TPA6021A4 Audio Power Amplifier Evaluation Module

This chapter provides an overview of the Texas Instruments (TI) TPA6021A4 audio amplifier evaluation module. It includes a list of EVM features, a brief illustrated description of the module, and a list of EVM specifications.

Contents

List of Figures

List of Tables

1 Introduction

1.1 Feature Highlights

The TI TPA6021A4 audio amplifier evaluation module includes the following features:

- TPA6021A4 stereo 2-W audio power amplifier evaluation module
  - Internal depop circuitry to minimize transients in outputs
  - Dual channel, bridge-tied load (BTL) or single-ended (SE) operation
  - 2 W per channel output power into 4 Ω at 5 V, BTL
  - Low current consumption in shutdown mode (maximum 20 μA)
  - DC voltage volume control from 20 dB to –40 dB, and –85 dB mute (BTL Mode)
  - SE dc voltage volume control proportional to BTL gain setting
  - Phenolic single sided PCB board
  - Differential stereo inputs
  - A fade mode slowly ramps up or down the volume when coming out of or going into shutdown.

1.2 Description

The TPA6021A4 stereo 2-W audio power amplifier evaluation module is a complete, 2-W per channel stereo audio power amplifier with dc volume control. It consists of the TI TPA6021A4 stereo 2-W audio power amplifier IC along with a small number of other parts mounted on a circuit board that measures approximately 2 1/4 inches by 1 1/2 inches (see Figure 1).

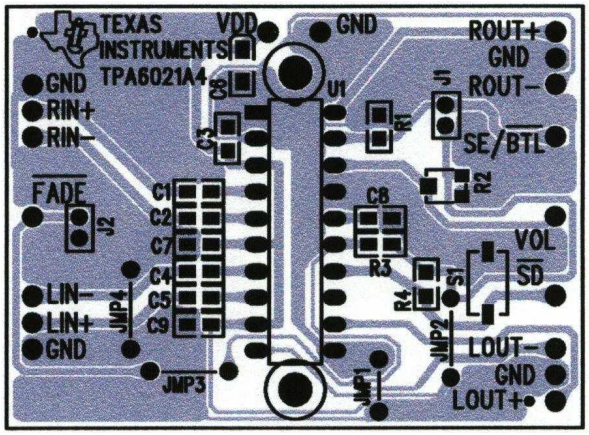

Figure 1. The TI TPA6021A4 Audio Amplifier Evaluation Module

Two screw holes are located at the top and bottom of the IC to allow easy mounting of an external heatsink. Single in-line header pins extend from the underside of the module circuit board to allow the EVM to be plugged into the TI plug-n-play audio amplifier evaluation platform (slou011), or to be wired directly into existing circuits and equipment when used stand-alone.

Table 1. TPA6021A4 EVM Specifications

			UNITS
V_{DD}	Supply voltage range		4.5 V to 5.5 V
I_{DD}	Supply current		2 A max
P_O	Continuous output power per channel	4-Ω BTL, V_{DD} = 5 V	2 W
V_I	Audio input voltage	HP input	V_{DD} + 0.3V max
		Line input	V_{DD} + 0.3V max
R_L	Minimum load impedance		4 Ω

1.3 Quick Start List for Stand-Alone

Follow these steps to use the TPA6021A4 EVM stand-alone or when connecting it into existing circuits or equipment. Refer to Figure 1 for pinouts and connections. Connections to the TPA6021A4 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.

- **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**
  1. Ensure that audio signal source level adjustments are set to minimum.
  2. Connect the right (left) positive lead of the audio source to the module RIN+ (LIN+) pins and the negative lead to the RIN– (LIN–) pins. If using the headphone inputs, connect the positive audio source to the module RIN+ (LIN+) and both the negative lead and GND to RIN– (LIN–). The inputs can be used with a differential or single-ended audio source.
  3. Select output mode:
     a. For BTL output, connect a speaker to the module OUT+ and OUT– pins of each channel (see Figure 2),
     or
     b. For single-ended output, connect a headphone or a speaker to the module OUT+ and GND pins of each channel through a 33-µF to 1000-µF output-coupling capacitor (see Figure 3).
- **Control Inputs**
  1. Connect control lines to the various module control input pins as needed:
     a. **SE/$\overline{\text{BTL}}$**: A high selects the single-ended (SE) output mode; a low or float selects the bridge-tied load (BTL) output mode.
     b. **$\overline{\text{SD}}$**: A low shuts down the amplifier IC on the module; a high or float allows normal operation.
     c. **$\overline{\text{FADE}}$**: A low places the amplifier in FADE mode which slowly increases/decreases the gain when leaving/entering the SHUTDOWN state; a high or float allows a quick ramp of gain when entering/leaving SHUTDOWN.
- **Power-Up**
  1. Verify correct voltage and input polarity and set the external power supply to ON.
     The EVM should begin operation.
  2. Adjust the signal source level as needed.
  3. Adjust the BTL (speaker) volume as needed by turning the R2 potentiometer in the clockwise direction to increase the volume. Turn in the counter clockwise direction to decrease the volume. The VOL pin on the right side of the EVM is provided to monitor the dc voltage.

1.4 TPA6021A4 EVM Connected for BTL Output and Headphone Input

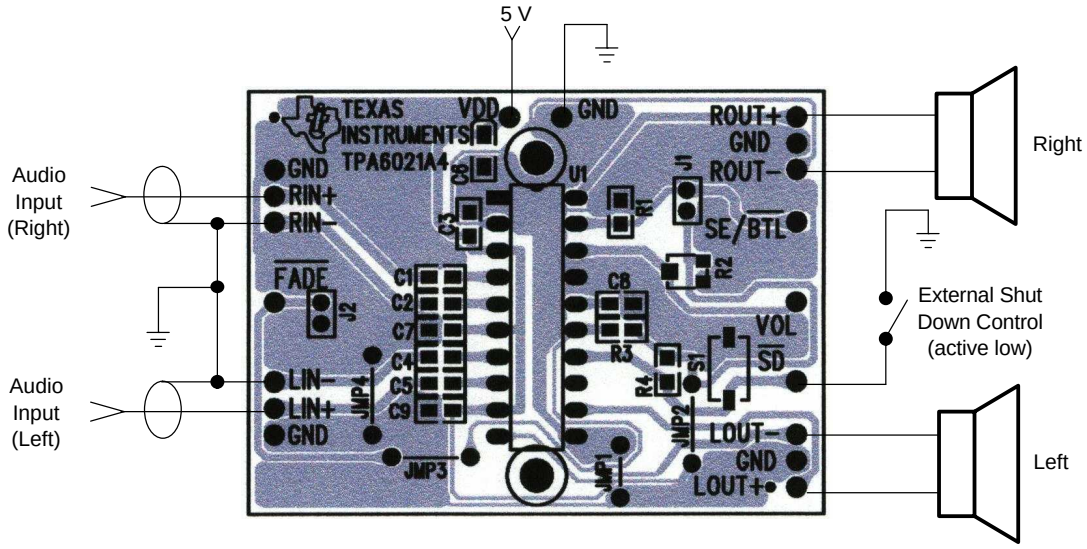

Figure 2. TPA6021A4 EVM Connected for Stereo BTL Output

Table 2. Typical TPA6021A4 EVM Jumper Settings for BTL Stand-Alone

EVM	J1	J2
TPA6021A4	OFF (1)	ON (2)

(1) OFF = Open
(2) ON = Shunt Installed

1.5 TPA6021A4 EVM Connected for Single-Ended Output and Headphone Input

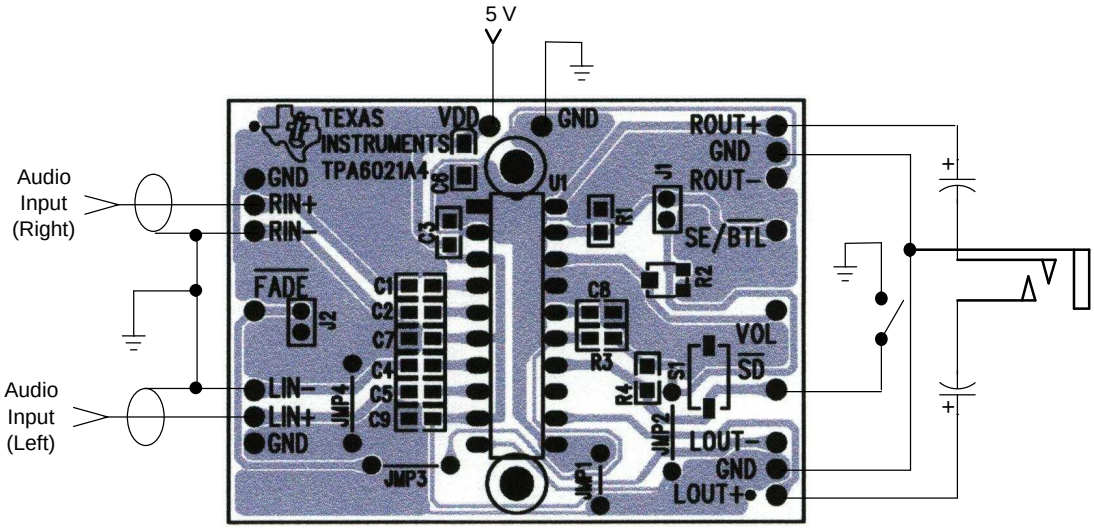

Figure 3. TPA6021A4 EVM Connected for Stereo Single-Ended Output

Table 3. Typical TPA6021A4 EVM Jumper Settings for Single-Ended Stand-Alone

EVM	J1	J2
TPA6021A4	ON (1)	ON (1)

(1) ON = Shunt Installed

2 Reference

The TPA6021A4 EVM board layers, board schematic, and parts list are presented in this chapter.

2.1 TPA6021A4 EVM Layers and Board Schematic

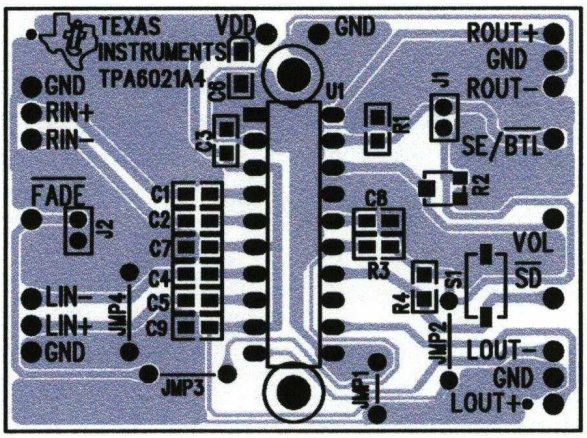

Figure 4. TPA6021A4 EVM Top View

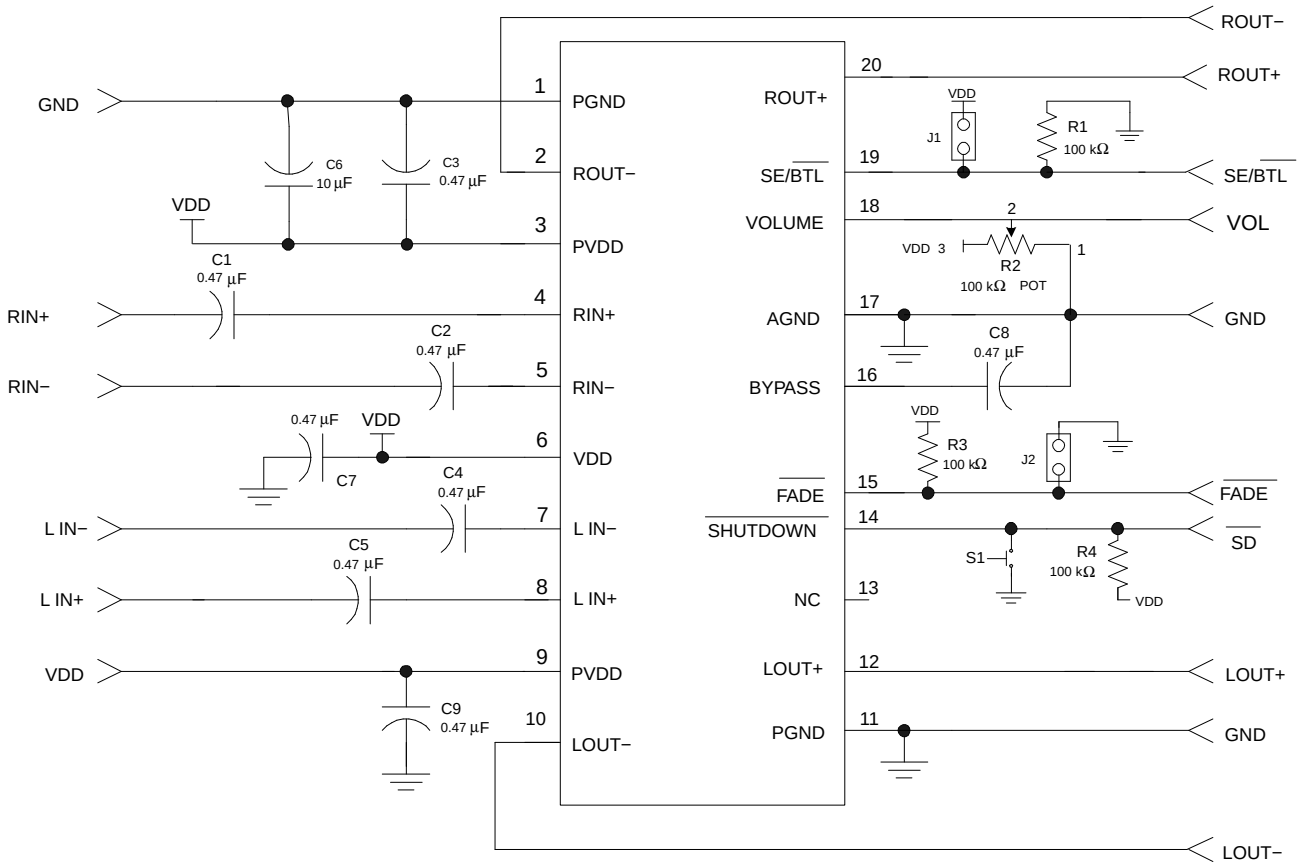

Figure 5. TPA6021A4 EVM Schematic Diagram

2.2 TPA6021A4 EVM Parts List

Table 4. EVM Parts List

REFERENCE	DESCRIPTION	SIZE	EVM QTY	MANUFACTURER/ PART NUMBER	DIGI-KEY NUMBER
C1, C2, C3, C4, C5, C7, C8, C9	Capacitor, 0.47 µF, 16 V, 80%/–20%, nonpolarized, SMD	0805	8	Murata GRM40-Y5V474Z16	Arrow GRM40-Y5V474Z 016
C6	Capacitor, 10 µF, 6.3 V, SMD	A	1	Panasonic ECS-TOJY106R	Digi-Key PCS1106CT-ND
R1, R3, R4	Resistor, 100 kΩ, 1/10 W, 5%, SMD	0805	3	Panasonic ERJ-6GEYJ104V	Digi-Key P100KATR-ND
R2	Potentiometer, 100 kΩ, SMD		1	Bourns 3303X-30104E	3303X-104ETR-ND
S1	Switch, momentary, SMD, low profile		1	Panasonic EVQ-PPBA25	Digi-Key P8086SCT-ND
J1, J2	Header, 2 position	2 mm	2	Norcomp 2163-2-01-P2	Digi-Key 2163S-02-ND
RIN+, RIN–, LIN+, LIN–, ROUT+, ROUT–, LOUT+, LOUT–, VDD, GND, VOL, $\overline{\text{FADE}}$, SE/$\overline{\text{BTL}}$, $\overline{\text{SD}}$	Shunts, terminal posts, 0.100 in centers	1/2 in	18	Sullins or SAMTEC PTC36SABN or TSW-19-8-G-S	Digi-Key S1022-36-ND
	20-pin DIP anodized heat sink		1	Aavid Thermalloy 580400B00000	Digi-Key HS181-ND
U1	IC, TPA6021A4, audio amplifier, 2W, through hole, 20-pin DIP	20 pin DIP	1	TI TPA6021A4	

3 Related Documentation From Texas Instruments

- *TPA6021A4 2-W Stereo Fully Differential Audio Power Amplifier With Advanced DC Volume Control* (SLOS465). This is the data sheet for the TPA6021A4 audio amplifier integrated circuit.

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