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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 staring 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
Supply:					
Minimum Current Required to Start Horizontal Oscillator & Output Stage (Pin 16)	I_{16}	–	>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
Input Signals:					
Sync Pulse Input Voltage (Peak−to−Peak Value; Negative Going)	$V_{5-9(p-p)}$	0.15 to 1V			
Output Signals:					
Horizontal Output Pulse (Open Collector) at I_{11} = 40mA	V_{11-9}	–	<0.5	–	V
Vertical Output Pulse (Emitter−Follower) at I_1 = 10mA	V_{1-9}	–	>4	–	V
Ratings:					
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			
Thermal Resistance:					
From Junction to Ambient in Free Air	$R_{th\ J-A}$	–	50	–	kW
Characteristics: I_{16} = 5mA: V_p = 12V: T_{amb} = 25°C (unless otherwise indicated)					
Supply:					
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
Video Input (Pin 5):					
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	–	μs
Noise Gate (Pin 5):					
Switching Level	V_{5-9}	–	0.7	–	V
		–	<1	–	V
First Control Loop (Sync to Oscillator: Pin 8)					
Holding Range	Δf	–	±800	–	Hz
Catching Range	Δf	±600 to 1100			Hz
Control Sensitivity Video with Respect to Oscillator, Burst Key & Fly-back Pulse (For Slow Time Constant)	–	–	1	–	kHz/μs
(For Fast Time Constant)		–	275	–	kHz/μs

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

Parameter	Symbol	Min	Typ	Max	Unit
Coincidence Detector: Video Transmitter ID Circuit; Time Constant Switches (Pin 18) (See Fig 2)					
Detector Output Current	$\pm I_{18}$	–	300	–	μA
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; ϕ_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			
Video Transmitter ID Output (Pin 13)					
Output Voltage Active (No Sync) at I_{13} = 1mA	V_{13-9}	–	>10	–	V
		–	11	–	
Output Voltage Active (No Sync) at I_{13} = 5mA	V_{13-9}	–	>7	–	V
Output Voltage Inactive	V_{13-9}	–	<0.5	–	V
		–	0.1	–	
VCR Switching (Pin 13):					
Input Current for Fast Time Constant Phase Detector ϕ_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	–	kΩ
Delay Time of Sync Pulse (Measured in ϕ_1)	t_o	–	1.3	–	μs
Duration of Vertical Blanking Pulse (Pin 12)	$-I_{12}$	–	0.2	–	mA
for 50Hz application; 21 lines blanking		>0.15 to <0.3			
for 60Hz application; 17 lines blanking		–	<0.1	–	
Maximum Allowed Input Current	$-I_{12}$	–	<0.4	–	mA
Vertical Sawtooth Generator (Pin 3):					
Vertical Frequency (No Sync)	f_s	–	46	–	Hz
Frequency Spread (C_{osc} = 680nF, R_{osc} = 180k' at >26V)	Δf_S	–	<4	–	%
Sychronization Range	–	–	22	–	%
Input Current at V_{3-9} = 6V	I_3	–	<2	–	μA
Frequency Shift for V_p = 10 to 13V	Δf_S	–	<0.2	–	%
Temperature Coefficient	TC	–	1.10−4k −1	–	–
Comparator (Pin 2):					

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	–	μA
Sawtooth Internal Precorrection (Parabolic Convex)	–	–	3	–	%
Vertical Output Stage: Emitter Follower (Pin 1)					
Output Voltage at I_1 = 10mA	V_{1-9}	–	3.6	–	V
		3.2 to 5			
Output Current	I_1	–	<20	–	mA
Vertical Guard Circuit:					
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 ϕ_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 $V_{5-9} \sim 5V$.

Pin Connection Diagram