

SN54AHCT86, SN74AHCT86 QUADRUPL 2-INPUT EXCLUSIVE-OR GATES

SCLS250F – OCTOBER 1995 – REVISED JULY 1997

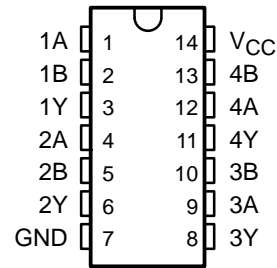
- Inputs Are TTL-Voltage Compatible
- **EPIC™** (Enhanced-Performance Implanted CMOS) Process
- High Latch-Up Immunity Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Very Small-Outline (DGV), and Thin Shrink Small-Outline (PW) Packages, Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

description

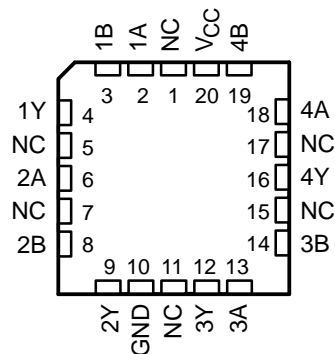
The 'AHCT86 are quadruple 2-input exclusive-OR gates. These devices perform the Boolean function $Y = A \oplus B$ or $Y = \overline{A}B + A\overline{B}$ in positive logic.

The SN54AHCT86 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AHCT86 is characterized for operation from -40°C to 85°C .

SN54AHCT86 . . . J OR W PACKAGE
SN74AHCT86 . . . D, DB, DGV, N, OR PW PACKAGE
(TOP VIEW)



SN54AHCT86 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE
(each gate)

INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L



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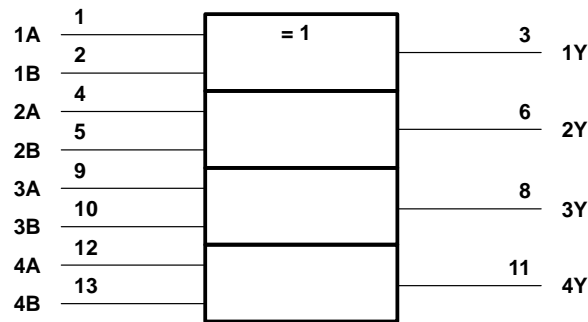
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SN54AHCT86, SN74AHCT86

QUADRUPLE 2-INPUT EXCLUSIVE-OR GATES

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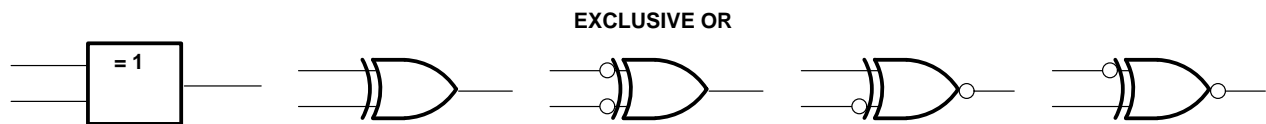
logic symbol†



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

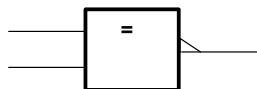
exclusive-OR logic

An exclusive-OR gate has many applications, some of which can be represented better by alternative logic symbols.



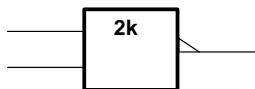
These are five equivalent exclusive-OR symbols valid for an SN74AHCT86 gate in positive logic; negation may be shown at any two ports.

LOGIC-IDENTITY ELEMENT



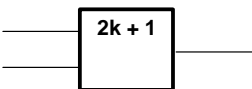
The output is active (low) if all inputs stand at the same logic level (i.e., $A = B$).

EVEN-PARITY ELEMENT



The output is active (low) if an even number of inputs (i.e., 0 or 2) are active.

ODD-PARITY ELEMENT



The output is active (high) if an odd number of inputs (i.e., only 1 of the 2) are active.

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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, 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, θ_{JA} (see Note 2): D package	127°C/W
DB package	158°C/W
DGV package	182°C/W
N package	78°C/W
PW package	170°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. The package thermal impedance is calculated in accordance with JEDEC 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions (see Note 3)

		SN54AHCT86		SN74AHCT86		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	4.5	5.5	4.5	5.5	V
V_{IH}	High-level input voltage	2		2		V
V_{IL}	Low-level input voltage		0.8		0.8	V
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		–8		–8	mA
I_{OL}	Low-level output current		8		8	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		20		20	ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

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

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			SN54AHCT86		SN74AHCT86		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$I_{OH} = -50 \mu\text{A}$	4.5 V	4.4	4.5		4.4		4.4		V
	$I_{OH} = -8 \text{ mA}$		3.94			3.8		3.8		
V_{OL}	$I_{OL} = 50 \mu\text{A}$	4.5 V			0.1		0.1		0.1	V
	$I_{OL} = 8 \text{ mA}$				0.36		0.44		0.44	
I_I	$V_I = V_{CC}$ or GND	5.5 V			±0.1		±1		±1	μA
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			2		20		20	μA
ΔI_{CC}^\ddagger	One input at 3.4 V, Other inputs at V_{CC} or GND	5.5 V			1.35		1.5		1.5	mA
C_i	$V_I = V_{CC}$ or GND	5 V			4 10				10	pF

[‡] This is the increase in supply current for each input at one of the specified TTL voltage levels rather than 0 V or V_{CC} .



SN54AHCT86, SN74AHCT86

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**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	SN54AHCT86				UNIT
				T _A = 25°C			MIN	MAX
				MIN	TYP	MAX		
t _{PLH} *	A or B	Y	C _L = 15 pF	5	6.9	1	8	ns
t _{PHL} *				5	6.9	1	8	
t _{PLH}	A or B	Y	C _L = 50 pF	5.5	8.8	1	10	ns
t _{PHL}				5.5	8.8	1	10	

* On products compliant to MIL-PRF-38535, this parameter is warranted but 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	SN74AHCT86				UNIT
				T _A = 25°C			MIN	MAX
				MIN	TYP	MAX		
t _{PLH}	A or B	Y	C _L = 15 pF	5	6.9	1	8	ns
t _{PHL}				5	6.9	1	8	
t _{PLH}	A or B	Y	C _L = 50 pF	5.5	8.8	1	10	ns
t _{PHL}				5.5	8.8	1	10	

noise characteristics, V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C (see Note 4)

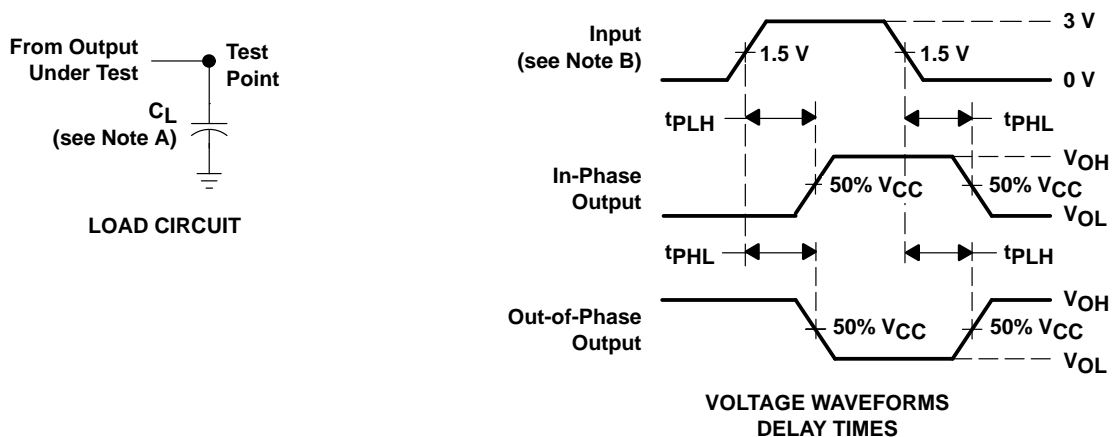
PARAMETER		SN74AHCT86			UNIT
		MIN	TYP	MAX	
V _{OL(P)}	Quiet output, maximum dynamic V _{OL}	0.4	0.8		V
V _{OL(V)}	Quiet output, minimum dynamic V _{OL}	−0.4	−0.8		V
V _{OH(V)}	Quiet output, minimum dynamic V _{OH}	4.4			V
V _{IH(D)}	High-level dynamic input voltage	2			V
V _{IL(D)}	Low-level dynamic input voltage			0.8	V

NOTE 4: Characteristics are for surface-mount packages only. These parameters are warranted but not production tested.

operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		TYP	UNIT
C _{pd}	Power dissipation capacitance	No load,	f = 1 MHz	18	pF

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
B. Input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 3$ ns, $t_f = 3$ 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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