19-0760; Rev 0; 4/07

MAX9814 Evaluation Kit

Evaluates: MAX9814

General Description

The MAX9814 evaluation kit (EV kit) is a fully assembled and tested PCB that is used to evaluate the single-supply MAX9814 low-noise microphone amplifier IC. The MAX9814 IC contains a low-noise amplifier, an output amplifier, a microphone bias-voltage generator, and automatic gain-control (AGC) internal circuitry. The overall gain of the microphone amplifier is selectable to 40dB, 50dB, or 60dB without compression. The MAX9814 incorporates compressor/limiter circuitry that limits the microphone output to a set voltage.

The MAX9814 EV kit operates over a 2.7V to 5.5V range. The EV kit also features low quiescent current, and shutdown control to minimize power consumption. The MAX9814 IC is available in a 14-pin TDFN (3mm x 3mm x 0.8mm) exposed paddle package.

Features

- **2.7V to 5.5V Single-Supply Operation**
- **20dB of Dynamic Gain Compression**
- **Selectable Gain Control**
- **Programmable Attack Time**
- **Selectable Attack/Release Ratio**
- **Low-Power Shutdown Mode**
- **Fully Assembled and Tested**

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX9814EVKIT+	0°C to +70°C*	14 TDFN-EP**

+ Denotes a lead-free and RoHS-compliant EV kit.
**EV kit PCB temperature range only.*
***EP = exposed paddle.*

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	0.22µF ±10%, 6.3V X5R ceramic capacitor (0402) TDK C1005X5R0J224K
C2, C7, C9	3	0.1µF ±10%, 10V X5R ceramic capacitors (0402) TDK C1005X5R1A104K
C3	1	0.047µF ±10%, 25V X7R ceramic capacitor (0402) TDK C1005X7R1E223K
C4	1	0.022µF ±10%, 25V X7R ceramic capacitor (0402) TDK C1005X7R1E223K
C5	1	2.2µF ±10%, 6.3V X5R ceramic capacitor (0603) TDK C1608X5R0J225K
C6	1	1µF ±10%, 6.3V X5R ceramic capacitor (0603) TDK C1608X5R1A105KB
C8	1	0.47µF ±10%, 6.3V X5R ceramic capacitor (0402) TDK C1005X5R0J474K

DESIGNATION	QTY	DESCRIPTION
J1	1	Nonswitched PC-mount RCA jack, black
J2	1	Nonswitched PC-mount RCA jack, red
JU1, JU2, JU3	3	3-pin headers
JU4, JU5, JU6	3	2-pin headers
R1	1	150kΩ ±1% resistor (0402)
R2	1	100kΩ ±1% resistor (0402)
R3	1	2.21kΩ ±1% resistor (0402)
U1	1	MAX9814ETD+ (14-pin TDFN)
—	6	Shunts (JU1–JU6)
—	1	PCB: MAX9814 Evaluation Kit

Component Supplier

SUPPLIER	PHONE	WEBSITE
TDK Corp.	847-803-6100	www.component.tdk.com

Note: *Indicate that you are using the MAX9814 when contacting this component supplier.*

For pricing, delivery, and ordering information, please contact Maxim/Dallas Direct! at 1-888-629-4642, or visit Maxim's website at www.maxim-ic.com.

MAX9814 Evaluation Kit

Quick Start

Recommended Equipment

- 5V 200mA power supply
- Function generator
- Digital multimeter (DMM)
- Oscilloscope

Procedure

The MAX9814 EV kit is fully assembled and tested. Follow the steps listed below to verify board operation. **Caution: Do not turn on the power supply until all connections are completed:**

1) Verify that shunts are installed across pins 1-2 of jumpers JU1 (MAX9814 enabled), JU2 (gain = 40dB), and JU3 (attack/release ratio = 1:2000).
2) Verify that a shunt is not installed across jumpers JU4, JU5, JU6 (attack time ≈ 53µs).
3) Set the power supply to 5V.
4) Set the function generator's output for a sine wave with $10mV_{P-P}$, 1kHz frequency, and 0V offset.
5) Turn off the power supply and function generator.
6) Connect channel 1 of the oscilloscope to the MIC_IN pad and channel 2 of the oscilloscope to the MIC_OUT pad. Connect the ground leads of the oscilloscope to the respective SGND_ pads.
7) Connect the 5V terminal of the power supply to the VCC pad and the ground terminal of the power supply to the GND pad.
8) Connect the positive output of the function generator to the MIC_IN pad on the EV kit and the ground lead of the function generator to the SGND_IN pad.
9) Connect the positive terminal of the digital multimeter to the TH pad and the ground terminal to the GND pad.
10) Turn on the power supply.
11) Verify that the TH voltage is approximately 800mV.
12) Turn on the function generator.
13) Using the oscilloscope, verify that the signal at the MIC_OUT pad is $1V_{P-P}$.
14) Increase the function generator to $50mV_{P-P}$.
15) Verify that MIC_OUT amplitude is $1.6V_{P-P}$.

Detailed Description

The MAX9814 EV kit is used to evaluate the MAX9814 low-noise microphone amplifier IC, which is designed for single-supply applications. The power supply must provide a minimum 200mA to the MAX9814 EV kit, which has an operating range of 2.7V to 5.5V.

The MAX9814 IC contains a low-noise amplifier, a variable gain amplifier (VGA) with automatic gain control, an output amplifier, and a microphone bias-voltage generator. The low-noise preamplifier gain is fixed to a 12dB gain, while the VGA has a dynamic gain from 0dB to 20dB and the output amplifier has gains of 8dB, 18dB, and 28dB. Without compression, the sum of all of the gain blocks result in an overall gain of 40dB, 50dB, or 60dB. The MAX9814 IC incorporates attack-/hold-and-release timing circuitry that limits the MICOUT pin to a set voltage.

The MAX9814 compression circuitry monitors MICOUT and limits the peak voltage to TH. Gain compression is realized by the VGA, which automatically adjusts its gain to keep the output voltage peak equal to the set threshold. The VGA has 20dB of dynamic gain, which results in a maximum gain compression of 20dB. The amplifier overall gain, with the AGC disabled, can be set to 40dB, 50dB, or 60dB using jumper JU2. With the AGC on and the output voltage fully compressed, the overall gain will be 20dB, 30dB, or 40dB.

The amplifier's output is compressed when the peak voltage amplitude at MICOUT exceeds the voltage set at TH. The MAX9814 EV kit compression threshold is preset at 800mV. A custom threshold voltage can be programmed using resistors R1 and R2, and the 2V microphone bias output MICBIAS. Removing resistor R1 and applying a voltage source at the TH pad can also externally control the MICOUT threshold.

The input signal can either be applied to the RCA jack J2, or a microphone can be connected between the MIC_IN and SGND_IN pads. The 2V microphone bias MICBIAS is connected to the MIC_IN node via R3.

The MAX9814 attack time and attack/release ratio are set through jumpers JU3–JU6.

Jumper Selection

Shutdown

Jumper JU1 controls the shutdown mode of the MAX9814 EV kit . The shutdown function can be activated on the EV kit by installing a shunt across pins 2-3. The shutdown function can also be controlled by

removing the shunt on jumper JU1 and connecting an external controller to the $\overline{SHDN}$ pad. See Table 1 for jumper JU1 shutdown configurations.

Table 1. Shutdown Configuration (JU1)

SHUNT POSITION	$\overline{SHDN}$ PIN	EV KIT FUNCTION
1-2	Connected to VCC	MAX9814 enabled
2-3	Connected to GND	MAX9814 disabled
—	Not connected	$\overline{SHDN}$ driven by external controller

Gain Control

The MAX9814 maximum signal gain can be configured to 40dB, 50dB, or 60dB. Jumper JU2 selects the overall gain for the MAX9814 EV kit. See Table 2 for jumper JU2 gain control configurations.

Table 2. Gain Control Configuration (JU2)

SHUNT POSITION	GAIN PIN	MAXIMUM GAIN (dB)
1-2	Connected to VCC	40
2-3	Connected to GND	50
—	Not connected	60

Attack/Release Ratio Setting

Jumper JU3 sets the ratio of the attack time to the release time of the MAX9814 AGC circuit to ratios of 1:500, 1:2000, and 1:4000. See Table 3 for configuring the desired attack/release ratio using jumper JU3 position.

Table 3. Attack/Release Ratio Configuration (JU3)

SHUNT POSITION	ATTACK/RELEASE PIN	ATTACK/RELEASE RATIO
2-3	Connected to GND	1:500
1-2	Connected to VCC	1:2000
—	Not connected	1:4000

Jumpers JU4, JU5, and JU6 configure the attack time. Capacitor C4 sets the attack time to 53µs. To increase the attack time, configure the shunts on JU4, JU5, and/or JU6, which change the total capacitance connected at the MAX9814 CT pin. See Table 4 for jumpers JU4, JU5, and JU6 configurations. Table 5 lists the attack/release times. The attack time can be estimated using the following equation:

$$t_{Attack} \approx 2400 * C_{CT}$$

where C_{CT} is in farads and the total connected capacitance.

Table 4. Attack Time Configuration (JU4, JU5, and JU6)

JU4 SHUNT POSITION	JU5 SHUNT POSITION	JU6 SHUNT POSITION	CT PIN CAPACITANCE (µF)	ATTACK TIME (µs)
Not installed	Not installed	Not installed	0.022	53
Installed	Not installed	Not installed	0.069	166
Installed	Installed	Not installed	0.169	406
Installed	Installed	Installed	0.389	937

Table 5. Attack/Release Times

ATTACK TIME (µs)	RELEASE TIMES (ms)		
	1:500	1:2000	1:4000
53	26.4	105.6	211.2
166	83	332	664
406	203	812	1624
937	468	1874	3748

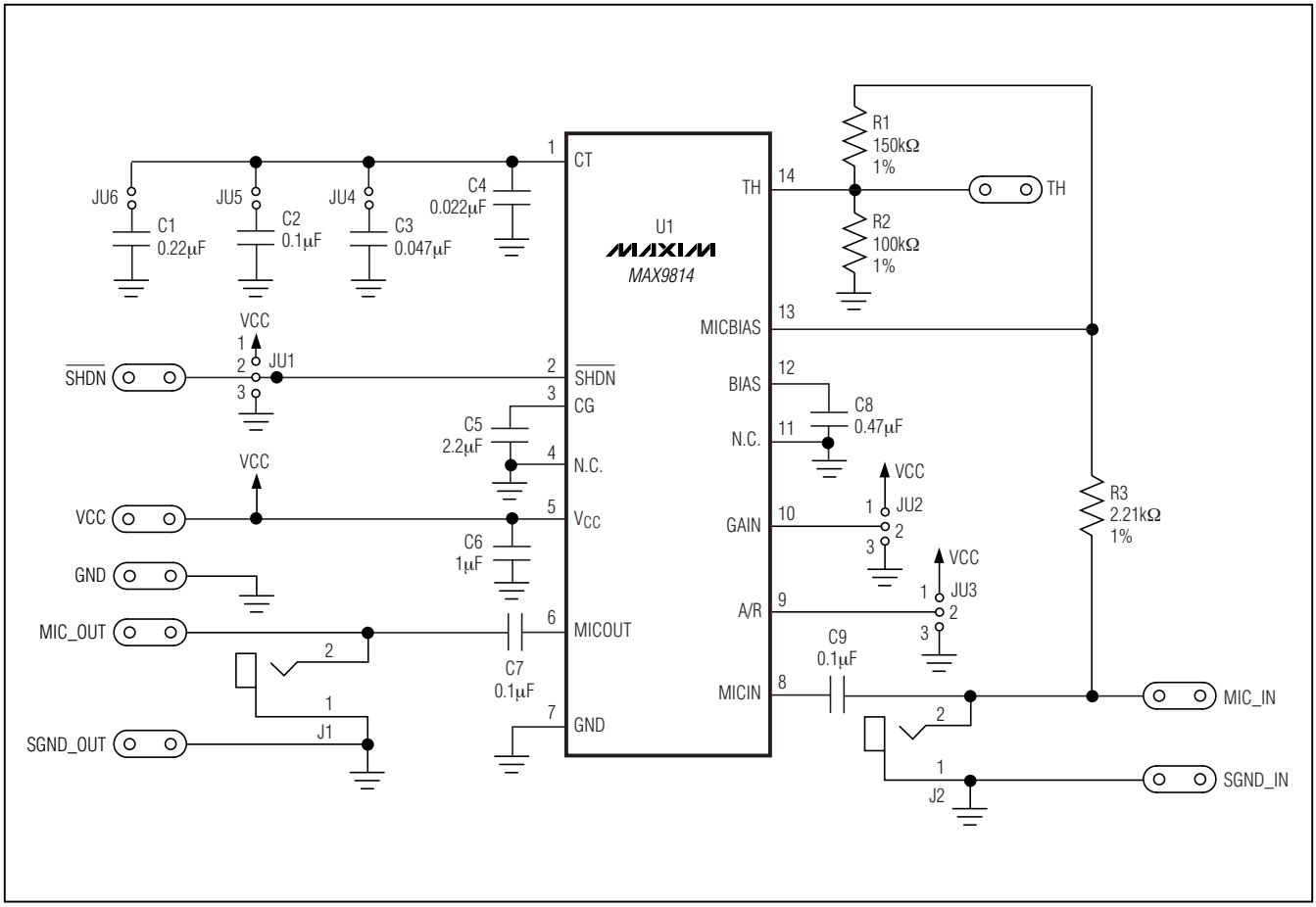


Figure 1. MAX9814 EV Kit Schematic

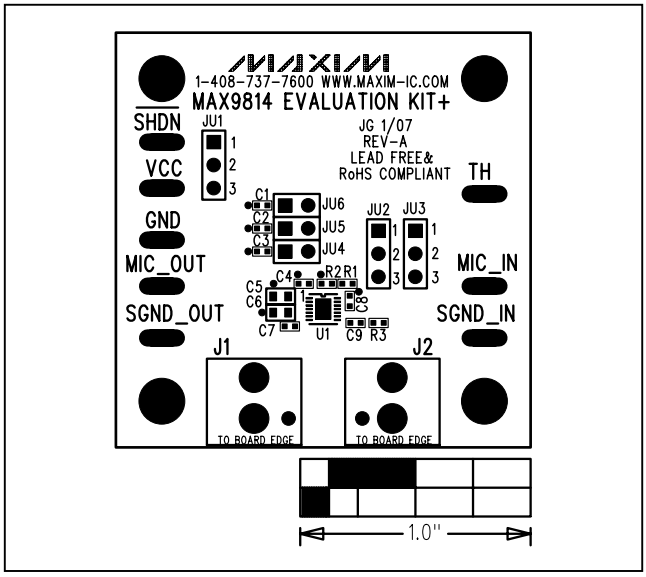


Figure 2. MAX9814 EV Kit Component Placement Guide—Component Side

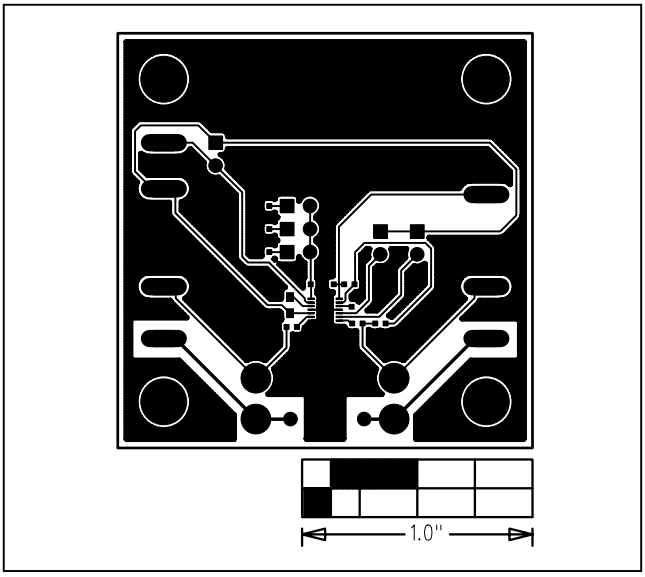


Figure 3. MAX9814 EV Kit PCB—Component Guide

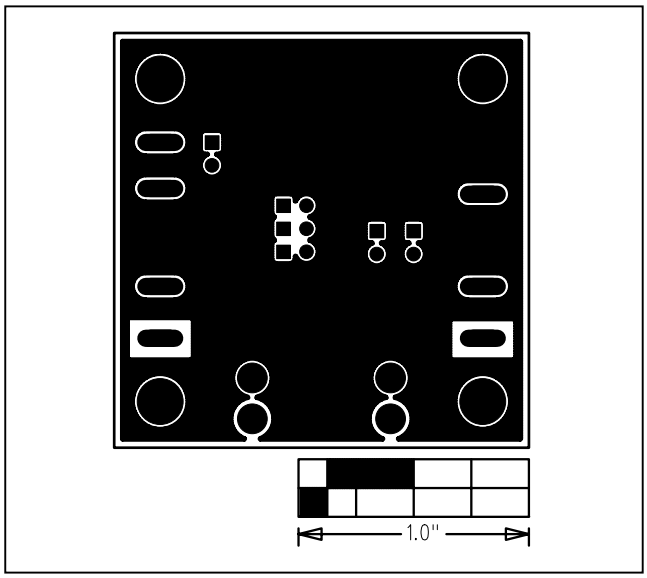


Figure 4. MAX9814 EV Kit PCB—Solder Side

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