DATA SHEET

74LV27
Triple 3-input NOR gate

Product data
Supersedes data of 1998 Apr 20

2003 Mar 10

Philips Semiconductors

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Triple 3-input NOR gate — 74LV27

FEATURES

- Wide operating voltage: 1.0 to 5.5 V
- 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 °C.
- Typical V_{OHV} (output V_{OH} undershoot) > 2 V at V_{CC} = 3.3 V, T_{amb} = 25 °C.
- Output capability: standard
- I_{CC} category: SSI

DESCRIPTION

The 74LV27 is a low-voltage Si-gate CMOS device and is pin and function compatible with 74HC/HCT27.

The 74LV27 provides the 3-input NOR function.

QUICK REFERENCE DATA

GND = 0 V; T_{amb} = 25 °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	8	ns
C_I	Input capacitance		3.5	pF
C_{PD}	Power dissipation capacitance per gate	See Notes 1 and 2	24	pF

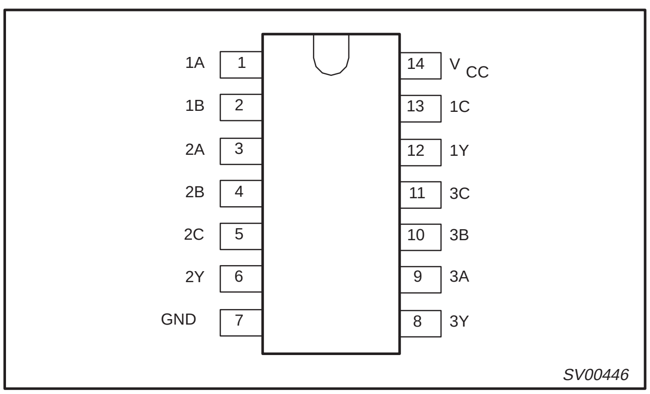
NOTES:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW)
   $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   N = number of outputs switching;
   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;
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.
2. The condition is V_I = GND to V_{CC}.

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	PKG. DWG. #
14-Pin Plastic SO	–40 °C to +125 °C	74LV27D	SOT108-1

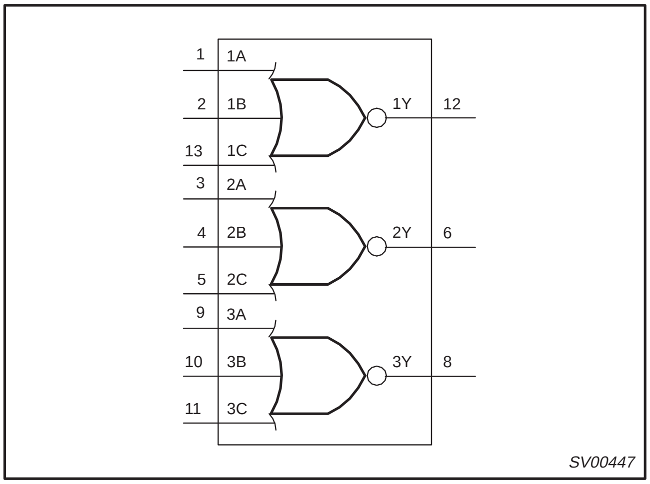
PIN CONFIGURATION



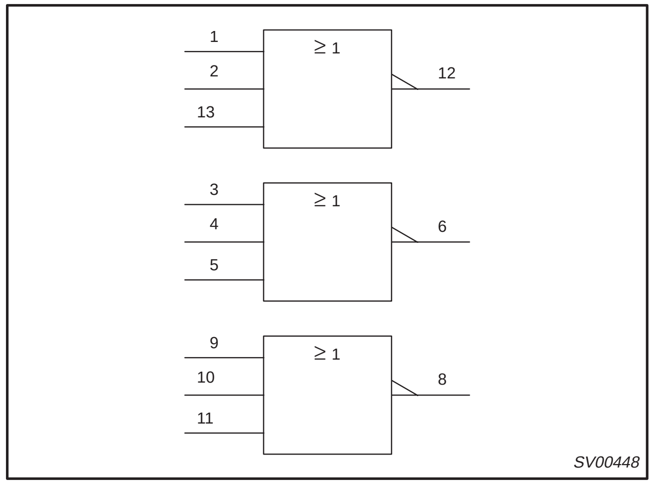
PIN DESCRIPTION

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

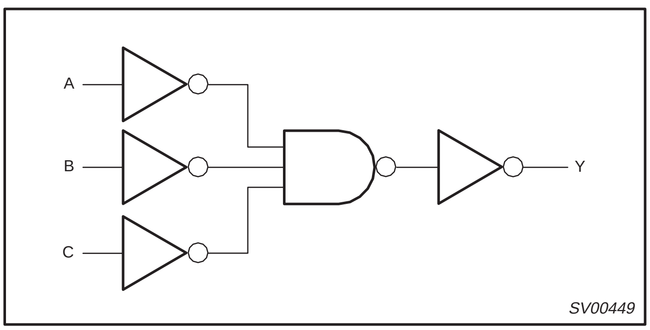
LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



LOGIC DIAGRAM



FUNCTION TABLE

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

NOTES:
H = HIGH voltage level
L = LOW voltage level
X = don't care

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
V_{CC}	DC supply voltage	See Note 1	1.0	3.3	5.5	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} = 1.0 V to 2.0 V	–	–	500	ns/V
		V_{CC} = 2.0 V to 2.7 V	–	–	200	ns/V
		V_{CC} = 2.7 V to 3.6 V	–	–	100	ns/V
		V_{CC} = 3.6 V to 5.5 V	–	–	50	ns/V

NOTE:
1. The LV is guaranteed to function down to V_{CC} = 1.0 V (input levels GND or V_{CC}); DC characteristics are guaranteed from V_{CC} = 1.2 V to V_{CC} = 5.5 V.

ABSOLUTE MAXIMUM RATINGS[1, 2]

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

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		–0.5 to +7.0	V
$\pm I_{IK}$	DC input diode current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V	20	mA
$\pm I_{OK}$	DC output diode current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V	50	mA
$\pm I_O$	DC output source or sink current (standard outputs)	-0.5 V $< V_O < V_{CC} + 0.5$ V	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 mini-pack (SO)	for temperature range: –40 to +125 °C above +70 °C derate linearly with 8 mW/K	500	mW

NOTES:
1. 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.
2. 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 –40 °C to +85 °C			LIMITS –40 °C to +125 °C		UNIT
			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 V to 3.6 V	2.0			2.0		
		V_{CC} = 4.5 V to 5.5 V	0.7 * V_{CC}			0.7 * V_{CC}		
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 V to 3.6 V			0.8		0.8	
		V_{CC} = 4.5 V to 5.5 V			0.3 * V_{CC}		0.3 * V_{CC}	
V_{OH}	HIGH level output voltage; all outputs	V_{CC} = 1.2 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100 µA		1.2				V
		V_{CC} = 2.0 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100 µA	1.8	2.0		1.8		
		V_{CC} = 2.7 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100 µA	2.5	2.7		2.5		
		V_{CC} = 3.0 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100 µA	2.8	3.0		2.8		
		V_{CC} = 4.5 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 100 µA	4.3	4.5		4.3		
V_{OH}	HIGH level output voltage; STANDARD outputs	V_{CC} = 3.0 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 6 mA	2.40	2.82		2.20		V
		V_{CC} = 4.5 V; $V_I = V_{IH}$ or V_{IL}; $-I_O$ = 12 mA	3.60	4.20		3.50		
V_{OL}	LOW level output voltage; all outputs	V_{CC} = 1.2 V; $V_I = V_{IH}$ or V_{IL}; I_O = 100 µA		0				V
		V_{CC} = 2.0 V; $V_I = V_{IH}$ or V_{IL}; I_O = 100 µA		0	0.2		0.2	
		V_{CC} = 2.7 V; $V_I = V_{IH}$ or V_{IL}; I_O = 100 µA		0	0.2		0.2	
		V_{CC} = 3.0 V; $V_I = V_{IH}$ or V_{IL}; I_O = 100 µA		0	0.2		0.2	
		V_{CC} = 4.5 V; $V_I = V_{IH}$ or V_{IL}; I_O = 100 µA		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 = 6 mA		0.25	0.40		0.50	V
		V_{CC} = 4.5 V; $V_I = V_{IH}$ or V_{IL}; I_O = 12 mA		0.35	0.55		0.65	
I_I	Input leakage current	V_{CC} = 5.5 V; $V_I = V_{CC}$ or GND			1.0		1.0	µA
I_{CC}	Quiescent supply current; SSI	V_{CC} = 5.5 V; $V_I = V_{CC}$ or GND; I_O = 0			20.0		40	µA
ΔI_{CC}	Additional quiescent supply current	V_{CC} = 2.7 V to 3.6 V; $V_I = V_{CC} - 0.6$ V			500		850	µA

NOTE:
1. All typical values are measured at T_{amb} = 25 °C.

AC CHARACTERISTICS

GND = 0 V; $t_r = t_f \leq 2.5$ ns; $C_L = 50$ pF; $R_L = 1$ kΩ

SYMBOL	PARAMETER	WAVEFORM	CONDITION	LIMITS					UNIT
				–40 °C to +85 °C			–40 °C to +125 °C		
			V_{CC} (V)	MIN	TYP[1]	MAX	MIN	MAX	
$t_{PHL/PLH}$	Propagation delay nA, nB, nC to nY	Figures 1, 2	1.2		50				ns
			2.0		17	22		27	
			2.7		13	16		20	
			3.0 to 3.6		10[2]	13		16	
			4.5 to 5.5			11		14	

NOTES:
1. Unless otherwise stated, all typical values are measured at $T_{amb} = 25$ °C
2. Typical values are measured at $V_{CC} = 3.3$ V.

AC WAVEFORMS

$V_M = 1.5$ V at $V_{CC} \geq 2.7$ V and ≤ 3.6 V;
$V_M = 0.5 \times V_{CC}$ at $V_{CC} < 2.7$ V and ≥ 4.5 V;
V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.

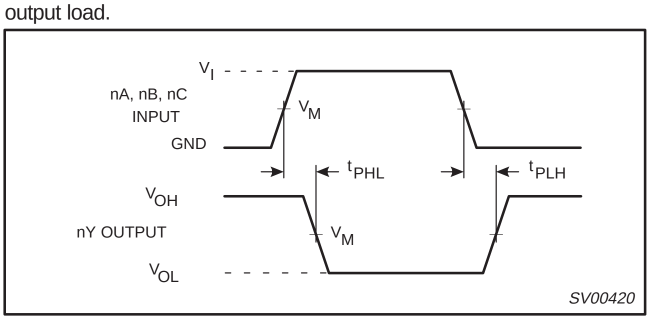


Figure 1. Input (nA, nB, nC) to output (nY) propagation delays.

TEST CIRCUIT

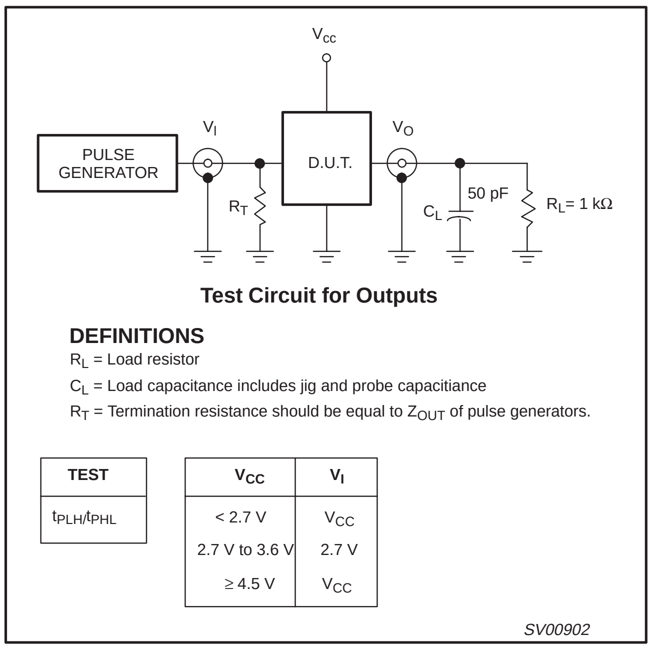
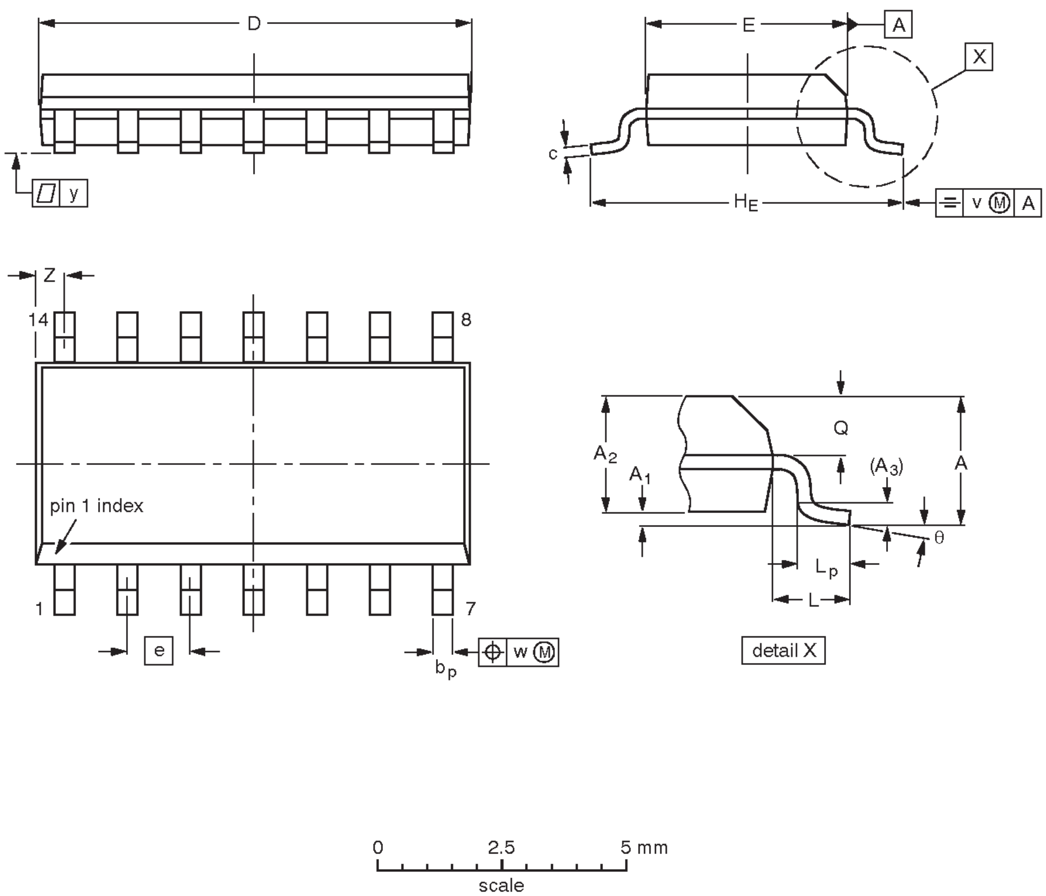


Figure 2. Load circuitry for switching times.

SO14: plastic small outline package; 14 leads; body width 3.9 mm SOT108-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT108-1	076E06	MS-012				~~97-05-22~~ 99-12-27

REVISION HISTORY

Rev	Date	Description
_4	20030310	**Product data (9397 750 11225). ECN 853-1896 29488 of 07 February 2003.** **Supersedes Product specification of 1998 Apr 20 (9397 750 04412).** Modifications: • Delete DIL, SSOP and TSSOP package ordering and package outlines (discontinued options). • Quick Reference Data: Correct power dissipation formula in Note 1.
_3	19980420	**Product specification (9397 750 04412). ECN 853-1896 19258 of 20 April 1998.** **Supersedes data of 1997 Feb 03.**

Triple 3-input NOR gate 74LV27

Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definitions
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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