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MAX6660 Evaluation System/Evaluation Kit

Evaluate: MAX6660

General Description

The MAX6660 evaluation system (EV system) consists of a MAX6660 evaluation kit (EV kit) and a companion Maxim System Management Bus (SMBus)™ interface board.

The MAX6660 EV kit is an assembled and tested PC board that demonstrates the MAX6660 remote temperature sensor and fan-speed regulator. It monitors the junction temperature of an external diode-connected transistor, and converts the temperature to 8-bit or 11-bit (extended resolution mode), 2-wire serial data. A 2N3906 temperature-sensor transistor comes soldered to the board in a SOT23 package, but it can be removed. The board can then be connected through a twisted pair to a remote diode close to your system. The MAX6660 also incorporates a closed-loop fan controller that regulates fan speed with tachometer feedback. **Note:** Use this EV kit data sheet in conjunction with the MAX6660 data sheet.

The Maxim SMBus interface board (MAXSMBUS) allows an IBM-compatible PC to use its parallel port to emulate an SMBus 2-wire interface. Windows® 95/98/2000-compatible software provides a user-friendly interface to exercise the features of the MAX6660. The program is menu driven and offers a graphic interface with control buttons and status display. (**Note:** Windows 2000 requires the installation of a driver; refer to Win2000.pdf or Win2000.txt located on the diskette.)

Order the MAX6660EVSYS for a complete IBM PC-based evaluation of the MAX6660. Order the MAX6660EVKIT if you already have an SMBus interface.

Features

♦ **Measures and Displays Remote-Sensor Temperature**

♦ **Controls Fan Speed**

♦ **Programmable Alarms and Configuration**

♦ **Operating Temperature Ranges**
   -40°C to +125°C (Remote Sensor)
   0°C to +70°C (Board)

♦ **I²C/SMBus Compatible**

♦ **Easy-to-use Menu-Driven Software**

♦ **Assembled and Tested**

♦ **Includes Windows 95/98/2000-Compatible Software and Demo PC Board**

Ordering Information

PART	TEMP RANGE	SMBus INTERFACE TYPE
MAX6660EVKIT	0°C to +70°C	Not included
MAX6660EVSYS	0°C to +70°C	MAXSMBUS

The MAX6660 EV kit software is provided with the MAX6660EVKIT. However, the MAXSMBUS board is required to interface the EV kit to the computer when using the software.

__MAX6660EVSYS Component List

PART	QTY	DESCRIPTION
MAX6660EVKIT	1	MAX6660 evaluation kit
MAXSMBUS	1	SMBus interface board

MAX6660EV Kit Component List

DESIGNATION	QTY	DESCRIPTION
C1, C4	2	0.1µF, 16V X7R ceramic capacitors Murata GRM39X7R104K016 Taiyo Yuden EMK107BJ104KA TDK C1608X7R1E104K
C2	1	2200pF, 50V X7R ceramic capacitor (0603)
C3, C5	2	10µF, 35V aluminum electrolytic capacitors
J1	1	2 x 10 right-angle female receptacle
JU1, JU2, JU3, JU5	4	3-pin headers

DESIGNATION	QTY	DESCRIPTION
JU4	0	Not installed
Q1	1	PNP bipolar transistor (SOT23) Central Semiconductor CMPT3906 Diodes Inc. MMBT3906 Fairchild MMBT3906 General Semiconductor MMBT3906
R1	1	100kΩ ±5% resistor
R2	0	Not installed
R3	1	4.99kΩ ±1% resistor
R4	1	51Ω ±5% resistor
S1	1	Slide switch
U1	1	MAX6660AEE (16-pin QSOP)
None	3	Shunts for JU1, JU2, and JU3

SMBus is a trademark of Intel Corp.
Windows is a registered trademark of Microsoft Corp.
I²C is a trademark of Philips Corp.

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For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

MAX6660 Evaluation System/Evaluation Kit

_____**Component Suppliers**

SUPPLIER	PHONE	FAX	WEBSITE
Central Semiconductor	515-435-1110	515-435-1824	www.centralsemi.com
Diodes Inc.	805-446-4800	805-381-3899	www.diodes.com
Fairchild	888-522-5372	—	www.fairchildsemi.com
General Semiconductor	760-804-9258	760-804-9259	www.gensemi.com
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: _Please indicate you are using the MAX6660 when contacting these component suppliers._

_____**Quick Start**

Required Equipment

Before you begin, the following equipment is needed:

- Computer running Windows 95, 98, or 2000 (**Note:** Windows 2000 requires the installation of a driver; refer to Win2000.pdf or Win2000.txt located on the diskette.)

- Parallel printer port (this is a 25-pin socket on the back of the computer)

- Standard 25-pin, straight-through, male-to-female cable (printer extension cable) to connect the computer's parallel port to the Maxim SMBus interface board

- DC power supply capable of supplying any voltage between 7V and 20V at 100mA

- 500mA DC power supply rated at 5V or 12V, depending on the fan

- DC power supply capable of supplying 5V at 50mA

- 5V or 12V fan rated up to 250mA with a tachometer output

Procedure

1) Carefully connect the boards by aligning the 20-pin connector of the MAX6660 EV kit with the 20-pin header of the MAXSMBUS interface board. Gently press them together.

2) Make sure switch S1 on the MAX6660 EV kit is in the OFF position.

3) Make sure JU3 is set to the 1-2 position.

4) Connect a fan to either J2 or the pads FAN+, FAN-, and TACH.

5) Connect a cable from the computer's parallel port to the SMBus interface board. Use a straight-through 25-pin female-to-male cable. To avoid damaging the EV kit or your computer, do not use a 25-pin SCSI port or any other connector that is physically similar to the 25-pin parallel printer port.

6) The MAX6660.EXE software program can be run from the floppy or hard drive. Use the Windows program manager to run the program. If desired, you may use the INSTALL.EXE program to copy the files and create icons for them in the Windows 95/98/2000 Start menu. An uninstall program is included with the software. Click on the UNINSTALL icon to remove the EV kit software from the hard drive.

Do not turn on the power until all connections are made.

7) Connect the fan power supply to the VFAN and PGND pads.

8) Connect the 7V to 20V power supply to the pads labeled POS9 and GND1 of the SMBus interface board.

9) Connect the 5V power supply to the VCC and AGND pads.

10) Turn on the power supplies.

11) Turn on the EV kit by moving S1 to the ON position.

12) Start the MAX6660 program by opening its icon in the Start menu.

13) Observe as the program automatically detects the address of the MAX6660 and starts the main program.

Note: The MAX6660 reads the address select pins at device power-up only.

_____**Detailed Description**

User-Interface Panel

The user interface 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.

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

The program continually polls the device for new temperature data and status, and monitors for alert conditions. To disable the continuous polling of data, uncheck the **Automatic Read** checkbox. To change the T_{HIGH} and T_{LOW} threshold comparison registers, select the appropriate data field and type in the new value. Pressing Enter after typing in the new values updates the internal registers.

If an interrupt condition is generated by the temperature crossing one of the alarm threshold levels, the message ALERT appears. To clear the interrupt, first eliminate the condition that caused it and then click on **Read Alert**. This action reads the Alert Response address, returns the value of the current MAX6660 slave address, and clears the interrupt. **Note:** The least-significant bit of the address is the read/write status bit; therefore, the address returned is 1 higher.

Simple SMBus Commands

There are two methods for communicating with the MAX6660: through the normal user-interface panel or through the SMBus commands available from pressing the **MAXSMBUS** button. A display pops up that allows the SMBus protocols, such as Read Byte and Write Byte, to be executed. To stop normal user-interface execution so that it does not override the manually set values, turn off the update timer that slaves the program to the conversion rate by unchecking the **Automatic Read** checkbox.

The SMBus dialog boxes accept numeric data in binary, decimal, or hexadecimal. Hexadecimal numbers should be prefixed by $ or 0x. Binary numbers must be exactly eight digits.

Note: In places where the slave address asks for an 8-bit value, it must be the 7-bit slave address of the MAX6660 as determined by ADD0 and ADD1 with the last bit set to 1 for a read operation and zero for a write.

Data Logging

Check the **Data Logging** checkbox to activate data logging. Data logging saves temperature and status data to a text file that includes a time/date stamp next to each data point. If Automatic Read is enabled, data is sampled at 2Hz; however, the data is logged to the file only if either the temperature or status change. This slows the growth of the data-logging file. When Automatic Read is disabled, the data is logged each time the **Read All** button is clicked. To stop data logging, uncheck the **Data Logging** checkbox.

Jumper and Switch Settings

Two jumpers set the MAX6660 slave address. The default address is 1001 110 (ADD0 = ADD1 = V_{CC}). JU1 corresponds to ADD0 and JU2 corresponds to ADD1; see Table 1 for a complete list of addresses. The MAX6660 must undergo a power-on reset for the new address to become effective.

Note: The first 7 bits shown are the address. Y (bit 0) is the SMBus read/write bit. This bit is a 1 for a read operation and zero for a write.

Table 1. JU1 and JU2 Shunt Settings for SMBus Address

SHUNT LOCATION		MAX6660 ADDRESS
JU1 (ADD0)	**JU2 (ADD1)**	
2-3	2-3	0011 000Y
2-3	Open	0011 001Y
2-3	1-2	0011 010Y
Open	2-3	0101 001Y
Open	Open	0101 010Y
Open	1-2	0101 011Y
1-2	2-3	1001 100Y
1-2	Open	1001 101Y
1-2	1-2	1001 110Y

A slide switch, S1, is provided as a means to force a power-on reset of the MAX6660. This switch disables

Table 2. JU3 Shunt Settings for $\overline{STBY}$

SHUNT LOCATION	$\overline{STBY}$ PIN	FUNCTION
1-2	Connected to V_{CC}	In operate mode
2-3	Connected to GND	In standby mode

power to the device.

Fan Control

The MAX6660 incorporates a closed-loop fan controller that regulates fan speed with tachometer feedback. It compares temperature data to fan threshold temperature and gain setting, resulting in automatic fan control proportional to the remote-junction temperature.

Figure 1 shows the registers that control the fan. The register values must be calculated for the selected fan.
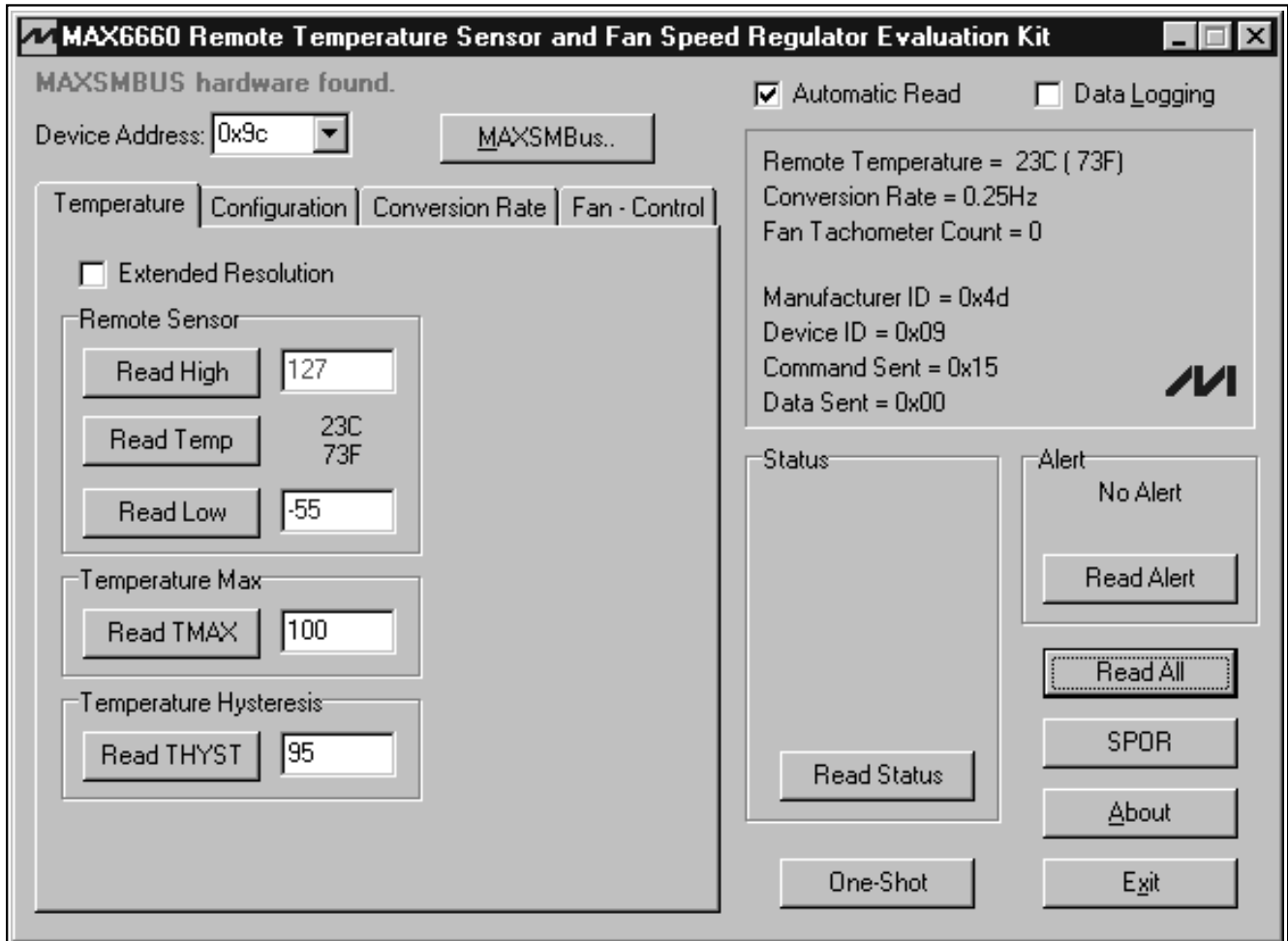
Figure 1. Main Display for the MAX6660EVKIT

Refer to the MAX6660 data sheet for determining the values.

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MAX6660 Remote Temperature Sensor and Fan Speed Regulator Evaluation Kit

MAXSMBUS hardware found.

Device Address: 0x9c

MAXSMBus..

☑ Automatic Read   ☐ Data Logging

Remote Temperature = 23C (73F)
Conversion Rate = 0.25Hz
Fan Tachometer Count = 0

Manufacturer ID = 0x4d
Device ID = 0x09
Command Sent = 0x15
Data Sent = 0x00

Temperature | Configuration | Conversion Rate | **Fan - Control**

Fan Threshold Temp
Read   60

Fan Speed Control
Read   0

Fan Tachometer Count
Read Count   0

Tachometer Count Limit
Read Limit   255

Fan Full Scale
Read   200

Fan Gain
◉ Resolution = 4 bits
◯ Resolution = 5 bits
◯ Resolution = 6 bits
☐ SMBus Timeout
☐ Fan Current Sense
☐ Fan Open Loop
Read Fan Gain

Fan Count Divisor
◯ Divide by 1
◉ Divide by 2
◯ Divide by 4
◯ Divide by 8
Read

Status

Read Status

One-Shot

Alert
No Alert

Read Alert

Read All

SPOR

About

Exit

Figure 2. Fan-Control Display with Settings for a 2500rpm Fan
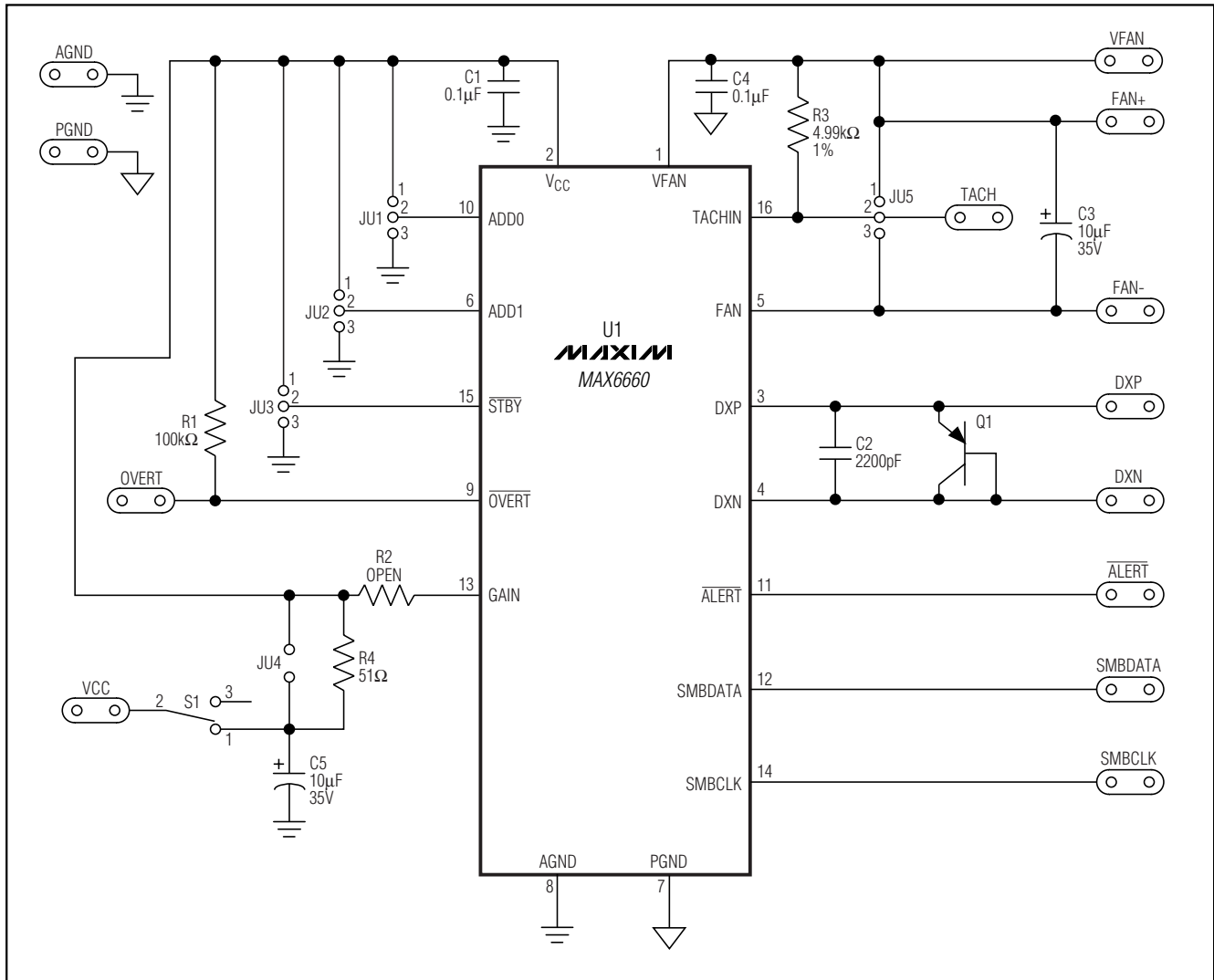
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Figure 3. MAX6660 EV Kit Schematic (Sheet 1 of 2)
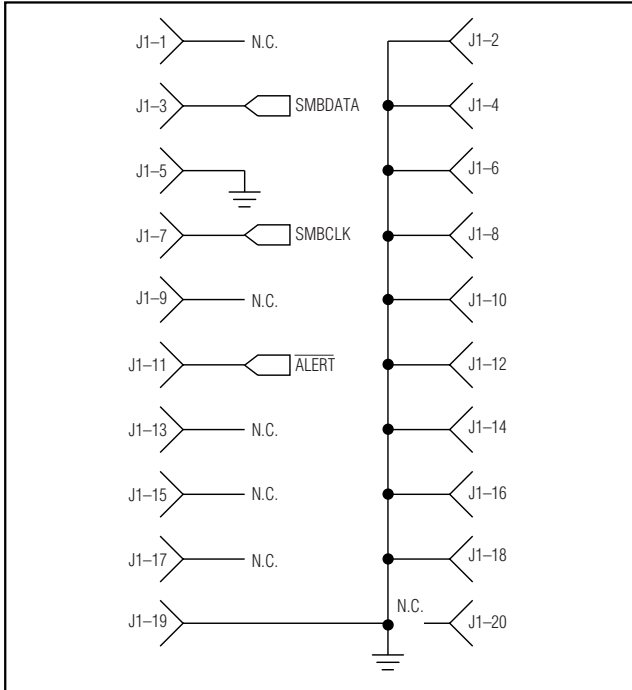
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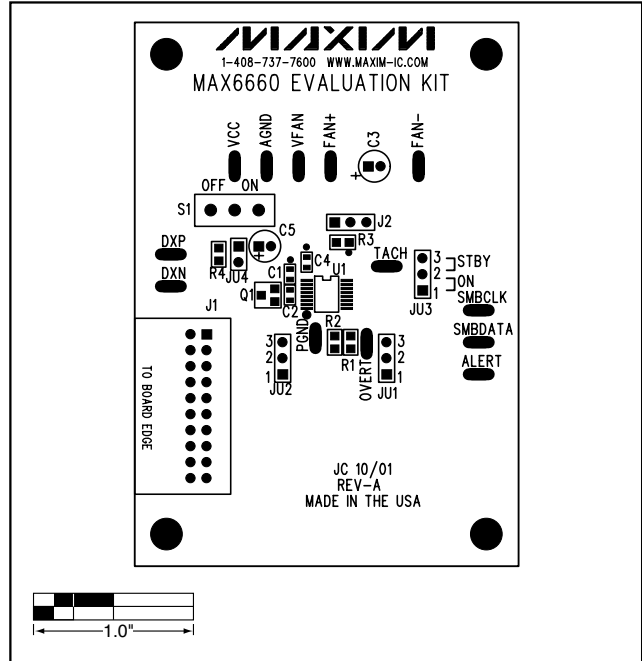Figure 3. MAX6660 EV Kit Schematic (Sheet 2 of 2)

Figure 4. MAX6660 EV Kit Component Placement Guide—Component Side
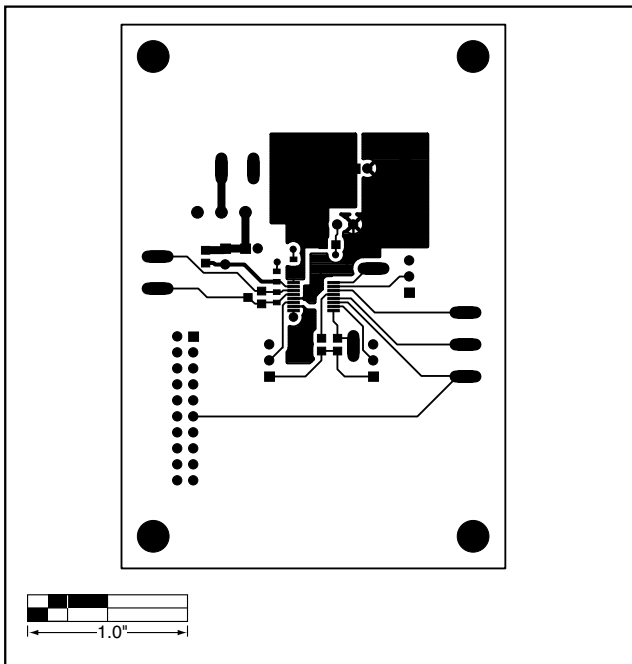

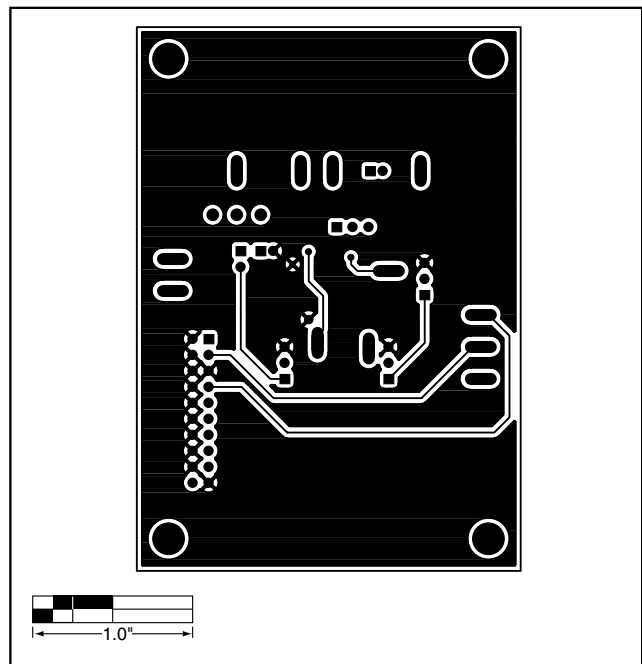Figure 5. MAX6660 EV Kit PC Board Layout—Component Side

Figure 6. MAX6660 EV Kit PC Board Layout—Solder Side

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