MAXIM

MAX3815 Evaluation Kit for DVI Cables

Evaluates: MAX3815

_____ *General Description*

The MAX3815 evaluation kit (EV kit) is an assembled demonstration board that provides in-system evaluation of the MAX3815 TMDS® cable equalizer. The input and output connections are made through Molex DVI™ connectors for direct connection to DVI cables.

Single-link and dual-link DVI cables can be connected but only the single-link data path is equalized and passed to the output connector.

In this version of the EV kit, the DDC signals are simply passed through the board. Also passed through are Hot-Plug Detect, +5V, R, G, B, HSync, VSync, and DDC Ground.

A battery holder is included along with DC-DC conversion circuitry to allow operation from two AA batteries. **Note:** The battery pack is for ease of use without an external power supply. Operational time will be limited when using batteries.

TMDS is a registered trademark of Silicon Image, Inc.
DVI is a trademark of Digital Display Working Group.

_____ *Features*

♦ **Extends TMDS Interface Length as Follows:**
    0 to 50m over DVI-Cable, 24 AWG STP
    (Shielded Twisted Pair)
    0 to 36m over DVI-Cable, 28 AWG STP
    0 to 30m over DVI-Cable, 30 AWG STP

♦ **Fully Assembled and Tested**

♦ **+3.3V Power-Supply Operation**

♦ **Includes AA Battery Supply Option**

♦ **Includes On-Board +15kV ESD Protection***

♦ **Pass-Through of Analog Video**

_____ *Ordering Information*

PART	TEMP RANGE
MAX3815EVKIT-DVI	0°C to +70°C

_____ *Component List*

DESIGNATION	QTY	DESCRIPTION
B1	1	Keystone AA battery holder
C1, C9	2	100µF ±10% tantalum capacitors (C case) AVX TPSC107K010R0100
C2–C5, C8, C10, C11, C12	8	0.1µF ±10% ceramic capacitors (0402)
C7	1	1µF ±10% ceramic capacitor (0402)
C15, C16	2	10µF ±5% ceramic capacitors (0805)
D1	1	LED, red
J1, J2	2	DVI connectors, Molex 74320-1000
J3, J4	2	Test points
JU1, JU3, JU4	3	3-pin headers, 0.1in centers
L1	1	22µH inductor TDK SLF6028T-220MR77
L2	1	Ferrite bead TDK MMZ1608S601 (0603)
Q1	1	PNP transistor (SOT23) Zetex FMMT591A
R2–R5, R19, R21, R23, R24	0	Not installed, resistors
R6	1	4.7kΩ ±5% resistor (0402)
R7	1	200Ω ±5% resistor (0402)
R8, R16, R17, R18	4	10kΩ ±5% resistors (0402)

DESIGNATION	QTY	DESCRIPTION
R11	1	1kΩ variable resistor
R12	1	1kΩ ±5% resistor (0402)
R13	1	300kΩ ±5% resistor (0402)
R14	1	180kΩ ±5% resistor (0402)
R15	1	1MΩ ±5% resistor (0402)
SW2	2	0Ω resistors (0603) soldered across bottom two vias of each lane
SW4	1	SPDT switch
U1, U2, U3	3	MAX3208EAUB ±15kV ESD protection ICs
U4	1	MAX3815CCM
U5	1	MAX1796EUA
U6	0	Not installed
—	1	MAX3815DVI board, rev A
—	3	Shunts

_____ *Component Suppliers*

SUPPLIER	PHONE	FAX
AVX	803-946-0690	803-626-3123
Zetex	516-543-7100	516-864-7630

Note: Indicate that you are using the MAX3815 when contacting these component suppliers.

*Human Body Model.

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For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

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Quick Start

For evaluation of the MAX3815, configure the evaluation kit as follows:

1) If power is supplied to the MAX3815 through the battery pack, place two AA batteries in the battery holder and place a shunt on the bottom two pins of JU1.

2) If power is supplied by an external source, set the power supply's current limit to 300mA and connect +3.3V at J3 and ground at J4. Then place a shunt on the top two pins of JU1.

3) If no cable is attached at J2 (INPUT FROM CABLE), the red LED at D1 should be illuminated (CLK LOSS).

    This indicates that no clock signal is being detected by the MAX3815. If the LED does not illuminate and no cable is attached at J2, check to make sure the batteries are getting proper contact. Alternatively, if external power is used, ensure that it is supplying +3.3V.

4) Set the equalizer to automatic equalization by switching SW4 to AUTO.

5) Connect a DVI source to J2 (INPUT FROM CABLE) and a DVI monitor or DVI receiver at J1 (OUTPUT).

6) Once the DVI source has begun transmitting, the red LED (CLK LOSS) will no longer be illuminated. This indicates that the DVI source has begun transmitting video.

If manual control of the equalizer is desired, switch SW4 to MANUAL. To increase the amount of equalization (long cables), turn R12 clockwise. To decrease the amount of equalization (short cables), turn R12 counter-clockwise. Note that during manual equalization, all three data channels will be set to the same level of equalization.

ESD Protection

The MAX3208 provides 15kV of ESD protection for the DVI interface. It is designed to provide protection to the differential lines while maintaining a low capacitance for minimal effects on signal transmission. Three MAX3208 devices are included on the reference design board on the cable side of the MAX3815.

Table 1. Adjustment and Control Descriptions (see Quick Start)

COMPONENT	NAME	FUNCTION
D1	CLK LOSS	This LED turns on when the MAX3815 does not detect clock signal.
J3	+3.3V	External power-supply positive connection.
J4	GND	External power-supply ground connection.
JU1	POWER	Placing a shunt across the top two pins connects the MAX3815 to the supply connectors J3 and J4 so an external power supply can be used. Place a shunt across the bottom two pins to supply the MAX3815 from the battery pack (requires two AA batteries).
JU3	DRVR_EN	For future functionality.
JU4	CPL_EN	For future functionality.
R12	MANUAL EQ SET	When manual control of the equalizer has been selected using SW4, the level of equalization can be controlled using R12. Turning the potentiometer clockwise increases the amount of equalization applied to the input signal. The voltage at EQ CONTROL can be measured at TP3.
SB1	SQUELCH	Short SB1 with solder to squelch the outputs when no clock signal is detected.
SB2	OUTLEVEL	Short SB2 with solder to set the outputs to transmit one-half normal amplitude signals (500mV$_{P-P}$ differential).
SB3	MAX3816 VDD	For future functionality.
SB4	DDC Ground Return	To connect the display-side DDC return ground to the cable-side DDC return ground, short the left two pads of SB4. To connect the display-side DDC return ground to the EV kit ground short the right two pads of SB4.
SW2	MAX3816	For future functionality. This switch is replaced by two 0Ω resistors that set the DDC clock and data signals to pass directly through the board.
SW4	EQ CONTROL	Slide the switch to the left to manually control the level of equalization of the MAX3815. Slide it to the right to have the MAX3815 automatically control the level of equalization.

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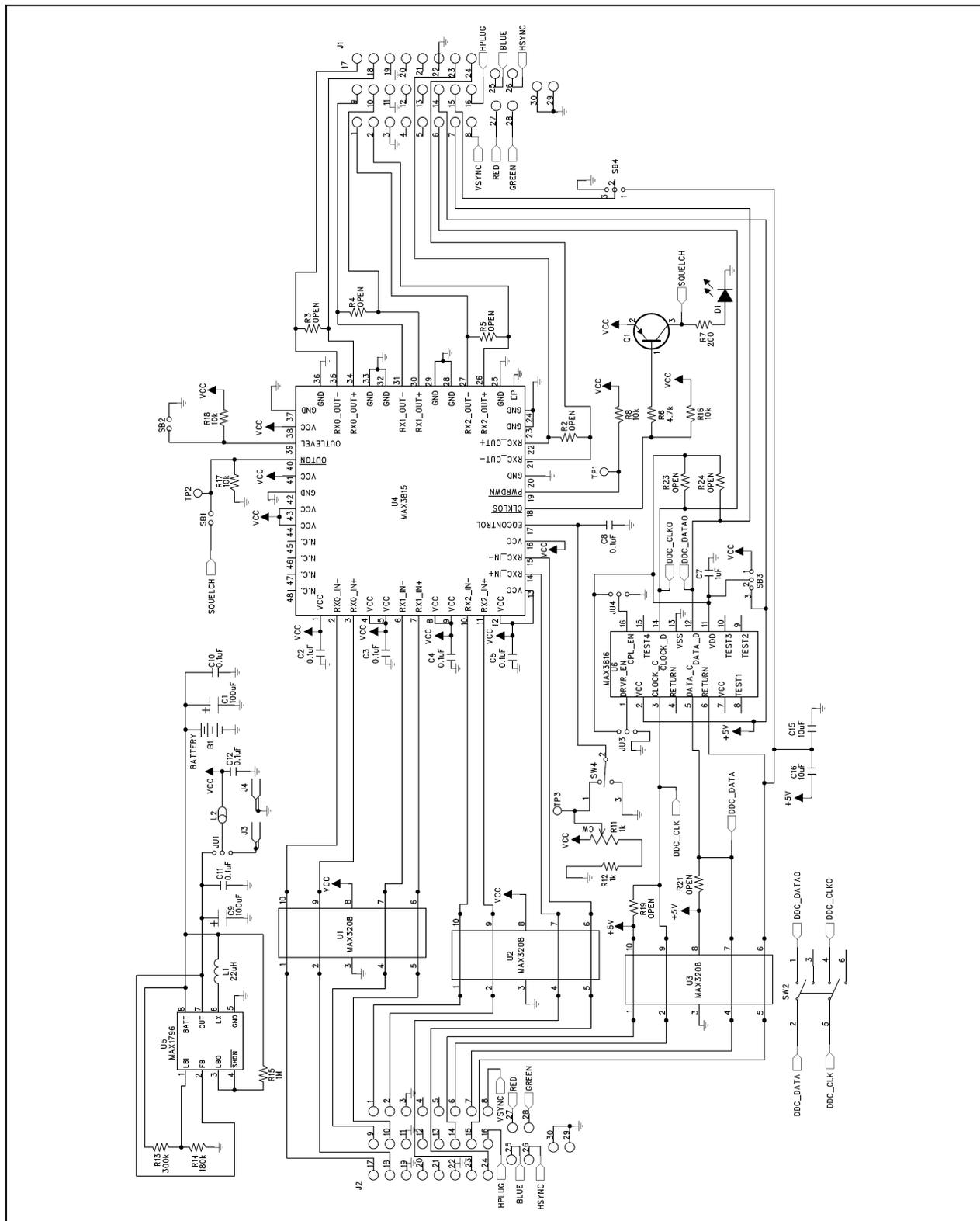
Figure 1. MAX3815 EV Kit Schematic
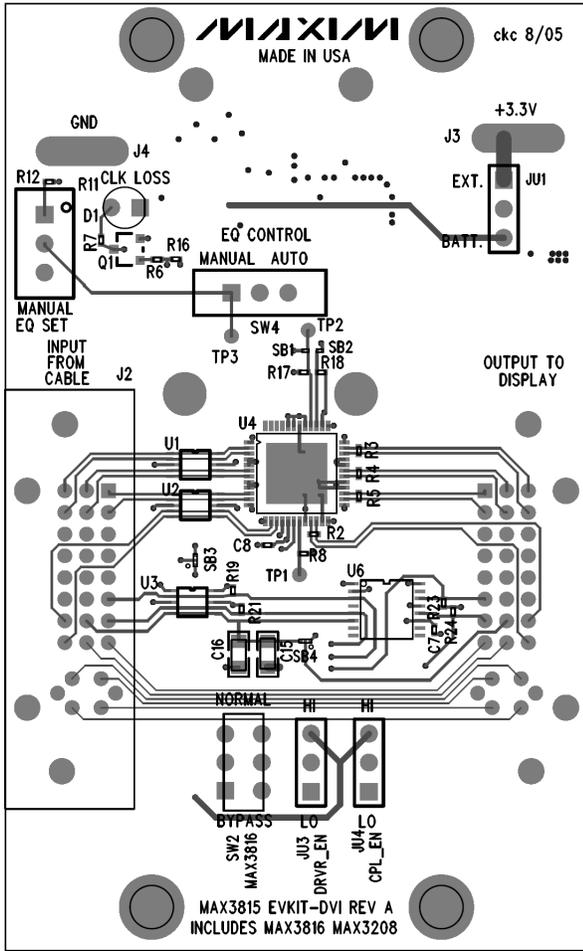
Figure 2. MAX3815 EV Kit PC Component Placement Guide—Component Side
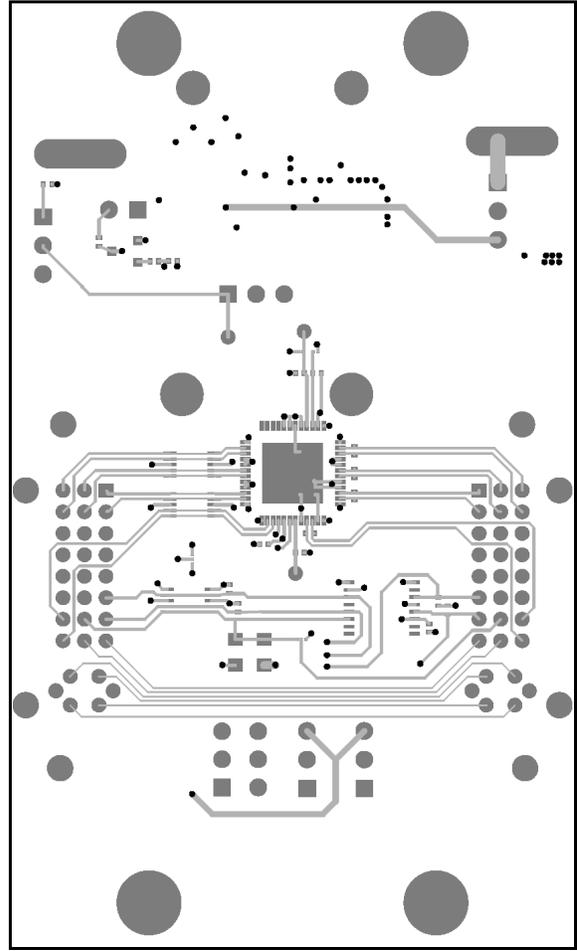
Figure 3. MAX3815 EV Kit PC Board Layout—Top Side

_____ *High Frequency Layout*

The following is a list of recommendations to maintain good signal integrity with the MAX3815.

- Use controlled impedance transmission lines for the clock and data channels. Make them differentially coupled 100Ω impedance.

- Use an uninterrupted ground plane below the clock and data transmission lines.

- Do not use vias on the clock and data transmission lines on the input side of the MAX3815.

- Keep the data transmission lines as short as possible.

- Place power-supply decoupling capacitors close to the MAX3815 on pins 1, 4 and 5, 8 and 9, and 12 and 13.

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/VI/IXI/VI
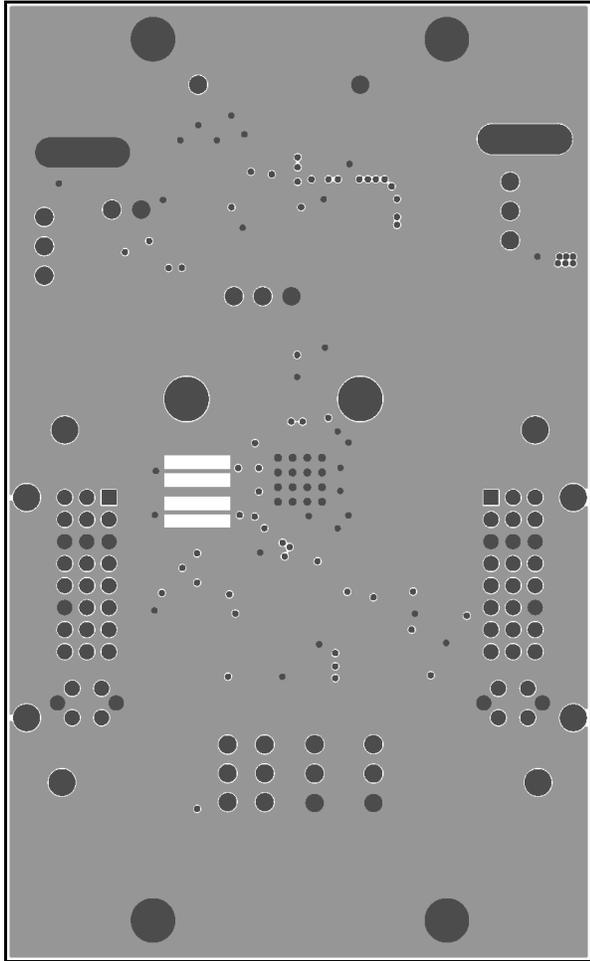
Evaluates: MAX3815

Figure 4. MAX3815 EV Kit PC Board Layout—Ground Plane
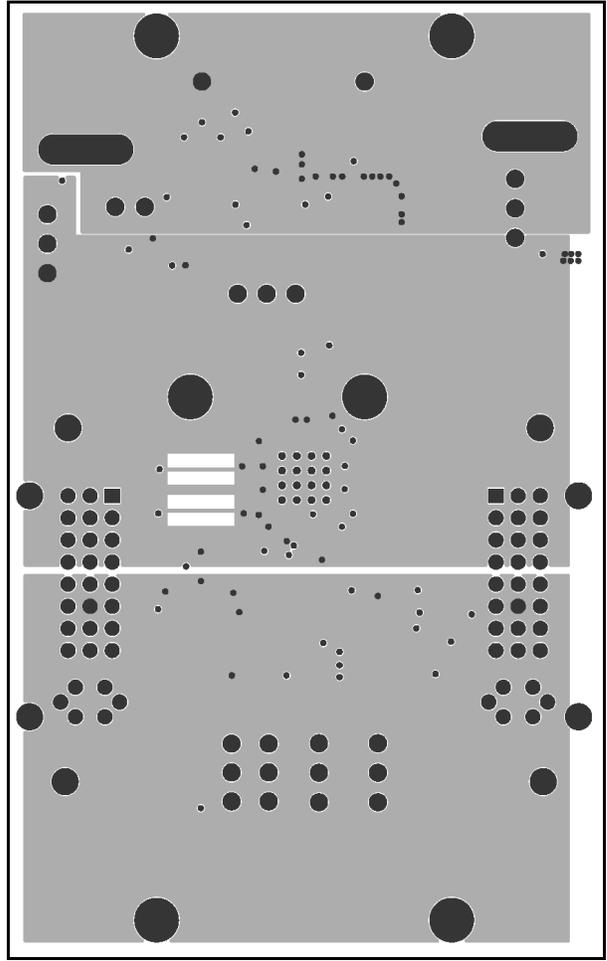
Figure 5. MAX3815 EV Kit PC Board Layout—Power Plane

/VI/AXI/VI _____ **5**

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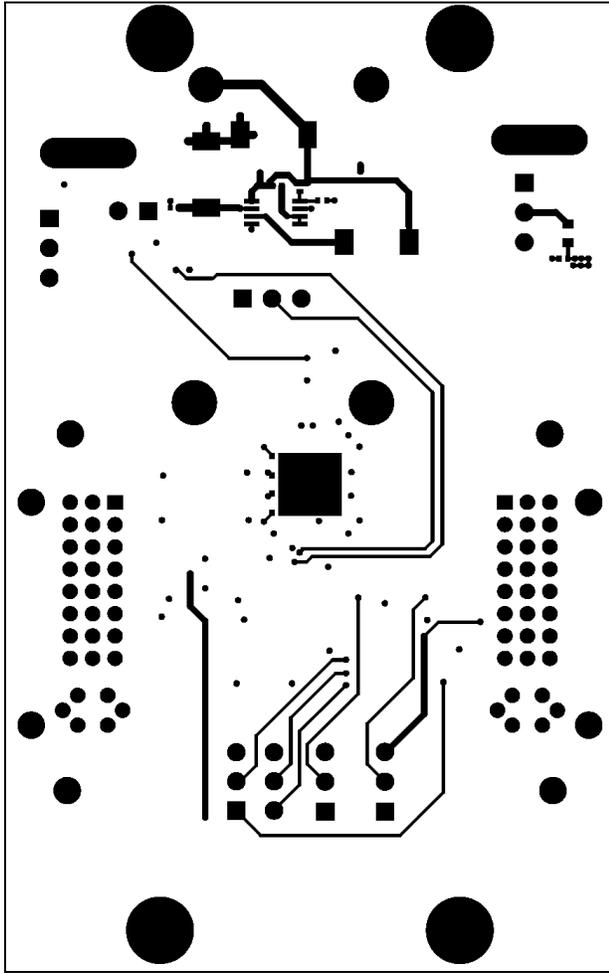
Figure 6. MAX3815 EV Kit PC Board Layout—Solder Side
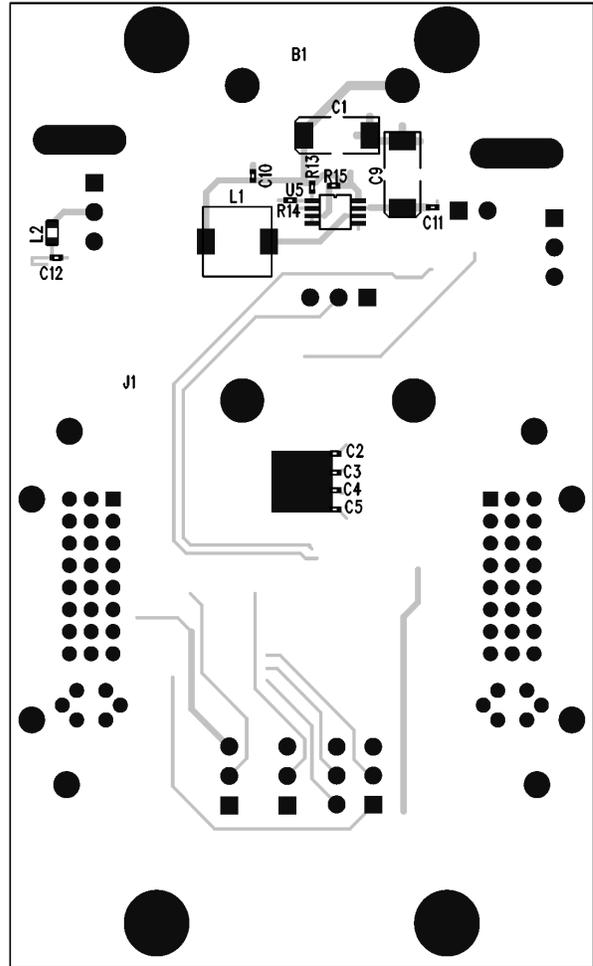
Figure 7. MAX3815 EV Kit PC Component Placement Guide—Solder Side

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