

LINEAR INTEGRATED CIRCUITS

7 W AUDIO POWER AMPLIFIER WITH THERMAL SHUT-DOWN

The TBA810 S is a monolithic integrated circuit in a 12-lead quad in-line plastic package, intended for use as a low frequency class B amplifier.

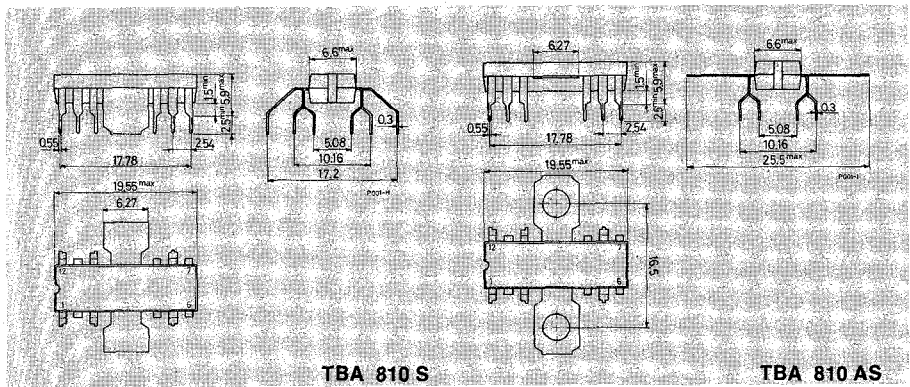
The TBA810 S provides 7 W output power at 16 V/4 Ω , 6 W at 14.4 V/4 Ω , 2.5 W at 9 V/4 Ω , 1 W at 6 V/4 Ω and works with a wide range of supply voltages (4 to 20 V); it gives high output current (up to 2.5 A), high efficiency (75% at 6 W output), very low harmonic and cross-over distortion. The circuit is provided with a thermal limiting circuit which fundamentally changes the criteria normally used in determining the size of the heatsink, in addition the TBA 810 S/AS can withstand short-circuit on the load for supply voltages up to 15 V.

ëThe TBA 810AS has the same electrical characteristics as the TBA 810S, but its cooling tabs are flat and pierced so that an external heatsink can easily be attached.

V_s	Supply voltage	20	v
I_o	Output peak current (non-repetitive)	3.5	A
→ I_o	Output peak current (repetitive)	2.5	A
→ P_{tot}	Power dissipation: at $T_{amb} \leq 80\text{ }^{\circ}\text{C}$ (for TBA 810 S) at $T_{tab} \leq 100\text{ }^{\circ}\text{C}$ (for TBA 810 AS)	1 5	w w
T_{stg}, T_j	Storage and junction temperature	-40 to 150	$^{\circ}\text{C}$

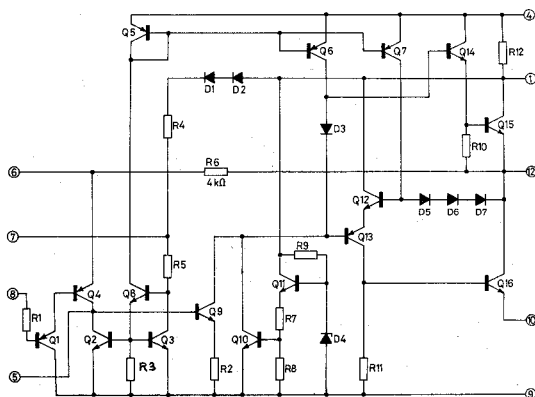
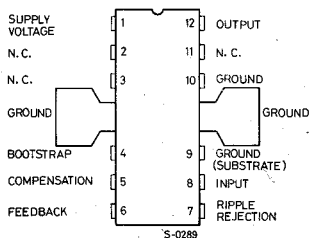
MECHANICAL DATA

Dimensions in mm

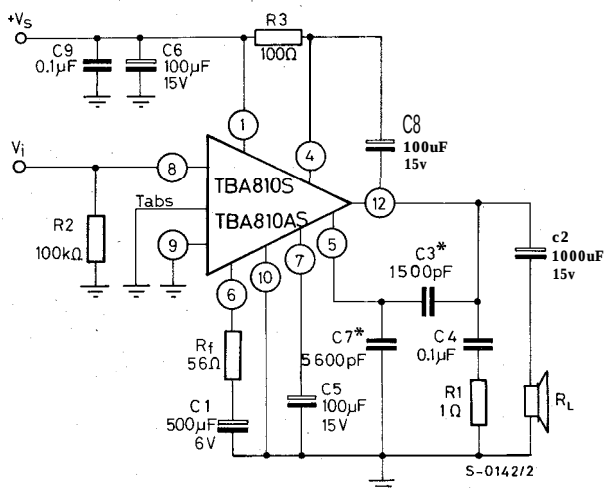


TBA 810S TBA 810AS

CONNECTION AND SCHEMATIC DIAGRAM



TEST AND APPLICATION CIRCUIT



* C3, C7 see fig. 6

THERMAL DATA

			TBA 810S	TBA 81 OAS
$R_{th \text{ j-tab}}$	Thermal resistance junction-tab	max	12 °C/W	10 °C/W
$R_{th \text{ j-amp}}$	Thermal resistance junction-ambient	max	70* °C/W	80 °C/W

* Obtained with tabs soldered to printed circuit with minimized copper area

ELECTRICAL CHARACTERISTICS (Refer to the test circuit; $T_{amb} = 25^{\circ}\text{C}$)

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
	V_s Supply voltage (pin 1)		4		20	V
	V_o Quiescent output voltage (pin 12)	$V_s = 14.4 \text{ V}$	6.4	7.2	8	V
	I_d Quiescent drain current			12	20	mA
→	I_b Bias current (pin 8)			0.4	4	μA
→	P_o Output power	$d = 10\%$ $R_L = 4 \Omega$ $f = 1 \text{ kHz}$ $V_s = 16 \text{ V}$ $V_s = 14.4 \text{ V}$ $V_s = 9 \text{ V}$ $V_s = 6 \text{ V}$	4.6	7 6 2.5 1		W W W W
	$V_{i(rms)}$ Input saturation voltage				220	mV
	V_i Input sensitivity	$P_o = 6 \text{ W}$ $V_s = 14.4 \text{ V}$ $R_L = 4 \Omega$ $f = 1 \text{ kHz}$ $R_f = 56 \Omega$ $R_f = 22 \Omega$		80 35		mV mV
	R_i Input resistance (pin 8)			5		MΩ
	1B Frequency response (-3 dB)	$V_s = 14.4 \text{ V}$ $R_L = 4 \Omega$ $C3 = 820 \text{ pF}$ $C3 = 1500 \text{ pF}$		40 to 20,000 40 to 10,000		Hz Hz

TBA 810S

TBA 810AS

ELECTRICAL CHARACTERISTICS (continued)

	Parameter	Test conditions	Min. Typ. Max.	Unit
	d Distortion	$P_o = 50 \text{ mW to } 3 \text{ W}$ $V_S = 14.4 \text{ V}$ $R_L = 4 \Omega$ $f = 1 \text{ kHz}$	0.3	%
	G _v Voltage gain (open loop)	$V_S = 14.4 \text{ V}$ $R_L = 4 \Omega$ $f = 1 \text{ kHz}$	80	dB
	G _v Voltage gain (closed loop)	$V_S = 14.4 \text{ V}$ $R_L = 4 \Omega$ $f = 1 \text{ kHz}$	34 37 40	dB
	e _N Input noise voltage	$V_S = 14.4 \text{ V}$ $R_g = 0$ B (-3 dB) = 20 Hz to 20,000 Hz	2	μV
	i _N input noise current	$V_S = 14.4 \text{ V}$ B (-3 dB) = 20 Hz to 20,000 Hz	0.1	nA
	Efficiency	$P_o = 5W$ $V_S = 14.4 \text{ V}$ $R_L = 4 \Omega$ $f = 1 \text{ kHz}$	70	%
→	SVR Supply voltage rejection	$V_S = 14.4 \text{ V}$ $R_L = 4 \Omega$ frippe = 100 Hz	48	dB
→	i _d Drain current	$P_o = 6W$ $V_S = 14.4 \text{ V}$ $R_L = 4 \Omega$	600	mA
→	* Thermal shut-down case temperature	$P_{tot} = 2.8 \text{ W}$	120	°C

*See figs. 7 and 16

Fig. 1 - Typical output power versus supply voltage

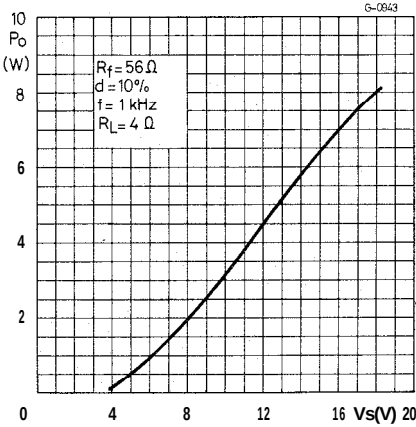


Fig. 2 - Maximum power dissipation versus supply voltage (sine wave operation)

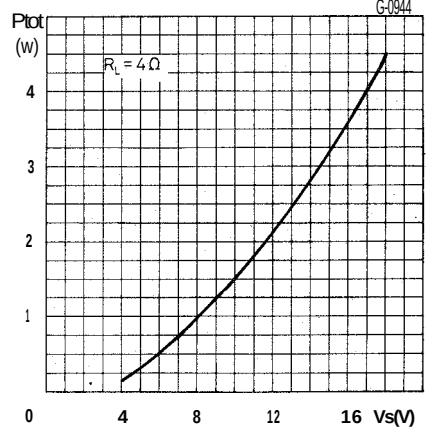


Fig. 3 - Typical distortion versus output power

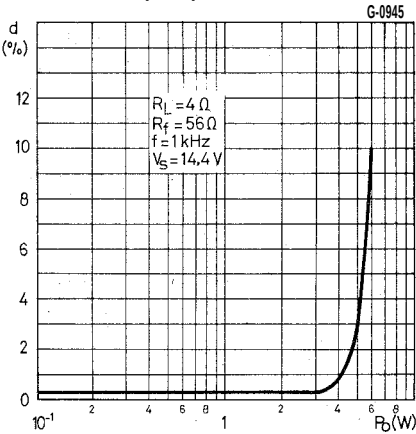


Fig. 4 - Typical distortion versus frequency

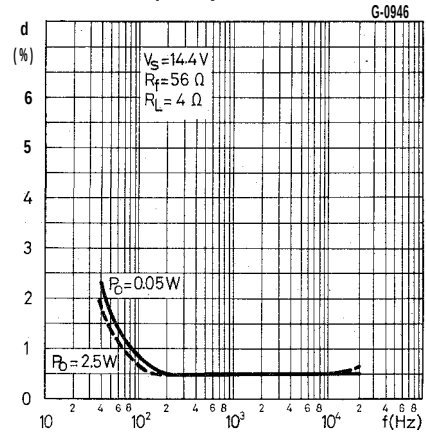


Fig. 5 - Typical relative voltage gain (closed loop) and typical input voltage versus feedback resistance (R_f)

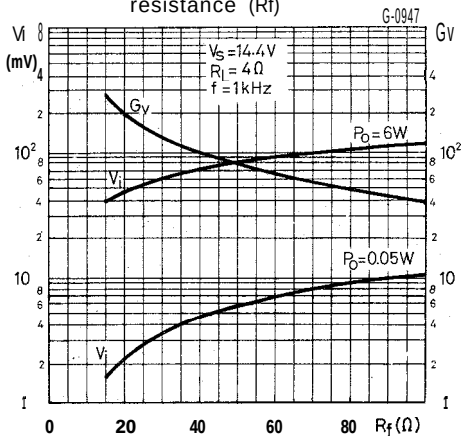


Fig. 6 - Typical value of C_3 versus R_f for various values of B

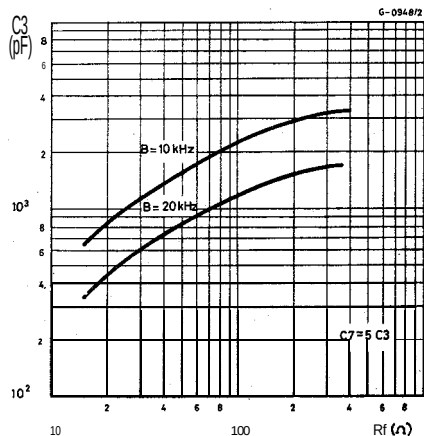


Fig. 7 - Typical power dissipation and efficiency versus output power

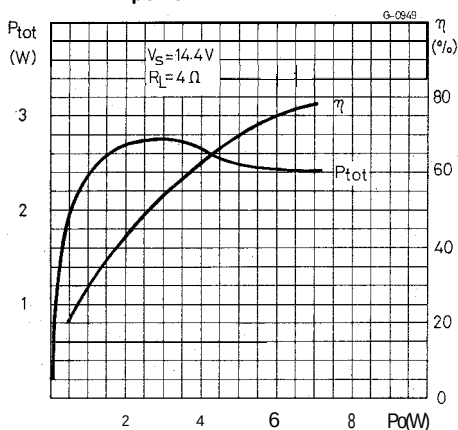


Fig. 8 - Typical quiescent output voltage (pin 12) versus supply voltage

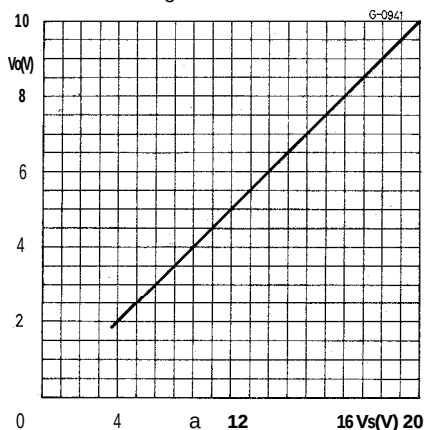


Fig. 9 - Typical quiescent current versus supply voltage

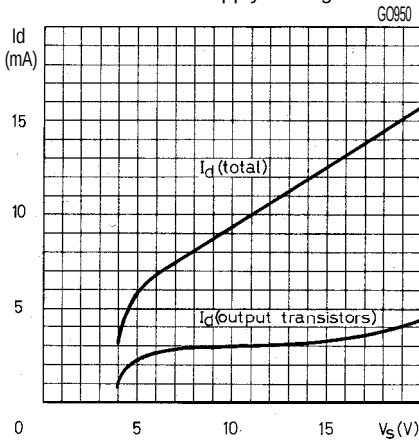
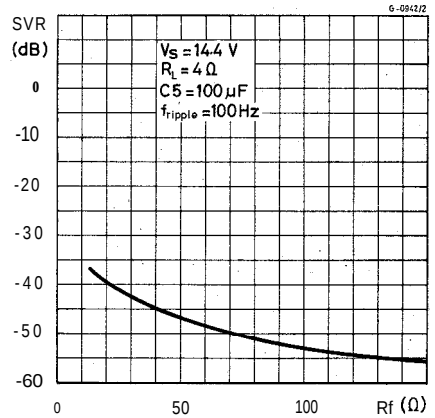
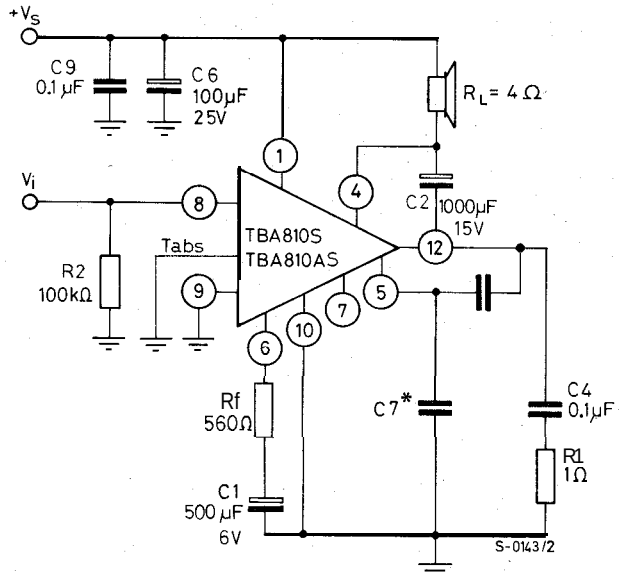


Fig. 10 - Typical supply voltage rejection



For portable equipment the circuit in Fig. 11 has the advantages of fewer external components and a better behaviour at low supply voltages (down to 4 V).

Fig. 11 - Typical circuit with load connected to the supply voltage



* C_3 , C_7 see fig. 6

TBA 810S TBA 810AS

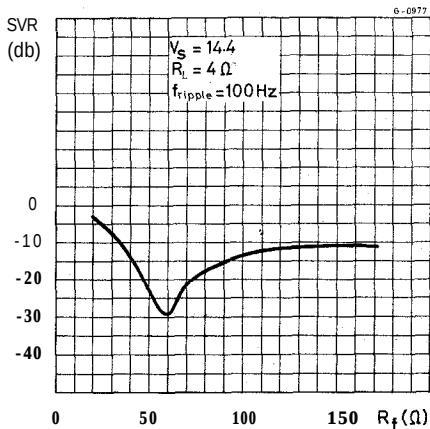


Fig. 12 - Typical supply voltage rejection versus R_f (fig. 11 circuit)

MOUNTING INSTRUCTIONS

The thermal power dissipated in the circuit may be removed by connecting the tabs to an external heat sink (TBA 810 AS - fig. 13) or by soldering them to an area of copper on the printed circuit board (TBA 810s - fig. 14).

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

Fig. 15a and 15b show two ways that can be used for mounting the device.

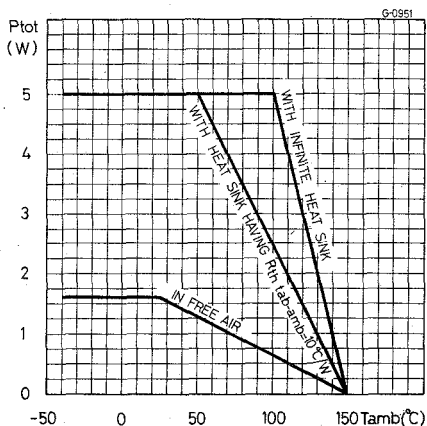


Fig. 13 - Maximum power dissipation versus ambient temperature (for TBA 810 AS only)

Fig. 14 - Maximum power dissipation versus copper area ,of the P.C. board
(for TBA 810s only)

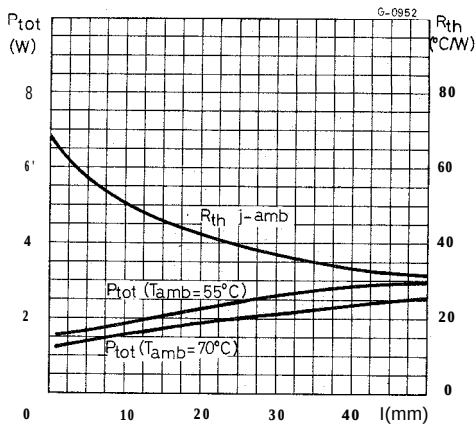
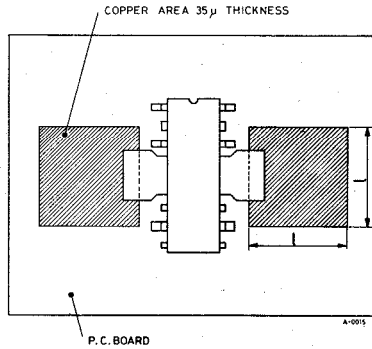


Fig. 15a shows a method, of mounting the TBA 810S that is satisfactory both from the point of view of heat dissipation and from mechanical considerations. For TBA 810AS the desired thermal resistance is obtained by fixing the elements shown in fig. 15b, to a suitably dimensioned plate. This plate can also act as a support for the whole printed circuit board; the mechanical stresses do not damage the integrated circuit. This is firmly fixed to the element, in fig. 15b.

Fig. 15a

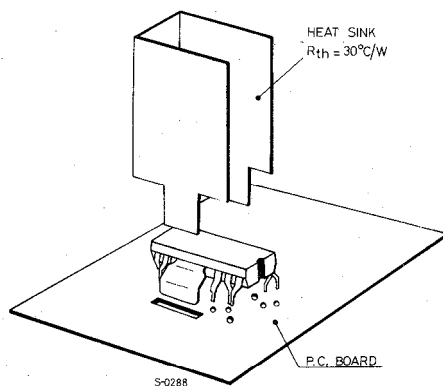
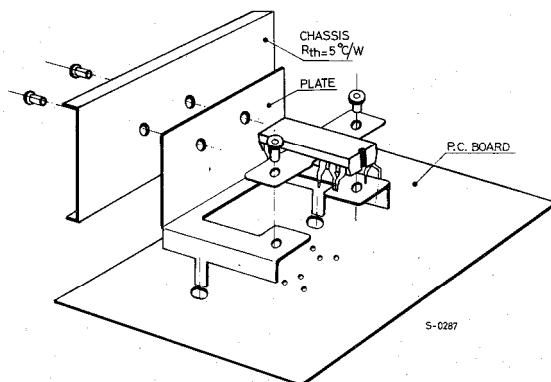


Fig. 15b



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
- 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 too high a junction temperature: all that happens is that P_o (and therefore P_{tot}) and I_d are reduced (fig. 16).

Fig. 16 - Output power and drain current versus package temperature

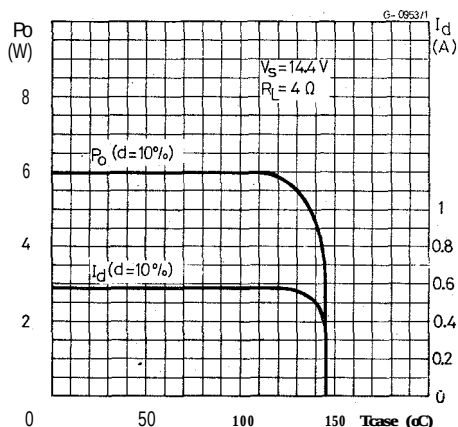


Fig. 17 - P.C. board and component layout for the test and application circuit

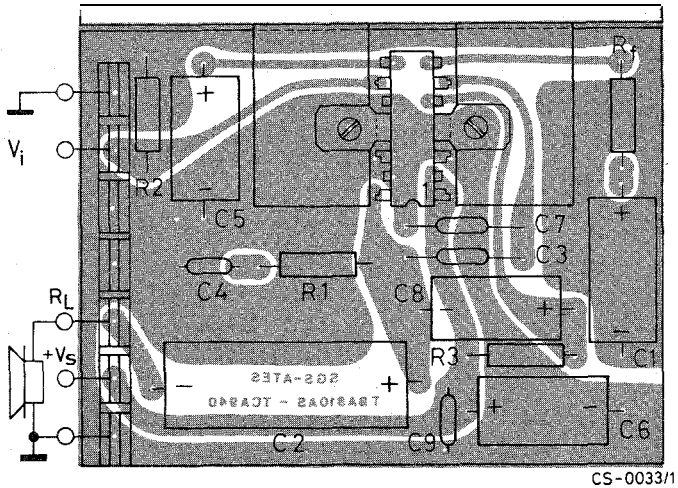


Fig. 18 - P.C. board and component layout for the fig. 11 circuit

