TPA3111D1EVM Audio Amplifier Evaluation Board

This user's guide provides the specifications, quick-start list for stand-alone operation, the schematic, bill of materials, and the board layout for the TPA3111DEVM evaluation module.

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1 Introduction

The TPA3111D1EVM customer evaluation module (EVM) demonstrates the integrated circuit TPA3111D1 from Texas Instruments.

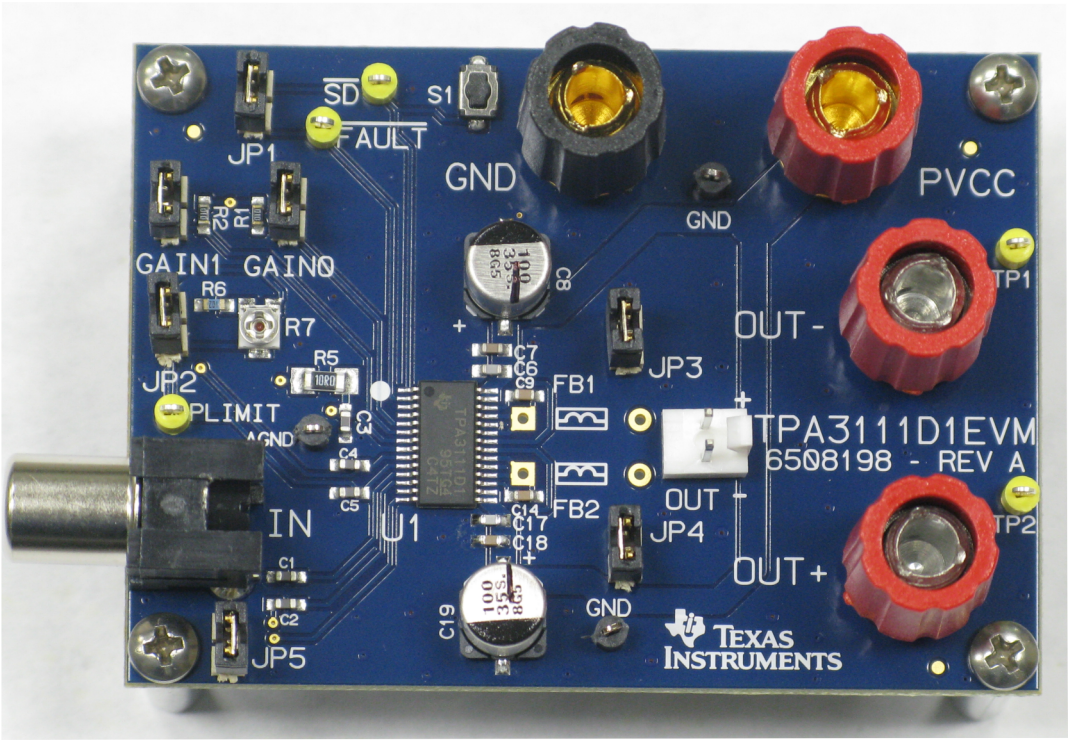


Figure 1. TI TPA3111D1EVM Audio Power Amplifier – Top View

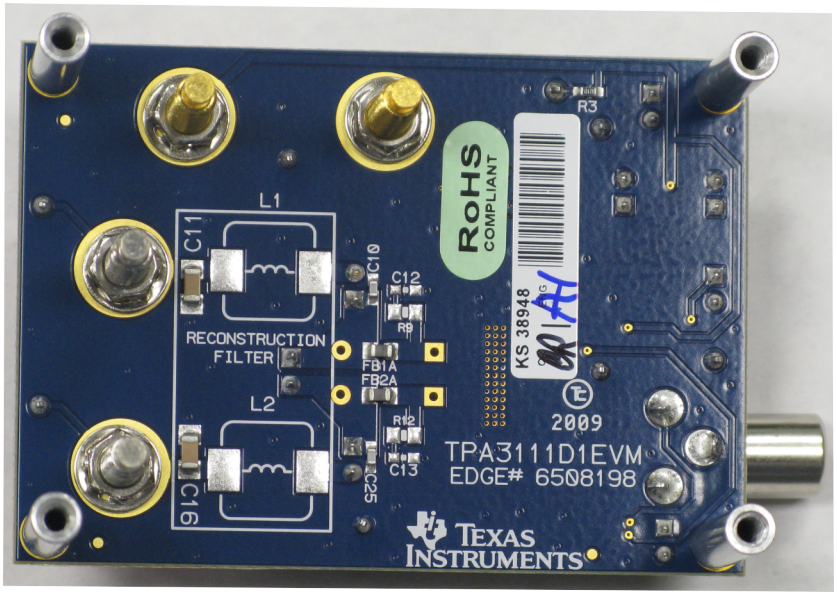


Figure 2. TI TPA3111D1EVM Audio Power Amplifier – Bottom View

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1.1 TPA3111D1EVM Specifications

Table 1. Key Parameters

Key Parameters	
Power Supply Voltage	8 V to 26 V
Number of Channels	1 - Bridge-Tied Load (BTL) Mono
Load Impedance Mono BTL	4 Ω to 8 Ω (connect 33-μH series inductor for 4-Ω, 68-μH inductor or 8 Ω if using the ferrite bead filters)
Output Power	10 W

2 Operation

2.1 Quick-Start List for Stand-Alone Operation

Follow these steps to use the TPA3111D1EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM module can be made by inserting stripped wire or banana plugs for the power supply and output connections. The outputs also can be connected via Molex connectors. The input connectors are RCA phono jacks.

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Power Supply

A single power supply is required to power up the EVM. Most of the pins are PVCC compliant. The PVCC supply can also be used to power the analog supply (AV_{CC}) and can be used to pull up the logic pins for shutdown (SD) control, fault detection (FAULT), and gain (GAIN0 and GAIN1) as long as the voltage slew rate is limited to 10 V/ms. GVDD is an internally generated supply for the output FETs and also can be used to power the PLIMIT circuit. PLIMIT is GVDD compliant, but not PVCC compliant. PLIMIT also can be powered by an external supply connected to the PLIMIT pin. Take care not to power the PLIMIT pin (or connect power to the GVDD pin inadvertently through the PLIMIT network) when the PVCC supply is turned off. This can cause damage to the integrated circuit (IC).

Table 2. Power Supply Requirements

Description	Voltage Range	Current Requirements	Minimum Wire Size
PVCC	8 to 26 V	3 A	24 AWG

1. Ensure that the external power source is set to OFF.
2. Connect the external regulated power supply adjusted from 8 V to 26 V to the module PVCC and GND banana jacks, taking care to observe marked polarity.

Evaluation Module Preparations

Inputs and Outputs

1. For a BTL configuration, connect a load across the outputs (OUT+ and OUT-).
2. Connect the audio input, either differential or single-ended, to the IN RCA phono plugs for BTL operation.

Control Inputs

1. Ensure that the mode jumpers, JP1, JP2, GAIN0, and GAIN1, are set correctly depending on the desired operating state (Table 3).

Power Up

1. Verify correct voltage and input polarity, and turn the external power supplies ON.
   The EVM begins operation.
2. Adjust the audio source for the desired volume.

Table 3. TPA3111D1 Control Guide

Control	Function	Options	Notes
JP1	Allows amplifier to self-reset after short-circuit protection event	Insert jumper for self-reset. Leave off for latched SC fault.	For latched SC fault, cycle power to reset the fault latch. DC Detect does not recover with SDZ cycle. PVCC must be cycled to reset DC Detect.
GAIN1/GAIN0	Controls amplifier gain	Insert jumper for zero state (low). Leave off for one state (high).	00 = 20 dB (GAIN1, GAIN0) 01 = 26 dB 10 = 32 dB 11 = 36 dB
JP2	Defeats PLIMIT function and allows amplifier to run at full power.	Insert jumper for PLIMIT defeat.	JP2 connects PLIMIT directly to GVDD.
R7	Adjust PLIMIT (an external voltage also can be applied to the PLIMIT test point)	Remove JP2 to allow PLIMIT operation.	The output voltage rails are limited to approximately 4X the voltage at the PLIMIT pin. Take care not to apply power to PLIMIT when the PVCC source is off.
JP3, JP4	Connects LC filters to outputs.		

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3 Schematic, Layout, and Bill of Materials

3.1 TPA3111D1EVM Schematic

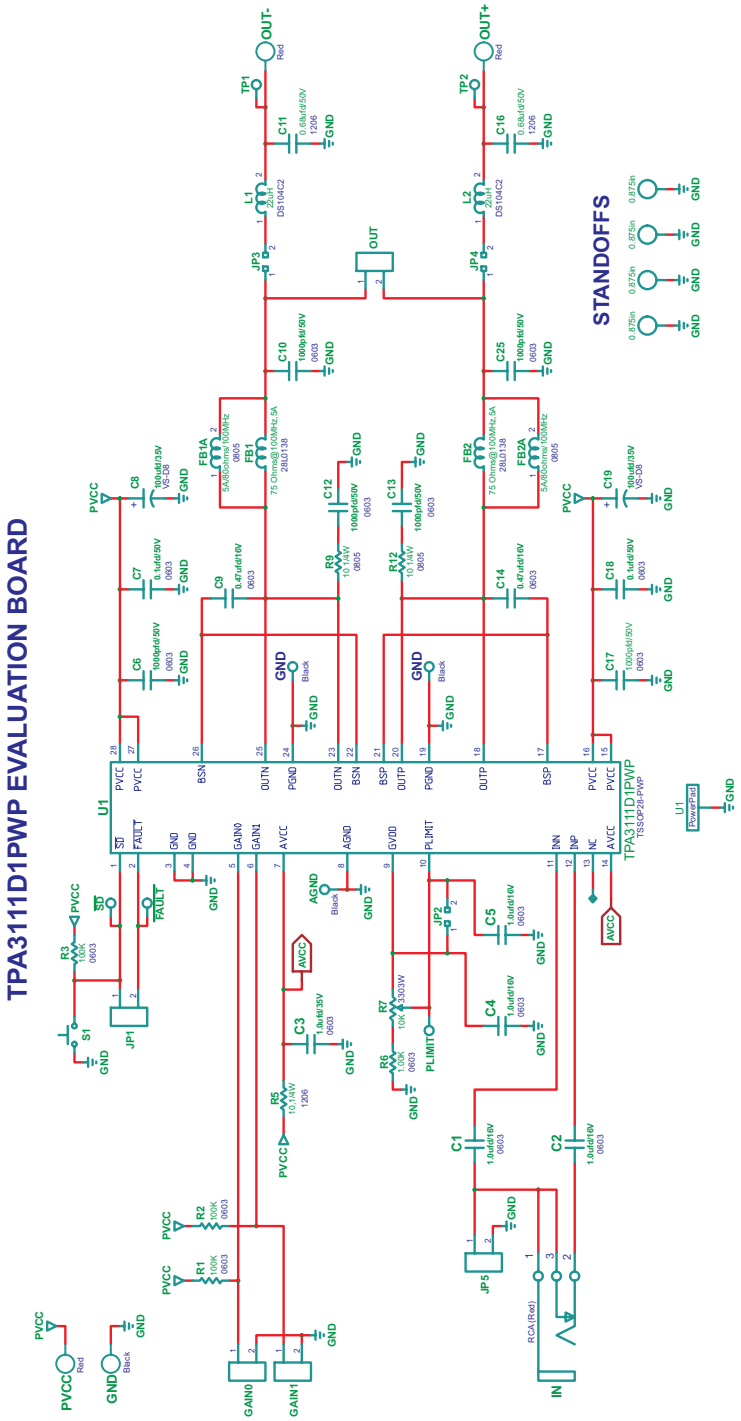


Figure 3. TPA3111D1EVM Schematic

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3.2 TPA3111D1EVM PCB Layers

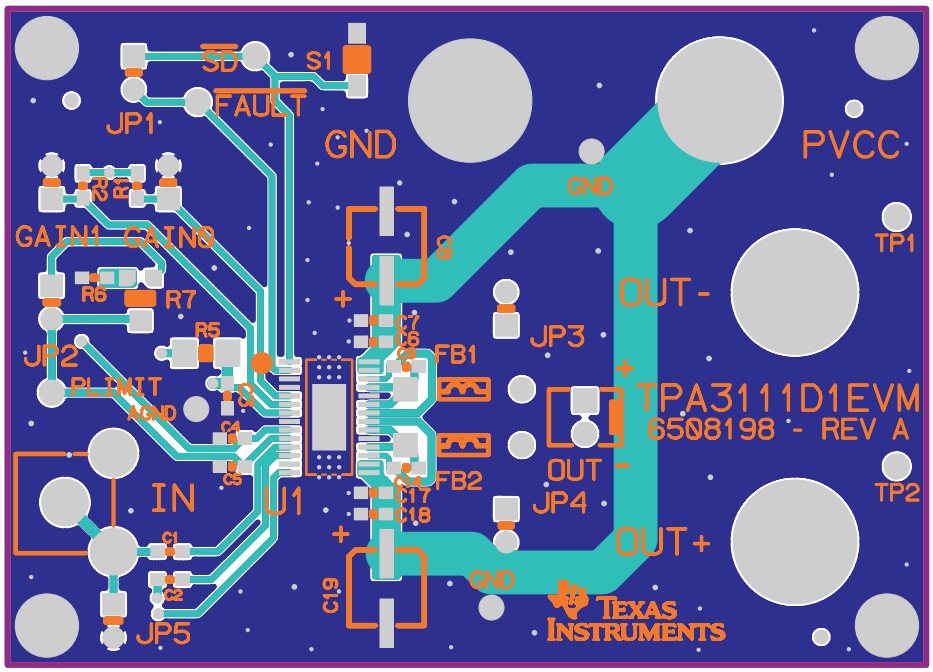


Figure 4. TPA3111D1EVM – Top Side Layout

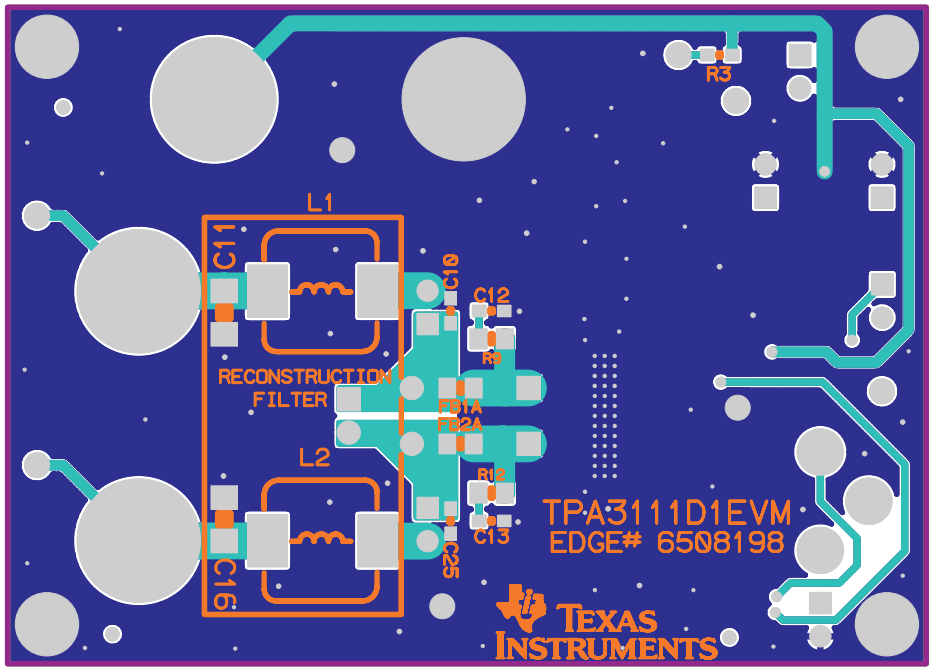


Figure 5. TPA3111D1EVM – Bottom Side Layout

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3.3 TPA3111D1EVM Bill of Materials

Table 4. Bill of Materials for TPA3111D1EVM

Item	MANU Part no.	QTY	Ref Designators	Vendor Part No	Description	Vendor	MANU
TI-SEMICONDUCTORS							
1	TPA3111D1PWP	1	U1	TPA3111D1PWP	10-W MONO CLASS-D AUDIO POWER AMP, TSSOP28-PWP ROIHS	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS
CAPACITORS							
2	C1608C0G1H102J	6	C6,C10,C12,C13,C17,C25	445-1293-1	CAP SMD0603 CERM 1000 pF 50V 5% COG ROHS	DIGI-KEY	TDK CORP.
3	C1608X7R1H104K	2	C7,C18	445-1314-1	CAP SMD0603 CERM 0.1 μF 50V X7R ROHS	DIGI-KEY	TDK
4	0603YD474KAT2A	2	C9,C14	478-1248-1	CAP SMD0603 CERM 0.47 μF 16V 10% X5R ROHS	DIGI-KEY	AVX
5	C1206C684K5RACTU	2	C11,C16	399-3500-1	CAP SMD1206 CERM 0.68 μF 50V 10% X7R ROHS	DIGI-KEY	KEMET
6	C0603C105K4PACTU	4	C1,C2,C4,C5	399-5090-1	CAP SMD0603 CERM 1.0 μF 16V 10% X5R ROHS	DIGI-KEY	KEMET
7	GMK107BJ105KA-T	1	C3	587-1437-1	CAP SMD0603 CERM 1.0 μF 35V 10% X5R ROHS	DIGI-KEY	TAIYO YUDEN
8	EEE-1VA101XP	2	C8,C19	PCE3951CT	CAP SMD ELECT 100 μF 35V 20% VS-D8 ROHS	DIGI-KEY	PANASONIC
RESISTORS							
9	ESR10EZPJ100	2	R9,R12	RHM10KCT	RESISTOR SMD0805 10Ω 1% 1/4W ROHS	DIGI-KEY	ROHM
10	ERJ-8ENF10R0	1	R5	P10.0FCT	RESISTOR SMD1206 10.0Ω 1% 1/4W ROHS	DIGI-KEY	PANASONIC
11	RC0603FR-071KL	1	R6	311-1.00KHRCT	RESISTOR SMD0603 1.00KΩ 1% 1/10W ROHS	DIGI-KEY	YAGEO
12	3303W-3-103E	1	R7	3303W-103ECT	POT SMD SINGLE TURN CERMET10K ROHS	DIGI-KEY	BOURNS
13	ERJ-3EKF1003V	3	R1,R2,R3	P100KHCT	RESISTOR SMD0603 100KΩ 1% 1/16W ROHS	DIGI-KEY	PANASONIC
FERRITE BEADS AND INDUCTORS							
14	HI0805R800R-10	2	FB1A,FB2A	240-2395-1	FERRITE BEAD SMD0805 80Ω@100MHz 5A ROHS	DIGI-KEY	STEWARD
15	28L0138-10R-10	2	FB1,FB2	240-2438-1	FERRITE BEAD THRU RN50 75Ω@100MHz 5A ROHS	DIGI-KEY	STEWARD
16	B952AS-220M	2	L1,L2	B952AS-220M	INDUCTOR SMT 22μH 2.4A 87Ω 20% DS104C2 ROHS	TOKO JAPAN	TOKO JAPAN
HEADERS AND JACKS							
17	PBC02SAAN	7	JP1, JP2, JP3, JP4, JP5, GAIN0, GAIN1	S1011E-02	HEADER 2 PIN MALE, PCB STRAIGHT GOLD ROHS	DIGI-KEY	SULLINS

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Table 4. Bill of Materials for TPA3111D1EVM (continued)

Item	MANU Part no.	QTY	Ref Designators	Vendor Part No	Description	Vendor	MANU
18	22-23-2021	1	OUT	WM4200	HEADER MALE 2PIN 100LS W/ FRICTION LOCK ROHS	DIGI-KEY	MOLEX
19	PJRAN1X1U03X	1	IN	89K7617	JACK, RCA 3-PIN PCB-RA RED ROHS	NEWARK	SWITCHCRAFT
TESTPOINTS AND SWITCHES							
20	5004	5	SD, FAULT, PLIMIT, TP1 TP2	5004K	PC TESTPOINT, YELLOW, ROHS	DIGI-KEY	KEYSTONE ELECTRONICS
21	5001	3	AGND, GND, GND	5001K	PC TESTPOINT, BLACK, ROHS	DIGI-KEY	KEYSTONE ELECTRONICS
22	TL1015AF160QG	1	S1	EG4344CT	SWITCH, MOM, 160G SMT 4X3MM ROHS	DIGI-KEY	E-SWITCH
BINDING POSTS							
23	3760-2	2	OUT+, OUT-	565-3760-2	BINDING POST, RED 60V/15A TIN ROHS	MOUSER	POMONA
24	3750-2	1	PVCC	565-3750-2	BINDING POST, RED 60V/15A GOLD ROHS	MOUSER	POMONA
25	3750-0	1	GND	565-3750-0	BINDING POST, BLACK 60V/15A GOLD ROHS	MOUSER	POMONA
SHUNTS							
26	SPC02SYAN	7	JP1, JP2, JP3, JP4, JP5, GAIN0, GAIN1	S9001	SHUNT, BLACK AU FLASH 0.100LS	DIGI-KEY	SULLINS
STANDOFFS AND HARDWARE							
27	PMS 440 0025 PH	4	SO1,SO2,SO3,SO4	H342	4-40 SCREW, STEEL 0.250 IN	DIGI-KEY	BUILDING FASTENERS
28	2030	4	SO1,SO2,SO3,SO4	2030K	STANDOFF, 4-40, 0.875IN x 3/16IN, ALUM RND F-F	DIGI-KEY	KEYSTONE
COMPONENTS NOT ASSEMBLED							
FB1, FB2							
COMPONENTS MISSING FROM SEQUENCE							
C15, C20-C24, R4, R8, R10, R11							

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of -0.3 V to 6.3 V and the output voltage range of -0.3 V to 30 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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Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
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RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
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