TPA3126D2 Evaluation Module

This user's guide describes the operation of the TPA3126D2EVM. The user's guide also provides design information such as PCB layout, bill of materials (BOM), and schematic.

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1 Hardware Overview

The TPA3126D2EVM customer evaluation module demonstrates the integrated circuits TPA3126D2 from Texas Instruments (TI). The TPA3126D2 is a 50-W (per channel) efficient stereo digital amplifier power stage for driving two bridge-tied speakers or a single parallel bridge-tied load. This document covers EVM specifications and design documentation.

Figure 1 illustrates the TPA3126D2EVM board.

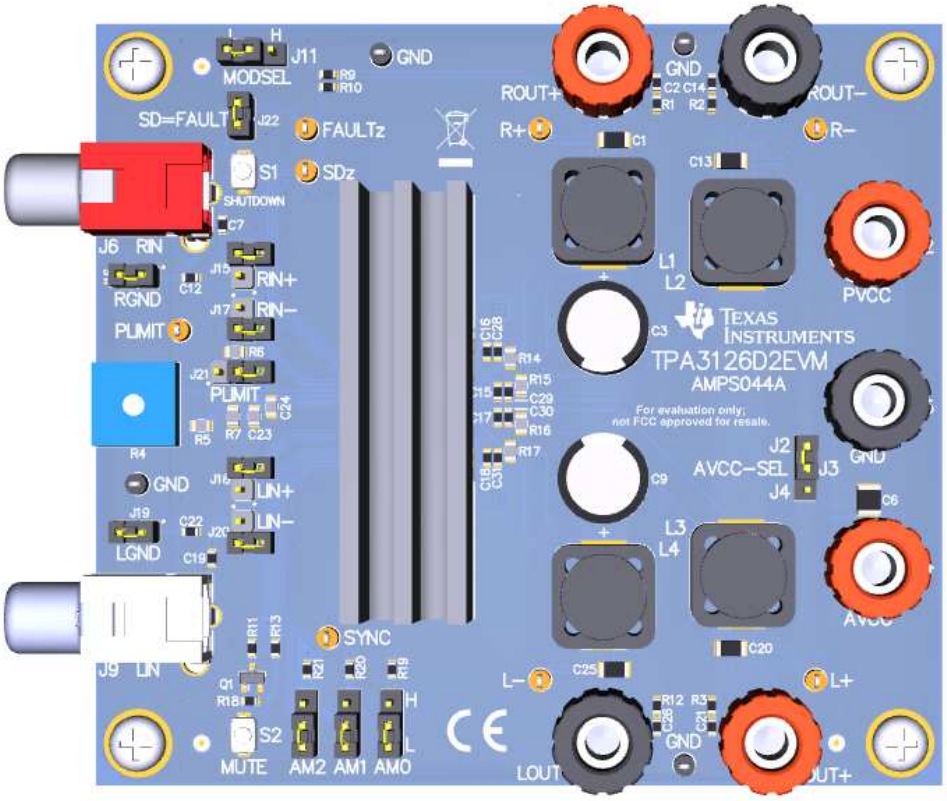


Figure 1. TPA3126D2EVM

Table 1 lists the TPA3126D2EVM specifications.

Table 1. TPA3126D2EVM Specification

Key Parameters	Value
Power supply voltage	4.5 V to 26 V
Number of channels	2 bridge-tied load (BTL) stereo
Load impedance	3.2 Ω to 8 Ω
Output power BTL	50 W per channel
Output power PBTL	100 W

2 Operation

This chapter describes the TPA3126D2EVM board in regards to power supply and system interfaces. The chapter provides information regarding handling and unpacking, absolute operating conditions, and a description of the factory default switch and jumper configurations.

The following sections provide a step–by–step guide to configuring the TPA3126D2EVM for device evaluation.

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2.1 Electrostatic Discharge Warning

Many of the components on the TPA3126D2EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM.

CAUTION

Failure to observe ESD handling procedures may result in damage to EVM components.

2.2 Unpacking the EVM

When opening the TPA3126D2EVM package, ensure that the following item is included:

- A 1-piece TPA3126D2EVM board using one TPA3126D2.

If the EVM is missing, contact the Texas Instruments Product Information Center nearest you to inquire about a replacement.

2.3 Power Supply Setup

A power supply or separate PVCC/AVCC is required to power up the EVM. Because most of the pins are PVCC compliant, the PVCC supply can also be used to power the analog supply (AVCC) and to pull up the logic pins for shutdown (SD) control, and fault detection (FAULT). Table 2 lists the power requirements.

Table 2. Power Requirements

Description	Voltage Range	Current Requirement	Minimum Wire Size
PVCC/AVCC	4.5 to 26 V	8 A	24 AWG

CAUTION

Applying voltages above the limitations given in Table 2 may cause permanent damage to your hardware.

2.4 Evaluation Module Preparations

Complete the following steps to prepare the EVM for use:

1. Ensure that the external power source is set to OFF.
2. Connect the external regulated power supply adjusted from 4.5 V to 26 V to the module PVCC and GND banana jacks, taking care to observe marked polarity.

2.5 Inputs and Outputs

Use the following instructions for input and output connections:

1. Connect audio inputs, either differential or single-ended, to the LIN and RIN RCA phono plugs for BTL operation. To enable individual channel shutdown feature, tie RINP and RINN directly to Ground (without capacitors) and OUTPL and OUTNL should be working normally in BTL configuration. For PBTL operation, apply a single input, differential or single ended, to the RIN RCA phono plug and tie LINP and LINN directly to Ground (without capacitors).
2. For a BTL Configuration, connect a Load(s) across the outputs (OUTL+ and OUTL–) and (OUTR+ and OUTR–). For PBTL configuration, connect a single load from one of the left speaker jacks to one of the right speaker jacks depending on how the filters are loaded.

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2.6 Power Up

Complete the following steps to power up the EVM board:

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

2.7 Recommended Settings

This section contains the recommended settings for stereo, single-channel, and mono output.

Table 3 lists the settings for a single-ended input with auto recovery, Plimit, and BTL (stereo output).

Table 3. TPA3126D2EVM Setting 1

Setting	Description
J6 (RIN)	R channel audio input
J9 (LIN)	L channel audio input
JP1(GNDR+) and JP3(GNDR-),set to OUT	R channel on
JP4(GNDL+) and JP6(GNDL-), set to OUT	L channel on
JP2 (RGND), set to IN	Single ended input (R channel)
JP5 (LGND), set to IN	Single ended input (L channel)
JP7, set to IN	Set PLIMIT
R4	Change PLMIT voltage value
JP8 (/SD=/FAULT) set to IN	Auto recovery mode
J11 (MODESEL=L)	Low idle-loss mode

Table 4 lists the settings for a single-ended input with auto recovery, Plimit, and BTL (single-channel output).

Table 4. TPA3126D2EVM Setting 2

Setting	Description
J6 (RIN)	No audio input
J9 (LIN)	L channel audio input
JP1(GNDR+) and JP3(GNDR-),set to IN	R channel off
JP4(GNDR+) and JP6(GNDR-),set to OUT	L channel on
JP5 (LGND), set to IN	Single ended input (L channel)
JP7, set to IN	Set PLIMIT
R4	Change PLMIT voltage value
JP8 (/SD=/FAULT) set to IN	Auto recovery mode
J11 (MODESEL=L)	Low idle-loss mode

Table 5 lists the settings for a single-ended input with auto recovery, Plimit, and PBTL (mono output).

Table 5. TPA3126D2EVM Setting 3

Setting	Description
J6 (RIN)	R channel audio input
J9 (LIN)	No audio input
JP1(GNDR+) and JP3(GNDR-),set to OUT	R channel on
JP4(GNDL+) and JP6(GNDL-), set to IN	L channel off, PBTL mode
JP2, set to IN	Single ended input (R channel)
JP7, set to IN	Set PLIMIT
R4	Change PLMIT voltage value

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Table 5. TPA3126D2EVM Setting 3 (continued)

Setting	Description
JP8 (/SD=/FAULT) set to IN	Auto recovery mode
J11 (MODESEL=L)	Low idle-loss mode

2.8 Separate PVCC/AVCC Supply Support

By supplying a voltage of AVCC which is lower than PVCC (that is PVCC = 24 V and AVCC = 12 V), the power dissipation on internal LDO is reduced. This gives customers the flexibility to choose between extreme low-idle current mode (J3, 1 and 2 set to in, with separate AVCC) and single power supply mode (J3, 2 and 3 set to in, without AVCC).

3 Board Layouts, Bill of Materials, and Schematic

3.1 TPA3126D2EVM Board Layouts

Figure 2 and Figure 3 illustrate the board layouts for the EVM.

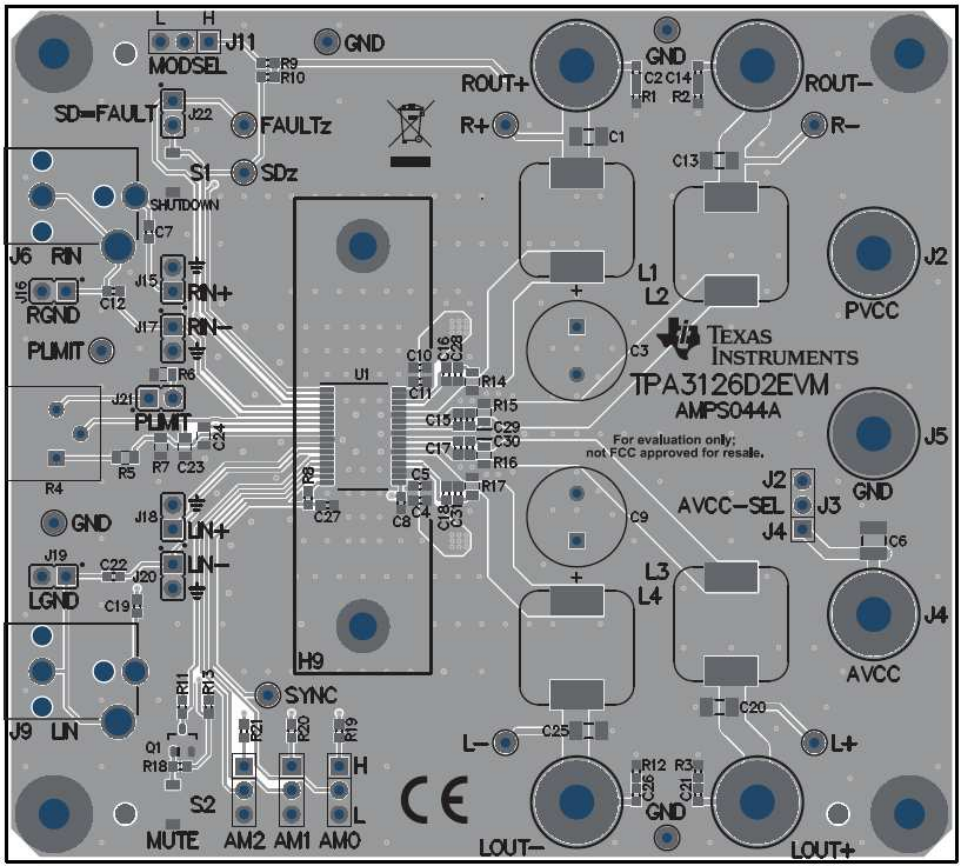


Figure 2. TPA3126D2EVM Top Overlay

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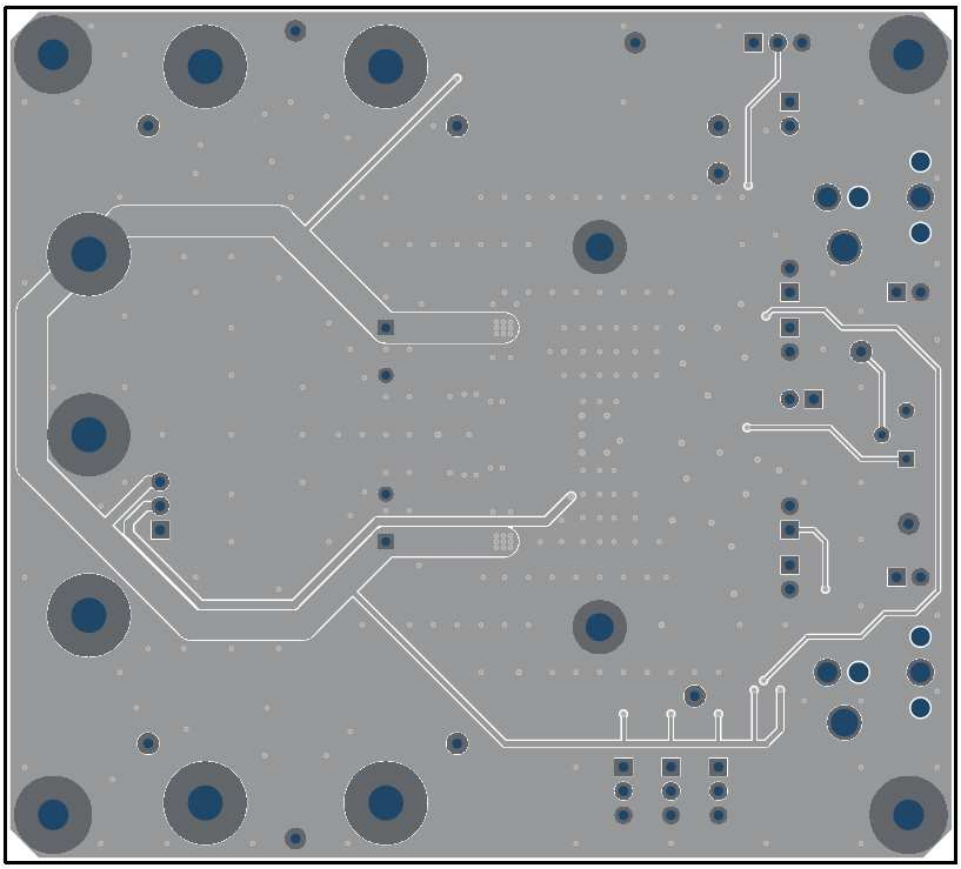


Figure 3. TPA3126D2EVM Bottom Overlay

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3.2 Bill of Materials

Table 6 displays the BOM for this EVM.

Table 6. TPA3126D2EVM Bill of Materials(1)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
PCB	1		Printed Circuit Board		AMPS044	Any		
C1, C13, C20, C25	4	0.68 µF	CAP, CERM, 0.68 µF, 50 V, ± 10%, X7R, 1206	1206	GRM31MR71H684KA88L	MuRata		
C2, C14, C21, C26	4	0.01 µF	CAP, CERM, 0.01 µF, 50 V, ± 10%, X7R, 0603	0603	GRM188R71H103KA01D	MuRata		
C3, C9	2	220 µF	CAP, AL, 220 µF, 35 V, ± 20%, 0.09 Ω, AEC-Q200 Grade 2, TH	10 × 12.5 mm	EEU-FC1V221	Panasonic		
C4, C10	2	0.1 µF	CAP, CERM, 0.1 µF, 50 V, ± 10%, X7R, 0603	0603	GCM188R71H104KA57D	MuRata		
C5, C11	2	1000 pF	CAP, CERM, 1000 pF, 50 V, ± 5%, C0G/NP0, 0603	0603	GRM1885C1H102JA01D	MuRata		
C6	1	10 µF	CAP, CERM, 10 µF, 35 V, ± 10%, X7R, 1210	1210	GRM32ER7YA106KA12L	MuRata		
C7, C12, C19, C22	4	1 µF	CAP, CERM, 1 µF, 16 V, ± 10%, X7R, 0603	0603	GRM188R71C105KA12D	MuRata		
C8	1	1 µF	CAP, CERM, 1 µF, 35 V, ± 10%, X7R, 0603	0603	C1608X7R1V105K080AC	TDK		
C15, C16, C17, C18	4	0.22 µF	CAP, CERM, 0.22 µF, 25 V, ± 10%, X7R, 0603	0603	GRM188R71E224KA88D	MuRata		
C23, C24	2	1 µF	CAP, CERM, 1 µf, 16 V, ± 10%, X7R, 0805	0805	C0805C105K4RACTU	Kemet		
C27	1	47 pF	CAP, CERM, 47 pF, 50 V, ± 5%, C0G/NP0, 0603	0603	GRM1885C1H470JA01D	MuRata		
H1, H2, H3, H4	4		Machine Screw, Round, 4-40 × 1/4, Nylon, Phillips Panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply		
H5, H6, H7, H8	4			Standoff	1902C	Keystone		
H9	1		Heat Sink for TI MOD 50 × 13.9 mm	HEAT SINK, 50 × 13.9 mm	ATS-TI10P-521-C1-R1	Advanced Thermal Solutions		
J1, J2, J4, J8	4		Binding Post, RED, TH	11.4 × 27.2 mm	7006	Keystone		
J3, J11, J12, J13, J14	5		Header, 100 mil, 3 × 1, Gold, TH	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions		
J5, J7, J10	3		Binding Post, BLACK, TH	11.4 × 27.2 mm	7007	Keystone		
J6	1		RCA Jack, Red, R/A, TH	PC Mount Phono Jack-Red, TH	971	Keystone		
J9	1		RCA Jack, White, R/A, TH	PC Mount Phono Jack-White, TH	970	Keystone		
J15, J16, J17, J18, J19, J20, J21, J22	8		Header, 100 mil, 2 × 1, Gold, TH	Sullins 100 mil, 1×2, 230 mil above insulator	PBC02SAAN	Sullins Connector Solutions		
L1, L2, L3, L4	4	10 µH	Inductor, Shielded Drum Core, Ferrite, 10 µH, 7.1 A, 0.01294 Ω, SMD	SMD	7447709100	Wurth Elektronik		
Q1	1	40 V	Transistor, NPN, 40 V, 0.6 A, SOT-23	SOT-23	MMBT2222ALT1G	ON Semiconductor		

(1) Unless otherwise noted in the Alternate Part Number and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

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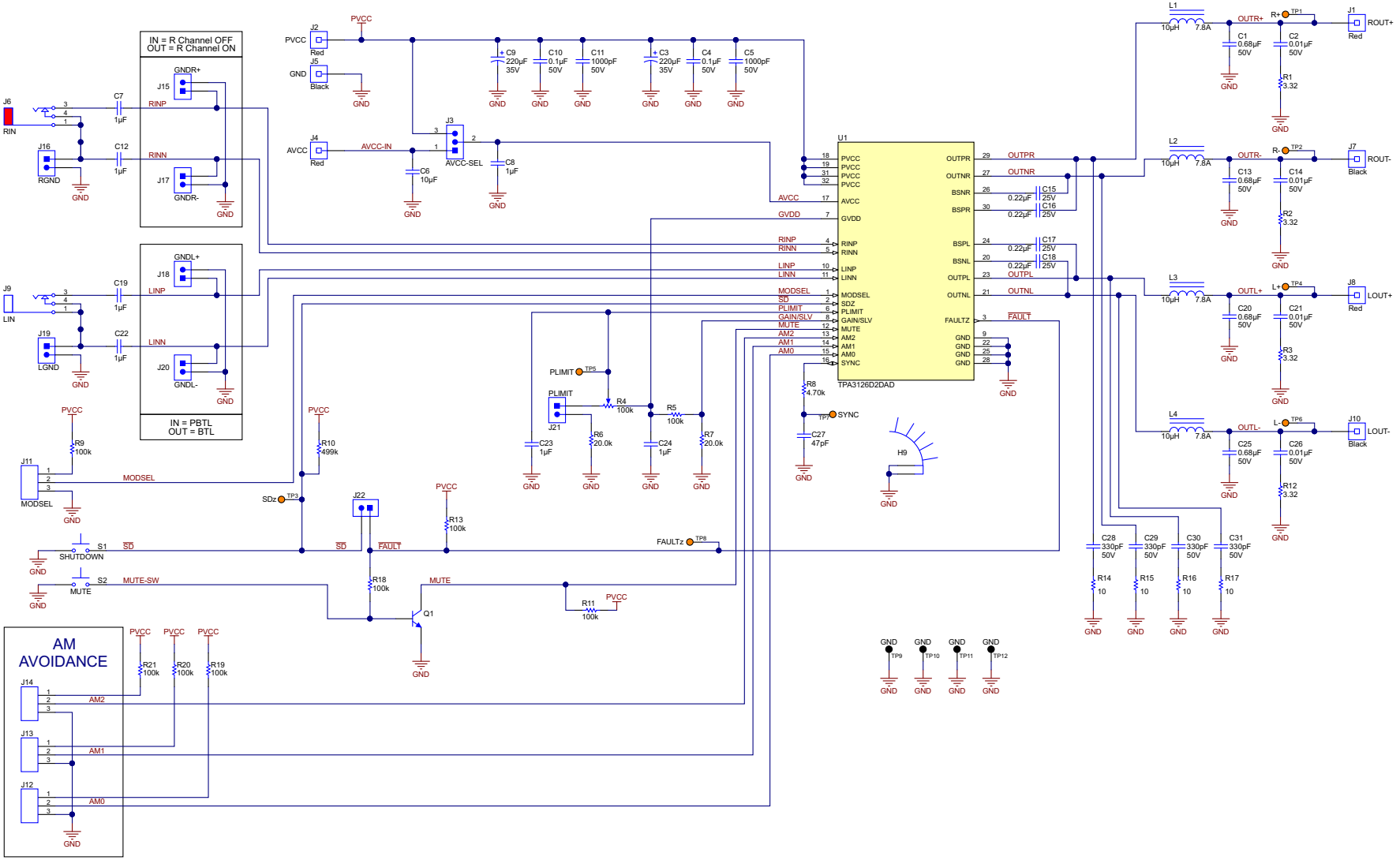
Table 6. TPA3126D2EVM Bill of Materials[(1)] (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R1, R2, R3, R12	4	3.32	RES, 3.32, 1%, 0.1 w, 0603	0603	RC0603FR-073R32L	Yageo America		
R4	1	100 k	TRIMMER, 100 kΩ, 0.5 W, TH	375 × 190 × 375 mil	3386P-1-104LF	Bourns		
R5	1	100 k	RES, 100 k, 1%, 0.125 W, 0805	0805	ERJ-6ENF1003V	Panasonic		
R6, R7	2	20.0 k	RES, 20.0 K, 1%, 0.125 w, 0805	0805	ERJ-6ENF2002V	Panasonic		
R8	1	4.70 k	RES, 4.70 K, 0.1%, 0.1 W, 0603	0603	RG1608P-472-B-T5	Susumu Co Ltd		
R9, R11, R13, R18, R19, R20, R21	7	100 k	RES, 100 k, 1%, 0.1 W, 0603	0603	RC0603FR-07100KL	Yageo America		
R10	1	499 k	RES, 499 k, 1%, 0.1 W, 0603	0603	RC0603FR-07499KL	Yageo America		
S1, S2	2		Switch, Tactile, SPST-NO, 0.05 A, 12 V, SMT	Switch, 4.4 × 2 × 2.9 mm	TL1015AF160QG	E-Switch		
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11, SH-J12, SH-J13	13	1 × 2	Shunt, 100 mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	8		Test Point, Miniature, Orange, TH	Orange Miniature Testpoint	5003	Keystone		
TP9, TP10, TP11, TP12	4		Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone		
U1	1		'2 x 50-W, Analog Input, Stereo, Class-d Audio Amplifier with Low Idle Power Dissipation, DAD0032A (TSSOP-32)	DAD0032A	TPA3126D2DAD	Texas Instruments	TPA3126D2DAD	Texas Instruments
C28, C29, C30, C31	0	330 pF	CAP, CERM, 330 pF, 50 V, ± 5%, C0G/NP0, 0603	0603	GRM1885C1H331JA01D	MuRata		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
R14, R15, R16, R17	0	10	RES, 10, 5%, 0.125 W, 0805	0805	CRCW080510R0JNEA	Vishay-Dale		

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3.3 TPA3126D2EVM Schematic

The schematics for TPA3126D2EVM are illustrated in Figure 4



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Figure 4. TPA3126D2EVM Schematic

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