



THE DATASHEET OF TDA2009A

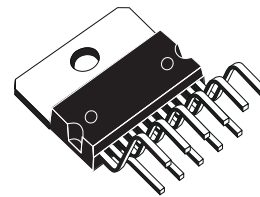




TDA2009A

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.



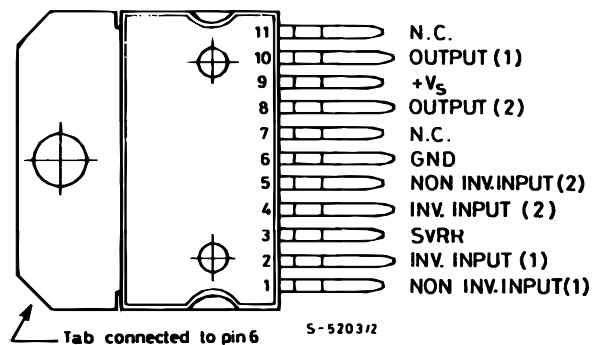
MULTIWATT11

ORDERING NUMBER : TDA2009A

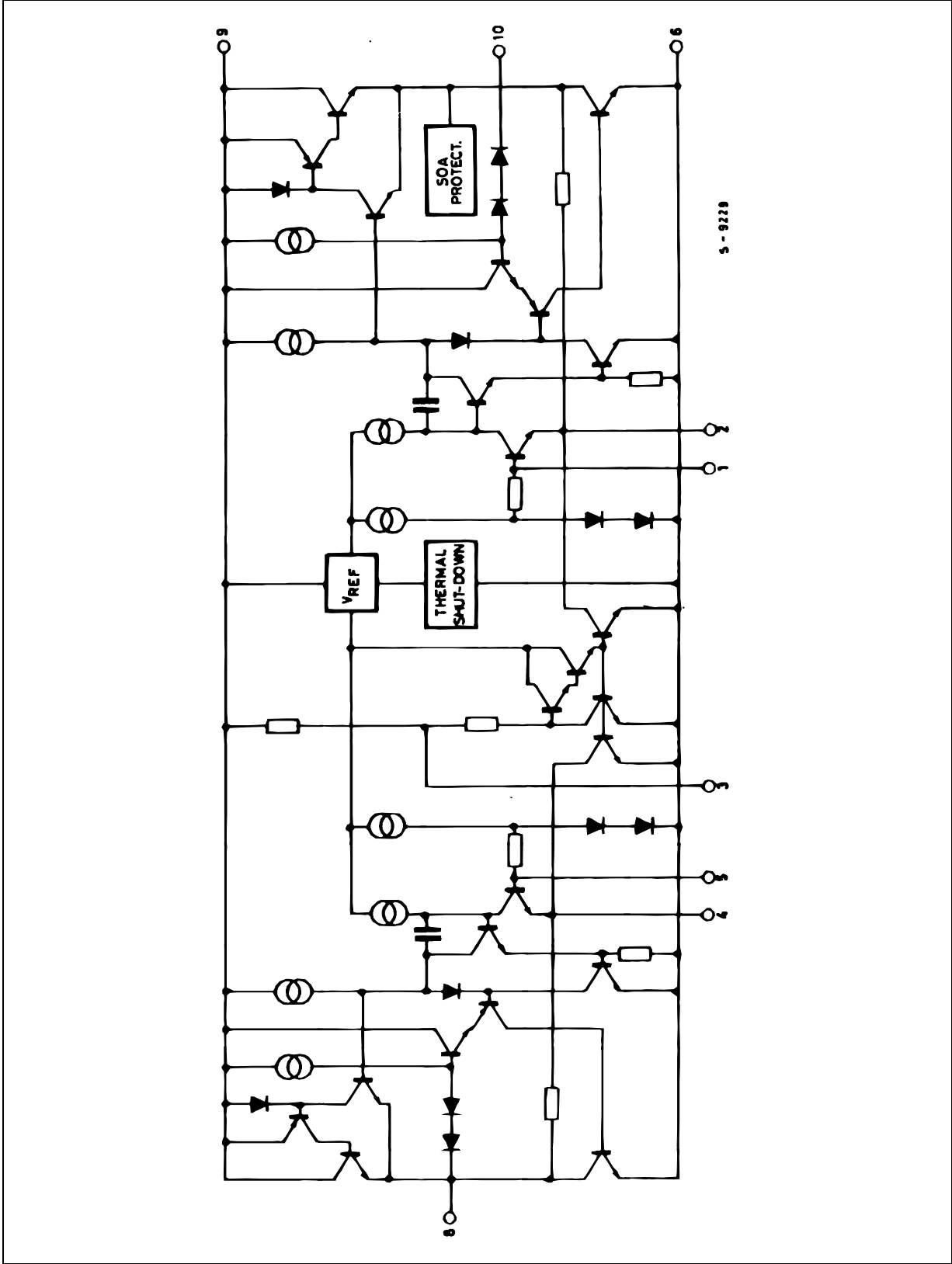
DESCRIPTION

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 $f \geq 20$ Hz) | 3.5 | A |
| I_o | Output Peak Current (non repetitive, $t = 100 \mu\text{s}$) | 4.5 | A |
| P_{tot} | Power Dissipation at $T_{\text{case}} = 90^\circ\text{C}$ | 20 | W |
| T_{stg}, T_j | Storage and Junction Temperature | - 40, + 150 | $^\circ\text{C}$ |

THERMAL DATA

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

ELECTRICAL CHARACTERISTICS

(refer to the stereo application circuit, $T_{\text{amb}} = 25^\circ\text{C}$, $V_s = 24\text{V}$, $G_v = 36\text{dB}$, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|---|--|---------|------------|------|--------------------------------|
| V_s | Supply Voltage | | 8 | | 28 | V |
| V_o | Quiescent Output Voltage | $V_s = 24\text{V}$ | | 11.5 | | V |
| I_d | Total Quiescent Drain Current | $V_s = 24\text{V}$ | | 60 | 120 | mA |
| P_o | Output Power (each channel) | $d = 1\%$, $V_s = 24\text{V}$, $f = 1\text{kHz}$ $R_L = 4\Omega$ $R_L = 8\Omega$ $f = 40\text{Hz}$ to 12.5kHz $R_L = 4\Omega$ $R_L = 8\Omega$ $V_s = 18\text{V}$, $f = 1\text{kHz}$ $R_L = 4\Omega$ $R_L = 8\Omega$ | 10 5 | 12.5 7 | | W W W W W W |
| d | Distortion (each channel) | $f = 1\text{kHz}$, $V_s = 24\text{V}$ $P_o = 0.1$ to 7W $R_L = 4\Omega$ $P_o = 0.1$ to 3.5W $R_L = 8\Omega$ $V_s = 18\text{V}$ $P_o = 0.1$ to 5W $R_L = 4\Omega$ $P_o = 0.1$ to 2.5W $R_L = 8\Omega$ | | 0.2 0.1 | | % % |
| CT | Cross Talk (3) | $R_L = \infty$, $R_g = 10\text{k}\Omega$ $f = 1\text{kHz}$ $f = 10\text{kHz}$ | | 60 50 | | dB |
| V_i | Input Saturation Voltage (rms) | | 300 | | | mV |
| R_i | Input Resistance | $f = 1\text{kHz}$, Non Inverting Input | 70 | 200 | | $\text{k}\Omega$ |
| f_L | Low Frequency Roll off (- 3dB) | $R_L = 4\Omega$ | | 20 | | Hz |
| f_H | High Frequency Roll off (- 3dB) | $R_L = 4\Omega$ | | 80 | | kHz |
| 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 | $R_g = 10\text{k}\Omega$ (1) $R_g = 10\text{k}\Omega$ (2) | | 1.5 2.5 | 8 | μV 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 | | $^\circ\text{C}$ |

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

TDA2009A

Figure 1 : Test and Application Circuit ($G_v = 36\text{dB}$)

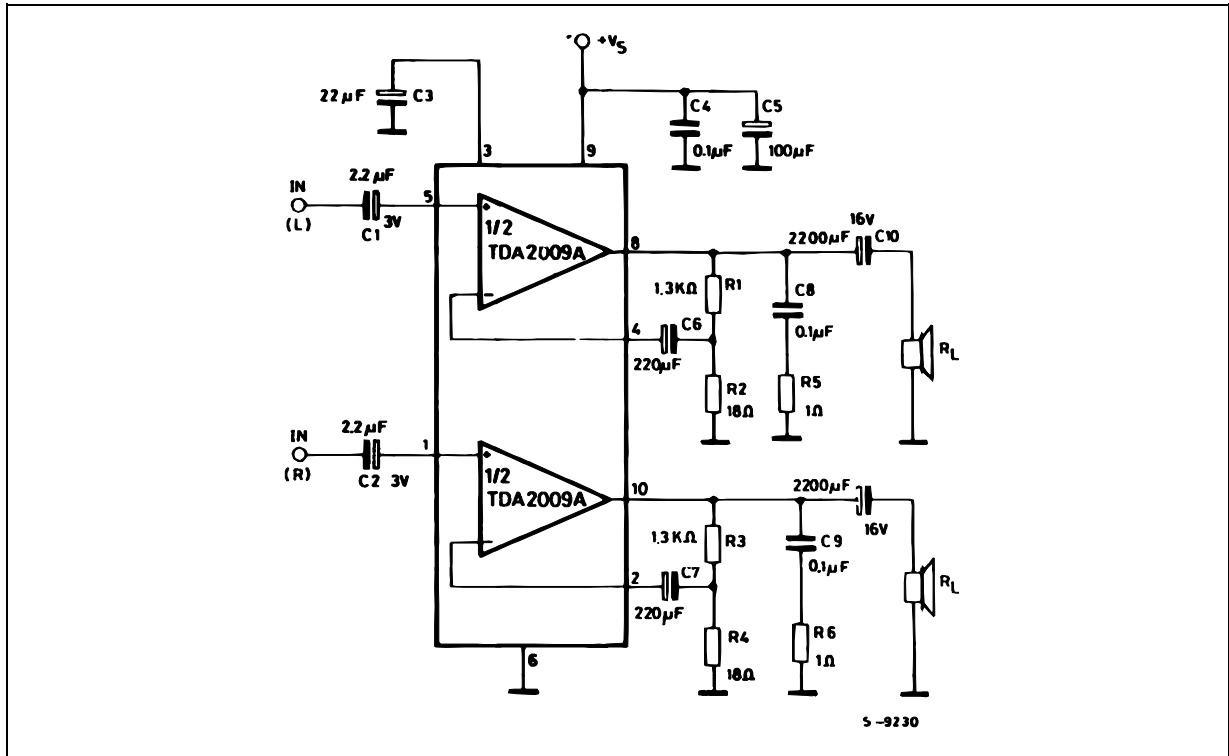


Figure 2 : P.C. board and component layout of the fig. 1

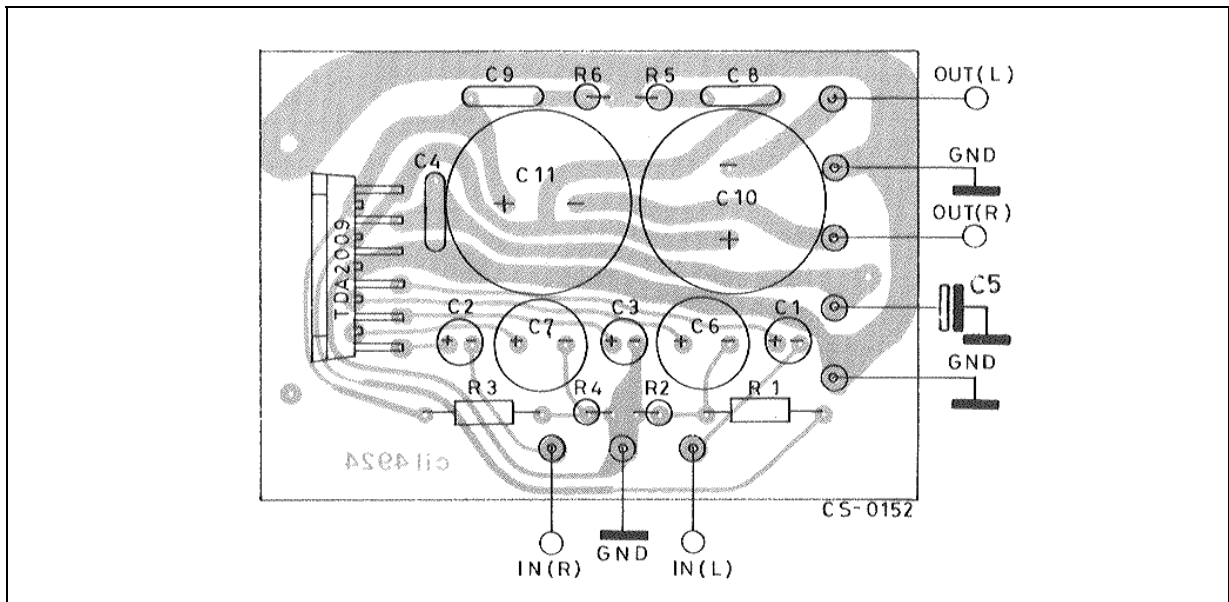


Figure 3 : Output Power versus Supply Voltage

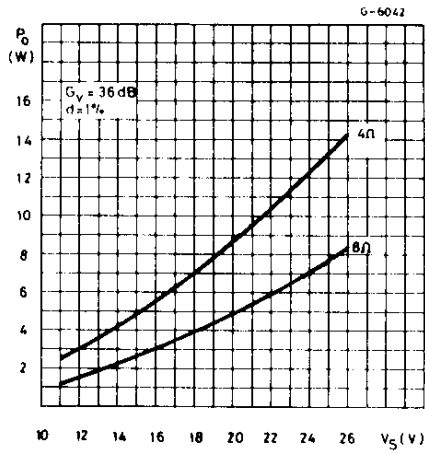


Figure 4 : Output Power versus Supply Voltage

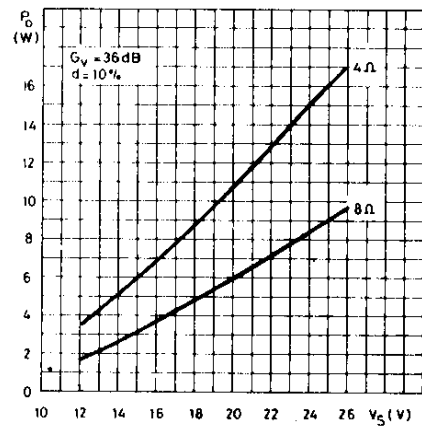


Figure 5 : Distortion versus Output Power

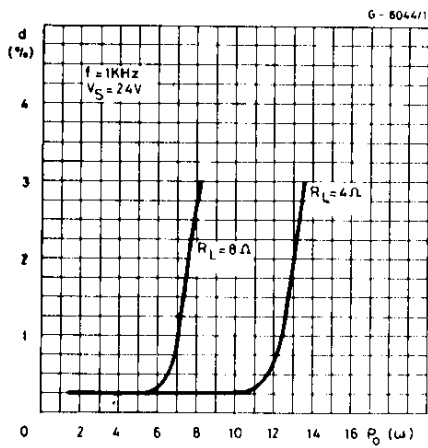


Figure 6 : Distortion versus Frequency

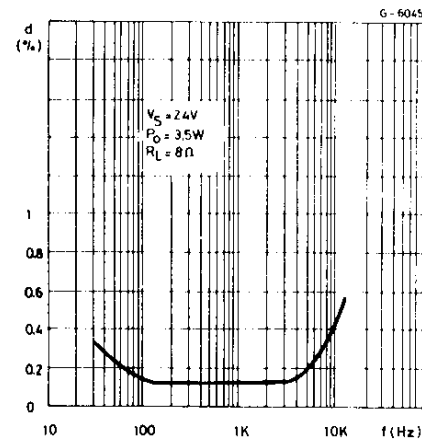


Figure 7 : Distortion versus Frequency

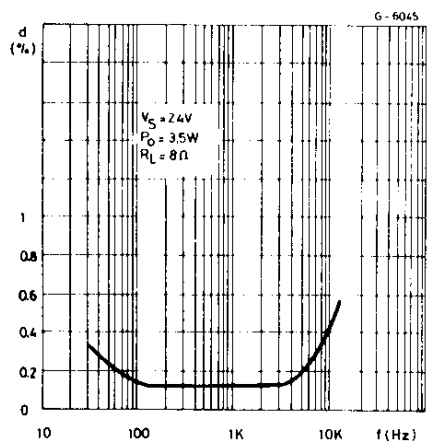


Figure 8 : Quiescent Current versus Supply Voltage

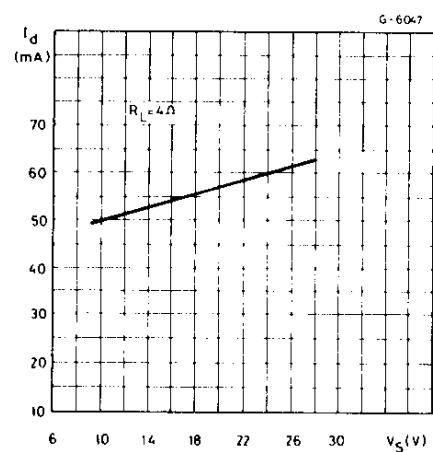


Figure 9 : Supply Voltage Rejection versus Frequency

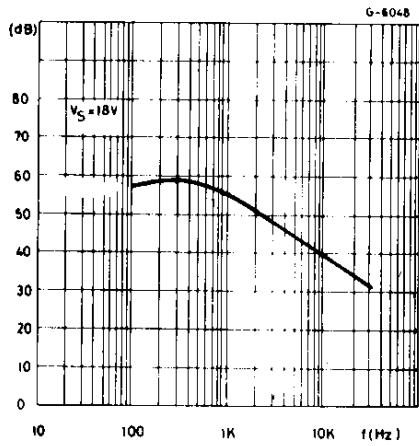


Figure 10 : Total Power Dissipation and Efficiency versus Output Power

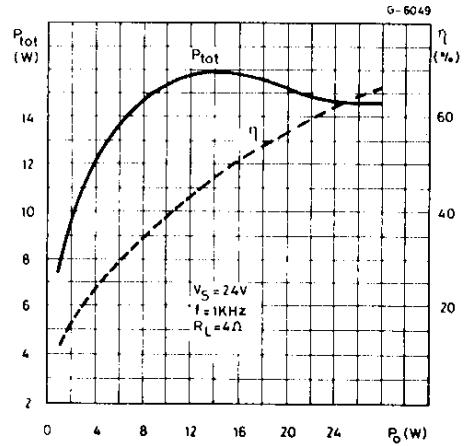
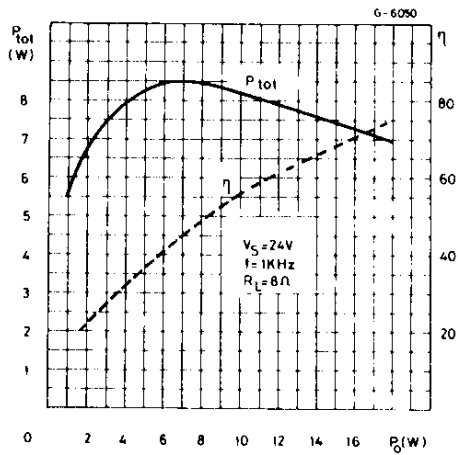


Figure 11 : Total Power Dissipation and Efficiency versus Output Power



APPLICATION INFORMATION

Figure 12 : Example of Muting Circuit

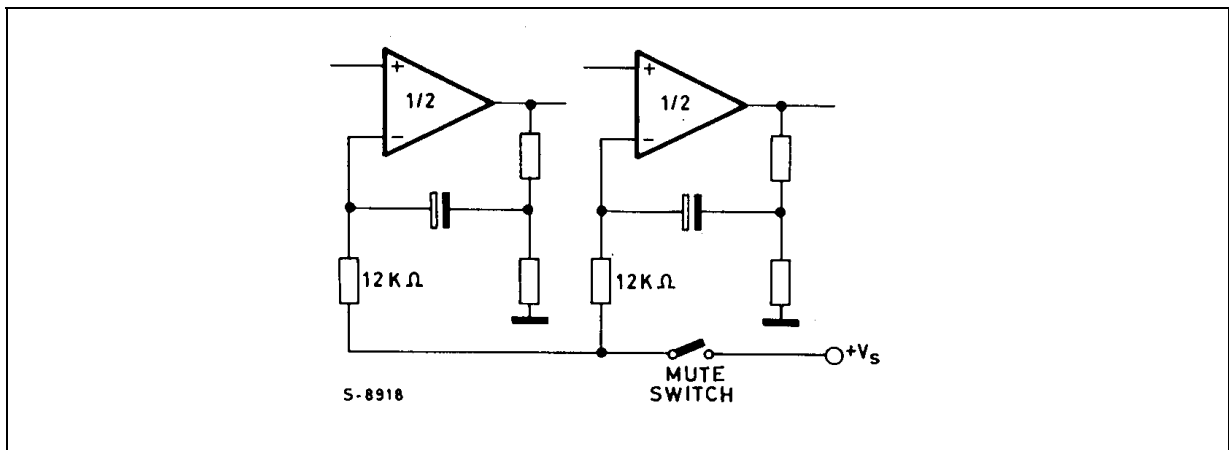


Figure 13 : 10W +10W Stereo Amplifier with Tone Balance and Loudness Control

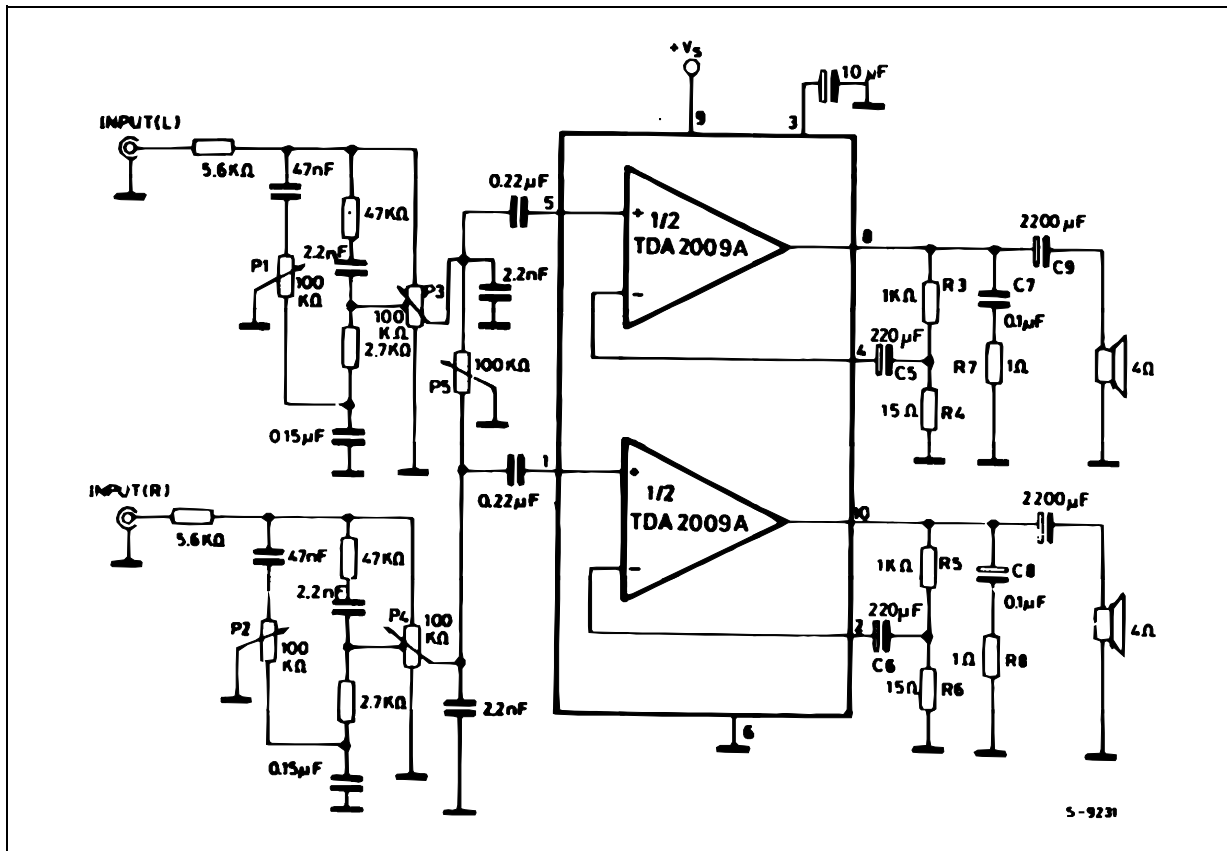


Figure 14 : Tone Control Response
(circuit of Figure 13)

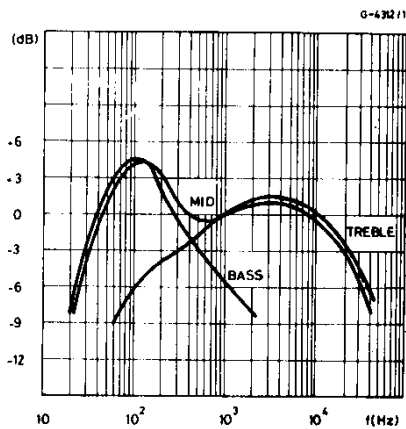


Figure 15 : High Quality 20 + 20W Two Way Amplifier for Stereo Music Center (one channel only)

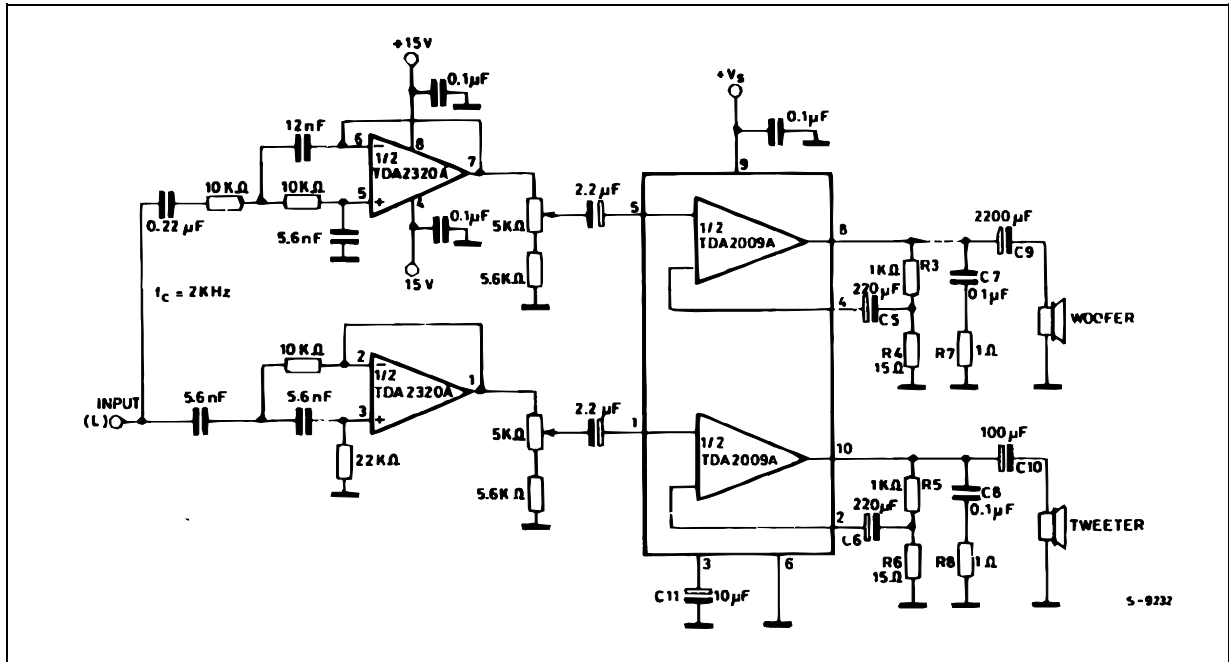


Figure 16 : 18W Bridge Amplifier (d = 1%, G_V = 40dB)

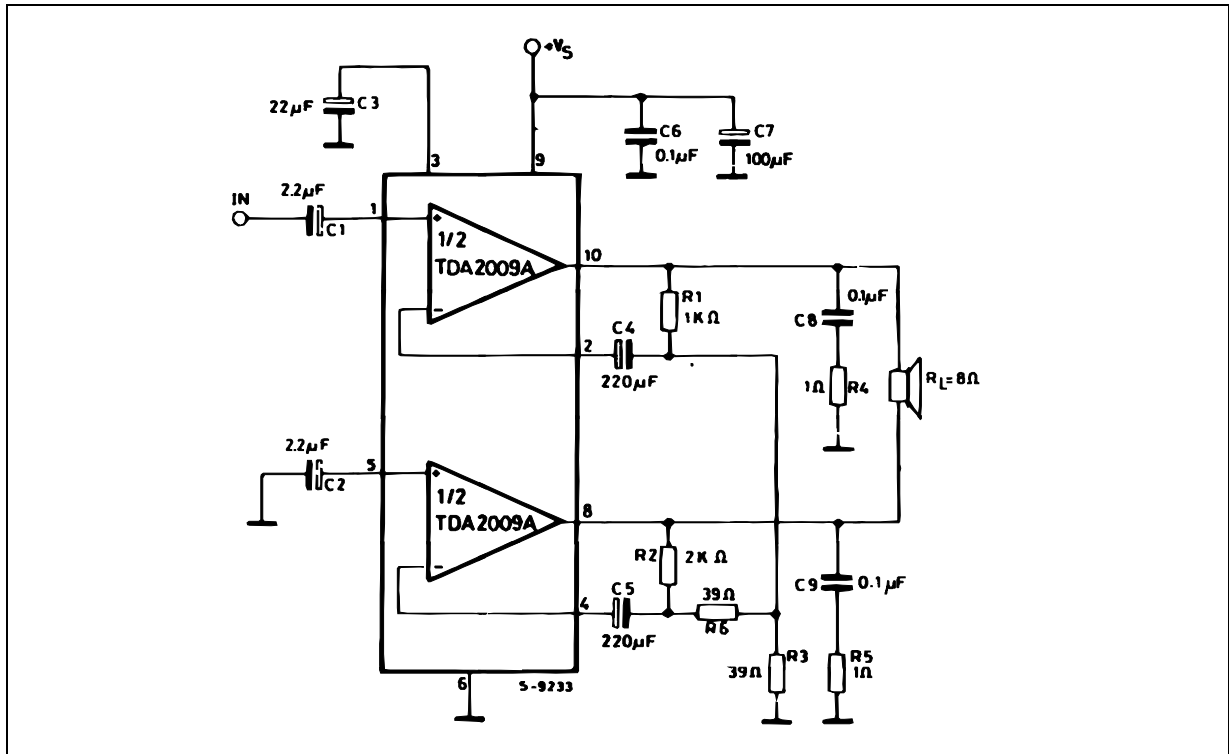
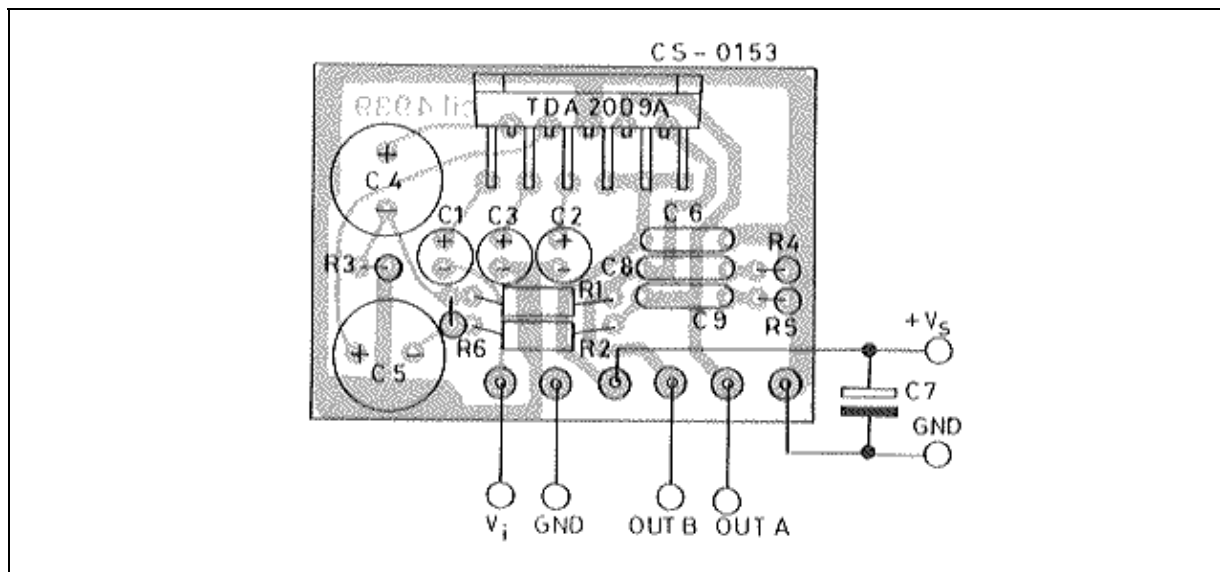


Figure 17 : P.C. BOARD and Components Layout of the Circuit of Figure 16 (1:1 scale)



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 | 1.2k Ω | Close Loop Gain Setting (1) | Increase of Gain | Decrease of Gain |
| R2, R4 | 18k Ω | | Decrease of Gain | Increase of Gain |
| R5, R6 | 1 Ω | Frequency Stability | Danger of Oscillation at High Frequency with Inductive Load | |
| C1, C2 | 2.2 μ F | Input DC Decoupling | High Turn-on Delay | High Turn-on Pop. Higher Low Frequency Cut-off. Increase of Noise |
| C3 | 22 μ F | Ripple Rejection | Better SVR. Increase of the Switch-on Time | Degradation of SVR |
| C6, C7 | 220 μ F | Feedback Input DC Decoupling | | |
| C8, C9 | 0.1 μ F | Frequency Stability | | Danger of Oscillation |
| C10, C11 | 1000 μ F to 2200 μ F | 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 overload 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 dissippable 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

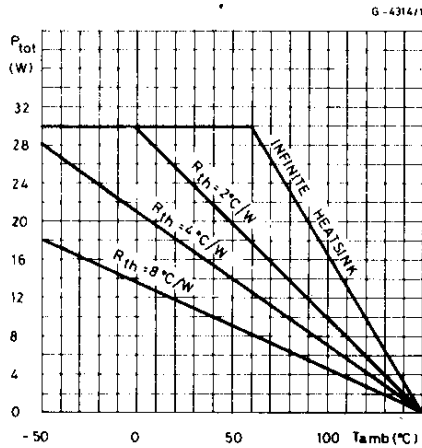


Figure 19 : Output Power versus Case Temperature

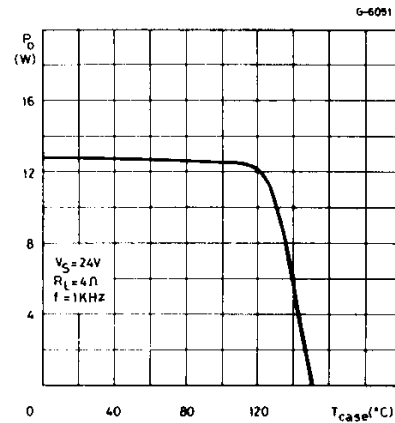
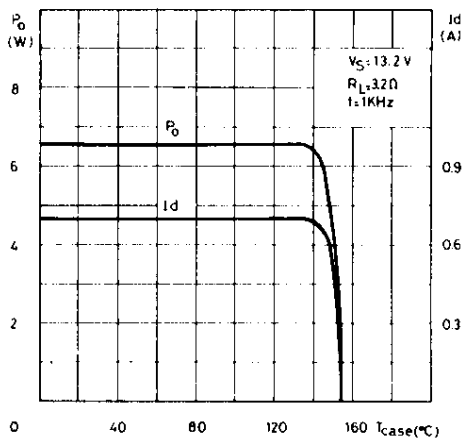
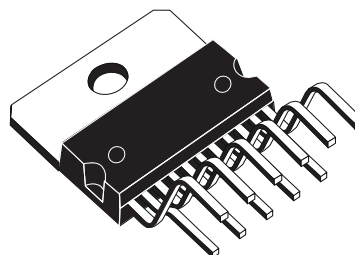


Figure 20 : Output Power and Drain Current versus Case Temperature

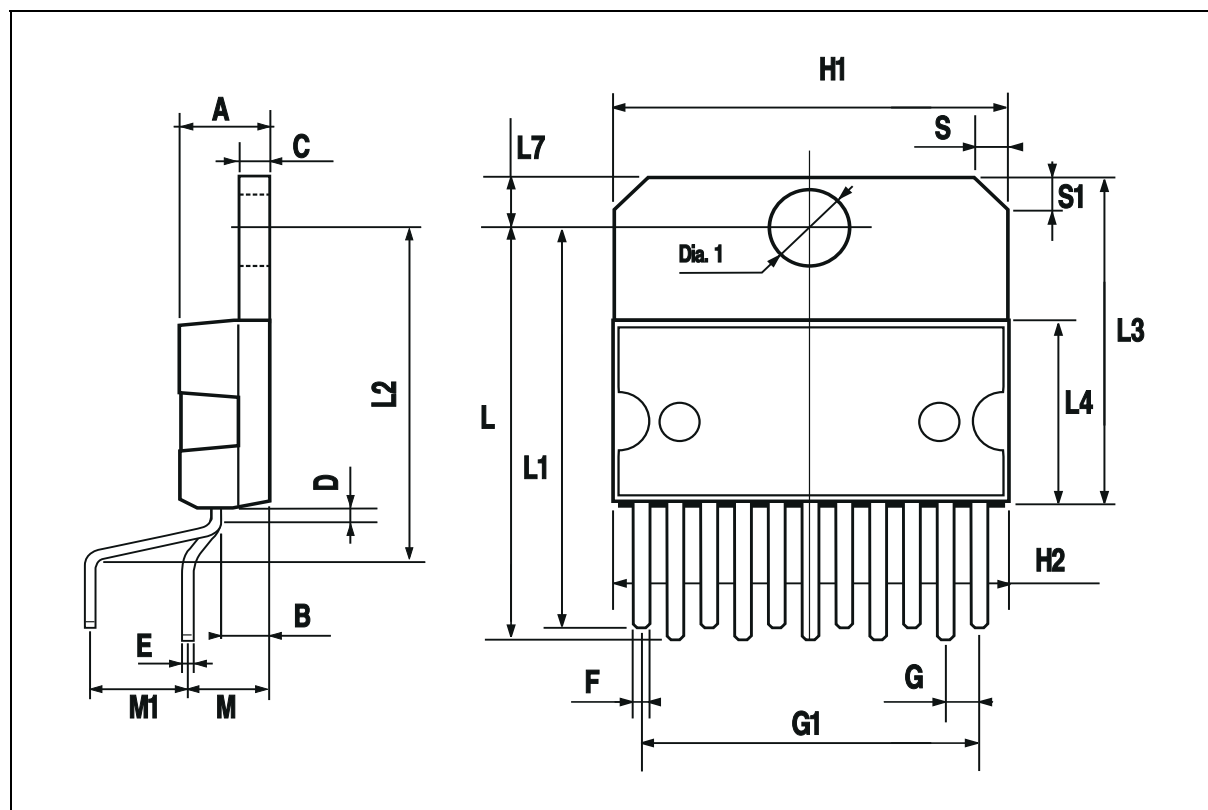


| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 5 | | | 0.197 |
| B | | | 2.65 | | | 0.104 |
| C | | | 1.6 | | | 0.063 |
| D | | 1 | | | 0.039 | |
| E | 0.49 | | 0.55 | 0.019 | | 0.022 |
| F | 0.88 | | 0.95 | 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 |

OUTLINE AND MECHANICAL DATA



Multiwatt11 V



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