

# MAX4888B Evaluation Kit

## Evaluates: MAX4888B

### General Description

The MAX4888B evaluation kit (EV kit) provides a proven design to evaluate the MAX4888B dual double-pole/double-throw (2 x DPDT) switch. The device is ideal for switching two half-lanes of PCI Express® (PCIe) data between two possible destinations and supports up to 8.0Gbps data rate (Gen III PCIe). The EV kit is used for critical tests (i.e., eye diagrams and s-parameter measurements such as insertion loss, return loss, and off-isolation).

The EV kit PCB comes with a MAX4888BETI+ installed, which is available in a lead(Pb)-free, 28-pin (3.5mm x 5.5mm) TQFN package with an exposed pad. The EV kit circuit requires a 3.3V power supply capable of supplying at least 100mA.

### Features

- ◆ Eye Diagram Test Circuit with SMA Input/Output
- ◆ SMA Connectors for Easy Data Interfacing
- ◆ Calibration Load and No Load Traces
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

[Ordering Information](#) appears at end of data sheet.

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C6, C8, C10	5	1 $\mu$ F $\pm$ 10%, 6.3V X5R ceramic capacitors (0402) Murata GRM155R60J105K
C3, C4, C5, C7, C9	5	1000pF $\pm$ 10%, 16V X5R ceramic capacitors (0402) Murata GRM155R61C102K
C11	1	10 $\mu$ F $\pm$ 10%, 16V X5R ceramic capacitor (0805) Murata GRM21BR61C106K
C12–C15	4	0.22 $\mu$ F $\pm$ 10%, 10V X5R ceramic capacitors (0402) Murata GRM155R61A224K

DESIGNATION	QTY	DESCRIPTION
JU1, JU2	2	3-pin headers
P1–P12	12	Edge-mount receptacle/SMA connectors
R1, R2	2	49.9 $\Omega$ $\pm$ 1% resistors (0402)
U1	1	8.0Gbps dual passive switches (28 TQFN-EP) Maxim MAX4888BETI+
—	2	Shunts
—	1	PCB: MAX4888B EVALUATION KIT

### Component Supplier

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

**Note:** Indicate that you are using the MAX4888B when contacting this component supplier.

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### Quick Start

#### Required Equipment

- MAX4888B EV kit
- 3.3V, 100mA DC power supply
- Waveform generator with a data rate of at least 8.0Gbps (i.e., Tektronix AWG7122B)
- Digital serial analyzer sampling oscilloscope with a data rate of at least 8.0Gbps (i.e., Tektronix DSA72004B)
- Six equal-length SMA cables

#### Procedure

The 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 DC power supply to the VCC and GND PCB pads on the EV kit.
- 2) Verify that jumper JU1 is in the 2-3 position and jumper JU2 is in the 1-2 position.
- 3) Set up the waveform generator for a bit rate of 8.0Gbps, 1V<sub>P-P</sub> differentially, 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 waveform generator to the P5 (AOUTA+) and P6 (AOUTA-) SMA connectors on the EV kit.
- 5) Using a single SMA cable, connect the trigger input of the digital serial analyzer to the trigger output of the waveform generator.
- 6) Using a single SMA cable, connect the clock input of the pattern sync module of the digital serial analyzer to the clock output of the waveform generator.
- 7) Use the other pair of SMA cables to connect both sampling channels of the digital serial analyzer to the P1 (D\_AIN+) and P2 (D\_AIN-) SMA connectors on the EV kit.
- 8) Set the digital serial analyzer to infinite persistence and select the math function of the signal ((D\_AIN+) - (D\_AIN-)).
- 9) Adjust the digital serial analyzer vertical scale to 100mV/div and the horizontal scale to 200ps/div.
- 10) Turn on the DC power supply.
- 11) Enable the data and clock outputs on the waveform 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 waveform generator.
- 14) Turn off the DC power supply.
- 15) Remove the pair of SMA cables connected to AOUTA+ and AOUTA- on the EV kit and connect the cables to the P9 (R\_AOUT+) and P10 (R\_AOUT-) SMA connectors on the EV kit.
- 16) Remove the pair of SMA cables connected to D\_AIN+ and D\_AIN- on the EV kit and connect the cables to the P7 (R\_AIN+) and P8 (R\_AIN-) SMA connectors on the EV kit.
- 17) Enable the data and clock outputs on the waveform generator and observe the waveform on the digital serial analyzer.
- 18) Compare the current waveform to the saved waveform and observe the jitter/eye height of both systems. Take the difference in jitter/eye height and that is the extra jitter/eye height coming from the device.

### Detailed Description of Hardware

The MAX4888B EV kit provides a proven design to evaluate the MAX4888B PCIe Gen III 8.0Gbps passive switch. The device is a dual DPDT switch ideal for switching two half lanes of PCIe data between two destinations. The EV kit is used for critical tests (i.e., 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 device output signal traces have 100Ω differential controlled-characteristic-impedance traces. Once the differential traces split into separate directions, the traces have 50Ω single-ended controlled-characteristic impedance, which is equivalent to 100Ω differentially.

The MAX4888B operates from a 3.0V to 3.6V supply that provides at least 1mA.

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### Calibration Trace

There are calibration traces on the bottom of the EV kit PCB that are used as a reference to differentiate the performance of the switch from the traces and the SMA connectors, providing a complete analysis of the device.

### No Load

The first set of calibration traces are made with no load. The trace lengths are equal to the circuit with the device. The traces starting from R\_AIN\_ and R\_AOUT\_ have  $50\Omega$  single-ended controlled-characteristic impedance. Once the calibration PCB traces run parallel to each other and are matched side-by-side, the traces have  $100\Omega$  differential controlled-characteristic impedance.

### Load

The second set of calibration traces are made with a  $50\Omega$  load. The lengths of these traces are half of the no-load calibration traces, as detailed in the *No Load* section.

### SEL and SELB Jumper Selection

Table 1 shows the truth table for the device control signals. Use the truth table to switch D\_AIN\_ between AOUTA\_ and AOUTB\_. Jumper JU1 is used to drive the device's SEL signal and jumper JU2 is used to drive the SELB signal. When the jumpers are in the 1-2 position, the signals are high and when the jumpers are in the 2-3 position, the signals are low.

**Table 1. SEL and SELB Jumper Description (JU1, JU2)**

JU1 (SEL)	JU2 (SELB)	SWITCHES D_AIN_ TO AOUTA_	SWITCHES D_AIN_ TO AOUTB_
2-3*	2-3	Off	On
1-2	2-3	Off	On
2-3*	1-2*	On	Off
1-2	1-2*	Off	On

\*Default settings.

# MAX4888B Evaluation Kit

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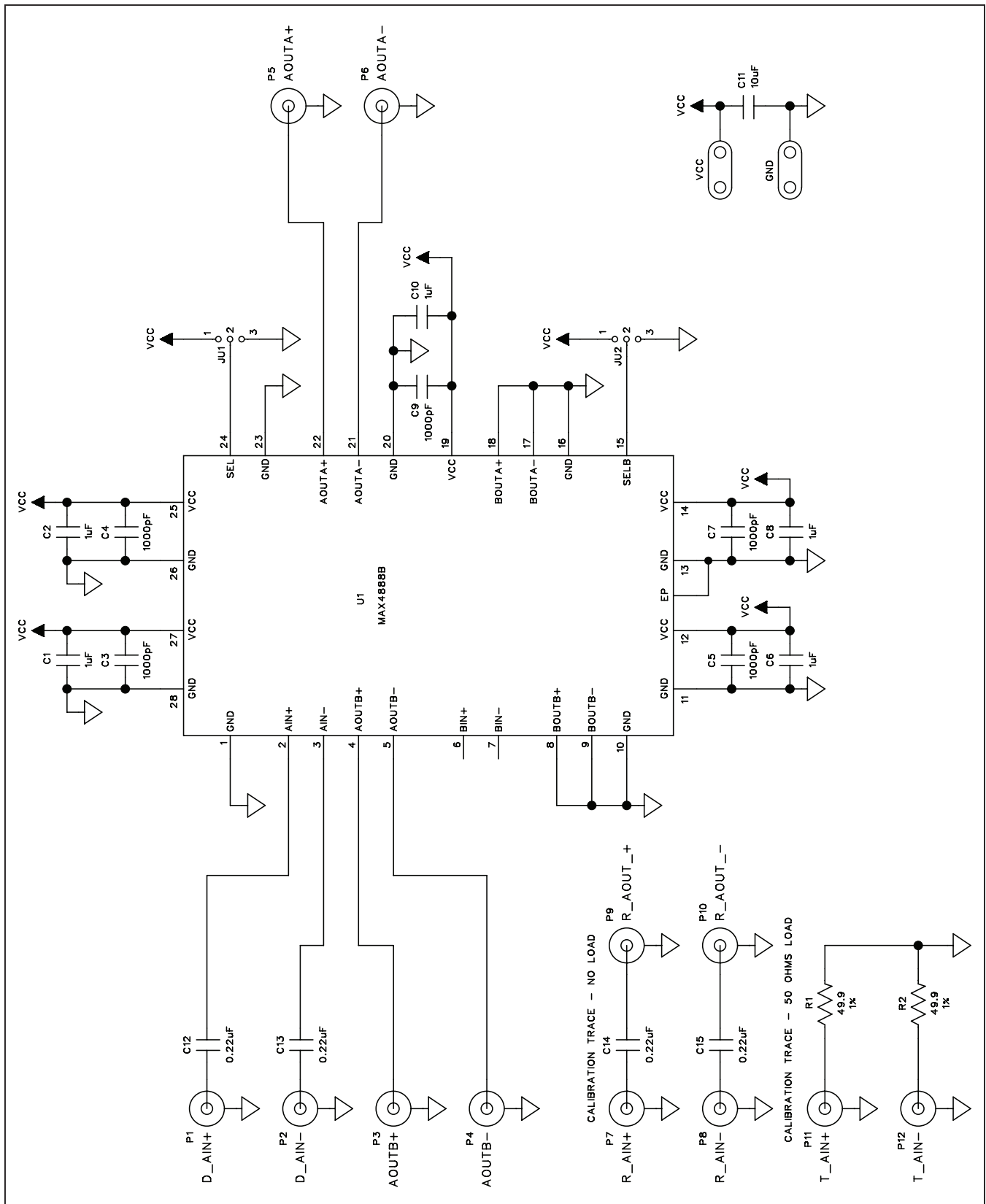


Figure 1. MAX4888B EV Kit Schematic

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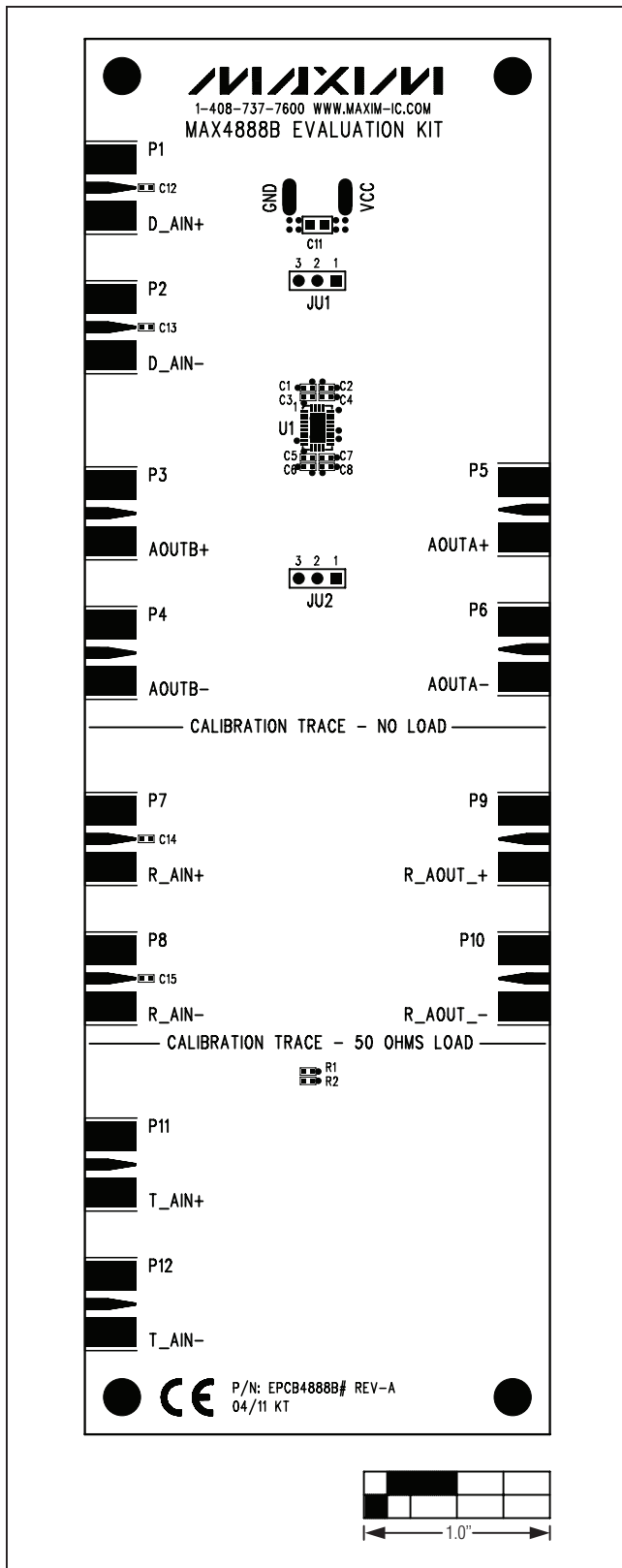


Figure 2. MAX4888B EV Kit Component Placement Guide—Component Side

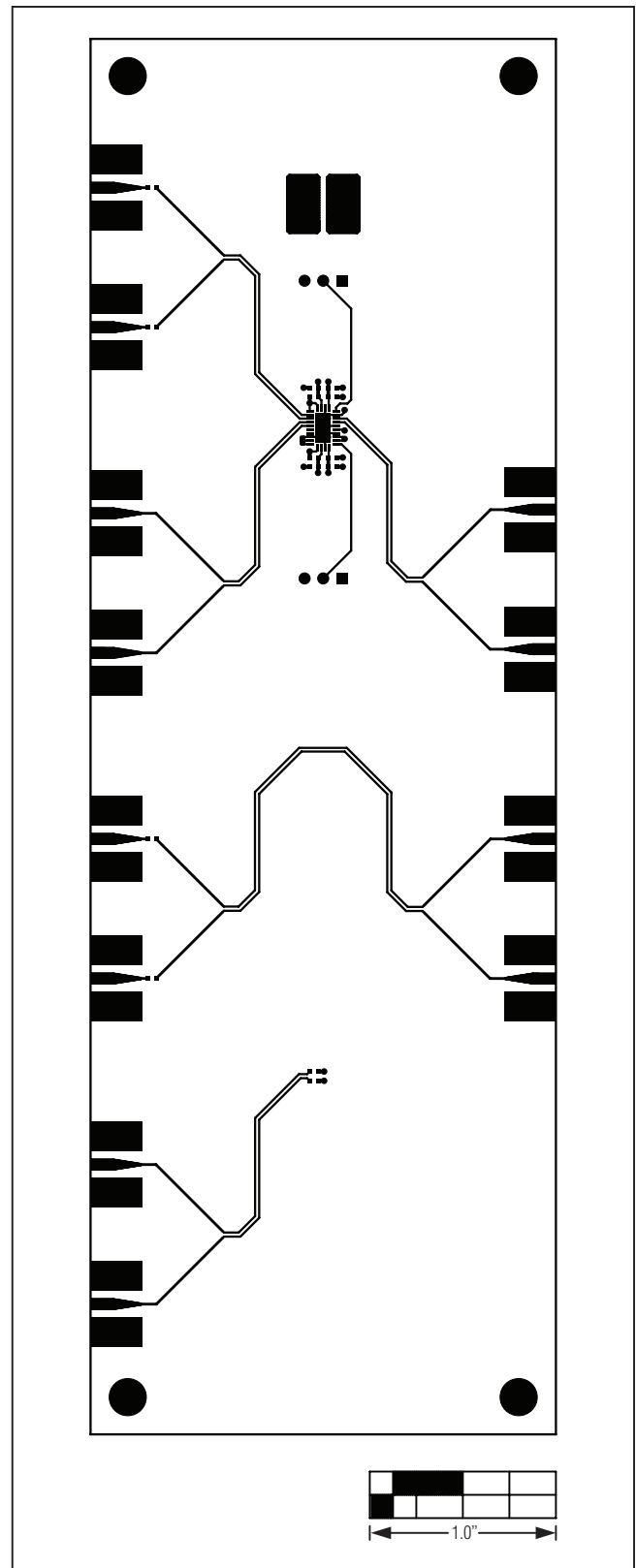


Figure 3. MAX4888B EV Kit PCB Layout—Component Side

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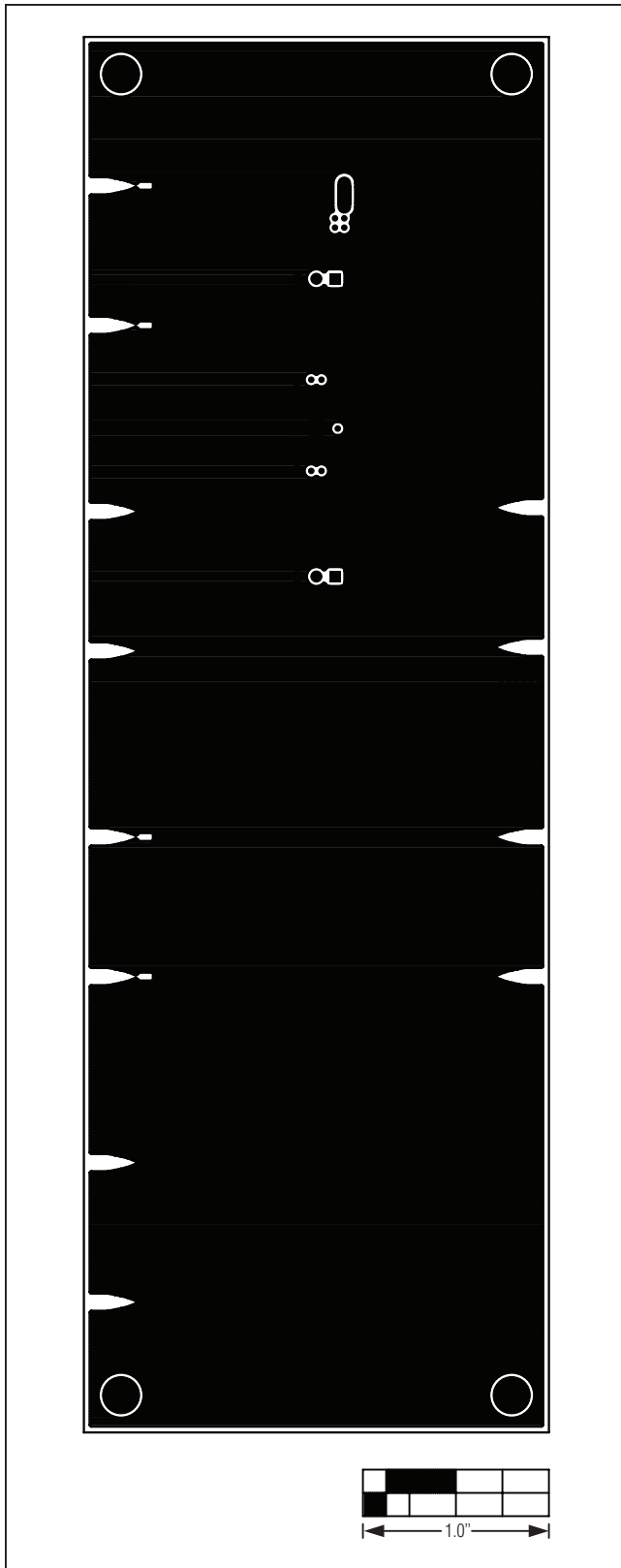


Figure 4. MAX4888B EV Kit PCB Layout—Inner Layer 2

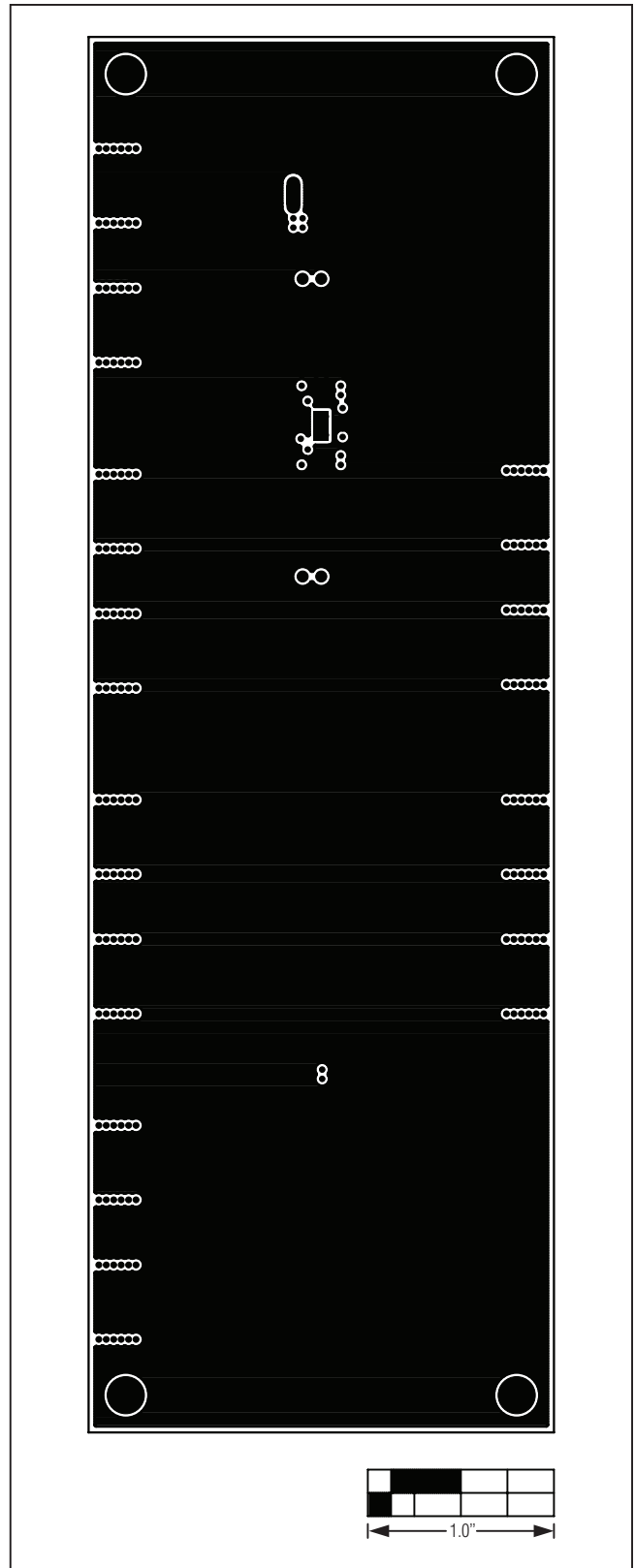


Figure 5. MAX4888B EV Kit PCB Layout—Inner Layer 3

# MAX4888B Evaluation Kit

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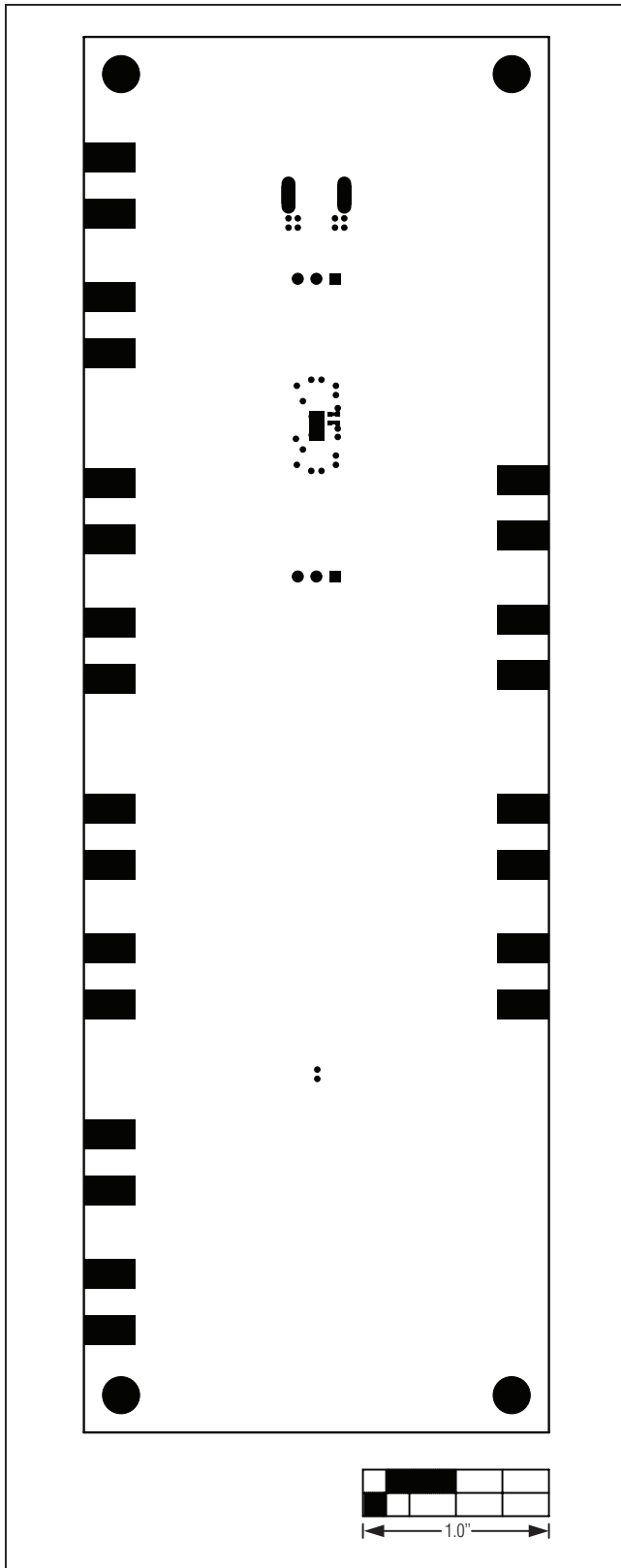


Figure 6. MAX4888B EV Kit PCB Layout—Solder Side

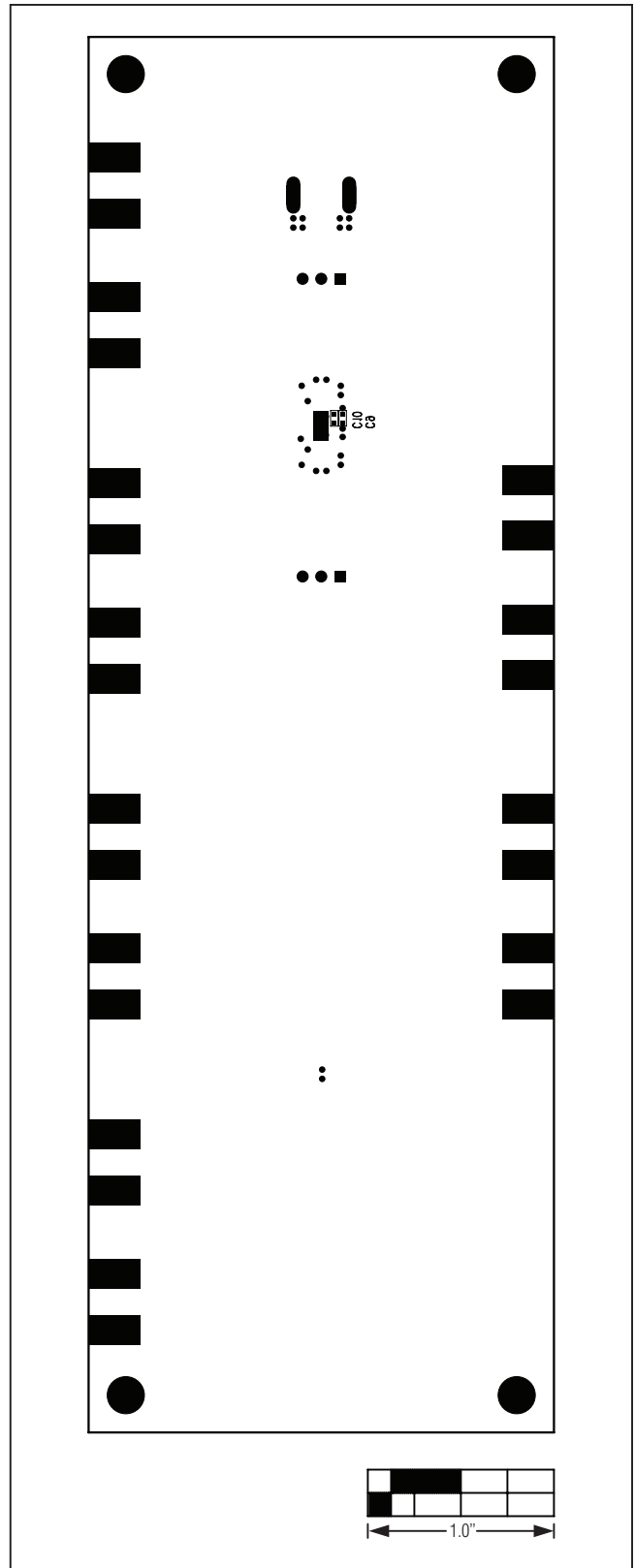


Figure 7. MAX4888B EV Kit Component Placement Guide—Solder Side

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### ***Ordering Information***

PART	TYPE
MAX4888BEVKIT#	EV Kit

#Denotes RoHS compliant.



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### ***Revision History***

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/11	Initial release	—

*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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