

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA8261AH

## Max Power 40 W BTL × 4CH Audio Power IC

The TA8261AH is 4 ch BTL audio power amplifier for car audio application.

This IC can generate more high power: P<sub>OUT</sub> MAX = 40 W as it is included the pure complementary PNP and NPN transistor output stage.

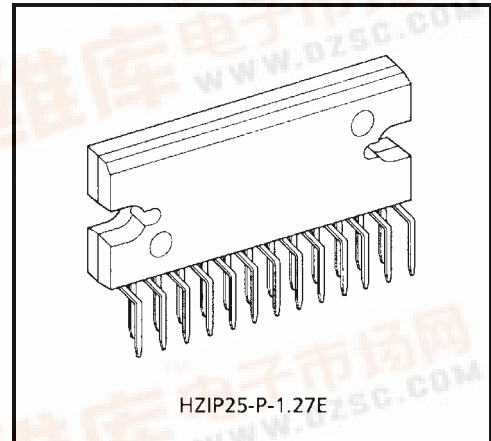
It is designed low distortion ratio for 4 ch BTL audio power amplifier, built-in Stand-by Function, Muting Function, Clip detector, and diagnosis circuit.

Additionally, the AUX. amplifier is built-in, it can make the beep signal etc. output to 2 channels (OUT1 and 4).

It contains various kind of protectors for car audio use.

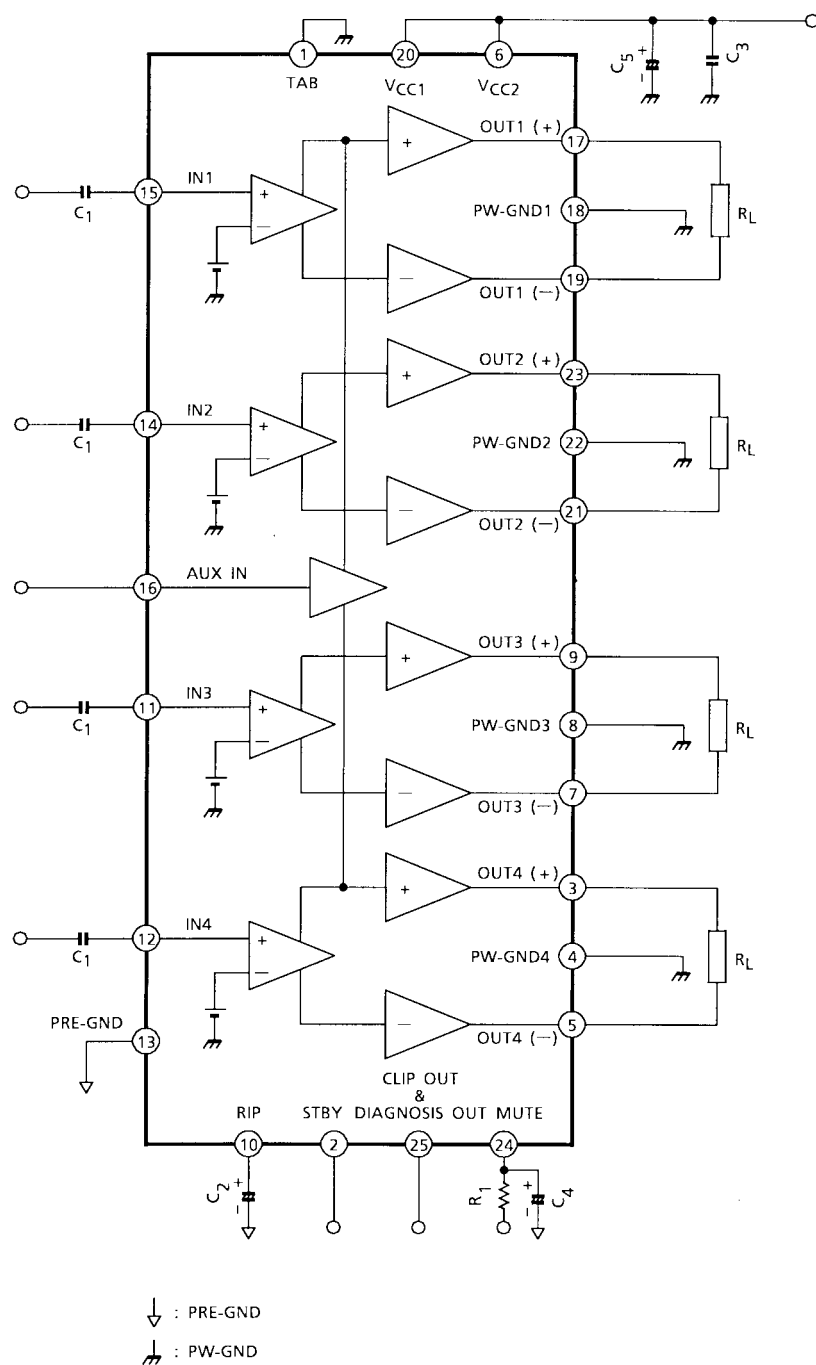
### Features

- High power
  - : P<sub>OUT</sub> MAX (1) = 40 W (typ.)  
(V<sub>CC</sub> = 14.4 V, f = 1 kHz, EIAJ max, R<sub>L</sub> = 4 Ω)
  - : P<sub>OUT</sub> MAX (2) = 37 W (typ.)  
(V<sub>CC</sub> = 13.7 V, f = 1 kHz, EIAJ max, R<sub>L</sub> = 4 Ω)
  - : P<sub>OUT</sub> (1) = 27 W (typ.)  
(V<sub>CC</sub> = 14.4 V, f = 1 kHz, THD = 10%, R<sub>L</sub> = 4 Ω)
  - : P<sub>OUT</sub> (2) = 22 W (typ.)  
(V<sub>CC</sub> = 13.2 V, f = 1 kHz, THD = 10%, R<sub>L</sub> = 4 Ω)
- Built-in clip detector & diagnosis circuit. (pin 25)
- Built-in AUX. amplifier from single input to 2 channels output (pin 16)
- Low distortion ratio
  - : THD = 0.02% (typ.)  
(V<sub>CC</sub> = 13.2 V, f = 1 kHz, P<sub>OUT</sub> = 5 W, R<sub>L</sub> = 4 Ω)
- Low noise
  - : V<sub>NO</sub> = 0.10 mVrms (typ.)  
(V<sub>CC</sub> = 13.2 V, R<sub>g</sub> = 0 Ω, G<sub>V</sub> = 26dB, BW = 20 Hz~20 kHz)
- Built-in stand-by switch function (pin 2)
- Built-in muting function (pin 24)
- Built-in various protection circuit
  - : Thermal shut down, over voltage, out to GND, out to V<sub>CC</sub>, out to out short
- Operating supply voltage: V<sub>CC</sub> (opr) = 9~18 V



Weight: 9.8 g (typ.)

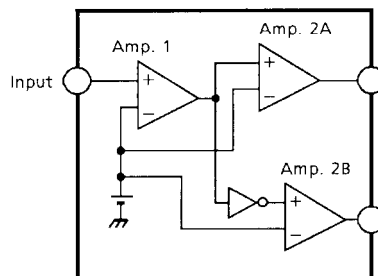
## Block Diagram



## Caution and Application Method (description is made only on the single channel)

### 1. Voltage gain adjustment

This IC has no NF (negative feedback) terminals. Therefore, the voltage gain can't adjusted, but it makes the device a space and total costs saver.



**Figure 1 Block diagram**

The voltage gain of Amp. 1 :  $GV_1 = 0\text{dB}$

The voltage gain of Amp. 2A, B :  $GV_2 = 20\text{dB}$

The voltage gain of BLT Connection :  $GV(\text{BTL}) = 6\text{dB}$

Therefore, the total voltage gain is decided by expression below.

$$GV = GV_1 + GV_2 + GV(\text{BTL}) = 0 + 20 + 6 = 26\text{dB}$$

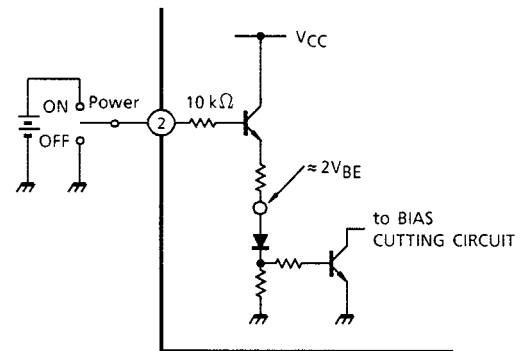
## 2. Stand-by SW function (pin 2)

By means of controlling pin 2 (Stand-by terminal) to High and Low, the power supply can be set to ON and OFF.

The threshold voltage of pin 2 is set at about  $3 V_{BE}$  (typ.), and the Power Supply current is about  $2 \mu A$  (typ.) at the stand-by state.

### Control voltage of pin 2: $V_{(SB)}$

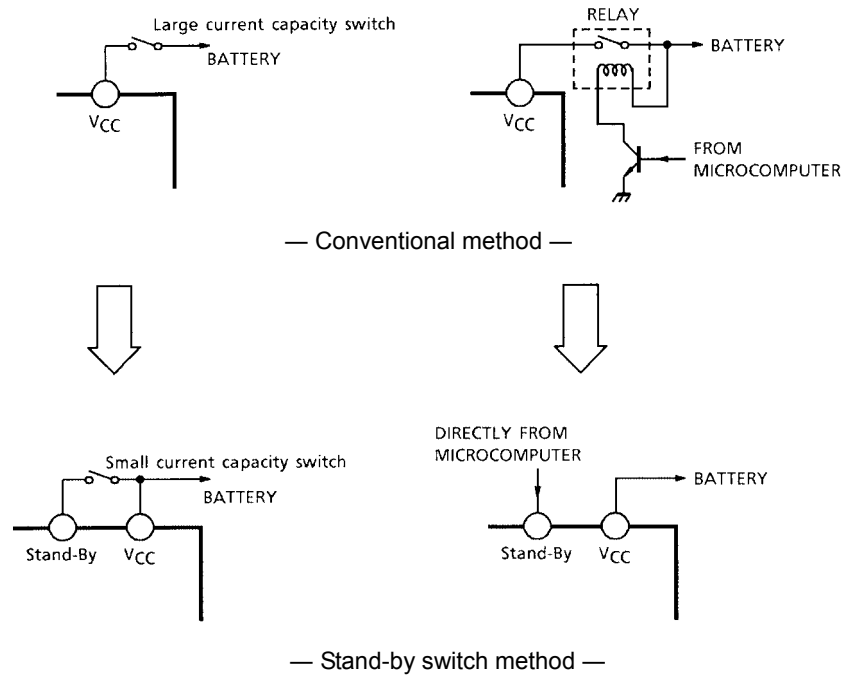
Stand-By	Power	$V_{(SB)}$ (V)
ON	OFF	0~1.5
OFF	ON	3~ $V_{CC}$



**Figure 2** With pin 2 set to High, power is turned ON

Adjustage of stand-by SW

- (1) Since  $V_{CC}$  can directly be controlled to ON or OFF by the microcomputer, the switching relay can be omitted.
- (2) Since the control current is microscopic, the switching relay of small current capacity is satisfactory for switching



**Figure 3**

### 3. Muting function (pin 24)

By means of controlling pin 24 less than 0.5 V, it can make the audio muting condition.

The muting time constant is decided by  $R_1$  and  $C_4$  and these parts is related the pop noise at power ON/OFF. The series resistance;  $R_1$  must be set up less than 15 k $\Omega$ , we recommend 10 k $\Omega$ .

The muting function have to be controlled by a transistor, FET and  $\mu$ -COM port which has  $I_{MUTE} \geq 250 \mu A$  ability.

Terminal 24 must not be pulled up and it shall be controlled by OPEN/LOW.

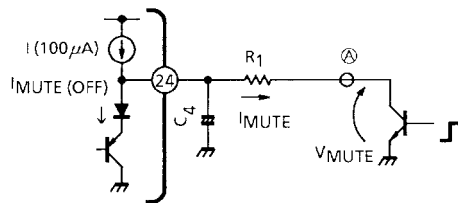


Figure 4 Muting function

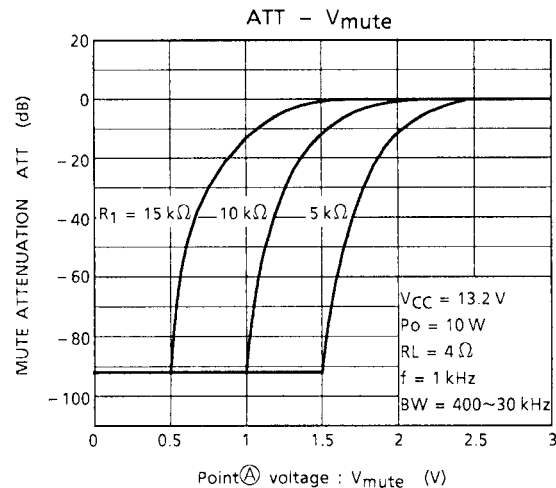


Figure 5 Mute attenuation- $V_{mute}$  (V)

### 4. AUX. input (pin 16)

The pin 16 is for input terminal of AUX. amplifier.

The total gain is 0dB by using of AUX. amplifier.

Therefore, the  $\mu$ -COM can directly drive the AUX. amplifier.

BEEP sound or voice synthesizer signal can be input to pin 16 directly.

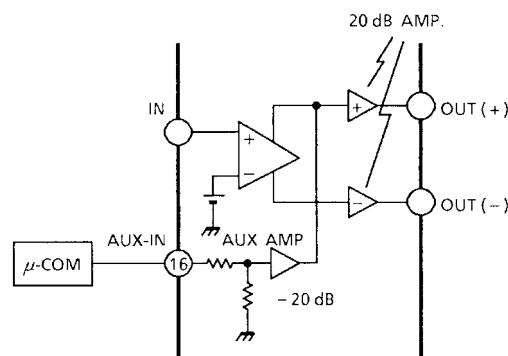
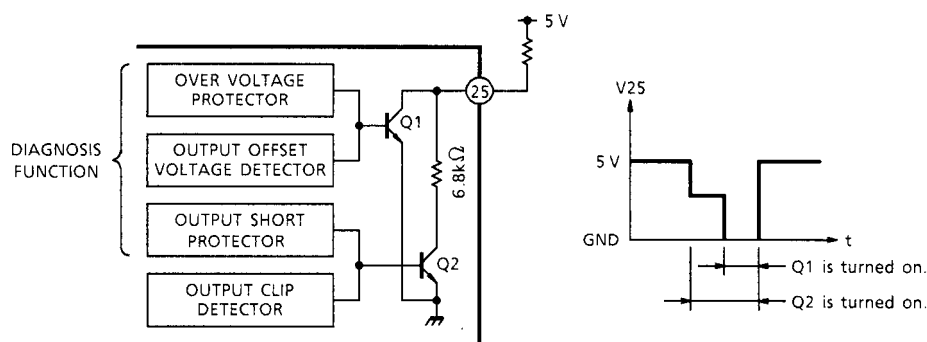


Figure 6 AUX. input

## 5. Diagnosis output (pin 25)

The diagnosis output terminal of pin 25 has open collector output structure on chip as shown in Figure 7. In case diagnosis circuit that detect unusual case is operated, NPN Tr. (Q1) or (Q2) is turned on. It is possible to protect all the system of apparatus as well as power IC protection. In case of being unused this function, use this IC as open-connection on pin 25.



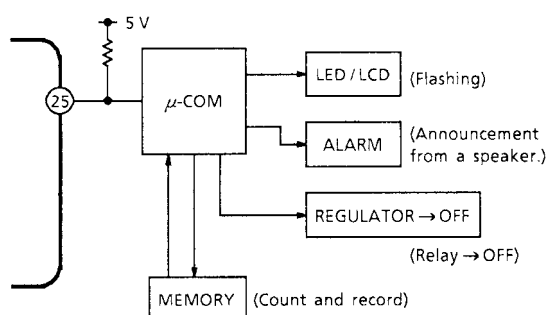
pin 25: Open collector output (active low)

**Figure 7 Self diagnosis output**

### 5.1 In case of over voltage power supplied.

NPN Tr. (Q1) is turned on.

Threshold of over voltage protection:  $V_{CC} = 22\text{ V}$  (typ.)



**Figure 8 Application 1**

### 5.2 In case of shorting output to $V_{CC}/GND$

NPN Tr. (Q2) is turned on.

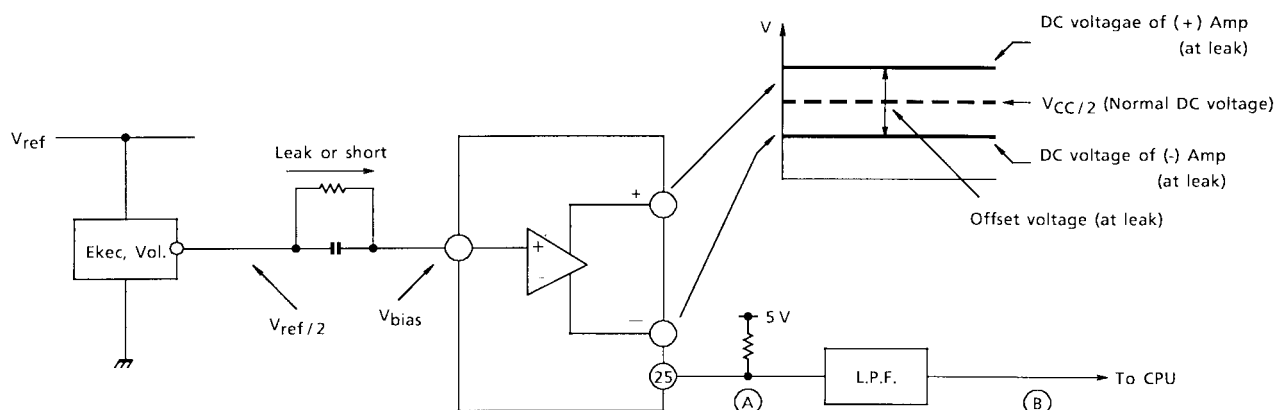
Additionally, in case of shorting OUT to GND, NPN Tr. (Q1) is turned on with (Q2), because output offset voltage detector is operated at this condition.

## 5.3 In case of shorting output to output

NPN Tr. (Q2) is turned on and off in response to the input signal voltage.

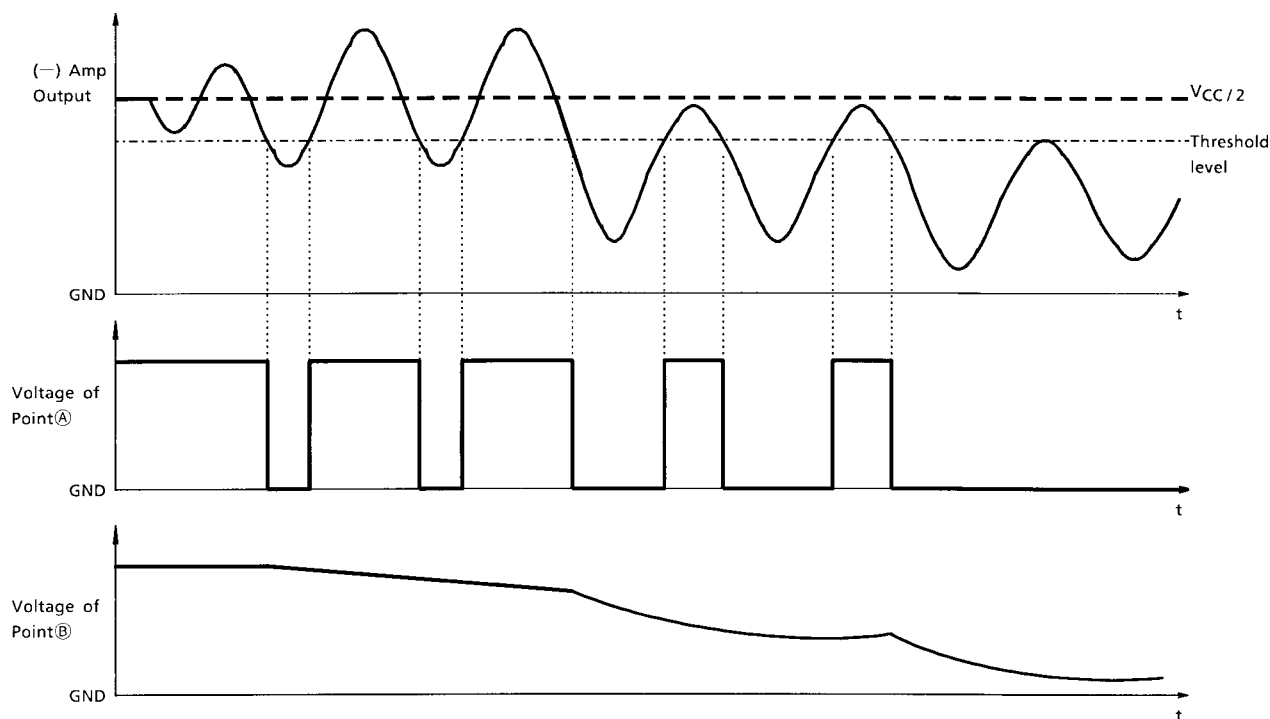
## 5.4 In case of appearing output offset voltage by generating a large leakage current on the input capacitor etc.

NPN Tr. (Q1) is turned on while the inverted output voltage level become less than the threshold level of output offset voltage detector.



\*: It is possible to detect the abnormal output offset which is appeared by the large leakage of the input capacitor at  $V_{ref}/2 > V_{bias}$  (about 1.4 V)

**Figure 9 Application and detection mechanism**



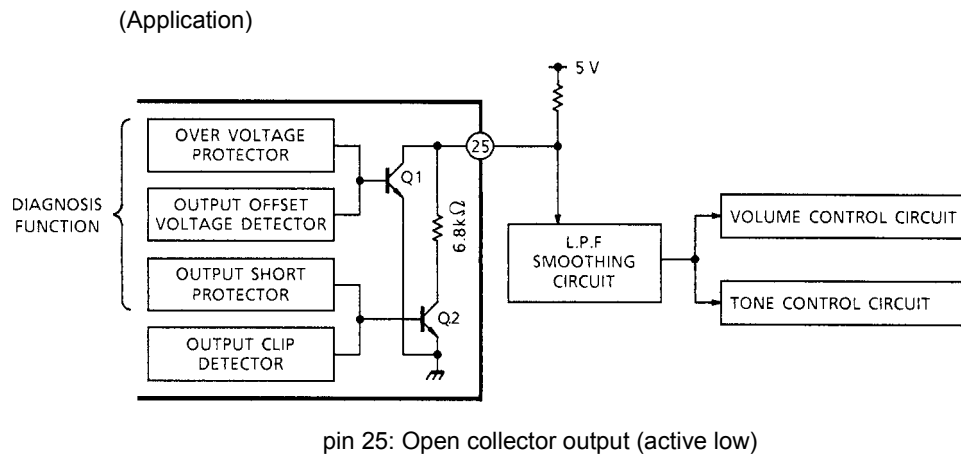
**Figure 10 Wave form**

## 6. Output clip detection function (pin 25)

The output clip detection terminal of pin 25 has the open collector output structure on chip as shown in Figure 11. In case that the output waveform is clipping, the clip detection circuit is operated and NPN Tr. (Q2) is turned on.

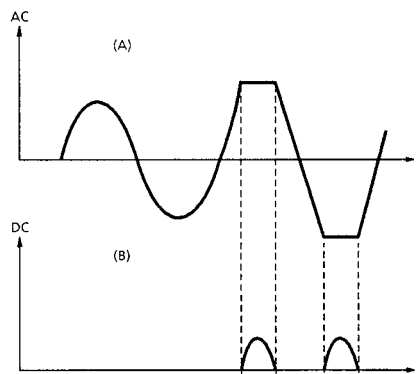
It is possible to improve the audio quality with controlling the volume, tone control circuit through L.P.F. smoothing circuit as shown in Figure 11.

In case of being unused this function, use this IC as open connection on pin 25.

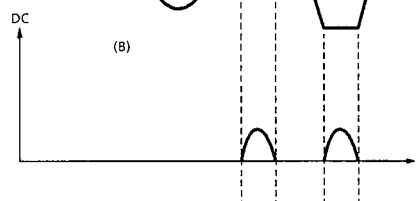


**Figure 11**

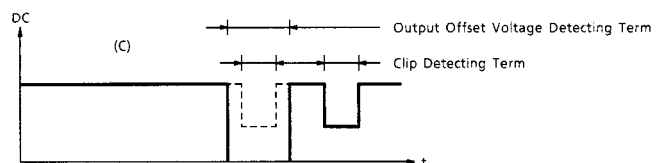
(A) Output (AC wave form)



(B) Clip detector circuit (internal)



(C) Clip DET. terminal (pin 25)



\*: Actually, the waveform is solid line because the output offset voltage detection, which is a kind of the self diagnosis, has priority.

**Figure 12 Clip detection**



## 7. Cross talk

The cross talk characteristics of the IC is not good between OUT1 and 2, OUT3 and 4.  
So we recommend to use by below method.

OUT1, 2	L-ch (or R-ch)
OUT3, 4	R-ch (or L-ch)

And, please refer to below table in case of applying the AUX. IN because it is out to OUT1 and 4.

ex) In case of the signal from AUX. IN to front speakers.

OUT1	Front	L-ch (or R-ch)	AUX. OUT
OUT2	Rear		—
OUT3	Rear	R-ch (or L-ch)	—
OUT4	Front		AUX. OUT

## Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Peak supply voltage (0.2 s)	V <sub>CC</sub> (surge)	50	V
DC supply voltage	V <sub>CC</sub> (DC)	25	V
Operating supply voltage	V <sub>CC</sub> (opr)	18	V
Output current (peak)	I <sub>O</sub> (peak)	9	A
Power dissipation	P <sub>D</sub> (Note 1)	250	W
Operating temperature	T <sub>opr</sub>	-40~85	°C
Storage temperature	T <sub>stg</sub>	-55~150	°C

Note 1: Package thermal resistance  $\theta_{j-T} = 0.5^{\circ}\text{C/W}$  (typ.)  
(Ta = 25°C, with infinite heat sink)

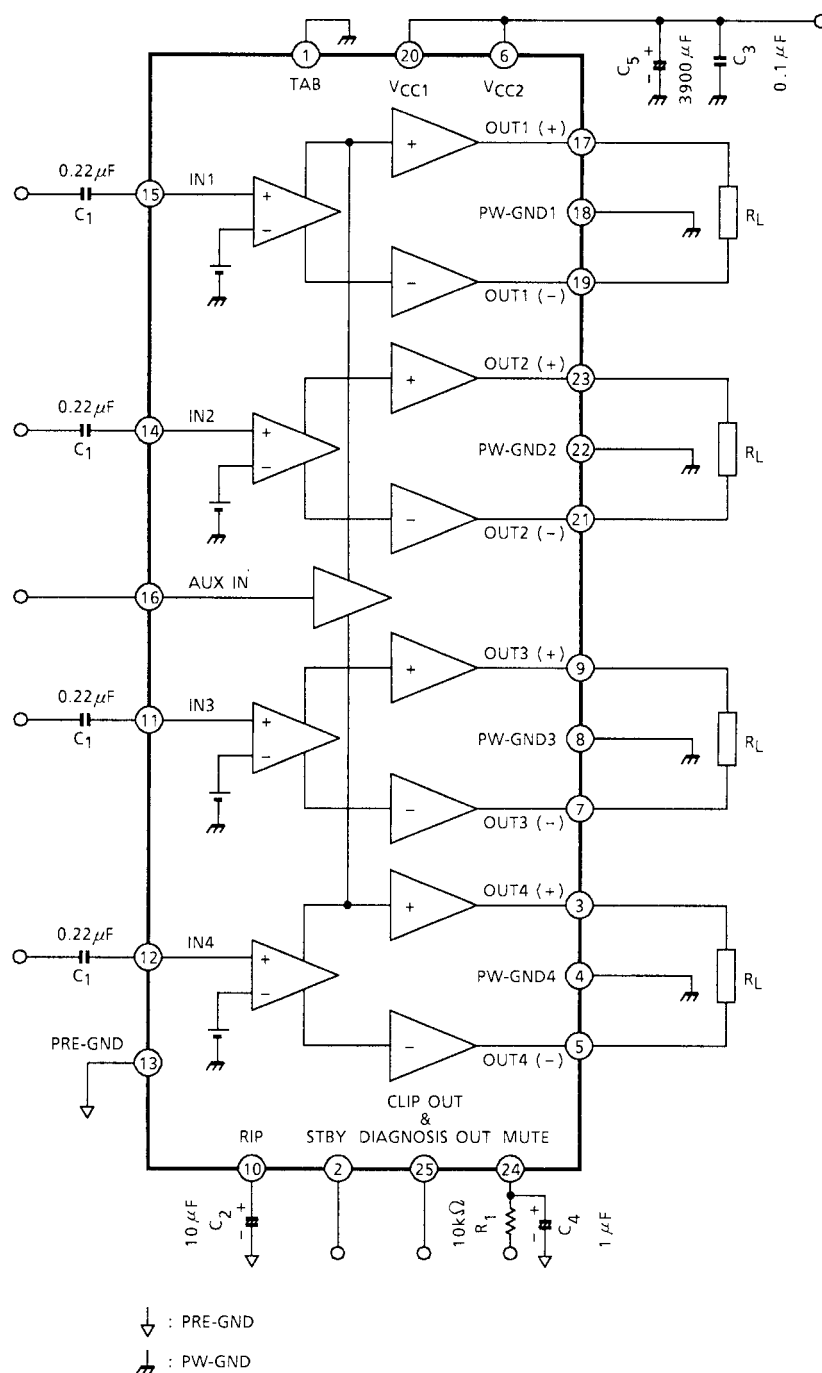
## Electrical Characteristics

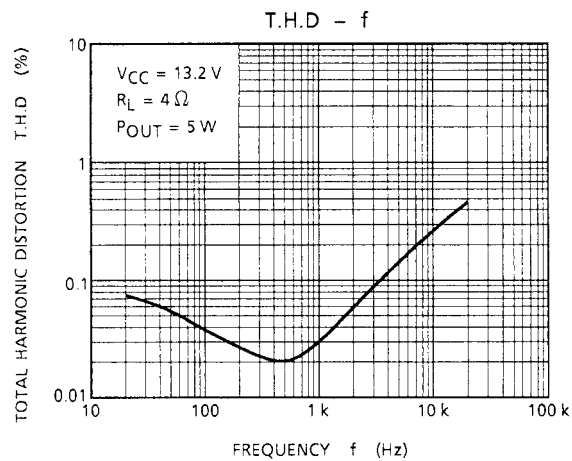
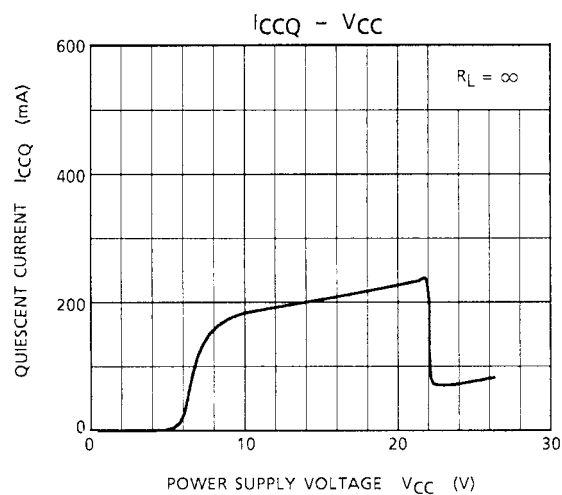
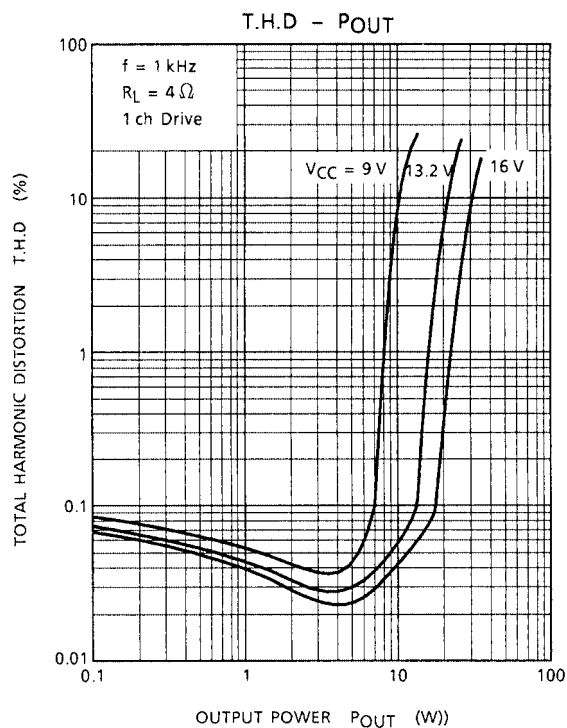
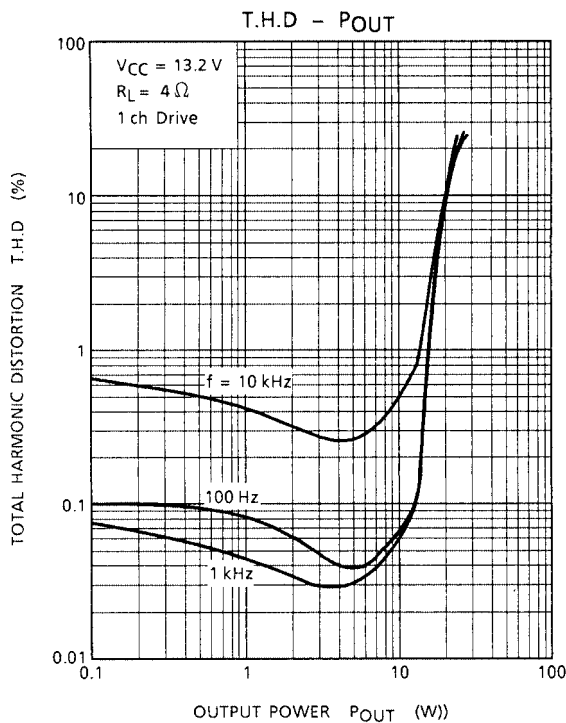
(unless otherwise specified, V<sub>CC</sub> = 13.2 V, f = 1 kHz, R<sub>L</sub> = 4 Ω, Ta = 25°C)

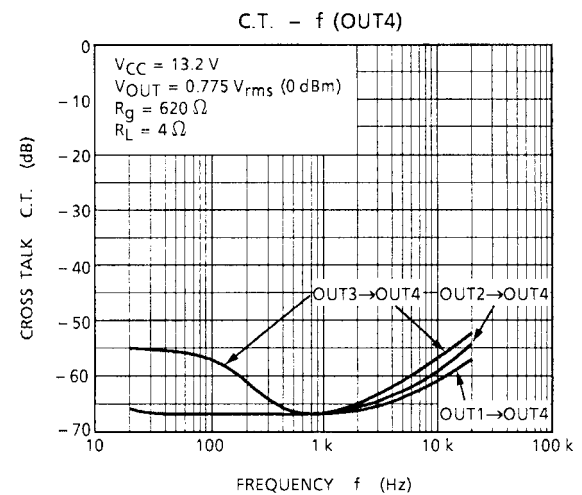
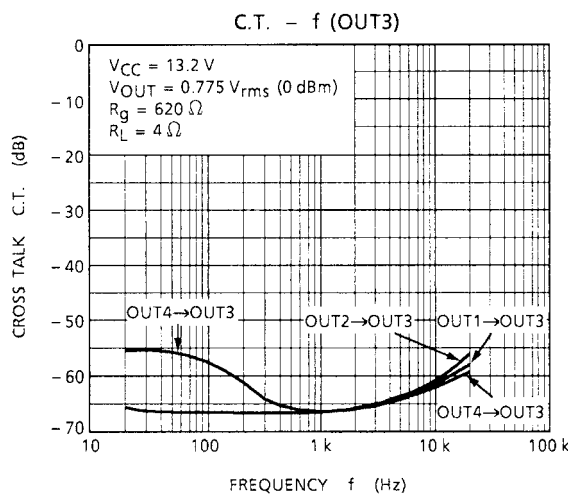
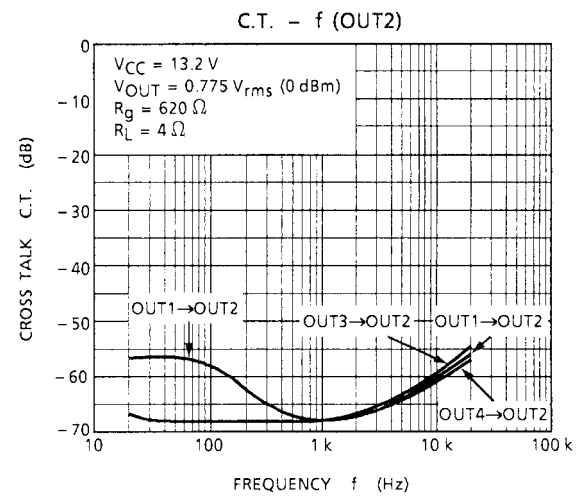
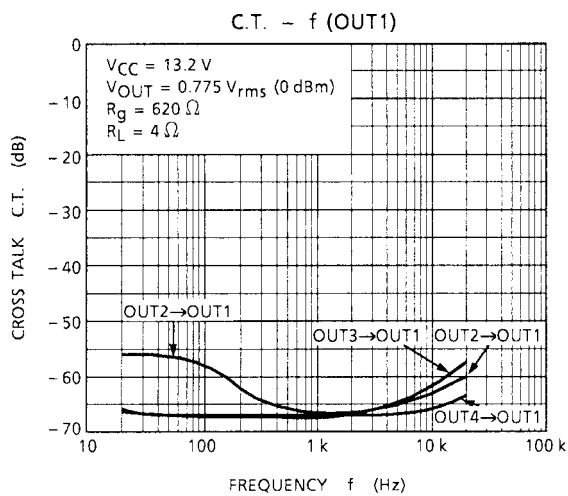
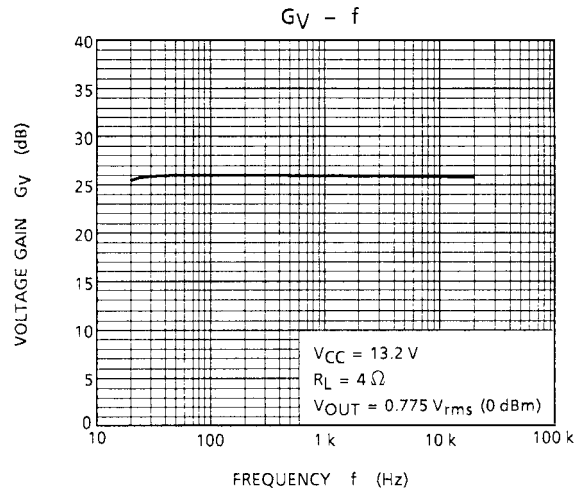
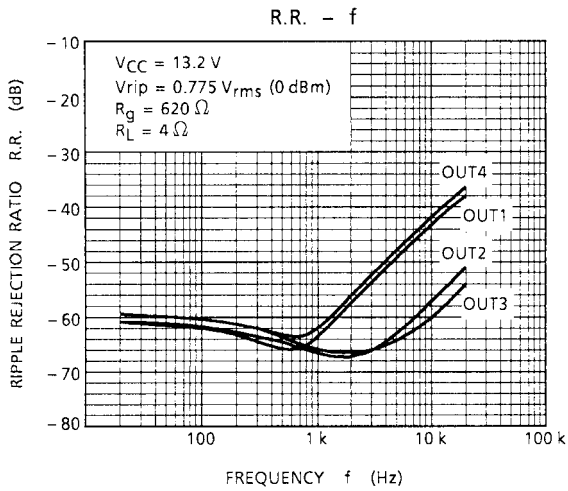
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Quiescent current	I <sub>CCQ</sub>	—	V <sub>IN</sub> = 0	—	200	400	mA
Output power	P <sub>OUT</sub> MAX (1)	—	V <sub>CC</sub> = 14.4 V, MAX power	—	40	—	W
	P <sub>OUT</sub> MAX (2)	—	V <sub>CC</sub> = 13.7 V, MAX power	—	37	—	
	P <sub>OUT</sub> (1)	—	V <sub>CC</sub> = 14.4 V, THD = 10%	—	27	—	
	P <sub>OUT</sub> (2)	—	THD = 10%	20	22	—	
Total harmonic distortion	THD	—	P <sub>OUT</sub> = 5 W	—	0.02	0.2	%
Voltage gain	G <sub>V</sub>	—	V <sub>OUT</sub> = 0.775 Vrms (0dBm)	24	26	28	dB
Voltage gain ratio	ΔG <sub>V</sub>	—	V <sub>OUT</sub> = 0.775 Vrms (0dBm)	-1.0	0	1.0	dB
Output noise voltage	V <sub>NO</sub> (1)	—	R <sub>g</sub> = 0 Ω, DIN45405	—	0.12	—	mVrms
	V <sub>NO</sub> (2)	—	R <sub>g</sub> = 0 Ω, BW = 20 Hz~20 kHz	—	0.10	0.35	
Ripple rejection ratio	R.R.	—	f <sub>rip</sub> = 100 Hz, R <sub>g</sub> = 620 Ω V <sub>rip</sub> = 0.775 Vrms (0dBm)	40	50	—	dB
Cross talk	C.T.	—	R <sub>g</sub> = 620 Ω, V <sub>OUT</sub> = 0.775 Vrms (0dBm)	—	70	—	dB
Output offset voltage	V <sub>OFFSET</sub>	—	—	-100	0	100	mV
Input resistance	R <sub>IN</sub>	—	—	—	90	—	kΩ
Stand-by current	I <sub>SB</sub>	—	Stand-by condition	—	2	10	μA
Stand-by control voltage	V <sub>SB</sub> H	—	Power: on	3.0	—	V <sub>CC</sub>	V
	V <sub>SB</sub> L	—	Power: off	0	—	1.5	
Mute control voltage (Note 2)	V <sub>M</sub> H	—	Mute: off	OPEN			—
	V <sub>M</sub> L	—	Mute: on, R <sub>1</sub> = 10 kΩ	0	—	0.5	V
Mute attenuation	ATT M	—	Mute: on, V <sub>OUT</sub> = 7.75 Vrms (20dBm) at Mute: off.	80	90	—	dB

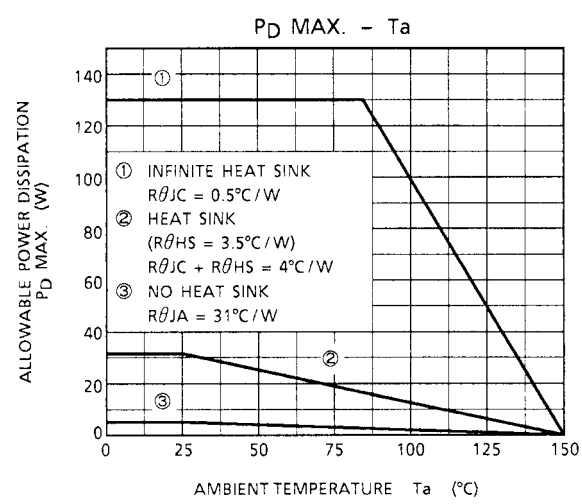
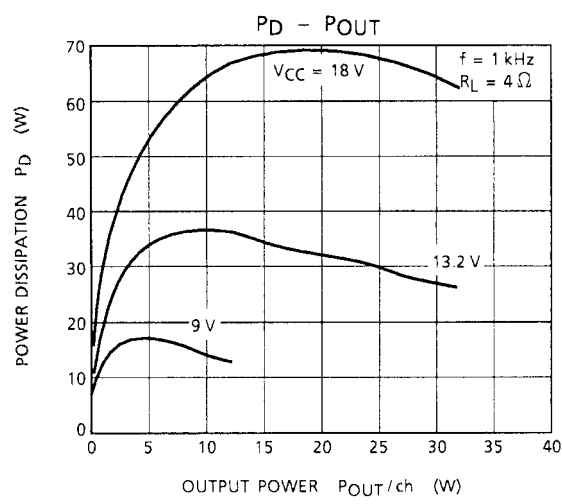
Note 2: Muting function have to be controlled by open and Low Logic, which Logic is a transistor, FET and μ-COM port of I<sub>MUTE</sub> ≥ 250 μA ability.  
This means that the Mute control terminal: pin 24 must not be pulled-up.

## Test Circuit





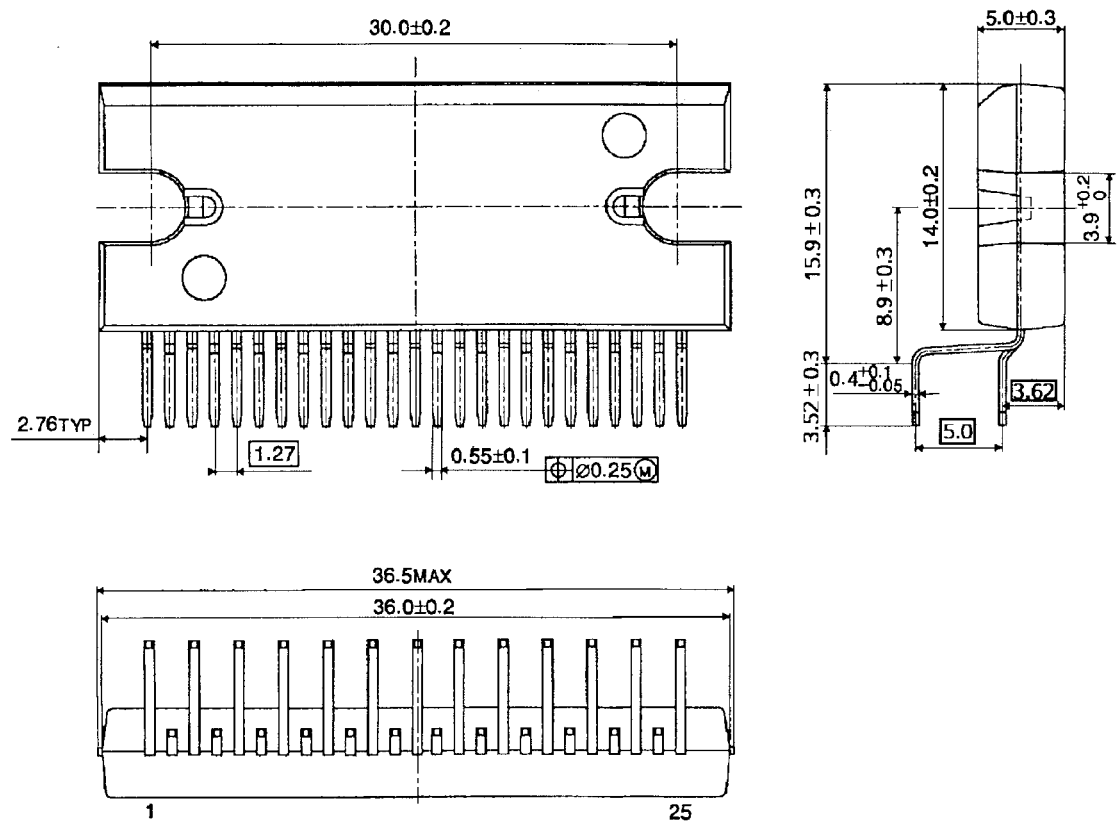




Package Dimensions

HZIP25-P-1.27E

Unit : mm



Weight: 9.8 g (typ.)

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