

# 4 x 40W QUAD BRIDGE CAR RADIO AMPLIFIER

- HIGH OUTPUT POWER CAPABILITY:
  - 4 x 45W/4 $\Omega$  MAX.
  - $4 \times 40W/4\Omega$  EIAJ
  - $4 \times 28W/4\Omega$  @ 14.4V, 1KHz, 10%
  - 4 x 24W/4Ω @ 13.2V, 1KHz, 10%
- LOW DISTORTION
- LOW OUTPUT NOISE
- ST-BY FUNCTION
- MUTE FUNCTION
- AUTOMUTE AT MIN. SUPPLY VOLTAGE DE-TECTION
- LOW EXTERNAL COMPONENT COUNT:
  - INTERNALLY FIXED GAIN (26dB)
  - NO EXTERNAL COMPENSATION
  - NO BOOTSTRAP CAPACITORS

#### **PROTECTIONS:**

- OUTPUT SHORT CIRCUIT TO GND, TO Vs, ACROSS THE LOAD
- VERY INDUCTIVE LOADS
- OVERRATING CHIP TEMPERATURE WITH SOFT THERMAL LIMITER
- LOAD DUMP VOLTAGE
- FORTUITOUS OPEN GND

## **BLOCK AND APPLICATION DIAGRAM**

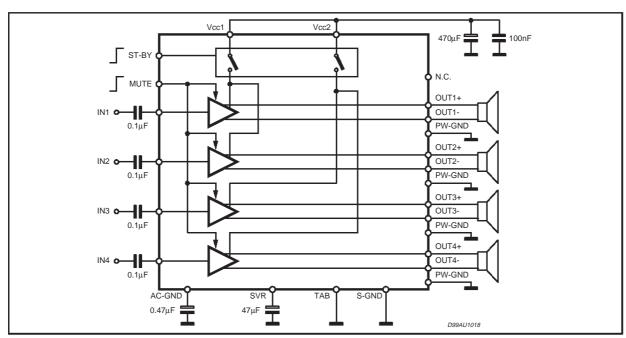


- REVERSED BATTERY
- ESD

#### **DESCRIPTION**

The TDA7386 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 TDA7386 allows a rail to rail output voltage swing with no need of bootstrap capacitors. The extremely reduced components count allows very compact sets.

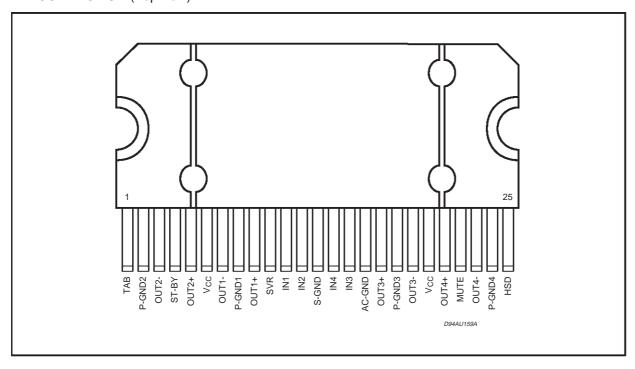


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## **ABSOLUTE MAXIMUM RATINGS**

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
l <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
Tj	Junction Temperature	150	°C
T <sub>stg</sub>	Storage Temperature	- 55 to 150	°C

## PIN CONNECTION (Top view)



## **THERMAL DATA**

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

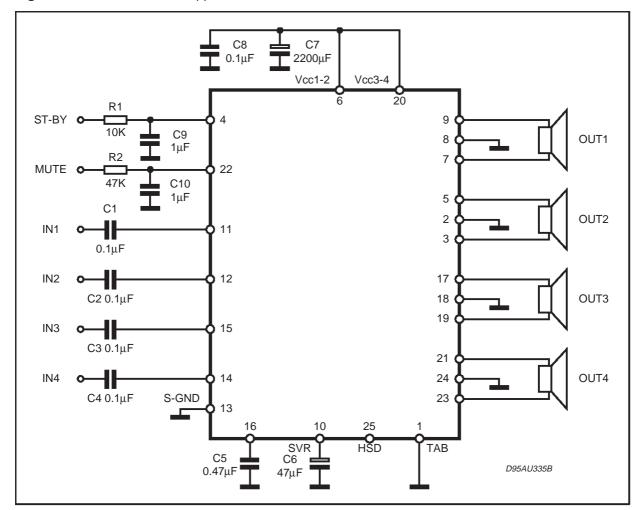
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**ELECTRICAL CHARACTERISTICS** (V<sub>S</sub> = 14.4V; f = 1KHz; R<sub>g</sub> =  $600\Omega$ ; R<sub>L</sub> =  $4\Omega$ ; T<sub>amb</sub> =  $25^{\circ}$ C; Refer to the test and application diagram, unless otherwise specified.)

Symbol	Parameter	Test Condition	Min.	Тур.	Max.	Unit
I <sub>q1</sub>	Quiescent Current	R <sub>L</sub> = ∞		190	350	mA
Vos	Output Offset Voltage	Play Mode			±80	mV
dV <sub>OS</sub>	During mute ON/OFF output offset voltage				±80	mV
G√	Voltage Gain		25	26	27	dB
$dG_{v}$	Channel Gain Unbalance				±1	dB
Po	Output Power	V <sub>S</sub> = 13.2V; THD = 10% V <sub>S</sub> = 13.2V; THD = 0.8% V <sub>S</sub> = 14,4V; THD = 10%	22 16.5 26	24 18 28		W W W
Po EIAJ	EIAJ Output Power (*)	V <sub>S</sub> = 13.7V	37.5	40		W
Po max.	Max. Output Power (*)	V <sub>S</sub> = 14.4V	43	45		W
THD	Distortion	$P_0 = 4W$		0.04	0.15	%
e <sub>No</sub>	Output Noise	"A" Weighted Bw = 20Hz to 20KHz		50 70	70 100	μV μV
SVR	Supply Voltage Rejection	$f = 100Hz; V_r = 1Vrms$	50	75		dB
f <sub>ch</sub>	High Cut-Off Frequency	$P_{O} = 0.5W$	80	200		KHz
$R_i$	Input Impedance		70	100		ΚΩ
C <sub>T</sub>	Cross Talk	$f = 1KHz$ $P_O = 4W$ $f = 10KHz$ $P_O = 4W$	60	70 60	_ _	dB dB
$I_{SB}$	St-By Current Consumption	$V_{St-By} = 1.5V$			100	μΑ
I <sub>pin4</sub>	St-by pin Current	VSt-By = 1.5V to 3.5V			±10	μА
$V_{SB  out}$	St-By Out Threshold Voltage	(Amp: ON)	3.5			V
$V_{SB\;in}$	St-By in Threshold Voltage	(Amp: OFF)			1.5	V
A <sub>M</sub>	Mute Attenuation	P <sub>Oref</sub> = 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 <sub>S</sub> Automute Threshold	(Amp: Mute) Att ≥ 80dB; P <sub>Oref</sub> = 4W (Amp: Play)			6.5	V
		Att < $0.1dB$ ; $P_0 = 0.5W$		7.6	8.5	V
I <sub>pin22</sub>	Muting Pin Current	V <sub>MUTE</sub> = 1.5V (Sourced Current)	5	11	20	μΑ
		$V_{MUTE} = 3.5V$	-5		20	μΑ

<sup>(\*)</sup> Saturated square wave output.

Figure 1: Standard Test and Application Circuit



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Figure 2: P.C.B. and component layout of the figure 1 (1:1 scale)

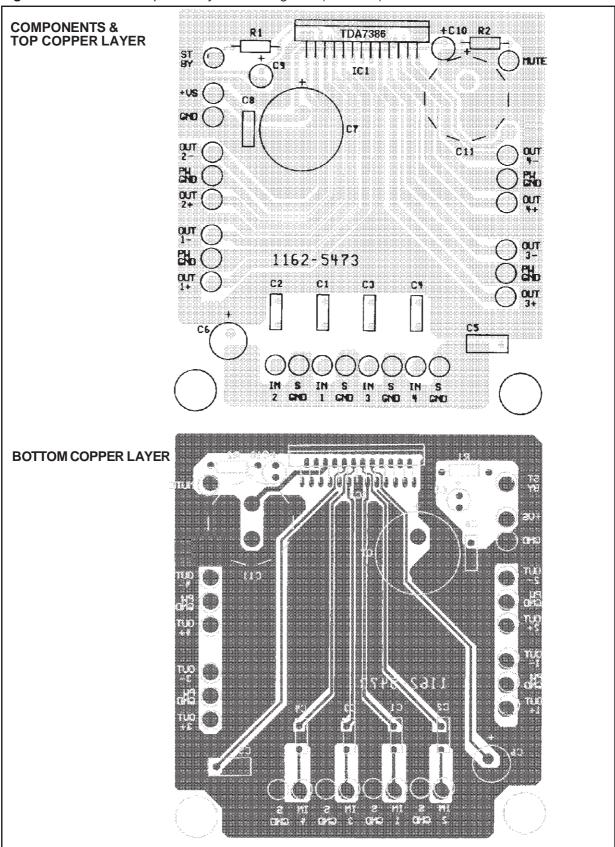
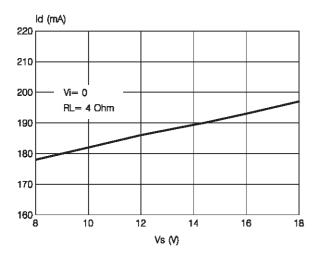


Figure 3: Quiescent Current vs. Supply Voltage



6 5

Voltage

Vi = 0

RL= 4 Ohm

Vo (V)

10 9

8

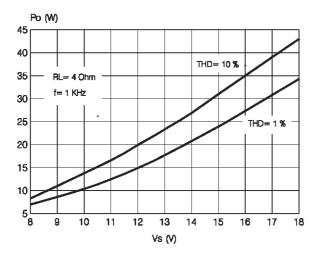
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10 11

Figure 4: Quiescent Output Voltage vs. Supply

Figure 5: Output Power vs. Supply Voltage



**Figure 6:** Maximum Output Power vs. Supply Voltage

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13 14

Vs (V)

15 16

17 18

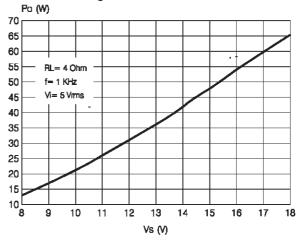


Figure 7: Distortion vs. Output Power

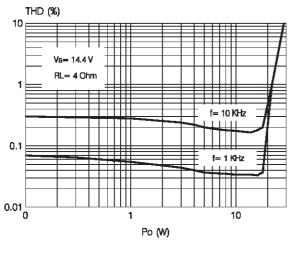
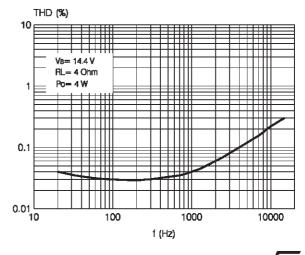


Figure 8: Distortion vs. Frequency



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**Figure 9:** Supply Voltage Rejection vs.

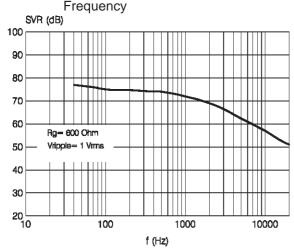
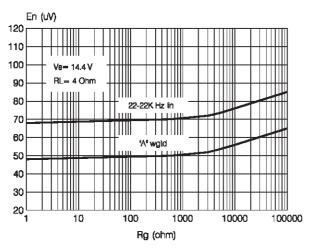


Figure 11: Output Noise vs. Source Resistance



**APPLICATION HINTS** (ref. to the circuit of fig. 1) <u>SVR</u>

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  $10\mu F$ .

## **INPUT STAGE**

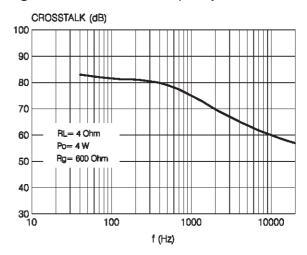
The TDA7386's inputs are ground-compatible and can stand very high input signals ( $\pm$  8Vpk) without any performances degradation.

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

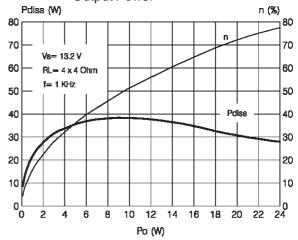
#### STAND-BY AND MUTING

STAND-BY and MUTING facilities are both

Figure 10: Crosstalk vs. Frequency



**Figure 12:** Power Dissipation & Efficiency vs. Output Power



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.

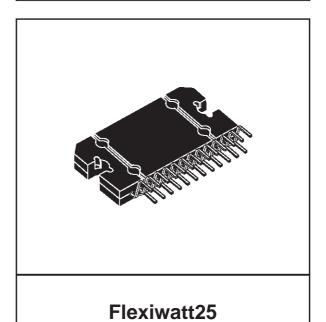
Since a DC current of about 10 uA normally flows out of pin 22, the maximum allowable muting-series resistance (R<sub>2</sub>) is  $70 \text{K}\Omega$ , which is sufficiently high to permit a muting capacitor reasonably small (about 1 $\mu$ F).

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.

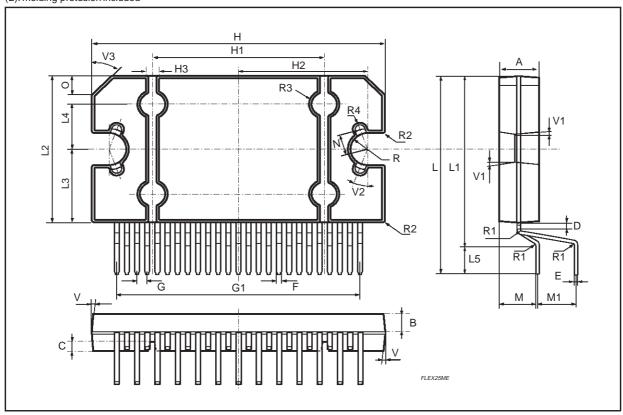
DIM.	mm			inch			
DIIVI.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Α	4.45	4.50	4.65	0.175	0.177	0.183	
В	1.80	1.90	2.00	0.070	0.074	0.079	
С		1.40			0.055		
D	0.75	0.90	1.05	0.029	0.035	0.041	
E	0.37	0.39	0.42	0.014	0.015	0.016	
F (1)			0.57			0.022	
G	0.80	1.00	1.20	0.031	0.040	0.047	
G1	23.75	24.00	24.25	0.935	0.945	0.955	
H (2)	28.90	29.23	29.30	1.138	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		
М	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		
0		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° (Typ.)						
V1	3° (Typ.)						
V2	20° (Typ.)						
V3	45° (Typ.)						

# OUTLINE AND MECHANICAL DATA



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





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