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# NTE7147 Integrated Circuit Full Bridge Current Driven Vertical Deflection Booster

## **Description:**

The NTE7147 is a power amplifier in a 9-Lead SIP type package designed for use in 90 degree color vertical deflection systems for frame frequencies of 50Hz to 160Hz. This device provides a high CMRR current driven differential input. Due to the bridge configuration of the two output stages, DC-coupling of the deflection coil is achieved.

## **Features:**

- Pre-Amplifier with Differential High CMRR Current Mode Inputs
- Low Offsets
- High Linear Sawtooth Signal Amplification
- High Efficient DC-Coupled Vertical Output Bridge Circuit
- Powerless Vertical Shift
- High Deflection Frequency up to 160Hz
- Power Supply and Flyback Supply Voltage Independent Adjustable to Optimize Power Consumption and Flyback Time
- Excellent Transition Behaviour Duriing Flyback
- Guard Circuit for Screen Protection

## **Absolute Maximum Ratings:** (Voltage referenced to Pin5 (GND) unless otherwise specified)

Supply Voltage (Pin3), $V_P$	30V
Flyback Supply Voltage (Pin7), $V_{FB}$	60V
Flyback Supply Current, $I_{FB}$	$\pm 1.8A$
Input Voltage, $V_1, V_2$	0 to $V_P$ V
Input Current, $I_1, I_2$	0 to $\pm 5mA$
Output Voltage, $V_4, V_6$	0 to $V_P$ V
Output Current (Note 1), $I_4, I_6$	0 to $\pm 1.8A$
Feedback Voltage, $V_9$	0 to $V_P$ V
Feedback Current, $I_9$	0 to $\pm 5mA$
Guard Voltage (Note 2), $V_8$	0 to $V_P + 0.4V$
Guard Current, $I_8$	0 to $\pm 5mA$
Operating Junction Temperature Range (Note 3), $T_J$	$-20^\circ$ to $+150^\circ C$
Ambient Temperature Range, $T_A$	$-20^\circ$ to $+75^\circ C$
Storage Temperature Range, $T_{stg}$	$-20^\circ$ to $+150^\circ C$
Thermal Resistance, Junction-to-Mounting Base, $R_{thJ-MB}$	4K/W
Electrostatic Handling Voltage (Note 4), $V_{es}$	$-500V$ to $+500V$

Note 1. Maximum output currents  $I_4$  and  $I_6$  are limited by current protection.

Note 2. For  $V_P > 13V$ , the guard voltage  $V_8$  is limited to 13V.

Note 3. Internally limited by thermal protection; switching point  $\geq +150^\circ C$ .

Note 4. Equivalent to discharging a 200pF capacitor through a  $0\Omega$  series resistor,

**Electrical Characteristics:** ( $V_P = 15V$ ,  $T_A = +25^\circ C$ ,  $V_{FB} = 40V$ , voltage referenced to Pin5 (GND) unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage (Pin3)	$V_P$		8.2	–	25	V
Flyback Supply Voltage (Pin7)	$V_{FB}$	Note 5	$V_P+6$	–	60	V
Quiescent Feedback Current (Pin7)	$I_{FB}$	No Load, No Signal	–	7	10	mA
<b>Input Stage</b>						
Differential Input Current ( $I_{id} = I_1 - I_2$ ) (Peak-to-Peak Value)	$I_{id(p-p)}$		–	$\pm 500$	$\pm 600$	$\mu A$
Single Ended Input Current (Peak-to-Peak Value)	$I_{1,2(p-p)}$	Note 6	0	$\pm 300$	$\pm 600$	$\mu A$
Common Mode Rejection Ratio	CMRR	Note 7	–	–54	–	dB
Input Clamp Voltage	$V_1$	$I_1 = 300\mu A$	2.7	3.0	3.3	V
	$V_2$	$I_2 = 300\mu A$	2.7	3.0	3.3	V
Input Clamp Signal TC on Pin1	$TC_{i,1}$		0	–	$\pm 800$	$\mu V/K$
Input Clamp Signal TC on Pin2	$TC_{i,2}$		0	–	$\pm 800$	$\mu V/K$
Differential Input Voltage	$V_1 - V_2$	$I_{id} = 0$	0	–	$\pm 10$	mV
Feedback Current	$I_9$		–	$\pm 500$	$\pm 600$	$\mu A$
Feedback Voltage	$V_9$		1	–	$V_P - 1$	V
Differential Input Offset Current ( $I_{id(offset)} = I_1 - I_2$ )	$I_{id(offset)}$	$I_{defl} = 0$ , $R_{ref} = 1.5k\Omega$ , $R_m = 1\Omega$	0	–	$\pm 20$	$\mu A$
Input Capacity Pin1 Reference to GND	$C_{i INA}$		–	–	5	pF
Input Capacity Pin2 Reference to GND	$C_{i INB}$		–	–	5	pF
<b>Output Stages A and B</b>						
Output Current	$I_4, I_6$		–	–	$\pm 1$	A
Output A Saturation Voltage to GND	$V_6$	$I_6 = 0.7A$	–	1.3	1.5	V
		$I_6 = 1.0A$	–	1.6	1.8	V
Output A Saturation Voltage to $V_P$	$V_{6,3}$	$I_6 = 0.7A$	–	2.3	2.9	V
		$I_6 = 1.0A$	–	2.7	3.3	V
Output B Saturation Voltage to GND	$V_4$	$I_4 = 0.7A$	–	1.3	1.5	V
		$I_4 = 1.0A$	–	1.6	1.8	V
Output B Saturation Voltage to $V_P$	$V_{4,3}$	$I_4 = 0.7A$	–	1.0	1.6	V
		$I_4 = 1.0A$	–	1.3	1.9	V
Linearity Error	LE	$I_{defl} = \pm 0.7A$ , Note 8	–	–	2	%

Note 5. Up to  $60V \geq V_{FB} \geq 40V$  a decoupling capacitor  $C_{FB} = 22\mu$ (between Pin7 and Pin5) and a resistor  $R_{FB} = 100\Omega$  (between Pin7 and  $V_{FB}$ ) are required.

Note 6. Saturation voltages of output stages A and B can be increased in the event of negative input currents  $I_{1,2} < -500\mu A$ .

Note 7.  $D_i = \frac{I_{deflc}}{I_{idc}} \times \frac{I_{id}}{I_{defl}}$  with  $I_{deflc}$  = common mode deflection current and  $I_{idc}$  = common mode input current.

Note 8. Deviation of the output slope at a constant input slope.

**Electrical Characteristics (Cont'd):** ( $V_P = 15V$ ,  $T_A = +25^\circ C$ ,  $V_{FB} = 40V$ , voltage referenced to Pin5 (GND) unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Output Stages A and B (Cont'd)</b>						
DC Output Voltage	$V_4, V_6$	$I_{id} = 0A$ , Closed-Loop	6.6	7.2	7.8	V
Open-Loop Current Gain ( $I_4, 6/I_{id}$ )	$G_{oi}$	$I_4, 6 < 100mA$ , Note 9	–	100	–	dB
Open-Loop Current Gain ( $I_4, 6/I_9$ )	$G_{ofb}$	$I_4, 6 < 100mA$ , Note 9	–	100	–	dB
Current Ratio ( $I_{id}/I_9$ )	$G_{ifb}$	Closed-Loop	–	–0.2	–	dB
Output Ripple Current as a Function of Supply Ripple	$I_{defl(ripple)}$	$V_{P(ripple)} = \pm 0.5V$ , $I_{id} = 0$ , Closed-Loop	–	$\pm 1$	–	mA
<b>Flyback Generator</b>						
Voltage Drop During Flyback Reverse  Forward	$V_{7, 6}$	$I_{defl} = 0.7A$	–	–2.0	–3.0	V
		$I_{defl} = 1.0A$	–	–2.3	–3.5	V
		$I_{defl} = 0.7A$	–	+5.6	+6.1	V
		$I_{defl} = 1.0A$	–	+5.9	+6.5	V
Switching On Threshold Voltage	$V_6$		$V_P - 1$	–	$V_P + 1.5$	V
Switching Off Threshold Voltage	$V_6$		$V_P - 1.5$	–	$V_P + 1$	V
Flyback Current During Flyback	$I_7$		–	–	$\pm 1$	A
<b>Guard Circuit</b>						
Output Voltage	$V_8$	Guard On	7.5	8.5	10	V
		Guard On, $V_P = 8.2V$	6.9	–	$V_P - 0.4$	V
		Guard Off	–	–	0.4	V
Output Current	$I_8$	Guard On	5	–	–	mA
		Guard Off, $V_8 = 5V$	0.5	1.0	1.5	mA
Allowable External Voltage on Pin8	$V_{8(ext.)}$		0	–	13	V
		$V_P \leq 13V$	0	–	$V_P + 0.3$	V

Note 9. Frequency behaviour of  $G_{oi}$  and  $G_{ofb}$ .

- a) –3dB open-loop bandwidth ( $-45^\circ$ ) at 15kHz; second pole ( $-135^\circ$ ) at 1.3MHz.
- b) Open-loop gain at second pole ( $-135^\circ$ ) 55dB.



