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 ±2.25V to ±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	0.1µF ±10%, 50V X7R ceramic capacitors (0805) Murata GRM21BR71H104K TDK C2012X7R1H104K
C2, C4	2	4.7µF ±20%, 50V X7R ceramic capacitors (1210) Murata GRM32ER71H475M TDK C3225X7R1H475M
C5–C10	0	Not installed, ceramic capacitors (0805)
JU1–JU4	4	2-pin headers
R1, R2, R6, R7	0	Not installed, resistors (0805)
R3, R4, R8, R9	4	100Ω ±1% resistors (0805)
R5, R10	2	0Ω 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.*

Quick Start

Required Equipment

- MAX9633 EV kit
- ±15V, 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 ±15V 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 ±2.25V to ±18V 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. 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.

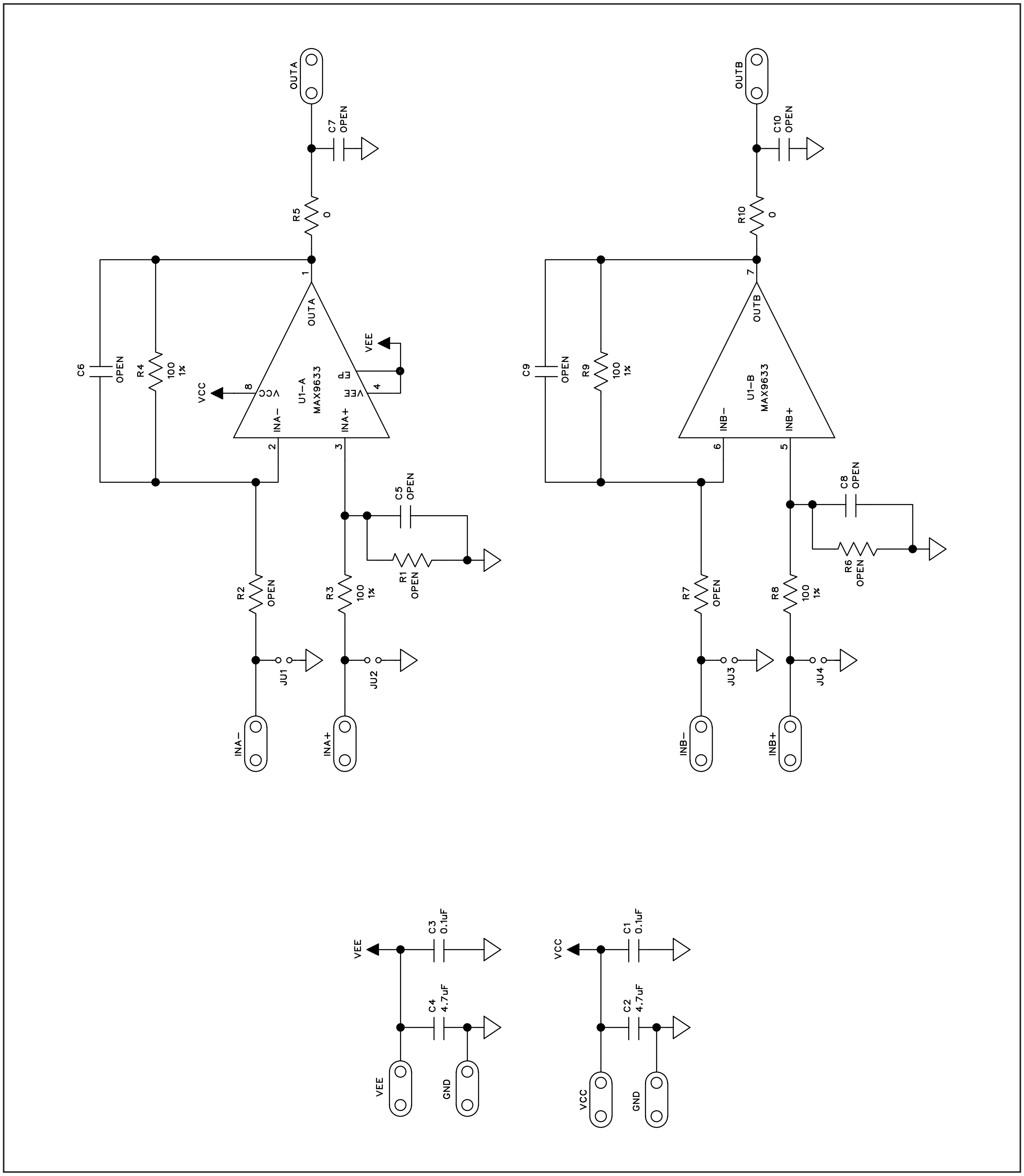

Figure 1. MAX9633 EV Kit Schematic

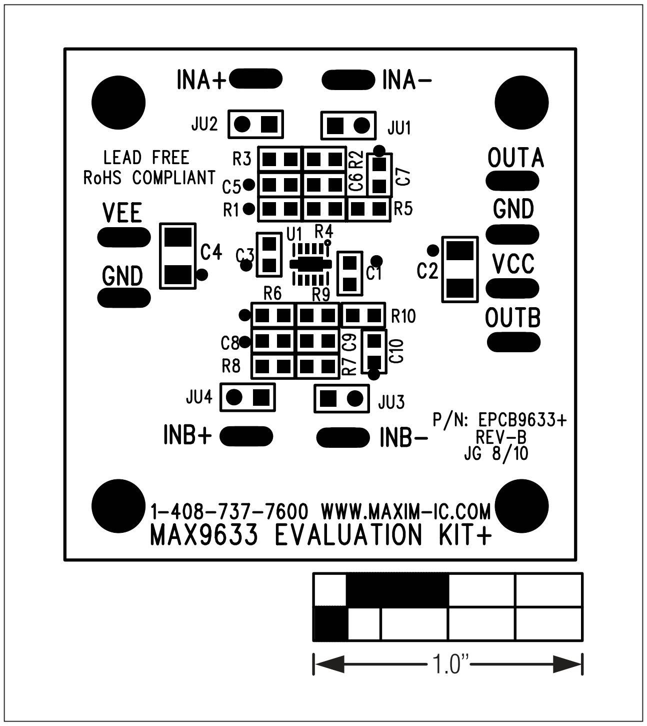

Figure 2. MAX9633 EV Kit Component Placement Guide—Component Side

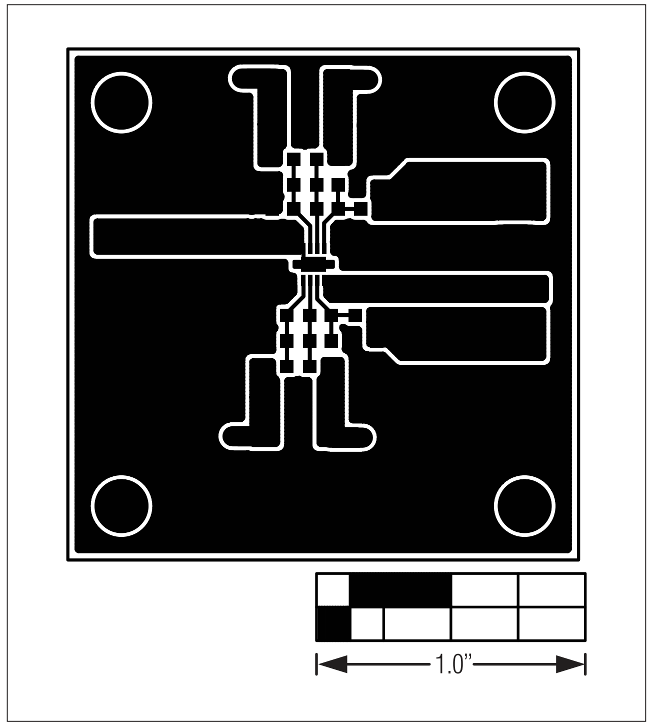

Figure 3. MAX9633 EV Kit PCB Layout—Component Side

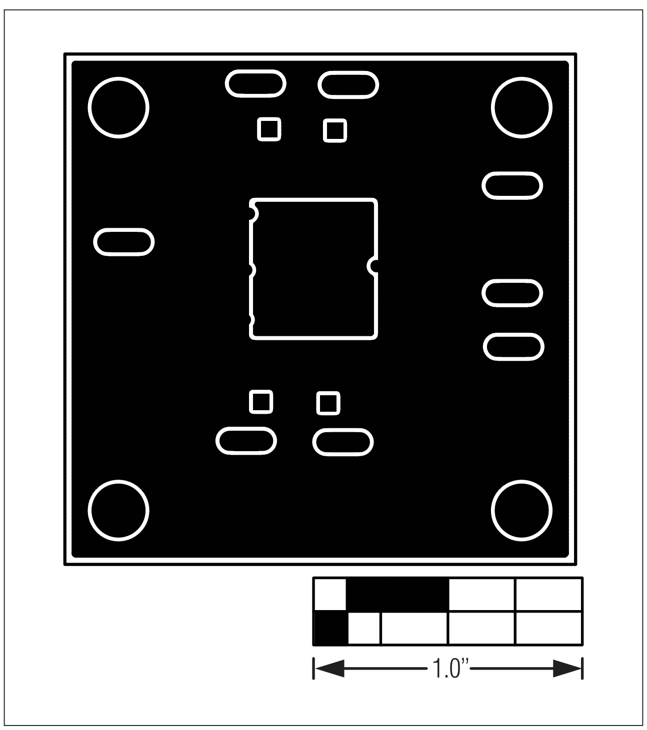

Figure 4. MAX9633 EV Kit PCB Layout—Solder Side

Revision History

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