

# MAXIM

## MAX4550 Evaluation Kit

### General Description

The MAX4550 evaluation kit (EV kit) simplifies evaluation of the MAX4550 dual 4x2 crosspoint analog switch with 2-wire serial user interface. The EV kit includes Windows 95<sup>®</sup> software, which provides a handy user interface for exercising the features of the MAX4550.

This kit can also be used to evaluate the MAX4570. Simply order a free sample of the MAX4570CWI along with the MAX4550 EV kit.

### Ordering Information

PART	TEMP. RANGE	IC PACKAGE
MAX4550EVKIT	0°C to +70°C	28 SO

### Features

- ◆ **Proven PC Board Layout**
- ◆ **Audio Mode**
  - 95dB Typical Crosstalk at 20kHz
  - 110dB Typical Off-Isolation at 20kHz (10kΩ load)
- ◆ **Video Mode**
  - 54dB Typical Crosstalk at 4.0MHz
  - 78dB Typical Off-Isolation at 4.0MHz (1kΩ load)
- ◆ **Total Harmonic Distortion (THD+N): 0.014%**
- ◆ **Easy-to-Use Software Included**
- ◆ **Fully Assembled and Tested Surface-Mount Board**

### Component List

DESIGNATION	QTY	DESCRIPTION
C1-C4	4	2.2μF, 16V ceramic capacitors Taiyo Yuden EMK316BJ225ML
C5-C8, C11, C12, C14, C15	8	0.1μF ceramic capacitors
C9, C10, C13	3	4.7μF, 10V tantalum capacitors
R1, R3, R5, R7, R9, R11, R12, R13, R21-R26, R30, R31	16	10kΩ, 5% resistors
R2, R4, R6, R8, R10, R14, R15, R16	8	75Ω, 5% resistors
R17-R20	4	1kΩ, 5% resistors
R27, R28, R29	3	47kΩ, 5% resistors
R32-R35	4	220Ω, 1% resistors
Q0-Q3	4	Red LEDs

DESIGNATION	QTY	DESCRIPTION
NO1A-NO4A, NO1B-NO4B, SA, SB, COM1A, COM2A, COM1B, COM2B	14	RCA jacks
JU9, JU14, JU16, JU17	4	3-pin headers
JU15, JU18, JU19	3	2-pin headers
None	6	Shunts (JU9, JU14, JU16-JU19)
JP1	1	DB25 right-angle male connector
U1	1	MAX4550CWI
U2	1	74HCT05
None	1	MAX4550 PC board
None	1	Software disk, "MAX4550 EVALUATION KIT"

### Component Suppliers

SUPPLIER	PHONE	FAX
Taiyo Yuden	408-573-4150	408-573-4159

**Note:** Please indicate that you are using the MAX4550 when contacting the above component supplier.

### Quick Start

The MAX4550 EV kit is fully assembled and tested. Follow these steps to verify board operation.

- 1) Install the MAX4550 EV kit software on your computer by running *INSTALL.EXE* on the floppy disk. This copies the MAX4550 files and creates an icon for the program.
- 2) Check the jumper settings of the EV board. Refer to Table 1.

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For small orders, phone 1-800-835-8769.**

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- 3) Connect a +4.75V to +5.25V DC supply voltage between the +5V pad and the DGND pad. For dual-supply operation, make sure that JU15 is open; connect dual-supply voltages in the range  $\pm 2.7V$  to  $\pm 5.25V$  to the V+ and V- pads, and connect their ground to the GND pad. For single-supply operation, refer to the *Single-Supply Operation* section.
- 4) Connect a 25-pin male-to-female I/O extension cable from the computer's parallel port to the DB25 connector on the EV kit.
- 5) Start the MAX4550 program by opening its icon in the Windows 95 Start Menu. The EV kit software selects the correct port by testing for the pin 5 to pin 13 loopback.
- 6) Apply an input signal to NO1A and connect an oscilloscope or network analyzer to COM1A. Verify the switch operation by opening and closing the NO1A-to-COM1A switch via the software user interface. Checkboxes control the status (open or closed) of each switch.

### Evaluating the MAX4570

To evaluate the MAX4570, turn off the power to the EV kit, open JU16 and JU17, and replace U1 with a MAX4570CWI. No other hardware changes are necessary.

**Table 1. Jumper Functions**

JUMPER	STATE	FUNCTION
JU1, JU20	1–2	10k $\Omega$ termination of NO1A, NO2A referenced to midsupply (for single-supply operation)
	2–3* (default trace)	10k $\Omega$ termination of NO1A, NO2A referenced to GND
	Open	Do not leave open
JU2, JU4, JU6, JU8	Closed* (default trace)	NO1A, NO2A, NO3A, NO4A DC-coupled to MAX4550 inputs
	Open	NO1A, NO2A, NO3A, NO4A AC-coupled to MAX4550 inputs with 2.2 $\mu$ F ceramic capacitor
JU3, JU21	1–2	75 $\Omega$ termination of NO1A, NO2A referenced to midsupply (for single-supply operation)
	2–3* (default trace)	75 $\Omega$ termination of NO1A, NO2A referenced to GND
	Open	Do not leave open
JU5, JU7	Closed* (default trace)	NO3A, NO4A terminated with 75 $\Omega$ load
	Open	NO3A, NO4A terminated with 10k $\Omega$ load
JU10–JU13	Closed* (default trace)	NO1B, NO2B, NO3B, NO4B terminated with 75 $\Omega$ load
	Open	NO1B, NO2B, NO3B, NO4B terminated with 10k $\Omega$ load
JU9, JU14	1–2	SA, SB connected to GND through 0.1 $\mu$ F capacitor
	2–3*	SA, SB connected directly to GND
	Open	SA, SB floating (can be used as ninth and tenth inputs)
JU15	Closed	V- tied to GND, for single-supply operation
	Open*	V- negative supply must be provided by user
JU16	1–2	A0 = 1; for use with MAX4550
	2–3*	A0 = 0; for use with MAX4550
	Open	Pin 13 functions as $\overline{CS}$ ; for use with MAX4570
JU17	1–2	A1 = 1; for use with MAX4550
	2–3*	A1 = 0; for use with MAX4550
	Open	Pin 16 functions as DOUT; for use with MAX4570
JU18	Closed*	BIASL tied to GND
	Open	BIASL floating
JU19	Closed*	BIASH tied to V+
	Open	BIASH floating

\* Indicates default jumper setting.

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## Detailed Description of Software

Upon execution of the MAX4550 program, the software determines whether the MAX4550 or MAX4570 is installed. If the MAX4550 is installed, the software automatically resolves its address (if the MAX4570 is installed, this step will not be performed). The software enables the command panel, after which the user may perform any of the operations described below.

### *Command Panel*

Each of the four inputs to switch matrix A, plus the SA input, can be connected to either COM1A or COM2A (or both). For example, to connect NO1A to COM1A, check the COM1A box next to NO1A in the "Switch Matrix A" panel. The same procedure applies to the switches in switch matrix B.

For midsupply biasing of any of the outputs, check the box next to the output in the "Output Biasing" panel. Make sure JU18 and JU19 are shunted, connecting BIASH to V+ and BIASL to GND. For more details regarding output biasing, refer to the *Output Biasing* section or to the MAX4550/MAX4570 data sheet.

For clickless operation of any of the outputs, check the box next to the output in the "Clickless Mode" panel. For more details regarding clickless operation, refer to the MAX4550/MAX4570 data sheet.

To drive any of the four auxiliary outputs high, check the box next to the output in the "Auxiliary Outputs" panel. Note that the LEDs are connected to V+, so driving an auxiliary output high will turn off its LED. For more details regarding the auxiliary outputs, refer to the MAX4550/MAX4570 data sheet.

Selecting the "Reset" button restores the MAX4550 to its power-up state. At power-up the COM outputs are connected to shunt inputs (SA and SB) with the clickless mode enabled. All auxiliary outputs are low and output biasing is disabled.

### *Serial Communications Interface*

When the user checks a checkbox, the MAX4550 software determines the command and data code bytes corresponding to the selected function. If the MAX4550 is installed, the software issues a start condition and the address byte, after which the MAX4550 issues an acknowledge pulse. The software then sends the command and data bytes, each followed by an acknowledge pulse from the MAX4550. The software completes the transfer by issuing a stop condition. The command and data bytes generated will be displayed on the

upper-right corner of the user interface, along with the address of the MAX4550.

If the MAX4570 is installed, the software drives the  $\overline{CS}$  pin low, sends the command and data bytes, and drives the  $\overline{CS}$  pin high. Note that an inverted version of DOUT serves as an input to the PC. This connection allows the software to verify that the MAX4570 is present before issuing a command.

### *Direct Command Entry*

The user may enter the command and data bytes directly by selecting the "Cmd Entry" button. A new window appears containing two edit fields corresponding to the command and data bytes. To execute a set of command and data bytes, enter each byte (in binary notation) into the edit fields and select "Execute." When finished, the main MAX4550 user-interface window resumes control.

## Detailed Description of Hardware

### *Components*

The MAX4550 is a dual 4x2 crosspoint switch array with 2-wire serial interface. R1–R16 are the termination resistors for the eight inputs. C1–C4 are for AC-coupling the inputs to the MAX4550. R32–R35 allow midsupply biasing of NO1A and NO2A. LEDs (Q0–Q3) are connected through V+ to the four auxiliary outputs of the MAX4550 through 1k $\Omega$  resistors. The 74HCT05 (U2), an open-drain inverter, implements the 2-wire serial interface. The HCT logic family ensures that the MAX4550 can output a logic high even when operating at V+ = 2.7V. RCA-type jacks facilitate audio/video evaluation of the MAX4550.

### *10k $\Omega$ Input Termination*

Any of the eight MAX4550 inputs can be configured for 10k $\Omega$  termination. To terminate an input in 10k $\Omega$ , cut the jumper connecting its 75 $\Omega$  termination to GND. Refer to Table 1 and the EV kit schematic to identify the correct jumpers.

### *AC-Coupled Inputs*

Any of the four switch matrix A inputs can be configured for AC-coupling of input signals. To AC-couple an input, cut the jumper shunting its 2.2 $\mu$ F input capacitor. Refer to Table 1 and the EV kit schematic to identify the correct jumpers. If 10k $\Omega$  termination is also selected for an AC-coupled input, the 2.2 $\mu$ F capacitor and 10k $\Omega$  resistor will form a highpass RC network with a cutoff frequency of 7Hz, low enough to pass frequencies in the audio band.

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## *Improving Off-Isolation*

The SA and SB inputs can be used to improve off-isolation. Suppose COM1A must remain off while the other outputs are being driven. To improve off-isolation of COM1A, connect SA to GND with JU9 and select the checkbox to close the switch between SA and COM1A. Note that if COM1A has output biasing enabled, JU9 must be positioned to connect SA to its 0.1 $\mu$ F capacitor. Refer to Table 1 to identify the correct jumper positions. For more information regarding output biasing, refer to the *Output Biasing* section or the MAX4550 data sheet.

## *Single-Supply Operation*

For single-supply operation, shunt JU15; this will short V- to GND. Connect a power-supply voltage between +2.7V and +5.25V to the V+ and GND pads.

## *Address Selection (MAX4550 only)*

To specify the two selectable bits of the address byte, place jumpers JU16 and JU17 in the positions corresponding to the desired address. Refer to Table 1 for more information regarding the configuration of JU16 and JU17.

## *Output Biasing*

The MAX4550 has an internal bias network to which any of the four outputs may be connected. To ensure that an output connected to the bias network will be biased midway between V+ and GND, shunt JU18 and JU19. For alternate bias voltages, remove JU18 and JU19 and apply new bias voltages to the BIASH and BIASL pads.

## *Input Biasing*

Note that the MAX4550 does not include an internal midsupply biasing option for the inputs. The MAX4550 EV kit includes optional midsupply biasing for the NO1A and NO2A inputs. To bias NO1A at midsupply, first cut the traces connecting pins 2 and 3 of jumpers JU1 and JU3. For a 10k $\Omega$  termination to midsupply, connect pins 1 and 2 of jumper JU1; for a 75 $\Omega$  termination to midsupply, connect pins 1 and 2 of jumper JU3. Midsupply biasing of NO2A is controlled with jumpers JU20 and JU21 in a similar manner.

## *Measuring Supply Current*

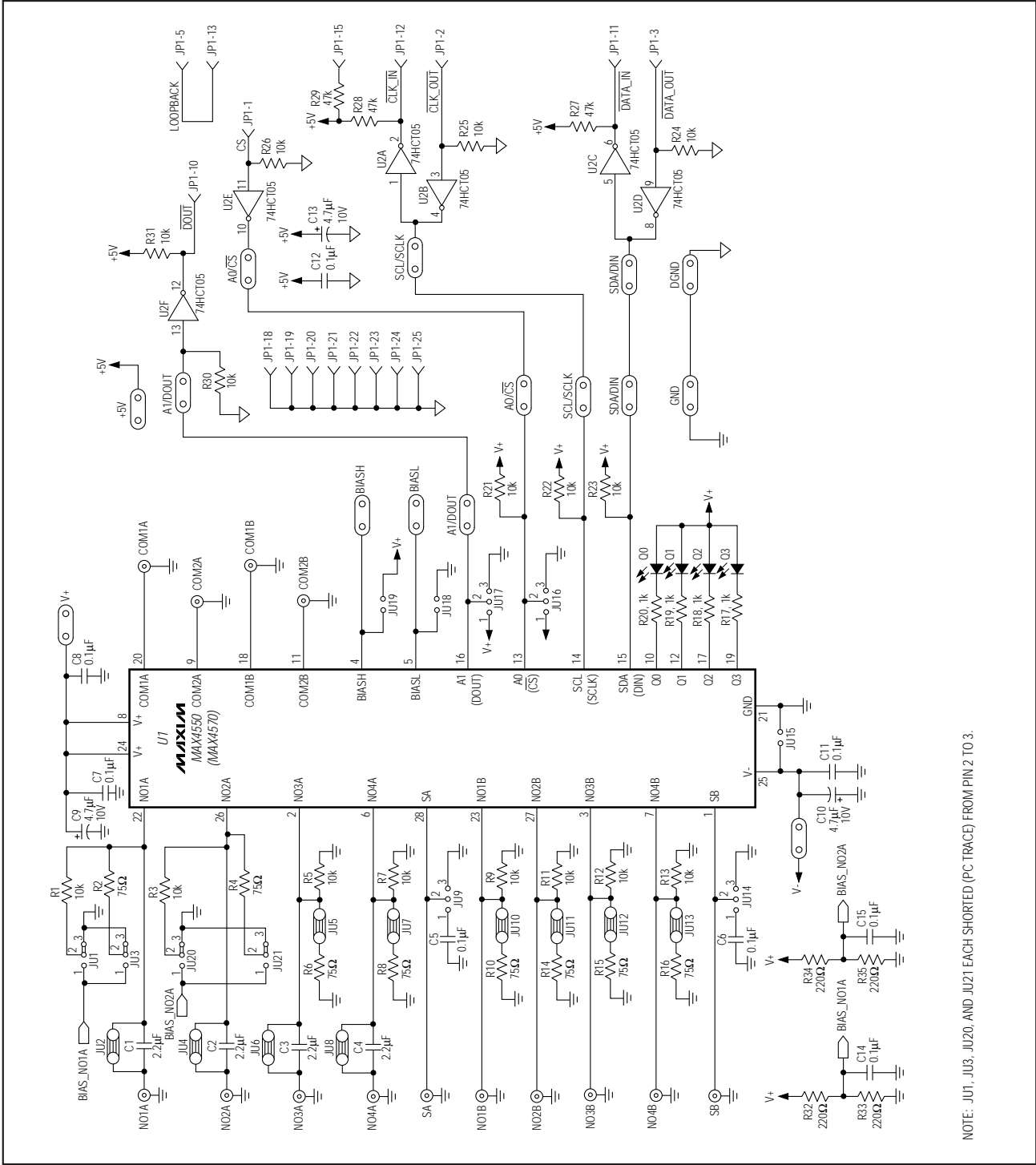
If measuring the quiescent current of the MAX4550, be sure to account for the two resistor voltage dividers formed by R32–R35. Collectively, these resistors amount to a 220 $\Omega$  path from V+ to GND. In addition, note that each LED draws about 5mA in the on state.

## *Layout Considerations*

The MAX4550 EV kit layout is optimized for high-speed signals and low crosstalk, with careful attention given to signal-path layout. Capacitance between input traces has been minimized by routing these traces as far apart from each other as possible.

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NOTE: JU1, JU3, JU20, AND JU21 EACH SHORTED (PC TRACE) FROM PIN 2 TO 3.

Figure 1. MAX4550 EV Kit Schematic

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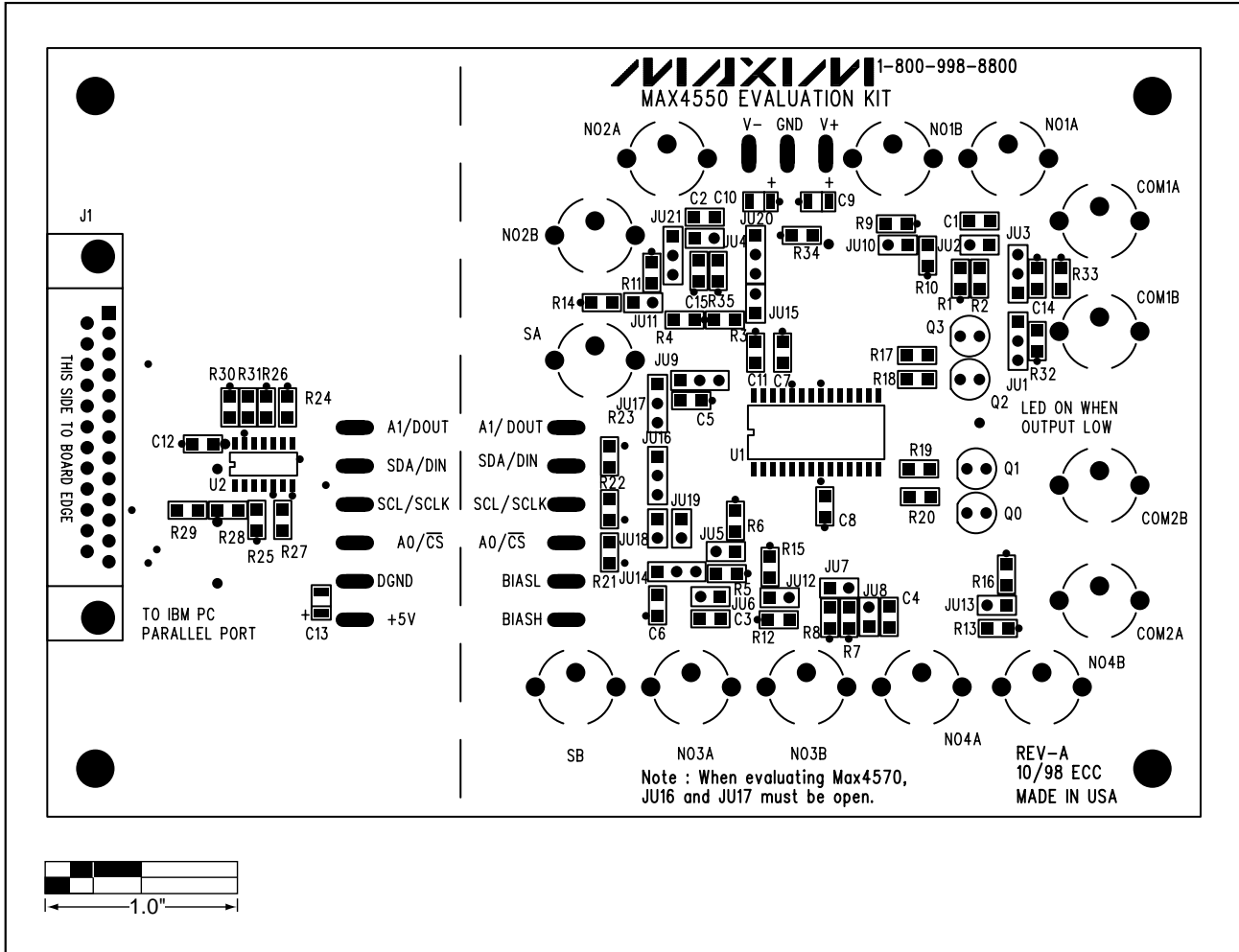


Figure 2. MAX4550 EV Kit Component Placement Guide—Component Side

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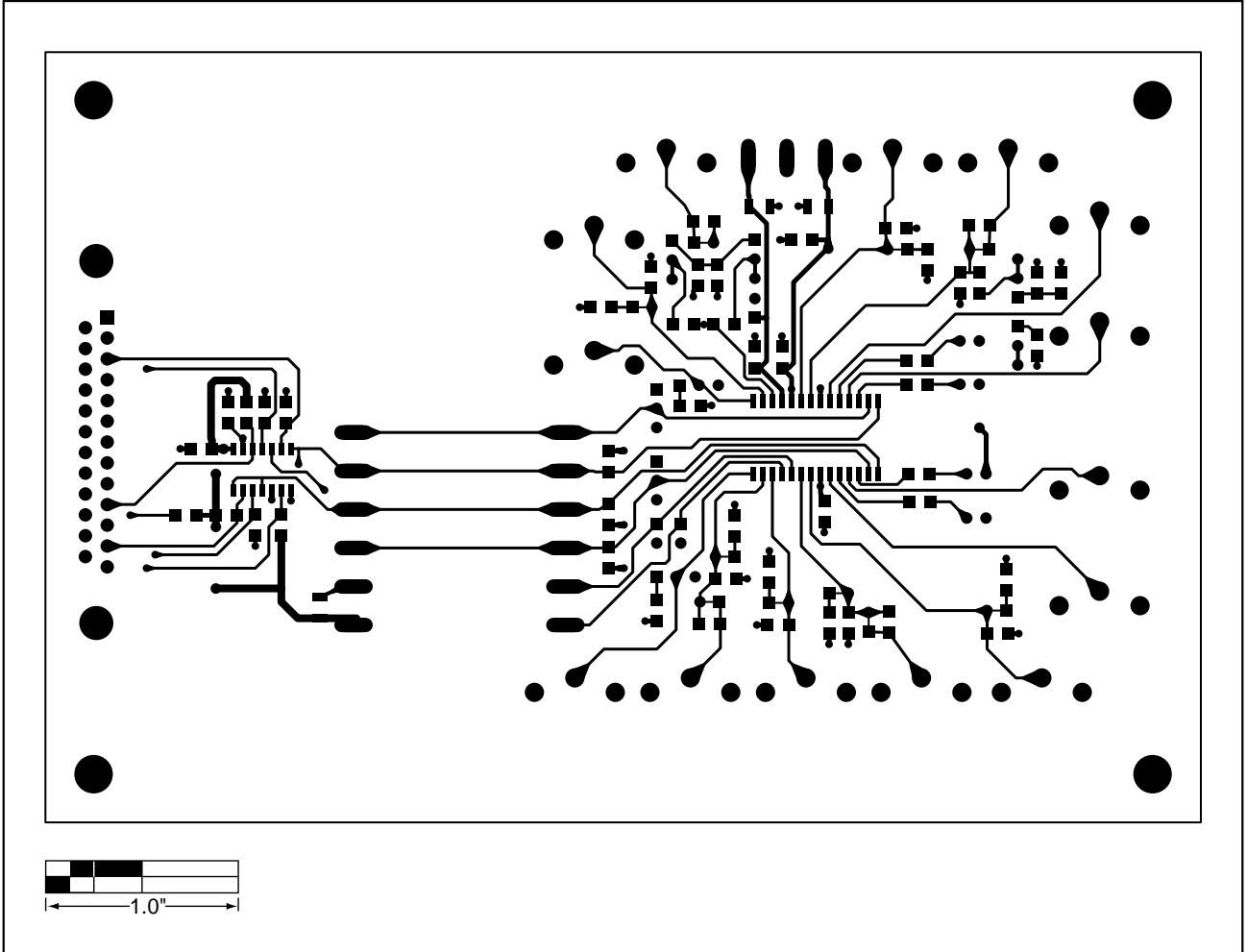


Figure 3. MAX4550 EV Kit PC Board Layout—Component Side

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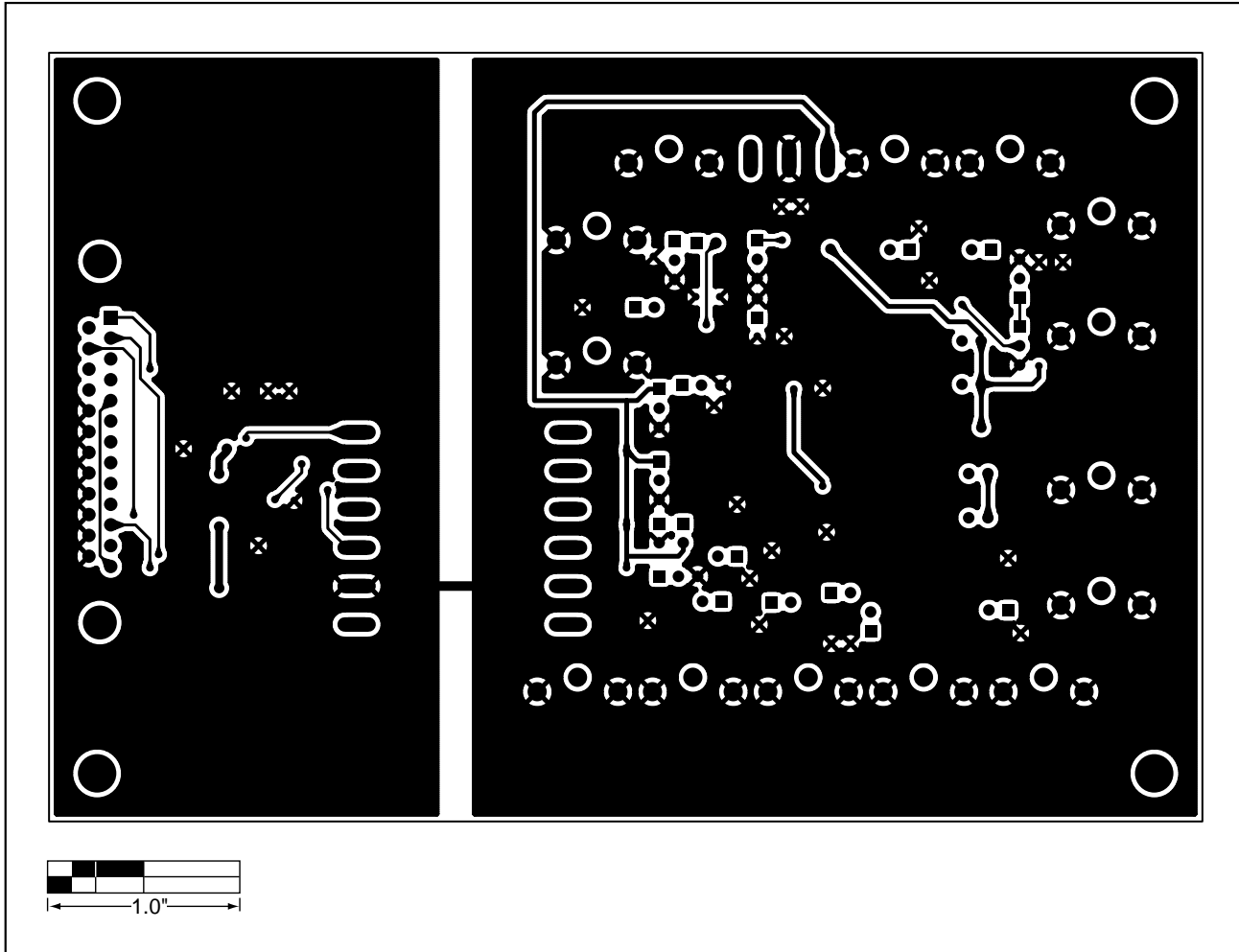


Figure 4. MAX4550 EV Kit PC Board Layout—Solder Side

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