

# MN4008B/MN4008BS

## 4-Bit Full Adder

### ■ Outline

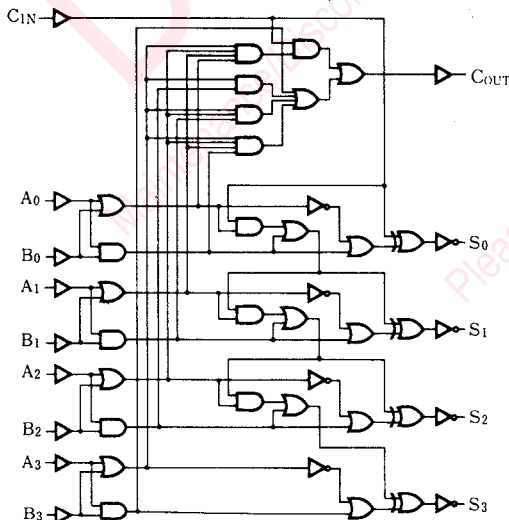
The MN4008B/S is a 4-bit parallel processing full adder equipped with a high speed parallel carry circuit. The sum of the four augend data inputs ( $A_0 \sim A_3$ ), the other four addend data inputs ( $B_0 \sim B_3$ ), and the binary input added to the carry input ( $C_{IN}$ ) from the lower digit is obtainable in the binary code as the addend data outputs ( $S_0 \sim S_3$ ) and the carry output ( $C_{OUT}$ ) to the upper digit.

It enables easy constitution of a  $4 \times n$ -bit adder circuit by cascade connection and adder-subtractor circuit supported by a simple external circuit.

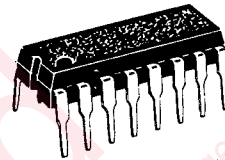
### ■ Truth Table

Input			Output	
$C_{IN}$	A	B	$C_{OUT}$	S
L	L	L	L	L
L	L	H	L	H
L	H	L	L	H
L	H	H	H	L
H	L	L	L	H
H	L	H	H	L
H	H	L	H	L
H	H	H	H	H

### ■ Logic Diagram

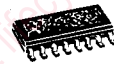


P-3



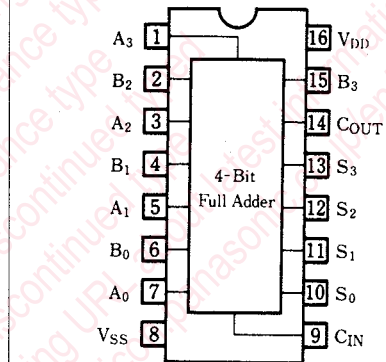
16-pin plastic DIL package

P-4



16-pin PANAFLAT package (SO-16D)

Pin Configuration



### ■ Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Supply voltage	$V_{DD}$	-0.5~+18	V
Input voltage	$V_I$	-0.5~ $V_{DD}+0.5^*$	V
Output pin voltage	$V_O$	-0.5~ $V_{DD}+0.5^*$	V
Peak input · output pin current	$\pm I_I$	max. 10	mA
Power dissipation (per package)	Ta=-40~+60°C	max. 400	mW
	Ta=+60~+80°C	Decrease to 200mW at the rate of 8mW/°C	
Power dissipation (per output pin)	$P_D$	max. 100	mW
Operating ambient temperature	$T_{opr}$	-40~+85	°C
Storage temperature	$T_{strg}$	-65~+150	°C

\*  $V_{DD}+0.5V$  should be lower than 18V.

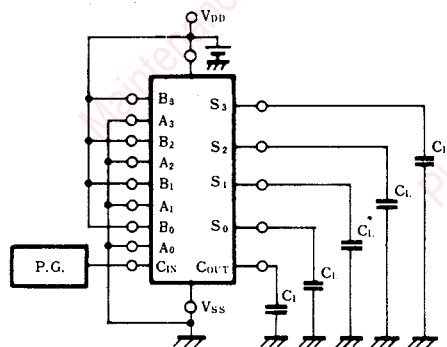
### ■ DC Characteristics ( $V_{SS}=0V$ )

Item	$V_{DD}$ (V)	Symbol	Condition	Ta=-40°C		Ta=25°C		Ta=85°C		Unit	
				min.	max.	min.	max.	min.	max.		
Static supply current	5	$I_{DD}$	$V_I=V_{SS}$ or $V_{DD}$	—	20	—	20	—	150	$\mu A$	
	10			—	40	—	40	—	300		
	15			—	80	—	80	—	600		
Output voltage low level	5	$V_{OL}$	$V_I=V_{SS}$ or $V_{DD}$ $ I_{O}  < 1\mu A$	—	0.05	—	0.05	—	0.05	V	
	10			—	0.05	—	0.05	—	0.05		
	15			—	0.05	—	0.05	—	0.05		
Output voltage high level	5	$V_{OH}$	$V_I=V_{SS}$ or $V_{DD}$ $ I_{O}  < 1\mu A$	4.95	—	4.95	—	4.95	—	V	
	10			9.95	—	9.95	—	9.95	—		
	15			14.95	—	14.95	—	14.95	—		
Input voltage low level	5	$V_{IL}$	$ I_{O}  < 1\mu A$	$V_O=0.5V$ or 4.5V	—	1.5	—	1.5	—	V	
	10			$V_O=1V$ or 9V	—	3	—	3	—		3
	15			$V_O=1.5V$ or 13.5V	—	4	—	4	—		4
Input voltage high level	5	$V_{IH}$	$ I_{O}  < 1\mu A$	$V_O=0.5V$ or 4.5V	3.5	—	3.5	—	3.5	V	
	10			$V_O=1V$ or 9V	7	—	7	—	7		—
	15			$V_O=1.5V$ or 13.5V	11	—	11	—	11		—
Output current low level	5	$I_{OL}$	$V_O=0.4V, V_I=0$ or 5V $V_O=0.5V, V_I=0$ or 10V $V_O=1.5V, V_I=0$ or 15V	0.52	—	0.44	—	0.36	—	mA	
	10			1.3	—	1.1	—	0.9	—		
	15			3.6	—	3	—	2.4	—		
Output current high level	5	$-I_{OH}$	$V_O=4.6V, V_I=0$ or 5V $V_O=9.5V, V_I=0$ or 10V $V_O=13.5V, V_I=0$ or 15V	0.52	—	0.44	—	0.36	—	mA	
	10			1.3	—	1.1	—	0.9	—		
	15			3.6	—	3	—	2.4	—		
Output current high level	5	$-I_{OH}$	$V_O=2.5V, V_I=0$ or 5V	1.7	—	1.4	—	1.1	—	mA	
Input leakage current	15	$\pm I_I$	$V_I=0$ or 15V	—	0.3	—	0.3	—	1	$\mu A$	

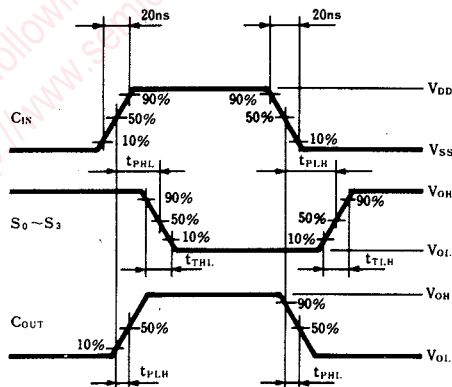
■ Switching Characteristics (Ta=25°C, V<sub>SS</sub>=0V, C<sub>L</sub>=50pF)

Item	V <sub>DD</sub> (V)	Symbol	min.	typ.	max.	Unit
Output rise time	5	t <sub>TLH</sub>	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Output fall time	5	t <sub>THL</sub>	—	60	180	ns
	10		—	30	90	
	15		—	20	60	
Transfer time Sum in→Sum out (L→H)	5	t <sub>PLH</sub>	—	135	405	ns
	10		—	55	165	
	15		—	40	120	
Transfer time Sum in→Sum out (H→L)	5	t <sub>PHL</sub>	—	150	450	ns
	10		—	55	165	
	15		—	40	120	
Transfer time Sum in→Cout (L→H)	5	t <sub>PLH</sub>	—	100	300	ns
	10		—	45	135	
	15		—	30	90	
Transfer time Sum in→Cout (H→L)	5	t <sub>PHL</sub>	—	125	375	ns
	10		—	50	150	
	15		—	35	105	
Transfer time C <sub>IN</sub> →Sum out (L→H)	5	t <sub>PLH</sub>	—	115	345	ns
	10		—	50	150	
	15		—	35	105	
Transfer time C <sub>IN</sub> →Sum out (H→L)	5	t <sub>PHL</sub>	—	130	390	ns
	10		—	50	150	
	15		—	35	105	
Transfer time C <sub>IN</sub> →Cout (L→H)	5	t <sub>PLH</sub>	—	75	225	ns
	10		—	35	105	
	15		—	25	75	
Transfer time C <sub>IN</sub> →Cout (H→L)	5	t <sub>PHL</sub>	—	90	270	ns
	10		—	35	105	
	15		—	25	75	
Input capacitance		C <sub>i</sub>	—	—	7.5	pF

1. Switching Time Measuring Circuit



2. Switching Waveforms



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