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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_H oscillator and flip-flop circuit
- Excellent inter-race
- Stable sync separator with V/H input terminals.

Absolute Maximum Ratings: (T_A = +25°C unless otherwise specified)

| | |
|---|-------------------|
| Supply Voltage, V ₃ max | 15V |
| Supply Current, I ₃₃ max | 40mA |
| Input Signal Level, e _{IN} | 5V _{P-P} |
| Demodulator Min Load Resistance, R _{LD} | 1.8kΩ |
| Horizontal Drive Peak Current, -I ₂₄ | 30mA |
| Horizontal Drive Operating Current, -I ₂₄ | 15mA |
| Vertical Ouput Current, I ₂₆ max | -5mA |
| Sync Separator Input Level, V ₃₈ max/V ₃₉ max | 3V _{P-P} |
| Pin7 Max Operating Current, I ₇ | 5mA |
| Pin2 Max Operating Current, I ₂ | 4mA |
| Power Dissipation, P _D | 2.2W |
| Derate Above 25°C | 17.6mW/°C |
| Operating Temperature Range, T _{opr} | -20° to +65°C |
| Storage Temperature Range, T _{stg} | -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 |
|--|---------------------|---|------|------|------|----------------|
| Video Section | | | | | | |
| 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 | ΔG_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 | ΔG_{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 | ΔG_{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} |
| Chroma (1) (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 | Δe_{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 |
|--|---|--|-----------|-----------|------|---------------|
| Chroma (2) (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 | ± 250 | ± 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 | ϕ_{R-Y} | S_1 : 1, S_2 : 2, v_{14} : Burst $0.6V_{P-P}$, Chroma $0.2V_{P-P}$ | 100 | 107 | 112 | deg |
| | ϕ_{G-Y} | | 230 | 240 | 250 | deg |
| Chroma (3) (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 |
|-------------------------------------|-----------------------------|---|--------|------------|--------|---------|
| Horizontal (1) | | | | | | |
| 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 | Δf_{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 | Δf_{HPULL} | $S_{38}: a, S_{35}: ON, S_{39}: a, \text{Changing } V_X, \text{Measure Pull-In Range}$ | - | ± 600 | - | Hz |
| Horizontal (2) | | | | | | |
| AFC Hold-In Range | $\Delta f_{H \text{ HOLD}}$ | Same as Pull-In Range, Measure Hold-In Range | - | ± 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 | μA |
| 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 | μA |
| Sync Separator | | | | | | |
| Sync Separator Sensitivity (1) | I_{IN39} | Pin38: OPEN, Measure I_{39} when V_{37} is Low-to-High | 18.1 | 35.0 | 11.3 | μA |
| Sync Separator Sensitivity (2) | I_{IN38} | Pin39: OPEN, Measure I_{38} when V_{37} is Low-to-High | 13.3 | 21.4 | 54.2 | μA |
| 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 |
| Vertical | | | | | | |
| 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 | μs |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------|--|------|------|------|---------|
| Vertical (Cont'd) | | | | | | |
| 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 | μA |
| Pin27 Input Current | I_{I27} | Same as above. Measure I_{27} at $V_{28} = 4V$ | 0.18 | 0.94 | 6.21 | μA |
| 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 | 1 | 42 | C-Contrast Output |
| E-Contrast Output | 2 | 41 | Brightness Control |
| V_{CC} | 3 | 40 | Clamp Input |
| Delay Input | 4 | 39 | Horiz Sync Separator |
| Contrast Control | 5 | 38 | Vert Sync Separator |
| Video Inv Input | 6 | 37 | Sync Output |
| Video Inv Output | 7 | 36 | Horiz OSC Discharge |
| Hue Control | 8 | 35 | AFC |
| Chroma Input | 9 | 34 | Horiz OSC Timing |
| ACC Filter | 10 | 33 | Horiz V_{CC} (8V) |
| GND | 11 | 32 | GND |
| Chroma Output | 12 | 31 | Vert Sync Input |
| Killer Filter | 13 | 30 | Timing |
| Demodulator Input | 14 | 29 | Height Control |
| APC Filter | 15 | 28 | Ramp Capacitor |
| X'tal Drive | 16 | 27 | NFB Input |
| X'tal Input | 17 | 26 | Vert Drive Output |
| $-\pi/4$ Input | 18 | 25 | Phase Compensation |
| B-Y Output | 19 | 24 | Horiz Drive Output |
| G-Y Output | 20 | 23 | X-Ray Protect |
| R-Y Output | 21 | 22 | Y Output |

