

DATA SHEET

TDA8562Q

4 x 12 W single-ended car radio
power amplifier with dynamic
distortion detector and diagnostic
interface

Product specification
File under Integrated Circuits, IC01

July 1994

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

FEATURES

- Requires very few external components
- High output power
- Fixed gain
- Diagnostic facility (distortion, short-circuit and temperature detection)
- Good ripple rejection
- Mode select switch (operating, mute and stand-by)
- Load dump protection
- AC and DC short-circuit safe to ground and to V_P
- Low power dissipation in any short-circuit condition

- Thermally protected
- Reverse polarity safe
- Electrostatic discharge protection
- No switch-on/switch-off pop
- Flexible leads
- Low thermal resistance
- Identical inputs.

GENERAL DESCRIPTION

The TDA8562Q is an integrated class-B output amplifier in a 17-lead single-in-line (SIL) power package. It contains 4 × 12 W single-ended amplifiers.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------|-----------------------------------|------------------|------|------|------|------------|
| V_P | positive operating supply voltage | | 6 | 14.4 | 18 | V |
| I_{ORM} | repetitive peak output current | | – | – | 4 | A |
| I_P | total quiescent current | | – | 80 | – | mA |
| I_{sb} | stand-by current | | – | 0.1 | 100 | μ A |
| P_o | output power | THD = 10% | | | | |
| | | 4 Ω | – | 7 | – | W |
| | | 2 Ω | – | 12 | – | W |
| RR | supply voltage ripple rejection | | 48 | – | – | dB |
| V_{no} | noise output voltage | $R_s = 0 \Omega$ | – | 50 | – | μ V |
| $ Z_i $ | input impedance | | 50 | – | – | k Ω |

ORDERING INFORMATION

| EXTENDED TYPE NUMBER | PACKAGE | | | |
|-------------------------|---------|--------------|----------|---------|
| | PINS | PIN POSITION | MATERIAL | CODE |
| TDA8562Q ⁽¹⁾ | 17 | DBS | plastic | SOT243R |

Note

1. SOT243-1; 1996 August 21.

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

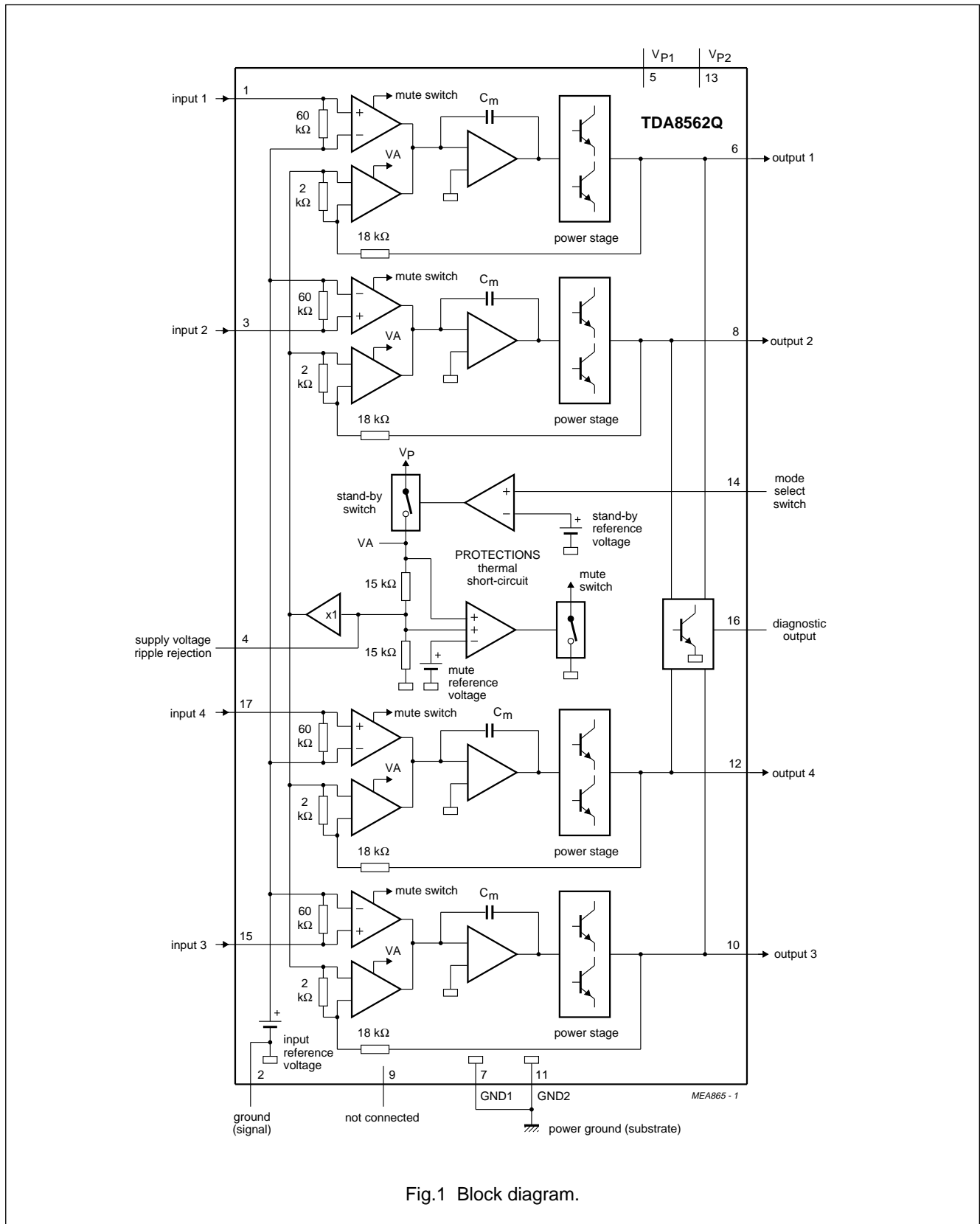


Fig.1 Block diagram.

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

PINNING

| SYMBOL | PIN | DESCRIPTION |
|-------------------|-----|---------------------------------|
| IN 1 | 1 | input 1 |
| GND(S) | 2 | signal ground |
| IN 2 | 3 | input 2 |
| RR | 4 | supply voltage ripple rejection |
| V _{P1} | 5 | supply voltage |
| OUT 1 | 6 | output 1 |
| GND1 | 7 | power ground 1 |
| OUT 2 | 8 | output 2 |
| n.c. | 9 | not connected |
| OUT 3 | 10 | output 3 |
| GND2 | 11 | power ground 2 |
| OUT 4 | 12 | output 4 |
| V _{P2} | 13 | supply voltage |
| MODE | 14 | mode select switch input |
| IN 3 | 15 | input 3 |
| V _{DIAG} | 16 | diagnostic output |
| IN 4 | 17 | input 4 |

The device is primarily developed for car radio applications.

FUNCTIONAL DESCRIPTION

The TDA8562Q contains four identical amplifiers and can be used for single-ended applications. The gain of each amplifier is fixed at 20 dB. Special features of the device are:

Mode select switch (pin 14)

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

To avoid switch-on plops, it is advised to keep the amplifier in the mute mode during ≥ 100 ms (charging of the input capacitors at pin 1, 3, 15 and pin 17).

This can be achieved by:

- microprocessor control
- external timing circuit (see Fig.7)

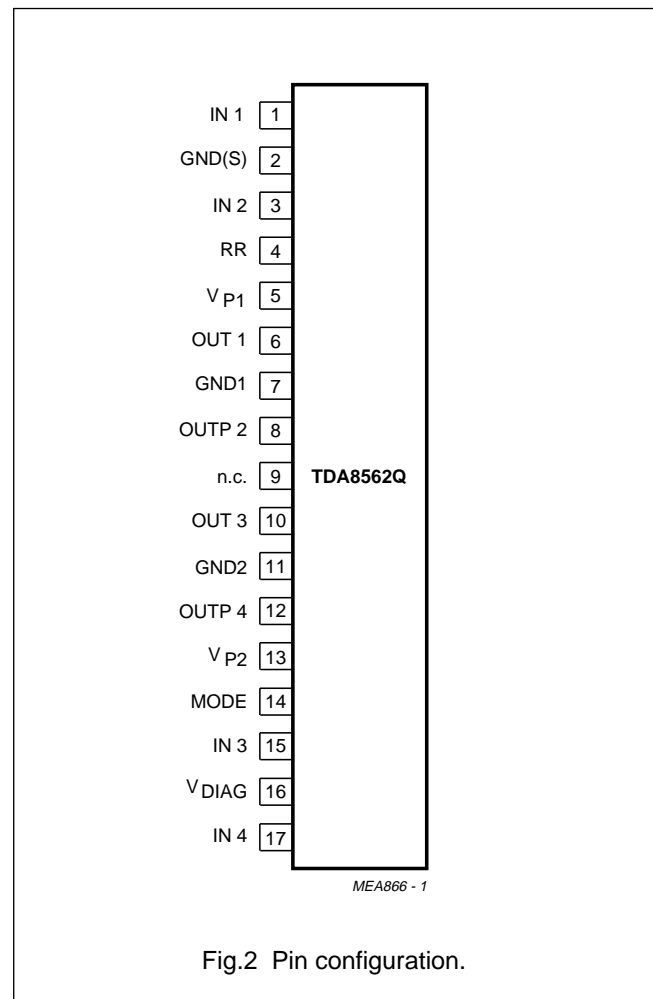


Fig.2 Pin configuration.

Diagnostic output (pin 16)

DYNAMIC DISTORTION DETECTOR (DDD)

At the onset of clipping of one or more output stages, the dynamic distortion detector becomes active and pin 16 goes low. This information can be used to drive a sound processor or DC volume control to attenuate the input signal and thus limit the distortion. The output level of pin 16 is independent of the number of channels that are clipping (see Fig.3).

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

SHORT-CIRCUIT PROTECTION

When a short-circuit occurs at one or more outputs to ground or to the supply voltage, the output stages are switched off until the short-circuit is removed and the device is switched on again, with a delay of approximately 20 ms, after removal of the short-circuit. During this short-circuit condition, pin 16 is continuously low.

When a short-circuit across the load of one or more channels occurs the output stages are switched off during approximately 20 ms. After that time it is checked during approximately 50 μ s to see whether the short-circuit is still present. Due to this duty cycle of 50 μ s/20 ms the average current consumption during this short-circuit condition is very low (approximately 40 mA).

During this short-circuit condition, pin 16 is low for 20 ms and high for 50 μ s (see Fig.4).

The power dissipation in any short-circuit condition is very low.

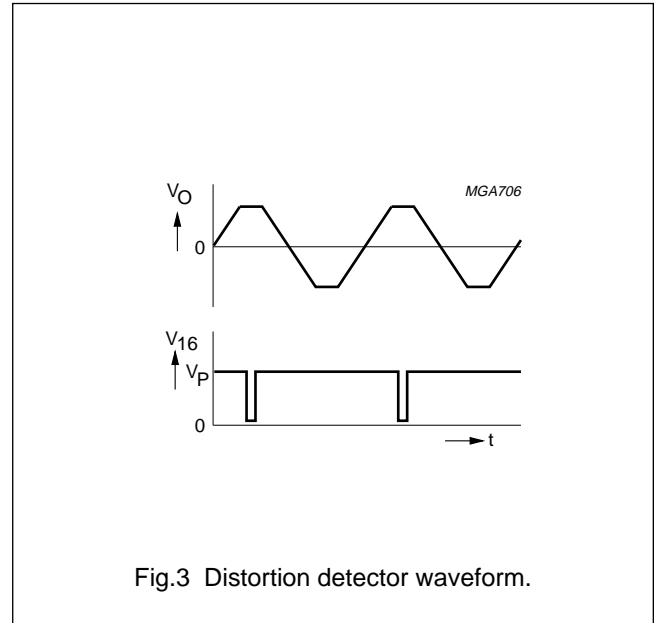


Fig.3 Distortion detector waveform.

TEMPERATURE DETECTION

When the virtual junction temperature T_{vj} reaches 150 $^{\circ}$ C, pin 16 will be active LOW.

OPEN COLLECTOR OUTPUT

Pin 16 is an open collector output, which allows pin 16 of more devices being tied together.

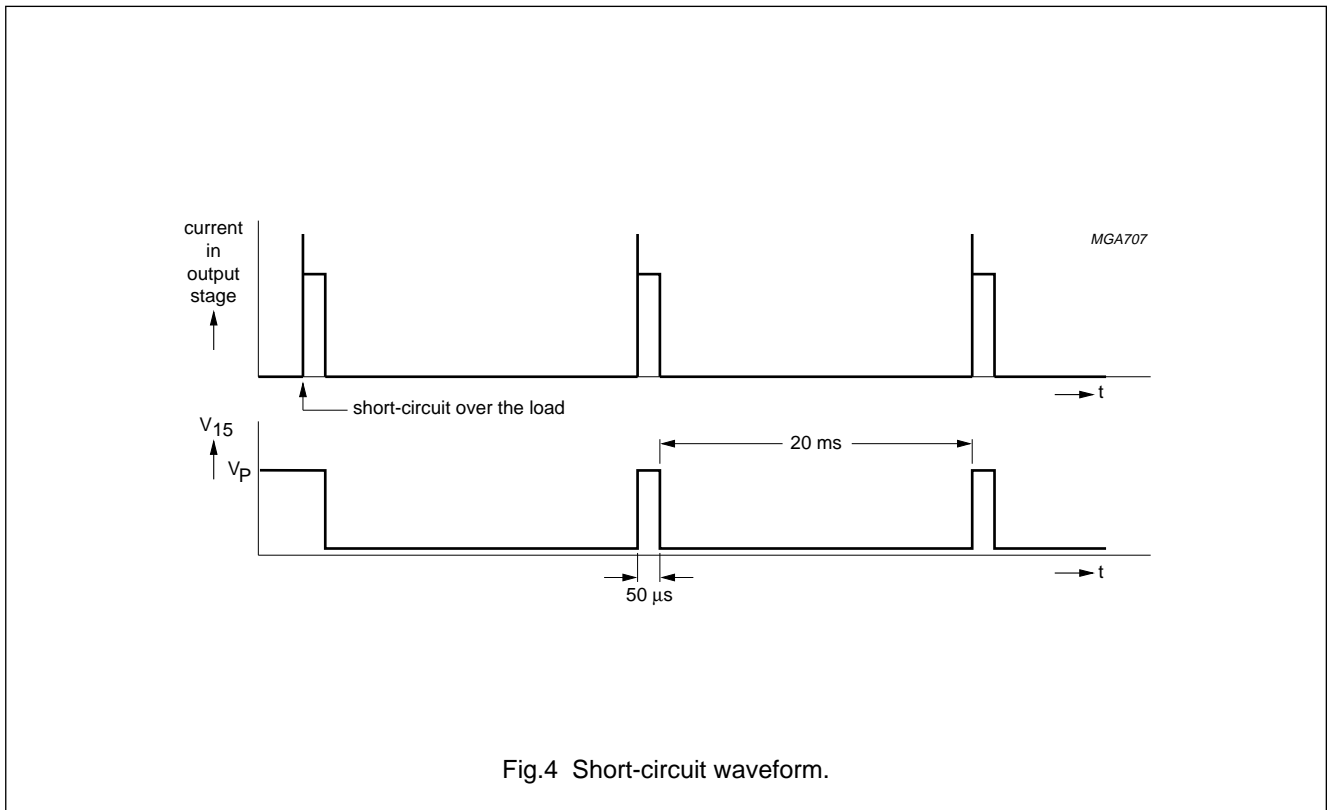


Fig.4 Short-circuit waveform.

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

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 protection | during 50 ms; t _r ≥ 2.5 ms | – | 45 | V |
| I _{OSM} | non-repetitive peak output current | | – | 6 | A |
| I _{ORM} | repetitive peak output current | | – | 4 | A |
| T _{stg} | storage temperature | | –55 | +150 | °C |
| T _{amb} | operating ambient temperature | | –40 | +85 | °C |
| T _{vj} | virtual junction temperature | | – | 150 | °C |
| V _{psc} | AC and DC short-circuit safe voltage | | – | 18 | V |
| V _{pr} | reverse polarity | | – | 6 | V |
| P _{tot} | total power dissipation | | – | 60 | W |

THERMAL RESISTANCE

In accordance with IEC 747-1.

| SYMBOL | PARAMETER | THERMAL RESISTANCE |
|---------------------|--------------------------------------|--------------------|
| R _{th j-a} | from junction to ambient in free air | 40 K/W |
| R _{th j-c} | from junction to case (see Fig.5) | 1.3 K/W |

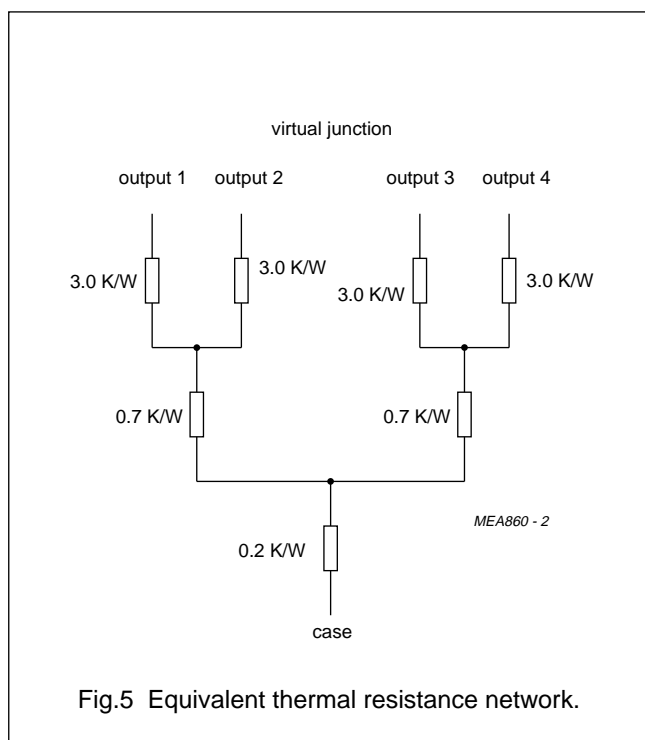


Fig.5 Equivalent thermal resistance network.

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

DC CHARACTERISTICS

$V_P = 14.4$ V; $T_{amb} = 25$ °C; measured in Fig.6; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------------------------------|---------------------------------|----------------------------------|------|------|------|------|
| Supply | | | | | | |
| V_P | positive supply voltage | note 1 | 6 | 14.4 | 18 | V |
| I_P | quiescent current | | – | 80 | 160 | mA |
| V_O | DC output voltage | note 2 | – | 6.9 | – | V |
| Mute select switch | | | | | | |
| V_{on} | switch-on voltage level | | 8.5 | – | – | V |
| MUTE CONDITION | | | | | | |
| V_{mute} | mute voltage | | 3.3 | – | 6.4 | V |
| V_O | output voltage in mute position | $V_{I_{max}} = 1$ V; $f = 1$ kHz | – | – | 2 | mV |
| STAND-BY CONDITION | | | | | | |
| V_{sb} | stand-by voltage | | 0 | – | 2 | V |
| I_{sb} | stand-by current | | – | – | 100 | μA |
| I_{sw} | switch-on current | | – | 12 | 40 | μA |
| Diagnostic output (pin 16) | | | | | | |
| V_{DIAG} | diagnostic output voltage | any short-circuit or clipping | – | – | 0.6 | V |

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

AC CHARACTERISTICS

$V_P = 14.4$ V; $R_L = 4$ Ω ; $f = 1$ kHz; $T_{amb} = 25$ °C; measured in Fig.6; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|------------------------------------|---------------------------------|--|------|------|------|------------|
| P_O | output power | note 3 | | | | |
| | | THD = 0.5% | 4 | 5 | – | W |
| | | THD = 10% | 5.5 | 7 | – | W |
| THD | total harmonic distortion | $P_O = 1$ W | – | 0.1 | – | % |
| P_O | output power | $R_L = 2$ Ω ; note 3 | | | | |
| | | THD = 0.5% | – | 10 | – | W |
| | | THD = 10% | – | 12 | – | W |
| f_l | low frequency roll-off | at –3 dB; note 4 | – | 45 | – | Hz |
| f_h | high frequency roll-off | at –1 dB | 20 | – | – | kHz |
| G_v | closed loop voltage gain | | 19 | 20 | 21 | dB |
| RR | supply voltage ripple rejection | note 5 | | | | |
| | on | | 48 | – | – | dB |
| | mute | | 48 | – | – | dB |
| | stand-by | | 80 | – | – | dB |
| $ Z_i $ | input impedance | | 50 | 60 | 75 | k Ω |
| V_{no} | noise output voltage | | | | | |
| | on | $R_s = 0$ Ω ; note 6 | – | 50 | – | μ V |
| | on | $R_s = 10$ k Ω ; note 6 | – | 70 | 100 | μ V |
| | mute | notes 6 and 7 | – | 50 | – | μ V |
| α | channel separation | $R_s = 10$ k Ω | 40 | – | – | dB |
| $ \Delta G_v $ | channel unbalance | | – | – | 1 | dB |
| Dynamic distortion detector | | | | | | |
| THD | total harmonic distortion | $V_{16} \leq 0.6$ V; no short-circuit | – | 10 | – | % |

Notes

- 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 $\leq V_P/2$.
- Output power is measured directly at the output pins of the IC.
- Frequency response externally fixed.
- Ripple rejection measured at the output with a source-impedance of 0 Ω , maximum ripple amplitude of 2 V (p-p) and at a frequency of between 100 Hz and 10 kHz.
- Noise measured in a bandwidth of 20 Hz to 20 kHz.
- Noise output voltage independent of R_s ($V_i = 0$ V).

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

TEST/APPLICATION INFORMATION

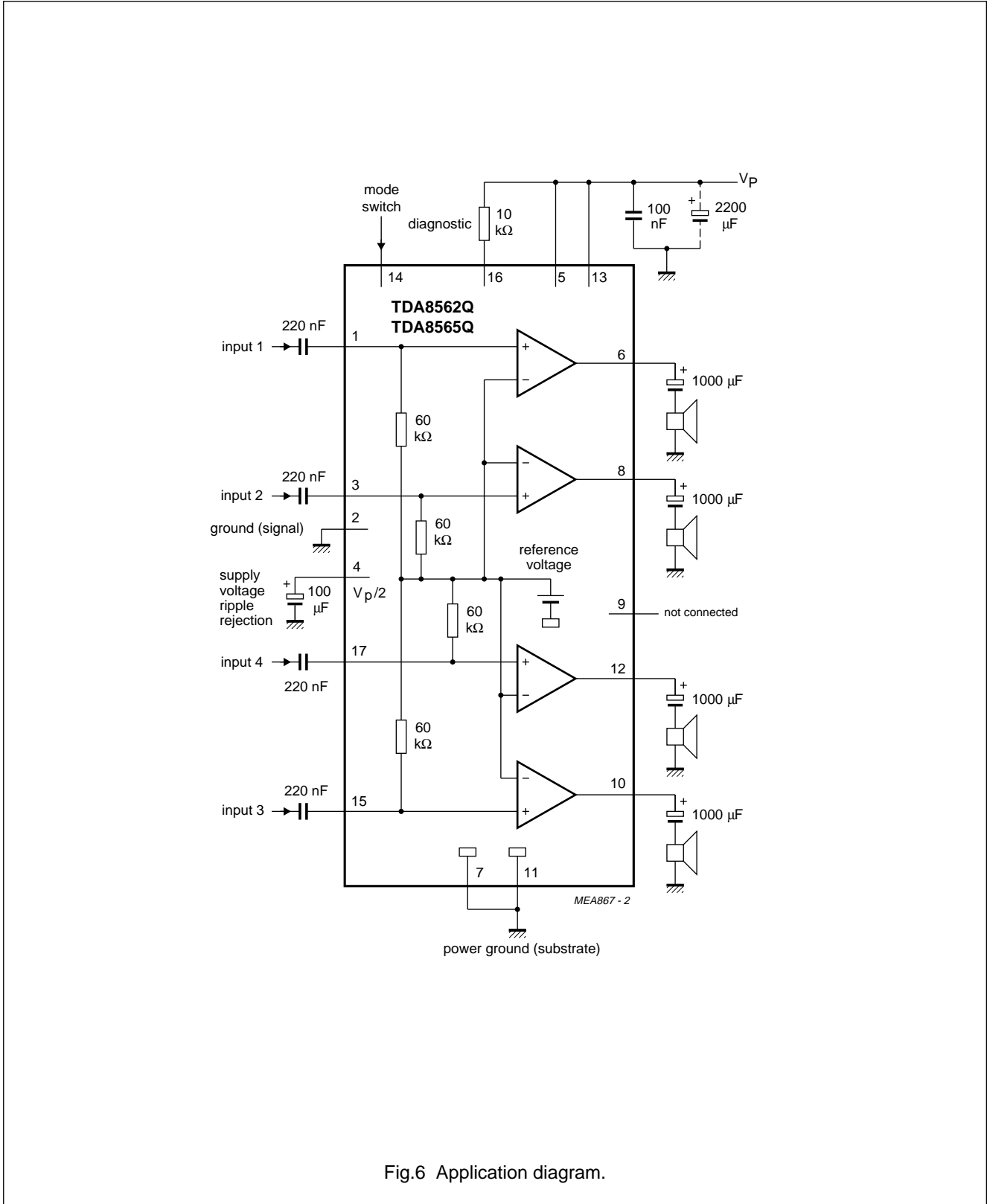


Fig.6 Application diagram.

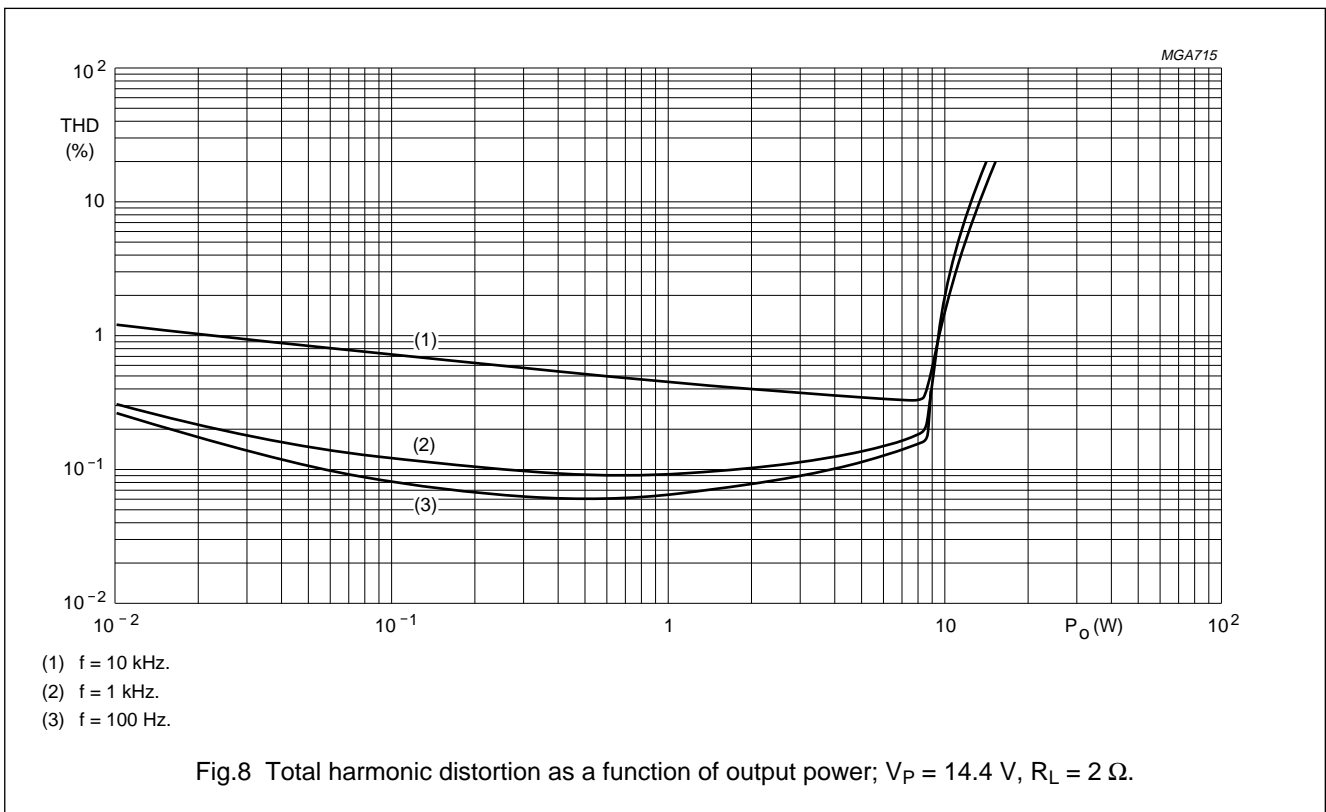
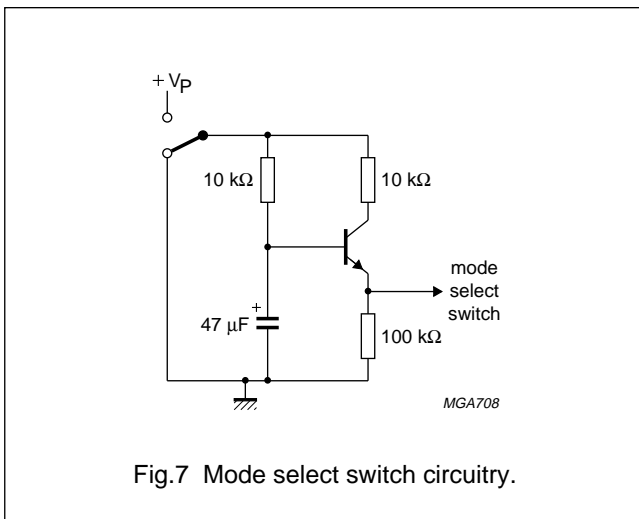
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TDA8562Q

Mode select switch

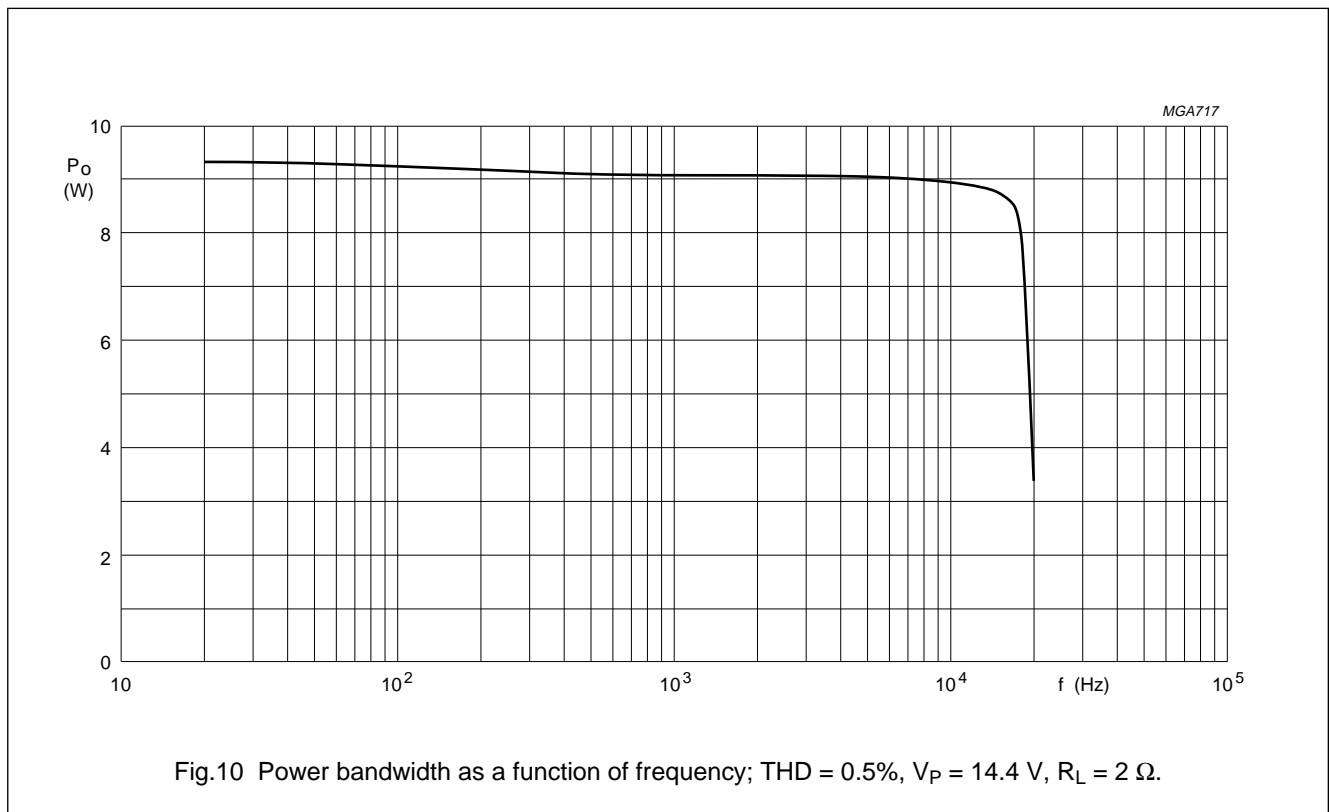
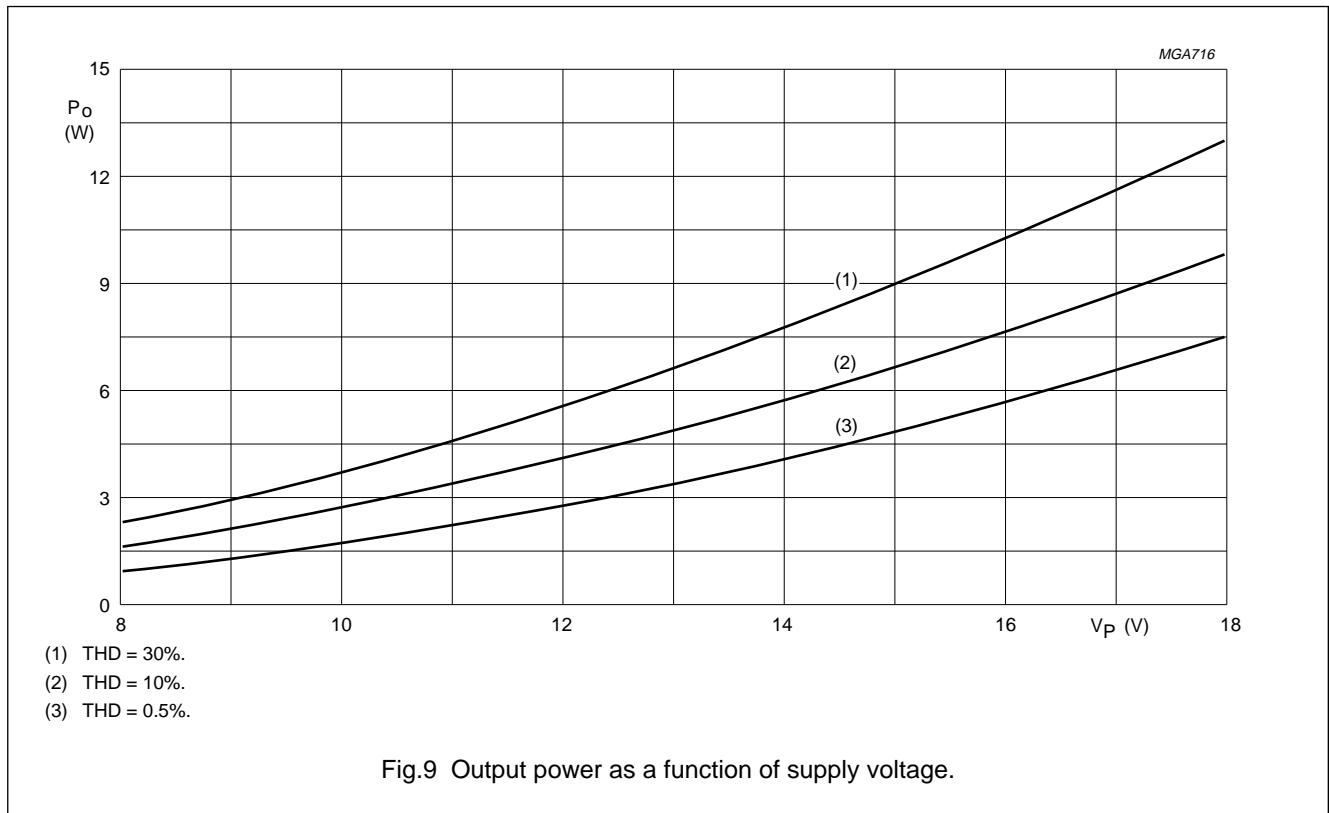
To avoid switch-on plops, it is advised to keep the amplifier in the mute mode during > 100 ms (charging of the input capacitors at pins 1, 3, 15 and 17).

The circuit in Fig.7 slowly ramps up the voltage at the mode select switch pin when switching on and results in fast muting when switching off.



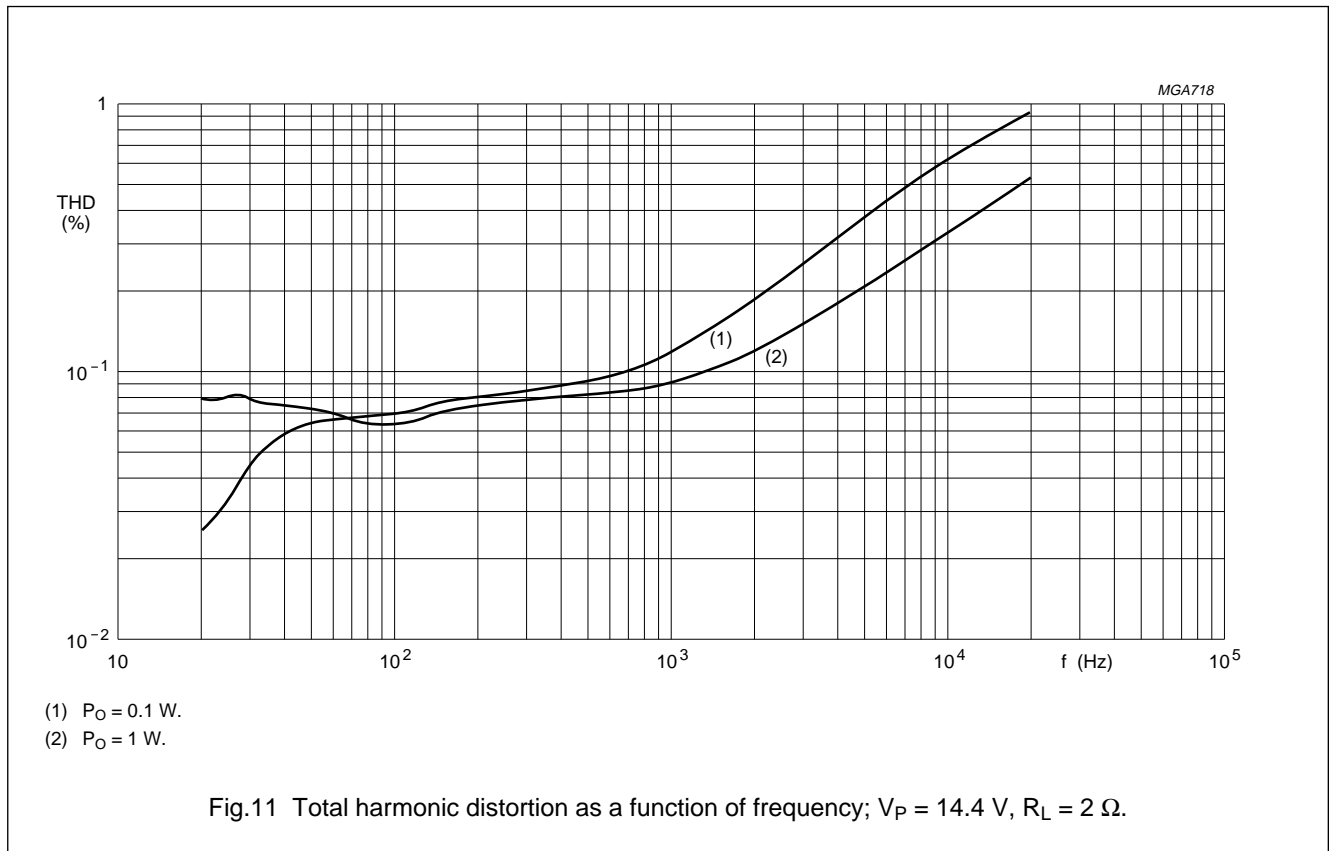
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TDA8562Q



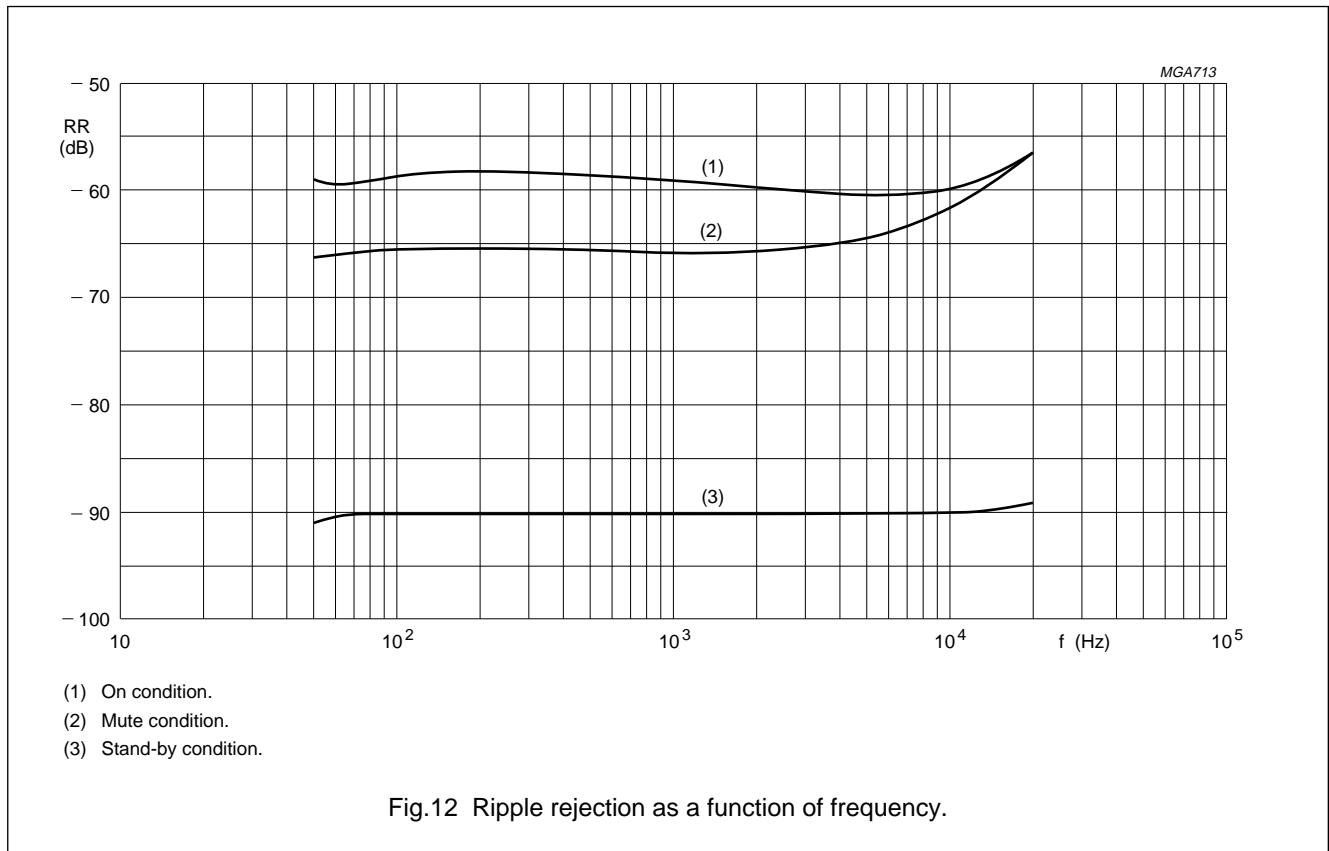
4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q



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TDA8562Q



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TDA8562Q

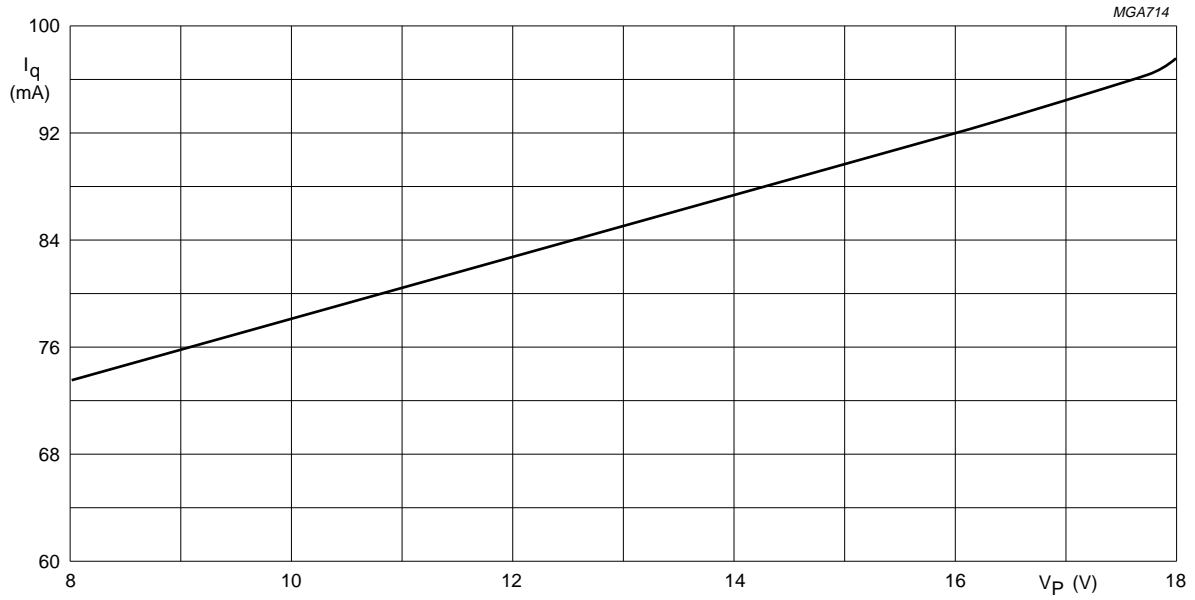


Fig.13 Quiescent current as a function of supply voltage; R_L = ∞.

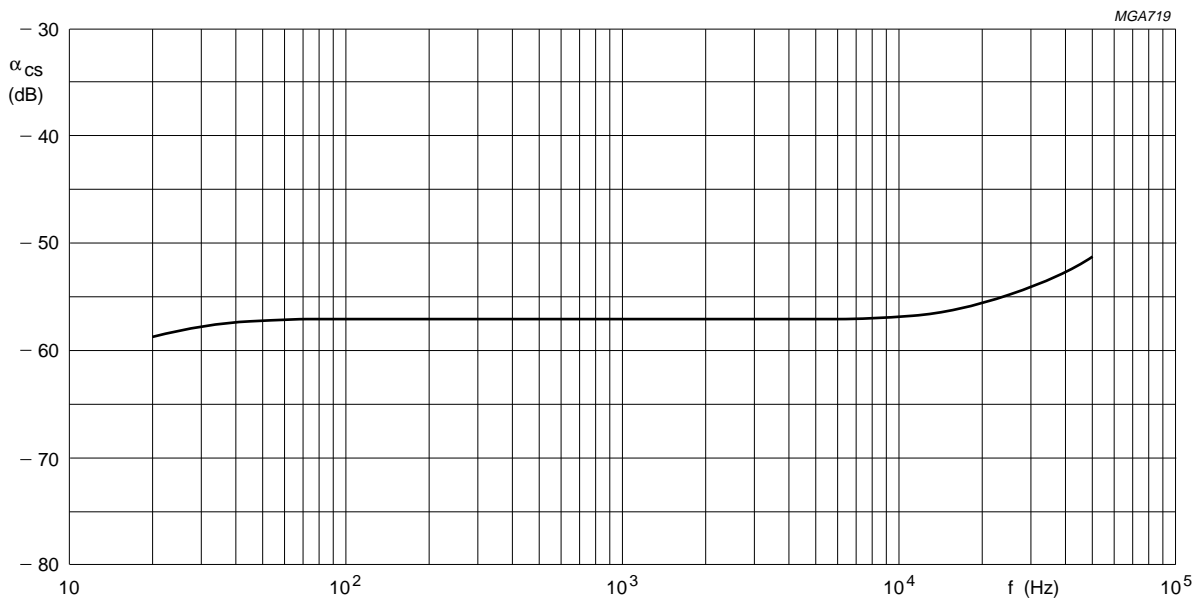


Fig.14 Channel separation as a function of frequency.

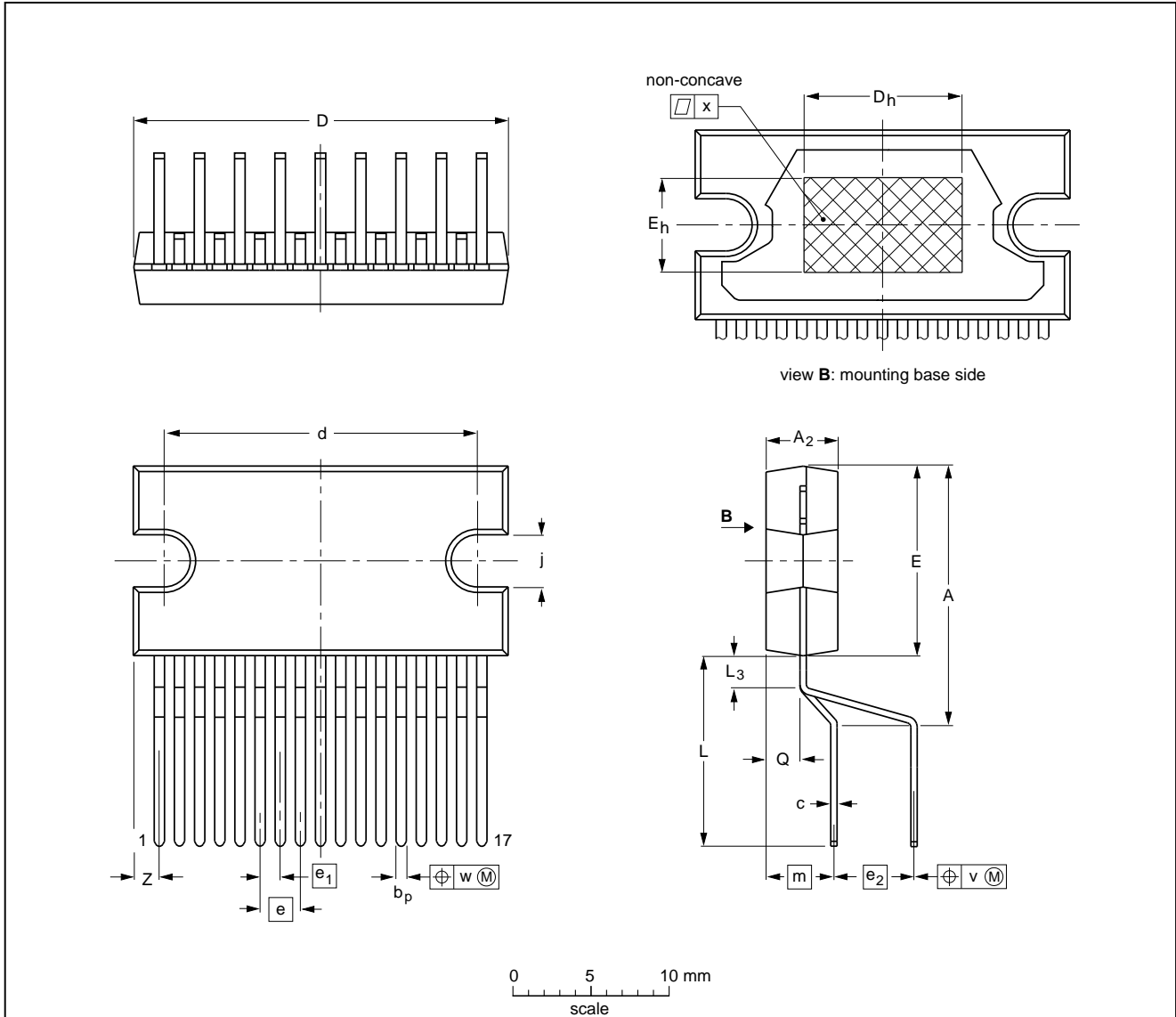
4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

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 |

4 x 12 W single-ended car radio power amplifier with dynamic distortion detector and diagnostic interface

TDA8562Q

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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