T-43-21

LC74HC02M

3034A

CMOS High-Speed Standard Logic
LC74HC Series

Quad 2-Input NOR Gate

©2139A

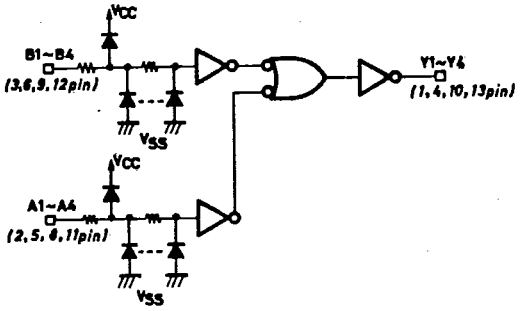
Features

- The LC74HC02M consists of 4 identical 2-input NOR gates.
- Uses CMOS silicon gate process technology to achieve operating speeds similar to LS-TTL (74LS02) with the low power dissipation and high noise margin of standard CMOS ICs.
- Has buffered outputs, improving the output transition characteristics.
- All inputs and outputs are protected from damage.
- The LC74HC02M is functionally as well as pin-out compatible with the standard 54LS/74LS-TTL logic family.

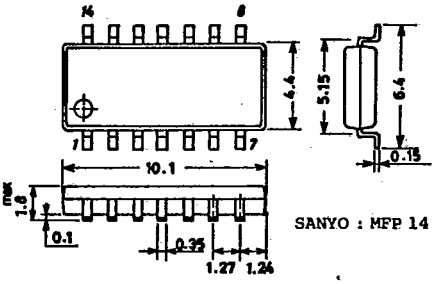
Absolute Maximum Ratings/Ta=25±2°C, V_{SS}=0V				unit
Maximum Supply Voltage	V_{CC} max		V_{SS}–0.5 to V_{SS}+7.0	V
Maximum Input Voltage	V_{IN} max		V_{SS}–0.5 to V_{CC}+0.5	V
Maximum Output Voltage	V_{OUT} max		V_{SS}–0.5 to V_{CC}+0.5	V
Maximum Output Current	I_{OUT}	Per output	±25	mA
Current Dissipation	I_{CC}/I_{Gnd}		±50	mA
Clamp Diode Current	I_K	Per input pin (Input protector)	±20	mA
Allowable Power Dissipation	Pd max	Per package, Ta≦85°C	150	mW
Storage Temperature	Tstg		–65 to +150	°C
Lead Temperature and Time	Tsol	t=10sec	260	°C

Allowable Operating Conditions/V_{SS}=0V			unit
Supply Voltage	V_{CC}	2.0 to 6.0	V
Input Voltage	V_{IN}	0 to V_{CC}	V
Output Voltage	V_{OUT}	0 to VCC	V
Operating Temperature	Topg	–40 to +85	°C
Input Rise/Fall Time	tr, tf	0 to 500	ns

Equivalent Circuit and Logic Diagram (1/4 LC74HC02M)



Case Outline 3034A-M14IC
(unit: mm)



For details, refer to the description of the LC74HC02.

T-43-21

LC74HC02

3003A

CMOS High-Speed Standard Logic
LC74HC Series

Quad 2-Input NOR Gate

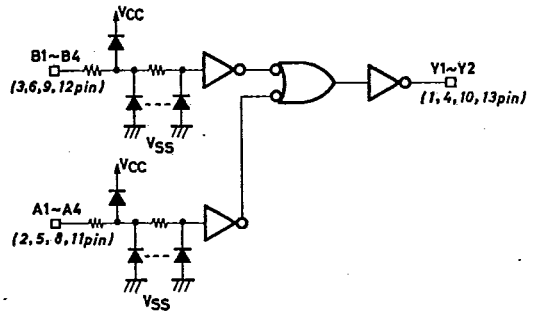
Features

- The LC74HC02 consists of 4 identical 2-input NOR gates.
- Uses CMOS silicon gate process technology to achieve operating speeds similar to LS-TTL (74LS02) with the low power dissipation and high noise margin of standard CMOS IC's.
- Has buffered outputs, improving the output transition characteristics.
- All inputs and outputs are protected from damage.
- The LC74HC02 is functionally as well as pin-out compatible with the standard 54LS/74LS TTL logic family.

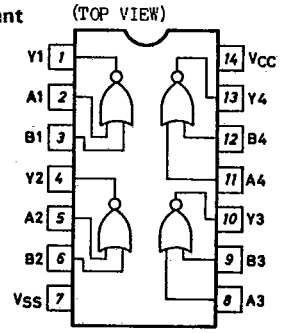
Absolute Maximum Ratings/T_a=25±2°C, V_{SS}=0V

				unit
Maximum Supply Voltage	V_{CC} max		V_{SS}–0.5 to V_{SS}+7.0	V
Input Voltage	V_{IN} max		V_{SS}–0.5 to V_{CC}+0.5	V
Output Voltage	V_{OUT}max		V_{SS}–0.5 to V_{CC}+0.5	V
Output Current	I_{OUT}	Per output	±25	mA
Current Dissipation	I_{CC}/I_{GND}		±50	mA
Clamp Diode Current	I_K	Per input pin	±20	mA
Allowable Power Dissipation	P_d max	Per package, $T_a \leqq 85°C$	300	mW
Storage Temperature	T_{stg}		–65 to +150	°C
Lead Temperature and Time	T_{sol}	t=10sec	300	°C

Equivalent Circuit (1/4 LC74HC02)



Pin Assignment (TOP VIEW)

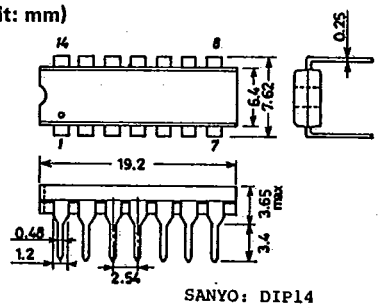


Truth Table

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

0:"L"level
1:"H"level

Case Outline 3003A-D14IC
(unit: mm)



SANYO: DIP14

Allowable Operating Conditions/V_{SS}=0V

			unit
Supply Voltage	V_{CC}	2 to 6	V
Input Voltage	V_{IN}	0 to V_{CC}	V
Output Voltage	V_{OUT}	0 to V_{CC}	V
Operating Temperature Range	T_{opg}	−40 to +85	°C
Input Rise/Fall Time	t_r, t_f	0 to 500	ns

Electrical Characteristics/T_a=25±2°C, V_{SS}=0V

			min	typ	max	unit
Input "H" Level Voltage	V_{IH}	V_{CC}=2.0V	1.5			V
		V_{CC}=4.5V	3.15			V
		V_{CC}=5.0V	3.5			V
		V_{CC}=5.5V	3.85			V
		V_{CC}=6.0V	4.2			V
Input "L" Level Voltage	V_{IL}	V_{CC}=2.0V			0.6	V
		V_{CC}=4.5V			1.35	V
		V_{CC}=5.0V			1.5	V
		V_{CC}=5.5V			1.65	V
		V_{CC}=6.0V			1.8	V
Output "H" Level Voltage	V_{OH}	V_{CC}=4.5V, V_{IN}=V_{IL}, I_{OH}=−20μA	4.4	4.5		V
		V_{CC}=5.0V, 〃 〃	4.9	5.0		V
		V_{CC}=5.5V, 〃 〃	5.4	5.5		V
		V_{CC}=4.5V, V_{IN}=V_{IL}, I_{OH}=−4mA	4.1	4.3		V
		V_{CC}=5.0V, 〃 〃	4.6	4.8		V
		V_{CC}=5.5V, 〃 〃	5.1	5.3		V
Output "L" Level Voltage	V_{OL}	V_{CC}=4.5V, V_{IN}=V_{IH} or V_{IL}, I_{OL}=20μA		0.0	0.1	V
Output "L" Level Voltage	V_{OL}	V_{CC}=5.0V, V_{IN}=V_{IH} or V_{IL}, I_{OL}=20μA		0.0	0.1	V
		V_{CC}=5.5V, 〃 〃		0.0	0.1	V
		V_{CC}=4.5V, V_{IN}=V_{IH} or V_{IL}, I_{OH}=4mA		0.2	0.4	V
		V_{CC}=5.0V, 〃 〃		0.2	0.4	V
		V_{CC}=5.5V, 〃 〃		0.2	0.4	V
Input Current	I_{IN}	V_{CC}=6.0V, V_{IN}=V_{CC} or V_{SS}			±0.1	μA
Quiescent Current	I_{CC}	V_{CC}=6.0V, V_{IN}=V_{CC} or V_{SS} (output open)			1.0	μA

Electrical Characteristics/T_a=−40°C, V_{SS}=0V

			min	typ	max	unit
Input "H" Level Voltage	V_{IH}	V_{CC}=2.0V	1.5			V
		V_{CC}=4.5V	3.15			V
		V_{CC}=5.0V	3.5			V
		V_{CC}=5.5V	3.85			V
		V_{CC}=6.0V	4.2			
Input "L" Level Voltage	V_{IL}	V_{CC}=2.0V			0.6	V
		V_{CC}=4.5V			1.35	V
		V_{CC}=5.0V			1.5	V
		V_{CC}=5.5V			1.65	V
		V_{CC}=6.0V			1.8	V
Output "H" Level Voltage	V_{OH}	V_{CC}=4.5V, V_{IN}=V_{IL}, I_{OH}=−20μA	4.4			V
		V_{CC}=5.0V, 〃 〃	4.9			V
		V_{CC}=5.5V, 〃 〃	5.4			V
		V_{CC}=4.5V, V_{IN}=V_{IL}, I_{OH}=−4mA	4.1			V
		V_{CC}=5.0V, 〃 〃	4.6			V
		V_{CC}=5.5V, 〃 〃	5.1			V

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			min	typ	max	unit
Output "L" Level Voltage	V_{OL}	V_{CC}=4.5V, V_{IN}=V_{IH} or V_{IL}, I_{OL}=20μA			0.1	V
		V_{CC}=5.0V, 〃 〃			0.1	V
		V_{CC}=5.5V, 〃 〃			0.1	V
		V_{CC}=4.5V, V_{IN}=V_{IH} or V_{IL}, I_{OH}=4mA			0.4	V
		V_{CC}=5.0V, 〃 〃			0.4	V
		V_{CC}=5.5V, 〃 〃			0.4	V
Input Current	I_{IN}	V_{CC}=6.0V, V_{IN}=V_{CC} or V_{SS}			±0.1	μA
Quiescent Current	I_{CC}	V_{CC}=6.0V, V_{IN}=V_{CC} or V_{SS} (output open)			1.0	μA

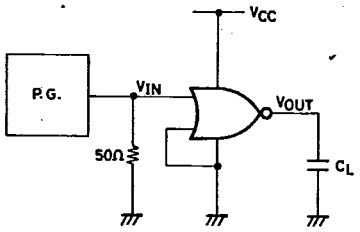
Electrical Characteristics/T_a=+85°C, V_{SS}=0V

			min	typ	max	unit
Input "H" Level Voltage	V_{IH}	V_{CC}=2.0V	1.5			V
		V_{CC}=4.5V	3.15			V
		V_{CC}=5.0V	3.5			V
		V_{CC}=5.5V	3.85			V
		V_{CC}=6.0V	4.2			V
Input "L" Level Voltage	V_{IL}	V_{CC}=2.0V			0.6	V
		V_{CC}=4.5V			1.35	V
		V_{CC}=5.0V			1.5	V
		V_{CC}=5.5V			1.65	V
		V_{CC}=6.0V			1.8	V
Output "H" Level Voltage	V_{OH}	V_{CC}=4.5V, V_{IN}=V_{IL}, I_{OH}=−20μA	4.4			V
		V_{CC}=5.0V, 〃 〃	4.9			V
		V_{CC}=5.5V, 〃 〃	5.4			V
		V_{CC}=4.5V, V_{IN}=V_{IN}, I_{OH}=−4mA	4.0			V
		V_{CC}=5.0V, 〃 〃	4.5			V
		V_{CC}=5.5V, 〃 〃	5.0			V
Output "L" Level Voltage	V_{OL}	V_{CC}=4.5V, V_{IN}=V_{IH} or V_{IL}, I_{OL}=20μA			0.1	V
		V_{CC}=5.0V, 〃 〃			0.1	V
		V_{CC}=5.5V, 〃 〃			0.1	V
		V_{CC}=4.5V, V_{IN}=V_{IH} or V_{IL}, I_{OH}=4mA			0.5	V
		V_{CC}=5.0V, 〃 〃			0.5	V
		V_{CC}=5.5V, 〃 〃			0.5	V
Input Current	I_{IN}	V_{CC}=6.0V, V_{IN}=V_{CC} or V_{SS}			±1.0	μA
Quiescent Current	I_{CC}	V_{CC}=6.0V, V_{IN}=V_{CC} or V_{SS} (output open)			10.0	μA

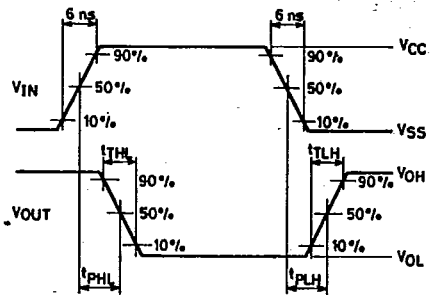
Switching Characteristics/T_a=25±2°C, V_{SS}=0V, INPUT: t_r, t_f=6ns

			min	typ	max	unit
Output Rise Time	t_{TLH}	V_{CC}=5V, C_L=15pF		4	8	ns
Output Fall Time	t_{THL}	V_{CC}=5V, 〃		4	8	ns
"H" Level Propagation Delay Time	t_{PLH}	V_{CC}=5V, 〃		8	15	ns
"L" Level Propagation Delay Time	t_{PHL}	V_{CC}=5V, 〃		8	15	ns
Output Rise Time	t_{TLH}	V_{CC}=5V, C_L=50pF		8	15	ns
Output Fall Time	t_{THL}	V_{CC}=5V, 〃		8	15	ns
"H" Level Propagation Delay Time	t_{PLH}	V_{CC}=5V, 〃		10	20	ns
"L" Level Propagation Delay Time	t_{PHL}	V_{CC}=5V, 〃		10	20	ns

Switching Time Test Circuit and Waveforms



Test Circuit



Switching Waveforms

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Maximum Supply Voltage	V_{CC} max		V_{SS}–0.5 to V_{SS}+7.0	V
Maximum Input Voltage	V_{IN} max		V_{SS}–0.5 to V_{CC}+0.5	V
Maximum Output Voltage	V_{OUT} max		V_{SS}–0.5 to V_{CC}+0.5	V
Maximum Output Current	I_{OUT}	Per output	±25	mA
Current Dissipation	I_{CC}/I_{Gnd}		±50	mA
Clamp Diode Current	I_K	Per input pin (Input protector)	±20	mA
Allowable Power Dissipation	Pd max	Per package, Ta≦85°C	150	mW
Storage Temperature	Tstg		–65 to +150	°C
Lead Temperature and Time	Tsol	t=10sec	260	°C

Allowable Operating Conditions/V_{SS}=0V			unit
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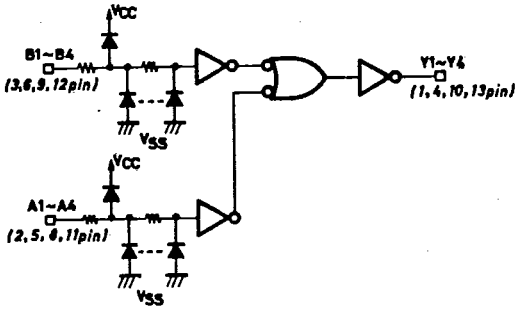
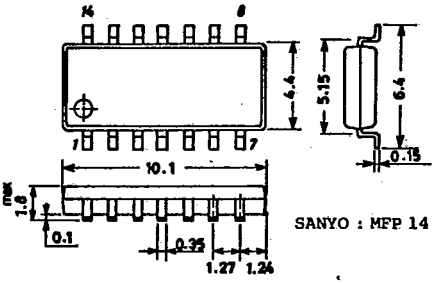
Input Voltage	V_{IN}	0 to V_{CC}	V
Output Voltage	V_{OUT}	0 to VCC	V
Operating Temperature	Topg	–40 to +85	°C
Input Rise/Fall Time	tr, tf	0 to 500	ns

Equivalent Circuit and Logic Diagram (1/4 LC74HC02M)



Case Outline 3034A-M14IC
(unit: mm)



For details, refer to the description of the LC74HC02.