

# LINEAR INTEGRATED CIRCUIT



## TV VERTICAL DEFLECTION SYSTEM

The TDA 1170 is a monolithic integrated circuit in a 12-lead quad in-line plastic package. It is designed mainly for use in large and small screen black and white TV receivers.

The functions incorporated are:

- oscillator
- voltage ramp generator
- high power gain amplifier
- flyback generator

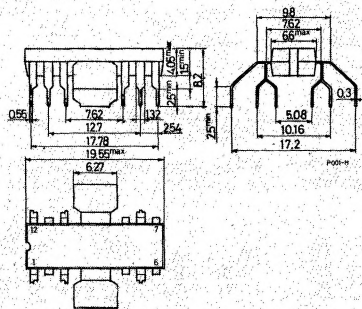
## ABSOLUTE MAXIMUM RATINGS

$V_s$	Supply voltage (pin 2)	27	V
$V_4$ - $V_5$	Flyback peak voltage	58	V
$V_8$	Sync. input voltage	$\pm 12$	V
$V_{10}$	Power amplifier input voltage	$\left\{ \begin{array}{l} 10 \\ -0.5 \end{array} \right.$	$\left\{ \begin{array}{l} V \\ V \end{array} \right.$
$I_o$	Output peak current (non-repetitive) @ $t = 2 \text{ ms}$	2	A
$I_o$	Output peak current @ $f = 50 \text{ Hz}, t \leq 10 \mu\text{s}$	2.5	A
	@ $f = 50 \text{ Hz}, t > 10 \mu\text{s}$	1.5	A
$P_{\text{tot}}$	Power dissipation: at $T_{\text{tab}} = 90^\circ\text{C}$	5	W
	at $T_{\text{amb}} = 80^\circ\text{C}$ (free air)	1	W
$T_{\text{stg}}, T_j$	Storage and junction temperature	-40 to 150	$^\circ\text{C}$

ORDERING NUMBER: TDA 1170

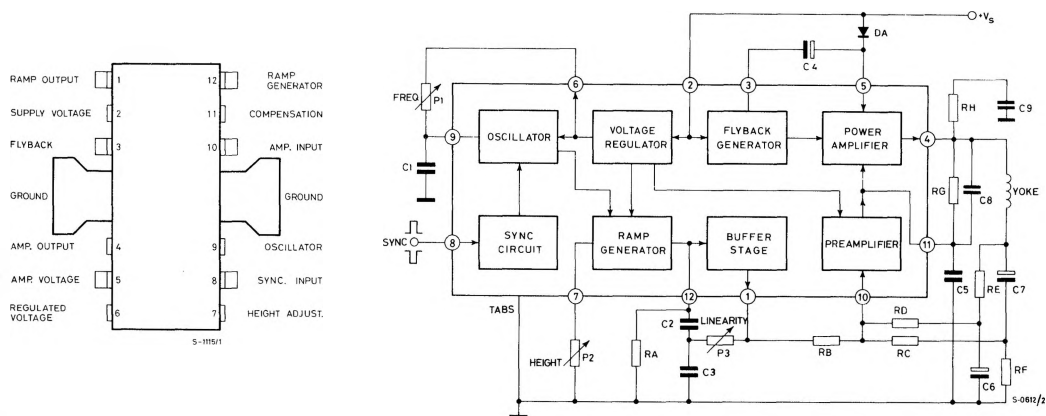
## MECHANICAL DATA

Dimensions in mm

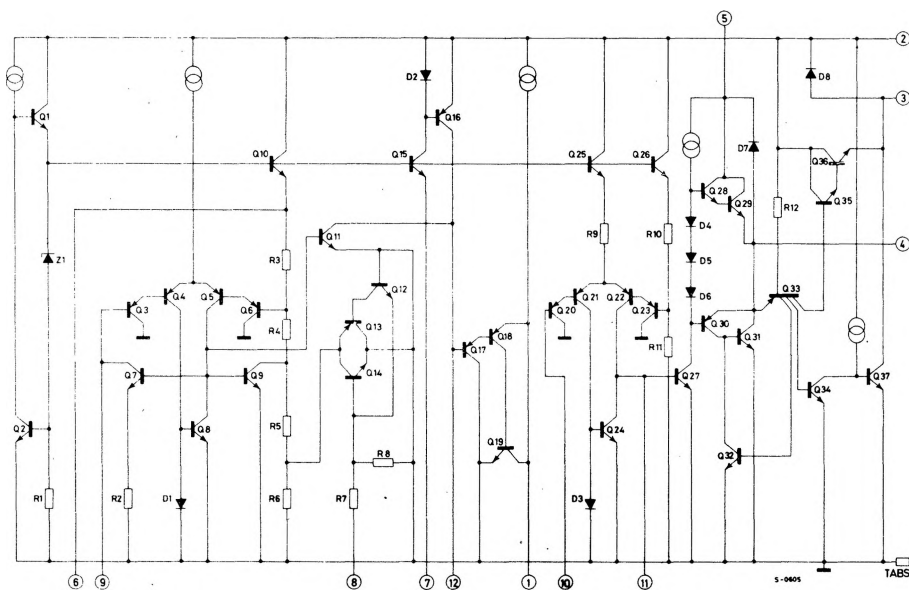


### CONNECTION AND BLOCK DIAGRAM

(top view)



### SCHEMATIC DIAGRAM





## THERMAL DATA

$R_{th\ j-tab}$	Thermal resistance junction-tab	max	12	°C/W
$R_{th\ j-amb}$	Thermal resistance junction-ambient	max	70*	°C/W

\* Obtained with tabs soldered to printed circuit with minimized area.

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

Parameter	Test conditions	Min.	Typ.	Max.	Unit	Fig.
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### DC CHARACTERISTICS

$-I_9$	Oscillator bias current	$V_9 = 1V$		0.2	1	$\mu A$	1a
$-I_{10}$	Amplifier input bias current	$V_{10} = 1V$		0.15	1	$\mu A$	1b
$-I_{12}$	Ramp generator bias current			0.05	0.5	$\mu A$	1a
$V_s$	Supply voltage		10			V	—
$V_4$	Quiescent output voltage	$R_2 = 10\ k\Omega$ $V_s = 25V$ $R_1 = 30\ k\Omega$ $V_s = 10V$ $R_1 = 10\ k\Omega$	8 4	8.8 4.4	9.6 4.8	V V	1a
$V_6, V_7$	Regulated voltage		6	6.5	7	V	1b
$\frac{\Delta V_6}{\Delta V_s}$ $\frac{\Delta V_7}{\Delta V_s}$	Line regulation	$V_s = 10\ to\ 27V$		1.5		mV/V	

### AC CHARACTERISTICS (f = 50 Hz)

$I_s$	Supply current	$I_Y = 1A$		140		mA	2
$I_Y$	Peak to peak yoke current (pin 4)				1.6	A	
$V_4$	Flyback voltage	$I_Y = 1A$		51		V	
$V_8$	Peak sync. input voltage (positive or negative)		1			V	



ELECTRICAL CHARACTERISTICS (continued)

Parameter	Test conditions	Min.	Typ.	Max.	Unit	Fig.
$V_9$ Peak to peak oscillator sawtooth voltage			2.4		V	2
$R_8$ Sync. input resistance	$V_8 = 1V$		3.5		$k\Omega$	
$t_{fly}$ Flyback time	$I_Y = 1A$		0.6	0.8	ms	
$\delta f$ Pull-in range (below 50 Hz)			7		Hz	
$\frac{\delta f}{\Delta V_s}$ Oscillator frequency drift with supply voltage	$V_s = 10 \text{ to } 27V$		0.01		$\frac{Hz}{V}$	
$\frac{\delta f}{\Delta T_{tab}}$ Oscillator frequency drift with tab temperature	$T_{tab} = 40 \text{ to } 120^\circ C$		0.015		$\frac{Hz}{^\circ C}$	

Fig. 1a - DC test circuit for measurement of  $-I_9$ ,  $-I_{12}$  and  $V_4$

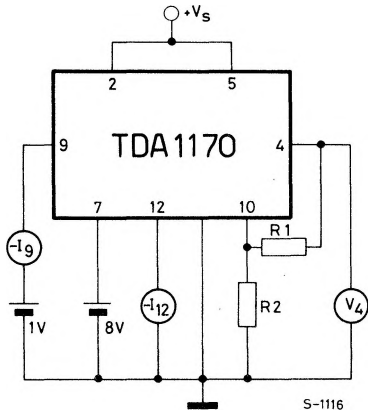


Fig. 1b - DC test circuit for measurement of  $-I_{10}$ ,  $V_6$ ,  $V_7$ ,  $\Delta V_6/\Delta V_s$  and  $\Delta V_7/\Delta V_s$

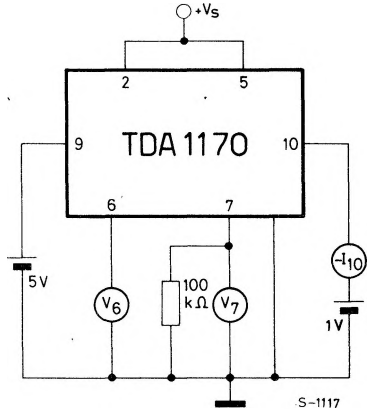






Fig. 6 - Regulated voltage vs. tab temperature

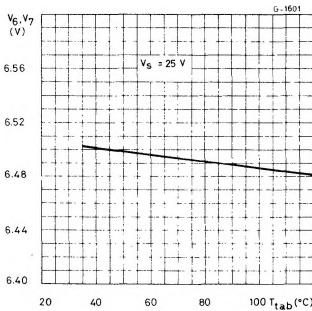


Fig. 7 - Frequency variation of unsynchronized oscillator vs. supply voltage

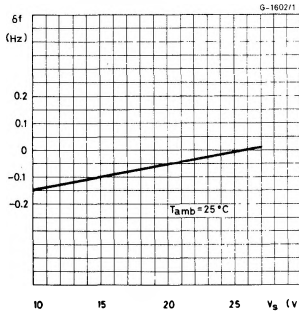
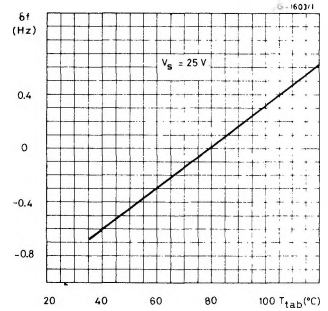


Fig. 8 - Frequency variation of unsynchronized oscillator vs. tab temperature



## APPLICATION INFORMATION

The thermistor in series to the yoke is not required because the current feedback enables the yoke current to be independent of yoke resistance variations due to thermal effects. The oscillator is directly synchronized by the sync. pulses (positive or negative), therefore its free frequency must be lower than the sync. frequency. The flyback generator applies a voltage, about twice the supply voltage, to the yoke. This produces short flyback time together with a high useful power to dissipated power ratio.

The flyback time is:

$$t_{fly} \cong \frac{2}{3} \frac{L_Y I_Y}{V_S}$$

where:  $L_Y$  = Yoke inductance  
 $V_S$  = Supply voltage  
 $I_Y$  = Peak to peak yoke current

The supply current is:

$$I_S \cong \frac{I_Y}{8} + 0.02 \text{ (A)}$$

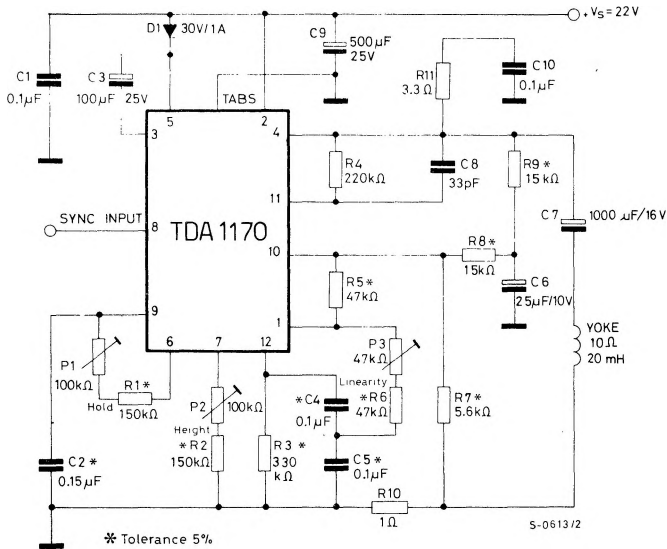
It does not depend on the value of  $V_S$  but only on yoke characteristics. The minimum value of  $V_S$  necessary for the required output current permits the maximum efficiency.

The quiescent output voltage (pin 4) is fixed by the voltage feedback network R7, R8 and R9 (refer to fig. 2) according to:

$$V_4 = V_{10} \frac{R7 + R8 + R9}{R7}$$

Pin 10 is the inverting input of the amplifier and its voltage is  $V_{10} \cong 2V$ .

Fig. 9 - Typical application circuit for B & W 24" 110° TV sets



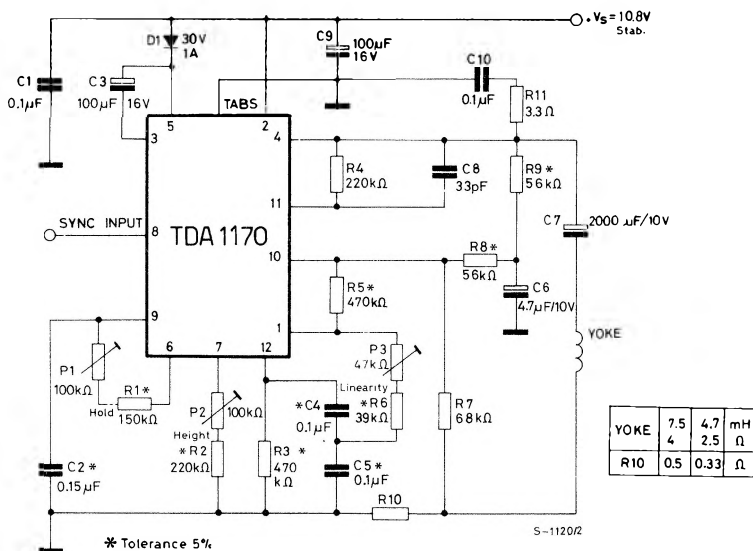
**Typical performance** ( $V_s = 22V$ ;  $I_Y = 1A$ ;  $R_Y = 10\Omega$ ;  $L_Y = 20\text{ mH}$ )

$I_s$	Supply current	140	mA
$t_{fly}$	Flyback time	0.75	ms
$I_{V-}$	Maximum scanning current (peak to peak)	1.2	A
$V_s$	Operating supply voltage	20 to 24	V
$P_{tot}$	TDA 1170 power dissipation	2.2	W

For safe working up to  $T_{amb} = 50^{\circ}\text{C}$  a heatsink of  $R_{th} = 40^{\circ}\text{C/W}$  is required and each tab of TDA 1170 must be soldered to 1 cm<sup>2</sup> copper area of the printed circuit board.



Fig. 10 - Typical application circuit for B & W small screen TV sets

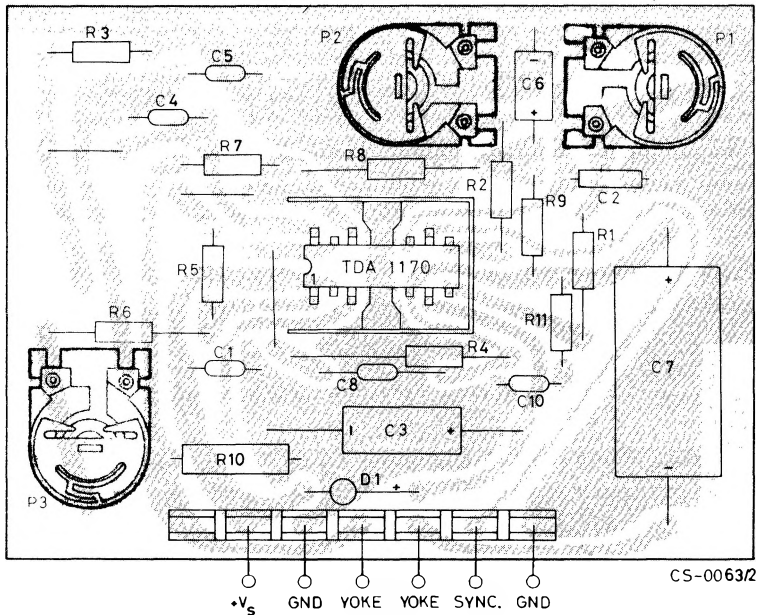


**Typical performance** ( $V_s = 10.8\text{V}$ ;  $I_Y = 1\text{A}$ ;  $R_Y = 4\Omega$ ;  $L_Y = 7.5\text{mH}$ )

$I_s$	Supply current	150	mA
$t_{fly}$	Flyback time	0.7	ms
$I_Y$	Maximum scanning current (peak to peak)	1.15	A
$V_s$	Operating supply voltage	10.8	V
$P_{tot}$	TDA 1170 power dissipation	1.3	W

For safe working up to  $T_{amb} = 50^\circ\text{C}$  a heatsink of  $R_{th} = 30^\circ\text{C/W}$  is required and each tab of the TDA 1170 must be soldered to  $1\text{cm}^2$  copper area of the printed circuit board.

Fig. 11 – P.C. board and component layout for the circuit of fig. 9 and fig. 10 (1:1 scale)



C9 is not mounted on the P.C. board.

## MOUNTING INSTRUCTIONS

The junction to ambient thermal resistance of the TDA 1170 can be reduced by soldering the tabs to a suitable copper area of the printed circuit board (fig. 12) or to an external heatsink (fig. 13).

The diagram of fig. 16 shows the maximum dissipable 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).

During soldering the tab temperature must not exceed  $260\ ^\circ\text{C}$  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.**

Fig. 12 - Example of P.C. board copper area used as heatsink

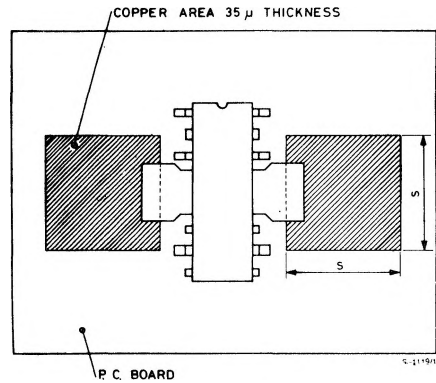


Fig. 13 - Example of TDA 1170 with external heatsink

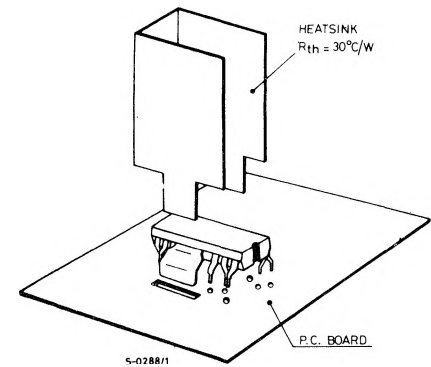


Fig. 14 - Maximum power dissipation and junction-ambient thermal resistance vs. "s"

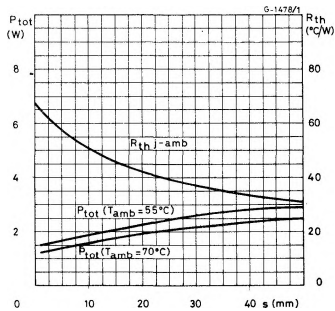


Fig. 15 - Maximum allowable power dissipation vs. ambient temperature

