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NTE974
Integrated Circuit
Phase–Frequency Detector

Description:

The NTE974 consists of two digital phase detectors, a charge pump, and an amplifier. In combination with a voltage controlled multivibrator, it is useful in a broad range of phase–locked loop applications. The circuit accepts MTTL waveforms at the R and V inputs and generates an error voltage that is proportional to the frequency and/or phase difference of the input signals. Phase detector #1 is intended for use in systems requiring zero frequency and phase difference at lock. Phase detector #2 is used if quadrature lock is desired. Phase detector #2 can also be used to indicate that the main loop, utilizing phase detector #1, is out of lock.

Absolute Maximum Ratings:

Supply Operating Voltage Range . . . . . 4.75 to 5.25V
Supply Voltage, V_{CC} . . . . . +7.0V
Input Voltage, V_I . . . . . +5.5V
Output Voltage, V_O . . . . . +5.5V
Operating Temperature Range, T_{opr} . . . . . 0° to +75°C
Storage Temperature Range, T_{stg} . . . . . –55° to +125°C
Maximum Junction Temperature, T_J . . . . . +150°C
Thermal Resistance, Junction–to–Case, R_{thJC} . . . . . 0.07°C/mW
Thermal Resistance, Junction–to–Ambient, R_{thJA} . . . . . 0.15°C/mW

Electrical Characteristics: (T_A = +25°C unless otherwise spcified)

Parameter	Symbol	Pin	Test Conditions	Min	Typ	Max	Unit
Input							
Forward Current	I_{IL}	1, 3	V_{IL} = 0.4V, V_{CCH} = 5.25V	–	–	–4.8	mA
		11		–	–	–1.6	mA
Leakage Current	I_{IH}	1, 3	V_{IH} = 5.5V, V_{CCH} = 5.25V	–	–	120	µA
		4	V_{CCH} = 5.25V	–	–	5.0	µA
		11	V_{IH} = 5.5V, V_{CCH} = 5.25V	–	–	40	µA
	I_{IHH}	1, 3, 11	V_{IHH} = 5.5V, V_{CCH} = 5.25V	1.0	–	–	mA
Clamp Voltage	V_{IC}	1, 3	I_{IC} = –10 mA, V_{CCL} = 4.75V	–	–	–1.5	V

Note 1. The outputs of the device must be tested by sequencing through the indicated input states according to the truth table. All input, power supply, and ground voltages must be maintained between tests unless otherwise noted.

Note 2. Input Loading Factor: R, V = 3
Output Loading Factor (Pin8) = 10
Total Power Dissipation = 85mW Typ/Pkg
Propagation Delay Time = 9ns Typ (thru phase detector)

Electrical Characteristics (Cont'd): (T_A = +25°C unless otherwise spcified)

Parameter	Symbol	Pin	Test Conditions	Min	Typ	Max	Unit
Output (Note 1)							
Ouput Voltage	V_{OH}	6, 12	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	6	I_{OL} = 20mA, V_{IHT} = 1.8V, V_{CCL} = 4.75V	–	–	0.4	V
	V_{OH}	12	I_{OH1} = –1.6mA, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OH}	6	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	12	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	–	–	0.4	V
	V_{OH}	2	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	13	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	–	–	0.4	V
	V_{OH}	2	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	13	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	–	–	0.4	V
	V_{OH}	2, 13	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OH}	2, 13	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	2	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	–	–	0.4	V
	V_{OH}	13	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	2	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	–	–	0.4	V
	V_{OH}	13	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OL}	2	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	2.5	–	–	V
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	V_{OL}	2	I_{OL} = 20mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OH}	13	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{IHT} = 1.8V, V_{CCL} = 4.75V	2.5	–	–	V
	V_{OH}	2, 13	I_{OH1} = –1.6mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	2.5	–	–	V
Short Circuit Current	I_{OS}	2	V_{IHT} = 1.8V	–20	–	–65	mA
		6, 12	V_{CC} = 5V	–20	–	–65	mA
		13	V_{IHT} = 1.8V, V_{CC} = 5V	–20	–	–65	mA
Collector–Emitter Voltage	I_{OLK}	2, 13	V_{IHT} = 1.8V, V_{CC} = 5V	–	–	250	µA
		6, 12	V_{CC} = 5V	–	–	250	µA
Output Voltage	V_{EH}	10	I_{OH2} = –1.0mA, V_{ILT} = 1.1V, V_{CCL} = 4.75V	1.5	–	–	V
Output Current	I_O	8	I_A = 0.002mA, V_{CCH} = 5.25V	0.8	–	–	mA
Leakage Current	I_{OLK}	8	V_{CCH} = 5.25V	–	–	120	µA
		10	V_{IH} = 2.5V, V_{out} = 1.5V, V_{CCH} = 5.25V	–	–	5.0	µA
Power Requirements (Total Device)							
Power Supply Drain	I_{CC}	14	V_{CC} = 5V	–	–	40	mA

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Note 2. Input Loading Factor: R, V = 3
Output Loading Factor (Pin8) = 10
Total Power Dissipation = 85mW Typ/Pkg
Propagation Delay Time = 9ns Typ (thru phase detector)

Pin Connection Diagram