



MAX4397 Evaluation System/Evaluation Kit

General Description

The MAX4397 evaluation system (**MAX4397EVCMODU**) is a complete dual SCART audio/video switch matrix system consisting of a MAX4397 evaluation kit (EV kit) and the Maxim CMODUSB command module. Order the EV kit (**MAX4397EVKIT**) separately if the user already has an I²C* master or if the Maxim CMODUSB command module has already been purchased.

The MAX4397 EV kit is an assembled and tested PC board used to evaluate the MAX4397 dual SCART audio/video switch matrix. It routes audio, video, and control signals between an MPEG decoder and the VCR/TV SCART connectors. The Maxim CMODUSB command module provides the I²C interface and is connected to the PC through the Universal Serial Bus (USB) port.

The EV kit also includes Windows 98/2000/XP®-compatible software, which provides a simple user interface for exercising the MAX4397's features. The program is menu-driven and offers a graphical user interface (GUI) complete with control buttons and a status display.

The EV kit comes with the MAX4397SCTM installed. Contact the factory for free samples of the pin-compatible MAX4397DCTM to evaluate this part.

Windows is a registered trademark of Microsoft Corp.

**Purchase of I²C components from Maxim Integrated Products, Inc., or one of its sublicensed Associate Companies, conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.*

Features

- ◆ Route MPEG Decoder Signals to VCR/TV SCART Connectors
- ◆ On-Board SCART Connectors
- ◆ I²C Interface
- ◆ Easy-to-Use, Menu-Driven Software
- ◆ Completely Assembled and Tested
- ◆ Include Windows 98/2000/XP-Compatible Software

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX4397EVKIT	0°C to +70°C	48 Thin QFN-EP**
MAX4397EVCMODU	0°C to +70°C	48 Thin QFN-EP**

**EP = Exposed paddle.

Note: The MAX4397EVKIT includes only the EV kit. The MAX4397EVCMODU includes both the EV kit and the CMODUSB command module. The MAX4397 EV kit software is provided with the MAX4397EVKIT; however, the Maxim CMODUSB command module is required when using the included software.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	10µF ±20%, 16V X7R ceramic capacitors (1210) TDK C3225X7R1C106M
C3	1	0.47µF ±20%, 10V X5R ceramic capacitor (0603) TDK C1608X5R1A474M
C4–C8, C14–C21, C23–C27	18	0.1µF ±20%, 10V X5R ceramic capacitors (0402) TDK C1005X5R1A104M
C9	1	10µF ±20%, 6.3V X5R ceramic capacitor (0805) TDK C2012X5R0J106M

DESIGNATION	QTY	DESCRIPTION
C10, C12, C29, C31, C36	5	10µF ±20%, 10V 900mΩ ESR tantalum capacitors (A-case) AVX TPSA106M010-900
C11, C13, C28, C30, C32–C35	8	0.1µF ±10%, 20V tantalum capacitors (R-case) AVX TAJR104K020
C22	1	47µF ±20%, 6.3V X5R ceramic capacitor (1206) TDK C3216X5R0J476M
J1, J2	2	SCART connectors (side-entry PC board mount) Kycon K-SCART-021



MAX4397 Evaluation System/Evaluation Kit

Component List

DESIGNATION	QTY	DESCRIPTION
J3	1	2 x 10 right-angle female receptacle SamTec # SSW-110-02-S-D-RA Methode Electronics # RS2R-20-G Adam Tech # RS2R-20-SG
J4	1	Phono jack (side-entry PC board mount) white CUI Inc. RCJ-043
J5	1	Phono jack (side-entry PC board mount) red CUI Inc. RCJ-042
J6	1	Phono jack (side-entry PC board mount) black CUI Inc. RCJ-041
JU1, JU2	0	Not installed, shorted PC board traces
JU3-JU8	6	2-pin headers
JU9	1	3-pin header
L1	1	220nH $\pm 20\%$, 0.67A chip inductor (1206) Coilcraft 1206CS-221XMB
R1, R6, R53, R58, R71	5	1M Ω $\pm 5\%$ resistors (0402)
R2, R7, R11, R12, R14-R33, R35-R46, R48, R52, R57, R69, R70	41	75 Ω $\pm 5\%$ resistors (0402)

DESIGNATION	QTY	DESCRIPTION
R3, R4, R5, R8, R9, R10, R49, R50, R51, R54, R55, R56,	12	3.32k Ω $\pm 1\%$ resistors (0402)
R13, R47	0	Not installed, resistors (0402)
R34	1	100k Ω $\pm 5\%$ resistor (0402)
R59, R60	0	Not installed, resistors (0603)
R61-R68	8	4.75k Ω $\pm 1\%$ resistors (0402)
U1	1	AV SCART multiplexer, MAX4397SCTM (48-pin 7mm x 7mm x 0.8mm Thin QFN)
VCR_R/C_IN ENCIN_FS ENC_C_IN ENC_Y_IN ENC_B_IN ENC_G_IN ENC_Y/CVBS_IN ENC_R/C_IN TV_R/C_IN RF_CVBS_OUT	10	75 Ω BNC female jacks, 4-pin 0.250in. spacing (top mount) A/D Electronics 580-072-10 Cambridge Products CP-BNC-PC- 004
N/A	7	Shunts
N/A	1	MAX4397 PC board
N/A	1	MAX4397 evaluation kit software, CD-ROM

Selector Guide

MAX4397EVCMODU EV SYSTEM

PART	QTY	DESCRIPTION
MAX4397EVKIT	1	MAX4397 EV Kit
CMODUSB	1	CMODUSB Command Module

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
API Delevan	408-865-0344	408-865-0343	www.delevan.com
AVX	843-946-0238	843-626-3123	www.avxcorp.com
Kycon	888-592-6622	408-494-0325	www.kycon.com
TDK	847-803-6100	847-390-4405	www.component.tdk.com

Note: Indicate that you are using the MAX4397 when contacting these component suppliers.

MAX4397 Evaluation System/Evaluation Kit

Quick Start

Recommended Equipment

- Windows 98, 2000, or XP PC with USB port
- MAX4397EVCMODU
 - MAX4397EVKIT
 - CMODUSB module (includes USB cable)
- 12V/100mA DC power supply (V12)
- 5V/250mA DC power supply (VVID)
- 5V/100mA DC power supply (VAUD)
- DVD player with S-video, composite, or RGB outputs
- S-video to BNC "Y" connector

Procedure

The MAX4397 EV kit is fully assembled and tested. 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 20-pin connector of the MAX4397 EV kit with the 20-pin header of the Maxim CMODUSB command module. Gently press them together.
- 2) Verify jumper JU1 → (1-2).
- 3) Verify jumper JU2 → (1-2).
- 4) Verify jumper JU3 → (Open).
- 5) Verify jumper JU4 → (1-2).
- 6) Verify jumper JU5 → (1-2).
- 7) Verify jumper JU6 → (Open).
- 8) Verify jumper JU7 → (1-2).
- 9) Verify jumper JU8 → (1-2).
- 10) Verify jumper JU9 → (1-2).
- 11) Run the INSTALL.EXE program on the provided CD-ROM to copy the files and create icons in the Windows 98/2000/XP **Start** menu.

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

- 12) Connect the second 12V/100mA DC power supply to the V12 and GNDAUD pads on the MAX4397 EV kit board.
- 13) Connect the 5V/250mA DC power supply to the VVID and GNDVID pads on the MAX4397 EV kit board.
- 14) Connect the 5V/100mA DC power supply to the VAUD and GNDAUD pads on the MAX4397 EV kit board.

- 15) Connect the GNDVID and GNDAUD pads together at the board.
- 16) Connect the DVD player output to the appropriate ENC input(s).
- 17) Connect a TV to the TV (J1) SCART connector.
- 18) Connect a VCR to the VCR (J2) SCART connector.
- 19) Turn on the power supplies.
- 20) Verify that the CMODUSB command module's jumper J1 → (1-2).
- 21) Connect the included USB cable from the PC to the CMODUSB command module. A **Building Driver Database** window should pop up in addition to a **New Hardware Found** message. If you don't see any window that is similar to the one described above after 30 seconds, try removing the USB cable from the CMODUSB command module and reconnect it again. Administrator privileges are required to install the USB device driver on Windows 2000 and XP.
- 22) 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:\Max4397** using the **Browse** button.
- 23) Start the MAX4397 EV kit software by opening its icon in the **Start** Menu.
- 24) Observe as the program automatically detects the address of the MAX4397 and starts the main program.

Detailed Description of Software

User-Interface Panel

The user interface (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 I²C-compatible write operation is generated to update the internal registers of the MAX4397. The **Interface** box indicates the current I²C-compatible **Device Address**, **Register Address**, and the **Data Sent/Received**, for the last read/write operation. This data is used to confirm proper device operation.

The MAX4397 EV kit software splits and groups the functions of the MAX4397 into three separate categories. **TV**, **VCR**, and **Configuration** functions can be accessed by selecting the appropriate tab at the top left of the MAX4397 EV kit software main window. The **TV** and **VCR** panels of the MAX4397 EV kit software are again split into two sections (Video Control and Audio Control).

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

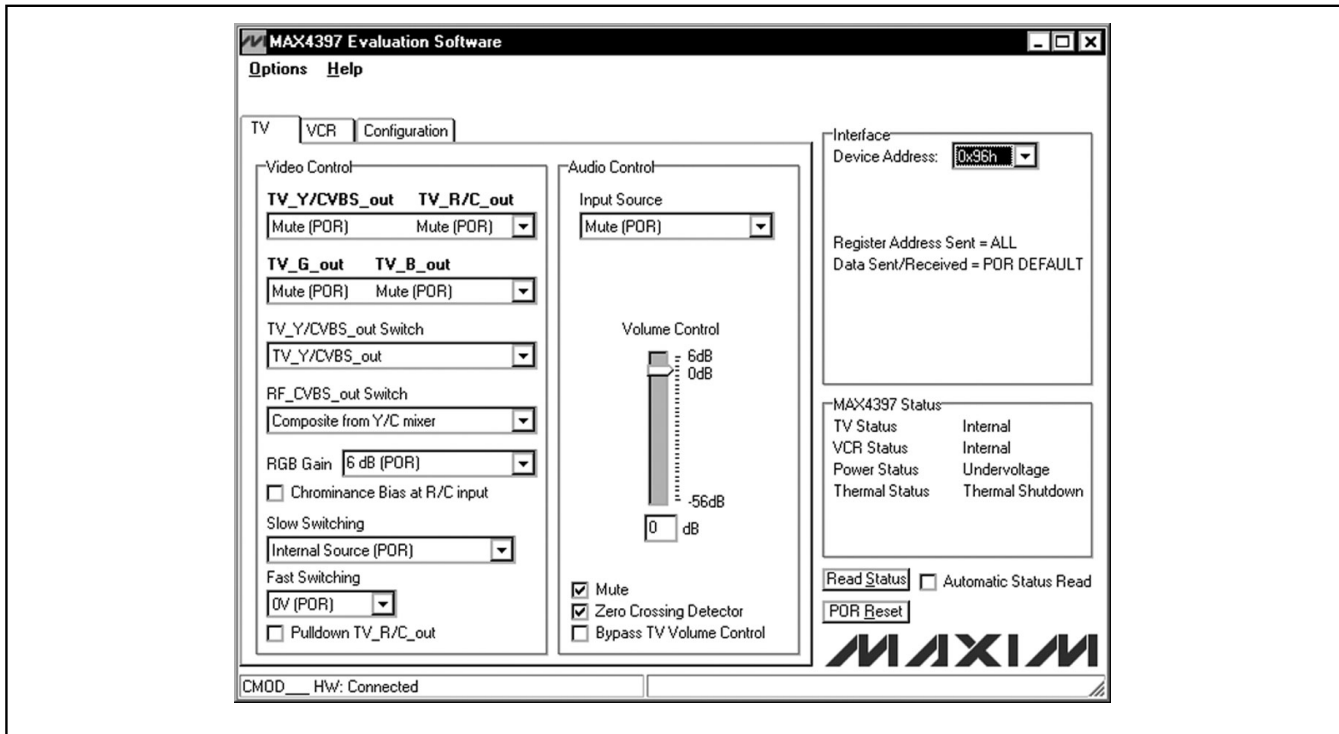


Figure 1. MAX4397 EV Kit Software Main Window

The device status registers (refer to the MAX4397 datasheet for status register information) are displayed in the MAX4397 status panel at the lower right of the main window. To read the status register click the **Read Status** button, or check the **Automatic Status Read** checkbox to automatically read the status register every 250ms.

Click the **POR Reset** button to reset the MAX4397 registers and EV kit software to their power-on-reset configuration.

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

TV Controls (Video Control)

The video control panel of the MAX4397 EV kit software (see Figure 1) allows the user to reroute selected signals to the TV SCART connector. Other functions such as: **RGB Gain**, **Chrominance Bias at R/C Input**, **Fast Switching**, **Slow Switching**, and **Pulldown TV_R/C_out** can also be changed through the video control panel. Manipulate the pulldowns and checkboxes to achieve the desired result.

TV Controls (Audio Control)

The audio control panel of the MAX4397 EV kit software allows the user to adjust various audio characteristics of the TV output. Adjust the volume by moving the **Volume Control** slider, or enter a number in the edit box below the **Volume Control** slider. **Input Source** selection, **Mono Switch Settings**, a **Mute** function, the **Zero Crossing Detector**, a **Bypass Phono Volume Control**, and a **Bypass TV Volume Control** function can also be accessed from the audio control panel (refer to the MAX4397 datasheet for a description of each of these functions).

VCR Controls (Video Control)

The VCR panel of the MAX4397 EV kit software is shown in Figure 2. SCART output signals (**VCR_Y/CVBS_out** and **VCR_R/C_out**), **Chrominance Bias at R/C input**, **Slow Switching**, and **Pulldown VCR_R/C_out** functions can all be accessed through the video control panel.

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

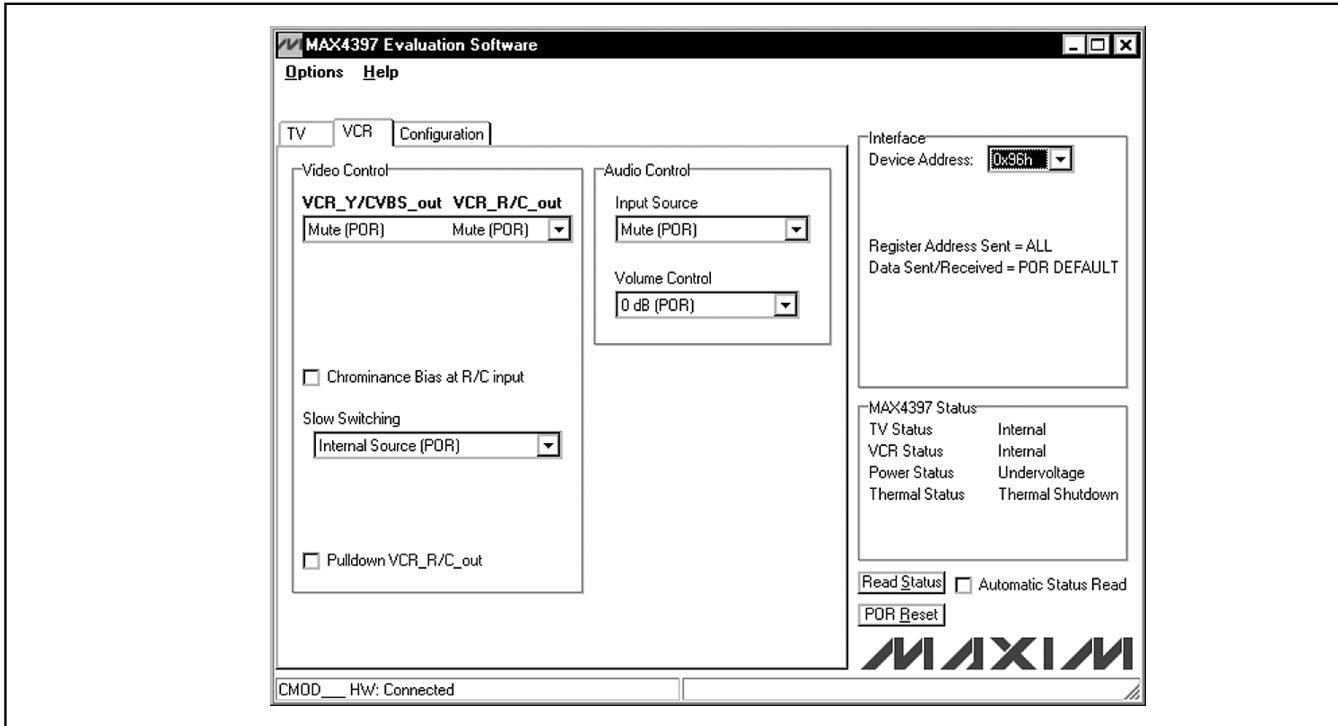


Figure 2. MAX4397 EV Kit Software Main Window (VCR Control Panel)

VCR Controls (Audio Control)

Adjust the **Input Source** and **Volume Control** through the audio control panel of the MAX4397 EV kit software.

Configuration Controls

Selecting the Configuration tab (Figure 3) of the MAX4397 EV kit software allows the user to adjust configuration features of the MAX4397.

Checking desired checkboxes in the Output Enable panel will enable selected outputs of the MAX4397. A bias voltage may also be applied at the R/C input of the encoder (**Chrominance Bias applied at ENC_R/C_IN**).

Simple I²C Commands

There are two methods for communicating with the MAX4397: through the normal user-interface panel or through the I²C commands available by selecting the **2-Wire Interface Diagnostic** item from the **Options**

pull-down menu. A display pops up that allows the SMBus™/I²C-compatible protocols, such as Read Byte and Write Byte, to be executed. The only SMBus/I²C-compatible protocols used by the MAX4397 are:

- 1) 1 – SMBusWriteByte (addr, cmd, data8)
- 2) 3 – SMBusReadByte (addr, cmd) → data8

The dialog boxes accept numeric data in hexadecimal and should be prefixed by 0x. See Figure 4 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 MAX4397 as determined by DEV_ADDR with the last bit set to 1 for a read operation or a zero for a write. Refer to the MAX4397 datasheet for a complete list of registers and functions.

SMBus is a trademark of Intel Corp.

MAX4397 Evaluation System/Evaluation Kit

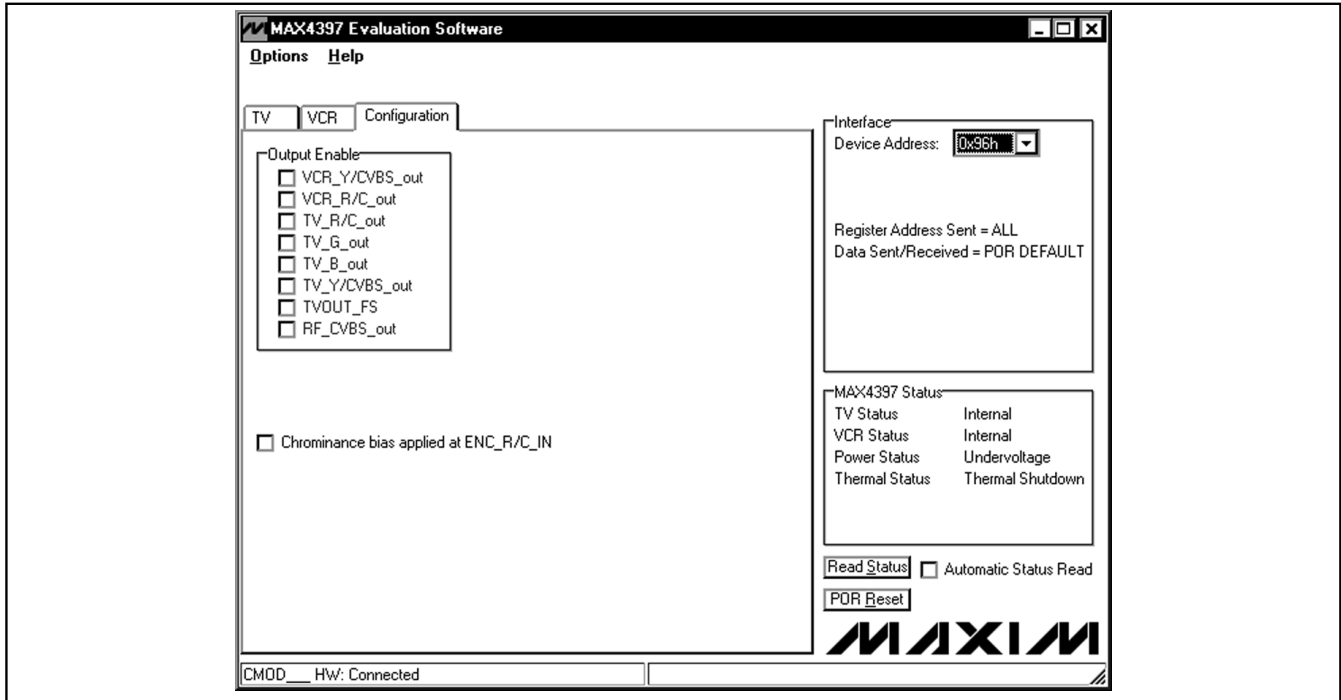


Figure 3. MAX4397 EV Kit Software Main Window (Configuration/Encoder)

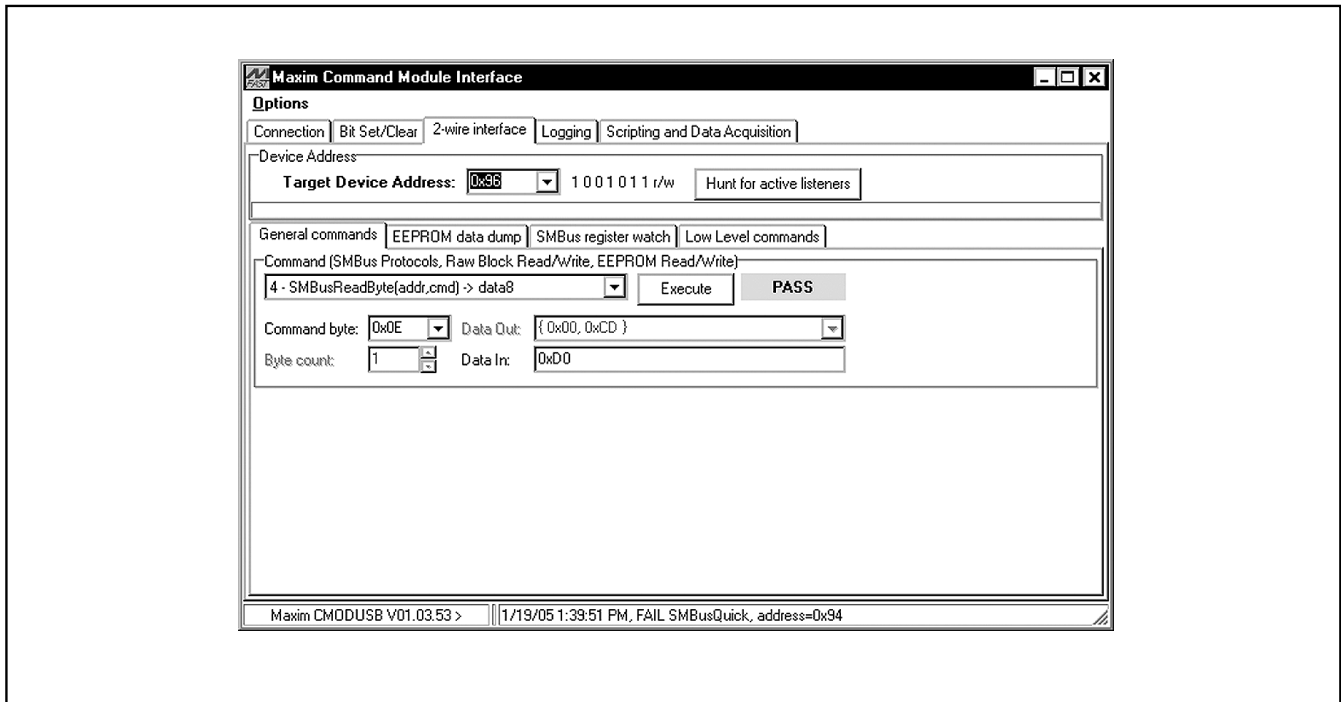


Figure 4. The above example shows a simple SMBusReadByte operation using the included Two-Wire Interface Diagnostics. In this example the software is reading from Device Address 1001011 (r/w) binary, Register Address 0x0E.

MAX4397 Evaluation System/Evaluation Kit

Detailed Description of Hardware

The MAX4397 EV kit is an assembled and tested PC board that demonstrates the MAX4397 dual SCART switch matrix. It routes audio, video, and control signals between an MPEG decoder and the TV and VCR SCART connectors. All video connections are made through 75Ω controlled-impedance traces.

Connect a TV and VCR to the corresponding SCART connectors. The MPEG decoder video connections are made through the 75Ω BNCs with the ENC prefix. MPEG decoder audio connections are made through the ENC LI and ENC RI (J4, and J5) RCA connectors.

Monitor the R/C inputs of the TV and VCR connections through the TV_R/C_IN and VCR_R/C_IN BNCs, respectively.

Monitor the RF modulator mono audio output through the RF MONO RCA connector. Monitor the RF modulator composite video output through the RF_CVBS_OUT BNC.

MAX4397S vs. MAX4397D

The audio encoder input on the MAX4397S is single-ended AC-coupled. The audio encoder input on the MAX4397D is differential DC-coupled. Table 1 shows the proper jumper settings for the audio encoder input circuitry. When evaluating the MAX4397D, apply a common-mode voltage bias at the encoder audio inputs.

Address Selection

Jumper JU9 sets the MAX4397 slave address. The default address is 1001 011Y (DEV_ADDR = V_DIG). See Table 2 for a complete list of addresses.

Evaluate: MAX4397

Table 1. Audio Encoder Input Circuitry (JU3–JU8)

JUMPER	MAX4397S SINGLE-ENDED (DEFAULT)	MAX4397D DIFFERENTIAL
JU3	Open	1-2
JU4	1-2	Open
JU5	1-2	1-2
JU6	Open	1-2
JU7	1-2	Open
JU8	1-2	1-2

Table 2. Shunts Settings for SMBus Address (JU9)

SHUNT POSITION	MAX4397 ADDRESS PIN	MAX4397 ADDRESS	
		BINARY	HEXADECIMAL
1-2*	V_DIG	1001 011Y	0x96
2-3	G_DIG	1001 010Y	0x94

*Default configuration: JU9 (1-2)

Note: The first 7 bits shown are the address. Y (bit 0) is the I²C read/write bit. This bit is a 1 for a read operation or a zero for a write.

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

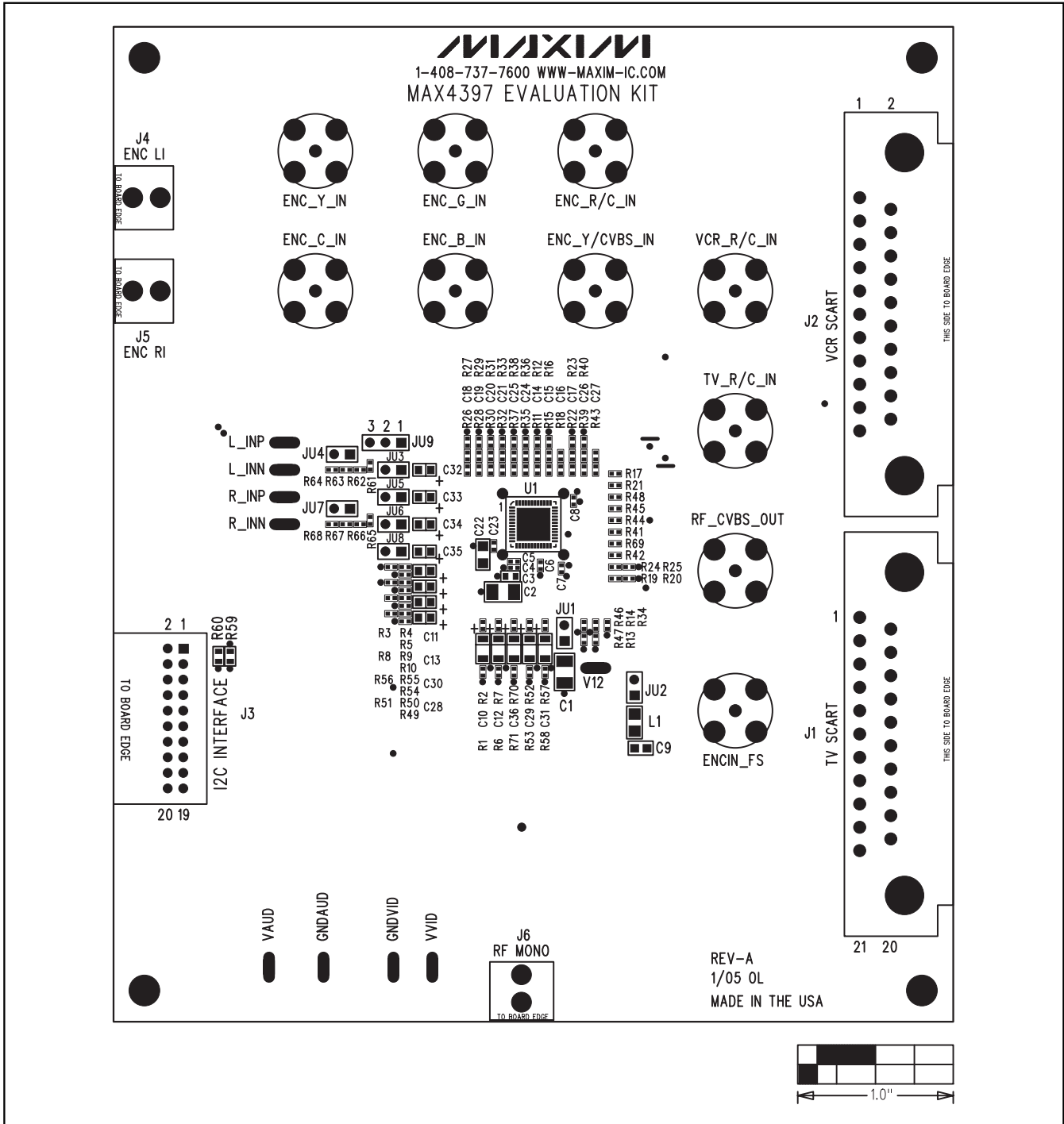


Figure 6. MAX4397 EV Kit Component Placement Guide

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

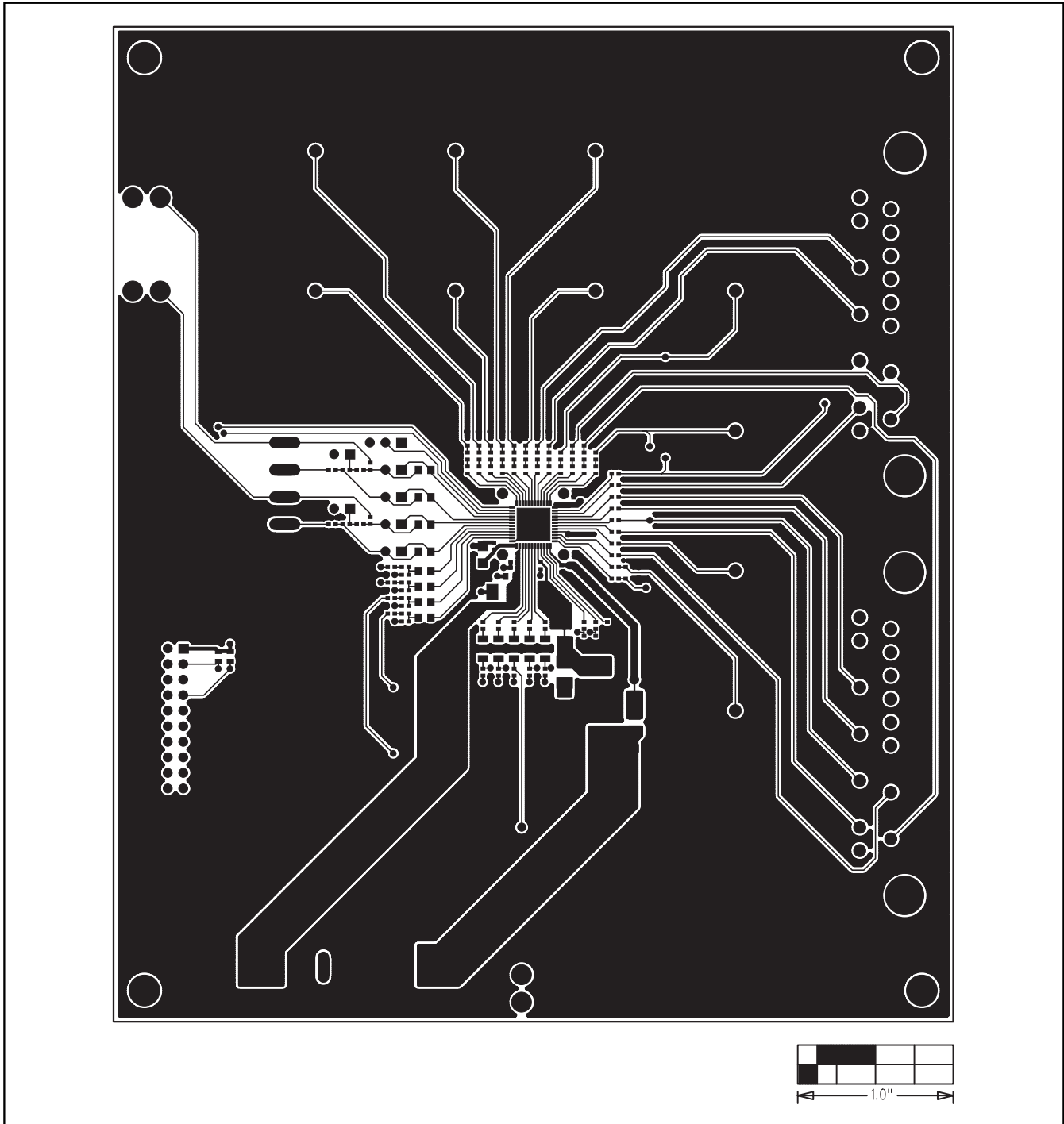


Figure 7. MAX4397 EV Kit PC Board Layout—Component Side

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

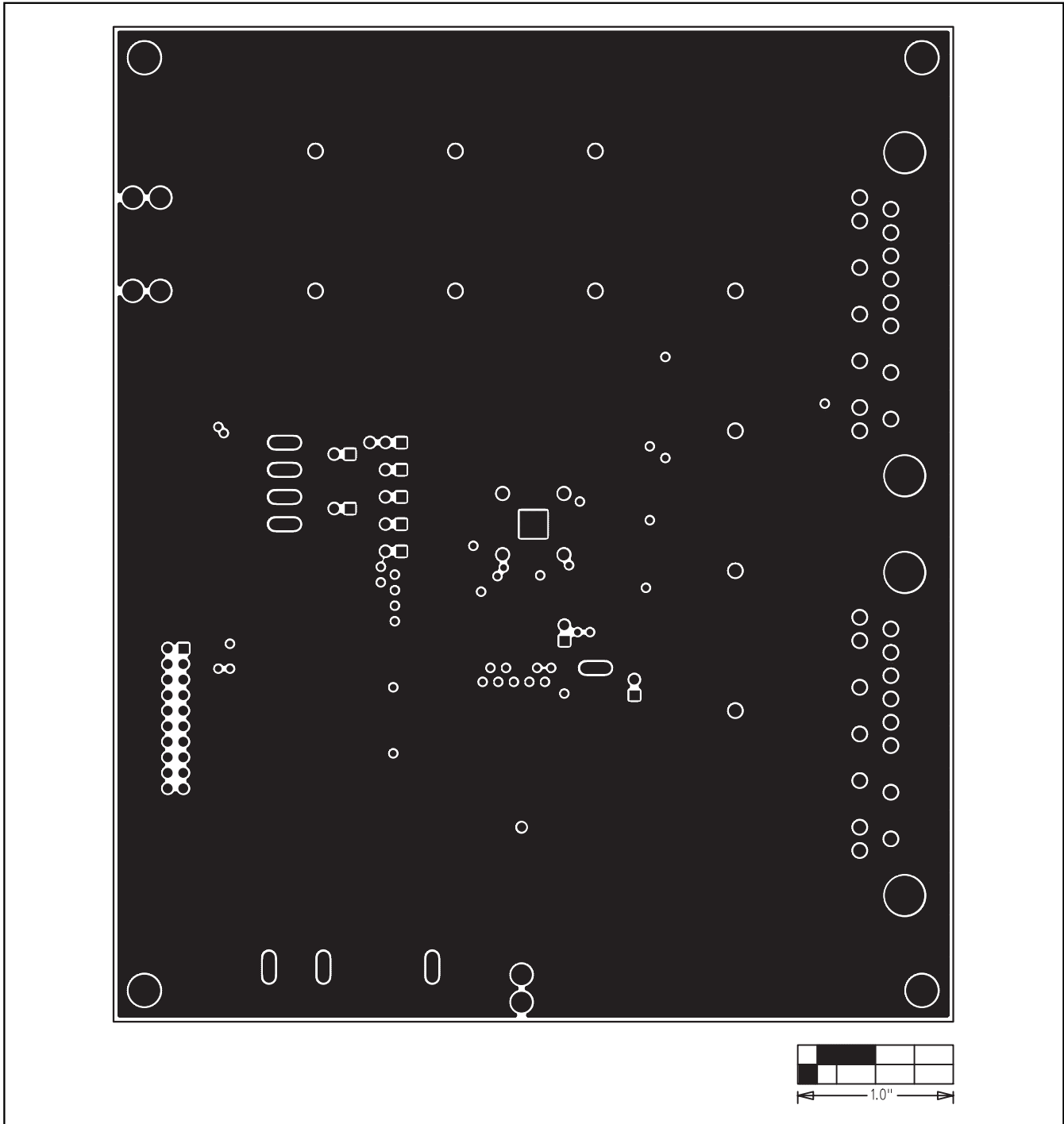


Figure 8. MAX4397 EV Kit PC Board Layout—Inner Layer 2

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

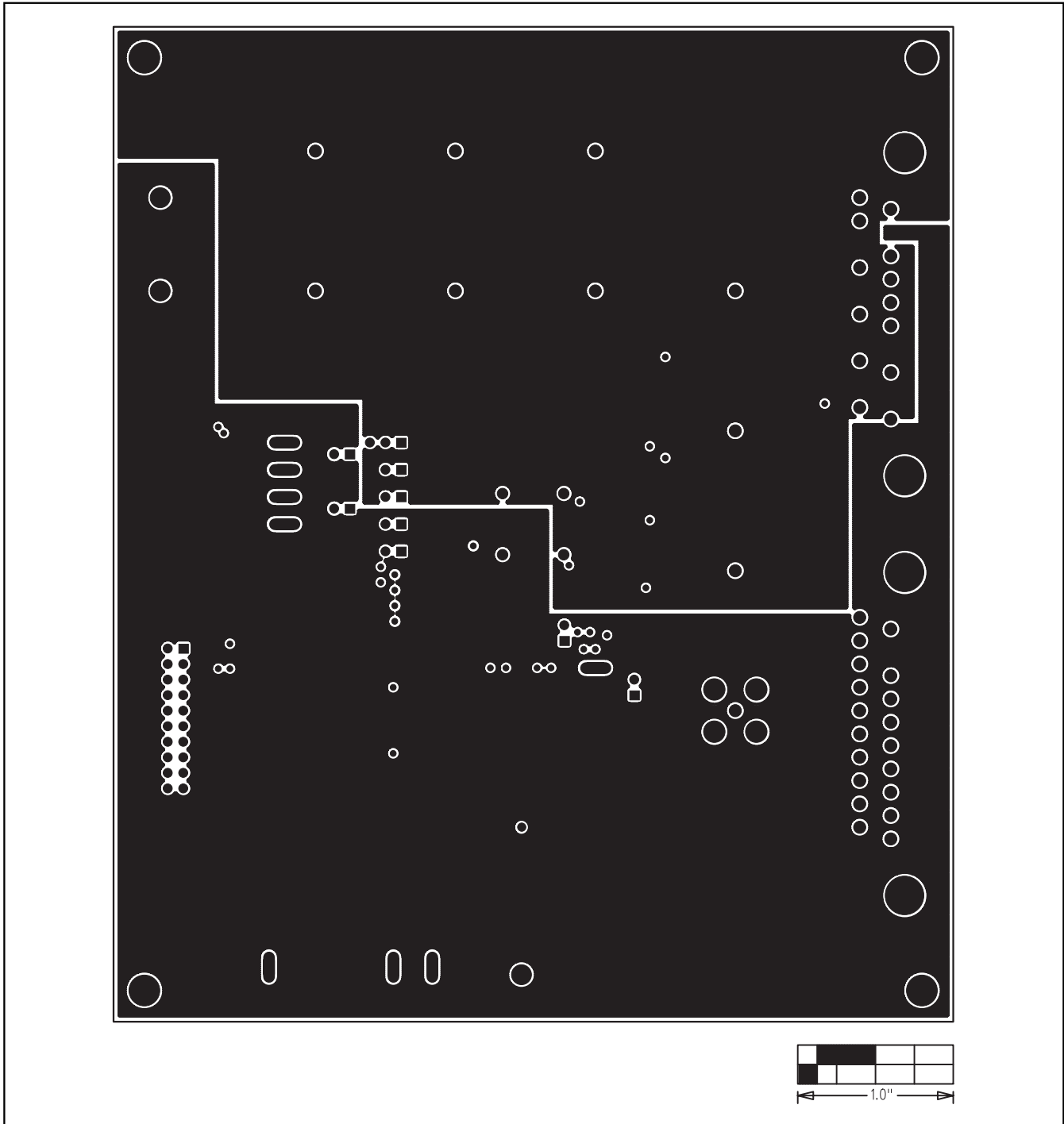


Figure 9. MAX4397 EV Kit PC Board Layout—Inner Layer 3

MAX4397 Evaluation System/Evaluation Kit

Evaluate: MAX4397

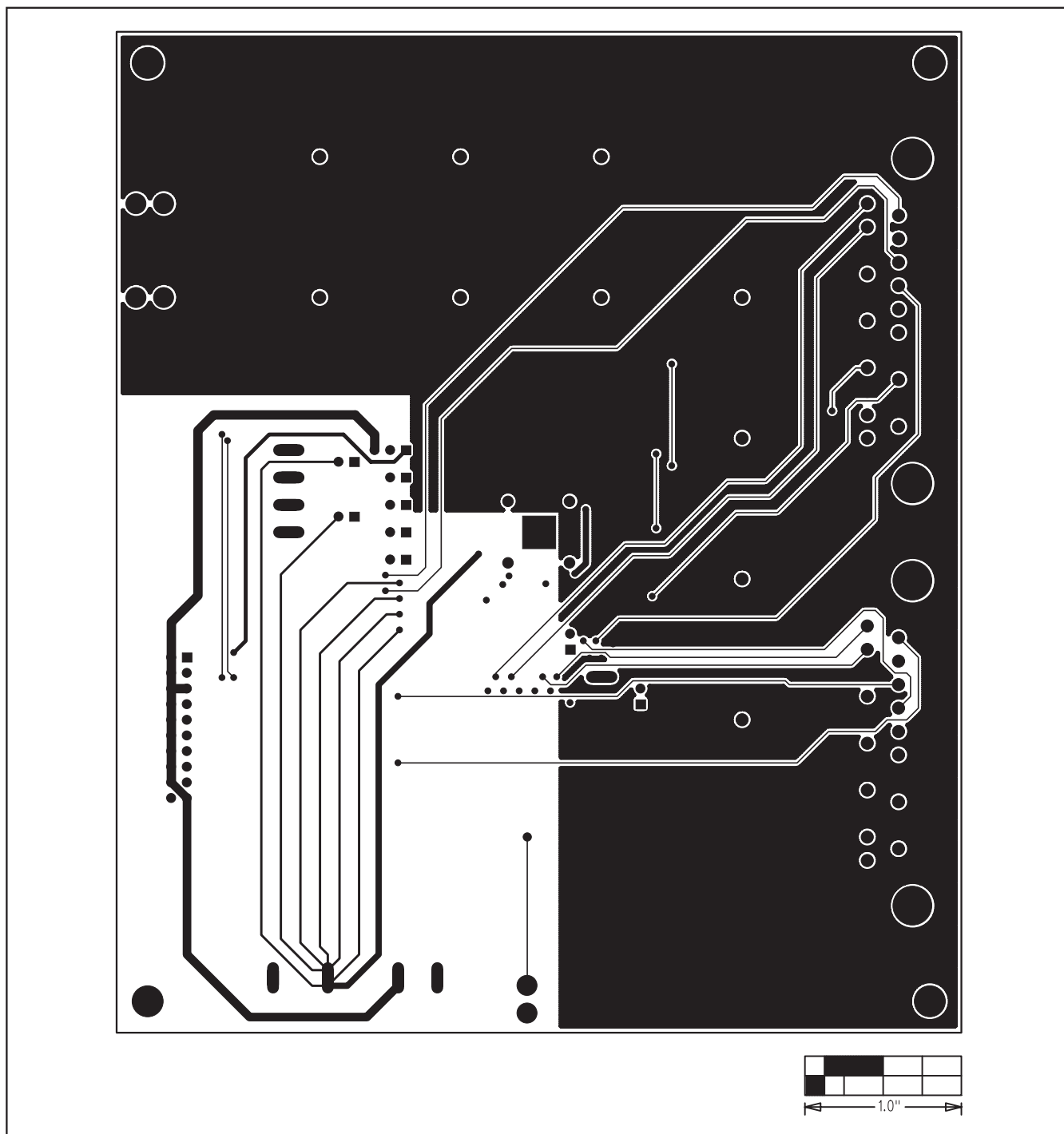


Figure 10. MAX4397 EV Kit PC Board Layout—Solder Side

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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