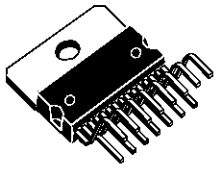
SGS-THOMSON MICROELECTRONICS

TDA7494

10W AMPLIFIER WITH DC VOLUME CONTROL

- 10W OUTPUT POWER R_L = 8Ω, @ 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

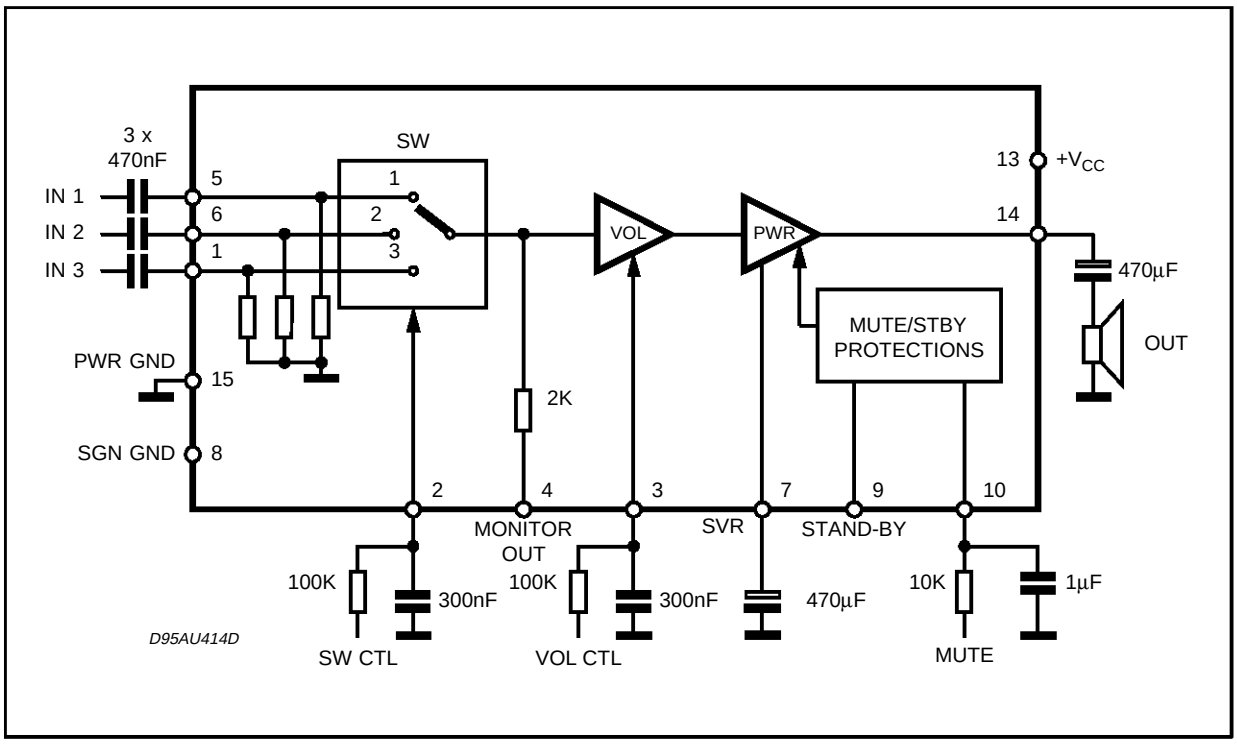
ORDERING NUMBER: TDA7494

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

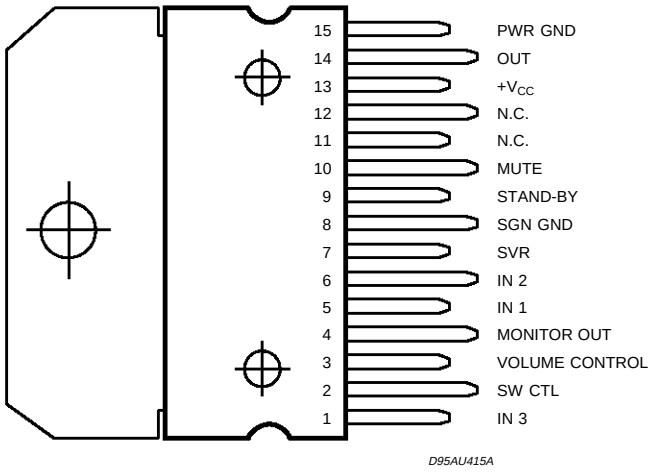


ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_S	DC Supply Voltage	35	V
V_{IN}	Maximum Input Voltage	8	Vpp
P_{tot}	Total Power Dissipation (Tamb = 70°C)	16	W
T_{amb}	Ambient Operating Temperature Range (1)	-20 to +85	°C
T_{stg}, T_j	Storage and Junction Temperature	-40 to 150	°C
V_2, V_3	Volume CTRL DC voltage	7	V

(1) Operation between -20 to 85 °C guaranteed by correlation with 0 to 70°C.

PIN CONNECTION



THERMAL DATA

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

ELECTRICAL CHARACTERISTICS (Refer to the test circuit, V_S = 21V, R_L = 8Ω; R_g = 50Ω; T_{amb} = 25°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
DCV_{OS}	Output DC Offset Referred to SVR Potential	No Input Signal	-400		400	mV
V_O	Quiescent Output Voltage	V_S = 28V		14		V
P_O	Output Power	THD = 10%; V_{CC} = 28V, R_L = 8Ω THD = 1%; V_{CC} = 28V	8 6	10 8		W
		THD = 10%; V_{CC} = 21V, THD = 1%; V_{CC} = 21V,	5 3.5	5.5 4		W
		THD = 10%; V_{CC} = 21V, R_L = 4Ω THD = 1%; V_{CC} = 21V,	5 3.9	7.5 5.5		W
		THD = 10%; V_{CC} = 18V, THD = 1%; V_{CC} = 18V	4.5 3.5	6 4.5		W
		THD = 10%; V_{CC} = 18V, R_L = 8Ω THD = 1%; V_{CC} = 18V	3.5 2.5	3.75 2.85		W W

ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
THD	Total Harmonic Distortion	P_O = 1W; f = 1KHz; Gv = 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	Vrms
G_V	Closed Loop Gain	Vol Ctrl > 4.5V	24.5	26	27.5	dB
G_{vLine}	Monitor Out Gain	$R_{LOAD\ Mon}$ = ∞	-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 Play, max volume		350	700	µV
		f = 20Hz to 22KHz Play, max attenuation		60	100	µV
		f = 20Hz to 22KHz 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 C_{SVR} = 470µA; V_{RIP} = $1V_{RMS}$	36	43		dB
		f = 1kHz; max attenuation C_{SVR} = 470µA; 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; 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.

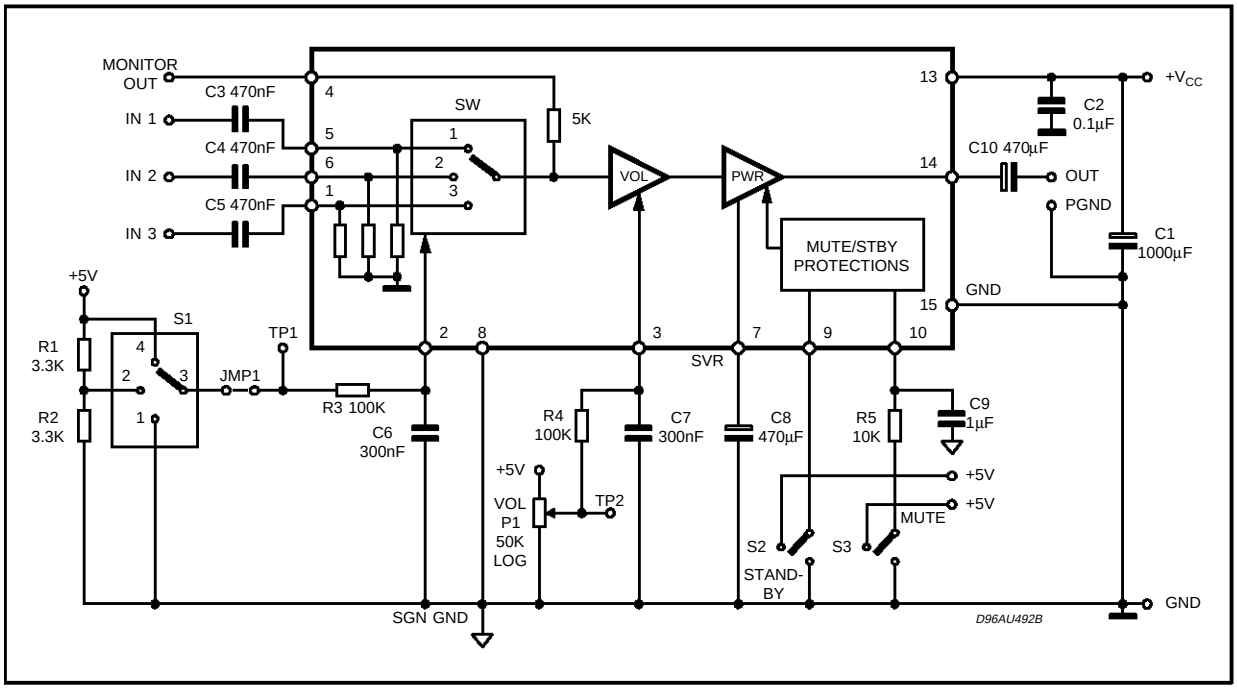
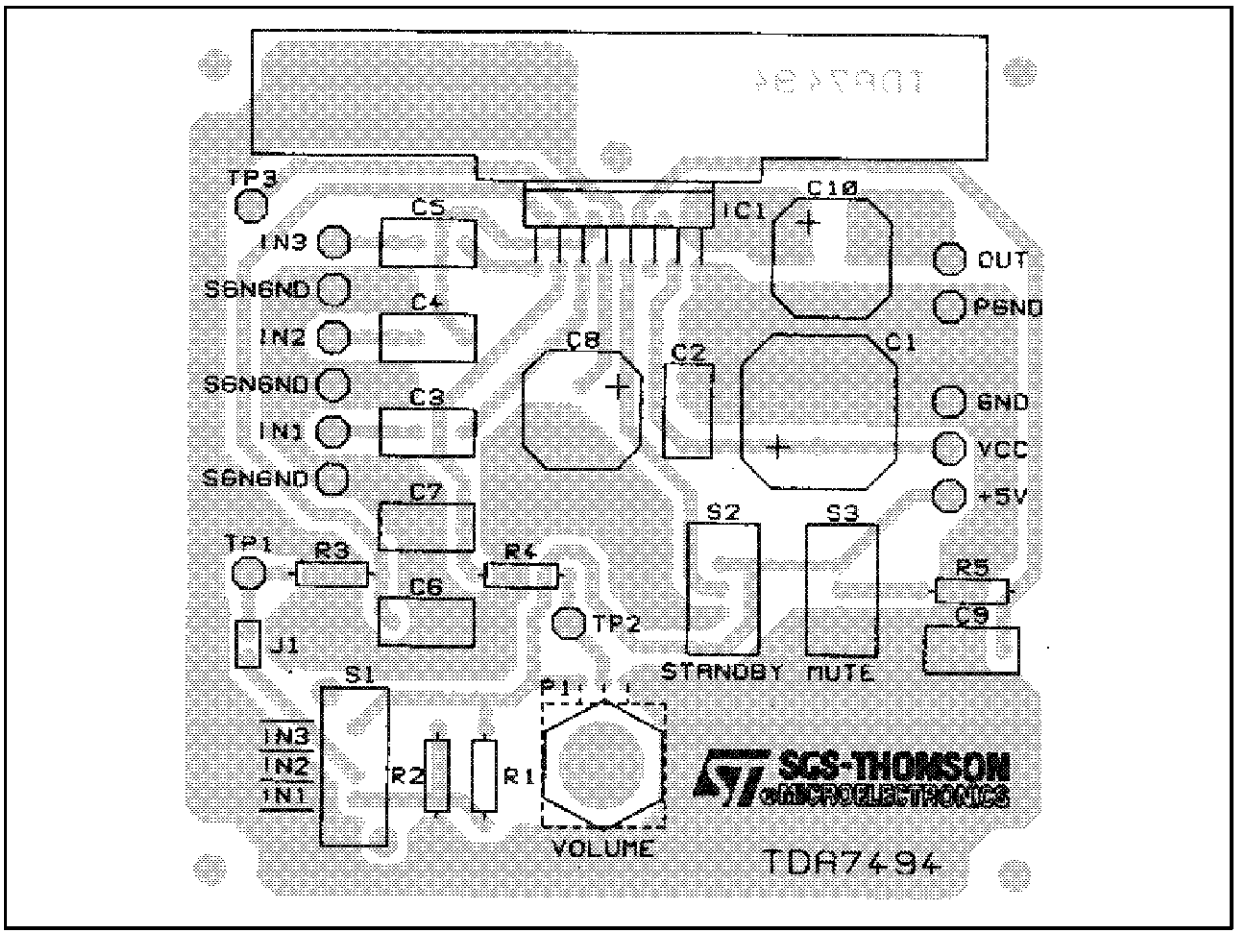


Figure 2: P.C.B. and component layout.



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	3.3KΩ	Input switch circuit	Vpin #2 shifted downward	Vpin #2 shifted upward
R2	3.3KΩ	Input switch circuit	Vpin #2 shifted upward	Vpin #2 shifted downward
R3	100KΩ	Input switch time constant	Larger Input Switch Time	Smaller input switch time
R4	100KΩ	Volume control time constant	Larger Volume Regulation Time	Smaller volume regulation time
R5	10KΩ	Mute time constant	Larger mute on/off time	Smaller mute on/off time
P1	50KΩ	Volume control circuit		
C1	1000µF	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	470µF	Ripple Rejection	Better SVR	Worse SVR
C9	1µF	Mute time constant	Larger mute on/off time	Smaller mute on/off time
C10	470µF	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 = 8Ω; f = 1KHz; R_S = 8Ω; Tamb = 25°C; R_S = 50Ω; unless otherwise specified

Figure 3: Output Power vs Supply Voltage

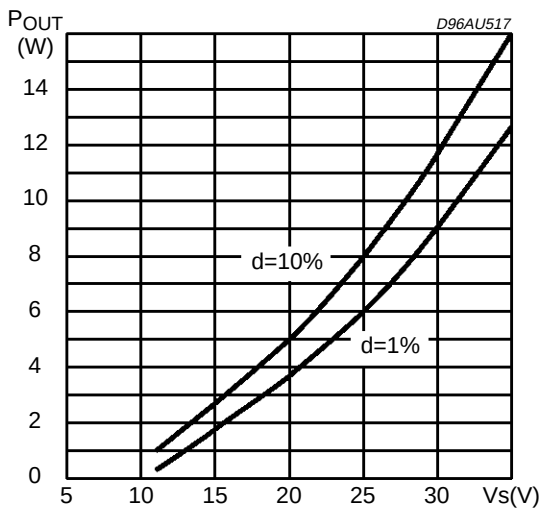


Figure 4: Distortion vs Output Power

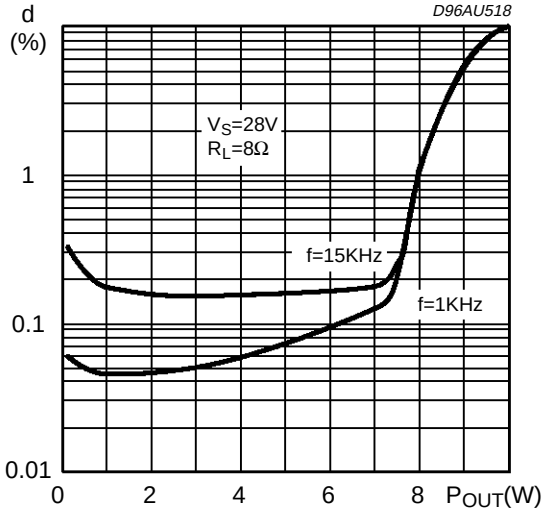


Figure 5: Output Power vs Supply Voltage

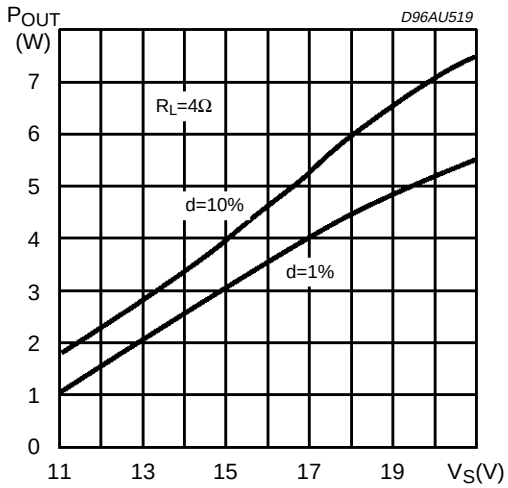


Figure 6: Distortion vs Output Power

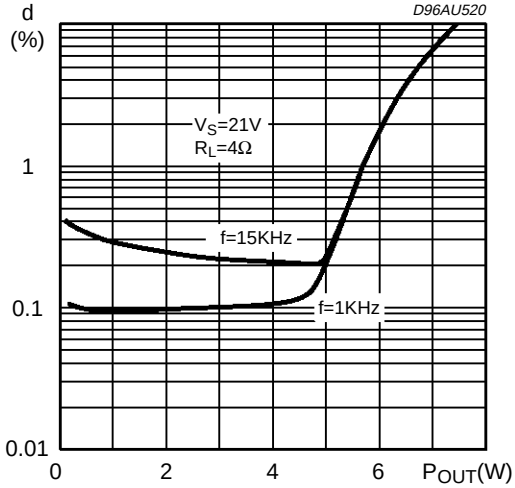


Figure 7: Distortion vs Frequency

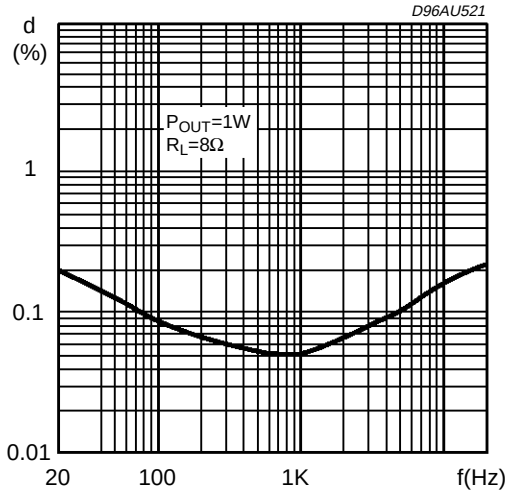


Figure 8: Distortion vs Frequency

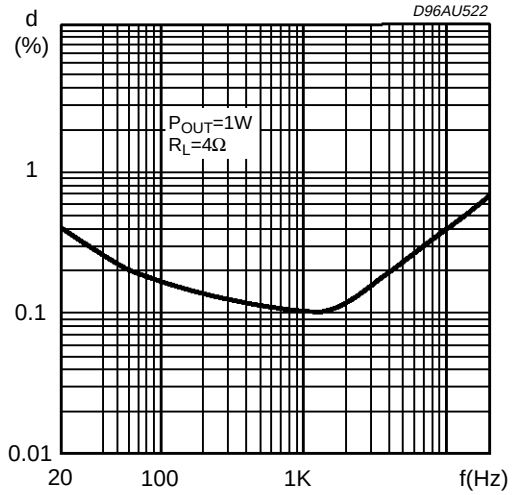


Figure 9: Quiescent Current vs Supply Voltage

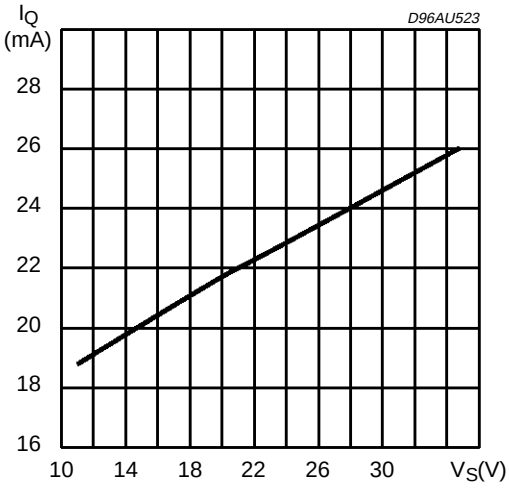


Figure 10: Quiescent Output Voltage vs Supply Voltage

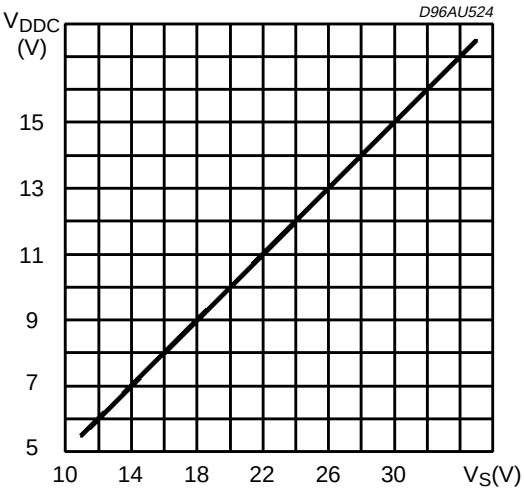


Figure 11: Gain vs Volume Control (pin #3)

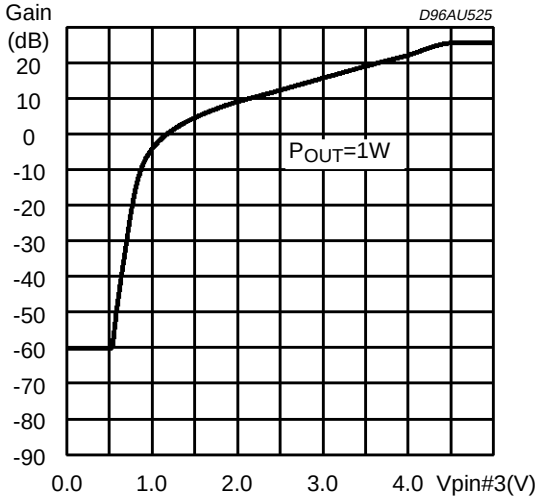


Figure 12: Supply Voltage Rejection vs Frequency

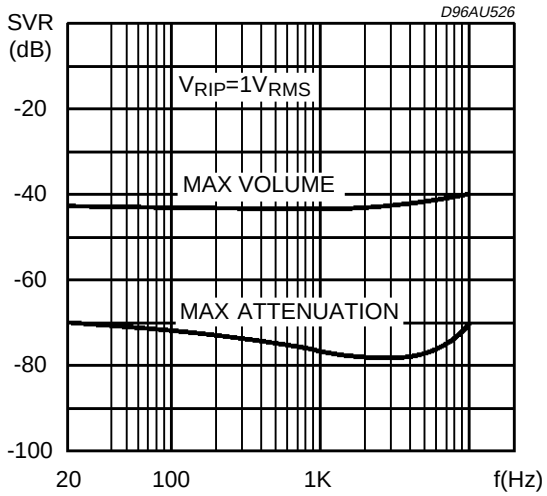


Figure 13: Stand-by Attenuation vs Vpin # 9

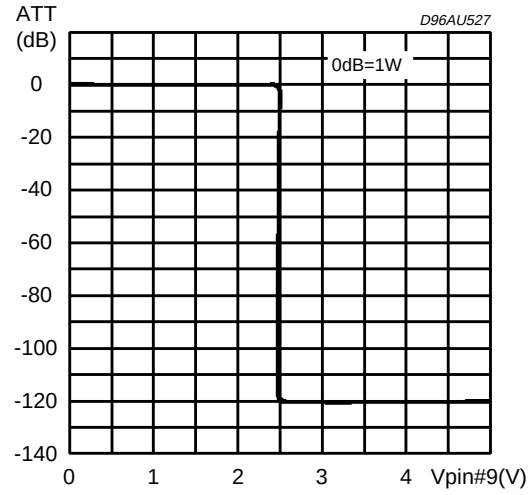


Figure 14: Mute Atttenuation vs Vpin # 10

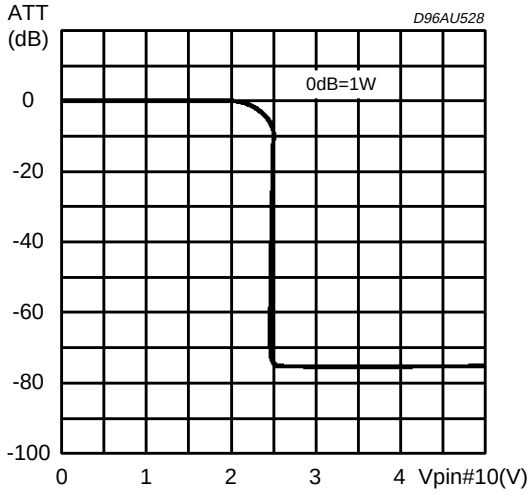


Figure 15: Power Dissipation vs Output Power

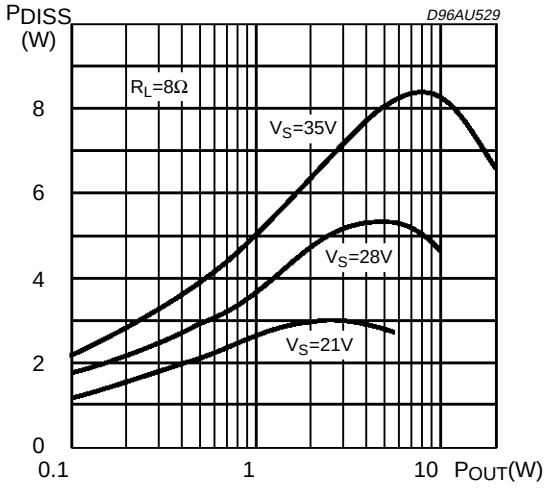
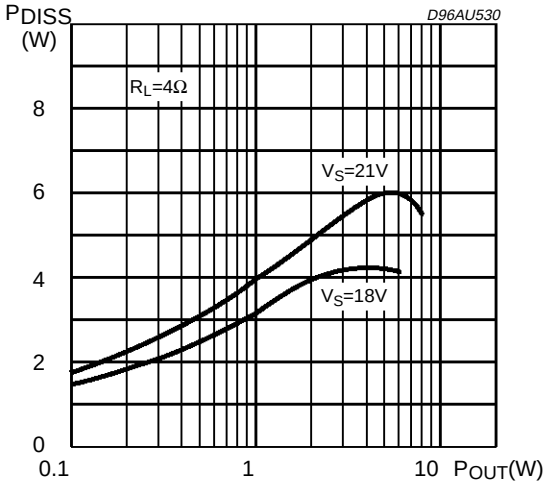


Figure 16: Power Dissipation vs Output Power

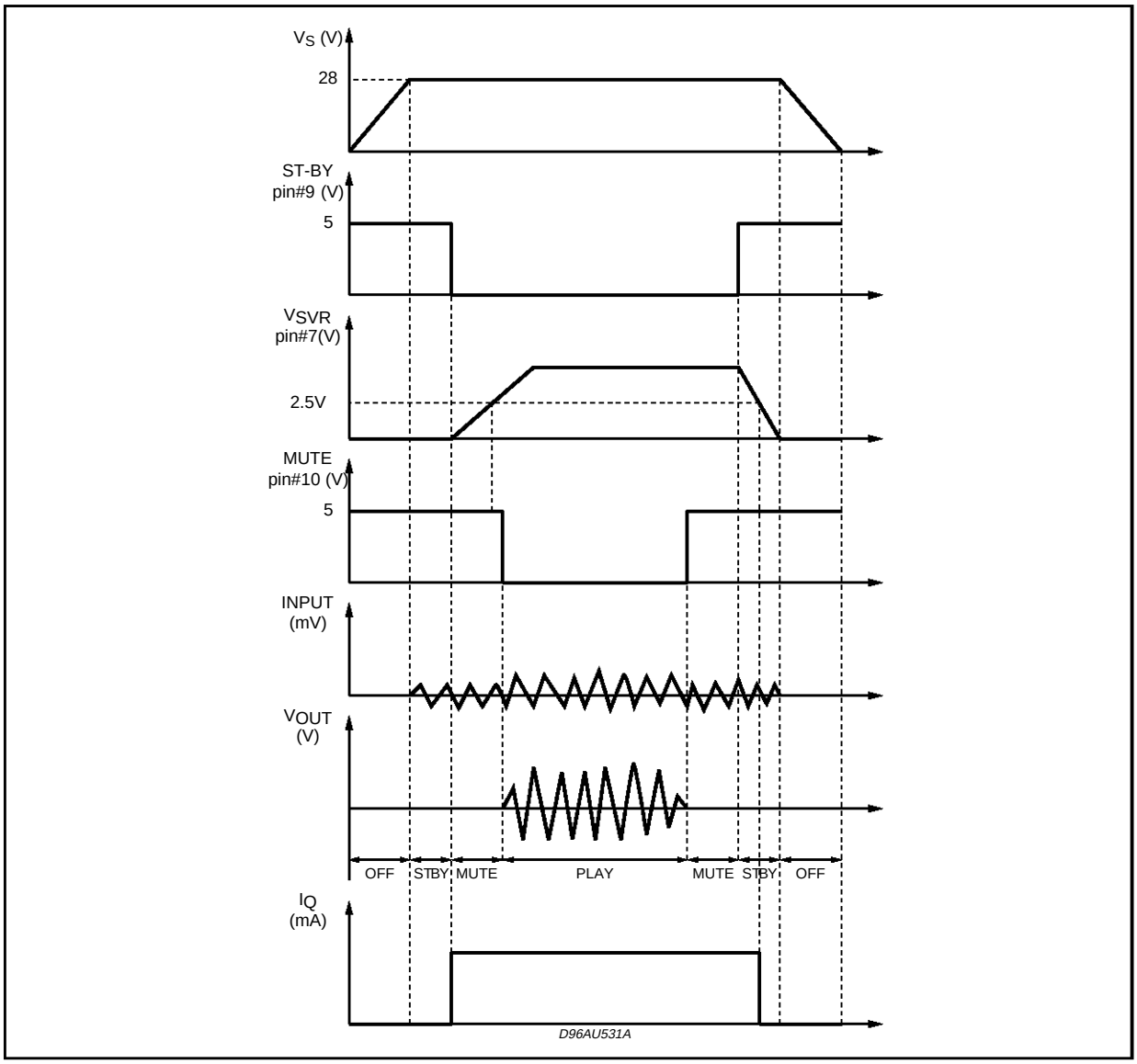


MUTE STAND-BY TRUTH TABLE

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



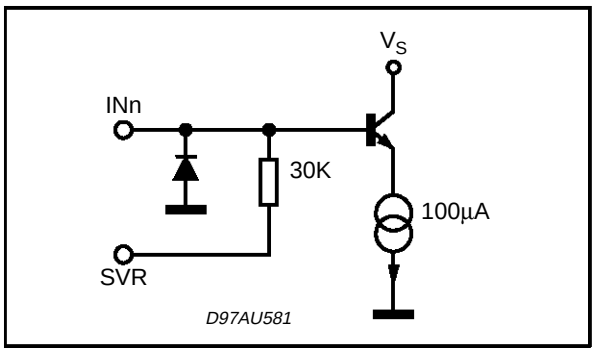
B) USING ONLY THE MUTE FUNCTION

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

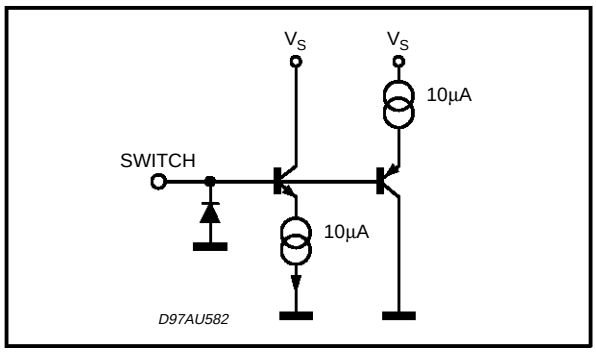
During the ON/OFF transitions we recommend to respect the following conditions:

- 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.

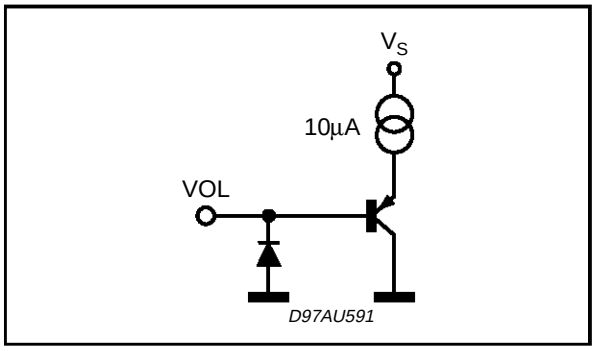
PINS: IN3, IN1, IN2



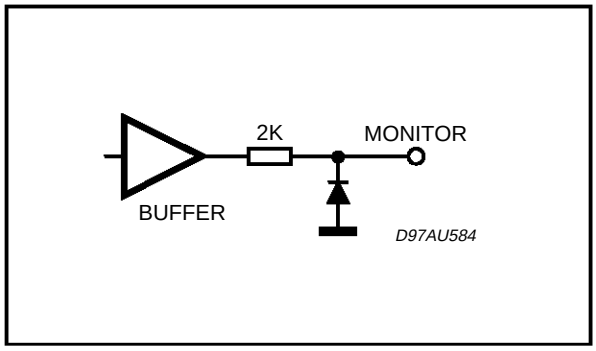
PIN: SWITCH



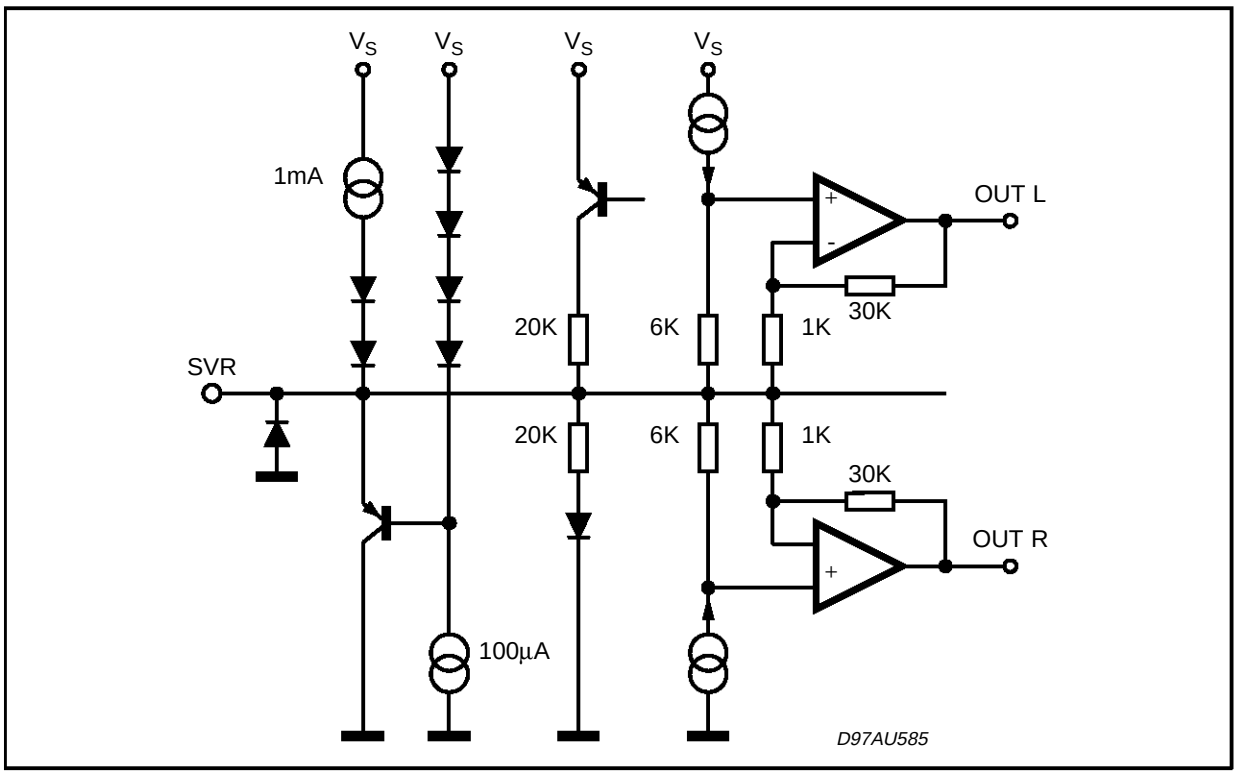
PIN: VOLUME



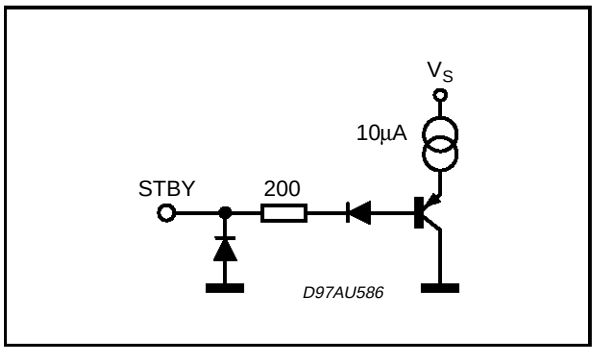
PIN: MONITOR



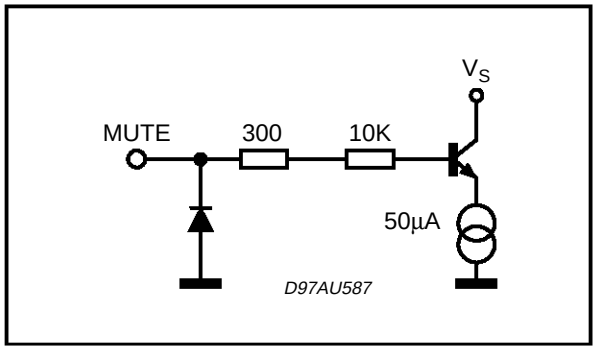
PIN: SVR



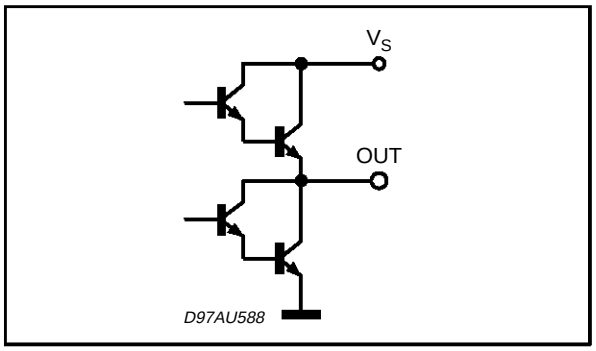
PIN: ST-BY



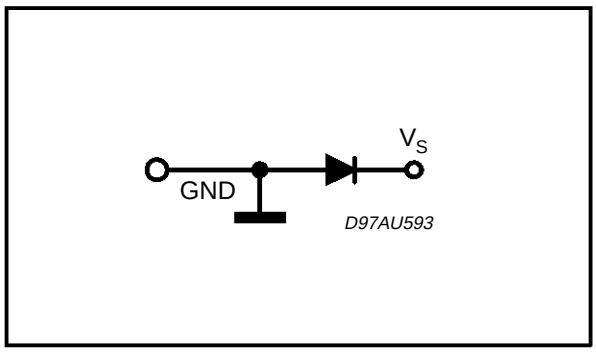
PIN: MUTE



PIN: OUT



PINS: PW-GND, S-GND



MULTIWATT15 PACKAGE MECHANICAL DATA

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	0.66		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	0.870	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	4.63	5.08	5.53	0.182	0.200	0.218
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