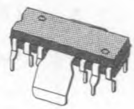
SGS-THOMSON
MICROELECTRONICS

TDA1908

8 W AUDIO AMPLIFIER

- FLEXIBILITY IN USE WITH A MAX OUTPUT CURRENT OF 3 A AND AN OPERATING SUPPLY VOLTAGE RANGE OF 4 V TO 30 V
- PROTECTION AGAINST CHIP OVERTEMPERATURE
- SOFT LIMITING IN SATURATION CONDITIONS
- LOW "SWITCH-ON" NOISE
- LOW NUMBER OF EXTERNAL COMPONENTS
- HIGH SUPPLY VOLTAGE REJECTION
- VERY LOW NOISE



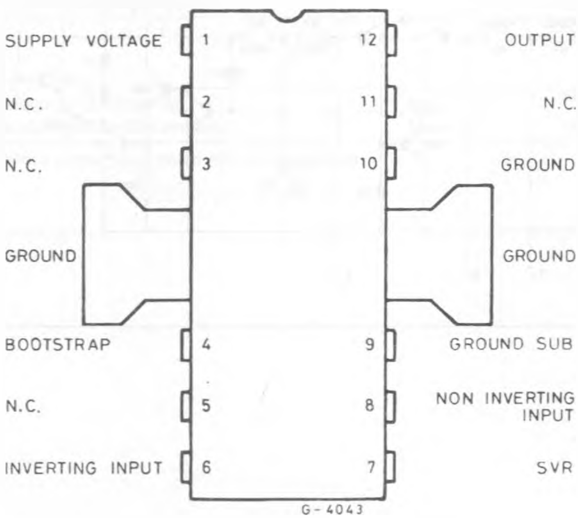
FINDIP
(Plastic 0.4)

ORDER CODE : TDA1908

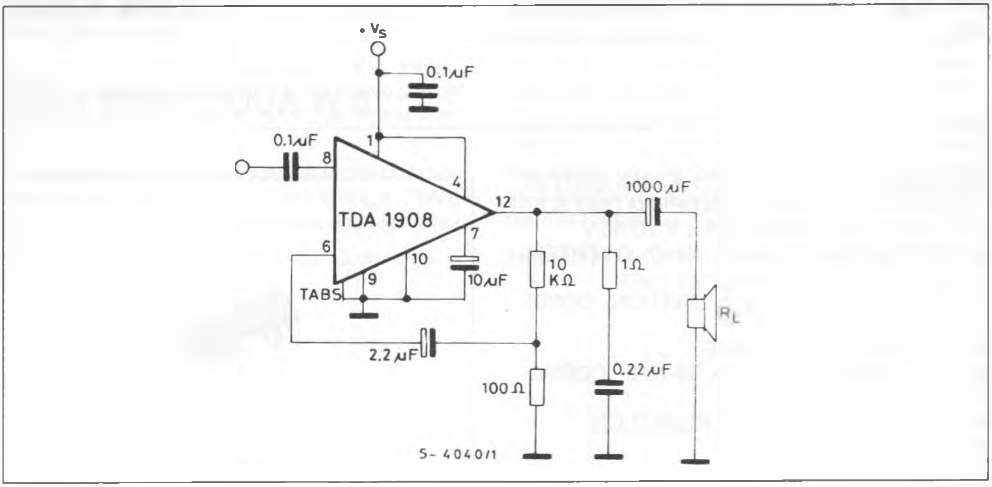
DESCRIPTION

The TDA1908 is a monolithic integrated circuit in 12 lead quad in-line plastic package intended for low frequency power applications. The mounting is compatible with the old types TBA800, TBA810S, TCA830S and TCA940N.

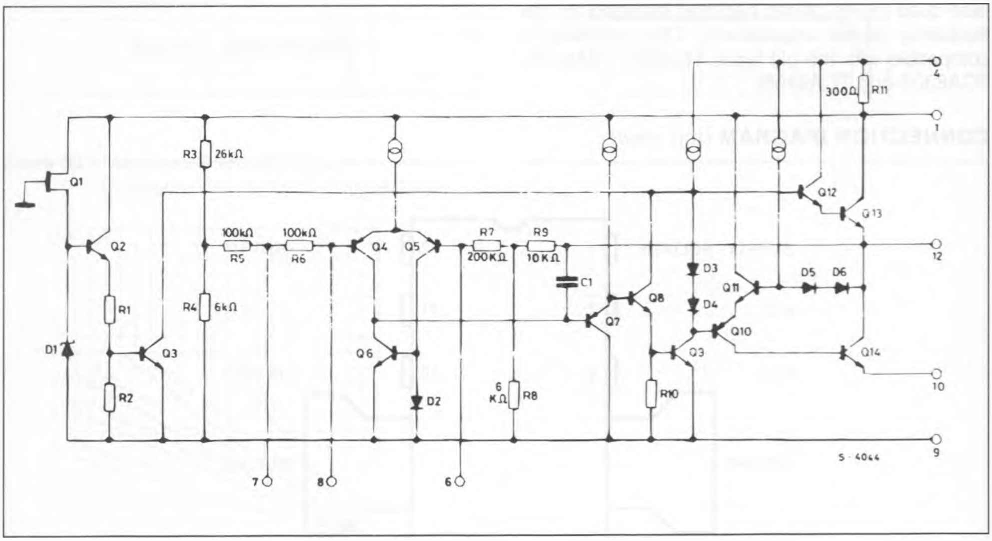
CONNECTION DIAGRAM (top view)



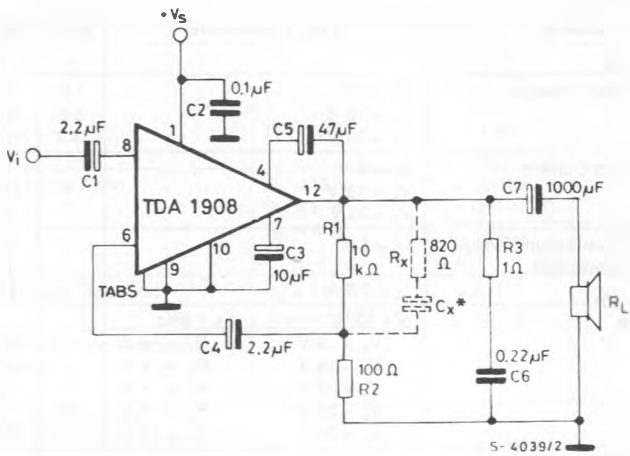
APPLICATION CIRCUIT



SCHEMATIC DIAGRAM



TEST CIRCUIT



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_s	Supply Voltage	30	V
I_o	Output Peak Current (non repetitive)	3.5	A
I_o	Output Peak Current (repetitive)	3	A
P_{tot}	Power Dissipation : at T_{amb} = 80 °C at T_{amb} = 90 °C	1 5	W W
T_{stg}, T_j	Storage and Junction Temperature	– 40 to 150	°C

THERMAL DATA

$R_{th\ j\text{-}tab}$	Thermal Resistance Junction-tab	Max	12	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	(°) 70	°C/W

(°) Obtained with tabs soldered to printed circuit board with min copper area.

ELECTRICAL CHARACTERISTICS (refer to the test circuit, T_{amb} = 25 °C, R_{th} (heatsink) = 8 °C/W, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_s	Supply Voltage		4		30	V
V_o	Quiescent Output Voltage	V_s = 4 V V_s = 18 V V_s = 30 V	1.6 8.2 14.4	2.1 9.2 15.5	2.5 10.2 16.8	V
I_d	Quiescent Drain Current	V_s = 4 V V_s = 18 V V_s = 30 V		15 17.5 21	 35	mA
V_{CEsat}	Output Stage Saturation Voltage (each output transistor)	I_C = 1 A I_C = 2.5 A		0.5 1.3		V
P_o	Output Power	d = 10 % f = 1 kHz V_s = 9 V R_L = 4 Ω V_s = 14 V R_L = 4 Ω V_s = 18 V R_L = 4 Ω V_s = 22 V R_L = 8 Ω V_s = 24 V R_L = 16 Ω	 7 6.5 4.5	 2.5 5.5 9 8 5.3		W
d	Harmonic Distortion	f = 1 kHz V_s = 9 V R_L = 4 Ω P_o = 50 mW to 1.5 W V_s = 18 V R_L = 4 Ω P_o = 50 mW to 4 W V_s = 24 V R_L = 16 Ω P_o = 50 mW to 3 W		 0.1 0.1 0.1		%
V_i	Input Sensitivity	V_s = 9 V R_L = 4 Ω P_o = 2.5 W V_s = 14 V R_L = 4 Ω P_o = 5.5 W V_s = 18 V R_L = 4 Ω P_o = 9 W V_s = 22 V R_L = 8 Ω P_o = 8 W V_s = 24 V R_L = 16 Ω P_o = 5.3 W		37 52 64 90 110		mV
V_i	Input Saturation Voltage (rms)	V_s = 9 V V_s = 14 V V_s = 18 V V_s = 24 V	0.8 1.3 1.8 2.4			V
R_i	Input Resistance (pin 8)	f = 1 kHz	60	100		KΩ
I_s	Drain Current	f = 1 kHz V_s = 14 V R_L = 4 Ω P_o = 5.5 W V_s = 18 V R_L = 4 Ω P_o = 9 W V_s = 22 V R_L = 8 Ω P_o = 8 W V_s = 24 V R_L = 16 Ω P_o = 5.3 W		 570 730 500 310		mA
η	Efficiency	V_s = 18 V f = 1 kHz R_L = 4 Ω P_o = 9 W		 72		%
BW	Small Signal Bandwidth (– 3 dB)	V_s = 18 V R_L = 4 Ω P_o = 1 W	40 to 40 000			Hz
G_v	Voltage Gain (open loop)	f = 1 kHz		75		dB
G_v	Voltage Gain (closed loop)	V_s = 18 V R_L = 4 Ω f = 1 kHz P_o = 1 W	39.5	40	40.5	dB

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
e_N	Total Input Noise	(°)	R_g = 50 Ω R_g = 1 KΩ R_g = 10 KΩ		1.2 1.3 1.5	 4.0	µV
		(°°)	R_g = 50 Ω R_g = 1 KΩ R_g = 10 KΩ		2.0 2.0 2.2	 6.0	µV
S/N	Signal to Noise Ratio	V_s = 18 V P_o = 9 W R_L = 4 Ω	R_g = 10 KΩ R_g = 0 (°)		92 94		dB
			R_g = 10 KΩ R_g = 0 (°°)		88 90		dB
SVR	Supply Voltage Rejection	V_s = 18 V f_{ripple} = 100 Hz	R_L = 4 Ω R_g = 10 KΩ	40	50		dB
T_{sd}	Thermal Shut-down Junction Temperature (°)				145		°C

Note : (°) Weighting filter = curve A.
(°°) Filter with noise bandwith : 22 Hz to 22 KHz.

Figure 1 : Quiescent Output Voltage vs. supply Voltage.

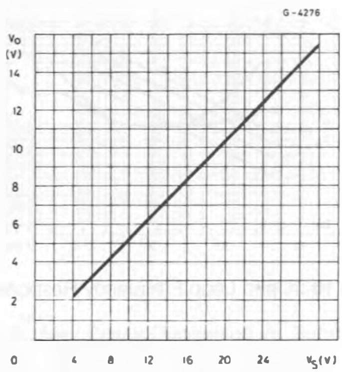


Figure 2 : Quiescent Drain Current vs. Supply Voltage.

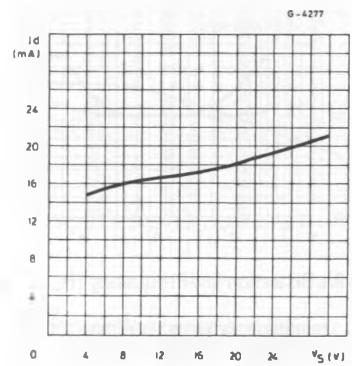


Figure 3 : Output Power vs. Supply Voltage.

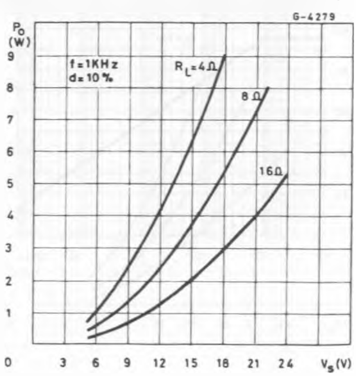


Figure 4 : Distortion vs. Output power (R_L = 16 Ω).

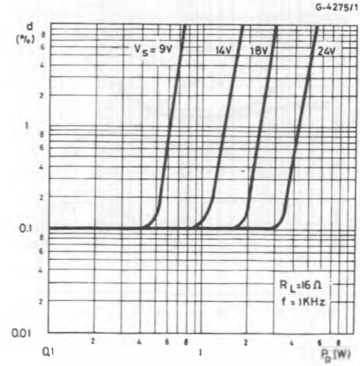


Figure 5 : Distortion vs. Output power (R_L = 8 Ω).

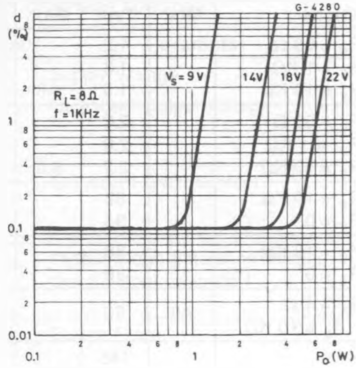


Figure 6 : Distortion vs. Output Power (R_L = 4 Ω).

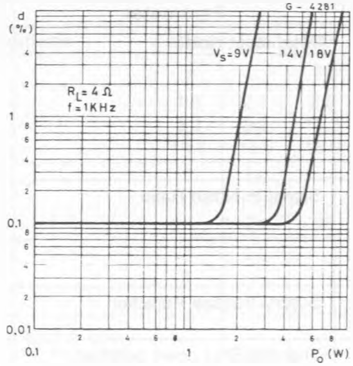


Figure 7 : Distortion vs. Frequency (R_L = 16 Ω).

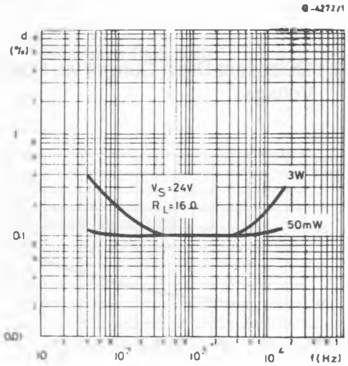


Figure 8 : Distortion vs. Frequency (R_L = 8 Ω).

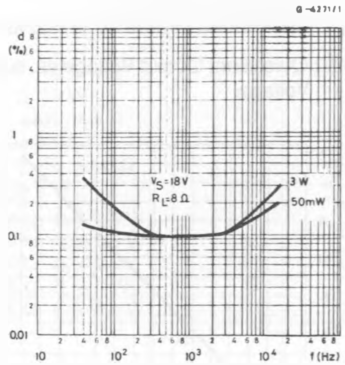


Figure 9 : Distortion vs. Frequency (R_L = 4 Ω).

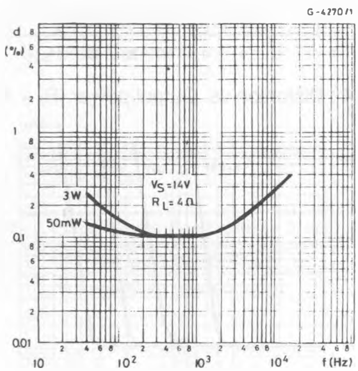


Figure 10 : Open Loop Frequency Response.

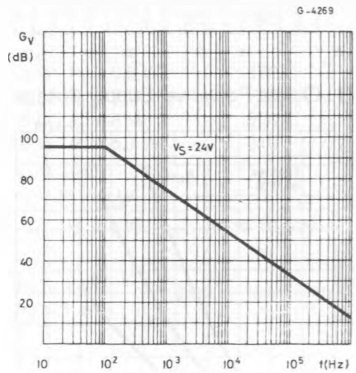


Figure 11 : Output power vs. Input Voltage.

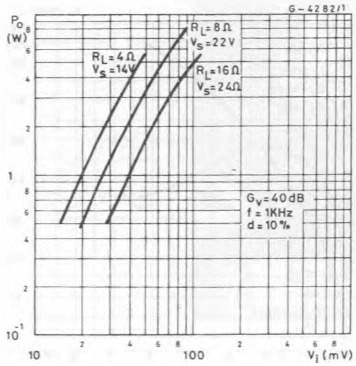


Figure 12 : Values of Capacitor C_x Versus Gain and Bw.

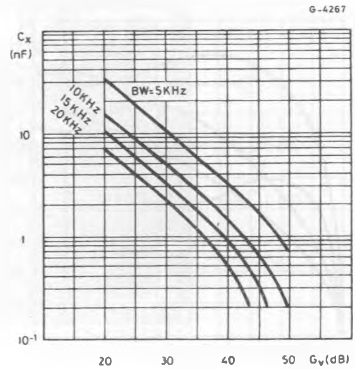


Figure 13 : Supply Voltage Rejection vs. Voltage Gain.

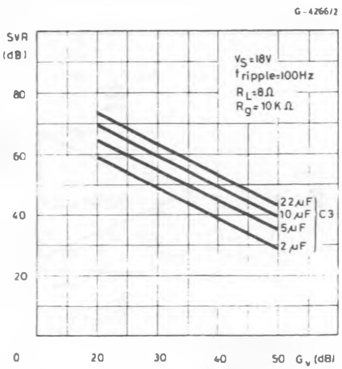


Figure 14 : Supply Voltage Rejection vs. Source Resistance..

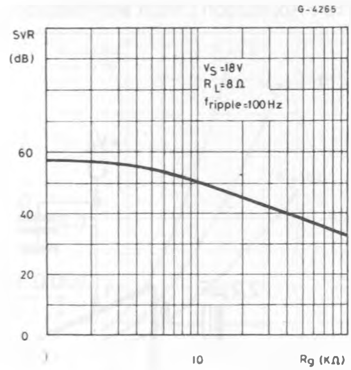


Figure 15 : Max Power Dissipation vs. Supply Voltage.

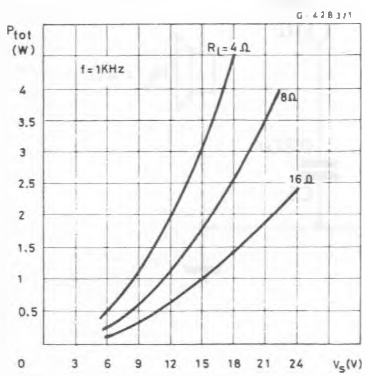


Figure 16 : Power Dissipation and Efficiency vs. Output Power (V_S = 14 V).

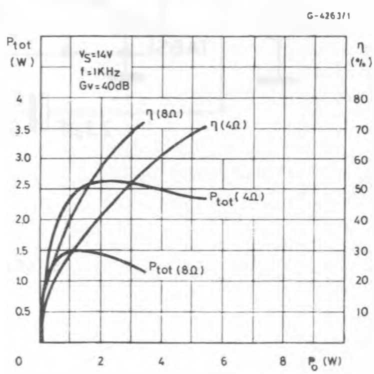


Figure 17 : Power Dissipation and Efficiency vs. Output Power (V_s = 18 V).

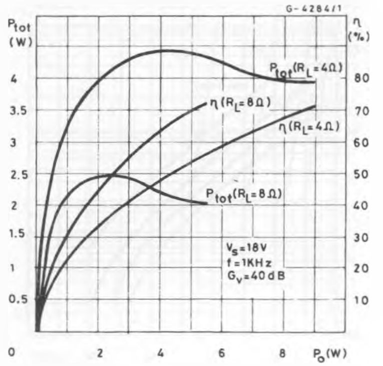
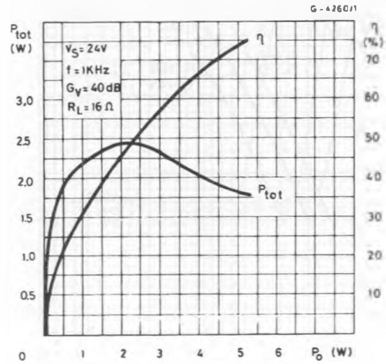
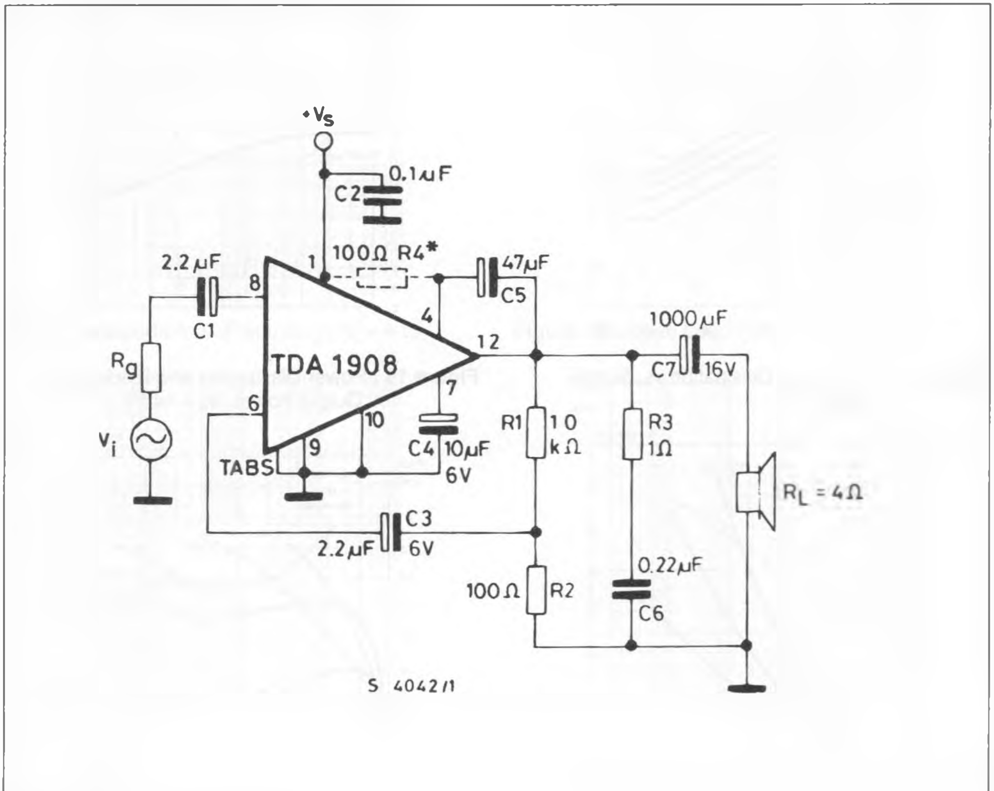


Figure 18 : Power Dissipation and Efficiency vs. Output Power (V_s = 24 V).



APPLICATION INFORMATION

Figure 19 : Application Circuit with Bootstrap.



* R4 is necessary when V_s is less than 10 V.

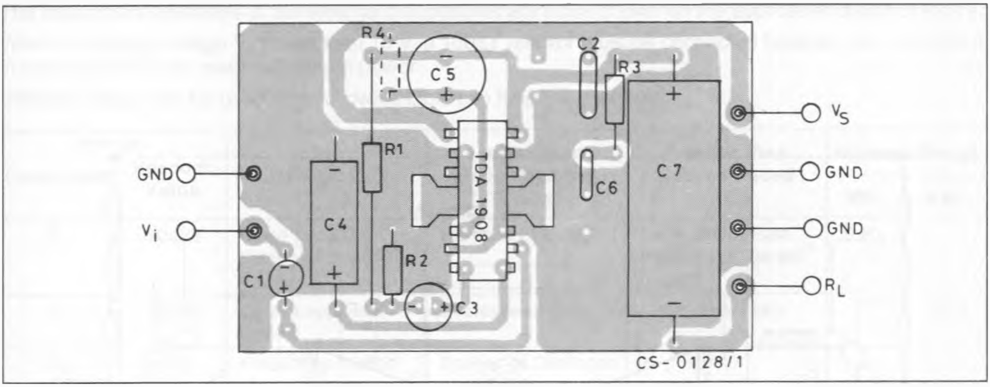


Figure 20 : P.C. Board and Component Layout of the Circuit of Fig. 19 (1 : 1 scale).

Figure 21 : Application Circuit without Bootstrap.

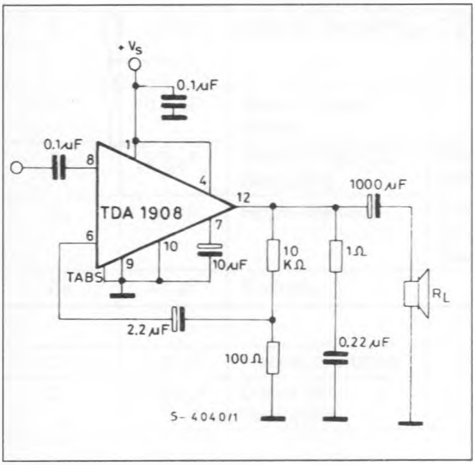


Figure 22 : Output Power vs. Supply Voltage (circuit of fig. 21).

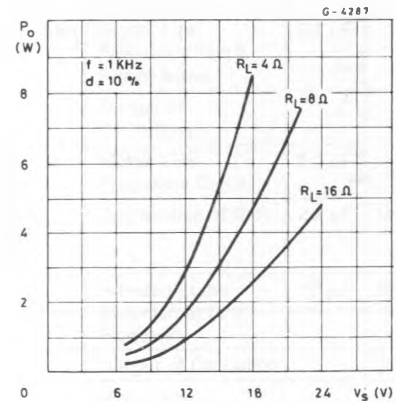
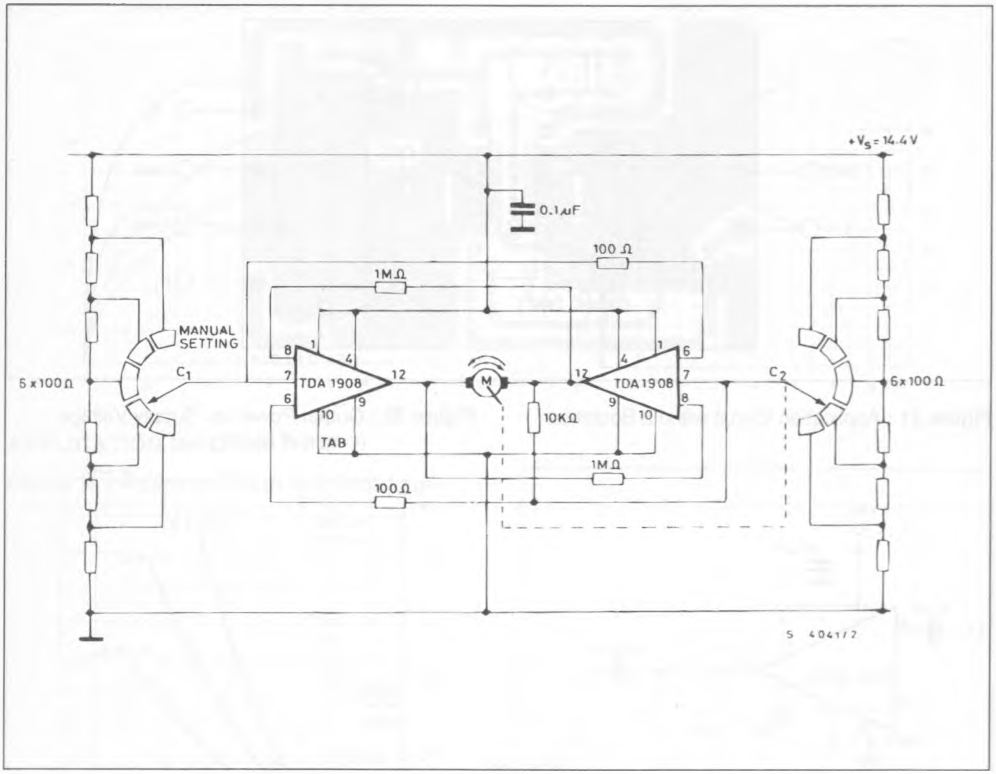


Figure 23 : Position Control for Car Headlights.



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APPLICATION SUGGESTION

The recommended values of the external components are those shown on the application circuit of fig. 19.

When the supply voltage V_s is less than 10 V, a 100 Ω resistor must be connected between pin 1 and pin 4 in order to obtain the maximum output power.

Different values can be used. The following table can help the designer.

Component	Raccom. Value	Purpose	Larger than Raccomanded Value	Smaller than Raccomanded Value	Allowed Range	
					Min.	Max.
R_1	10 KΩ	Close Loop Gain Setting.	Increase of Gain.	Decrease of Gain. Increase Quiescent Current.	9 R_2	
R_2	100 Ω	Close Loop Gain Setting.	Decrease of Gain.	Increase of Gain.		$R_1/9$
R_3	1 Ω	Frequency Stability	Danger of Oscillation at High Frequencies with Inductive Loads.			
R_4	100 Ω	Increasing of Output Swing with Low V_s.			47 Ω	330 Ω
C_1	2.2 µF	Input DC Decoupling.	Lower Noise	Higher Low Frequency Cutoff. Higher Noise.	0.1 µF	
C_2	0.1 µF	Supply Voltage Bypass.		Danger of Oscillations.		
C_3	2.2 µF	Inverting Input DC Decoupling.	Increase of the Switch-on Noise	Higher Low Frequency Cutoff.	0.1 µF	
C_4	10 µF	Ripple Rejection.	Increase of SVR. Increase of the Switch-on Time.	Degradation of SVR.	2.2 µF	100 µF
C_5	47 µF	Bootstrap		Increase of the Distortion at Low Frequency	10 µF	100 µF
C_6	0.22 µF	Frequency Stability		Danger of Oscillation		
C_7	1000 µF	Output DC Decoupling.		Higher Low Frequency Cutoff.		

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 above limit ambient temperature can be easily supported since the T_j cannot be higher than 150 °C.
2) The heatsink can have a smaller factor of safety compared with that of a conventional circuit. There is no possibility of device damage due to high junction temperature.

If, for any reason, the junction temperature increase up to 150 ° C, the thermal shut-down simply reduces the power dissipation and the current consumption.

The maximum allowable power dissipation depends upon the size of the external heatsink (i.e. its thermal resistance) ; fig. 26 shows the dissipable power as a function of ambient temperature for different thermal resistance.

Figure 24 : Output Power and Drain Current vs. Case Temperature.

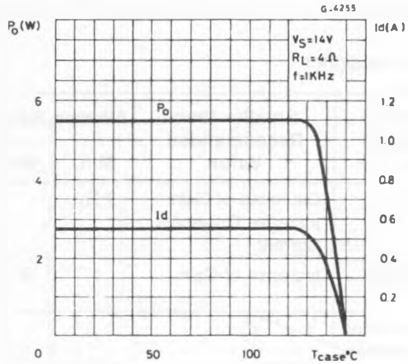


Figure 25 : Output Power and Drain Curent vs. Case Temperature.

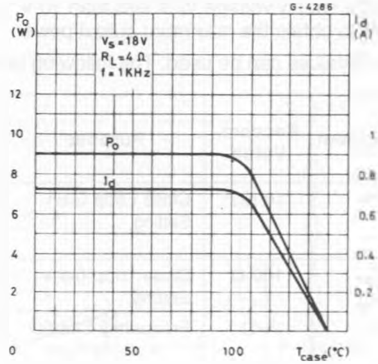
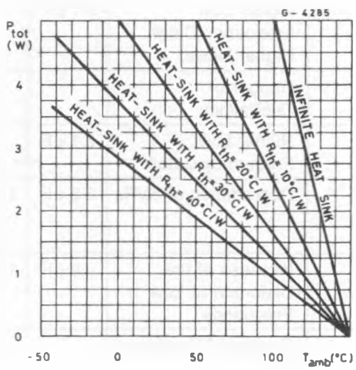


Figure 26 : Maximum Power Dissipation vs. Ambient Temperature.



MOUNTING INSTRUCTIONS

The thermal power dissipated in the circuit may be removed by soldering the tabs to a copper area on the PC board (see fig. 27).

During soldering, tab temperature must not exceed 260 °C and the soldering time must not be longer than 12 seconds.

Figure 27 : Mounding Example.

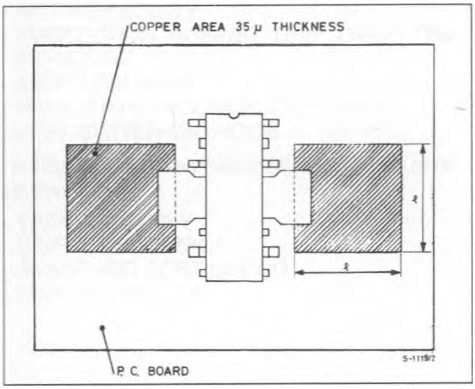


Figure 28 : Maximum Power Dissipation and Thermal Resistance vs. Side "∝".