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 $\bar{Q}$ 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

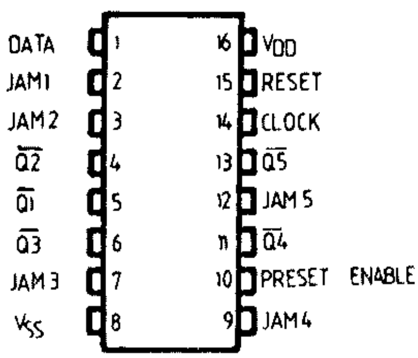
V_{DD}*	Supply voltage:	G and H types	-0.5 to	20	V
		E and F types	-0.5 to	18	V
V_i	Input voltage		-0.5 to	V_{DD}+0.5	V
I_I	DC input current (any one input)			±10	mA
P_{tot}	Total power dissipation (per package)			200	mW
	Dissipation per output transistor for T_A = full package-temperature range			100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

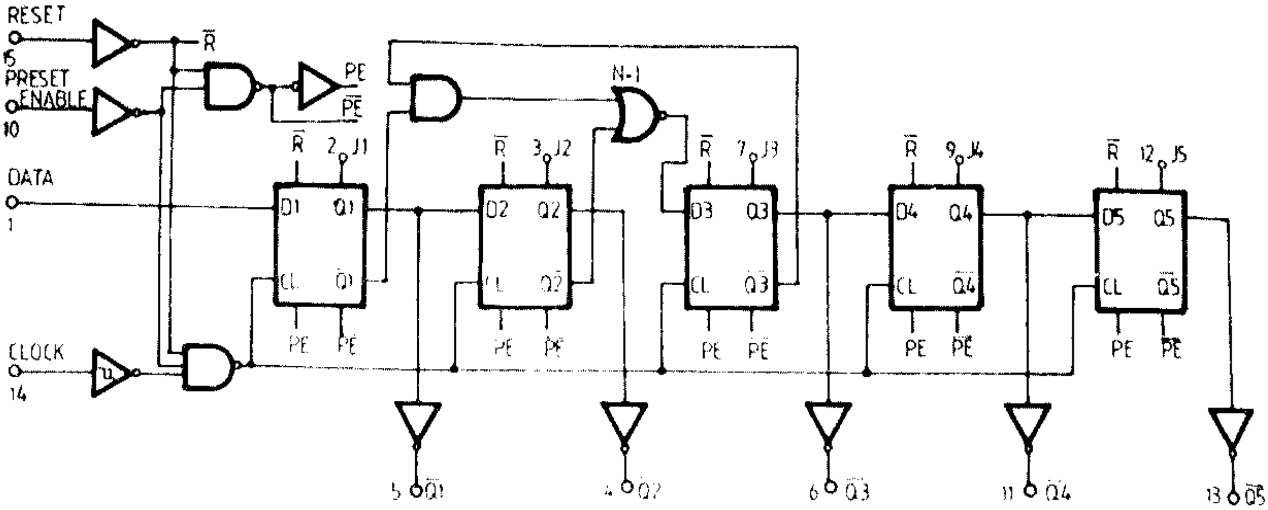
RECOMMENDED OPERATING CONDITIONS

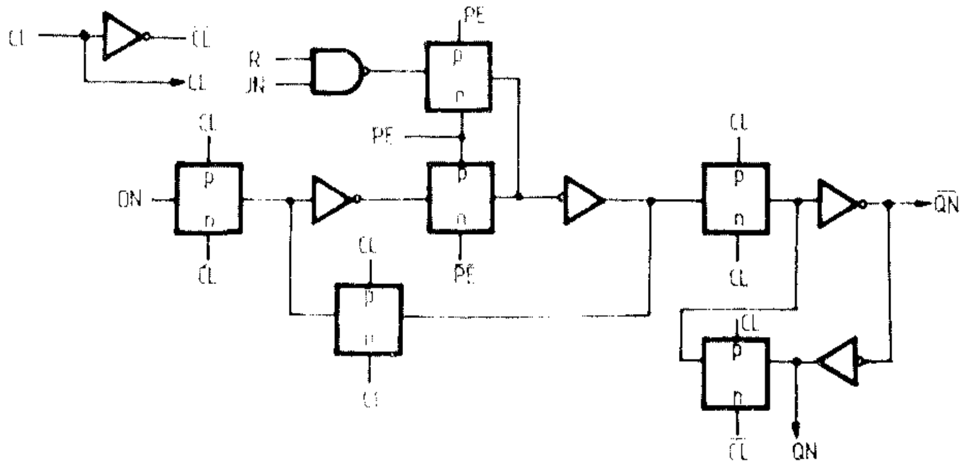
V_{DD}*	Supply voltage:	G and H types	3 to	18	V
		E and F types	3 to	15	V
V_I	In put voltage		0 to	V_{DD}	V
T_A	Operating temperature:	G and H types	-55 to	125	°C
		E and F types	-40 to	85	°C

CONNECTION DIAGRAM



LOGIC DIAGRAM

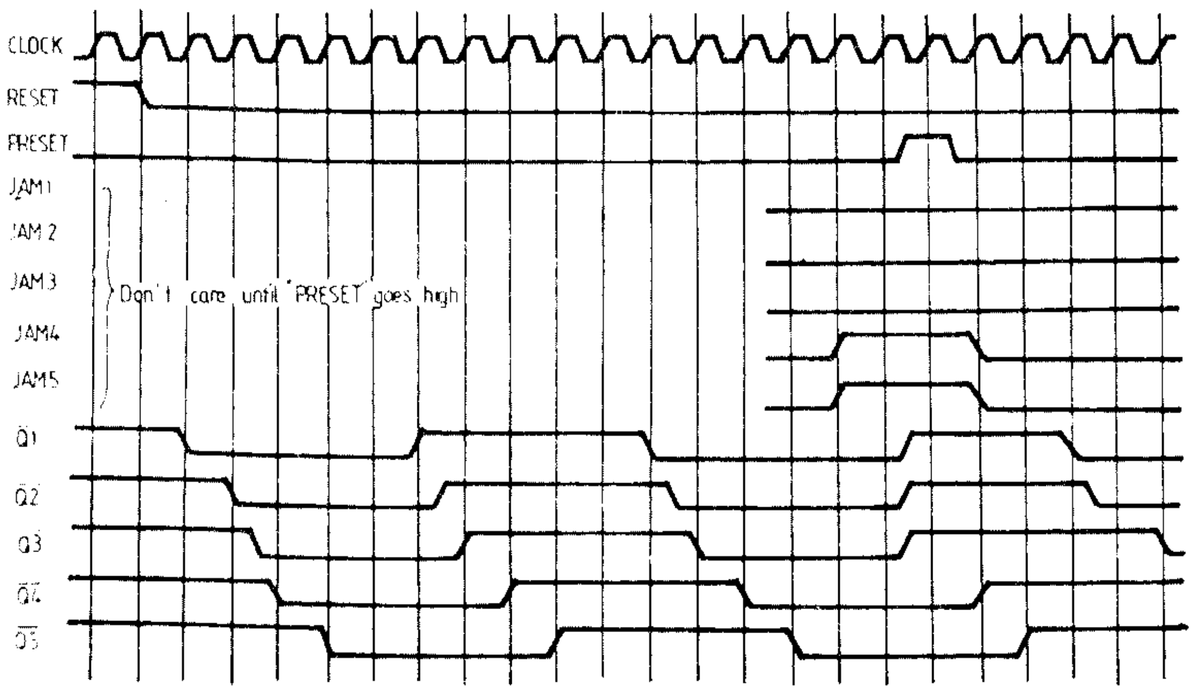




Detail for flip-flop

TIMING DIAGRAM

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



STATIC ELECTRICAL CHARACTERISTICS

(over recommended operating conditions)

Parameter		Types	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.	UNIT
I_L	Quiescent current	G, H types	0/5 0/10 0/15 0/20			5 10 15 20		5 10 20 100		0.04 0.04 0.04 0.08	5 10 20 100		150 300 600 3000	µA
		E, F types	0/5 0/10 0/15			5 10 15		20 40 80		0.04 0.04 0.04	20 40 80		150 300 600	µA
V_{OH}	Output high voltage		0/5 0/10 0/15		<1 <1 <1	5 10 15	4.95 9.95 14.95		4.95 9.95 14.95			4.95 9.95 14.95		V
V_{OL}	Output low voltage		5/0 10/0 15/0		<1 <1 <1	5 10 15		0.05 0.05 0.05			0.05 0.05 0.05		0.05 0.05 0.05	V
V_{IH}	Input high voltage			0.5/4.5 1/9 1.5/13.5	<1 <1 <1	5 10 15	3.5 7 11		3.5 7 11			3.5 7 11		V
V_{IL}	Input low voltage			4.5/0.5 9/1 13.5/1.5	<1 <1 <1	5 10 15		1.5 3 4			1.5 3 4		1.5 3 4	V
I_{OH}	Output drive current	G, H types	0/5 0/5 0/10 0/15	2.5 4.6 9.5 13.5		5 5 10 15	−2 −0.64 −1.6 −4.2		−1.6 −0.51 −1.3 −3.4	−3.2 −1 −2.6 −6.8		−1.15 −0.36 −0.9 −2.4		mA
		E, F types	0/5 0/5 0/10 0/15	2.5 4.6 9.5 13.5		5 5 10 15	−1.53 −0.52 −1.3 −3.6		−1.36 −0.44 −1.1 −3.0	−3.2 −1 −2.6 −6.8		−1.1 −0.36 −0.9 −2.4		mA
I_{OL}	Output sink current	G, H types	0/5 0/10 0/15	0.4 0.5 1.5		5 10 15	0.64 1.6 4.2		0.51 1.3 3.4	1 2.6 6.8		0.36 0.9 2.4		mA
		E, F types	0/5 0/10 0/15	0.4 0.5 1.5		5 10 15	0.52 1.3 3.6		0.44 1.1 3.0	1 2.6 6.8		0.36 0.9 2.4		mA
I_{IH}, I_{IL}	Input leakage current	G, H types	0/18	Any input		18		±0.1		$\pm10^{-5}$	±0.1		±1	µA
		E, F types	0/15	Any input		15		±0.3		$\pm10^{-5}$	±0.3		±1	µA
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

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 $\bar{Q}$)	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.