TDA7854

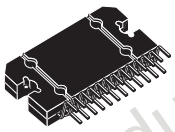
4 x 47W MOSFET quad bridge power amplifier

Features

- Multipower BCD technology
- High output power capability:
  - 4 x 47W/4Ω max.
  - 4 x 80W/2Ω max.
- MOSFET output power stage
- Excellent 2Ω driving capability
- Hi-fi class 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



Flexiwatt 25

- Fortuitous open GND
- Reversed battery
- ESD

Description

The TDA7854 is a breakthrough MOSFET technology class AB audio power amplifier in Flexiwatt 25 package designed for high power car radio. The fully complementary P-Channel/N-Channel output structure allows a rail to rail output voltage swing which, combined with high output current and minimized saturation losses sets new power references in the car-radio field, with unparalleled distortion performances.

Table 1. Device summary

Order code	Package	Packing
TDA7854	Flexiwatt 25	Tube

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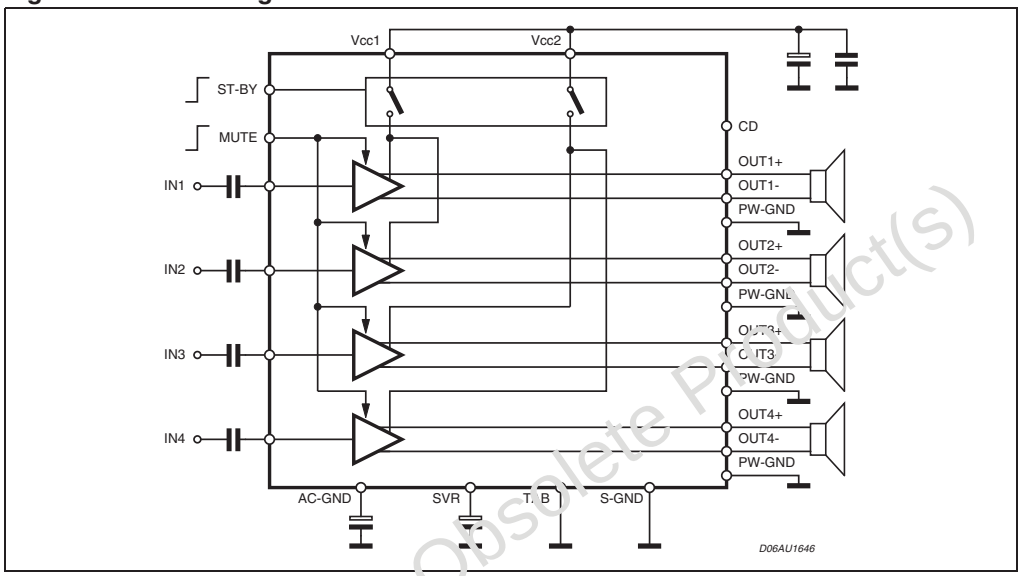
1 Block diagram and application circuit

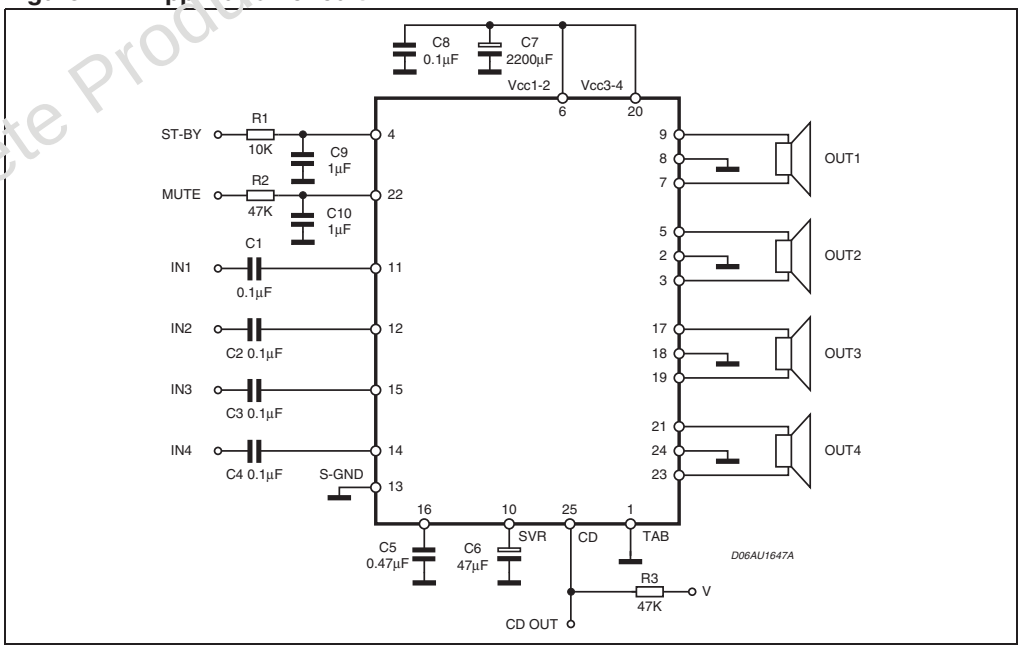
1.1 Block diagram

Figure 1. Block diagram



1.2 Application circuit

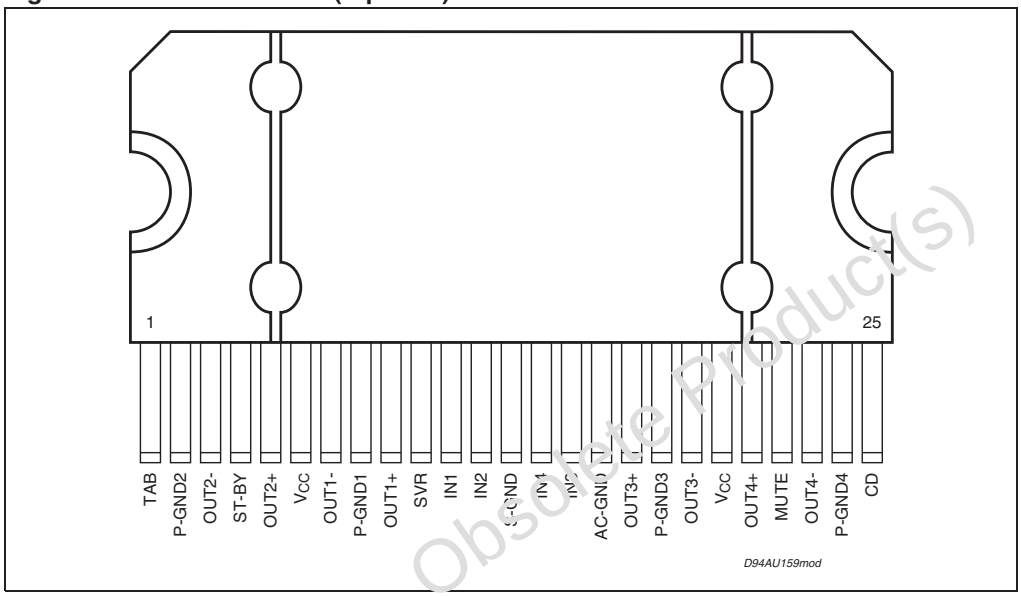
Figure 2. Application circuit



2 Pin description

2.1 Pin connection

Figure 3. Pin connection (top view)



2.2 Thermal data

Table 2. Thermal data

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

3 Electrical specifications

3.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_S	Operating supply voltage	18	V
$V_{S\ (DC)}$	DC supply voltage	28	V
$V_{S\ (pk)}$	Peak supply voltage (for t = 50ms)	50	V
I_O	Output peak current Non repetitive (t = 100µs) Repetitive (duty cycle 10% at f = 10Hz)	 10 9	 A A
P_{tot}	Power dissipation T_{case} = 70°C	85	W
T_j	Junction temperature	150	°C
T_{stg}	Storage temperature	-55 to 150	°C

3.2 Electrical characteristics

Table 4. Electrical characteristics

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{q1}	Quiescent current	$R_L = \infty$	100	150	250	mA
V_{OS}	Output offset voltage	Play mode / Mute mode	-60		+60	mV
G_v	Voltage gain		25	26	27	dB
dG_v	Channel gain unbalance				±1	dB
P_o	Output power	V_S = 14.4V; THD = 10% V_S = 14.4V; THD = 1%		28 22		W W
		V_S = 14.4V; THD = 10%, 2Ω V_S = 14.4V; THD = 1%, 2Ω		48 38		W W
$P_{o\ max.}$	Max. output power(1)	V_S = 15.2V; R_L = 4Ω V_S = 15.2V; R_L = 2Ω		47 80		W W
THD	Distortion	P_o = 4W		0.01		%
e_{No}	Output Noise	"A" Weighted Bw = 20Hz to 20KHz		35 50	 100	µV µV
SVR	Supply voltage rejection	f = 100Hz; V_r = 1Vrms	50	70		dB
f_{ch}	High cut-off frequency	P_O = 0.5W	100	300		KHz
R_i	Input Impedance		80	100	120	KΩ

Table 4. Electrical characteristics (continued)

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
C_T	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} = 0			10	µA
I_{pin5}	St-by pin current	V_{St-By} = 1.2V to 2.65V			±1	µA
$V_{SB\ out}$	St-by out threshold voltage	(Amp: ON)	2.65			V
$V_{SB\ in}$	St-by in threshold voltage	(Amp: OFF)			1.2	V
A_M	Mute attenuation	P_{Oref} = 4W	80	90		dB
$V_{M\ out}$	Mute out threshold voltage	(Amp: Play)	2.6			V
$V_{M\ in}$	Mute in threshold voltage	(Amp: Mute)			1.2	V
$V_{AM\ in}$	VS automute threshold	(Amp: Mute) Att ≥ 80dB; P_{Oref} = 4W (Amp: Play) Att < 0.1dB; P_O = 0.5W	6.8	7 7.5	 8	V V
Ipin23	Muting pin current	V_{MUTE} = 1.2V (Sourced current)	7	12	18	µA
		V_{MUTE} = 2.6V	-5		18	µA
CLIPPING DETECTOR						
CD_{LK}	Clip Det high leakage current	Cd Off		0	1	µA
CD_{SAT}	Clip Det sat voltage	DC On; I_{CD} = 1mA		0.2	0.4	V
CD_{THD}	Clip Det THD level			2		%

1. Saturated square wave output

4 Application hints

4.1 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**.

4.2 Input stage

The TDA7854'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.

4.3 Stand-by and muting

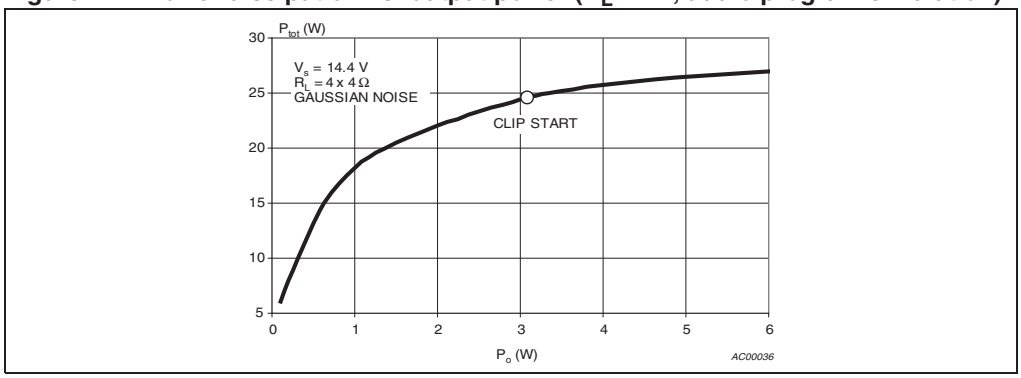
R-C cells have always to be used in order to smooth down the transitions for preventing any audible transient noise.
About stand-by, the time constant to be assigned in order to obtain a virtually pop-free transition has to be slower than 2.5V/ms.

A direct connection to Vs of these two pins is admissible but a 470kOhm equivalent resistance should be present between the power supply and muting and stand-by pins.

4.4 Heatsink definition

Under normal usage (4 Ohm speakers) the heatsink's thermal requirements have to be deduced from *Figure 4*, which reports the simulated power dissipation when real music/speech programmes are played out. Noise with gaussian-distributed amplitude was employed for this simulation. Based on that, frequent clipping occurrence (worst-case) will cause P_{diss} = 26W. Assuming T_{amb} = 70°C and T_{CHIP} = 150°C as boundary conditions, the heatsink's thermal resistance should be approximately 2°C/W. This would avoid any thermal shutdown occurrence even after long-term and full-volume operation.

Figure 4. Power dissipation vs. output power (R_L = 4Ω, audio program simulation)



5 Package information

In order to meet environmental requirements, ST offers this device in ECOPACK® packages. This package has a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label.

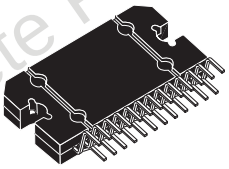
ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

Figure 5. Flexiwatt25 mechanical data and package dimensions

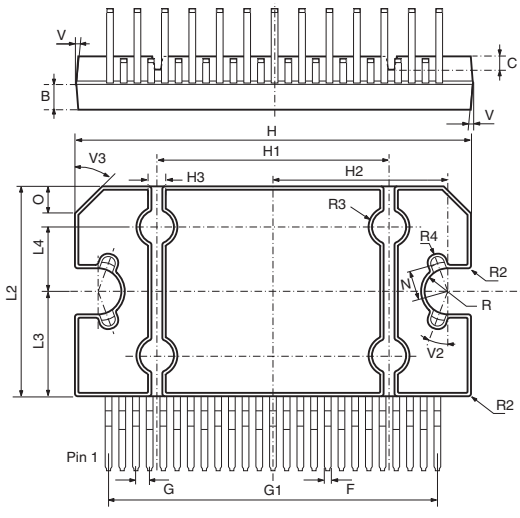
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.45	4.50	4.65	0.175	0.177	0.183
B	1.80	1.90	2.00	0.070	0.074	0.079
C		1.40			0.055	
D	0.75	0.90	1.05	0.029	0.035	0.041
E	0.37	0.39	0.42	0.014	0.015	0.016
F (1)			0.57			0.022
G	0.80	1.00	1.20	0.031	0.040	0.047
G1	23.75	24.00	24.25	0.935	0.945	0.955
H (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° (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 (vertical)



6 Revision history

Table 5. Document revision history

Date	Revision	Changes
4-Oct-2007	1	Initial release.