TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

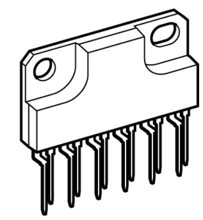
TA8258HQ

Dual Audio Power Amplifier

The TA8258HQ is dual audio power amplifier for consumer applications.

This IC provides an output power of 20 watts per channel (at V_{CC} = 37 V, f = 1kHz, THD = 10%, R_L = 8 Ω).

It is suitable for power amplifier of music center.



HZIP12-P-1.78B

Weight: 4.04 g (typ.)

Features

- High output power: P_{out} = 20 W/channel (Typ.)
  (V_{CC} = 37 V, R_L = 8 Ω, f = 1 kHz, THD = 10%)
- Low noise: V_{no} = 0.14 mVrms (Typ.)
  (V_{CC} = 37 V, R_L = 8 Ω, G_V = 34dB, R_g = 10 kΩ, BW = 20 Hz~20 kHz)
- Very few external parts.
- Built in audio muting circuit.
- Built in thermal shut down protector circuit.
- Built in output shifted to GND protection circuit. (AC short)
- Available for using same PCB layout with: TA8200AH, TA8211AH, TA8216H
- Operation supply voltage range (Ta = 25°C)
  : $V_{CC\ (opr)}$ = 15~42 V

The TA8258HQ is plated with lead-free lead finishes, but the silicon pellet is attached to a heatsink with lead-containing solder paste.

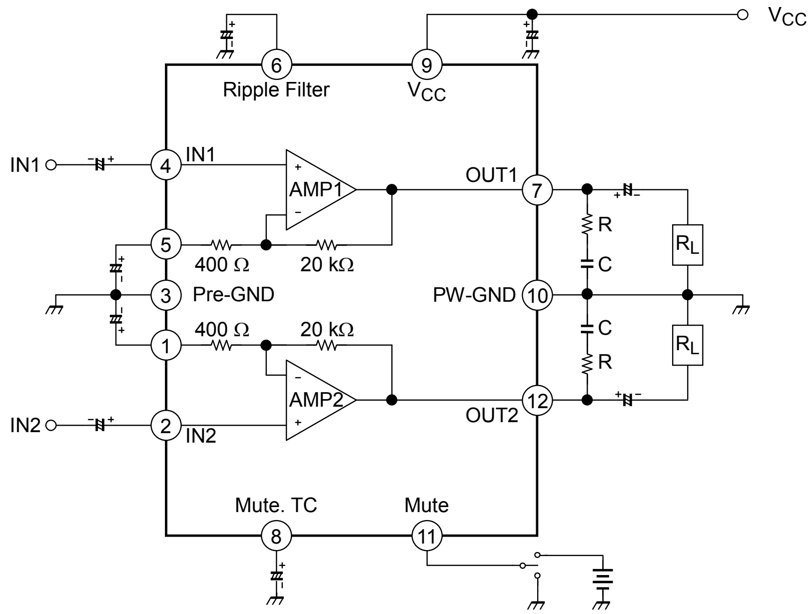
About solderability, following conditions were confirmed

- Solderability

(1) Use of Sn-63Pb solder Bath
- · solder bath temperature = 230°C
- · dipping time = 5seconds
- · the number of times = once
- · use of R-type flux

(2) Use of Sn-3.0Ag-0.5Cu solder Bath
- · solder bath temperature = 245°C
- · dipping time = 5seconds
- · the number of times = once
- · use of R-type flux

Block Diagram



Application Information

1. Voltage gain

The closed loop voltage gain is determined by R_1, R_2.

$$G_V = 20\ell og \frac{R_1 + R2}{R_2} (dB)$$

$$= 20\ell og \frac{20\ k\Omega + 400\ \Omega}{400\ \Omega}$$

$$= 34\ (dB)$$

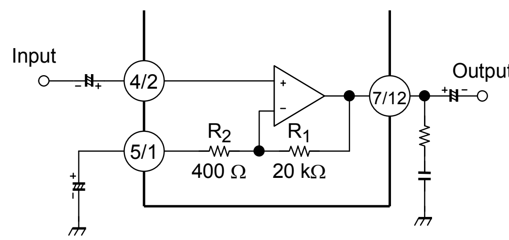


Figure 1

$$G_V = 20\ell og \frac{R_1 + R_2 + R_3}{R_2 + R_3} (dB)$$

When $R_3 = 220\ \Omega$
$G_V \simeq 30$ (dB)
is given.

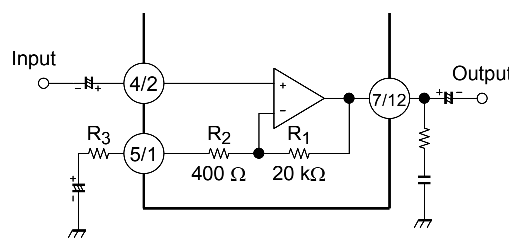


Figure 2

Toshiba has confirmed that the G_V (min) is approximately 28 (dB) on a regular printed circuit board. However, if the value of $R_2 + R_3$ is larger, the feedback voltage increases and oscillation will start. Determine the value of $R_2 + R_3$ to ensure proper startup behavior under actual usage conditions.

2. Muting

This product has an excellent muting system.

(1) Audio muting

This IC is possible to make audio muting operation by using 11 pin muting terminal.
Figure 3 shows the equivalent circuit in the muting circuit.
By reducing the voltage of 11 pin to 2.8 V or less, Q_1 will be ON.
Also the base voltage of Q_2 in the differential circuit that has Q_2 and Q_3 will be down.
When Q_2 is OFF, I_2 and I_5 dummy circuits will be operated, and it will shut down the input.
However, the bias circuit is operating after muting, and it takes power supply current at no signal.
8 pin is the capacitor terminal for reducing the pop noise, and it can make the time constant longer by inserting the capacitor externally. If 11 pin is not used, connect 11 pin and 8 pin, then set the voltage abode 4 V.

(2) IC internal muting at V_{CC} OFF

When V_{CC} = 8 V or less at V_{CC} off, the detection circuit at V_{CC} off is operated. And the base voltage of Q_1 is reduced and the muting is operated in IC.

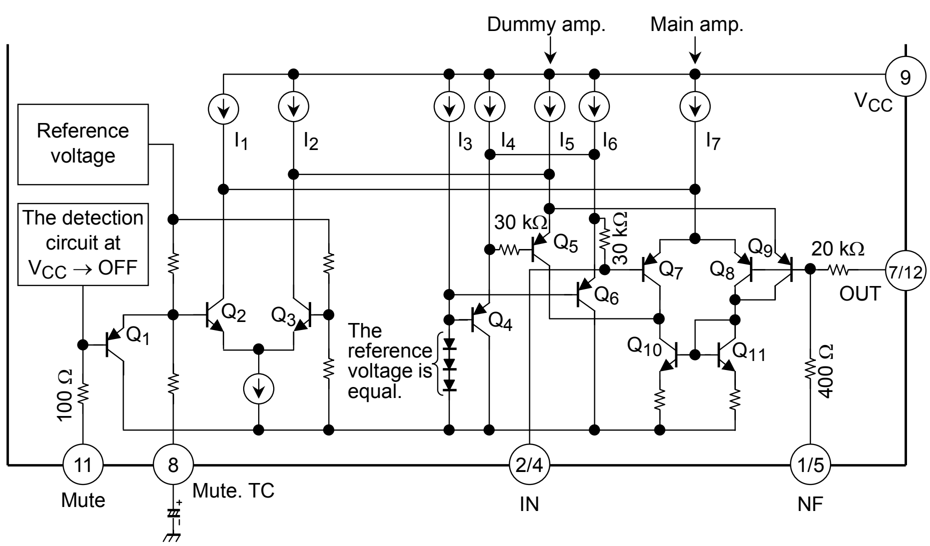


Figure 3

3. The Mounting Place of an Integrated Circuit

This IC cannot withstand the strong electromagnetic fields generated by a CRT. These are likely to cause the device to exhibit malfunctions such as leakage.
Please ensure that the IC is kept away from CRT.

4. Preventive Measures Against Oscillation

To prevent oscillation, it is advisable to use capacitors made of polyester film, which have low temperature and frequency fluctuation characteristics, as C.
The resistance R in series with C performs phase correction at high frequencies and improves the oscillation allowance.

(1) Capacitor rating and type

(2) PCB layout

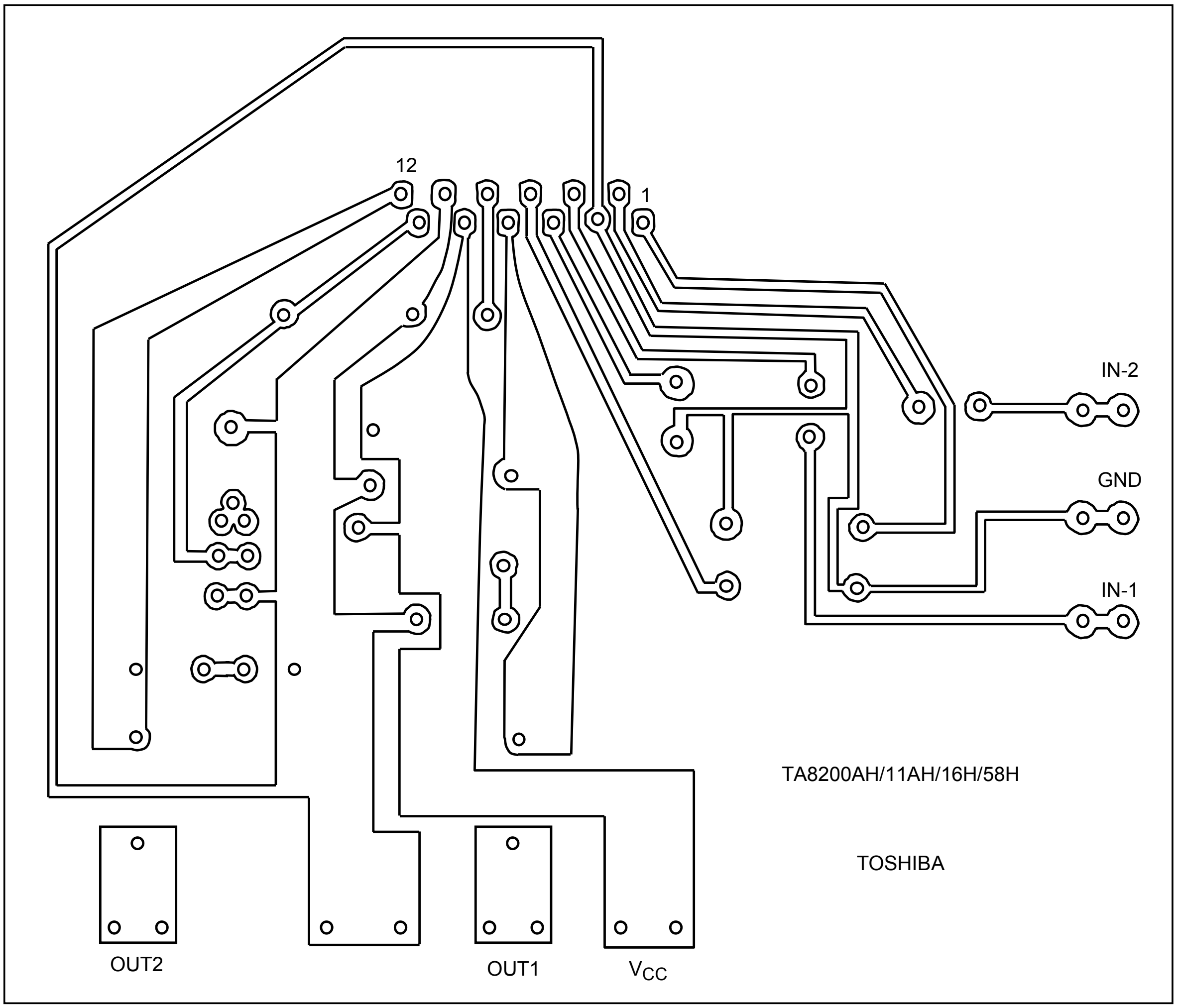
Note 1: Since the oscillation allowance varies according to the PCB layout, it is recommended that a standard Toshiba PCB be used as a reference for design.

5. Heat-sink

Be aware of the heat-sink capacity.
Use a heat-sink that has high heat conduction.

Note 2: Please connected a Heat-sink to GND potential, otherwise THD may deteriorate.

Standard PCB



(bottom view)

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	50	V
Output current (Peak/ch)	$I_{O\ (peak)}$	3.5	A
Power dissipation	P_D (Note 3)	25	W
Operation temperature	T_{opr}	−20 to 75	°C
Storage temperature	T_{stg}	−55 to 150	°C

Note 3: Derated above Ta = 25°C in the proportion of 200 mW/°C.

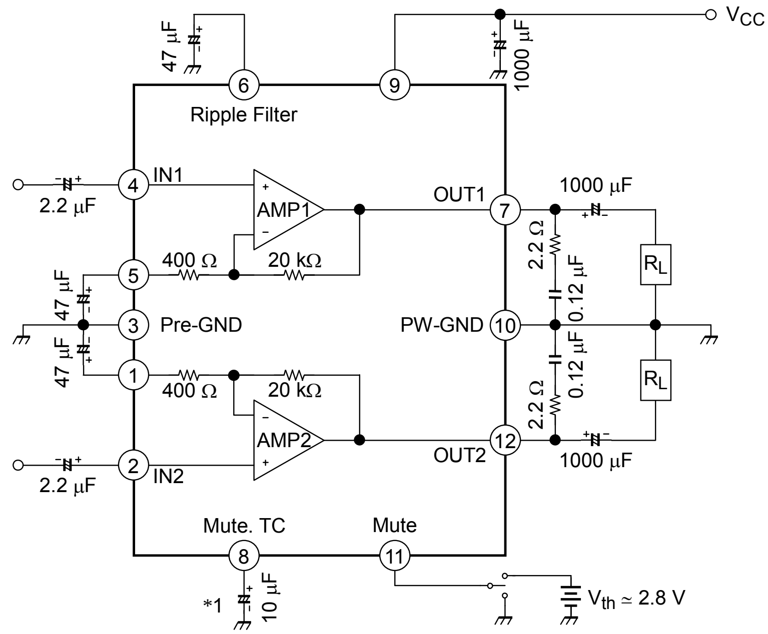
Electrical Characteristics
(unless otherwise specified V_{CC} = 37 V, R_L = 8 Ω, R_g = 600 Ω, f = 1 kHz, Ta = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Quiescent current	I_{CCQ}	—	V_{in} = 0	—	75	130	mA
Output power	P_{out} (1)	—	THD = 10%	17	20	—	W
	P_{out} (2)	—	THD = 1%	—	15	—	
Total harmonic distortion	THD	—	P_{out} = 2 W	—	0.05	0.2	%
Voltage gain	G_V	—	V_{out} = 0.775 Vrms (0dBm)	32.5	34.0	35.5	dB
Input resistance	R_{IN}	—	—	—	30	—	kΩ
Ripple rejection ratio	R.R.	—	f_{ripple} = 100 Hz V_{ripple} = 0.775 Vrms (0dBm)	−48	−60	—	dB
Output noise voltage	V_{no}	—	Rg = 10 kΩ, BW = 20 Hz~20 kHz	—	0.14	0.3	mVrms
Cross talk	C.T.	—	Rg = 10 kΩ, V_{out} = 0.775 Vrms (0dBm)	−50	−60	—	dB
Mute on voltage	Mute-on	—	Mute on	GND	—	1.4	V
Mute off voltage	Mute-off	—	Mute off	3.7	—	10	V
Mute ATT	ATT	—	V_{out} = 0.775 Vrms → Mute	−50	−60	—	dB

Typ. DC Voltage of Each Terminal (V_{CC} = 28 V, Ta = 25°C)

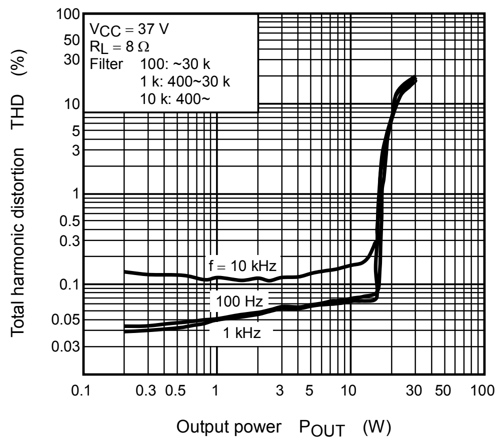
Terminal No.	1	2	3	4	5	6	7	8	9	10	11	12
DC voltage (V)	2.5	2.8	GND	2.8	2.5	12.5	19.4	5.1	V_{CC}	GND	4.8	19.4

Test Circuit

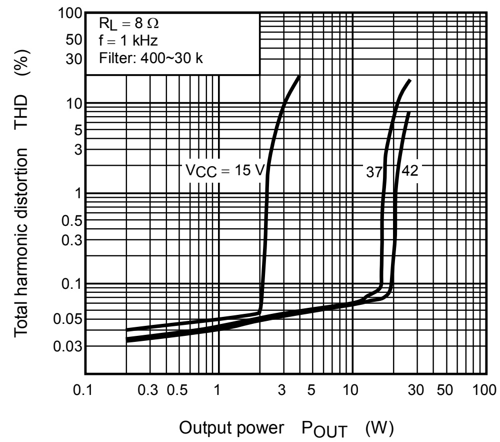


*1: The capacitor for reducing POP noise at mute ON.

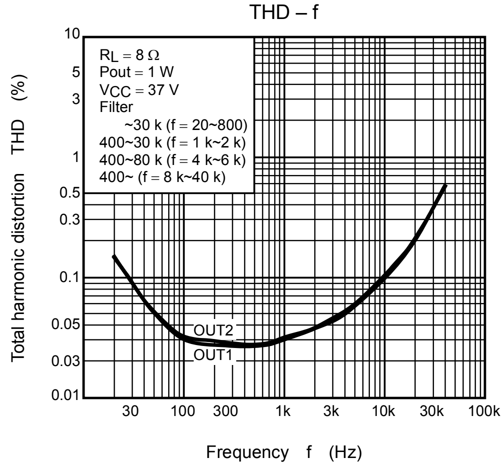
THD – Pout



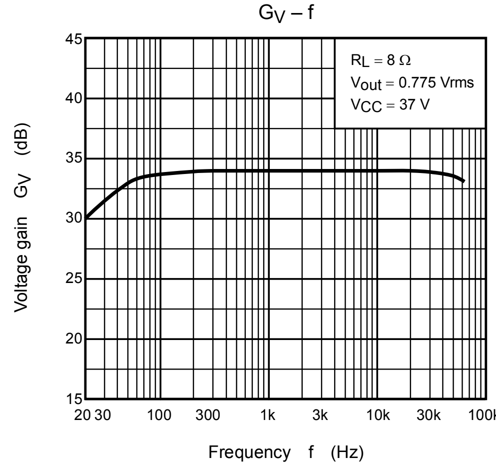
THD – Pout



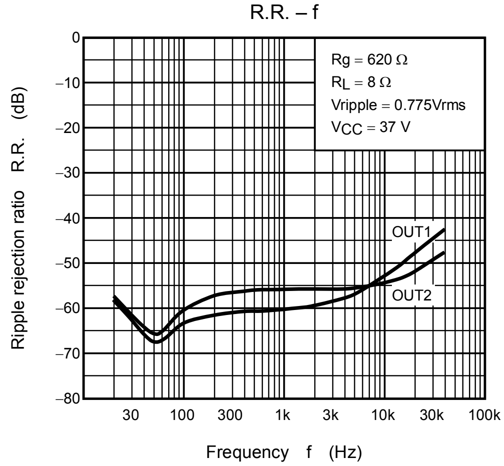
THD – f



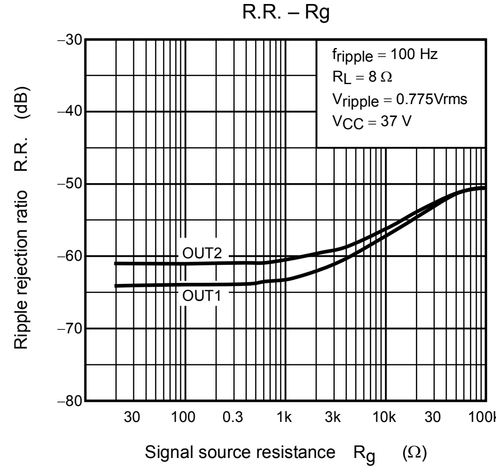
G_V – f

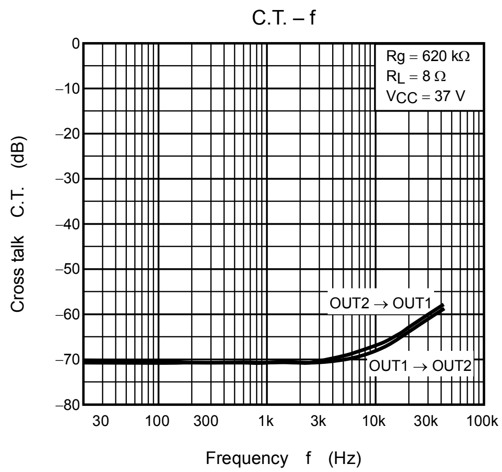


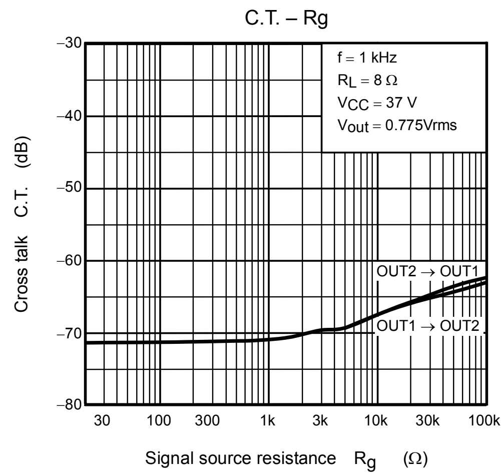
R.R. – f

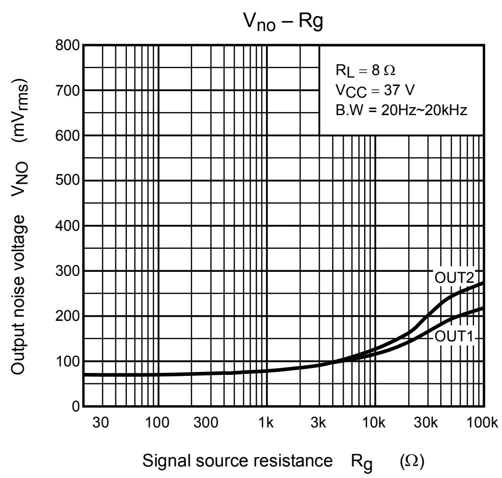


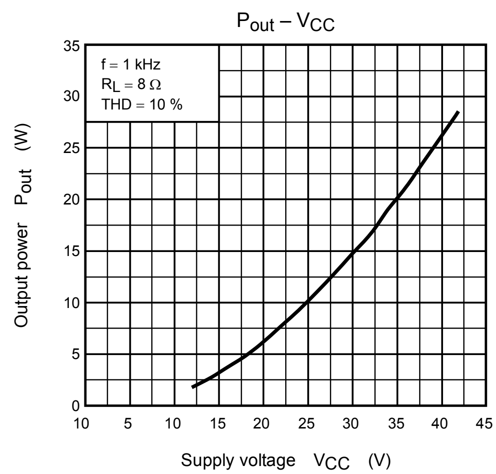
R.R. – Rg

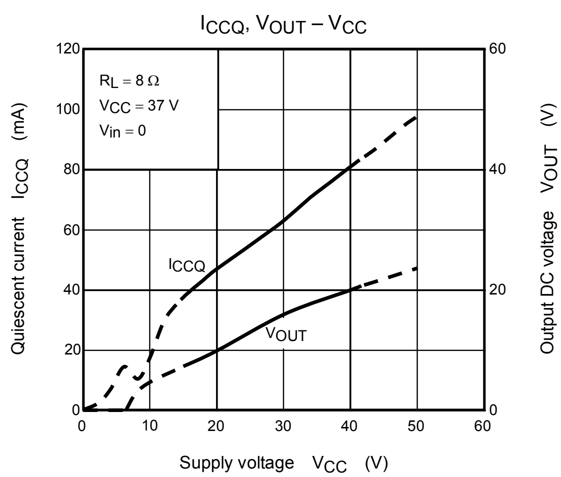


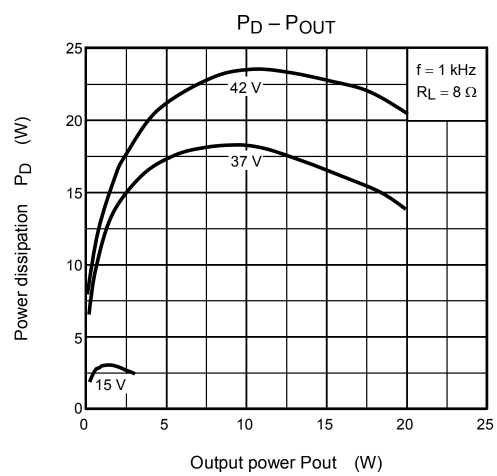

C.T. – f
Rg = 620 kΩ
RL = 8 Ω
VCC = 37 V
OUT2 → OUT1
OUT1 → OUT2
Cross talk C.T. (dB)
Frequency f (Hz)

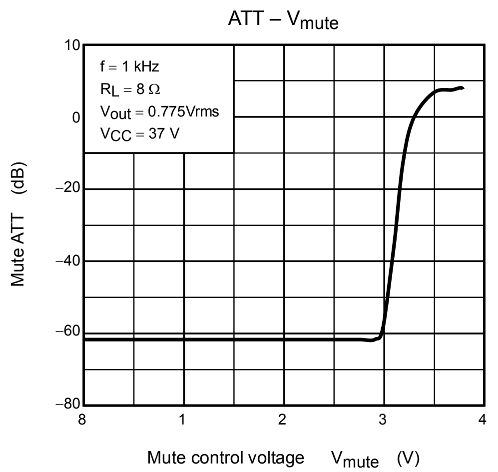

C.T. – Rg
f = 1 kHz
RL = 8 Ω
VCC = 37 V
Vout = 0.775Vrms
OUT2 → OUT1
OUT1 → OUT2
Cross talk C.T. (dB)
Signal source resistance Rg (Ω)

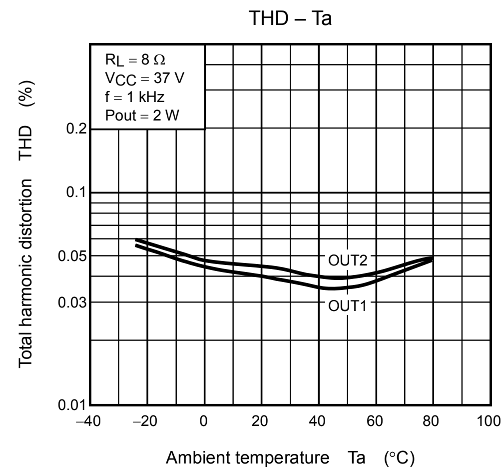

Vno – Rg
RL = 8 Ω
VCC = 37 V
B.W = 20Hz~20kHz
OUT2
OUT1
Output noise voltage VNO (mVrms)
Signal source resistance Rg (Ω)

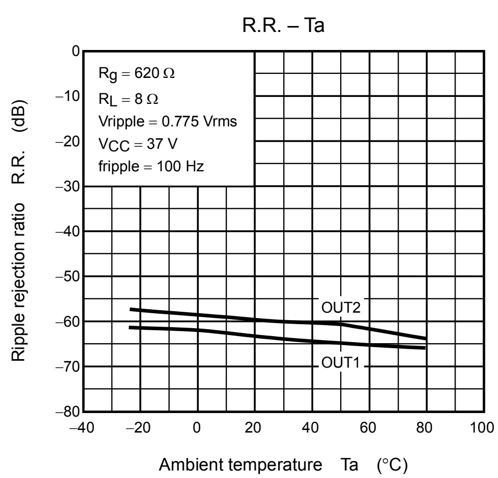

Pout – VCC
f = 1 kHz
RL = 8 Ω
THD = 10 %
Output power Pout (W)
Supply voltage VCC (V)

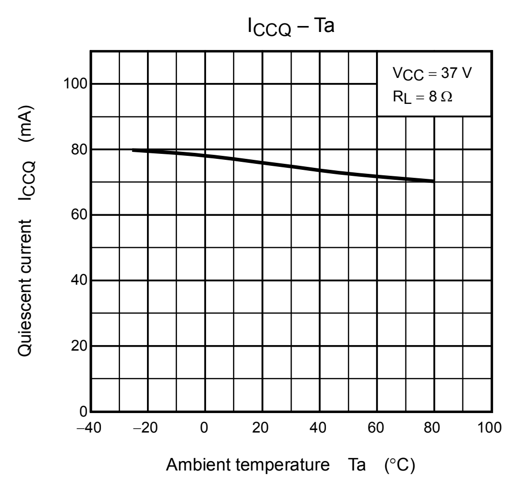

ICCQ, VOUT – VCC
RL = 8 Ω
VCC = 37 V
Vin = 0
ICCQ
VOUT
Quiescent current ICCQ (mA)
Output DC voltage VOUT (V)
Supply voltage VCC (V)

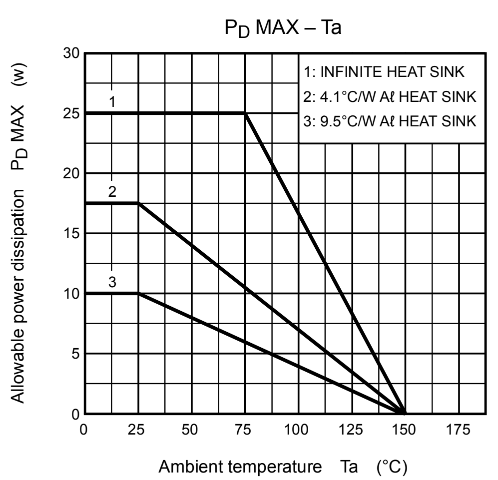

PD – POUT
f = 1 kHz
RL = 8 Ω
42 V
37 V
15 V
Power dissipation PD (W)
Output power Pout (W)


ATT – Vmute
f = 1 kHz
RL = 8 Ω
Vout = 0.775Vrms
VCC = 37 V
Mute ATT (dB)
10
0
−20
−40
−60
−80
8
1
2
3
4
Mute control voltage Vmute (V)


THD – Ta
RL = 8 Ω
VCC = 37 V
f = 1 kHz
Pout = 2 W
Total harmonic distortion THD (%)
0.2
0.1
0.05
0.03
0.01
OUT2
OUT1
−40
−20
0
20
40
60
80
100
Ambient temperature Ta (°C)


R.R. – Ta
Rg = 620 Ω
RL = 8 Ω
Vripple = 0.775 Vrms
VCC = 37 V
fripple = 100 Hz
Ripple rejection ratio R.R. (dB)
0
−10
−20
−30
−40
−50
−60
−70
−80
OUT2
OUT1
−40
−20
0
20
40
60
80
100
Ambient temperature Ta (°C)

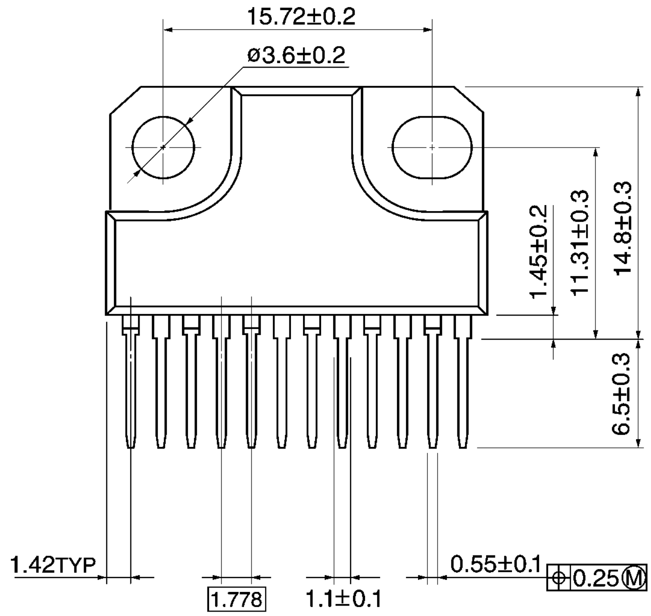

ICCQ – Ta
VCC = 37 V
RL = 8 Ω
Quiescent current ICCQ (mA)
100
80
60
40
20
0
−40
−20
0
20
40
60
80
100
Ambient temperature Ta (°C)

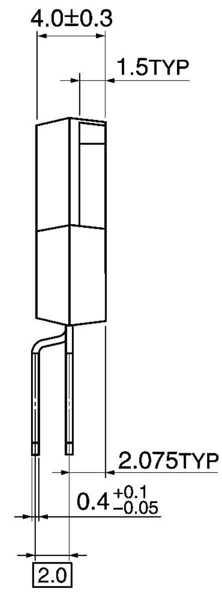

PD MAX – Ta
1: INFINITE HEAT SINK
2: 4.1°C/W Aℓ HEAT SINK
3: 9.5°C/W Aℓ HEAT SINK
Allowable power dissipation PD MAX (w)
30
25
20
15
10
5
0
1
2
3
0
25
50
75
100
125
150
175
Ambient temperature Ta (°C)

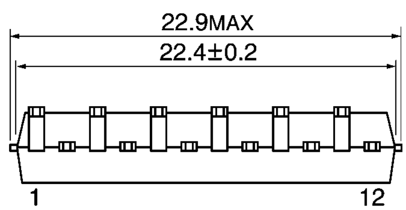
Package Dimensions

HZIP12-P-1.78B

Unit: mm







Weight: 4.04 g (typ.)

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