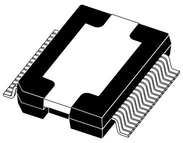
TDA7376PD

2 x 35 W power amplifier for car radio

Features

- High output power capability:
  - 2 x 40 W max./4 Ω
  - 2 x 35 W/4 Ω EIAJ
  - 2 x 25 W/4 Ω @14.4 V, 1 kHz, 10 %
  - 2 x 25 W/2 Ω @14.4 V, 1 kHz, 10 %
- 2 Ω driving
- Differential inputs
- Minimum external components count
- Internally fixed gain (26 dB)
- Mute function (CMOS compatible)
- Automute at minimum supply voltage detection
- Standby function
- No audible pop during mute and standby operations
- Clipping detector with programmable distortion threshold
- Protections:
  - Short circuit (out to ground, out to supply voltage, across the load)
  - Overrating chip temperature with soft thermal limiter
  - Load dump voltage
  - Fortuitous open ground
  - Loudspeaker DC current
  - ESD



PowerSO36 (Slug up)

Description

The TDA7376PD is a new technology dual bridge audio amplifier in PowerSO36 package designed for car radio applications.

Thanks to the fully complementary PNP/NPN output stage configuration the TDA7376PD delivers a rail-to-rail voltage swing with no need of bootstrap capacitors.

Differential input pairs, that will accept either single ended or differential input signals, guarantee high noise immunity making the device suitable for both car radio and car boosters applications.

The audio mute control, that attenuates the output signal of the audio amplifiers, suppresses pop on - off transients and cuts any noises coming from previous stages. The standby control, that de-biases the amplifiers, reduces the cost of the power switch. The on-board programmable distortion detector allows compression facility whenever the amplifier is overdriven, so limiting the distortion at any levels inside the presettable range.

Table 1. Device summary

Order code	Package	Packing
TDA7376PD	PowerSO36	Tube
TDA7376PDTR	PowerSO36	Tape and reel

Contents

List of tables

List of figures

1 Block and pins connection diagrams

Figure 1. Block diagram

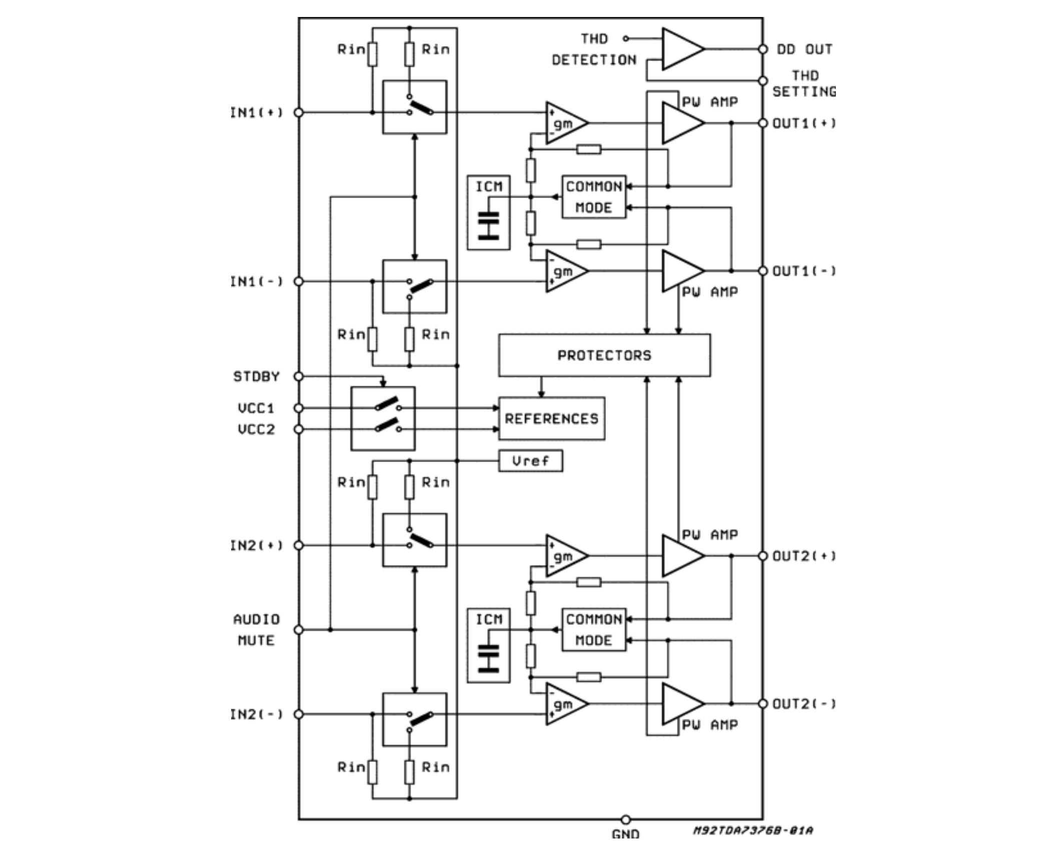
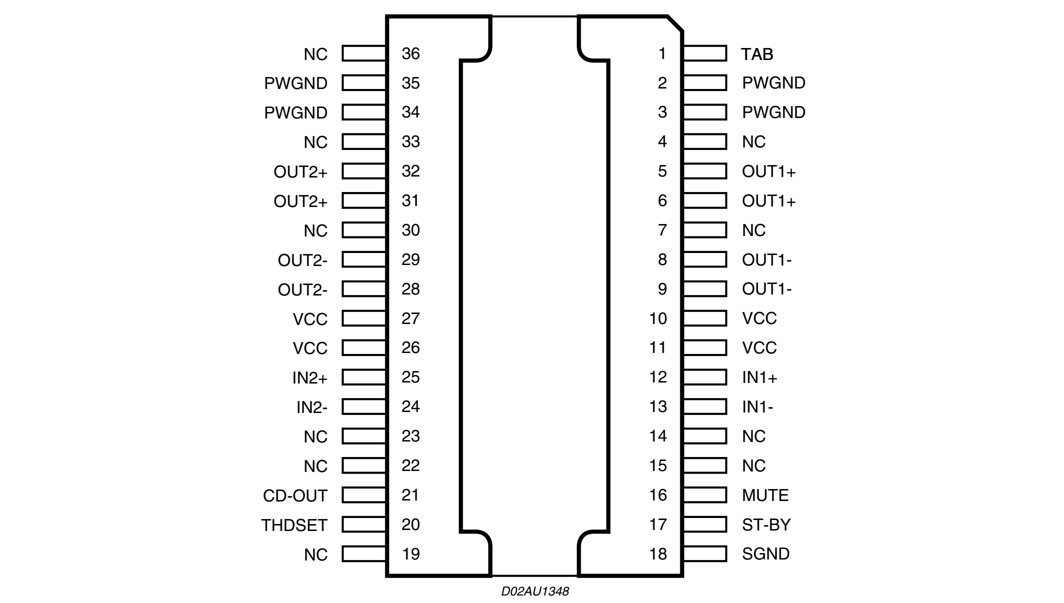


Figure 2. Pins connection diagram (top view)



2 Electrical specifications

2.1 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{OP}	Operating supply voltage	18	V
V_s	DC supply voltage	28	V
V_{peak}	Peak supply voltage (t = 50 ms)	50	V
I_O	Output peak current (not repetitive t = 100 µs)	8	A
	Output peak current (repetitive f > 10 Hz)	6	A
P_{tot}	Power dissipation T_{case} = 85°C	36	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

2.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{th\ j\text{-}case}$	Thermal resistance junction-to-case Max	2	°C/W

2.3 Electrical characteristics

Refer to the test circuits *Figure 15* and *16*, V_S = 14.4 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C, unless otherwise specified.

Table 4. Electrical characteristics

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_S	Supply voltage range	-	8	-	18	V
I_d	Total quiescent drain current	$R_L = \infty$	-	-	200	mA
V_{OS}	Output offset voltage	-	-	-	120	mV
P_O	Output power	THD = 10 %; THD = 10 %; R_L = 2 Ω	23 33	25 37	-	W
$P_{O\ max}$	Max. output power (1)	-	36	40	-	W
$P_{O\ EIAJ}$	EIAJ output power (1)	V_S = 13.7 V	32	35	-	W
THD	Distortion	P_O = 0.5 to 10 W P_O = 0.5 to 15 W	-	0.03 0.08	-	%
C_T	Cross talk	f = 1 kHz; R_g f = 10 kHz; R_g	-	80 70	-	dB

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
R_{IN}	Input impedance	differential input Single Ended input	45 40	-	-	kΩ
G_V	Voltage gain	differential input	25	26	27	dB
		Single Ended input	25	26	27	dB
ΔG_V	Channel gain balance	-	-	-	1	dB
E_{IN}	Input noise voltage	R_g = 600 Ω; "A" weighted R_g = 600 Ω; 22 Hz to 33 kHz	-	3 4	6	µV
SVR	Supply voltage rejection	f = 100 Hz; V_r = 1 Vrms; R_g = 0; f = 10 Hz; V_r = 1 Vrms; R_g = 0;	45	55	-	dB
BW	Power bandwidth	(-3dB)	75	-	-	kHz
CMRR	Common mode rejection ratio	V_{CM} = 1 Vrms input referred	60	-	-	dB
A_{SB}	Standby attenuation	V_{SB} = 1.5V; $P_{O\ ref}$ = 1 W	80	90		dB
$V_{SB\ IN}$	Standby input threshold	-	-	-	1.5	V
$V_{SB\ OUT}$	Standby output threshold	-	3.5	-	-	V
I_{sb}	Standby current consumption	V_{SB} = 0V	-	-	20	µA
A_M	Mute attenuation	V_M = 1.5 V; P_{Oref} = 1 W	-	85	-	dB
$V_{M\ IN}$	Mute in threshold	-	-	-	1.5	V
$V_{M\ OUT}$	Mute out threshold	-	3.5	-	-	V
I_6	Mute pin current	V_6 = 0 to V_S,; $V_{S\ max.}$ = 18 V	-	-	100	µA
D_{DL}	Distortion detection level (2)	-	3.5	-	-	%
D_{DOUT}	Distortion detector output DC current	Output low, sinked current (V_{pin10} = 1.5 V)	1	-	-	mA
		Output high, leakage current (V_{pin10} = V_S, @ V_{Smax} = 18 V)	-	-	10	µA

1. Saturated square wave output
2. See *Figure 3* for THD setting.

The TDA7376PD is equipped with a programmable clipping distortion detector circuitry that allows to signal out the output stage saturation by providing a current sinking into an open collector output (D_{DOUT}) when the total harmonic distortion of the output signal reaches the preset level. The desired threshold is fixed through an external divider that produces a proper voltage level across the THD set pin. *Figure 3* shows the THD detection threshold versus the THD set voltage. Since it is essential that the THD set voltage be proportional to the supply voltage, *Figure 4* shows its value as a fraction of V_{CC}. The actual voltage can be computed by multiplying the fraction corresponding to the desired THD threshold by the application's supply voltage.

2.4 Electrical characteristics curves

Figure 3. Clip detector threshold vs. THD set. voltage

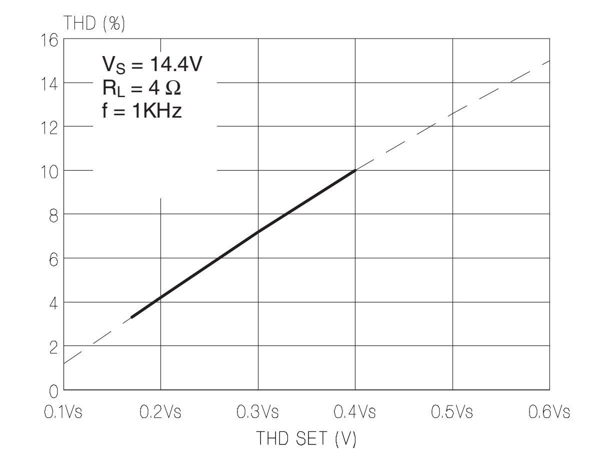


Figure 4. Quiescent current vs. supply voltage

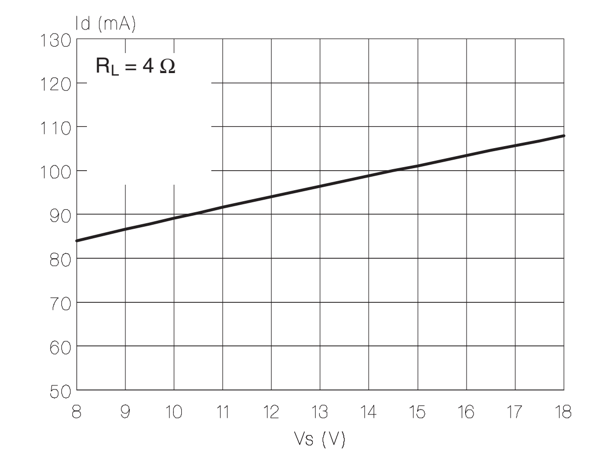


Figure 5. Output power vs. supply voltage (THD = 1 %)

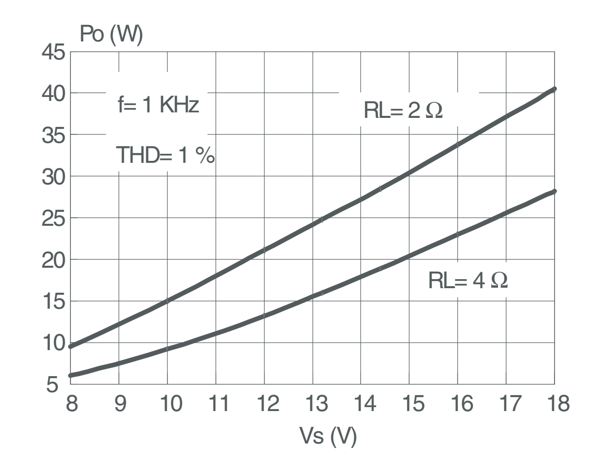


Figure 6. Output power vs. supply voltage (THD = 10 %)

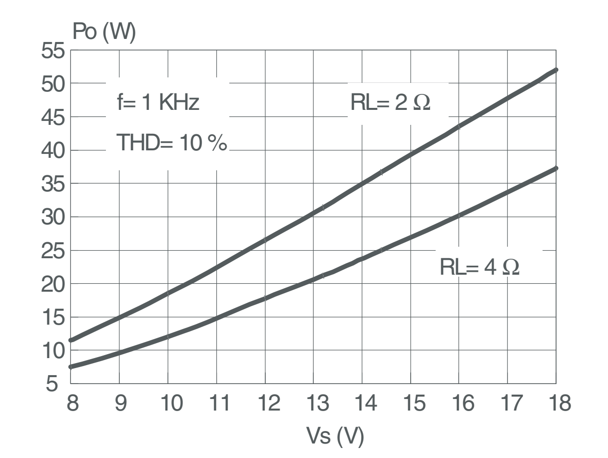


Figure 7. EIAJ power vs. supply voltage

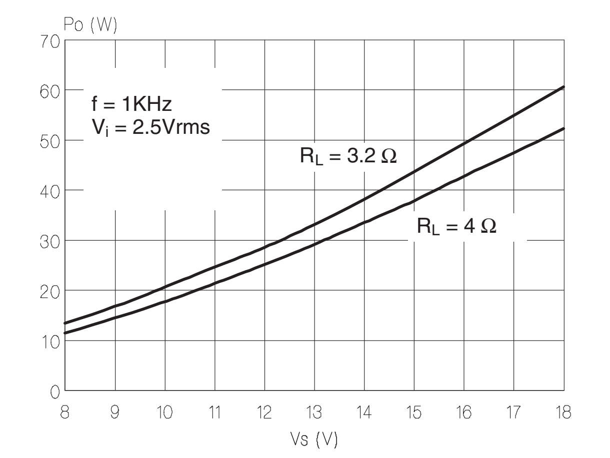


Figure 8. THD vs. frequency

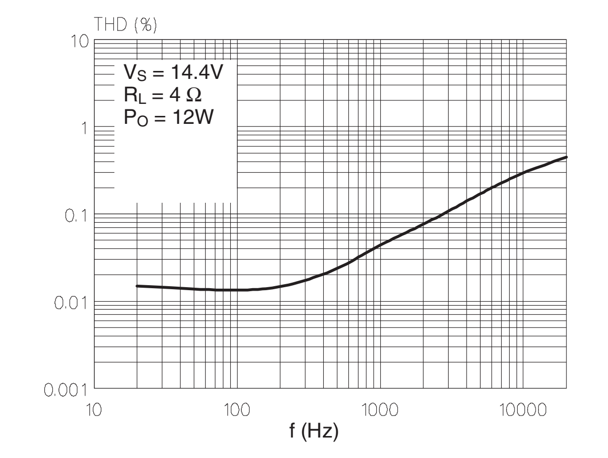


Figure 9. THD vs. output power (R_L = 4 Ω)

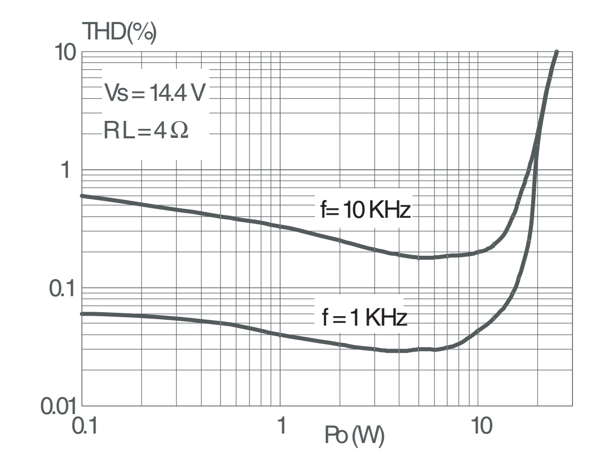


Figure 10. THD vs. output power (R_L = 24 Ω)

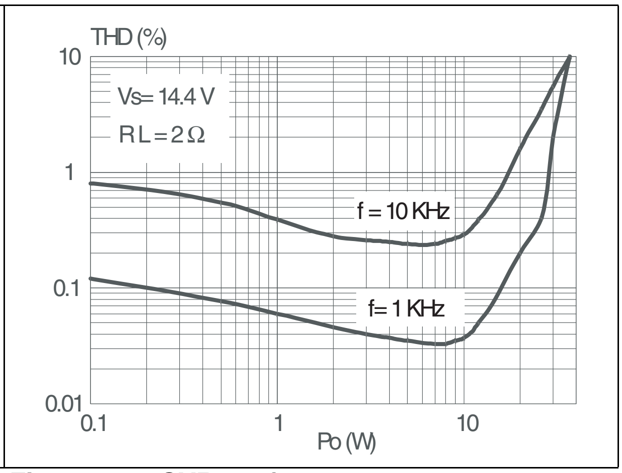


Figure 11. Dissipated power and efficiency vs. output power

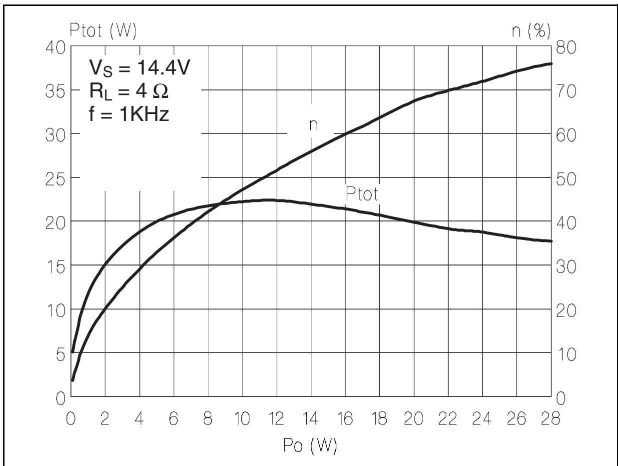


Figure 12. SVR vs. frequency

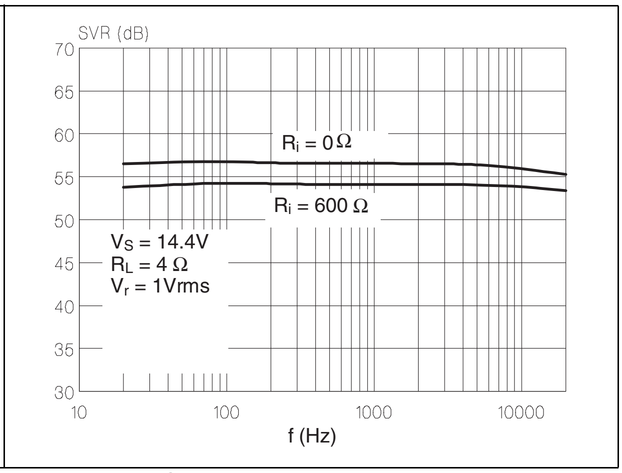


Figure 13. CMRR vs. frequency

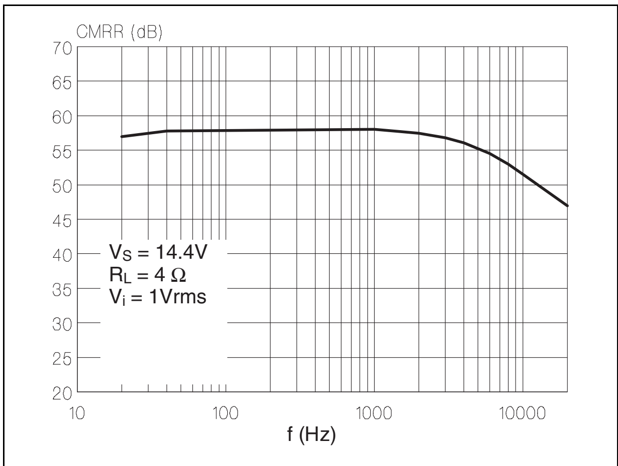
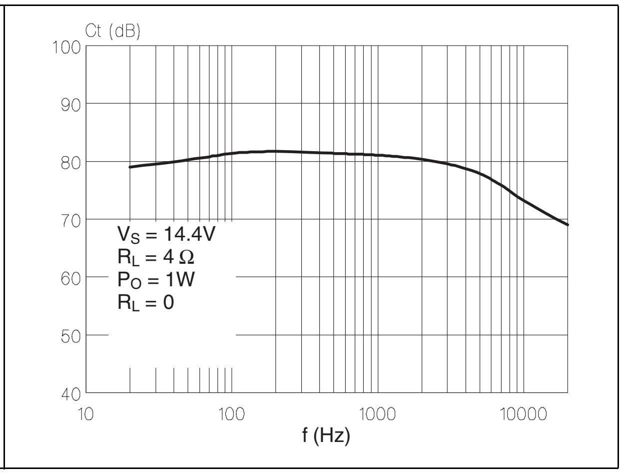


Figure 14. Crosstalk vs. frequency



2.5 Test and application circuits

Figure 15. Differential inputs test and application circuit

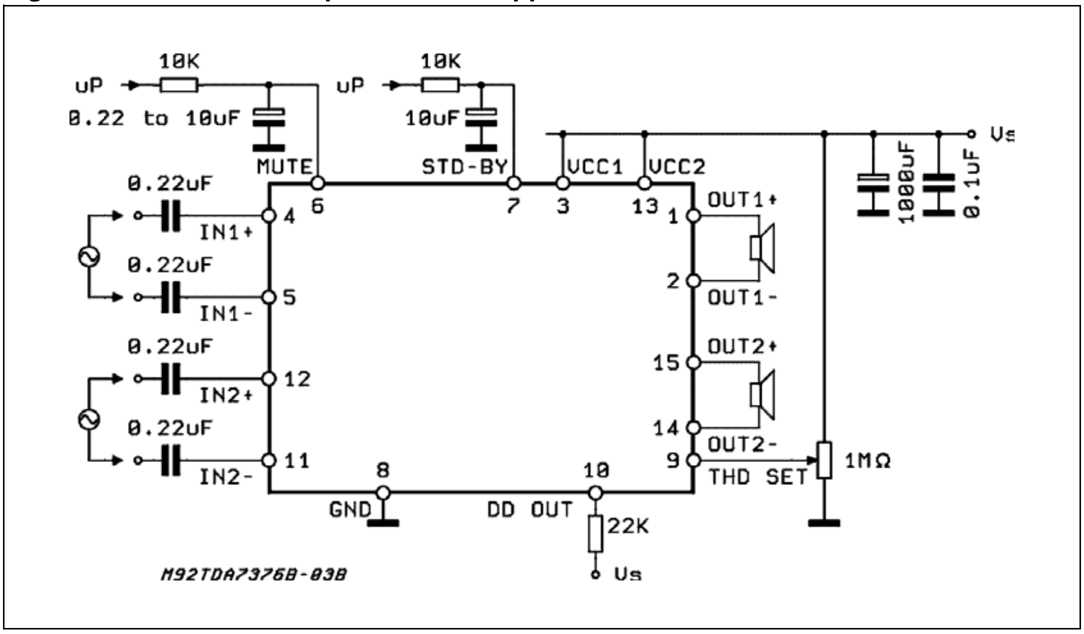


Figure 16. Single ended inputs test and application circuit

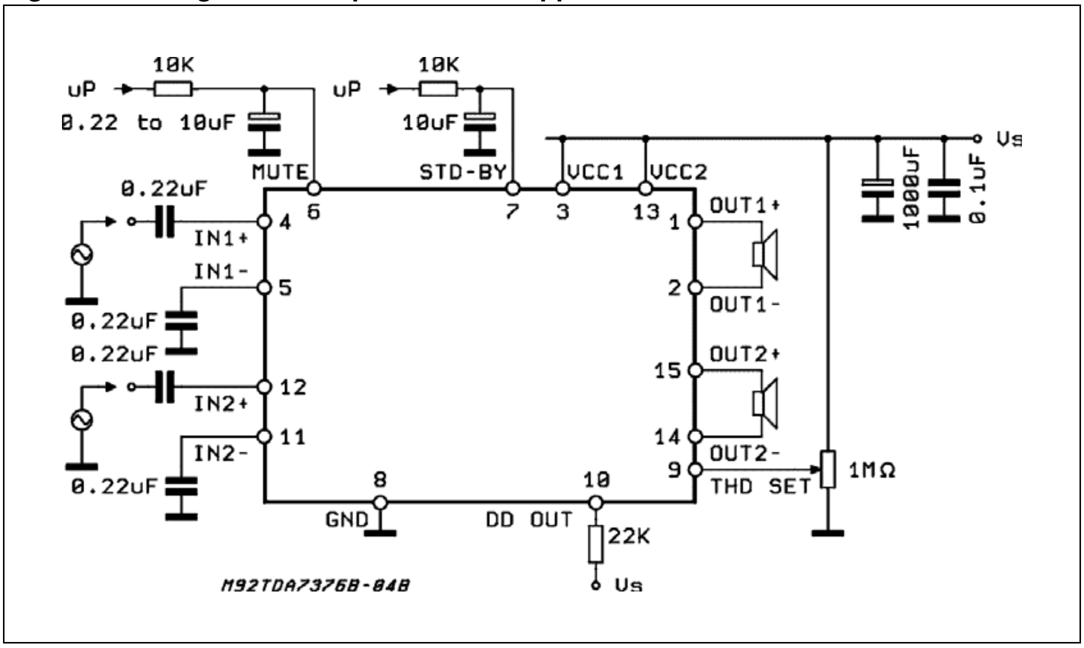
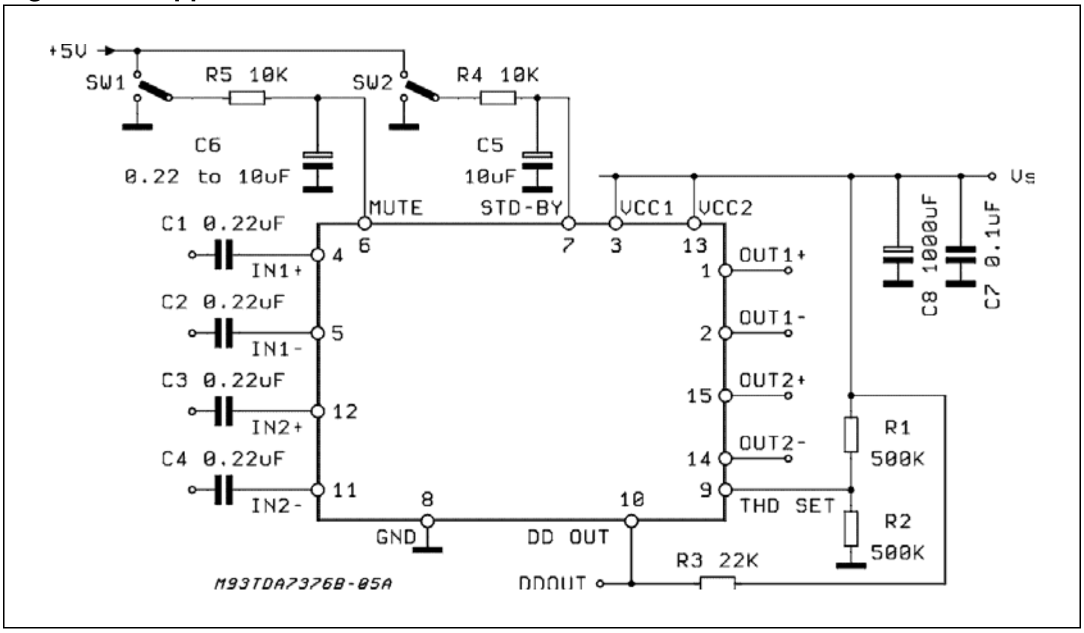


Figure 17. Application board reference circuit



3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.

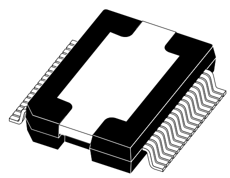
ECOPACK® is an ST trademark.

Figure 18. PowerSO36 (slug up) mechanical data and package dimensions

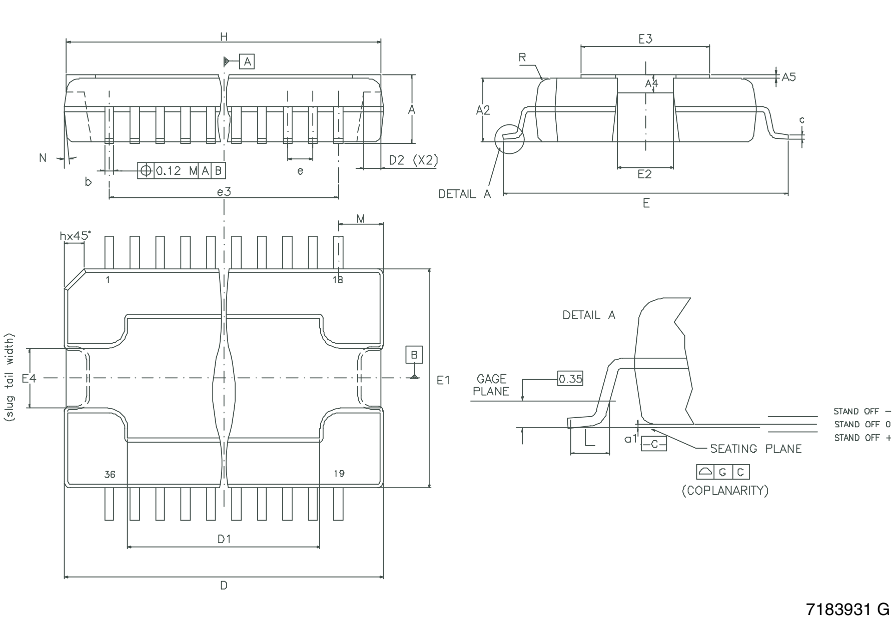
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.270	-	3.410	0.1287	-	0.1343
A2	3.100	-	3.180	0.1220	-	0.1252
A4	0.800	-	1.000	0.0315	-	0.0394
A5	-	0.200	-	-	0.0079	-
a1	0.030	-	-0.040	0.0012	-	-0.0016
b	0.220	-	0.380	0.0087	-	0.0150
c	0.230	-	0.320	0.0091	-	0.0126
D	15.800	-	16.000	0.6220	-	0.6299
D1	9.400	-	9.800	0.3701	-	0.3858
D2	-	1.000	-	-	0.0394	-
E	13.900	-	14.500	0.5472	-	0.5709
E1	10.900	-	11.100	0.4291	-	0.4370
E2	-	-	2.900	-	-	0.1142
E3	5.800	-	6.200	0.2283	-	0.2441
E4	2.900	-	3.200	0.1142	-	0.1260
e	-	0.650	-	-	0.0256	-
e3	-	11.050	-	-	0.4350	-
G	0	-	0.075	0	-	0.0031
H	15.500	-	15.900	0.6102	-	0.6260
h	-	-	1.100	-	-	0.0433
L	0.800	-	1.100	0.0315	-	0.0433
N	-	-	10°	-	-	10°
s	-	-	8°	-	-	8°

(1) "D and E1" do not include mold flash or protusions.
Mold flash or protusions shall not exceed 0.15mm (0.006").
(2) No intrusion allowed inwards the leads.

OUTLINE AND MECHANICAL DATA



PowerSO36 (SLUG UP)



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
13-Dec-2003	1	Initial release.
16-Apr-2004	2	Corrected package drawing.
11-Dec-2009	3	Document reformatted. Updated *Section 3: Package information on page 12*.
17-Sep-2013	4	Updated Disclaimer.