

TYPES SN5405, SN54H05, SN54LS05, SN54S05, SN7405, SN74H05, SN74LS05, SN74S05 HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

REVISED DECEMBER 1983

- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to 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, SN54H05, SN54LS05 and SN54S05 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN7405, SN74H05, 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 (each inverter)

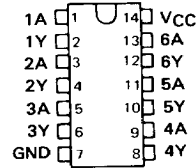


positive logic

$$Y = \overline{A}$$

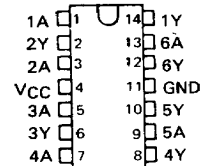
SN5405, SN54H05 ... J PACKAGE
SN54LS05, SN54S05 ... J OR W PACKAGE
SN7405, SN74H05 ... J OR N PACKAGE
SN74LS05, SN74S05 ... D, J OR N PACKAGE

(TOP VIEW)



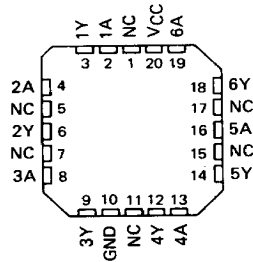
SN5405, SN54H05 ... W PACKAGE

(TOP VIEW)



SN54LS05, SN54S05 ... FK PACKAGE
SN74LS05, SN74S05 ... FN PACKAGE

(TOP VIEW)



NC - No internal connection

3

TTL DEVICES

PRODUCTION DATA
This document contains information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

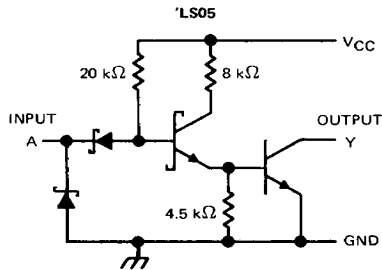
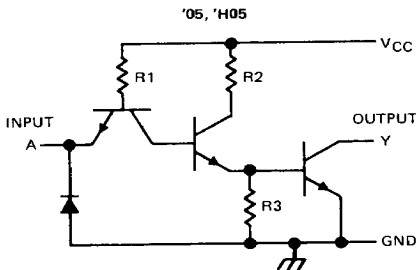
**TEXAS
INSTRUMENTS**

POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

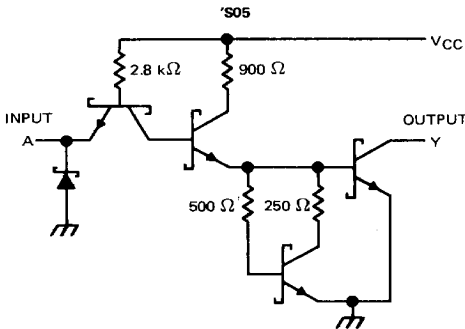
3-37

**TYPES SN5405, SN54H05, SN54LS05, SN54S05,
SN7405, SN74H05, SN74LS05, SN74S05
HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS**

schematics (each inverter)



CIRCUITS	R1	R2	R3
'05	4K Ω	1.6K Ω	1K Ω
'H05	2.8K Ω	760 Ω	470 Ω



Resistor values are nominal.

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

Supply voltage, V_{CC} (see Note 1): '05, 'H05, 'LS05, 'S05	7 V
Input voltage: '05, 'H05, '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.

3

TTL DEVICES

TYPES 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			V
V _{OH} High-level output voltage				5.5			V
I _{OL} Low-level output current				16			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†	MIN	TYP‡	MAX	UNIT
V _{IK}	V _{CC} = MIN, I _I = -12 mA			-1.5	V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V			0.25	mA
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 16 mA		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			40	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-1.6	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		6	12	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		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: See General Information Section for load circuits and voltage waveforms.

3
TTL DEVICES


**TEXAS
INSTRUMENTS**

POST OFFICE BOX 225012 • DALLAS, TEXAS 75265

3-39

TYPES SN54H05, SN74H05 HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

recommended operating conditions

	SN54H05			SN74H05			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†	MIN	TYP‡	MAX	UNIT
V _{IK}	V _{CC} = MIN, I _I = -8 mA			-1.5	V
I _{OH}	V _{CC} = MIN, V _{IL} = 0.8 V, V _{OH} = 5.5 V			0.25	mA
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, I _{OL} = 20 mA		0.2	0.4	V
I _I	V _{CC} = MAX, V _I = 5.5 V			1	mA
I _{IH}	V _{CC} = MAX, V _I = 2.4 V			50	μA
I _{IL}	V _{CC} = MAX, V _I = 0.4 V			-2	mA
I _{CCH}	V _{CC} = MAX, V _I = 0 V		16	26	mA
I _{CCL}	V _{CC} = MAX, V _I = 4.5 V		40	58	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 = 25 pF		10	15	ns
t _{PHL}					7.5	12	ns

NOTE 2: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES

TYPES 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			V
V _{OH} High-level output voltage				5.5			V
I _{OL} Low-level output current				4			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 †	SN54LS05		SN74LS05		UNIT
		MIN	TYP ‡	MAX	MIN	
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 V	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: See General Information Section for load circuits and voltage waveforms.

3
TTL DEVICES

TYPES 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			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			0.25			mA
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 V	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: See General Information Section for load circuits and voltage waveforms.

3

TTL DEVICES