## General Description

The MAX3223E evaluation kit (EV kit) provides a proven design to evaluate the MAX3223E 1µA supply current, 1Mbps, 3.0V to 5.5V, RS-232 transceivers with AutoShutdown™.

The MAX3223E EV kit PCB comes with a MAX3223EEUP+ installed.

*AutoShutdown is a trademark of Maxim Integrated Products, Inc.*

## Features

- Single-Supply Operation
- 6-Pin Signal Header
- DCE-Connected DB9 Socket
- Digital Loopbacks
- RS-232 Loopbacks
- Hardware Handshake Loopbacks
- Lead(Pb)-Free and RoHS Compliant
- Proven PCB Layout
- Fully Assembled and Tested

## Ordering Information

| PART | TYPE |
|---|---|
| MAX3223EEVKIT+ | EV Kit |

*+Denotes lead(Pb)-free and RoHS compliant.*

## Component List

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C1–C5 | 5 | 0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K |
| C6 | 1 | 10µF ±20%, 16V X5R ceramic capacitor (1206) Murata GRM31CR61C106M |
| H1, H2 | 2 | 10-pin headers |
| H3 | 1 | 6-pin header |
| J1 | 1 | DB9 female right-angle receptacle |
| JU1, JU2, JU3, JU5–JU8 | 7 | 3-pin headers |
| JU4, JU9, JU10, JU11 | 4 | 2-pin headers |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| LED1, LED2 | 2 | Red LEDs (0805) |
| R1, R2 | 2 | 470Ω ±5% resistors (0603) |
| U1 | 1 | ±15kV ESD-protected, 1µA, 3.0V to 5.5V, 250kbps, RS-232 transceiver with AutoShutdown (20 TSSOP) Maxim MAX3223EEUP+ |
| — | 11 | Shunts |
| — | 1 | DB9 I/O extension cable, 6ft |
| — | 1 | PCB: MAX3223E Evaluation Kit+ |

## Component Suppliers

| SUPPLIER | WEBSITE |
|---|---|
| Murata Electronics, North America, Inc. | www.murata-northamerica.com |
| TDK Corp. | www.component.tdk.com |

**Note:** *Indicate that you are using the MAX3223E when contacting these component suppliers.*

## Quick Start—Digital Loopback

### Required Equipment

- MAX3223E EV kit (DB9 I/O extension cable included)
- A user-supplied Windows® 2000/XP- or Windows Vista®-compatible PC with a spare RS-232 serial port
- 3.3V DC power supply

**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 operating system.

### Procedure

The MAX3223E EV kit is fully assembled and tested. Follow the steps below to verify board operation. This procedure is written for one particular terminal emulator (RealTerm version 2.0.0.57), but any terminal emulation software should work.

1) Visit **www.maximintegrated.com/evkitsoftware** to download the latest version of the EV kit software, 3223Rxx.ZIP. Save the EV kit software to a tempo-rary folder and uncompress the ZIP file. The EV kit software consists of the free, open-source terminal emulator, RealTerm (also available from http://real-term.sourceforge.net).

2) Verify that all jumpers (JU1–JU11) are in their default positions, as shown in Table 1.

3) Connect the 3.3V DC power supply between the VCC and GND pads on EV kit.

4) Connect the DB9 I/O extension cable between the EV kit and the computer's serial port.

5) Start the RealTerm software by opening its icon in the **Start | Programs** menu. The RealTerm software main window appears, as shown in Figure 1. **Note:** If the serial cable is connected to a serial port other than COM1, then bring up the **Port** tab and open the corresponding serial port.

6) Install a shunt across jumper JU1 pins 2-3 to enable normal operation.

7) Install a shunt across jumper JU9 pins 1-2 to enable digital loopback.

8) Enable the 3.3V DC power supply.

9) In the RealTerm window, click in the display area and type on the keyboard. The digital loopback con-nection immediately relays each character from the receiver to the transmitter, so each character typed on the keyboard appears in the display area.

10) Move the JU1 shunt to pins 1-2 to disable the MAX3223E.

11) In the RealTerm window, click in the display area and type on the keyboard. With the MAX3223E disabled, characters typed on the keyboard do not appear in the display area.

## Quick Start—External Microcontroller

### Required Equipment

Before beginning, the following equipment is needed:

- MAX3223E EV kit (DB9 I/O extension cable included)
- A user-supplied Windows 2000/XP- or Windows Vista-compatible PC with a spare RS-232 serial port
- 3.3V DC power supply
- A user-supplied microcontroller, such as MAXQ2000EVKIT or DS89C450-K00

**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 operating system.

### Procedure

The MAX3223E EV kit is fully assembled and tested. Follow the steps below to verify board operation. This procedure is written for one particular terminal emulator (RealTerm version 2.0.0.57), but any terminal emulation software should work.

1) Visit **www.maximintegrated.com/evkitsoftware** to download the latest version of the EV kit software, 3223Rxx.ZIP. Save the EV kit software to a tempo-rary folder and uncompress the ZIP file. The EV kit software consists of the free, open-source terminal emulator, RealTerm (also available from http://real-term.sourceforge.net).

2) Verify that all jumpers (JU1–JU11) are in their default positions, as shown in Table 1.

3) Connect the 3.3V DC power supply between the VCC and GND pads on EV kit.

4) Connect the DB9 I/O extension cable between the EV kit and the computer's serial port.

5) Start the RealTerm software by opening its icon in the **Start | Programs** menu. The RealTerm software main window appears, as shown in Figure 1. **Note:** If the serial cable is connected to a serial port other than COM1, then bring up the **Port** tab and open the corresponding serial port.

*Windows and Windows Vista are registered trademarks of Microsoft Corp.*

## Table 1. MAX3223E EV Kit Jumper Descriptions (JU1–JU11)

| JUMPER | SIGNAL | SHUNT POSITION | DESCRIPTION |
|--------|--------|----------------|-------------|
| JU1 | $\overline{\text{EN}}$ | 1-2 | $\overline{\text{EN}}$ = VCC |
| | | 2-3* | $\overline{\text{EN}}$ = GND |
| JU2 | FORCEON | 1-2* | FORCEON = VCC |
| | | 2-3 | FORCEON = GND |
| JU3 | $\overline{\text{FORCEOFF}}$ | 1-2* | $\overline{\text{FORCEOFF}}$ = VCC |
| | | 2-3 | $\overline{\text{FORCEOFF}}$ = GND |
| JU4 | $\overline{\text{INVALID}}$ | 1-2* | $\overline{\text{INVALID}}$ drives LED2 |
| | | Open | $\overline{\text{INVALID}}$ is not connected to LED2 |
| JU5 | R2IN | 1-2* | R2IN is driven by DTRIN from connector J1 |
| | | 2-3 | R2IN is driven by RTSIN from connector J1 |
| | | Open | R2IN is not connected to J1 |
| JU6 | DCDOUT | 1-2* | DCDOUT drives DTRIN from connector J1 |
| | | 2-3 | DCDOUT drives T2OUT from U1 |
| JU7 | DSROUT | 1-2* | DSROUT drives DTRIN from connector J1 |
| | | 2-3 | DSROUT drives T2OUT from U1 |
| JU8 | CTSOUT | 1-2* | CTSOUT drives RTSIN from connector J1 |
| | | 2-3 | CTSOUT drives T2OUT from U1 |
| JU9 | T1IN Loopback | 1-2 | T1IN is driven by R1OUT from U1. Data received from RS-232 side loops back at digital connection. |
| | | Open* | T1IN is not connected to R1OUT |
| JU10 | T2IN Loopback | 1-2 | T2IN is driven by R2OUT from U1. Handshake received from RS-232 side loops back at digital connection. |
| | | Open* | T2IN is not connected to R2OUT |
| JU11 | RS232 Loopback | 1-2 | R1IN is driven by T1OUT from U1. Data received from digital side loops back at RS-232 connection. |
| | | Open* | R1IN is not connected to T1OUT |

*Default position.*

6) Install a shunt across jumper JU1 pins 2-3 to enable normal operation.

7) Enable the 3.3V DC power supply.

8) Connect the microcontroller's 3.3V bus to the EV kit header's H3 VCC (H3-1) pin.

9) Connect the microcontroller's UART RXD input to the EV kit header's H3 R1OUT (H3-2) output.

10) Connect the microcontroller's UART TXD output to the EV kit header's H3 T1IN (H3-3) input.

11) Connect the microcontroller's ground return to the EV kit header's H3 GND (H3-6) pin.

12) In the RealTerm window, click in the display area and type on the keyboard. Characters typed from the keyboard are sent to the microcontroller UART. Characters sent by the microcontroller UART are displayed in the terminal window.

## Detailed Description of Hardware

The MAX3223E EV kit provides a proven layout for the MAX3223E. Capacitors C1–C4 are used by the charge pump to generate the internal V+ and V- supplies from VCC. Capacitors C5 and C6 bypass the VCC supply. Header H3 provides the digital connections to the MAX3223E. Jumpers JU1, JU2, and JU3 control the
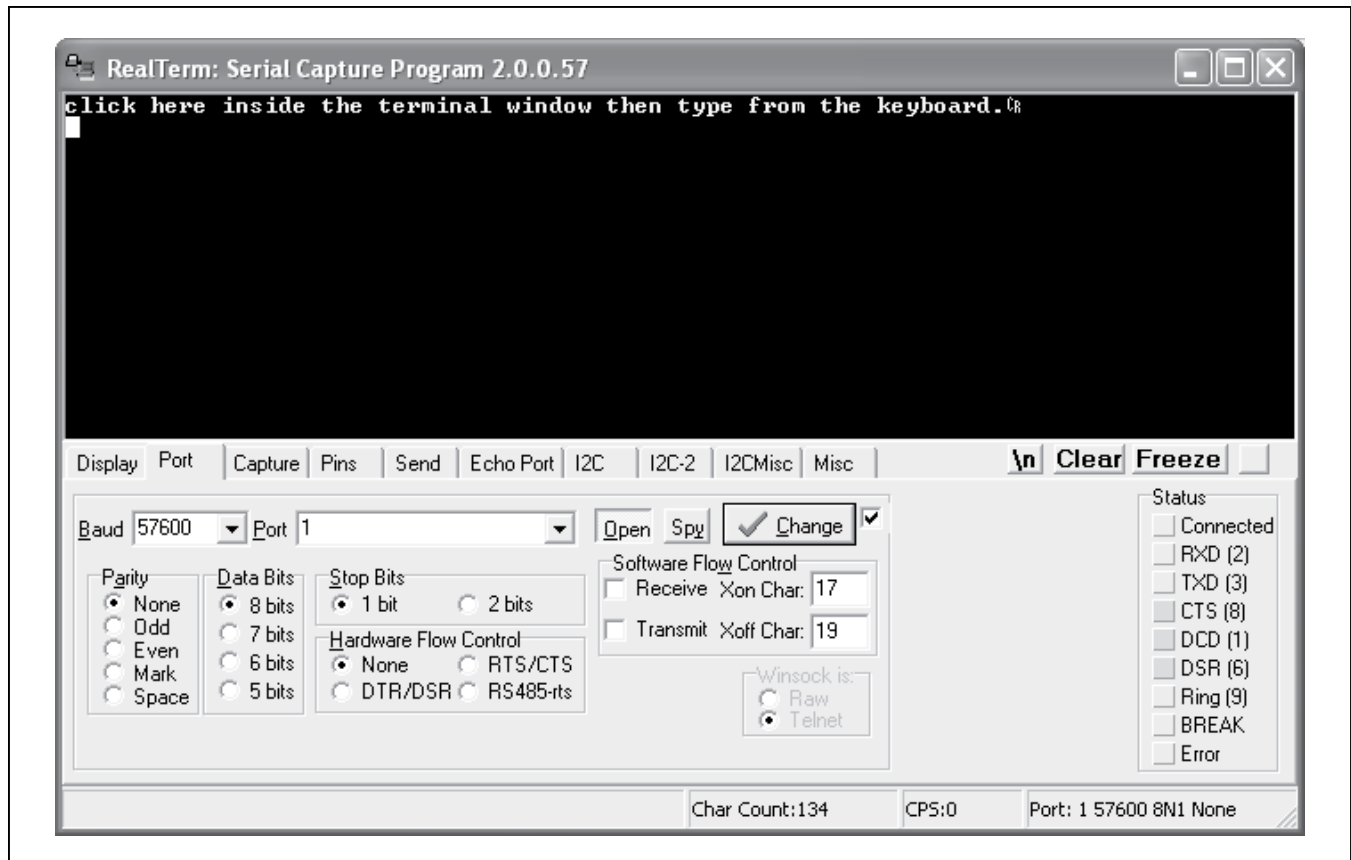
*Figure 1. RealTerm Software Main Window (Port Tab Sheet)*

MAX3223E power-management signals. Jumper JU4 connects the $\overline{INVALID}$ status output to LED2. Jumpers JU5–JU8 configure the hardware handshake signals. Jumpers JU9 and JU10 allow digital loopback. Jumper JU11 allows RS-232 loopback.

The DCE-connected RS-232 connector (J1) uses MAX3223E transmitter 1 and receiver 1 for the serial data. MAX3223E transmitter 2 and receiver 2 can optionally be used for DTR-DSR or RTS-CTS hardware handshake.

### Hardware Handshakes

A hardware handshake consists of two or more signal wires used to control the flow of information on the other wires. The MAX3223E does not enforce any hardware handshake convention, but allows a microcontroller to use the secondary receiver/transmitter to conduct active flow control using one of the defined hardware handshakes.

If the hardware handshake is not being actively managed by a microcontroller, then the corresponding handshake signals should be connected together to allow data to flow. Without a hardware handshake connection, communication may be blocked.

Tables 2 and 3 provide suggested jumper settings for the two most common hardware handshakes.

## Table 2. Jumper Settings for DTR-DSR Handshake (JU5–JU8)

| JUMPER | SIGNAL | SHUNT POSITION | DESCRIPTION |
|---|---|---|---|
| JU5 | R2IN | 1-2 | R2IN is driven by DTRIN from connector J1 |
| JU6 | DCDOUT | 1-2 | DCDOUT = DTRIN from connector J1 |
| JU7 | DSROUT | 2-3 | DSROUT = T2OUT from U1 |
| JU8 | CTSOUT | 1-2 | CTSOUT = RTSIN from connector J1 |

## Table 3. Jumper Settings for RTS-CTS Handshake (JU5–JU8)

| JUMPER | SIGNAL | SHUNT POSITION | DESCRIPTION |
|---|---|---|---|
| JU5 | R2IN | 2-3 | R2IN = RTSIN from connector J1 |
| JU6 | DCDOUT | 1-2 | DCDOUT = DTRIN from connector J1 |
| JU7 | DSROUT | 1-2 | DSROUT = DTRIN from connector J1 |
| JU8 | CTSOUT | 2-3 | CTSOUT = T2OUT from U1 |
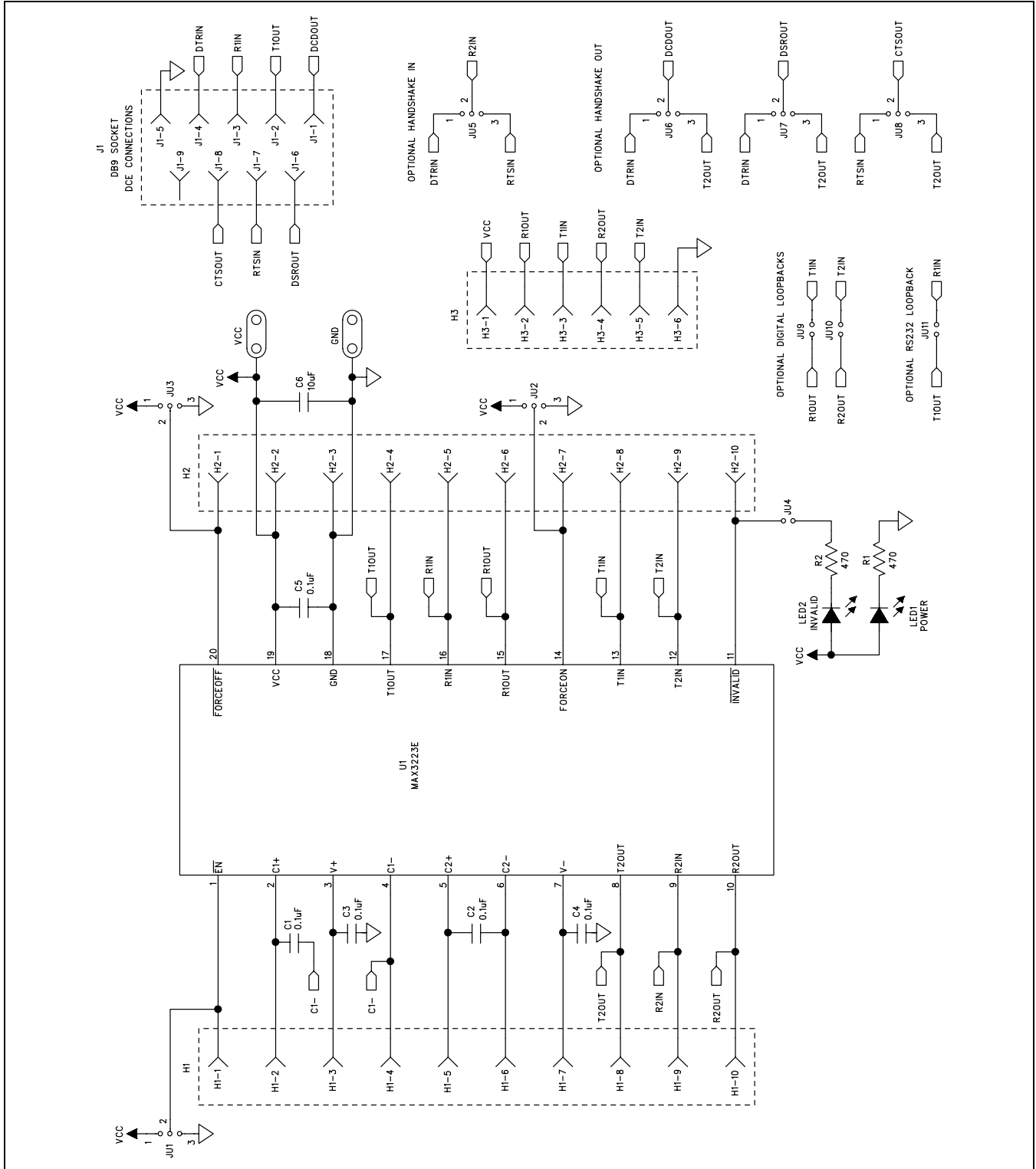
*Figure 2. MAX3223E EV Kit Schematic*
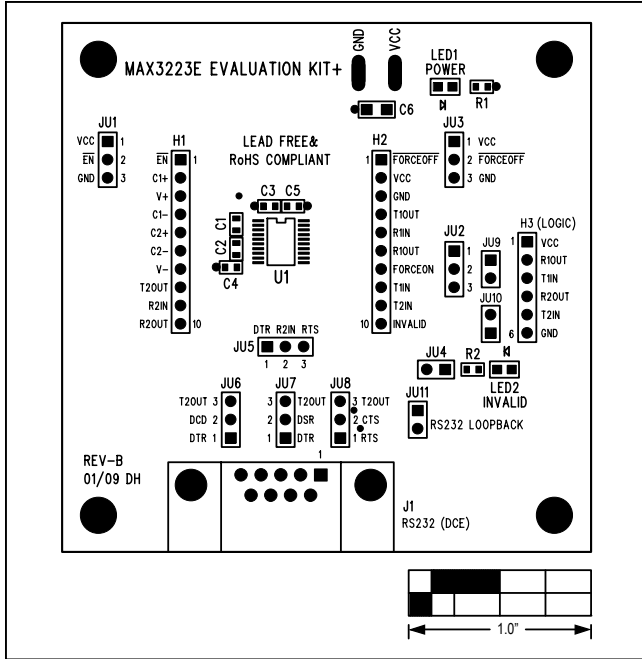
Figure 3. MAX3223E EV Kit Component Placement Guide—Component Side
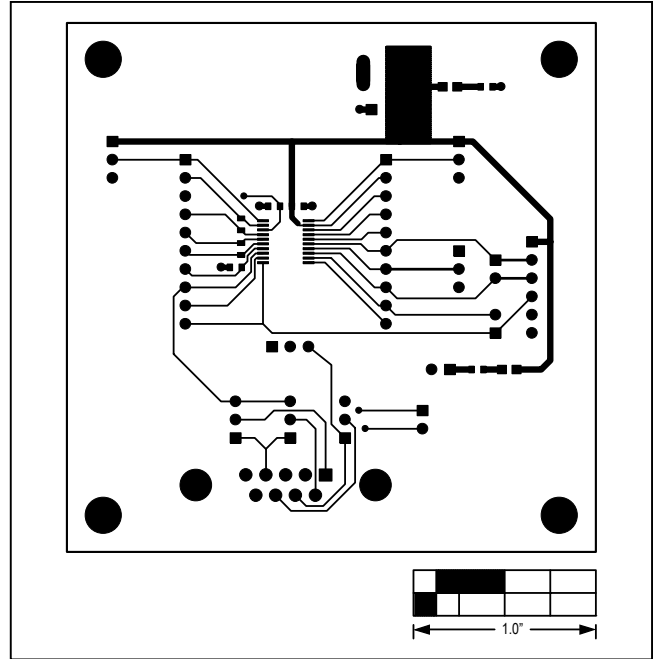


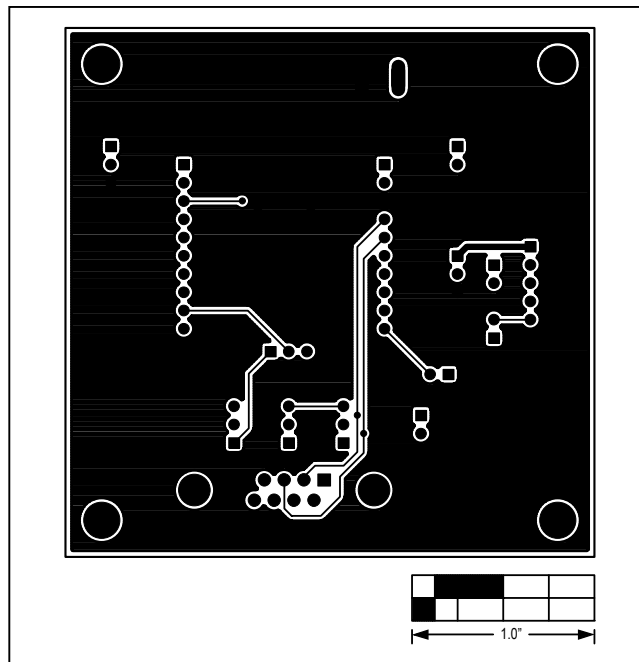Figure 4. MAX3223E EV Kit PCB Layout—Component Side



Figure 5. MAX3223E EV Kit PCB Layout—Solder Side

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 2/09 | Initial Release | — |
| 1 | 2/18 | Updated trademark reference | 1 |

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