

DATA SHEET

TDA1517ATW

**8 W BTL or 2 × 4 W SE power
amplifier**

Product specification
Supersedes data of 2001 Feb 14

2001 Apr 17



8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

FEATURES

- Requires very few external components
- Flexibility in use: mono Bridge-Tied Load (BTL) and stereo Single-Ended (SE); it should be noted that in stereo applications the outputs of both amplifiers are in opposite phase
- High output power
- Low offset voltage at output (important for BTL)
- Fixed gain
- Good ripple rejection
- Mode select switch (operating, mute and standby)
- AC and DC short-circuit safe to ground and V_P
- Electrostatic discharge protection
- Thermal protection
- Reverse polarity safe
- Capable of handling high energy on outputs ($V_P = 0$ V)
- No switch-on/switch-off plop
- Low thermal resistance.

GENERAL DESCRIPTION

The TDA1517ATW is an integrated class-AB output amplifier contained in a plastic heatsink thin shrink small outline package (HTSSOP20). The device is primarily developed for multimedia applications.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage		6	12	18	V
I_{ORM}	repetitive peak output current		–	–	2.5	A
$I_{q(tot)}$	total quiescent current		–	40	80	mA
I_{stb}	standby current		–	0.1	100	μ A
SE application						
P_o	output power	THD = 10%; $R_L = 4 \Omega$	–	4	–	W
SVRR	supply voltage ripple rejection	$R_S = 0 \Omega$	46	–	–	dB
α_{cs}	channel separation	$R_S = 10 \text{ k}\Omega$	40	55	–	dB
$V_{n(o)}$	noise output voltage	$R_S = 0 \Omega$	–	50	–	μ V
$ Z_i $	input impedance		50	–	–	$\text{k}\Omega$
BTL application						
P_o	output power	THD = 10%; $R_L = 8 \Omega$	–	8	–	W
SVRR	supply voltage ripple rejection	$R_S = 0 \Omega$	50	–	–	dB
$ \Delta V_{OO} $	output offset voltage		–	–	150	mV
$V_{n(o)(offset)}$	noise output offset voltage	$R_S = 0 \Omega$	–	70	–	μ V
$ Z_i $	input impedance		25	–	–	$\text{k}\Omega$

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA1517ATW	HTSSOP20	plastic thermal enhanced thin shrink small outline package; 20 leads; body width 4.4 mm; exposed die pad	SOT527-1

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

BLOCK DIAGRAM

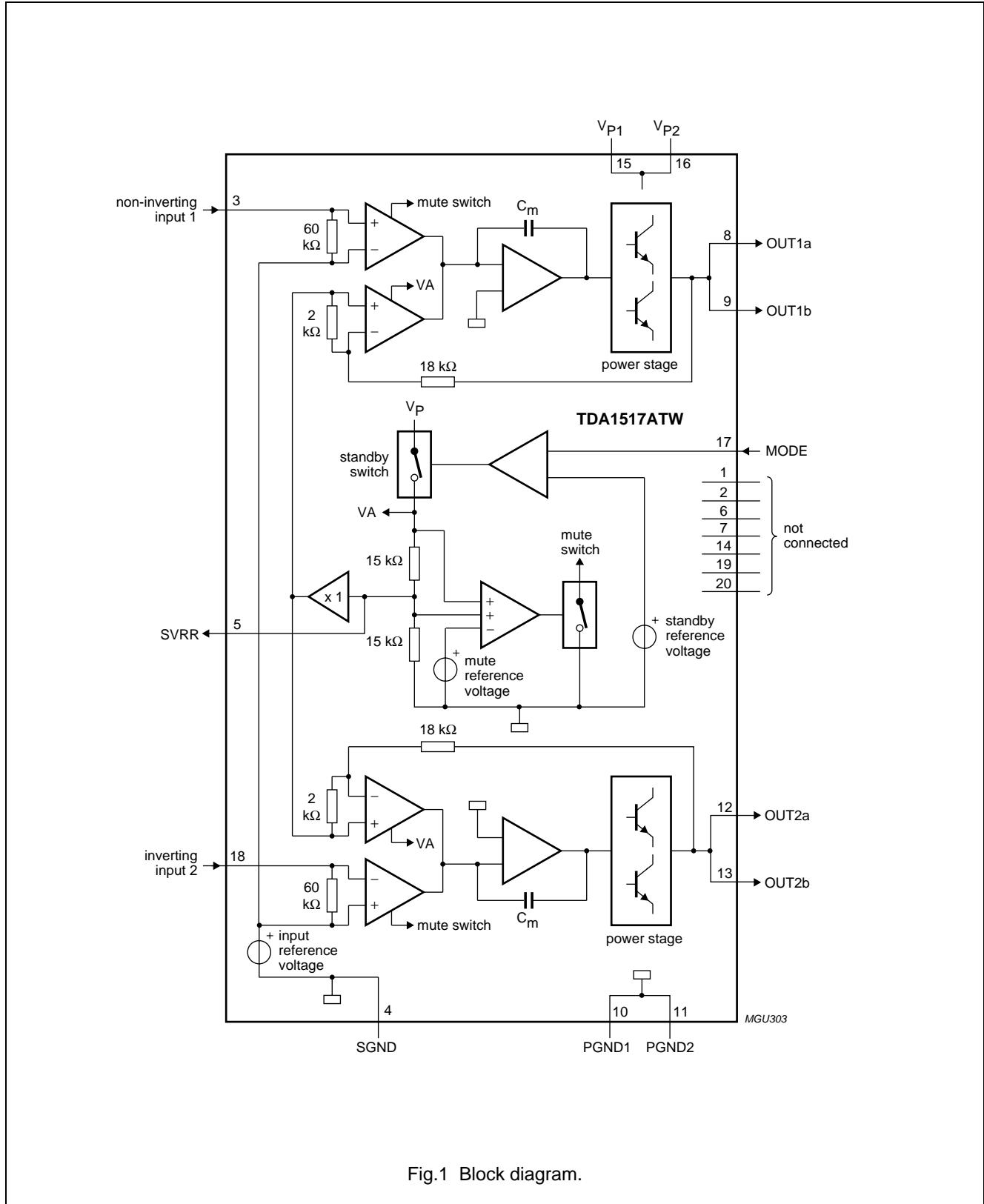


Fig.1 Block diagram.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

PINNING

SYMBOL	PIN	DESCRIPTION
n.c.	1	not connected
n.c.	2	not connected
IN1+	3	non-inverting input 1
SGND	4	signal ground
SVRR	5	supply voltage ripple rejection
n.c.	6	not connected
n.c.	7	not connected
OUT1a	8	output 1a
OUT1b	9	output 1b
PGND1	10	power ground 1
PGND2	11	power ground 2
OUT2a	12	output 2a
OUT2b	13	output 2b
n.c.	14	not connected
V _{P1}	15	supply voltage 1
V _{P2}	16	supply voltage 2
MODE	17	mode select switch
IN2-	18	inverting input 2
n.c.	19	not connected
n.c.	20	not connected

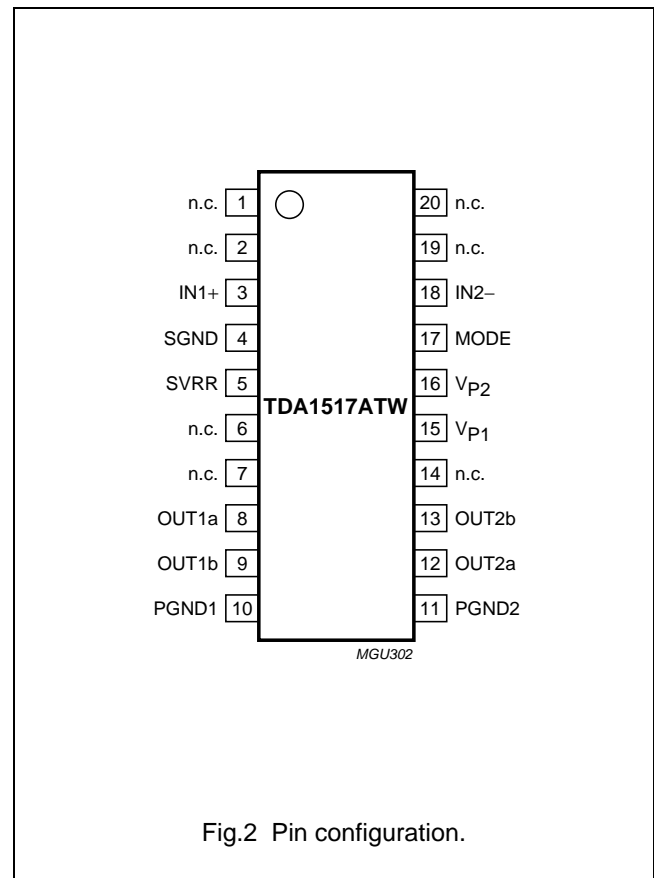


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

The TDA1517ATW contains two identical amplifiers with differential input stages. This device can be used for Bridge-Tied Load (BTL) or Single-Ended (SE) applications. The gain of each amplifier is fixed at 20 dB. A special feature of this device is the mode select switch. Since this pin has a very low input current (<40 μA), a low cost supply switch can be used. With this switch the TDA1517ATW can be switched into three modes:

- Standby: low supply current
- Mute: input signal suppressed
- Operating: normal on condition.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT.
V_P	supply voltage		–	18	V
V_{PSC}	AC and DC short-circuit-safe voltage		–	18	V
V_{rp}	reverse polarity voltage		–	6	V
ERG_o	energy handling capability at outputs	$V_P = 0$ V	–	200	mJ
I_{OSM}	non-repetitive peak output current		–	4	A
I_{ORM}	repetitive peak output current		–	2.5	A
P_{tot}	total power dissipation		–	5	W
T_{vj}	virtual junction temperature		–	150	°C
T_{stg}	storage temperature		–55	+150	°C
T_{amb}	ambient temperature		–40	+85	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
tbf			–	–

DC CHARACTERISTICS

$V_P = 12$ V; $T_{amb} = 25$ °C; measured in Fig.3; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_P	supply voltage	note 1	6.0	12	18	V
I_q	quiescent current	$R_L = \infty$	–	40	80	mA
Operating condition						
$V_{MODE(oper)}$	mode switch voltage level		8.5	–	V_P	V
$I_{MODE(oper)}$	mode switch current	$V_{MODE} = 12$ V	–	15	40	μA
V_O	DC output voltage		–	5.7	–	V
$ \Delta V_{OO} $	DC output offset voltage		–	–	150	mV
Mute condition						
$V_{MODE(mute)}$	mode switch voltage level		3.3	–	6.4	V
V_O	DC output voltage		–	5.7	–	V
$ \Delta V_{OO} $	DC output offset voltage		–	–	150	mV
Standby condition						
$V_{MODE(stb)}$	mode switch voltage level		0	–	2	V
I_{stb}	standby current		–	0.1	100	μA

Note

1. The circuit is DC adjusted at $V_P = 6$ to 18 V and AC operating at $V_P = 8.5$ to 18 V.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

AC CHARACTERISTICS

$V_P = 12\text{ V}$; $f = 1\text{ kHz}$; $T_{\text{amb}} = 25\text{ °C}$; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
SE application; note 1						
P_o	output power	note 2				
		THD = 1%	2.5	3.3	–	W
		THD = 10%	3	4	–	W
THD	total harmonic distortion	$P_o = 1\text{ W}$	–	0.1	–	%
$f_{ro(L)}$	low frequency roll-off	–1 dB; note 3	–	25	–	Hz
$f_{ro(H)}$	high frequency roll off	–1 dB	20	–	–	kHz
G_V	voltage gain		19	20	21	dB
$ \Delta G_V $	channel balance		–	–	1	dB
SVRR	supply voltage ripple rejection	note 4				
		on	46	–	–	dB
		mute	46	–	–	dB
	standby	80	–	–	dB	
$ Z_i $	input impedance		50	60	75	k Ω
$V_{n(o)(rms)}$	noise output voltage (RMS value)	note 5				
		on; $R_S = 0\ \Omega$	–	50	–	μV
		on; $R_S = 10\ \text{k}\Omega$	–	70	100	μV
	mute; note 6	–	50	–	μV	
α_{cs}	channel separation	$R_S = 10\ \text{k}\Omega$	40	55	–	dB
$V_{o(mute)}$	output voltage in mute	note 7	–	–	2	mV
BTL application; note 8						
P_o	output power	note 2				
		THD = 1%	5	6.6	–	W
		THD = 10%	6.5	8.0	–	W
THD	total harmonic distortion	$P_o = 1\text{ W}$	–	0.03	–	%
$f_{ro(L)}$	low frequency roll-off	–1 dB; note 3	–	25	–	Hz
$f_{ro(H)}$	high frequency roll off	–1 dB	20	–	–	kHz
G_V	voltage gain		25	26	27	dB
SVRR	supply voltage ripple rejection	note 4				
		on	50	–	–	dB
		mute	50	–	–	dB
	standby	80	–	–	dB	
$ Z_i $	input impedance		25	30	38	k Ω
$V_{n(o)(rms)}$	noise output voltage (RMS value)	note 5				
		on; $R_S = 0\ \Omega$	–	70	–	μV
		on; $R_S = 10\ \text{k}\Omega$	–	100	200	μV
	mute; note 6	–	60	–	μV	
$V_{o(mute)}$	output voltage in mute	note 7	–	–	2	mV

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

Notes to the characteristics

1. $R_L = 4 \Omega$, measured in Fig.4.
2. Output power is measured directly at the output pins of the IC.
3. Frequency response externally fixed.
4. $V_{ripple} = V_{ripple(max)} = 2 \text{ V (p-p)}$; $R_S = 0 \Omega$.
5. Noise voltage measured in a bandwidth of 20 Hz to 20 kHz.
6. Noise output voltage independent of R_S .
7. $V_i = V_{i(max)} = 1 \text{ V (RMS)}$.
8. $R_L = 8 \Omega$, measured in Fig.3.

APPLICATION INFORMATION

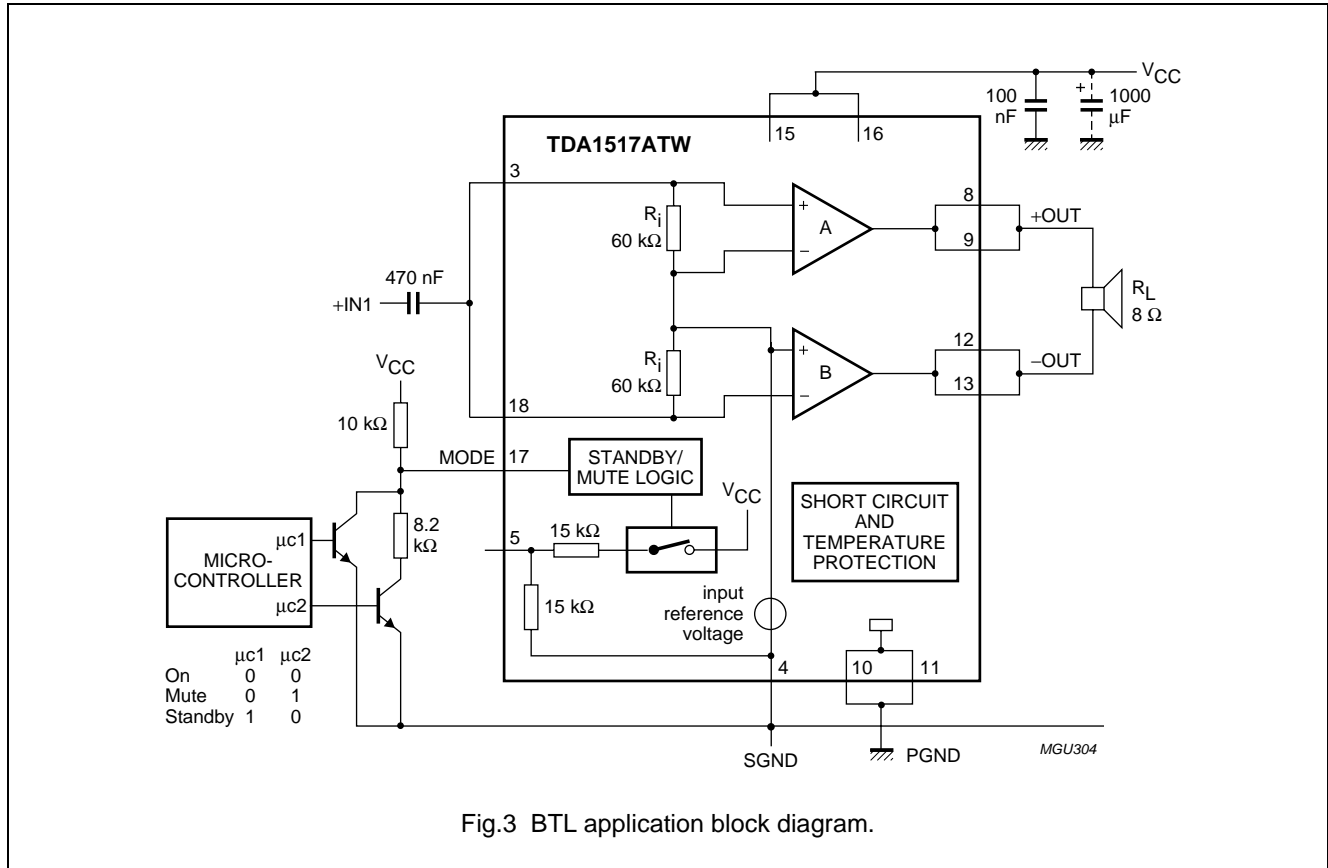
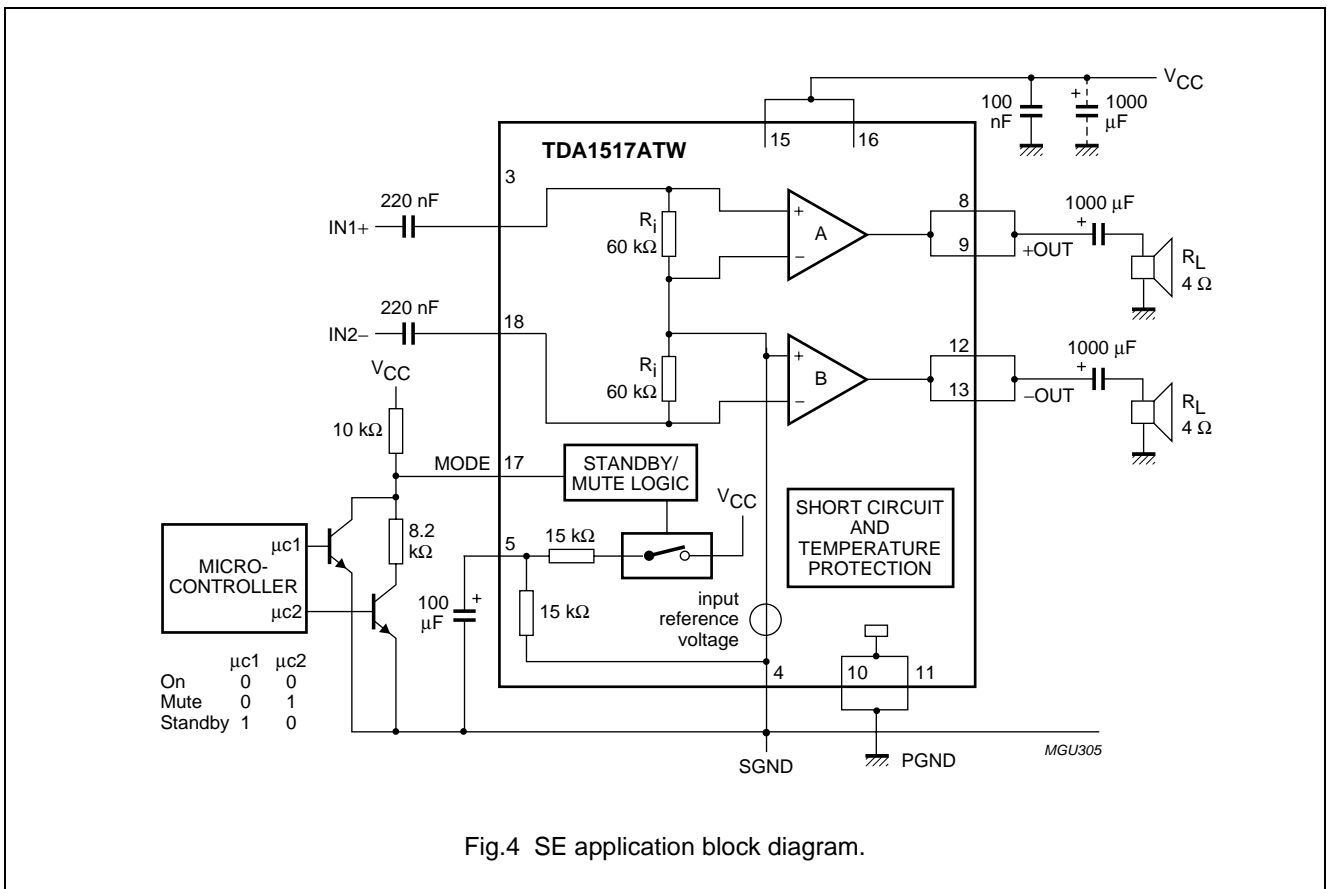


Fig.3 BTL application block diagram.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW



Test conditions

T_{amb} = 25 °C; unless otherwise specified: V_P = 12 V, BTL application, f = 1 kHz, R_L = 8 Ω, fixed gain = 26 dB, audio band-pass: 22 Hz to 22 kHz. In the figures as a function of frequency a band-pass of 10 Hz to 80 kHz was applied.

The BTL application block diagram is shown in Fig.3. The PCB layout [which accommodates both the mono (BTL) and stereo (single-ended) application] is shown in Fig.6.

Printed-Circuit Board (PCB) layout and grounding

For high system performance levels certain grounding techniques are imperative. The input reference grounds have to be tied to their respective source grounds and must have separate traces from the power ground traces; this will separate the large (output) signal currents from interfering with the small AC input signals. The small signal ground traces should be located physically as far as possible from the power ground traces. Supply and output traces should be as wide as possible for delivering maximum output power.

Proper supply bypassing is critical for low noise performance and high power supply rejection. The respective capacitor locations should be as close as possible to the device and grounded to the power ground. Decoupling the power supply also prevents unwanted oscillations. For suppressing higher frequency transients (spikes) on the supply line a capacitor with low ESR (typical 0.1 μF) has to be placed as close as possible to the device. For suppressing lower frequency noise and ripple signals, a large electrolytic capacitor (e.g. 1000 μF or greater) must be placed close to the IC.

In single-ended (stereo) application a bypass capacitor connected to pin SVR reduces the noise and ripple on the midrail voltage. For good THD and noise performance a low ESR capacitor is recommended.

Input configuration

It should be noted that the DC level of the input pins is approximately 2.1 V; a coupling capacitor is therefore necessary.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

The formula for the cut-off frequency at the input is as

$$\text{follows: } f_{IC} = \frac{1}{2 \times \pi \times R_1 C_1}$$

$$\text{thus } f_{IC} = \frac{1}{2 \times \pi \times 30 \times 10^{-3} \times 470 \times 10^{-9}} = 11 \text{ Hz}$$

As can be seen it is not necessary to use high capacitor values for the input; so the delay during switch-on, which is necessary for charging the input capacitors, can be minimized. This results in a good low frequency response and good switch-on behaviour.

In stereo applications (single-ended) coupling capacitors on both input and output are necessary. It should be noted that the outputs of both amplifiers are in opposite phase.

Built-in protection circuits

The IC contains two types of protection circuits:

- Short-circuits the outputs to ground, the supply to ground and across the load: short-circuit is detected and controlled by a SOAR protection circuit
- Thermal shut-down protection: the junction temperature is measured by a temperature sensor. Thermal foldback is activated at a junction temperature of >150 °C.

Output power

The output power as a function of supply voltage has been measured on the output pins and at THD = 10%. The maximum output power is limited by the maximum allowable power dissipation and the maximum available output current, 2.5 A repetitive peak current.

Supply voltage ripple rejection

The SVRR has been measured without an electrolytic capacitor on pin 5 and at a bandwidth of 10 Hz to 80 kHz. The curves for operating and mute condition (respectively) were measured with $R_{source} = 0 \Omega$. Only in single-ended applications is an electrolytic capacitor (e.g. 100 µF) on pin 5 necessary to improve the SVRR behaviour.

Headroom

A typical music CD requires at least 12 dB (is factor 15.85) dynamic headroom (compared with the average power output) for passing the loudest portions without distortion. The following calculation can be made for this application at $V_P = 12 \text{ V}$ and $R_L = 8 \Omega$: P_o at THD = 0.1% is approximately 5 W (see Fig.7).

Average listening level without any distortion yields:

$$P_{ALL} = \frac{P_{tot}}{\text{factor}} = \frac{5}{15.85} = 315 \text{ mW}$$

The power dissipation can be derived from Fig.11 for 0 dB and 12 dB headroom.

Table 1 Power rating

RATING	HEADROOM	POWER DISSIPATION
$P_o = 5 \text{ W}$ (THD = 0.1%)	0 dB	3.5 W
	12 dB	2.0 W

Thus for the average listening level (music power) a power dissipation of 2.0 W can be used for the thermal PCB calculation; see Section "Thermal behaviour (PCB design considerations)".

Mode pin

For the 3 functional modes: standby, mute and operate, the MODE pin can be driven by a 3-state logic output stage, e.g. a microcontroller with some extra components for DC-level shifting; see Fig.10 for the respective DC levels.

- Standby mode is activated by a low DC level between 0 and 2 V. The power consumption of the IC will be reduced to <0.12 mW.
- Mute mode is activated by a DC level between 3.3 and 6.4 V. The outputs of the amplifier will be muted (no audio output); however the amplifier is DC biased and the DC level of the output pins stays at half the supply voltage. The input coupling capacitors are charged when in mute mode to avoid pop-noise.
- The IC will be in the operating condition when the voltage at pin MODE is between 8.5 V and V_{CC} .

Switch-on/switch-off

To avoid audible plops during switch-on and switch-off of the supply voltage, the MODE pin has to be set in standby condition (V_{CC} level) before the voltage is applied (switch-on) or removed (switch-off). The input and SVRR capacitors are smoothly charged during mute mode.

The turn-on and turn-off time can be influenced by an RC-circuit connected to the MODE pin. Switching the device or the MODE pin rapidly on and off may cause 'click and pop' noise. This can be prevented by proper timing on the MODE pin. Further improvement in the BTL application can be obtained by connecting an electrolytic capacitor (e.g. 100 µF) between the SVRR pin and signal ground.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

Thermal behaviour (PCB design considerations)

The typical thermal resistance [$R_{th(j-a)}$] of the IC in the HTSSOP20 package is 37 K/W if the IC is soldered on a printed-circuit board with double sided 35 μm copper with a minimum area of approximately 30 cm^2 . The actual usable thermal resistance depends strongly on the mounting method of the device on the printed-circuit board, the soldering method and the area and thickness of the copper on the printed-circuit board.

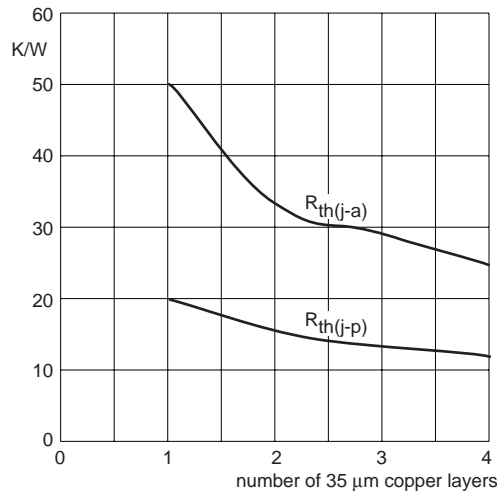
The bottom 'heat-spreader' of the IC has to be soldered efficiently on the 'thermal land' of the copper area of the printed-circuit board using the re-flow solder technique.

A number of thermal vias in the 'thermal land' provide a thermal path to the opposite copper site of the printed-circuit board. The size of the surface layers should be as large as needed to dissipate the heat.

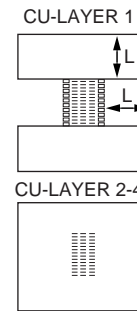
The thermal vias (0.3 mm \varnothing) in the 'thermal land' should not use web construction techniques, because those will have high thermal resistance; continuous connection completely around the via-hole is recommended.

For a maximum ambient temperature of 60 $^{\circ}\text{C}$ the following calculation can be made: for the application at $V_P = 12\text{ V}$ and $R_L = 8\ \Omega$ the (ALL-) music power dissipation approximately 2.0 W;
 $T_{j(max)} = T_{amb} + P \times R_{th(j-a)} = 60\ ^{\circ}\text{C} + 2.0 \times 37 = 134\ ^{\circ}\text{C}$.

Note: the above calculation holds for application at 'average listening level' music output signals. Applying (or testing) with sine wave signals will produce approximately twice the music power dissipation; at worst case condition this can activate the maximum temperature protection.



ON-BOARD-COOLING COPPER DESIGN



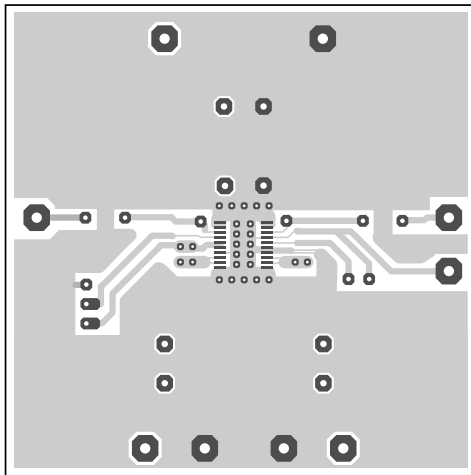
MGU306

$R_{th(j-p)}$ curve is given for practical calculation purpose.
 L = 30 mm plus vias

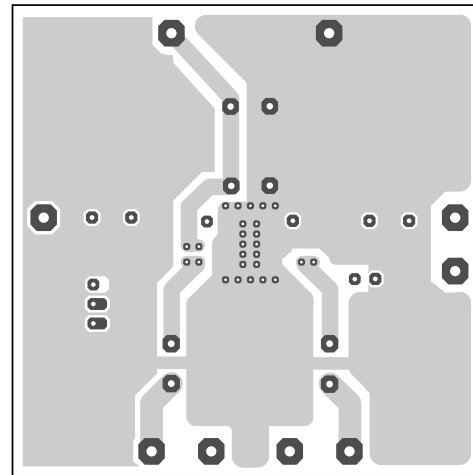
Fig.5 Thermal resistance of the HTSSOP20 mounted on printed-circuit board.

8 W BTL or 2 × 4 W SE power amplifier

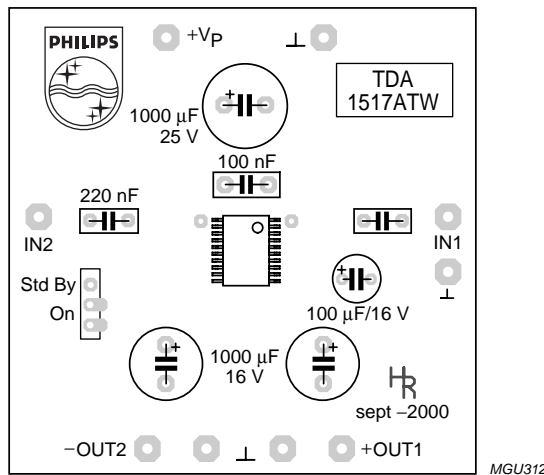
TDA1517ATW



top view
bottom copper layout



top view
top copper layout



top view
component layout

MGU312

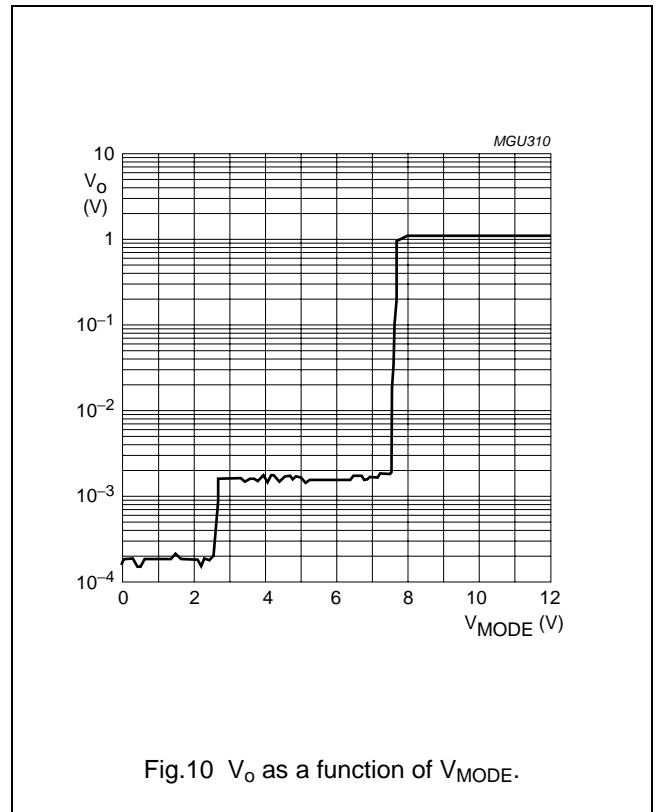
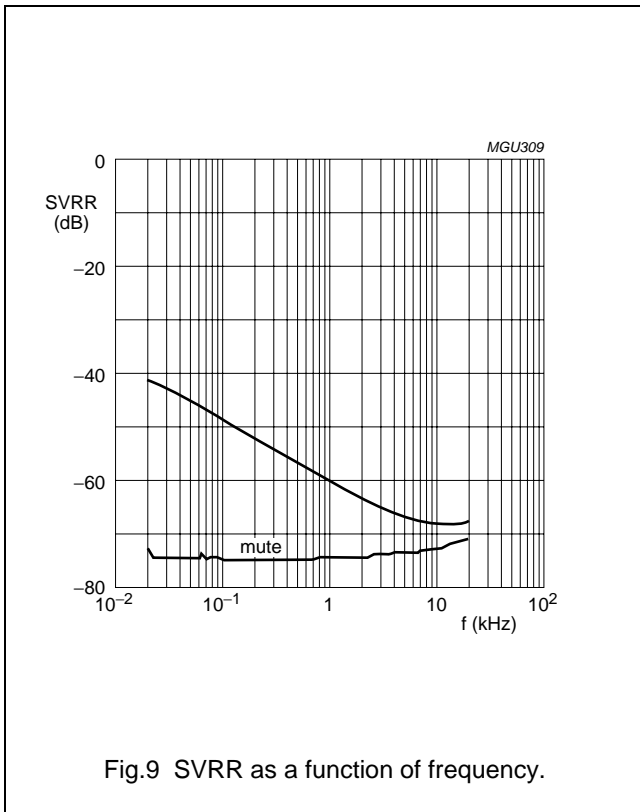
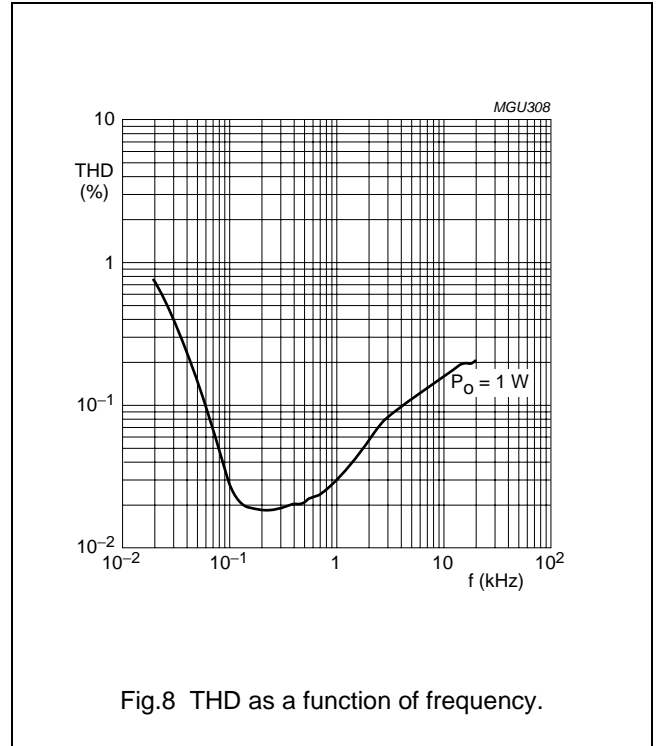
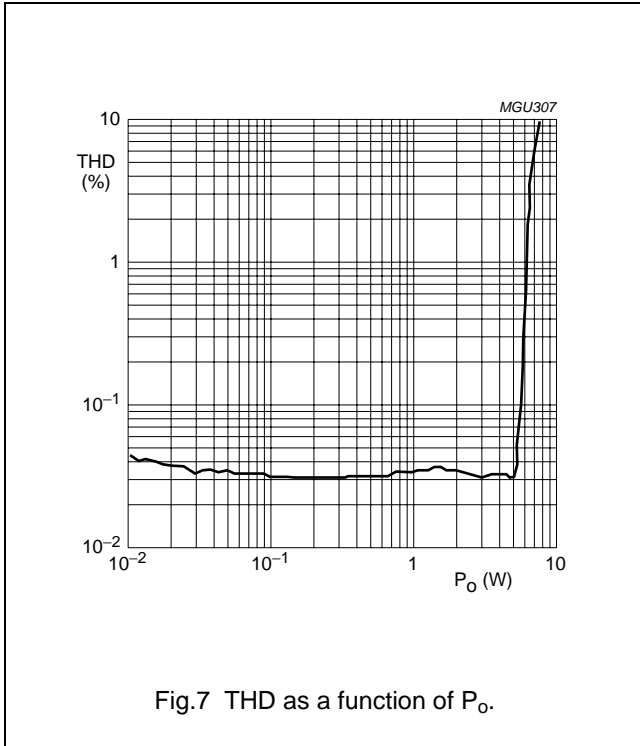
For BTL applications the two 1000 μF/16 V capacitors must be replaced by 0 Ω jumpers.

Fig.6 Printed-circuit board layout for BTL and SE application.

8 W BTL or 2 × 4 W SE power amplifier

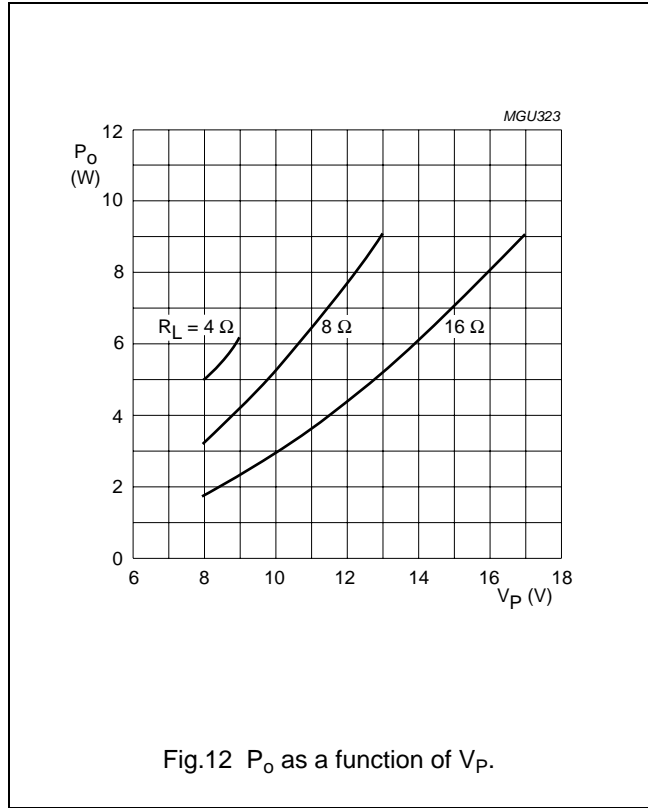
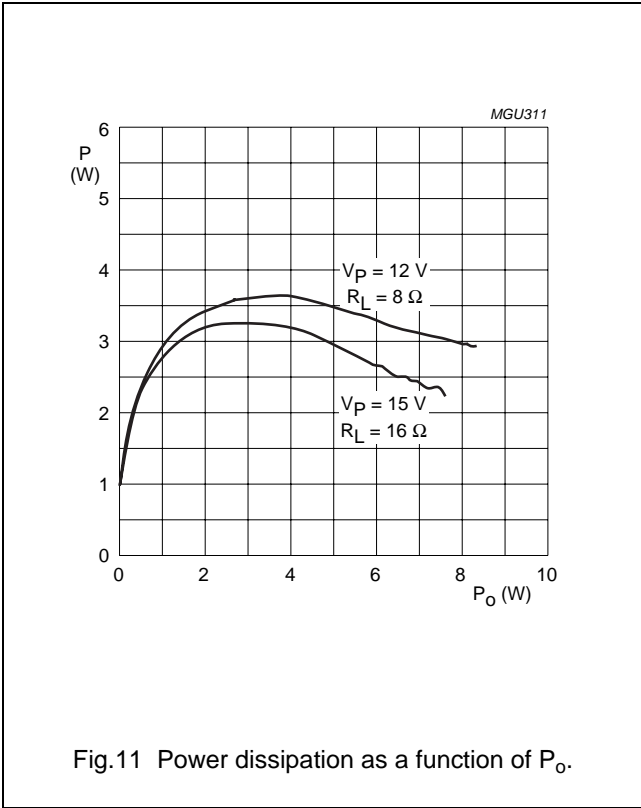
TDA1517ATW

Typical performance characteristics for BTL application at $V_P = 12\text{ V}$ and $R_L = 8\ \Omega$



8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW



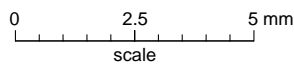
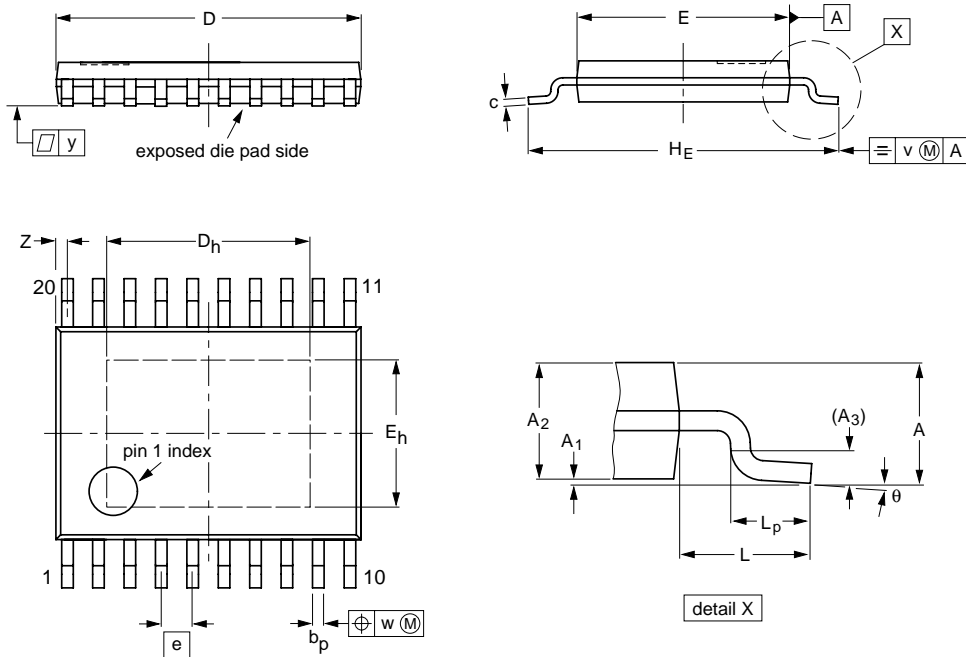
8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

PACKAGE OUTLINE

HTSSOP20: plastic thermal enhanced thin shrink small outline package; 20 leads; body width 4.4 mm; exposed die pad

SOT527-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	D _h	E ⁽²⁾	E _h	e	H _E	L	L _p	v	w	y	Z ⁽¹⁾	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.20 0.09	6.6 6.4	4.3 4.1	4.5 4.3	3.1 2.9	0.65	6.6 6.2	1	0.75 0.50	0.2	0.13	0.1	0.5 0.2	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT527-1		MO-153				03-04-07- 05-11-02

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

SOLDERING**Introduction to soldering surface mount packages**

This text gives a very brief insight to a complex technology. 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).

There is no soldering method that is ideal for all surface mount IC packages. Wave soldering can still be used for certain surface mount ICs, but it is not suitable for fine pitch SMDs. In these situations reflow soldering is recommended.

Reflow soldering

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several methods exist for reflowing; for example, convection or convection/infrared heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 100 and 200 seconds depending on heating method.

Typical reflow peak temperatures range from 215 to 250 °C. The top-surface temperature of the packages should preferably be kept below 220 °C for thick/large packages, and below 235 °C for small/thin packages.

Wave soldering

Conventional single wave soldering is not recommended for surface mount devices (SMDs) or printed-circuit boards with a high component density, as solder bridging and non-wetting can present major problems.

To overcome these problems the double-wave soldering method was specifically developed.

If wave soldering is used the following conditions must be observed for optimal results:

- Use a double-wave soldering method comprising a turbulent wave with high upward pressure followed by a smooth laminar wave.
- For packages with leads on two sides and a pitch (e):
 - larger than or equal to 1.27 mm, the footprint longitudinal axis is **preferred** to be parallel to the transport direction of the printed-circuit board;
 - smaller than 1.27 mm, the footprint longitudinal axis **must** be parallel to the transport direction of the printed-circuit board.

The footprint must incorporate solder thieves at the downstream end.

- For packages with leads on four sides, the footprint must be placed at a 45° angle to the transport direction of the printed-circuit board. The footprint must incorporate solder thieves downstream and at the side corners.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Manual soldering

Fix the component by first soldering two diagonally-opposite end leads. Use a low voltage (24 V or less) soldering iron applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C.

When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

Suitability of surface mount IC packages for wave and reflow soldering methods

PACKAGE	SOLDERING METHOD	
	WAVE	REFLOW ⁽¹⁾
BGA, HBGA, LFBGA, SQFP, TFBGA	not suitable	suitable
HBCC, HLQFP, HSQFP, HSOP, HTQFP, HTSSOP, HVQFN, SMS	not suitable ⁽²⁾	suitable
PLCC ⁽³⁾ , SO, SOJ	suitable	suitable
LQFP, QFP, TQFP	not recommended ⁽³⁾⁽⁴⁾	suitable
SSOP, TSSOP, VSO	not recommended ⁽⁵⁾	suitable

Notes

1. All surface mount (SMD) packages are moisture sensitive. Depending upon the moisture content, the maximum temperature (with respect to time) and body size of the package, there is a risk that internal or external package cracks may occur due to vaporization of the moisture in them (the so called popcorn effect). For details, refer to the Drypack information in the *"Data Handbook IC26; Integrated Circuit Packages; Section: Packing Methods"*.
2. These packages are not suitable for wave soldering as a solder joint between the printed-circuit board and heatsink (at bottom version) can not be achieved, and as solder may stick to the heatsink (on top version).
3. If wave soldering is considered, then the package must be placed at a 45° angle to the solder wave direction. The package footprint must incorporate solder thieves downstream and at the side corners.
4. Wave soldering is only suitable for LQFP, TQFP and QFP packages with a pitch (e) equal to or larger than 0.8 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.65 mm.
5. Wave soldering is only suitable for SSOP and TSSOP packages with a pitch (e) equal to or larger than 0.65 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.5 mm.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

DATA SHEET STATUS

DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

Notes

1. Please consult the most recently issued document before initiating or completing a design.
2. The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

DISCLAIMERS

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe

property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

8 W BTL or 2 × 4 W SE power amplifier

TDA1517ATW

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

NXP Semiconductors

provides High Performance Mixed Signal and Standard Product solutions that leverage its leading RF, Analog, Power Management, Interface, Security and Digital Processing expertise

Customer notification

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version. The Ordering information was modified accordingly.

Contact information

For additional information please visit: <http://www.nxp.com>

For sales offices addresses send e-mail to: salesaddresses@nxp.com

© NXP B.V. 2010

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

753503/02/pp19

Date of release: 2001 Apr 17

Document order number: 9397 750 08264