

# DATA SHEET

## **TDA8580J**

### Multi-purpose power amplifier

Preliminary specification  
Supersedes data of 1998 Feb 25  
File under Integrated Circuits, IC01

2000 Apr 18

# Multi-purpose power amplifier

# TDA8580J

## FEATURES

### General

- Supply voltage range from 8 to 24 V
- Low distortion
- Few external components, fixed gain
- High output power
- Can be used as a stereo amplifier in Bridge-Tied Load (BTL) or quad Single-Ended (SE) amplifiers
- Single-ended mode without loudspeaker capacitor
- Mute and standby mode with one- or two-pin operation
- Diagnostic information for Dynamic Distortion Detector (DDD), high temperature (145 °C) and short-circuit
- No switch on/off plops when switching between standby and mute or mute and on; an external RC-network is prescribed to ensure pop-free operation
- Low offset variation at outputs between mute and on
- Fast mute on supply voltage drops.

### Protection

- Short-circuit proof to ground, positive supply voltage and across load; the supply voltage ranges where the different short circuit conditions are guaranteed are given in Chapter "Limiting values"
- ESD protected on all pins
- Thermal protection against temperatures exceeding 150 °C.

## GENERAL DESCRIPTION

The TDA8580J is a stereo Bridge-Tied Load (BTL) or a quad Single-Ended (SE) amplifier that operates over a wide supply voltage range from 8 to 24 V. This makes it suitable for applications such as television, home-sound systems and active speakers.

Because of an internal voltage buffer, this device can be used without a capacitor connected in series with the load (SE application). A combined BTL and 2 × SE application can also be configured (one chip stereo and subwoofer application).

## ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA8580J	DBS17P	plastic DIL-bent-SIL power package; 17 leads (lead length 12 mm)	SOT243-1

## Multi-purpose power amplifier

## TDA8580J

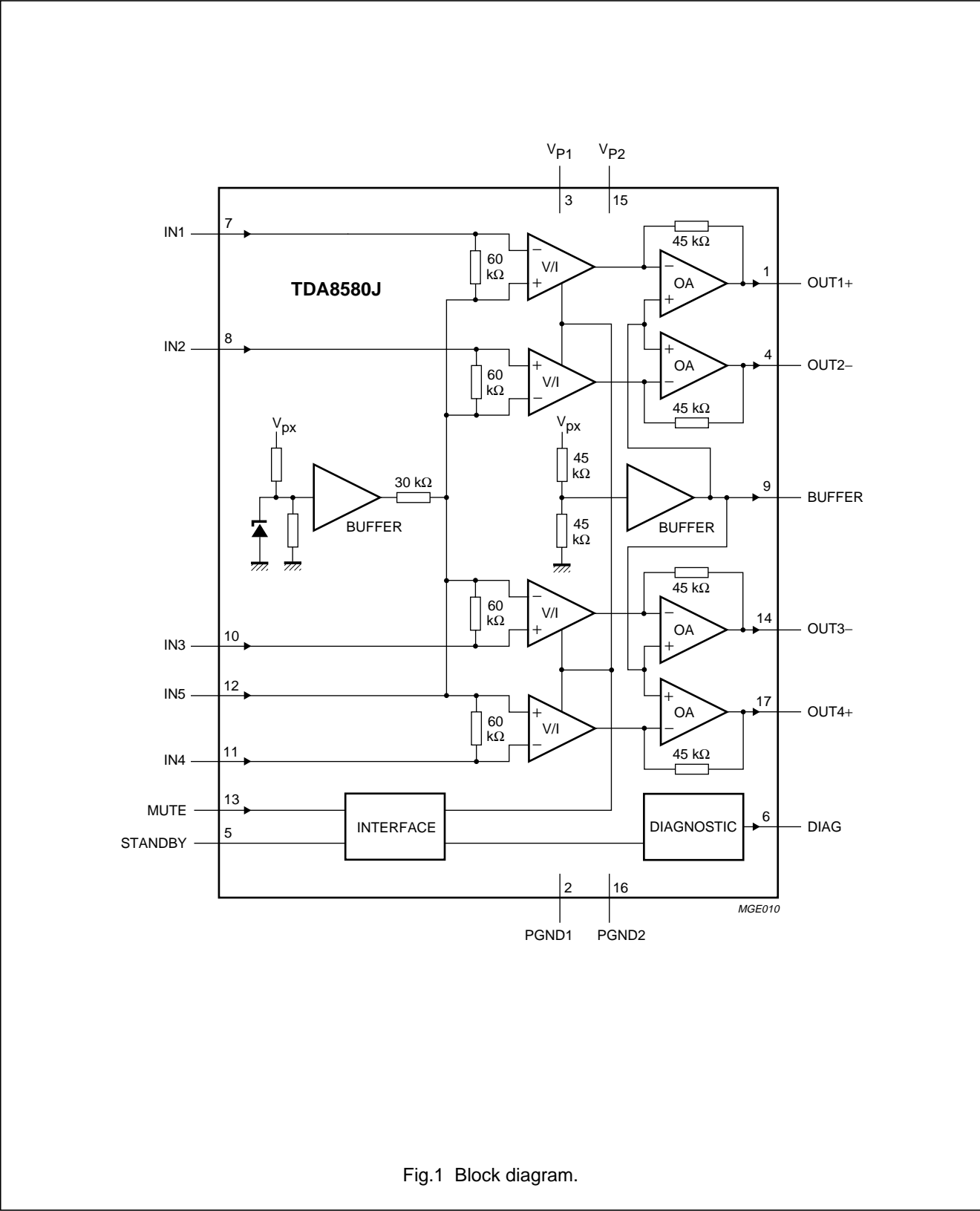
## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_P$	operating supply voltage		8.0	14.4	24	V
$I_{q(tot)}$	total quiescent current	$V_P = 14.4\text{ V}$	–	140	170	mA
$I_{stb}$	standby supply current	$V_P = 14.4\text{ V}$	–	1	50	$\mu\text{A}$
<b>Bridge-tied load application</b>						
$G_v$	voltage gain		31	32	33	dB
$P_o$	output power	THD = 0.5%; $V_P = 14.4\text{ V}$ ; $R_L = 4\ \Omega$	14	15	–	W
		THD = 0.5%; $V_P = 24\text{ V}$ ; $R_L = 8\ \Omega$	21	23	–	W
THD	total harmonic distortion	$f_i = 1\text{ kHz}$ ; $P_o = 1\text{ W}$ ; $V_P = 14.4\text{ V}$ ; $R_L = 4\ \Omega$	–	0.05	0.1	%
		$f_i = 1\text{ kHz}$ ; $P_o = 10\text{ W}$ ; $V_P = 24\text{ V}$ ; $R_L = 8\ \Omega$	–	0.02	0.05	%
$V_{offset(DC)}$	DC output offset voltage	$V_P = 14.4\text{ V}$ ; mute condition; $R_L = 4\ \Omega$	–	10	20	mV
		$V_P = 14.4\text{ V}$ ; on condition	–	0	140	mV
$V_{no}$	noise output voltage	$R_s = 1\text{ k}\Omega$ ; $V_P = 14.4\text{ V}$	–	100	150	$\mu\text{V}$
SVRR	supply voltage ripple rejection	$f_i = 1\text{ kHz}$ ; $V_{ripple(p-p)} = 2\text{ V}$ ; on or mute condition; $R_s = 0\ \Omega$	50	60	–	dB
<b>Single-ended application</b>						
$G_v$	voltage gain		25	26	27	dB
$P_o$	output power	THD = 0.5%; $V_P = 14.4\text{ V}$ ; $R_L = 4\ \Omega$	3.8	4.0	–	W
		THD = 0.5%; $V_P = 24\text{ V}$ ; $R_L = 4\ \Omega$	10.5	11.5	–	W
$V_{offset(DC)}$	DC output offset voltage	$V_P = 14.4\text{ V}$ ; mute condition; $R_L = 4\ \Omega$	–	10	20	mV
		$V_P = 14.4\text{ V}$ ; on condition	–	0	100	mV
$V_{no}$	noise output voltage	$R_s = 1\text{ k}\Omega$ ; $V_P = 14.4\text{ V}$	–	80	120	$\mu\text{V}$
SVRR	supply voltage ripple rejection	$f_i = 1\text{ kHz}$ ; $V_{ripple(p-p)} = 2\text{ V}$ ; on or mute condition; $R_s = 0\ \Omega$	40	45	–	dB

Multi-purpose power amplifier

TDA8580J

BLOCK DIAGRAM

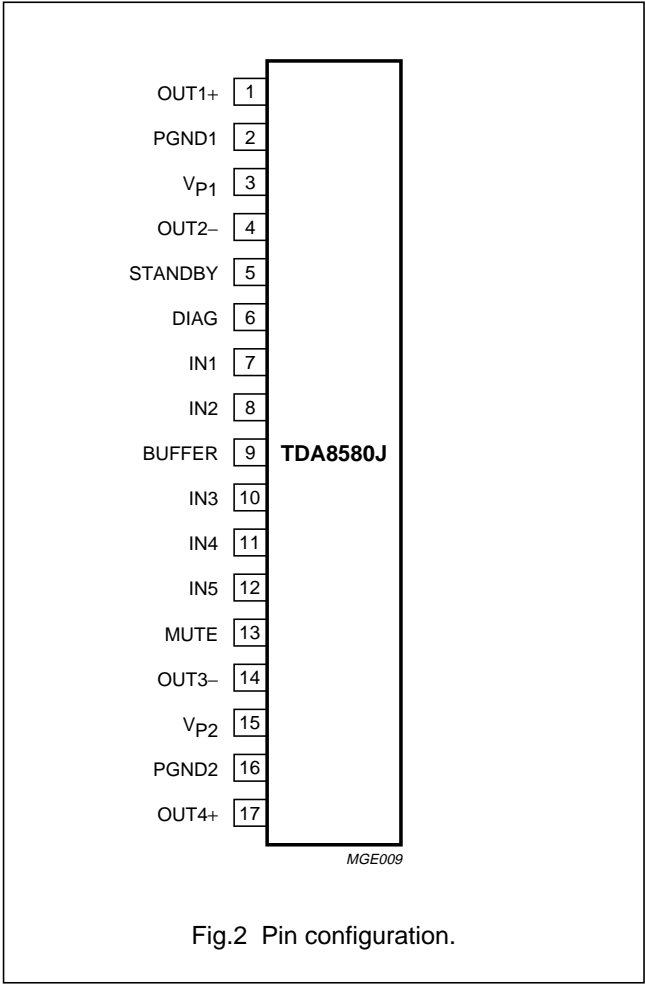


Multi-purpose power amplifier

TDA8580J

PINNING

SYMBOL	PIN	DESCRIPTION
OUT1+	1	non-inverting output 1
PGND1	2	power ground 1
V <sub>P1</sub>	3	supply voltage 1
OUT2−	4	inverting output 2
STANDBY	5	standby/mute/on selection input
DIAG	6	diagnostic output
IN1	7	input 1
IN2	8	input 2
BUFFER	9	single-ended buffer output
IN3	10	input 3
IN4	11	input 4
IN5	12	input 5; signal ground capacitor connection
MUTE	13	mute/on selection input
OUT3−	14	inverting output 3
V <sub>P2</sub>	15	supply voltage 2
PGND2	16	power ground 2
OUT4+	17	non-inverting output 4



## Multi-purpose power amplifier

## TDA8580J

**FUNCTIONAL DESCRIPTION**

The TDA8580J is a multi-purpose power amplifier with four amplifiers which can be connected in the following configurations with high output power and low distortion (at minimum quiescent current):

- Dual bridge-tied load amplifiers
- Quad single-ended amplifiers
- Dual single-ended amplifiers and one bridge-tied load amplifier.

The amplifier can be switched in on, mute and off (standby) by the MUTE and STANDBY pins (for interfacing directly with a microcontroller). One-pin operation is also possible by applying a voltage greater than 8 V to the STANDBY pin to switch the amplifier in on mode.

Special attention is given to the dynamic behaviour as follows:

- Slow offset change between mute and on (controlled by MUTE and STANDBY pins)

- Low noise levels, which are independent of the supply voltage.

Protections are included to avoid the IC being damaged at:

- Over temperature:  $T_j > 150\text{ }^{\circ}\text{C}$
- Short-circuit of the output pin(s) to ground or supply rail; when short-circuited, the power dissipation is limited
- ESD protection (Human Body Model 3000 V, Machine Model 300 V)
- Energy handling. A DC voltage of 6 V can be connected to the output of any amplifier while the supply pins are short-circuited to ground.

Diagnostics are available for the following conditions (see Figs 3, 4 and 5):

- Chip temperature above  $145\text{ }^{\circ}\text{C}$
- Distortion over 2% due to clipping
- Short-circuit protection active.

**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_P$	supply voltage	operating	–	24	V
		no signal condition	–	28	V
$V_{DIAG}$	voltage on pin DIAG		–	18	V
$I_{OSM}$	non-repetitive peak output current		–	6	A
$I_{ORM}$	repetitive peak output current		–	4.5	A
$V_{P(scl)}$	supply voltage with short-circuit across load		–	28	V
$V_{P(scg)}$	supply voltage with short-circuit from output to ground		–	26	V
$V_{P(scs)}$	supply voltage with short-circuit from output to supply		–	16	V
$V_{P(rp)}$	reverse polarity		–	6	V
$P_{tot}$	total power dissipation		–	75	W
$T_j$	junction temperature		–	150	$^{\circ}\text{C}$
$T_{stg}$	storage temperature		–55	+150	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature		–40	+85	$^{\circ}\text{C}$

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	40	K/W
$R_{th(j-c)}$	thermal resistance from junction to case		1.5	K/W

## Multi-purpose power amplifier

## TDA8580J

## CHARACTERISTICS

$V_P = 14.4\text{ V}$ ;  $T_{\text{amb}} = 25\text{ °C}$ ;  $f_i = 1\text{ kHz}$ ;  $R_L = \infty$ ; measured in test circuit of Fig.28; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supplies</b>						
$V_P$	operating supply voltage		8.0	14.4	24	V
$I_{q(\text{tot})}$	total quiescent current		–	140	170	mA
$I_{\text{stb}}$	standby current		–	1	50	$\mu\text{A}$
$V_O$	DC output voltage		–	7.0	–	V
$V_{P(\text{mute})}$	low supply voltage mute		6.0	7.0	8.0	V
$V_I$	DC input voltage		–	4.0	–	V
<b>Control pins</b>						
STANDBY PIN (see Table 1)						
$V_{5(\text{stb})}$	voltage at STANDBY pin for standby condition		0	–	0.8	V
$V_{\text{hys}(5)(\text{stb})}$	hysteresis voltage at STANDBY pin for standby condition	note 1	–	0.2	–	V
$V_{5(\text{mute})}$	voltage at STANDBY pin for mute condition	$V_{13} < 0.8\text{ V}$	2.0	–	5.3	V
$V_{5(\text{on})}$	voltage at STANDBY pin for on condition	$V_P > 9\text{ V}$ ; note 2	8.0	–	18	V
MUTE PIN (see Table 1)						
$V_{13(\text{mute})}$	voltage at MUTE pin for mute condition	$V_5 = 5\text{ V}$	0	–	0.8	V
$V_{13(\text{on})}$	voltage at MUTE pin for on condition	$V_5 = 5\text{ V}$	2.5	–	5.3	V
<b>Diagnostic; output buffer (open-collector);</b> see Figs 3, 4 and 5						
$V_{OL}$	LOW-level output voltage	$I_{\text{sink}} = 1\text{ mA}$	–	0.2	0.8	V
$I_{LI}$	leakage current	$V_{\text{DIAG}} = 14.4\text{ V}$	–	–	1	$\mu\text{A}$
CD	clip detector	$V_{\text{DIAG}} < 0.8\text{ V}$	1	2	4	%
$T_{j(\text{diag})}$	junction temperature for high temperature warning	$V_{\text{DIAG}} < 0.8\text{ V}$	–	145	–	$^{\circ}\text{C}$
<b>Stereo BTL application;</b> see Figs 6, 7, 10, 11, 14, 15, 18, 19, 21, 22, 23, 24, 26 and 28						
THD	total harmonic distortion	$f_i = 10\text{ kHz}$ ; $P_o = 1\text{ W}$ ; $R_L = 4\text{ }\Omega$ ; filter: $22\text{ Hz} < f < 30\text{ kHz}$	–	0.2	0.3	%
		$f_i = 1\text{ kHz}$ ; $P_o = 1\text{ W}$ ; $V_P = 14.4\text{ V}$ ; $R_L = 4\text{ }\Omega$	–	0.05	0.1	%
		$f_i = 1\text{ kHz}$ ; $P_o = 10\text{ W}$ ; $V_P = 24\text{ V}$ ; $R_L = 8\text{ }\Omega$	–	0.02	0.05	%
$P_o$	output power	THD = 0.5%; $V_P = 14.4\text{ V}$ ; $R_L = 4\text{ }\Omega$	14	15	–	W
		THD = 0.5%; $V_P = 24\text{ V}$ ; $R_L = 8\text{ }\Omega$	21	23	–	W
		THD = 10%; $V_P = 14.4\text{ V}$ ; $R_L = 4\text{ }\Omega$	18	20	–	W
		THD = 10%; $V_P = 24\text{ V}$ ; $R_L = 8\text{ }\Omega$	28	30	–	W
$G_v$	voltage gain	$V_{O(\text{rms})} = 3\text{ V}$	31	32	33	dB

## Multi-purpose power amplifier

## TDA8580J

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\alpha_{cs}$	channel separation	$P_o = 2\text{ W}$ ; $f_i = 1\text{ kHz}$ ; $R_L = 4\ \Omega$	60	65	—	dB
$ \Delta G_v $	channel unbalance		—	—	1	dB
$V_{\text{offset(DC)}}$	DC output offset voltage	on condition	—	0	140	mV
		mute condition; $R_L = 4\ \Omega$	—	10	20	mV
$V_{no}$	noise output voltage	$R_s = 1\text{ k}\Omega$ ; $V_P = 14.4\text{ V}$ ; note 3	—	100	150	$\mu\text{V}$
$V_{no(\text{mute})}$	noise output voltage mute	note 3	—	0	20	$\mu\text{V}$
$V_{o(\text{mute})}$	output voltage mute	$V_{i(\text{rms})} = 1\text{ V}$	—	3	500	$\mu\text{V}$
SVRR	supply voltage ripple rejection	$R_s = 0\ \Omega$ ; $f_i = 1\text{ kHz}$ ; $V_{\text{ripple(p-p)}} = 2\text{ V}$ ; on or mute condition	50	60	—	dB
$Z_i$	input impedance		23	30	37	$\text{k}\Omega$
CMRR	common mode rejection ratio	$R_s = 0\ \Omega$ ; $V_{i(\text{rms})} = 0.5\text{ V}$ ; $f_i = 1\text{ kHz}$	—	60	—	dB
<b>Quad SE application; see Figs 8, 9, 12, 13, 16, 17, 20, 25, 27 and 29</b>						
THD	total harmonic distortion	$f_i = 1\text{ kHz}$ ; $P_o = 1\text{ W}$ ; $R_L = 4\ \Omega$	—	0.05	0.1	%
		$f_i = 10\text{ kHz}$ ; $P_o = 1\text{ W}$ ; $R_L = 4\ \Omega$ ; filter: $22\text{ Hz} < f < 30\text{ kHz}$	—	0.2	0.3	%
		$f_i = 1\text{ kHz}$ ; $P_o = 1\text{ W}$ ; $V_P = 24\text{ V}$ , $R_L = 4\ \Omega$ ; filter: $22\text{ Hz} < f < 30\text{ kHz}$	—	0.05	0.1	%
$P_o$	output power	THD = 0.5%; $V_P = 14.4\text{ V}$ ; $R_L = 4\ \Omega$	3.8	4.0	—	W
		THD = 0.5%; $V_P = 24\text{ V}$ ; $R_L = 4\ \Omega$	10.5	11.5	—	W
		THD = 10%; $V_P = 14.4\text{ V}$ ; $R_L = 4\ \Omega$	4.9	5.2	—	W
		THD = 10%; $V_P = 24\text{ V}$ ; $R_L = 4\ \Omega$	14	15	—	W
$G_v$	voltage gain	$V_{o(\text{rms})} = 3\text{ V}$	25	26	27	dB
$\alpha_{cs}$	channel separation	$P_o = 2\text{ W}$ ; $f_i = 1\text{ kHz}$ ; $R_L = 4\ \Omega$	40	46	—	dB
$ \Delta G_v $	channel unbalance		—	—	1	dB
$V_{\text{offset(DC)}}$	DC output offset voltage	$V_P = 14.4\text{ V}$ ; on condition	—	0	100	mV
		$V_P = 14.4\text{ V}$ ; mute condition; $R_L = 4\ \Omega$	—	10	20	mV
$V_{no}$	noise output voltage	$R_s = 1\text{ k}\Omega$ ; $V_P = 14.4\text{ V}$ ; note 3	—	80	120	$\mu\text{V}$
$V_{no(\text{mute})}$	noise output voltage mute	note 3	—	0	20	$\mu\text{V}$
$V_{o(\text{mute})}$	output voltage mute	$V_{i(\text{rms})} = 1\text{ V}$	—	3	500	$\mu\text{V}$
SVRR	supply voltage ripple rejection	$f_i = 1\text{ kHz}$ ; $V_{\text{ripple(p-p)}} = 2\text{ V}$ , on or mute condition; $R_s = 0\ \Omega$	40	45	—	dB
$Z_i$	input impedance		46	60	74	$\text{k}\Omega$
CMRR	common mode rejection ratio	$V_{i(\text{rms})} = 0.5\text{ V}$ ; $f_i = 1\text{ kHz}$ ; $R_s = 0\ \Omega$	—	60	—	dB

**Notes**

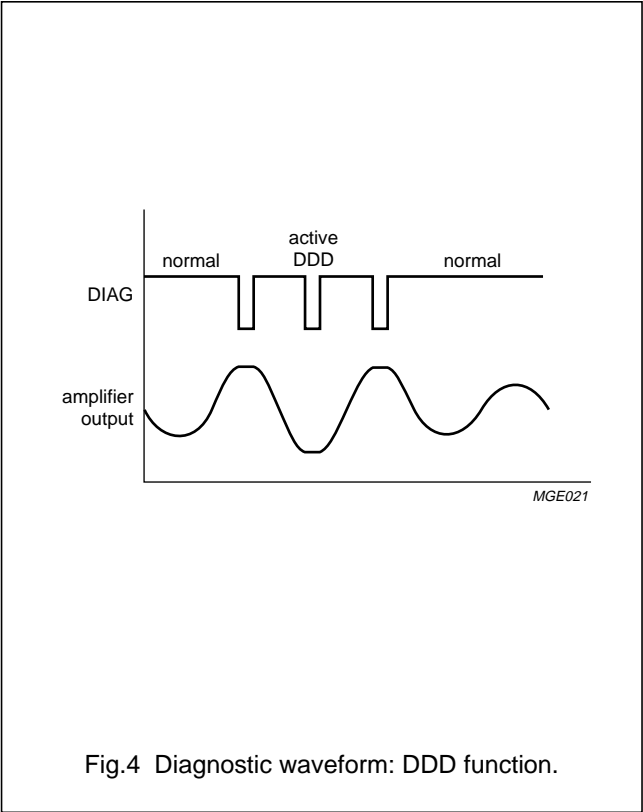
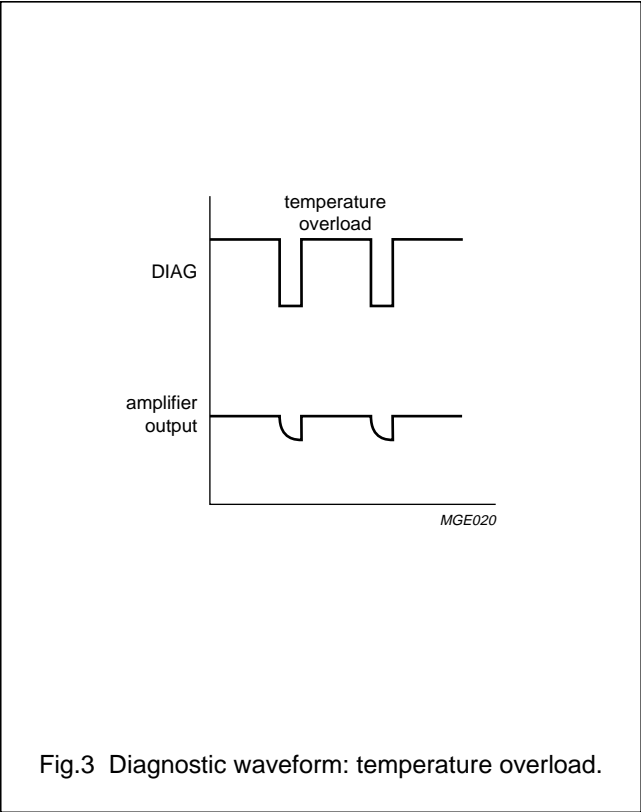
1. Hysteresis between the rise and fall voltage when pin STANDBY is controlled with low ohmic voltage source.
2. At lower  $V_P$  the voltage at the STANDBY pin for on condition will be adjusted automatically to maintain an on condition at low battery voltage (down to 8 V) when using one-pin operation.
3. The noise output is measured in a bandwidth of 20 Hz to 20 kHz.

Multi-purpose power amplifier

TDA8580J

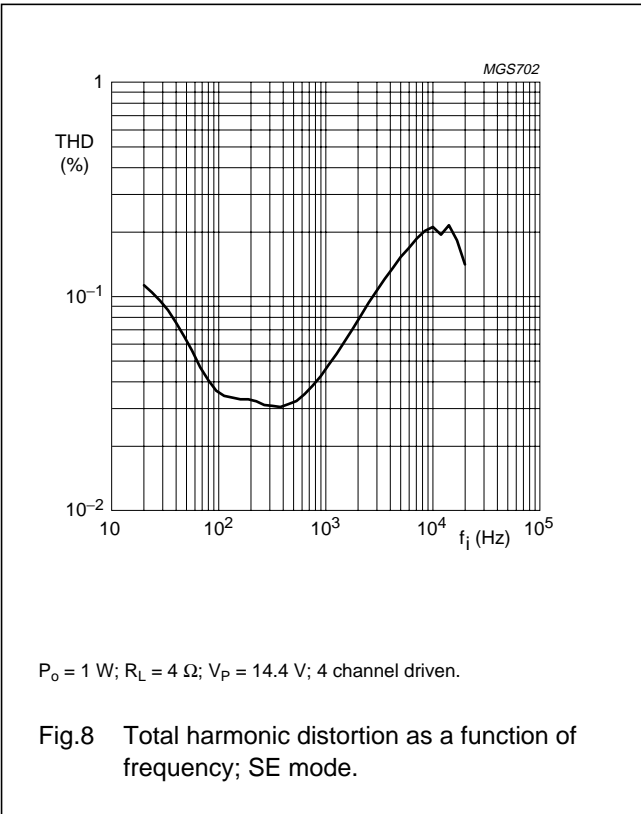
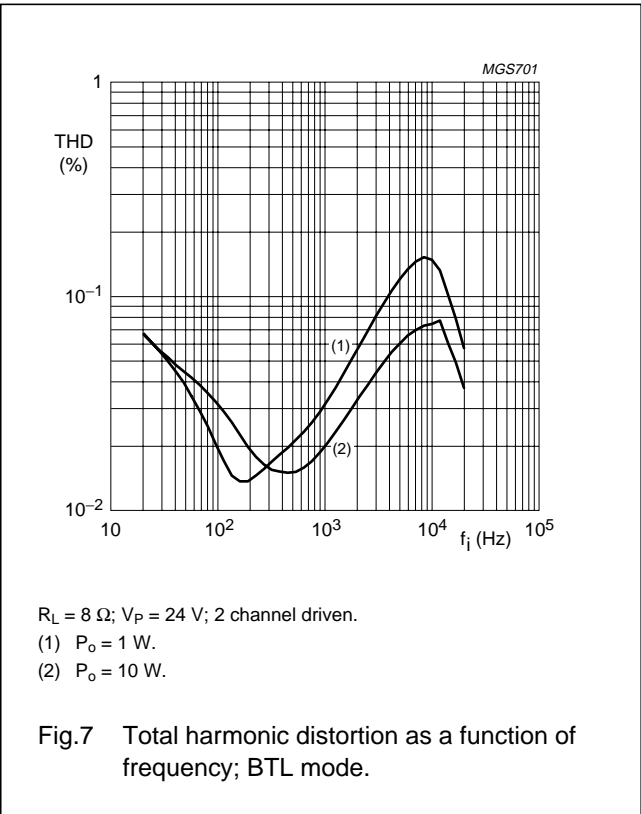
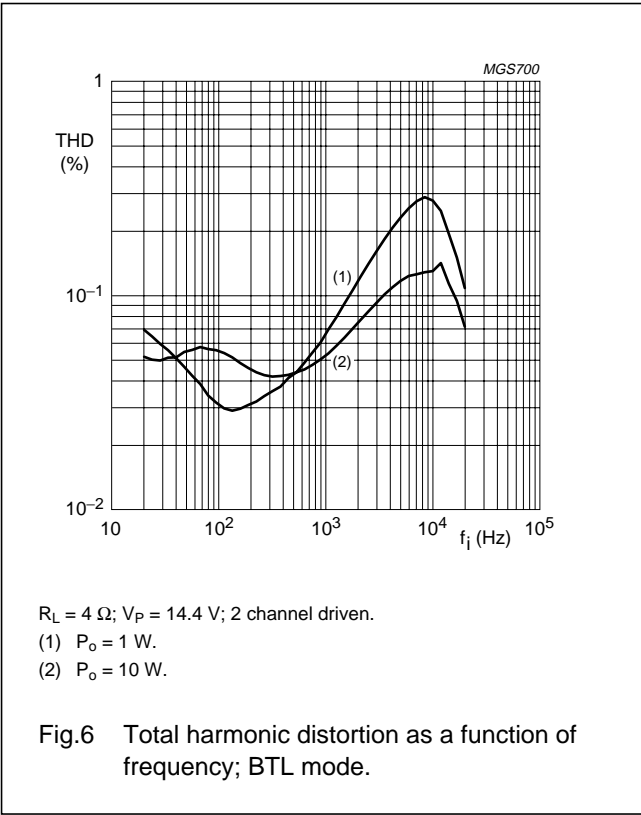
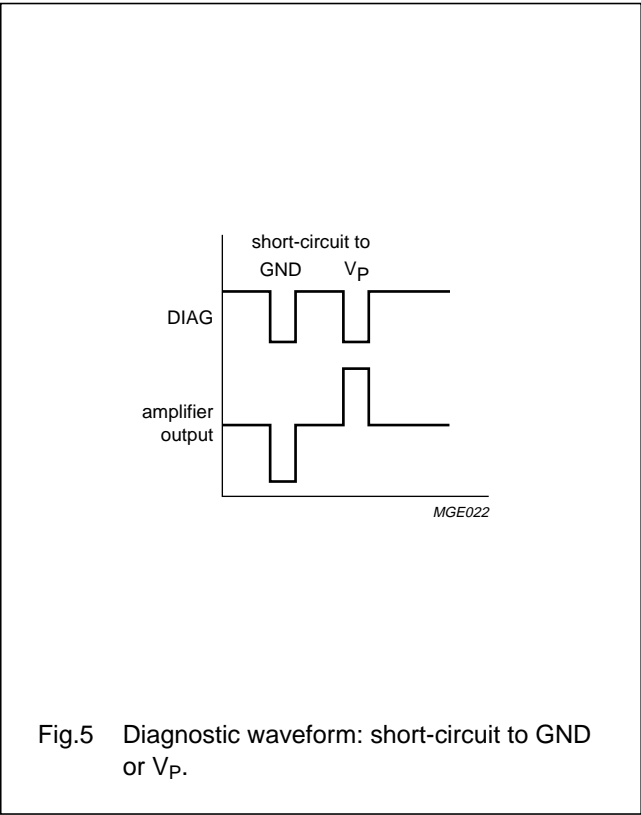
Table 1 Selection of standby, mute and on

VOLTAGE AT PIN STANDBY	VOLTAGE AT PIN MUTE	FUNCTION
< 0.8 V	don't care	standby (off)
2 to 5.3 V	< 0.8 V	mute (DC settled)
2 to 5.3 V	2.5 to 5.3 V	on (AC operating)
≥ 8.0 V	don't care	on (AC operating)



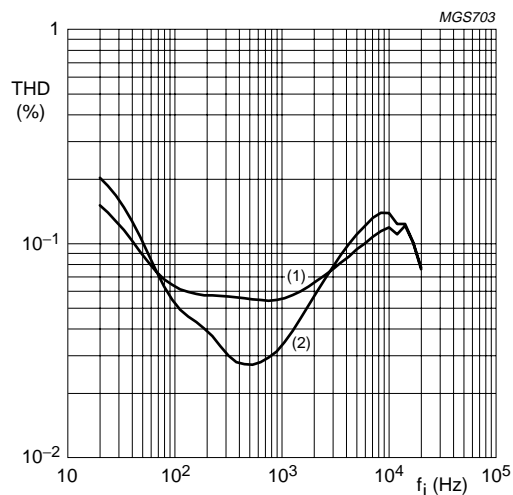
Multi-purpose power amplifier

TDA8580J



## Multi-purpose power amplifier

## TDA8580J

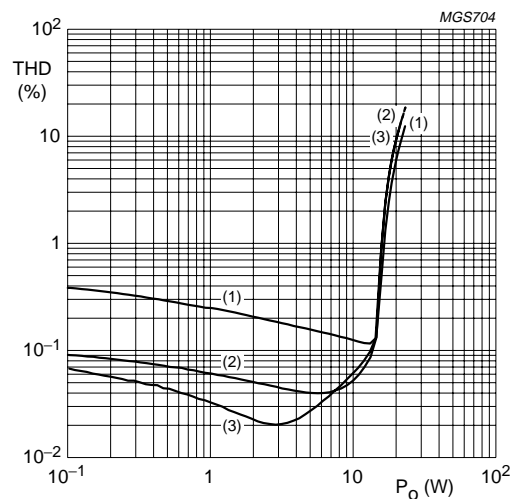


$R_L = 4 \Omega$ ;  $V_P = 24 \text{ V}$ ; 4 channel driven.

(1)  $P_o = 5 \text{ W}$ .

(2)  $P_o = 1 \text{ W}$ .

Fig.9 Total harmonic distortion as a function of frequency; SE mode.



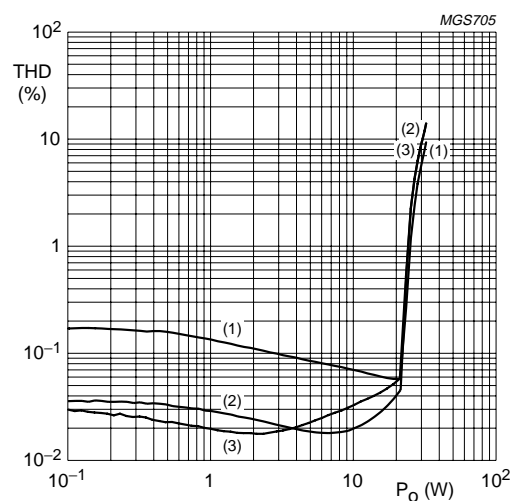
$R_L = 4 \Omega$ ;  $V_P = 14.4 \text{ V}$ ; 2 channel driven.

(1)  $f_i = 10 \text{ kHz}$ .

(2)  $f_i = 1 \text{ kHz}$ .

(3)  $f_i = 100 \text{ Hz}$ .

Fig.10 Total harmonic distortion as a function of output power; BTL mode.



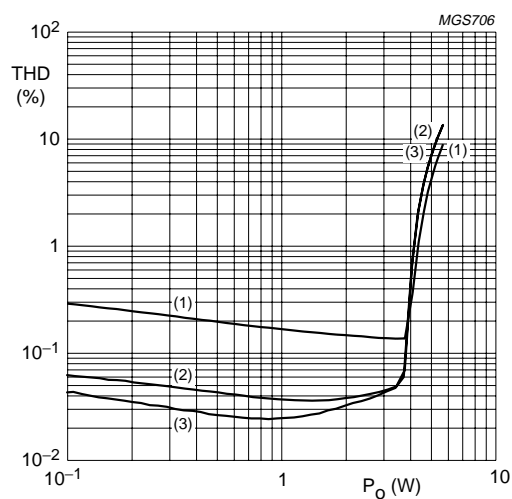
$R_L = 8 \Omega$ ;  $V_P = 24 \text{ V}$ ; 2 channel driven.

(1)  $f_i = 10 \text{ kHz}$ .

(2)  $f_i = 1 \text{ kHz}$ .

(3)  $f_i = 100 \text{ Hz}$ .

Fig.11 Total harmonic distortion as a function of output power; BTL mode.



$R_L = 4 \Omega$ ;  $V_P = 14.4 \text{ V}$ ; 4 channel driven

(1)  $f_i = 10 \text{ kHz}$ .

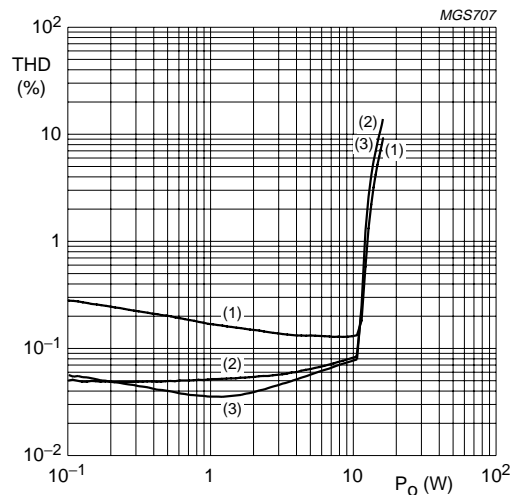
(2)  $f_i = 1 \text{ kHz}$ .

(3)  $f_i = 100 \text{ Hz}$ .

Fig.12 Total harmonic distortion as a function of output power; SE mode.

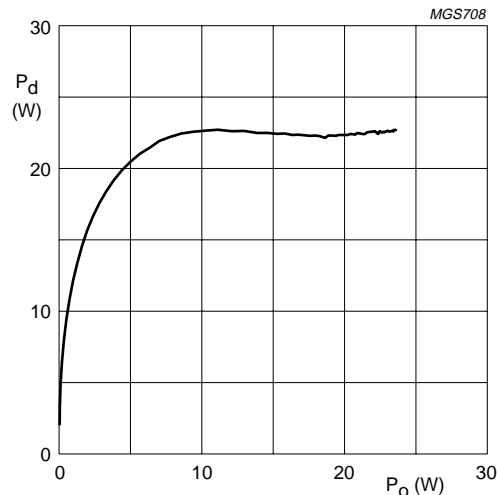
Multi-purpose power amplifier

TDA8580J



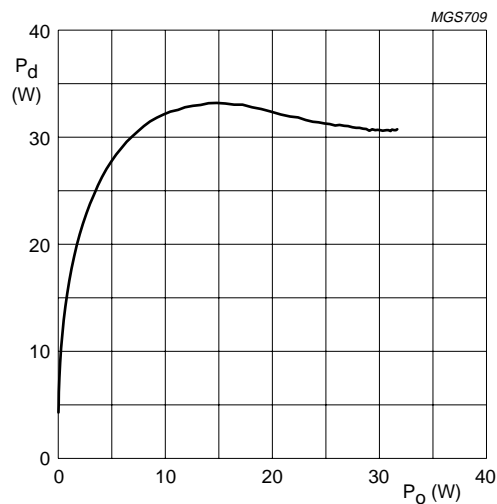
$R_L = 4 \Omega$ ;  $V_P = 24$  V; 4 channel driven.  
(1)  $f_i = 10$  kHz.  
(2)  $f_i = 1$  kHz.  
(3)  $f_i = 100$  Hz.

Fig.13 Total harmonic distortion as a function of output power; SE mode.



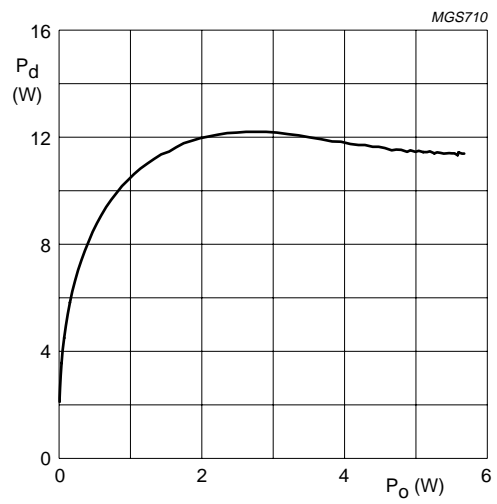
$f_i = 1$  kHz;  $R_L = 4 \Omega$ ;  $V_P = 14.4$  V; 2 channel driven.

Fig.14 Power dissipation as a function of output power; BTL mode.



$f_i = 1$  kHz;  $R_L = 8 \Omega$ ;  $V_P = 24$  V; 2 channel driven.

Fig.15 Power dissipation as a function of output power; BTL mode.

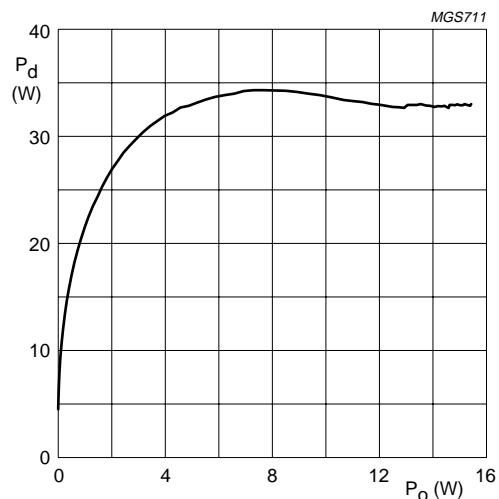


$f_i = 1$  kHz;  $R_L = 4 \Omega$ ;  $V_P = 14.4$  V; 4 channel driven.

Fig.16 Power dissipation as a function of output power; SE mode.

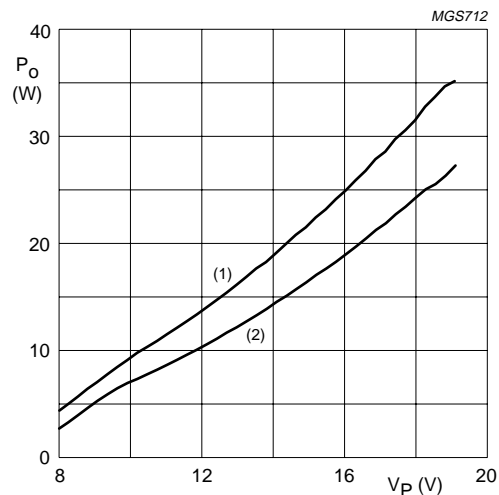
## Multi-purpose power amplifier

## TDA8580J



$f_i = 1 \text{ kHz}$ ;  $R_L = 4 \Omega$ ;  $V_P = 24 \text{ V}$ ; 4 channel driven.

Fig.17 Power dissipation as a function of output power; SE mode.

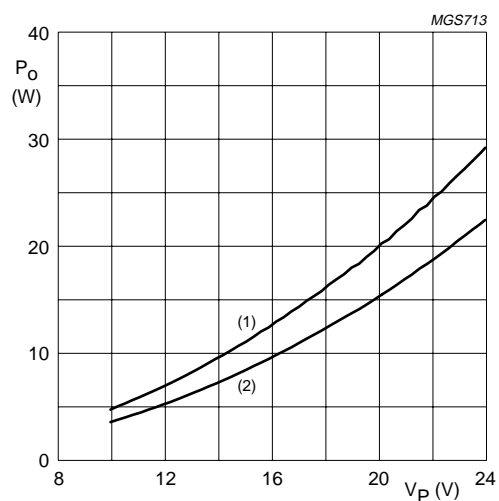


$f_i = 1 \text{ kHz}$ ;  $R_L = 4 \Omega$ ; 2 channel driven.

(1) THD = 10%.

(2) THD = 0.5%.

Fig.18 Output power as a function of supply voltage; BTL mode.

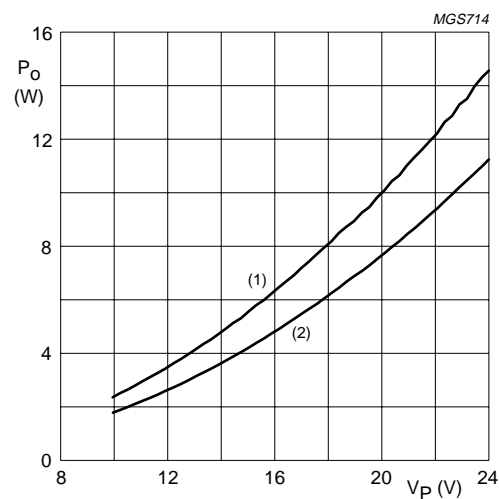


$f_i = 1 \text{ kHz}$ ;  $R_L = 8 \Omega$ ; 2 channel driven.

(1) THD = 10%.

(2) THD = 0.5%

Fig.19 Output power as a function of supply voltage; BTL mode.



$f_i = 1 \text{ kHz}$ ;  $R_L = 4 \Omega$ ; 2 channel driven.

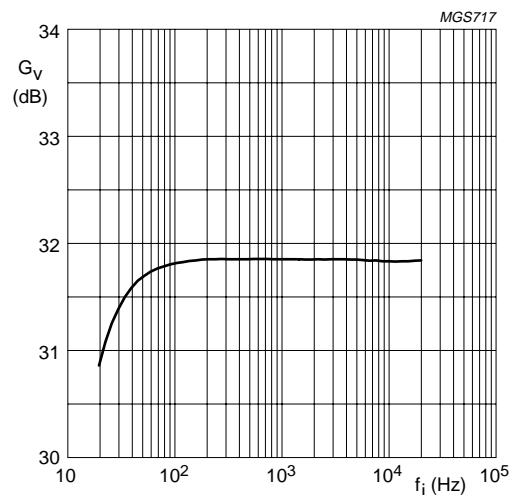
(1) THD = 0.5%.

(2) THD = 10%

Fig.20 Output power as a function of supply voltage; SE mode.

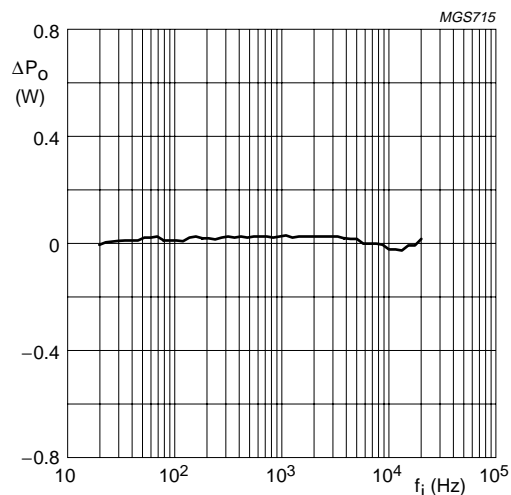
## Multi-purpose power amplifier

## TDA8580J



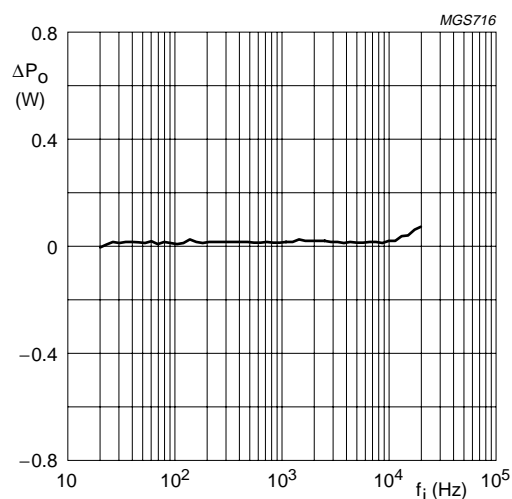
$C_i = 470 \text{ nF}$ .

Fig.21 Gain as a function of input frequency; BTL mode.



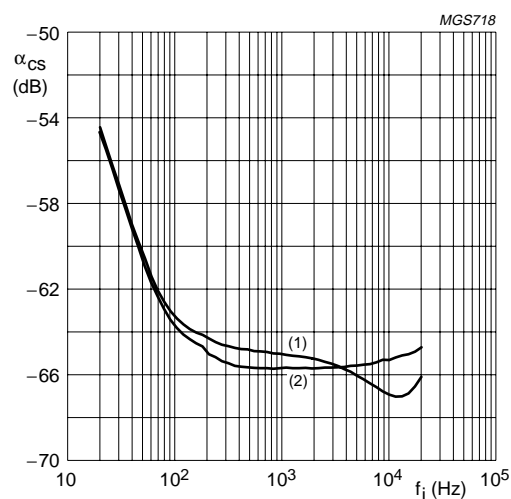
THD = 0.5%;  $R_L = 4 \Omega$ ;  $V_P = 14.4 \text{ V}$ .

Fig.22 Power bandwidth as a function of frequency; BTL mode.



THD = 0.5%;  $R_L = 8 \Omega$ ;  $V_P = 24 \text{ V}$ .

Fig.23 Power bandwidth as a function of frequency; BTL mode.



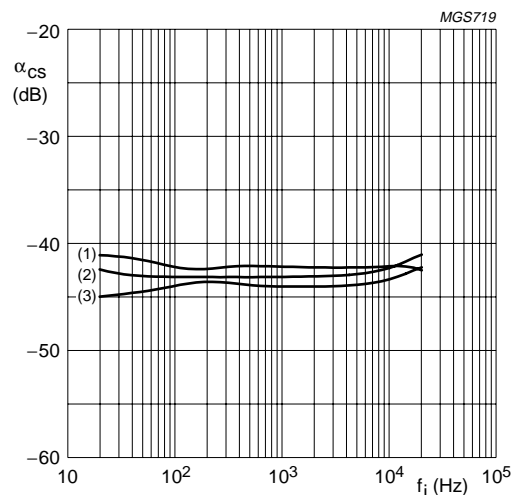
$P_O = 2 \text{ W}$ ;  $R_L = 4 \Omega$ ;  $V_P = 14.4 \text{ V}$ .

- (1) Channels 3 and 4 to channels 1 and 2.
- (2) Channels 1 and 2 to channels 3 and 4.

Fig.24 Channel separation as a function of frequency; BTL mode.

## Multi-purpose power amplifier

## TDA8580J



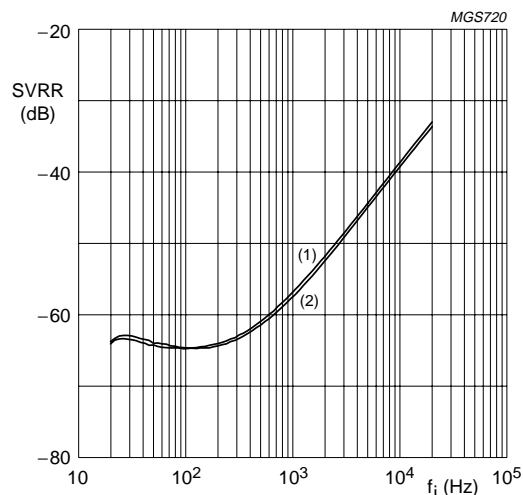
$P_o = 2 \text{ W}$ ;  $R_S = 0 \Omega$ ;  $R_L = 4 \Omega$ ;  $V_p = 14.4 \text{ V}$ .

(1) Channel 1 to channel 2.

(2) Channel 1 to channel 3.

(3) Channel 1 to channel 4.

Fig.25 Channel separation as a function of frequency; SE mode.

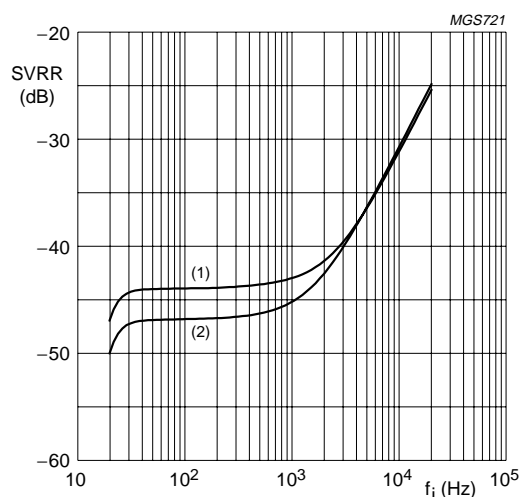


$R_S = 0 \Omega$ ;  $V_{\text{ripple(p-p)}} = 2 \text{ V}$ .

(1)  $V_p = 14.4 \text{ V}$ .

(2)  $V_p = 24 \text{ V}$ .

Fig.26 SVRR as a function of frequency; BTL mode.



$R_S = 0 \Omega$ ;  $V_{\text{ripple(p-p)}} = 2 \text{ V}$ .

(1)  $V_p = 14.4 \text{ V}$ .

(2)  $V_p = 24 \text{ V}$ .

Fig.27 SVRR as a function of frequency; SE mode.

## Multi-purpose power amplifier

## TDA8580J

**APPLICATION INFORMATION**

The application circuit depends on the supply voltage used. For supply voltages below 18 V the application circuits are shown in Figs 28, 29 and 30.

The typical application circuits for the different supply voltage ranges are shown in Figs 31, 32 and 33.

**Additional information for the applications shown in Figs 28, 29 and 30**

The RC-network connected to pin 5 determines the amplifier switch on/off behaviour as follows;

- Switched from STANDBY to MUTE when  $V_{\text{switching}}$  (typically 9 V) is enabled and the switch SW1 is closed. During MUTE there is no output noise and no offset.
- Switched from MUTE to ON when the switch SW1 is opened. During switching ON the offset and noise are gradually built up. The time constant is fixed by  $R1 \times C1$ .

The inputs can be tied together and connected to one input capacitor. Because the input resistance is decreased by a factor of 2, the low frequency roll-off is shifted to a higher frequency when  $C_i$  is kept the same value.

The low frequency cut-off is determined by;

$$f_{-3\text{dB}} = 1 / (2\pi \times R_i \times C_i)$$

$$= \frac{1}{2\pi \times 60 \times 10^3 \times 220 \times 10^{-9}} = 12 \text{ Hz.}$$

The Boucherot network connected to the buffer (pin 9) is necessary to guarantee a low output resistance at high frequencies when the buffer is loaded (only in SE applications).

**Additional information for the applications shown in Figs 31, 32 and 33**

Short circuit behaviour at high supply voltages ( $V_p > 18 \text{ V}$ ):

- When  $V_p > 18 \text{ V}$  it is advisable to use the applications given in Figs 32 and 33. In these applications the diagnostics output is tied to pin 5 (one pin operation) or pin 13 (two pin operation). During a fault condition the amplifier is soft-muted and the amplitude of the output signal is reduced at:
  - over temperature (still large dynamic range)
  - short to ground and over load (output current reduced)

- The 4.7  $\mu\text{F}$  capacitor and the 10 k $\Omega$  resistor connected to pin 5 or to pin 13 are used to:
  - provide a stable loop
  - control the switch on/off behaviour
  - minimize the effect due to clip detection.

**Use of common buffer**

In SE applications the buffer output is used in place of a SE capacitor. To minimize the crosstalk (high channel separation) and distortion it is advised to connect the speaker wires as closely as possible to pin 9 without using a shared wire. Internally in the IC all the efforts have been taken to minimize the crosstalk by locating the feedback loops as close as possible to pin 9.

If a common wire is shared by all the speakers, the series resistance of this shared wire will introduce added signal voltages resulting from the currents flowing through this wire when a connected amplifier is driven by a signal.

**Optimize the THD performance**

The TDA8580J application can be optimized to gain the lowest THD possible by applying the following guidelines:

- SE application: minimize the shared wires to pin 9 (see section "Use of common buffer").
- Because the inputs are quasi differential, ground loops can be avoided by connecting the negative terminal of the 100  $\mu\text{F}$  signal ground capacitor (connected to pin 12) to the ground pin of the signal processor.  
Note: do not leave the inputs in the open condition to prevent HF oscillation.
- Increase the value of electrolytic supply capacitor (typical value 1000  $\mu\text{F}$ ) to the maximum possible to minimize cross talk and distortion at low signal frequencies, due to the PSRR (power supply rejection ratio). For suppressing high frequency transients on the supply line a capacitor (typical value 100 nF) with a low ESR is required to be connected in parallel with the electrolytic capacitor. The capacitor combination must be placed as close as possible to the IC (using short interconnection tracks).

**Headroom**

A typical CD requires at least 12 dB dynamic headroom (a factor of 15.85), compared with the average power output, for passing the loudest parts without distortion.

## Multi-purpose power amplifier

## TDA8580J

For BTL application at  $V_p = 24\text{ V}$ ,  $R_L = 8\ \Omega$  and  $P_o$  at THD = 0.5% (see Fig.15), the Average Listening Level (ALL) for music power without distortion yields:

$$P_{o(ALL)} = \frac{23}{15.85} = 1.45\text{ W}.$$

**Table 2**  $P_d$  as a function of headroom (music signals) for  $P_o = 2 \times 23\text{ W}$  (THD = 0.5%).

HEADROOM	$P_d$
0 dB	32 W
12 dB	16 W

So for the average music listening level a total power dissipation of 16 W can be used for calculating the optimum heat sink thermal resistance.

#### Heatsink calculation

The measured thermal resistance of this package  $R_{th(j-c)}$  is a maximum of 1.5 K/W. For a maximum ambient temperature of 60°C the required heatsink thermal resistance can be calculated as shown in the following example.

#### EXAMPLE

Measured or given values:

$$V_p = 24\text{ V}$$

$$R_L = 8\ \Omega\ (2 \times \text{BTL})$$

$$\text{Measured worst case } P_d\ (\text{sine wave}) = 32\text{ W}$$

$$T_{j(max)} = 150^\circ\text{C}$$

$$T_{amb(max)} = 60^\circ\text{C}$$

$$R_{th(j-c)} = 1.5\text{ K/W}$$

$$R_{th(hs)} = \frac{T_{j(max)} - T_{amb(max)}}{P_d} - R_{th(j-c)}$$

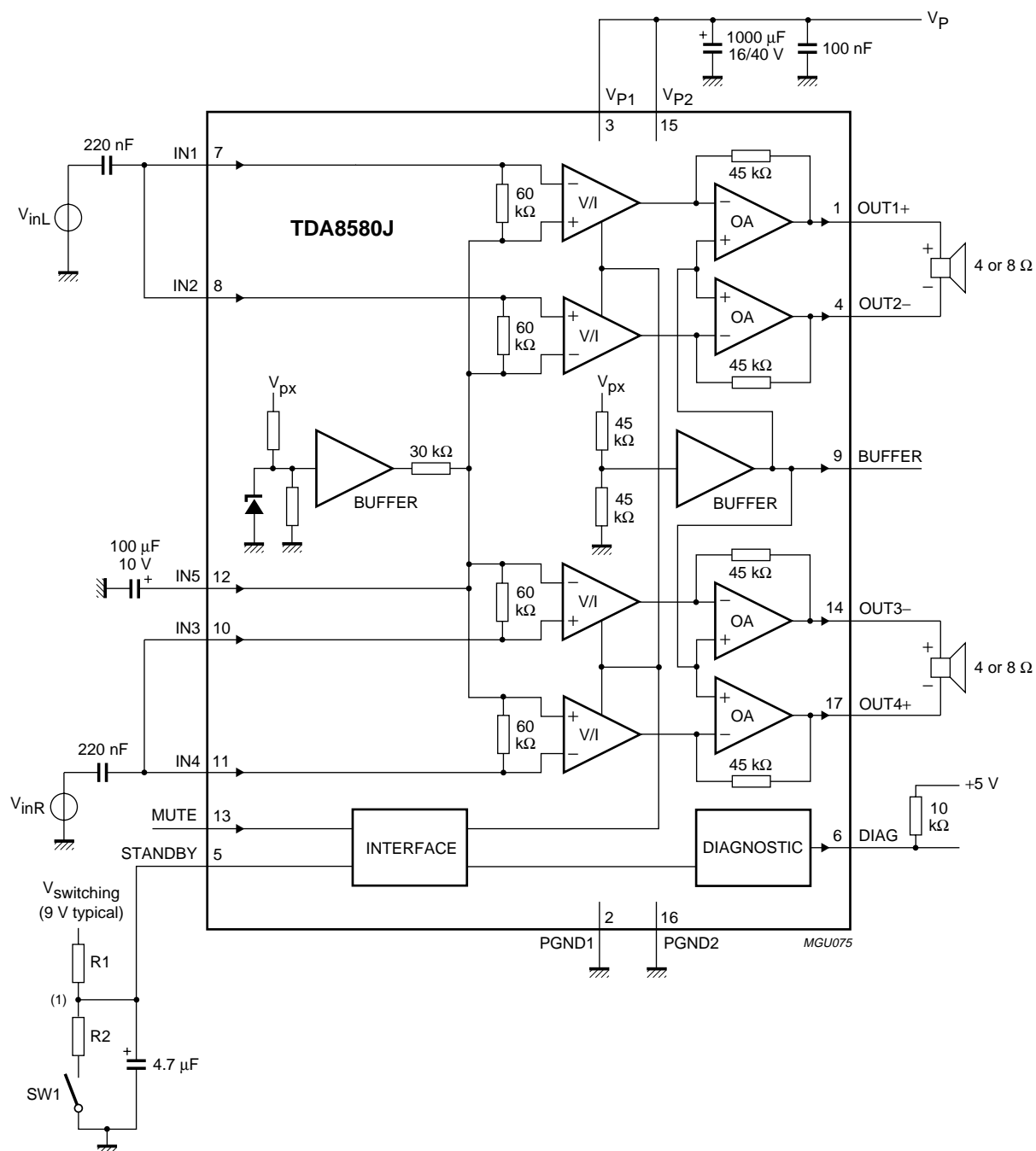
$$= \frac{150 - 60}{32} - 1.5 = 1.3\text{ K/W}$$

**Table 3** Heatsink thermal resistance as a function of headroom for  $P_o = 2 \times 23\text{ W}$  (THD = 0.5%).

HEAD ROOM	$P_d$	$R_{th(hs)}$
0 dB	32 W	1.3 K/W
12 dB	16 W	4.12 K/W

## Multi-purpose power amplifier

## TDA8580J

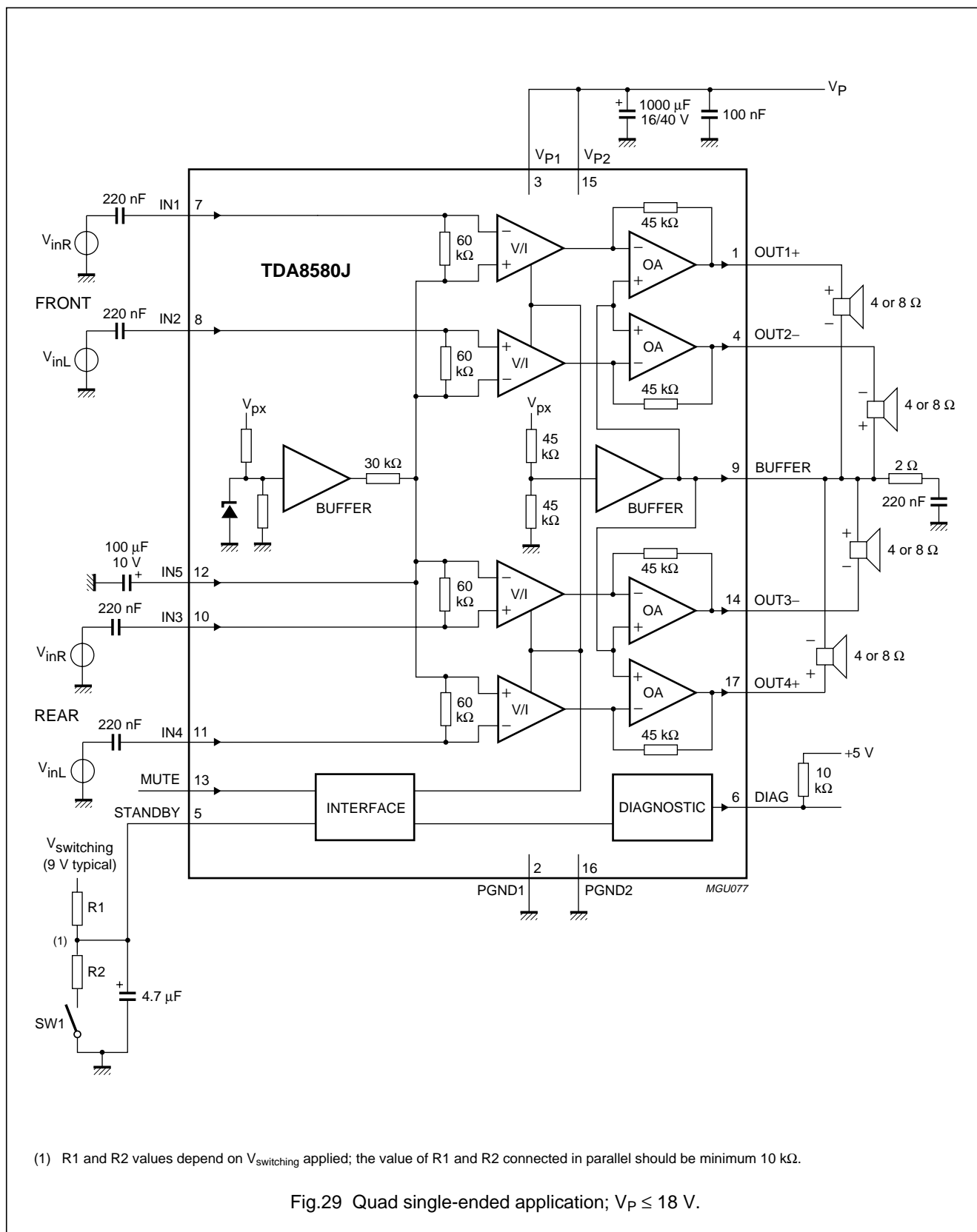


(1) R1 and R2 values depend on  $V_{\text{switching}}$  applied; the value of R1 and R2 connected in parallel should be minimum 10 kΩ.

Fig.28 Stereo bridge-tied load application;  $V_P \leq 18 \text{ V}$ .

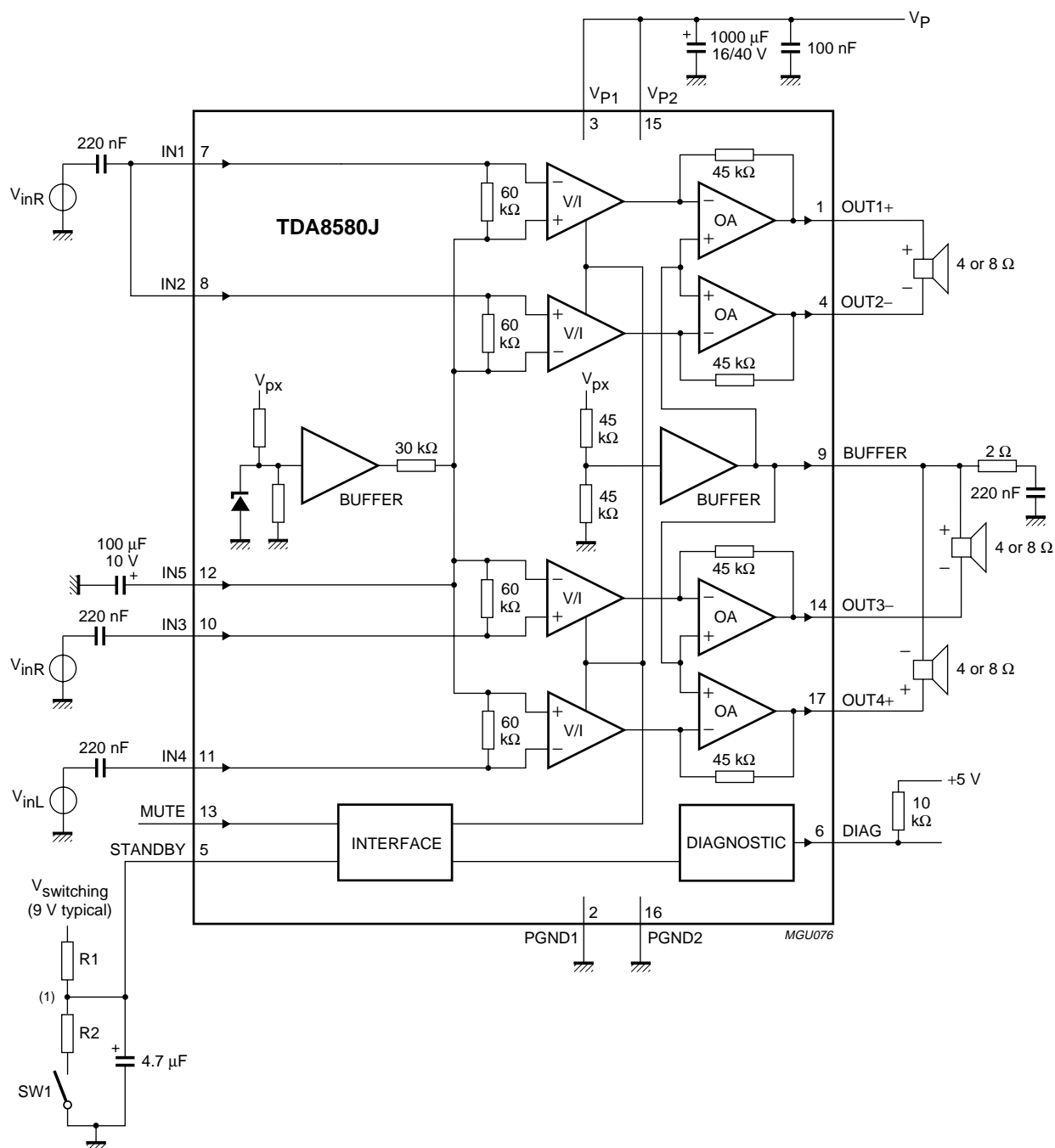
## Multi-purpose power amplifier

## TDA8580J



## Multi-purpose power amplifier

## TDA8580J

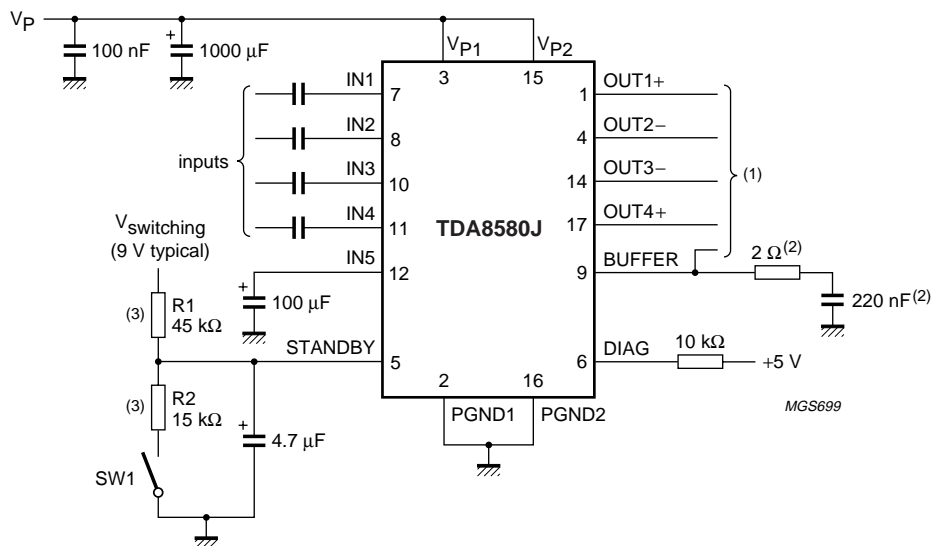


(1) R1 and R2 values depend on  $V_{\text{switching}}$  applied; the value of R1 and R2 connected in parallel should be minimum 10 kΩ.

Fig.30 Dual single-ended and one bridge-tied load application;  $V_P \leq 18 \text{ V}$ .

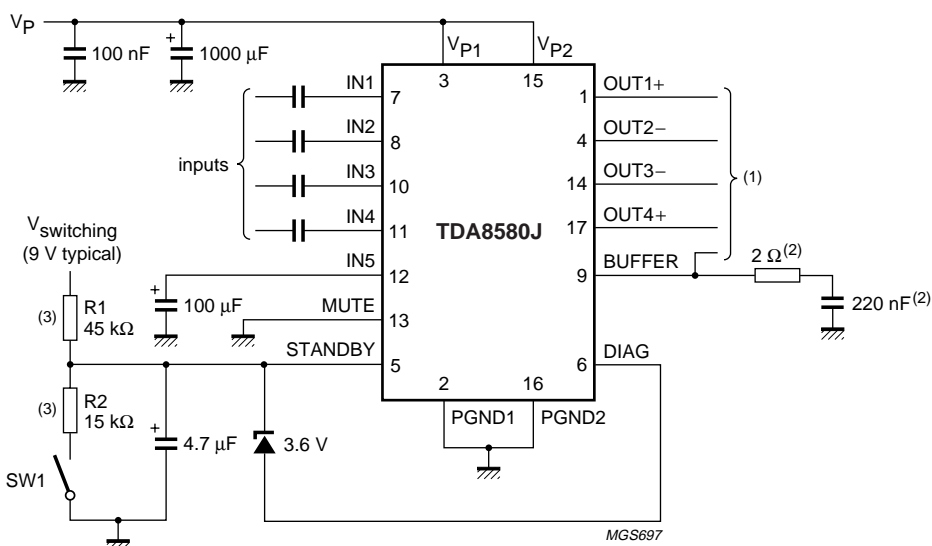
## Multi-purpose power amplifier

## TDA8580J



- (1) Load conditions: quad SE ( $4 \times 4 \Omega$ ), or dual BTL ( $2 \times 8 \Omega$ ), or dual SE ( $2 \times 4 \Omega$ ) and one BTL ( $1 \times 8 \Omega$ ).  
 (2) RC combination not required in BTL mode.  
 (3) R1 and R2 values depend on  $V_{\text{switching}}$  applied; the value of R1 and R2 connected in parallel should be minimum  $10 \text{ k}\Omega$ .

Fig.31 Application 1; supply voltage range  $8 \text{ V} < V_P \leq 18 \text{ V}$ ; 1-pin and 2-pin operation.

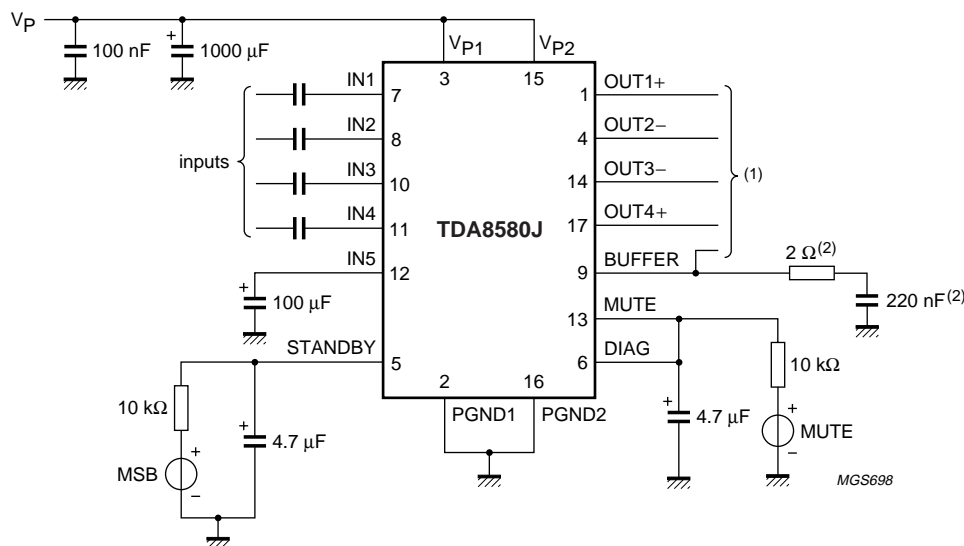


- (1) Load conditions: quad SE ( $4 \times 4 \Omega$ ), or dual BTL ( $2 \times 8 \Omega$ ), or dual SE ( $2 \times 4 \Omega$ ) and one BTL ( $1 \times 8 \Omega$ ).  
 (2) RC combination not required in BTL mode.  
 (3) R1 and R2 values depend on  $V_{\text{switching}}$  applied; the value of R1 and R2 connected in parallel should be minimum  $10 \text{ k}\Omega$ .

Fig.32 Application 2; supply voltage range  $18 \text{ V} < V_P \leq 24 \text{ V}$ ; 1-pin operation.

## Multi-purpose power amplifier

TDA8580J



(1) Load conditions: quad SE ( $4 \times 4 \Omega$ ), or dual BTL ( $2 \times 8 \Omega$ ), or dual SE ( $2 \times 4 \Omega$ ) and one BTL ( $1 \times 8 \Omega$ )

(2) RC combination not required in BTL mode.

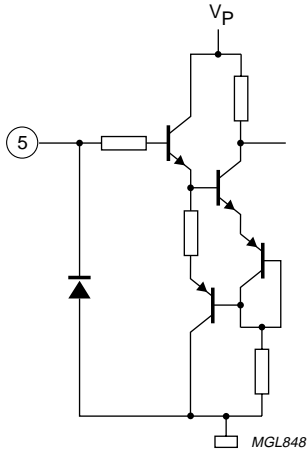
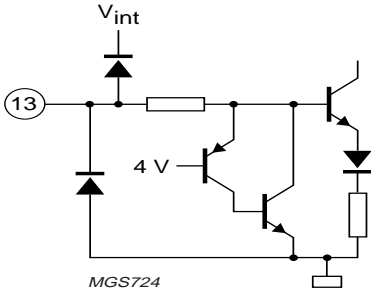
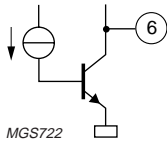
Fig.33 Application 3; supply voltage range  $18\text{ V} < V_P \leq 24\text{ V}$ ; 2-pin operation.

## INTERNAL PIN CONFIGURATION

PIN	NAME	EQUIVALENT CIRCUIT
7, 8, 10, 11 and 12	Inputs	
1, 4, 9, 14 and 17	Outputs	

Multi-purpose power amplifier

TDA8580J

PIN	NAME	EQUIVALENT CIRCUIT
5	STANDBY	
13	MUTE	
6	DIAG	

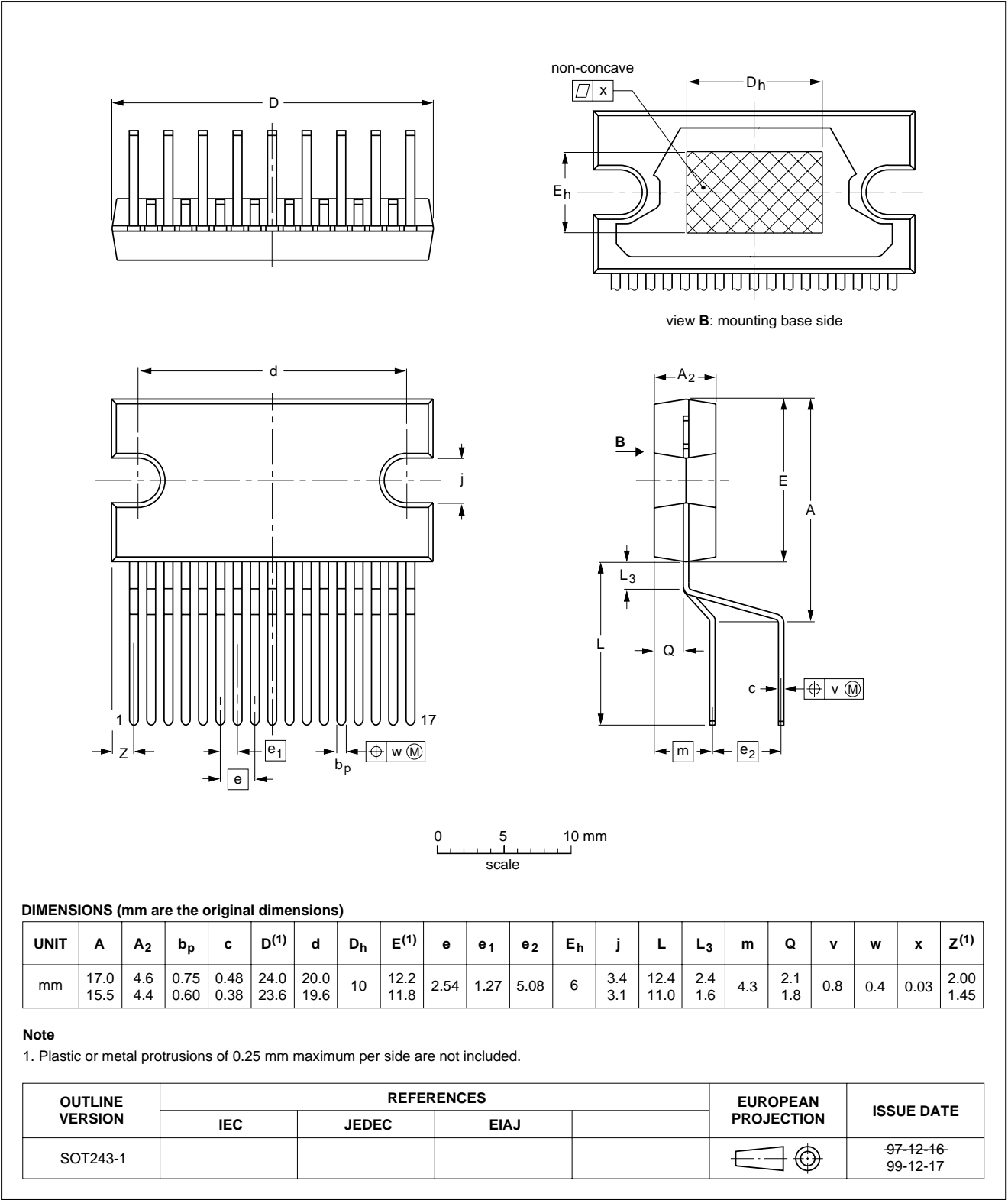
Multi-purpose power amplifier

TDA8580J

PACKAGE OUTLINE

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

SOT243-1



## Multi-purpose power amplifier

## TDA8580J

**SOLDERING****Introduction to soldering through-hole mount packages**

This text gives a brief insight to wave, dip and manual soldering. A more in-depth account of soldering ICs can be found in our *"Data Handbook IC26; Integrated Circuit Packages"* (document order number 9398 652 90011).

Wave soldering is the preferred method for mounting of through-hole mount IC packages on a printed-circuit board.

**Soldering by dipping or by solder wave**

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joints 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.

**Manual soldering**

Apply the soldering iron (24 V or less) to the lead(s) of the package, either 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.

**Suitability of through-hole mount IC packages for dipping and wave soldering methods**

PACKAGE	SOLDERING METHOD	
	DIPPING	WAVE
DBS, DIP, HDIP, SDIP, SIL	suitable	suitable <sup>(1)</sup>

**Note**

- For SDIP packages, the longitudinal axis must be parallel to the transport direction of the printed-circuit board.

## Multi-purpose power amplifier

TDA8580J

## DATA SHEET STATUS

DATA SHEET STATUS	PRODUCT STATUS	DEFINITIONS <sup>(1)</sup>
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

## Note

1. Please consult the most recently issued data sheet before initiating or completing a design.

## DEFINITIONS

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

## DISCLAIMERS

**Life support applications** — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no licence or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Multi-purpose power amplifier

TDA8580J

---

**NOTES**

# Philips Semiconductors – a worldwide company

**Argentina:** see South America

**Australia:** 3 Figtree Drive, HOMEBUSH, NSW 2140,  
Tel. +61 2 9704 8141, Fax. +61 2 9704 8139

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213,  
Tel. +43 1 60 101 1248, Fax. +43 1 60 101 1210

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,  
220050 MINSK, Tel. +375 172 20 0733, Fax. +375 172 20 0773

**Belgium:** see The Netherlands

**Brazil:** see South America

**Bulgaria:** Philips Bulgaria Ltd., Energoproject, 15th floor,  
51 James Bourchier Blvd., 1407 SOFIA,  
Tel. +359 2 68 9211, Fax. +359 2 68 9102

**Canada:** PHILIPS SEMICONDUCTORS/COMPONENTS,  
Tel. +1 800 234 7381, Fax. +1 800 943 0087

**China/Hong Kong:** 501 Hong Kong Industrial Technology Centre,  
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
Tel. +852 2319 7888, Fax. +852 2319 7700

**Colombia:** see South America

**Czech Republic:** see Austria

**Denmark:** Sydhavnsgade 23, 1780 COPENHAGEN V,  
Tel. +45 33 29 3333, Fax. +45 33 29 3905

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615 800, Fax. +358 9 6158 0920

**France:** 51 Rue Carnot, BP317, 92156 SURESNES Cedex,  
Tel. +33 1 4099 6161, Fax. +33 1 4099 6427

**Germany:** Hammerbrookstraße 69, D-20097 HAMBURG,  
Tel. +49 40 2353 60, Fax. +49 40 2353 6300

**Hungary:** see Austria

**India:** Philips INDIA Ltd, Band Box Building, 2nd floor,  
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,  
Tel. +91 22 493 8541, Fax. +91 22 493 0966

**Indonesia:** PT Philips Development Corporation, Semiconductors Division,  
Gedung Philips, Jl. Buncit Raya Kav.99-100, JAKARTA 12510,  
Tel. +62 21 794 0040 ext. 2501, Fax. +62 21 794 0080

**Ireland:** Newstead, Clonskeagh, DUBLIN 14,  
Tel. +353 1 7640 000, Fax. +353 1 7640 200

**Israel:** RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,  
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

**Italy:** PHILIPS SEMICONDUCTORS, Via Casati, 23 - 20052 MONZA (MI),  
Tel. +39 039 203 6838, Fax +39 039 203 6800

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,  
TOKYO 108-8507, Tel. +81 3 3740 5130, Fax. +81 3 3740 5057

**Korea:** Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,  
Tel. +82 2 709 1412, Fax. +82 2 709 1415

**Malaysia:** No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,  
Tel. +60 3 750 5214, Fax. +60 3 757 4880

**Mexico:** 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,  
Tel. +9-5 800 234 7381, Fax +9-5 800 943 0087

**Middle East:** see Italy

**Netherlands:** Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,  
Tel. +31 40 27 82785, Fax. +31 40 27 88399

**New Zealand:** 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,  
Tel. +64 9 849 4160, Fax. +64 9 849 7811

**Norway:** Box 1, Manglerud 0612, OSLO,  
Tel. +47 22 74 8000, Fax. +47 22 74 8341

**Pakistan:** see Singapore

**Philippines:** Philips Semiconductors Philippines Inc.,  
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,  
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

**Poland:** Al.Jerozolimskie 195 B, 02-222 WARSAW,  
Tel. +48 22 5710 000, Fax. +48 22 5710 001

**Portugal:** see Spain

**Romania:** see Italy

**Russia:** Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,  
Tel. +7 095 755 6918, Fax. +7 095 755 6919

**Singapore:** Lorong 1, Toa Payoh, SINGAPORE 319762,  
Tel. +65 350 2538, Fax. +65 251 6500

**Slovakia:** see Austria

**Slovenia:** see Italy

**South Africa:** S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,  
2092 JOHANNESBURG, P.O. Box 58088 Newville 2114,  
Tel. +27 11 471 5401, Fax. +27 11 471 5398

**South America:** Al. Vicente Pinzon, 173, 6th floor,  
04547-130 SÃO PAULO, SP, Brazil,  
Tel. +55 11 821 2333, Fax. +55 11 821 2382

**Spain:** Balmes 22, 08007 BARCELONA,  
Tel. +34 93 301 6312, Fax. +34 93 301 4107

**Sweden:** Kottbygatan 7, Akalla, S-16485 STOCKHOLM,  
Tel. +46 8 5985 2000, Fax. +46 8 5985 2745

**Switzerland:** Allmendstrasse 140, CH-8027 ZÜRICH,  
Tel. +41 1 488 2741 Fax. +41 1 488 3263

**Taiwan:** Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,  
TAIPEI, Taiwan Tel. +886 2 2134 2886, Fax. +886 2 2134 2874

**Thailand:** PHILIPS ELECTRONICS (THAILAND) Ltd.,  
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,  
Tel. +66 2 745 4090, Fax. +66 2 398 0793

**Turkey:** Yukari Dudullu, Org. San. Blg., 2.Cad. Nr. 28 81260 Umraniye,  
ISTANBUL, Tel. +90 216 522 1500, Fax. +90 216 522 1813

**Ukraine:** PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,  
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

**United Kingdom:** Philips Semiconductors Ltd., 276 Bath Road, Hayes,  
MIDDLESEX UB3 5BX, Tel. +44 208 730 5000, Fax. +44 208 754 8421

**United States:** 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,  
Tel. +1 800 234 7381, Fax. +1 800 943 0087

**Uruguay:** see South America

**Vietnam:** see Singapore

**Yugoslavia:** PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,  
Tel. +381 11 3341 299, Fax.+381 11 3342 553

**For all other countries apply to:** Philips Semiconductors,  
International Marketing & Sales Communications, Building BE-p, P.O. Box 218,  
5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

**Internet:** <http://www.semiconductors.philips.com>

© Philips Electronics N.V. 2000

SCA 69

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

73503/25/03/pp28

Date of release: 2000 Apr 18

Document order number: 9397 750 05478

*Let's make things better.*

**Philips  
Semiconductors**



**PHILIPS**