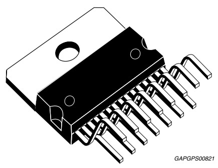
TDA7376B

2 x 35 W Power amplifier for car radio

Datasheet - production data



Multiwatt15

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/ 2Ω (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

Description

The TDA7376B is a new technology dual bridge audio amplifier in Multiwatt 15 package designed for car radio applications. Thanks to the fully complementary PNP/NPN output stage configuration the TDA7376B 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 over driven, so limiting the distortion at any levels inside the presettable range.

Table 1. Device summary

Order code	Package	Packing
TDA7376B	Multiwatt15	Tube

This is information on a product in full production. www.st.com

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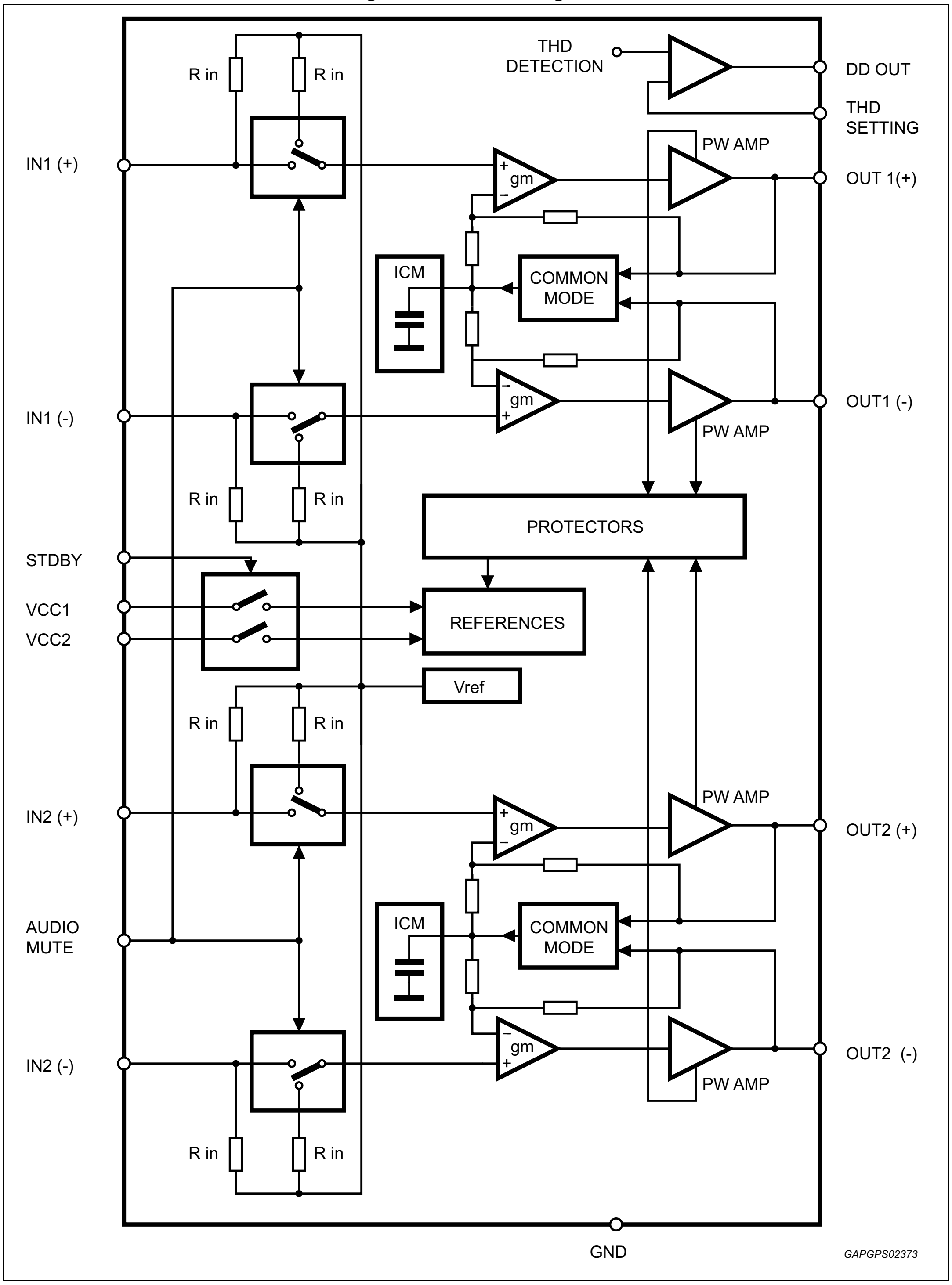
List of figures

1 Block and pin connection diagrams

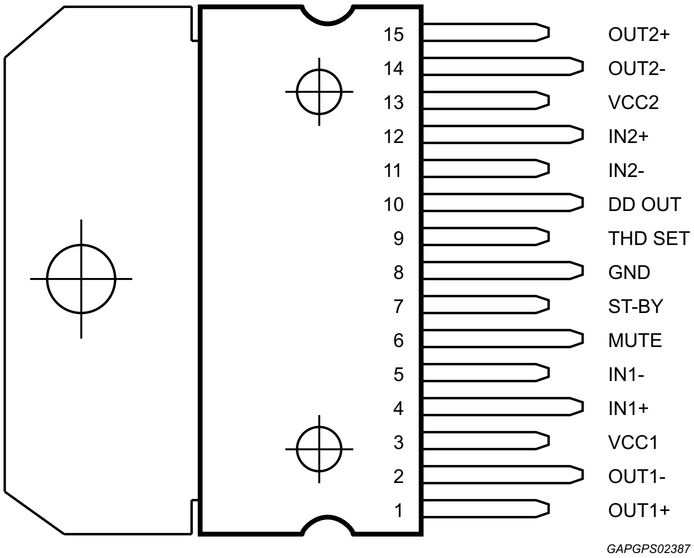
1.1 Block diagram

Figure 1. Block diagram



1.2 Pin connection

Figure 2. Pin connection diagram (top view)



2 Test and application circuits

Figure 3. Differential inputs test and application circuit

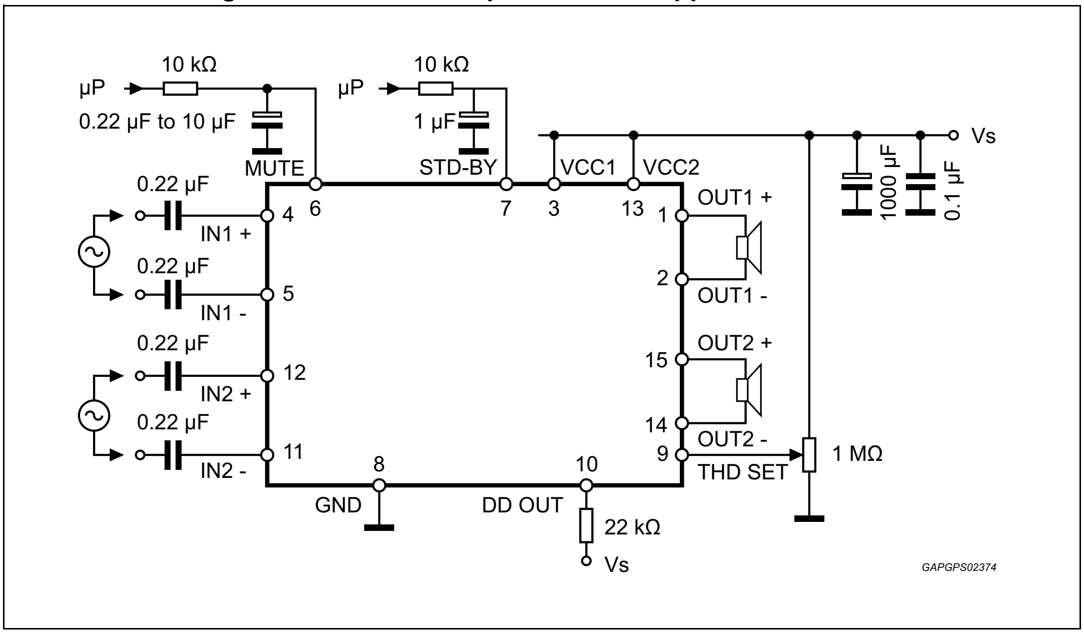


Figure 4. Single ended inputs test and application circuit

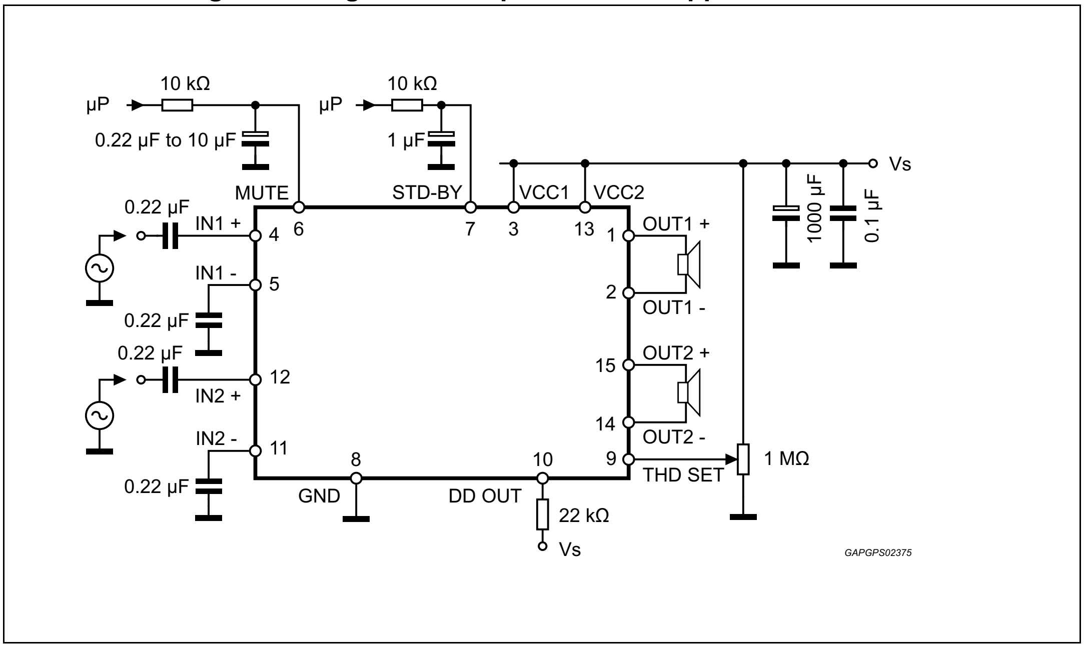


Figure 5. Application board reference circuit

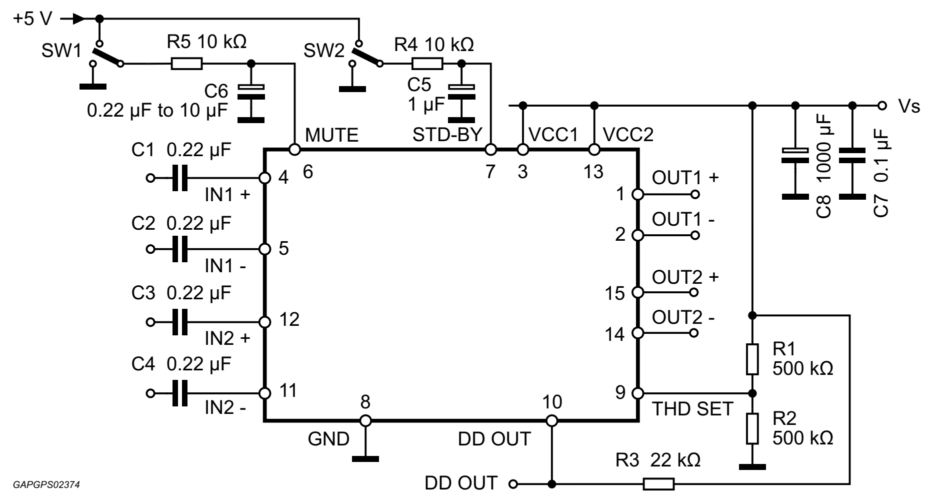
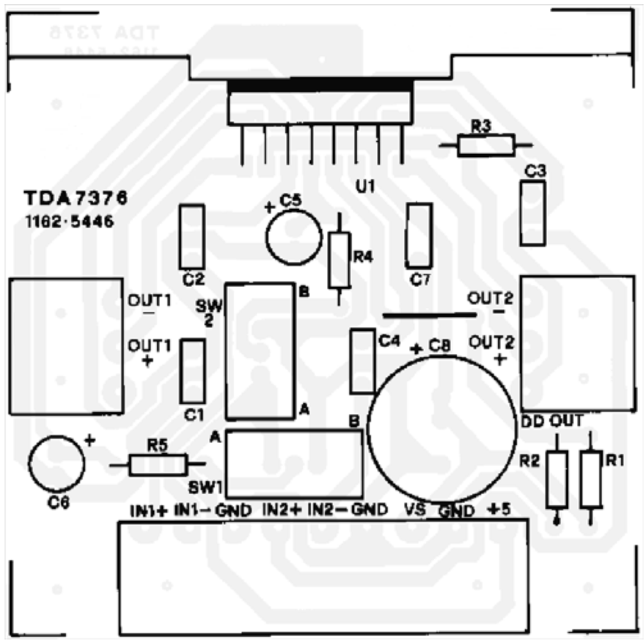


Figure 6. Printed circuit board and components layout of the circuit of figure 5



3 Electrical specifications

3.1 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(1)	-40 to 150	°C
T_{amb}	Operative ambient temperature range	-40 to 105	°C

1. A suitable heatsink/dissipation system should be used to keep T_j inside specified limits.

3.2 Thermal data

Table 3. Thermal data

Symbol	Parameter		Value	Unit
$R_{th\ j\text{-}case}$	Thermal Resistance Junction to case	Max	1.8	°C/W

3.3 Electrical characteristics

Refer to the test circuits figures 3 and 4, 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 W
$P_{O\ max}$	Max. output power(1)	-	36	40	-	W
$P_{O\ EIAJ}$	EIAJ output power(1)	V_S = 13.7V	32	35	-	W
THD	Distortion	P_O = 0.5 to 10 W P_O = 0.5 to 15 W	-	0.03 0.08	-	% %

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
C_T	Cross talk	f = 1 kHz; R_g f = 10 kHz; R_g	-	80 70	-	dB dB
R_{IN}	Input Impedance	differential input Single Ended input	45 40	-	-	kΩ kΩ
G_V	Voltage gain	differential input Single Ended input	25 25	26 26	27 27	dB 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 µV
SVR	Supply Voltage Rejection	f = 100 Hz; V_r = 1 Vrms; R_g = 0; f = 10 Hz; V_r = 1V rms; R_g = 0;	45 -	- 55	-	dB 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; $P_{O\ ref}$ = 1W	80	90	-	dB
$V_{SB\ IN}$	Standby In threshold	-	-	-	1.5	V
$V_{SB\ OUT}$	Standby Out threshold	-	3.5	-	-	V
I_{sb}	Standby current consumption	-	-	-	100	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
I6	Mute pin current	V6 = 0 to V_S,; $V_{S\ max.}$ = 18V	-	-	100	µA
D_{DL}	Distortion detection level(2)		3.5	-	-	%
D_{DOUT}	Distortion detector output dc current	Output low, sinked current (V_{pin10} = 1.5V)	1	-	-	mA
		Output high, leakage current (V_{pin10} = V_S, @ V_{Smax} = 18V)	-	-	10	µA

1. Saturated square wave output.
2. see figure 5 for THD setting.*Figure 7*.

The TDA7376B 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 (DDout) 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 7* 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 7* shows its value as a fraction of VCC.

The actual voltage can be computed by multiplying the fraction corresponding to the desired THD threshold by the application's supply voltage.

3.4 Electrical characteristics curves

Figure 7. Clip detector threshold vs. THD set. voltage

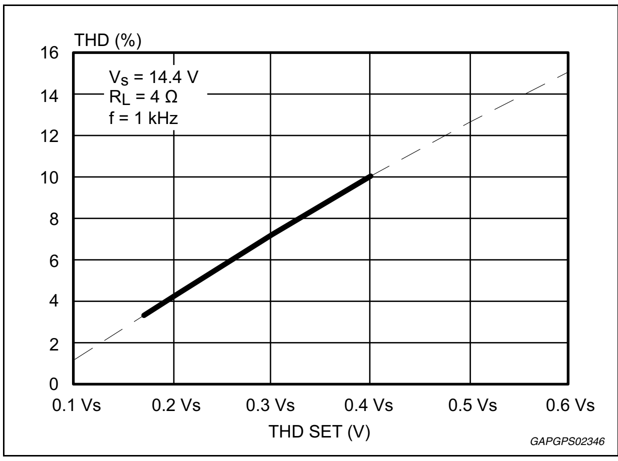


Figure 8. Quiescent current vs. supply voltage

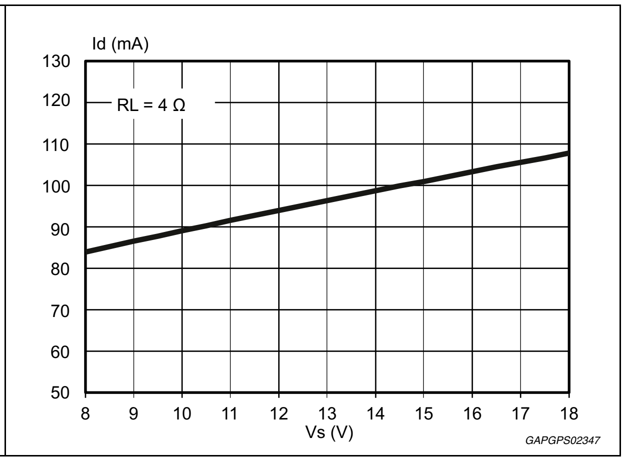


Figure 9. Output power vs. supply voltage

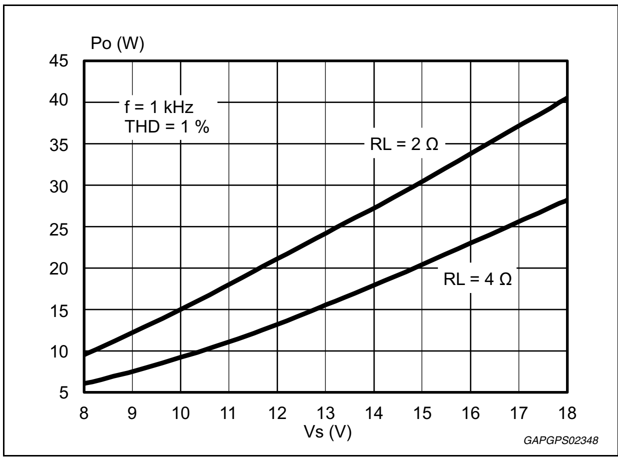


Figure 10. Output power vs. supply voltage

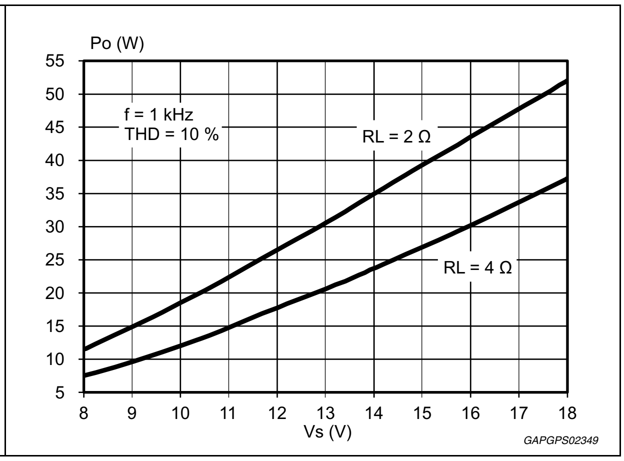


Figure 11. EIAJ power vs. supply voltage

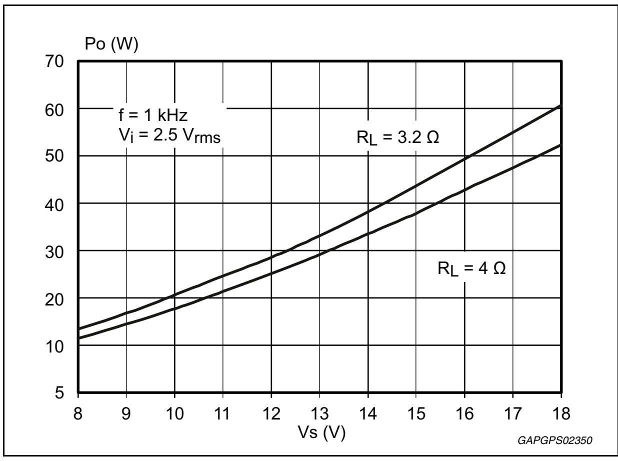


Figure 12. THD vs. frequency

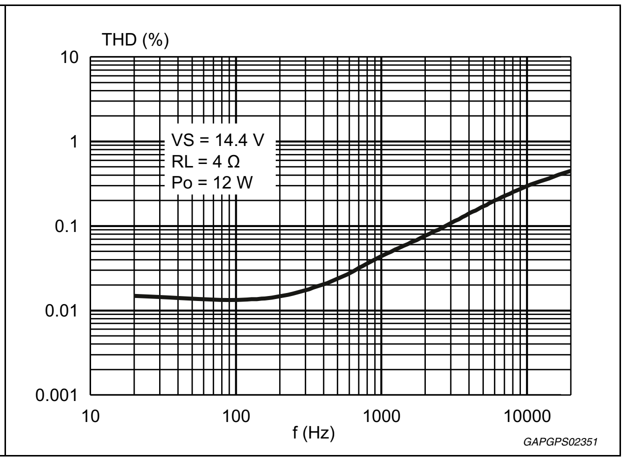


Figure 13. THD vs. output power (R_L = 4 Ω)

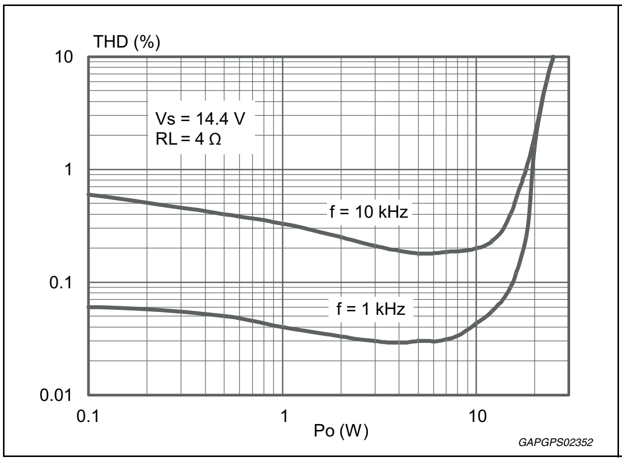


Figure 14. THD vs. output power (R_L = 2 Ω)

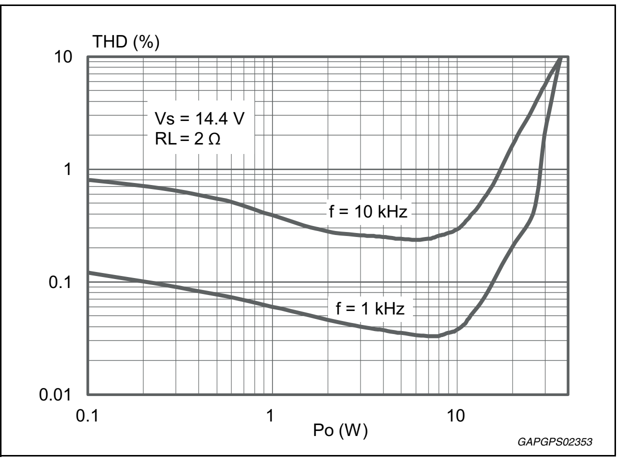


Figure 15. Dissipated power & efficiency vs. output power

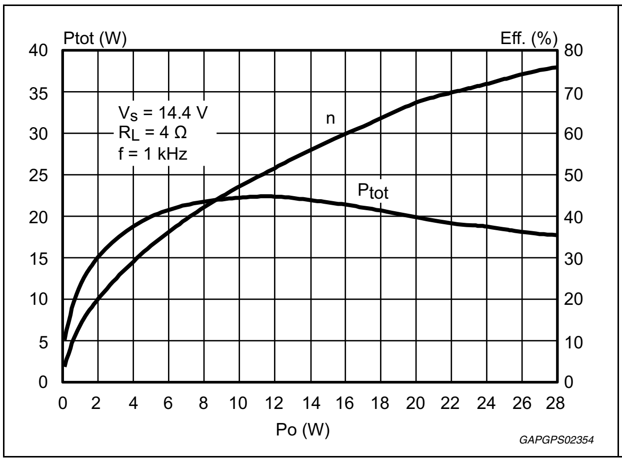


Figure 16. SVR vs. frequency

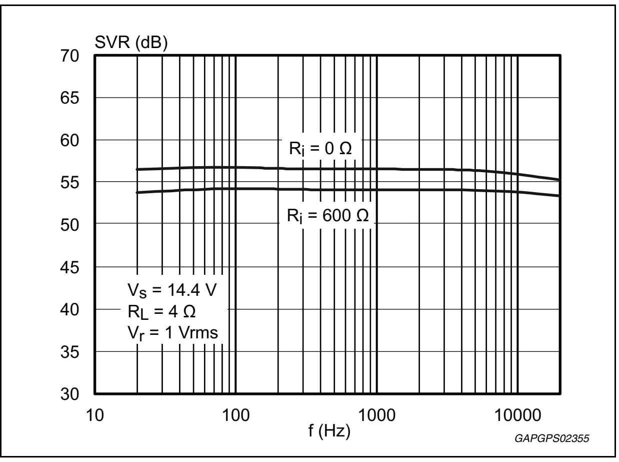


Figure 17. CMRR vs. frequency

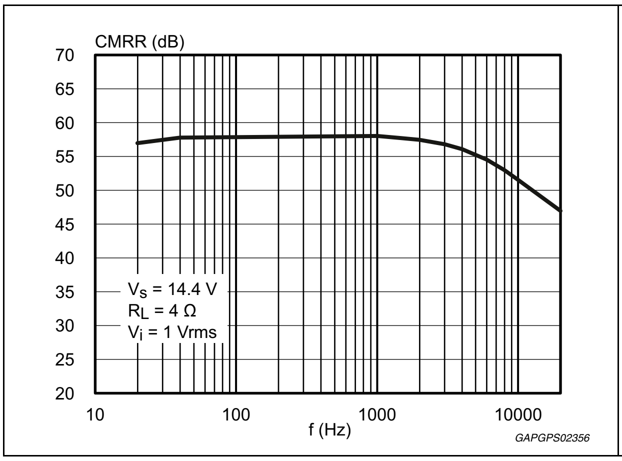
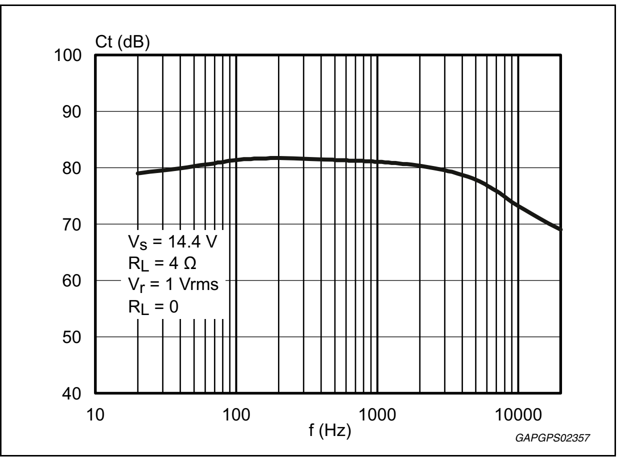


Figure 18. Crosstalk vs. frequency



4 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.

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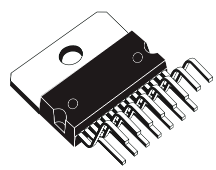
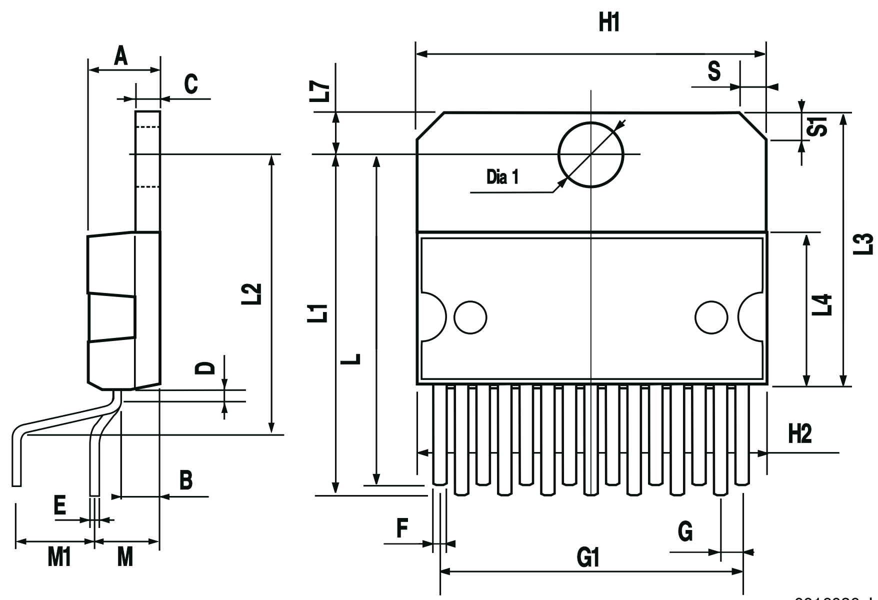
Figure 19. Multiwatt15 (vertical) mechanical data and package dimensions

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			5			0.197
B			2.65			0.104
C			1.6			0.063
D		1			0.039	
E	0.49		0.55	0.019		0.022
F	0.66		0.75	0.026		0.030
G	1.02	1.27	1.52	0.040	0.050	0.060
G1	17.53	17.78	18.03	0.690	0.700	0.710
H1	19.6			0.772		
H2			20.2			0.795
L	21.9	22.2	22.5	0.862	0.874	0.886
L1	21.7	22.1	22.5	0.854	0.87	0.886
L2	17.65		18.1	0.695		0.713
L3	17.25	17.5	17.75	0.679	0.689	0.699
L4	10.3	10.7	10.9	0.406	0.421	0.429
L7	2.65		2.9	0.104		0.114
M	4.25	4.55	4.85	0.167	0.179	0.191
M1	4.73	5.08	5.43	0.186	0.200	0.214
S	1.9		2.6	0.075		0.102
S1	1.9		2.6	0.075		0.102
Dia1	3.65		3.85	0.144		0.152

OUTLINE AND MECHANICAL DATA



Multiwatt15 (Vertical)



GAPGPS00822

5 Revision history

Table 5. Document revision history

Date	Revision	Changes
19-Aug-2000	4	Initial release.
20-Jun-2013	5	Updated *Table 2: Absolute maximum ratings on page 9*.
18-Sep-2013	6	Updated Disclaimer.

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