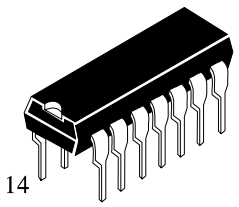
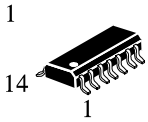
KK4541B

Programmable Timer

High-Performance Silicon-Gate CMOS



N SUFFIX
PLASTIC



D SUFFIX
SOIC

ORDERING INFORMATION
KK4541BN Plastic
KK4541BD SOIC
T_A = -55° to 125° C for all packages

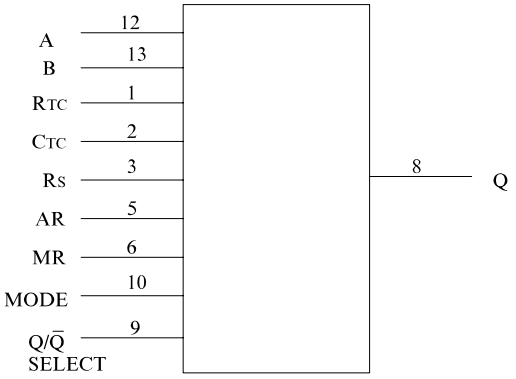
The KK4541B programmable timer consists of a 16-stage binary counter, an oscillator that is controlled by external R-C components (2 resistors and a capacitor), an automatic power-on reset circuit, and output control logic. The counter increments on positive-edge clock transitons and can also be reset via the MASTER RESET input.

The output from this timer is the Q or not Q output from the 8th, 10th, 13th, or 16th counter stage. The desired stage is chosen using time-select inputs A and B. The output is available in either of two modes selectable via the MODE input, pin 10. When this MODE input is a logic “1”,the output will be a continuous square wave having a frequency equal to the oscillator frequency divided by 2^N. With the MODE input set to logic ”0” and after a MASTER RESET is initiated, the output (assuming Q output has been selected) changes from a low to a high state after 2^{N-1} counts and remains in that state until another MASTER RESET pulse is applied or the MODE input is set to a logic “1”.

Timing is initialized by setting the AUTO RESET input (pin 5) to logic “0”and turning power on. If pin 5 is set to logic “1”, the AUTO RESET circuit is disabled and counting will not start untill after a positive MASTER RESET pulse is applied and returns to a low level. The AUTO RESET consumes an appreciable amount of power and should not be used if low-power operation is desired. For reliable automatic power-on reset, V_{CC} should be greater than 5V.

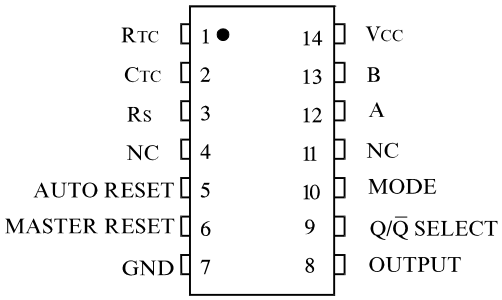
- Operating Voltage Range: 3.0 to 18 V
- Maximum input current of 1 μA at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over full package temperature range):
  1.0 V min @ 5.0 V supply
  2.0 V min @ 10.0 V supply
  2.5 V min @ 15.0 V supply

LOGIC DIAGRAM



PIN 14 =V_{CC}
PIN 7 = GND
PINS 4,11 = NO CONNECTION

PIN ASSIGNMENT



NC = NO CONNECTION

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
V_{OUT}	DC Output 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+	750 500	mW
P_D	Power Dissipation per Output Transistor	100	mW
Tstg	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds (Plastic DIP or SOIC Package)	260	°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: - 10 mW/°C from 65° to 125°C
SOIC Package: : - 7 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	3.0	18	V
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage (Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature, All Package Types	-55	+125	°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} and V_{OUT} should be constrained to the range GND≤(V_{IN} or V_{OUT})≤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 Digital Section

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}=0.5V or V_{CC}-0.5V V_{OUT}=1.0V or V_{CC}-1.0V V_{OUT}=1.5V or V_{CC}-1.5V	5 10 15	3.5 7 11	3.5 7 11	3.5 7 11	V
V_{IL}	Maximum Low -Level Input Voltage	V_{OUT}=0.5V or V_{CC}-0.5V V_{OUT}=1.0V or V_{CC}-1.0V V_{OUT}=1.5V or V_{CC}-1.5V	5 10 15	1.5 3 4	1.5 3 4	1.5 3 4	V
V_{OH}	Minimum High-Level Output Voltage	V_{IN}=GND or V_{CC}	5.0 10 15	4.95 9.95 14.95	4.95 9.95 14.95	4.95 9.95 14.95	V
V_{OL}	Maximum Low-Level Output Voltage	V_{IN}=GND or V_{CC}	5.0 10 15	0.05 0.05 0.05	0.05 0.05 0.05	0.05 0.05 0.05	V
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 10 15 20	5 10 20 100	5 10 20 100	150 300 600 3000	μA
I_{OL}	Minimum Output Low (Sink) Current	V_{IN}= GND or V_{CC} U_{OL}=0.4 V U_{OL}=0.5 V U_{OL}=1.5 V	 5.0 10 15	 1.9 5 12.6	 1.55 4 10	 1.08 2.8 7.2	mA
I_{OH}	Minimum Output High (Source) Current	V_{IN}= GND or V_{CC} U_{OH}=2.5 V U_{OH}=4.6 V U_{OH}=9.5 V U_{OH}=13.5 V	 5.0 5.0 10 15	 -6.2 -1.9 -5 -12.6	 -5 -1.55 -4 -10	 -3 -1.08 -2.8 -7.2	mA

AC ELECTRICAL CHARACTERISTICS (C_L=50pF, R_L=200kΩ, Input t_r=t_f=20 ns)

Symbol	Parameter	V_{CC} V	Guaranteed Limit ≥-55°C	Guaranteed Limit 25°C	Guaranteed Limit ≤125°C	Unit
f_{max}	Maximum Clock Frequency (Figure 1)	5.0 10 15	1.5 4 6	1.5 4 6	0.75 2 3	MHz
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Clock to Q (Figure 1) (2^8)	5.0 10 15	10.5 3.8 2.9	10.5 3.8 2.9	21 7.6 5.8	ns
	(2^{16})	5.0 10 15	18 10 7.5	18 10 7.5	36 20 15	
t_{THL}	Maximum Output Transition Time, Any Output (Figure 1)	5.0 10 15	200 100 80	200 100 80	400 200 160	ns
t_{TLH}	Maximum Output Transition Time, Any Output (Figure 1)	5.0 10 15	360 180 130	360 180 130	720 360 260	
C_{IN}	Maximum Input Capacitance	-		7.5		pF

TIMING REQUIREMENTS (C_L=50pF, R_L=200kΩ, Input t_r=t_f=20 ns)

Symbol	Parameter	V_{CC}	Guaranteed Limit +25° C	Guaranteed Limit -40° C to +85° C	Unit
t_w	Minimum Pulse Width, Master Reset or Clock (Figure 1)	5 10 15	900 300 225	1800 600 450	ns
t_r,t_f	Maximum Rise and Fall Time, Clock (Figure 1)	5 10 15	Unlimited		μs

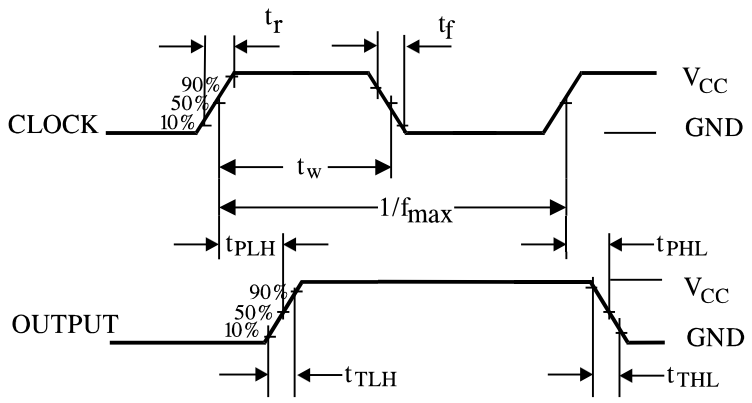


Figure 1. Switching Weveforms

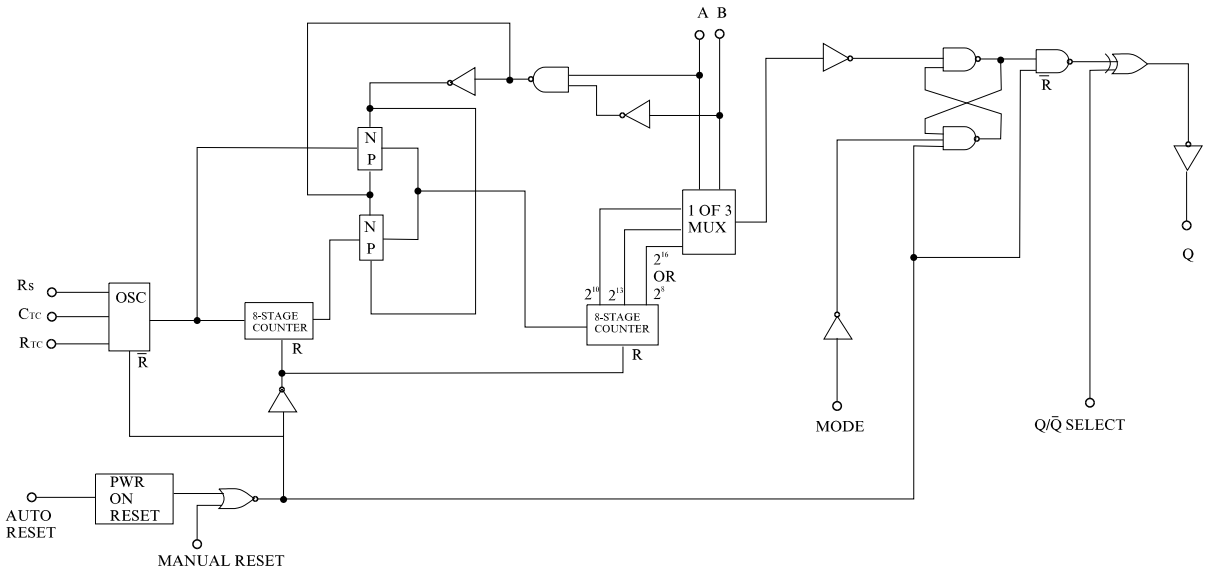
FREQUENCY SELECTION TABLE

INPUTS		No. of Stages	Count
A	B	N	2^N
L	L	13	8192
L	H	10	1024
H	L	8	256
H	H	16	65536

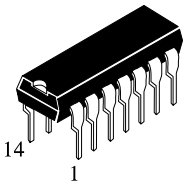
FUNCTION TABLE

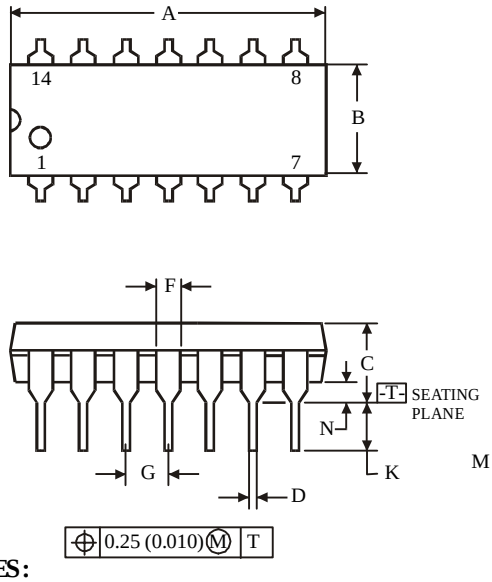
PIN	STATE	
	0	1
5	Auto Reset On	Auto Reset Disable
6	Master Reset Off	Master Reset On
9	Output Initially Low After Reset (Q)	Output Initially High After Reset (not Q)
10	Single Transition Mode	Recycle Mode

EXPANDED LOGIC DIAGRAM



N SUFFIX PLASTIC DIP
(MS - 001AA)



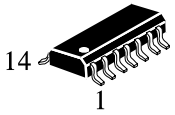


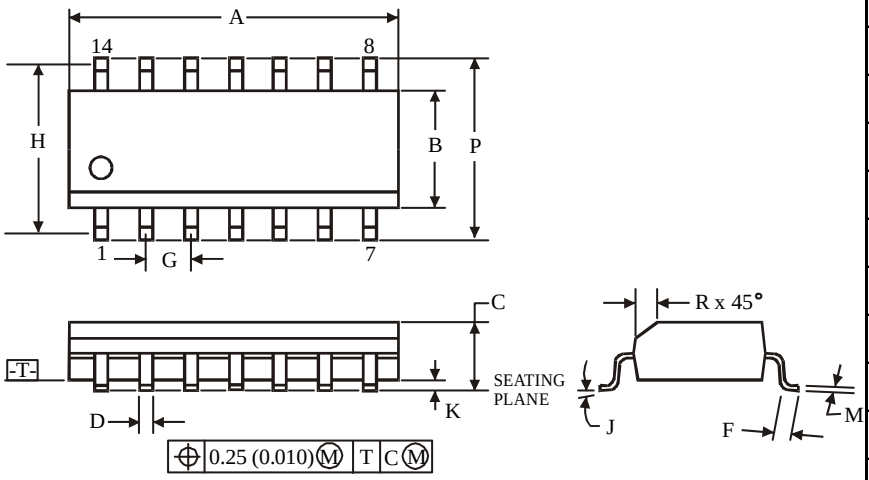
	Dimension, mm	
Symbol	**MIN**	**MAX**
A	18.67	19.69
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

NOTES:

1. 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 - 012AB)





	Dimension, mm	
Symbol	**MIN**	**MAX**
A	8.55	8.75
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.27	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side
   for A; for B – 0.25 mm (0.010) per side.