

30W BRIDGE CAR RADIO AMPLIFIER

- NO AUDIBLE POP DURING MUTE AND STANDBY OPERATIONS
- MUTING TTL COMPATIBLE
- VERY LOW STANDBY CONSUMPTION
- PROGRAMMABLE TURN ON DELAY
- DIFFERENTIAL INPUT
- SHORT CIRCUIT PROTECTIONS:
RL SHORT - OUT TO GROUND - OUT TO V_S
- OTHER PROTECTIONS:
- Load dump voltage surge
- Loudspeaker DC current
- Very inductive load
- Overrating temperature
- Open ground

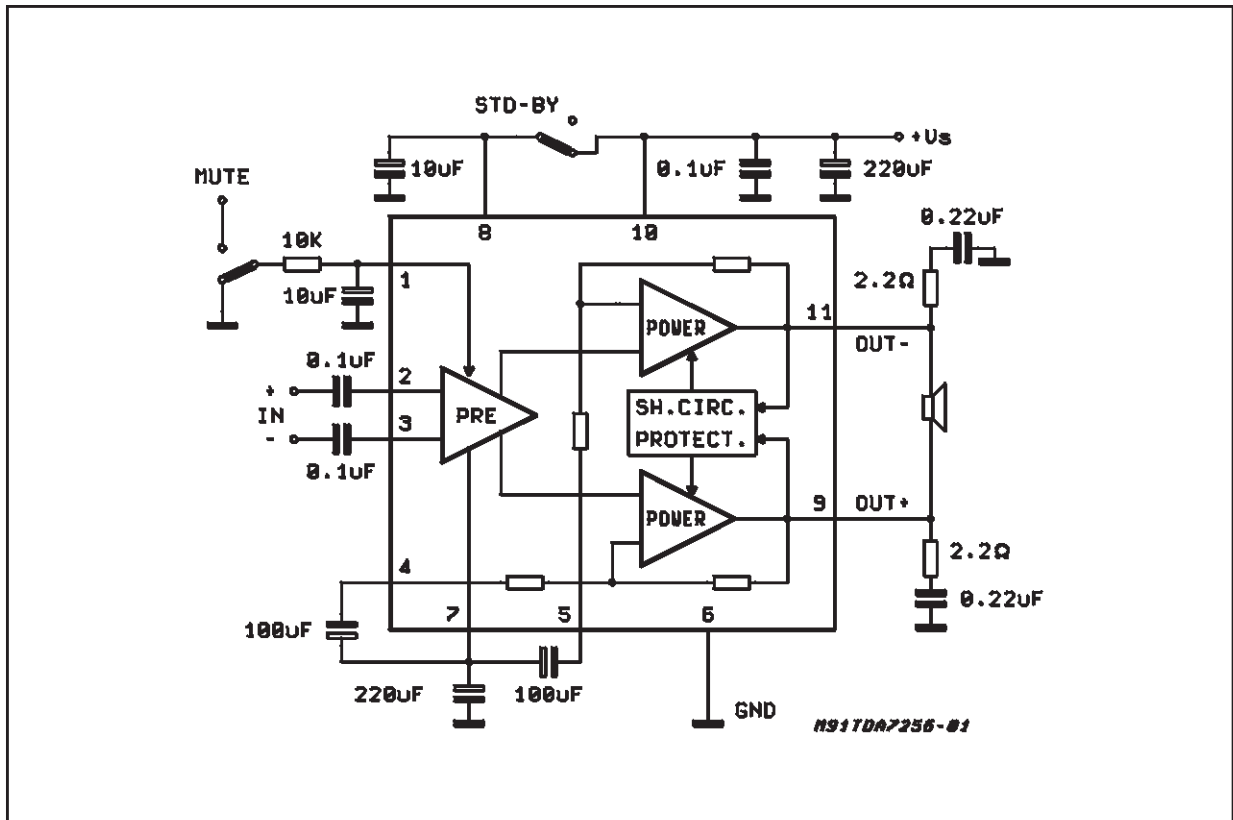


tions. The high current capability allows to drive low impedance loads (up to 2Ω). The differential inputs availability makes it particularly suitable for boosters and active loudspeakers applications.

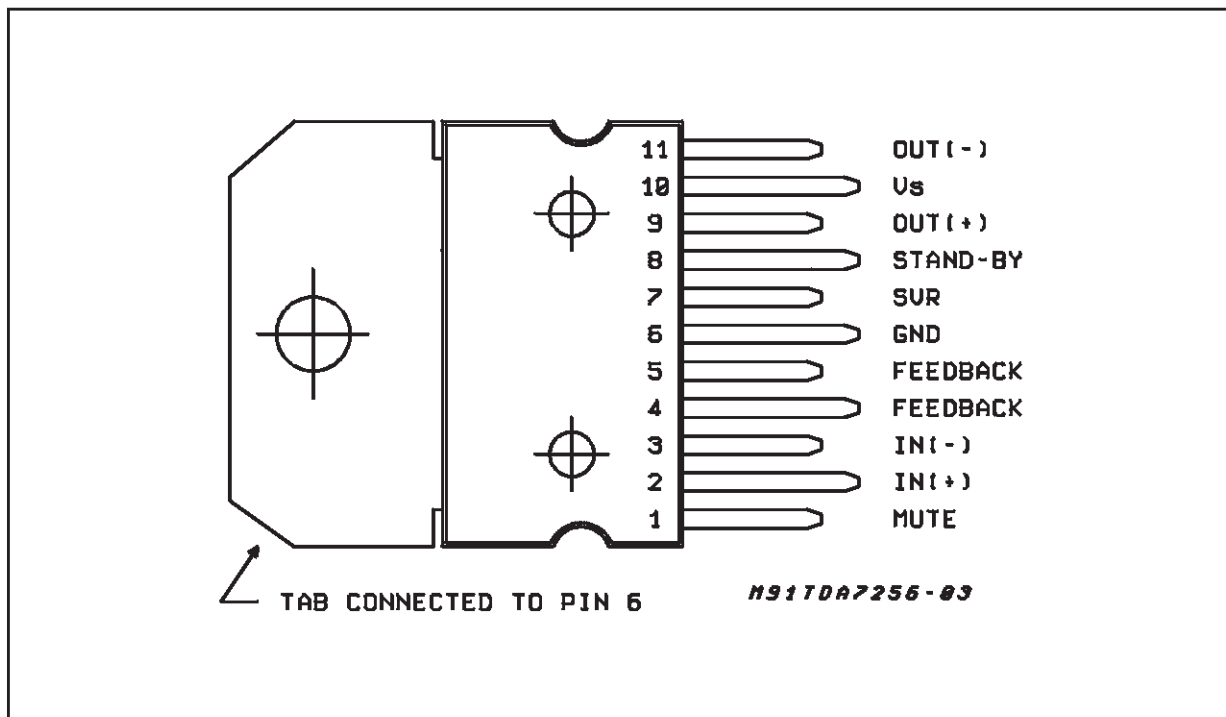
DESCRIPTION

The TDA7256 is a class AB fully protected bridge power amplifier, designed for car radio applica-

BLOCK DIAGRAM



PIN CONNECTION (Top view)



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Test Conditions | Unit |
|----------------|--|--------------------|------------------|
| V_S | Operating Supply Voltage | 18 | V |
| V_S | DC Supply Voltage | 28 | V |
| V_S | Peak Supply Voltage (for 50ms) | 40 | V |
| I_o | Output Peak Current (non repetitive $t = 0.1\text{ms}$) | internally limited | |
| I_o | Output Peak Current Repetitive $f > 10\text{Hz}$ | 5.5 | A |
| P_{tot} | Power Dissipation ($T_{case} = 85^\circ\text{C}$) | 36 | W |
| T_{stg}, T_J | Storage and Junction Temperature Range | -40 to +150 | $^\circ\text{C}$ |

THERMAL DATA

| Symbol | Description | Value | Unit |
|------------------|----------------------------------|---------|--------------------|
| $R_{th\ j-case}$ | Thermal Resistance Junction-case | Max 1.8 | $^\circ\text{C/W}$ |

ELECTRICAL CHARACTERISTICS ($V_S = 14.4V$, $R_L = 4\Omega$, $f = 1KHz$; $T_{amb} = 25^\circ C$, unless otherwise specified)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|----------|--|---|------|----------------|------|-------------|
| V_S | Supply Voltage | | 8 | | 18 | V |
| I_q | Quiescent Drain Current | | | 80 | 150 | mA |
| R_i | Input Resistance | | 50 | | | K Ω |
| CMR | Common Mode Rejection | $f = 1KHz$, $V_{in} = 100mV$ | | 60 | | dB |
| V_{OS} | Output Offset Voltage | | | | 150 | mV |
| P_o | Output Power | $d = 10\%$ $R_L = 4\Omega$ $R_L = 3.2\Omega$ $R_L = 2\Omega$ | 18 | 22 26 30 | | W W W |
| d | Distortion | $P_o = 0.1W$ to $13W$ | | 0.05 | 0.5 | % |
| G_V | Voltage Gain (CL) | | | 36 | | dB |
| e_N | Total Input Noise Voltage | $R_g = 10K\Omega$, $B = 22Hz$ to $22KHz$ | | 3 | 10 | μV |
| SVR | Supply Voltage Rejection | $R_g = 10K\Omega$, $V_r = 1V_{rms}$, $f = 300Hz$ | 45 | 60 | | dB |
| | Muting Attenuation | $V_{ref} = 1V_{rms}$, $f = 100Hz$ to $10KHz$ | 60 | | | dB |
| | Muting-in Threshold Voltage | Pin 1 | 2.4 | | | V |
| | Muting-out Threshold Voltage | Pin 1 | | | 0.8 | V |
| | Stand-by Attenuation | $V_{ref} = 1V_{rms}$ | 60 | | | dB |
| | Stand-by Current Consumption | | | | 100 | μA |
| T_{SD} | Thermal Shut-down Junction Temperature | | | 145 | | $^\circ C$ |

Figure 1: Test and Application Circuit

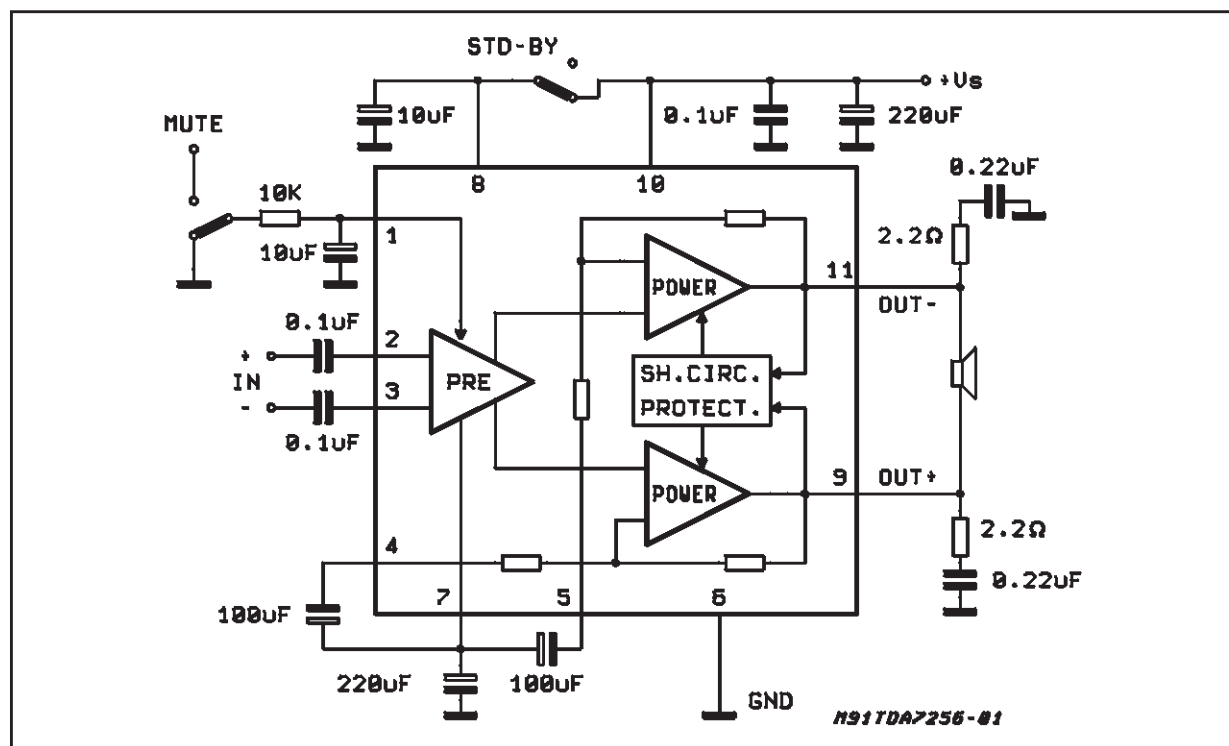


Figure 2: P.C. and Layout of the fig.1 (1:1 scale)

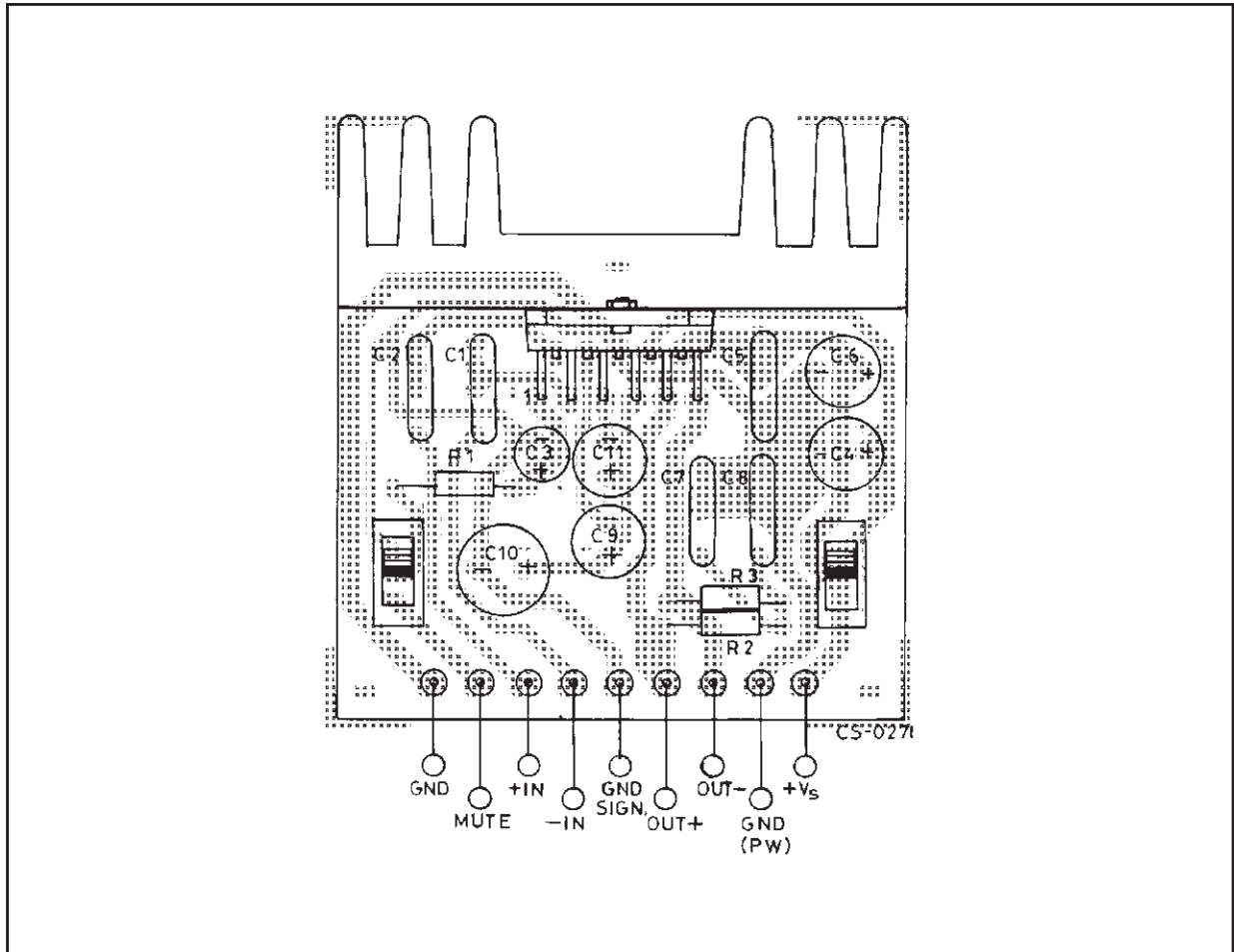


Figure 3: Drain Current vs. Supply Voltage

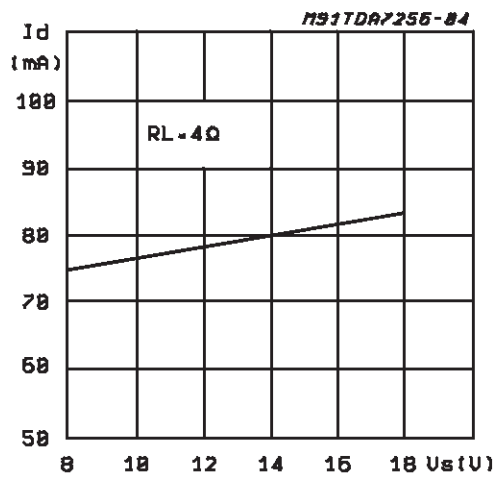


Figure 4: Output Power vs. Supply Voltage

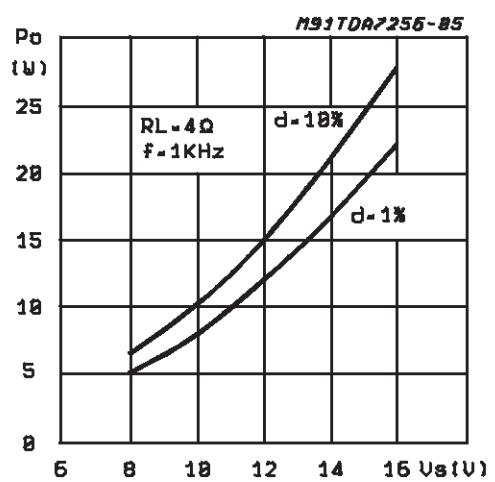


Figure 5: Output Power vs. Supply Voltage

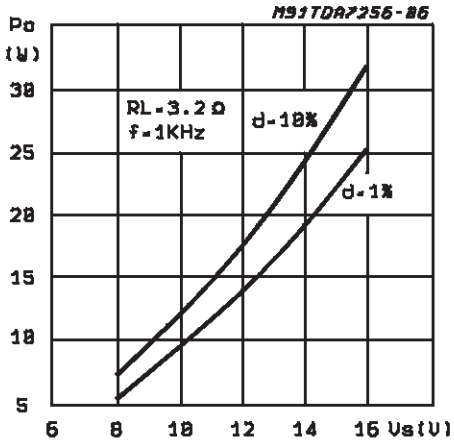


Figure 6: Output Power vs. Supply Voltage

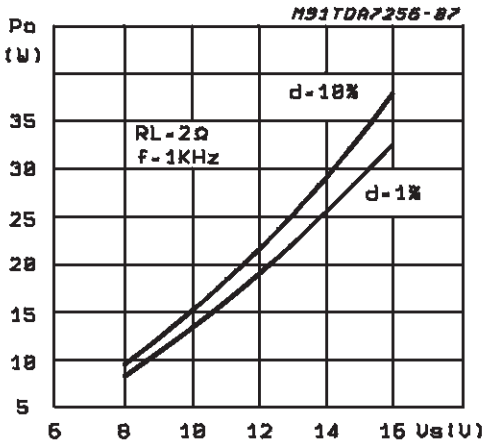


Figure 7: Distortion vs. Output Power

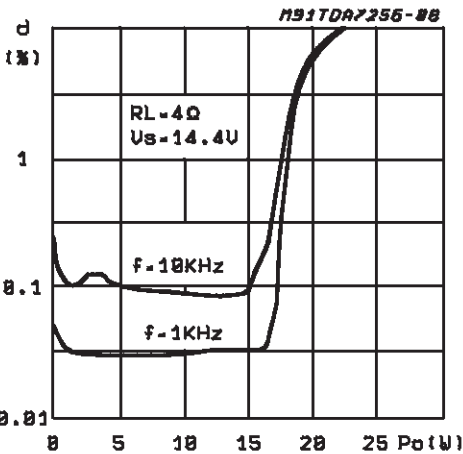


Figure 8: Distortion vs. Output Power

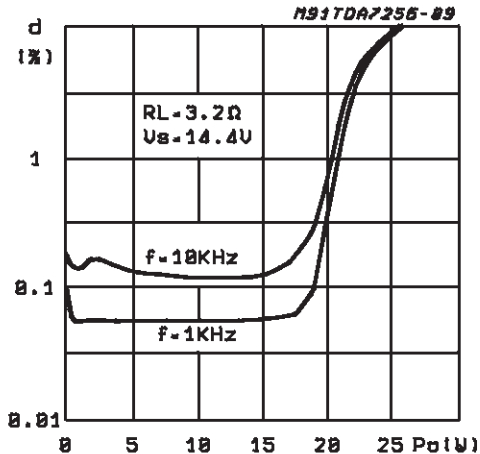


Figure 9: Distortion vs. Output Power

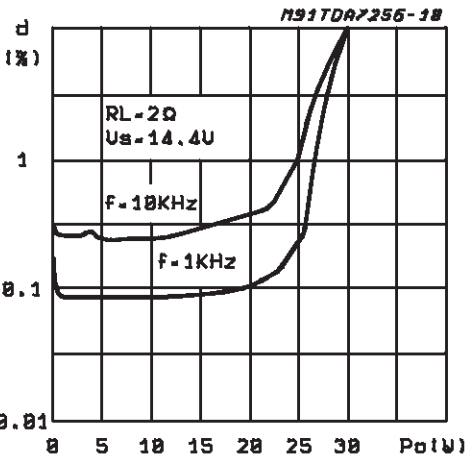


Figure 10: Distortion vs. Frequency

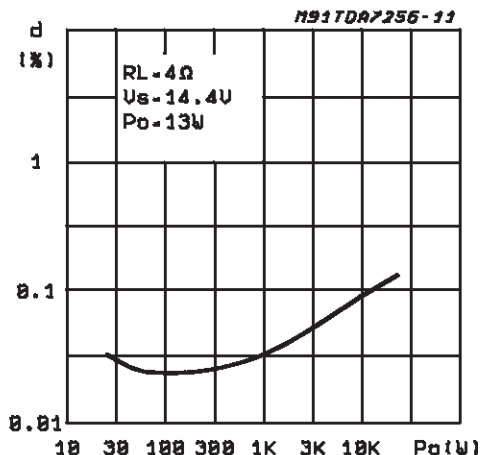


Figure 11: Distortion vs. Frequency

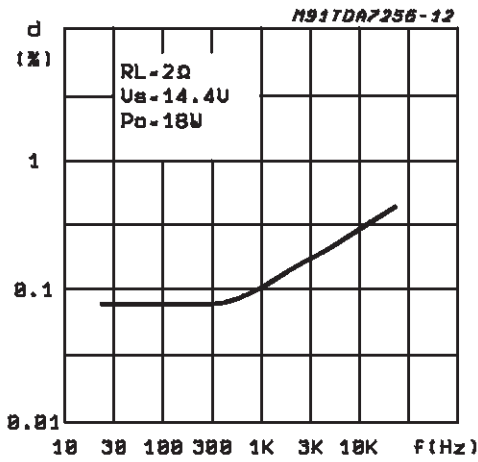


Figure 12: SVR vs. Frequency

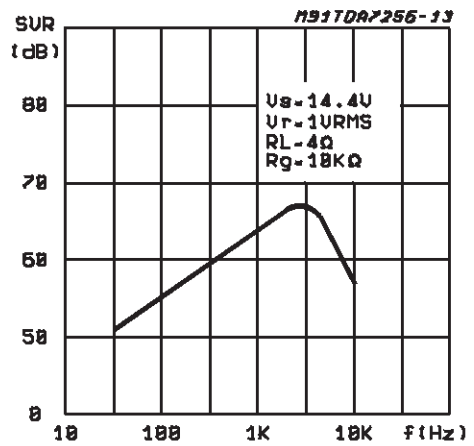


Figure 13: CMRR vs. Frequency

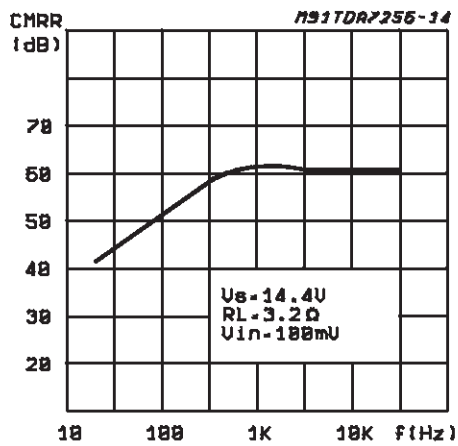


Figure 14: Power Dissipation & Efficiency vs. Output Power

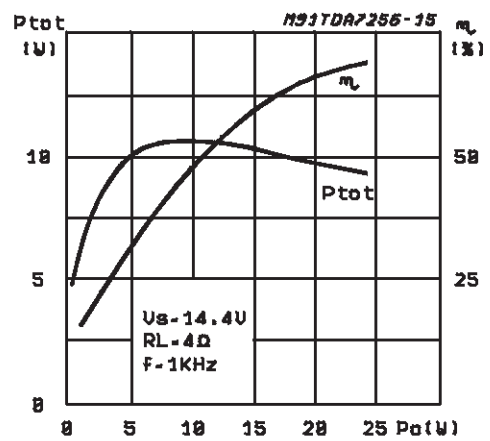


Figure 15: Power Dissipation & Efficiency vs. Output Power

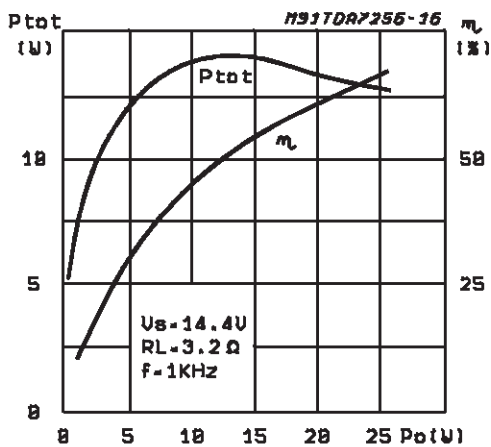
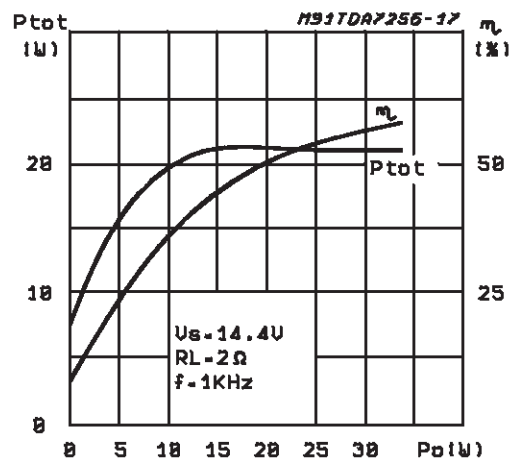


Figure 16: Power Dissipation & Efficiency vs. Output Power



CIRCUIT DESCRIPTION

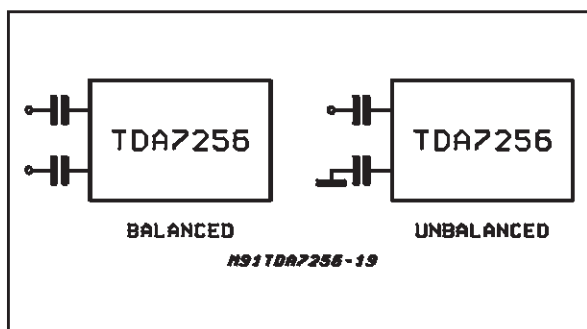
INPUT STAGE

The input stage is a differential type preamplifier stage with two independent inputs and two outputs in phase opposition.

It is designed for particular linearity characteristics in order to have output amplitude large enough (1VPP) yet maintaining low distortion.

The voltage gain of the stage is 6 dB. The possibility to use the differential input allows the system immunity to common-mode noise in case of long wire connections (fig. 17)

Figure 17: Balanced -Unbalanced Input

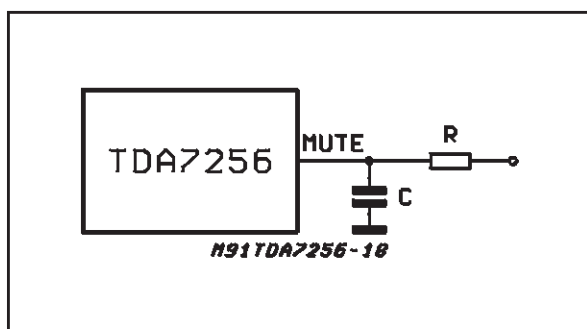


MUTE

The mute circuit (TTL compatible) acts at preamplifier level and disables the inputs without changing the DC voltage values. In such a way the operation is fully popless. The use of a RC network produces a soft reduction of the audio signal providing the best effect from the acoustic point of view (fig 18).

The mute circuit is also activated during turn-on/turn-off operations when the voltage at standby pin is lower than about 2 volt

Figure 18: Soft Muting



TURN-ON

The TDA7256 is fully popless at turn-on thanks to a delay circuit which keeps the output low during the capacitors charge transient.

The delay-time is given by the following formula:

$$T_o = 800 C_{10} + 600 (C_9 + C_{11}) \left(\frac{C_{10}}{C_9 + C_{11}} + 1 \right)$$

TURN-OFF

The ground compatible structures and the choice of a soft turn-off circuit ensure a fully popless operation.

OUTPUT STAGE

It is a power stage designed in a way of being able to drive loads up to 2 ohm in bridge configuration without bootstrap capacitors (22 W with $R_L=4$ ohm , 30W with $R_L=2$ ohm).

SVR

The noises coming from the car environment are essentially inside the bandwidth from 300 Hz to 6 KHz.

The ripple rejection circuit which utilizes also the gain capacitors C11, C9 ensures in this frequency range a rejection typ. of 60dB.

SHORT CIRCUIT PROTECTION

The short circuit protection circuits intervene in the following cases:

- s.c. between one output and ground
- s.c. between one output and +Vs
- s.c. between the outputs

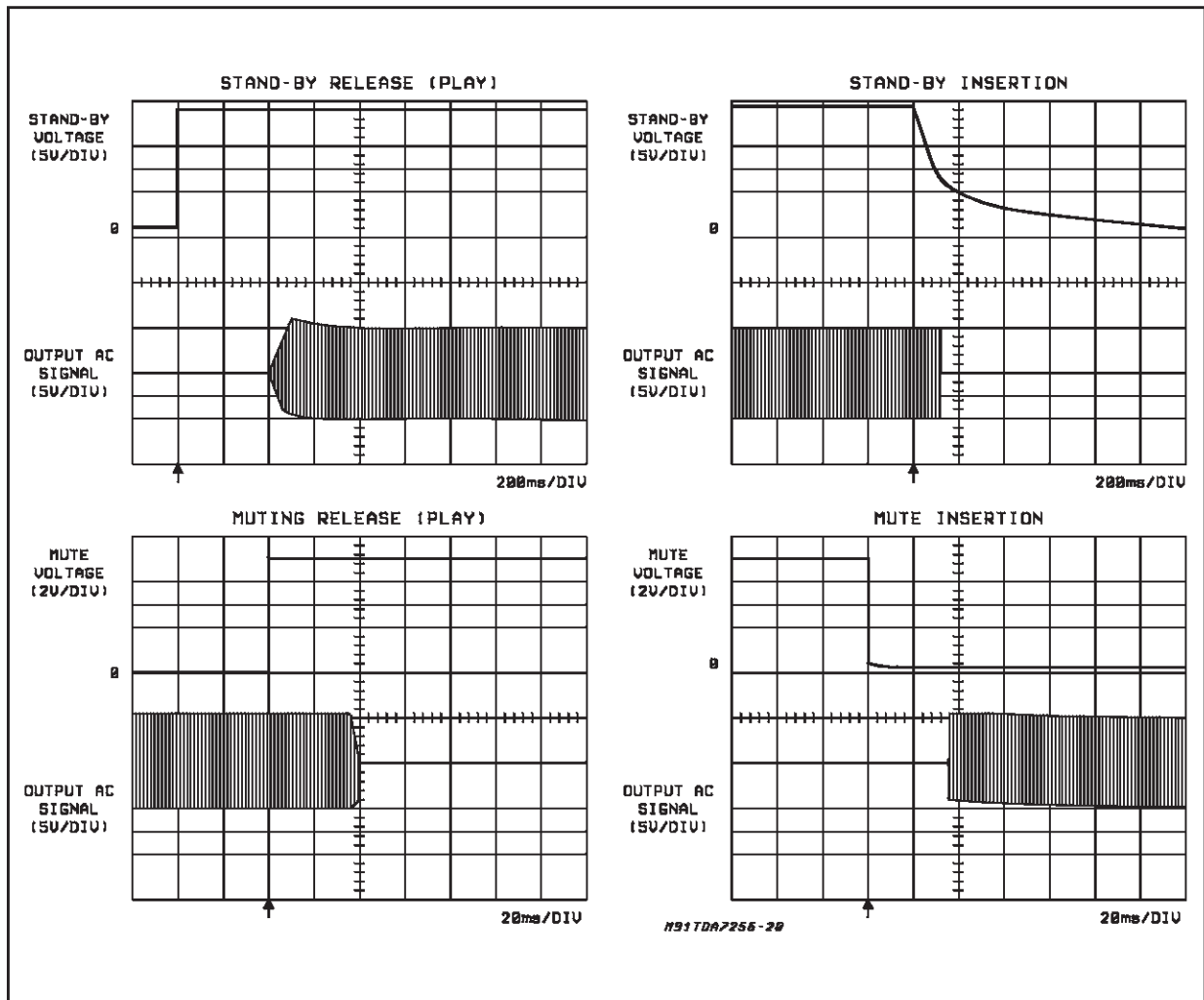
In the first two cases they stop the current in both the final stages, allowing also loudspeaker protection. In the last case the current is limited, thus avoiding the load point to reach the SOA of the output transistors.

STAND-BY

In stand-by condition the current generators are disabled: the current drops to a very low value (few μ A). Also this function is fully popless.

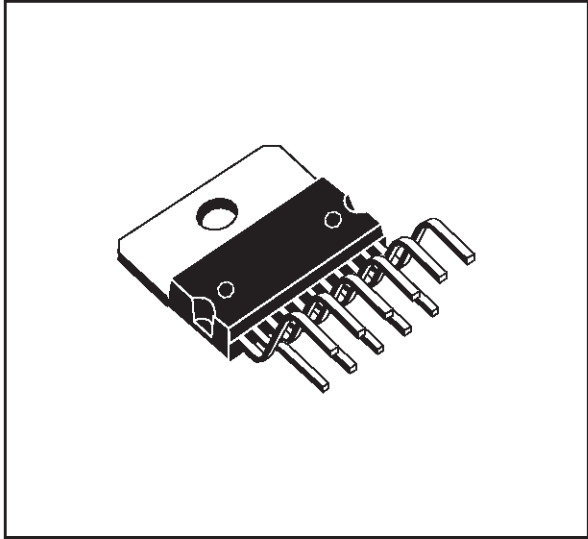
Fig. 19 shows the silent transients of turn-on and turn-off operations through both the mute and the stand-by pins.

Figure 19: Silent Transients Through the Mute and Stand-by pins.

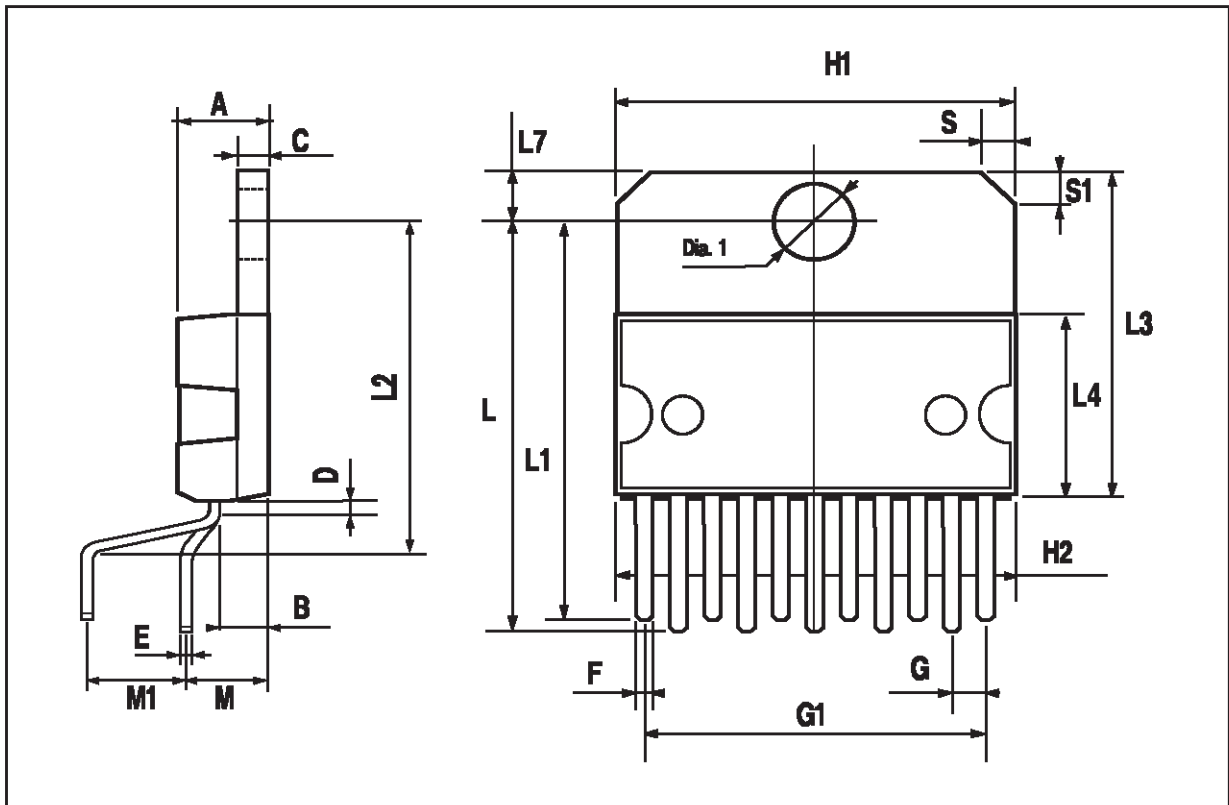


| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 5 | | | 0.197 |
| B | | | 2.65 | | | 0.104 |
| C | | | 1.6 | | | 0.063 |
| D | | 1 | | | 0.039 | |
| E | 0.49 | | 0.55 | 0.019 | | 0.022 |
| F | 0.88 | | 0.95 | 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 V



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