Fig. 15

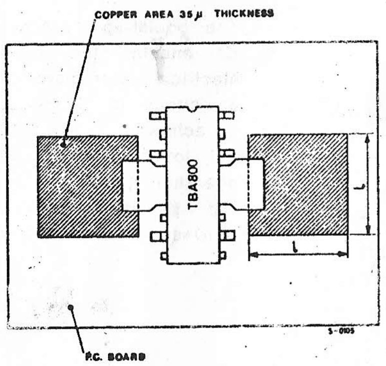


Fig. 16

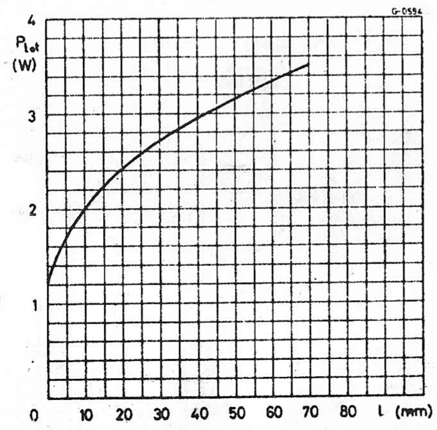
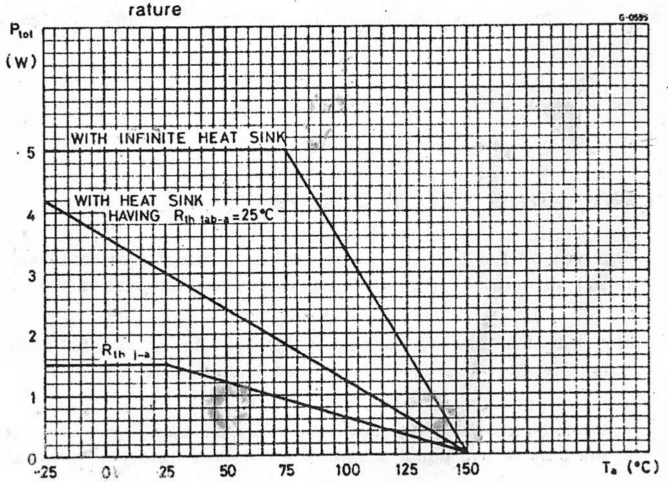


Fig. 17 - Maximum power dissipation versus ambient temperature



ATES

MONOLITHIC SILICON IC TBA 800

PRELIMINARY DATA

GENERAL INFORMATION

TYPICAL APPLICATION: AUDIO POWER AMPLIFIER

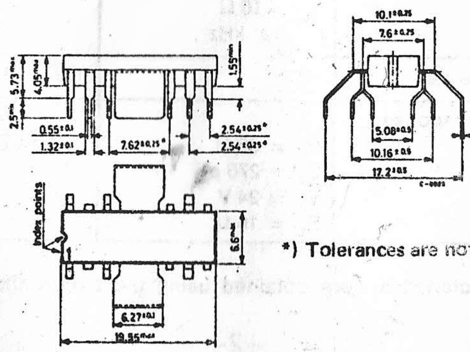
The TBA 800 is an integrated monolithic power amplifier in a 12-lead dual-in-line plastic package with leads specially formed to facilitate automatic insertion of the device in suitably punched printed-circuit boards. The external cooling tabs enable 2.5 W power output to be achieved without external heat-sink and 5 W power output using a small area of the P.C. board Copper as a heat sink.
It is intended for use as a low frequency Class B amplifier.
The TBA 800 provides 5 W power output at 24 V/16 Ω and works with a wide range of supply voltages (5-30 V); it gives high output current (up to 1 A), high efficiency (70% at 4 W output), very low harmonic distortion and no cross-over distortion.

ABSOLUTE MAXIMUM RATINGS

V_s	Supply voltage	30	V
I_o	Output peak current (non repetitive)	2	A
I_o	Output current (repetitive)	1	A
P_{tot}	Power dissipation: at $T_a = 70$ °C	1	W
	at $T_{tab} = 75$ °C	5	W
T_s	Storage temperature	-25÷85	°C
T_j	Junction temperature	-25÷150	°C

MECHANICAL DATA

Dimensions in mm



*) Tolerances are not cumulative

TBA 800

THERMAL DATA

$R_{th\ j-tab}$	Thermal resistance junction-tab	Typ.	15	°C/W
$R_{th\ j-a}$	Thermal resistance junction-ambient	Typ.	80	°C/W

ELECTRICAL CHARACTERISTICS (☆) (T_a = 25 °C)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
V_s	Supply voltage		5		30	V	—
I_o	Output peak current				1	A	—
V_o	Quiescent output voltage (pin 12)	V_s = 24 V	11	12	13	V	2
I_d	Quiescent drain current	V_s = 24 V		8.5	20	mA	2
I_b	Bias current	V_s = 24 V		1		µA	—
P_o	Power output	d = 10 % V_s = 24 V R_L = 16 Ω f = 1 kHz		5		W	2
P_o	Power output	d = 2% V_s = 24 V R_L = 16 Ω f = 1 kHz		4		W	2
V_i	Input sensitivity	P_o = 5 W V_s = 24 V R_L = 16 Ω f = 1 kHz		70		mV	2
R_i	Input resistance		1	5		MΩ	—
B	Frequency response (-3 dB)	R_f = 56 Ω C_4* = 270 pF V_s = 24 V R_L = 16 Ω		35÷20000		Hz	2

(☆) The above characteristics were obtained using the circuit shown in fig. 2

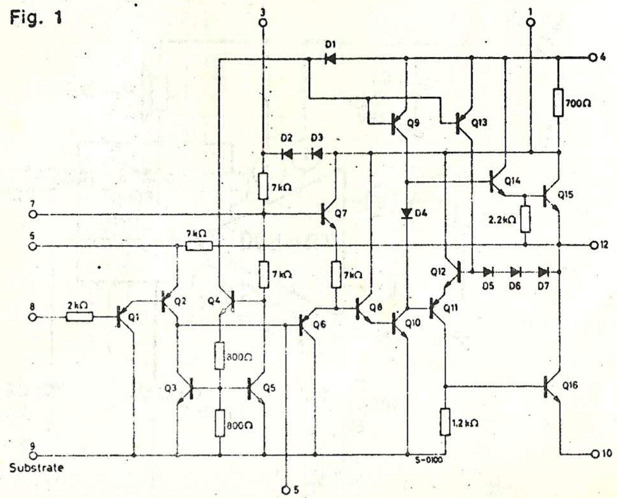
* See fig. 7

ELECTRICAL CHARACTERISTICS (continued)

	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	Fig.
d	Distortion	P_o = 50 mW ÷ 2.5 W V_s = 24 V R_L = 16 Ω f = 1 kHz		0.5		%	2
G_v	Voltage gain	V_s = 24 V R_L = 16 Ω f = 1 kHz	40	43	46	dB	2
G_v	Voltage gain (open loop)	V_s = 24 V R_L = 16 Ω f = 1 kHz		74		dB	2
e_n	Input noise			10		µV	2
η	Efficiency	P_o = 4 W V_s = 24 V R_L = 16 Ω f = 1 kHz		70		%	2

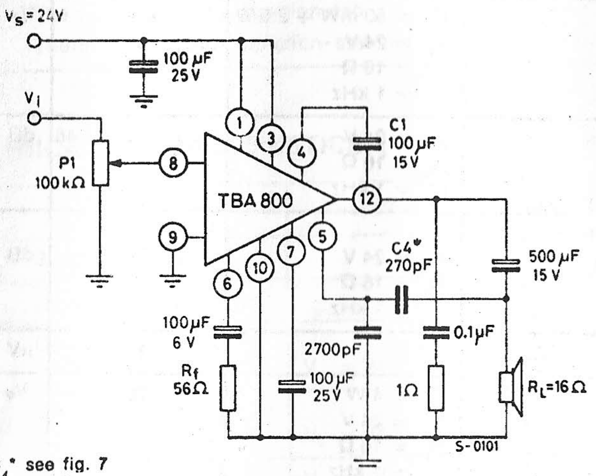
SCHEMATIC DIAGRAM

Fig. 1



TEST CIRCUIT

Fig. 2

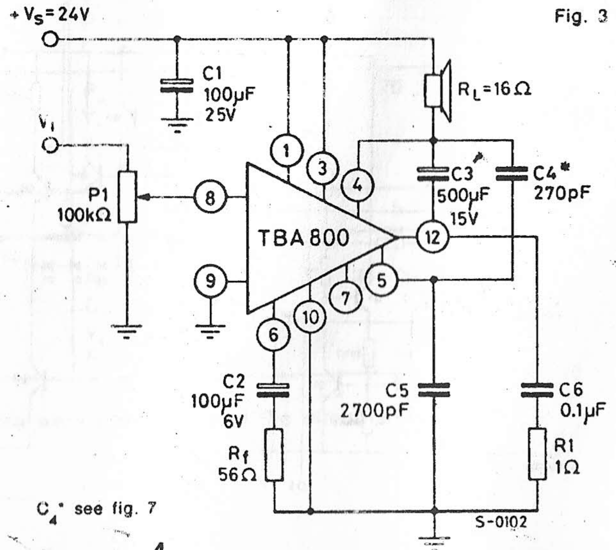


C_4* see fig. 7

APPLICATION INFORMATIONS

Circuit with the load connected to the supply voltage (fig. 3)

Fig. 3



This configuration entails a smaller number of external components and can be used at low supply voltages

C_4* see fig. 7

Fig. 4 - Power output versus supply voltage (fig. 2 circuit)

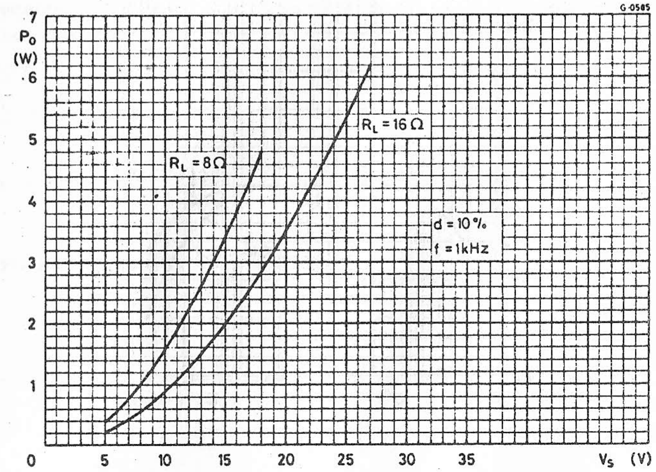


Fig. 5 - Distortion versus power output (fig. 2 circuit)

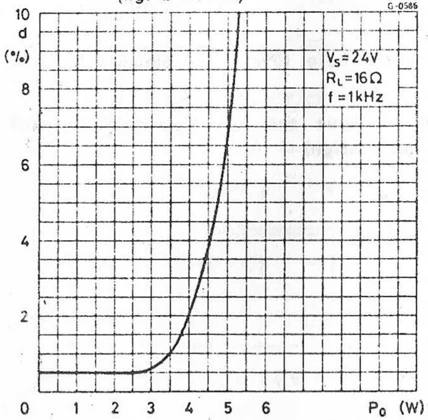


Fig. 6 - Distortion versus frequency (fig. 2 circuit)

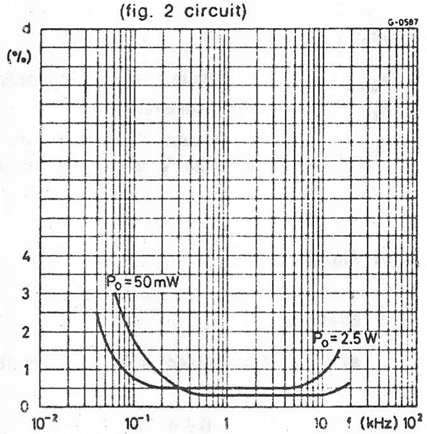
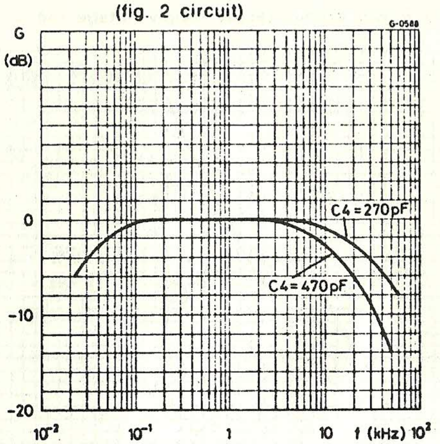


Fig. 7 - Frequency response
(fig. 2 circuit)



PROCEDURE TO CALCULATE AREA OF COPPER NEEDED

1) Calculate maximum power dissipation

$$P_{tot} = 0.4 \cdot \frac{V_{S\,max}^2}{8\,R_L} + V_{S\,max}\,I_d$$

where

$V_{S\,max}$ = maximum value of supply voltage (increase 10% if not stabilized)

R_L = load resistance

I_d = quiescent drain current; for typical value see fig. 10; maximum value at V_S = 24 V is 20 mA (for worst case design)

2) Fig. 16 gives l

Examples:

a) V_S (not stabilized) = 24 V; R_L = 16 Ω

$$P_{tot} = 0.4 \cdot \frac{(24 + 2.4)^2}{8 \cdot 16} + (24 + 2.4) \cdot 20 \cdot 10^{-3} = 2.6 \text{ W}$$

From fig. 16 $l \cong 25$ mm

For geometries different from the one of fig. 15 note that copper areas near the tabs have better efficiency as regards power dissipation. Therefore additional safety factors must be added for worst case designs

b) V_S (stabilized) = 12 V; R_L = 8 Ω

$$P_{tot} = 0.4 \cdot \frac{12^2}{8 \cdot 8} + 0.02 \cdot 12 = 1 \text{ W}$$

The fig. 16 shows that no heat sink is required if $T_a \leq 55\,°C$

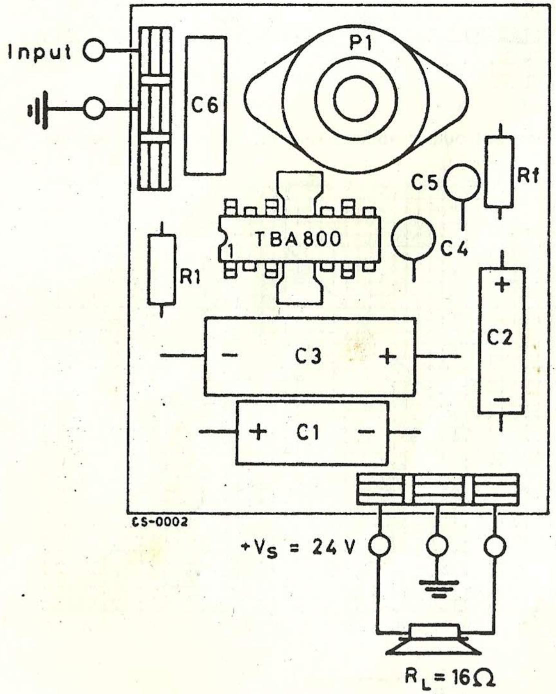


Fig. 18 - P.C. board layout (fig. 3 circuit)

Fig. 8 - Power dissipation and efficiency versus power output (fig. 2 circuit)

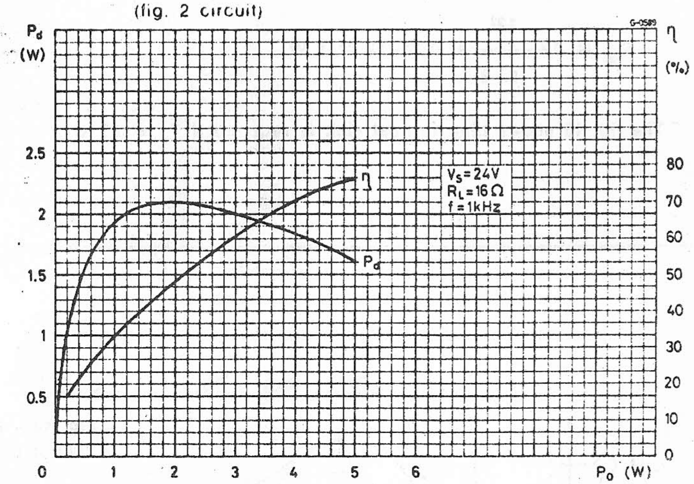


Fig. 9 - Quiescent output voltage (pin 12) versus supply voltage (fig. 2 circuit)

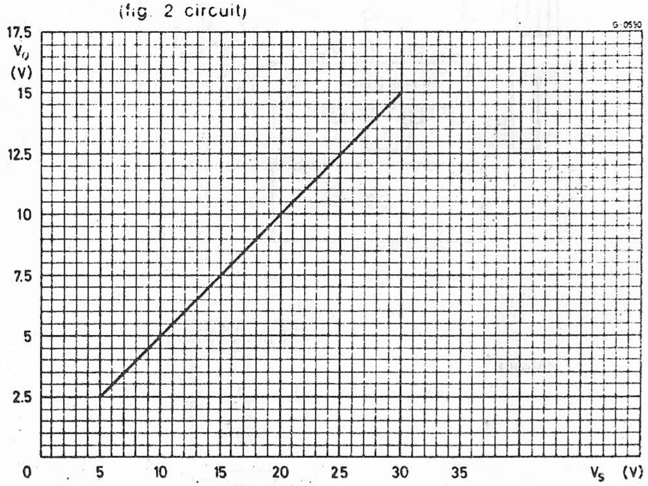
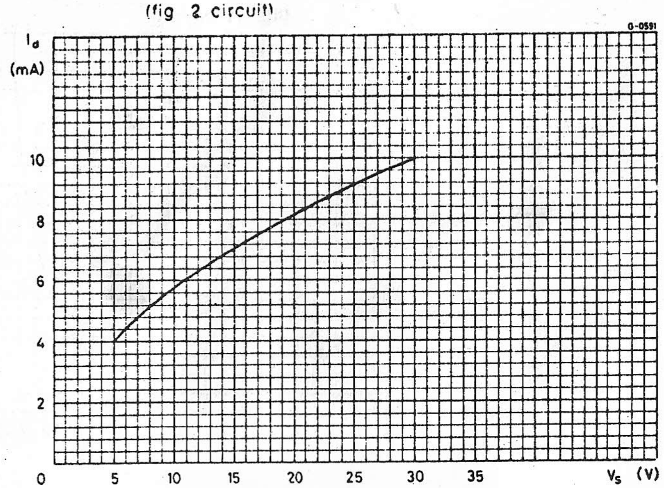
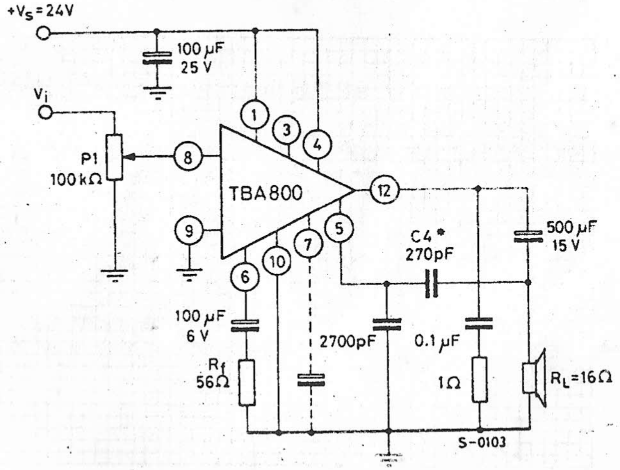


Fig. 10 - Total quiescent current versus supply voltage (fig 2 circuit)



Circuits with load connected to earth (fig. 11 and 14)

Fig. 11



C_4* see fig. 7

There is no bootstrap connection and hence there is a greater loss of potential output swing.

This circuit is only for use at high voltages.

In the absence of "bootstrap", the reduction in the upper part of the wave is greater than that in the lower part: if pin 3 is left open circuit, this automatically inserts diodes D2-D3 (see fig. 1) and this enambles a symmetrical wave to be obtained at the output.