

SN5405, SN54LS05, SN54S05, SN7405, SN74LS05, SN74S05 HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

DECEMBER 1983 — REVISED MARCH 1988

- Package Option Includes Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

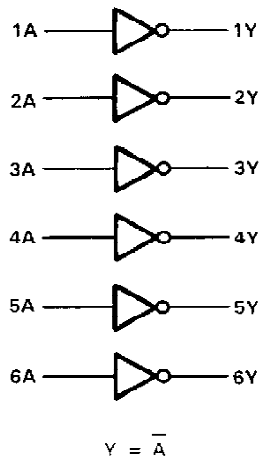
These devices contain six independent inverters. The open-collector outputs require pull-up resistors to perform correctly. They may be connected to other open-collector outputs to implement active-low wired-OR or active-high wired-AND functions. Open-collector devices are often used to generate high V_{OH} levels.

The SN5405, SN54LS05, and SN54S05 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7405, SN74LS05, and SN74S05 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE (each inverter)

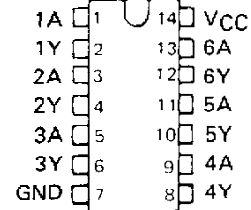
INPUT A	OUTPUT Y
H	L
L	H

logic diagram (positive logic)

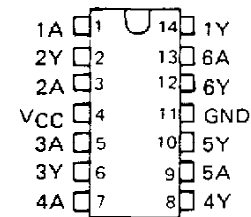


- SN5405 . . . J PACKAGE
- SN54LS05, SN54S05 . . . J OR W PACKAGE
- SN7405 . . . N PACKAGE
- SN74LS05, SN74S05 . . . D OR N PACKAGE

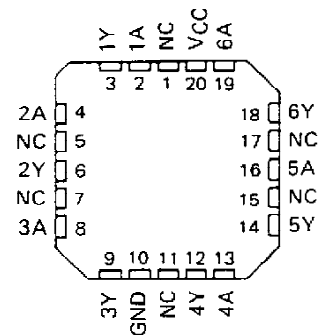
(TOP VIEW)



SN5405 . . . W PACKAGE
(TOP VIEW)

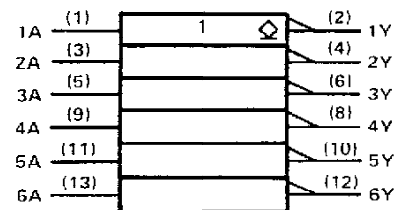


SN54LS05, SN54S05 . . . FK PACKAGE
(TOP VIEW)



NC — No internal connection

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, N, and W packages.

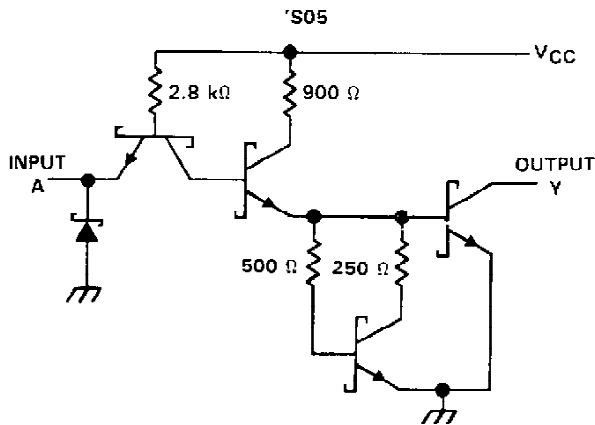
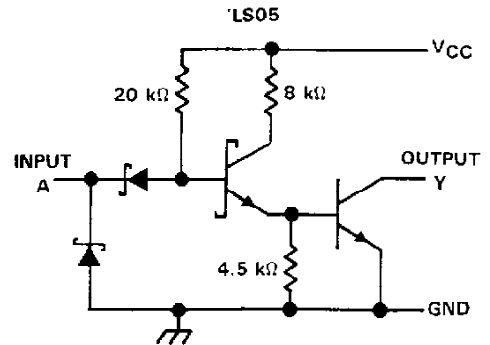
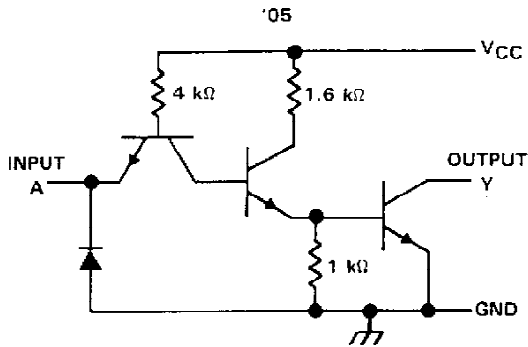
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**SN5405, SN54LS05, SN54S05,
SN7405, SN74LS05, SN74S05
HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS**

schematics (each inverter)



Resistor values are nominal.

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

Supply voltage, V_{CC} (see Note 1): '05, 'LS05, 'S05	7 V
Input voltage: '05, 'S05	5.5 V
'LS05	7 V
Off-state output voltage	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

SN5405, SN7405 HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN5405			SN7405			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage			0.8			0.8	V
V _{OH} High-level output voltage			5.5			5.5	V
I _{OL} Low-level output current			16			16	mA
T _A Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†	SN5405			SN7405			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{IK}	V _{CC} = MIN, I _I = -12 mA			-1.5			-1.5	V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V						0.25	mA
	V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V			0.25				
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			40			40	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-1.6			-1.6	mA
I _{CCH}	V _{CC} = MAX, V _I = 0		6	12		6	12	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		18	33		18	33	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 4 kΩ,	C _L = 15 pF		40	55	ns
t _{PHL}			R _L = 400 Ω,	C _L = 15 pF		8	15	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

SN54LS05, SN74LS05

HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54LS05			SN74LS05			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage			0.7			0.8	V
V _{OH} High-level output voltage			5.5			5.5	V
I _{OL} Low-level output current			4			8	mA
T _A Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS †	SN54LS05		SN74LS05		UNIT		
		MIN	TYP ‡	MAX	MIN		TYP ‡	MAX
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5		-1.5	V	
I _{OH}	V _{CC} = MIN, V _{IL} = MAX, V _{OH} = 5.5 V			0.1		0.1	mA	
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 4 mA		0.25	0.4		0.25	0.4	V
	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 8 mA					0.35	0.5	
I _I	V _{CC} = MAX, V _I = 7 V			0.1		0.1	mA	
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			20		20	μA	
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-0.4		-0.4	mA	
I _{CCH}	V _{CC} = MAX, V _I = 0		1.2	2.4		1.2	2.4	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		3.6	6.6		3.6	6.6	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 2 kΩ,	C _L = 15 pF		17	32	ns
t _{PHL}						15	28	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

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SN54S05, SN74S05 HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54S05			SN74S05			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage	0.8			0.8			V
V _{OH} High-level output voltage	5.5			5.5			V
I _{OL} Low-level output current	20			20			mA
T _A Operating free-air temperature	- 55			125			°C

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

PARAMETER	TEST CONDITIONS [†]	SN54S05			SN74S05			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V _{IK}	V _{CC} = MIN, I _I = -18 mA	-1.2			-1.2			V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V				0.25			mA
	V _{CC} = MIN, V _{IL} = 0.7 V, V _{OH} = 5.5 V				0.25			
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA	0.5			0.5			V
I _I	V _{CC} = MAX, V _I = 5.5 V	1			1			mA
I _{IH}	V _{CC} = MAX, V _I = 2.7 V	50			50			μA
I _{IL}	V _{CC} = MAX, V _I = 0.5 V	-2			-2			mA
I _{CCH}	V _{CC} = MAX, V _I = 0	9 19.8			9 19.8			mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V	30 54			30 54			mA

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡] All typical values are at V_{CC} = 5 V, T_A = 25°C

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see note 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	A	Y	R _L = 280 Ω, C _L = 15 pF	2	5	7.5	ns
t _{PHL}				2	4.5	7	ns
t _{PLH}			R _L = 280 Ω, C _L = 50 pF	7.5		ns	
t _{PHL}				7		ns	

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.


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