

## 4 X 41W QUAD BRIDGE CAR RADIO AMPLIFIER

### 1 FEATURES

- HIGH OUTPUT POWER CAPABILITY:
  - 4 x 41W/4Ω MAX.
  - 4 x 25W/4Ω @ 14.4V, 1KHz, 10%
- LOW DISTORTION
- LOW OUTPUT NOISE
- ST-BY FUNCTION
- MUTE FUNCTION
- AUTOMUTE AT MIN. SUPPLY VOLTAGE DETECTION
- LOW EXTERNAL COMPONENT COUNT:
  - INTERNALLY FIXED GAIN (26dB)
  - NO EXTERNAL COMPENSATION
  - NO BOOTSTRAP CAPACITORS

### 2 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

Figure 1. Package

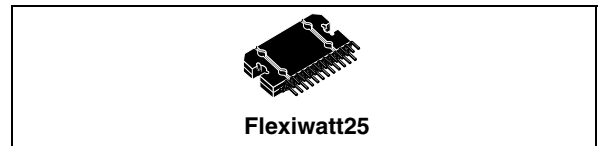


Table 1. Order Codes

Part Number	Package
TDA7388	Flexiwatt25

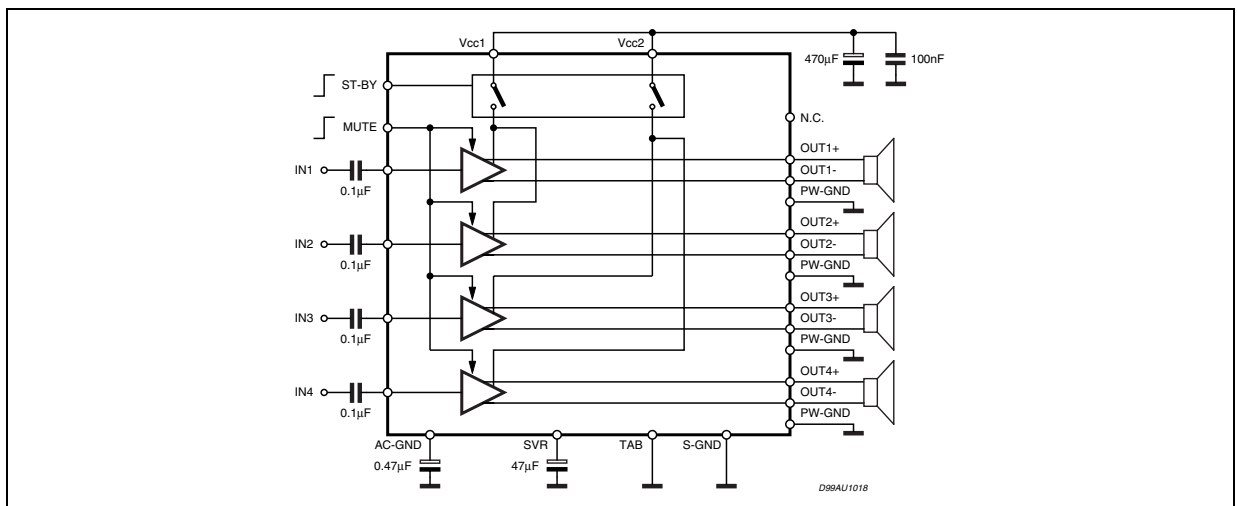
- REVERSED BATTERY
- ESD

### 3 DESCRIPTION

The TDA7388 is a new technology class AB Audio Power Amplifier in Flexiwatt 25 package designed for high end car radio applications.

Thanks to the fully complementary PNP/NPN output configuration the TDA7388 allows a rail to rail output voltage swing with no need of bootstrap capacitors. The extremely reduced components count allows very compact sets.

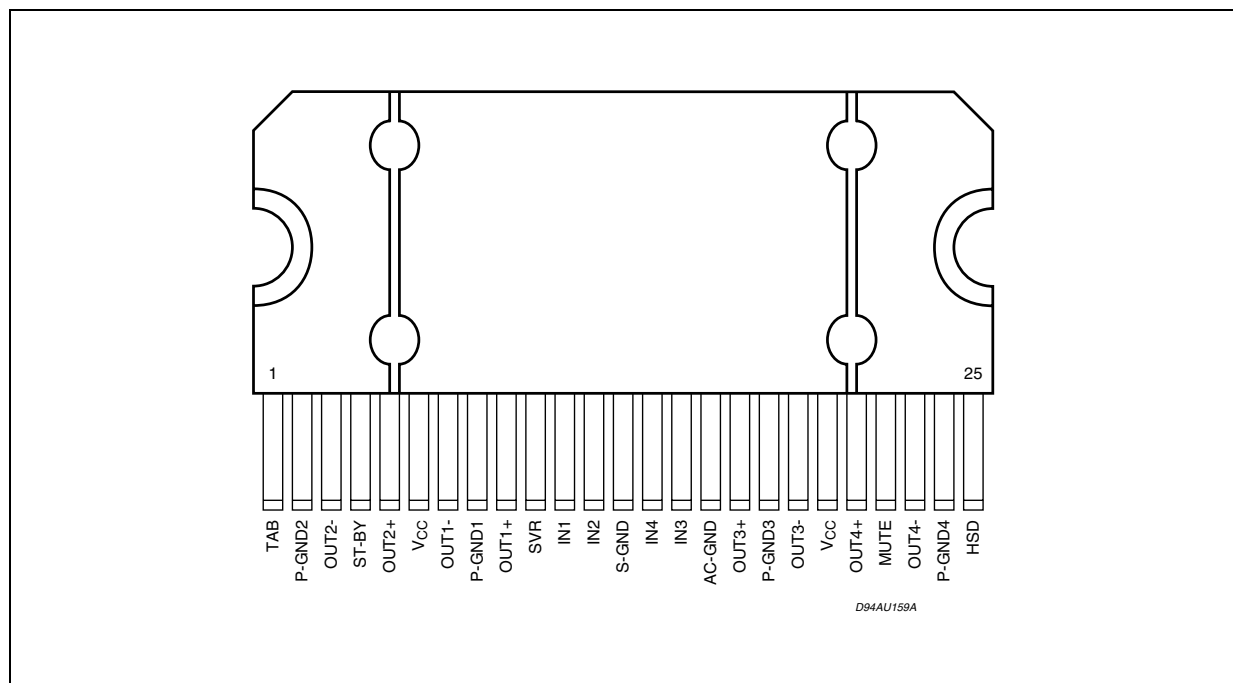
Figure 2. Block and Application Diagram



**Table 2. Absolute Maximum Ratings**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Operating Supply Voltage	18	V
V <sub>CC (DC)</sub>	DC Supply Voltage	28	V
V <sub>CC (pk)</sub>	Peak Supply Voltage (t = 50ms)	50	V
I <sub>O</sub>	Output Peak Current: Repetitive (Duty Cycle 10% at f = 10Hz) Non Repetitive (t = 100μs)	4.5 5.5	A A
P <sub>tot</sub>	Power dissipation, (T <sub>case</sub> = 70°C)	80	W
T <sub>j</sub>	Junction Temperature	150	°C
T <sub>stg</sub>	Storage Temperature	- 55 to 150	°C

**Figure 3. Pin Connection**



**Table 3. Thermal Data**

Symbol	Parameter	Value	Unit
R <sub>th j-amb</sub>	Thermal Resistance Junction to Case	max 1	°C/W

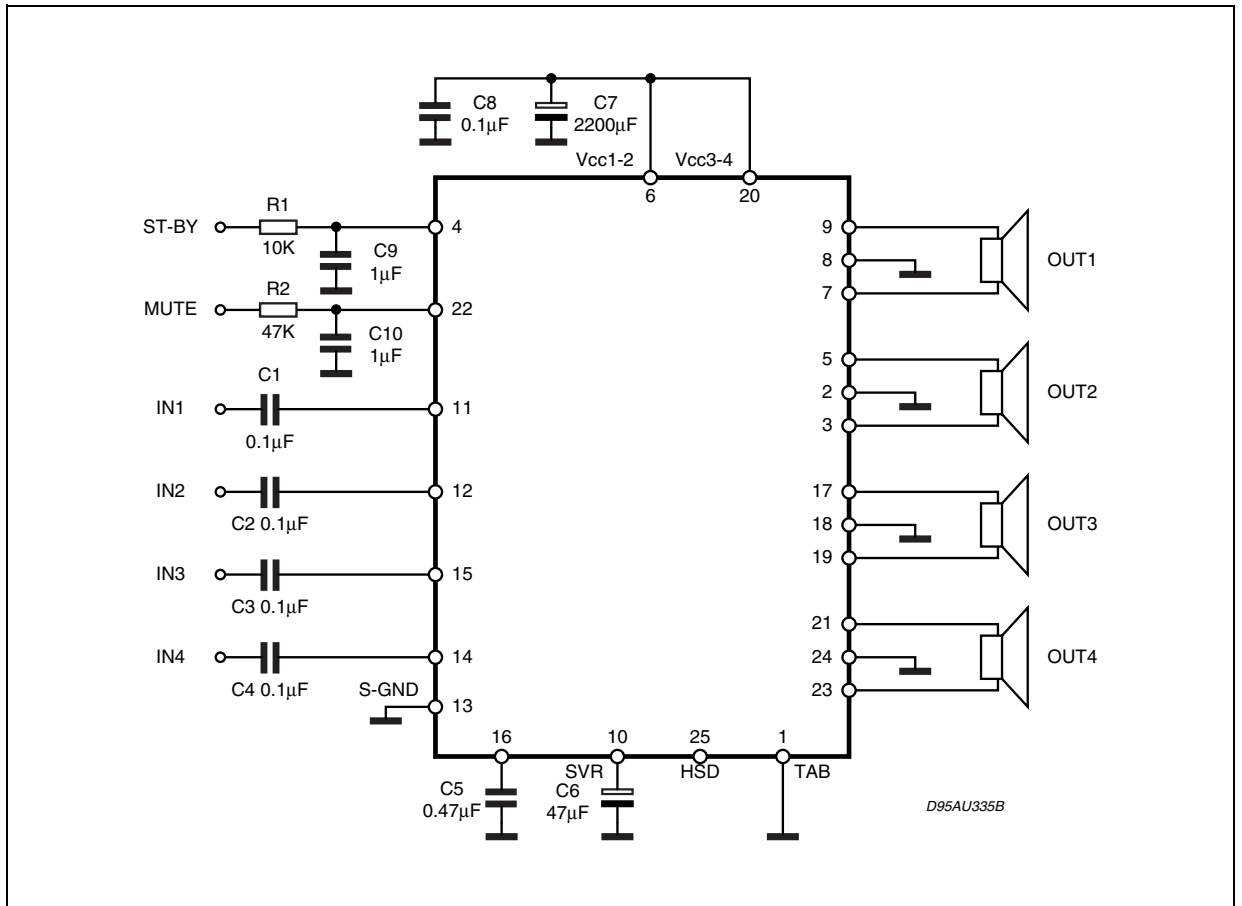
**Table 4. Electrical Characteristics** ( $V_S = 14.4V$ ;  $f = 1KHz$ ;  $R_g = 600\Omega$ ;  $R_L = 4\Omega$ ;  $T_{amb} = 25^\circ C$ ; Refer to the Test and application diagram, unless otherwise specified.)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$I_{q1}$	Quiescent Current	$R_L = \infty$	120	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
$P_o$	Output Power	THD = 10%; $V_S = 14.4V$	22	26		W
$P_{o\ max}$	Max.Output Power (*)	$V_S = 14.4V$	38	41		W
THD	Distortion	$P_o = 4W$		0.04	0.15	%
$e_{No}$	Output Noise	"A" Weighted		50	70	$\mu V$
		Bw = 20Hz to 20KHz		70	100	$\mu V$
SVR	Supply Voltage Rejection	$f = 100Hz$ ; $V_r = 1V_{rms}$	50	65		dB
$f_{ch}$	High Cut-Off Frequency	$P_o = 0.5W$	100	200		KHz
$R_i$	Input Impedance		70	100		K $\Omega$
$C_T$	Cross Talk	$f = 1KHz$ ; $P_o = 4W$	60	70		dB
		$f = 10KHz$ ; $P_o = 4W$	50	60		dB
$I_{SB}$	St-By Current Consumption				50	$\mu A$
$V_{SB\ out}$	St-By OUT Threshold Voltage	(Amp: ON)	3.5			V
$V_{SB\ in}$	St-By IN Threshold Voltage	(Amp: OFF)			1.5	V
$A_M$	Mute Attenuation	$P_{Oref} = 4W$	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 $\geq 80dB$ ; $P_{Oref} = 4\Omega$		7.6	6.5	V
		(Amp: Play); Att $< 0.1dB$ ; $P_O = 0.5\Omega$			8.5	V
$I_{pin22}$	Muting Pin Current	$V_{MUTE} = 1.5V$ (Source Current)	5	11	20	$\mu A$

(\*) Saturated square wave output.

(

Figure 4. Standard Test and Application Circuit



## 4 P.C.B. AND COMPONENT LAYOUT OF THE FIGURE 4

Figure 5. Components & Top Copper Layer

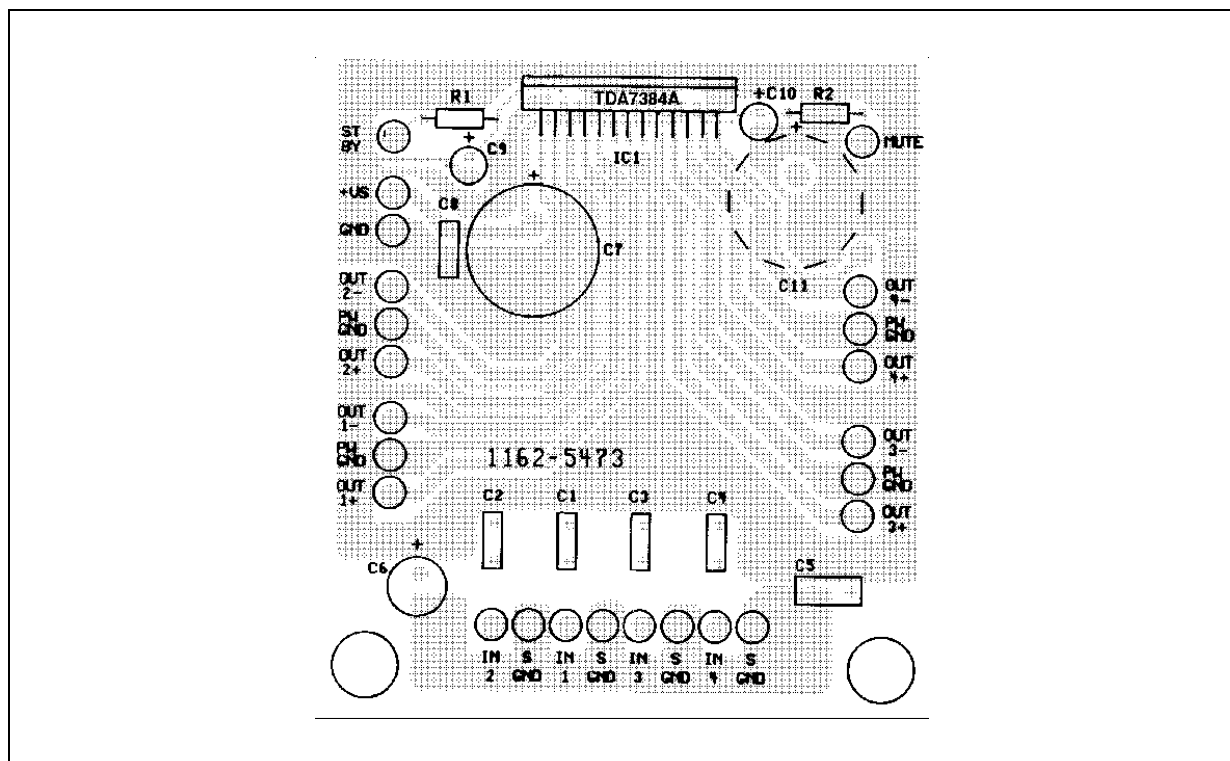


Figure 6. Bottom Copper Layer

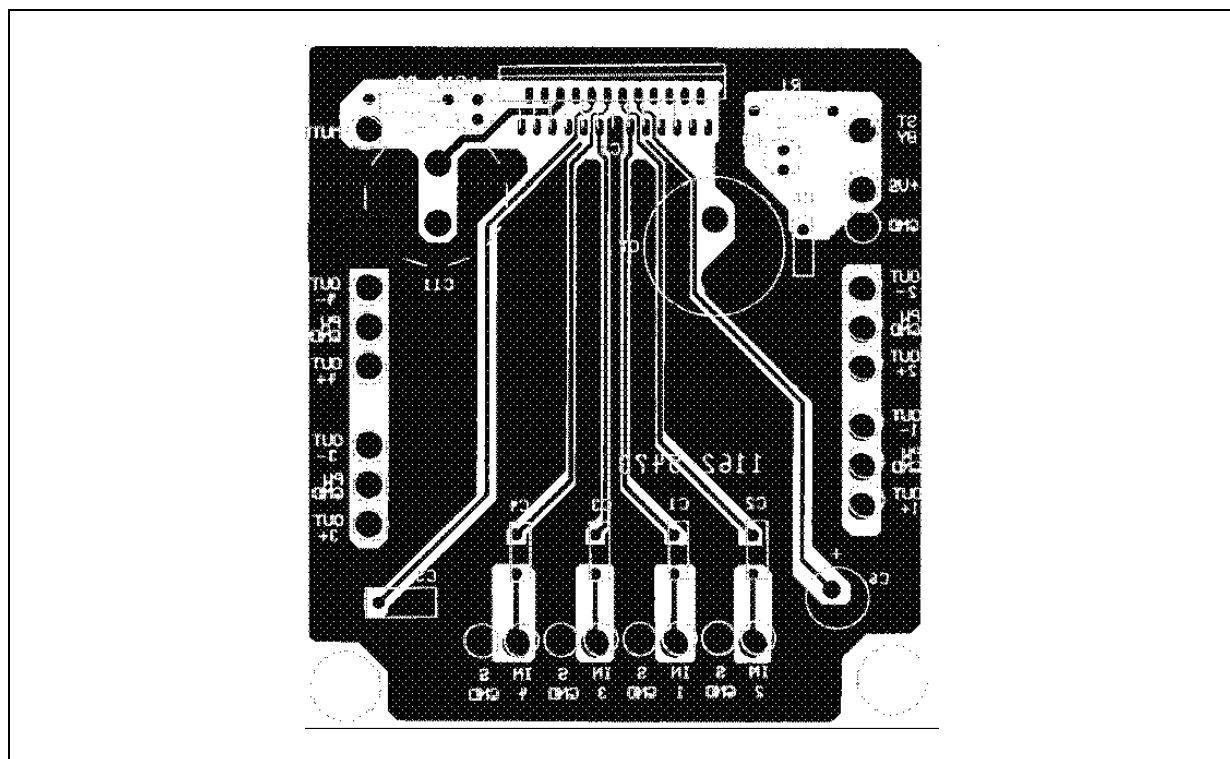


Figure 7. Quiescent Current vs. Supply Voltage

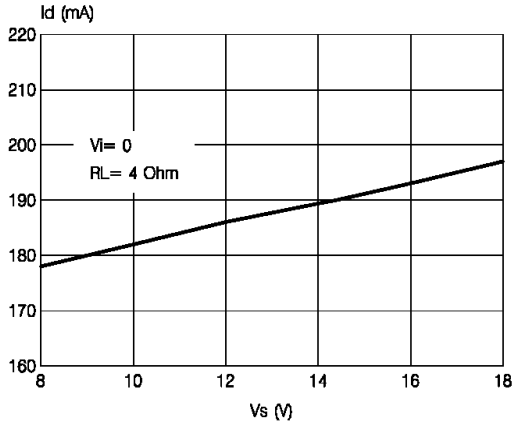


Figure 10. Distortion vs. Output Power

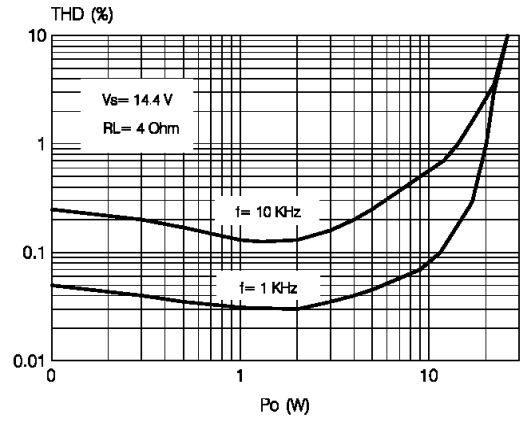


Figure 8. Quiescent Output Voltage Supply Voltage

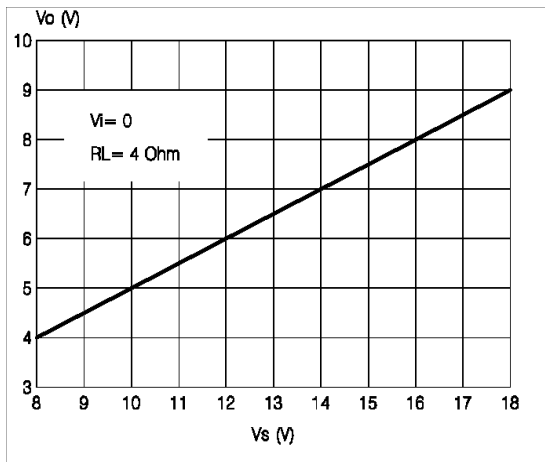


Figure 11. Distortion vs. Frequency

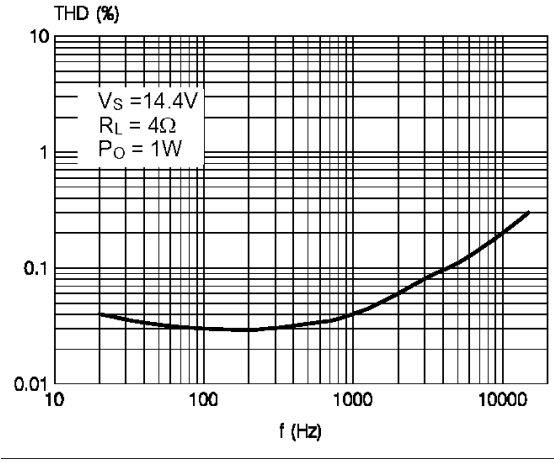


Figure 9. Output Power vs. Supply Voltage

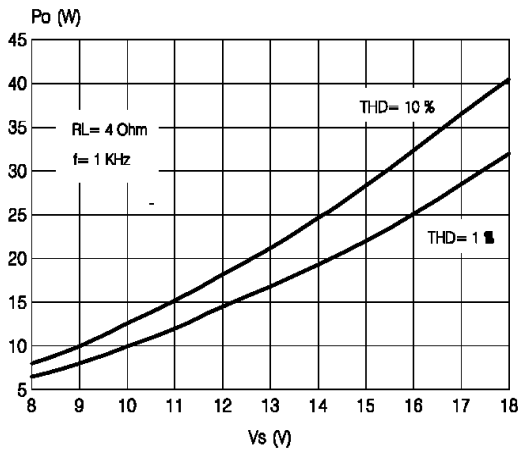
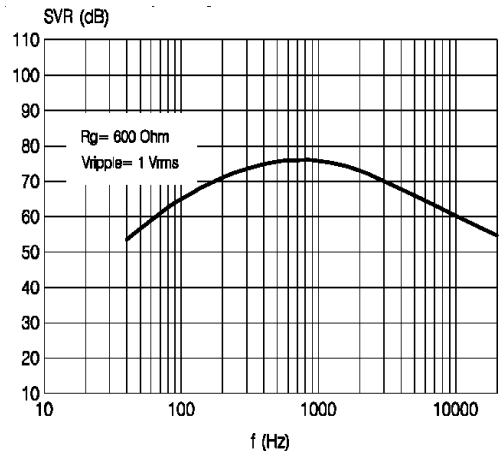
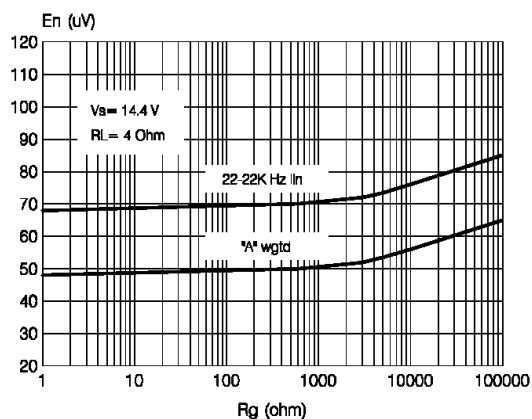


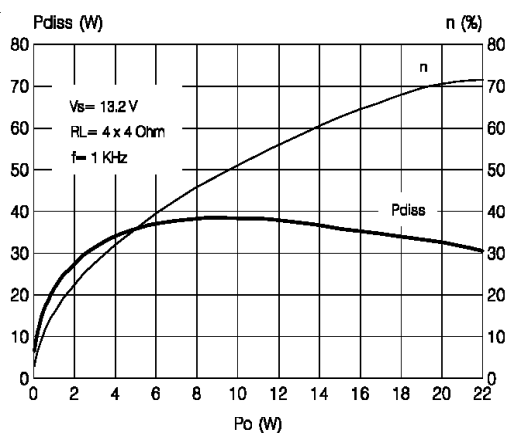
Figure 12. Supply Voltage Rejection vs. Frequency.



**Figure 13. Output Noise vs. Source Resistance.**



**Figure 14. Power Dissipation & Efficiency vs. Output Power.**



## 5 APPLICATION HINTS

(ref. to the circuit of fig. 4)

### 5.1 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 10µF.**

### 5.2 INPUT STAGE

The TDA7388'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 (0.1µF) is adopted, the low frequency cut-off will amount to 16 Hz.

### 5.3 STAND-BY AND MUTING

STAND-BY and MUTING facilities are both CMOS-COMPATIBLE. If unused, a straight connection to Vs 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 µA normally flows out of pin 22, the maximum allowable muting-series resistance (R2) is 70KΩ, which is sufficiently high to permit a muting capacitor reasonably small (about 1µF).

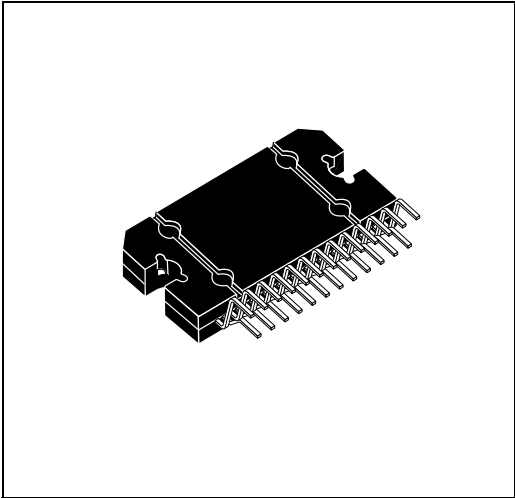
If R2 is higher than recommended, the involved risk will be that the voltage at pin 22 may rise to above the 1.5 V threshold voltage and the device will consequently fail to turn OFF when the mute line is brought down. About the stand-by, the time constant to be assigned in order to obtain a virtually pop-free transition has to be slower than 2.5V/ms.

Figure 15. Flexiwatt 25 Mechanical Data & Package Dimensions

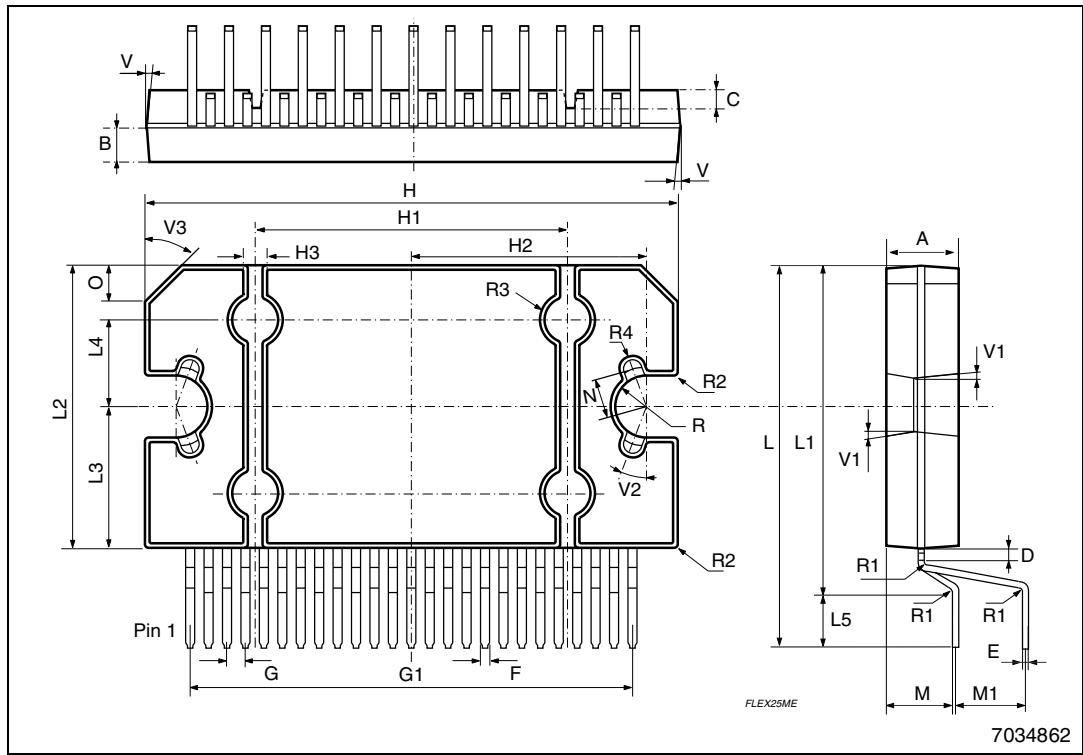
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.45	4.50	4.65	0.175	0.177	0.183
B	1.80	1.90	2.00	0.070	0.074	0.079
C		1.40			0.055	
D	0.75	0.90	1.05	0.029	0.035	0.041
E	0.37	0.39	0.42	0.014	0.015	0.016
F (1)			0.57			0.022
G	0.80	1.00	1.20	0.031	0.040	0.047
G1	23.75	24.00	24.25	0.935	0.945	0.955
H (2)	28.90	29.23	29.30	1.139	1.150	1.153
H1		17.00			0.669	
H2		12.80			0.503	
H3		0.80			0.031	
L (2)	22.07	22.47	22.87	0.869	0.884	0.904
L1	18.57	18.97	19.37	0.731	0.747	0.762
L2 (2)	15.50	15.70	15.90	0.610	0.618	0.626
L3	7.70	7.85	7.95	0.303	0.309	0.313
L4		5			0.197	
L5		3.5			0.138	
M	3.70	4.00	4.30	0.145	0.157	0.169
M1	3.60	4.00	4.40	0.142	0.157	0.173
N		2.20			0.086	
O		2			0.079	
R		1.70			0.067	
R1		0.5			0.02	
R2		0.3			0.12	
R3		1.25			0.049	
R4		0.50			0.019	
V			5° (T p.)			
V1			3° (Typ.)			
V2			20° (Typ.)			
V3			45° (Typ.)			

(1): dam-bar protusion not included  
 (2): molding protusion included

**OUTLINE AND MECHANICAL DATA**



**Flexiwatt25 (vertical)**





## 6 REVISION HISTORY

Table 5. Revision History

Date	Revision	Description of Changes
July 2005	1	First Issue

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics.  
All other names are the property of their respective owners

© 2005 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -  
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)