

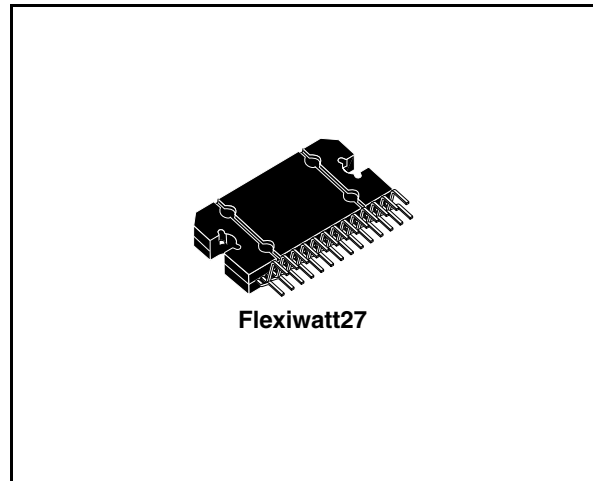
4 x 42W quad bridge car radio amplifier

Features

- High output power capability:
 - 4 x 42W/4Ω max.
 - 4 x 27W/4Ω @ 14.4V, 1KHz, 10%
- Low distortion
- Low output noise
- Standby function
- Mute function
- Automute at min. supply voltage detection
- Low external component count:
 - Internally fixed gain (26dB)
 - No external compensation
 - No bootstrap capacitors
- Clipping detector
- Offset detector
- Diagnostic facility for:
 - Out to GND short
 - Out to V_S short
 - Thermal shutdown

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
- Output DC offset detector
- Reversed battery
- ESD

Description

The TDA7388A is a new technology class AB audio power amplifier in Flexiwatt 27 package designed for high end car radio applications.

Thanks to the fully complementary PNP/NPN output configuration the TDA7388A allows a rail to rail output voltage swing with no need of bootstrap capacitors. The extremely reduced components count allows very compact sets.

The TDA7388A is also equipped with Clipping detector and Offset detector features.

Table 1. Device summary

Order code	Package	Packing
TDA7388A	Flexiwatt27	Tube

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1 Pin connection and test/application diagrams

Figure 1. Pin connections

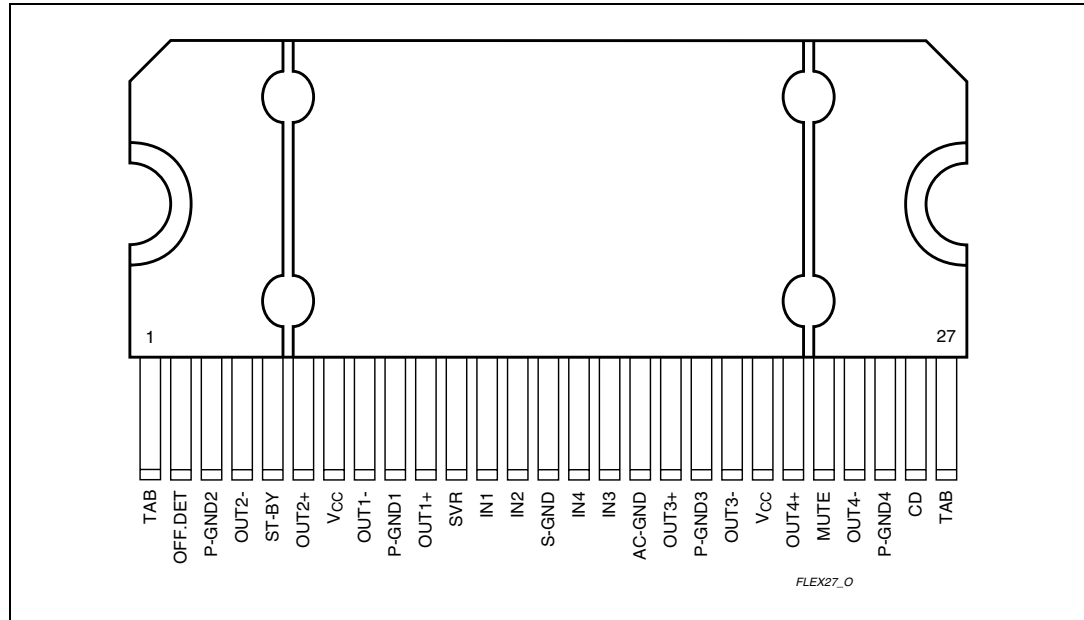
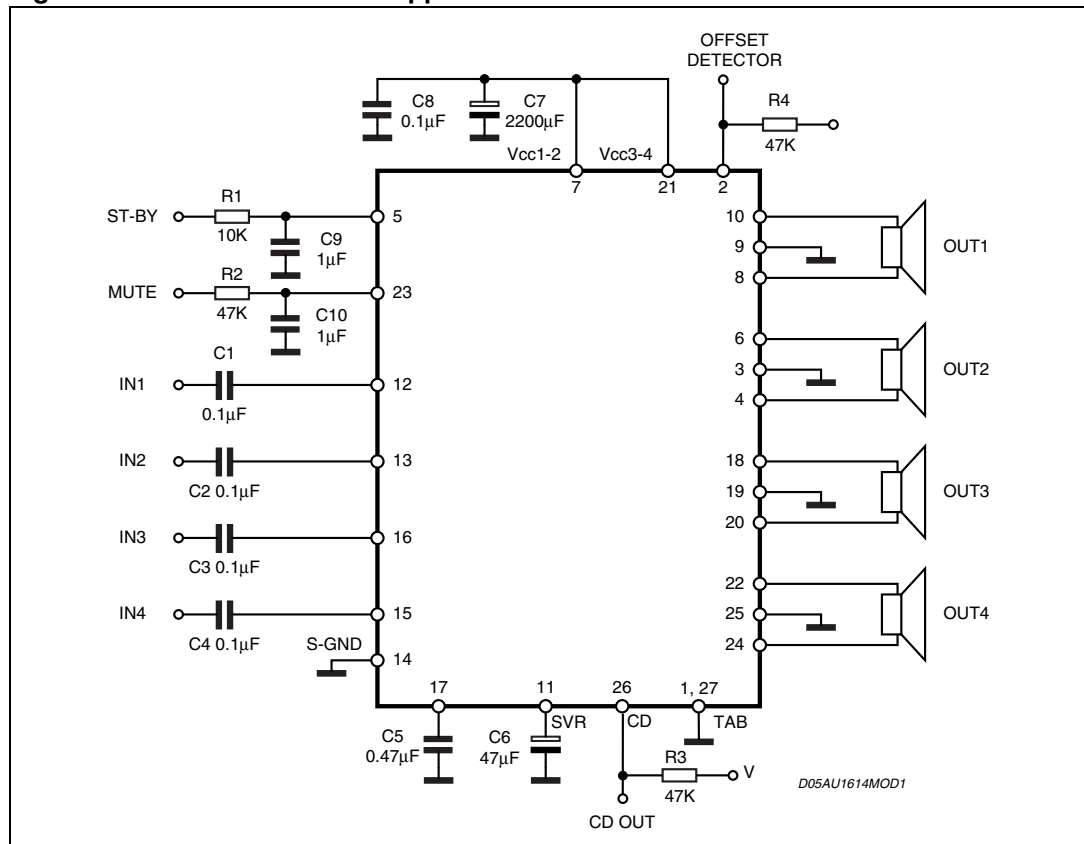


Figure 2. Standard test and application circuit



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 = 50ms)	50	V
I_O	Output peak current: Repetitive (duty cycle 10% at f = 10Hz)	4.5	A
	Non repetitive (t = 100 μ s)	5.5	A
P_{tot}	Power dissipation, ($T_{case} = 70^\circ\text{C}$)	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

Table 4. Electrical characteristics

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{q1}	Quiescent current	$R_L = \infty$	100	190	350	mA
V_{OS}	Output offset voltage	Play mode			± 100	mV
dV_{OS}	During mute ON/OFF output offset voltage	ITU R-ARM weighted see Figure 11	-10		+10	mV
	During St-By ON/OFF output offset voltage		-50		+50	mV
G_V	Voltage gain		25	26	27	dB
ΔG_V	Channel gain unbalance				± 1	dB
P_o	Output power	THD = 10%; $V_S = 14.4\text{V}$	25	27		W
$P_{o\ max}$	Max.output power ⁽¹⁾	$V_S = 14.4\text{V}$	39	42		W

Table 4. Electrical characteristics (continued)

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

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
THD	Distortion	$P_o = 4\text{ W}$		0.04	0.10	%
e_{No}	Output noise	"A" Weighted		50	70	μV
		$B_w = 20\text{ Hz to } 20\text{ kHz}$		70	100	μV
SVR	Supply voltage rejection	$f = 100\text{ Hz}$; $V_r = 1\text{ V}_{\text{rms}}$	50	65		dB
f_{ch}	High cut-off frequency	$P_o = 0.5\text{ W}$	100	200		KHz
R_i	Input Impedance		70	100		$\text{K}\Omega$
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	μA
I_{pin4}	Standby pin current	$V_{\text{St-By}} = 1.2\text{ to } 2.6\text{ V}$			± 10	μA
$V_{\text{SB out}}$	Standby out threshold voltage	(Amp: on)	2.6			V
$V_{\text{SB IN}}$	Standby in threshold voltage	(Amp: off)			1.2	V
A_M	Mute attenuation	$P_{\text{Oref}} = 4\text{ W}$	80	90		dB
$V_{\text{M out}}$	Mute out threshold voltage	(Amp: Play)	2.6			V
$V_{\text{M in}}$	Mute in threshold voltage	(Amp: Mute)			1.2	V
$V_{\text{AM in}}$	V_S automute threshold	(Amp: Mute); $\text{Att} \geq 80\text{ dB}$; $P_{\text{Oref}} = 4\text{ W}$			6.5	V
		(Amp: Play); $\text{Att} < 0.1\text{ dB}$; $P_o = 0.5\text{ W}$		7.6	8.5	V
I_{pin22}	Muting pin current	$V_{\text{MUTE}} = 1.2\text{ V}$ (Source current)	5	11	20	μA
Offset detector						
V_{off}	Detected diff. output offset	$V_{\text{St-by}} = 5\text{ V}$	± 1.4	± 2	± 2.6	V
$V_{\text{OFF LK}}$	V_{OFF} high leakage current	OD off			10	μA
$V_{\text{OFF SAT}}$	V_{OFF} det saturation voltage	OD on; $I_{\text{OD}} = 1\text{ mA}$		300		mV
Clipping detector						
CD_{LK}	Clip det high leakage current	CD Off			10	μA
CD_{SAT}	Clip det sat voltage	DC On; $I_{\text{CD}} = 1\text{ mA}$		300		mV
CD_{THD}	Clip det THD level			0.2		%

1. Saturated square wave output.

2.4 Electrical characteristic curves

Figure 3. Quiescent current vs. supply voltage

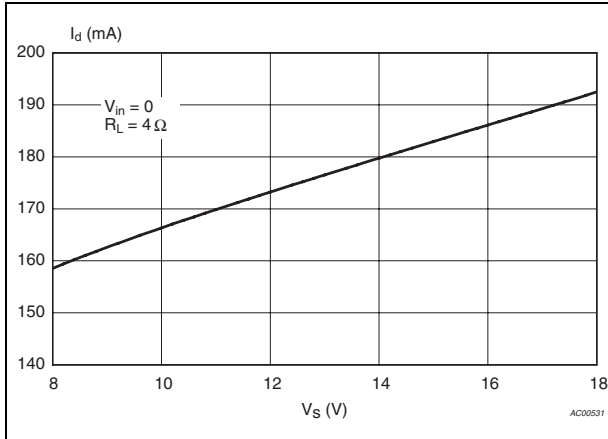


Figure 4. Output power vs. supply voltage (4 Ohm)

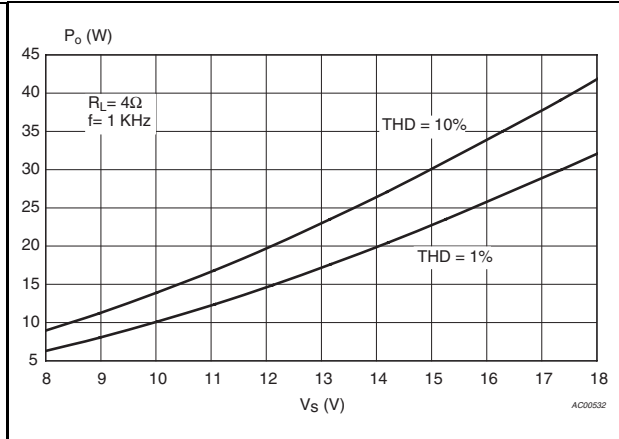


Figure 5. Distortion vs. output power

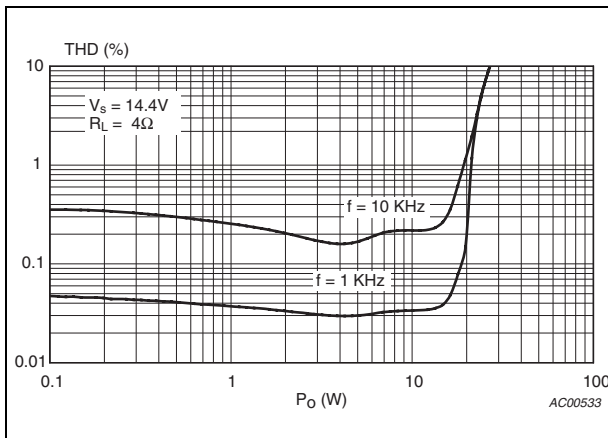


Figure 6. Distortion vs. frequency

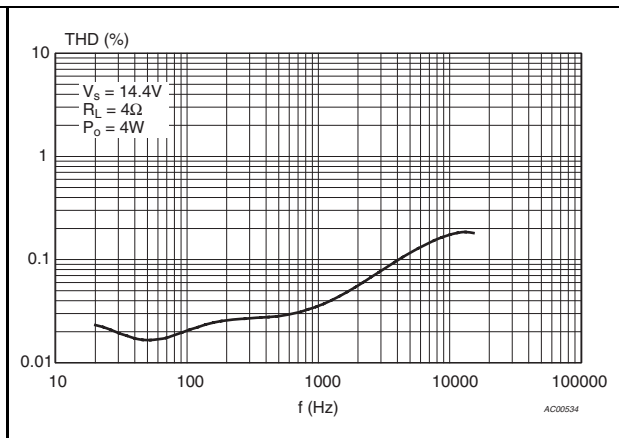


Figure 7. Supply voltage rejection vs. frequency

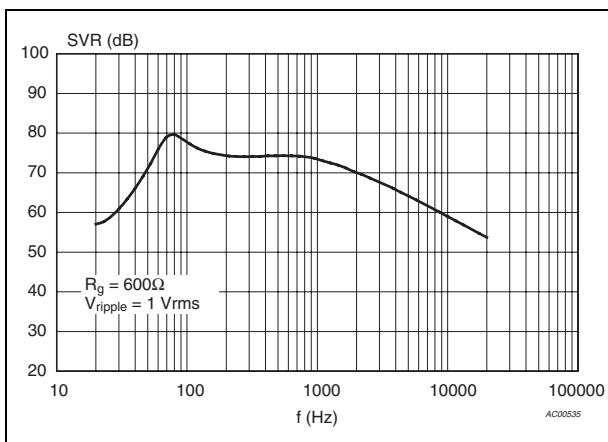


Figure 8. Crosstalk vs. frequency

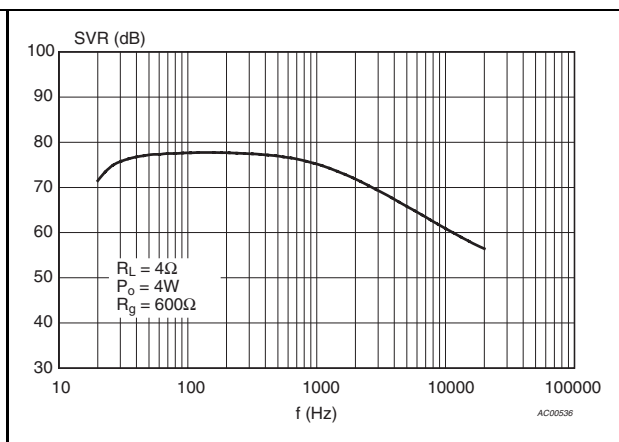


Figure 9. Output noise vs. source resistance **Figure 10. Power dissipation & efficiency vs. output power**

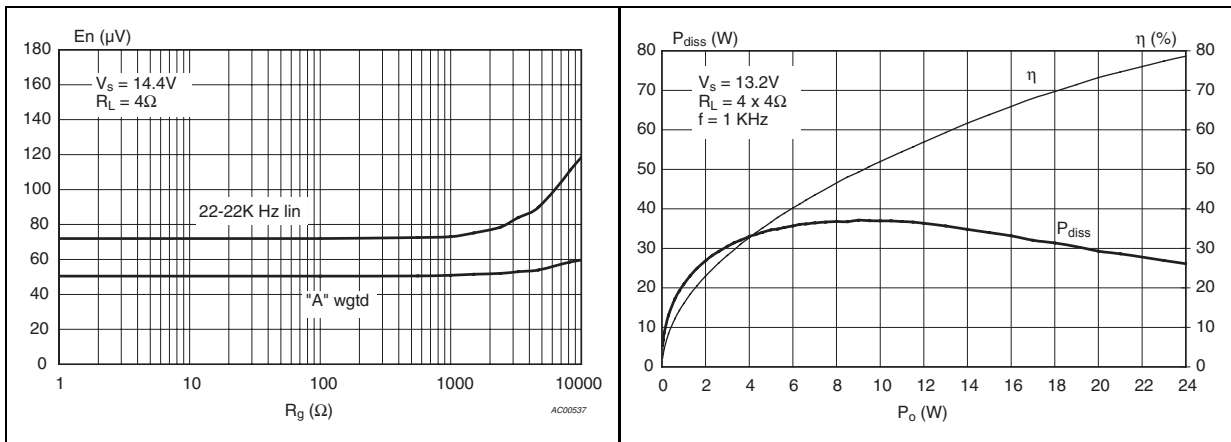
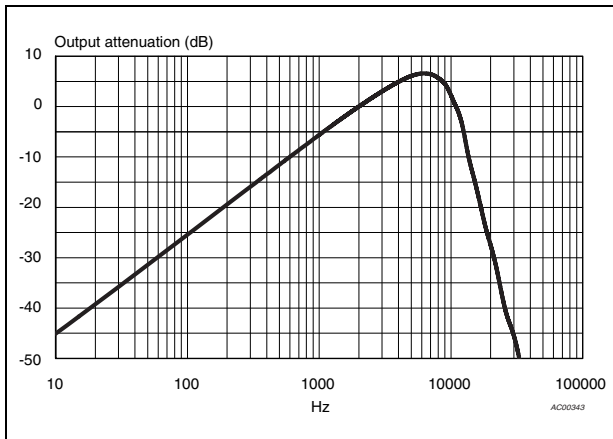


Figure 11. ITU R-ARM frequency response, weighting filter for transient pop



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 μ F**.

3.2 Input stage

The TDA7388A's inputs are ground-compatible and can stand very high input signals (± 8 Vpk) without any performances degradation.

If the standard value for the input capacitors (0.1 μ F) is adopted, the low frequency cut-off will amount to 16 Hz.

3.3 Standby and muting

Standby and muting facilities are both 3.3V CMOS-compatible. If unused, a straight connection to V_S of their respective pins would be admissible.

Conventional/low-power transistors can be employed to drive muting and stand-by 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 μ A normally flows out of pin 23, the maximum allowable muting-series resistance (R_2) is 70K Ω , which is sufficiently high to permit a muting capacitor reasonably small (about 1 μ F).

If R_2 is higher than recommended, the involved risk will be that the voltage at pin 23 may rise to above the 1.5V threshold voltage and the device will consequently fail to turn OFF when the mute line is brought down.

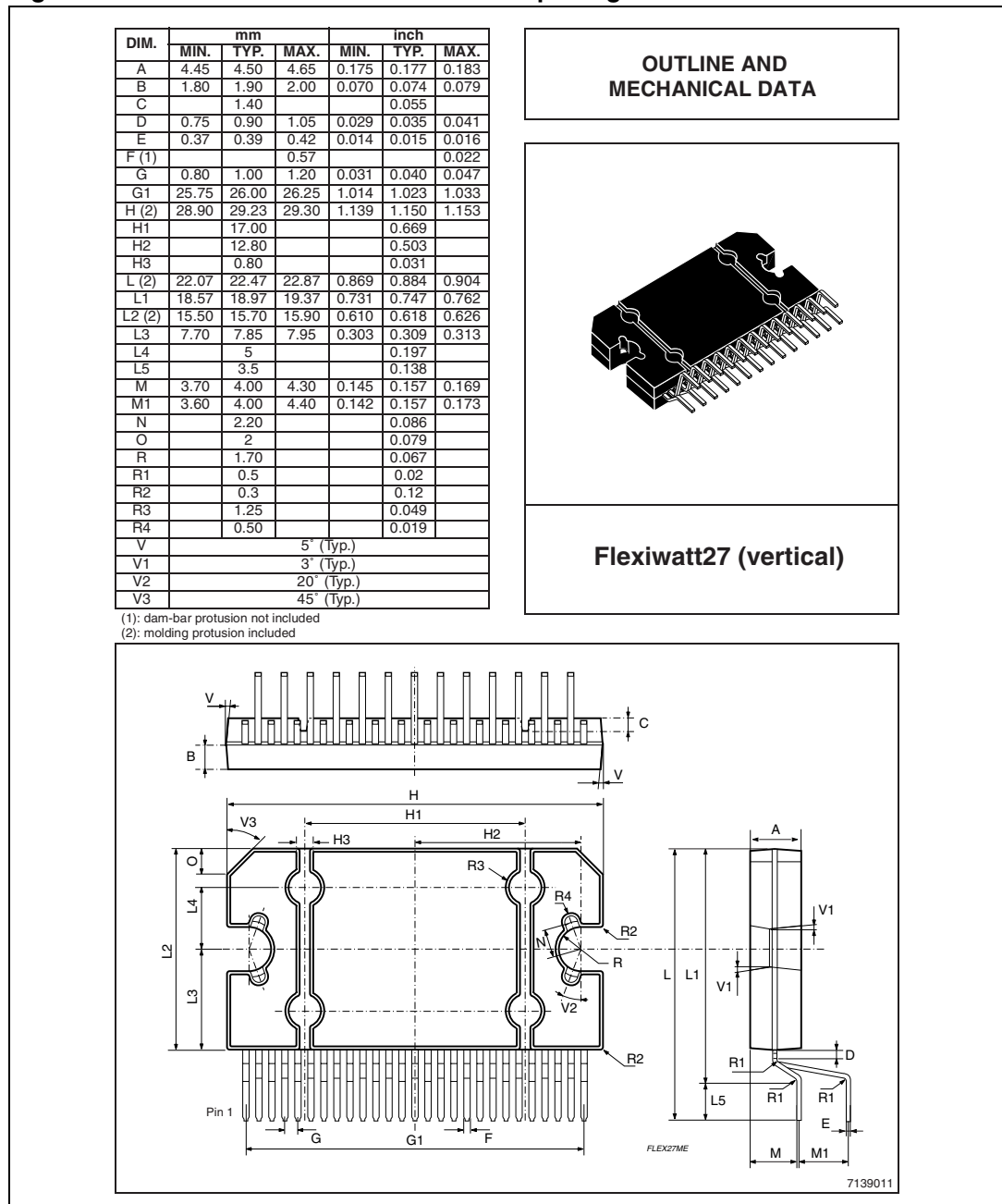
About the stand-by, the time constant to be assigned in order to obtain a virtually pop-free transition has to be slower than 2.5V/ms.

4 Package information

In order to meet environmental requirements, ST (also) offers these devices in ECOPACK® packages. ECOPACK® packages are lead-free. 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 12. Flexiwatt27 mechanical data and package dimensions



5 Revision history

Table 5. Document revision history

Date	Revision	Changes
06-Dec-2007	1	Initial release.
15-Oct-2008	2	Document status promoted from preliminary data to datasheet. Updated Table 3: Thermal data on page 6 .

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