19-1629; Rev 1; 2/00

MAXIM

2-Wire Interface Board

Evaluates: MAXSMBus

General Description

MAXSMBus is an interface between an IBM-compatible PC and System Management Bus (SMBus™)-compatible serial-interface devices such as temperature monitors, voltage regulators, or A/D converters (ADCs). The MAXSMBus interface board is connected between the PC parallel port and the device under test, converting parallel data into 2-wire, open-drain serial data. The board is provided for use with selected Maxim products and is not intended to replace commercially available SMBus hardware. MAXSMBus is shipped with a companion EV kit board, including all relevant software.

Note that the MAXSMBus board, combined with a PC, is intended only for the functional evaluation of Maxim SMBus-interfaced devices. The PC functions as the only bus master, and does not yield to any other SMBus master. The SMBus emulation system is not designed to meet all of the SMBus specifications.

MAXSMBus Interface Board Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C3	3	0.1µF ceramic capacitors
C4–C7, C9	5	3.3µF, 20V tantalum capacitors
C8	1	2.2µF, 35V tantalum capacitor
D1	1	1N4692 zener diode, 6.8V
D2	1	1N4688 zener diode, 4.7V
D3	1	1N4148 small-signal diode
J1	1	DB25 right-angle plug
J2	0	Not installed
P1	1	2x10 right-angle male header
R1, R2, R3, R8–R11	7	47kΩ ±5% resistors
R4–R7	4	4.7kΩ ±5% resistors
U1	1	74HCT05 hex open-collector inverter
U2	1	74HCT04 hex inverter
U3	1	74HCT08 quad AND gate
U4	1	74HCT74 dual D flip-flop
U5	1	+5V, 100mA regulator LM78L05ACM
U6	1	MAX865EUA (8-pin µMAX)
U7	1	MAX367CWN (18-pin SO)
NONE	1	PC board

SMBus is a trademark of Intel Corp.

Features

- **SMBus-Compatible 2-Wire Interface**
- **SMBus Suspend Output**
- **Two SMBus Alert Inputs**
- **Overvoltage Fault Protection**
- **PC Parallel Port Interface**

Ordering Information

PART	BOARD TYPE
MAXSMBus	Companion Board for SMBus EV Kits

MAXSMBus Functionality Check

Follow these steps to verify that the MAXSMBus interface board is functioning properly. All necessary software is supplied on a disk with the companion EV kit. Instructions for operating the software are included in the EV kit manual.

1) Connect a +9VDC supply (+7V minimum, +30V maximum) to the MAXSMBus interface board at the terminals labeled POS9 and GND in the lower left corner of the board.
2) Use a digital voltmeter to verify that the oval pad labeled POS5 is +5V (+4.75V minimum, +5.25V maximum). Also verify that the pads labeled SBDAT1, SBCLK1, SBSUS1, ALERT1, and ALERT2 are above +4V.
3) If these DC voltages are correct, MAXSMBus passes the functionality test.

Detailed Description

The MAXSMBus interface board provides all of the interface signals necessary to interface an IBM PC-compatible computer with an SMBus-compliant device. A DB25 right-angle plug connects to the computer (Table 1). The companion board plugs into a 20-pin dual-row right-angle header at the edge of the board (Table 2). Alternatively, connection can be made by soldering wires to the oval pads as appropriate. This allows the companion board to be placed in an environmental chamber for evaluation over temperature.

Refer to the documentation of the companion Maxim EV kit for quick start and operating instructions.

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.

2-Wire Interface Board

Power Supply

The interface board is powered by a 78L05 linear regulator. The companion board can draw about 20mA of +5V power through the circuit protector. Companion boards that require more power must provide their own regulator. The unregulated input to the 78L05 is available on the right-angle header.

Fault-Protection Circuitry

Overvoltage fault protection is provided by a MAX367 fault protector (U7). If any of the SMBus interface signals exceed the MAX367's power-supply rails, the MAX367 increases its resistance to prevent damage to the user's computer. A MAX865 dual charge pump (U6) and two zener diodes (D1 and D2) provide +7V and -3V supplies to the MAX367, thus allowing 0 and +5V signals to pass with a nominal resistance of 100Ω.

Bus Driving Circuitry

A 74HCT05 open-drain inverter (U1) is used to pull down the SMBus interface signals. The 74HCT08 (U3), 74HCT74 (U4), and 74HCT04 (U2) buffer the signal to the IBM PC and provide the capability to mask the ALERT interrupts, detect an externally generated start condition, and capture data sent by an external bus master. Interface connections are listed in Table 1 and Table 2.

Bus Monitoring Circuitry

Flip-flop U4A detects the start condition (falling edge of SMBDATA when SMBCLK is high). Flip-flop U4B detects the falling SMBCLK edge when enabled, and U1F holds SMBCLK low until the software releases it. To advance to the next data bit, the software uses U1A to assert and then release SMBCLK. A logic high at the input of U1A also resets flip-flop U4B. Because the IBM PC parallel port has a limited number of inputs, the start-detect circuit and the two alert inputs share a single interrupt input. The source of the interrupt is distinguished using U3A, U3B, and U3C.

Troubleshooting Guide

SYMPTOM	CAUSE	SOLUTION
Can't Find the Interface Board	Board not connected to parallel printer port	Verify that the cable is a 25-pin parallel port I/O extension cable with a plug on one end and a socket on the other end. Verify that the cable is connected to a printer port, not a floppy disk, SCSI, or serial communications port.
Clock or Data Stuck Low	Board is connected to correct port, but SMBus is not functioning	Check power connections on the interface board. Check clock and data signal connections. Try operating the interface board without the companion Maxim evaluation kit—this should cause the address-not-acknowledged symptom described below.
Address Not Acknowledged	SMBus is OK, but no response at expected SMBus address	Verify that the companion board is connected to the MAXSMBus interface board. Verify that the companion board is powered. If the companion offers a choice of addresses, confirm that the software and hardware addresses match. Some devices only read the address select pins at device power-up.
Erratic Operation	Conflict with local printer driver	Disable print manager in the Windows printer control panel. Disable printer driver.
	Operating system conflict	1) Use computer with commercially available BIOS. 2) Make a bootable floppy disk, remove unnecessary device drivers from A:config.sys, and boot system from floppy.

Table 1. DB25 Connector Signals

PIN	NAME	FUNCTION
1	SPARE OUTPUT A	Spare output
2	$\overline{\text{SMBCLK_OUT}}$	When high, drives SMBCLK signal low
3	$\overline{\text{SMBDATA_OUT}}$	When high, drives SMBDATA signal low
4	SMBUS_OUT	When high, drives SMBSUS signal low
5	LOOPBACK	Loopback connection for port verification
6	$\overline{\text{MASK_ALERT1}}$	When high, allows $\overline{\text{ALERT1}}$ to trigger $\overline{\text{INT}}$ low
7	$\overline{\text{MASK_ALERT2}}$	When high, allows $\overline{\text{ALERT2}}$ to trigger $\overline{\text{INT}}$ low
8	$\overline{\text{MASK_START}}$	When high, allows a start condition to trigger $\overline{\text{INT}}$ low
9	CAPTURE_ENABLE	When high, enables slave / bus monitor circuitry. This circuit waits until SMBCLK is pulled low, and then it holds SMBCLK until the software resets it.
10	$\overline{\text{INT}}$	Active low interrupt input
11	$\overline{\text{SMBDATA_IN}}$	When high, indicates that SMBDATA is low
12	$\overline{\text{SMBCLK_IN}}$	When high, indicates that SMBCLK is low
13	LOOPBACK	Loopback connection for port verification
14	SPARE OUTPUT B	Spare output
15	$\overline{\text{HOLDING_CLOCK}}$	When low, indicates that interface board is holding SMBCLK low
16	UNUSED	Not used
17	UNUSED	Not used
18–25	GND	Signal ground return

2-Wire Interface Board

Table 2. Right-Angle Header P1 Signals

PIN	NAME	FUNCTION
1	DUT +5V	+5V at 1mA power supply to Maxim companion board
2	GND	Signal ground return
3	DUT SDA	SMBDATA interface signal
4	GND	Signal ground return
5	GND	Signal ground return
6	GND	Signal ground return
7	DUT SCL	SMBCLK interface signal
8	GND	Signal ground return
9	DUT $\overline{\text{SMBSUS}}$	$\overline{\text{SMBSUS}}$ interface signal
10	GND	Signal ground return
11	DUT $\overline{\text{SMBALERT}}$	Primary $\overline{\text{ALERT}}$ interface signal
12	GND	Signal ground return
13	DUT $\overline{\text{ALERT2}}$	Secondary $\overline{\text{ALERT}}$ interface signal
14	GND	Signal ground return
15	SPARE OUTPUT A	Spare output from pin 1 of the DB25 connector
16	GND	Signal ground return
17	SPARE OUTPUT B	Spare output from pin 14 of the DB25 connector
18	GND	Signal ground return
19	GND	Signal ground return
20	RAW POWER	Unregulated, unprotected power-supply input to MAXSMBus interface board

Note: *Odd-numbered pins are on the outer row. Even-numbered pins are on the inner row. All right-angle header signals pass through the MAX367 circuit protector, except 20.*

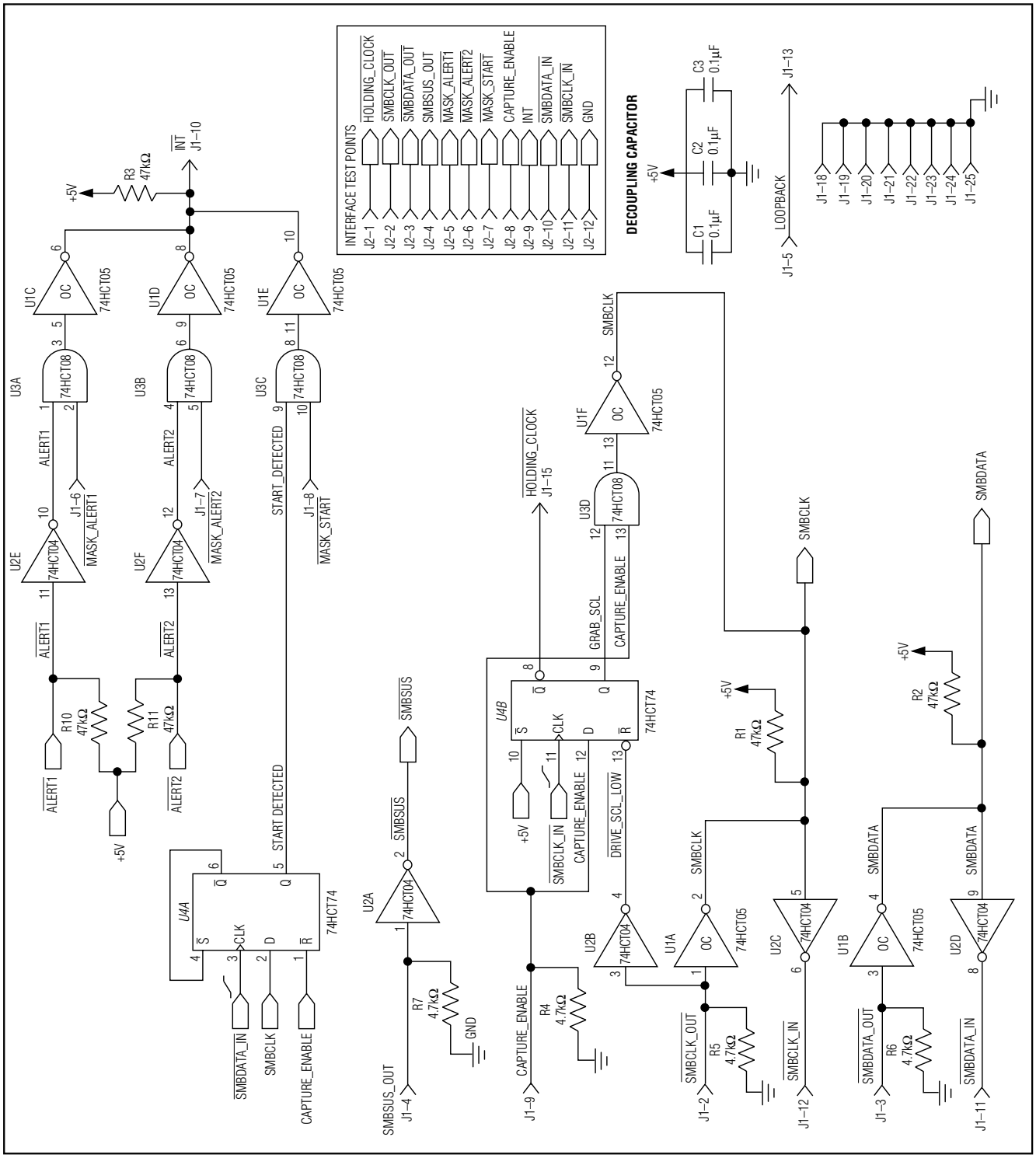


Figure 1a. MAXSMBus Schematic

2-Wire Interface Board

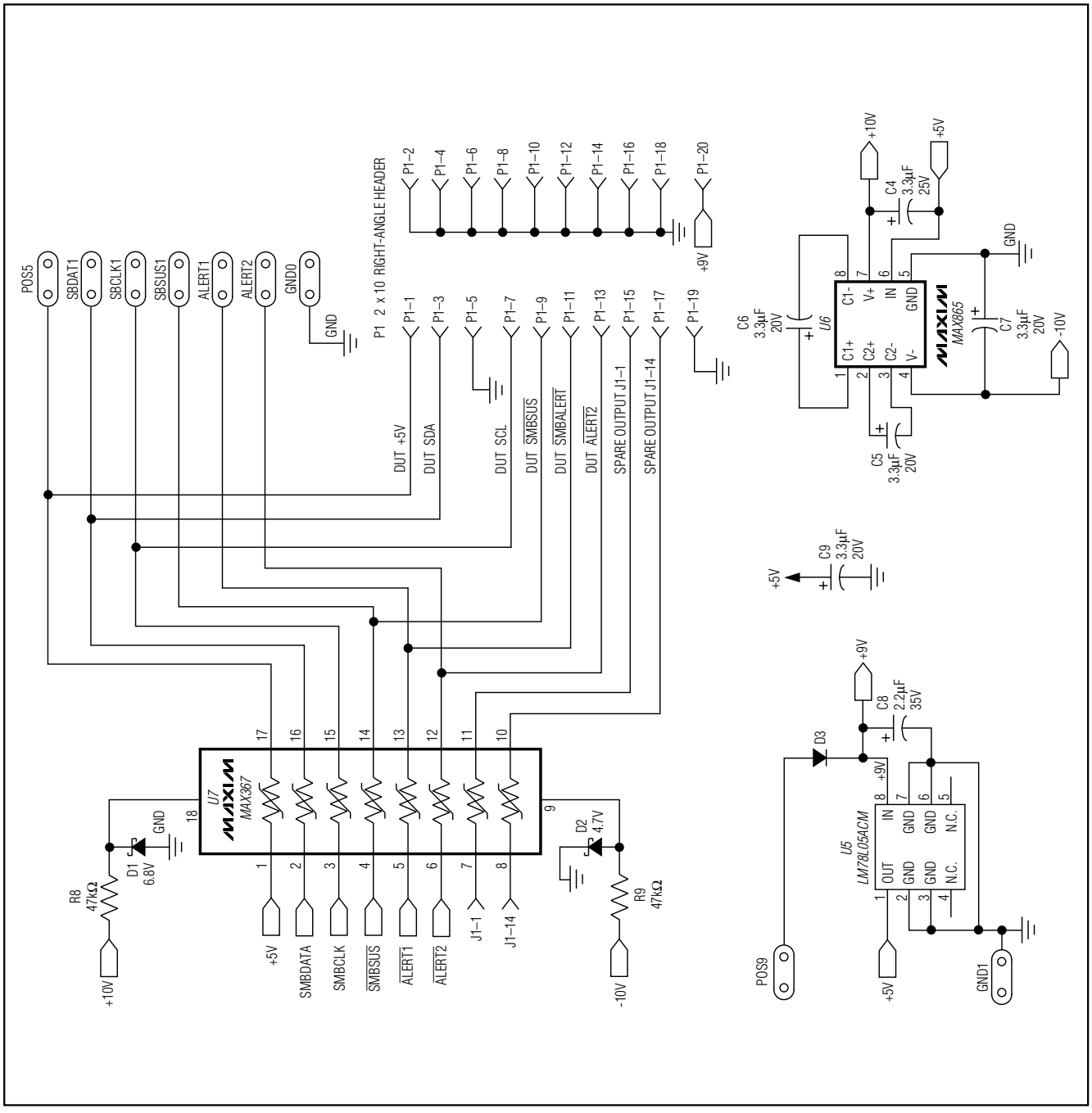


Figure 1b. MAXSMBus Schematic (continued)

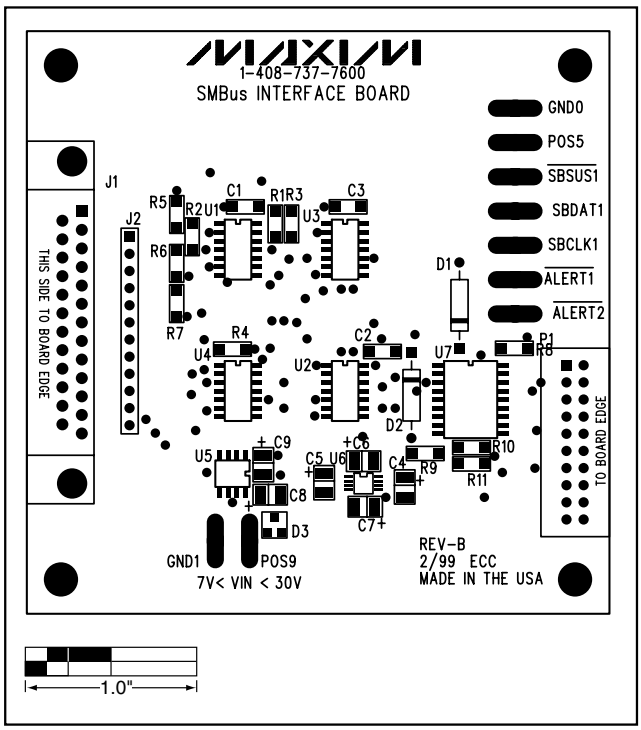


Figure 2. MAXSMBus Component Placement Guide—Component Side

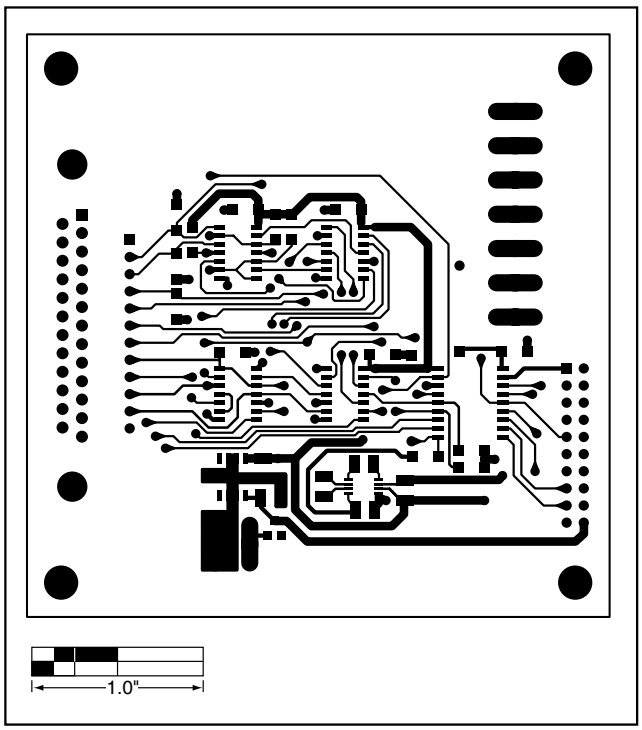


Figure 3. MAXSMBus PC Board Layout—Component Side

2-Wire Interface Board

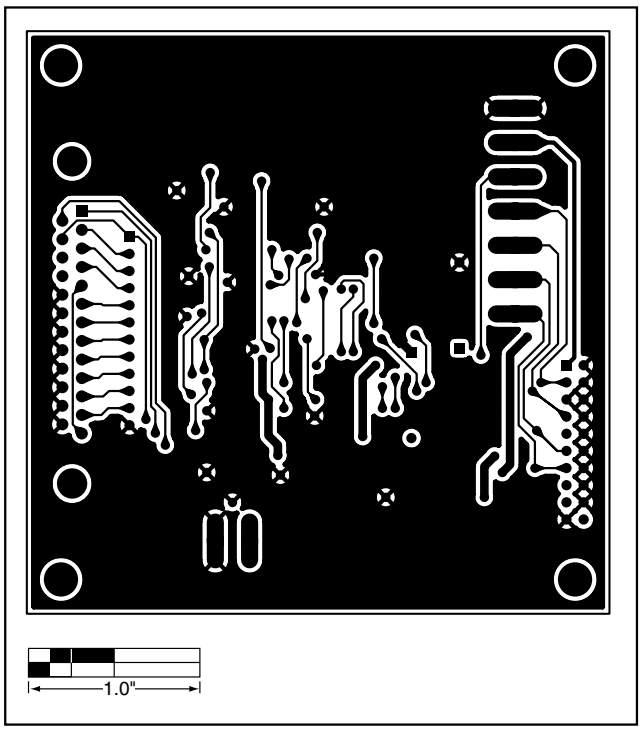


Figure 4. MAXSMBus PC Board Layout—Solder Side

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