3003

LOOK-AHEAD CARRY GENERATOR

The INTEL® 3003 Look-Ahead Carry Generator (LCG) is a high speed circuit capable of anticipating a carry across a full 16-bit 3002 Central Processing Array. When used with a larger 3002 CP Array multiple 3003 carry generators provide high speed carry look-ahead capability for any word length.

The LCG accepts eight pairs of active high cascade inputs (X,Y) and an active low carry input and generates active low carries for up to eight groups of binary adders.

High Performance – 10 ns typical propagation delay

Compatible with INTEL 3001 MCU and 3002 CPE

DTL and TTL compatible

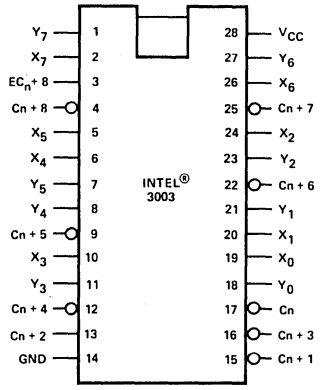
Full look-ahead across 8 adders

Low voltage diode input clamp

Expandable

28-pin DIP

PACKAGE CONFIGURATION



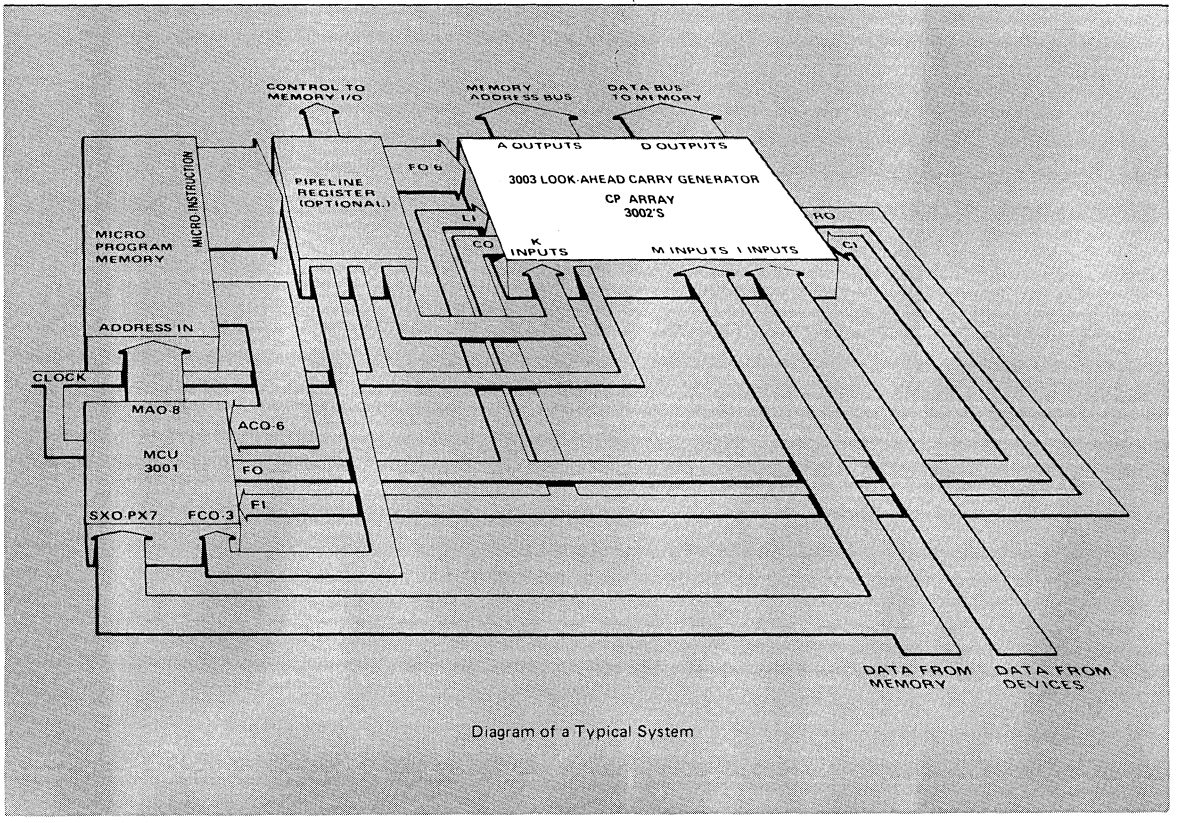


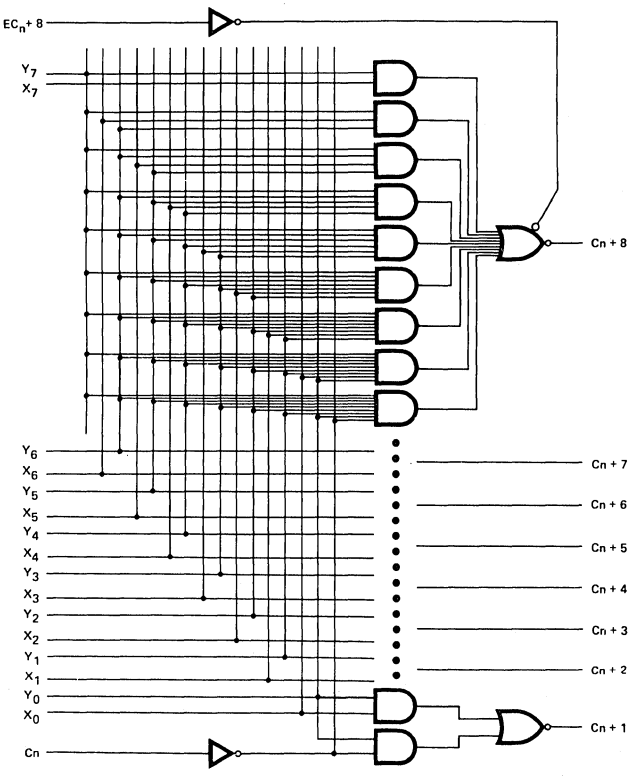
Diagram of a Typical System

SERIES 3000

PIN DESCRIPTION

PIN	SYMBOL	NAME AND FUNCTION	TYPE
1,7,8,11 18,21,23 27	Y_0-Y_7	Standard carry look-ahead inputs	Active HIGH
2,5,6,10 19,20,24 26	X_0-X_7	Standard carry look-ahead inputs	Active HIGH
17	C_n	Carry input	Active LOW
4,9,12 13,15,16	C_{n+1}- C_{n+8}	Carry outputs	Active LOW
3	EC_{n+8}	C_{n+8} carry output enable	Active HIGH
28	V_{CC}	+5 volt supply	
14	GND	Ground	

LOGIC DIAGRAM



3003 LOGIC EQUATIONS

The 3003 Look-Ahead Generator is implemented in a compatible form for direct connection to the 3001 MCU and 3002 CPE. Logic equations for the 3003 are:

$$\overline{C_{n+1}} = Y_0X_0 + Y_0\overline{C}_n$$

$$\overline{C_{n+2}} = Y_1X_1 + Y_1Y_0X_0 + Y_1Y_0\overline{C}_n$$

$$\overline{C_{n+3}} = Y_2X_2 + Y_2Y_1X_1 + Y_2Y_1Y_0X_0 + Y_2Y_1Y_0\overline{C}_n$$

$$\overline{C_{n+4}} = Y_3X_3 + Y_3Y_2X_2 + Y_3Y_2Y_1X_1 + Y_3Y_2Y_1Y_0X_0 + Y_3Y_2Y_1Y_0\overline{C}_n$$

$$\overline{C_{n+5}} = Y_4X_4 + Y_4Y_3X_3 + Y_4Y_3Y_2X_2 + Y_4Y_3Y_2Y_1X_1 + Y_4Y_3Y_2Y_1Y_0X_0 + Y_4Y_3Y_2Y_1Y_0\overline{C}_n$$

$$\overline{C_{n+6}} = Y_5X_5 + Y_5Y_4X_4 + Y_5Y_4Y_3X_3 + Y_5Y_4Y_3Y_2X_2 + Y_5Y_4Y_3Y_2Y_1X_1 + Y_5Y_4Y_3Y_2Y_1Y_0X_0 + Y_5Y_4Y_3Y_2Y_1Y_0\overline{C}_n$$

$$\overline{C_{n+7}} = Y_6X_6 + Y_6Y_5X_5 + Y_6Y_5Y_4X_4 + Y_6Y_5Y_4Y_3X_3 + Y_6Y_5Y_4Y_3Y_2X_2 + Y_6Y_5Y_4Y_3Y_2Y_1X_1 + Y_6Y_5Y_4Y_3Y_2Y_1Y_0X_0 + Y_6Y_5Y_4Y_3Y_2Y_1Y_0\overline{C}_n$$

$\overline{C_{n+8}}$ = High Impedance State when $EC_n + 8$ Low

$$\overline{C_{n+8}} = Y_7X_7 + Y_7Y_6X_6 + Y_7Y_6Y_5X_5 + Y_7Y_6Y_5Y_4X_4 + Y_7Y_6Y_5Y_4Y_3X_3 + Y_7Y_6Y_5Y_4Y_3Y_2X_2 + Y_7Y_6Y_5Y_4Y_3Y_2Y_1X_1 + Y_7Y_6Y_5Y_4Y_3Y_2Y_1Y_0X_0 + Y_7Y_6Y_5Y_4Y_3Y_2Y_1Y_0\overline{C}_n \text{ when } EC_n + 8 \text{ high}$$

D.C. AND OPERATING CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS*

Temperature Under Bias . . . . . -55°C to +125°C

Storage Temperature . . . . . -65°C to +160°C

All Output and Supply Voltages . . . . . -0.5V to +7V

All Input Voltages . . . . . -1.0V to +5.5V

Output Current . . . . . 100 mA

*COMMENT: Stresses above those listed under "Absolute Maximum Rating" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied.

T_A = -55°C to +125°C, V_{CC} = 5.0V ±10%.

SYMBOL	PARAMETER	MIN.	TYP.(1)	MAX.	UNIT	CONDITIONS
V_C	Input Clamp Voltage (All Input Pins)		-0.8	-1.2	V	I_C = -5 mA
I_F	Input Load Current:					
	X_6, X_7, Cn, EC_{n+8}		-0.07	-0.25	mA	V_F = 0.45V
	Y_7, X_0-X_5,		-0.200	-0.500	mA	
	Y_o-Y_6		-0.6	-1.5	mA	
I_R	Input Leakage Current:					
	C_n and EC_n + 8			40	µA	V_{CC} = 5.25V, V_R = 5.5V
	All Other Inputs			100	µA	
V_{IL}	Input Low Voltage			0.8	V	V_{CC} = 5.0V
V_{IH}	Input High Voltage	2.1			V	V_{CC} = 5.0V
I_{CC}	Power Supply Current		80	130	mA	All Y and EC_n + 8 high, All X and C_n low
V_{OL}	Output Low Voltage (All Output Pins)		0.35	0.45	V	I_{OL} = 4 mA
V_{OH}	Output High Voltage (All Output Pins)	2.4	3		V	I_{OH} = -1 mA
I_{OS}	Short Circuit Output Current (All Output Pins)	-15	-40	-65	mA	V_{CC} = 5V
$I_{O(off)}$	Off-State Output Current (C_n + 8)			-100	µA	V_O = 0.45V
				+100	µA	V_O = 5.5V

NOTE:
(1) Typical values are for T_A = 25°C and nominal supply voltage.

A.C. CHARACTERISTICS

T_A = -55°C to +125°C, V_{CC} = +5.0V ±10%

SYMBOL	PARAMETER	MIN.	TYP.(1)	MAX.	UNIT
t_{XC}	X, Y to Outputs	3	10	25	ns
t_{CC}	Carry In to Outputs		13	40	ns
t_{EN}	Enable Time, C_n + 8		20	50	ns

NOTE:
(1) Typical values are for T_A = 25°C and nominal supply voltage.

MILITARY TEMP.

D.C. AND OPERATING CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS*

Temperature Under Bias . . . . . 0°C to 70°C

Storage Temperature . . . . . -65°C to +160°C

All Output and Supply Voltages . . . . . -0.5V to +7V

All Input Voltages . . . . . -1.0V to +5.5V

Output Current . . . . . 100 mA

*COMMENT: Stresses above those listed under "Absolute Maximum Rating" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied.

T_A = 0°C to +70°C V_{CC} = 5.0V ±5%

SYMBOL	PARAMETER	MIN.	TYP.(1)	MAX.	UNIT	CONDITIONS
V_C	Input Clamp Voltage (All Input Pins)		-0.8	-1.0	V	I_C = -5 mA
I_F	Input Load Current:					
	X_8,X_7Cn,EC_n + 8		-0.07	-0.25	mA	V_F = 0.45V
	Y_7,X_0-X_5,		-0.200	-0.500	mA	
	Y_0-Y_6		-0.6	-1.5	mA	
I_R	Input Leakage Current:					
	C_n and EC_n + 8			40	µA	V_R = 5.25V
	All Other Inputs			100	µA	
V_{IL}	Input Low Voltage			0.8	V	V_{CC} = 5.0V
V_{IH}	Input High Voltage	2.0			V	V_{CC} = 5.0V
I_{CC}	Power Supply Current		80	130	mA	All Y and EC_n + 8 high, All X and C_n low
V_{OL}	Output Low Voltage (All Output Pins)		0.35	0.45	V	I_{OL} = 4 mA
V_{OH}	Output High Voltage (All Output Pins)	2.4	3		V	I_{OH} = -1 mA
I_{OS}	Short Circuit Output Current (All Output Pins)	-15	-40	-65	mA	V_{CC} = 5V
$I_{O(off)}$	Off-State Output Current (C_n + 8)			-100	µA	V_O = 0.45V
				+100	µA	V_O = 5.25V

NOTE:
(1) Typical values are for T_A = 25°C and nominal supply voltage.

A.C. CHARACTERISTICS

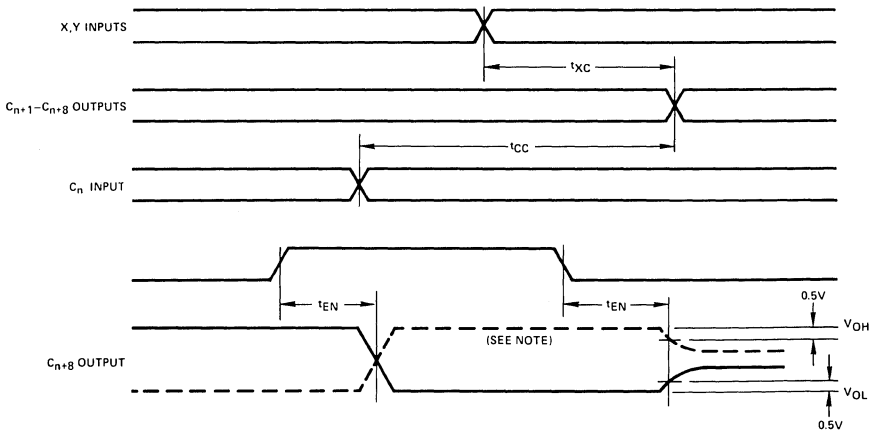
T_A = 0°C to 70°C, V_{CC} = +5V ± 5%

SYMBOL	PARAMETER	MIN.	TYP.(1)	MAX.	UNIT
t_{XC}	X, Y to Outputs	3	10	20	ns
t_{CC}	Carry In to Outputs		13	30	ns
t_{EN}	Enable Time, C_n + 8		20	40	ns

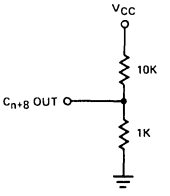
NOTE:
(1) Typical values are for T_A = 25°C and nominal supply voltage.

SERIES 3000

WAVEFORMS



NOTE: ALTERNATE TEST LOAD:



CAPACITANCE[2] T_A = 25°C

SYMBOL	PARAMETER		MIN	TYP	MAX	UNIT
C_{IN}	Input Capacitance	All inputs		12	20	pF
C_{OUT}	Output Capacitance	C_n + 8		7	12	pF

NOTE:
(2) This parameter is periodically sampled and is not 100% tested. Condition of measurement is f = 1 MHz, V_{BIAS} = 5.0V, V_{CC} = 5.0V and T_A = 25°C.

TEST CONDITIONS:

Input pulse amplitude of 2.5V.
Input rise and fall times of 5 ns between 1 and 2 volts.
Output loading is 5 mA and 30 pF.
Speed measurements are made at 1.5 volt levels.

TEST LOAD CIRCUIT: