74LS09
Gates

Quad Two-Input AND Gate (Open Collector)
Product Specification

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74LS09	23ns	4.3

ORDERING CODE

PACKAGES	COMMERCIAL RANGE V_{CC} = 5V ±5%; T_A = 0°C to +70°C
Plastic DIP	N74LS09N

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

FUNCTION TABLE

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

H = HIGH voltage level
L = LOW voltage level

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74LS
A, B	Inputs	1LSul
Y	Output	10LSul

NOTE:
Where 74LS unit load (LSul) is 20μA I_{IH} and −0.4mA I_{IL}.

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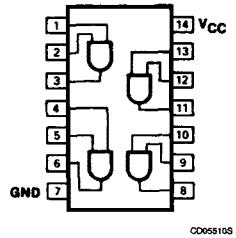
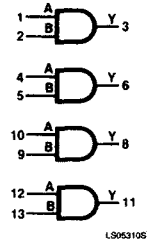
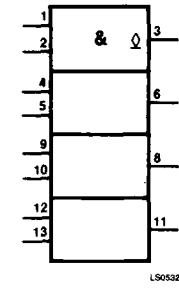
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



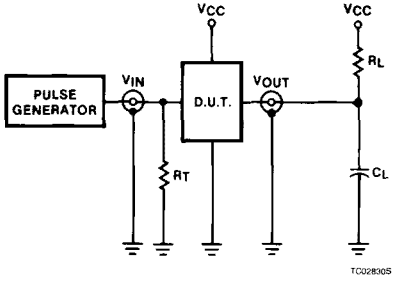
ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

PARAMETER		74LS	UNIT
V_{CC}	Supply voltage	7.0	V
V_{IN}	Input voltage	−0.5 to +7.0	V
I_{IN}	Input current	−30 to +1	mA
V_{OUT}	Voltage applied to output in HIGH output state	−0.5 to +V_{CC}	V
T_A	Operating free-air temperature range	0 to 70	°C

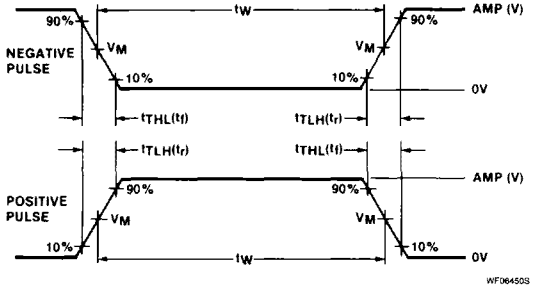
RECOMMENDED OPERATING CONDITIONS

PARAMETER		74LS			UNIT
		Min	Nom	Max	
V_{CC}	Supply voltage	4.75	5.0	5.25	V
V_{IH}	HIGH-level input voltage	2.0			V
V_{IL}	LOW-level input voltage			+0.8	V
I_{IK}	Input clamp current			−18	mA
V_{OH}	HIGH-level output voltage			5.5	V
I_{OL}	LOW-level output current			8	mA
T_A	Operating free-air temperature	0		70	°C

TEST CIRCUITS AND WAVEFORMS



Test Circuit For 74 Open Collector Outputs



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

Input Pulse Definition

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.

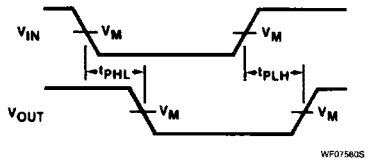
FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t_{TLH}	t_{THL}
74	3.0V	1MHz	500ns	7ns	7ns
74LS	3.0V	1MHz	500ns	15ns	6ns
74S	3.0V	1MHz	500ns	2.5ns	2.5ns

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

PARAMETER		TEST CONDITIONS[1]		74LS09			UNIT
				Min	Typ[2]	Max	
I_{OH}	HIGH-level output current	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN, V_{OH} = MAX				250	μA
V_{OL}	LOW-level output voltage	V_{CC} = MIN, V_{IL} = MAX, I_{OL} = 4mA			0.25	0.4	V
V_{IK}	Input clamp voltage	V_{CC} = MIN, I_I = 18mA				−1.5	V
I_I	Input current at maximum input voltage	V_{CC} = MAX, V_I = 7.0V				0.1	mA
I_{IH}	HIGH-level input current	V_{CC} = MAX, V_I = 2.7V				20	μA
I_{IL}	LOW-level input current	V_{CC} = MAX, V_I = 0.4V				−0.4	mA
I_{CC}	Supply current (total)	V_{CC} = MAX	I_{CCH} Outputs HIGH		2.4	4.8	mA
			I_{CCL} Outputs LOW		4.4	8.8	mA

NOTES:
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_A = 25°C.

AC WAVEFORM



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

Waveform 1. Waveform For Non-Inverting Outputs

AC ELECTRICAL CHARACTERISTICS T_A = 25°C, V_{CC} = 5.0V

PARAMETER		TEST CONDITIONS	74LS		UNIT
			C_L = 15pF, R_L = 2kΩ		
			Min	Max	
t_{PLH} t_{PHL}	Propagation delay	Waveform 1		35 35	ns