TPA3121D2 Audio Power Amplifier Evaluation Module

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1 Introduction

1.1 Description

The TPA3121D2 evaluation module consists of a single 20W, class-D, stereo audio power amplifier complete with a small number of external components mounted on a circuit board that can be used to directly drive speakers with an external analog audio source as the input.

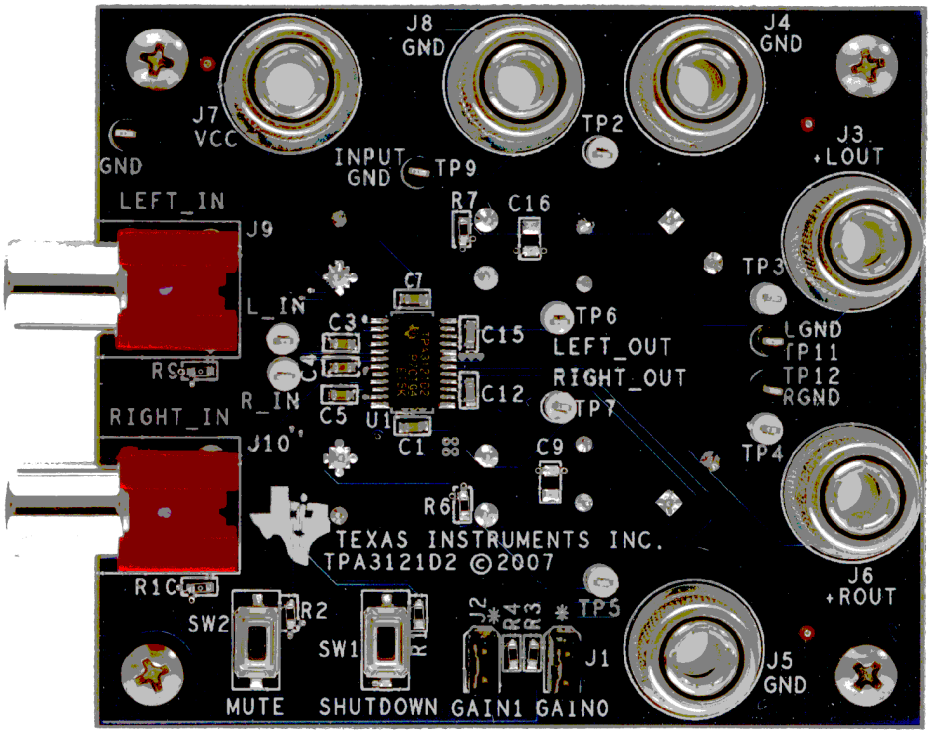


Figure 1. The TI TPA3121D2 Audio Power Amplifier EVM – Top View

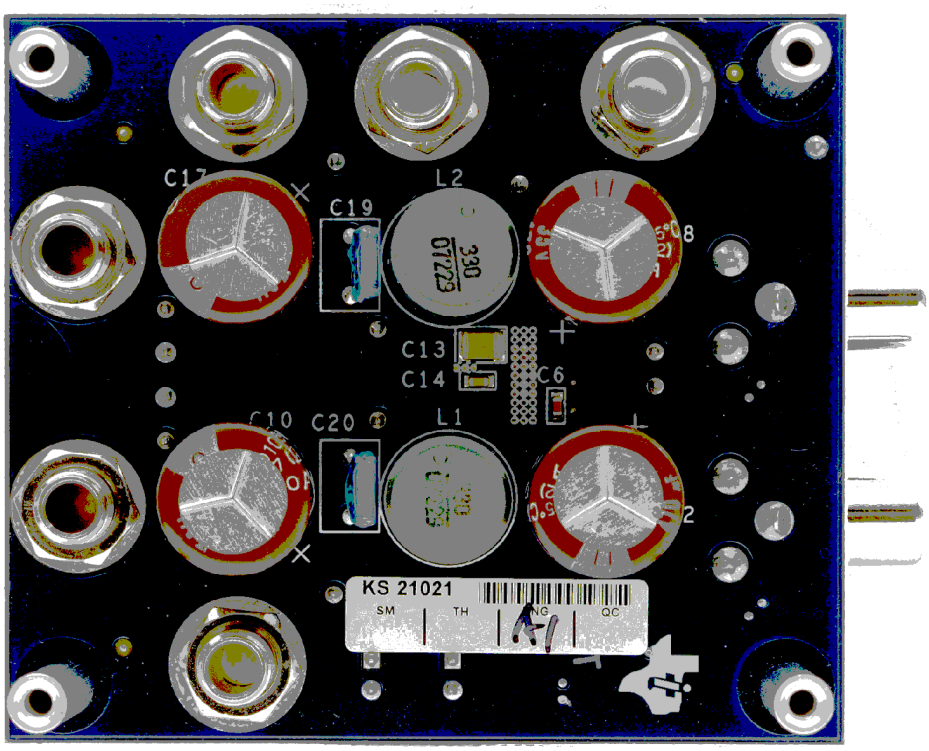


Figure 2. The TI TPA3121D2 Audio Power Amplifier EVM – Bottom View

1.2 TPA3121D2 EVM Specifications

V_{CC}	Supply voltage range	10V to 26V
I_{CC}	Supply current	3A max
P_O	Continuous output power per channel: 8 Ω, VCC = 24 V, THD+N = 10%	10 W
R_L	Minimum load impedance	6Ω

2 Operation

2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the TPA3121D2EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM module can be made by inserting stripped wire or using banana plugs for the power supply and output connections. The inputs accept standard RCA plugs.

2.1.1 Power Supply

1. Ensure that all external power sources are set to OFF.
2. Connect an external regulated power supply adjusted from 10V–26V to the module VCC (J7) and GND (J8) banana jacks taking care to observe marked polarity.

2.1.2 Evaluation Module Preparations

Inputs and Outputs

1. Connect a speaker across GND (**J5**) and +ROUT (**J6**). Connect another speaker across LOUT (**J3**) and GND (**J4**)
2. Install both gain jumpers GAIN0 (**J1**) and GAIN1 (**J2**). This will set the gain of the amplifier to the lowest level, 20dB.

Control Inputs

1. **$\overline{\text{SHUTDOWN}}$**: This terminal is active LOW. A LOW on the device terminal (<0.8V) shuts down the amplifier; a HIGH (>2V) on the device terminal places the amplifier in the active state. Holding down switch **SW1** will place the amplifier in the SHUTDOWN state. Releasing **SW1** will return the amplifier to the active state. This terminal is Vcc compliant.
2. **MUTE**: This terminal is active HIGH. A HIGH (>2V) on this terminal will immediately terminate audio playback through the speakers; a LOW (<0.8V) will enable the device. The outputs will remain switching with fifty percent duty cycle. **SW2** on the EVM controls the state of the MUTE terminal. Holding down switch **SW2** will place the amplifier in the MUTE state. Releasing **SW2** will return the amplifier to the active state. This terminal is Vcc compliant.
3. **GAIN0/GAIN1**: Together, these terminals determine the gain of the amplifier. Refer to Table 1 below. Installing a jumper in **J1** or **J2** will set the respective terminal to GND. Removing the jumper will set the respective terminals to VCC. Removing jumpers will **INCREASE** the gain while installing jumpers will **DECREASE** the gain. Logic levels are TTL compatible. These terminals are Vcc compliant

Table 1. Gain Settings(1)

GAIN0 (J1)	GAIN1 (J2)	Amplifier Gain (dB)
ON	ON	20
ON	OFF	26
OFF	ON	32
OFF	OFF	36

(1) OFF = Jumper REMOVED; ON = Jumper INSTALLED

2.1.3 Power Up

1. Verify correct voltage and input polarity and turn the external power supplies ON. The EVM should begin operation
2. Adjust the input signal.
3. Adjust the control inputs to the desired settings.
4. Adjust the amplifier gain by installing/removing the gain jumpers, **J1** and **J2**.

3 Reference

3.1 TPA3121D2 EVM Schematic

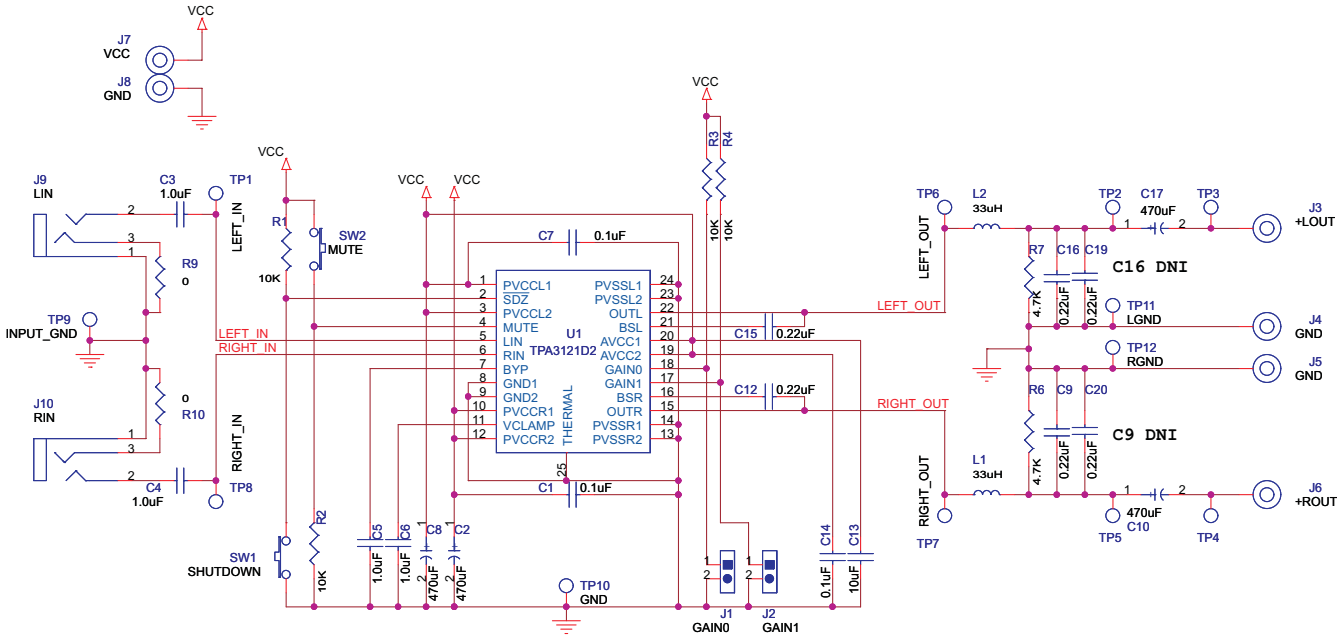


Figure 3. TPA3121D2 EVM Schematic

3.2 TPA3121D2 EVM PCB Layers

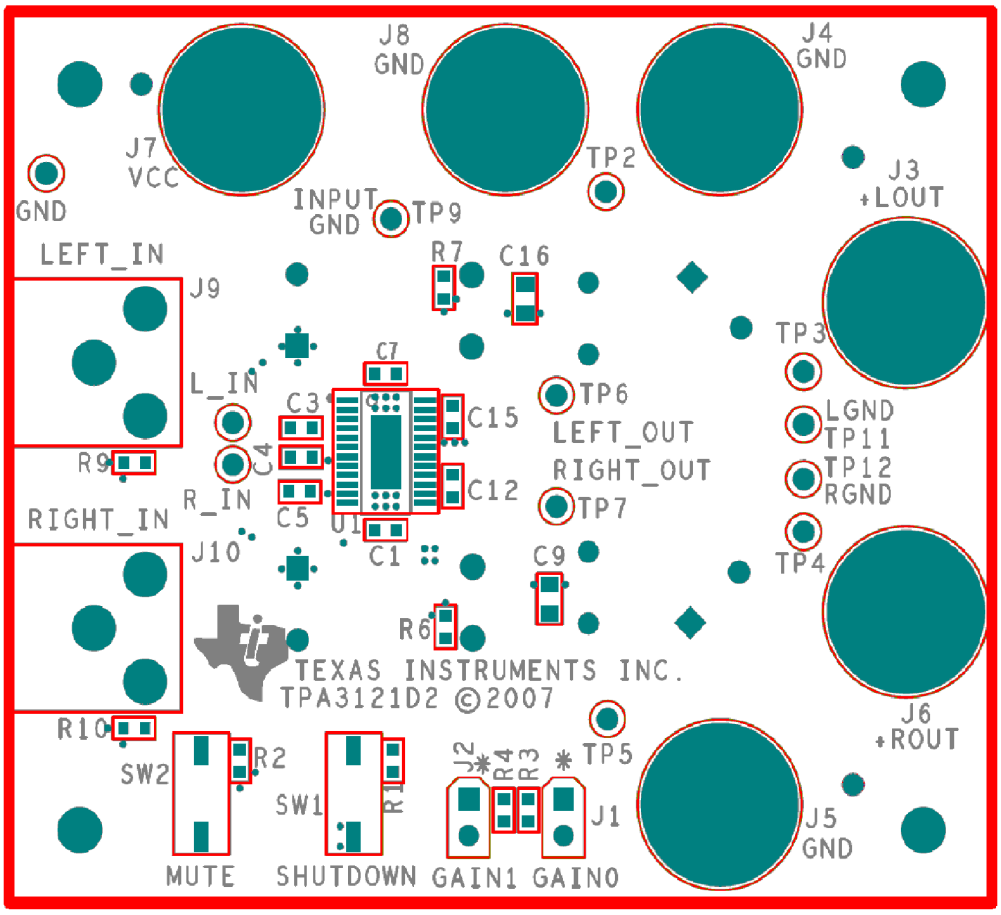


Figure 4. TPA3121D2 EVM – Top Side Layout

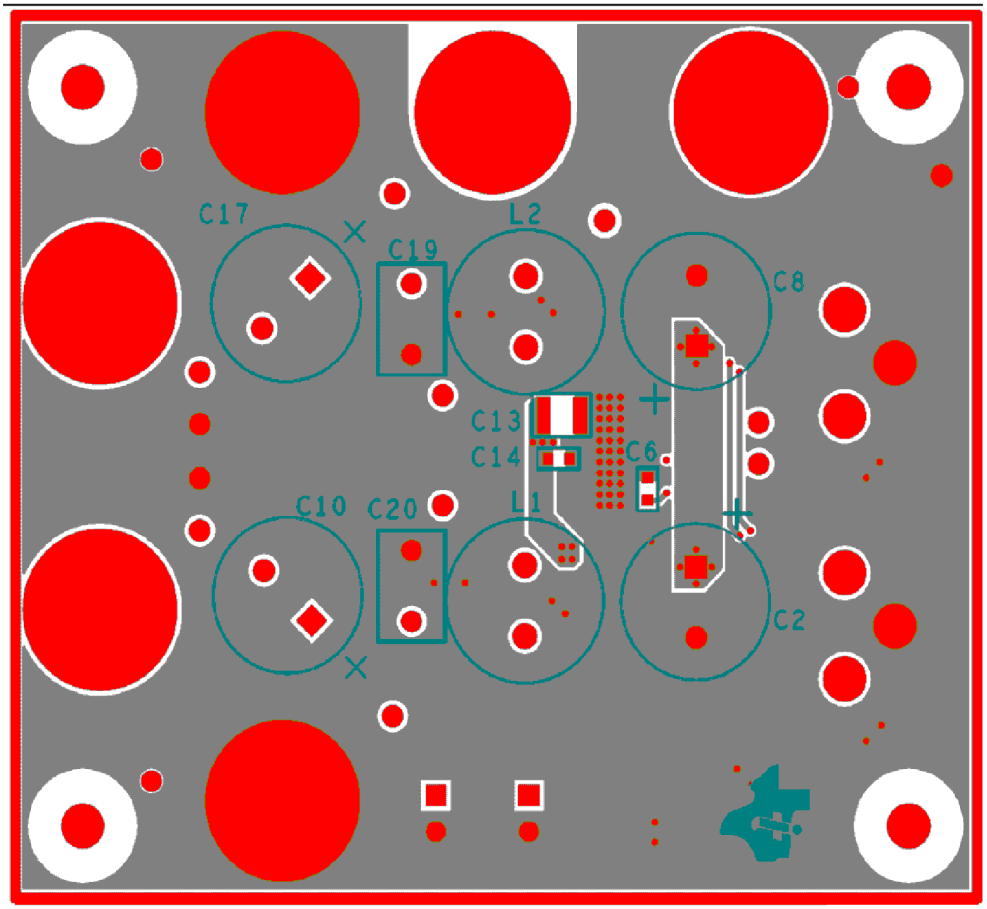


Figure 5. TPA3121D2 EVM – Bottom Side Layout

3.3 TPA3121D2EVM Bill of Materials

Reference	Description	Load Status	Size	Qty	MFR	Part Number
ALL COMPONENTS SHOULD BE ORDERED AS LEAD-FREE						
C1, C7, C14	Capacitor, ceramic, 0.1 µF, ±10%, X7R, 50V		0603	3	TDK	C1608X7R1H104KT
C2, C8, C10, C17	Capacitor, electrolytic, 470 µF, 35V, 105C, Low impedance		Radial	4	Nichicon	UHE1V471MH06
C3, C4, C5, C6,	Capacitor, ceramic, 1.0 µF, ±10%, X7R, 16V		0603	4	Taiyo Yuden	EMK107BJ105KA-TR
C9, C16	Capacitor, ceramic, 0.22 µF, ±10%, X7R, 50V	do not install	1206	2	Kemet	C1206C684K5RACTU
C11	Capacitor, electrolytic, 220µF, 35V, 85°C, General Purpose		Radial	1	Panasonic	ECA-1VM221B
C12, C15	Capacitor, ceramic, 0.22 µF, ±10%, X7R, 16V		0603	2	TDK	C1608X7R1C224KT
C13	Capacitor, ceramic, 10 µF, +80%/–20%, Y5V, 50V		1210	1	Murata	GRM32DF51H106ZA01L
C19, C20	Capacitor, metal poly, 0.22 µF, 63V		Radial	2	Epcos, Inc.	B32559C224K000
L1–L2	Inductor, 33 µH, radial lead, ferrite material, shielded		Radial	2	Toko	A7503AY-330M
R1–R4	Resistor, chip, 10 kΩ, 1/16 W, 5%		0603	4	Panasonic	ERA-V15J103V
R6, R7	Resistor, chip, 4.7 kΩ, 1/10 W, 5%		603	2	Panasonic	ERJ-3GEYJ472V
R9, R10	Resistor, chip, 0 Ω, 1/10 W, 5%		603	2	Panasonic	ERJ-3GEY0R00V
R11	Resistor, chip, 220 Ω, 1/4 W, 1%		1206	1	Panasonic	ERJ-SENF2200V
J1–J2	Phono Jack, PC mount, switched			2	Switchcraft	PJRAN1X1U03
J3–J8	Banana Jack w/knurled Thumbnut (nickel plate)			6	Johnson	111-2223-001
J9–J10	Header, 2 position, Male		2mm	2	Norcomp	2163-36-01-P2
JP9–JP10 (shunts)	SHUNT, 2MM		2mm	2	Specialty	2JM-G
SW1, SW2	SWITCH, MOMENTARY, SMD, LOW PROFILE			2	Panasonic	EVQ-PPBA25
	Standoffs, 5/8" length, 4-40 thread			4	Keystone	1808
	Screws, 4-40, 0.375			4		
U1	TPA3121D2PWP		24 pin TSSOP	1	TI	TPA3121D2PWP

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 10 V to 26 V and input current of 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 60°C . The EVM is designed to operate properly with certain components above 60°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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