

T-75-07

04

# 9304 DUAL FULL ADDER

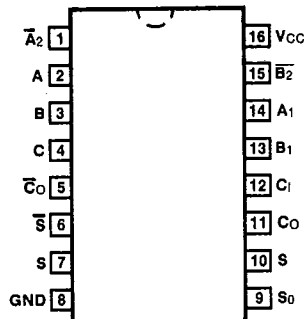
**DESCRIPTION** — The '04 consists of two independent, binary full adders. The adders are useful in a wide variety of applications including multiple bit parallel add/serial carry addition, parity generation and checking, code conversion and majority gating.

- MULTIFUNCTION CAPABILITY
- 8.0 ns CARRY PROPAGATION DELAY
- COMPLEMENTARY INPUTS AND OUTPUTS AVAILABLE
- TYPICAL POWER DISSIPATION OF 150 mW

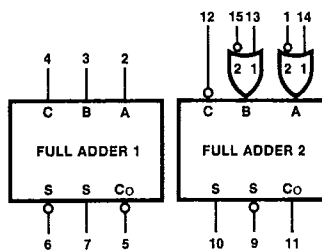
**ORDERING CODE:** See Section 9

PKGS	PIN OUT	COMMERCIAL GRADE	MILITARY GRADE	PKG TYPE
		V <sub>CC</sub> = +5.0 V ±5%, T <sub>A</sub> = 0°C to +70°C	V <sub>CC</sub> = +5.0 V ±10%, T <sub>A</sub> = -55°C to +125°C	
Plastic DIP (P)	A	9304PC		9B
Ceramic DIP (D)	A	9304DC	9404DM	6B
Flatpak (F)	A	9304FC	9304FM	4L

### CONNECTION DIAGRAM PINOUT A



### LOGIC SYMBOL



V<sub>CC</sub> = Pin 16  
GND = Pin 8

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**INPUT LOADING/FAN-OUT:** See Section 3 for U.L. definitions

PIN NAMES	DESCRIPTION	93XX (U.L.) HIGH/LOW
<b>Full Adder 1</b>		
A, B	Operand Inputs	4.0/4.0
C <sub>i</sub>	Carry Input	4.0/4.0
S	Sum Output	20/10
S	Complementary Sum Output	20/10
C <sub>o</sub>	Carry Output (Active LOW)	14/7.0
<b>Full Adder 2</b>		
A <sub>1</sub> , B <sub>1</sub>	OR Operand Inputs (Active HIGH)	1.0/1.0
A <sub>2</sub> , B <sub>2</sub>	OR Operand Inputs (Active LOW)	4.0/4.0
C <sub>i</sub>	Carry Input (Active LOW)	4.0/4.0
S	Sum Output	20/10
S	Complementary Sum Output	20/10
C <sub>o</sub>	Carry Output (Active HIGH)	14/7.0

**FUNCTIONAL DESCRIPTION** — The '04 logic block consists of two separate high speed carry dependent sum full adders. This design allows a minimum carry propagation time when the adders are used in ripple carry applications. The adders are identical except that adder 2 has provision for either active HIGH or active LOW inputs at the A and B terminals. The adders produce a LOW carry and both LOW and HIGH sum with active HIGH inputs, a HIGH carry and both HIGH and LOW sum when active LOW inputs are used. This principle of duality is shown in the diagram below, where the adders are drawn as functional blocks.

**TRUTH TABLES**

**ADDER 1**

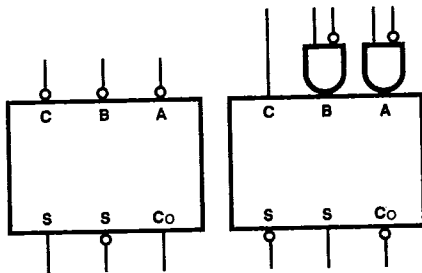
INPUTS			OUTPUTS		
$\bar{C}_1$	B	A	$\bar{C}_0$	$\bar{S}$	S
L	L	L	H	H	L
L	L	H	H	L	H
L	H	L	H	L	H
L	H	H	L	H	L
H	L	L	H	L	H
H	L	H	L	H	L
H	H	L	L	H	L
H	H	H	L	L	H

H = HIGH Voltage Level  
L = LOW Voltage Level

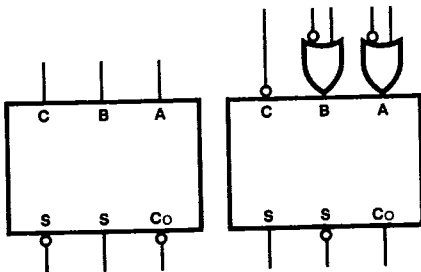
**ADDER 2**

INPUTS					OUTPUTS		
$\bar{C}_1$	B <sub>1</sub>	A <sub>1</sub>	$\bar{B}_2$	$\bar{A}_2$	C <sub>0</sub>	S	$\bar{S}$
L	L	L	L	L	H	H	L
L	L	L	L	H	H	L	H
L	L	L	H	L	H	L	H
L	L	L	H	H	L	H	L
L	L	H	L	L	H	H	L
L	L	H	L	H	H	H	L
L	L	H	H	L	H	L	H
L	L	H	H	H	H	L	H
L	L	H	H	H	H	H	L
L	H	L	L	L	H	H	L
L	H	L	L	H	H	L	H
L	H	L	H	L	H	H	L
L	H	L	H	H	H	L	H
L	H	H	L	L	H	L	H
L	H	H	L	H	L	H	L
L	H	H	H	L	H	L	H
L	H	H	H	H	H	L	H
H	L	L	L	L	H	L	H
H	L	L	L	H	L	H	L
H	L	L	H	L	L	L	H
H	L	L	H	H	L	L	H
H	L	H	L	L	H	L	H
H	L	H	L	H	L	H	L
H	L	H	H	L	H	L	H
H	L	H	H	H	H	L	H
H	H	L	L	L	H	L	H
H	H	L	L	H	L	H	L
H	H	L	H	L	L	L	H
H	H	L	H	H	L	L	H
H	H	H	L	L	H	L	H
H	H	H	L	H	L	L	H
H	H	H	H	L	H	L	H
H	H	H	H	H	H	L	H

**ACTIVE LOW**

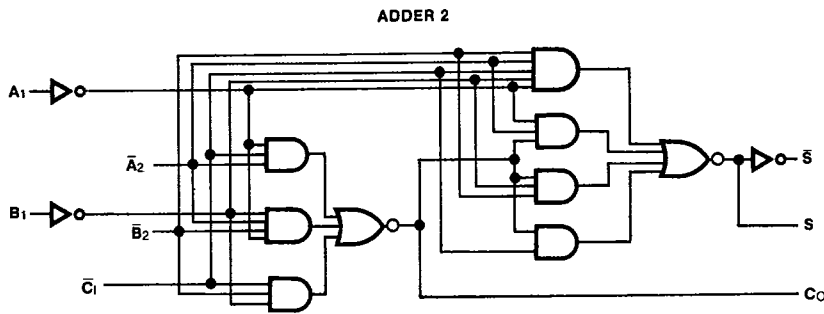
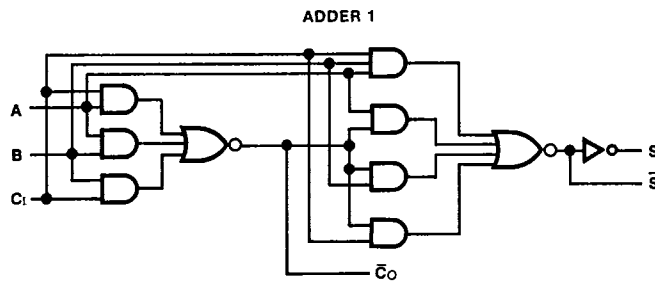


**ACTIVE HIGH**



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LOGIC DIAGRAM



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DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER	93XX		UNITS	CONDITIONS
		Min	Max		
Isc	Output Short Circuit Current	-20	-70	mA	Vcc = Max, Vout = 0 V
Icc	Power Supply Current		55	mA	Vcc = Max, Pins 13 & 14 = 0 V

AC CHARACTERISTICS: Vcc = +5.0 V, TA = +25°C (See Section 3 for waveforms and load configurations)

SYMBOL	PARAMETER	93XX		UNITS	CONDITIONS
		CL = 15 pF			
		Min	Max		
tPLH tPHL	Propagation Delay An to S		36 35	ns	Figs. 3-1, 3-20
tPLH tPHL	Propagation Delay Ci to Co		13 13	ns	Figs. 3-1, 3-4