

19-2903; Rev 0; 7/03

# MAXIM

## MAX3656 Evaluation Kit

### General Description

The MAX3656 evaluation kit (EV-Kit) is an assembled demonstration board that provides optical and electrical evaluation of the MAX3656 155Mbps to 2.5Gbps laser driver. The optical output of the evaluation board allows connection with coaxial laser packages as well as BIDI packages. The electrical output of the evaluation board is interfaced to an SMP connector that can be connected to a 50Ω terminated oscilloscope.

### Features

- ◆ Fully Assembled and Tested
- ◆ Single +3.3V Power-Supply Operation
- ◆ Allows Optical and Electrical Evaluation

### Ordering Information

PART	TEMP. RANGE	IC PACKAGE
MAX3656EVKIT	-40°C to +85°C	24QFN*

\*Exposed Pad

### Electrical Evaluation Component List

DESIGNATION	QTY	DESCRIPTION
C16, C17, C25-C28	6	0.01μF ±5% ceramic capacitors (0402) Murata GRM36X7R103J016AD
C5, C6, C8	3	0.1μF ±10% ceramic capacitors (0402) Murata GRP155R61A104K
C7	1	10μF tantalum capacitor (B CASE) AVX TAJB106K010R
D1	1	LED, green T1 package
J1-J4, J11	5	SMA connectors, tab contact (edge mount) Johnson 142-0701-851
J10	1	SMP 698 (edge mount) Johnson 131-1701-201
J5, J7, J9, J12, J13	5	Open
JP5	1	Open
JP6, JP7, JP9, JP11, JP16	5	1X2 pin headers (0.1in centers)
JP8, JP10, JP12, JP13, JP15	5	1X3 pin headers (0.1 in centers)
Q0	1	FMMT591A Zetex
Q1	1	FMMT491A Zetex
R14	1	49.9Ω ±1% resistor (0402)
R20, R24	2	3kΩ resistor (0402)
R28, R32	2	26.7Ω resistor (0402)

DESIGNATION	QTY	DESCRIPTION
R2, R7, R12, R17, R29, R55, R67, R68, R70, R71, R74, R76, R77	13	Open
R1, R22, R26	3	50kΩ potentiometers (3296W) BOURNS Digi-Key 3296W-202-ND
R3, R36, R62-R65	6	0Ω resistor (0402)
R30	1	121Ω resistor (0402)
R33	1	35.7Ω resistor (0402)
R34	1	511Ω resistor (0402)
R39, R40	2	100Ω resistor (0402)
R52	1	30Ω resistor (0402)
R53	1	330Ω resistor (0402)
R54	1	4.64kΩ resistor (0402)
R8	1	4.42kΩ resistor (0402)
R9, R10	2	22.1Ω resistor (0402)
TP3, TP5, TP7, TP9, J17, J19	6	Test points Digi-Key 5000K-ND
U1	1	MAX3656ETG 24-QFN
U3	1	MAX495 8-SOIC
None	10	Shunts
None	1	MAX3656 EV Kit
None	1	MAX3656 data sheet

Evaluates: MAX3656

# MAX3656 Evaluation Kit

## Optical Evaluation Component List

DESIGNATION	QTY	DESCRIPTION
C10-C15, C30	7	0.01 $\mu$ F $\pm$ 5% ceramic capacitors (0402) Murata GRM36X7R103J016AD
C18, C20, C21, C32, C35-C37	7	0.1 $\mu$ F $\pm$ 10% ceramic capacitors (0402) Murata GRP155R61A104K
C19	1	10 $\mu$ F tantalum capacitor (B CASE) AVX TAJB106K010R
C24*	1	10pF ceramic capacitor (0402)
D2	1	LED, green T1 package
J14	1	Open
J16	1	Phone Jack Digi-Key A9036-ND
J23-J26	4	SMA connectors, tab contact (edge mount) Johnson 142-0701-851
JP25	1	1X2 pin headers (0.1in centers)
JP26, JP28, JP30, JP32, JP33	5	1X3 pin headers (0.1in centers)
L1	1	Open
Q4	1	FMMT491A Zetex
R103, R104	2	100 $\Omega$ resistor (0402)
R109, R122	2	15 $\Omega$ resistor (0402)
R118	1	Open
R121*	1	43 $\Omega$ resistor (0402)
R124	1	10 $\Omega$ resistor (0402)
R126	1	13 $\Omega$ resistor (0402)
R41, R42, R113-R116	6	0 $\Omega$ resistor (0402)
R43	1	511 $\Omega$ resistor (0402)
R44, R45	2	4.7k $\Omega$ resistor (0402)

DESIGNATION	QTY	DESCRIPTION
R61, R119	2	3k $\Omega$ resistor (0402)
R59, R79, R90	3	50k $\Omega$ potentiometers (3296W) BOURNS Digi-Key 3296W-202-ND
R82, R120	2	1.5k $\Omega$ resistor (0402)
R88	1	4.42k $\Omega$ resistor (0402)
R91, R92, R94, R95, R97, R98, R100, R101	8	Open
SB1-SB6	6	Solder Bridge
TP1, TP23, TP27, J18, J20	5	Test points Digi-Key 5000K-ND
U2	1	MAX3656ETG 24-QFN
U4	1	DS1847 14-TSSOP
None	6	Shunts
None	1	MAX3656 EV Kit
None	1	MAX3656 data sheet

\*These components are part of a compensation network to reduce overshoot and ringing caused by parasitic inductance of the laser. For most lasers the starting values will be R121 = 43 $\Omega$  and C24 = 10pF. These values should be experimentally tested to optimize the output waveform.

## Component Suppliers

SUPPLIER	PHONE	FAX
AVX	803-946-0690	803-626-3123
Digi-Key	218-681-6674	218-681-3380
Murata	814-237-1431	814-238-0490

Note: Please indicate that you are using the MAX3656 when ordering from these suppliers.

## MAX3656 Evaluation Kit

### Electrical Quick Start

The MAX3656 EV kit's electrical section comes equipped with APC open loop functionality, but can be configured for APC closed loop operation.

- 1) Install a shunt on JP15 from center pin to GND.
- 2) Install a shunt on JP13 from center pin to VCC.
- 3) Install a shunt on JP8, JP12, and JP10 from the center pin to R20, R24, and R8 respectively.
- 4) Set R22, R26, and R1 to 50k $\Omega$ . Measure their values on TP7, TP9, and TP5 respectively.
- 5) Connect the differential data signal on J1 and J2 with the common mode for each single ended signal within the MAX3656 data sheet limits.
- 6) Connect a +3.3V power supply to J17. Connect ground to J19.
- 7) Configure the MAX3656 in continuous mode operation in one of two ways.
  - a) Remove R39. Connect a 1k $\Omega$  resistor on R70 and a 3k $\Omega$  resistor on R71, R67, and R68.
  - b) Connect a +2.3V power supply on J3. Connect a +1.7V power supply on J4.
- 8) Connect J10 (OUT+) to a high-speed 50 $\Omega$  oscilloscope, through a DC blocking capacitor. An attenuator might be necessary to meet the oscilloscope requirements, since the voltage at OUT+ may exceed the maximum voltage for the oscilloscope. Reduce the resistance on R26 to change the amplitude of the modulation. The modulation current is the amplitude from the oscilloscope divided by 15 $\Omega$ , assuming no external attenuation.

### APC Open Loop

- 9) Remove shunts on JP9 and JP6.
- 10) Connect J11 to a high-speed 50 $\Omega$  oscilloscope. Reduce the resistance on R1 to change the amplitude of the bias. The bias current is the amplitude from the oscilloscope divided by 15 $\Omega$ .
- 11) Connect for burst mode operation by removing the voltage sources on J3 and J4 and removing R67, R68, R70, and R71. Install a 100 $\Omega$  resistor on R39.
- 12) Connect the burst signal on J3 and J4.

### APC Closed Loop

- 9) Remove R28 and R30. Install a 0 $\Omega$  resistor for R29.
- 10) Install shunts on JP9, JP6, JP16, and JP7.

- 11) Reduce the resistance on R22 to change the bias current. Change the bias current until the APC loop is operational. The APC loop is operational when the LED, D1, is lit.
- 12) The bias current is (VCC – Voltage at BIAS+) divided by 30 $\Omega$ .
- 13) Connect for burst mode operation by removing the voltage sources on J3 and J4 and removing R67, R68, R70, and R71. Install a 100 $\Omega$  resistor on R39.
- 14) Connect the burst signal on J3 and J4.

### Optical Quick Start

- 1) Install a shunt on JP26 from the center pin to GND.
- 2) Install a shunt on JP28 from the center pin to VCC.
- 3) Shunt JP25.
- 4) Install a shunt on JP33, JP30, and JP32 from the center pin to R120, R119, and R88 respectively.
- 5) Set R79, R59, and R90 to 50k $\Omega$ . Measure their values on TP27, TP23, and TP1 respectively.
- 6) Connect the differential data signal on J26 and J25 with the common mode for each single ended signal within the MAX3656 data sheet limits.
- 7) 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 as follows:
  - Keeping its leads as short as possible, connect the laser diode to two of the three pads 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 VCC).
  - 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.
- 8) Connect +3.3V power supply to J18. Connect ground to J20.
- 9) Configure the MAX3656 in continuous mode operation in one of two ways.
  - a) Remove R103. Connect a 1k $\Omega$  resistor on R101 and a 3k $\Omega$  resistor on R100, R92, and R91.
  - b) Connect a +2.3V power supply on J24. Connect a +1.7V power supply on J23.

## MAX3656 Evaluation Kit

- 10) Reduce the resistance on R90 to set the maximum allowable bias current.
- 11) Reduce the resistance on R79 to achieve the desired average power. The average power can be measured by connecting the output of the laser to an optical power meter.
- 12) Reduce the resistance on R59 to achieve the desired extinction ratio. The extinction ratio can be measured on an oscilloscope connected to an optical/electrical converter. Laser overshoot and ringing can be improved by appropriate selection of R121 and C24.
- 13) The APC loop is functional when the LED, D2, is lit.
- 14) Connect for burst mode operation by removing the voltage sources on J24 and J23 and removing R91, R92, R100, and R101. Install a 100Ω resistor on R103
- 15) Connect the burst signal on J24 and J23.

### **Adjustment and Control Descriptions (see Quick Start first)**

COMPONENT		NAME	FUNCTION
OPTICAL	ELECTRICAL		
D2	D1	FAIL	When lit the APC loop is tracking the average power and FAIL is high. When <u>not</u> lit the APC loop is not tracking the average power and FAIL is low.
JP25	JP16	---	Shunting drives the base of a transistor to switch LED on and off based on the TTL output of FAIL.
JP26	JP15	EN	When connected to VCC disables the MAX3656. When connected to GND enables the MAX3656.
JP28	JP13	LONGB	Connect the center pin to VCC or GND to set the LONGB pin.
---	JP7	---	Shunting this jumper sets $I_{MD}/I_{BIAS} = 1/11$ . Leaving this jumper open sets $I_{MD}/I_{BIAS} = 3/497$ .
---	JP6, JP9	---	Shunting these jumpers, removing R28 and R30, and installing a 0Ω resistor on R29 allows closed loop operation.
---	JP8	---	Allows connecting the APCSET pin to either the resistor, R20, or to a fixed, uninstalled resistor R17.
---	JP12	---	Allows connecting the MODSET pin to either the resistor, R24, or to a fixed, uninstalled resistor R7.
---	JP10	---	Allows connecting the BIASMAX pin to either the resistor, R8, or to a fixed, uninstalled resistor R12.
JP33	---	---	Allows connecting the APCSET pin to either the DS1847 or the resistor R120.
JP30	---	---	Allows connecting the MODSET pin to either the DS1847 or the resistor R119.
JP32	---	---	Allows connecting the BIASMAX pin to either the resistor, R88, or to a fixed, uninstalled resistor R118.

## MAX3656 Evaluation Kit

**Evaluates: MAX3656**

---	R76, R77, R2, R74, R67, R68, R70, R71	---	Allows for external DC biasing for PECL termination on the MAX3656 inputs. Remove R40 and R39 when connecting the resistors.
R94, R95, R98, R97, R101, R100, R92, R91	---	---	Allows for external DC biasing for PECL termination on the MAX3656 inputs. Remove R104 and R103 when connecting the resistors.
R79	R22	---	Adjusts the current going into APCSET, which is used to set the average power when APC loop is closed.
R59	R26	---	Adjusts the current going into MODSET, which is used to set the modulation current amplitude.
R90	R1	---	Adjusts the current going into BIASMAX, which is used to set the maximum bias current with closed APC loop and the bias current with open APC loop.

# MAX3656 Evaluation Kit

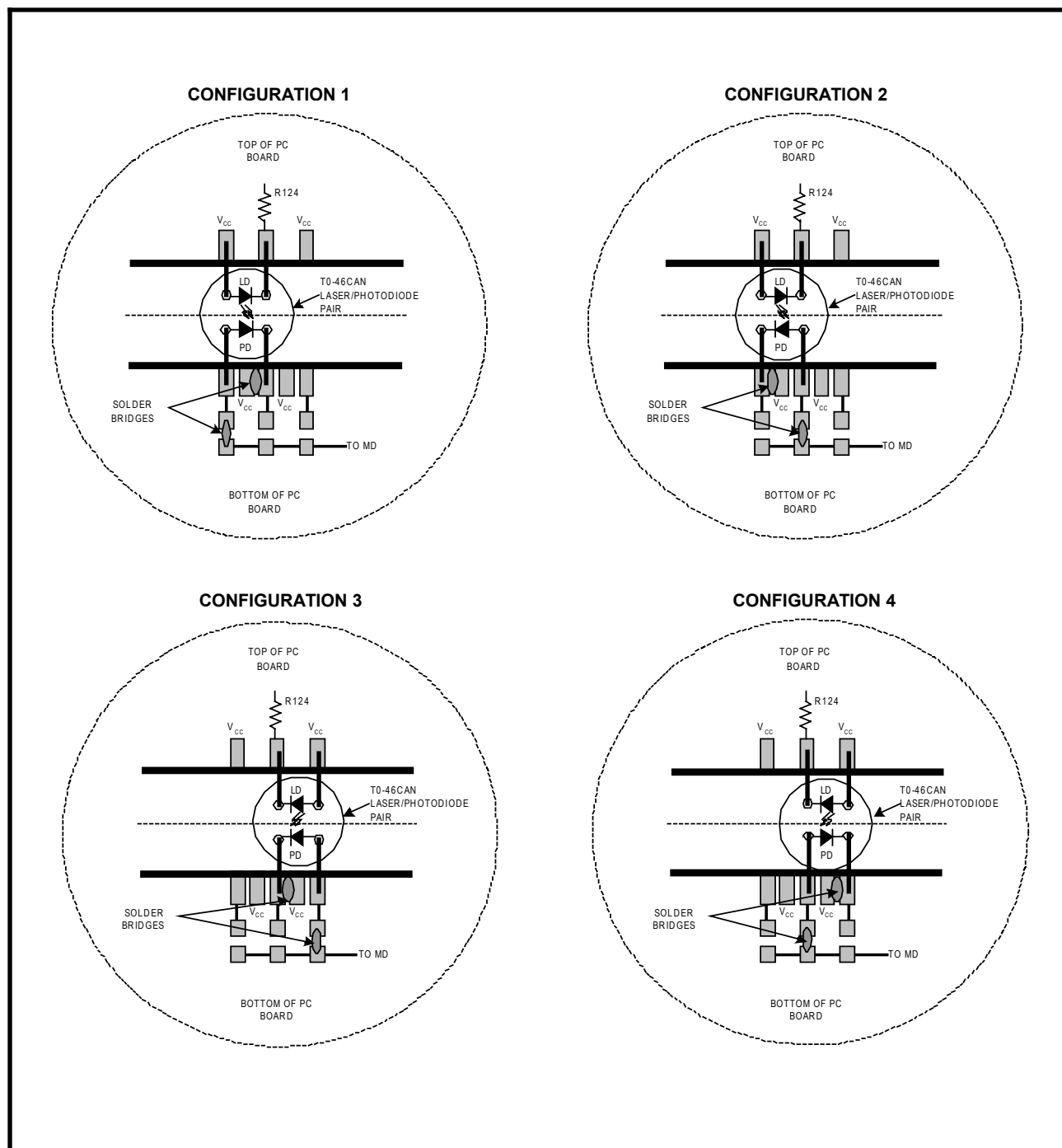


Figure 1. Attachment of Laser Diode/Monitor Diode to the MAX3656 EV kit

# MAX3656 Evaluation Kit

Evaluates: MAX3656

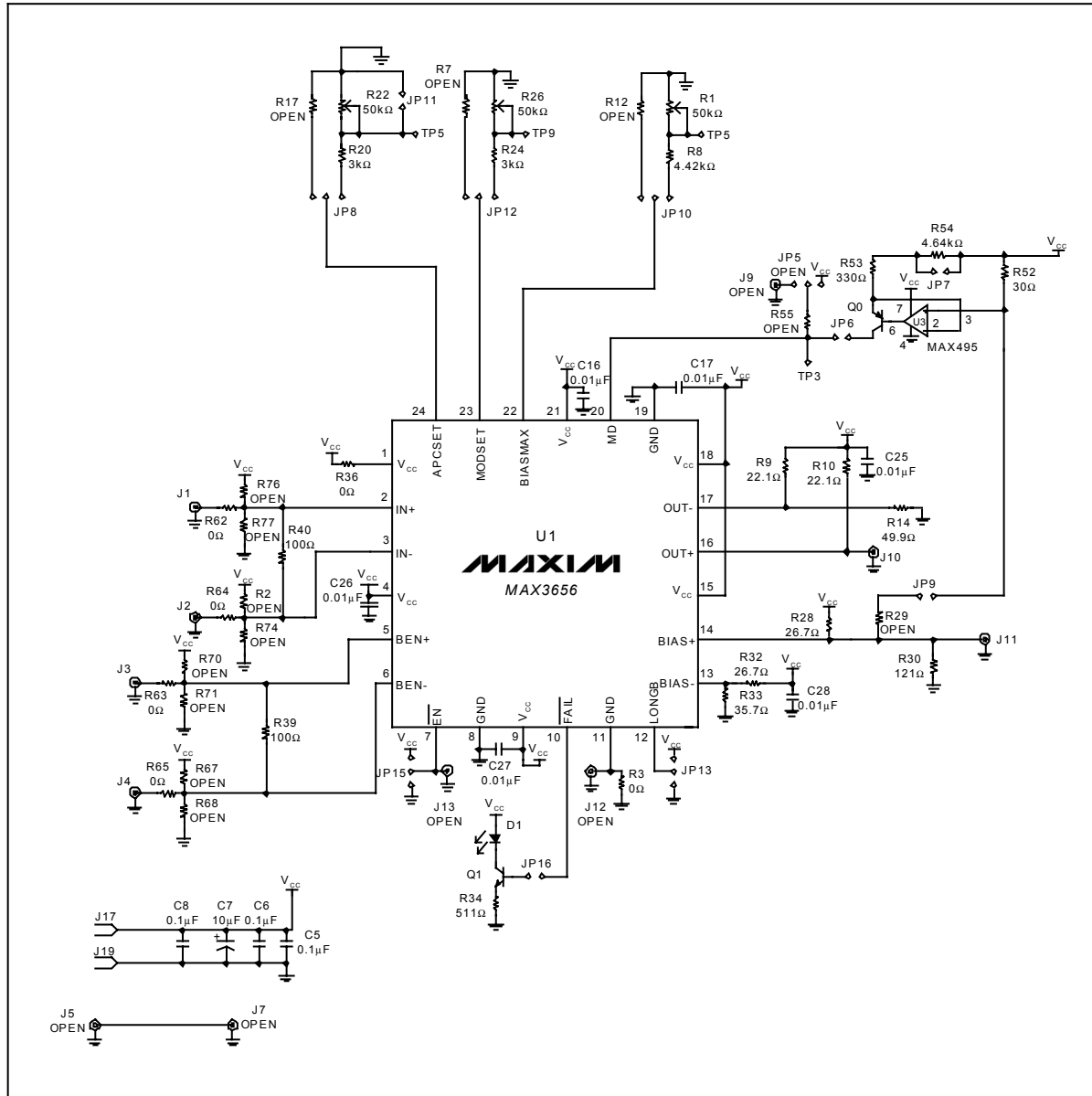
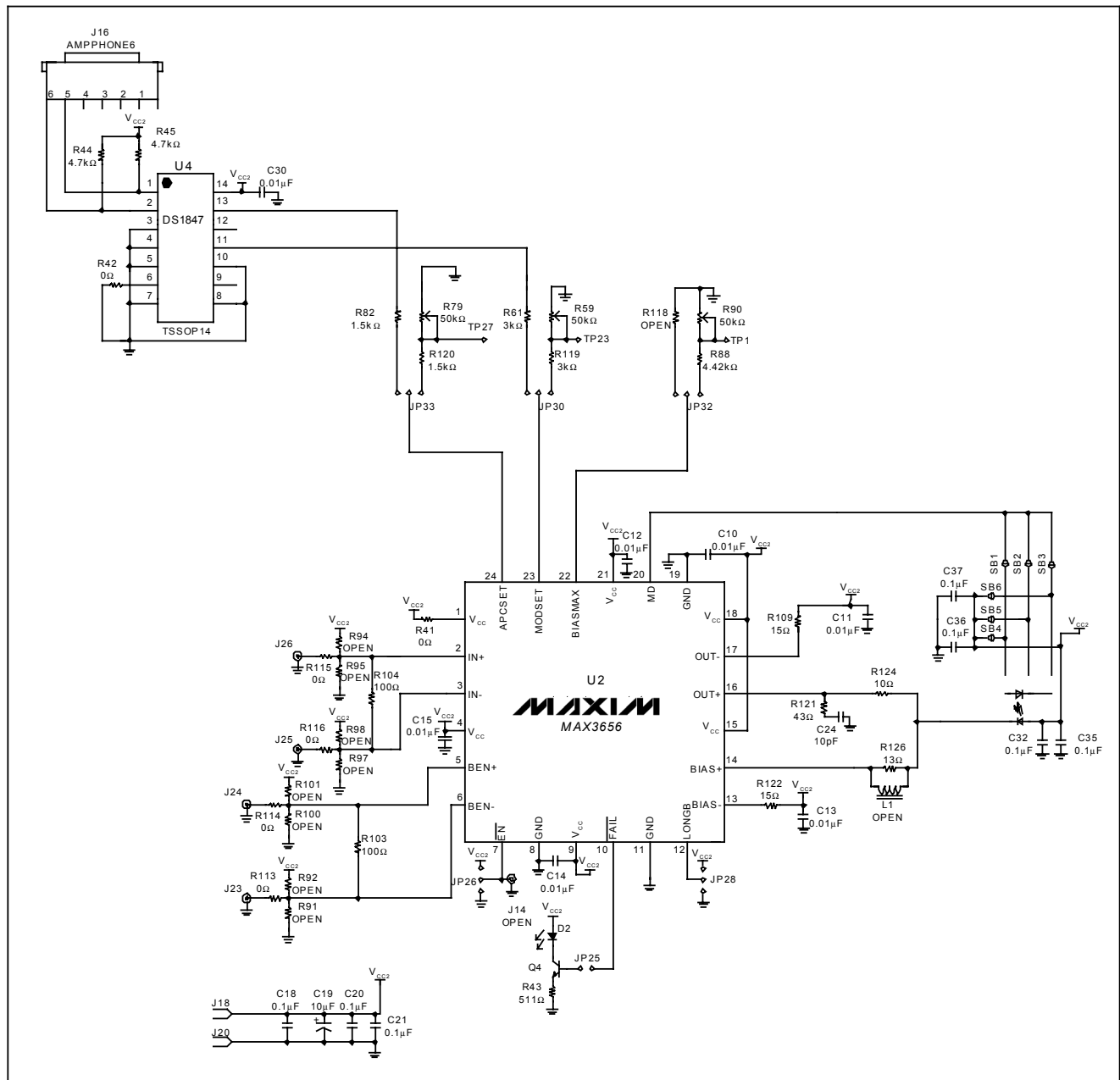


Figure 2. MAX3656 EV Kit Schematic-Electrical Configuration

## Evaluates: MAX3656





## MAX3656 Evaluation Kit

Evaluates: MAX3656

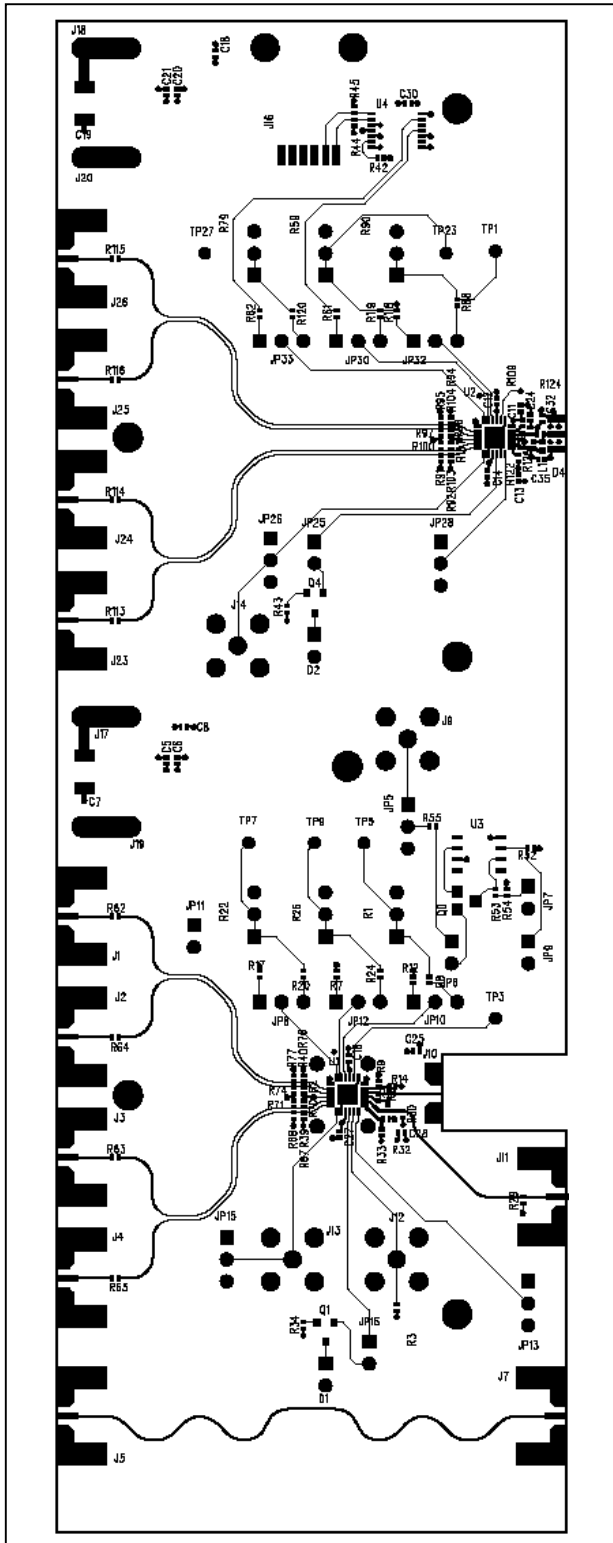


Figure 4. MAX3656 Component Placement Guide-Component Side

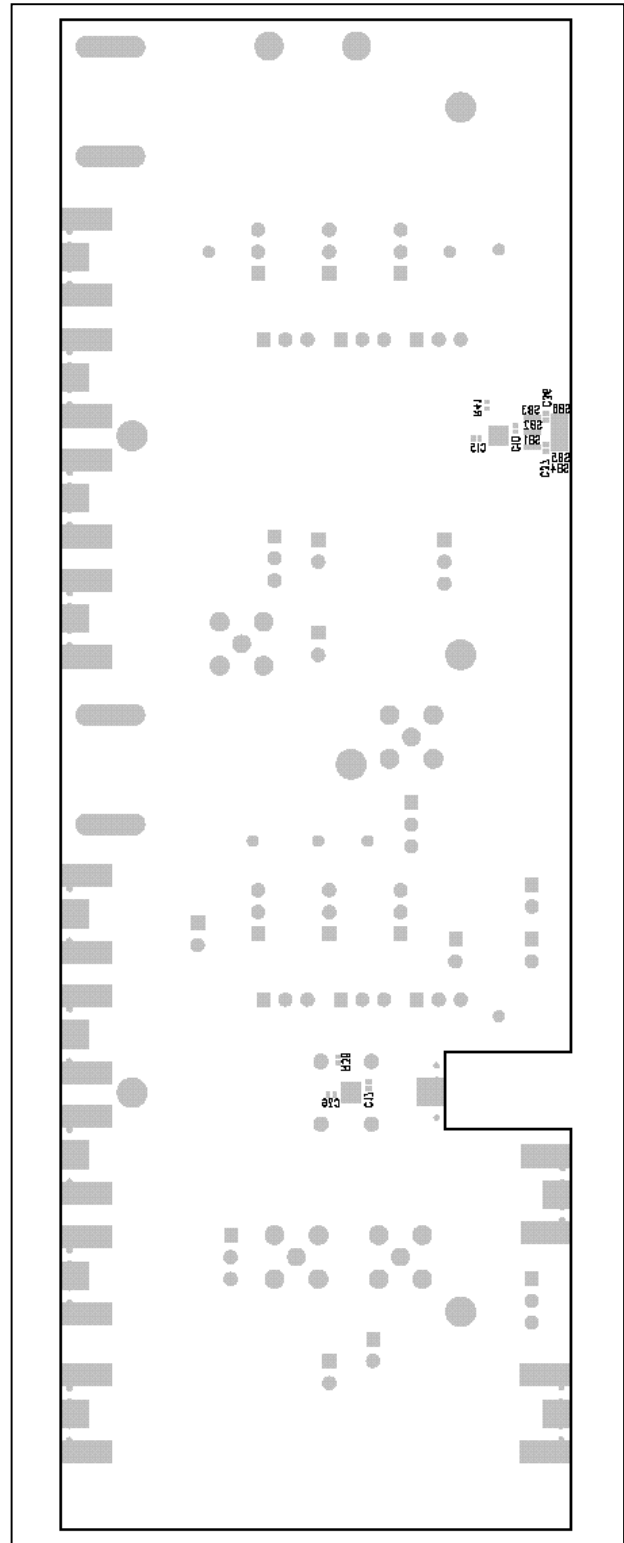


Figure 5. MAX3656 Component Placement Guide-Solder Side

## MAX3656 Evaluation Kit

**Evaluates: MAX3656**

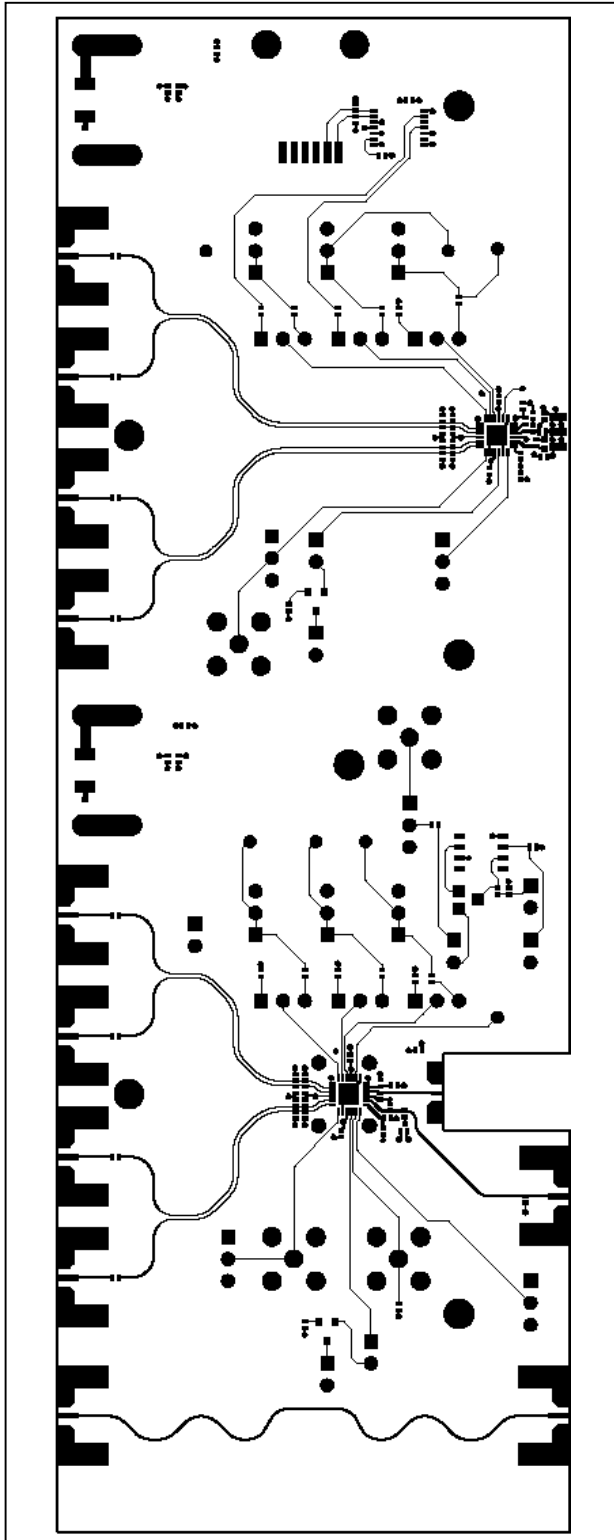


Figure 6. MAX3656 PC Board Layout-Component Side

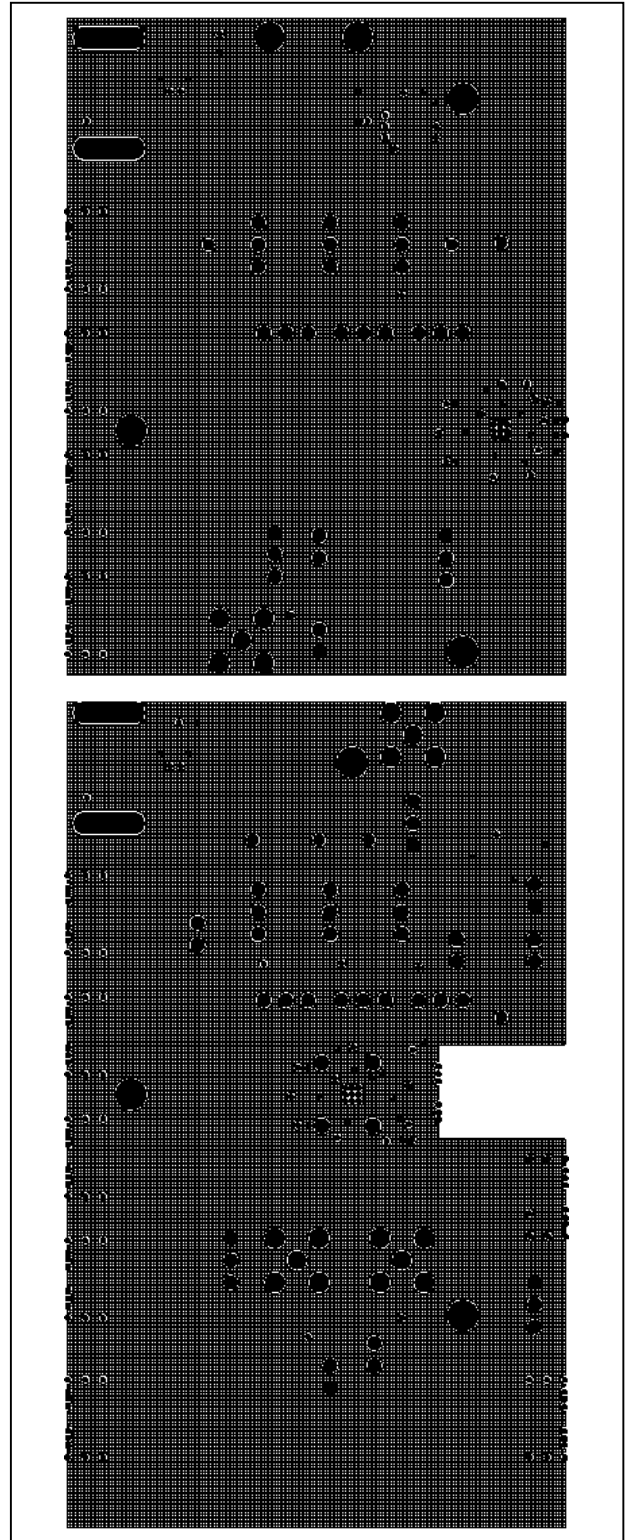


Figure 7. MAX3656 PC Board Layout-Ground Plane

## MAX3656 Evaluation Kit

Evaluates: MAX3656

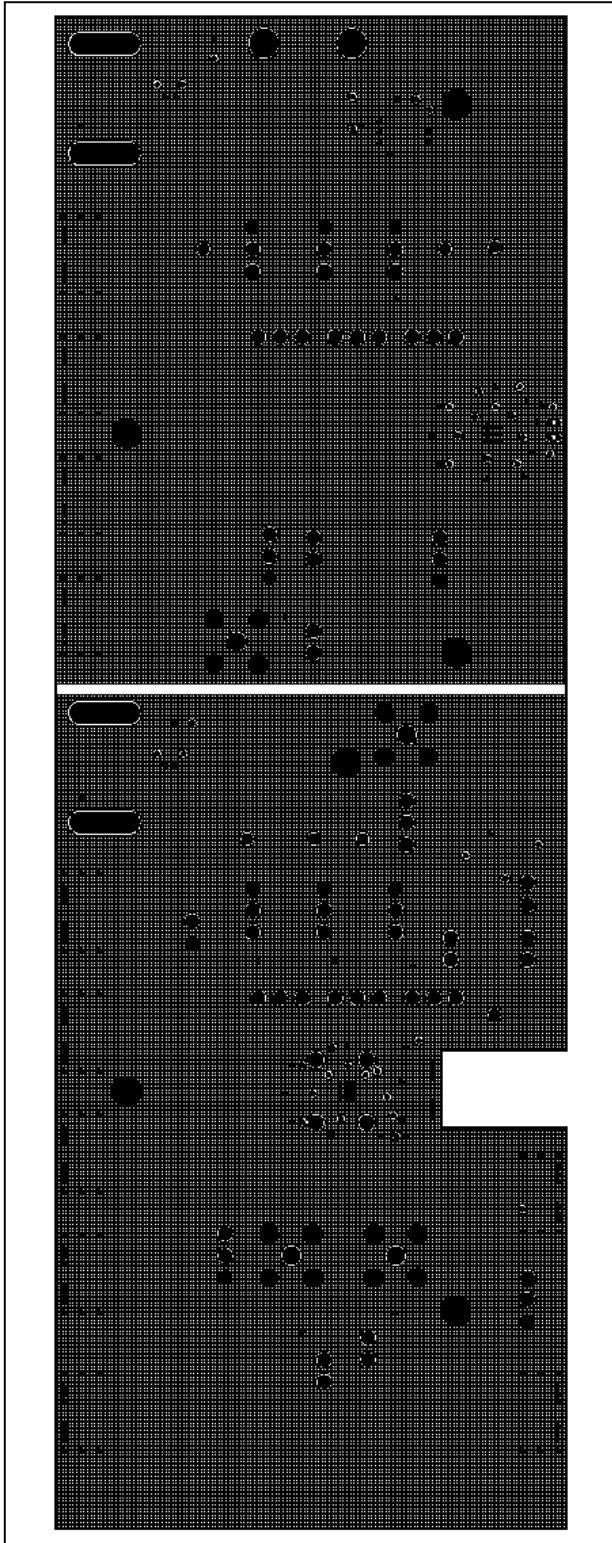


Figure 8. MAX3656 PC Board Layout-Power Plane

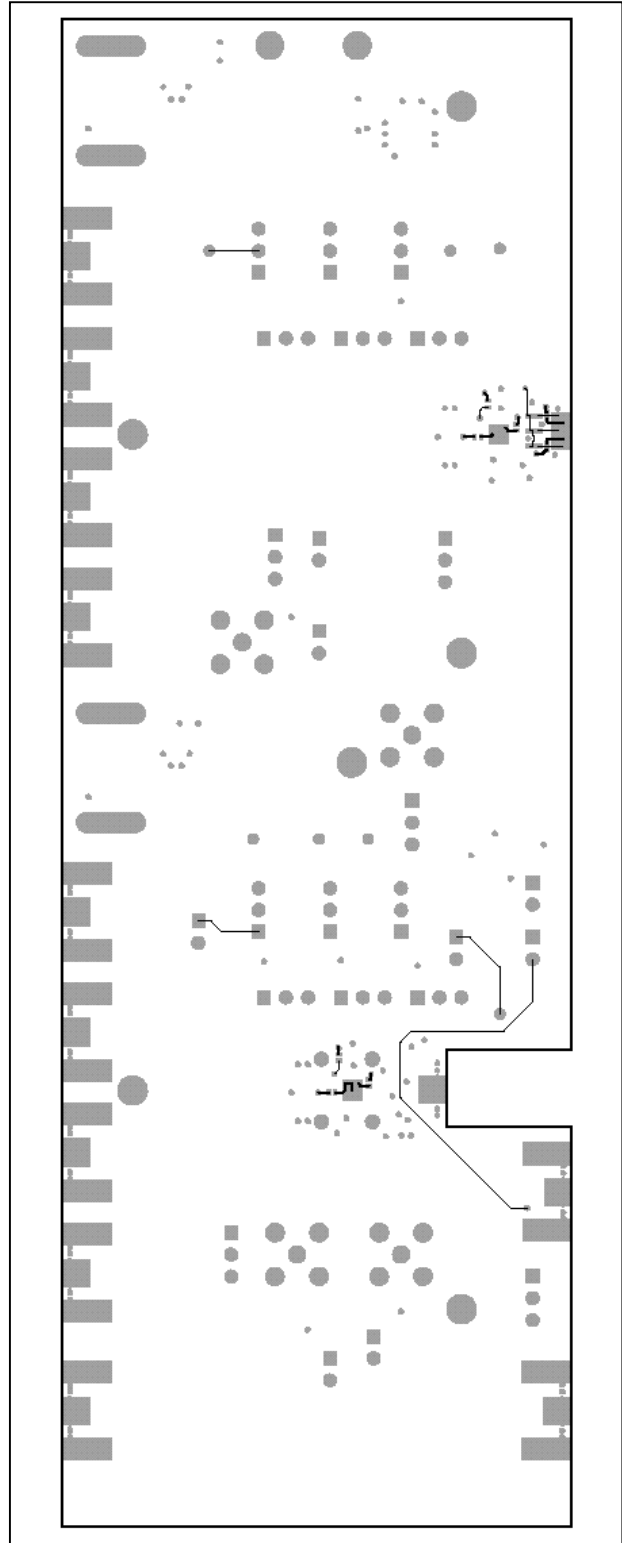


Figure 9. MAX3656 PC Board Layout-Solder Side

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.