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## NTE1547 Integrated Circuit Video Chroma Deflection System for Color TV

**Description:**

The NTE1547 combines the video-chroma subsystem and the deflection combination on a single monolithic integrated integrated circuit to provide a color television video-chroma-deflection system. This device includes a video amplifier, color demodulator that is designed to provide color differential output, and improved sync-separator, horizontal oscillator with saw tooth wave type AFC, horizontal pre-driver in a 42-Lead DIP type plastic package.

**Features:**

**Video-Chroma Section**

- Minimum number of external parts required
- Stabilized with respect to variation of temperature and supply voltage
- A few initial adjustments required

**Deflection System**

- Excellent temperature stability of horizontal oscillator
- Exact 50% duty cycle output due to the 2-f<sub>H</sub> oscillator and flip-flop circuit
- Excellent inter-race
- Stable sync separator with V/H input terminals.

**Absolute Maximum Ratings:** (T<sub>A</sub> = +25°C unless otherwise specified)

Supply Voltage, V <sub>3</sub> max	15V
Supply Current, I <sub>33</sub> max	40mA
Input Signal Level, e <sub>IN</sub>	5V <sub>P-P</sub>
Demodulator Min Load Resistance, R <sub>LD</sub>	1.8kΩ
Horizontal Drive Peak Current, -I <sub>24</sub>	30mA
Horizontal Drive Operating Current, -I <sub>24</sub>	15mA
Vertical Ouptut Current, I <sub>26</sub> max	-5mA
Sync Separator Input Level, V <sub>38</sub> max/V <sub>39</sub> max	3V <sub>P-P</sub>
Pin7 Max Operating Current, I <sub>7</sub>	5mA
Pin2 Max Operating Current, I <sub>2</sub>	4mA
Power Dissipation, P <sub>D</sub>	2.2W
Derate Above 25°C	17.6mW/°C
Operating Temperature Range, T <sub>opr</sub>	-20° to +65°C
Storage Temperature Range, T <sub>stg</sub>	-55° to +150°C

**Electrical Characteristics:** ( $V_3 = 12V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Video Section</b>						
12v Supply Current	$I_{CC3}$	Measure Pin3 Currnt	60	82	100	mA
Video Gain	$v_{22}/v_6$	$V_6 = 4.25V$ , $v_6 = 4MHz$ , $1V_{P-P}$ , $V_5 = 10V$ , $V_B = 8V$	2.0	3.5	5.0	dB
Contrast Gain Control Range	$\Delta G_V$	$V_6 = 4.25V$ , $v_6 = 500kHz$ , $1V_{P-P}$ , $V_5 = 5$ to $10V$	11.2	12.3	13.4	dB
Video Frequency Characteristics	$\Delta G_{Vf}$	$V_6 = 4.25V$ , $V_5 = 10V$ , $V_B = 8V$ , $v_6 = 4MHz$ , $0.5MHz$ , $1V_{P-P}$ , $20\log(22(4MHz)/22(0.5MHz))$	-3.5	-1.5	0.5	dB
DC Restoration Ratio	K	$V_{41} = 4.1V$ , Change APL 10% to 90%, measure pedestal level change of Pin22	63	70	77	%
Max. Video Output		Pin5 OPEN, Change $V_{40}$ DC Voltage, Measure 90% of Voltage Change at Pin22	5.0	7.5	-	$V_{P-P}$
Video DC Output Temperature Coefficient		$V_6 = 3.25V$ , $V_{41} = 4.1V$ , $T_A = -20^\circ$ to $+65^\circ C$	-2.5	0	+2.5	mV/ $^\circ C$
Inv. Amp Gain	$v_7/v_6$	$V_6 = 4.25V$ , $v_6 = 4MHz$ , $1V_{P-P}$ , $v_5 = 10V$ , $V_B = 8V$	2.2	3.5	4.6	dB
Inv. Amp Differential Gain	$DG_R$	$V_6 = 3.3$ to $5.2V$ , $v_6 = 3.58MHz$ , $100mV_{P-P}$	-	2.5	10.0	%
Inv. Amp Frequency Characteristics	$\Delta G_{Rf}$	$V_6 = 4.25V$ , $V_5 = 10V$ , $V_B = 8V$ , $v_6 = 4MHz$ , $500kHz$ , $1V_{P-P}$ , $20\log(v_7(4MHz)/v_7(0.5MHz))$	-3.5	-0.1	0.5	dB
Inv. Amp 3.58MHz Linearity	$L_7$	$V_6 = 4V$ , $v_6 = 3.58MHz$	1.6	-	-	$V_{P-P}$
<b>Chroma (1)</b> (Gate Pulse and Blanking Pulse is applied)						
Max. Chroma Output	$e_{CH}$	$V_1 = 12V$ , $V_5 = 10V$ , $V_8$ : OPEN, $v_9$ : $120mV_{P-P}$ (B:C = 1:1), $V_G = 8V$ , $V_B = 15V$ , Measure Pin12	0.5	0.75	1.05	$V_{P-P}$
Burst Output	$e_B$		0.45	0.70	0.95	$V_{P-P}$
ACC Characteristics (1)	$e_a$	$V_1 = 12V$ , $V_5 = 10V$ , $V_8$ : OPEN, $v_9 = 1.5mV_{P-P}$ (B:C = 1:1), measure Chroma Amplitude Pin12	0.16	0.34	-	$V_{P-P}$
ACC Characteristics (2)	A	$v_9 = 100mV_{P-P}$ , $300mV_{P-P}$ (B:C = 1:1), Chroma Amplitude Ratio at Pin12 $A = v_{12}(v_9 = 300mV_{P-P})/v_{12}(v_9 = 100mV_{P-P})$	-	1.0	1.3	
Color Control Residual Signal	$e_{CS}$	$V_1 = 0V$ , $V_5 = 10V$ , $V_8$ : OPEN, $S_1$ : 1, $S_2$ : 1, $V_G = 5V$ , $V_B = 15V$ , $v_9 = 120mV_{P-P}$ (B:C = 1:1)	-	-	3	$mV_{P-P}$
Uni Color Control Gain Range	$\Delta e_{cu}$	$V_1 = 12V$ , $V_5 = 5$ to $10V$ , $V_8$ : OPEN, $S_1$ : 1, $S_2$ : 1, $V_G = 8V$ , $V_B = 15V$ , $v_9 = 120mV_{P-P}$ (B:C = 1:1)	7.5	8.5	9.5	dB
Uni Color Control Phase Range	$\Delta \phi_{cu}$	Same as above. Burst Chroma Phase Change at Pin12	-	4	10	deg.
HUE Phase Control Range (1)	$\Delta \phi_{bH1}$	$V_1 = 12V$ , $V_5 = 10V$ , $V_8 = 0$ to $12V$ , $v_9 = 120mV_{P-P}$ , $V_G = 8V$ , $V_B = 15V$ , Burst Chroma Phase Change at Pin12, $S_1$ : 1, $S_2$ : 1	75	105	-	deg
HUE Phase Control Range (2)	$\Delta \phi_{bH2}$	Same as above. Phase cahnge from $V_8$ OPEN	37	51	62	deg

**Electrical Characteristics (Cont'd):** ( $V_3 = 12V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Chroma (2)</b> (Gate Pulse and Blanking Pulse is applied)						
Color Control Phase Change	$\Delta\phi_{CC}$	$V_1 = 0$ to $12V$ , $V_5$ : OPEN, $V_8$ : OPEN, $v_9 = 120mV_{P-P}$ (B:C = 1:1), $V_G = 8V$ , $V_B = 15V$ , $S_1$ : 1, $S_2$ : 1	–	3	5	deg
Burst–Chroma Phase Difference	$\Delta\phi_{bc}$	Same as above. $V_1$ : OPEN	–8	0	+8	deg
APC Pull–In Range	$f_P$	$v_{14} = 0.6V_{P-P}$ (Burst), Measure Pin16 Frequency Difference between $f_C$ and $f_O$ when APC is Out	$\pm 250$	$\pm 350$	–	Hz
Killer Sensitivity	$e_{bk}$	$v_{14}$ Burst Amplitude when $V_1 = 2V$ , $S_1$ : 1, $S_2$ : 2	18	29	45	$mV_{P-P}$
Residual Carrier of Demodulator Output	$e_{car R}$ $e_{car G}$ $e_{car B}$	$v_{14}$ : AC GND, 3.58MHz Component at Pin19, Pin20, and Pin21, $S_1$ : 1, $S_2$ : 2	–	–	300	$mV_{P-P}$
Color Diff. Signal Output	$e_{OR}$	$S_1$ : 1, $S_2$ : 2, $v_{14} = 3.56945MHz$ , $0.2V_{P-P}$ , CH: 3.579549MHz	1.45	1.85	2.30	$V_{P-P}$
	$e_{OG}$		0.49	0.62	0.77	$V_{P-P}$
	$e_{OB}$		1.55	1.95	2.42	$V_{P-P}$
Color Diff. Signal Relative Output	R–Y/B–Y	Same as above	0.85	0.95	1.05	$V_{P-P}$
	G–Y/B–Y		0.25	0.31	0.38	$V_{P-P}$
Color Diff. Signal Max. Output	$e_{ORM}$	$S_1$ : 1, $S_2$ : 2, $v_{14} = 3.56945MHz$ , $1.2V_{P-P}$ , CW: 3.579545MHz	4.5	5.5	–	$V_{P-P}$
	$e_{OGM}$		1.4	1.8	–	$V_{P-P}$
	$e_{OBM}$		4.5	5.5	–	$V_{P-P}$
Relative Phase	$\phi_{R-Y}$	$S_1$ : 1, $S_2$ : 2, $v_{14}$ : Burst $0.6V_{P-P}$ , Chroma $0.2V_{P-P}$	100	107	112	deg
	$\phi_{G-Y}$		230	240	250	deg
<b>Chroma (3)</b> (Gate Pulse and Blanking Pulse is applied)						
Demodulator Bandwidth	$f_{BR}$ $f_{BG}$ $f_{BB}$	$S_1$ : 1, $S_2$ : 2, $v_{14}$ : 10kHz to 5MHz, $0.2V_{P-P}$ , –3dB Frequency (0db: 10kHz)	1.13	1.77	3.16	MHz
Blanking Operation Voltage		$S_1$ : 1, $S_2$ : 2, $v_{14}$ : Burst $0.6V_{P-P}$ , Chroma $0.2V_{P-P}$ , Blanking Pulse Height when Demodulator Output is Disappear	10.4	11.1	–	V
Demodulator Output DC Voltage	$E_{OR}$ $E_{OG}$ $E_{OB}$	$S_1$ : 1, $S_2$ : 2, $v_{14}$ : AC GND	7.00	7.71	8.35	V
Demodulator Output Difference Voltage	$E_{O(R-G)}$ $E_{O(R-B)}$ $E_{O(B-G)}$	Same as above	–0.3	–	+0.3	V
Demodulator DC Output Thermal Coefficient	$\Delta E_{OR\phi}$ $\Delta E_{OG\phi}$ $\Delta E_{OB\phi}$	Same as above. $T_A = -20^\circ$ to $+65^\circ C$	–3	0	2	$mV/^\circ C$
DC Output Voltage Difference Component Thermal Coefficient	$\Delta E_{O(R-G)\phi}$ $\Delta E_{O(R-B)\phi}$ $\Delta E_{O(B-G)\phi}$	Same as above	–2	0	+2	$mV/^\circ C$
Color Control Pin Voltage	$V_1$	Measure Pin1 Open Circuit Voltage	5.4	6.0	6.52	V
Uni Color Control Pin Voltage	$V_5$	Measure Pin5 Open Circuit Voltage	6.9	7.5	8.02	V
Hue Control Pin Voltage	$V_8$	Measure Pin8 Open Circuit Voltage	5.4	6.0	6.52	V

**Electrical Characteristics (Cont'd):** ( $V_3 = 12V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Horizontal (1)</b>						
Horizontal $V_{CC}$	$V_{33}$	$V_B = 20.3V$	7.4	8.2	9.0	V
Recommended Supply Current	$I_{33}$		22	26	30	mA
Horizontal Frequency	$f_H$	$S_{39}: b, S_{38}: b, S_{35}: ON, V_X = 4V$	150.69	15.569	16.069	kHz
$f_H$ Thermal Drift	$\Delta f_{HT}$	Same as above. $T_A = -20^\circ$ to $+65^\circ C$	-70	80	230	Hz
AFC Clamping Voltage	$V_{CL}$	Measure Pin35 Open, Circuit Voltage $S_1: ON$	3.71	4.2	4.75	V
AFC Input Current	$I_{IN35}$	$S_1: ON, S_5: 2$	2.2	3.42	5.1	mA
AFC Output Current	$I_{O35}$	$S_1: ON, S_5: 2$	2.4	3.99	5.6	mA
Horizontal Drive Saturation Voltage	$V_{OL24}$	$S_1: ON, S_3: ON, \text{Measure } V_{24}$	-	-	0.3	V
Horizontal Drive Output Duty Cycle	$T_{O24}$	$S_{39}: b, S_{38}: b, S_{35}: OPEN, V_X = 4V, H \text{ Level Period}/1 \text{ Cycle Period} = 100, \text{Measure } v_{24} \text{ Wave Form}$	45	50	55	%
Oscillator Starting Voltage	$V_{33min}$	Minimum $V_{33}$ when Output Duty of Pin24 is 50%	-	-	4.0	V
Starting Supply Current	$I_{33min}$	$V_{33} = 4V, \text{Measure } I_{33}$	5.5	8.8	11.5	mA
AFC Pull-In Range	$\Delta f_{HPULL}$	$S_{38}: a, S_{35}: ON, S_{39}: a, \text{Changing } V_X, \text{Measure Pull-In Range}$	-	$\pm 600$	-	Hz
<b>Horizontal (2)</b>						
AFC Hold-In Range	$\Delta f_{H \text{ HOLD}}$	Same as Pull-In Range, Measure Hold-In Range	-	$\pm 1000$	-	Hz
X-Ray Protector Voltage Range	$V_{IN23}$	Measure $V_{23}$ when $v_{24}$ Output becomes L Level, $T_A = +25^\circ C$	0.50	0.88	1.10	V
X-Ray Protector Current Sensitivity	$I_{IN23}$	Measure $I_{23}$ when $v_{23}$ Output becomes L Level, $T_A = +25^\circ C$	0.060	0.178	1.000	$\mu A$
X-Ray Protector Operating Voltage	$V_{IN23\phi}$	Same as $V_{IN23}, T_A = -20^\circ$ to $+65^\circ C$	0.30	0.84	1.28	V
X-Ray Protector Operating Current	$I_{IN23\phi}$	Same as $I_{IN23}, T_A = -20^\circ$ to $+65^\circ C$	0.030	0.178	2.000	$\mu A$
<b>Sync Separator</b>						
Sync Separator Sensitivity (1)	$I_{IN39}$	Pin38: OPEN, Measure $I_{39}$ when $V_{37}$ is Low-to-High	18.1	35.0	11.3	$\mu A$
Sync Separator Sensitivity (2)	$I_{IN38}$	Pin39: OPEN, Measure $I_{38}$ when $V_{37}$ is Low-to-High	13.3	21.4	54.2	$\mu A$
Sync Output High Level	$V_{OH37}$	Pin38: OPEN	7.04	8.19	9.34	V
Sync Output Low Level	$V_{OL37}$		0	1.5	2.4	V
Sync Clamp Voltage	$V_{CL31}$	Measure $V_{31}$ at $I_{31} = -1mA$	-0.85	-0.63	-0.5	V
<b>Vertical</b>						
Vertical Free-Running Frequency	$f_V$	$S_{31}: ON, \text{Measure Pin28}$	56	60	64	Hz
Retrace Time	$T_r$	Pin28 Output Pulse	500	690	850	$\mu s$

**Electrical Characteristics (Cont'd):** ( $V_3 = 12V$ ,  $T_A = +25^\circ C$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Vertical (Cont'd)</b>						
$f_V$ Pull-In Range	$\Delta f_{V\ PULL}$	$S_{31}$ : ON/OFF, Pin31 to $V_R$ , $S_{31}$ : OFF, $f_{OSC28} = 60Hz$ , $S_{31}$ : ON, Measure $f_{OSC28}$ , $\Delta f_{V\ PULL} = f_{OSC28} = 60Hz$	11.1	12.1	12.9	Hz
Ramp Max. Voltage	$V_{O28}$	$V_{30} = 6V$ , Measure $V_{28}$	7.05	7.65	8.25	V
Ramp Max. Current	$I_{O28}$	$V_{30} = 6V$ , Measure $I_{28}$ , $S_6$ : ON	16.7	26.8	48.4	mA
Max. Common Mode Input Voltage	$V_{IH28}$	$S_{26}$ , $S_{27}$ : ON, $V_{30} = 0V$ , $V_{28} = 6$ to $12V$ , Measure $V_{28}$ when $V_{27}$ is saturated	11.9	–	–	V
Min. Common Mode Input Voltage	$V_{IL28}$	Same as above. $V_{28} = 6$ to $0V$	–	2.86	3.7	V
Pin28 Input Current	$I_{I28}$	$S_{26}$ , $S_{27}$ : ON, $V_{30} = 0V$ , Measure $I_{28}$ at $V_{28} = 6V$	0.25	0.98	4.50	$\mu A$
Pin27 Input Current	$I_{I27}$	Same as above. Measure $I_{27}$ at $V_{28} = 4V$	0.18	0.94	6.21	$\mu A$
Max. Vertical Output Voltage	$V_{OH26}$	$S_{26}$ : OFF, $S_{27}$ : ON, $V_{30} = 6V$ , Measure $V_{26}$	5.6	6.3	7.2	V
Min. Vertical Output Voltage	$V_{OL26}$	$S_{26}$ , $S_{27}$ : OFF, $V_{30} = 6V$ , Measure $V_{26}$	–	–	0.3	V
Pin29 Bias Voltage	$V_{29}$	Measure $V_{29}$ when $I_{29} = -0.2mA$	3.7	3.9	4.1	V

**Pin Connection Diagram**

Color Control	<b>1</b>	<b>42</b>	C-Contrast Output
E-Contrast Output	<b>2</b>	<b>41</b>	Brightness Control
$V_{CC}$	<b>3</b>	<b>40</b>	Clamp Input
Delay Input	<b>4</b>	<b>39</b>	Horiz Sync Separator
Contrast Control	<b>5</b>	<b>38</b>	Vert Sync Separator
Video Inv Input	<b>6</b>	<b>37</b>	Sync Output
Video Inv Output	<b>7</b>	<b>36</b>	Horiz OSC Discharge
Hue Control	<b>8</b>	<b>35</b>	AFC
Chroma Input	<b>9</b>	<b>34</b>	Horiz OSC Timing
ACC Filter	<b>10</b>	<b>33</b>	Horiz $V_{CC}$ (8V)
GND	<b>11</b>	<b>32</b>	GND
Chroma Output	<b>12</b>	<b>31</b>	Vert Sync Input
Killer Filter	<b>13</b>	<b>30</b>	Timing
Demodulator Input	<b>14</b>	<b>29</b>	Height Control
APC Filter	<b>15</b>	<b>28</b>	Ramp Capacitor
X'tal Drive	<b>16</b>	<b>27</b>	NFB Input
X'tal Input	<b>17</b>	<b>26</b>	Vert Drive Output
$-\pi/4$ Input	<b>18</b>	<b>25</b>	Phase Compensation
B-Y Output	<b>19</b>	<b>24</b>	Horiz Drive Output
G-Y Output	<b>20</b>	<b>23</b>	X-Ray Protect
R-Y Output	<b>21</b>	<b>22</b>	Y Output

