



# TDA9533

## 7.5NS TRIPLE HIGH VOLTAGE VIDEO AMPLIFIER

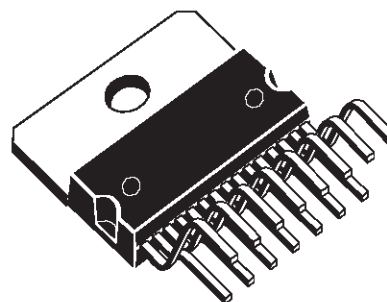
PRELIMINARY DATA

### 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

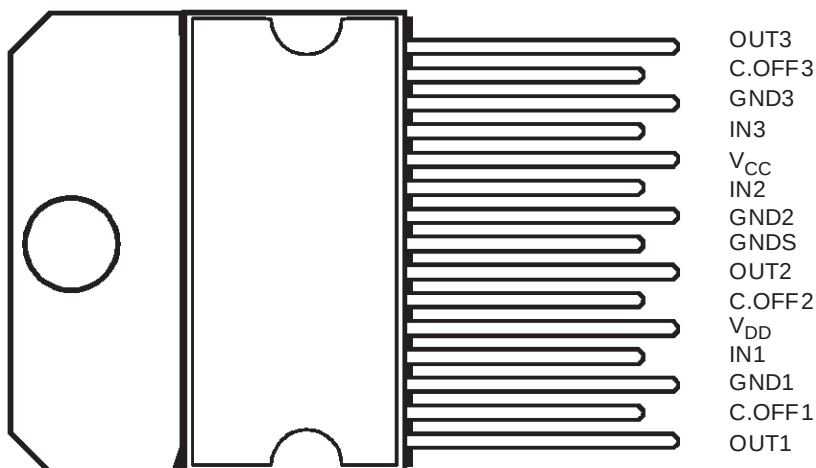
The TDA9533 is a triple video amplifier with high voltage Bipolar/CMOS/DMOS technology (BCD). It can drive the 3 cathodes of a monitor CRT in DC or AC coupling mode. A DC coupling application is obtained by connecting a triple DC controlled circuit either on the input pin or on the cut-off pin.



**MULTIWATT 15**  
(Plastic Package)

**ORDER CODE: TDA9533**

### PIN CONNECTIONS



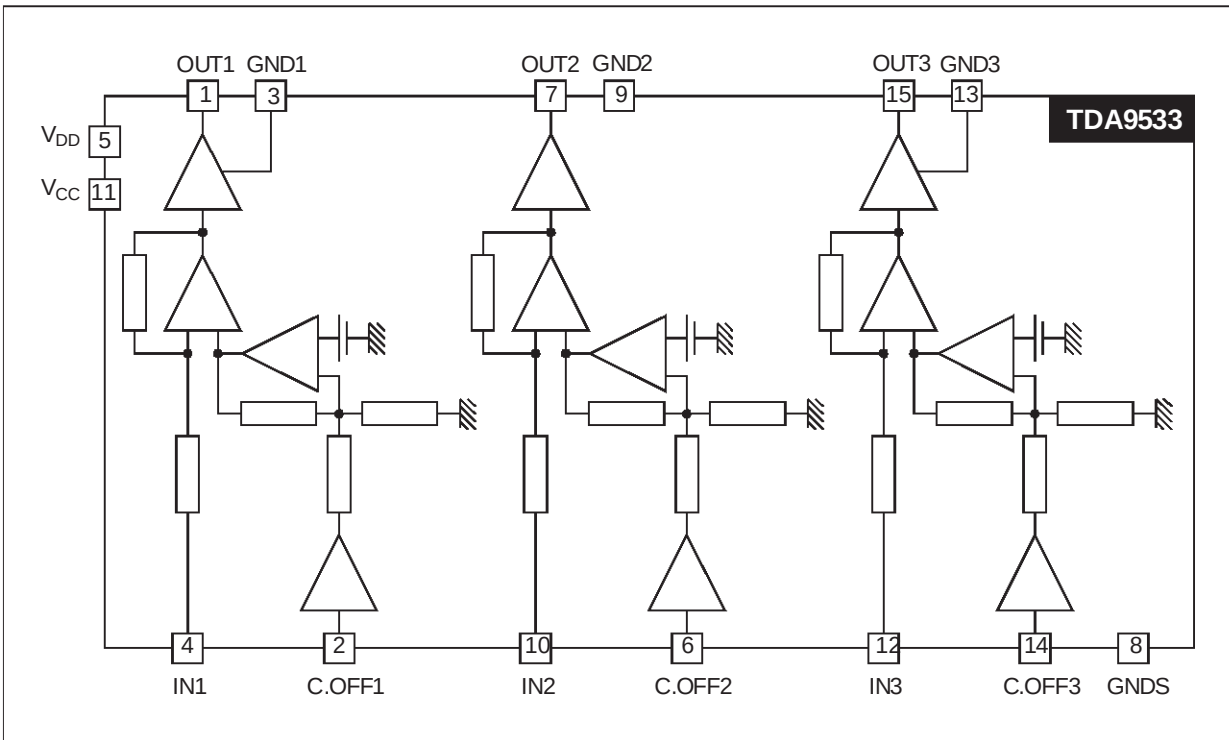
Version 3.2

March 2000

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This is preliminary information on a new product in development or undergoing evaluation. Details are subject to change without notice.

# BLOCK DIAGRAM



# ABSOLUTE MAXIMUM RATINGS

| Symbol             | Parameter                                                                                                                        | Value          | Unit         |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| $V_{DD}$           | High Supply Voltage                                                                                                              | 120            | V            |
| $V_{CC}$           | Low Supply Voltage                                                                                                               | 17             | V            |
| $V_{ESD}$          | ESD Susceptibility<br>Human Body Model, 100pF. Discharge through 1.5K $\Omega$<br>EIAJ Norm, 200pF. Discharge through 0 $\Omega$ | 2              | kV           |
|                    |                                                                                                                                  | 300            | V            |
| $I_{OD}$           | Output Source Current (pulsed < 50 $\mu$ s)                                                                                      | 80             | mA           |
| $I_{OG}$           | Output Sink Current (pulsed < 50 $\mu$ s)                                                                                        | 80             | mA           |
| $V_{I\ Max}$       | Maximum Input Voltage                                                                                                            | 15             | V            |
| $V_{I\ Min}$       | Minimum Input Voltage                                                                                                            | - 0.5          | V            |
| $V_{IC\ OFF\ Max}$ | Maximum C. off Input Voltage                                                                                                     | $V_{CC} + 0.5$ | V            |
| $V_{IC\ OFF\ Min}$ | Minimum C. off Input Voltage                                                                                                     | - 0.5          | V            |
| $T_J$              | Junction Temperature                                                                                                             | 150            | $^{\circ}$ C |
| $T_{STG}$          | Storage Temperature                                                                                                              | -20 + 150      | $^{\circ}$ C |

# THERMAL DATA

| Symbol          | Parameter                                  | Value | Unit           |
|-----------------|--------------------------------------------|-------|----------------|
| $R_{th\ (j-c)}$ | Junction-Case Thermal Resistance (Max.)    | 3     | $^{\circ}$ C/W |
| $R_{th\ (j-a)}$ | Junction-Ambient Thermal Resistance (Typ.) | 35    | $^{\circ}$ C/W |

## ELECTRICAL CHARACTERISTICS

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

| Symbol                                         | Parameter                                                                         | Test Conditions                                                                                                              | Min | Typ                            | Max | Unit      |
|------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----|--------------------------------|-----|-----------|
| V <sub>DD</sub>                                | High Supply Voltage (Pin 5)                                                       |                                                                                                                              | 20  | 110                            | 115 | V         |
| V <sub>CC</sub>                                | Low Supply Voltage (Pin 11)                                                       |                                                                                                                              | 10  | 12                             | 15  | V         |
| I <sub>DD</sub><br>I <sub>CC</sub>             | High Voltage Supply Internal DC Current<br>Low Voltage Supply Internal DC Current | V <sub>OUT</sub> = 50V                                                                                                       |     | 25<br>60                       |     | mA<br>mA  |
| dV <sub>OUT</sub> /dV <sub>DD</sub>            | High Voltage Supply Rejection                                                     | V <sub>OUT</sub> = 50V                                                                                                       |     | 0.5                            |     | %         |
| dV <sub>OUT</sub> /dθ                          | Output Voltage Drift Versus Temperature for any Channel                           | V <sub>OUT</sub> = 80V                                                                                                       |     | 15                             |     | mV/<br>°C |
| dΔV <sub>OUT</sub> /dθ                         | Differential Output Voltage Offset Drift Versus Temperature                       | V <sub>OUT</sub> = 80V                                                                                                       |     | 5                              |     | mV/<br>°C |
| $\frac{\Delta V_{OUT}}{\Delta V_{C.OFF}}$      | Cut-Off Control Gain                                                              | V <sub>OUT</sub> = 80V<br>1V < V <sub>C OFF</sub> < 4V                                                                       |     | 14                             |     |           |
| I <sub>BC.OFF</sub>                            | Cut-Off Control Bias Current                                                      | V <sub>OUT</sub> = 80V                                                                                                       |     |                                | 10  | μA        |
| V <sub>OUT SATH</sub><br>V <sub>OUT SATL</sub> | Max. Output Voltage<br>Min. Output Voltage                                        | I <sub>0</sub> = -60mA, (1)<br>I <sub>0</sub> = 60mA, (1)                                                                    |     | V <sub>DD</sub> -<br>6.5<br>11 |     | V<br>V    |
| AV <sub>R</sub>                                | Typical Video Gain                                                                | V <sub>OUT</sub> = 50V                                                                                                       |     | 20                             |     |           |
| E <sub>lin</sub>                               | Linearity Error                                                                   | 17 < V <sub>OUT</sub> < V <sub>DD</sub> - 15V                                                                                |     | 5                              | 8   | %         |
| OS                                             | Overshoot                                                                         |                                                                                                                              |     | 5                              |     | %         |
| Lf Δg/g                                        | Low Frequency Gain Matching                                                       | V <sub>OUT</sub> = 50V, f = 1MHz                                                                                             |     |                                | 5   | %         |
| R <sub>IN</sub>                                | Video Input Resistor                                                              | V <sub>OUT</sub> = 50V                                                                                                       |     | 2                              |     | KΩ        |
| BW                                             | Bandwidth at -3dB                                                                 | V <sub>OUT</sub> = 50V, C <sub>LOAD</sub> = 8pF<br>R <sub>P</sub> = 200Ω, ΔV <sub>OUT</sub> = 20V                            |     | 50                             |     | MHz       |
| t <sub>R</sub> , t <sub>F</sub>                | Rise and Fall Time                                                                | V <sub>OUT</sub> = 50V, C <sub>LOAD</sub> = 8pF<br>R <sub>P</sub> = 200Ω, ΔV <sub>OUT</sub> = 40V                            |     | 7.5                            |     | ns        |
| t <sub>SET</sub>                               | 2.5% Settling Time                                                                | V <sub>OUT</sub> = 50V, C <sub>LOAD</sub> = 8pF<br>R <sub>P</sub> = 200Ω, ΔV <sub>OUT</sub> = 40V                            |     | 15                             |     | ns        |
| Lf CT<br>Hf CT                                 | Low Frequency Crosstalk<br>High Frequency Crosstalk                               | V <sub>OUT</sub> = 50V, C <sub>LOAD</sub> = 8pF<br>R <sub>P</sub> = 200 Ω, ΔV <sub>OUT</sub> = 20V<br>f = 1 MHz<br>f = 20MHz |     | 50<br>32                       |     | dB<br>dB  |

**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:

$$P_{STAT} = V_{DD} \cdot I_{DD} + V_{CC} \cdot I_{CC}$$

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

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

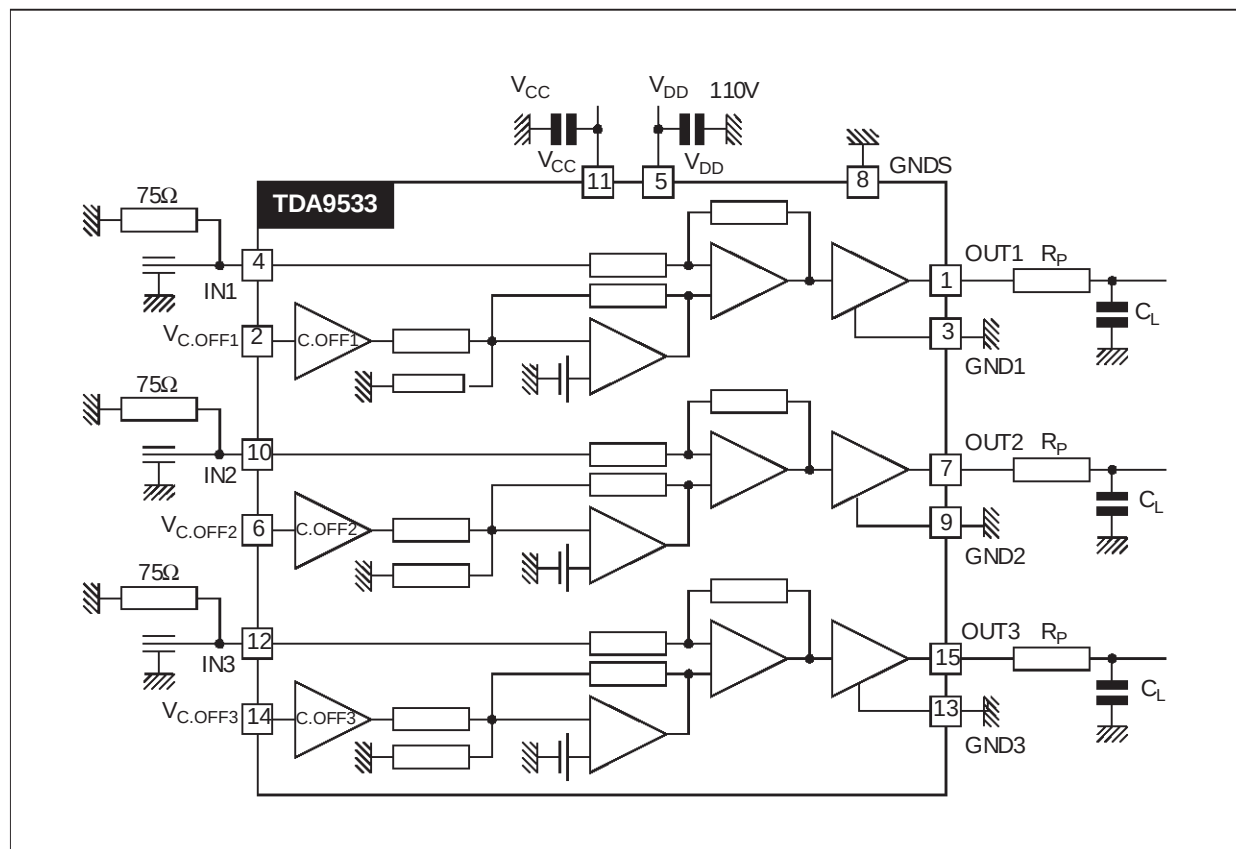
where f is the video frequency and K the active line duration / total duration.

Example: for  $V_{DD} = 110V$ ,  $V_{CC} = 12V$ ,  $V_{OUT} = 40 V_{PP}$ ,  $I_{DD} = 25mA$ ,  $I_{CC} = 60mA$ ,  $f_{VIDEO} = 40MHz$ ,  $C_L = 8pF$  and  $K = 0.72$ .

We have:  $P_{STAT} = 3.47W$  and  $P_{DYN} = 3.04W$

Therefore:  $P_{tot} = 6.51W$ .

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



**Figure 1. TDA9207/9209 - TDA9533/9530 Demonstration Board: Silk Screen and Trace (scale 1:1)**

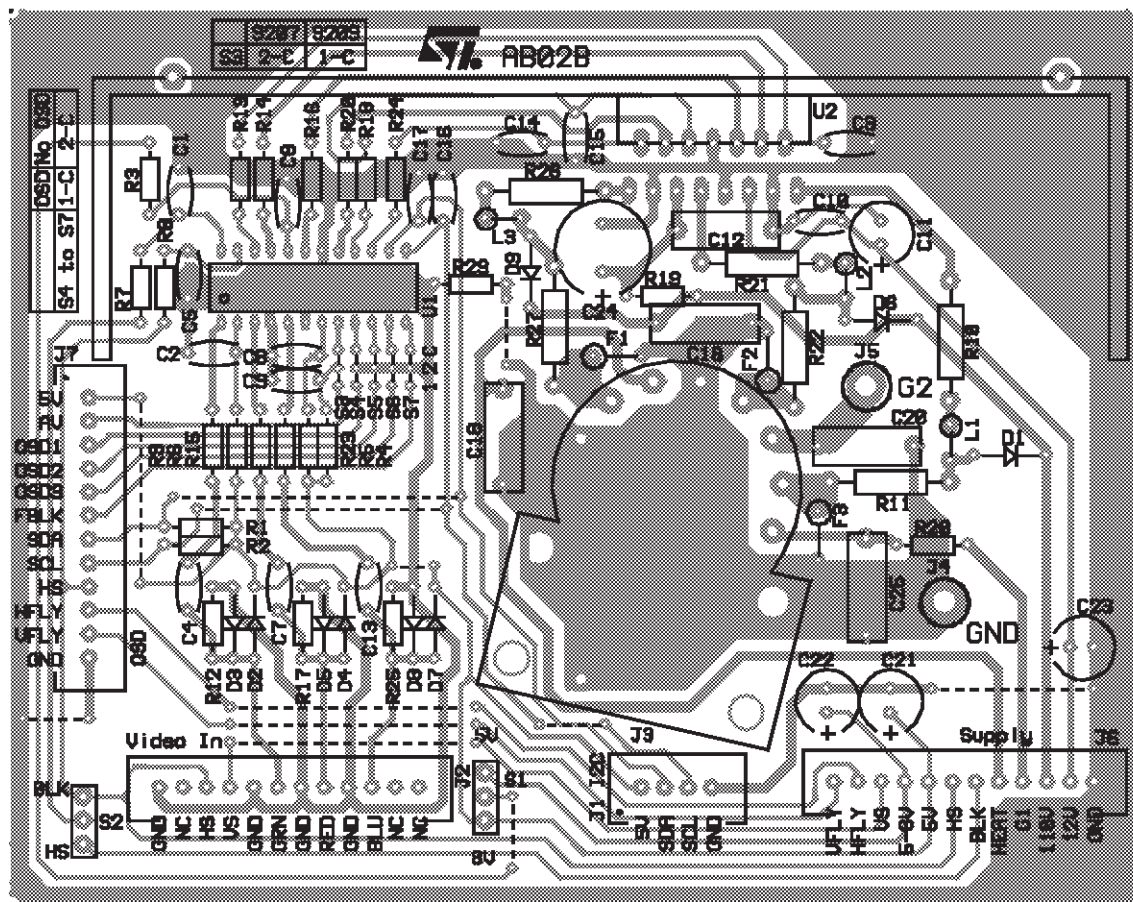
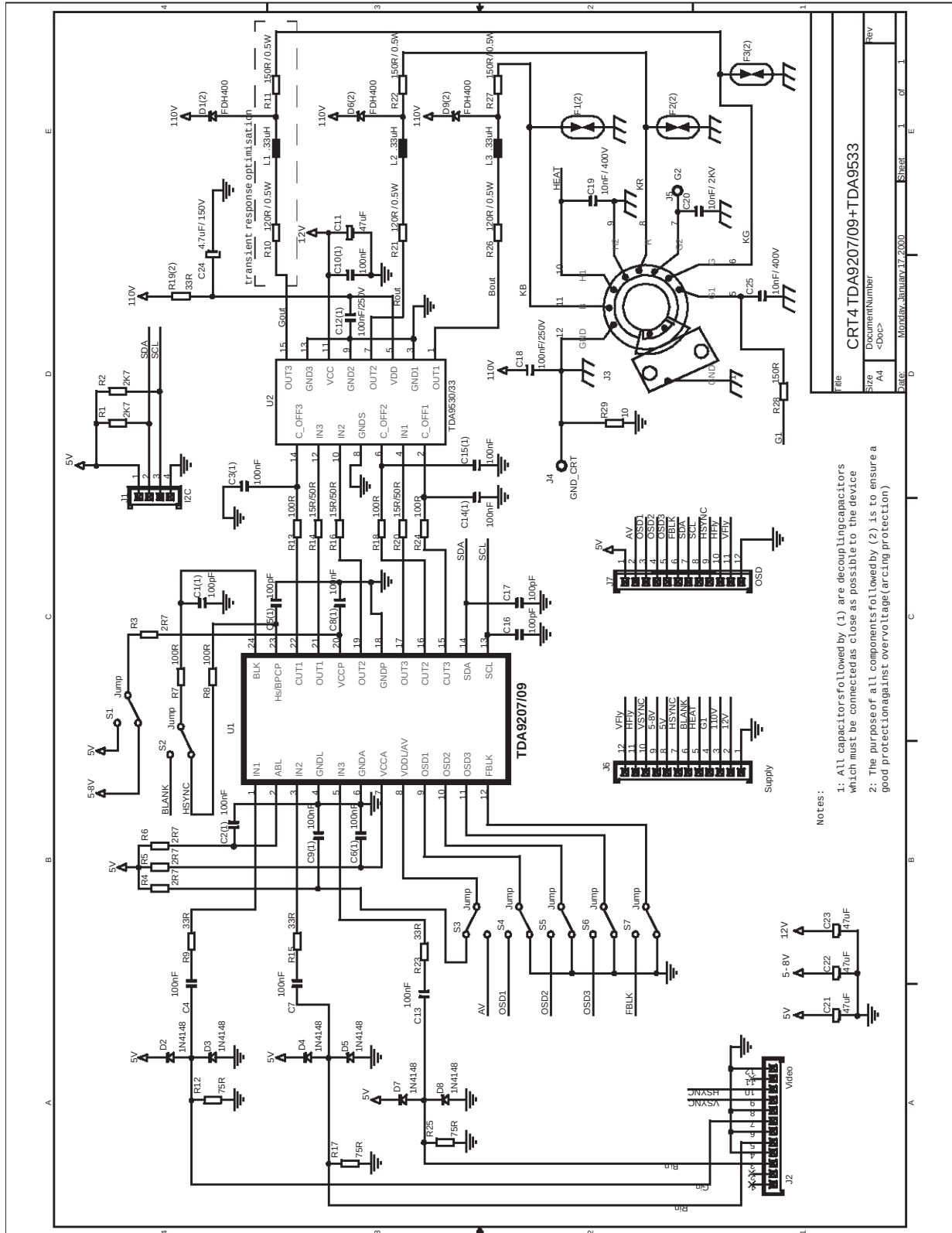
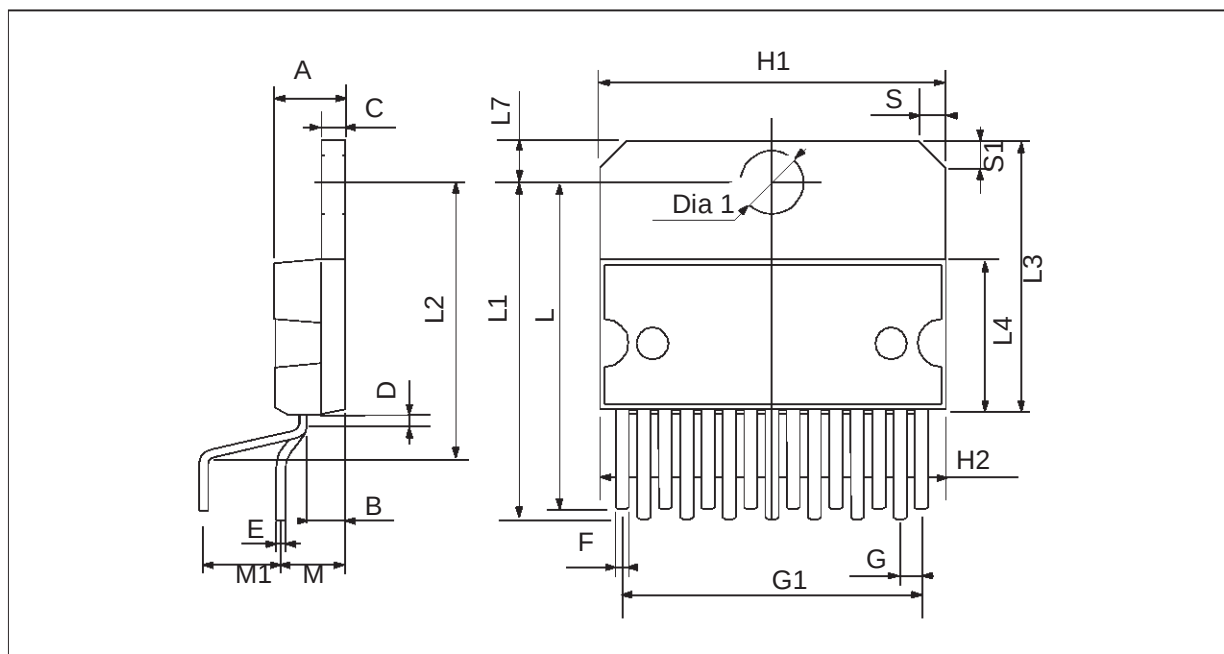


Figure 2. TDA9207/9209 - TDA9533/9530 Demonstration Board Schematic



## PACKAGE MECHANICAL DATA

### 15 PIN - PLASTIC MULTIWATT



| Dimensions | Millimeters |       |       | Inches |       |       |
|------------|-------------|-------|-------|--------|-------|-------|
|            | 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 |
| Dia. 1     | 3.65        |       | 3.85  | 0.144  |       | 0.152 |

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