Ordering number:ENN1724D

Monolithic Linear IC

LA4270

6W Dual-Channel AF Power Amplifier

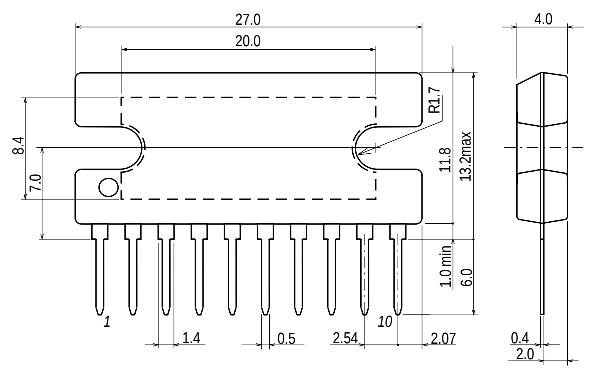
Features

- High-output dual-channel AF Power IC. (P_O=6.0W×2, V_{CC}=25V, R_L=8Ω, f=1kHz, THD=1.0%)
- Low distortion (THD=0.1%, V_{CC}=25V, R_L=8Ω, f=1kHz, P_O=2W).
- Minimum number of external parts requierd (no boot-strap capacitor requierd).
- Low pop noise at the time of power switch ON/OFF.
- High ripple rejection (58dB typ).
- Wide supply voltage range (10V to 32V).
- On-chip protector against abnormality (thermal shutdown, overvoltage).

Package Dimensions

unit:mm

3024A-SIP10H



Specifications

Absolute Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		35	V
Maximum output current	I_O peak		3.5	V
Allowable power dissipation	Pd max	With heat sink. See Pd–Ta graph.	20	W
Operating temperature	Topr		–20 to +75	˚C
Storage temperature	Tstg		–40 to +150	˚C

Operating Conditions at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		25	V
Operating voltage range	V_{CC} op		10 to 32	V
Recommended load resistance	R_L		8	Ω

Operating Characteristics at Ta = 25˚C, V_{CC}=25V, R_L=8Ω, f=1kHz, Rg=600Ω, See specified test circuit

Parameter	Symbol	Conditions	Ratings min	Ratings typ	Ratings max	Unit
Quiescent current	I_{CCO}		25	45	90	mA
Voltage gain	VG		38	40	42	dB
Output power	P_O	THD=1%	5.0	6.0		W
Total harmonic distortion	THD	P_O=2W		0.1	0.8	%
Output noise voltage	V_{NO}	Rg=10kΩ, BW=20Hz to 20kHz		0.25	1.0	mV
Ripple rejection	SVRR	Rg=10kΩ, f_R=100Hz, V_R=0dBm	45	58		dB

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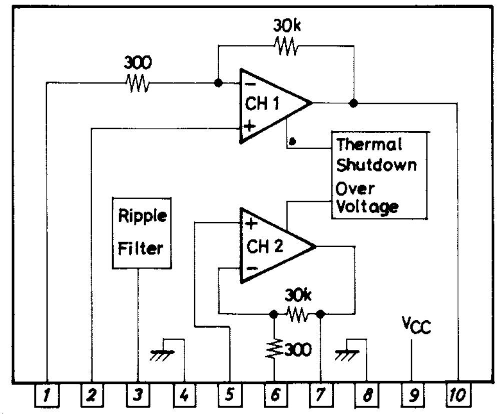
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

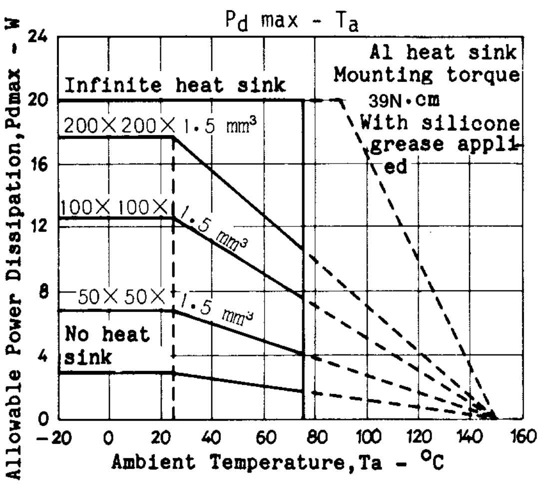
Continued from preceding page.

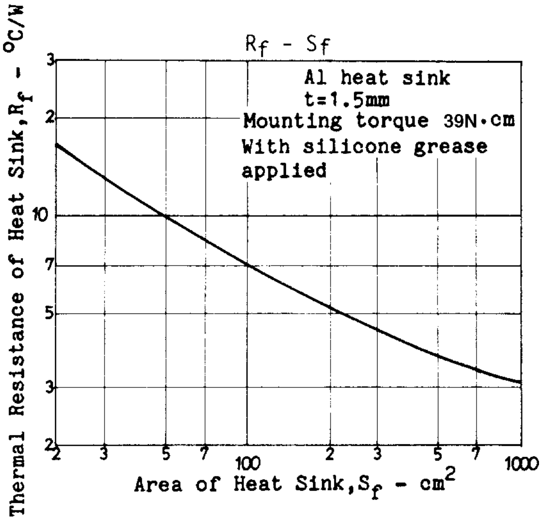
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Crosstalk	CT	Rg=10kΩ	45	60		dB
Channel balance	ΔVG				1.5	dB

Equivalent Circuit Block Diagram and Pin Assignment

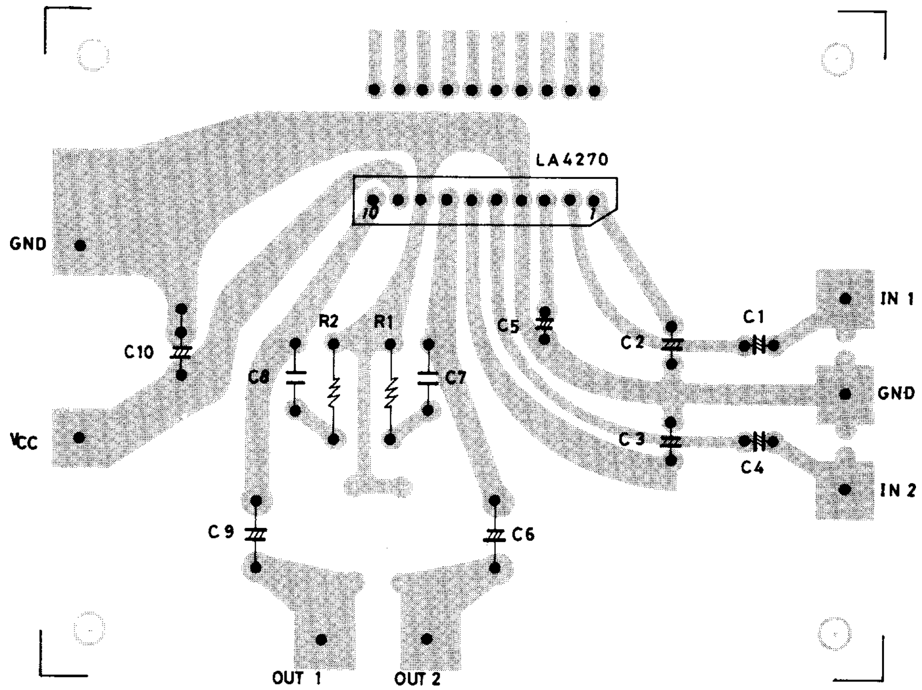
Unit (resistance: Ω)



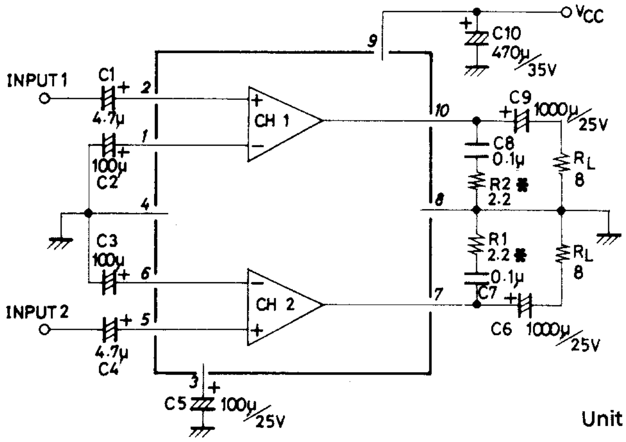




Sample Printed Circuit Pattern



Sample Application Circuit 1 : Dual-channel use (specified Test Circuit)



✱ : Polyester film capacitor

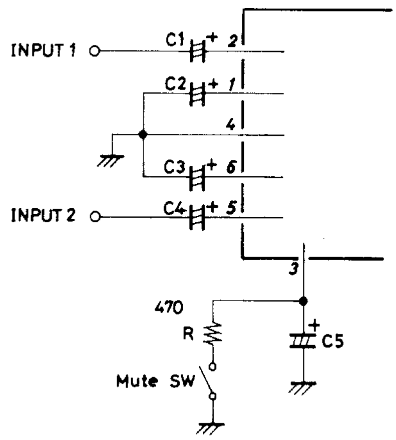
Unit (resistance: Ω, capacitance: F)

Description of External Parts

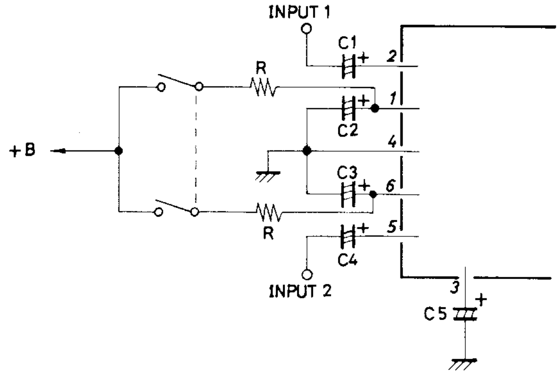
C1, C4 :	Input capacitors
(4.7µF)	Since the DC potential of the input pins is not 0, the two capacitors cannot be omitted. Decreasing the capacitor value extremely causes the frequency response to lower at low frequencies.
C2, C3 :	Feedback capacitors
(100µF)	Decreasing the capacitor value causes the frequency response to lower at low frequencies. Increasing the capacitor value makes the starting time later.
C5 :	Ripple filter capacitor
(100µF/25V)	Decreasing the capacitor value provides less ripple rejection. Decreasing the capacitor value also makes the starting time earlier.
C6, C9 :	Output capacitors
(1000µF/25V)	Decreasing the capacitor value provides less power at low frequencies.
C7, C8 :	Oscillation blocking capacitors
(0.1µF polyester film capacitors)	Decreasing the capacitor value causes oscillation to be liable to occur. It is recommended to use polyester film capacitors which are excellent in high frequency response, temperature characteristic. The use of electrolytic capacitors or ceramic capacitors may cause oscillation to occur at low temperatures.
C10 :	Power capacitor
(470µF/35V)	Decreasing the capacitor value causes ripple to be liable to occur. If the distance between the IC and this capacitor is made long or this capacitor is removed, oscillation may occur.
R1, R2 :	Resistors connected in series with oscillation blocking capacitors
(2.2Ω)	Used to prevent phase shift attributable to the oscillation blocking capacitors so that oscillation is hard to occur. Increasing or decreasing the resistor value causes oscillation to be liable to occur. The optimum value must be used.

External Muting

1. Lowering of potential at ripple filter pin (pin 3).
   Muting can be provided by discharging resistor R connected across pin 3 and GND to lower the potential at pin 3. Too small an R value causes pop noise to occur ; and too large an R value causes muting to fail to work.
   If no adequate R value is obtained, it is recommended that the R value is made rather small and the C5 value is increased.

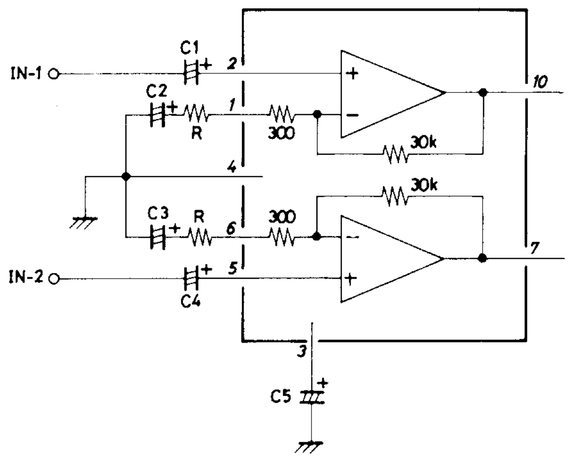


2. Application of positive bias to NF pins.
   Muting can be provided by positive bias applied to the NF pins. In this case, the R value must be determined so that the potential at the NF pins (pins 1, 6) does not exceed 3V at the muting mode.

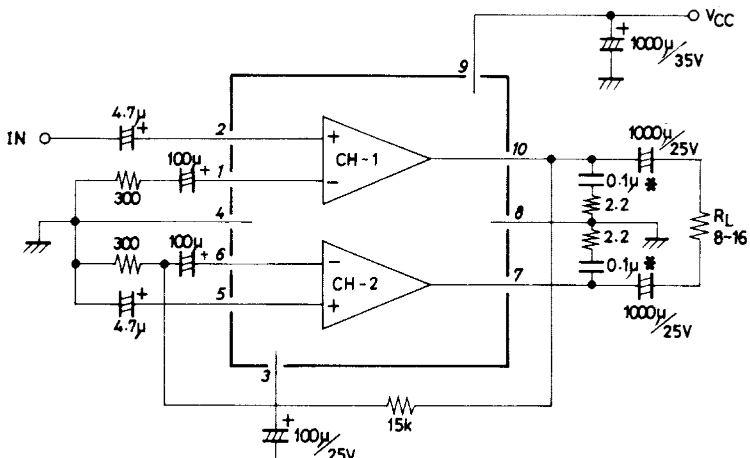


Voltage Gain

The voltage gain is fixed to 40dB by the ratio of on-chip resistors 30kΩ and 300Ω. It is impossible to use the IC at a voltage gain greater than this. In an application where the IC is used at a voltage gain of less than 40dB, resistors are connected in series with feedback resistors as shown right. In this application, however, oscillation is liable to occur. So, the voltage gain must not be less than 30dB.



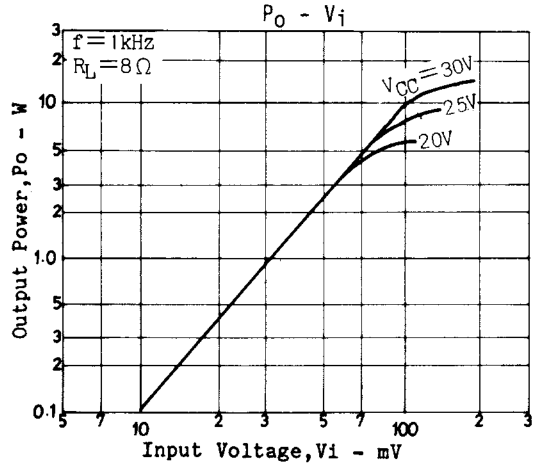
Sample Application Circuit 2 : Bridge amplifier use

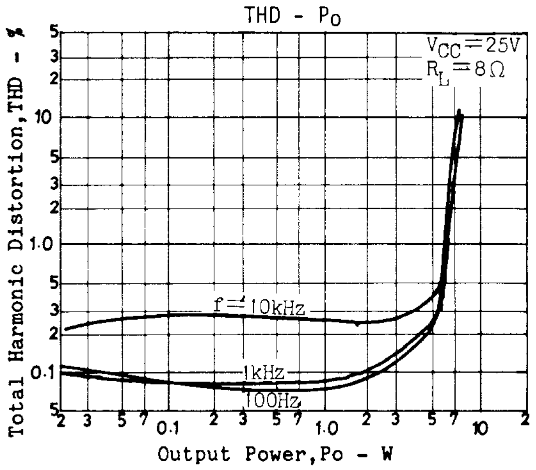


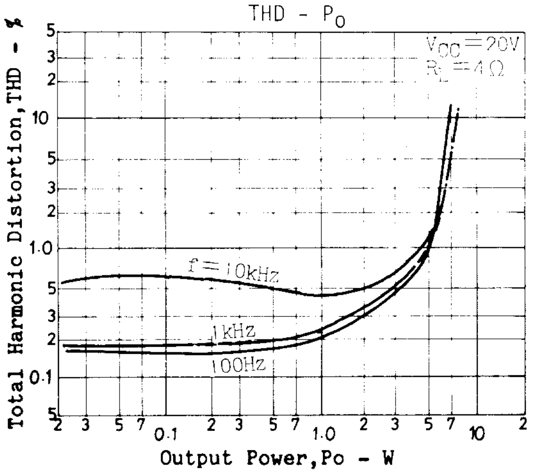
* : Polyester film capacitor

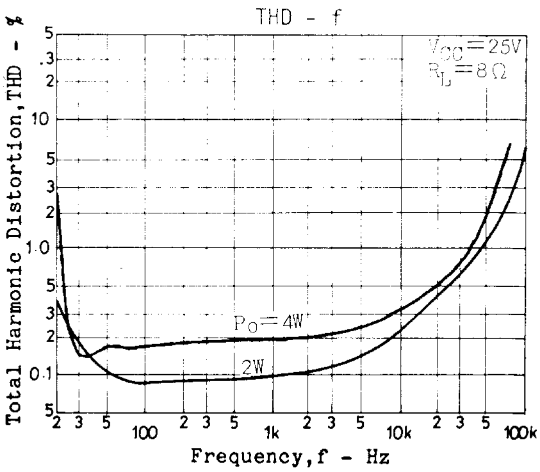
Unit (resistance: Ω, capacitance: F)

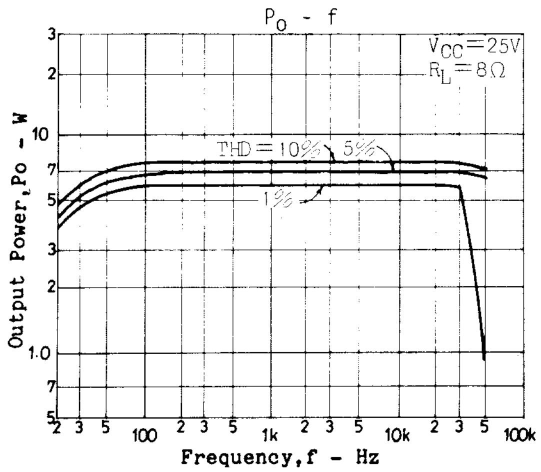
In this application, output capacitors must be used. Since the IC handles an apparent load of 4Ω, more distortion results, making it impossible for the IC to deliver power at THD=1% as in 2-channel use. It is possible for the IC to deliver power at THD=5% or 10%

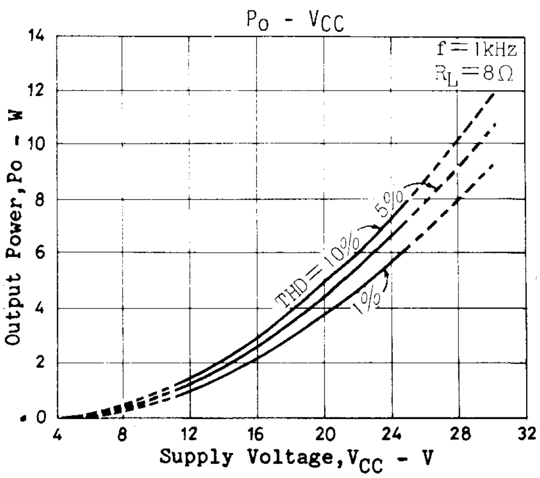


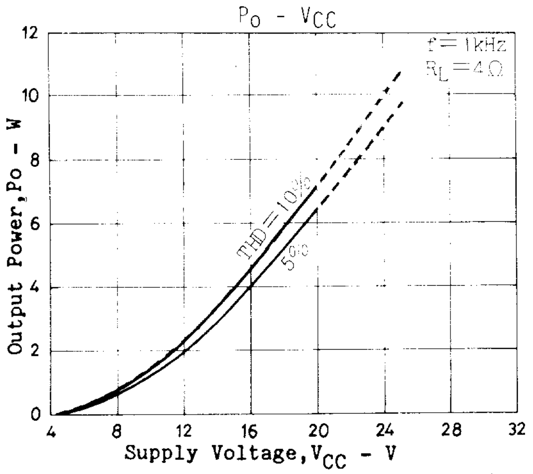


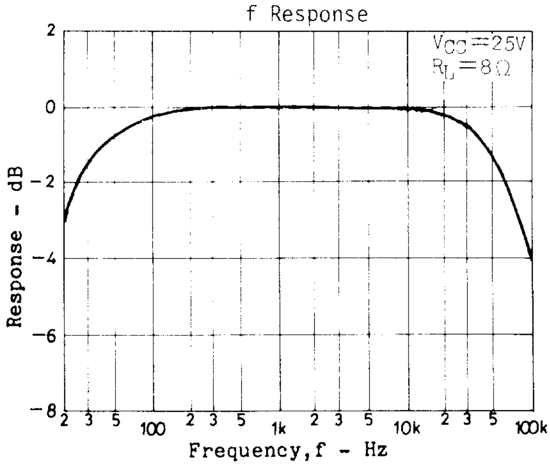


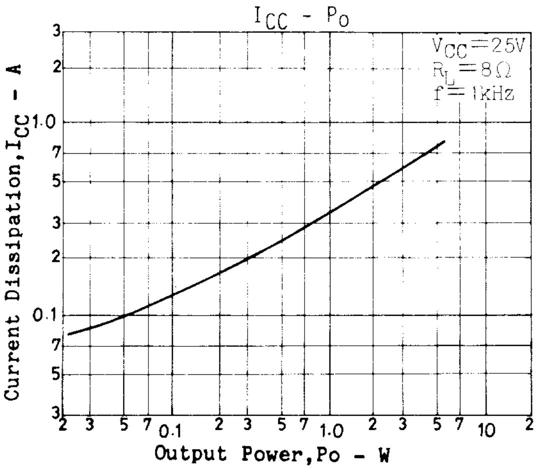


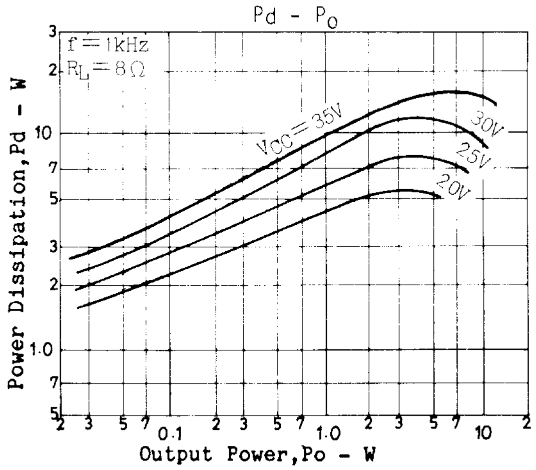


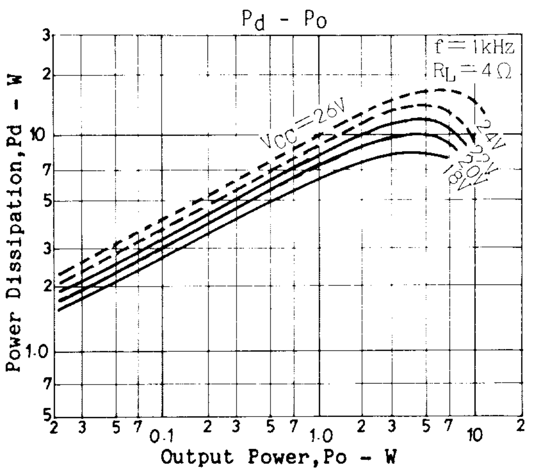


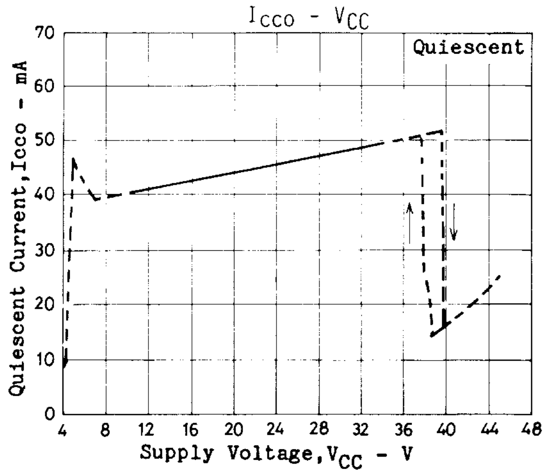

Po - VCC
f = 1kHz
RL = 4Ω
THD = 10%
5%
Output Power, Po - W
Supply Voltage, VCC - V

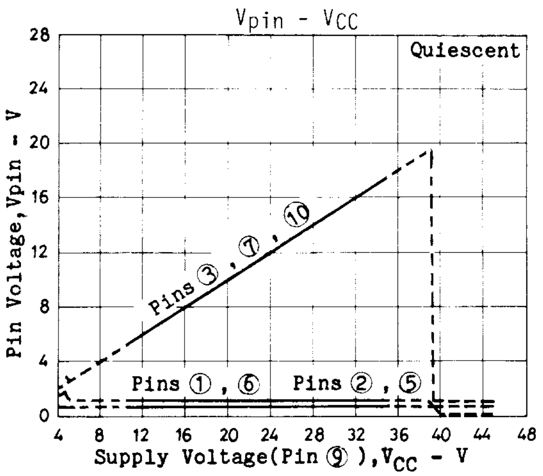

f Response
VCC = 25V
RL = 8Ω
Response - dB
Frequency, f - Hz

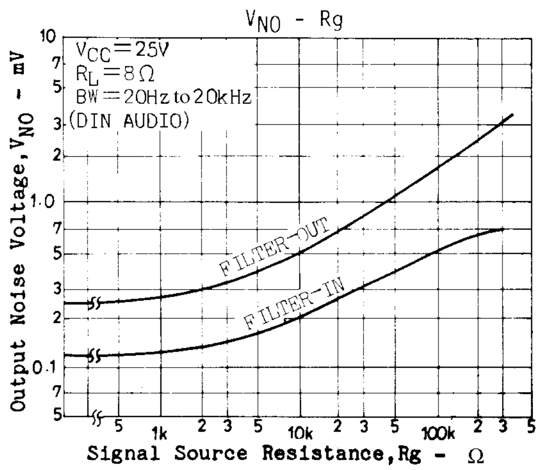

ICC - Po
VCC = 25V
RL = 8Ω
f = 1kHz
Current Dissipation, ICC - A
Output Power, Po - W

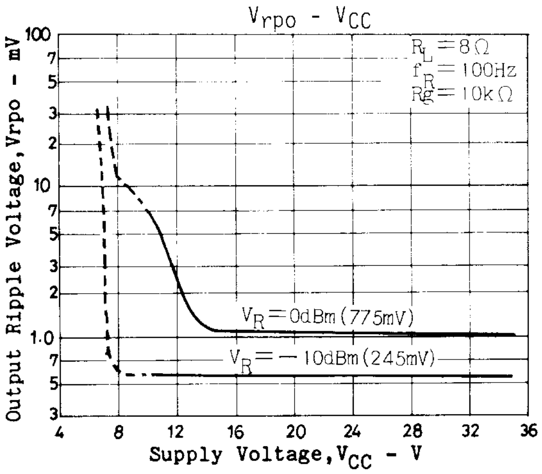

Pd - Po
f = 1kHz
RL = 8Ω
VCC = 35V
30V
25V
20V
Power Dissipation, Pd - W
Output Power, Po - W

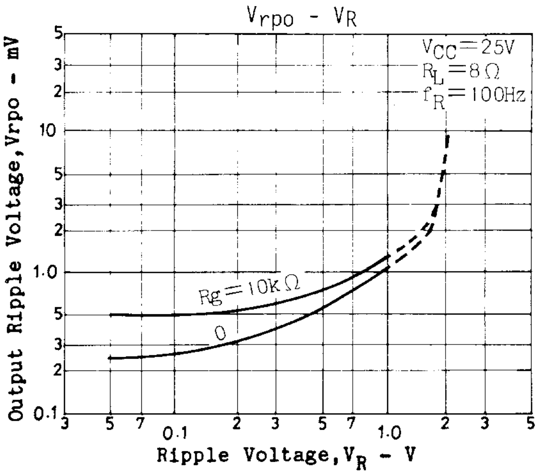

Pd - Po
f = 1kHz
RL = 4Ω
VCC = 26V
24V
22V
20V
18V
Power Dissipation, Pd - W
Output Power, Po - W

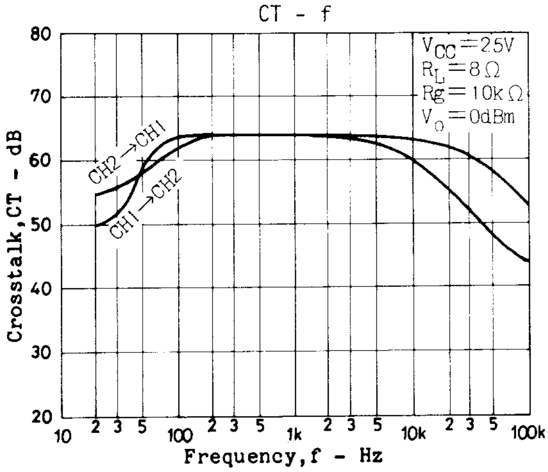

Icco - VCC
Quiescent
Quiescent Current, Icco - mA
Supply Voltage, VCC - V

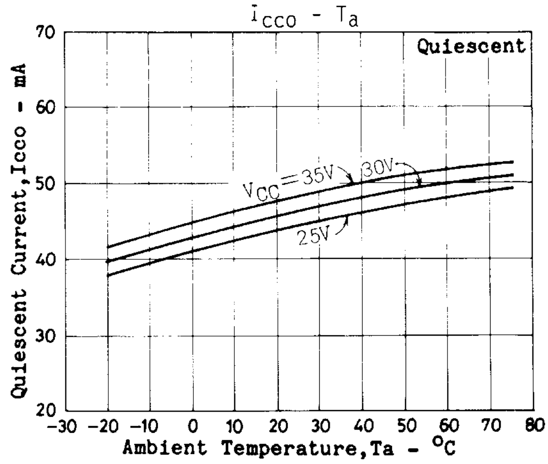

Vpin - VCC
Quiescent
Pins ③, ⑦, ⑩
Pins ①, ⑥
Pins ②, ⑤
Pin Voltage, Vpin - V
Supply Voltage (Pin ⑨), VCC - V

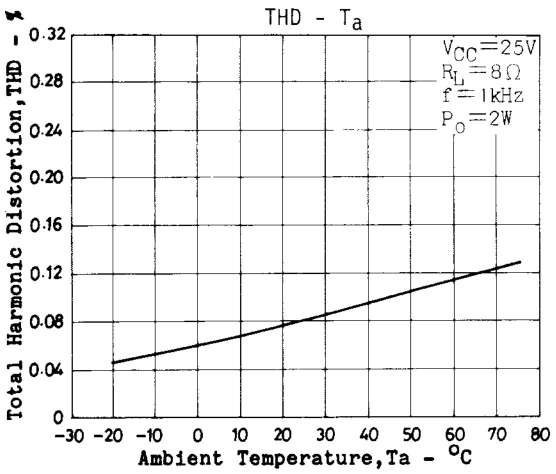

VNO - Rg
VCC = 25V
RL = 8Ω
BW = 20Hz to 20kHz
(DIN AUDIO)
FILTER-OUT
FILTER-IN
Output Noise Voltage, VNO - mV
Signal Source Resistance, Rg - Ω

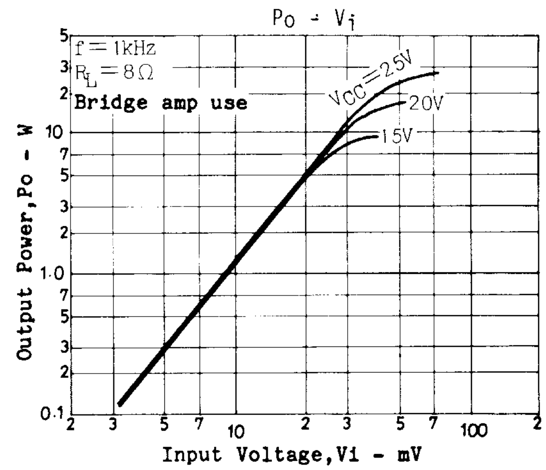

Vrpo - VCC
RL = 8Ω
fR = 100Hz
Rg = 10kΩ
VR = 0dBm (775mV)
VR = −10dBm (245mV)
Output Ripple Voltage, Vrpo - mV
Supply Voltage, VCC - V

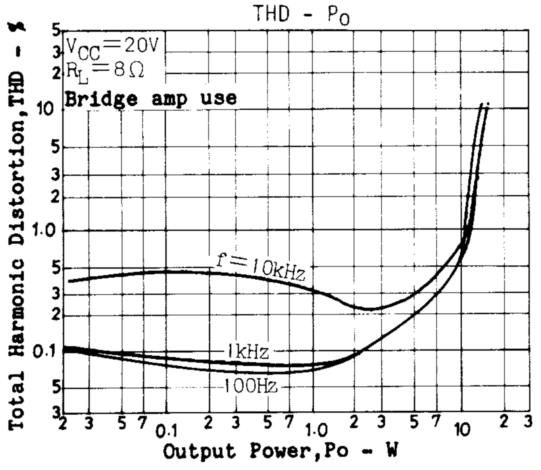

Vrpo - VR
VCC = 25V
RL = 8Ω
fR = 100Hz
Rg = 10kΩ
0
Output Ripple Voltage, Vrpo - mV
Ripple Voltage, VR - V

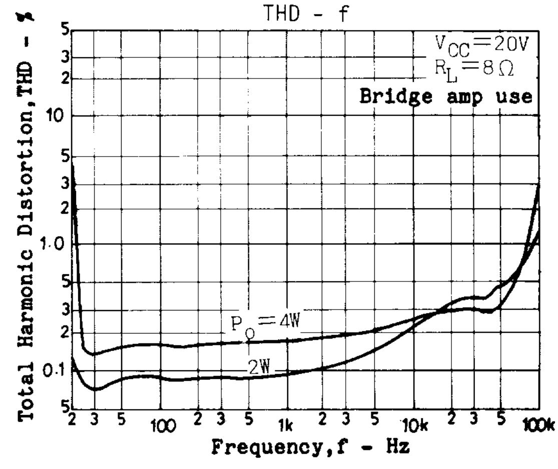

CT - f
VCC = 25V
RL = 8Ω
Rg = 10kΩ
Vo = 0dBm
CH2→CH1
CH1→CH2
Crosstalk, CT - dB
Frequency, f - Hz

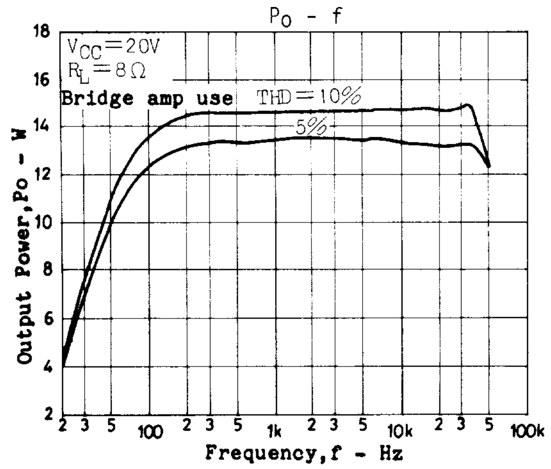

Icco - Ta
Quiescent
VCC = 35V
30V
25V
Quiescent Current, Icco - mA
Ambient Temperature, Ta - °C

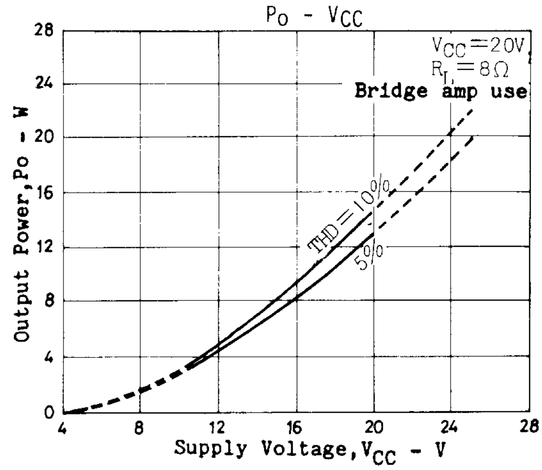

THD - Ta
VCC = 25V
RL = 8Ω
f = 1kHz
Po = 2W
Total Harmonic Distortion, THD - %
Ambient Temperature, Ta - °C

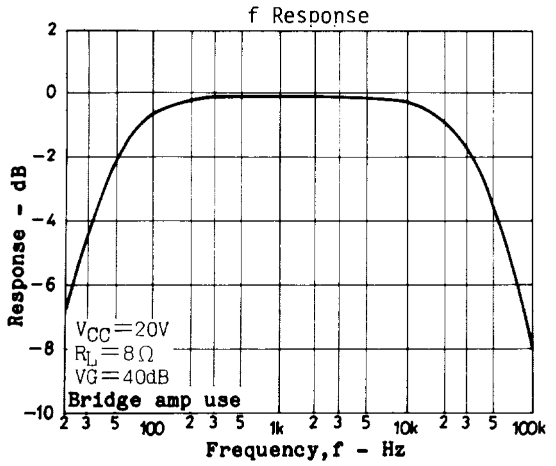

Po - Vi
f = 1kHz
RL = 8Ω
Bridge amp use
VCC = 25V
20V
15V
Output Power, Po - W
Input Voltage, Vi - mV

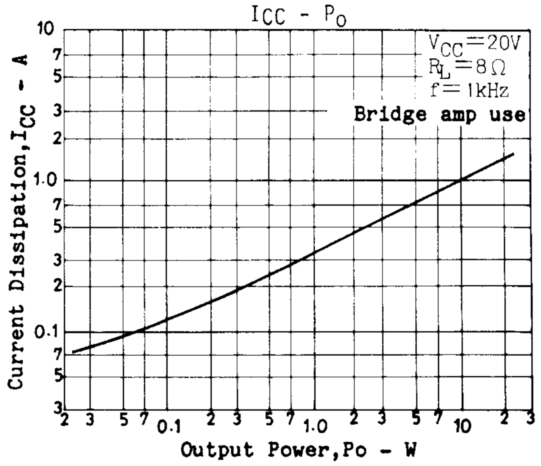

THD - Po
VCC = 20V
RL = 8Ω
Bridge amp use
f = 10kHz
1kHz
100Hz
Total Harmonic Distortion, THD - %
Output Power, Po - W

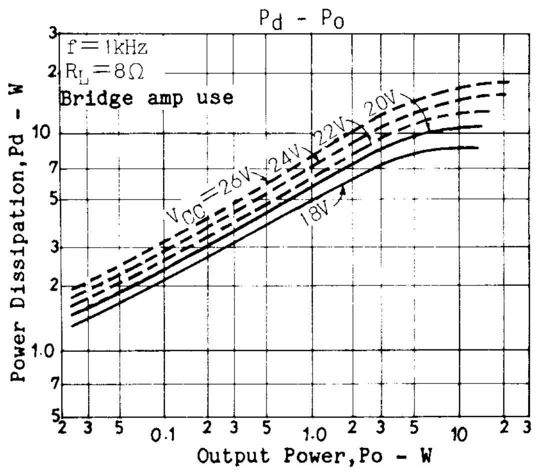

THD - f
VCC = 20V
RL = 8Ω
Bridge amp use
Po = 4W
2W
Total Harmonic Distortion, THD - %
Frequency, f - Hz

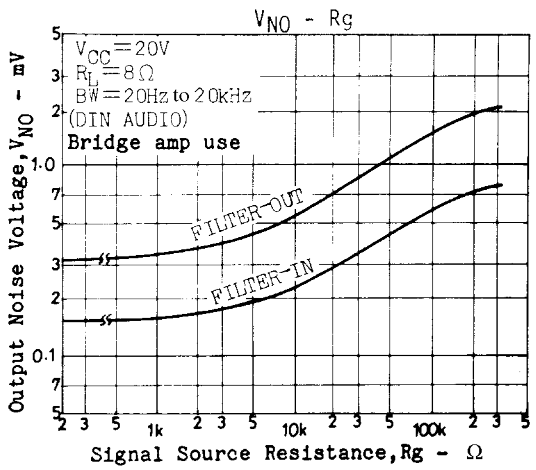

Po - f
VCC=20V
RL=8Ω
Bridge amp use
THD=10%
5%
Output Power,Po - W
Frequency,f - Hz

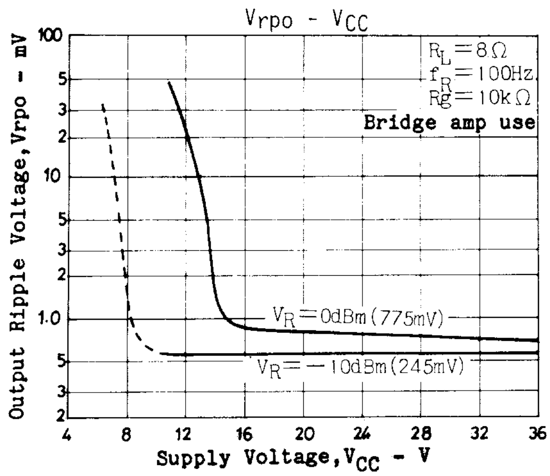

Po - VCC
VCC=20V
RL=8Ω
Bridge amp use
THD=10%
5%
Output Power,Po - W
Supply Voltage,VCC - V

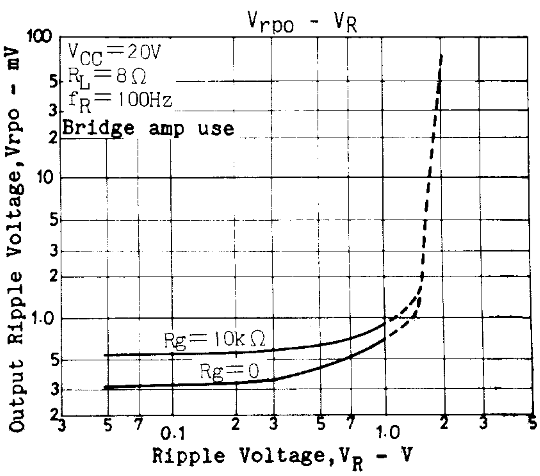

f Response
VCC=20V
RL=8Ω
VG=40dB
Bridge amp use
Response - dB
Frequency,f - Hz


ICC - Po
VCC=20V
RL=8Ω
f=1kHz
Bridge amp use
Current Dissipation,ICC - A
Output Power,Po - W


Pd - Po
f=1kHz
RL=8Ω
Bridge amp use
VCC=26V
24V
22V
20V
18V
Power Dissipation,Pd - W
Output Power,Po - W


VNO - Rg
VCC=20V
RL=8Ω
BW=20Hz to 20kHz
(DIN AUDIO)
Bridge amp use
FILTER-OUT
FILTER-IN
Output Noise Voltage,VNO - mV
Signal Source Resistance,Rg - Ω


Vrpo - VCC
RL=8Ω
fR=100Hz
Rg=10kΩ
Bridge amp use
VR=0dBm(775mV)
VR=−10dBm(245mV)
Output Ripple Voltage,Vrpo - mV
Supply Voltage,VCC - V

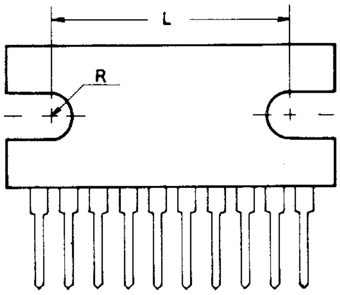

Vrpo - VR
VCC=20V
RL=8Ω
fR=100Hz
Bridge amp use
Rg=10kΩ
Rg=0
Output Ripple Voltage,Vrpo - mV
Ripple Voltage,VR - V

Proper Cases in Using IC

- Maximum ratings : If the IC is used in the vicinity of the maximum ratings, even a slight variation in conditions may cause the maximum ratings 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 ratings are not exceeded.
- Pin-to-pin short : If power is applied when the space between pins is shorted, breakdown or deterioration may occur. When mounting the IC on the board or applying power, make sure that the space between pins is not shorted with solder, etc.
- When used in radio applications : When using in radios, allow a good distance between IC and bar antenna.
- Printed circuit pattern : When drawing the printed circuit pattern, make the power supply, output, and ground lines thick and short and arrange the pattern and parts so that no feedback loop is formed between input and output. Place power capacitor C10, oscillatoin blocking capacitors C7, C8 as close to IC pins as possible to prevent oscillation from occurring. Refer to the sample printed circuit pattern.

Proper Cares Mounting Radiator Fin

1. The mounting torque is in the range of 39 to 59N · 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 tightend 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.