19-3909; Rev 0; 11/05

MAX3643 Evaluation Kit

Evaluates: MAX3643

General Description

The MAX3643 evaluation kit (EV kit) is an assembled demonstration board that provides optical evaluation of the MAX3643 155Mbps to 1.25Gbps burst-mode laser driver. The through-hole output connection of the evaluation board allows connection with coaxial laser packages as well as BIDI packages.

Features

- **Drives Common-Anode Lasers**
- **Fully Assembled and Tested**
- **Adjustable Laser Bias Current**
- **Adjustable Laser Modulation Current**
- **Single +3.3V Power-Supply Operation**

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX3643EVKIT	-40°C to +85°C	24 Thin QFN

Component List

DESIGNATION	QTY	DESCRIPTION
C5–C8, C18, C30	6	0.1µF ±10%, 10V ceramic capacitors (0402)
C10, C12	2	2.2µF ±10%, 6.3V ceramic capacitors (0603)
C11, C24, C55	3	0.47µF ±10%, 10V ceramic capacitors (0402)
C13, C14	0	Not installed, capacitors (0402)
C15, C19	0	Not installed, capacitors (0805)
C16	1	10µF ±10% tantalum capacitor (B case)
C51	1	680pF ±10%, 10V ceramic capacitor (0402)
C53, C56	2	0.01µF ±10%, 10V ceramic capacitors (0402)
C54	1	9.1pF ±1%, 10V ceramic capacitor (0402)
D1	1	Laser, user-supplied
D6	1	15Ω ±5% resistor (0603)
D7	1	5.11Ω ±1% resistor (0603)
J9, J17	2	Test points
J14, J19	2	SMB connectors, PC mount
J23–J26	4	SMA connectors, edge mount
JP4–JP7, JP30, JP33	6	3-pin headers, 0.1in center

DESIGNATION	QTY	DESCRIPTION
JP9	1	2-pin header, 0.1in center
L3	1	27nH ±10% inductor (0402)
R17, R51, R54, R66	4	3.01kΩ ±1% resistors (0402)
R20, R52	2	50kΩ variable resistors
R42, R50, R53, R58, R60, R61, R72	7	1kΩ ±5% resistors (0402)
R43	1	20kΩ variable resistor
R55	1	13Ω ±5% resistor (0402)
R56, R83	2	10Ω ±5% resistors (0402)
R57	1	30.1Ω ±1% resistor (0402)
R82	1	24.3Ω ±1% resistor (0402)
R91, R92, R94, R95, R97, R98, R100, R101	0	Not installed, resistors (0402)
R103, R104	2	100Ω ±5% resistors (0402)
R113–R116	4	0Ω resistors (0402)
TP1, TP5, TP15, TP16, TP23	5	Test points
U2	1	MAX3643ETG (24-pin TQFN)
—	7	Shunts
—	1	MAX3643 EV kit PC board
—	1	MAX3643 data sheet

Quick Start

Procedures

To evaluate the MAX3643 with a laser diode, configure the evaluation kit as follows:

1) Solder a laser to through-hole connection D1. Use Figure 2 to determine which solder bridges (SB1 thru SB6) need to be shorted and how the laser should mounted on the EV kit. Be sure to keep the laser leads as short as possible to keep parasitic inductance minimized.

2) Connect a differential data source to IN+ (J26) and IN- (J25) and a differential burst-enable source to BEN+ (J24) and BEN- (J23). Make sure the differential signal (V_{IN}) is between 200mV$_{P-P}$ and 1600mV$_{P-P}$ and the common-mode is between (V_{CC} - 1.49V) and (V_{CC} - V_{IN} / 4).

If needed, an LVPECL load termination, a Thevenin equivalent load of 50Ω to (V_{CC} - 2V), can be created by doing the following:

- Remove differential 100Ω resistors R103 and R104
- Solder 130Ω resistors on R92, R94, R98, and R101
- Solder 82Ω resistors on R91, R95, R97, and R100

For more information see Maxim Application Note: *HFAN-01.0 Introduction to LVDS, PECL, and CML*.

3) Shunt the jumpers JP4–JP7, JP9, JP30, and JP33 according to your application's requirements (see the *Adjustment and Control Descriptions* section).

Below are the recommended settings for open-loop, or manual control of the laser power:

- JP4 – shunt left two pins
- JP5 – shunt left two pins
- JP6 – shunt bottom two pins
- JP7 – shunt left two pins
- JP9 – shunt pins
- JP30 – shunt left two pins
- JP33 – shunt right two pins
- R43 – turn pot clockwise until it clicks

4) Attach a 3.3V power supply to J9 (+3.3V) and J17 (GND). Set the current limit to 250mA.

5) Connect the output of the user-supplied laser to an optical-to-electrical converter that has the appropriate bandwidth for the intended application.

6) Turn on the power supply and adjust the laser power by adjusting the MODSET (R20) and BIASSET (R52) potentiometers. Turning the potentiometers clockwise will increase bias and modulation current. In a DC coupled open-loop configuration, MODSET will affect the P1 power level and BIASSET will affect the average power level, i.e. P0 and P1 will move together as the resistance on BIASSET is adjusted.

7) If the eye diagram contains too much overshoot or the edge rates are too slow, adjust the values of the RC filter components R57 and C54 to better match the characteristics of the laser.

8) If the laser does not seem to be putting out any power or the part shuts down when you increase the bias or modulation current, the IMAX resistance may be set too high. Turn off the power, remove the shunt from JP7, and measure the resistance from the center pin to GND. Setting this resistance to 0Ω will ensure that the maximum amount of bias and modulation current can be achieved. **Note:** For proper operation the minimum resistance from IMAX to GND is 3kΩ.

Using the EV Kit

Measuring MDOUT

The voltage at MDOUT is internally forced to 1.2V during the burst-on period. When the MAX3643 transitions to a burst-off period the voltage at MDIN is sampled and then mirrored at MDOUT during the burst-off period. If the monitor diode has a high bandwidth the MDIN voltage will fall significantly while being sampled, resulting in a lower/inaccurate voltage at MDOUT. To compensate for this, solder a capacitor to C13. Start with 22pF and check to see if the voltage on MDIN reaches > 90% of steady-state during the minimum burst-on period (use a high-impedance probe on MDIN). Maximizing the value of C13 while still making sure that the proper voltage during burst-on is reached at MDIN will minimize the amount of voltage error that occurs on MDOUT.

There is also a certain amount of voltage shifting that occurs burst-to-burst on MDOUT. The voltage shift is due to differences in data mark-density during the burst-on period (see Figure 1). The fewer the number of bits in the burst-on period, the larger the voltage shifts at MDOUT. Therefore it is necessary to filter or average the MDOUT voltage to reduce the shifting effects.

NOTE: the resistance at MDIN (R72) may need to be adjusted to obtain approximately 1.2V at MDIN during the burst-on time period. Setting the operating voltage at MDIN to 1.2V maximizes the margins for this pin and MDOUT. R_{MDIN} can be computed by dividing 1.2V by

the expected monitor diode current at the nominal average operating laser power. Setting the operating point at 1.2V will cause any droop up or down of MDOUT to be minimized.

Controlling I_{BIAS} and I_{MOD} from External Voltages

The modulation and bias current can be controlled from external sources by applying the controlling voltage at TP15 (for controlling modulation current) and TP23 (for controlling bias current). Jumpers JP30 and JP33 must be set properly when driving TP15 and TP23 (see the *Adjustments and Control Descriptions* section).

When setting the bias and modulations currents using VMSET and VBSET, the following equations can be used to determine the amplitudes:

$$I_{MOD} = \frac{V_{MSET}}{R_{MODSET} + 50\Omega} \times 88$$

$$I_{BIAS} = \frac{V_{BSET}}{R_{BIASSET} + 50\Omega} \times 88$$

Note: The 50Ω resistances in the above equations are the internal resistances on the MODSET and BIASSET pins. The usable voltage range on VBSET and VMSET is 5mV to 1.4V.

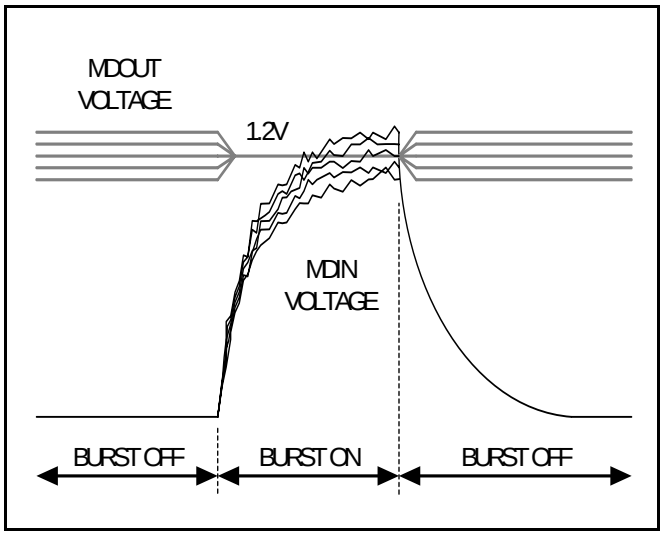


Figure 1. Relationship Between MDIN and MDOUT Voltage

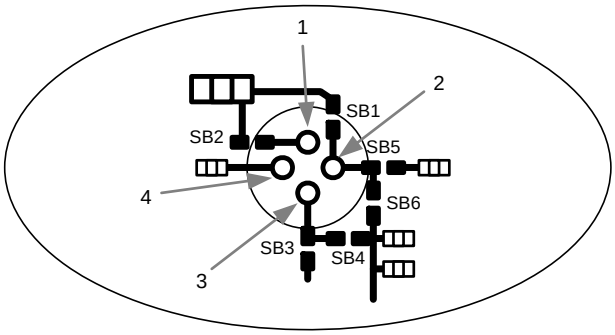
Adjustment and Control Descriptions (see Quick Start))

COMPONENT	NAME	FUNCTION
J9	MDOUT	The MDOUT voltage can be monitored by a high-impedance oscilloscope at this SMB connector
J14	BENOUT	The BENOUT voltage can be monitored by a high impedance oscilloscope at this SMB connector
JP4	MODSET SELECT	This jumper places either a 1kΩ resistor (shunt left two pins) or a 3.01kΩ resistor (shunt right two pins) between R20 and the MODSET pin
JP5	BIASSET SELECT	This jumper places either a 1kΩ resistor (shunt left two pins) or a 3.01kΩ resistor (shunt right two pins) between R52 and the BIASSET pin
JP6	$\overline{EN}$	This jumper is used to connect the $\overline{EN}$ pin to V_{CC} to disable the MAX3643 (shunt top two pins) or to GND to enable the part (shunt bottom two pins)

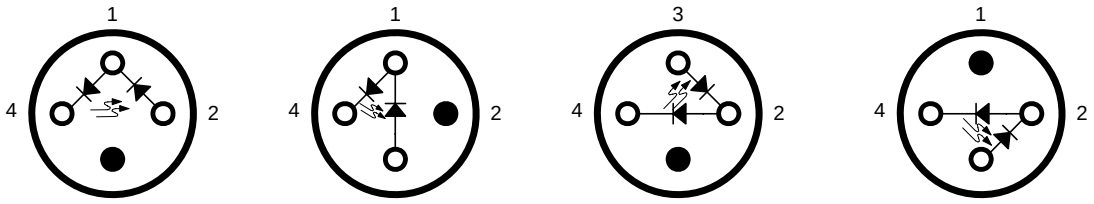
Adjustment and Control Descriptions (continued)

COMPONENT	NAME	FUNCTION
JP7	IMAX SELECT	This jumper places either a 1kΩ resistor (shunt right two pins) or a 3.01kΩ resistor (shunt left two pins) between R43 and the IMAX pin
JP9	MDIN	This jumper allows the connection between the laser's monitoring diode to be disconnected from MDIN by removal of the shunt
JP30	VMSET SELECT	This jumper connects VMSET to either the VREF pin (shunt the left two pins) or to TP15 for external control (shunt right two pins)
JP33	VBSET SELECT	This jumper connects VBSET to either the VREF pin (shunt right two pins) or to TP15 for external control (shunt left two pins)
R20	MODSET RESISTOR	This potentiometer, in addition to the resistance selected by JP4, sets the external resistance on the MODSET pin. Turn the potentiometer clockwise to increase modulation amplitude.
R43	IMAX RESISTOR	This potentiometer, in addition to the resistance selected by JP7, sets the external resistance on the IMAX pin. Turn the potentiometer clockwise to increase the laser current limit.
R52	BIASSET RESISTOR	This potentiometer, in addition to the resistance selected by JP5, sets the external resistance on the BIASSET pin. Turn the potentiometer clockwise to increase bias current.
TP1	VREF	Monitoring point for the voltage at VREF
TP5	BCMON	Monitoring point for the voltage at BCMON
TP15	VMSET	Connection point for driving the VMSET pin
TP16	MDIN	Monitoring point for the voltage at MDIN
TP23	VBSET	Connection point for driving the VBSET pin

PC BOARD LAYOUT OF LASER SOCKET



BOTTOM VIEWS OF LASER PACKAGE AND
THEIR RELATED BOARD CONFIGURATIONS



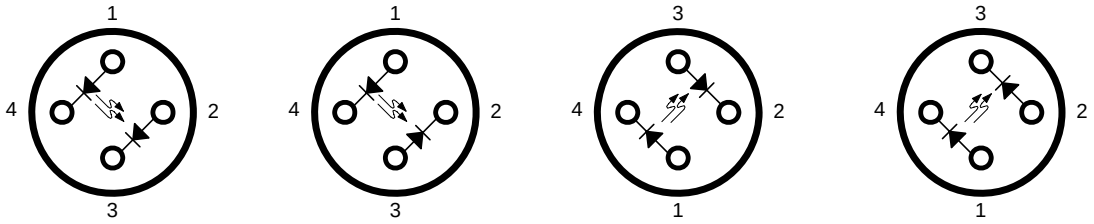


Figure 2. Optical Configurations

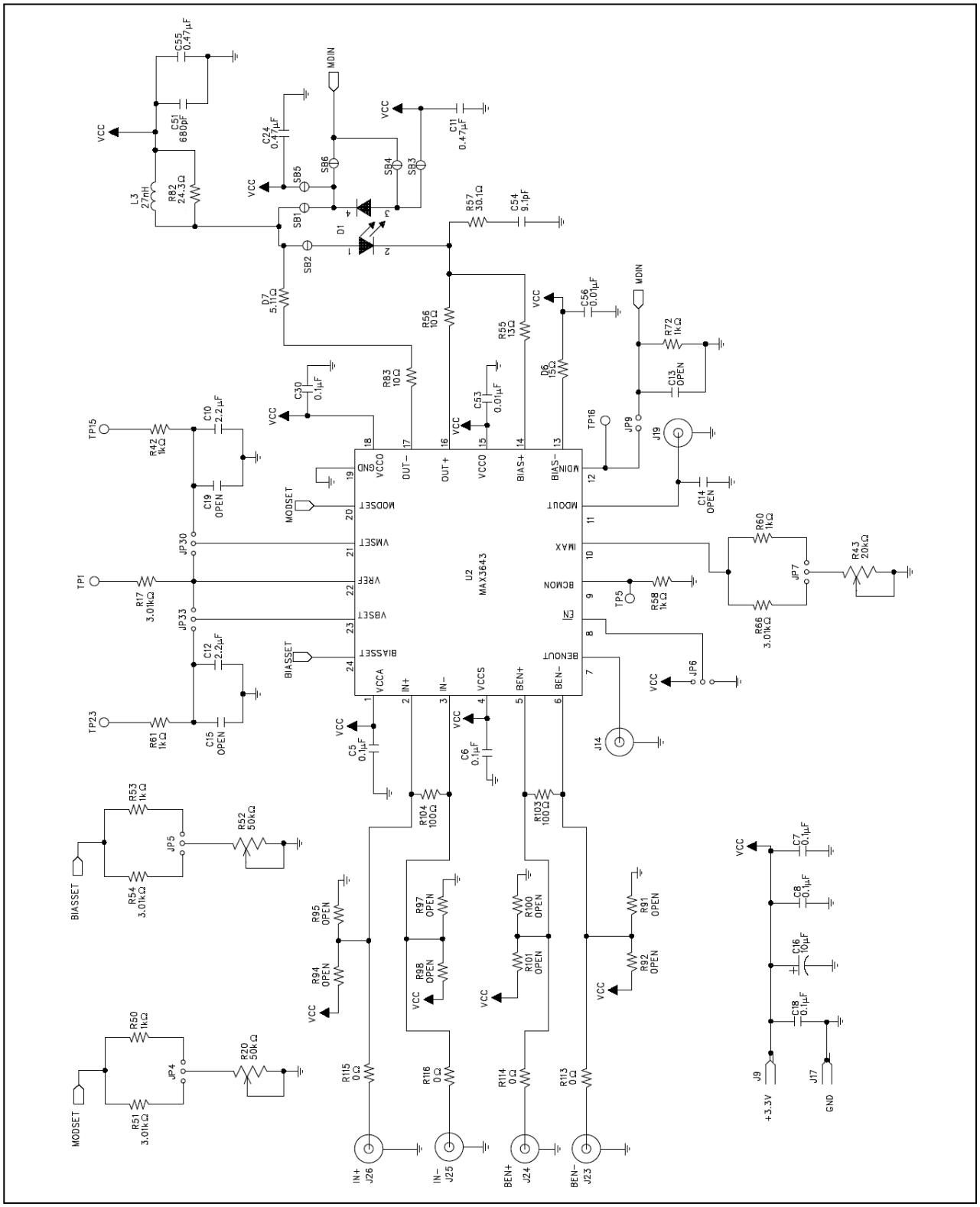


Figure 3. MAX3643 EV Kit Schematic

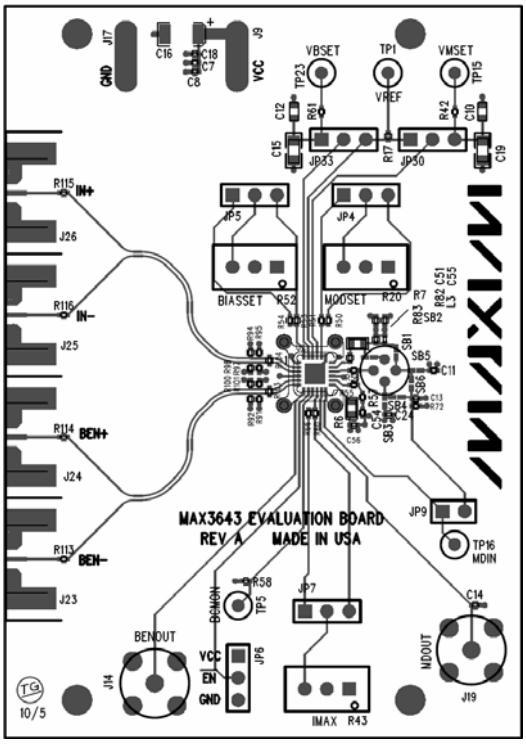


Figure 4. MAX3643 EV Kit PC Component Placement Guide—Component Side

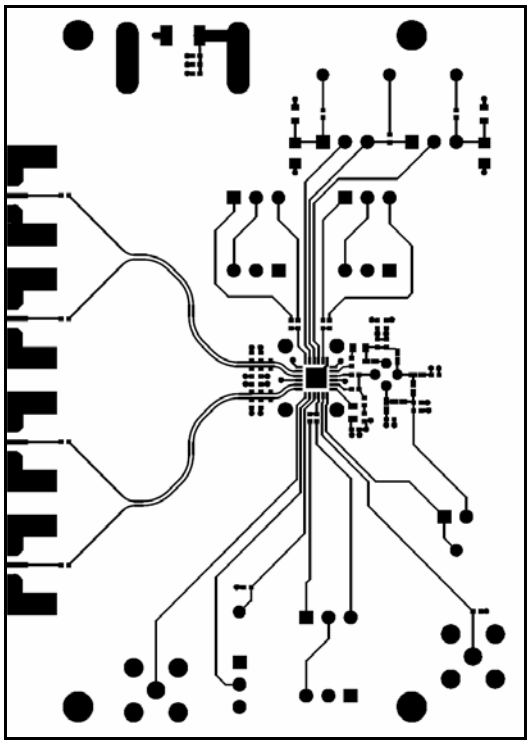


Figure 5. MAX3643 EV Kit PC Board Layout—Component Side

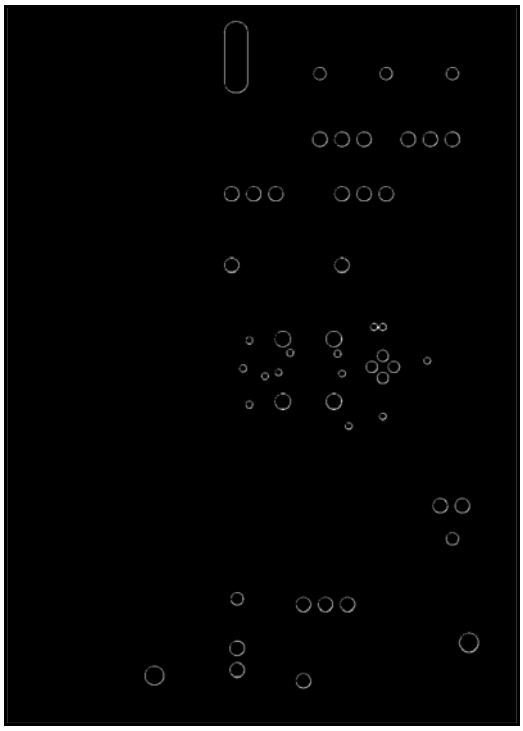


Figure 6. MAX3643 EV Kit PC Board Layout—Ground Plane

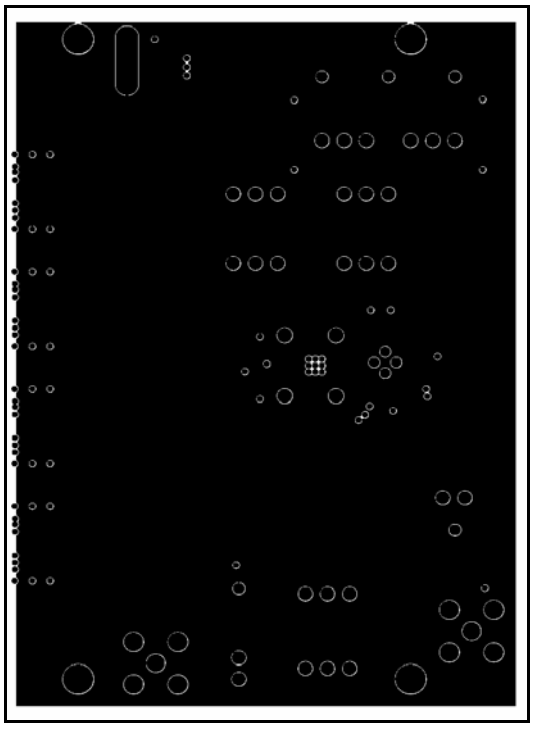


Figure 7. MAX3643 EV Kit PC Board Layout—Power Plane

Figure 8. MAX3643 EV Kit PC Board Layout—Solder Side