Quad 2-Input NAND Gate

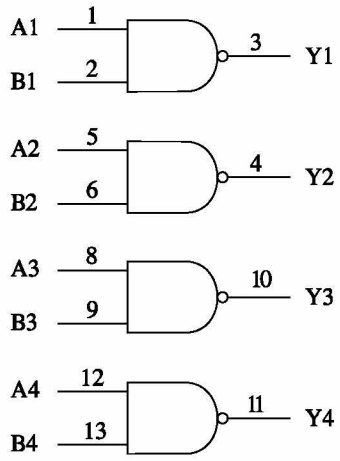
■ DESCRIPTION

The TK4011 NAND gates provide the system designer with direct emplementation of the NAND function. With typical 20V high voltage characteristics .

■ FEATURES

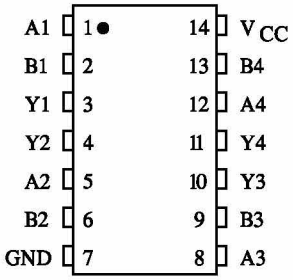
- Operating Voltage Range: 3 to 18 V
- Maximum input current of 1 μA at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over full package temperature range):
  1.0 V min @ 5 V supply
  2.0 V min @ 10V supply
  2.5 V min @ 15 V supply
- Buffered inputs and outputs
- High-Voltage Silicon-Gate CMOS
- TA = -40° to 125° C for all packages

■ LOGIC DIAGRAM



PIN 14 =V_{CC}
PIN 7 = GND

■ PIN ASSIGNMENT



■ FUNCTION TABLE

Inputs		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

■ Ordering information

Part Number	Package	Packing	Operating Temperature	Standard Package
TK4011BM	SOIC-14	Reel	-40°C ~ 125°C	2500
TK4011BP	TSSOP-14	Reel	-40°C ~ 125°C	2500
TK4011BE	DIP-14	Tube	-40°C ~ 125°C	1000

■ 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 Plastic DIP+ SOIC Package+	750 500	mW
P_D	Power Dissipation per Output Transistor	100	mW
Tstg	Storage Temperature	-55 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 85° 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	-40	+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 (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	V_{CC} V	Guaranteed Limit ≥-55°C	Guaranteed Limit 25°C	Guaranteed Limit ≤125 °C	Unit
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 10 15	3.5 7 11	3.5 7 11	3.5 7 11	V
V_{IL}	Maximum Low - Level Input Voltage	V_{OUT}= V_{CC} - 0.5V V_{OUT}= V_{CC} - 1.0 V V_{OUT}= V_{CC} - 1.5V	5.0 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}= 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	0.25 0.5 1.0 5.0	0.25 0.5 1.0 5.0	7.5 15 30 150	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	 0.64 1.6 4.2	 0.51 1.3 3.4	 0.36 0.9 2.4	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	 -2.0 -0.64 -1.6 -4.2	 -1.6 -0.51 -1.3 -3.4	 -1.15 -0.36 -0.9 -2.4	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
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Input A or B to Output Y (Figure 1)	5.0 10 15	250 120 90	250 120 90	500 240 180	ns
t_{TLH}, t_{THL}	Maximum Output Transition Time, Any Output (Figure 1)	5.0 10 15	200 100 80	200 100 80	400 200 160	ns
C_{IN}	Maximum Input Capacitance	-		7.5		pF

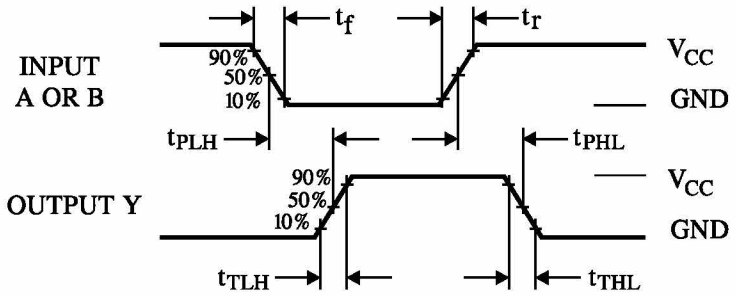
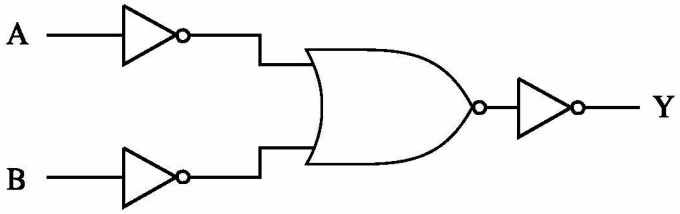
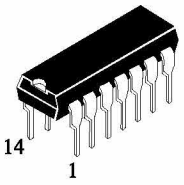


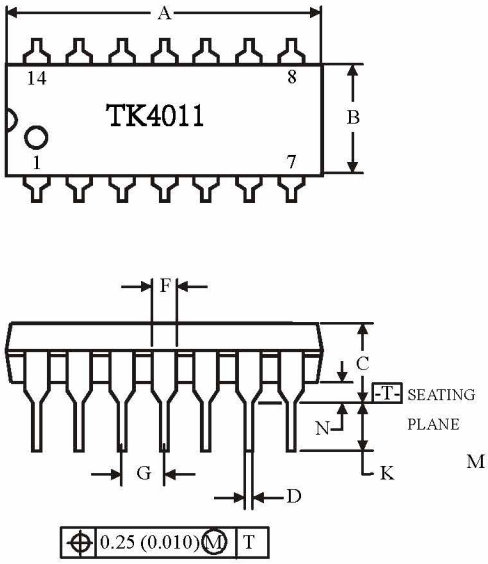
Figure 1. Switching Waveforms

EXPANDED LOGIC DIAGRAM
(1/4 of the Device)



N SUFFIX PLASTIC DIP
(MS - 001AA)



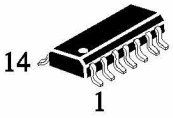


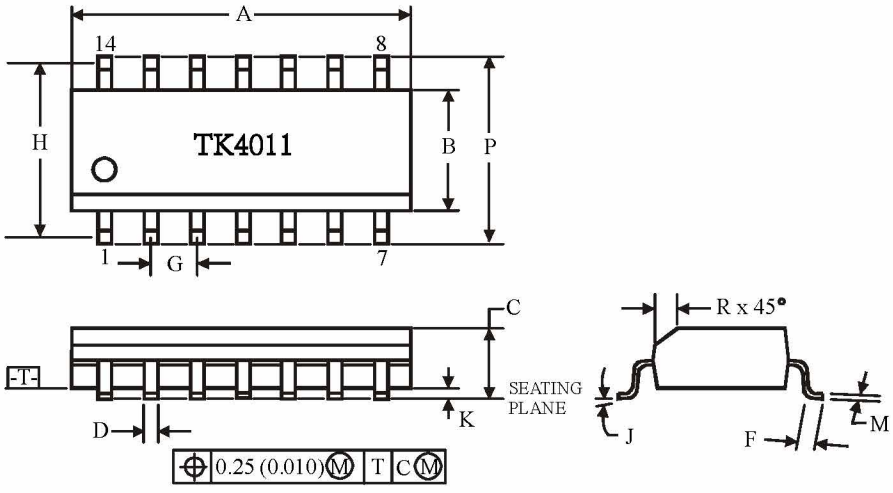
Symbol	Dimensions, mm	
	MIN	MAX
A	18.67	19.69
B	6.10	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.20	0.36
N	0.38	

NOTES:

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)





Symbol	Dimensions, mm	
	MIN	MAX
A	8.55	8.75
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:

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.