

# ***TPA3005D2EVM***

## ***6-W Stereo Class-D Audio Power Amplifier***

# *User's Guide*

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## EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the supply voltage range specified in this user's guide. The supply voltage range should be 8.5 V to 18 V, and supply current ( $I_{CC}$ ) should be no greater than 3 A maximum.

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  $xxx^{\circ}\text{C}$ . The EVM is designed to operate properly with certain components above  $xxx^{\circ}\text{C}$  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.

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# Read This First

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This book may contain cautions and warnings.

**This is an example of a caution statement.**

**A caution statement describes a situation that could potentially damage your software or equipment.**

**This is an example of a warning statement.**

**A warning statement describes a situation that could potentially cause harm to you.**

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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.

## ***Electrostatic Sensitive Devices***



**This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. For more information on proper handling, refer to SSYA008.**

## ***Related Documentation From Texas Instruments***

- TPA3005D2 data sheet (SLOS427)

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# Introduction

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This chapter provides a brief description of the TPA3005D2EVM.

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## 1.1 Description

The TPA3005D2 audio power amplifier evaluation module is a 6-watt per channel class-D 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 1-3/4 inches (Figure 1–1 and Figure 1–2).

Figure 1–1. The TI TPA3005D2 Audio Power Amplifier EVM (Top View)

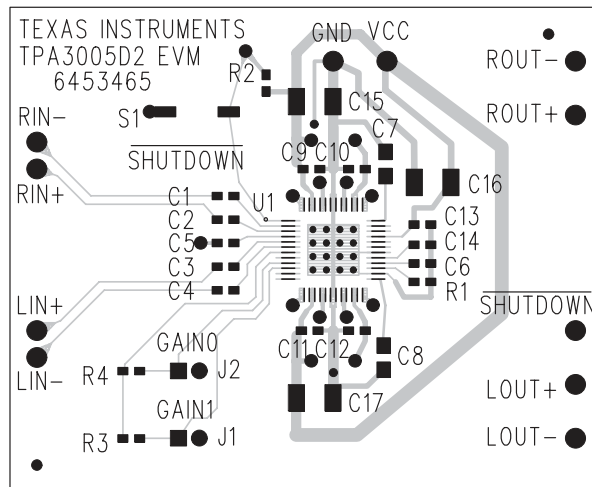
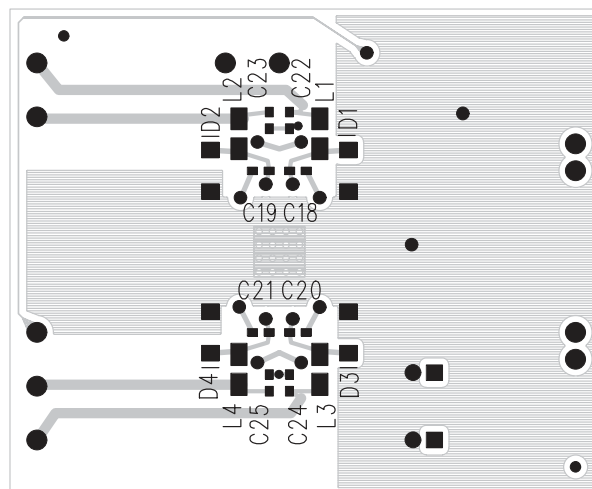


Figure 1–2. The TI TPA3005D2 Audio Power Amplifier EVM (Bottom View)



## 1.2 TPA3005D2EVM Specifications

Supply voltage range, $V_{CC}$ .....	8.5 V to 18 V
Input voltage range, $V_I$ (GAIN0, GAIN1, LINN, LINP, RINN, RINP) .....	-0.3 V to 6 V
$V_I$ (SHUTDOWN) .....	-0.3 V to $V_{CC} + 0.3$ V
Supply current, $I_{CC}$ .....	3 A Max
Continuous output power per channel, $P_O$ : 8 $\Omega$ , $V_{CC} = 12$ V .....	6 W
Minimum load impedance, $R_L$ .....	6 $\Omega$

# Operation

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This chapter describes how to operate the TPA3005D2EVM.

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## 2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the TPA3005D2EVM 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.

### 2.1.1 Power Supply

- 1) Ensure that all external power sources are set to OFF.
- 2) Connect an external regulated power supply, between 8.5 V and 18 V, to the module VCC and GND pins taking care to observe marked polarity.

### 2.1.2 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 at the source and connect the signal source to RIN- and LIN-. Conversely, RIN- and LIN- should be grounded if RIN+ and LIN+ are connected to the signal source.

**Note:**

If RIN+ and LIN+ on the EVM are connected to ground, the RINP and LINP pins on the TPA3005D2 IC are ac-grounded through C2 and C3.

### 2.1.3 Evaluation Module Preparations

- 1) Adjust the signal source level as needed.

### 2.1.4 Control Inputs

**Note:**

Refer to the TPA3005D2 data sheet for logic threshold voltage ratings.

- 1) **SHUTDOWN**: This pin is active low. A low on this pin shuts down the amplifier; a high on this pin places the amplifier in the active state. Leaving this pin floating also allows normal amplifier operation. Holding down switch S1 places the amplifier in the shutdown state. Releasing S1 returns the amplifier to the active state. The absolute maximum voltage on this terminal is  $V_{CC} + 0.3$  V.
- 2) **GAIN0, GAIN1**: These pins control the amplifier gain. (See Table 2-1)

Table 2–1. TPA3005D2 Gain Settings

GAIN1 (J1)	GAIN0 (J2)	GAIN (dB)
ON	ON	15.3
ON	OFF	21.2
OFF	ON	27.2
OFF	OFF	31.8

- ON = Jumper installed  
 OFF = Jumper removed

### 2.1.5 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 amplifier gain by installing or removing J1 and J2 jumpers. (See Table 2–1)



# Reference

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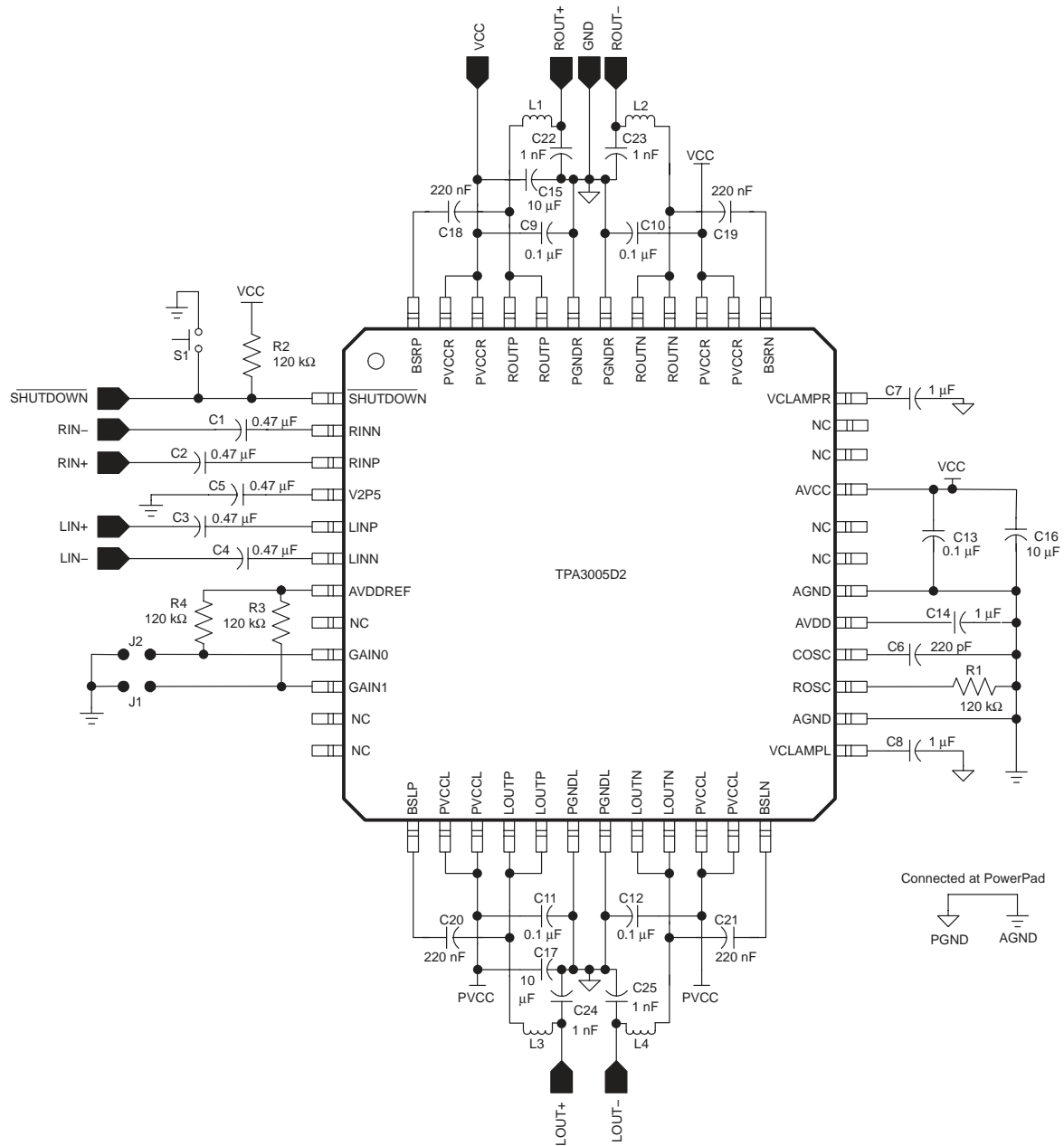
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This chapter provides reference information for the TPA3005D2EVM.

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### 3.1 TPA3005D2EVM Schematic

Figure 3-1. TPA3005D2EVM Schematic





### 3.2 EVM PCB Layers

Figure 3-2. TPA3005D2EVM (Top Layer)

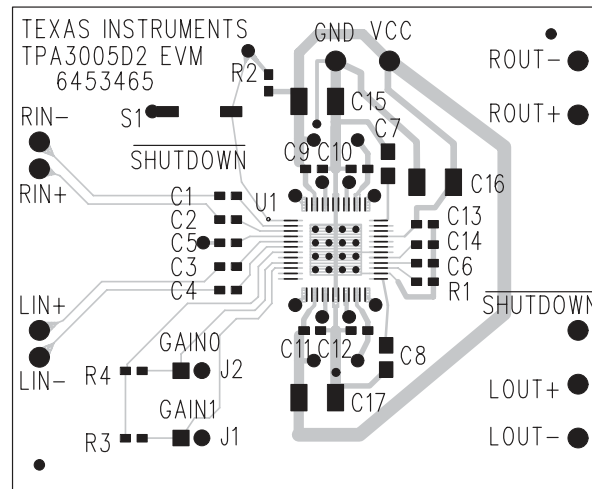
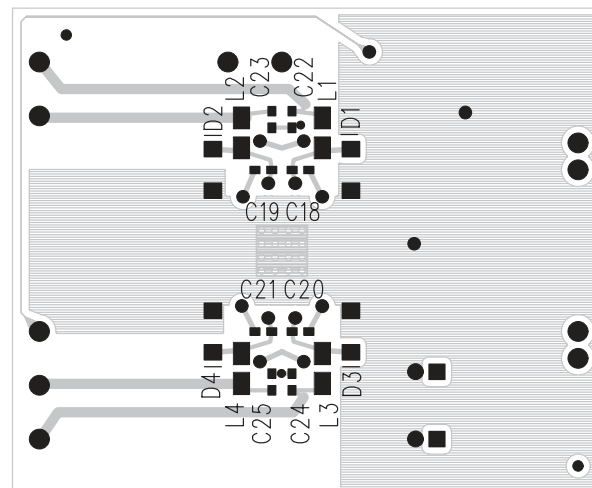


Figure 3-3. TPA3005D2EVM (Bottom Layer)



### 3.3 TPA3005D2EVM Parts List

Table 3–1. TPA3005D2EVM Parts List

Reference	Description	Size	Qty	Mfg.	Part #	Vendor Part #
C1–C5	Capacitor, ceramic, 0.47 $\mu$ F, +80%/–20%, Y5V, 16 V	0603	5	Panasonic	ECJ–1VF1C474Z	Digi-Key/ PCC1792CT–ND
C6	Capacitor, ceramic, 220 pF, $\pm$ 5%, 50 V	0603	1	Panasonic	ECJ–1VC1H221J	Digi-Key/ PCC221ACVCT–ND
C7, C8	Capacitor, ceramic, 1.0 $\mu$ F, +80%/–20%, Y5V, 50 V	0805	2	Taiyo Yuden	UMK212F105ZG–T	TeCal/ UMK212F105ZG–T
C9–C13	Capacitor, ceramic, 0.1 $\mu$ F, +80%/–20%, Y5V, 50 V	0603	5	Panasonic	ECJ–1VF1H104Z	Digi-Key/ PCC2153CT–ND
C14	Capacitor, ceramic, 1.0 $\mu$ F, +80%/–20%, Y5V, 50 V	0603	1	Murata	GRM188F51A105ZA01D	Digi-Key/ 490-1585-2-ND
C15–C17	Capacitor, ceramic, 10 $\mu$ F, +80%/–20%, Y5V, 25 V	1210	3	Panasonic	ECJ–4YF1E106Z	Digi-Key/ PCC2171CT–ND
C18–C21	Capacitor, ceramic, 0.22 $\mu$ F, +80%/–20%, Y5V, 16V	0603	4	Panasonic	ECJ–1VF1C224Z	Digi-Key/ PCC1790CT–ND
C22–C25	Capacitor, ceramic, 1000 pF, $\pm$ 10%, X7R, 50 V	0603	4	Panasonic	ECJ–1VB1H102K	Digi-Key/ PCC1772TR–ND
D1–D4	Do not install	SMA	4	Diodes, Inc.	B130–13	Digi-Key/B130DITR–ND
J1, J2	Header, 2 position, male	2mm	2	Norcomp	2163–36–01–P2	Digi-Key/2163S–36–ND
J1, J2 (shunts)	SHUNT, 2MM	2mm	2	Specialty	2JM–G	
L1–L4	Ferrite bead, 0.05 $\Omega$ DCR, 70 $\Omega$ at 100 MHz, 3A	1206	4	Fair–rite	2512067007Y3	Mouser/ 623–2512067007Y3
PnP pins	Headers, 0.1 in. centers, 1/2 in. long		11	Samtec	SW–19–8–G–S	
R1–R4	Resistor, chip, 120 k $\Omega$ , 1/16 W, 5%	0603	4	Panasonic	ERJ–3GEYJ124V	Digi-Key/ P120KGTR–ND
S1	Switch, momentary, SMD, low profile		1	Panasonic	EVQ–PPBA25	Digi-Key/ P8086SCT–ND
U1	TPA3005D2PHP	48-pin QFP	1	TI	TPA3005D2PHP	