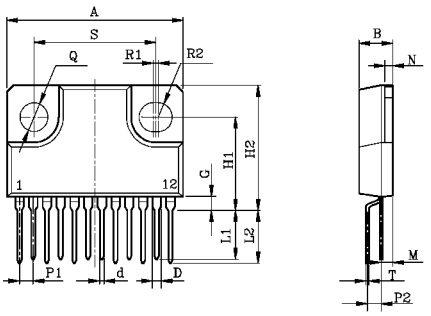
5.8W DUAL AUDIO POWER AMPLIFIER.
22W BTL AUDIO POWER AMPLIFIER.

The KIA6280H is dual audio power amplifier for consumer application.
It is designed for high power, low distortion and low noise.
It also contains various kind of protectors.
It is suitable for car-audio power amplifier with high performance.



DIM	MILLIMETERS
A	22.6±0.2
B	4.0±0.2
D	1.1±0.1
d	0.55±0.1
G	1.55±0.2
H1	11.25±0.3
H2	14.5±0.3
L1	6.55±0.3
L2	7.05±0.3
M	2.075 TYP.
N	1.5 TYP.
P1	1.778
P2	2.0
Q	3.7±0.2
R1	0.4
R2	R1.85
S	15.6±0.2
T	0.4+0.1/-0.05

CPP-12

FEATURES

- High Power
  $P_{OUT(1)}$=22W(Typ.)
  (V_{CC}=14.4V, f=1kHz, THD=10%, R_L=4Ω, BTL)
  $P_{OUT(2)}$=19W(Typ.)
  (V_{CC}=13.2V, f=1kHz, THD=10%, R_L=4Ω, BTL)
  $P_{OUT(3)}$=15W(Typ.)
  (V_{CC}=13.2V, f=1kHz, THD=1%, R_L=4Ω, BTL)
  $P_{OUT(4)}$=5.8W(Typ.)/ch
  (V_{CC}=13.2V, f=1kHz, THD=10%, R_L=4Ω, DUAL).

- Low Distortion
  THD(1)=0.03%(Typ.)
  (V_{CC}=13.2V, f=1kHz, P_{OUT}=4W, G_V=40dB, R_L=4Ω, BTL)
  THD(2)=0.06%(Typ.)
  (V_{CC}=13.2V, f=1kHz, P_{OUT}=1W, G_V=52dB, R_L=4Ω, DUAL).

- Low Noise
  $V_{NO(1)}$=0.14mV_{rms}(Typ.)
  (V_{CC}=13.2V, R_L=4Ω, G_V=40dB, Rg=0, DIN Noise : DIN45405)
  $V_{NO(2)}$=0.7mV_{rms}(Typ.)
  (V_{CC}=13.2V, R_L=4Ω, G_V=52dB, Rg=10kΩ, BW=20Hz~20kHz, DUAL).

- Protector Circuit
  Thermal shut down, over voltage protection
  Out-V_{CC} short, OUT-GND short and Out-Out short protection.

- Operating supply voltage range
  V_{CC}=9~18V.

MAXIMUM RATINGS (Ta=25℃)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2 sec)	V_{CC} surge	45	V
DC Supply Voltage	V_{CC} DC	25	V
Operating Supply Voltage	V_{CC} opr	18	V
Output Current (Peak)	I_O (peak)	4.5	A
Power Dissipation	P_D	25	W
Operating Temperature	T_{opr}	-30~85	℃
Storage Temperature	T_{stg}	-55~150	℃

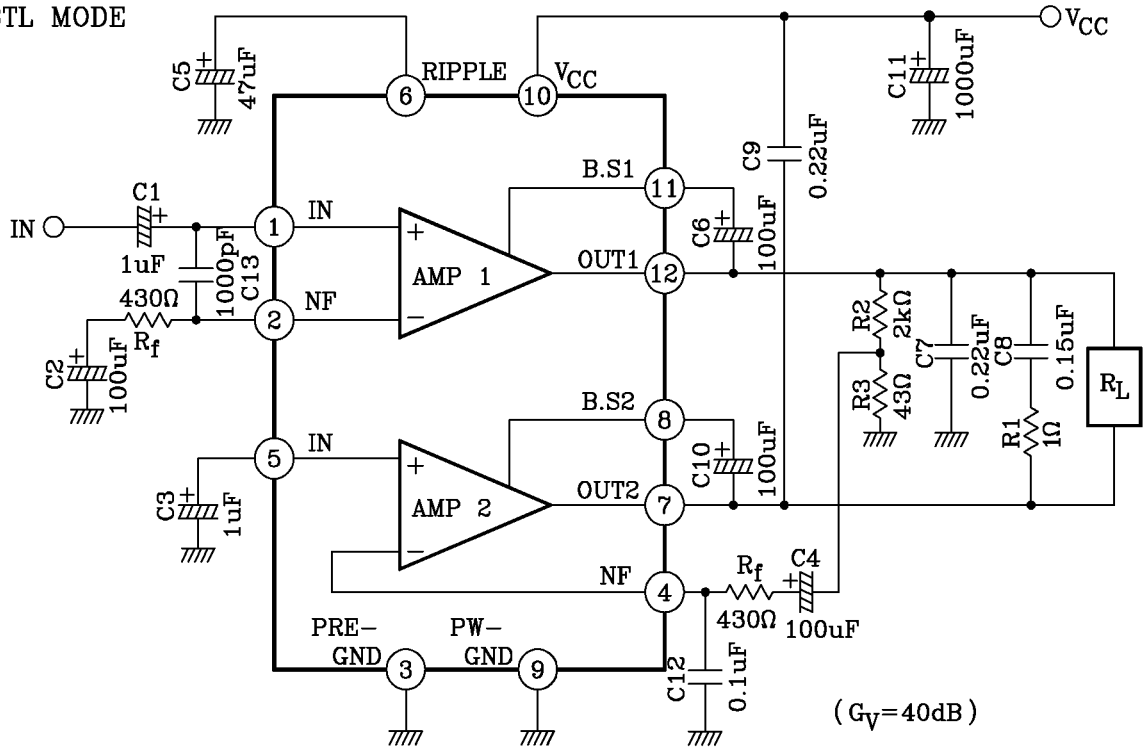
ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{CC}=13.2V, R_L=4Ω, Rg=600Ω, f=1kHz, Ta=25℃)

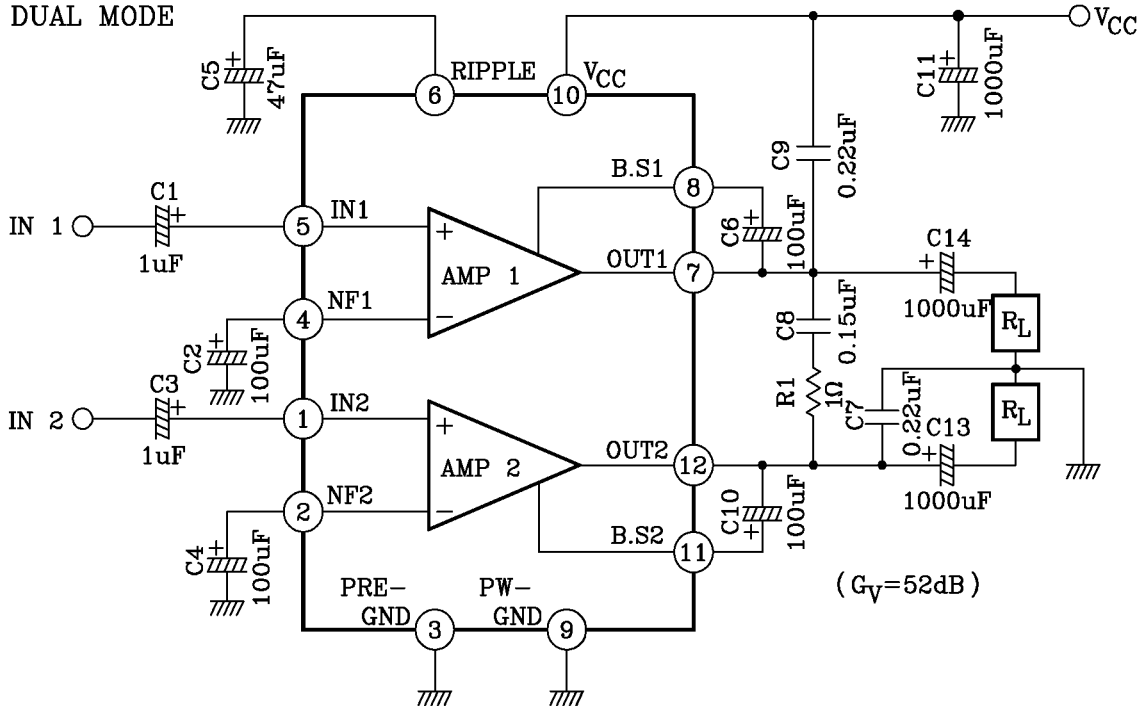
CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current		I_{CCQ}	2	V_{IN}=0	-	80	145	mA
	Output Power	P_{OUT}(1)	1	V_{CC}=14.4V, THD=10%	-	22	-	W
		P_{OUT}(2)	1	THD=10%	-	19	-	
		P_{OUT}(3)	1	THD=1%	-	15	-	
	Total Harmonic Distortion	THD(1)	1	P_{OUT}=4W, G_V=40dB	-	0.03	0.25	%
	Output Offset Voltage	V_{OFF}	1	V_{IN}=0	-	0	0.35	V
	Voltage Gain	G_V(1)	1	V_{OUT}=0dBm	-	40	-	dB
	Output Noise Voltage	V_{NO}(1)	1	Rg=0, BW=20Hz~20kHz	-	0.14	-	mV_{rms}
	Ripple Rejection Ratio	R.R(1)	1	f_{RIP}=100Hz, V_{RIP}=0dBm	-	-52	-40	dB
	Output Power	P_{OUT}(4)	2	THD=10%	5	5.8	-	W
	Total Harmonic Distortion	THD(2)	2	P_{OUT}=1W	-	0.06	0.30	%
	Voltage Gain	G_V(2)	2	V_{OUT}=0dBm	50	52	54	dB
	Voltage Gain Ratio	ΔG_V	2	V_{OUT}=0dBm	-1	0	1	dB
	Output Noise Voltage	V_{NO}(2)	2	Rg=10kΩ, BW=20Hz~20kHz	-	0.7	1.5	mV_{rms}
	Ripple Rejection Ratio	R.R(2)	2	f_{RIP}=100Hz, V_{RIP}=0dBm	-	-52	-40	dB
	Cross Talk	C.T	2	V_{OUT}=0dBm, Rg=600Ω	-	-57	-	dB
	Input Resistance	R_{IN}	2	-	-	33	-	kΩ

TEST CIRCUIT/APPLICATION CIRCUIT

(1) BTL MODE



(2) DUAL MODE



TYPICAL VOLTAGE OF EACH TERMINAL
(V_{CC}=13.2V, Ta=25℃, DUAL MODE TEST CIRCUIT)

TERMINAL NO.	1	2	3	4	5	6	7	8	9	10	11	12
DC Voltage(V)	1.5	1.5	GND	1.5	1.5	6.4	6.4	12.3	GND	V_{CC}	12.3	6.4

APPLICATION INFORMATION

1.VOLTAGE GAIN ADJUSTMENT

(1) DUAL AMPLIFIER

The voltage gian G_V is determined by R_1, R_2 and R_f in Fig. 1.

$$G_V = 20\log\frac{R_f + R_1 + R_2}{R_f + R_1}(dB)$$

In case of R_f=0
The voltage gain is set as follows:
G_V=52dB (Typ.)

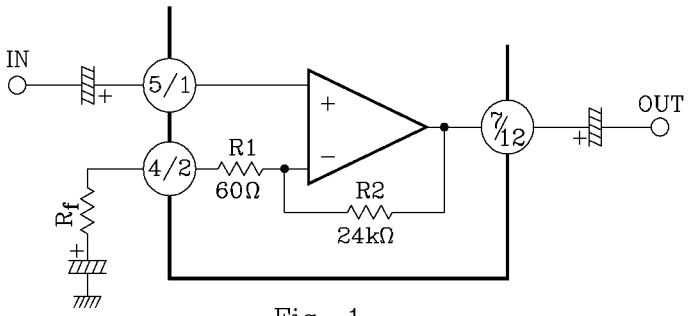


Fig. 1

(2) BTL AMPLIFIER

The recommended BTL connection amplifier shown in Fig. 2.

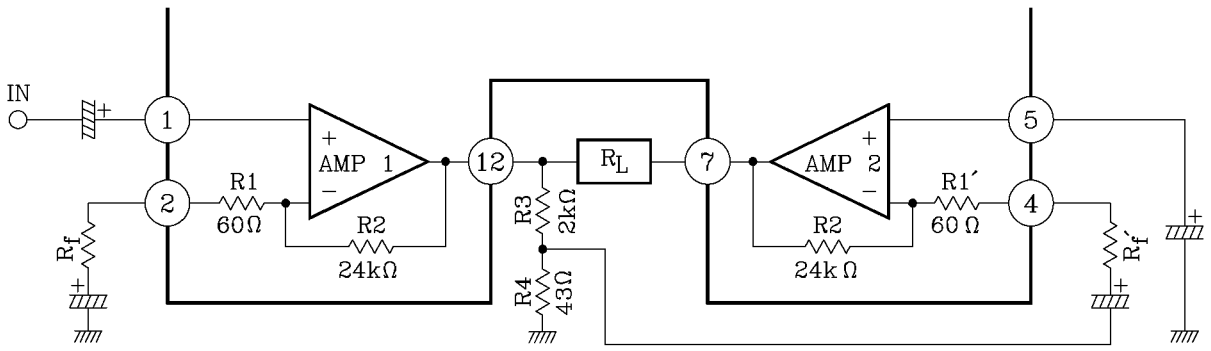


Fig. 2

Amp. 1 is noninverting amplifier and Amp. 2 is invert one.
The output voltage is divided by resistors R_3 and R_4.
The divided voltage is applied to inverting input of Amp. 2.
R_3 and R_4 are determined in the following equation.

$$20\log\frac{R_3+R_4}{R_4}=20\log\frac{R_f+R_1+R_2}{R_f+R_1}(dB) \quad G_V \text{ in Dual Mode}$$

The voltage gain in this circuit is 6dB higher than that in Dual Mode.

$$G_V=20\log\frac{R_f+R_1+R_2}{R_f+R_1}+6(dB)$$

In case of R_f=0
G_V=52+6=58(dB)
In case of R_f=430Ω
G_V=34+6=40(dB)

Each voltage gain can be set as shown above.

2.MUTING

Audio muting can be accomplished by connecting pin 6 (ripple filter) to GND as shown in Fig. 3.
Then, the bias circuits are cut off.
However, caution must be exercised to the following items.

(1) The recovery time from the muting operation is determined by the capacities of the ripple filter capacitor between 6 pin and GND, and of the capacitor for NF.

(2) As this muting system is operated by the short-circuit of ripple filter : C5, the ripple rejection ratio becomes worse in the muting condition.
At mute ON, some pop noises of breaking the bias are produced.

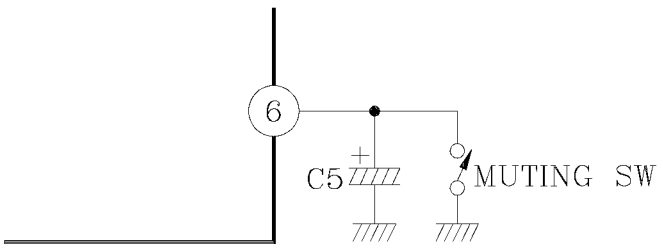


Fig. 3

The output waveform at muting ON/OFF during BTL, are shown in fig. 4.
(Provided V_{CC}=13.2V, R_L=4Ω, non-signal.)
50dB or more can be obtained for muting amount.

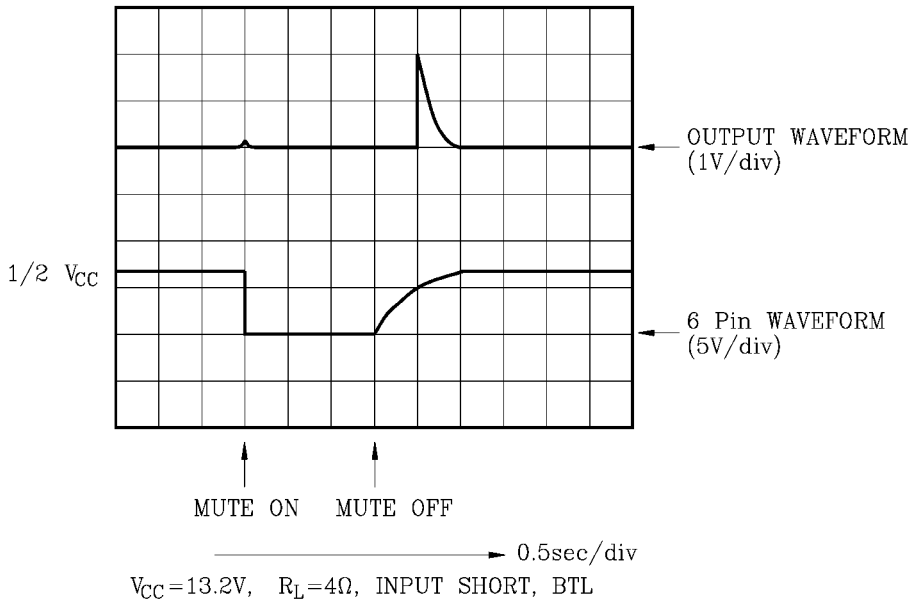


Fig. 4

3. MEASURES AGAINST OSCILLATION

C7, C8, C9, C12 : The capacitor of polyester film having small variation of the temperature characteristics is recommended as the capacitor for oscillation prevention.

C13 : Reduces the gain in the high range frequency (150kHz or over) and increases the oscillation allowance.

R1 : Increases the oscillation allowance at output cripping of the low range frequency (100Hz or less).

Since the oscillation allowance varies according to the following items, carry out the temperature test to confirm the oscillation allowance.

(1). Gain to be used (G_V setting).
(2). Capacity of capacitor
(3). Kinds of capacitor
(4). Layout of printed board

It is recommended to use the capacitor having the capacity exceeding the oscillation stopping value.
At using with the voltage gain G_V lowered or with the high range frequency and the oscillation becomes liable to be produced.
Therefore, application with G_V=40dB or over is advisable.
Especially for using with the gain lowered in DUAL operation, insert 1000pF between NF (2 pin and 4 pin) and GND.
This capacitor reduces the gain of the high range frequency and is effective for oscillation prevention.

4. OUTPUT WAVEFORM AT POWER SUPPLY ON/OFF

BTL and dual Amplifier DC output waveforms in the condition of V_{CC}=13.2V, R_L=4Ω at non-signal (input short) are shown in Fig. 5 and 6.

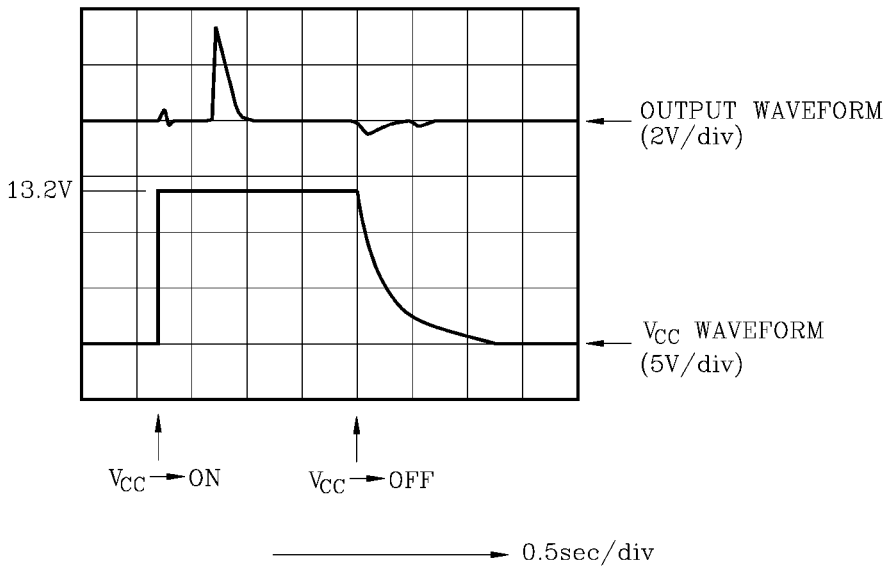


Fig. 5 BTL OPERATION

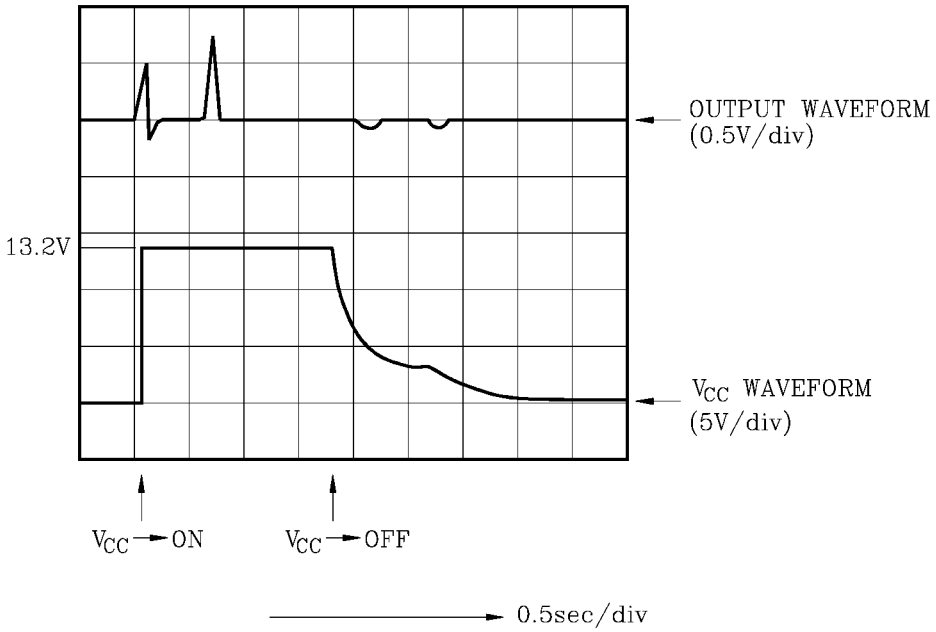
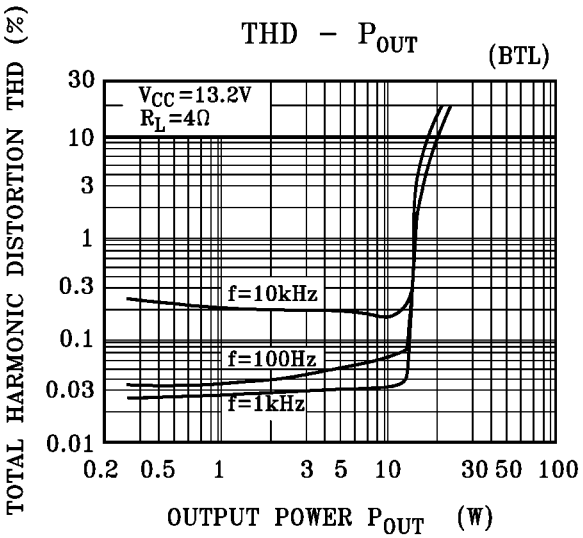
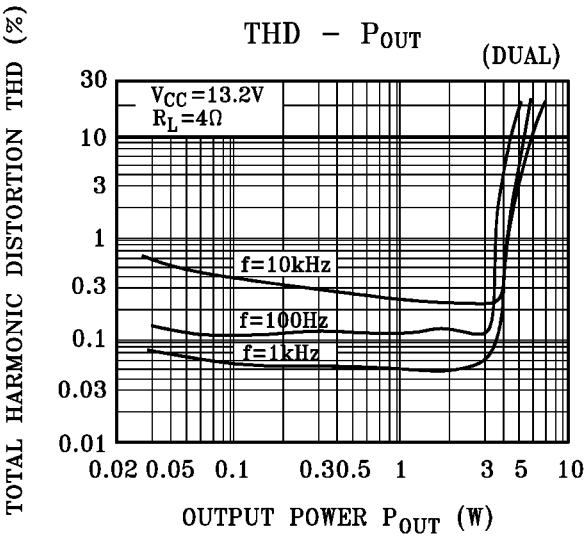
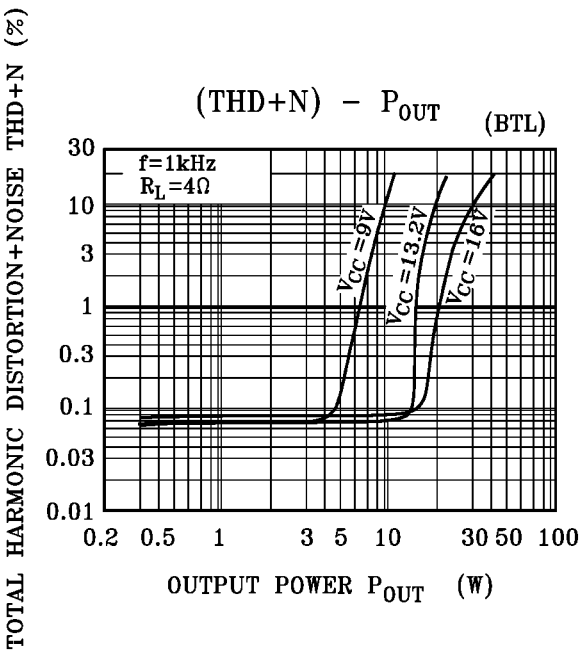


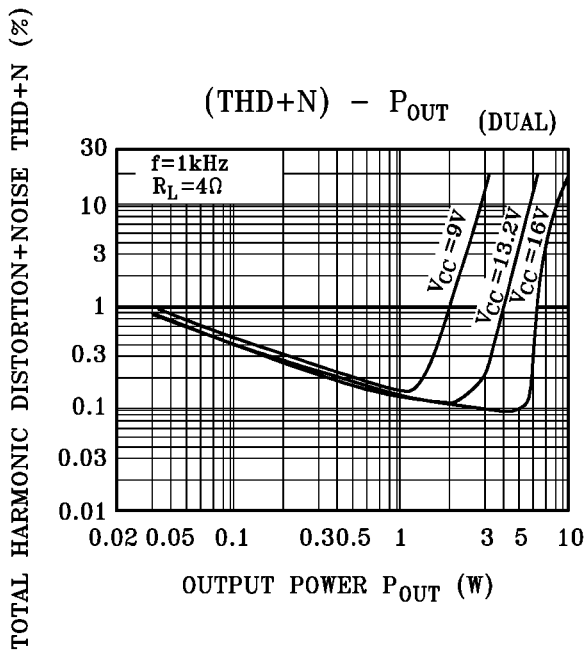
Fig. 6 DUAL OPERATION

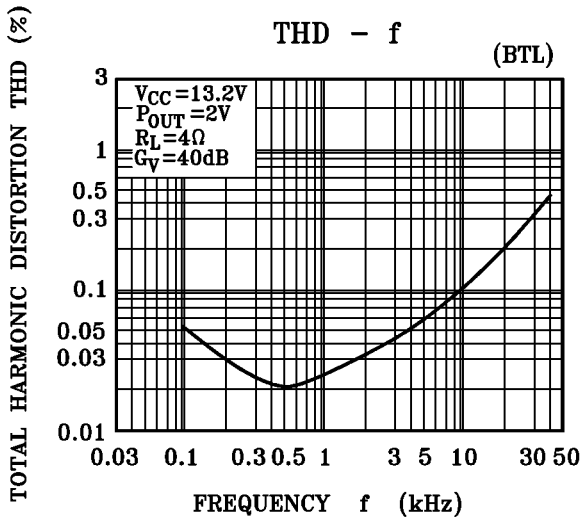
The popping time at power supply ON/OFF varies according to the rise and fall times. The condition in which the power supply is rapidly and repeatedly made ON/OFF, that is, the condition in which the charge is made on the external capacitor of IC is different from the conditions shown in Fig. 5 and Fig. 6.

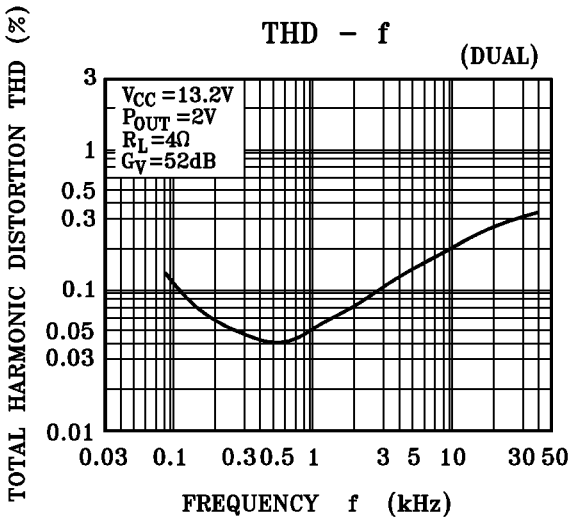

THD - POUT
(BTL)
VCC=13.2V
RL=4Ω
f=10kHz
f=100Hz
f=1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER POUT (W)
30
10
3
1
0.3
0.1
0.03
0.01
0.2 0.5 1 3 5 10 30 50 100

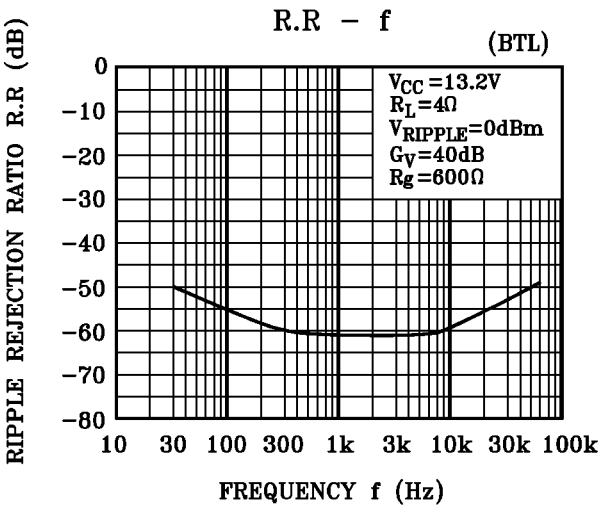

THD - POUT
(DUAL)
VCC=13.2V
RL=4Ω
f=10kHz
f=100Hz
f=1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER POUT (W)
30
10
3
1
0.3
0.1
0.03
0.01
0.02 0.05 0.1 0.3 0.5 1 3 5 10

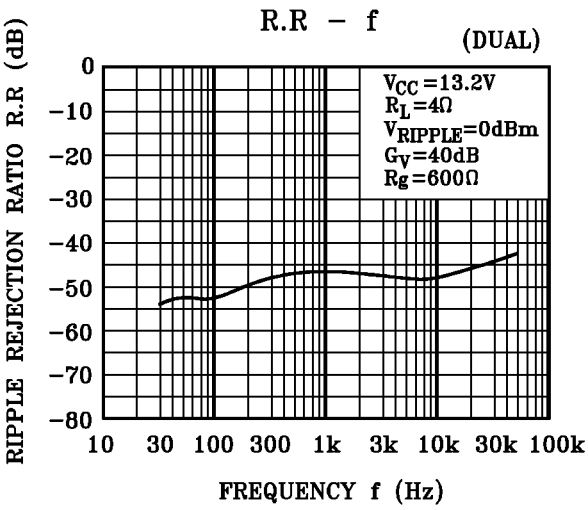

(THD+N) - POUT
(BTL)
f=1kHz
RL=4Ω
VCC=9V
VCC=13.2V
VCC=16V
TOTAL HARMONIC DISTORTION+NOISE THD+N (%)
OUTPUT POWER POUT (W)
30
10
3
1
0.3
0.1
0.03
0.01
0.2 0.5 1 3 5 10 30 50 100

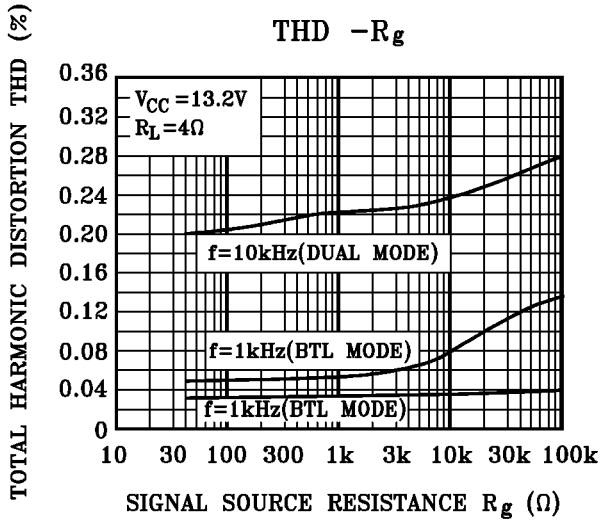

(THD+N) - POUT
(DUAL)
f=1kHz
RL=4Ω
VCC=9V
VCC=13.2V
VCC=16V
TOTAL HARMONIC DISTORTION+NOISE THD+N (%)
OUTPUT POWER POUT (W)
30
10
3
1
0.3
0.1
0.03
0.01
0.02 0.05 0.1 0.3 0.5 1 3 5 10

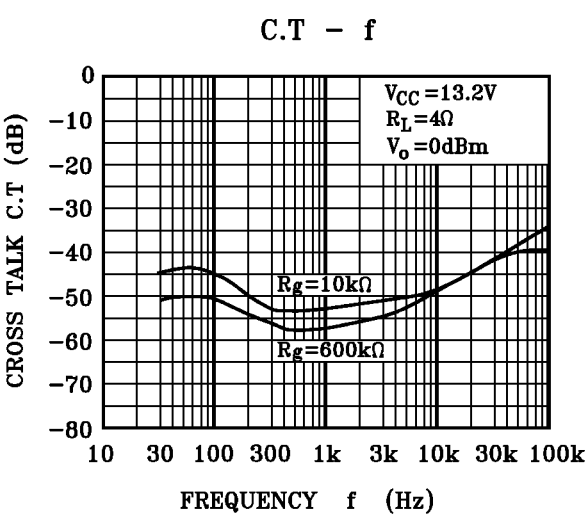

THD - f
(BTL)
V_{CC}=13.2V
P_{OUT}=2V
R_L=4Ω
G_V=40dB
TOTAL HARMONIC DISTORTION THD (%)
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.03 0.1 0.3 0.5 1 3 5 10 30 50
FREQUENCY f (kHz)


THD - f
(DUAL)
V_{CC}=13.2V
P_{OUT}=2V
R_L=4Ω
G_V=52dB
TOTAL HARMONIC DISTORTION THD (%)
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.03 0.1 0.3 0.5 1 3 5 10 30 50
FREQUENCY f (kHz)

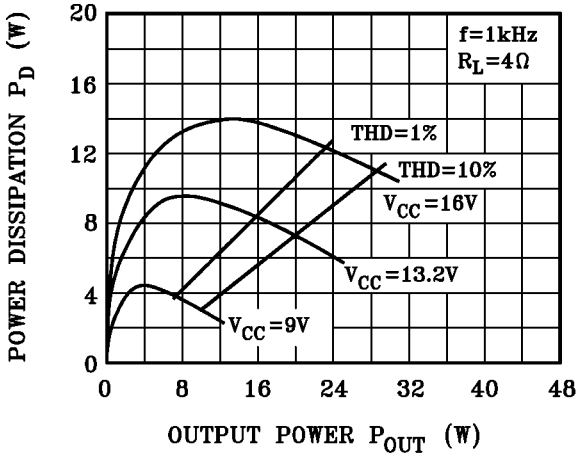

R.R - f
(BTL)
V_{CC}=13.2V
R_L=4Ω
V_{RIPPLE}=0dBm
G_V=40dB
R_g=600Ω
RIPPLE REJECTION RATIO R.R (dB)
0
-10
-20
-30
-40
-50
-60
-70
-80
10 30 100 300 1k 3k 10k 30k 100k
FREQUENCY f (Hz)


R.R - f
(DUAL)
V_{CC}=13.2V
R_L=4Ω
V_{RIPPLE}=0dBm
G_V=40dB
R_g=600Ω
RIPPLE REJECTION RATIO R.R (dB)
0
-10
-20
-30
-40
-50
-60
-70
-80
10 30 100 300 1k 3k 10k 30k 100k
FREQUENCY f (Hz)

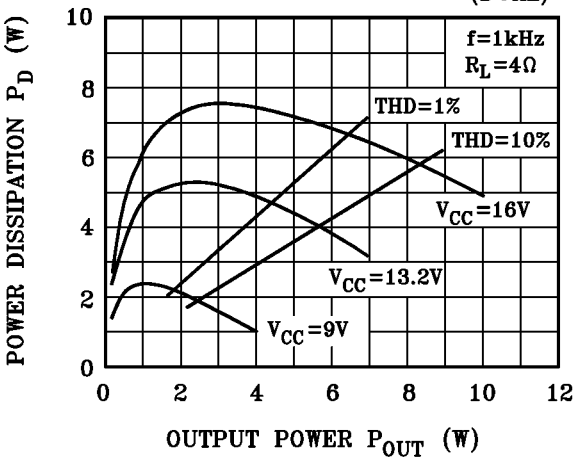

THD -R_g
V_{CC}=13.2V
R_L=4Ω
f=10kHz(DUAL MODE)
f=1kHz(BTL MODE)
f=1kHz(BTL MODE)
TOTAL HARMONIC DISTORTION THD (%)
0.36
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0
10 30 100 300 1k 3k 10k 30k 100k
SIGNAL SOURCE RESISTANCE R_g (Ω)


C.T - f
V_{CC}=13.2V
R_L=4Ω
V_o=0dBm
R_g=10kΩ
R_g=600kΩ
CROSS TALK C.T (dB)
0
-10
-20
-30
-40
-50
-60
-70
-80
10 30 100 300 1k 3k 10k 30k 100k
FREQUENCY f (Hz)

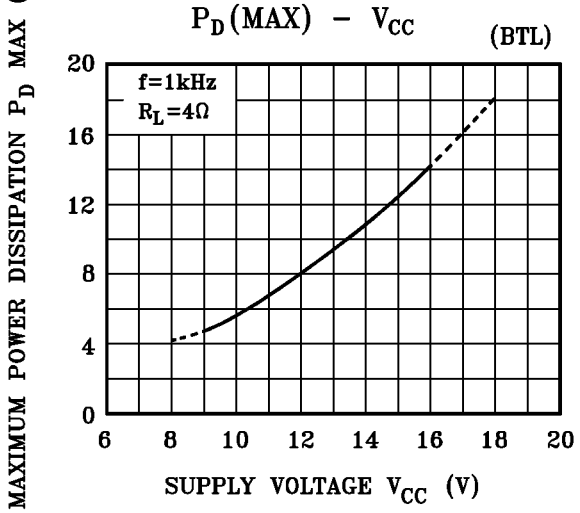
P_D – P_{OUT} (BTL)



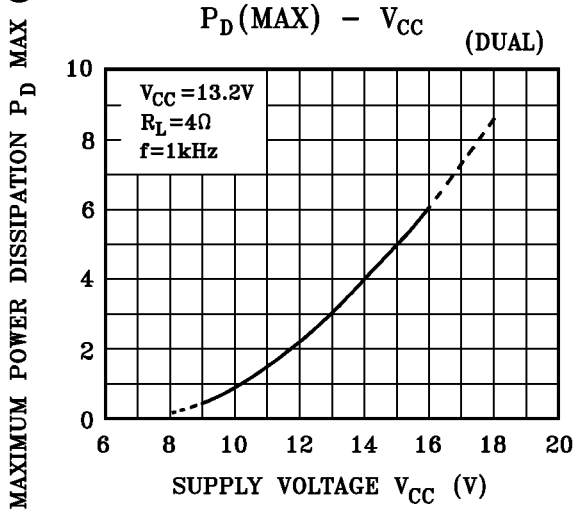
P_D – P_{OUT} (DUAL)



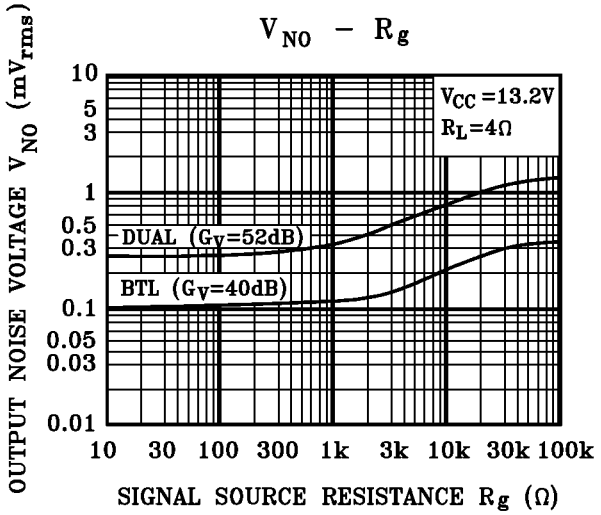
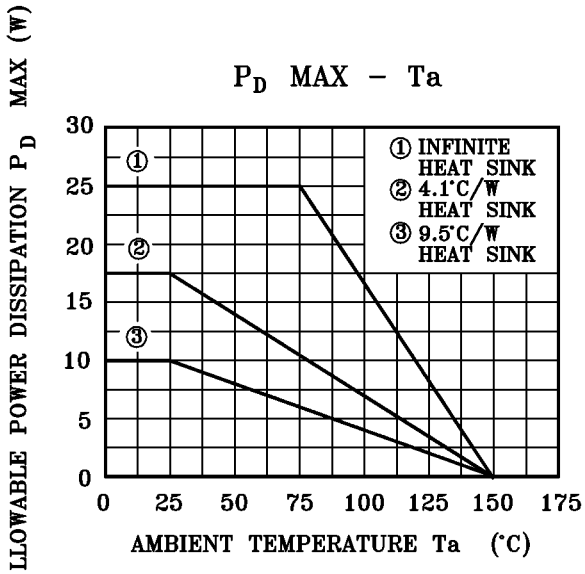
$P_D(MAX)$ – V_{CC} (BTL)



$P_D(MAX)$ – V_{CC} (DUAL)



V_{NO} – R_g



P_D MAX – Ta