



**ELECTRONICS, INC.**  
 44 FARRAND STREET  
 BLOOMFIELD, NJ 07003  
 (973) 748-5089

## NTE1172 Integrated Circuit Phase–Frequency Detector

**Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

Supply Voltage, $V_{CC}$ .....	7V
Input Voltage, $V_I$ .....	5.5V
Output Voltage, $V_O$ .....	5.5V
Power Dissipation, $P_D$ .....	360mW
Operating Temperature Range, $T_{opr}$ .....	$-15^\circ$ to $+75^\circ\text{C}$
Storage Temperature Range, $T_{stg}$ .....	$-40^\circ$ to $+125^\circ\text{C}$

**Recommended Operating Conditions:**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$		4.75	5.0	5.25	V
Input Voltage, High Level	$V_{IH}$		2.0	–	5.0	V
Input Voltage, Low Level	$V_{IL}$		0	–	0.8	V

**Electrical Characteristics:** ( $T_A = -15^\circ$  to  $+75^\circ\text{C}$ , GND = Pin7, Note 1 unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Low Level Input Current (Pin1)	$I_{IL}$	$V_{CC} = 5.25\text{V}$ , $V_{IL(1)} = 0.4\text{V}$	–	–	–4.8	mA
Low Level Input Current (Pin3)	$I_{IL}$	$V_{CC} = 5.25\text{V}$ , $V_{IL(3)} = 0.4\text{V}$	–	–	–4.8	mA
Low Level Input Current (Pin11)	$I_{IL}$	$V_{CC} = 5.25\text{V}$ , $V_{IL(11)} = 0.4\text{V}$	–	–	–1.6	mA
High Level Input Current (Pin1)	$I_{IH}$	$V_{CC} = 5.25\text{V}$ , $V_{IH(1)} = 2.5\text{V}$	–	–	120	$\mu\text{A}$
High Level Input Current (Pin3)	$I_{IH}$	$V_{CC} = 5.25\text{V}$ , $V_{IH(3)} = 2.5\text{V}$	–	–	120	$\mu\text{A}$
High Level Input Current (Pin11)	$I_{IH}$	$V_{CC} = 5.25\text{V}$ , $V_{IH(11)} = 2.5\text{V}$	–	–	40	$\mu\text{A}$
Low Level Output Voltage (Pin6)	$V_{OL}$	$V_{CC} = 4.75\text{V}$ , $V_{IH(1,3)} = 1.8\text{V}$ , $I_{OL(6)} = 20\text{mA}$	–	–	0.4	V
Low Level Output Voltage (Pin12)	$V_{OL}$	$V_{CC} = 4.75\text{V}$ , $V_{IH(1,3)} = 1.2\text{V}$ , $I_{OL(12)} = 20\text{mA}$	–	–	0.4	V
High Level Output Voltage (Pin6)	$V_{OH}$	$V_{CC} = 4.75\text{V}$ , $V_{IH(1,3)} = 1.8\text{V}$ , $I_{OH(6)} = -1.6\text{mA}$	2.5	–	–	V
High Level Output Voltage (Pin12)	$V_{OH}$	$V_{CC} = 4.75\text{V}$ , $V_{IH(1,3)} = 1.8\text{V}$ , $I_{OH(12)} = -1.6\text{mA}$	2.5	–	–	V
High Level Output Voltage (Pin2)	$V_{OH}$	$V_{CC} = 4.75\text{V}$ , $V_{OL(1,3)} = 1.1\text{V}$ , $I_{OH(2)} = -1.6\text{mA}$ , $I_{OL(13)} = 20\text{mA}$ , Note 2	2.5	–	–	V
Low Level Output Voltage (Pin13)	$V_{OL}$		–	–	0.4	V

Note 1. Pin numbers shown in ( ).

Note 2. This value is measured at Input State 9 of the truth table and varies depending on the situation of sequential logic.

**Electrical Characteristics:** ( $T_A = -15^\circ$  to  $+75^\circ\text{C}$  GND = Pin7, Note 1 unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
High Level Output Voltage (Pin2)	$V_{OH}$	$V_{CC} = 4.75\text{V}$ , $V_{OL(1,3)} = 1.1\text{V}$ , $I_{OH(2)} = -0\text{mA}$ , $I_{OL(13)} = -1.6\text{mA}$ , Note 3	2.5	–	–	V
Low Level Output Voltage (Pin13)	$V_{OL}$		–	–	0.4	V
Short Circuit Output Current (Pin2)	$I_{OS}$	$V_{IH(1)} = 1.8\text{V}$ , GND (2, 3, 7)	–20	–	–65	mA
Short Circuit Output Current (Pin6)	$I_{OS}$	$V_{CC} = 5\text{V}$ , GND (1, 3, 6, 7)	–20	–	–65	mA
Short Circuit Output Current (Pin12)	$I_{OS}$	$V_{CC} = 5\text{V}$ , GND (1, 3, 7, 12)	–20	–	–65	mA
Short Circuit Output Current (Pin13)	$I_{OS}$	$V_{CC} = 5\text{V}$ , $V_{IH(1)} = 1.8\text{V}$ , GND (3, 7, 13)	–20	–	–65	mA
Output Voltage (Pin10)	$V_{EH}$	$I_{OH(10)} = -1\text{mA}$ , $V_{IL(11)} = 1.1\text{V}$	1.5	–	–	V
Output Current (Pin8)	$I_O$	$V_{CC(8)} = 5.25\text{V}$ , $I_{A(9)} = 2\mu\text{A}$	0.8	–	–	mA
Output Leakage Current (Pin2)	$I_{OLK}$	$V_{CC(2,14)} = 5\text{V}$ , $V_{IH(1)} = 1.8\text{V}$ , GND (3, 7)	–	–	250	$\mu\text{A}$
Output Leakage Current (Pin6)	$I_{OLK}$	$V_{CC(6,14)} = 5\text{V}$ , GND (1, 3, 9)	–	–	250	$\mu\text{A}$
Output Leakage Current (Pin12)	$I_{OLK}$	$V_{CC(12,14)} = 5\text{V}$ , GND (1, 3, 7)	–	–	250	$\mu\text{A}$
Output Leakage Current (Pin13)	$I_{OLK}$	$V_{CC(2,14)} = 5\text{V}$ , $V_{IH(1)} = 1.8\text{V}$ , GND (3, 7)	–	–	250	$\mu\text{A}$
Collector–Emitter Voltage	$V_{CE}$	$I_{in(15)} = 1\text{mA}$ , GND (4, 7)	0.5	–	–	V
Output Leakage Current (Pin8)	$I_{OLK}$	$V_{CC(8)} = 5.25\text{V}$ , GND (7, 9)	–	–	120	$\mu\text{A}$
Output Leakage Current (Pin10)	$I_{OLK}$	$V_{CC} = 5.25\text{V}$ , $V_{IH(11)} = 2.5\text{V}$ , $V_{O(10)} = 1.5\text{V}$	–	–	5	$\mu\text{A}$
Supply Current	$I_{CC}$	$V_{CC} = 5\text{V}$	–	–	40	mA
<b>Switching Characteristics</b>						
Maximum Count Pulse Frequency	$f_{max1}$	$C_L = 15\text{pF}$ , $R_L = 300\Omega$	–	30	–	MHz
	$f_{max2}$		–	30	–	MHz
Propagation Delay Time	$t_{PHL1}$		–	13	–	ns
	$t_{PLH1}$		–	19	–	ns
	$t_{PHL2}$		–	4.5	–	ns
	$t_{PLH2}$		–	10	–	ns

Note 1. Pin numbers shown in ( ).

Note 2. This value is measured at Input State 13 of the truth table and varies depending on the situation of sequential logic.

**Truth Table:** (0 = L, 1 = H, X = Don't Care)

Input State	Input		Output			
	Ref	Variable	Upper 1	Down 1	Upper 2	Down2
1	0	0	X	X	1	1
2	1	0	X	X	0	1
3	1	1	X	X	1	0
4	1	0	X	X	0	1
5	0	0	X	X	1	1
6	1	0	X	X	0	1
7	0	0	X	X	1	1
8	1	0	X	X	0	1
9	0	0	0	1	1	1
10	0	1	0	1	1	1
11	0	0	1	1	1	1
12	0	1	1	1	1	1
13	0	0	1	0	1	1
14	0	1	1	0	1	1
15	0	0	1	0	1	1
16	1	0	1	0	0	1
17	0	0	1	1	1	1

**Pin Connection Diagram**



