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# LINEAR INTEGRATED CIRCUITS

7929225 S G S SEMICONDUCTOR CORP

## TV VERTICAL DEFLECTION SYSTEM

The TDA 1170S is a monolithic integrated circuit in a 12-lead quad in-line plastic package. It is intended for use in black and white and colour TV receivers.

The functions incorporated are:

- synchronization circuit
- oscillator and ramp generator
- high power gain amplifier
- flyback generator
- voltage regulator

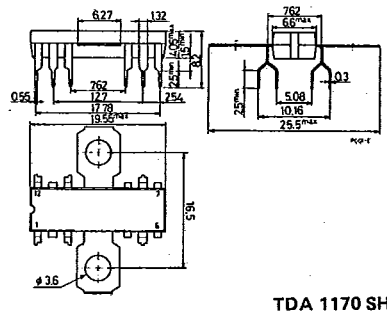
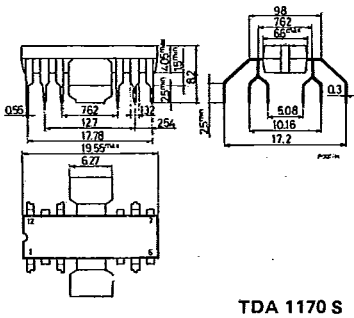
### ABSOLUTE MAXIMUM RATINGS

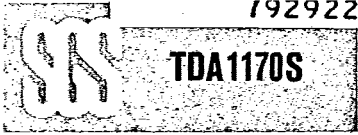
|                |   |            |                  |
|----------------|---|------------|------------------|
| $V_s$          | Supply voltage at pin 2   | 35         | V                |
| $V_4, V_5$     | Flyback peak voltage  | 60         | V                |
| $V_{10}$       | Power amplifier input voltage   | + 10       | V                |
|                |   | - 0.5      | V                |
| $I_o$          | Output peak current (non repetitive) at $t = 2$ msec                        | 2          | A                |
| $I_o$          | Output peak current at $f = 50$ Hz $t \leq 10$ $\mu$ sec                    | 2.5        | A                |
| $I_o$          | Output peak current at $f = 50$ Hz $t > 10$ $\mu$ sec                       | 1.5        | A                |
| $I_3$          | Pin 3 DC current at $V_4 < V_2$   | 100        | mA               |
| $I_3$          | Pin 3 peak to peak flyback current for $f = 50$ Hz, $t_{fly} \leq 1.5$ msec | 1.8        | A                |
| $I_8$          | Pin 8 current   | $\pm 20$   | mA               |
| $P_{tot}$      | Power dissipation: at $T_{tab} = 90^\circ\text{C}$                          | 5          | W                |
|                | at $T_{amb} = 80^\circ\text{C}$   | 1          | W                |
| $T_{stg}, T_j$ | Storage and junction temperature  | -40 to 150 | $^\circ\text{C}$ |

ORDERING NUMBERS: TDA 1170 S  
TDA 1170 SH

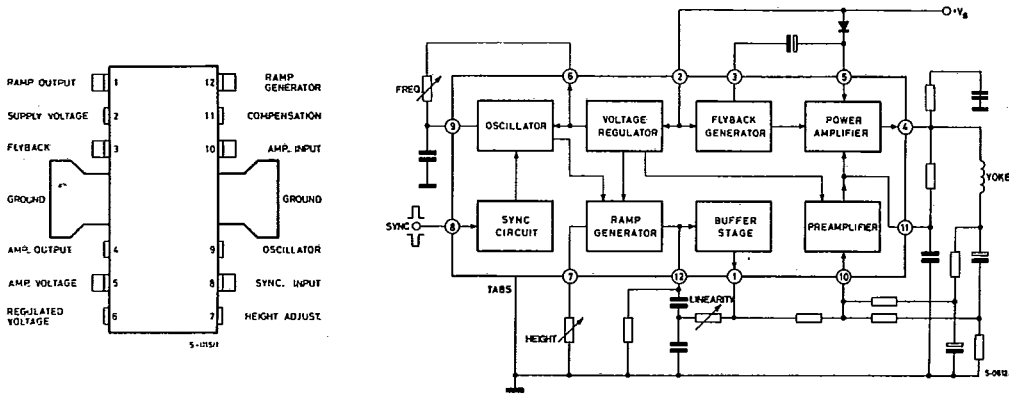
### MECHANICAL DATA

Dimensions in mm

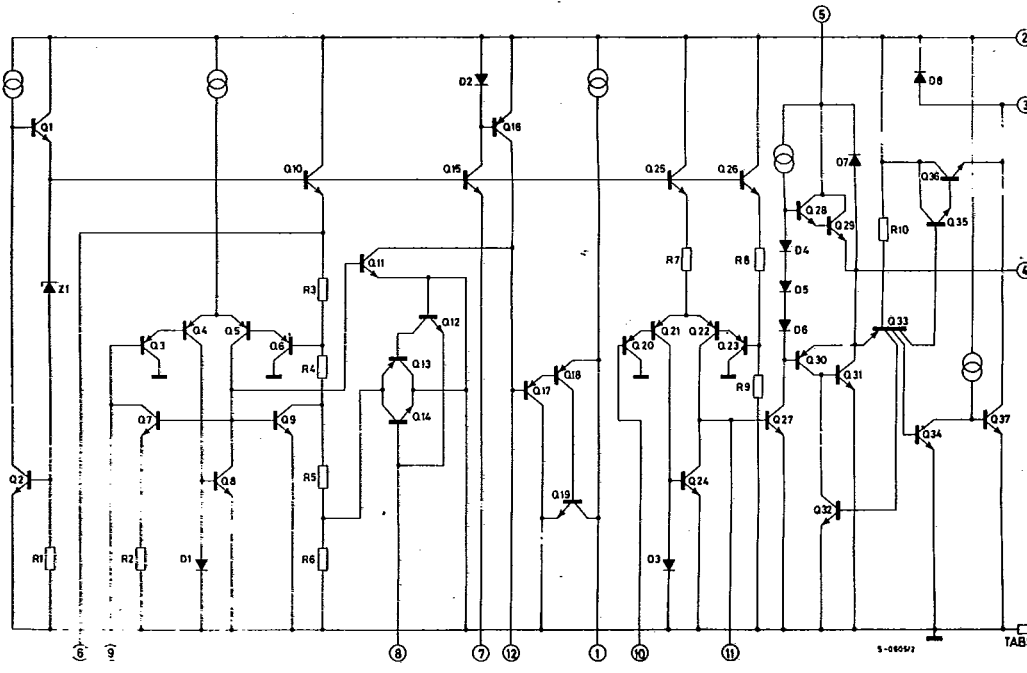




CONNECTION AND BLOCK DIAGRAMS



SCHEMATIC DIAGRAM





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## THERMAL DATA

|                 |                                     | TDA 1170S     | TDA 1170SH |
|-----------------|-------------------------------------|---------------|------------|
| $R_{th\ j-tab}$ | Thermal resistance junction-tab     | max 12°C/W    | max 10°C/W |
| $R_{th\ j-amb}$ | Thermal resistance junction-ambient | max 70°C/W(°) | max 80°C/W |

(a) Obtained with tabs soldered to printed circuit with minimized copper area.

ELECTRICAL CHARACTERISTICS (Refer to the test circuits,  $V_s=35V$ ,  $T_{amb}=25^\circ C$ , unless otherwise specified)

| Parameter | Test conditions | Min. | Typ. | Max. | Unit | Fig. |
|-----------|-----------------|------|------|------|------|------|
|-----------|-----------------|------|------|------|------|------|

## DC CHARACTERISTICS

|  |   |  |      |      |      |           |    |
|--|---|--|------|------|------|-----------|----|
| $I_2$  | Pin 2 quiescent current                     | $I_3 = 0$  |      | 7    | 14   | mA        | 1b |
| $I_5$  | Pin 5 quiescent current                     | $I_4 = 0$  |      | 8    | 15   | mA        | 1b |
| $-I_9$   | Oscillator bias current                     | $V_9 = 1V$   |      | 0.1  | 1    | $\mu A$   | 1a |
| $-I_{10}$  | Amplifier input bias current                | $V_{10} = 1V$  |      | 0.1  | 1    | $\mu A$   | 1b |
| $-I_{12}$  | Ramp generator bias current                 | $V_{12} = 0$   |      | 0.02 | 0.3  | $\mu A$   | 1a |
| $-I_{12}$  | Ramp generator current                      | $I_7 = 20\ \mu A$ $V_{12} = 0$                         | 19   | 20   | 24   | $\mu A$   | 1b |
| $\frac{\Delta I_{12}}{I_{12}}$                                 | Ramp generator non-linearity                | $\Delta V_{12} = 0$ to 12V<br>$I_7 = 20\ \mu A$        |      | 0.2  | 1    | %         | 1b |
| $V_s$  | Supply voltage range                        |  | 10   |      | 36   | V         | —  |
| $V_1$  | Pin 1 saturation voltage to ground          | $I_1 = 1\ mA$  |      | 1    | 1.4  | V         | —  |
| $V_3$  | Pin 3 saturation voltage to ground          | $I_3 = 10\ mA$   |      | 1.7  | 2.6  | V         | 1a |
| $V_4$  | Quiescent output voltage                    | $V_s = 10V$ $R_1 = 10\ K\Omega$<br>$R_2 = 10\ K\Omega$ | 4.17 | 4.4  | 4.63 | V         | 1a |
|  |   | $V_s = 35V$ $R_1 = 30\ K\Omega$<br>$R_2 = 10\ K\Omega$ | 8.35 | 8.8  | 9.25 | V         | 1a |
| $V_{4L}$   | Output saturation voltage to ground         | $-I_4 = 0.1A$  |      | 0.9  | 1.2  | V         | 1c |
|  |   | $-I_4 = 0.8A$  |      | 1.9  | 2.3  | V         | 1c |
| $V_{4H}$   | Output saturation voltage to supply         | $I_4 = 0.1A$   |      | 1.4  | 2.1  | V         | 1d |
|  |   | $I_4 = 0.8A$   |      | 2.8  | 3.2  | V         | 1d |
| $V_6$  | Regulated voltage at pin 6                  |  | 6.1  | 6.5  | 6.9  | V         | 1b |
| $V_7$  | Regulated voltage at pin 7                  | $I_7 = 20\ \mu A$                                      | 6.2  | 6.6  | 7    | V         | 1b |
| $\frac{\Delta V_6}{\Delta V_s}; \frac{\Delta V_7}{\Delta V_s}$ | Regulated voltage drift with supply voltage | $\Delta V_s = 10$ to 35V                               |      | 1    |      | mV/V      | 1b |
| $V_{10}$   | Amplifier input reference voltage           |  | 2.07 | 2.2  | 2.3  | V         | —  |
| $R_8$  | Pin 8 input resistance                      | $V_8 \leq 0.4V$  | 1    |      |      | $M\Omega$ | 1a |



Fig. 1 - DC test circuits

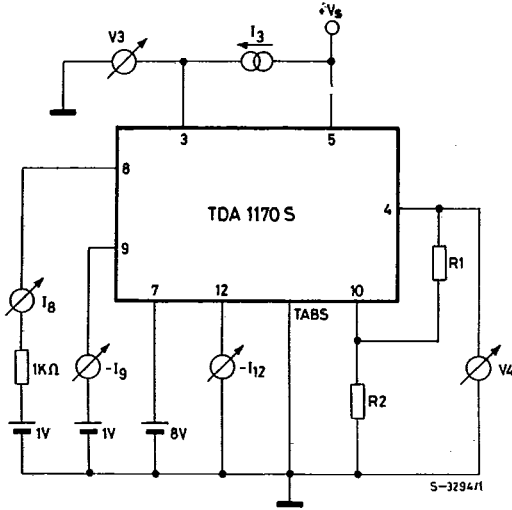


Fig. 1a

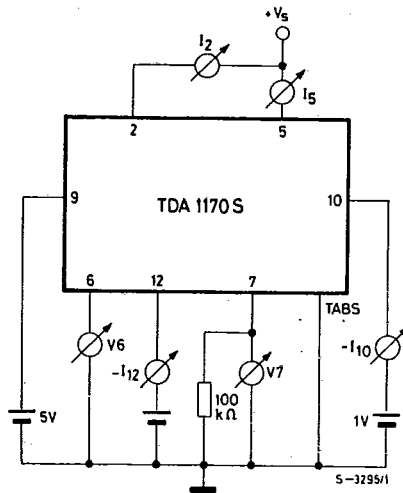


Fig. 1b

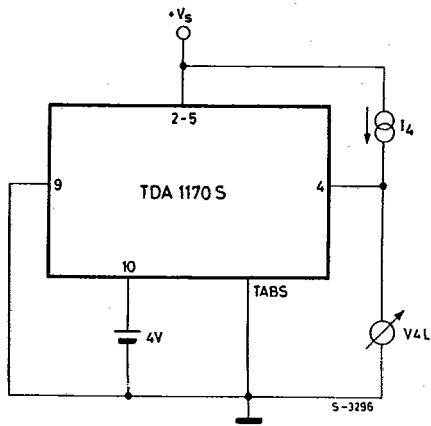


Fig. 1c

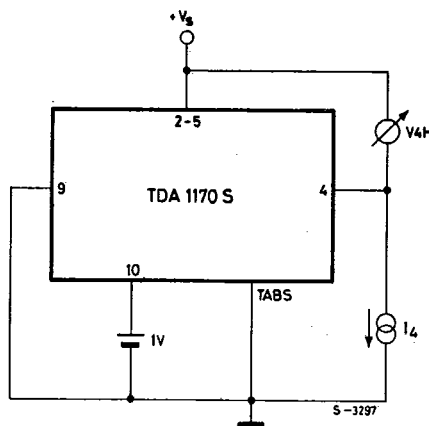


Fig. 1d

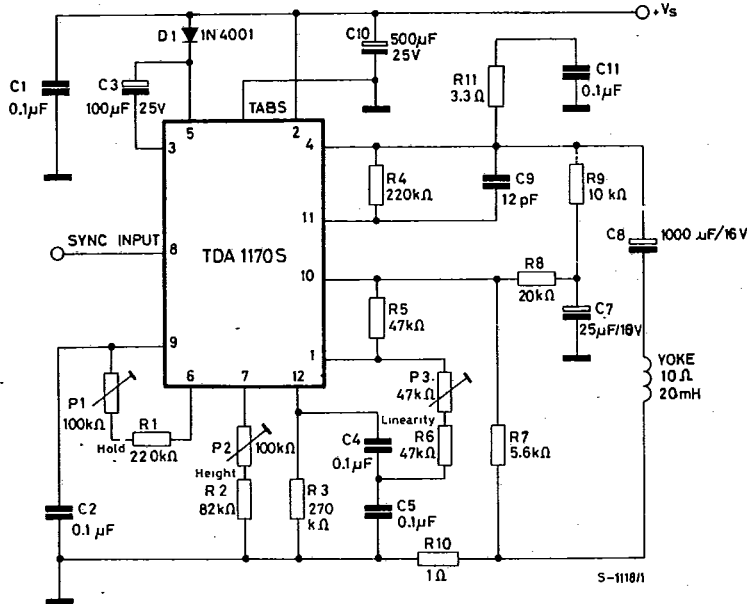


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**AC CHARACTERISTICS** (Refer to the test circuit,  $V_s = 25V$ ;  $f = 50\text{ Hz}$ ;  $T_{amb} = 25^\circ\text{C}$ , unless otherwise specified)

| Parameter                         | Test conditions                            | Min.  | Typ.  | Max. | Unit                 | Fig. |
|-----------------------------------|--|---|-------|------|----------------------|------|
| $I_s$                             | Supply current                             |   | 140   |      | mA                   | 2    |
| $I_b$                             | Sync. input current (positive or negative) | 500   |       |      | $\mu\text{A}$        | 2    |
| $V_4$                             | Flyback voltage                            |   | 51    |      | V                    | 2    |
| $V_9$                             | Peak to peak oscillator sawtooth voltage   |   | 2.4   |      | V                    | 2    |
| $t_{fly}$                         | Flyback time                               |   | 0.7   |      | ms                   | 2    |
| $f_o$                             | Free running frequency                     | $(P_1 + R_1) = 300\text{ K}\Omega$<br>$C_2 = 100\text{ nF}$ | 44    |      | Hz                   | 2    |
|                                   |  | $(P_1 + R_1) = 260\text{ K}\Omega$<br>$C_2 = 100\text{ nF}$ | 52    |      | Hz                   | 2    |
| $\Delta f$                        | Synchronization range                      | 14  |       |      | Hz                   | 2    |
| $\frac{\Delta f}{\Delta V_s}$     | Frequency drift with supply voltage        |   | 0.005 |      | Hz/V                 | 2    |
| $\frac{\Delta f}{\Delta T_{tab}}$ | Frequency drift with tab temperature       |   | 0.01  |      | Hz/ $^\circ\text{C}$ | 2    |

Fig. 2 - AC test circuit



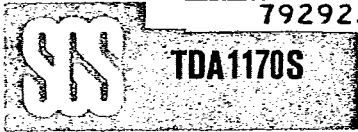
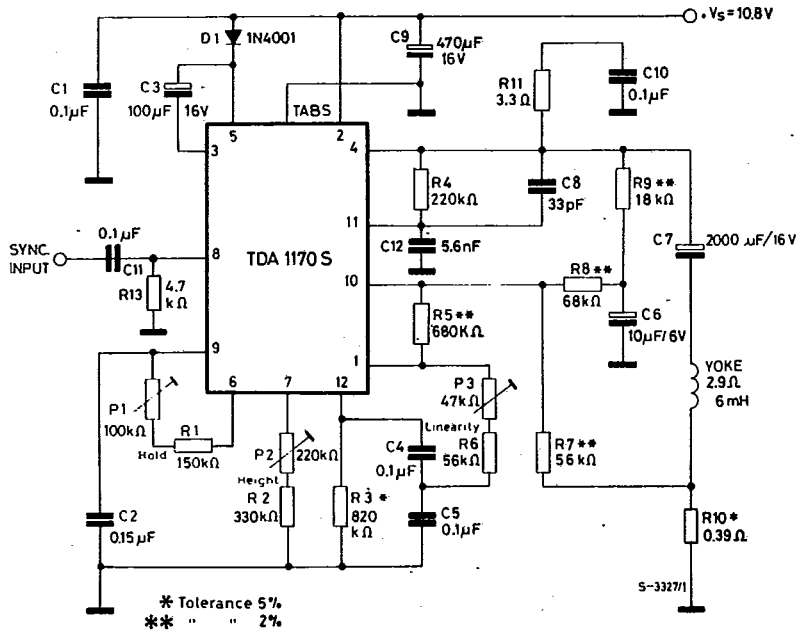


Fig. 3 - Typical application circuit for small screen B/W TV set ( $R_y = 2.9\Omega$ ,  $L_y = 6\text{ mH}$ ;  $I_y = 1.1\text{ App}$ )



Typical performance

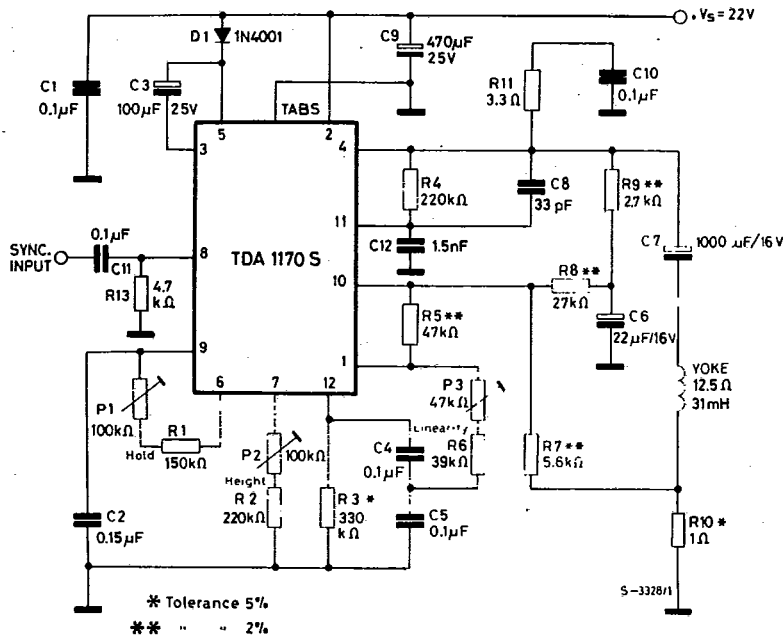
|           |   |      |    |
|-----------|---|------|----|
| $V_s$     | Operating supply voltage                | 10.8 | V  |
| $I_s$     | Supply current                          | 155  | mA |
| $t_{fly}$ | Flyback time                            | 0.5  | ms |
| $P_{tot}$ | TDA 1170S power dissipation             | 1.35 | W  |
| $I_y$     | Maximum scanning current (peak to peak) | 1.30 | A  |

For safe working up to  $T_{amb} = 60^\circ\text{C}$  a heatsink of  $R_{th} = 30^\circ\text{C/W}$  is required.



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Fig. 4 - Typical application circuit for small screen 90° PIL TVC set ( $R_y = 12.5\Omega$ ;  $L_y = 31\text{ mH}$ ;  $I_y = 0.8\text{ App}$ )



### Typical performance

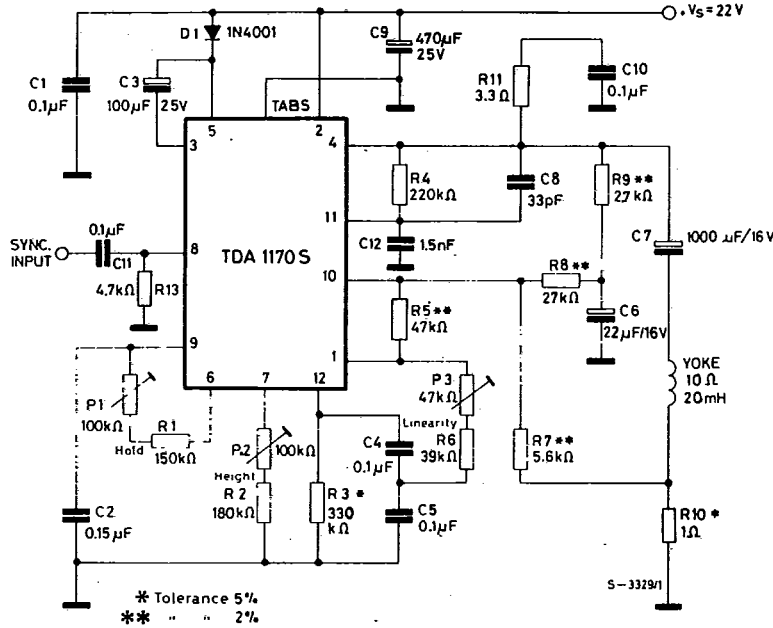
|           |   |      |    |
|-----------|---|------|----|
| $V_s$     | Operating supply voltage                | 22   | V  |
| $I_s$     | Supply current                          | 120  | mA |
| $t_{fly}$ | Flyback time                            | 0.8  | ms |
| $P_{tot}$ | TDA 1170S power dissipation             | 1.95 | W  |
| $I_y$     | Maximum scanning current (peak to peak) | 1.0  | A  |

For safe working up to  $T_{amb} = 60^\circ\text{C}$  a heatsink of  $R_{th} = 18^\circ\text{C/W}$  is required.





Fig. 5 - Typical application circuit for large screen B/W TV set ( $R_y = 10\Omega$ ;  $L_y = 20\text{ mH}$ ;  $I_y = 1\text{ App}$ )



Typical performance

|           |   |     |    |
|-----------|---|-----|----|
| $V_s$     | Operating supply voltage                | 22  | V  |
| $I_s$     | Supply current                          | 145 | mA |
| $t_{fly}$ | Flyback time                            | 0.7 | ms |
| $P_{tot}$ | TDA 1170S power dissipation             | 2.3 | W  |
| $I_y$     | Maximum scanning current (peak to peak) | 1.2 | A  |

For safe working up to  $T_{amb} = 60^\circ\text{C}$  a heatsink of  $R_{th} = 14^\circ\text{C/W}$  is required.

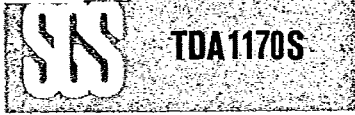
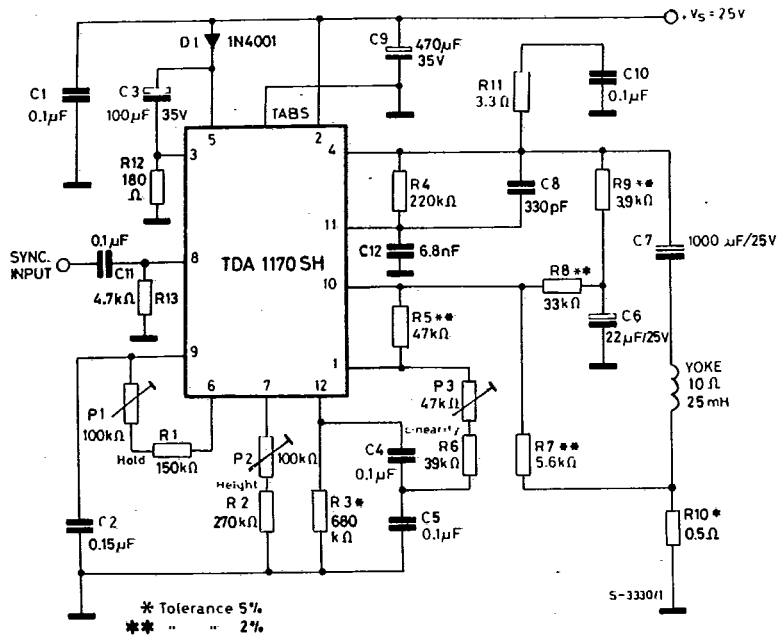


Fig. 6 - Typical application circuit for large screen 110° PIL TVC set ( $R_y = 10\Omega$ ;  $L_y = 25\text{ mH}$ ;  $I_y = 1.25\text{ App}$ )



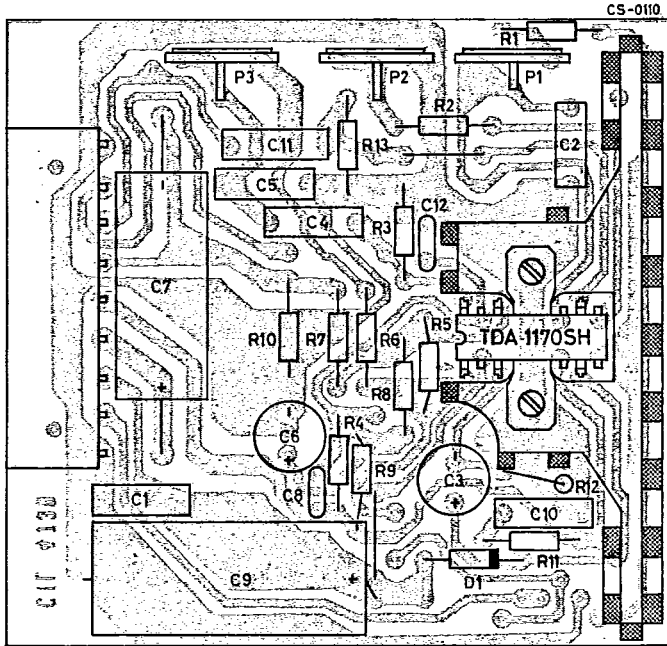
Typical performance

|           |   |      |    |
|-----------|---|------|----|
| $V_s$     | Operating supply voltage                | 25   | V  |
| $I_s$     | Supply current                          | 175  | mA |
| $t_{fly}$ | Flyback time                            | 1    | ms |
| $P_{tot}$ | TDA 1170SH power dissipation            | 3.25 | W  |
| $I_y$     | Maximum scanning current (peak to peak) | 1.4  | A  |

For safe working up to  $T_{amb} = 60^\circ\text{C}$  a heatsink of  $R_{th} = 8.5^\circ\text{C/W}$  is required.



Fig. 7 - P.C. board and component layout of the circuit of fig. 6 (1 : 1 scale)



Note: For the heatsink (1170 S and 1170 SH) see mounting instructions

### MOUNTING INSTRUCTIONS

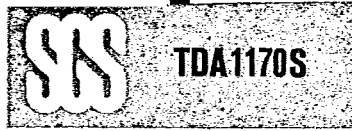
During soldering the tab temperature must not exceed 260°C and the soldering time must not be longer than 12 seconds.

The external heatsink or printed circuit copper area must be connected to electrical ground.

### TDA 1170S

The junction to ambient thermal resistance of the TDA 1170S can be reduced by soldering the tabs to a suitable copper area of the printed circuit board (fig. 8) or to an external heatsink (fig. 9).

The diagram of fig. 10 shows the maximum dissippable power  $P_{tot}$  and the  $R_{th j-amb}$  as a function of the side "s" of two equal square copper areas having a thickness of 35  $\mu$  (1.4 mil).



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MOUNTING INSTRUCTIONS (continued)

Fig. 8 - Example of P.C. board copper area used as heatsink.

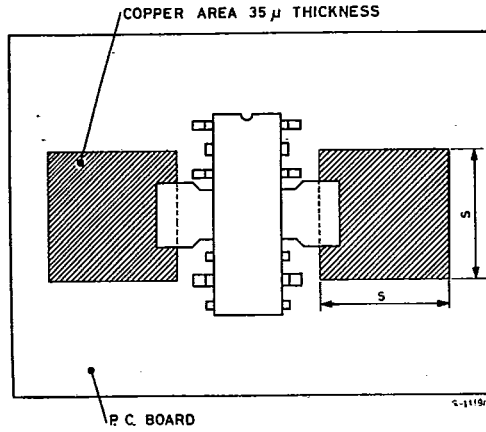


Fig. 9 - Example of TDA 1170 S with external heatsink.

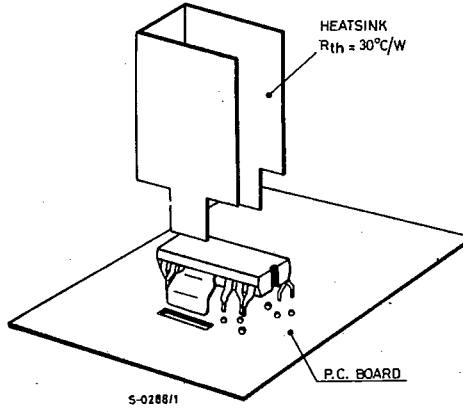


Fig. 10 - Maximum Power dissipation and junctional-ambient thermal resistance vs. "S"

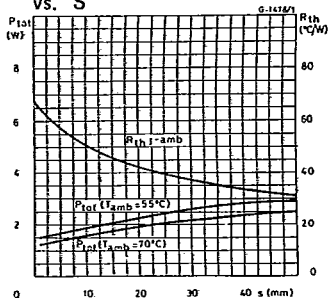


Fig. 11 - Maxim. allowable power dissipation vs. ambient temp. (TDA1170S)

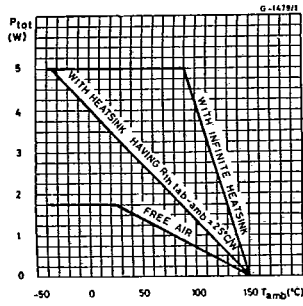
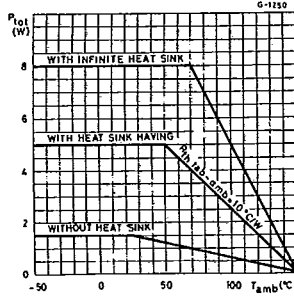
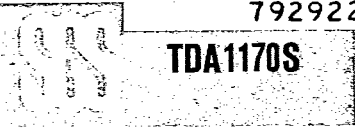


Fig. 12 - Maxim. allowable power dissipation vs. ambient temp. (TDA1170SH)



TDA 1170SH

The power dissipated in the circuit may be removed by connecting the tabs to an external heatsink according to fig. 12. The desired thermal resistance may be obtained by fixing the TDA1170SH to a suitable dimensioned plate as shown in fig. 13.



MOUNTING INSTRUCTIONS (continued)

Fig. 13 - Mounting example.

