

DATA SHEET

TDA1558Q

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

Product specification
File under Integrated Circuits, IC01

May 1992

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

TDA1558Q

FEATURES

- Requires very few external components
- Flexibility in use Quad single-ended or stereo BTL
- High output power
- Low offset voltage at output (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 ($V_P = 0$)
- Protected against electrostatic discharge
- No switch-on/switch-off plop
- Flexible leads
- Low thermal resistance
- Identical inputs (inverting and non-inverting).

GENERAL DESCRIPTION

The TDA1558Q is a monolithic integrated class-B output amplifier in a 17-lead single-in-line (SIL) plastic power package. The device contains 4 x 11 W single-ended or 2 x 22 W BTL amplifiers and has been primarily developed for car radio applications.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|---------------------------------|-----------------------|------|------|------|------------|
| V_P | positive supply voltage range | operating | 6.0 | 14.4 | 18 | V |
| I_{ORM} | repetitive peak output current | | – | – | 4 | A |
| I_{tot} | total quiescent current | | – | 80 | – | mA |
| I_{sb} | stand-by current | | – | 0.1 | 100 | μ A |
| Stereo BTL application | | | | | | |
| P_O | output power | THD = 10%; 4 Ω | – | 22 | – | W |
| SVRR | supply voltage ripple rejection | | 45 | – | – | dB |
| V_{no} | noise output voltage | $R_S = 0$ | – | 200 | – | μ V |
| $ Z_i $ | input impedance | | 25 | – | – | k Ω |
| $ \Delta V_{os} $ | DC output offset voltage | | – | – | 250 | mV |
| G_v | closed loop voltage gain | | 45 | 46 | 47 | dB |
| Quad single-ended application | | | | | | |
| P_O | output power | THD = 10%; 4 Ω | – | 6 | – | W |
| | | THD = 10%; 2 Ω | – | 11 | – | W |
| SVRR | supply voltage ripple rejection | | 44 | – | – | dB |
| V_{no} | noise output voltage | $R_S = 0$ | – | 150 | – | μ V |
| $ Z_i $ | input impedance | | 50 | – | – | k Ω |
| G_v | closed loop voltage gain | | 39 | 40 | 41 | dB |

ORDERING INFORMATION

| EXTENDED TYPE NUMBER | PACKAGE | | | |
|----------------------|---------|--------------|----------|------------------------|
| | PINS | PIN POSITION | MATERIAL | CODE |
| TDA1558Q | 17 | DIL | plastic | SOT243R ⁽¹⁾ |

Note

1. SOT243-1; 1996 August 21.

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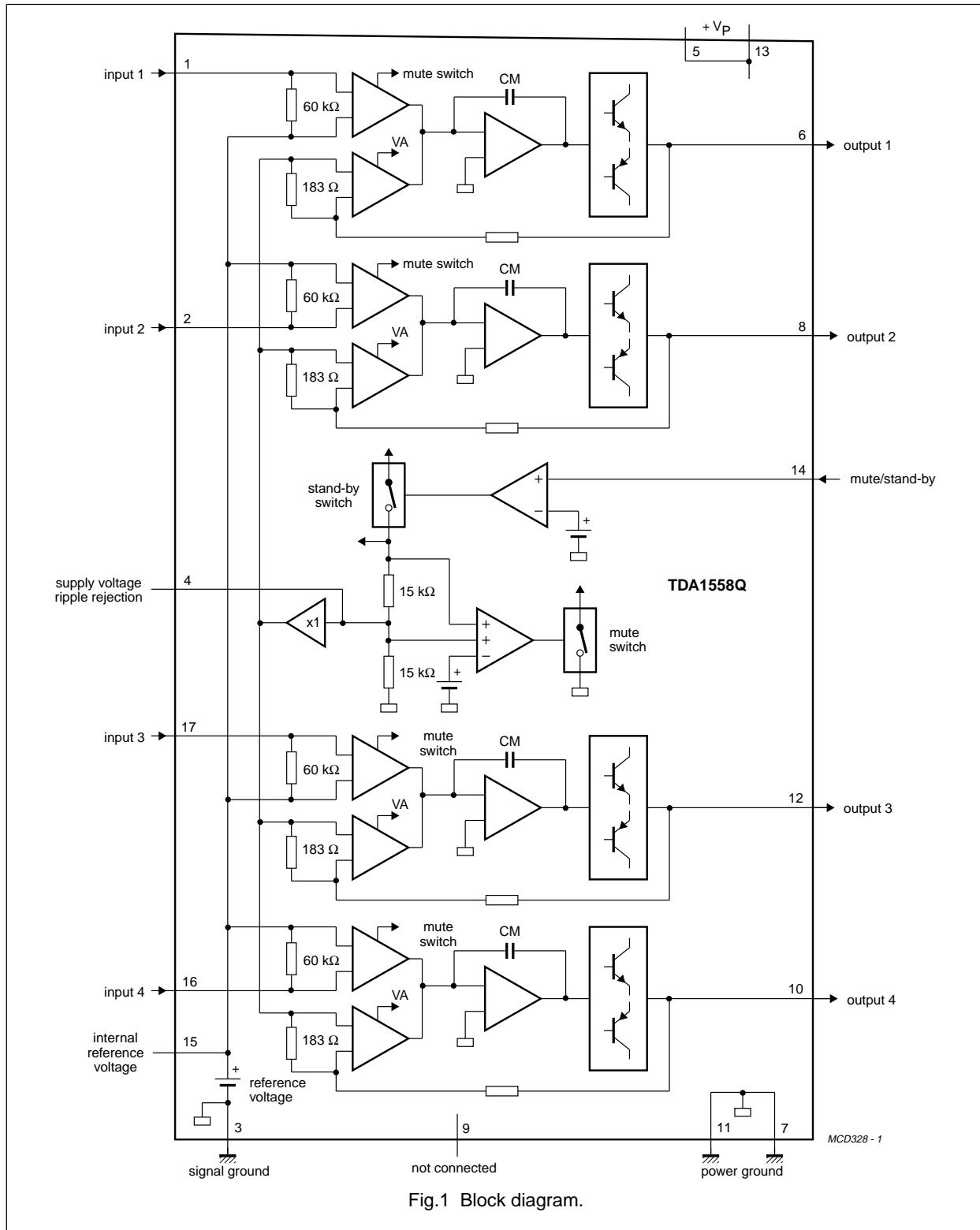


Fig.1 Block diagram.

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

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PINNING

| SYMBOL | PIN | DESCRIPTION |
|------------------|-----|---------------------------------|
| -INV1 | 1 | non-inverting input 1 |
| INV2 | 2 | inverting input 2 |
| GND | 3 | ground (signal) |
| SVRR | 4 | supply voltage ripple rejection |
| V _{P1} | 5 | supply voltage |
| OUT1 | 6 | output 1 |
| GND1 | 7 | power ground 1 |
| OUT2 | 8 | output 2 |
| n.c. | 9 | not connected |
| OUT4 | 10 | output 4 |
| GND2 | 11 | power ground 2 |
| OUT3 | 12 | output 3 |
| V _{P2} | 13 | supply voltage |
| M/SS | 14 | mute/stand-by switch |
| V _{ref} | 15 | internal reference voltage |
| INV3 | 16 | inverting input 3 |
| -INV4 | 17 | non-inverting input 4 |

FUNCTIONAL DESCRIPTION

The TDA1558Q contains four identical amplifiers with differential input stages (two inverting and two non-inverting), and can be used for single-ended or BTL applications. The gain of each amplifier is fixed at 40 dB (46 dB in BTL). Special features of this device are:

a. mute/stand-by switch

- low stand-by current (< 100 μ A)
- low mute/stand-by switching current (low cost supply switch)
- mute facility.

b. the harmonic distortion at low frequencies can be decreased by connecting two diodes at pin 15 to ground or a zener diode of 1.5 V.

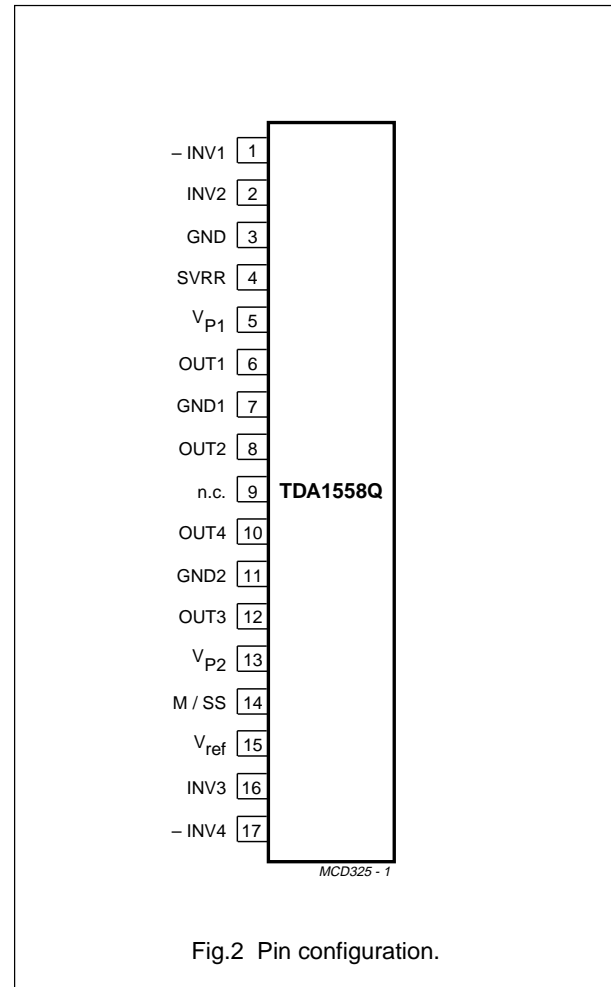


Fig.2 Pin configuration.

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

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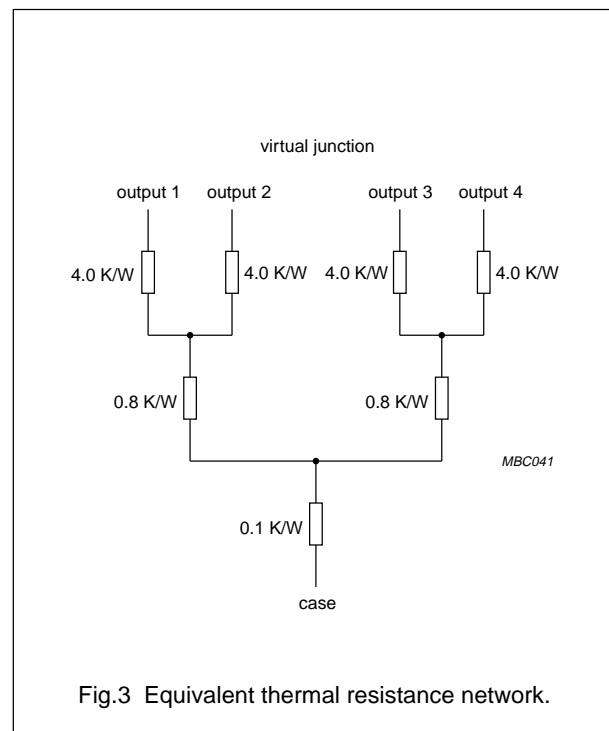
LIMITING VALUES

In accordance with the Absolute maximum System (IEC 134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|---------------------------------------|--|------|------|------|
| V_P | positive supply voltage | operating | – | 18 | V |
| | | non-operating | – | 30 | V |
| | | load dump protected; during 50 ms; rise time ≥ 2.5 ms | – | 45 | V |
| V_{PSC} | AC and DC short-circuit safe voltage | | – | 18 | V |
| V_{PR} | reverse polarity | | – | 6 | V |
| | energy handling capability at outputs | $V_P = 0$ | – | 200 | mJ |
| I_{OSM} | non-repetitive peak output current | | – | 6 | A |
| I_{ORM} | repetitive peak output current | | – | 4 | A |
| P_{tot} | total power dissipation | | – | 60 | W |
| T_{stg} | storage temperature range | | –55 | +150 | °C |
| T_j | junction temperature | | – | +150 | °C |

THERMAL RESISTANCE

| SYMBOL | PARAMETER | THERMAL RESISTANCE |
|----------------|--|--------------------|
| $R_{th\ vj-a}$ | from virtual junction to ambient in free air | 40 K/W |
| $R_{th\ vj-c}$ | from virtual junction to case (see Fig.3) | 1.5 K/W |



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DC CHARACTERISTICS

$V_P = 14.4$ V, $T_{amb} = 25$ °C, unless otherwise specified. See note 1.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------------------------|----------------------------------|---------------------------------|------|------|------|------|
| Supply | | | | | | |
| V_P | positive supply voltage range | note 2 | 6.0 | 14.4 | 18 | V |
| I_P | quiescent current | | – | 80 | 160 | mA |
| V_O | DC output voltage | note 3 | – | 6.9 | – | V |
| $ \Delta V_{os} $ | DC output offset voltage | | – | – | 250 | mV |
| Mute/stand-by switch | | | | | | |
| V_{ON} | switch-on voltage level | | 8.5 | – | – | V |
| MUTE CONDITION | | | | | | |
| V_{mute} | mute voltage | | 3.3 | – | 6.4 | V |
| V_O | output signal in mute position | $V_I = 1$ V (max); $f = 1$ kHz | – | – | 20 | mV |
| $ \Delta V_{os} $ | DC output offset voltage | between pins 6-8 and pins 10-12 | – | – | 250 | mV |
| STAND-BY CONDITION | | | | | | |
| V_{sb} | stand-by voltage | | 0 | – | 2 | V |
| I_{sb} | DC current in stand-by condition | | – | – | 100 | μA |
| I_{sw} | switch-on current | | – | 12 | 40 | μA |

AC CHARACTERISTICS

$V_P = 14.4$ V, $R_L = 4$ Ω, $f = 1$ kHz, $T_{amb} = 25$ °C, unless otherwise specified. See note 1.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|------------|---------------------------------|--|------|--------------|------|------|
| P_O | output power | THD = 0.5% | 15 | 17 | – | W |
| | | THD = 10% | 20 | 22 | – | W |
| | | $V_P = 13.2$ V; THD = 0.5% | – | 12 | – | W |
| | | $V_P = 13.2$ V; THD = 10% | – | 17 | – | W |
| THD | total harmonic distortion | $P_O = 1$ W | – | 0.1 | – | % |
| B | power bandwidth | THD = 0.5%; $P_O = -1$ dB with respect to 15 W | – | 20 to 15 000 | – | Hz |
| f_{low} | low frequency roll-off | -1 dB; note 4 | – | 45 | – | Hz |
| f_{high} | high frequency roll-off | -1 dB | 20 | – | – | kHz |
| G_v | closed loop voltage gain | | 45 | 46 | 47 | dB |
| SVRR | supply voltage ripple rejection | ON; note 5 | 45 | – | – | dB |
| | | MUTE; note 5 | 45 | – | – | dB |
| | | stand-by; note 5 | 80 | – | – | dB |

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| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--|---------------------------------|---------------------------------|------|------|------|------------|
| $ Z_i $ | input impedance | | 25 | 30 | 38 | k Ω |
| V_{no} | noise output voltage | ON; $R_S = 0$; note 6 | – | 200 | 300 | μ V |
| | | $R_S = 10$ k Ω ; note 6 | – | 350 | – | μ V |
| | | MUTE; notes 6 and 7 | – | 180 | – | μ V |
| α | channel separation | $R_S = 10$ k Ω | 40 | – | – | dB |
| $ \Delta G_v $ | channel unbalance | | – | – | 1 | dB |
| Quad single-ended application (see Fig.5) | | | | | | |
| P_O | output power | note 8 | | | | |
| | | THD = 0.5% | 4 | 5 | – | W |
| | | THD = 10% | 5.5 | 6 | – | W |
| | | $R_L = 2$ Ω ; THD = 0.5% | 7.5 | 8.5 | – | W |
| | | $R_L = 2$ Ω ; THD = 10% | 10 | 11 | – | W |
| THD | total harmonic distortion | $P_O = 1$ W | – | 0.1 | – | % |
| f_{low} | low frequency roll-off | –3 dB; note 4 | – | 45 | – | Hz |
| f_{high} | high frequency roll-off | –1 dB | 20 | – | – | kHz |
| G_v | closed loop voltage gain | | 39 | 40 | 41 | dB |
| SVRR | supply voltage ripple rejection | note 5 | | | | |
| | | ON | 44 | – | – | dB |
| | | MUTE | 44 | – | – | dB |
| | | stand-by | 80 | – | – | dB |
| $ Z_i $ | input impedance | | 50 | 60 | 75 | k Ω |
| V_{no} | noise output voltage | ON; $R_S = 0$; note 6 | – | 150 | 230 | μ V |
| | | $R_S = 10$ k Ω ; note 6 | – | 250 | – | μ V |
| | | MUTE; notes 6 and 7 | – | 120 | – | μ V |
| α | channel separation | $R_S = 10$ k Ω | 40 | – | – | dB |
| $ \Delta G_v $ | channel unbalance | | – | – | 1 | dB |

Notes to the characteristics

- All characteristics are measured using the circuit shown in Fig.4
- The circuit is DC adjusted at $V_P = 6$ to 18 V and AC operating at $V_P = 8.5$ to 18 V.
- At 18 V < V_P < 30 V, the DC output voltage $\leq V_P/2$.
- Frequency response externally fixed.
- Ripple rejection measured at the output with a source-impedance of 0 Ω (max. ripple amplitude of 2 V) and a frequency between 100 Hz and 10 kHz.
- Noise voltage measured in a bandwidth of 20 Hz to 20 kHz.
- Noise output voltage independent of R_S ($V_{in} = 0$).
- Output power is measured directly at the output pins of the IC.

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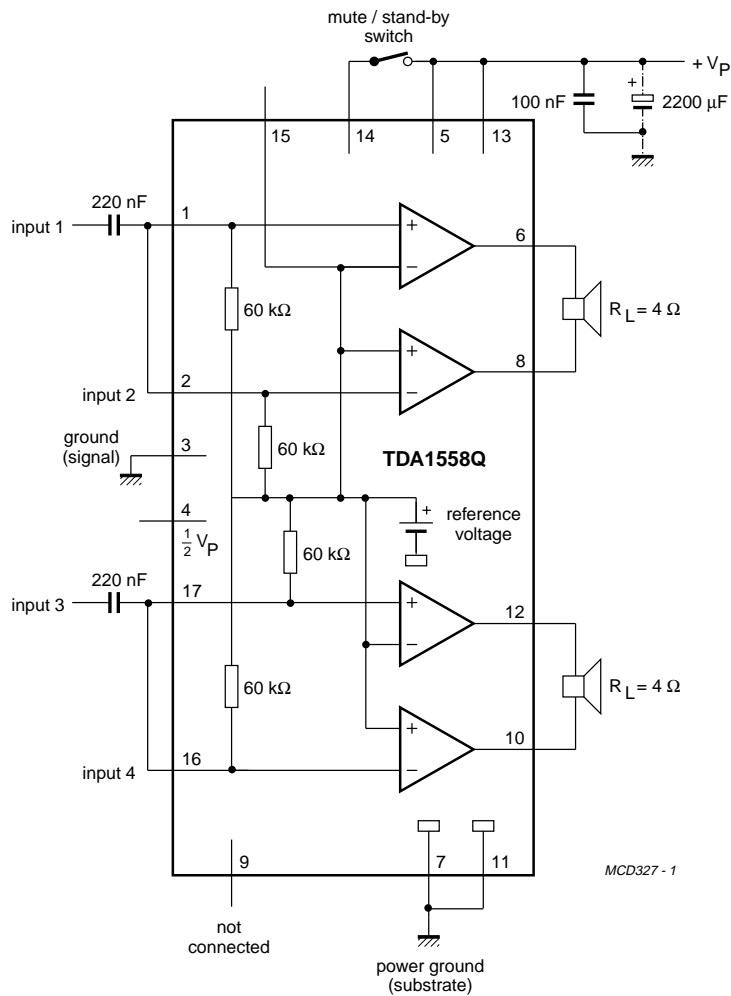


Fig.4 Stereo BTL application.

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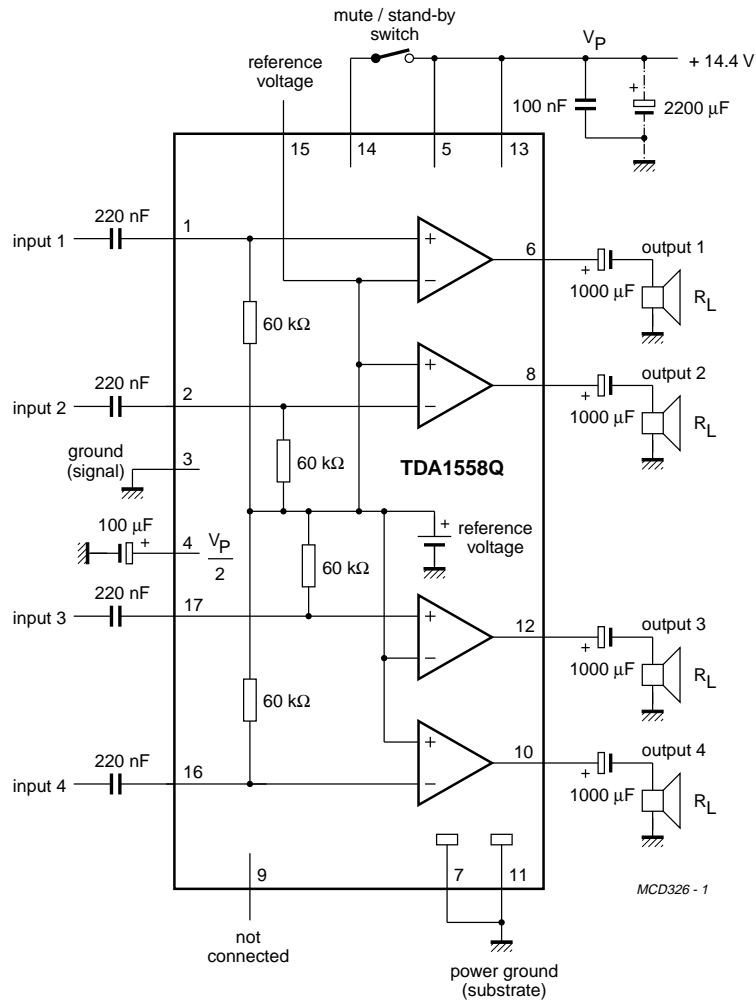


Fig.5 Quad single-ended application.

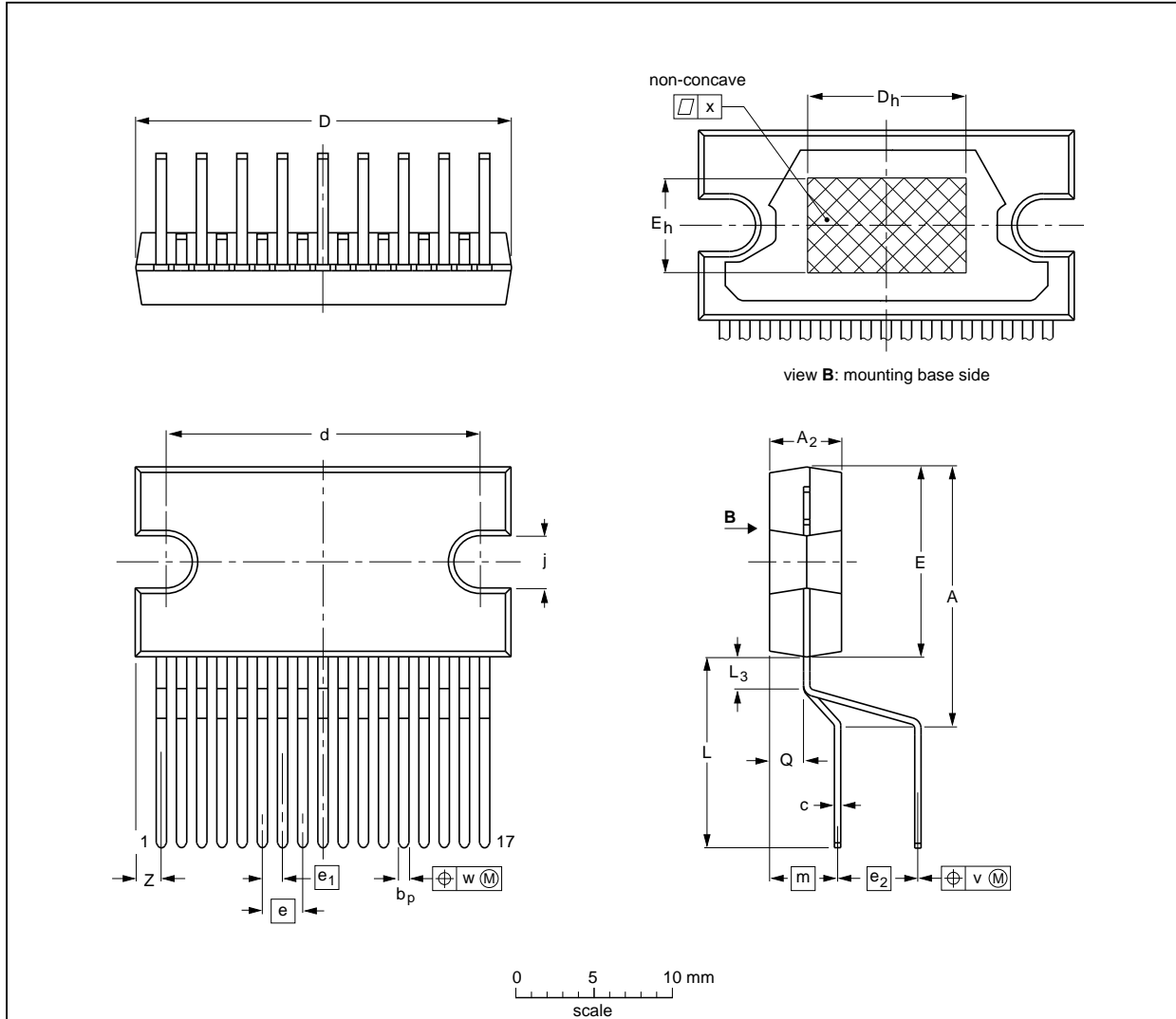
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PACKAGE OUTLINE

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

SOT243-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₂ | b _p | c | D ⁽¹⁾ | d | D _h | E ⁽¹⁾ | e | e ₁ | e ₂ | E _h | j | L | L ₃ | m | Q | v | w | x | Z ⁽¹⁾ |
|------|--------------|----------------|----------------|--------------|------------------|--------------|----------------|------------------|------|----------------|----------------|----------------|------------|--------------|----------------|-----|------------|-----|-----|------|------------------|
| mm | 17.0 15.5 | 4.6 4.2 | 0.75 0.60 | 0.48 0.38 | 24.0 23.6 | 20.0 19.6 | 10 | 12.2 11.8 | 2.54 | 1.27 | 5.08 | 6 | 3.4 3.1 | 12.4 11.0 | 2.4 1.6 | 4.3 | 2.1 1.8 | 0.8 | 0.4 | 0.03 | 2.00 1.45 |

Note

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT243-1 | | | | | | 92-11-17 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

| 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. | |

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