22 W BTL OR 2 × 11 WATT STEREO CAR RADIO POWER AMLIFIER

GENERAL DESCRIPTION

The TDA1519A is an integrated class-B dual output amplifier in a 9-lead single in-line (SIL) plastic power package. The device is primarily developed for car radio applications.

Features

- Requires very few external components for Bridge Tied Load (BTL)
- Stereo or BTL application
- High output power
- Low offset voltage at output (important for BTL)
- Fixed gain
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- AC and DC short-circuit-safe to ground and V_P
- Thermally protected
- Reverse polarity safe
- Capability to handle high energy on outputs (V_P = 0 V)
- No switch-on/switch-off plop
- Protected against electrostatic discharge
- Low thermal resistance
- Identical inputs (inverting and non-inverting)
- Compatible with TDA1519B (except output power)

QUICK REFERENCE DATA

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage range						
operating		V_P	6.0	14.4	17.5	V
non-operating		V_P	–	–	30	V
load dump protected		V_P	–	–	45	V
Repetitive peak output current		I_{ORM}	–	–	4	A
Total quiescent current		I_{tot}	–	40	80	mA
Stand-by current		I_{sb}	–	0.1	100	μA
Switch-on current		I_{sw}	–	–	40	μA
Input impedance						
BTL		$\lvert Z_I \rvert$	25	–	–	kΩ
stereo		$\lvert Z_I \rvert$	50	–	–	kΩ
Stereo application						
Output power	THD = 10%; 4 Ω	P_o	–	6	–	W
	THD = 10%; 2 Ω	P_o	–	11	–	W
Channel separation		α	40	–	–	dB
Noise output voltage		$V_{no(rms)}$	–	150	–	μV
BTL application						
Output power	THD = 10%; 4 Ω	P_o	–	22	–	W
Supply voltage ripple rejection	R_S = 0 Ω					
	f = 100 Hz	RR	34	–	–	dB
	f = 1 kHz to 10 kHz	RR	48	–	–	dB
DC output offset voltage		$\lvert \Delta V_O \rvert$	–	–	250	mV
Crystal temperature		T_c	–	–	150	°C

PACKAGE OUTLINES

9-lead SIL; plastic power (SOT131).
9-lead SIL-bent-to-DIL, plastic power (SOT157).

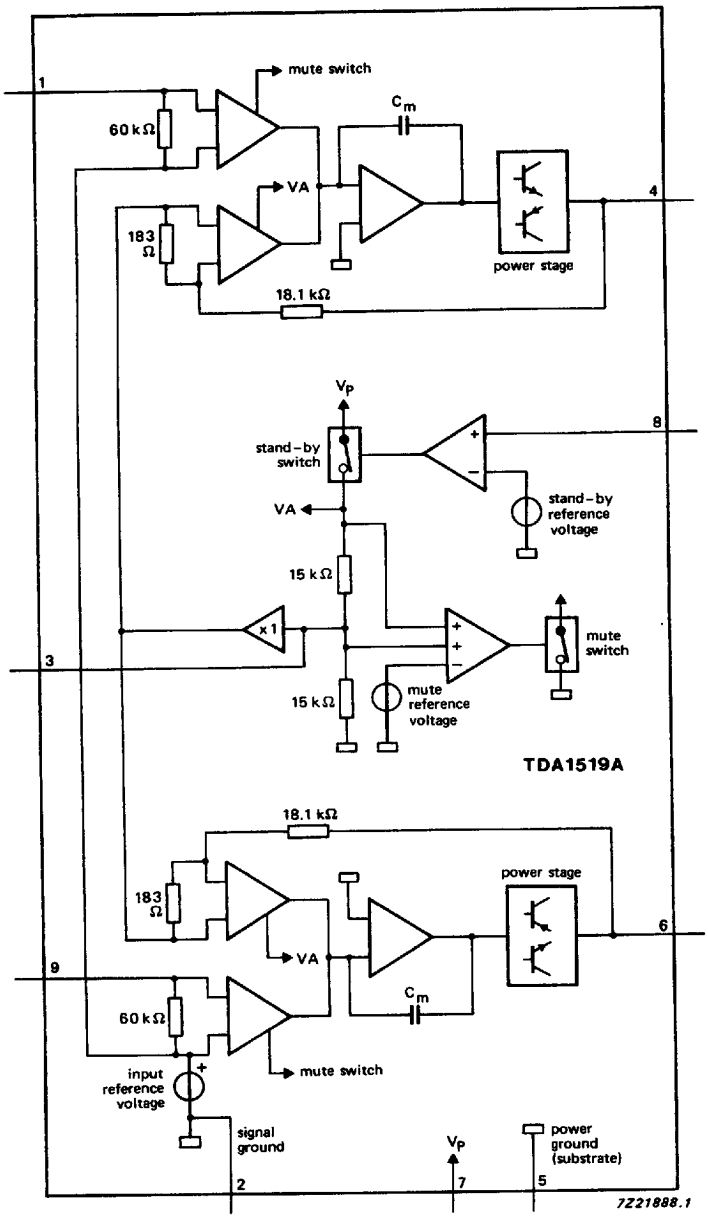

Fig.1 Block diagram.

PINNING

1	NINV	non-inverting input
2	GND1	ground (signal)
3	RR	supply voltage ripple rejection
4	OUT1	output 1
5	GND2	ground (substrate)
6	OUT2	output 2
7	V_P	positive supply voltage
8	M/SS	mute/stand-by switch
9	INV	inverting input

FUNCTIONAL DESCRIPTION

The TDA1519A contains two identical amplifiers with differential input stages. The gain of each amplifier is fixed at 40 dB. A special feature of this device is the mute/stand-by switch which has the following features:

- Low stand-by current ($< 100\ \mu A$)
- Low mute/stand-by switching current (low cost supply switch)
- Mute condition

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

parameter	conditions	symbol	min.	max.	unit
Supply voltage					
operating		V_P	–	17.5	V
non-operating		V_P	–	30	V
load dump protected	during 50 ms; $t_r \geqslant 2.5$ ms	V_P	–	45	V
AC and DC short-circuit-safe voltage		V_{PSC}	–	18	V
Reverse polarity		V_{PR}	–	6	V
Energy handling capability at outputs	$V_P = 0$ V		–	200	mJ
Non-repetitive peak output current		I_{OSM}	–	6	A
Repetitive peak output current		I_{ORM}	–	4	A
Total power dissipation	see Fig.2	P_{tot}	–	25	W
Crystal temperature		T_c	–	150	°C
Storage temperature range		T_{stg}	−55	+150	°C

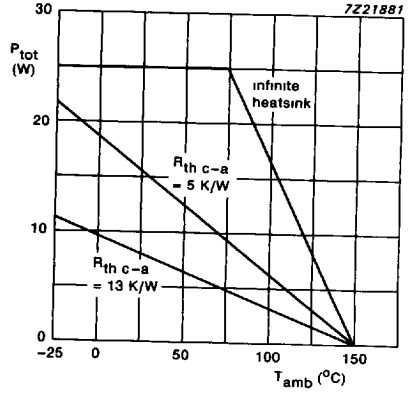

Fig.2 Power derating curve.

DC CHARACTERISTICS

V_P = 14.4 V; T_{amb} = 25 °C; measurements taken using Fig.3; unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
Supply						
Supply voltage range	note 1	V_P	6.0	14.4	17.5	V
Total quiescent current		I_{tot}	–	40	80	mA
DC output voltage	note 2	V_O	–	6.95	–	V
DC output offset voltage		$\lvert\Delta V_{4\text{-}6}\rvert$	–	–	250	mV
Mute/stand-by switch						
Switch-on voltage level		V_{ON}	8.5	–	–	V
Mute condition		V_{mute}	3.3	–	6.4	V
Output signal in mute position	V_I = 1 V (max.); f = 20 Hz to 15 kHz	V_O	–	–	20	mV
DC output offset voltage		$\lvert\Delta V_{4\text{-}6}\rvert$	–	–	250	mV
Stand-by condition		V_{sb}	0	–	2	V
DC current in stand-by condition		I_{sb}	–	–	100	μA
Switch-on current		I_{sw}	–	12	40	μA

AC CHARACTERISTICS

V_P = 14.4 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; measurements taken using Fig.3; unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
Stereo application						
Output power	note 3					
	THD = 0.5%	P_o	4	5	–	W
	THD = 10%	P_o	5.5	6.0	–	W
Output power at R_L = 2 Ω	note 3					
	THD = 0.5%	P_o	7.5	8.5	–	W
	THD = 10%	P_o	10	11	–	W
Total harmonic distortion	P_o = 1 W	THD	–	0.1	–	%
Low frequency roll-off	note 4					
	−3 dB	f_L	–	45	–	Hz
High frequency roll-off	−1 dB	f_H	20	–	–	kHz
Closed loop voltage gain		G_v	39	40	41	dB
Supply voltage ripple rejection						
ON	notes 5 and 6	RR	40	–	–	dB
ON	notes 5 and 7	RR	45	–	–	dB
mute	notes 5 and 8	RR	45	–	–	dB
stand-by	notes 5 and 8	RR	80	–	–	dB
Input impedance		$\|Z_i\|$	50	60	75	kΩ
Noise output voltage (RMS value)	note 9					
ON	R_S = 0 Ω	$V_{no(rms)}$	–	150	–	μV
ON	R_S = 10 kΩ	$V_{no(rms)}$	–	250	500	μV
mute	note 10	$V_{no(rms)}$	–	120	–	μV
Channel separation	R_S = 10 kΩ	α	40	–	–	dB
Channel unbalance		$\|\Delta G_v\|$	–	0.1	1	dB

AC CHARACTERISTICS

V_P = 14.4 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; measurements taken using Fig.4, unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
BTL application						
Output power	note 3					
	THD = 0.5%	P_o	15	17	–	W
	THD = 10%	P_o	20	22	–	W
Output power at V_P = 13.2 V	note 3					
	THD = 0.5%	P_o	–	13	–	W
	THD = 10%	P_o	–	17.5	–	W
Total harmonic distortion	P_o = 1 W	THD	–	0.1	–	%
Power bandwidth	THD = 0.5%; P_o = −1 dB; w.r.t. 15 W	B_W	–	35 to 15 000	–	Hz
Low frequency roll-off	note 4 −1 dB	f_L	–	45	–	Hz
High frequency roll-off	−1 dB	f_H	20	–	–	kHz
Closed loop voltage gain		G_v	45	46	47	dB
Supply voltage ripple rejection						
ON	notes 5 and 6	RR	34	–	–	dB
ON	notes 5 and 7	RR	48	–	–	dB
mute	notes 5 and 8	RR	48	–	–	dB
stand-by	notes 5 and 8	RR	80	–	–	dB
Input impedance		$\|Z_i\|$	25	30	38	kΩ
Noise output voltage (RMS value)	note 9					
ON	R_S = 0 Ω	$V_{no(rms)}$	–	200	–	μV
ON	R_S = 10 kΩ	$V_{no(rms)}$	–	350	700	μV
mute	note 10	$V_{no(rms)}$	–	180	–	μV

Notes to the characteristics

1. The circuit is DC adjusted at V_P = 6 V to 17.5 V and AC operating at V_P = 8.5 V to 17.5 V.
2. At 17.5 V < V_P < 30 V the DC output voltage ⩽ $V_P/2$.
3. Output power is measured directly at the output pins of the IC.
4. Frequency response externally fixed.
5. Ripple rejection measured at the output with a source impedance of 0 Ω (maximum ripple amplitude of 2 V).
6. Frequency f = 100 Hz.
7. Frequency between 1 kHz and 10 kHz.
8. Frequency between 100 Hz and 10 kHz.
9. Noise voltage measured in a bandwidth of 20 Hz to 20 kHz.
10. Noise output voltage independent of R_S (V_I = 0 V).

APPLICATION INFORMATION

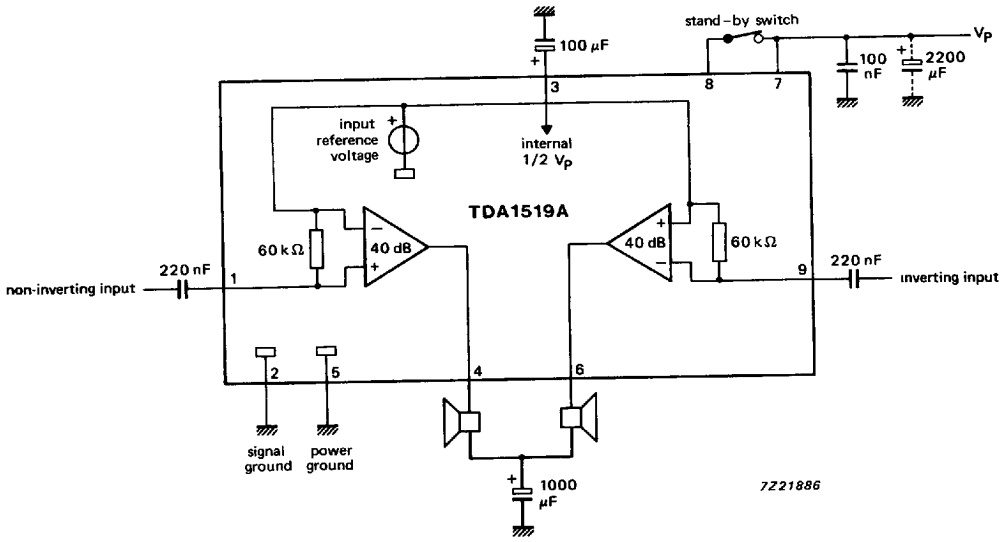

Fig.3 Stereo application circuit diagram.

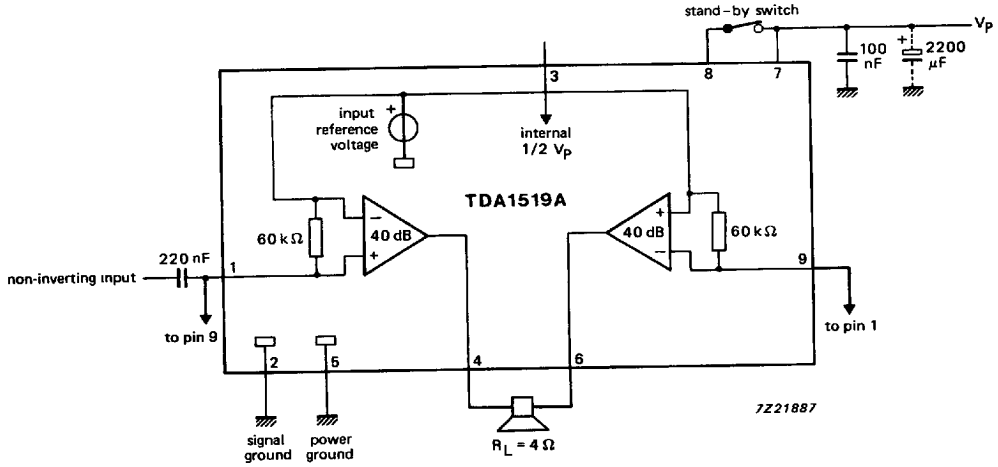

Fig.4 BTL application circuit diagram.

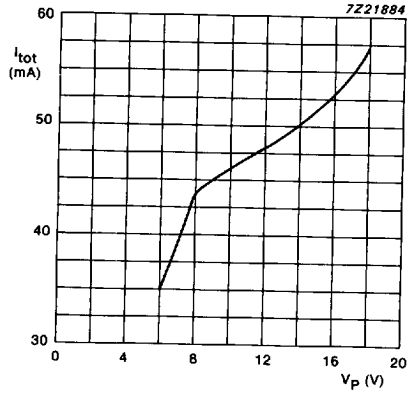

Fig.5 Total quiescent current (I_{tot}) as a function of supply voltage (V_P).

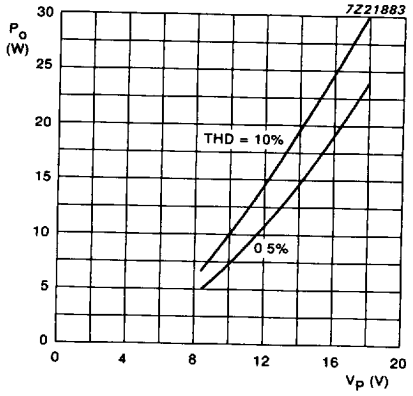

Fig.6 Output power (P_o) as a function of supply voltage (V_P) for BTL application at $R_L = 4\ \Omega$; f = 1 kHz.

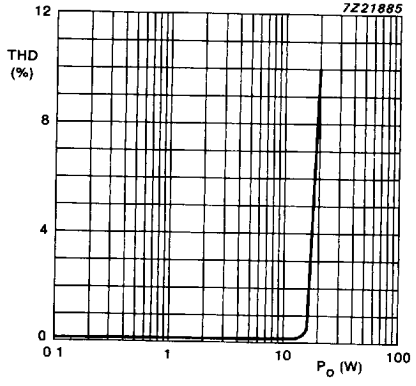

Fig.7 Total harmonic distortion (THD) as a function of output power (P_o) for BTL application at $R_L = 4\ \Omega$; f = 1 kHz.

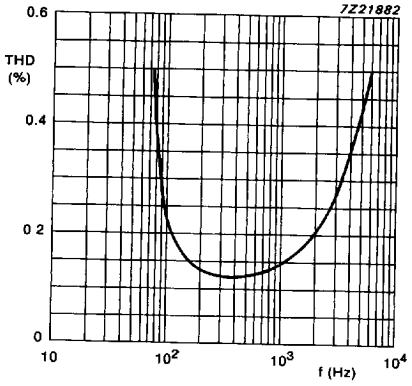

Fig.8 Total harmonic distortion (THD) as a function of operating frequency (f) for BTL application at $R_L = 4\ \Omega$; $P_o = 1$ W.