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## NTE7048 Integrated Circuit NTSC Decoder w/Fast RGB Blanking

### Description:

The NTE7048 is a monolithic integrated decoder for the NTSC color television standard. This device combines all functions required for the identification and demodulation of NTSC signals in a 20-Lead DIP type package. Furthermore, it contains a luminance amplifier, an RGB-matrix and amplifier. These amplifiers supply output signals up to 5V<sub>P-P</sub> (Picture information) enabling direct drive of discrete output stages.

### Features:

- Automatic Chrominance Leveling (Avoids Saturation at the Chrominance Input)
- Peaking Circuit with DC Control
- Fast RGB Output Blanking

### Absolute Maximum Ratings:

Supply Voltage (Pin1), V<sub>P</sub> ..... 13.2V  
 Total Power Dissipation, P<sub>tot</sub> ..... 1700mW  
 Operating Ambient Temperature Range, T<sub>A</sub> ..... -25° to +65°C  
 Storage Temperature Range, T<sub>stg</sub> ..... -55° to +150°C  
 Thermal Resistance, Junction-to-Ambient, R<sub>thJA</sub> ..... 50K/W

**Electrical Characteristics:** (T<sub>A</sub> = +25°C, V<sub>P</sub> = 12V, All voltages referenced to Pin19, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Supply (Pin1)</b>						
Supply Voltage	V <sub>P</sub>		10.8	12.0	13.2	V
Supply Current	I <sub>P</sub>		-	90	-	mA
Total Power Dissipation	P <sub>tot</sub>		-	1.08	-	W
<b>Luminance Amplifier (Pin8)</b>						
Input Voltage (Peak-to-Peak Value)	V <sub>8(P-P)</sub>	Note 1	-	450	-	mV
Input Level before Clipping	V <sub>8</sub>		-	-	1.0	V
Input Current	I <sub>8</sub>		-	0.15	1.0	μA
Contrast Control Range			-	-17 to +3	-	dB
Input Current Contrast Control	I <sub>6</sub>	V <sub>6</sub> < 6V	-	0.5	15.0	μA
		V <sub>6</sub> = 2.5V, Note 2	3	7	-	mA

Note 1. Signal with negative going sync; amplitude includes sync. pulse amplitude.

Note 2. Peak white limiter active.

**Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$ ,  $V_P = 12\text{V}$ , All voltages referenced to Pin19, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Peaking of Luminance Signal</b>						
Input Impedance (Pin15)	$ Z_{15} $		7	10	13	$k\Omega$
Output Impedance (Pin10)	$ Z_{10} $		50	75	90	$\Omega$
Luminance Gain Ratio		Note 3	–	10	–	
<b>Chrominance Amplifier (Pin3)</b>						
Input Signal Amplitude (Peak-to-Peak Value)	$V_{3(P-P)}$	Note 4	–	550	–	mV
		Note 5	–	–	1100	mV
Minimum Burst Signal Amplitude within the ACC Control Range (Peak-to-Peak Value)			35	–	–	mV
Change of Red Output Signal over 30dB ACC Control Range	$\Delta V_{12}$		–	–	2	dB
Input Impedance (Pin3)	$ Z_3 $		6	9	12	$k\Omega$
Input Capacitance	$C_3$		–	4	6	pF
Saturation Control Range			50	–	–	dB
Saturation Control Input Current (Pin5)	$I_5$	$V_5 < 6\text{V}$	–	1	20	$\mu\text{A}$
Input Impedance (Pin5)	$ Z_5 $	$V_5 = 6\text{V to } 10\text{V}$	1.5	2.1	2.7	$k\Omega$
		Color Killer Active	1.5	2.1	2.7	$k\Omega$
Tracking Between Luminance and Chrominance Contrast Control		For 10dB of Control	–	1	2	dB
<b>ALC Circuit</b>						
Chrominance/Burst Ratio at which ALC Commences		Note 6	–	2.9	–	
<b>Reference Part (Note 7)</b>						
Phase-Locked-Loop						
Phase-Locked-Loop Catching Range	$\Delta f$		$\pm 300$	$\pm 400$	–	Hz
Phase Shift for 400Hz Deviation of $f_{OSC}$	$\Delta\phi$		–	–	5	deg
Oscillator (See Note 7)						
Oscillator Temperature Coefficient of Oscillator Frequency	$TC_{OSC}$		–	–1.5	–2.5	Hz/K
Frequency Deviation	$\Delta f_{OSC}$	$\Delta V_P = \pm 10\%$	–	150	250	Hz
Input Resistance (Pin18)	$R_{18}$		1.0	1.4	1.8	$k\Omega$
Input Capacitance (Pin18)	$C_{18}$		–	–	10	pF

Note 3. Pin10 AC short-circuit to GND.

Note 4. Indicated is a signal for color bar with 75% saturation, so the chrominance to burst ratio is 2.2:1.

Note 5. Before clipping occurs in the input stage.

Note 6. The ALC circuit limits the chrominance amplitude to a particular value as soon as the chrominance/burst ratio exceeds 2.9: to 1. The limiting is performed via the ACC function.

Note 7. All frequency variations are referenced to the 3.58MHz carrier frequency.

**Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$ ,  $V_P = 12\text{V}$ , All voltages referenced to Pin19, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Reference Part (Cont'd) (Note 7)</b>						
ACC Generation (Pin4)						
Control Voltage at Nominal Input Signal	$V_4$		–	5.2	–	V
Control Voltage without Burst Input			–	2	–	V
Color–Off Voltage			–	2.6	–	V
$\Delta$ Color On/Off Voltage	$\Delta V_4$		100	300	500	mV
Control Voltage at Nominal Input Signal (Pin2)	$V_2$		–	5.2	–	V
Hue Control						
Input Current (Pin17)	$I_{17}$	$V_{17} < 5\text{V}$	–	0.5	20.0	$\mu\text{A}$
Input Impedance (Pin17)	$ Z_{17} $	$V_{15} > 5\text{V}$	1.5	2.5	3.5	$\text{k}\Omega$
<b>Demodulator Part; Ratio of Demodulated Signals <math>\pm 25\%</math> (Note 8)</b>						
$(R - Y)/(B - Y)$	$V_{12}/V_{14}$	No (R - Y) Signal	–	–0.29	–	
$(G - Y)/(R - Y)$	$V_{13}/V_{12}$	No (B - Y) Signal	–	–0.39	–	
$(G - Y)/(B - Y)$	$V_{13}/V_{14}$	No (R - Y) Signal	–	–0.10	–	
Frequency Response between 0 and 0.7MHz	$\sigma_{17}$		–	–	–3	dB
<b>RGB Matrix and Amplifiers</b>						
Output Signal Amplitude (Peak–to–Peak Value)	$V_{12}, V_{13}, V_{14(p-p)}$	Note 9	4.0	5.0	6.0	V
Output Signal Amplitude of the “Blue” Channel (B - Y) at Pin14 (Peak–to–Peak Value)	$V_{14(p-p)}$	Note 10	–	3.8	–	V
Maximum Peak–White Level	$V_{12}, V_{13}, V_{14(m)}$	Note 11	9.0	9.3	9.6	V
Available Output Current (Pin12, Pin13, Pin14)	$I_{12}, I_{13}, I_{14}$		10	–	–	mA
Difference in Black Level between the Three Channels	$\Delta V_{12}, \Delta V_{13}, \Delta V_{14}$		–	–	600	mV
Brightness Control Input Current	$-I_9$		–	–	–50	$\mu\text{A}$
Variation of Black Level with Temperature	$\Delta V/\Delta T$		–	0.15	1.0	mV/K
Variation of Black Level with Contrast	$\Delta V$	Note 12	–	75	200	mV

Note 7. All frequency variations are referenced to the 3.58MHz carrier frequency.

Note 8. These matrixed values are found when hue is in a normal condition and by measuring the ratio of the various output signals. The values are derived from the following matrix equations:

$$\begin{aligned} (R - Y)_{\text{matrixed}} &= 1.29 (R - Y)_{\text{IN}} - 0.29 (B - Y)_{\text{IN}} \\ (G - Y)_{\text{matrixed}} &= -0.50 (R - Y)_{\text{IN}} - 0.10 (B - Y)_{\text{IN}} \\ (B - Y)_{\text{matrixed}} &= (B - Y)_{\text{IN}} \end{aligned}$$

Note 9. With nominal luminance and contrast (black–to–white), nominal contrast is specified as maximum contrast –4dB and nominal saturation as maximum saturation –9dB.

Note 10. With nominal contrast, saturation and hue, no luminance input.

Note 11. When this level is exceeded the amplifier of the output signal is reduced via a discharge of the capacitor on Pin6 (contrast control). Discharge current is 7mA.

Note 12. Control range: Nominal –10dB.

**Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$ ,  $V_P = 12\text{V}$ , All voltages referenced to Pin19, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>RGB Matrix and Amplifiers (Cont'd)</b>						
Relative Spread between the R, G, and B Output Signals (Black-White)			-	-	10	%
Relative Black-Level Variation between the Three Channels During Variation of Contrast		Note 13	-	-	20	mV
Relative Black-Level Variation between the Three Channels During Variation of Brightness		Note 14	-	-	20	mV
Blanking Level at the RGB Outputs	$V_{\text{blk}}$		1.95	2.15	2.35	V
Differential Drift of the Blanking Levels Over a Temperature Range of $40^\circ\text{C}$	$\Delta V$		-	0	20	mV
Tracking of Output Black Level with Supply Voltage	$\frac{DV_{\text{bl}}}{V_{\text{bl}}} \times \frac{V_f}{DV_F}$		1.0	1.05	1.1	
Signal-to-Noise Ratio of Output Signals	S/N	Note 15	62	-	-	dB
Residual 3.58MHz Signal at RGB Outputs (Peak-to-Peak Value)	$V_{R(p-p)}$		-	50	75	mV
Residual 7.1MHz Signal at the RGB Outputs (Peak-to-Peak Value)			-	50	75	mV
Output Impedance	$ Z_{10} $		-	-	50	$\Omega$
	$ Z_{11} $		-	-	50	$\Omega$
	$ Z_{12} $		-	-	50	$\Omega$
Frequency Response of Total Luminance and RGB Amplifier Circuits for $f = 0$ to 5MHz	$\alpha$	Note 16	-	-	-3	dB
<b>Sandcastle Input</b>						
Level at which the RGB Blanking is Activated	$V_7$		1.0	1.5	2.0	V
Level at which the Burst Gate Clamping Pulses are Separated	$V_7$		6.5	7.0	7.5	V
Delay between Black Level Clamping and Burst Gating Pulse	$t_d$		300	375	450	ns
Input Current	$-I_7$	$V_7 = 0$ to $0.8\text{V}$	-	-	-1	mA
	$I_7$	$V_7 = 1\text{V}$ to $8\text{V}$	-	-	-40	$\mu\text{A}$
		$V_7 = 8.5\text{V}$ to $12\text{V}$	-	-	2	mA
<b>Fast Blanking</b>						
Level at which the Fast Blanking is Activated (Pin11)	$V_{11}$		3.5	-	-	V
Allowable Voltage at Blanking Input	$V_{11}$		-	-	5	V
Delay between Fast Blanking Input and Output	$t_d$		-	40	-	ns
Input Current	$I_{11}$	$V_{11} = 3.5\text{V}$	-	160	-	$\mu\text{A}$
Difference between Normal Black-Level and the Fast Blanking Black-Level			-	-0.9	-	V

Note 13. During variations of contrast (10dB) at nominal saturation.

Note 14. During variations of brightness ( $\pm 1\text{V}$ ) at nominal controls.

Note 15. The signal-to-noise ratio is specified as peak-to-peak signal with respect to RMS noise. The effective bandwidth is 5MHz.

Note 16. Disconnected peaking capacitor.

### Pin Connection Diagram

