Panasonic

# AN7561Z

BTL output power IC for car audio

■ Overview

The AN7561Z is an audio power IC developed as a car audio output (35 W × 4-ch). CR to stop oscillation is built in between the output pin and GND so that a space saving of set is possible. Also, it is incorporating a perfect muting circuit which does not make a shock noise so that a shock noise design in the set transitional state can be made easily when used together with its standby function. In addition, it is incorporating various protective circuits to protect the IC from destruction by GND-open earth short-circuiting and power supply surge which are the important subject of power IC, and the IC will largely contribute to a high reliability design of equipment.

■ Features

- Pin arrangement which does not allow the input/output patterns to intersect each other so that it is possible to make a pattern design on a one-sided printed circuit board.
- Incorporating various protection circuits (thermal protection, short-circuit to V_{CC}, short-circuit to V_{CC} in V_{CC}-opened, short-circuit to GND, short-circuit to GND in GND-opened, over voltage, power supply surge, and ASO protection, etc.)
- Incorporating standby function (shock noise-free at STB-on/off)
- Incorporating standby function (shock noise-free at Mute-on/off)
- External components reduction
- Provided with beep sound input pin
- Equipped with auxiliary sound input pin
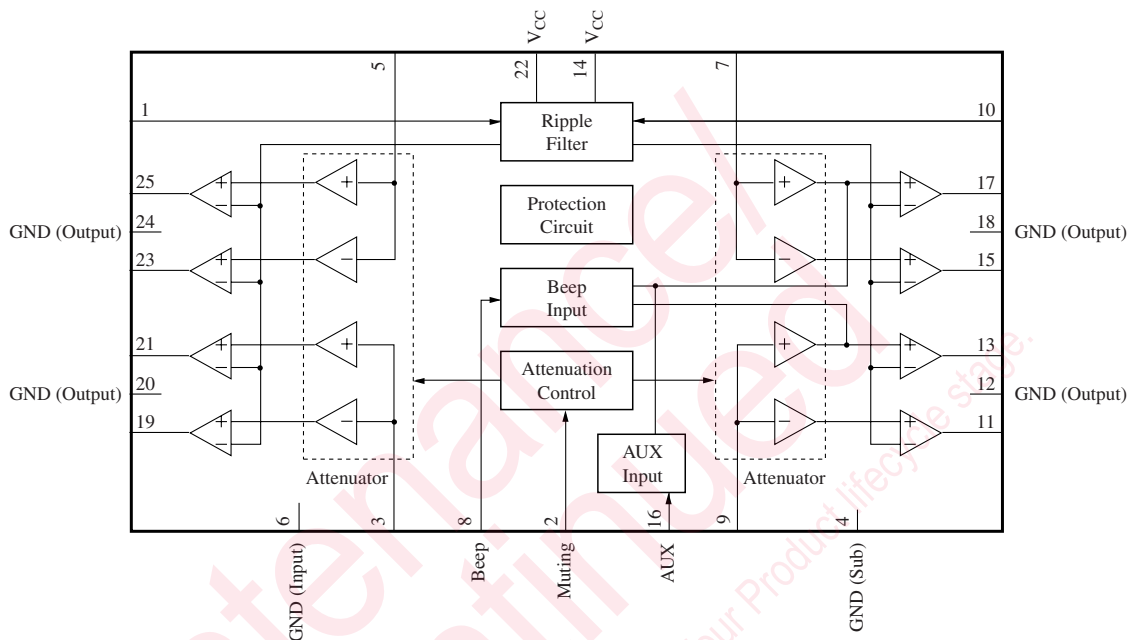- Inverted pin layout of AN7560Z on right and left pins

■ Applications

- Car stereo, miniature audio component, karaoke and other audio equipment.

Unit: mm
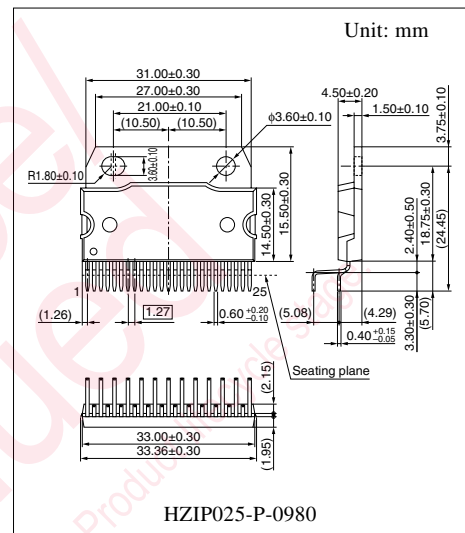
HZIP025-P-0980

Note) The package of this product will be changed to lead-free type (HZIP025-P-0980B). See the new package dimensions section later of this datasheet.

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■ Block Diagram

■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Ripple filter	14	Supply voltage V_{CC}
2	Mute	15	ch.2 − output
3	ch.3 input	16	AUX input
4	GND (Sub)	17	ch.2 + output
5	ch.4 input	18	GND (ch.2 output)
6	GND (Input)	19	ch.3 − output
7	ch.2 input	20	GND (ch.3 output)
8	Beep input	21	ch.3 + output
9	ch.1 input	22	Supply voltage V_{CC}
10	Standby	23.	ch.4 − output
11	ch.1 − output	24	GND (ch.4 output)
12	GND (ch.1 output)	25	ch.4 + output
13	ch.1 + output		

Note) The output pin requires no capacitor and resistor for oscillation prevention.

If those are required for countermeasure against noise, be sure to use after confirmation.

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage [*2]	V_{CC}	25	V
Peak power-supply-voltage [*3]	V_{Surge}	65	V
Supply current	I_{CC}	12	A
Power dissipation [*4]	P_D	59	W
Operating ambient temperature [*1]	T_{opr}	−30 to +85	°C
Storage temperature [*1]	T_{stg}	−55 to +150	°C

Note) *1 : T_a = 25 °C except power dissipation, operating ambient temperature and storage temperature.

　　 *2 : Without signal

　　 *3 : Time = 0.2 s

　　 *4 : T_a = 85 °C

■ Recommended Operating Range
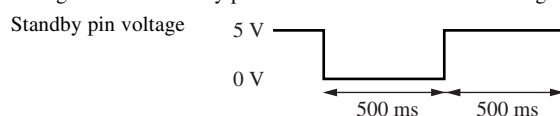
Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	8.0 to 18.0	V

■ Electrical Characteristics at V_{CC} = 13.2 V, freq = 1 kHz, T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Quiescent circuit current	I_{CQ}	R_G = 10 kΩ, R_L = 4 Ω	—	300	450	mA
Standby current	I_{STB}	R_G = 10 kΩ, R_L = 4 Ω	—	1	10	μA
Output noise voltage [*1]	V_{NO}	R_G = 10 kΩ, R_L = 4 Ω	—	0.15	0.5	mV[rms]
Voltage gain	G_V	V_{IN} = 40 mV, R_L = 4 Ω	32	34	36	dB
Total harmonic distortion 1	THD1	V_{IN} = 40 mV, R_L = 4 Ω	—	0.05	0.2	%
Maximum output power	P_O	THD = 10%, R_L = 4 Ω	16.0	19.5	—	W
Ripple rejection ratio [*1]	RR	R_L = 4 Ω, R_G = 10 kΩ, V_R = 1 V[rms], fr = 1 kHz	60	68	—	dB
Channel balance	CB	V_{IN} = 40 mV, R_L = 4 Ω	—	0	1	dB
Crosstalk	CT	V_{IN} = 40 mV, R_L = 4 Ω R_G = 10 kΩ	60	70	—	dB
Output offset voltage	V_{OFF}	R_G = 10 kΩ, R_L = 4 Ω	−250	0	250	mV
Muting effect [*1]	MT	V_{IN} = 40 mV, R_L = 4 Ω	70	86	—	dB
Input impedance	Z_I	V_{IN} = ±0.3 V_{DC}	24	30	36	kΩ
Shock noise [*2]	V_S	R_L = 4 Ω, R_G = 10 kΩ, V_{MUTE} = 5 V, V_{STB} = On/Off 50 Hz HPF	−100	0	100	mV[p-0]

Note) *1 : Use 15 Hz to 30 kHz (12 dB/OCT) band-pass filter at measurement.

　　 *2 : Change over the standby pin at 0V and 5V with the following time.

Standby pin voltage　　5 V

　　　　　　　　　　　0 V

←500 ms→ ←500 ms→

■ Electrical Characteristics at V_{CC} = 9 V, T_a = 25 °C (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Total harmonic distortion 2	THD2	V_{IN} = 20 mV, f_{IN} = 20 kHz, R_G = 10 Ω, R_L = ∞	—	0.1	0.5	%
Mute-on threshold voltage	MT_{ON}	V_{IN} = 40 mV, R_L = 4 Ω	4	—	—	V
Mute-off threshold voltage	MT_{OFF}	V_{IN} = 40 mV, R_L = 4 Ω	—	—	0.8	V
Cutoff frequency	f_C	V_{IN} = 40 mV, R_L = 4 Ω G_V = −1 dB (0 dB: 1 kHz)	20	40	—	kHz

● Design reference data at V_{CC} = 13.2 V, f = 1 kHz, measuring bandwidth 15 Hz to 30 kHz (12 dB/OCT) filter is used
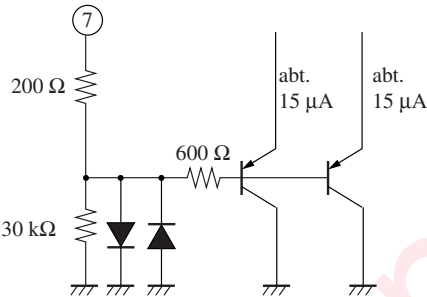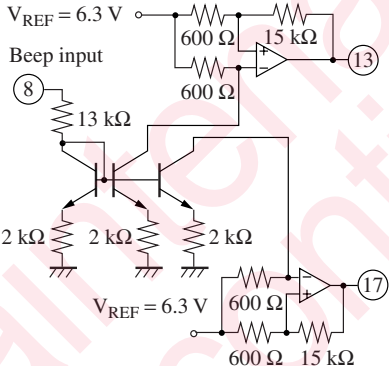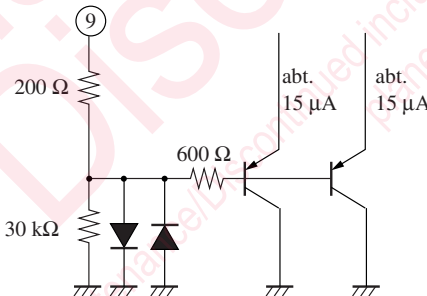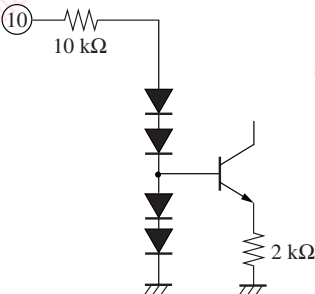
Note) The characteristic values below are theoretical values for designing and not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Maximum output power	P_{Omax}	max. power, R_L = 4 Ω	—	28	—	W
Maximum output power	P_{O2}	V_{CC} = 14.4 V, THD = 10%, R_L = 4 Ω	—	21	—	W
Maximum output power	P_{Omax2}	V_{CC} = 14.4 V, max. power, R_L = 4 Ω	—	34	—	W
Power band	f_{PL}	V_{CC} = 14.4 V, THD = 1%, R_L = 4 Ω, P_{OL} = −3 dB (1 kHz: 0 dB)	—	10	—	Hz
Power band	f_{PH}	V_{CC} = 14.4 V, THD = 1%, R_L = 4 Ω, P_{OH} = −3 dB (1 kHz: 0 dB)	—	18	—	kHz
STB threshold voltage	V_{STB1}	R_G = 10 kΩ, R_L = 4 Ω, STB→ACT	—	2.2	—	V
STB threshold voltage	V_{STB2}	R_G = 10 kΩ, R_L = 4 Ω, ACT→STB	—	1.5	—	V

■ Terminal Equivalent Circuits

Pin No.	Equivalent circuit	Description	DC Voltage
1		Ripple filter pin: Output current from 3 mA to 10mA	13 V
2		Mute pin: Mute switchover pin Threshold voltage about 2.1 V	0 V
3		ch.3 input pin: ch.3 input signal application pin Input impedance 30 kΩ	0 mV to 10 mV
4	—	GND (circuit board): Circuit board	0 V
5		ch.4 input pin: ch.4 input signal application pin Input impedance 30 kΩ	0 mV to 10 mV

■ Terminal Equivalent Circuits (continued)

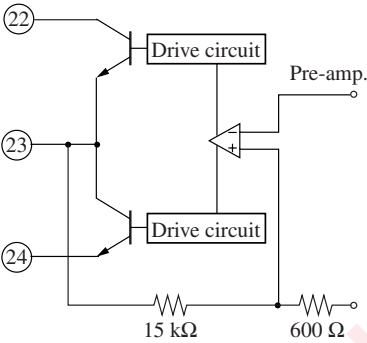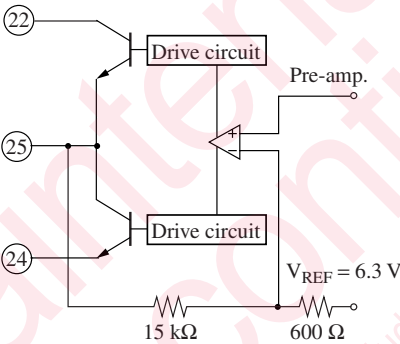| Pin No.	Equivalent circuit	Description	Voltage
6	—	GND (input): Grounding pin for input	0 V
7		ch.2 input pin: ch.2 input signal application pin Input impedance 30 kΩ	0 mV to 10 mV
8		Beep sound input pin: Beep sound signal input pin Input impedance 15 kΩ	0 V
9		ch.1 input pin: ch.1 input signal application pin Input impedance 30 kΩ	0 mV to 10 mV
10		Standby control pin: Standby switch over pin Threshold voltage about 2.1 V	5 V

■ Terminal Equivalent Circuits (continued)

| Pin No.	Equivalent circuit	Description	Voltage
11		ch.1 output pin (−): ch.1 negative phase output pin	6.3 V
12	—	GND (output): Grounding pin for ch.1 output	0 V
13		ch.1 output pin (+): ch.1 positive phase output pin	6.3 V
14	—	Power supply voltage pin: Power supply connection pin	13.2 V
15		ch.2 output pin (−): ch.2 negative phase output pin	6.3 V
16		AUX input pin: Input impedance 10.6 kΩ	6.3 V

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■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Voltage
17		ch.2 output pin (+): ch.2 positive phase output pin	6.3 V
18	—	GND (output): Grounding pin for ch.2 output	0 V
19		ch.3 output pin (−): ch.3 negative phase output pin	6.3 V
20	—	GND (output): Grounding pin for ch.3 output	0 V
21		ch.3 output pin (+): ch.3 positive phase output pin	6.3 V
22	—	Power supply voltage pin: Power supply connection pin	13.2 V

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■ Terminal Equivalent Circuits (continued)

| Pin No.	Equivalent circuit	Description	Voltage
23		ch.4 output pin (−): ch.4 negative phase output pin	6.3 V
24	—	GND (output): Grounding pin for ch.4 output	0 V
25		ch.4 output pin (+): ch.4 positive phase output pin	6.3 V

■ Application Circuit Example
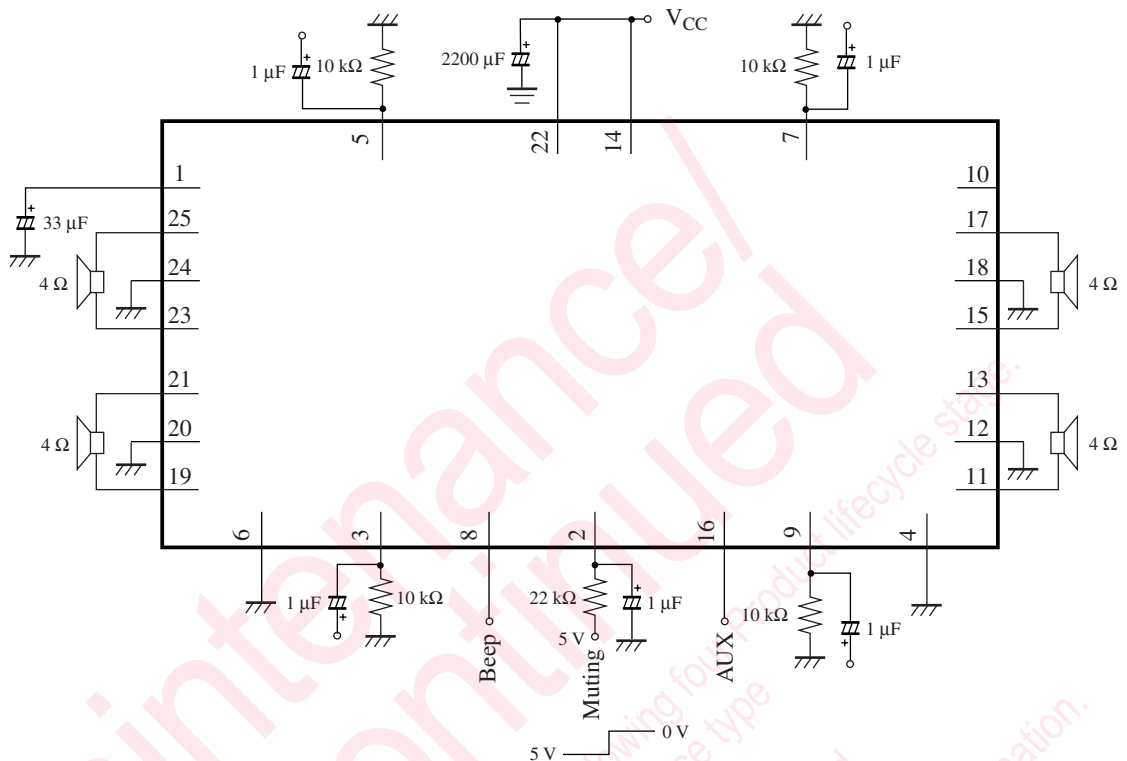
■ Usage notes

1. Be sure to use the circuit with an external heat-sink and fix the external heat-sink on chassis when using it.
2. Connect the heat radiating fin to GND potential.
3. This IC has built-in protection circuit against short-circuit to V_{CC}, short-circuit to GND and ASO. However avoid short-circuit to V_{CC}, short-circuit to GND and short-circuit of load.
4. The thermal protection circuit operates at T_j = about 150 °C but it automatically returns to the normal operation when the temperature decreases.
5. The over voltage protection circuit operates at V_{CC} = about 20 V.
6. Be especially careful to heat radiation design when used at an increased V_{CC}.
7. Connect the beep sound input pin to GND when the beep sound function is not used.
8. Do not lower the beep sound input pin below − 0.3 V.
9. Keep AUX input pin in open state when AUX function is not used.
10. Connect only GND pin (signal source) to the signal GND of the amplifier in previous stage.

• There is a possibility of device destruction under the following conditions;

1. If the power supply pin and GND pin are connected in reverse to the power supply.
2. If the power supply pin and GND pin are in open state and the power supply is connected across the output pins.
3. If the output pin is grounded when GND pin is open.
4. If more than three output pins are grounded to the earth at a time with more than 1.3 Ω short-circuiting resistor with which the protection circuit does not operate.
5. If plus and minus output pins are short circuited to the supply line at a time with more than 1 Ω short-circuiting resistor with which the protection circuit does not operate.
6. If the RF pin and the output pin are short circuited and short-circuited to the earth.
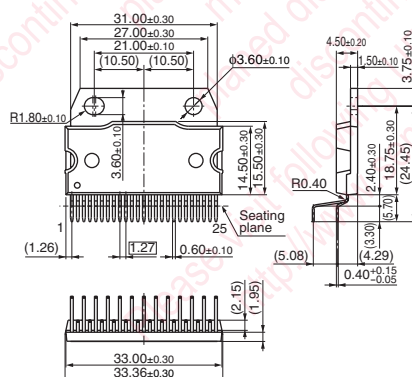
■ Technical Information

• HZP025-P-0980 package power dissipation

$$P_D \text{ --- } T_a$$
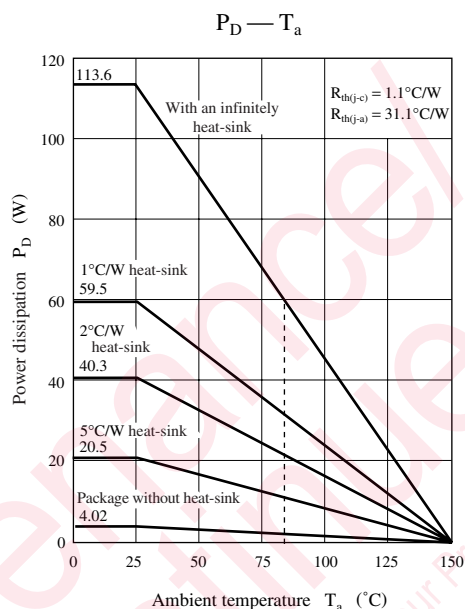
■ New Package Dimensions (Unit: mm)

• HZIP025-P-0980B (Lead-free package)

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