

# MN4028B/MN4028BS

## BCD-to-Decimal/Binary-to-Octal Decoder

### ■ Outline

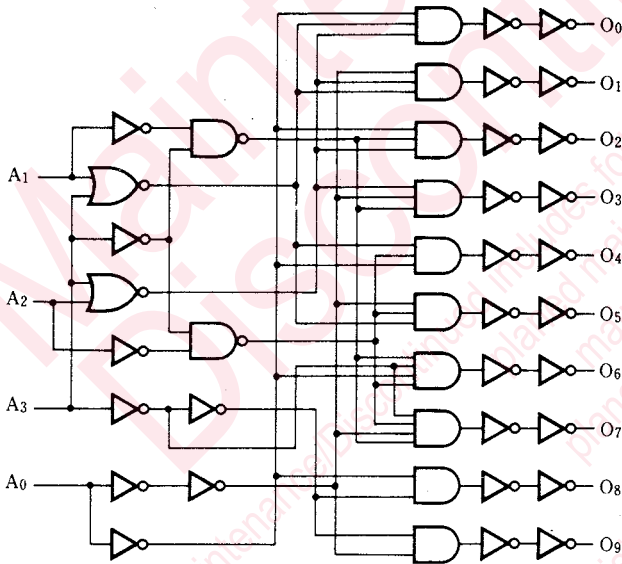
The MN4028B/S is a decoder to convert a BDC signal into a decimal signal.

Of ten outputs of  $O_0 \sim O_9$ , those corresponding to the input codes for  $A_0 \sim A_3$  become the "H" level, and all the other outputs become the "L" level.

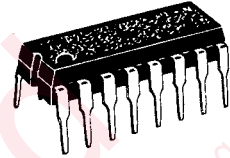
It is also possible to use this MN4028B/S as a 1-OF-8 decoder by using the input  $A_0 \sim A_2$ .

This decoder is equivalent to Motorola's MC14028B and RCA's CD4028B.

### ■ Logic Diagram



P-3



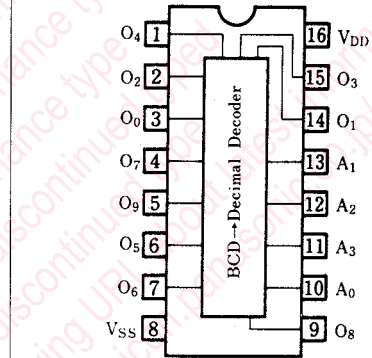
16-pin plastic DIL package

P-4



16-pin PANAFLAT package (SO-16D)

### Pin Configuration



### Pin description

$A_0 \sim A_3$  : Address input 1-2-4-BCD

$O_0 \sim O_9$  : Output

■ Truth Table

Input				Output									
A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	O <sub>0</sub>	O <sub>1</sub>	O <sub>2</sub>	O <sub>3</sub>	O <sub>4</sub>	O <sub>5</sub>	O <sub>6</sub>	O <sub>7</sub>	O <sub>8</sub>	O <sub>9</sub>
L	L	L	L	H	L	L	L	L	L	L	L	L	L
L	L	L	H	L	H	L	L	L	L	L	L	L	L
L	L	H	L	L	L	H	L	L	L	L	L	L	L
L	L	H	H	L	L	L	H	L	L	L	L	L	L
L	H	L	L	L	L	L	L	H	L	L	L	L	L
L	H	L	H	L	L	L	L	L	H	L	L	L	L
L	H	H	L	L	L	L	L	L	L	H	L	L	L
L	H	H	H	L	L	L	L	L	L	L	H	L	L
H	L	L	L	L	L	L	L	L	L	L	L	H	L
H	L	L	H	L	L	L	L	L	L	L	L	L	H
H	L	H	L	L	L	L	L	L	L	L	L	H	L
H	L	H	H	L	L	L	L	L	L	L	L	L	H
H	H	L	L	L	L	L	L	L	L	L	L	H	L
H	H	L	H	L	L	L	L	L	L	L	L	L	H
H	H	H	L	L	L	L	L	L	L	L	L	H	L
H	H	H	H	L	L	L	L	L	L	L	L	L	H

■ Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Supply voltage	V <sub>DD</sub>	-0.5~+18	V
Input voltage	V <sub>I</sub>	-0.5~V <sub>DD</sub> +0.5*	V
Output pin voltage	V <sub>O</sub>	-0.5~V <sub>DD</sub> +0.5*	V
Peak input · output pin current	±I <sub>I</sub>	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 <sub>D</sub>	max. 100	mW
Operating ambient temperature	T <sub>opr</sub>	-40~+85	°C
Storage temperature	T <sub>stg</sub>	-65~+150	°C

\* V<sub>DD</sub>+0.5V should be lower than 18V.

■ DC Characteristics (V<sub>SS</sub>=0V)

Item	V <sub>DD</sub> (V)	Symbol	Condition	Ta = -40°C		Ta = 25°C		Ta = 85°C		Unit
				min.	max.	min.	max.	min.	max.	
Static supply current	5	I <sub>DD</sub>	V <sub>I</sub> =V <sub>SS</sub> or V <sub>DD</sub>	—	20	—	20	—	150	μA
	10			—	40	—	40	—	300	
	15			—	80	—	80	—	600	
Output voltage low level	5	V <sub>OL</sub>	V <sub>I</sub> =V <sub>SS</sub> or V <sub>DD</sub>  I <sub>O</sub>  <1μA	—	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 <sub>OH</sub>	V <sub>I</sub> =V <sub>SS</sub> or V <sub>DD</sub>  I <sub>O</sub>  <1μA	4.95	—	4.95	—	4.95	—	V
	10			9.95	—	9.95	—	9.95	—	
	15			14.95	—	14.95	—	14.95	—	

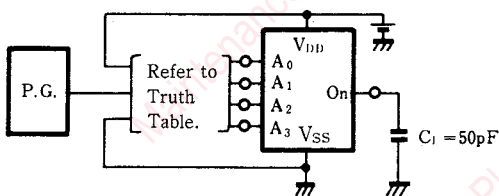
■ DC Characteristics ( $V_{SS}=0V$ )

Item	$V_{DD}$ (V)	Symbol	Condition	$T_a=-40^{\circ}C$		$T_a=25^{\circ}C$		$T_a=85^{\circ}C$		Unit
				min.	max.	min.	max.	min.	max.	
Input voltage low level	5	$V_{IL}$	$ I_{OL}  < 1\mu A$ $V_O=0.5V$ or $4.5V$	—	1.5	—	1.5	—	1.5	V
	10			—	3	—	3	—	3	
	15			—	4	—	4	—	4	
Input voltage high level	5	$V_{IH}$	$ I_{OL}  < 1\mu A$ $V_O=0.5V$ or $4.5V$	3.5	—	3.5	—	3.5	—	V
	10			7	—	7	—	7	—	
	15			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	$\mu A$

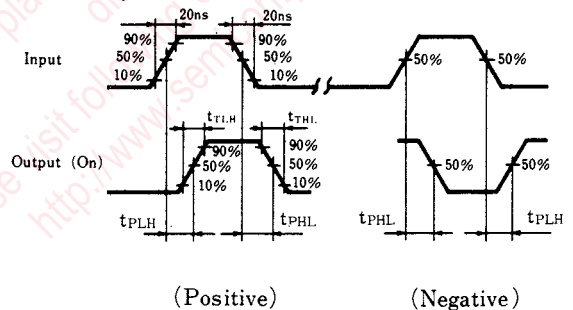
■ Switching Characteristics ( $T_a=25^{\circ}C, V_{SS}=0V, C_L=50pF$ )

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	
Propagation time	5	$t_{PLH}$	—	100	300	ns
	10		—	45	135	
	15		—	30	90	
Propagation time	5	$t_{PHL}$	—	110	330	ns
	10		—	50	150	
	15		—	35	105	
Input capacitance		$C_I$	—	—	7.5	pF

1. Switching time measuring circuit



2. Switching waveforms



(Positive)

(Negative)

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