



MMC 4518 MMC 4520

DUAL UP-COUNTERS: MMC 4518 DUAL BCD UP-COUNTER MMC 4520 DUAL BINARY UP-COUNTER

GENERAL DESCRIPTION

The MMC 4518/4520 are monolithic integrated circuits available in 16-lead dual in-line plastic package. The MMC 4518 Dual BCD Up Counter and MMC 4520 Dual Binary Up Counter each consist of two identical, internally synchronous, 4-stage counters. The counter stages are D-type flip-flops having interchangeable Clock and Enable lines for incrementing on either the positive-going or negative-going transition. For single-unit operation the Enable input is maintained "high" and the counter advances on each positive-going transition of the Clock. The counters are cleared by high levels on their Reset lines. The counter can be cascaded in the ripple mode by connecting Q4 to the Enable input of the subsequent counter while the clock input of the latter is held low.

FEATURES

- Medium-speed operation-6 MHz typ. clock frequency at 10 V
- Positive or negative edge triggering
- Synchronous internal CARRY propagation

ABSOLUTE MAXIMUM RATINGS

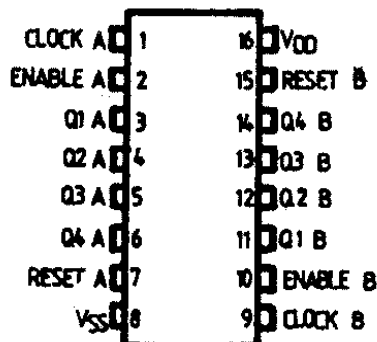
V_{DD}^*	Supply voltage: G and H types E and F types	-0.5 to -0.5 to -0.5 to	20 18 $V_{DD}+0.5$	V V V
V_i	Input voltage		± 10	mA
I_i	DC input current (any one input)		200	mW
P_{tot}	Total power dissipation (per package) Dissipation per output transistor for T_A = full package-temperature range		100	mW
T_A	Operating temperature : G and H types E and F types	-55 to -40 to -65 to	125 85 150	°C °C °C
T_{stg}	Storage temperature			

* All voltage values are referred to V_{SS} pin voltage

RECOMMENDED OPERATING CONDITIONS

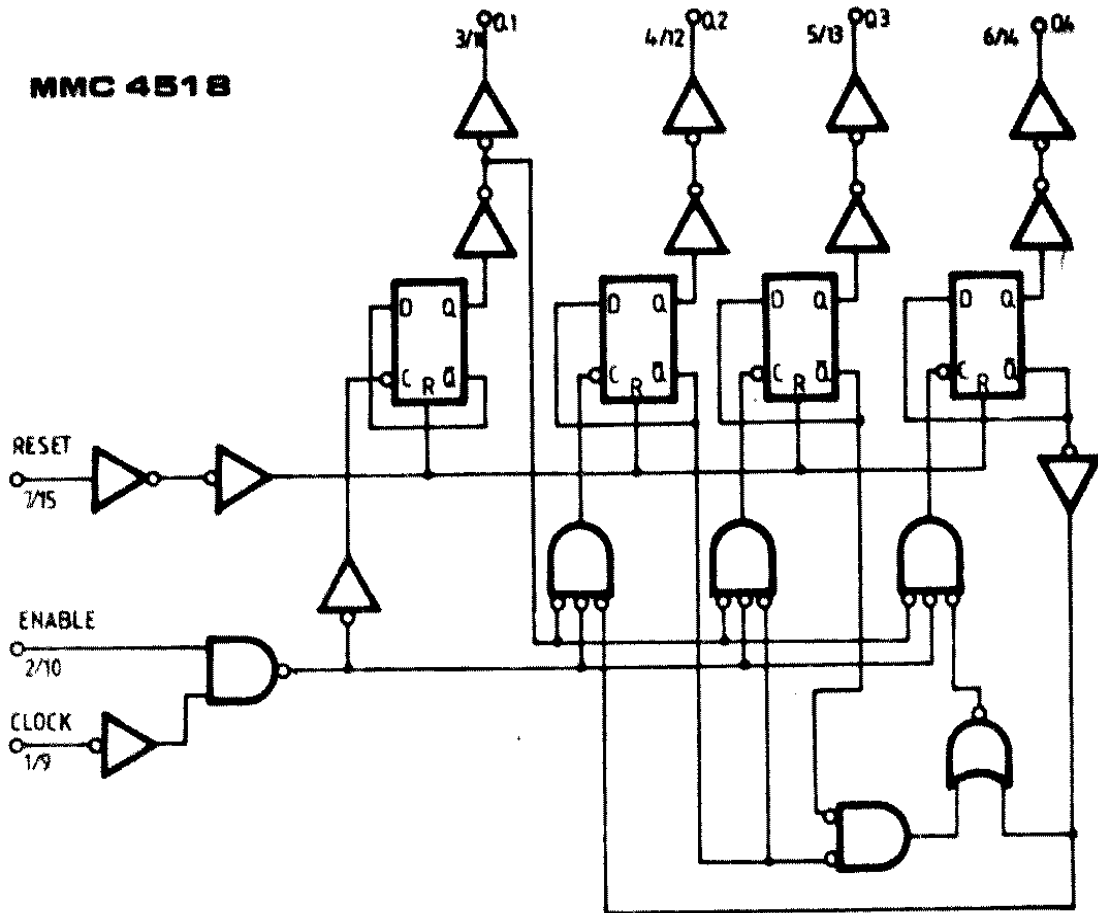
V_{DD}^*	Supply voltage: G and H types E and F types	3 to 3 to 0 to	18 15 V_{DD}	V V V
V_i	Input voltage			
T_A	Operating temperature : G and H types E and F types	-55 to -40 to	125 85	°C °C

CONNECTION DIAGRAM

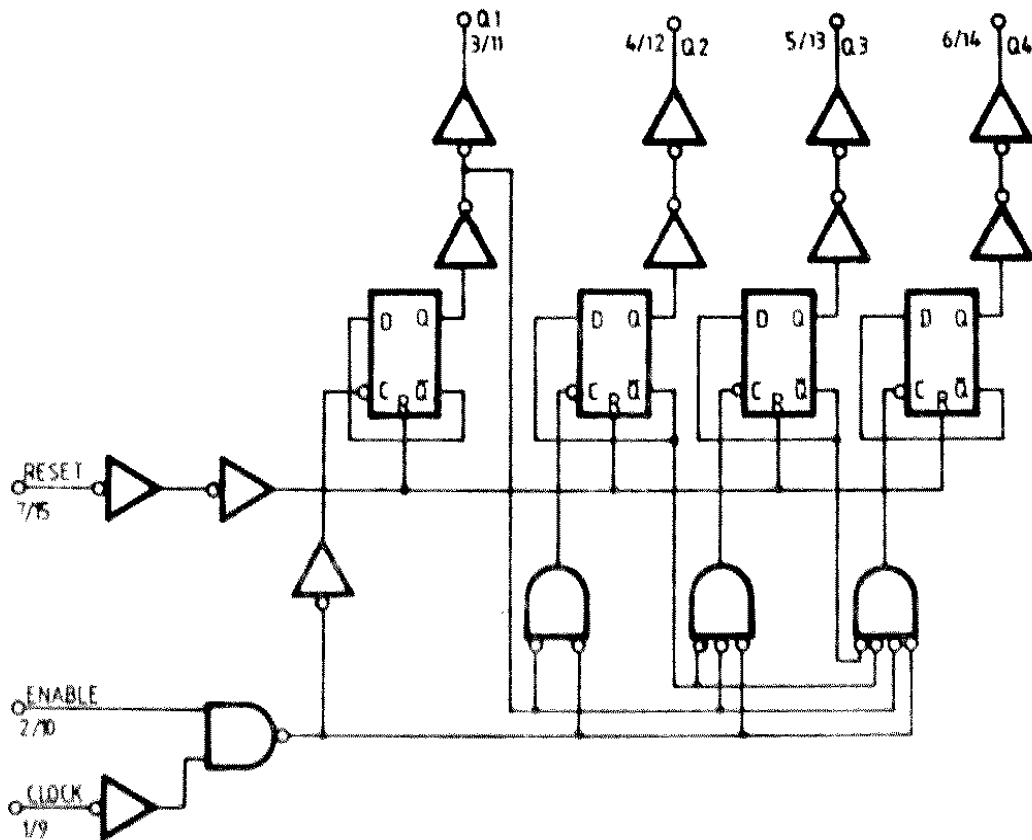


LOGIC DIAGRAMS







MMC 4518



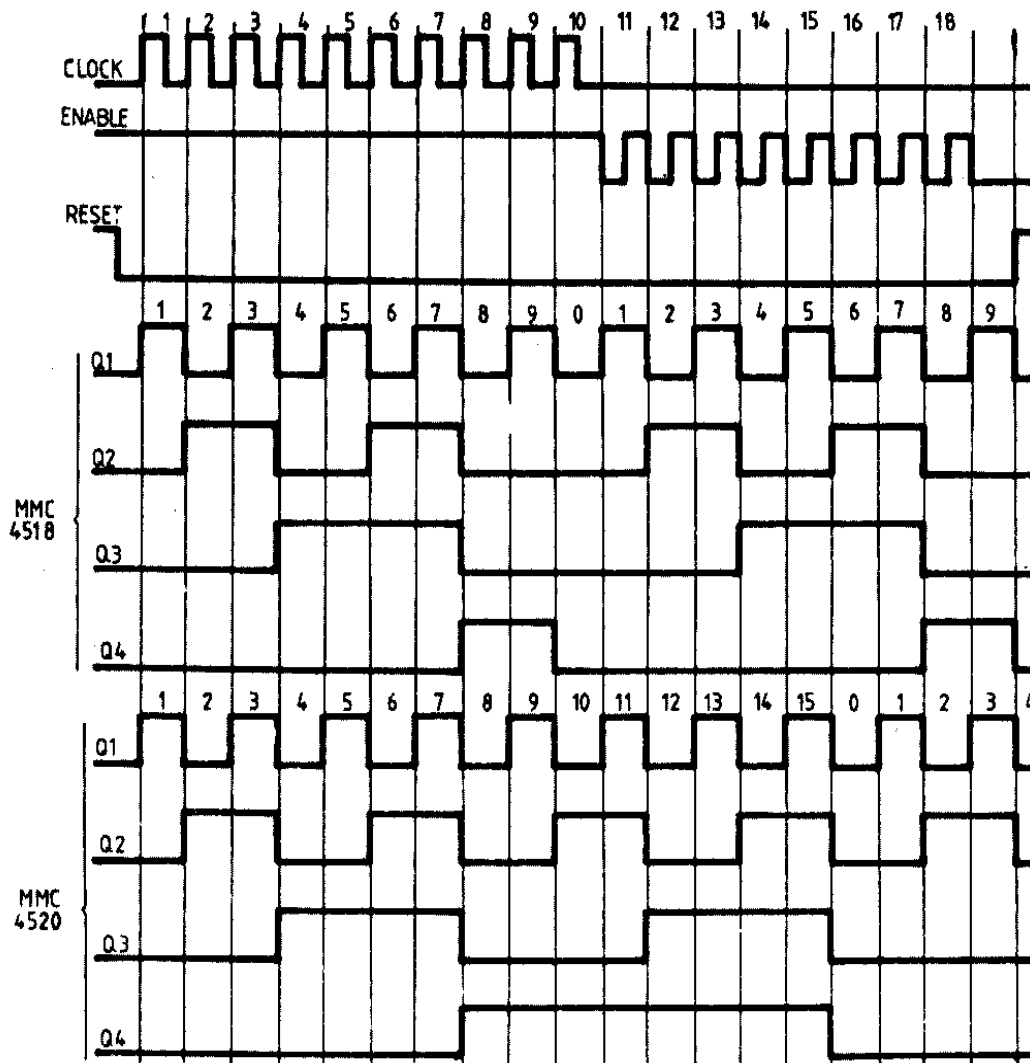
MMC 4520



**TRUTH TABLE for MMC
4518/4520**

CLOCK	ENABLE	RESET	ACTION
	1	1	Increment counter
0		0	Inter counter
X		0	No change
	X	0	No change
	0	0	No change
1		0	No change
X	X	1	Q1 thru Q4 = 0

TIMING DIAGRAM



STATIC ELECTRICAL CHARACTERISTICS

(over recommended operating conditions)

PARAMETER			TEST CONDITIONS				VALUES						UNIT	
			V _I (V)	V _O (V)	I _O (μ A)	V _{DD} (V)	T _{LOW}		25°C			T _{HIGH}		
							min.	max.	min.	typ.	max.	min.		max.
I _L	Quiescent current	G, H types	0/5			5		5		0.04	5		150	μ A
			0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
			0/20			20		100		0.08	100		3000	
	E, F types	0/5			5		20		0.04	20		150		
		0/10			10		40		0.04	40		300		
		0/15			15		80		0.04	80		600		
V _{OH}	Output high voltage	0/5		< 1	5	4.95		4.95			4.95		V	
		0/10		< 1	10	9.95		9.95			9.95			
		0/15		< 1	15	14.95		14.95			14.95			
V _{OL}	Output low voltage	5/0		< 1	5		0.05			0.05		0.05	V	
		10/0		< 1	10		0.05			0.05		0.05		
		15/0		< 1	15		0.05			0.05		0.05		
V _{IH}	Input high voltage		0.5/4.5	< 1	5	3.5		3.5			3.5		V	
			1/9	< 1	10	7		7			7			
			1.5/13.5	< 1	15	11		11			11			
V _{IL}	Input low voltage		4.5/0.5	< 1	5		1.5			1.5		1.5	V	
			9/1	< 1	10		3			3		3		
			13.5/1.5	< 1	15		4			4		4		
I _{OH}	Output drive current	G, H types	0/5	25		5	-2		-1.6	-3.2		-1.15	mA	
			0/5	4.6		5	-0.64		-0.51	-1		-0.36		
			0/10	9.5		10	-1.6		-1.3	-2.6		-0.9		
			0/15	13.5		15	-4.2		-3.4	-6.8		-2.4		
		E, F types	0/5	2.5		5	-1.53		-1.36	-3.2		-1.1		
			0/5	4.6		5	-0.52		-0.44	-1		-0.36		
		0/10	9.5		10	-1.3		-1.1	-2.6		-0.9			
		0/15	13.5		15	3.6		3.0	6.8		2.4			
I _{OL}	Output sink current	G, H types	0/5	0.4		5	0.64		0.51	1		0.36	mA	
			0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
		E, F types	0/5	0.4		5	0.52		0.44	1		0.36		
			0/10	0.5		10	1.3		1.1	2.6		0.9		
			0/15	1.5		15	3.6		3.0	6.8		2.4		
I _{IH} , I _{IL}	Input leakage current	G, H types	0/18	Any input		18		± 0.1		$\pm 10^{-5}$	± 0.1		± 1	μ A
		E, F types	0/15											
C _i	Input capacitance		Any input						5	7.5			pF	

* T_{LOW} = -55°C for G, H devices, -40°C for E, F devices* T_{HIGH} = +125°C for G, H devices; +85°C for E, F devices

The Noise Margin for both "1" and "0" level is:

1 V min. with V_{DD} = 5 V2 V min. with V_{DD} = 10 V2.5 V min. with V_{DD} = 15 V

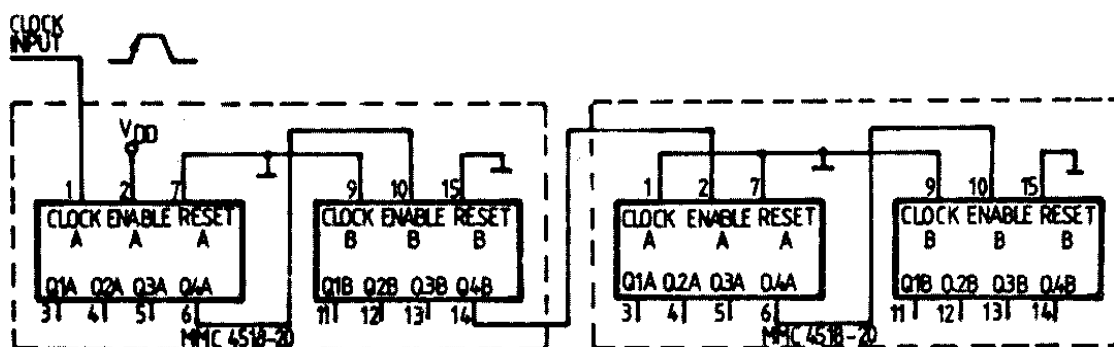
DYNAMIC ELECTRICAL CHARACTERISTICS

($T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}$, typical temperature coefficient for all V_{DD} values is $0.3\%/^\circ\text{C}$, all input rise and fall time = 20 ns)

PARAMETER	TEST CONDITIONS $V_{DD}(V)$	VALUES			UNIT
		Min.	Typ.	Max.	
t_{PLH} , t_{PHL} propagation delay time (Reset to output)	5 10 15		280 115 80	560 230 160	ns
t_{PLH} , t_{PHL} Propagation delay time (Clock or Enable to output)	5 10 15		330 130 90	650 225 170	ns
t_{TLH} , t_{THL} Transition time	5 10 15		100 50 40	200 100 80	ns
t_w Clock pulse width	5 10 15	200 100 70	100 50 35		ns
t_w Enable pulse width	5 10 15	400 200 140	200 100 70		ns
t_r , t_f Clock or enable rise and fall time	5 10 15			15 15 5	μs
f_{max} Maximum clock frequency	5 10 15	1.5 3 4	3 6 8		MHz
t_r , t_f Clock input rise and fall time	5 10 15			15 5 5	μs
t_w Reset pulse width	5 10 15	250 110 80	125 55 40		ns

TYPICAL APPLICATIONS

Ripple cascading of four counters with positive-edge triggering



Synchronous cascading of four binary counters with negative-edge triggering

