19-2567; Rev 1, 09/03

MAX3735A Evaluation Kit

Evaluates: MAX3735A

General Description

The MAX3735A evaluation kit (EV kit) is an assembled demonstration board that provides complete optical and electrical evaluation of the MAX3735A.

The EV kit is composed of two independent sections, one optical and one electrical, on the PC board. The output of the electrical evaluation section is interfaced to an SMP connector that can be connected to a 50Ω terminated oscilloscope. The output of the optical evaluation section is configured for attachment to a laser/monitor diode.

Features

- **Fully Assembled and Tested**
- **Single +3.3V Power Supply Operation**
- **AC-Coupling Provided On-Board**
- **Allows Optical and Electrical Evaluation**

Ordering Information

PART	TEMP RANGE	IC-PACKAGE
MAX3735AEVKIT	-40°C to +85°C	24 QFN*

**Exposed pad.*

Electrical Evaluation Component List

DESIGNATION	QTY	DESCRIPTION
C1, C10, C11, C13, C14	5	0.01µF ±10% ceramic capacitors (0402)
C2, C12, C19, C20	—	Open
C3	1	0.5pF ±10% ceramic capacitor (0201)
C4, C5, C16, C17, C18	5	0.1µF ±10% ceramic capacitors (0402)
C7, C8, C9	3	470pF ±10% ceramic capacitors (0402)
C15	1	0.01µF ±10% ceramic capacitor (0201)
C21	1	10µF ±10% tantalum capacitor, case B
D1	1	Diode, DIO-S1A
D2	1	LED, red T1 package
J1	1	SMP connector
J2, J3	2	SMA connectors, tab contact
JU1, JU5, JU6, JU7, JU9, JU10, JU13, JU14	8	2-pin headers, 0.1in centers
JU8, JU15	—	Open
JU11	—	Open
JU25	—	Open, 0201 solder bridge
L1, L5	—	Open

DESIGNATION	QTY	DESCRIPTION
Q1	1	MOSFET (SOT23) Fairchild FDN306P
Q2	—	Open
Q3	1	NPN transistor (SOT23) Zetex FMMT491A
Q4	1	PNP transistor (SOT23) Zetex FMMT591A
R1, R34–R40	—	Open
R2	1	5.1Ω ±1% resistor (0402)
R3, R4, R5	3	30Ω ±1% resistors (0402)
R6	1	75Ω ±1% resistor (0402)
R7	1	200Ω ±1% resistor (0402)
R8	1	392Ω ±1% resistor (0402)
R9	1	511Ω ±1% resistor (0402)
R10	1	1.5kΩ ±1% resistor (0402)
R11	1	4.3kΩ ±1% resistor (0402)
R13	1	0Ω resistor (0603)
R14–R17	4	50kΩ variable resistors
R41	1	0Ω resistor (0201)
U1	1	MAX3735AETG (24 QFN)
U2	1	MAX495ESA (8 SO)
VCC, GND, TP1–TP11, TP22	14	Test points
None	8	Shunts
None	1	MAX3735 EV board
None	1	MAX3735A data sheet

Optical Evaluation Component List

DESIGNATION	QTY	DESCRIPTION
C22, C23, C38, C39	4	0.1µF ±10% ceramic capacitors (0402)
C24	1	8.2pF ±10% ceramic capacitor (0402)*
C25, C26, C27	3	470pF ±10% ceramic capacitors (0402)
C28–C35	8	0.01µF ±10% ceramic capacitors (0402)
C36, C37	2	0.01µF ±10% ceramic capacitors (0603)
C40	—	Open
C41	1	10µF ±10% tantalum capacitor, case B
D3	—	Open, user-supplied laser diode
D4, D5, D6	3	LED, red T1 Package
J4, J5	2	SMA connectors, tab contact
J6	—	Open**
JU16–JU20	5	2-pin headers, 0.1in centers
JU21, JU22	2	3-pin headers, 0.1in centers
L3	1	600Ω ferrite bead (0603) Murata BLM18HG601SN1
L4	1	1µH inductor (1008CS) Coilcraft 1008CS-102XKBC
Q5	1	MOSFET (SOT23) Fairchild FDN306P
Q6	1	NPN transistor (SOT23) Zetex FMMT491A
R18	—	Open (0402)
R19	1	11Ω ±1% resistor (0402)
R20	1	15Ω ±1% resistor (0402)
R21	1	49.9Ω ±1% resistor (0402)*
R22	1	200Ω ±1% resistor (0402)
R23	1	511Ω ±1% resistor (0402)
R24	1	1.5kΩ ±1% resistor (0402)
R25	1	4.3kΩ ±1% resistor (0402)
R26, R27	2	4.7kΩ ±1% resistors (0402)
R28, R29	2	330Ω ±1% resistors (0603)
R30–R33	4	50kΩ variable resistors
U3	—	Open**
U4	1	MAX3735AETG (24 QFN)
VCC, GND, TP12–TP21	12	Test points
None	7	Shunts
None	1	MAX3735 EV board
None	1	MAX3735A data sheet

*These components are part of the compensation network, which can reduce overshoot and ringing. Parasitic series inductance introduces a zero into the laser's frequency response. R21 and C24 add a pole to cancel this zero. Starting values for most coaxial lasers is R21 = 49.9Ω in series with C24 = 8.2pF. These values should be experimentally adjusted until the output waveform is optimized.

**These components are not supplied on the EV kit but can be populated if the customer wants to use the MAX3735A laser driver with the DS1858 dual temperature controlled digital resistor with current monitors. See schematics on page 8 for details.

Component Suppliers

SUPPLIER	PHONE	FAX
AVX	803-946-0690	803-626-3123
Coilcraft	847-639-6400	847-639-1469
Murata	814-237-1431	814-238-0490
Zetex	516-543-7100	516-864-7630

Note: *Please indicate that you are using the MAX3735A when contacting these component suppliers.*

Quick Start

Electrical Evaluation

In the electrical configuration, an automatic power control (APC) test circuit is included to emulate a semiconductor laser with a monitor photodiode. Monitor diode current is provided by transistor Q4, which is controlled by an operational amplifier (U2). The APC test circuit consisting of U2 and Q4 applies the simulated monitor diode current (the laser bias current divided by a factor of 77) to the MD pin of the MAX3735A. To ensure proper operation in the electrical configuration, set up the evaluation board as follows:

1) Place shunts on JU5, JU6, JU7, JU10 and JU14 (Refer to table 1 for details).

2) If the EV kit is to be used without the optional shutdown transistor (Q1), place a shunt on JU13.

3) Remove the shunt from JU1 to use the filter inductor.

4) To enable the outputs, connect TX_DISABLE to GND by placing a shunt on JU9.

   Note: When performing the following resistance checks, manually set the ohmmeter to a high range to avoid forward biasing the on-chip ESD protection diodes.

5) Adjust R15, the R_{MODSET} potentiometer, for 25kΩ resistance between TP6 and ground.

6) Adjust R16, the R_{APCSET} potentiometer, for 25kΩ resistance between TP4 and ground.

7) Adjust R17, the R_{PC_MON} potentiometer, to set the maximum monitor diode current (I_{MDMAX}, see below). R_{PC_MON} can be measured from TP10 to ground.

$$R_{PC\_MON} = \frac{1.38V}{I_{MDMAX}}$$

8) Adjust R14, the R_{BC_MON} potentiometer, to set the maximum bias current ($I_{BIASMAX}$, see below). R_{BC_MON} can be measured from TP11 to ground.

$$R_{BC\_MON} = \frac{76 \times 1.38V}{I_{BIASMAX}}$$

9) Apply a differential input signal ($200mV_{P-P}$ to $2400mV_{P-P}$) between SMA connectors J2 and J3 (IN+ and IN-).

10) Attach a high-speed oscilloscope with a 50Ω input to the SMP connector J1 (OUT+).

    Note: J1 has a DC voltage of approximately $V_{CC}/2$ and can have voltage swings greater than 1V. Care should be taken that the large swing and DC voltage do not damage the test equipment. An attenuator might be needed to make the signal compatible with the oscilloscope's input requirements.

11) Connect a +3.3V supply between TP2 (V_{CC}) and TP1 (GND) Adjust the power supply until the voltage between TP7 and ground is +3.3V.

12) Adjust R16 (R_{APCSET}) until the desired laser bias current is achieved.

$$I_{BIAS} = \frac{V_{TP3} - V_{TP5}}{5.11\Omega}$$

13) The MD and BIAS currents can be monitored at TP10 (V_{PC_MON}) and TP11 (V_{BC_MON}) using the equation below:

$$I_{MD} = \frac{V_{PC\_MON}}{R_{PC\_MON}}$$

$$I_{BIAS} = \frac{76 \times V_{BC\_MON}}{R_{BC\_MON}}$$

    Note: If the voltage at TP10 or TP 11 exceeds 1.38V, the TX_FAULT signal will be asserted and latched.

14) Adjust R15 until the desired laser modulation current is achieved.

$$I_{MOD} = \frac{\text{Signal Amplitude (V)}}{15\Omega}$$

Optical Evaluation

For optical evaluation of the MAX3735A, configure the evaluation kit as follows:

1) Place a shunt on JU18 to connect the FAULT indicator and remove shunt JU20 to use the filter inductor.

2) Place a shunt across pin 2 (MODSET) and pin 1 (R_{MODSET}) of JU21. This connects the MODSET pin to the R_{MODSET} potentiometer (R31).

3) Place a shunt across pin 2 (APCSET) and pin 3 (R_{APCSET}) of JU22. This connects the APCSET pin to the R_{APCSET} potentiometer (R30).

4) If the EV kit is to be used without the optional shutdown transistor (Q5), place a shunt on JU17.

5) To enable the outputs, connect TX_DISABLE to GND by placing a shunt on JU16.

6) The EV kit is designed to allow connection of a variety of possible laser/monitor diode pin configurations. Connect a TO-header style laser with monitor diode (Figure 1) as follows:

   - Keeping its leads as short as possible, connect the laser diode to two of the three pads in the cutout portion on the top (component) side of the PC board. Solder the laser diode cathode to the center pad, and solder the anode to either of the other two pads (they are both connected to V_{CC} through the shutdown transistor (Q5)).
   - Connect the monitor photodiode to two of the five pads on the bottom (solder) side of the PC board, directly below the laser diode pads. Connect the anode and cathode of the photodiode as shown in figure 1.

   Note: When performing the following resistance checks, manually set the ohmmeter to a high range to avoid forward biasing the on-chip ESD protection diodes.

7) Adjust R31, the R_{MODSET} potentiometer, for maximum resistance (≈50kΩ) between TP17 and ground. This sets the modulation current to a low value (<10mA). (Refer to the *Design Procedure* section of the MAX3735A data sheet.)

8) Adjust R30, the R_{APCSET} potentiometer, for maximum resistance (≈50kΩ) between TP19 and ground. This sets the photodiode current to a low value (<18uA). (Refer to the *Design Procedure* section of the MAX3735A data sheet.)

   WARNING: Consult your laser data sheet to ensure that 18µA of photodiode current and 10mA of modulation current does not correspond to excessive laser power.

9) Adjust R33, the R_{PC_MON} potentiometer, to set the maximum monitor diode current (I_{MDMAX}, see below).

$$R_{PC\_MON} = \frac{1.38V}{I_{MDMAX}}$$

10) Adjust R32, the R_{BC_MON} potentiometer, to set the maximum bias current ($I_{BIASMAX}$, see below).

$$R_{BC\_MON} = \frac{76 \times 1.38V}{I_{BIASMAX}}$$

11) Apply a differential input signal ($200mV_{P-P}$ to $2400mV_{P-P}$) between SMA connectors J5 and J4 (IN+ and IN-).

12) Attach the laser diode fiber connector to an optical/electrical converter.

13) Connect a +3.3V supply between TP12 (V_{CC}) and TP13 (GND). Adjust the power supply until the voltage between TP15 and ground is +3.3V.

14) Adjust R30 (R_{APCSET}) until the desired average optical power is achieved.

15) The MD and BIAS currents can be monitored at TP16 (V_{PC_MON}) and TP18 (V_{BC_MON}) using the equations below:

$$I_{MD} = \frac{V_{PC\_MON}}{R_{PC\_MON}}$$

$$I_{BIAS} = \frac{76 \times V_{BC\_MON}}{R_{BC\_MON}}$$

Note: If the voltage at TP16 or TP18 exceeds 1.38V, the TX_FAULT signal will be asserted and latched.

16) Adjust R31 (R_{MODSET}) until the desired optical amplitude is achieved. Optical amplitude can be observed on an oscilloscope connected to an optical/electrical converter. Laser overshoot and ringing can be improved by appropriate selection of R21 and C24, as described in the *Design Procedure* section of the MAX3735A data sheet.

Adjustment and Control Descriptions (see Quick Start first)

COMPONENT		NAME	FUNCTION
OPTICAL	ELECTRICAL		
D6	D2	Fault Indicator	LED is illuminated when a fault condition has occurred (Refer to the *Detailed Description* section of the MAX3735A data sheet).
JU22	—	—	Connects the APCSET pin to either the potentiometer or the Dallas digital resistor. Shunt pin 2 to pin 3 when using the potentiometer. Shunt pin 2 to pin 1 when using the Dallas DS1858 controller IC.
JU21	—	—	Connects the MODSET pin to either the potentiometer or the Dallas digital resistor. Place a shunt on pin 2 to pin 1 when using the potentiometer. Place a shunt on pin 2 to pin 3 when using the Dallas DS1858 controller IC.
JU19	—	WP	Can be used to enable and disable the write protection feature of the DS1858 controller IC.
JU20	JU1	—	Placing a shunt on JU1 or JU20 removes the inductor from the filter networks by shorting the inductor lead together. Remove shunts for normal operation.
JU18	JU5	—	Place a shunt on JU18 or JU5 to connect the open collector FAULT output to the LED indicator. The LED is illuminated when FAULT is asserted.
—	JU6	—	Placing a shunt on JU6 connects the MODSET pin of the MAX3735A to the R_{MODSET} potentiometer.
—	JU7	—	Placing a shunt on JU7 connects the emulated monitor diode current to the MD pin of the MAX3735A.
JU16	JU9	TX_DISABLE	Enables/disables the output currents. Active low (shunt across JU9 or JU16 to enable output currents).
—	JU10	—	Placing a shunt on JU10 connects the APCSET pin of the MAX3735A to the R_{APCSET} potentiometer.
JU17	JU13	—	Installing a jumper on JU13 or JU17 disables the optional shutdown transistors.
R31	R15	R_{MODSET}	Adjusts the laser modulation current
R30	R16	R_{APCSET}	Adjusts the monitor diode current level to be maintained by the APC loop
TP14	TP8	Fault	TTL high level indicates a fault condition. Installing and then removing JU16 for the optical section or JU9 for the electrical section will clear the fault condition (Refer to the *Detailed Description* section of the MAX3735A data sheet).

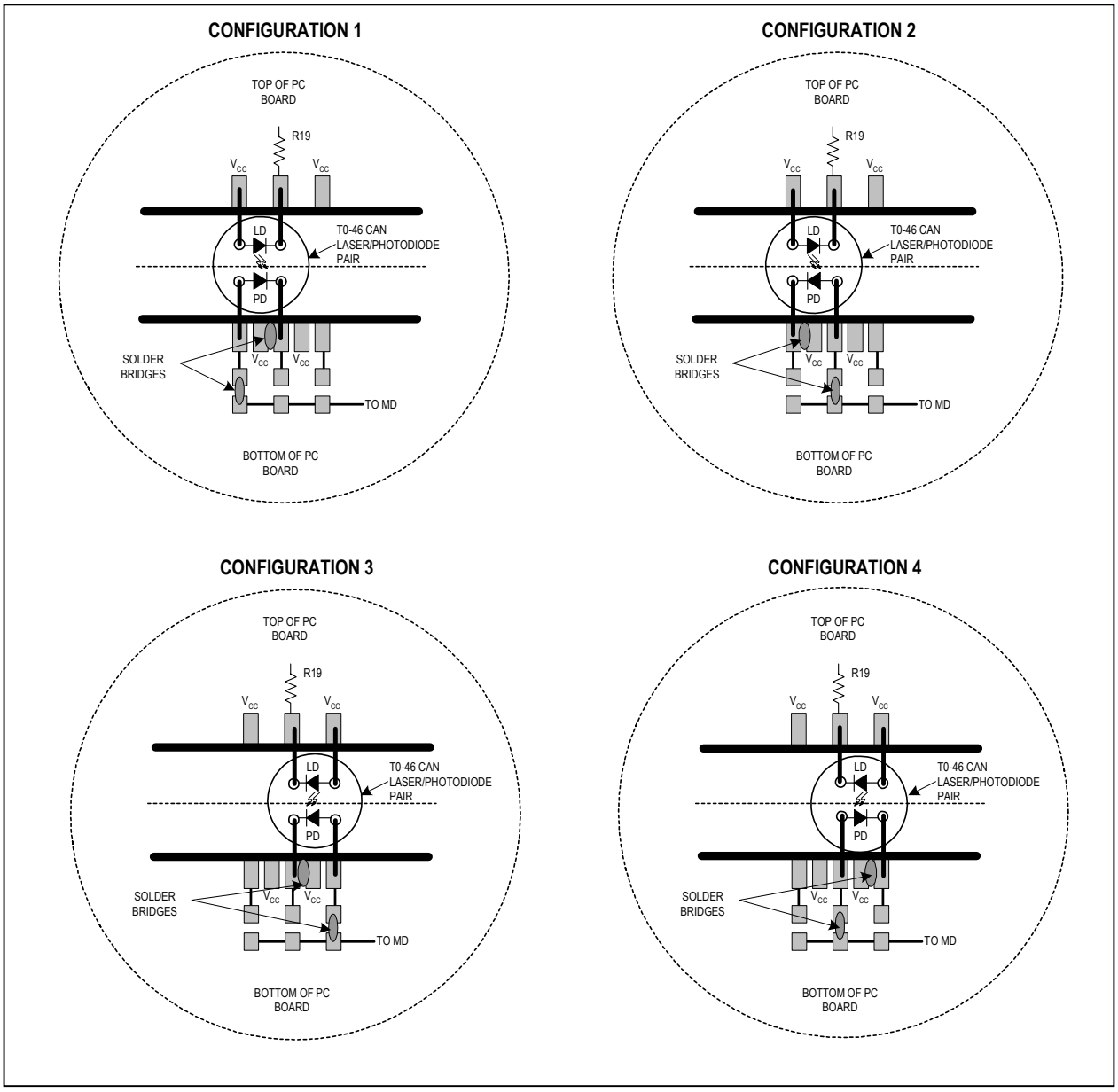

Figure 1. Attachment of Laser Diode/Monitor Diode to the MAX3735A EV Kit

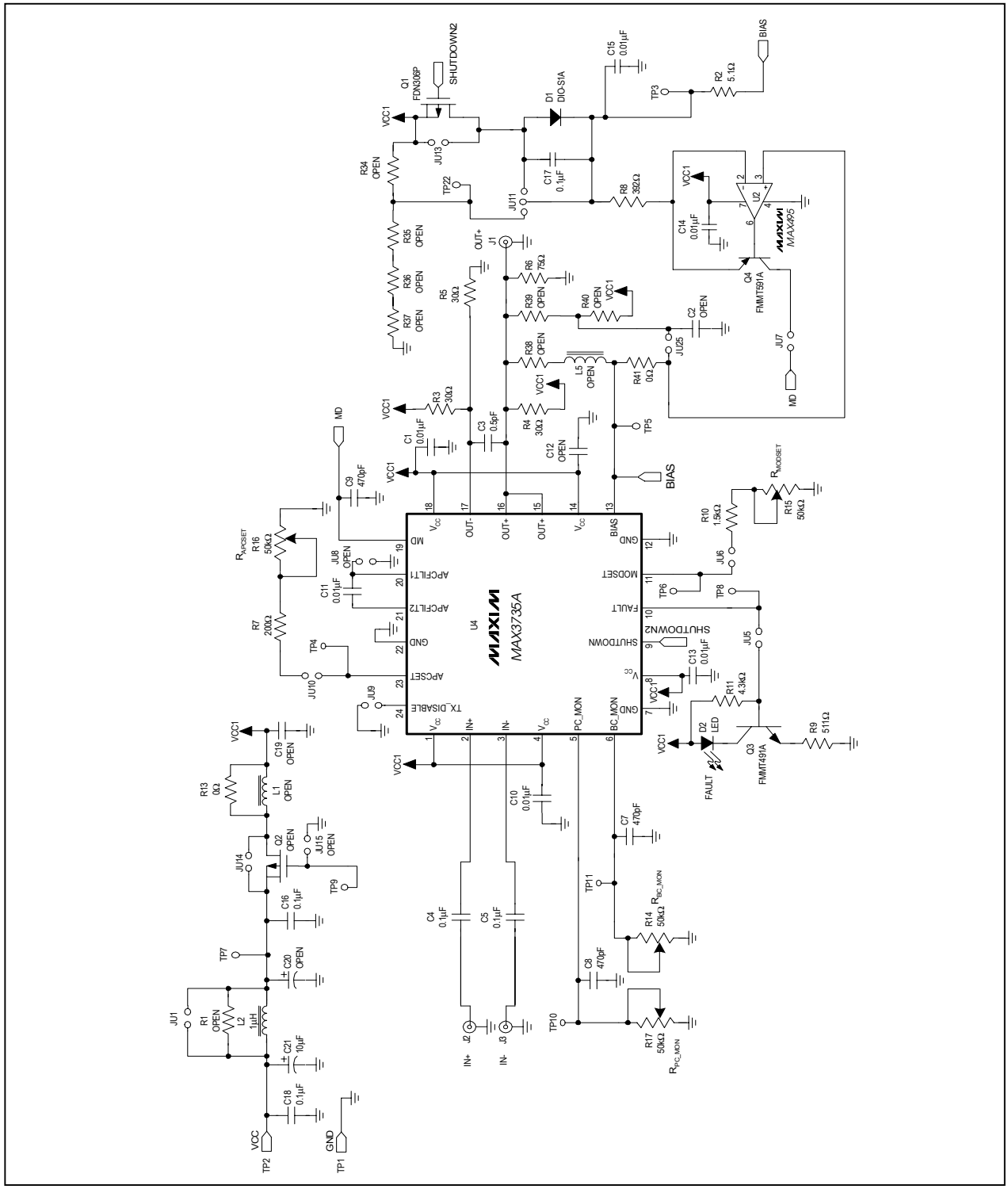

Figure 2. MAX3735A EV Kit Schematic—Electrical Configuration

MAX3735A Evaluation Kit

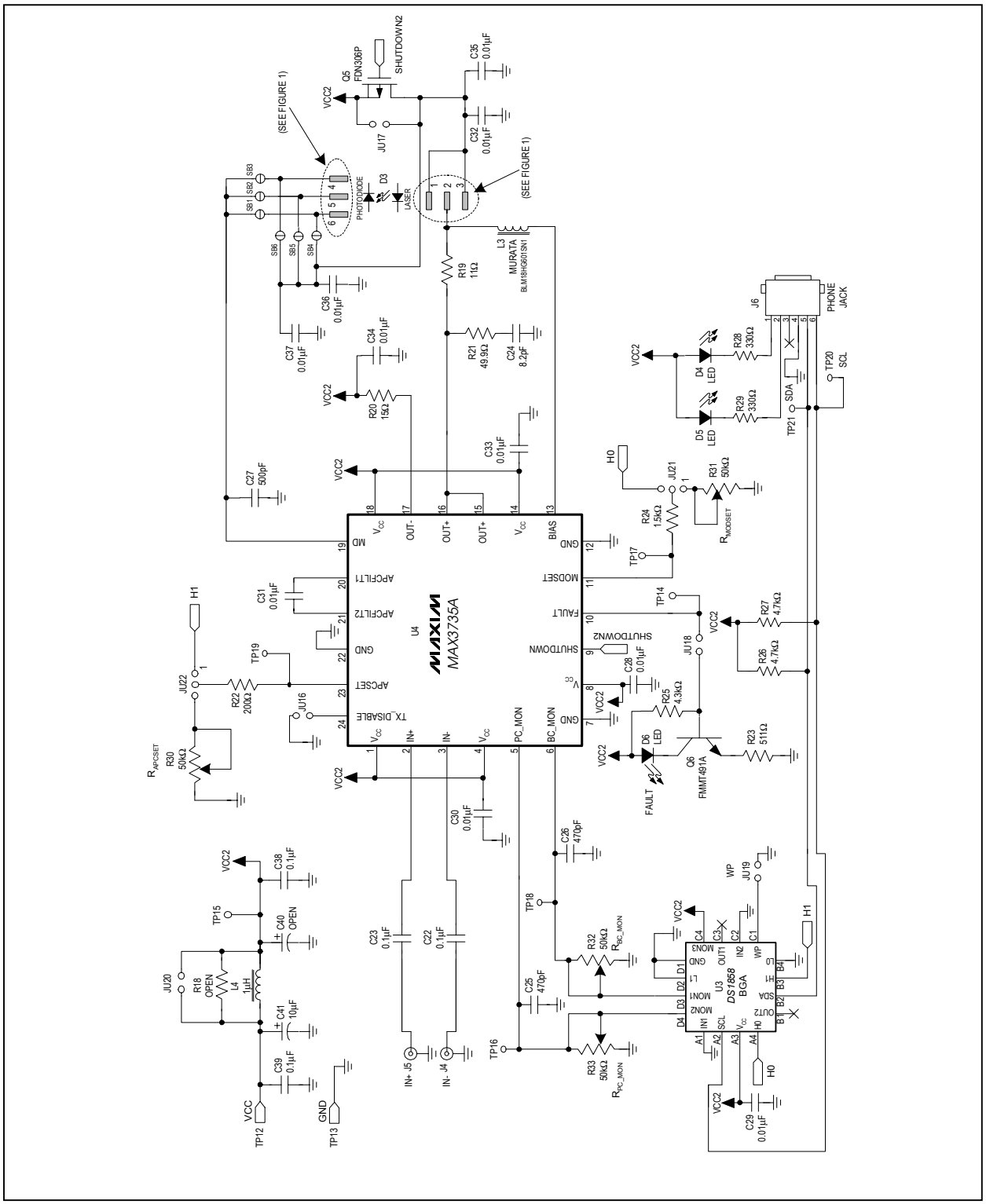

Figure 3. MAX3735A EV Kit Schematic—Optical Configuration

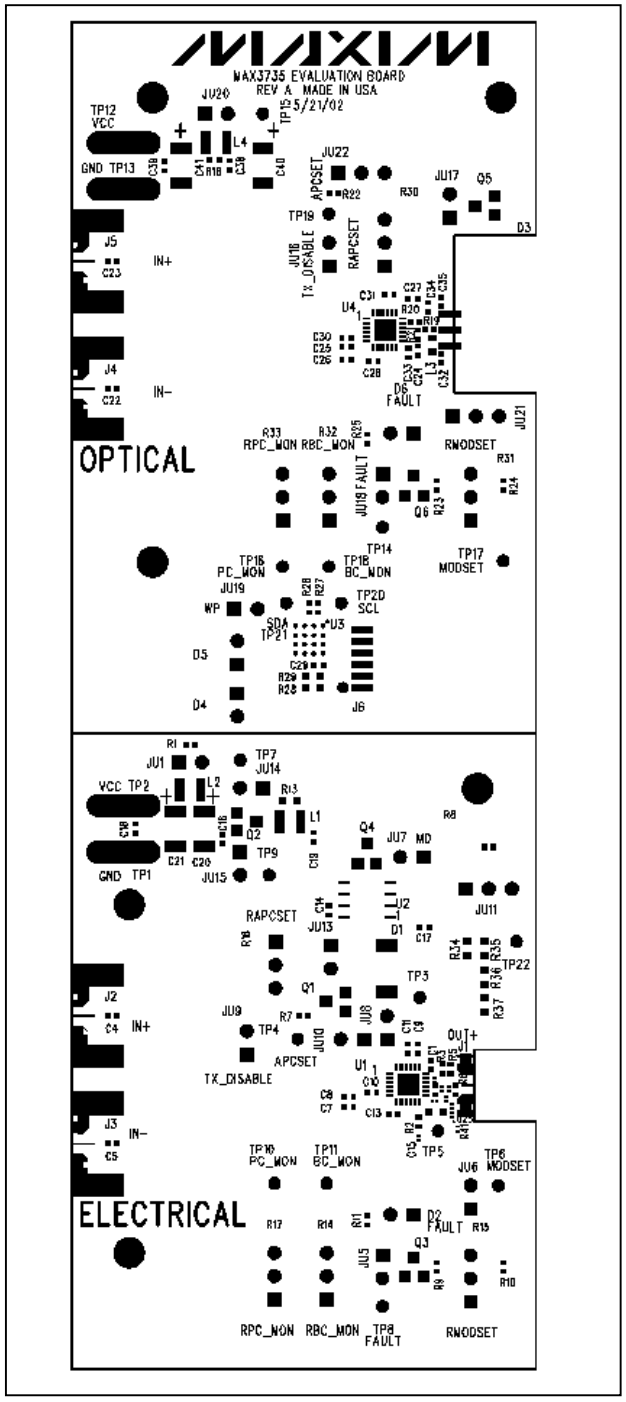

Figure 4. MAX3735A EV Kit PC Component Placement Guide—Component Side

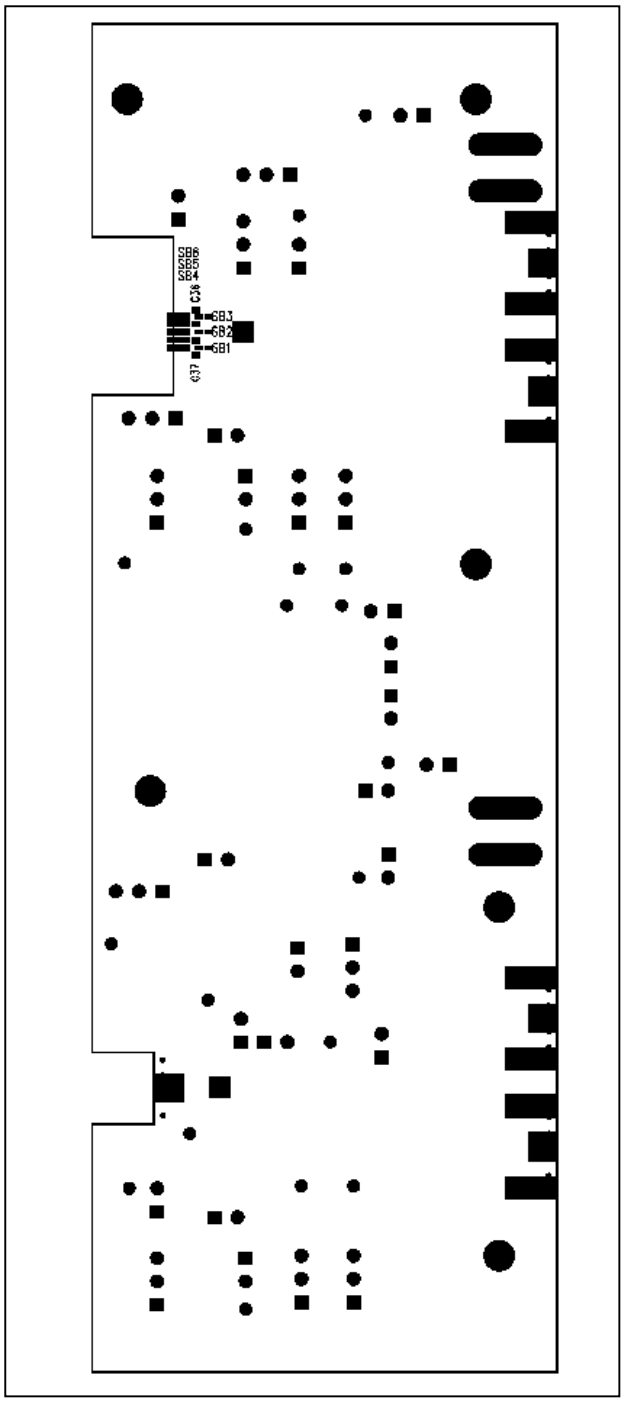

Figure 5. MAX3735A EV Kit PC Component Placement Guide—Solder Side

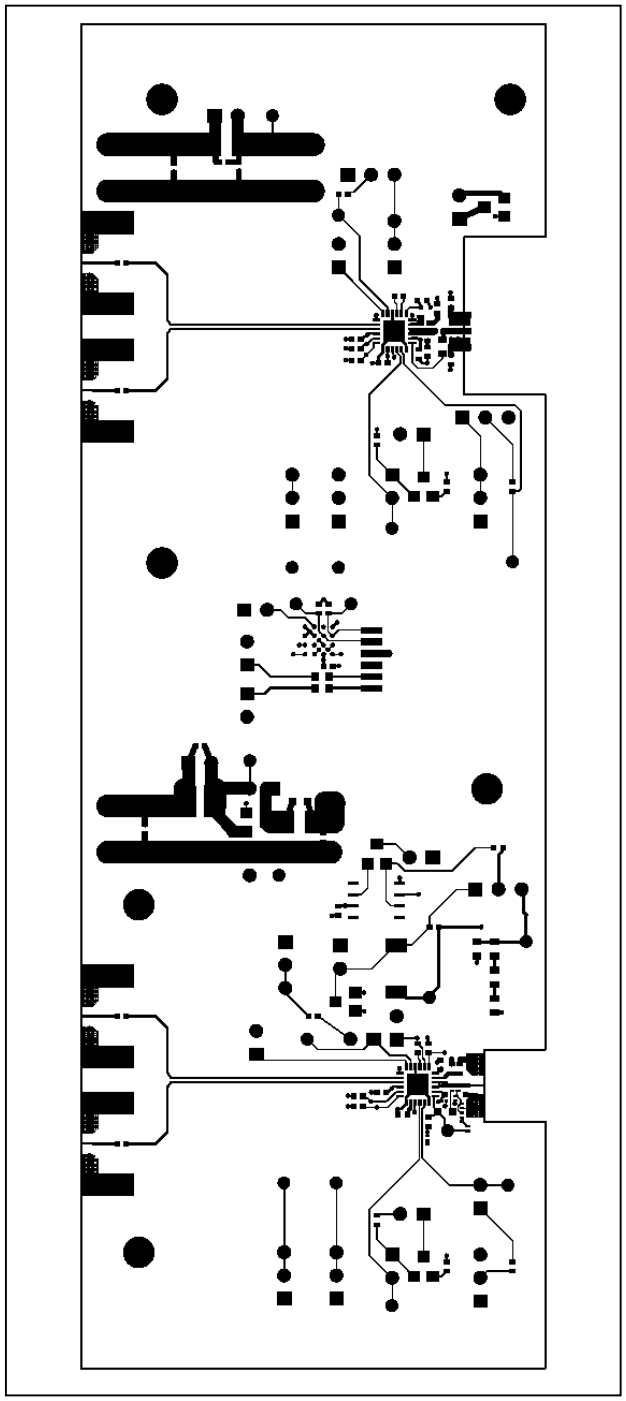

Figure 6. MAX3735A EV Kit PC Board Layout—Component Side

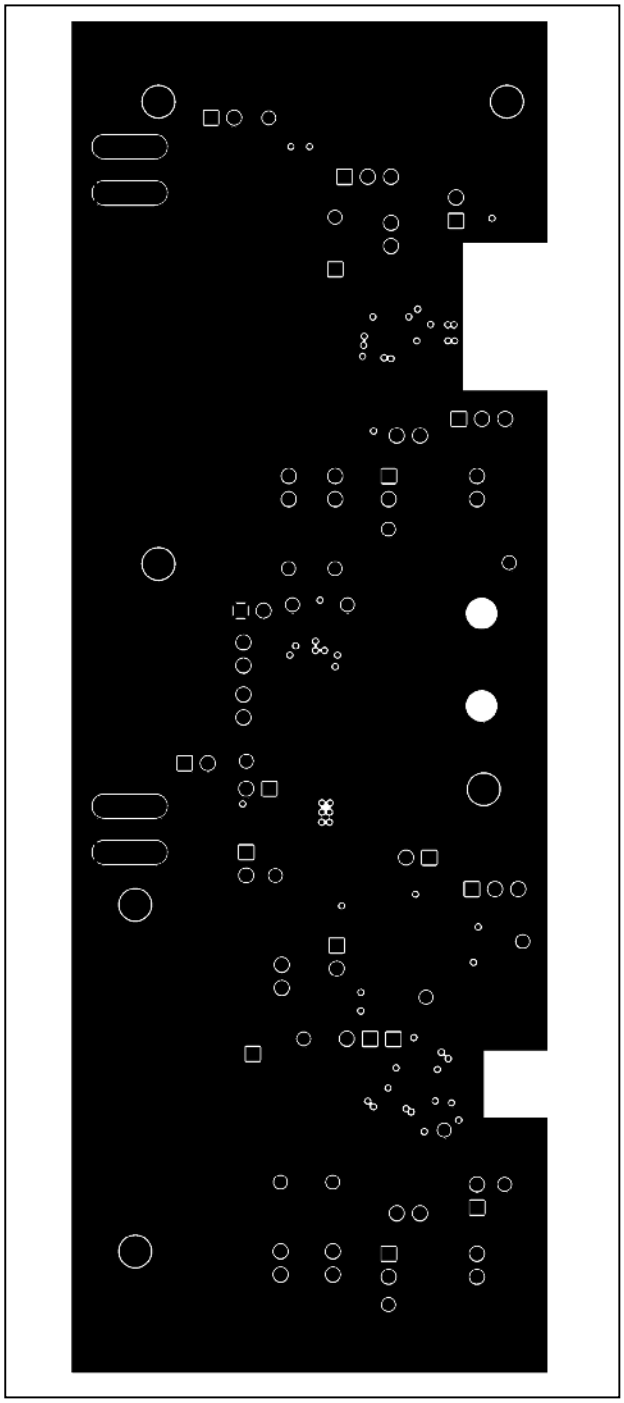

Figure 7. MAX3735A EV Kit PC Board Layout—Ground Plane

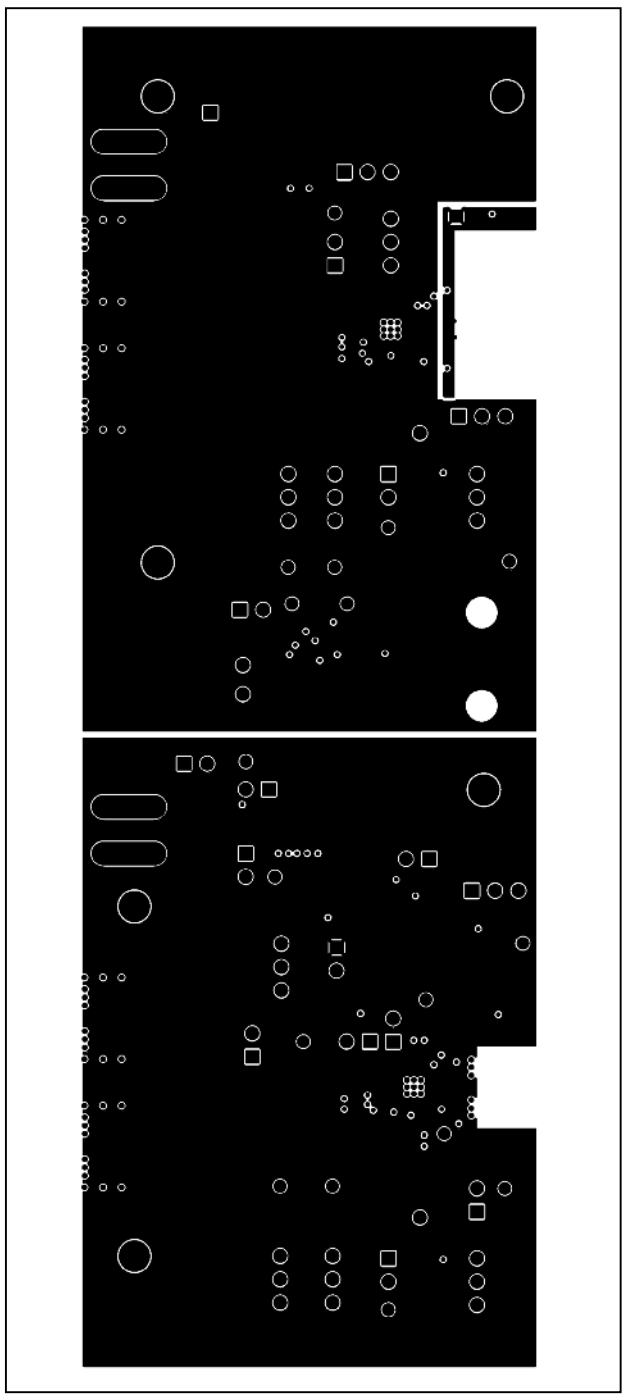

Figure 8. MAX3735A EV Kit PC Board Layout—Power Plane

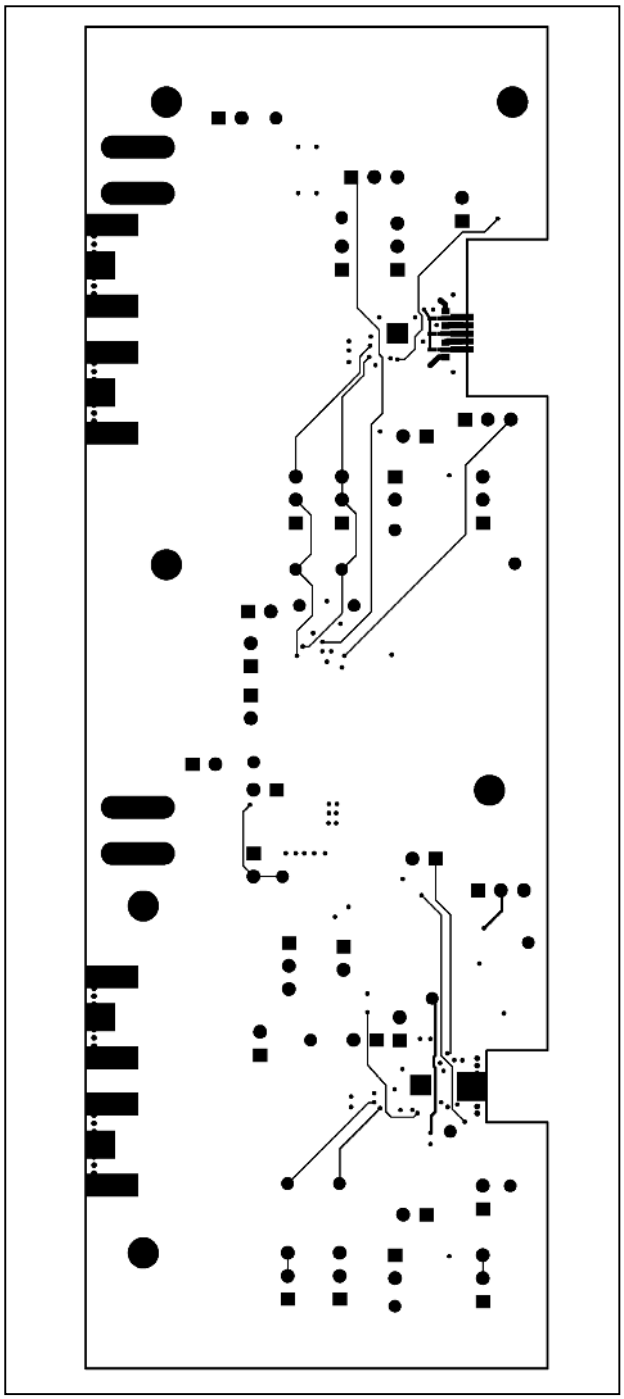

Figure 9. MAX3735A EV Kit PC Board Layout—Solder Side