MN4040B / MN4040BS

12-Stage Binary Counters

■ Description

The MN4040B/S are 12-stage binary ripple counters with a clock input. The reset input and outputs are fully buffered. The counter advances on the negative going edge of the clock input.
A High on the MR input clears all counter stages and forces all outputs ($O_0 \sim O_{11}$) Low, independent of the clock input.
These are suitable for frequency dividers and center-control circuits, and are equivalent to MOTOROLA MC14040B and RCA CD4040B.

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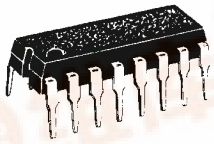

16-Pin • Plastic DIL Package

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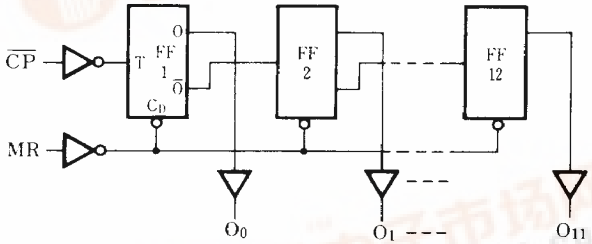
16-Pin • Panaflat Package (SO-16D)

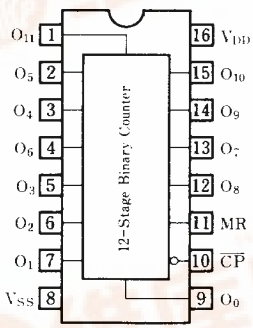
■ Logic Diagram



Pin Explanation

$\overline{CP}$: Clock input (⌝⌞)
MR : Reset input
$O_0 \sim O_{11}$: Output (12 Bits)

Pin Configuration



■ 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} + 0.5 V 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}, $\|I_O\|<1\mu A$	—	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	—	1.5	V
	10		$\|I_O\|<1\mu A$, $V_O=1V$ or $9V$	—	3	—	3	—	3	
	15		$\|I_O\|<1\mu A$, $V_O=1.5V$ 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		$\|I_O\|<1\mu A$, $V_O=1V$ or $9V$	7	—	7	—	7	—	
	15		$\|I_O\|<1\mu A$, $V_O=1.5V$ 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

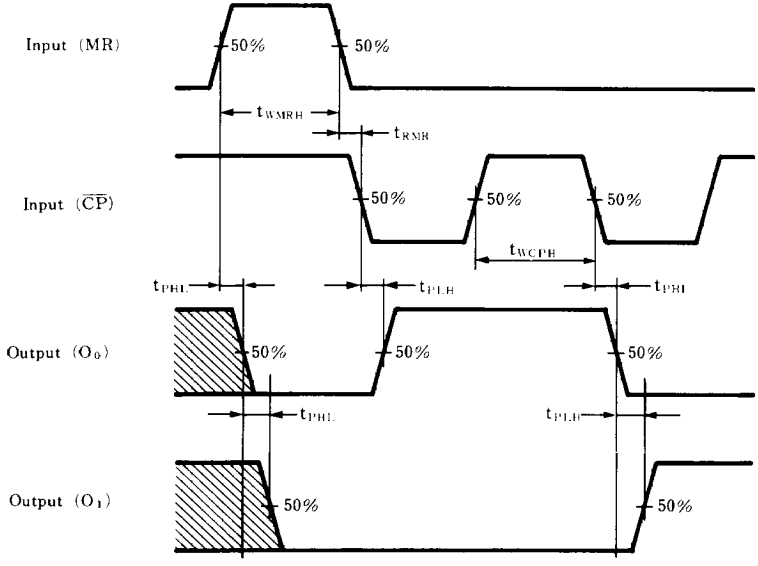
■ Switching Characteristics ($Ta=25℃$, $V_{SS}=0V$, $C_L=50pF$)

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 $\overline{CP}\rightarrow O_0$ (L→H)	5	t_{PLH}	—	105	315	ns
	10		—	50	150	
	15		—	35	105	
Propagation Delay Time $\overline{CP}\rightarrow O_0$ (H→L)	5	t_{PHL}	—	105	315	ns
	10		—	45	135	
	15		—	30	90	
Propagation Delay Time $On\rightarrow On_{-1}$ (L→H)	5	t_{PLH}	—	70	210	ns
	10		—	25	75	
	15		—	20	60	
Propagation Delay Time $On\rightarrow On_{-1}$ (H→L)	5	t_{PHL}	—	80	240	ns
	10		—	30	90	
	15		—	20	60	

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

Item	V_{DD} (V)	Symbol	min.	typ.	max.	Unit
Propagation Delay Time MR→On (H→L)	5	t_{PHL}	—	180	540	ns
	10		—	90	270	
	15		—	70	210	
Minimum Clock Pulse Width	5	t_{WCPH}	—	25	75	ns
	10		—	15	45	
	15		—	10	30	
Minimum Reset Pulse Width	5	t_{WMRH}	—	65	195	ns
	10		—	50	150	
	15		—	45	135	
Reset Recovery Time	5	t_{RMR}	—	60	180	ns
	10		—	35	105	
	15		—	25	75	
Maximum Clock Frequency	5	fmax	5	10	—	MHz
	10		13	25	—	
	15		18	35	—	
Input Capacitance		C_I	—	—	7.5	pF

• Dynamic Signal Waveforms



Waveforms showing propagation delays for MR to O_n and $\overline{CP}$ to O_0, minimum MR and $\overline{CP}$ pulse widths and recovery time for MR