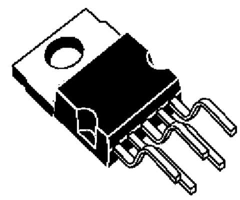
SGS-THOMSON MICROELECTRONICS

TDA9501

AC COUPLING HIGH VOLTAGE VIDEO AMPLIFIER

- BANDWIDTH : 40MHz TYPICAL
- RISE AND FALL TIME : 9ns TYPICAL
- SUPPLY VOLTAGE : 90V
- POWER DISSIPATION : 2.3W
- ESD PROTECTED



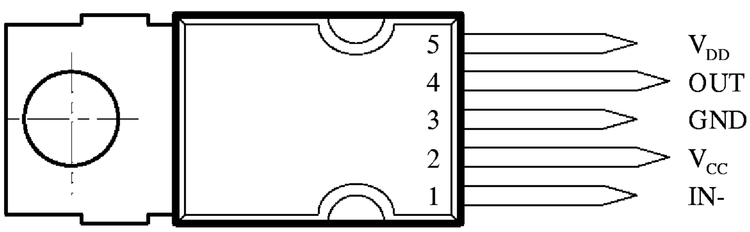
PENTAWATT
(Plastic Package)

ORDER CODE : TDA9501

DESCRIPTION

The TDA9501 is a video amplifier designed with a high voltage Bipolar/CMOS/DMOS technology (BCD). It drives in AC coupling mode one cathode of a monitor and is protected against flashovers. It is available in Pentawatt package.

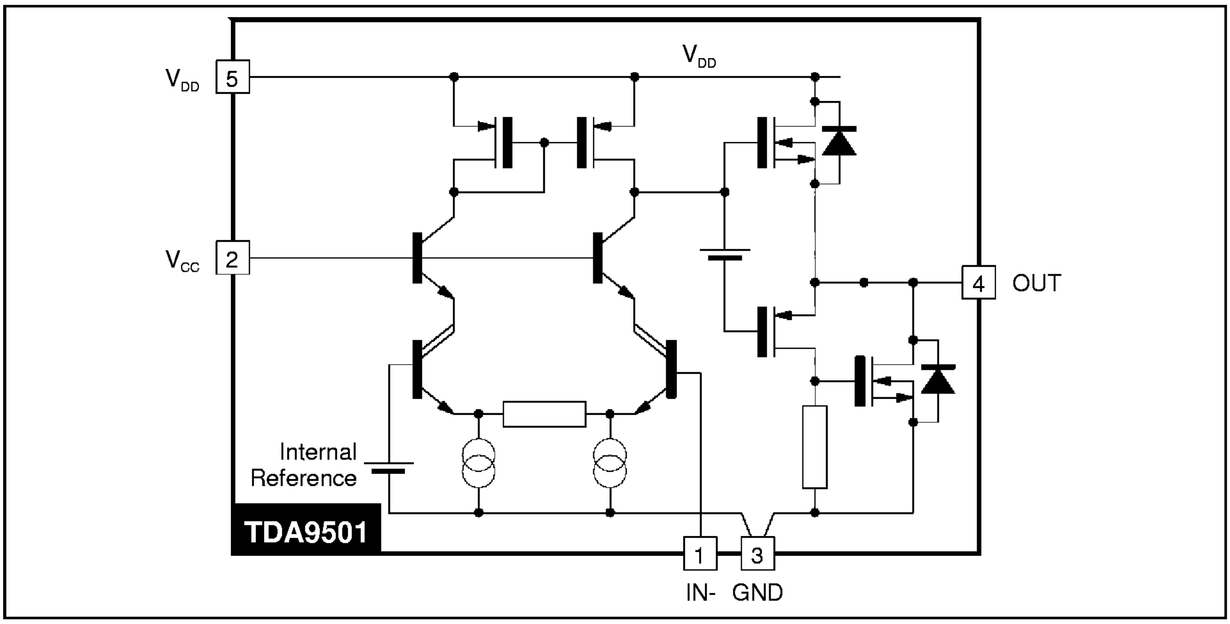
PIN CONNECTIONS



PIN CONFIGURATION

Pin N	Symbol	Function
1	IN-	Input of the amplifier
2	V_{CC}	Low Voltage Power Supply
3	GND	Also connected to the heatsink
4	OUT	Output driving the cathode
5	V_{DD}	High Voltage Power Supply

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{OUT}, V_{DD}	Supply High Voltage (Pins 4-5)	100	V
V_{CC}	Supply Low Voltage (Pin 2)	20	V
I_{OD} I_{OG}	Output Current to V_{DD} (Pin 4) Output Current to Ground (Pin 4) (See note 1)	protected 80	 mA
I_j	Input Current (Pin 1)	50	mA
VESD	ESD Susceptibility - Human Body Model, 100pF Discharge through 1.5kΩ (see Note 2) - EIAJ Norm, 200pF Discharge through 0Ω (see Note 3)	 2 300	 kV V
T_j	Junction Temperature	150	°C
T_{oper}	Operating Ambient Temperature	0, +70	°C
T_{stg}	Storage Temperature	-20, +150	°C

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Notes : 1. Pulsed current $t \leq 50\mu s$.
2. Except V_{DD} = 800V.
3. Except V_{DD} & V_{CC} = 120V.

THERMAL DATA

Symbol	Parameter		Value	Unit
$R_{th\ (j\text{-}c)}$	Junction-Case Thermal Resistance	Max.	3	°C/W
$R_{th\ (j\text{-}a)}$	Junction-Ambient Thermal Resistance	Typ.	70	°C/W

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ELECTRICAL CHARACTERISTICS (V_{CC} = 12V, V_{DD} = 90V, T_{amb} = 25°C, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DD}	High Supply Voltage (Pin 5)		30		90	V
V_{CC}	Low Supply Voltage (Pin 2)		10	12	15	V
I_{DD}	High Voltage Supply Internal DC Current (without current due to the feedback network)	V_{OUT} = 50V		10	15	mA
I_{CC}	Low Voltage Supply Internal DC Current			5.5		mA
V_{IN}	Input Voltage	See Figure 1	3.55	3.8	4.05	V
dV_{IN}/dV_{CC}	Drift of Input Voltage versus V_{CC}			0.15		%
dV_{IN}/dT	Drift of Input Voltage versus Temperature	See Note 4		2		mV/°C
V_{SATH}	High Output Saturation Voltage (Pin 4)	I_O= -60mA		V_{DD} - 6.5		V
V_{SATL}	Low Output Saturation Voltage (Pin 4)	I_O= 60mA		17		V
ELin	Linearity Error	17V < V_{OUT} < V_{DD} - 15V		5	8	%
OS	Overshoot			5		%
BW	Bandwidth at -3dB	Measured on CRT cathodes. C_{LOAD} = 10pF, Rprotect = 200Ω, Gain = 20 V_{OUT}= 50V, ΔV_{OUT} = 20V_{PP}		40		MHz
t_R, t_F	Rise and Fall Time	Measured between 10% & 90% of output pulse, C_{LOAD} = 10pF, Rprotect = 200Ω, Gain = 20 V_{OUT} = 50V, ΔV_{OUT} = 40V_{PP}		9		ns
G_O	Open Loop Gain	V_{OUT} = 50V		57		dB
I_{IB}	Input Bias Current (Pin 1)	V_{OUT} = 50V		10		µA
R_{IN}	Input Resistance	See Note 4		200		kΩ

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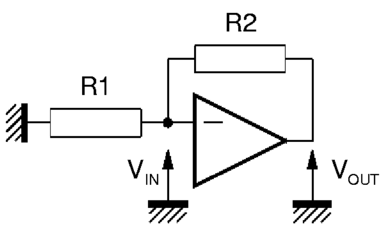
Note 4 : Characterized and not tested.

Figure 1 : Measurement of Input Voltage

$$V_{IN} = \frac{V_{OUT}}{(1 + R2/R1)}$$



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TYPICAL APPLICATION

The TDA9501 consists of :
- A differential amplifier with active load,
- A DMOS output buffer,
- A bandgap voltage reference.

PC board lay-out

The best performances are obtained with a carefully designed HF PC-Board, especially for the output and input capacitors.
The feedback resistor R_F must have a low parasitic capacitor (C_F < 0.3pF).
This parasitic capacitor C_F must be compensated by a capacitor R3 (roughly 20 · C_F) connected in parallel with the input resistor R1.
The full bandwidth of the device is only obtained with well matched compensation otherwise the application will have either an integrator response with a low bandwidth or a differentiator response with too much ringing.
A diode D_P (see Figure 2) has to be connected for flashover protection.

Power dissipation

The power dissipation consists of a static part and a dynamic part. The static dissipation varies with the output voltage and the feedback resistor. The dynamic power dissipation increases with the pixel frequency.

For a signal frequency of 40MHz and $40V_{PP}$ output signal, the typical power dissipation is about 3.0W, for V_{DD} = 110V.

In first approximation, the dynamic dissipation is :

$$P_D = V_{DD} * C_{LOAD} * \Delta V_{OUT} * f$$

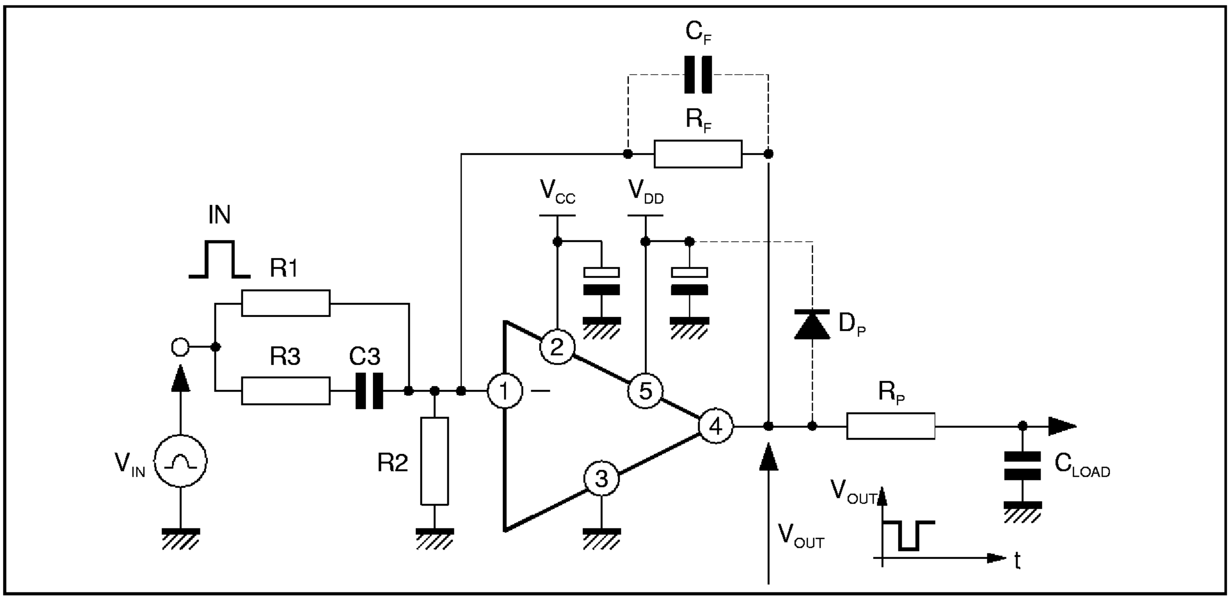
and the total dissipation is :

$$P = V_{DD} * C_{LOAD} * \Delta V_{OUT} * f + V_{DD} * I_{DD}$$
$$+ V_{CC} * I_{CC} - (V_{DD} - \overline{V_{OUT}}) \frac{\overline{V_{OUT}}}{R_{FEEDBACK}}$$

with f = pixel frequency

P = 110V x 10pF x 40V x 40MHz + 110V x 7mA +12 x 20mA - 60^2V/20kΩ = 2.95W

Figure 2 : Typical Evaluation Schematic



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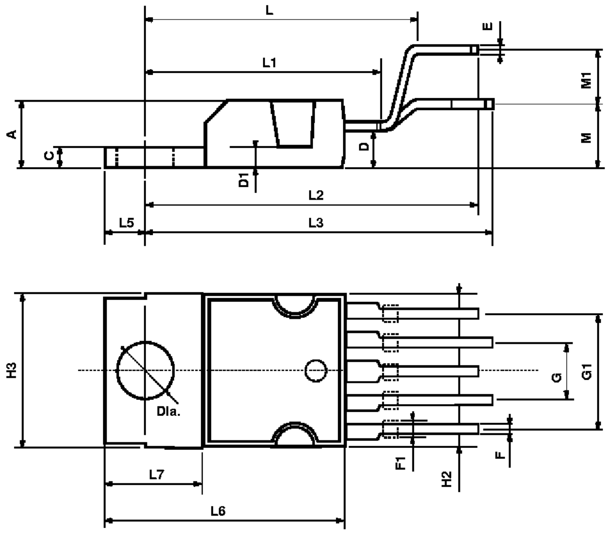
Recommended values :
R1 = 1kΩ, R2 = 1.8kΩ, R_F = 20kΩ, R_P = 200Ω,
C3 = 10 to 12pF for C_F # 0.5pF.
R3 # 150Ω.

PACKAGE MECHANICAL DATA : 5 PINS - PLASTIC PENTAWATT



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Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
F	0.8		1.05	0.031		0.041
F1	1		1.4	0.039		0.055
G		3.4		0.126	0.134	0.142
G1		6.8		0.260	0.268	0.276
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L		17.85			0.703	
L1		15.75			0.620	
L2		21.4			0.843	
L3		22.5			0.886	
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
M		4.5			0.177	
M1		4			0.157	
Dia	3.65		3.85	0.144		0.152

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