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STMicroelectronics
TDA7256

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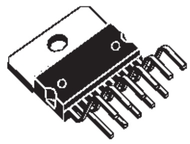
TDA7256

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

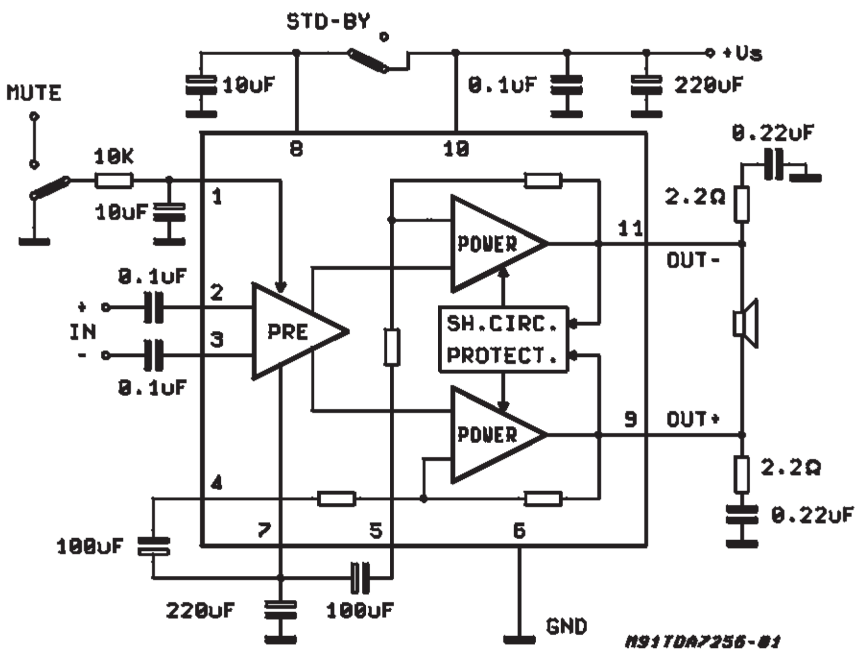


MULTIWATT11
ORDERING NUMBER: TDA7256

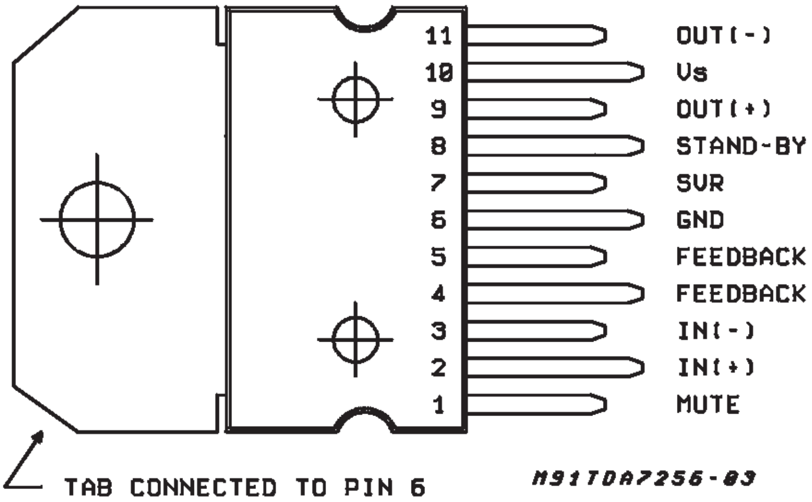
DESCRIPTION

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

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 repetiitive t = 0.1ms)	internally limited	
I_o	Output Peak Current Repetitive f > 10Hz	5.5	A
P_{tot}	Power Dissipation (Tcase = 85°C)	36	W
T_{stg}, T_J	Storage and Junction Temperature Range	-40 to +150	°C

THERMAL DATA

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

ELECTRICAL CHARACTERISTICS (V_S = 14.4V, R_L = 4Ω, f = 1KHz; T_{amb} = 25°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			KΩ
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 = 4Ω R_L = 3.2Ω R_L = 2Ω	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 = 10KΩ, B = 22Hz to 22KHz		3	10	µV
SVR	Supply Voltage Rejection	R_g = 10KΩ, V_r = 1Vrms, f = 300Hz	45	60		dB
	Muting Attenuation	V_{ref} = 1Vrms, 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	Vref = 1Vrms	60			dB
	Stand-by Current Consumption				100	µA
T_{SD}	Thermal Shut-down Junction Temperature			145		°C

Figure 1: Test and Application Circuit

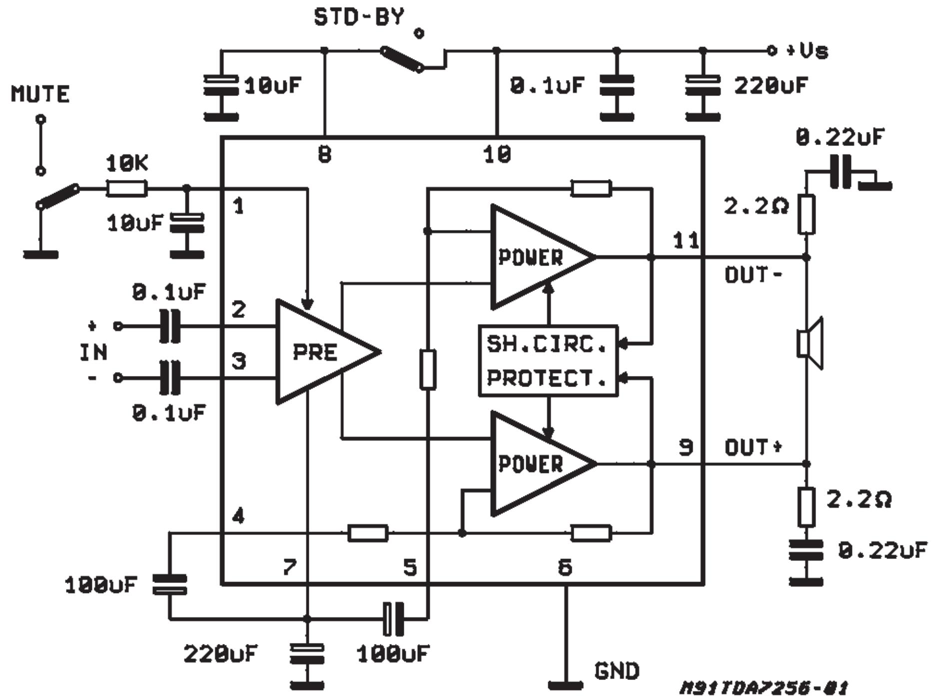


Figure 2: P.C. and Layout of the fig.1 (1:1 scale)

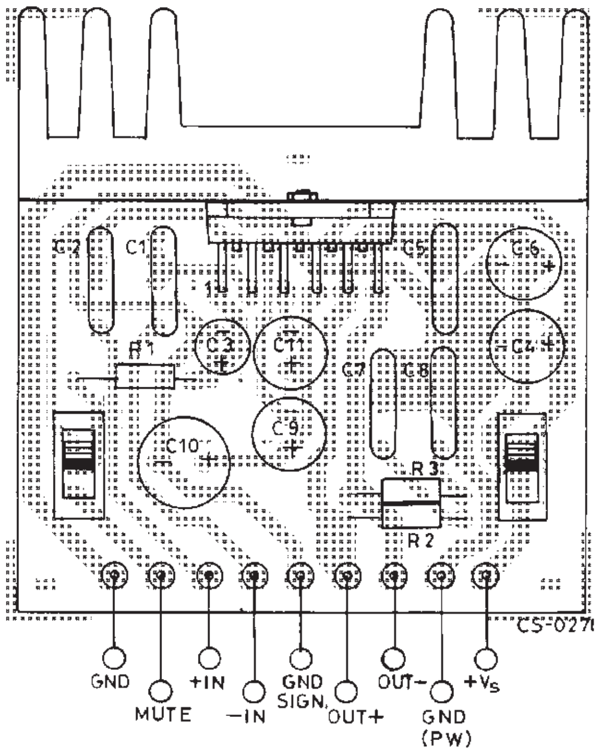


Figure 3: Drain Current vs. Supply Voltage

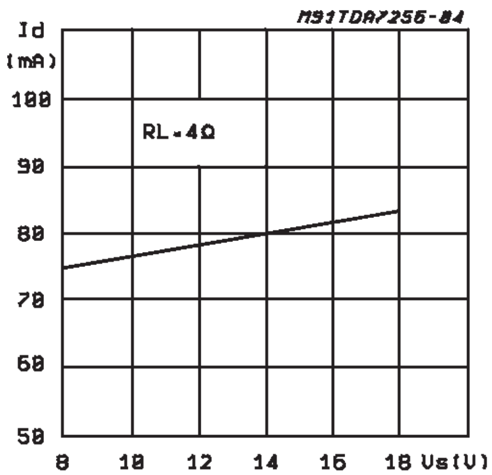


Figure 4: Output Power vs. Supply Voltage

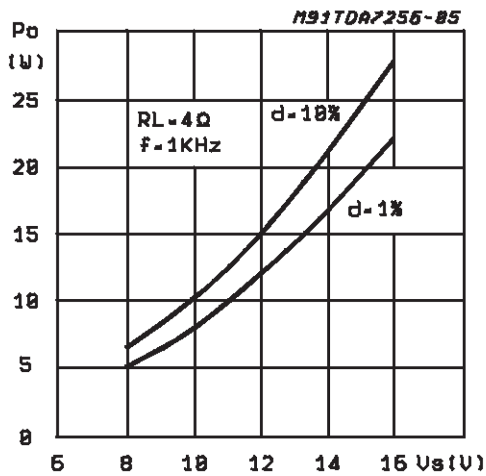


Figure 5: Output Power vs. Supply Voltage

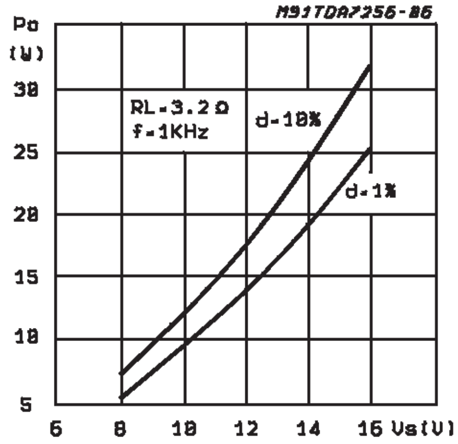


Figure 6: Output Power vs. Supply Voltage

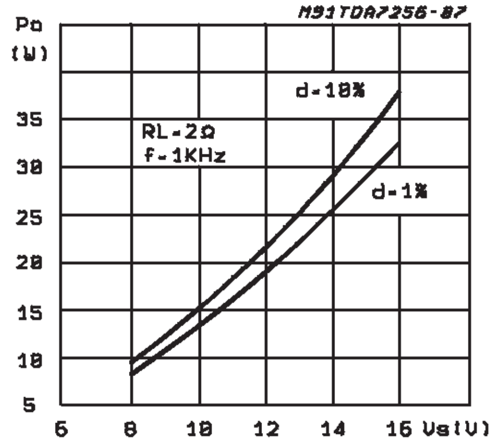


Figure 7: Distortion vs. Output Power

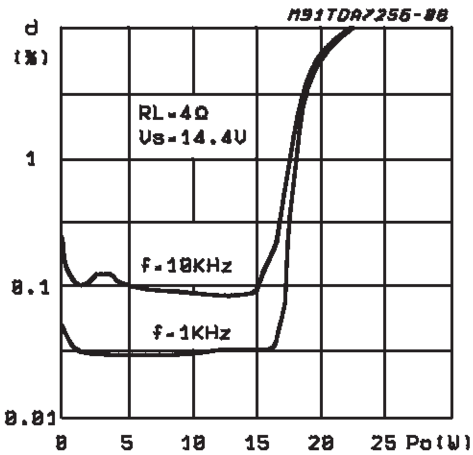


Figure 8: Distortion vs. Output Power

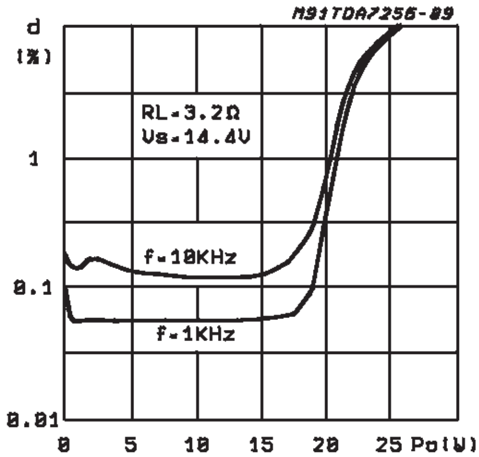


Figure 9: Distortion vs. Output Power

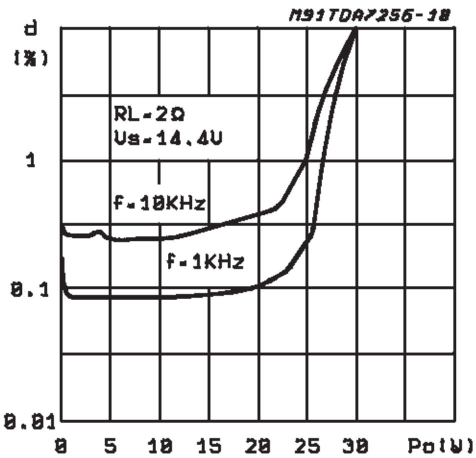


Figure 10: Distortion vs. Frequency

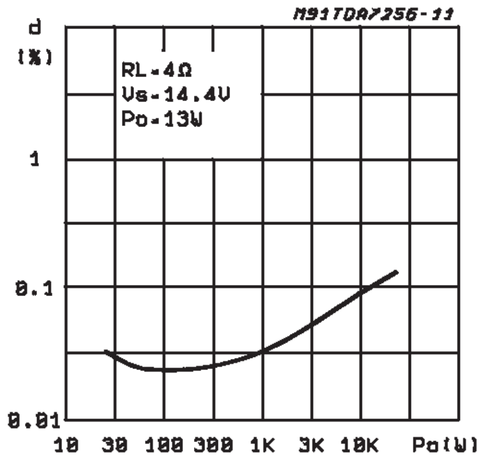


Figure 11: Distortion vs. Frequency

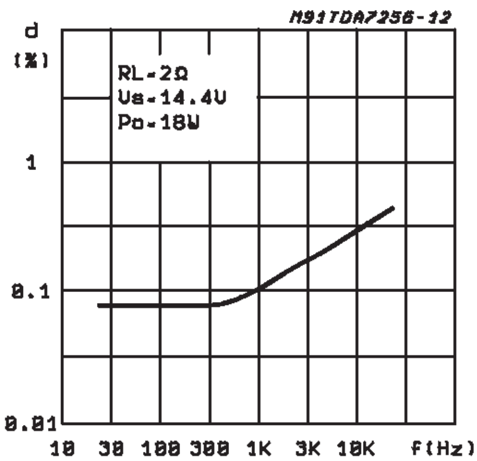


Figure 12: SVR vs. Frequency

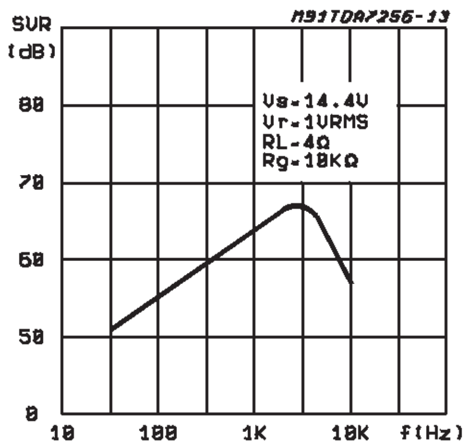


Figure 13: CMRR vs. Frequency

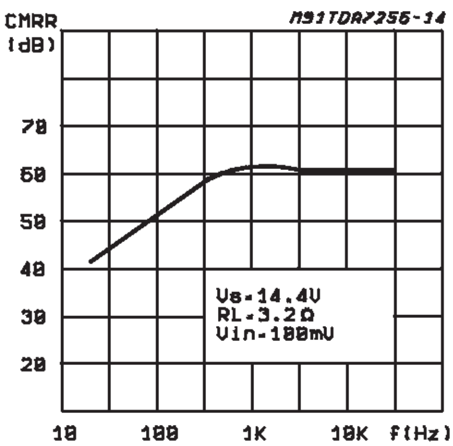


Figure 14: Power Dissipation & Efficiency vs. Output Power

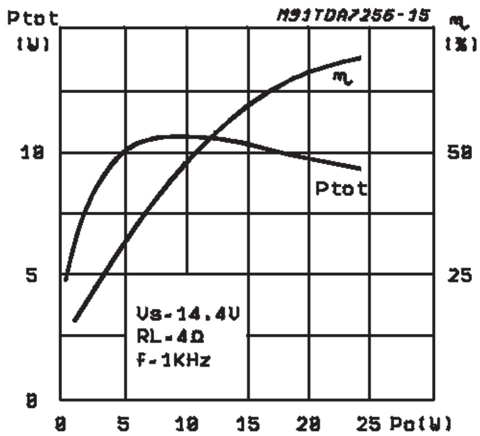


Figure 15: Power Dissipation & Efficiency vs. Output Power

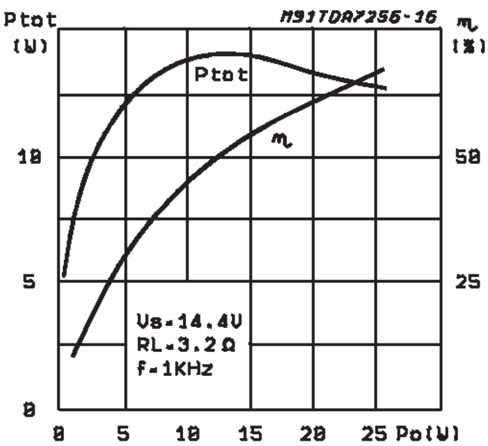
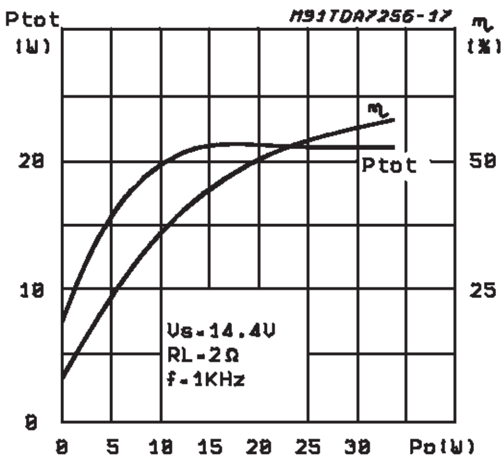


Figure 16: Power Dissipation & Efficiency vs. Output Power



CIRCUIT DESCRIPTION

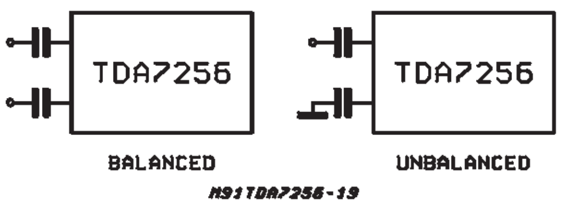
INPUT STAGE

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

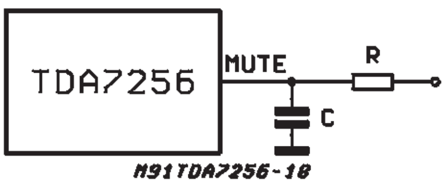


MUTE

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 stand-by 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:

$$T_o = 800\ C10 + 600\ (C9 + C11) \left(\frac{C10}{C9 + C11} + 1 \right)$$

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 bandwith 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

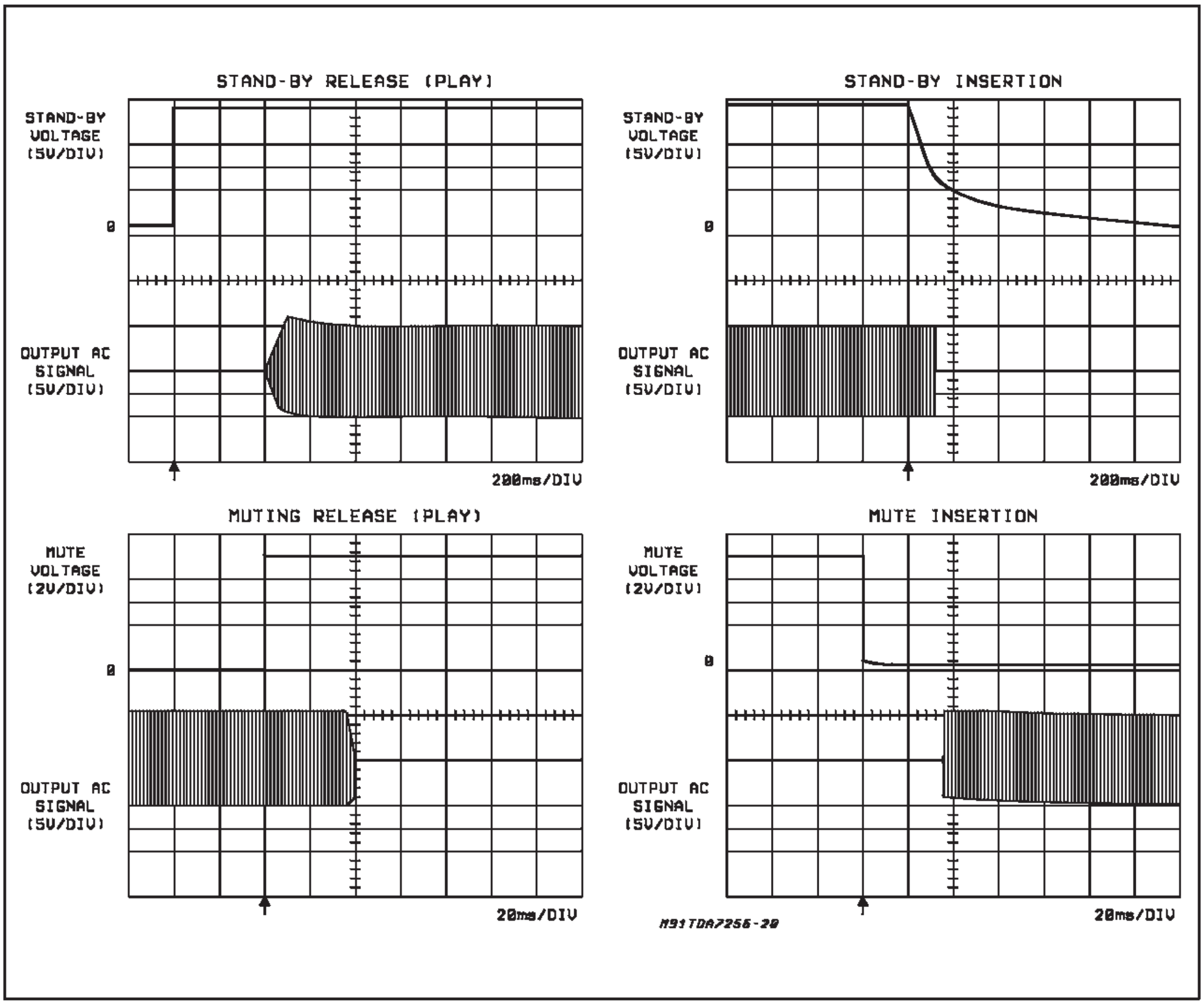
In the first two cases they stop the current in both the final stages,allowing also loudspeaker protection.In the last case the current is limited, thus avoiding the load point to reach the SOA of the output transistors.

STAND-BY

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

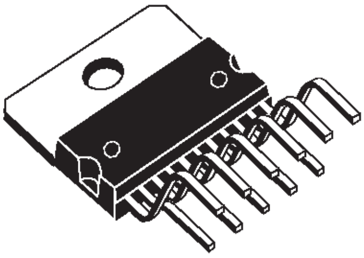
Fig. 19 shows the silent transients of turn-on and turn-off operations through both the mute and the stand-by pins.

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



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