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ECL Products	

# 10179

## Look-Ahead Carry Block

### FEATURES

- Typical propagation delay: 2.3ns
- Typical supply current ( $-I_{EE}$ ): 58mA

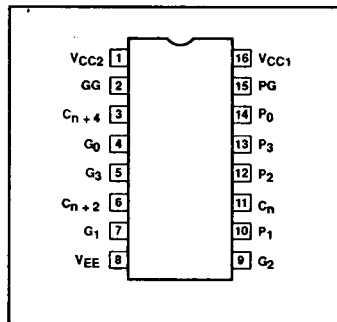
### DESCRIPTION

The 10179 is a Look-Ahead Carry Block. It can be used in conjunction with the 10181 4-bit arithmetic/logic unit to perform a high order look-ahead carry, in applications requiring high-speed arithmetic operation on long words. All unused inputs can be left open due to integrated pull-down resistors, which avoid the need for a supply voltage.

### ORDERING INFORMATION

DESCRIPTION	ORDER CODE
16-Pin Plastic DIP	10179N
16-Pin Ceramic DIP	10179F

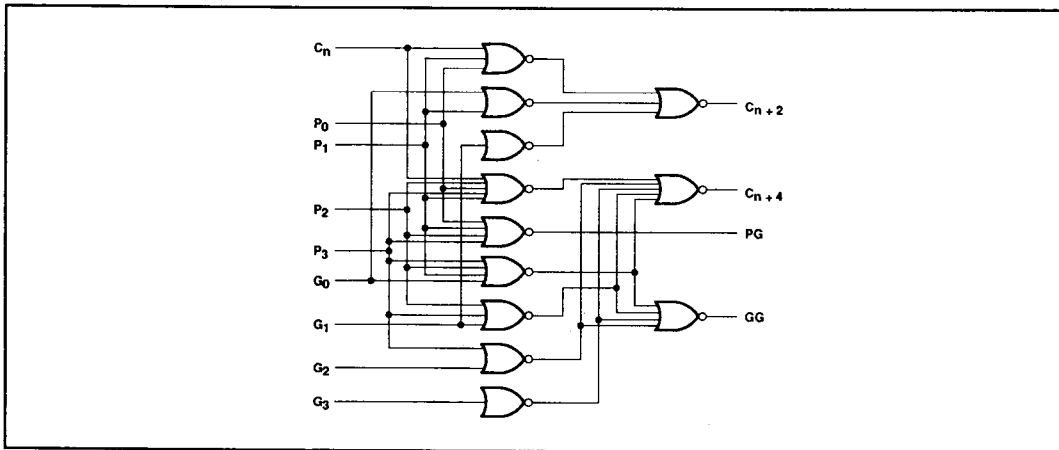
### PIN CONFIGURATION



### PIN DESCRIPTION

PINS	DESCRIPTION
$C_n$	Carry Input
$P_0 - P_3$	Carry Propagate Inputs
$G_0 - G_3$	Carry Generate Inputs
$C_{n+2}, C_{n+4}$	Carry Outputs
PG	Carry Propagate Output
GG	Carry Generate Output

### LOGIC DIAGRAM



### LOGIC FUNCTIONS

$PG = P_1 + P_2 + P_3 + P_4, P_n = P_{n-1}$   
 $GG = G_4 (G_3 + P_4) (G_2 + P_3 + P_4) (G_1 + P_2 + P_3 + P_4), G_n = G_{n-1}, P_n = P_{n-1}$   
 $C_{n+2} = G_2 (G_1 + P_2) (C_n + P_1 + P_2), G_n = G_{n-1}, P_n = P_{n-1}$   
 $C_{n+4} = G_4 (G_3 + P_4) (G_2 + G_3 + P_4) (G_1 + P_2 + P_3 + P_4) (C_n + P_1 + P_2 + P_3 + P_4), G_n = G_{n-1}, P_n = P_{n-1}$

The overall carry function is invariant with the polarity (positive or negative) of the logic if the P and G inputs are interchanged.

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## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER		LIMITS	UNIT
$V_{EE}$	Supply voltage		-8.0	V
$V_{IN}$	Input voltage ( $V_{IN}$ should never be more negative than $V_{EE}$ )		0 to $V_{EE}$	V
$I_O$	Output source current (continuous)		-50	mA
$T_S$	Storage temperature range		-55 to +150	°C
$T_J$	Maximum junction temperature	Ceramic Package	+165	°C
		Plastic Package	+150	°C

## NOTE:

Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted, these limits are specified over the operating ambient temperature range.

## DC OPERATING CONDITIONS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			MIN.	NOM.	MAX.	
$V_{CC1}, V_{CC2}$	Circuit ground		0	0	0	V
$V_{EE}$	Supply voltage (negative)			-5.2		V
$V_{IH}$	High level input voltage	$T_A = -30^\circ\text{C}$			-890	mV
		$T_A = +25^\circ\text{C}$			-810	mV
		$T_A = +85^\circ\text{C}$			-700	mV
$V_{IHT}$	High level input threshold voltage	$T_A = -30^\circ\text{C}$	-1205			mV
		$T_A = +25^\circ\text{C}$	-1105			mV
		$T_A = +85^\circ\text{C}$	-1035			mV
$V_{ILT}$	Low level input threshold voltage	$T_A = -30^\circ\text{C}$			-1500	mV
		$T_A = +25^\circ\text{C}$			-1475	mV
		$T_A = +85^\circ\text{C}$			-1440	mV
$V_{IL}$	Low level input voltage	$T_A = -30^\circ\text{C}$	-1890			mV
		$T_A = +25^\circ\text{C}$	-1850			mV
		$T_A = +85^\circ\text{C}$	-1825			mV
$T_A$	Operating ambient temperature range		-30	+25	+85	°C

## NOTE:

When operating at other than the specified  $V_{EE}$  voltage (-5.2V), the DC and AC Electrical Characteristics will vary slightly from specified values.

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**DC ELECTRICAL CHARACTERISTICS**  $V_{CC1} = V_{CC2} = \text{ground}$ ,  $V_{EE} = -5.2V \pm 0.010V$ ,  $T_A = -30^\circ\text{C}$  to  $+85^\circ\text{C}$  output loading  $50\Omega$  to  $-2.0V \pm 0.010V$  unless otherwise specified<sup>1,3</sup>

SYMBOL	PARAMETER	TEST CONDITIONS <sup>2</sup>		LIMITS			UNIT	
		MIN.	TYP.	MAX.				
$V_{OH}$	High level output voltage	$T_A = -30^\circ\text{C}$	For GG output, apply $V_{IHMAX}$	-1060		-890	mV	
		$T_A = +25^\circ\text{C}$	to all $G_n$ inputs with $V_{ILMIN}$	-960		-810	mV	
		$T_A = +85^\circ\text{C}$	applied to all other inputs.	-890		-700	mV	
$V_{OHT}$	High level output threshold voltage	$T_A = -30^\circ\text{C}$	For GG output, apply $V_{IHT}$ to each	-1080			mV	
		$T_A = +25^\circ\text{C}$	$G_n$ input, one at a time, $V_{IHMAX}$	-980			mV	
		$T_A = +85^\circ\text{C}$	applied to all other $G_n$ inputs.	-910			mV	
$V_{OLT}$	Low level output threshold voltage	$T_A = -30^\circ\text{C}$	For GG output, apply $V_{ILT}$			-1655	mV	
		$T_A = +25^\circ\text{C}$	to $G_3$ input with $V_{IHMAX}$			-1630	mV	
		$T_A = +85^\circ\text{C}$	applied to all other inputs.			-1595	mV	
$V_{OL}$	Low level output voltage	$T_A = -30^\circ\text{C}$	For GG output, apply $V_{ILMIN}$	-1890		-1675	mV	
		$T_A = +25^\circ\text{C}$	to all $G_n$ inputs with $V_{IHMAX}$	-1850		-1650	mV	
		$T_A = +85^\circ\text{C}$	applied to all other inputs.	-1825		-1615	mV	
$I_{IH}$	High level input current	$G_0, G_1, C_n$ inputs	$T_A = -30^\circ\text{C}$	Apply $V_{IHMAX}$ to each input under test, one at a time, with $V_{ILMIN}$ applied to all other inputs.			430	$\mu\text{A}$
			$T_A = +25^\circ\text{C}$				270	$\mu\text{A}$
			$T_A = +85^\circ\text{C}$				270	$\mu\text{A}$
		$G_2, G_3$ inputs	$T_A = -30^\circ\text{C}$				360	$\mu\text{A}$
			$T_A = +25^\circ\text{C}$				225	$\mu\text{A}$
			$T_A = +85^\circ\text{C}$				225	$\mu\text{A}$
		$P_0$ input	$T_A = -30^\circ\text{C}$	Apply $V_{IHMAX}$ to $P_0$ input			565	$\mu\text{A}$
			$T_A = +25^\circ\text{C}$	with $V_{ILMIN}$ applied			355	$\mu\text{A}$
			$T_A = +85^\circ\text{C}$	to all other inputs.			355	$\mu\text{A}$
		$P_1, P_3$ inputs	$T_A = -30^\circ\text{C}$	Apply $V_{IHMAX}$ to each input under			700	$\mu\text{A}$
			$T_A = +25^\circ\text{C}$	test, one at a time, with $V_{ILMIN}$			440	$\mu\text{A}$
			$T_A = +85^\circ\text{C}$	applied to all other inputs.			440	$\mu\text{A}$
$P_2$ input	$T_A = -30^\circ\text{C}$	Apply $V_{IHMAX}$ to $P_3$ input			630	$\mu\text{A}$		
	$T_A = +25^\circ\text{C}$	with $V_{ILMIN}$ applied to all			395	$\mu\text{A}$		
	$T_A = +85^\circ\text{C}$	other inputs.			395	$\mu\text{A}$		
$I_{IL}$	Low level input current	$T_A = -30^\circ\text{C}$	Apply $V_{ILMIN}$ to each input under	0.5			$\mu\text{A}$	
		$T_A = +25^\circ\text{C}$	test, one at a time, with $V_{IHMAX}$	0.5			$\mu\text{A}$	
		$T_A = +85^\circ\text{C}$	applied to all other inputs.	0.3			$\mu\text{A}$	
$-I_{EE}$	$V_{EE}$ supply current	$T_A = -30^\circ\text{C}$				79	mA	
		$T_A = +25^\circ\text{C}$			58	72	mA	
		$T_A = +85^\circ\text{C}$				79	mA	

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## DC ELECTRICAL CHARACTERISTICS (Continued)

SYMBOL	PARAMETER	TEST CONDITIONS <sup>2</sup>	LIMITS			UNIT
			MIN.	TYP.	MAX.	
$\frac{\Delta V_{OH}}{\Delta V_{EE}}$	High level output voltage compensation	$T_A = +25^\circ\text{C}$		0.016		V/V
$\frac{\Delta V_{OL}}{\Delta V_{EE}}$	Low level output voltage compensation			0.250		V/V
$\frac{\Delta V_{BB}}{\Delta V_{EE}}$	Reference bias voltage compensation			0.148		V/V

**NOTES:**

1. The specified limits represent the worst case values for the parameter. Since these worst case values normally occur at the supply voltage and temperature extremes, additional noise immunity can be achieved by decreasing the allowable operating condition ranges.
2. Conditions for testing shown in the tables are not necessarily worst case. For worst case testing guidelines, refer to DC Testing, Chapter 1, Section 3.
3. The specified limits shown in the DC Electrical Characteristics table can be met only after thermal equilibrium has been established. Thermal equilibrium is established by applying power for at least 2 minutes, while maintaining transverse airflow of 2.5 meters/sec (500 linear feet/min) over the device, mounted either in a test socket or on a printed circuit board. Test voltage values are given in the DC Operating Conditions table.

## AC ELECTRICAL CHARACTERISTICS $V_{CC1} = V_{CC2} = \text{ground}, V_{EE} = -5.2\text{V} \pm 0.010\text{V}$

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS						UNIT	
			$T_A = -30^\circ\text{C}$		$T_A = +25^\circ\text{C}$			$T_A = +85^\circ\text{C}$		
			MIN.	MAX.	MIN.	TYP.	MAX.	MIN.		MAX.
$t_{PLH}$ $t_{PHL}$	Propagation delay $P_n$ to PG	Waveform 1	1.00	3.70	1.00	2.30	3.50	1.00	3.90	ns
			1.00	3.70	1.00	1.80	3.50	1.00	3.90	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $C_n$ to $C_{n+2}$		1.00	5.80	1.00	3.00	4.50	1.00	6.10	ns
			1.00	5.80	1.00	3.00	4.50	1.00	6.10	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $G_n$ to GG		1.00	5.80	1.00	3.20	5.50	1.00	6.10	ns
			1.00	5.80	1.00	3.20	5.50	1.00	6.10	ns
$t_{TLH}$ $t_{THL}$	Transition time 20% to 80%, 80% to 20%	1.30	3.50	1.30	2.50	3.50	1.30	3.50	ns	
		1.30	3.50	1.30	2.50	3.50	1.30	3.50	ns	

**NOTE:**

For AC test setup information, see AC Testing, Chapter 2, Section 3.

## AC WAVEFORMS

