

# **TPA6017A2**

## **Audio Power Amplifier Evaluation Module**

# *User's Guide*

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

### Mailing Address:

Texas Instruments  
Post Office Box 655303  
Dallas, Texas 75265

## EVM IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

This evaluation kit being sold by TI is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not considered by TI to be fit for commercial use. As such, the goods being provided may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety measures typically found in the end product incorporating the goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may not meet the technical requirements of the directive.

Should this evaluation kit not meet the specifications indicated in the EVM User's Guide, the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods. Please be aware that the products received may not be regulatory compliant or agency certified (FCC, UL, CE, etc.). Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge.

EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

TI currently deals with a variety of customers for products, and therefore our arrangement with the user **is not exclusive**.

TI assumes **no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein**.

Please read the EVM User's Guide and, specifically, the EVM Warnings and Restrictions notice in the EVM User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact the TI application engineer.

Persons handling the product must have electronics training and observe good laboratory practice standards.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used.

Mailing Address:

Texas Instruments  
Post Office Box 655303  
Dallas, Texas 75265

## **EVM WARNINGS AND RESTRICTIONS**

It is important to operate this EVM within the maximum supply voltage of 6 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 25°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

### **Mailing Address:**

Texas Instruments  
Post Office Box 655303  
Dallas, Texas 75265

# Contents

---

---

---

<b>1</b>	<b>Introduction</b>	<b>1-1</b>
1.1	Description	1-2
1.2	TPA6017A2 EVM Specifications	1-3
1.3	Related Documentation From Texas Instruments	1-3
<b>2</b>	<b>Operation</b>	<b>2-1</b>
2.1	Quick Start List for Plug-n-Play Platform	2-2
2.2	Quick Start List for Stand-Alone Operation	2-4
<b>3</b>	<b>Schematic, PCB Layers, and Parts List</b>	<b>3-1</b>
3.1	TPS6017A2 EVM Schematic	3-2
3.2	TPA6017A2 EVM PCB Layers	3-3
3.3	TPA6017A2 EVM Parts List	3-4

# Figures

---

---

---

1-1	The TI TPA6017A2 Audio Power Amplifier EVM—Top View	1-2
1-2	The TI TPA6017A2 Audio Power Amplifier EVM—Bottom View	1-2
2-1	Module Preparation	2-3
3-1	TPA6017A2 EVM Schematic	3-2
3-2	TPA6017A2 EVM—Top Layer	3-3
3-3	TPA6017A2 EVM—Bottom Layer	3-3

# Tables

---

---

---

2-1	Platform Jumper and Switch Settings for the TPA6017A2	2-2
2-2	Gain Settings	2-3
3-1	TPA6017A2 EVM Parts List	3-4



# Introduction

---

---

---

---

---

The TPA6017A2 is a class AB 2-watts per channel stereo audio power evaluation module.

<b>Topic</b>	<b>Page</b>
1.1 Description .....	1-2
1.2 TPA6017A2 EVM Specifications .....	1-3
1.3 Related Documentation From Texas Instruments .....	1-3

### 1.1 Description

The TPA6017A2 audio power amplifier evaluation module is a 2-watt per channel class-AB stereo audio power amplifier complete with a small number of external components mounted on a circuit board that measures approximately 2-1/4 inches by 1-1/2 inches (Figure 1–1 and Figure 1–2).

Figure 1–1. The TI TPA6017A2 Audio Power Amplifier EVM—Top View

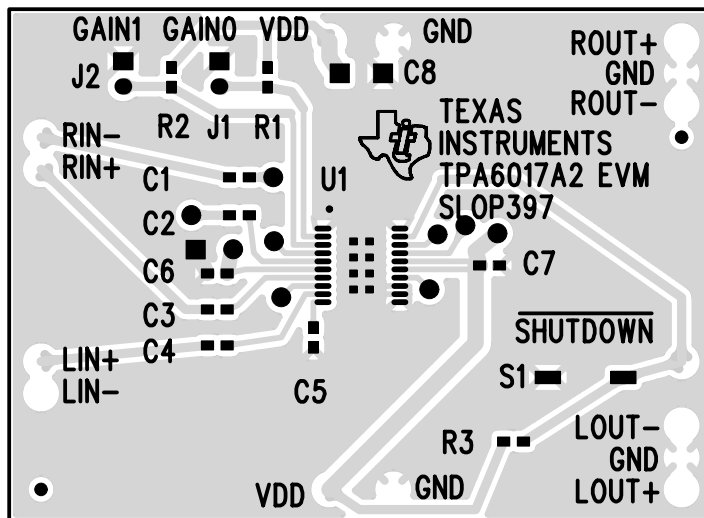
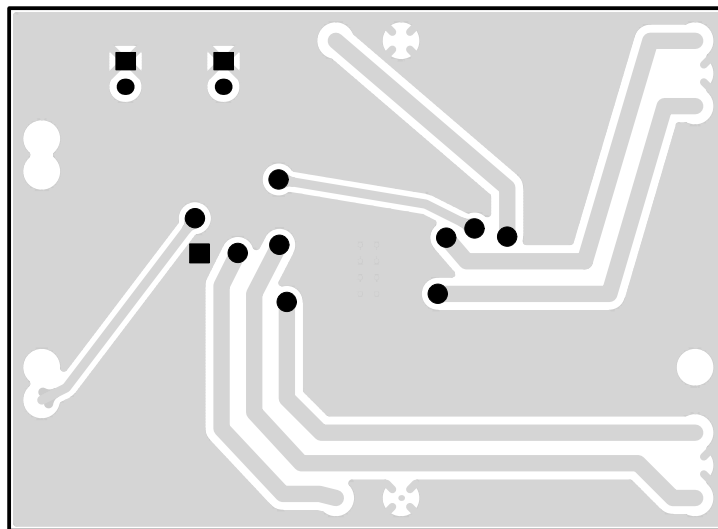


Figure 1–2. The TI TPA6017A2 Audio Power Amplifier EVM—Bottom View



Single in-line header pins extend from the underside of the module to allow the EVM to be plugged into the TI plug-n-play audio amplifier platform (see literature number SLOU011), or to be directly wired into existing circuits and equipment when used stand-alone.



The plug-n-play platform has room for a single TPA6017A2 evaluation module and is convenient for evaluating the TPA6017A2 device. The EVMs simply plug into the platform, which provides power to the modules and connects them to a versatile array of standard audio input and output jacks and connectors.

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

## 1.2 TPA6017A2 EVM Specifications

Supply voltage range,  $V_{DD}$  ..... 4.5 V to 5.5 V  
 Supply current,  $I_{DD}$  ..... 2 A max  
 Continuous output power per channel,  $P_O$ : 3  $\Omega$ ,  $V_{DD} = 5$  V ..... 2 W  
 Minimum load impedance,  $R_L$  ..... 3  $\Omega$

## 1.3 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.
- TPA6017A2 2-W Stereo Audio Power Amplifier With Four Selectable Gain Settings* (literature number SLOS386) is the data sheet for the TPA6017A2 audio amplifier integrated circuit.



# Operation

---

---

---

---

---

This chapter describes the steps for use with plug-n-play platform and stand-alone operation.

<b>Topic</b>	<b>Page</b>
<b>2.1 Quick Start List for Plug-n-Play Platform .....</b>	<b>2-2</b>
<b>2.2 Quick Start List for Stand-Alone Operation .....</b>	<b>2-4</b>

## 2.1 Quick Start List for Plug-n-Play Platform

Follow these steps when using the TPA6017A2 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 TPA6017A2 module in platform socket U2, taking care to align the module pins correctly.
- 3) Use switch S2 to select or bypass the signal conditioning EVM installed in U1. If no EVM is installed in U1, set this switch to OFF.
- 4) Set control signal polarity jumper JP8 to Lo.
- 5) Set jumper JP6 to select the Mute control input (this causes the TPA6017A2 to shut down if a plug is inserted into platform headphone jack J10).
- 6) If a headphone amplifier will be installed in U5, set headphone source switch S3 to U5.

Table 2–1. Platform Jumper and Switch Settings for the TPA6017A2

EVM	JP4	JP5	JP6	JP7	JP8	S2	S3
PNP Platform	X	ON	Mute	X	Lo	Note 2	U5

**Notes:** 1) ON = Jumper installed, OFF = Jumper NOT installed, 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

- 1) Select and connect the power supply (ensure power supply switch S1 is set to OFF)
  - a) Connect an external regulated power supply set to 5 V to platform  $V_{DD}$  power input connector J6. Observed marked polarity.

OR

  - b) Install a voltage regulator EVM (SLVP097 or equiv.) in platform socket U6. 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). If using J1, J2, or B1, set S1 to ON to supply power to the EVM.

### □ Inputs and Outputs

- 1) Ensure that the audio signal source level is set to a minimum.
- 2) Connect the audio source to the left and right RCA phono jacks J3 and J5 or stereo miniature phone jack J4.

- 3) Connect speakers to left and right RCA jacks J7 and J9 or to stripped wire speaker connectors J8.

Evaluation Module Settings

- 1) Use jumpers J1 and J2 to set the gain of the TPA6017A2 amplifier (see Table 2–2 callout). Refer to Table 2–2 for gain settings.

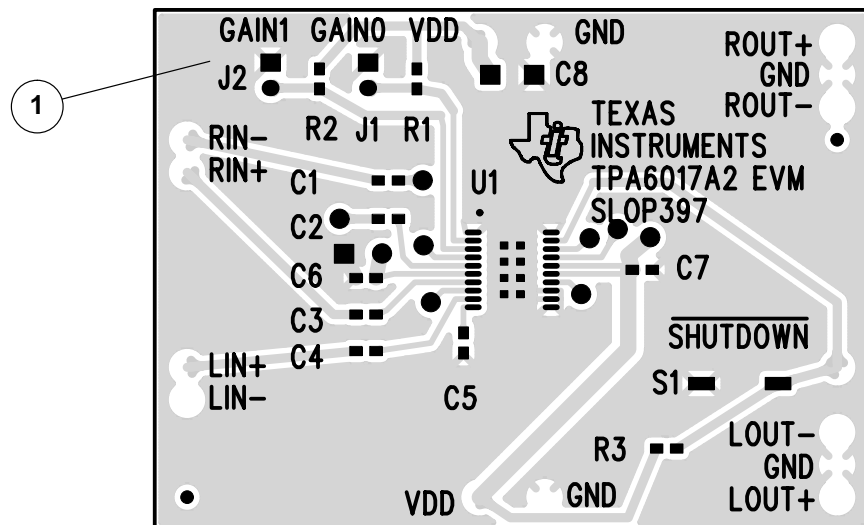
Table 2–2. Gain Settings

GAIN0 (J1 jumper)	GAIN1 (J2 jumper)	Gain
ON	ON	6 dB
ON	OFF	10 dB
OFF	ON	15.6 dB
OFF	OFF	21.6 dB

**Note:** ON = jumper installed; OFF = jumper NOT installed

- 2) Switch S1 is used to shut down the device. Push and hold S1 to put the device into shutdown mode. Releasing S1 returns the device to the active state.

Figure 2–1. Module Preparation



Power Up

- 1) 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 the 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.

- 2) Adjust the signal source level and gain setting jumpers, J1 and J2, as needed.

## 2.2 Quick Start List for Stand-Alone Operation

Follow these steps to use the TPA6017A2 EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM 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 the audio signal source level adjustments are set to minimum.
- 2) Connect the right and left positive audio source to the module RIN+ and LIN+ pins, respectively. Connect the right and left negative audio source to the module RIN– and LIN– pins, respectively.
- 3) If using single ended inputs, ground the LIN+ and RIN+ pins and connect the signal source to RIN– and LIN–.

### Evaluation Module Preparations

- 1) Use jumpers J1 and J2 to set the gain of the TPA6017A2 amplifier. Refer to Table 2–2 for gain settings.

### Control Inputs

- 1)  $\overline{\text{SHUTDOWN}}$ : This pin is active LOW. A LOW on this pin (< 0.8 V) shuts down the amplifier; a HIGH (> 2 V) on this pin places the amplifier in the active state. Leaving this pin floating allows normal amplifier operation in the active state.

### 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 and gain setting jumpers, J1 and J2, as needed.

# Schematic, PCB Layers, and Parts List

---

---

---

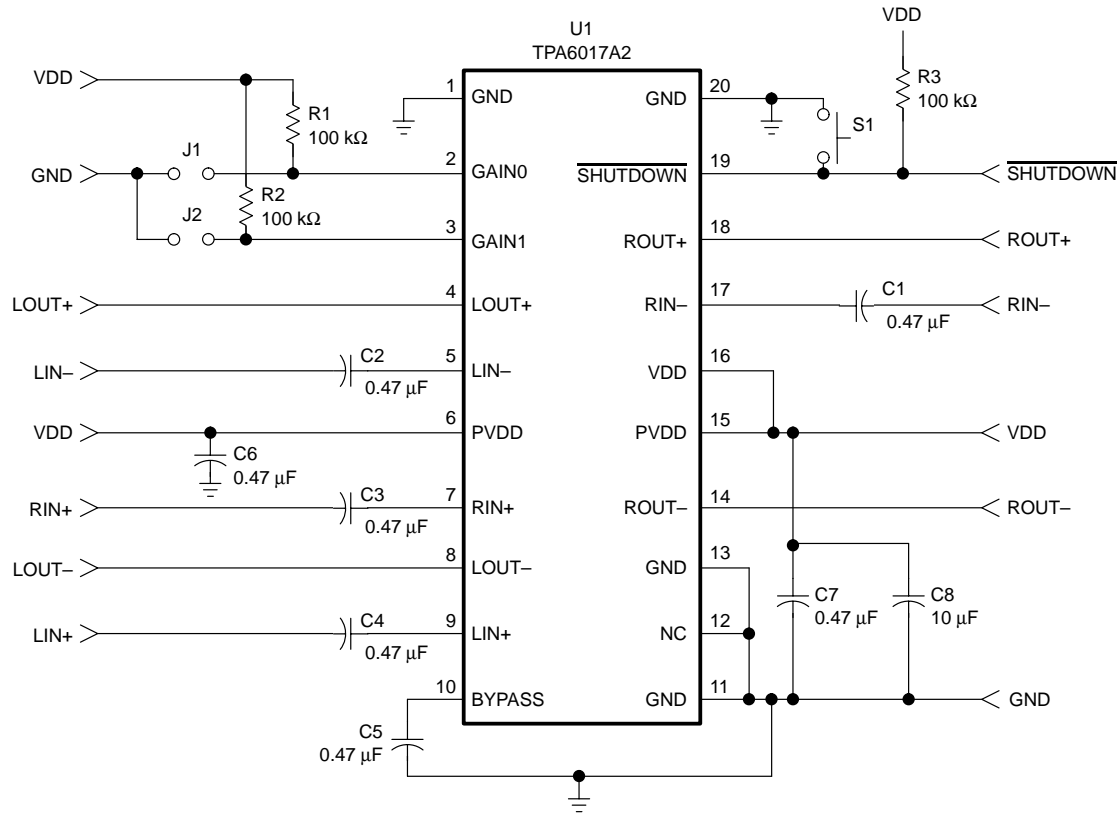
---

This chapter describes PCB layers, part list, and schematics.

<b>Topic</b>	<b>Page</b>
3.1 TPA6017A2 EVM Schematic .....	3-2
3.2 TPA6017A2 EVM PCB Layers .....	3-3
3.3 TPA6017A2 EVM Parts List .....	3-4

### 3.1 TPS6017A2 EVM Schematic

Figure 3–1. TPA6017A2 EVM Schematic





### 3.2 TPA6017A2 EVM PCB Layers

Figure 3–2. TPA6017A2 EVM—Top Layer

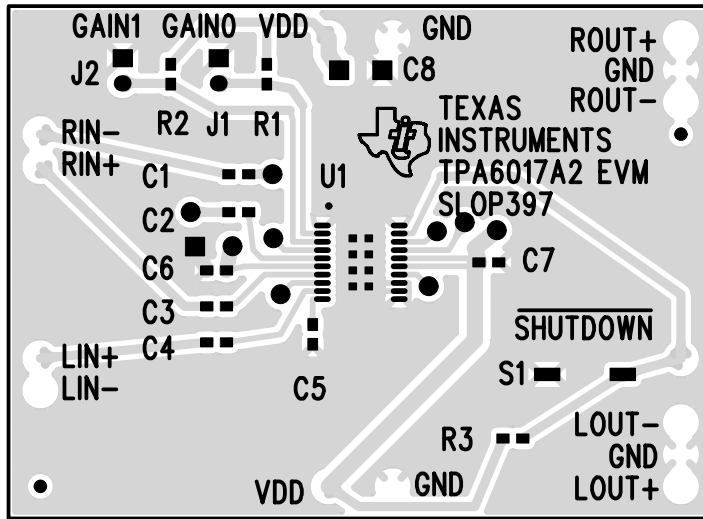
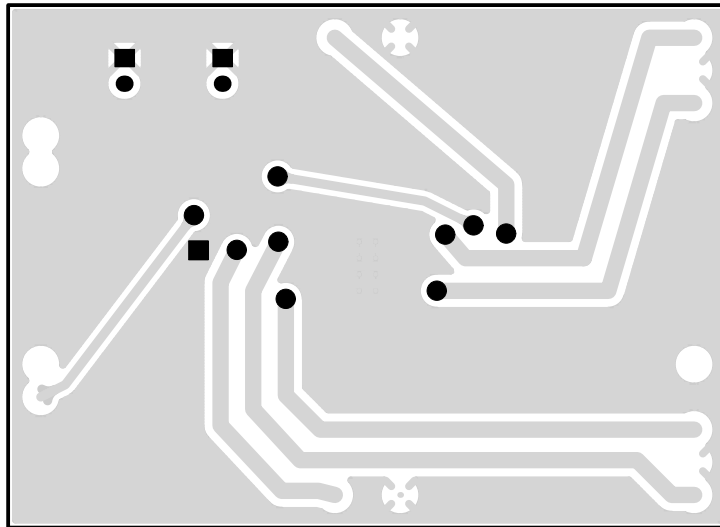


Figure 3–3. TPA6017A2 EVM—Bottom Layer



### 3.3 TPA6017A2 EVM Parts List

Table 3–1. TPA6017A2 EVM Parts List

Reference	Description	Size	EVM QTY.	Manufacturer/ Part Number
C1, C2, C3, C4, C5, C6, C7	Capacitor, 0.47 $\mu$ F, 80%/–20%, 16 V	0603	7	Panasonic/ ECJ–1VF1C474Z
C8	Capacitor, 10 $\mu$ F, 6.3 V	A	1	Panasonic/ ECS–TOJY106R
R1, R2, R3	Resistor, 100 k $\Omega$ , 1/16 W, 5%	0603	3	Panasonic/ ERJ–3GEYJ104V
S1	Switch, momentary pushbutton, 12 V, 50 mA	SMD	1	Panasonic/ EVQ–PPBA25
J1, J2	Header, 2 position	2 mm	2	Norcomp/ 2163–2–01–P2
P1, P2	Shunts	2 mm	2	3M / 953170–30
	Headers, 0.100 in centers, 1/2 in length		15	Samtec/ TSW–19–8–G–S
U1	IC, TPA6017A2, 2W, Stereo audio power amplifier	20-pin TSSOP	1	TI/ TPA6017A2PWP
PCB	PCB, 2 layer, fits U2 on PnP	2.25" $\times$ 1.5"	1	TI