TDA9533

7.5NS TRIPLE HIGH VOLTAGE VIDEO AMPLIFIER

FEATURE
- TRIPLE CHANNEL VIDEO AMPLIFIER
- SUPPORTS DC OR AC COUPLING APPLICATIONS
- BUILT IN VOLTAGE GAIN: 20
- RISE AND FALL TIMES: 7.5ns TYPICAL
- BANDWIDTH: 50MHz TYPICAL
- SUPPLY VOLTAGE: 110V
- ADDITIONAL CUT-OFF INPUT CONTROL

DESCRIPTION
The TDA9533 is a triple video amplifier with high voltage Bipolar/CMOS/DMOS technology (BCD). It can drive the 3 cathodes of a monitor CRT in DC or AC coupling mode. A DC coupling application is obtained by connecting a triple DC controlled circuit either on the input pin or on the cut-off pin.

PIN CONNECTIONS

MULTIWATT 15
(Plastic Package)

ORDER CODE: TDA9533
**ABSOLUTE MAXIMUM RATINGS**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VDD</td>
<td>High Supply Voltage</td>
<td>120 V</td>
<td></td>
</tr>
<tr>
<td>VCC</td>
<td>Low Supply Voltage</td>
<td>17 V</td>
<td></td>
</tr>
<tr>
<td>VESD</td>
<td>ESD Susceptibility</td>
<td>2 kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Body Model, 100pF. Discharge through 1.5KΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EIAJ Norm, 200pF. Discharge through 0Ω</td>
<td>300 V</td>
<td></td>
</tr>
<tr>
<td>IDD</td>
<td>Output Source Current (pulsed &lt; 50µs)</td>
<td>80 mA</td>
<td></td>
</tr>
<tr>
<td>IOG</td>
<td>Output Sink Current (pulsed &lt; 50µs)</td>
<td>80 mA</td>
<td></td>
</tr>
<tr>
<td>VIMAX</td>
<td>Maximum Input Voltage</td>
<td>15 V</td>
<td></td>
</tr>
<tr>
<td>VIMIN</td>
<td>Minimum Input Voltage</td>
<td>-0.5 V</td>
<td></td>
</tr>
<tr>
<td>VICOFF MAX</td>
<td>Maximum C. off Input Voltage  VCC + 0.5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VICOFF MIN</td>
<td>Minimum C. off Input Voltage  -0.5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TJ</td>
<td>Junction Temperature</td>
<td>150 °C</td>
<td></td>
</tr>
<tr>
<td>TSTG</td>
<td>Storage Temperature</td>
<td>-20 + 150 °C</td>
<td></td>
</tr>
</tbody>
</table>

**THERMAL DATA**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rth (J-C)</td>
<td>Junction-Case Thermal Resistance (Max.)</td>
<td>3</td>
<td>°C/W</td>
</tr>
<tr>
<td>Rth (J-A)</td>
<td>Junction-Ambient Thermal Resistance (Typ.)</td>
<td>35</td>
<td>°C/W</td>
</tr>
</tbody>
</table>
## ELECTRICAL CHARACTERISTICS

(VCC = 12V, VC OFF = 2.5V, VDD = 110V, Tamb = 25 °C, unless otherwise specified)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DD}$</td>
<td>High Supply Voltage (Pin 5)</td>
<td>$V_{OUT} = 50V$</td>
<td>20</td>
<td>110</td>
<td>115</td>
<td>V</td>
</tr>
<tr>
<td>$V_{CC}$</td>
<td>Low Supply Voltage (Pin 11)</td>
<td></td>
<td>12</td>
<td>12</td>
<td>15</td>
<td>V</td>
</tr>
<tr>
<td>$I_{DD}$</td>
<td>High Voltage Supply Internal DC Current</td>
<td></td>
<td>25</td>
<td>60</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$I_{CC}$</td>
<td>Low Voltage Supply Internal DC Current</td>
<td></td>
<td></td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$dV_{OUT}/dV_{DD}$</td>
<td>High Voltage Supply Rejection</td>
<td>$V_{OUT} = 50V$</td>
<td></td>
<td></td>
<td>0.5</td>
<td>%</td>
</tr>
<tr>
<td>$dV_{OUT}/dV_{CC}$</td>
<td>Output Voltage Drift Versus Temperature for any Channel</td>
<td>$V_{OUT} = 80V$</td>
<td></td>
<td></td>
<td>15</td>
<td>mV/°C</td>
</tr>
<tr>
<td>$dV_{OUT}/d_{θ}$</td>
<td>Differential Output Voltage Offset Drift Versus Temperature</td>
<td>$V_{OUT} = 80V$</td>
<td></td>
<td></td>
<td>5</td>
<td>mV/°C</td>
</tr>
<tr>
<td>$ΔV_{OUT}/ΔV_{C.OFF}$</td>
<td>Cut-Off Control Gain</td>
<td>$V_{OUT} = 80V$</td>
<td></td>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>$I_{BC .OFF}$</td>
<td>Cut-Off Control Bias Current</td>
<td>$V_{OUT} = 80V$</td>
<td>10</td>
<td>µA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{OUT SATH}$</td>
<td>Max. Output Voltage</td>
<td>$I_{0} = 60mA, (1)$</td>
<td>$V_{DD} - 6.5$</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{OUT SATL}$</td>
<td>Min. Output Voltage</td>
<td>$I_{0} = 60mA, (1)$</td>
<td>11</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A_{VR}$</td>
<td>Typical Video Gain</td>
<td>$V_{OUT} = 50V$</td>
<td></td>
<td></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>$E_{lin}$</td>
<td>Linearity Error</td>
<td>$17 &lt; V_{OUT} &lt; V_{DD} - 15V$</td>
<td>5</td>
<td>8</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>OS</td>
<td>Overshoot</td>
<td></td>
<td>5</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Lf_{Δφ/g}$</td>
<td>Low Frequency Gain Matching</td>
<td>$V_{OUT} = 50V, f = 1MHz$</td>
<td></td>
<td></td>
<td>5</td>
<td>%</td>
</tr>
<tr>
<td>$R_{IN}$</td>
<td>Video Input Resistor</td>
<td>$V_{OUT} = 50V$</td>
<td>2</td>
<td>KΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW</td>
<td>Bandwidth at -3dB</td>
<td>$V_{OUT} = 50V, C_{LOAD} = 8pF$</td>
<td></td>
<td></td>
<td>50</td>
<td>MHz</td>
</tr>
<tr>
<td>$t_R, t_F$</td>
<td>Rise and Fall Time</td>
<td>$V_{OUT} = 50V, C_{LOAD} = 8pF$</td>
<td></td>
<td></td>
<td>7.5</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{SET}$</td>
<td>2.5% Settling Time</td>
<td>$V_{OUT} = 50V, C_{LOAD} = 8pF$</td>
<td></td>
<td></td>
<td>15</td>
<td>ns</td>
</tr>
<tr>
<td>Lf CT</td>
<td>Low Frequency Crosstalk</td>
<td>$V_{OUT} = 50V, C_{LOAD} = 8pF$</td>
<td></td>
<td></td>
<td>50</td>
<td>dB</td>
</tr>
<tr>
<td>Hf CT</td>
<td>High Frequency Crosstalk</td>
<td>$I_{F} = 1 MHz$</td>
<td></td>
<td></td>
<td>32</td>
<td>dB</td>
</tr>
</tbody>
</table>

**Note:** 1 Pulsed current width < 50µs
TYPICAL APPLICATION

PC Board Lay-out
The best performance is obtained with a carefully designed HF PC board, especially for the output and input capacitors.
Rise/fall time and bandwidth are measured on a 8pF load (including a PC board parasitical, socket and a CRT capacitor).
The input voltage range for the cut-off adjustment pins is from 1 to 4 volts and a 10 nF to 47 nF bypass capacitor is recommended on these pins.

Power Dissipation
The power dissipation is the sum of the DC and the dynamic dissipation.
As the feedback resistors are integrated, the DC power dissipation (capacitive load) can be estimated by:

\[ P_{\text{STAT}} = V_{\text{DD}} \cdot I_{\text{DD}} + V_{\text{CC}} \cdot I_{\text{CC}} \]

The dynamic dissipation in worst case (full bandwidth and black pixel/white pixel picture - (2) is:

\[ P_{\text{DYN}} = 3 V_{\text{DD}} \cdot C_L \cdot V_{\text{OUT(PP)}} \cdot f \cdot K \]

where \( f \) is the video frequency and \( K \) the active line duration / total duration.
Example: for \( V_{\text{DD}} = 110V \), \( V_{\text{CC}} = 12V \), \( V_{\text{OUT}} = 40 V_{\text{PP}} \), \( I_{\text{DD}} = 25mA \), \( I_{\text{CC}} = 60mA \), \( f_{\text{VIDEO}} = 40MHz \), \( C_L = 8pF \) and \( K = 0.72 \).
We have: \( P_{\text{STAT}} = 3.47W \) and \( P_{\text{DYN}} = 3.04W \)
Therefore: \( P_{\text{tot}} = 6.51W \).

*Note: 2* This worst thermal case must only be considered for \( T_{\text{Jmax}} \) calculation. Nevertheless, during the average life of the circuit, the conditions are very close to the white picture conditions.

![Schematic of TDA9533](image-url)
Figure 1. TDA9207/9209 - TDA9533/9530 Demonstration Board: Silk Screen and Trace (scale 1:1)
Figure 2. TDA9207/9209 - TDA9533/9530 Demonstration Board Schematic

Notes:
1. All capacitors followed by (1) are decoupling capacitors which must be connected as close as possible to the device.
2. The purpose of all components followed by (2) is to ensure a good protection against overvoltage (arcing protection).
## PACKAGE MECHANICAL DATA

### 15 PIN - PLASTIC MULTIWATT

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Millimeters</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Min.</td>
<td>Typ.</td>
</tr>
<tr>
<td></td>
<td>Min.</td>
<td>Typ.</td>
</tr>
<tr>
<td>B</td>
<td>2.65</td>
<td>0.104</td>
</tr>
<tr>
<td>C</td>
<td>1.6</td>
<td>0.063</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>0.039</td>
</tr>
<tr>
<td>E</td>
<td>0.49</td>
<td>0.197</td>
</tr>
<tr>
<td>F</td>
<td>0.66</td>
<td>0.104</td>
</tr>
<tr>
<td>G</td>
<td>1.02</td>
<td>0.040</td>
</tr>
<tr>
<td></td>
<td>1.27</td>
<td>0.050</td>
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<tr>
<td>G1</td>
<td>17.53</td>
<td>0.690</td>
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<tr>
<td></td>
<td>17.78</td>
<td>0.700</td>
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<tr>
<td>H1</td>
<td>19.6</td>
<td>0.772</td>
</tr>
<tr>
<td>H2</td>
<td>20.2</td>
<td>0.795</td>
</tr>
<tr>
<td>L</td>
<td>21.9</td>
<td>0.862</td>
</tr>
<tr>
<td>L1</td>
<td>21.7</td>
<td>0.854</td>
</tr>
<tr>
<td>L2</td>
<td>17.65</td>
<td>0.695</td>
</tr>
<tr>
<td>L3</td>
<td>17.25</td>
<td>0.679</td>
</tr>
<tr>
<td>L4</td>
<td>10.3</td>
<td>0.406</td>
</tr>
<tr>
<td>L7</td>
<td>2.65</td>
<td>0.104</td>
</tr>
<tr>
<td>M</td>
<td>4.25</td>
<td>0.167</td>
</tr>
<tr>
<td>M1</td>
<td>4.63</td>
<td>0.182</td>
</tr>
<tr>
<td>S</td>
<td>1.9</td>
<td>0.075</td>
</tr>
<tr>
<td>S1</td>
<td>1.9</td>
<td>0.075</td>
</tr>
<tr>
<td>Dia. 1</td>
<td>3.65</td>
<td>0.144</td>
</tr>
</tbody>
</table>

ST