TEXAS INSTRUMENTS

TPA6100A2
Audio Power Amplifier
Evaluation Module

User's Guide

2000

Mixed-Signal Products

SLOU084

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This book may contain cautions and warnings.

This is an example of a caution statement.

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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.
- ***TPA6100A2 50-mW Stereo Audio Power Amplifier*** (literature number SLOS269) This is the data sheet for the TPA6100A2 audio amplifier integrated circuit.

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Chapter 1

Introduction

This chapter provides an overview of the Texas Instruments (TI) TPA6100A2 audio amplifier evaluation module (SLOP335). It includes a list of EVM features, a brief description of the module illustrated with a pictorial diagram, and a list of EVM specifications.

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1.1 Features

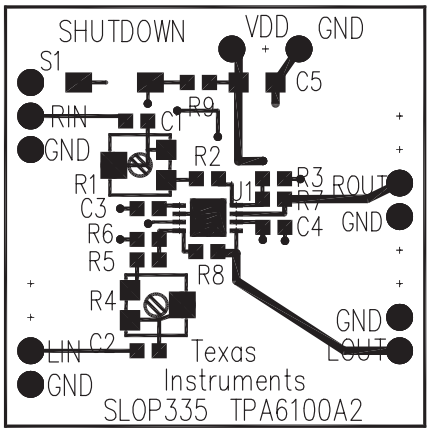
The TI TPA6100A2 audio amplifier evaluation module and the TI Plug-N-Play audio amplifier evaluation platform include the following features:

- TPA6100A2 Stereo Audio Power Amplifier Evaluation Module
  - 1.6-V to 3.6-V operation
  - Dual channel, single-ended operation
  - 50-mW output power into 16 Ω at 3.3 V
  - Very low distortion — THD+N is less than 0.04% at 1 kHz and less than 0.2% from 20 Hz to 20 kHz into 16-Ω loads, and less than 0.03% at 1 kHz and less than 0.2% from 20 Hz to 20 kHz into 32-Ω loads
  - Extremely low current consumption in shutdown mode
  - Internal thermal and short-circuit protection
  - Internal pop reduction circuitry
- 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 onboard 5-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 TPA6100A2 audio power amplifier evaluation module is a complete, low-power stereo audio power amplifier for high-fidelity line-level output, headphone, and small speaker applications. It consists of the TI TPA6100A2 50-mW stereo 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 TPA6100A2 Audio Amplifier Evaluation Module



† Due to the very small size of the MSOP IC package, the standard part number TPA6100A2 is replaced with the code TIAJL.

Single in-line header pins are mounted to the underside of the module circuit board to 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 has room for a single TPA6100A2 evaluation module and 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 TPA6100A2 EVM Specifications

Supply voltage range, V_{DD} . . . . . 1.6 V to 3.6 V
Supply current, I_{DD} . . . . . 160 mA, max
Continuous output power, P_O: 16 Ω, V_{DD} = 3.3 V . . . . . 50 mW
Audio input voltage, V_I . . . . . V_{DD} + 0.3 Vpp, max
Minimum load impedance, R_L . . . . . 16 Ω

Chapter 2

Quick Start

The steps in this chapter can be followed to prepare the TPA6100A2 audio amplifier EVM for use. Using the TPA6100A2 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 TPA6100A2 EVM and will cause the TPA6100A2 IC to shutdown/mute when a plug is removed from platform headphone jack J10.

Table 2–1. Typical TI Plug-N-Play Platform Jumper and Switch Settings for the TPA6100A2 EVM

EVM	JP6	JP7	JP8	S2	S3
TPA6100A2	X	Lo	X	See Note 2	U5

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.

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2.1 Precautions

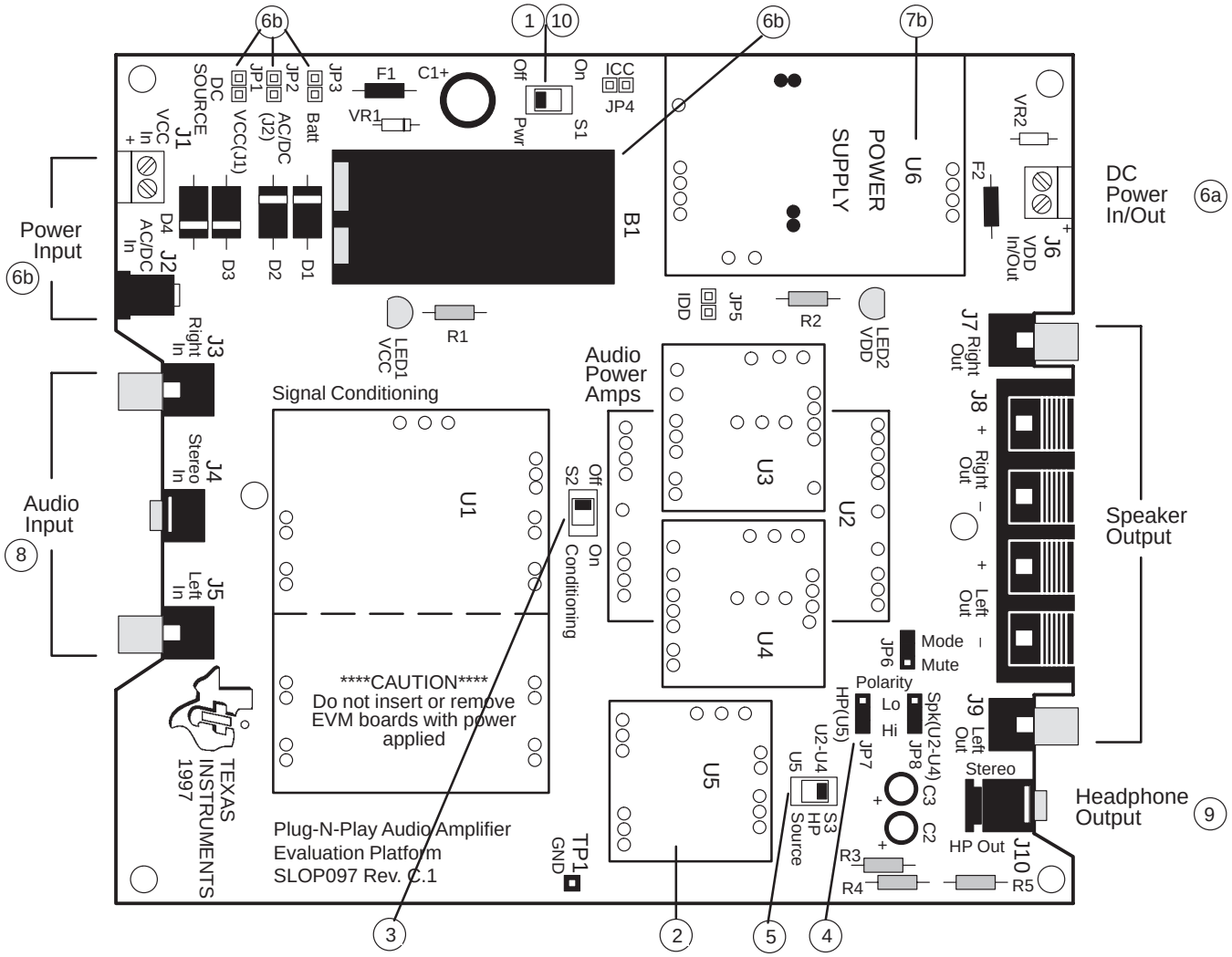
Power Supply Input Polarity and Maximum Voltage

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 TPA6100A2 EVM with the TI plug-n-play audio amplifier evaluation platform (see the platform user's guide, literature number SLOU011, for additional details). Numbered callouts for selected steps are shown in Figure 2–1.

❑ **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 TPA6100A2 module in platform socket U5, 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 JP7 to *Lo.*
5) Set Hp source switch S3 to U5 to route the output signal to the headphone Jack (J10).

❑ **Power supply**

6) Select and connect the power supply:
   a) Connect an external regulated power supply set to a voltage between 1.6 V and 3.6 V to platform V_{DD} power input connector J6, taking care to observe marked polarity,

      or

   b) Install a 3-V to 5-V voltage regulator EVM (SLVP097 or equiv.) in platform socket U6. Install a 9-V battery in B1 or connect a 7-V to 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). Set jumper JP1 on the SLVP097 to 3.3-V operation.

❑ **Inputs and outputs**

7) Ensure that signal source level is set to minimum and that potentiometers R1 and R4 are set to the midpoint.
8) Connect the audio source to left and right RCA phono jacks J3 and J5 or stereo miniature phone jack J4.
9) Connect 16-Ω to 32-Ω headphones to headphone jack J10.

❑ **Power-up**

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

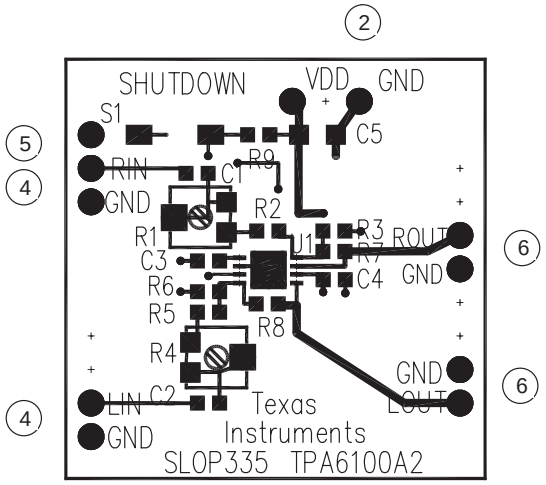
Platform LED2 should light indicating the presence of V_{DD}, and the evaluation modules installed on the platform should begin operation.

11) Adjust the signal source level and potentiometers R1 and R4 as needed.

2.3 Quick Start List for Stand-Alone

Follow these steps to use the TPA6100A2 EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the TPA6100A2 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 TPA6100A2 is replaced with the code TIAJL.

❑ **Power supply**

1) Ensure that all external power sources are set to *OFF*.
2) Connect an external regulated power supply set between 1.6 V and 3.3 V to the module VDD and GND pins taking care to observe marked polarity.

❑ **Inputs and outputs**

3) Ensure that signal source level is set to minimum and that potentiometers R1 and R4 are set to the midpoint.
4) Connect the audio source to the module IN1, IN2, and GND pins taking care to observe marked polarity.
5) Connect the shutdown pin to V_{DD} through a normally open switch.
6) Connect 32-Ω headphones to the module V_O1 and V_O2 pins through 33-µF to 1000-µF output-coupling capacitors (see Figure 3–8) and return to the GND pin, or
7) For line output, connections to the V_O1 and V_O2 pins must be made through 33-µF to 1000-µF output-coupling capacitors and returned to GND.

❑ **Power-up**

8) Verify correct voltage and input polarity and set the external power supply to *ON.*

The EVM should begin operation.

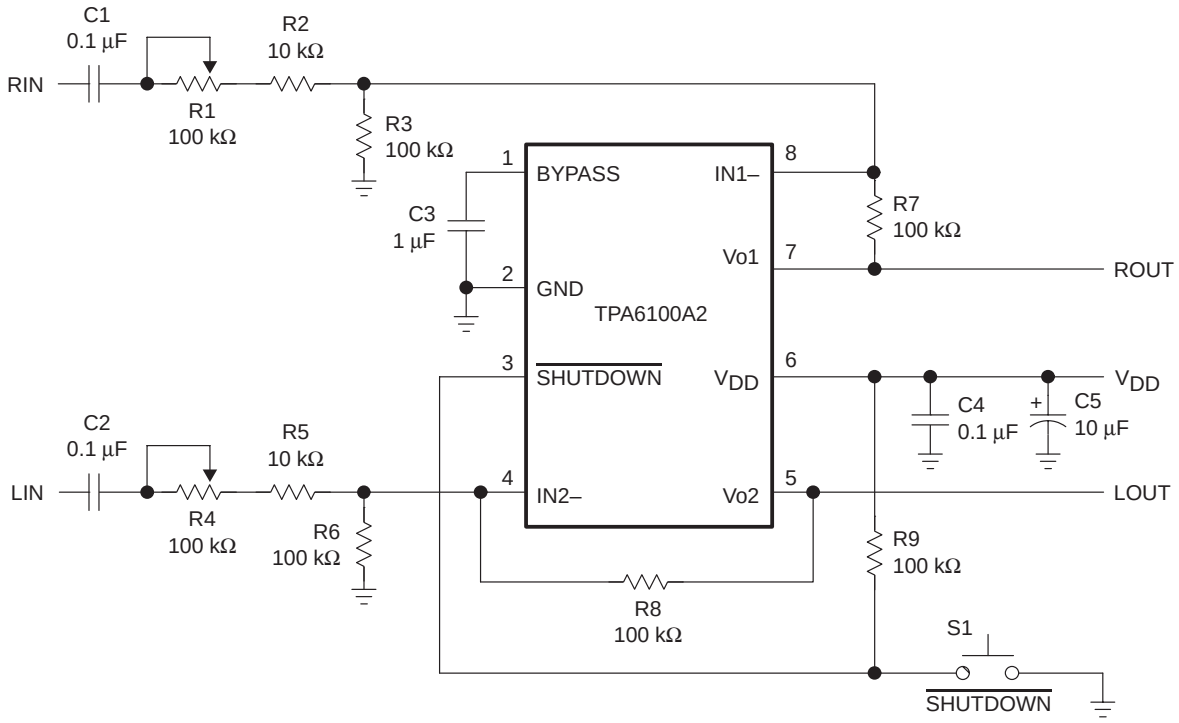
9) Adjust the signal source level and potentiometers R1 and R4 as needed.

2.4 Reference

2.4.1 TPA6100A2 EVM Schematic

The TPA6100A2 EVM schematic is shown in Figure 2–3.

Figure 2–3. TPA6100A2 EVM Schematic Diagram



2.4.2 TPA6100A2 Audio Power Amplifier Evaluation Module Parts List

Table 2–2. TPA6100A2 EVM Parts List

Ref.	Description	Size	Qty.	Manufacturer/ Part Number	Vendor/Number
C1, C2	Capacitor, 0.47 μF, ±10%, Nonpolarized, SMD	0603	1	Panasonic ECJ–1VB0J474K	Digi-Key PCS1911CT-ND
C4	Capacitor, 0.1 μF, ±10%, Nonpolarized, SMD	0603	1	Murat GRM39X7R104K16	Arrow GRM39X7R104K16
C3	Capacitor, 1 μF, ±10%, Nonpolarized, SMD	0603	1	Murata GRM39Y5V106Z010	Arrow GRM39Y5V106Z010
C5	Capacitor, 10 μF, 6.3 V, SMD	A	1	Panasonic ECS–TOJY106R	Digi-Key PCS1106CT-ND
R2, R5	Resistor, 10 kΩ, 1/16 W, 5%, SMD	0603	2	Panasonic ERJ-3GSYJ103	Digi-Key P10KGTR-ND
R3, R6, R7, R8, R9	Resistor, 100 kΩ, 1/16 W, 5%, SMD	0603	4	Panasonic ERJ-3GSYJ104	Digi-Key P100KGTR-ND
R1, R4	Potentiometer, 100 kΩ, 1/2 W, 20%, thru hole		2	Bourns 3314J–1–104E	Digi-Key 3314J–104ETR–ND
S1 (SHUT-DOWN)	Switch, momentary, SMD		1	Panasonic P8048SCT-ND	Digi-Key P8048SCT-ND
U1	IC, TPA6100A2DGK APA, 50 mW, 2 channel	MSOP-8	1	TI TPA6100A2DGK	
PnP Pins	Terminal post headers		11	Sullins	Digi-Key S1022-36-ND

2.4.3 TPA6100A2 EVM PCB Layers

The following illustrations depict the TPA6100A2 PCB layers. These drawings are not to scale. Gerber plots can be obtained from any TI sales office.

Figure 2–4. TPA6100A2 EVM Top Layer

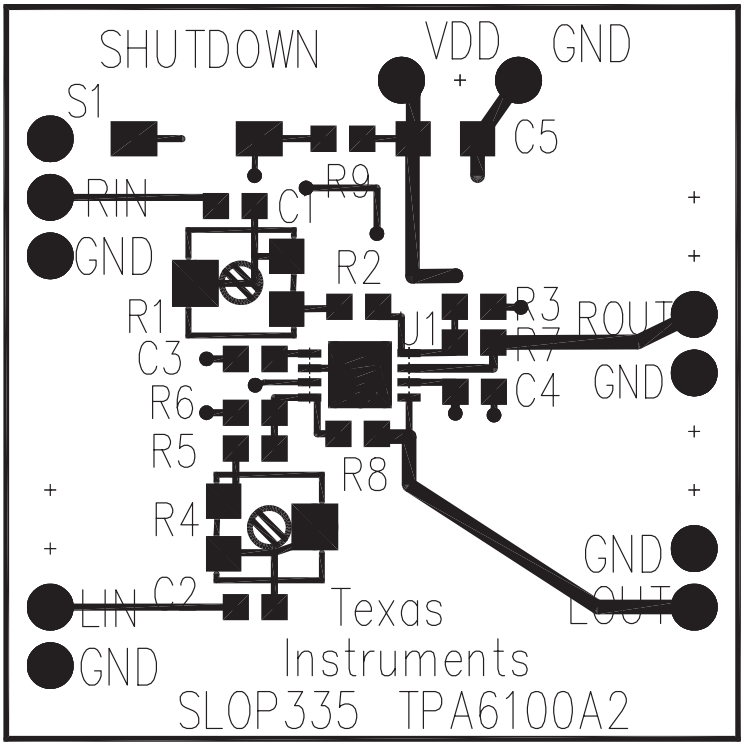


Figure 2–5. TPA6100A2 EVM Bottom Layer

