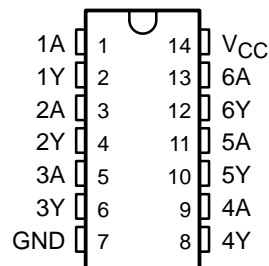


- AC Types Feature 1.5-V to 5.5-V Operation and Balanced Noise Immunity at 30% of the Supply Voltage
- Speed of Bipolar F, AS, and S, With Significantly Reduced Power Consumption
- Balanced Propagation Delays
- $\pm 24$ -mA Output Drive Current  
– Fanout to 15 F Devices
- SCR-Latchup-Resistant CMOS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

CD54AC05 . . . F PACKAGE  
CD74AC05 . . . E OR M PACKAGE  
(TOP VIEW)



## description

The 'AC05 devices contain six independent inverters. These devices perform the Boolean function  $Y = \bar{A}$ . The open-drain outputs require pullup resistors to perform correctly, and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions.

## ORDERING INFORMATION

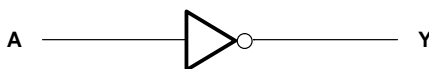
TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	PDIP – E	Tube	CD74AC05E	CD74AC05E
	SOIC – M	Tube	CD74AC05M	AC05M
		Tape and reel	CD74AC05M96	
	CDIP – F	Tube	CD54AC05F3A	CD54AC05F3A

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

FUNCTION TABLE  
(each inverter)

INPUT A	OUTPUT Y
H	L
L	Z

## logic diagram, each inverter (positive logic)



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**TEXAS  
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# CD54AC05, CD74AC05

## HEX INVERTERS

### WITH OPEN-DRAIN OUTPUTS

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#### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

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)	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1)	±50 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±50 mA
Continuous current through $V_{CC}$ or GND	±100 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): E package	80°C/W
M package	86°C/W
Storage temperature range, $T_{stg}$	–65°C to 150°C

<sup>†</sup> 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)

			$T_A = 25^\circ\text{C}$		–40°C TO 85°C		–55°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
$V_{CC}$	Supply voltage		1.5	5.5	1.5	5.5	1.5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 1.5\text{ V}$	1.2		1.2		1.2		V
		$V_{CC} = 3\text{ V}$	2.1		2.1		2.1		
		$V_{CC} = 5.5\text{ V}$	3.85		3.85		3.85		
$V_{IL}$	Low-level input voltage	$V_{CC} = 1.5\text{ V}$		0.3		0.3		0.3	V
		$V_{CC} = 3\text{ V}$		0.9		0.9		0.9	
		$V_{CC} = 5.5\text{ V}$		1.65		1.65		1.65	
$V_I$	Input voltage		0	$V_{CC}$	0	$V_{CC}$	0	$V_{CC}$	V
$V_O$	Output voltage		0	5.5	0	5.5	0	5.5	V
$I_{OH}$	High-level output current	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$		–24		–24		–24	mA
$I_{OL}$	Low-level output current	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$		24		24		24	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 1.5\text{ V to }3\text{ V}$		50		50		50	ns/V
		$V_{CC} = 3.6\text{ V to }5.5\text{ V}$		20		20		20	

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.

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C		–40°C TO 85°C		–55°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50 µA	1.5 V	0.1	0.1	0.1	0.1	0.1	V
			3 V	0.1	0.1	0.1	0.1	0.1	
			4.5 V	0.1	0.1	0.1	0.1	0.1	
		I <sub>OL</sub> = 12 mA	3 V	0.36	0.44	0.5	0.5	0.5	
		I <sub>OL</sub> = 24 mA	4.5 V	0.36	0.44	0.5	0.5	0.5	
		I <sub>OL</sub> = 50 mA†	5.5 V			1.65	1.65	1.65	
		I <sub>OL</sub> = 75 mA†	5.5 V		1.65	1.65	1.65	1.65	
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V		±0.1	±1	±1	±1	±1	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V		4	40	80	80	80	µA
C <sub>i</sub>				10	10	10	10	10	pF

† 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<sub>CC</sub> = 1.5 V, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°C TO 85°C		–55°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	
t <sub>PLZ</sub>	A	Y		94		103	ns
t <sub>PZL</sub>				74		81	

**switching characteristics over recommended operating free-air temperature range,**  
**V<sub>CC</sub> = 3.3 V ± 0.3 V, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°C TO 85°C		–55°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	
t <sub>PLZ</sub>	A	Y	3	10.4	2.9	11.5	ns
t <sub>PZL</sub>			2.3	8.3	2.3	9.1	

**switching characteristics over recommended operating free-air temperature range,**  
**V<sub>CC</sub> = 5 V ± 0.5 V, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	–40°C TO 85°C		–55°C TO 125°C		UNIT
			MIN	MAX	MIN	MAX	
t <sub>PLZ</sub>	A	Y	2.2	7.5	2.1	8.2	ns
t <sub>PZL</sub>			1.7	5.9	1.6	6.5	

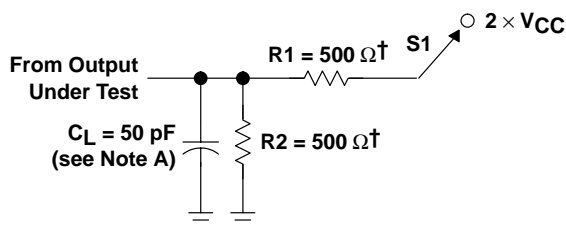
**operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**

PARAMETER		TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance	105	pF

# CD54AC05, CD74AC05 HEX INVERTERS WITH OPEN-DRAIN OUTPUTS

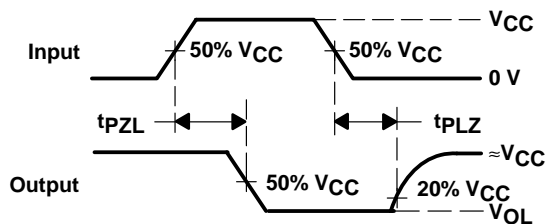
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## PARAMETER MEASUREMENT INFORMATION



† When  $V_{CC} = 1.5\text{ V}$ ,  $R1 = R2 = 1\text{ k}\Omega$

**LOAD CIRCUIT**



**VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES**

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .  
C. The outputs are measured one at a time with one input transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

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