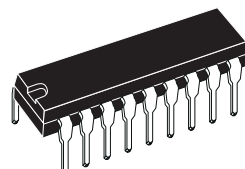


5W AUDIO AMPLIFIER WITH MUTING AND STAND-BY

- MUTING AND STAND-BY FUNCTIONS
- VOLTAGE RANGE UP TO 30V
- HIGH SUPPLY VOLTAGE REJECTION
SVR TYP = 50dB (f = 100Hz)
- MUSIC POWER = 12W ($R_L = 4\Omega$, d = 10%)
- PROTECTION AGAINST CHIP OVER TEMPERATURE



Powerdip 9+9

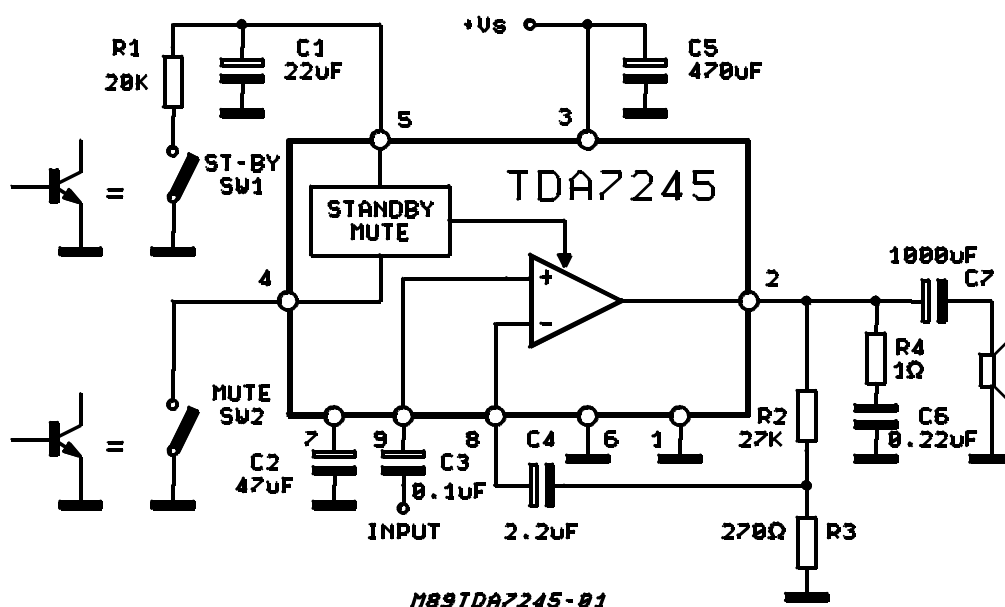
ORDERING NUMBER: TDA7245

DESCRIPTION

The TDA7245 is a monolithic integrated circuit in 9+9 POWERDIP package, intended for use as

low frequency power amplifier in a wide range of applications in radio and TV sets.

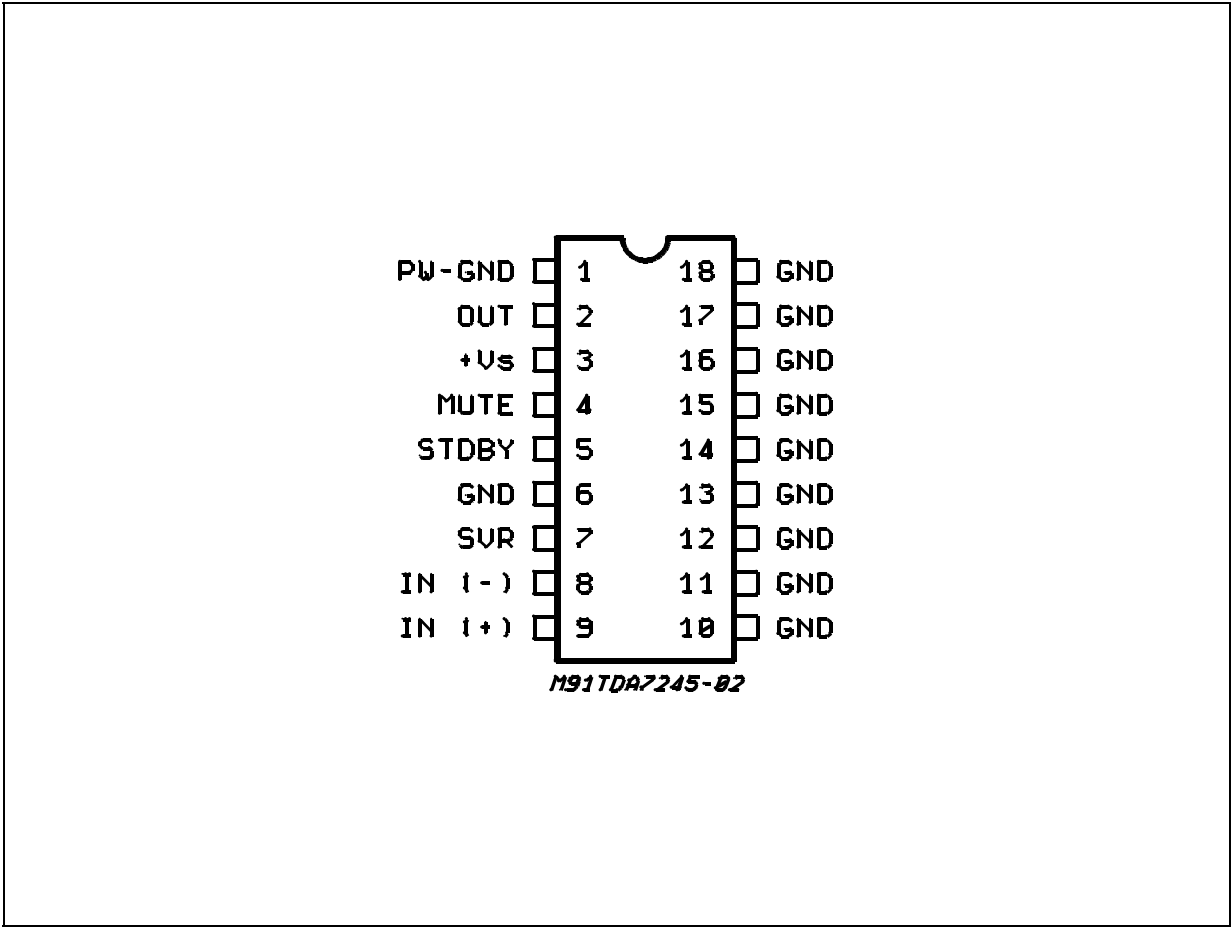
Figure 1: Test and Application Circuit



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|----------------|---|------------|------------------|
| V_S | Supply Voltage | 30 | V |
| I_O | Output Peak Current (non repetitive $t = 100\mu s$) | 3 | A |
| I_O | Output Peak Current (repetitive, $f > 20\text{Hz}$) | 2.5 | A |
| P_{tot} | Power Dissipation at $T_{amb} = 80^\circ\text{C}$ at $T_{case} = 70^\circ\text{C}$ | 1 | W |
| | | 6 | W |
| T_{stg}, T_j | Storage and junction Temperature | -40 to 150 | $^\circ\text{C}$ |

PIN CONNECTION (Top view)



THERMAL DATA

| Symbol | Description | Value | Unit |
|------------------|-------------------------------------|-------|--------------------|
| $R_{th\ j-case}$ | Thermal Resistance junction-case | Max | $^\circ\text{C/W}$ |
| $R_{th\ j-amb}$ | Thermal Resistance junction-ambient | Max | $^\circ\text{C/W}$ |

ELECTRICAL CHARACTERISTICS (Refer to the test circuit, $T_{amb} = 25^{\circ}\text{C}$, $f = 1\text{kHz}$; unless otherwise specified).

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|----------|--|--|--------------|---|------|--------------------------------------|
| V_S | Supply Voltage | | 12 | | 30 | V |
| V_O | Quiescent Output Voltage | $V_S = 24\text{V}$ | | 11.6 | | V |
| I_d | Quiescent Drain Current | $V_S = 14\text{V}$ $V_S = 28\text{V}$ | | 17 21 | 35 | mA mA |
| P_O | Output Power | $d = 1\%, f = 1\text{KHz}$ $V_S = 14\text{V}, R_L = 4\Omega$ $V_S = 18\text{V}, R_L = 8\Omega$ $d = 10\%, f = 1\text{KHz}$ $V_S = 14\text{V}, R_L = 4\Omega$ $V_S = 18\text{V}, R_L = 8\Omega$ Music Power (*) $V_S = 24\text{V}, d = 10\%, R_L = 4\Omega$ | 4 | 4 5 12 | | W W W |
| d | Harmonic Distortion | $V_S = 14\text{V}, R_L = 4\Omega$, $P_O = 50\text{mW to } 3\text{W}$ $f = 1\text{KHz}$ $f = 10\text{KHz}$ $V_S = 18\text{V}, R_L = 8\Omega$, $P_O = 50\text{mW to } 3.5\text{W}$ $f = 1\text{KHz}$ $f = 10\text{KHz}$ $V_S = 22\text{V}, R_L = 16\Omega$, $P_O = 50\text{mW to } 3\text{W}$ $f = 1\text{KHz}$ $f = 10\text{KHz}$ | | 0.15 0.8 0.12 0.5 0.08 0.4 | 0.5 | % % % % % % |
| R_i | Input Impedance | $f = 1\text{kHz}$ | 30 | | | k Ω |
| BW | Small signal bandwidth (-3dB) | $P_O = 1\text{W}; R_L = 4\Omega \quad V_S = 14\text{V}$ | 50 to 40,000 | | | Hz |
| G_V | Voltage Gain (open loop) | $f = 1\text{kHz}$ | | 75 | | dB |
| G_V | Voltage Gain (closed loop) | $f = 1\text{kHz}$ | 39 | 40 | 41 | dB |
| e_N | Total Input Noise | $B = 22 - 22,000\text{Hz}$ $R_s = 50\Omega$ $R_s = 1\text{k}\Omega$ $R_s = 10\text{k}\Omega$ | | 1.7 2 3 | 6 | mV μV μV |
| S/N | Signal to Noise Ratio | $V_S = 18\text{V}; R_L = 8\Omega$ $P_O = 5\text{W}; R_S = 10\text{k}\Omega$ | | 86 | | dB |
| SVR | Supply Voltage Rejection | $V_S = 16.5\text{V}; R_L = 8\Omega; f = 100\text{Hz}$ $R_s = 10\text{k}\Omega; V_r = 0.5\text{Vrms}$ | 40 | 50 | | dB |
| T_{sd} | Thermal shut-down Junction Temperature | | | 150 | | $^{\circ}\text{C}$ |

MUTE FUNCTION

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---------|--------------------|-------------------------------------|------|------|------|------|
| V_m | Pin 4 DC Voltage | Mute SW Open (play) | | 6.4 | | V |
| ATT_m | Muting Attenuation | $f = 100\text{Hz to } 10\text{kHz}$ | 60 | 65 | | dB |

ELECTRICAL CHARACTERISTICS (Continued)**STAND-BY FUNCTION**

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|----------------|----------------------------|-------------------------------------|------|------|------|---------|
| V_{st-by} | Pin 5 DC Voltage | Mute SW Open (play) | | 6.4 | | V |
| I_{st-by} | Pin 5 Current | Mute SW Closed (st-by) | | 160 | 280 | μA |
| ATT_{st-by} | Stand-by Attenuation | $f = 100\text{Hz to } 10\text{kHz}$ | 70 | 90 | | dB |
| V_t | Stand-by Threshold (pin 5) | | | 3.8 | | V |
| $I_{d\ st-by}$ | Stand-by Current | $V_S = 14\text{V}$ | | 1 | 3 | mA |

Note (*):**MUSIC POWER CONCEPT**

MUSIC POWER is (according to the IEC clauses n.268-3 of Jan 83) the maximal power which the amplifier is capable of producing across the rated load resistance (regardless of non linearity) 1 sec after the application of a sinusoidal input signal of frequency 1KHz.

According to this definition our method of measurement comprises the following steps:

- 1) Set the voltage supply at the maximum operating value -20%
- 2) Apply a input signal in the form of a 1KHz tone burst of 1 sec duration; the repetition period of the signal pulses is > 60 sec
- 3) The output voltage is measured 1 sec from the start of the pulse
- 4) Increase the input voltage until the output signal show a THD = 10%
- 5) The music power is then $V_{out}^2/R1$, where V_{out} is the output voltage measured in the condition of point 4) and R1 is the rated load impedance

The target of this method is to avoid excessive dissipation in the amplifier.

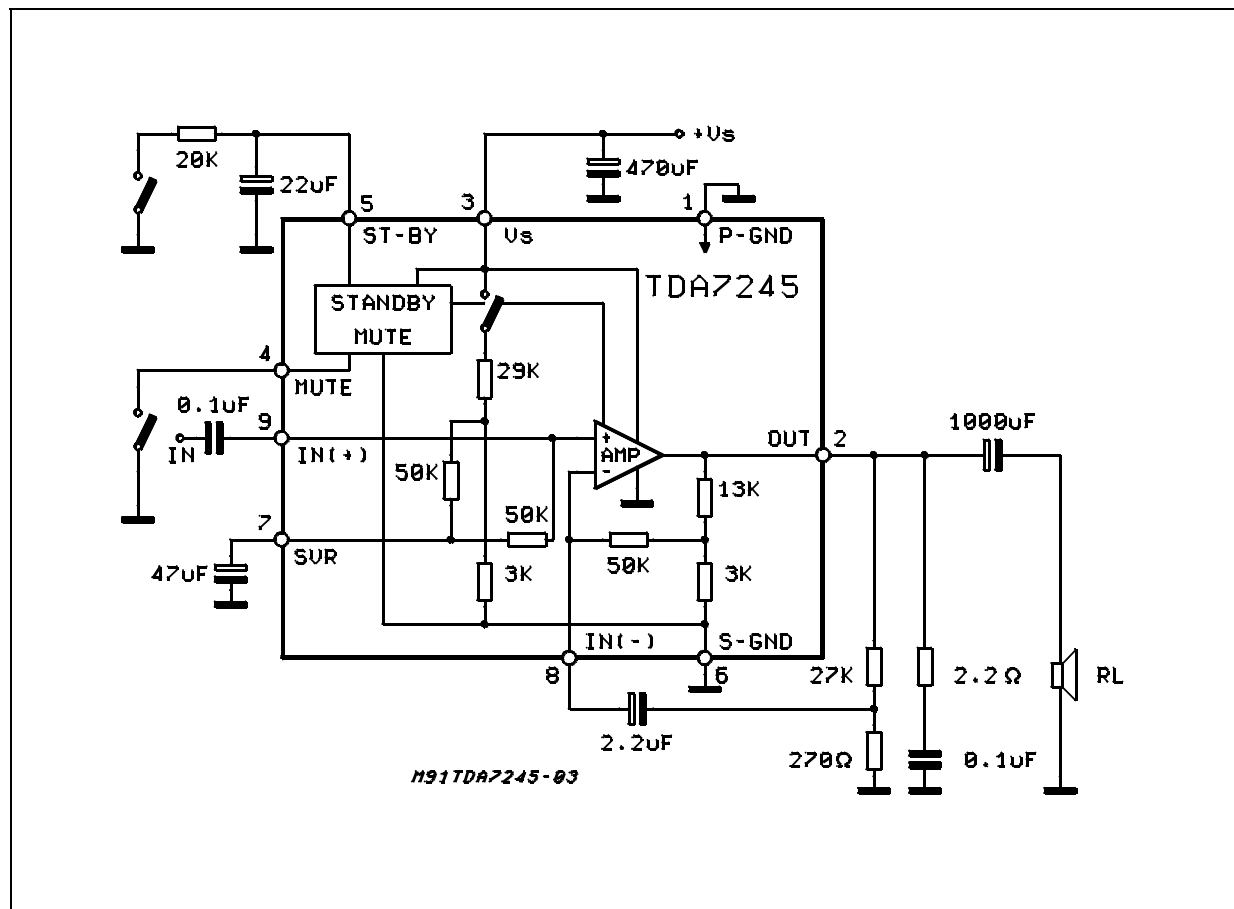
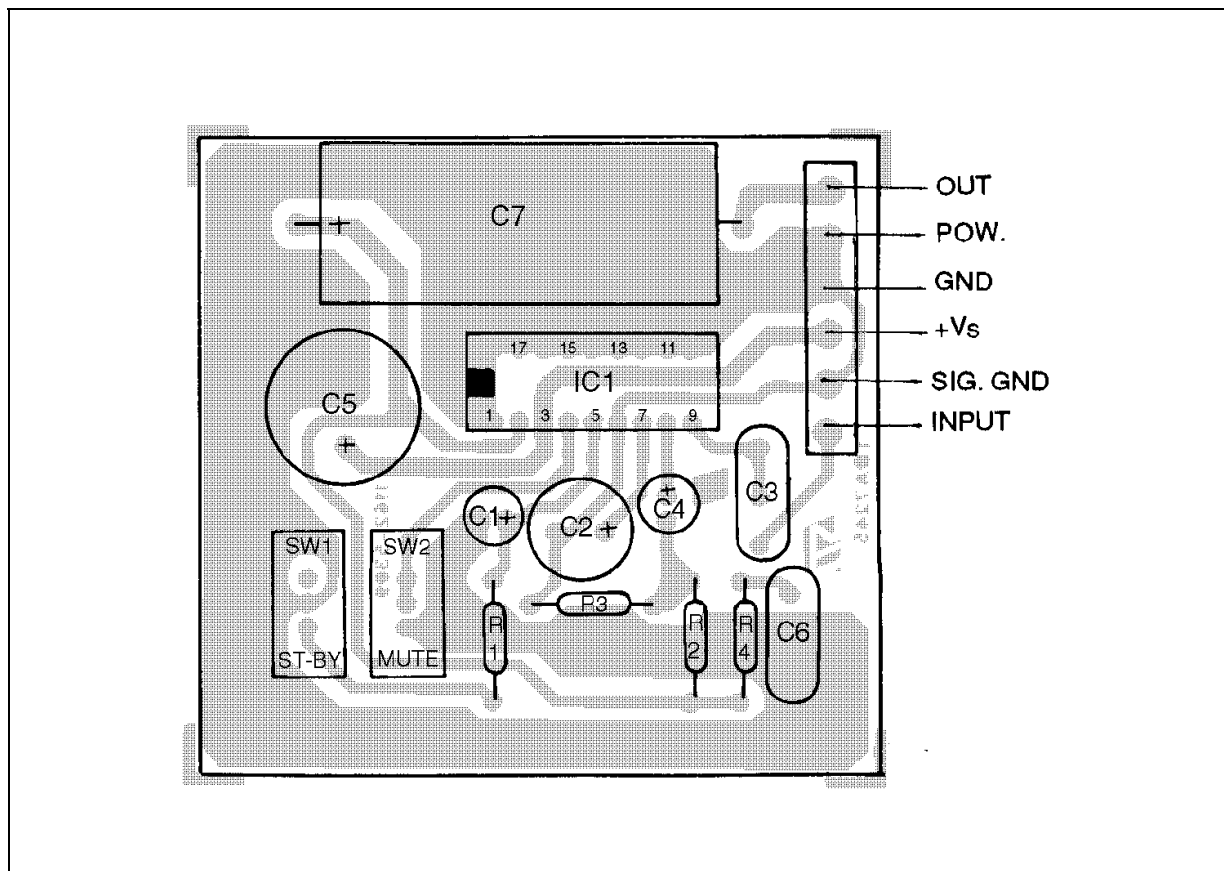
Figure 2: Schematic Diagram

Figure 3: P.C. Board and Components Layout of the Circuit of fig 2 (1:1 scale)

APPLICATION SUGGESTIONS

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

| Component | Rec. Value | Purpose | Larger than Rec. Value | Smaller than Rec. Value |
|-----------|--------------|-------------------------------|--|--|
| R1 | 20K Ω | St-By Biasing | Incorrect St-By Function | Worse POP and Shorter Delay at St-By Insertion |
| R2(*) | 27K Ω | Feedback Resistors | Increase of Gain | Decrease of Gain |
| R3(*) | 270 Ω | | Decrease of Gain | Increase of Gain |
| R4 | 1 Ω | Frequency Stability | Danger of Oscillations | |
| C1 | 22 μ F | St-By Capacitor | Longer ON/OFF Delay Time at St-By IN/OUT | Worse POP and Shorter Delay at St-By insertion |
| C2 | 47 μ F | SVR Capacitor | Worse Turn-On POP by V_s and St-By | Degradation of SVR |
| C3 | 0.1 μ F | Input Capacitance | | Higher Low Frequency Cut-off |
| C4 | 2.2 μ F | Inverting Input DC Decoupling | | Higher Low Frequency Cut-off |
| C5 | 470 μ F | Supply Voltage | | Danger of Oscillations |
| C6 | 0.22 μ F | Frequency Stability | Danger of Oscillations | |
| C7 | 1000 μ F | Output DC Decoupling | | Higher Low Frequency Cut-off |

(*) The value of closed loop gain ($G_V = 1 + R_2/R_3$) must be higher than 25dB.

Figure 4: DC Output Voltage vs. Supply Voltage

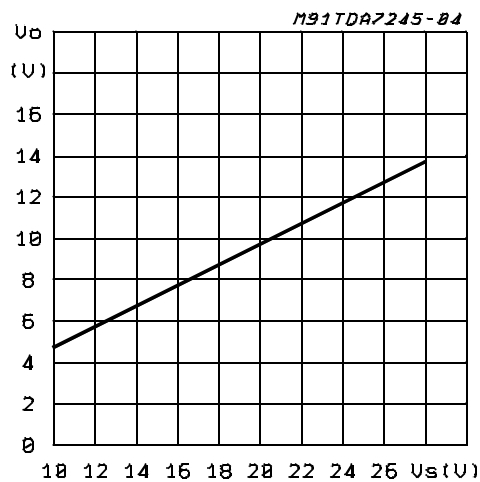
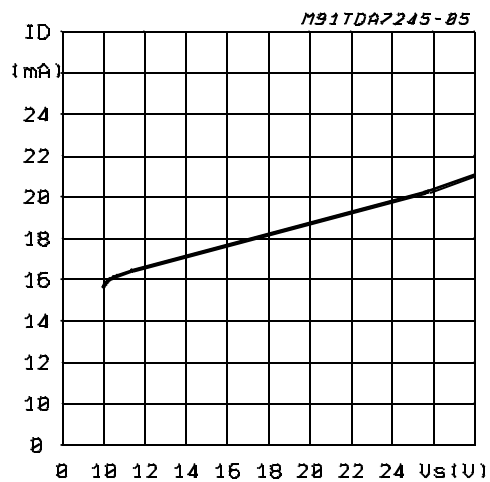
Figure 5: I_D vs. Supply Voltage

Figure 6: Output Power vs. Supply Voltage

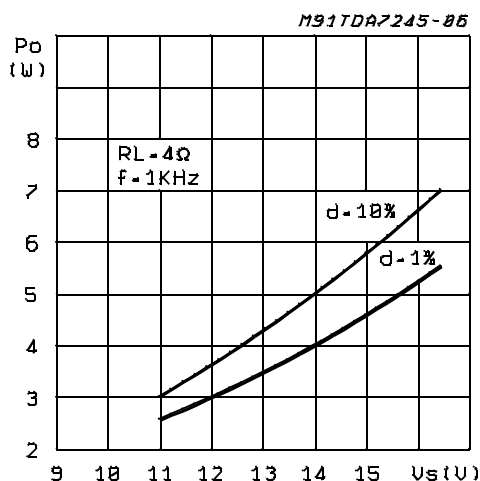


Figure 7: Output Power vs. Supply Voltage

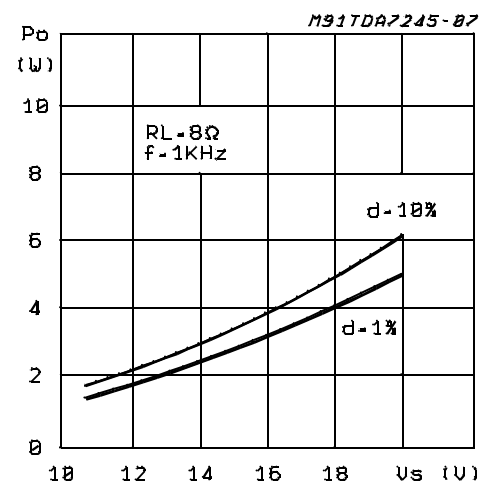


Figure 8: Output Power vs. Supply Voltage

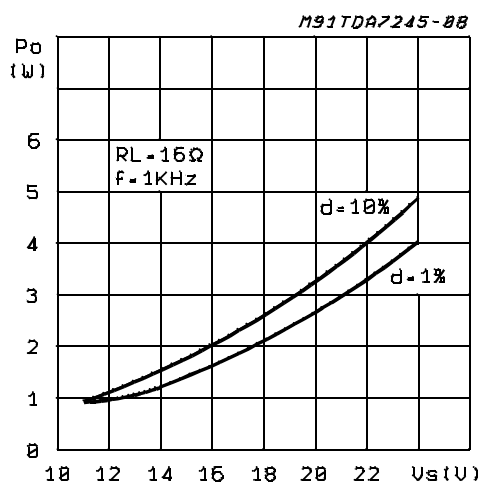


Figure 9: Distortion vs. Output Power

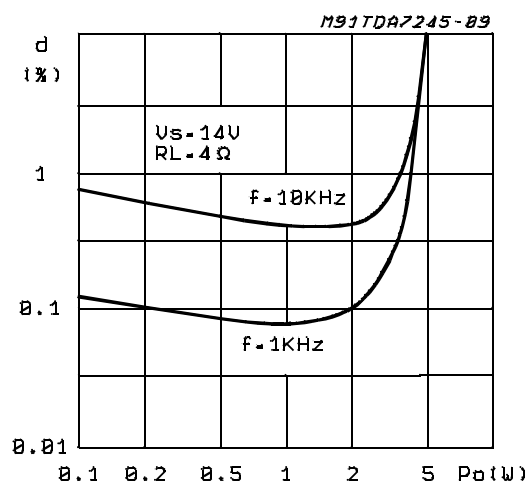


Figure 10: Distortion vs. Output Power

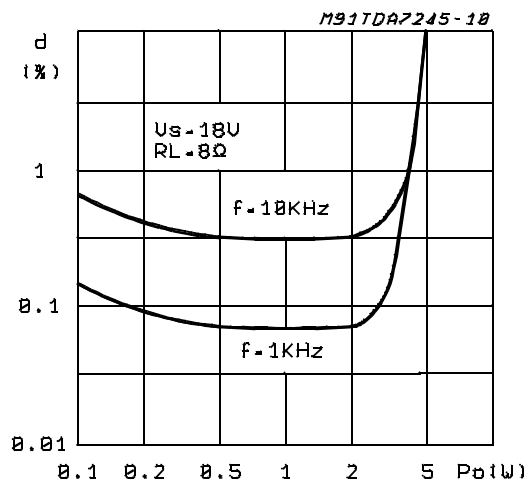


Figure 11: Distortion vs. Output Power

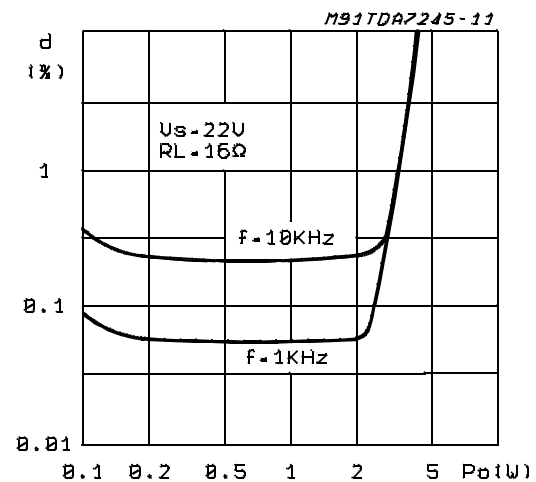


Figure 12: Supply Voltage Rejection vs. Frequency (play)

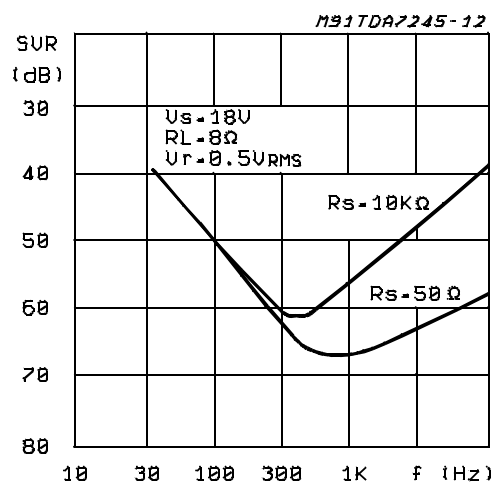


Figure 13: Power Dissipation & Efficiency vs. Output Power

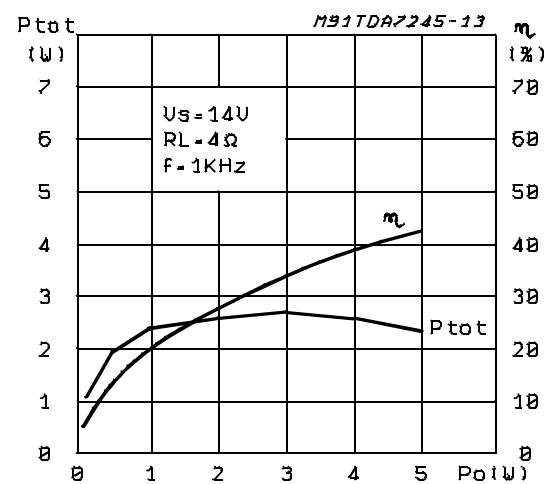


Figure 14: Power Dissipation & Efficiency vs. Output Power

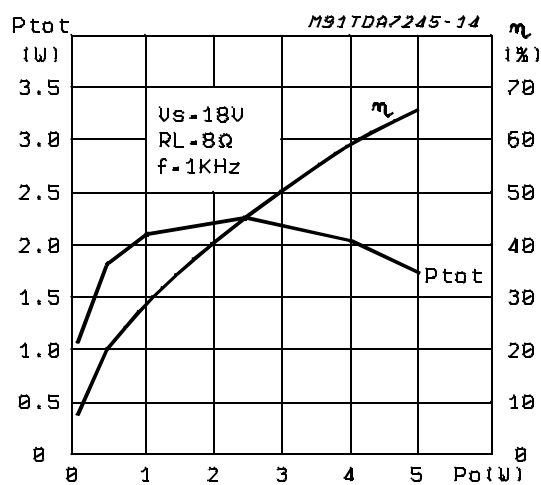
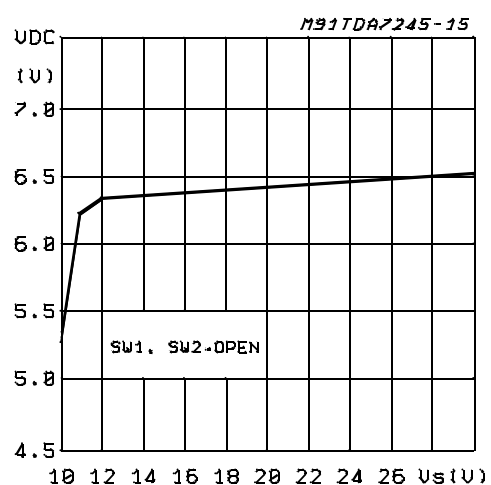
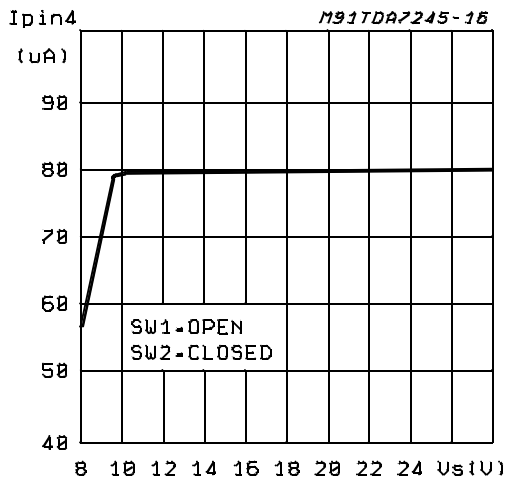
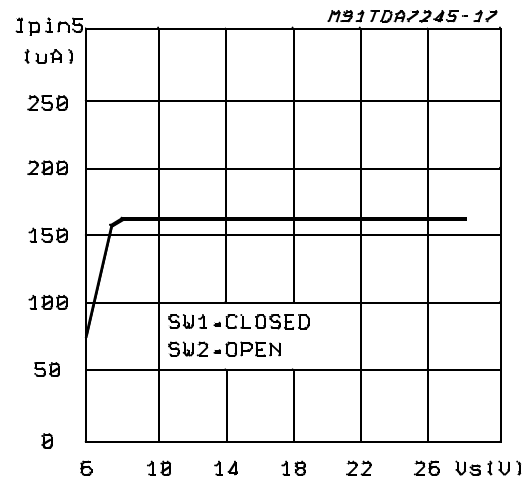
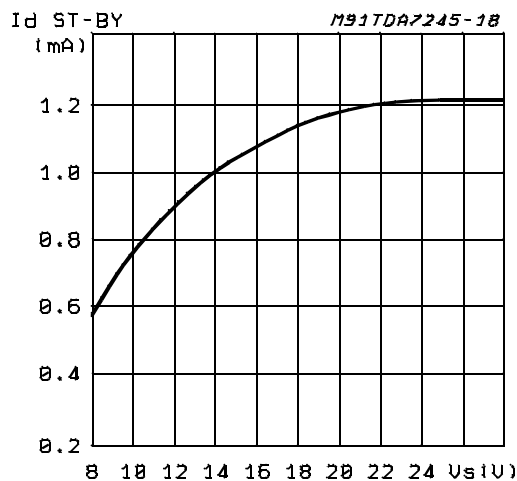
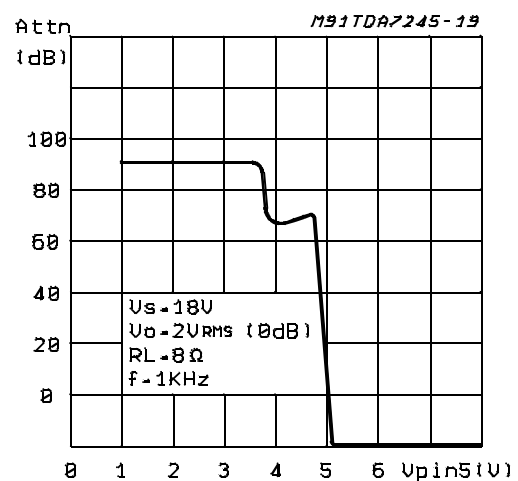
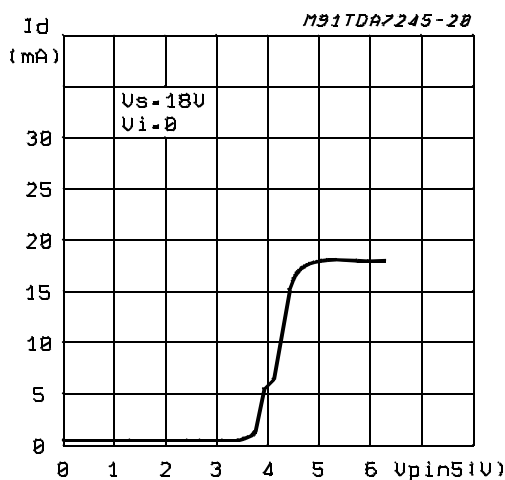
Figure 15: V_{pin5} (=V_{pin4}) vs. Supply Voltage

Figure 16: I_{pin4} (muting) vs. Supply Voltage**Figure 17:** I_{pin5} (St-By) vs. Supply Voltage**Figure 18:** Quiescent Current (St-By) vs. Supply Voltage**Figure 19:** Output Attenuation vs. V_{pin5} **Figure 20:** Quiescent Current vs. V_{pin5} **MUTING / STAND-BY**

The muting function allows to inhibit the output signal through an external control signal.

It can be used in many cases, when a temporary inhibition of the output signal is requested, for example:

- in switch-on condition, to avoid preamplifier power-on transients
- during switching at the input stages
- during the receiver tuning.

The stand-by function is very useful and permits a complete turn ON/OFF of the device through a low power signal, which can be provided by a μP .

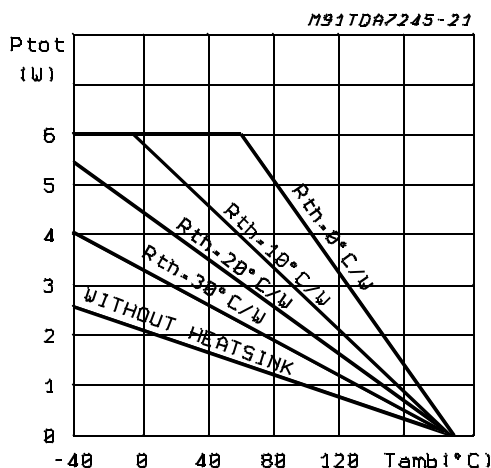
THERMAL SHUTDOWN

The presence of a thermal limiting circuit offers the following advantages:

- 1) An overload on the output (even if it is permanent), or an above limit ambient temperature can be easily tolerated since the T_j cannot be higher than 150°C .
- 2) The heatsink can have a smaller factor of safety compared with that of a conventional circuit. There is no possibility of device damage due to high junction temperature. If for any reason, the junction temperature increase up to 150°C , the thermal shutdown simply reduces the power dissipation and the current consumption.

The maximum allowable power dissipation depends upon the junction-ambient thermal resistance. Fig. 21 shows this dissippable power as a function of ambient temperature for different thermal resistance.

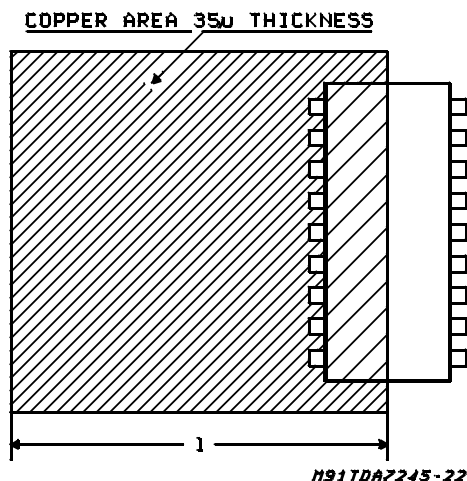
Figure 21: Maximum Allowable Power Dissipation vs. Ambient Temperature



MOUNTING INSTRUCTIONS

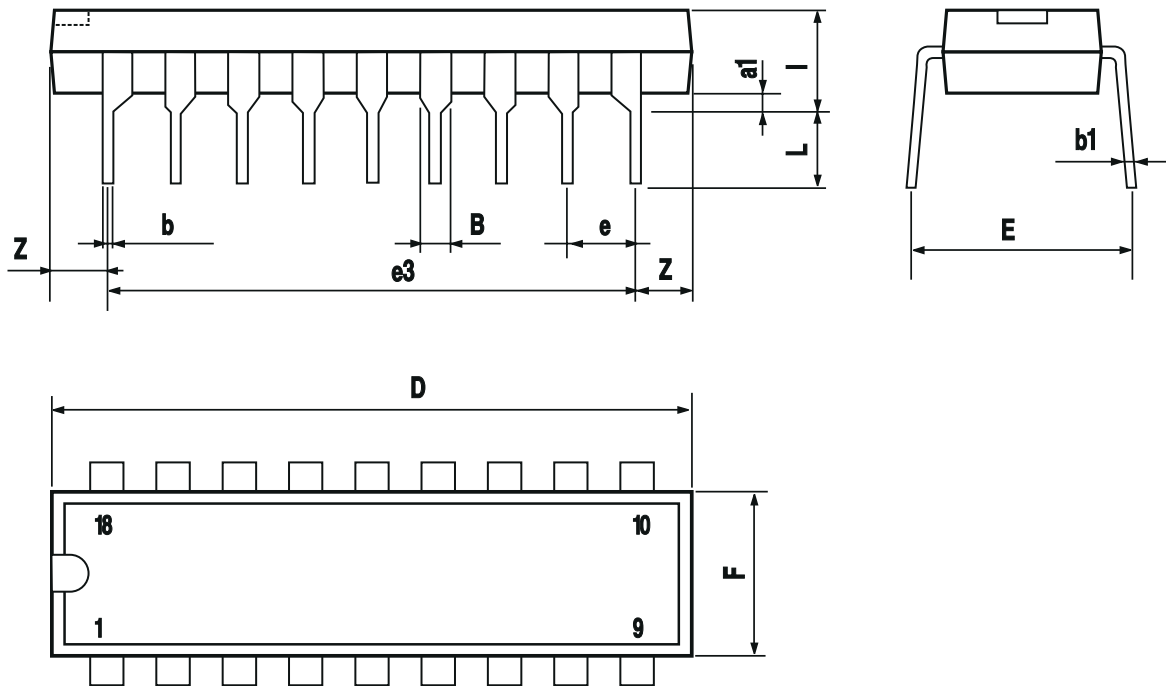
The TDA7245 is assembled in the POWERDIP, in which 9 pins (from 10 to 18) are attached to the frame and remove the heat produced by the chip. Figure 22 shows a PC Board copper area used as a Heatsink ($l = 65\text{mm}$). The Thermal Resistance Junction-Ambient is 35°C .

Figure 22: Example of Heatsink using PC Board Copper ($l = 65\text{mm}$)



POWERDIP 18 (9+9) PACKAGE MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.85 | | 1.40 | 0.033 | | 0.055 |
| b | | 0.50 | | | 0.020 | |
| b1 | 0.38 | | 0.50 | 0.015 | | 0.020 |
| D | | | 24.80 | | | 0.976 |
| E | | 8.80 | | | 0.346 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 20.32 | | | 0.800 | |
| F | | | 7.10 | | | 0.280 |
| I | | | 5.10 | | | 0.201 |
| L | | 3.30 | | | 0.130 | |
| Z | | | 2.54 | | | 0.100 |



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