

KK4027B

Dual JK Flip-Flop

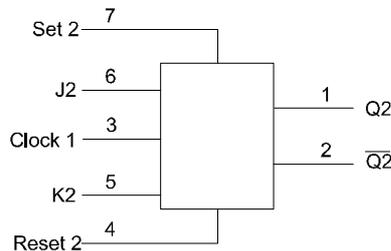
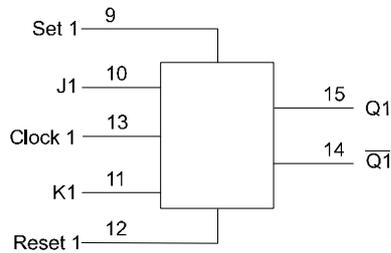
The KK4027B is a Dual JK Flip-Flop which is edge-triggered and features independent Set, Reset, and Clock inputs. Data is accepted when the Clock is LOW and transferred to the output on the positive-going edge of the Clock. The active HIGH asynchronous Reset and Set are independent and override the J, K, or Clock inputs. The outputs are buffered for best system performance.

- Operating Voltage Range: 3.0 to 18 V
- Maximum input current of 1 μ A at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over full package temperature range):
 - 1.0 V min @ 5.0 V supply
 - 2.0 V min @ 10.0 V supply
 - 2.5 V min @ 15.0 V supply

ORDERING INFORMATION

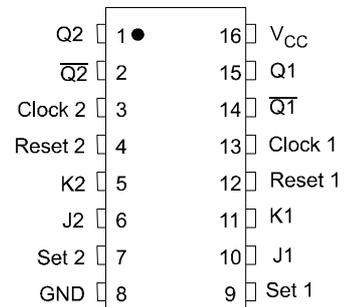
KK4027BN Plastic
 KK4027BD SOIC
 T_A = -55° to 125° C for all packages

LOGIC DIAGRAM



PIN 16 = V_{CC}
 PIN 8 = GND

PIN ASSIGNMENT



FUNCTION TABLE

Inputs					Outputs	
Set	Reset	Clock	J	K	Q _{n+1}	\overline{Q}_{n+1}
L	H	X	X	X	L	H
H	L	X	X	X	H	L
H	H	X	X	X	H	H
L	L		L	L	No change	
L	L		H	L	H	L
L	L		L	H	L	H
L	L		H	H	\overline{Q}_n	Q _n

X = don't care

Q_{n+1} = State After Clock Positive Transition

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	-0.5 to +20	V
V_{IN}	DC Input Voltage (Referenced to GND)	-0.5 to $V_{CC} + 0.5$	V
I_{IN}	DC Input Current, per Pin	± 10	mA
P_D	Power Dissipation in Still Air, Plastic DIP, SOIC Package	500**	mW
P_{tot}	Power Dissipation per Output Transistor	100	mW
T_{stg}	Storage Temperature	-65 to +150	$^{\circ}C$
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	$^{\circ}C$

*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

**Derating: - Plastic DIP from -55 to +100 $^{\circ}C$
 - SOIC Package from -55 to +65 $^{\circ}C$
 - Plastic DIP: - 10 mW/ $^{\circ}C$ from +100 to +125 $^{\circ}C$
 - SOIC Package: - 7 mW/ $^{\circ}C$ from +65 to +125 $^{\circ}C$

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	3.0	18	V
V_{IN}	DC Input Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	-55	+125	$^{\circ}C$

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation V_{IN} should be constrained to the range $GND \leq V_{IN} \leq V_{CC}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V _{CC} V	Guaranteed Limit			Unit
				≥-55°C	25°C	≤125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{OUT} =0.5 V or V _{CC} - 0.5 V V _{OUT} =1.0 V or V _{CC} - 1.0 V V _{OUT} =1.5 V or V _{CC} - 1.5 V	5.0	3.5	3.5	3.5	V
			10	7	7	7	
			15	11	11	11	
V _{IL}	Maximum Low - Level Input Voltage	V _{OUT} =0.5 V or V _{CC} - 0.5 V V _{OUT} =1.0 V or V _{CC} - 1.0 V V _{OUT} =1.5 V or V _{CC} - 1.5 V	5.0	1.5	1.5	1.5	V
			10	3	3	3	
			15	4	4	4	
V _{OH}	Minimum High-Level Output Voltage	V _{IN} =GND or V _{CC}	5.0	4.95	4.95	4.95	V
			10	9.95	9.95	9.95	
			15	14.95	14.95	14.95	
		V _{IL} =1.5V, V _{IH} =3.5V, I _O =-1μA	5.0	4.5	4.5	4.5	
		V _{IL} =3.0V, V _{IH} =7.0V, I _O =-1μA	10	9.0	9.0	9.0	
V _{IL} =4.0V, V _{IH} =11V, I _O =-1μA	15	13.5	13.5	13.5			
V _{OL}	Maximum Low-Level Output Voltage	V _{IN} =GND or V _{CC}	5.0	0.05	0.05	0.05	V
			10	0.05	0.05	0.05	
			15	0.05	0.05	0.05	
		V _{IL} =1.5V, V _{IH} =3.5V, I _O =1μA	5.0	0.5	0.5	0.5	
		V _{IL} =3.0V, V _{IH} =7.0V, I _O =1μA	10	1.0	1.0	1.0	
V _{IL} =4.0V, V _{IH} =11V, I _O =1μA	15	1.5	1.5	1.5			
I _{IN}	Maximum Input Leakage Current	V _{IN} = GND or V _{CC}	18	±0.1	±0.1	±1.0	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{IN} = GND or V _{CC}	5.0	1.0	1.0	30	μA
			10	2.0	2.0	60	
			15	4.0	4.0	120	
			20	20	20	600	
I _{OL}	Minimum Output Low (Sink) Current	V _{IN} = GND or V _{CC} V _{OL} =0.4 V V _{OL} =0.5 V V _{OL} =1.5 V	5.0	0.64	0.51	0.36	mA
			10	1.6	1.3	0.9	
			15	4.2	3.4	2.4	
I _{OH}	Minimum Output High (Source) Current	V _{IN} = GND or V _{CC} V _{OH} =4.6 V V _{OH} =2.5 V V _{OH} =9.5 V V _{OH} =13.5 V	5.0	-0.64	-0.51	-0.36	mA
			5.0	-2.0	-1.6	-1.15	
			10	-1.6	-1.3	-0.9	
			15	-4.2	-3.4	-2.4	

AC ELECTRICAL CHARACTERISTICS ($C_L=50\text{pF}$, $R_L=200\text{ k}\Omega$, Input $t_r=t_f=20\text{ ns}$)

Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			$\geq -55^\circ\text{C}$	25°C	$\leq 125^\circ\text{C}$	
f_{\max}	Maximum Clock Frequency	5.0	3.5	3.5	1.75	MHz
		10	8	8	4	
		15	12	12	6	
t_{PLH} , t_{PHL}	Maximum Propagation Delay, Clock to \overline{Q} or Q	5.0	300	300	600	ns
		10	130	130	260	
		15	90	90	180	
t_{PLH}	Maximum Propagation Delay, Set to Q or Reset to Q	5.0	300	300	600	ns
		10	130	130	260	
		15	90	90	180	
t_{PHL}	Maximum Propagation Delay, Set to Q or Reset to Q	5.0	400	400	800	ns
		10	170	170	340	
		15	120	120	240	
t_{TLH} , t_{THL}	Maximum Output Transition Time, Any Output	5.0	200	200	400	ns
		10	100	100	200	
		15	80	80	160	
C_{IN}	Maximum Input Capacitance	-		7.5		pF

TIMING REQUIREMENTS ($C_L=50\text{pF}$, $R_L=200\text{ k}\Omega$, Input $t_r=t_f=20\text{ ns}$)

Symbol	Parameter	V_{CC} V	Guaranteed Limit			Unit
			$\geq -55^\circ\text{C}$	25°C	$\leq 125^\circ\text{C}$	
t_w	Minimum Pulse Width, Clock	5.0	140	140	280	ns
		10	60	60	120	
		15	40	40	80	
t_w	Minimum Pulse Width, Set or Reset	5.0	180	180	360	ns
		10	80	80	160	
		15	50	50	100	
t_{su}	Minimum Data Setup Time	5.0	200	200	400	ns
		10	75	75	150	
		15	50	50	100	
t_r , t_f	Maximum Input Rise or Fall Time, Clock	5.0	45	45	90	μs
		10	5	5	10	
		15	2	2	4	

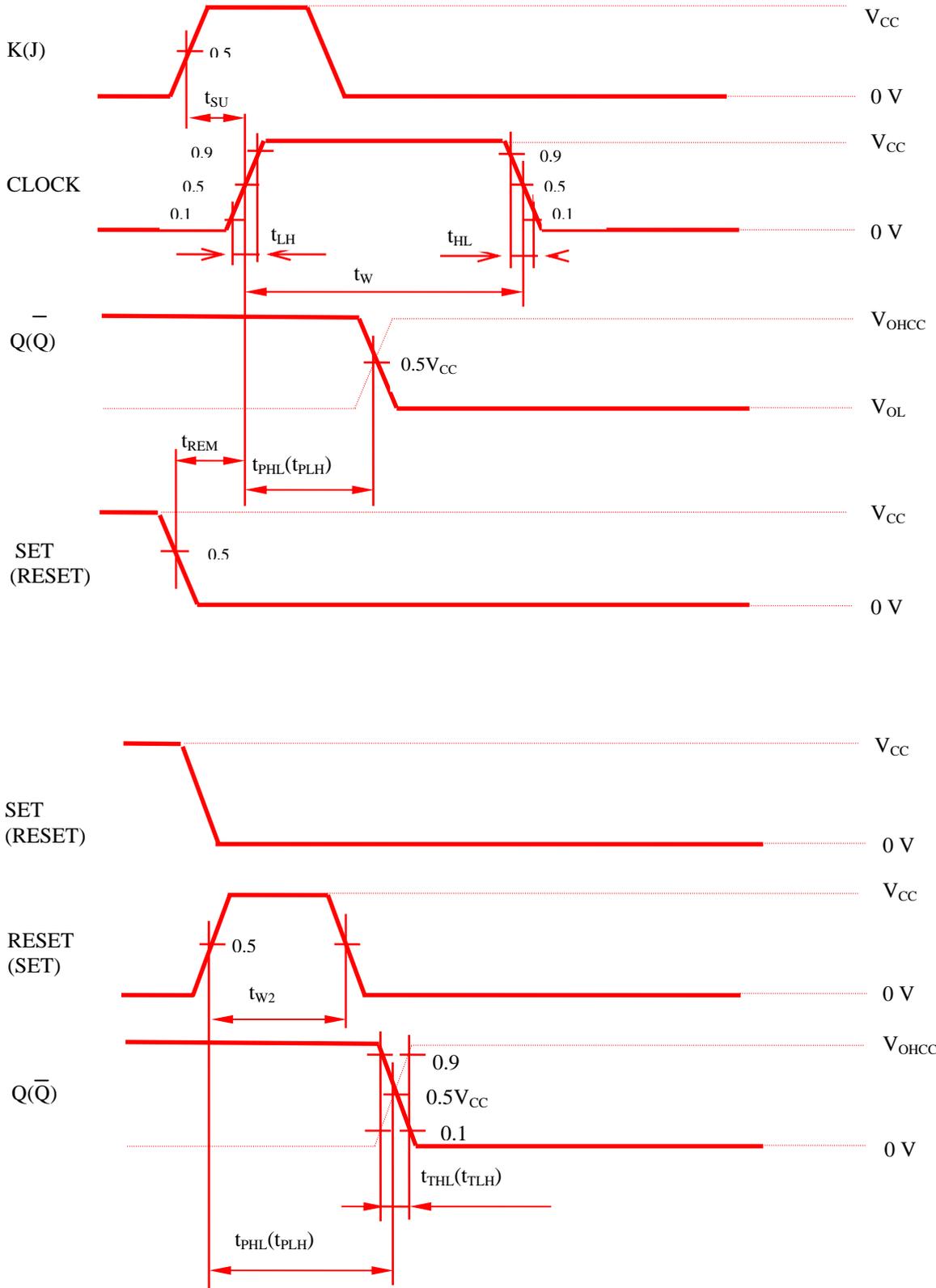
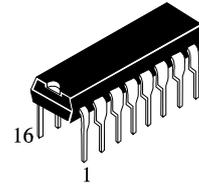
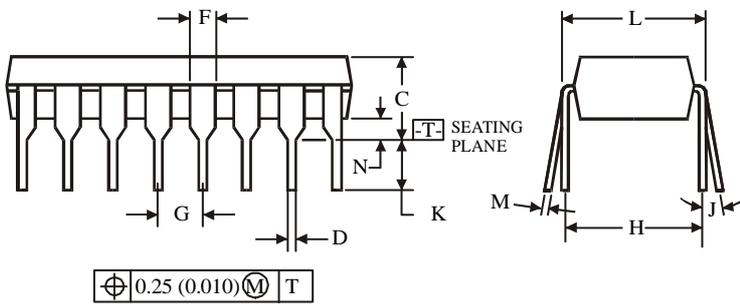
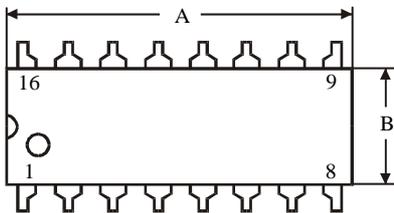


Figure 1. Switching Waveforms

N SUFFIX PLASTIC (MS - 001BB)

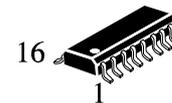
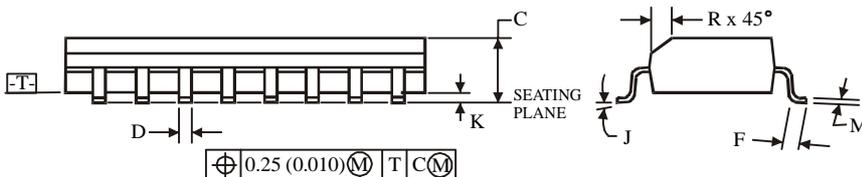
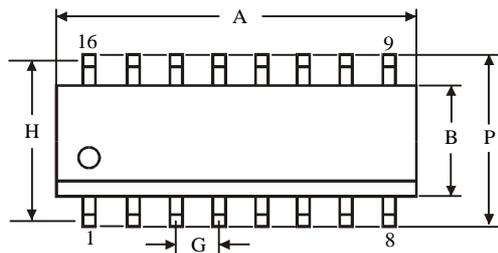


Symbol	Dimensions, mm	
	MIN	MAX
A	18.67	19.69
B	6.10	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.20	0.36
N	0.38	

NOTES:

- Dimensions "A", "B" do not include mold flash or protrusions. Maximum mold flash or protrusions 0.25 mm (0.010) per side.

D SUFFIX SOIC (MS - 012AC)



Symbol	Dimensions, mm	
	MIN	MAX
A	9.80	10.0
B	3.80	4.00
C	1.35	1.75
D	0.33	0.51
F	0.40	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.10	0.25
M	0.19	0.25
P	5.80	6.20
R	0.25	0.50

NOTES:

- Dimensions A and B do not include mold flash or protrusion.
- Maximum mold flash or protrusion 0.15 mm (0.006) per side for A, for B - 0.25 mm (0.010) per side.