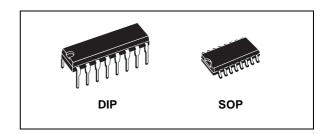


RIPPLE-CARRY BINARY COUNTER/DIVIDERS 12 STAGE

- MEDIUM SPEED OPERATION: $t_{PD} = 80$ ns (TYP.) at $V_{DD} = 10$ V
- **FULLY STATIC OPERATION**
- COMMON RESET
- BUFFERED INPUTS AND OUTPUTS
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT I_I = 100nA (MAX) AT V_{DD} = 18V T_A = 25°C
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B " STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



The HCF4040B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.



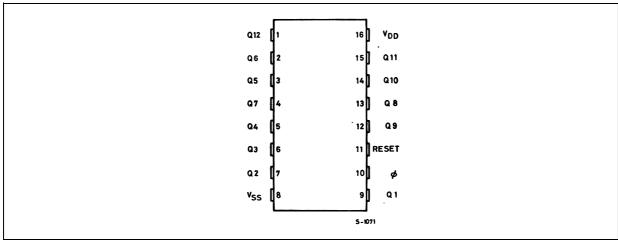
ORDER CODES

PACKAGE	TUBE	T&R
DIP	HCF4040BEY	
SOP	HCF4040BM1	HCF4040M013TR

The HCF4040B is a ripple carry binary counter. All counter stages are master-slave flip-flops. The state of a counter advances one count on the negative transition of each input pulse; a high level on the RESET line resets the counter to its all zeros stage. Schmitt trigger action on the input pulse line permits unlimited clock rise and fall times.

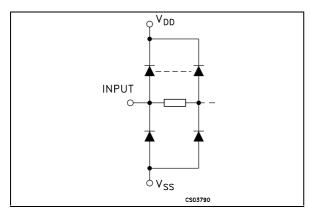
All inputs and outputs are buffered

PIN CONNECTION



September 2001 1/10

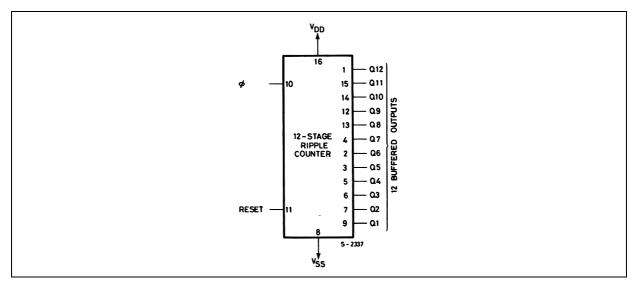
IINPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
9, 7, 5, 4, 6, 13, 12, 14, 15, 1, 2, 3	Q1 to Q12	12 Buffered Outputs
11	RESET	Reset Input
10	Φ	Input Pulses
8	V _{SS}	Negative Supply Voltage
16	V _{DD}	Positive Supply Voltage

FUNCTIONAL DIAGRAM

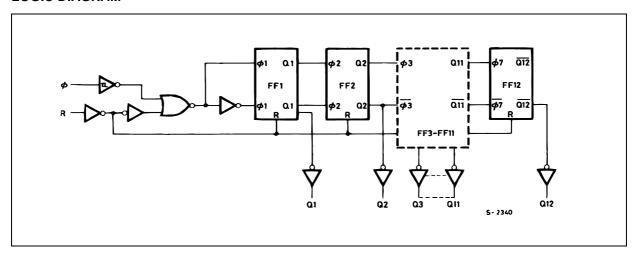


TRUTH TABLE

Ф	RESET	OUTPUT STATE
X	Н	ALL OUTPUTS = "L"
	L	NO CHANGE
	L	ADVANCE TO NEXT STATE

X : Don't Care

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	-0.5 to +22	V
VI	DC Input Voltage	-0.5 to V _{DD} + 0.5	V
II	DC Input Current	± 10	mA
P _D	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
T _{op}	Operating Temperature	-55 to +125	°C
T _{stg}	Storage Temperature	-65 to +150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

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

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	3 to 20	V
VI	Input Voltage	0 to V _{DD}	V
T _{op}	Operating Temperature	-55 to 125	°C

DC SPECIFICATIONS

			Test Con	dition		Value							
Symbol	Parameter	Vı	v _o	o IIol	V _{DD}	T _A = 25°C		С	-40 to 85°C		-55 to 125°C		Unit
		(V)	(V)	(μ A)	(V)	Min.	Тур.	Max.	Min.	Max.	Min.	Max.	
ΙL	Quiescent Current	0/5			5		0.04	5		150		150	
		0/10			10		0.04	10		300		300	μA
		0/15			15		0.04	20		600		600	μΑ
		0/20			20		0.08	100		3000		3000	
V _{OH}	High Level Output	0/5		<1	5	4.95			4.95		4.95		
	Voltage	0/10		<1	10	9.95			9.95		9.95		V
		0/15		<1	15	14.95			14.95		14.95		
V_{OL}	Low Level Output	5/0		<1	5		0.05			0.05		0.05	
	Voltage	10/0		<1	10		0.05			0.05		0.05	V
		15/0		<1	15		0.05			0.05		0.05	
V_{IH}	High Level Input		0.5/4.5	<1	5	3.5			3.5		3.5		
	Voltage		1/9	<1	10	7			7		7		V
			1.5/13.5	<1	15	11			11		11		
V_{IL}	Low Level Input		4.5/0.5	<1	5			1.5		1.5		1.5	
	Voltage		9/1	<1	10			3		3		3	V
			13.5/1.5	<1	15			4		4		4	
I _{OH}	Output Drive	0/5	2.5	<1	5	-1.36	-3.2		-1.1		-1.1		
	Current	0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		mA
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		IIIA
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
l _{OL}	Output Sink	0/5	0.4	<1	5	0.44	1		0.36		0.36		
	Current	0/10	0.5	<1	10	1.1	2.6		0.9		0.9		mΑ
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
II	Input Leakage Current	0/18	Any In	put	18		±10 ⁻⁵	±0.1		±1		±1	μΑ
Cı	Input Capacitance		Any In	put		_	5	7.5	_			_	pF

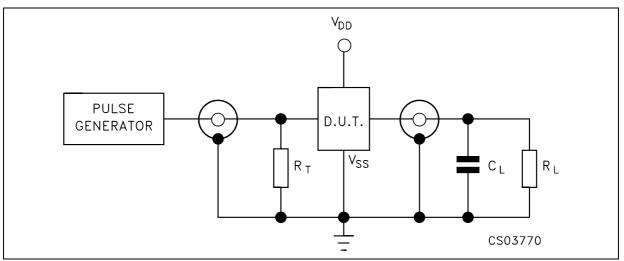
The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD} =5V, 2V min. with V_{DD} =10V, 2.5V min. with V_{DD} =15V

$\textbf{DYNAMIC ELECTRICAL CHARACTERISTICS} \; (\textbf{T}_{amb} = 25^{\circ} \textbf{C}, \;\; \textbf{C}_{L} = 50 \text{pF}, \; \textbf{R}_{L} = 200 \text{K}\Omega, \;\; \textbf{t}_{f} = \textbf{t}_{f} = 20 \; \text{ns})$

			Test Condition	,	Value (*)			
Symbol	Symbol Parameter			Min.	Тур.	Max.		
		INPUT-I	PULSE OPERATION	<u> </u>	1	<u> </u>		
t _{PLH} t _{PHL}	Propagation Delay Time	5			180	360		
	(Ø to Q1 Out)	10			80	160	ns	
		15			65	130		
t _{PLH} t _{PHL}	I H t _{PHI} Propagation Delay Time	5			100	200		
	(Qn to Qn+1)	10			40	80	ns	
		15			30	60		
t _{THL} t _{TLH}	Transition Time	5			100	200		
		10			50	100	ns	
		15			40	80		
t _W	t _W Minimum Input Pulse Width	5			70	140		
		10			30	60	ns	
		15			20	40		
t _r , t _f	Input Pulse Rise and Fall							
	Time	Time	10			unlimited		μs
		15						
f _{max}	Maximum Clock Input	5		3.5	7			
	Frequency	10		8	16		MHz	
		15		12	24			
		RES	SET OPERATION					
t_{PHL}	Propagation Delay Time	5			140	280		
		10			60	120	ns	
		15			50	100		
t _W	Minimum Reset Pulse	5			100	200		
	Width	10			40	80	ns	
		15			30	60		
t_{REM}	Reset Removal Time	5			175	350		
		10			75	150	ns	
		15			50	100		

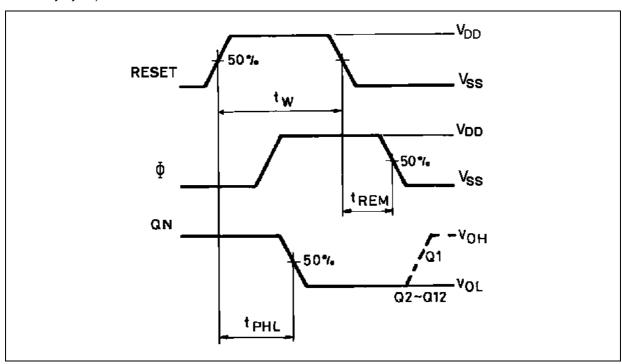
^(*) Typical temperature coefficient for all $\rm V_{DD}$ value is 0.3 %/°C.

TEST CIRCUIT

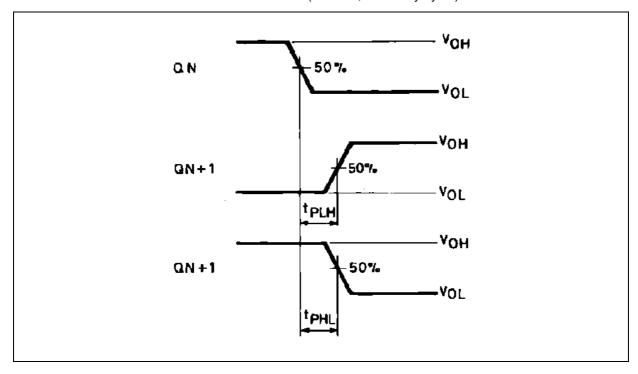


 C_L = 50pF or equivalent (includes jig and probe capacitance) R_L = 200K Ω R_T = Z_{OUT} of pulse generator (typically 50 Ω)

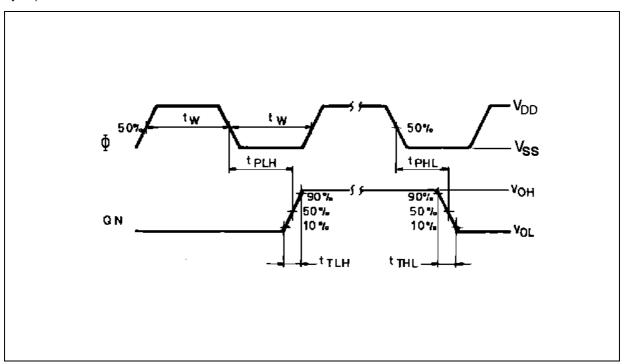
WAVEFORM 1 : MINIMUM PULSE WIDTH (RESET) AND REMOVAL TIME (RESET TO Φ) (f=1MHz; 50% duty cycle)



WAVEFORM 2: PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)

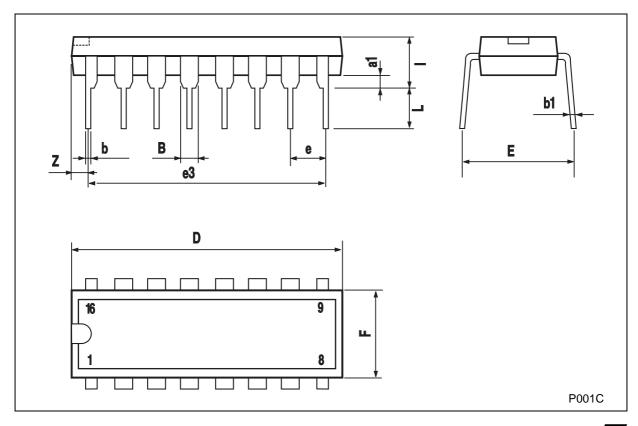


WAVEFORM 3 : PROPAGATION DELAY TIME, MINIMUM PULSE WIDTH (Φ **)** (f=1MHz; 50% duty cycle)



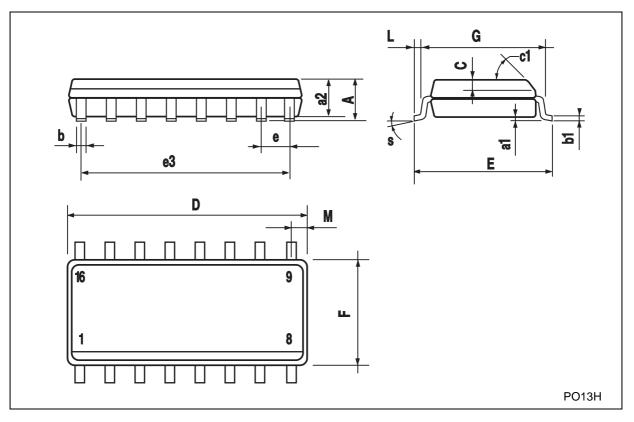
Plastic DIP-16 (0.25) MECHANICAL DATA

DIM		mm.		inch					
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.			
a1	0.51			0.020					
В	0.77		1.65	0.030		0.065			
b		0.5			0.020				
b1		0.25			0.010				
D			20			0.787			
Е		8.5			0.335				
е		2.54			0.100				
e3		17.78			0.700				
F			7.1			0.280			
I			5.1			0.201			
L		3.3			0.130				
Z			1.27			0.050			



SO-16 MECHANICAL DATA

DIM		mm.			inch			
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.		
А			1.75			0.068		
a1	0.1		0.2	0.003		0.007		
a2			1.65			0.064		
b	0.35		0.46	0.013		0.018		
b1	0.19		0.25	0.007		0.010		
С		0.5			0.019			
c1			45°	(typ.)	•			
D	9.8		10	0.385		0.393		
E	5.8		6.2	0.228		0.244		
е		1.27			0.050			
e3		8.89			0.350			
F	3.8		4.0	0.149		0.157		
G	4.6		5.3	0.181		0.208		
L	0.5		1.27	0.019		0.050		
М			0.62			0.024		
S			8° (r	max.)		!		



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