

TPA2029D1YZFEVM Evaluation Module

This guide assists users in evaluating the TPA2029D1 Class-D audio power amplifier with the TPA2029D1YZFEVM evaluation module. Included in the document are operating instructions, schematic, printed-circuit board artwork, and a bill of materials.

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1 Introduction



Figure 1. TPA2029D1YZFEVM Evaluation Module

1.1 Description

The TPA2029D1 is a mono, filter-free, Class-D, audio power amplifier with automatic gain control (AGC) and dynamic range compression (DRC). The DRC/AGC function can be enabled and disabled. The AGC and DRC functions enhance the perceived audio loudness, and at the same time prevent speaker damage from overdrive.

Availability in the WCSP package makes the TPA2029D1 an ideal choice for both cellular handsets and PDAs.

The TPA2029D1 evaluation module (EVM) is a complete, stand-alone audio board. It contains the TPA2029D1 WCSP (YZF) Class-D audio power amplifier.

All components and the EVM are Pb free.

1.2 TPA2029D1YZFEVM Specifications

Table 1 presents the specifications for the TPA2029D1YZFEVM.

Table 1. TPA2029D1YZFEVM	Specifications
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V _{DD}	Supply voltage range	–0.3 V to 6 V
I _{DD}	Supply current	2 A Maximum
Po	Continuous output power per channel, 4 Ω , Vdd = 5 V, THD + N = 10%	3 W
VI	Audio Input Voltage	0.5 V to V_{DD} – 0.5 V
RL	Minimum load impedance	3.6 Ω

2 Operation

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The TPA2029D1YZFEVM can be evaluated in a stand-alone mode with an external dc supply.

2.1 Evaluation Module Preparations

- 1. Ensure that the power source (VDD) is set to OFF.
- 2. Install shunts in jumpers AGC1 and AGC2 as shown in Figure 2.
- 3. Install shunt in jumper JP1 when single-ended audio input is used; this ties IN- to ground.

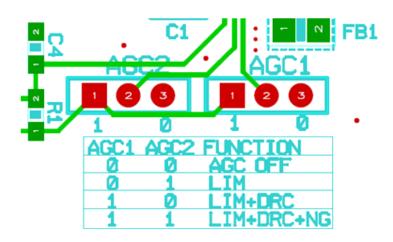


Figure 2. AGC1 and AGC2 Shunts in "0" Position

2.2 Adjusting Limiter, Compression, and Noise Gate Functions

The default values for the TPA2029D1 AGC function are given in Table 2.

Table	2.	AGC	Default	Values
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AGC Parameters	TPA2029D1
Attack Time	14.084 ms/6-dB Step
Release Time	822 ms/6-dB step
Hold Time	off
Fixed Gain	9 dB
Noise Gate Threshold	4 mV
Output Limiter Level	9 dBV
Maximum Gain	30 dB
Compression Ratio	2:1

Pins AGC1 and AGC2 are used to enable/disable the limiter, compression, and noise gate functions. Table 3 shows each function. For more information on the AGC/DRC function, see the TPA2029D1 data sheet (SLOS661).

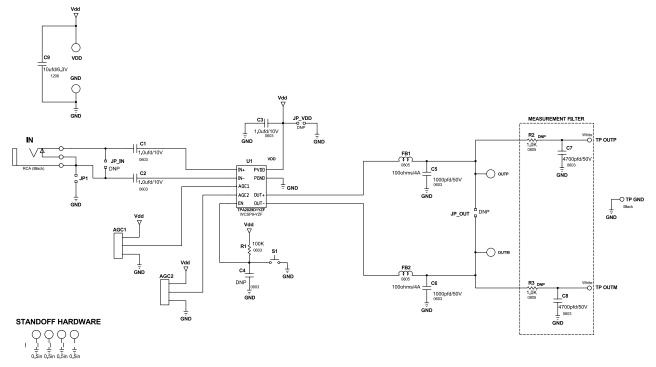
Table 3. Function Definition for AGC1 and AGC2	Table 3. F	unction	Definition	for	AGC1	and AGC2
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AGC1	AGC2	Function
0	0	AGC function disabled
0	1	AGC limiter function enabled
1	0	AGC, limiter, and compression functions enabled
1	1	AGC, limiter, compression, and noise gate functions enabled

TPA2029D1YZFEVM Schematic

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4 TPA2029D1YZFEVM Printed-Circuit Board Layers

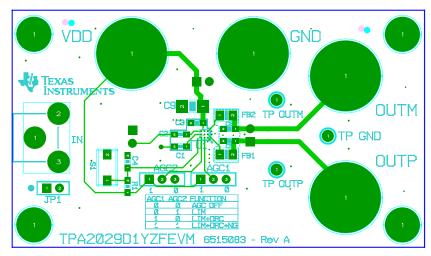


Figure 4. TPA2028DYZF1EVM Top Layer

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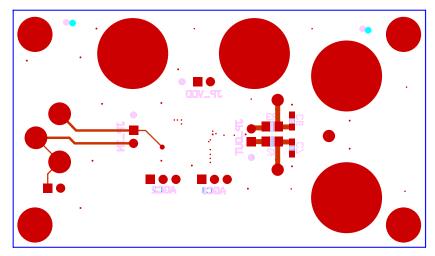


Figure 5. TPA2029D1YZFEVM Bottom Layer

5 TPA2029D1YZFEVM Bill of Materials

Table 4. Bill of Materials for TPA2029D1YZFEVM

ltem	Manufacturer Part No.	QTY	Reference Designator	Vendor Part No.	Description	Vendor	Manufacturer	
TI-Semiconductors								
1	TPA2029D1YZF	1	U1	TPA2029D1YZF	1.7W MONO CLASS-D AUDIO AMP W/SMARTGAIN AGC/DRC WCSP9-YZF ROHS	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS	
			1	I	Capacitors	L.	I	
2	ECJ-1VB1H472K	2	C7,C8	PCC1780CT	CAP SMD0603 CERM 4700PFD 50V 10% X7R ROHS	DIGI-KEY	PANASONIC	
3	ECJ-1VB1A105K	3	C1,C2,C3	PCC2174CT	CAP SMD0603 CERM 1.0UFD 10V 10% X5R ROHS	DIGI-KEY	PANASONIC	
4	C3216X5R0J106K	1	C9	445-1388-1	CAP SMD1206 CERM 10UFD 6.3V 10% X5R ROHS	DIGI-KEY	TDK CORP.	
				L	Resistors		L	
5	ERJ-3EKF1003V	1	R1	P100KHCT	RES 100K OHM 1/16W 1% SMD 0603 ROHS	DIGI-KEY	PANASONIC	
				F	errite Beads		L	
6	MPZ2012S101A	2	FB1,FB2	445-1567-1	FERRITE BEAD, 100 Ohms 4A 100MHz SM0805 ROHS	DIGI-KEY	TDK	
				Hea	ders and Jacks		L	
7	26630201RP2	1	JP2	2663S-02	HEADER 2 PIN, PCB 2.0MM ROHS	DIGI-KEY	NORCOMP	
8	26630301RP2	2	AGC1, AGC2	2663S-03	HEADER 3 PIN, PCB 2.0MM ROHS	DIGI-KEY	NORCOMP	
9	PJRAN1X1U01X	1	IN	65K7770	JACK, RCA 3-PIN PCB-RA BLACK ROHS	NEWARK	SWITCHCRAFT	
				Testpo	ints and Switches			
10	5002	2	TP OUTM, TP OUTP	5002K	PC TESTPOINT, WHITE, ROHS	DIGI-KEY	KEYSTONE ELECTRONICS	
11	5001	1	TP GND	5001K	PC TESTPOINT, BLACK, ROHS	DIGI-KEY	KEYSTONE ELECTRONICS	
12	TL1015AF160QG	1	S1	EG4344CT	SWITCH, MOM, 160G SMT 4X3MM ROHS	DIGI-KEY	E-SWITCH	
				L	Shunts		L	
13	810-002-SP2L001	6	JP1, JP4, USB PWR	SP2-001E	SHUNT, BLACK AU FLASH 2mmLS	DIGI-KEY	NORCOMP INC.	
				B	linding Posts		L	
14	111-2223-001	4	GND, VDD, OUTM,OUTP	J587	BINDING-POST, NONINS, THRU, ROHS	DIGI-KEY	EMERSON NPCS	
				Stando	offs and Hardware			
15	2027	4	HW1, HW2, HW3, HW4	2027K	STANDOFF ,4-40 0.5IN 3/16IN DIA ALUM RND F-F	DIGI-KEY	KEYSTONE	
16	PMS 440 0025 PH	4	HW1, HW2, HW3, HW4	H342	4-40 SCREW, STEEL 0.250 IN	DIGI-KEY	BUILDING FASTENERS	
Compor	nent Count: 36							
				Compon	ents not Assembled			

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User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this is strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

REGULATORY COMPLIANCE INFORMATION (continued)

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- · Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

- 1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
- 2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
- 3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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