CD54AC02...F PACKAGE CD74AC02...E OR M PACKAGE

(TOP VIEW)

1Y

1A [

2Y 🛛

2A 🛛 5

2B 🛛 6

GND 7

1B 🛛 3

2

4

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14 VCC

13 🛛 4Y

12 4B

11 🛛 4A

10 3Y

9 🛛 3B

8 🛛 3A

- AC Types Feature 1.5-V to 5.5-V Operation and Balanced Noise Immunity at 30% of the Supply Voltage
- Speed of Bipolar F, AS, and S, With Significantly Reduced Power Consumption
- Balanced Propagation Delays
- ±24-mA Output Drive Current
 Fanout to 15 F Devices
- SCR-Latchup-Resistant CMOS Process and Circuit Design
- Exceeds 2-kV ESD Protection Per MIL-STD-883, Method 3015

description

The 'AC02 devices contain four independent 2-input NOR gates that perform the Boolean function $Y = \overline{A} \cdot \overline{B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

т _А	PAC	KAGE [†]	ORDERABLE PART NUMBER	TOP-SIDE MARKING						
PDIP – E		Tube	CD74AC02E	CD74AC02E						
–55°C to 125°C	SOIC – M	Tube	CD74AC02M	AC02M						
-55°C to 125°C	30IC – M	Tape and reel	CD74AC02M96	ACUZIVI						
	CDIP – F	Tube	CD54AC02F3A	CD54AC02F3A						

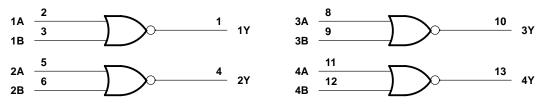
ORDERING INFORMATION

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

FUNCTION TABLE
(each gate)

INP	UTS	OUTPUT
Α	В	Y
Н	Х	L
х	Н	L
L	L	н

logic diagram (positive logic)





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

Supply voltage range, V _{CC}	–0.5 V to 6 V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1)	
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1)	
Continuous output current, $I_O (V_O = 0 \text{ to } V_{CC})$	±50 mA
Continuous current through V _{CC} or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 2): E package	80°C/W
M package	
Storage temperature range, T _{stg}	–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)

			T _A = 25°C		–40°C TO 85°C		–55°C TO 125°C		UNIT	
			MIN	MAX	MIN	MAX	MIN	MAX		
VCC	Supply voltage		1.5	5.5	1.5	5.5	1.5	5.5	V	
		V _{CC} = 1.5 V	1.2		1.2		1.2			
VIH High-level input voltage	High-level input voltage	VCC = 3 V	2.1		2.1		2.1		V	
		V _{CC} = 5.5 V	3.85		3.85		3.85			
		V _{CC} = 1.5 V		0.3		0.3		0.3		
VIL	Low-level input voltage	VCC = 3 V		0.9		0.9		0.9	V	
		V _{CC} = 5.5 V		1.65		1.65		1.65		
VI	Input voltage		0	VCC	0	VCC	0	VCC	V	
VO	Output voltage		0	VCC	0	VCC	0	VCC	V	
IOH	High-level output current	V_{CC} = 4.5 V to 5.5 V		-24		-24		-24	mA	
IOL	Low-level output current	V_{CC} = 4.5 V to 5.5 V		24		24		24	mA	
Δt/Δv	Input transition rise or fall rate	V_{CC} = 1.5 V to 3 V		50		50		50	ns/V	
∆t/∆v inpu		V_{CC} = 3.6 V to 5.5 V		20		20		20	115/ V	

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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PARAMETER	TEST C	TEST CONDITIONS			TEST CONDITIONS V _{CC}		T _A = 25°C		–40°C TO 85°C		–55°C TO 125°C		UNIT
				MIN	MAX	MIN	MAX	MIN	MAX				
			1.5 V	1.4		1.4		1.4					
		I _{OH} = -50 μA	3 V	2.9		2.9		2.9					
			4.5 V	4.4		4.4		4.4					
VOH	$V_I = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -4 \text{ mA}$	3 V	2.58		2.48		2.4		V			
		I _{OH} = -24 mA	4.5 V	3.94		3.8		3.7					
		$I_{OH} = -50 \text{ mA}^{\dagger}$	5.5 V					3.85					
	I _{OH} = -75 mA†	5.5 V			3.85								
			1.5 V		0.1		0.1		0.1				
		I _{OL} = 50 μA	3 V		0.1		0.1		0.1				
			4.5 V		0.1		0.1		0.1				
VOL	$V_I = V_{IH} \text{ or } V_{IL}$	I _{OL} = 12 mA	3 V		0.36		0.44		0.5	V			
		I _{OL} = 24 mA	4.5 V		0.36		0.44		0.5				
		$I_{OL} = 50 \text{ mA}^{\dagger}$	5.5 V						1.65				
		$I_{OL} = 75 \text{ mA}^{\dagger}$	5.5 V				1.65						
lj	$V_I = V_{CC}$ or GND		5.5 V		±0.1		±1		±1	μA			
ICC	$V_I = V_{CC}$ or GND,	I ^O = 0	5.5 V		4		40		80	μA			
Ci					10		10		10	pF			

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

[†] Test one output at a time, not exceeding 1-second duration. Measurement is made by forcing indicated current and measuring voltage to minimize power dissipation. Test verifies a minimum 50-Ω transmission-line drive capability at 85°C and 75-Ω transmission-line drive capability at 125°C.

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 1.5 \text{ V}$, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°C 85°C		–55°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	
^t PLH	A or B	V		131		144	20
^t PHL	AUB	T		131		144	ns

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V \pm 0.3 V, C_L = 50 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°0 85°		–55°C 125		UNIT
			MIN	MAX	MIN	MAX	
^t PLH	A or B	V	4.1	14.6	4	16.1	-
^t PHL	AUB	Т	4.1	14.6	4	16.1	ns



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switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V \pm 0.5 V, C_L = 50 pF (unless otherwise noted) (see Figure 1)

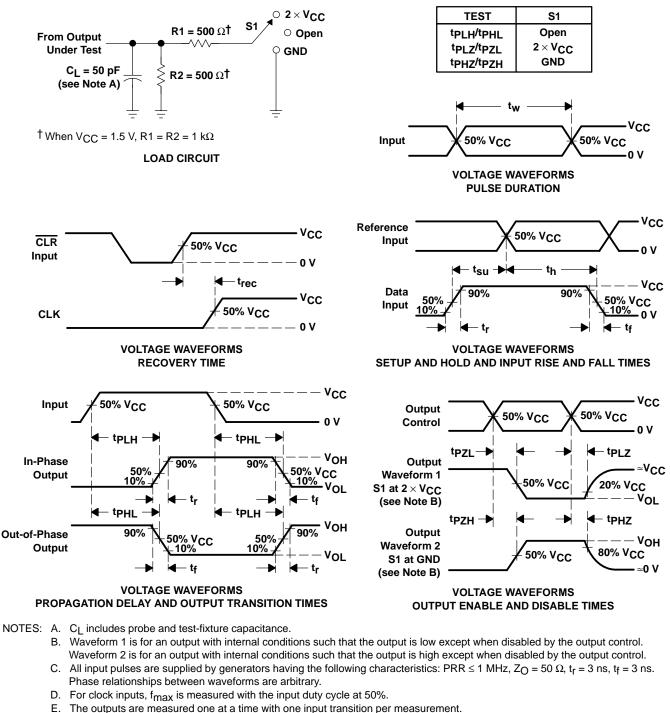
PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°C 85°		–55°C 125	-	UNIT
		(001101)	MIN	MAX	MIN	MAX	
^t PLH	A or B	V	3	10.4	2.9	11.5	
^t PHL	AOLP	Ĭ	3	10.4	2.9	11.5	ns

operating characteristics, V_{CC} = 5 V, T_A = 25° C

PARAMETER	TYP	UNIT
C _{pd} Power dissipation capacitance	55	рF

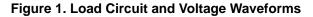


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PARAMETER MEASUREMENT INFORMATION

- F. tPLH and tPHL are the same as tpd.
- G. tp71 and tp7H are the same as ten.
- H. tpLz and tpHz are the same as tdis.







PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Top-Side Markings	Samples
CD54AC02F3A	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	CD54AC02F3A	Samples
CD74AC02E	ACTIVE	PDIP	Ν	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-55 to 125	CD74AC02E	Samples
CD74AC02EE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-55 to 125	CD74AC02E	Samples
CD74AC02M	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC02M	Samples
CD74AC02M96	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC02M	Samples
CD74AC02M96E4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC02M	Samples
CD74AC02M96G4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC02M	Samples
CD74AC02ME4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC02M	Samples
CD74AC02MG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	AC02M	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.

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.



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⁽⁴⁾ Only one of markings shown within the brackets will appear on the physical device.

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OTHER QUALIFIED VERSIONS OF CD54AC02, CD74AC02 :

• Catalog: CD74AC02

• Military: CD54AC02

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions a	are nominal
-------------------	-------------

Device		Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	· /	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CD74AC02M96	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

TEXAS INSTRUMENTS

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PACKAGE MATERIALS INFORMATION

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CD74AC02M96	SOIC	D	14	2500	367.0	367.0	38.0

J (R-GDIP-T**) 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

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.



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