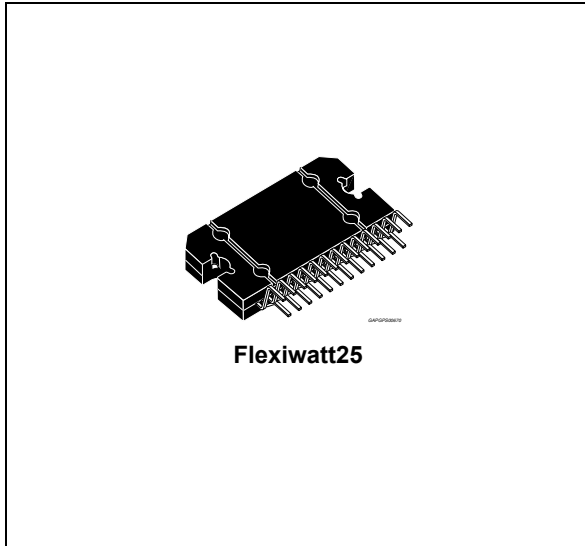


## 4 x 45 W quad bridge car radio amplifier

Datasheet - production data



- Low external component count:
  - Internally fixed gain (26 dB)
  - 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
- Reversed battery
- ESD

### Features

- High output power capability:
  - 4 x 45 W / 4  $\Omega$  max.
  - 4 x 26 W / 4  $\Omega$  @ 14.4 V, 1 kHz, 10 %
- Low distortion
- Low output noise
- Standby function
- Mute function
- Automute at min. supply voltage detection

### Description

The TDA7388 is an AB class audio power amplifier, packaged in Flexiwatt 25 and designed for high end car radio applications.

Based on a fully complementary PNP/NPN configuration, the TDA7388 allows a rail to rail output voltage swing with no need of bootstrap capacitors. The extremely reduced boundary components count allows very compact sets.

**Table 1. Device summary**

| Order code | Package     | Packing |
|------------|-------------|---------|
| TDA7388    | Flexiwatt25 | Tube    |

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# 1 Pin connection and test/application diagrams

Figure 1. Pin connection (top view)

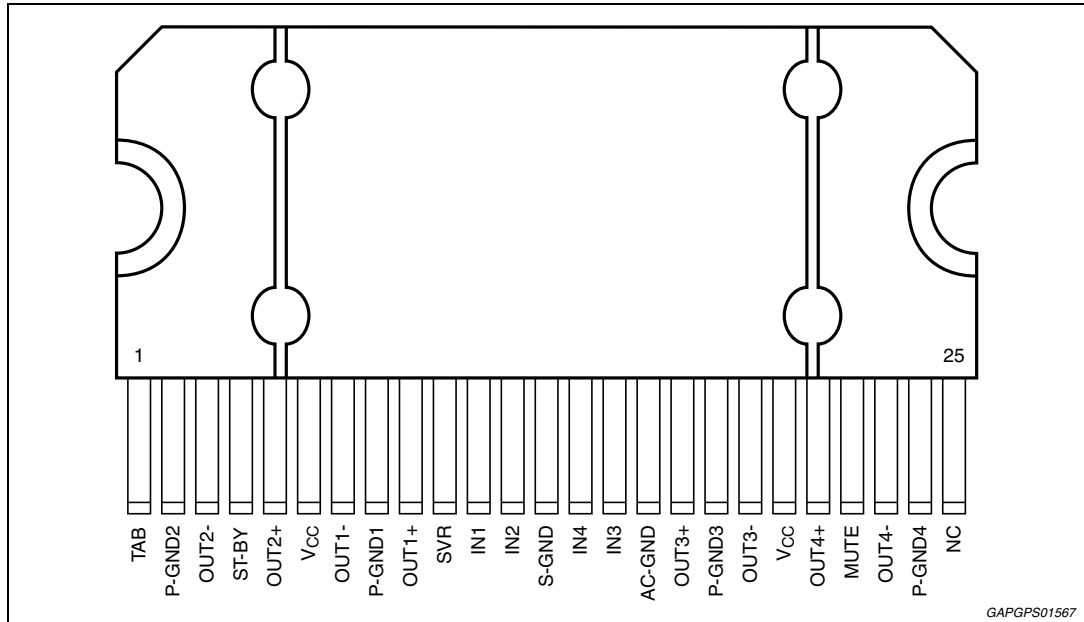
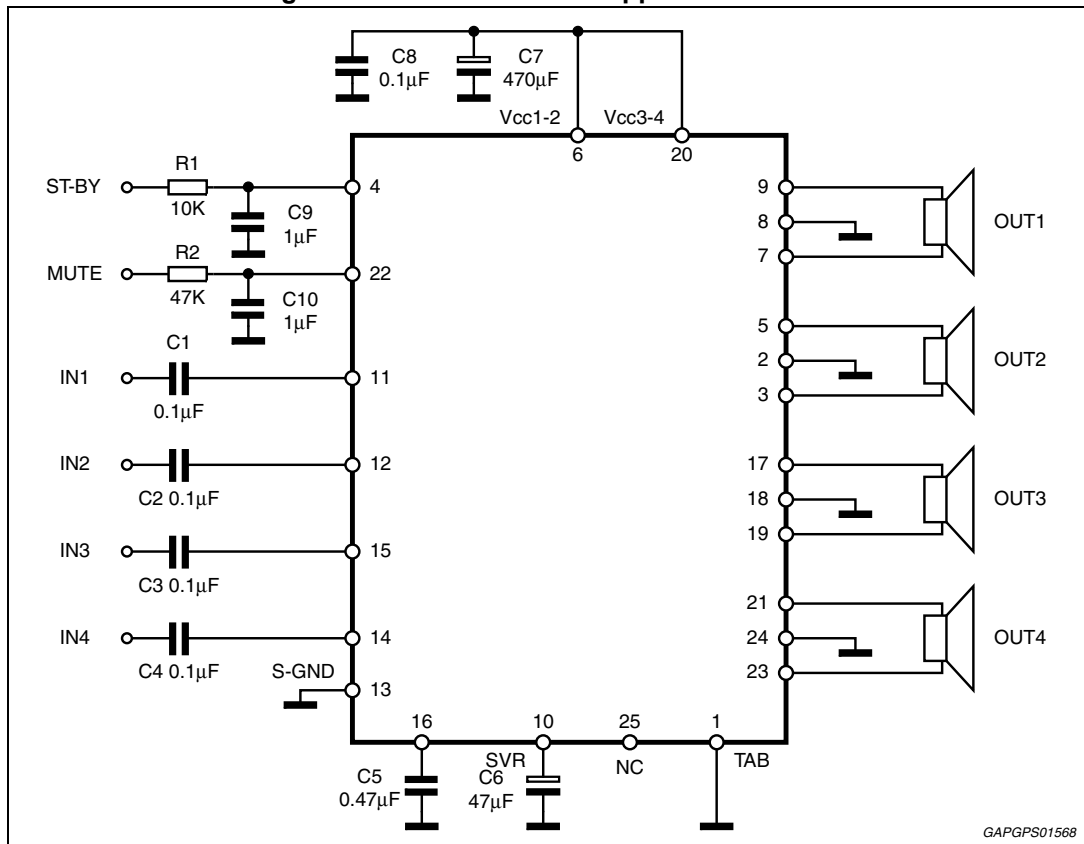


Figure 2. Standard test and application circuit



## 2 Electrical specifications

### 2.1 Absolute maximum ratings

Table 2. 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 (t = 50 ms)                                   | 50          | V                |
| $I_O$       | Output peak current:<br>Repetitive (duty cycle 10 % at f = 10 Hz) | 4.5         | A                |
|             | Non repetitive (t = 100 $\mu$ s)                                  | 5.5         |                  |
| $P_{tot}$   | Power dissipation, ( $T_{case} = 70\text{ }^\circ\text{C}$ )      | 80          | W                |
| $T_j$       | Junction temperature  | 150         | $^\circ\text{C}$ |
| $T_{stg}$   | Storage temperature   | - 55 to 150 | $^\circ\text{C}$ |

### 2.2 Thermal data

Table 3. Thermal data

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

## 2.3 Electrical characteristics

$V_S = 14.4\text{ V}$ ;  $f = 1\text{ kHz}$ ;  $R_g = 600\ \Omega$ ;  $R_L = 4\ \Omega$ ;  $T_{\text{amb}} = 25\text{ }^\circ\text{C}$ ; Refer to the test and application diagram ([Figure 2](#)), unless otherwise specified.

**Table 4. Electrical characteristics**

| Symbol              | Parameter                                | Test condition   | Min. | Typ. | Max.      | Unit          |
|---------------------|--|--|------|------|-----------|---------------|
| $I_{q1}$            | Quiescent current                        | $R_L = \infty$   | 120  | 190  | 350       | mA            |
| $V_{OS}$            | Output offset voltage                    | Play mode  | -    | -    | $\pm 100$ | mV            |
| $dV_{OS}$           | During mute ON/OFF output offset voltage | ITU R-ARM weighted<br>see <a href="#">Figure 12</a>  | -80  | -    | +80       | mV            |
| $G_V$               | Voltage gain                             | -  | 25   | 26   | 27        | dB            |
| $P_o$               | Output power                             | THD = 10 %; $V_S = 14.4\text{ V}$  | 22   | 26   | -         | W             |
| $P_{o\text{ max}}$  | Max.output power <sup>(1)</sup>          | $V_S = 14.4\text{ V}$  | 37   | 41   | -         | W             |
|                     |  | $V_S = 15.2\text{ V}$  | -    | 45   | -         |               |
| THD                 | Distortion                               | $P_o = 4\text{ W}$   | -    | 0.04 | 0.15      | %             |
| $e_{No}$            | Output noise                             | "A" Weighted   | -    | 50   | 70        | $\mu\text{V}$ |
|                     |  | Bw = 20 Hz to 20 kHz   | -    | 70   | 100       | $\mu\text{V}$ |
| SVR                 | Supply voltage rejection                 | $f = 100\text{ Hz}$ ; $V_r = 1\text{ Vrms}$  | 50   | 65   | -         | dB            |
| $f_{ch}$            | High cut-off frequency                   | $P_o = 0.5\text{ W}$   | 100  | 200  | -         | kHz           |
| $R_i$               | Input Impedance                          | -  | 70   | 100  | -         | k $\Omega$    |
| $C_T$               | Cross talk                               | $f = 1\text{ kHz}$ ; $P_o = 4\text{ W}$  | 60   | 70   | -         | dB            |
|                     |  | $f = 10\text{ kHz}$ ; $P_o = 4\text{ W}$   | -    | 60   | -         | dB            |
| $I_{SB}$            | Standby current consumption              | $V_{\text{St-by}} = 0\text{ V}$  | -    | -    | 20        | $\mu\text{A}$ |
| $V_{SB\text{ out}}$ | Standby OUT threshold voltage            | (Amp: ON)  | 3.5  | -    | -         | V             |
| $V_{SB\text{ IN}}$  | Standby IN threshold voltage             | (Amp: OFF)   | -    | -    | 1.5       | V             |
| $A_M$               | Mute attenuation                         | $P_{\text{Oref}} = 4\text{ W}$   | 80   | 90   | -         | dB            |
| $V_{M\text{ out}}$  | Mute OUT threshold voltage               | (Amp: play)  | 3.5  | -    | -         | V             |
| $V_{M\text{ in}}$   | Mute IN threshold voltage                | (Amp: mute)  | -    | -    | 1.5       | V             |
| $V_{AM\text{ in}}$  | $V_S$ automute threshold                 | (Amp: mute); Att. $\geq 80\text{ dB}$ ;<br>$P_{\text{Oref}} = 4\text{ W}$<br>(Amp: play); Att. $< 0.1\text{ dB}$ ;<br>$P_o = 0.5\text{ W}$ | -    | 7.6  | 8.5       | V             |
| $I_{\text{pin22}}$  | Muting pin current                       | $V_{\text{MUTE}} = 1.2\text{ V}$ (Source current)  | 5    | 11   | 20        | $\mu\text{A}$ |

1. Saturated square wave output.

## 2.4 Electrical characteristic curves

Figure 3. Quiescent current vs. supply voltage

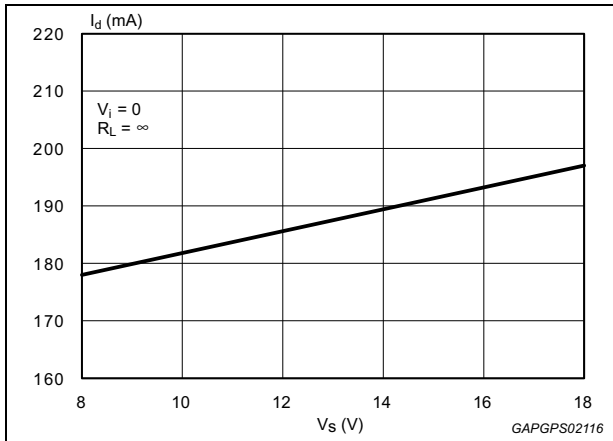


Figure 4. Output power vs. supply voltage (4 Ohm)

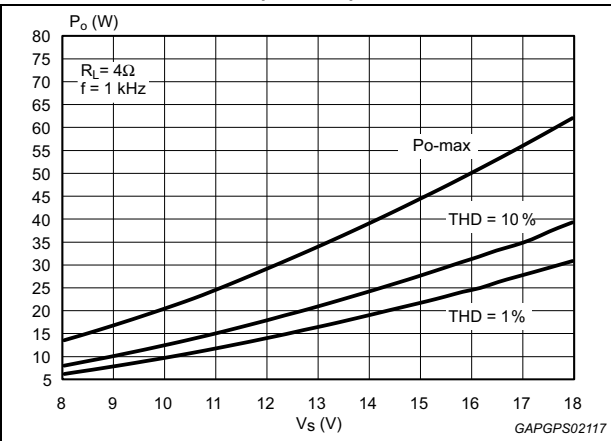


Figure 5. Distortion vs. output power (4 Ohm)

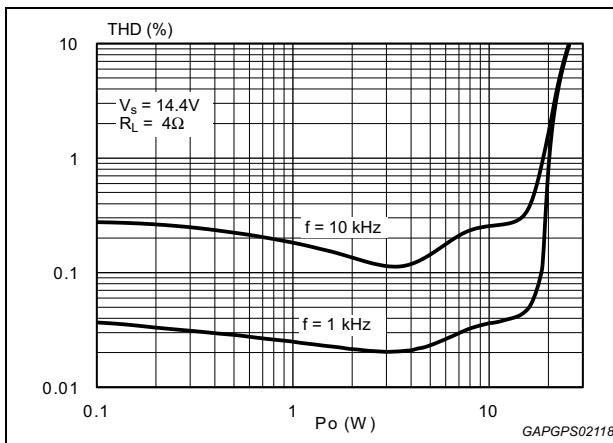


Figure 6. Distortion vs. frequency (4 Ohm)

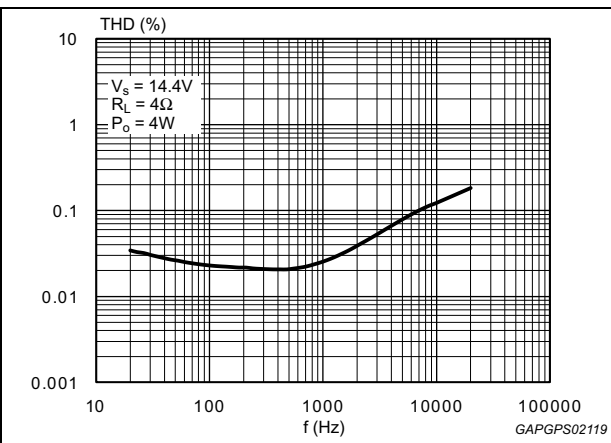


Figure 7. Supply voltage rejection vs. frequency

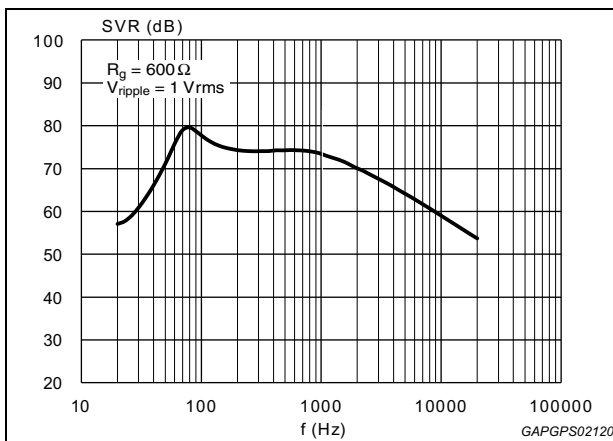


Figure 8. Crosstalk vs. frequency

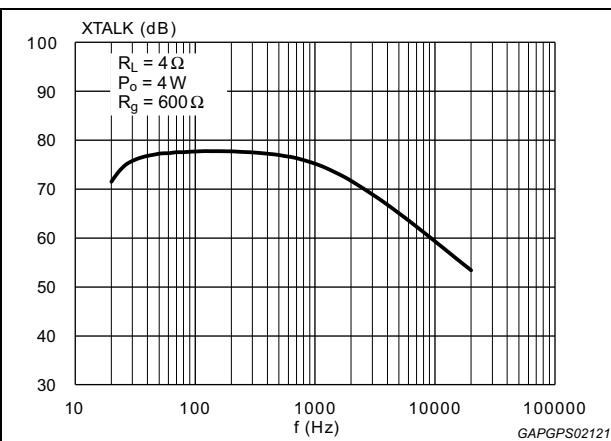




Figure 9. Output noise vs. source resistance

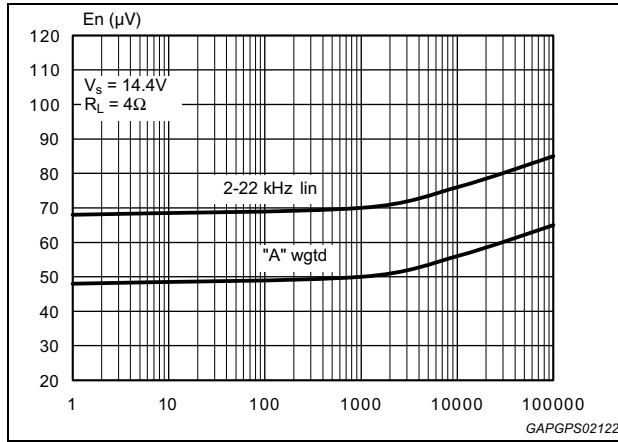


Figure 10. Total power dissipation & efficiency (4 Ohm, sine)

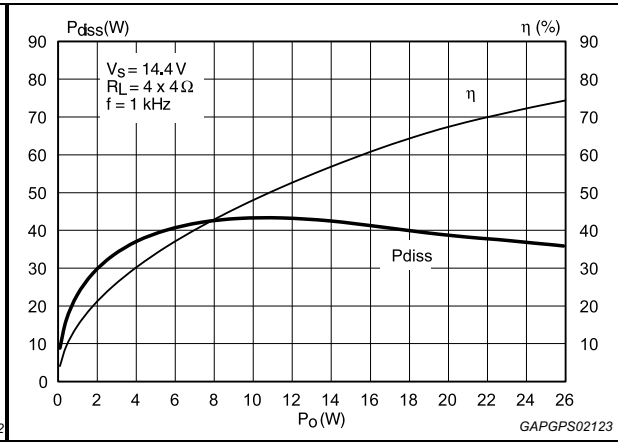


Figure 11. Power dissipation vs. average output power (4 Ohm, audio program simulation)

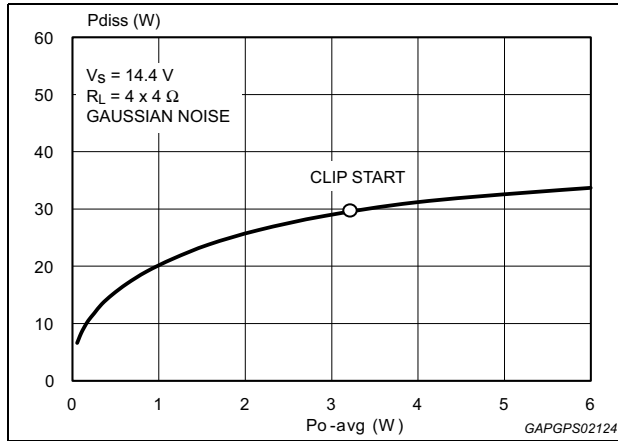
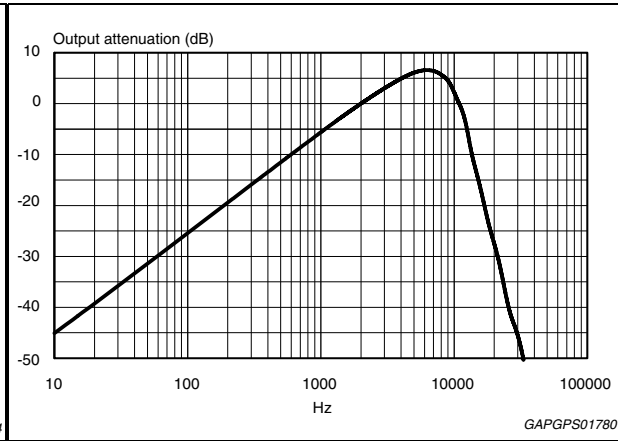


Figure 12. ITU R-ARM frequency response, weighting filter for transient pop



## 3 Application hints

Ref. to the circuit of [Figure 2](#).

### 3.1 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 10  $\mu$ F**.

### 3.2 Input stage

The TDA7388's inputs are ground-compatible and can stand very high input signals ( $\pm 8$  Vpk) without any performances degradation.

If the standard value for the input capacitors (0.1  $\mu$ F) is adopted, the low frequency cut-off amounts to 16 Hz.

### 3.3 Standby and muting

If standby and muting are not used, a straight connection to  $V_S$  of their respective pins would be admissible.

Conventional/low-power transistors can be employed to drive muting and standby 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  $\mu$ A normally flows out of pin 22, the maximum allowable muting-series resistance ( $R_2$ ) is 70 k $\Omega$ , which is sufficiently high to permit a muting capacitor reasonably small (about 1  $\mu$ F).

If  $R_2$  is higher than recommended, the involved risk is that the voltage at pin 22 may rise to above the 1.5 V threshold voltage and the device consequently fails to turn OFF when the mute line is brought down.

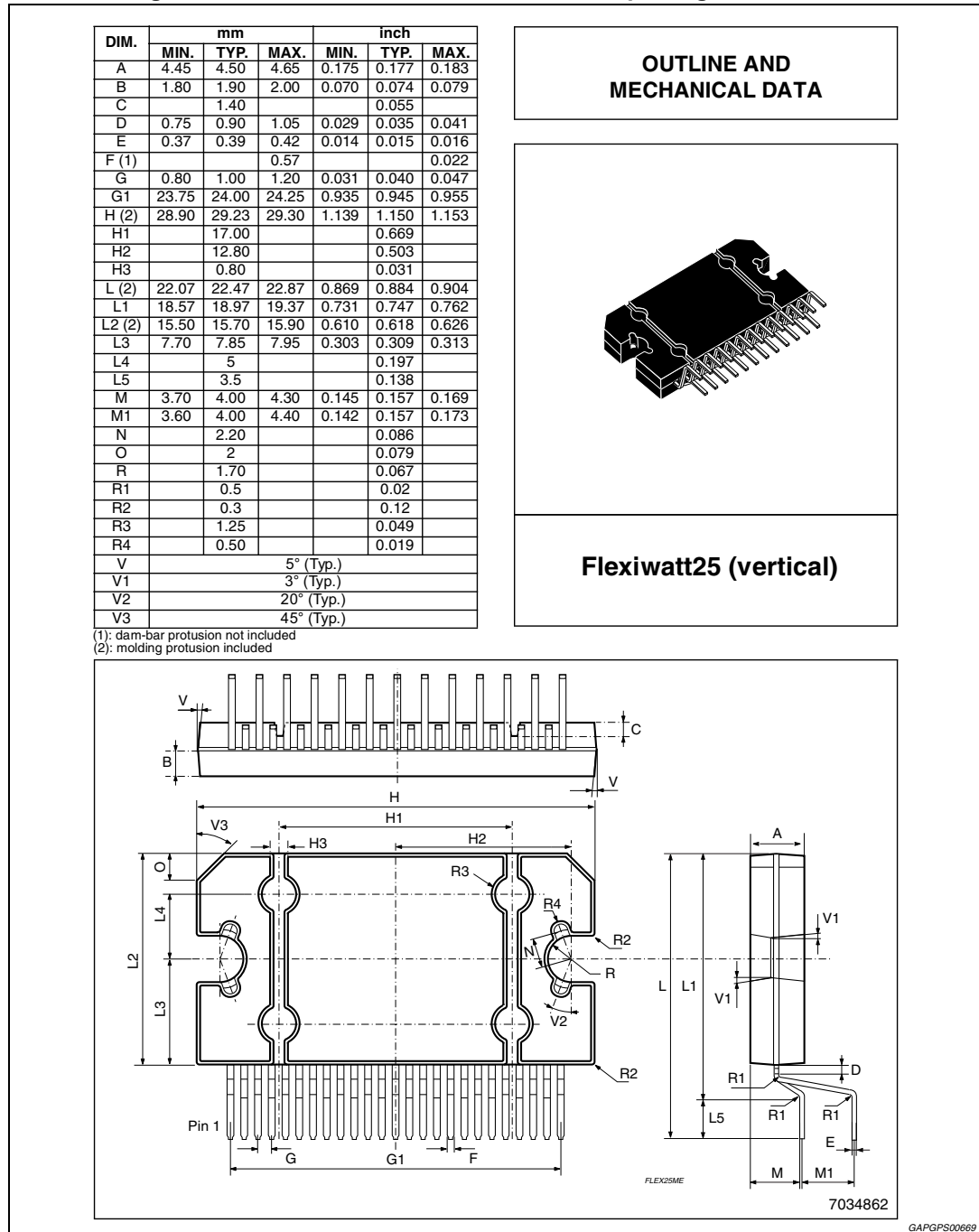
About the stand-by, the time constant to be assigned in order to obtain a virtually pop-free transition has to be slower than 2.5 V/ms.

# 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 13. Flexiwatt25 mechanical data and package dimensions**



## 5 Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 06-Dec-2007 | 1        | Initial release.   |
| 12-Jul-2010 | 2        | Document status promoted from preliminary data to datasheet.   |
| 26-Apr-2012 | 3        | Modified <i>Features on page 1</i> .<br>Updated <i>Table 4: Electrical characteristics on page 7</i> . |
| 20-Jun-2012 | 4        | Updated <i>Section 3.3: Standby and muting</i> .   |
| 11-Mar-2013 | 5        | Added <i>Section 2.4: Electrical characteristic curves</i> .   |
| 17-Sep-2013 | 6        | Updated Disclaimer.  |

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