



ELECTRONICS, INC.  
 44 FARRAND STREET  
 BLOOMFIELD, NJ 07003  
 (973) 748-5089  
<http://www.nteinc.com>

## NTE1632 Integrated Circuit Vertical/Horizontal Sync Separator

**Description:**

The NTE1632 separates the horizontal and vertical sync pulses from the composite TV video signal and uses them to synchronize vertical and horizontal oscillators. The NTE1632 is supplied in a 18-Lead DIP type package.

**Features:**

- Horizontal sync separator & noise inverter
- Horizontal oscillator
- Horizontal phase detector (sync to oscillator)
- Horizontal output stage
- Inhibit of horizontal phase detector & video transmitter identification circuit during vertical oscillator flyback
- Stabilizer & supply circuit for starting the horizontal oscillator & output stage directly from the mains rectifier
- Duty factor of horizontal output pulse is 50% when flyback pulse is absent
- Vertical sync separator
- Vertical comparator with internal 3% precorrection circuit for vertical oscillator/sawtooth generator
- Vertical driver stage
- Vertical blanking pulse generator with external adjustment of pulse duration (50Hz: 21 lines: 60Hz: 17 lines)
- Vertical guard circuit
- Bandgap 6.5V reference voltage for vertical oscillator & comparator
- Synchronized vertical oscillator/sawtooth generator (synchronization inhibited when no video transmitter is detected)
- Time constant switch for phase detector (fast time constant during catching)
- Slow time constant for noise only conditions
- Time constant externally switchable (e.g. fast for VCR)
- Second phase detector for storage compensation of horizontal deflection stage
- Sandcastle pulse generator (3 levels)
- Video transmitter identification circuit
- Internal circuit for 3% parabolic precorrection of the oscillator/sawtooth generator. Comparator supplied with precorrected sawtooth & external feedback input

Parameter	Symbol	Min	Typ	Max	Unit
<b>Supply:</b>					
Minimum Current Required to Start Horizontal Oscillator & Output Stage (Pin 16)	I <sub>16</sub>	-	>4	-	mA

Parameter	Symbol	Min	Typ	Max	Unit
Main Supply Voltage (Pin 10)	$V_P = V_{10-9}$	-	12	-	V
Supply Current	$I_P = I_{10}$	-	55	-	mA
<b>Input Signals:</b>					
Sync Pulse Input Voltage (Peak-to-Peak Value; Negative Going)	$V_{5-9(p-p)}$	0.15 to 1V			
<b>Output Signals:</b>					
Horizontal Output Pulse (Open Collector) at $I_{11} = 40\text{mA}$	$V_{11-9}$	-	<0.5	-	V
Vertical Output Pulse (Emitter-Follower) at $I_1 = 10\text{mA}$	$V_{1-9}$	-	>4	-	V
<b>Ratings:</b>					
Start Current (Pin 16)	$I_{16}$	-	-	8	mA
Supply Voltage (Pin 10)	$V_P = V_{10-9}$	-	-	13.2	V
Total Power Dissipation	$T_{tot}$	-	-	1.1	W
Storage Temperature Range	$T_{stg}$	-55 to +150°C			
Operating Ambient Temperature Range	$T_{amb}$	-25 to +65°C			
<b>Thermal Resistance:</b>					
From Junction to Ambient in Free Air	$R_{th J-A}$	-	50	-	kW
<b>Characteristics: <math>I_{16} = 5\text{mA}</math>; <math>V_P = 12\text{V}</math>; <math>T_{amb} = 25^\circ\text{C}</math> (unless otherwise indicated)</b>					
<b>Supply:</b>					
Supply Current at Pin 16	$I_{16}$	4 to 8			mA
Stabilized Supply Voltage (Pin 16)	$V_{16-9}$	-	8.7	-	V
Supply Current (Pin 10)	$I_{10}$	-	55	-	mA
		-	<70	-	mA
Supply Voltage (Pin 10)	$V_P = V_{10-9}$	-	12	-	V
		10 to 13.2			V
<b>Video Input (Pin 5):</b>					
Top-Sync Level	$V_{5-9}$	-	3.1	-	V
		1.5 to 3.75			V
Sync Pulse Amplitude (Peak-to-Peak Value) (Note 1)	$V_{5-9(p-p)}$	-	0.6	-	V
		0.15 to 1			V
Slicing Level	-	-	50	-	%
		35 to 65			%
Delay Between Video Input & Detector Output	$t_1$	-	0.35	-	$\mu\text{s}$
<b>Noise Gate (Pin 5):</b>					
Switching Level	$V_{5-9}$	-	0.7	-	V
		-	<1	-	V
<b>First Control Loop (Sync to Oscillator: Pin 8)</b>					
Holding Range	$\Delta f$	-	$\pm 800$	-	Hz
Catching Range	$\Delta f$	$\pm 600$ to 1100			Hz
Control Sensitivity Video with Respect to Oscillator, Burst Key & Fly-back Pulse (For Slow Time Constant) (For Fast Time Constant)	-	-	1	-	$\text{kHz}/\mu\text{s}$
		-	275	-	$\text{kHz}/\mu\text{s}$

Parameter	Symbol	Min	Typ	Max	Unit
Second Control Loop: (Horizontal Output to Flyback: Pin 14)					
Control Sensitivity; Static (Note 2)	$\Delta t_d / \Delta t_o$	-	400	-	$\mu s / \mu s$
Control Range	$t_d$		1 to 50		$\mu s$
Controlled Edge	Negative				
<b>Phase Adjustment (Via 2nd Control Loop; Pin 14)</b>					
Control Sensitivity		-	25	-	$\mu A / \mu s$
Maximum Permissible Control Current	$\pm I_{14}$	-	<50	-	$\mu A$
<b>Horizontal Oscillator (Pin 15):</b>					
Frequency (No Sync)	$f_{OSC}$	-	15625	-	Hz
Frequency Spread ( $C_{OSC} = 2.2nF$ ; $R_{OSC} = 40k\Omega$ )	$\Delta f_{OSC}$	-	<4	-	%
Frequency Deviation Between Starting Point of Output Signal & Stabilized Condition	$\Delta f_{OSC}$	-	6 <8	-	%
Temperature Coefficient	TC	-	1.10 -4k-1	-	-
<b>Horizontal Output (Pin 11)</b>					
Output Voltage; High Level	$V_{11-9}$	-	<13.2	-	V
Voltage at which Protection Starts	$V_{11-9}$	-	0.3	-	V
		-	0.5	-	
Output Voltage; Low Level Start Condition at $I_{11} = 10mA$ Normal Condition at $I_{11} = 40mA$	$V_{11-9}$	-	0.3	-	V
		-	0.5	-	
Duty Factor of Output Signal During Starting (No phase shift; voltage at pin 11 low)	-	-	65	-	%
Duty Factor of Output Signal without Flyback Pulse	-	-	50	-	%
			45 to 55		%
Controlled Edge	Negative				$\mu s$
Duration of Output Pulse (Fig 3)			$t_d + t_o + 2.5$		
<b>Sandcastle Output Pulse (Pin 17):</b>					
Output Voltage During: Burst Key	$V_{18-9}$	-	>10	-	V
Horizontal Blanking	$V_{17-9}$	-	4.6	-	V
			4.2 to 5		
Vertical Blanking	$V_{17-9}$	-	2.5	-	V
			2 to 3		
Pulse Duration Burst Key	$t_p$	-	4	-	$\mu s$
Horizontal Blanking	Flyback Pulse (note 3)	-	-	-	-
Vertical Blanking for 50Hz application ( $-I_{12}$ : 0 to 0.1mA) for 60Hz application ( $-I_{12}$ : typ -0.2mA)	-	-	21 17	-lines	
Delay Between the Start of the Sync at the Video Input & the Rising Edge of the Burst Key Pulse	$t_2$	-	4.9	-	$\mu s$
			4.5 to 5.3		

Parameter	Symbol	Min	Typ	Max	Unit
<b>Coincidence Detector: Video Transmitter ID Circuit; Time Constant Switches (Pin 18) (See Fig 2)</b>					
Detector Output Current	$\pm I_{18}$	-	300	-	$\mu\text{A}$
Voltage During Noise (Note 4)	$V_{18-9}$	-	0.3	-	V
Voltage Level for In-Sync Condition	$V_{18-9}$	-	7.5	-	V
Switching Level Slow to Fast	$V_{18-9}$	-	3.5	-	V
		3.2 to 3.8			
Switching Level Must Function Active; $\phi_1$ Fast to Slow	$V_{\pm 8-9}$	-	1.2	-	V
		1.0 to 1.4			
Vertical Period Counter 3 periods fast	$V_{18-9}$	-	0.12	-	V
		0.08 to 0.16			
Switching Level Slow to Fast (Locking) Mute Function Inactive	$V_{18-9}$	-	1.7	-	V
		1.5 to 1.9			
Switching Level Fast to Slow (Locking)	$V_{18-9}$	-	5.0	-	V
		4.7 to 5.3			
Switching Level for VCR (Fast Time Constant) Without Mute Function	$V_{18-9}$	-	8.6	-	V
		8.2 to 9.0			
<b>Video Transmitter ID Output (Pin 13)</b>					
Output Voltage Active (No Sync) at $I_{13} = 1\text{mA}$	$V_{13-9}$	-	>10	-	V
		-	11	-	
Output Voltage Active (No Sync) at $I_{13} = 5\text{mA}$	$V_{13-9}$	-	>7	-	V
Output Voltage Inactive	$V_{13-9}$	-	<0.5	-	V
		-	0.1	-	
<b>VCR Switching (Pin 13):</b>					
Input Current for Fast Time Constant Phase Detector $\phi_1$ , with Mute Function Active	$I_{13}$	-	0.6	-	mA
		0.4 to 0.8			
Input Pulse Amplitude (Peak-to-Peak Value)	$V_{12-9 (p-p)}$	-	<12	-	V
Input Resistance	$R_{12-9}$	-	2.7	-	k $\Omega$
Delay Time of Sync Pulse (Measured in $\phi_1$ )	$t_o$	-	1.3	-	$\mu\text{s}$
Duration of Vertical Blanking Pulse (Pin 12) for 50Hz application; 21 lines blanking for 60Hz application; 17 lines blanking	$-I_{12}$	-	0.2	-	mA
		>0.15 to <0.3			
		-	<0.1	-	
Maximum Allowed Input Current	$-I_{12}$	-	<0.4	-	mA
<b>Vertical Sawtooth Generator (Pin 3):</b>					
Vertical Frequency (No Sync)	$f_s$	-	46	-	Hz
Frequency Spread ( $C_{OSC} = 680\text{nF}$ , $R_{OSC} = 180\text{k}'$ at >26V)	$\Delta f_S$	-	<4	-	%
Synchronization Range	-	-	22	-	%
Input Current at $V_{3-9} = 6\text{V}$	$I_3$	-	<2	-	$\mu\text{A}$
Frequency Shift for $V_p = 10$ to 13V	$\Delta f_S$	-	<0.2	-	%
Temperature Coefficient	TC	-	1.10-4k -1	-	-
<b>Comparator (Pin 2):</b>					

Parameter	Symbol	Min	Typ	Max	Unit
Input Voltage; DC Level	$V_{2-9}$	-	4.4	-	V
		4.0 to 4.8			
AC level (Peak-to-Peak)	$V_{2-9(p-p)}$	-	1.6	-	V
Input Current at $V_{2-9} = 6V$	$I_2$	-	<2	-	$\mu A$
Sawtooth Internal Precorrection (Parabolic Convex)	-	-	3	-	%
<b>Vertical Output Stage: Emitter Follower (Pin 1)</b>					
Output Voltage at $I_1 = 10mA$	$V_{1-9}$	-	3.6	-	V
		3.2 to 5			
Output Current	$I_1$	-	<20	-	mA
<b>Vertical Guard Circuit:</b>					
Activating Voltage Levels (Vertical Blanking Level is 2.5V) Switching Level Low	$V_{2-9}$	-	3	-	V
Switching Level High	$V_{2-9}$	-	5.7	-	V
		5.3 to 6.1			

Note 1 Up to 1V peak-to-Peak the slicing level is constant; at amplitudes exceeding 1V Peak-to-Peak, the slicing level will increase.

Note 2  $t_d$  = delay between negative transient of horizontal output pulse and the rising edge of the flyback pulse.  $t_o$  = delay between the rising edge of the flyback pulse and the start of the current in  $\phi_1$  (pin 8).

Note 3 The duration of the flyback pulse is measured at the input switching level which is about 1V ( $t_{f1}$ ).

Note 4 Depends on DC level at pin 5; value given applicable for  $V_{5-9} \sim 5V$ .

