

# DATA SHEET

## **TDA1518BQ**

24 W BTL or 2 x 12 watt stereo  
car radio power amplifier

Product specification  
File under Integrated Circuits, IC01

July 1994

## 24 W BTL or 2 x 12 watt stereo car radio power amplifier

## TDA1518BQ

### GENERAL DESCRIPTION

The TDA1518BQ is an integrated class-B output amplifier in a 13-lead single-in-line (SIL) plastic power package. The device is primarily developed for car radio applications.

### FEATURES

- Requires very few external components
- Flexibility in use — stereo as well as mono BTL
- High output power (without bootstrap)
- Low offset voltage at output (important for BTL)
- Fixed gain
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- A.C. and d.c. short-circuit-safe to ground and  $V_P$
- Thermally protected
- Reverse polarity safe
- Capability to handle high energy on outputs ( $V_P = 0$  V)
- No switch-on/switch-off plop
- Flexible leads
- Low thermal resistance
- Identical inputs (inverting and non-inverting)
- Compatible with TDA1516BQ (except gain).

### QUICK REFERENCE DATA

| PARAMETER                       | CONDITIONS                                   | SYMBOL         | MIN. | TYP. | MAX. | UNIT       |
|---------------------------------|----------------------------------------------|----------------|------|------|------|------------|
| Supply voltage range            |                                              |                |      |      |      |            |
| operating                       |                                              | $V_P$          | 6,0  | 14,4 | 18,0 | V          |
| non-operating                   |                                              | $V_P$          | —    | —    | 30,0 | V          |
| load dump                       |                                              | $V_P$          | —    | —    | 45,0 | V          |
| Repetitive peak output current  |                                              | $I_{ORM}$      | —    | —    | 4    | A          |
| Total quiescent current         |                                              | $I_{tot}$      | —    | 30   | —    | mA         |
| Stand-by current                |                                              | $I_{sb}$       | —    | 0,1  | 100  | $\mu$ A    |
| Switch-on current               |                                              | $I_{sw}$       | —    | —    | 40   | $\mu$ A    |
| Input impedance                 |                                              |                |      |      |      |            |
| BTL                             |                                              | $ Z_I $        | 25   | —    | —    | k $\Omega$ |
| stereo                          |                                              | $ Z_I $        | 50   | —    | —    | k $\Omega$ |
| <b>Stereo application</b>       |                                              |                |      |      |      |            |
| Output power                    | THD = 10%; 4 $\Omega$                        | $P_O$          | —    | 6    | —    | W          |
|                                 | THD = 10%; 2 $\Omega$                        | $P_O$          | —    | 11   | —    | W          |
| Channel separation              |                                              | $\alpha$       | 40   | —    | —    | dB         |
| Noise output voltage            |                                              | $V_{no(rms)}$  | —    | 150  | —    | $\mu$ V    |
| <b>BTL application</b>          |                                              |                |      |      |      |            |
| Output power                    | THD = 10%, 4 $\Omega$                        | $P_O$          | —    | 22   | —    | W          |
| Supply voltage ripple rejection | $R_S = 0$ $\Omega$ ;<br>f = 100 Hz to 10 kHz | RR             | 48   | —    | —    | dB         |
| D.C. output offset voltage      |                                              | $ \Delta V_O $ | —    | —    | 250  | mV         |

# 24 W BTL or 2 x 12 watt stereo car radio power amplifier

TDA1518BQ

## PACKAGE OUTLINE

13-lead SIL-bent-to-DIL; plastic power (SOT141C); SOT141-6; 1996 July 19.

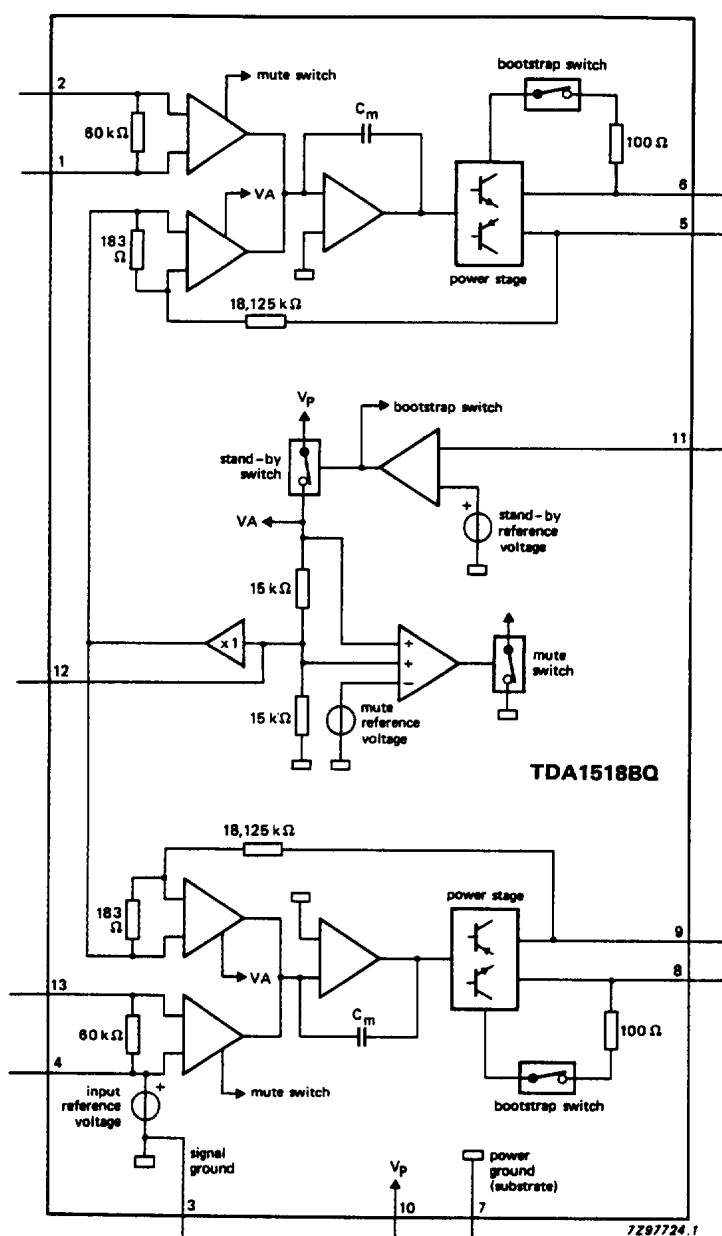


Fig.1 Block diagram.

## 24 W BTL or 2 x 12 watt stereo car radio power amplifier

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### PINNING

|   |                  |                       |    |                |                                 |
|---|------------------|-----------------------|----|----------------|---------------------------------|
| 1 | –INV1            | non-inverting input 1 | 8  | BS2            | bootstrap 2                     |
| 2 | INV              | inverting input       | 9  | OUT2           | output 2                        |
| 3 | GND1             | ground (signal)       | 10 | V <sub>P</sub> | supply voltage                  |
| 4 | V <sub>ref</sub> | reference voltage     | 11 | M/SS           | mute/stand-by switch            |
| 5 | OUT1             | output 1              | 12 | RR             | supply voltage ripple rejection |
| 6 | BS1              | bootstrap 1           | 13 | –INV2          | non-inverting input 2           |
| 7 | GND2             | ground (substrate)    |    |                |                                 |

### FUNCTIONAL DESCRIPTION

The TDA1518BQ contains two identical amplifiers with differential input stages. This device can be used for stereo or bridge applications. The gain of each amplifier is fixed at 40 dB. A special feature of this device is the mute/stand-by switch which has the following features:

- low stand-by current (< 100 µA)
- low mute/stand-by switching current (low cost supply switch)
- mute condition.

### RATINGS

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

| PARAMETER                                    | CONDITIONS                               | SYMBOL           | MIN. | MAX. | UNIT |
|----------------------------------------------|------------------------------------------|------------------|------|------|------|
| Supply voltage                               |                                          |                  |      |      |      |
| operating                                    |                                          | V <sub>P</sub>   | –    | 18   | V    |
| non-operating                                |                                          | V <sub>P</sub>   | –    | 30   | V    |
| load dump                                    | during 50 ms;<br>t <sub>r</sub> ≥ 2,5 ms | V <sub>P</sub>   | –    | 45   | V    |
| A.C. and d.c. short-circuit-<br>safe voltage |                                          | V <sub>PSC</sub> | –    | 18   | V    |
| Reverse polarity                             |                                          | V <sub>PR</sub>  | –    | 6    | V    |
| Energy handling capability<br>at outputs     | V <sub>P</sub> = 0 V                     |                  | –    | 200  | mJ   |
| Non-repetitive peak output<br>current        |                                          | I <sub>OSM</sub> | –    | 6    | A    |
| Repetitive peak output<br>current            |                                          | I <sub>ORM</sub> | –    | 4    | A    |
| Total power dissipation                      | see Fig.2                                | P <sub>tot</sub> | –    | 25   | W    |
| Crystal temperature                          |                                          | T <sub>c</sub>   | –    | 150  | °C   |
| Storage temperature range                    |                                          | T <sub>stg</sub> | –55  | +150 | °C   |

## 24 W BTL or 2 x 12 watt stereo car radio power amplifier

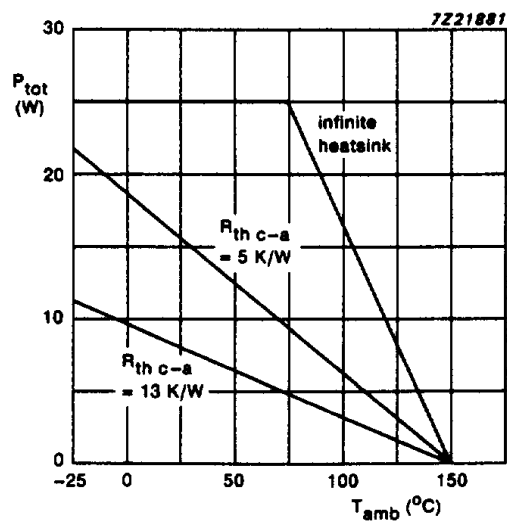
**TDA1518BQ**

Fig.2 Power derating curve.

## 24 W BTL or 2 x 12 watt stereo car radio power amplifier

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### D.C. CHARACTERISTICS (note 1)

 $V_P = 14.4\text{ V}$ ;  $T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified

| PARAMETER                                       | CONDITIONS                                                              | SYMBOL             | MIN. | TYP.   | MAX.   | UNIT          |
|-------------------------------------------------|-------------------------------------------------------------------------|--------------------|------|--------|--------|---------------|
| <b>Supply</b>                                   |                                                                         |                    |      |        |        |               |
| Supply voltage range                            | note 2                                                                  | $V_P$              | 6,0  | 14,4   | 18,0   | V             |
| Quiescent current                               |                                                                         | $I_P$              | –    | 30     | note 3 | mA            |
| D.C. output voltage at<br>approximately $V_P/2$ | note 4                                                                  | $V_O$              | –    | 6,8    | –      | V             |
| D.C. output offset<br>voltage                   |                                                                         | $ \Delta V_{5-9} $ | –    | –      | 200    | mV            |
| <b>Mute/stand-by switch</b>                     |                                                                         |                    |      |        |        |               |
| Switch-on voltage level                         |                                                                         | $V_{\text{ON}}$    | 8,5  | –      | –      | V             |
| <b>Mute condition</b>                           |                                                                         |                    |      |        |        |               |
| Output signal in mute<br>position               | $V_I = 1\text{ V (max.)}$ ;<br>$f = 20\text{ Hz to}$<br>$15\text{ kHz}$ | $V_{\text{mute}}$  | 3,0  | –      | 6,4    | V             |
|                                                 |                                                                         | $V_O$              | –    | note 3 | 20     | mV            |
| D.C. output offset<br>voltage                   |                                                                         | $ \Delta V_{5-9} $ | –    | –      | 250    | mV            |
| <b>Stand-by condition</b>                       |                                                                         |                    |      |        |        |               |
| D.C. current in<br>stand-by condition           |                                                                         | $V_{\text{sb}}$    | 0    | –      | 2      | V             |
|                                                 |                                                                         | $I_{\text{sb}}$    | –    | –      | 100    | $\mu\text{A}$ |
| Switch-on current                               |                                                                         | $I_{\text{sw}}$    | –    | 12     | 40     | $\mu\text{A}$ |

# 24 W BTL or 2 x 12 watt stereo car radio power amplifier

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## A.C. CHARACTERISTICS

 $V_P = 14,4 \text{ V}$ ;  $R_L = 4 \Omega$ ;  $f = 1 \text{ kHz}$ ;  $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ ; unless otherwise specified

| PARAMETER                           | CONDITIONS                         | SYMBOL               | MIN. | TYP.            | MAX. | UNIT          |
|-------------------------------------|------------------------------------|----------------------|------|-----------------|------|---------------|
| <b>Stereo application</b>           | note 1                             |                      |      |                 |      |               |
| Output power                        | note 5;<br>THD = 0,5%              | $P_o$                | 4    | 5               | –    | W             |
|                                     | THD = 10%                          | $P_o$                | 5,5  | 6,0             | –    | W             |
|                                     | notes 5 and 6;<br>THD = 10%        | $P_o$                | 6    | 7               | –    | W             |
| Output power at<br>$R_L = 2 \Omega$ | note 5;<br>THD = 0,5%              | $P_o$                | 7,75 | 8,5             | –    | W             |
|                                     | THD = 10%                          | $P_o$                | 10   | 11              | –    | W             |
|                                     | notes 5 and 6;<br>THD = 10%        | $P_o$                | 10,5 | 12,0            | –    | W             |
| Low frequency roll-off              | note 7;<br>–3 dB                   | $f_L$                | –    | 45              | –    | Hz            |
| High frequency roll-off             | –1 dB                              | $f_H$                | 20   | –               | –    | kHz           |
| Closed loop voltage gain            |                                    | $G_v$                | 39   | 40              | 41   | dB            |
| Supply voltage ripple<br>rejection: | note 8                             |                      |      |                 |      |               |
| ON                                  |                                    | RR                   | 48   | –               | –    | dB            |
| mute                                |                                    | RR                   | 48   | –               | –    | dB            |
| stand-by                            |                                    | RR                   | 80   | –               | –    | dB            |
| Input impedance                     |                                    | $ Z_i $              | 50   | 60              | 75   | k $\Omega$    |
| Noise output voltage:               | note 9;                            |                      |      |                 |      |               |
| ON                                  | $R_S = 0 \Omega$                   | $V_{\text{no(rms)}}$ | –    | 150             | –    | $\mu\text{V}$ |
| ON                                  | $R_S = 10 \text{ k}\Omega$         | $V_{\text{no(rms)}}$ | –    | 250             | 500  | $\mu\text{V}$ |
| mute                                | note 10                            | $V_{\text{no(rms)}}$ | –    | 120             | –    | $\mu\text{V}$ |
| Channel separation                  | $R_S = 10 \text{ k}\Omega$         | $\alpha$             | 40   | –               | –    | dB            |
| Channel balance                     |                                    | $G_v$                | –    | 0.1             | 1    | dB            |
| <b>BTL application</b>              | note 11                            |                      |      |                 |      |               |
| Output power                        | THD = 0,5%                         | $P_o$                | 15,5 | 17,0            | –    | W             |
|                                     | THD = 10%                          | $P_o$                | 20   | 22              | –    | W             |
|                                     | note 6; THD = 10%                  | $P_o$                | 21   | 24              | –    | W             |
| Output power at $V_P$<br>= 13,2 V   | THD = 0,5%                         | $P_o$                | –    | 13.5            | –    | W             |
|                                     | THD = 10%                          | $P_o$                | –    | 17              | –    | W             |
|                                     | note 6; THD = 10%                  | $P_o$                | –    | 19              | –    | W             |
| Power bandwidth                     | THD = 0,5%<br>$P_o = 15 \text{ W}$ | $B_w$                | –    | 20 to<br>15 000 | –    | Hz            |

## 24 W BTL or 2 x 12 watt stereo car radio power amplifier

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| PARAMETER                        | CONDITIONS         | SYMBOL        | MIN. | TYP. | MAX.   | UNIT       |
|----------------------------------|--------------------|---------------|------|------|--------|------------|
| Low frequency roll-off           | note 7;<br>-3 dB   | $f_L$         | —    | 45   | —      | Hz         |
| High frequency roll-off          | -1 dB              | $f_H$         | 20   | —    | —      | kHz        |
| Closed loop voltage gain         |                    | $G_v$         | 45   | 46   | 47     | dB         |
| Supply voltage ripple rejection: | note 8             |               |      |      |        |            |
| ON                               |                    | RR            | 48   | —    | —      | dB         |
| mute                             |                    | RR            | 48   | —    | —      | dB         |
| stand-by                         |                    | RR            | 80   | —    | —      | dB         |
| Input impedance                  |                    | $ Z_i $       | 25   | 30   | 38     | k $\Omega$ |
| Noise output voltage:            | note 9;            |               |      |      |        |            |
| ON                               | $R_S = 0 \Omega$   | $V_{no(rms)}$ | —    | 200  | —      | $\mu V$    |
| ON                               | $R_S = 10 k\Omega$ | $V_{no(rms)}$ | —    | 350  | 700    | $\mu V$    |
| mute                             | note 10            | $V_{no(rms)}$ | —    | 120  | —      | $\mu V$    |
| Switch-on/switch-off behaviour   |                    | dV/dt         | —    | —    | note 3 | V/ms       |

### Notes to the characteristics

1. All characteristics, for stereo application are measured using the circuit shown in Fig.3.
2. The circuit is d.c. adjusted at  $V_P = 6 V$  to  $18 V$  and a.c. operating at  $V_P = 8,1 V$  to  $18 V$ .
3. Value to be fixed.
4. At  $18 V < V_P < 30 V$  the d.c. output voltage  $\leq V_P/2$ .
5. Output power is measured directly at the output pins of the IC.
6. With bootstrap and a  $100 k\Omega$  resistor from pin 12 to the positive supply voltage ( $V_P$ ), value of bootstrap capacitor is  $47 \mu F$ .
7. Frequency response externally fixed.
8. Ripple rejection measured at the output with a source impedance of  $0 \Omega$  (maximum ripple amplitude of  $2 V$ ) and a frequency between  $1 kHz$  and  $10 kHz$ .
9. Noise voltage measured in a bandwidth of  $20 Hz$  to  $20 kHz$ .
10. Noise output voltage independent of  $R_S$  ( $V_I = 0 V$ ).
11. All characteristics, for BTL application are measured using the circuit shown in Fig.4.

24 W BTL or 2 x 12 watt stereo  
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## APPLICATION INFORMATION

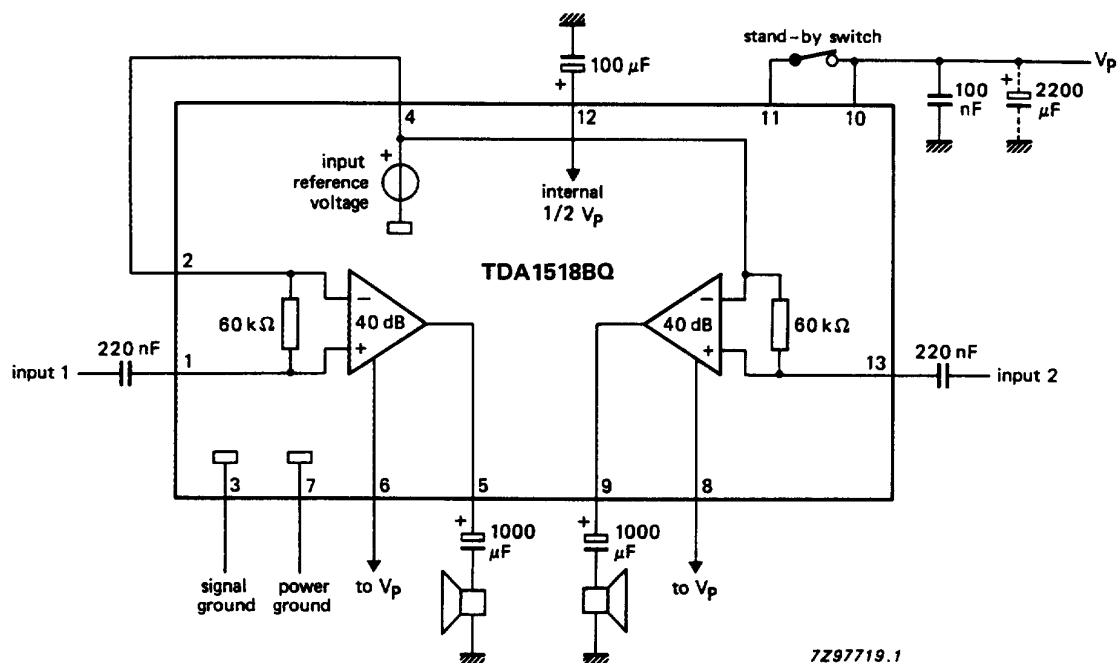


Fig.3 Stereo application circuit diagram.

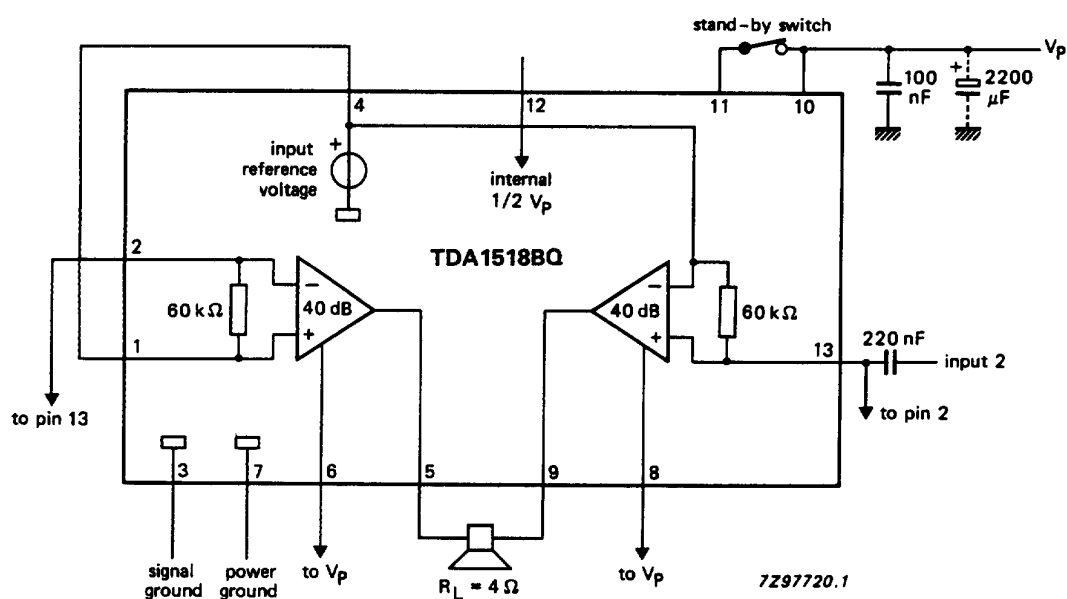


Fig.4 BTL application circuit diagram (without bootstrapping).

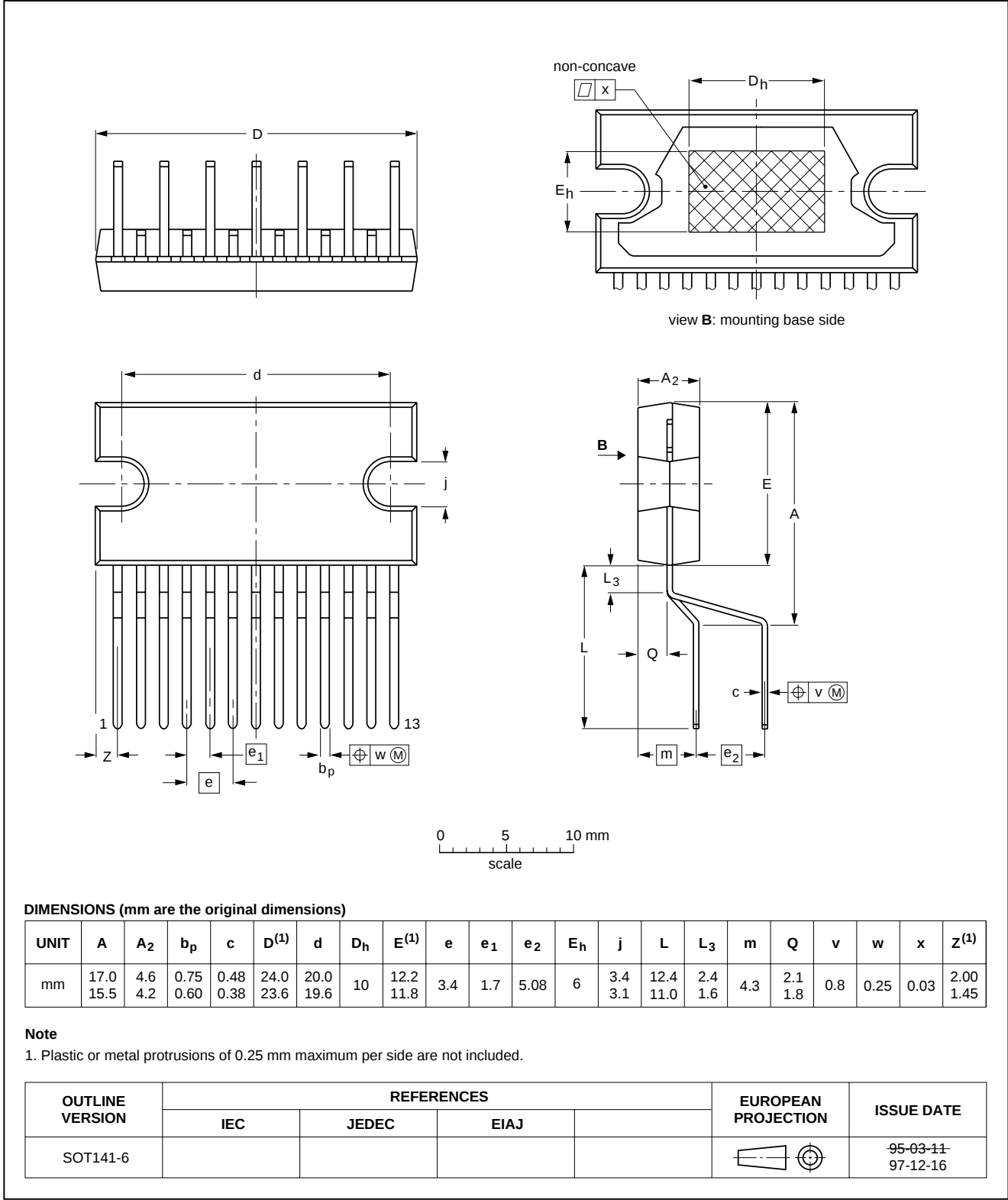
24 W BTL or 2 x 12 watt stereo  
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PACKAGE OUTLINE

DBS13P: plastic DIL-bent-SIL power package; 13 leads (lead length 12 mm)

SOT141-6



## 24 W BTL or 2 x 12 watt stereo car radio power amplifier

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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 ( $T_{\text{stg max}}$ ). 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

| Data sheet status                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 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.                                |
| Limiting values                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 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. |                                                                                       |
| Application information                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                       |                                                                                       |

### LIFE SUPPORT APPLICATIONS

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