

7486, LS86, S86 Gates

Quad Two-Input Exclusive-OR Gate Product Specification

Logic Products

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|--------|---------------------------|--------------------------------|
| 7486 | 14ns | 30mA |
| 74LS86 | 10ns | 6.1mA |
| 74S86 | 7ns | 50mA |

ORDERING CODE

| PACKAGES | COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$ |
|-------------|--|
| Plastic DIP | N7486N, N74LS86N, N74S86N |
| Plastic SO | N74LS86D, N74S86D |

FUNCTION TABLE

| INPUTS | | OUTPUT |
|--------|---|--------|
| A | B | Y |
| L | L | L |
| L | H | H |
| H | L | H |
| 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.

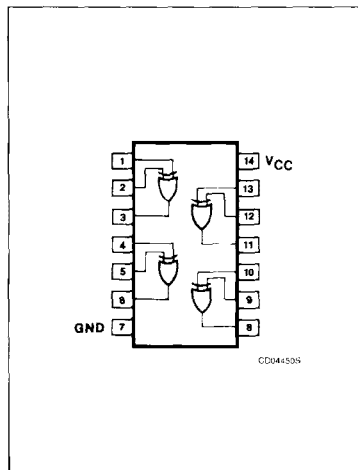
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

| PINS | DESCRIPTION | 74 | 74S | 74LS |
|------|-------------|------|-------|--------|
| A, B | Inputs | 1uI | 1SuI | 1LSuI |
| Y | Output | 10uI | 10SuI | 10LSuI |

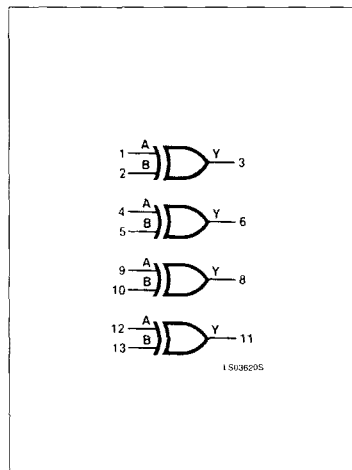
NOTE:

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

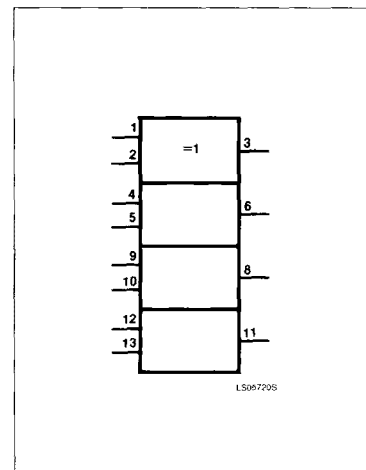
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



Gates

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

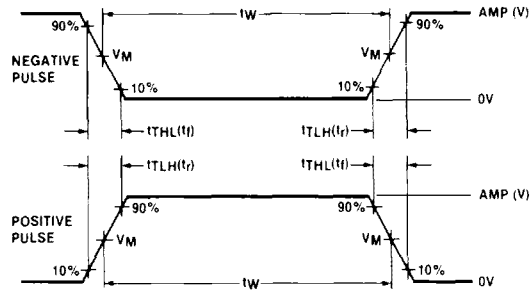
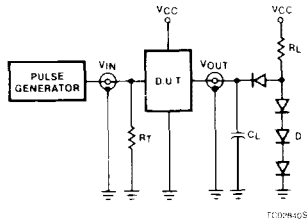
| PARAMETER | 74 | 74LS | 74S | UNIT |
|---|--------------------------|--------------------------|--------------------------|------|
| V _{CC} Supply voltage | 7.0 | 7.0 | 7.0 | V |
| V _{IN} Input voltage | -0.5 to +5.5 | -0.5 to +7.0 | -0.5 to +5.5 | V |
| I _{IN} Input current | -30 to +5 | -30 to +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 |
| I _{OH} HIGH-level output current | | | -800 | | | -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 |

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TEST CIRCUITS AND WAVEFORMS



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

Test Circuit For 74 Totem-Pole 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

| 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 |

Gates

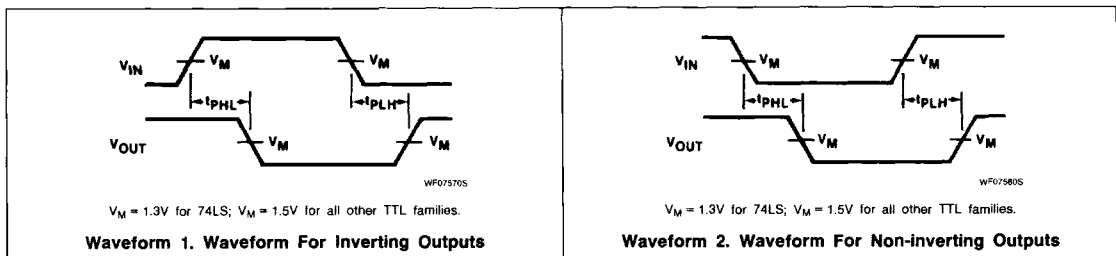
7486, LS86, S86

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

| PARAMETER | TEST CONDITIONS ¹ | 7486 | | | 74LS86 | | | 74S86 | | | UNIT |
|--|--|------------------------------|------------------|-----|--------|------------------|------|-------|------------------|------|---------------|
| | | Min | Typ ² | Max | Min | Typ ² | Max | Min | Typ ² | Max | |
| V_{OH} HIGH-level output voltage | $V_{CC} = \text{MIN}, V_{IH} = \text{MIN}, V_{IL} = \text{MAX}, I_{QH} = \text{MAX}$ | 2.4 | 3.4 | | 2.7 | 3.4 | | 2.7 | 3.4 | | V |
| V_{OL} LOW-level output voltage | $V_{CC} = \text{MIN}, V_{IH} = \text{MIN}, V_{IL} = \text{MAX}$ | $I_{OL} = \text{MAX}$ | | 0.2 | 0.4 | | 0.35 | 0.5 | | 0.5 | V |
| | | $I_{OL} = 4\text{mA (74LS)}$ | | | | | 0.25 | 0.4 | | | V |
| 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 |
| | | $V_I = 7.0\text{V}$ | | | | | | 0.2 | | | mA |
| I_{IH} HIGH-level input current | $V_{CC} = \text{MAX}$ | $V_I = 2.4\text{V}$ | | | 40 | | | | | | μA |
| | | $V_I = 2.7\text{V}$ | | | | | | 40 | | 50 | μA |
| I_{IL} LOW-level input current | $V_{CC} = \text{MAX}$ | $V_I = 0.4\text{V}$ | | | -1.6 | | | -0.8 | | | mA |
| | | $V_I = 0.5\text{V}$ | | | | | | | | -2.0 | mA |
| I_{OS} Short-circuit output current ³ | $V_{CC} = \text{MAX}$ | -18 | | | -55 | -15 | | -100 | -40 | | mA |
| I_{CC} Supply current ⁴ (total) | $V_{CC} = \text{MAX}$ | | 30 | 50 | | 6.1 | 10 | | 50 | 75 | 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 $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$.
- I_{OS} is tested with $V_{OUT} = +0.5\text{V}$ and $V_{CC} = V_{CC, \text{MAX}} + 0.5\text{V}$. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
- I_{CC} is measured with inputs grounded and outputs open.

AC WAVEFORMS**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} Propagation delay A or B to output | Other input LOW Waveform 2 | | 23 | | 23 | | 10.5 | ns |
| t_{PHL} Propagation delay A or B to output | | | 17 | | 17 | | 10 | |
| t_{PLH} Propagation delay A or B to output | Other input HIGH Waveform 1 | | 30 | | 30 | | 10.5 | ns |
| t_{PHL} Propagation delay A or B to output | | | 22 | | 22 | | 10 | |