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# NTE7161
# Integrated Circuit
# Horizontal & Vertical Deflection for Autosync Monitors

**Description:**

The NTE7161 is a monolithic integrated circuit in a 20−Lead DIP type package designed for economical solutions in autosync monitors. This device incorporates the complete horizontal and vertical small signal processing on a single chip. When used in conjunction with the NTE7135 or NTE7156 vertical output circuits, this device offers an extremely advanced system solution.

**Features:**

- Low Jitter
- All Adjustments DC−Controllable
- Alignment−Free Oscillators
- Sync Separators fo Video or Horizontal and Vertical TTL Sync Levels Regardless of Polarity
- Hoizontal Oscillator with PLL1 for Sync and PLL2 for Flyback
- Constant Vertical and E/W Amplitude in Autosync Operation
- DC−Coupling to Vertical Power Amplifier
- Internal Supply Voltage Stabilization with Excellent Ripple Rejection to Ensure Stable Geometrical Adjustments

**Absolute Maximum Ratings:**

Supply Voltag (Pin1), $V_P$ . . . . . −0.5 to 16V
Voltage on Pin3, $V_3$ . . . . . −0.5 to 16V
Voltage on Pin8, $V_8$ . . . . . −0.5 to 7V
Voltage on Pin5, Pin6, Pin9, Pin10, Pin13, Pin14 and Pin18, $V_n$ . . . . . −0.5 to 6.5V
Current on Pin2, $I_2$ . . . . . ±10mA
Current on Pin3, $I_3$ . . . . . 100mA
Current on Pin8, $I_8$ . . . . . −10mA
Maximum Junction Temperature, $T_J$ . . . . . +150°C
Operating Ambient Temperature Range, $T_A$ . . . . . 0° to +70°C
Storage Temperature Range, $T_{stg}$ . . . . . −55° to +150°C
Thermal Resistance, Junction−to−Ambient (In free air), $R_{thJA}$ . . . . . 65K/W
Electrostatic Handling (For All Pins, Note 1), $V_{ESD}$ . . . . . ±400V

Note 1. Equivalent to discharging a 200pF capacitor hrough a 0Ω series resistor.

**Electrical Characteristics:** ($V_P$ = 12V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Positive Supply Voltage (Pin1) | $V_P$ | | 9.2 | 12.0 | 16.0 | V |
| Supply Current | $I_P$ | $I_{18}$ = −1.05mA | − | 36 | 44 | mA |
| | | $I_{18}$ = −3.388mA | − | 40 | 49 | mA |
| **Internal Reference Voltage** | | | | | | |
| Internal Reference Voltage | $V_{ref}$ | | 6.0 | 6.25 | 6.5 | V |
| Temperature Coefficient | TC | $T_A$ +20° to +100°C | − | − | ±90 | $10^{-6}$/K |
| Power Supply Ripple Rejection | PSRR | f = 1kHz Sinewave | 60 | 75 | − | dB |
| | | f = 1MHz Sinewave | 25 | 35 | − | dB |
| Supply Voltage (Pin1) to Ensure all Internal Reference Voltages | $V_P$ | | 9.2 | − | 16 | V |
| **Composite Sync Input (AC−Coupled)** | | | | | | |
| Sync Amplitude of Video Input Signal (Pin9) | $V_{i\ sync}$ | Sync on Green | − | 300 | − | mV |
| Top Sync Clamping Level | | | 1.1 | 1.28 | 1.5 | V |
| Slicing Level Above Top Sync Level | | $R_S$ = 50Ω | 90 | 120 | 150 | mV |
| Allowed Source Resistance for 7% Duty Factor | $R_S$ | $V_{i\ sync}$ > 200mV | − | − | 1.5 | kΩ |
| Differntial Input Resistance | $r_9$ | During Sync | − | 80 | − | Ω |
| Charging Current of Coupling Capacitor | $I_9$ | $V_9$ > 1.5V | 1.3 | 2.0 | 3.0 | µA |
| Vertical Sunc Integration Time to Generate Vertical Trigger Pulse | $t_{int}$ | $f_H$ = 31kHz, $I_{18}$ = −1.050mA | 7 | 10 | 13 | µs |
| | | $f_H$ = 64kHz, $I_{18}$ = −2.169mA | 3.5 | 5.0 | 6.5 | µs |
| | | $f_H$ = 100kHz, $I_{18}$ = −3.388mA | 2.5 | 3.4 | 4.5 | µs |
| **Horizontal Sync Input (DC−Coupled, TTL−Compatible)** | | | | | | |
| Sync Input Signal (Peak−to−Peak Value, Pin9) | $V_{i\ sync}$ | | 1.7 | − | − | V |
| Slicing Level | | | 1.2 | 1.4 | 1.6 | V |
| Minimum Pulse Width | $t_p$ | | 700 | − | − | ns |
| Rise Time and Fall Time | $t_r$, $t_f$ | | 10 | − | 500 | ns |
| Input Current | $I_9$ | $V_9$ = 0.8V | − | − | −200 | µA |
| | | $V_9$ = 5.5V | − | − | 10 | µA |
| **Automatic Horizontal Polarity Switch** | | | | | | |
| Horizontal Sync Pulse Width Related to $t_H$ (Duty factor for Automatic Polarity Correction) | $t_{p\,H}/t_H$ | | − | − | 30 | % |
| Delay Time for Changing Sync Polarity | $t_p$ | | 0.3 | − | 1.8 | ms |

**Electrical Characteristics (Cont'd):** ($V_P$ = 12V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Vertical Sync Input (DC−Coupled, TTL−Coupled)** (V−sync on Pin10) | | | | | | |
| Sync Input Signal (Peak−to−Peak Value, Pin10) | $V_{i\ sync}$ | | 1.7 | − | − | V |
| Slicing Level | | | 1.2 | 1.4 | 1.6 | V |
| Input Current | $I_{10}$ | $0 < V_{10} < 5.5V$ | − | − | ±10 | μA |
| Maximum Vertical Sync Pulse Width for Automatic Vertical Polaity Switch | $t_{p\ V}$ | | − | − | 300 | μs |
| **Horizontal Clamping/Blanking Generator Output** | | | | | | |
| Output Voltage LOW | $V_8$ | | − | − | 0.9 | V |
| Blanking Output Voltage | | Internal V Blanking | 1.6 | 1.9 | 2.2 | V |
| Clamping Output Voltage | | H−Sync on Pin9 | 5.15 | 5.4 | 5.65 | V |
| Internal Sink Current for All Output Levels | $I_8$ | H and V Scanning | 2.3 | 2.9 | 3.5 | mA |
| External Load Current | | | − | − | −3.0 | mA |
| Clamping Pulse Start | $t_8$ | | With End of H−Sync | | | |
| Clamping Pulse Width | $t_{clp}$ | $V_8$ = 3V | 0.6 | 0.8 | 1.0 | μs |
| Steepness of Rise an Fall Times | S | | − | 60 | 75 | ns/V |
| **Vertical Oscillator** | | | | | | |
| Vertical Free−Running Frequency | $f_0$ | $R_{15}$ = 22kΩ, $C_{16}$ = 0.1μF | − | 42 | − | Hz |
| Nominal Vertical Sync Range | $f_v$ | No $f_0$ Adjustment | 50 | − | 110 | Hz |
| Voltage on Pin15 | $V_{15}$ | $R_{15}$ = 22kΩ | 2.8 | 3.0 | 3.2 | V |
| Delay Between Sync Pulse and Start of Vertical Scan | $t_d$ | Measured on Pin8 | 240 | 300 | 360 | μs |
| Control Current for Amplitude Control | $I_{12}$ | | − | ±200 | − | μA |
| Capacitor for Amplitude Control | $C_{12}$ | | − | − | 0.18 | μF |
| **Vertical Differential Output** | | | | | | |
| Differential Output Current Between Pin5 and Pin6 (Peak−to−Peak Value) | $I_o$ | Mode 3, $I_{13}$ > −135μA, $R_{15}$ = 22kΩ | 0.9 | 1.0 | 1.1 | mA |
| Maximum Offset−Current Error | | $I_o$ = 1mA | − | − | ±2.5 | % |
| Maximum Linearity Error | | | − | − | ±1.5 | % |
| **Vertical Amplitude Adjustment** (In Percentage of Output Signal) | | | | | | |
| Input Voltage | $V_{13}$ | | − | 5.0 | − | V |
| Adjustment Current | $I_{13}$ | $I_{o\ max}$ (100%) | −110 | −120 | −135 | μA |
| | | $I_{o\ min}$ (Typically 58%) | − | 0 | − | μA |
| **Horizontal Comparator PLL1** | | | | | | |
| Upper Control Voltage Limitation | $V_{17}$ | | − | 5.9 | − | V |
| Lower Control Voltage Limitation | | | − | 5.1 | − | V |
| Control Current | $I_{17}$ | | − | $+0.083I_{18}$ | − | mA |

**Electrical Characteristics (Cont'd):** ($V_P$ = 12V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Horizontal Oscillator** | | | | | | |
| Center Frequency | $f_{OSC}$ | $R_{18}$ = 2.4Ω (Pin18), $C_{19}$ = 10nF (Pin19) | − | 31.45 | − | kHz |
| Deviation of Center Frequency | | | − | − | ±3 | % |
| Temperature Coefficient | | | 0 | ±200 | ±300 | $100^{-6}$/K |
| Relative Holding/Catching Range | $\varphi_H/t_H$ | | ±6 | ±6.5 | ±7.3 | % |
| External Oscillator Current | $I_{18}$ | | −0.5 | − | −4.3 | mA |
| Voltage at Reference Current Input | $V_{18}$ | | 2.35 | 2.5 | 2.65 | V |
| **Horizontal PLL2** | | | | | | |
| Upper Clamping Level of Flyback Input | $V_2$ | $I_2$ = 6mA | − | 5.5 | − | V |
| Lower Clamping Level of Flyback Input | | $I_2$ = −1mA | − | −0.75 | − | V |
| H−Flyback Slicing Level | | | − | 3.0 | − | V |
| Delay Between Midle of Sync and Middle of H−Flyback Related to $t_H$ | $t_d/t_H$ | | − | 3.0 | − | % |
| Upper Control Voltage Limitation | $V_{20}$ | | − | 6.2 | − | V |
| Lower Control Voltage Limitation | | | − | 4.8 | − | V |
| Control Current | $I_{20}$ | | − | $\pm 0.083 I_{18}$ | − | μA |
| PLL2 Control Range Related to $t_H$ | $\Delta t/t_H$ | | 30 | − | − | % |
| **Horizontal Output** (Open−Collector) | | | | | | |
| Output Voltage LOW | $V_3$ | $I_3$ = 20mA | − | − | 0.3 | V |
| | | $I_3$ = 60mA | − | − | 0.8 | V |
| $t_H$ Duty factor | $t_p/t_H$ | | 42 | 45 | 48 | % |
| Threshold to Activate Under Voltage Protection | $V_P$ | Horizontal Output Off | − | 5.6 | − | V |
| | | Horizontal Output On | − | 5.8 | − | V |
| Jitter of Horizontal Output | $\Delta t_H$ | f = 31kHz | − | − | 3.5 | ns |
| | | f = 64kHz | − | − | 1.9 | ns |
| | | f = 100kHz | − | − | 1.2 | ns |
| **E/W Output** (Note 2) | | | | | | |
| Bottom Output Signal During Mid−Scan (Pin11) | $V_{11}$ | Internally Stabilized | 1.05 | 1.2 | 1.35 | V |
| Top Output Signal During Flyback | | | 4.2 | 4.5 | 4.8 | V |
| Temperature Coefficient of Output Signal | | | − | − | 250 | $10^{-6}$/K |

Note 2. Parabola amplitude does not track with vertical amplitude adjustment. Tracking can be achieved by a resistor from vertical amplitude potentiometer to Pin14.

**Electrical Characteristics (Cont'd):** ($V_P$ = 12V, $T_A$ = +25°C unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Internal Reference Voltage** | | | | | | |
| Input Voltage (Pin14) | $V_{14}$ | | – | 5.0 | – | V |
| Adjustment Current | $I_{14}$ | 100% Parabola | −110 | −120 | −135 | µA |
| | | Typically 28% Parabola | – | 0 | – | µA |

**Pin Configuration Diagram**