

### General Description

The MAX4889B evaluation kit (EV kit) provides a proven design to evaluate the MAX4889B PCI Express® (PCIe) Gen II 5.0Gbps passive switch. The MAX4889B is a quad double-pole/double-throw (4 x DPDT) switch ideal for switching four half lanes of PCIe data between two destinations. The MAX4889B EV kit is used for critical tests (e.g., eye diagrams and s-parameter measurements such as insertion loss, return loss, and off-isolation).

The MAX4889B EV kit PCB comes with a MAX4889BETO+ installed. The MAX4889BETO+ is available in a lead(Pb)-free 3.5mm x 9.0mm, 42-pin TQFN package with an exposed pad.

The MAX4889B EV kit can also be used to evaluate the MAX4889C. Contact the factory for a free sample of the pin-compatible MAX4889CETO+.

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C6, C8, C10, C12, C14, C16	8	0.1µF ±10%, 16V X7R ceramic capacitors (0402) Murata GRM155R71C104K
C3, C4, C5, C7, C9, C11, C13, C15	8	1000pF ±10%, 16V X5R ceramic capacitors (0402) Murata GRM155R61C102K
C17	1	10µF ±10%, 16V X5R ceramic capacitor (0805) Murata GRM21BR61C106K
JU1	1	3-pin header
P1-P12	12	Edge-mount receptacle, SMA connectors
R1, R2	2	49.9Ω ±1% resistors (0402)
U1	1	5.0Gbps PCIe passive switch (42 TQFN-EP*) Maxim MAX4889BETO+
—	1	Shunt
—	1	PCB: MAX4889B Evaluation Kit+

\*EP = Exposed pad.

### Component Supplier

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

**Note:** Indicate that you are using the MAX4889B when contacting this component supplier.

PCI Express is a registered trademark of PCI-SIG Corp.



For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).

### Features

- ◆ Eye Diagram Test Circuit with SMA Input/Output
- ◆ Calibration Trace Load and No Load
- ◆ Lead(Pb)-Free and RoHS Compliant
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

### Ordering Information

PART	TYPE
MAX4889BEVKIT+	EV Kit

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

### Quick Start

#### Required Equipment

- MAX4889B EV kit
- 3.3V/100mA DC power supply
- Pulse data generator with frequency of at least 2.5GHz (e.g., Agilent 81142A)
- Digital serial analyzer sampling oscilloscope with frequency of at least 2.5GHz (e.g., Tektronix DSA8200)
- Six SMA cables of equal lengths

#### Procedure

The MAX4889B EV kit is fully assembled and tested. Follow the steps below to verify board operation and eye diagram/jitter measurements. **Caution: Do not turn on the power until all connections are completed.**

- 1) Connect the 3.3V/100mA power supply to the VCC and GND pads of the EV kit.
- 2) Verify that JU1 is in the 2-3 position.
- 3) Set up the pulse data generator to a bit rate of 5Gbps (2.5GHz), the V<sub>H</sub> and V<sub>L</sub> to +250mV and -250mV, respectively, nonreturn-to-zero (NRZ) mode, and desired pseudorandom binary (bit) sequence (PRBS) with 2<sup>15</sup>-1 or 2<sup>7</sup>-1 patterns.
- 4) Use a pair of SMA cables to connect the differential output signals of the pulse data generator to the AOUTA+ and AOUTA- (P5 and P6) of the EV kit.
- 5) Use a single SMA cable to connect the trigger input of the digital serial analyzer to the trigger output of the pulse data generator.

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- 6) Use a single SMA cable to connect the clock input of the pattern sync module of the digital serial analyzer to the clock output of the pulse data generator.
- 7) Use the other pair of SMA cables to connect the two sampling channels of the digital serial analyzer to AIN+ and AIN- (P1 and P2) of the EV kit.
- 8) Set the digital serial analyzer to infinite persistence and select the math function of the signal ((AIN+) - (AIN-)).
- 9) Adjust the vertical scale to 100mV/div and horizontal scale to 200ps/div on the digital serial analyzer.
- 10) Turn on the DC power supply.
- 11) Enable the data and clock outputs on the pulse data generator and observe the waveform on the digital serial analyzer.
- 12) Save the waveform on the digital serial analyzer.
- 13) Disable the data and clock outputs of the pulse generator.
- 14) Turn off the DC power supply.
- 15) Remove the pair of SMA cables connected to AOUTA+ and AOUTA- (P5 and P6) of the EV kit and connect the cables to R\_AOUT\_+ and R\_AOUT\_- (P9 and P10) of the EV kit.
- 16) Remove the pair of SMA cables connected to AIN+ and AIN- (P1 and P2) of the EV kit and connect the cables to R\_AIN+ and R\_AIN- (P7 and P8) of the EV kit.
- 17) Enable the data and clock outputs on the pulse data generator and observe the waveform on the digital serial analyzer.
- 18) Compare the waveform to the waveform that includes the MAX4889B and observe the jitter/eye height of both systems. Take the difference in jitter/eye height, which is the extra jitter/eye height coming from the MAX4889B.

## Detailed Description of Hardware

The MAX4889B EV kit provides a proven design to evaluate the MAX4889B PCIe Gen II 5.0Gbps passive switch. The MAX4889B is a quad double-pole/double-throw (4 x DPDT) switch ideal for switching four half lanes of PCIe data between two destinations. The MAX4889B EV kit is used for critical tests (e.g., eye diagrams and s-parameter measurements such as insertion loss, return loss, and off-isolation).

For simplicity, only one channel of the device is used in the EV kit. Only the AIN\_, AOUTA\_, and AOUTB\_ signals are used in the EV kit. All signal traces coming out of the MAX4889B are  $100\Omega$  differential controlled-impedance traces. Once the traces split into separate directions, the traces are  $50\Omega$  single-ended controlled impedances, which is equivalent to  $100\Omega$  differentially. The MAX4889B operates from a 3.0V to 3.6V supply.

### Calibration Trace

At the bottom of the EV kit board are calibration traces used as a reference to differentiate the performance of the switch from the traces and SMA connector providing a complete analysis of the MAX4889B.

#### No Load

The first calibration traces are made with no load. The lengths of the traces are equal to the above circuitry minus the MAX4889B. The traces starting from R\_AIN\_ and R\_AOUT\_ are  $50\Omega$  single-ended controlled impedances. Once the traces run parallel to each other, and are matched side by side, the traces are  $100\Omega$  differential controlled impedances.

#### Load

The second calibration traces are made with a  $50\Omega$  load. The lengths of the traces are half the calibration traces without the load.

### Jumper Selection

Table 1 shows the control input for SEL. The MAX4889B EV kit default setting is JU1 in the 2-3 position, which selects the signal's path between AIN\_ and AOUTA\_. Move JU1 to the 1-2 position to test the quality of the signals between AIN\_ and AOUTB\_.

**Table 1. SEL Control Input (JU1)**

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2	Selects signal path between AIN_ and AOUTB_ channels
	2-3*	Selects signal path between AIN_ and AOUTA_ channels

\*Default position.

# MAX4889B Evaluation Kit

Evaluates: MAX4889B/MAX4889C

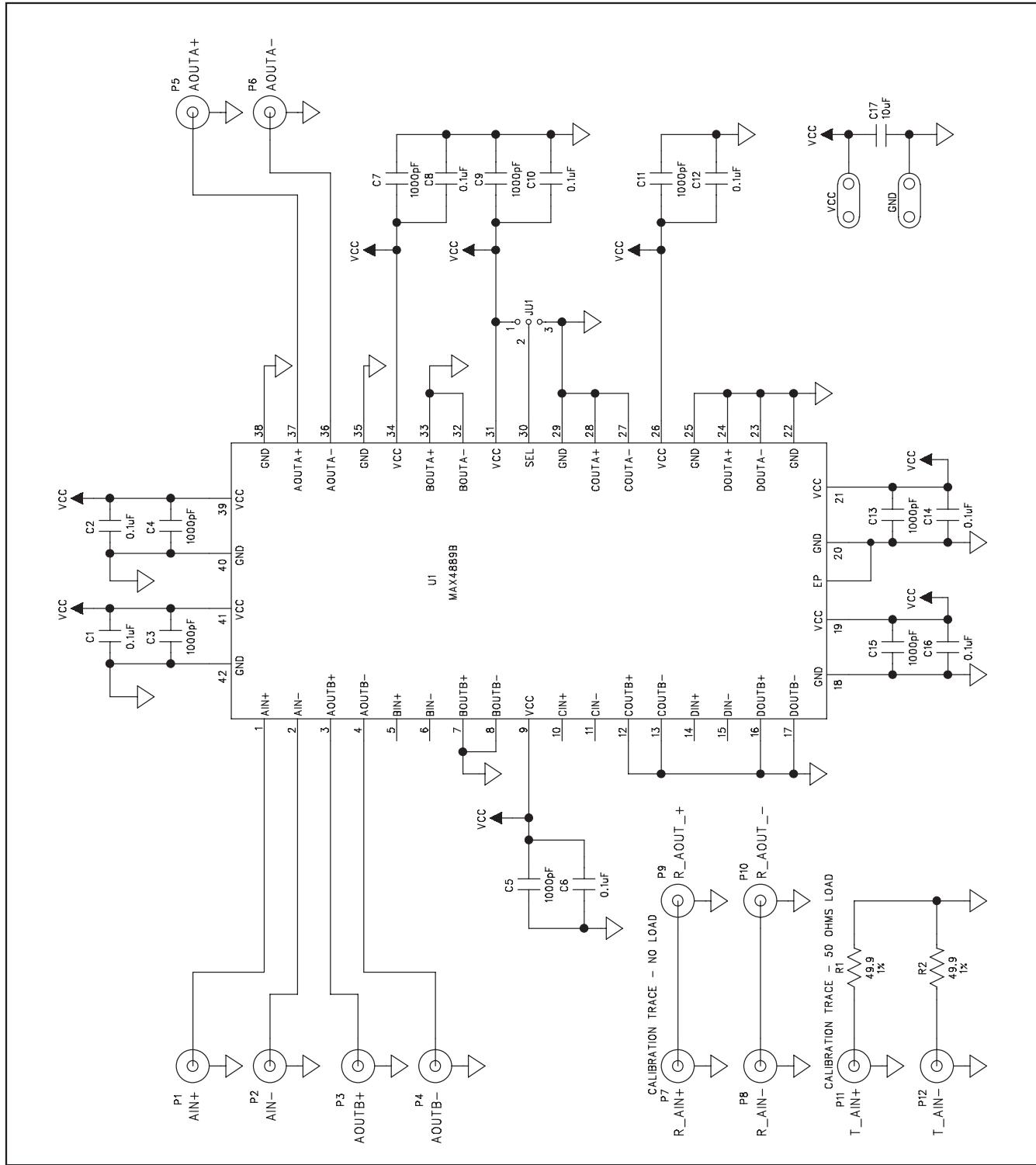


Figure 1. MAX4889B EV Kit Schematic

## Evaluates: MAX4889B/MAX4889C

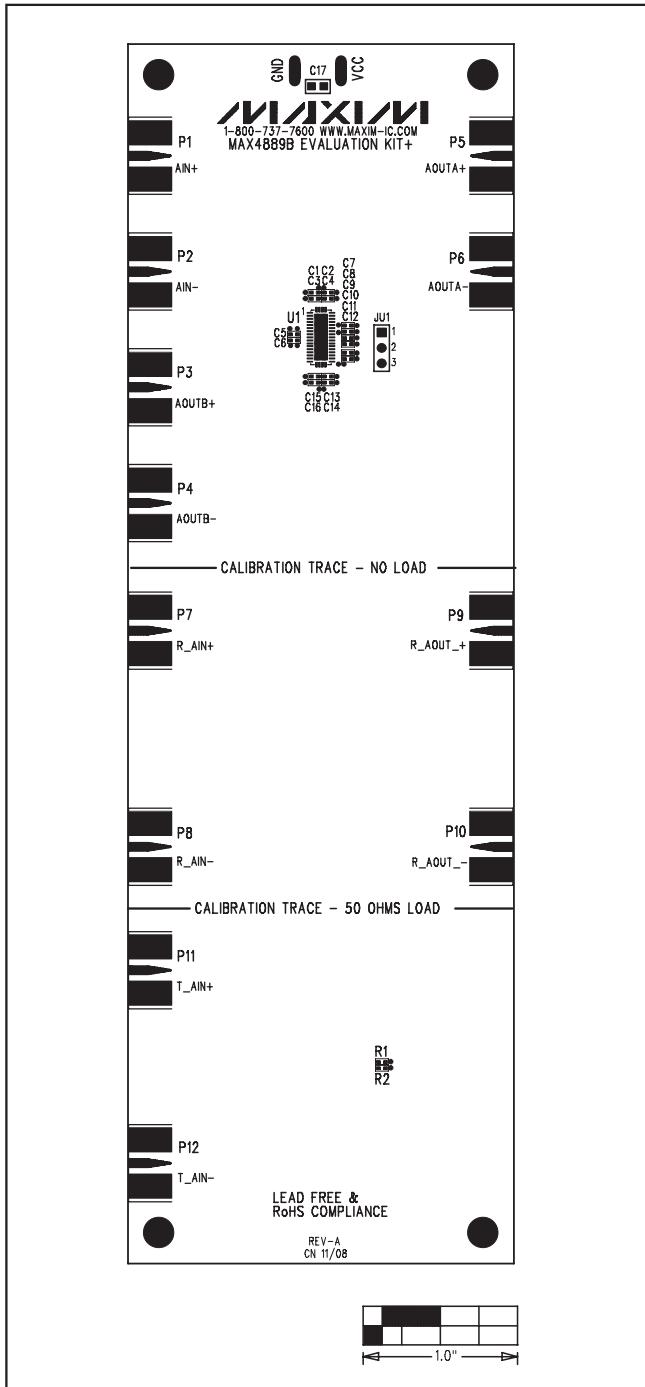


Figure 2. MAX4889B EV Kit Component Placement Guide—Component Side

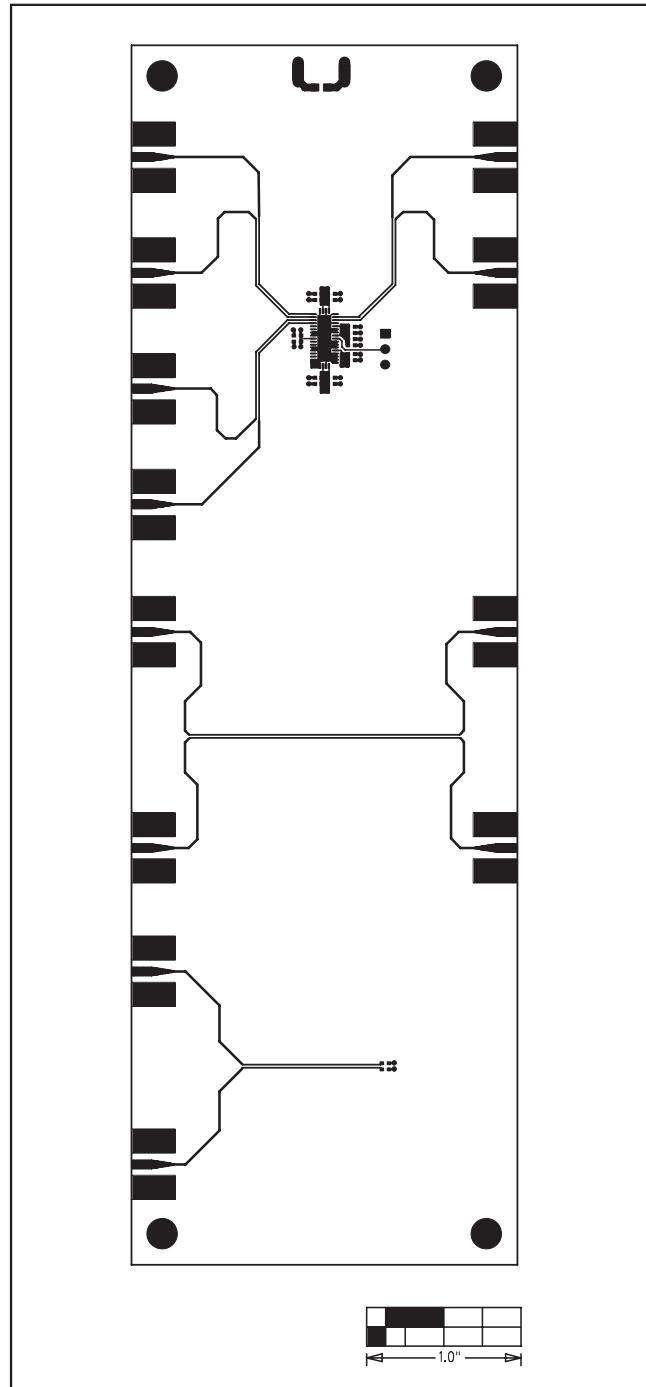


Figure 3. MAX4889B EV Kit PCB Layout—Component Side

# MAX4889B Evaluation Kit

**Evaluates: MAX4889B/MAX4889C**

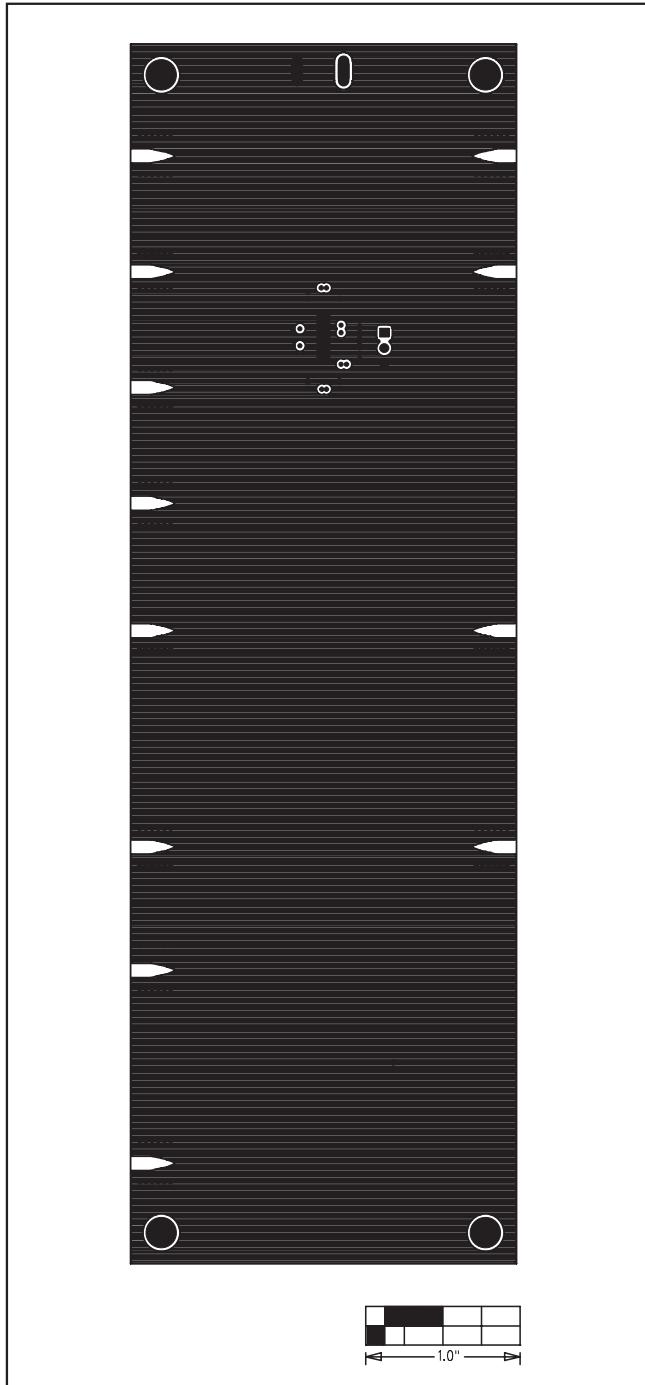


Figure 4. MAX4889B EV Kit PCB Layout—Inner Layer 2

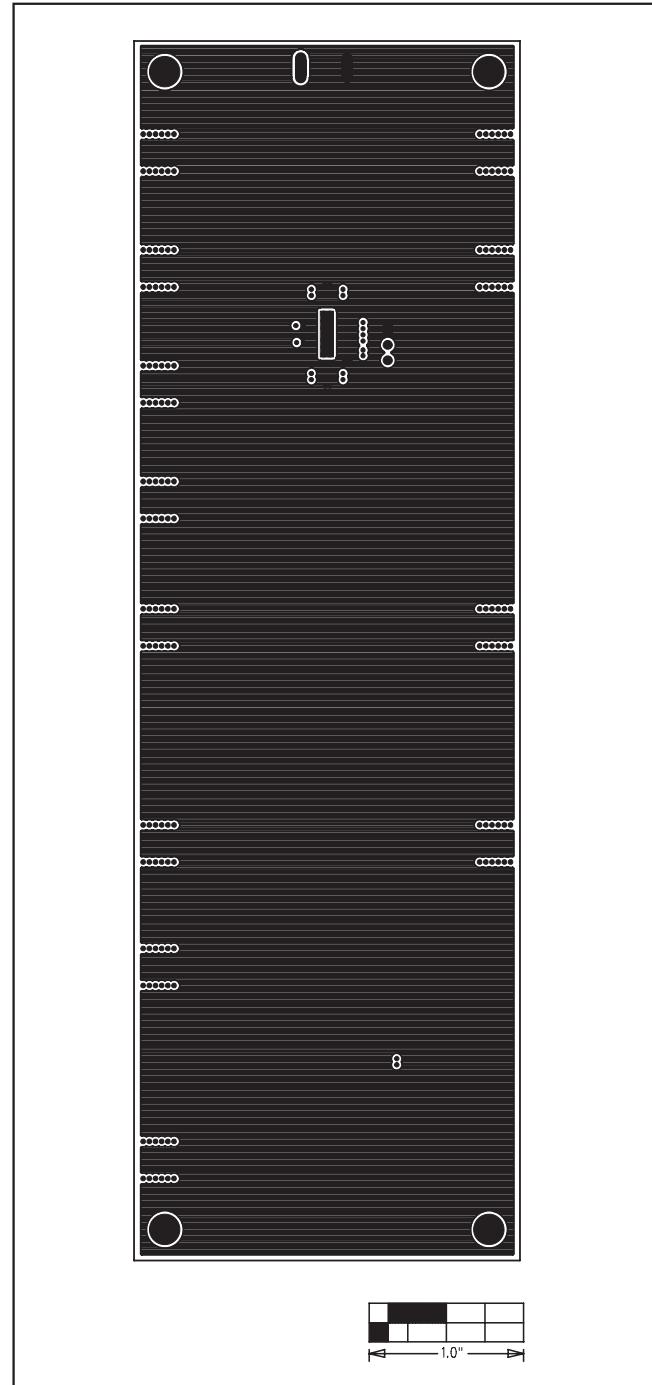


Figure 5. MAX4889B EV Kit PCB Layout—Inner Layer 3

## **MAX4889B Evaluation Kit**

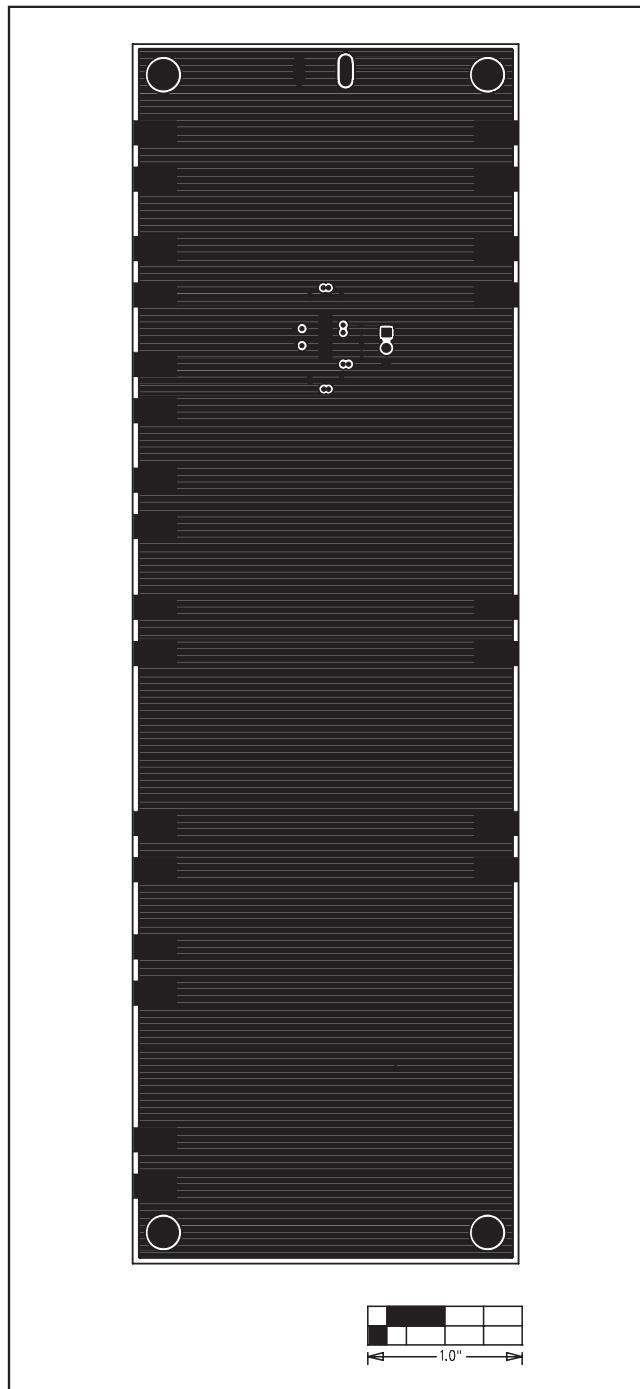


Figure 6. MAX4889B EV Kit PCB Layout—Solder Side

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