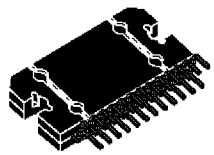
# TDA7386

## 4 x 40W QUAD BRIDGE CAR RADIO AMPLIFIER

- HIGH OUTPUT POWER CAPABILITY:
  4 x 45W/4Ω MAX.
  4 x 40W/4Ω EIAJ
  4 x 28W/4Ω @ 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 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



**FLEXIWATT25**

**ORDERING NUMBER:** TDA7386

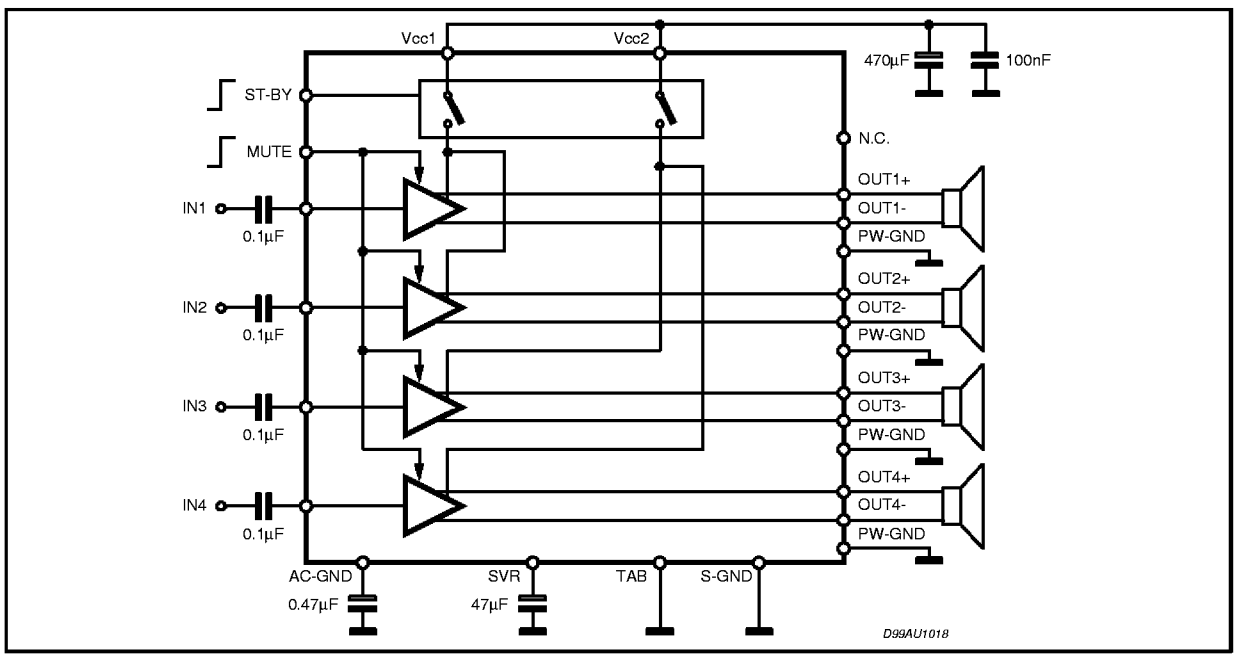
- REVERSED BATTERY
- ESD

### 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.

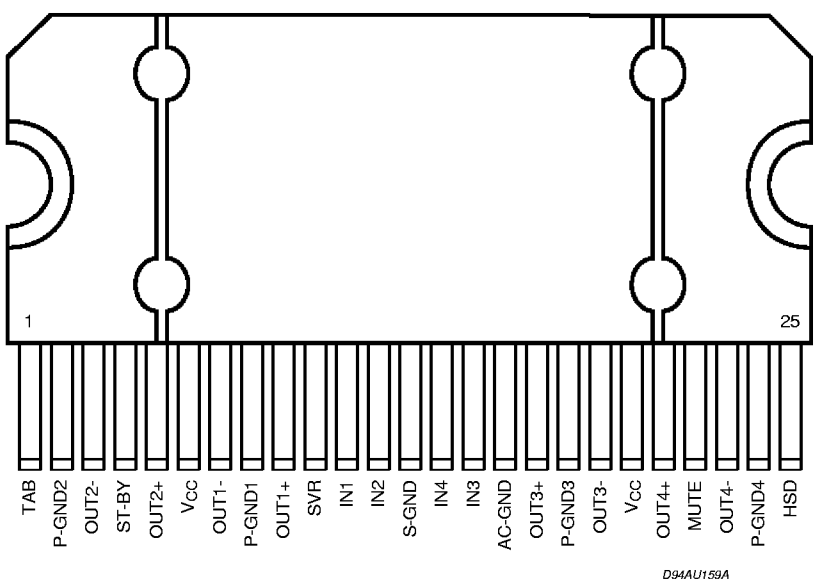
### BLOCK AND APPLICATION DIAGRAM



## 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 = 50ms) | 50 | V |
| $I_O$ | Output Peak Current:<br>Repetitive (Duty Cycle 10% at f = 10Hz)<br>Non Repetitive (t = 100µs) | <br>4.5<br>5.5 | <br>A<br>A |
| $P_{tot}$ | Power dissipation, ($T_{case}$ = 70°C) | 80 | W |
| $T_j$ | Junction Temperature | 150 | °C |
| $T_{stg}$ | Storage Temperature | – 55 to 150 | °C |

## PIN CONNECTION (Top view)




## THERMAL DATA

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th\ j\text{-}case}$ | Thermal Resistance Junction to Case | Max. | 1 | °C/W |

**ELECTRICAL CHARACTERISTICS** ($V_S$ = 14.4V; f = 1KHz; $R_g$ = 600Ω; $R_L$ = 4Ω; $T_{amb}$ = 25°C; Refer to the test and application diagram, unless otherwise specified.)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{q1}$ | Quiescent Current | $R_L = \infty$ | | 190 | 350 | mA |
| $V_{OS}$ | Output Offset Voltage | Play Mode | | | ±80 | mV |
| $dV_{OS}$ | During mute ON/OFF output offset voltage | | | | ±80 | mV |
| $G_v$ | Voltage Gain | | 25 | 26 | 27 | dB |
| $dG_v$ | Channel Gain Unbalance | | | | ±1 | dB |
| $P_o$ | Output Power | $V_S$ = 13.2V; THD = 10%<br>$V_S$ = 13.2V; THD = 0.8%<br>$V_S$ = 14,4V; THD = 10% | 22<br>16.5<br>26 | 24<br>18<br>28 | | W<br>W<br>W |
| $P_{o\ EIAJ}$ | EIAJ Output Power (*) | $V_S$ = 13.7V | 37.5 | 40 | | W |
| $P_{o\ max.}$ | Max. Output Power (*) | $V_S$ = 14.4V | 43 | 45 | | W |
| THD | Distortion | $P_o$ = 4W | | 0.04 | 0.15 | % |
| $e_{No}$ | Output Noise | "A" Weighted<br>Bw = 20Hz to 20KHz | | 50<br>70 | 70<br>100 | µV<br>µV |
| SVR | Supply Voltage Rejection | f = 100Hz; $V_r$ = 1Vrms | 50 | 75 | | dB |
| $f_{ch}$ | High Cut-Off Frequency | $P_O$ = 0.5W | 80 | 200 | | KHz |
| $R_i$ | Input Impedance | | 70 | 100 | | KΩ |
| $C_T$ | Cross Talk | f = 1KHz $P_O$ = 4W<br>f = 10KHz $P_O$ = 4W | 60 | 70<br>60 | –<br>– | dB<br>dB |
| $I_{SB}$ | St-By Current Consumption | $V_{St\text{-}By}$ = 1.5V | | | 100 | µA |
| $I_{pin4}$ | St-by pin Current | VSt-By = 1.5V to 3.5V | | | ±10 | µA |
| $V_{SB\ out}$ | 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)<br>Att ≥ 80dB; $P_{Oref}$ = 4W<br>(Amp: Play)<br>Att < 0.1dB; $P_O$ = 0.5W | | <br><br><br>7.6 | 6.5<br><br>8.5 | V<br><br>V |
| $I_{pin22}$ | Muting Pin Current | $V_{MUTE}$ = 1.5V<br>(Sourced Current) | 5 | 11 | 20 | µA |
| | | $V_{MUTE}$ = 3.5V | -5 | | 20 | µA |

(*) Saturated square wave output.

**Figure 1:** Standard Test and Application Circuit

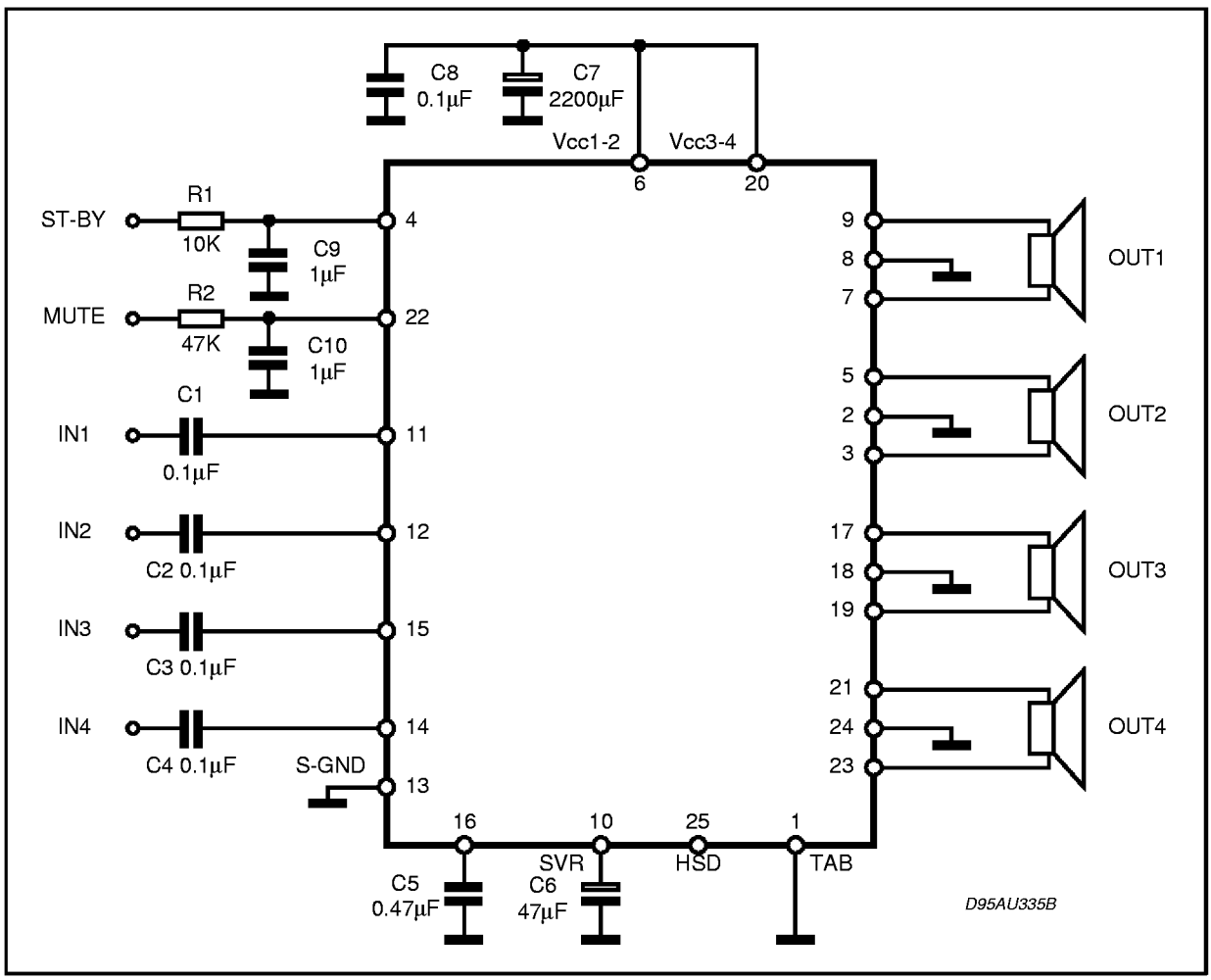
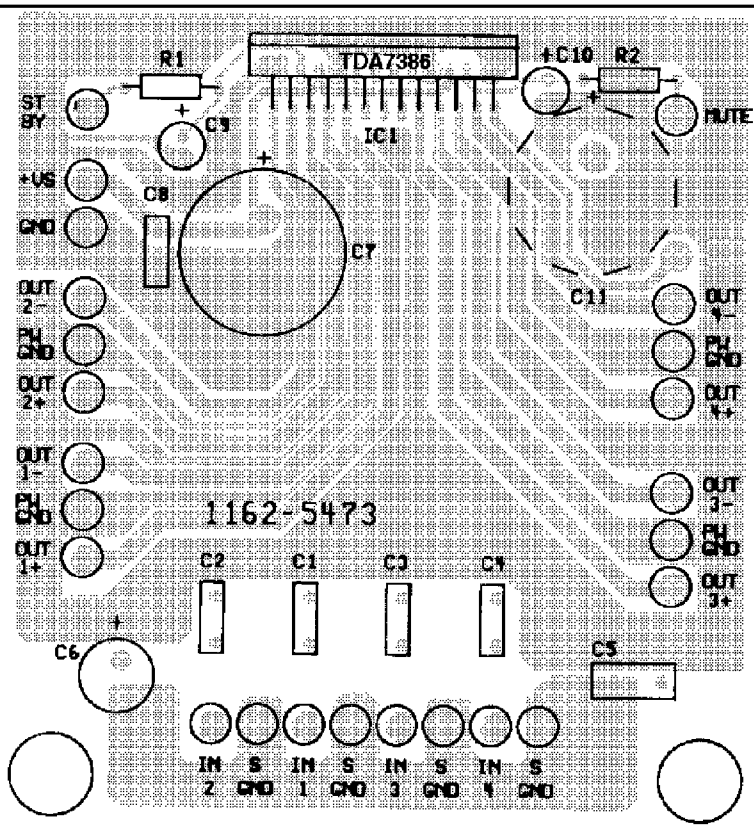


**Figure 2:** P.C.B. and component layout of the figure 1 (1:1 scale)

COMPONENTS &
TOP COPPER LAYER




BOTTOM COPPER LAYER

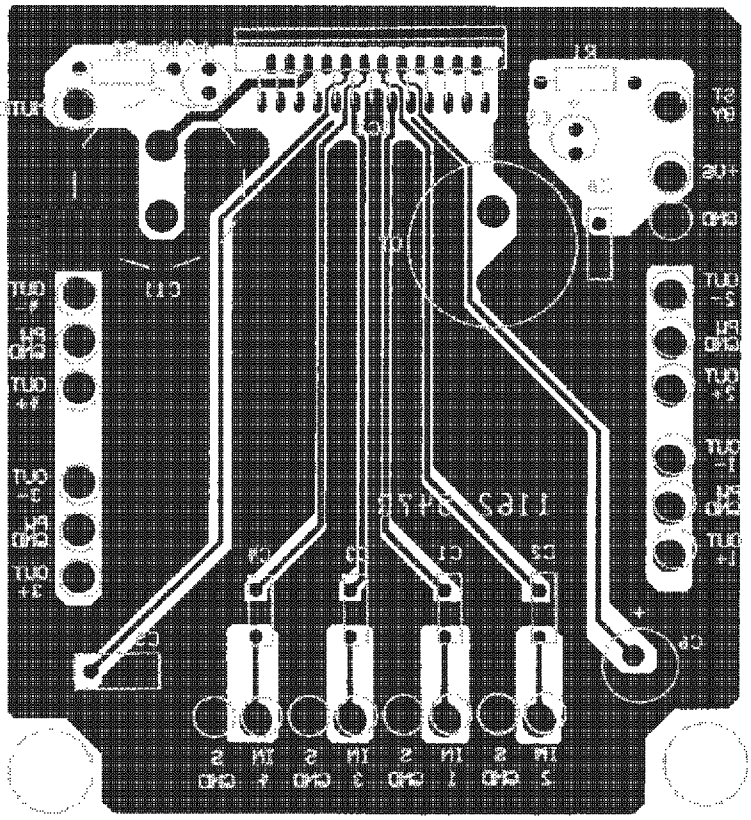


**Figure 3:** Quiescent Current vs. Supply Voltage

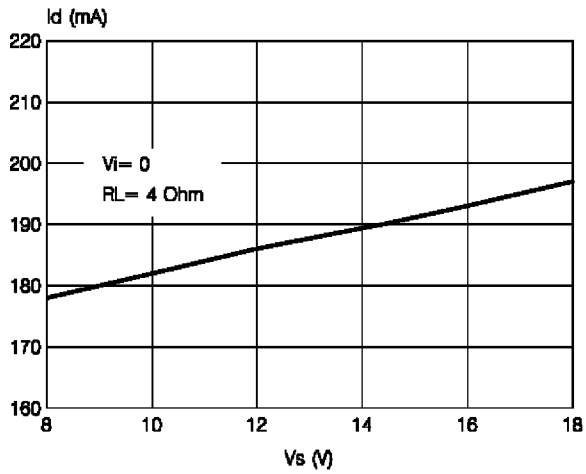



**Figure 4:** Quiescent Output Voltage vs. Supply Voltage

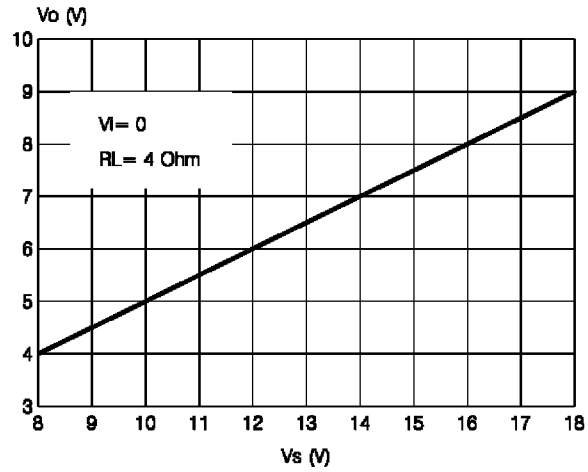



**Figure 5:** Output Power vs. Supply Voltage

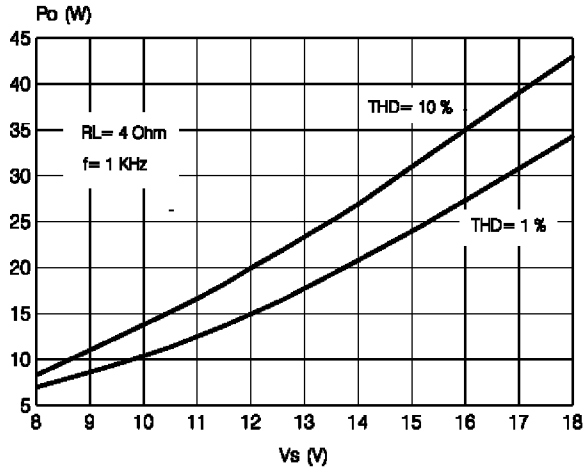



**Figure 6:** Maximum Output Power vs. Supply Voltage

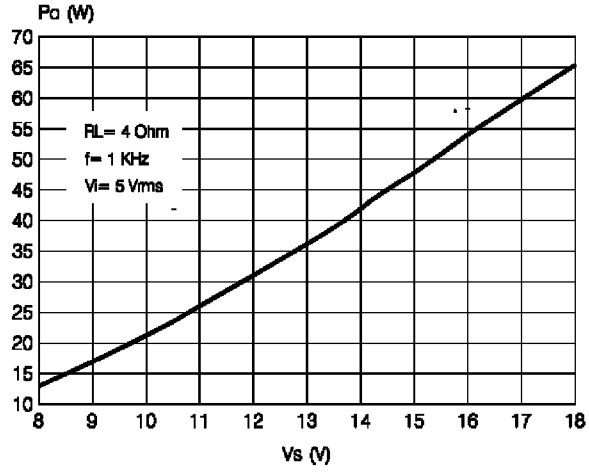



**Figure 7:** Distortion vs. Output Power

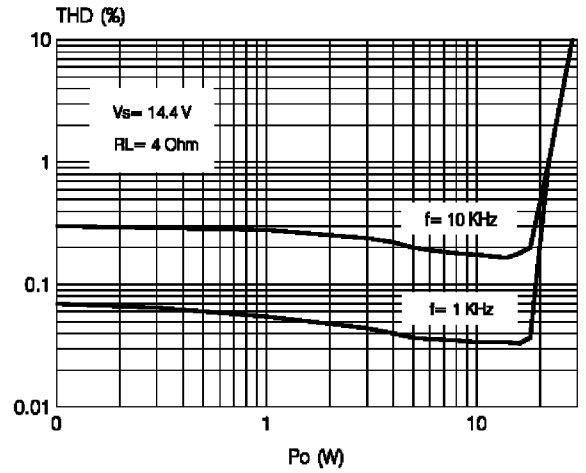



**Figure 8:** Distortion vs. Frequency

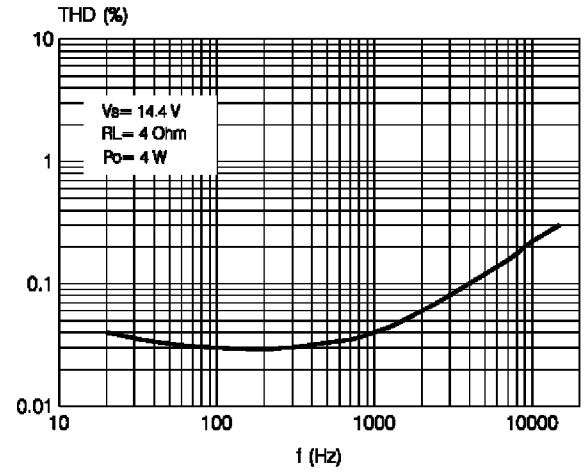


**Figure 9:** Supply Voltage Rejection vs. Frequency

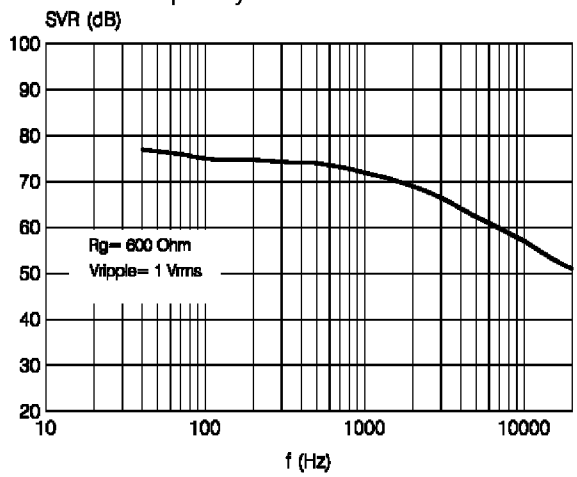



**Figure 10:** Crosstalk vs. Frequency

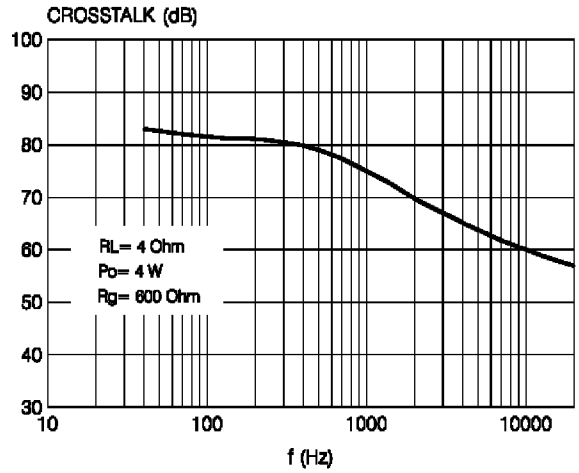



**Figure 11:** Output Noise vs. Source Resistance

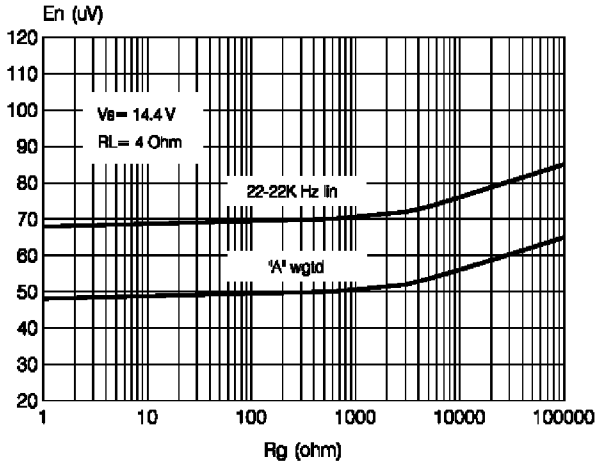
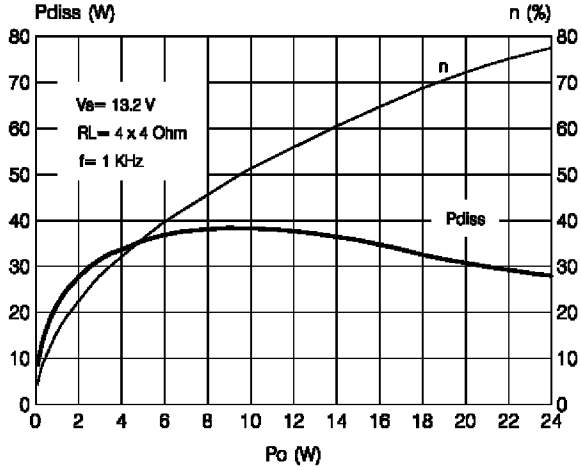



**Figure 12:** Power Dissipation & Efficiency vs. Output Power




**APPLICATION HINTS** (ref. to the circuit of fig. 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**.

INPUT STAGE

The TDA7386's inputs are ground-compatible and can stand very high input signals (± 8Vpk) 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.

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 uA normally flows out of pin 22, the maximum allowable muting-series resistance ($R_2$) is 70KΩ, which is sufficiently high to permit a muting capacitor reasonably small (about 1µF).

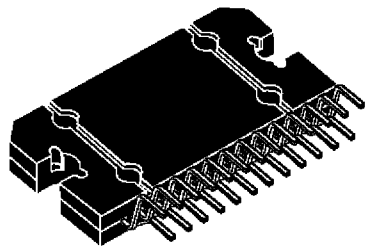
If $R_2$ is higher than recommended, the involved risk will be that the voltage at pin 22 may rise to above the 1.5 V threshold voltage and the device will consequently fail to turn OFF when the mute line is brought down.

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 | | |
|---|---|---|---|---|---|---|
| | 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 | 1.138 | 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 | |
| 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° (Typ.) | | | | | |
| V1 | 3° (Typ.) | | | | | |
| V2 | 20° (Typ.) | | | | | |
| V3 | 45° (Typ.) | | | | | |

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

## OUTLINE AND MECHANICAL DATA



## Flexiwatt25