

74AC/ACT11520

8-Bit Identity Comparator with Input Pull-Up

Product Specification

ACL Products

FEATURES

- Compares two 8-bit words
- Output capability: ± 24 mA
- CMOS (AC) and TTL (ACT) voltage level inputs
- 50 Ω incident wave switching
- Center-pin V_{CC} and ground configuration to minimize high-speed switching noise
- I_{CC} category: MSI

DESCRIPTION

The 74AC/ACT11520 high-performance CMOS devices combine very high speed and high output drive comparable to the most advanced TTL families.

The 74AC/ACT11520 identity comparators perform comparisons on two 8-bit binary or BCD words and provides a Low output when the two words match bit for bit.

The 74AC/ACT11520 identity comparators also feature 20-k ohm pull-up termination resistors on the Q inputs for analog or switch data and a provision for $\overline{P=Q}$ totem-pole outputs.

GENERAL INFORMATION

SYMBOL	PARAMETER	CONDITIONS $T_A = 25^\circ\text{C}; \text{GND} = 0\text{V};$ $V_{CC} = 5.0\text{V}$	TYPICAL		UNIT
			AC	ACT	
t_{PLH}' t_{PHL}	Propagation delay P_n or Q_n to $\overline{P=Q}$	$C_L = 50\text{pF}$	7.6	8.3	ns
C_{PD}	Power dissipation capacitance ¹	$f = 1\text{MHz}; C_L = 50\text{pF}$	42	40	pF
C_{IN}	Input capacitance	$V_I = 0\text{V}$ or V_{CC}	3.5	3.5	pF
I_{LATCH}	Latch-up current	Per Jeduc JC40.2 Standard 17	500	500	mA

Note:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$$

f_i = input frequency in MHz, C_L = output load capacitance in pF,

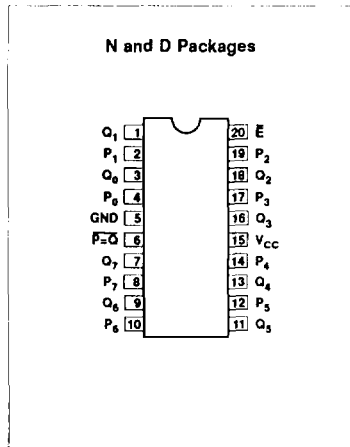
f_o = output frequency in MHz, V_{CC} = supply voltage in V,

$\sum (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs

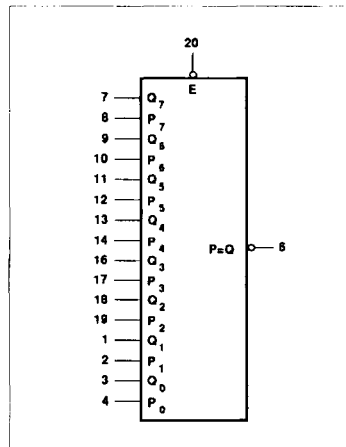
ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE
20-pin plastic DIP (300mil-wide)	-40°C to +85°C	74AC11520N 74ACT11520N
20-pin plastic SO (300mil-wide)	-40°C to +85°C	74AC11520D 74ACT11520D

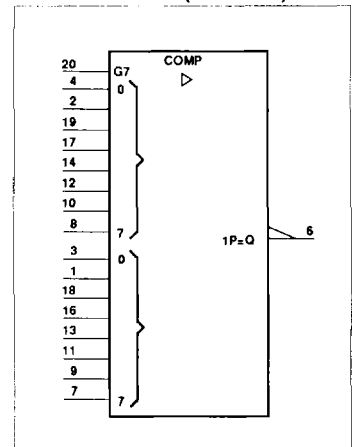
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



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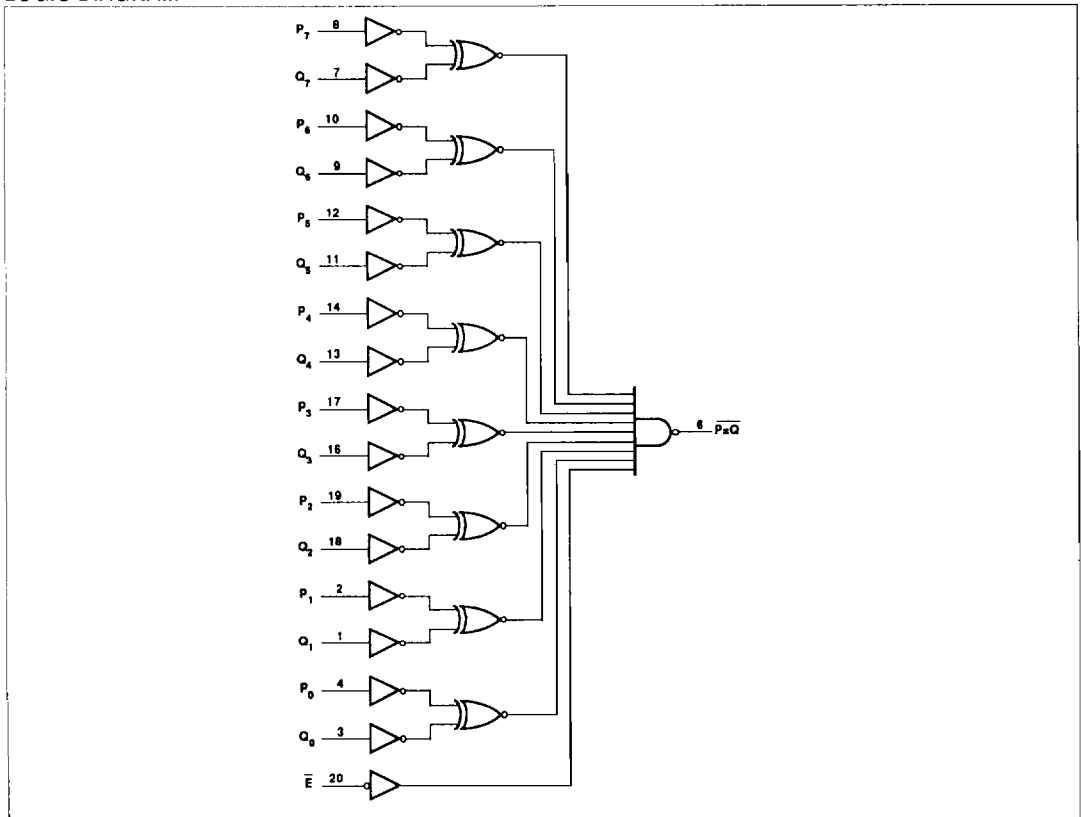
PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
4, 2, 19, 17 14, 12, 10, 8	P_0 to P_7	Data inputs
3, 1, 18, 16 13, 11, 9, 7	Q_0 to Q_7	Data inputs
20	\bar{E}	Enable input (active Low)
6	$\overline{P=Q}$	Output
5	GND	Ground (0V)
15	V_{CC}	Positive supply voltage

FUNCTION TABLE

INPUTS		OUTPUT
DATA P, Q	ENABLE \bar{E}	$\overline{P=Q}$
$P = Q$	L	L
$P > Q$	L	H
$P < Q$	L	H
X	H	H

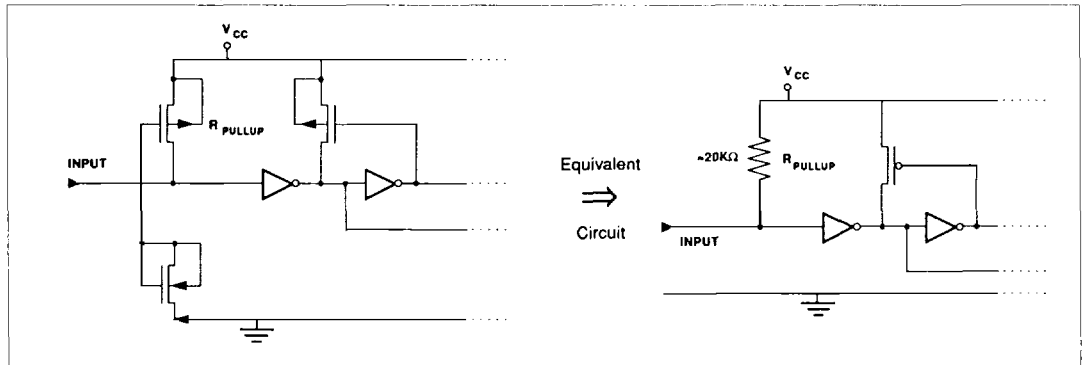
LOGIC DIAGRAM



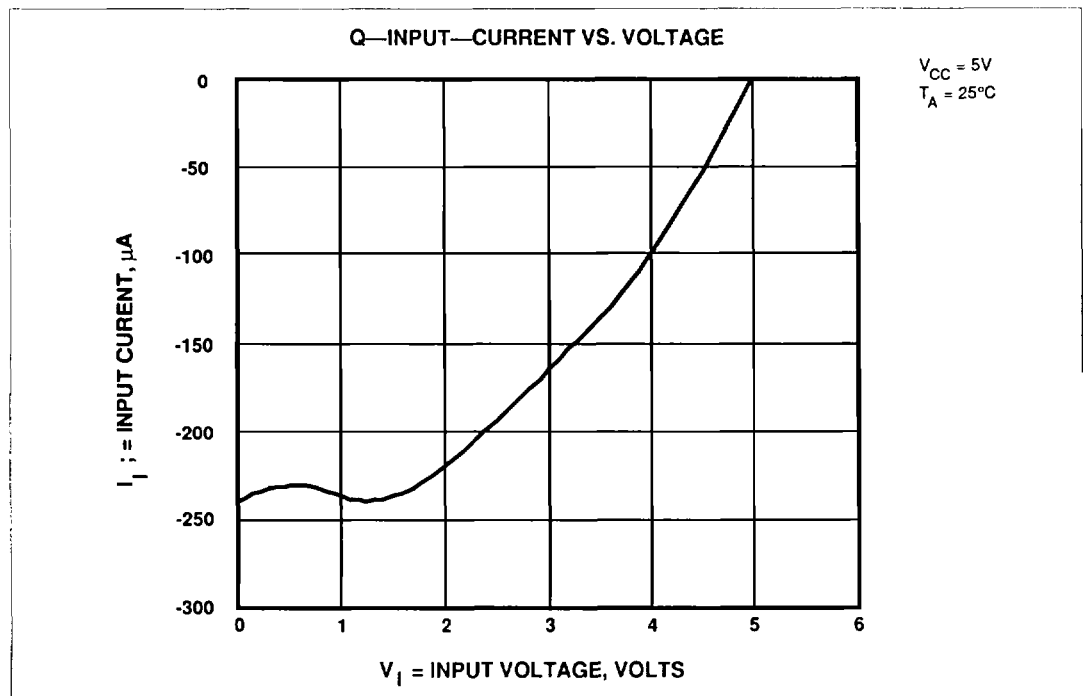
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Q-INPUT SCHEMATIC



TYPICAL Q-INPUT CHARACTERISTICS



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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	74AC11520			74ACT11520			UNIT
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	DC supply voltage	3.0 ¹	5.0	5.5	4.5	5.0	5.5	V
V_I	Input voltage	0		V_{CC}	0		V_{CC}	V
V_O	Output voltage	0		V_{CC}	0		V_{CC}	V
$\Delta t/\Delta v$	Input transition rise or fall rate	0		10	0		10	ns/V
T_A	Operating free-air temperature	-40		+85	-40		+85	°C

NOTE:

- No electrical or switching characteristics are specified at $V_{CC} < 3V$. Operation between 2V and 3V is not recommended, but within that range, a device output will maintain a previously established logic state.

ABSOLUTE MAXIMUM RATINGS¹

SYMBOL	PARAMETER	TEST CONDITIONS	RATING	UNIT
V_{CC}	DC supply voltage		-0.5 to +7.0	V
I_{IK} or V_I	DC input diode current ²	$V_I < 0$	-20	mA
		$V_I > V_{CC}$	20	
	DC input voltage		-0.5 to $V_{CC} + 0.5$	V
I_{OK} or V_O	DC output diode current ²	$V_O < 0$	-50	mA
		$V_O > V_{CC}$	50	
	DC output voltage		-0.5 to $V_{CC} + 0.5$	V
I_O	DC output source or sink current per output pin	$V_O = 0$ to V_{CC}	±50	mA
I_{CC} or I_{GND}	DC V_{CC} current		±100	mA
	DC ground current		±100	
T_{STG}	Storage temperature		-65 to 150	°C
P_{TOT}	Power dissipation per package Plastic DIP	Above 70°C: derate linearly by 8mW/K	500	mW
	Power dissipation per package Plastic surface mount (SO)	Above 70°C: derate linearly by 6mW/K	400	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.

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DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	V _{CC}	74AC11520				74ACT11520				UNIT	
				T _A = +25°C		T _A = -40°C to +85°C		T _A = +25°C		T _A = -40°C to +85°C			
				Min	Max	Min	Max	Min	Max	Min	Max		
V _{IH}	High-level input voltage		3.0	2.10		2.10						V	
			4.5	3.15		3.15		2.0		2.0			
			5.5	3.85		3.85		2.0		2.0			
V _{IL}	Low-level input voltage		3.0		0.90		0.90					V	
			4.5		1.35		1.35	0.8		0.8			
			5.5		1.65		1.65	0.8		0.8			
V _{OH}	High-level output voltage	V _I = V _{IL} or V _{IH} I _{OH} = -50μA	3.0	2.9		2.9						V	
			4.5	4.4		4.4		4.4		4.4			
			5.5	5.4		5.4		5.4		5.4			
			I _{OH} = -4mA	3.0	2.58		2.48						
				4.5	3.94		3.8		3.94		3.8		
				5.5	4.94		4.8		4.94		4.8		
			I _{OH} = -75mA [†]	5.5			3.85				3.85		
V _{OL}	Low-level output voltage	V _I = V _{IL} or V _{IH} I _{OL} = 50μA	3.0		0.1		0.1					V	
			4.5		0.1		0.1	0.1		0.1			
			5.5		0.1		0.1	0.1		0.1			
			I _{OL} = 12mA	3.0		0.36		0.44					
				4.5		0.36		0.44	0.36		0.44		
				5.5		0.36		0.44	0.36		0.44		
			I _{OL} = 75mA [†]	5.5				1.65					1.65
I _I	Input leakage current [†]	P and \bar{E} inputs only V _I = V _{CC} or GND	5.5		±0.1		±1.0		±0.1		±1.0	μA	
I _{CC}	Quiescent supply current [†]	Q inputs open; P and \bar{E} inputs, V _I = V _{CC} or GND	5.5		8.0		80		8.0		80	μA	
ΔI _{CC}	Supply current, TTL inputs High ²	Q inputs open; P and \bar{E} inputs, one input at 3.4V and other inputs at V _{CC} or GND	5.5						0.9		1.0	mA	

NOTES:

- Not more than one output should be tested at a time, and the duration of the test should not exceed 10ms.
 - This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0V or V_{CC}.
- [†] Refer to the following DC ELECTRICAL CHARACTERISTICS ADDENDUM table.

DC ELECTRICAL CHARACTERISTICS ADDENDUM

SYMBOL	PARAMETER	TEST CONDITIONS	V _{CC}	74AC11520				74ACT11520				UNIT
				T _A = +25°C		T _A = -40°C to +85°C		T _A = +25°C		T _A = -40°C to +85°C		
				Typ	Max	Min	Max	Typ	Max	Min	Max	
I _{IH}	Input current	Q inputs only, V _I = V _{CC}	5.5		10		10		10		10	μA
I _{IL}	Input current	Q inputs only, V _I = GND	5.5	-0.3	-0.6		-1.0	-0.3	-0.6		-1.0	mA
I _{CC}	Quiescent supply current	Q inputs, V _I = GND; P and \bar{E} inputs, V _I = V _{CC} or GND	5.5	2.3	4.8		8.0	2.3	4.8		8.0	mA

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AC ELECTRICAL CHARACTERISTICS AT 3.3V ±0.3V

SYMBOL	PARAMETER	WAVEFORM	74AC11520					UNIT
			T _A = +25°C			T _A = -40°C to +85°C		
			Min	Typ	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay P _n , Q _n to $\overline{P=Q}$	1	1.5	12.0	16.5	1.5	18.6	ns
t _{PLH} t _{PHL}	Propagation delay E to $\overline{P=Q}$	1	1.5	6.9	9.0	1.5	10.0	
			1.5	6.3	8.6	1.5	9.5	ns

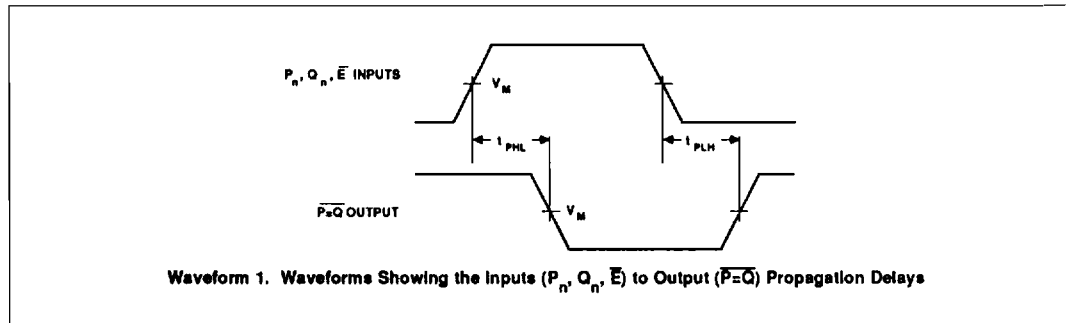
AC ELECTRICAL CHARACTERISTICS AT 5.0V ±0.5V

SYMBOL	PARAMETER	WAVEFORM	74AC11520					UNIT
			T _A = +25°C			T _A = -40°C to +85°C		
			Min	Typ	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay P _n , Q _n to $\overline{P=Q}$	1	1.5	8.1	11.1	1.5	12.6	ns
t _{PLH} t _{PHL}	Propagation delay E to $\overline{P=Q}$	1	1.5	4.9	6.6	1.5	7.4	
			1.5	4.8	7.1	1.5	7.8	ns

AC ELECTRICAL CHARACTERISTICS AT 5.0V ±0.5V

SYMBOL	PARAMETER	WAVEFORM	74ACT11520					UNIT
			T _A = +25°C			T _A = -40°C to +85°C		
			Min	Typ	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation delay P _n , Q _n to $\overline{P=Q}$	1	1.5	8.6	12.7	1.5	14.3	ns
t _{PLH} t _{PHL}	Propagation delay E to $\overline{P=Q}$	1	1.5	6.4	8.5	1.5	9.5	
			1.5	5.8	9.0	1.5	9.8	ns

AC WAVEFORMS



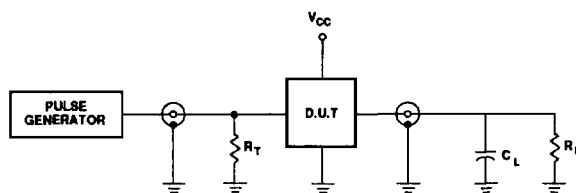
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WAVEFORM CONDITIONS

	INPUTS	OUTPUTS
AC	$V_{IN} = \text{GND to } V_{CC}$ $V_M = 50\% V_{CC}$	$V_{OUT} = V_{OL} \text{ to } V_{OH}$
ACT	$V_{IN} = \text{GND to } 3.0\text{V}$ $V_M = 1.5\text{V}$	$V_M = 50\% V_{CC}$

TEST CIRCUIT



Test Circuit

DEFINITIONS

C_L = Load capacitance, 50pF; includes jig and probe capacitance

R_L = Load resistor, 500 Ω

R_T = Termination resistance should be equal to Z_{OUT} of pulse generators

Input pulses: PRR \leq 10MHz

$t_r = t_f = 3\text{ns}$