Ordering number: EN 1440E

Monolithic Linear IC

SANYO No.1440E

LA4508

8.5W 2-Channel AF Power Amplifier

Features

- Low idling current (20mA/2 channels)
- Output power 8.5W x 2 typ. (R_L = 3ohms)
- High ripple rejection (60dB at steady state)
- Small pop noise at the time of power supply ON
- Thermal protector
- Adoption of SEP14H ($\Theta_{j\text{-}c}$ = 3°C/W) facilitates thermal design.

Maximum Ratings/T_a = 25°C

				unit
Maximum supply voltage	V_{CC} max		24	V
Allowable power dissipation	P_d max	With infinite heat sink	15	W
Maximum output current	I_O peak	1 channel	2.5	A
Operating temperature	T_{opr}		−20 to +75	°C
Storage temperature	T_{stg}		−40 to +150	°C

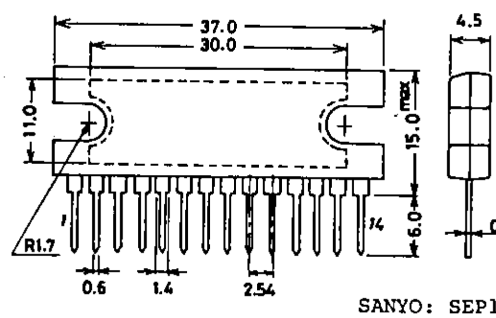
Operating Conditions/T_a = 25°C

				unit
Recommended supply voltage	V_{CC}		15	V
Operating voltage range	V_{CC}*	P_d max must not be exceeded.	9 to 23	V
Recommended load resistance	R_L	2 channels	3	Ω

Operating Characteristics/T_a = 25°C, V_{CC} = 15V, R_L = 3Ω (2 channels), f = 1kHz, R_g = 600Ω, See specified test circuit.

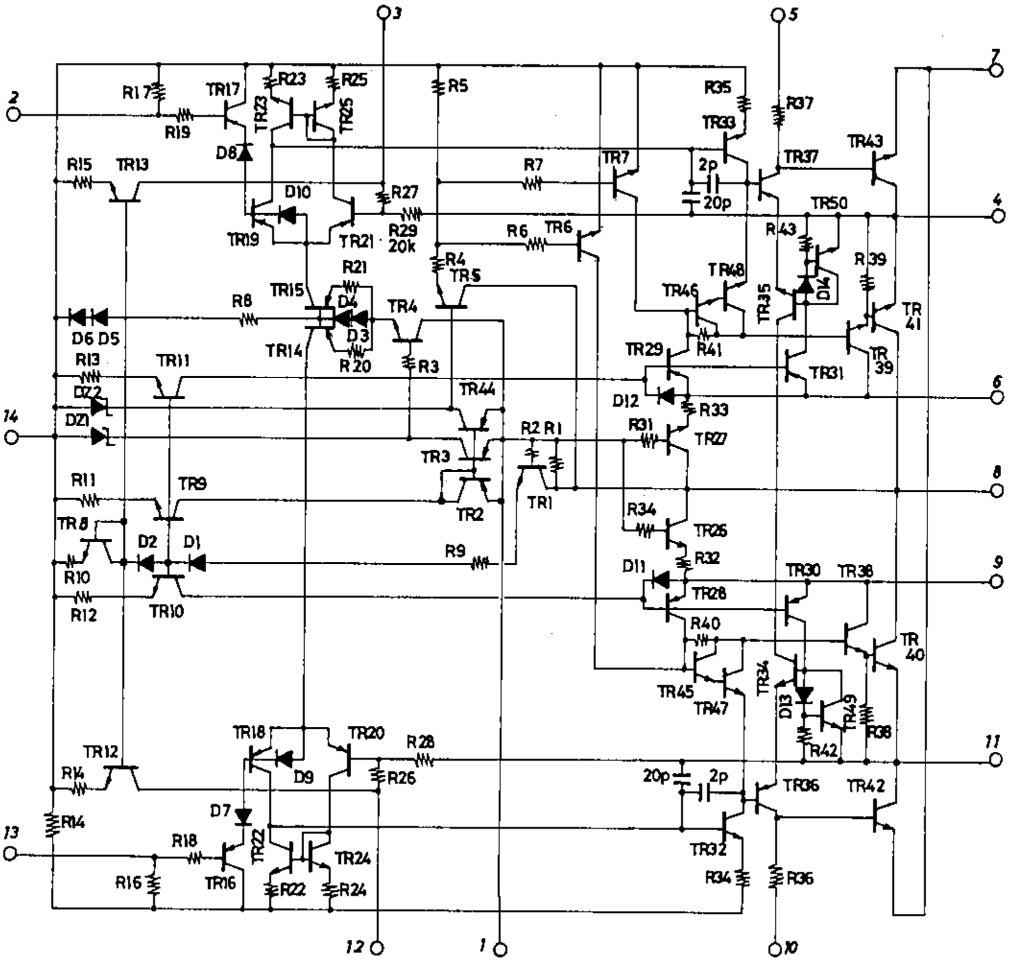
			min	typ	max	unit
Quiescent current	I_{CCO}	2 channels	10	20	30	mA
Voltage gain	VG		42	44	46	dB
Voltage gain difference	ΔVG	ch1, ch2			±1	dB
Output power	P_O	THD = 10%	7.5	8.5		W
Total harmonic distortion	THD	V_O = 2V		0.15	1.0	%
Input resistance	r_i			30k		Ω
Output noise voltage	V_{NO1}	R_g = 0, f = 20Hz to 20kHz, B.P.F		0.2	0.5	mV
	V_{NO2}	R_g = 10kΩ, f = 20Hz to 20kHz, B.P.F		0.3	1.0	mV
Ripple rejection	R_r		45	60		dB
Channel separation	ch sep		45	55		dB

Package Dimensions 3023A-S14HIC (unit: mm)



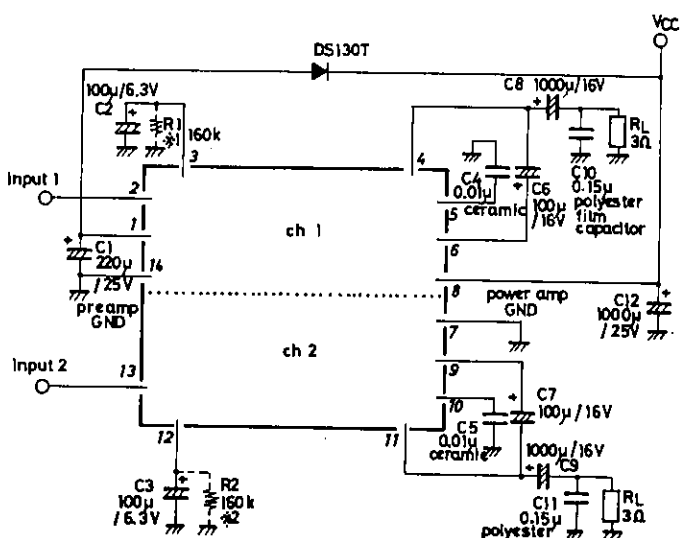
SANYO: SEP14H

Equivalent Circuit



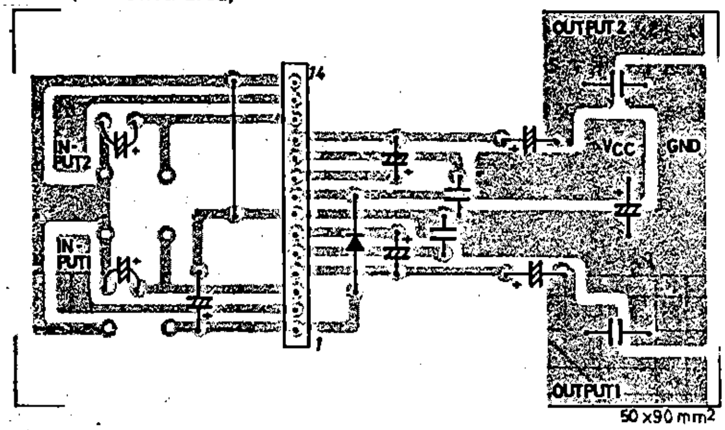
Unit (resistance: Ω, capacitance: F)

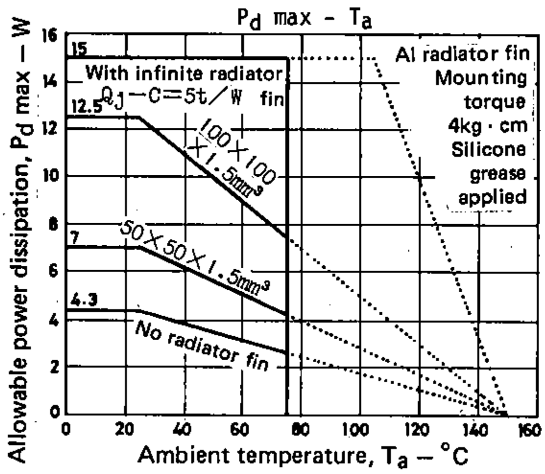
■ **Sample Application Circuit**

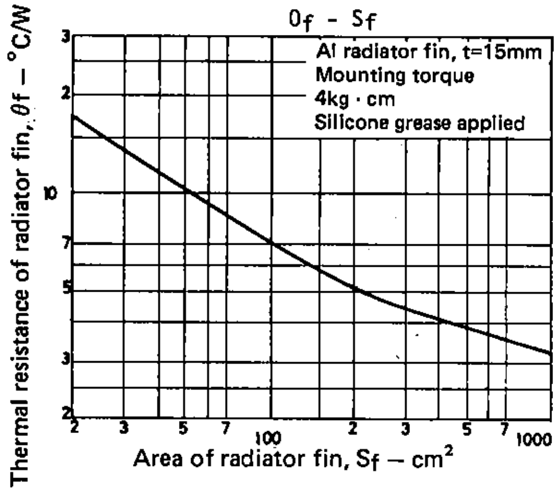


*1, *2: Connected when operating 9V sets

Sample Printed Circuit Pattern (Cu-foiled area)







Description of external parts

C_1: Decoupling capacitor
Used for the ripple filter. Since the rejection effect is saturated at a certain capacity, it is meaningless to increase the capacity more than needed. This capacitor, being also used for the time constant of the pop noise preventer, affects the starting time. Too small a capacity makes the pop noise level higher. (Recommended value: 100μF to 330μF)

C_2 (C_3): Feedback capacitor
Since the low cutoff frequency depends on this feedback capacitor, the required bandwidth must be considered before determining the value of this feedback capacitor. This feedback capacitor also affects the starting time.

C_4 (C_5): Switching distortion suppressing capacitor
Used to suppress switching distortion which often appears at high frequencies in overinput mode. The recommended value is 0.01μF (ceramic capacitor).

C_6 (C_7): Bootstrap capacitor
The output at low frequencies depends on this capacitor. If the capacity is decreased, the output at low frequencies goes lower. 47μF min. is required. (This, however, does not apply if load R_L is light.)

C_8 (C_9): Output capacitor
The low cutoff frequency depends on this output capacitor. (Refer to the characteristic graph.)

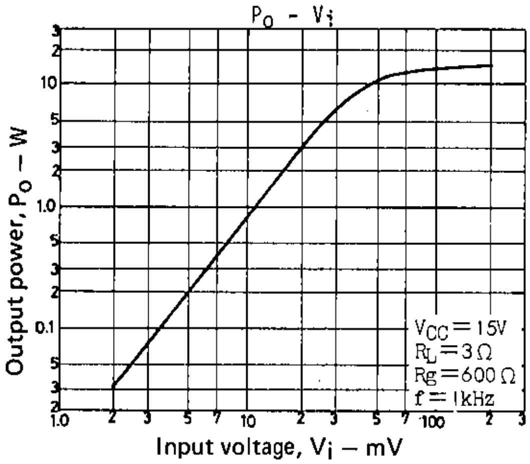
C_{10} (C_{11}): Oscillation blocking capacitor
Polyester film capacitor, being excellent in temperature characteristic, frequency characteristic, is used. The use of an aluminum electrolytic capacitor or ceramic capacitor may cause oscillation to occur at low temperatures.

C_{12}: Power source capacitor
This power source capacitor must accomodate loads (motor, etc.) in the power line or ripple in the transformer output. The recommended value is 1000μF to 2200μF.

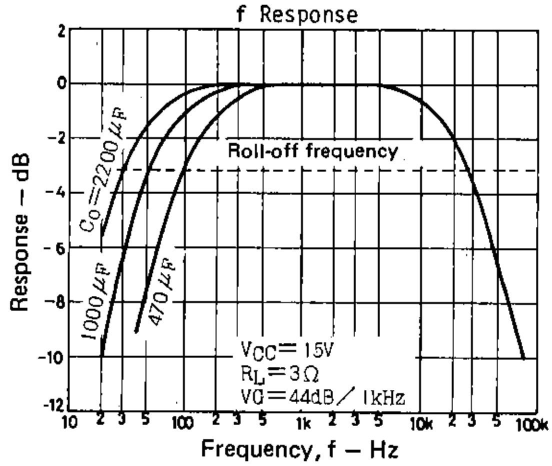
R_1 (R_2): Normally, this resistor is not required.
If the IC is used at V_{CC} = 9V or thereabouts, clip balance may be disturbed. This resistor can be used to correct such disturbance.

D_1: When a motor is started, or in similar modes, the supply voltage drops abruptly, causing the filter transistor to be saturated. This diode is a bypass diode and can be used to prevent such saturation from occurring. Whether or not to use this diode depends on the set to be made.

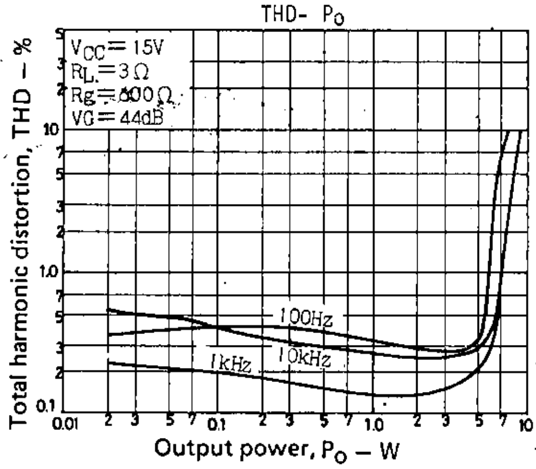
P_O - V_i



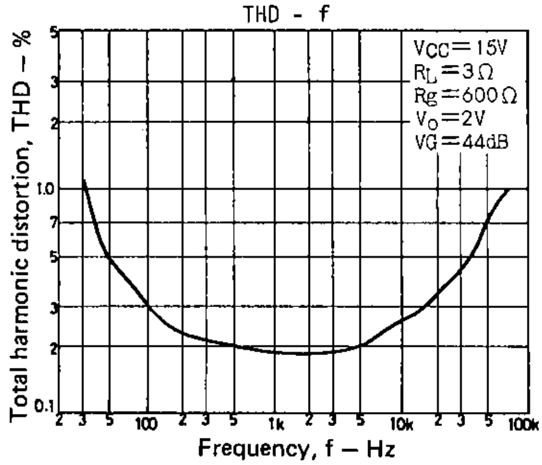
f Response



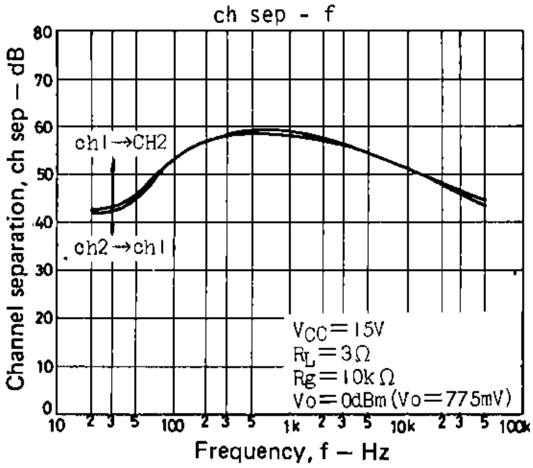
THD- P_O



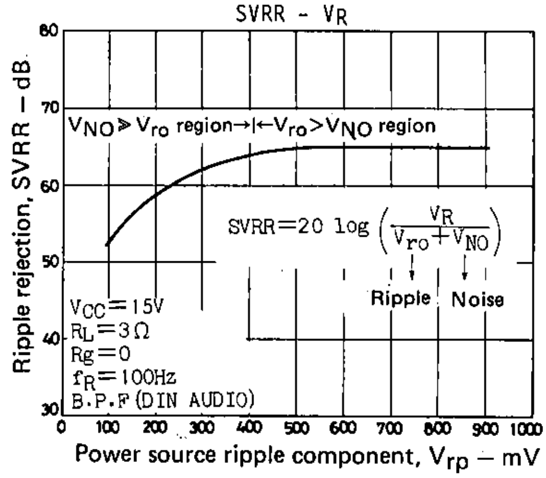
THD - f

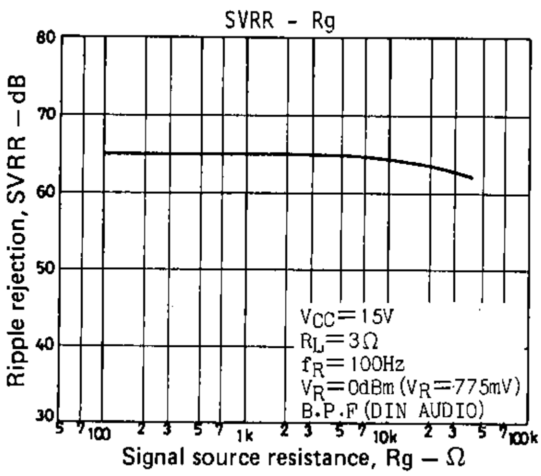


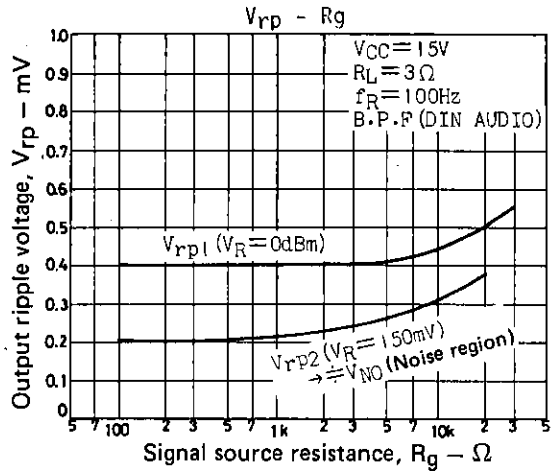
ch sep - f

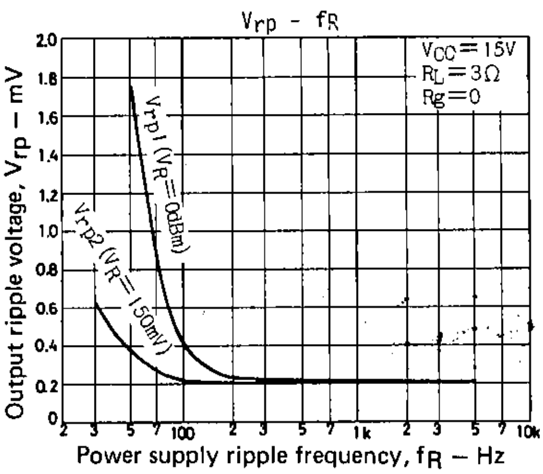


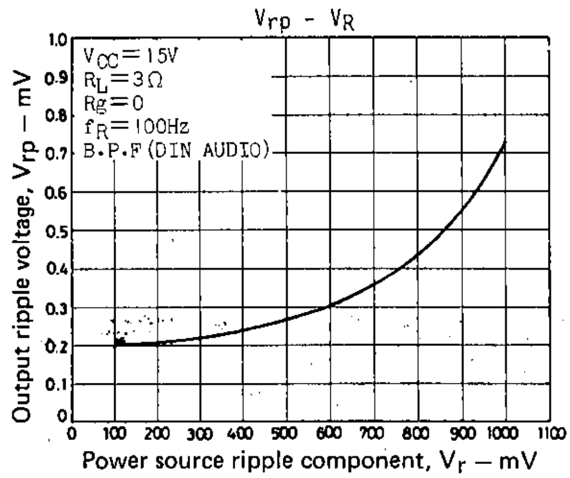
SVRR - V_R

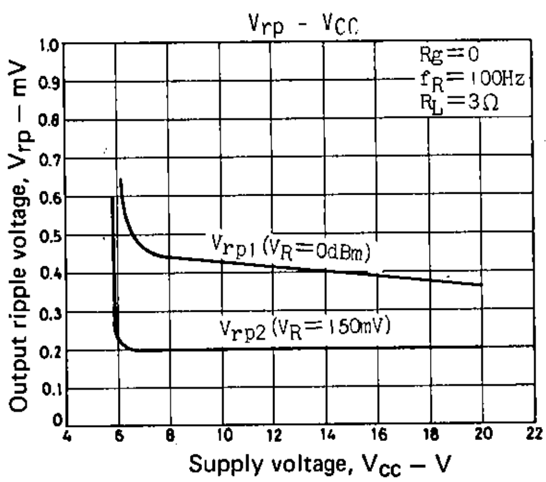


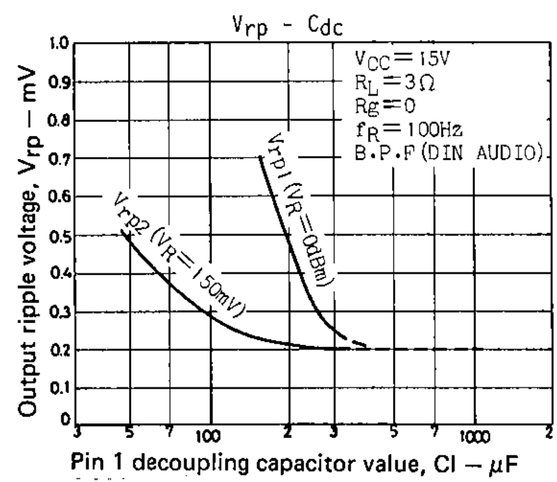

SVRR - Rg
Ripple rejection, SVRR – dB
Signal source resistance, Rg – Ω
VCC=15V
RL=3Ω
fR=100Hz
VR=0dBm (VR=775mV)
B.P.F (DIN AUDIO)

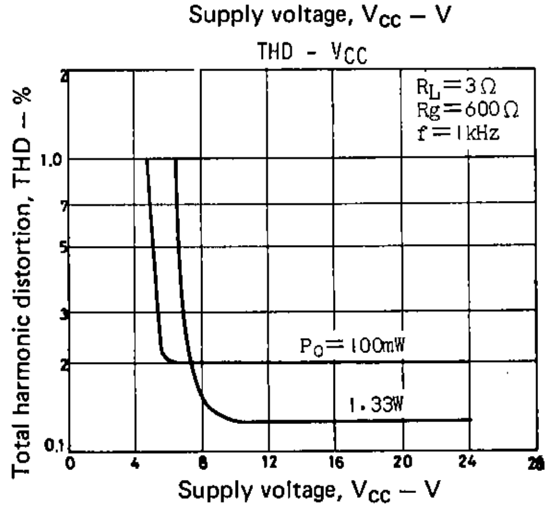

Vrp - Rg
Output ripple voltage, Vrp – mV
Signal source resistance, Rg – Ω
VCC=15V
RL=3Ω
fR=100Hz
B.P.F (DIN AUDIO)
Vrp1 (VR=0dBm)
Vrp2 (VR=150mV)
→≒VNO (Noise region)

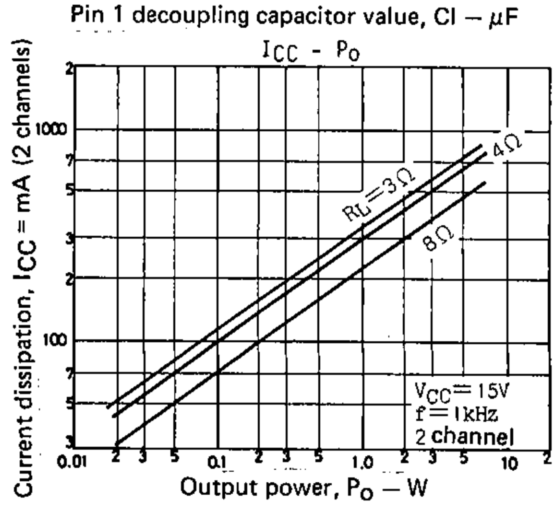

Vrp - fR
Output ripple voltage, Vrp – mV
Power supply ripple frequency, fR – Hz
VCC=15V
RL=3Ω
Rg=0
Vrp1 (VR=0dBm)
Vrp2 (VR=150mV)

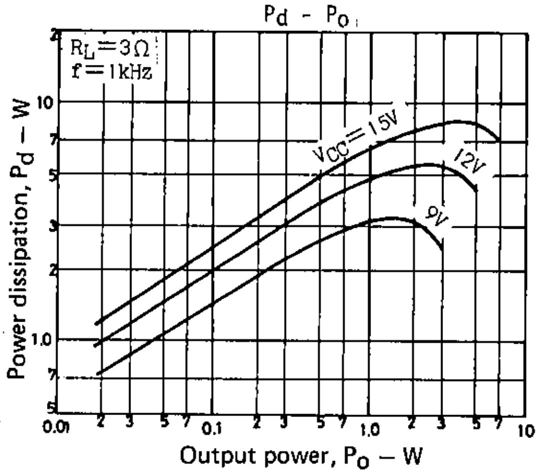

Vrp - VR
Output ripple voltage, Vrp – mV
Power source ripple component, Vr – mV
VCC=15V
RL=3Ω
Rg=0
fR=100Hz
B.P.F (DIN AUDIO)

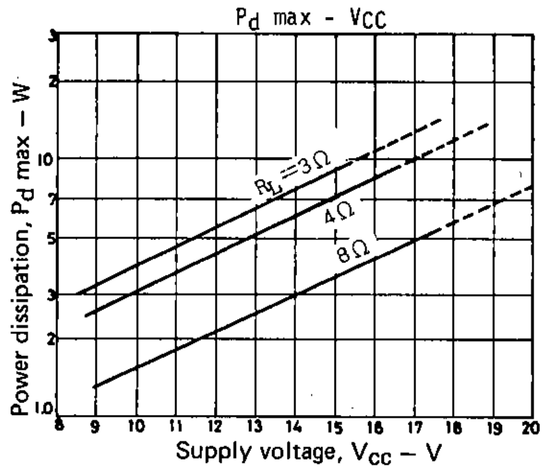

Vrp - VCC
Output ripple voltage, Vrp – mV
Supply voltage, VCC – V
Rg=0
fR=100Hz
RL=3Ω
Vrp1 (VR=0dBm)
Vrp2 (VR=150mV)

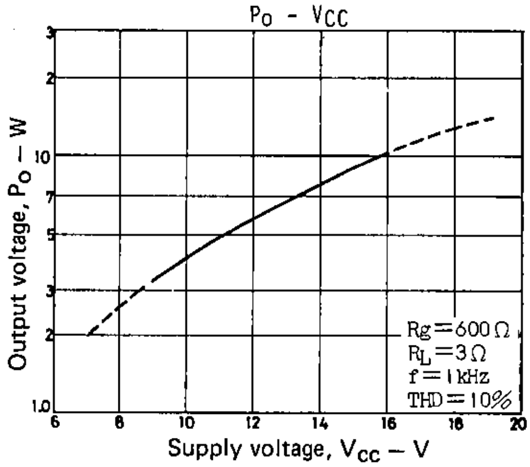

Vrp - Cdc
Output ripple voltage, Vrp – mV
Pin 1 decoupling capacitor value, Cl – µF
VCC=15V
RL=3Ω
Rg=0
fR=100Hz
B.P.F (DIN AUDIO)
Vrp1 (VR=0dBm)
Vrp2 (VR=150mV)

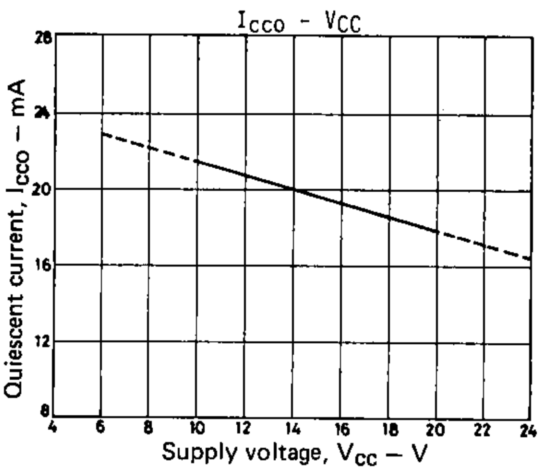

THD - VCC
Total harmonic distortion, THD – %
Supply voltage, VCC – V
RL=3Ω
Rg=600Ω
f=1kHz
Po=100mW
1.33W


ICC - Po
Current dissipation, ICC = mA (2 channels)
Output power, Po – W
RL=3Ω
4Ω
8Ω
VCC=15V
f=1kHz
2 channel









Proper cares in using IC

1. If the IC is used in the vicinity of the maximum rating, even a slight variation in conditions may cause the maximum rating to be exceeded, thereby leading to breakdown. Allow an ample margin of variation for supply voltage, etc. and use the IC in the range where the maximum rating is not exceeded.
2. Pin-to-pin short, inverted insertion
   If supply voltage is applied when the space between pins is shorted, breakdown or deterioration may occur. When mounting the IC on the board or applying supply voltage, make sure that the space between pins is not shorted with solder, etc. If the IC is inserted inversely, it may be broken down momentarily because of pin 7: Power Gnd, pin 8: V_{CC}.
3. Load short
   If the IC is used with the load shorted for a long time, breakdown or deterioration may occur. Be sure not to short the load.
4. Change in closed-loop gain
   By connecting R_{NF} in series with pins 3, 12 (NF pin), the gain can be reduced, but the following must be noted.
   a. If R_{NF} is connected, the ripple bypass effect brought about by the NF capacitor is lessened, leading to insufficient ripple rejection.
   b. Do not operate at 40dB or less so that stable oscillation is maintained.
5. When the IC is used in radios or radio-cassette tape recorders, keep a good distance between IC and bar antenna. A capacitor of 0.022μF or more (polyester film capacitor) connected between pins 9 and 7 and between pins 6 and 7 acts effectively against radiation to the SW band.
6. Printed circuit board
   When making the board, refer to the sample printed circuit pattern. No feedback loop must be formed between input and output and make the line thick and short so that no common resistor exists between pre-GND and power-GND.

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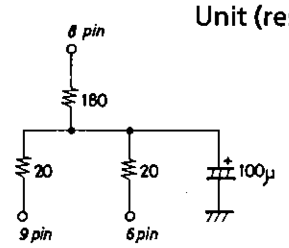
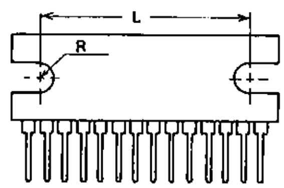
7. Some plug jacks to be used for connecting to the external speaker are such that both poles are short-circuited once when connecting. In this case, the load is short-circuited, which may break down the IC.
8. Improvement in reduced voltage characteristic (Reference example).
   By connecting parts as shown below, distortion-free operation can be performed at a supply voltage down to V_{CC} = 4.5V or thereabouts. The capacitor of 100μF is connected to suppress pop noise.

Unit (resistance: Ω, capacitance: F)



Proper cares in mounting radiator fin

1. The mounting torque is in the range of 4 to 6kg.cm.
2. The distance between screw holes of the radiator fin must coincide with the distance between screw holes of the IC. With case outline dimensions L and R referred to, the screws must be tightened with the distance between them as close to each other as possible.



3. The screw to be used must have a head equivalent to the truss machine screw or binder machine screw defined by JIS. Washers must be also used to protect the IC case.
4. No foreign matter such as cutting particles shall exist between heat sink and radiator fin. When applying grease on the junction surface, it must be applied uniformly on the whole surface.
5. IC lead pins are soldered to the printed circuit board after the radiator fin is mounted on the IC.