

# 54ACT11470, 74ACT11470 8-BIT REGISTERED BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCAS207 – D4016, APRIL 1993

- Inputs Are TTL-Voltage Compatible
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin  $V_{CC}$  and GND Configuration Minimizes 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, Ceramic Chip Carriers, and Standard Ceramic 300-mil DIPs

## description

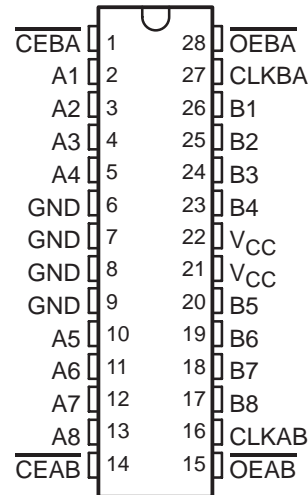
The 'ACT11470 is an 8-bit registered bus transceiver that contains two sets of D-type flip-flops for temporary storage of data flowing in either direction. Separate clock (CLKAB or CLKBA) and output-enable ( $\overline{OEAB}$  or  $\overline{OEBA}$ ) inputs are provided for each register to permit independent control in either direction of data flow.

The A-to-B enable ( $\overline{CEAB}$ ) input must be low in order to enter data from A or to output data to B. If both  $\overline{CEAB}$  and CLKAB are low, then the B port presents the level of the A port prior to the most recent low-to-high transition of CLKAB. Data flow from B to A is similar, but requires the use of  $\overline{CEBA}$ , CLKBA, and  $\overline{OEBA}$  inputs.

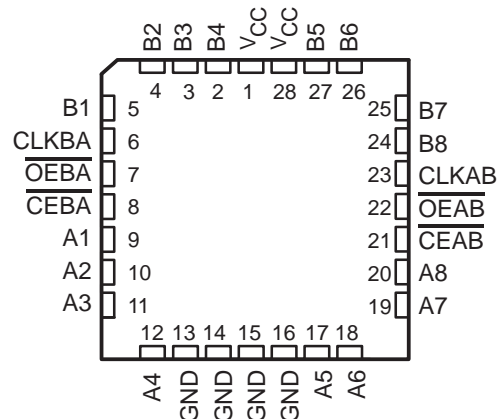
To avoid false clocking of the flip-flops,  $\overline{CEAB}$  and  $\overline{CEBA}$  should not be switched from low to high while CLK is low.

The 54ACT11470 is characterized for operation over the full military temperature range of -55°C to 125°C. The 74ACT11470 is characterized for operation from -40°C to 85°C.

54ACT11470 ... JT PACKAGE  
74ACT11470 ... DW PACKAGE  
(TOP VIEW)



54AC11470 ... FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE†

INPUTS				OUTPUT
$\overline{CEAB}$	CLKAB	$\overline{OEAB}$	A	B
H	X	X	X	Z
X	X	H	X	Z
L	L	L	X	$B_0^\ddagger$
L	↑	L	L	L
L	↑	L	H	H

† A-to-B data flow is shown; B-to-A flow is similar but uses  $\overline{CEBA}$ , CLKBA, and  $\overline{OEBA}$ .

‡ Output level before the indicated steady-state input conditions were established.

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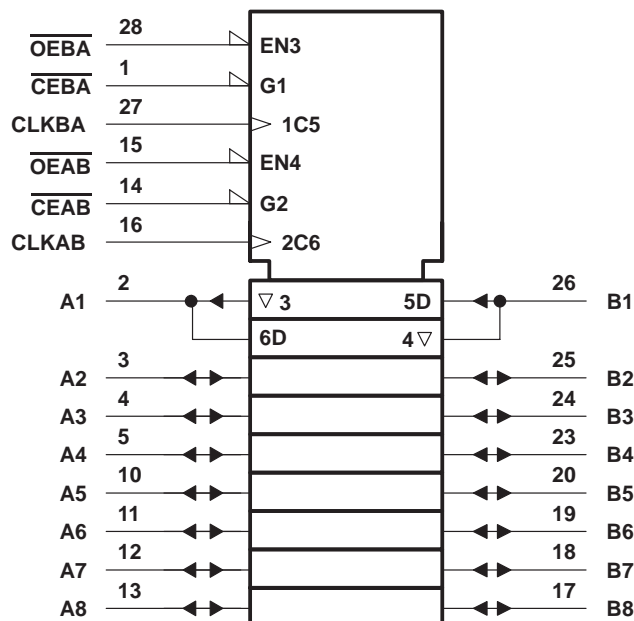


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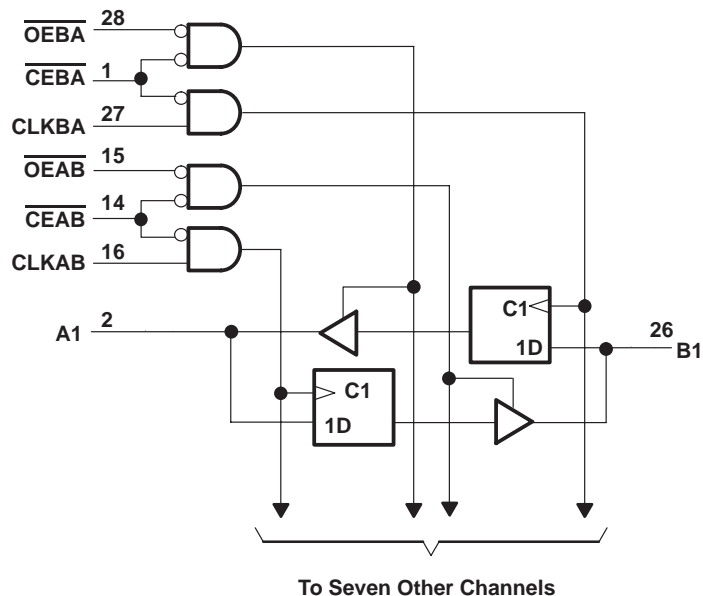
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## logic symbol†



## logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for the DW, JT, and NT packages.

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

Supply voltage range, $V_{CC}$ .....	-0.5 to 7 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 to $V_{CC} + 0.5$ V
Output voltage range, $V_O$ (see Note 1) .....	-0.5 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 .....	$\pm 200$ mA
Storage temperature range .....	-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.

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

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SCAS207 – D4016, APRIL 1993

## recommended operating conditions (see Note 2)

		54ACT11470			74ACT11470			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			2			V
V <sub>IL</sub>	Low-level input voltage			0.8			0.8	V
V <sub>I</sub>	Input voltage	0		V <sub>CC</sub>	0		V <sub>CC</sub>	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			-24			-24	mA
I <sub>OL</sub>	Low-level output current			24			24	mA
Δt/Δv	Input transition rise or fall rate	0		10	0		10	ns/V
T <sub>A</sub>	Operating free-air temperature	-55		125	-40		85	°C

NOTE 2: Unused or floating pins (input or I/O) must be held high or low.

## 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			54ACT11470		74ACT11470		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 μA	4.5 V	4.4			4.4		4.4	V		
		5.5 V	5.4			5.4		5.4			
	I <sub>OH</sub> = -24 mA	4.5 V	3.94			3.7		3.8			
		5.5 V	4.94			4.7		4.8			
	I <sub>OH</sub> = -50 mA <sup>†</sup>	5.5 V				3.85					
I <sub>OH</sub> = -75 mA <sup>†</sup>	5.5 V						3.85				
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	4.5 V			0.1		0.1	0.1	V		
		5.5 V			0.1		0.1	0.1			
	I <sub>OL</sub> = 24 mA	4.5 V			0.36		0.5	0.44			
		5.5 V			0.36		0.5	0.44			
	I <sub>OL</sub> = 50 mA <sup>†</sup>	5.5 V					1.65				
I <sub>OL</sub> = 75 mA <sup>†</sup>	5.5 V						1.65				
I <sub>I</sub>	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V			±0.1		±1	±1	μA	
I <sub>OZ</sub> <sup>‡</sup>	A or B ports	V <sub>O</sub> = V <sub>CC</sub> or GND	5.5 V			±0.5		±10	±5	μA	
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			8		160	80	μA	
ΔI <sub>CC</sub> <sup>§</sup>		One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	5.5 V			0.9		1	1	mA	
C <sub>i</sub>	Control inputs	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V			4.5				pF	
C <sub>io</sub>	A or B ports	V <sub>O</sub> = V <sub>CC</sub> or GND	5 V			12				pF	

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

<sup>‡</sup> For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

<sup>§</sup> This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V<sub>CC</sub>.

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

			$T_A = 25^\circ\text{C}$		54ACT11470		74ACT11470		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
$f_{\text{clock}}$	Clock frequency		0	90	0	90	0	90	MHz
$t_w$	Pulse duration	CLK high or low	5.5		5.5		5.5		ns
$t_{\text{su}}$	Setup time	Data before $\text{CLK}\uparrow$	2		2		2		ns
		Data before $\overline{\text{CEAB}}\uparrow$ or $\overline{\text{CEBA}}\uparrow$	2		2		2		
$t_h$	Hold time	Data after $\text{CLK}\uparrow$	3		3		3		ns
		Data after $\overline{\text{CEAB}}\uparrow$ or $\overline{\text{CEBA}}\uparrow$	3		3		3		

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)	$T_A = 25^\circ\text{C}$			54ACT11470		74ACT11470		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$f_{\text{max}}$			90			90		90		MHz
$t_{\text{PLH}}$	CLKAB or CLKBA	A or B	3.4	7.3	9	3.4	10.7	3.4	10.1	ns
$t_{\text{PHL}}$			4.2	8.3	10.2	4.2	12	4.2	11.4	
$t_{\text{PZH}}$	$\overline{\text{OEAB}}$ or $\overline{\text{OEBA}}$	B or A	3	7	9.5	3	11.5	3	10.5	ns
$t_{\text{PZL}}$			4.3	8.6	11.4	4.3	15	4.3	13.7	
$t_{\text{PHZ}}$	$\overline{\text{OEAB}}$ or $\overline{\text{OEBA}}$	B or A	4.5	7.9	9.6	4.5	11	4.5	10.5	ns
$t_{\text{PLZ}}$			5.1	7.7	9.5	5.1	10.7	5.1	10.2	
$t_{\text{PZH}}$	$\overline{\text{CEAB}}$ or $\overline{\text{CEBA}}$	B or A	3.4	7.3	10	3.4	12	3.4	11.1	ns
$t_{\text{PZL}}$			4.6	9	11.9	4.6	15.5	4.6	14.2	
$t_{\text{PHZ}}$	$\overline{\text{CEAB}}$ or $\overline{\text{CEBA}}$	B or A	4.8	7.9	9.9	4.8	11.4	4.8	10.9	ns
$t_{\text{PLZ}}$			5.1	7.9	9.8	5.1	11.2	5.1	10.7	

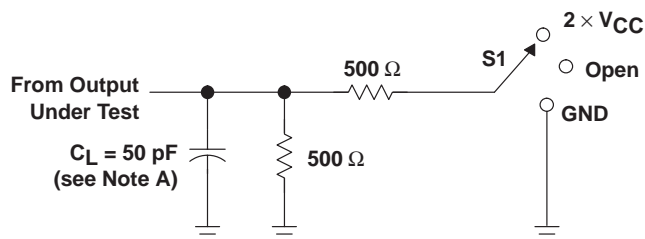
operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
$C_{\text{pd}}$	Power dissipation capacitance per transceiver	Outputs enabled	41	pF
		Outputs disabled	27	

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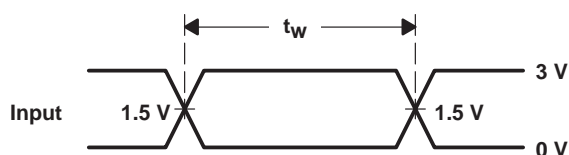


PARAMETER MEASUREMENT INFORMATION

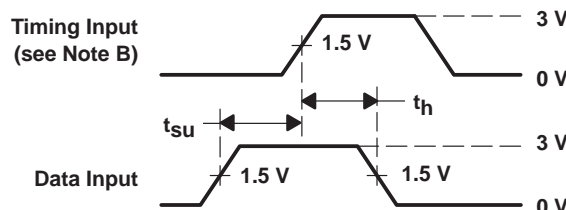


LOAD CIRCUIT

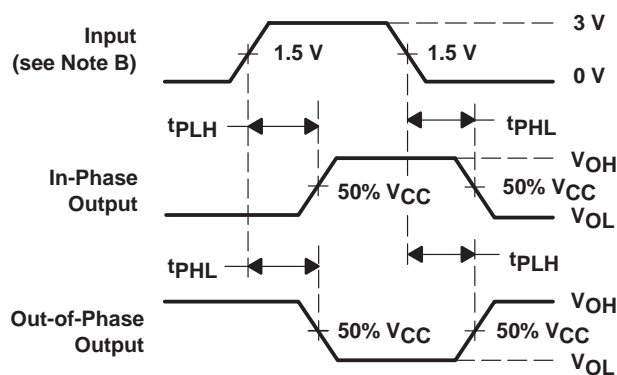
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



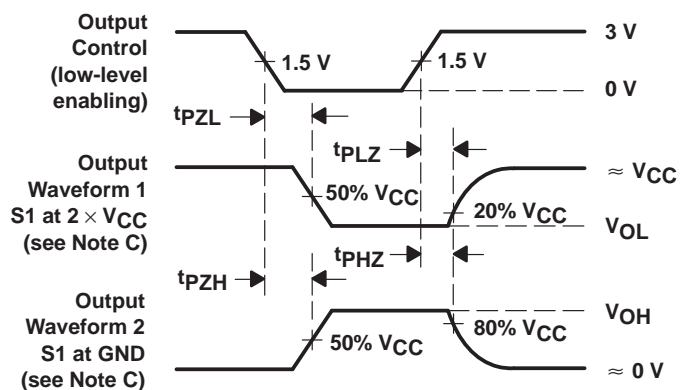
VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS

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