LINEAR INTEGRATED CIRCUIT

SGS **TDA 1170**

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

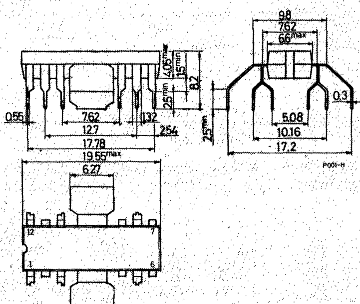
ABSOLUTE MAXIMUM RATINGS

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

ORDERING NUMBER: TDA 1170

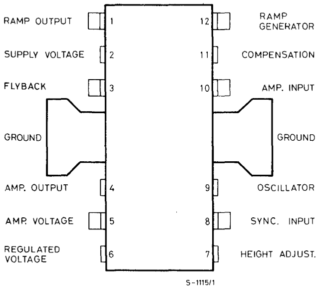
MECHANICAL DATA

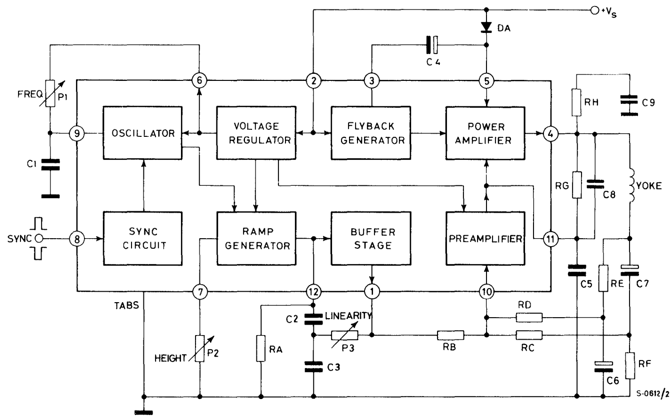
Dimensions in mm



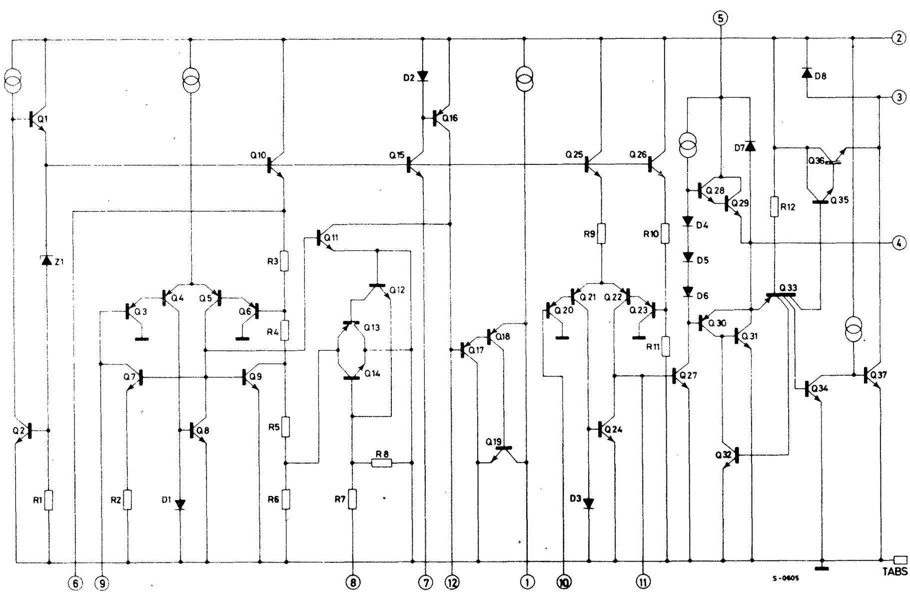
SGS **TDA1170**

CONNECTION AND BLOCK DIAGRAM
(top view)





SCHEMATIC DIAGRAM



THERMAL DATA

$R_{th\ j\text{-}tab}$	Thermal resistance junction-tab	max	12	°C/W
$R_{th\ j\text{-}amb}$	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°C unless otherwise specified)

DC CHARACTERISTICS

Parameter		Test conditions	Min.	Typ.	Max.	Unit	Fig.
$-I_9$	Oscillator bias current	V_9 = 1V		0.2	1	μA	1a
$-I_{10}$	Amplifier input bias current	V_{10}= 1V		0.15	1	μA	1b
$-I_{12}$	Ramp generator bias current			0.05	0.5	μA	1a
V_s	Supply voltage		10			V	–
V_4	Quiescent output voltage	R2 = 10 kΩ V_s = 25V R1 = 30 kΩ V_s = 10V R1 = 10 kΩ	 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)

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

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

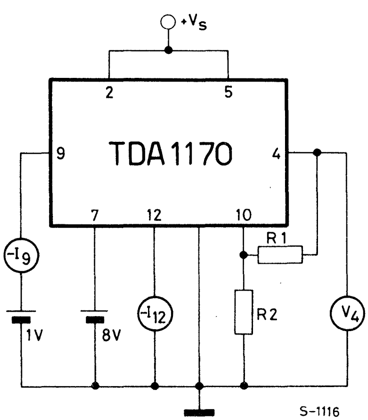


Fig. 1b - DC test circuit for measurement of $-I_{10}$, V_6, V_7, $\Delta V_6/\Delta V_s$ and $\Delta V_7/\Delta V_s$

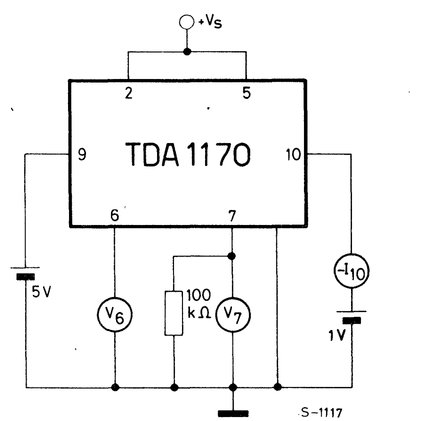


Fig. 2 - AC test circuit

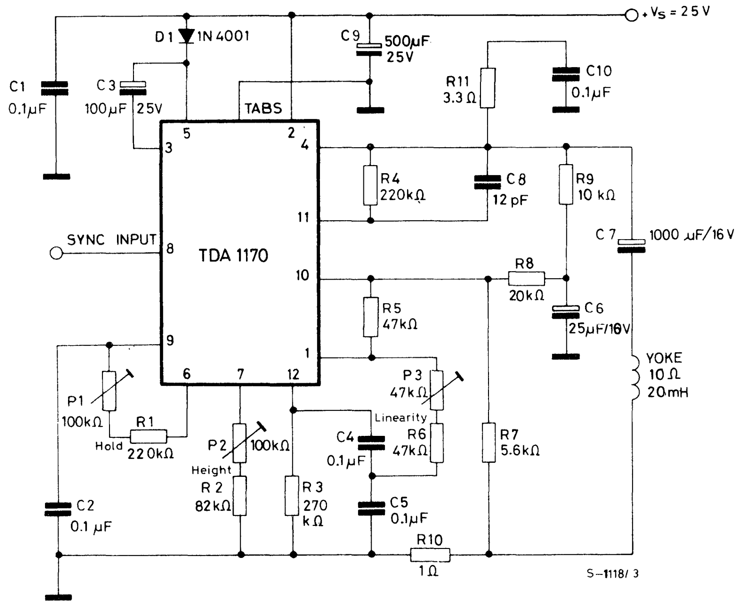


Fig. 3 - Relative quiescent voltage variation vs. supply voltage

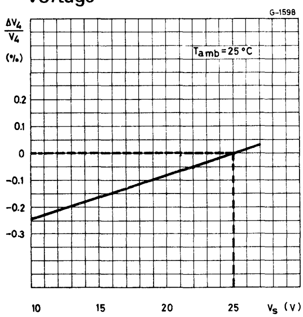


Fig. 4 - Relative quiescent voltage variation vs. tab temperature

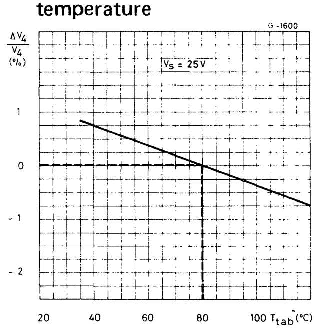


Fig. 5 - Regulated voltage vs. supply voltage

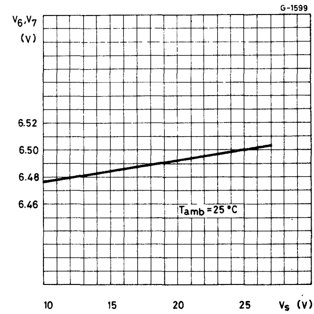


Fig. 6 - Regulated voltage vs. tab temperature

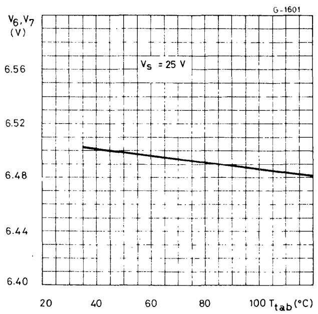


Fig. 7 - Frequency variation of unsynchronized oscillator vs. supply voltage

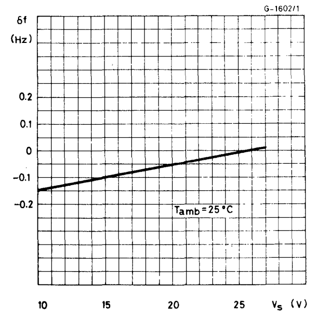
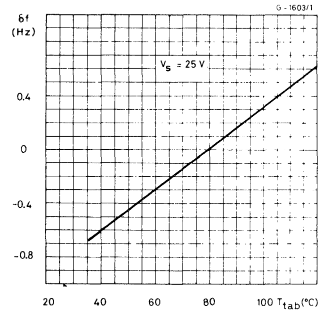


Fig. 8 - Frequency variation of unsynchronized oscillator vs. tab temperature



APPLICATION INFORMATION

The thermistor in series to the yokè 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 synchonized 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:

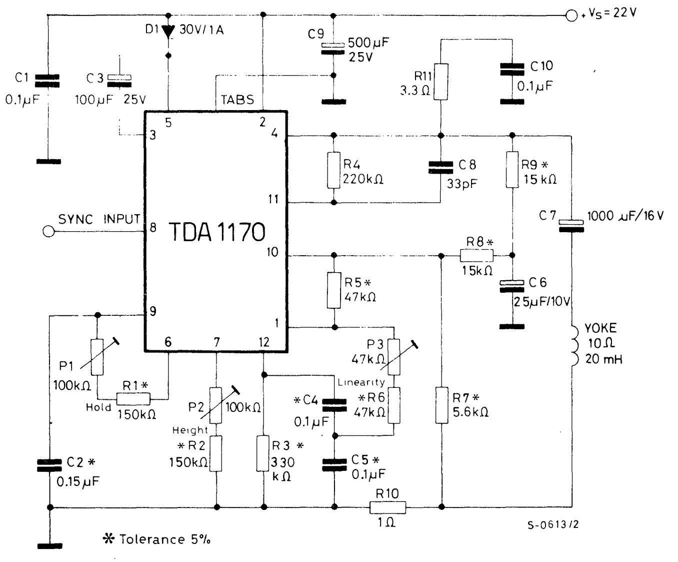
$$I_s \cong \frac{I_Y}{8} + 0.02 \text{ (A)}$$

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

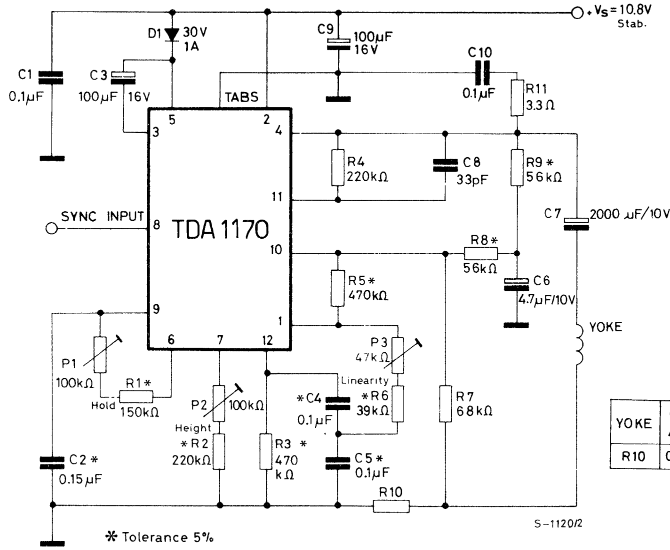


Typical performance ($V_s = 22V$; $I_Y = 1A$; $R_Y = 10\Omega$; $L_Y = 20$ mH)

I_s	Supply current	140	mA
t_{fly}	Flyback time	0.75	ms
I_Y	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 $T_{amb} = 50°C$ a heatsink of $R_{th} = 40$ °C/W is required and each tab of TDA 1170 must be soldered to 1 cm^2 copper area of the printed circuit board.

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



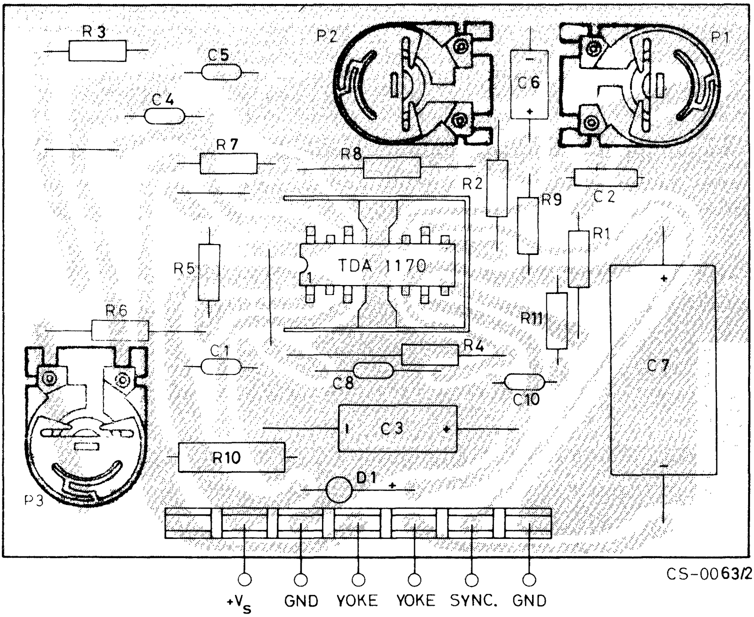
YOKE	7.5 4	4.7 2.5	mH Ω
R10	0.5	0.33	Ω

Typical performance (V_s = 10.8V; I_Y = 1A; R_Y = 4Ω; L_Y = 7.5 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°C a heatsink of R_{th} = 30 °C/W is required and each tab of the TDA 1170 must be soldereb to 1 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 $R_{th\ j\text{-}amb}$ as a function of the side "s" of two equal square copper areas having a thickness of 35 μ (1.4 mil).
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.

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

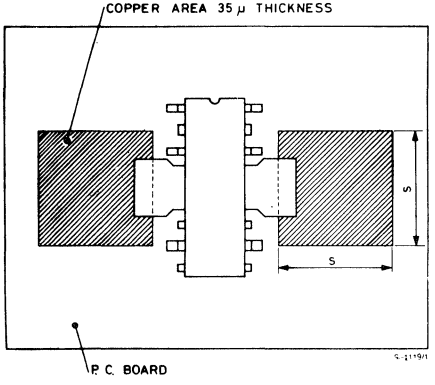


Fig. 13 - Example of TDA 1170 with external heatsink

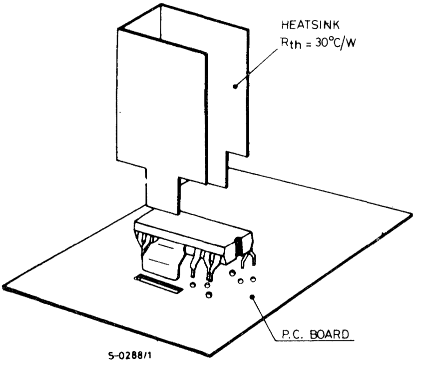


Fig. 14 - Maximum power dissipation and junction-ambient thermal resistance vs. "s"

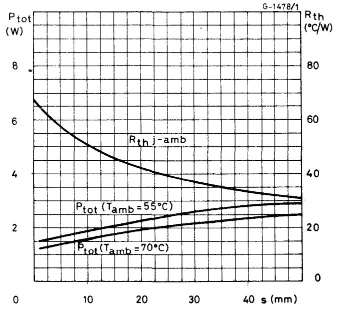


Fig. 15 - Maximum allowable power dissipation vs. ambient temperature