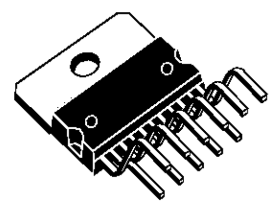
SGS-THOMSON
MICROELECTRONICS

TDA2009A

10 +10W STEREO AMPLIFIER

- HIGH OUTPUT POWER
  (10 + 10W Min. @ D = 1%)
- HIGH CURRENT CAPABILITY (UP TO 3.5A)
- AC SHORT CIRCUIT PROTECTION
- THERMAL OVERLOAD PROTECTION
- SPACE AND COST SAVING : VERY LOW NUMBER OF EXTERNAL COMPONENTS AND SIMPLE MOUNTING THANKS TO THE MULTIWATT ® PACKAGE.



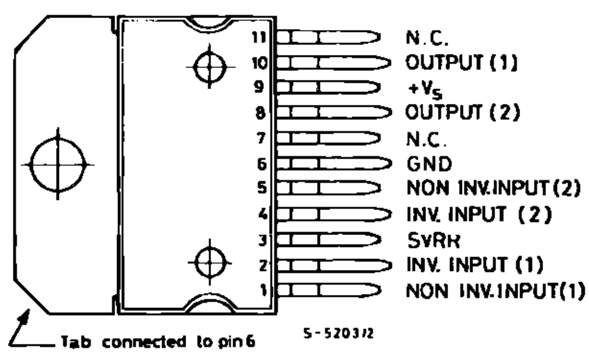
MULTIWATT11

ORDERING NUMBER : TDA2009A

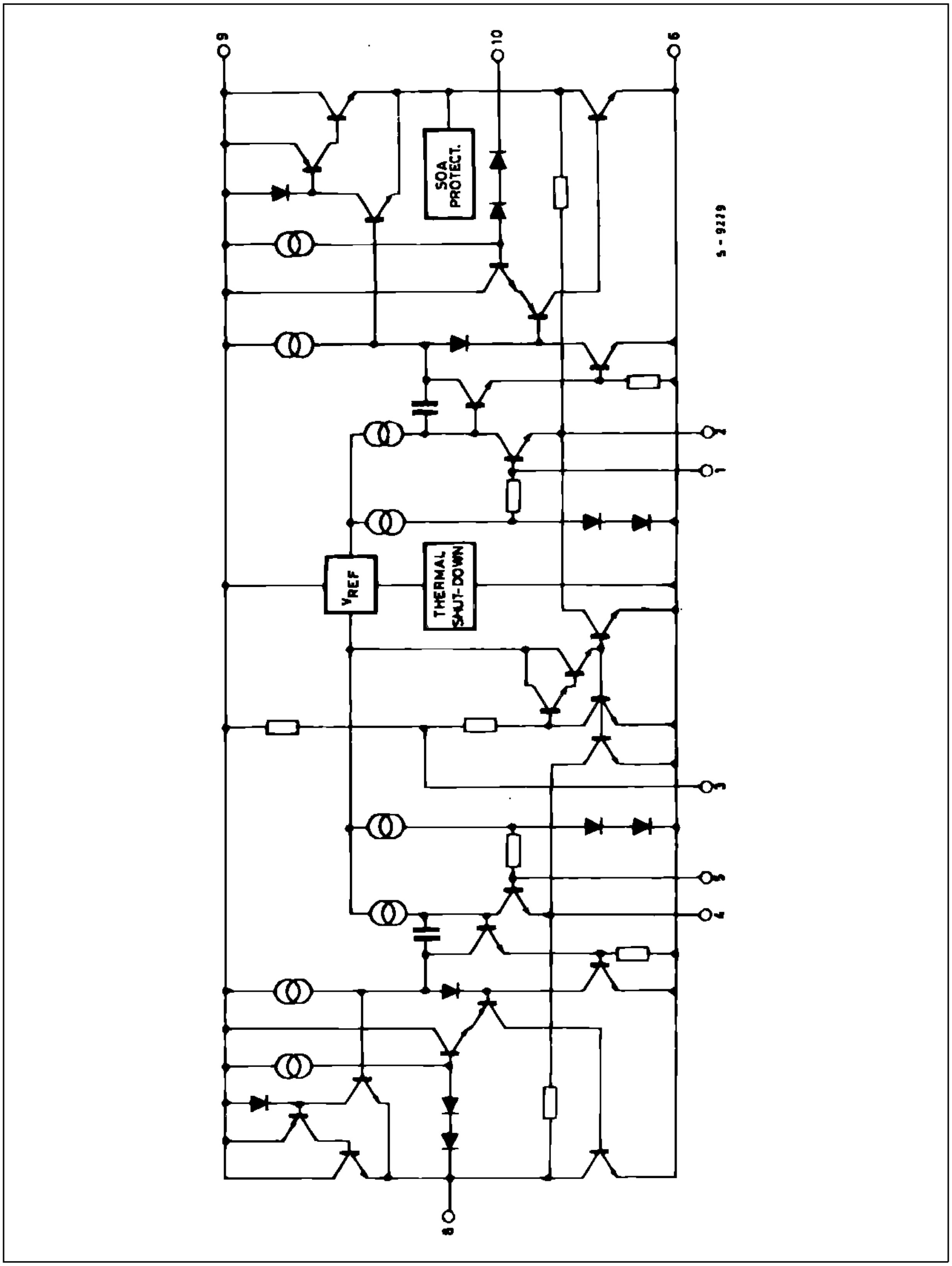
DESCRIPTION

The TDA2009A 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.

PIN CONNECTION



SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_s	Supply Voltage	28	V
I_o	Output Peak Current (repetitive f ≥ 20 Hz)	3.5	A
I_o	Output Peak Current (non repetitive, t = 100 µs)	4.5	A
P_{tot}	Power Dissipation at T_{case} = 90 °C	20	W
T_{stg}, T_j	Storage and Junction Temperature	– 40, + 150	°C

THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case Max.	3	°C/W

ELECTRICAL CHARACTERISTICS

(refer to the stereo application circuit, T_{amb} = 25°C, V_S = 24V, G_V = 36dB, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_s	Supply Voltage		8		28	V
V_o	Quiescent Output Voltage	V_s = 24V		11.5		V
I_d	Total Quiescent Drain Current	V_s = 24V		60	120	mA
P_o	Output Power (each channel)	d = 1%, V_s = 24V, f = 1kHz R_L = 4Ω R_L = 8Ω f = 40Hz to 12.5kHz R_L = 4Ω R_L = 8Ω V_s = 18V, f = 1kHz R_L = 4Ω R_L = 8Ω	 10 5 	 12.5 7 7 4		 W W W W W W
d	Distortion (each channel)	f = 1kHz, V_s = 24V P_o = 0.1 to 7W R_L = 4Ω P_o = 0.1 to 3.5W R_L = 8Ω V_s = 18V P_o = 0.1 to 5W R_L = 4 Ω P_o = 0.1 to 2.5W R_L = 8Ω		 0.2 0.1 0.2 0.1		 % % % %
CT	Cross Talk (3)	R_L = ∞, R_g = 10kΩ f = 1kHz f = 10kHz		 60 50		dB
V_i	Input Saturation Voltage (rms)		300			mV
R_i	Input Resistance	f = 1kHz, Non Inverting Input	70	200		kΩ
f_L	Low Frequency Roll off (– 3dB)	R_L = 4Ω		20		Hz
f_H	High Frequency Roll off (– 3dB)	R_L = 4Ω		80		kHz
G_v	Voltage Gain (closed loop)	f = 1kHz	35.5	36	36.5	dB
ΔG_v	Closed Loop Gain Matching			0.5		dB
e_N	Total Input Noise Voltage	R_g = 10kΩ (1) R_g = 10kΩ (2)		1.5 2.5	 8	µV µV
SVR	Supply Voltage Rejection (each channel)	R_g = 10kΩ f_{ripple} = 100Hz, V_{ripple} = 0.5V		55		dB
T_J	Thermal Shut-down Junction Temperature			145		°C

Notes : 1. Curve A
2. 22Hz to 22kHz

Figure 1 : Test and Application Circuit (G_V = 36dB)

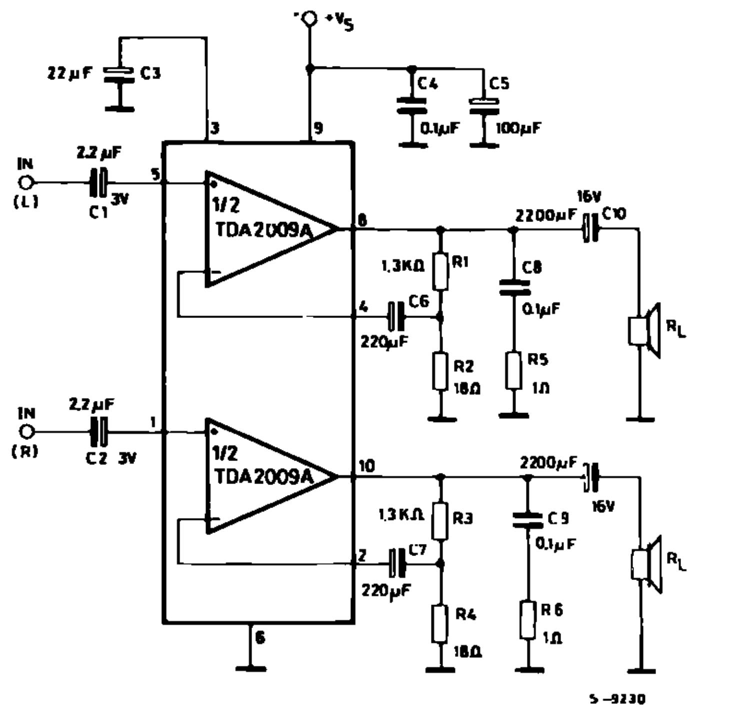


Figure 2 : P.C. board and component layout of the fig. 1

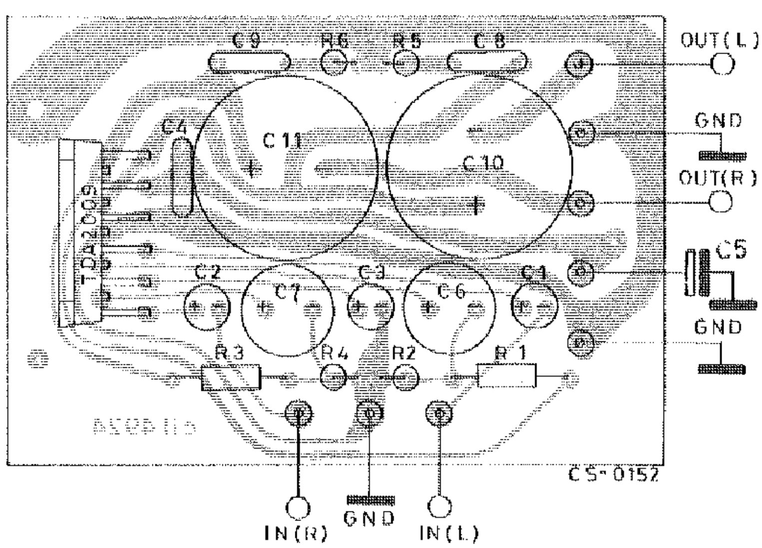


Figure 3 : Output Power versus Supply Voltage

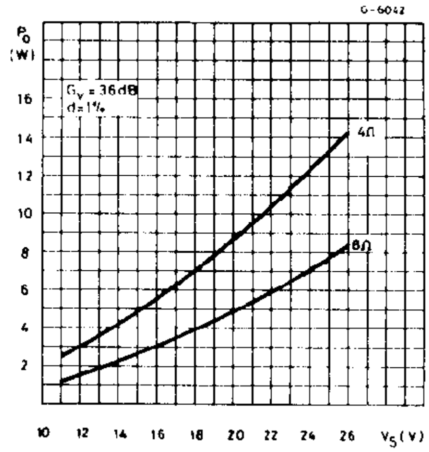


Figure 4 : Output Power versus Supply Voltage

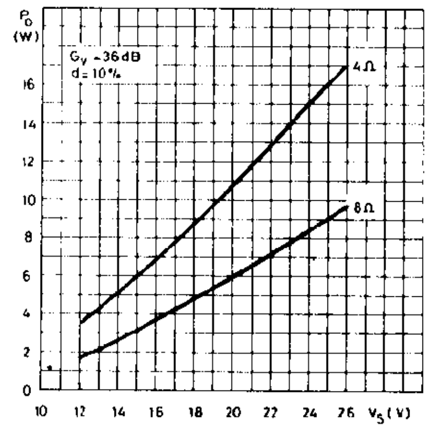


Figure 5 : Distortion versus Output Power

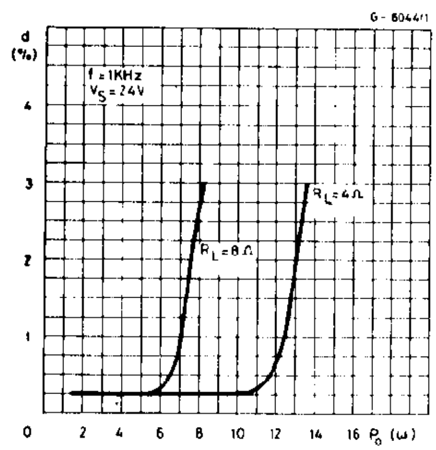


Figure 6 : Distortion versus Frequency

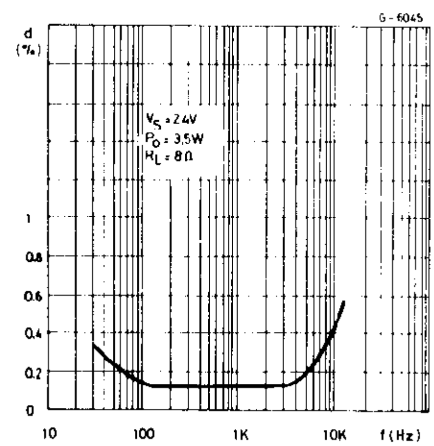


Figure 7 : Distortion versus Frequency

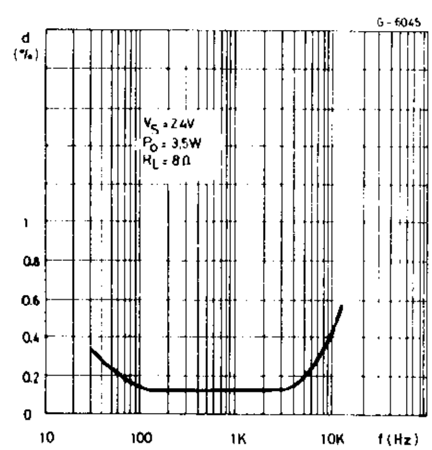


Figure 8 : Quiescent Current versus Supply Voltage

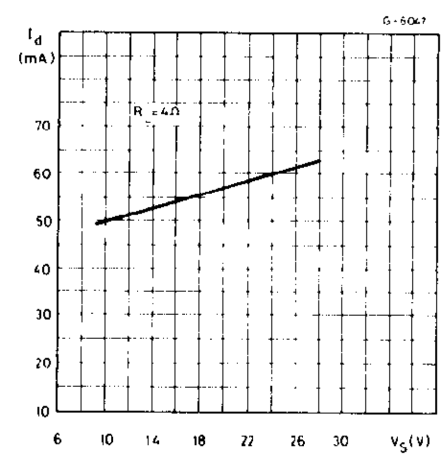


Figure 9 : Supply Voltage Rejection versus Frequency

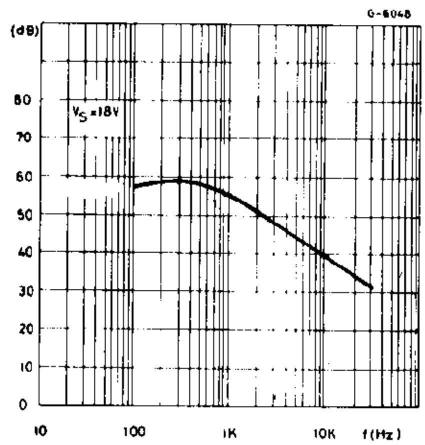


Figure 10 : Total Power Dissipation and Efficiency versus Output Power

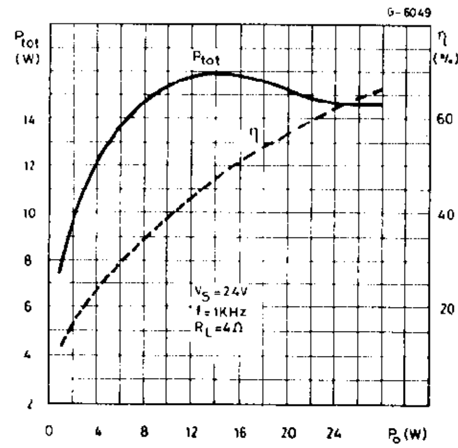
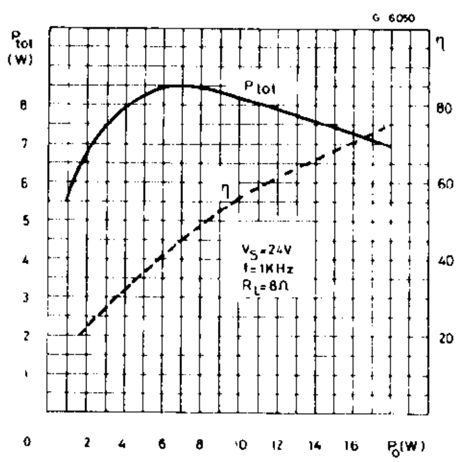


Figure 11 : Total Power Dissipation and Efficiency versus Output Power



APPLICATION INFORMATION

Figure 12 : Example of Muting Circuit

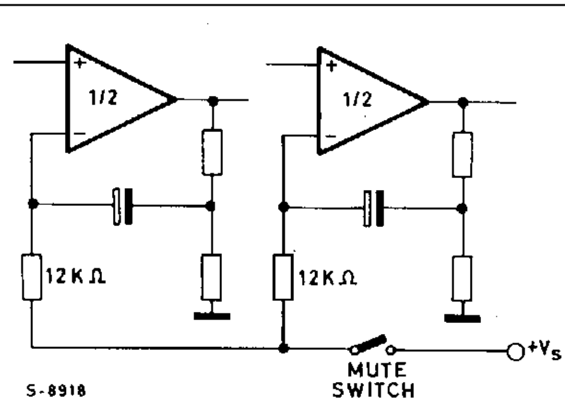


Figure 13 : 10W +10W Stereo Amplifier with Tone Balance and Loudness Control

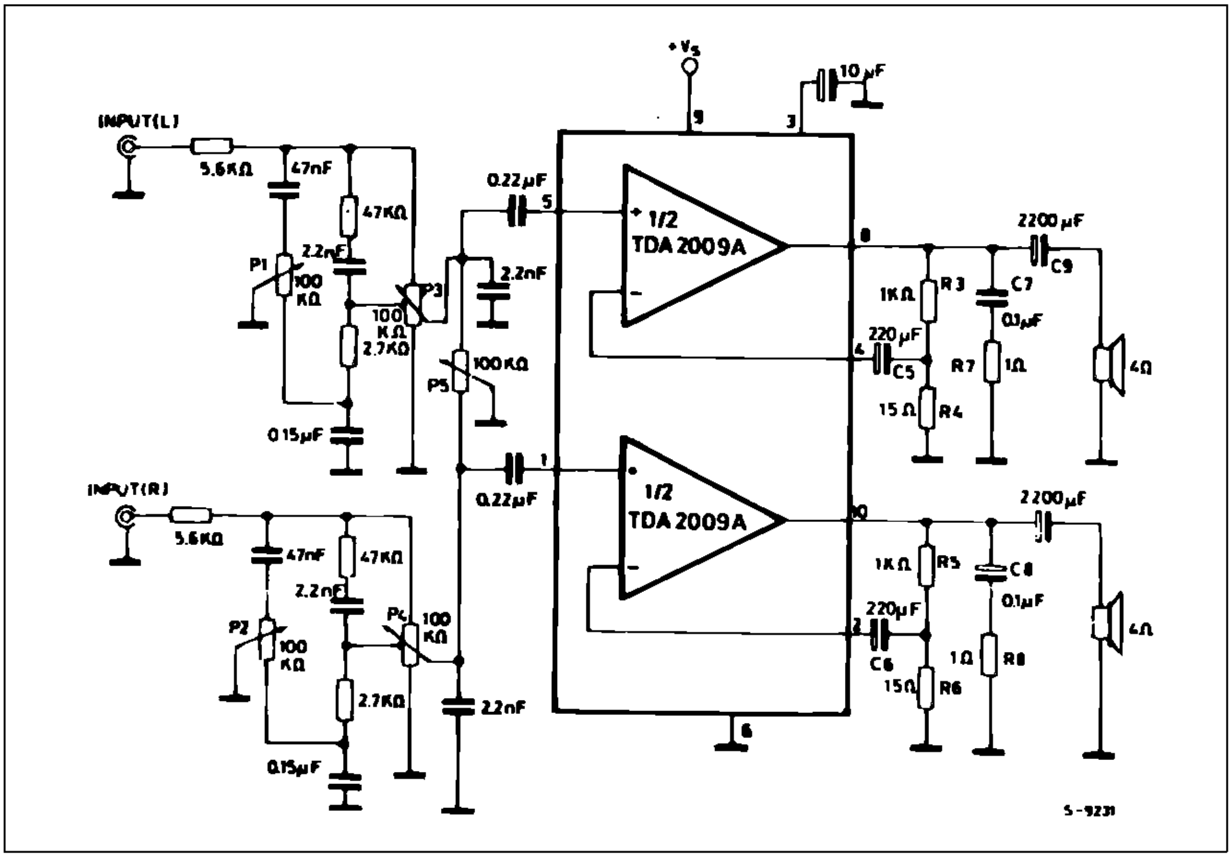


Figure 14 : Tone Control Response (circuit of Figure 13)

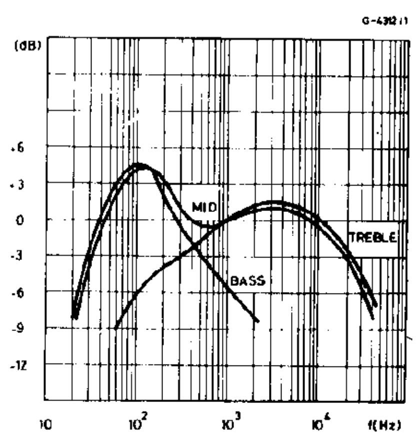


Figure 15 : High Quality 20 + 20W Two Way Amplifier for Stereo Music Center (one channel only)

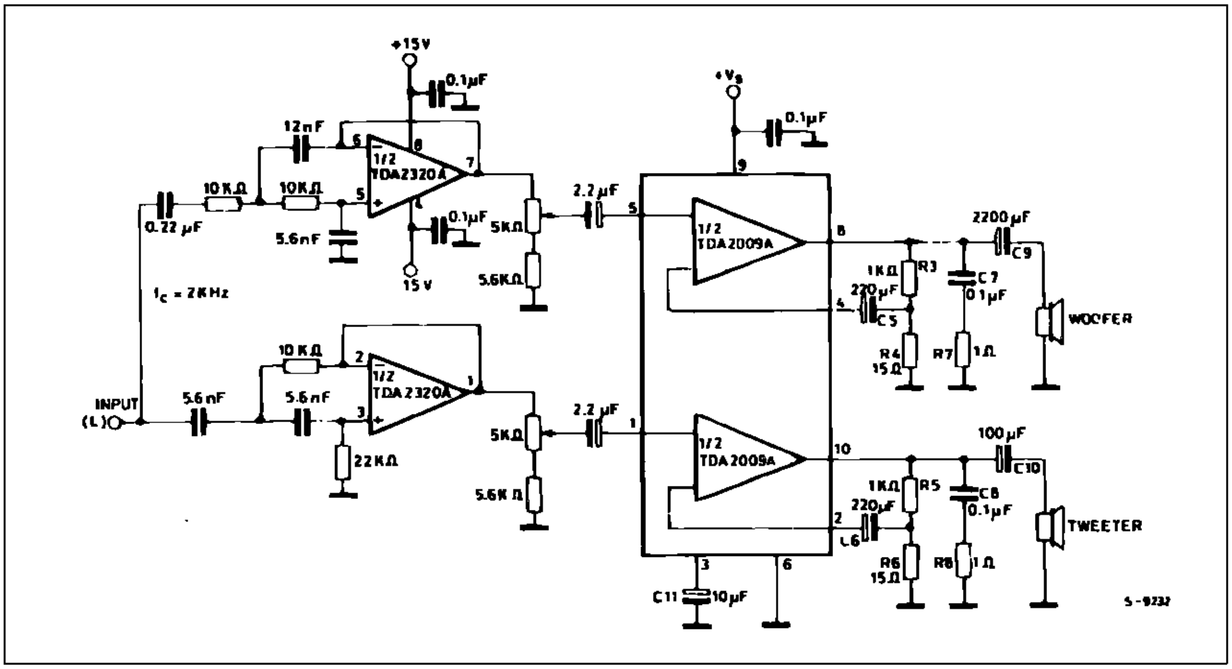


Figure 16 : 18W Bridge Amplifier (d = 1%, G_V = 40dB)

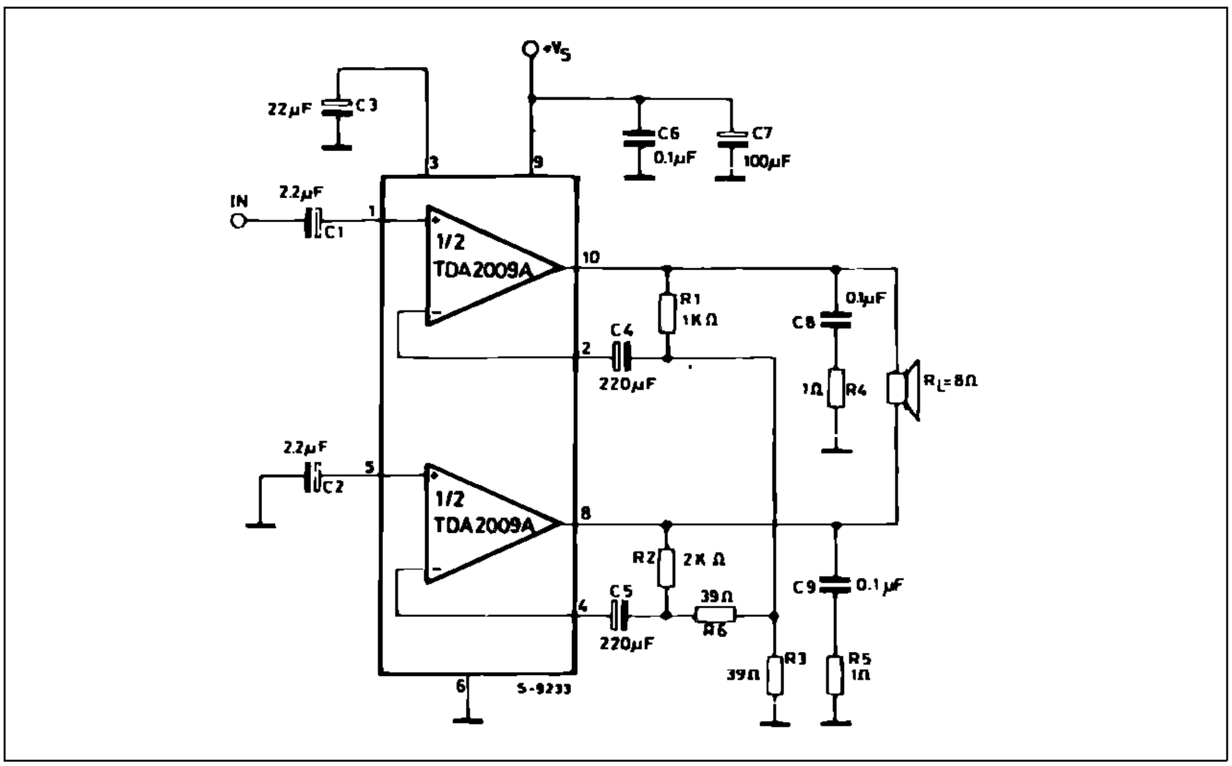
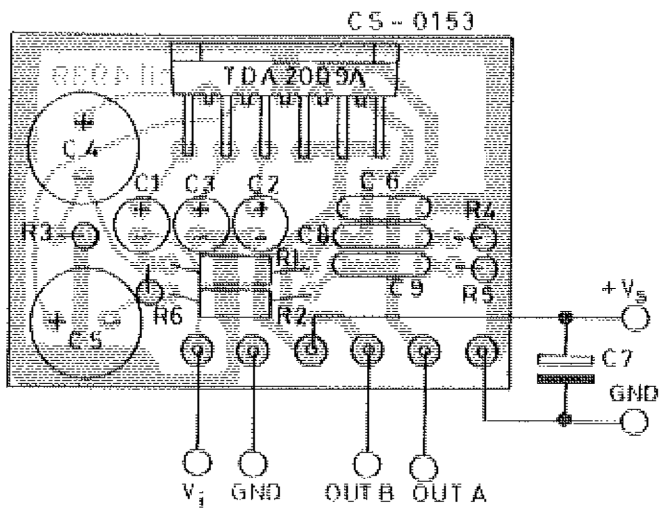


Figure 17 : P.C. BOARD and Components Layout of the Circuit of Figure 16 (1:1 scale)



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	Recommended Value	Purpose	Larger than	Smaller than
R1, R3	1.2kΩ	Close Loop Gain Setting (1)	Increase of Gain	Decrease of Gain
R2, R4	18kΩ		Decrease of Gain	Increase of Gain
R5, R6	1Ω	Frequency Stability	Danger of Oscillation at High Frequency with Inductive Load	
C1, C2	2.2µF	Input DC Decoupling	High Turn-on Delay	High Turn-on Pop. Higher Low Frequency Cut-off. Increase of Noise
C3	22µF	Ripple Rejection	Better SVR. Increase of the Switch-on Time	Degradation of SVR
C6, C7	220µF	Feedback Input DC Decoupling		
C8, C9	0.1µF	Frenquency Stability		Danger of Oscillation
C10, C11	1000µF to 2200µF	Output DC Decoupling		Higher Low-frequency Cut-off

(1) The closed loop gain must be higher than 26dB.

BUILD-IN PROTECTION SYSTEMS

THERMAL SHUT-DOWN

The presence of a thermal limiting circuit offers the following advantages:

1) an averload on the output (even if it is permanent), or an excessive ambient temperature can be easily withstood.
2) the heatsink can have a smaller factor of safety compared with that of a conventional circuit. There is no device damage in the case of excessive junction temperature : all that happens is that P_o (and therefore P_{tot}) and I_o are reduced.

The maximum allowable power dissipation depends upon the size of the external heatsink (i.e. its thermal resistance); Figure 18 shows this dissipable power as a function of ambient temperature for different thermal resistance.

Short circuit (AC Conditions). The TDA2009A can withstand an accidental short circuit from the output and ground made by a wrong connection during normal play operation.

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

Figure 18 : Maximum Allowable Power Dissipation versus Ambient Temperature

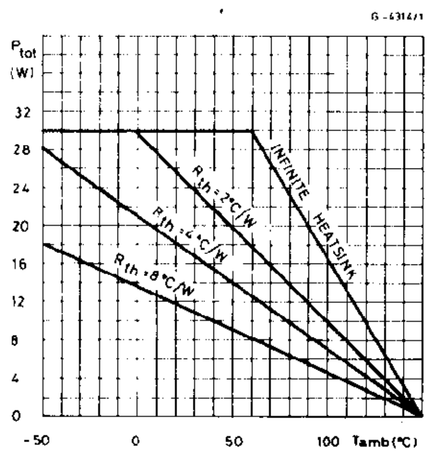


Figure 19 : Output Power versus Case Temperature

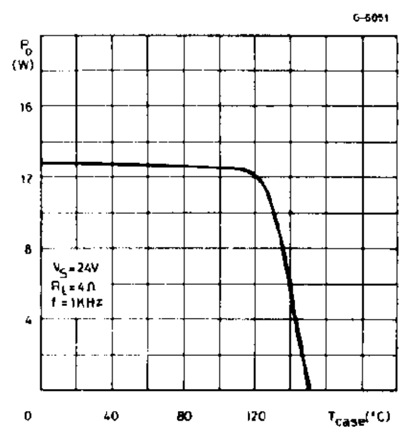
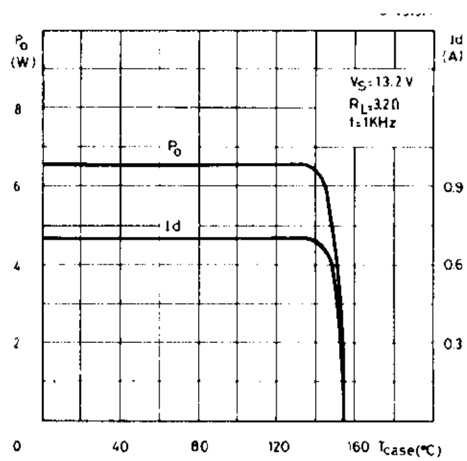


Figure 20 : Output Power and Drain Current versus Case Temperature



MULTIWATT11 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			5			0.197
B			2.65			0.104
C			1.6			0.063
D		1			0.039	
E	0.49		0.55	0.019		0.022
F	0.88		0.95	0.035		0.037
G	1.45	1.7	1.95	0.057	0.067	0.077
G1	16.75	17	17.25	0.659	0.669	0.679
H1	19.6			0.772		
H2			20.2			0.795
L	21.9	22.2	22.5	0.862	0.874	0.886
L1	21.7	22.1	22.5	0.854	0.87	0.886
L2	17.4		18.1	0.685		0.713
L3	17.25	17.5	17.75	0.679	0.689	0.699
L4	10.3	10.7	10.9	0.406	0.421	0.429
L7	2.65		2.9	0.104		0.114
M	4.25	4.55	4.85	0.167	0.179	0.191
M1	4.73	5.08	5.43	0.186	0.200	0.214
S	1.9		2.6	0.075		0.102
S1	1.9		2.6	0.075		0.102
Dia1	3.65		3.85	0.144		0.152