

7438, LS38, S38 Buffers

Quad Two-Input NAND Buffers (Open Collectors)
Product Specification

Logic Products

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
7438	13ns	28mA
74LS38	19ns	3.5mA
74S38	6.5ns	33mA

ORDERING CODE

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$
Plastic DIP	N7438N, N74LS38N, N74S38N
Plastic SO	N74S38D, N74LS38D

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

NOTE:

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

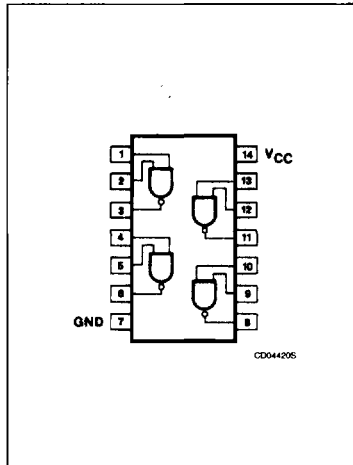
INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74	74S	74LS
A, B	Inputs	1ul	2Sul	1LSul
Y	Output	30ul	30Sul	30LSul

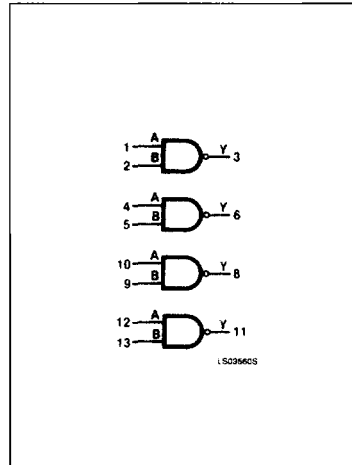
NOTE:

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

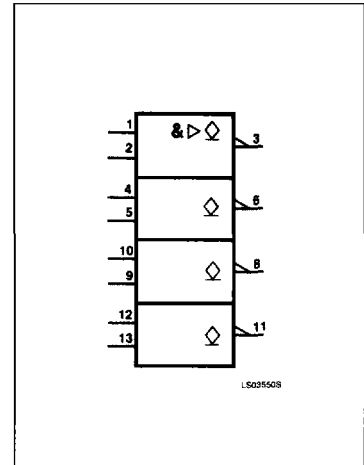
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



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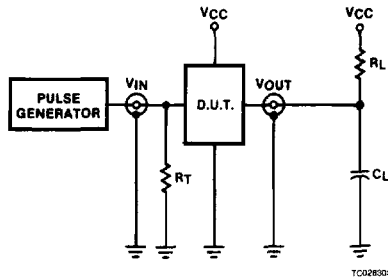
ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

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
V _{OH} HIGH-level output current			5.5			5.5			5.5	V
I _{OL} LOW-level output current			48			24			60	mA
T _A Operating free-air temperature	0		70	0		70	0		70	°C

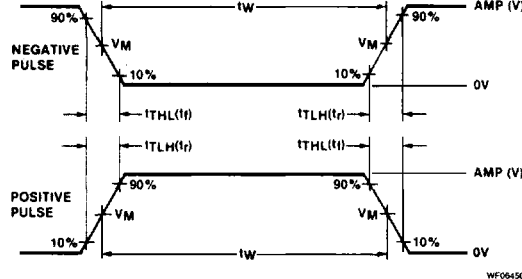
TEST CIRCUITS AND WAVEFORMS



Test Circuit For 74 Open Collector 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.
 t_{TLH}, t_{THL} Values should be less than or equal to the table entries.



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

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

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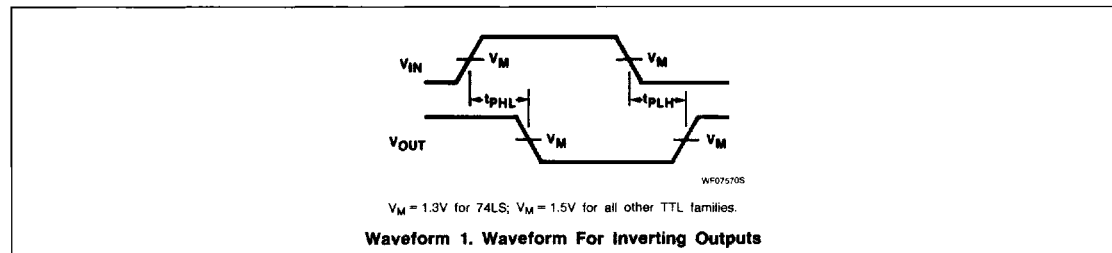
DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

PARAMETER	TEST CONDITIONS ¹	7438			74LS38			74S38			UNIT		
		Min	Typ ²	Max	Min	Typ ²	Max	Min	Typ ²	Max			
I_{OH}	HIGH-level output voltage $V_{CC} = \text{MIN}, V_{IL} = \text{MAX}, V_{OH} = 5.5\text{V}$			250			250			250	μA		
V_{OL}	LOW-level output voltage $V_{CC} = \text{MIN}, V_{IH} = \text{MIN}$	$I_{OL} = \text{MAX}$				0.2	0.4		0.35	0.5		0.5	V
		$I_{OL} = 12\text{mA (74LS)}$							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		
		$V_I = 7.0\text{V}$						0.1			mA		
I_{IH}	HIGH-level input current $V_{CC} = \text{MAX}$	$V_I = 2.4\text{V}$				40					μA		
		$V_I = 2.7\text{V}$						20		100	μA		
I_{IL}	LOW-level input current $V_{CC} = \text{MAX}$	$V_I = 0.4\text{V}$				-1.6			-0.4		mA		
		$V_I = 0.5\text{V}$								-4.0	mA		
I_{CC}	Supply current (total) $V_{CC} = \text{MAX}$	I_{CCH} Outputs HIGH			5	8.5		0.9	2		20	36	mA
		I_{CCL} Outputs LOW			34	54		6	12		46	80	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 $V_{CC} = 5\text{V}, T_A = 25^\circ\text{C}$.

AC WAVEFORM



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

PARAMETER	TEST CONDITIONS	74		74LS		74S		UNIT
		$C_L = 45\text{pF}, R_L = 133\Omega$		$C_L = 45\text{pF}, R_L = 667\Omega$		$C_L = 50\text{pF}, R_L = 93\Omega$		
		Min	Max	Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation delay Waveform 1		22 18		32 28		10 10	ns