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NTE74LS90 Integrated Circuit TTL– Decade Counter 14–Lead DIP

Description:

The NTE74LS90 is a monolithic counter in a 14–Lead DIP type package that contains four master–slave flip–flops and additional gating to provide a divide–by–two counter and a three–stage binary counter for which the count cycle length is divide–by–five.

The counter has a gated zero reset and also has gated set–to–nine inputs for use in BDC nine’s complement applications.

To use the maximum count length (decade or four–bit binary), the B input is connected to the Q_A output. The input count pulses are applied to input A and the outputs are as described in the appropriate Function Table. A symmetrical divide–by–ten count can be obtained from the counter by connecting the Q_D output to the A input and applying the input count to the B input which gives a divide–by–ten square wave at output Q_A .

Features:

- Typical Power Dissipation: 145mW

Absolute Maximum Ratings: ($T_A = 0^\circ$ to $+70^\circ\text{C}$ unless otherwise specified)

Supply Voltage (Note 1)	7V
Input Voltage	
R Inputs	7V
A and B Inputs	5.5V
Operating Free–Air Temperature Range	0° to $+70^\circ\text{C}$
Storage Temperature Range	-65° to $+150^\circ\text{C}$

Note 1. Voltage values are with respect to network ground terminal.

Recommended Operating Conditions:

Parameter		Symbol	Min	Typ	Max	Unit
Supply Voltage		V_{CC}	4.75	5.0	5.25	V
HIGH Level Output Current		I_{OH}	–	–	–400	μA
LOW Level Output Current		I_{OL}	–	–	8	mA
Count Frequency	A Input	f_{count}	0	–	32	MHz
	B Input		0	–	16	MHz
Pulse Width	A Input	t_W	15	–	–	ns
	B Input		30	–	–	ns
	Reset Inputs		30	–	–	ns
Reset Inactive–State Setup Time		t_{su}	25	–	–	ns
Operating Free Air Temperature		T_A	0	–	70	$^\circ\text{C}$

DC Electrical Characteristics: ($T_A = 0^\circ$ to $+70^\circ\text{C}$, Note 2, Note 3 unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
HIGH Level Input Voltage	V _{IH}			2	–	–	V
LOW Level Input Voltage	V _{IL}			–	–	0.8	V
Input Clamp Voltage	V _{IK}	V _{CC} = Min, I _I = –18mA		–	–	–1.5	V
HIGH Level Output Voltage	V _{OH}	V _{CC} = Min, I _{OH} = –400μA, V _{IL} = Max, V _{IH} = 2V		2.7	3.4	–	V
LOW Level Output Voltage	V _{OL}	V _{CC} = Min, V _{IH} = 2V, V _{IL} – Max, Note 5	I _{OL} = 4mA	–	0.25	0.4	V
			I _{OL} = 8mA	–	0.35	0.5	V
Input Current at Max Input Voltage	I _I	V _{CC} = Max, V _I = 7V V _{CC} = Max, V _I = 5.5V	Any Reset	–	–	0.1	mA
			A Input	–	–	0.2	mA
			B Input	–	–	0.4	mA
HIGH Level Input Current	I _{IH}	V _{CC} = Max, V _I = 2.7V	Any Reset	–	–	20	μA
			A Input	–	–	40	μA
			B Input	–	–	80	μA
LOW Level Input Current	I _{IL}	V _{CC} = Max, V _I = 0.4V	Any Reset	–	–	–0.4	mA
			A Input	–	–	–2.4	mA
			B Input	–	–	–3.2	mA
Short–Circuit Output Current	I _{OS}	V _{CC} = Max, Note 4		–20	–	–100	mA
Supply Current	I _{CC}	V _{CC} = Max, Note 6		–	9	15	mA

Note 2. For conditions shown as MIN or MAX, use the appropriate value specified under “Recommended Operating Conditions”.

Note 3. All typicals are at $V_{CC} = +5\text{V}$, $T_A = +25^\circ\text{C}$.

Note 4. Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second

Note 5. Q_A outputs are tested at I_{OL} plus the limit value of I_{IL} for the B input. This permits driving the B input while maintaining full fan-out capability.

Note 6. I_{CC} is measured with all outputs open, both R_O inputs grounded following momentary connection to 4.5V, and all other o=inputs grounded.

Switching Characteristics: ($V_{CC} = +5\text{V}$, $T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	From (Input) To (Output)	$R_L = 2\text{k}\Omega$, $C_L = 15\text{pF}$			Unit
			Min	Typ	Max	
Maximum Clock Frequency	f_{MAX}	A to Q_A	32	42	–	MHz
		B to Q_B	16	–	–	MHz
Propagation Delay Time LOW-to-HIGH Level Output	t_{PLH}	A to Q_A	–	10	16	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	A to Q_A	–	12	18	ns
Propagation Delay Time LOW-to-HIGH Level Output	t_{PLH}	A to Q_D	–	32	48	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	A to Q_D	–	34	50	ns
Propagation Delay Time LOW-to-HIGH Level Output	t_{PLH}	B to Q_B	–	10	16	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	B to Q_B	–	14	21	ns
Propagation Delay Time LOW-to-HIGH Level Output	t_{PLH}	B to Q_C	–	21	32	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	B to Q_C	–	23	35	ns
Propagation Delay Time LOW-to-HIGH Level Output	t_{PLH}	B to Q_D	–	21	32	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	B to Q_D	–	23	35	ns

Switching Characteristics (Con't): ($V_{CC} = +5V$, $T_A = +25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	From (Input) To (Output)	$R_L = 2k\Omega$, $C_L = 15pF$			Unit
			Min	Typ	Max	
Propagation Delay Time LOW-to-HIGH Level Output	t_{PLH}	SET-9 to Q_A , Q_D	–	20	30	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	SET-9 to Q_B , Q_C	–	26	40	ns
Propagation Delay Time HIGH-to-LOW Level Output	t_{PHL}	SET-0 Any Q	–	26	40	ns

Function Tables:**BCD Count Sequence:** (Note 7)

Count	Outputs			
	Q_D	Q_C	Q_B	Q_A
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H

BCD Bi-Quinary: (Note 8)

Count	Outputs			
	Q_A	Q_D	Q_C	Q_B
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	H	L	L	L
6	H	L	L	H
7	H	L	H	L
8	H	L	H	H
9	H	H	L	L

H = HIGH Logic Level

L = LOW Logic Level

X = Don't Care

Note 7. Output Q_A is connected to input B for BCD count.Note 8. Output Q_D is connected to input A for bi-quinary count.

Function Tables (Cont'd):

Reset/Count Function Table:

Reset Inputs				Outputs			
R ₀ (1)	R ₀ (2)	R ₉ (1)	R ₉ (2)	Q _D	Q _C	Q _B	Q _A
H	H	L	X	L	L	L	L
H	H	X	L	L	L	L	L
X	X	H	H	H	L	L	H
X	L	X	L	COUNT			
L	X	L	X	COUNT			
L	X	X	L	COUNT			
X	L	L	X	COUNT			

H = HIGH Logic Level

L = LOW Logic Level

X = Don't Care

Pin Connection Diagram

