19-4765; Rev 0; 7/98

MAXIM

# MAX3760 Evaluation Kit



## General Description

The MAX3760 evaluation kit (EV kit) simplifies evaluation of the MAX3760 transimpedance preamplifier. The MAX3760 is optimized for hybrid applications that place the preamplifier die in the same package with a photodetector. The EV kit uses a packaged version of the MAX3760 to simplify product evaluation. It allows both optical and electrical testing.

The MAX3760's input voltage is determined by internal circuitry. When the input is connected to a photodiode, the MAX3760's input voltage determines the reverse diode voltage. Electrical signal sources connected to the input must be AC coupled. AC coupling the input removes the signal's DC component. Many of the MAX3760's specifications are affected by the average DC input current, which is normally present when the input signal is derived from a photodiode. A current mirror and simple bias-tee are used to create a signal similar to that of a photodiode.

The MAX3760 EV kit has several mounting holes for inserting common photodiodes, allowing optical testing.

## Features

- **Single +5V Supply**
- **Differential Output Drives 100Ω Load**
- **560MHz Bandwidth**
- **Electrical or Optical Input**
- **Provision for User-Supplied Photodiode**
- **Fully Assembled and Tested**

## Ordering Information

| PART | TEMP. RANGE | BOARD TYPE |
|---|---|---|
| MAX3760EVKIT-SO | -40°C to +85°C | Surface Mount |

## Component Suppliers

| SUPPLIER | PHONE | FAX |
|---|---|---|
| AVX | 803-946-0690 | 803-626-3123 |
| Central Semiconductor | 516-435-1110 | 516-435-1824 |
| Zetex | 516-543-7100 | 516-864-7630 |

## Component List

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| C1, C9 | 2 | 33µF, 25V tantalum capacitors<br>AVX TAJE336K025R |
| C2, C3, C8 | 3 | 0.01µF, 25V ceramic capacitors |
| C4, C5, C6 | 3 | 0.1µF, 25V ceramic capacitors |
| R1 | 1 | 49.9Ω, 1% resistor |
| R2, R3 | 2 | 200Ω, 5% resistors |
| R4 | 1 | 2kΩ, 5% resistor |
| R5 | 1 | 2kΩ, 1% resistor |
| R6, R8 | 2 | 1kΩ, 1% resistors |
| R7 | 1 | 10kΩ potentiometer |
| L1 | 1 | 47µH inductor<br>Panasonic ELJ-FA470KF2 |

| DESIGNATION | QTY | DESCRIPTION |
|---|---|---|
| L2, L3 | 2 | 4.7µH inductors<br>Panasonic ELJ-FA4R7KF2 |
| Q1, Q2 | 2 | PNP small-signal transistors<br>Zetex BCX71KCT |
| D2 | 1 | High-speed switching diode<br>Central Semiconductor CMPD4448 |
| U1 | 1 | MAX3760ESA |
| J1, J3, J4 | 3 | SMA connectors (PC edge mount)<br>E.F. Johnson 142-0701-801 |
| JU1, JU2 | 2 | 2-pin headers |
| None | 2 | Shunts on JU1 and JU2 |
| None | 1 | MAX3760 data sheet |

## Quick Start

### Test Equipment Required

- Signal-source sine-wave generator or network analyzer with range to 650MHz
- Signal-source function generator with range to 1MHz
- Signal-source pattern generator
- Power supply capable of 5.5V, 35mA output with current limit
- Oscilloscope with at least 1GHz bandwidth
- Wideband noise meter or RF power meter
- 470MHz filter with Bessel response (example: Mini Circuits SBLP-467 filter)

### Setup

1) Connect a 5V power supply to VCC1 and GND.
2) Remove the shunts from JU1 and JU2.
3) Connect VOUT+ and VOUT- to a dual-channel oscilloscope through terminated 50Ω cables.
4) Apply a 150mVp-p, 311MHz square wave to VIN.
5) Observe each output of approximately 150mVp-p on the oscilloscope.

## Detailed Description

### Connections, Adjustments, and Controls

***VCC1 Connection***

This connection provides supply current for the MAX3760. Connect to 5V.

***VCC2 Connection***

This connection provides supply current for the current mirror that adds the DC component to the input signal. Connect to 5V if used.

***J1–VIN Connection***

A signal generator can be connected here. This input is terminated with 50Ω to ground and AC coupled to IN (MAX3760) through series resistors (3000Ω). The AC signal input current to the MAX3760 is $V_{IN}/3000\Omega$.

***J3–VOUT+, J4–VOUT- Connection***

These are the MAX3760 outputs. These connectors are AC coupled to the MAX3760 and connect directly to test equipment with 50Ω input impedance.

***Jumper JU1***

This jumper is in series with the current mirror that adds a DC component to the input signal. This is a convenient place to measure the DC input current.

***Jumper JU2***

This jumper grounds the MAX3760's COMP pin. The DC cancellation circuit is disabled when COMP is grounded.

***Potentiometer R7***

This potentiometer controls the amount of DC current added to the input signal.

### Measurement Information

***AC Measurement***

When making AC measurements, place a shunt on JU1 after setting the DC signal current. Wires attached to this jumper add noise to the signal.

***DC Measurement***

For most DC measurements, place a shunt on JU2 to disable the DC cancellation circuit. Measure output offset with JU2 open.

***Noise Measurement***

Remove R5 before attempting noise measurements to minimize input capacitance. With R5 removed the total capacitance at the IN pin is 0.75pF.

***Photodiode Emulation***

Use the following relations to emulate a photodiode input with a signal generator and the current mirror (Figure 1):

$P_{AVE}$ = average power = (P1 + P0) / 2 (assuming 50% average duty cycle)

$r_e$ = extinction ratio = P1 / P0

P1 = high signal level = $2P_{AVE}(r_e) / (r_e + 1)$

P0 = low signal level = $2P_{AVE} / (r_e + 1)$

P1-P0 = p-p signal amplitude = $2P_{AVE}(r_e - 1) / (r_e + 1)$

Input current is related to optical power by the photodiode responsivity (ρ), as shown in the following equations:

$$I_{AVE} = (P_{AVE})\rho$$

For example, follow these steps to emulate a signal with an average power of -20dBm and an extinction ratio of 10:

1) -20dBm optical power will produce 10µA of average input current (assume photodiode responsivity of 1A/W). Install a current meter at JU1. Adjust R7 until current is 10µA.
2) The signal amplitude is $2P_{AVE}(r_e - 1) / (r_e + 1)$ = 16.3µA. To generate this current through the 3000Ω input resistors, set the signal source to produce an output level of 16.3µA x 3000Ω = 49mVp-p.

### *Using a Photodiode*

1) Remove resistor R5 before installing your photodiode in holes provided at location D1.
2) Connect the photodiode anode to IN (pin 2) on the MAX3760.
3) Connect the photodiode cathode to the junction of C8 and R8.
4) Connect the photodiode case ground to INREF.

### *Supply Current*

Supply current, as specified in the MAX3760 data sheet, is the current flowing into the VCC1 pad. Current flowing into VCC2 pad powers the current mirror only.

### *Layout Considerations*

The EV kit layout has been developed for packaged MAX3760s. 50Ω controlled impedance traces are used for the VOUT+ and VOUT- signal paths. Power and ground planes are relieved beneath the MAX3760 IN pin to reduce input capacitance.

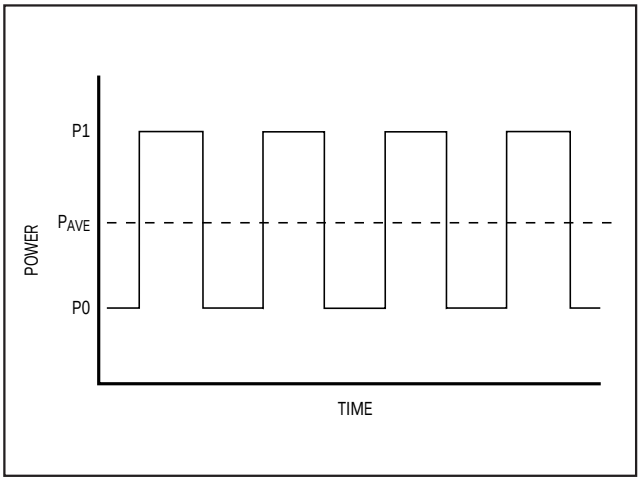


*Figure 1. Optical Power Definitions*

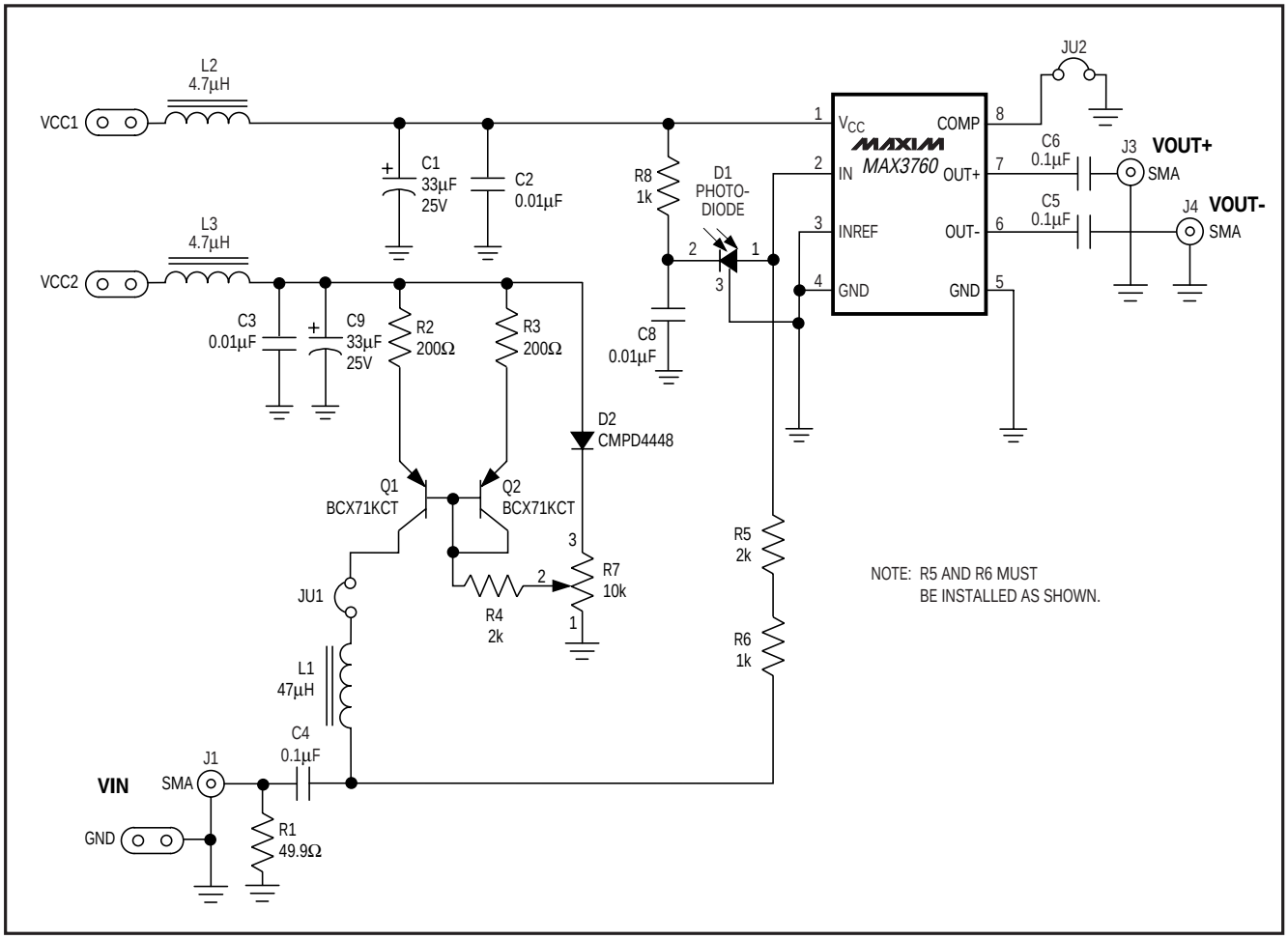


*Figure 2. MAX3760 EV Kit Schematic*

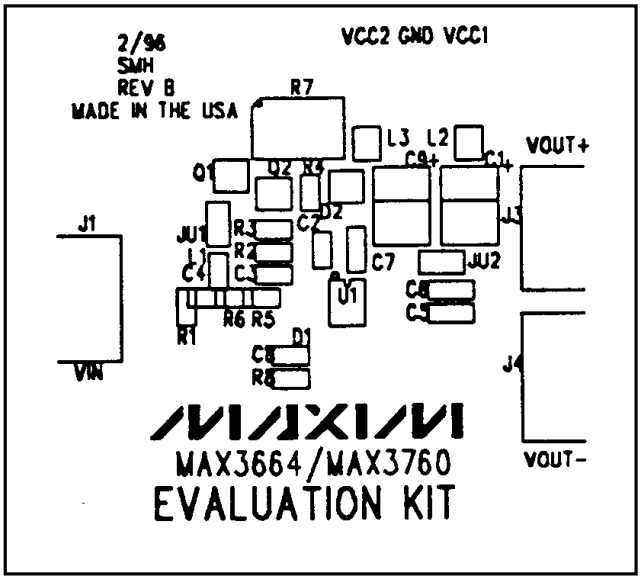


*Figure 3. MAX3760 EV Kit Component Placement Guide—Component Side*

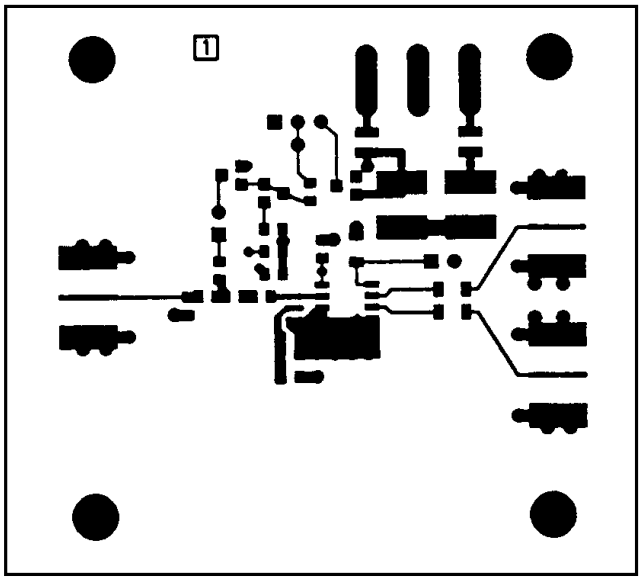


*Figure 4. MAX3760 EV Kit PC Board Layout—Component Side*

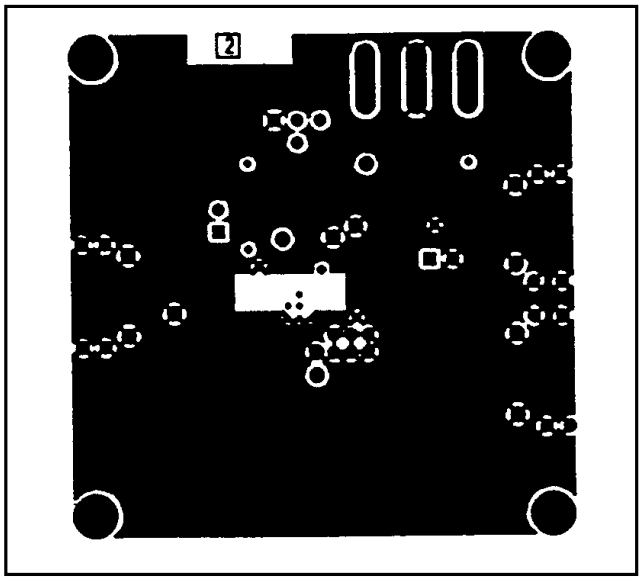


*Figure 5. MAX3760 EV Kit PC Board Layout—Ground Plane*

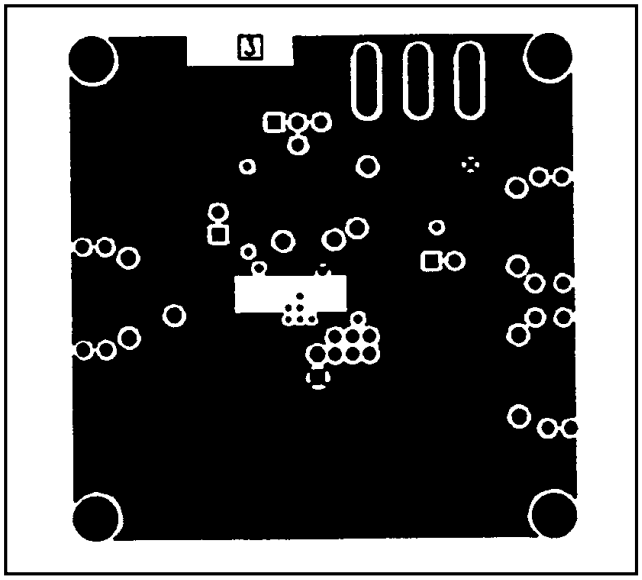

Figure 6. MAX3760 EV KIt PC Board Layout—Power Plane

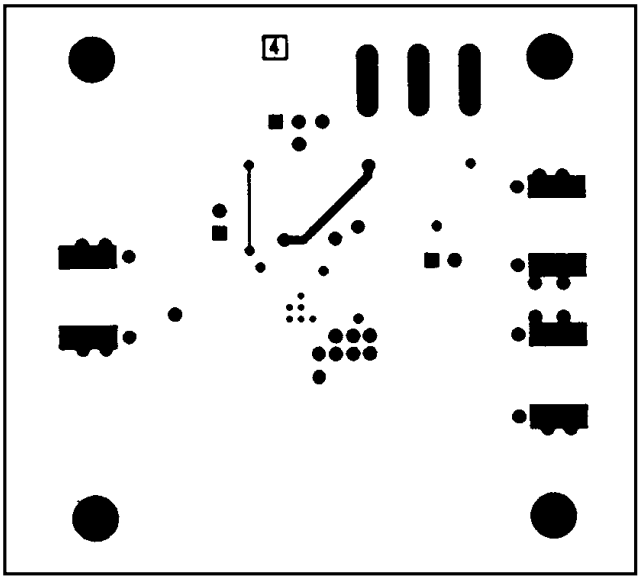

Figure 7. MAX3760 EV KIt PC Board Layout—Solder Side

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