CMOS FOUR-BIT FULL ADDER

FEATURES

- **Look-Ahead Carry Output**
- **High-Speed Operation**

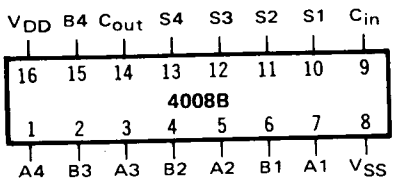
DESCRIPTION

The 4008B consists of four Full-Adder stages with fast Look-Ahead Carry provision from stage to stage. Circuitry is included to provide a fast Parallel-Carry-out bit to permit high-speed operation in arithmetic sections using several 4008B's. 4008B inputs include the four sets of bits to be added, A1 to A4 and B1 to B4, in addition to the Carry-in bit from a previous section. 4008B outputs include the four Sum bits, S1 and S4, in addition to the high-speed Parallel-Carry-out which may be utilized at a succeeding 4008B section.

TRUTH TABLE
(one stage)

C_{in}	B	A	C_{out}	S
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

CONNECTION DIAGRAM
(all packages)



Add suffix for package:

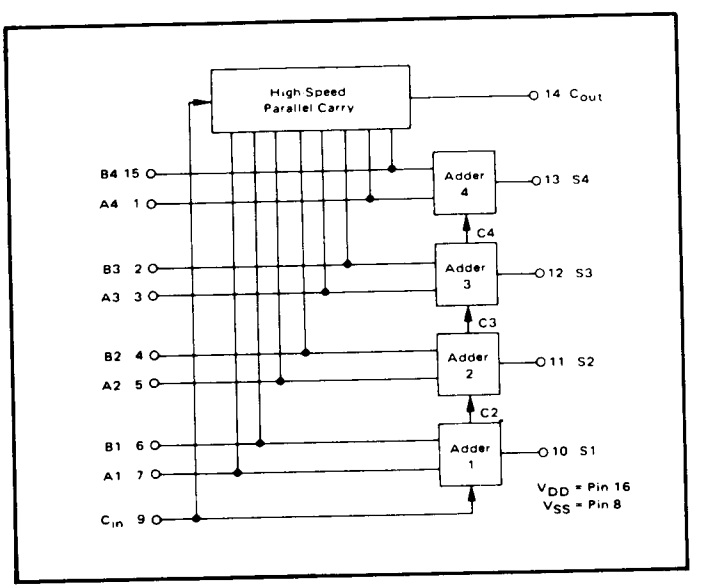
C 16-pin Cerdip
D 16-pin Ceramic
E 16-pin Epoxy
F 16-pin Flat
H Chip

RECOMMENDED OPERATING CONDITIONS

For maximum reliability:

DC Supply Voltage	$V_{DD} - V_{SS}$	3 to 15	Vdc
Operating Temperature	T_A		
C, D, F, H Device		-55 to +125	°C
E Device		-40 to +85	°C

BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS

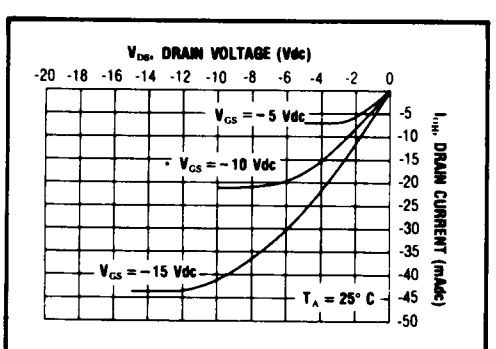
STATIC CHARACTERISTICS [1]

PARAMETER		V_{DD} (Vdc)	CONDITIONS	T_{LOW} [2]		+25°C			T_{HIGH} [2]		Units
				Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
QUIESCENT DEVICE CURRENT	I_{DD}	5	$V_{IN} = V_{SS}$ or V_{DD}	–	5	–	0.05	5	–	150	μAdc
		10	All valid input	–	10	–	0.1	10	–	300	
		15	combinations	–	20	–	0.2	20	–	600	

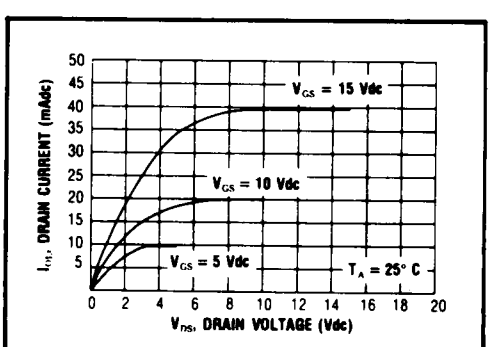
NOTES: [1] Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".
[2] T_{LOW} = -55°C for C, D, F, H device.
= -40°C for E device.
T_{HIGH} = +125°C for C, D, F, H device.
= + 85°C for E device.

DYNAMIC CHARACTERISTICS (C_L = 50pF, T_A = 25°C)

PARAMETER		V_{DD} (Vdc)	Min.	Typ.	Max.	Units
PROPAGATION DELAY TIME Sum In to Sum Out	t_{PLH}, t_{PHL}	5	–	400	800	ns
		10	–	160	320	
		15	–	115	230	
Sum In to Carry Out	t_{PLH}, t_{PHL}	5	–	310	620	ns
		10	–	140	280	
		15	–	110	220	
Carry In to Sum Out	t_{PLH}, t_{PHL}	5	–	380	760	ns
		10	–	150	300	
		15	–	115	230	
Carry In to Carry Out	t_{PLH}, t_{PHL}	5	–	180	360	ns
		10	–	75	150	
		15	–	55	110	
OUTPUT TRANSITION TIME	t_{TLH}, t_{THL}	5	–	100	200	ns
		10	–	50	100	
		15	–	40	80	

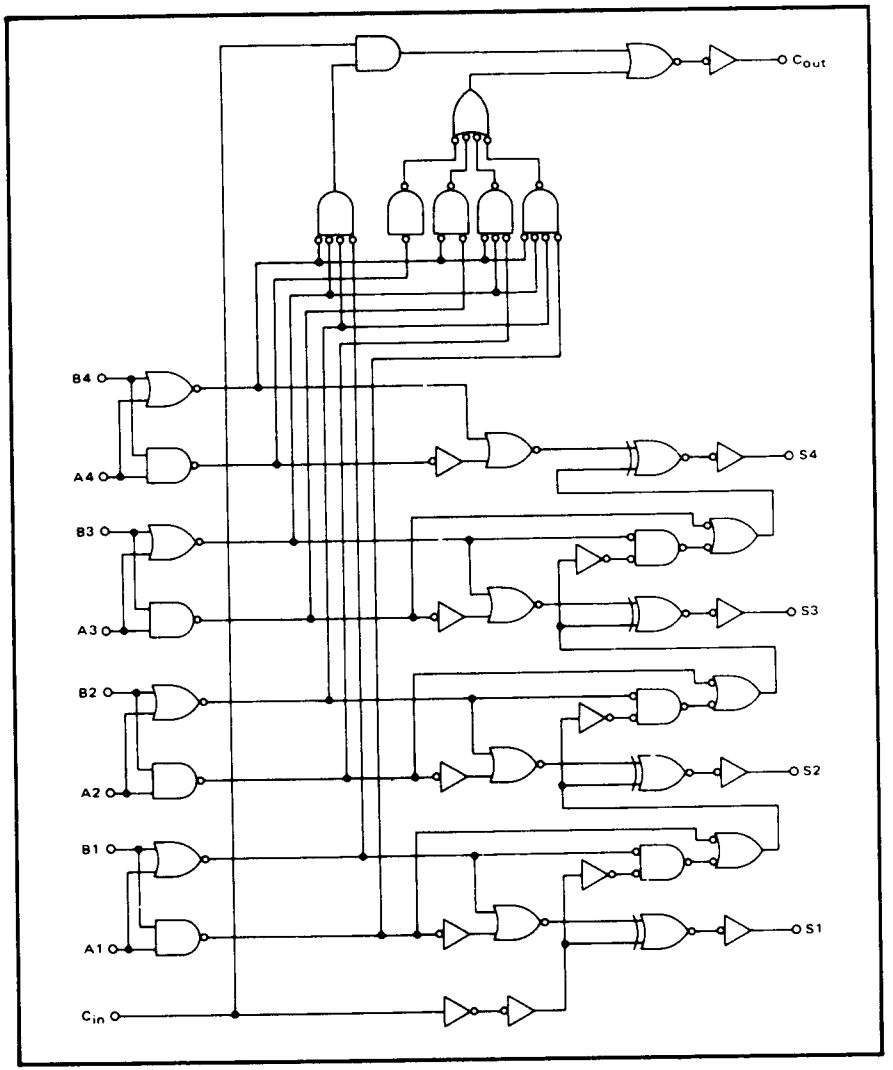


Typical P-Channel
Source Current Characteristics

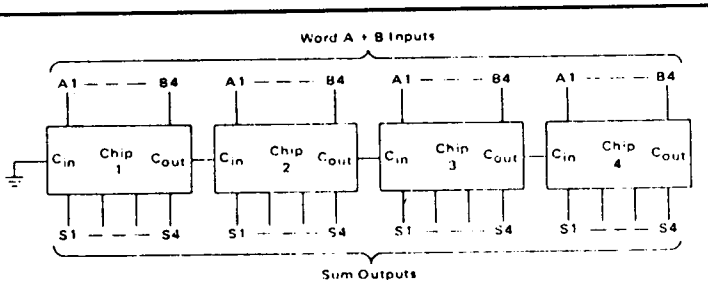


Typical N-Channel
Sink Current Characteristics

LOGIC DIAGRAM



APPLICATIONS INFORMATION

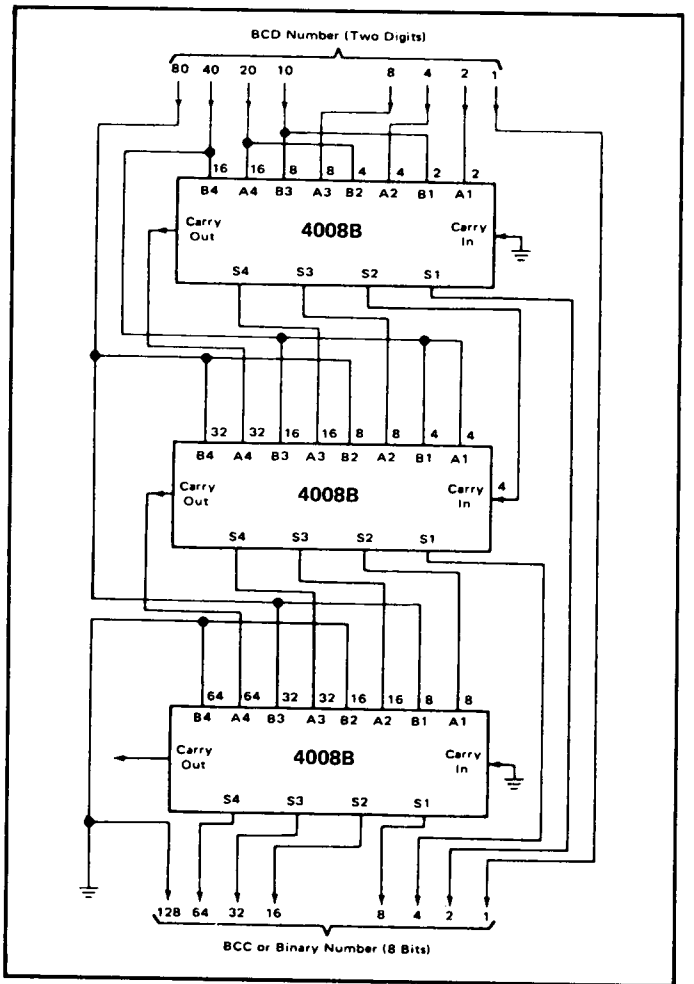


Calculation of 16-bit adder speed:

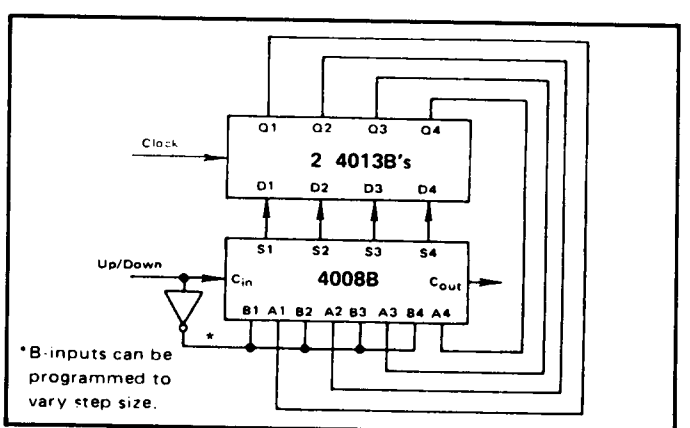
t_p total = t_p (Sum to Carry) + t_p (Carry to Sum) + 2 t_p (Carry to Carry)

16–Bit Adder

APPLICATIONS INFORMATION (Continued)



2-Digit BCD-to-Binary Conversion



4-Bit Up/Down Counter