MOTOROLA

MC10179

LOOK-AHEAD CARRY BLOCK

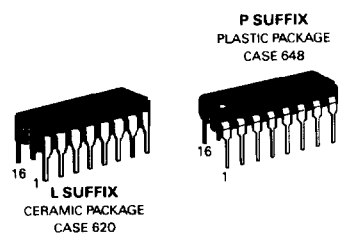
The MC10179 is a high speed, low power, standard MECL complex function that is designed to perform the look-ahead carry function. This device can be used with the MC10181 4-bit ALU directly, or with the MC10180 dual arithmetic unit in any computer, instrumentation or digital communication application requiring high speed arithmetic operation on long words.

When used with the MC10181, the MC10179 performs a second order or higher look-ahead. Figure 2 shows a 16-bit look-ahead carry arithmetic unit. Second order carry is valuable for longer binary words. As an example, addition of two 32-bit words is improved from 30 nanoseconds with ripple-carry techniques. A block diagram of a 32-bit ALU is shown in Figure 1. The MC10179 may also be used in many other applications. It can, for example, reduce system package count when used to generate functions of several variables.

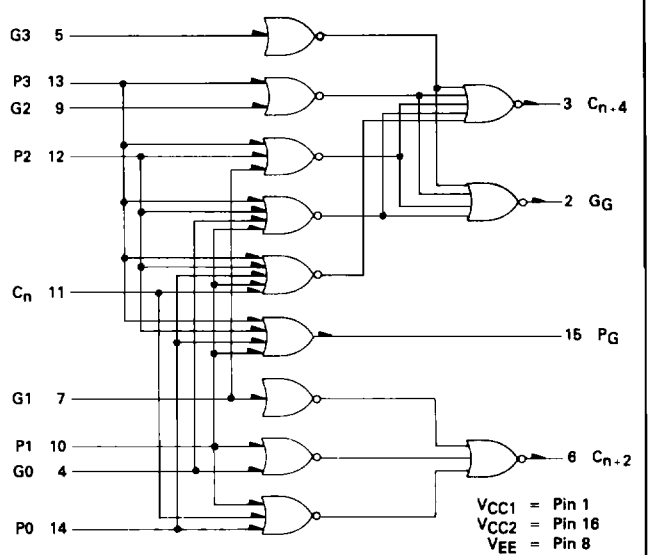
P_D = 300 mW typ/pkg (No Load)
t_{pd} = 3.0 ns typ (Carry, Propogate)
4.0 ns typ (Generate)
t_r, t_f = 2.3 ns typ (20%–80%)

MECL 10K SERIES

LOOK-AHEAD CARRY BLOCK

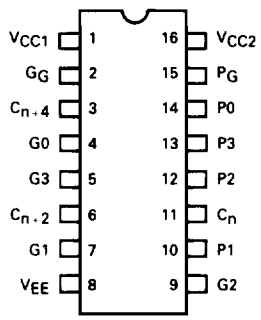


LOGIC DIAGRAM



P_G = P0 + P1 + P2 + P3
G_G = (G0 + P1 + P2 + P3) (G1 + P2 + P3) (G2 + P3) G3
C_{n+2} = (C_n + P0 + P1) (G0 + P1) G1
C_{n+4} = (C_n + P0 + P1 + P2 + P3) (G0 + P1 + P2 + P3) (G1 + P2 + P3) (G2 + P3) G3

PIN ASSIGNMENT



ELECTRICAL CHARACTERISTICS

Each MECL 10,000 series device has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are terminated through a 50-ohm resistor to −2.0 volts. Test procedures are shown only for selected inputs and outputs. Other inputs and outputs are tested in a similar manner.

@ Test Temperature	TEST VOLTAGE VALUES (Volts) V_{IH} max	V_{IL} min	V_{IHA} min	V_{ILA} max	V_{EE}
−30°C	−0.890	−1.890	−1.205	−1.500	−5.2
+25°C	−0.810	−1.850	−1.105	−1.475	−5.2
+85°C	−0.700	−1.825	−1.035	−1.440	−5.2

Characteristic	Symbol	Pin Under Test	MC10179 Test Limits −30°C Min	−30°C Max	+25°C Min	+25°C Typ	+25°C Max	+85°C Min	+85°C Max	Unit	TEST VOLTAGE APPLIED TO PINS LISTED BELOW: V_{IH} max	V_{IL} min	V_{IHA} min	V_{ILA} max	V_{EE}	(V_{CC}) Gnd
Power Supply Drain Current	I_E	8		79	–	58	72	–	79	mAdc	–	–	–	–	8	1,16
Input Current	I_{inH}	4,7,11	–	430	–	–	270	–	270	μAdc	4,7,11	–	–	–	8	1,16
		5,9	–	360	–	–	225	–	225	↓	5,9	–	–	–	↓	↓
		10,13	–	700	–	–	440	–	440		10,13	–	–	–		
		12	–	630	–	–	395	–	395		12	–	–	–		
		14	–	565	–	–	355	–	355		14	–	–	–		
	I_{inL}	4	0.5	–	0.5	–	–	0.3	–	μAdc	–	4	–	–	8	1,16
Logic "1" Output Voltage	V_{OH}	2	-1.060	-0.890	-0.960	–	-0.810	-0.890	-0.700	Vdc	4,5,7,9	–	–	–	8	1,16
Logic "0" Output Voltage	V_{OL}	3	-1.890	-1.675	-1.850	–	-1.650	-1.825	-1.615	Vdc	–	–	–	–	8	1,16
Logic "1" Threshold Voltage	V_{OHA}	2	-1.080	–	-0.980	–	–	-0.910	–	Vdc	13	–	5	–	8	1,16
		2	↓	–	↓	–	–	↓	–	↓	5,12	–	9	–	↓	↓
		2		–		–			–		5,9	–	12	–		
		2		–		–			–		5	–	13	–		
Logic "0" Threshold Voltage	V_{OLA}	2	–	-1.655	–	–	-1.630	–	-1.595	Vdc	13	–	–	5	8	1,16
		2	–	↓	–	–	↓	–	↓	↓	5	–	–	13	↓	↓
		2	–		–	–		–			5	–	–	9		
		2	–		–	–		–			5,9	–	–	12		
											+1.11 V		Pulse In	Pulse Out	-3.2 V	+2.0 V
Switching Times (50 Ω Load)	t_{10+15+}	15	1.0	3.7	1.0	2.5	3.5	1.0	3.9	ns	4.7	–	10	15	8	1,16
	t_{10-15-}	15	↓	3.7	↓	2.5	3.5	↓	3.9	↓	4.7	–	10	15	↓	↓
Propagation Delay	t_{11+6+}	6		5.8		3.0	5.5		6.1		4,7	–	11	6		
	t_{11-6-}	6				3.0	5.5				4,7	–	11	6		
	t_{5+2+}	2				4.0	5.5				4,7,9	–	5	2		
	t_{5-2-}	2	↓	↓	↓	4.0	5.5	↓	↓	↓	4,7,9	–	5	2		
Rise Time (20% to 80%)	t_{6+}	6	1.1	3.7	1.1	2.5	3.5	1.1	3.9		4,7	–	11	6	↓	↓
Fall Time (20% to 80%)	t_{6-}	6	1.1	3.7	1.1	2.5	3.5	1.1	3.9	↓	4,7	–	11	6		

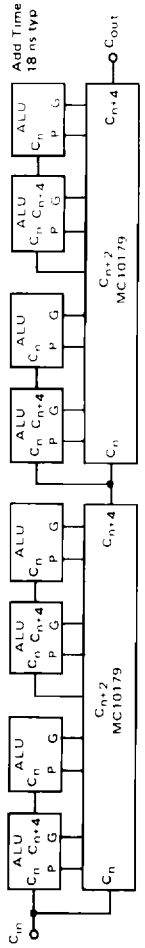


FIGURE 1 — 32-BIT ALU WITH CARRY LOOK-AHEAD

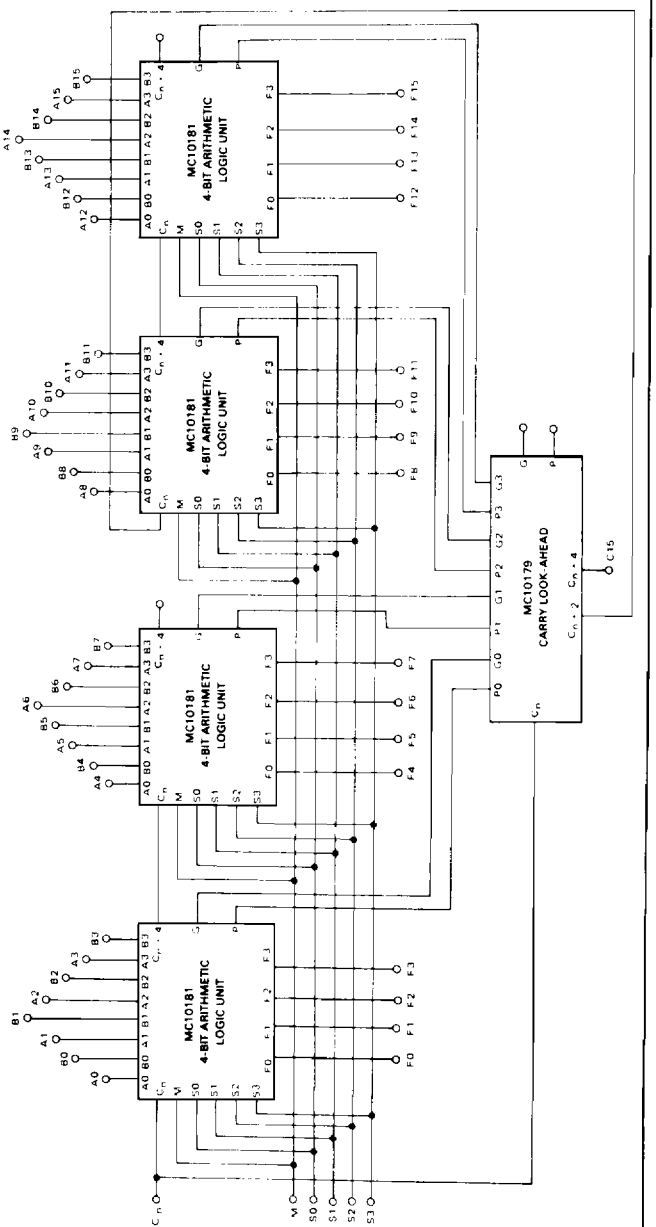


FIGURE 2 — 16-BIT FULL LOOK-AHEAD CARRY ARITHMETIC LOGIC UNIT