19-4495; Rev 0; 2/09

MAX4993 Evaluation Kit

Evaluates: MAX4993

General Description

The MAX4993 evaluation kit (EV kit) demonstrates the MAX4993 double-pole/double-throw (DPDT) analog switch featuring low on-resistance (0.3Ω R_{ON}) and slow turn-on time for click-and-pop reduction in portable audio applications. The IC features a space-saving package, low THD+N (0.004%), and low supply current (1.2µA at 3V). The EV kit can operate from a 1.8V to 5.5V DC power supply and comes configured to operate from USB power.

Features

- **Demonstrates Slow Turn-On for Built-In Click-and-Pop Reduction**
- **Low 0.3Ω On-Resistance (R_{ON})**
- **0.004% THD+N in Audio Applications**
- **1.8V to 5.5V DC Supply Operation**
- **Demonstrates USB Power Operation**
- **Lead(Pb)-Free and RoHS Compliant**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX4993EVKIT+	EV Kit

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C3, C4, C5, C8	5	0.1µF ±10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C2	1	10µF ±10%, 10V X7R ceramic capacitor (0805) Murata GRM21BR71A106K
C6, C7	2	220µF ±10%, 6.3V low-ESR tantalum capacitors (D size) KEMET B45197A1227K409
FB1	0	Not installed, ferrite-bead inductor—short (0603)
GND, OUTL, OUTR	0	Not installed, miniature PCB test points

DESIGNATION	QTY	DESCRIPTION
JU1, JU2, JU3	3	3-pin headers
JU4, JU5	2	2-pin headers
OUT	1	Stereo headphone jack (3.5mm)
R1–R4	4	0Ω ±5% resistors (1206)
R5, R7	2	330Ω ±5% resistors (0603)
R6, R8	2	150Ω ±5% resistors (0603)
U1	1	DPDT audio switch (10 UTQFN) Maxim MAX4993EVB+ (Top Mark: AAF)
USB	1	USB type-B right-angle receptacle
—	5	Shunts (JU1–JU5)
—	1	PCB: MAX4993 Evaluation Kit+

Component Suppliers

SUPPLIER	PHONE	WEBSITE
KEMET Corp.	864-963-6300	www.kemet.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com

Note: *Indicate that you are using the MAX4993 when contacting these suppliers.*

MAX4993 Evaluation Kit

Quick Start

Required Equipment

- User-supplied PC with a spare USB port
- A-to-B USB cable
- One stereo headphone
- Two audio signal sources ranging between 0 and 5V

Procedure

The MAX4993 EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not connect a signal to the NO_1, NO_2, NC_1, or NC_2 PCB pads until power is supplied to VCC.**

1) Connect the **powered** USB cable from the computer to the EV kit's USB receptacle.
2) Verify that shunts are installed as follows:
   JU1: Pins 1-2 (USB power to VCC)
   JU2: Pins 1-2 (NO_ terminals selected)
   JU3: Pins 2-3 (switches enabled)
   JU4: Not installed (no input DC biasing on NO_1 PCB pad)
   JU5: Not installed (no input DC biasing on NO_2 PCB pad)
3) Verify that the stereo audio source outputs are disabled.
4) Connect one audio source's right channel to the NO_1 PCB pad, the left channel to the NO_2 PCB pad, and the audio ground return to the nearby GND PCB pad.
5) Connect the other audio source's right channel to the NC_1 PCB pad, the left channel to the NC_2 PCB pad, and the audio ground return to the nearby GND PCB pad.
6) Plug the headphone into the OUT headphone jack.
7) Enable the audio sources.
8) Verify that the headphone is playing the audio source connected to the NO_1 and NO_2 PCB pads.
9) Move the jumper JU2 shunt to pins 2-3.
10) Verify that the headphone is playing the audio source connected to the NC_ 1 and NC_2 PCB pads.

Detailed Description of Hardware

The MAX4993 evaluation kit (EV kit) demonstrates the MAX4993 DPDT analog switch in a 1.4mm x 1.8mm 10-pin ultra-thin QFN package specified for operating over the -40°C to +85°C extended temperature range. The IC's slow turn-on time provides click-and-pop reduction without additional parts in portable audio applications. The IC features low 0.3Ω R_{ON} resistance, low 0.004% THD+N distortion in audio applications, and demonstrates low supply current. An active-low output enable pin ($\overline{EN}$) can set the switches to high-impedance mode. The COM_, NC_1, NC_2, NO_1, and NO_2 PCB pads can pass up to ±350mA of continuous current through the MAX4993 IC. The EV kit can operate from a 1.8V to 5.5V DC power supply and also comes configured to operate from USB power.

The user may install optional input resistors in place of the default 0Ω resistors (R1–R4). Resistor-divider pairs R5/R6 and R7/R8 and jumpers JU4 and JU5 provide the ability to add a DC bias to the NO_1 and NO_2 PCB pads for demonstrating the slow turn-on feature. Capacitors C6 and C7 provide DC voltage blocking for the OUT headphone jack signals. Test points OUTL, OUTR, and GND provide access to the OUT headphone jack signals.

Power Supply

Jumper JU1 provides two options for powering the MAX4993 VCC supply input. VCC can operate from a user-supplied 1.8V to 5.5V DC power supply connected across the VIN and GND PCB pads or from a 5V USB power source. See Table 1 to configure the VCC supply options using jumper JU1.

Table 1. Power Supply Configuration (JU1)

SHUNT POSITION	VCC PIN CONNECTION	MAX4993 VCC POWER
1-2*	+5V bus	Connect a **powered** USB cable to receptacle USB. VCC set to 5V USB power.
2-3	VIN PCB pad	User-provided DC power supply. VCC range: 1.8V to 5.5V.

**Default position.*

Digital Control

Jumper JU2 configures the MAX4993 digital-control bit, CB. The CB input sets the position of the switches to either the NO_ or NC_ terminals. Remove capacitor C8 to drive the CB signal using an external controller connected to the CB and nearby GND PCB pads. See Table 2 to set CB using jumper JU2.

Switch Enable

Jumper JU3 configures the MAX4993 enable input, $\overline{EN}$. The $\overline{EN}$ signal can also be driven by an external controller using the $\overline{EN}$ and nearby GND PCB pads. See Table 3 to set $\overline{EN}$ using jumper JU3.

Table 2. Digital Control Configuration (JU2)

SHUNT POSITION	CB PIN	SWITCH POSITION
1-2*	Connected to VCC	NO_
2-3	Connected to GND	NC_
—	Connected to CB PCB pad	Driven by external controller. Remove capacitor C8.

**Default position.*

Table 3. Switch Enable Configuration (JU3)

SHUNT POSITION	$\overline{EN}$ PIN	SWITCH ENABLE
1-2	Connected to VCC	Switches set to high impedance
2-3*	Connected to GND	Switches enabled
—	Connected to $\overline{EN}$ PCB pad	Driven by external controller

**Default position.*

NO_ DC Offset

Jumpers JU4 and JU5 give the option to provide a DC offset to the NO_1 and NO_2 PCB pads, respectively. Install shunts on jumpers JU4 and JU5 to enable the DC offset voltages. Resistor-dividers R5/R6 and R7/R8 are configured to provide an offset voltage given by the equation below:

$$V_{OFFSET} = 0.3125 \times VCC$$

where V_{OFFSET} is the offset voltage applied to the NO_1 and NO_2 PCB pads and VCC is the MAX4993 supply voltage.

To use a different offset voltage, select a different value for R6 and R8 and use the equation below to determine R5 and R7:

$$R_{TOP} = \frac{R_{BOTTOM}\,(VCC - V_{OFFSET})}{V_{OFFSET}}$$

where the suggested R_{BOTTOM} range is 100Ω to 1MΩ and R_{BOTTOM} is resistor R6 or R8, R_{TOP} is resistor R5 or R7, the VCC range is 1.8V to 5.5V, and V_{OFFSET} is the desired offset voltage.

MAX4993 Evaluation Kit

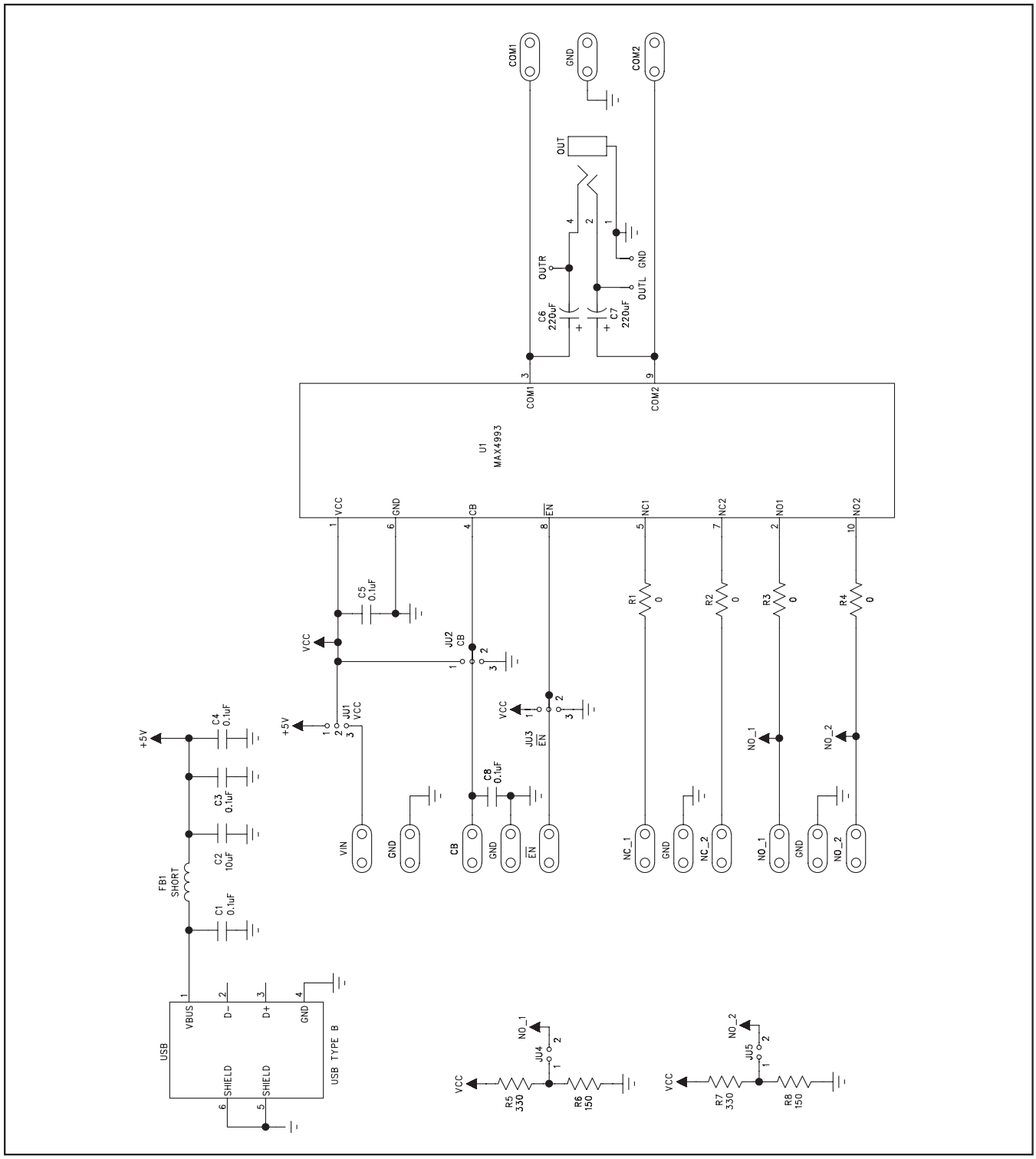

Figure 1. MAX4993 EV Kit Schematic

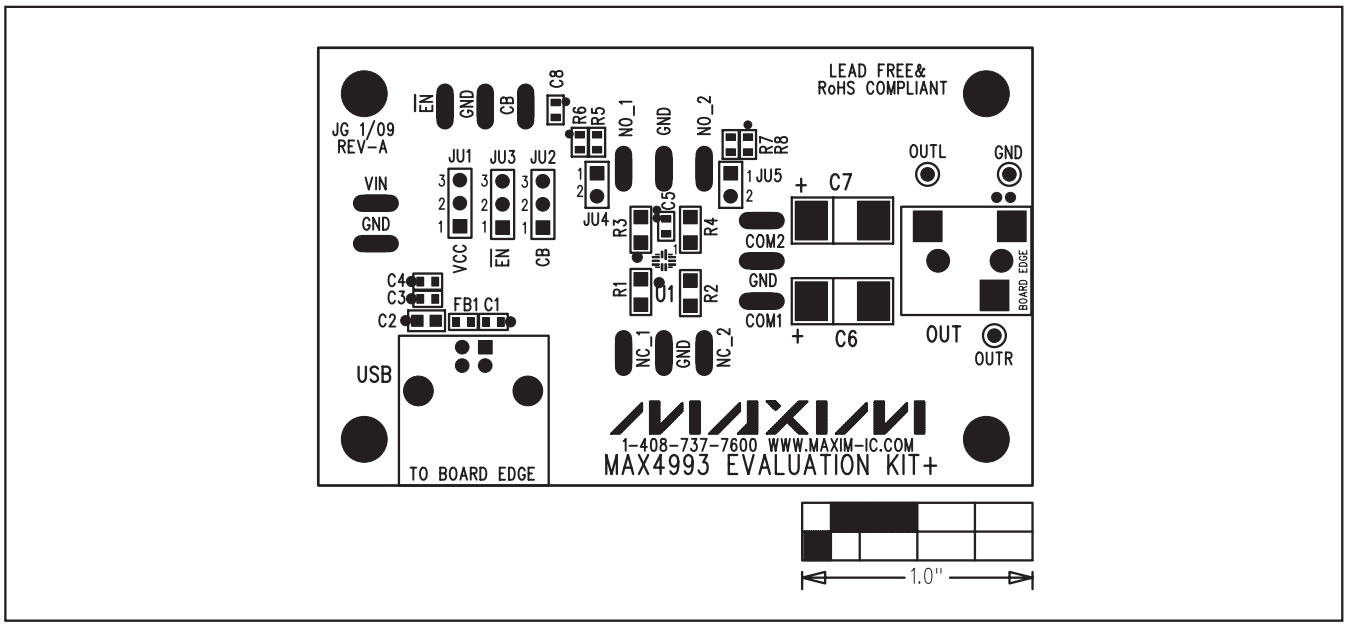

Figure 2. MAX4993 EV Kit Component Placement Guide—Component Side

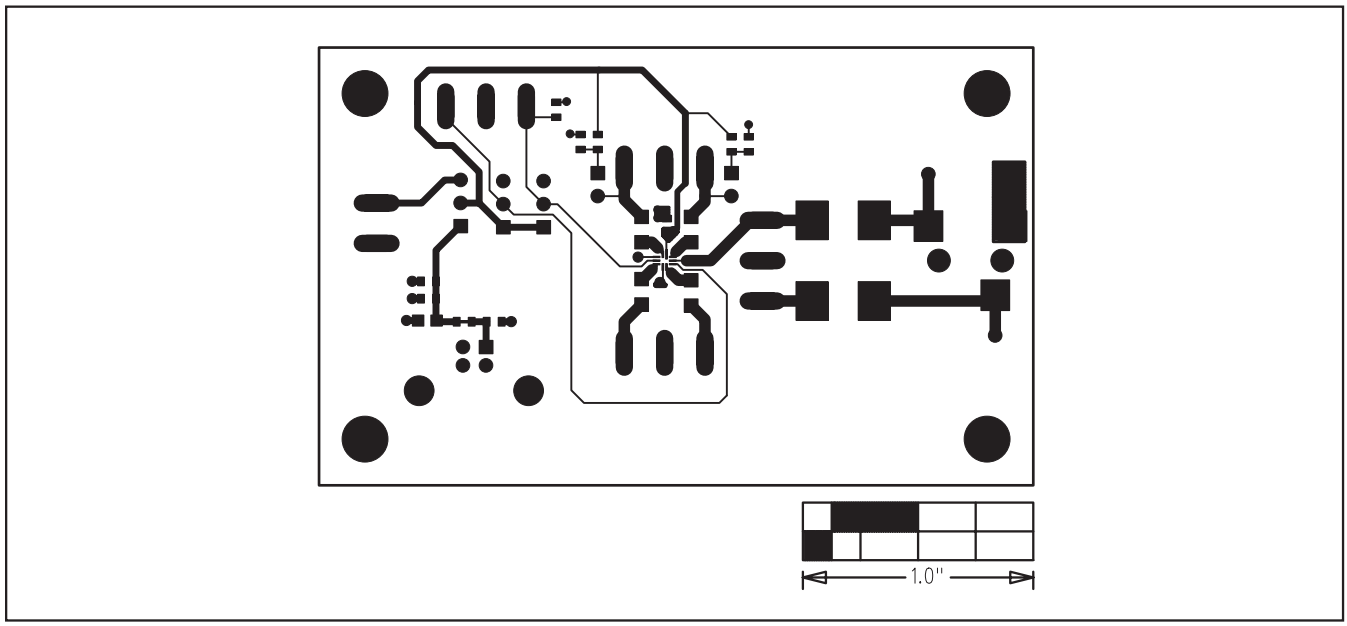

Figure 3. MAX4993 EV Kit PCB Layout—Component Side

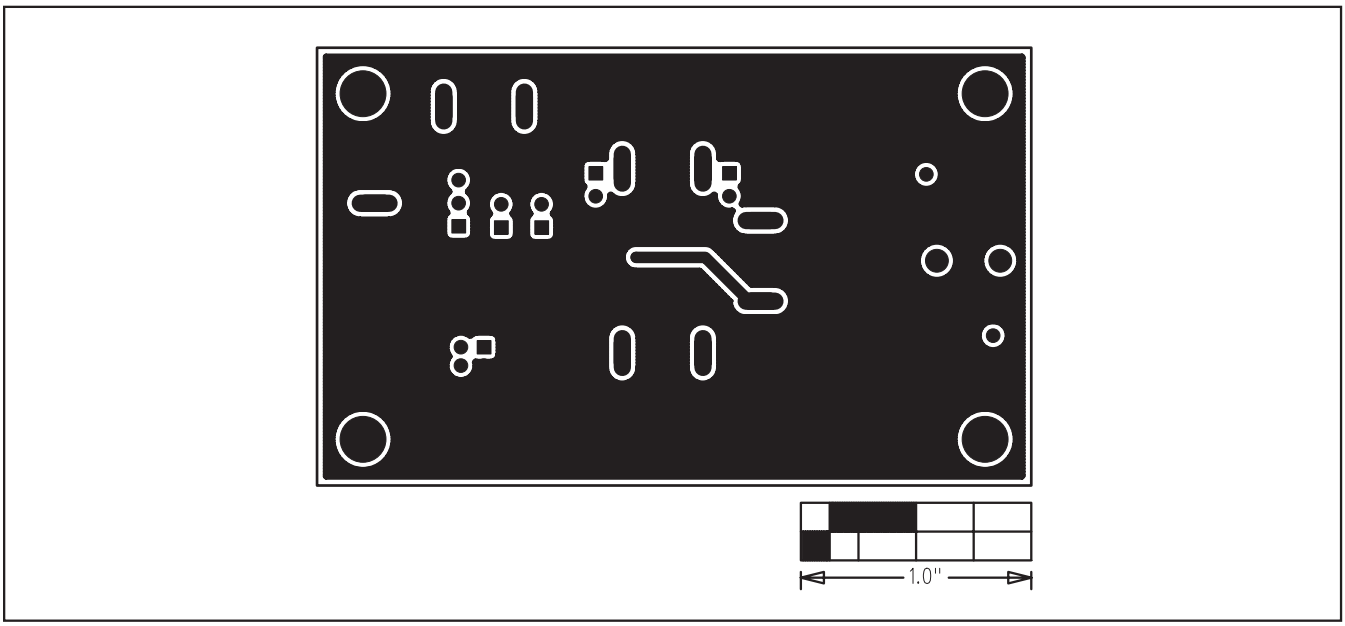

Figure 4. MAX4993 EV Kit PCB Layout—Solder Side

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