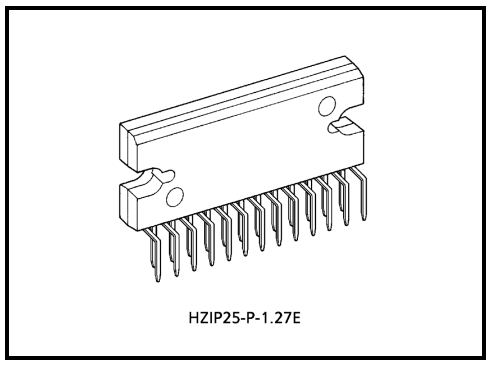
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8252H

Max Power 37W BTL × 4ch Audio Power IC

The TA8252H is 4ch BTL audio power amplifier for car audio application.
This IC can generate more high power: P_{OUT} MAX = 37W 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,and diagnosis circuit.
Additionally, the AUX.amplifier is built−in, it can make the beep signal etc.output to 2 channnels (out 1 and 4).It contains various kind of protectors for car audio use.

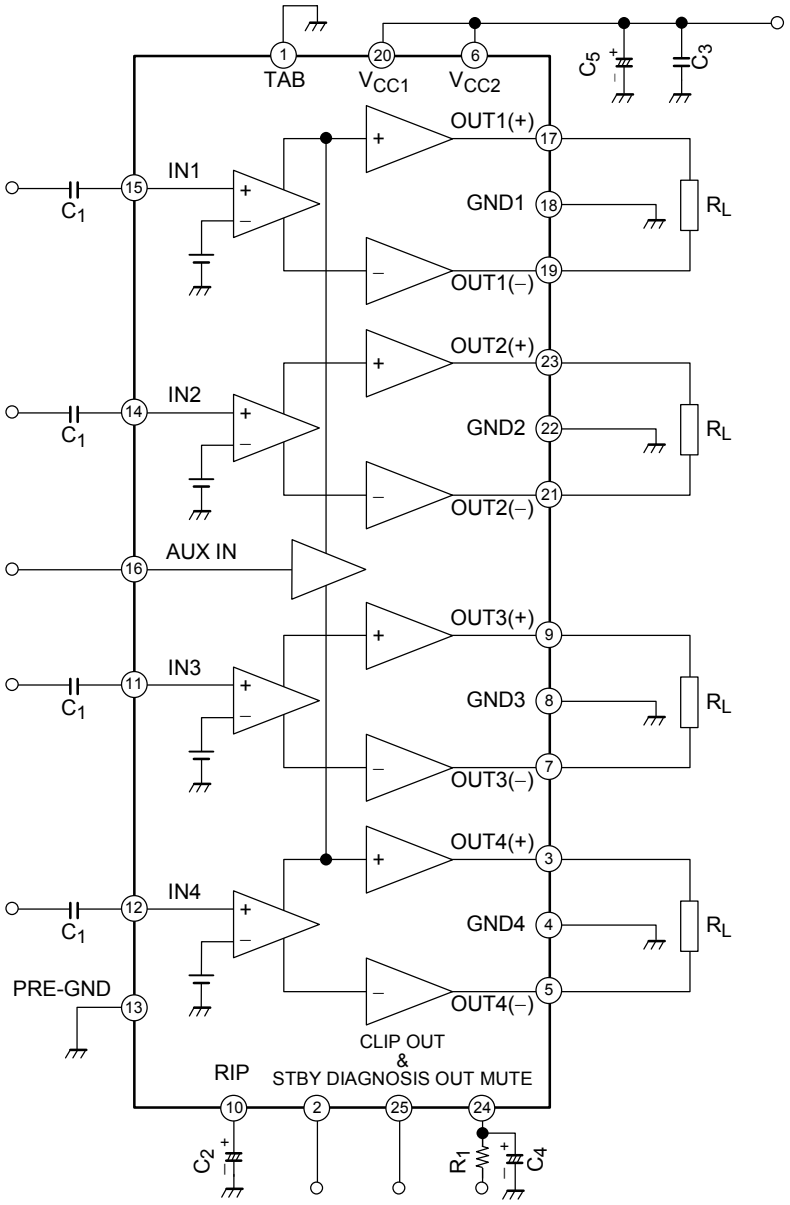


Weight: 9.8g (typ.)

Features

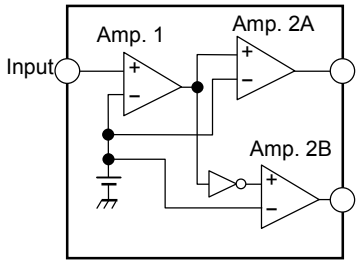
- High power
  : P_{OUT} MAX (1) = 37W (typ.)
  (V_{CC} = 14.4V, f = 1kHz, EIAJ max., R_L = 4Ω)
  : P_{OUT} MAX (2) = 35W (typ.)
  (V_{CC} = 13.7V, f = 1kHz, EIAJ max., R_L = 4Ω)
  : P_{OUT} (1) = 24W (typ.)
  (V_{CC} = 14.4V, f = 1kHz, THD = 10%, R_L = 4Ω)
  : P_{OUT} (2) = 21W (typ.)
  (V_{CC} = 13.2V, f = 1kHz, THD = 10%, R_L = 4Ω)
- Built−in clip detector & diagnosis circuit.(pin(25))
- Low distortion ratio: THD = 0.02% (typ.)
  (V_{CC} = 13.2V, f = 1kHz, P_{OUT} = 5W, R_L = 4Ω)
- Low noise: V_{NO} = 0.10mV_{rms} (typ.)
  (V_{CC} = 13.2V, R_g = 0Ω, G_V = 26dB, BW = 20~20kHz)
- Built−in stand−by switch function (pin(2))
- Built−in multing function (pin(24))
- Built−in AUX. amplifier from single input (pin(16)) 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: $V_{CC\ (opr)}$ = 9~18V

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.

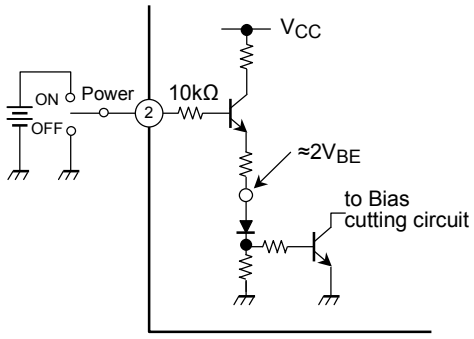


(Fig.1) Block diagram

The voltage gain of amp.1: G_{V1} = 0dB
The voltage gain of amp.2A, B: G_{V2} = 20dB
The voltage gain of BTL connection: $G_{V\ (BTL)}$ = 6dB
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 (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 $3V_{BE}$ (typ.), and the power supply current is about 2μA (typ.) at the stand–by state.

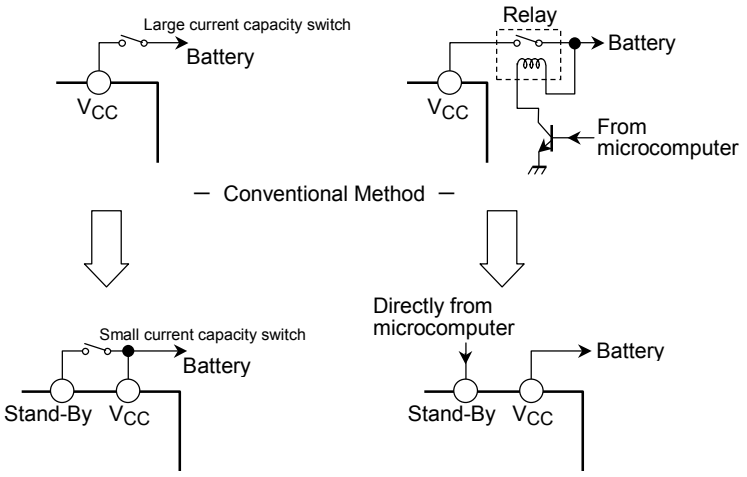


(Fig.2) With pin(2) set to High,
Power is turned ON

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

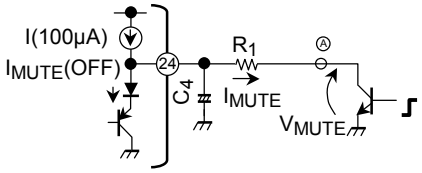
Stand–by	Power	$V_{(SB)}$ (V)
On	Off	0~1.5
Off	On	3~6

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

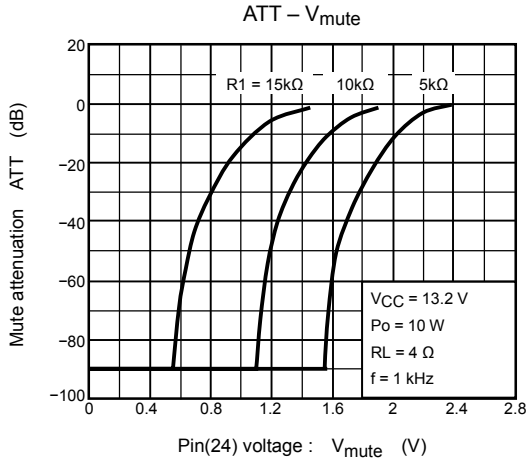


— Stand–by switch method —
(Fig.3)

3. Multing function (pin(24))
   By means of controlling pin(24) 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 15kΩ, we recommend 10kΩ.
   The muting function have to be controlled by a transistor, FET and µ–COM port which has
   I_{MUTE} > 250µA ability.
   Terminal (24) must not be pulled up and it shall be controlled by open / low.



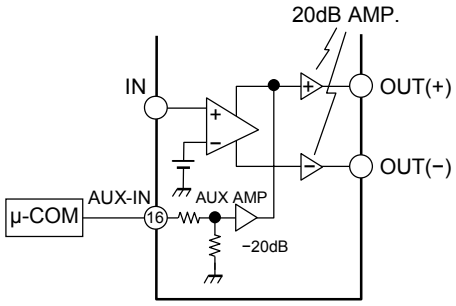
(Fig.4) Muting function



(Fig.5) Mute attenuation–V_{mute} (V)

4.AUX. input (pin(16))

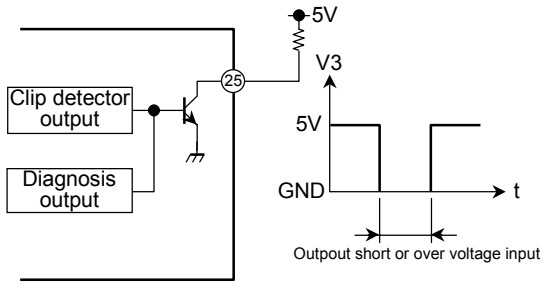
The pin(16) is for input terminal of AUX. amplifier.
The total gain is 0dB by using of AUX. amplifier.
Therfore, the μ–COM can directly drive the AUX. amplifier.
Beep sound or voice synthesizer signal can be input to pin(16) directly.



(Fig.6) AUX input

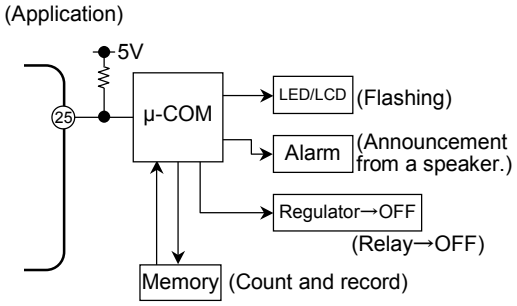
5. Diagnosis output (pin(25))

The diagnosis output terminal of pin(25) has open collector output structure on clip as shown in Fig.7.
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 pin(25).



Pin(25): Open collector output (active low)

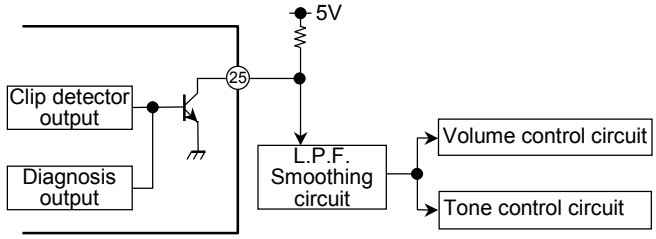
(Fig.7)



(Fig.8)

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 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(25).

   (Application)



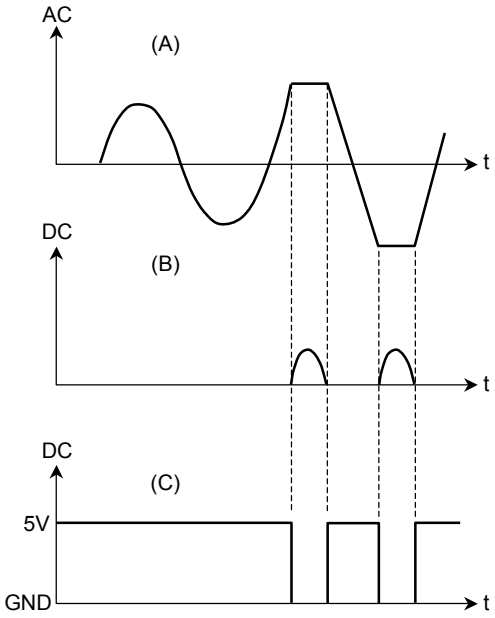
Pin ㉕ : Open collector output (active low)

(Fig.9)

(A) Output (AC wave form)

(B) Clip detector circuit (internal)

(C) Clip DET. terminal (pin ㉕)



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 (0.2s)	$V_{CC\ (surge)}$	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

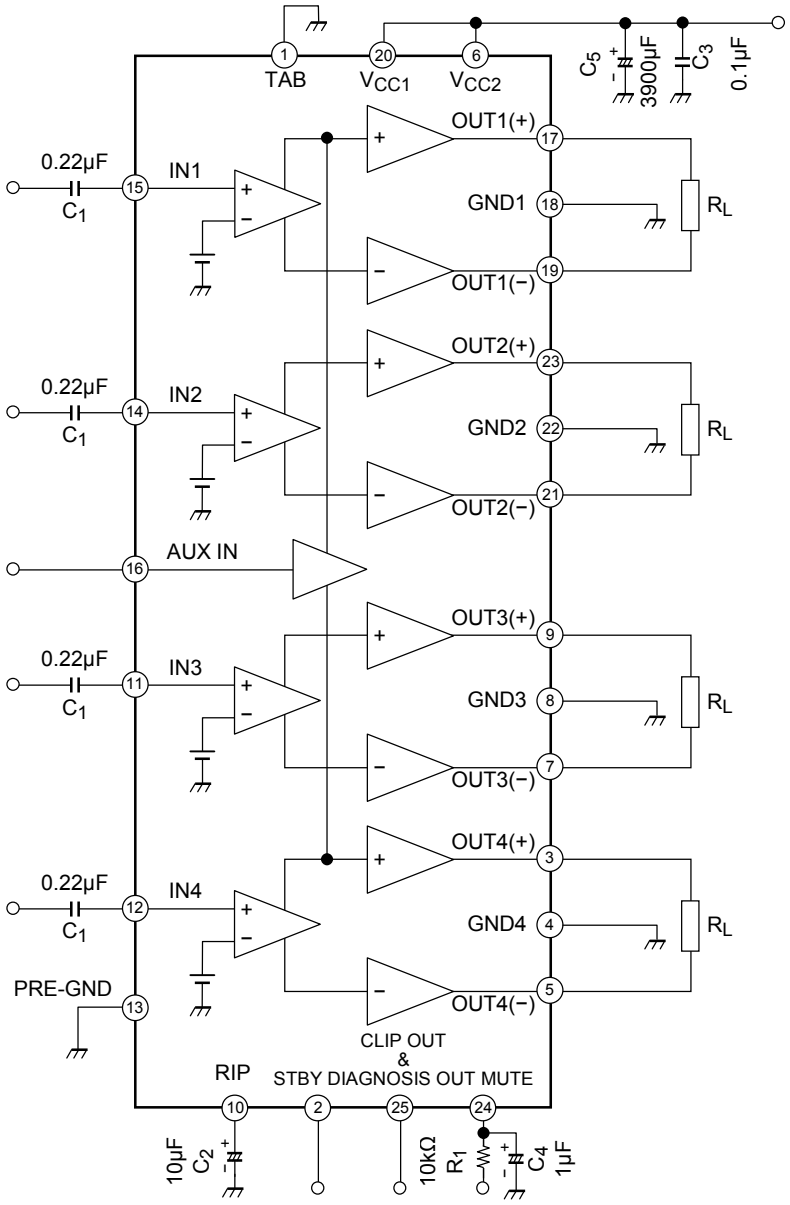
(*): Package thermal resistance θ_{j-T} = 0.5°C / W (typ.)
(Ta = 25°C, with infinite heat sink)

Electrical Characteristics
(unless otherwise specified V_{CC} = 13.2V, f = 1kHz, R_L = 4Ω, Ta = 25°C)

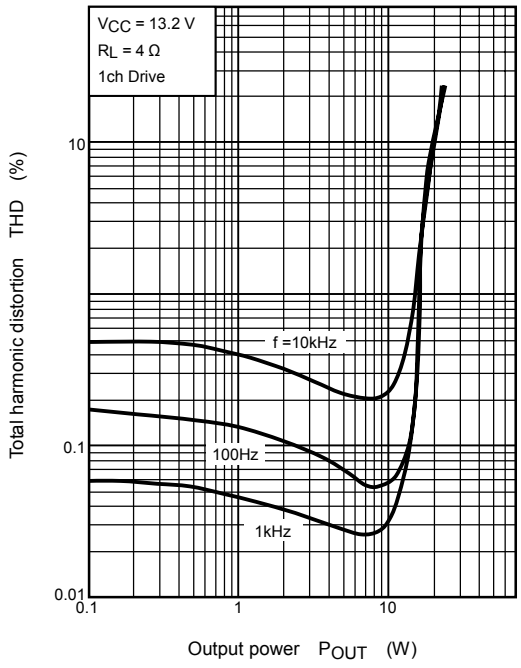
Characteristic	Symbol	Test Circuit	Condition	Min.	Typ.	Max.	Unit
Quiescent current	I_{CCQ}	—	V_{IN} = 0	—	200	400	mA
Output power	P_{OUT} MAX (1)	—	V_{CC} = 14.4V, max power	—	37	—	W
	P_{OUT} MAX (2)	—	V_{CC} = 13.7V, max power	—	35	—	
	P_{OUT} (1)	—	V_{CC} = 14.4V, THD = 10%	—	24	—	
	P_{OUT} (2)	—	THD = 10%	19	21	—	
Total harmonic distortion	THD	—	P_{OUT} = 3W	—	0.02	0.2	%
Voltage gain	G_V	—	V_{OUT} = 0.775V_{rms} (0dBm)	24	26	28	dB
Voltage gain ratio	ΔG_V	—	V_{OUT} = 0.775V_{rms} (0dBm)	−1.0	0	1.0	dB
Output noise voltage	$V_{NO\ (1)}$	—	R_g = 0Ω, DIN45405	—	0.12	—	mV_{rms}
	$V_{NO\ (2)}$		R_g = 0Ω, BW = 20Hz~20kHz	—	0.10	0.35	mV_{rms}
Ripple rejection ratio	R.R.	—	f_{rip} = 100Hz, R_g = 620Ω, V_{rip} = 0.775V_{rms} (0dBm)	40	50	—	dB
Cross talk	C.T.	—	R_g = 620Ω, V_{OUT} = 0.775V_{rms} (0dBm)	—	65	—	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 = 10kΩ	0	—	0.5	
Mute attenuation	ATT M	—	Mute: On, V_{OUT} = 7.75V_{rms} (20dBm) 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} > 250μA ability.
This means that the mute control terminal: Pin(24) must not be pulled−up.

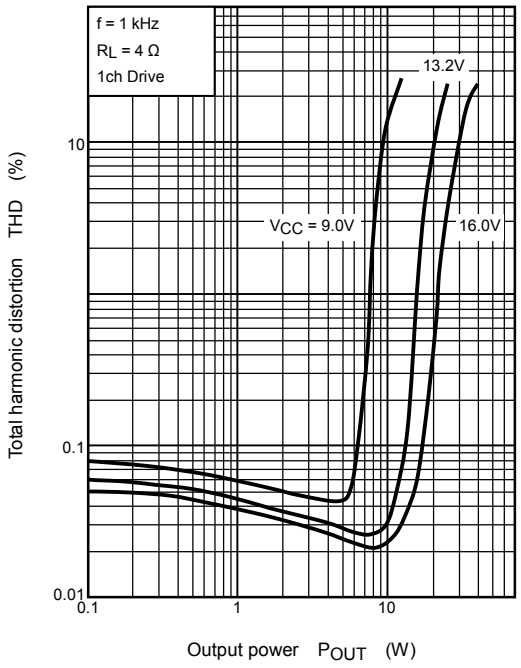
Test Circuit



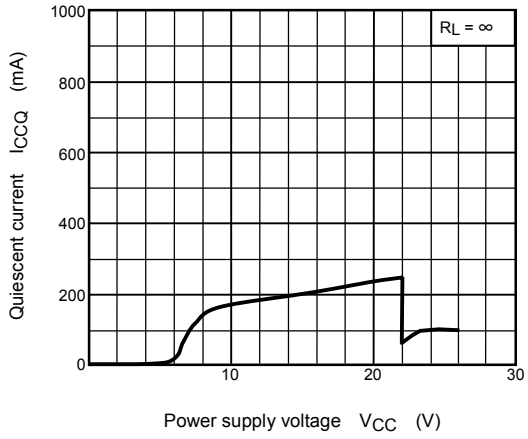
THD – P_{OUT}



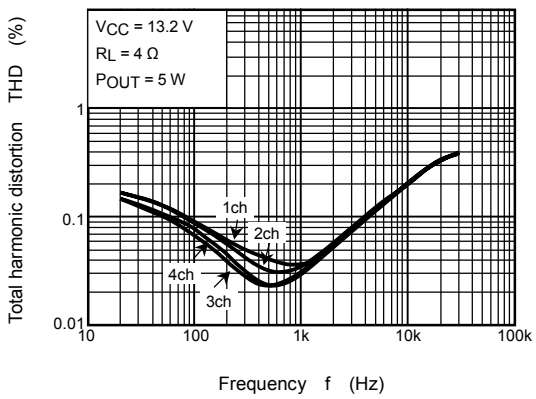
THD – P_{OUT}



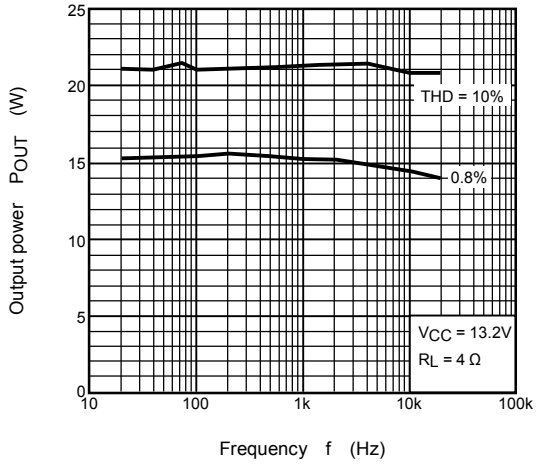
I_{CCQ} – V_{CC}



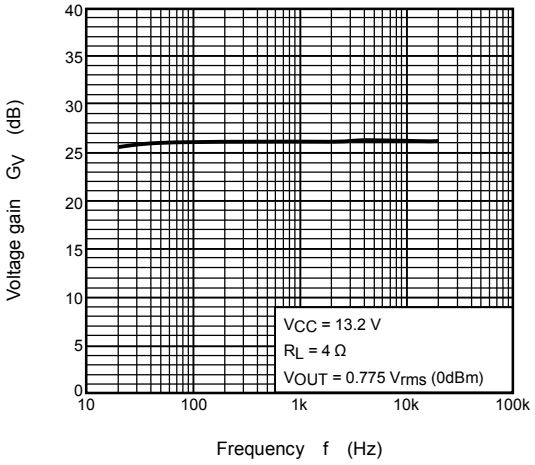
THD – f



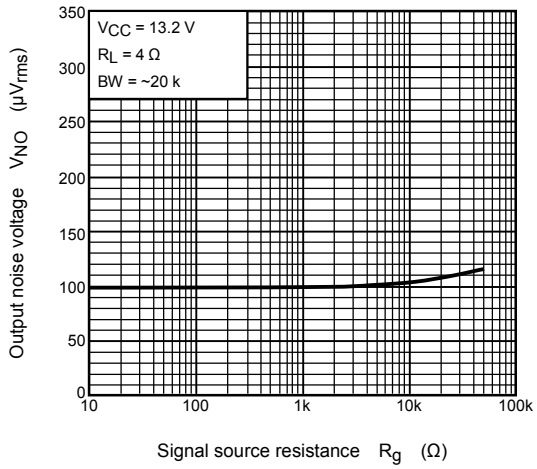
P_{OUT} – f



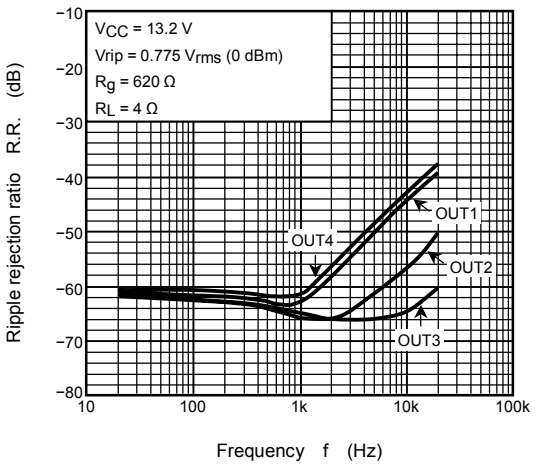
G_V – f



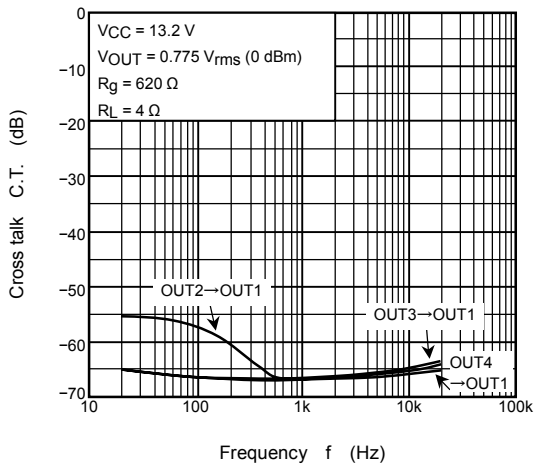
V_{NO} – R_g



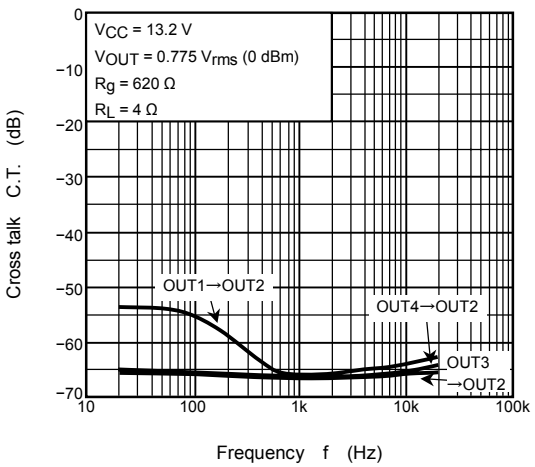
R.R. – f



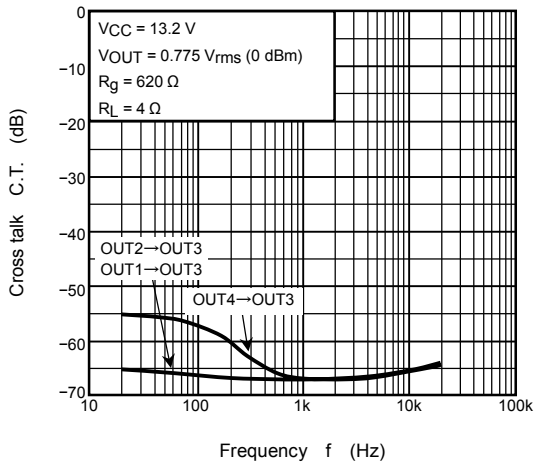
C.T. – f (OUT1)



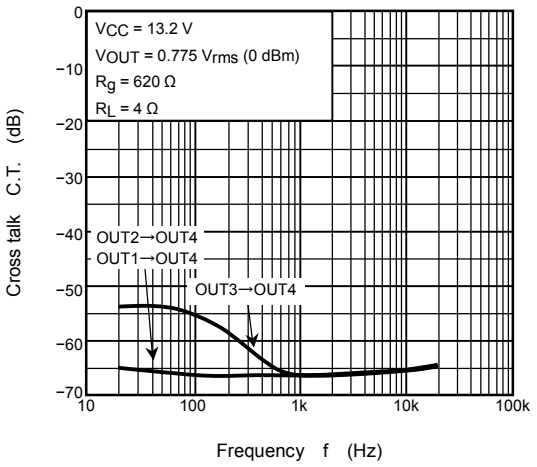
C.T. – f (OUT2)



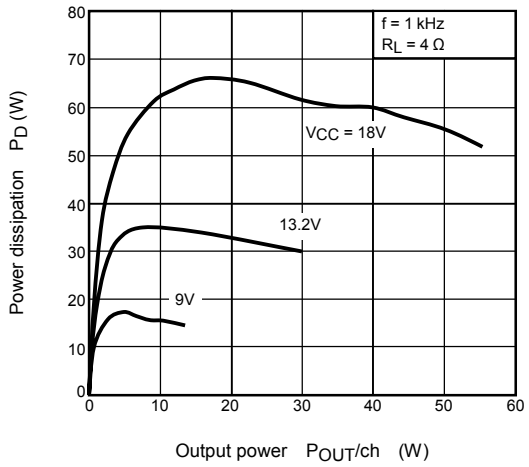
C.T. – f (OUT3)



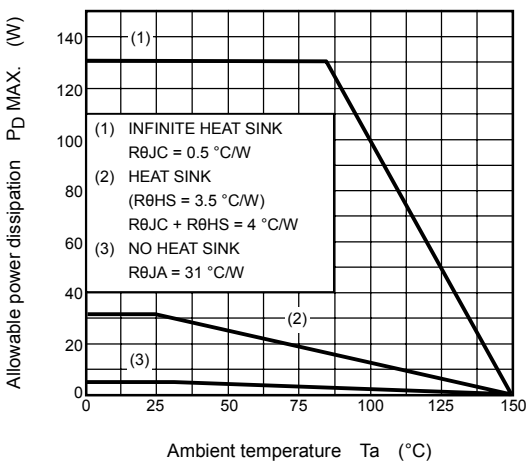
C.T. – f (OUT4)



P_D – P_{OUT}

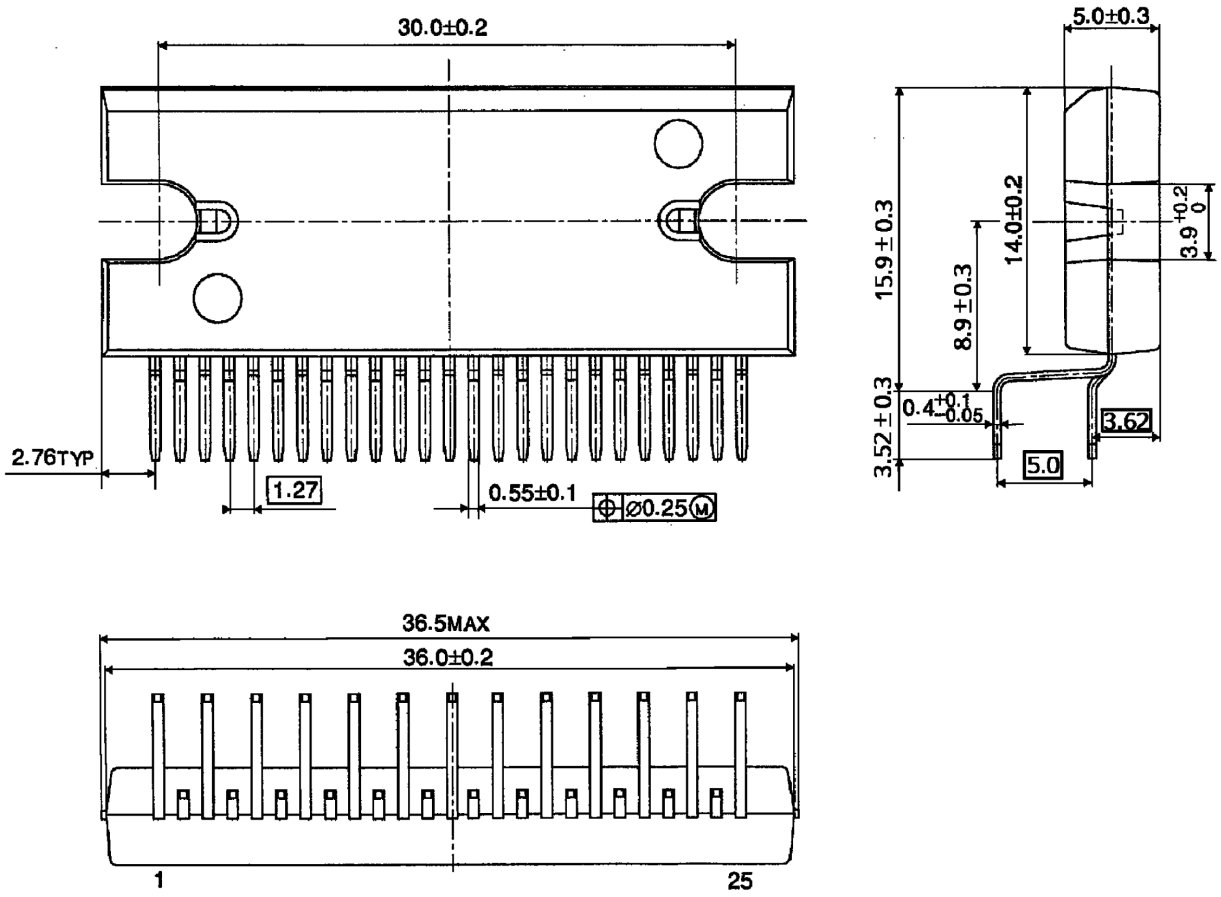


P_D MAX. – Ta



Package Dimensions

HZIP25-P-1.27E UNIT : mm



Weight: 9.8g (typ.)

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