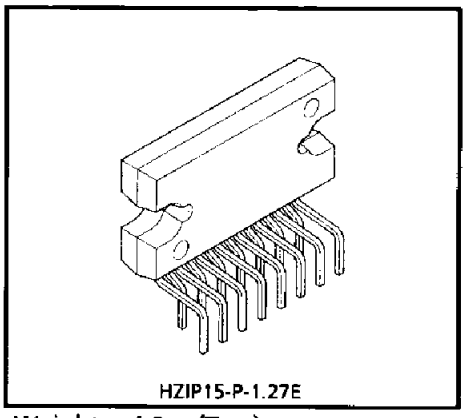
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA8254BHQ

45 W BTL × 2 CH AUDIO POWER AMPLIFIER

The TA8254BHQ is BTL stereo audio power amplifier for car audio application, especially for 2 Ω load impedance. It is built-in Stand-by Function, Muting Function, diagnosis circuit output clipping detector and various kind of protections.



HZIP15-P-1.27E

Weight : 4.0 g (Typ.)

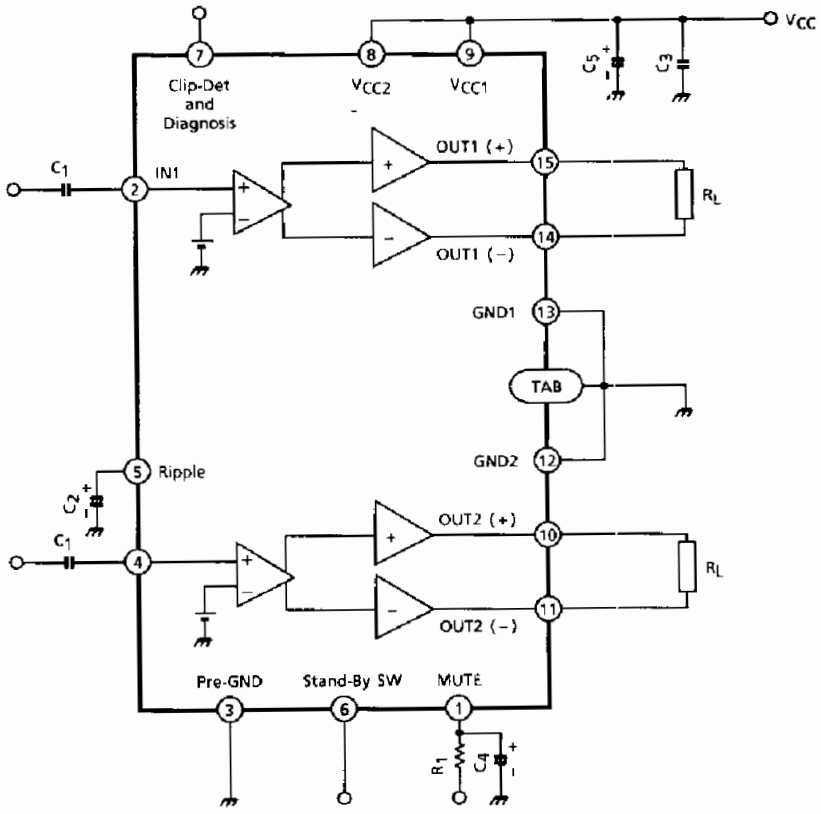
FEATURES

- High power
  : P_{OUT} (1) = 45 W (Typ.) / Channel
  (V_{CC} = 14.4 V, f = 1 kHz, THD = 10%, R_L = 2 Ω)
  P_{OUT} (2) = 35 W (Typ.) / Channel
  (V_{CC} = 13.2 V, f = 1 kHz, THD = 10%, R_L = 2 Ω)
  P_{OUT} (3) = 21 W (Typ.) / Channel
  (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} = 10 W, R_L = 4 Ω)
- Low noise : V_{NO} = 0.10 mV_{rms} (Typ.)
  (V_{CC} = 13.2 V, R_L = 4 Ω, R_g = 0 Ω, BW = 20 Hz~20 kHz)
- Built-in stand-by function
  : (With pin set at LOW, Power is turned OFF.) I_{SB} = 1 μA (Typ.)
- Built-in output clipping detection and diagnosis circuit
  : (Open Collector (Active Low))
- Built-in various protection circuits
  : Thermal Shut Down, Over Voltage, Out → V_{CC} Short, Out → GND Short and OUT-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



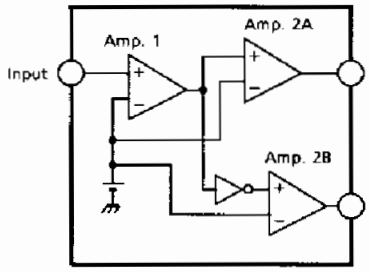
Note3: Some of the functional blocks, circuits, or constants in the block diagram may be omitted or simplified for explanatory purpose.

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.



(Fig.1) Block diagram

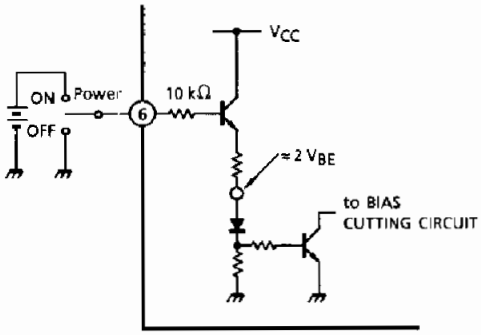
The voltage gain of Amp. 1 : G_{V1} = 0dB
The voltage gain of Amp. 2A, B : G_{V2} = 20dB
The voltage gain of BLT Connection : $G_{V\,(BTL)}$ = 6dB

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

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

2. Stand-by SW function (pin⑥)

By means of controlling pin⑥ (Stand-by terminal) to High and Low, the power supply can be set to ON and OFF. The threshold voltage of pin⑥ is set at about $3V_{BE}$ (Typ.), and the Power Supply current is about 1 μA (Typ.) at the stand-by state.



(Fig.2) With pin⑥ set to High, Power is turned ON

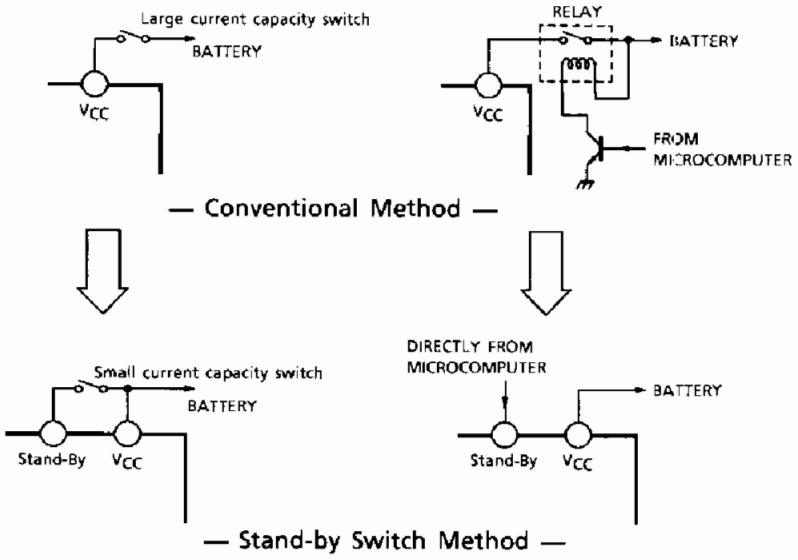
Control Voltage of pin⑥ : V_{SB}

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

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.

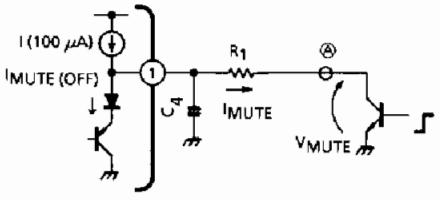
(2) Since the control current is microscopic, the switching relay of small current capacity is satisfactory for switching



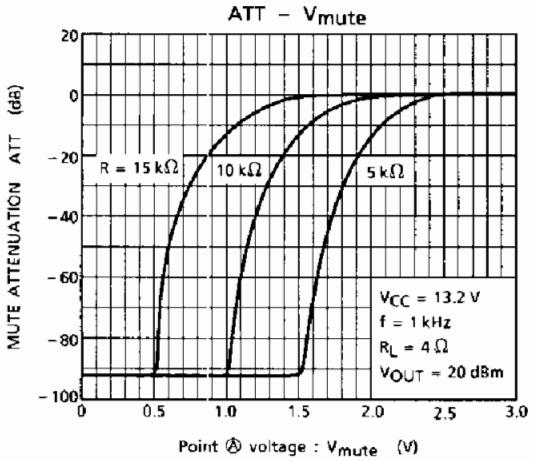
(Fig.3)

3. Muting function (pin①)

By means of controlling pin① 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 $I_{MUTE} > 250\ \mu A$ ability.
pin① must not be pulled up and it shall be controlled by OPEN / LOW.



(Fig.4) Muting Function



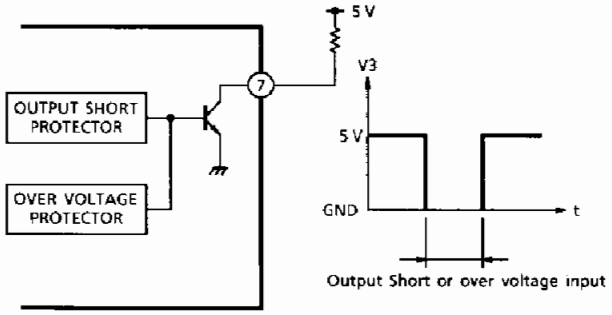
(Fig.5) Mute Attenuation – V_{mute} (V)

4. Diagnosis output (pin⑦)

The diagnosis output terminal of pin⑦ 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.

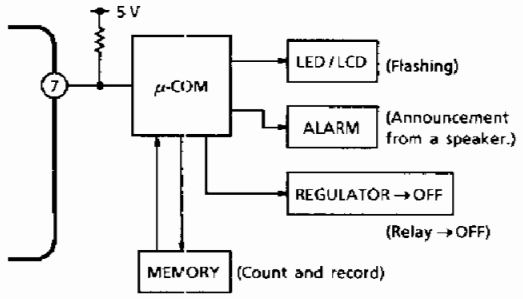
In case of being unused this function, use this IC as open-connection on pin⑦.



pin⑦ : Open Collector Output (Active Low)

(Fig.6)

(Application)

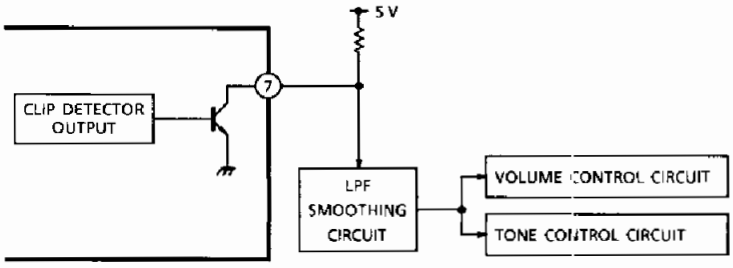


(Fig.7)

5. Output clip detection function (pin⑦)

The output clip detection terminal of pin⑦ has the open collector output structure on chip as shown in Fig.8. 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.8.
In case of being unused this function, use this IC as open connection on pin⑦.

(Application)



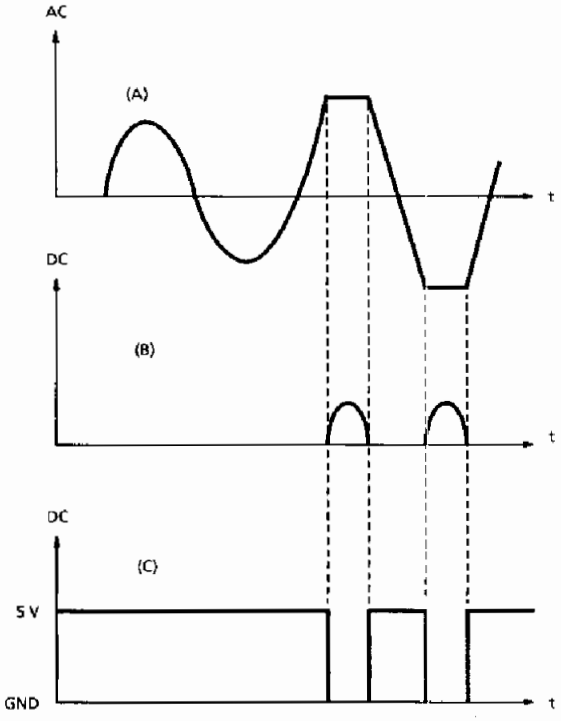
Pin⑦ : Open Collector Output (Active Low)

(Fig.8)

(A) OUTPUT (AC WAVE FORM)

(B) CLIP DETECTOR CIRCUIT (INTERNAL)

(C) CLIP DET. TERMINAL (PIN⑦)



MAXIMUM RATINGS (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 (*)	83	W
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−55~150	°C

(*) : Package terminal resistance $\theta_{j\text{-}T}$ = 1.5°C/w (Typ.)
(Ta = 25°C, with infinite heat sink)

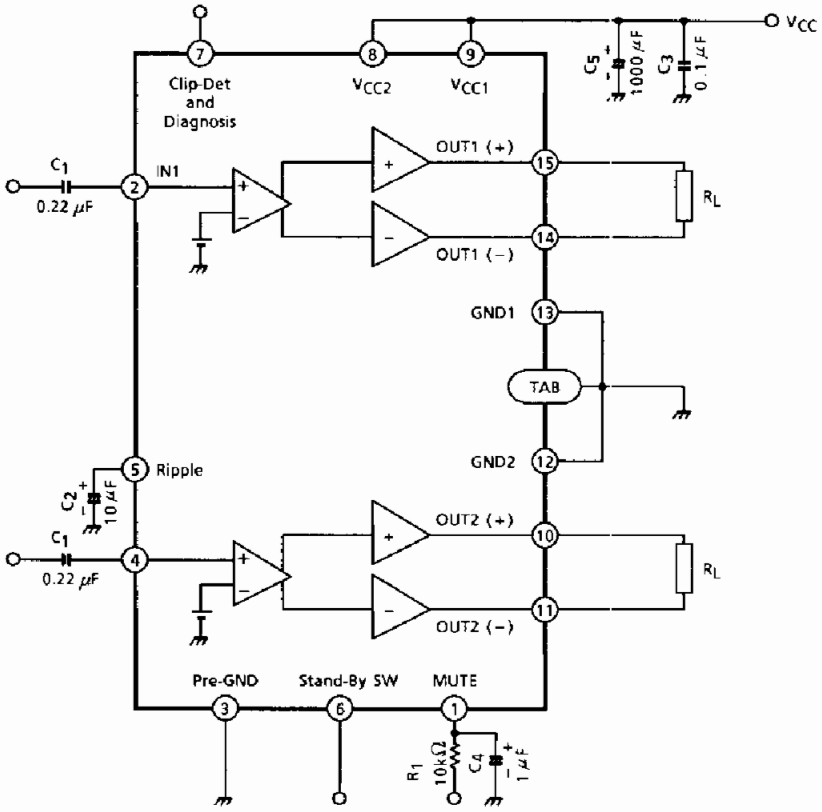
The absolute maximum ratings of a semiconductor device are a set of specified parameter values, which must not be exceeded during operation, even for an instant. If any of these rating would be exceeded during operation, the device electrical characteristics may be irreparably altered and the reliability 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, R_L = 4 Ω, f = 1 kHz, Ta = 25°C)

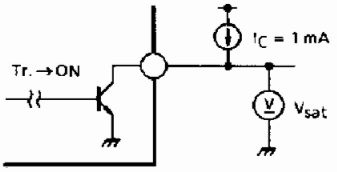
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Supply Current	I_{CCQ}	—	V_{IN} = 0	—	120	250	mA
Output Power	P_{OUT} (1)	—	V_{CC} = 14.4 V, R_L = 2Ω THD = 10%	40	45	—	W
	P_{OUT} (2)	—	R_L = 2 Ω, THD = 10%	—	35	—	
	P_{OUT} (3)	—	THD = 10%	19	21	—	
Total Harmonic Distortion Ratio	THD	—	P_{OUT} = 10 W	—	0.02	0.2	%
Voltage Gain	G_V	—	—	24	26	28	dB
Voltage Gain Ratio	ΔG_V	—	—	−1.0	0	1.0	dB
Output Noise Voltage	V_{NO}	—	R_g = 0 Ω, BW = 20 Hz~20 kHz	—	0.10	0.35	mV_{rms}
Ripple Rejection Ratio	R.R.	—	f_{ripple} = 100 Hz, R_g = 600 Ω	40	55	—	dB
Input Resistance	R_{IN}	—	—	—	90	—	kΩ
Output Offset Voltage	V_{offset}	—	V_{IN} = 0	−150	0	150	mV
Current at Stand-by State	I_{SB}	—	—	—	1	10	μA
Cross Talk	C.T.	—	R_g = 600 Ω V_{OUT} = 0.775 V_{rms} (0 dBm)	—	75	—	dB
Stand-by Control Voltage	V_{SB}	—	Stand-By → OFF (Power → ON)	3.0	—	V_{CC}	V
DIAGNOSIS OUT Saturation Voltage	V_{sat}	—	I_C = 1 mA	—	100	—	mV
Mute Control Voltage (*)	V_M H	—	Mute : off	OPEN			V
	V_M L	—	Mute : on	0	—	1.5	
Mute Attenuation	ATT M	—	Mute : on, V_{OUT} = 7.75 V_{rms} (20 dBm) at Mute : off	—	85	—	dB

(*) : Muting function must be controlled by open and Low Logic.
This means that the Mute control terminal : pin① must not be pulled up.

TEST CIRCUIT

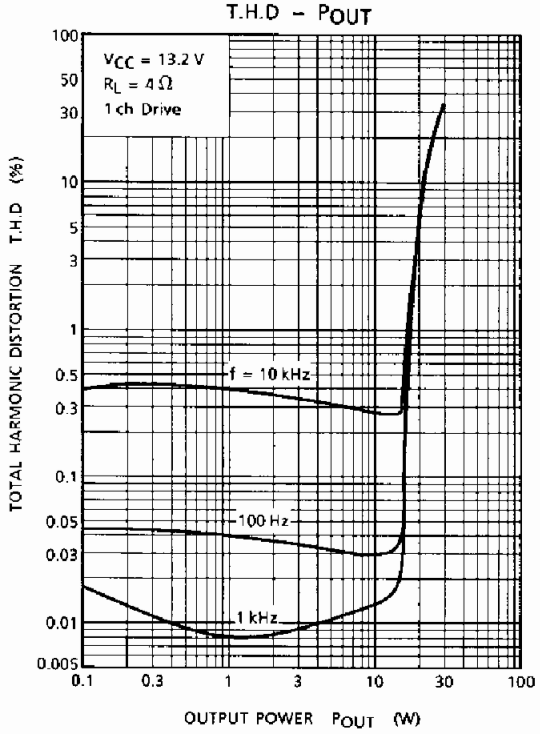


Diagnosis Out Test Circuit

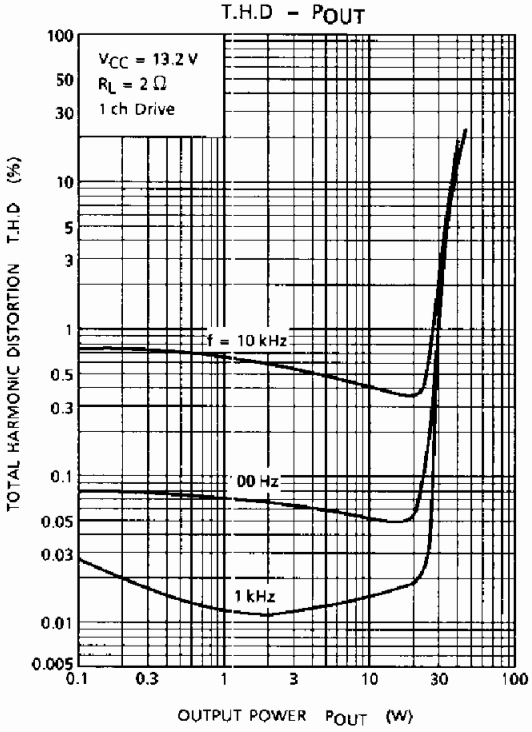


Components in the test circuits are only used to obtain and confirm the device characteristics.
These components and circuits do not warrant to prevent the application equipment from malfunction or failure.

T.H.D – POUT



T.H.D – POUT



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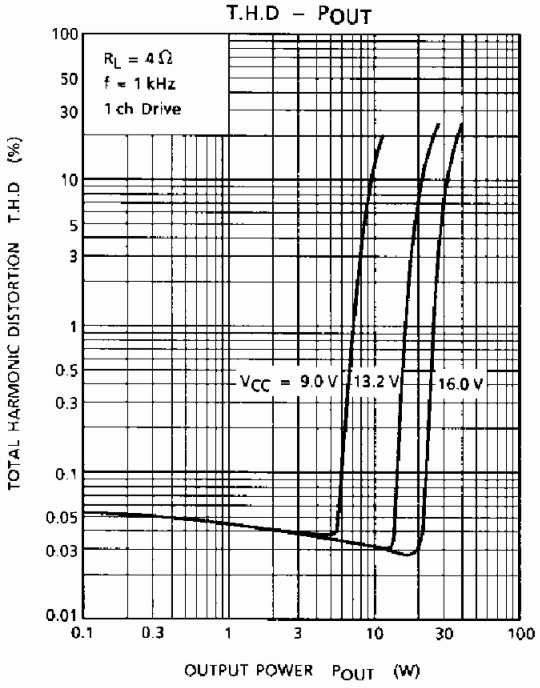
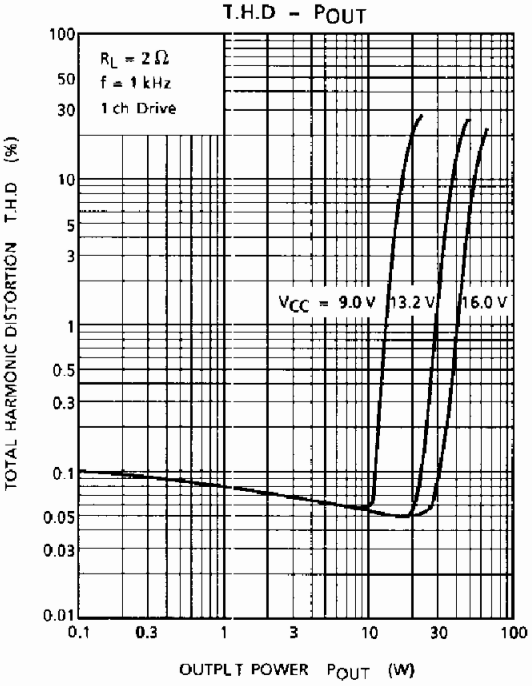
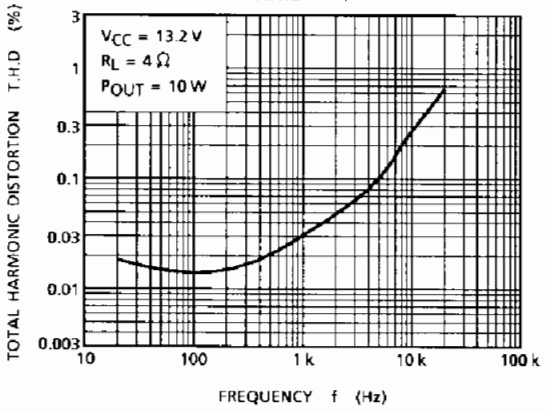


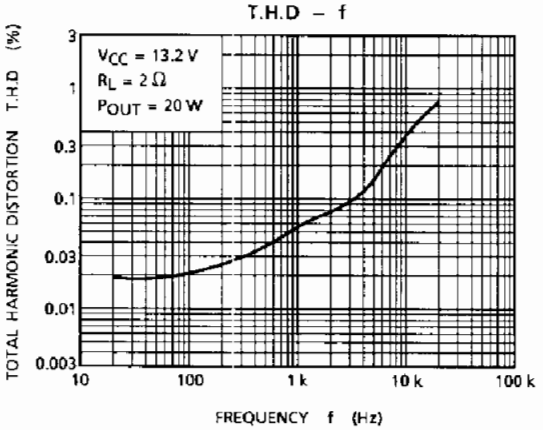
T.H.D – POUT



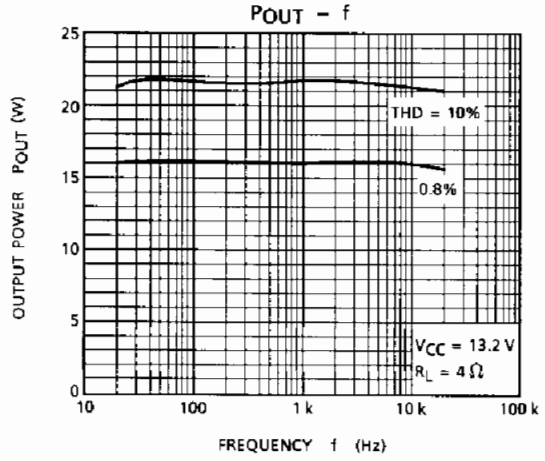
T.H.D – f



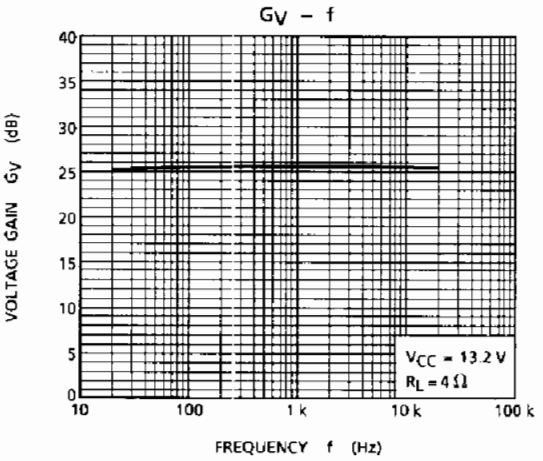
T.H.D – f



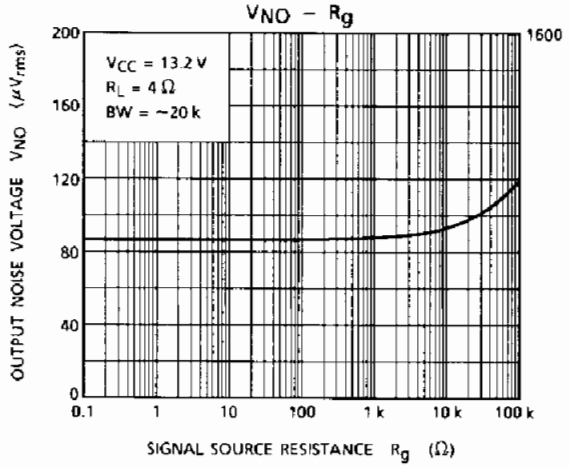
POUT – f



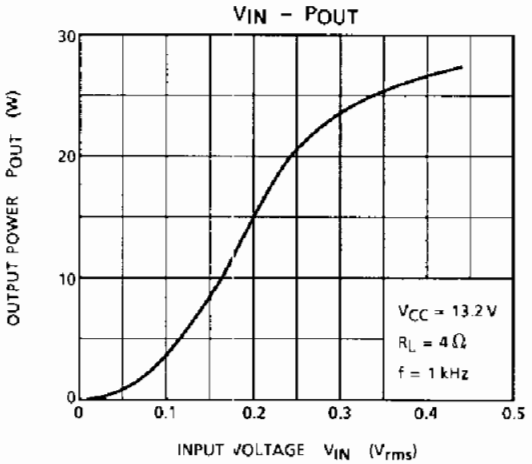
GV – f



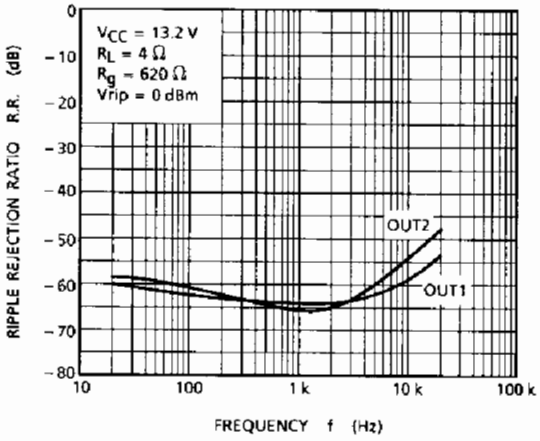
VNO – Rg



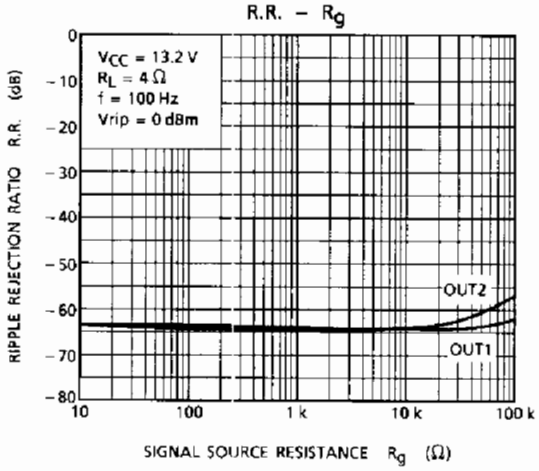
VIN – POUT



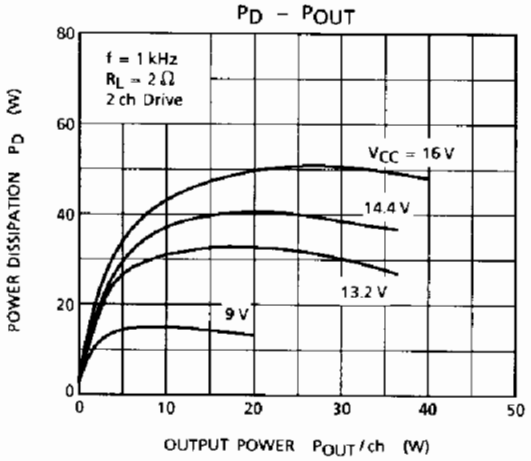
R.R. – f



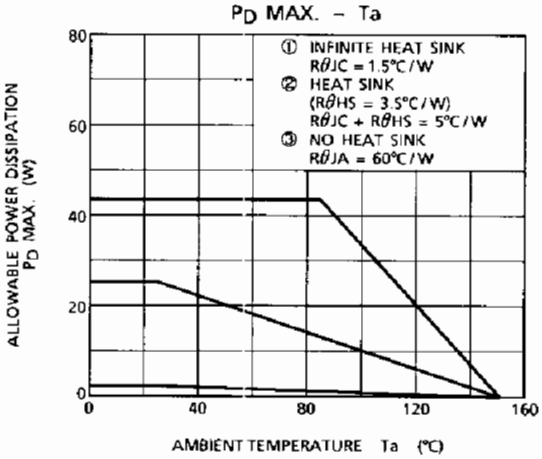
R.R. – R_g



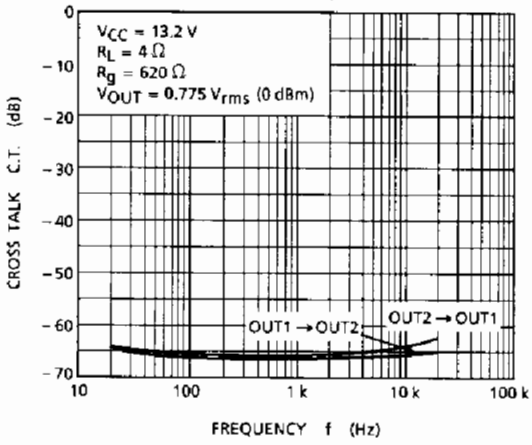
P_D – P_{OUT}



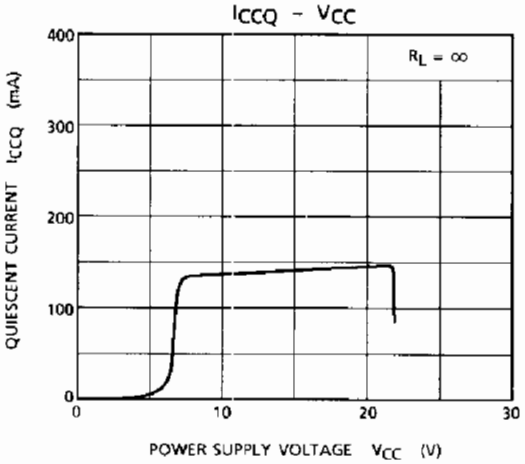
P_D MAX. – Ta



C.T. – f



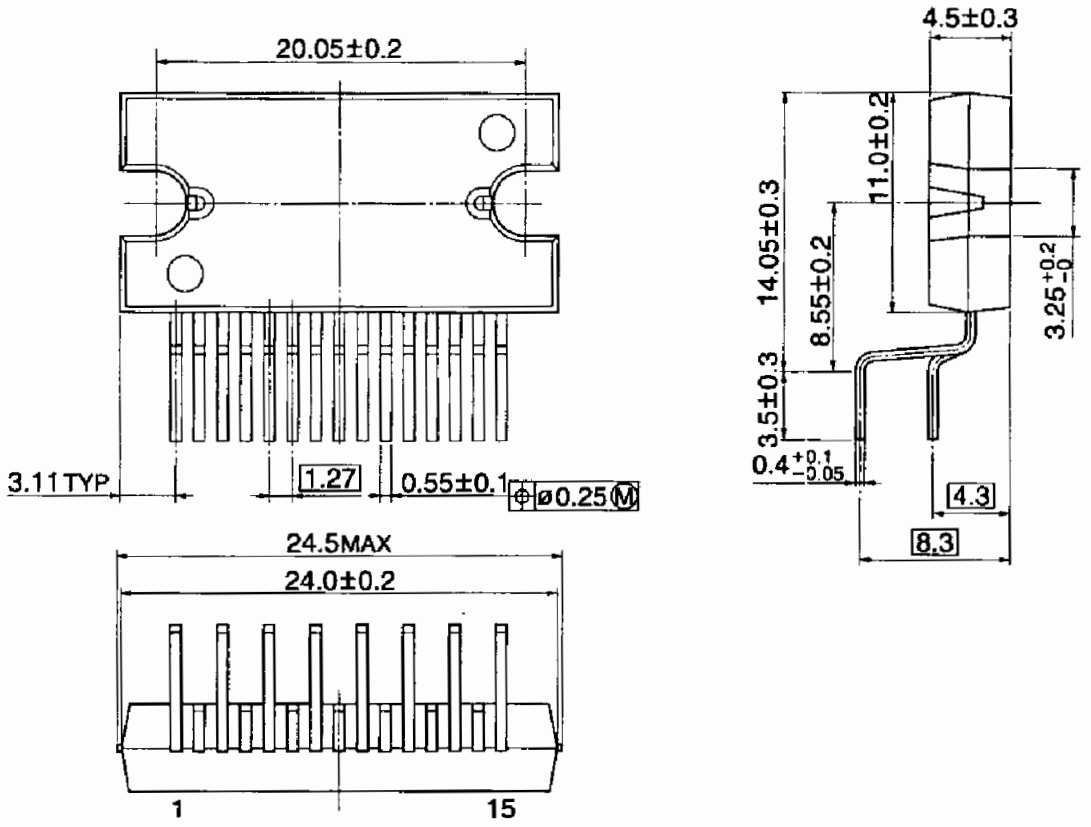
I_{CCQ} – V_{CC}



PACKAGE DIMENSIONS

HZIP15-P-1.27E

Unit : mm



Weight : 4.0 g (Typ.)

About solderability, following conditions were confirmed

- Solderability

(1) Use of Sn-63Pb solder Bath
- solder bath temperature = 230°C
- dipping time = 5 seconds
- the number of times = once
- use of R-type flux

(2) Use of Sn-3.0Ag-0.5Cu solder Bath
- solder bath temperature = 245°C
- dipping time = 5 seconds
- the number of times = once
- use of R-type flux

RESTRICTIONS ON PRODUCT USE

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- 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.