CMOS NOR GATES HIGH-VOLTAGE TYPES

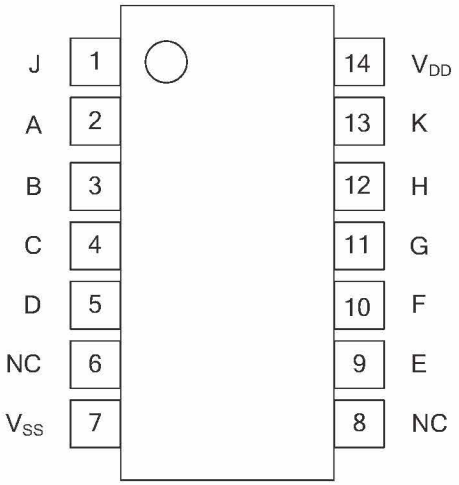
■ DESCRIPTION

The TK4002 NOR gate provides the system designer with direct implementation of the NOR function and supplements the existing family of CMOS gates.All inputs and outputs are buffered.

■ FEATURES

* Propagation delay time=60ns at C_L=50pF,V_{DD}=10V
* Buffered inputs and outputs
* Maximum input current of 1μA at 18V
* standardized symmetrical output characteristics
* 100% tested for maximum quiescent current at 20V

■ PIN ASSIGNMENT

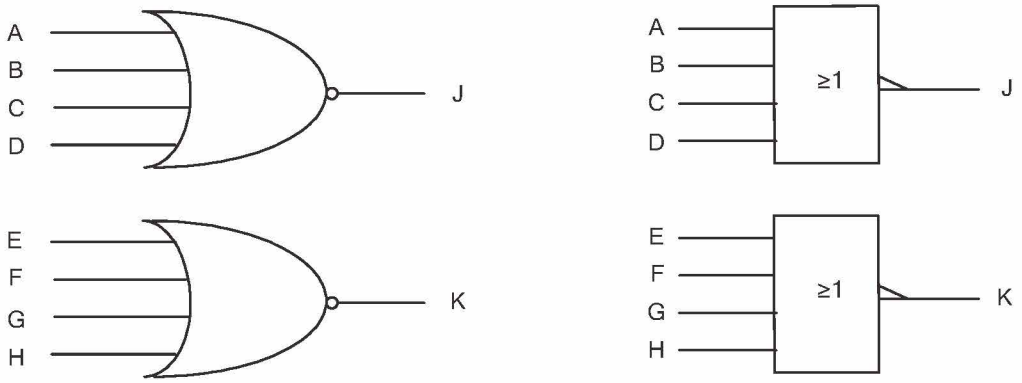


■ FUNCTION TABLE

INPUT	INPUT	INPUT	INPUT	INPUT	INPUT	INPUT	INPUT	OUTPUT	OUTPUT
A	B	C	D	E	F	G	H	K	J
L	L	L	L	L	L	L	L	H	H
H	X	X	X	H	X	X	X	L	L
X	H	X	X	X	H	X	X	L	L
X	X	H	X	X	X	H	X	L	L
X	X	X	H	X	X	X	H	L	L

NOTE: X = DON'T CARE CASE

■ LOGIC DIAGRAM



■ ORDERING INFORMATION

Part Number	Package	Packing	Temperature(TA)	Package Qty
TK4002BM	SOIC-14	Reel	-40°C ~ 125°C	2500
TK4002BP	TSSOP-14	Reel	-40°C ~ 125°C	2500
TK4002BE	DIP-14	Reel	-40°C ~ 125°C	2500

■ MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	-0.5 ~ 20	V
Input Voltage	V_{IN}	-0.5 ~ V_{CC}+0.5	V
Output Voltage	V_{OUT}	-0.5 ~ V_{CC}+0.5	V
Power Dissipation(T_A =55°C)	P_D	500	mW
Storage Temperature	T_{STG}	-65 ~ + 150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING COMDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{DD}		3		18	V
Operating Temperature	T_{OPR}		-40		+125	°C

■ ELECTRICAL CHARACTERISTICS (T_A =25℃, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Input Voltage	V_{IH}	V_{DD}= 5V, V_O=0.5V	3.5			V
		V_{DD} = 10V, V_O=1.0V	7.0			
		V_{DD}= 15V, V_O=1.5V	11.0			
Low-Level Input Voltage	V_{IL}	V_{DD}= 5V, V_O=4.5V			1.5	V
		V_{DD}= 10V, V_O=9.0V			3.0	
		V_{DD}= 15V, V_O=13.5V			4.0	
High-Level Output Voltage	V_{OH}	V_{DD}= 5V, No Load	4.95	5		V
		V_{DD}= 10V, No Load	9.95	10		
		V_{DD}= 15V, No Load	14.95	15		
Low-Level Output Voltage	V_{OL}	V_{DD}= 5V, No Load		0	0.05	V
		V_{DD}= 10V, No Load		0	0.05	
		V_{DD}= 15V, No Load		0	0.05	
High-Level Output Current (Note)	I_{OH}	V_{DD}= 5V, V_O=4.6V	-0.51	-1.0		mA
		V_{DD}= 5V, V_O=2.5V	-1.6	-3.2		
		V_{DD}= 10V, V_O=9.5V	-1.3	-2.6		
		V_{DD}= 15V, V_O=13.5V	-3.4	-6.8		
Low-Level Output Current (Note)	I_{OL}	V_{DD}= 5V, V_O=0.4V	0.51	1		
		V_{DD}= 10V, V_O=0.5V	1.3	2.6		
		V_{DD}= 15V, V_O=1.5V	3.4	6.8		
Input Leakage Current	$I_{I(LEAK)}$	V_{DD}= 15V ,V_{IN} = V_{DD} or GND			±0.1	μA
Quiescent Supply Current	I_{DD}	V_{DD}= 5V, V_{IN} = V_{DD} or V_{SS}, I_{OUT} = 0		0.01	0.25	μA
		V_{DD}= 10V, V_{IN} = V_{DD} or V_{SS}, I_{OUT} = 0		0.01	0.5	
		V_{DD}= 15V, V_{IN} = V_{DD} or V_{SS}, I_{OUT} = 0		0.01	1.0	
		V_{DD}= 20V, V_{IN} = V_{DD} or V_{SS}, I_{OUT} = 0		0.02	5.0	

Note: I_{OL} and I_{OH} are tested one output at a time.

■ SWITCHING CHARACTERISTICS

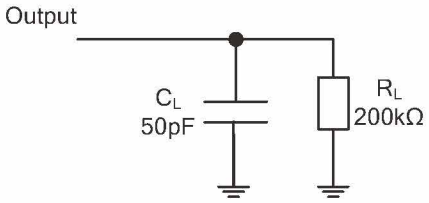
(T_A =25℃, Input t_r, t_f =20ns, C_L =50pf, R_L = 200kΩ, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from Input(A or B) to Output(Y)	t_{PLH}	V_{DD}=5V		125	250	ns
		V_{DD}=10V		60	120	
		V_{DD}=15V		45	90	
	t_{PHL}	V_{DD}=5V		125	250	
		V_{DD}=10V		60	120	
		V_{DD}=15V		45	90	
Transition Time	t_{TLH}/t_{THL}	V_{DD}=5V		100	200	ns
		V_{DD}=10V		50	100	
		V_{DD}=15V		40	80	

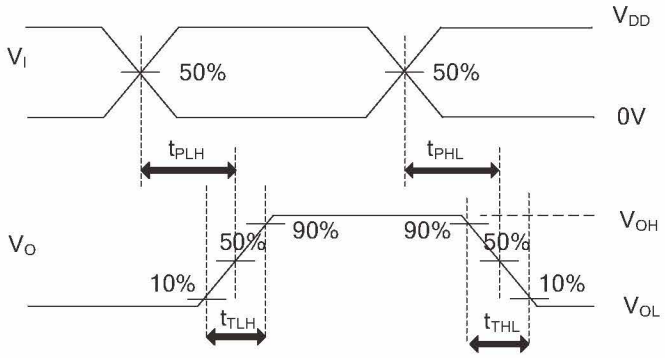
■ OPERATING CHARACTERISTICS(T_A=25°C,unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Average Input Capacitance	C_{IN}	Any Input		5	7.5	pF

■ TEST CIRCUIT AND WAVEFORMS



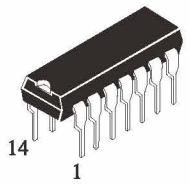
Definitions for test circuit

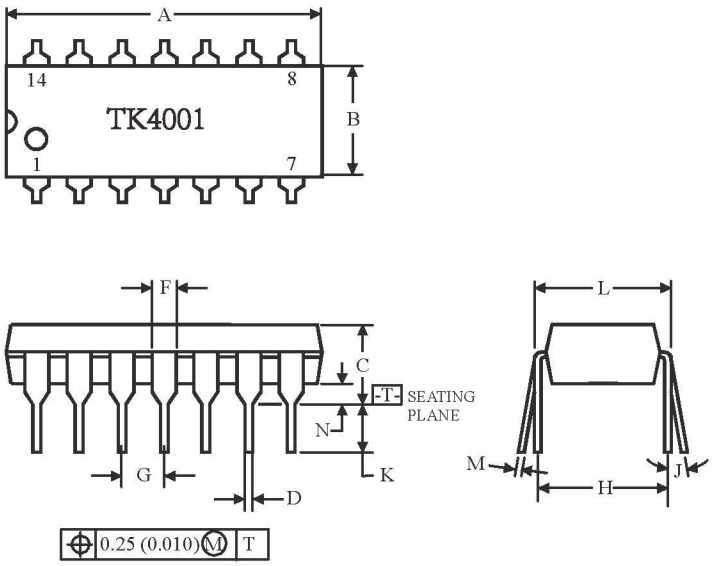


Propagation Delay Times

Note: C_L includes probe and jig capacitance.

N SUFFIX PLASTIC DIP
(MS - 001AA)

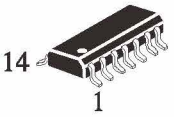


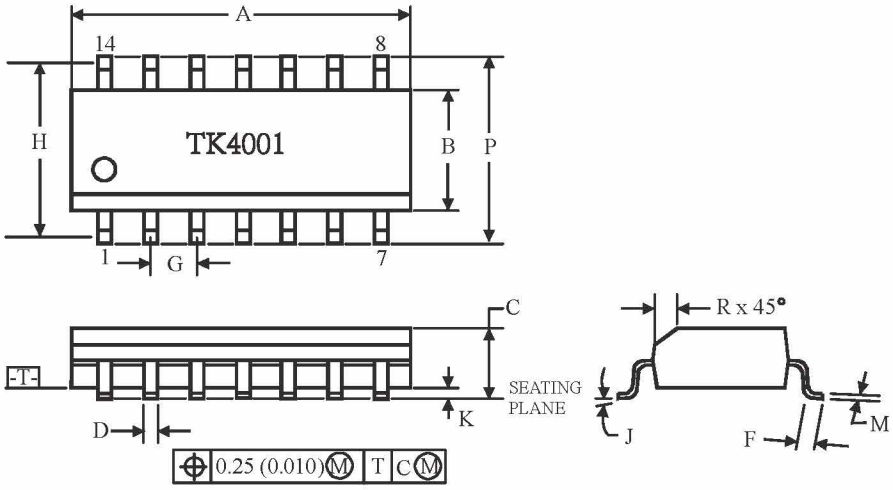


Symbol	Dimensions, mm	
	MIN	MAX
A	18.67	19.69
B	6.10	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.20	0.36
N	0.38	

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.