

# 54AC11521, 74AC11521 8-BIT IDENTITY COMPARATORS

SCAS022A – D2957, JULY 1987 – REVISED APRIL 1993

- Compares Two 8-Bit Words
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin  $V_{CC}$  and GND Configurations Minimize High-Speed Switching Noise
- EPIC™ (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline Packages, Plastic Shrink Small-Outline Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs

## description

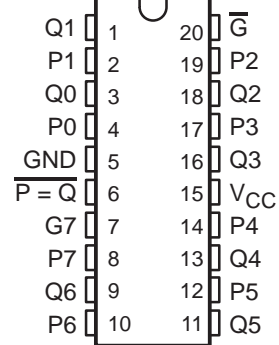
These identity comparators perform comparisons on two 8-bit binary or BCD words. Also included is a  $\overline{P = Q}$  totem-pole output.

The 54AC11521 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The 74AC11521 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

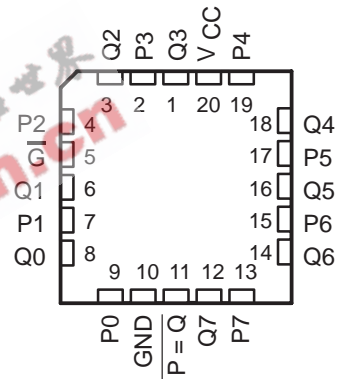
FUNCTION TABLE

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

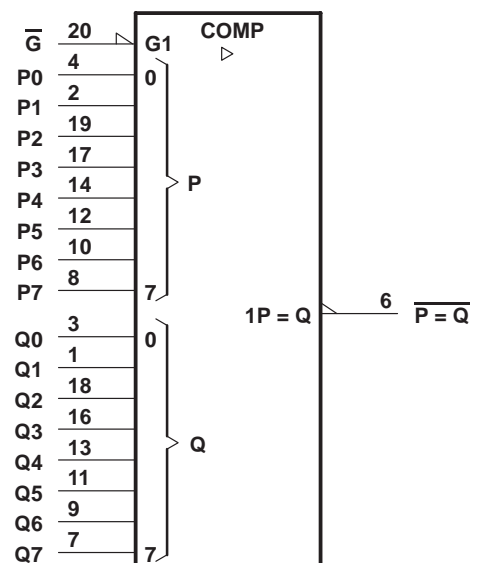
54AC11521 . . . J PACKAGE  
74AC11521 . . . DB, DW OR N PACKAGE  
(TOP VIEW)



54AC11521 . . . FK PACKAGE  
(TOP VIEW)



## logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pins numbers shown are for the DW, J, and N packages.

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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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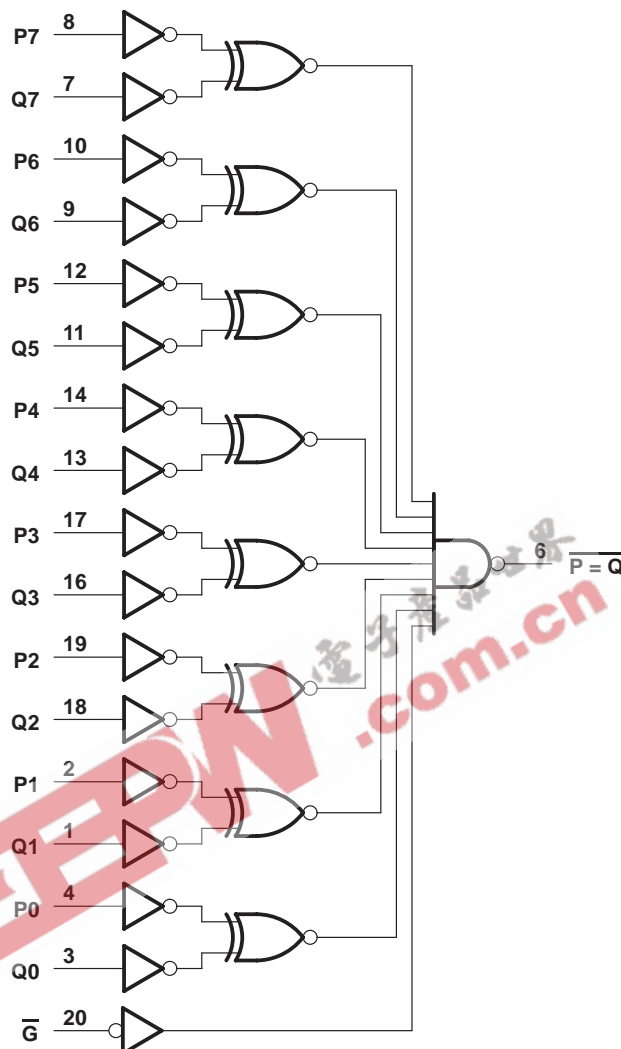
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2-1

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## logic diagram (positive logic)



Pin numbers shown are for the DW, J, and N packages.

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

Supply voltage range, $V_{CC}$ .....	-0.5 V to 6 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1) .....	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) .....	$\pm 50$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 100$ mA
Storage temperature range .....	-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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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SCAS022A – D2957, JULY 1987 – REVISED APRIL 1993

## recommended operating conditions

		54AC11521			74AC11521			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	3	5	5.5	3	5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 3\text{ V}$	2.1		2.1			V
		$V_{CC} = 4.5\text{ V}$	3.15		3.15			
		$V_{CC} = 5.5\text{ V}$	3.85		3.85			
$V_{IL}$	Low-level input voltage	$V_{CC} = 3\text{ V}$			0.9			V
		$V_{CC} = 4.5\text{ V}$			1.35			
		$V_{CC} = 5.5\text{ V}$			1.65			
$V_I$	Input voltage	0		$V_{CC}$	0		$V_{CC}$	V
$V_O$	Output voltage	0		$V_{CC}$	0		$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 3\text{ V}$			-4			mA
		$V_{CC} = 4.5\text{ V}$			-24			
		$V_{CC} = 5.5\text{ V}$			-24			
$I_{OL}$	Low-level output current	$V_{CC} = 3\text{ V}$			12			mA
		$V_{CC} = 4.5\text{ V}$			24			
		$V_{CC} = 5.5\text{ V}$			24			
$\Delta t/\Delta v$	Input transition rise or fall rate	0		10	0		10	ns/V
$T_A$	Operating free-air temperature	-55		125	-40		85	°C

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			54AC11521		74AC11521		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$I_{OH} = -50\ \mu\text{A}$	3 V	2.9			2.9		2.9	V	
		4.5 V	4.4			4.4		4.4		
		5.5 V	5.4			5.4		5.4		
	$I_{OH} = -4\text{ mA}$	3 V	2.58			2.4		2.48		
		4.5 V	3.94			3.7		3.8		
	$I_{OH} = -24\text{ mA}$	4.5 V	4.94			4.7		4.8		
		5.5 V				3.85				
$V_{OL}$	$I_{OL} = 50\ \mu\text{A}$	3 V			0.1		0.1	0.1	V	
		4.5 V			0.1		0.1	0.1		
		5.5 V			0.1		0.1	0.1		
	$I_{OL} = 12\text{ mA}$	3 V			0.36		0.5	0.44		
		4.5 V			0.36		0.5	0.44		
	$I_{OL} = 24\text{ mA}$	4.5 V			0.36		0.5	0.44		
		5.5 V			0.36		0.5	0.44		
$I_{OL} = 50\text{ mA}^\dagger$	5.5 V					1.65				
$I_{OL} = 75\text{ mA}^\dagger$	5.5 V						1.65			
$I_I$	$V_I = V_{CC}$ or GND	5.5 V			$\pm 0.1$		$\pm 1$	$\pm 1$	$\mu\text{A}$	
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			8		160	80	$\mu\text{A}$	
$C_i$	$V_I = V_{CC}$ or GND	5 V			4				pF	

$^\dagger$  Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			54AC11521		74AC11521		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	P or Q	$\overline{P = Q}$	1.5	12.5	16.6	1.5	20.4	1.5	19	ns
$t_{PHL}$			1.5	10.5	14.1	1.5	17.4	1.5	16.1	
$t_{PLH}$	G	$P = Q$	1.5	7.1	9.8	1.5	11.4	1.5	10.8	ns
$t_{PHL}$			1.5	6.4	8.8	1.5	10.8	1.5	10.1	

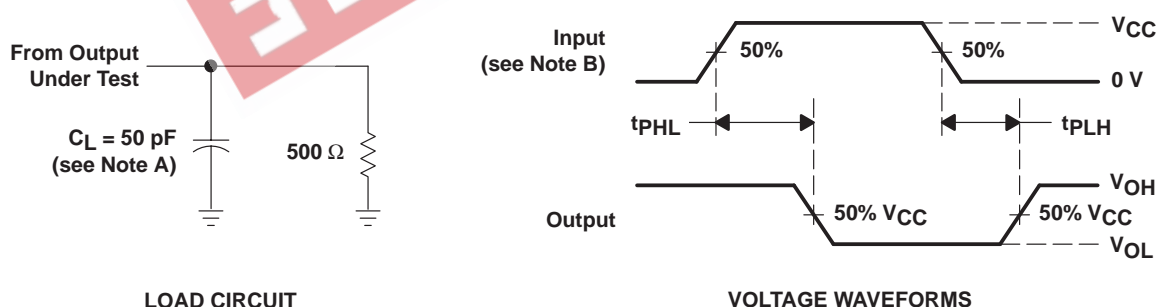
switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			54AC11521		74AC11521		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	P or Q	$\overline{P = Q}$	1.5	8.3	11.3	1.5	14	1.5	13	ns
$t_{PHL}$			1.5	7.2	10.1	1.5	12.2	1.5	11.4	
$t_{PLH}$	$\overline{G}$	$\overline{P = Q}$	1.5	5.1	7.1	1.5	8.4	1.5	7.9	ns
$t_{PHL}$			1.5	4.8	7.1	1.5	8.6	1.5	8.1	

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	$C_L = 50 \text{ pF}$ , $f = 1 \text{ MHz}$	42	pF

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .  
 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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