# 7400, LS00, S00
## Gates

**Quad Two-Input NAND Gate**
***Product Specification***

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|---|---|---|
| 7400 | 9ns | 8mA |
| 74LS00 | 9.5ns | 1.6mA |
| 74S00 | 3ns | 15mA |

### ORDERING CODE

| PACKAGES | COMMERCIAL RANGE $V_{CC}$ = 5V ±5%; $T_A$ = 0°C to +70°C |
|---|---|
| Plastic DIP | N7400N, N74LS00N, N74S00N |
| Plastic SO | N74LS00D, N74S00D |

**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 | H |
| L | H | H |
| H | L | H |
| H | H | L |

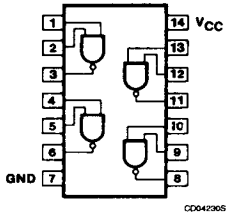
H = HIGH voltage level
L = LOW voltage level

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

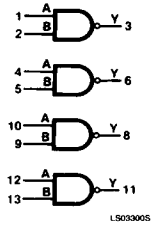
| PINS | DESCRIPTION | 74 | 74S | 74LS |
|---|---|---|---|---|
| A, B | Inputs | 1ul | 1Sul | 1LSul |
| Y | Output | 10ul | 10Sul | 10LSul |

**NOTE:**
Where a 74 unit load (ul) is understood to be 40μA $I_{IH}$ and −1.6mA $I_{IL}$, a 74S unit load (Sul) is 50μA $I_{IH}$ and −2.0mA $I_{IL}$, and 74LS unit load (LSul) is 20μA $I_{IH}$ and −0.4mA $I_{IL}$.

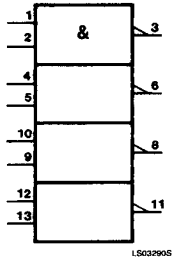
### PIN CONFIGURATION




### LOGIC SYMBOL




### LOGIC SYMBOL (IEEE/IEC)



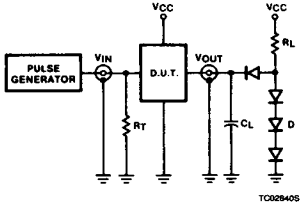
## ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

| 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 |

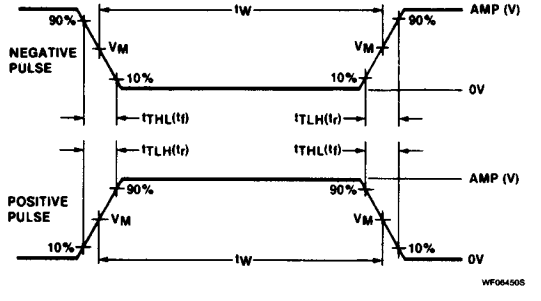
## RECOMMENDED OPERATING CONDITIONS

| 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 |
| $I_{OH}$ | HIGH-level output current | | | −400 | | | −400 | | | −1000 | μA |
| $I_{OL}$ | LOW-level output current | | | 16 | | | 8 | | | 20 | mA |
| $T_A$ | Operating free-air temperature | 0 | | 70 | 0 | | 70 | 0 | | 70 | °C |

## TEST CIRCUITS AND WAVEFORMS




**Test Circuit For 74 Totem-Pole 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.

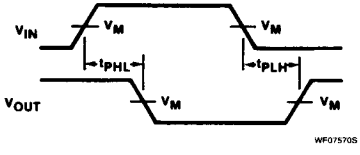
| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|---|---|---|---|---|---|
| | Amplitude | Rep. Rate | Pulse Width | $t_{TLH}$ | $t_{THL}$ |
| 74 | 3.0V | 1MHz | 500ns | 7ns | 7ns |
| 74LS | 3.0V | 1MHz | 500ns | 15ns | 6ns |
| 74S | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

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

| PARAMETER | | TEST CONDITIONS[1] | | 7400 | | | 74LS00 | | | 74S00 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ[2] | Max | Min | Typ[2] | Max | Min | Typ[2] | Max | |
| $V_{OH}$ | HIGH-level output voltage | $V_{CC}$ = MIN, $V_{IH}$ = MIN, $V_{IL}$ = MAX, $I_{OH}$ = MAX | | 2.4 | 3.4 | | 2.7 | 3.4 | | 2.7 | 3.4 | | V |
| $V_{OL}$ | LOW-level output voltage | $V_{CC}$ = MIN, $V_{IH}$ = MIN | $I_{OL}$ = MAX | | 0.2 | 0.4 | | 0.35 | 0.5 | | | 0.5 | V |
| | | | $I_{OL}$ = 4mA (74LS) | | | | | 0.25 | 0.4 | | | | V |
| $V_{IK}$ | Input clamp voltage | $V_{CC}$ = MIN, $I_I$ = $I_{IK}$ | | | | −1.5 | | | −1.5 | | | −1.2 | V |
| $I_I$ | Input current at maximum input voltage | $V_{CC}$ = MAX | $V_I$ = 5.5V | | | 1.0 | | | | | | 1.0 | mA |
| | | | $V_I$ = 7.0V | | | | | | 0.1 | | | | mA |
| $I_{IH}$ | HIGH-level input current | $V_{CC}$ = MAX | $V_I$ = 2.4V | | | 40 | | | | | | | μA |
| | | | $V_I$ = 2.7V | | | | | | 20 | | | 50 | μA |
| $I_{IL}$ | LOW-level input current | $V_{CC}$ = MAX | $V_I$ = 0.4V | | | −1.6 | | | −0.4 | | | | mA |
| | | | $V_I$ = 0.5V | | | | | | | | | −2.0 | mA |
| $I_{OS}$ | Short-circuit output current[3] | $V_{CC}$ = MAX | | −18 | | −55 | −20 | | −100 | −40 | | −100 | mA |
| $I_{CC}$ | Supply current (total) | $V_{CC}$ = MAX | $I_{CCH}$ Outputs HIGH | | 4 | 8 | | 0.8 | 1.6 | | 10 | 16 | mA |
| | | | $I_{CCL}$ Outputs LOW | | 12 | 22 | | 2.4 | 4.4 | | 20 | 36 | 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.
3. $I_{OS}$ is tested with $V_{OUT}$ = +0.5V and $V_{CC}$ = $V_{CC}$ MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

## AC WAVEFORM




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

**Waveform 1. Waveform For Inverting Outputs**

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

| PARAMETER | | TEST CONDITIONS | 74 | | 74LS | | 74S | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | $C_L$ = 15pF, $R_L$ = 400Ω | | $C_L$ = 15pF, $R_L$ = 2kΩ | | $C_L$ = 15pF, $R_L$ = 280Ω | | |
| | | | Min | Max | Min | Max | Min | Max | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay | Waveform 1 | | 22<br>15 | | 15<br>15 | | 4.5<br>5.0 | ns |