



MMC 4018

PRESSETTABLE DIVIDE-BY-N COUNTER

GENERAL DESCRIPTION

The MMC 4018 (G and H types) and MMC 4018 (E and F types) are monolithic integrated circuits, available in 16-lead dual in-line plastic or ceramic package, ceramic flat package and plastic micropackage.

The MMC 4018 types consists of 5 Johnson-Counter stages, buffered Q outputs from each stage, and counter preset control gating. CLOCK, RESET, DATA, PRESET ENABLE, and 5 individual JAM inputs are provided. Divide by 10, 8, 6, 4, or 2 counter configurations can be implemented by feeding the Q5, Q4, Q3, Q2, Q1 signals, respectively, back to the DATA input. Divide-by-9, 7, 5, or 3 counter configurations can be implemented by the use of a MMC 4011 gate package to properly gate the feedback connection to the DATA input. Divide-by-functions greater than 10 can be achieved by use of multiple

MMC 4018 units. The counter is advanced one count at the positive clock-signal transition. Schmitt-Trigger action on the clock line permits unlimited clock rise and fall times. A high RESET signal clears the counter to an all-zero condition. A high PRESET-ENABLE signal allows information on the JAM inputs to preset the counter. Anti-lock gating is provided to assure the proper counting sequence.

FEATURES

- Medium speed operation 10 MHz (typ.) at $V_{DD}-V_{SS} = 10\text{ V}$.
- Fully static operation.

ABSOLUTE MAXIMUM RATINGS

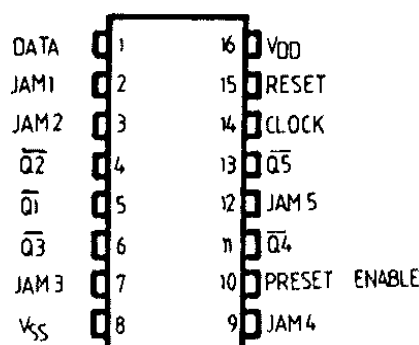
V_{DD}^*	Supply voltage: G and H types	-0.5 to 20	V
	E and F types	-0.5 to 18	V
V_i	Input voltage	-0.5 to $V_{DD}+0.5$	V
I_i	DC input current (any one input)	± 10	mA
P_{tot}	Total power dissipation (per package)	200	mW
	Dissipation per output transistor for $T_A =$ full package-temperature range	100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

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

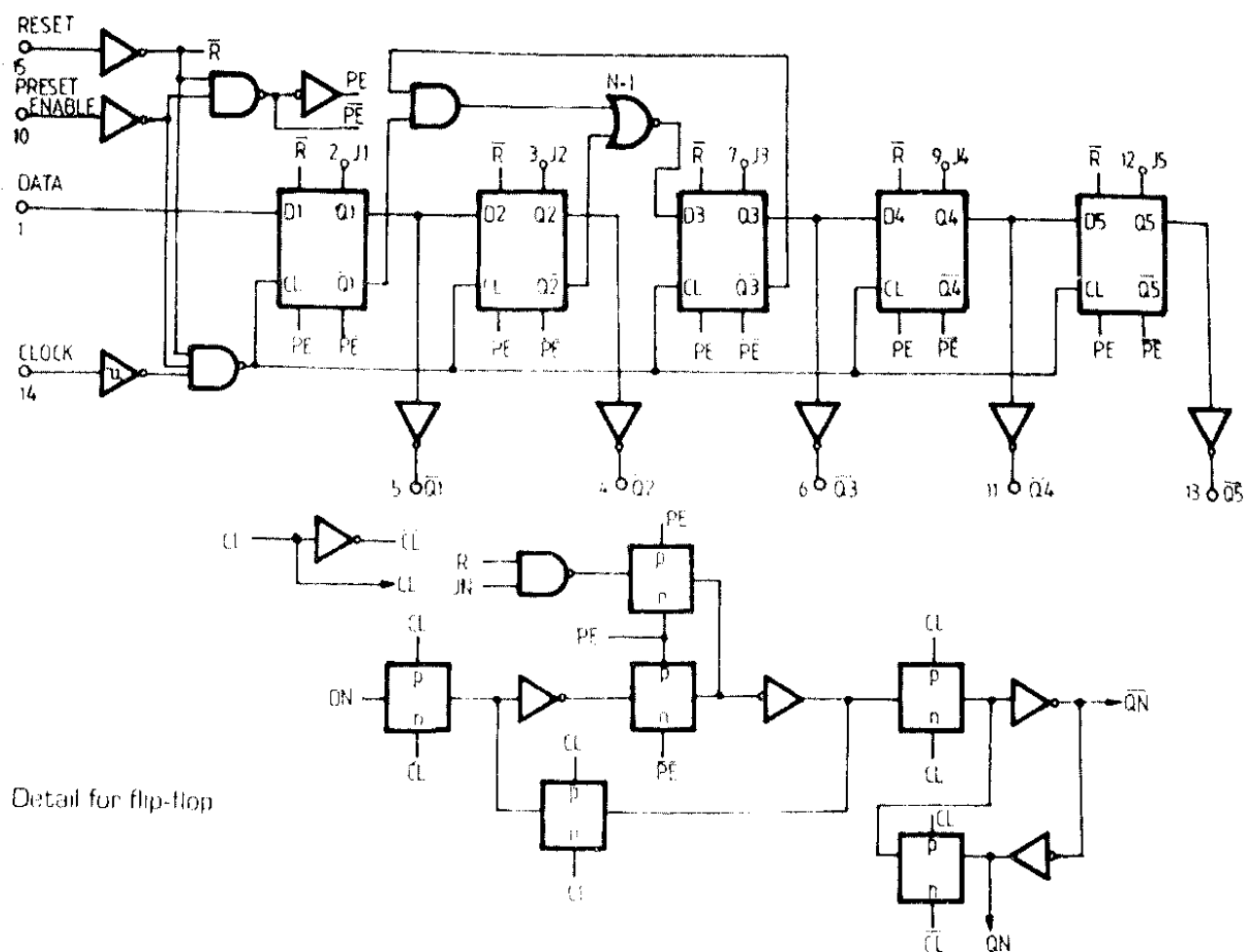
RECOMMENDED OPERATING CONDITIONS

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

CONNECTION DIAGRAM

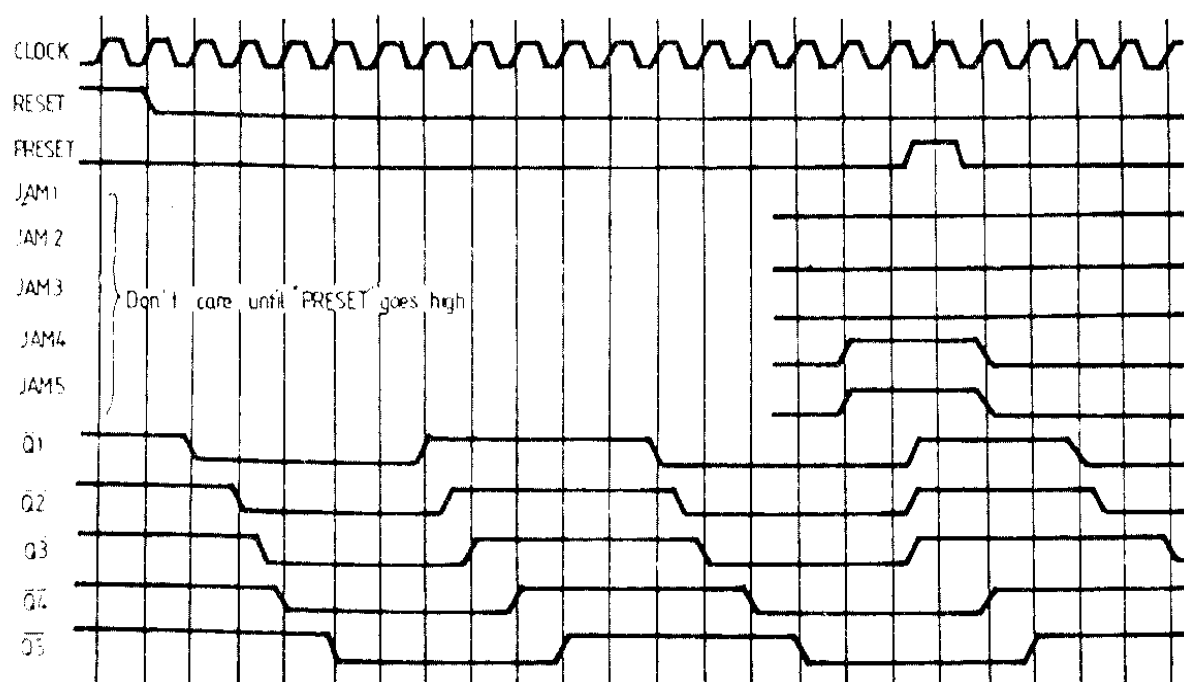


LOGIC DIAGRAM



TIMING DIAGRAM

(Data input tied to Q5 for decade counter configuration)



STATIC ELECTRICAL CHARACTERISTICS

(over recommended operating conditions)

PARAMETER			TEST CONDITIONS				VALUES							UNIT
			V _I (V)	V _O (V)	I _o (μA)	V _{OD} (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	μA	
		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	2.5		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		±10 ⁻⁵	±0.1		±1	μA	
	E, F types	0/15			15		±0.3		±10 ⁻⁵	±0.3		±1		
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

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

PARAMETER	TEST CONDITIONS V_{DD} (V)	VALUES			UNIT
		min.	typ.	max.	
t_{PLH} , t_{PHL} Propagation delay time	5 10 15		200 90 65	400 180 130	ns
t_{THL} , t_{TLH} Transition time	5 10 15		100 50 40	200 100 80	
f_{CL} Maximum clock input frequency	5 10 15	3 7 8.5	6 14 17		MHz
t_W Clock pulse width	5 10 15	160 70 50	80 35 25		ns
t_r , t_f Clock input rise or fall time	5 10 15	Unlimited			μs
t_{setup} Data input Set-Up time	5 10 15	40 12 6	20 6 3		ns
t_H Data input Hold-time	5 10 15	140 80 60	70 40 30		ns

Preset* or reset operation

t_{PLH} , t_{PHL} Propagation delay time (Preset or Reset to $\bar{Q}$)	5 10 15		275 125 90	550 250 180	ns
t_W Preset or reset pulse width	5 10 15	160 70 50	80 35 25		ns
t_{rem} Preset or reset removal time	5 10 15	80 30 20	40 15 10		ns

* At PRESET ENABLE OR JAM inputs.