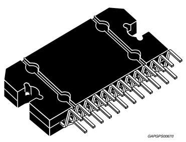
TDA7386

4 x 49 W quad bridge car radio amplifier

Datasheet - production data



Flexiwatt25

Features

- High output power capability:
- 4 x 49 W/4 Ω max.
- 4 x 28 W/4 Ω @ 14.4V, 1 kHz, 10%
- 4 x 24 W/4 Ω @ 13.2V, 1 kHz, 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
- 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

Description

The TDA7386 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 TDA7386 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
TDA7386	Flexiwatt25	Tube

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1 Block and pin connection diagrams

Figure 1. Block diagram

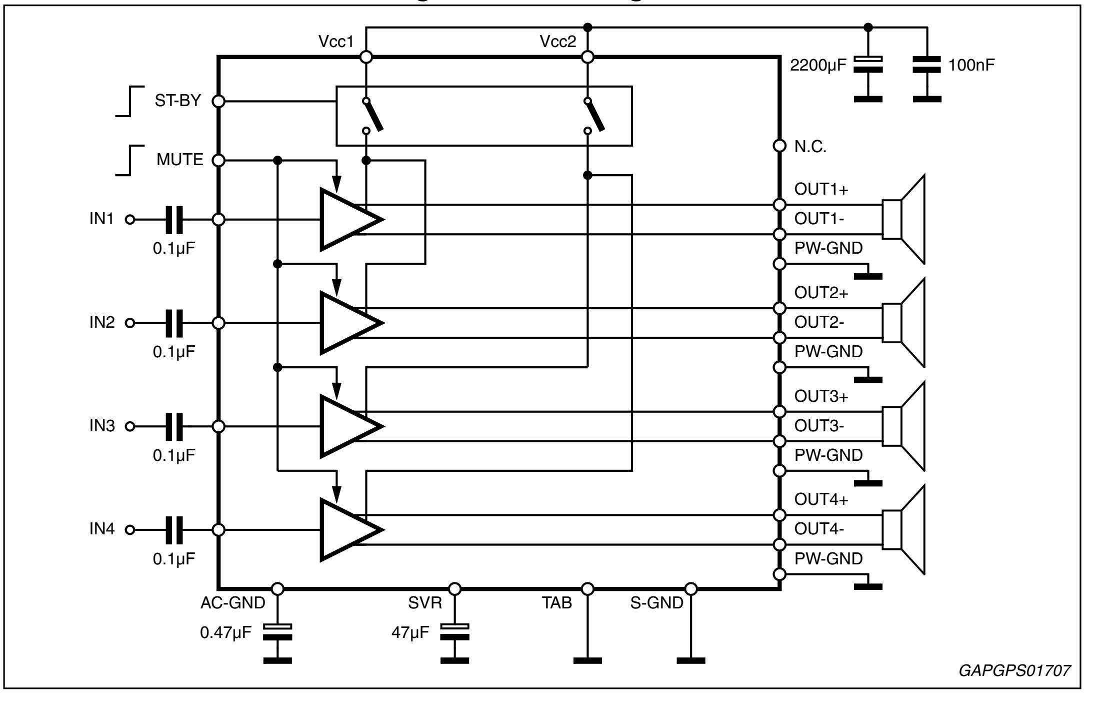
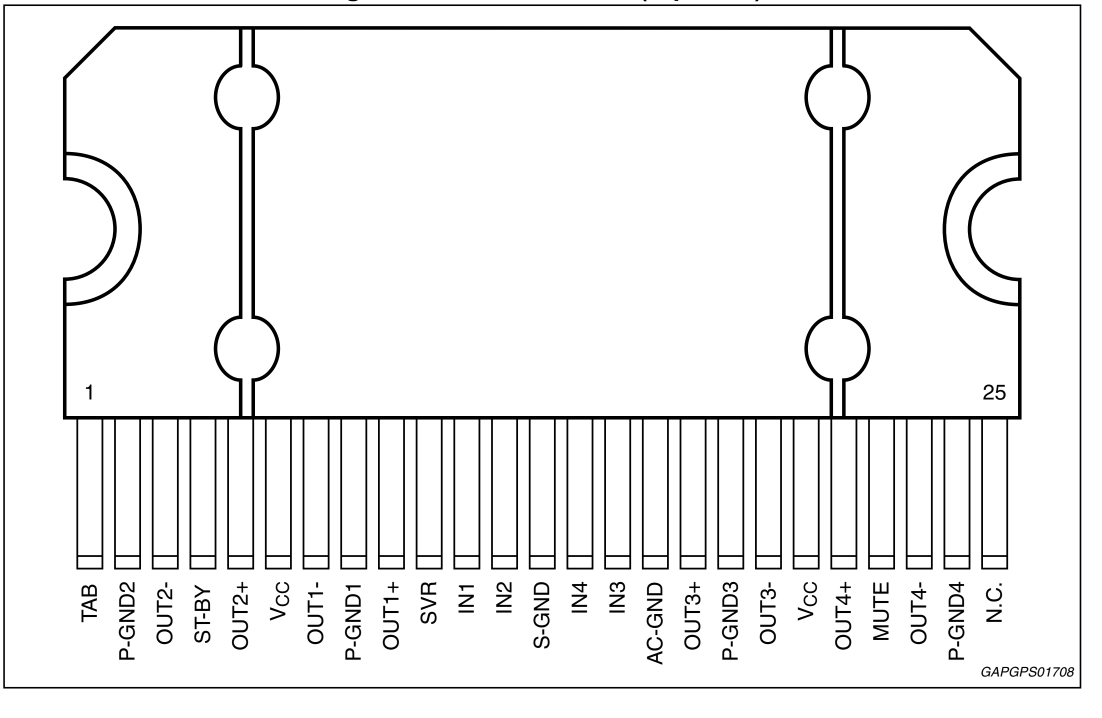


Figure 2. Pin connection (top view)



2 Electrical specifications

2.1 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Operating supply voltage	18	V
$V_{CC\ (DC)}$	DC supply voltage	28	V
$V_{CC\ (pk)}$	Peak supply voltage (t = 50 ms)	50	V
I_O	Output peak current: Repetitive (Duty Cycle 10% at f = 10 Hz) Non Repetitive (t = 100 µs)	 4.5 5.5	 A A
P_{tot}	Power dissipation, (T_{case} = 70 °C)	80	W
T_{amb}	Operating temperature range	– 40 to 105	°C
T_j	Junction temperature	150	°C
T_{stg}	Storage temperature	– 55 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.	1	°C/W

2.3 Electrical characteristics

V_S = 14.4 V; f = 1 kHz; R_g = 600 Ω; R_L = 4 Ω; T_{amb} = 25 °C; Refer to the test and application diagram, unless otherwise specified.

Table 4. Electrical characteristics

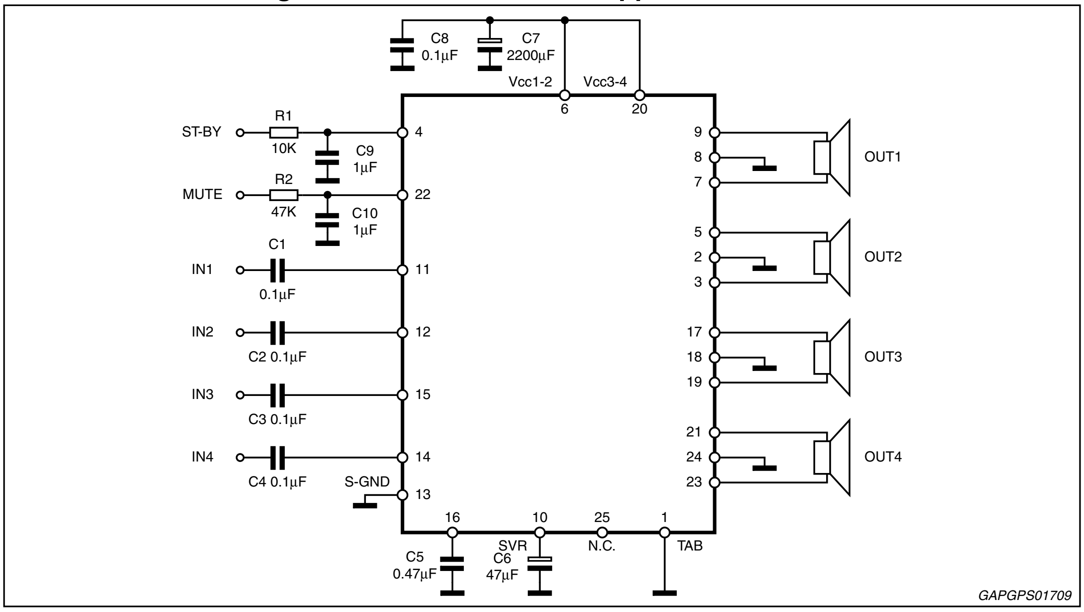
Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
I_{q1}	Quiescent current	$R_L = \infty$	-	190	350	mA
V_{OS}	Output offset voltage	Play Mode	-	-	±80	mV
ΔV_{OS}	During mute on/off output offset voltage	-	-	-	±80	mV
G_v	Voltage gain	-	25	26	27	dB
ΔG_v	Channel gain unbalance	-	-	-	±1	dB
P_o	Output power	THD = 10%; V_S = 13.2 V	22	24	-	W
		THD = 0.8%; V_S = 13.2 V	16.5	18	-	W
		THD = 10%; V_S = 14.4 V	26	28	-	W

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
$P_{o\ max}$	Max.output power [1]	V_S = 14.4 V V_S = 15.2 V	43	45 49	-	W
THD	Distortion	P_o = 4W	-	0.04	0.15	%
e_{No}	Output noise	"A" Weighted	-	50	70	µV
		Bw = 20 Hz to 20 kHz	-	70	100	µV
SVR	Supply voltage rejection	f = 100 Hz; V_r = 1V_{rms}	50	75	-	dB
f_{ch}	High cut-off frequency	P_o = 0.5 W	80	200	-	kHz
R_i	Input impedance	-	70	100	-	kΩ
C_T	Cross talk	f = 1 kHz; Po = 4 W	60	70	-	dB
		f = 10 kHz; Po = 4W	-	60	-	dB
I_{SB}	Standby current consumption	$V_{St\text{-}by}$ = 1.5	-	-	50	µA
		$V_{St\text{-}by}$ = 0 V	-	-	20	µA
I_{pin4}	Standby pin current	$V_{St\text{-}by}$ = 1.5 to 3.5 V	-	-	±1	µA
$V_{SB\ out}$	Standby out threshold voltage	(Amp: on)	3.5	-	-	V
$V_{SB\ IN}$	Standby in threshold voltage	(Amp: off)	-	-	1.5	V
A_M	Mute attenuation	P_{Oref} = 4 W	80	90	-	dB
$V_{M\ out}$	Mute out threshold voltage	(Amp: play)	3.5	-	-	V
$V_{M\ in}$	Mute in threshold voltage	(Amp: mute)	-	-	1.5	V
$V_{AM\ in}$	V_S automute threshold	(Amp: mute); Att ≥ 80 dB; P_{Oref} = 4 Ω (Amp: play); Att < 0.1 dB; P_O = 0.5 Ω	-	 7.6	6.5 8.5	V V
I_{pin22}	Muting pin current	V_{MUTE} = 1.5 V (Source current)	5	11	20	µA
		V_{MUTE} = 3.5 V	-5	-	20	µA

1. Saturated square wave output.

Figure 3. Standard test and application circuit



2.4 PCB and component layout

Referred to the circuit of *Figure 3*.

Figure 4. Components and top copper layer

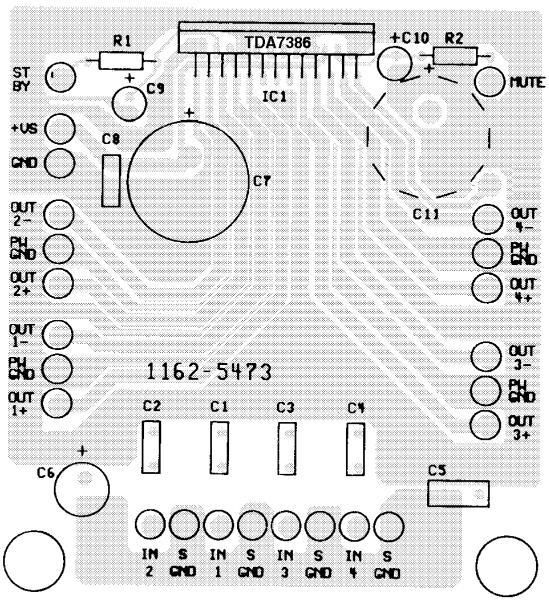
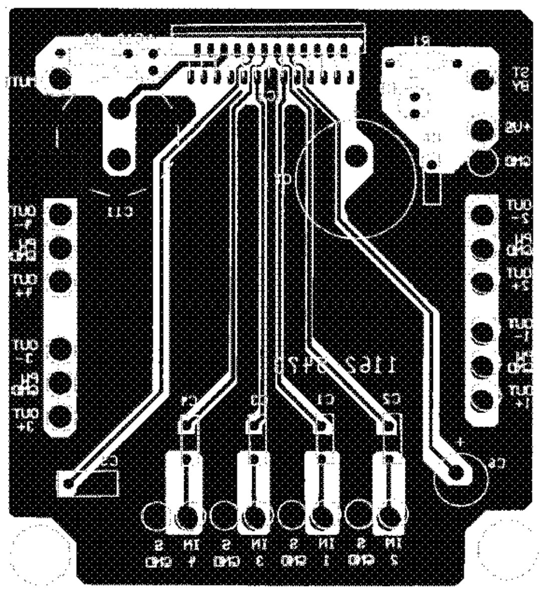


Figure 5. Bottom copper layer



2.5 Electrical characteristics curves

Figure 6. Quiescent current vs. supply voltage

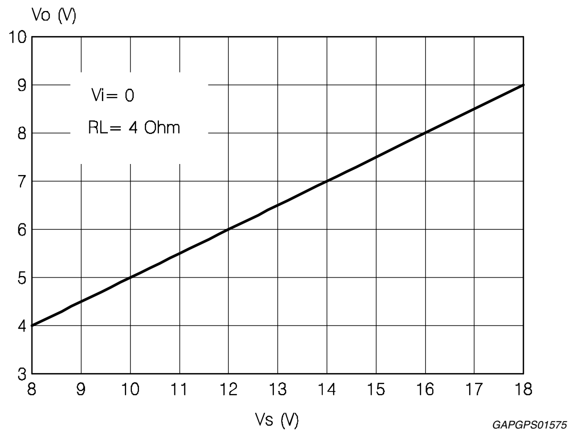


Figure 7. Quiescent output voltage vs. supply voltage

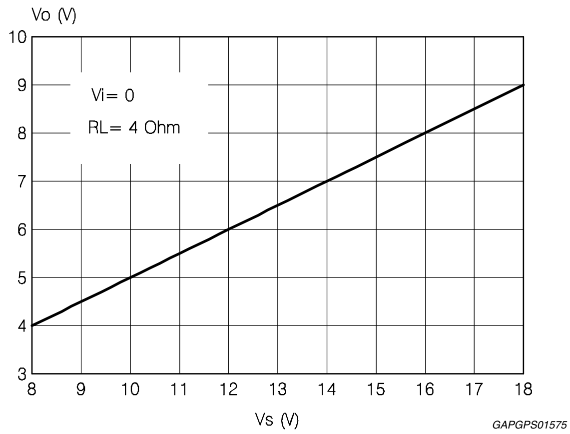


Figure 8. Output power vs. supply voltage

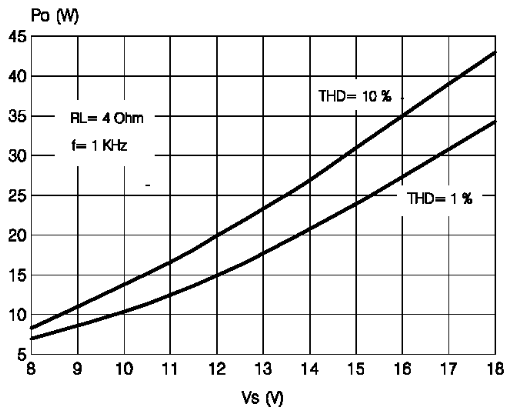


Figure 9. Max. output power vs. supply voltage

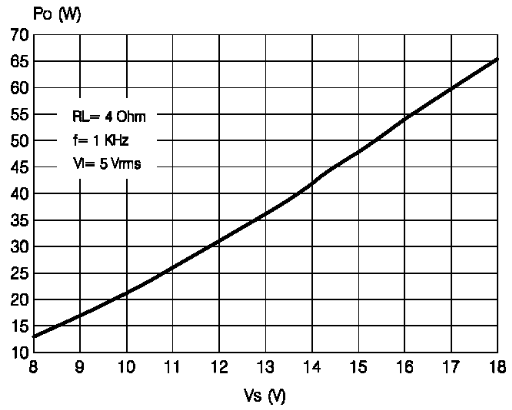


Figure 10. Distortion vs. output power

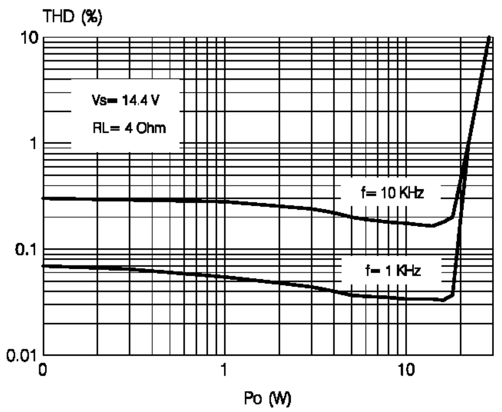


Figure 11. Distortion vs. frequency

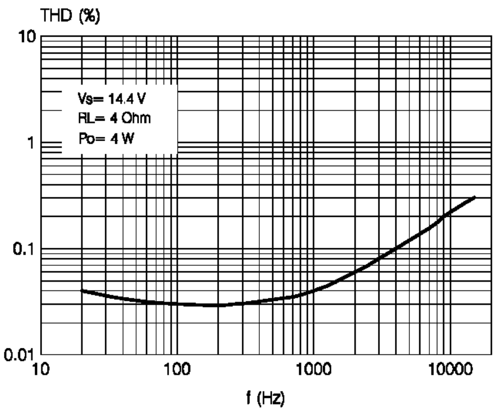


Figure 12. Supply voltage rejection vs. frequency

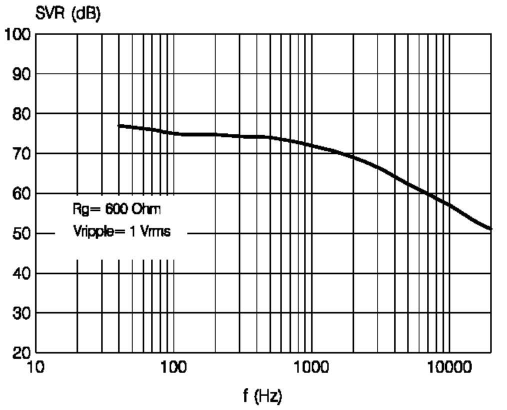


Figure 13. Crosstalk vs. frequency

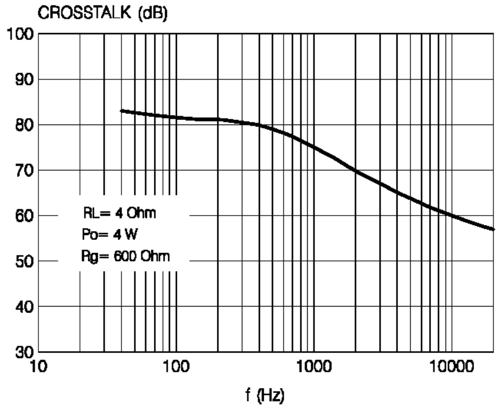


Figure 14. Output noise vs. source resistance

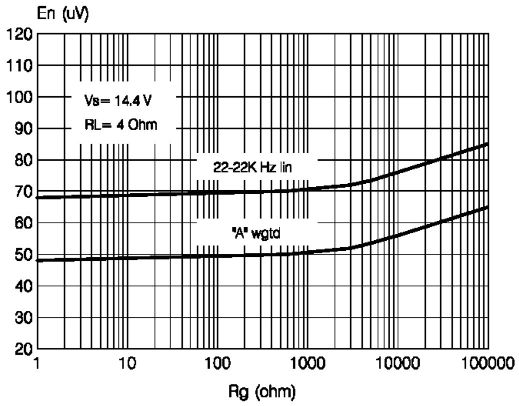
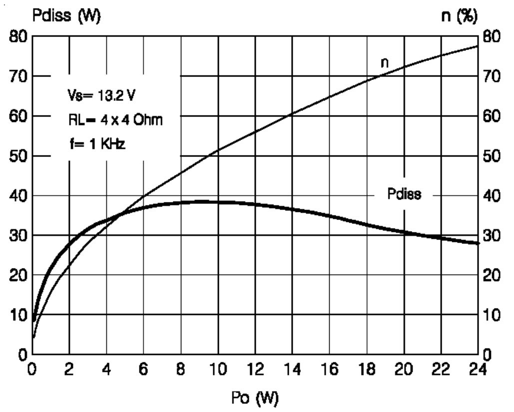


Figure 15. Power dissipation and efficiency vs. output power



3 Application hints

Referred to the circuit of *Figure 3*.

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 10µF**.

3.2 Input stage

The TDA7386's inputs are ground-compatible and can stand very high input signals (±8Vpk) without any performances degradation.

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

3.3 Standby and muting

Standby and muting facilities are both CMOS-compatible. If unused, a straight connection to Vs 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 µA normally flows out of pin 22, the maximum allowable muting-series resistance (R_2) is 70 kΩ, which is sufficiently high to permit a muting capacitor reasonably small (about 1µF).

If R_2 is higher than recommended, the involved risk will be that the voltage at pin 22 may rise to above the 1.5 V 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 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*.

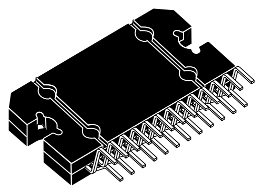
ECOPACK® is an ST trademark.

Figure 16. Flexiwatt25 mechanical data and package dimensions

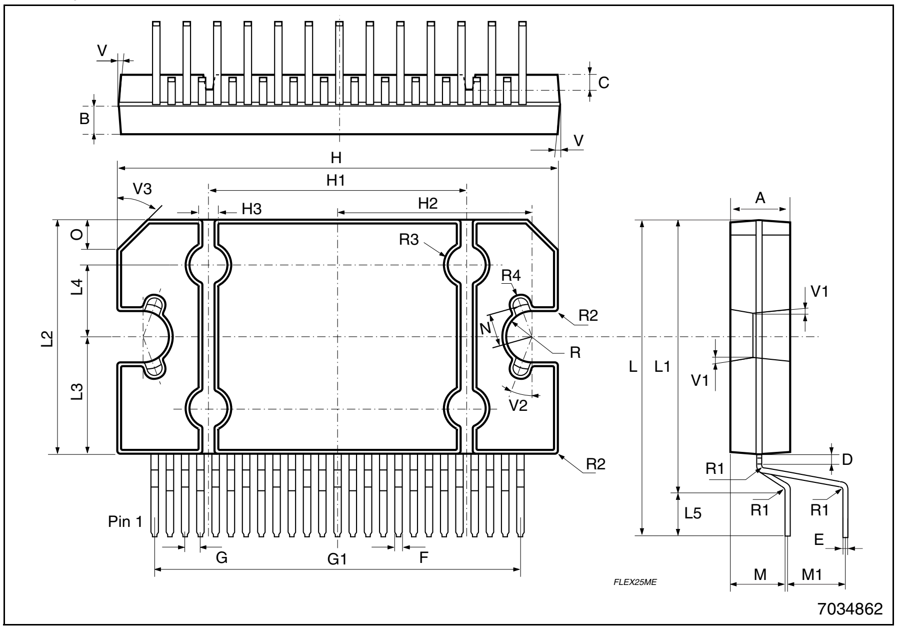
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.45	4.50	4.65	0.175	0.177	0.183
B	1.80	1.90	2.00	0.070	0.074	0.079
C		1.40			0.055	
D	0.75	0.90	1.05	0.029	0.035	0.041
E	0.37	0.39	0.42	0.014	0.015	0.016
F (1)			0.57			0.022
G	0.80	1.00	1.20	0.031	0.040	0.047
G1	23.75	24.00	24.25	0.935	0.945	0.955
H (2)	28.90	29.23	29.30	1.139	1.150	1.153
H1		17.00			0.669	
H2		12.80			0.503	
H3		0.80			0.031	
L (2)	22.07	22.47	22.87	0.869	0.884	0.904
L1	18.57	18.97	19.37	0.731	0.747	0.762
L2 (2)	15.50	15.70	15.90	0.610	0.618	0.626
L3	7.70	7.85	7.95	0.303	0.309	0.313
L4		5			0.197	
L5		3.5			0.138	
M	3.70	4.00	4.30	0.145	0.157	0.169
M1	3.60	4.00	4.40	0.142	0.157	0.173
N		2.20			0.086	
O		2			0.079	
R		1.70			0.067	
R1		0.5			0.02	
R2		0.3			0.12	
R3		1.25			0.049	
R4		0.50			0.019	
V	5° (Typ.)					
V1	3° (Typ.)					
V2	20° (Typ.)					
V3	45° (Typ.)					

(1): dam-bar protusion not included
(2): molding protusion included

OUTLINE AND MECHANICAL DATA



Flexiwatt25 (vertical)



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5 Revision history

Table 5. Document revision history

Date	Revision	Changes
24-Nov-2001	1	Initial release.
20-Dec-2007	2	Document reformatted. Modified the *Features on page 1*. Modified the *Figure 1* and *2*. Updated the *Table 4: Electrical characteristics*.
29-Oct-2008	3	Updated the *Table 3: Thermal data on page 6*.
19-Nov-2008	4	Update the *Table 2: Absolute maximum ratings on page 6*.
18-Sep-2013	5	Updated *Features on page 1*; Updated *Table 4: Electrical characteristics*. Updated Disclaimer.