19-6275; Rev 0; 4/12

MAX98502 Evaluation Kit
Evaluates: MAX98502

General Description

The MAX98502 evaluation kit (EV kit) is a fully assembled and tested circuit board that uses the MAX98502 boosted Class D amplifier to drive a mono bridge-tied-load (BTL) speaker in portable audio applications. Designed to operate from a 2.5V to 5.5V DC power supply, the EV kit is capable of delivering 2.2W into an 8Ω load or 4W into a 4Ω load. The EV kit accepts differential or single-ended input signals, features selectable gain, and separate speaker and boost shutdown inputs.

Features

- **2.5V to 5.5V Single-Supply Operation**
- **4W Mono Class D Output**
- **Selectable Gain: +6dB, +15.5dB, and +20dB**
- **Boosted Class D Output**
- **Differential or Single-Ended Input**
- **Boost Converter Shutdown**
- **Speaker Output Shutdown**
- **Proven PCB Layout**
- **Fully Assembled and Tested**

Ordering Information appears at end of data sheet.

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	10µF ±10%, 6.3V X7R ceramic capacitor (0805) Murata GRM21BR70J106K TDK C2012X7R0J106K
C2	1	22µF ±20%, 16V X5R ceramic capacitor (1206) Murata GRM31CR61C226M Taiyo Yuden EMK316BJ226M
C3, C4	2	1µF ±10%, 25V X7R ceramic capacitors (0603) Murata GRM188R71E105K Murata GRM188R71E105M
C5	1	22µF ±10%, 6.3V X5R ceramic capacitor (0805) Murata GRM21BR60J226M TDK C2012X5R0J226K
C8	1	0.1µF ±10%, 16V X7R ceramic capacitor (0402) Murata GRM155R71C104K TDK C1005X7R1C104K
C12, C13	0	Not installed, ceramic capacitors (0603)
C14–C18	5	0.22µF ±10%, 25V X7R ceramic capacitors (0603) Murata GRM188R71E224K TDK C1608X7R1E224K
FB2, FB3	0	Not installed, ferrite beads (0603)
J1	1	Phono jack, black (side-entry PCB mount)
JU1, JU2, JU3	3	3-pin headers
JU4	1	2-pin header
L1	1	2.2µH, 91mΩ, 1.5A inductor (3.2mm x 2.5mm) Murata LQH32PN2R2NN0
L2, L3	0	Not installed, inductors
OUT-, OUT+, RKNEE, PGND	4	Test points
R1	1	27.4kΩ ±1% resistor (0603)
R2, R3	2	22Ω ±5% resistors (0603)
U1	1	Boosted Class D audio amplifier (16 WLP) Maxim MAX98502EWE+
VCCOUT	0	Not installed, test point
—	4	Shunts
—	1	PCB: MAX98502 EVALUATION KIT
OPTIONAL COMPONENTS		
L2, L3	2	22µH ±20%, 2A inductors (D75LC) TOKO B1047AS-220M

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Taiyo Yuden	800-348-2496	www.t-yuden.com
TDK Corp.	847-803-6100	www.component.tdk.com
TOKO America, Inc.	847-297-0070	www.tokoam.com

Note: *Indicate that you are using the MAX98502 when contacting these component suppliers.*

Quick Start

Recommended Equipment

- MAX98502 EV kit
- 2.5V to 5.5V, 4A DC supply
- 8Ω or 4Ω speaker
- Mono audio signal source

Procedure

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

1) Verify that shunts are installed as follows:
   JU1: Open (+15.5dB gain)
   JU2: Pins 1-2 (speaker enabled)
   JU3: Pins 1-2 (boost enabled)
   JU4: Short (single-ended/unbalanced input)
2) Set the power-supply output to 3.6V.
3) Disable the power-supply output.
4) Connect the power-supply ground to the PGND PCB pad and the power-supply positive output to the VBAT PCB pad on the EV kit. Keep VBAT lengths < 8in (and twisted to minimize inductance) to ensure proper device operation.
5) Verify that the audio source output is disabled.
6) Connect the mono audio source between the IN+ and IN- PCB pads or J1 on the EV kit.
7) Connect the speaker across the OUT+ and OUT- test points.
8) Enable the power-supply output.
9) Enable the audio source.
10) Verify that the speaker is playing the audio source signal.

Detailed Description of Hardware

The MAX98502 EV kit features the MAX98502 boosted Class D amplifier IC, designed to drive a BTL mono speaker in portable audio applications. The EV kit accepts a differential or single-ended audio input, features three selectable gain settings, and provides two active-low shutdown inputs for flexibility. The audio input source is amplified to drive 2.2W into an 8Ω speaker or 4W into an 4Ω speaker. The EV kit operates from a single DC power supply that can provide 2.5V to 5.5V.

The EV kit provides two sets of differential outputs. The device outputs (OUT+/OUT-) can be connected directly to a speaker load, without any filtering, with up to 24in of cable. However, a filter can be added to ease evaluation.

Selectable Gain Setting

The IC features three internal gain settings that are selectable with the GAIN input. Jumper JU1 controls the amplifier's gain select input. See Table 1 for JU1 configuration.

Table 1. GAIN Input (JU1)

SHUNT POSITION	GAIN PIN	GAIN SETTING (dB)
2-3	Connected to AGND	+6
Not installed*	Unconnected	+15.5
1-2	Connected to VBAT	+20

**Default position.*

Shutdown Inputs

The IC features two active-low shutdown inputs ($\overline{SDSPK}$ and $\overline{SDBST}$). Jumper JU2 enables or disables the speaker amplifier ($\overline{SDSPK}$) and jumper JU3 controls the boost converter ($\overline{SDBST}$). See Table 2 for JU2 and JU3 configuration. The boost must be enabled for the speaker amplifier to enable.

Input Mode

Jumper JU4 provides the option to select between a differential or single-ended input mode for the EV kit. See Table 3 for JU4 configuration.

Optional Output Filtering

The IC is designed to pass FCC emissions standards without any filtering when using up to 24in of cable to connect the speaker. When evaluating the IC without any filtering, connect the speaker to the output test points (OUT+/OUT-).

The EV kit also features PCB pads for a lowpass filter that can be added to ease evaluation. Audio analyzers typically cannot accept the Class D amplifier's pulse-width-modulated (PWM) waveform at their inputs. The lowpass filter extracts the audio content from the PWM output signal and allows the device to be connected directly to an audio analyzer. The PWM output signal can be lowpass-filtered by simply installing L2 and L3; all other components are populated. The filtered outputs should then be monitored at the FOUT+/FOUT- pads. See Table 4 for suggested filtering components for an 8Ω load. Contact the factory for suggested filtering components for a 4Ω load.

Optional Output Loading

The EV kit can be used to drive a 4Ω or 8Ω load. See tables 5 and 6 below for required components for each load.

Table 2. Shutdown Configuration (JU2, JU3)

$\overline{\text{SDBST}}$ PIN (JU3)	$\overline{\text{SDSPK}}$ PIN (JU2)	BOOST STATUS	SPEAKER STATUS
2-3 (low)	2-3 (low)	Off	Off
2-3 (low)	1-2 (high)	Off	Off
1-2 (high)	2-3 (low)	On	Off
1-2* (high)	1-2* (high)	On	On

**Default position.*

Table 3. Input Mode (JU4)

SHUNT POSITION	IN- PIN	INPUT MODE
Installed*	Connected to AGND	Single-ended/ unbalanced input
Not installed	Connected to user-supplied negative differential output	Differential input

**Default position.*

Table 4. Suggested Filtering Components for 8Ω Load

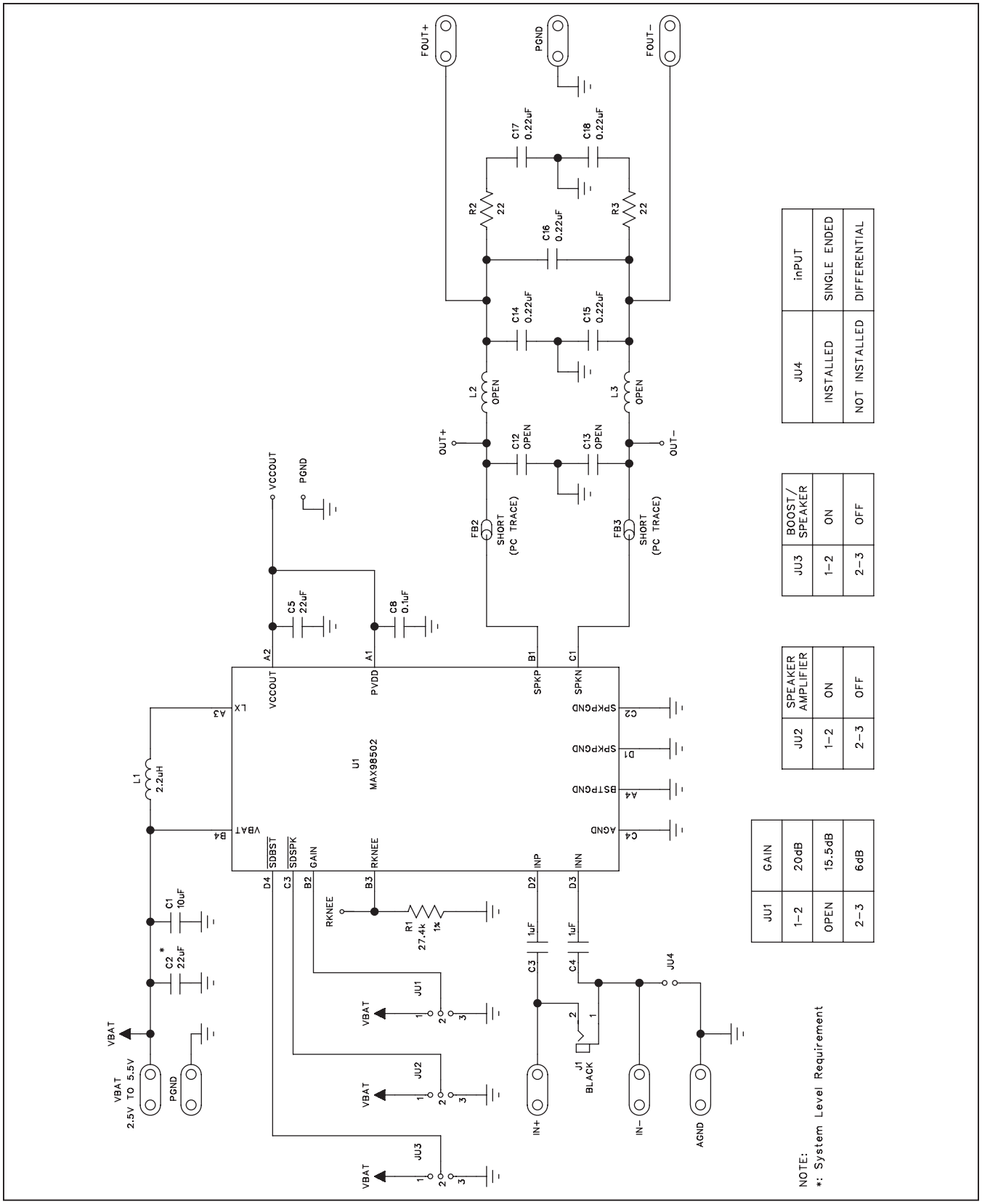
DESIGNATION	QTY	DESCRIPTION
L2, L3	2	22µH ±20%, 2A inductors (D75LC) TOKO B1047AS-220M

Table 5. Components Required for 4Ω Speaker Drive

DESIGNATION	QTY	DESCRIPTION
C5	1	22µF, 6.3V ceramic capacitor (0805)
C8	1	0.1µF, 6.3V ceramic capacitor (0402)

Table 6. Minimum Components Required for 8Ω Speaker Drive

DESIGNATION	QTY	DESCRIPTION
C5	1	22µF, 6.3V ceramic capacitor (0603)
C8	1	Not installed, ceramic capacitor



JU1	GAIN
1–2	20dB
OPEN	15.5dB
2–3	6dB

JU2	SPEAKER AMPLIFIER
1–2	ON
2–3	OFF

JU3	BOOST/ SPEAKER
1–2	ON
2–3	OFF

JU4	inPUT
INSTALLED	SINGLE ENDED
NOT INSTALLED	DIFFERENTIAL

Figure 1. MAX98502 EV Kit Schematic

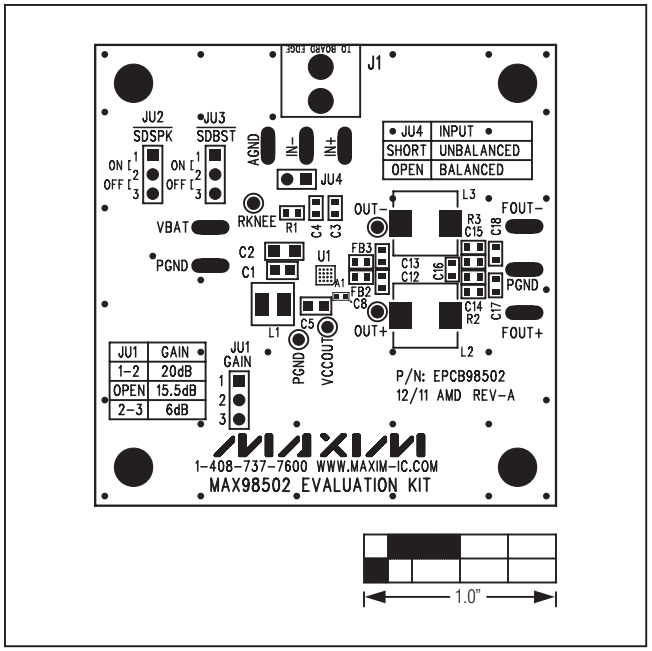


Figure 2. MAX98502 EV Kit Component Placement Guide—Component Side

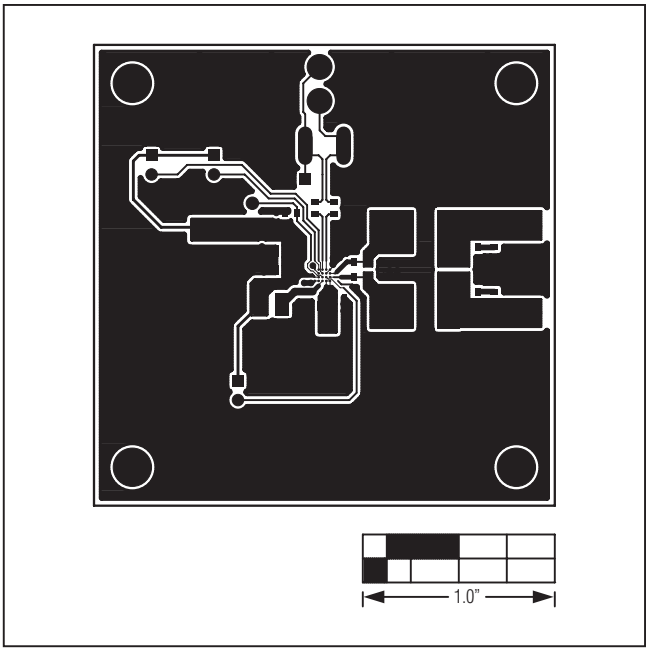


Figure 3. MAX98502 EV Kit PCB Layout—Component Side

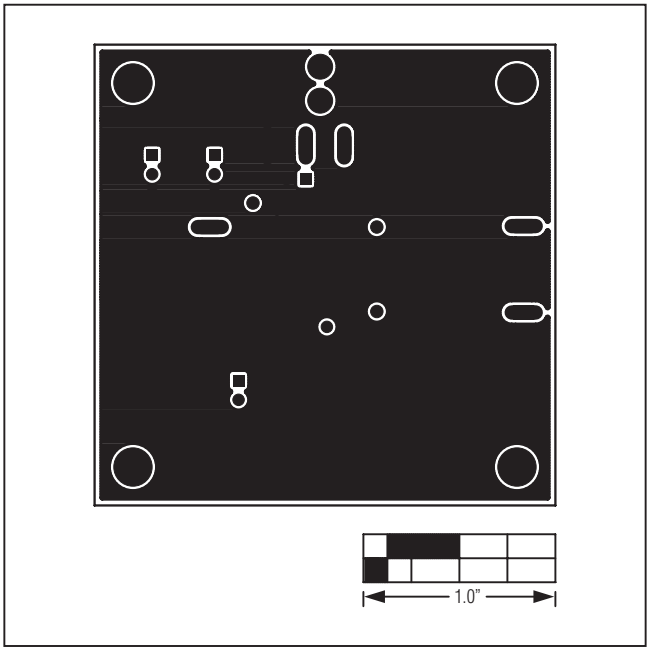


Figure 4. MAX98502 EV Kit PCB Layout—Solder Side

Ordering Information

PART	TYPE
MAX98502EVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/12	Initial release	—

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Maxim Integrated:

MAX98502EVKIT#