



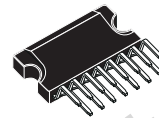
# TDA7496SA

## 5W+5W AMPLIFIER WITH DC VOLUME CONTROL

PRODUCT PREVIEW

- 5+5W OUTPUT POWER  
 $R_L = 8\Omega$  @THD = 10%  $V_{CC} = 22V$
- ST-BY AND MUTE FUNCTIONS
- LOW TURN-ON TURN-OFF POP NOISE
- LINEAR VOLUME CONTROL DC COUPLED WITH POWER OP. AMP.
- NO BOUCHEROT CELL
- NO ST\_BY RC INPUT NETWORK
- SINGLE SUPPLY RANGING UP TO 35V
- SHORT CIRCUIT PROTECTION
- THERMAL OVERLOAD PROTECTION
- INTERNALLY FIXED GAIN
- SOFT CLIPPING
- VARIABLE OUTPUT AFTER VOLUME CONTROL CIRCUIT
- CLIPWATT 15 PACKAGE

### MULTIPOWER BI50II TECHNOLOGY



Clipwatt 15

ORDERING NUMBER: TDA7496SA

amplifier assembled in the @Clipwatt 15 package, specially designed for high quality sound TV applications.

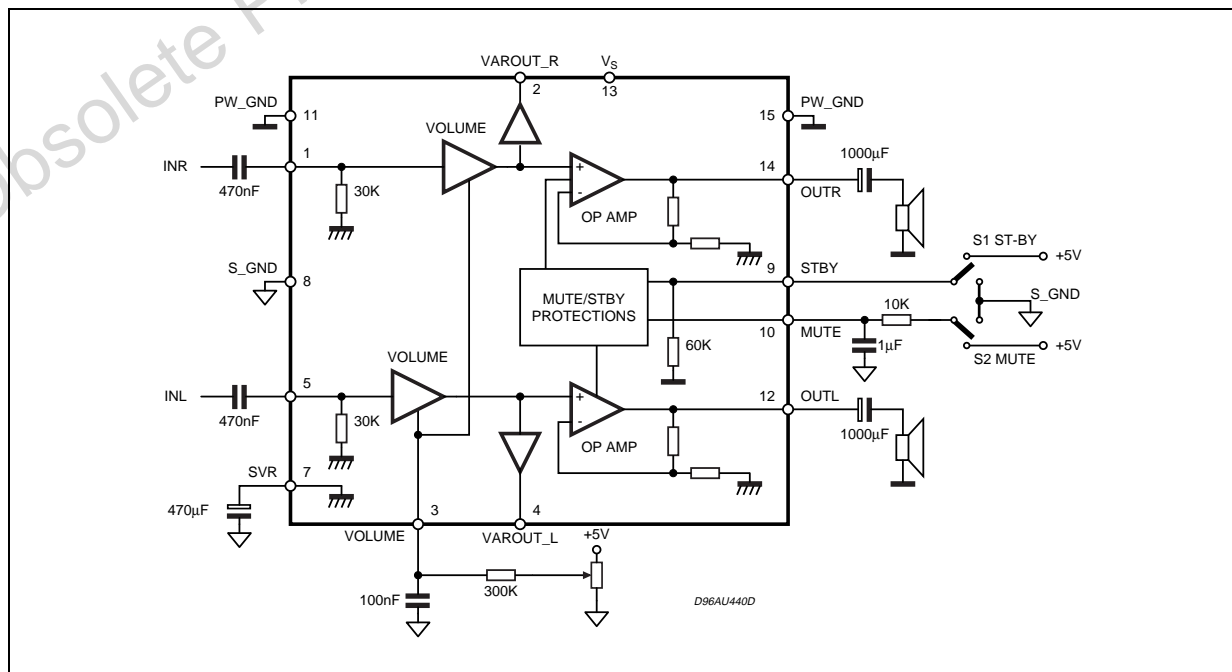
Features of the TDA7496SA include linear volume control Stand-by and Mute functions.

The TDA7496SA is pin to pin compatible with TDA7496, TDA7496S, TDA7496SA, TDA7495, TDA7495SA, TDA7494S, TDA7494SA.

### DESCRIPTION

The TDA7496SA is a stereo 5+5W class AB power

### BLOCK DIAGRAM



September 2003

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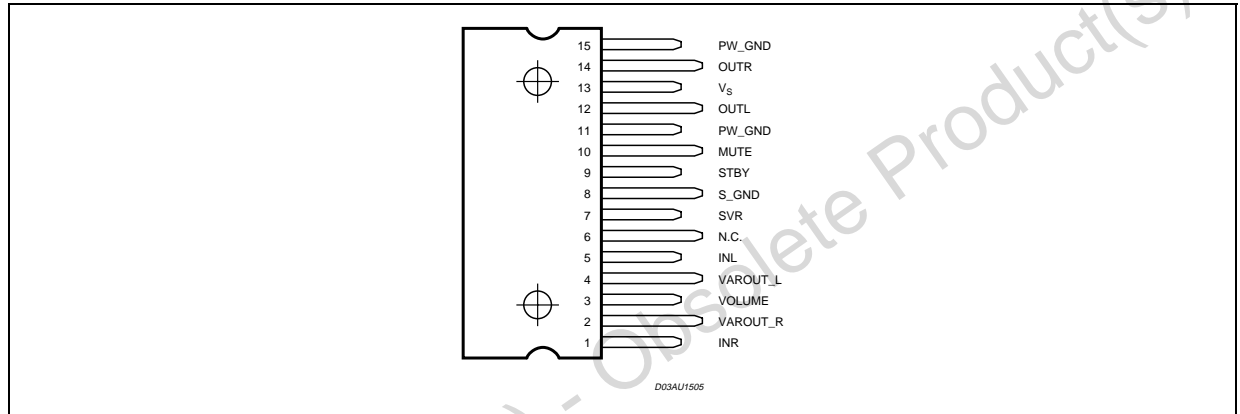
This is preliminary information on a new product now in development. Details are subject to change without notice.

# TDA7496SA

## ABSOLUTE MAXIMUM RATINGS

| Symbol                            | Parameter   | Value      | Unit            |
|-----------------------------------|---|------------|-----------------|
| V <sub>S</sub>                    | DC Supply Voltage                                 | 35         | V               |
| V <sub>IN</sub>                   | Maximum Input Voltage                             | 8          | V <sub>pp</sub> |
| P <sub>tot</sub>                  | Total Power Dissipation (T <sub>amb</sub> = 70°C) | 16         | W               |
| T <sub>amb</sub>                  | Ambient Operating Temperature (1)                 | 0 to 70    | °C              |
| T <sub>stg</sub> , T <sub>J</sub> | Storage and Junction Temperature                  | -40 to 150 | °C              |
| V <sub>3</sub>                    | Volume Control DC Voltage                         | 7          | V               |

## PIN CONNECTION (top view)



## THERMAL DATA

| Symbol                 | Parameter                                | Value                | Unit |
|------------------------|--|----------------------|------|
| R <sub>th j-case</sub> | Thermal Resistance junction-case         | Typ. = 4.5; Max. = 5 | °C/W |
| R <sub>th j-amb</sub>  | Thermal Resistance junction-ambient Max. | 48                   | °C/W |

## ELECTRICAL CHARACTERISTICS

(Refer to the test circuit R<sub>L</sub> = 8Ω, f = 1KHz, R<sub>G</sub> = 50Ω, V<sub>S</sub> = 22V, T<sub>amb</sub> = 25°C)

| Symbol            | Parameter                                  | Test Condition  | Min. | Typ.       | Max. | Unit |
|-------------------|--|---|------|------------|------|------|
| V <sub>S</sub>    | Supply Voltage Range                       |   | 10   |            | 32   | V    |
| I <sub>q</sub>    | Total Quiescent Current                    |   |      | 25         | 50   | mA   |
| DCV <sub>os</sub> | Output DC Offset Referred to SVR Potential | No Input Signal   |      | 200        |      | mV   |
| V <sub>O</sub>    | Quiescent Output Voltage                   |   |      | 11         |      | V    |
| P <sub>O</sub>    | Output Power                               | THD = 10%; R <sub>L</sub> = 8Ω;<br>THD = 1%; R <sub>L</sub> = 8Ω;   | 5    | 5.5<br>4   |      | W    |
|                   |  | THD = 10%; R <sub>L</sub> = 4Ω; V <sub>S</sub> = 12V<br>THD = 1%; R <sub>L</sub> = 4Ω; V <sub>S</sub> = 12V |      | 2.1<br>1.0 |      | W    |
| THD               | Total Harmonic Distortion                  | G <sub>V</sub> = 30dB; P <sub>O</sub> = 1W; f = 1KHz  |      |            | 0.4  | %    |

**ELECTRICAL CHARACTERISTICS** (continued)(Refer to the test circuit  $R_L = 8\Omega$ ,  $f = 1\text{KHz}$ ,  $R_G = 50\Omega$ ,  $V_S = 22\text{V}$ ,  $T_{\text{amb}} = 25^\circ\text{C}$ )

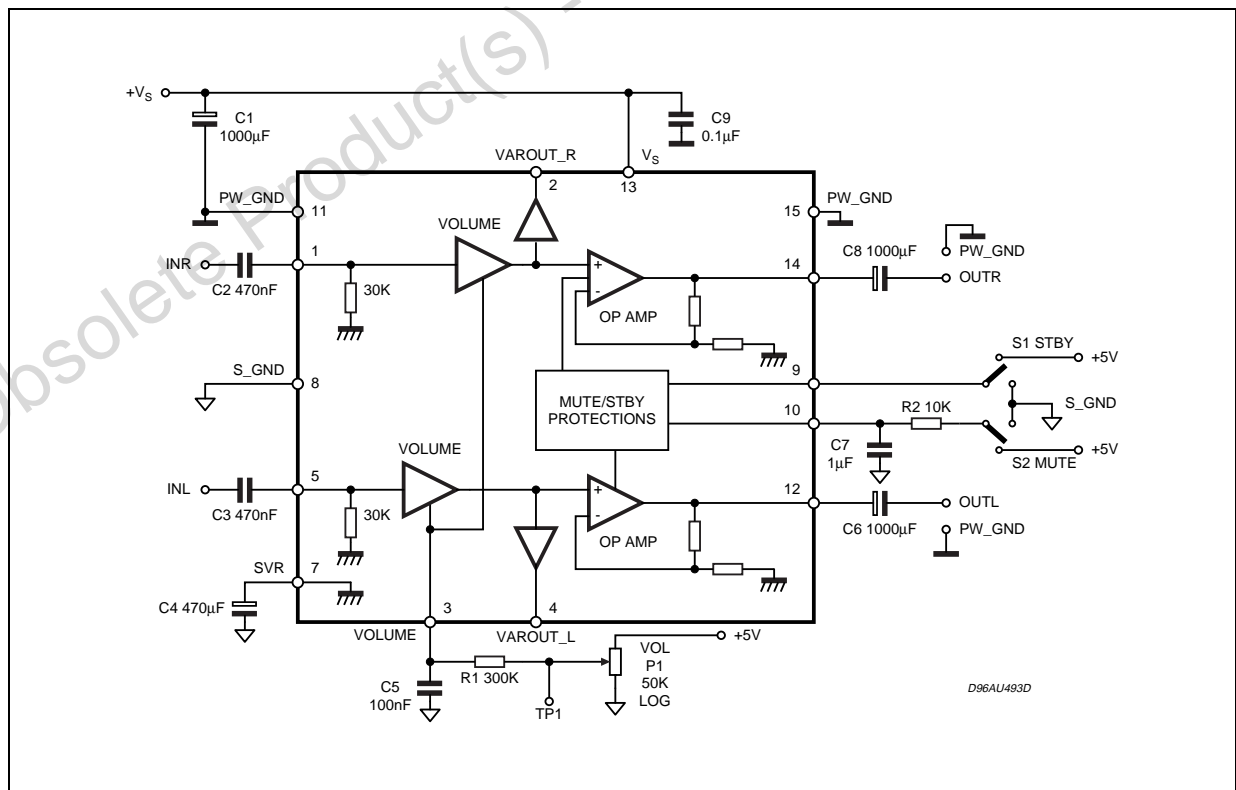
| Symbol                                      | Parameter                     | Test Condition   | Min. | Typ. | Max. | Unit             |
|---|-------------------------------|--|------|------|------|------------------|
| $I_{\text{peak}}$                           | Output Peak Current           | (internally limited)   | 1.0  | 1.3  |      | A                |
| $V_{\text{IN}}$                             | Input Signal                  |  |      |      | 2.8  | V <sub>rms</sub> |
| $G_V$                                       | Closed Loop Gain              | $V_{\text{OI Ctrl}} > 4.5\text{V}$   | 28.5 | 30   | 31.5 | dB               |
| $G_{\text{VLine}}$                          | Monitor Out Gain              | $V_{\text{OI Ctrl}} > 4.5\text{V}$ ; $Z_{\text{load}} > 30\text{K}\Omega$                                  | -1.5 | 0    | 1.5  | dB               |
| $A_{\text{Min VOL}}$                        | Attenuation at Minimum Volume | $V_{\text{OI Ctrl}} < 0.5\text{V}$   | 80   |      |      | dB               |
| BW  |                               |  |      | 0.6  |      | MHz              |
| $e_N$                                       | Total Output Noise            | $f = 20\text{Hz to } 22\text{KHz}$<br>PLAY, max volume   |      | 500  | 800  | $\mu\text{V}$    |
|   |                               | $f = 20\text{Hz to } 22\text{KHz}$<br>PLAY, max attenuation  |      | 100  | 250  | $\mu\text{V}$    |
|   |                               | $f = 20\text{Hz to } 22\text{KHz}$ MUTE  |      | 60   | 150  | $\mu\text{V}$    |
| SR  | Slew Rate                     |  | 5    | 8    |      | V/ $\mu\text{s}$ |
| $R_i$                                       | Input Resistance              |  | 22.5 | 30   |      | K $\Omega$       |
| $R_{\text{Var Out}}$                        | Variable Output Resistance    |  |      | 30   | 100  | $\Omega$         |
| $R_{L \text{ Var Out}}$                     | Variable Output Load          |  | 2    |      |      | K $\Omega$       |
| SVR   | Supply Voltage Rejection      | $f = 1\text{KHz}$ ; max volume<br>$C_{\text{SVR}} = 470\mu\text{F}$ ; $V_{\text{RIP}} = 1\text{Vrms}$      | 35   | 39   |      | dB               |
|   |                               | $f = 1\text{KHz}$ ; max attenuation<br>$C_{\text{SVR}} = 470\mu\text{F}$ ; $V_{\text{RIP}} = 1\text{Vrms}$ | 55   | 65   |      | dB               |
| $T_M$                                       | Thermal Muting                |  |      | 150  |      | $^\circ\text{C}$ |
| $T_S$                                       | Thermal Shut-down             |  |      | 160  |      | $^\circ\text{C}$ |
| <b>MUTE &amp; INPUT SELECTION FUNCTIONS</b> |                               |  |      |      |      |                  |
| $V_{\text{ST-ON}}$                          | Stand-by ON Threshold         |  | 3.5  |      |      | V                |
| $V_{\text{ST-OFF}}$                         | Stand-by OFF Threshold        |  |      |      | 1.5  | V                |
| $V_{\text{MUTEON}}$                         | Mute ON threshold             |  | 3.5  |      |      | V                |
| $V_{\text{MUTEOFF}}$                        | Mute OFF threshold            |  |      |      | 1.5  | V                |
| $A_{\text{MUTE}}$                           | Mute Attenuation              |  | 50   | 65   |      | dB               |
| $I_{\text{qST-BY}}$                         | Quiescent Current @ Stand-by  |  |      | 0.6  | 1    | mA               |
| $I_{\text{stbyBIAS}}$                       | Stand-by bias current         | Stand by ON: $V_{\text{ST-BY}} = 5\text{V}$ ;<br>$V_{\text{mute}} = 5\text{V}$                             |      | 80   |      | $\mu\text{A}$    |
|   |                               | Play or Mute   | -20  | -5   |      | $\mu\text{A}$    |
| $I_{\text{muteBIAS}}$                       | Mute Bias Current             | Mute   |      | 1    | 5    | $\mu\text{A}$    |
|   |                               | Play   |      | 0.2  | 2    | $\mu\text{A}$    |

**APPLICATION SUGGESTIONS**

The recommended values of the external components are those shown on the application circuit of figure 1. Different values can be used, the following table can help the designer.

| COMPONENT | SUGGESTION VALUE | PURPOSE                      | LARGER THAN SUGGESTION        | SMALLER THAN SUGGESTION        |
|-----------|------------------|------------------------------|-------------------------------|--------------------------------|
| R1        | 300K             | Volume Control Circuit       | Larger volume regulation time | Smaller volume regulation time |
| R2        | 10K              | Mute time constant           | Larger mute on/off time       | Smaller mute on/off time       |
| P1        | 50K              | Volume Control Circuit       |                               |                                |
| C1        | 1000µF           | Supply voltage bypass        |                               | Danger of oscillation          |
| C2        | 470nF            | Input DC decoupling          | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C3        | 470nF            | Input DC decoupling          | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C4        | 470µF            | Ripple rejection             | Better SVR                    | Worse SVR                      |
| C5        | 100nF            | Volume control time constant | Larger volume regulation time | Smaller volume regulation time |
| C6        | 1000µF           | Output DC decoupling         | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C7        | 1µF              | Mute time constant           | Larger mute on/off time       | Smaller mute on/off time       |
| C8        | 1000µF           | Output DC decoupling         | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C9        | 100nF            | Supply voltage bypass        |                               | Danger of oscillation          |

Figure 1. Application Circui

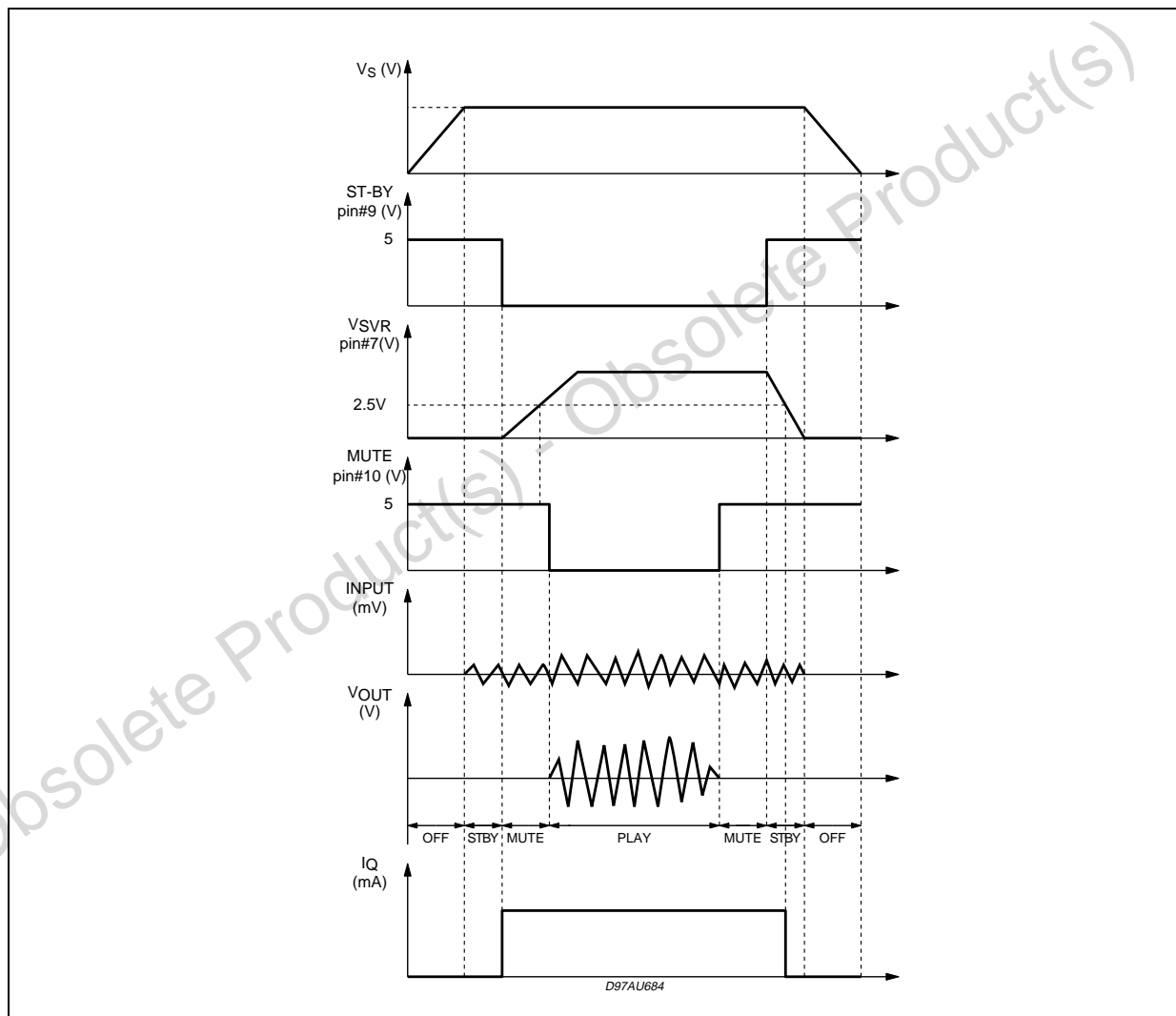


**MUTE STAND-BY TRUTH TABLE**

| MUTE | St-BY | OPERATING CONDITION |
|------|-------|---------------------|
| H    | H     | STAND-BY            |
| L    | H     | STAND-BY            |
| H    | L     | MUTE                |
| L    | L     | PLAY                |

Turn ON/OFF Sequences (for optimizing the POP performances)

**Figure 1. USING ONLY THE MUTE FUNCTION**

**USING ONLY THE MUTE FUNCTION**

To simplify the application, the stand-by pin can be connected directly to Ground. During the ON/OFF transitions is recommended to respect the following conditions:

- At the turn-on the transition mute to mute - play must be made when the SVR pin is higher than 2.5V
- At the turn-off the TDA7496A must be brought to mute from the play condition when the SVR pin is higher than 2.5V.

Figure 2. P.C.B. and Component layout PCB and Component Layout

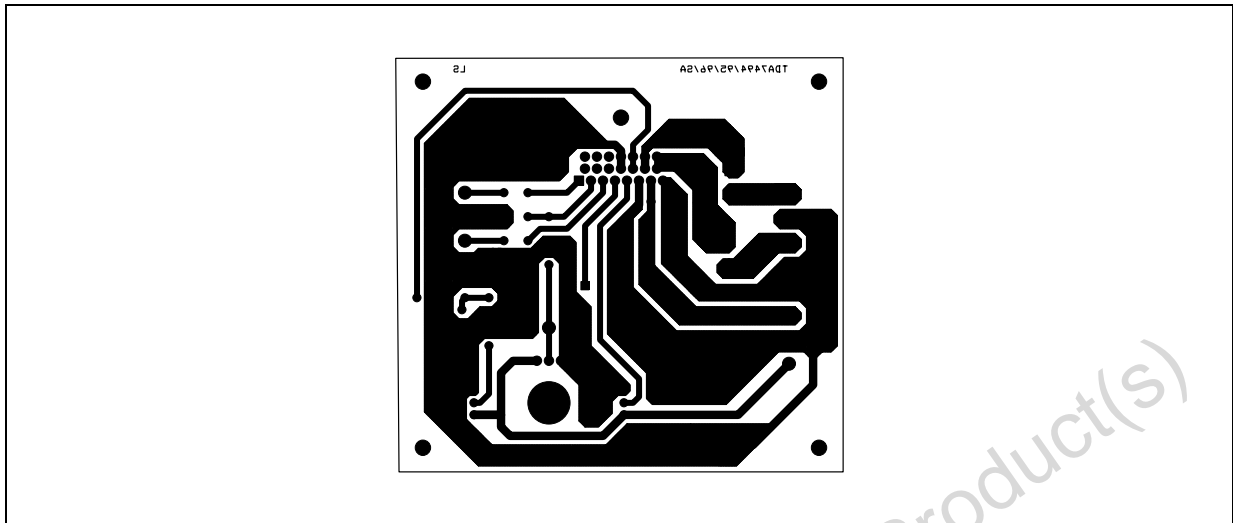


Figure 3.

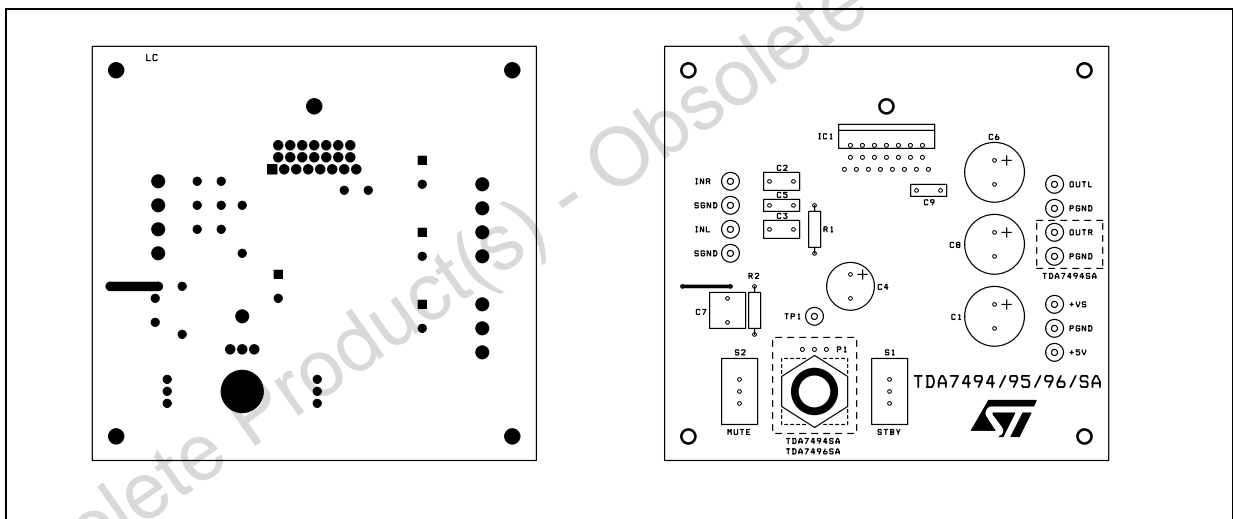


Figure 4. Quiescent Current vs. Supply Voltage

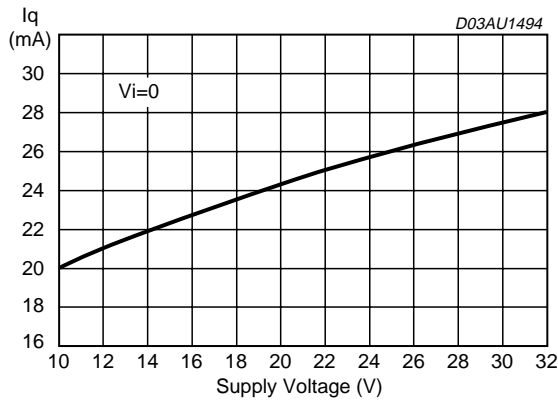


Figure 7. Output DC Offset vs. Supply Voltage

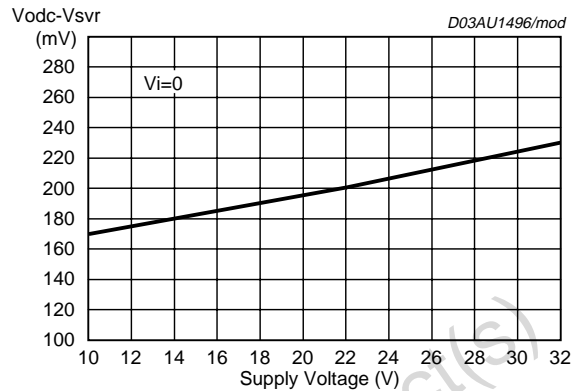


Figure 5. Output Dc Offset vs. Supply Voltage

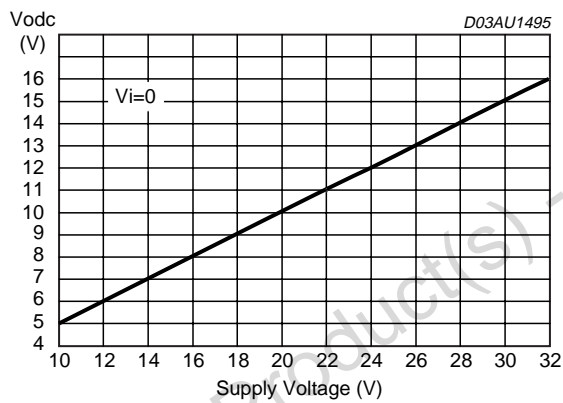


Figure 8. Output Power vs Supply Voltage

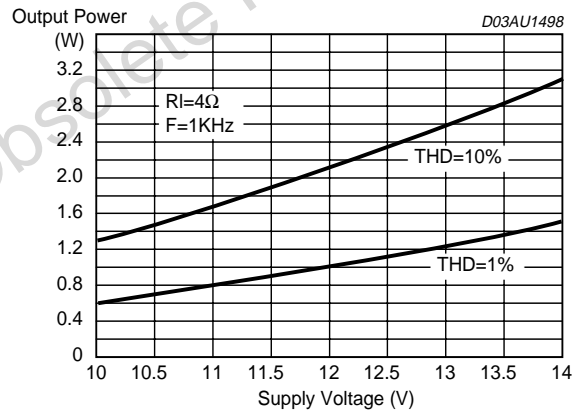


Figure 6. Output Power vs. Supply Voltage

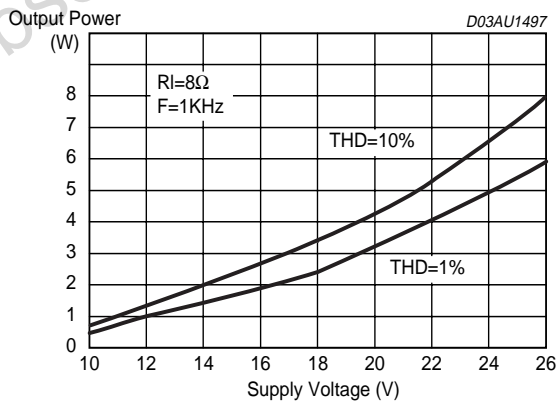


Figure 9. Distortion vs Output Power

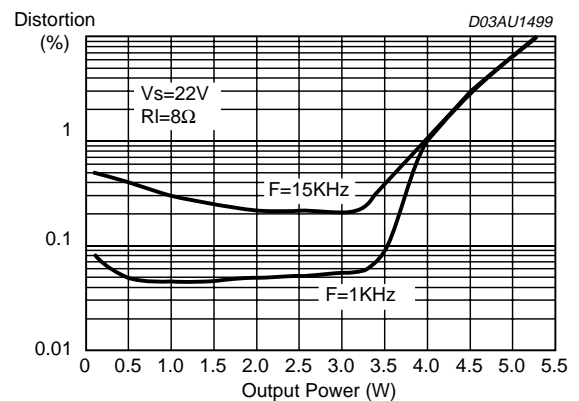


Figure 10. Distortion vs Output Power

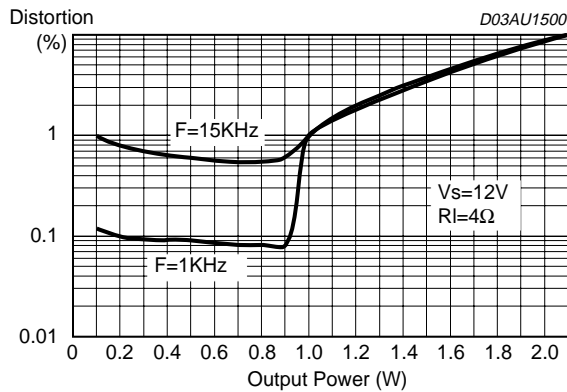


Figure 11. Closed Loop Gain vs. Frequency

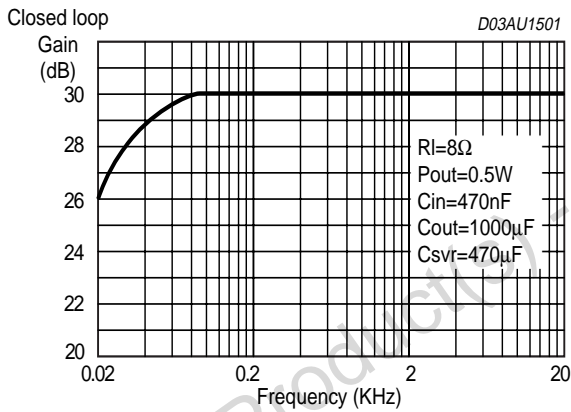


Figure 12. St-By Attenuation vs Vpin 9

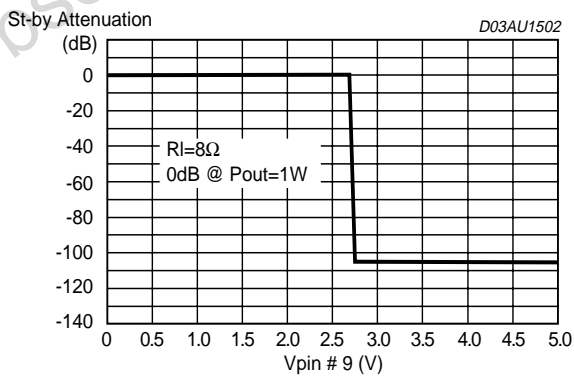
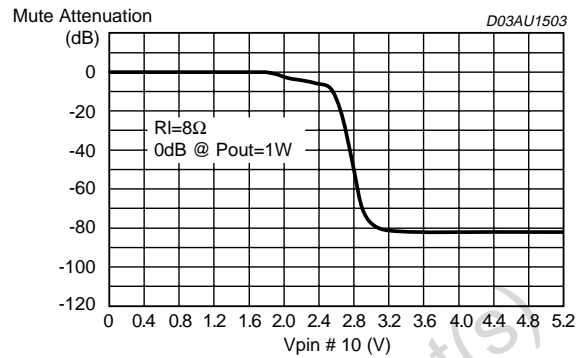


Figure 13. Mute Attenuation vs Vpin 10



PINS DESCRIPTION

Figure 14. PIN SVR

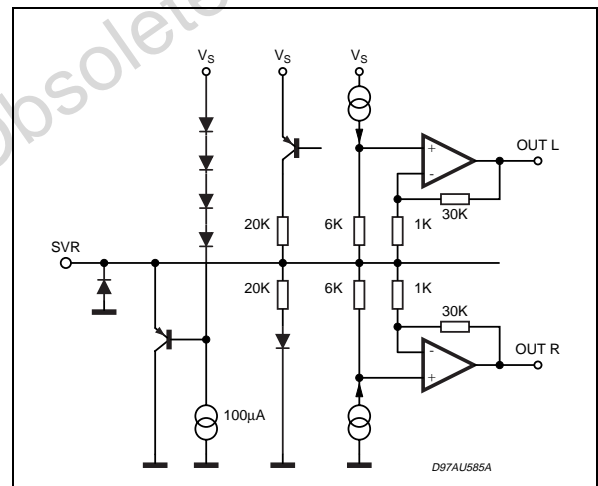


Figure 15. PINS: INL, INR

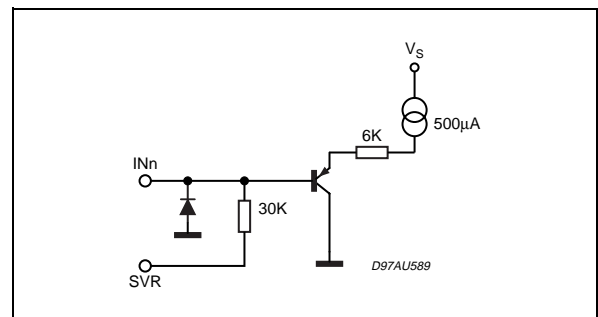




Figure 17. PIN ST-BY

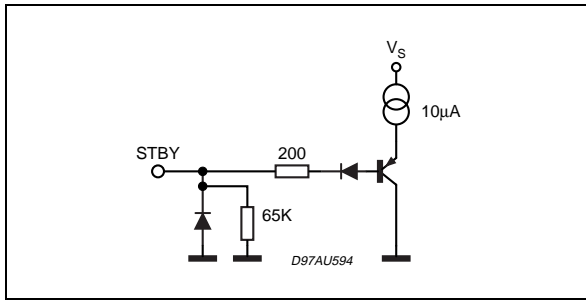


Figure 20. PINS: VAROUT-L VAROUT-R

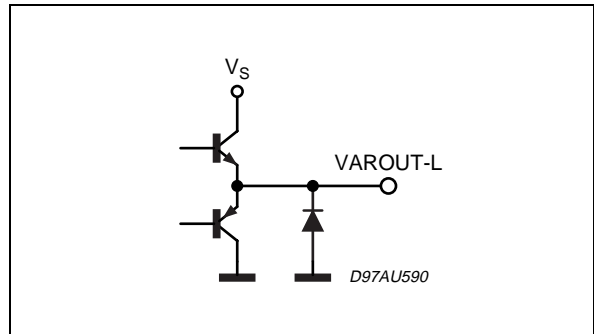


Figure 18. PIN: MUTE

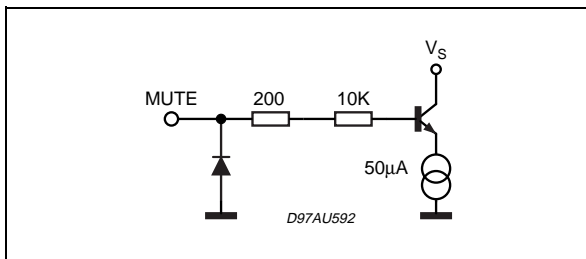


Figure 21. PIN: VOLUME

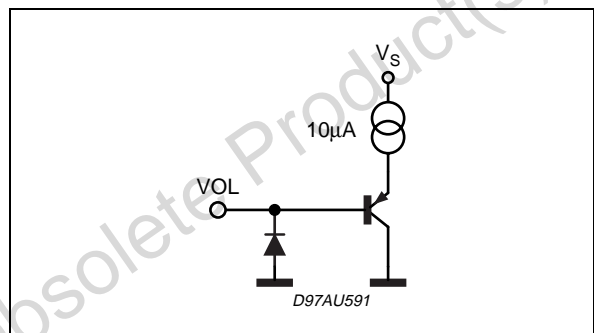


Figure 19. PINS: OUT R, OUT L

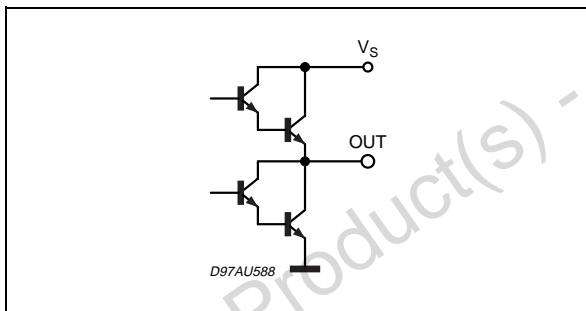
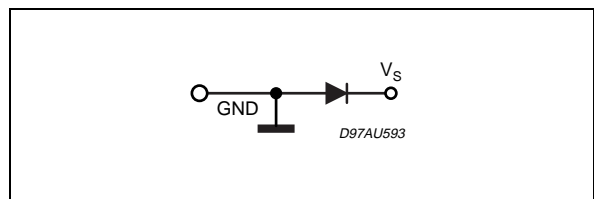


Figure 22. PINS: PW-GND, S-GND



**HEAT SINK DIMENSIONING:**

In order to avoid the thermal protection intervention, that is placed approximatively at  $T_j = 150^\circ\text{C}$ , it is important the dimensioning of the Heat Sink  $R_{Th}$  ( $^\circ\text{C}/\text{W}$ ).

The parameters that influence the dimensioning are:

- Maximum dissipated power for the device ( $P_{dmax}$ )
- Max thermal resistance Junction to case ( $R_{Th\ j-c}$ )
- Max. ambient temperature  $T_{amb\ max}$
- Quiescent current  $I_q$  (mA)

Example:

$V_{CC} = 22\text{V}$ ,  $R_{load} = 80\text{ohm}$ ,  $R_{Th\ j-c} = 5\ ^\circ\text{C}/\text{W}$ ,  $T_{amb\ max} = 50^\circ\text{C}$

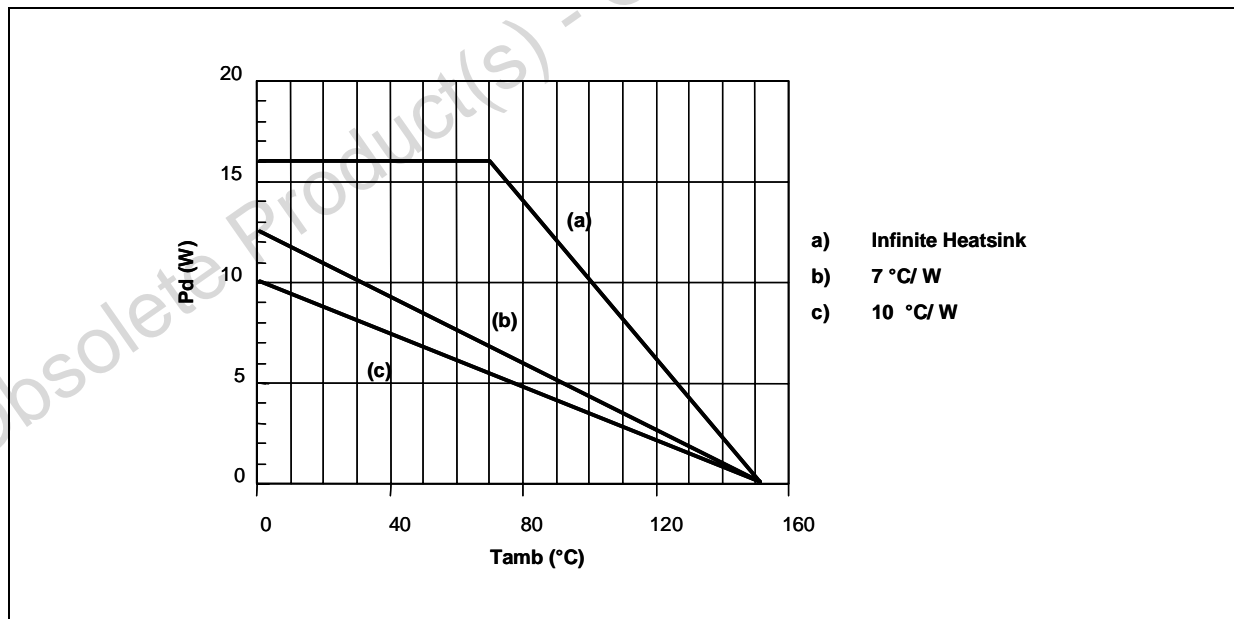
$$P_{dmax} = (N^\circ \text{ channels}) \cdot \frac{V_{cc}^2}{2\Pi^2 \cdot R_{load}} + I_q \cdot V_{cc}$$

$$P_{dmax} = 2 \cdot (3.0) + 0.5 = 6.5\ \text{W}$$

$$(\text{Heat Sink}) R_{Th\ c-a} = \frac{150 - T_{amb\ max}}{P_{d\ max}} - R_{Th\ j-c} = \frac{150 - 50}{6.5} - 5.0 = 10^\circ\text{C}/\text{W}$$

In figure 23 is shown the Power derating curve for the device.

**Figure 23. Power derating curve**



### Clipwatt Assembling Suggestions

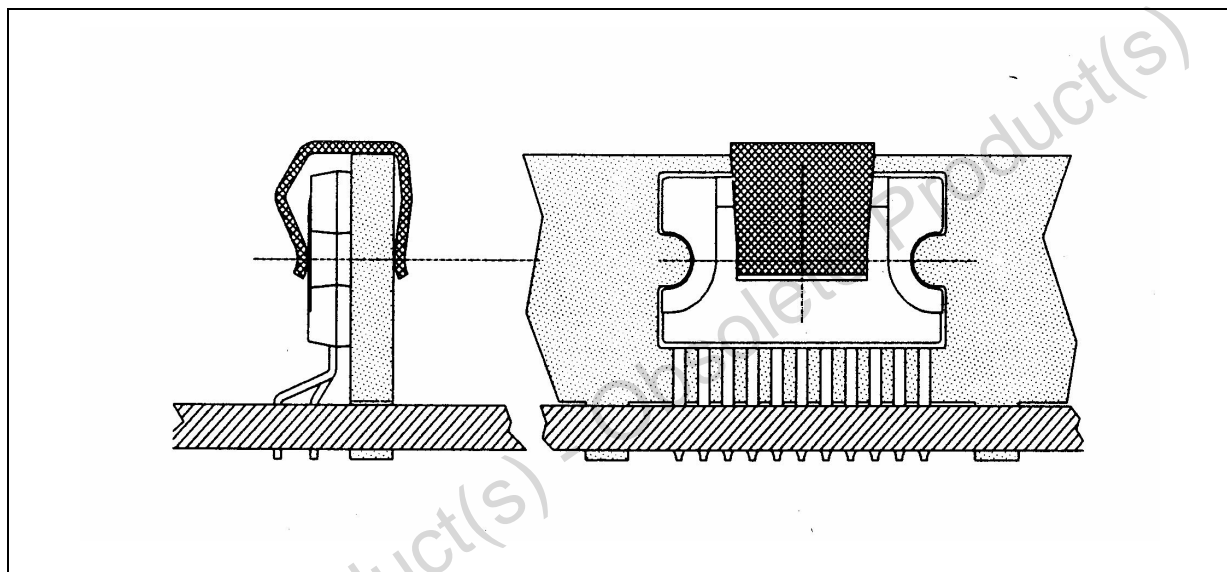
The suggested mounting method of Clipwatt on external heat sink, requires the use of a clip placed as much as possible in the plastic body center, as indicated in the example of figure 24.

A thermal grease can be used in order to reduce the additional thermal resistance of the contact between package and heatsink.

A pressing force of 7 - 10 Kg gives a good contact and the clip must be designed in order to avoid a maximum contact pressure of 15 Kg/mm<sup>2</sup> between it and the plastic body case.

As example, if a 15Kg force is applied by the clip on the package, the clip must have a contact area of 1mm<sup>2</sup> at least.

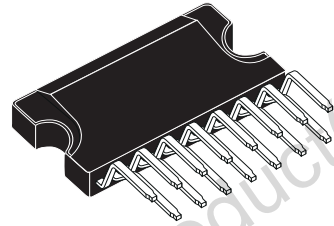
**Figure 24. Example of right placement of the clip**



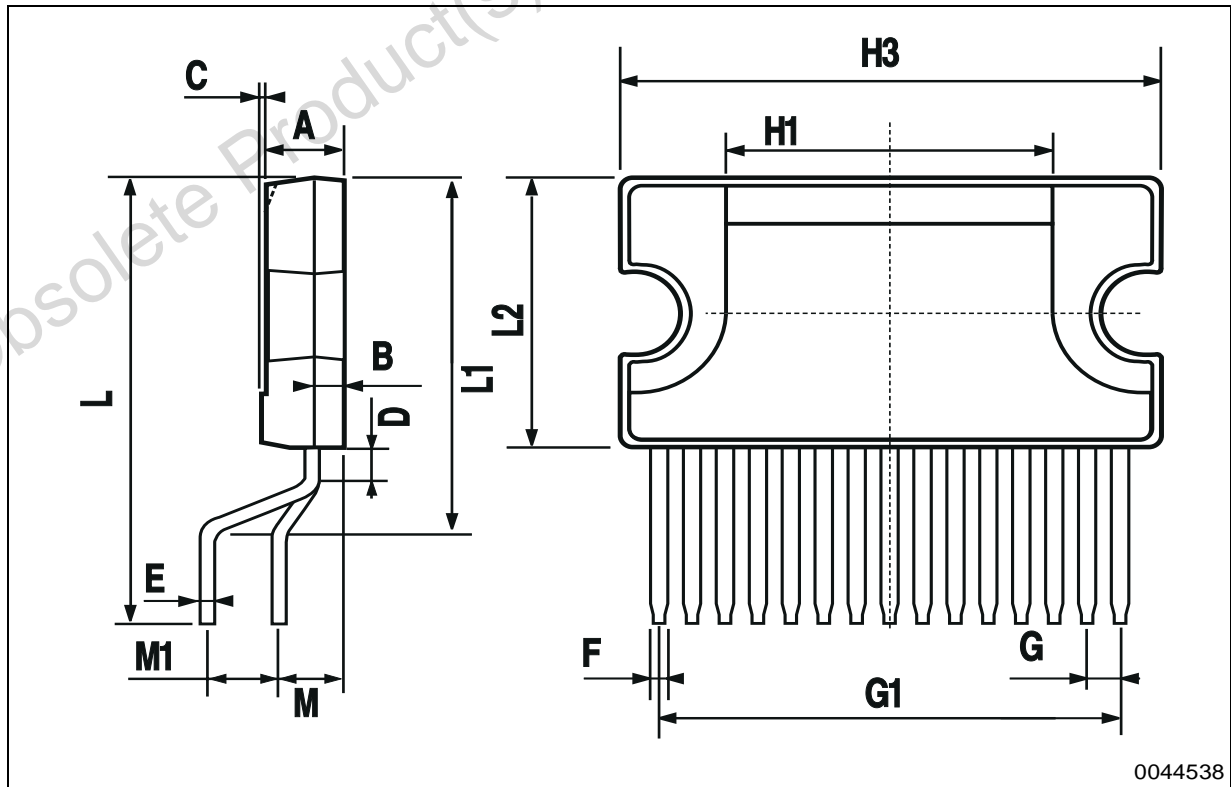
| DIM. | mm    |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    |       |       | 3.2   |       |       | 0.126 |
| B    |       |       | 1.05  |       |       | 0.041 |
| C    |       | 0.15  |       |       | 0.006 |       |
| D    |       | 1.55  |       |       | 0.061 |       |
| E    | 0.49  |       | 0.55  | 0.019 |       | 0.022 |
| F    | 0.67  |       | 0.73  | 0.026 |       | 0.029 |
| G    | 1.14  | 1.27  | 1.4   | 0.045 | 0.050 | 0.055 |
| G1   | 17.57 | 17.78 | 17.91 | 0.692 | 0.700 | 0.705 |
| H1   |       | 12    |       |       | 0.480 |       |
| H2   |       | 18.6  |       |       | 0.732 |       |
| H3   | 19.85 |       |       | 0.781 |       |       |
| L    |       | 17.95 |       |       | 0.707 |       |
| L1   |       | 14.45 |       |       | 0.569 |       |
| L2   | 10.7  | 11    | 11.2  | 0.421 | 0.433 | 0.441 |
| L3   |       | 5.5   |       |       | 0.217 |       |
| M    |       | 2.54  |       |       | 0.100 |       |
| M1   |       | 2.54  |       |       | 0.100 |       |

**OUTLINE AND MECHANICAL DATA**

Weight: 1.92gr



**Clipwatt15**



0044538

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