

# DATA SHEET

## **TDA1554Q**

4 x 11 W single-ended or 2 x 22 W  
power amplifier

Product specification  
File under Integrated Circuits, IC01

May 1992

## 4 x 11 W single-ended or 2 x 22 W power amplifier

## TDA1554Q

### GENERAL DESCRIPTION

The TDA1554Q is an integrated class-B output amplifier in a 17-lead single-in-line (SIL) plastic power package. The circuit contains 4 x 11 W single-ended or 2 x 22 W bridge amplifiers. The device is primarily developed for car radio applications.

### Features

- Requires very few external components
- Flexibility in use – Quad single-ended or stereo BTL
- High output power
- Low offset voltage at outputs (important for BTL)
- Fixed gain
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- AC and DC short-circuit-safe to ground and  $V_P$
- Thermally protected
- Reverse polarity safe
- Capability to handle high energy on outputs ( $V_P = 0$  V)
- Protected against electrostatic discharge
- No switch-on/switch-off plop
- Low thermal resistance
- Identical inputs (inverting and non-inverting)
- Flexible leads.

### QUICK REFERENCE DATA

| PARAMETER                            | CONDITIONS                   | SYMBOL         | MIN. | TYP. | MAX. | UNIT       |
|--------------------------------------|------------------------------|----------------|------|------|------|------------|
| Supply voltage range operating       |                              | $V_P$          | 6.0  | 14.4 | 18.0 | V          |
| Repetitive peak output current       |                              | $I_{ORM}$      | —    | —    | 4    | A          |
| Total quiescent current              |                              | $I_{tot}$      | —    | 80   | 160  | mA         |
| Stand-by current                     |                              | $I_{sb}$       | —    | 0.1  | 100  | $\mu$ A    |
| <b>Stereo BTL application</b>        |                              |                |      |      |      |            |
| Output power                         | $R_L = 4 \Omega$ ; THD = 10% | $P_O$          | 20   | 22   | —    | W          |
| Supply voltage ripple rejection      |                              | RR             | 48   | —    | —    | dB         |
| Noise output voltage (RMS value)     | $R_S = 0 \Omega$             | $V_{no(rms)}$  | —    | 70   | —    | $\mu$ V    |
| Input impedance                      |                              | $ Z_I $        | 25   | 30   | 38   | k $\Omega$ |
| DC output offset voltage             |                              | $ \Delta V_O $ | —    | —    | 100  | mV         |
| <b>Quad single-ended application</b> |                              |                |      |      |      |            |
| Output power                         | THD = 10%                    |                |      |      |      |            |
|                                      | $R_L = 4 \Omega$             | $P_O$          | —    | 6    | —    | W          |
|                                      | $R_L = 2 \Omega$             | $P_O$          | —    | 11   | —    | W          |
| Supply voltage ripple rejection      |                              | RR             | 48   | —    | —    | dB         |
| Noise output voltage (RMS value)     | $R_S = 0 \Omega$             | $V_{no(rms)}$  | —    | 50   | —    | $\mu$ V    |
| Input impedance                      |                              | $ Z_I $        | 50   | 60   | 75   | k $\Omega$ |

### PACKAGE OUTLINE

17-lead SIL-bent-to-DIL; plastic power (SOT243R); SOT243-1; 1996 July 23.

# 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

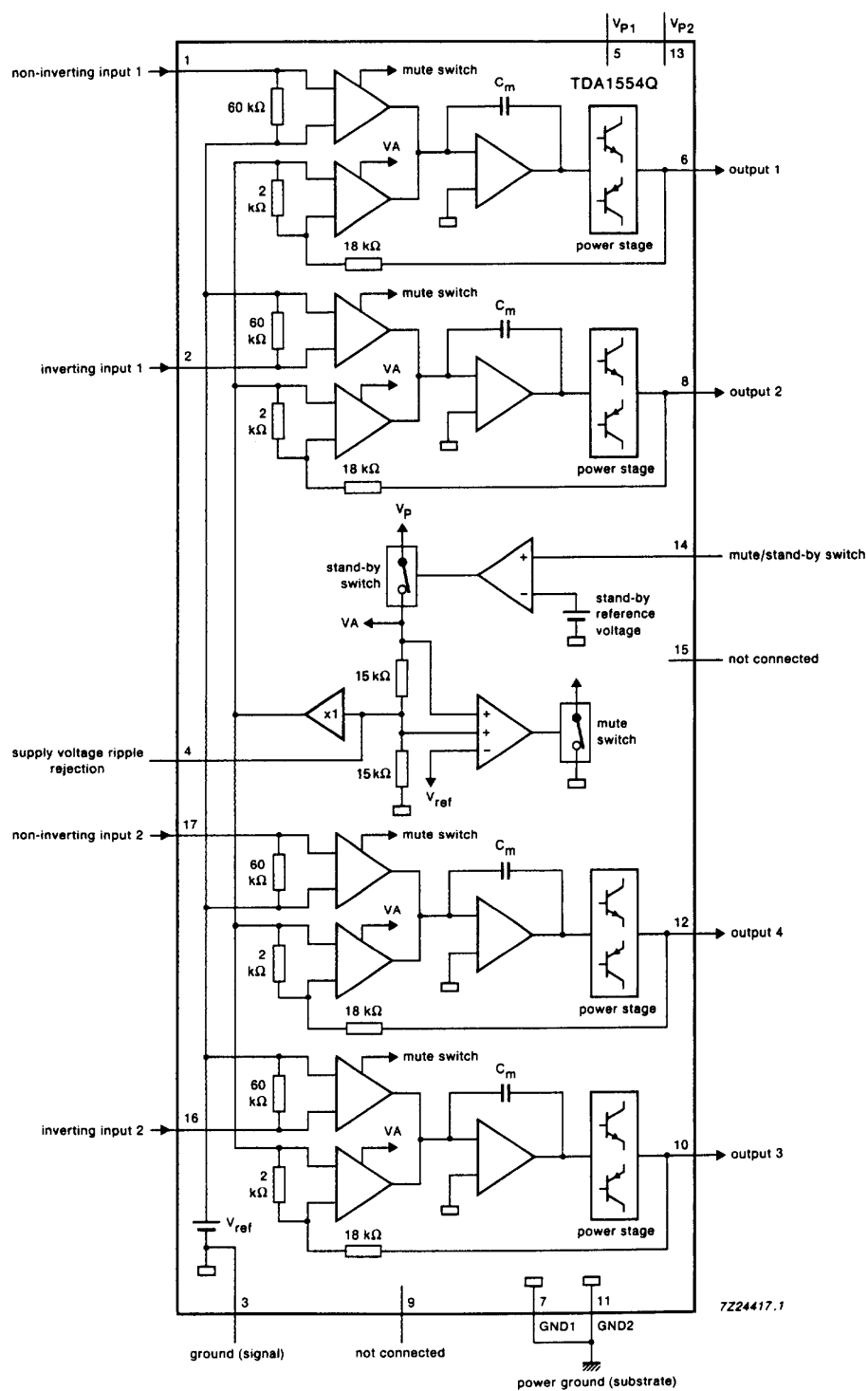


Fig.1 Block diagram.

# 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

## PINNING

|   |                 |                                 |    |                 |                            |
|---|-----------------|---------------------------------|----|-----------------|----------------------------|
| 1 | NINV1           | non-inverting input 1           | 9  | n.c.            | not connected              |
| 2 | INV1            | inverting input 1               | 10 | OUT3            | output 3                   |
| 3 | GND             | ground (signal)                 | 11 | GND2            | power ground 2 (substrate) |
| 4 | RR              | supply voltage ripple rejection | 12 | OUT4            | output 4                   |
| 5 | V <sub>P1</sub> | positive supply voltage 1       | 13 | V <sub>P2</sub> | positive supply voltage 2  |
| 6 | OUT1            | output 1                        | 14 | M/SS            | mute/stand-by switch       |
| 7 | GND1            | power ground 1 (substrate)      | 15 | n.c.            | not connected              |
| 8 | OUT2            | output 2                        | 16 | INV2            | inverting input 2          |
|   |                 |                                 | 17 | NINV2           | non-inverting input 2      |

## FUNCTIONAL DESCRIPTION

The TDA1554Q contains four identical amplifiers with differential input stages (two inverting and two non-inverting) and can be used for single-ended or bridge applications. The gain of each amplifier is fixed at 20 dB (26 dB in BTL). A special feature of this device is:

### Mute/stand-by switch

- low stand-by current (< 100  $\mu$ A)
- low mute/stand-by switching current (low cost supply switch)
- mute facility

## 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 protected                   | during 50 ms;<br>t <sub>r</sub> ≥ 2.5 ms | V <sub>P</sub>   | –    | 45    | V    |
| Non-repetitive peak output current    |                                          | I <sub>OSM</sub> | –    | 6     | A    |
| Repetitive peak output current        |                                          | I <sub>ORM</sub> | –    | 4     | A    |
| Storage temperature range             |                                          | T <sub>stg</sub> | –55  | + 150 | °C   |
| Junction temperature                  |                                          | T <sub>j</sub>   | –    | 150   | °C   |
| AC and DC short-circuit-safe voltage  |                                          | V <sub>PSC</sub> | –    | 18    | V    |
| Energy handling capability at outputs | V <sub>P</sub> = 0 V                     |                  | –    | 200   | mJ   |
| Reverse polarity                      |                                          | V <sub>PR</sub>  | –    | 6     | V    |
| Total power dissipation               | see Fig.2                                | P <sub>tot</sub> | –    | 60    | W    |

4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

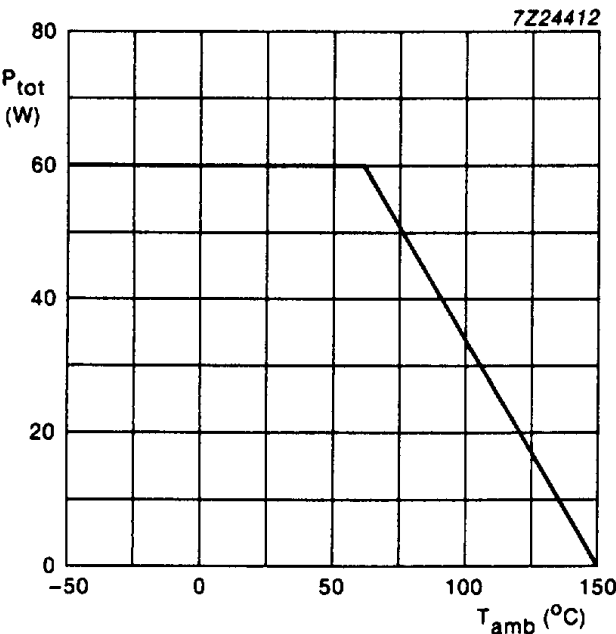


Fig.2 Power derating curve.

DC CHARACTERISTICS

$V_P = 14.4\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; measurements taken using Fig.4; unless otherwise specified

| PARAMETER                                                      | CONDITIONS                               | SYMBOL           | MIN. | TYP. | MAX. | UNIT |
|----------------------------------------------------------------|------------------------------------------|------------------|------|------|------|------|
| <b>Supply</b>                                                  |                                          |                  |      |      |      |      |
| Supply voltage range                                           | note 1                                   | V <sub>P</sub>   | 6.0  | 14.4 | 18.0 | V    |
| Total quiescent current                                        |                                          | I <sub>tot</sub> | —    | 80   | 160  | mA   |
| DC output voltage                                              | note 2                                   | V <sub>O</sub>   | —    | 6.9  | —    | V    |
| DC output offset voltage                                       |                                          | ΔV <sub>O</sub>  | —    | —    | 100  | mV   |
| <b>Mute/stand-by switch</b>                                    |                                          |                  |      |      |      |      |
| Switch-on voltage level                                        |                                          | V <sub>ON</sub>  | 8.5  | —    | —    | V    |
| <b>Mute condition</b>                                          |                                          |                  |      |      |      |      |
| Output signal in mute position                                 | V <sub>I</sub> = 1 V (max);<br>f = 1 kHz | V <sub>O</sub>   | —    | —    | 2    | mV   |
| DC output offset voltage<br>(between pins 6 to 8 and 10 to 12) |                                          | ΔV <sub>O</sub>  | —    | —    | 100  | mV   |
| <b>Stand-by condition</b>                                      |                                          |                  |      |      |      |      |
| DC current in stand-by condition                               |                                          | V <sub>sb</sub>  | 0    | —    | 2    | V    |
| Switch-on current                                              |                                          | I <sub>sb</sub>  | —    | —    | 100  | μA   |
|                                                                |                                          | I <sub>sw</sub>  | —    | 12   | 40   | μA   |

# 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

## AC CHARACTERISTICS

$V_P = 14.4\text{ V}$ ;  $R_L = 4\ \Omega$ ;  $f = 1\text{ kHz}$ ;  $T_{amb} = 25\text{ °C}$ ; measurements taken using Fig.3 for stereo BTL application and Fig.4 for quad single-ended application unless otherwise specified

| PARAMETER                             | CONDITIONS                         | SYMBOL         | MIN. | TYP.            | MAX. | UNIT          |
|---------------------------------------|------------------------------------|----------------|------|-----------------|------|---------------|
| <b>Stereo BTL application</b>         |                                    |                |      |                 |      |               |
| Output power                          | THD = 0.5%                         | $P_O$          | 15   | 17              | –    | W             |
|                                       | THD = 10%                          | $P_O$          | 20   | 22              | –    | W             |
| Output power at $V_P = 13.2\text{ V}$ | THD = 0.5%                         | $P_O$          | –    | 12              | –    | W             |
|                                       | THD = 10%                          | $P_O$          | –    | 17              | –    | W             |
| Total harmonic distortion             | $P_O = 1\text{ W}$                 | THD            | –    | 0.1             | –    | %             |
| Power bandwidth                       | THD = 0.5%                         |                |      |                 |      |               |
|                                       | $P_O = -1\text{ dB}$               |                |      |                 |      |               |
|                                       | w.r.t. 15 W                        | $B_W$          | –    | 20 to<br>15 000 | –    | Hz            |
| Low frequency roll-off                | note 3                             |                |      |                 |      |               |
|                                       | -1 dB                              | $f_L$          | –    | 45              | –    | Hz            |
| High frequency roll-off               | -1 dB                              | $f_H$          | 20   | –               | –    | kHz           |
| Closed loop voltage gain              |                                    | $G_V$          | 25   | 26              | 27   | dB            |
| Supply voltage ripple rejection       | note 4                             |                |      |                 |      |               |
| ON                                    |                                    | RR             | 48   | –               | –    | dB            |
| mute                                  |                                    | RR             | 48   | –               | –    | dB            |
| stand-by                              |                                    | RR             | 80   | –               | –    | dB            |
| Input impedance                       |                                    | $ Z_{il} $     | 25   | 30              | 38   | k $\Omega$    |
| Noise output voltage                  |                                    |                |      |                 |      |               |
| (RMS value)                           |                                    |                |      |                 |      |               |
| ON                                    | $R_S = 0\ \Omega$ ; note 5         | $V_{no(rms)}$  | –    | 70              | –    | $\mu\text{V}$ |
| ON                                    | $R_S = 10\text{ k}\Omega$ ; note 5 | $V_{no(rms)}$  | –    | 100             | 200  | $\mu\text{V}$ |
| mute                                  | notes 5 and 6                      | $V_{no(rms)}$  | –    | 60              | –    | $\mu\text{V}$ |
| Channel separation                    | $R_S = 10\text{ k}\Omega$          | $\alpha$       | 40   | –               | –    | dB            |
| Channel unbalance                     |                                    | $ \Delta G_V $ | –    | –               | 1    | dB            |

# 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

| PARAMETER                            | CONDITIONS                         | SYMBOL         | MIN. | TYP. | MAX. | UNIT          |
|--------------------------------------|------------------------------------|----------------|------|------|------|---------------|
| <b>Quad single-ended application</b> |                                    |                |      |      |      |               |
| Output power                         | note 7                             |                |      |      |      |               |
|                                      | THD = 0.5%                         | $P_o$          | 4    | 5    | –    | W             |
|                                      | THD = 10%                          | $P_o$          | 5.5  | 6    | –    | W             |
| Output power at $R_L = 2\text{ W}$   | note 7                             |                |      |      |      |               |
|                                      | THD = 0.5%                         | $P_o$          | 7.5  | 8.5  | –    | W             |
|                                      | THD = 10%                          | $P_o$          | 10   | 11   | –    | W             |
| Total harmonic distortion            | $P_o = 1\text{ W}$                 | THD            | –    | 0.1  | –    | %             |
| Low frequency roll-off               | note 3                             |                |      |      |      |               |
|                                      | –3 dB                              | $f_L$          | –    | 45   | –    | Hz            |
| High frequency roll-off              | –1 dB                              | $f_H$          | 20   | –    | –    | kHz           |
| Closed loop voltage gain             |                                    | $G_v$          | 19   | 20   | 21   | dB            |
| Supply voltage ripple rejection      | note 4                             |                |      |      |      |               |
| 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<br>(RMS value)  |                                    |                |      |      |      |               |
| ON                                   | $R_S = 0\text{ }\Omega$ ; note 5   | $V_{no(rms)}$  | –    | 50   | –    | $\mu\text{V}$ |
| ON                                   | $R_S = 10\text{ k}\Omega$ ; note 5 | $V_{no(rms)}$  | –    | 70   | 100  | $\mu\text{V}$ |
| mute                                 | notes 5 and 6                      | $V_{no(rms)}$  | –    | 50   | –    | $\mu\text{V}$ |
| Channel separation                   | $R_S = 10\text{ k}\Omega$          | $\alpha$       | 40   | –    | –    | dB            |
| Channel unbalance                    |                                    | $ \Delta G_v $ | –    | –    | 1    | dB            |

## Notes to the characteristics

1. The circuit is DC adjusted at  $V_P = 6\text{ V}$  to  $18\text{ V}$  and AC operating at  $V_P = 8.5\text{ V}$  to  $18\text{ V}$ .
2. At  $18\text{ V} < V_P < 30\text{ V}$  the DC output voltage  $\leq V_P/2$ .
3. Frequency response externally fixed.
4. Ripple rejection measured at the output with a source impedance of  $0\text{ }\Omega$  (maximum ripple amplitude of  $2\text{ V}$ ) and a frequency between  $100\text{ Hz}$  and  $10\text{ kHz}$ .
5. Noise voltage measured in a bandwidth of  $20\text{ Hz}$  to  $20\text{ kHz}$ .
6. Noise output voltage independent of  $R_S$  ( $V_i = 0\text{ V}$ ).
7. Output power is measured directly at the output pins of the IC.

# 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

## APPLICATION INFORMATION

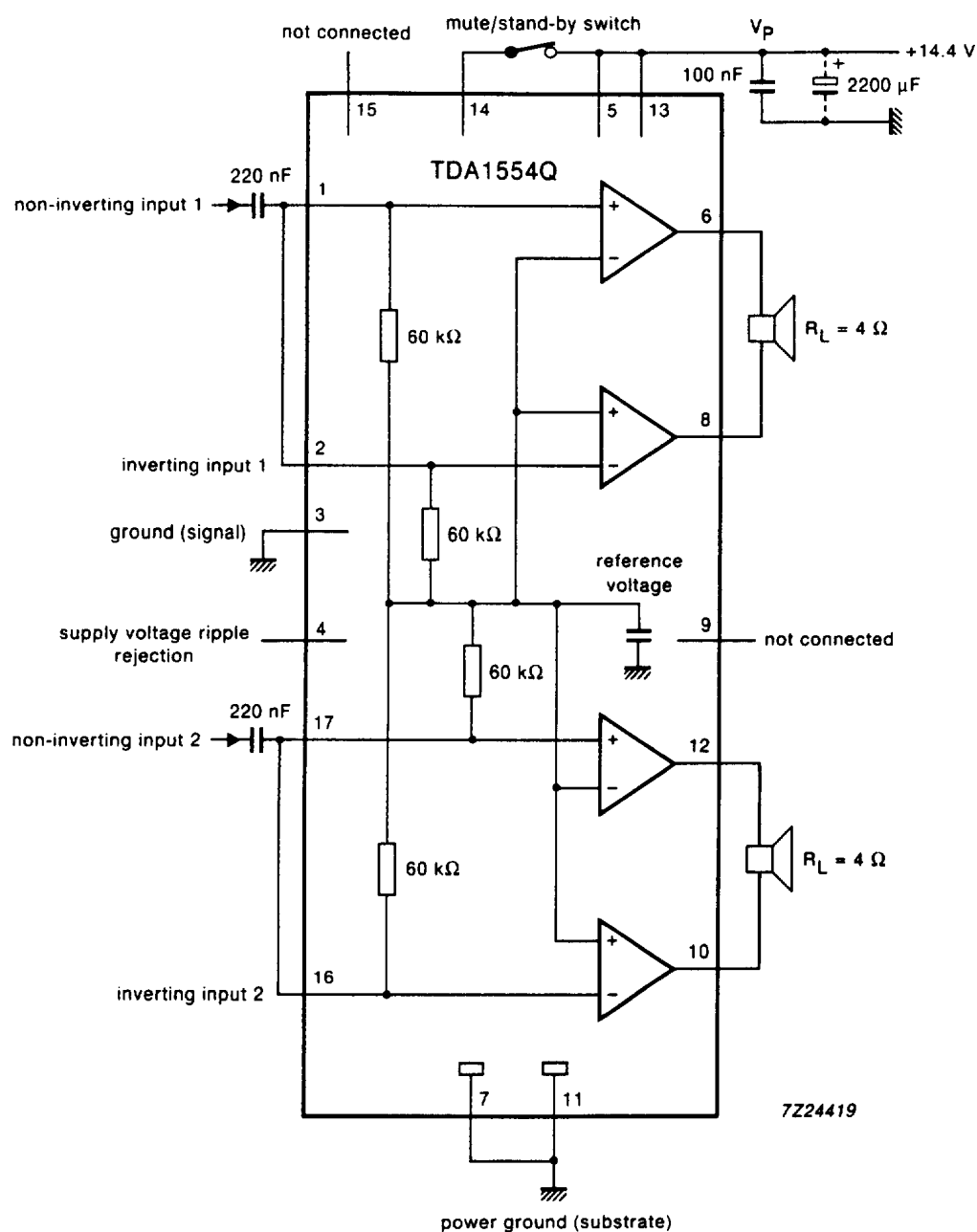


Fig.3 Stereo BTL application circuit diagram.

# 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

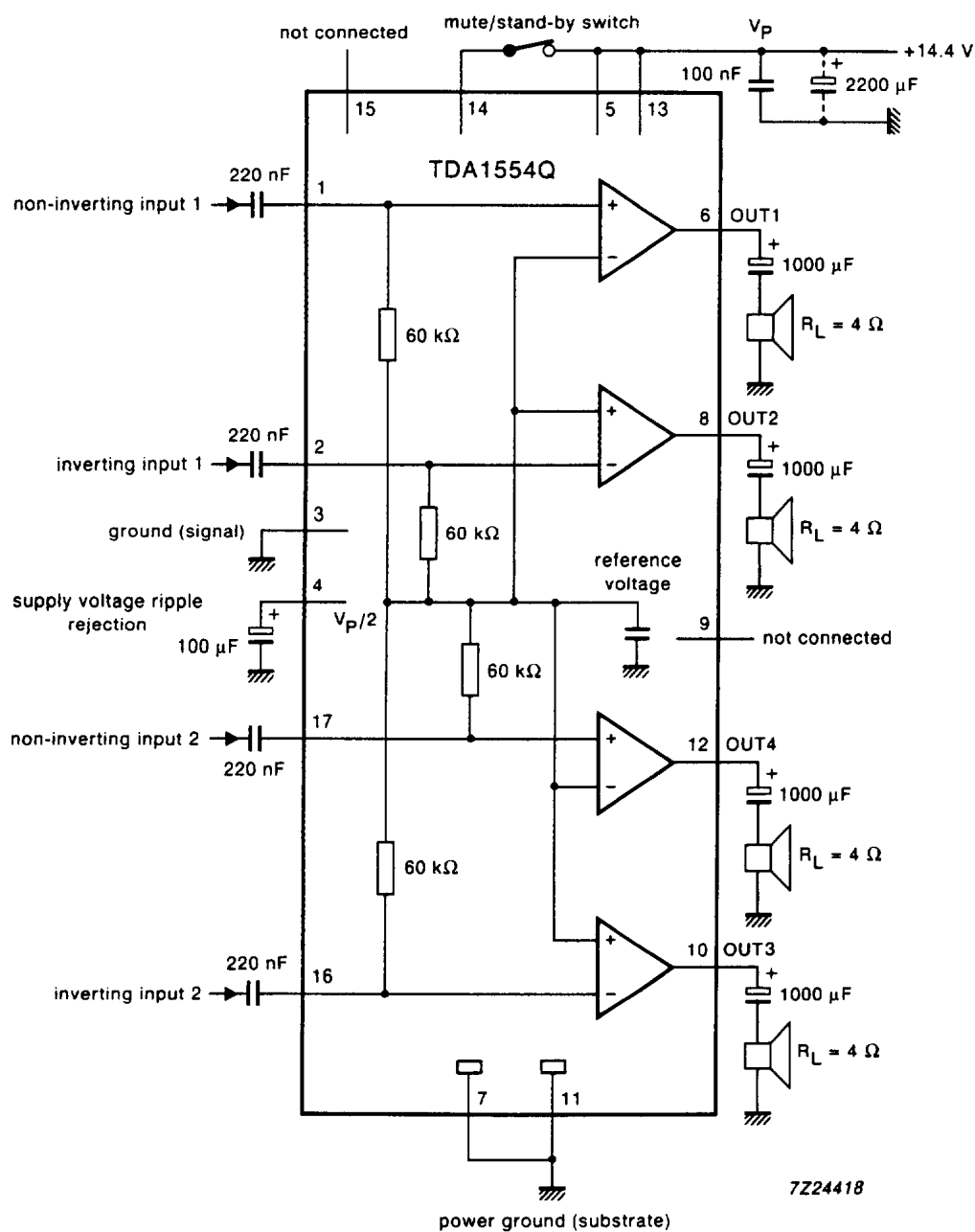


Fig.4 Quad single-ended application circuit diagram.

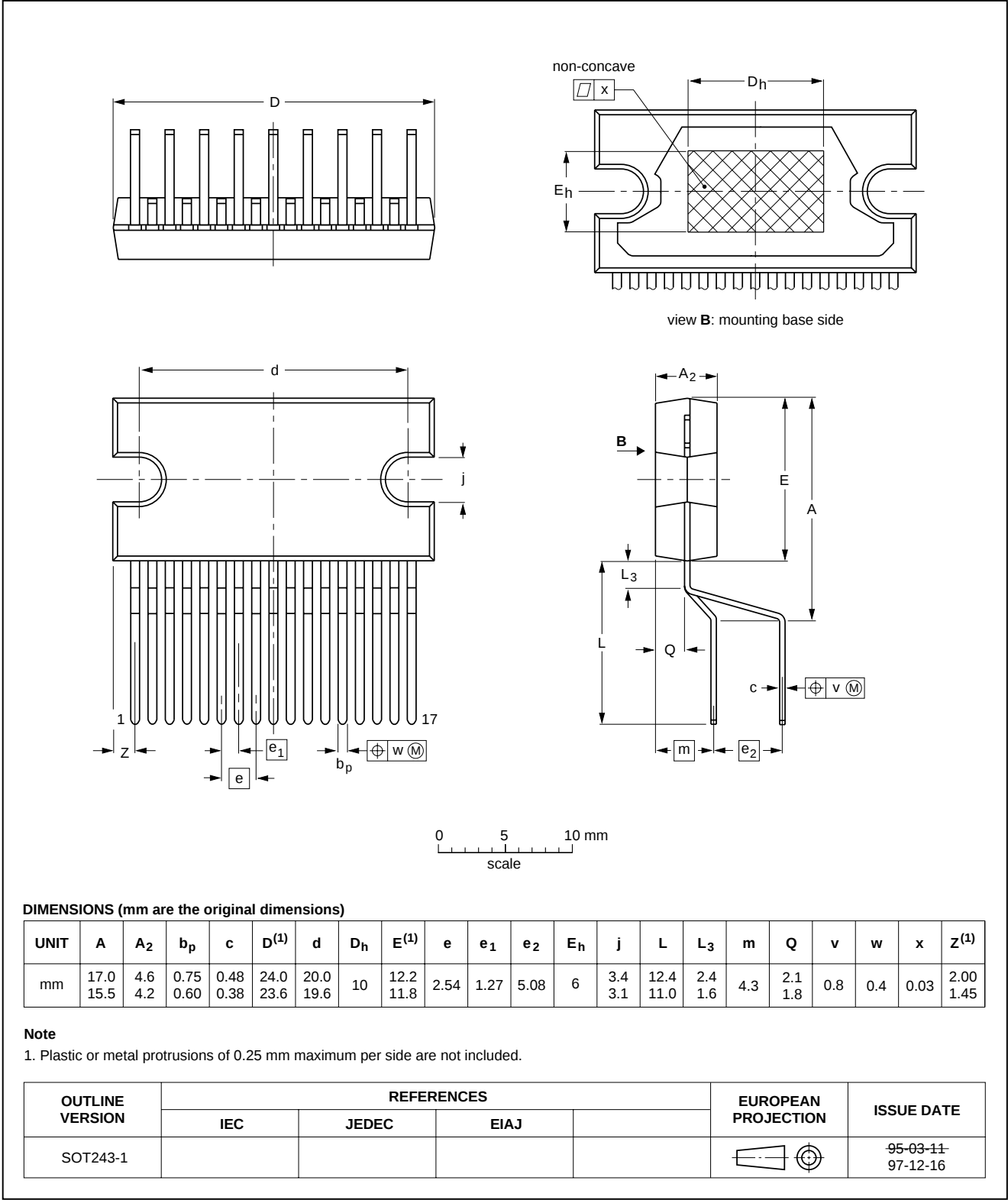
4 x 11 W single-ended or 2 x 22 W power  
amplifier

TDA1554Q

PACKAGE OUTLINE

DBS17P: plastic DIL-bent-SIL power package; 17 leads (lead length 12 mm)

SOT243-1



## 4 x 11 W single-ended or 2 x 22 W power amplifier

TDA1554Q

### 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

| 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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