

# SN54HCT245, SN74HCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS020C – MARCH 1984 – REVISED MAY 1997

- Inputs Are TTL-Voltage Compatible
- High-Current 3-State Outputs Drive Bus Lines Directly or up to 15 LSTTL Loads
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

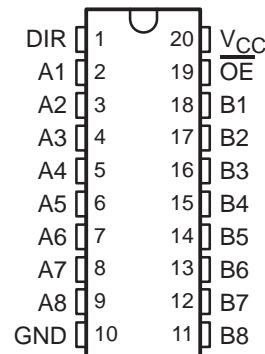
## description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

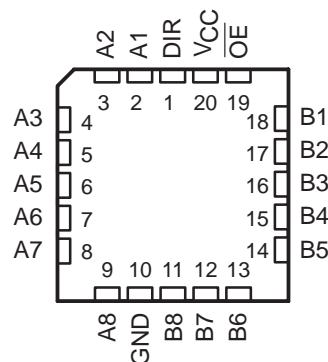
The devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

The SN54HCT245 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HCT245 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

SN54HCT245 . . . J OR W PACKAGE  
SN74HCT245 . . . DB, DW, N, OR PW PACKAGE  
(TOP VIEW)



SN54HCT245 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation



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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.

 **TEXAS  
INSTRUMENTS**

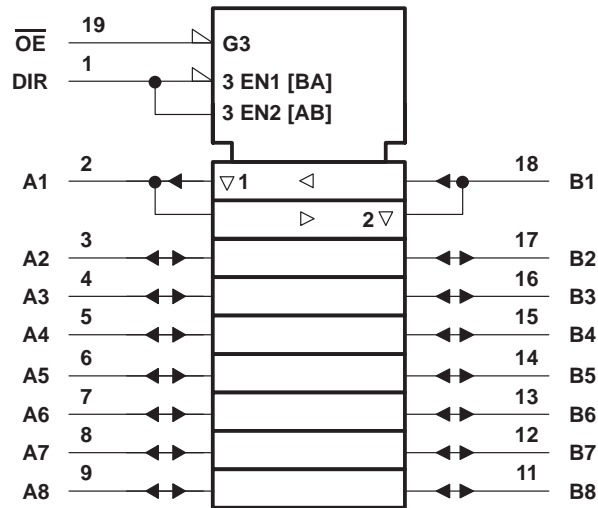
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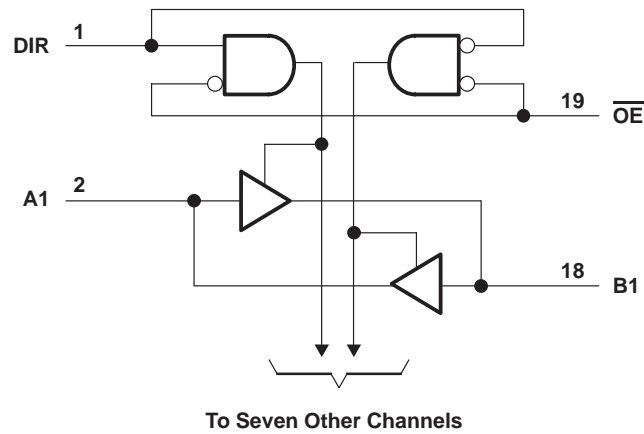
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## logic symbol†



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

## logic diagram (positive logic)



# SN54HCT245, SN74HCT245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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## absolute maximum ratings over operating free-air temperature range†

Supply voltage range, $V_{CC}$ .....	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1) .....	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1) .....	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	±35 mA
Continuous current through $V_{CC}$ or GND .....	±70 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package .....	115°C/W
DW package .....	97°C/W
N package .....	67°C/W
PW package .....	128°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 JESD 51, except for through-hole packages, which use a trace length of zero.

## recommended operating conditions

		SN54HCT245			SN74HCT245			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$			2			V
$V_{IL}$	Low-level input voltage	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$			0			V
$V_I$	Input voltage	0	$V_{CC}$		0	$V_{CC}$		V
$V_O$	Output voltage	0	$V_{CC}$		0	$V_{CC}$		V
$t_t$	Input transition (rise and fall) time	0			500			ns
$T_A$	Operating free-air temperature	–55			125			°C

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HCT245		SN74HCT245		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$V_I = V_{IH}$ or $V_{IL}$	4.5 V	$I_{OH} = -20\ \mu\text{A}$		4.4		4.4		V	
			$I_{OH} = -6\ \text{mA}$		3.98		3.7			
$V_{OL}$	$V_I = V_{IH}$ or $V_{IL}$	4.5 V	$I_{OL} = 20\ \mu\text{A}$		0.001		0.1		V	
			$I_{OL} = 6\ \text{mA}$		0.17		0.26			
$I_I$	DIR or $\overline{OE}$	$V_I = V_{CC}$ or 0	5.5 V			±0.1		±100		nA
$I_{OZ}$	A or B	$V_O = V_{CC}$ or 0	5.5 V			±0.01		±0.5		µA
$I_{CC}$		$V_I = V_{CC}$ or 0, $I_O = 0$	5.5 V			8		160		µA
$\Delta I_{CC}^\ddagger$		One input at 0.5 V or 2.4 V, Other inputs at 0 or $V_{CC}$	5.5 V			1.4		2.4		mA
$C_i^\S$	DIR or $\overline{OE}$	4.5 V to 5.5 V	4.5 V to 5.5 V			3		10		pF

‡ 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  $V_{CC}$ .

§ Parameter  $C_i$  does not apply to transceiver I/O ports.



**SN54HCT245, SN74HCT245  
OCTAL BUS TRANSCEIVERS  
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switching characteristics over recommended operating free-air temperature range,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HCT245		SN74HCT245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	B or A	4.5 V	16	22	33	28	ns			
			5.5 V	14	20	30	25				
$t_{en}$	$\overline{OE}$	A or B	4.5 V	25	46	69	58	ns			
			5.5 V	22	41	62	52				
$t_{dis}$	$\overline{OE}$	A or B	4.5 V	26	40	60	50	ns			
			5.5 V	23	36	54	45				
$t_t$		A or B	4.5 V	9	12	18	15	ns			
			5.5 V	8	11	16	14				

switching characteristics over recommended operating free-air temperature range,  $C_L = 150 \text{ pF}$  (unless otherwise noted) (see Figure 1)

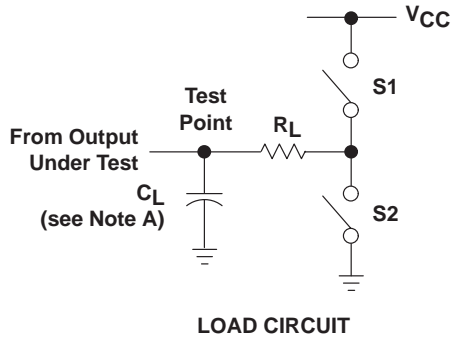
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HCT245		SN74HCT245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	B or A	4.5 V	20	30	45	38	ns			
			5.5 V	18	27	41	34				
$t_{en}$	$\overline{OE}$	A or B	4.5 V	36	59	89	74	ns			
			5.5 V	30	53	80	67				
$t_t$		A or B	4.5 V	17	42	63	53	ns			
			5.5 V	14	38	57	48				

operating characteristics,  $T_A = 25^\circ\text{C}$

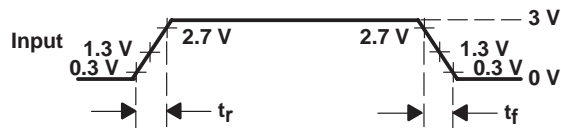
PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per transceiver	No load	40	pF



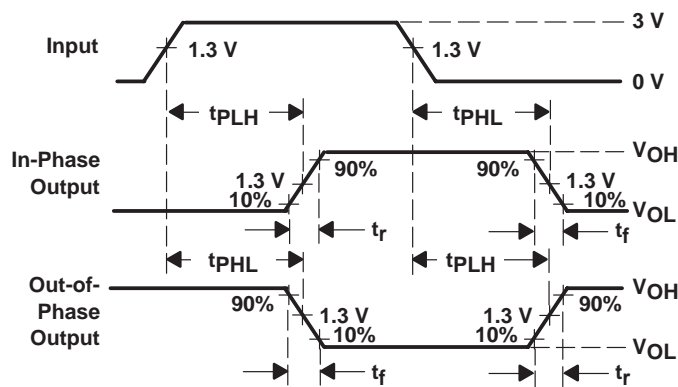
PARAMETER MEASUREMENT INFORMATION



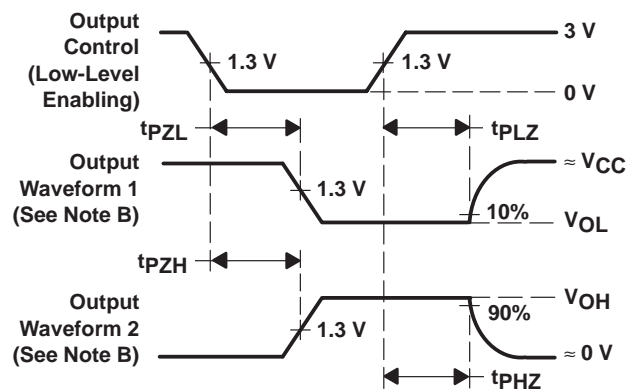
PARAMETER	$R_L$	$C_L$	S1	S2
$t_{en}$	1 k $\Omega$	50 pF or 150 pF	Open	Closed
			Closed	Open
$t_{dis}$	1 k $\Omega$	50 pF	Open	Closed
			Closed	Open
$t_{pd}$ or $t_t$	—	50 pF or 150 pF	Open	Open



VOLTAGE WAVEFORM  
INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY AND OUTPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

- NOTES:
- $C_L$  includes probe and test-fixture capacitance.
  - 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.
  - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
  - The outputs are measured one at a time with one input transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

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