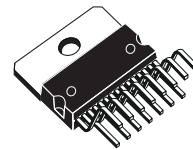


# 10W AMPLIFIER WITH DC VOLUME CONTROL

- 10W OUTPUT POWER  $R_L = 8\Omega$ ,  
@ THD = 10%  $V_{CC} = 28V$
- ST-BY AND MUTE FUNCTIONS
- LINEAR VOLUME CONTROL DC COUPLED  
WITH POWER OP AMPLIFIER
- NO BOUCHEROT CELL
- NO ST-BY RC INPUT NETWORK
- SIGNAL LINE OUTPUT BEFORE VOLUME  
CONTROLLING AND MUTING
- 3 SWITCHABLE VOLTAGE CONTROLLED  
INPUT PINS
- SINGLE SUPPLY RANGING UP TO 35V
- SHORT CIRCUIT PROTECTION
- THERMAL OVERLOAD PROTECTION
- INTERNALLY FIXED GAIN
- SOFT CLIPPING
- LOW TURN-ON TURN-OFF POP NOISE
- MULTIWATT 15 PACKAGE

## MULTIPOWER BI50II TECHNOLOGY

**Multiwatt15**

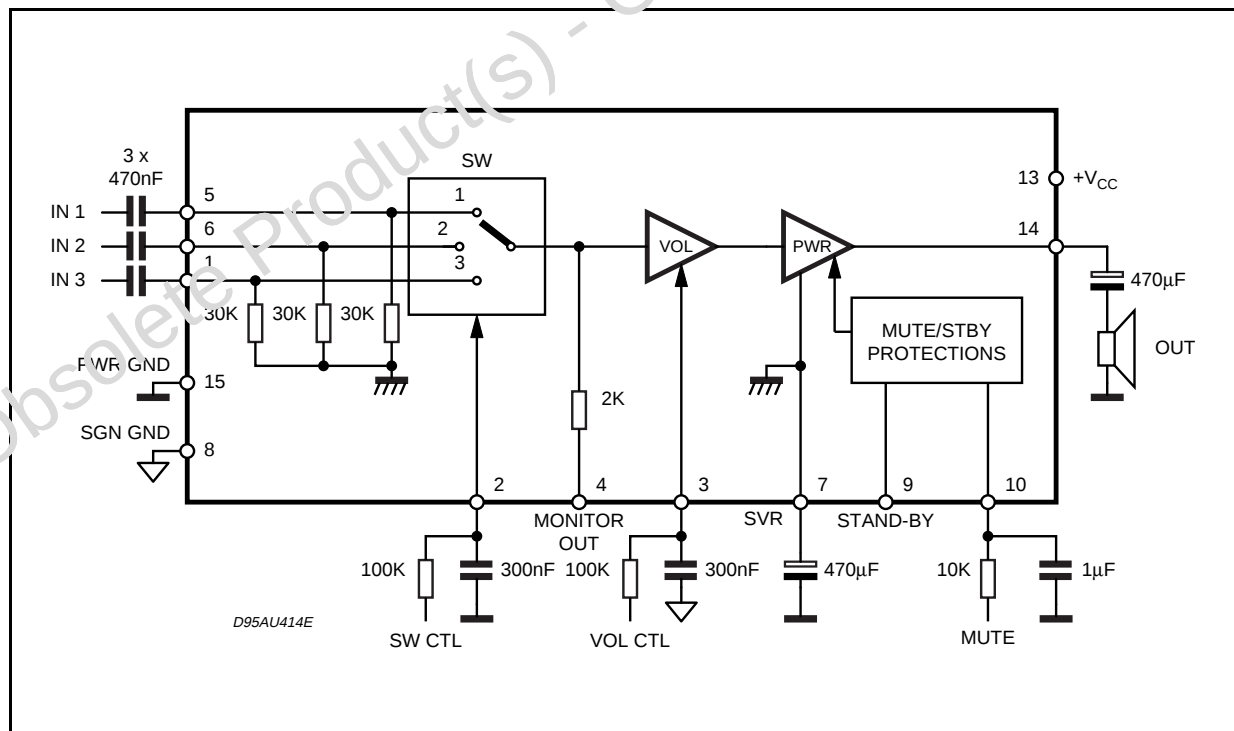
**ORDERING NUMBER: TDA7494**

### DESCRIPTION

The TDA7494 10W is class AB power amplifier assembled in the @Multiwatt 15 package, specially designed for high quality sound, TV applications.

Features of the TDA7494 include volume control, 3 switchable inputs, Stand-by and mute functions.

### BLOCK AND APPLICATION DIAGRAM

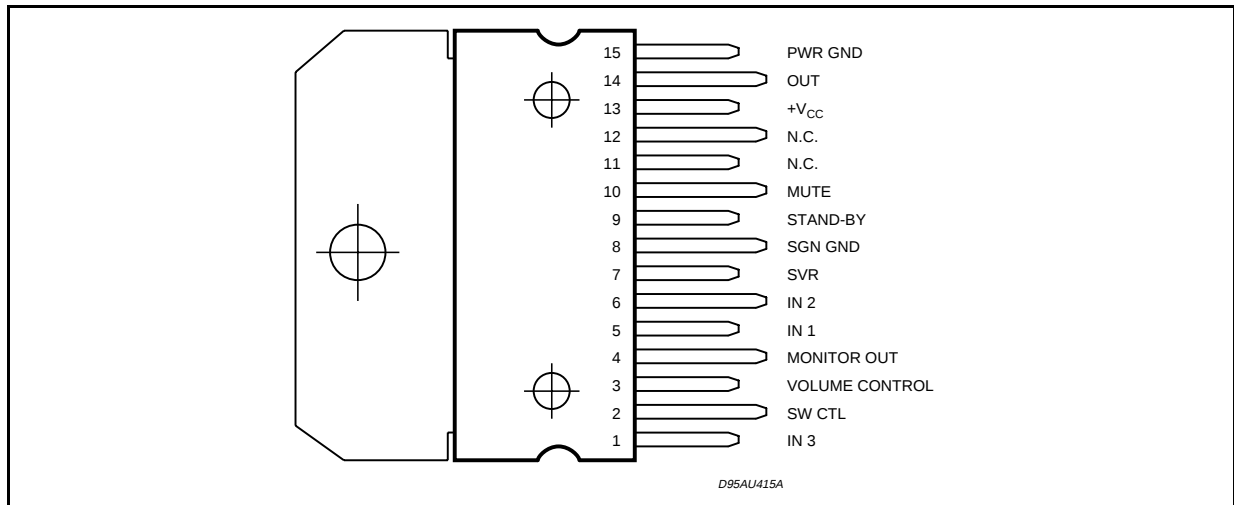


## ABSOLUTE MAXIMUM RATINGS

| Symbol         | Parameter                                                  | Value      | Unit               |
|----------------|------------------------------------------------------------|------------|--------------------|
| $V_S$          | DC Supply Voltage                                          | 40         | V                  |
| $V_{IN}$       | Maximum Input Voltage                                      | 8          | V <sub>pp</sub>    |
| $P_{tot}$      | Total Power Dissipation ( $T_{amb} = 70^{\circ}\text{C}$ ) | 16         | W                  |
| $T_{amb}$      | Ambient Operating Temperature Range (1)                    | -20 to +85 | $^{\circ}\text{C}$ |
| $T_{stg}, T_j$ | Storage and Junction Temperature                           | -40 to 150 | $^{\circ}\text{C}$ |
| $V_2, V_3$     | Volume CTRL DC voltage (2)                                 | 7          | V                  |

(1) Operation between -20 to 85  $^{\circ}\text{C}$  guaranteed by correlation with 0 to 70 $^{\circ}\text{C}$ .(2) Pin 3 is ESD sensitive (max. voltage  $\pm 1.5\text{kV}$ )

## PIN CONNECTION



## THERMAL DATA

| Symbol           | Parameter                           | Value                  | Unit                 |
|------------------|-------------------------------------|------------------------|----------------------|
| $R_{th\ j-case}$ | Thermal Resistance Junction-case    | Typ = 3.8    Max = 4.8 | $^{\circ}\text{C/W}$ |
| $R_{th\ j-amb}$  | Thermal Resistance Junction-ambient | max 35                 | $^{\circ}\text{C/W}$ |

**ELECTRICAL CHARACTERISTICS** (Refer to the test circuit,  $V_S = 21\text{V}$ ,  $R_L = 8\Omega$ ;  $R_g = 50\Omega$ ;  $T_{amb} = 25^{\circ}\text{C}$ ; unless otherwise specified.)

| Symbol | Parameter                                  | Test Condition                                                          | Min.       | Typ.     | Max. | Unit |
|--------|--------------------------------------------|-------------------------------------------------------------------------|------------|----------|------|------|
| $V_S$  | Supply Voltage Range                       |                                                                         | 11         |          | 35   | V    |
| $I_q$  | Total Quiescent Current                    |                                                                         |            | 22       | 50   | mA   |
| DCVos  | Output DC Offset Referred to SVR Potential | No Input Signal                                                         | -550       |          | 550  | mV   |
| $V_o$  | Quiescent Output Voltage                   | $V_S = 18\text{V}$                                                      | 7.8        | 9        | 10.2 | V    |
| $P_o$  | Output Power                               | THD = 10%; $V_{CC} = 28\text{V}$ , $R_L = 8\Omega$                      | 8          | 10       |      | W    |
|        |                                            | THD = 1%; $V_{CC} = 28\text{V}$                                         | 6          | 8        |      |      |
|        |                                            | THD = 10%; $V_{CC} = 21\text{V}$ ,<br>THD = 1%; $V_{CC} = 21\text{V}$ , | 5<br>3.5   | 5.5<br>4 |      | W    |
|        |                                            | THD = 10%; $V_{CC} = 21\text{V}$ , $R_L = 4\Omega$                      | 5          | 7.5      |      | W    |
|        |                                            | THD = 1%; $V_{CC} = 21\text{V}$ ,                                       | 3.9        | 5.5      |      |      |
|        |                                            | THD = 10%; $V_{CC} = 18\text{V}$ ,<br>THD = 1%; $V_{CC} = 18\text{V}$   | 4.5<br>3.5 | 6<br>4.5 |      | W    |
|        |                                            | THD = 10%; $V_{CC} = 18\text{V}$ , $R_L = 8\Omega$                      | 3.5        | 3.75     |      | W    |
|        |                                            | THD = 1%; $V_{CC} = 18\text{V}$                                         | 2.2        | 2.85     |      | W    |

## ELECTRICAL CHARACTERISTICS (continued)

| Symbol           | Parameter                    | Test Condition                                                              | Min. | Typ. | Max. | Unit             |
|------------------|------------------------------|-----------------------------------------------------------------------------|------|------|------|------------------|
| THD              | Total Harmonic Distortion    | $P_O = 1W$ ; $f = 1KHz$ ; $G_V = 26dB$                                      |      |      | 0.4  | %                |
| $I_{peak}$       | Output Peak Current          | (internally limited)                                                        | 1.4  | 1.9  |      | A                |
| $T_{op}$         | Operating Temperature        |                                                                             | 0    |      | 70   | °C               |
| $V_{in}$         | Input Signal                 |                                                                             |      |      | 2.8  | V <sub>rms</sub> |
| $G_V$            | Closed Loop Gain             | Vol Ctrl > 4.5V                                                             | 24.5 | 26   | 27.5 | dB               |
| $G_{VLine}$      | Monitor Out Gain             | $R_{LOAD Mon} = \infty$                                                     | -3   | -1.5 | 0    | dB               |
| $A_{MinVol}$     | Attenuation at Min Volume    | Vol Ctrl < 0.5V                                                             | 80   |      |      | dB               |
| BW               |                              |                                                                             |      | 0.6  |      | MHz              |
| $e_N$            | Total Output Noise           | $f = 20Hz$ to $22KHz$<br>Play, max volume                                   |      | 350  | 700  | μV               |
|                  |                              | $f = 20Hz$ to $22KHz$<br>Play, max attenuation                              |      | 60   | 100  | μV               |
|                  |                              | $f = 20Hz$ to $22KHz$<br>Mute                                               |      | 30   | 50   | μV               |
| SR               | Slew Rate                    |                                                                             | 5    | 8    |      | V/μs             |
| $R_i$            | Input Resistance             |                                                                             | 22.5 | 30   |      | KΩ               |
| $R_{Mon}$        | Monitor Output Resistance    |                                                                             | 1.4  | 2    | 3    | KΩ               |
| $R_{load Mon}$   | Monitor Output Load          |                                                                             | 30   |      |      | KΩ               |
| SVR              | Supply Voltage Rejection     | $f = 1kHz$ ; max volume<br>$C_{SVR} = 470\mu A$ ; $V_{RIP} = 1V_{RMS}$      | 36   | 43   |      | dB               |
|                  |                              | $f = 1kHz$ ; max attenuation<br>$C_{SVR} = 470\mu A$ ; $V_{RIP} = 1V_{RMS}$ | 60   | 73   |      | dB               |
| $T_M$            | Thermal Muting               |                                                                             |      | 150  |      | °C               |
| $T_s$            | Thermal Shut-down            |                                                                             |      | 160  |      | °C               |
| $V_{ST-BY}$      | Stand-by threshold           |                                                                             | 2.3  | 2.5  | 2.7  | V                |
| $V_{MUTE}$       | Mute Threshold               |                                                                             | 2.3  | 2.5  | 2.7  | V                |
| Sel #1           | Control Voltage              | Input #1 selected                                                           | 0    |      | 1    | V                |
| Sel #2           | Control Voltage              | Input #2 selected                                                           | 2.3  |      | 2.7  | V                |
| Sel #3           | Control Voltage              | Input #3 selected                                                           | 4    |      | 5    | V                |
| $I_{qST-BY}$     | Quiescent Current @ Stand-by |                                                                             |      | 0.6  | 1    | mA               |
| $A_{MUTE}$       | Mute Attenuation             |                                                                             | 60   | 75   |      | dB               |
| $I_{stbyBIAS}$   | Stand-by bias current        | Stand by on; $V_{ST-BY} = 5V$ ;<br>$V_{MUTE} = 5V$ ;                        |      | 80   | 150  | μA               |
|                  |                              | Play or Mute                                                                |      | 2    | 20   | μA               |
| $I_{muteBIAS}$   | Mute bias current            | Mute                                                                        |      | 1.5  | 10   | μA               |
|                  |                              | Play                                                                        |      | 0.5  | 5    | μA               |
| $I_{switchBIAS}$ | Switch bias current          | Input #1 selected                                                           |      | -0.5 | 5    | μA               |
|                  |                              | Input #2 selected                                                           |      | 1    | 10   | μA               |
|                  |                              | Input #3 selected                                                           |      | 1.5  | 20   | μA               |

Figure 1: Test and Application Circuit.

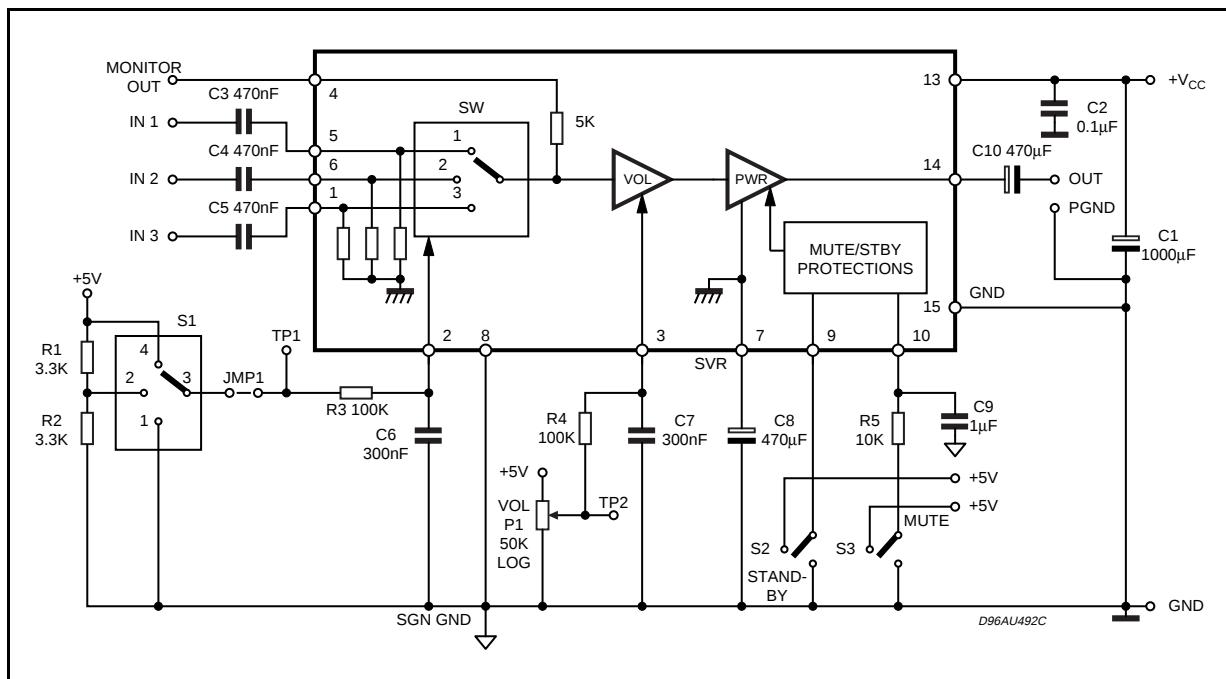
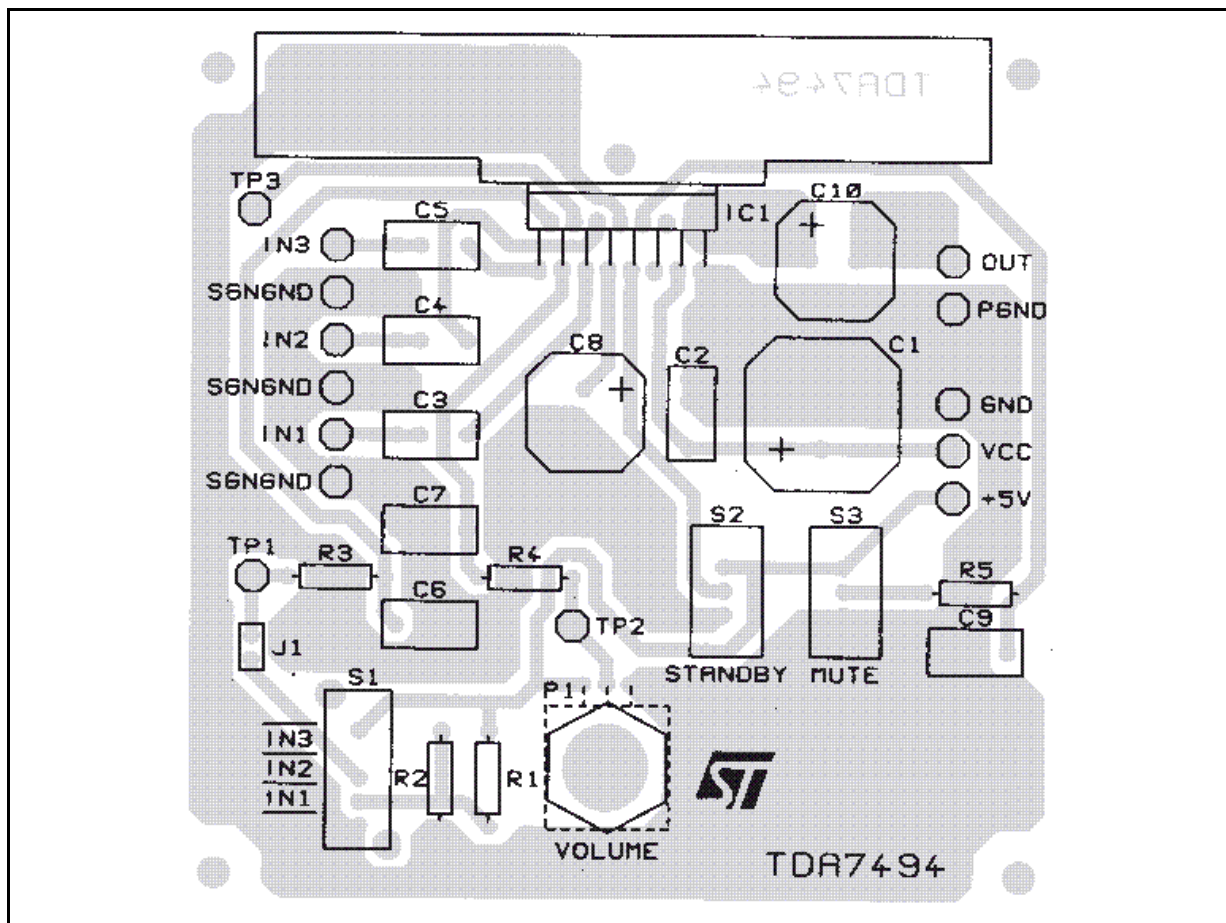


Figure 2: P.C.B. and component layout.



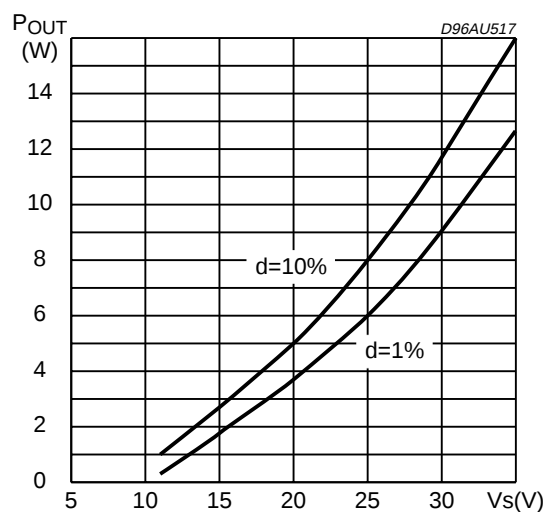
## APPLICATION SUGGESTIONS

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        | 3.3K $\Omega$    | Input switch circuit         | Vpin #2 shifted downward      | Vpin #2 shifted upward         |
| R2        | 3.3K $\Omega$    | Input switch circuit         | Vpin #2 shifted upward        | Vpin #2 shifted downward       |
| R3        | 100K $\Omega$    | Input switch time constant   | Larger Input Switch Time      | Smaller input switch time      |
| R4        | 100K $\Omega$    | Volume control time constant | Larger Volume Regulation Time | Smaller volume regulation time |
| R5        | 10K $\Omega$     | Mute time constant           | Larger mute on/off time       | Smaller mute on/off time       |
| P1        | 50K $\Omega$     | Volume control circuit       |                               |                                |
| C1        | 1000 $\mu$ F     | Supply voltage bypass        |                               | Danger of oscillation          |
| C2        | 100nF            | Supply voltage bypass        |                               | Danger of oscillation          |
| C3        | 470nF            | Input DC decoupling          | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C4        | 470nF            | Input DC decoupling          | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C5        | 470nF            | Input DC decoupling          | Lower low frequency cutoff    | Higher low frequency cutoff    |
| C6        | 300nF            | Input- switch time constant  | Larger-Input- switch time     | Smaller input- switch time     |
| C7        | 300nF            | Volume control time constant | Larger volume regulation time | Smaller volume regulation time |
| C8        | 470 $\mu$ F      | Ripple Rejection             | Better SVR                    | Worse SVR                      |
| C9        | 1 $\mu$ F        | Mute time constant           | Larger mute on/off time       | Smaller mute on/off time       |
| C10       | 470 $\mu$ F      | Output DC decoupling         | Lower low frequency cutoff    | Higher low frequency cutoff    |

**TYPICAL CHARACTERISTICS:** Refer to the Application Circuit of Fig.1  $V_S = 21V$ ;  $R_L = 8\Omega$ ;  $f = 1KHz$ ;  $R_s = 8\Omega$ ;  $T_{amb} = 25^\circ C$ ;  $R_s = 50\Omega$ ; unless otherwise specified

**Figure 3:** Output Power vs Supply Voltage



**Figure 4:** Distortion vs Output Power

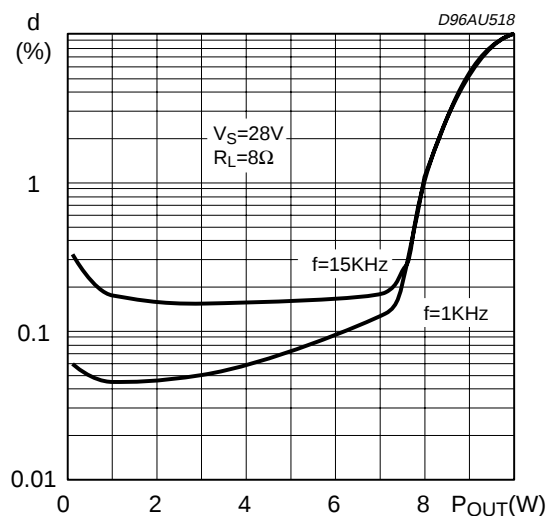


Figure 5: Output Power vs Supply Voltage

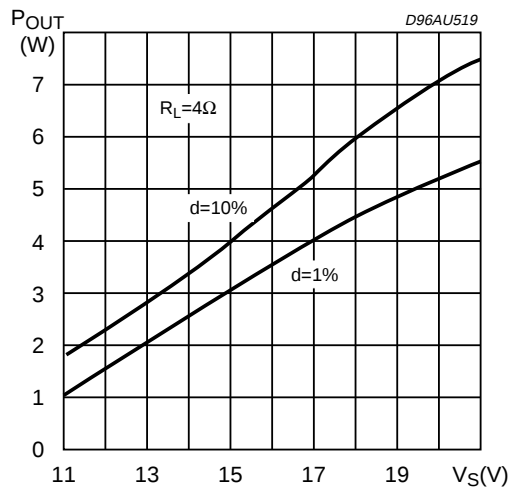


Figure 6: Distortion vs Output Power

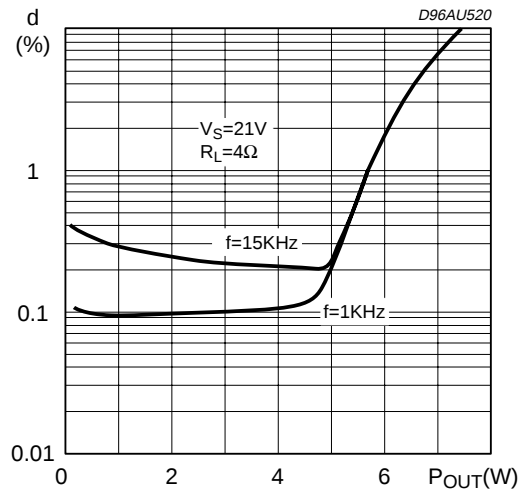


Figure 7: Distortion vs Frequency

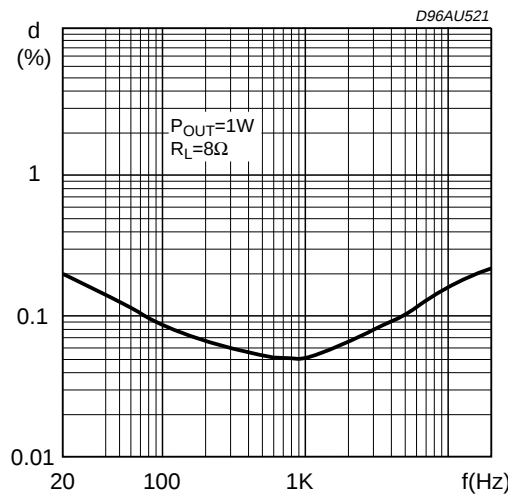


Figure 8: Distortion vs Frequency

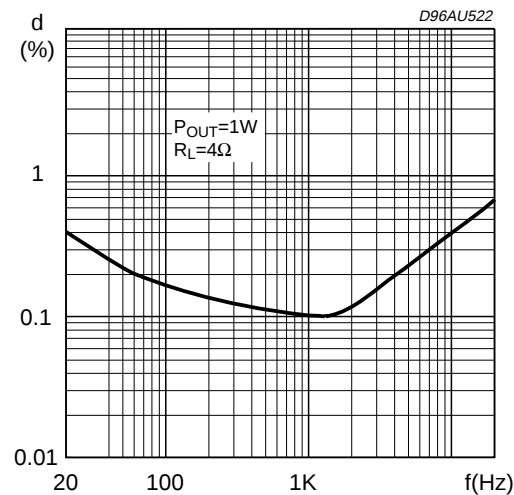


Figure 9: Quiescent Current vs Supply Voltage

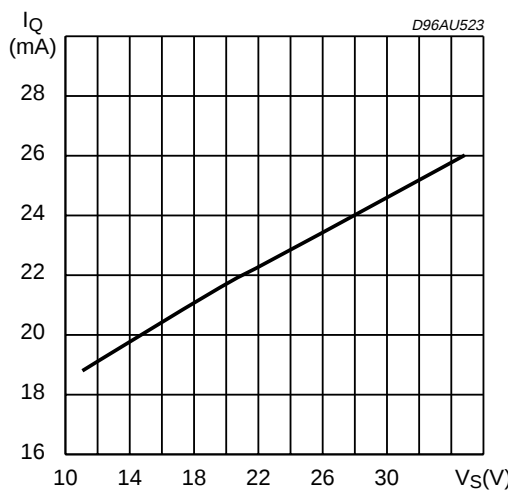


Figure 10: Quiescent Output Voltage vs Supply Voltage

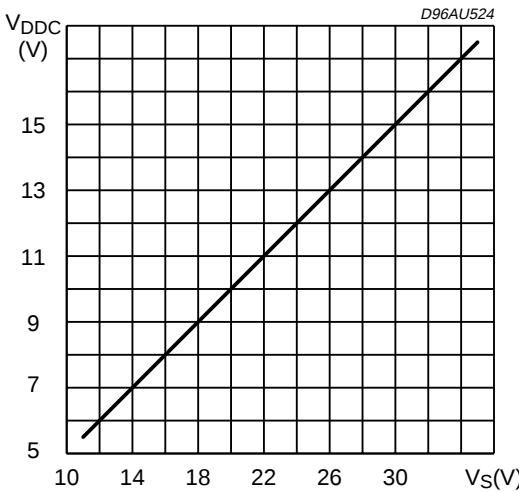


Figure 11: Gain vs Volume Control (pin #3)

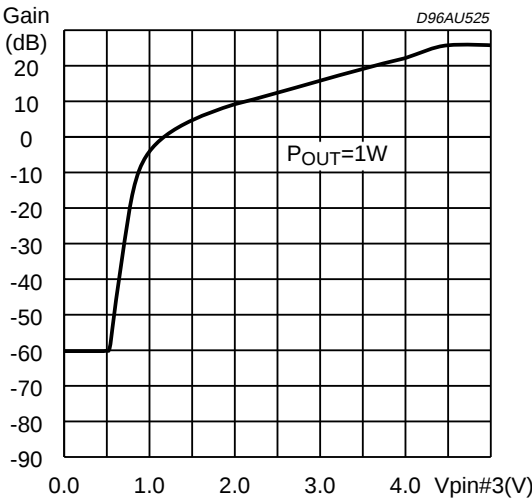


Figure 12: Supply Voltage Rejection vs Frequency

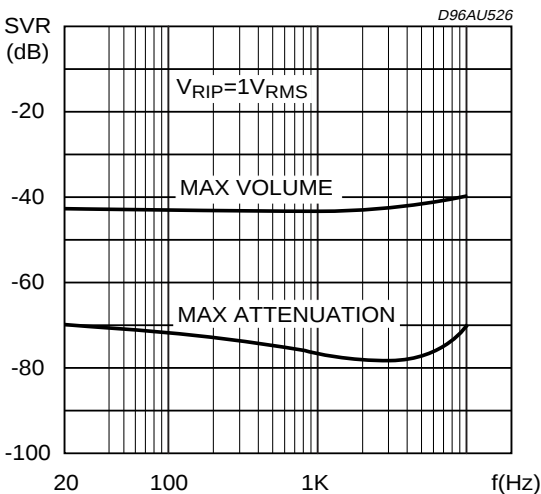


Figure 13: Stand-by Attenuation vs Vpin # 9

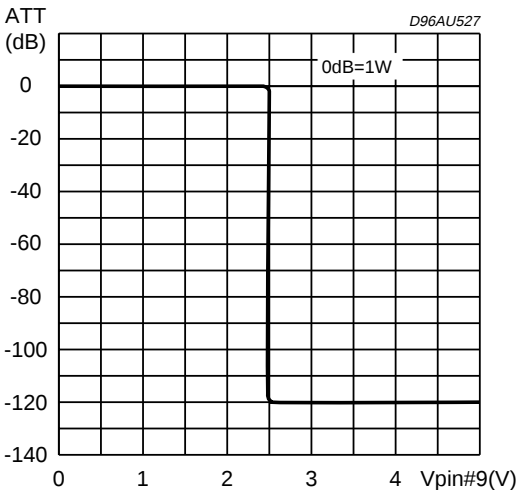


Figure 14: Mute Attenuation vs Vpin # 10

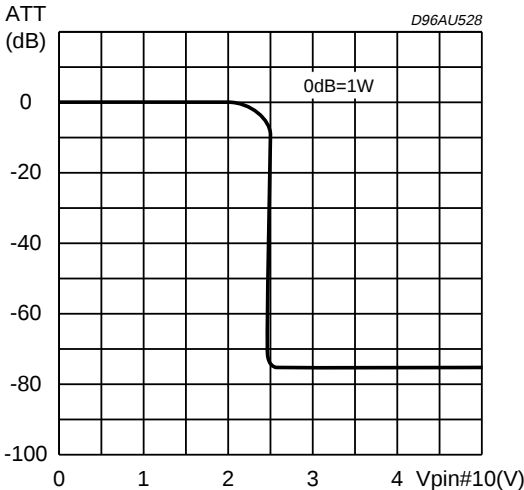


Figure 15: Power Dissipation vs Output Power

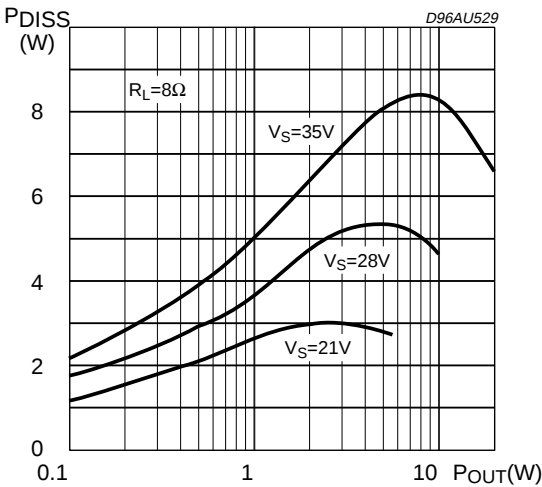
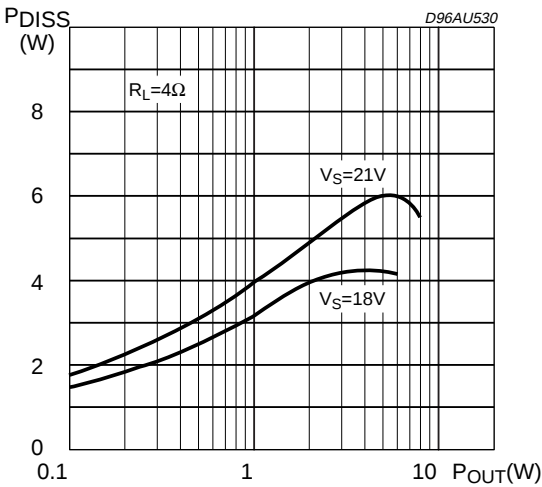


Figure 16: Power Dissipation vs Output Power

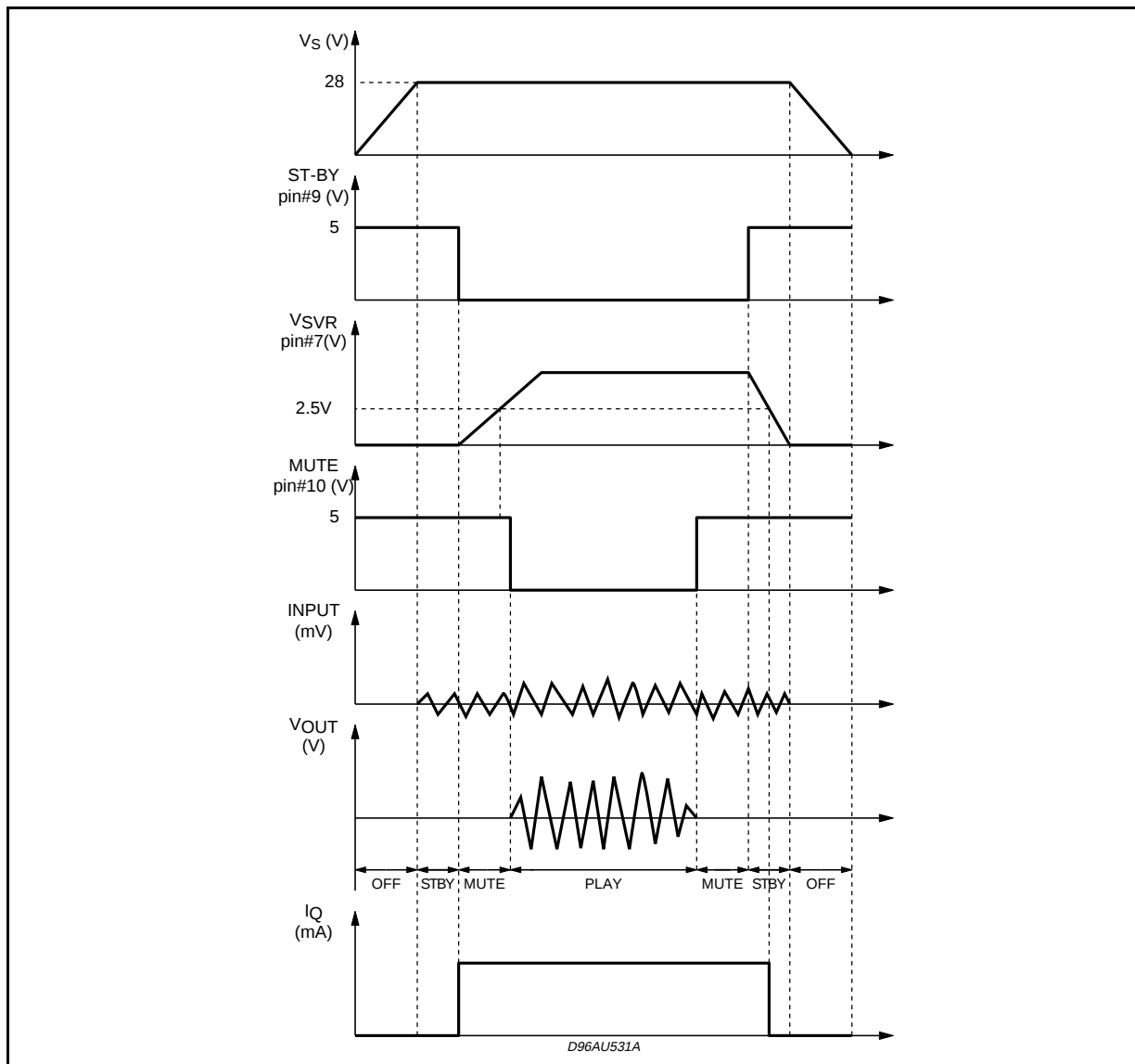


## MUTE STAND-BY TRUTH TABLE

| MUTE | ST-BY | OPERATING CONDITION |
|------|-------|---------------------|
| H    | H     | STANDBY             |
| L    | H     | STANDBY             |
| H    | L     | MUTE                |
| L    | L     | PLAY                |

## Turn ON/OFF Sequences (for optimising the POP performances)

## A) USING MUTE AND STAND-BY FUNCTIONS



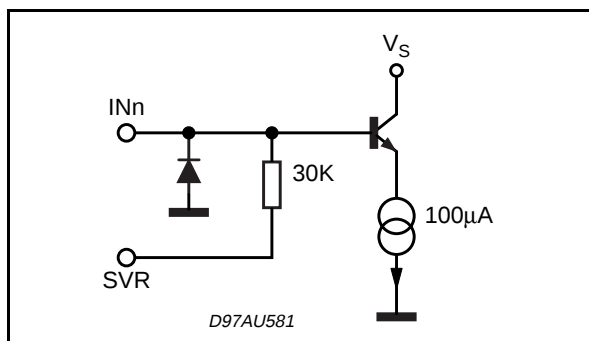
## B) USING ONLY THE MUTE FUNCTION

To simplify the application, the stand-by pin can be connected directly to Ground.

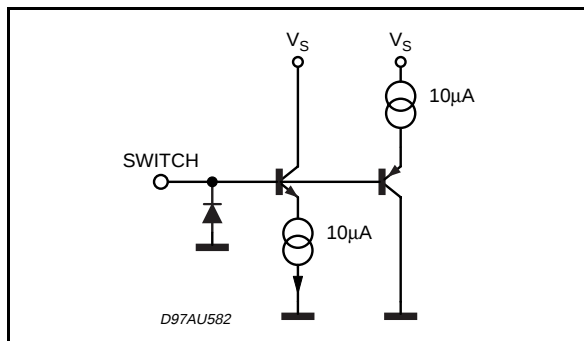
During the ON/OFF transitions we recommend to respect the following conditions:

- At the turn-on the transition mute to play must be made when the SVR pin is higher than 2.5V
- At the turn-off the TDA7494 must be brought to mute from the play condition when the SVR pin is higher than 2.5V.

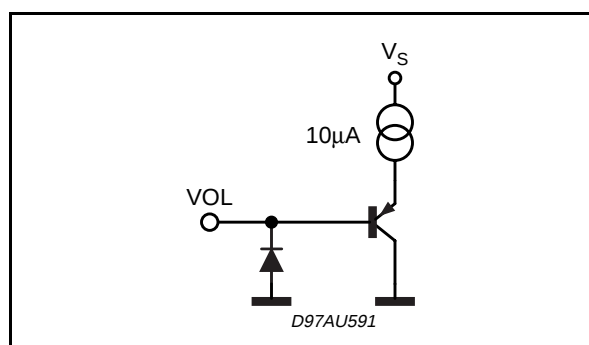
PINS: IN3, IN1, IN2



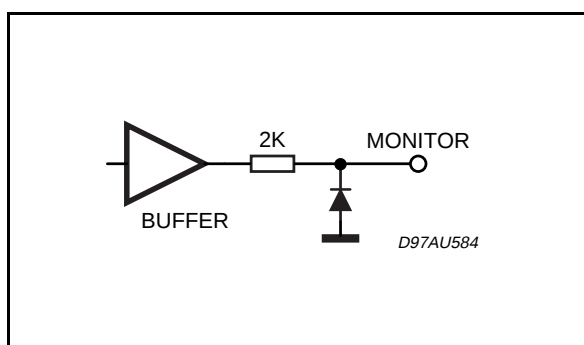
PIN: SWITCH



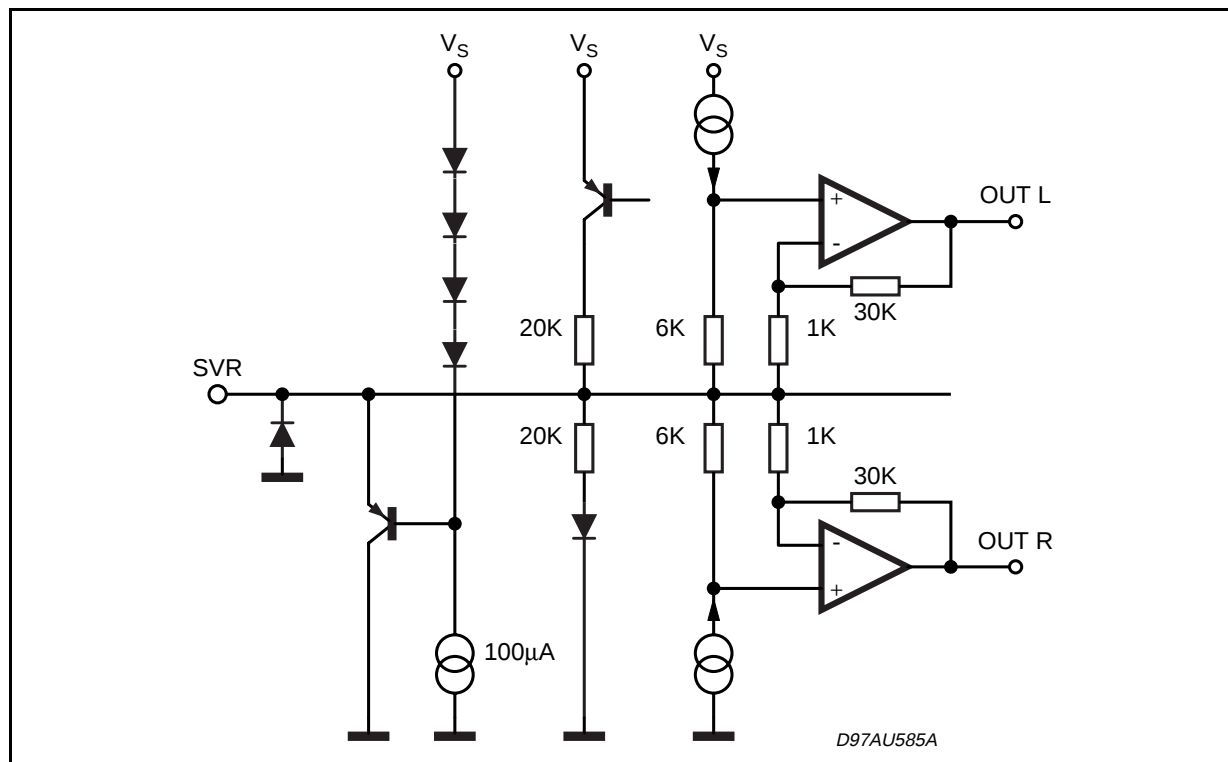
PIN: VOLUME



PIN: MONITOR



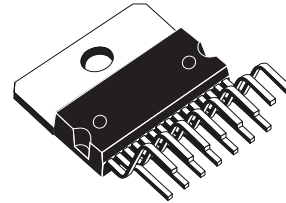
PIN: SVR



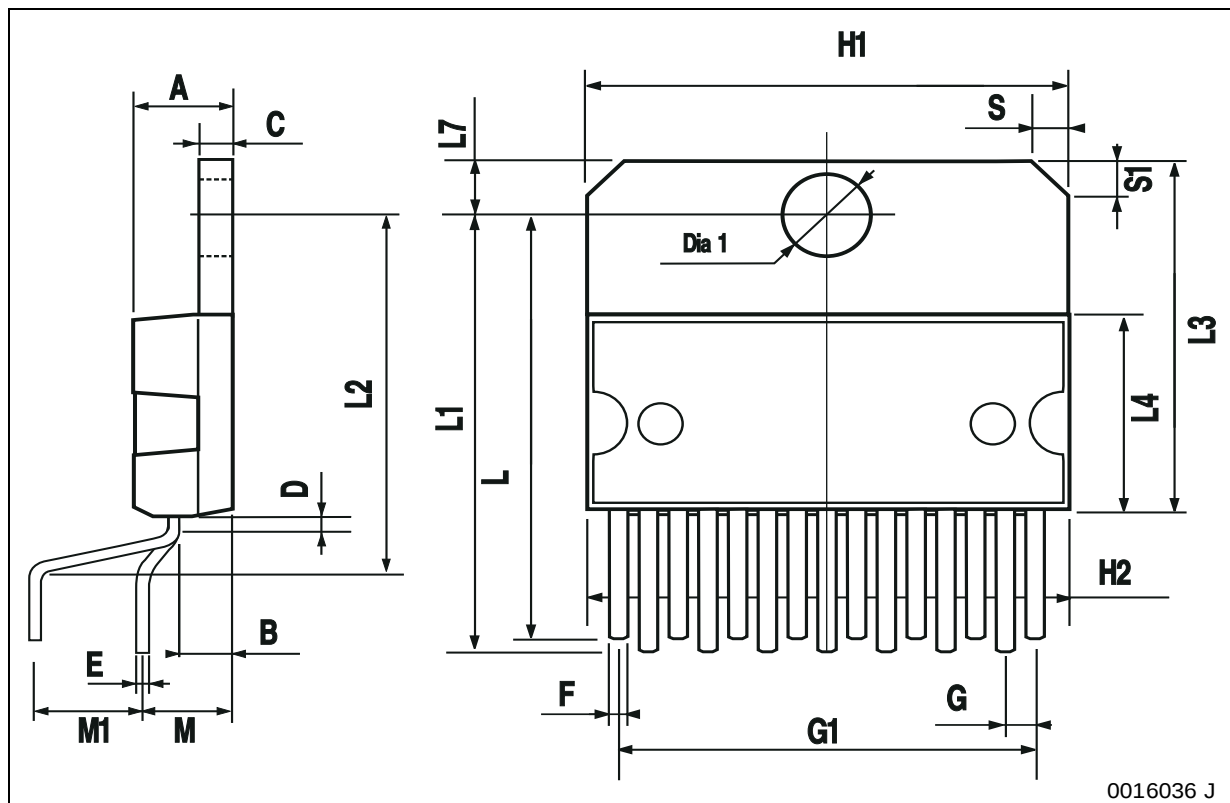
A circuit diagram showing a diode connected to ground. The diode is represented by a triangle pointing to a vertical line. The left terminal of the diode is connected to a node labeled 'GND'. The right terminal of the diode is connected to a node labeled  $V_S$ . The diode is labeled 'D97AU593' below it.

| DIM. | mm    |       |       | inch  |       |       |
|------|-------|-------|-------|-------|-------|-------|
|      | MIN.  | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A5   |       |       |       |       |       | 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    | 0.66  |       | 0.75  | 0.026 |       | 0.030 |
| G    | 1.02  | 1.27  | 1.52  | 0.040 | 0.050 | 0.060 |
| G1   | 17.53 | 17.78 | 18.03 | 0.690 | 0.700 | 0.710 |
| 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   | 17.65 |       | 18.1  | 0.695 |       | 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



**Multiwatt15 (Vertical)**



0016036 J

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