TPA3106D1 Audio Power Amplifier EVM With LC Filter

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1 Introduction

1.1 Description

The TPA3106D1 evaluation module consists of a single 40 W, class-D, mono 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.

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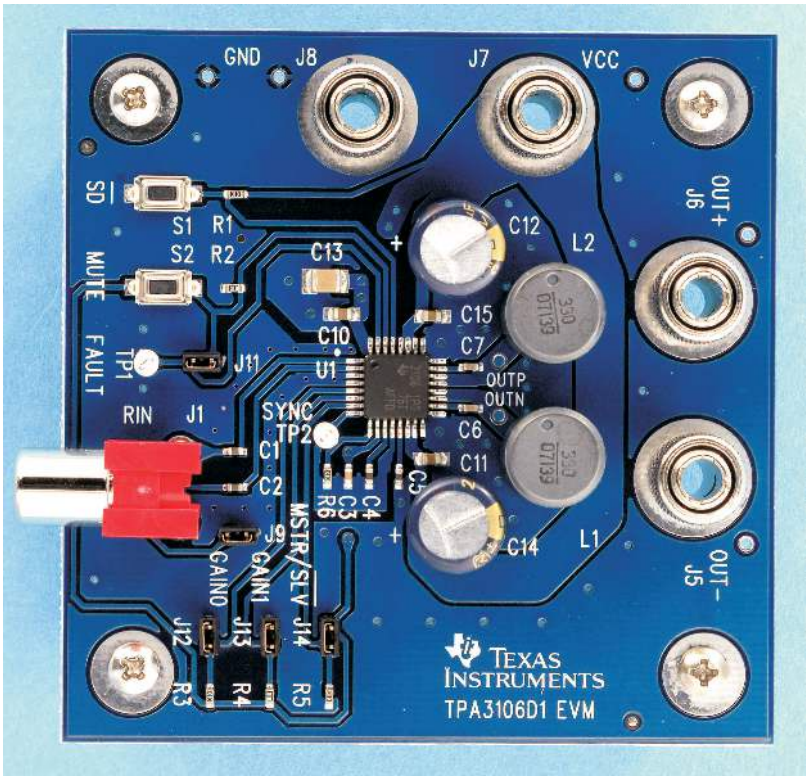

Figure 1. The TI TPA3106D1 Audio Power Amplifier EVM – Top View

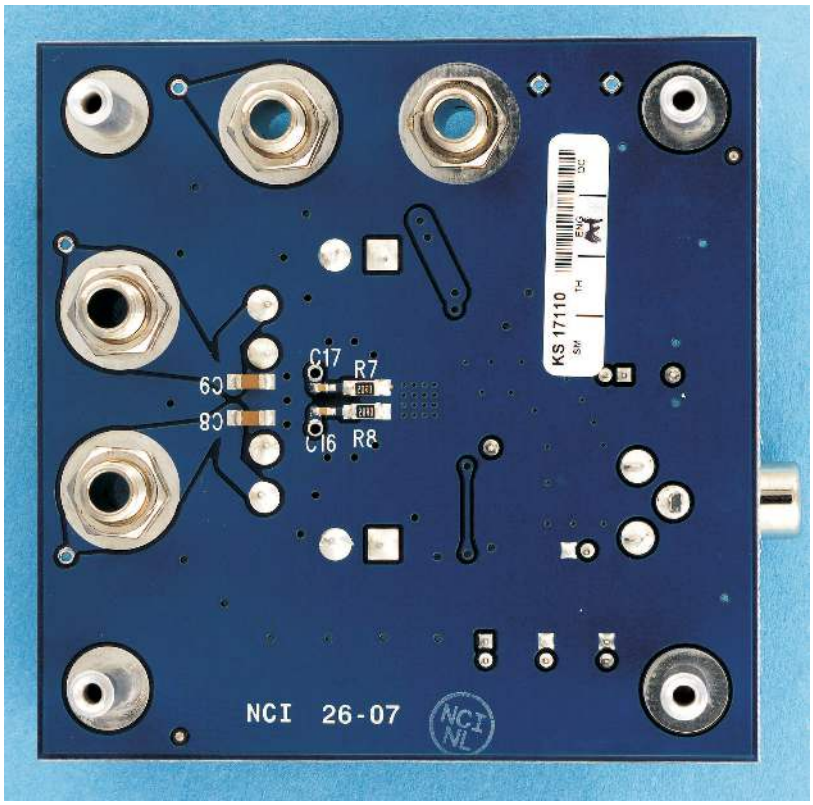

Figure 2. The TI TPA3106D1 Audio Power Amplifier EVM – Bottom View

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1.2 TPA3106D1 EVM Specifications

V_{CC}	Supply voltage range	10 V to 26 V
I_{CC}	Supply current	4 A Max
P_O	Continuous output power per channel, 8 Ω, V_{CC} = 24 V, THD+N = 10%	40 W
Z_I	Minimum load impedance	4 Ω

2 Operation

2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the TPA3106D1EVM 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 10 V to 26 V) to the module VCC (**J7**) and GND (**J8**) banana jacks, taking care to observe the marked polarity.

2.1.2 Evaluation Module Preparations

2.1.2.1 Inputs and Outputs

1. Connect a speaker across OUT+ (**J5**) and OUT– (**J6**).
2. Install both gain jumpers GAIN0 (**J12**) and GAIN1 (**J13**). This sets the gain of the amplifier to the lowest level, 20 dB.
3. Install the Master/Slave jumper (**J14**), if Master mode operation is desired.
4. Install the fault jumper if resettable short circuit protection is desired.

2.1.2.2 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.
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.
3. **GAIN0/GAIN1:** Together, these terminals determine the gain of the amplifier. Refer to Table 1. Installing a jumper in **J12** or **J13** will set the respective terminal to GND. Removing the jumper will set the respective terminals to Vreg. Removing jumpers **INCREASES** the gain while installing jumpers **DECREASES** the gain. Logic levels are TTL compatible.

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Table 1. Jumper and Resulting Gain Settings

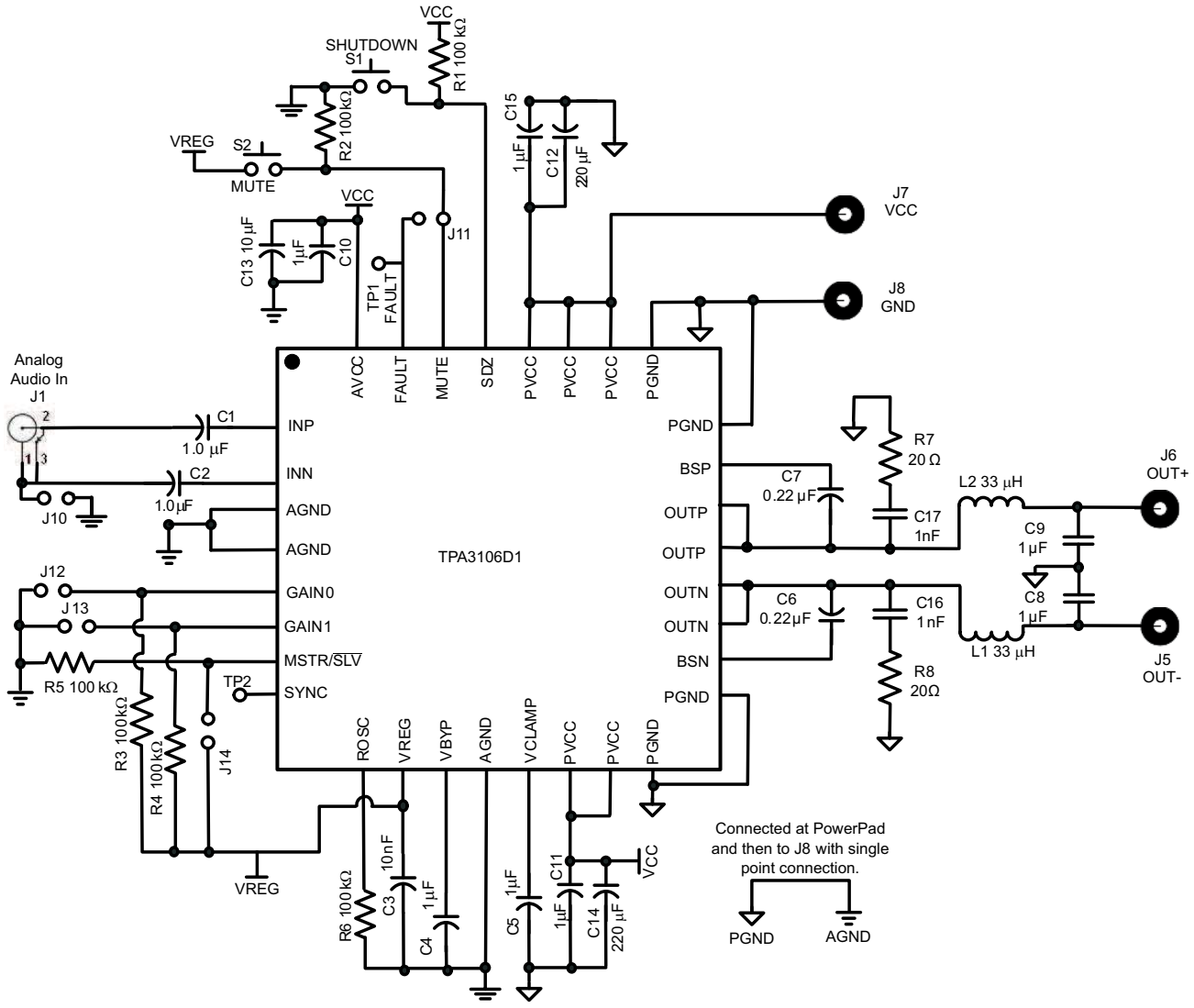
GAIN0 (J12) (1)	GAIN1 (J13) (1)	Amplifier Gain (dB)
ON	ON	20
OFF	ON	26
ON	OFF	32
OFF	OFF	36

(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 or removing the **J12** and **J13** gain jumpers, according to Table 1.

3 TPA3106D1 EVM Schematic



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3.1 TPA3106D1 EVM PCB Layers

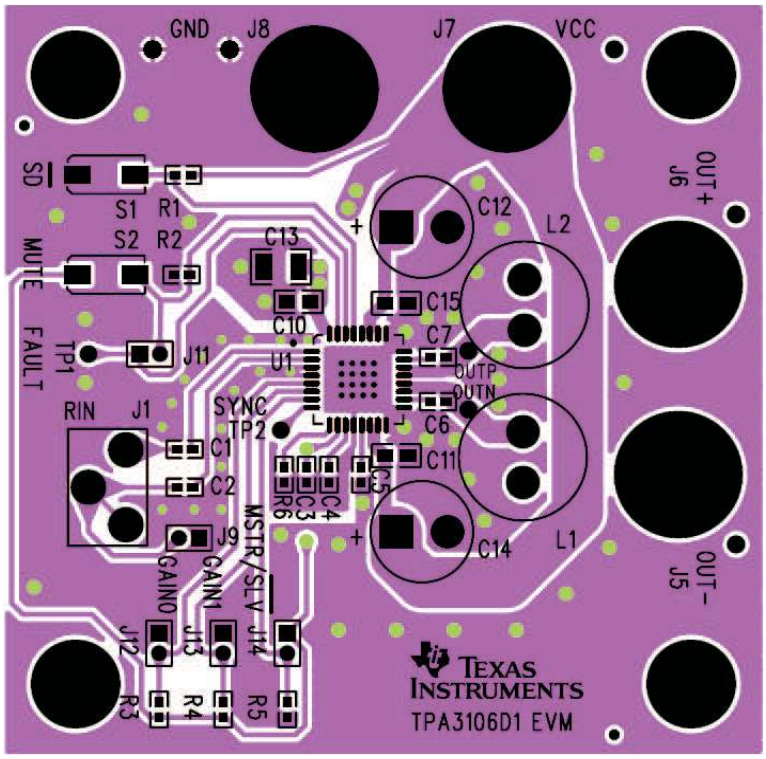

Figure 3. TPA3106D1 EVM – Top Side Layout

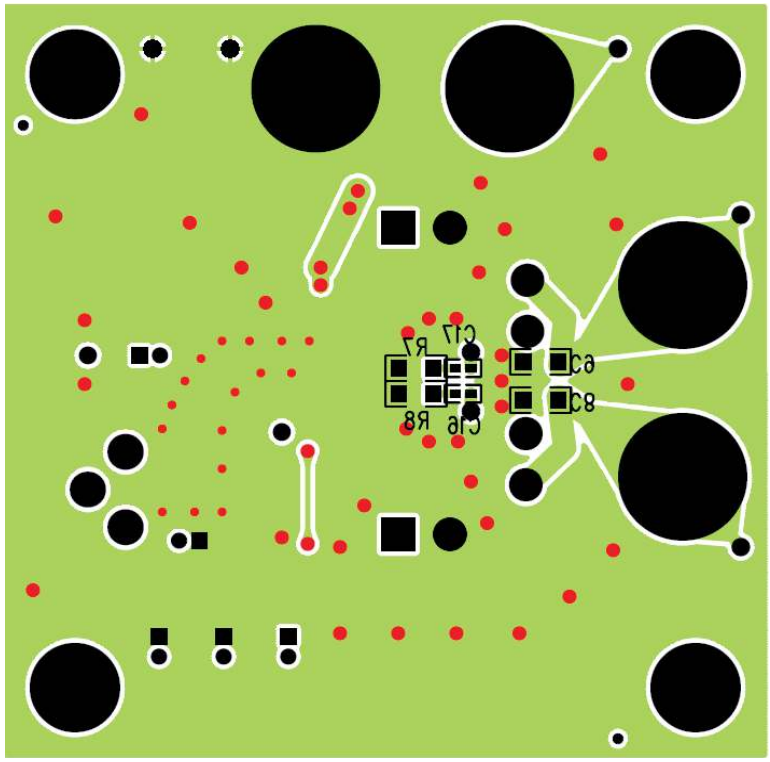

Figure 4. TPA3106D1 EVM – Bottom Side Layout

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4 TPA3106D1 EVM Bill of Material –LC Board

All components should be ordered as lead free.

Table 2. Bill OF Materials for TPA3106D1EVM

RefDes	Description	Size	Qty	Mfg.	Part No.	Vendor No.
C1, C2, C4	Capacitor, ceramic, 1.0 µF, ±10%, X7R, 10 V	0603	3	Murata	GRM188R71A105KA61D	Digi-Key/490-3899-1-ND
C3	Capacitor, ceramic, 0.01 µF, ±10%, X7R, 50 V	0603	1	TDK	C1608X7R1H103KT	Digi-Key/445-1311-2
C5, C10, C11, C15	Capacitor, ceramic, 1.0 µF, +80%/–20%, Y5V, 50 V	0805	4	TDK	C2012Y5V1H105Z	Digi-Key/445-1364-2
C6, C7	Capacitor, ceramic, 0.22 µF, ±10%, X7R, 16 V	0603	2	TDK	C1608X7R1C224KT	Digi-Key/445-1318-2
C8, C9	Capacitor, ceramic, 1.0 µF, ±10%, X7R, 50 V	1206	2	Murata	GRM31CR71H105KA61L	Digi-Key/490-3908-1-ND
C12, C14	Capacitor, electrolytic, 220 µF, Low impedance, 35 V	Radial	2	Panasonic	EEU-FC1V221	Digi-Key/P10297
C13	Capacitor, ceramic, 10 µF, +80%/–20%, Y5V, 50 V	1210	1	Murata	GRM32DF51H106ZA01L	Digi-Key/490-1891-2
C16, C17	Capacitor, ceramic, 1.0 nF, ±5%, COG, 50 V	0603	2	Panasonic	ECJ-1VC1H102J	Digi-Key/PCC2151TR-ND
L1, L2	Inductor, 33 µH, radial lead, ferrite material, shielded	Radial	2	Toko	A7503AY-330M	
R1–R6	Resistor, chip, 100 kΩ, 1/16 W, 5%	0603	6	Panasonic	ERJ-3GEYJ104V	Digi-Key/P100KG
R7, R8	Resistor, chip, 20 Ω, 1/4 W, 5%	1206	2	Panasonic	ERJ-8GEYJ200V	Digi-Key/P20ETR-ND
J1	Phono Jack, PC mount, switched		1	Switchcraft	PJRAN1X1U03	Newark/16C1860
J5–J8	Banana Jack w/knurled thumbnut (nickel plate)		6	Johnson	111-2223-001	Digi-Key/J587
J9, J11–J14	Header, 2 position, Male	2 mm	5	Norcomp	2163-36-01-P2	Digi-Key/2163S-36
J9, J11–J14 (shunts)	SHUNT, 2MM	2 mm	5	Specialty	2JM-G	
TP1, TP2, OUTP, OUTN, VCC, OUT+, OUT-	Test Points, 0.040" mounting hole		7	Farnell	240-345 White	
GND	Test Points, 0.040" mounting hole		2	Farnell	240-345 Black	
S1, S2	Switch, Momentary, SMD, Low Profile		2	Panasonic	EVQ-PPBA25	Digi-Key/P8086S
	Standoffs, 5/8" length, 4-40 thread		4	Keystone	1808	(Newark) 89F1934
	Screws, 4-40, 0.375		4			(Digi-Key) H781-ND
U1	TPA3106D1VFP	32 pin HLQFP	1	TI	TPA3106D1VFP	

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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 the output voltage range of 0 V to 26 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 85°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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