

7405, LS05, S05 Inverters

Hex Inverter (Open Collector)
Product Specification

Logic Products

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
7405	40ns (t_{PLH}) 8ns (t_{PHL})	12mA
74LS05	17ns (t_{PLH}) 15ns (t_{PHL})	2.4mA
74S05	5ns (t_{PLH}) 4.5ns (t_{PHL})	20mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N7405N, N74LS05N, N74S05N
Plastic SO	N74LS05D, N74S05D
Ceramic DIP	

FUNCTION TABLE

INPUT	OUTPUT
A	Y
L	H
H	L

H = HIGH voltage level
L = LOW voltage level

NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

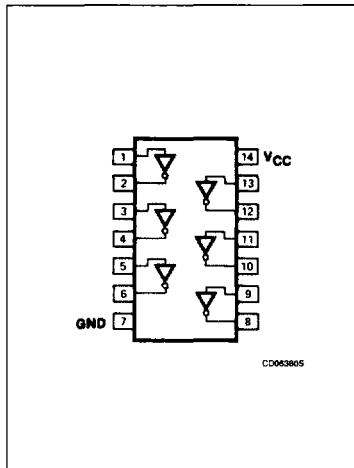
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74	74S	74LS
A	Input	1ul	1Sul	1LSul
Y	Output	10ul	10Sul	10LSul

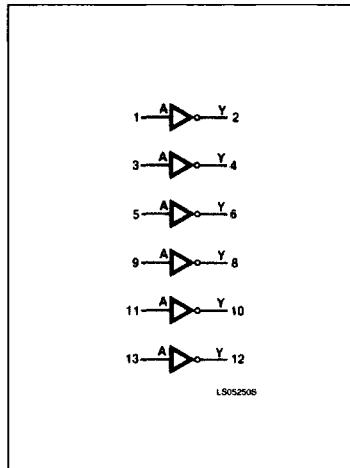
NOTE:

Where a 74 unit load (ul) is understood to be $40\mu A I_{IH}$ and $-1.6mA I_{IL}$, a 74S unit load (Sul) is $50\mu A I_{IH}$ and $-2.0mA I_{IL}$, and 74LS unit load (LSul) is $20\mu A I_{IH}$ and $-0.4mA I_{IL}$.

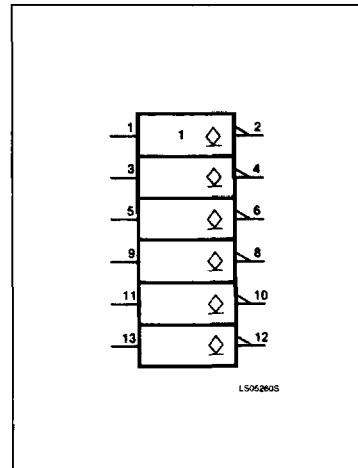
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



Inverters

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ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER	74	74LS	74S	UNIT
V _{CC} Supply voltage	7.0	7.0	7.0	V
V _{IN} Input voltage	-0.5 to +5.5	-0.5 to +7.0	-0.5 to +5.5	V
I _{IN} Input current	-30 to +5	-30 to +1	-30 to +5	mA
V _{OUT} Voltage applied to output in HIGH output state	-0.5 to +V _{CC}	-0.5 to +V _{CC}	-0.5 to +V _{CC}	V
T _A Operating free-air temperature range	0 to 70			°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	74			74LS			74S			UNIT
	Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	
V _{CC} Supply voltage	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	V
V _{IH} HIGH-level input voltage	2.0			2.0			2.0			V
V _{IL} LOW-level input voltage			+0.8			+0.8			+0.8	V
I _{IK} Input clamp current			-12			-18			-18	mA
V _{OH} HIGH-level output voltage			5.5			5.5			5.5	V
I _{OL} LOW-level output current			16			8			20	mA
T _A Operating free-air temperature	0		70	0		70	0		70	°C

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TEST CIRCUITS AND WAVEFORMS

Test Circuit For 74 Open Collector Outputs

DEFINITIONS
 R_L = Load resistor to V_{CC}; see AC CHARACTERISTICS for value.
 C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.
 R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.
 D = Diodes are 1N916, 1N3064, or equivalent.
 t_{TLH}, t_{THL} Values should be less than or equal to the table entries.

Input Pulse Definition

V_M = 1.3V for 74LS; V_M = 1.5V for all other TTL families.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t _{TLH}	t _{THL}
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

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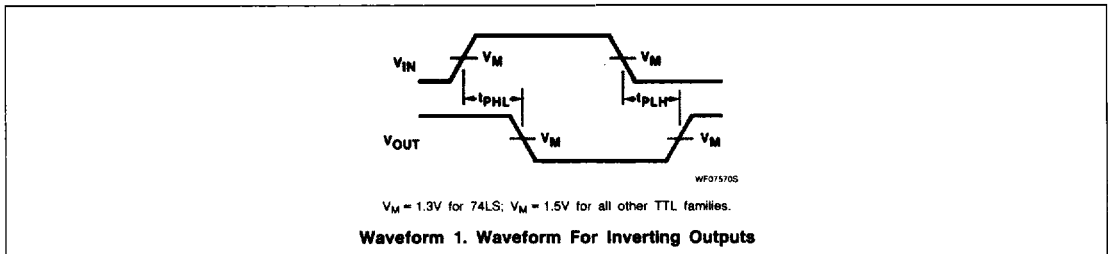
DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS ¹	7405			74LS05			74S05			UNIT
		Min	Typ ²	Max	Min	Typ ²	Max	Min	Typ ²	Max	
I_{OH} HIGH-level output current	$V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{OH} = 5.5\text{V}$			250			100			250	μA
V_{OL} LOW-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = \text{MIN}$	$I_{OL} = \text{MAX}$	0.2	0.4		0.35	0.5			0.5	V
		$I_O = 4\text{mA}$ (74LS)				0.25	0.4				
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = I_{IK}$			-1.5			-1.5			-1.2	V
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}$	$V_I = 5.5\text{V}$		1.0						1.0	mA
		$V_I = 7.0\text{V}$					0.1				mA
I_{IH} HIGH-level input current	$V_{CC} = \text{MAX}$	$V_I = 2.4\text{V}$		40							μA
		$V_I = 2.7\text{V}$					20			50	μA
I_{IL} LOW-level input current	$V_{CC} = \text{MAX}$	$V_I = 0.4\text{V}$		-1.6			-0.4				mA
		$V_I = 0.5\text{V}$								-2.0	mA
I_{CC} Supply current (total)	$V_{CC} = \text{MAX}$	I_{OCH} Outputs HIGH	6	12		1.2	2.4		9	19.8	mA
		I_{OCL} Outputs LOW	18	33		3.6	6.6		30	54	mA

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$.

AC WAVEFORM



AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}, V_{CC} = 5.0\text{V}$

PARAMETER	TEST CONDITIONS	74		74LS		74S		UNIT
		$C_L = 15\text{pF}, R_L = 400\Omega$		$C_L = 15\text{pF}, R_L = 2\text{k}\Omega$		$C_L = 15\text{pF}, R_L = 280\Omega$		
		Min	Max	Min	Max	Min	Max	
t_{PLH} t_{PHL} Propagation delay	For 7405 only, $R_L = 4\text{k}\Omega$ for t_{PLH} Waveform 1		55 15		32 28		7.5 7.0	ns