

# SN54AHC11, SN74AHC11 TRIPLE 3-INPUT POSITIVE-AND GATES

SCLS361 – MAY 1997

- Operating Range 2-V to 5.5-V  $V_{CC}$
- **EPIC™** (Enhanced-Performance Implanted CMOS) Process
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

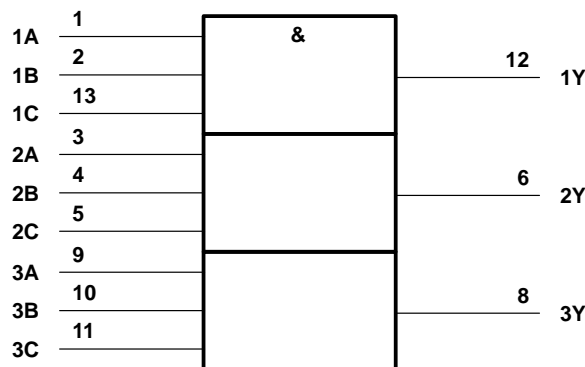
These devices contain three independent 3-input AND gates. They perform the Boolean function  $Y = A \cdot B \cdot C$  or  $Y = \overline{A} + \overline{B} + \overline{C}$  in positive logic.

The SN54AHC11 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74AHC11 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE  
(each gate)

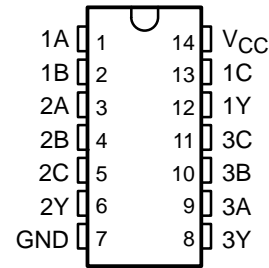
INPUTS			OUTPUT Y
A	B	C	
H	H	H	H
L	X	X	L
X	L	X	L
X	X	L	L

## logic symbol†

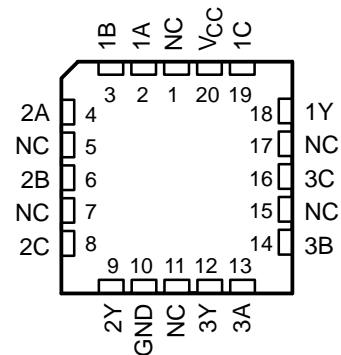


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, DB, J, N, PW, and W packages.

SN54AHC11 . . . J OR W PACKAGE  
SN74AHC11 . . . D, DB, N, OR PW PACKAGE  
(TOP VIEW)



SN54AHC11 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

PRODUCT PREVIEW



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PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

**TEXAS  
INSTRUMENTS**

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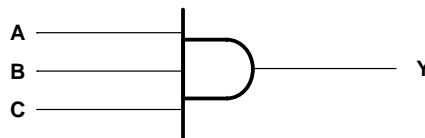
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# SN54AHC11, SN74AHC11

## TRIPLE 3-INPUT POSITIVE-AND GATES

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logic diagram, each gate (positive logic)



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

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, $V_O$ (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ )	–20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )	±20 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, $\theta_{JA}$ (see Note 2): D package	127°C/W
DB package	158°C/W
N package	78°C/W
PW package	170°C/W
Storage temperature range, $T_{stg}$	–65°C to 150°C

<sup>†</sup> 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. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions (see Note 3)

			SN54AHC11		SN74AHC11		UNIT
			MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage		2	5.5	2	5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5		1.5		V
		V <sub>CC</sub> = 3 V	2.1		2.1		
		V <sub>CC</sub> = 5.5 V	3.85		3.85		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5		0.5		V
		V <sub>CC</sub> = 3 V	0.9		0.9		
		V <sub>CC</sub> = 5.5 V	1.65		1.65		
V <sub>I</sub>	Input voltage		0	5.5	0	5.5	V
V <sub>O</sub>	Output voltage		0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2 V	−50		−50		μA
		V <sub>CC</sub> = 3.3 V ± 0.3 V	−4		−4		mA
		V <sub>CC</sub> = 5 V ± 0.5 V	−8		−8		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2 V	50		50		μA
		V <sub>CC</sub> = 3.3 V ± 0.3 V	4		4		mA
		V <sub>CC</sub> = 5 V ± 0.5 V	8		8		
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 3.3 V ± 0.3 V	100		100		ns/V
		V <sub>CC</sub> = 5 V ± 0.5 V	20		20		
T <sub>A</sub>	Operating free-air temperature		−55	125	−40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.



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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54AHC11		SN74AHC11		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 µA	2 V	1.9	2		1.9		1.9		V
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I <sub>OH</sub> = -4 mA	3 V	2.58			2.48		2.48		
	I <sub>OH</sub> = -8 mA	4.5 V	3.94			3.8		3.8		
V <sub>OL</sub>	I <sub>OL</sub> = 50 µA	2 V			0.1		0.1		0.1	V
		3 V			0.1		0.1		0.1	
		4.5 V			0.1		0.1		0.1	
	I <sub>OL</sub> = 4 mA	3 V			0.36		0.5		0.44	
	I <sub>OL</sub> = 8 mA	4.5 V			0.36		0.5		0.44	
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V			±0.1		±1		±1	µA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			2		20		20	µA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V		4	10				10	pF

switching characteristics over recommended operating free-air temperature range,  
V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHC11				UNIT	
				T <sub>A</sub> = 25°C			MIN		MAX
				MIN	TYP	MAX			
t <sub>PLH</sub> *	A, B, or C	Y	C <sub>L</sub> = 15 pF	6.1	8.8	1	10.5	ns	
t <sub>PHL</sub> *				6.1	8.8	1	10.5		
t <sub>PLH</sub>	A, B, or C	Y	C <sub>L</sub> = 50 pF	8.6	12.3	1	14	ns	
t <sub>PHL</sub>				8.6	12.3	1	14		

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

switching characteristics over recommended operating free-air temperature range,  
V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHC11				UNIT	
				T <sub>A</sub> = 25°C			MIN		MAX
				MIN	TYP	MAX			
t <sub>PLH</sub>	A, B, or C	Y	C <sub>L</sub> = 15 pF	6.1	8.8	1	10.5	ns	
t <sub>PHL</sub>				6.1	8.8	1	10.5		
t <sub>PLH</sub>	A, B, or C	Y	C <sub>L</sub> = 50 pF	8.6	12.3	1	14	ns	
t <sub>PHL</sub>				8.6	12.3	1	14		

# SN54AHC11, SN74AHC11

## TRIPLE 3-INPUT POSITIVE-AND GATES

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHC11				UNIT
				$T_A = 25^\circ\text{C}$			MIN	MAX
				MIN	TYP	MAX		
$t_{PLH}^*$	A, B, or C	Y	$C_L = 15\text{ pF}$	4.1	5.9	1	7	ns
$t_{PHL}^*$				4.1	5.9	1	7	
$t_{PLH}$	A, B, or C	Y	$C_L = 50\text{ pF}$	5.6	7.9	1	9	ns
$t_{PHL}$				5.6	7.9	1	9	

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

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHC11				UNIT
				$T_A = 25^\circ\text{C}$			MIN	MAX
				MIN	TYP	MAX		
$t_{PLH}$	A, B, or C	Y	$C_L = 15\text{ pF}$	4.1	5.9	1	7	ns
$t_{PHL}$				4.1	5.9	1	7	
$t_{PLH}$	A, B, or C	Y	$C_L = 50\text{ pF}$	5.6	7.9	1	9	ns
$t_{PHL}$				5.6	7.9	1	9	

noise characteristics,  $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 4)

PARAMETER		SN74AHC11			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$			0.8	V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$			−0.8	V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$				V
$V_{IH(D)}$	High-level dynamic input voltage	3.5			V
$V_{IL(D)}$	Low-level dynamic input voltage			1.5	V

NOTE 4: Characteristics are determined during product characterization and ensured by design for surface-mount packages only.

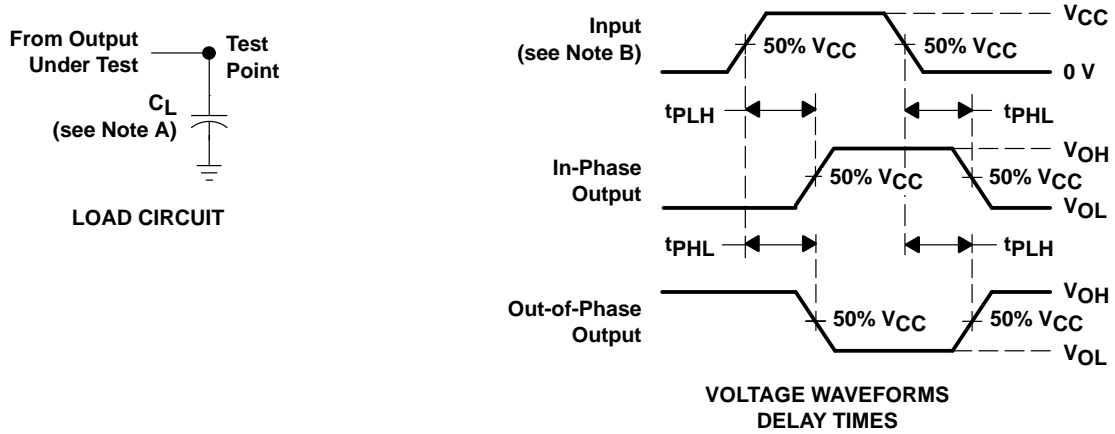
operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		TYP	UNIT
$C_{pd}$	Power dissipation capacitance	No load,	$f = 1\text{ MHz}$	17	pF



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PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. Input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .  
C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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