

# **AM2902A**

# High-Speed Look-Ahead Carry Generator

The AM2902A is a high-speed, look-ahead carry generator which accepts up to four pairs of carry propagate and carry generate signals and a carry input and provides anticipated carries across four groups of binary ALU's. The device also has carry propagate and carry generate outputs which may be used for further levels of look-ahead.

# Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

## **Quality Overview**

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
  - Class Q Military
  - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
  - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

# Am2902A

High-Speed Look-Ahead Carry Generator

#### DISTINCTIVE CHARACTERISTICS

- Provides look-ahead carries across a group of four Am2901 or Am2903 microprocessor ALU's
- Capability of multi-level look-ahead for high-speed arithmetic operation over large word lengths
- Typical carry propagation delay of 4.5ns

#### GENERAL DESCRIPTION

The Am2902A is a high-speed, look-ahead carry generator which accepts up to four pairs of carry propagate and carry generate signals and a carry input and provides anticipated carries across four groups of binary ALU's. The device also has carry propagate and carry generate outputs which may be used for further levels of look-ahead.

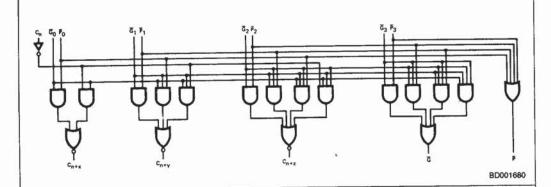
The Am2902A is generally used with the Am2901 bipolar microprocessor unit to provide look-ahead over word lengths of more than four bits. The look-ahead carry generator can be used with binary ALU's in an active LOW

or active HIGH input operand mode by reinterpreting the carry functions. The connections to and from the ALU to the look-ahead carry generator are identical in both cases.

The logic equations provided at the outputs are:

$$\begin{array}{l} C_{n+x} = G_0 + P_0 C_n \\ C_{n+y} = G_1 + P_1 G_0 + P_1 P_0 C_n \\ C_{n+z} = G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_n \\ G = G_3 + P_3 G_2 + P_3 P_2 G_1 + P_3 P_2 P_1 G_0 \\ P = P_3 P_2 P_1 P_0 \end{array}$$





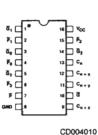
#### RELATED PRODUCTS

Part No.	Description
Am2901	4-Bit Microprocessor Slice
Am2903	4-Bit Microprocessor Slice
Am29203	Improved 2903
Am29501	Multiport Pipelined Processor

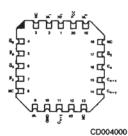
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#### CONNECTION DIAGRAM Top View

P-16, D-16



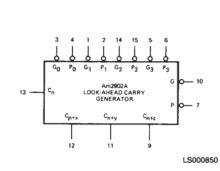
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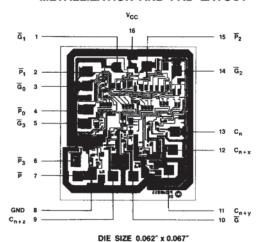


F-16 pin configuration identical to D-16, P-16. Note: Pin 1 is marked for orientation

#### LOGIC SYMBOL

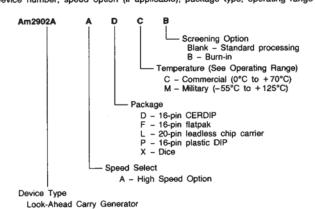
#### METALLIZATION AND PAD LAYOUT





#### ORDERING INFORMATION

AMD products are available in several packages and operating ranges. The order number is formed by a combination of the following: Device number, speed option (if applicable), package type, operating range and screening option (if desired).



Valid Combinations								
Am2902A	PC DC, DCB, DM, DMB FM, FMB LC, LCB, LM, LMB XC, XM							

#### Valid Combinations

Consult the AMD sales office in your area to determine if a device is currently available in the combination you wish.

PIN DESCRIPTION								
Pin No. Name I/O Description								
13	Cn	1	Carry-in. The carry-in input to the look-ahead generator. Also the carry-in input to the nth Am2901 microprocessor ALU input.					
12, 11, 9	Cn+j	0	Carry-out. (j = x, y, z). The carry-out output to be used at the carry-in inputs of the $n + 1$ , $n + 2$ and $n + 3$ microprocessor ALU slices.					
1-6, 14, 15	G <sub>i</sub> , P <sub>i</sub>	1	Generate and propagate inputs respectively (i = 0, 1, 2, 3). The carry generate and carry propagate inputs from the n $n+1$ , $n+2$ and $n+3$ microprocessor ALU slices.					
10, 7	G, P	0	Generate and propagate outputs respectively. The carry generate and carry propagate outputs that can be used with the next higher level of carry look-ahead if used.					

#### TRUTH TABLE

Inputs						Outputs							
Cn	Ğ0	P <sub>0</sub>	G <sub>1</sub>	P <sub>1</sub>	G <sub>2</sub>	$\bar{P}_2$	G <sub>3</sub>	P <sub>3</sub>	C <sub>n+x</sub>	C <sub>n+y</sub>	C <sub>n+z</sub>	Ğ	P
х	Н	Н				cine.			L				
L	H	X							L				
X	L	X							Н				
н	X	L							Н				
X	X	Х	н	н						L			
X	Н	Н	Н	X						L			
L	Н	X	Н	X						L			
X	X	X	L	X						Н			
X L X	L	X	X	L						Н			
Н	Х	L	X	L						н			
X	X	Х	X	X	н	н					L		
X	X	X	Н	Н	Н	X					L		
X	H	Н	Н	X	Н	X					L		
L	н	X	Н	X	Н	X					L		
X	X	X	X	X	L	X					H		
XXLXX	X	X	L	X	X	L					Н		
	L	X	X	L	X	L					Н		
Н	X	L	X	L	X	L					Н		
	X		X	X	X	X	Н	Н				Н	
	X		X	X	Н	Н	Н	X				Н	
	Х		Н	Н	Н	X	Н	X				н	
	Н		Н	X	Н	X	Н	X				н	
	X		X	X	X	X	L	X				L	
	X		X	X	L	X	X	L				L	
	X		L	X	X	L	X	L				L	
_	L		Х	L	X	L	X	L				L	
		Н		Х		X		X					Н
		X		Н		X		X					Н
		X		X		Н		X	1				Н
		X		X		X		Н					Н
		L		L		L		L					L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

#### **ABSOLUTE MAXIMUM RATINGS**

Storage Temperature65°C to +150°C
(Ambient) Temperature with
Applied Powers55°C to +125°C
Supply Voltage to Ground Potential
Continuous0.5V to +7.0V
DC Voltage Applied to Outputs For
High Output State0.5V to +V <sub>CC</sub> max
DC Input Voltage0.5V to +5.5V
DC Output Current, Into Outputs
DC Input Current30mA to +5.0mA

Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

#### **OPERATING RANGES**

Commercial (C) Devices  Temperature
Military (M) Devices Temperature

#### DC CHARACTERISTICS over operating range unless otherwise specified

Parameters	Description	Test Conditions	Test Conditions (Note 2)			Max	Units	
		V <sub>CC</sub> = MIN, I <sub>OH</sub> = -1mA	MIL	2.5	3.4			
VOH	Output HIGH Voltage	VIN - VIH or VIL	сом	2.7	3.4		Volts	
VOL	Output LOW Voltage	V <sub>CC</sub> = MIN, I <sub>OL</sub> = 20mA V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>				0.5	Volts	
VIH	Input HIGH Level	Guaranteed input logical HIC inputs	GH voltage for all	2.0			Volts	
V <sub>IL</sub>	Input LOW Level	Guaranteed input logical LO inputs	W voltage for all			0.8	Volts	
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18mA				-1.2	Volts	
	Input LOW Current		Cn			-2	mA	
			P <sub>3</sub>			-4		
l <sub>IL</sub>		V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.5V	P <sub>2</sub>			-6		
41.			P <sub>0</sub> , P <sub>1</sub> , G <sub>3</sub>			-8		
			Ġ₀, Ġ₂			-14		
			G <sub>1</sub>			-16		
	Input HIGH Current		Cn			50	μΑ	
		1	₱3			100		
lu.		V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7V	P <sub>2</sub>			150		
IH		VCC - MIXX, VIN - 2.7 V	Po, P1, G3			200		
			₫ <sub>0</sub> , ₫ <sub>2</sub>			350		
			G <sub>1</sub>			400		
l <sub>l</sub>	Input HIGH Current	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 5.5V	```			1.0	mA	
Isc	Output Short Circuit (Note 3)	V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0.0V		-40		-100	mA	
		V <sub>CC</sub> = MAX	MIL		69	99		
		All Outputs LOW	COM'L		69	109	mA	
fcc	Power Supply Current	V <sub>CC</sub> = MAX	MIL		35			
		All Outputs HIGH	COM'L		35		mA	

Notes: 1. Typical limits are at V<sub>CC</sub> = 5.0V, 25°C ambient and maximum loading.

2. For conditions shown as MIN or MAX, use the appropriate value specified under Operating Ranges for the applicable device type.

3. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

#### SWITCHING CHARACTERISTICS ( $T_A = +25$ °C, $V_{CC} = 5.0V$ ) Units Max **Test Conditions** Тур Description **Parameters** 10 6.5 ns **t**PLH $C_n$ to $C_{n\,+\,x},\;C_{n\,+\,y},\;\text{or}\;\;C_{n\,+\,z}$ 7 10.5 tPHL 4.5 ns tplH $\overline{P}_i$ or $\overline{G}_i$ to $C_{n+x}$ , $C_{n+y}$ , or $C_{n+z}$ 4.5 7 <sup>t</sup>PHL 5 7.5 **t**PLH ns ₱<sub>i</sub> or ₲<sub>i</sub> to ₲ 7 10.5 tpHL 4.5 6.5 ns ₱i to ₱ 6.5 10 tphl

### SWITCHING CHARACTERISTICS over operating range unless otherwise specified\*

				PO2A	MILITARY Am2902A		
Parameters	Description	Test Conditions	Min	Max	Min	Max	Units
tplH				13		15	ns
	C <sub>n</sub> to C <sub>n+x</sub> , C <sub>n+y</sub> or C <sub>n+z</sub>	1		14		16.5	ns
t <sub>PHL</sub>	F <sub>i</sub> or G <sub>i</sub> to C <sub>n+x</sub> , C <sub>n+y</sub> , or C <sub>n+z</sub>	C <sub>L</sub> = 50 pF R <sub>L</sub> = 280 Ω		В		9.5	ns
tPLH				9		11.5	ns
₹PHL			_	12		16.5	ns
tplH	P <sub>i</sub> or G <sub>i</sub> to G		<u> </u>	12		13.5	ns
tphl				9.5		11.5	ns
t <sub>PLH</sub>	P <sub>i</sub> to P			-		12	ns
t <sub>PHL</sub>	7,101			11	L	1	

<sup>\*</sup>Switching Characteristics' performance over the operating temperature range is guaranteed by testing defined in Group A, Subgroup 9.