![TEXAS INSTRUMENTS]

TPA731 MSOP
Audio Power Amplifier
Evaluation Module

User's Guide

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Related Documentation From Texas Instruments

■ *TI Plug-N-Play Audio Amplifier Evaluation Platform* (literature number SLOU011) Provides detailed information on the evaluation platform and its use with TI audio evaluation modules.

■ *TPA731 700-mW Low-Voltage Audio Power Amplifier* (literature number SLOS315) This is the data sheet for the TPA731 audio amplifier integrated circuit.

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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Introduction

This chapter provides an overview of the Texas Instruments (TI) TPA731 MSOP audio amplifier evaluation module (SLOP342). It includes a list of EVM features, a brief description of the module illustrated with a pictorial diagram, and a list of EVM specifications.

1.1   Feature Highlights

The TI TPA731 MSOP audio amplifier evaluation module and the TI plug-n-play audio amplifier evaluation platform include the following features:

❑ TPA731 low-voltage audio power amplifier evaluation module

  ■ Single channel, bridge-tied load (BTL)

  ■ 2.5-V and 5.5-V operation

  ■ 700-mW output power into 8 Ω at 5 V, BTL

  ■ Ultra-low current consumption in shutdown mode

  ■ Internal thermal and short-circuit protection

  ■ Module gain is set at –4 V/V in BTL mode, –2 V/V in SE mode

❑ Quick and Easy Configuration With The TI Plug-N-Play Audio Amplifier Evaluation Platform

  ■ Evaluation module is designed to simply plug into the platform, automatically making all signal, control, and power connections

  ■ Platform provides flexible power options

  ■ Jumpers on the platform select power and module control options

  ■ Switches on the platform route signals

  ■ Platform provides quick and easy audio input and output connections

❑ Platform Power Options

  ■ Onboard 9-V battery

  ■ External 5-V–15-V (V_{CC}) supply inputs

  ■ External regulated V_{DD} supply input

  ■ Socket for on-board 5-V/3.3-V V_{DD} voltage regulator EVM

  ■ Onboard overvoltage and reverse polarity power protection

❑ Platform Audio Input and Output Connections

  ■ Left and right RCA phono jack inputs

  ■ Miniature stereo phone jack input

  ■ Left and right RCA phono jack outputs

  ■ Left and right compression speaker terminal outputs

  ■ Miniature stereo headphone jack output

1.2 Description

The TPA731 MSOP audio power amplifier evaluation module is a complete, low-power single-channel audio power amplifier. It consists of the TI TPA731 700-mW low-voltage audio power amplifier IC in a very small MSOP package, along with a small number of other parts mounted on a circuit board that is approximately one and a quarter inches square (see Figure 1–1).

Figure 1–1. The TI TPA731 Audio Amplifier Evaluation Module
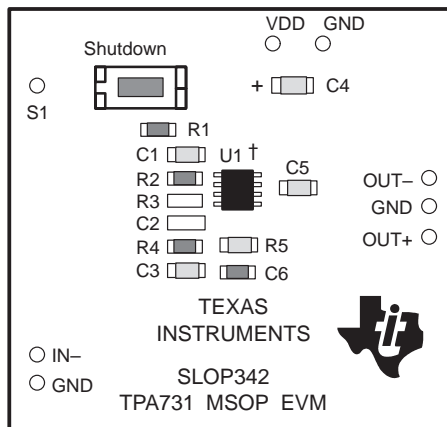
† Due to the very small size of the MSOP IC package, the standard part number TPA731 is replaced with the code TAJC.

Single in-line header pins are mounted to the underside of the module circuit board. These pins allow the EVM to be plugged into the TI plug-n-play audio amplifier evaluation platform or to be wired directly into existing circuits and equipment when used stand-alone.

The platform, with room for a pair of TPA731 MSOP evaluation modules, is a convenient vehicle for demonstrating TI's audio power amplifier and related evaluation modules. The EVMs simply plug into the platform, which automatically provides power to the modules, interconnects them correctly, and connects them to a versatile array of standard audio input and output jacks and connectors. Easy-to-use configuration controls allow the platform and EVMs to quickly model many possible end-equipment configurations.

There is nothing to build, nothing to solder, and nothing but the speakers included with the platform to hook up.

1.3 TPA731 EVM Specifications

Supply voltage range, V_{DD} . . . . 2.5 V to 5.5 V
Supply current, I_{DD} . . . . 450 mA, max
Continuous output power, P_O: 8-Ω BTL, V_{DD} = 5 V . . . . 700 mW
Audio input voltage, V_I . . . . 2 Vpp, max
Minimum load impedance, R_L . . . . 8 Ω

Operation

Follow the steps in this chapter to quickly prepare the TPA731 MSOP audio amplifier EVM for use. Using the TPA731 MSOP EVM with the TI plug-n-play audio amplifier evaluation platform is a quick and easy way to connect power, signal and control inputs, and signal outputs to the EVM, using standard connectors. However, the audio amplifier evaluation module can be used stand-alone by making connections directly to the module pins, and it can be wired directly into existing circuits or equipment.

The platform switch and jumper settings shown in Table 2–1 are typical for the TPA731 MSOP EVM. They will cause the TPA731 device to shutdown when a plug is inserted into platform headphone jack J10.

Table 2–1. Typical TI Plug-N-Play Platform Jumper and Switch Settings for the TPA731 MSOP EVM

EVM	JP6	JP7	JP8	S2	S3
TPA731	Mute	X	Hi	See Note 2	X

Notes: 1) X = Don't care

2) Set S2 to ON when signal conditioning board is installed in U1; set S2 to OFF when no signal conditioning board is installed.

Topic	Page

2.1 Precautions

> **Power Supply Input Polarity and Maximum Voltage**
>
> **Always ensure that the polarity and voltage of the external power connected to V_{CC} power input connector J1, J2, and/or V_{DD} power input connector J6 are correct. Overvoltage or reverse-polarity power applied to these terminals can open onboard soldered-in fuses and cause other damage to the platform, installed evaluation modules, and/or the power source.**

> **Inserting or Removing EVM Boards**
>
> **Do not insert or remove EVM boards with power applied – damage to the EVM board, the platform, or both may result.**

Figure 2–1. Quick Start Platform Map
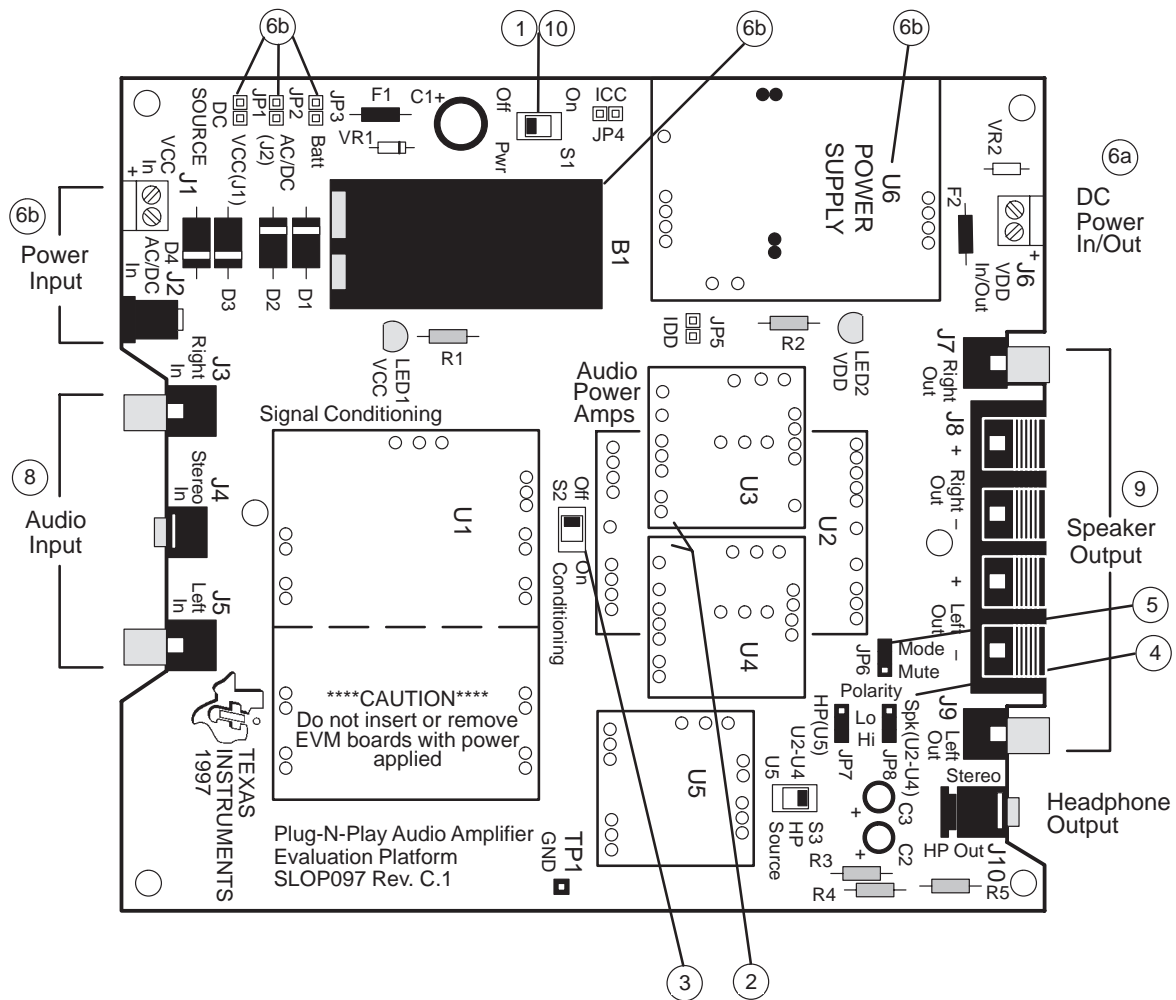
2.2 Quick Start List for Platform

Follow these steps when using the TPA731 MSOP EVM with the TI plug-n-play audio amplifier evaluation platform (see the platform user's guide, SLOU011, for additional details). Numbered callouts for selected steps are shown in Figure 2–1 and details appear in Chapter 3.

❑ **Platform preparations**

1) Ensure that all external power sources are set to off and that the platform power switch S1 is set to off.

2) Install a TPA731 MSOP module in platform sockets U3 and U4 for stereo operation (or a module in either U3 *or* U4 for single channel operation), taking care to align the module pins correctly.

3) Use switch S2 to select or bypass the signal conditioning EVM (U1).

4) Set control signal Polarity jumper JP8 to Hi.

5) Set jumper JP6 to select the Mute control input (causes the TPA731 to shutdown if a plug is inserted into platform headphone jack J10).

Table 2–2. Platform Jumper and Switch Settings for the TPA731 MSOP EVM

EVM	JP6	JP7	JP8	S2	S3
TPA731	Mute	X	Hi	See Note 2	X

Notes: 1) X = Don't care

2) Set S2 to ON when signal conditioning board is installed in U1; set S2 to OFF when no signal conditioning board is installed.

❑ **Power supply**

6) Select and connect the power supply:

a) Connect an external regulated power supply set to a voltage between 2.5 V and 5.5 V to platform V_{DD} power input connector J6, taking care to observe marked polarity, or

b) Install a voltage regulator EVM (SLVP097 or equiv.) in platform socket U6. Install a 9-V battery in B1 or connect a 7 V – 12 V power source to a platform V_{CC} power input J1 or J2 and jumper the appropriate power input (see platform user's guide).

❑ **Inputs and outputs**

7) Ensure that signal source level is set to minimum.

8) Connect the audio source to left and right RCA phono jacks J3 and J5 or stereo miniature phone jack J4.

9) Connect 8-Ω–32-Ω speakers to left and right RCA jacks J7 and J9 or to stripped wire connectors J8.

❑ **Power-up**

10) Verify correct voltage and input polarity and set the external power supply to ON. If V_{CC} and an on-board regulator EVM are used to provide V_{DD}, set platform power switch S1 to on.

Platform LED2 lights indicating the presence of V_{DD}, and the evaluation modules installed on the platform begin operation.

11) Adjust the signal source level as needed.

2.3 Quick Start List for Stand-Alone

Follow these steps to use the TPA731 MSOP EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the TPA731 MSOP module header pins can be made via individual sockets, wire-wrapping, or soldering to the pins, either on the top or the bottom of the module circuit board. Numbered callouts for selected steps are shown in Figure 2–2.

Figure 2–2. Quick Start Module Map
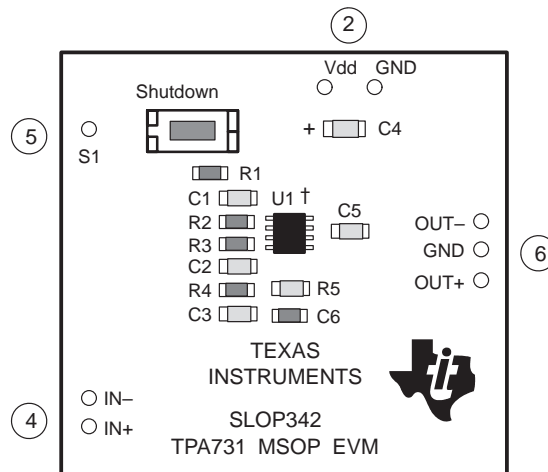
† Due to the very small size of the MSOP IC package, the standard part number TPA731 is replaced with the code TIAJC.

❏ **Power supply**

1) Ensure that all external power sources are set to off.

2) Connect an external regulated power supply set to 5 V to the module V_{DD} and GND pins, taking care to observe marked polarity.

❏ **Inputs and outputs**

3) Ensure that the signal source level is set to minimum.

4) Connect the audio source to the module IN– and IN+ pins, taking care to observe marked polarity.

5) Connect the shutdown (S1) pin to V_{DD} through a normally open switch.

6) Connect an 8-Ω–32-Ω speaker to the module OUT+ and OUT– pins.

❏ **Power-up**

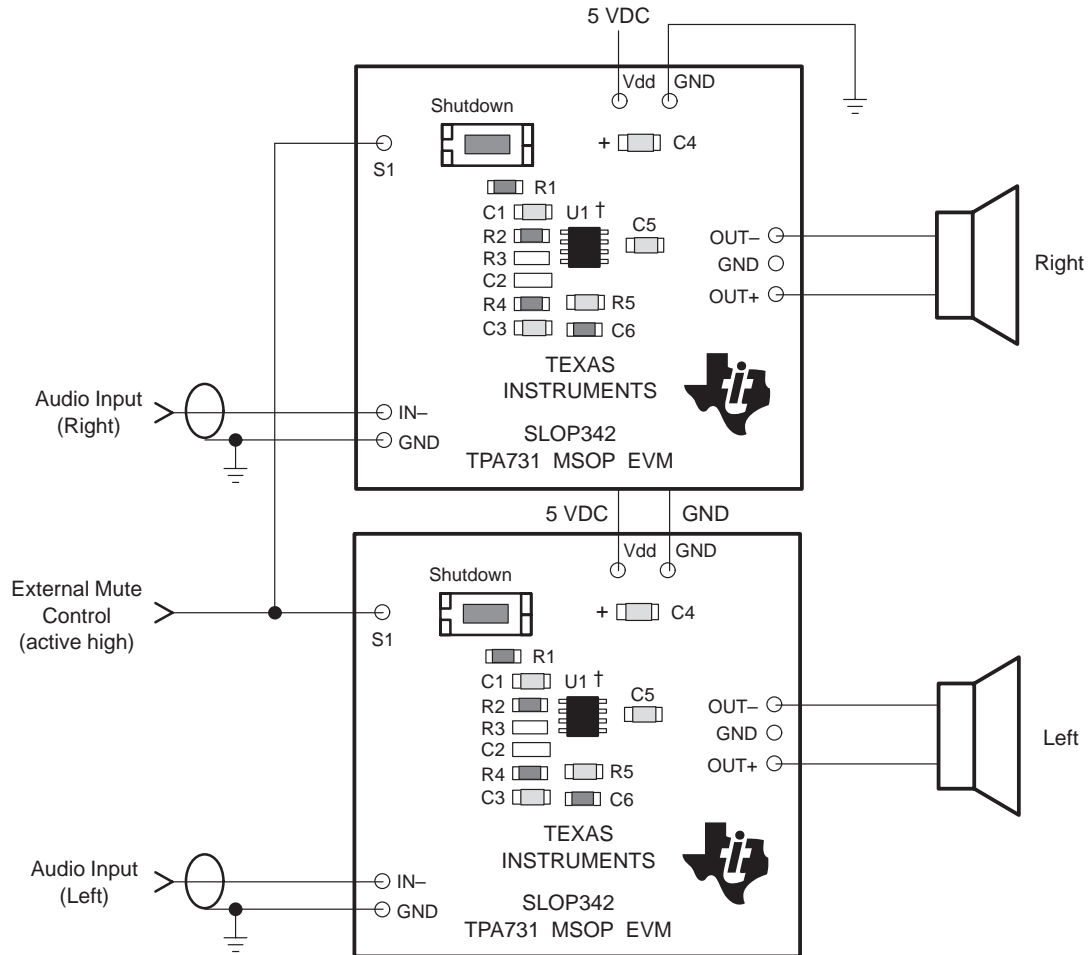7) Verify correct voltage and input polarity and set the external power supply to on.

The EVM should begin operation.

8) Adjust the signal source level as needed.

2.4 Reference
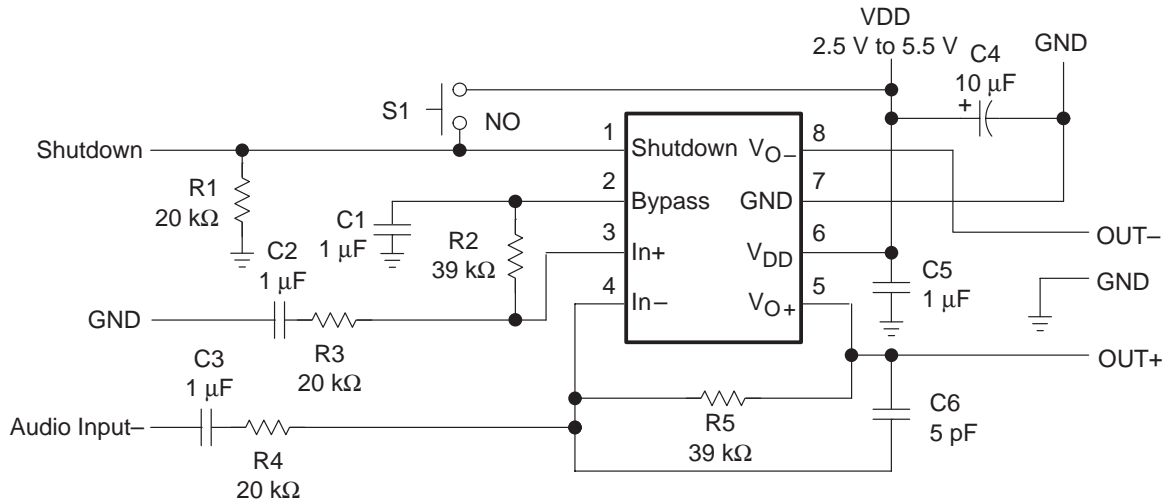
2.4.1 TPA731 MSOP EVM Connected for BTL Output

Figure 2–3. TPA731 MSOP EVM Connected for Stereo BTL Output

† Due to the very small size of the MSOP IC package, the standard part number TPA731 is replaced with the code TIAJC.

2.4.2 TPA731 MSOP EVM Schematic Diagram

Figure 2–4. TPA731 MSOP EVM Schematic Diagram

2.4.3 TPA731 MSOP Audio Power Amplifier Evaluation Module Parts List

Table 2–3. TPA731 MSOP EVM Parts List

Reference	Description	Size	EVM Qty.	Manufacturer/ Part Number	Vendor Number
C4	Capacitor, 10 µF, 6.3 V	A	1	Panasonic ECS-TOJY106R	Digi-Key PCS1106CT-ND
C1, C2, C3, C5	Capacitor, 1 µF, 80%/–20%, nonpolarized	0603	3	Murata GRM39-Y5V105Z10PT	Newark
C6	Capacitor, pad only	0603	0		
R1, R3, R4	Resistor, 20 kΩ, 1/16 W, 5%	0603	2	Panasonic ERJ-3GSYJ203	Digi-Key P20KGCT-ND
R2, R5	Resistor, 39 kΩ, 1/16 W, 5%	0603	1	Panasonic ERJ-3GSYJ393	Digi-Key P39KGCT-ND
S1	Switch, momentary		1	Panasonic P8048SCT-ND	Digi-Key P8048SCT-ND
	Terminal Post Headers		9	Sullins PTC36SABN	Digi-Key S1022-36-ND
U1	IC, TPA731DGN†, audio amplifier, 700 mW, mono	MSOP-8	1	TI TPA731DGN	
PCB1	PCB, TPA731 MSOP EVM		1		

† Due to the very small size of the MSOP IC package, the standard part number TPA731 is replaced with the code TIAJC.

Note: All items are SMD except as noted.

2.4.4 TPA731 MSOP EVM PCB Layers

The following illustrations depict the TPA731 EVM PCB layers and silkscreen. These drawings are not to scale. Gerber plots can be obtained from any TI sales office.
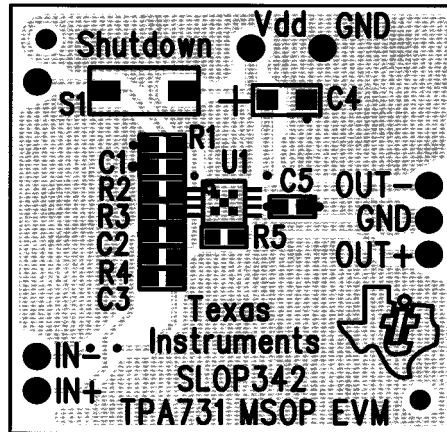
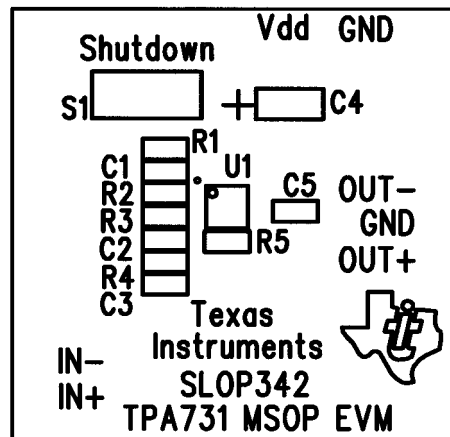*Figure 2–5. TPA731 EVM PCB*
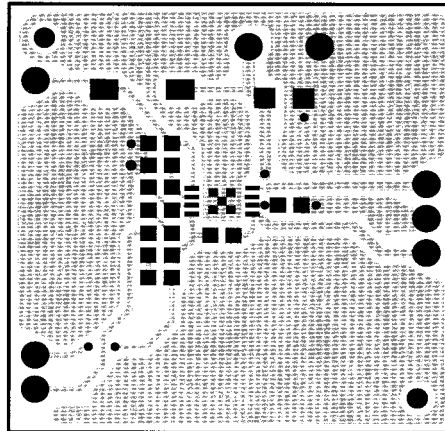

Figure 2–6. TPA731 EVM Silkscreen

Figure 2–7. TPA731 EVM Top Layer

Figure 2–8. TPA731 EVM Bottom Layer