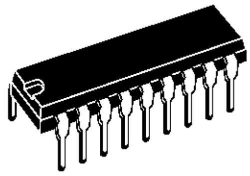
SGS-THOMSON MICROELECTRONICS

TDA7245

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 = 4Ω, d = 10%)
- PROTECTION AGAINST CHIP OVER TEMPERATURE



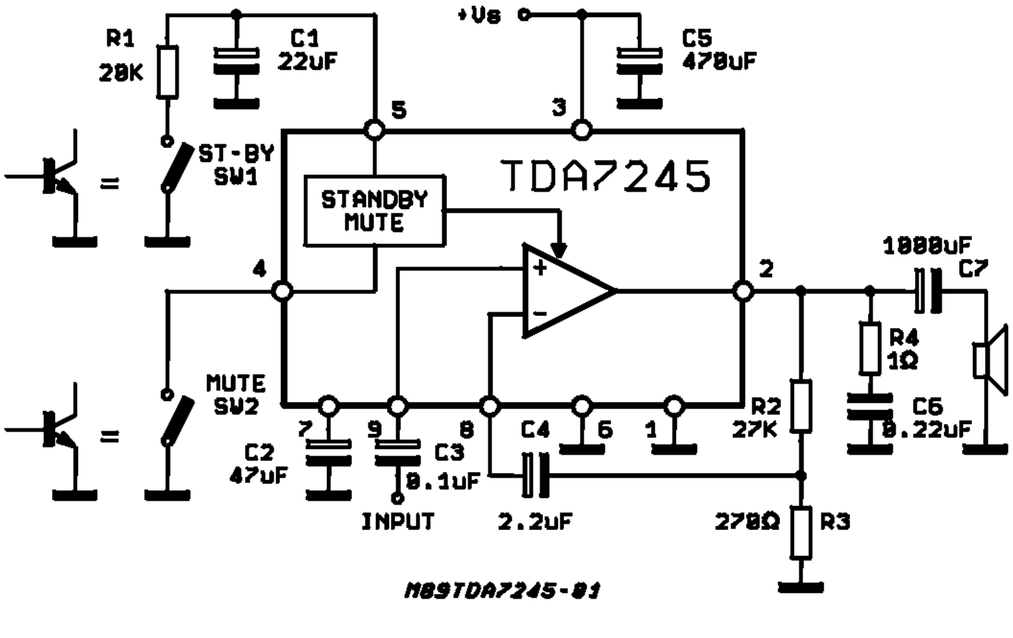
Powerdip 9+9

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.

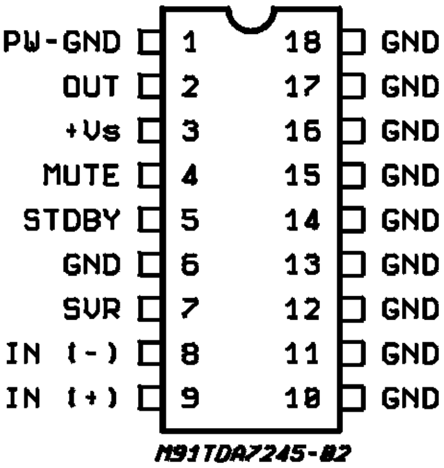
Figure 1: Test and Application Circuit



ABSOLUTE MAXIMUM RATINGS

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

PIN CONNECTION (Top view)



THERMAL DATA

Symbol	Description		Value	Unit
$R_{th\ j\text{-}case}$ $R_{th\ j\text{-}amb}$	Thermal Resistance junction-case Thermal Resistance junction-ambient	Max Max	15 70	°C/W °C/W

ELECTRICAL CHARACTERISTICS (Refer to the test circuit, T_{amb} = 25°C, f = 1kHz; 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 = 24V		11.6		V
I_d	Quiescent Drain Current	V_S = 14V V_S = 28V		17 21	 35	mA mA
P_O	Output Power	d = 1%, f = 1KHz V_S = 14V, R_L = 4Ω V_S = 18V, R_L = 8Ω d = 10%, f = 1KHz V_S = 14V, R_L = 4Ω V_S = 18V, R_L = 8Ω Music Power (*) V_S = 24V, d = 10%, R_L = 4Ω	 4	 4 4 5 5 12		 W W W W W
d	Harmonic Distortion	V_S = 14V, R_L = 4Ω, P_O = 50mW to 3W f = 1KHz f = 10KHz V_S = 18V, R_L = 8Ω, P_O = 50mW to 3.5W f = 1KHz f = 10KHz V_S = 22V, R_L = 16Ω, P_O = 50mW to 3W f = 1KHz f = 10KHz		 0.15 0.8 0.12 0.5 0.08 0.4	 0.5	 % % % % % %
R_I	Input Impedance	f = 1kHz	30			kΩ
BW	Small signal bandwidth (-3dB)	P_O = 1W; R_L = 4Ω V_S = 14V	50 to 40,000			Hz
G_V	Voltage Gain (open loop)	f = 1kHz		75		dB
G_V	Voltage Gain (closed loop)	f = 1kHz	39	40	41	dB
e_N	Total Input Noise	B = 22 - 22,000Hz R_s = 50Ω R_s = 1kΩ R_s = 10kΩ		 1.7 2 3	 6	 mV µV µV
S/N	Signal to Noise Ratio	V_S = 18V; R_L = 8Ω P_O = 5W; R_S = 10KΩ		86		dB
SVR	Supply Voltage Rejection	V_S = 16.5V; R_L = 8Ω; f = 100Hz R_s = 10kΩ; V_r = 0.5Vrms	40	50		dB
T_{sd}	Thermal shut-down Junction Temperature			150		°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 = 100Hz to 10kHz	60	65		dB

ELECTRICAL CHARACTERISTCS (Continued)

STAND-BY FUNCTION

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{st\text{-}by}$	Pin 5 DC Voltage	Mute SW Open (play)		6.4		V
$I_{st\text{-}by}$	Pin 5 Current	Mute SW Closed (st-by)		160	280	µA
$ATT_{st\text{-}by}$	Stand-by Attenuation	f = 100Hz to 10kHz	70	90		dB
V_t	Stand-by Threshold (pin 5)			3.8		V
$I_{d\ st\text{-}by}$	Stand-by Current	V_S = 14V		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 $V^2_{out}/R1$, 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

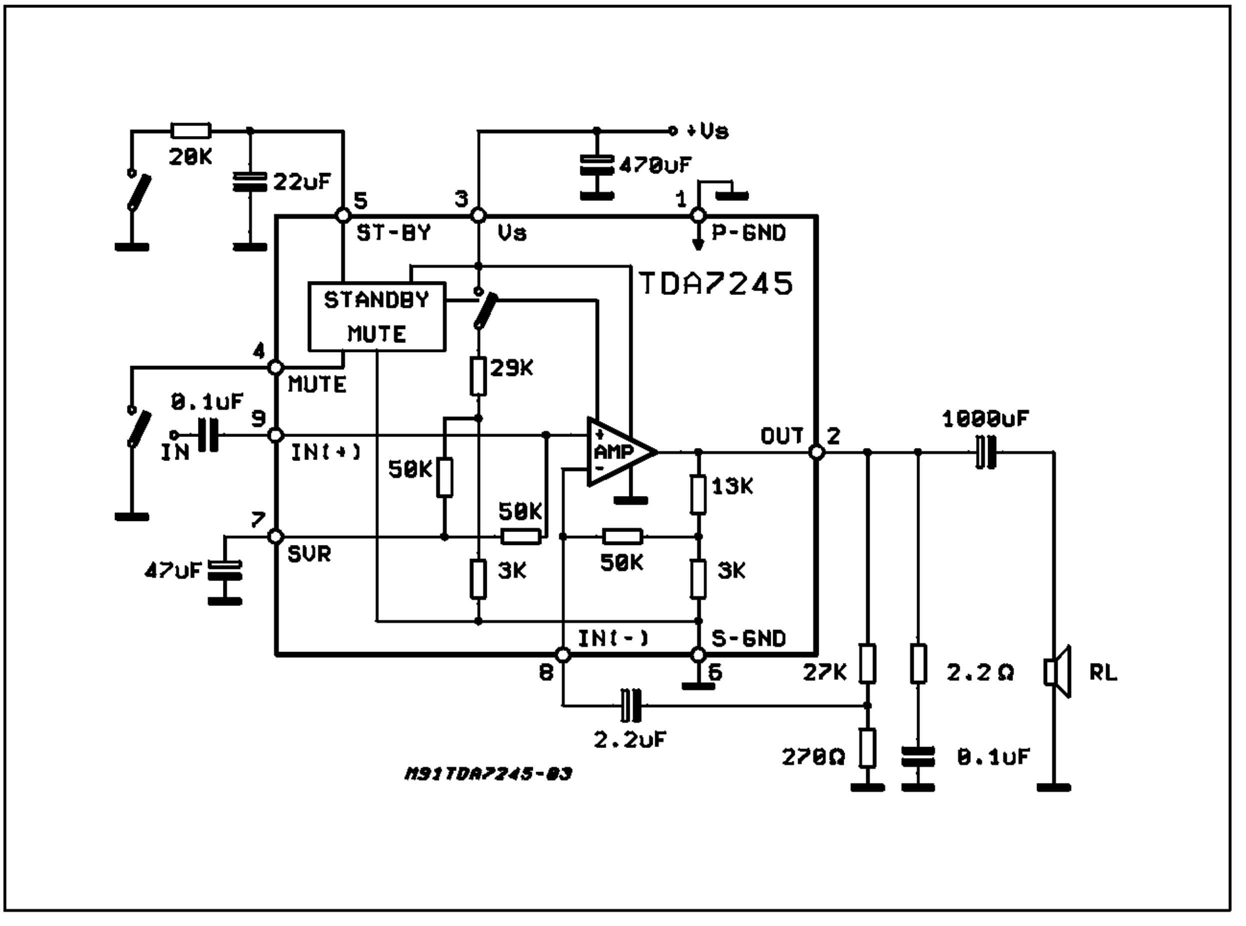
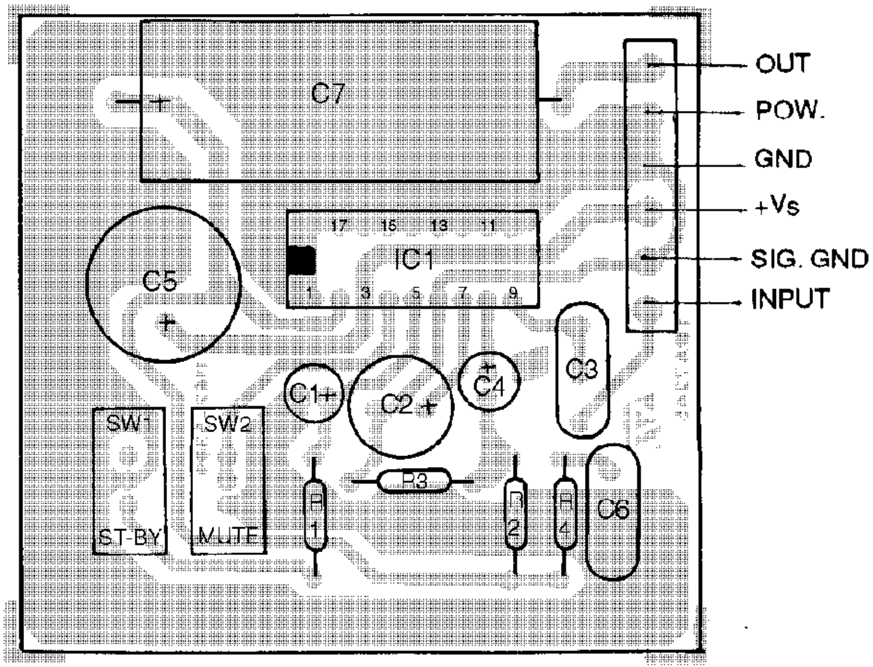


Figure 3: P.C. Board and Components Layout of the Circuit of fig 2 (1:1 scale)



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 dsigner.

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

(*) The value of closed loop gain (G_V = 1 + R2/R3) must be higher than 25dB.

Figure 4: DC Output Voltage vs. Supply Voltage

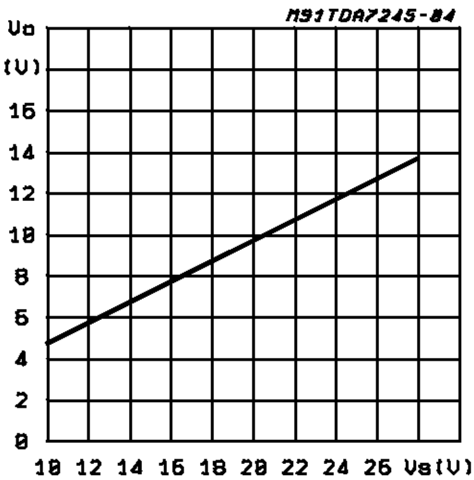


Figure 5: I_D vs. Supply Voltage

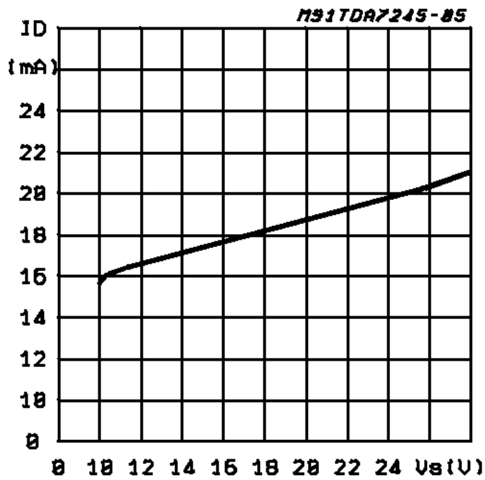


Figure 6: Output Power vs. Supply Voltage

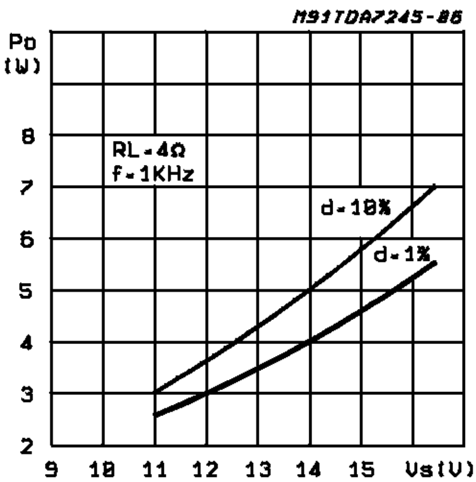


Figure 7: Output Power vs. Supply Voltage

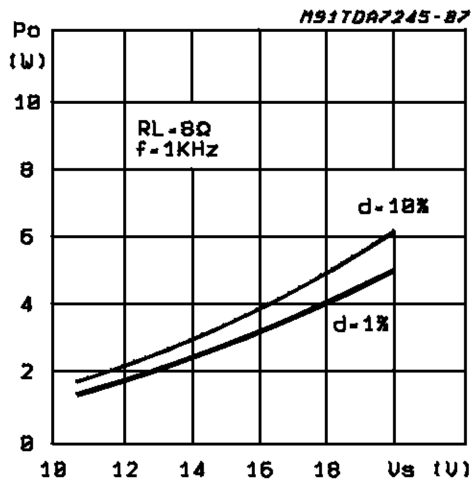


Figure 8: Output Power vs. Supply Voltage

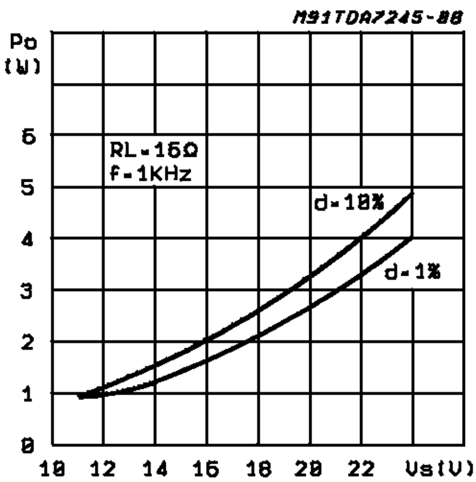


Figure 9: Distortion vs. Output Power

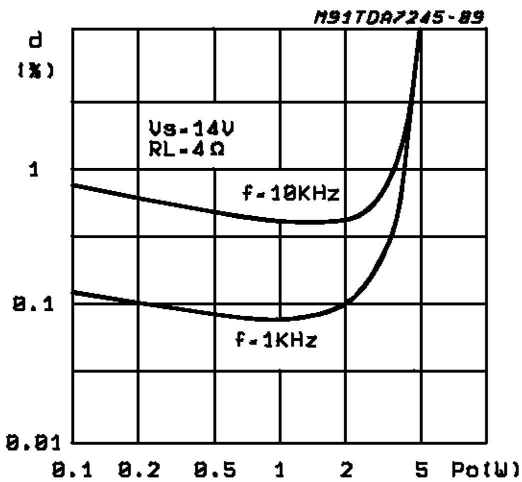


Figure 10: Distortion vs. Output Power

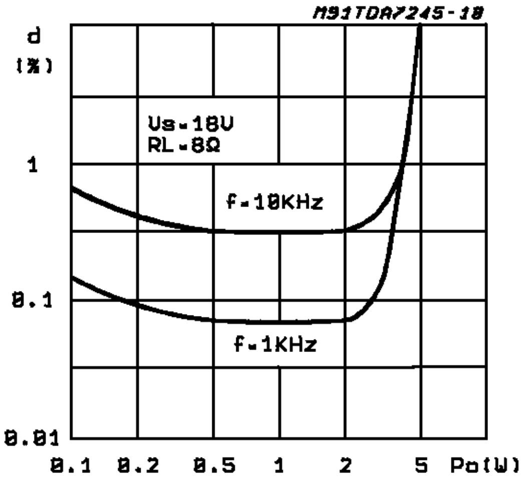


Figure 11: Distortion vs. Output Power

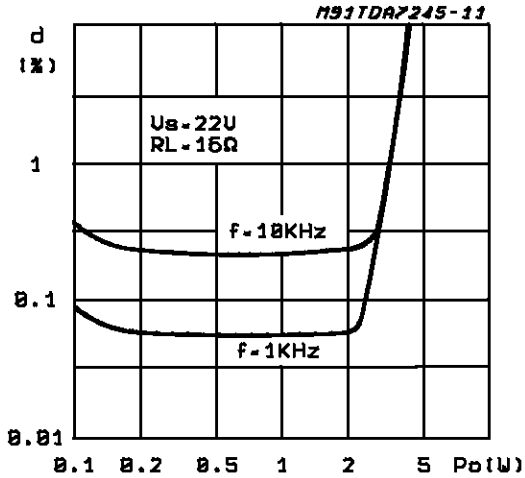


Figure 12: Supply Voltage Rejection vs. Frequency (play)

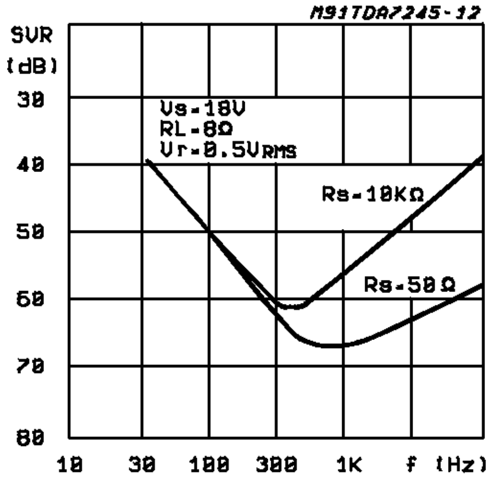


Figure 13: Power Dissipation & Efficiency vs. Output Power

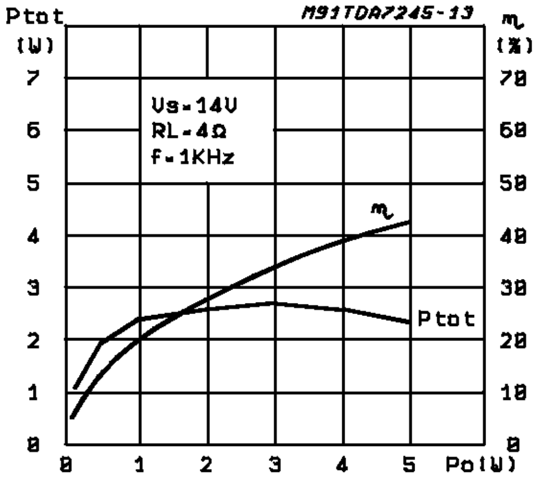


Figure 14: Power Dissipation & Efficiency vs. Output Power

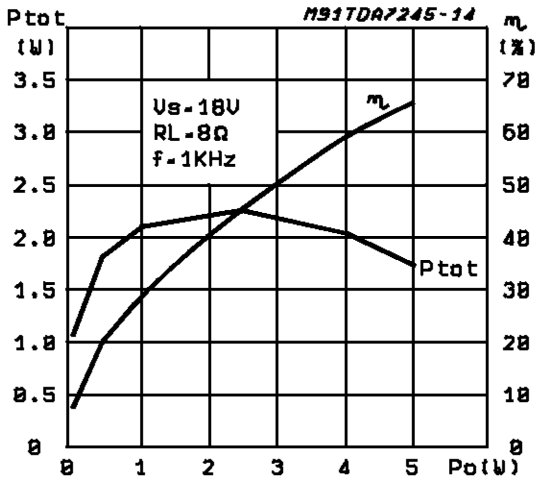


Figure 15: V_{pin5} (=V_{pin4}) vs. Supply Voltage

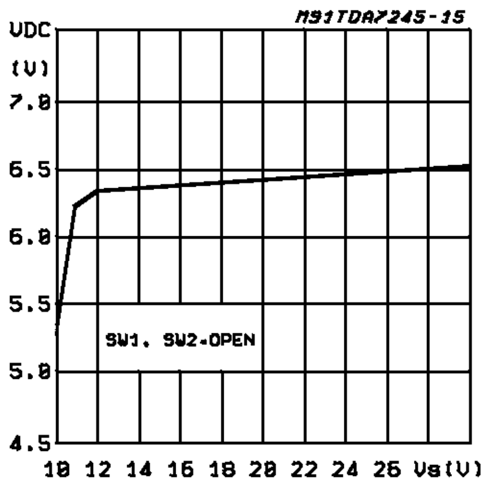


Figure 16: I_{pin4} (muting) vs. Supply Voltage

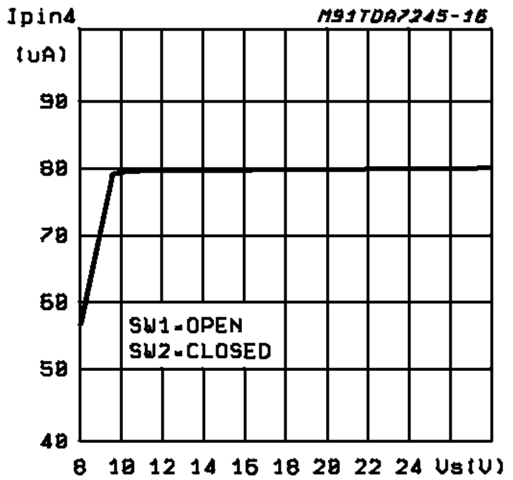


Figure 17: I_{pin5} (St-By) vs. Supply Voltage

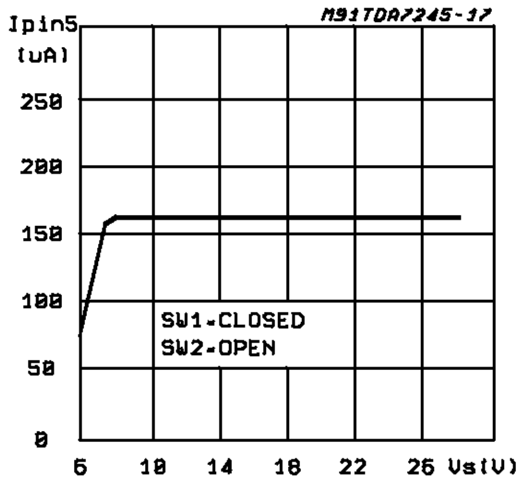


Figure 18: Quiescent Current (St-By) vs. Supply Voltage

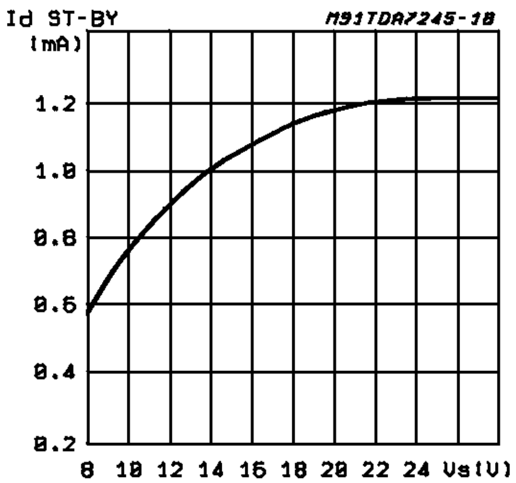


Figure 19: Output Attenuation vs. V_{pin5}

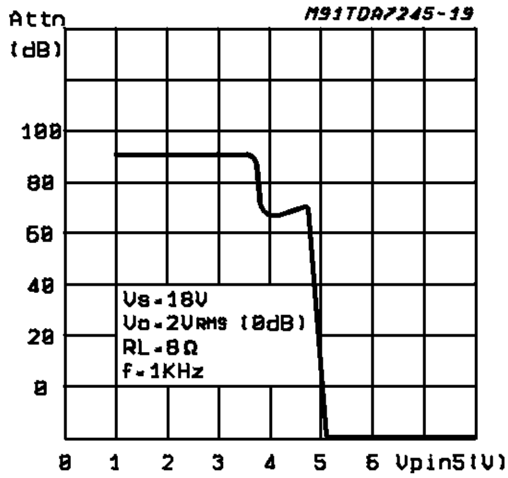
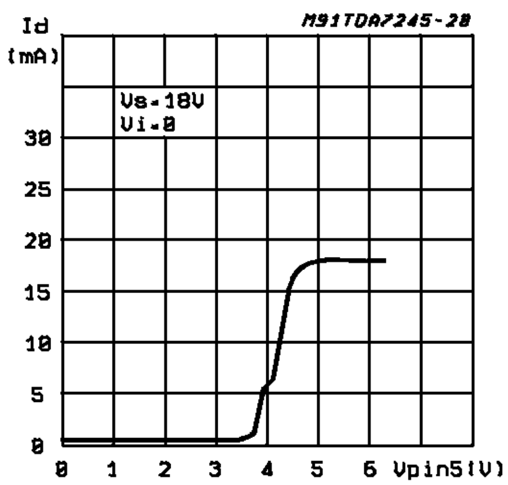


Figure 20: Quiescent Current vs. V_{pin5}



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.

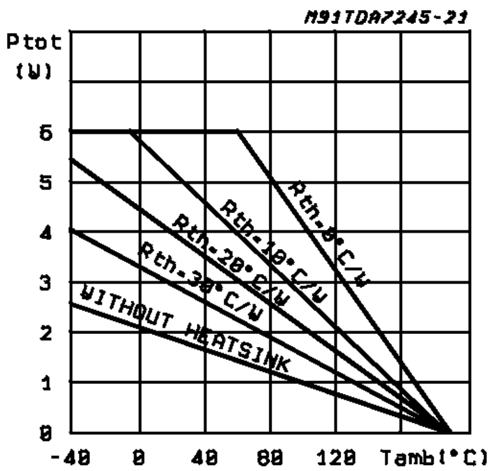
THERMAL SHUTDOWN

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 Tj 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 dissipable power as a function of ambient temperature for different thermal resistance.

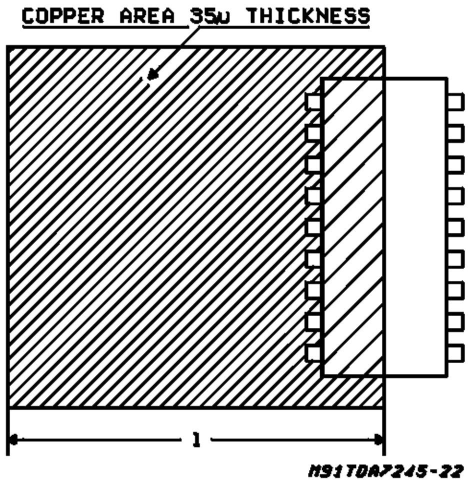
Figure 21: Maximum Allowable Power Dissipation vs. Ambient Temperature



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 = 65mm). The Thermal Resistance Junction-Ambient is 35°C.

Figure 22: Example of Heatsink using PC Board Copper (l = 65mm)



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