

# DATA SHEET

## **TDA1555Q**

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

Product specification  
File under Integrated Circuits, IC01

May 1992

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

## TDA1555Q

### GENERAL DESCRIPTION

The TDA1555Q 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 pop
- Low thermal resistance
- Identical inputs (inverting and non-inverting)
- Flexible leads
- Distortion detector.

### 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 with distortion detector

TDA1555Q

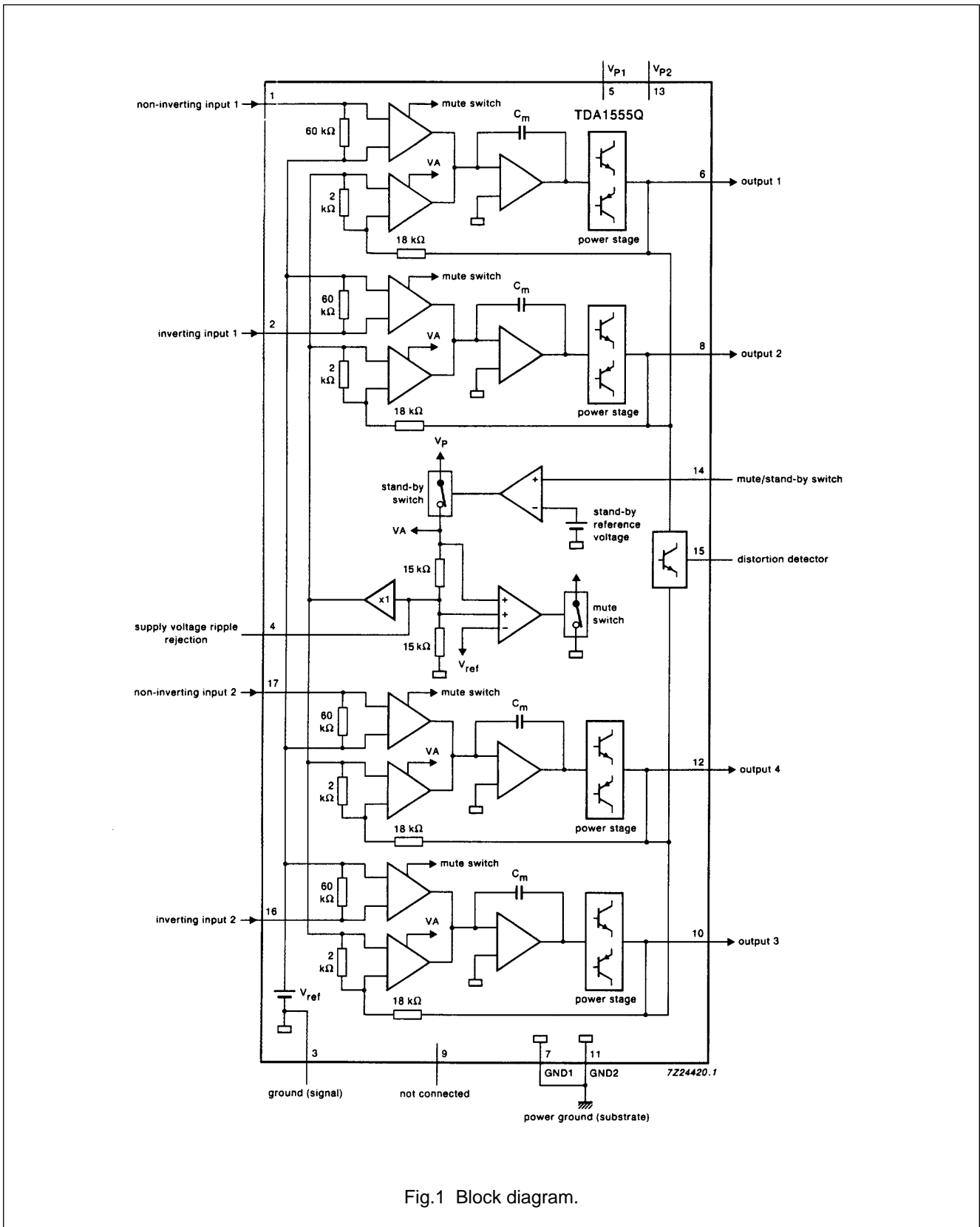


Fig.1 Block diagram.

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

TDA1555Q

### 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	DD	distortion detector
8	OUT2	output 2	16	INV2	inverting input 2
			17	NINV2	non-inverting input 2

### FUNCTIONAL DESCRIPTION

The TDA1555Q 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). Special features of this device are:

#### Mute/stand-by switch

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

#### Distortion detector

- At onset of clipping of one or more channels the distortion detector (pin 15) becomes active. This information can be used to drive a sound processor or DC volume control to decrease the input signal and so limit distortion.

### 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; 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 with distortion detector

TDA1555Q

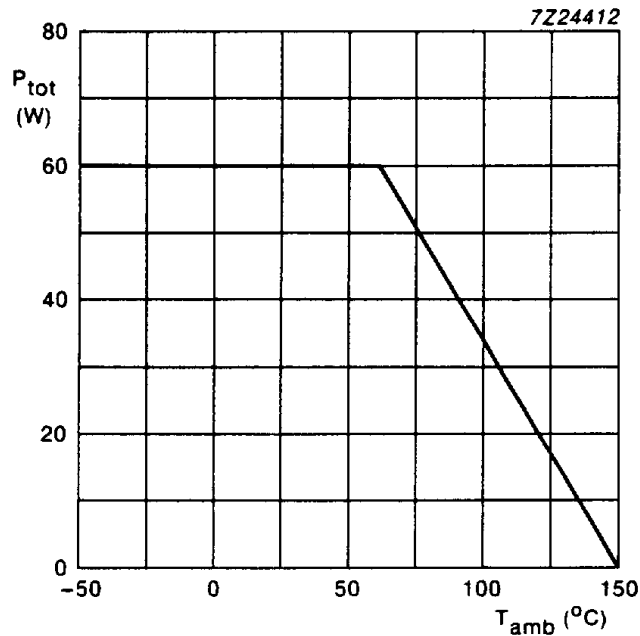


Fig.2 Power derating curve.

DC CHARACTERISTICS

V<sub>P</sub> = 14.4 V; T<sub>amb</sub> = 25 °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>		V <sub>mute</sub>	3.3	–	6.4	V
Output signal in mute position	V <sub>I</sub> = 1 V (max.); f = 1 kHz	V <sub>O</sub>	–	–	2	mV
DC output offset voltage (between pins 6 to 8 and 10 to 12)		ΔV <sub>O</sub>	–	–	100	mV
<b>Stand-by condition</b>		V <sub>sb</sub>	0	–	2	V
DC current in stand-by condition		I <sub>sb</sub>	–	–	100	μA
Switch-on current		I <sub>sw</sub>	–	12	40	μA

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

TDA1555Q

### AC CHARACTERISTICS

$V_P = 14.4$  V;  $R_L = 4$   $\Omega$ ;  $f = 1$  kHz;  $T_{amb} = 25$  °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 $V_P = 13.2$ V	THD = 0.5%	$P_o$	–	12	–	W
	THD = 10%	$P_o$	–	17	–	W
Total harmonic distortion	$P_o = 1$ W	THD	–	0.1	–	%
Power bandwidth	THD = 0.5%					
	$P_o = -1$ dB w.r.t. 15 W	$B_w$	–	20 to 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_i $	25	30	38	k $\Omega$
Noise output voltage (RMS value)						
ON	$R_S = 0$ $\Omega$ ; note 5	$V_{no(rms)}$	–	70	–	$\mu$ V
ON	$R_S = 10$ k $\Omega$ ; note 5	$V_{no(rms)}$	–	100	200	$\mu$ V
mute	notes 5 and 6	$V_{no(rms)}$	–	60	–	$\mu$ V
Channel separation	$R_S = 10$ k $\Omega$	$\alpha$	40	–	–	dB
Channel unbalance		$ \Delta G_v $	–	–	1	dB
Distortion detector	$I_{DD} = 50$ $\mu$ A	THD	2	–	5	%

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

TDA1555Q

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 $R_L = 2 \Omega$	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 (RMS value)						
ON	$R_S = 0 \Omega$ ; 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
Distortion detector	$I_{DD} = 50 \mu\text{A}$	THD	2	–	5	%

### Notes to the characteristics

1. The circuit is DC adjusted at  $V_P = 6 \text{ V}$  to  $18 \text{ V}$  and AC operating at  $V_P = 8.5$  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  $0 \Omega$  (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 with distortion detector

TDA1555Q

APPLICATION INFORMATION

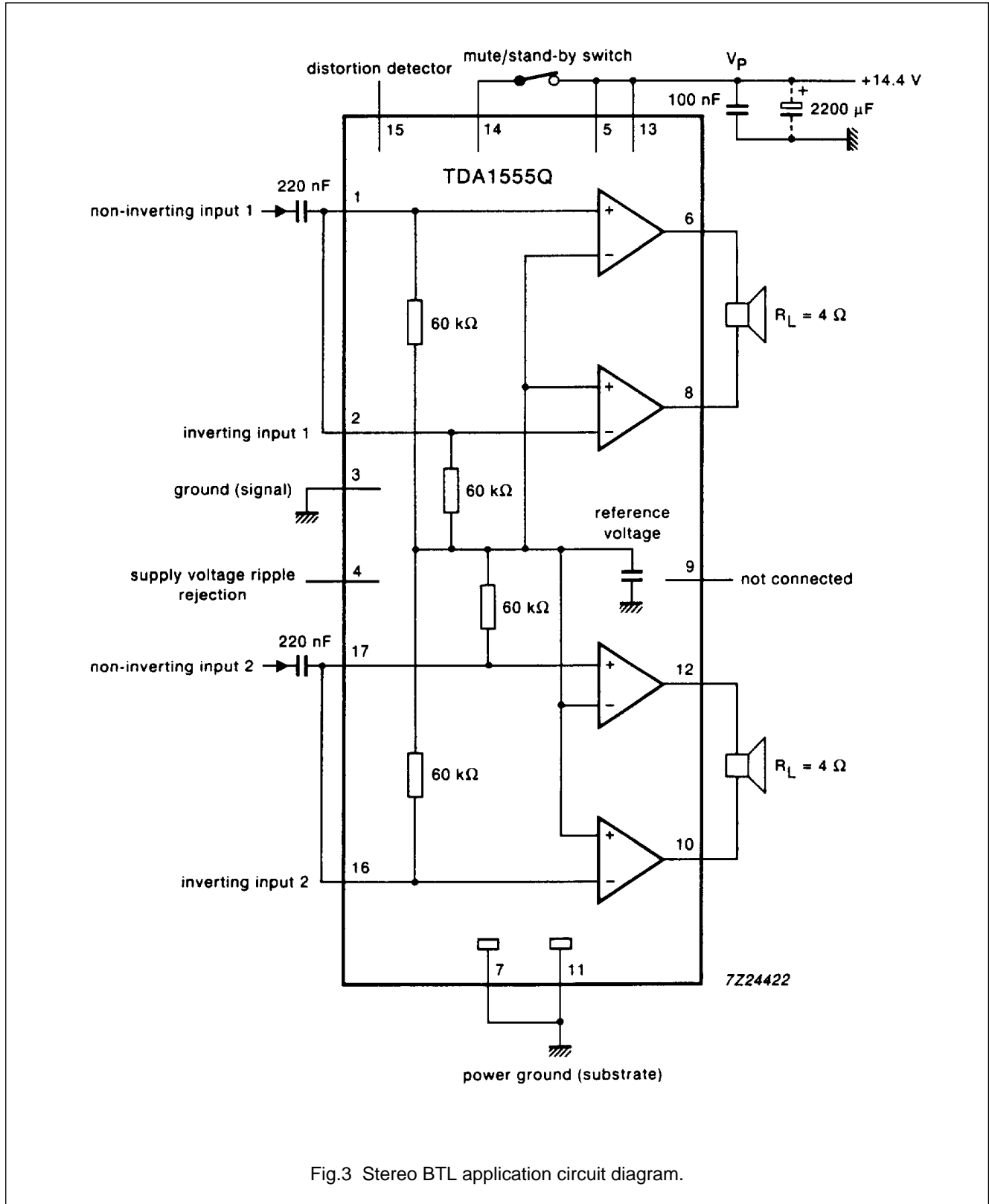


Fig.3 Stereo BTL application circuit diagram.



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

TDA1555Q

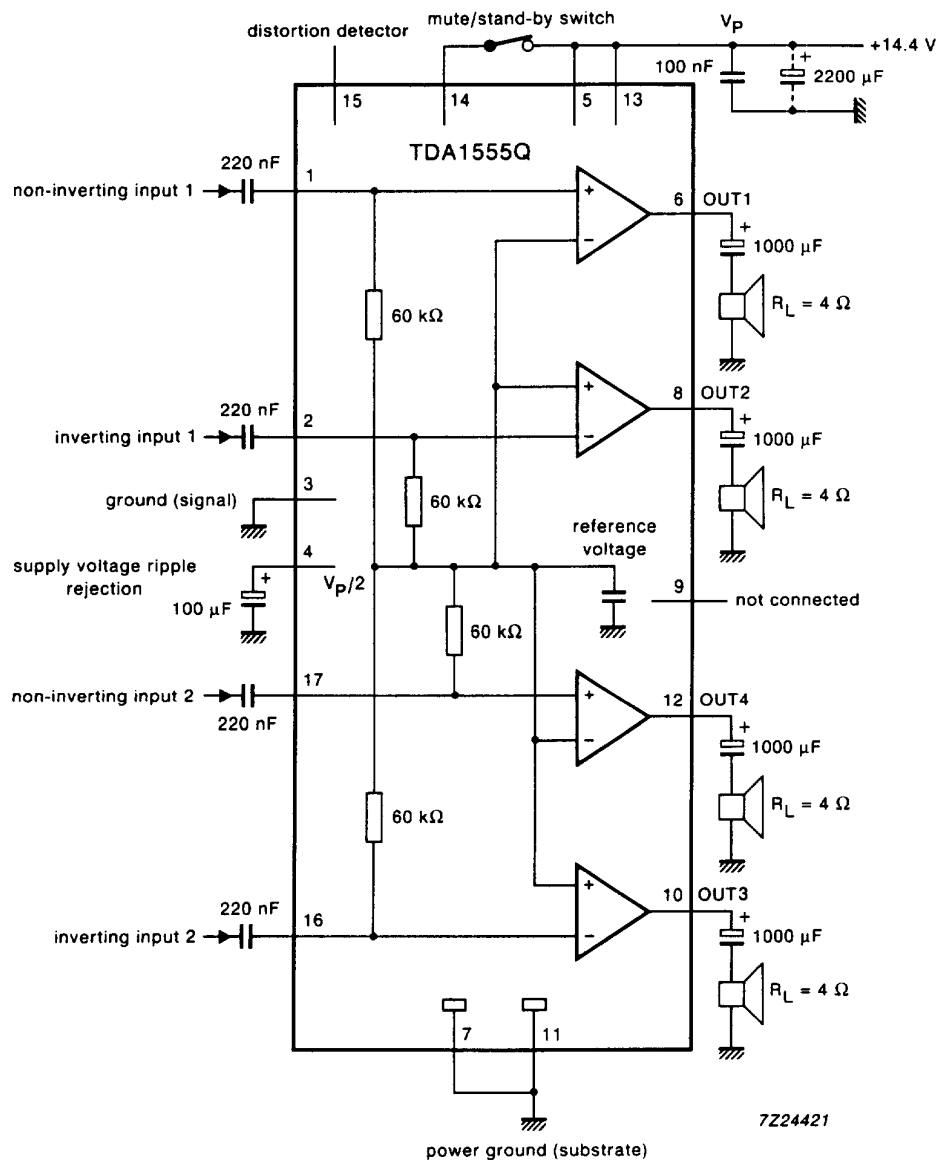


Fig.4 Quad single-ended application circuit diagram.

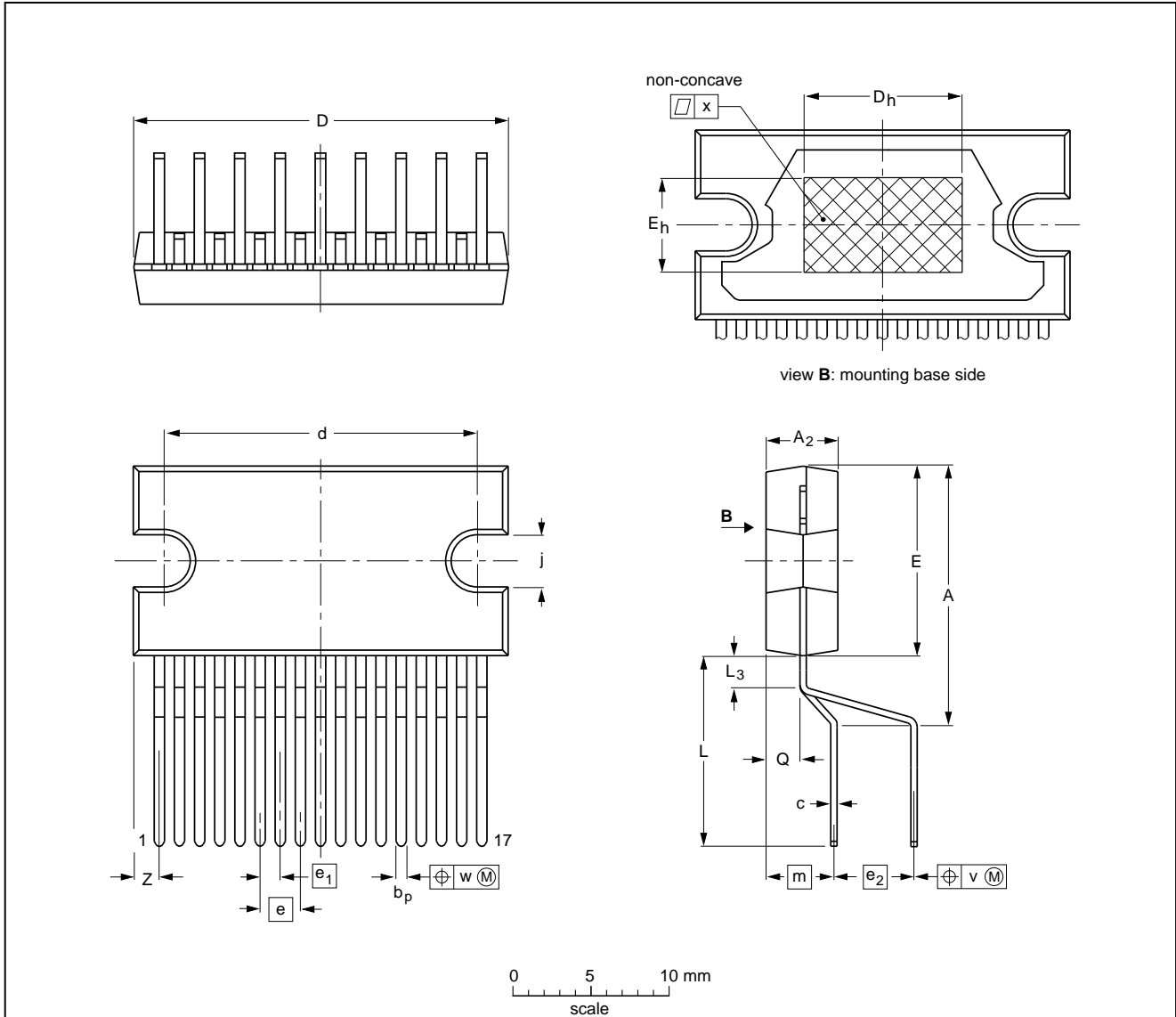
4 x 11 W single-ended or 2 x 22 W power amplifier with distortion detector

TDA1555Q

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 <sub>2</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	d	D <sub>h</sub>	E <sup>(1)</sup>	e	e <sub>1</sub>	e <sub>2</sub>	E <sub>h</sub>	j	L	L <sub>3</sub>	m	Q	v	w	x	z <sup>(1)</sup>
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 11 W single-ended or 2 x 22 W power amplifier with distortion detector

TDA1555Q

### 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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