

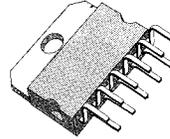


TDA2009

10 + 10W HIGH QUALITY STEREO AMPLIFIER

The TDA2009 is class AB dual Hi-Fi Audio power amplifier assembled in Multiwatt[®] package, specially designed for high quality stereo application as Hi-Fi and music centers. Its main features are:

- High output power (10 + 10W min. @ d = 0.5%)
- High current capability (up to 3.5A)
- Thermal overload protection
- Space and cost saving: very low number of external components and simple mounting thanks to the Multiwatt[®] package.



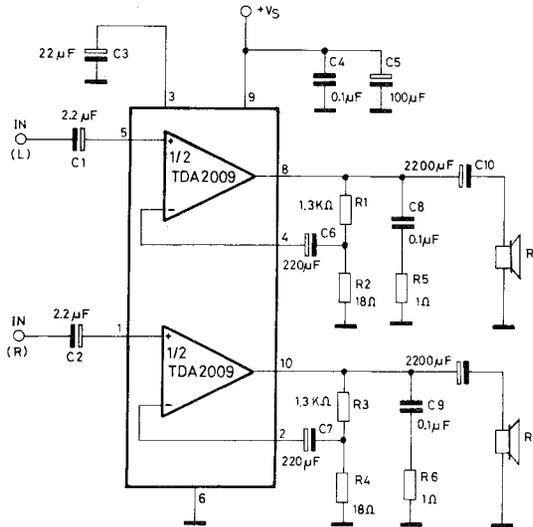
Multiwatt-11

ORDERING NUMBER: TDA2009

ABSOLUTE MAXIMUM RATINGS

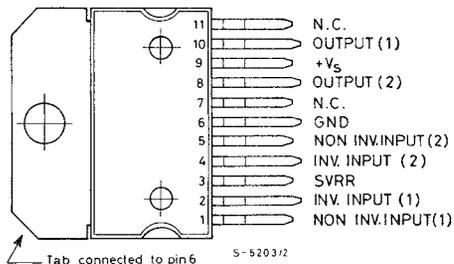
V_s	Supply voltage	28	V
I_o	Output peak current (repetitive $f \geq 20\text{Hz}$)	3.5	A
I_o	Output peak current (non repetitive, $t = 100\mu\text{s}$)	4.5	A
P_{tot}	Power dissipation at $T_{case} = 90^\circ\text{C}$	20	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	$^\circ\text{C}$

TEST CIRCUIT

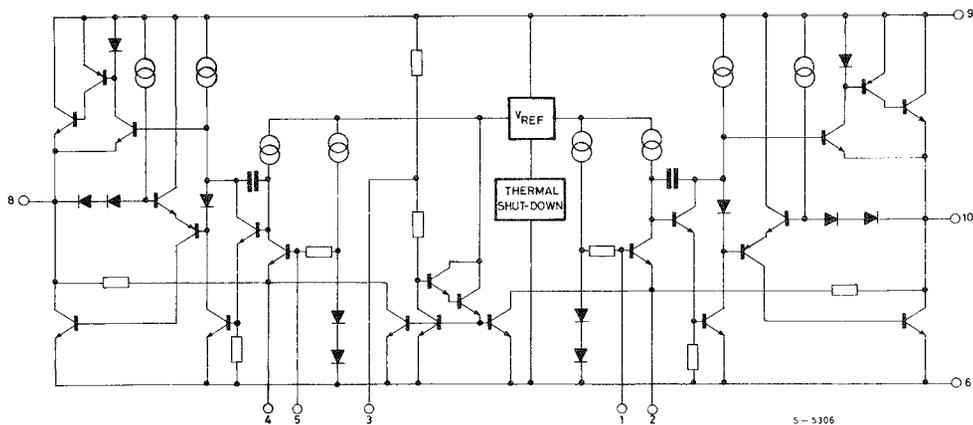


S-5189/1

CONNECTION DIAGRAM (top view)



SCHEMATIC DIAGRAM



THERMAL DATA

R _{th j-case}	Thermal resistance junction-case	max	3	°C/W
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Fig. 1 - Test and application circuit ($G_v = 36 \text{ dB}$)

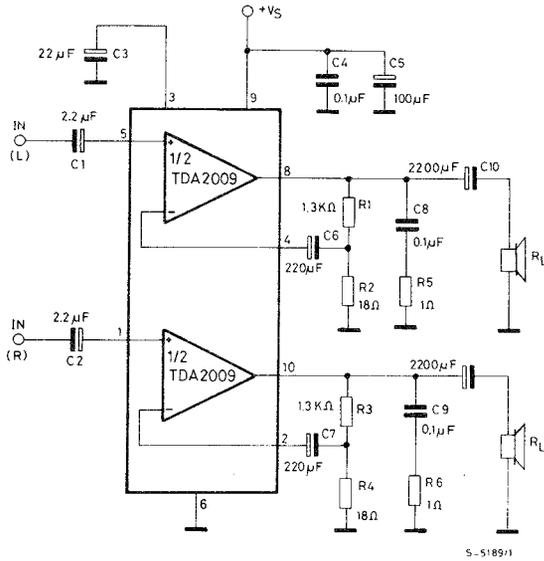
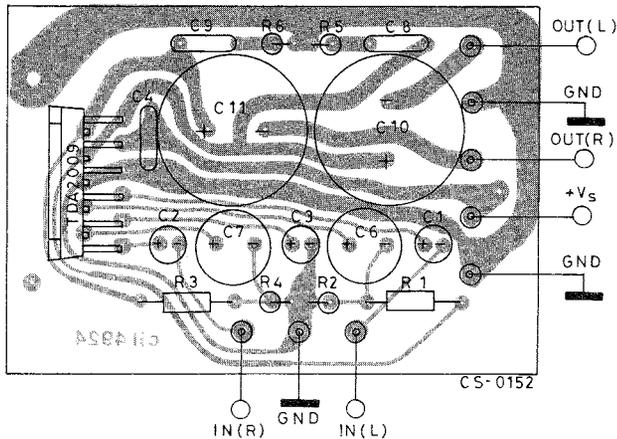


Fig. 2 - P.C. board and components layout of the circuit of fig. 1 (1 : 1 scale)



ELECTRICAL CHARACTERISTICS (Refer to the stereo application circuit, $T_{amb} = 25^{\circ}\text{C}$, $G_v = 36\text{ dB}$, unless otherwise specified)

Parameters		Test conditions		Min.	Typ.	Max.	Unit
V_s	Supply voltage			8		28	V
V_o	Quiescent output voltage	$V_s = 23\text{V}$			11		V
I_d	Total quiescent drain current	$V_s = 23\text{V}$			80	120	mA
P_o	Output power (each channel)	$f = 50\text{ Hz to }16\text{ KHz}$ $d = 0.5\%$ $V_s = 23\text{V}$ $R_L = 4\ \Omega$ $R_L = 8\ \Omega$		10	11		W
		$V_s = 18\text{V}$ $R_L = 4\ \Omega$ $R_L = 8\ \Omega$		5.5	6.5	4	W
d	Distortion (each channel)	$f = 1\text{ KHz}$ $V_s = 23\text{V}$ $R_L = 4\ \Omega$ $P_o = 100\text{ mW to }8\text{W}$			0.1		%
		$V_s = 23\text{V}$ $R_L = 8\ \Omega$ $P_o = 100\text{ mW to }3\text{W}$			0.05		
CT	Cross talk ($^{\circ\circ\circ}$)	$R_L = \infty$	$f = 1\text{ KHz}$		60		dB
		$R_g = 10\text{ K}\Omega$	$f = 10\text{ KHz}$		50		dB
V_i	Input saturation voltage (rms)			300			mV
R_i	Input resistance	$f = 1\text{ KHz}$	non inverting input	70	200		$\text{K}\Omega$
			inverting input		10		$\text{K}\Omega$
f_L	Low frequency roll off (-3 dB)	$R_L = 4\ \Omega$			20		Hz
f_H	High frequency roll off (-3 dB)				80		KHz
G_v	Voltage gain (open loop)	$f = 1\text{ KHz}$			85		dB
G_v	Voltage gain (closed loop)	$f = 1\text{ KHz}$		35.5	36	36.5	dB
ΔG_v	Closed loop gain matching				0.5		dB
e_N	Total input noise voltage	$R_g = 10\text{ K}\Omega$ ($^{\circ}$)			1.5		μV
		$R_g = 10\text{ K}\Omega$ ($^{\circ\circ}$)			2.5	8	μV
SVR	Supply voltage rejection (each channel)	$R_g = 10\text{ K}\Omega$ $f_{\text{ripple}} = 100\text{ Hz}$ $V_{\text{ripple}} = 0.5\text{V}$			55		dB
T_J	Thermal shut-down junction temperature				145		$^{\circ}\text{C}$

 $^{\circ}$ Curve A.

 $^{\circ\circ}$ 22 Hz to 22 KHz.

 $^{\circ\circ\circ}$ Optimized test box.

Fig. 3 - Output power vs. supply voltage

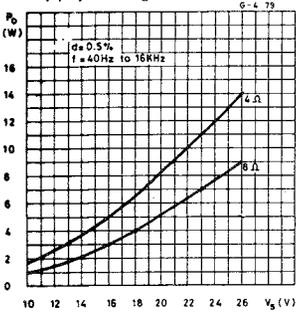


Fig. 4 - Output power vs. supply voltage

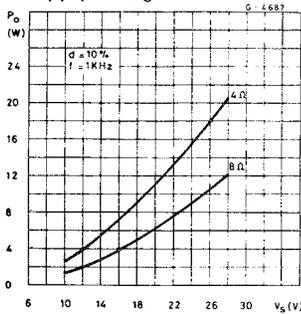


Fig. 5 - Distortion vs. output power

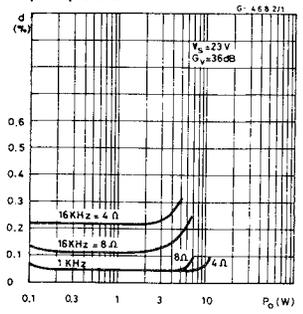


Fig. 6 - Distortion vs. frequency

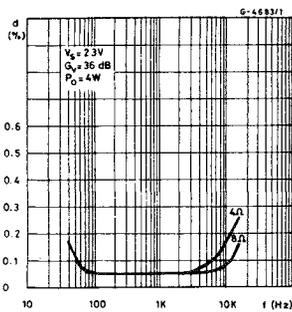


Fig. 7 - Quiescent current vs. supply voltage

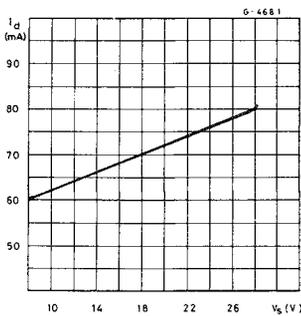


Fig. 8 - Supply voltage rejection vs. value of capacitor C3

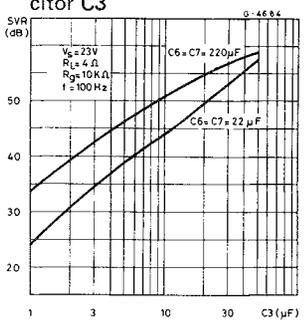


Fig. 9 - Supply voltage rejection vs. frequency

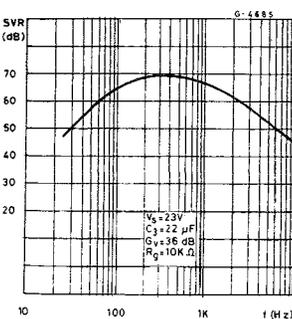


Fig. 10 - Total power dissipation and efficiency vs. output power

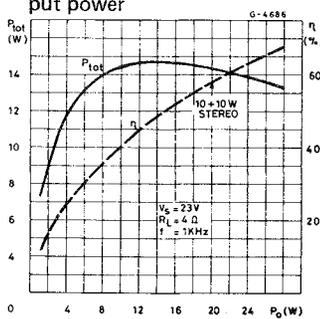
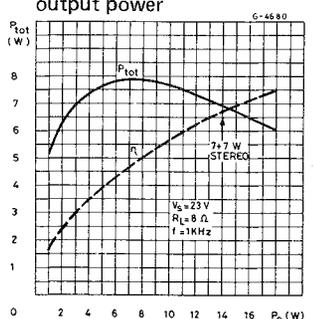


Fig. 11 - Total power dissipation and efficiency vs. output power



APPLICATION INFORMATION

Fig. 12 - Simple short-circuit protection

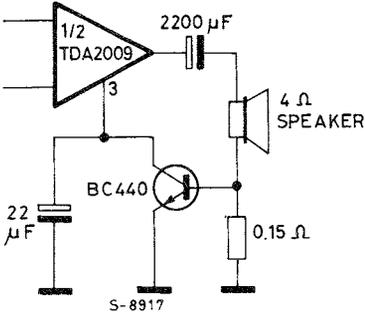


Fig. 13 - Example of muting circuit

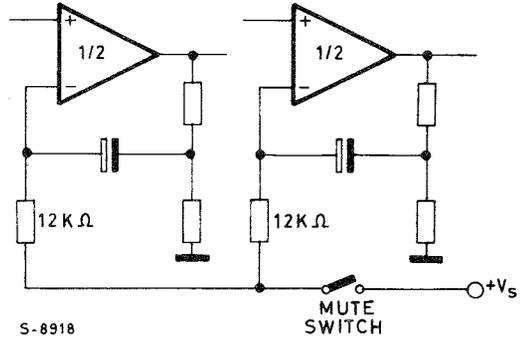


Fig. 14 - 10 + 10W stereo amplifier with tone balance and loudness control

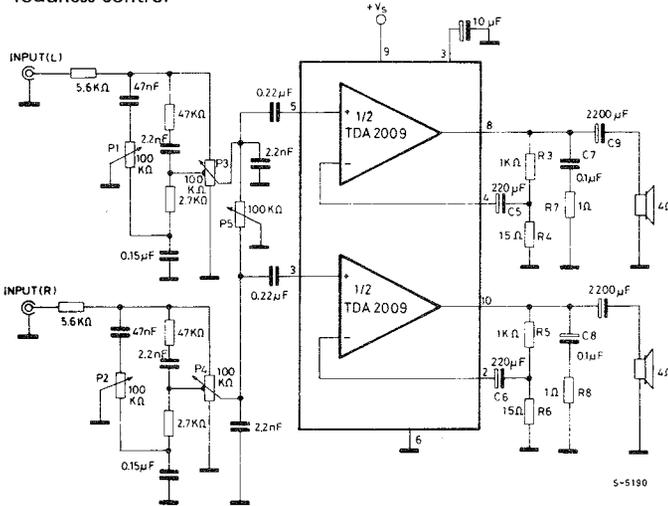
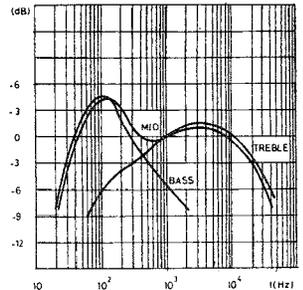
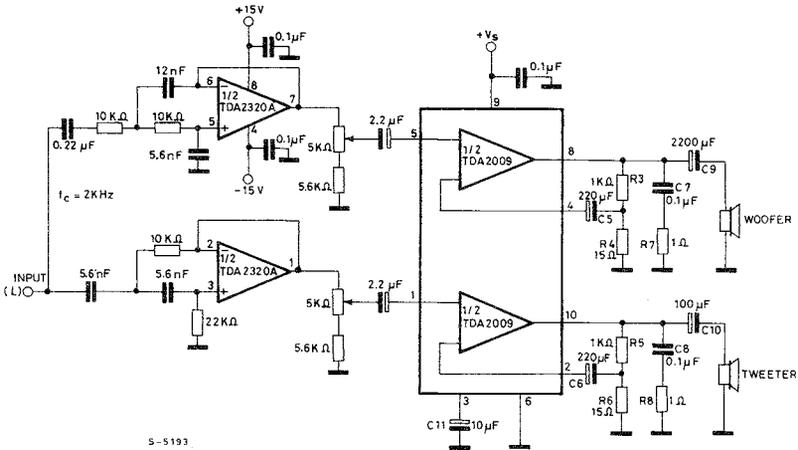
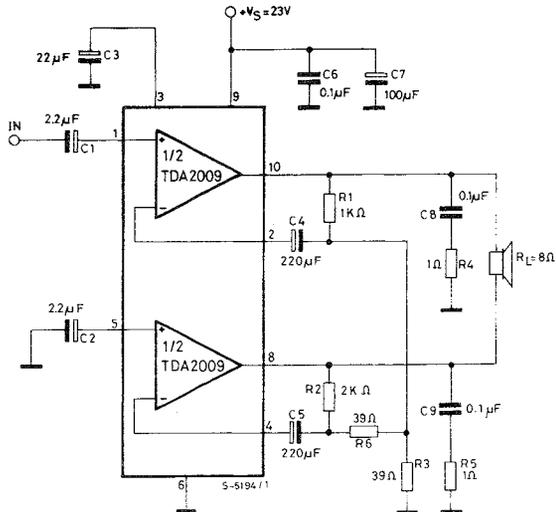
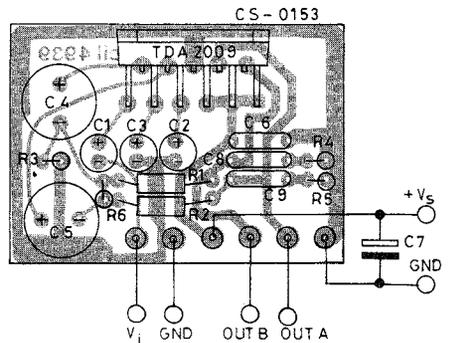


Fig. 15 - Tone control response (circuit of fig. 14)



APPLICATION INFORMATION (continued)
Fig. 16 - High quality 20 + 20W two way amplifier for stereo music center (one channel only).

Fig. 17 - 18W bridge amplifier (d = 0.5%, $G_v = 40\text{dB}$)

Fig. 18 - P.C. board and components layout of the circuit of fig. 17 (1 : 1 scale)


APPLICATION SUGGESTION

The recommended values of the components are those shown on application circuit of fig. 1 . Different values can be used; the following table can help the designer.

Component	Recomm. value	Purpose	Larger than	Smaller than
R1 and R3	1.2 K Ω	Close loop gain setting	Increase of gain	Decrease of gain
R2 and R4	18 Ω		Decrease of gain	Increase of gain
R5 and R6	1 Ω	Frequency stability	Danger of oscillation at high frequency with inductive load	
C1 and C2	2.2 μ F	Input DC decoupling	High turn-on delay	High turn-on pop Higher low frequency cutoff. Increase of noise
C3	22 μ F	Ripple rejection	Better SVR. Increase of the switch-on time	Degradation of SVR.
C6 and C7	220 μ F	Feedback Input DC decoupling.		
C8 and C9	0.1 μ F	Frequency stability.		Danger of oscillation.
C10 and C11	1000 μ F to 2200 μ F	Output DC decoupling.		Higher low-frequency cut-off.

MOUNTING INSTRUCTIONS

The power dissipated in the circuit must be removed by adding an external heatsink. Thanks to the MULTIWATT[®] package attaching the heatsink is very simple, a screw or a compression spring (clip) being sufficient. Between the heatsink and the package it is better to insert a layer of silicon grease, to optimize the thermal contact; no electrical isolation is needed between the two surfaces.