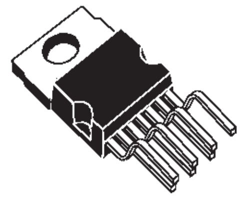
SGS-THOMSON MICROELECTRONICS

TDA9511

DC COUPLING HIGH VOLTAGE VIDEO AMPLIFIER

- BANDWIDTH : 40MHz TYPICAL
- RISE AND FALL TIME : 9ns TYPICAL
- SUPPLY VOLTAGE : 110V
- POWER DISSIPATION : 3.0W
- ESD PROTECTED



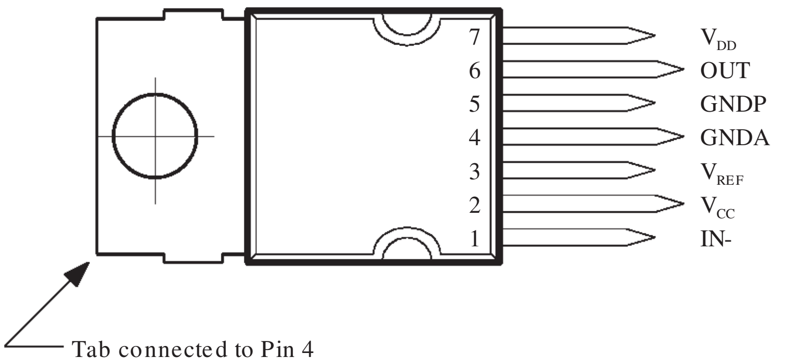
HEPTAWATT
(Plastic Package)

ORDER CODE : TDA9511

DESCRIPTION

The TDA9511 is a video amplifier designed with a high voltage Bipolar/CMOS/DMOS technology (BCD). It drives in DC coupling mode one cathode of a monitor and is protected against flashovers. It is available in Heptawatt package.

PIN CONNECTIONS



9511-01.EPS

PIN CONFIGURATION

Pin N	Symbol	Function
1	IN-	Input of the amplifier
2	V_{CC}	Low Voltage Power Supply (12V Typ.)
3	V_{REF}	Internal Voltage Reference (3.3V)
4	GNDA	Analog Ground
5	GNDP	Power Ground
6	OUT	Output driving the cathode
7	V_{DD}	High Voltage Power Supply (110V Max.)

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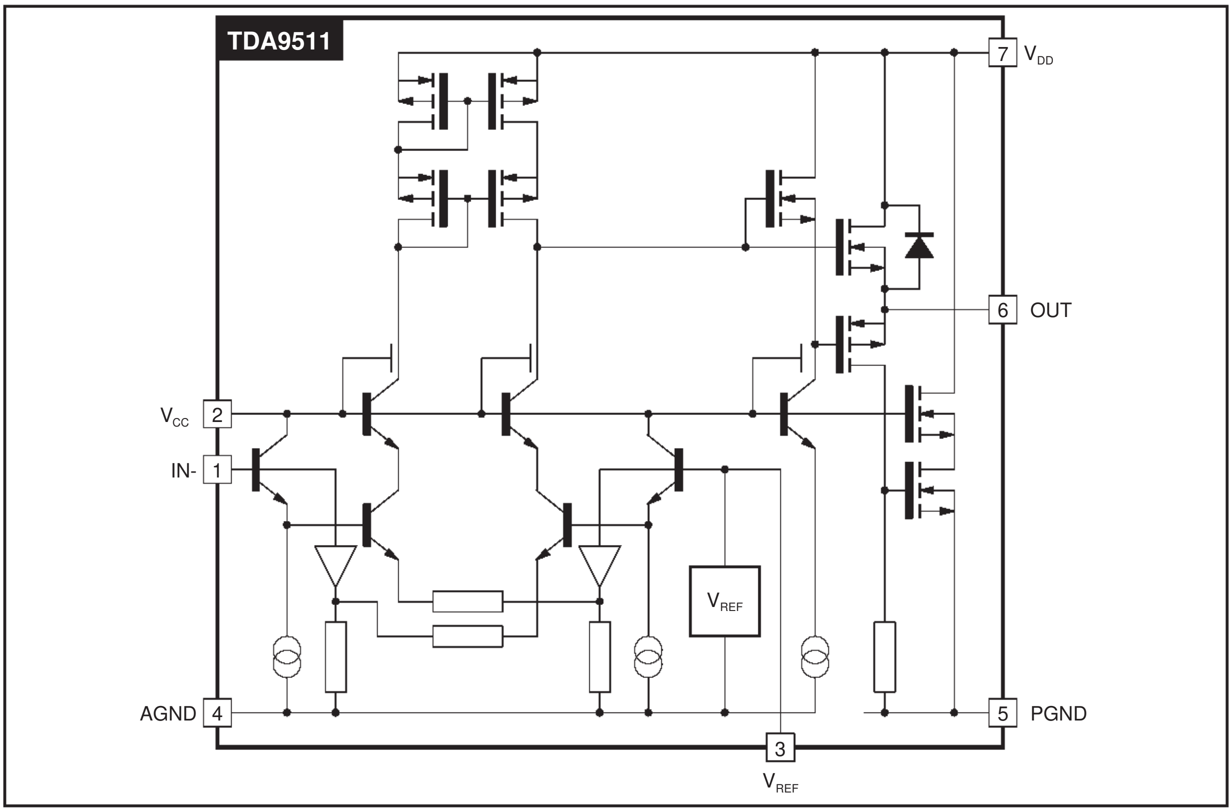
BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply High Voltage (Pin 7)	120	V
V_{CC}	Supply Low Voltage (Pin 2)	20	V
VESD	ESD Susceptibility Human Body Model, 100pF Discharge through 1.5kΩ EIAJ Norm, 200pF Discharge through 0Ω	 2 300	 kV V
I_{OD} I_{OG}	Output Current to V_{DD} (Pin 6) Output Current to Ground (Pin 6) (see Note 1)	protected 80	 mA
I_j	Input Current (Pin 1)	50	mA
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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Note 1 : Pulsed current t ≤ 50µs

THERMAL DATA

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

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ELECTRICAL CHARACTERISTICS (V_{CC} = 12V, V_{DD} = 110V, T_{amb} = 25°C, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{DD}	High Supply Voltage (Pin 7)		20		110	V
V_{CC}	Low Supply Voltage (Pin 2)		10	12	15	V
I_{DD}	DC Current of High Voltage Supply (without feedback current)	V_{OUT} = 60V		9		mA
I_{CC}	Low Voltage Supply Internal DC Current			15		mA
V_{REF}	Internal Reference (Pin 3)			3.2		V
V_{IN}	Input Voltage	V_{OUT} = 60V		3.25		V
dV_{IN}/dV_{CC}	Drift of Input Voltage versus V_{CC}	Measured on Pin 1		0.12		%
dV_{IN}/dT	Drift of Input Voltage versus Temperature			0.5		mV/°C
V_{SATH}	High Output Saturation Voltage (Pin 6)	I_O = -60mA		V_{DD} - 8.5		V
V_{SATL}	Low Output Saturation Voltage (Pin 6)	I_O = 60mA		12		V
ELin	Linearity Error	17V < V_{OUT} < V_{DD} - 15V			5	%
OS	Overshoot			5		%
BW	Bandwidth at -3dB	Measured on CRT cathodes. C_{LOAD} = 10pF, Rprotect = 220Ω, V_{OUT}= 60V, ΔV_{OUT} = 20V_{PP}, Feedback gain = 20		40		MHz
t_R, t_F	Rise and Fall Time	Measured between 10% & 90% of output pulse, C_{LOAD} = 10pF, Rprotect = 220Ω, V_{OUT} = 60V, ΔV_{OUT} = 40V_{PP}		9		ns
G_O	Open Loop Gain	V_{OUT} = 60V		60		dB
	Open Loop Gain Temperature Coefficient			0.03		dB/°C
I_{IB}	Input Bias Current (Pin 1)	V_{OUT} = 60V		20	30	µA
	Input Bias Temperature Coefficient			90		nA/°C
R_{IN}	Input Resistance	See Note 2		200		kΩ

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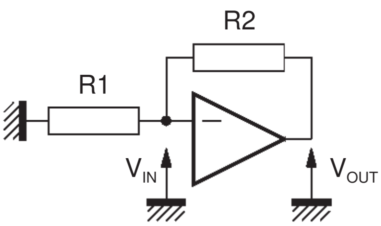
Note 2 : Characterized and not tested.

Figure 1 : Measurement of Input Voltage

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



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TYPICAL APPLICATION

The TDA9511 consists of :
- A differential amplifier with active load,
- A DMOS output buffer,
- A bandgap voltage reference (Pin 3 for filtering only).

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 $20 \cdot C_F$) 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 :

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

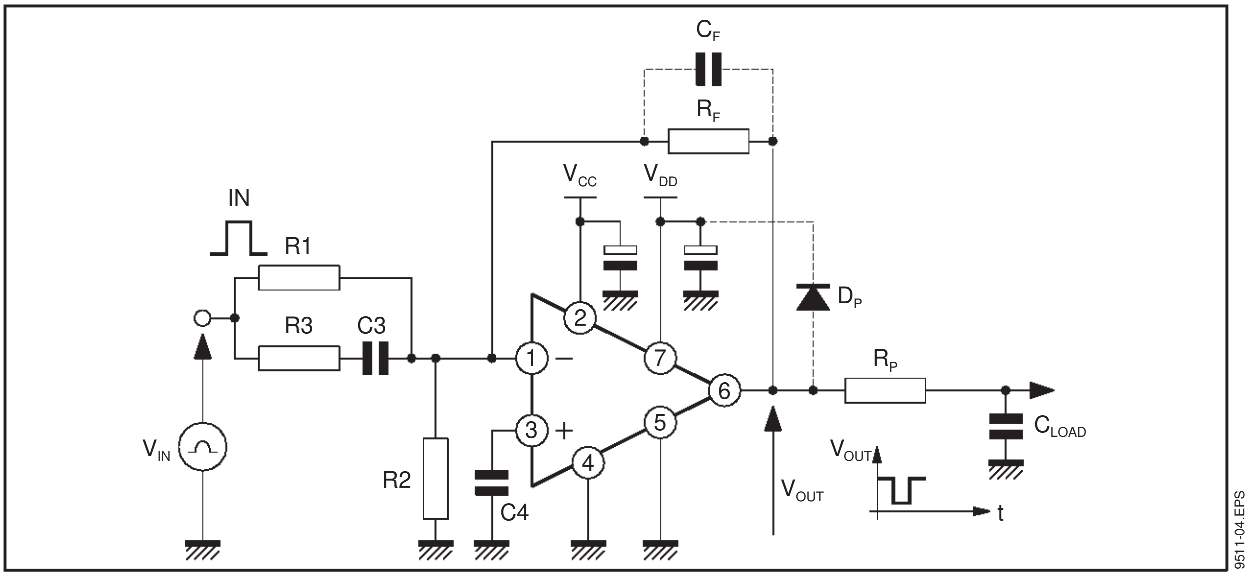
and the total dissipation is :

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

with f = pixel frequency

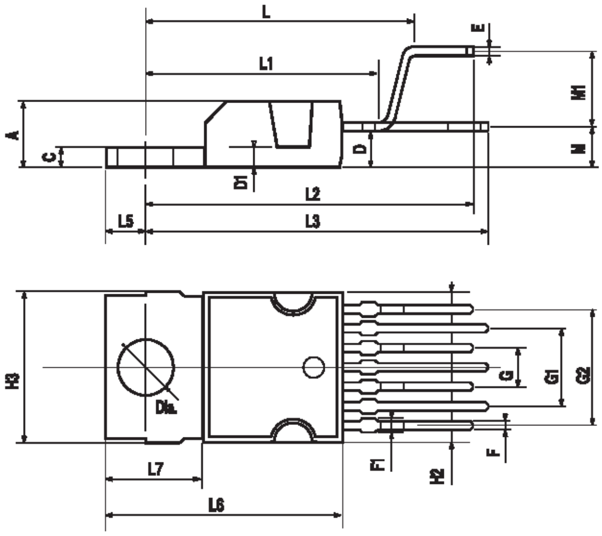
$$P = 110V \times 10pF \times 40V \times 40MHz + 110V \times 7mA + 12 \times 20mA - 60^2V/20k\Omega = 2.95W$$

Figure 2 : Typical Evaluation Schematic



Recommended values :
R1 = 1kΩ, R2 = 1.8kΩ, R_F = 20kΩ, R_P = 200Ω,
C4 > 10nF, C3 = 10 to 12pF for C_F # 0.5pF.
R3 # 150Ω.

PACKAGE MECHANICAL DATA : 7 PINS - PLASTIC HEPTAWATT



PM-HEPTV.EPS

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	0.6		08	0.024		0.031
F1			0.9			0.035
G	2.41	2.54	2.67	0.095	0.100	0.105
G1	4.91	5.08	5.21	0.193	0.200	0.205
G2	7.49	7.62	7.8	0.295	0.300	0.307
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L		16.97			0.668	
L1		14.92			0.587	
L2		21.54			0.848	
L3		22.62			0.891	
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		2.8			0.110	
M1		5.08			0.200	
Dia.	3.65		3.85	0.144		0.152

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