



MAX9633 Evaluation Kit

Evaluates: MAX9633

General Description

The MAX9633 evaluation kit (EV kit) provides a proven design to evaluate the MAX9633 dual, low-noise, low-distortion op amp that is optimized to drive ADCs for use in applications from DC to a few MHz. The exceptionally fast settling time and low input offset voltage make the device an excellent solution to drive high-resolution 12-bit to 18-bit SAR ADCs. The EV kit circuit is configured as a unity-gain buffer, but can easily be adapted by installing shunts and changing a few components to support multiple op-amp configurations: transimpedance, noninverting, inverting, or differential amplifier. The components on the EV kit have pads that accommodate 0805 packages, making them easy to solder and replace. The EV kit accepts a +4.5V to +36V single-supply voltage, or a $\pm 2.25V$ to $\pm 18V$ dual-supply voltage.

Features

- ◆ Accommodates Multiple Op-Amp Configurations
- ◆ +4.5V to +36V Wide Input Supply Range
- ◆ 0805 Components
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

Ordering Information

PART	TYPE
MAX9633EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3	2	0.1 μ F $\pm 10\%$, 50V X7R ceramic capacitors (0805) Murata GRM21BR71H104K TDK C2012X7R1H104K
C2, C4	2	4.7 μ F $\pm 20\%$, 50V X7R ceramic capacitors (1210) Murata GRM32ER71H475M TDK C3225X7R1H475M
C5-C10	0	Not installed, ceramic capacitors (0805)

DESIGNATION	QTY	DESCRIPTION
JU1-JU4	4	2-pin headers
R1, R2, R6, R7	0	Not installed, resistors (0805)
R3, R4, R8, R9	4	100 Ω $\pm 1\%$ resistors (0805)
R5, R10	2	0 Ω resistors (0805)
U1	1	Dual, high-voltage op amp (8 TDFN-EP*) Maxim MAX9633ATA+
—	1	PCB: MAX9633 EVALUATION KIT+

*EP = Exposed pad.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: Indicate that you are using the MAX9633 when contacting these component suppliers.



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Quick Start

Required Equipment

- MAX9633 EV kit
- $\pm 15\text{V}$, 40mA DC power supply (PS1)
- +1V precision voltage source
- Digital multimeter (DMM)

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Connect the positive terminal of the +15V supply to the VCC pad, and the GND terminal to the GND pad. Connect the negative terminal of the -15V supply to the VEE pad, and the GND terminal to the GND pad. The power supplies should be off.
- 2) Connect the positive terminal of the precision voltage source to the INA+ pad. Connect the negative terminal of the precision voltage source to the INA- pad.
- 3) Install a shunt on jumper JU1 to short INA- to GND.
- 4) Connect the DMM to monitor the voltage on the OUTA pad.
- 5) Turn on the $\pm 15\text{V}$ power supply.
- 6) Apply +1V from the precision voltage source. Observe the output at the OUTA pad on the DMM. OUTA should read approximately +1V.
- 7) Repeat steps 2–7 to evaluate OUTB.

Detailed Description of Hardware

The MAX9633 EV kit provides a proven layout for the MAX9633 dual, low-noise, low-distortion op amp to support multiple op-amp configurations. The EV kit accepts a +4.5V to +36V single-supply voltage, or a $\pm 2.25\text{V}$ to $\pm 18\text{V}$ dual-supply voltage.

Jumper Selection

Input Configuration

Jumpers JU1–JU4 are provided to allow flexibility in grounding inputs for multiple op-amp configurations. When a shunt is installed on the jumper, the corresponding input pad is referenced to ground. See Table 1 for the JU1–JU4 configuration. See the *Op-Amp Configuration* section for more information regarding EV kit configuration.

Table 1. Jumper Selection (JU1–JU4)

SHUNT POSITION	IN-/IN+ INPUT
Installed	Connected to GND
Not installed*	Signal applied at IN-/IN+ pad

*Default position.

Op-Amp Configuration

Inverting Configuration

To configure op-amp U1-A as an inverting amplifier, replace R2 and R4 with the desired 1% gain-setting resistors, install a shunt on jumper JU2, and feed a voltage V_{IN} between the INA- and INA+ pads. Install a shunt on JU2 to ground the INA+ input in this configuration. The output voltage is given by the following equation:

$$V_{OUT} = \frac{R4}{R2} (V_{IN} + V_{OS})$$

The offset voltage V_{OS} can be either positive or negative. To configure op-amp U1-B as an inverting amplifier, replace R7 and R9 with the desired 1% gain-setting resistors, install a shunt on jumper JU4, and feed a voltage V_{IN} between the INB- and INB+ pads. Install a shunt on JU4 to ground the INB+ input in this configuration. The output voltage is given by the following equation:

$$V_{OUT} = \frac{R9}{R7} (V_{IN} + V_{OS})$$

The offset voltage V_{OS} can be either positive or negative.

Noninverting Configuration

To configure op-amp U1-A as a noninverting amplifier, replace R2 and R4 with the desired 1% gain-setting resistors, replace R3 with a 0Ω resistor, install a shunt on jumper JU1, and feed a voltage V_{IN} between the INA+ and INA- pads. Install a shunt on JU1 to ground the INA- input in this configuration. The output voltage is given by the following equation:

$$V_{OUT} = \left(1 + \frac{R4}{R2}\right) (V_{IN})$$

To configure op-amp U1-B as a noninverting amplifier, replace R7 and R9 with the desired 1% gain-setting resistors, replace R8 with a 0Ω resistor, install a shunt on jumper JU3, and feed a voltage V_{IN} between the INB+ and INB- pads.

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and INB- pads. Install a shunt on JU3 to ground the INB- input in this configuration. The output voltage is given by the following equation:

$$V_{OUT} = \left(1 + \frac{R9}{R7}\right) (V_{IN})$$

Differential Amplifier

To configure op-amp U1-A as a differential amplifier, replace R1–R4 with appropriate resistors and install a shunt on jumper JU1. Make sure R1 = R4 and R2 = R3. The CMRR of the differential amplifier is determined by the matching of the resistor ratios R4/R2 and R1/R3:

$$V_{OUT} = GAIN(INP - INN)$$

where:

$$GAIN = \frac{R4}{R2} = \frac{R1}{R3}$$

To configure op-amp U1-B as a differential amplifier, replace R6–R9 with appropriate resistors and install a shunt on jumper JU3. Make sure R6 = R9 and R7 = R8. The CMRR of the differential amplifier is determined by the matching of the resistor ratios R9/R7 and R6/R8:

$$V_{OUT} = GAIN(INP - INN)$$

where:

$$GAIN = \frac{R9}{R7} = \frac{R6}{R8}$$

Transimpedance Application

To configure op-amp U1-A as a transimpedance amplifier (TIA), replace R2 with a 0Ω resistor and install a shunt on jumper JU2. The output voltage of the TIA is the input current multiplied by the feedback resistor:

$$V_{OUT} = (I_{IN} + I_{BIAS}) \times R4 + V_{OS}$$

where R4 is installed as a 100Ω resistor, I_{IN} is defined as the input current source applied at the INA- pad, I_{BIAS} is the input bias current, and V_{OS} is the input offset voltage of the op amp. Use capacitor C6 (and C5, if applicable) to stabilize the op amp by rolling off high-frequency gain due to a large cable capacitance.

To configure op-amp U1-B as a TIA, replace R7 with a 0Ω resistor and install a shunt on jumper JU4. The output voltage of the TIA is the input current multiplied by the feedback resistor:

$$V_{OUT} = (I_{IN} + I_{BIAS}) \times R9 + V_{OS}$$

where R9 is installed as a 100Ω resistor, I_{IN} is defined as the input current source applied at the INB- pad, I_{BIAS} is the input bias current, and V_{OS} is the input offset voltage of the op amp. Use capacitor C9 (and C8, if applicable) to stabilize the op amp by rolling off high-frequency gain due to a large cable capacitance.

Capacitive Loads

Some applications require driving large capacitive loads. To improve the stability of the amplifier in such cases, replace R5 (R10) with a suitable resistor value to improve amplifier phase margin. The R5/C7 (R10/C10) filter can also be used as an anti-alias filter, or to limit amplifier output noise by reducing its output bandwidth.

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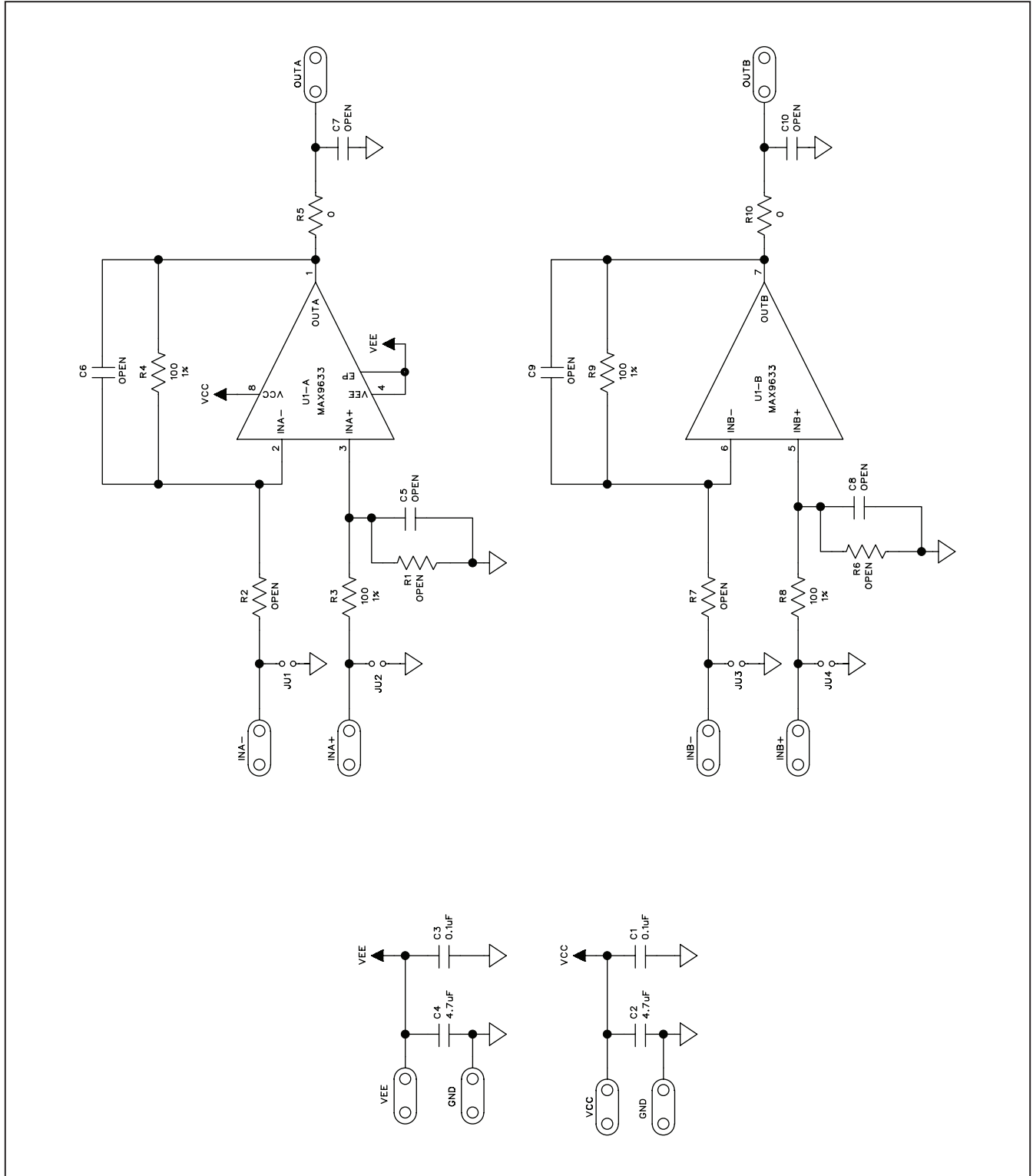


Figure 1. MAX9633 EV Kit Schematic

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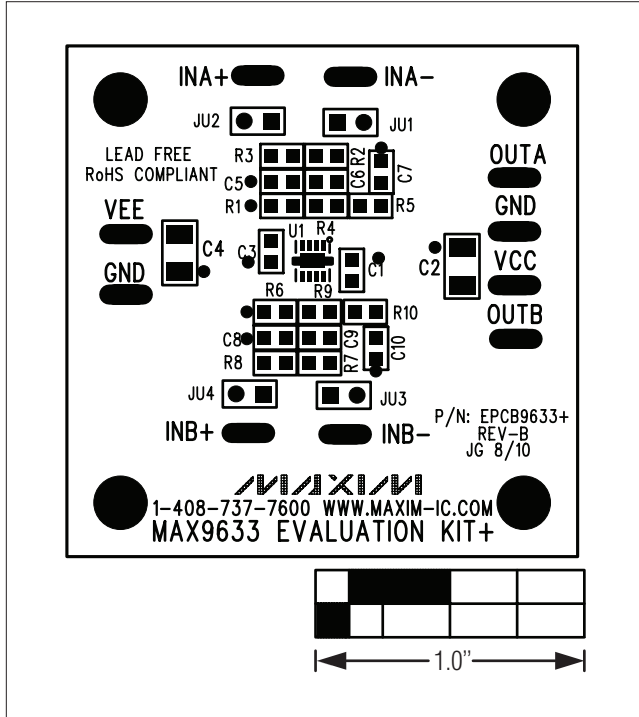


Figure 2. MAX9633 EV Kit Component Placement Guide—Component Side

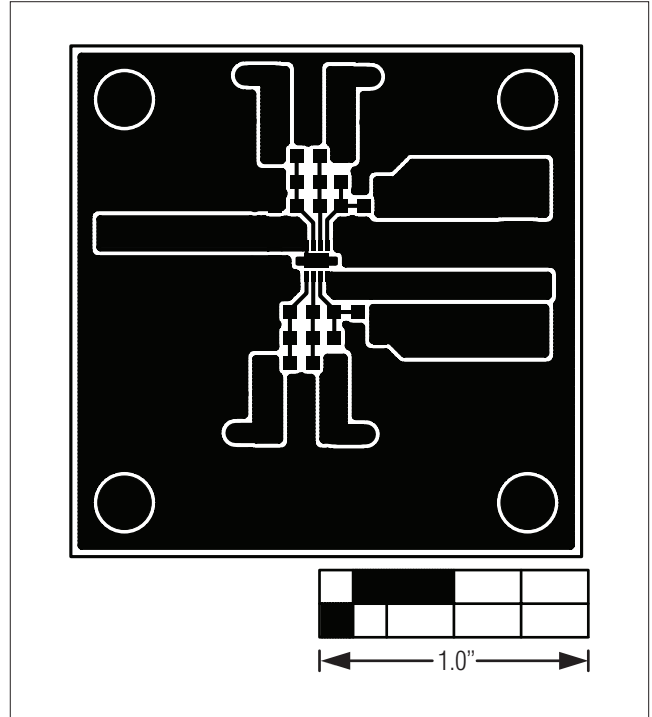


Figure 3. MAX9633 EV Kit PCB Layout—Component Side

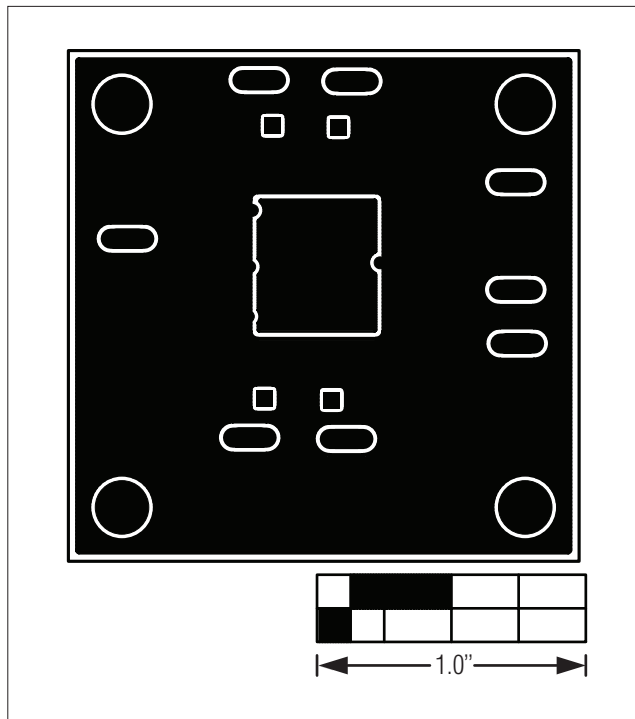


Figure 4. MAX9633 EV Kit PCB Layout—Solder Side

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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	9/10	Initial release	—

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