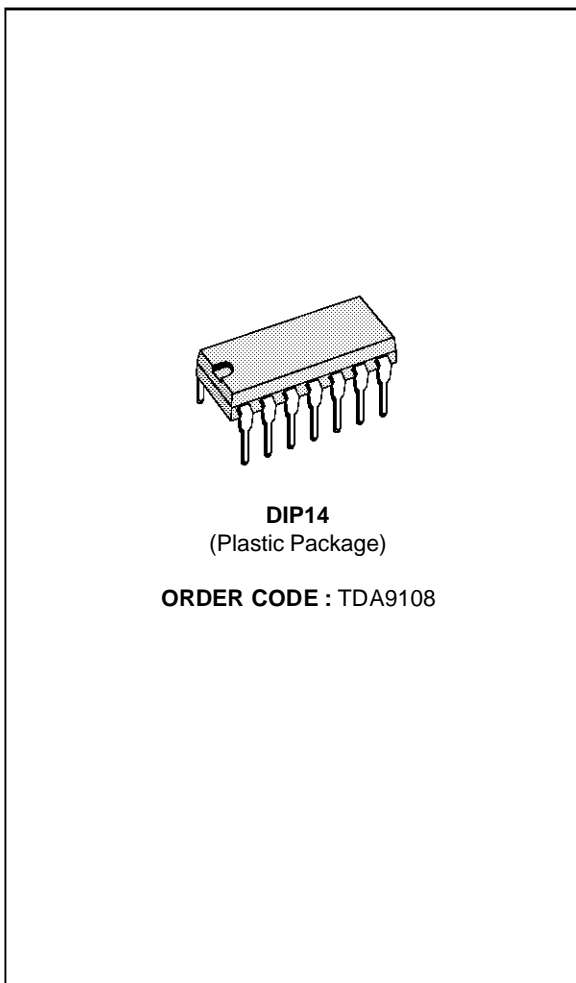


**MONITOR HORIZONTAL PROCESSOR**

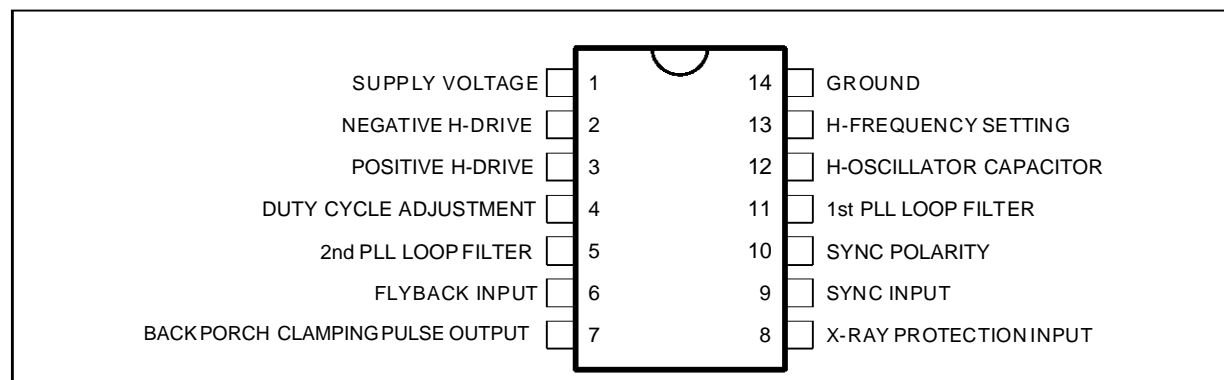
- POS/NEG SYNC INPUT
- SYNC POLARITY DETECTION
- 2 PLLs CONCEPT
- 2 COMPLEMENTARY OUTPUTS
- DC ADJUSTABLE FREQUENCY
- DC ADJUSTABLE DUTY CYCLE
- X-RAY PROT INPUT
- BACK PORCH CLAMPING PULSE GENERATOR
- H-DRIVE INHIBITION WHEN  $V_S < V_{S \text{ START}}$



**DESCRIPTION**

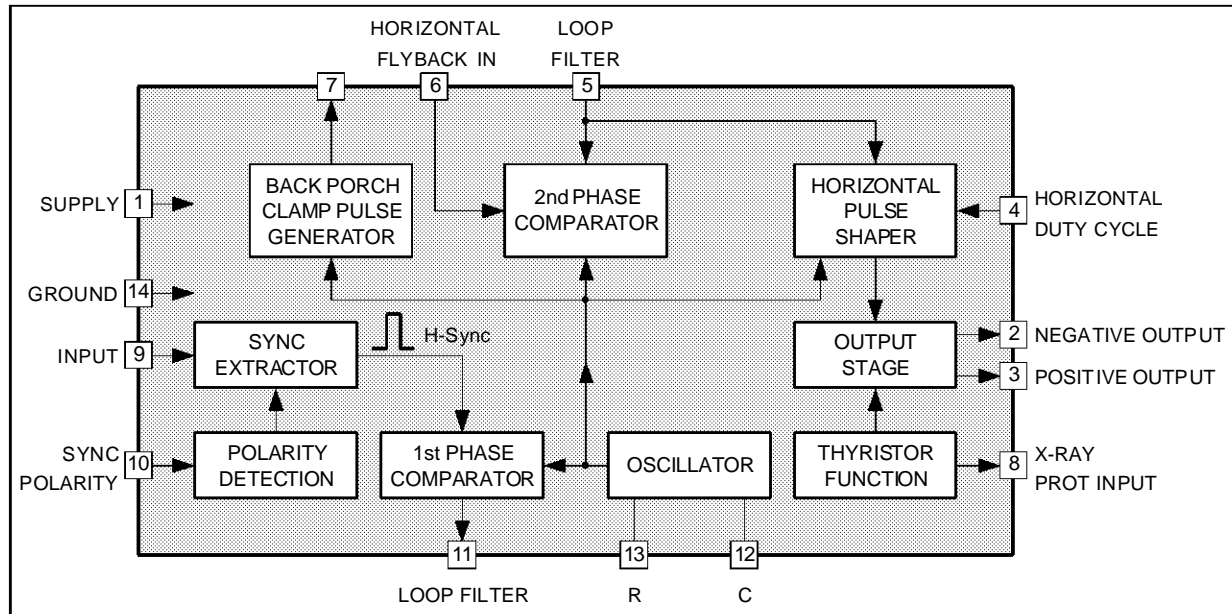
The TDA9108 is a horizontal deflection processor specially designed for monitor applications. The H-drive output duty cycle, the horizontal frequency and the horizontal position are DC adjustable ; it accepts both POS/NEG polarity on sync input and delivers polarity information on a dedicated pin. All these features make the device a good choice for multifrequency application. In addition to this, X-ray protection, 2 complementary H-drive output , and a back porch clamping pulse generator are also included. It is a monolithic integrated circuit encapsulated in a 14 lead dual line plastic package.

**PIN CONNECTIONS**



9108-01.EPS

**BLOCK DIAGRAM**



9108-02.EPS

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>S</sub>	Supply Voltage (Pin 1)	15	V
V <sub>2</sub>	Voltage at Pin 2	18	V
V <sub>4</sub>	Voltage at Pin 4	0, V <sub>S</sub>	V
V <sub>8</sub>	Voltage at Pin 8	0, V <sub>S</sub>	V
V <sub>9</sub>	Voltage at Pin 9	0, V <sub>S</sub>	V
V <sub>10</sub>	Voltage at Pin 10	0, V <sub>S</sub>	V
I <sub>2</sub>	Pin 2 Peak Current	1	A
I <sub>3</sub>	Pin 3 Peak Current	0.5	A
I <sub>6</sub>	Pin 6 Input Current	30	mA
I <sub>7</sub>	Pin 7 Input Current	10	mA
P <sub>tot</sub>	Total Power Dissipation at T <sub>amb</sub> ≤ 70°C	0.9	W
T <sub>stg</sub> , T <sub>j</sub>	Storage and Junction Temperature	- 40, + 150	°C

9108-01.TBL

**THERMAL DATA**

Symbol	Parameter	Value	Unit
R <sub>th(j-a)</sub>	Thermal Resistance Junction-ambient	Max. 90	°C/W

9108-02.TBL

**ELECTRICAL CHARACTERISTICS**

(refer to the test circuit, V<sub>S</sub> = 12V, T<sub>A</sub> = 25°C, unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>S</sub>	Supply Voltage Range		10	12	13.2	V
I <sub>S</sub>	Supply Current (Pin 1)	I <sub>3</sub> = 0		38	55	mA
V <sub>S</sub>	Supply voltage at which the output pulses (at Pin 2 and 3) are switched off				4	V



9108-03.TBL

**ELECTRICAL CHARACTERISTICS** (continued)

(refer to the test circuit,  $V_S = 12V$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{9SW}$	Sync Input Threshold	<ul style="list-style-type: none"> <li>• Sync high</li> <li>• Sync Low</li> </ul>	2		$V_S$ 0.8	V V
$I_{9SW}$	Sync Input Current	<ul style="list-style-type: none"> <li>• Sync high</li> <li>• Sync Low</li> </ul>	-20	-7	1	$\mu A$ $\mu A$

**SYNC POLARITY SELECTION**

$V_{10th}$	Polarity Selection Threshold  Positive sync on Pin 9 for $V_{10} < V_{10th}$  Negative sync on Pin 9 for $V_{10} > V_{10th}$		2.3	2.5	2.7	V
$I_{10}$	Input Current	$V_{10} = 2V$ $V_{10} = 3V$			1 12	$\mu A$ $\mu A$
$V_{10ZL}$	Low Impedance (2k $\Omega$ ) Threshold	(see note 1)		6.3		V

**X-RAY PROTECTION CIRCUIT**

$V_{8th}$	X-ray Prot Input Threshold Voltage (when $V_8 > V_{8th}$ Pin 2 and 3 are inhibited until $V_S$ is switched off/on)		2.6	2.9	3.2	V
$I_8$	Input Current	$V_8 \leq 2.5$ $V_8 \geq 3.3$	-0.5		0.5	$\mu A$ $\mu A$

**FLYBACK INPUT**

$V_6$	Phase Comparator Input Threshold				10	V
$I_6$	Input Switching Current		0.1			mA

**OUTPUT PULSE**

$V_2$	Saturation Voltage (Pin 3 grounded)	$I_2 = 150mA$		2.2	3.2	V
$I_2$	Output Current (Pin 3 grounded)	$V_2 = 5V$			150	mA
$V_3$	Output Voltage (Pin 2 connected to supply)	<ul style="list-style-type: none"> <li>• High level (<math>I_3 = 150mA</math>)</li> <li>• Low level (<math>I_3 = 100mA</math>)</li> </ul>	8.8	9.8 1.5	10.8 2.7	V V
$I_3$	Output Current Capability	<ul style="list-style-type: none"> <li>• Source</li> <li>• Sink</li> </ul>			150 100	mA mA
$R_3$	Output Resistance	<ul style="list-style-type: none"> <li>• At leading edge of output pulse</li> <li>• At falling edge of output pulse</li> </ul>		3 20		$\Omega$ $\Omega$

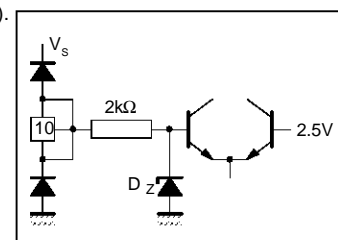
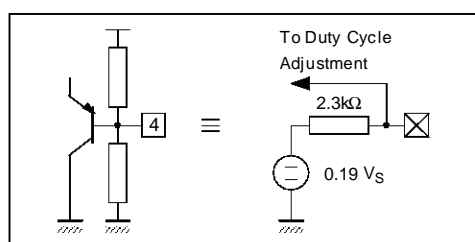
**DUTY CYCLE ADJUSTMENT**

$t_p$	Horizontal Output Pulse Duty Cycle on Pin 3 (high level, line transistor off time)	$f = 31.5kHz$ Pin 4 not connected	26	30	34	%
$V_4$	Voltage on Pin 4 (see note 2)	Pin 4 not connected	$0.178 V_S$	$0.19 V_S$	$0.202 V_S$	V
$R_4$	Serial Equivalent Resistor on Pin 4 (see note 2)	Pin 4 not connected	1.7	2.3	2.9	k $\Omega$

**Note 1:** The voltage on the polarity detection comparator is clamped by an internal Zener diode ( $V_Z$ ).

$$\text{When voltage on Pin 10 reaches } V_Z, \text{ then } I_{Pin\ 10} = \frac{V_{Pin\ 10} - V_Z}{2k\Omega}$$

**Note 2:** Pin 4 internal schematic



9108-04.TBL

9108-03.EPS

# TDA9108

## ELECTRICAL CHARACTERISTICS (continued)

(refer to the test circuit,  $V_S = 12V$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
DUTY CYCLE ADJUSTMENT (continued)						
$t_{pADJ}$	Max. Horizontal Output Duty Cycle Range (function of $V_4$ ) $t_p = K4 \cdot \frac{V_4}{V_S}$ (see note 3)	$f = 31.5kHz$		50		%
K4	Duty Cycle Adjustment Coefficient		1.6	1.8	2	

### KEY PULSE OUTPUT

$V_{7k}$	Key Pulse Output Peak Voltage (emitter follower)	$I_7 = 5mA$	4	5		V
$V_{7L}$	Low Level (outside the key pulse)			0.2	0.5	V
$t_{SK}$	Phase Relation between Trailing Edge of Key Pulse and Middle of Sync. Input Pulse	$f = 31.5kHz$ Sync width = $2\mu s$	1.1	1.5	1.9	$\mu s$
$t_k$	Key Pulse Duration		1.25	1.7	2.15	$\mu s$

### OSCILLATOR

$V_{12}$	Low Level Threshold Voltage			5.4		V
$V_{12}$	High Level Threshold Voltage			8.2		V
$I_{12}$	Charge Current	$R_{13} = 10k\Omega$		0.6		mA
$I_{12}$	Discharge Current	$R_{13} = 10k\Omega$		0.3		mA
$V_{13}$	Reference Voltage on Pin 13		2.6	2.9	3.2	V
$f_o$	Free Running Frequency	$R_{13} = 10k\Omega$ $C_{12} = 2.2nF$	27	30	33	kHz
$f_{Max.}$	Maximum Oscillator Frequency	$R_{13} = 47k\Omega$ $C_{12} = 2.2nF$	66			kHz
Jitt.	Horizontal Jitter	$f = 31.5kHz$		5		ns
$\frac{\Delta f_o}{\Delta I_{13}}$	Frequency Control Sensitivity	$R_{13} = 10k\Omega$ $C_{12} = 2.2nF$		100		$\frac{Hz}{\mu A}$
$\Delta f_o$	Frequency Change when $V_S$ Drops to 7.5V				-6	%

### PHASE COMPARATOR

$V_5$	Control Voltage Range			9.4 to 8.2		V
$I_5$	Peak Control Current	During flyback pulse		$\pm 0.85$		mA
$I_5$	Input Current (blocked Phase Detector)	Outside flyback pulse			5	$\mu A$
$t_D$	Permissible Delay between Output Pulse Leading Edge and Flyback Pulse Leading Edge			$t_p - t_r$		$\mu s$
$\frac{\Delta t}{\Delta t_D}$	Static Control Error				0.2	%

### SYNC PULSE-OSCILLATOR PHASE COMPARATOR

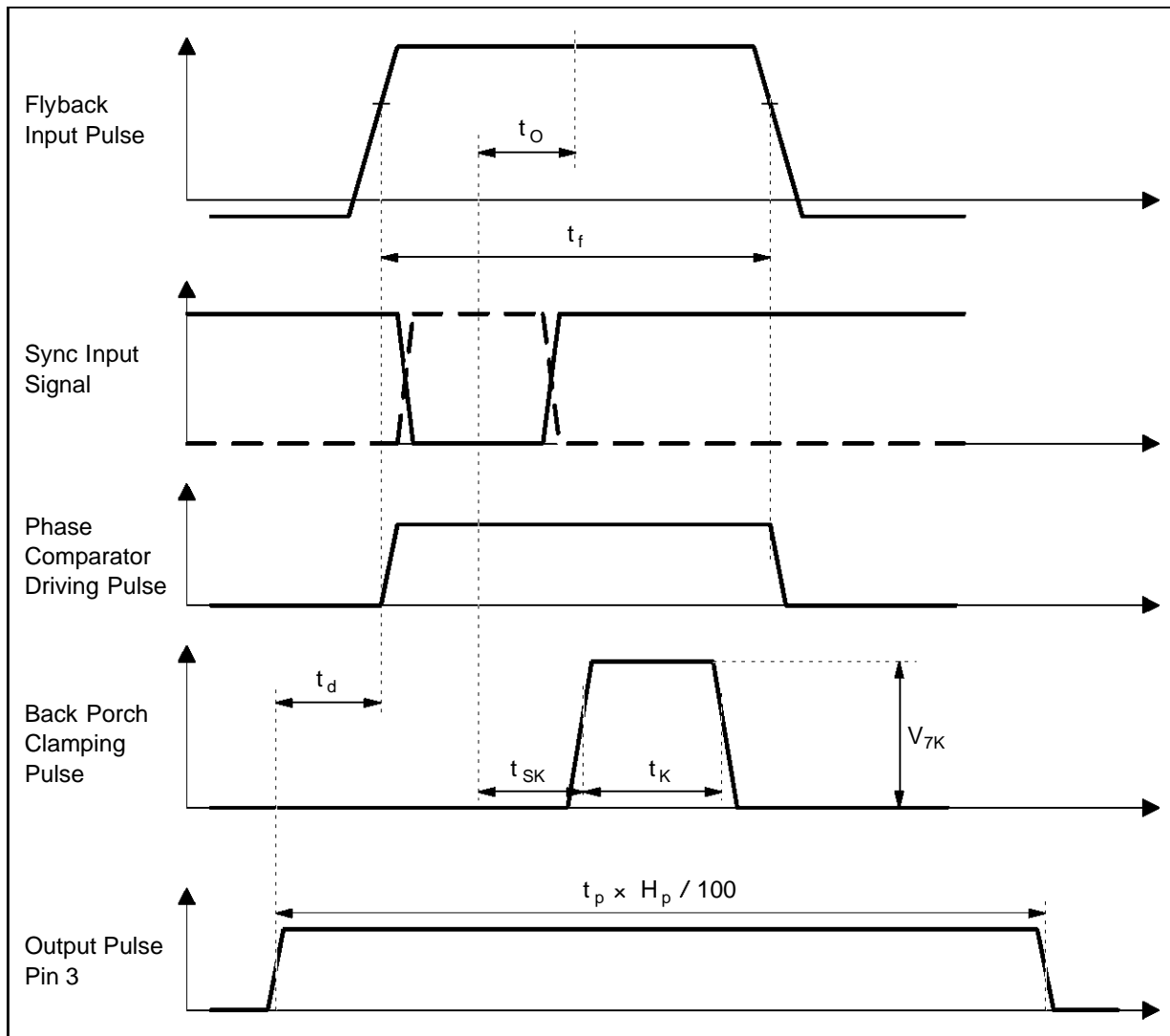
$V_{11}$	Control Voltage Range			4.6 to 1.4		V
$I_{11}$	Control Peak Current	During Sync Pulse		$\pm 2.3$		mA
$\frac{\Delta f}{\Delta t}$	Phase Lock Loop Gain	$R_{11-13} = 100k\Omega$		4		$\frac{kHz}{\mu s}$
f	Catching and Holding Range	See Typical Application		$\pm 700$		Hz

### OVERALL PHASE RELATIONSHIP

$t_o$	Phase Relation between Middle of Flyback Pulse and Middle of Sync. Pulse	$R_{13} = 10k\Omega$ $C_{12} = 2.2nF$		1.1		$\mu s$
$\frac{\Delta V_5}{\Delta t_o}$	Adjustment Sensitivity			130		$\frac{mV}{\mu s}$
$\frac{\Delta I_5}{\Delta t_o}$	Adjustment Sensitivity			50		$\frac{\mu A}{\mu s}$

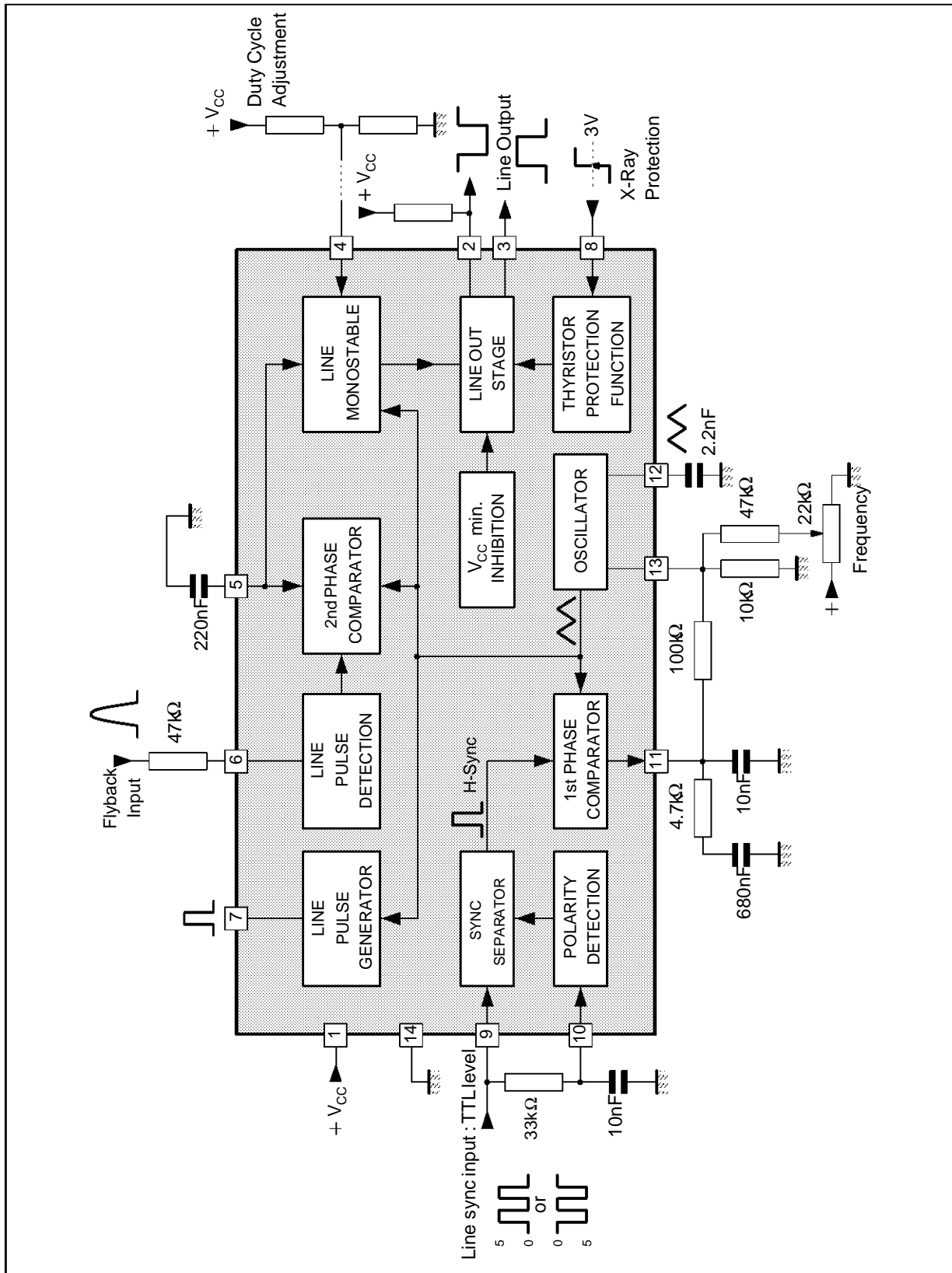
**Note 3:**  $t_a$  must be  $\geq (H_{period} \left[ \frac{t_p}{100} - 0.25 \right] - \frac{t_{fly}}{2})$  in order to have  $\pm 5\%$  horizontal phase adjustment range.

Figure 1 : Relation Ship of Main Waveform Phases



9108-05.EPS

TYPICAL APPLICATION



9108-06.EPS

**APPLICATION INFORMATION**

**Sync Extractor and Polarity Detection**

This circuit is able to handle both positive or negative TTL input signal on Pin 9. The voltage on Pin 10 drives an internal inverter providing a constant sync polarity to the 1st phase comparator.

When using a RC network between Pin 9 and 10 (see Typical Application), the IC will adapt itself automatically to positive or negative sync. On an other hand, and in order to simplified the application, the Pin 10 can be connected to ground or supply (through a resistor), in this case the IC will work only with one sync polarity.

**1st PLL**

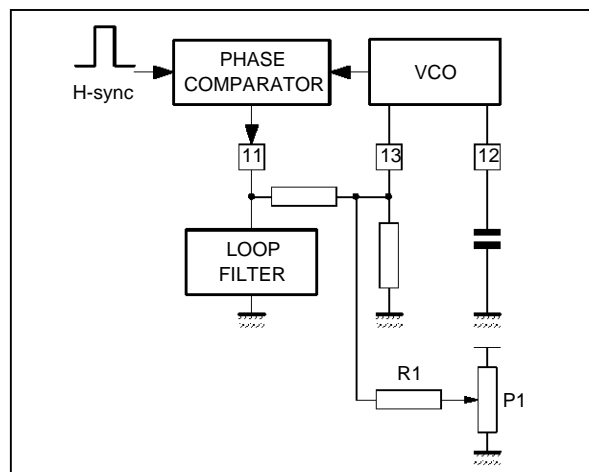
It is composed by a phase comparator, the oscillator and an external loop filter (see Figure 2)

- The phase comparator receives the H-sync signal (with positive polarity) and a signal coming from the internal current controlled oscillator. The loop is closed through an external resistor between Pin 11 and 13.
- The oscillator generates a sawtooth waveform on Pin 12 by charging and discharging the external capacitor. The capacitor is discharging by the current flowing Pin 13 and charged by two times this latter (see Figure 3).

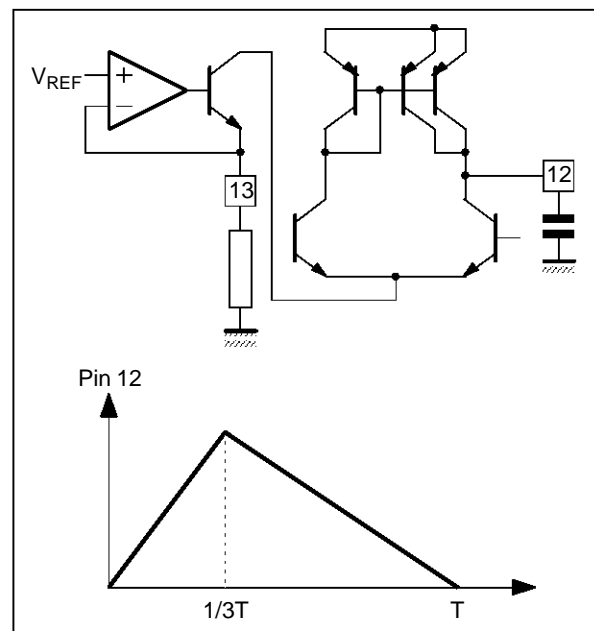
The sawtooth is used internally to generate all the required timings.

It is possible to DC control the frequency by adding or subtracting a DC current on Pin 13 (see Figure 2).

**Figure 2**



**Figure 3**



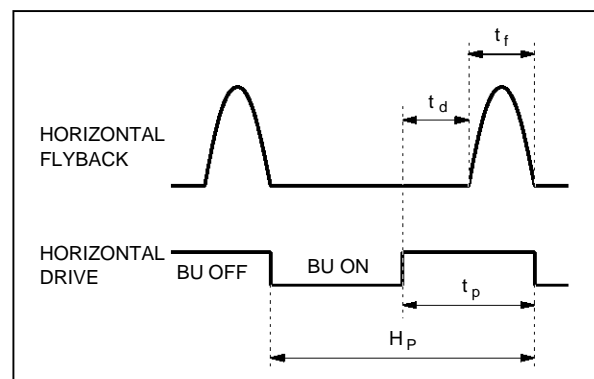
**2nd Phase Locked Loop**

To compensate the delay introduced by the horizontal final stage, the flyback pulse (Pin 6) and the oscillator waveform (Pin 12) are compared in the 2nd phase comparator. The result of the comparison is a control current which, after it has been filtered by the external capacitor on Pin 5, is sent to a phase shifter which adequately regulates the horizontal output pulses phase.

The maximum phase shift allowed is  $t_d = t_p - t_f$  where  $t_f$  is the flyback duration (see Figure 4).

If  $t_d > t_p - t_f$ , then the horizontal output transistor will be turned on during flyback destroying it.

**Figure 4**



**X-Ray Protection Input (Pin 8)**

When the voltage on this pin becomes higher than 2.9V (typ.), the horizontal outputs are inhibited and will remain in this condition until a reset is made on supply voltage (power-off/power-on).

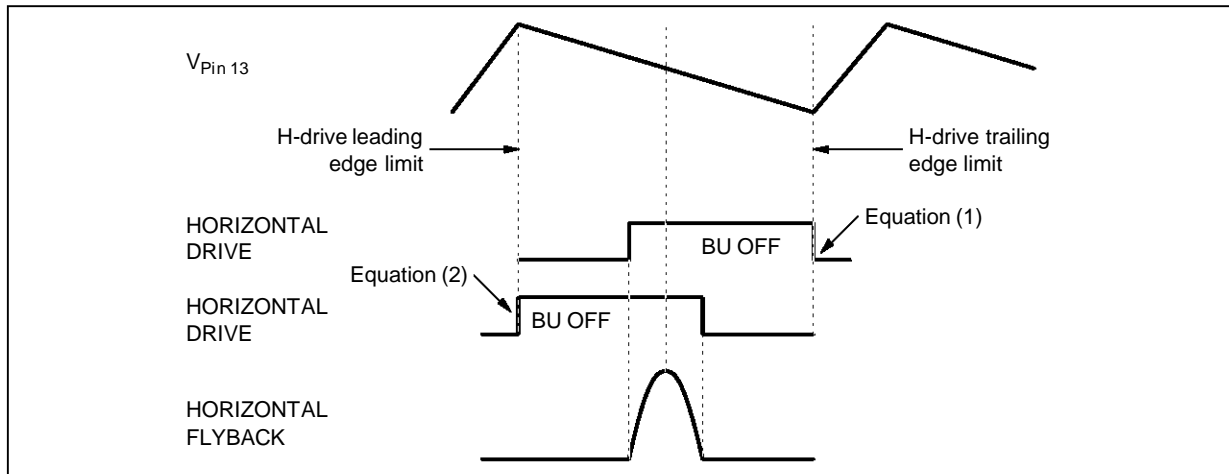
**H-Duty Cycle (see Figure 5)**

The output duty cycle is variable between 0 and 50% by varying the voltage on Pin 4.

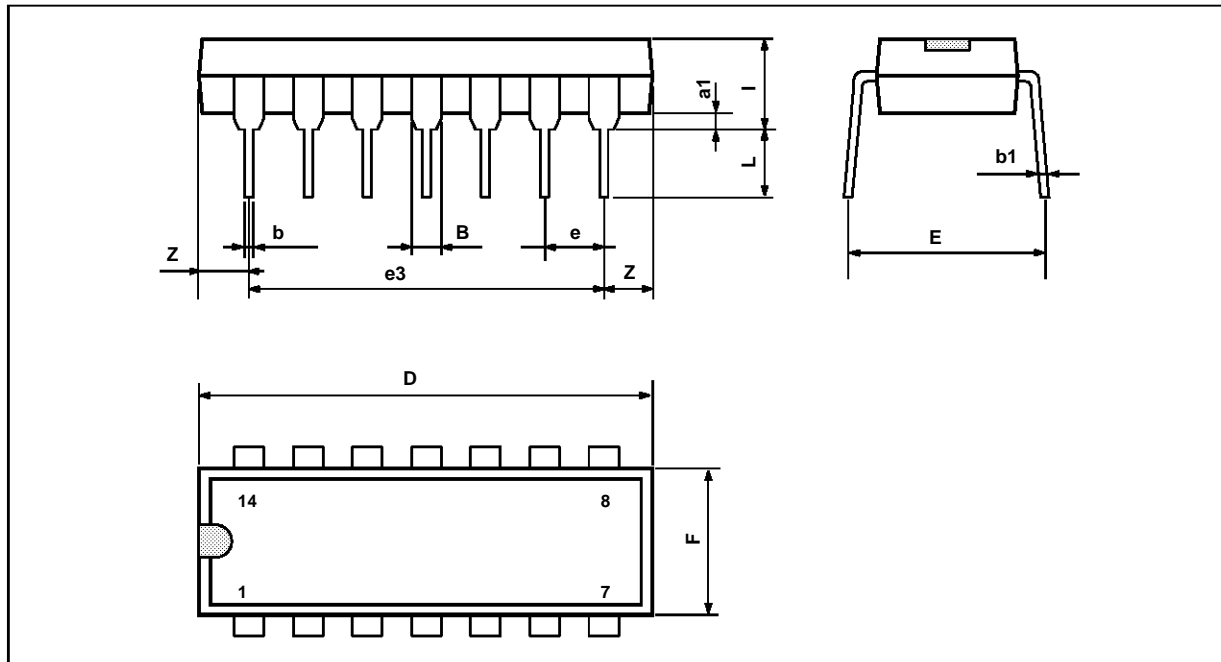
In order to maintain ± 5% horizontal phase adjustment possibilities the following equation must be respected.

- (1)  $H_{\text{period}} \left[ \frac{t_p}{100} - 0.25 \right] - \frac{t_{\text{fly}}}{2} \leq t_d \Rightarrow$  If not,  $t_p$  will decrease because of H-drive trailing edge wrong position (phase shifter saturation)
- (2)  $t_d \leq 0.36 H_p - \frac{t_{\text{fly}}}{2} - 2\mu\text{s} \Rightarrow$  If not,  $t_p$  will decrease because of H-drive leading edge wrong position (phase shifter saturation)

**Figure 5**



**PACKAGE MECHANICAL DATA**  
14 PINS - PLASTIC DIP



P14-DIP14.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

DIP14.TBL

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