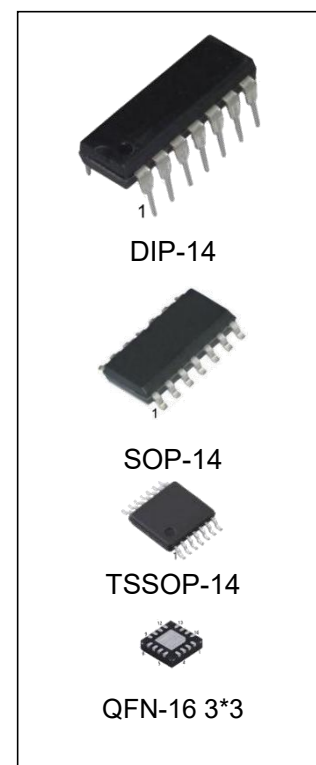


Quad 2-Input NOR Gate

High-Performance Silicon-Gate CMOS

FEATURES

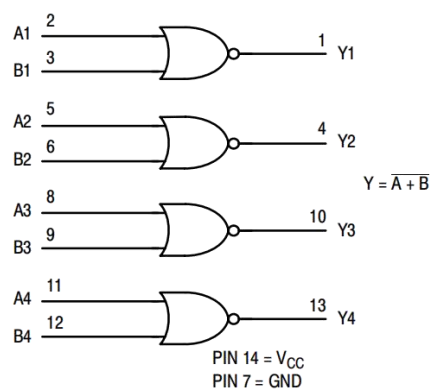
- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2.0 to 6.0 V
- Low Input Current: 1.0 A
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance with the Requirements Defined by JEDEC Standard No. 7A
- ESD Performance:
 - HBM 2000 V;
 - Machine Model 200 V
- Chip Complexity: 40 FETs or 10 Equivalent Gates
- These are Pb-Free Devices



ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
74HC02N	DIP-14	74HC02	TUBE	1000pcs/box
74HC02M/TR	SOP-14	74HC02	REEL	2500pcs/reel
74HC02MT/TR	TSSOP-14	HC02	REEL	2500pcs/reel
74HC02LQ/TR	QFN-16 3*3	HC02	REEL	5000pcs/reel

LOGIC DIAGRAM

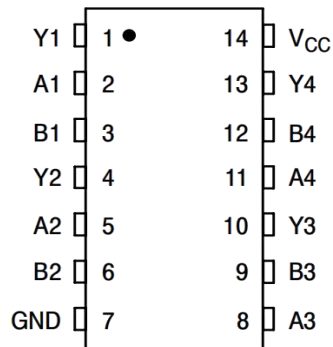


FUNCTION TABLE

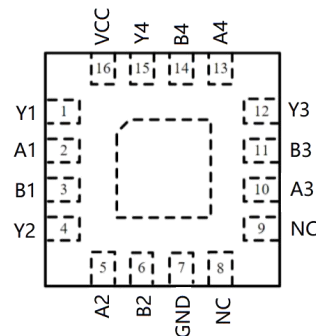
Inputs		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

PIN ASSIGNMENT

DIP-14/SOP-14/TSSOP-14



QFN-16 3*3



MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	− 0.5 to + 7.0	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	20	mA
I _{out}	DC Output Current, per Pin	25	mA
I _{CC}	DC Supply Current, V _{CC} and GND Pins	50	mA
P _D	Power Dissipation in Still Air, SOP Package TSSOP Package	500 450	mW
T _{stg}	Storage Temperature	− 65 to + 150	°C
T _L	Lead Temperature, 1 mm from Case for 10 Seconds SOP or TSSOP Package	260	°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.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Derating SOP Package: 7 mW/°C from 65° to 125°C ; TSSOP Package: 6.1 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	2.0	6.0	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	+ 85	°C
t _r , t _f	Input Rise and Fall Time(Figure 1)	0	1000	ns
	V _{CC} = 2.0 V	0	500	
	V _{CC} = 4.5 V	0	400	
	V _{CC} = 6.0 V	0	400	

DC ELECTRICAL CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Test Conditions	VCC (V)	Guaranteed Limit			Unit
				-40 to 25°C	≤ 85°C	≤ 125°C	
V _{IH}	Minimum High-Level Input Voltage	V _{out} = 0.1 V or VCC – 0.1 V I _{out} ≤ 20 μA	2.0	1.5	1.5	1.5	V
			3.0	2.1	2.1	2.1	
			4.5	3.15	3.15	3.15	
			6.0	4.2	4.2	4.2	
V _{IL}	Maximum Low-Level Input Voltage	V _{out} = 0.1 V or VCC – 0.1 V I _{out} ≤ 20 μA	2.0	0.5	0.5	0.5	V
			3.0	0.9	0.9	0.9	
			4.5	1.35	1.35	1.35	
			6.0	1.8	1.8	1.8	
V _{OH}	Minimum High-Level Output Voltage	V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA	2.0	1.9	1.9	1.9	V
			4.5	4.4	4.4	4.4	
			6.0	5.9	5.9	5.9	
		V _{in} = V _{IH} or V _{IL} I _{out} ≤ 2.4 mA I _{out} ≤ 4.0 mA I _{out} ≤ 5.2 mA	3.0 4.5 6.0	2.48 3.98 5.48	2.34 3.84 5.34	2.20 3.7 5.2	
V _{OL}	Maximum Low-Level Output Voltage	V _{in} = V _{IH} or V _{IL} I _{out} ≤ 20 μA	2.0	0.1	0.1	0.1	V
			4.5	0.1	0.1	0.1	
			6.0	0.1	0.1	0.1	
		V _{in} = V _{IH} or V _{IL} I _{out} ≤ 2.4 mA I _{out} ≤ 4.0 mA I _{out} ≤ 5.2 mA	3.0 4.5 6.0	0.26 0.26 0.26	0.33 0.33 0.33	0.4 0.4 0.4	
I _{in}	Maximum Input Leakage Current	V _{in} = VCC or GND	6.0	0.1	1.0	1.0	μA
I _{CC}	Maximum Quiescent Supply Current (per Package)	V _{in} = VCC or GND I _{out} = 0 μA	6.0	2.0	20	40	μA

AC ELECTRICAL CHARACTERISTICS (CL = 50 pF, Input tr = tf = 6.0 ns)

Symbol	Parameter	VCC (V)	Guaranteed Limit			Unit
			-40 to 25°C	≤ 85°C	≤ 125°C	
t _{PLH} , t _{PHL}	Maximum Propagation Delay, Input A or B to Output Y (Figures 1 and 2)	2.0	75	95	110	ns
		3.0	30	40	55	
		4.5	15	19	22	
		6.0	13	16	19	
t _{TLH} , t _{THL}	Maximum Output Transition Time, Any Output (Figures 1 and 2)	2.0	75	95	110	ns
		3.0	30	40	55	
		4.5	15	19	22	
		6.0	13	16	19	
C _{in}	Maximum Input Capacitance	—	10	10	10	pF

CPD	Power Dissipation Capacitance (Per Gate)*	Typical @ 25 °C, VCC = 5.0 V	pF
		22	

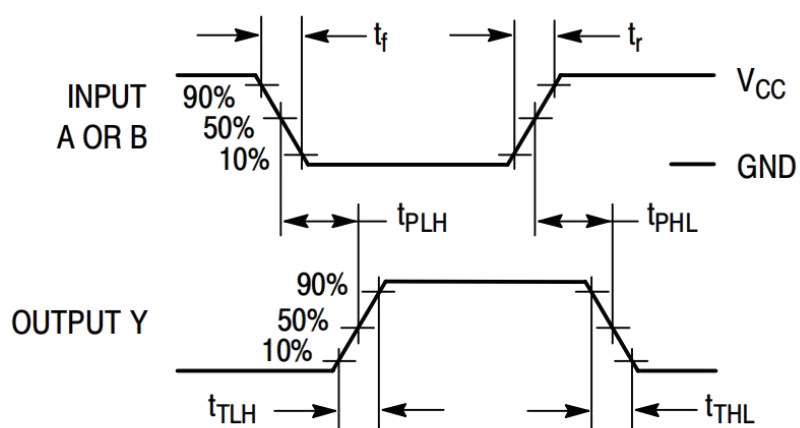
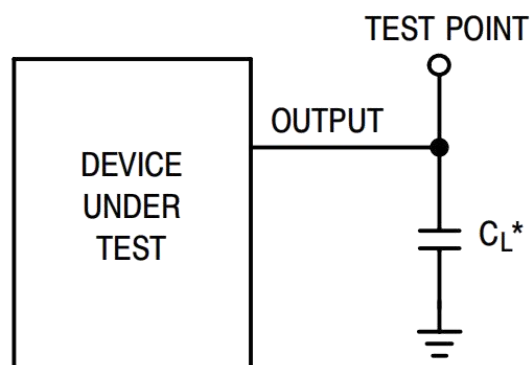


Figure 1. Switching Waveforms



*Includes all probe and jig capacitance

Figure 2. Test Circuit

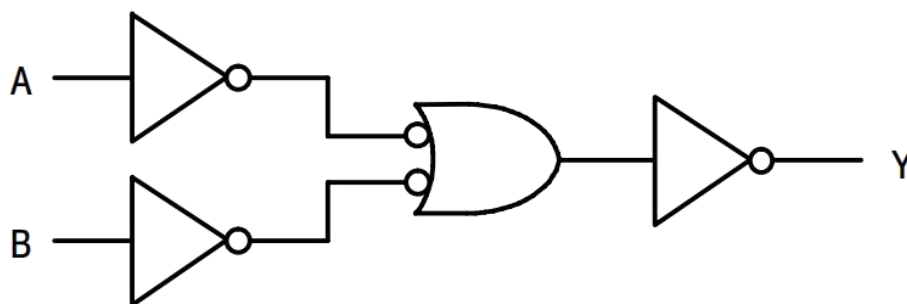
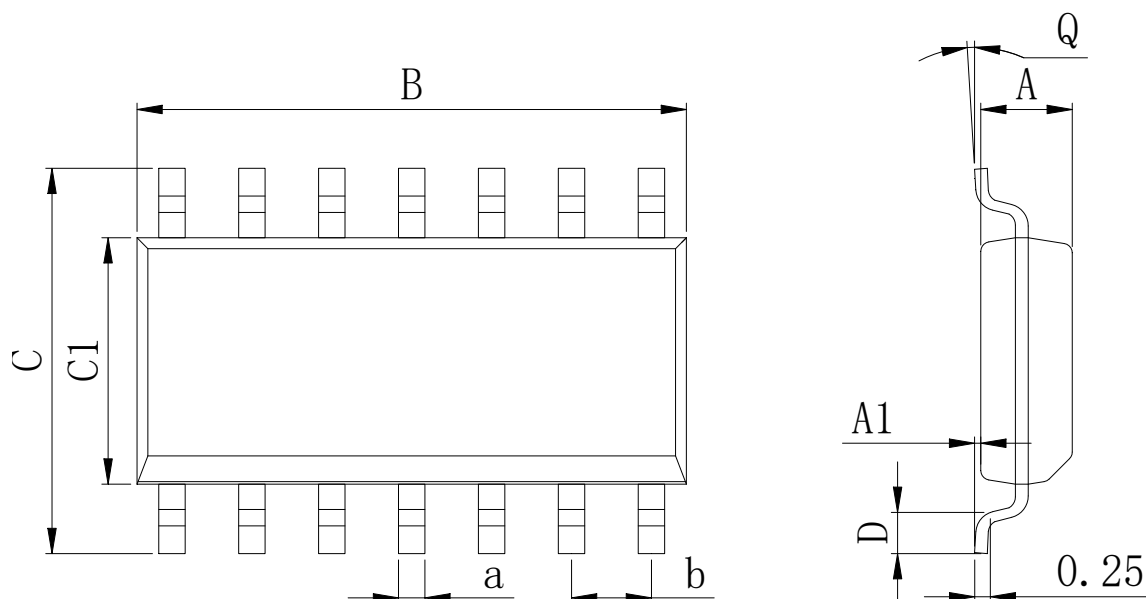


Figure 3. Expanded Logic Diagram
(1/4 of the Device)

PHYSICAL DIMENSIONS

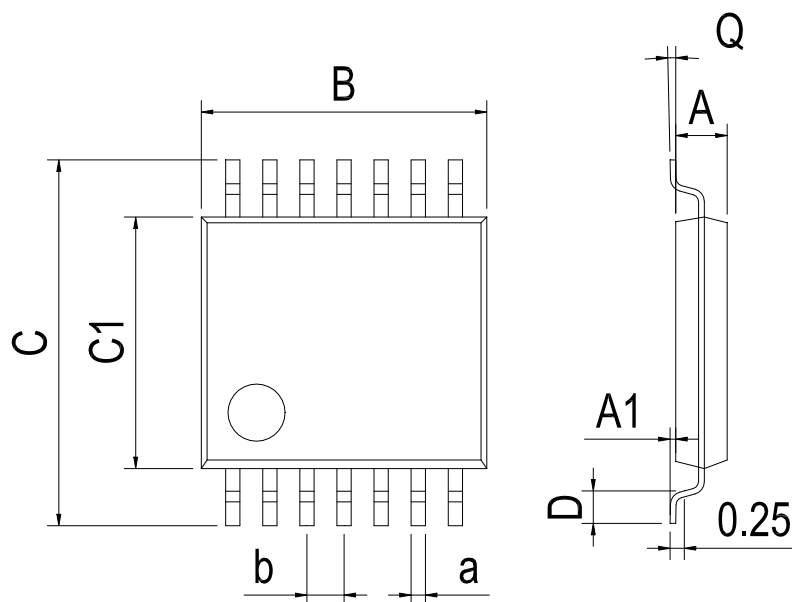
SOP-14



Dimensions In Millimeters(SOP-14)

Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	8.55	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	8.75	6.20	4.00	0.80	8°	0.45	

TSSOP-14

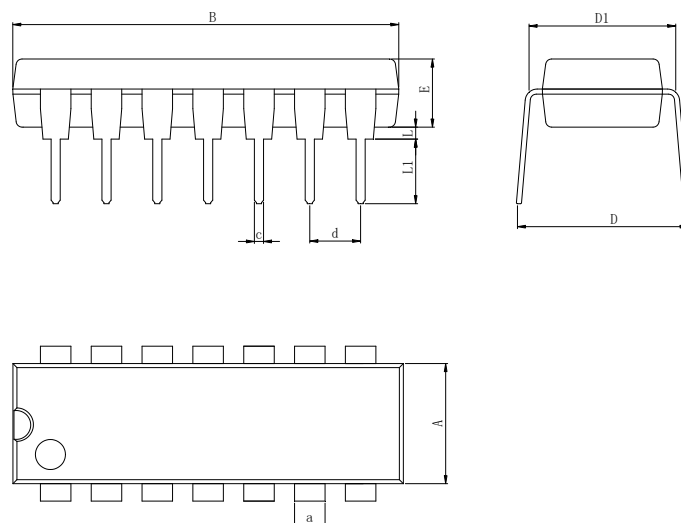


Dimensions In Millimeters(TSSOP-14)

Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

PHYSICAL DIMENSIONS

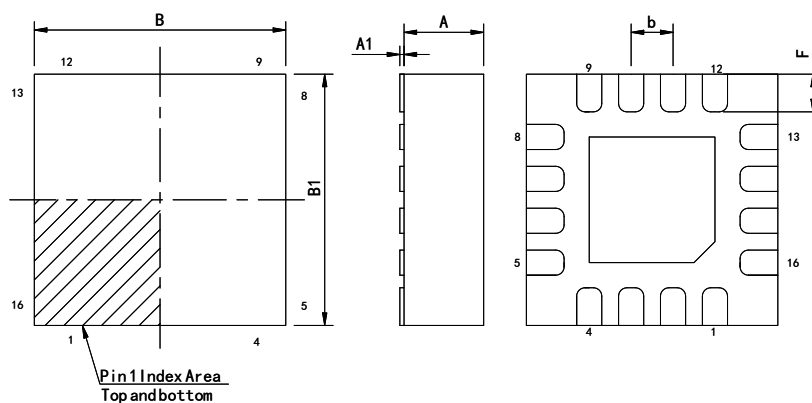
DIP-14



Dimensions In Millimeters(DIP-14)

Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.50	

QFN-16 3*3



Dimensions In Millimeters(QFN-16 3*3)

Symbol:	A	A1	B	B1	E	F	a	b
Min:	0.85	0	2.90	2.90	0.15	0.25	0.18	0.50TYP
Max:	0.95	0.05	3.10	3.10	0.25	0.45	0.30	

REVISION HISTORY

DATE	REVISION	PAGE
2019-5-9	New	1-9
2023-8-31	Update encapsulation type、Updated DIP-14 dimension	1、 7
2024-11-8	Add the QFN-16 package device、Update Lead Temperature	1、 3

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