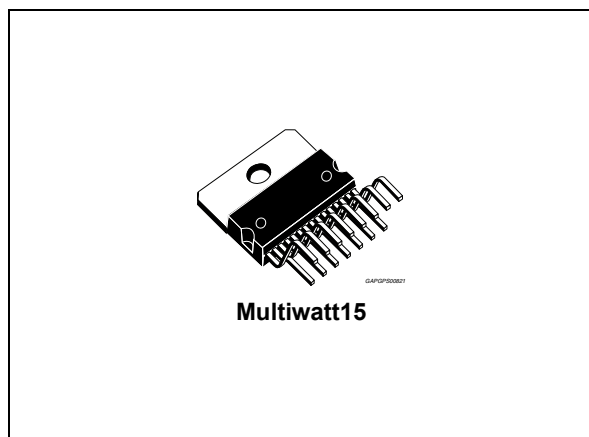


## 2 x 35 W Power amplifier for car radio

Datasheet - production data



### Features

- High output power capability:
  - 2 x 40 W max./ 4  $\Omega$
  - 2 x 35 W/4  $\Omega$  EIAJ
  - 2 x 25 W/4  $\Omega$  (14.4 V, 1 kHz, 10 %)
  - 2 x 25 W/ 2 $\Omega$  (14.4 V, 1 kHz, 10 %)
- 2  $\Omega$  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    |

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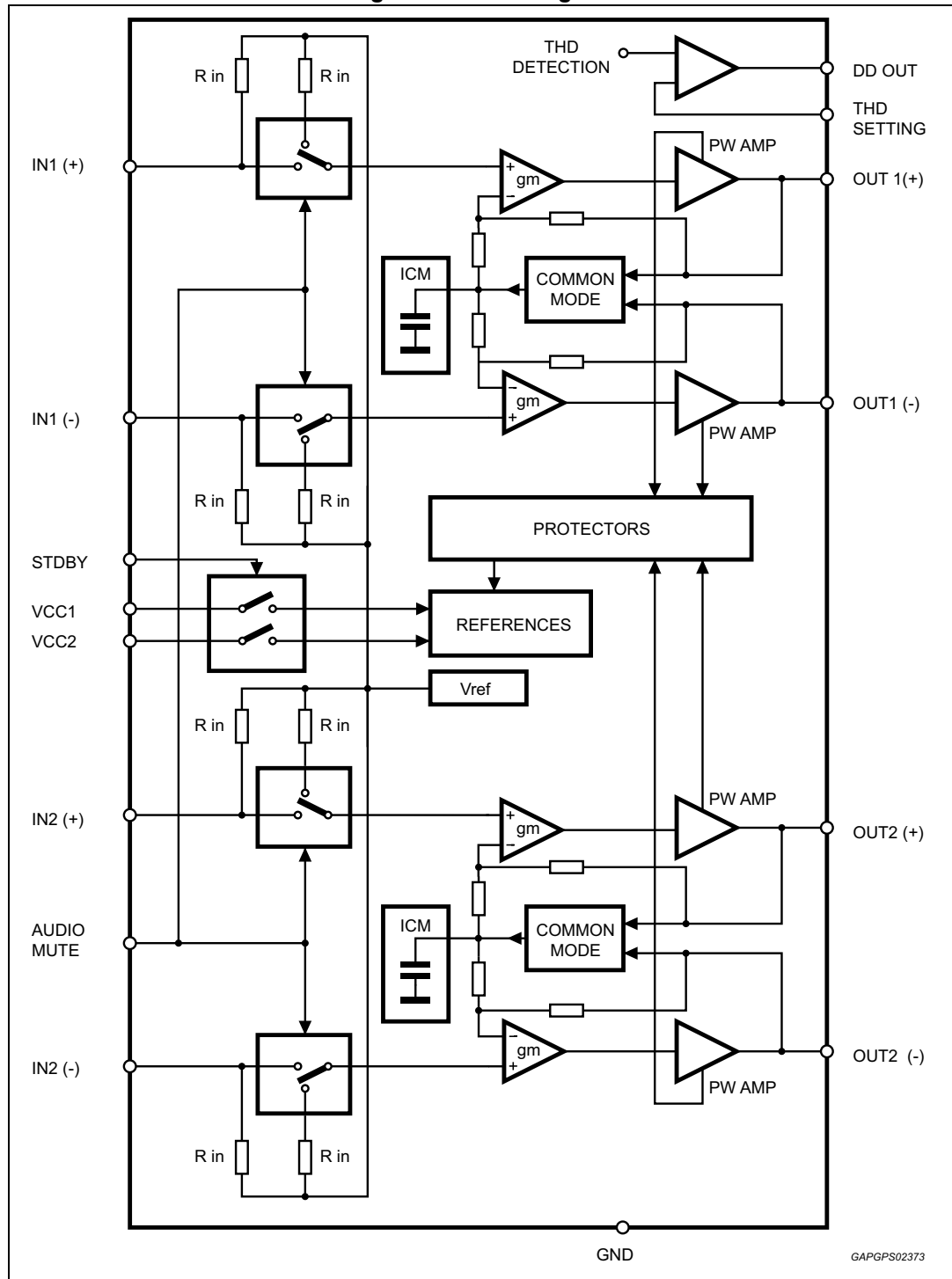
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# 1 Block and pin connection diagrams

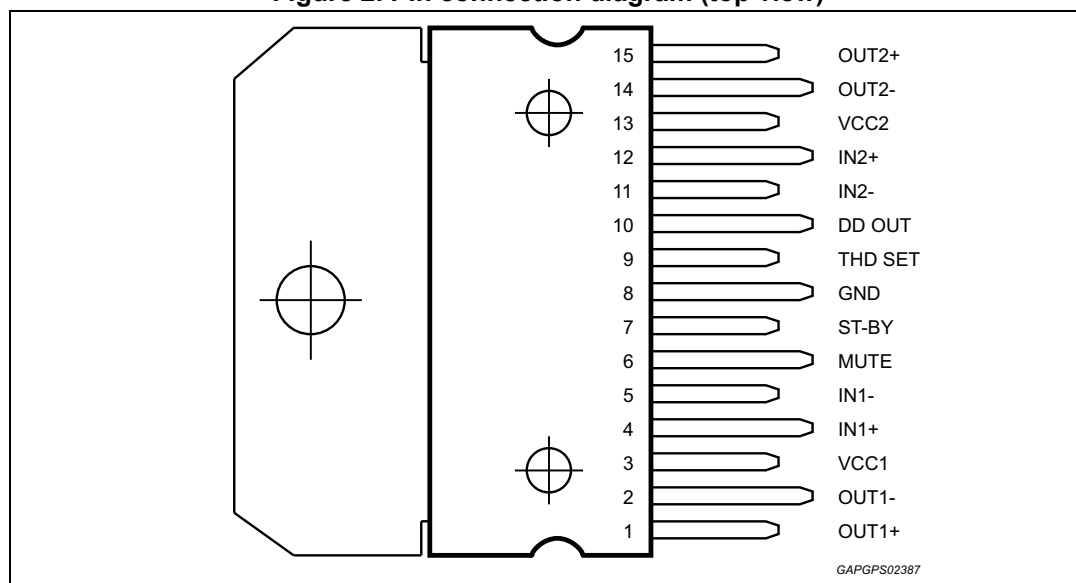
## 1.1 Block diagram

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

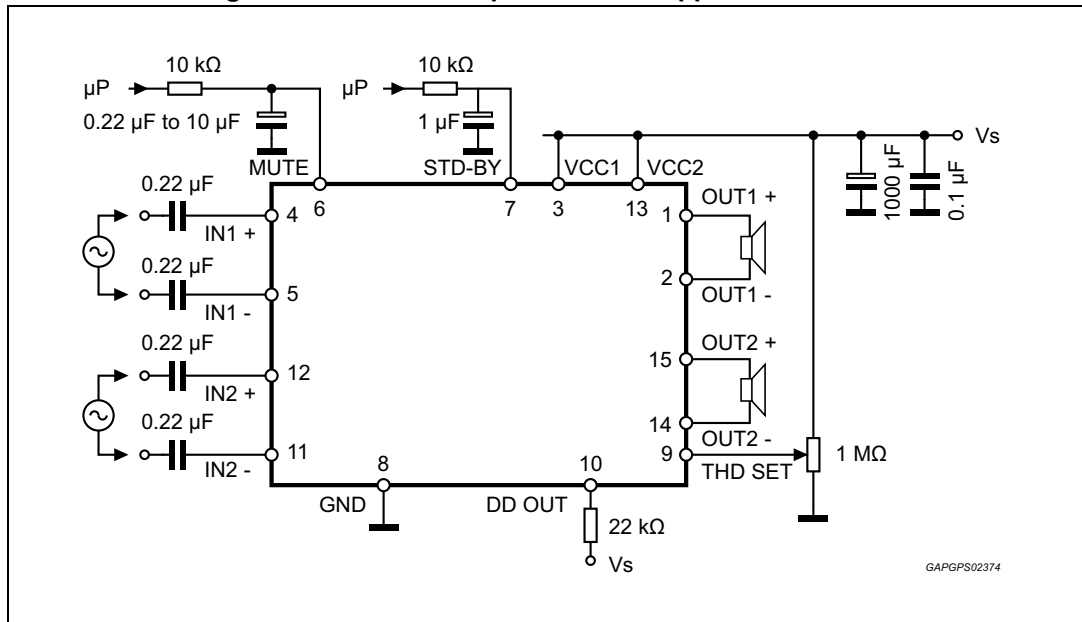


Figure 4. Single ended inputs test and application circuit

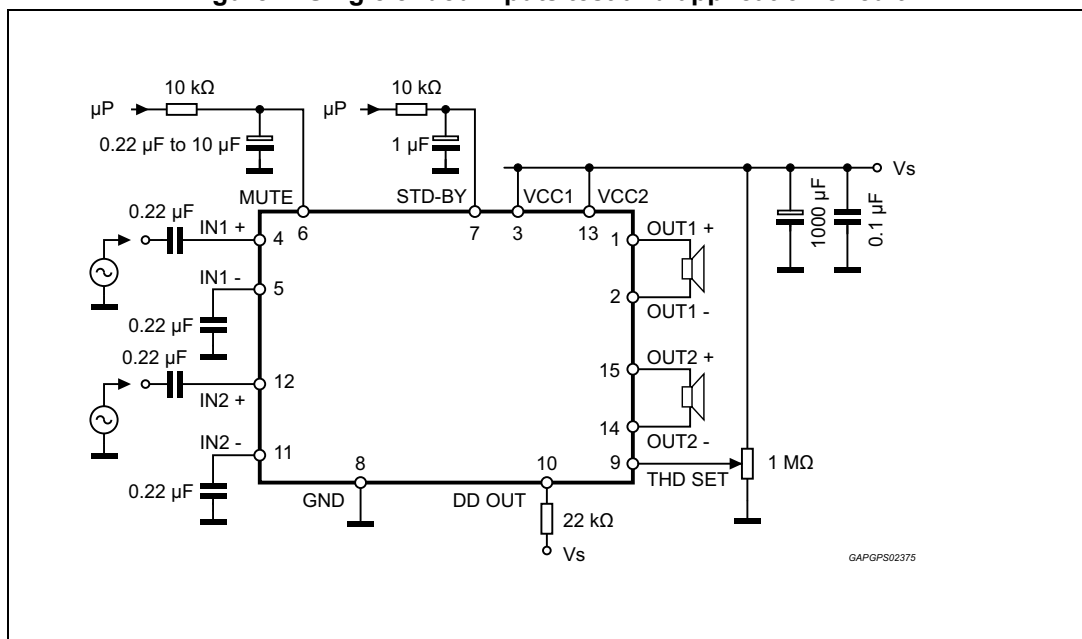


Figure 5. Application board reference circuit

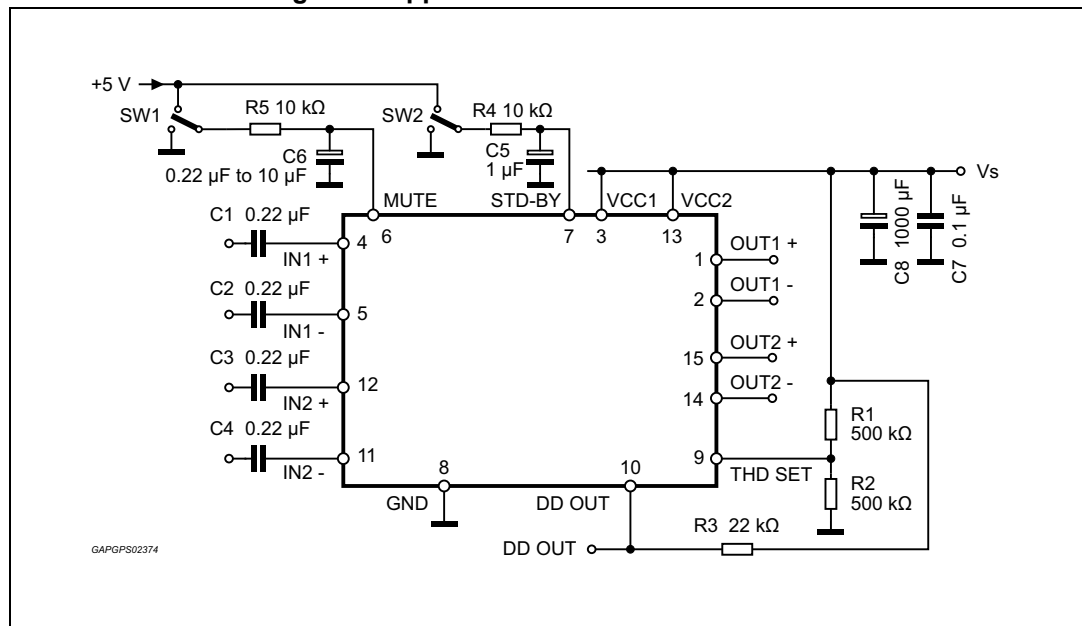
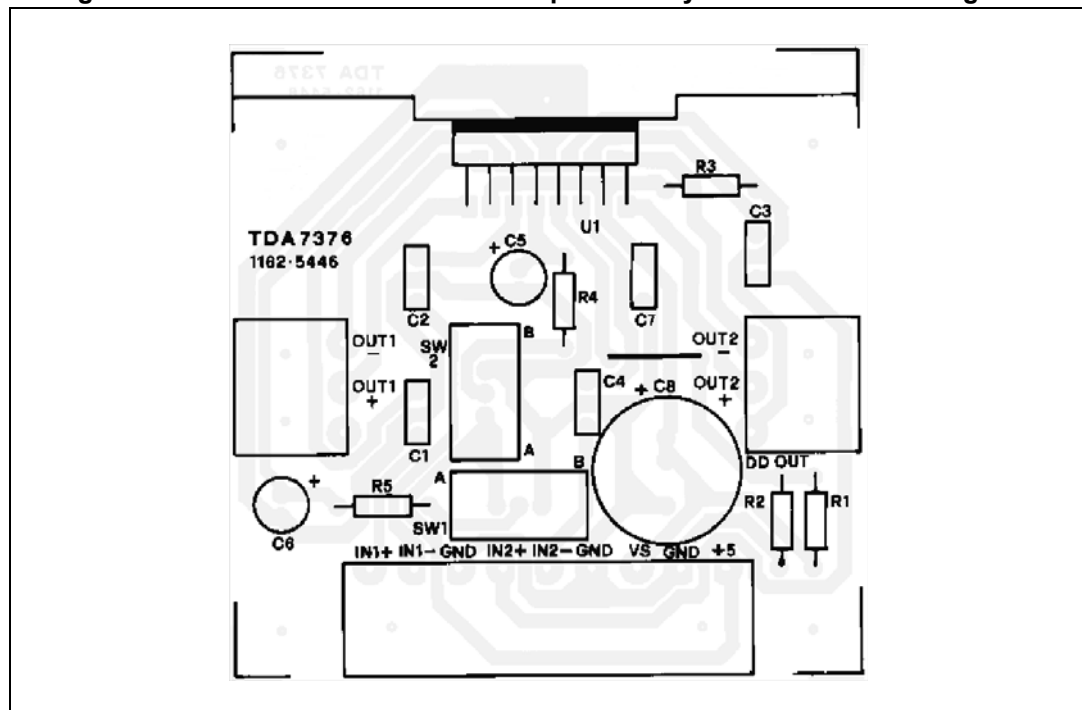


Figure 6. Printed circuit board and components layout of the circuit of figure 5



## 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 $\mu$ s)      | 8          | A                  |
|                | Output Peak Current (repetitive f > 10 Hz)                | 6          | A                  |
| $P_{tot}$      | Power Dissipation $T_{case} = 85\text{ }^{\circ}\text{C}$ | 36         | W                  |
| $T_{stg}, T_j$ | Storage and junction temperature <sup>(1)</sup>           | -40 to 150 | $^{\circ}\text{C}$ |
| $T_{amb}$      | Operative ambient temperature range                       | -40 to 105 | $^{\circ}\text{C}$ |

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                        |
|------------------|-----------------------------------------|-------|-----------------------------|
| $R_{th\ j-case}$ | Thermal Resistance Junction to case Max | 1.8   | $^{\circ}\text{C}/\text{W}$ |

### 3.3 Electrical characteristics

Refer to the test circuits figures 3 and 4,  $V_S = 14.4\text{ V}$ ;  $R_L = 4\text{ }\Omega$ ;  $f = 1\text{ kHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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%;                         | 23   | 25   | -    | W    |
|               |                                  | THD = 10%; $R_L = 2\text{ }\Omega$ | 33   | 37   |      |      |
| $P_{O\ max}$  | Max. output power <sup>(1)</sup> | -                                  | 36   | 40   | -    | W    |
| $P_{O\ EIAJ}$ | EIAJ output power <sup>(1)</sup> | $V_S = 13.7\text{ V}$              | 32   | 35   | -    | W    |
| THD           | Distortion                       | $P_O = 0.5\text{ to }10\text{ W}$  | -    | 0.03 | -    | %    |
|               |                                  | $P_O = 0.5\text{ to }15\text{ W}$  |      | 0.08 |      | %    |

Table 4. Electrical characteristics (continued)

| Symbol               | Parameter                                 | Test condition                                                                                | Min. | Typ. | Max. | Unit          |
|----------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------|------|------|------|---------------|
| $C_T$                | Cross talk                                | $f = 1 \text{ kHz}; R_g$                                                                      | -    | 80   | -    | dB            |
|                      |                                           | $f = 10 \text{ kHz}; R_g$                                                                     | -    | 70   | -    | dB            |
| $R_{IN}$             | Input Impedance                           | differential input                                                                            | 45   | -    | -    | k $\Omega$    |
|                      |                                           | Single Ended input                                                                            | 40   | -    | -    | k $\Omega$    |
| $G_V$                | Voltage gain                              | differential input                                                                            | 25   | 26   | 27   | dB            |
|                      |                                           | Single Ended input                                                                            | 25   | 26   | 27   | dB            |
| $\Delta G_V$         | Channel gain balance                      | -                                                                                             | -    | -    | 1    | dB            |
| $E_{IN}$             | Input Noise Voltage                       | $R_g = 600 \Omega$ ; "A" weighted                                                             | -    | 3    | -    | $\mu\text{V}$ |
|                      |                                           | $R_g = 600 \Omega$ ; 22 Hz to 33 kHz                                                          | -    | 4    | 6    | $\mu\text{V}$ |
| SVR                  | Supply Voltage Rejection                  | $f = 100 \text{ Hz}; V_r = 1 \text{ Vrms}; R_g = 0$ ;                                         | 45   | -    | -    | dB            |
|                      |                                           | $f = 10 \text{ Hz}; V_r = 1 \text{ V rms}; R_g = 0$ ;                                         | -    | 55   | -    | dB            |
| BW                   | Power bandwidth                           | (-3dB)                                                                                        | 75   | -    | -    | kHz           |
| CMRR                 | Common mode rejection ratio               | $V_{CM} = 1 \text{ Vrms}$ input referred                                                      | 60   | -    | -    | dB            |
| $A_{SB}$             | Standby Attenuation                       | $V_{SB} = 1.5 \text{ V}; P_{O \text{ ref}} = 1 \text{ W}$                                     | 80   | 90   | -    | dB            |
| $V_{SB \text{ IN}}$  | Standby In threshold                      | -                                                                                             | -    | -    | 1.5  | V             |
| $V_{SB \text{ OUT}}$ | Standby Out threshold                     | -                                                                                             | 3.5  | -    | -    | V             |
| $I_{sb}$             | Standby current consumption               | -                                                                                             | -    | -    | 100  | $\mu\text{A}$ |
| $A_M$                | Mute attenuation                          | $V_M = 1.5 \text{ V}; P_{O \text{ ref}} = 1 \text{ W}$                                        | -    | 85   | -    | dB            |
| $V_{M \text{ IN}}$   | Mute In threshold                         | -                                                                                             | -    | -    | 1.5  | V             |
| $V_{M \text{ OUT}}$  | Mute Out threshold                        | -                                                                                             | 3.5  | -    | -    | V             |
| $I_6$                | Mute pin current                          | $V_6 = 0 \text{ to } V_{S.}; V_{S \text{ max.}} = 18 \text{ V}$                               | -    | -    | 100  | $\mu\text{A}$ |
| $D_{DL}$             | Distortion detection level <sup>(2)</sup> | -                                                                                             | 3.5  | -    | -    | %             |
| $D_{DOUT}$           | Distortion detector output dc current     | Output low, sinked current<br>( $V_{pin10} = 1.5 \text{ V}$ )                                 | 1    | -    | -    | mA            |
|                      |                                           | Output high, leakage current<br>( $V_{pin10} = V_S$ ; @ $V_{S \text{ max.}} = 18 \text{ V}$ ) | -    | -    | 10   | $\mu\text{A}$ |

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

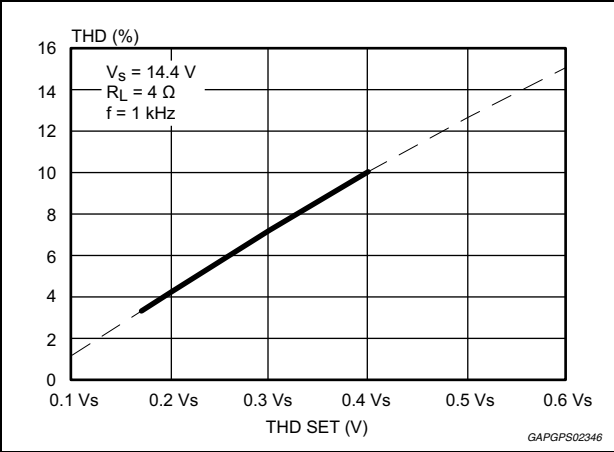


Figure 9. Output power vs. supply voltage

Figure 8. Quiescent current vs. supply voltage

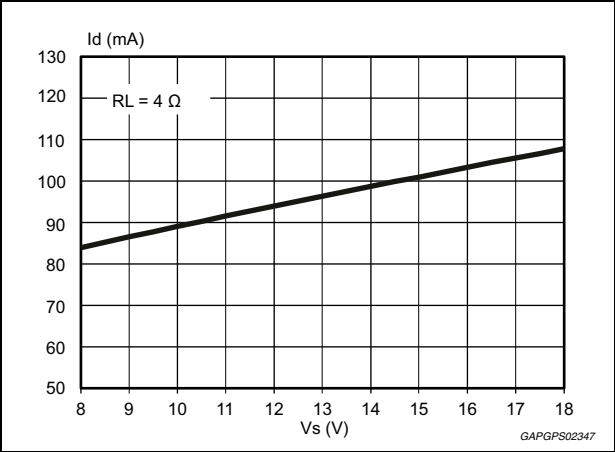


Figure 10. Output power vs. supply voltage

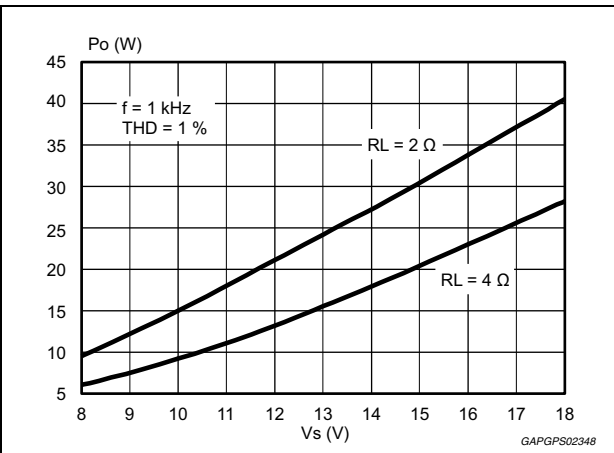


Figure 11. EIAJ power vs. supply voltage

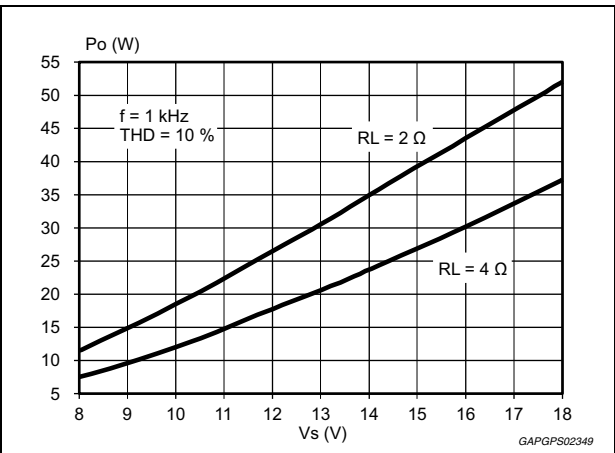


Figure 12. THD vs. frequency

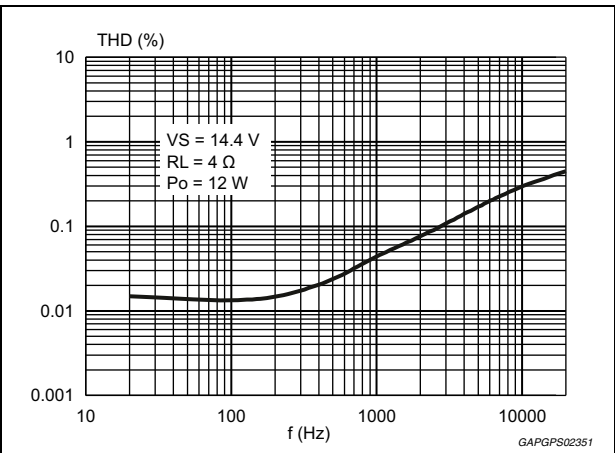
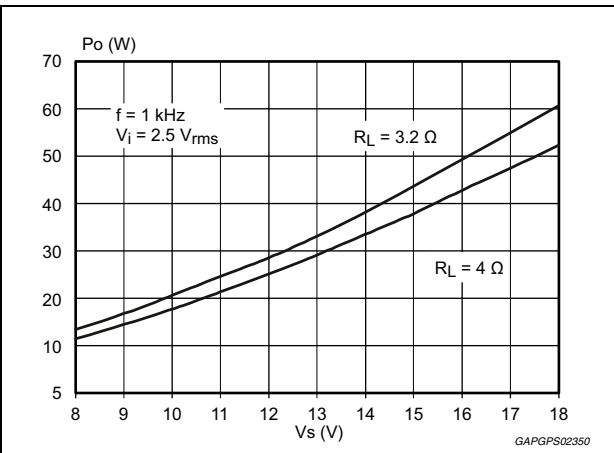


Figure 13. THD vs. output power ( $R_L = 4 \Omega$ )

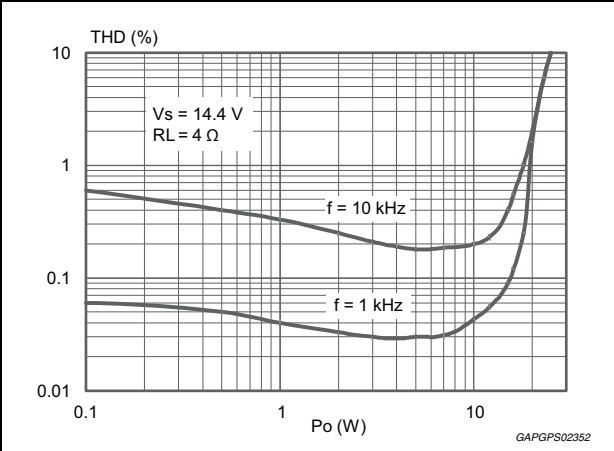


Figure 14. THD vs. output power ( $R_L = 2 \Omega$ )

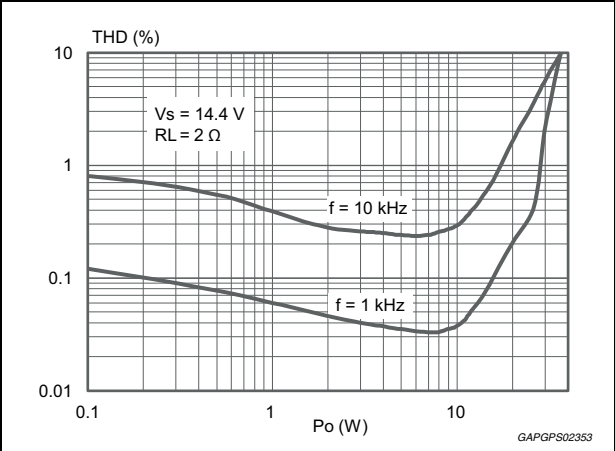


Figure 15. Dissipated power & efficiency vs. output power

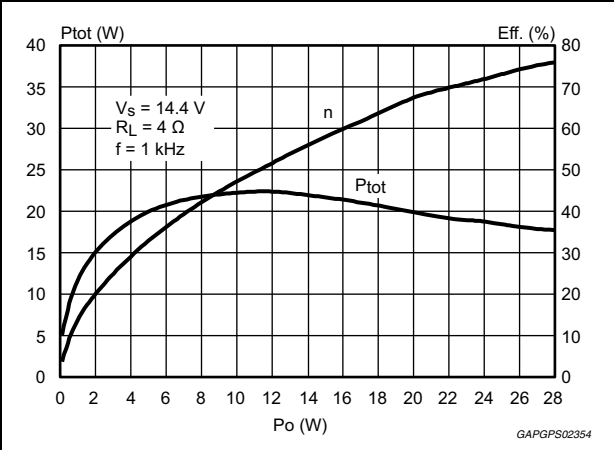


Figure 16. SVR vs. frequency

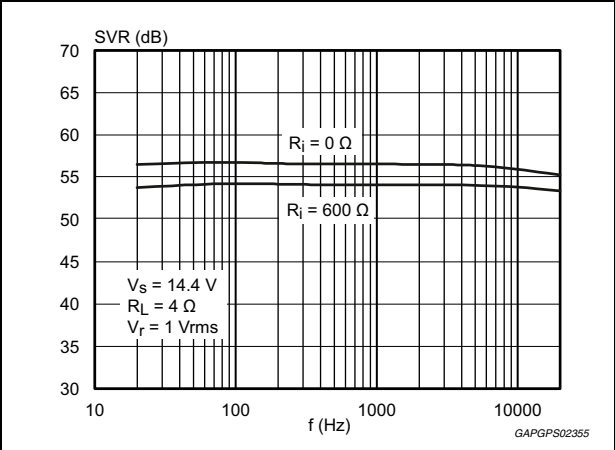


Figure 17. CMRR vs. frequency

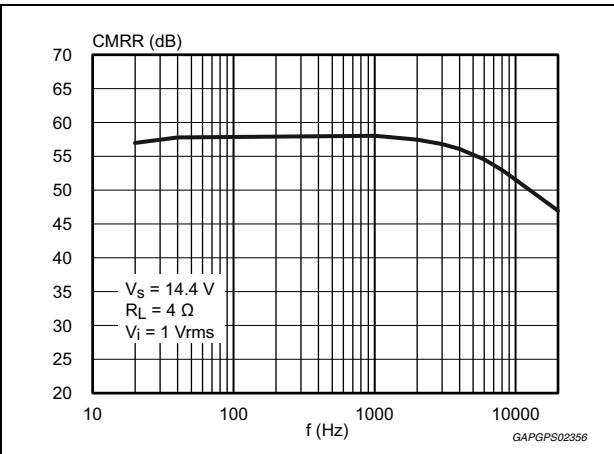
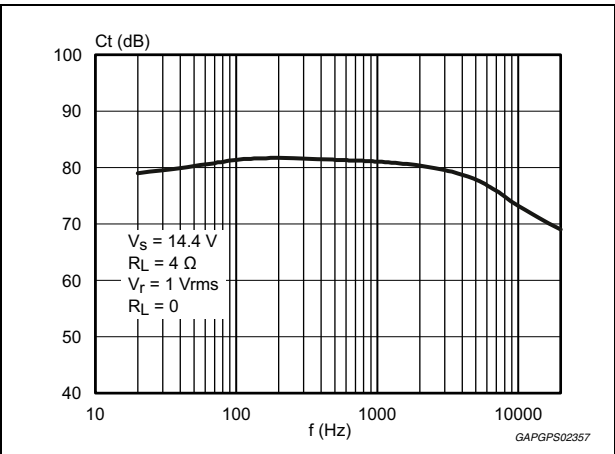


Figure 18. Crosstalk vs. frequency

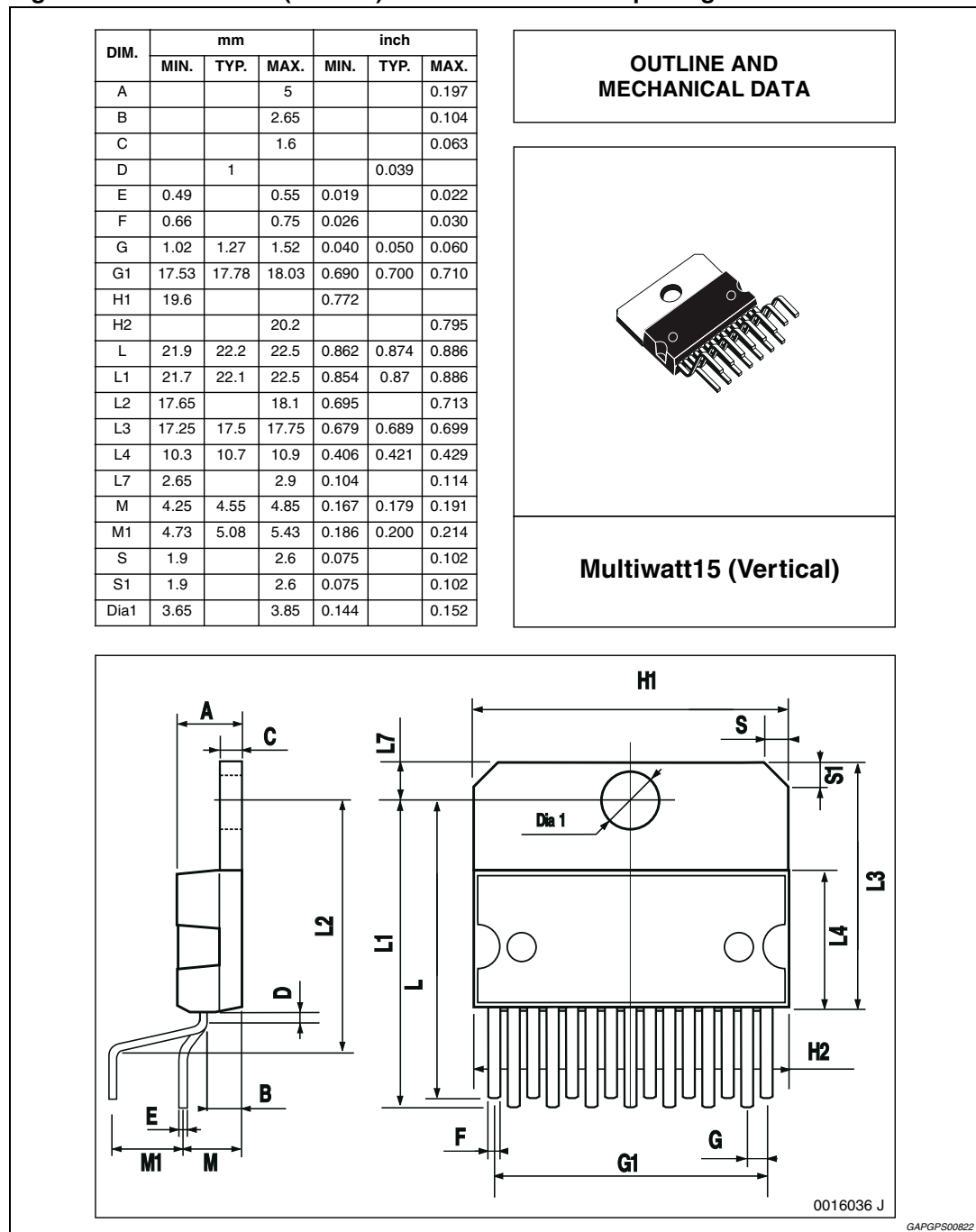


## 4 Package information

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](http://www.st.com).

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



## 5 Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes                                                               |
|-------------|----------|-----------------------------------------------------------------------|
| 19-Aug-2000 | 4        | Initial release.                                                      |
| 20-Jun-2013 | 5        | Updated <a href="#">Table 2: Absolute maximum ratings on page 9</a> . |
| 18-Sep-2013 | 6        | Updated Disclaimer.                                                   |

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