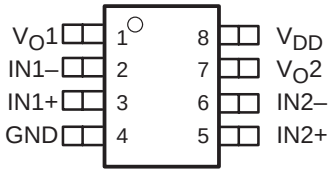
- **150-mW Stereo Output**
- **Wide Range of Supply Voltages**
  - **Fully Specified for 3.3 V and 5 V Operation**
  - **Operational From 2.5 V to 5.5 V**
- **Thermal and Short-Circuit Protection**
- **Surface Mount Packaging**
  - **PowerPAD™ MSOP**
  - **SOIC**
- **Standard Operational Amplifier Pinout**

D OR DGN PACKAGE
(TOP VIEW)

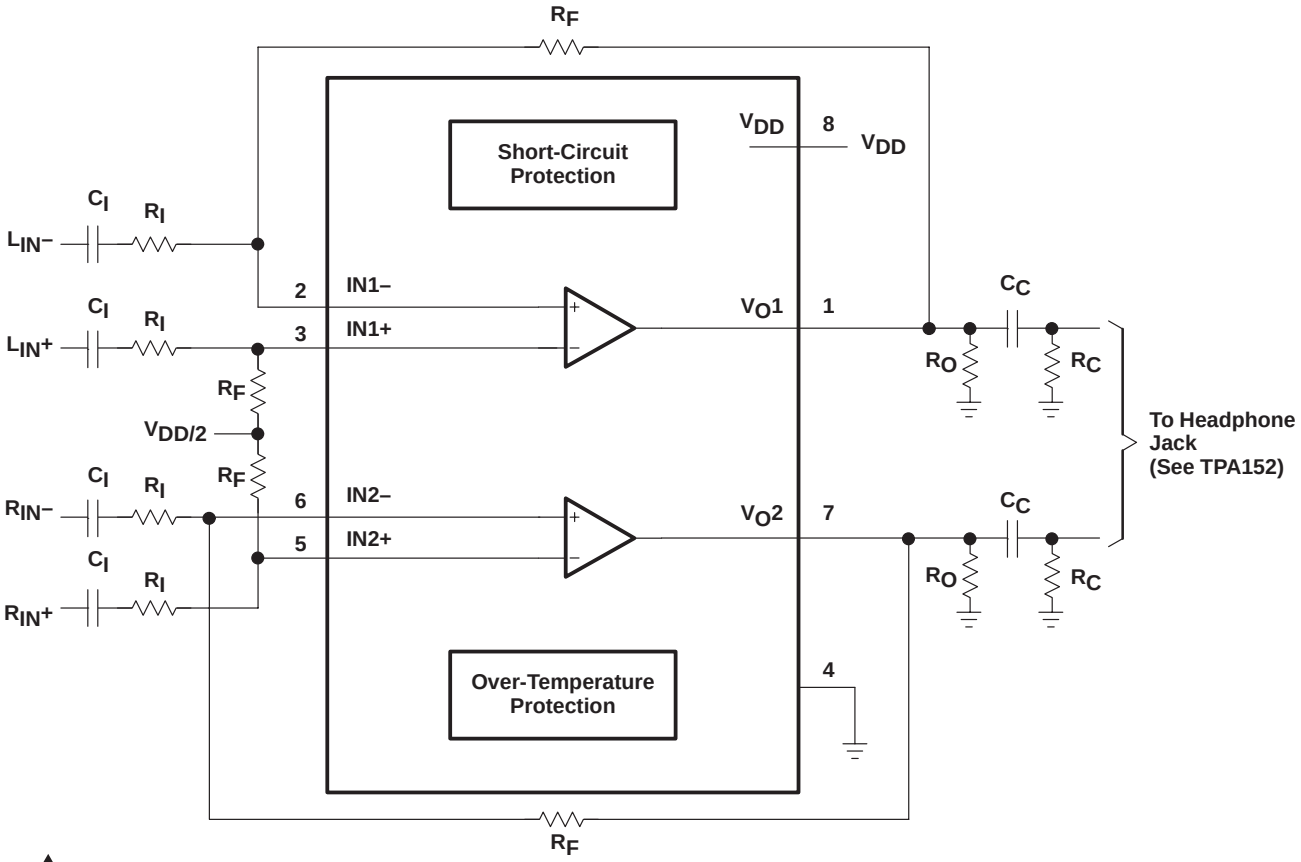


description

The TPA112 is a stereo audio power amplifier packaged in an 8-pin PowerPAD™ MSOP package capable of delivering 150 mW of continuous RMS power per channel into 8-Ω loads. Amplifier gain is externally configured by means of two resistors per input channel and does not require external compensation for settings of 1 to 10.

THD+N when driving an 8-Ω load from 5 V is 0.1% at 1 kHz, and less than 2% across the audio band of 20 Hz to 20 kHz. For 32-Ω loads, the THD+N is reduced to less than 0.06% at 1 kHz, and is less than 1% across the audio band of 20 Hz to 20 kHz. For 10-kΩ loads, the THD+N performance is 0.01% at 1 kHz, and less than 0.02% across the audio band of 20 Hz to 20 kHz.

functional block diagram



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PowerPAD is a trademark of Texas Instruments.

AVAILABLE OPTIONS

T_A	PACKAGED DEVICES		MSOP Symbolization
	SMALL OUTLINE† (D)	MSOP† (DGN)	
–40°C to 85°C	TPA112D	TPA112DGN	TI AAD

† The D and DGN package is available in left-ended tape and reel only (e.g., TPA112DR, TPA112DGNR).

Terminal Functions

TERMINAL NAME	TERMINAL NO.	I/O	DESCRIPTION
GND	4	I	GND is the ground connection.
IN1–	2	I	IN1– is the inverting input for channel 1.
IN1+	3	I	IN1+ is the noninverting input for channel 1.
IN2–	6	I	IN2– is the inverting input for channel 2.
IN2+	5	I	IN2+ is the noninverting input for channel 2.
V_{DD}	8	I	V_{DD} is the supply voltage terminal.
V_O1	1	O	V_O1 is the audio output for channel 1.
V_O2	7	O	V_O2 is the audio output for channel 2.

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage, V_{DD} . . . . . 6 V
Differential input voltage, V_I . . . . . –0.3 V to V_{DD} + 0.3 V
Input current, I_I . . . . . ±2.5 µA
Output current, I_O . . . . . ±250 mA
Continuous total power dissipation . . . . . internally limited
Operating junction temperature range, T_J . . . . . –40°C to 150°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 85°C$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW
DGN	2.14 W‡	17.1 mW/°C	1.37 W	1.11 W

‡ Please see the Texas Instruments document, *PowerPAD Thermally Enhanced Package Application Report* (literature number SLMA002), for more information on the PowerPAD package. The thermal data was measured on a PCB layout based on the information in the section entitled *Texas Instruments Recommended Board for PowerPAD* on page 33 of the before mentioned document.

recommended operating conditions

	MIN	MAX	UNIT
Supply voltage, V_{DD}	2.5	5.5	V
Operating free-air temperature, T_A	–40	85	°C

dc electrical characteristics at T_A = 25°C, V_{DD} = 3.3 V

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage				5	mV
PSRR	Power supply rejection ratio	V_{DD} = 3.2 V to 3.4 V		83		dB
$I_{DD(q)}$	Supply current			1.5	3	mA
$I_{DD(SD)}$	Supply current in SHUTDOWN mode			10	50	μA
Z_I	Input impedance			>1		MΩ

ac operating characteristics, V_{DD} = 3.3 V, T_A = 25°C, R_L = 8 Ω

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O	Output power (each channel)	THD ≤ 0.1%		70†		mW
THD+N	Total harmonic distortion + noise	P_O = 70 mW, 20–20 kHz		2%		
B_{OM}	Maximum output power BW	G = 10, THD <5%		>20		kHz
	Phase margin	Open loop		58°		
S_{VRR}	Supply ripple rejection	f = 1 kHz		68		dB
	Channel/channel output separation	f = 1 kHz		86		dB
SNR	Signal-to-noise ratio	P_O = 100 mW		100		dB
V_n	Noise output voltage			9.5		μV(rms)

† Measured at 1 kHz

dc electrical characteristics at T_A = 25°C, V_{DD} = 5 V

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage				5	mV
PSRR	Power supply rejection ratio	V_{DD} = 4.9 V to 5.1 V		76		dB
$I_{DD(q)}$	Supply current			1.5	3	mA
$I_{DD(SD)}$	Supply current in SHUTDOWN mode			60	100	μA
Z_I	Input impedance			>1		MΩ

ac operating characteristics, V_{DD} = 5 V, T_A = 25°C, R_L = 8 Ω

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O	Output power (each channel)	THD ≤ 0.1%		70†		mW
THD+N	Total harmonic distortion + noise	P_O = 150 mW, 20–20 kHz		2%		
B_{OM}	Maximum output power BW	G = 10, THD <5%		>20		kHz
	Phase margin	Open loop		56°		
S_{VRR}	Supply ripple rejection	f = 1 kHz		68		dB
	Channel/channel output separation	f = 1 kHz		86		dB
SNR	Signal-to-noise ratio	P_O = 150 mW		100		dB
V_n	Noise output voltage			9.5		μV(rms)

† Measured at 1 kHz

ac operating characteristics, V_{DD} = 3.3 V, T_A = 25°C, R_L = 32 Ω

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O	Output power (each channel)	THD ≤ 0.1%		40†		mW
THD+N	Total harmonic distortion + noise	P_O = 30 mW, 20–20 kHz		0.5%		
B_{OM}	Maximum output power BW	G = 10, THD <2%		>20		kHz
	Phase margin	Open loop		58°		
S_{VRR}	Supply ripple rejection	f = 1 kHz		68		dB
	Channel/channel output separation	f = 1 kHz		86		dB
SNR	Signal-to-noise ratio	P_O = 100 mW		100		dB
V_n	Noise output voltage			9.5		μV(rms)

† Measured at 1 kHz

ac operating characteristics, V_{DD} = 5 V, T_A = 25°C, R_L = 32 Ω

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O	Output power (each channel)	THD ≤ 0.1%		40†		mW
THD+N	Total harmonic distortion + noise	P_O = 60 mW, 20–20 kHz		0.4%		
B_{OM}	Maximum output power BW	G = 10, THD <2%		>20		kHz
	Phase margin	Open loop		56°		
S_{VRR}	Supply ripple rejection	f = 1 kHz		68		dB
	Channel/channel output separation	f = 1 kHz		86		dB
SNR	Signal-to-noise ratio	P_O = 150 mW		100		dB
V_n	Noise output voltage			9.5		μV(rms)

† Measured at 1 kHz

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
THD+N	Total harmonic distortion plus noise	vs Frequency	1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 34, 36
		vs Power output	3, 6, 9, 12, 15, 18
PSSR	Power supply rejection ratio	vs Frequency	19, 20
V_n	Output noise voltage	vs Frequency	21, 22
	Crosstalk	vs Frequency	23 – 26, 37, 38
	Mute attenuation	vs Frequency	27, 28
	Open-loop gain	vs Frequency	29, 30
	Phase margin	vs Frequency	29, 30
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I_{CC}	Supply current	vs Supply voltage	33
SNR	Signal-to-noise ratio	vs Voltage gain	35
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