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Analogue LSI Business Unit
Semiconductor Company
Matsushita Electric Industrial Co., Ltd.

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AN17827A

A single channel BTL audio power amplifier IC

■ Overview

AN17827A is a monolithic integrated circuit designed for 2.5 W X 1 (8Ω) and. It is a single channel BTL IC suitable for operation in audio application..

■ Features

- Few external components – no Boucherot cells (output C, R) and no negative feedback capacitors.
- Built-in Thermal Protection circuit.
- High ripple rejection.

■ Applications

- IC for audio applications

■ Package

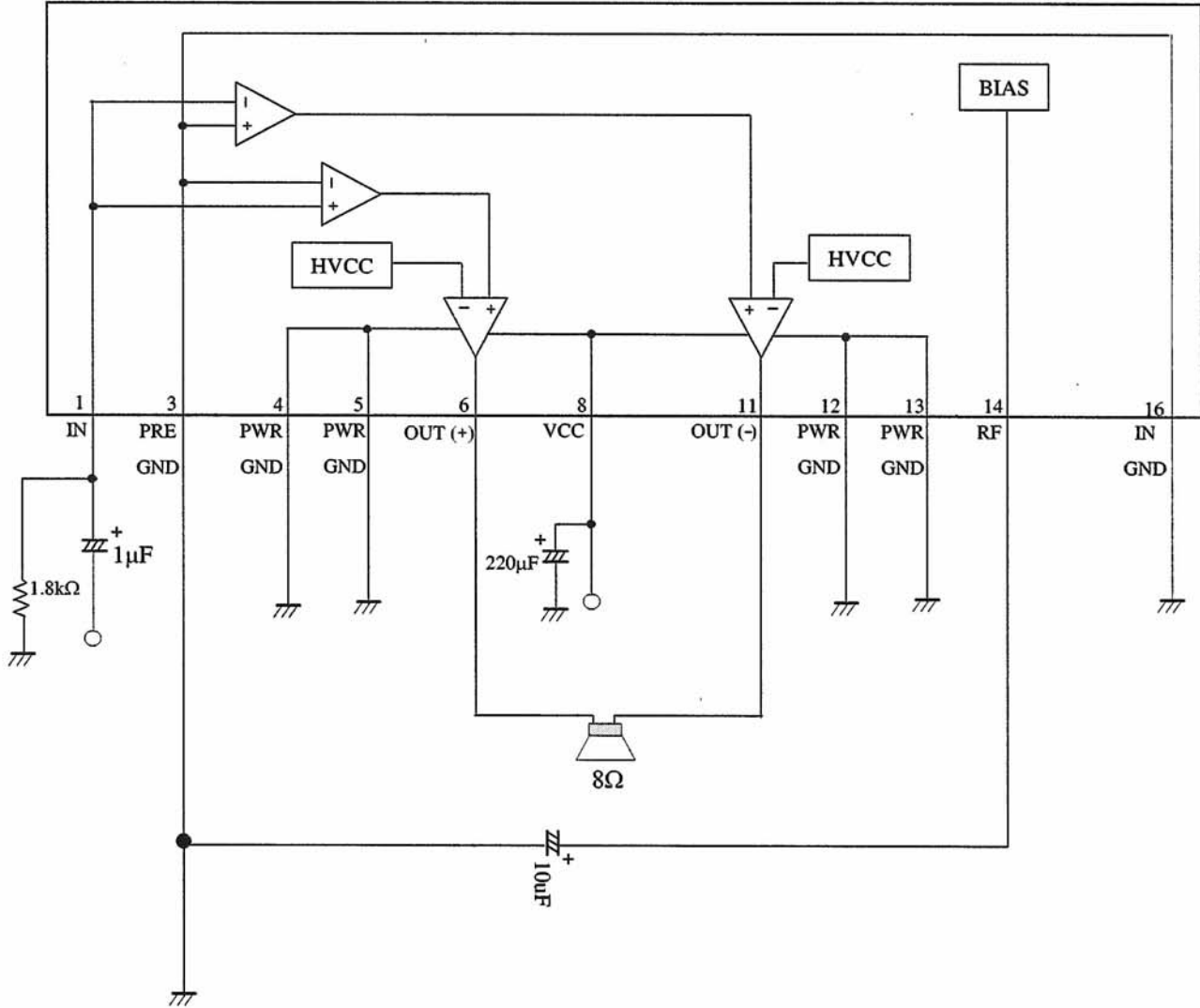
- 16 pin plastic Dual Inline Package (DIP type)

■ Type

- Silicon Monolithic Bipolar IC

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■ Application Circuit Example



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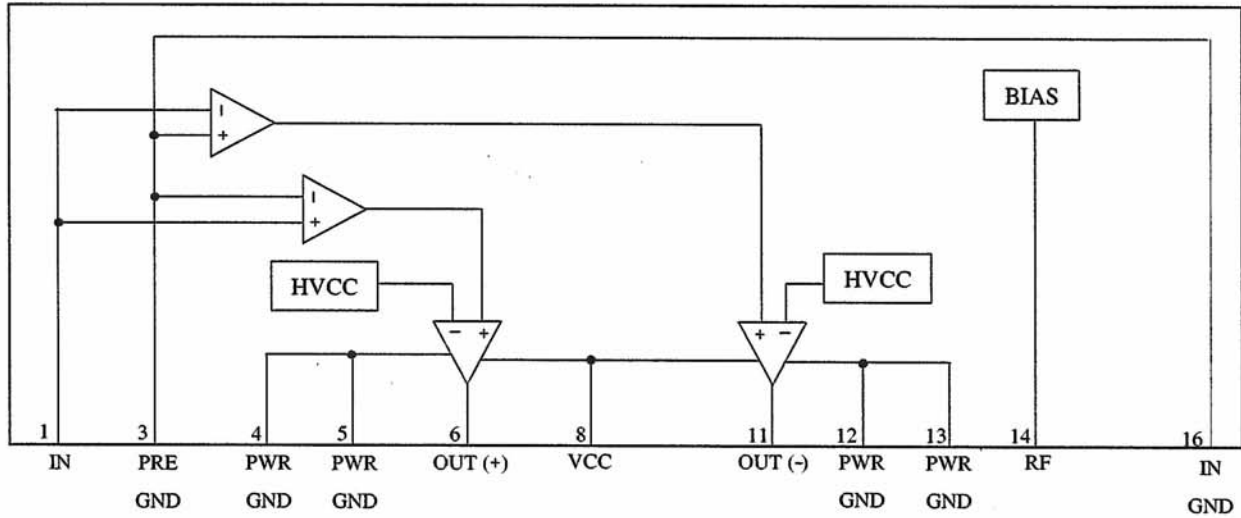
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■ Block Diagram



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■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	IN	Input	Input signal
2	NC	Not connected	Not Connected
3	PRE-GND	Ground	Ground
4	PWR GND	Ground	Ground
5	PWR GND	Ground	Ground
6	OUT(+)	Output	Positive Output
7	NC	Not connected	Not Connected
8	VCC	Power supply	8.0V power supply
9	NC	Not connected	Not Connected
10	NC	Not connected	Not Connected
11	OUT(-)	Output	Negative output
12	PWR GND	Ground	Ground
13	PWR GND	Ground	Ground
14	RF	Reference voltage	Ripple Filter
15	NC	Not connected	Not Connected
16	IN GND	Ground	Ground

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■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Note
1	Supply voltage	V_{CC}	14.9	V	*1
2	Supply current	I_{CC}	1	A	
3	Power dissipation	P_D	0.728	W	*2
4	Operating ambient temperature	T_{opr}	-20 ~ +75	°C	*3
5	Storage temperature	T_{stg}	-55 ~ +150	°C	*3

Note) *1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

*2: The power dissipation shown is the value at $T_a = 75\text{ °C}$ for the independent (unmounted) IC package without a heat sink.

When using this IC, refer to the Pd-Ta diagram of the package standard page 18 and use under the condition not exceeding the allowable value.

*3: Except for the operating ambient temperature and storage temperature, all ratings are for $T_s = 25\text{ °C}$.

■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Note
Supply voltage range	V_{CC}	6 ~ 14.5	V	—

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■ Electrical Characteristics at $V_{CC} = 8\text{ V}$, $R_L = 8\ \Omega$, $\text{freq} = 1\ \text{kHz}$ unless otherwise specified.

(Note : $T_a = 25\ ^\circ\text{C} \pm 2\ ^\circ\text{C}$ unless otherwise specified.)

B No.	Parameter	Symbol	Test circuits	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
1	Quiescent Circuit Current	I_{CQ}	1	No input signal, $R_L = \infty$	7	15	30	mA	
2	Output Noise Voltage	V_{no}	1	No input signal	-	0.3	0.7	mV[rms]	1
3	Voltage Gain	G_v	1	$V_{in} = 20\ \text{mV}$	38	40	42	dB	
4	Total Harmonic Distortion	THD	1	$V_{in} = 20\ \text{mV}$	-	0.2	0.5	%	
5	Maximum Output Power	P_o	1	THD = 10 %	2	2.5	-	W	
6	Output Offset Voltage	V_{off}	1		-350	0	350	mV	
7	Ripple Rejection	RR	1	Freq-ripple = 120 Hz, V-ripple = 1 V[rms]	35	50	-	dB	1

Note) *1: For this measurement, use the 20Hz ~ 20kHz (12dB/OCT) filter.

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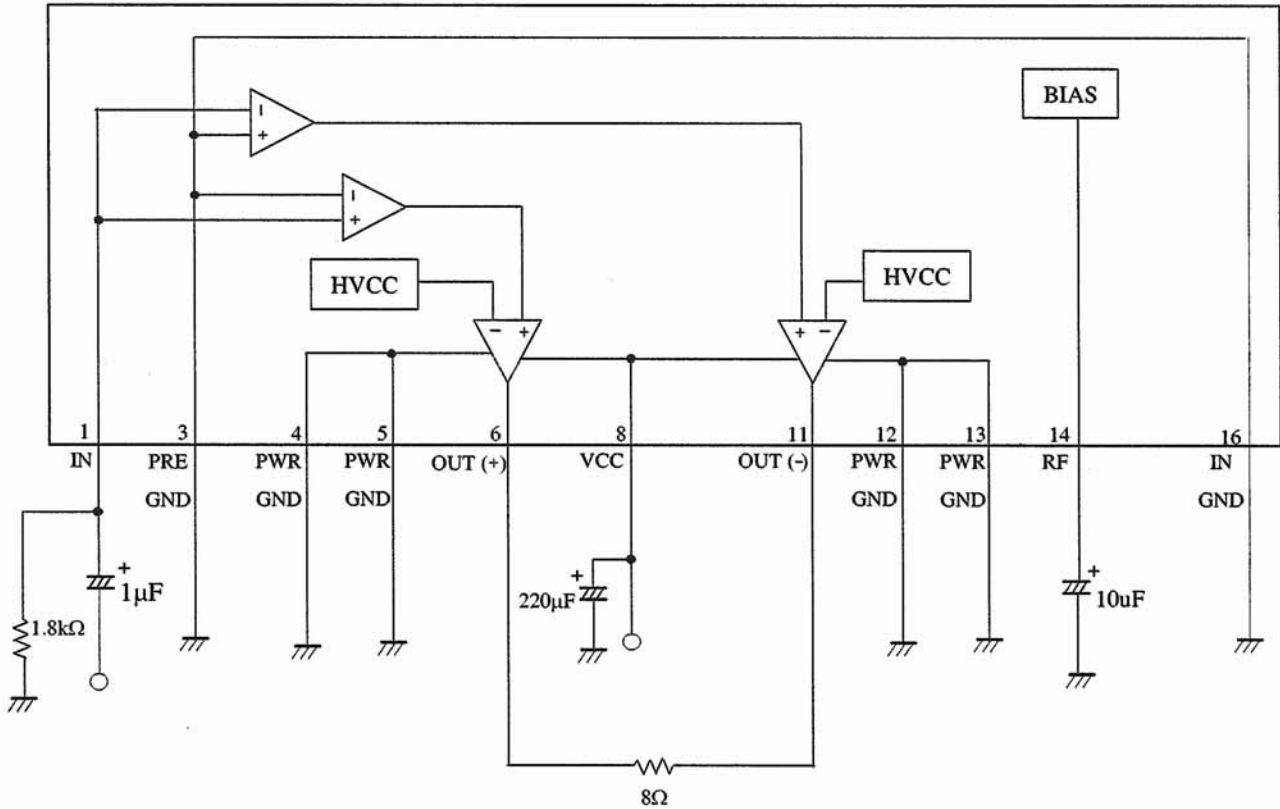
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■ Test Circuit Diagram

Test Circuit 1



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■ Technical Data

- I/O block circuit diagrams and pin function descriptions

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Pin No.	Waveform and Voltage	Internal circuit	Description
1	0V		INPUT
2	-	NC	Not Connected
3	0V	PRE GND	Pre Ground
4	0V	PWR GND	Power Ground
5	0V	PWR GND	Power Ground
6	VCC/2		Positive Output
7	-	NC	Not Connected
8	(Typical)8V	VCC	Supply Voltage

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Technical Data

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Pin No.	Waveform and Voltage	Internal circuit	Description
9	-	NC	Not Connected
10	-	NC	Not Connected
11	VCC/2		Negative Output
12	0V	PWR GND	Power Ground
13	0V	PWR GND	Power Ground
14	0.45*VCC		Ripple Filter

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■ Technical Data

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Pin No.	Waveform and Voltage	Internal circuit	Description
15	-	NC	Not Connected
16	0V	IN GND	Input Ground

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Technical Data

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Power Dissipation

Description on the measuring method and the thermal resistance $R_{th(j-a)}$ of AN17827A is indicated in the following explanation.

T_A : Ambient Temperature

T_C : Case Temperature

T_J : Junction (Chip Surface) Temperature

$\theta(j-a)$: Thermal Resistance from
Junction to Ambient

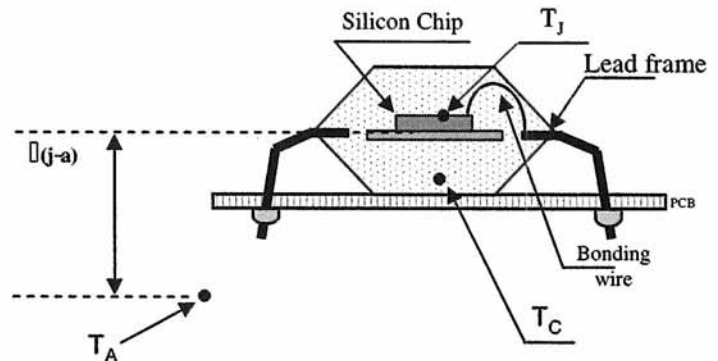


Figure 1. Heat-flow of a package mounted on PCB.

Measurement Method

1. The heat generated by the power transistor in the IC is dissipated to the air through the case. To investigate the thermal resistance from junction to case, a diode shown in Figure 2 is used as the temperature sensitivity parameter together with a heating element (to emulate the heat from power transistor).

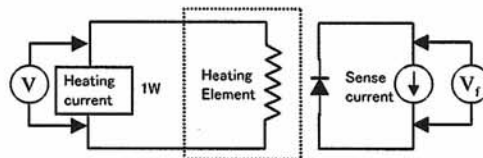


Figure 2. Diode as Temperature Sensitivity Parameter.

- The linear relationship between the forward-biased voltage drop (V_{be}) and junction temperature when a constant forward-biased current is applied can be used to compute the junction temperature with respect to the power dissipation in the junction region.
- For example, with heating power 1W(1V,1A) initiated at the heating element and the temperature sampling interval from 0 to 500us to ensure thermal equilibrium is reached, the temperature dependent voltage, V_f is measured and converted to junction temperature as shown in Figure 3.

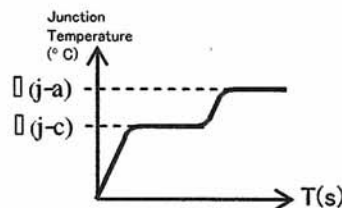


Figure 3. $\theta(j-a)$ Characteristic Plot

- The junction temperature can be used to compute the thermal resistance from junction to case, $\theta(j-a)$ using Equation(1) where T_c is the case temperature.

$$\theta(j-a) = \frac{T_j - T_a}{1W} \quad \text{Equation (1)}$$

Thermal resistance

The thermal resistance from junction to case, $\theta(j-a)$ for AN17827A measured using the method mention above is 40°C/W

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■ Technical Data

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

Junction temperature estimation

$$T_j = T_a + \theta_{(j-a)} \times P_d$$

Pd: Power dissipation according to application given by (VCC x ICC) – Output power

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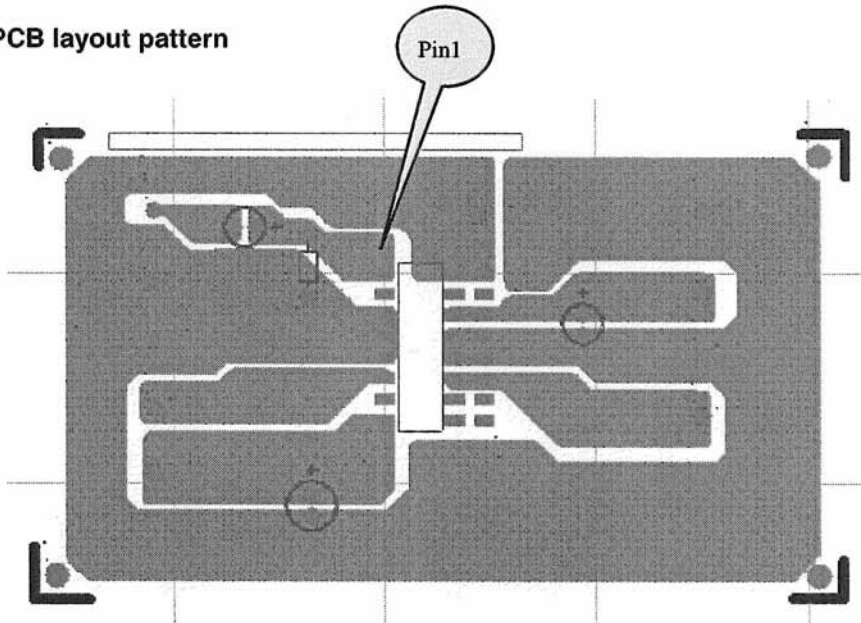
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■ Technical Data

Note) The characteristics listed below are reference values based on the IC design and are not guaranteed.

PCB layout pattern



PCB area : 98.3mm X 58.78 mm = 5778.07 mm²

PCB thickness: 1.5 mm

Material : FR (Flame Retardant)4

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■ Usage Notes

- Carry out the thermal design with sufficient margin such that the power dissipation will not be exceeded under the necessary conditions of power supply voltage, load impedance and ambient temperature.
- The protection circuit is for maintaining safety against an abnormal operation. Therefore, design the protection circuit such that it should not operate during normal operation. Especially for the over-temperature protection circuit, if the area of safe operation or the absolute maximum rating is momentarily exceeded by output pin to VCC short, or output pin to GND short (Ground fault), the LSI might be damaged before the over-temperature protection circuit starts working.
- Pay attention to the PCB (Printed-Circuit-Board) pattern layout in order to prevent damage due to short circuit between pins. In addition, for the pin configuration, refer to the pin functional description diagram (Sheet No.6).
- Do not mount the LSI in the reverse direction onto the PCB (Printed-Circuit-Board). It might be damaged when power is applied.
- Carry out visual inspection on the PCB (Printed-Circuit-Board) before applying the power, otherwise damage might happen due to problems such as solder-bridge between the pins of the semiconductor device. Also, perform a full technical verification on the assembly quality, because the same damage may happen due to conductive substances, such as solder ball, that adhere to the LSI during transportation.
- Take notice in the use of this product that it might be damaged or occasionally emit smoke when an abnormal state occurs such as output pin-VCC short, output pin-GND short, output-to-output-pin short (load short), or pin to pin leakage current. (And, safety measures such as an installation of fuses are recommended because the extent of the above-mentioned damage and smoke emission will depend on the current capability of the power supply.)
- When carrying out derivative product expansion or when the product is going to be used in a new set, verify the safety including the long-term reliability for each set.
- Check the risk that is caused by the failure of external components.
- The Input pin of this product is necessary to be tied to ground through a resistor as it has significant effect on the output offset and the supply surge susceptibility.

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