C25	2	330pF \pm 5%, 50V C0G ceramic capacitors (0603) TDK C1608C0G1H331J
D1	1	Switching diode (SOT323) Central Semiconductor CMSD4448
J1	1	2 x 10 right-angle female receptacle
JU1–JU7	7	Jumpers, 3-pin headers
L1	1	3.3 μ H, 2.66A inductor TOKO A915AY-3R3M

DESIGNATION	QTY	DESCRIPTION
L2	1	6.8 μ H, 1.51A inductor TOKO A915AY-6R8M
L3	1	10 μ H, 0.85A inductor Sumida CDRH2D18/HP-100 TOKO A960AW-100M
R1, R2, R3, R6, R17, R18	0	Not installed, resistors (0402)
R4, R5, R7–R10	0	Not installed, resistors (0603)
R11, R12, R13	3	1M Ω \pm 5% resistors (0402)
R14, R15, R16	3	240k Ω \pm 1% resistors (0402)
SW1	1	Momentary pushbutton switch (NO)
U1	1	Maxim MAX1587AETL (40-pin thin QFN)
—	7	Shunts
—	1	PCB: MAX1587A Evaluation Kit
—	1	Software disk (CD-ROM) "MAX1587A Evaluation Kit"

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
Central Semiconductor	631-435-1110	631-435-1824	www.centrasemi.com
Sumida USA	847-545-6700	847-545-6720	www.sumida.com
TDK Corp.	847-803-6100	847-390-4405	www.component.tdk.com
TOKO America	847-297-0070	847-699-1194	www.tokoam.com

Note: Indicate that you are using the MAX1587A when contacting these component suppliers.

Quick Start

Recommended Equipment

- 4.0V, 2A DC power supply
- 3.6V backup battery (optional)
- One voltmeter
- The MAX1587A EV system
 - MAX1587A EV kit
 - Maxim CMAXQUSB interface board (USB cable included)
- A user-supplied Windows 98SE/2000/XP 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 98SE/2000/XP operating system.

Procedure

The MAX1587A EV kit is fully assembled and tested. Follow the steps below to verify board operation.

Caution: Do not turn on the power supply until all connections are completed.

- 1) Visit the Maxim website (www.maxim-ic.com/evkit-software) to download the latest version of the EV kit software, 1587ARxx.ZIP.

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- 2) Install the MAX1587A evaluation software on your computer by running the INSTALL.EXE program. The program files are copied and icons are created in the Windows **Start** menu.
- 3) On the CMAXQUSB board, ensure that the shunt of JU1 is in the 3.3V position.
- 4) Carefully connect the boards by aligning the 20-pin connector of the MAX1587A EV kit with the 20-pin header of the CMAXQUSB interface board. Gently press them together.
- 5) Ensure that a shunt is placed across pins 1-2 of jumpers JU1–JU5.
- 6) Ensure that a shunt is placed across pins 2-3 of jumpers JU6 (set default SMBus address) and JU7 (pulse skipping enabled on VCC_CORE). Do not turn on the power until all connections are made.
- 7) Connect the 4.0V power supply to the pads labeled VIN and GND on the MAX1587A EV kit board.
- 8) Connect the optional backup battery to the pads labeled BKBT and GND.
- 9) Connect a voltmeter to the pads labeled VCC_CORE and GND.
- 10) Connect the USB cable from the PC to the CMAXQUSB board. A **Building Driver Database** window pops up in addition to a **New Hardware Found** message. If you do not see a window that is similar to the one described above after 30 seconds, remove the USB cable from the CMAXQUSB and reconnect it again. Administrator privileges are required to install the USB device driver on Windows 98SE/2000/XP. Refer to the TROUBLESHOOTING_USB.PDF document included with the software if you have any problems during this step.
- 11) 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\MAX1587A** (default installation directory) using the **Browse** button.
- 12) Turn on the DC power supply.
- 13) Start the MAX1587A EV kit software by opening its icon in the **Start** menu. The GUI main window appears, as shown in Figure 1.
- 14) Move the **Core Voltage** track bar located inside the **Voltage Control** box to 1V.
- 15) Verify that the VCC_CORE voltage on the voltmeter reads approximately 1V.

Detailed Description of Software

User-Interface Panel

The user interface (shown in Figure 1) is easy to operate; use the mouse, or press the Tab key to navigate with the arrow keys. Each of the buttons corresponds to bits in the command and configuration bytes. By clicking on them, the correct SMBus write operation is generated to update the internal registers of the MAX1587A. The **Interface** box indicates the current **Device Address**, and the **Data Sent/Received** (the MAX1587A EV kit software only sends) for the last read/write operation. This data is used to confirm proper device operation.

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

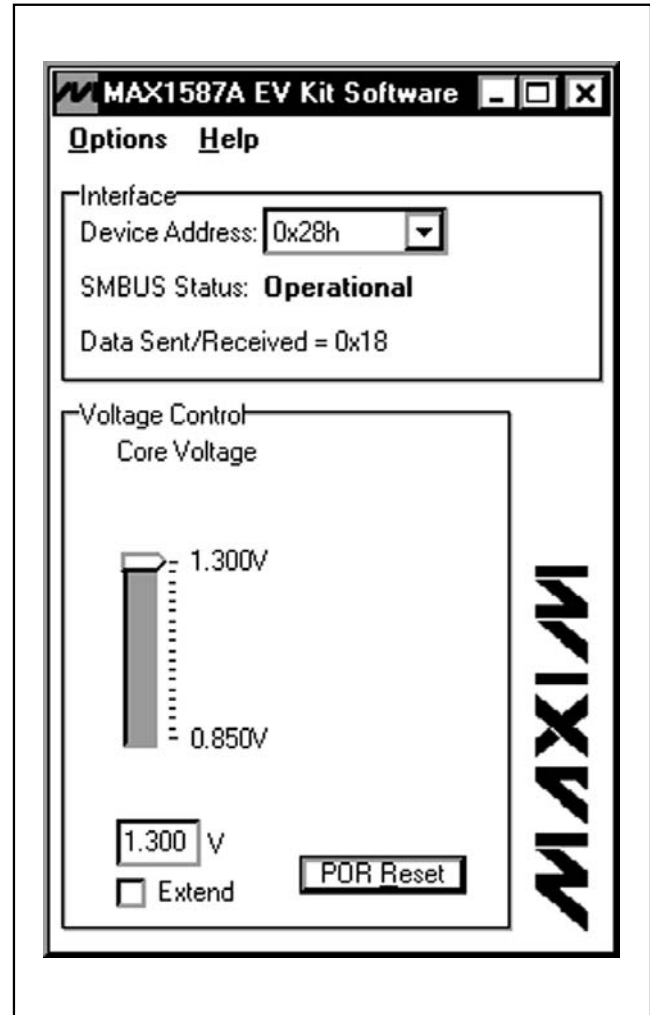


Figure 1. MAX1587A EV Kit Software Main Window

MAX1587A Evaluation Kit/ Evaluation System

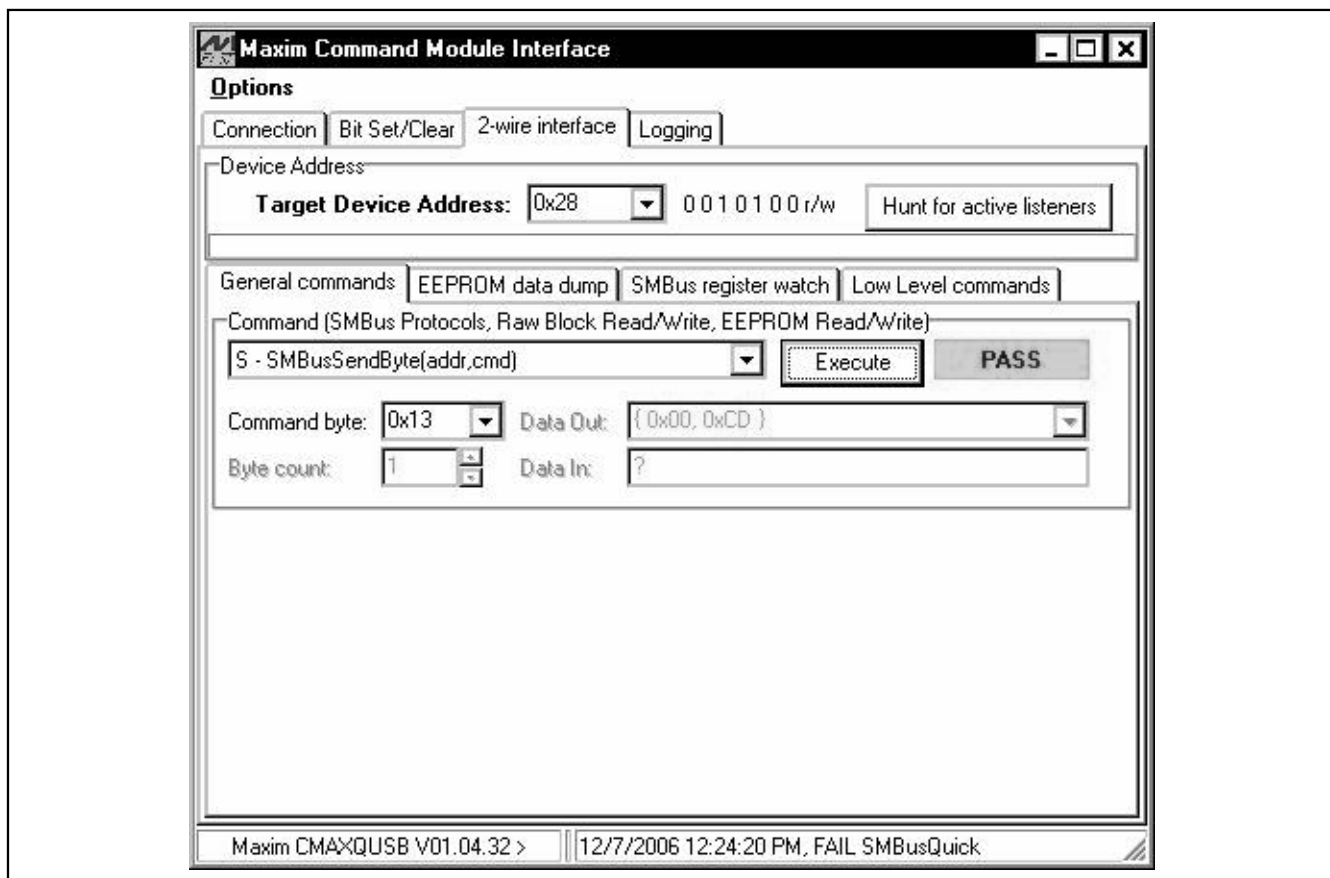


Figure 2. A Simple SMBusSendByte Operation Using the Included Two-Wire Interface Diagnostics. In this example, the software is writing data (0x13) to Device Address 0x28. The above data sequence sets the core voltage of the MAX1587A to 1.175V.

Core Voltage Control

The core voltage (VCC_CORE) can be adjusted in 25mV increments by adjusting the **Core Voltage** slider. Alternatively, a number can be entered in the box below the **Core Voltage** slider. If a number not divisible by 0.025 is entered, the software automatically rounds the number to the nearest 25mV increment and sends the appropriate data to the MAX1587A.

Check the **Extend** checkbox to increase the core voltage range to 0.7V to 1.475V.

Simple SMBus Commands

There are two methods for communicating with the MAX1587A: through the normal user-interface panel or through the SMBus commands available by selecting the **2-Wire Interface Diagnostic** item from the **Options** pulldown menu. A display pops up that allows the SMBus protocols, such as Read Byte, Write Byte, and Send Byte, to be executed.

The SMBus dialog boxes accept numeric data in binary, decimal, or hexadecimal form. Hexadecimal numbers should be prefixed by \$ or 0x. Binary numbers must be exactly eight digits. See Figure 2 for an example of this tool.

Note: In places where the slave address asks for an 8-bit value, it must be the 7-bit slave address of the MAX1587A as determined by SRAD with the last bit set to 1 for a read operation or zero for a write operation. Refer to the MAX1587A data sheet for a complete list of registers and functions.

Detailed Description of Hardware

The MAX1587A EV kit is a fully assembled and tested surface-mount PCB that evaluates the MAX1587A power-management IC. The MAX1587A integrates three high-performance, 1MHz, synchronous step-down DC-DC power supplies, two low-dropout regulators, and a battery backup supply.

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The power outputs consist of a 3.3V at 1.3A I/O (VCC_I/O) step-down output, 2.5V at 900mA memory (VCC_MEM) step-down output, a software adjustable 0.7V to 1.475V at 500mA core (VCC_CORE) step-down output, a 1.3V at 35mA phase-locked loop (VCC_PLL) LDO, and a 1.1V at 40mA SRAM (VCC_SRAM) LDO. An additional 30mA backup battery (VCC_BATT) output is also available.

Power-management functions include a power-OK (POK) output, a manual-reset input, multiple output-enable inputs, and a reset output. Activate the manual reset input by pressing the switch labeled SW1.

Power sequencing is also available through component placeholders R4, R5, R7, R8, C2, C3, C4, and C5. See the *Optional Power-Sequencing Circuitry* section for more details.

Address Selection

Jumper JU6 sets the MAX1587A slave address. The default address is 0010 1000 (SRAD = GND). See Table 1 for a complete list of addresses.

Sleep Mode

Jumper JU1 controls the sleep function of the MAX1587A EV kit. Removing the shunt from JU1 allows the sleep function to be controlled by an external signal source connected to the $\overline{\text{SLP}}$ pad. See Table 2 for sleep shunt positions.

Output Enables

Jumpers JU2–JU5 control the on/off state of the MAX1587A EV kit VCC_I/O, VCC_MEM, VCC_CORE, VCC_PLL, and VCC_SRAM outputs. Removing the shunt allows the output enable function to be controlled by an external signal source. See Table 3 for output-enable shunt positions.

Pulse-Skipping Mode

Jumper JU7 controls the pulse-skipping mode of the VCC_CORE output. See Table 4 for pulse-skipping shunt positions.

Adjusting the I/O Voltage

The I/O (VCC_I/O) output voltage can be adjusted from its default value of 3.3V. Cut the trace at R3 and install a 0Ω resistor at R17 to set the I/O voltage to 3.0V. To set the I/O voltage to an alternative value, cut the trace at R3 and install resistors at R1 and R3. Use the equation below to calculate resistor values:

$$R_1 = R_3 \times \left(\frac{V_{\text{CC_I/O}}}{V_{\text{FB1}}} - 1 \right)$$

where $R_3 = 100\text{k}\Omega$, $V_{\text{CC_I/O}}$ = desired I/O voltage, and $V_{\text{FB1}} = 1.25\text{V}$.

Adjusting the MEM Voltage

The MEM (VCC_MEM) output voltage can be adjusted from its default value of 2.5V. Cut the trace at R6 and install a 0Ω resistor at R18 to set the MEM voltage to 1.8V. To set the MEM voltage to an alternative value, cut the trace at R6 and install resistors at R2 and R6. Use the equation below to calculate resistor values:

$$R_2 = R_6 \times \left(\frac{V_{\text{CC_MEM}}}{V_{\text{FB2}}} - 1 \right)$$

where $R_6 = 100\text{k}\Omega$, $V_{\text{CC_MEM}}$ = desired MEM voltage, and $V_{\text{FB2}} = 1.25\text{V}$.

Table 1. Shunts Settings for SMBus Address (JU6)

SHUNT POSITION	MAX1587A ADDRESS PIN	MAX1587A ADDRESS	
		BINARY	HEXADECIMAL
1-2	VIN	0010 1010	0x2A
2-3*	GND	0010 1000	0x28

*Default Configuration: JU6 (2-3)

Table 2. Sleep Selection (JU1)

SHUNT POSITION	DESCRIPTION
1-2*	I/O and MEM DC-DC converters enabled
2-3	I/O and MEM DC-DC converters disabled; I/O and MEM sleep LDOs enabled
Not Installed	$\overline{\text{SLP}}$ function controlled by an external signal source

*Default Configuration: JU1 (1-2)

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Table 3. Output Enable (JU2–JU5)

JUMPER	SHUNT POSITION	DESCRIPTION
JU2 (ON2)	1-2*	VCC_MEM output enabled
	2-3	VCC_MEM output disabled
	Not Installed	ON2 controlled by an external signal source
JU3 (ON1)	1-2*	VCC_I/O output enabled
	2-3	VCC_I/O output disabled
	Not Installed	ON1 controlled by an external signal source
JU4 (ON45)	1-2*	VCC_PLL/VCC_SRAM output enabled
	2-3	VCC_PLL/VCC_SRAM output disabled
	Not Installed	ON45 controlled by an external signal source
JU5 (ON3)	1-2*	VCC_CORE output enabled
	2-3	VCC_CORE output disabled
	Not Installed	ON3 controlled by an external signal source

*Default Configuration: JU2 (1-2), JU3 (1-2), JU4 (1-2), JU5 (1-2)

Optional Power-Sequencing Circuitry

The MAX1587A EV kit provides extra pads to support power sequencing. The directions below describe the implementation of this feature:

- 1) Cut the trace at R4, R5, R7, and R8.

To create an RC time delay:

- 2) Install resistors and capacitors at locations R4, R5, R7, R8, C5, C2, C4, and C3.
- 3) Ensure that shunts are installed across pins 1 and 2 of jumpers JU2–JU5.

Calculate component values using the equation below:

$$R_N = \frac{-t}{C_N \times \ln\left(1 - \frac{V_{TH}}{V_{IN}}\right)}$$

where:

$C_N = 0.1\mu\text{F}$

$V_{TH} = 1.1\text{V}$

V_{IN} = battery input voltage

t = desired startup time

Table 4. Pulse-Skipping Mode Selection (JU7)

SHUNT POSITION	DESCRIPTION
1-2	VCC_CORE pulse-skipping mode disabled (forced PWM)
2-3*	VCC_CORE pulse-skipping mode enabled

*Default Configuration: JU7 (2-3)

Using an Alternative SMBus Interface

The MAX1587A EV kit provides pads and pullup resistor placeholders that allow an alternative SMBus/I²C-compatible interface to be used. Connect the interface through the SCL, SDA, and GND pads. Install pullup resistors at positions R9 and R10, if required.

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Evaluates: **MAX1587A**

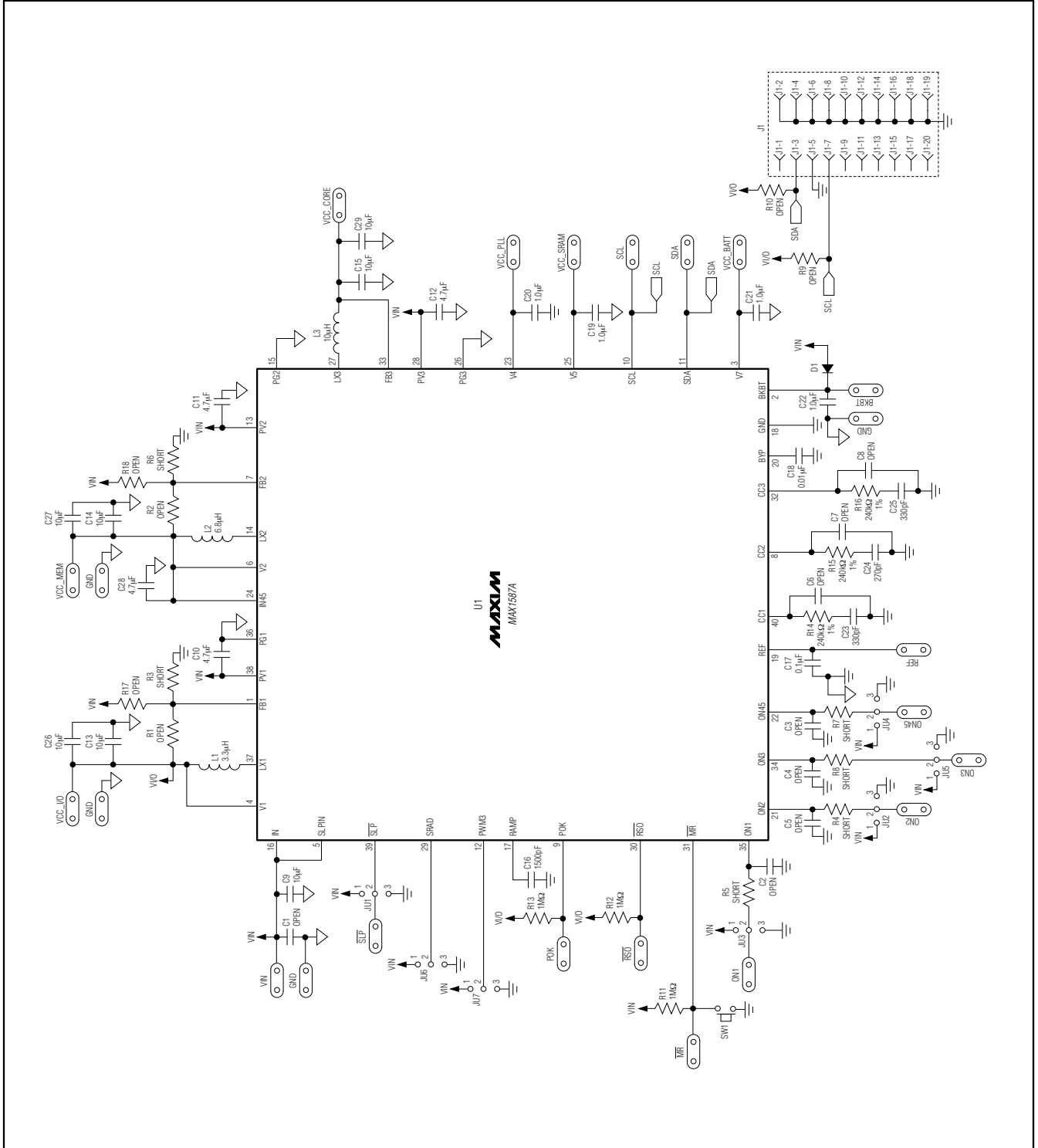


Figure 3. MAX1587A EV Kit Schematic

MAX1587A Evaluation Kit/ Evaluation System

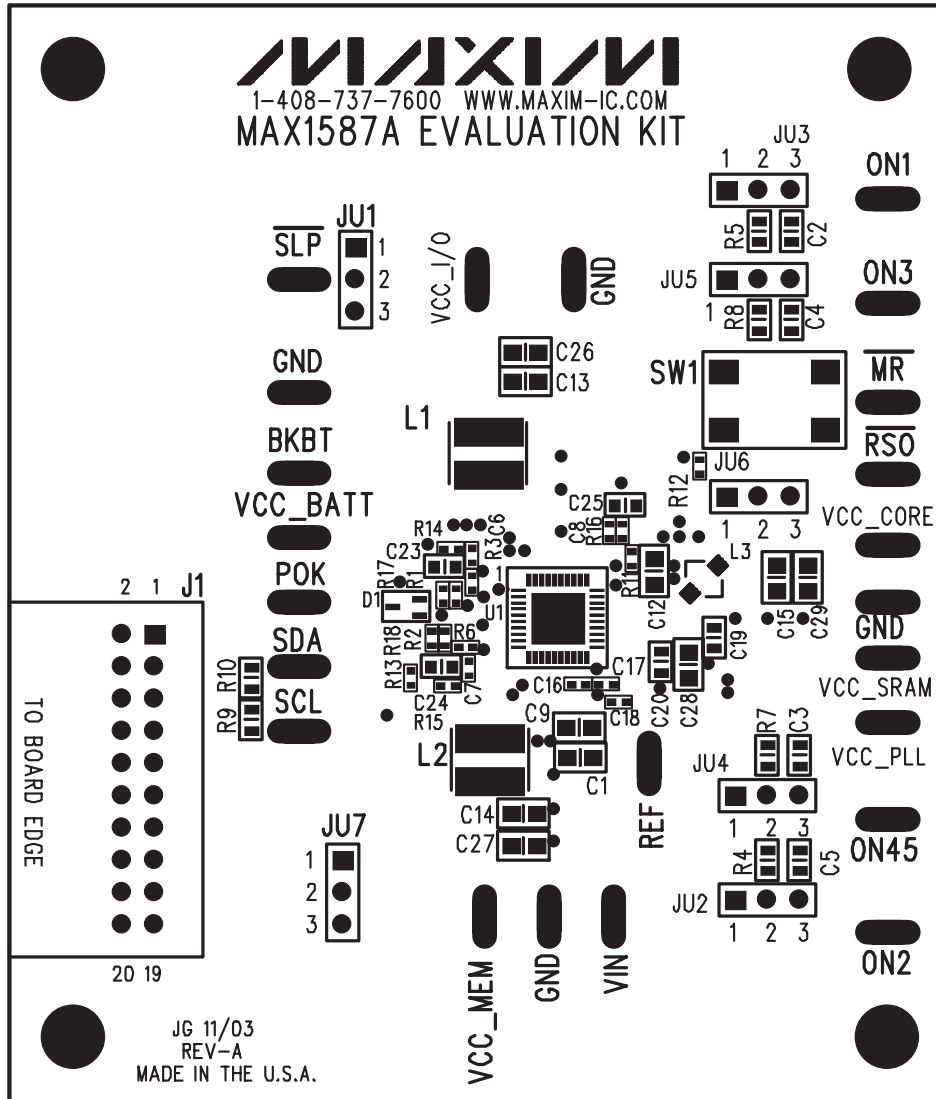


Figure 4. MAX1587A EV Kit Component Placement Guide—Component Side

MAX1587A Evaluation Kit/ Evaluation System

Evaluates: MAX1587A

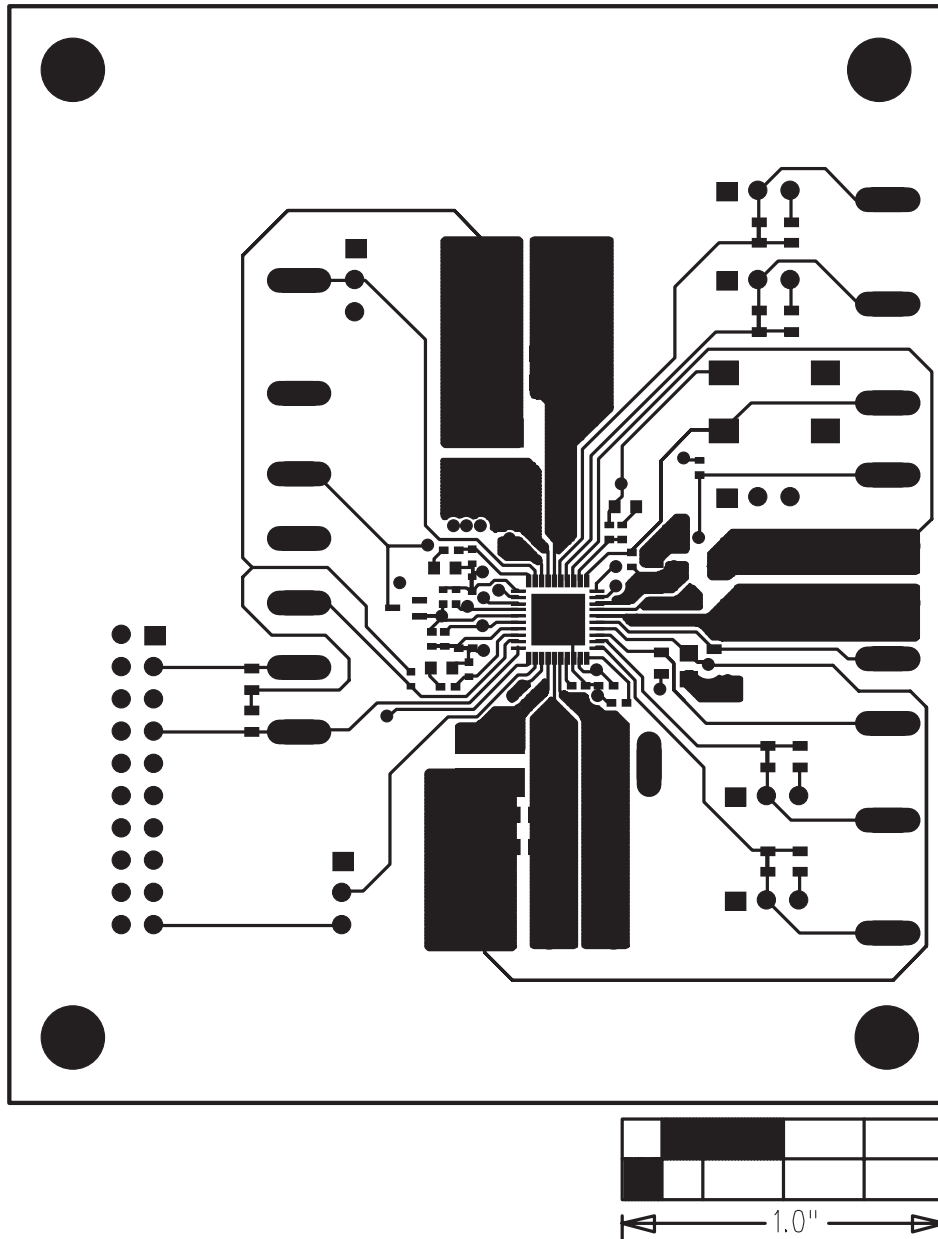


Figure 5. MAX1587A EV Kit PCB Layout—Component Side

MAX1587A Evaluation Kit/ Evaluation System

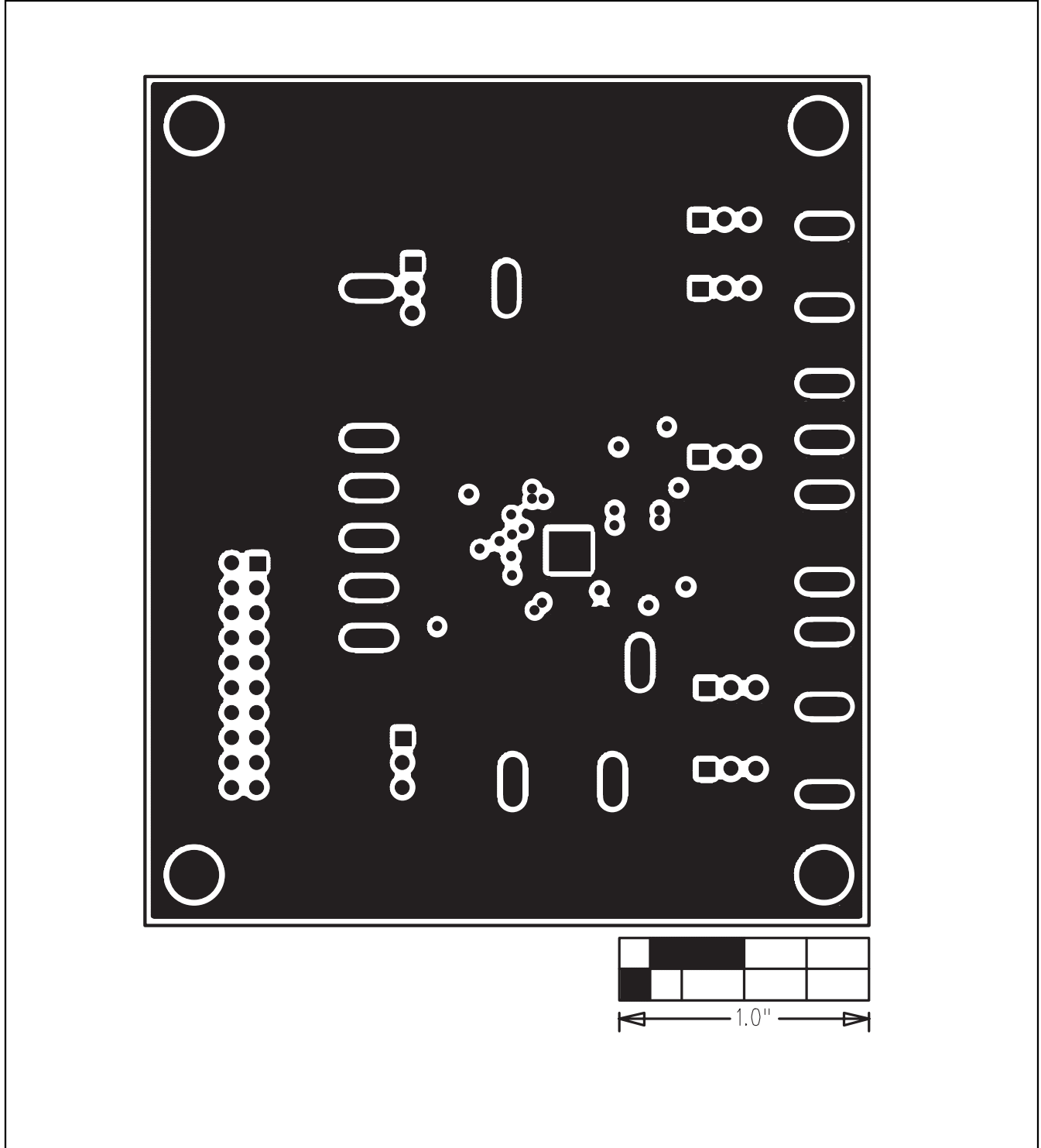


Figure 6. MAX1587A EV Kit PCB Layout—Inner Layer 2

MAX1587A Evaluation Kit/ Evaluation System

Evaluates: MAX1587A

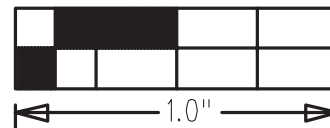
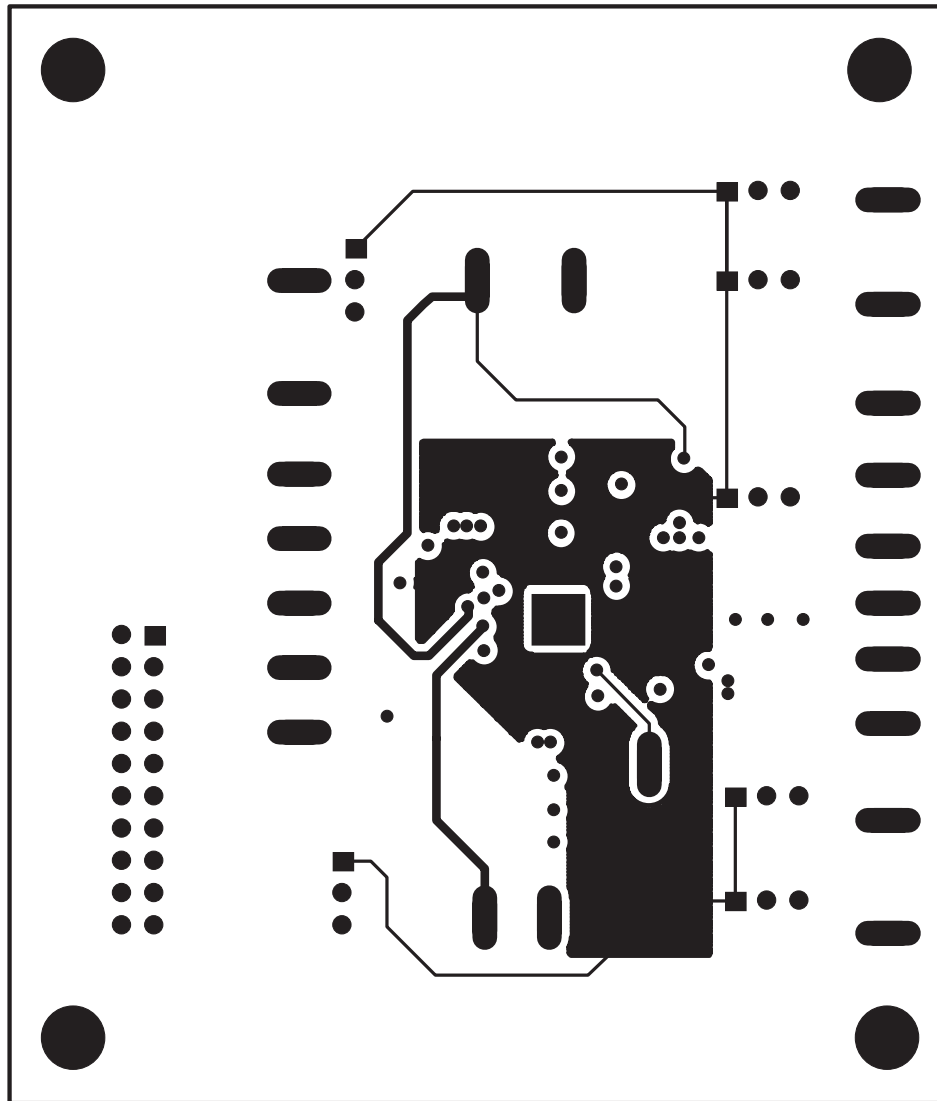


Figure 7. MAX1587A EV Kit PCB Layout—Inner Layer 3

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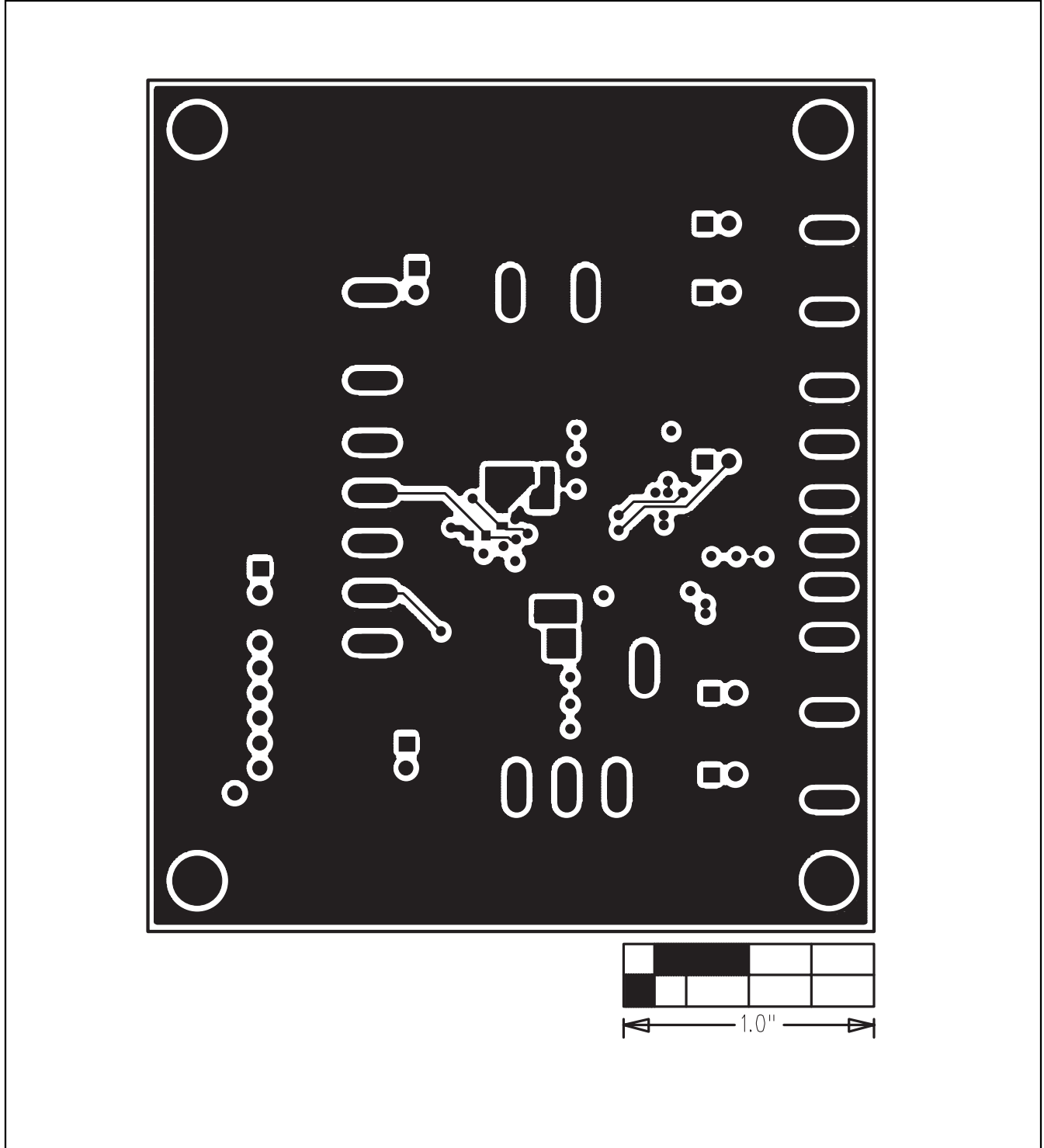


Figure 8. MAX1587A EV Kit PCB Layout—Solder Side

MAX1587A Evaluation Kit/ Evaluation System

Evaluates: MAX1587A

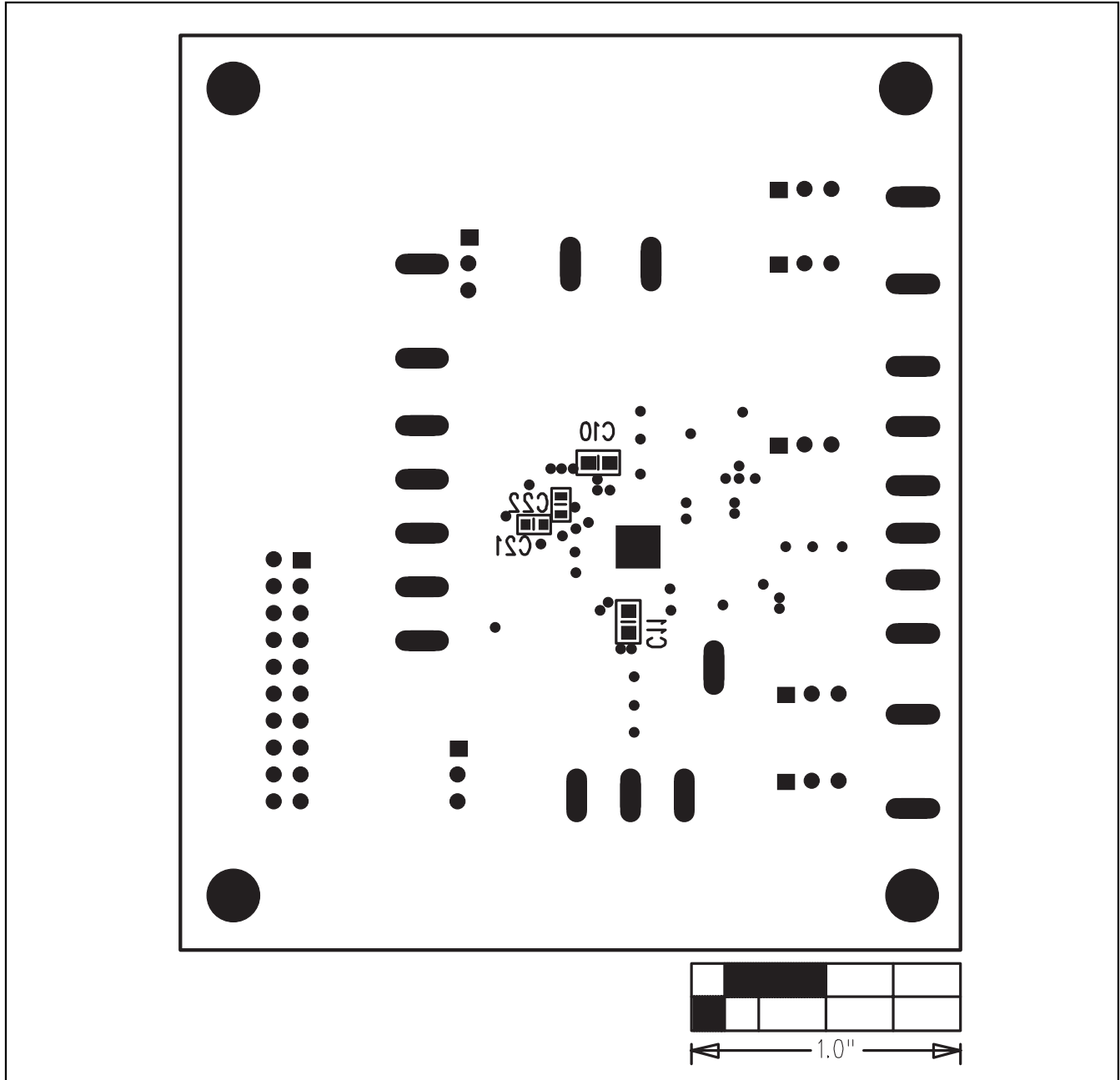


Figure 9. MAX1587A EV Kit Component Placement Guide—Solder Side

Revision History

Pages changed at Rev 1: 1–13

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

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