

MN4076B/MN4076BS

4-Bit D-Type Register

■ Outline

The MN4076B/S is a 3-state output register consisting of four D-type flip-flops, and controlled by the common clock input and reset input.

When the levels of the data enable inputs ($\overline{ED}_1, \overline{ED}_0$) are both "L", the data inputs ($D_0 \sim D_3$) are stored in the four flip-flops at the rise of the clock input. In any other combination of the data enable input level conditions, the four flip-flops hold the previous state even if the clock input rose.

When the levels of the output enable inputs $\overline{EO}_0, \overline{EO}_1$ are both "L", the outputs of the respective flip-flops appear on the outputs $O_0 \sim O_3$.

In any other combination of the output enable input level conditions, the respective output becomes high impedance.

At the reset time, each output is asynchronously cleared. This D-type register is equivalent to Motorola's MC14076B and RCA's CD4076B.

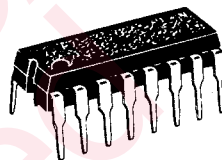
■ Truth Table

Input							Output
MR	CP	\overline{ED}_0	\overline{ED}_1	D_0	\overline{EO}_0	\overline{EO}_1	O_{0n+1}
x	x	x	x	x	H	x	Z
x	x	x	x	x	x	H	Z
H	x	x	x	x	L	L	L
L		H	x	x	L	L	no change
L		x	H	x	L	L	no change
L		L	L	H	L	L	H
L		L	L	L	L	L	L
L		x	x	x	L	L	no change
L	x	x	x	x	L	L	no change

Note) x : don't care

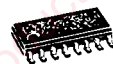
2 : high impedance

P-3



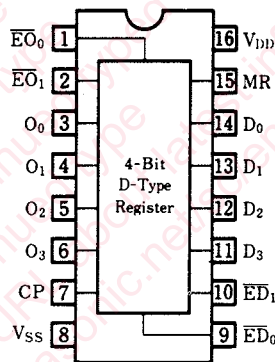
16-pin plastic DIL package

P-4



16-pin PANAFLAT package (SO-16D)

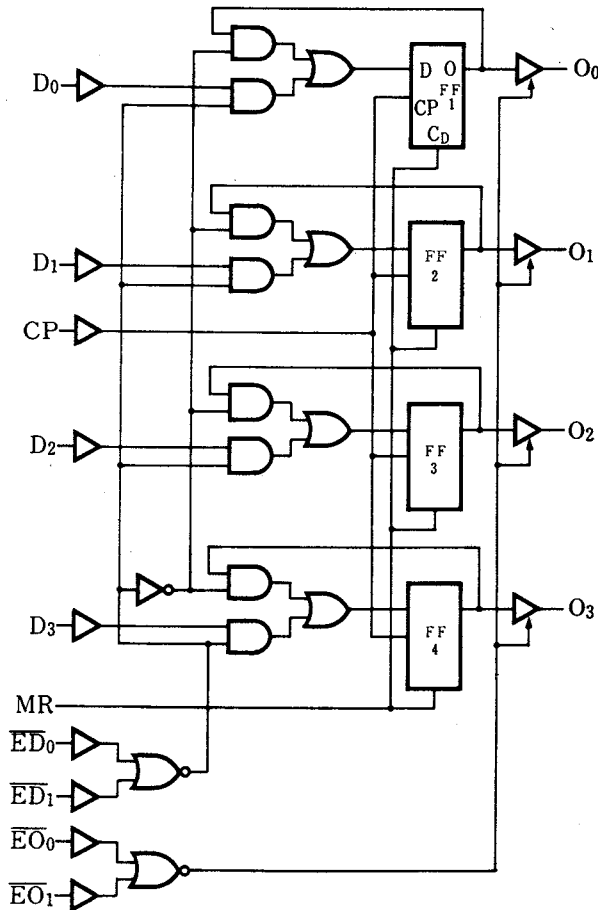
Pin Configuration



Pin description

- $D_0 \sim D_3$: Data input (4 bits)
- $\overline{ED}_0, \overline{ED}_1$: Data enable input
- $\overline{EO}_0, \overline{EO}_1$: Output enable input
- CP : Clock input
- MR : Reset input
- $O_0 \sim O_3$: Data output (4 bits)

■ Logic Diagram



■ 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)	P_D	max. 400	mW
		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	$T_a=-40^{\circ}C$		$T_a=25^{\circ}C$		$T_a=85^{\circ}C$		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_{OL} <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_{OL} <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_{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	μA	
3-state output pin	Leakage current high level	15	I_{OZH}	$V_O=V_{DD}$	—	1.6	—	1.6	—	12	μA
	Leakage current low level	15	$-I_{OZL}$	$V_O=V_{SS}$	—	1.6	—	1.6	—	12	

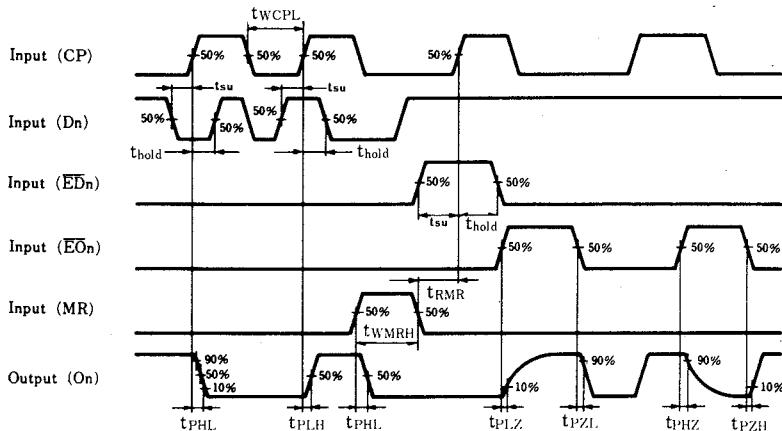
■ Switching Characteristics ($T_a=25^{\circ}C$, $V_{SS}=0V$, $C_L=50pF$)

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 CP→On (H→L)	5	t_{PHL}	—	150	450	ns
	10		—	60	180	
	15		—	45	135	
Propagation time CP→On (L→H)	5	t_{PLH}	—	160	480	ns
	10		—	65	195	
	15		—	45	135	
Propagation time MR→On (H→L)	5	t_{PHL}	—	95	285	ns
	10		—	40	120	
	15		—	30	90	

■ Switching Characteristics (cont.)

Item	V _{DD} (V)	Symbol	min.	typ.	max.	Unit
High level output disable time E _{On} →On (H)	5	t _{PHZ}	—	50	150	ns
	10		—	35	105	
	15		—	30	90	
Low level output disable time E _{On} →On (L)	5	t _{PLZ}	—	45	135	ns
	10		—	30	90	
	15		—	30	90	
High level output enable time E _{On} →On (H)	5	t _{PZH}	—	65	195	ns
	10		—	30	90	
	15		—	20	60	
Low level output enable time E _{On} →On (L)	5	t _{PZL}	—	60	180	ns
	10		—	25	75	
	15		—	20	60	
Set-up time D _n →CP	5	t _{su}	—	-15	10	ns
	10		—	-10	0	
	15		—	-5	0	
Set-up time E _{Dn} →CP	5	t _{su}	—	-50	0	ns
	10		—	-20	0	
	15		—	-15	0	
Hold time D _n →CP	5	t _{hold}	—	30	55	ns
	10		—	10	20	
	15		—	10	15	
Hold time E _{Dn} →CP	5	t _{hold}	—	-25	25	ns
	10		—	-10	10	
	15		—	-5	5	
Low level minimum clock pulse width	5	t _{wCPL}	—	60	180	ns
	10		—	20	60	
	15		—	15	45	
High level minimum MR pulse width	5	t _{wMRH}	—	25	75	ns
	10		—	15	45	
	15		—	10	30	
Maximum clock frequency	5	f _{max}	4	8	—	MHz
	10		11	22	—	
	15		16	32	—	
Input capacitance		C _i	—	—	7.5	pF

● Switching waveforms



Request for your special attention and precautions in using the technical information and semiconductors described in this book

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.
- (3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
 - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
 - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
 - Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of our company.