

# DATA SHEET

**74LVC11**

Triple 3-input AND gate

Product specification

1998 Apr 28

## Triple 3-input AND gate

74LVC11

## FEATURES

- Wide supply voltage range of 1.2 V to 3.6 V
- In accordance with JEDEC standard no. 8-1A.
- Inputs accept voltages up to 5.5 V
- CMOS low power consumption
- Direct interface with TTL levels
- Output capability: standard
- $I_{CC}$  category: SSI

## DESCRIPTION

The 74LVC11 is a high-performance, low power, low-voltage Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74LVC11 provides the 3-input AND function.

## QUICK REFERENCE DATA

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

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
$t_{PHL}/t_{PLH}$	Propagation delay nA, nB, nC to nY	$C_L = 50 \text{ pF}$ ; $V_{CC} = 3.3 \text{ V}$	3.7	ns
$C_I$	Input capacitance		5.0	pF
$C_{PD}$	Power dissipation capacitance per gate	Notes 1 and 2	26	pF

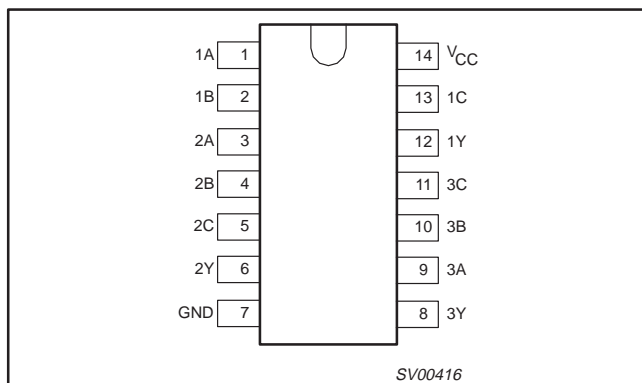
## NOTES:

- $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ )  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
 $f_i$  = input frequency in MHz;  $C_L$  = output load capacity 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  $V_i = \text{GND to } V_{CC}$ .

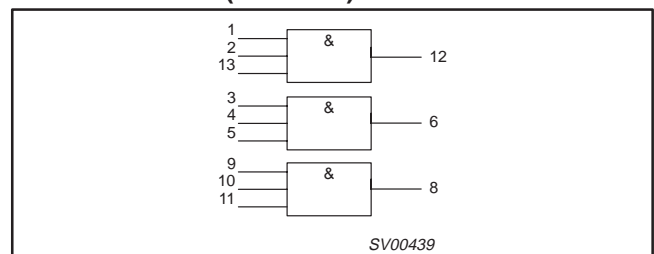
## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
14-Pin Plastic SO	$-40^{\circ}\text{C to } +85^{\circ}\text{C}$	74LVC11 D	74LVC11 D	SOT108-1
14-Pin Plastic SSOP Type II	$-40^{\circ}\text{C to } +85^{\circ}\text{C}$	74LVC11 DB	74LVC11 DB	SOT337-1
14-Pin Plastic TSSOP Type I	$-40^{\circ}\text{C to } +85^{\circ}\text{C}$	74LVC11 PW	74LVC11PW DH	SOT402-1

## PIN CONFIGURATION



## LOGIC SYMBOL (IEEE/IEC)



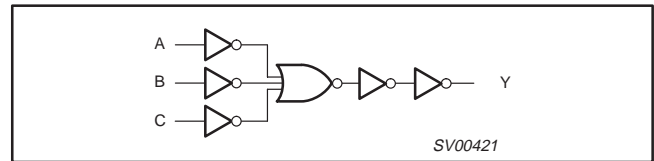
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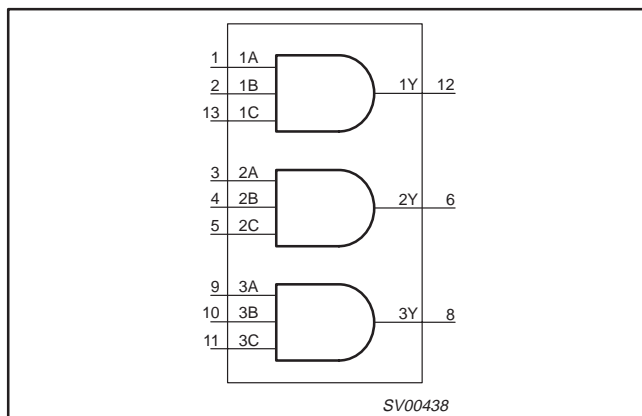
### PIN DESCRIPTION

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 <sub>CC</sub>	Positive supply voltage

### LOGIC DIAGRAM (ONE GATE)



### LOGIC SYMBOL



### FUNCTION TABLE

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

#### NOTES:

H = HIGH voltage level  
L = LOW voltage level

### RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
V <sub>CC</sub>	DC supply voltage (for max. speed performance)		2.7	3.6	V
V <sub>CC</sub>	DC supply voltage (for low-voltage applications)		1.2	3.6	V
V <sub>I</sub>	DC input voltage range		0	5.5	V
V <sub>O</sub>	DC output voltage range		0	V <sub>CC</sub>	V
T <sub>amb</sub>	Operating free-air temperature range		-40	+85	°C
t <sub>r</sub> , t <sub>f</sub>	Input rise and fall times	V <sub>CC</sub> = 1.2 to 2.7V V <sub>CC</sub> = 2.7 to 3.6V	0	20	ns/V
			0	10	

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**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>**

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 +6.5	V
$I_{IK}$	DC input diode current	$V_I < 0$	-50	mA
$V_I$	DC input voltage	Note 2	-0.5 to +5.5	V
$I_{OK}$	DC output diode current	$V_O > V_{CC}$ or $V_O < 0$	$\pm 50$	mA
$V_O$	DC output voltage	Note 2	-0.5 to $V_{CC} + 0.5$	V
$I_O$	DC output source or sink current	$V_O = 0$ to $V_{CC}$	$\pm 50$	mA
$I_{GND}, I_{CC}$	DC $V_{CC}$ or GND current		$\pm 100$	mA
$T_{stg}$	Storage temperature range		-65 to +150	°C
$P_{TOT}$	Power dissipation per package – plastic mini-pack (SO) – plastic shrink mini-pack (SSOP and TSSOP)	above +70°C derate linearly with 8 mW/K above +60°C derate linearly with 5.5 mW/K	500 500	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 = 0V)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
$V_{IH}$	HIGH level Input voltage	$V_{CC} = 1.2V$	$V_{CC}$			V
		$V_{CC} = 2.7$ to $3.6V$	2.0			
$V_{IL}$	LOW level Input voltage	$V_{CC} = 1.2V$			GND	V
		$V_{CC} = 2.7$ to $3.6V$			0.8	
$V_{OH}$	HIGH level output voltage	$V_{CC} = 2.7V; V_I = V_{IH}$ or $V_{IL}; I_O = -12mA$	$V_{CC} - 0.5$			V
		$V_{CC} = 3.0V; V_I = V_{IH}$ or $V_{IL}; I_O = -100\mu A$	$V_{CC} - 0.2$	$V_{CC}$		
		$V_{CC} = 3.0V; V_I = V_{IH}$ or $V_{IL}; I_O = -12mA$	$V_{CC} - 0.6$			
		$V_{CC} = 3.0V; V_I = V_{IH}$ or $V_{IL}; I_O = -24mA$	$V_{CC} - 1.0$			
$V_{OL}$	LOW level output voltage	$V_{CC} = 2.7V; V_I = V_{IH}$ or $V_{IL}; I_O = 12mA$			0.40	V
		$V_{CC} = 3.0V; V_I = V_{IH}$ or $V_{IL}; I_O = 100\mu A$		GND	0.20	
		$V_{CC} = 3.0V; V_I = V_{IH}$ or $V_{IL}; I_O = 24mA$			0.55	
$I_I$	Input leakage current	$V_{CC} = 3.6V; V_I = 5.5V$ or GND		$\pm 0.1$	$\pm 5$	$\mu A$
$I_{CC}$	Quiescent supply current	$V_{CC} = 3.6V; V_I = V_{CC}$ or GND; $I_O = 0$		0.1	10	$\mu A$
$\Delta I_{CC}$	Additional quiescent supply current per input pin	$V_{CC} = 2.7V$ to $3.6V; V_I = V_{CC} - 0.6V; I_O = 0$		5	500	$\mu A$

**NOTE:**

- All typical values are at  $V_{CC} = 3.3V$  and  $T_{amb} = 25^\circ C$ .

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## AC CHARACTERISTICS

GND = 0 V;  $t_r = t_f \leq 2.5$  ns;  $C_L = 50$  pF;  $R_L = 500\Omega$ ;  $T_{amb} = -40^\circ\text{C}$  to  $+85^\circ\text{C}$

SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT
			$V_{CC} = 3.3V \pm 0.3V$			$V_{CC} = 2.7V$		
			MIN	TYP <sup>1</sup>	MAX	MIN	MAX	
$t_{PHL}/t_{PLH}$	Propagation delay nA, nB, nC to nY	1, 2	–	3.7	6.2	–	7.0	ns

**NOTE:**

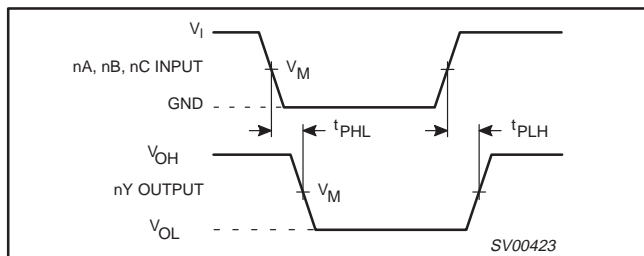
1. These typical values are at  $V_{CC} = 3.3V$  and  $T_{amb} = 25^\circ\text{C}$ .

## AC WAVEFORMS

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

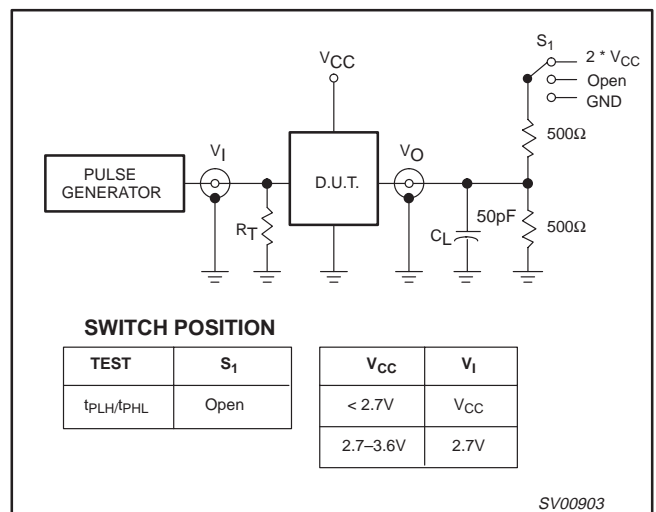
$V_M = 0.5 \cdot V_{CC}$  at  $V_{CC} < 2.7$  V

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



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

## TEST CIRCUIT



**Waveform 2. Load circuitry for switching times.**

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**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 <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	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° 0°
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	076E06S	MS-012AB				95-01-29 97-05-22

# Triple 3-input AND gate

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**SSOP14:** plastic shrink small outline package; 14 leads; body width 5.3 mm

**SOT337-1**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.4 0.9	8° 0°

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

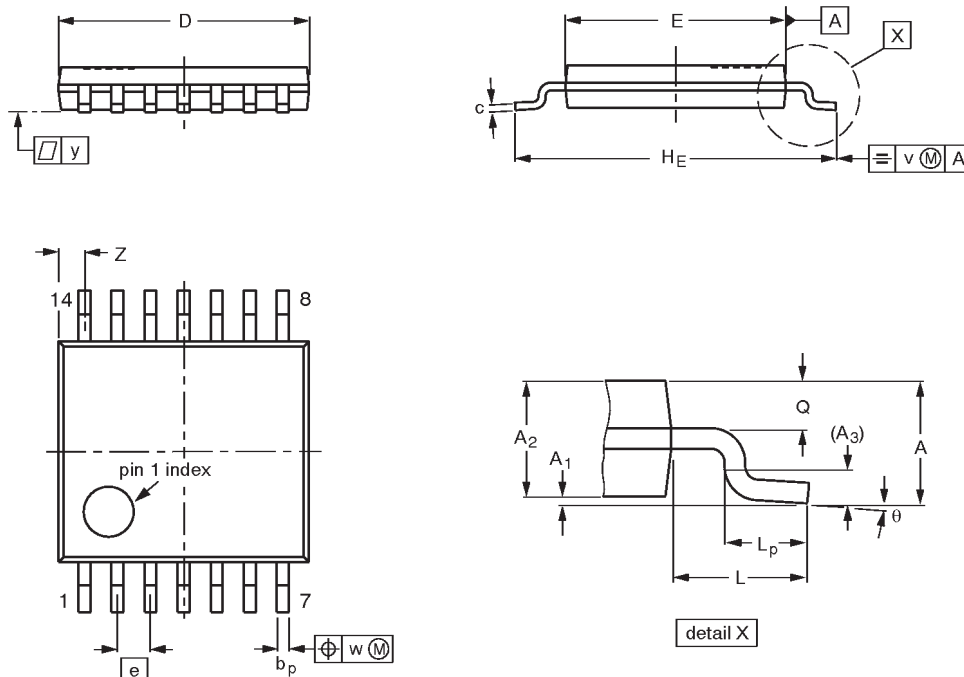
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT337-1		MO-150AB				<del>95-02-04</del> 96-01-18

# Triple 3-input AND gate

# 74LVC11

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT402-1		MO-153				-94-07-12- 95-04-04



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**NOTES**

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## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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