



# MAX98303 Evaluation Kit

## General Description

The MAX98303 evaluation kit (EV kit) is a fully assembled and tested PCB that evaluates the MAX98303 stereo 3.1W Class D amplifier in a 16-bump, 0.4mm pitch wafer-level package (WLP). The EV kit operates from a single 2.6V to 5.5V DC power supply and is capable of delivering 3.1W into a 4Ω load. The EV kit accepts a differential or single-ended audio input and provides differential outputs for the speaker. The device outputs can be connected directly to a speaker load for filterless applications; however, a filter can be added to ease evaluation.

## Features

- ◆ 2.6V to 5.5V Single-Supply Operation
- ◆ Delivers 3.1W Into a 4Ω Load
- ◆ Single-Ended or Differential Audio Input
- ◆ Five Selectable Gains
- ◆ Filterless Operation
- ◆ Optional Class D Output Filters for Ease of Evaluation
- ◆ Low-Power Shutdown Input
- ◆ Fully Assembled and Tested

## Ordering Information

| PART           | TYPE   |
|----------------|--------|
| MAX98303EVKIT+ | EV Kit |

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

## Component List

| DESIGNATION                              | QTY | DESCRIPTION                                                                                   |
|------------------------------------------|-----|-----------------------------------------------------------------------------------------------|
| C1                                       | 1   | 0.1μF ±10%, 16V X7R ceramic capacitor (0402)<br>Murata GRM155R71C104K<br>TDK C1005X7R1C104K   |
| C2                                       | 1   | 10μF ±10%, 6.3V X7R ceramic capacitor (0805)<br>Murata GRM21BR70J106K<br>TDK C2012X7R0J106K   |
| C3, C4, C17, C18                         | 4   | 1μF ±10%, 25V X7R ceramic capacitors (0603)<br>Murata GRM188R71E105K<br>Murata GRM188R71E105M |
| C5–C16, C19, C20                         | 0   | Not installed, capacitors (0603)                                                              |
| FB1–FB4                                  | 4   | 0Ω resistors (0603)                                                                           |
| FOUTL+, FOUTL-, FOUTR+, FOUTR-, GND, VDD | 6   | Binding posts                                                                                 |
| INL                                      | 1   | White phono jack (side-entry PCB mount)                                                       |
| INR                                      | 1   | Red phono jack (side-entry PCB mount)                                                         |
| JU1, JU4                                 | 2   | 2-pin headers                                                                                 |

| DESIGNATION                | QTY | DESCRIPTION                                           |
|----------------------------|-----|-------------------------------------------------------|
| JU2                        | 1   | 3-pin header                                          |
| JU3                        | 1   | 5-pin header                                          |
| L1–L4                      | 0   | Not installed, inductors—PCB short                    |
| OUTL+, OUTL-, OUTR+, OUTR- | 4   | Test points                                           |
| R1, R2                     | 2   | 100kΩ ±5% resistors (0603)                            |
| R3–R6                      | 0   | Not installed, resistors (0603)                       |
| U1                         | 1   | 2.6W Class D amplifier (16 WLP)<br>Maxim MAX98303EWE+ |
| —                          | 4   | Shunts (JU1–JU4)                                      |
| —                          | 1   | PCB: MAX98303 EVALUATION KIT+                         |

### OPTIONAL COMPONENTS

|        |    |                                                                                               |
|--------|----|-----------------------------------------------------------------------------------------------|
| C7–C16 | 10 | 0.22μF ±10%, 25V X7R ceramic capacitors (0603)<br>Murata GRM188R71E224K<br>TDK C1608X7R1E224K |
| L1–L4  | 4  | 22μH ±20%, 1A inductors<br>TOKO A916CY-220M                                                   |
| R3–R6  | 4  | 22Ω ±5% resistors (0603)                                                                      |



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## 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       |
| TOKO America, Inc.                     | 847-297-0070 | www.tokoam.com              |

**Note:** Indicate that you are using the MAX98303EWE+ when contacting these component suppliers.

## Quick Start

### Recommended Equipment

- MAX98303 EV kit
- 2.6V to 5.5V, 2A DC power supply
- Stereo audio input
- Two 4Ω speakers

### Procedures

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, JU4: Installed (single-ended input)
  - JU2: Pins 1-2 (device enabled)
  - JU3: Pins 1-3 (12dB gain)
- 2) Set the power-supply output to 5V. Disable the power supply.
- 3) Connect the power-supply ground terminal to the GND pad and the power-supply positive terminal to the VDD pad of the EV kit.
- 4) With the audio source disabled, connect the left channel of the audio source to the INL+ pad.
- 5) Connect the right channel of the audio source to the INR+ pad.
- 6) Connect the audio source ground to the GND test pad.
- 7) Connect the first speaker across the OUTL+ and OUTL- test points.
- 8) Connect the second speaker across the OUTF+ and OUTF- test points.
- 9) Enable the power-supply output.
- 10) Enable the audio source.
- 11) Verify that the speakers are playing the audio source signal.

## Detailed Description of Hardware

### Filterless Output

The MAX98303 EV kit's filterless outputs (OUTL+, OUTL-, OUTF+, and OUTF-) can be connected directly to a speaker load without any filtering. Use the OUTL+ and OUTL- test points or the OUTF+ and OUTF- test points to connect the speaker directly to the device output.

### Filtered Output

Audio analyzers typically cannot accept the Class D amplifier's pulse-width modulated (PWM) signals at their inputs. Therefore, the EV kit features optional lowpass filters at the outputs to ease evaluation. As shipped, the EV kit's lowpass filter RC components are unpopulated and inductors L1-L4 are shorted on the PCB.

To use the filtered output posts (FOUTF+, FOUTF-, FOUTF+, and FOUTF-), remove the shorts on L1-L4 and install components L1-L4, C7-C16, and R3-R6 (provided separately with the EV kit). Use the output posts to connect the filtered outputs to the audio analyzer. The default lowpass filters at the EV kit output are optimized for an 8Ω speaker.

### Jumper Selection

#### Single-Ended/Differential Audio Inputs

The EV kit features jumpers JU1 and JU4 to select between a differential or single-ended input mode. See Table 1 for JU1 and JU4 configuration.

**Table 1. JU1 and JU4 Jumper Selection**

| SHUNT POSITION | IN_ - PIN                                                 | DEVICE OPERATION   |
|----------------|-----------------------------------------------------------|--------------------|
| Installed*     | AC-grounded                                               | Single-ended input |
| Not installed  | AC-coupled to a user-supplied negative differential input | Differential input |

\*Default position.

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## Shutdown Input ( $\overline{\text{SHDN}}$ )

The EV kit features 3-pin jumper JU2 to control the active-low shutdown input. Drive  $\overline{\text{SHDN}}$  high to place the device in normal operation; drive  $\overline{\text{SHDN}}$  low to place the device in the low-power shutdown mode. See Table 2 for shunt positions.

## Selectable Gain (GAIN)

The EV kit features 5-pin jumper JU3 to control the device's five programmable gain settings. See Table 3 for gain-control configuration.

**Table 2. JU2 Jumper Selection ( $\overline{\text{SHDN}}$ )**

| SHUNT POSITION | $\overline{\text{SHDN}}$ PIN | DEVICE OPERATION |
|----------------|------------------------------|------------------|
| 1-2*           | Connected to PVDD            | Normal operation |
| 2-3            | Connected to GND             | Shutdown mode    |

\*Default position.

**Table 3. JU3 Jumper Selection (GAIN)**

| SHUNT POSITION | GAIN PIN                                            | MAXIMUM GAIN (dB) |
|----------------|-----------------------------------------------------|-------------------|
| 1-2            | Connected to PVDD through 100k $\Omega$ resistor R1 | 9                 |
| 1-3*           | Connected to PVDD                                   | 12                |
| 1-4            | Connected to GND through 100k $\Omega$ resistor R2  | 15                |
| 1-5            | Connected to GND                                    | 18                |
| Not installed  | Unconnected                                         | 6                 |

\*Default position.

Evaluates: MAX98303

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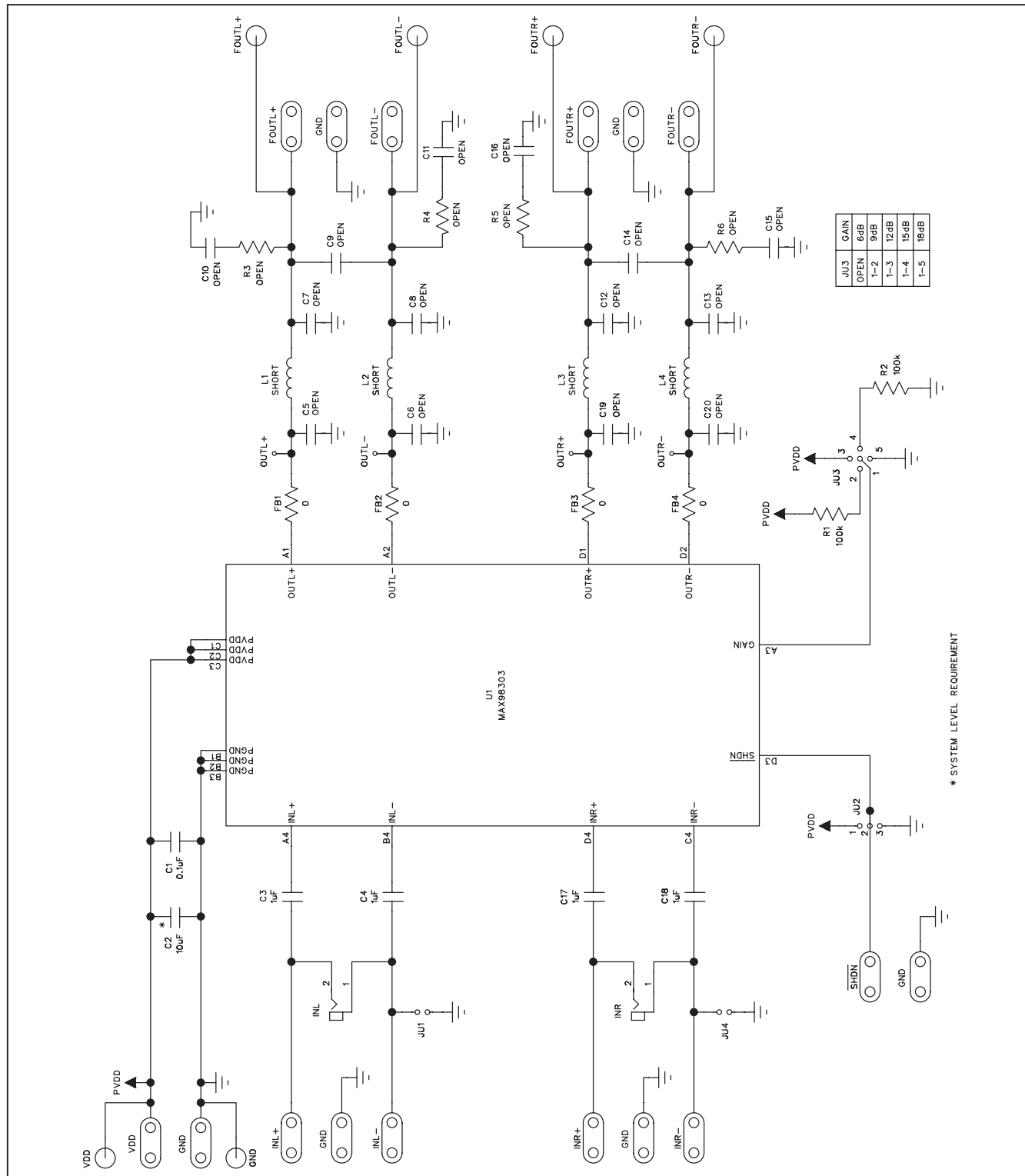


Figure 1. MAX98303 EV Kit Schematic

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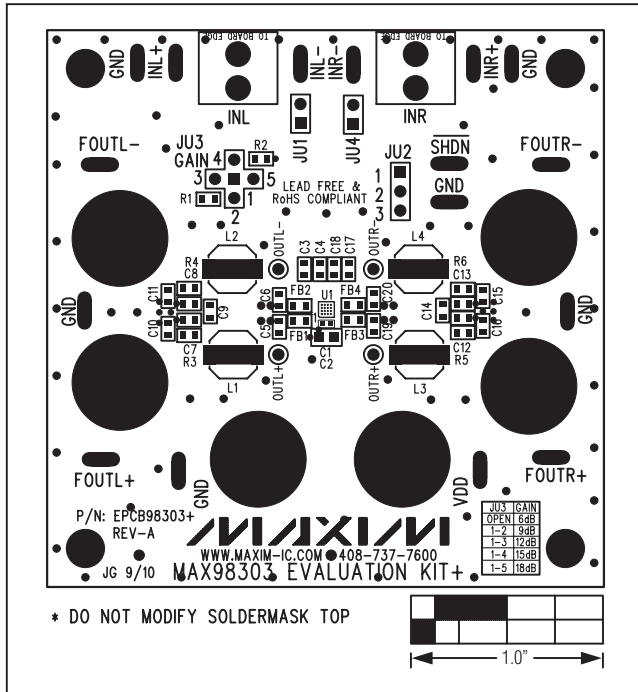


Figure 2. MAX98303 EV Kit Component Placement Guide—Component Side

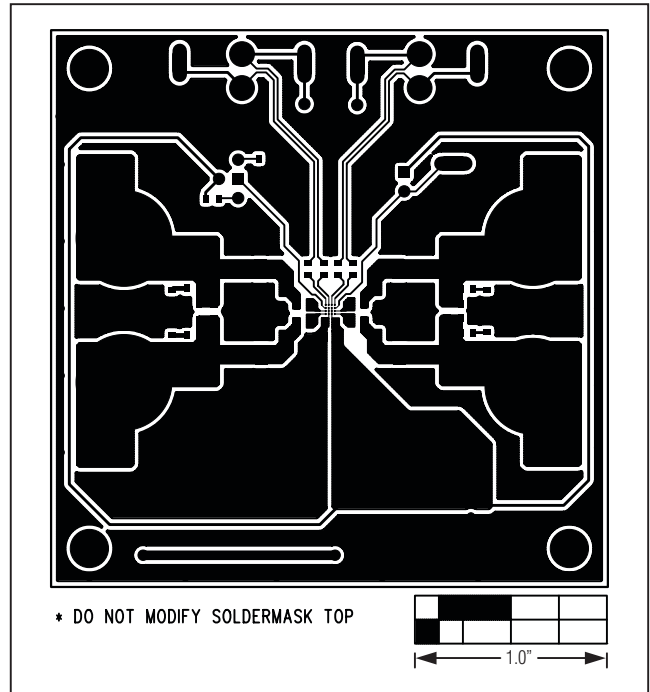


Figure 3. MAX98303 EV Kit PCB Layout—Component Side

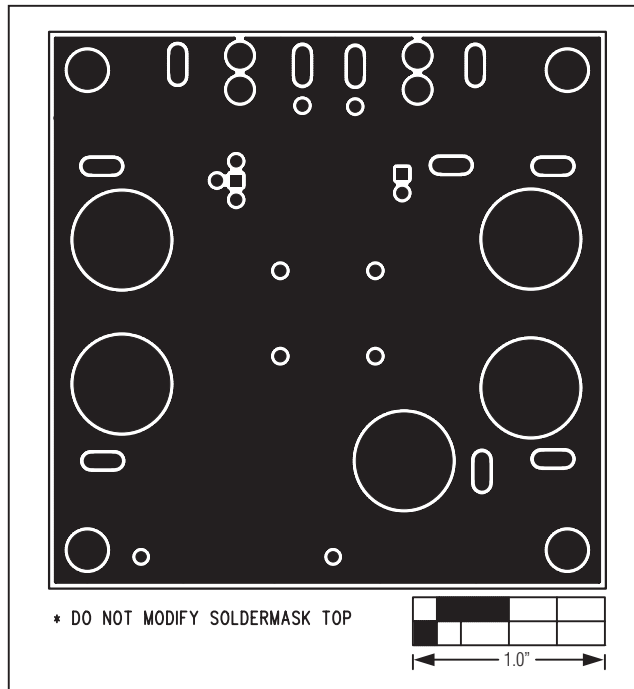


Figure 4. MAX98303 EV Kit PCB Layout—Solder Side

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## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION     | PAGES<br>CHANGED |
|--------------------|------------------|-----------------|------------------|
| 0                  | 10/10            | Initial release | —                |

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