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## NTE4049, NTE4049T NTE4050B, NTE4050BT Integrated Circuit CMOS, Hex Buffer/Converter

**Description:**

The NTE4049/NTE4049T (Inverting) and NTE4050B/NTE4050BT (Non-Inverting) are Hex Buffers and feature logic-level conversion using only one supply voltage ( $V_{DD}$ ). The input-signal high level ( $V_{IH}$ ) can exceed the  $V_{DD}$  supply voltage when these devices are used for logic level conversions. These devices are intended for use as COS/MOS to DTL/TTL converters and can drive directly two DTL/TTL loads ( $V_{DD} = 5V$ ,  $V_{OL} \leq 400mV$ ,  $I_{OL} \geq 3.2mA$ ).

These devices are available in a standard 16-Lead DIP (NTE4049 and NTE4050B) and SOIC-16 surface mount (NTE4049T and NTE4050BT) type packages.

**Features:**

- High Sink Current for Driving 2 TTL Loads
- High-to-Low Level Logic Conversion
- Quiescent Current Specified to 20V
- Maximum Input Current of 1 $\mu$ A at 18V (Full Package Temperature Range)
- High "Sink" and "Source" Current Capability
- 5V, 10V, and 15V Parametric Ratings

**Absolute Maximum Ratings:**

Supply Voltage (Note 1), $V_{DD}$ .....	-0.5 to 20V
Input Voltage, $V_I$ .....	-0.5 to $V_{DD} + 0.5V$
DC Input Current (Any One Input), $I_I$ .....	$\pm 10mA$
Total Power Dissipation, $P_{tot}$	
Per Package .....	200mW
Per Output Transistor ( $T_{op} = -40^\circ$ to $+85^\circ C$ ) .....	100mW
Operating Temperature Range, $T_{opr}$ .....	$-40^\circ$ to $+85^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-65^\circ$ to $+150^\circ C$

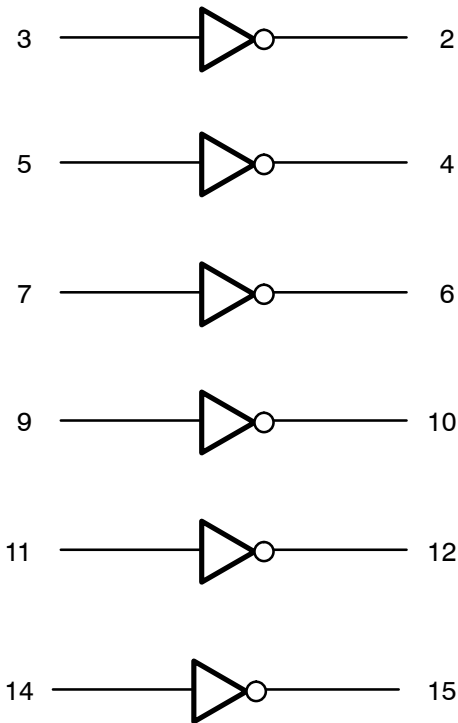
Note 1. All voltage values are referred to  $V_{SS}$  pin voltage.

**Recommended Operating Conditions:**

Supply Voltage, $V_{DD}$ .....	3 to 18V
Input Voltage (Note 2), $V_I$ .....	$V_{DD}$ to 18V
Operating Temperature Range, $T_{opr}$ .....	$-40^\circ$ to $+85^\circ C$

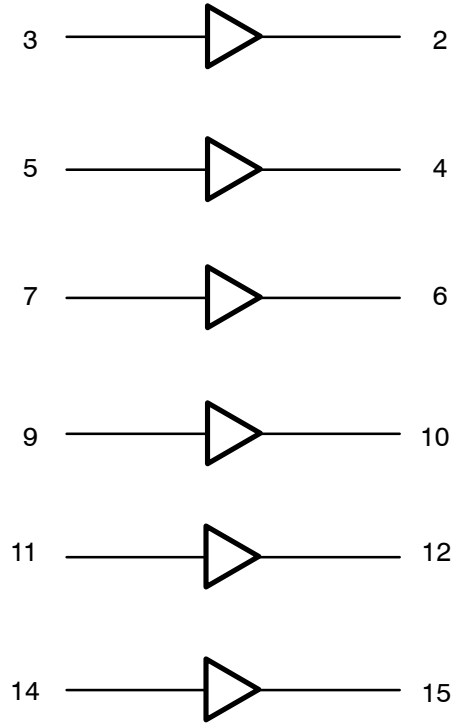
Note 2. The NTE4049/T and NTE4050B/BT have high-to-low-level voltage conversion capability but not low-to-high-level; therefore it is recommended that  $V_{IN} \geq V_{DD}$ .

**NTE4049 & NTE4049T**



NC = Pin 13, 16  
 V<sub>SS</sub> = Pin 8  
 V<sub>DD</sub> = Pin 1

**NTE4050B and NTE4050BT**



NC = Pin 13, 16  
 V<sub>SS</sub> = Pin 8  
 V<sub>DD</sub> = Pin 1

**Static Electrical Characteristics:** (T<sub>A</sub> = +25°C unless otherwise specified)

Parameter	Symbol	Test Conditions			Min	Typ	Max	Unit		
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	V <sub>DD</sub> (V)						
Quiescent Supply Current	I <sub>L</sub>	0 to 5	-	5	-	0.02	-	μA		
		0 to 10	-	10	-	0.02	-	μA		
		0 to 15	-	15	-	0.02	-	μA		
		0 to 20	-	20	-	0.04	-	μA		
Output High Voltage	V <sub>OH</sub>	0 to 5	-	5	4.95	-	-	V		
		0 to 10	-	10	9.95	-	-	V		
		0 to 15	-	15	14.95	-	-	V		
Input High Voltage NTE4049, NTE4049T	V <sub>IH</sub>	-	0.5	5	4	-	-	V		
		-	1.0	10	8	-	-	V		
		-	2.0	15	12	-	-	V		
		NTE4050B, NTE4050BT		-	4.5	5	3.5	-	-	V
		-	9.0	10	7.0	-	-	V		
		-	13.5	15	11.0	-	-	V		

**Static Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Conditions			Min	Typ	Max	Unit
		$V_I$ (V)	$V_O$ (V)	$V_{DD}$ (V)				
Input Low Voltage NTE4049, NTE4049T  NTE4050B, NTE4050BT	$V_{IL}$	-	4.5	5	-	-	1	V
		-	9.0	10	-	-	2	V
		-	13.0	15	-	-	3	V
		-	0.5	5	-	-	1.5	V
		-	1.0	10	-	-	3.0	V
		-	1.5	15	-	-	4.0	V
Output Drive Current	$I_{OH}$	0 to 5	2.5	5	-6.0	-6.4	-	mA
		0 to 5	4.6	5	-3.2	-1.6	-	mA
		0 to 10	9.5	10	-0.8	-3.6	-	mA
		0 to 15	13.5	15	-1.8	-12.0	-	mA
Output Sink Current	$I_{OL}$	0 to 5	0.4	4.5	2.6	5.2	-	mA
		0 to 5	0.4	5	3.2	6.4	-	mA
		0 to 10	0.5	10	8.0	16.0	-	mA
		0 to 15	1.5	15	24.0	48.0	-	mA
Input Leakage Current	$I_{IH}, I_{IL}$	0 to 18	Any Input	18	-	$\pm 10^{-5}$	$\pm 0.1$	$\mu\text{A}$
Input Capacitance NTE4049, NTE4049T  NTE4050B, NTE4050BT	$C_I$	Any Input		-	-	15	22.5	pF
					-	5	7.5	pF

Note 3. The Noise Margin (NTE4050B/BT Only) for both "1" and "0" level is: 1V min. with  $V_{DD} = 5\text{V}$   
 2V min. with  $V_{DD} = 10\text{V}$   
 2.5V min. with  $V_{DD} = 15\text{V}$

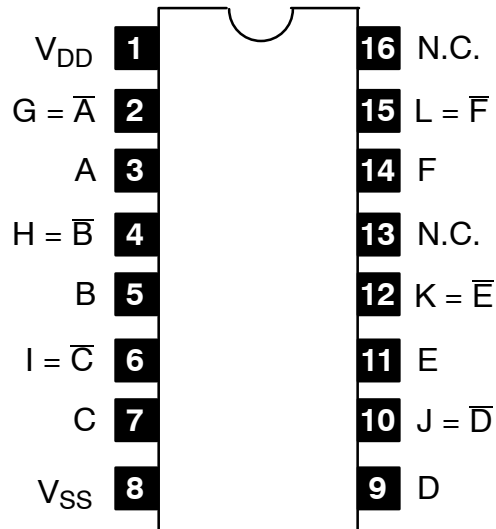
**Dynamic Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $0.3\%/^\circ\text{C}$ , all input rise and fall times = 20ns unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
		$V_I$ (V)	$V_{DD}$ (V)				
Propagation Delay Time NTE4049, NTE4049T  NTE4050B, NTE4050BT	$t_{PLH}$	5	5	-	60	120	ns
		10	10	-	32	65	ns
		10	5	-	45	90	ns
		15	15	-	25	590	ns
		15	5	-	45	90	ns
		5	5	-	70	140	ns
		10	10	-	40	80	ns
		10	5	-	45	90	ns
		15	15	-	30	60	ns
		15	5	-	40	80	ns

**Dynamic Electrical Characteristics (Cont'd):** ( $T_A = +25^\circ\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $0.3\%/^\circ\text{C}$ , all input rise and fall times =  $20\text{ns}$  unless otherwise specified)

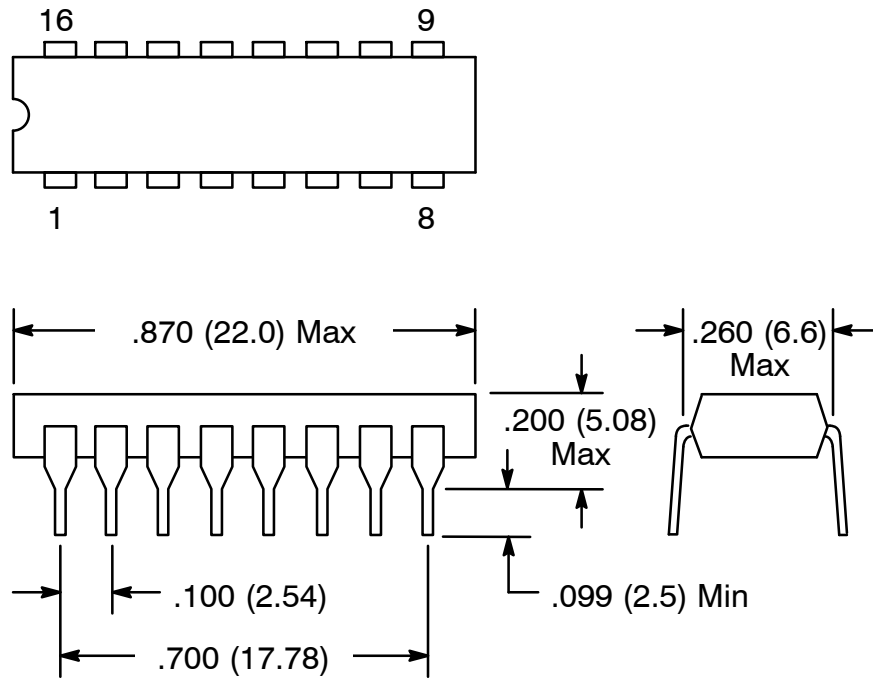
Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
		$V_I$ (V)	$V_{DD}$ (V)				
Propagation Delay Time NTE4049, NTE4049T  NTE4050B, NTE4050BT	$t_{PHL}$	5	5	–	32	65	ns
		10	10	–	20	40	ns
		10	5	–	15	30	ns
		15	15	–	15	30	ns
		15	5	–	10	20	ns
		5	5	–	55	110	ns
		10	10	–	22	55	ns
		10	5	–	50	100	ns
		15	15	–	15	30	ns
		15	5	–	50	100	ns
Transition Time	$t_{TLH}$	5	5	–	80	160	ns
		10	10	–	40	80	ns
		15	15	–	30	60	ns
Transition Time	$t_{THL}$	5	5	–	30	60	ns
		10	10	–	20	40	ns
		15	15	–	15	30	ns

**Pin Connection Diagram**

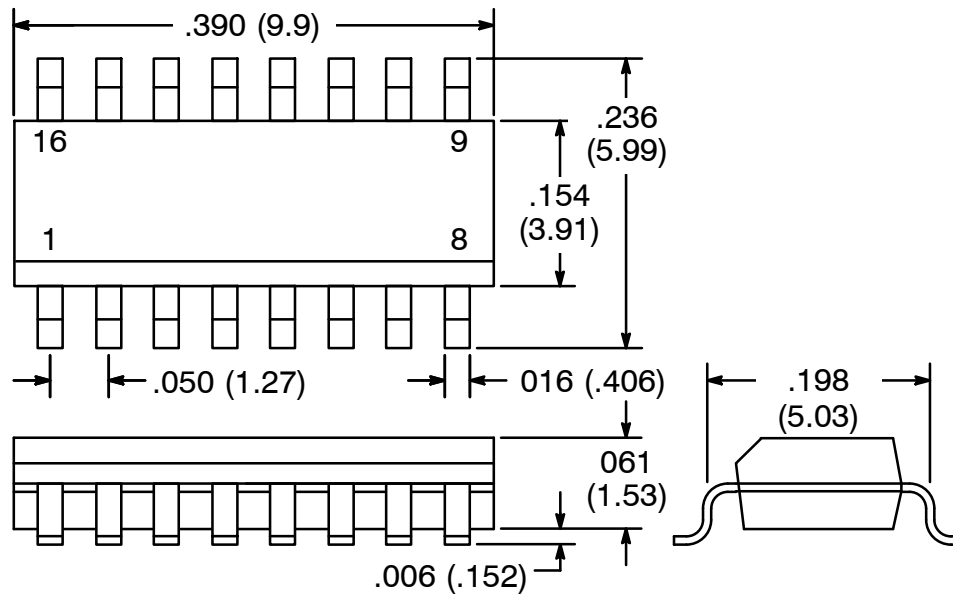


**Note:** On NTE4050B/BT, Pins 2, 4, 6, 10, 12, and 15 are not inverted.

NTE4049 / NTE4050B



NTE4049T / NTE4050BT



NOTE: Pin1 on Beveled Edge