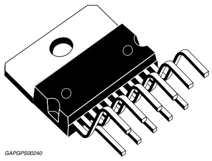
TDA7391

35 W bridge car radio amplifier

Datasheet - production data



Multiwatt11

Features

- High power capability:
  - 40 W/4 Ω max
  - 35 W/4 Ω EIAJ
  - 45 W/3.2 Ω max
  - 40 W/3.2 Ω EIAJ
  - 32 W/3.2 Ω @ V_S = 14.4 V, f = 1 kHz, d = 10 %
  - 26 W/4 Ω @ V_S = 14.4 V, f = 1 kHz, d = 10 %
- DIfferential inputs (either single ended or differential input signal are accepted)
- Minimum external component count:
  - No bootstrap capacitors
  - No Boucherot cells
  - Internally fixed gain (30 dB)
  - No SVR Capacitor
- Standby function (CMOS compatible)
- Programmable turn-on/off delay
- No audible pop during mute and standby operations
- Protections:
  - Short circuit (to GND, to V_S, across the load)
  - Very inductive loads
  - Chip over temperature
  - Load dump
  - Open GND
  - ESD

Description

The TDA7391 is a bridge class AB audio power amplifier specially intended for car radio high power applications.

The high power capability together with the possibility to operate either in differential input mode or single ended input mode makes it suitable for boosters and high end car radio equipments. The exclusive fully complementary output stage and the internal fixed gain configuration drop the external component count.

The on board clipping detector allows easy implementation of gain compression systems.

Table 1. Device summary

Order code	Package	Packing
TDA7391	Multiwatt11 (vertical)	Tube

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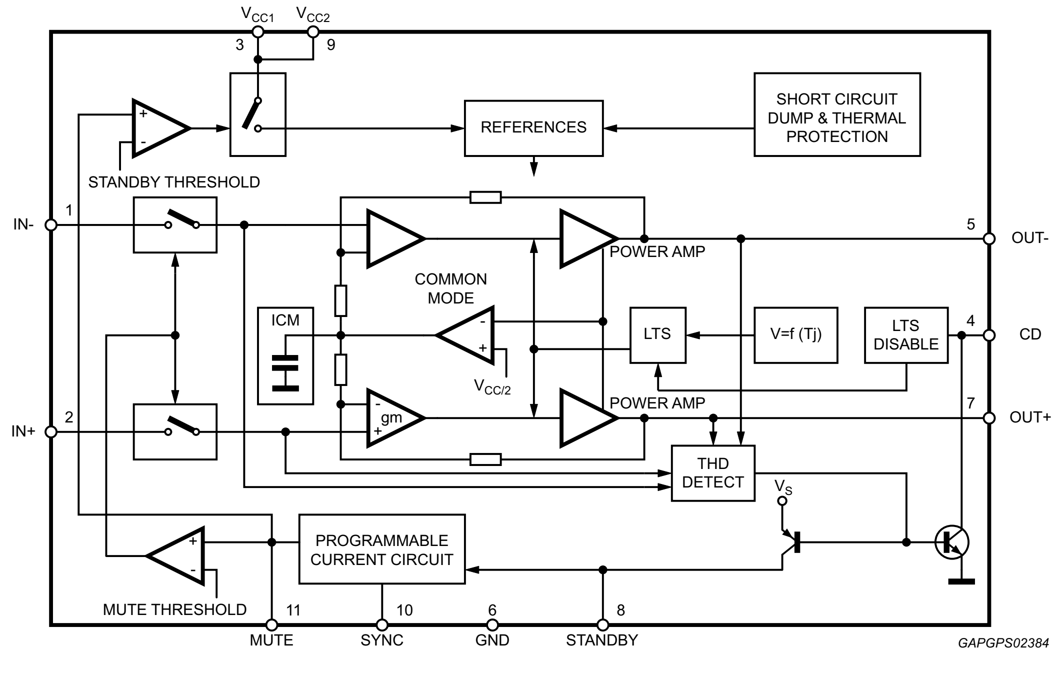
1 Block and pin description diagrams

1.1 Block diagram

Figure 1. Block diagram



1.2 Pin description

Figure 2. Pin connection (top view)

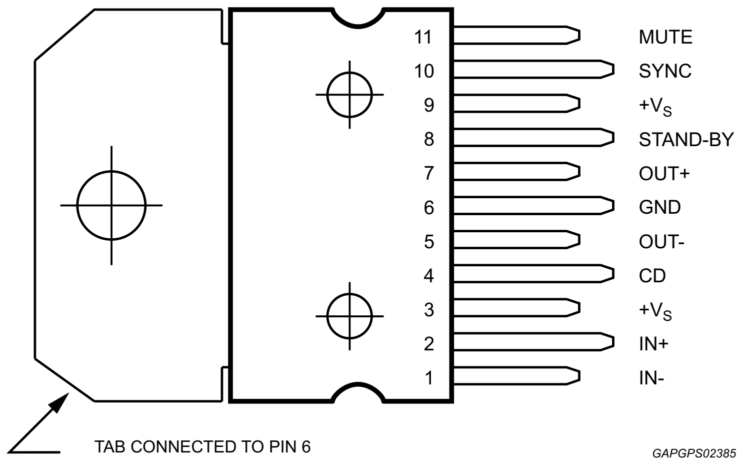


Table 2. Pin functional description

Pin#	Pin name	Description
1, 2	INPUTS	The input stage is a high impedance type also capable of operation in single ended mode with one input capacitively coupled to the signal GND. The impedance seen by the inverting and non inverting input pins must be matched.
3,9	+V	Supply voltage.
4	CD	The TDA7391 is equipped with a diagnostic circuitry able to detect the clipping in the Output Signal (distortion = 10%). The CD pin (open collector) gives out low level signal during clipping.
5, 7	OUTPUTS	The output stage is a bridge type able to drive loads as low as 3.2Ω. It consists of two class AB fully complementary PNP/NPN stages fully protected. A rail to rail output voltage swing is achieved without need of bootstrap capacitors. No external compensation is necessary.
6	GND	Ground.
8	STAND-BY	The device features a standby function which shuts down all the internal bias supplies when the STAND-BY pin is low. In standby mode the amplifier sinks a small current (in the range of few µA). When the STAND-BY pin is high the IC becomes fully operational.
10	SYNC	A resistor (R_2) has to be connect between pin 10 and GND in order to program the current that flows in the C_3 capacitor (pin 11). The values of C_3 and R_2 determine the time required to bias the amplifier.
11	MUTE	The pin will have a capacitor (C_3) tied to GND to set the MUTE/STAND-BY time. An automatic Mute during turn on/off is provided to prevent noisy transients.

2 Electrical specifications

2.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_S	DC supply voltage	28	V
V_{OP}	Operating supply voltage	18	V
V_{PEAK}	Peak supply voltage (t = 50 ms)	50	V
I_O	Output peak current repetitive (f > 10 Hz)	4.5	A
	Output peak current non repetitive	6	A
P_{tot}	Power dissipation (T_{case} = 85 °C)	43	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.

2.2 Thermal data

Table 4. Thermal data

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

2.3 Electrical characteristics

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

Table 5. Electrical characteristics

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_S	Supply voltage range	-	8	-	18	V
I_q	Total quiescent current	-	-	60	150	mA
V_{OS}	Output offset voltage	-	-		120	mV
I_{SB}	Standby current	$V_{ST\text{-}BY}$ = 1.5 V	-	-	100	µA
I_{SBin}	Standby input bias current	$V_{ST\text{-}BY}$ = 5 V	-	-	10	µA
V_{SBon}	Standby On threshold voltage	-	-	-	1.5	V
V_{SBoff}	Standby Off threshold voltage	-	3.5	-	-	V
$ATT_{ST\text{-}BY}$	Standby attenuation	-	--	90	-	dB
I_{M_in}	Mute input bias current	V_{MUTE} = 5 V	-	-	10	µA

Table 5. Electrical characteristics (continued)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
A_M	Mute attenuation	-	-	90	-	dB
P_O	Output power	d = 10 %	20	26	-	W
		d = 1 %	-	21	-	W
		d = 10 %; R_L = 3.2 Ω	-	32	-	W
$P_{O\ EIAJ}$	EIAJ output power(1)	V_S = 13.7 V; R_L = 3.2 Ω	-	40	-	W
$P_{O\ MAX}$	Max. output power(1)	V_S = 14.4 V; R_L = 3.2 Ω	-	45	-	W
d	Distortion	-	-	0.06	-	%
		P_O = 0.1 to 15 W	-	0.03	-	%
G_V	Voltage gain	-	29.5	30	30.5	dB
f_H	High frequency roll-off	P_O = 1W; -3dB	75		-	kHz
R_{IN}	Input Impedance	Differential	36	60	-	kΩ
		Single Ended	30	55	-	kΩ
E_{IN}	Input noise voltage	R_g = 0 Ω; f = 22 Hz to 22 kHz	-	4	-	mV
CMRR	Input common mode rejection	f = 1 kHz; V_{IN} = 1 Vrms	-	65	-	dB
SVR	Supply voltage rejection	R_g = 0 Ω; V_r = 1 Vrms	-	60	-	dB
CDL	Clipping detection level	-	5	10	15	%
T_{sd}	Absolute thermal shutdown junction temperature	-	-	160	-	°C

1. Saturated square wave output.

Figure 3. Test and application circuit

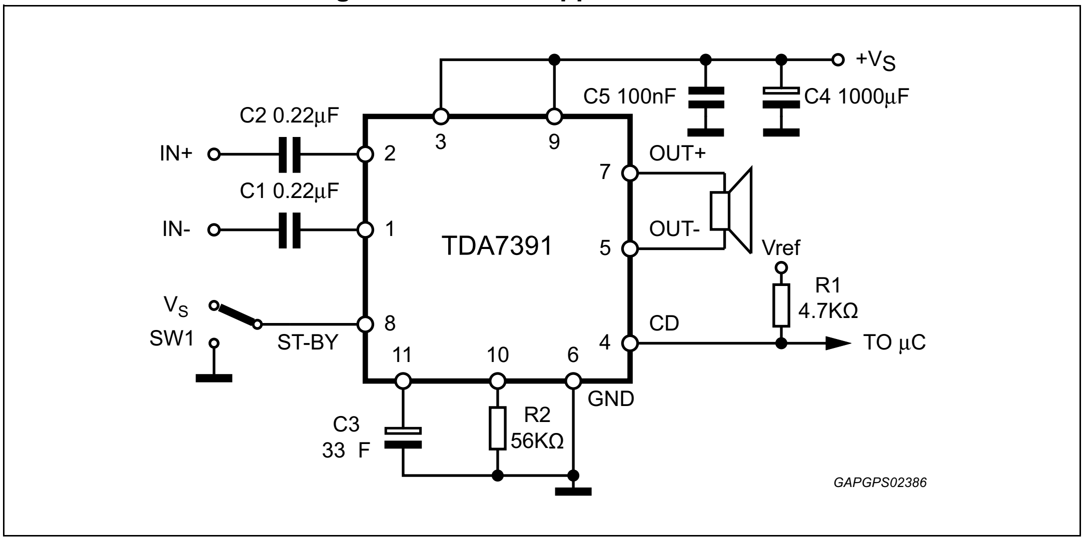
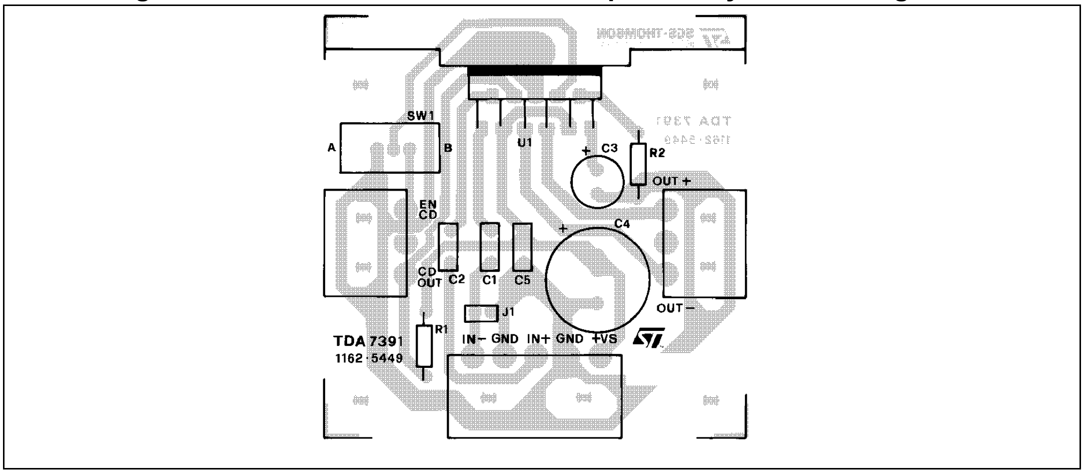


Figure 4. Printed circuit board and component layout of the Figure 4



2.4 Electrical characteristics curves

Figure 5. Quiescent current vs. supply voltage

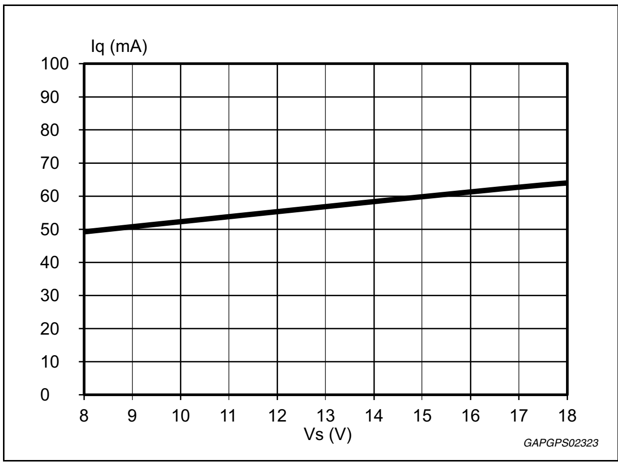


Figure 6. EIAJ power vs. supply voltage

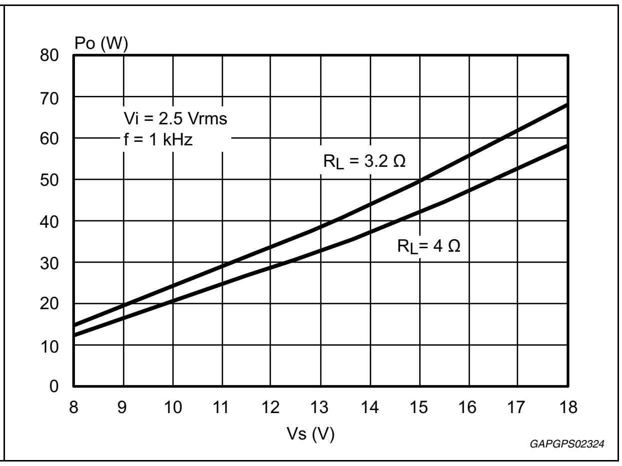


Figure 7. Output power vs. supply voltage (R_L = 4 Ω)

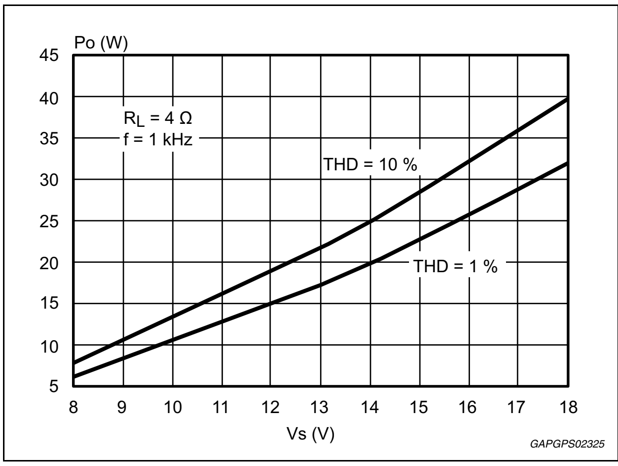


Figure 8. Distortion vs. frequency (R_L = 4 Ω)

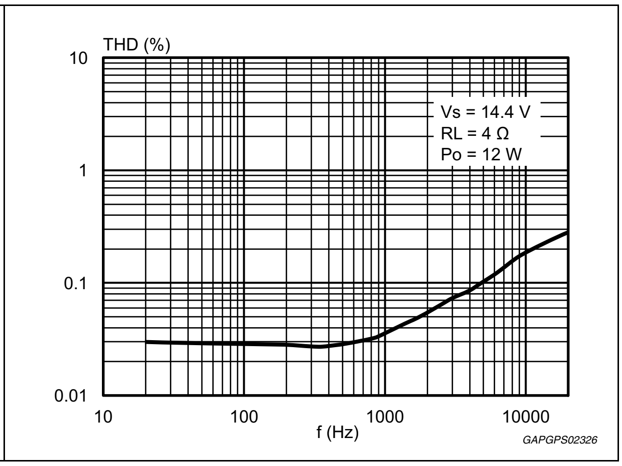


Figure 9. Output power vs. supply voltage (R_L = 3.2 Ω)

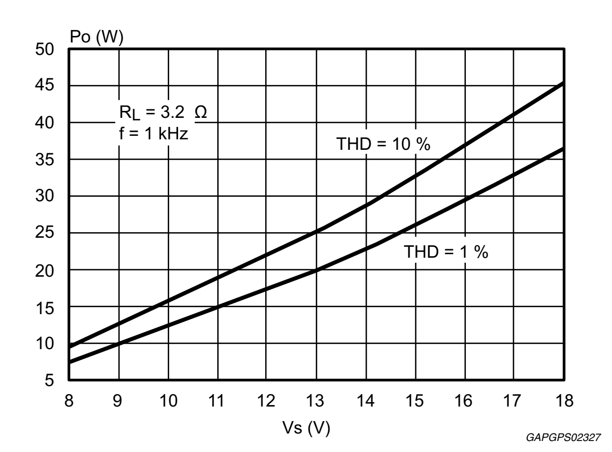


Figure 10. Distortion vs. frequency (R_L = 3.2 Ω)

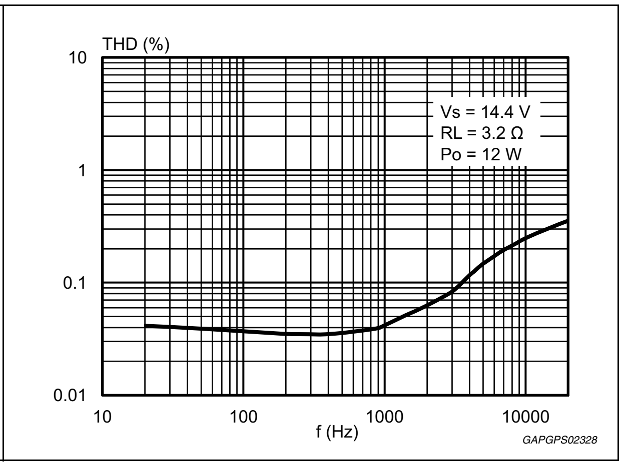


Figure 11. Supply voltage rejection vs. frequency

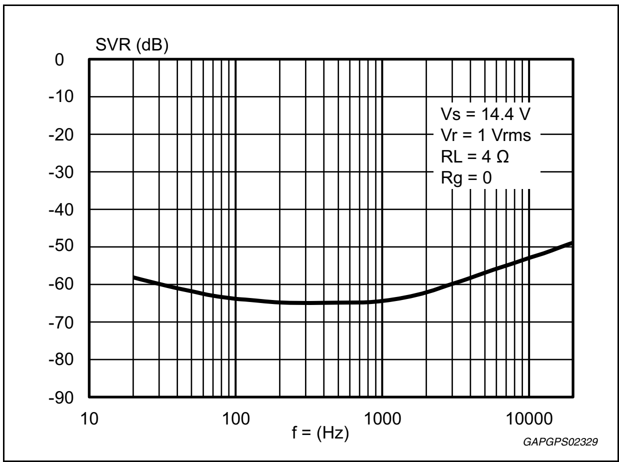


Figure 12. Common mode rejection vs. frequency

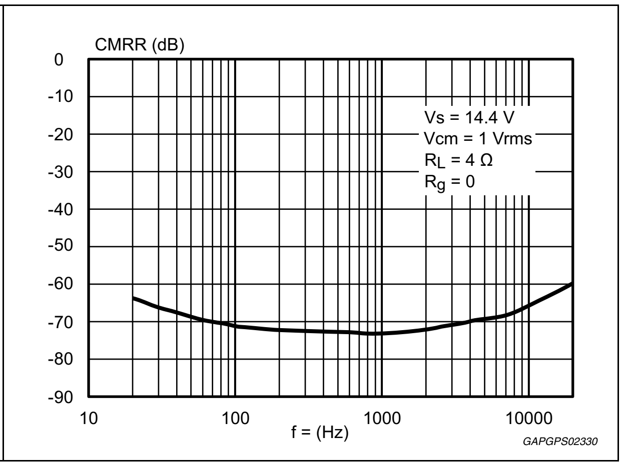


Figure 13. Total power dissipation and efficiency vs. output power (R_L = 4Ω)

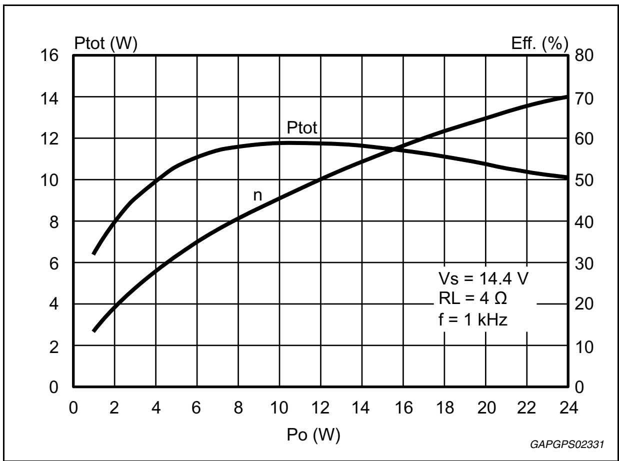
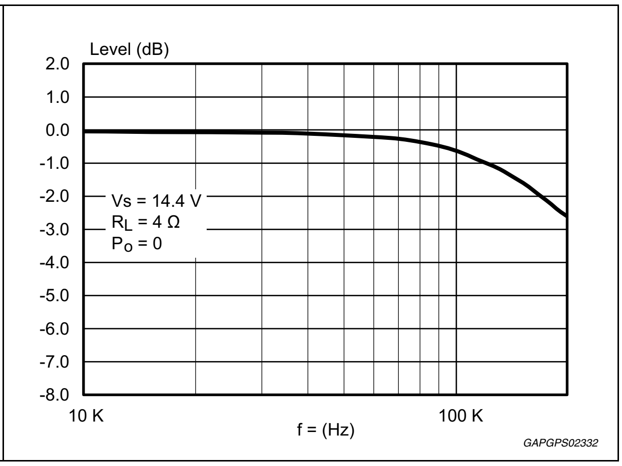


Figure 14. Power bandwidth



3 Package information

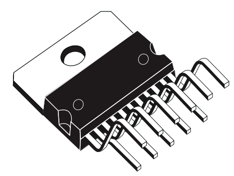
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.

ECOPACK® is an ST trademark

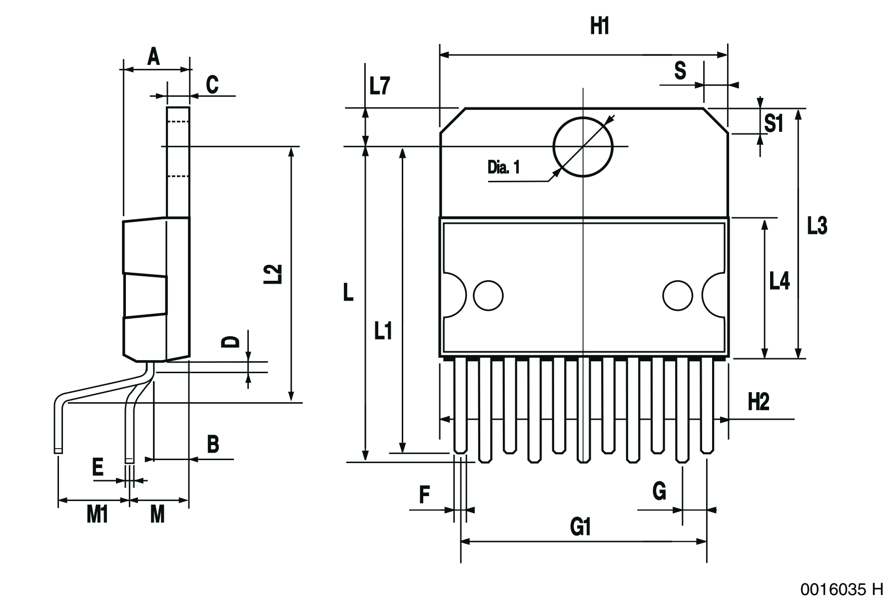
Figure 15. Multiwatt11 (vertical) mechanical data and package dimensions

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	0.88		0.95	0.035		0.037
G	1.45	1.7	1.95	0.057	0.067	0.077
G1	16.75	17	17.25	0.659	0.669	0.679
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	17.4		18.1	0.685		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



Multiwatt11 (Vertical)



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4 Revision history

Table 6. Document revision history

Date	Revision	Changes
24-May1998	3	Initial release.
19-Jun-2013	4	Updated *Table 3: Absolute maximum ratings on page 7*.
18-Sep-2013	5	Updated Disclaimer.