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## NTE7115 Integrated Circuit Color TV Horizontal Combination Circuit

### **Description:**

The NTE7115 is a monolithic integrated circuit in a 18-Lead DIP type package designed for use in color television receivers.

### **Features:**

- Positive Video Input: Capacitively Coupled (Source Impedance < 200 $\Omega$ )
- Adaptive Sync Separator: Slicing Level at 50% of Sync Amplitude
- Internal Vertical Pulse Separator <sup>w</sup>/Double Slope Integrator
- Output Stage for Vertical Sync Pulse or Composite Sync Depending on the Load; Both are Switched OFF at Muting
- $\varphi_1$  Phase Control Between Horizontal Sync and Oscillator
- Coincidence Detector  $\varphi_3$  for Automatic Time Constant Switching; Overruled by the VCR Switch
- Time Constant Switch Between Two External Time Constants for Loop Gain; Both Controlled by the Coincidence Detector  $\varphi_3$
- $\varphi_1$  Gating Pulse Controlled by Coincidence Detector  $\varphi_3$
- Mute Circuit Depending on TV Transmitter Identification
- $\varphi_2$  Phase Control Between Line Flyback and Oscillator; the Slicing Levels for  $\varphi_2$  Control and Horizontal Blanking can be set Separately
- Burst Keying and Horizontal Blanking Pulse Generation, in Combination with Clamping of the Vertical Blanking Pulse (Three-Level Sandcastle)
- Horizontal Drive Output with Constant Duty Cycle Inhibited by the Protection Circuit or the Supply Voltage Sensor
- Detector for Too Low Supply Voltage
- Protection Circuit for Switching Off the Horizontal Drive Output Continuously if the Input Voltage is Below 4V or Higher than 8V
- Line Flyback Control Causing the Horizontal Blanking Level at the Sandcastle Output Continuously in Case of a Missing Flyback Pulse
- Spot Suppressor Controlled by the Line Flyback Control

### **Applications:**

- Television Receivers
- Video Receivers

**Absolute Maximum Ratings:**

Supply Voltage (Pin19),  $V_{15-5} = V_{CC}$  ..... 13.2V

Voltages at:

(Pin1, Pin4, and Pin7),  $V_{1-5}, V_{4-5}, V_{7-5}$  ..... 18V

(Pin8, Pin13, and Pin18),  $V_{8-5}, V_{13-5}, V_{18-5}$  .....  $V_{CC}$

(Pin11 (Range)),  $V_{11-5}$  ..... -0.5 to +6.0V

Currents at:

Pin1,  $I_1$  ..... 10mA

Pin2 (Peak Value),  $\pm I_{2M}$  ..... 10mA

Pin4,  $I_4$  ..... 100mA

Pin6 (Peak Value),  $\pm I_{6M}$  ..... 6mA

Pin7,  $I_7$  ..... 10mA

Pin8 (Range),  $I_8$  ..... -5 to +1mA

Pin9 (Range),  $I_9$  ..... -10 to +3mA

Pin18,  $\pm I_{18}$  ..... 10mA

Total Power Dissipation,  $P_{TOT}$  ..... 800mW

Operating Ambient Temperature Range,  $T_A$  ..... -0° to +70°C

Storage Temperature Range,  $T_{stg}$  ..... -65° to +150°C

**DC and AC Electrical Characteristics:** ( $V_{CC} = 12V, T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Composite Video Input and Sync Separator, Pin11</b> (Internal Black Level Determination)						
Input Signal (Positive Video; Standard Signal; Peak-to-Peak Value)	$V_{11-5(P-P)}$		0.2	1.0	3.0	V
Sync Pulse Amplitude (Independent of Video Content)	$V_{11-5(P-P)}$		50	-	-	mV
Generator Resistance	$R_G$		-	-	200	$\Omega$
Input Current During Video	$I_{11}$		-	5	-	$\mu A$
Sync Pulse	$-I_{11}$		-	40	-	$\mu A$
Black Level	$-I_{11}$		-	25	-	$\mu A$
<b>Composite Sync Generation, Pin10</b> (Horizontal Slicing Level at 50% of the Sync Pulse Amplitude)						
Capacitor Current During Video	$I_{10}$		-	16	-	$\mu A$
Sync Pulse	$-I_{10}$		-	170	-	$\mu A$
<b>Vertical Sync Pulse Generation, Pin9</b> (Slicing Level at 30% (60% Between Black Level and Horizontal Slicing Level))						
Output Voltage	$V_{9-5}$		10	-	-	V
Pulse Duration	$t_p$		-	190	-	$\mu s$
Delay With Respect to the Vertical Sync Pulse (Leading Edge)	$t_D$		-	45	-	$\mu s$
Pulse-Mode Control Output Current for Vertical Sync Pulse (Dual Integrated)			No Current Applied at Pin9			
Output Current for Horizontal and Vertical Sync Pulse (Non-Integrated Separated Signal)			Current Applied Via a 15k $\Omega$ from $V_{CC}$ to Pin9			
<b>Horizontal Oscillator, Pin14 and Pin16</b>						
Free-Running Frequency	$f_{OSC}$		-	15.625	-	kHz
Reference Voltage for $f_{OSC}$	$V_{14-5}$		-	6	-	V

**DC and AC Electrical Characteristics (Cont'd):** ( $V_{CC} = 12V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Horizontal Oscillator, Pin14 and Pin16 (Cont'd)</b>						
Frequency Control Sensitivity	$\Delta f_{OSC}/\Delta I_{14}$		–	31	–	Hz/ $\mu A$
Adjustment Range of Circuit	$\Delta f_{OSC}$		–	$\pm 10$	–	%
Spread of Frequency	$\Delta f_{OSC}$		–	–	5	%
Frequency Dependency (Excluding Tolerance of External Components) w/Supply Voltage	$\frac{\Delta f_{OSC}/f_{OSC}}{\Delta V_{15-5}/V_{15-5}}$	$V_{CC} = 12V$	–	$\pm 0.05$	–	%
w/Supply Voltage Drop of 5V	$\Delta f_{OSC}$		–	–	10	%
w/Temperature	TC		–	–	$\pm 10^{-4}$	$^\circ C^{-1}$
Capacitor Current During: Charging	$-I_{16}$		–	1024	–	$\mu A$
Discharging	$I_{16}$		–	313	–	$\mu A$
Sawtooth Voltage Timing (Pin14) Rise Time	$t_R$		–	49	–	$\mu s$
Fall Time	$t_F$		–	15	–	$\mu s$
<b>Horizontal Output Pulse, Pin4</b>						
Output Voltage, Low	$V_{4-5}$	$I_4 = 30mA$	–	–	0.5	V
Pulse Duration, High	$t_P$		–	$29 \pm 1.5$	–	$\mu s$
Supply Voltage for Switching Off the Output Pulse (Pin15)	$V_{CC}$		–	4	–	V
Hysteresis for Switching On the Output Pulse	$\Delta V_P$		–	250	–	mV
<b>Phase Compensation, <math>\phi_1</math>, Pin17</b>						
Control Voltage Range	$V_{17-5}$		3.55	–	8.3	V
Leakage Current	$I_{17}$	$V_{17-5} = 3.55$ to $8.3V$	–	–	1	$\mu A$
Control Current: for External Time Constant Switch	$\pm I_{17}$		1.8	2.0	2.2	mA
at $V_{18-5} = V_{15-5}$ and $V_{13-5} < 2V$ or $V_{13-5} > 9.5V$			–	8	–	mA
at $V_{18-5} = V_{15-5}$ and $V_{13-5} = 2$ to $9.5V$			1.8	2.0	2.2	mA
Horizontal Oscillator Control Control Sensitivity	$S_\phi$		6	–	–	kHz/ $\mu s$
Catching and Holding Range	$\Delta f_{OSC}$		–	$\pm 680$	–	Hz
Spread of Catching and Holding Range			–	$\pm 10$	–	%
Internal Keying Pulse	$t_P$	$V_{13-5} = 2.9$ to $9.5V$	–	7.5	–	$\mu s$
Time Constant Switch Slow Time Constant	$V_{13-5}$		9.5	–	2.0	V
Fast Time Constant			2.0	–	9.5	V
Impedance Converter Offset Voltage (Slow Time Constant)	$\pm V_{17-18}$		–	–	3	mV
Output Resistance Slow Time Constant	$R_{18-5}$		–	–	10	$\Omega$
Fast Time Constant			High Impedance	–	–	$\Omega$

**DC and AC Electrical Characteristics (Cont'd):** ( $V_{CC} = 12V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Phase Compensation, <math>\phi_1</math>, Pin17 (Cont'd)</b>						
Leakage Current	$I_{18}$		-	-	1	$\mu A$
<b>Coincidence Detector, <math>\phi_3</math>, Pin13</b>						
Output Voltage w/o Coincidence w/Composite Video Signal	$V_{13-5}$		-	-	1	V
w/o Coincidence w/o Composite Video Signal (Noise)			-	-	2	V
w/Coincidence w/Composite Video Signal			-	6	-	V
Output Current w/o Coincidence w/Composite Video Signal	$I_{13}$		-	50	-	$\mu A$
w/Coincidence w/Composite Video Signal	$-I_{13}$		-	300	-	$\mu A$
Switching Current	$I_{13}$	$V_{13-5} = V_{CC} - 0.5V$	-	-	100	$\mu A$
	$I_{13(av)}$	$V_{13-5} = 0.5V$ (Average)	-	-	100	$\mu A$
<b>Phase Comparison, <math>\phi_2</math>, Pin2 and Pin3 (Note 1)</b>						
Phase Relation Between Middle of the Horizontal Sync Pulse and the Middle of the Line Flyback Pulse	$\Delta t$	$t_{FP} = 12\mu s$ , Note 2	-	$2.6 \pm 0.7$	-	$\mu s$
If Additional Adjustment is Required, it can be Arranged by Applying a Current at Pin3, such that for Applied Current	$\Delta I/\Delta t$		-	30	-	$\mu A/\mu s$
<b>Input for Line Flyback Pulse, Pin2</b>						
Switching Level for $\phi_2$ Comparison	$V_{2-5}$		-	3	-	V
Switching Level for Horizontal Blanking and Flyback Control	$V_{2-5}$		-	0.3	-	V
Input Voltage Limiting	$V_{2-5}$		-	-0.7 +4.5	-	V
Switching Current at Horizontal Flyback	$I_2$		0.01	1.0	-	mA
at Horizontal Scan			-	-	2.0	$\mu A$
Maximum Negative Input Current	$-I_2$		-	-	500	$\mu A$
<b>Phase Detector Output, Pin3</b>						
Control Current for $\phi_2$	$\pm I_3$		-	1	-	mA
Control Range	$\Delta t_{\phi_2}$		-	19	-	$\mu s$
Static Control Error	$\Delta t/\Delta t_d$		-	-	0.2	%
Leakage Current	$I_3$		-	-	5	$\mu A$

Note 1. Phase comparison between horizontal oscillator and the line flyback pulse. Generation of a phase-modulated ( $\phi_2$ ) horizontal output pulse with constant duration.

Note 2.  $t_{FP}$  is the line flyback pulse duration.

**DC and AC Electrical Characteristics (Cont'd):** ( $V_{CC} = 12V$ ,  $T_A = +25^{\circ}C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Burst Gating Pulse, Pin6</b> (Note 3)						
Output Voltage	$V_{6-5}$		10	11	–	V
Pulse Duration	$t_p$		3.7	4.0	4.3	$\mu s$
Phase Relation Between Middle of Sync Pulse at the Input and the Leading Edge of the Burst Gating Pulse	$t_{\phi 6}$	$V_{6-5} = 7V$	2.15	2.65	3.15	$\mu s$
Output Trailing Edge Current	$I_6$		–	2	–	mA
<b>Horizontal Blanking Pulse, Pin6</b> (Note 3)						
Output Voltage	$V_{6-5}$		4.2	4.5	4.9	V
Output Trailing Edge Current	$I_6$		–	2	–	mA
Saturation Voltage at Horizontal Scan	$V_{6-5sat}$		–	–	0.5	V
<b>Clamping Circuit for Vertical Blanking Pulse, Pin6</b> (Note 3)						
Output Voltage	$V_{6-5}$	$I_6 = 2.8mA$	2.15	2.5	3.0	V
Minimum Output Current	$I_{6min}$	$V_{6-5} > 2.15V$	–	2.3	–	mA
Maximum Output Current	$I_{6max}$	$V_{6-5} < 3V$	–	3.3	–	mA
<b>TV Transmitter Identification, Pin12</b>						
Output Voltage No TV Transmitter	$V_{12-5}$		–	–	1	V
TV Transmitter Identified			7	–	–	V
<b>Mute Output, Pin7</b>						
Output Voltage, No TV Transmitter	$V_{7-5}$	$I_7 = 3mA$	–	–	0.5	V
Output Resistance, No TV Transmitter	$R_{7-5}$	$I_7 = 3mA$	–	–	100	$\Omega$
Output Leakage Current, TV Transmitter Identified	$I_7$	$V_{12-5} > 3V$	–	–	5	$\mu A$
<b>Protection Circuit, Pin8</b> (Beam Current/EHT Voltage Protection)						
No-Load Voltage (Operative Condition)	$V_{8-5}$	$I_8 = 0$	–	6	–	V
Threshold Positive-Going Voltage	$V_{8-5}$		–	$8 \pm 0.8$	–	V
Negative-Going Voltage			–	$4 \pm 0.4$	–	V
Current Limiting	$\pm I_8$	$V_{8-5} = 1 \text{ to } 8.5V$	–	60	–	$\mu A$
Input Resistance	$R_{8-5}$	$V_{8-5} > 8.5V$	–	3	–	$k\Omega$
Response Delay of Threshold Switch	$t_d$		–	10	–	$\mu s$
<b>Control Output of Line Flyback Pulse Condition, Pin1</b>						
Saturation Voltage at Standard Operation	$V_{1-5sat}$	$I_1 = 3mA$	–	–	0.5	V
Output Leakage Current in Case of Break in Transmission	$I_1$		–	–	5	$\mu A$

Note 3. Three-level sandcastle pulse.

### Pin Connection Diagram

