NTE1172
Integrated Circuit
Phase–Frequency Detector

Absolute Maximum Ratings: (T_A = +25°C unles 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° to +75°C
Storage Temperature Range, T_{stg} .... −40° to +125°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 Charactersitics: (T_A = −15° to +75°C, GND = Pin7, Note 1 unless otherwsie specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Low Level Input Current (Pin1)	I_{IL}	V_{CC} = 5.25V, $V_{IL(1)}$ = 0.4V	–	–	−4.8	mA
Low Level Input Current (Pin3)	I_{IL}	V_{CC} = 5.25V, $V_{IL(3)}$ = 0.4V	–	–	−4.8	mA
Low Level Input Current (Pin11)	I_{IL}	V_{CC} = 5.25V, $V_{IL(11)}$ = 0.4V	–	–	−1.6	mA
High Level Input Current (Pin1)	I_{IH}	V_{CC} = 5.25V, $V_{IH(1)}$ = 2.5V	–	–	120	μA
High Level Input Current (Pin3)	I_{IH}	V_{CC} = 5.25V, $V_{IH(3)}$ = 2.5V	–	–	120	μA
High Level Input Current (Pin11)	I_{IH}	V_{CC} = 5.25V, $V_{IH(11)}$ = 2.5V	–	–	40	μA
Low Level Output Voltage (Pin6)	V_{OL}	V_{CC} = 4.75V, $V_{IH(1,3)}$ = 1.8V, $I_{OL(6)}$ = 20mA	–	–	0.4	V
Low Level Output Voltage (Pin12)	V_{OL}	V_{CC} = 4.75V, $V_{IH(1,3)}$ = 1.2V, $I_{OL(12)}$ = 20mA	–	–	0.4	V
High Level Output Voltage (Pin6)	V_{OH}	V_{CC} = 4.75V, $V_{IH(1,3)}$ = 1.8V, $I_{OH(6)}$ = −1.6mA	2.5	–	–	V
High Level Output Voltage (Pin12)	V_{OH}	V_{CC} = 4.75V, $V_{IH(1,3)}$ = 1.8V, $I_{OH(12)}$ = −1.6mA	2.5	–	–	V
High Level Output Voltage (Pin2)	V_{OH}	V_{CC} = 4.75V, $V_{OL(1,3)}$ = 1.1V, $I_{OH(2)}$ = −1.6mA, $I_{OL(13)}$ = 20mA, 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 Charactersitics: ($T_A = -15°$ to $+75°C$ GND = Pin7, Note 1 unless otherwsie specified)

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

Reference	**1**	**14**	V_{CC}
Down 1	**2**	**13**	Upper 1
Variable	**3**	**12**	Upper 2
Charge Pump Upper	**4**	**11**	Charge Pump Down
Charge Pump Upper	**5**	**10**	Charge Pump Down
Down 2	**6**	**9**	Filter Amp
GND	**7**	**8**	Filter Amp

14   8

1   7

.785 (19.95) Max

.300 (7.62)

.200 (5.08)
Max

.100 (2.45)

.099 (2.5) Min

.600 (15.24)