SDLS030

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.
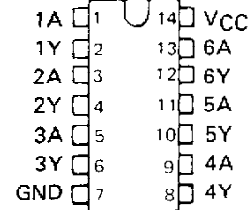
FUNCTION TABLE (each inverter)

INPUT	OUTPUT
A	Y
H	L
L	H

logic diagram (positive logic)

1A ▷○ 1Y

2A ▷○ 2Y

3A ▷○ 3Y

4A ▷○ 4Y

5A ▷○ 5Y

6A ▷○ 6Y

$$Y = \overline{A}$$
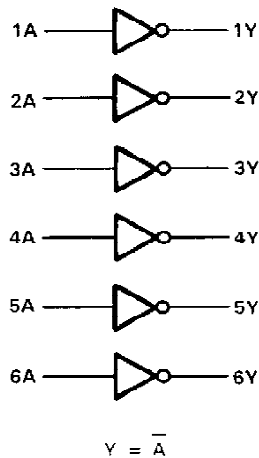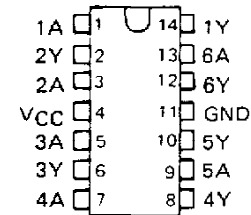
SN5405 . . . J PACKAGE
SN54LS05, SN54S05 . . . J OR W PACKAGE
SN7405 . . . N PACKAGE
SN74LS05, SN74S05 . . . D OR N PACKAGE
(TOP VIEW)

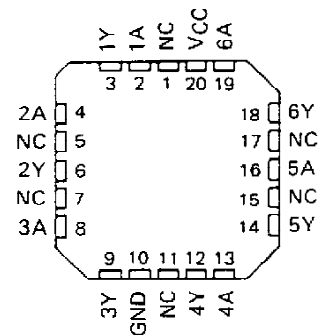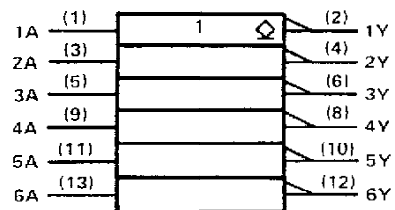|		
1A	1	14 VCC
1Y	2	13 6A
2A	3	12 6Y
2Y	4	11 5A
3A	5	10 5Y
3Y	6	9 4A
GND	7	8 4Y

SN5405 . . . W PACKAGE
(TOP VIEW)

1A	1	14 1Y
2Y	2	13 6A
2A	3	12 6Y
VCC	4	11 GND
3A	5	10 5Y
3Y	6	9 5A
4A	7	8 4Y

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

NC — No internal connection

logic symbol†

1A	(1)	1	◇	(2)	1Y
2A	(3)			(4)	2Y
3A	(5)			(6)	3Y
4A	(9)			(8)	4Y
5A	(11)			(10)	5Y
6A	(13)			(12)	6Y

† 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.

TEXAS INSTRUMENTS

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schematics (each inverter)

'05

'LS05

'S05
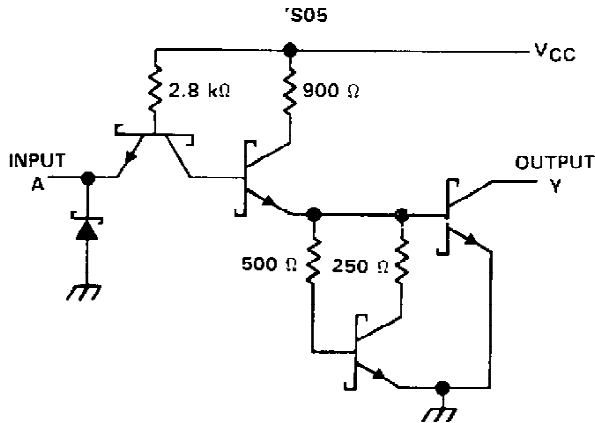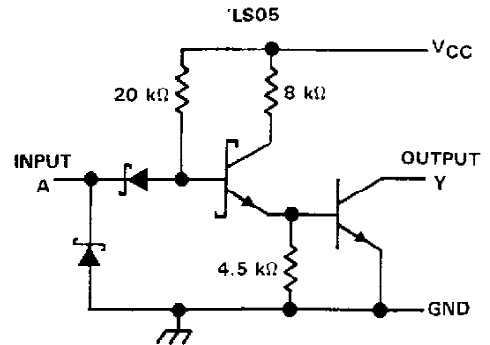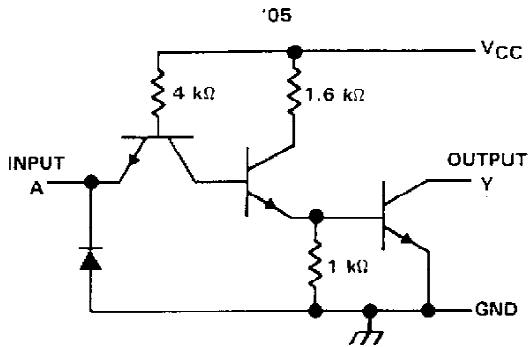
Resistor values are nominal.

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.

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.

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	$^{\circ}$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, $T_A = 25^{\circ}$C.

switching characteristics, $V_{CC} = 5$ V, $T_A = 25^{\circ}$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.

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	0		70	°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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PRODUCT SUPPORT: TRAINING

SN74S05, Hex inverters with open collector outputs
DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN54S05	SN74S05
Voltage Nodes (V)	5	5
Vcc range (V)	4.5 to 5.5	4.75 to 5.25
Input Level	TTL	TTL
Output Level	TTL	TTL
Output Drive (mA)		- /20
No. of Gates	6	6
Static Current		36.9
tpd max (ns)		7.5

FEATURES   ▲Back to Top

- 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   ▲Back to Top

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.

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DATASHEET   ▲Back to Top

Full datasheet in Acrobat PDF: sn74s05.pdf (240 KB) (Updated: 03/01/1988)

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- [Designing With Logic (Rev. C)](#) (SDYA009C - Updated: 06/01/1997)
- [Evaluation of Nickel/Palladium/Gold-Finished Surface-Mount Integrated Circuits](#) (SZZA026 - Updated: 06/20/2001)
- [Input and Output Characteristics of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
- [Live Insertion](#) (SDYA012 - Updated: 10/01/1996)

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- [Logic Reference Guide](#) (SCYB004, 1032 KB - Updated: 10/23/2001)
- [Logic Selection Guide Second Half 2002 (Rev. R)](#) (SDYU001R, 4274 KB - Updated: 07/19/2002)
- [Military Semiconductors Selection Guide 2002 (Rev. B)](#) (SGYC003B, 1648 KB - Updated: 04/22/2002)

PRICING/AVAILABILITY/PKG   ▲[Back to Top](#)

DEVICE INFORMATION							TI INVENTORY STATUS AS OF 3:00 PM GMT, 26 Sep 2002			REPORTED DISTRIBUTOR INVENTORY AS OF 3:00 PM GMT, 26 Sep 2002		
ORDERABLE DEVICE	STATUS	PACKAGE TYPE|PINS	TEMP (°C)	PRODUCT CONTENT	BUDGETARY PRICING QTY | $US	STD PACK QTY	IN STOCK	IN PROGRESS QTY|DATE	LEAD TIME	DISTRIBUTOR COMPANY|REGION	IN STOCK	PURCHASE
SN74S05D	ACTIVE	SOP (D) | 14	0 TO 70	View Contents	1KU | 0.34	50	N/A*	750 | 19 Sep	5 WKS	Avnet | AMERICA	333	**BUY NOW**
								>10k | 07 Oct				
								>10k | 14 Oct				
								>10k | 21 Oct				
SN74S05DR	ACTIVE	SOP (D) | 14	0 TO 70	View Contents	1KU | 0.36	2500	N/A*	>10k | 04 Oct	5 WKS			
								>10k | 11 Oct				
								>10k | 18 Oct				
SN74S05N	ACTIVE	PDIP (N) | 14	0 TO 70	View Contents	1KU | 0.32	25	N/A*	225 | 19 Sep	5 WKS	Avnet | AMERICA	16	**BUY NOW**
								21 | 23 Sep				
								>10k | 04 Oct				
								>10k | 11 Oct				
								2030 | 18 Oct				
SN74S05N3	OBSOLETE	PDIP (N) | 14	0 TO 70	View Contents	1KU |		N/A*		Not Available			
SN74S05NSR	ACTIVE	SOP (NS) | 14		View Contents	1KU | 0.32	2000	N/A*	>10k | 04 Oct	5 WKS			
								>10k | 11 Oct				
								>10k | 18 Oct				

Table Data Updated on: 9/26/2002