TA7207P, TA7208P

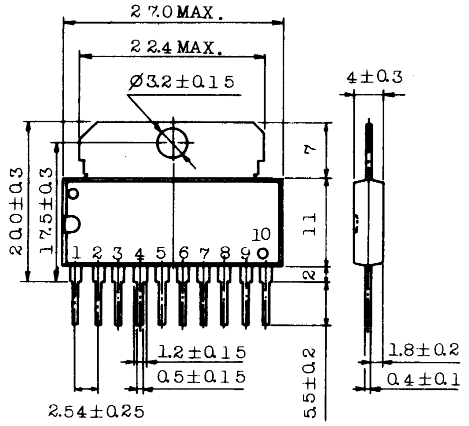
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT
SILICON MONOLITHIC

AUDIO POWER AMPLIFIER

DESIGNED FOR POWER AMPLIFIER OF PORTABLE CASSETTE TAPE RECORDER APPLICATION.

- Recommended Supply Voltage :
  TA7207P...V_{CC}=6.0V
  TA7208P...V_{CC}=7.5V, 9.0V
- Output Power :
  TA7207P...P_{OUT}=0.95W(Typ.) at V_{CC}=6.0V, R_L=4Ω
  TA7208P...P_{OUT}=1.4W(Typ.) at V_{CC}=7.5V, R_L=4Ω
  P_{OUT}=2.0W(Typ.) at V_{CC}=9.0V, R_L=4Ω
  THD=10%
- Minimum Operating Voltage: TA7207P...V_{CC}=4.0V
  TA7208P...V_{CC}=5.0V
- Low Quiescent Current
- Excellent Ripple Rejection
- Built in Turn-On Muting Circuit.

Unit in mm



JEDEC	—
TOSHIBA	5−27E

MAXIMUM RATINGS (Ta=25 °C)

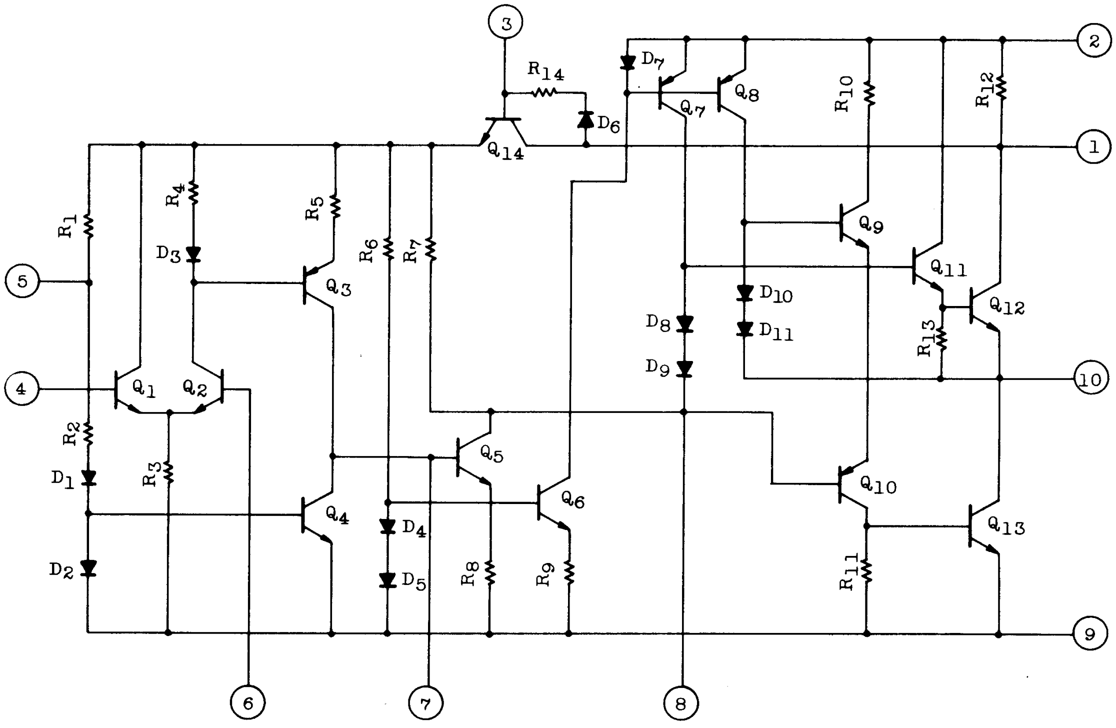
CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage	TA7207P	V_{CC}	10	V
	TA7208P		14	
Output Current (Peak)		$I_{O(peak)}$	1.8	A
Power Dissipation		P_D	5.0	W
Operating Temperature		T_{opr}	-20 ~ 75	°C
Storage Temperature		T_{stg}	-55 ~ 150	°C

ELECTRICAL CHARACTERISTICS

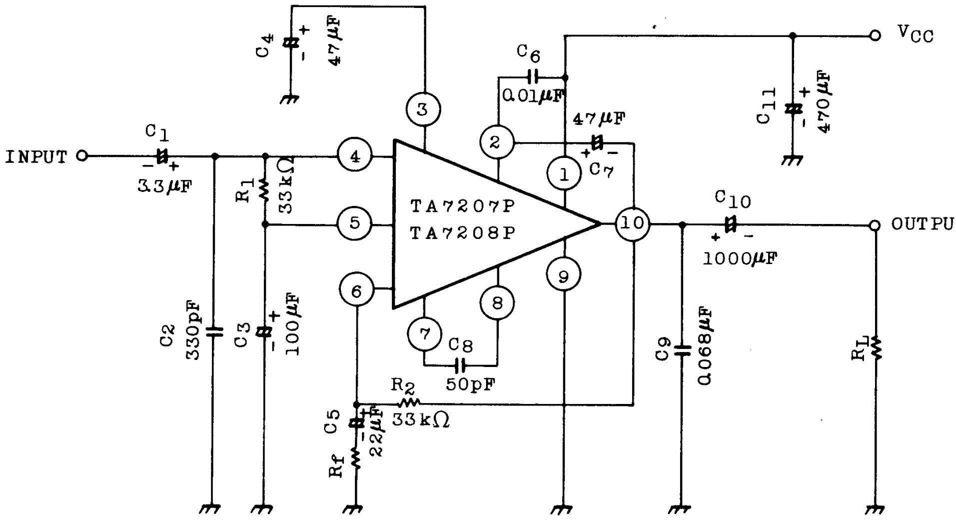
(Unless otherwise specified $R_L=4\Omega$, $R_g=600\Omega$, $R_f=150\Omega$, f=1kHz, Ta=25°C)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION		TA7207P			TA7208P			UNIT
					MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Quiescent Current	I_{CCQ}	-	V_{CC}=4,0V		5.0	-	-	-	-	-	mA
			V_{CC}=5.0V		-	-	-	55	-	-	
			V_{CC}=6.0V		6.0	-	27.0	-	-	-	
			V_{CC}=9,0		-	-	-	7.0	-	30.0	
			V_{CC}=10V		-	-	32.0	-	-	-	
			V_{CC}=14V		-	-	-	-	-	35.0	
Output Power	P_{OUT}	-	THD=10%	V_{CC}=4V	-	0.3	-	-	-	-	W
				V_{CC}=5V	-	-	-	-	0.65	-	
				V_{CC}=6V	0.8	0,95	-	-	-	-	
				V_{CC}=7.5V	-	-	-	-	1.4	-	
				V_{CC}=9V	-	-	-	1.5	2.0	-	
Total Harmonic Distortion	THD	-	P_{OUT}=100mW	V_{CC}=6V	-	0.35	1.0	-	-	-	%
				V_{CC}=7.5V	-	-	-	-	0.35	-	
				V_{CC}=9V	-	-	-	-	0.35	1.0	
Open Loop Voltage Gain	G_{VO}	-	R_f=0 V_{IN}=0,245mV_{rms}	V_{CC}=6V	-	72	-	-	-	-	dB
				V_{CC}=9V	-	-	-	-	72	-	
Closed Loop Voltage Gain	G_V	-	R_f=150Ω V_{IN}=3,9mV_{rms}	V_{CC}=6V	-	46	-	-	-	-	dB
				V_{CC}=9V	-	-	-	-	46	-	
Input Resistance	R_{IN}	-	V_{OUT}=1V_{rms}	V_{CC}=6V	25	30	-	-	-	-	kΩ
				V_{CC}=9V	-	-	-	25	30	-	
Output Noise Voltage	V_{NO}	-	R_g=10kΩ BW=50Hz ~20kHz	V_{CC}=6V	-	-	1,0	-	-	-	mV
				V_{CC}=9V	-	-	-	-	-	1.0	

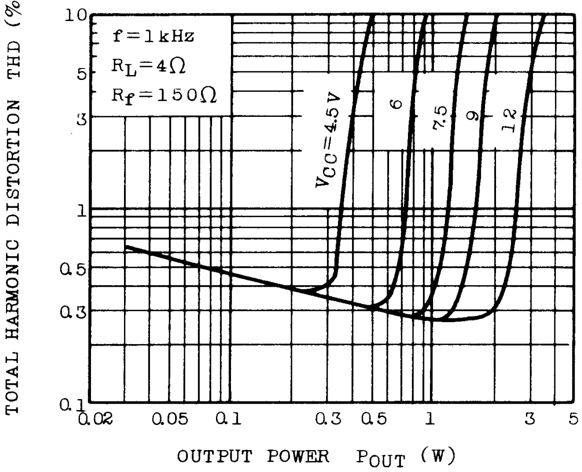
EQUIVALENT CIRCUIT



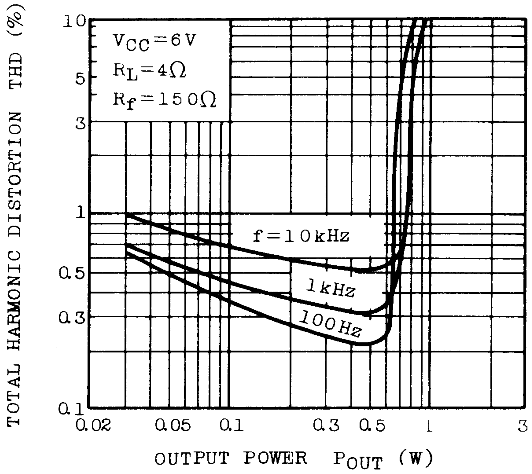
TEST AND APPLICATION CIRCUIT



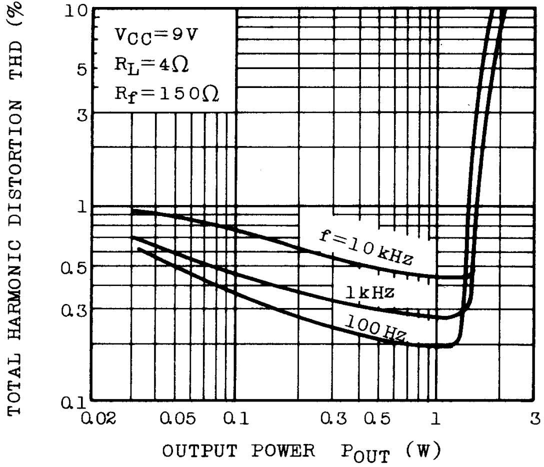
THD – P_{OUT}



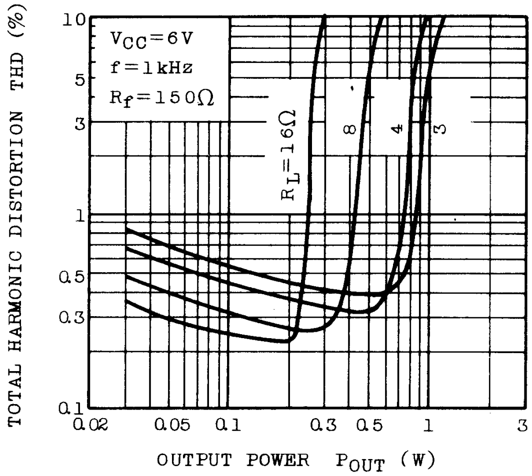
TA7207P THD – P_{OUT}



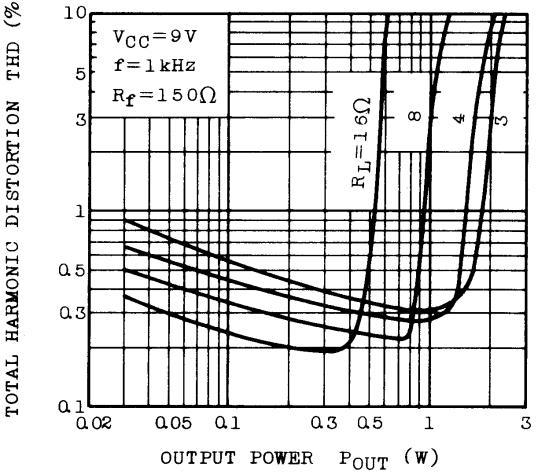
TA7208P THD – P_{OUT}



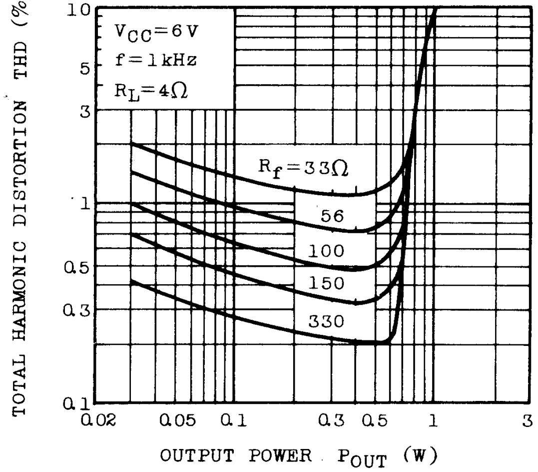
TA7207P THD – P_{OUT}



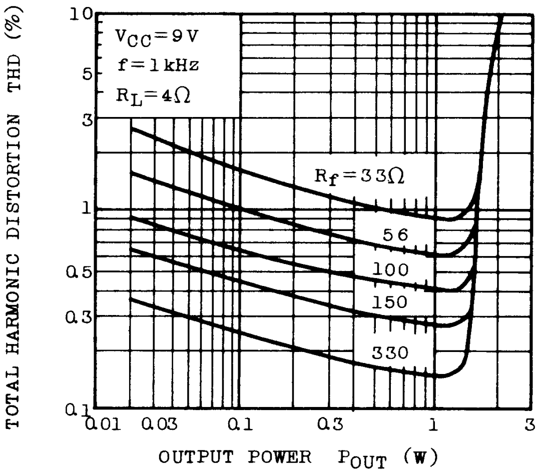
TA7208P THD – P_{OUT}



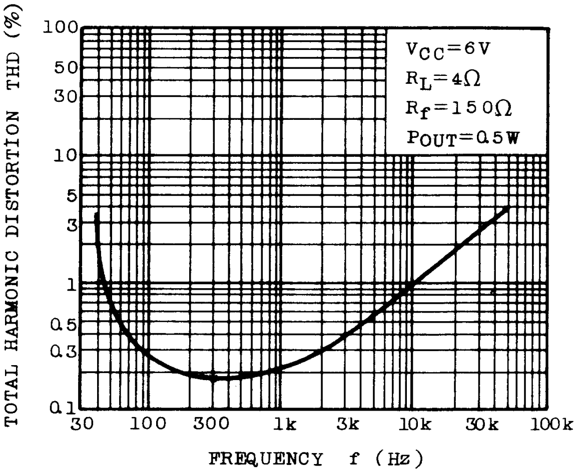
TA7207P THD – P_{OUT}



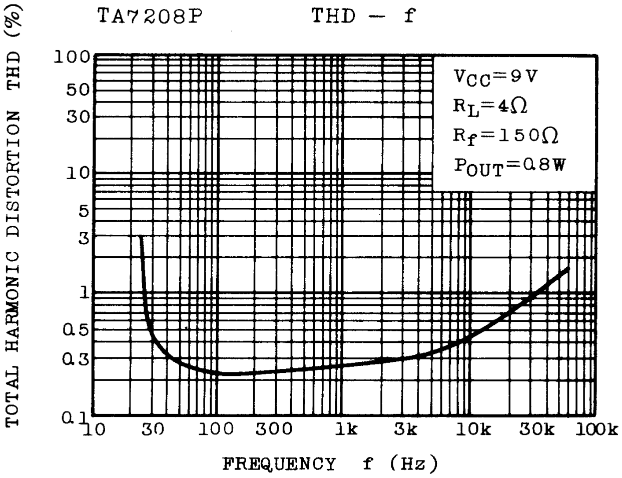
TA7208P THD — P_{OUT}



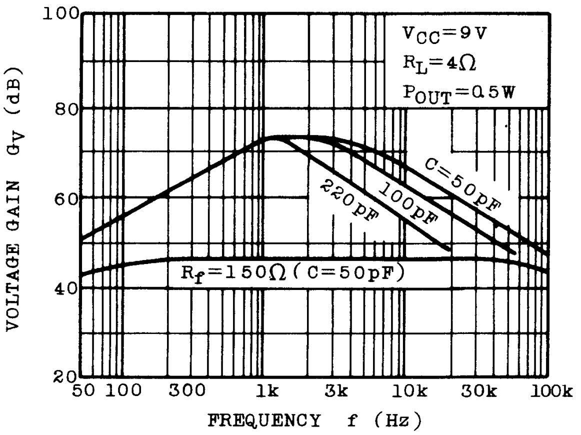
TA7207P THD — f



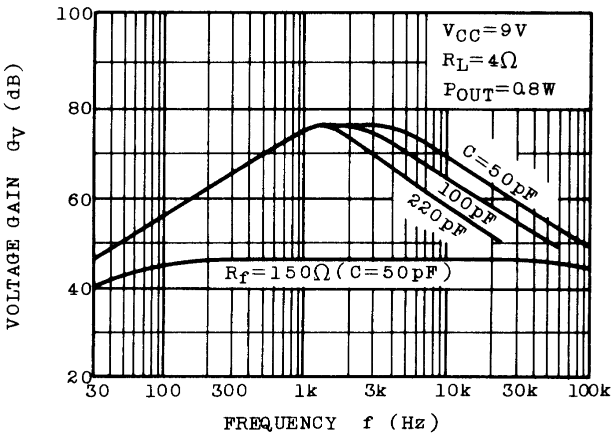
TA7208P THD — f



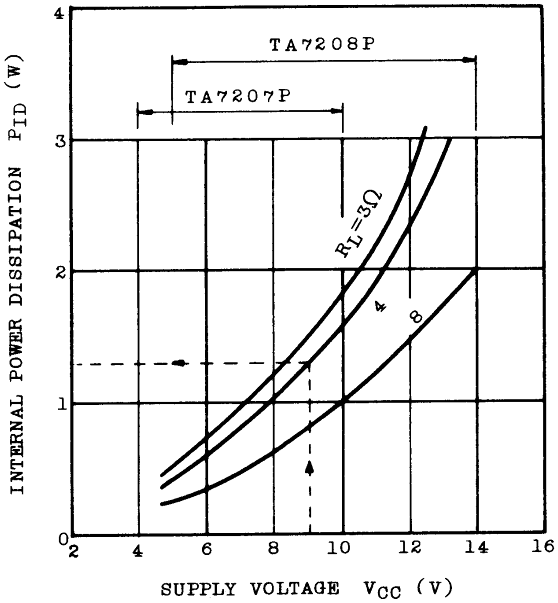
TA7207P G_V — f



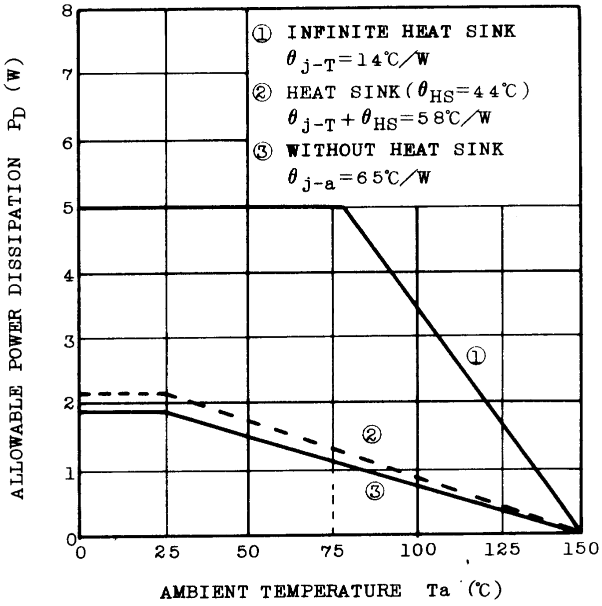
TA7208P G_V — f



(Fig.1) $P_{ID} - V_{CC}$



(Fig.2) P_D − Ta



DESIGN OF HEAT SINK

The heat sink can be designed by using "Internal Power Dissipation vs. Supply Voltage Characteristics" shown in Fig. 1 and "Maximum Allowable Power Dissipation vs. Ambient Temperature Characteristics" shown in Fig.2.
Junction to Tab and Junction to Ambient Thermal Resistance are follows.

θ_{j-T} = 14°C/W (Max.).......Junction to Tab

θ_{j-a} = 65°C/W (Max.).......Junction to Ambient

1. Operating Without External Heat Sink

In this case, Maximum Allowable Power Dissipation (P_D) is given in the next equation.

$$P_D = \frac{T_j\ Max - Ta}{\theta_{j-a}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where

Tj Max	; Maximum junction temperature (equal to T_{stg} Max (150°C)
Ta	; Ambient temperature.
θ_{j-a}	; Thermal Resistance between junction of IC and air. (θ_{j-a} is 65°C/W from Fig.2)

In case of $Ta=25^\circ C$

$$P_D = \frac{150 - 75}{65} = 1.1W$$

In the following operation, external heat sink is not necessary. Because the internal Power dissipation is less than 1.1W under this condition.

$V_{CC} \leq 7.5V$, $R_L \geq 3\Omega$

2. Operating with External Heat Sink

The required thermal resistance of external heat sink (θ_{HS}) is given in the following equation.

$$\theta_{HS} = \frac{T_j\ max - Ta}{P_{ID}} - \theta_{j-T} \ldots\ldots\ldots\ldots\ldots (2)$$

where

θ_{j-T} ; Thermal resistance between junction and tab of IC (θ_{j-T} is $14^\circ C/W$)

Now, we suppose to use TA7208P at $V_{CC}=9V$, $R_L=4\Omega$, $Ta=75^\circ C$ max.
In this case, P_{ID} is more than 1.1W, external heat sink is necessary. The thermal resistance of heat sink is given from equation (2). (From Fig.1, $P_{ID}=1.3W$)

$$\theta_{HS} = \frac{150 - 75}{1.3} - 14 = 44^\circ C/W$$

This value is correspond to that of 4 ~ 5 cm^2 × 2 mm Aluminum plate thermal resistor.

Table 1 shows thermal resistance value of required external heat sink for various conditions. (V_{CC} and R_L)

R_L (Ω) \ V_{CC} (V)	6.0	7.5	9.0
3	▨	▨	$36^\circ C/W$ (1)
4	▨	▨	$44^\circ C/W$ (2)
6	▨	▨	▨

The area of shaded portion external heat sink is unnecessary.

(1) ; Equivalent to 5 ~ 6cm^2 × 1 ~ 2mm Aluminum.

(2) ; Equivalent to 4 ~ 5cm^2 × 1 ~ 2mm Alunimum.