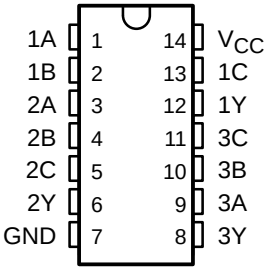
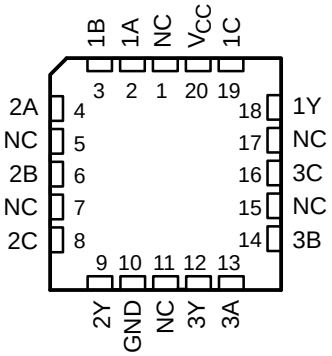
- **2-V to 5.5-V V_{CC} Operation**
- **Typical V_{OLP} (Output Ground Bounce) <0.8 V at V_{CC}= 3.3 V, T_A = 25°C**
- **Typical V_{OHV} (Output V_{OH} Undershoot) >2.3 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Support Mixed-Mode Voltage Operation on All Ports**
- **I_{off} Supports Partial-Power-Down Mode Operation**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Protection Exceeds JESD 22**
  - **2000-V Human-Body Model (A114-A)**
  - **200-V Machine Model (A115-A)**
  - **1000-V Charged-Device Model (C101)**

SN54LV11A . . . J OR W PACKAGE
SN74LV11A . . . D, DB, DGV, NS, OR PW PACKAGE
(TOP VIEW)



SN54LV11A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

These triple 3-input positive-AND gates are designed for 2-V to 5.5-V V_{CC} operation.

The ’LV11A devices perform the Boolean function $Y = A \bullet B \bullet C$ or $Y = \overline{\overline{A} + \overline{B} + \overline{C}}$ in positive logic.

These devices are fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – D	Tube	SN74LV11AD	LV11A
		Tape and reel	SN74LV11ADR	
	SOP – NS	Tape and reel	SN74LV11ANSR	74LV11A
	SSOP – DB	Tape and reel	SN74LV11ADBR	LV11A
	TSSOP – PW	Tape and reel	SN74LV11APWR	LV11A
	TVSOP – DGV	Tape and reel	SN74LV11ADGVR	LV11A
–55°C to 125°C	CDIP – J	Tube	SNJ54LV11AJ	SNJ54LV11AJ
	CFP – W	Tube	SNJ54LV11AW	SNJ54LV11AW
	LCCC – FK	Tube	SNJ54LV11AFK	SNJ54LV11AFK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

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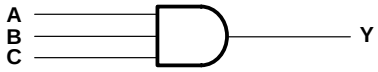
FUNCTION TABLE
(each gate)

INPUTS			OUTPUT
A	B	C	Y
H	H	H	H
L	X	X	L
X	L	X	L
X	X	L	L

logic diagram, each gate (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC} . . . . . –0.5 V to 7 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to 7 V
Output voltage range applied in high or low state, V_O (see Notes 1 and 2) . . . . . –0.5 V to V_{CC} + 0.5 V
Voltage range applied to any output in the power-off state, V_O (see Note 1) . . . . . –0.5 V to 7 V
Input clamp current, I_{IK} (V_I < 0) . . . . . –20 mA
Output clamp current, I_{OK} (V_O < 0 or V_O > V_{CC}) . . . . . ±50 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . . ±25 mA
Continuous current through V_{CC} or GND . . . . . ±50 mA
Package thermal impedance, θ_{JA} (see Note 3): D package . . . . . 86°C/W
DB package . . . . . 96°C/W
DGV package . . . . . 127°C/W
NS package . . . . . 76°C/W
PW package . . . . . 113°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4)

			SN54LV11A		SN74LV11A		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage		2	5.5	2	5.5	V
V_{IH}	High-level input voltage	V_{CC} = 2 V	1.5		1.5		V
		V_{CC} = 2.3 V to 2.7 V	$V_{CC} \times 0.7$		$V_{CC} \times 0.7$		
		V_{CC} = 3 V to 3.6 V	$V_{CC} \times 0.7$		$V_{CC} \times 0.7$		
		V_{CC} = 4.5 V to 5.5 V	$V_{CC} \times 0.7$		$V_{CC} \times 0.7$		
V_{IL}	Low-level input voltage	V_{CC} = 2 V		0.5		0.5	V
		V_{CC} = 2.3 V to 2.7 V		$V_{CC} \times 0.3$		$V_{CC} \times 0.3$	
		V_{CC} = 3 V to 3.6 V		$V_{CC} \times 0.3$		$V_{CC} \times 0.3$	
		V_{CC} = 4.5 V to 5.5 V		$V_{CC} \times 0.3$		$V_{CC} \times 0.3$	
V_I	Input voltage		0	5.5	0	5.5	V
V_O	Output voltage		0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 2 V		–50		–50	μA
		V_{CC} = 2.3 V to 2.7 V		–2		–2	mA
		V_{CC} = 3 V to 3.6 V		–6		–6	
		V_{CC} = 4.5 V to 5.5 V		–12		–12	
I_{OL}	Low-level output current	V_{CC} = 2 V		50		50	μA
		V_{CC} = 2.3 V to 2.7 V		2		2	mA
		V_{CC} = 3 V to 3.6 V		6		6	
		V_{CC} = 4.5 V to 5.5 V		12		12	
$\Delta t/\Delta v$	Input transition rise or fall rate	V_{CC} = 2.3 V to 2.7 V		200		200	ns/V
		V_{CC} = 3 V to 3.6 V		100		100	
		V_{CC} = 4.5 V to 5.5 V		20		20	
T_A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	SN54LV11A			SN74LV11A			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{OH}	I_{OH} = –50 μA	2 V to 5.5 V	V_{CC}–0.1			V_{CC}–0.1			V
	I_{OH} = –2 mA	2.3 V	2			2			
	I_{OH} = –6 mA	3 V	2.48			2.48			
	I_{OH} = –12 mA	4.5 V	3.8			3.8			
V_{OL}	I_{OL} = 50 μA	2 V to 5.5 V			0.1			0.1	V
	I_{OL} = 2 mA	2.3 V			0.4			0.4	
	I_{OL} = 6 mA	3 V			0.44			0.44	
	I_{OL} = 12 mA	4.5 V			0.55			0.55	
I_I	V_I = 5.5 V or GND	0 to 5.5 V			±1			±1	μA
I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0	5.5 V			20			20	μA
I_{off}	V_I or V_O = 0 to 5.5 V	0 V			5			5	μA
C_i	$V_I = V_{CC}$ or GND	3.3 V		1.9			1.9		pF

PRODUCT PREVIEW

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switching characteristics over recommended operating free-air temperature range, V_{CC} = 2.5 V ± 0.2 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T_A = 25°C			SN54LV11A		SN74LV11A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A, B, or C	Y	C_L = 15 pF		6.9*	13.8*	1*	16*	1	16	ns
t_{pd}	A, B, or C	Y	C_L = 50 pF		9.9	17.5	1	21	1	21	ns

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T_A = 25°C			SN54LV11A		SN74LV11A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A, B, or C	Y	C_L = 15 pF		5.2*	8.8*	1*	10.5*	1	10.5	ns
t_{pd}	A, B, or C	Y	C_L = 50 pF		7.2	12.3	1	14	1	14	ns

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T_A = 25°C			SN54LV11A		SN74LV11A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A, B, or C	Y	C_L = 15 pF		3.9*	5.9*	1*	7*	1	7	ns
t_{pd}	A, B, or C	Y	C_L = 50 pF		5.4	7.9	1	9	1	9	ns

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

noise characteristics, V_{CC} = 3.3 V, C_L = 50 pF, T_A = 25°C (see Note 5)

PARAMETER		SN74LV11A			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.2	0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		0	–0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		3.2		V
$V_{IH(D)}$	High-level dynamic input voltage	2.31			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.99	V

NOTE 5: Characteristics are for surface-mount packages only.

operating characteristics, T_A = 25°C

PARAMETER		TEST CONDITIONS	V_{CC}	TYP	UNIT
C_{pd}	Power dissipation capacitance	C_L = 50 pF, f = 10 MHz	3.3 V	13.9	pF
			5 V	15.4	

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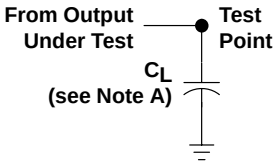
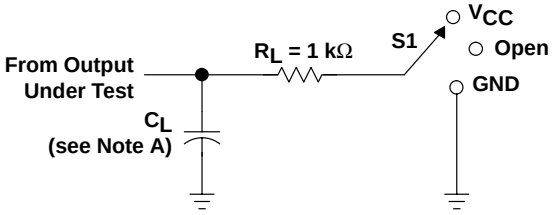
PARAMETER MEASUREMENT INFORMATION

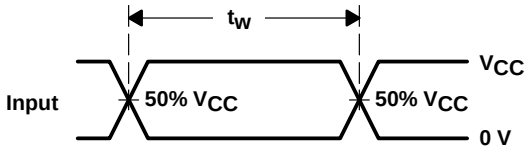


LOAD CIRCUIT FOR
TOTEM-POLE OUTPUTS

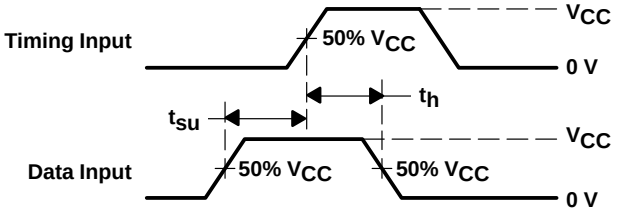


LOAD CIRCUIT FOR
3-STATE AND OPEN-DRAIN OUTPUTS

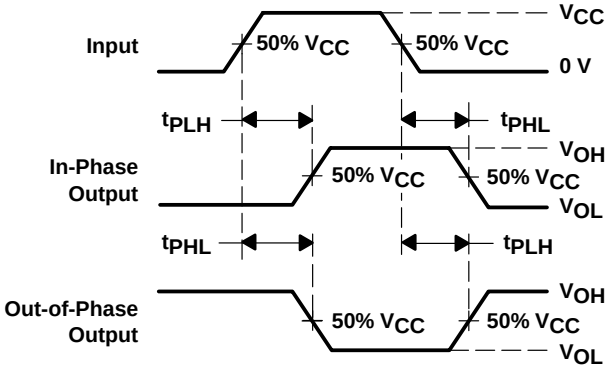
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{CC}
t_{PHZ}/t_{PZH}	GND
Open Drain	V_{CC}



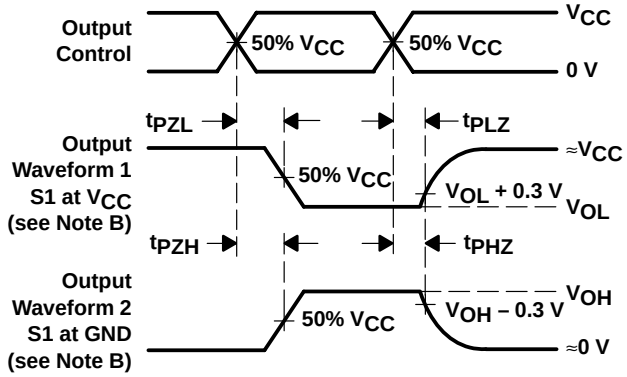
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 3 ns, t_f ≤ 3 ns.
D. The outputs are measured one at a time with one input transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
F. t_{PZL} and t_{PZH} are the same as t_{en}.
G. t_{PHL} and t_{PLH} are the same as t_{pd}.

Figure 1. Load Circuit and Voltage Waveforms

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Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

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