



# TDA9535

## 9.5NS TRIPLE HIGH VOLTAGE VIDEO AMPLIFIER

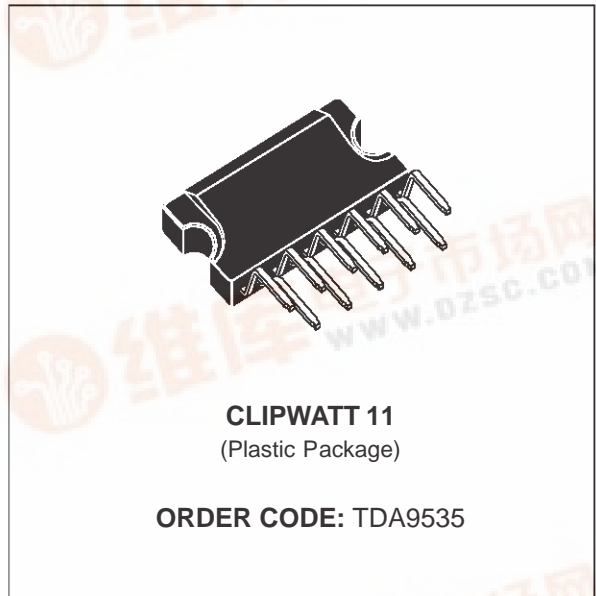
PRELIMINARY DATA

### FEATURE

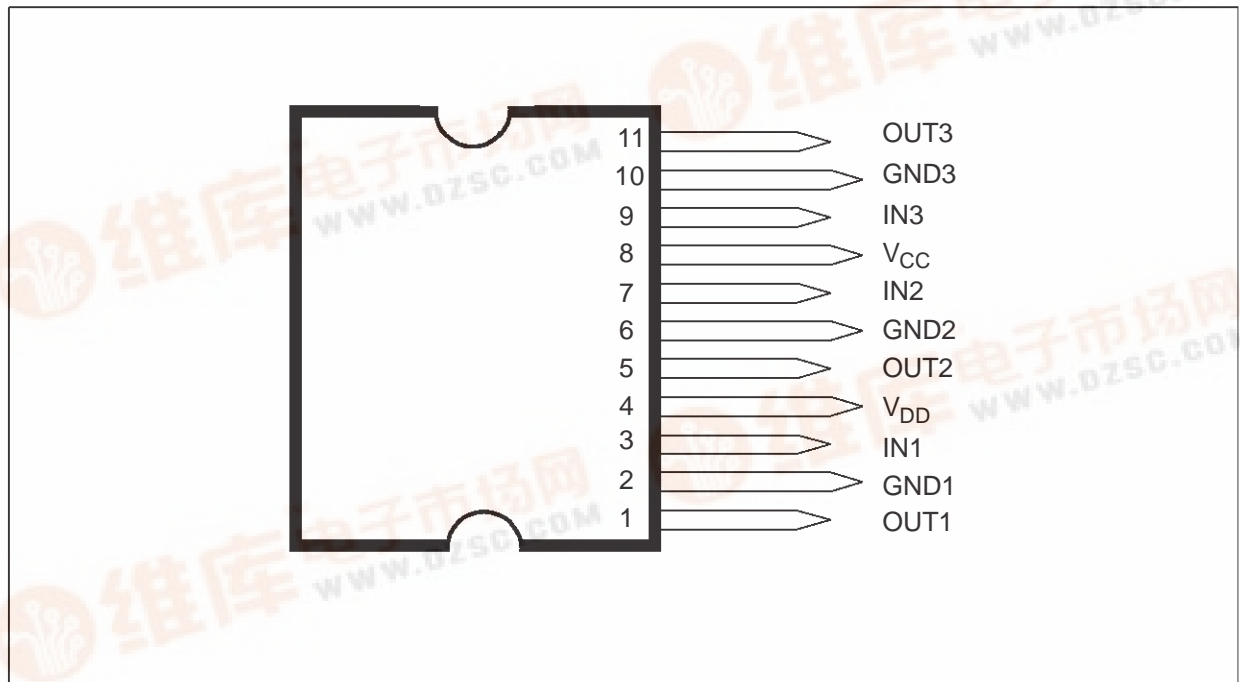
- TRIPLE CHANNEL VIDEO AMPLIFIER
- SUPPLY VOLTAGE: 110V TYPICAL
- RISE AND FALL TIMES: 9.5ns TYPICAL
- BANDWIDTH: 37MHz TYPICAL
- 80 VOLTS OUTPUT DYNAMIC RANGE
- LOW POWER CONSUMPTION
- WELL MATCHED WITH TDA9210 PREAMP
- FULL PIN COMPATIBILITY WITH TDA9536

### DESCRIPTION

The TDA9535 is a triple video amplifier with high voltage Bipolar/CMOS/DMOS technology (BCD) for use in color monitor application. Used with TDA9210 preamp in DC coupled mode, it provides for a low component, high performance and cost effective system solution. Other features include 1024 x 768 displays, pixel clock frequencies up to 75MHz, and DC or AC coupling designs.

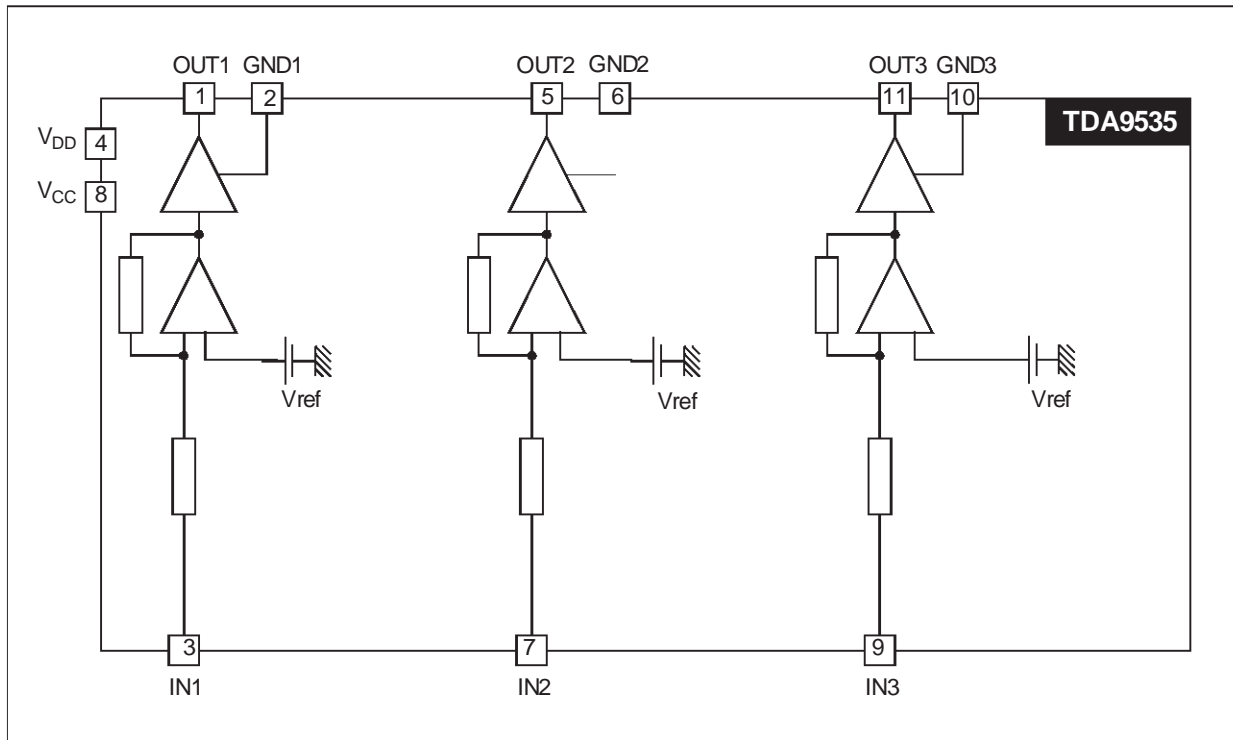


### PIN CONNECTIONS



Version 3.2

**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           |
|              |  | 250       | 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            |
| $T_J$        | 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, VDD = 110V, Tamb = 25 °C)

| Symbol   | Parameter   | Test Conditions  | Min | Typ                            | Max | Unit      |
|--|---|--|-----|--------------------------------|-----|-----------|
| V <sub>DD</sub>                                | High Supply Voltage (Pin 4)   |  |     | 110                            | 115 | V         |
| V <sub>CC</sub>                                | Low Supply Voltage (Pin 8)  |  | 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   |     | 15<br>40                       |     | 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> /dTemp                       | Output Voltage Drift Versus Temperature for any Channel                           | V <sub>OUT</sub> = 80V   |     | 15                             |     | mV/<br>°C |
| 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                            |     | 37                             |     | 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                            |     | 9.5                            |     | 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 10pF load. The best rise/fall times and bandwidth results will be obtained with low Rp resistor value while the best CRT arcing protection will be obtained by a high Rp resistor value. Finally a value between 150 and 220Ω is a good compromise.

### 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 the worst case (full bandwidth and black pixel/white pixel picture (note 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  $V_{DD} = 110V$ ,  $V_{CC} = 12V$ ,  $V_{OUT} = 40 V_{PP}$ ,  $I_{DD} = 15mA$ ,  $I_{CC} = 40mA$ ,  $f_{VIDEO} = 30MHz$ ,  $C_L = 8pF$  and  $K = 0.72$ .

We have:  $P_{STAT} = 2.13W$  and  $P_{DYN} = 2.28W$

Therefore:  $P_{tot} = 4.41W$ .

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

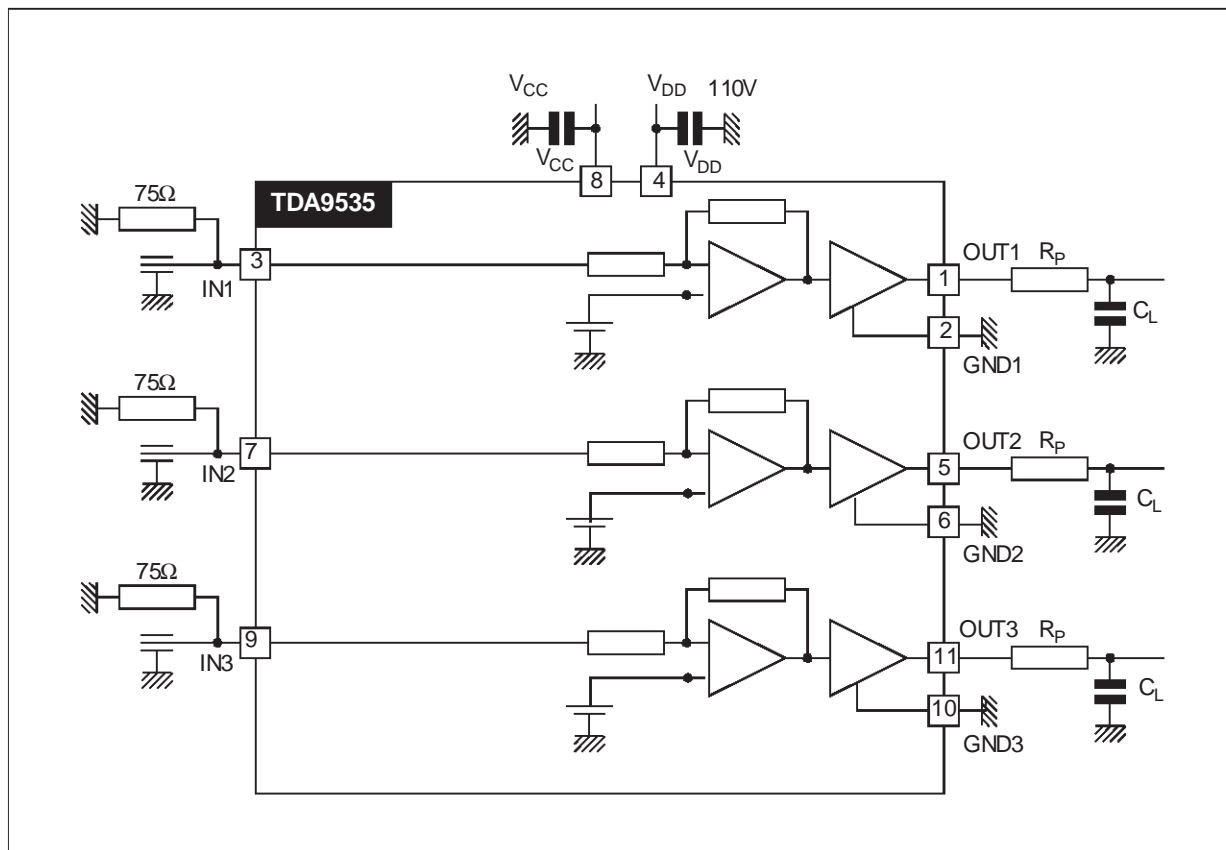
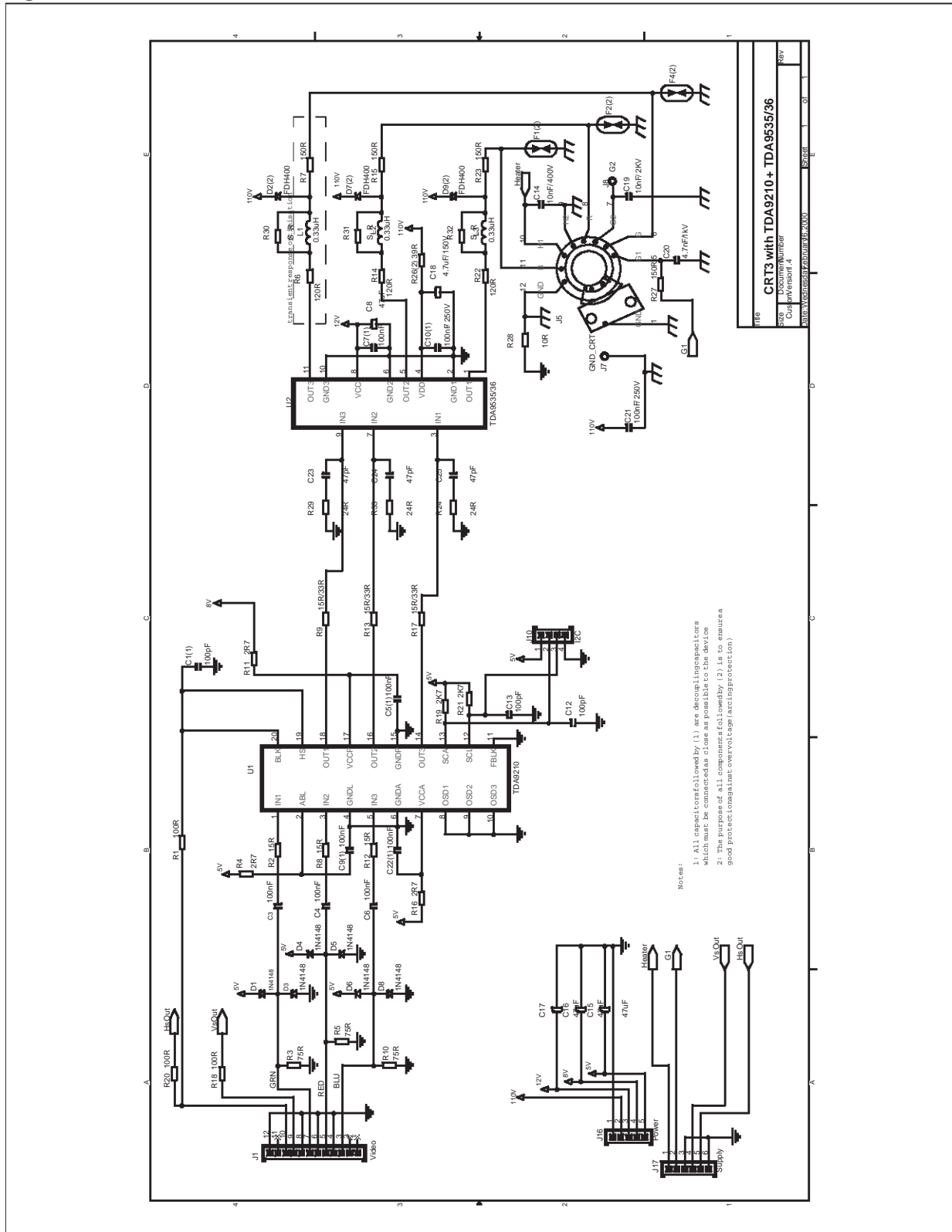


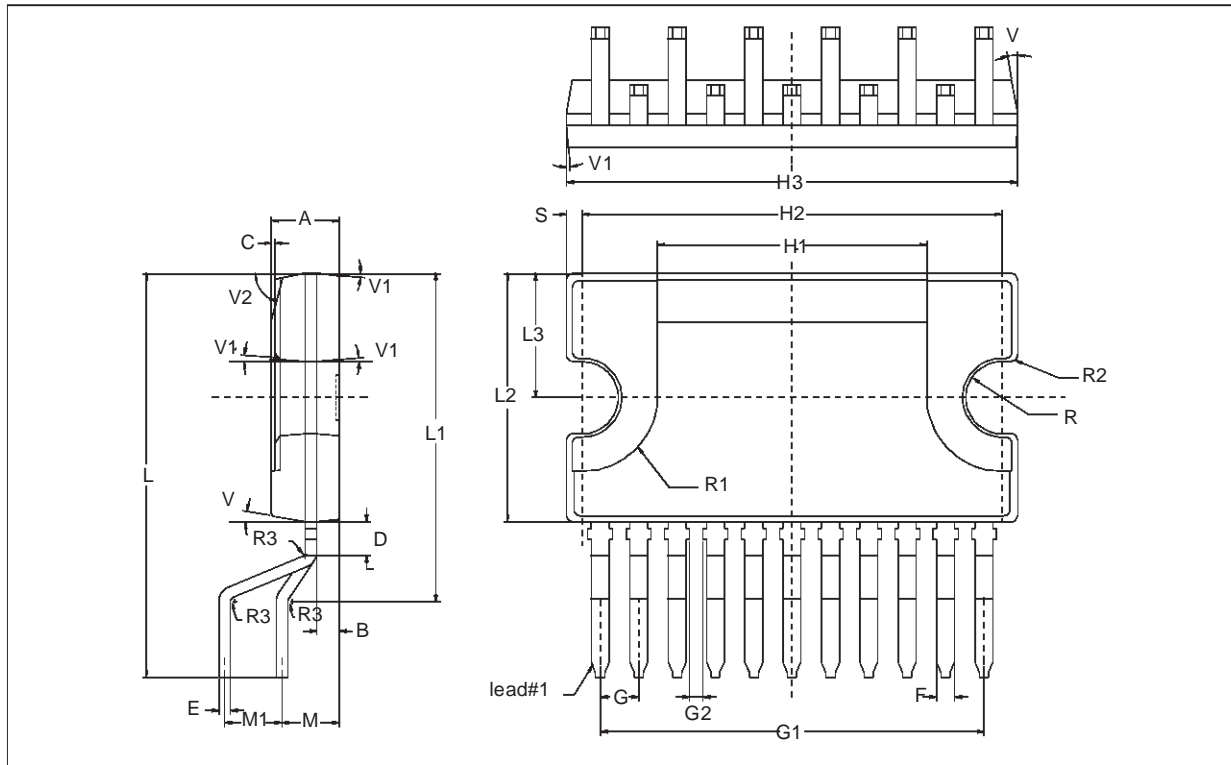


Figure 2. TDA9535/9536 - TDA9210 - Demonstration Board Schematic



## PACKAGE MECHANICAL DATA

## 11 PIN - CLIPWATT



| Dimensions | Millimeters |       |       | Inches |       |           |
|------------|-------------|-------|-------|--------|-------|-----------|
|            | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.      |
| A          | 2.95        | 3.00  | 3.05  | 0.116  | 0.118 | 0.120     |
| B          | 0.95        | 1.00  | 1.05  | 0.037  | 0.039 | 0.041     |
| C          |             | 0.15  |       |        | 0.006 |           |
| D          | 1.30        | 1.50  | 1.70  | 0.051  | 0.059 | 0.066     |
| E          | 0.49        | 0.515 | 0.55  | 0.019  | 0.020 | 0.021     |
| F          | 0.78        | 0.80  | 0.88  | 0.031  | 0.033 | 0.034     |
| G          | 1.60        | 1.70  | 1.80  | 0.063  | 0.067 | 0.071     |
| G1         | 16.90       | 17.00 | 17.10 | 0.665  | 0.669 | 0.673     |
| H1         |             | 12.00 |       |        | 0.472 |           |
| H2         | 18.55       | 18.60 | 18.65 | 0.730  | 0.732 | 0.734     |
| H3         | 19.90       | 20.00 | 20.10 | 0.783  | 0.787 | 0.791 ( ) |
| L          | 17.70       | 17.90 | 18.10 | 0.696  | 0.704 | 0.712     |
| L1         | 14.35       | 14.55 | 14.65 | 0.564  | 0.572 | 0.576     |
| L2         | 10.90       | 11.00 | 11.10 | 0.429  | 0.433 | 0.437( )  |
| L3         | 5.40        | 5.50  | 5.60  | 0.212  | 0.216 | 0.220     |
| M          | 2.34        | 2.54  | 2.74  | 0.092  | 0.100 | 0.107     |
| M1         | 2.34        | 2.54  | 2.74  | 0.092  | 0.100 | 0.107     |
| R          | 1.45        |       |       | 0.057  |       |           |
| R1         | 3.20        | 3.30  | 3.40  | 0.126  | 0.130 | 0.134     |

## TDA9535

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| Dimensions | Millimeters |        |      | Inches |        |       |
|------------|-------------|--------|------|--------|--------|-------|
|            | Min.        | Typ.   | Max. | Min.   | Typ.   | Max.  |
| R2         |             | 0.30   |      |        | 0.012  |       |
| R3         |             | 0.50   |      |        | 0.019  |       |
| S          | 0.65        | 0.70   | 0.75 | 0.025  | 0.027  | 0.029 |
| V          |             | 10deg. |      |        | 10deg. |       |
| V1         |             | 5deg.  |      |        | 5deg.  |       |
| V2         |             | 75deg. |      |        | 75deg. |       |

"H3 and L2" do not include mold flash or protrusions

Mold flash or protrusions shall not exceed 0.15mm per side.



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