

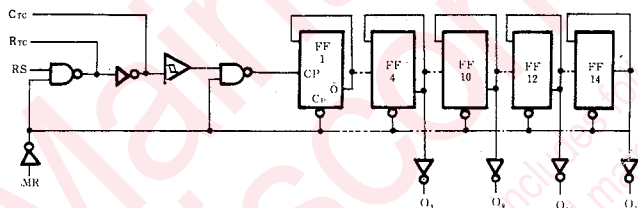
MN4060B/MN4060BS

14-Stage Ripple-Carry Binary Counter/Divider and Oscillator

■ Outline

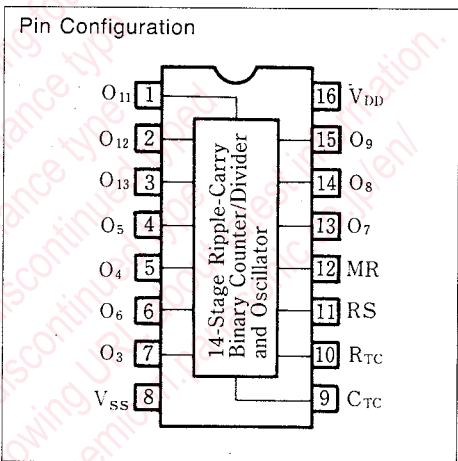
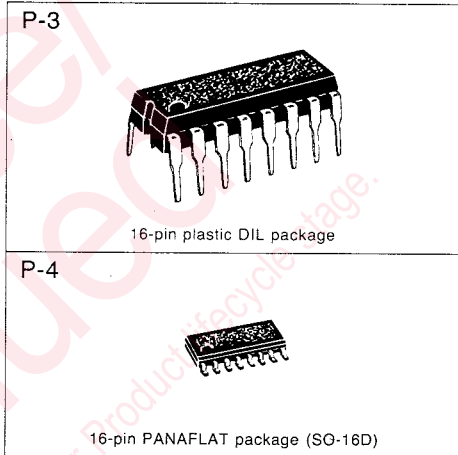
The MN4060B/S is a 14-stage ripple-carry binary counter divider and oscillator having oscillation pins (R_S , R_{TC} , C_{TC}), buffer outputs ($O_3 \sim O_9$, $O_1 \sim O_{13}$), and an asynchronous master reset input. The oscillation circuit accepts both CR oscillation and crystal oscillation. The oscillator having oscillation pins (R_S , R_{TC} , C_{TC}), buffer outputs ($O_3 \sim O_9$, $O_1 \sim O_{13}$), and an asynchronous master reset input. The oscillation circuit accepts both CR oscillation and crystal oscillation. The oscillator signals can be substituted by external clock signals from the RS input. The counter advances at the fall of RS. When MR is set to "H", the other inputs become independent and the counter is reset $O_3 \sim O_9$, $O_{11} \sim O_{13} = "L"$.

■ Logic Diagram



Pin description

- MR : Master reset
- RS : CLOCK input/OSCILLATOR pin
- R_{TC} : OSCILLATOR pin
- C_{TS} : External capacity connecting pin
- $O_3 \sim O_9$, $O_{11} \sim O_{13}$: Counter output



■ Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Item	Symbol	Rating	Unit
Supply voltage	V_{DD}	$-0.5 \sim +18$	V
Input voltage	V_I	$-0.5 \sim V_{DD} + 0.5^*$	V
Output pin voltage	V_O	$-0.5 \sim V_{DD} + 0.5^*$	V
Peak input · output pin current	$\pm I_I$	max. 10	mA
Power dissipation (per package)	$T_a = -40 \sim +60^\circ\text{C}$	max. 400	mW
	$T_a = +60 \sim +80^\circ\text{C}$	Decrease to 200mW at the rate of 8mW/°C	
Power dissipation (per output pin)	P_D	max. 100	mW
Operating ambient temperature	T_{opr}	$-40 \sim +85$	°C
Storage temperature	T_{stg}	$-65 \sim +150$	°C

* $V_{DD} + 0.5\text{V}$ should be lower than 18V.

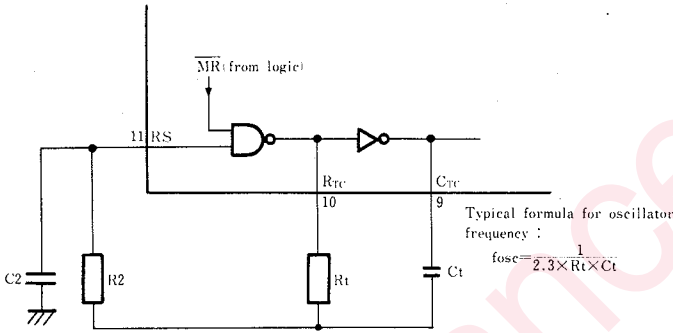
■ DC Characteristics ($V_{SS}=0V$)

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} $I_{O1}<1\mu A$	—	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} $I_{O1}<1\mu A$	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}	$I_{O1}<1\mu A$	$V_O=0.5V$ or $4.5V$	—	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}	$I_{O1}<1\mu A$	$V_O=0.5V$ 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 (Ta=25°C, V_{SS}=0V, C_L)

Item	V _{DD} (V)	Symbol	min.	typ.	max.	Unit
Output rise time	5	t _{TLH}	—	60	120	ns
	10		—	30	60	
	15		—	20	40	
Output fall time	5	t _{THL}	—	60	120	ns
	10		—	30	60	
	15		—	20	40	
Propagation time RS→03 (L→H)	5	t _{PLH}	—	210	420	ns
	10		—	80	160	
	15		—	50	100	
Propagation time RS→03 (H→L)	5	t _{PHL}	—	210	420	ns
	10		—	80	160	
	15		—	50	100	
Propagation time On→On+1 (L→H)	5	t _{PLH}	—	25	50	ns
	10		—	10	20	
	15		—	6	12	
Propagation time On→On+1 (H→L)	5	t _{PHL}	—	25	50	ns
	10		—	10	20	
	15		—	6	12	
Propagation time Mr→On (H→L)	5	t _{PLH}	—	100	200	ns
	10		—	40	80	
	15		—	30	60	
Minimum RS clock pulse width	5	t _{WRSH}	120	60	—	ns
	10		50	25	—	
	15		30	15	—	
Minimum reset pulse width	5	t _{WMRH}	50	25	—	ns
	10		30	15	—	
	15		20	10	—	
Reset recovery time	5	t _{RMR}	160	80	—	ns
	10		80	40	—	
	15		60	30	—	
Maximum RS clock frequency	5	f _{max}	4	8	—	MHz
	10		10	20	—	
	15		15	30	—	

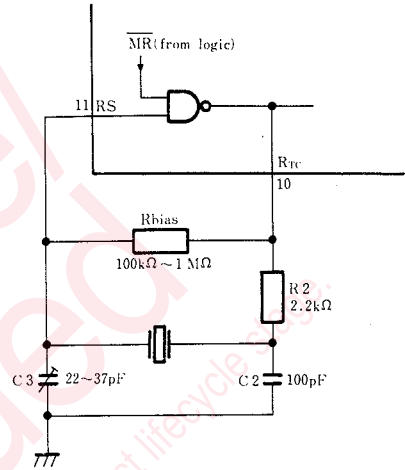
■ RC Oscillator Circuit



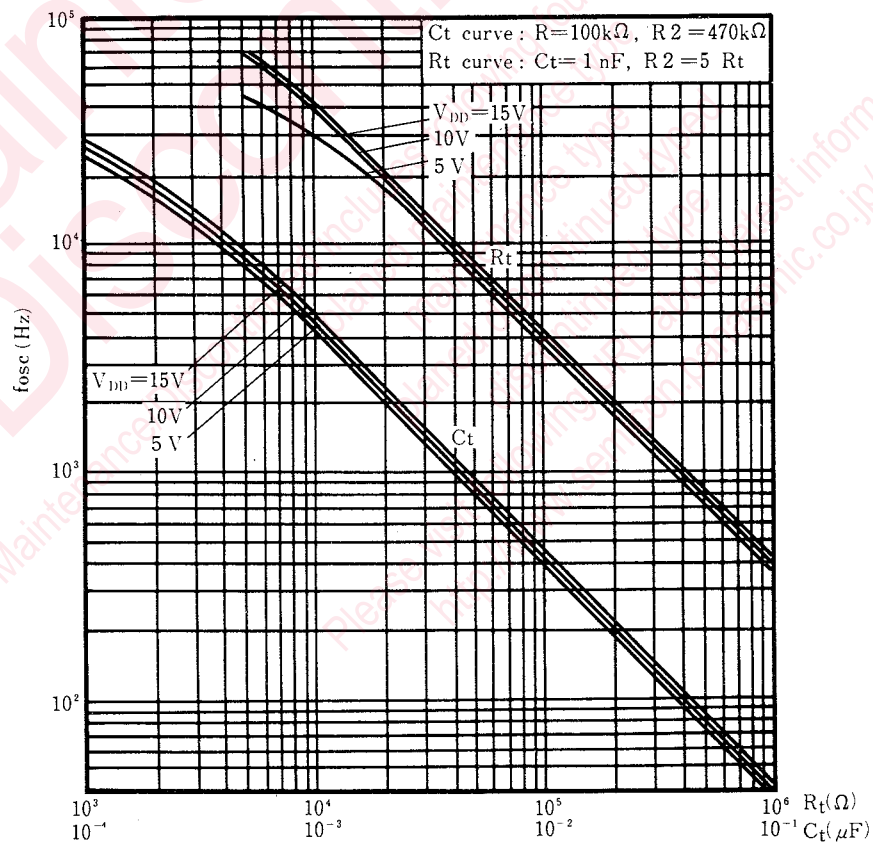
Typical formula for oscillator frequency :

$$f_{osc} = \frac{1}{2.3 \times R_1 \times C_t}$$

■ Crystal Oscillation Circuit



■ RC Oscillating Frequency Characteristics



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