4 W AUDIO POWER AMPLIFIER WITH D.C. VOLUME CONTROL

The TDA1013 is a monolithic integrated audio amplifier circuit with d.c. volume control in a 9-lead single in-line (SIL) plastic package. The wide supply voltage range makes this circuit very suitable for applications in mains-fed apparatus such as : television receivers and record players.
The d.c. volume control stage has a good control characteristic with a range of more than 80 dB; control can be obtained by means of a variable d.c. voltage between 4 and 8 V.
The audio amplifier has a well defined open loop gain and a fixed integrated closed loop gain. This offers an optimum in number of external components, performance and stability.
The SIL package (SOT-110A) offers a simple and low-cost heatsink connection.

QUICK REFERENCE DATA

Supply voltage range	V_P		15 to 35 V
Repetitive peak output current	I_{ORM}	max.	1,5 A
Total sensitivity (d.c. control at max. gain) for P_o = 2,5 W	V_i	typ.	55 mV
Audio amplifier			
Output power at d_{tot} = 10 % V_P = 18 V; R_L = 8 Ω	P_o	typ.	4,5 W
Total harmonic distortion at P_o = 2,5 W; R_L = 8 Ω	d_{tot}	typ.	0,5 %
Sensitivity for P_o = 2,5 W	V_i	typ.	125 mV
D.C. volume control unit			
Gain control range	ϕ	>	80 dB
Signal handling at $d_{tot} < 1\%$ (d.c. control at 0 dB)	V_i	>	1,2 V
Sensitivity for V_o = 125 mV at max. voltage gain	V_i	typ.	55 mV
Input impedance (pin 9)	$\|Z_i\|$	typ.	200 kΩ

PACKAGE OUTLINE

9-lead SIL; plastic (SOT-110A).

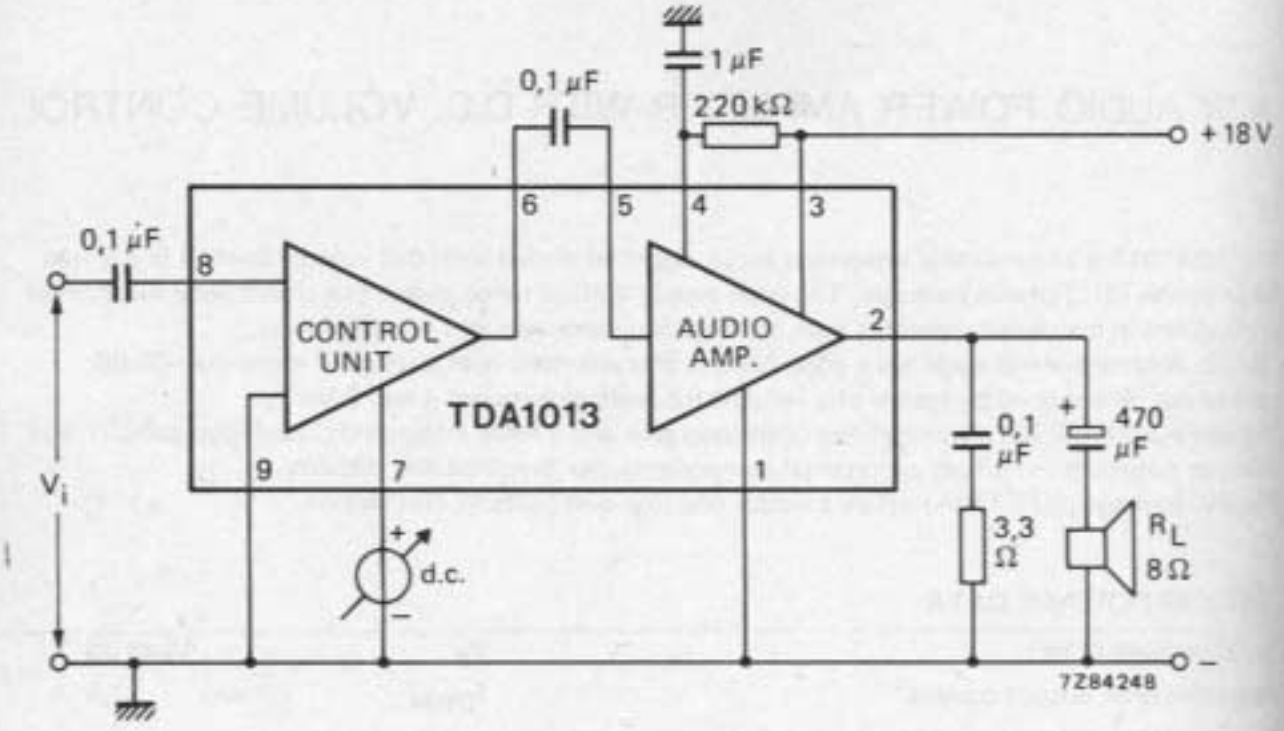

Fig. 1 Block diagram and external components.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Supply voltage	V_P	max.	35 V
Non-repetitive peak output current	I_{OSM}	max.	3 A
Repetitive peak output current	I_{ORM}	max.	1,5 A
Storage temperature	T_{stg}	–55 to +	150 °C
Crystal temperature	T_j	–25 to +	150 °C
Total power dissipation	see derating curve Fig. 2		

HEATSINK DESIGN

Assume V_P = 18 V; R_L = 8 Ω; T_{amb} = 60 °C (max.); T_j = 150 °C (max.); for a 4 W application into an 8 Ω load, the maximum dissipation is about 2,5 W.

The thermal resistance from junction to ambient can be expressed as:

$$R_{th\ j\text{-}a} = R_{th\ j\text{-}tab} + R_{th\ tab\text{-}h} + R_{th\ h\text{-}a} = \frac{T_{j\ max} - T_{amb\ max}}{P_{max}} = \frac{150 - 60}{2,5} = 36\ K/W.$$

Since $R_{th\ j\text{-}tab}$ = 12 K/W and $R_{th\ tab\text{-}h}$ = 1 K/W, $R_{th\ h\text{-}a}$ = 36 – (12 + 1) = 23 K/W.

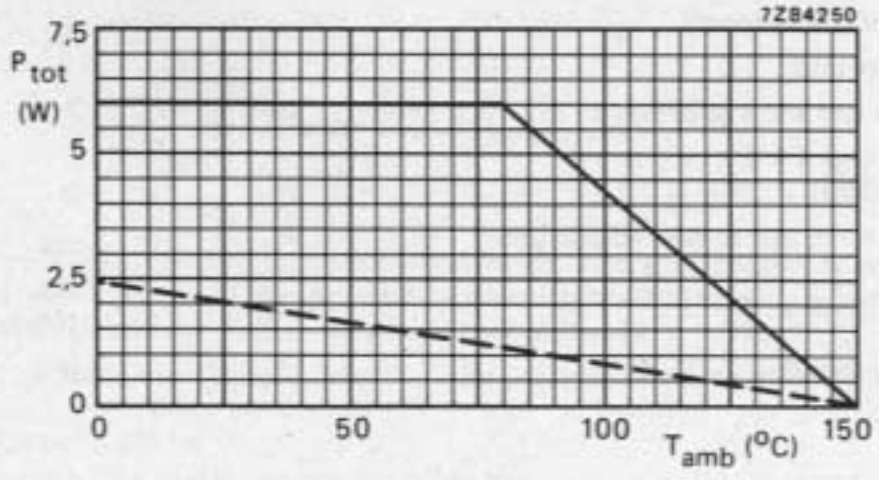

Fig. 2 Power derating curve.
—— infinite heatsink;
– – – without heatsink.

CHARACTERISTICS

V_P = 18 V; R_L = 8 Ω; f = 1 kHz; T_{amb} = 25 °C; unless otherwise specified

Supply voltage	V_P	typ.	18 V
			15 to 35 V
Total quiescent current	I_{tot}	typ.	35 mA
Ripple rejection at f = 100 Hz; R_S = 0	RR	>	40 dB
Signal-to-noise ratio (d.c. control at minimum gain) see also note	S/N	>	60 dB
Total sensitivity (d.c. control at maximum gain) for P_o = 2,5 W	V_i	typ.	55 mV
Audio amplifier			
Repetitive peak output current	I_{ORM}	<	1,5 A
Output power at d_{tot} = 10%	P_o	>	4 W
		typ.	4,5 W
Total harmonic distortion at P_o = 2,5 W	d_{tot}	typ.	0,5 %
Voltage gain	G_v	typ.	30 dB
Sensitivity for P_o = 2,5 W	V_i	typ.	125 mV
Input impedance (pin 5)	$\|Z_i\|$	typ.	200 kΩ
			100 to 500 kΩ
Frequency response	f	>	15 kHz

Note

Measured in a bandwidth according to IEC-curve 'A', related to P_o = 2,5 W; R_S = 5 kΩ.

CHARACTERISTICS (continued)

D.C. volume control unit

Gain control range (see also Fig. 3)	ϕ	>	80 dB
Signal handling at $d_{tot} < 1\%$ (d.c. control at 0 dB)	V_i	>	1,2 V
Sensitivity for V_o = 125 mV at max. voltage gain	V_i	typ.	55 mV
Input impedance (pin 9)	$\|Z_i\|$	typ. 100 to	200 kΩ 500 kΩ
Output impedance (pin 7)	$\|Z_o\|$	typ.	1 kΩ

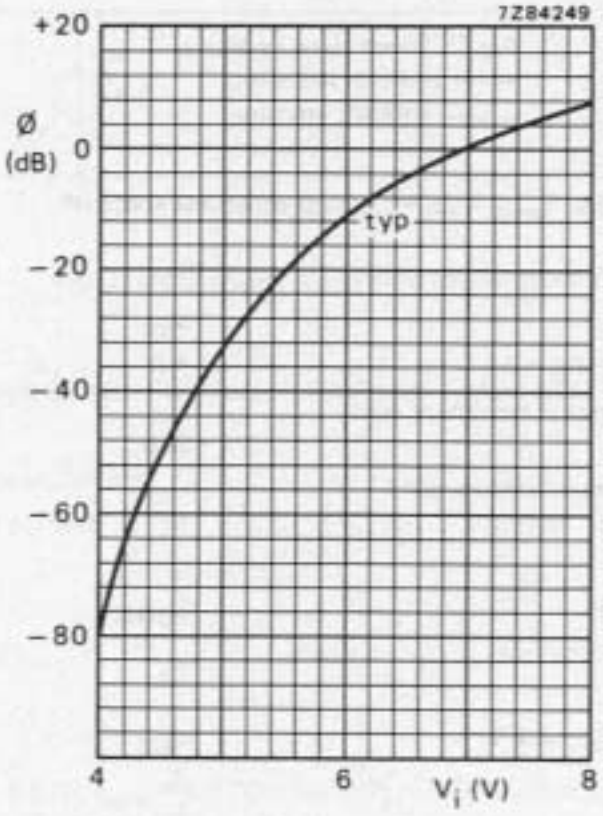

Fig. 3 Gain control curve; V_i at pin 8.