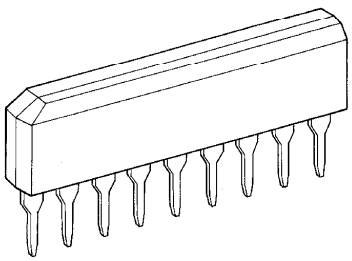
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7376P

AUDIO POWER AMPLIFIER

The TA7376P is dual audio power amplifier for portable products.



SIP9-P-2.54A

Weight : 0.92g (Typ.)

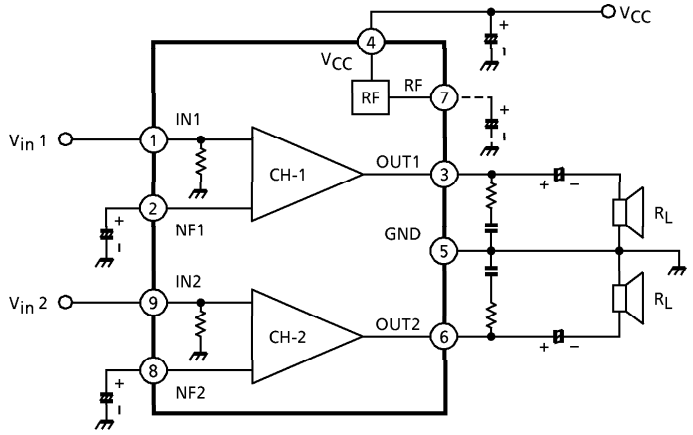
FEATURES

- Low operating supply voltage : V_{CC} = 1.8~6V (Ta = 25°C)
- Low quiescent current : I_{CCQ} = 5.3mA (V_{CC} = 4.5V)
- Including ripple filter circuit : RR = −42dB (C_{RIP} = 10μF, f_r = 100Hz)
- Voltage gain : G_V = 39.5dB (Typ.)
- Very few external parts and small package. (SIP-9PIN)

OUTPUT POWER TABLE (THD = 10%, f = 1kHz, Stereo, Typ. value)

LOAD / V_{CC}	R_L = 32Ω	R_L = 16Ω	R_L = 8Ω	R_L = 4Ω
3V	21mW	38mW	65mW	100mW
4.5V	56mW	100mW	180mW	300mW
6V	120mW	230mW	400mW	—

BLOCK DIAGRAM



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APPLICATION NOTE

1. Input stage

   The input stage of power amplifier (Equivalent Circuit) is comprised of a PNP differential pair (Q_2 and Q_3) preceded by a PNP emitter follower (Q_1) which allows DC referencing of the source signal to ground.
   This eliminates the need for an input coupling condenser. However, in case the brush noise of volume becomes a problem, provide serially a coupling condenser to the input side.

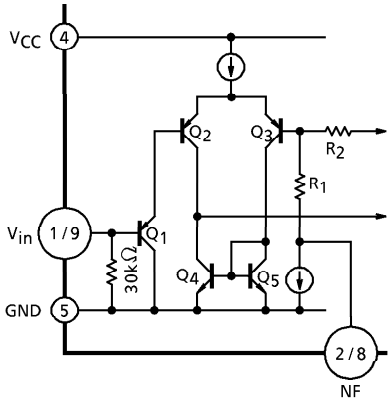


Fig.1

2. Adjustment of voltage gain

   The voltage gain is fixed at $G_V \fallingdotseq 40dB$ by the resistors (R_1 and R_2) in IC, however, its reduction is possible through adding R_f as shown in Fig.2.
   In this case, the voltage gain is obtained by the following equation.

$$G_V \fallingdotseq 20\ell og \frac{R_1 + R_2 + R_f}{R_1 + R_f}$$

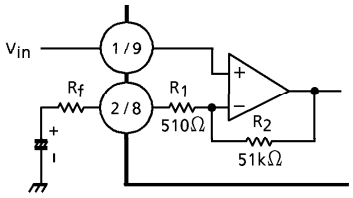


Fig.2

   It is recommended to use this IC with the voltage gain of $G_V \fallingdotseq 30dB$ or over.

3. Ripple rejection ratio (RR)

   If the TA7376P does not have the ripple filter condenser (C_{RIP}), the ripple rejection ratio is as follow.
   RR = – 25dB (Typ.)
   ($C_{NF} = 22\mu F$, $f_r = 100Hz$)
   RR = – 34dB (Typ.)
   ($C_{NF} = 100\mu F$, $f_r = 100Hz$)
   If the ripple filter condenser is connected to the pin⑦, the ripple rejection ratio is improved as following the DATA ($RR - f_r$).

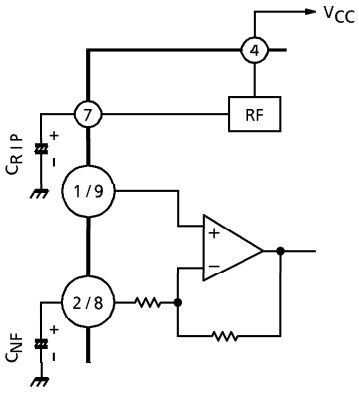


Fig.3

4. Pop sound

   It must be connected the condenser (C_{RIP}) from pin⑦ to GND, if the "Pop" sound is harshness.
   In this case, the value is 10μF something.

5. Phase-compensation

The purpose of condenser C_1 is to prevent oscillation.
These condenser need to be small temperature coefficient and excellent frequency characteristic. So ceramic condenser is unsuitable.
Condenser C_2 is rather large value than 10μF and GND line is better to short and wide lay-out so that the some common impedance are decreased.

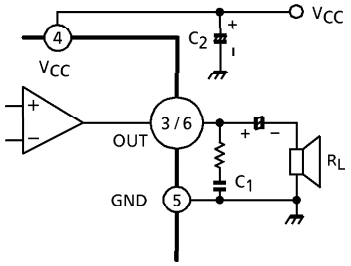


Fig.4

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	8	V
Power Dissipation	P_D (Note)	950	mW
Operation Temperature	T_{opr}	− 25~75	°C
Storage Temperature	T_{stg}	− 55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 7.6mW / °C.

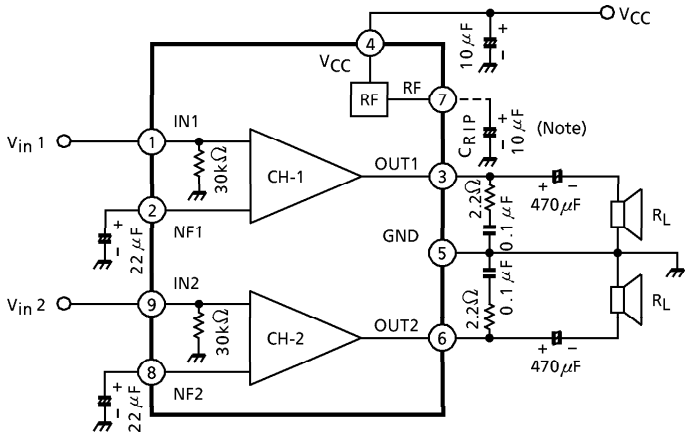
ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, V_{CC} = 4.5V, f = 1kHz, R_g = 600Ω, R_L = 4Ω, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	V_{in} = 0, V_{CC} = 3V	—	4.9	8.0	mA
			V_{in} = 0	—	5.3	10.0	
			V_{in} = 0, V_{CC} = 6V	—	5.7	14.0	
Output Power	P_{out}	—	V_{CC} = 3V, R_L = 4Ω, THD = 10%	84	100	—	mW
			V_{CC} = 3V, R_L = 32Ω, THD = 10%	—	21	—	
			V_{CC} = 4.5V, R_L = 4Ω, THD = 10%	250	300	—	
			V_{CC} = 4.5V, R_L = 8Ω, THD = 10%	—	180	—	
			V_{CC} = 6V, R_L = 8Ω, THD = 10%	—	400	—	
Total Harmonic Distortion	THD	—	P_{out} = 100mW	—	0.11	1.0	%
Voltage Gain	G_V	—	V_{out} = 0.775V_{rms}	37.5	39.5	41.5	dB
Output Noise Voltage	V_{no}	—	R_g = 10kΩ, BPF = 20Hz~20kHz	—	0.21	0.7	mV_{rms}
Ripple Rejection Ratio	RR	—	C_{RIP} = 10μF, C_{NF} = 22μF f_r = 100Hz, V_r = 0.38V_{rms}	—	− 42	− 30	dB
			C_{RIP} = OPEN, C_{NF} = 100μF f_r = 100Hz, V_r = 0.38V_{rms}	—	− 34	—	
Cross Talk	CT	—	V_{out} = 0.775V_{rms}	—	− 60	− 40	dB
Input Resistance	R_{IN}	—	—	—	30	—	kΩ

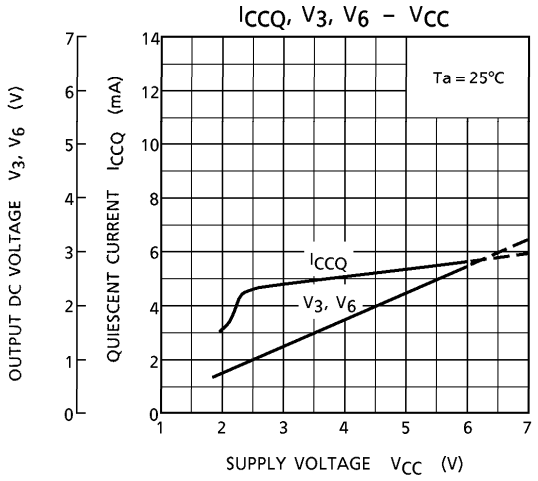
QUIESCENT TERMINAL DC VOLTAGE (V_{CC} = 4.5V, Ta = 25°C, Typ. value) 〔UNIT : V〕

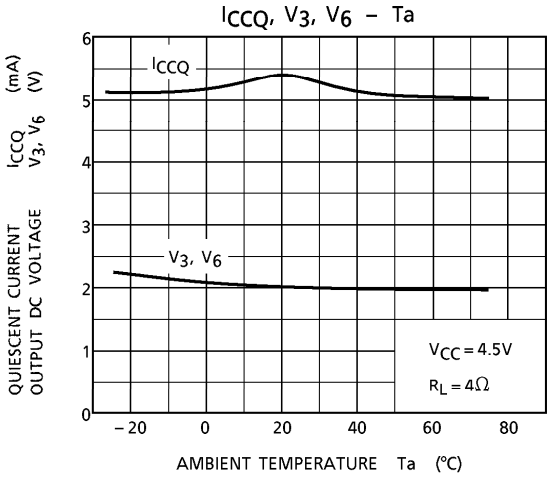
TERMINAL	1	2	3	4	5	6	7	8	9
VOLTAGE (V)	0.003	0.59	1.98	4.5	0	1.98	1.28	0.59	0.003

TEST CIRCUIT

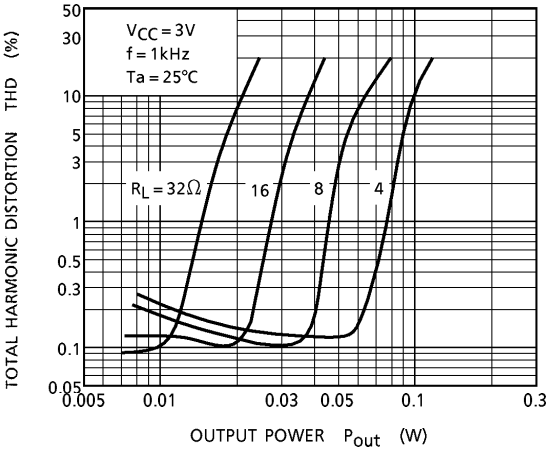


(Note) C_{RIP} is shown in item 3 and 4 of APPLICATION NOTE.

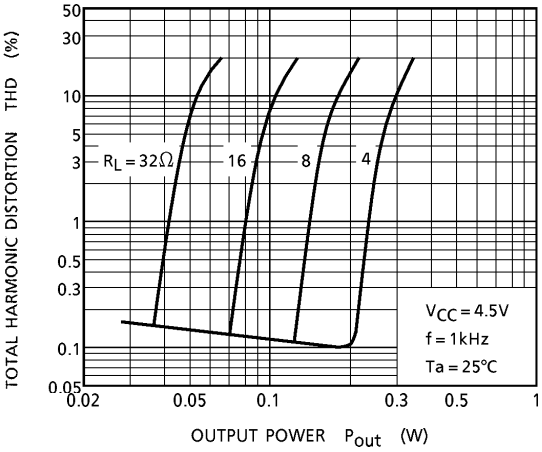




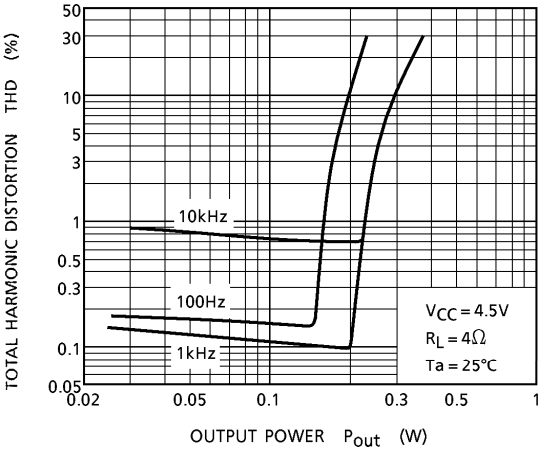
THD – P_{out}



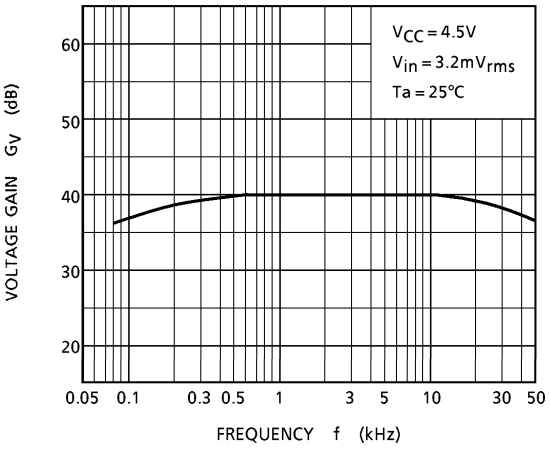
THD – P_{out}



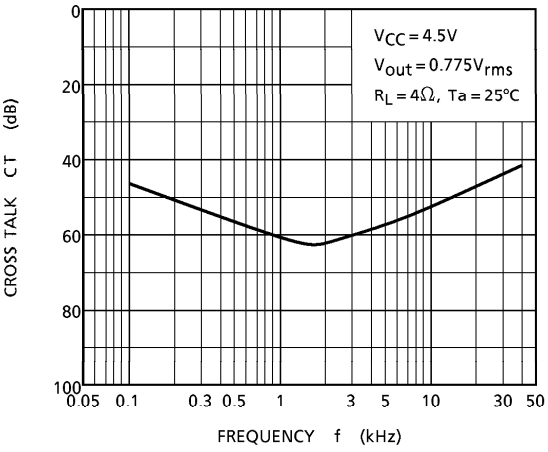
THD – P_{out}



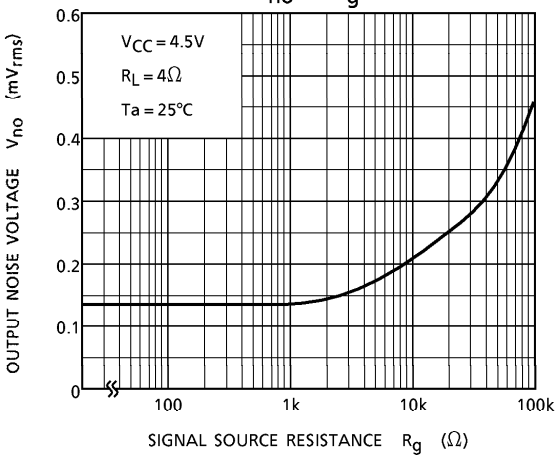
G_V – f



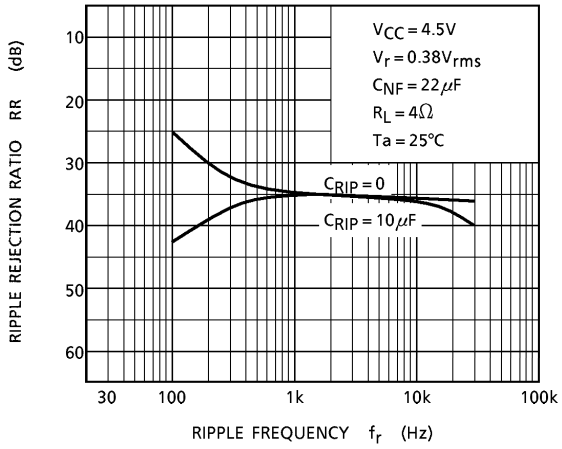
CT – f



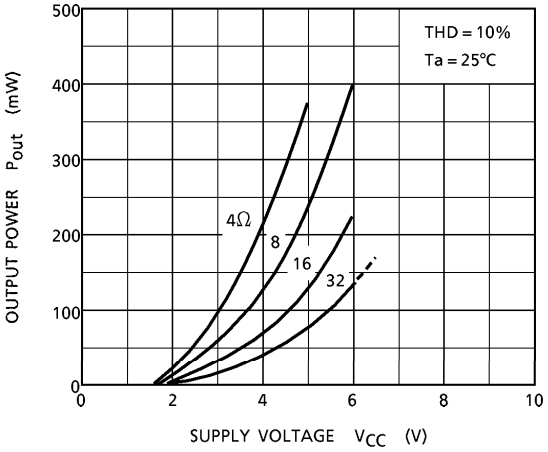
V_{no} – R_g



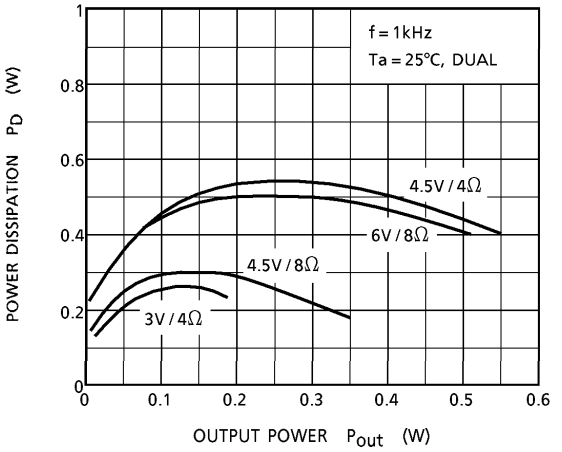
RR – f_r



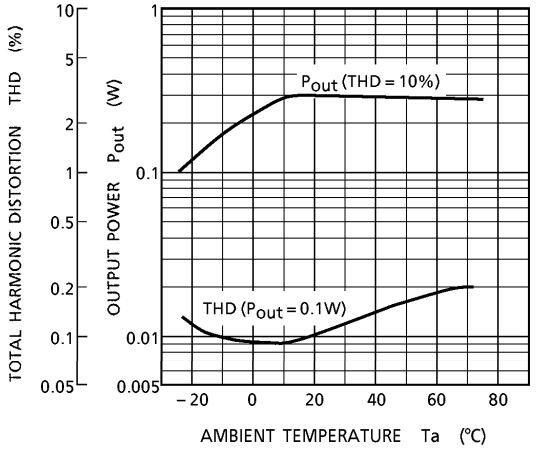
P_{out} – V_{CC}



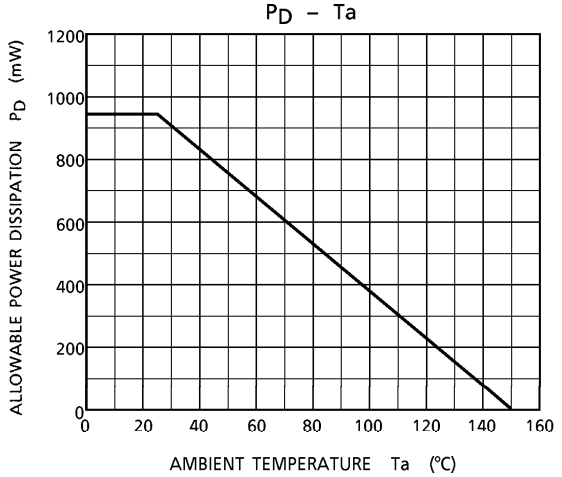
P_D – P_{out}



THD, P_{out} – Ta



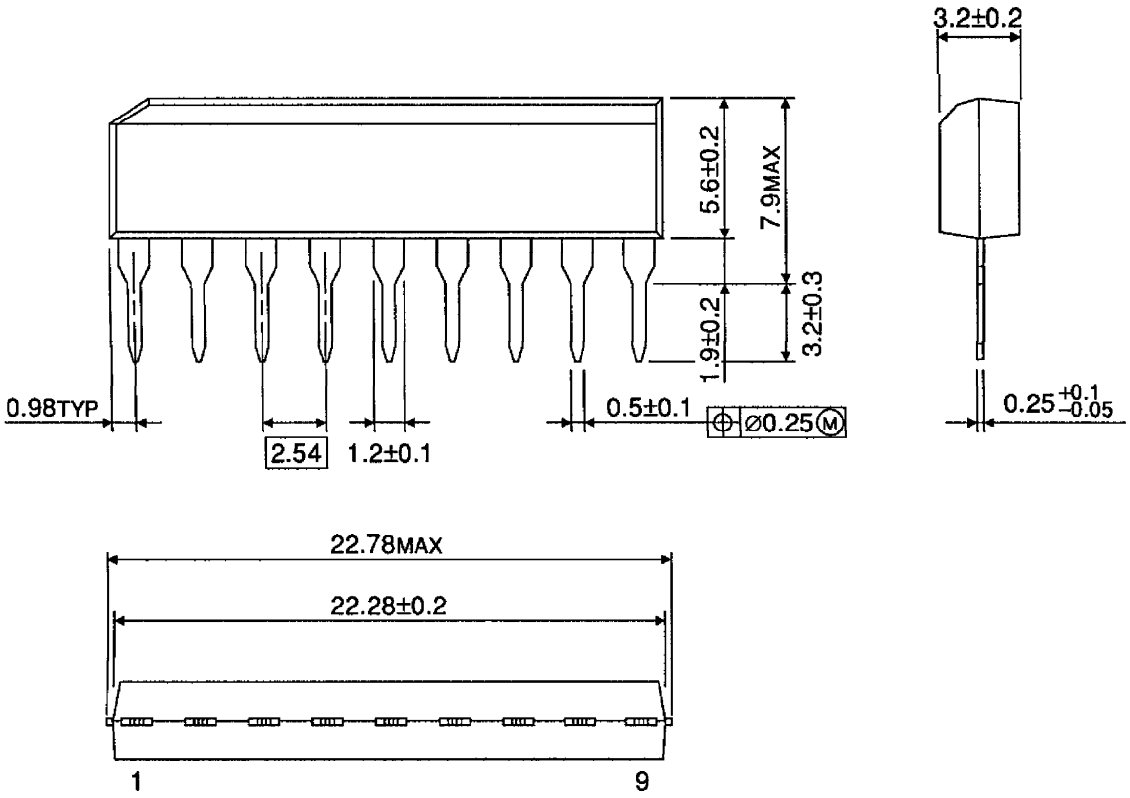
P_D – Ta



OUTLINE DRAWING

SIP9-P-2.54A

Unit : mm



Weight : 0.92g (Typ.)