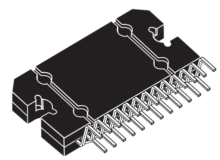
TDA7382

4 x 22W FOUR BRIDGE CHANNELS CAR RADIO AMPLIFIER

- HIGH OUTPUT POWER CAPABILITY:
  4 x 30W max./4Ω EIAJ
  4 x 22W/4Ω @ 14.4V, 1KHz, 10%
  4 x 18.5W/4Ω @ 13.2V, 1KHz, 10%
- CLIPPING DETECTOR (THD = 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

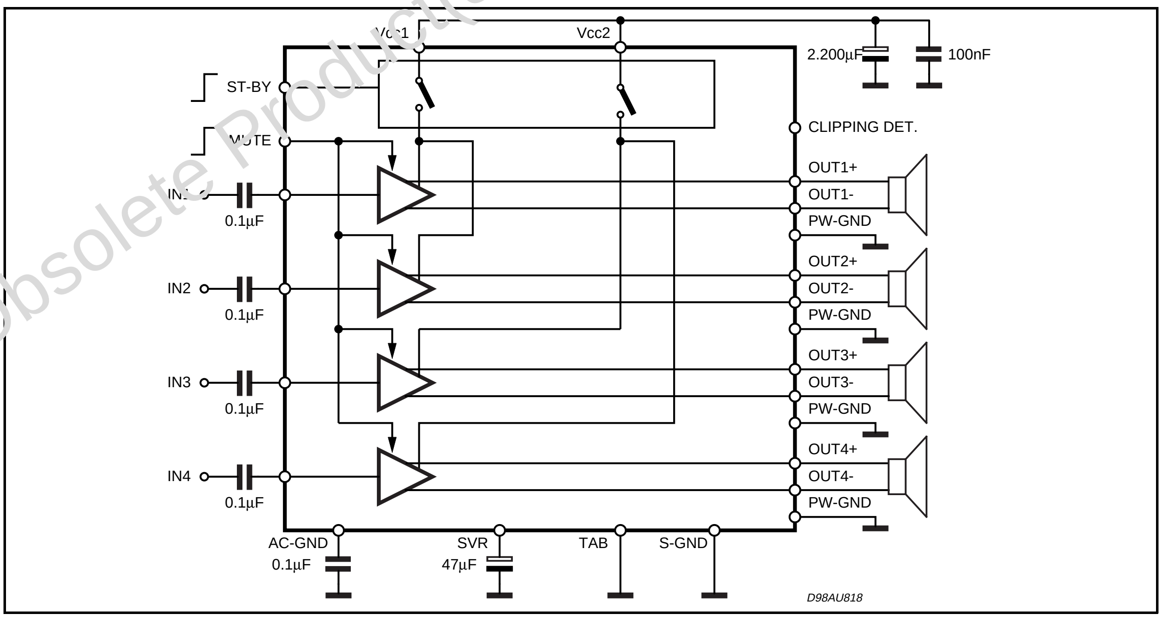
ORDERING NUMBER: TDA7382

- REVERSED BATTERY
- ESD PROTECTION

DESCRIPTION

The TDA7382 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 TDA7382 allows a rail to rail output voltage swing with no need of bootstrap capacitors. The extremely reduced components count allows very compact sets. The on-board clipping detector simplifies gain compression operations.

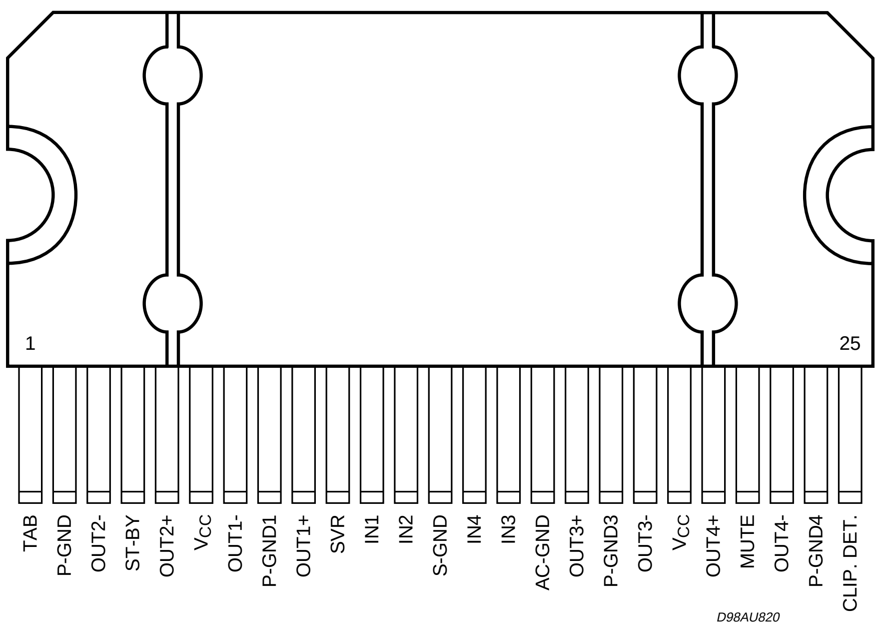
BLOCK AND APPLICATION DIAGRAM



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: Repetitive (Duty Cycle 10% at f = 10Hz) Non Repetitive (t = 100µs)	 4.5 5.5	 A 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 circuit (fig.1), unless otherwise specified.)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_{q1}	Quiescent Current		85	180	300	mA
V_{OS}	Output Offset Voltage				100	mV
G_v	Voltage Gain		25	26	27	dB
P_o	Output Power	THD = 10% THD = 1% THD = 10%; V_S = 13.5V THD = 10%; V_S = 14V THD = 5%; V_S = 14V THD = 1%; V_S = 14V THD = 10%; V_S = 13.2V THD = 1%; V_S = 13.2V	20 16.5 17 19 17 16 17 14	22 18 20 21 19 17 18.5 15		W W W W W W W W
$P_{o\,max}$	Max. Output Power	EIAJ RULES	27.5	30		W
THD	Distortion	P_o = 4W		0.04	0.3	%
e_{No}	Output Noise	"A" Weighted Bw = 20Hz to 20KHz		50 65	120 150	µV µV
SVR	Supply Voltage Rejection	f = 100Hz	50	65		dB
f_{cl}	Low Cut-Off Frequency			20		Hz
f_{ch}	High Cut-Off Frequency		75			KHz
R_i	Input Impedance		60	100	130	KΩ
C_T	Cross Talk	f = 1KHz	50	70		dB
I_{SB}	St-By Current Consumption	St-By = LOW		20	50	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	V_O = 1Vrms	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
$I_{m\,(L)}$	Muting Pin Current	V_{MUTE} = 1.5V (Source Current)	5	13	16	µA
CDL	Clipping Detection THD Level		5	10	15	%

Figure 1: Standard Test and Application Circuit

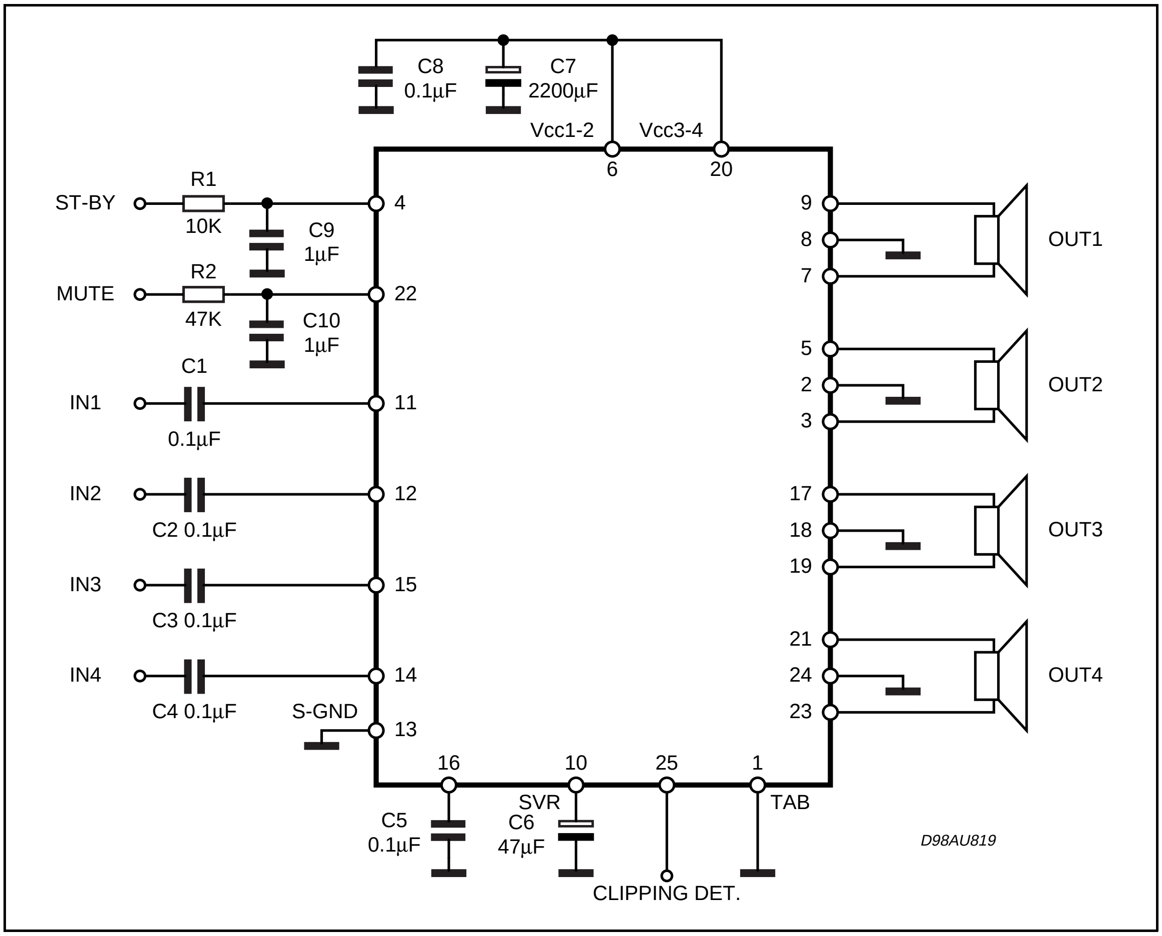


Figure 2: P.C.B. and component layout of the figure 1 (1:1 scale)

COMPONENTS & TOP COPPER LAYER

BOTTOM COPPER LAYER

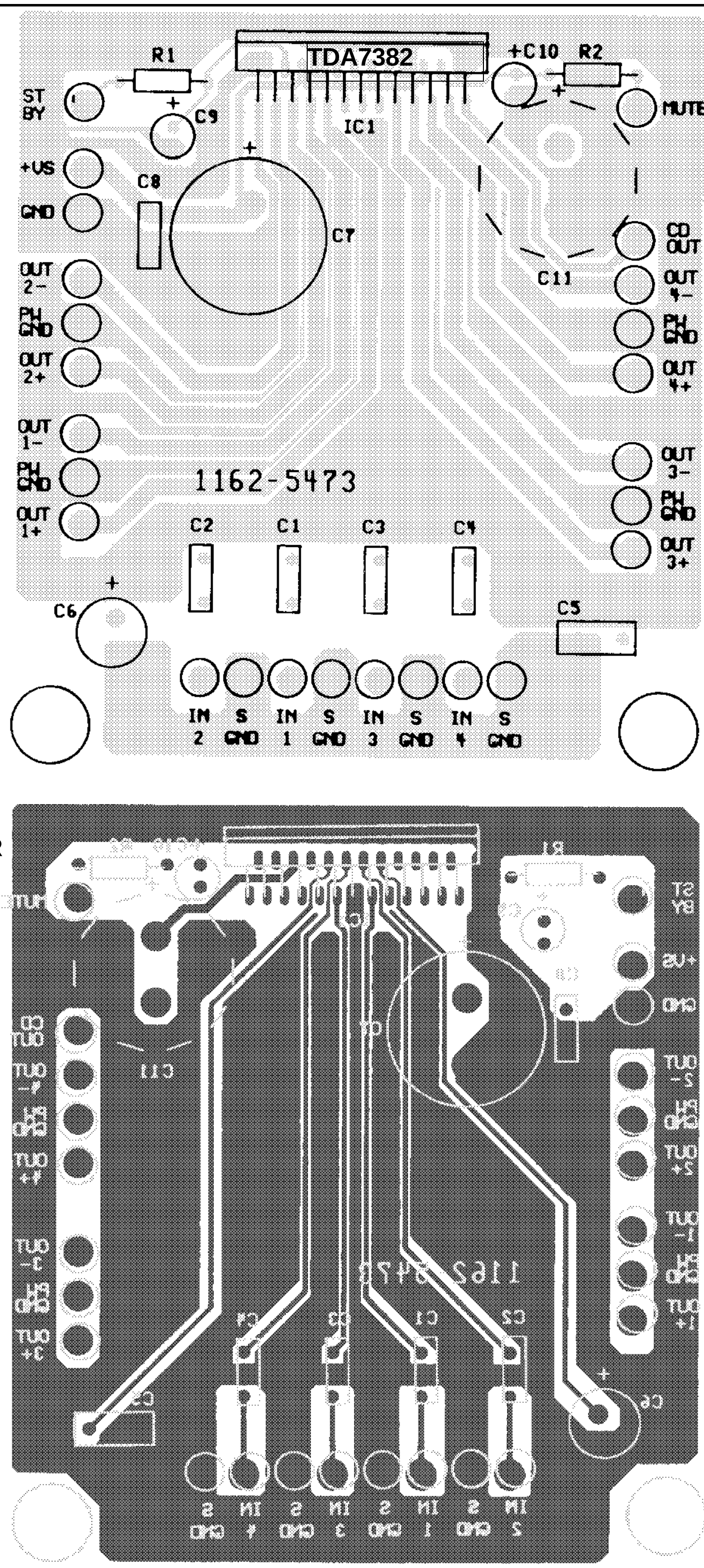


Figure 3: Quiescent Current vs. Supply Voltage

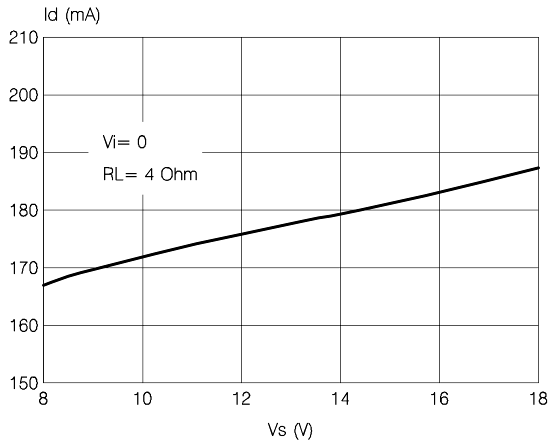


Figure 4: Quiescent Output Voltage vs. Supply Voltage

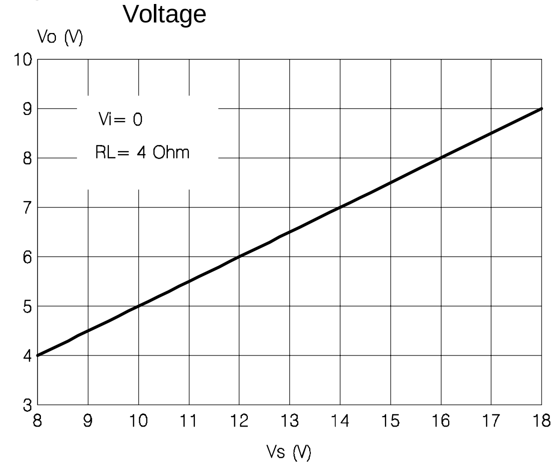


Figure 5: Output Power vs. Supply Voltage

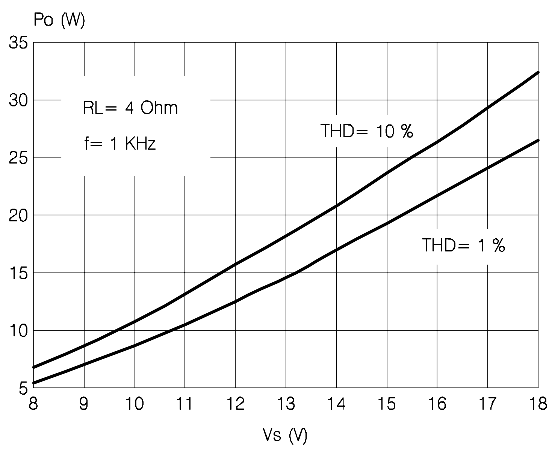


Figure 6: Distortion vs. Output Power

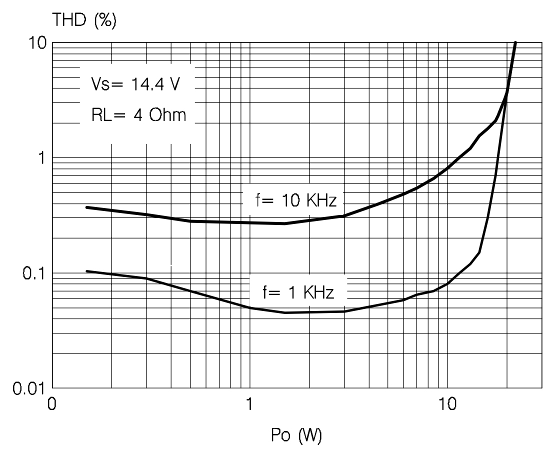


Figure 7: Distortion vs. Frequency.

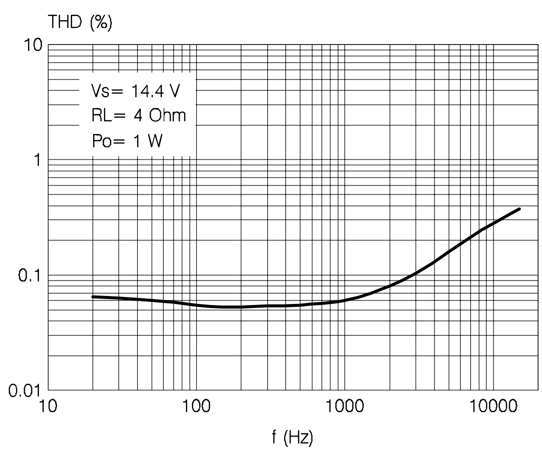


Figure 8: Supply Voltage Rejection vs. Frequency by varying C6

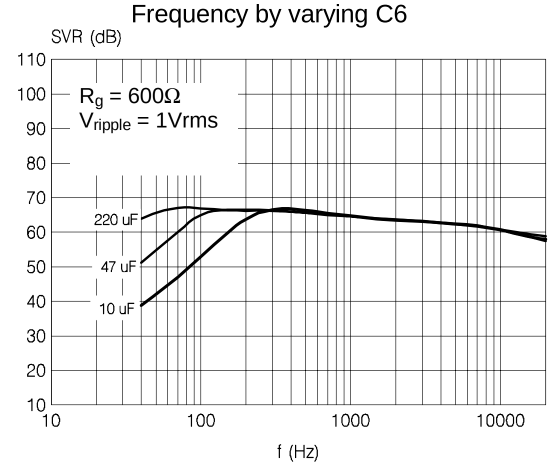


Figure 9: Output Noise vs. Source Resistance

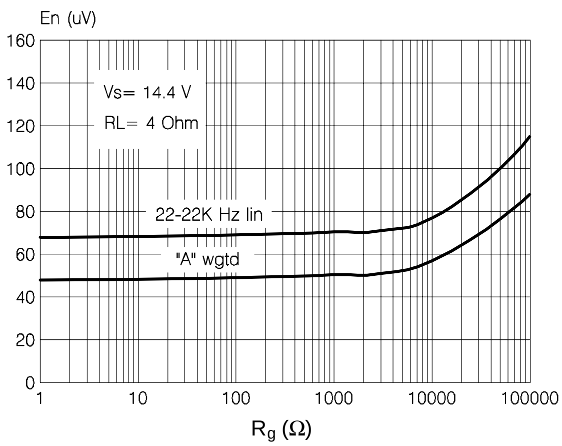
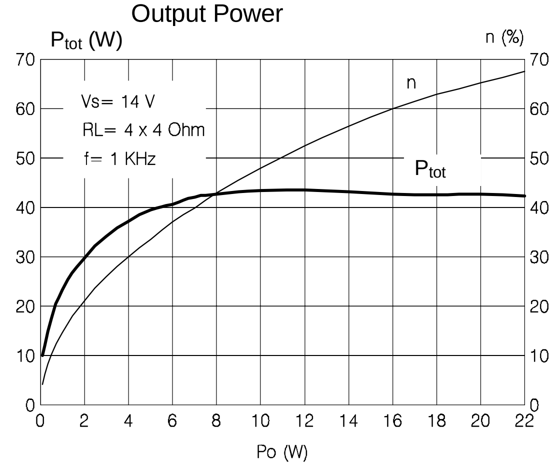


Figure 10: Power Dissipation & Efficiency vs. Output Power



INPUT STAGE

The TDA7382'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.

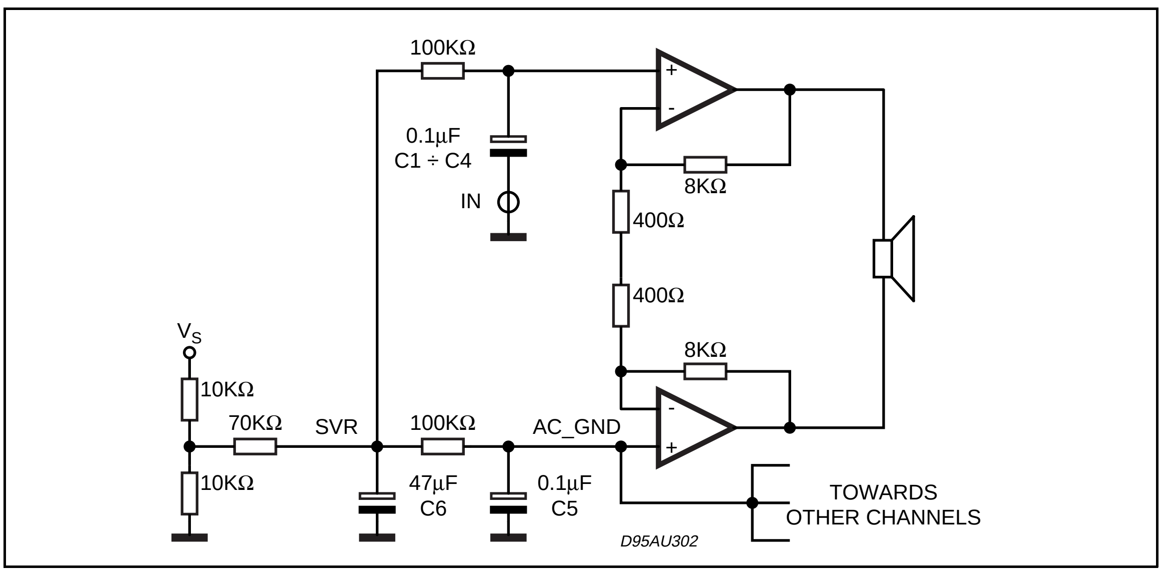
R-C cells have always to be used in order to smooth down the transitions for preventing any audible transient noises.

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 as-

Figure 11: Input/Output Biasing.



signed in order to obtain a virtually pop-free transition has to be slower than 2.5V/ms.

CLIPPING DETECTOR

The **CLIPPING DETECTOR** acts in a way to output a signal as soon as one or more outputs reach or trespass a typical THD level of 10%.

As a result, the clipping-related signal at pin 25 takes the form of pulses, which are syncronized with each single clipping event in the music program. Applications making use of this facility usually operate a filtering/integration of the pulses train through passive R-C networks and realize a volume (or tone bass) stepping down in association with microprocessor-driven audioprocessors.

The maximum load that pin 25 can sustain is 1KΩ.

Due to its operating principles, the clipping detector has to be viewed mainly as a power-dependent feature rather than frequency-dependent. This means that clipping state causing THD = 10% typ. will be immediately signaled out whenever a fixed power level is reached, regardless of the audio frequency.

In other words, this feature offers the means to counteract the extremely sound-damaging effects of heavy clipping, caused by a sudden increase of odd order harmonics and appearance of serious intermodulation phenomena.

Figure 12: Diagnostics circuit.

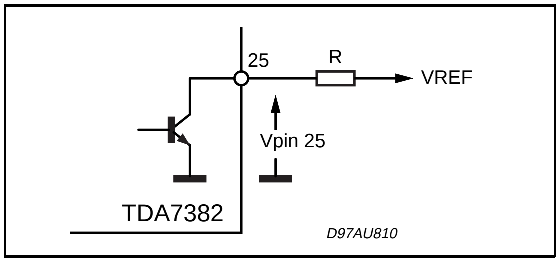


Figure 13: Clipping Detection Waveforms.

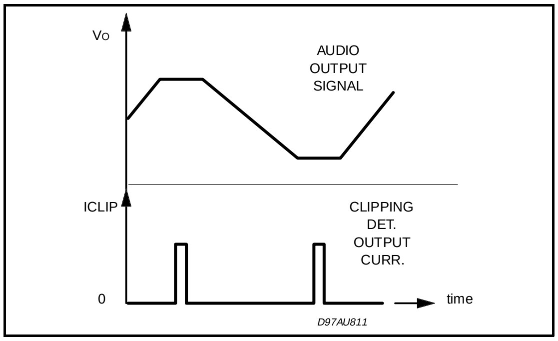
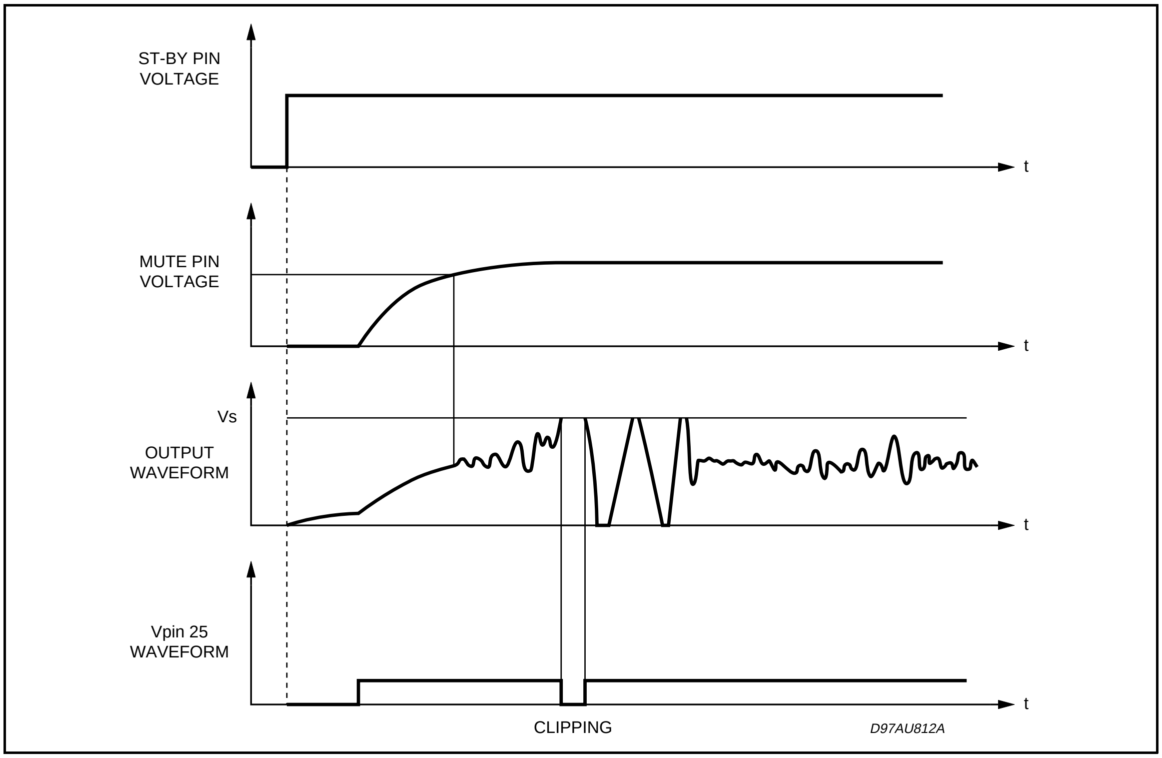
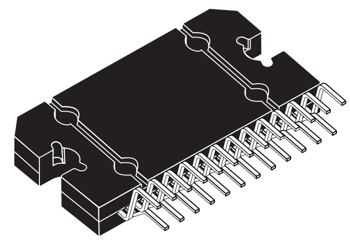


Figure 14: Diagnostics Waveforms.



OUTLINE AND MECHANICAL DATA



Flexiwatt25

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