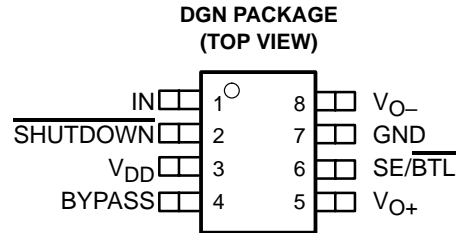


TPA0211

2-W MONO AUDIO POWER AMPLIFIER

SLOS275C – JANUARY 2000 – REVISED APRIL 2001

- Ideal for Wireless Communicators, Notebook PCs, PDAs, and Other Small Portable Audio Devices
- 2 W Into 4 Ω From 5-V Supply
- 0.6 W Into 4 Ω From 3-V Supply
- Wide Power Supply Compatibility
3 V to 5 V
- Low Supply Current
 - 4 mA Typical at 5 V
 - 4 mA Typical at 3 V
- Shutdown Control . . . 1 μ A Typical
- Shutdown Pin Is TTL Compatible
- –40°C to 85°C Operating Temperature Range
- Space-Saving, Thermally-Enhanced MSOP Packaging



description

The TPA0211 is a 2-W mono bridge-tied-load (BTL) amplifier designed to drive speakers with as low as 4- Ω impedance. The device is ideal for use in small wireless communicators, notebook PCs, PDAs, anyplace a mono speaker and stereo headphones are required. From a 5-V supply, the TPA0211 can deliver 2 W of power into a 4- Ω speaker.

The gain of the input stage is set by the user-selected input resistor and a 50-k Ω internal feedback resistor ($A_V = -R_F/R_I$). The power stage is internally configured with a gain of –1.25 V/V in SE mode, and –2.5 V/V in BTL mode. Thus, the overall gain of the amplifier is –62.5 k Ω / R_I in SE mode and –125 k Ω / R_I in BTL mode. The input terminals are high-impedance CMOS inputs, and can be used as summing nodes.

The TPA0211 is available in the 8-pin thermally-enhanced MSOP package (DGN) and operates over an ambient temperature range of –40°C to 85°C.

AVAILABLE OPTIONS

T _A	PACKAGED DEVICES	MSOP SYMBOLIZATION
	MSOP† (DGN)	
–40°C to 85°C	TPA0211DGN	AEG

† The DGN package are available taped and reeled. To order a taped and reeled part, add the suffix R to the part number (e.g., TPA0211DGNR).



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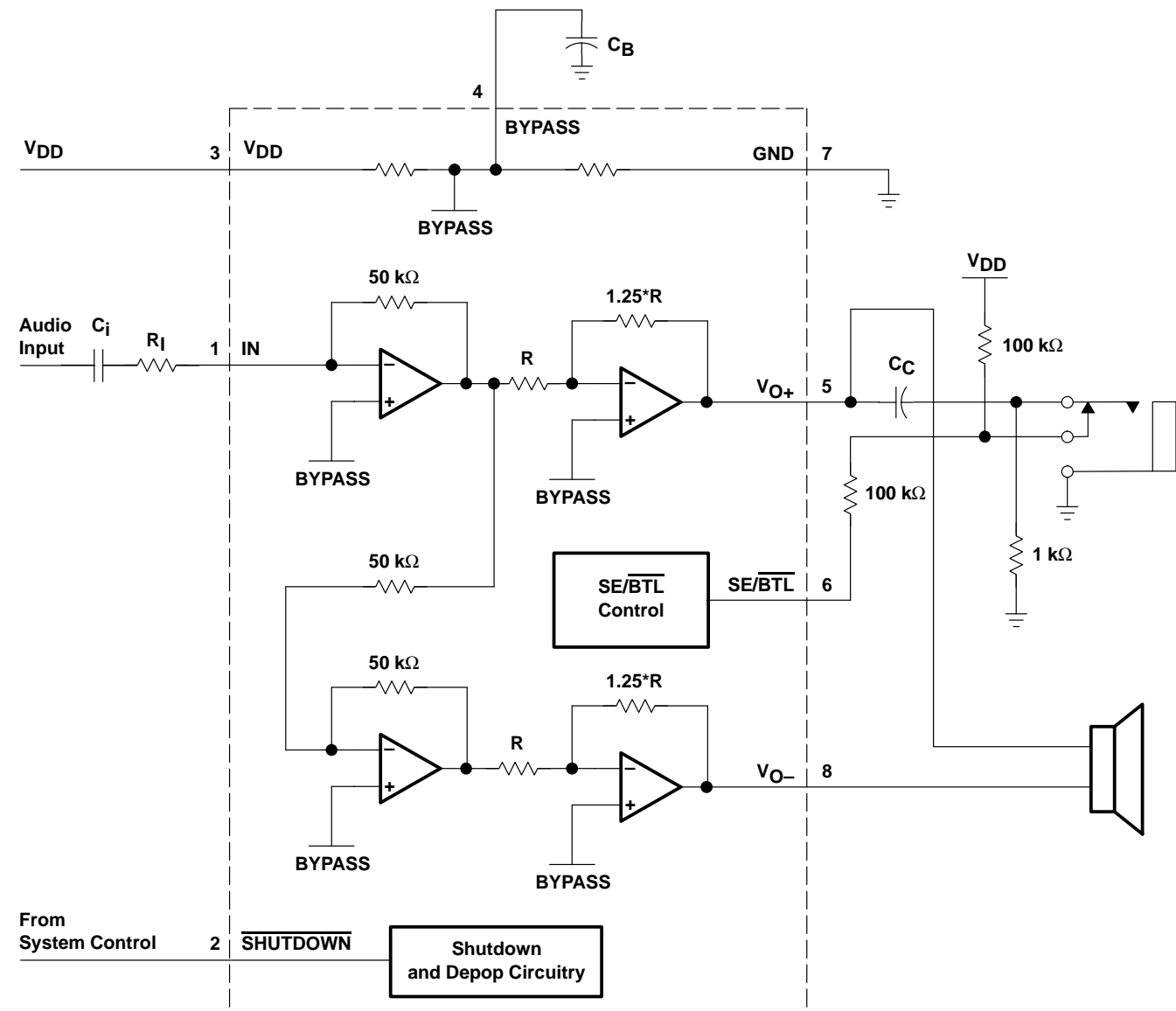
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functional block diagram



Terminal Functions

TERMINAL NAME	NO.	I/O	DESCRIPTION
BYPASS	4	I	BYPASS is the tap to the voltage divider for internal mid-supply bias. This terminal should be connected to a 0.1- μ F to 1- μ F capacitor.
GND	7		GND is the ground connection.
IN	1	I	IN is the audio input terminal.
SE/BTL	6	I	When SE/BTL is held low, the TPA0211 is in BTL mode. When SE/BTL is held high, the TPA0211 is in SE mode.
SHUTDOWN	2	I	SHUTDOWN places the entire device in shutdown mode when held low. TTL compatible input.
VDD	3		VDD is the supply voltage terminal.
VO+	5	O	VO+ is the positive output for BTL and SE modes.
VO-	8	O	VO- is the negative output in BTL mode and a high-impedance output in SE mode.

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

Supply voltage, V_{DD}	6 V
Input voltage, V_I	–0.3 V to $V_{DD} + 0.3$ V
Continuous total power dissipation	internally limited (see Dissipation Rating Table)
Operating free-air temperature range, T_A	–40°C to 85°C
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	$T_A \leq 25^\circ\text{C}$	DERATING FACTOR	$T_A = 70^\circ\text{C}$	$T_A = 85^\circ\text{C}$
DGN	2.14 W [‡]	17.1 mW/°C	1.37 W	1.11 W

[‡] 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
High-level input voltage, V_{IH}	SE/BTL	$V_{DD} = 3$ V	2.7	V
		$V_{DD} = 5$ V	4.5	
	SHUTDOWN		2	
Low-level input voltage, V_{IL}	SE/BTL	$V_{DD} = 3$ V	1.65	V
		$V_{DD} = 5$ V	2.75	
	SHUTDOWN		0.8	
Operating free-air temperature, T_A		–40	85	°C

electrical characteristics at specified free-air temperature, $V_{DD} = 3$ V, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$ V_{OO} $ Output offset voltage (measured differentially)				30	mV
I_{DD} Supply current			4	6	mA
$I_{DD(SD)}$ Supply current, shutdown mode			1	10	μA

operating characteristics, $V_{DD} = 3$ V, $T_A = 25^\circ\text{C}$, $R_L = 4 \Omega$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O Output power	THD = 1%, BTL mode, $f = 1$ kHz		660		mW
	THD = 0.1%, SE mode, $f = 1$ kHz, $R_L = 32 \Omega$		33		
THD + N Total harmonic distortion plus noise	$P_O = 500$ mW, $f = 20$ Hz to 20 kHz		0.3%		
BOM Maximum output power bandwidth	Gain = 2, THD = 2%		20		kHz
SNR Signal-to-noise ratio			88		dB
V_n Output noise voltage	$C_B = 0.47 \mu\text{F}$, $f = 20$ Hz to 20 kHz	BTL mode, $R_L = 8 \Omega$, $A_V = 8$ dB		65	μV _{RMS}
		SE mode, $R_L = 32 \Omega$, $A_V = 2$ dB		25	



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electrical characteristics at specified free-air temperature, $V_{DD} = 5\text{ V}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$ V_{OO} $ Output offset voltage (measured differentially)				30	mV
I_{DD} Supply current			4	6	mA
$I_{DD}(\text{SD})$ Supply current, shutdown mode			1	10	μA

operating characteristics, $V_{DD} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, $R_L = 4\ \Omega$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
P_O Output power	THD = 1%, BTL mode, $f = 1\text{ kHz}$		2		W
	THD = 0.1%, SE mode, $f = 1\text{ kHz}$, $R_L = 32\ \Omega$		92		mW
THD + N Total harmonic distortion plus noise	$P_O = 1.5\text{ W}$, $f = 20\text{ Hz to } 20\text{ kHz}$		0.2%		
BOM Maximum output power bandwidth	Gain = 2.5, THD = 2%		20		kHz
SNR Signal-to-noise ratio			93		dB
V_n Output noise voltage	$C_B = 0.47\ \mu\text{F}$, $f = 20\text{ Hz to } 20\text{ kHz}$, BTL mode, $R_L = 8\ \Omega$, $A_V = 8\text{ dB}$		65		μV_{RMS}
	SE mode, $R_L = 32\ \Omega$, $A_V = 2\text{ dB}$		25		

TYPICAL CHARACTERISTICS

Table of Graphs

		FIGURE
Supply ripple rejection ratio	vs Frequency	1, 2
I_{DD} Supply current	vs Supply voltage	3
P_O Output power	vs Supply voltage	4, 5
	vs Load resistance	6, 7
THD+N Total harmonic distortion plus noise	vs Frequency	8, 9, 10, 11
	vs Output power	12, 13, 14, 15, 16, 17
V_n Output noise voltage	vs Frequency	18, 19
Closed loop gain and phase		20, 21



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APPLICATION INFORMATION

ST/BTL operation (continued)

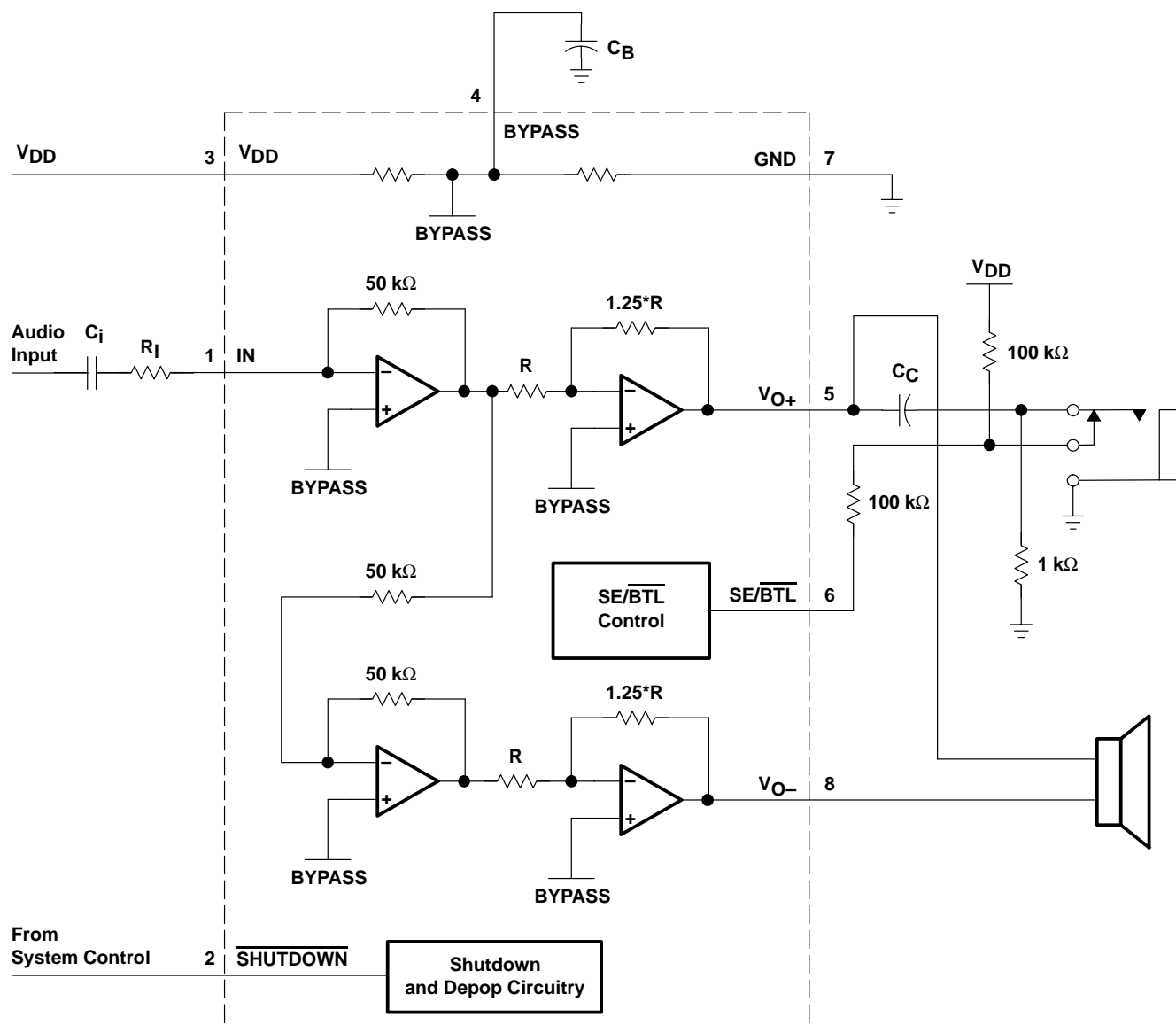


Figure 25. TPA0211 Resistor Divider Network Circuit

Using a readily available 1/8-in. (3.5 mm) mono headphone jack, the control switch is closed when no plug is inserted. When closed, the 100-kΩ/1-kΩ divider pulls the SE/BTL input low. When a plug is inserted, the 1-kΩ resistor is disconnected and the SE/BTL input is pulled high.