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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 $\overline{Q5}$, $\overline{Q4}$, $\overline{Q3}$, $\overline{Q2}$, $\overline{Q1}$ 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 V.
- Fully static operation.

ABSOLUTE MAXIMUM RATINGS

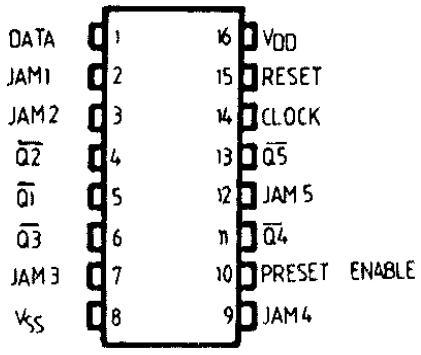
V_{DD}*	Supply voltage:	G and H types	-0.5 to	20	V
		E and F types	-0.5 to	18	V
V_I	Input voltage		-0.5 to	V_{DD}+0.5	V
I_I	DC input current (any one input)			±10	mA
P_{tot}	Total power dissipation (per package)			200	mW
	Dissipation per output transistor for T_A = full package-temperature range			100	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

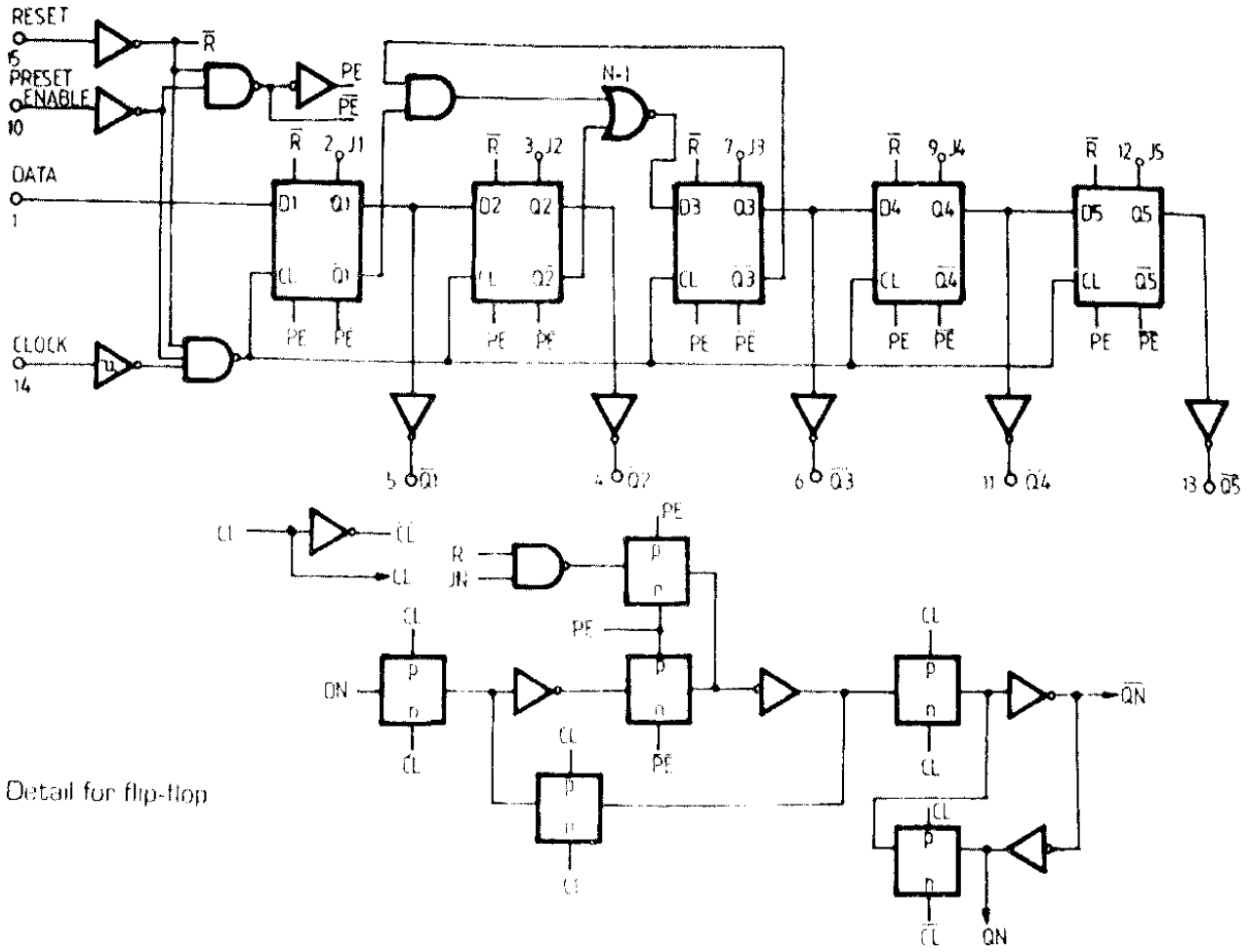
V_{DD}*	Supply voltage:	G and H types	3 to	18	V
		E and F types	3 to	15	V
V_I	In put voltage		0 to	V_{DD}	V
T_A	Operating temperature :	G and H types	-55 to	125	°C
		E and F types	-40 to	85	°C

CONNECTION DIAGRAM



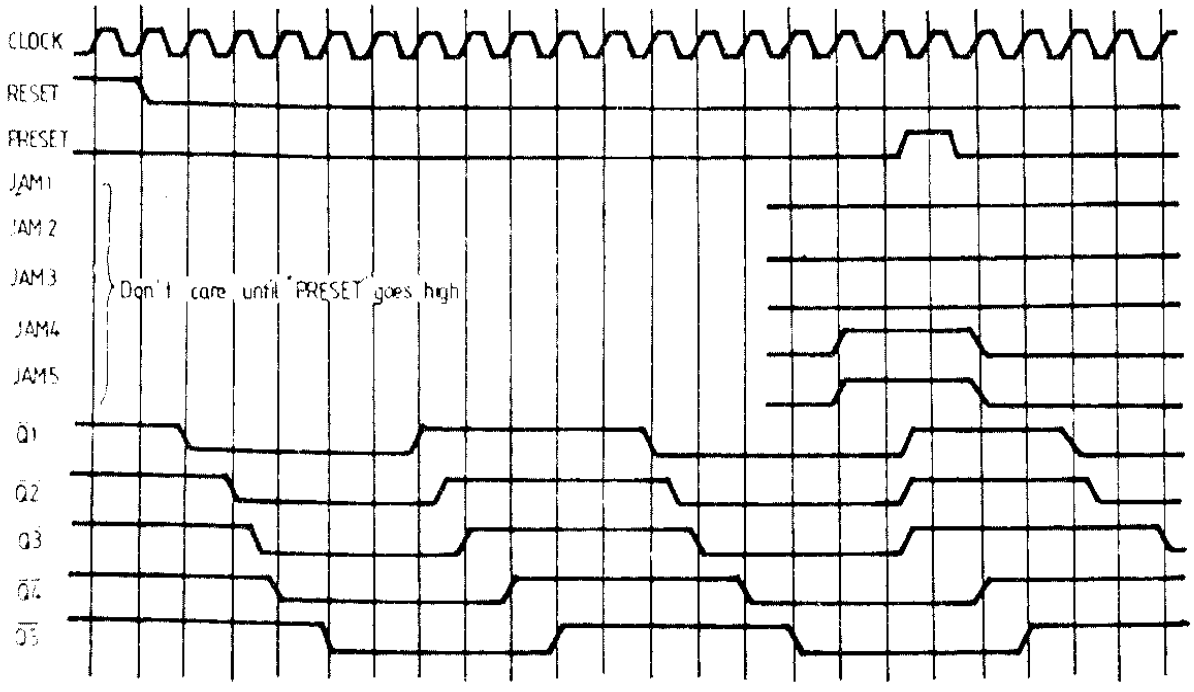
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LOGIC DIAGRAM



TIMING DIAGRAM

(Data input tied to $\overline{Q5}$ for decade counter configuration)



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STATIC ELECTRICAL CHARACTERISTICS

(over recommended operating conditions)

PARAMETER			TEST CONDITIONS				VALUES							UNIT
			V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_{LOW}* min.	T_{LOW}* max.	25°C min.	25°C typ	25°C max.	T_{HIGH}* min.	T_{HIGH}* 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 V

2 V min. with V_{DD} = 10 V

2.5 V min. with V_{DD} = 15 V

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DYNAMIC ELECTRICAL CHARACTERISTICS

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

	PARAMETER	TEST CONDITIONS V_{DD} (V)	VALUES min.	VALUES typ.	VALUES max.	UNIT
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	ns
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 $\overline{Q}$)	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.