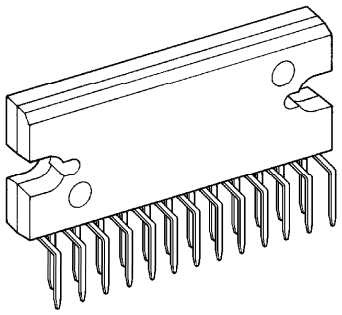
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8260AH

MAX POWER 40 W BTL × 4 CH AUDIO POWER IC

The TA8260AH is 4 ch BTL audio power amplifier for car audio application.
This IC can generate more high power : $P_{OUT}MAX$ = 40 W as it is included the pure complementary PNP and NPN transistor output stage.
It is designed low distortion ratio for 4ch BTL audio power amplifier, built-in Stand-by Function, Muting Function, Clip detector, diagnosis circuit and Junction Temperature Detection 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.



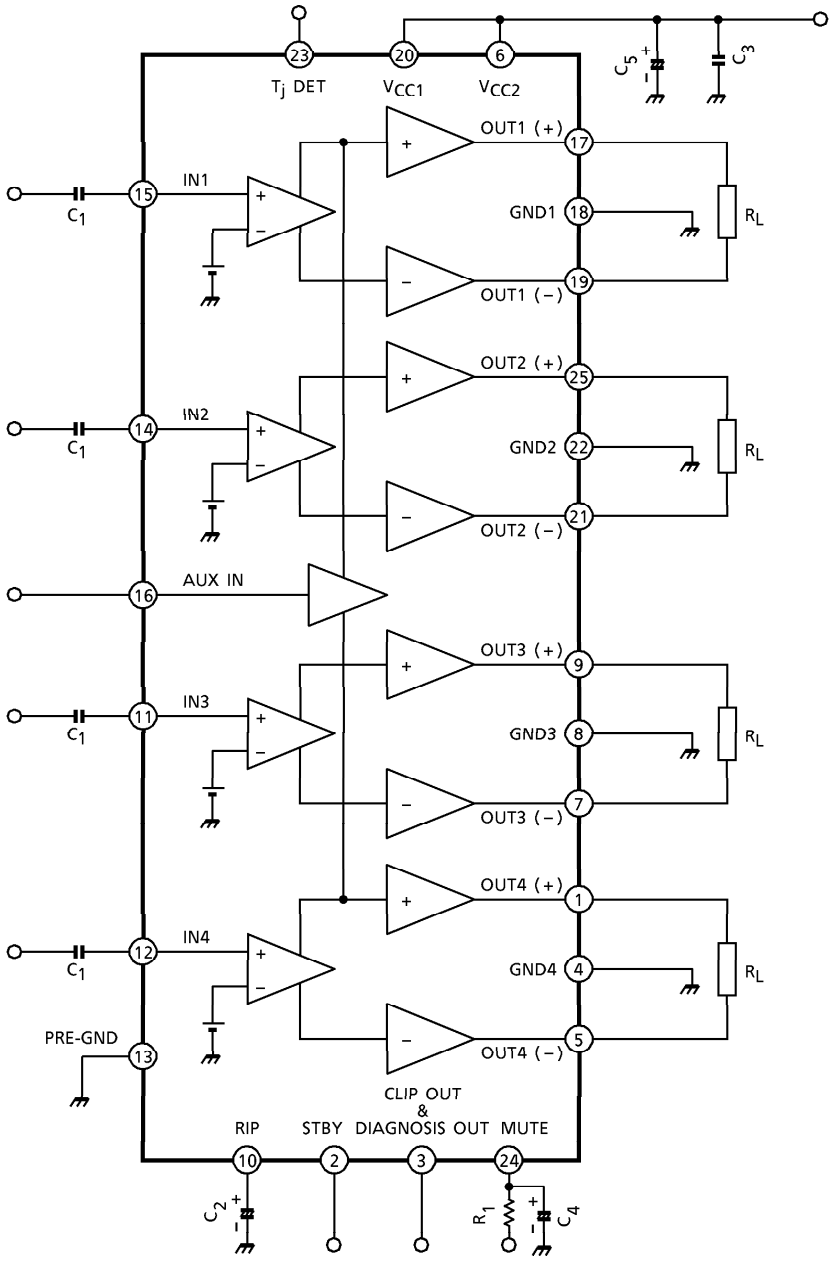
HZIP25-P-1.27E

Weight : 9.8 g (Typ.)

FEATURES

- High power
  - : $P_{OUT}MAX$ (1) = 40 W (Typ.) (V_{CC} = 14.4 V, f = 1 kHz, EIAJ Max., R_L = 4 Ω)
  - : $P_{OUT}MAX$ (2) = 37 W (Typ.) (V_{CC} = 13.7 V, f = 1 kHz, EIAJ Max., R_L = 4 Ω)
  - : P_{OUT} (1) = 27 W (Typ.) (V_{CC} = 14.4 V, f = 1 kHz, THD = 10%, R_L = 4 Ω)
  - : P_{OUT} (2) = 22 W (Typ.) (V_{CC} = 13.2 V, f = 1 kHz, THD = 10%, R_L = 4 Ω)
- Built-in clip detector & diagnosis circuit. (Pin③)
- Low distortion ratio : THD = 0.02% (Typ.) (V_{CC} = 13.2 V, f = 1 kHz, P_{OUT} = 3 W, R_L = 4 Ω)
- Low noise : V_{NO} = 0.10 mV_{rms} (Typ.) (V_{CC} = 13.2 V, R_g = 0 Ω, G_V = 26 dB, BW = 20~20 kHz)
- Built-in stand-by switch function (Pin②)
- Built-in muting function (Pin㉔)
- Built-in AUX. amplifier from single input (Pin⑯) to 2 channels output ; OUT1 and 4
- Built-in junction temperature detection circuit (Pin㉓)
  - : Pin㉓ DC voltage rises at about +5 mV/°C in proportion to junction temperature.
- Built-in various protection circuit
  - : Thermal shut down, over voltage, out to GND, out to V_{CC}, out to out short
- Operating supply voltage : $V_{CC\,(opr)}$ = 9~18 V

BLOCK DIAGRAM

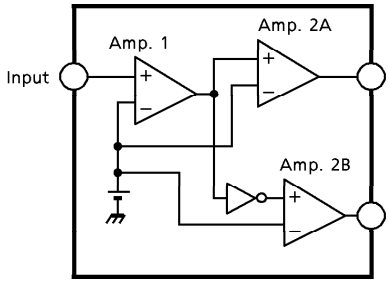


CAUTION AND APPLICATION METHOD

(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.



(Fig.1) Block diagram

The voltage gain of Amp. 1 : G_{V1} = 0 dB
The voltage gain of Amp. 2A, B : G_{V2} = 20 dB
The voltage gain of BLT Connection : $G_{V\,(BTL)}$ = 6 dB

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

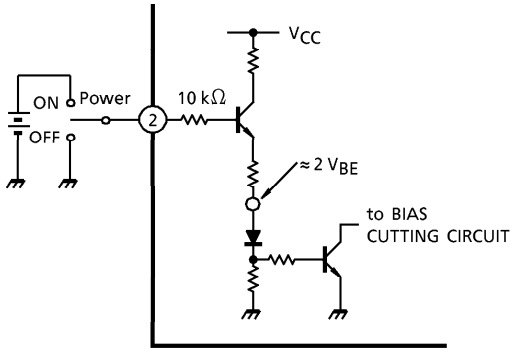
$$G_V = G_{V1} + G_{V2} + G_{V\,(BTL)} = 0 + 20 + 6 = 26\,dB$$

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 3 V_{BE} (Typ.), and the Power Supply current is about 2 μA (Typ.) at the stand-by state.

Control Voltage of pin② : $V_{(SB)}$

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

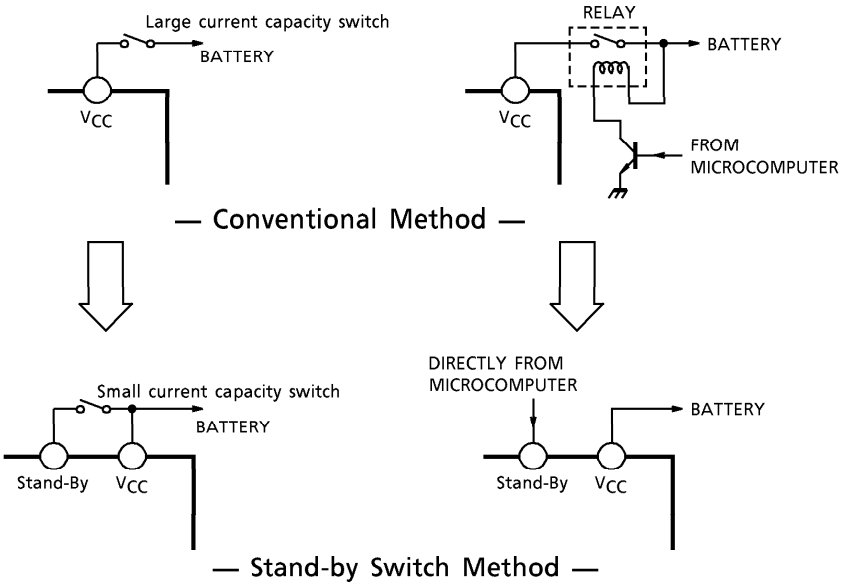


(Fig.2) With pin② set to High, Power is turned ON

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.

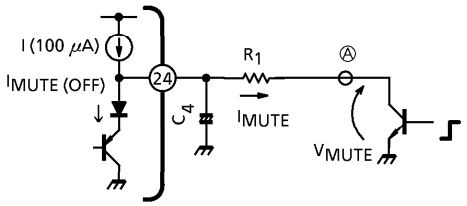
(2) Since the control current is microscopic, the switching relay of small current capacity is satisfactory for switching



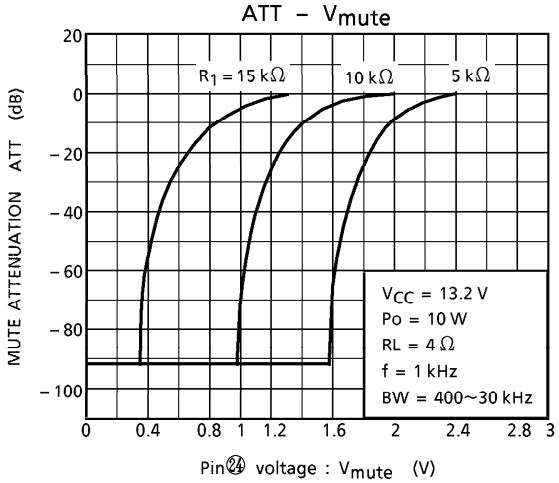
(Fig.3)

3. Muting function (pin㉔)

By means of controlling pin㉔ 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 kΩ, we recommend 10 kΩ.
The muting function have to be controlled by a transistor, FET and μ-COM port which has I_{MUTE} > 250 μA ability.
Terminal ㉔ must not be pulled up and it shall be controlled by OPEN / LOW.



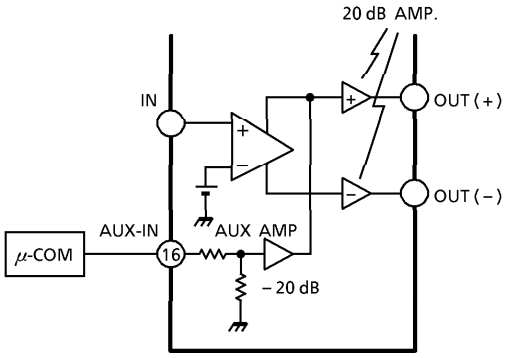
(Fig.4) Muting Function



(Fig.5) Mute Attenuation – V_{mute} (V)

4. AUX. Input (pin⑯)

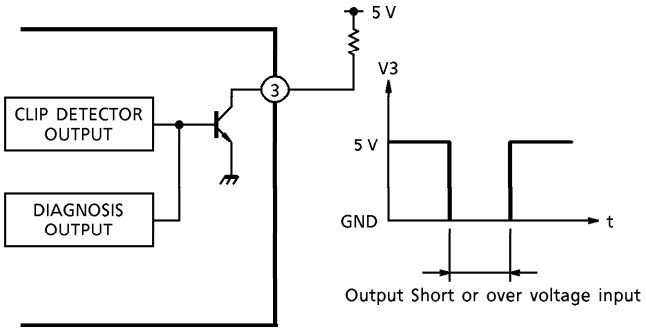
The pin⑯ is for input terminal of AUX. amplifier.
The total gain is 0 dB by using of AUX. amplifier.
Therefore, the μ-COM can directly drive the AUX. amplifier.
BEEP sound or voice synthesizer signal can be input to pin⑯ directly.



(Fig.6) AUX INPUT

5. DIAGNOSIS OUTPUT (pin③)

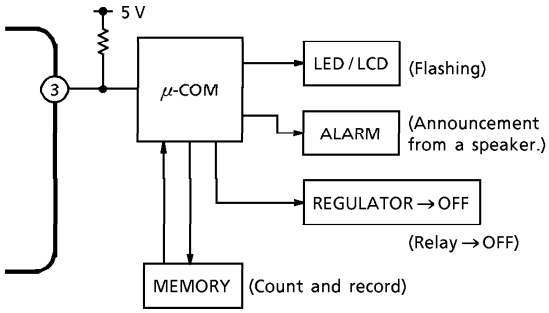
The diagnosis output terminal of pin③ has open collector output structure on chip as shown in Fig.6.
In unusual case that output terminal of Power Amp. is condition of output to V_{CC} or output to GND short and over voltage input mode, it is possible to protect all the system of apparatus as well as power IC protection.
In case of being unused this function, use this IC as open-connection on pin③.



pin ③ : Open Collector Output (Active Low)

(Fig.7)

(Application)

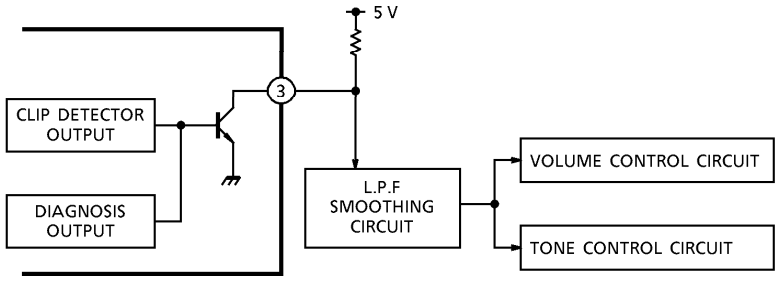


(Fig.8)

6. Output Clip Detection Function (pin③)

The output clip detection terminal of pin③ 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 pin③.

(Application)



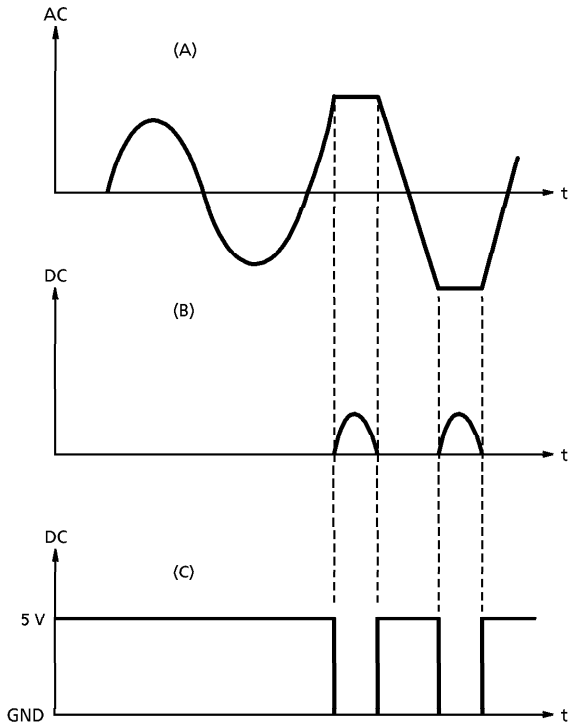
pin③ : Open Collector Output (Active Low)

(Fig.9)

(A) OUTPUT (AC WAVE FORM)

(B) CLIP DETECTOR CIRCUIT (INTERNAL)

(C) CLIP DET. TERMINAL (pin③)

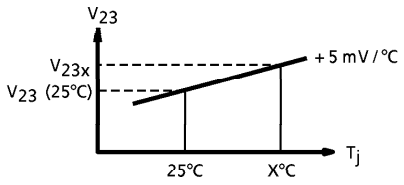


7. Junction temperature detecting pin㉓

Using temperature characteristic of a band gap circuit and in proportion to junction temperature, pin㉓ DC voltage : V_{23} rises at about +5 mV / °C temperature characteristic. The relation between V_{23} at T_j = 25°C and V_{23x} at T_j = x°C is decided by the following expression :

$$T\ (x°C) = \frac{V_{23x} - V_{23}\ (25°C)}{5\ mV / °C} + 25\ (°C)$$

In deciding a heat sink size, a junction temperature can be easily made clear by measuring voltage at this pin while a backside temperature of IC was so far measured using a thermocouple type thermometer.



(Fig.10)

8. 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)

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)	$V_{CC\ (surge)}$	50	V
DC Supply Voltage	$V_{CC\ (DC)}$	25	V
Operating Supply Voltage	$V_{CC\ (opr)}$	18	V
Output Current (peak)	$I_{o\ (peak)}$	9	A
Power Dissipation	P_D (*)	250	W
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−55~150	°C

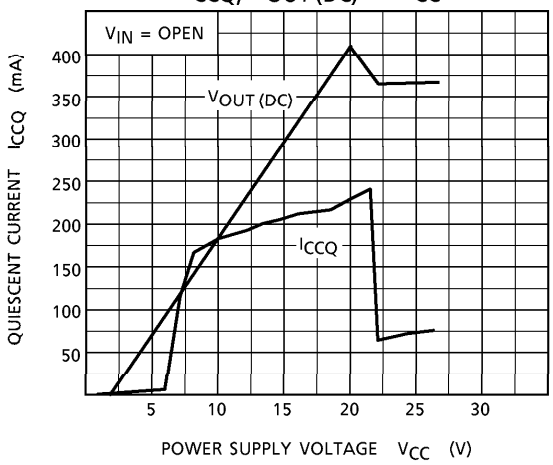
(*) : Package thermal resistance $\theta_{j\text{-}T}$ = 0.5°C / W (Typ.)
(Ta = 25°C, with infinite heat sink)

ELECTRICAL CHARACTERISTICS (Unless otherwise specified V_{CC} = 13.2 V, f = 1 kHz, R_L = 4 Ω, Ta = 25°C)

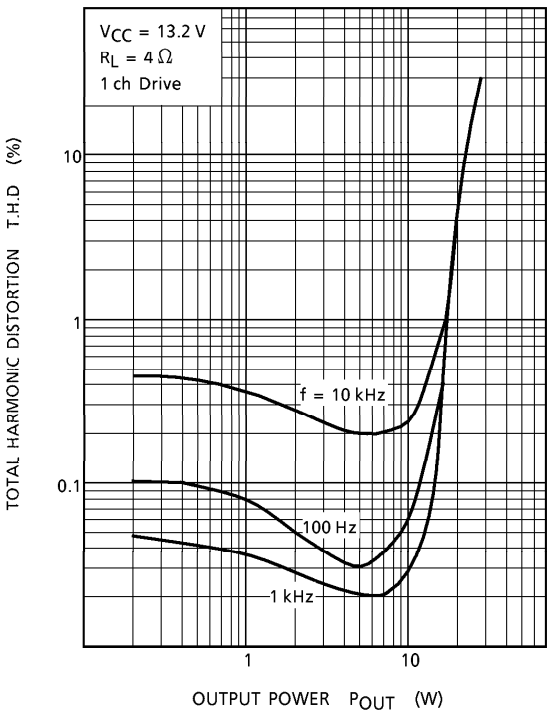
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	V_{IN} = 0	—	200	400	mA
Output Power	P_{OUT} MAX (1)	—	V_{CC} = 14.4 V, MAX power	—	40	—	W
	P_{OUT} MAX (2)	—	V_{CC} = 13.7 V, MAX power	—	37	—	
	P_{OUT} (1)	—	V_{CC} = 14.4 V, THD = 10%	—	27	—	
	P_{OUT} (2)	—	THD = 10%	20	22	—	
Total Harmonic Distortion	THD	—	P_{OUT} = 3 W	—	0.02	0.2	%
Voltage Gain	G_V	—	V_{OUT} = 0.775 V_{rms} (0 dBm)	24	26	28	dB
Voltage Gain Ratio	ΔG_V	—	V_{OUT} = 0.775 V_{rms} (0 dBm)	−1.0	0	1.0	dB
Output Noise Voltage	V_{NO} (1)	—	R_g = 0 Ω, DIN45405	—	0.12	—	mV_{rms}
	V_{NO} (2)	—	R_g = 0 Ω, BW = 20 Hz~20 kHz	—	0.10	0.35	mV_{rms}
Ripple Rejection Ratio	R.R.	—	f_{rip} = 100 Hz, R_g = 620 Ω, V_{rip} = 0.775 V_{rms} (0 dBm)	40	50	—	dB
Cross Talk	C.T.	—	R_g = 620 Ω, V_{OUT} = 0.775 V_{rms} (0 dBm)	—	70	—	dB
Output Offset Voltage	V_{OFFSET}	—	—	−100	0	+100	mV
Input Resistance	R_{IN}	—	—	—	90	—	kΩ
Stand-by Current	I_{SB}	—	Stand-by condition	—	2	10	μA
Stand-by Control Voltage	V_{SB} H	—	Power : on	3.0	—	6.0	V
	V_{SB} L	—	Power : off	0	—	1.5	
Mute Control Voltage (*)	V_M H	—	Mute : off	OPEN			V
	V_M L	—	Mute : on, R_1 = 10 kΩ	0	—	0.5	
Mute Attenuation	ATT M	—	Mute : on, V_{OUT} = 7.75 Vrms (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_{MUTE} > 250 μA ability.
This means that the Mute control terminal : pin㉔ must not be pulled-up.

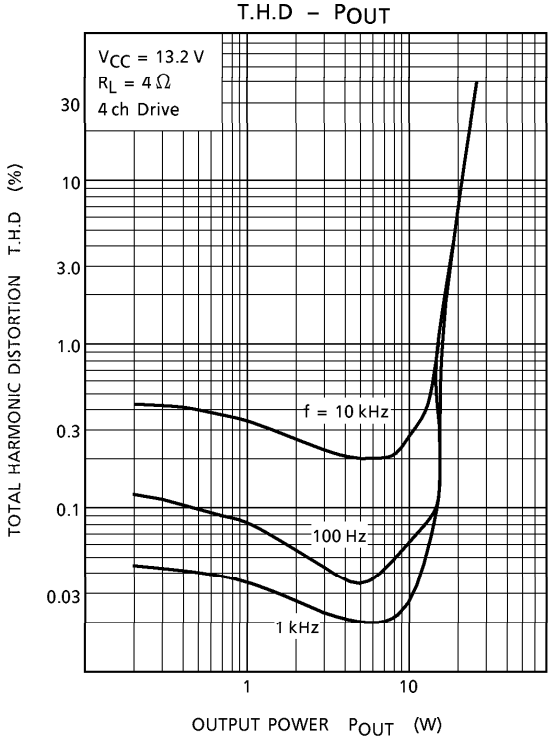
I_{CCQ}, $V_{OUT\,(DC)}$ – V_{CC}



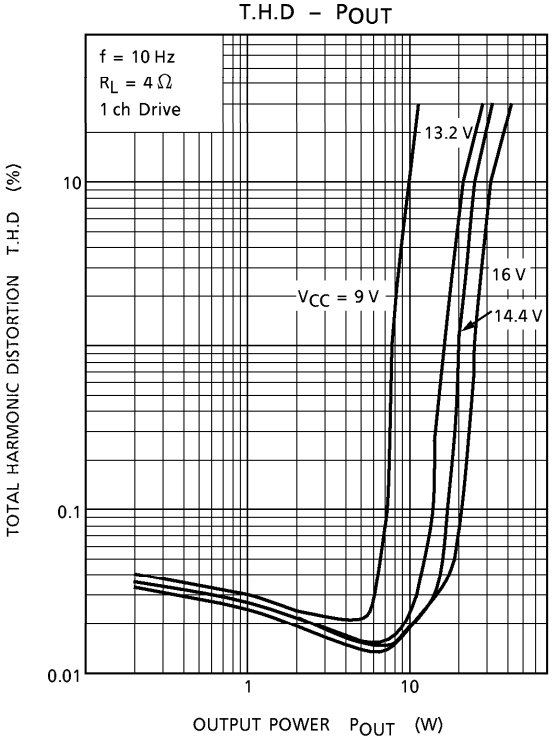
T.H.D – P_{OUT}



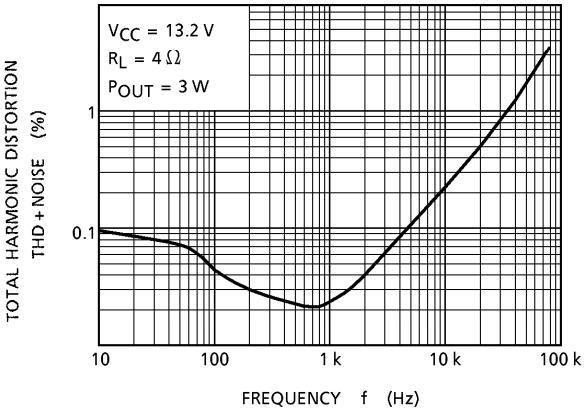
T.H.D – P_{OUT}



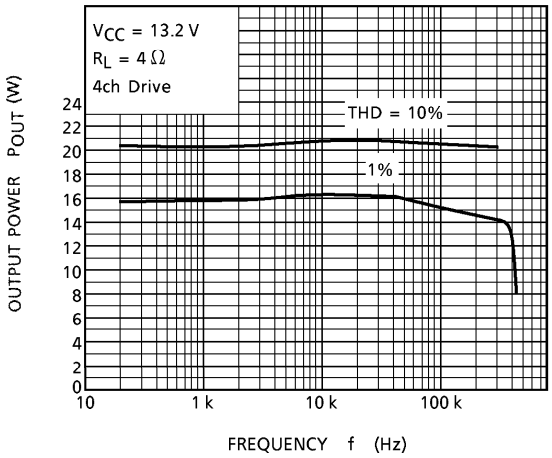
T.H.D – P_{OUT}



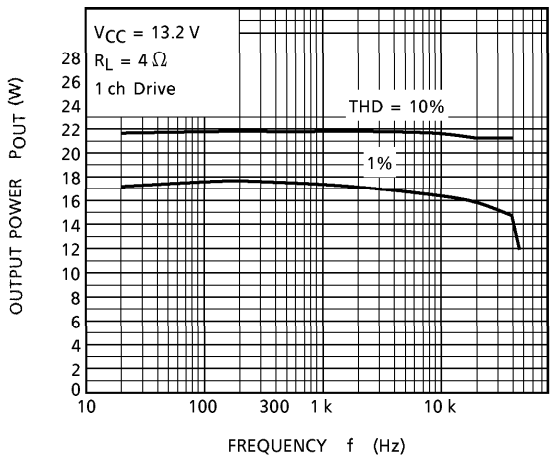
T.H.D – f



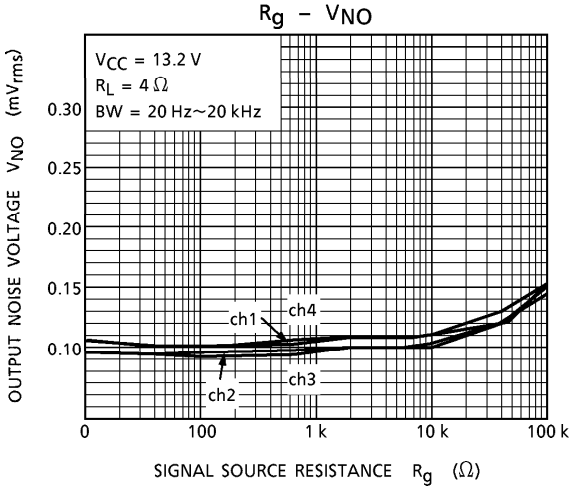
P_{OUT} – f



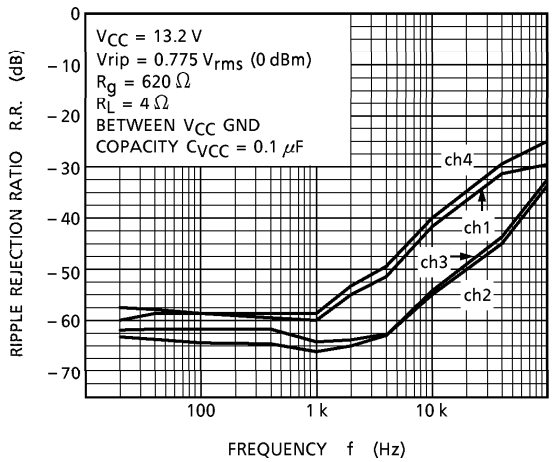
P_{OUT} – f



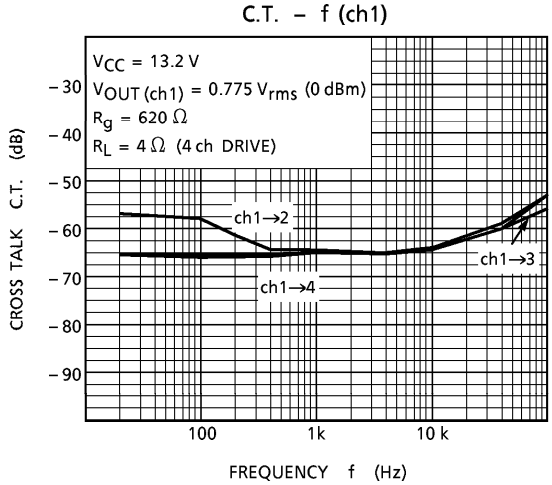
R_g – V_{NO}



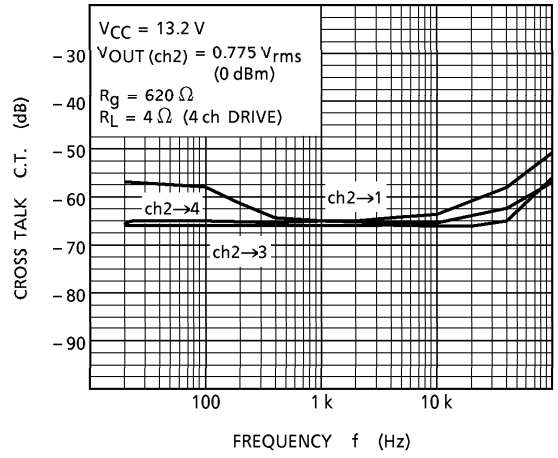
R.R. – f



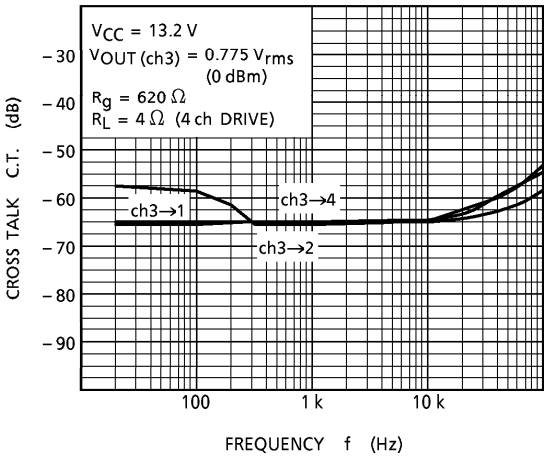
C.T. – f (ch1)



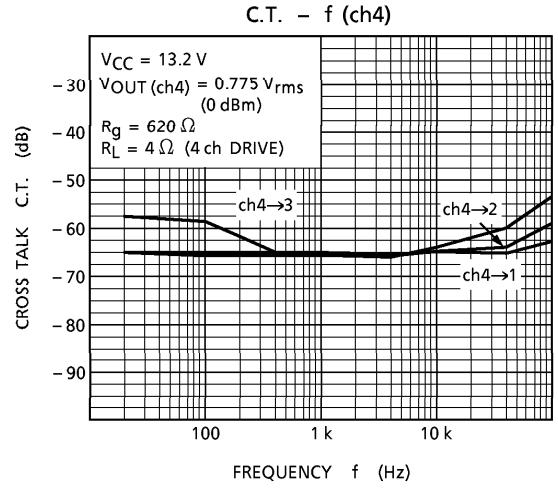
C.T. – f (ch2)



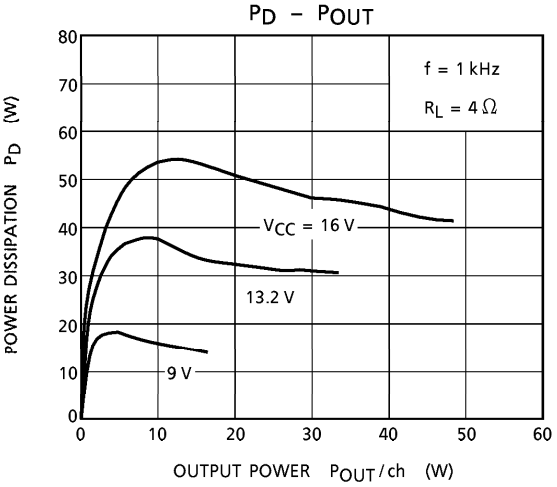
C.T. – f (ch3)



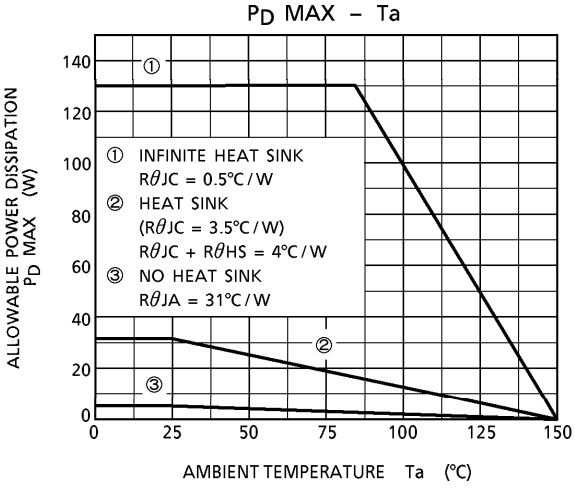
C.T. – f (ch4)



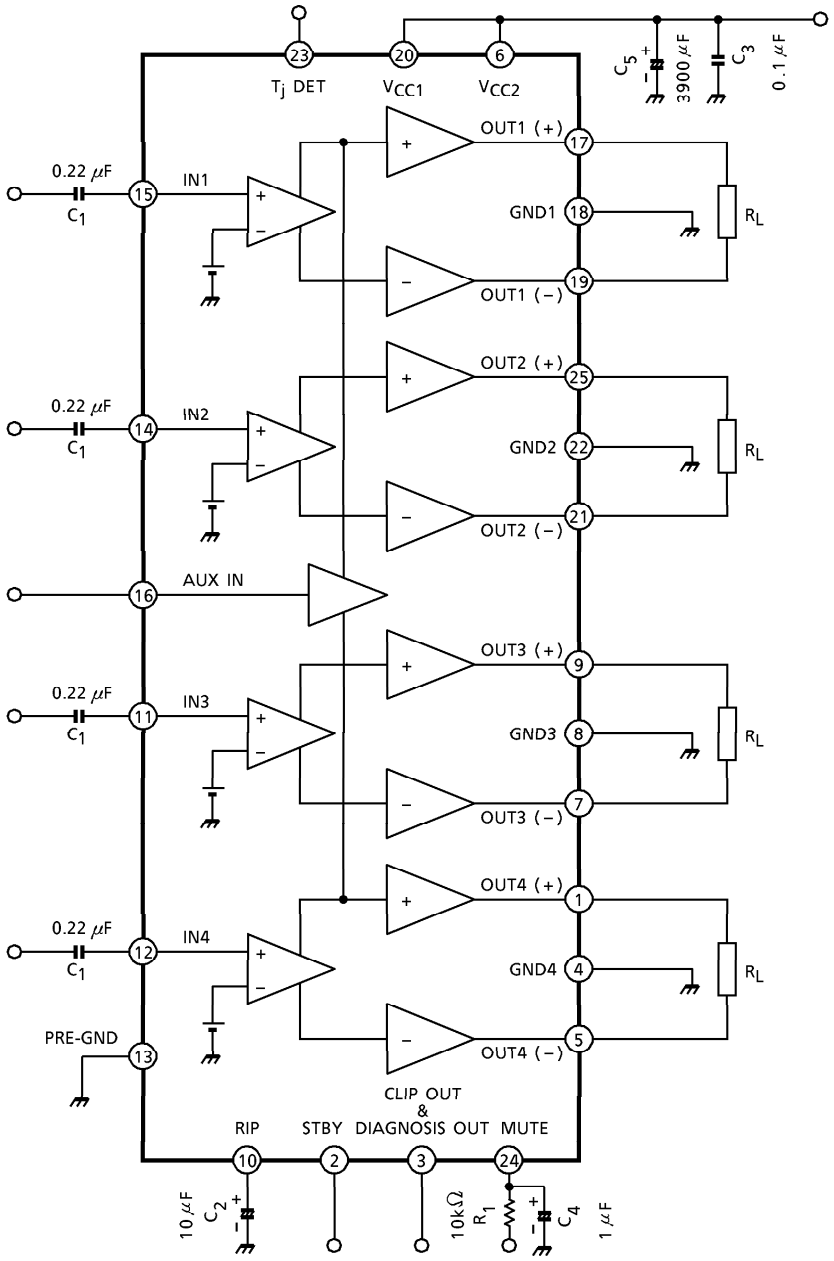
P_D – P_{OUT}



P_D MAX – Ta



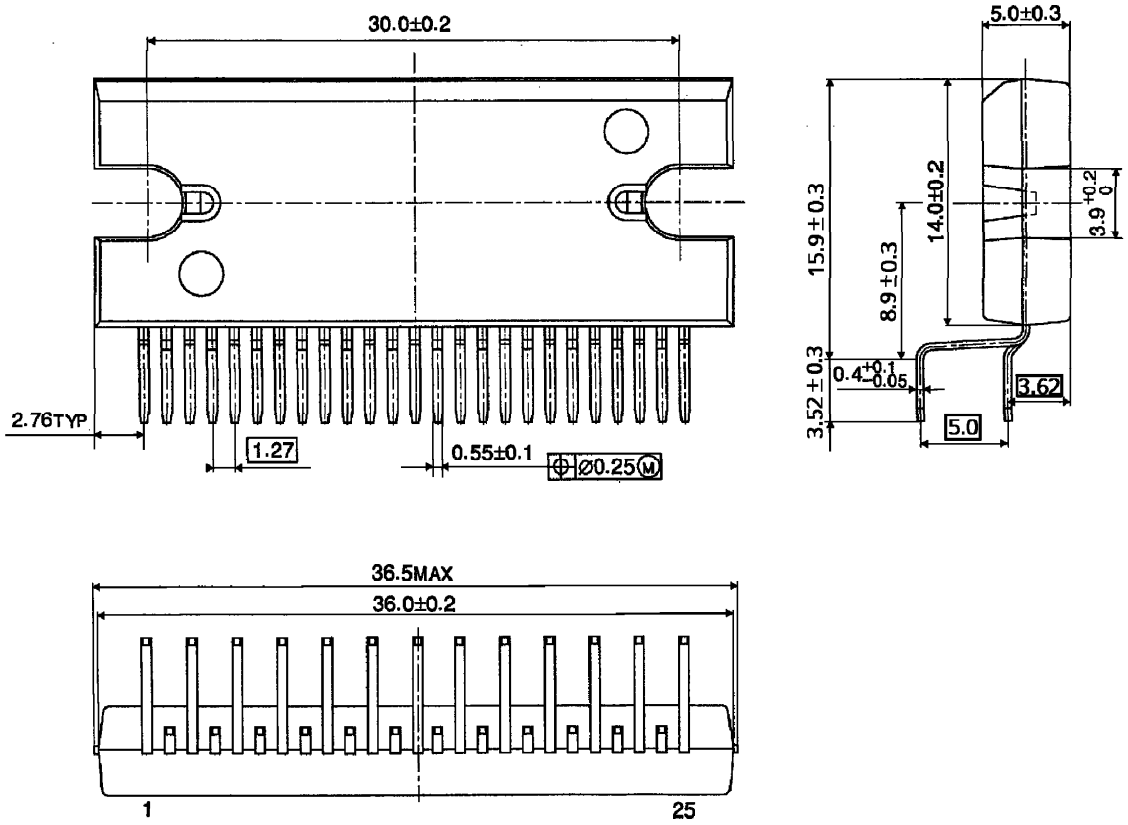
TEST CIRCUIT



PACKAGE DIMENSIONS

HZIP25-P-1.27E

UNIT : mm



Weight : 9.8 g (Typ.)