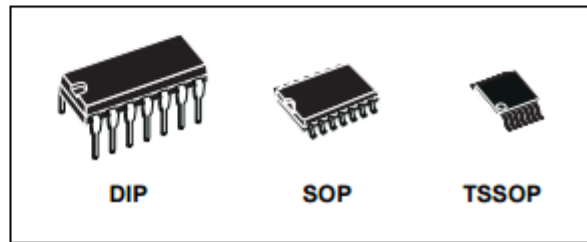


## QUAD 2-INPUT NOR GATE

- HIGH SPEED:  $t_{PD} = 4.2\text{ns}$  (TYP.) at  $V_{CC} = 5\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 2\mu\text{A}$ (MAX.) at  $T_A=25^\circ\text{C}$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- 50Ω TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24\text{mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 02
- IMPROVED LATCH-UP IMMUNITY



### ORDER CODES

PACKAGE	TUBE	T & R
DIP	74AC02B	
SOP	74AC02M	74AC02MTR
TSSOP		74AC02TTR

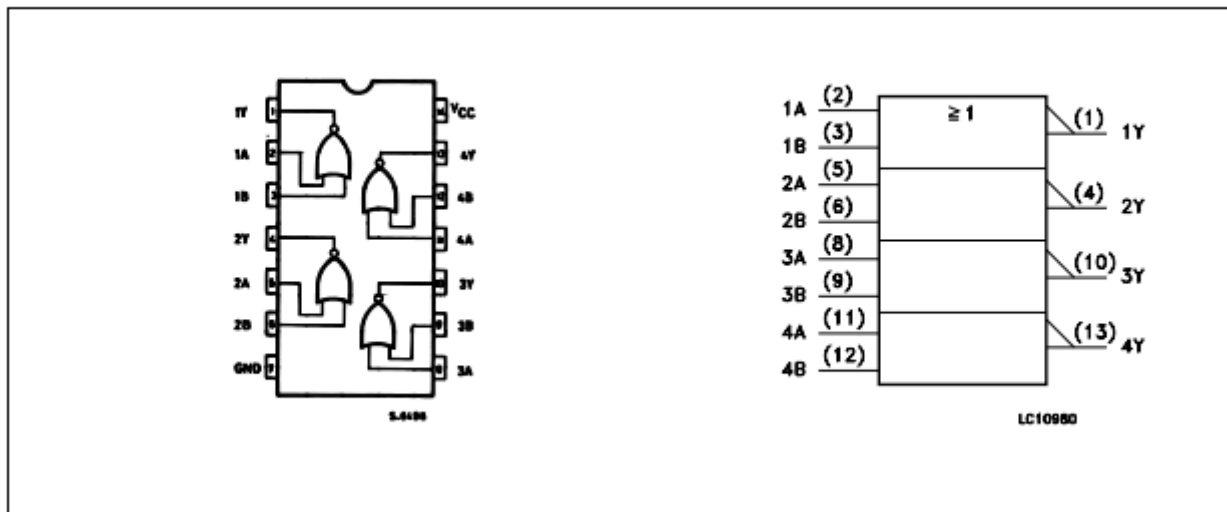
### DESCRIPTION

The 74AC02 is an advanced high-speed CMOS QUAD 2-INPUT NOR GATE fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

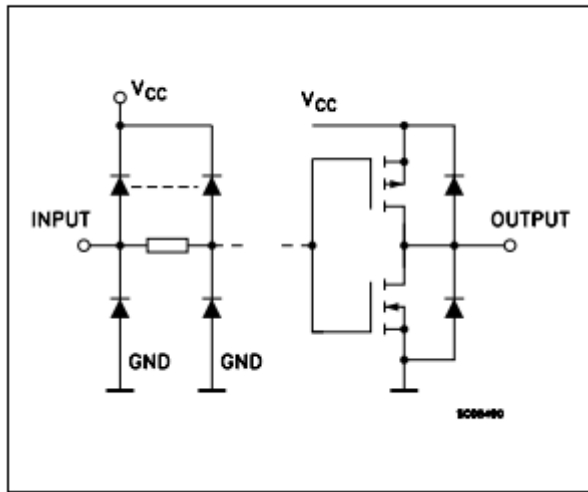
The internal circuit is composed of 3 stages including buffer output, which enables high noise immunity and stable output.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
2, 5, 8, 11	1A to 4A	Data Inputs
3, 6, 9, 12	1B to 4B	Data Inputs
1, 4, 10, 12	1Y to 4Y	Data Outputs
7	GND	Ground (0V)
14	V <sub>CC</sub>	Positive Supply Voltage

## TRUTH TABLE

A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Current	± 50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 200	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	2 to 6	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time V <sub>CC</sub> = 3.0, 4.5 or 5.5V (note 1)	8	ns/V

1) V<sub>IN</sub> from 30% to 70% of V<sub>CC</sub>

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	Test Condition	Value						Unit	
				T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C <sub>IN</sub>	Input Capacitance	5.0			4						pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	5.0	f <sub>IN</sub> = 10MHz		46						pF

1) C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I<sub>CC(opr)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>IN</sub> + I<sub>CC</sub>/4 (per gate)

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>IH</sub>	High Level Input Voltage	3.0	V <sub>O</sub> = 0.1 V or V <sub>CC</sub> -0.1V	2.1	1.5		2.1		2.1		V
		4.5		3.15	2.25		3.15		3.15		
		5.5		3.85	2.75		3.85		3.85		
V <sub>IL</sub>	Low Level Input Voltage	3.0	V <sub>O</sub> = 0.1 V or V <sub>CC</sub> -0.1V		1.5	0.9		0.9		0.9	V
		4.5			2.25	1.35		1.35		1.35	
		5.5			2.75	1.65		1.65		1.65	
V <sub>OH</sub>	High Level Output Voltage	3.0	I <sub>O</sub> = -50 μA	2.9	2.99		2.9		2.9		V
		4.5	I <sub>O</sub> = -50 μA	4.4	4.49		4.4		4.4		
		5.5	I <sub>O</sub> = -50 μA	5.4	5.49		5.4		5.4		
		3.0	I <sub>O</sub> = -12 mA	2.56			2.46		2.4		
		4.5	I <sub>O</sub> = -24 mA	3.86			3.76		3.7		
		5.5	I <sub>O</sub> = -24 mA	4.86			4.76		4.7		
V <sub>OL</sub>	Low Level Output Voltage	3.0	I <sub>O</sub> = 50 μA		0.002	0.1		0.1		0.1	V
		4.5	I <sub>O</sub> = 50 μA		0.001	0.1		0.1		0.1	
		5.5	I <sub>O</sub> = 50 μA		0.001	0.1		0.1		0.1	
		3.0	I <sub>O</sub> = 12 mA			0.36		0.44		0.5	
		4.5	I <sub>O</sub> = 24 mA			0.36		0.44		0.5	
		5.5	I <sub>O</sub> = 24 mA			0.36		0.44		0.5	
I <sub>I</sub>	Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1		± 1	μA
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			2		20		40	μA
I <sub>OLD</sub>	Dynamic Output Current (note 1, 2)	5.5	V <sub>OLD</sub> = 1.65 V max					75		50	mA
I <sub>OHD</sub>			V <sub>OHD</sub> = 3.85 V min					-75		-50	mA

1) Maximum test duration 2ms, one output loaded at time

2) Incident wave switching is guaranteed on transmission lines with impedances as low as 50Ω

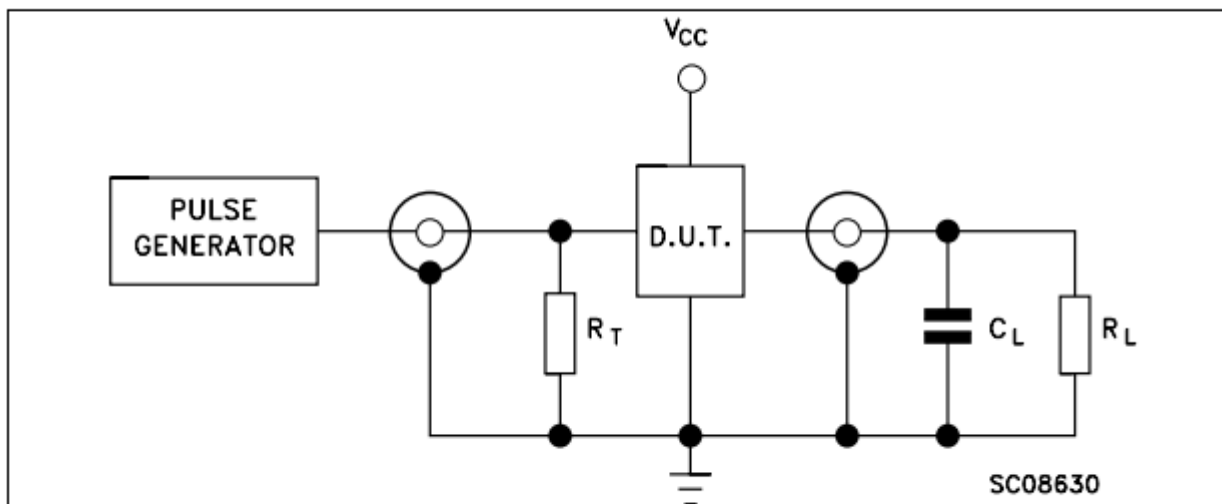
## AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50 pF, R<sub>L</sub> = 500 Ω, Input t<sub>r</sub> = t<sub>f</sub> = 3ns)

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	3.3(*)		1.5	5.5	9.5	1.0	10.0	1.0	11.0	ns
		5.0(**)		1.5	4.2	8.0	1.0	8.5	1.0	8.5	

(\*) Voltage range is 3.3V ± 0.3V

(\*\*) Voltage range is 5.0V ± 0.5V

## TEST CIRCUIT

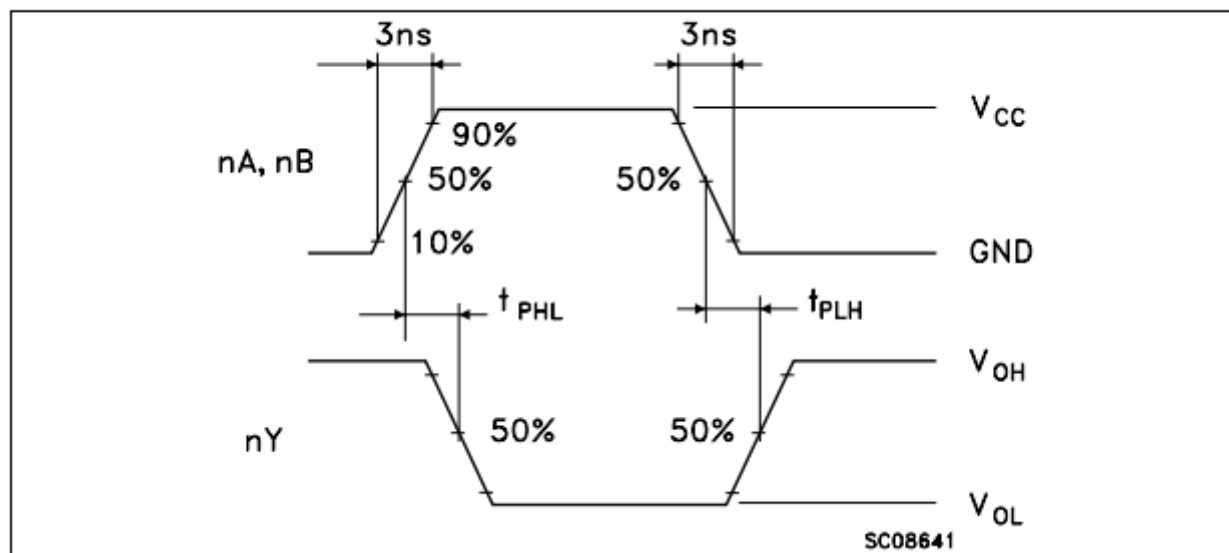


C<sub>L</sub> = 50pF or equivalent (includes jig and probe capacitance)

R<sub>L</sub> = R<sub>1</sub> = 500Ω or equivalent

R<sub>T</sub> = Z<sub>OUT</sub> of pulse generator (typically 50Ω)

**WAVEFORM: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)**



**Plastic DIP-14 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		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		15.24			0.600	
F			7.1			0.280
l			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100