20 W HI-FI AUDIO POWER AMPLIFIER

GENERAL DESCRIPTION

The TDA1520B is an integrated hi-fi audio power amplifier designed for use with non-stabilized symmetrical or stabilized asymmetrical power supplies in mains-fed applications (e.g. stereo radio, stereo TV sound and cassette recorder).

Features

- Low offset voltage at output (suitable for BTL application)
- Low cross-over and secondary cross-over distortion
- Low intermodulation and transient intermodulation distortion
- Low harmonic distortion
- Good hum suppression
- High slew rate
- No switch-on/switch-off plop
- Thermal protection

QUICK REFERENCE DATA (note 1)

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage range		V_P	15	–	50	V
Total quiescent current		I_{tot}	22	60	105	mA
Output power at THD = 0,5%		P_o	20	22	–	W
Input impedance		Z_I	1000	–	–	kΩ
Signal plus noise to noise ratio at P_O = 50 mW	note 2	(S+N)/N	70	75	–	dB
Supply voltage ripple rejection at R_S = 0 Ω	f = 100 Hz	SVRR	45	60	–	dB
	f = 10 kHz	SVRR	45	80	–	dB

Notes to the Quick Reference Data

1. All values measured from test circuit Fig.6; V_P = 33 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; unless otherwise specified.
2. Bandwidth is 20 Hz to 20 kHz; R_S = 2 kΩ (RMS value).

PACKAGE OUTLINES

TDA1520B: 9-lead SIL; plastic power (SOT131).
TDA1520BQ: 9-lead SIL-bent-to-DIL; plastic power (SOT157).

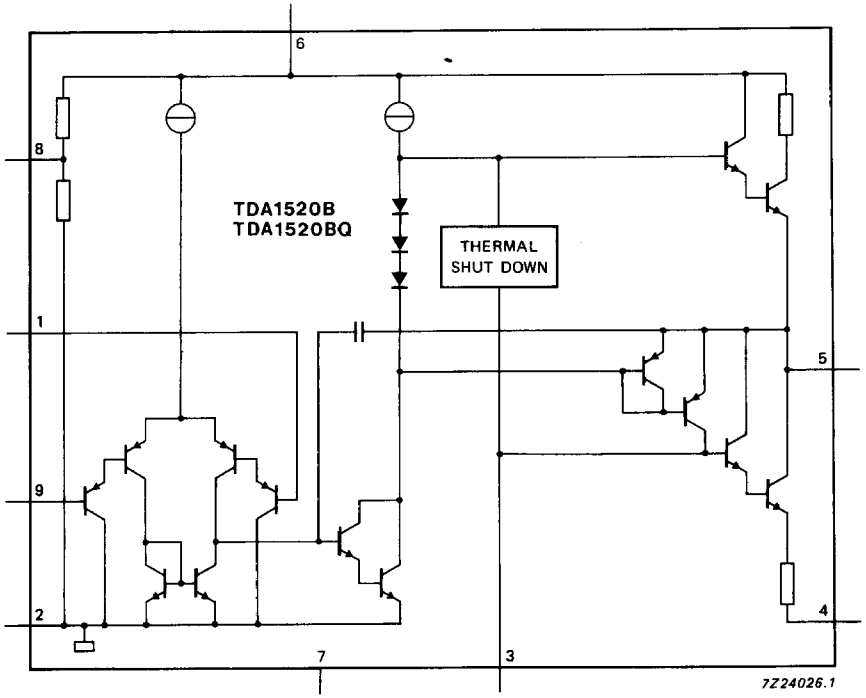

Fig. 1 Block diagram.

PINNING

1 Non-inverting input
2 Input ground (substrate)
3 Compensation
4 Negative supply (ground)
5 Output
6 Positive supply (V_P)
7 Not connected
8 Supply voltage ripple rejection
9 Inverting input (feedback)

DEVELOPMENT DATA

RATINGS

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

parameter	conditions	symbol	min.	max.	unit
Supply voltage	note 1	V_P	–	50	V
Input voltage					
pins 1 to 2		V_I	–	25	V
pins 9 to 2		V_I	–	25	V
Repetitive peak output current		I_{ORM}	–	4	A
Non-repetitive peak output current	note 2	I_{OSM}	–	5	A
Total power dissipation		P_{tot}	see Fig.2		
AC short-circuit time of the load impedance during signal drive at					
$V_P = \pm 20$ V	symmetrical supply; $R_S = 2\ \Omega$; $f = \geqslant 20$ Hz	T_{sc}	–	1	hour
$V_P = 30$ V	asymmetrical supply; $R_S = 4\ \Omega$	T_s	–	1	hour
Operating ambient temperature range		T_{amb}	see Fig.2		
Storage temperature range		T_{stg}	−55	+ 150	°C

Notes to the Ratings

1. Minimum rise time of the supply must be $\geqslant 20$ ms.
2. Maximum peak current is defined by the internal protection circuits.

POWER DISSIPATION AND HEATSINK INFORMATION

The maximum theoretical power dissipation with a stabilized power supply is ($V_P = 33$ V and $R_L = 4\,\Omega$):

$$\frac{V_P^2}{2\,\pi^2\,R_L} = 13.8\,\text{W}.$$

Worst case power dissipation with a non-stabilized power supply is (regulation factor of 15%; over voltage of 10% and R_L min. = $0.8 \times R_L$ typ.; V_{PL} is the loaded supply voltage):

$$\frac{(1.1 \times V_{PL})^2}{2\,\pi^2\,R_L\,\text{min.}} = 23.4\,\text{W}.$$

With a maximum ambient temperature of 50 °C and a maximum crystal temperature of 150 °C, the required thermal resistance is:

$$R_{th\,j\text{-}a} = \frac{150 - 50}{23.4} = 4.3\,\text{K/W}.$$

The thermal resistance of the encapsulation is $\leqslant 2.5$ K/W, therefore the thermal resistance of the heatsink must be < 1.8 K/W.

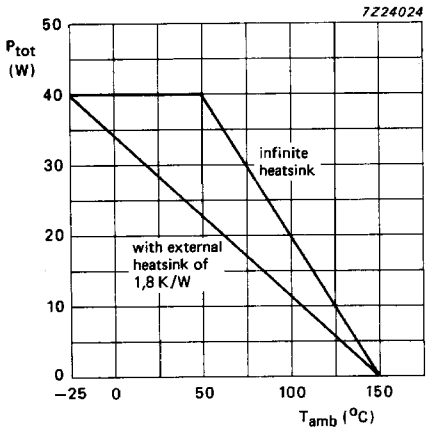

Fig.2 Power derating curve.

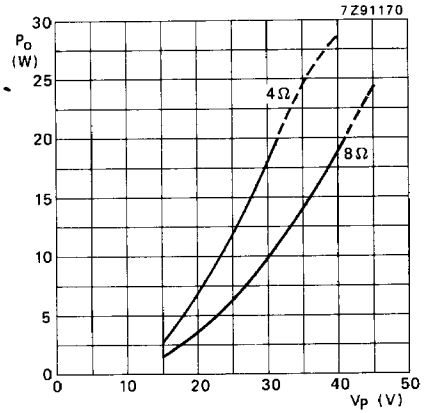

Fig. 3 Output power (P_O) as a function of supply voltage (V_P); f = 1 kHz; d_{tot} = 0.5%; G_V = 30 dB.

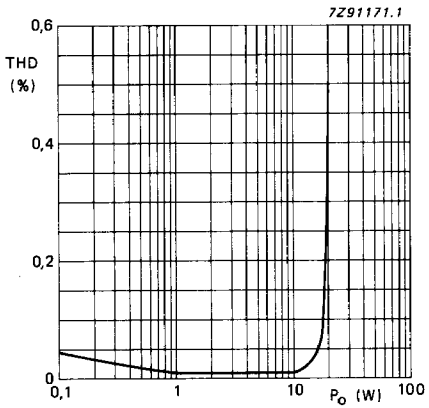

Fig. 4 Total harmonic distortion (THD) as a function of output power (P_O); V_P = 33 V; R_L = 4 Ω; f = 1 kHz.

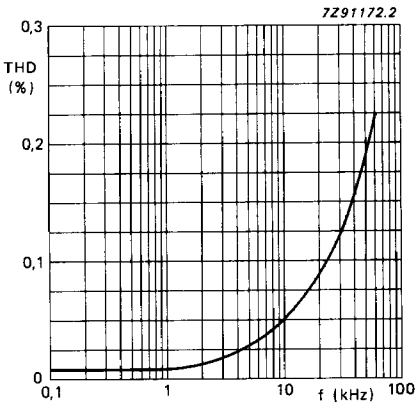

Fig. 5 Total harmonic distortion (THD) as a function of operating frequency (f); V_P = 33 V; R_L = 4 Ω; P_O = 10 W (constant).

CHARACTERISTICS

V_P = 33 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; unless otherwise specified; measured from test circuit, Fig. 6.

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage range		V_P	15	–	50	V
Total quiescent current		I_P	22	60	105	mA
Peak output current		I_{OM}	–	–	3,2	A
Power output at THD = 0.5%	note 1	P_O	20	22	–	W
Total harmonic distortion at P_O = 12 W	note 1	THD	–	0.01	0.1	%
Power bandwidth at THD = 0.5%	P_O = 50 mW to 10 W	B	–	20 to 20 000	–	Hz
Input voltage at P_O = 20 W	note 2	V_I	225	290	325	mV
Input impedance	note 3	Z_I	1000	–	–	kΩ
Signal plus noise to noise ratio at P_O at 50 mW	note 4	(S+N)/N	70	75	–	dB
Offset voltage		$\lvert V_{5-8} \rvert$	0	± 10	± 100	mV
Input offset current		I_{os}	–	0	1	μA
Output impedance		Z_O	–	–	0.1	Ω
Supply voltage ripple rejection at R_S = 0 Ω	f = 100 Hz	SVRR	45	60	–	dB
	f = 10 kHz	SVRR	45	80	–	dB
Intermodulation distortion at P_O = 10 W		d_{IM}	–	0.02	–	%
Transient intermodulation distortion	note 5	d_{TIM}	–	0.01	–	%
Slew rate		SR	–	6	–	V/μs

Notes to the Characteristics

1. Output power is measured directly at the output pin.
2. The closed-loop gain is determined by external resistors and is variable between 20 to 40 dB.
3. Input impedance in the test circuit is determined by the bias resistor R.
4. Unweighted noise measured in a bandwidth of 20 Hz to 20 kHz at R_S = 2 kΩ.
5. The transient intermodulation distortion is measured at P_O = 10 W. The input signal is a 3.18 kHz square-wave signal mixed with a 15 kHz sine-wave signal and a peak-to-peak voltage ratio of 4:1.

DEVELOPMENT DATA

APPLICATION INFORMATION

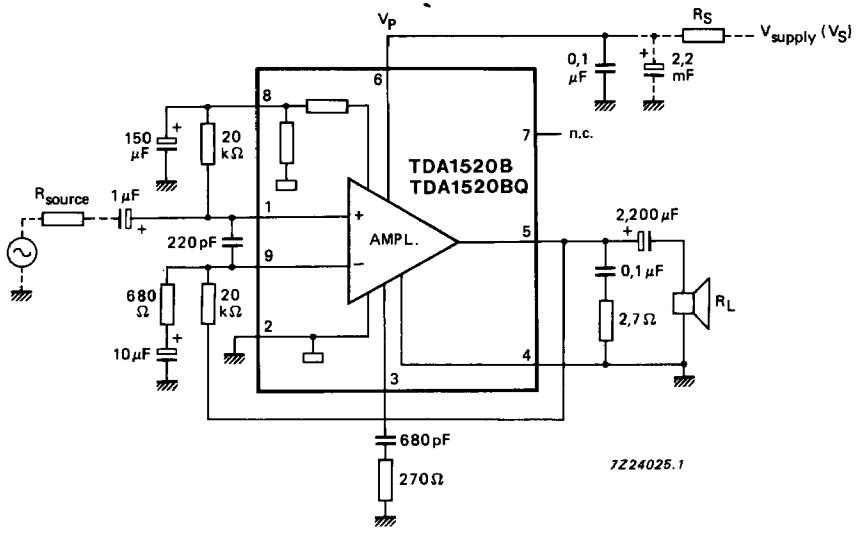

Fig. 6 Test and application diagram.