

# 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.

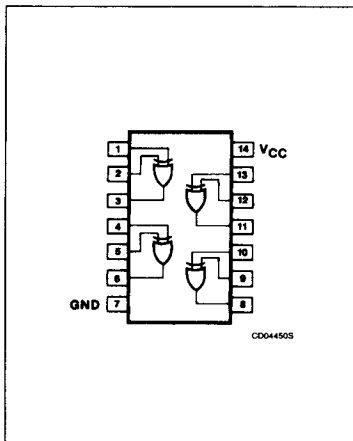
### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

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

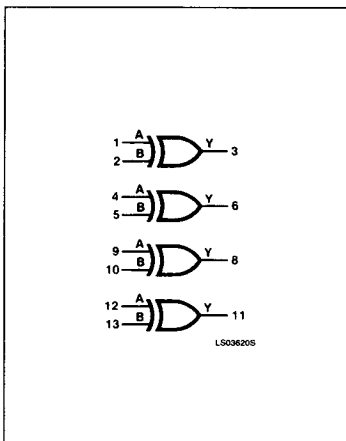
### NOTE:

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

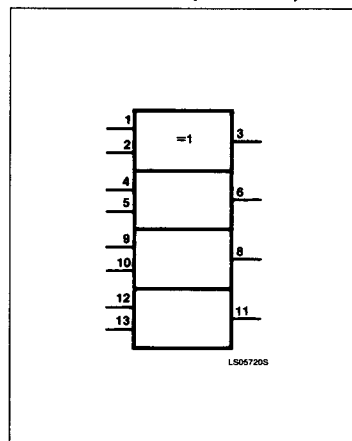
### PIN CONFIGURATION



### LOGIC SYMBOL



### LOGIC SYMBOL (IEEE/IEC)



December 4, 1985

5-132

853-0578 81501

# Gates

# 7486, LS86, S86

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

PARAMETER	74	74LS	74S	UNIT
V <sub>CC</sub> Supply voltage	7.0	7.0	7.0	V
V <sub>IN</sub> Input voltage	-0.5 to +5.5	-0.5 to +7.0	-0.5 to +5.5	V
I <sub>IN</sub> Input current	-30 to +5	-30 to +1	-30 to +5	mA
V <sub>OUT</sub> Voltage applied to output in HIGH output state	-0.5 to +V <sub>CC</sub>	-0.5 to +V <sub>CC</sub>	-0.5 to +V <sub>CC</sub>	V
T <sub>A</sub> 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 <sub>CC</sub> Supply voltage	4.75	5.0	5.25	4.75	5.0	5.25	4.75	5.0	5.25	V
V <sub>IH</sub> HIGH-level input voltage	2.0			2.0			2.0			V
V <sub>IL</sub> LOW-level input voltage			+0.8			+0.8			+0.8	V
I <sub>IK</sub> Input clamp current			-12			-18			-18	mA
I <sub>OH</sub> HIGH-level output current			-800			-400			-1000	μA
I <sub>OL</sub> LOW-level output current			16			8			20	mA
T <sub>A</sub> Operating free-air temperature	0		70	0		70	0		70	°C

5

## TEST CIRCUITS AND WAVEFORMS

TC028405

WF064505

V<sub>M</sub> = 1.3V for 74LS; V<sub>M</sub> = 1.5V for all other TTL families.

**Test Circuit For 74 Totem-Pole Outputs**

**DEFINITIONS**  
 R<sub>L</sub> = Load resistor to V<sub>CC</sub>; see AC CHARACTERISTICS for value.  
 C<sub>L</sub> = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.  
 R<sub>T</sub> = Termination resistance should be equal to Z<sub>OUT</sub> of Pulse Generators.  
 D = Diodes are 1N916, 1N3064, or equivalent.  
 t<sub>TLH</sub>, t<sub>THL</sub> Values should be less than or equal to the table entries.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	Pulse Width	t <sub>TLH</sub>	t <sub>THL</sub>
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

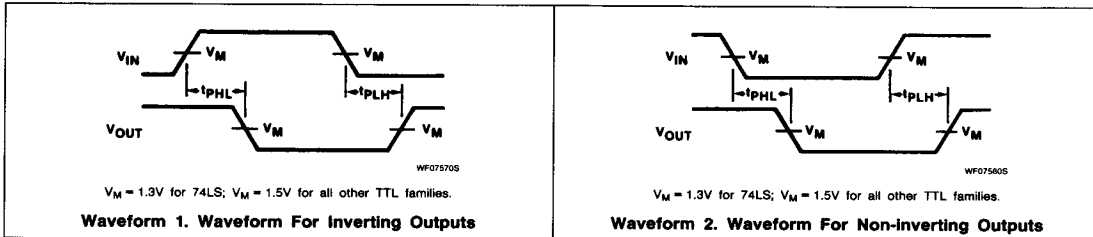
## DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS <sup>1</sup>	7486			74LS86			74S86			UNIT
		Min	Typ <sup>2</sup>	Max	Min	Typ <sup>2</sup>	Max	Min	Typ <sup>2</sup>	Max	
V <sub>OH</sub> HIGH-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OH</sub> = MAX	2.4	3.4		2.7	3.4		2.7	3.4		V
V <sub>OL</sub> LOW-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = MIN, V <sub>IL</sub> = MAX	I <sub>OL</sub> = MAX	0.2	0.4		0.35	0.5			0.5	V
		I <sub>OL</sub> = 4mA (74LS)				0.25	0.4				V
V <sub>IK</sub> Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>			-1.5			-1.5			-1.2	V
I <sub>I</sub> Input current at maximum input voltage	V <sub>CC</sub> = MAX	V <sub>I</sub> = 5.5V		1.0						1.0	mA
		V <sub>I</sub> = 7.0V					0.2				mA
I <sub>IH</sub> HIGH-level input current	V <sub>CC</sub> = MAX	V <sub>I</sub> = 2.4V		40							μA
		V <sub>I</sub> = 2.7V					40		50		μA
I <sub>IL</sub> LOW-level input current	V <sub>CC</sub> = MAX	V <sub>I</sub> = 0.4V		-1.6			-0.8				mA
		V <sub>I</sub> = 0.5V								-2.0	mA
I <sub>OS</sub> Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = MAX	-18		-55	-15		-100	-40		-100	mA
I <sub>CC</sub> Supply current <sup>4</sup> (total)	V <sub>CC</sub> = 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<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.
- I<sub>OS</sub> is tested with V<sub>OUT</sub> = +0.5V and V<sub>CC</sub> = V<sub>CC</sub> 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.
- I<sub>CC</sub> is measured with inputs grounded and outputs open.

### AC WAVEFORMS



### AC ELECTRICAL CHARACTERISTICS T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5.0V

PARAMETER	TEST CONDITIONS	74		74LS		74S		UNIT
		C <sub>L</sub> = 15pF, R <sub>L</sub> = 400Ω		C <sub>L</sub> = 15pF, R <sub>L</sub> = 2kΩ		C <sub>L</sub> = 15pF, R <sub>L</sub> = 280Ω		
		Min	Max	Min	Max	Min	Max	
t <sub>PLH</sub> Propagation delay A or B to output	Other input LOW Waveform 2		23		23		10.5	ns
t <sub>PHL</sub> Propagation delay A or B to output			17		17		10	
t <sub>PLH</sub> Propagation delay A or B to output	Other input HIGH Waveform 1		30		30		10.5	ns
t <sub>PHL</sub> Propagation delay A or B to output			22		22		10	