TBA810S/TBA810AS TBA810DS/TBA810DAS
7 WATT AUDIO POWER AMPLIFIERS
FAIRCHILD LINEAR INTEGRATED CIRCUITS

GENERAL DESCRIPTION – The TBA810S is a monolithic integrated circuit in a 12-lead plastic power package intended for use as a low frequency class B power amplifier. It is constructed using the Fairchild Planar* epitaxial process. With a 4 Ω speaker impedance, it typically provides 7 W at 16 V, 6 W at 14.4 V, 2.5 W at 9 V, and 1 W at 6.0 V. It offers high output current capability (up to 2.5 A), high efficiency (75% at 6 W output) and very low harmonic and crossover distortion.

The TBA810AS has the same electrical characteristics as the TBA810S, but its cooling tabs are flat and provide mounting holes for heat sink attachment.

The TBA810DS is electrically the same as the TBA810S except it includes an overvoltage protection circuit (load dump circuit). This feature makes the TBA810DS ideally suitable for car radio applications.

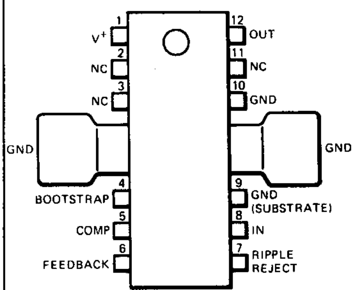
The TBA810DAS has the same electrical characteristics as the TBA810DS, but the cooling tabs are flat and provide mounting holes.

- **THERMAL SHUTDOWN**
- **OVERVOLTAGE PROTECTION (TBA810DS, TBA810DAS)**
- **WIDE SUPPLY VOLTAGE RANGE (4 V TO 20 V)**
- **HIGH CURRENT CAPABILITY (2.5 A)**
- **12-LEAD POWER PACKAGE**

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	20 V
Output Peak Current (Non-Repetitive)	3.5 A
Output Current (Repetitive)	2.5 A
Input Voltage	220 mVrms
Power Dissipation: at T_A = 70°C	1.0 W
at T_C = 100°C	5.0 W
Storage and Junction Temperature	–40 to 150°C
Lead Temperature (Soldering, 12 s)	230°C

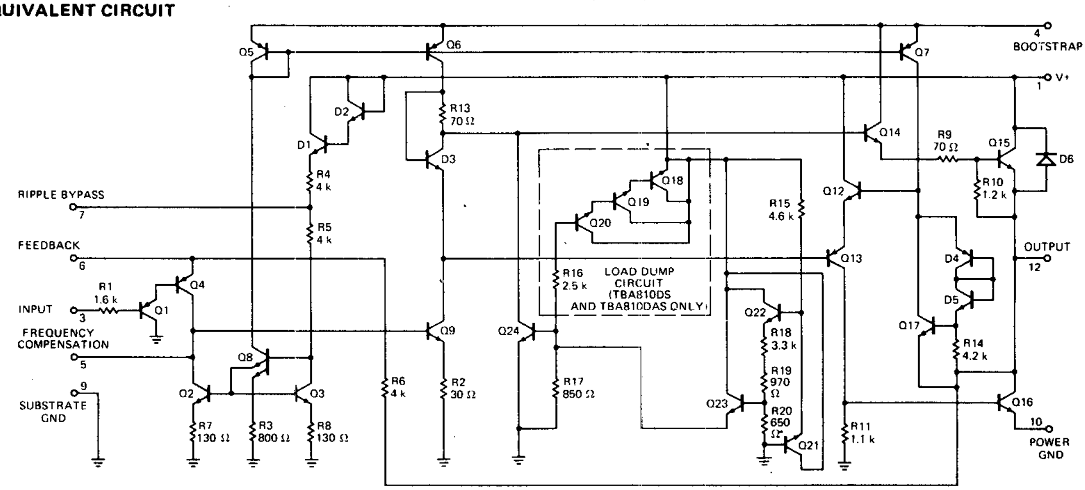
CONNECTION DIAGRAM
12-LEAD POWER PACKAGE
(TOP VIEW)
PACKAGE OUTLINE 9W
PACKAGE CODES P3, P4



ORDER INFORMATION

TYPE	PART NO.
810S(P3)	TBA810S
810DS(P3)	TBA810DS
810AS(P4)	TBA810AS
810DAS (P4)	TBA810DAS

EQUIVALENT CIRCUIT



*Planar is a patented Fairchild process.

ELECTRICAL CHARACTERISTICS (Refer to the test circuit: $T_A = 25°C$)

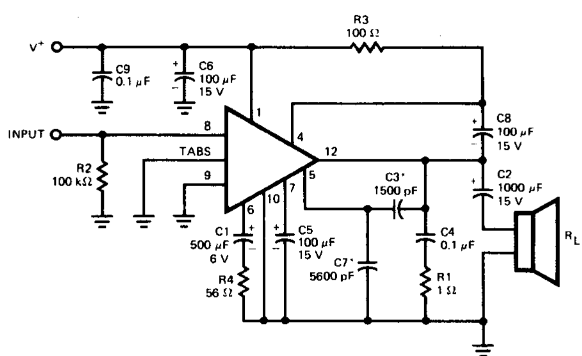
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Quiescent Output Voltage (Pin 12)	V+ = 14.4 V	6.4	7.2	8.0	V
Quiescent Drain Current (Pin 1)			12	20	mA
Bias Current (Pin 8)			0.4		μA
Power Output	THD = 10%, R_L = 4.0 Ω, f = 1.0 kHz				
	V+ = 16 V		7.0		W
	V+ = 14.4 V		6.0		W
	V+ = 9.0 V		2.5		W
	V+ = 6.0 V		1.0		W
Input Sensitivity	P_{OUT} = 6 W, V+ = 14.4 V, R_L = 4.0 Ω, f = 1.0 kHz				
	R_f = 56 Ω		80		mV
	R_f = 22 Ω		35		mV
Input Resistance (Pin 8)			5.0		MΩ
Frequency Response (−3.0 dB)	V+ = 14.4 V, R_L = 4.0 Ω				
	C3 = 820 pF		40 to 20,000		Hz
	C3 = 1500 pF		40 to 10,000		Hz
Total Harmonic Distortion	P_{OUT} = 50 mW to 3 W, V+ = 14.4 V, R_L = 4.0 Ω, f = 1.0 kHz		0.3		%
Voltage Gain (Open Loop)	V+ = 14.4 V, R_L = 4.0 Ω, f = 1.0 kHz		80		dB
Voltage Gain (Closed Loop)	V+ = 14.4 V, R_L = 4.0 Ω, f = 1.0 kHz	34	37	40	dB
Input Noise Voltage	V+ = 14.4 V, R_g = 0, BW (−3.0 dB) = 20 Hz to 20,000 Hz		2.0		μV
Input Noise Current	V+ = 14.4 V, BW(−3.0 dB) = 20 Hz to 20,000 Hz		0.1		nA
Efficiency	P_{OUT} = 5 W, V+ = 14.4 V, R_L = 4.0 Ω, f = 1.0 kHz		70		%
Supply Voltage Rejection	V+ = 14.4 V, R_L = 4.0 Ω, f_{ripple} = 100 Hz		38		dB

THERMAL DATA

		TBA810S/DS	TBA810AS/DAS
θ_{JC}	Thermal Resistance Junction to Case (tab)	12°C/W	10°C/W
θ_{JA}	Thermal Resistance Junction to Ambient	70°C/W**	80°C/W

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

TEST AND APPLICATION CIRCUIT



*C3, C7 See Fig. 6

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TYPICAL PERFORMANCE CURVES FOR TBA810S/TBA810AS/TBA810DS/TBA810DAS

POWER OUTPUT AS A FUNCTION OF SUPPLY VOLTAGE

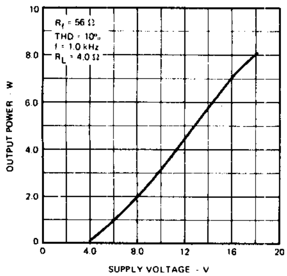

Fig. 1

MAXIMUM POWER DISSIPATION AS A FUNCTION OF SUPPLY VOLTAGE (SINE WAVE OPERATION)

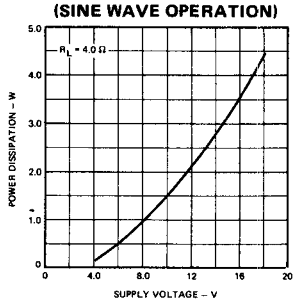

Fig. 2

TOTAL HARMONIC DISTORTION AS A FUNCTION OF POWER OUTPUT

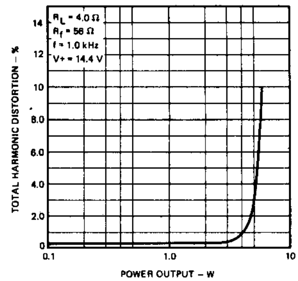

Fig. 3

TOTAL HARMONIC DISTORTION AS A FUNCTION OF FREQUENCY

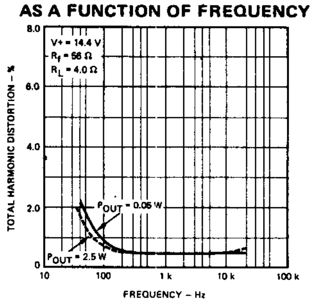

Fig. 4

TYPICAL RELATIVE VOLTAGE GAIN (CLOSED LOOP) AND TYPICAL INPUT VOLTAGE AS A FUNCTION OF FEEDBACK RESISTANCE (R_f)

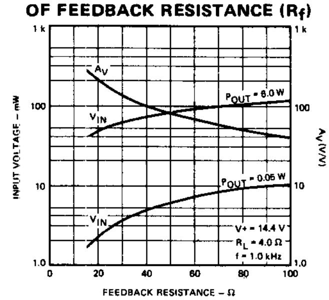

Fig. 5

TYPICAL VALUE OF C3 AS A FUNCTION OF R_f FOR VARIOUS VALUES OF BANDWIDTH

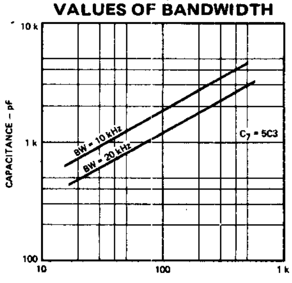

Fig. 6

TYPICAL POWER DISSIPATION AND EFFICIENCY AS A FUNCTION OF POWER OUTPUT

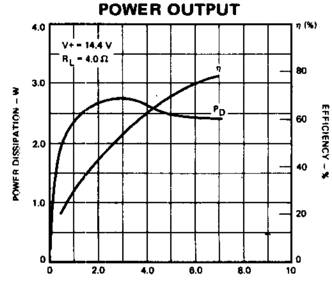

Fig. 7

TYPICAL PERFORMANCE CURVES FOR TBA810S/TBA810AS/TBA810DS/TBA810DAS (Cont'd)

TYPICAL QUIESCENT OUTPUT VOLTAGE (PIN 12) AS A FUNCTION OF SUPPLY VOLTAGE

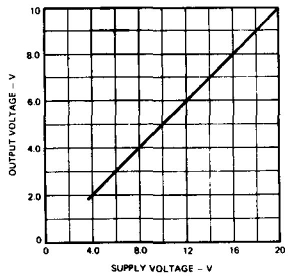

Fig. 8

TYPICAL QUIESCENT CURRENT AS A FUNCTION OF SUPPLY VOLTAGE

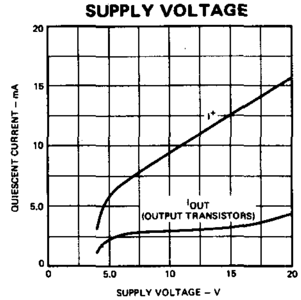

Fig. 9

TYPICAL SUPPLY VOLTAGE REJECTION AS A FUNCTION OF FEEDBACK RESISTANCE

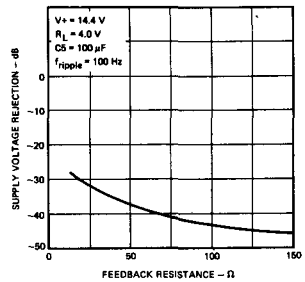

Fig. 10

TYPICAL CIRCUIT WITH LOAD CONNECTED TO THE SUPPLY VOLTAGE

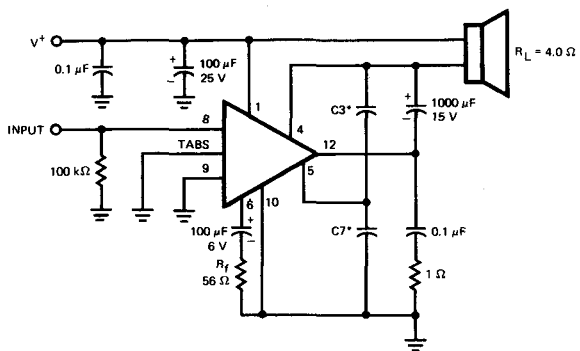

Fig. 11

*C3, C7 see Fig. 6.

TYPICAL SUPPLY VOLTAGE REJECTION AS A FUNCTION OF R_f (FIG. 11 CIRCUIT)

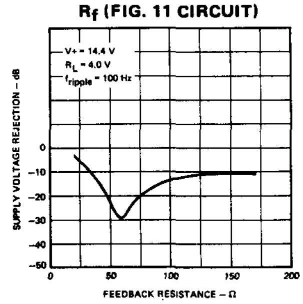

Fig. 12

MOUNTING INSTRUCTIONS

The thermal power dissipated in the circuit may be removed by connecting the tabs to an external heat sink (TBA810AS/TBA810DAS, Figure 13) or by soldering them to an area of copper on the printed circuit. (TBA810S/TBA810DS, Figure 14). During soldering, the tabs temperature must not exceed 230°C and the soldering time must not be longer than 12 seconds. Figures 15a and 15b show two ways that can be used for mounting the device.

MAXIMUM POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE (TBA810AS AND TBA810DAS)

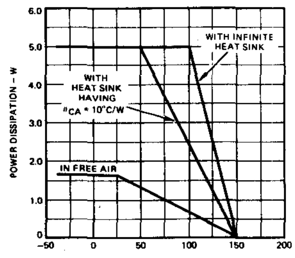

Fig. 13

MAXIMUM POWER DISSIPATION AND TOTAL THERMAL RESISTANCE AS A FUNCTION OF COPPER AREA OF PC BOARD (TBA810S AND TBA810DS)

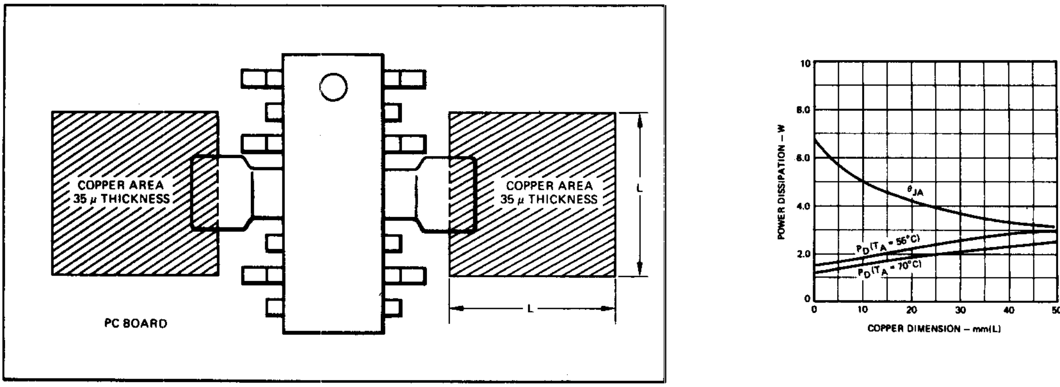

Fig. 14

Figure 15a shows a method of mounting the TBA810S or TBA810DS that is satisfactory both from the point of view of heat dissipation and from mechanical considerations. For the TBA810AS and the TBA810DAS, the desired thermal resistance is obtained attaching the hardware shown in Figure 15b, to a bracket with proper dimensions. This bracket can also act as a support for the whole printed circuit board.

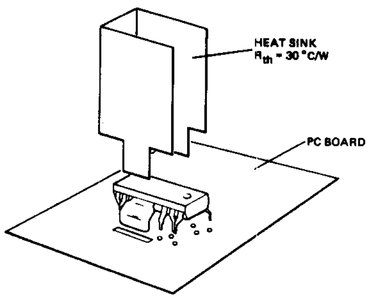

Fig. 15a

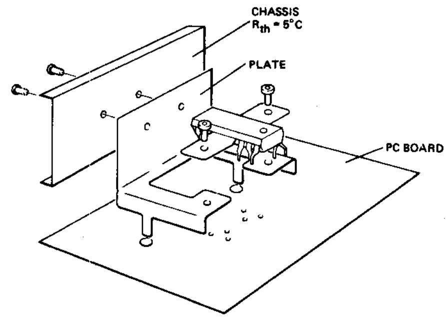

Fig. 15b

THERMAL SHUTDOWN

The on chip design of the thermal limiting circuit offers the following advantages:

1. An overload on the output (even if permanent) or an above-limit ambient temperature can be easily handled.
2. The heat sink can have a smaller factor of safety compared with that of a conventional circuit. In case of too high a junction temperature, power output, power dissipation and the supply current decrease (Figure 16) thus protecting the device.

OUTPUT POWER AND SUPPLY CURRENT AS A FUNCTION OF CASE TEMPERATURE

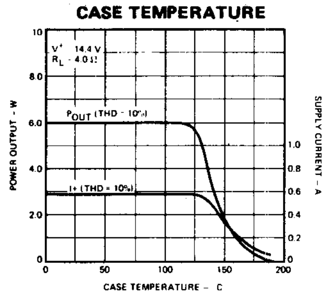

Fig. 16