

74LS09 Gates

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

Logic Products

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

ORDERING CODE

| PACKAGES | COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$ |
|-------------|--|
| 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

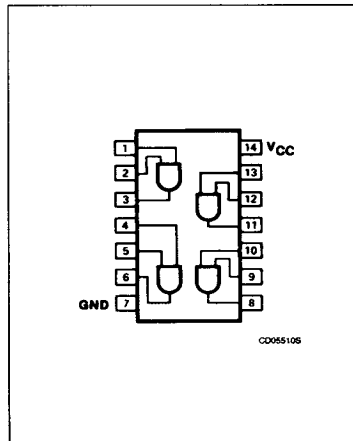
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

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

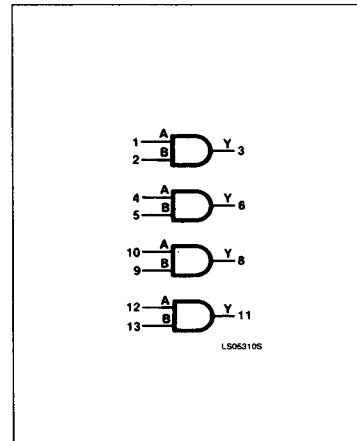
NOTE:

Where 74LS unit load (LSul) is $20\mu A$ I_{IH} and $-0.4mA$ I_{IL} .

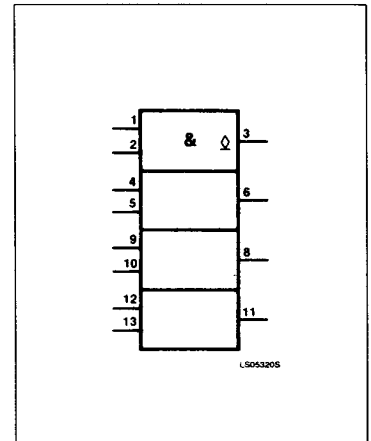
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



December 4, 1985

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853-0451 81501

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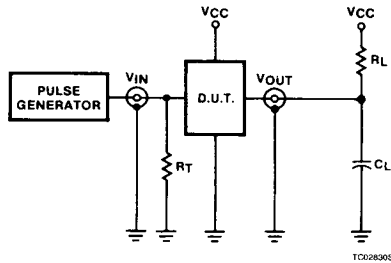
ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

| 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 |

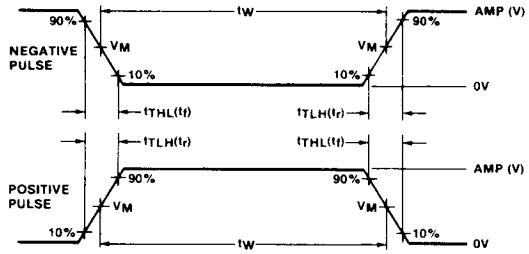
RECOMMENDED OPERATING CONDITIONS

| 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_{PLH}, t_{PHL} Values should be less than or equal to the table entries.

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

Gates

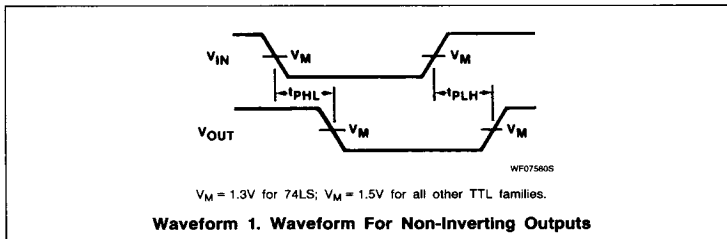
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DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

| PARAMETER | TEST CONDITIONS ¹ | 74LS09 | | | UNIT | |
|--|--|------------------------|------------------|------|---------------|----|
| | | Min | Typ ² | Max | | |
| I_{OH} HIGH-level output current | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{IH} = \text{MIN}, V_{OH} = \text{MAX}$ | | | 250 | μA | |
| V_{OL} LOW-level output voltage | $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, I_{OL} = 4\text{mA}$ | | 0.25 | 0.4 | V | |
| V_{IK} Input clamp voltage | $V_{CC} = \text{MIN}, I_I = 18\text{mA}$ | | | -1.5 | V | |
| I_I Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 7.0\text{V}$ | | | 0.1 | mA | |
| I_{IH} HIGH-level input current | $V_{CC} = \text{MAX}, V_I = 2.7\text{V}$ | | | 20 | μA | |
| I_{IL} LOW-level input current | $V_{CC} = \text{MAX}, V_I = 0.4\text{V}$ | | | -0.4 | mA | |
| I_{CC} Supply current (total) | $V_{CC} = \text{MAX}$ | 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 $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$.

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

| PARAMETER | TEST CONDITIONS | 74LS | | UNIT |
|--|-----------------|--|----------|------|
| | | $C_L = 15\text{pF}, R_L = 2\text{k}\Omega$ | | |
| | | Min | Max | |
| t_{PLH} t_{PHL} Propagation delay | Waveform 1 | | 35 35 | ns |