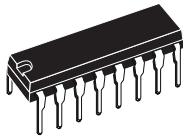
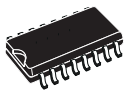
HCF4027B

DUAL J-K MASTER SLAVE FLIP-FLOP

- SET RESET CAPABILITY
- STATIC FLIP-FLOP OPERATION - RETAINS STATE INDEFINETELY WITH CLOCK LEVEL EITHER "HIGH" OR "LOW"
- MEDIUM-SPEED OPERATION - 16MHz (Typ. clock toggle rate at 10V)
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- 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"



DIP



SOP

ORDER CODES

PACKAGE	TUBE	T & R
DIP	HCF4027BEY	
SOP	HCF4027BM1	HCF4027M013TR

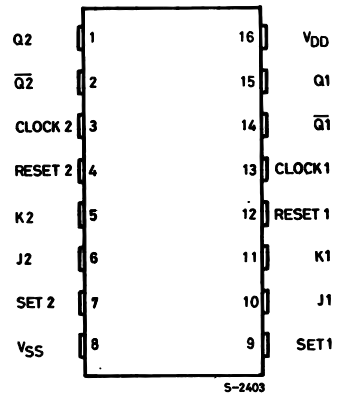
DESCRIPTION

HCF4027B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.

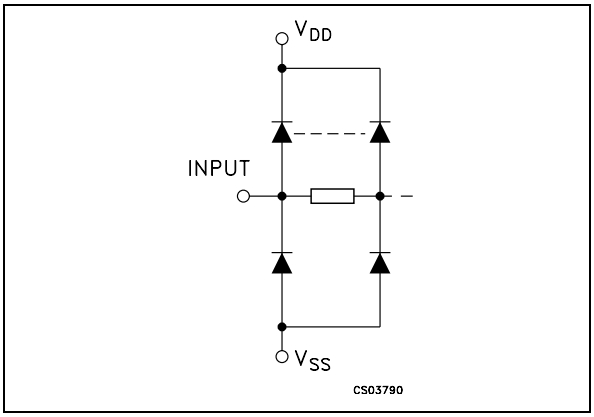
HCF4027B is a single monolithic chip integrated circuit containing two identical complementary-symmetry J-K master-slave flip-flops. Each flip-flop has provisions for individual J, K, Set, Reset, and Clock input signals. Buffered Q and $\overline{Q}$ signals are provided as outputs. This input-output arrangement provides for compatible operation with the HCF4013B dual D type flip-flop.

This device is useful in performing control, register, and toggle functions. Logic levels present at the J and K inputs, along with internal self-steering, control the state of each flip-flop; changes in the flip-flop state are synchronous with the positive-going transition of the clock pulse. Set and Reset functions are independent of the clock and are initiated when a high level signal is present at either the Set or Reset input.

PIN CONNECTION



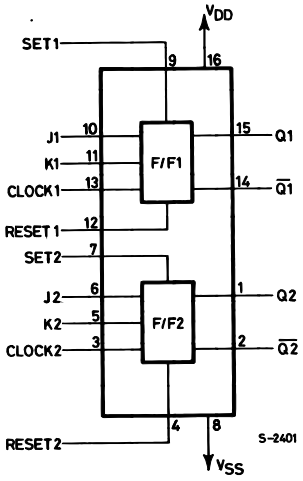
INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
6, 5	J2, K2	Inputs
10,11	J1, K1	inputs
13, 3	CLOCK1, CLOCK2	Clock Inputs
12, 4	RESET1, RESET2	Reset Inputs
9, 7	SET1, SET2	Set Inputs
1, 2	Q2, $\overline{Q2}$	Outputs
15, 14	Q1, $\overline{Q1}$	Outputs
8	V_{SS}	Negative Supply Voltage
16	V_{DD}	Positive Supply Voltage

FUNCTIONAL DIAGRAM

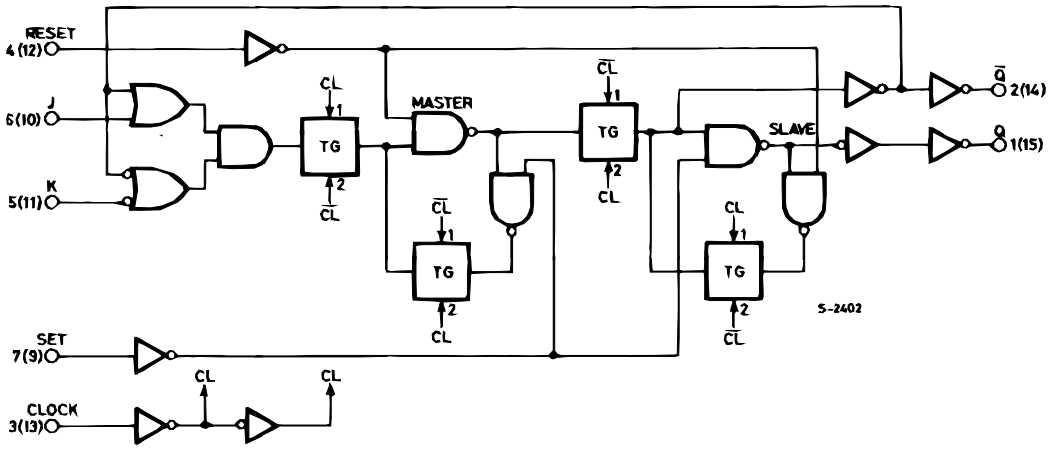


TRUTH TABLE

PRESENT STATE					CLOCK*	NEXT STATE		
Inputs				Output		Outputs		
J	K	S	R	Q		Q	$\overline{Q}$	
H	X	L	L	L	⌐¯	H	L	
X	L	L	L	H	⌐¯	H	L	
L	X	L	L	L	⌐¯	L	H	
X	H	L	L	H	⌐¯	L	H	
X	X	L	L	X	¯⌐			NO CHANGE
X	X	H	L	X	X	H	L	
X	X	L	H	X	X	L	H	
X	X	H	H	X	X	H	H	

X : Don"t Care
* : Level Change

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	-0.5 to +22	V
V_I	DC Input Voltage	-0.5 to V_{DD} + 0.5	V
I_I	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
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature	-55 to 125	°C

DC SPECIFICATIONS

Symbol	Parameter	Test Condition				Value							Unit
		V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_A = 25°C			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
I_L	Quiescent Current	0/5			5		0.02	1		30		30	μA
		0/10			10		0.02	2		60		60	
		0/15			15		0.02	4		120		120	
		0/20			20		0.04	20		600		600	
V_{OH}	High Level Output 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}	Low Level Output 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}	High Level Input 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}	Low Level Input 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	0/5	2.5	<1	5	-1.36	-3.2		-1.15		-1.1		mA
		0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
I_{OL}	Output Sink Current	0/5	0.4	<1	5	0.44	1		0.36		0.36		mA
		0/10	0.5	<1	10	1.1	2.6		0.9		0.9		
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
I_I	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	±0.1		±1		±1	μA
C_I	Input Capacitance		Any Input				5	7.5					pF

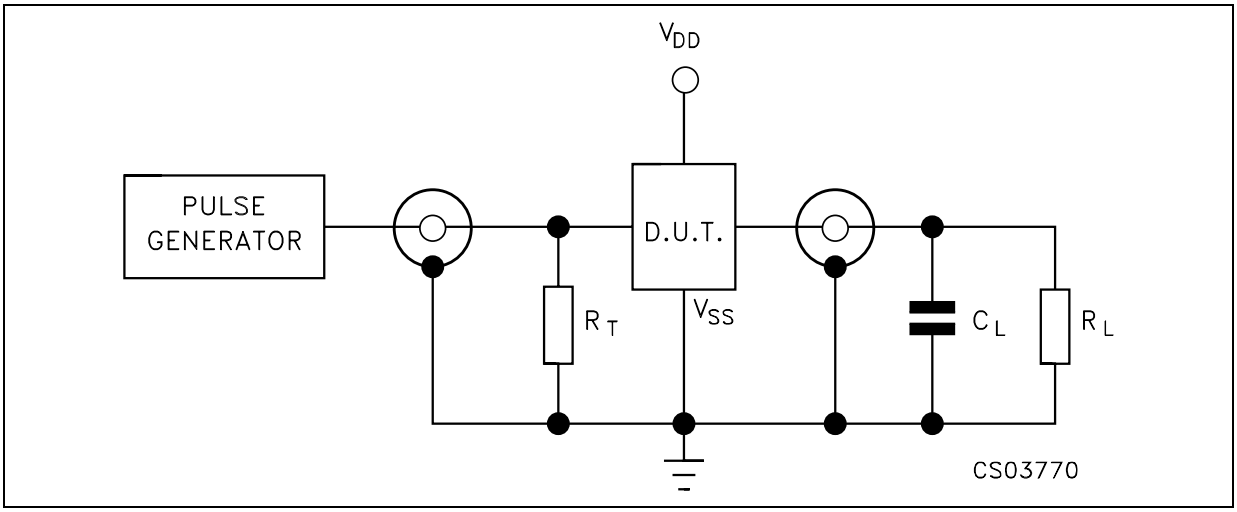
The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200KΩ, $t_r = t_f$ = 20 ns)

Symbol	Parameter	Test Condition		Value (*)			Unit
		V_{DD} (V)		Min.	Typ.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time(Clock to Q or $\overline{Q}$ Outputs)	5			150	300	ns
		10			65	130	
		15			45	90	
t_{PLH}	Propagation Delay Time (Set to Q or Reset to $\overline{Q}$)	5			150	300	ns
		10			65	130	
		15			45	90	
t_{PHL}	Propagation Delay Time (Set to $\overline{Q}$ or Reset to Q)	5			200	400	ns
		10			85	170	
		15			60	120	
t_{TLH} t_{THL}	Transition Time	5			100	200	ns
		10			50	100	
		15			40	80	
t_W	Pulse Width (Clock)	5		140	70		ns
		10		60	30		
		15		40	20		
t_W	Pulse Width (Set or Reset)	5		180	90		ns
		10		80	40		
		15		50	25		
t_r, t_f	Clock input Rise or Fall Time	5				15	µs
		10				4	
		15				1	
t_{setup}	Setup Time (DATA)	5		200	100		ns
		10		75	35		
		15		50	25		
f_{MAX}	Maximum Clock Input Frequency (1) (toggle mode)	5		3.5	7		MHz
		10		8	16		
		15		12	24		

(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.
(1) Input t_r, t_f = 5ns

TEST CIRCUIT

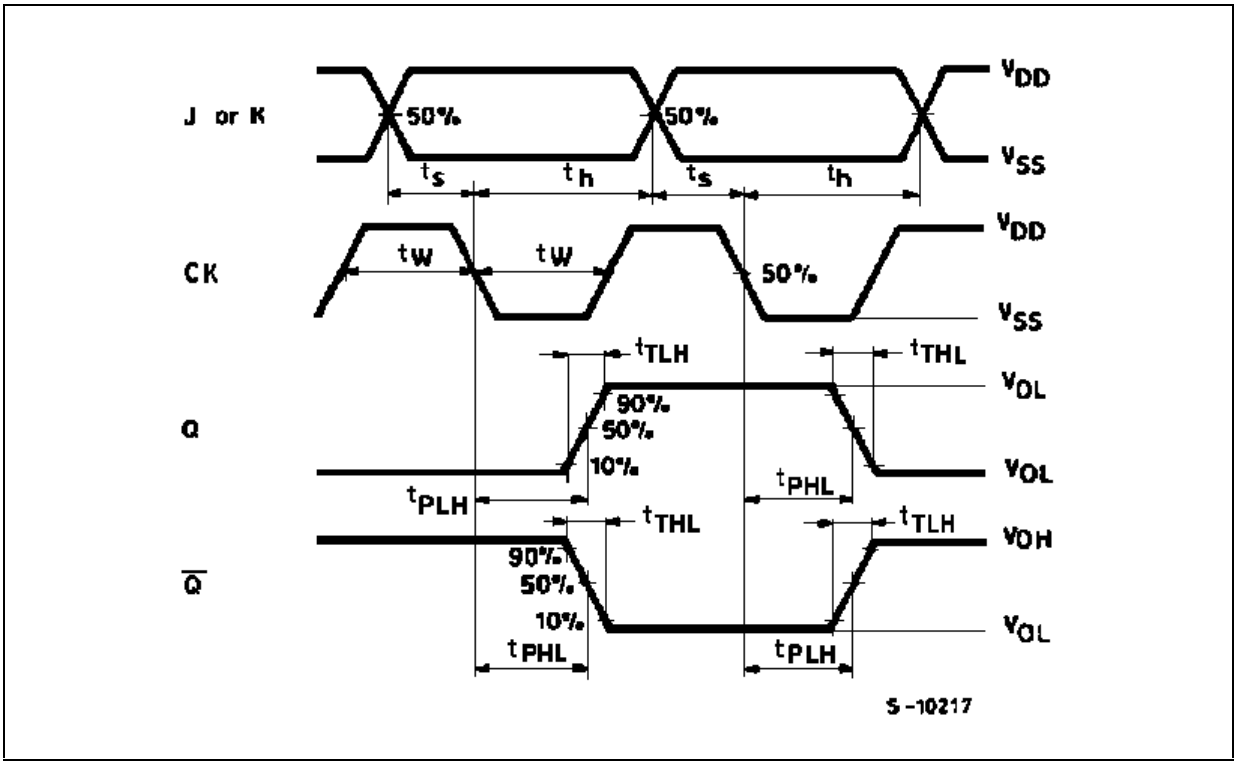


C_L = 50pF or equivalent (includes jig and probe capacitance)

R_L = 200KΩ

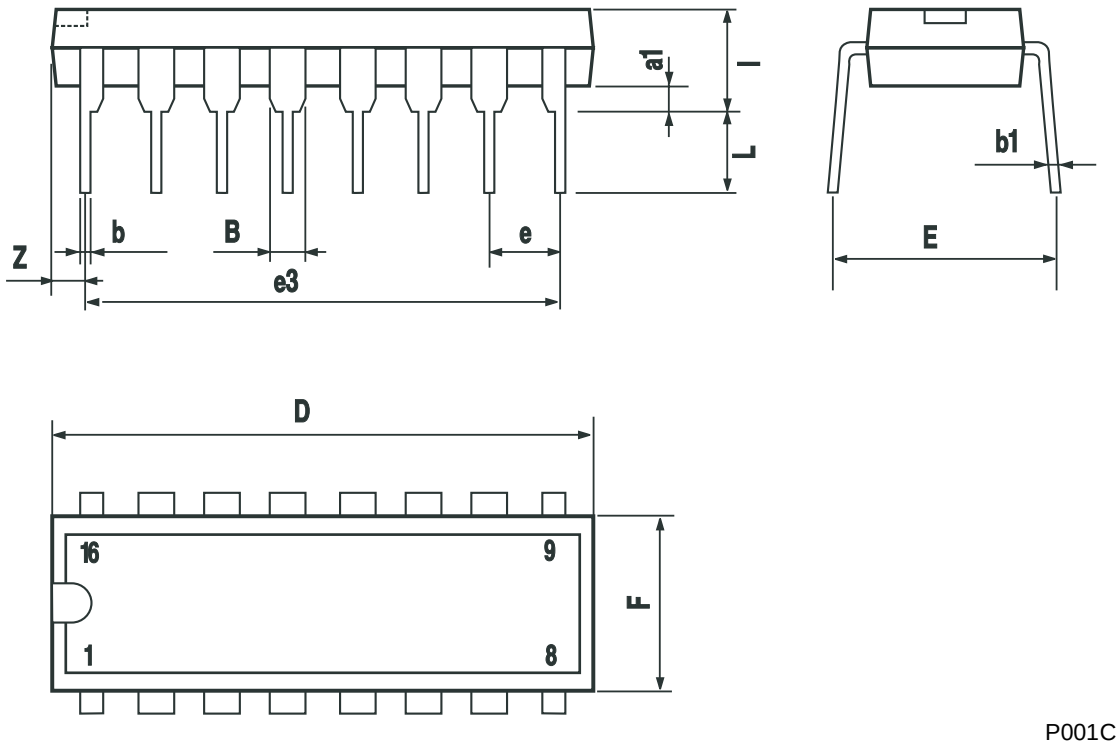
R_T = Z_{OUT} of pulse generator (typically 50Ω)

WAVEFORM : PROPAGATION DELAY TIMES, MINIMUM PULSE WIDTH (CK), SETUP AND HOLD TIME (J or K to CK) (f=1MHz; 50% duty cycle)



Plastic DIP-16 (0.25) MECHANICAL DATA

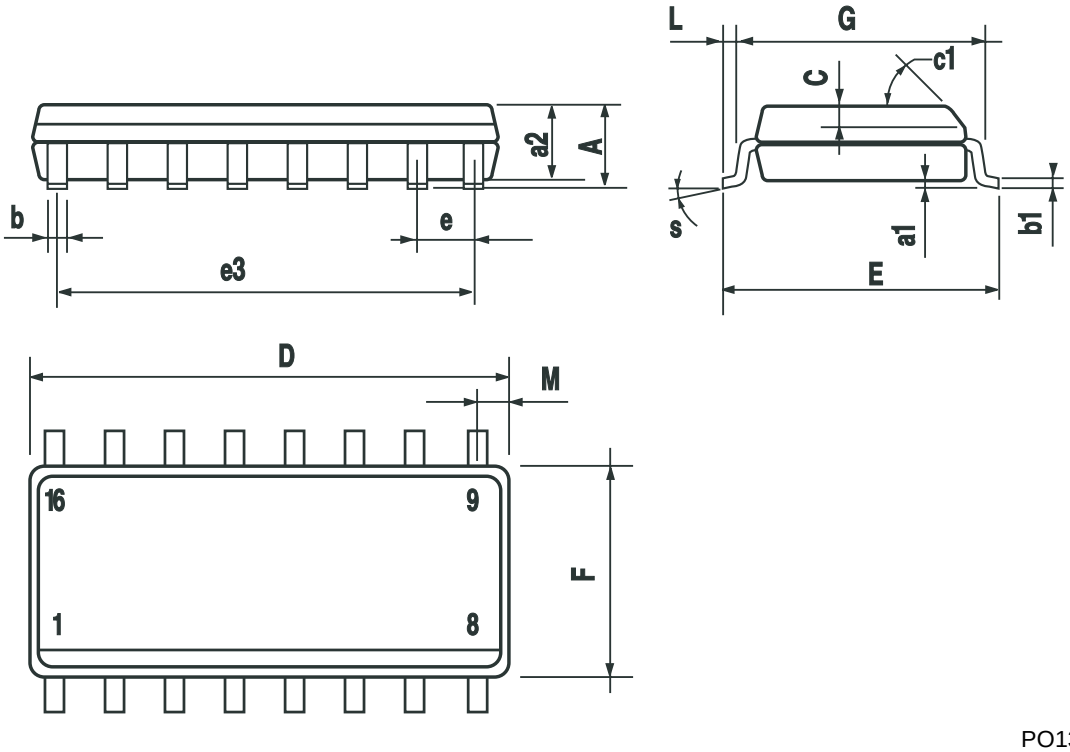
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

SO-16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			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
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		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
M			0.62			0.024
S	8° (max.)					



PO13H