

# MAX3948 Evaluation Kit

## Evaluates: MAX3948

### General Description

The MAX3948 evaluation kit (EV kit) is a fully tested and assembled demonstration board that provides optical evaluation of the MAX3948 DC-coupled, 1Gbps to 11.3Gbps laser driver. The controlling software communicates with the EV kit through the USB port and provides simplified control of all functions of the MAX3948. The EV kit can be fully powered by the USB port, or the user can choose to power the MAX3948 by a single external 3.3V supply while the USB port supplies the on-board microcontroller. The flex-cable connection on the evaluation board allows attachment of lasers incorporating flex-cables.

### Features

- ◆ Drives Differentially-Connected Lasers
- ◆ Software Control of the MAX3948
- ◆ Power Supplied Through USB or External Connection

### EV Kit Contents

- ◆ MAX3948 EV Kit Board

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

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3, C4, C5, C8, C16	6	0.01 $\mu$ F $\pm$ 10% ceramic capacitors (0402)
C2	1	0.3pF $\pm$ 0.1pF ceramic capacitor (0201)
C6, C9	0	0.5pF $\pm$ 0.1pF ceramic capacitors (0402)
C7, C12, C29	3	0.1 $\mu$ F $\pm$ 20% ceramic capacitors (0204)
C11, C13, C15	3	10 $\mu$ F $\pm$ 10% ceramic capacitors (0805)
C21, C22	2	33pF $\pm$ 10% ceramic capacitors (0402)
C25, C26, C27, C49, C52	5	0.1 $\mu$ F $\pm$ 10% ceramic capacitors (0402)
C28		Not installed (0201)
C33	1	0.01 $\mu$ F $\pm$ 10% ceramic capacitor (0201)
C34, C55	2	1 $\mu$ F $\pm$ 10% ceramic capacitors (0603)
C35, C37, C38	3	4.7 $\mu$ F $\pm$ 10% ceramic capacitors (0805)
D6	1	Green LED
J1, J2	2	SMA connectors, edge mount
J3, J4, TP1-TP4, TP6-TP15	16	Test points
J5, J6, J7, J9, J10	5	1 x 2 headers, 0.1in centers
J8	1	Mini-B USB connector
L1	1	22 $\mu$ F, $\pm$ 20% inductor Taiyo Yuden CBC3225T220M

DESIGNATION	QTY	DESCRIPTION
L2, L3	2	18nH $\pm$ 2% inductors (0402)
L4	1	Ferrite bead (0402) Murata BLM15GG471
L10, L14	2	10 $\mu$ H $\pm$ 10% inductors (0603)
R1	1	1.00k $\Omega$ $\pm$ 1% resistor (0402)
R3	1	680 $\Omega$ $\pm$ 5% resistor (0402)
R4, R31, R51, R53	4	10k $\Omega$ $\pm$ 5% resistors (0402)
R5, R6	2	20 $\Omega$ $\pm$ 5% resistors (0402)
R7	1	100 $\Omega$ $\pm$ 5% resistor (0201)
R12	0	Not installed (0201)
R15, R50	2	4.7k $\Omega$ $\pm$ 5% resistors (0402)
R18, R52, R55, R66, R73	5	51 $\Omega$ $\pm$ 5% resistors (0402)
R24	1	1.5k $\Omega$ $\pm$ 5% resistor (0402)
SW1	1	SPDT switch
U1	1	1Gbps to 11.3Gbps, SFP+ laser driver (16 TQFN) Maxim MAX3948ETE+
U2	1	Low-noise LDO regulator (8 TDFN) Maxim MAX8902AATA+
U6	0	User-supplied TOSA
U10	1	Microcontroller (28 SO) Microchip PIC16C745-I/SO
Y2	1	6MHz crystal ECS Inc. ECS-60-32-5PXDN
None	1	MAX3948 EVALUATION BOARD, REV A

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### Quick Start

**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.

- 1) Solder a laser to U6. See [Figure 1](#) for more information about the laser connection.
- 2) Set SW1 to the desired power-supply option (USB or external supply).
- 3) If an external power supply is used, set the voltage to 3.3V, the current limit to 300mA, and connect the supply to the board.

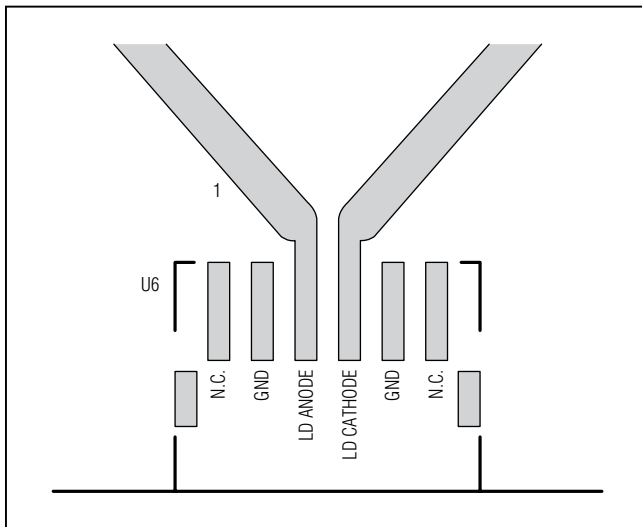


Figure 1. TOSA Connection

- 4) Get the latest version of the EV kit software (MAX3948Rev1.ZIP) by contacting Maxim customer support at [www.maximintegrated.com/support](http://www.maximintegrated.com/support). After receiving the file unzip it to a local folder and run the installation executable (setup.EXE). Installation requires administrative rights and can also require Internet access to download the necessary drivers.
- 5) After installation is complete, follow this path to start the program: **Start** → **All Programs** → **Maxim Integrated Products** → **MAX3948 EV Kit GUI**.
- 6) Connect the computer to the EV kit with a USB cable (A-male to Mini-B-Male). LED D6 should illuminate, indicating that USB power is detected. Click the **USB Connect** button in the software to initiate communication to the EV kit. The **Status** indicator turns green when communication is established.
- 7) Connect a 50Ω source to TIN- and TIN+ (J1 and J2). Set the source differential amplitude to 500mV<sub>p-p</sub>.
- 8) Connect the output from the TOSA to an optical receiver (optical-to-electrical converter or optical input head on an oscilloscope).
- 9) All device controls are available in the software. Fault and warning indicators are displayed on the right side of the GUI window. When a hard fault has occurred, the part goes into latched shutdown. The source of the fault should be removed and the **DISABLE** checkbox should be toggled to reset the part.
- 10) The registers contain a default setting and can be read using the **Tx Read All** button. For detailed register functions, refer to the MAX3948 IC data sheet.

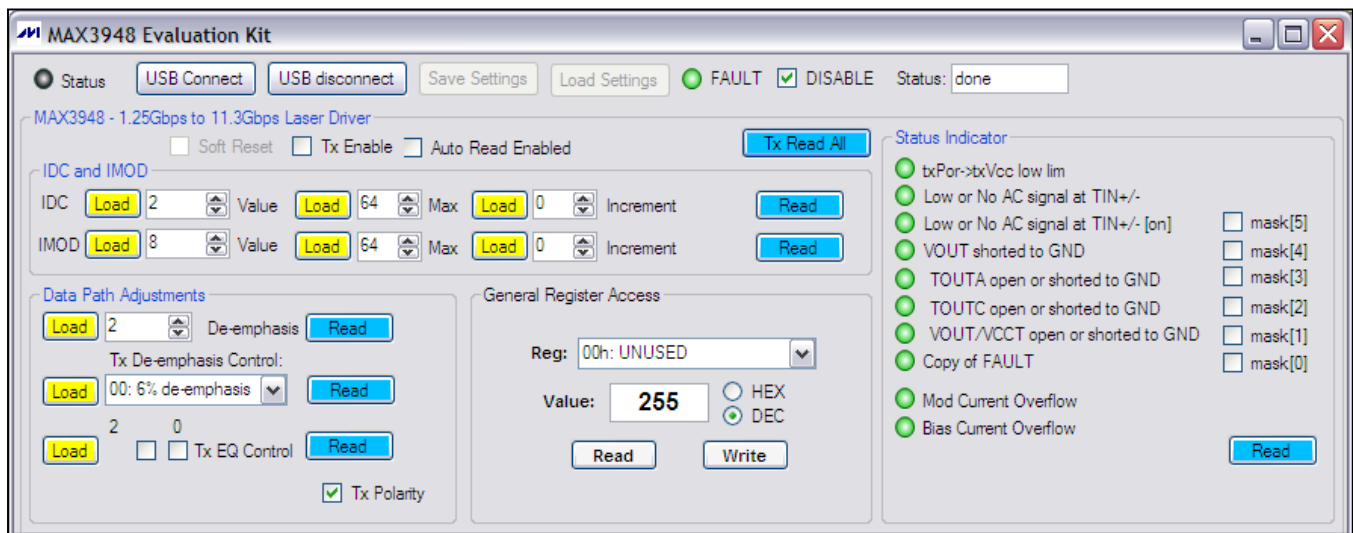


Figure 2. MAX3948 EV Kit Software

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- 11) To enable the part, the **DISABLE** checkbox should be toggled (check, then uncheck) and the **TX Enable** checkbox should be checked. After doing this, click the **TX Read All** button twice and check to see if any faults are indicated. If everything is set up properly all fault indicators should be green.
- 12) The **Tx De-emphasis Control** can be used to adjust the eye diagram. After choosing a new setting, click the **Tx De-emphasis Control Load** button followed by the **IMOD Load** button. Doing so loads the new pre-emphasis setting to the modulation current driver. Further improvements to the eye diagram can be accomplished by tuning the component values of C2, C6, C9, C28, L2, L3, R5, R6, R7, and R12.

### **Graphical User Interface (GUI)**

The GUI consists of three main blocks: DC and modulation control, data path adjustments, and fault indicators.

#### **DC and Modulation Control**

For DC and modulation current there are three controls: set current, set maximum, and increment. The left-side data-entry boxes allow the user to write to the SET\_IDC or SET\_IMOD register directly, as long as that value is below the value loaded in the IDC\_MAX and IMOD\_MAX registers. The middle data-entry boxes allow the user to write to the IDC\_MAX and IMOD\_MAX registers. The right-side data-entry boxes allow the user to increment or decrement the bias and modulation current registers over a  $\pm 15$  LSB range by writing to the DCINC and MODINC registers. The appropriate **Load** button must be clicked to initiate a register write. The **Read** buttons read and display the values held in the SET\_IDC/SET\_IMOD, IDC\_MAX/IMOD\_MAX, and DCINC/MODINC registers.

#### **Data Path Adjustments**

This block allows control of de-emphasis, the input equalization, and data polarity. The **Tx De-emphasis Control** has a drop-down box with four options for setting the TXDE\_MD register. When manual control is selected, the **De-emphasis** checkbox becomes available to write values to the SET\_TXDE register. The **Tx EQ Control** data-entry boxes let you set the two SET\_TXEQ bits, checked for a "1" and unchecked for a "0". When the **Tx Polarity** box is checked, the TOUT+ pin sinks current when TIN+ is high (typical setup). The output polarity is inverted if the box is unchecked.

#### **Fault Indicators**

Along the right-hand side of the GUI are fault indicators that show the status of the TXSTAT1 and TXSTAT2 registers. Hard faults disable the part and require a toggling of the **DISABLE** checkbox to restart the part (once the source of the fault has been removed). The hard faults can be masked by checking the appropriate box beside the fault indicator. Soft faults operate as warnings but do not disable the part. Automatic updating of the fault monitors can be enabled by checking the **Auto Read Monitors** checkbox.

#### **Output Network**

The output network has multiple components to improve the optical eye diagram. The RC shunts on the laser's anode and cathode (R5, C6, R6, and C9) affect the S22 of the MAX3948 and must be placed very close to the output pins TOUTA and TOUTC. The differential RC (R7 and C2) also affects the S22 and must be placed as close as possible to the output. Another differential RC (R12 and C28) is placed as close as possible to the laser connector to help compensate for the mismatch in impedance where the TOSA solders to the PCB. These last two components may not be necessary depending on the TOSA.

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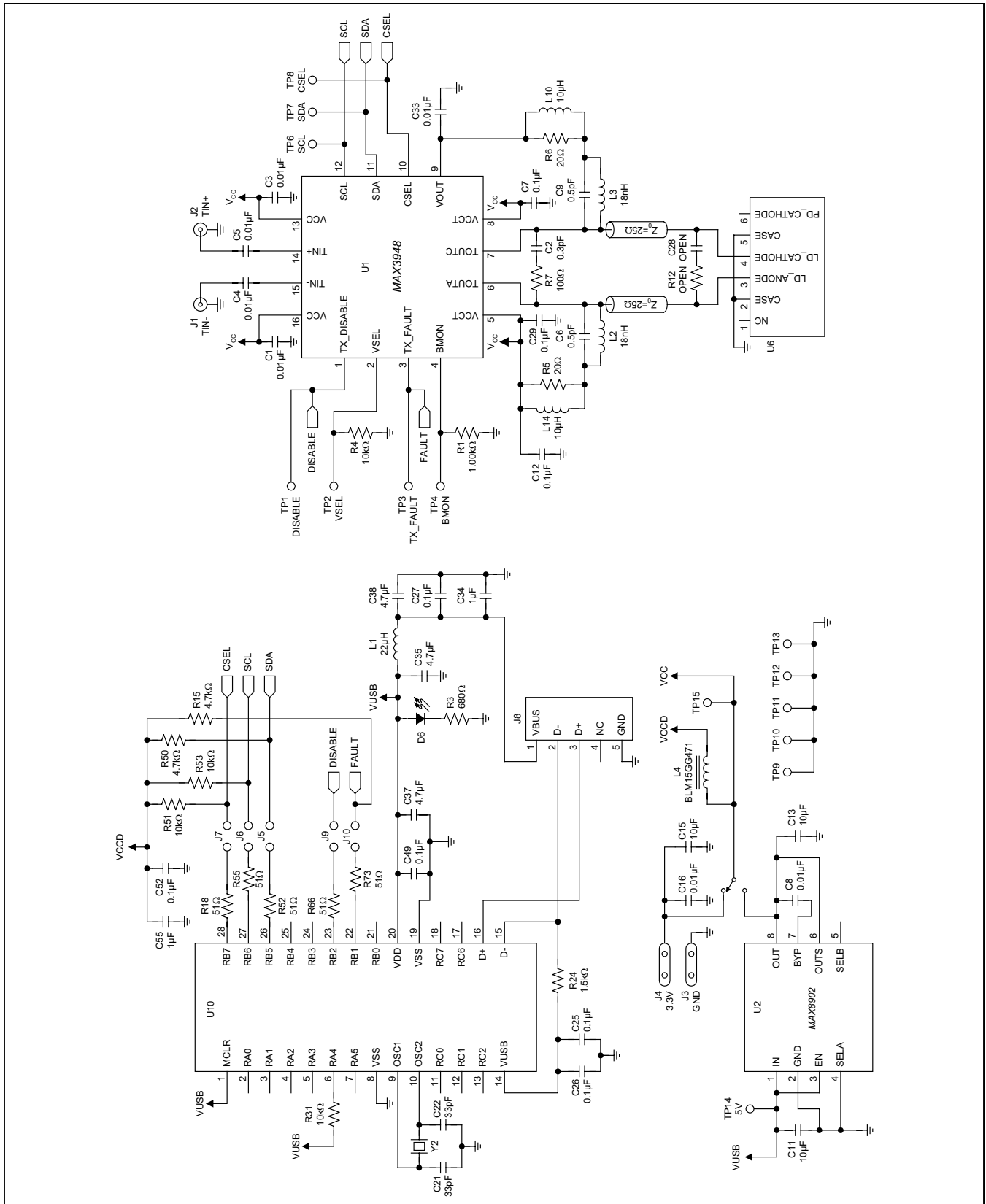


Figure 3. MAX3948 EV Kit Schematic

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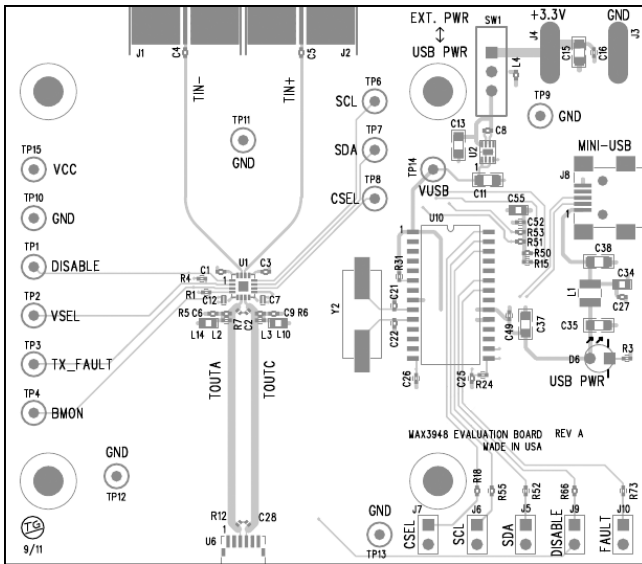


Figure 4. MAX3948 EV Kit Component Placement Guide—Component Side

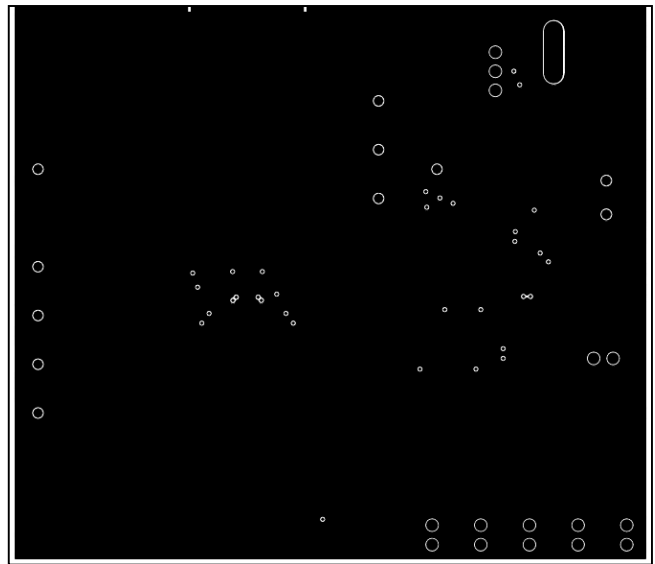


Figure 6. MAX3948 EV Kit PCB Layout—Ground Plane

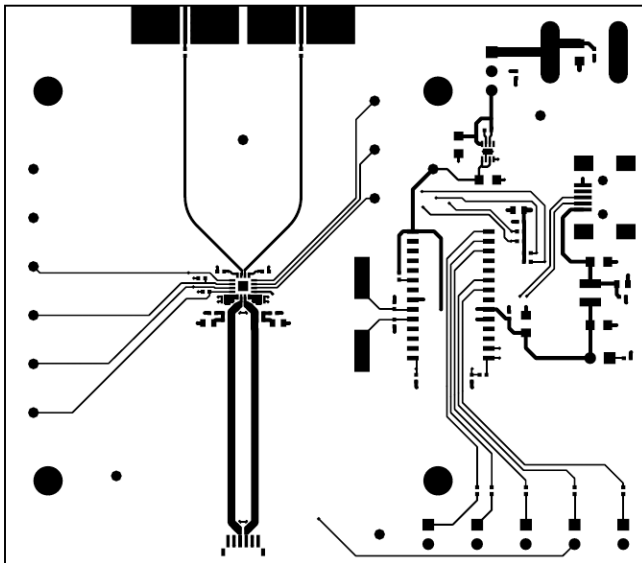


Figure 5. MAX3948 EV Kit PCB Layout—Top Side

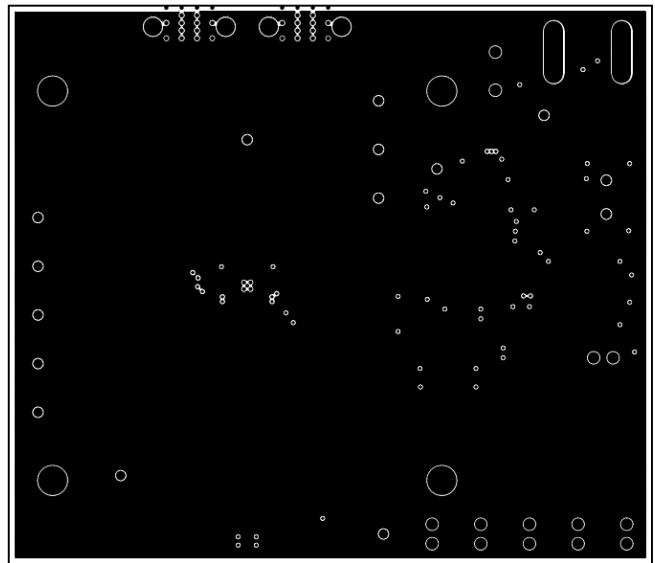


Figure 7. MAX3948 EV Kit PCB Layout—Power Plane

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### Ordering Information

PART	TYPE
MAX3948EVKIT	EV Kit

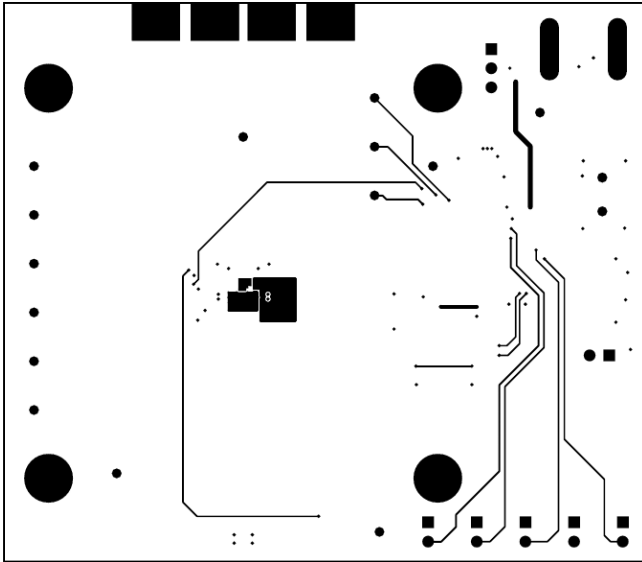


Figure 8. MAX3948 EV Kit PCB Layout—Solder Side

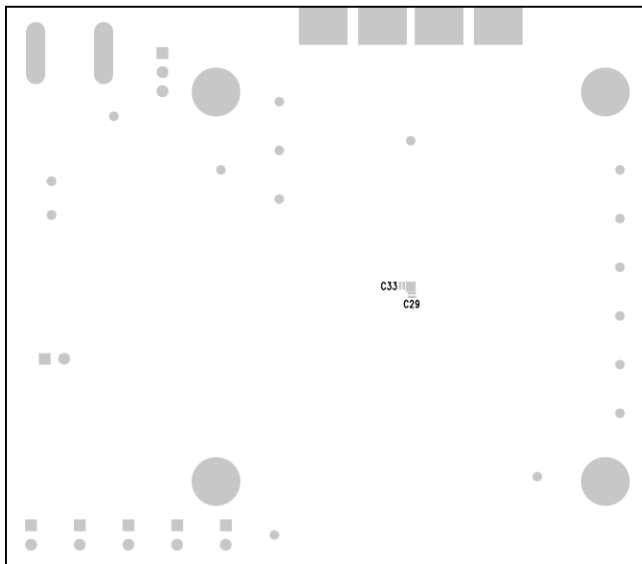


Figure 9. MAX3948 EV Kit PC Component Placement Guide—Solder Side

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### Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/11	Initial release	—



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