

# DATA SHEET

## **TDA1514A** 50 W high performance hi-fi amplifier

Product specification  
File under Integrated Circuits, IC01

May 1992

**50 W high performance hi-fi amplifier****TDA1514A****GENERAL DESCRIPTION**

The TDA1514A integrated circuit is a hi-fi power amplifier for use as a building block in radio, tv and other audio applications. The high performance of the IC meets the requirements of digital sources (e.g. Compact Disc equipment).

The circuit is totally protected, the two output transistors both having thermal and SOAR protection (see Fig.3). The circuit also has a mute function that can be arranged for a period after power-on with a delay time fixed by external components.

The device is intended for symmetrical power supplies but an asymmetrical supply may also be used.

**Features**

- High output power
- Low harmonic distortion
- Low intermodulation distortion
- Low offset voltage
- Good ripple rejection
- Mute/stand-by facilities
- Thermal protection
- Protected against electrostatic discharge
- No switch-on or switch-off clicks
- Very low thermal resistance
- Safe Operating Area (SOAR) protection.

**QUICK REFERENCE DATA**

| PARAMETER                                | CONDITIONS   | SYMBOL    | MIN.     | TYP. | MAX.     | UNIT       |
|--|--|-----------|----------|------|----------|------------|
| Supply voltage range<br>(pin 6 to pin 4) |  | $V_P$     | $\pm 10$ | –    | $\pm 30$ | V          |
| Total quiescent current                  | $V_P = \pm 27.5$ V                                       | $I_{tot}$ | –        | 56   | –        | mA         |
| Output power                             | THD = –60 dB;<br>$V_P = \pm 27.5$ V;<br>$R_L = 8 \Omega$ | $P_o$     | –        | 40   | –        | W          |
|  | $V_P = \pm 23$ V;<br>$R_L = 4 \Omega$                    | $P_o$     | –        | 48   | –        | W          |
| Closed loop voltage gain                 | determined<br>externally                                 | $G_c$     | –        | 30   | –        | dB         |
| Input resistance                         | determined<br>externally                                 | $R_i$     | –        | 20   | –        | k $\Omega$ |
| Signal plus noise-to-noise ratio         | $P_o = 50$ mW  | (S+N)/N   | –        | 83   | –        | dB         |
| Supply voltage ripple<br>rejection       | $f = 100$ Hz   | SVRR      | –        | 64   | –        | dB         |

**PACKAGE OUTLINE**

9-lead SIL, plastic power (SOT131R); SOT131-2; 1996 July 19.

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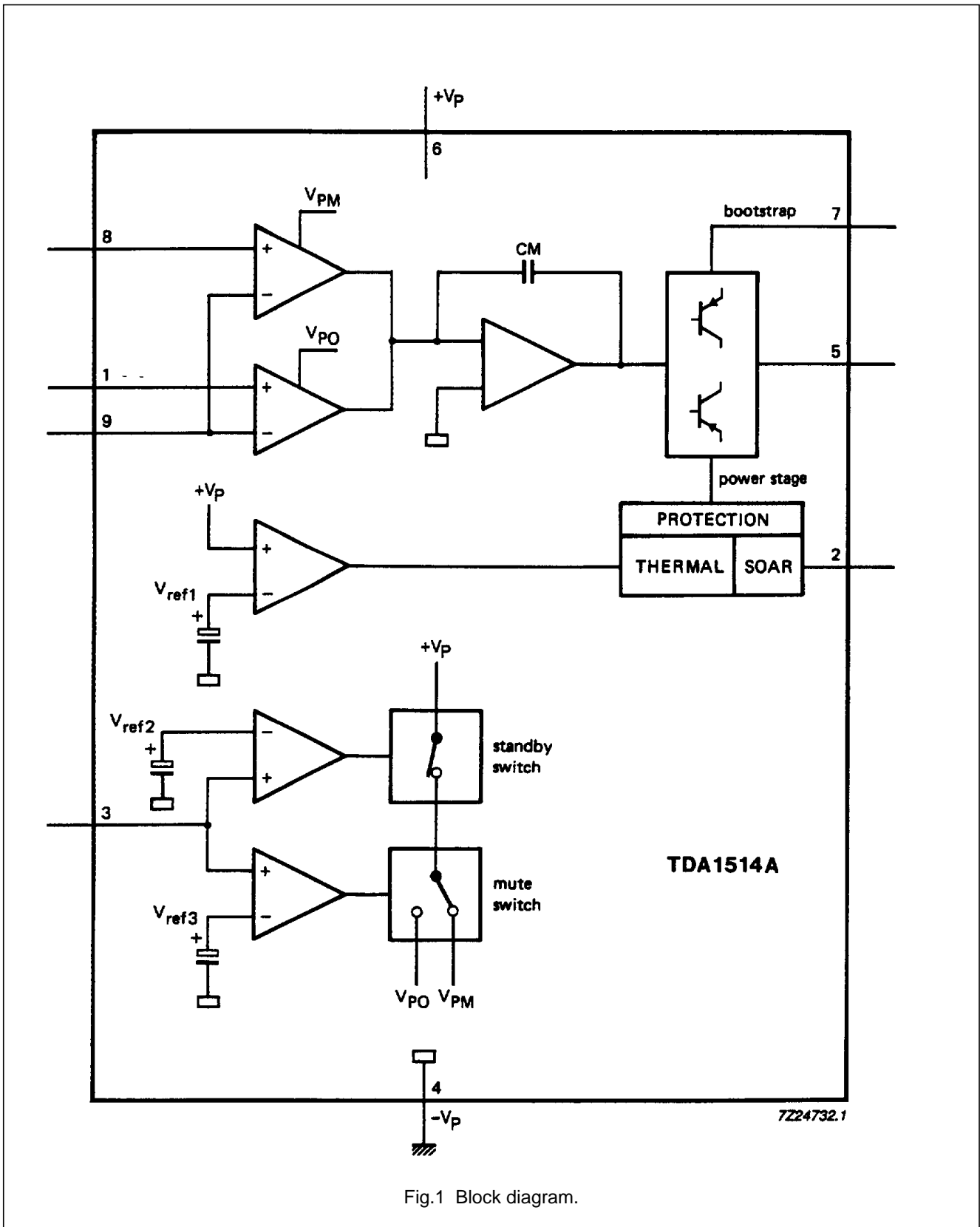


Fig.1 Block diagram.

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**RATINGS**

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

| PARAMETER                           | SYMBOL     | MIN.      | MAX.     | UNIT |
|-------------------------------------|------------|-----------|----------|------|
| Supply voltage (pin 6 to pin 4)     | $V_P$      | -         | $\pm 30$ | V    |
| Bootstrap voltage (pin 7 to pin 4)  | $V_{bstr}$ | -         | 70       | V    |
| Output current (repetitive peak)    | $I_o$      | -         | 8        | A    |
| Operating ambient temperature range | $T_{amb}$  | see Fig.2 |          |      |
| Storage temperature range           | $T_{stg}$  | -55       | + 150    | °C   |
| Power dissipation                   |            | see Fig.2 |          |      |
| Thermal shut-down protection time   | $t_{pr}$   | -         | 1        | hour |
| Mute voltage (pin 3 to pin 4)       | $V_m$      | -         | 7.25     | V    |

**THERMAL RESISTANCE**

From junction to mounting base

$R_{th\ j-mb}$

1 K/W

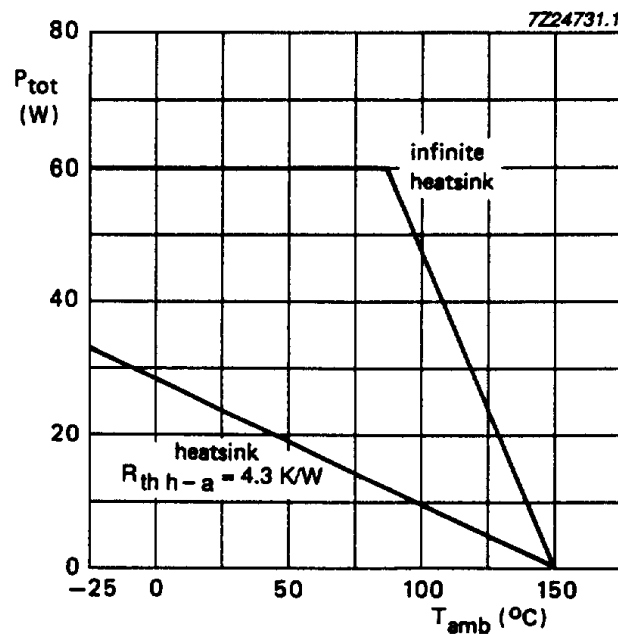


Fig.2 Power derating curve.

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The theoretical maximum power dissipation for  $P_o = 40\text{ W}$  with a stabilized power supply is:

$$\frac{V_p^2}{2\pi^2 R_L} = 19\text{ W}; \text{ where } V_p = \pm 27.5\text{ V}; R_L = 8\ \Omega$$

Considering, for example, a maximum ambient temperature of  $50\text{ }^\circ\text{C}$  and a maximum junction temperature of  $150\text{ }^\circ\text{C}$  the total thermal resistance is:

$$R_{th\ j-a} = \frac{150 - 50}{19} = 5.3\text{ K/W}$$

Since the thermal resistance of the SOT131A encapsulation is  $R_{th\ j-mb} < 1\text{ K/W}$ , the thermal resistance required of the heatsink is  $R_{th\ h-a} < 4.3\text{ K/W}$ .

**SAFE OPERATING AREA (SOAR) PROTECTION**

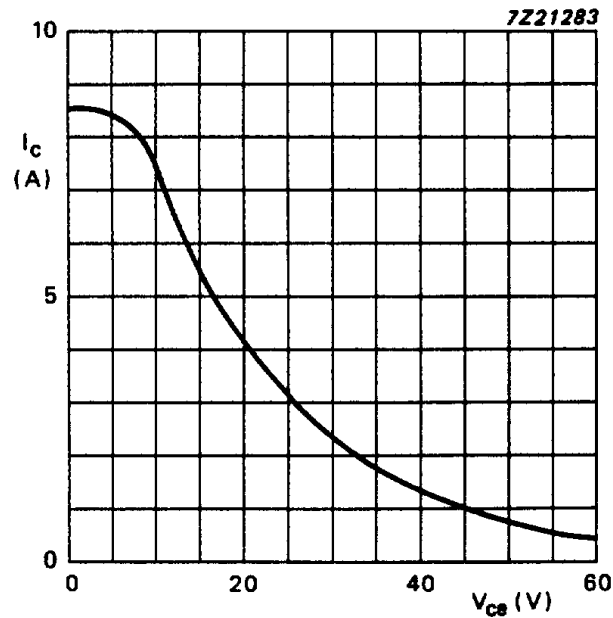


Fig.3 SOAR protection curve.

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**CHARACTERISTICS**

$V_P = \pm 27.5$  V;  $R_L = 8 \Omega$ ;  $f = 1$  kHz;  $T_{amb} = 25$  °C; test circuit as Fig.4; unless otherwise specified.

| PARAMETER                                | CONDITIONS                        | SYMBOL        | MIN.     | TYP.            | MAX.     | UNIT       |
|--|-----------------------------------|---------------|----------|-----------------|----------|------------|
| Supply voltage range<br>(pin 6 to pin 4) |                                   | $V_P$         | $\pm 10$ | –               | $\pm 30$ | V          |
| Maximum output current<br>(peak value)   |                                   | $I_{OM\ max}$ | 6.4      | –               | –        | A          |
| <b>Operating state</b>                   |                                   |               |          |                 |          |            |
| Voltage (pins 3 to 4)                    |                                   | $V_{3-4}$     | 6        | –               | 7.25     | V          |
| Total quiescent current                  | $R_L = \infty$                    | $I_{tot}$     | 30       | 56              | 90       | mA         |
| Output power                             | THD = –60 dB                      | $P_o$         | 37       | 40              | –        | W          |
|  | THD = –20 dB                      | $P_o$         | –        | 51              | –        | W          |
| Output power                             | $V_P = \pm 23$ V;<br>THD = –60 dB |               |          |                 |          |            |
|  | $R_L = 8 \Omega$                  | $P_o$         | –        | 28              | –        | W          |
|  | $R_L = 4 \Omega$                  | $P_o$         | –        | 48              | –        | W          |
| Total harmonic distortion                | $P_o = 32$ W                      | THD           | –        | –90             | –80      | dB         |
| Intermodulation distortion               | $P_o = 32$ W                      |               |          |                 |          |            |
|  | note 1                            | $d_{im}$      | –        | –86             | –        | dB         |
| Power bandwidth                          | (–3 dB);<br>THD = –60 dB          | B             | –        | 20 to<br>25 000 | –        | Hz         |
| Slew rate                                |                                   | dV/dt         | –        | 14              | –        | V/ $\mu$ s |
| Closed loop voltage gain                 | note 2                            | $G_c$         | –        | 30              | –        | dB         |
| Open loop voltage gain                   |                                   | $G_o$         | –        | 89              | –        | dB         |
| Input impedance                          | note 3                            | $ Z_i $       | 1        | –               | –        | M $\Omega$ |
| Signal-to-noise ratio                    | note 4<br>$P_o = 50$ mW           | S/N           | 80       | 83              | –        | dB         |
| Output offset voltage                    |                                   | $V_o$         | –        | 7               | 200      | mV         |
| Input bias current                       |                                   | $I_i$         | –        | 0.1             | 1.0      | $\mu$ A    |
| Output impedance                         |                                   | $ Z_o $       | –        | –               | 0.1      | $\Omega$   |
| Supply voltage ripple<br>rejection       | note 5                            | SVRR          | 58       | 64              | –        | dB         |
| Quiescent current into pin 2             | note 6                            | $I_2$         | –        | 0.1             | –        | $\mu$ A    |

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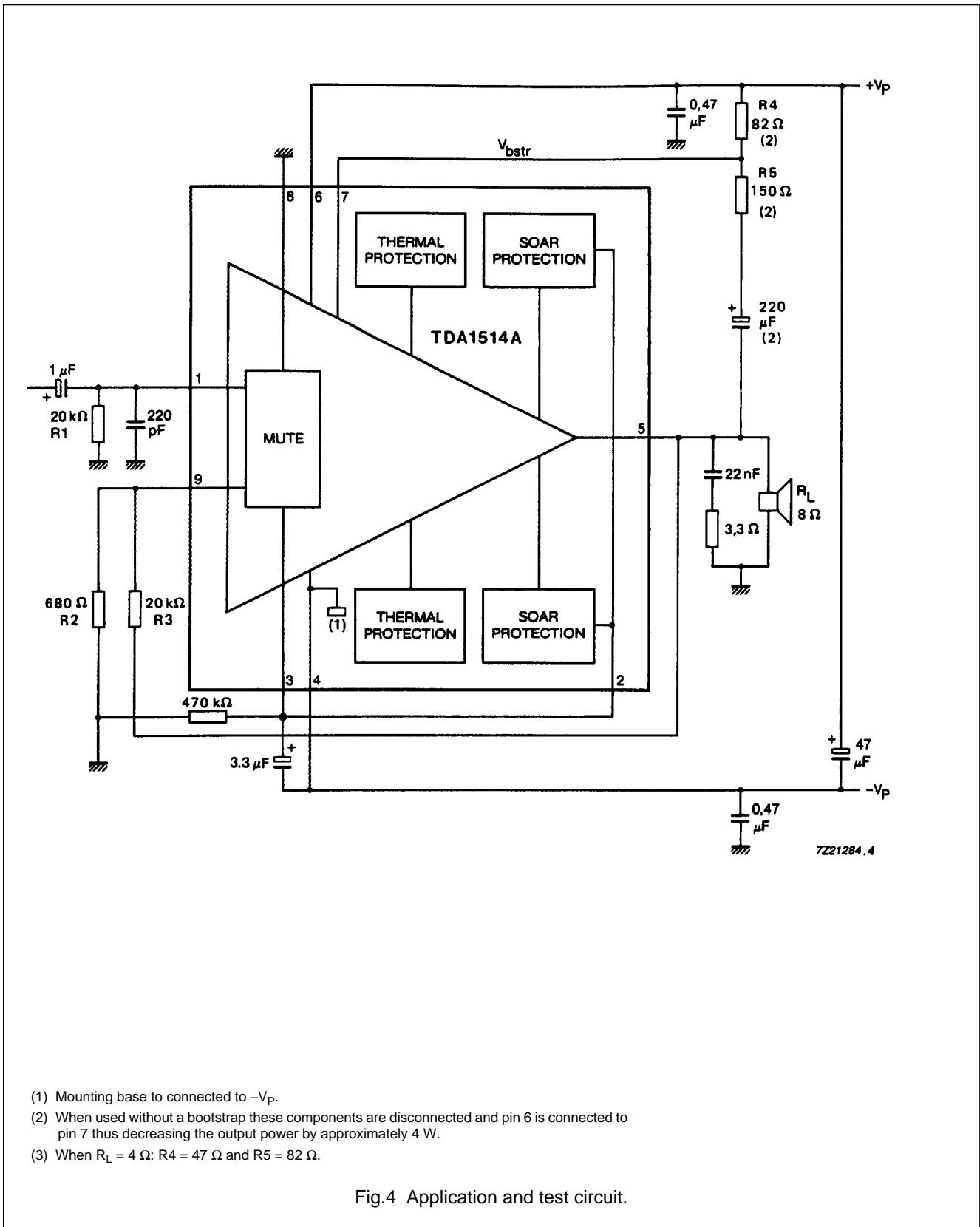
| PARAMETER                              | CONDITIONS                | SYMBOL    | MIN. | TYP. | MAX. | UNIT          |
|--|---------------------------|-----------|------|------|------|---------------|
| <b>Mute state</b>                      |                           |           |      |      |      |               |
| Voltage on pin 3                       |                           | $V_{3-4}$ | 2    | –    | 4.5  | V             |
| Offset voltage                         |                           | $V_o$     | –    | 30   | 200  | V             |
| Output voltage                         | $V_{i(rms)} = 1\text{ V}$ |           |      |      |      |               |
|  | $f = 1\text{ kHz}$        | $V_o$     | –    | 450  | –    | $\mu\text{V}$ |
| Ripple rejection                       | note 5                    | RR        | –    | 60   | –    | dB            |
| <b>Standby state</b>                   |                           |           |      |      |      |               |
| Voltage on pin 3                       |                           | $V_{3-4}$ | 0    | –    | 0.9  | V             |
| Total quiescent current                |                           | $I_{tot}$ | –    | 18   | 25   | mA            |
| Ripple rejection                       | notes 5 and 7             | RR        | –    | 60   | –    | dB            |
| Supply voltage to obtain standby state |                           | $\pm V_P$ | 5.0  | –    | 7.0  | V             |

**Notes to the characteristics**

1. Measured with two superimposed signals of 50 Hz and 7 kHz with an amplitude relationship of 4 : 1.
2. The closed loop gain is determined by external resistors (Fig.4, R2 and R3) and is variable between 20 and 46 dB.
3. The input impedance in the test circuit (Fig.4) is determined by the bias resistor R1.
4. The noise output voltage is measured in a bandwidth of 20 Hz to 20 kHz with a source resistance of 2 k $\Omega$ .
5.  $f = 100\text{ Hz}$ ;  $R_S = 2\text{ k}\Omega$ ; ripple voltage = 500 mV<sub>(eff)</sub> on positive and negative supply.
6. The quiescent current into pin 2 has an impact on the mute time.
7. Without bootstrap.

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- (1) Mounting base to connected to  $-V_p$ .
- (2) When used without a bootstrap these components are disconnected and pin 6 is connected to pin 7 thus decreasing the output power by approximately 4 W.
- (3) When  $R_L = 4 \Omega$ :  $R_4 = 47 \Omega$  and  $R_5 = 82 \Omega$ .

Fig.4 Application and test circuit.



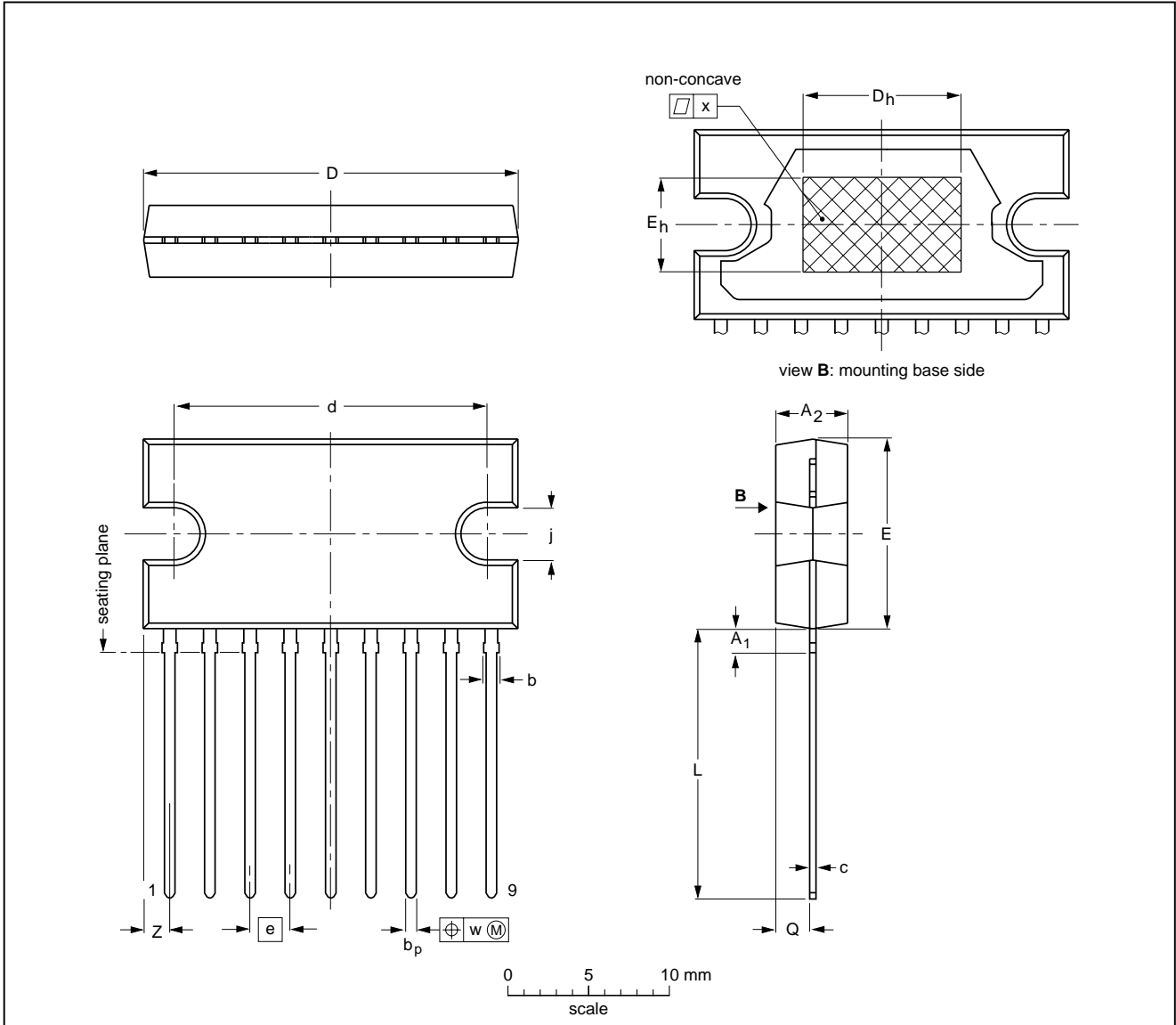
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PACKAGE OUTLINE

SIL9P: plastic single in-line power package; 9 leads

SOT131-2



DIMENSIONS (mm are the original dimensions)

| UNIT | A <sub>1</sub><br>max. | A <sub>2</sub> | b<br>max. | b <sub>p</sub> | c            | D <sup>(1)</sup> | d            | D <sub>h</sub> | E <sup>(1)</sup> | e    | E <sub>h</sub> | j          | L            | Q          | w    | x    | z <sup>(1)</sup> |
|------|------------------------|----------------|-----------|----------------|--------------|------------------|--------------|----------------|------------------|------|----------------|------------|--------------|------------|------|------|------------------|
| mm   | 2.0                    | 4.6<br>4.2     | 1.1       | 0.75<br>0.60   | 0.48<br>0.38 | 24.0<br>23.6     | 20.0<br>19.6 | 10             | 12.2<br>11.8     | 2.54 | 6              | 3.4<br>3.1 | 17.2<br>16.5 | 2.1<br>1.8 | 0.25 | 0.03 | 2.00<br>1.45     |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |       |      |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|-------|------|--|------------------------|----------------------|
|                    | IEC        | JEDEC | EIAJ |  |                        |                      |
| SOT131-2           |            |       |      |  |                        | 92-11-17<br>95-03-11 |

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**SOLDERING****Introduction**

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our "IC Package Databook" (order code 9398 652 90011).

**Soldering by dipping or by wave**

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ( $T_{stg\ max}$ ). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

**Repairing soldered joints**

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

**DEFINITIONS**

| <b>Data sheet status</b>  |   |
|---|---|
| Objective specification   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification   | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>  |   |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

**LIFE SUPPORT APPLICATIONS**

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.