

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

# TA8252H

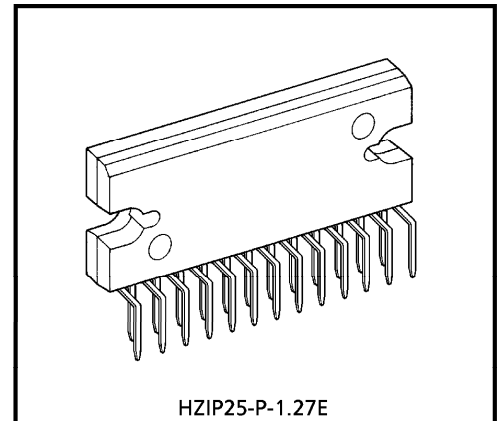
## MAX POWER 37 W BTL×4CH AUDIO POWER IC

The TA8252H is 4 ch BTL audio power amplifier for car audio application.

This IC can generate more high power :  $P_{OUTMAX} = 37\text{ W}$  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.



HZIP25-P-1.27E

Weight : 9.8 g (Typ.)

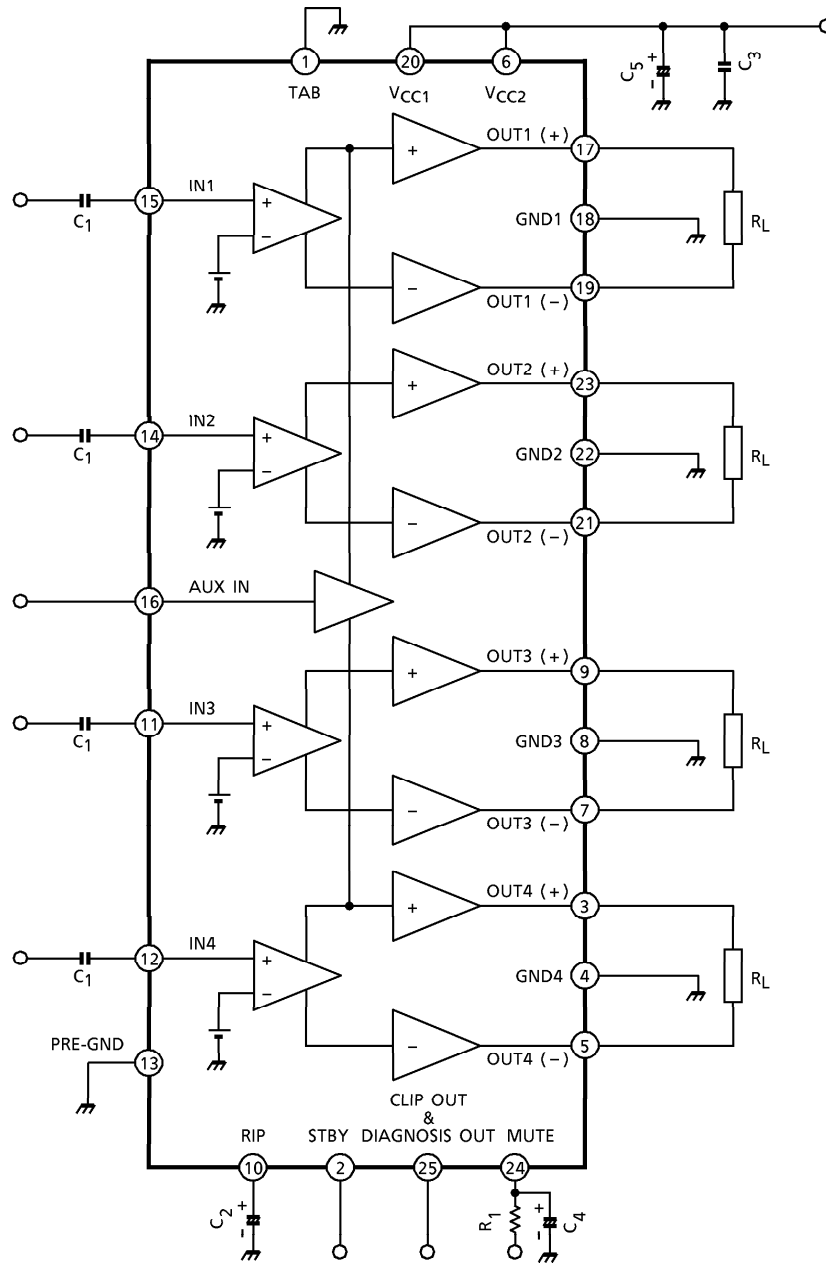
### FEATURES

- High power
  - :  $P_{OUTMAX}(1) = 37\text{ W}$  (Typ.)  
( $V_{CC} = 14.4\text{ V}$ ,  $f = 1\text{ kHz}$ , EIAJ Max.,  $R_L = 4\ \Omega$ )
  - :  $P_{OUTMAX}(2) = 35\text{ W}$  (Typ.)  
( $V_{CC} = 13.7\text{ V}$ ,  $f = 1\text{ kHz}$ , EIAJ Max.,  $R_L = 4\ \Omega$ )
  - :  $P_{OUT}(1) = 24\text{ W}$  (Typ.)  
( $V_{CC} = 14.4\text{ V}$ ,  $f = 1\text{ kHz}$ , THD = 10%,  $R_L = 4\ \Omega$ )
  - :  $P_{OUT}(2) = 21\text{ W}$  (Typ.)  
( $V_{CC} = 13.2\text{ V}$ ,  $f = 1\text{ kHz}$ , THD = 10%,  $R_L = 4\ \Omega$ )
- Built-in clip detector & diagnosis circuit. (Pin<sup>25</sup>)
- Low distortion ratio : THD = 0.02% (Typ.)  
( $V_{CC} = 13.2\text{ V}$ ,  $f = 1\text{ kHz}$ ,  $P_{OUT} = 5\text{ W}$ ,  $R_L = 4\ \Omega$ )
- Low noise :  $V_{NO} = 0.10\text{ mV}_{rms}$  (Typ.)  
( $V_{CC} = 13.2\text{ V}$ ,  $R_g = 0\ \Omega$ ,  $G_V = 26\text{ dB}$ ,  $BW = 20\sim 20\text{ kHz}$ )
- Built-in stand-by switch function (Pin<sup>2</sup>)
- Built-in muting function (Pin<sup>24</sup>)
- Built-in AUX. amplifier from single input (Pin<sup>16</sup>) to 2 channels output ; OUT1 and 4
- Built-in various protection circuit
  - : Thermal shut down, over voltage, out to GND, out to  $V_{CC}$ , out to out short
- Operating supply voltage :  $V_{CC(opr)} = 9\sim 18\text{ V}$

980910EBF2

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- This product generates heat during normal operation. However, substandard performance or malfunction may cause the product and its peripherals to reach abnormally high temperatures.  
The product is often the final stage (the external output stage) of a circuit. Substandard performance or malfunction of the destination device to which the circuit supplies output may cause damage to the circuit or to the product.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

BLOCK DIAGRAM

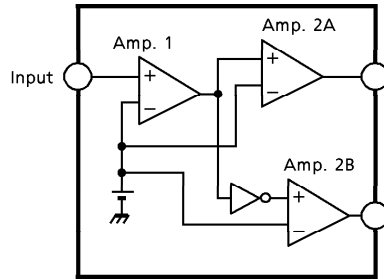


**CAUTION AND APPLICATION METHOD**

(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 be adjusted, but it makes the device a space and total costs saver.



(Fig.1) Block diagram

The voltage gain of Amp. 1 :  $G_{V1} = 0 \text{ dB}$

The voltage gain of Amp. 2A, B :  $G_{V2} = 20 \text{ dB}$

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

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

$$G_V = G_{V1} + G_{V2} + G_V(\text{BTL}) = 0 + 20 + 6 = 26 \text{ dB}$$

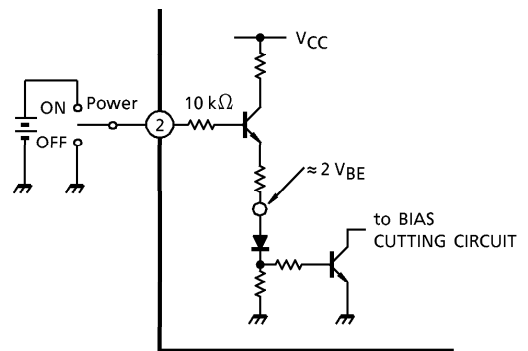
2. Stand-by SW function (pin②)

By means of controlling pin② (Stand-by terminal) to High and Low, the power supply can be set to ON and OFF.

The threshold voltage of pin② is set at about  $3V_{BE}$  (Typ.), and the Power Supply current is about  $2 \mu\text{A}$  (Typ.) at the stand-by state.

Control Voltage of pin② :  $V(\text{SB})$

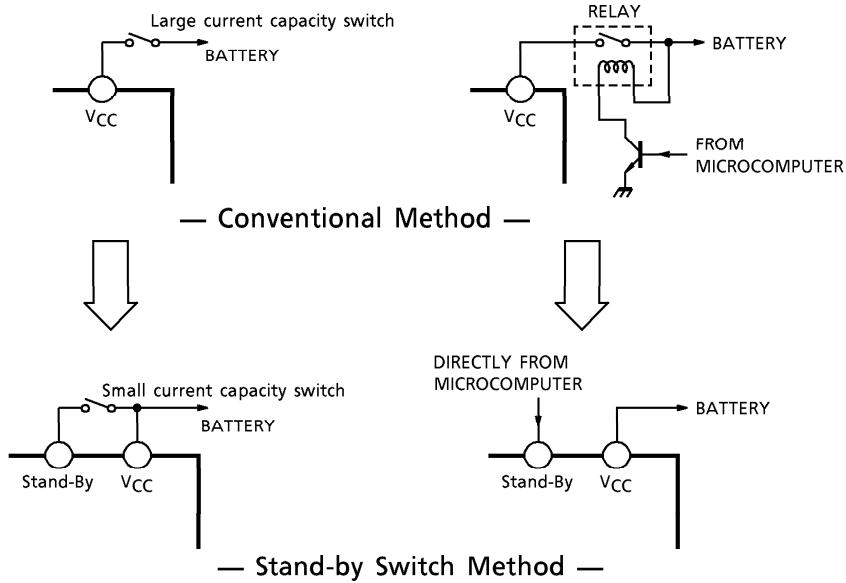
STAND-BY	POWER	$V(\text{SB})$ (V)
ON	OFF	0~1.5
OFF	ON	3~6



(Fig.2) With pin② 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



(Fig.3)

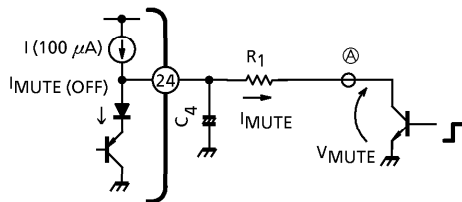
3. Muting function (pin<sup>24</sup>)

By means of controlling pin<sup>24</sup> less than 0.5V, 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.

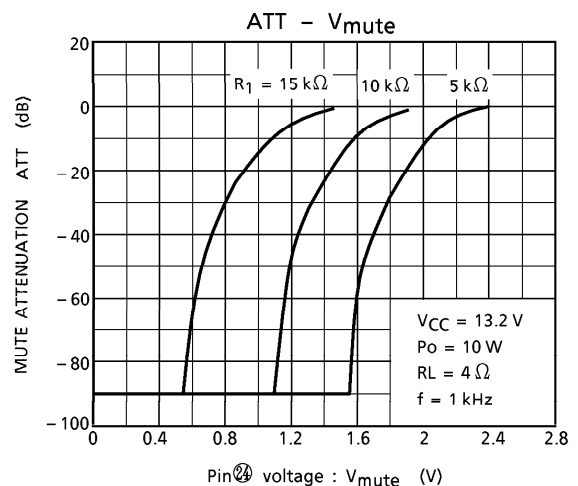
The series resistance;  $R_1$  must be set up less than  $15\text{ k}\Omega$ , we recommend  $10\text{ k}\Omega$ .

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

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



(Fig.4) Muting Function

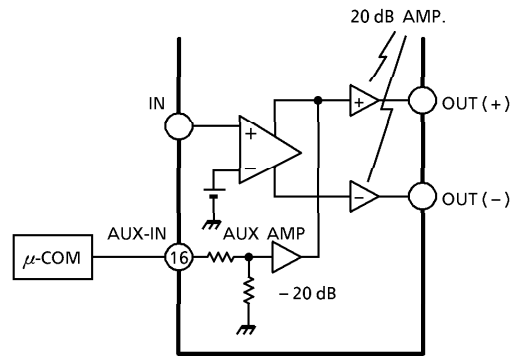


(Fig.5) Mute Attenuation -  $V_{\text{mute}}$  (V)

4. AUX. Input (pin<sup>16</sup>)

The pin<sup>16</sup> 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<sup>16</sup> directly.



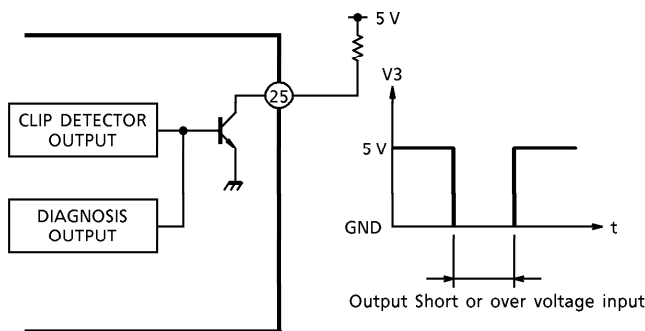
(Fig.6) AUX INPUT

5. DIAGNOSIS OUTPUT (pin<sup>25</sup>)

The diagnosis output terminal of pin<sup>25</sup> has open collector output structure on chip as shown in Fig.7.

In unusual case that output terminal of Power Amp. is condition of output to V<sub>CC</sub> or output to GND short and over voltage input mode, it is possible to protect all the system of apparatus as well as power IC protection.

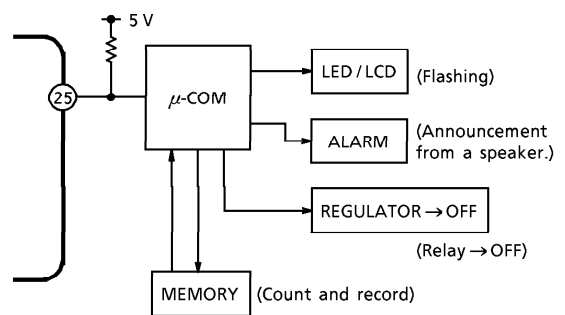
In case of being unused this function, use this IC as open-connection on pin<sup>25</sup>.



pin<sup>25</sup> : Open Collector Output (Active Low)

(Fig.7)

(Application)



(Fig.8)

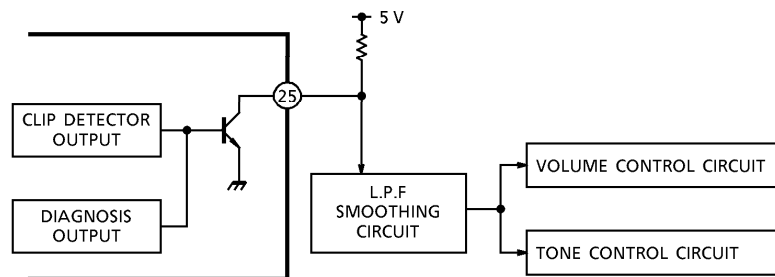
6. Output Clip Detection Function (pin<sup>25</sup>)

The output clip detection terminal of pin<sup>25</sup> has the open collector output structure on chip as shown in Fig.9. In case that the output waveform is clipping, the clip detection circuit is operated and NPN Tr. 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 Fig.9.

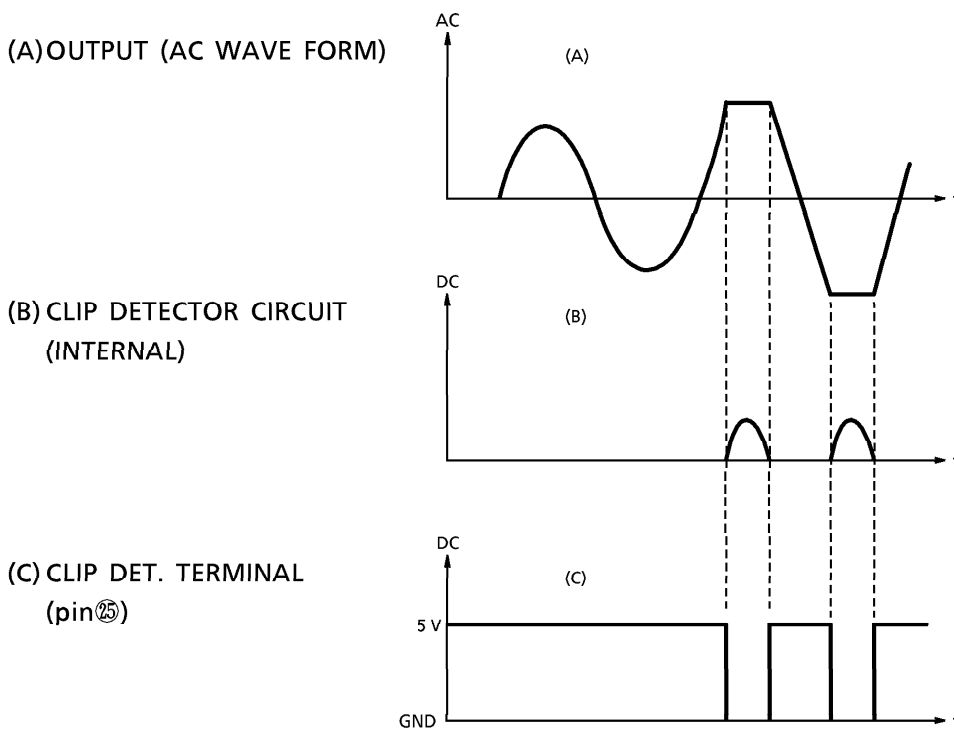
In case of being unused this function, use this IC as open connection on pin<sup>25</sup>.

(Application)



pin<sup>25</sup> : Open Collector Output (Active Low)

(Fig.9)



**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 RATING (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2 s)	V <sub>CC (surge)</sub>	50	V
DC Supply Voltage	V <sub>CC (DC)</sub>	25	V
Operating Supply Voltage	V <sub>CC (opr)</sub>	18	V
Output Current (peak)	I <sub>o (peak)</sub>	9	A
Power Dissipation	P <sub>D (*)</sub>	250	W
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

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

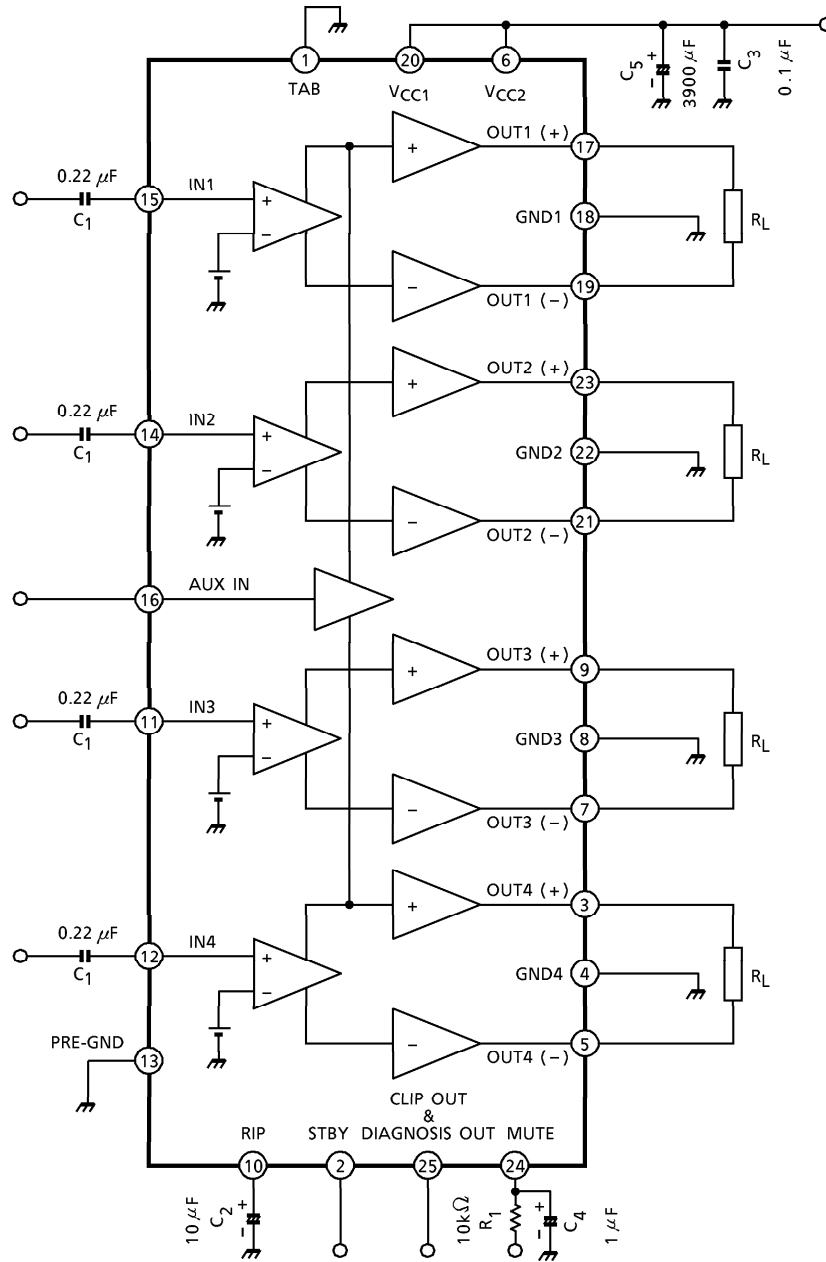
ELECTRICAL CHARACTERISTICS (Unless otherwise specified V<sub>CC</sub> = 13.2 V, f = 1 kHz, R<sub>L</sub> = 4 Ω, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I <sub>CCO</sub>	—	V <sub>IN</sub> = 0	—	200	400	mA
Output Power	P <sub>OUT MAX (1)</sub>	—	V <sub>CC</sub> = 14.4 V, MAX power	—	37	—	W
	P <sub>OUT MAX (2)</sub>	—	V <sub>CC</sub> = 13.7 V, MAX power	—	35	—	
	P <sub>OUT (1)</sub>	—	V <sub>CC</sub> = 14.4 V, THD = 10%	—	24	—	
	P <sub>OUT (2)</sub>	—	THD = 10%	19	21	—	
Total Harmonic Distortion	THD	—	P <sub>OUT</sub> = 3 W	—	0.02	0.2	%
Voltage Gain	G <sub>V</sub>	—	V <sub>OUT</sub> = 0.775 V <sub>rms</sub> (0 dBm)	24	26	28	dB
Voltage Gain Ratio	ΔG <sub>V</sub>	—	V <sub>OUT</sub> = 0.775 V <sub>rms</sub> (0 dBm)	-1.0	0	1.0	dB
Output Noise Voltage	V <sub>NO (1)</sub>	—	R <sub>g</sub> = 0 Ω, DIN45405	—	0.12	—	mV <sub>rms</sub>
	V <sub>NO (2)</sub>	—	R <sub>g</sub> = 0 Ω, BW = 20 Hz~20 kHz	—	0.10	0.35	mV <sub>rms</sub>
Ripple Rejection Ratio	R.R.	—	f <sub>rip</sub> = 100 Hz, R <sub>g</sub> = 620 Ω V <sub>rip</sub> = 0.775 V <sub>rms</sub> (0 dBm)	40	50	—	dB
Cross Talk	C.T.	—	R <sub>g</sub> = 620 Ω, V <sub>OUT</sub> = 0.775 V <sub>rms</sub> (0 dBm)	—	65	—	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 H</sub>	—	Power : on	3.0	—	6.0	V
	V <sub>SB L</sub>	—	Power : off	0	—	1.5	
Mute Control Voltage (*)	V <sub>M H</sub>	—	Mute : off	OPEN			V
	V <sub>M L</sub>	—	Mute : on, R <sub>1</sub> = 10 kΩ	0	—	0.5	
Mute Attenuation	ATT M	—	Mute : on, V <sub>OUT</sub> = 7.75 V <sub>rms</sub> (20 dBm) at Mute : off.	80	90	—	dB

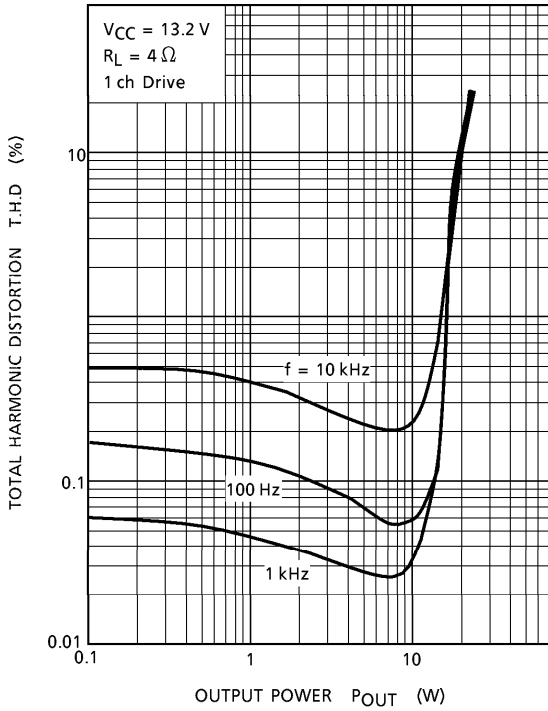
(\*) : Muting function have to be controlled by open and Low Logic, which Logic is a transistor, FET and μ-COM port of I<sub>MUTE</sub> > 250 μA ability.  
This means that the Mute control terminal : pin④ must not be pulled-up.



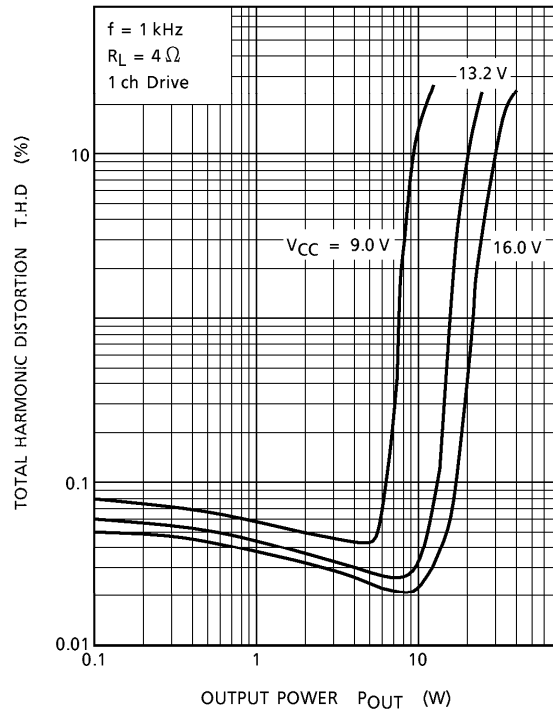
TEST CIRCUIT



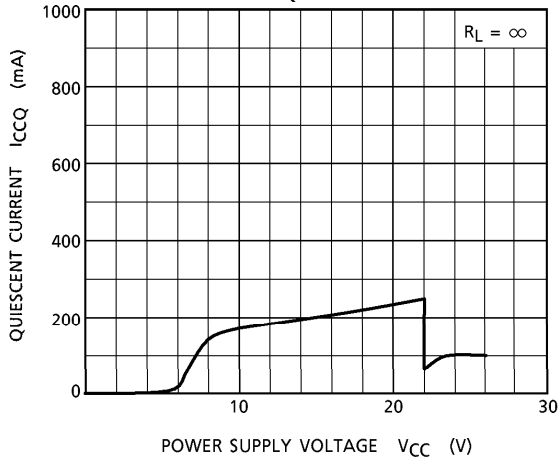
T.H.D - P<sub>OUT</sub>



T.H.D - P<sub>OUT</sub>



I<sub>CCQ</sub> - V<sub>CC</sub>



T.H.D - f

