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NTE74182 Integrated Circuit TTL – Look-Ahead Carry Generator

Description:

The NTE74182 is a high-speed, look-ahead carry generator in a 16-Lead plastic DIP type package capable of anticipating a carry across four binary adders or group of adders. It is capable of performing full look-ahead across n-bit adders. Carry, generate-carry, and propagate-carry functions are provided as enumerated in the pin designation table.

When used in conjunction with the NTE74181, NTE74LS181, or NTE74S181 arithmetic logic unit (ALU), this generator provides high-speed carry look-ahead capability for any word length. This device generates look-ahead (anticipated carry) across a group of four ALU's and, in addition, other carry look-ahead circuits may be employed to anticipate carry across sections of four look-ahead packages up to n-bits.

Logic equations for this device are:

$$\begin{aligned}
 C_{n+x} &= G_0 + P_0 C_n \\
 C_{n+y} &= G_1 + P_1 G_0 + P_1 P_0 C_n \\
 C_{n+z} &= G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_n \\
 \overline{C}_{n+z} &= \overline{G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_n} \\
 \overline{G} &= \overline{G_3 + P_3 G_2 + P_3 P_2 G_1 + P_3 P_2 P_1 G_0} \\
 \overline{P} &= \overline{P_3 P_2 P_1 P_0}
 \end{aligned}$$

or

$$\begin{aligned}
 \overline{C}_{n+x} &= \overline{Y_0 (X_0 + C_n)} \\
 \overline{C}_{n+y} &= \overline{Y_1 [X_1 + Y_0 (X_0 + C_n)]} \\
 \overline{C}_{n+z} &= \overline{Y_1 \{X_2 + Y_1 [X_1 + Y_0 (X_0 + C_n)]\}} \\
 Y &= Y_3 (X_3 + Y_2) (X_3 + X_2 + Y_1) (X_3 + X_2 + X_1 + Y_0) \\
 X &= X_3 + X_2 + X_1 + X_0
 \end{aligned}$$

Features:

- Directly Compatible for Use With:
 NTE74181, NTE74LS181

Absolute Maximum Ratings: (Note 1)

Supply Voltage, V _{CC}	7V
DC Input Voltage, V _{IN}	5.5V
Interemitter Voltage (Note 2)	5.5V
Operating Temperature Range, T _A	0°C to +70°C
Storage Temperature Range, T _{stg}	-65°C to +150°C

- Note 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.
 Note 2. This is the voltage between two emitters of a multiple-emitter input transistor. For this circuit, this rating applies to each \overline{G} input in conjunction with any other \overline{G} input or in conjunction with any \overline{P} input.

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}	-	-	-800	μA
Low-Level Output Current	I_{OL}	-	-	16	mA
Operating Temperature Range	T_A	0	-	+70	$^{\circ}C$

Electrical Characteristics: (Note 3, Note 4)

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}	$V_{CC} = \text{MIN}, I_I = -12\text{mA}$	-	-	-1.5	V
High-Level Output Voltage	V_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = 0.8\text{V}, I_{OH} = -800\mu A$	2.4	3.4	-	V
Low-Level Output Voltage	V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = 0.8\text{V}, I_{OL} = 16\text{mA}$	-	0.2	0.4	V
Input Current	I_I	$V_{CC} = \text{MAX}, V_I = 5.5\text{V}$	-	-	1	mA
High-Level Input Current C_n Input	I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.4\text{V}$	-	-	80	μA
$\overline{P}3$ Input			-	-	120	μA
$\overline{P}2$ Input			-	-	160	μA
$\overline{P}0, \overline{P}1,$ or $\overline{G}3$ Input			-	-	200	μA
$\overline{G}0$ or $\overline{G}2$ Input			-	-	360	μA
$\overline{G}1$ Input			-	-	400	μA
Low-Level Input Current C_n Input	I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4\text{V}$	-	-	-3.2	mA
$\overline{P}3$ Input			-	-	-4.8	mA
$\overline{P}2$ Input			-	-	-6.4	mA
$\overline{P}0, \overline{P}1,$ or $\overline{G}3$ Input			-	-	-8.0	mA
$\overline{G}0$ or $\overline{G}2$ Input			-	-	-14.4	mA
$\overline{G}1$ Input			-	-	-16.0	mA
Short-Circuit Output Current	I_{OS}	$V_{CC} = \text{MAX}, \text{Note 5}$	-40	-	-100	mA
Supply Current	I_{CCH}	$V_{CC} = 5\text{V}, \text{Note 6}$	-	27	-	mA
	I_{CCL}	$V_{CC} = \text{MAX}, \text{Note 7}$	-	45	72	mA

Note 3. For conditions shown as MIN or MAX, use the appropriate value specified under "Recommended Operation Conditions".

Note 4. All typical values are at $V_{CC} = 5\text{V}, T_A = +25^{\circ}C$.

Note 5. Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

Note 6. I_{CCH} is measured with all outputs open, inputs $\overline{P}3$ and $\overline{G}3$ at 4.5V, and all other inputs grounded.

Note 7. I_{CCL} is measured with all outputs open, inputs $\overline{G}0, \overline{G}1,$ and $\overline{G}2$ at 4.5V, and all other inputs grounded.

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Propagation Delay Time	t_{PLH}		-	11	17	ns
	t_{PHL}		-	15	22	ns

Function Table for \bar{G} Output:

Inputs							Output
G3	G2	G1	G0	P3	P2	P1	G
L	X	X	X	X	X	X	L
X	L	X	X	L	X	X	L
X	X	L	X	L	L	X	L
X	X	X	L	L	L	L	L
All other combinations							H

Function Table for P Output:

Inputs				Output
P3	P2	P1	P0	P
L	L	L	L	L
All other combinations				H

Function Table for C_{n+x} Output:

Inputs			Output
G0	P0	C_n	C_{n+x}
L	X	X	H
X	L	H	H
All other combinations			L

Function Table for C_{n+y} Output:

Inputs					Output
G1	G0	P1	P0	C_n	C_{n+y}
L	X	X	X	X	H
X	L	L	X	X	H
X	X	L	L	H	H
All other combinations					L

Function Table for C_{n+z} Output:

Inputs							Output
G2	G1	G0	P2	P1	P0	C_n	C_{n+z}
L	X	X	X	X	X	X	H
X	L	X	L	X	X	X	H
X	X	L	L	L	X	X	H
X	X	X	L	L	L	H	H
All other combinations							L

H = HIGH Level, L = LOW Level, X = Irrelevant
 Any inputs not shown in a given table are irrelevant with respect to that output.

