

Triple 3-input NAND gate

74LV10

FEATURES

- Optimized for Low Voltage applications: 1.0 to 3.6 V
- Accepts TTL input levels between $V_{CC} = 2.7$ V and $V_{CC} = 3.6$ V
- Typical V_{OLP} (output ground bounce) < 0.8 V at $V_{CC} = 3.3$ V, $T_{amb} = 25^{\circ}\text{C}$.
- Typical V_{OHV} (output V_{OH} undershoot) > 2 V at $V_{CC} = 3.3$ V, $T_{amb} = 25^{\circ}\text{C}$.
- Output capability: standard
- I_{CC} category: SSI

DESCRIPTION

The 74LV10 is a low-voltage Si-gate CMOS device and is pin and function compatible with 74HC/HCT10.

The 74LV10 provides the 3-input NAND function.

QUICK REFERENCE DATA

GND = 0 V; $T_{amb} = 25^{\circ}\text{C}$; $t_r = t_f \leq 2.5$ ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	Propagation delay nA, nB, nC to nY	$C_L = 15$ pF; $V_{CC} = 3.3$ V	9	ns
C_I	Input capacitance		3.5	pF
C_{PD}	Power dissipation capacitance per gate	See Notes 1 and 2	12	pF

NOTES:

- C_{PD} is used to determine the dynamic power dissipation (P_D in μW)
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:
 f_i = input frequency in MHz; C_L = output load capacitance in pF;
 f_o = output frequency in MHz; V_{CC} = supply voltage in V;
 $\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
- The condition is $V_I = \text{GND to } V_{CC}$

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
14-Pin Plastic DIL	$-40^{\circ}\text{C to } +125^{\circ}\text{C}$	74LV10 N	74LV10 N	SOT27-1
14-Pin Plastic SO	$-40^{\circ}\text{C to } +125^{\circ}\text{C}$	74LV10 D	74LV10 D	SOT108-1
14-Pin Plastic SSOP Type II	$-40^{\circ}\text{C to } +125^{\circ}\text{C}$	74LV10 DB	74LV10 DB	SOT337-1
14-Pin Plastic TSSOP Type I	$-40^{\circ}\text{C to } +125^{\circ}\text{C}$	74LV10 PW	74LV10PW DH	SOT402-1

PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
1, 3, 9	1A – 3A	Data inputs
2, 4, 10	1B – 3B	Data inputs
7	GND	Ground (0 V)
12, 6, 8	1Y – 3Y	Data outputs
13, 5, 11	1C – 3C	Data inputs
14	V_{CC}	Positive supply voltage

FUNCTION TABLE

INPUTS			OUTPUTS
nA	nB	nC	nY
L	L	L	H
L	L	H	H
L	H	L	H
L	H	H	H
H	L	L	H
H	L	H	H
H	H	L	H
H	H	H	L

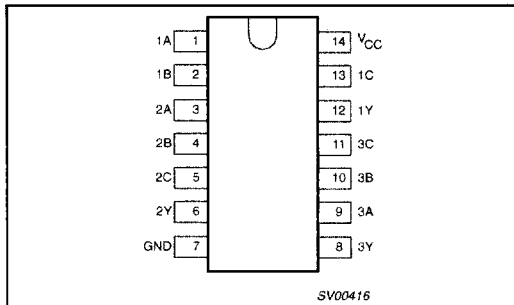
NOTES:

H = HIGH voltage level
L = LOW voltage level

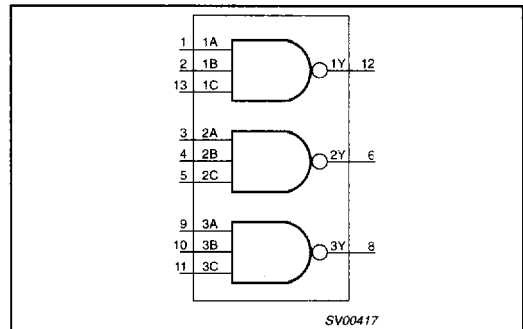
Triple 3-input NAND gate

74LV10

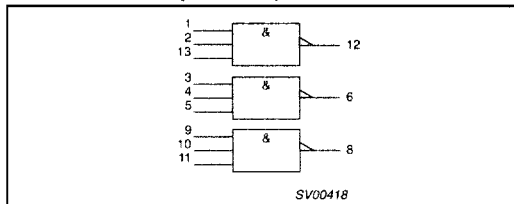
PIN CONFIGURATION



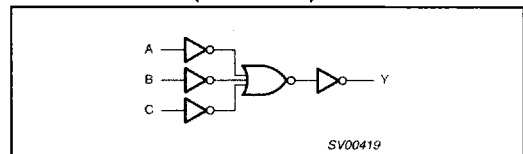
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM (ONE GATE)



RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP.	MAX	UNIT
V_{CC}	DC supply voltage	See Note 1	1.0	3.3	3.6	V
V_I	Input voltage		0	—	V_{CC}	V
V_O	Output voltage		0	—	V_{CC}	V
T_{amb}	Operating ambient temperature range in free air	See DC and AC characteristics	-40 -40		+85 +125	°C
t_r, t_f	Input rise and fall times	$V_{CC} = 1.0V$ to $2.0V$ $V_{CC} = 2.0V$ to $2.7V$ $V_{CC} = 2.7V$ to $3.6V$	— — —	— — —	500 200 100	ns/V

NOTE:

1. The LV is guaranteed to function down to $V_{CC} = 1.0V$ (input levels GND or V_{CC}); DC characteristics are guaranteed from $V_{CC} = 1.2V$ to $V_{CC} = 3.6V$.

Triple 3-input NAND gate

74LV10

ABSOLUTE MAXIMUM RATINGS^{1, 2}

In accordance with the Absolute Maximum Rating System (IEC 134).
 Voltages are referenced to GND (ground = 0V).

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		-0.5 to +4.6	V
$\pm I_{IK}$	DC input diode current	$V_I < -0.5$ or $V_I > V_{CC} + 0.5V$	20	mA
$\pm I_{OK}$	DC output diode current	$V_O < -0.5$ or $V_O > V_{CC} + 0.5V$	50	mA
$\pm I_O$	DC output source or sink current – standard outputs	$-0.5V < V_O < V_{CC} + 0.5V$	25	mA
$\pm I_{GND},$ $\pm I_{CC}$	DC V_{CC} or GND current for types with – standard outputs		50	mA
T_{stg}	Storage temperature range		-65 to +150	°C
P_{TOT}	Power dissipation per package – plastic DIL – plastic mini-pack (SO) – plastic shrink mini-pack (SSOP and TSSOP)	for temperature range: -40 to +125°C above +70°C derate linearly with 12 mW/K above +70°C derate linearly with 8 mW/K above +60°C derate linearly with 5.5 mW/K	750 500 400	mW

NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			-40°C to +85°C			-40°C to +125°C		
			MIN	TYP ¹	MAX	MIN	MAX	
V_{IH}	HIGH level Input voltage	$V_{CC} = 1.2 V$	0.9			0.9		V
		$V_{CC} = 2.0 V$	1.4			1.4		
		$V_{CC} = 2.7$ to $3.6 V$	2.0			2.0		
V_{IL}	LOW level Input voltage	$V_{CC} = 1.2 V$			0.3		0.3	V
		$V_{CC} = 2.0 V$			0.6		0.6	
		$V_{CC} = 2.7$ to $3.6 V$			0.8		0.8	
V_{OH}	HIGH level output voltage; all outputs	$V_{CC} = 1.2 V; V_I = V_{IH}$ or $V_{IL}; -I_O = 100\mu A$		1.2				V
		$V_{CC} = 2.0 V; V_I = V_{IH}$ or $V_{IL}; -I_O = 100\mu A$	1.8	2.0		1.8		
		$V_{CC} = 2.7 V; V_I = V_{IH}$ or $V_{IL}; -I_O = 100\mu A$	2.5	2.7		2.5		
		$V_{CC} = 3.0 V; V_I = V_{IH}$ or $V_{IL}; -I_O = 100\mu A$	2.8	3.0		2.8		
V_{OH}	HIGH level output voltage; STANDARD outputs	$V_{CC} = 3.0 V; V_I = V_{IH}$ or $V_{IL}; -I_O = 6mA$	2.40	2.82		2.20		V
V_{OL}	LOW level output voltage; all outputs	$V_{CC} = 1.2 V; V_I = V_{IH}$ or $V_{IL}; I_O = 100\mu A$		0				V
		$V_{CC} = 2.0 V; V_I = V_{IH}$ or $V_{IL}; I_O = 100\mu A$		0	0.2		0.2	
		$V_{CC} = 2.7 V; V_I = V_{IH}$ or $V_{IL}; I_O = 100\mu A$		0	0.2		0.2	
		$V_{CC} = 3.0 V; V_I = V_{IH}$ or $V_{IL}; I_O = 100\mu A$		0	0.2		0.2	
V_{OL}	LOW level output voltage; STANDARD outputs	$V_{CC} = 3.0 V; V_I = V_{IH}$ or $V_{IL}; I_O = 3mA$		0.25	0.40		0.50	V
I_I	Input leakage current	$V_{CC} = 3.6 V; V_I = V_{CC}$ or GND			1.0		1.0	μA
I_{CC}	Quiescent supply current; SSI	$V_{CC} = 3.6V; V_I = V_{CC}$ or GND; $I_O = 0$			20.0		40	μA

Triple 3-input NAND gate

74LV10

DC ELECTRICAL CHARACTERISTICS (Continued)

Over recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			-40°C to +85°C			-40°C to +125°C		
			MIN	TYP ¹	MAX	MIN	MAX	
ΔI_{CC}	Additional quiescent supply current per input	$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}; V_i = V_{CC} - 0.6 \text{ V}$			500		850	μA

NOTE:

1. All typical values are measured at $T_{amb} = 25^\circ\text{C}$.

AC CHARACTERISTICS

GND = 0V; $t_r = t_f \leq 2.5\text{ns}$; $C_L = 50\text{pF}$; $R_L = 1\text{K}\Omega$

SYMBOL	PARAMETER	WAVEFORM	CONDITION	LIMITS					UNIT
				-40 to +85 °C			-40 to +125 °C		
				MIN	TYP ¹	MAX	MIN	MAX	
$t_{PHL/PLH}$	Propagation delay nA, nB, nC to nY	Figure 1, 2	$V_{CC}(\text{V})$						ns
			1.2		55				
			2.0		19	36		44	
			2.7		14	26		33	
			3.0 to 3.6		10^2	21		26	

NOTES:

- Unless otherwise stated, all typical values are measured at $T_{amb} = 25^\circ\text{C}$.
- Typical values are measured at $V_{CC} = 3.3 \text{ V}$.

AC WAVEFORMS

$V_M = 1.5 \text{ V}$ at $V_{CC} \geq 2.7 \text{ V}$;

$V_M = 0.5 \times V_{CC}$ at $V_{CC} < 2.7 \text{ V}$;

V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.

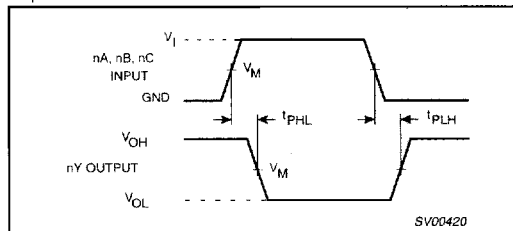


Figure 1. Input (nA, nB, nC) to output (nY) propagation delays.

TEST CIRCUIT

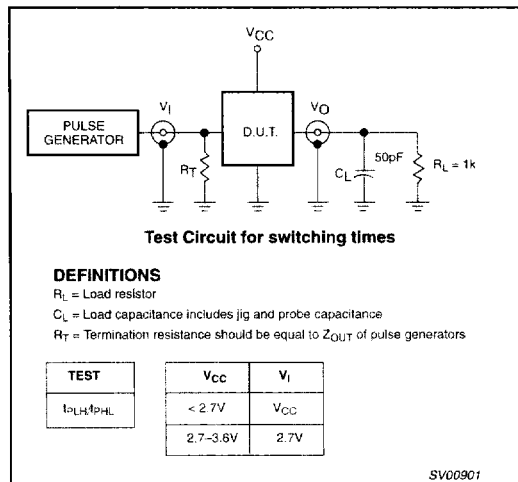


Figure 2. Load circuitry for switching times.