TPA2017D2 Audio Power Amplifier EVM

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1 Introduction

1.1 Description

The TPA2017D2 is a stereo, filter-free Class-D audio power amplifier with automatic gain control (AGC), dynamic range compression (DRC). The AGC and DRC functions enhance the perceived audio loudness, and at the same time prevent speaker damage from overdrive. Availability in the QFN package makes TPA2017D2 an ideal choice for laptop and portable applications. The TPA2017D2 evaluation module (EVM) is a complete, stand-alone audio board. It contains the TPA2017D2 QFN (RTJ) Class-D audio power amplifier.

The TPA2017D2 evaluation module (EVM) is a complete stand-alone audio board. All components are Pb-free.

1.2 TPA2017D2EVM Specifications

Supply voltage range, V_{DD}	4.5 V to 5.5 V
Supply current, I_{DD}	1 A, maximum
Speaker amplifier output power per channel, P_O: 4Ω, V_{DD} = 5 V, THD+N = 1%	2 W

2 Operation

2.1 Quick-Start List for Stand-Alone Operation

2.1.1 Speaker Amplifier

Follow these steps to use the TPA2017D2EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM can be made by inserting stripped wire or using banana plugs for the power supply and output connections. The inputs accept standard RCA plugs.

2.1.2 Power Supply

1. Ensure that all external power sources are set to OFF.
2. Connect an external regulated power supply adjusted to 5 V to the module VDD and GND banana jacks, taking care to observe marked polarity.

2.1.3 Evaluation Module Preparations

Inputs and Outputs

1. If connecting to a fully differential input or a grounded input (the shield of the RCA is GND), remove jumpers JP1 and JP2 from the EVM. If connecting to a floating source like a portable CD, install jumpers JP1 and JP2. After setting the JP1 and JP2 jumpers appropriately, connect the input source to the speaker left and right inputs (INL and INR) .
2. Connect a speaker across OUTR+ and OUTR-. Connect another speaker across OUTL+ and OUTL-.

Control Inputs

1. **Enable:** Hold down switch EN to place the amplifier in shutdown. Release EN to reactivate the amplifier.
2. **AGC1/AGC2:** Together, these terminals determine the AGC setting of the amplifier. See Table 1. Installing the jumpers in position 0 sets the respective terminal to GND. Installing the jumpers in position 1 sets the respective terminals to VDD.

Table 1. Gain Settings

AGC1	AGC2	Function
0	0	AGC Function disabled
0	1	AGC Limiter Function enabled
1	0	AGC, Limiter, and Compression Functions enabled
1	1	AGC, Limiter, Compression, and Noise Gate Functions enabled

2.1.4 Power Up

1. Verify correct voltage and input polarity, and turn on the external power supplies.
   The EVM should begin operation.
2. Adjust the input signal.
3. Adjust the control inputs to the desired settings.
4. Adjust the amplifier AGC setting by installing/removing the jumpers, AGC1 and AGC2.

3 Schematic and Bill of Materials

3.1 TPA2017D2EVM Schematic

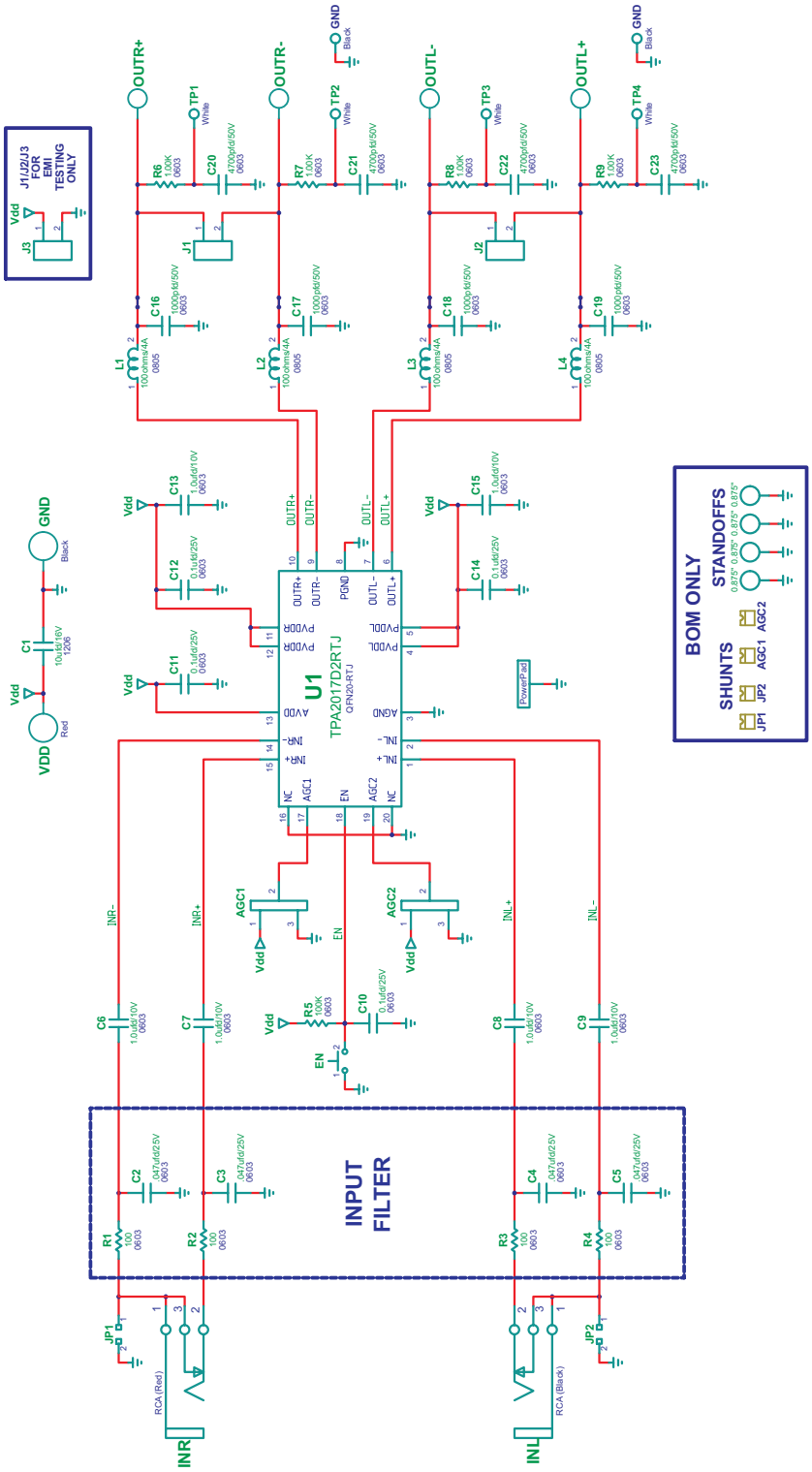

Figure 1. EVM Schematic

3.2 TPA2017D2EVM PCB Layers

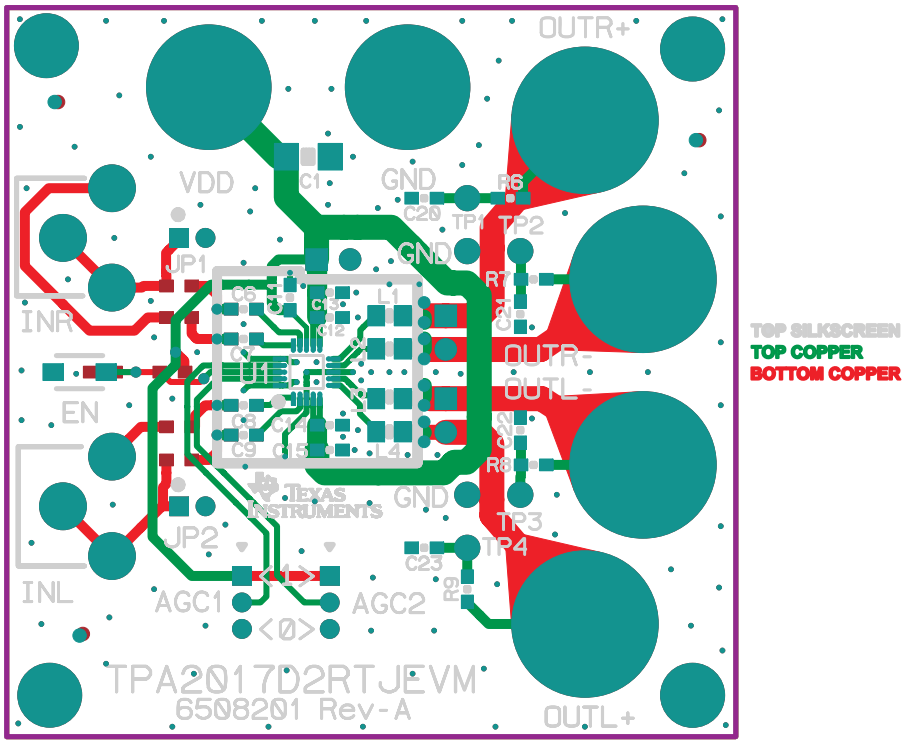

Figure 2. Top Side Layout

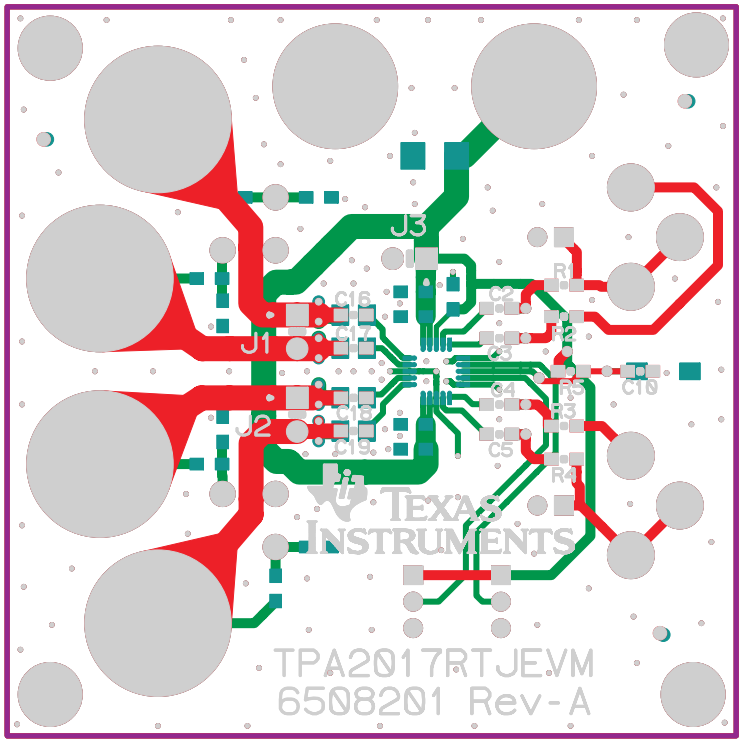

Figure 3. Bottom Side Layout

3.3 TPA2017D2EVM Bill of Materials

Description	RefDes	QTY	MFG	MFG Part#	Vendor	Vendor Part#
TI-SEMICONDUCTORS						
Stereo AGC Class-D amplifier	U1	1	TEXAS INSTRUMENTS	TPA2017D2RTJ	TEXAS INSTRUMENTS	TPA2017D2RTJ
Description	**RefDes**	**QTY**	**MFG**	**MFG Part#**	**Vendor**	**Cut Tape Part#**
CAPACITORS						
CAP 1000PFD 50V CERM 0603 COG ROHS	C16, C17, C18, C19	4	TDK CORP.	C1608C0G1H102J	DIGI-KEY	445-1293-2
CAP 4700PFD 50V CERM 0603 X7R	C20, C21, C22, C23	4	PANASONIC	ECJ-1VB1H472K	DIGI-KEY	PCC1780TR
CAP .047UFD 25V CERM 0603 X7R ROHS	C2, C3, C4, C5	4	PANASONIC	ECJ-1VB1E473K	DIGI-KEY	PCC1771TR
CAP 0.1UFD 25V CERM 0603 X5R ROHS	C10, C11, C12, C14	4	PANASONIC	06033D104KAT2A	DIGI-KEY	478-1244-2
CAP 1.0UFD 10V 10% CERM 0603 X5R ROHS	C6, C7, C8, C9, C13, C15	6	PANASONIC	ECJ-1VB1A105K	DIGI-KEY	PCC2174TR
CAP 10UFD 16V 10% CERM 1206 X5R ROHS	C1	1	KEMET	C1206C106K4PACTU	DIGI-KEY	399-5091-2
RESISTORS						
RES 100 OHM 1/10W 1% SMD 0603 ROHS	R1, R2, R3, R4	4	VISHAY	CRCW0603100RFKEA	DIGI-KEY	541-100HTR
RES 1.00K OHM 1/16W 1% SMD 0603	R6, R7, R8, R9	4	PANASONIC	ERJ-3EKF1001V	DIGI-KEY	P1.00KHTR
RES 100K OHM 1/10W 5% SMD 0603 ROHS	R5	1	PANASONIC	ERJ-3GEYJ104V	DIGI-KEY	P100KGTR
FERRITE BEADS						
FERRITE BEAD, 100 Ohms 4A 100MHz SM0805	L1, L2, L3, L4	4	TDK CORPORATION	MPZ2012S101A	DIGI-KEY	445-1567-2
HEADERS AND JACKS						
HEADER, 2 PIN MALE, PCB STRAIGHT GOLD ROHS	J1, J2, J3	3	SULLINS	PBC02SAAN	DIGI-KEY	S1011E-02
HEADER 2 PIN, PCB 2.0MM ROHS	JP1, JP2	2	NORCOMP	26630201RP2	DIGI-KEY	2663S-02
HEADER 3 PIN, PCB 2.0MM ROHS	AGC1, AGC2	2	NORCOMP	26630301RP2	DIGI-KEY	2663S-03
JACK, RCA, PCB-RA, BLACK	INL	1	SWITCHCRAFT	PJRAN1X1U01	NEWARK	16C1858
JACK, RCA, PCB-RA, RED	INR	1	SWITCHCRAFT	PJRAN1X1U03	NEWARK	16C1860
TESTPOINTS AND SWITCHES						
PC Testpoint, Black	GND, GND	2	KEYSTONE ELECTRONICS	5001	DIGI-KEY	5001K
PC Testpoint, White	TP1, TP2, TP3, TP4	4	KEYSTONE ELECTRONICS	5002	DIGI-KEY	5002K
Switch, Momentary SMT-Short, Black Tab, 240g	EN	1	PANASONIC	EVQ-PPDA25	DIGI-KEY	P8087STR
BINDING POSTS						
BINDING POST, 15A, UNINSULATED	OUTL-, OUTL+, OUTR-, OUTR+	4	JOHNSON COMPONENTS	111-2223-001	DIGI-KEY	J587
BINDING POST, BLACK, 15A ECONO	GND	1	KEYSTONE ELECTRONICS	7007	DIGI-KEY	7007K
BINDING POST, RED, 15A ECONO	VDD	1	KEYSTONE ELECTRONICS	7006	DIGI-KEY	7006K
SHUNTS						
SHUNT, BLACK AU FLASH 2 MM ROHS	JP1, JP2, AGC1, AGC2	4	NORCOMP INC.	810-002-SP2L001	DIGI-KEY	SP2-001E
STANDOFFS AND HARDWARE						
Hex Nut, 4-40, Zinc/Steel	HW1, HW2, HW3, HW4	4	BUILDING FASTENERS	HNZ440	DIGI-KEY	H216
Standoff 4-40 Threaded M/F 0.50 in. ALUM-HEX	HW1, HW2, HW3, HW4	4	KEYSTONE ELECTRONICS	8401	DIGI-KEY	8401K
Component Count: 71						

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 4.5 V to 5.5 V and the output voltage range of 0 V to 5.5 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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