TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8271HQ

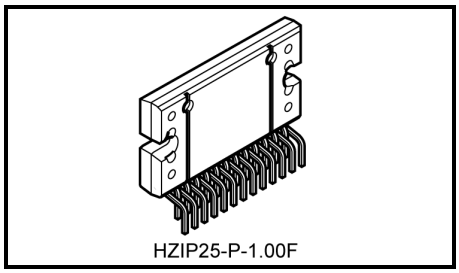
Max Power 41 W BTL × 4 ch Audio Power IC

The TA8271HQ is 4 ch BTL audio power amplifier for car audio application.

This IC can generate more high power: $P_{OUT}MAX$ = 41 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 and muting function.

Additionally, the AUX amplifier and various kind of protector for car audio use is built-in.



Weight: 7.7 g (typ.)

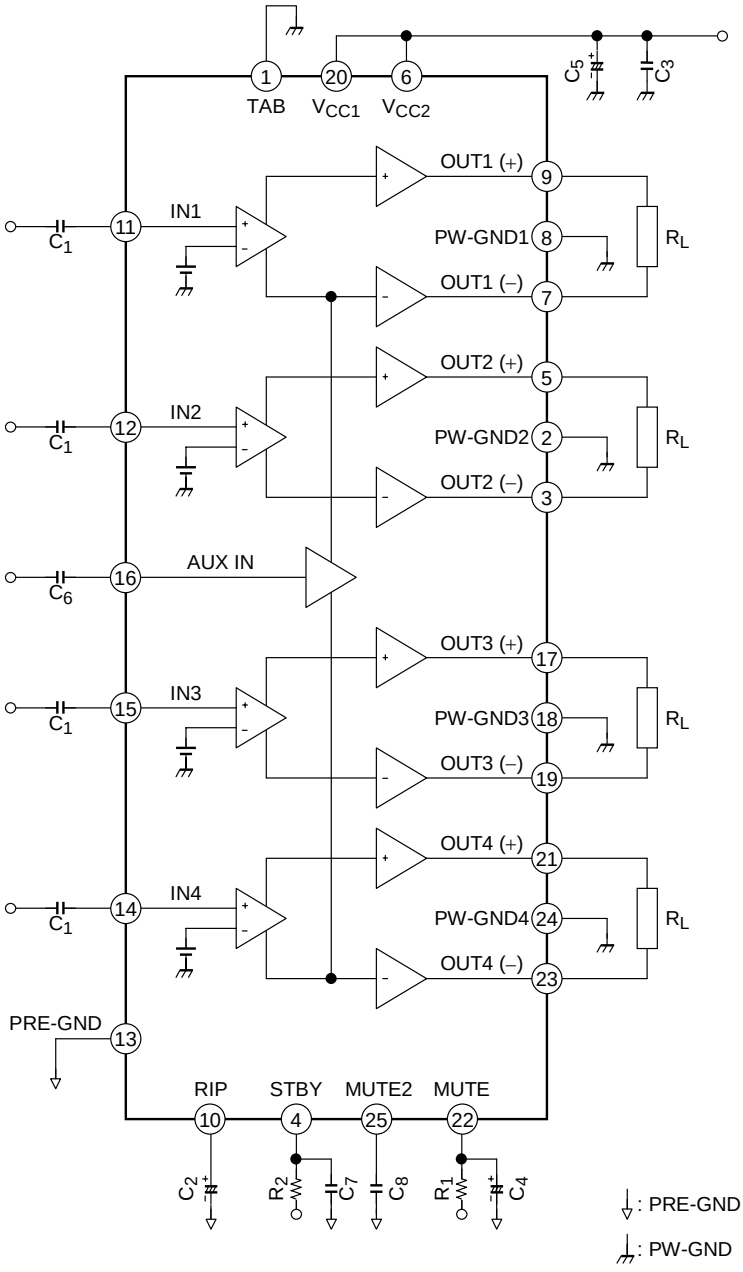
Features

- High power: $P_{OUT}MAX$ (1) = 41 W (typ.)
  (V_{CC} = 14.4 V, f = 1 kHz, JEITA max, R_L = 4 Ω)
  : $P_{OUT}MAX$ (2) = 37 W (typ.)
  (V_{CC} = 13.7 V, f = 1 kHz, JEITA max, R_L = 4 Ω)
  : P_{OUT} (1) = 24 W (typ.)
  (V_{CC} = 14.4 V, f = 1 kHz, THD = 10%, R_L = 4 Ω)
  : P_{OUT} (2) = 21 W (typ.)
  (V_{CC} = 13.2 V, f = 1 kHz, THD = 10%, R_L = 4 Ω)
- Low distortion ratio: THD = 0.02% (typ.)
  (V_{CC} = 13.2 V, f = 1 kHz, P_{OUT} = 5 W, R_L = 4 Ω)
- Low noise: V_{NO} = 0.18 mVrms (typ.)
  (V_{CC} = 13.2 V, R_g = 0 Ω, G_V = 34dB, BW = 20 Hz~20 kHz)
- Built-in stand-by switch function (pin 4)
- Built-in muting function (pin 22)
- Built-in AUX amplifier from single input to 2 channels output (pin 16)
- 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

Note 1: Install the product correctly. Otherwise, it may result in break down, damage and/or degradation to the product or equipment.

Note 2: These protection functions are intended to avoid some output short circuits or other abnormal conditions temporarily. These protect functions do not warrant to prevent the IC from being damaged.
- In case of the product would be operated with exceeded guaranteed operating ranges, these protection features may not operate and some output short circuits may result in the IC being damaged.

Block Diagram



Note3: Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purpose.

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.

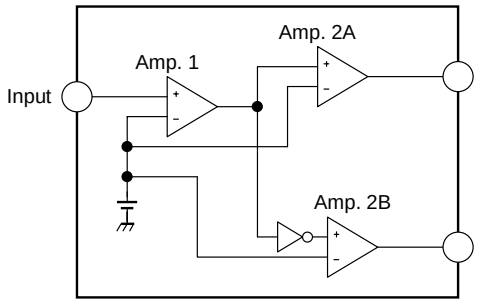


Figure 1 Block Diagram

The voltage gain of Amp.1: G_{V1} = 8 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.

$G_V = G_{V1} + G_{V2} + G_{V\,(BTL)} = 8 + 20 + 6 = 34$ dB

2. Stand-by SW Function (pin 4)

By means of controlling pin 4 (stand-by terminal) to high and low, the power supply can be set to ON and OFF. The threshold voltage of pin 4 is set at about $3V_{BE}$ (typ.), and the power supply current is about 2 μA (typ.) at the stand-by state.

Control Voltage of pin 4: V_{SB}

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

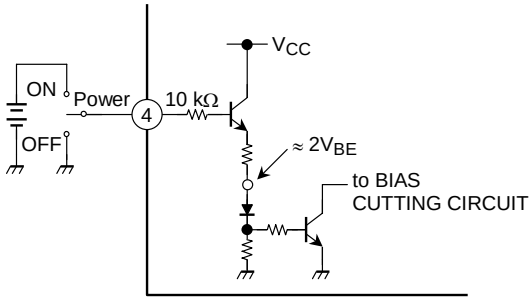


Figure 2 With pin 4 set to High, Power is turned ON

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

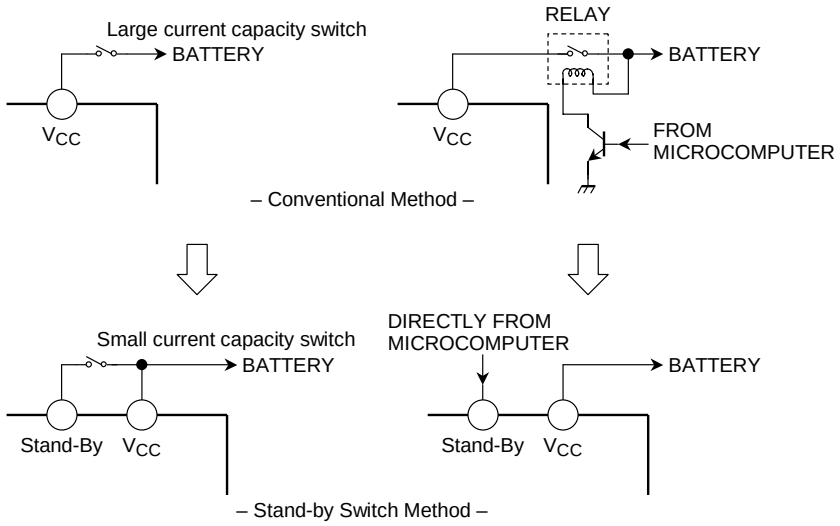


Figure 3

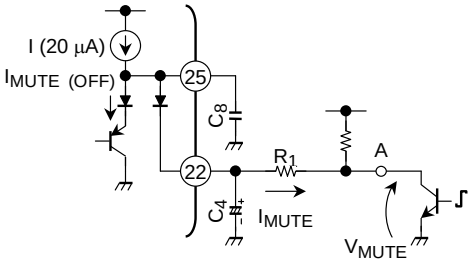
3. Muting Function (pin 22)

By means of controlling pin 22 less than 0.5 V, it can make the audio muting condition.

The muting time constant is decided by R_1, C_4 and C_8 and these parts is related the pop noise at power ON/OFF.

The series resistance; R_1 must be set up less than 5 kΩ.

The muting function have to be controlled by a transistor, FET and μ-COM port which has $I_{MUTE} > 50$ μA ability.



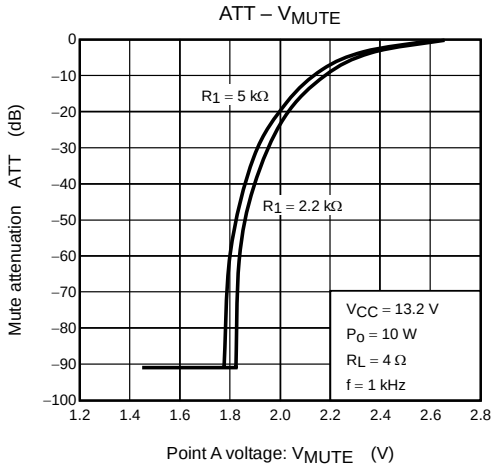


Figure 4 Muting Function **Figure 5 Mute Attenuation – V_{MUTE} (V)**

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 μ-COM can directly drive the AUX amplifier.

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

When AUX function is not used, this pin must be connected to PRE-GND (pin 13) via a capacitor.

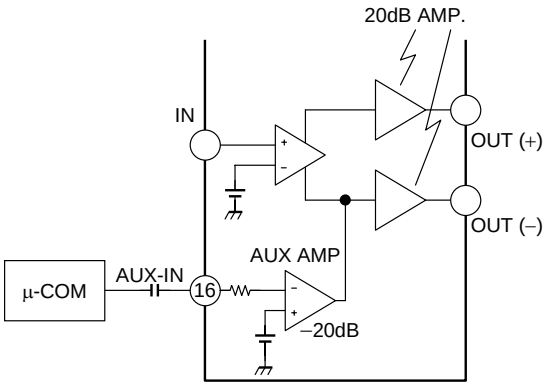


Figure 6 AUX Input

5. Prevention of speaker burning accident (In Case of Rare Short Circuit of Speaker)

When the direct current resistance between OUT + and OUT – terminal becomes 1 Ω or less and output current over 4 A flows, this IC makes a protection circuit operate and suppresses the current into a speaker.

This system makes the burning accident of the speaker prevent as below mechanism.

<The guess mechanism of a burning accident of the speaker>

Abnormal output offset voltage (voltage between OUT + and OUT –) over 4 V is made by the external circuit failure.(Note 4)

↓

The speaker impedance becomes 1 Ω or less as it is in a rare short circuit condition.

↓

The current more than 4 A flows into the speaker and the speaker is burned.

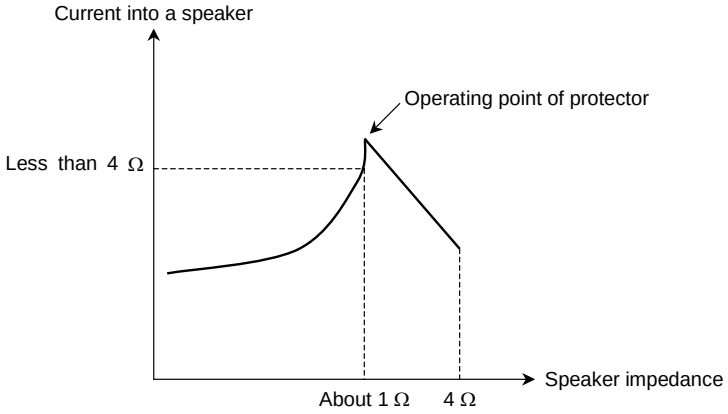


Figure 9

Note 4: It is appeared by biased input DC voltage
(for example, large leakage of the input capacitor, short-circuit between copper patterns of PCB.)

Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Peak supply voltage (0.2 s)	$V_{CC\ (surge)}$	50	V
DC supply voltage	$V_{CC\ (DC)}$	25	V
Operation supply voltage	$V_{CC\ (opr)}$	18	V
Output current (peak)	$I_{O\ (peak)}$	9	A
Power dissipation	P_D (Note5)	125	W
Operation temperature	T_{opr}	−40~85	°C
Storage temperature	T_{stg}	−55~150	°C

Note5: Package thermal resistance $\theta_{j\text{-}T}$ = 1°C/W (typ.)
(Ta = 25°C, with infinite heat sink)

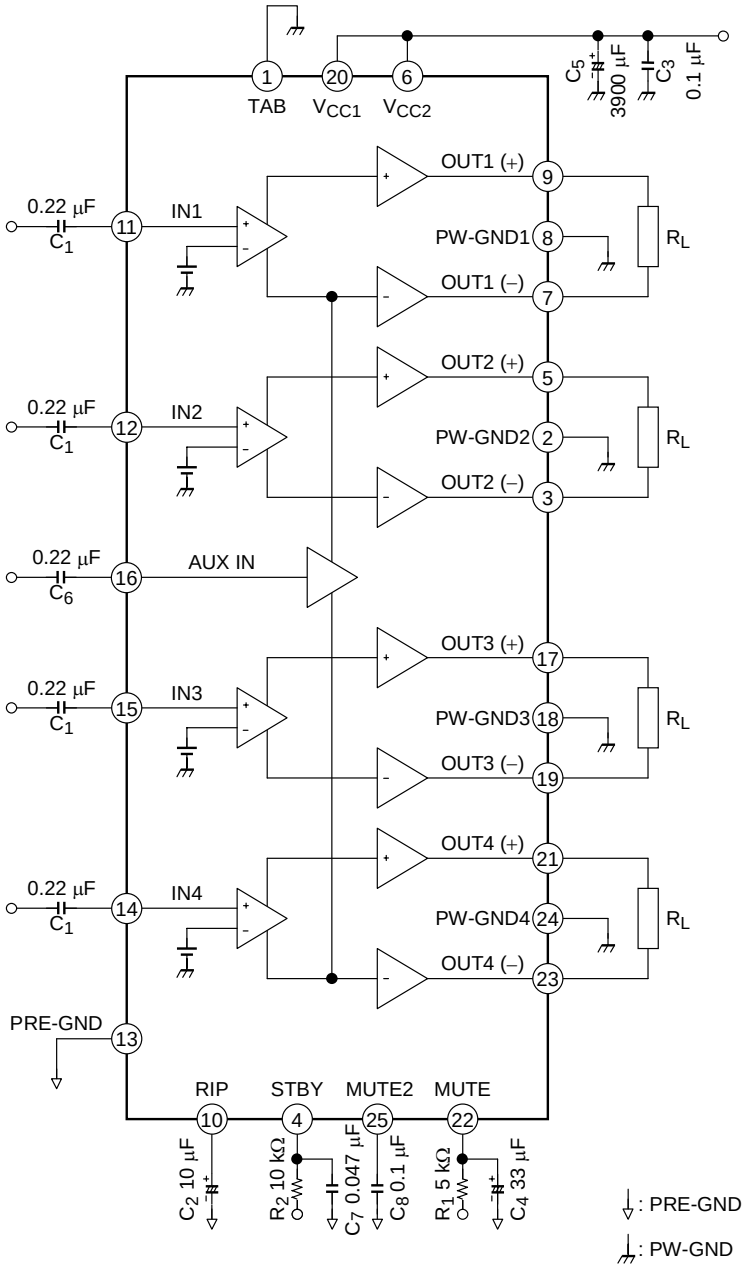
The absolute maximum ratings of a semiconductor device are a set of specified parameter values, which must not be exceeded during operation, even for an instant. If any of these rating would be exceeded during operation, the device electrical characteristics may be irreparably altered and the reliability and lifetime of the device can no longer be guaranteed. Moreover, these operations with exceeded ratings may cause break down, damage and/or degradation to any other equipment. Applications using the device should be designed such that each maximum rating will never be exceeded in any operating conditions. Before using, creating and/or producing designs, refer to and comply with the precautions and conditions set forth in this documents.

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

Characteristics	Symbol	Test Circuit	Test 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	—	41	—	W
	P_{OUT} MAX (2)	—	V_{CC} = 13.7 V, max Power	—	37	—	
	P_{OUT} (1)	—	V_{CC} = 14.4 V, THD = 10%	—	24	—	
	P_{OUT} (2)	—	THD = 10%	19	21	—	
Total harmonic distortion	THD	—	P_{OUT} = 5 W	—	0.02	0.2	%
Voltage gain	G_V	—	V_{OUT} = 0.775 Vrms (0dBm)	32	34	36	dB
Voltage gain ratio	ΔG_V	—	V_{OUT} = 0.775 Vrms (0dBm)	−1.0	0	1.0	
Output noise voltage	V_{NO} (1)	—	Rg = 0 Ω, DIN45405	—	0.20	—	mVrms
	V_{NO} (2)	—	Rg = 0 Ω, BW = 20 Hz~20 kHz	—	0.18	0.42	
Ripple rejection ratio	R.R.	—	f_{rip} = 100 Hz, Rg = 620 Ω V_{rip} = 0.775 Vrms (0dBm)	40	50	—	dB
Cross talk	C.T.	—	Rg = 620 Ω V_{OUT} = 0.775 Vrms (0dBm)	—	60	—	dB
Output offset voltage	V_{OFFSET}	—	—	−150	0	+150	mV
Input resistance	R_{IN}	—	—	—	30	—	kΩ
Stand-by current	I_{SB}	—	Stand-by condition	—	2	10	μA
Stand-by control voltage	V_{SB} H	—	Power: ON	3.0	—	V_{CC}	V
	V_{SB} L	—	Power: OFF	0	—	1.5	
Mute control voltage (Note6)	V_M H	—	Mute: OFF	Open			—
	V_M L	—	Mute: ON, R_1 = 10 kΩ	0	—	0.5	V
Mute attenuation	ATT M	—	Mute: ON, V_{OUT} = 7.75 Vrms (20dBm) at Mute: OFF.	80	90	—	dB

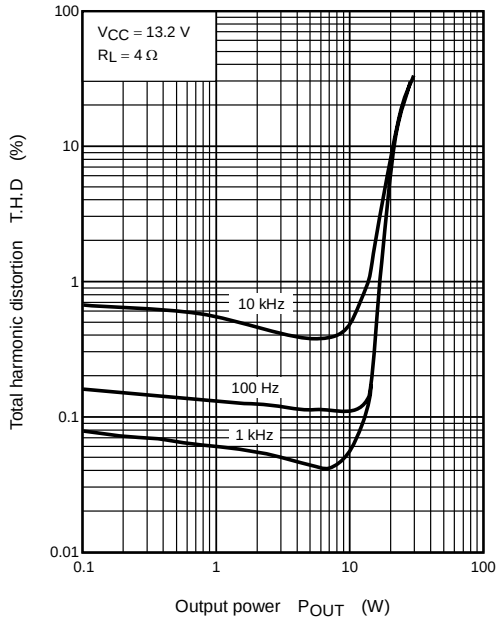
Note6: Muting function have to be controlled by open and low logic, which logic is a transistor, FET and μ-COM port of I_{MUTE} > 50 μA ability.

Test Circuit

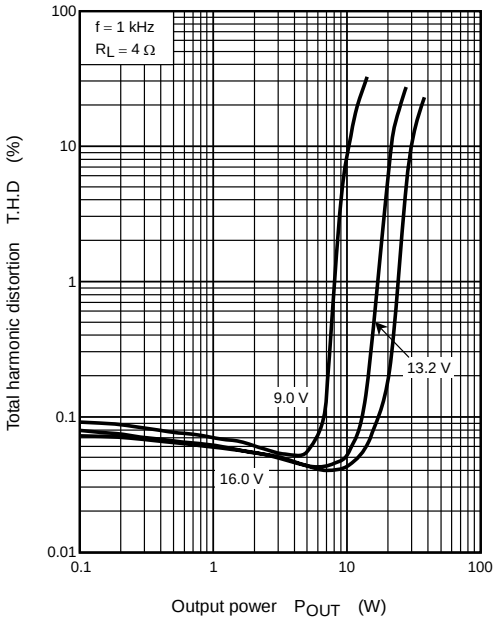


Components in the test circuits are only used to obtain and confirm the device characteristics.
These components and circuits do not warrant to prevent the application equipment from malfunction or failure.

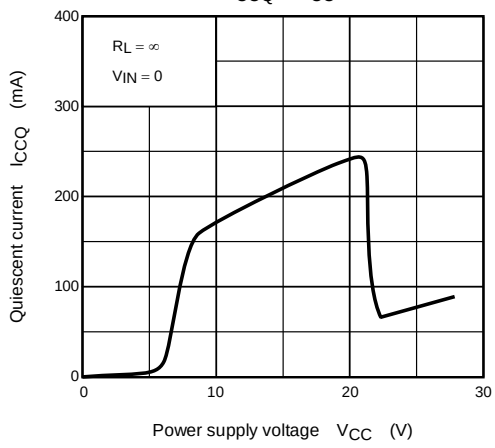
T.H.D – P_{OUT}



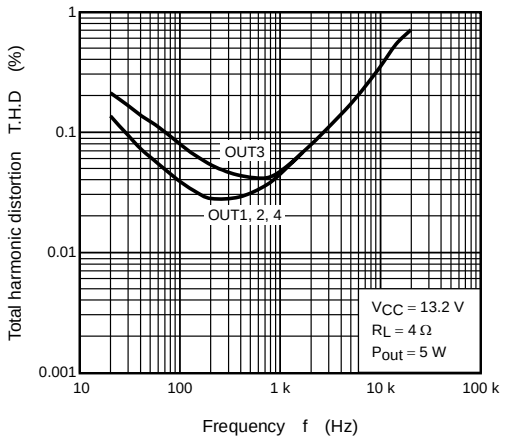
T.H.D – P_{OUT}



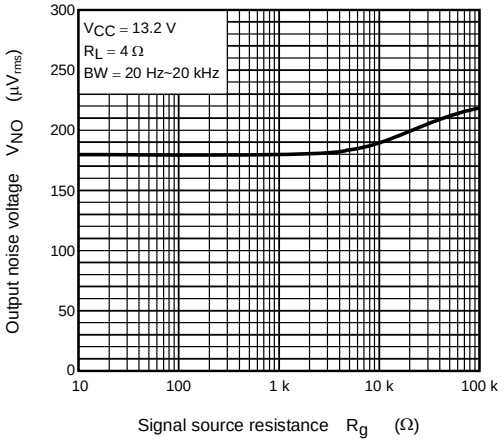
I_{CCQ} – V_{CC}



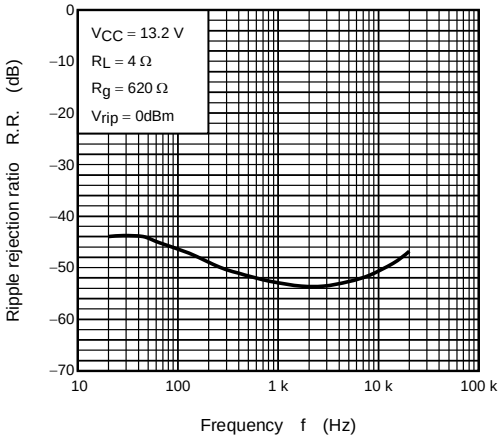
T.H.D – f



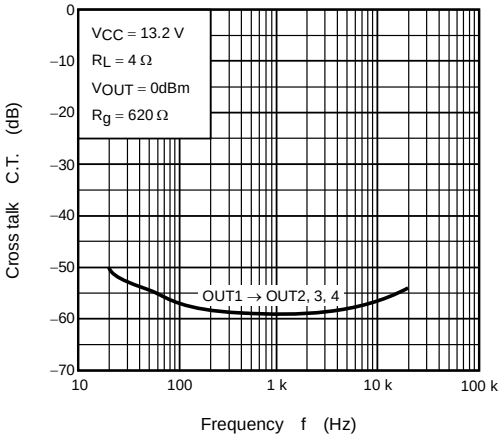
$V_{NO} – R_g$



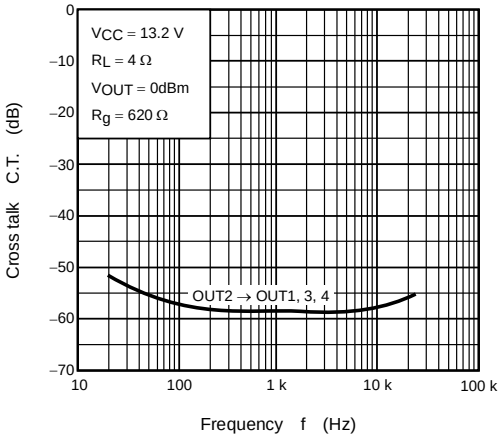
R.R. – f



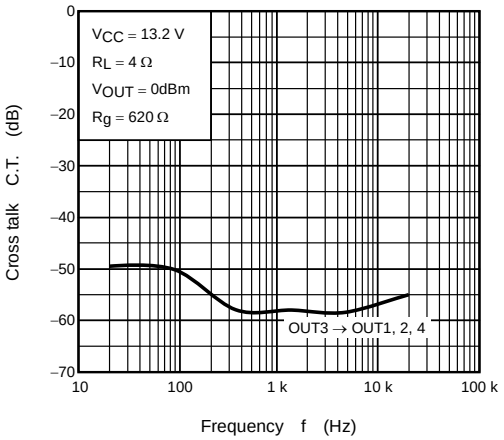
C.T. – f (OUT1)



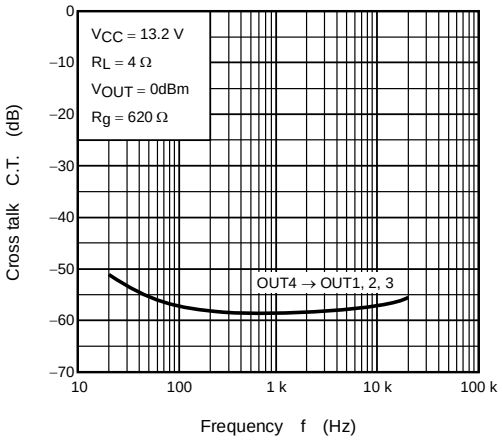
C.T. – f (OUT2)



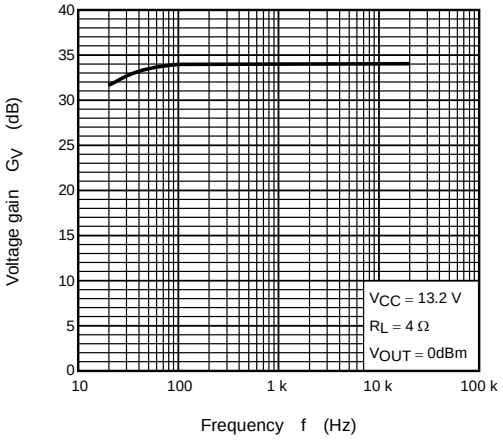
C.T. – f (OUT3)



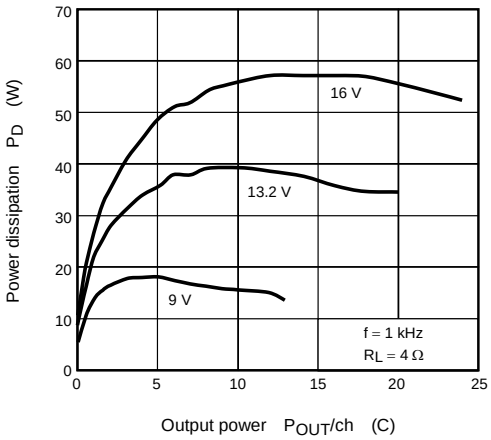
C.T. – f (OUT4)



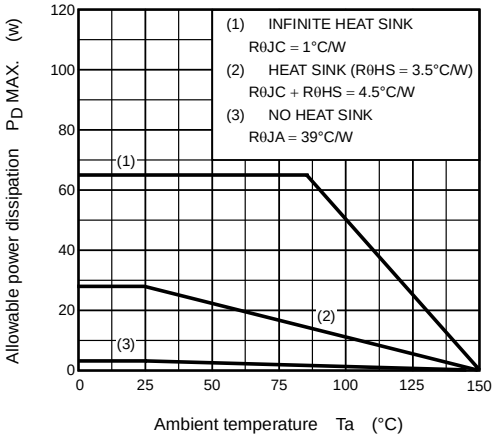
G_V – f



P_D – P_{OUT}

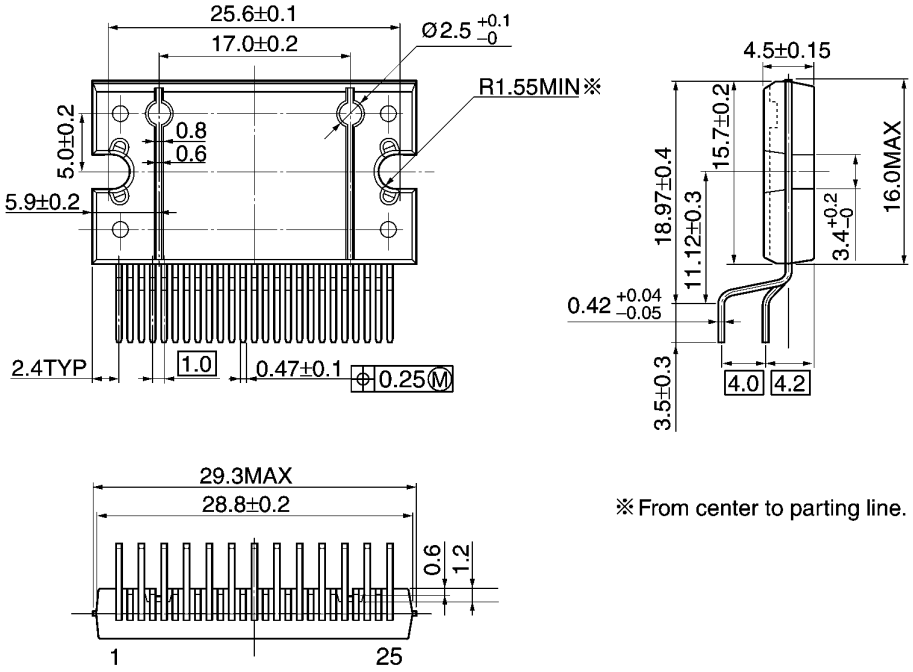


P_D MAX –Ta



Package Dimensions

HZIP25-P-1.00F Unit: mm



※ From center to parting line.

Weight: 7.7 g (typ.)