

MN4008B/MN4008BS

4-Bit Full Adder

■ Outline

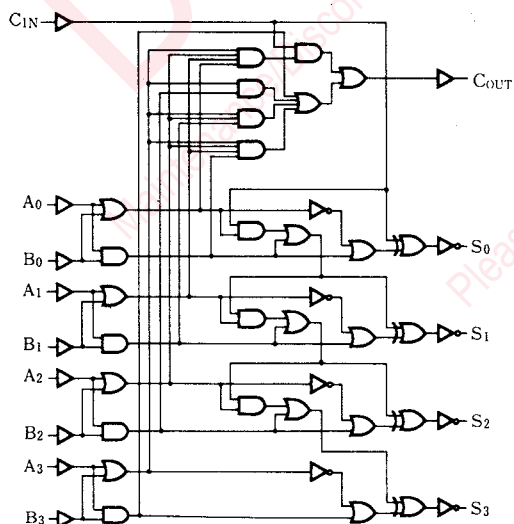
The MN4008B/S is a 4-bit parallel processing full adder equipped with a high speed parallel carry circuit. The sum of the four augend data inputs ($A_0 \sim A_3$), the other four addend data inputs ($B_0 \sim B_3$), and the binary input added to the carry input (C_{IN}) from the lower digit is obtainable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

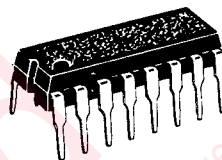
■ Truth Table

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

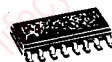


P-3



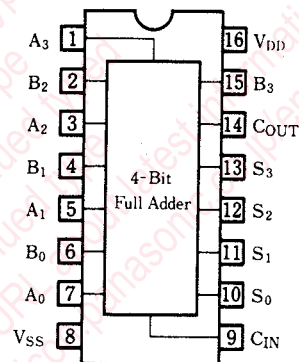
16-pin plastic DIL package

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_{stg}	-65~+150	°C

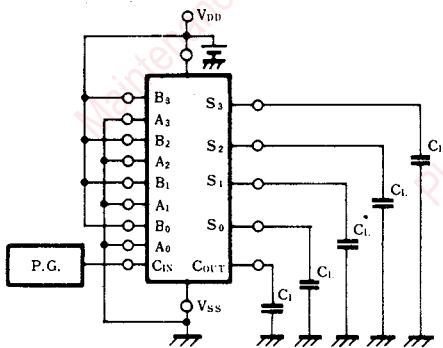
* $V_{DD}+0.5V$ should be lower than 18V.■ DC Characteristics ($V_{SS}=0V$)

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	μA
	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}	$V_O=0.5V$ or 4.5V	—	1.5	—	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}	$V_O=0.5V$ 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	0.52	—	0.44	—	0.36	—	mA
	10		$V_O=0.5V$, $V_I=0$ or 10V	1.3	—	1.1	—	0.9	—	
	15		$V_O=1.5V$, $V_I=0$ or 15V	3.6	—	3	—	2.4	—	
Output current high level	5	$-I_{OH}$	$V_O=4.6V$, $V_I=0$ or 5V	0.52	—	0.44	—	0.36	—	mA
	10		$V_O=9.5V$, $V_I=0$ or 10V	1.3	—	1.1	—	0.9	—	
	15		$V_O=13.5V$, $V_I=0$ or 15V	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	μA

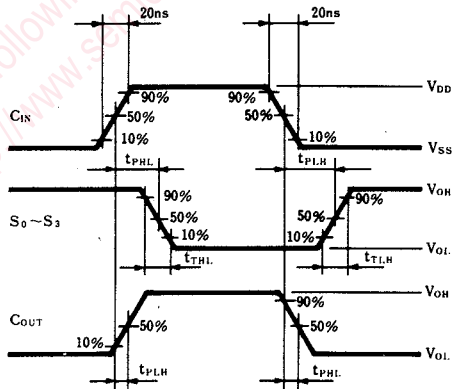
■ Switching Characteristics ($T_a=25^{\circ}\text{C}$, $V_{SS}=0\text{V}$, $C_L=50\text{pF}$)

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

1. Switching Time Measuring Circuit



2. Switching Waveforms



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