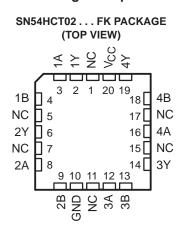
SCLS065E - NOVEMBER 1988 - REVISED JULY 2003

- Operating Voltage Range of 4.5 V to 5.5 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 20-μA Max I_{CC}

SN54HCT02 ... J OR W PACKAGE SN74HCT02 ... D, DB, N, NS, OR PW PACKAGE (TOP VIEW)

- Typical t_{pd} = 10 ns
- ±4-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- Inputs Are TTL-Voltage Compatible



NC - No internal connection

description/ordering information

These devices contain four independent 2-input NOR gates. They perform the Boolean function $Y = \overline{A} \bullet \overline{B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

ТА	PACKA	GET	ORDERABLE PART NUMBER	TOP-SIDE MARKING	
	PDIP – N	Tube of 25	SN74HCT02N	SN74HCT02N	
		Tube of 50	SN74HCT02D		
	SOIC – D	Reel of 2500	SN74HCT02DR	HCT02	
–40°C to 85°C		Reel of 250	SN74HCT02DT		
	SOP – NS	Reel of 2000	SN74HCT02NSR	HCT02	
	SSOP – DB	Reel of 2000	SN74HCT02DBR	HT02	
		Tube of 90	SN74HCT02PW		
	TSSOP – PW	Reel of 2000	SN74HCT02PWR	HT02	
		Reel of 250	SN74HCT02PWT		
	CDIP – J	Tube of 25	SNJ54HCT02J	SNJ54HCT02J	
–55°C to 125°C	CFP – W	Tube of 150	SNJ54HCT02W	SNJ54HCT02W	
	LCCC – FK	Tube of 55	SNJ54HCT02FK	SNJ54HCT02FK	

ORDERING INFORMATION

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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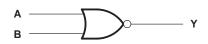


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FUNCTION TABLE (each gate)										
INP	UTS	OUTPUT								
Α	В	Y								
Н	Х	L								
Х	Н	L								
L	L	Н								

logic diagram, each gate (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see N Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see N Continuous output current, I_O ($V_O = 0$ to V_{CC}) Continuous current through V_{CC} or GND Package thermal impedance, θ_{JA} (see Note 2): D DI N	-0.5 V to 7 V Note 1)
	N package 113°C/W –65°C to 150°C

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

			SN	154HCT02	SN74HCT02			UNIT
			MIN	NOM MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage		4.5	5 🔥 5.5	4.5	5	5.5	V
VIH	High-level input voltage	V _{CC} = 4.5 V to 5.5 V	2	N	2			V
VIL	Low-level input voltage	V_{CC} = 4.5 V to 5.5 V		0.8			0.8	V
VI	Input voltage		0	Vcc	0		VCC	V
VO	Output voltage		0	S Vcc	0		VCC	V
$\Delta t/\Delta v$	Input transition rise/fall time		C	500			500	ns
Τ _Α	Operating free-air temperature		-55	125	-40		85	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs, literature number SCBA004.



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electrical characteristics	over	recommended	operating	free-air	temperature	range	(unless
otherwise noted)					-	•	

PARAMETER	TEST CO	vcc	Т	A = 25°C	;	SN54H	ICT02	SN74HCT02		UNIT		
PARAMETER	TEST CO		MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT		
Vau	$V_{I} = V_{IH} \text{ or } V_{IL}$	I _{OH} = -20 μA	4.5 V	4.4	4.499		4.4		4.4		V	
VOH	VI = VIH OL VIL	I _{OH} = -4 mA	4.5 V	3.98	4.3		3.7	<u>h</u>	3.84		V	
Ve	VI = VIH or VIL	I _{OL} = 20 μA	4.5 V		0.001	0.1		0.1		0.1	V	
VOL	VI = VIH OI VIL	$I_{OL} = 4 \text{ mA}$	4.5 V		0.17	0.26		0.4		0.33	v	
li li	AI = ACC or 0		5.5 V		±0.1	±100	~	±1000		±1000	nA	
ICC	$V_I = V_{CC} \text{ or } 0,$	$I_{O} = 0$	5.5 V			2	202	40		20	μΑ	
∆lcc‡	One input at 0.5 V of Other inputs at 0 or		5.5 V		1.4	2.4	PRO1	3		2.9	mA	
Ci			4.5 V to 5.5 V		3	10		10		10	pF	

[†] This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

switching characteristics over recommended operating free-air temperature range, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

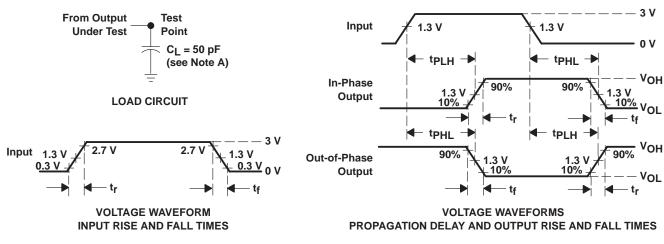
PARAMETER	FROM	то	Vaa	T _A = 25°C			SN54HCT02	SN74HCT02	UNIT
	(INPUT)	(OUTPUT)	Vcc	MIN	TYP	MAX	MIN MAX	MIN MAX	
t _{pd} A or B	V	4.5 V		11	20	30	25		
	AOIB	'	5.5 V		10	18	27	22	ns
tt		V	4.5 V		9	15	22	19	-
		Ť	5.5 V		8	14	20	17	, ns

operating characteristics, T_{A} = 25°C

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd}	Power dissipation capacitance	No load	20	pF



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PARAMETER MEASUREMENT INFORMATION

NOTES: A. CL includes probe and test-fixture capacitance.

- B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_Q = 50 Ω, t_r = 6 ns, t_f = 6 ns.
 - C. The outputs are measured one at a time with one input transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms





10-Jun-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type		Pins	-	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
SN74HCT02D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DT	ACTIVE	SOIC	D	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT02N	Samples
SN74HCT02NE4	ACTIVE	PDIP	Ν	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT02N	Samples
SN74HCT02NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02PW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT02	Samples
SN74HCT02PWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT02	Samples
SN74HCT02PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT02	Samples
SN74HCT02PWT	ACTIVE	TSSOP	PW	14	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT02	Samples

(1) The marketing status values are defined as follows:
 ACTIVE: Product device recommended for new designs.
 LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
 NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.



www.ti.com

10-Jun-2014

PREVIEW: Device has been announced but is not in production. Samples may or may not be available. **OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes. **Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION

REEL DIMENSIONS

Texas Instruments





TAPE AND REEL INFORMATION

TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

*All dimensions are nominal												
Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT02DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCT02DT	SOIC	D	14	250	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCT02NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74HCT02PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HCT02PWT	TSSOP	PW	14	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TEXAS INSTRUMENTS

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PACKAGE MATERIALS INFORMATION

14-Jul-2012



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT02DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74HCT02DT	SOIC	D	14	250	367.0	367.0	38.0
SN74HCT02NSR	SO	NS	14	2000	367.0	367.0	38.0
SN74HCT02PWR	TSSOP	PW	14	2000	367.0	367.0	35.0
SN74HCT02PWT	TSSOP	PW	14	250	367.0	367.0	35.0

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

- A. All linear dimensions are in inches (millimeters).B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- \triangle The 20 pin end lead shoulder width is a vendor option, either half or full width.



D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AB.





NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



A. An integration of the information o

Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153





NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



MECHANICAL DATA

PLASTIC SMALL-OUTLINE PACKAGE

0,51 0,35 ⊕0,25⊛ 1,27 8 14 0,15 NOM 5,60 8,20 5,00 7,40 \bigcirc Gage Plane ₽ 0,25 7 1 1,05 0,55 0-10 Δ 0,15 0,05 Seating Plane — 2,00 MAX 0,10PINS ** 14 16 20 24 DIM 10,50 10,50 12,90 15,30 A MAX A MIN 9,90 9,90 12,30 14,70 4040062/C 03/03

NOTES: A. All linear dimensions are in millimeters.

NS (R-PDSO-G**)

14-PINS SHOWN

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.



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