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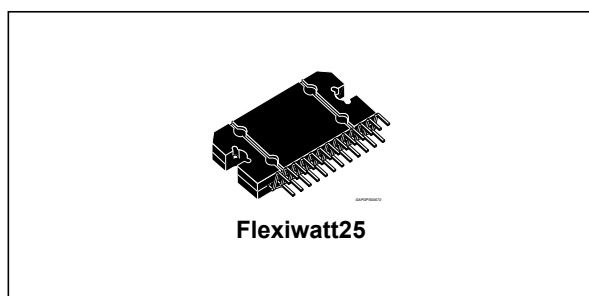
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# TDA7386

## 4 x 49 W quad bridge car radio amplifier

Datasheet - production data



### Features

- High output power capability:
- 4 x 49 W/4 Ω max.
- 4 x 28 W/4 Ω @ 14.4V, 1 kHz, 10%
- 4 x 24 W/4 Ω @ 13.2V, 1 kHz, 10%
- Low distortion
- Low output noise
- Standby function
- Mute function
- Automute at min. supply voltage detection
- Low external component count:

- Internally fixed gain (26dB)
- No external compensation
- No bootstrap capacitors
- Protections:
  - Output short circuit to GND, to  $V_S$ , across the load
  - Very inductive loads
  - Overrating chip temperature with soft thermal limiter
  - Load dump voltage
  - Fortuitous open GND
  - Reversed battery
  - ESD

### Description

The TDA7386 is an AB class audio power amplifier, packaged in Flexiwatt 25 and designed for high end car radio applications.

Based on a fully complementary PNP/NPN configuration, the TDA7386 allows a rail to rail output voltage swing with no need of bootstrap capacitors. The extremely reduced boundary components count allows very compact sets.

**Table 1. Device summary**

Order code	Package	Packing
TDA7386	Flexiwatt25	Tube

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Block and pin connection diagrams

# 1 Block and pin connection diagrams

Figure 1. Block diagram

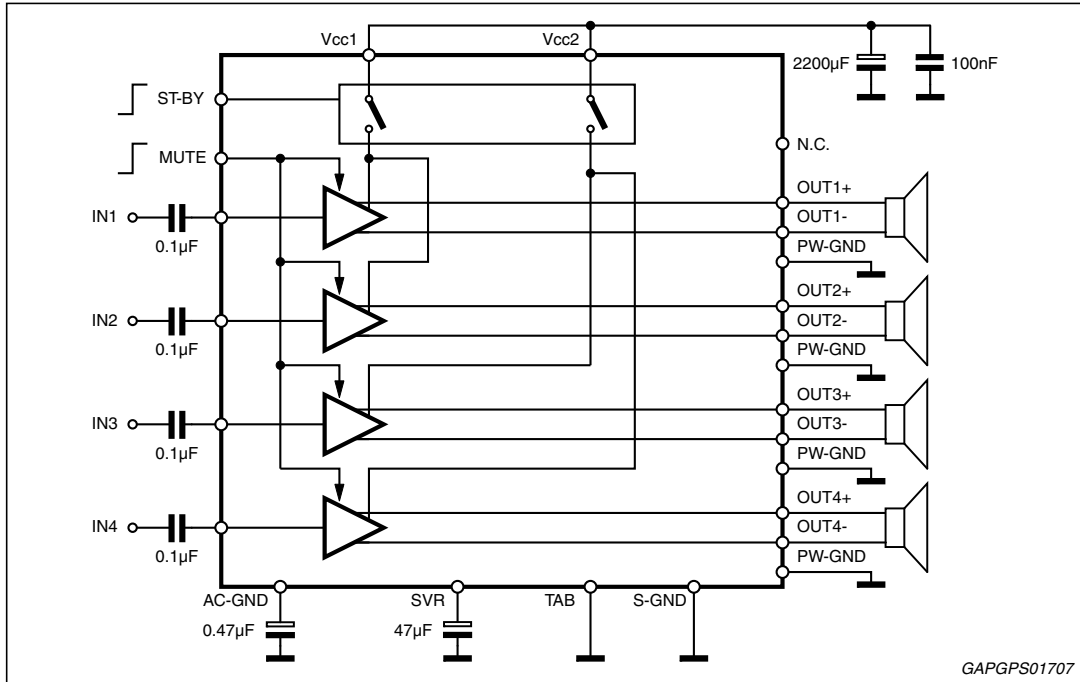
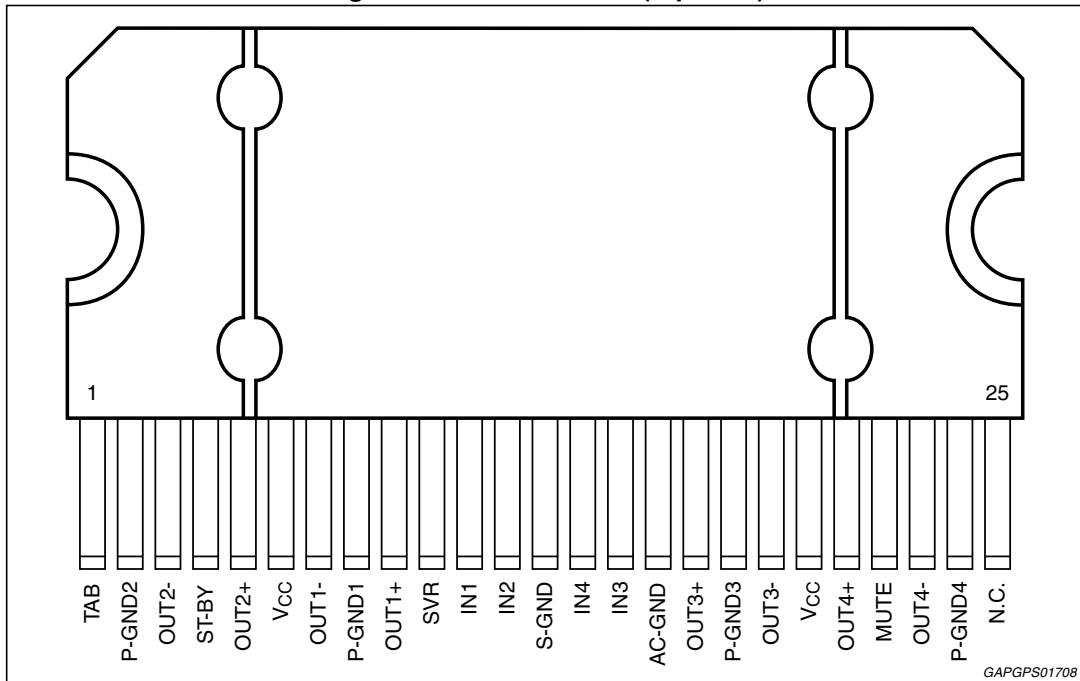


Figure 2. Pin connection (top view)



## 2 Electrical specifications

### 2.1 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{CC}$	Operating supply voltage	18	V
$V_{CC(DC)}$	DC supply voltage	28	V
$V_{CC(pk)}$	Peak supply voltage (t = 50 ms)	50	V
$I_O$	Output peak current: Repetitive (Duty Cycle 10% at f = 10 Hz)	4.5	A
	Non Repetitive (t = 100 $\mu$ s)	5.5	A
$P_{tot}$	Power dissipation, ( $T_{case} = 70\text{ }^{\circ}\text{C}$ )	80	W
$T_{amb}$	Operating temperature range	- 40 to 105	$^{\circ}\text{C}$
$T_j$	Junction temperature	150	$^{\circ}\text{C}$
$T_{stg}$	Storage temperature	- 55 to 150	$^{\circ}\text{C}$

### 2.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{th\ j-case}$	Thermal resistance junction-to-case max.	1	$^{\circ}\text{C}/\text{W}$

### 2.3 Electrical characteristics

$V_S = 14.4\text{ V}$ ; f = 1 kHz;  $R_g = 600\ \Omega$ ;  $R_L = 4\ \Omega$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ; Refer to the test and application diagram, unless otherwise specified.

Table 4. Electrical characteristics

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$I_{q1}$	Quiescent current	$R_L = \infty$	-	190	350	mA
$V_{OS}$	Output offset voltage	Play Mode	-	-	$\pm 80$	mV
$\Delta V_{OS}$	During mute on/off output offset voltage	-	-	-	$\pm 80$	mV
$G_v$	Voltage gain	-	25	26	27	dB
$\Delta G_v$	Channel gain unbalance	-	-	-	$\pm 1$	dB
$P_o$	Output power	THD = 10%; $V_S = 13.2\text{ V}$	22	24	-	W
		THD = 0.8%; $V_S = 13.2\text{ V}$	16.5	18	-	W
		THD = 10%; $V_S = 14.4\text{ V}$	26	28	-	W

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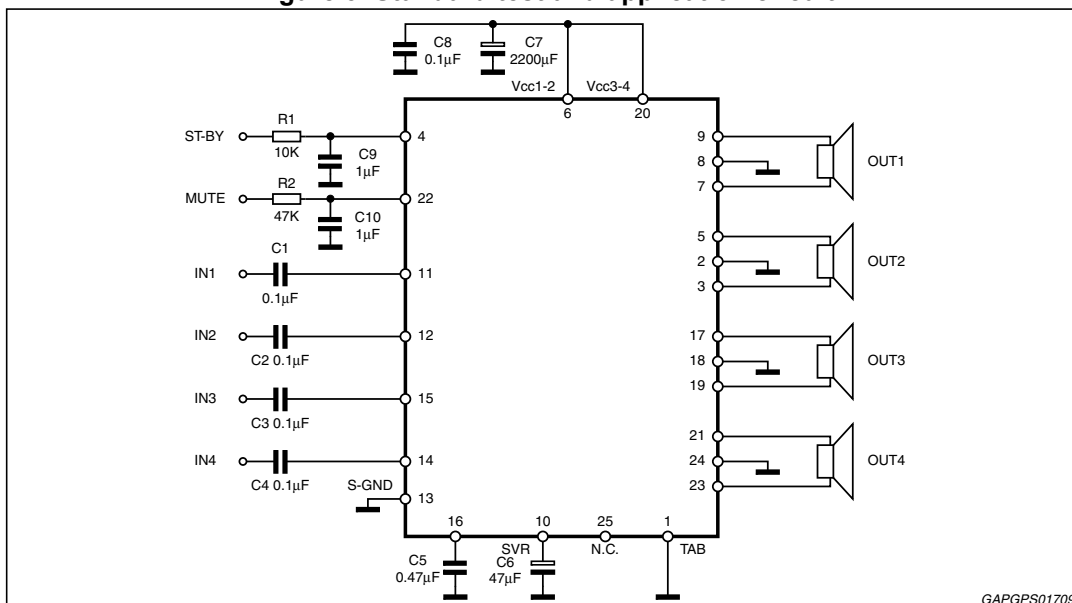
Electrical specifications

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$P_{O\ max}$	Max.output power (1)	$V_S = 14.4\ V$ $V_S = 15.2\ V$	43	45 49	-	W
THD	Distortion	$P_O = 4W$	-	0.04	0.15	%
$e_{No}$	Output noise	"A" Weighted Bw = 20 Hz to 20 kHz	-	50 70	70 100	$\mu V$
SVR	Supply voltage rejection	$f = 100\ Hz; V_r = 1V_{rms}$	50	75	-	dB
$f_{ch}$	High cut-off frequency	$P_O = 0.5\ W$	80	200	-	kHz
$R_i$	Input impedance	-	70	100	-	k $\Omega$
$C_T$	Cross talk	$f = 1\ kHz; P_O = 4\ W$ $f = 10\ kHz; P_O = 4W$	60	70	-	dB
$I_{SB}$	Standby current consumption	$V_{St-by} = 1.5$ $V_{St-by} = 0\ V$	-	-	50 20	$\mu A$
$I_{pin4}$	Standby pin current	$V_{St-by} = 1.5\ to\ 3.5\ V$	-	-	$\pm 1$	$\mu A$
$V_{SB\ out}$	Standby out threshold voltage	(Amp: on)	3.5	-	-	V
$V_{SB\ in}$	Standby in threshold voltage	(Amp: off)	-	-	1.5	V
$A_M$	Mute attenuation	$P_{Oref} = 4\ W$	80	90	-	dB
$V_{M\ out}$	Mute out threshold voltage	(Amp: play)	3.5	-	-	V
$V_{M\ in}$	Mute in threshold voltage	(Amp: mute)	-	-	1.5	V
$V_{AM\ in}$	$V_S$ automute threshold	(Amp: mute); Att $\geq 80\ dB; P_{Oref} = 4\ \Omega$ (Amp: play); Att $< 0.1\ dB; P_O = 0.5\ \Omega$	-	7.6	6.5 8.5	V
$I_{pin22}$	Muting pin current	$V_{MUTE} = 1.5\ V$ (Source current) $V_{MUTE} = 3.5\ V$	5 -5	11 -	20 20	$\mu A$

1. Saturated square wave output.

Figure 3. Standard test and application circuit





## 2.4 PCB and component layout

Referred to the circuit of [Figure 3](#).

Figure 4. Components and top copper layer

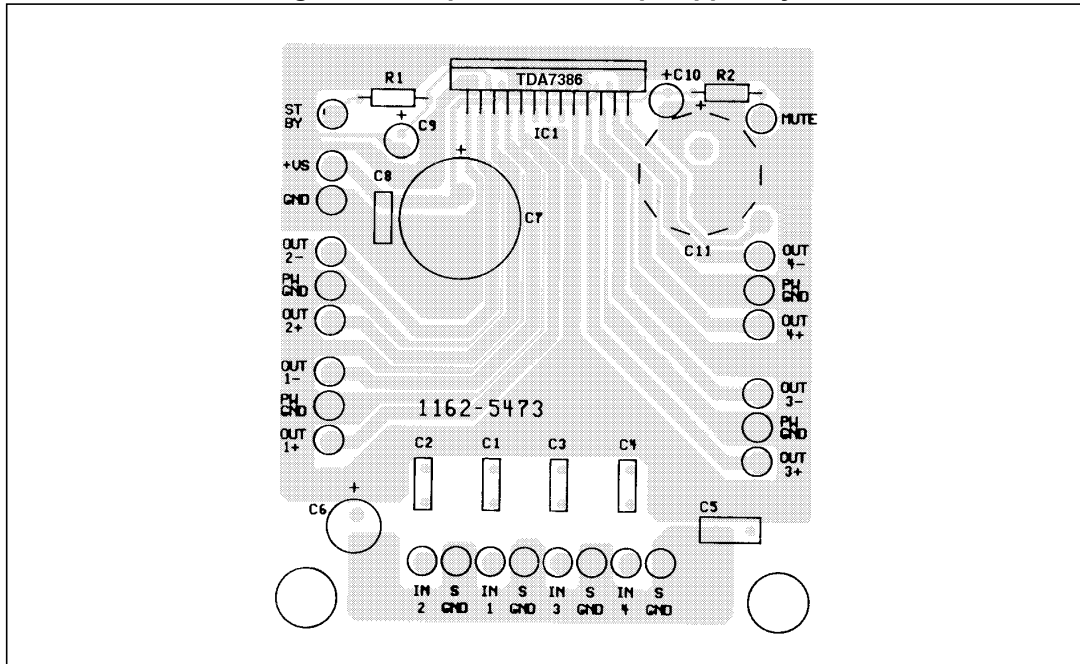
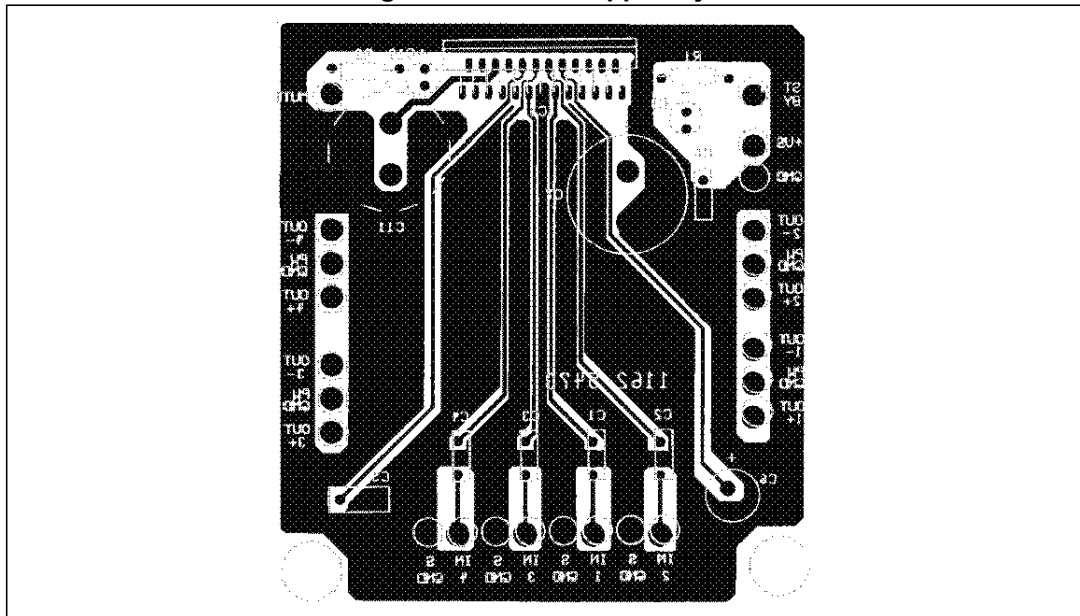
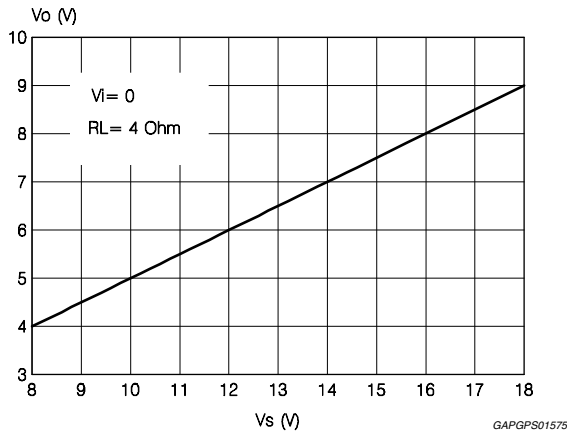


Figure 5. Bottom copper layer

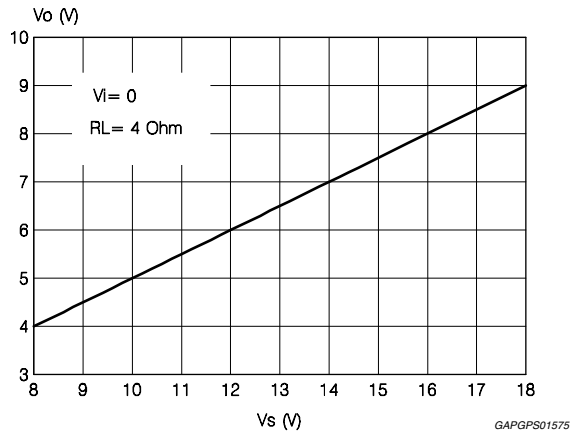


## 2.5 Electrical characteristics curves

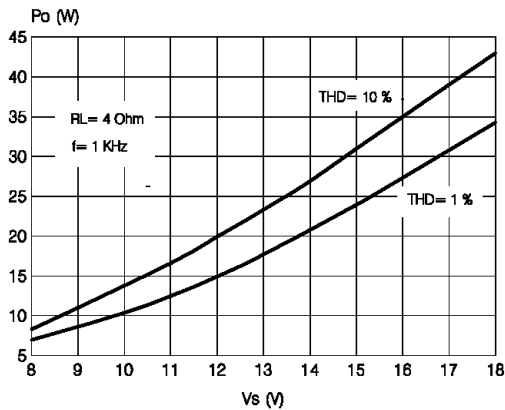
**Figure 6. Quiescent current vs. supply voltage**



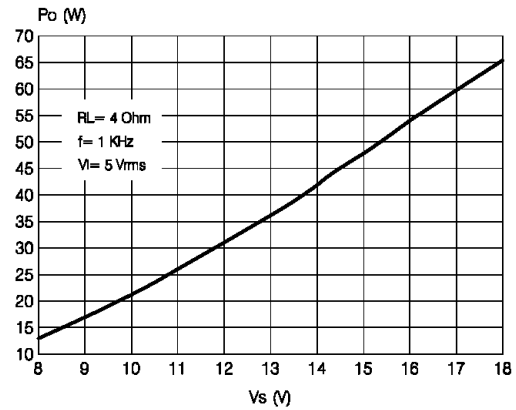
**Figure 7. Quiescent output voltage vs. supply voltage**



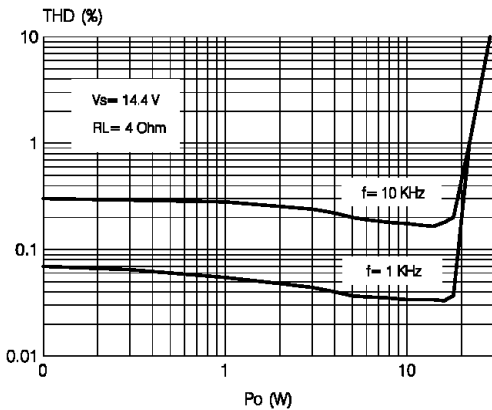
**Figure 8. Output power vs. supply voltage**



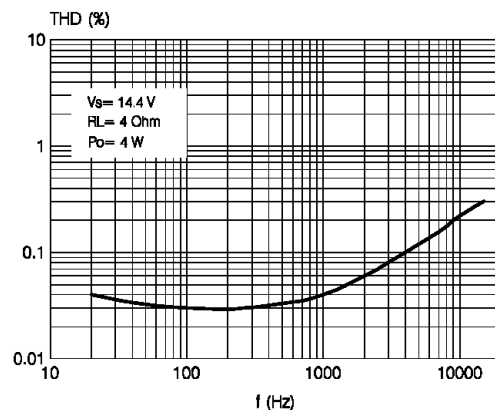
**Figure 9. Max. output power vs. supply voltage**



**Figure 10. Distortion vs. output power**



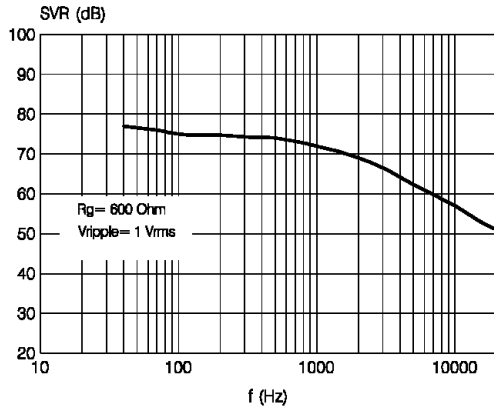
**Figure 11. Distortion vs. frequency**



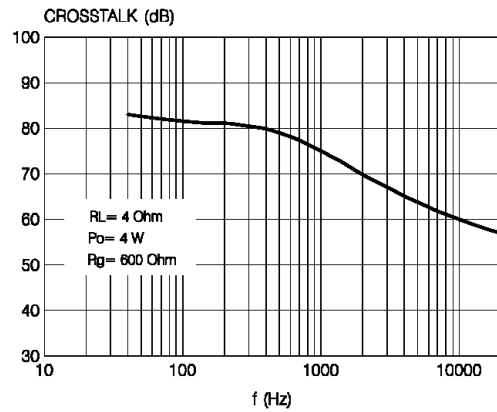
**Electrical specifications**

**TDA7386**

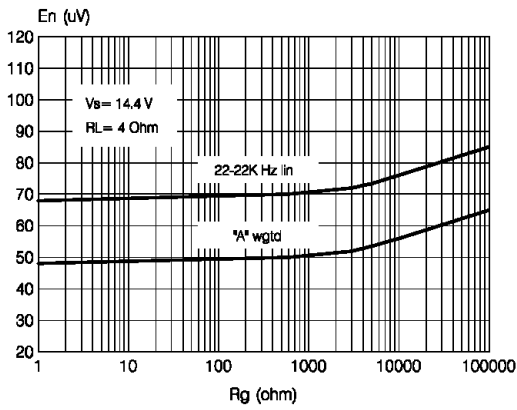
**Figure 12. Supply voltage rejection vs. frequency**



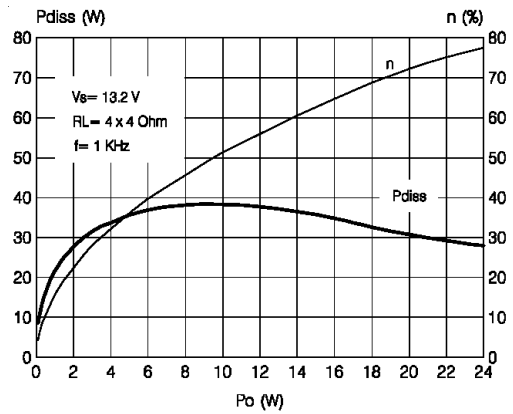
**Figure 13. Crosstalk vs. frequency**



**Figure 14. Output noise vs. source resistance**



**Figure 15. Power dissipation and efficiency vs. output power**



## 3 Application hints

Referred to the circuit of *Figure 3*.

### 3.1 SVR

Besides its contribution to the ripple rejection, the SVR capacitor governs the turn ON/OFF time sequence and, consequently, plays an essential role in the pop optimization during ON/OFF transients.

To conveniently serve both needs, **ITS MINIMUM RECOMMENDED VALUE IS 10 $\mu$ F**.

### 3.2 Input stage

The TDA7386's inputs are ground-compatible and can stand very high input signals ( $\pm 8V_{pk}$ ) without any performances degradation.

If the standard value for the input capacitors (0.1  $\mu$ F) is adopted, the low frequency cut-off will amount to 16 Hz.

### 3.3 Standby and muting

Standby and muting facilities are both CMOS-compatible. If unused, a straight connection to  $V_s$  of their respective pins would be admissible.

Conventional/low-power transistors can be employed to drive muting and stand-by pins in absence of true CMOS ports or microprocessors. R-C cells have always to be used in order to smooth down the transitions for preventing any audible transient noises.

Since a DC current of about 10  $\mu$ A normally flows out of pin 22, the maximum allowable muting-series resistance ( $R_2$ ) is 70 k $\Omega$ , which is sufficiently high to permit a muting capacitor reasonably small (about 1 $\mu$ F).

If  $R_2$  is higher than recommended, the involved risk will be that the voltage at pin 22 may rise to above the 1.5 V threshold voltage and the device will consequently fail to turn OFF when the mute line is brought down.

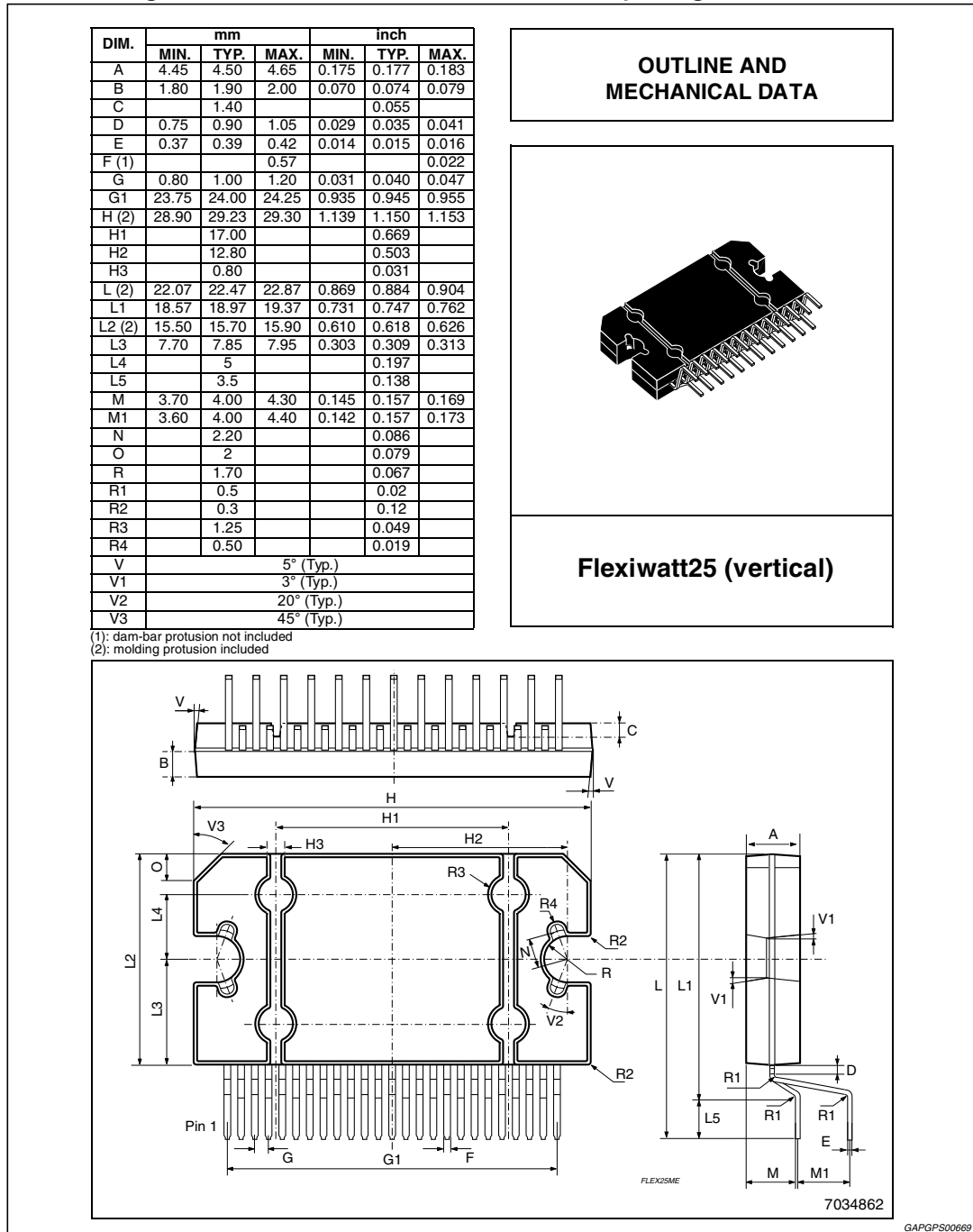
About the stand-by, the time constant to be assigned in order to obtain a virtually pop-free transition has to be slower than 2.5V/ms.

## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com).

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**Figure 16. Flexiwatt25 mechanical data and package dimensions**



## 5 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
24-Nov-2001	1	Initial release.
20-Dec-2007	2	Document reformatted. Modified the <i>Features on page 1</i> . Modified the <i>Figure 1</i> and <i>2</i> . Updated the <i>Table 4: Electrical characteristics</i> .
29-Oct-2008	3	Updated the <i>Table 3: Thermal data on page 6</i> .
19-Nov-2008	4	Update the <i>Table 2: Absolute maximum ratings on page 6</i> .
18-Sep-2013	5	Updated <i>Features on page 1</i> ; Updated <i>Table 4: Electrical characteristics</i> . Updated Disclaimer.

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