MN4015B / MN4015BS

Dual 4-Stage Static Shift Registers

■ Description

The MN4015B/S are dual 4-bit static shift registers.
Each register of D type flip-flop has a common reset input and can be cleared asynchronously, and triggered on the positive going edge of the clock.
A High on the reset input clears all registers and forces the outputs (O_0 ~ O_3) Low, independent of the clock and data inputs.
The MN4015B/S are equivalent to MOTOROLA MC14015B and RCA CD4015B.

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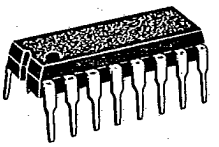

16-Pin • Plastic DIL Package

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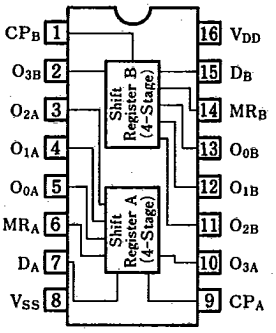
16-Pin • Panaflat Package (SO-16D)

■ Truth Table

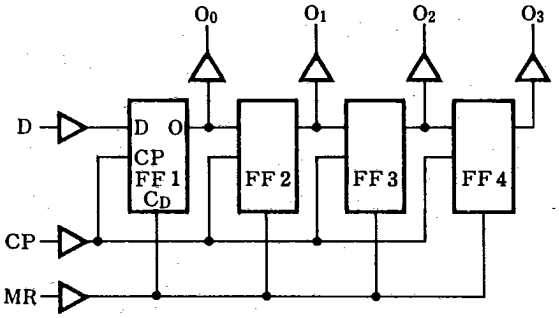
Input				Output			
n	CP	D	MR	O_0	O_1	O_2	O_3
1	↗	D_1	L	D_1	×	×	×
2	↗	D_2	L	D_2	D_1	×	×
3	↗	D_3	L	D_3	D_2	D_1	×
4	↗	D_4	L	D_4	D_3	D_2	D_1
	↘	×	L	no change			
	×	×	H	L	L	L	L

Note) X : don't care
D_n : High or Low
n : Clock pulse count

■ Pin Configuration



■ Logic Diagram (1/2)



Pin Explanation

D : Data input
CP : Clock input (↗)
MR : Reset input
O_0~O_3 : Output (4 Bits)

Maximum Ratings (Ta=25℃)

Item		Symbol	Ratings	Unit
Supply Voltage		V_{DD}	−0.5~+18	V
Input Voltage		V_I	−0.5~V_{DD}+0.5*	V
Output Voltage		V_O	−0.5~V_{DD}+0.5*	V
Peak Input · Output Current		$\pm I_I$	max. 10	mA
Power Dissipation (per package)	Ta=−40~+60℃	P_D	max. 400	mW
	Ta=+60~+85℃		Decrease up to 200mW rating at 8mW/°C	
Power Dissipation (per output terminal)		P_D	max. 100	mW
Operating Ambient Temperature		Topr	−40~+85	℃
Storage Temperature		Tstg	−65~+150	℃

* V_{DD} + 0.5V should be under 18V

DC Characteristics (V_{SS}=0V)

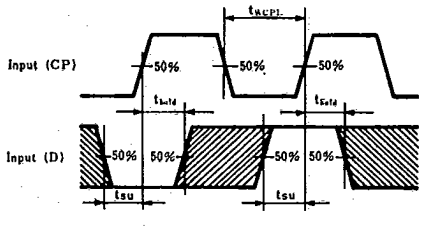
Item	V_{DD} (V)	Symbol	Conditions	Ta=−40℃ min.	Ta=−40℃ max.	Ta=25℃ min.	Ta=25℃ max.	Ta=85℃ min.	Ta=85℃ max.	Unit
Quiescent Power Supply Current	5	I_{DD}	V_I=V_{SS} or V_{DD}	—	20	—	20	—	150	μA
	10			—	40	—	40	—	300	
	15			—	80	—	80	—	600	
Output Voltage Low Level	5	V_{OL}	V_I=V_{SS} or V_{DD} | I_O |<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_{OH}	V_I=V_{SS} or V_{DD} | I_O |<1μA	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 |<1μA, V_O=0.5V or 4.5V	—	1.5	—	1.5	—	1.5	V
	10		| I_O |<1μA, V_O=1V or 9V	—	3	—	3	—	3	
	15		| I_O |<1μA, V_O=1.5V or 13.5V	—	4	—	4	—	4	
Input Voltage High Level	5	V_{IH}	| I_O |<1μA, V_O=0.5V or 4.5V	3.5	—	3.5	—	3.5	—	V
	10		| I_O |<1μA, V_O=1V or 9V	7	—	7	—	7	—	
	15		| I_O |<1μA, V_O=1.5V or 13.5V	11	—	11	—	11	—	
Output Current Low Level	5	I_{OL}	V_O=0.4V, V_I=0V or 5V	0.52	—	0.44	—	0.36	—	mA
	10		V_O=0.5V, V_I=0V or 10V	1.3	—	1.1	—	0.9	—	
	15		V_O=1.5V, V_I=0V or 15V	3.6	—	3	—	2.4	—	
Output Current High Level	5	$-I_{OH}$	V_O=4.6V, V_I=0V or 5V	0.52	—	0.44	—	0.36	—	mA
	10		V_O=9.5V, V_I=0V or 10V	1.3	—	1.1	—	0.9	—	
	15		V_O=13.5V, V_I=0V or 15V	3.6	—	3	—	2.4	—	
Output Current High Level	5	$-I_{OH}$	V_O=2.5V, V_I=0V or 5V	1.7	—	1.4	—	1.1	—	mA
Input Leakage Current	15	$\pm I_I$	V_I=0V or 15V	—	0.3	—	0.3	—	1	μA

■ **Switching Characteristics** ($Ta=25℃$, $V_{SS}=0V$, $C_L=50pF$)

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 Delay Time CP→On(H→L)	5	t_{PHL}	—	145	435	ns
	10		—	60	180	
	15		—	40	120	
Propagation Delay Time CP→On(L→H)	5	t_{PLH}	—	120	360	ns
	10		—	55	165	
	15		—	40	120	
Propagation Delay Time MR→On(H→L)	5	t_{PHL}	—	185	555	ns
	10		—	70	210	
	15		—	40	120	
Set-up Time (Fig. 1) D→CP	5	t_{su}	—	55	166	ns
	10		—	15	45	
	15		—	10	30	
Hold Time (Fig. 1) D→CP	5	t_{hold}	—	20	60	ns
	10		—	10	30	
	15		—	8	24	
Minimum Clock Pulse Width (Fig. 1)	5	t_{WCPL}	—	50	150	ns
	10		—	20	60	
	15		—	15	45	
Minimum Reset Pulse Width (Fig. 2)	5	t_{WMRH}	—	55	165	ns
	10		—	20	60	
	15		—	15	45	
Reset Recovery Time (Fig. 2)	5	t_{RMR}	—	65	195	ns
	10		—	20	60	
	15		—	15	45	
Maximum Clock Frequency	5	fmax	4	9	—	MHz
	10		12	23	—	
	15		17	34	—	
Input Capacitance		C_I	—	—	7.5	pF

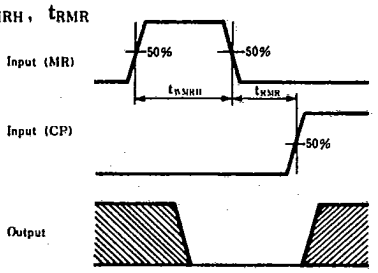
• Dynamic Signal Waveforms

(Fig. 1) t_{su}, t_{hold}, t_{WCPL}



Waveforms showing set-up times, hold times and minimum clock pulse width

(Fig. 2) t_{WMRH}, t_{RMR}



Waveforms showing recovery time for MR and minimum MR pulse width