

# 54LS245 Transceiver

Octal Transceiver (3-State)

*Product Specification*

Military Logic Products

### FEATURES

- Octal bidirectional bus interface
- 3-State buffer outputs
- PNP inputs for reduced loading
- Hysteresis on all Data inputs

### DESCRIPTION

The 54LS245 is an octal transceiver featuring non-inverting 3-State bus compatible outputs in both send and receive directions. The outputs are all capable of sinking 12mA and sourcing up to 15mA, producing very good capacitive drive characteristics. The device features a Chip Enable (CE) input for easy cascading and a Send/Receive (S/R) input for direction control. All data inputs have hysteresis built in to minimize AC noise effects.

### ORDERING INFORMATION

DESCRIPTION	ORDER CODE
20-Pin Ceramic DIP	54LS245/BRA
20-Pin Ceramic FlatPack	54LS245/BSA
20-Pin Ceramic LLCC	54LS245/B2A

### FUNCTION TABLE

INPUTS		INPUTS/OUTPUTS	
CE	S/R	A <sub>n</sub>	B <sub>n</sub>
L	L	A = B	INPUT
L	H	INPUT	B = A
H	X	(Z)	(Z)

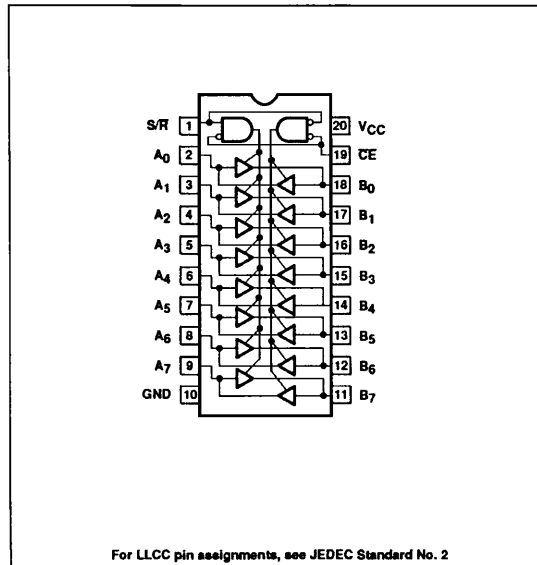
H = High voltage level  
 L = Low voltage level  
 X = Don't care  
 (Z) = High impedance (off) state

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

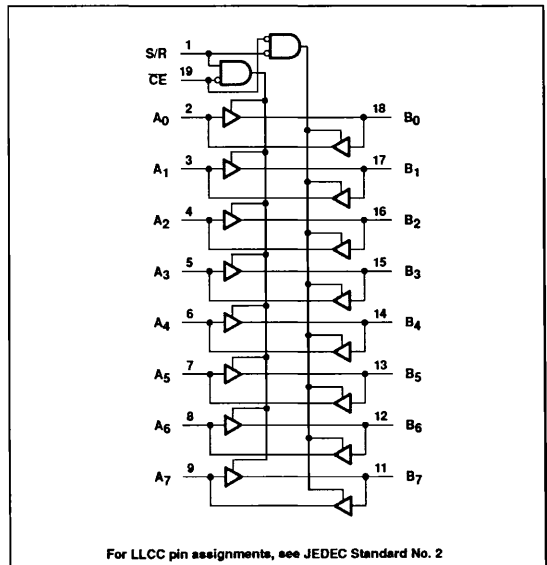
PINS	DESCRIPTION	54LS
All	Inputs	1LSUL
All	Outputs	30LSUL

NOTE: Where a 54LS Unit Load (LSUL) is 20μA I<sub>IH</sub> and -0.4mA I<sub>IL</sub>.

### PIN CONFIGURATION



### LOGIC SYMBOL



## Transceiver

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**ABSOLUTE MAXIMUM RATINGS** (Over operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	RATING	UNIT
V <sub>CC</sub>	Supply voltage	7.0	V
V <sub>I</sub>	Input voltage range	-0.5 to +7.0	V
I <sub>I</sub>	Input current range	-30 to +1	mA
V <sub>O</sub>	Voltage applied to output in High output state range	-0.5 to +V <sub>CC</sub>	V
T <sub>STG</sub>	Storage temperature range	-65 to +150	°C

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS			UNIT
		Min	Nom	Max	
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0			V
V <sub>IL</sub>	Low-level input voltage			+0.7	V
I <sub>IK</sub>	Input clamp current			-18	mA
I <sub>OH</sub>	High-level output current			-12	mA
I <sub>OL</sub>	Low-level output current			12	mA
T <sub>A</sub>	Operating free-air temperature range	-55		+125	°C

**DC ELECTRICAL CHARACTERISTICS** (Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT
			Min	Typ <sup>2</sup>	Max	
ΔV <sub>T</sub>	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> ) <sup>5</sup>	V <sub>CC</sub> = Min	0.2	0.4		V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = Min, V <sub>IH</sub> = Min, V <sub>IL</sub> = 0.5V, I <sub>OH</sub> = Max	2.0			V
		V <sub>CC</sub> = Min, V <sub>IH</sub> = Min, V <sub>IL</sub> = Max, I <sub>OH</sub> = -3mA	2.4	3.4		V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = Min, V <sub>IH</sub> = Min, V <sub>IL</sub> = Max, I <sub>OL</sub> = Max			0.4	V
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = I <sub>IK</sub>			-1.5	V
I <sub>OZH</sub>	Offstate output current, High-level voltage applied	V <sub>CC</sub> = Max, V <sub>O</sub> = 2.7V, CE = 2.0V			20	μA
I <sub>OZL</sub>	Offstate output current, Low-level voltage applied	V <sub>CC</sub> = Max, V <sub>O</sub> = 0.4V, CE = 2.0V			-20	μA
I <sub>IH2</sub>	Input current at maximum input voltage	V <sub>CC</sub> = Max	V <sub>I</sub> = 5.5V	A, B inputs	0.1	mA
			V <sub>I</sub> = 7.0V	S/R, CE inputs	0.1	mA
I <sub>IH1</sub>	High-level input current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V			20	μA
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			-0.2	mA
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = Max	-40		-130	mA
I <sub>CC</sub>	Supply current <sup>4</sup> (total)	V <sub>CC</sub> = Max	I <sub>CC</sub> H Outputs High	48	70	mA
			I <sub>CC</sub> L Outputs Low	62	90	mA
			I <sub>CC</sub> Z Outputs Off	64	95	mA

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AC ELECTRICAL CHARACTERISTICS  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}$ 

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITSS		UNIT
			$C_L = 50\text{pF}$		
			Min	Max	
$t_{PLH}$	Propagation delay	Waveform 1		12	ns
$t_{PHL}$	Propagation delay	Waveform 1		12	ns
$t_{PZH}$	Enable to High	Waveform 2		40	ns
$t_{PZL}$	Enable to Low	Waveform 3		40	ns
$t_{PHZ}$	Disable from High	Waveform 2, $C_L = 5\text{pF}^6$		25	ns
$t_{PLZ}$	Disable from Low	Waveform 3, $C_L = 5\text{pF}^6$		25	ns
$t_{PHZ}$	Disable from High	Waveform 2, $C_L = 50\text{pF}$		30	ns
$t_{PLZ}$	Disable from Low	Waveform 3, $C_L = 50\text{pF}$		27	ns

AC ELECTRICAL CHARACTERISTICS  $T_A = -55^\circ\text{C}$  and  $+125^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V}^5$ 

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITSS		UNIT
			$C_L = 50\text{pF}$		
			Min	Max	
$t_{PLH}$	Propagation delay	Waveform 1		16	ns
$t_{PHL}$	Propagation delay	Waveform 1		16	ns
$t_{PZH}$	Enable to High	Waveform 2		52	ns
$t_{PZL}$	Enable to Low	Waveform 3		52	ns
$t_{PHZ}$	Disable from High	Waveform 2, $C_L = 5\text{pF}^6$		33	ns
$t_{PLZ}$	Disable from Low	Waveform 3, $C_L = 5\text{pF}^6$		33	ns
$t_{PHZ}$	Disable from High	Waveform 2, $C_L = 50\text{pF}$		39	ns
$t_{PLZ}$	Disable from Low	Waveform 3, $C_L = 50\text{pF}$		35	ns

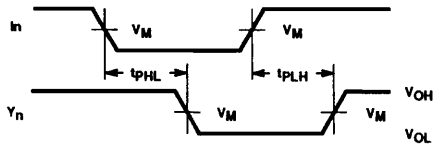
## NOTES:

1. For conditions shown as Min or Max, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at  $V_{CC} = 5\text{V}$ ,  $T_A = 25^\circ\text{C}$ .
3. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
4. Measure  $I_{CC}$  with outputs open.
5. These parameters are guaranteed, but not tested.
6. Guaranteed by the 50pF limits, but not tested.

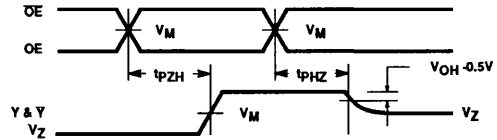
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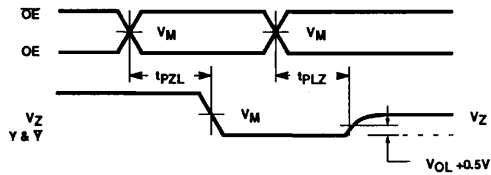
## AC WAVEFORMS



Waveform 1. Waveform for Non-Inverting Outputs



Waveform 2. 3-State Enable Time to High Level and Disable Time from High Level



Waveform 3. 3-State Enable Time to Low Level and Disable Time from Low Level

FAMILY	$V_M$	$V_{MZL}$	$V_{MZH}$	$V_Z$
54LSXXX	1.3V	0.7V	1.9V	1.45V

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## TEST CIRCUIT AND WAVEFORM

**Test Circuit for 54 3-State Outputs**

**Input Pulse Definition**

FAMILY	INPUT PULSE CHARACTERISTICS							
	$R_L$	$R_X$	$V_L$	$V_M$	Rep. Rate	$T_W$	$T_{TLH}$	$T_{THL}$
54LSXXX	110Ω	2.4kΩ	2.1V	1.3V	1MHz	500ns	≤15ns	≤6ns

Optional load for 54LSXXX only:  $R_B = 631\Omega$ ;  $V_B = 5.5V$  for all tests except  $T_{PHZ}$ ;  $V_B = -0.6V$  for  $T_{PHZ}$  test.

**DEFINITIONS:**

- $C_L$  = Load capacitance includes jig and probe capacitance; see AC Characteristics for value.
- $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of Pulse Generators.
- D = Diodes are 1N916, 1N3064, or equivalent.
- $V_X$  = Unlocked pins must be held at ≤0.8V, ≥2.7V or open per FunctionTable.