

SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS230G – OCTOBER 1995 – REVISED JANUARY 2000

- **EPIC™** (Enhanced-Performance Implanted CMOS) Process
- Operating Range 2-V to 5.5-V V_{CC}
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), Thin Very Small-Outline (DGV), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs

description

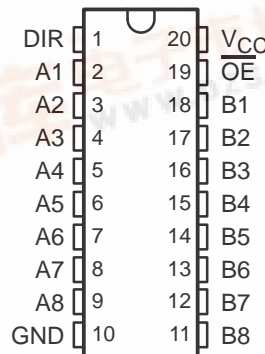
The 'AHC245 octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

These devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on 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.

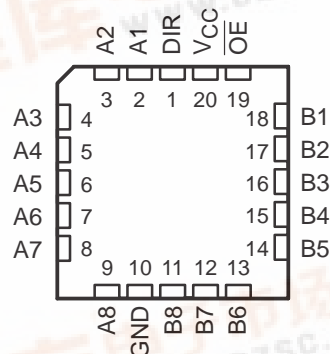
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54AHC245 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AHC245 is characterized for operation from -40°C to 85°C .

SN54AHC245 ... J OR W PACKAGE
SN74AHC245 ... DB, DGV, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54AHC245 ... FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each transceiver)

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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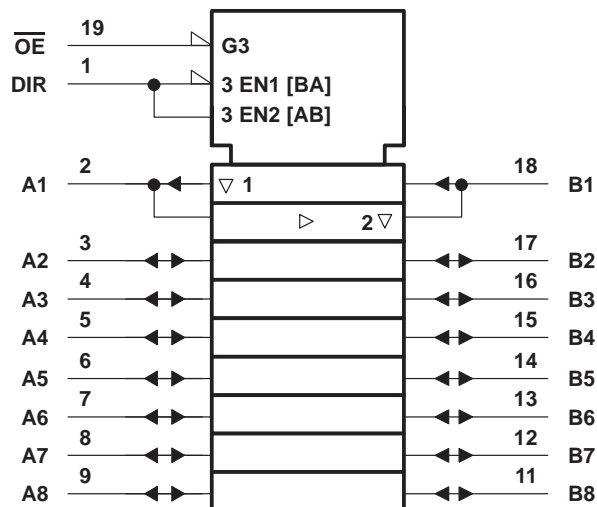


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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

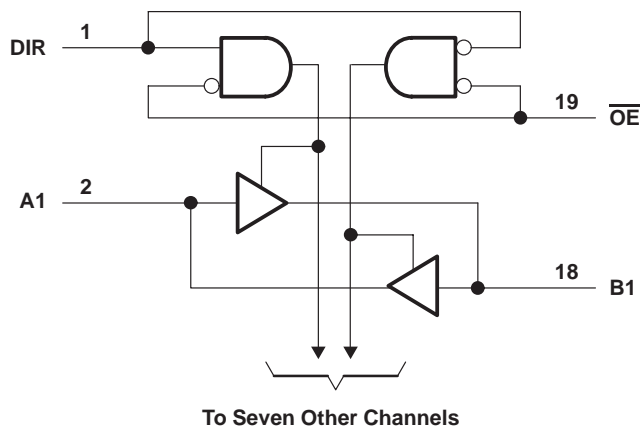
SCLS230G – OCTOBER 1995 – REVISED JANUARY 2000

logic symbol†



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

logic diagram (positive logic)



SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS230G – OCTOBER 1995 – REVISED JANUARY 2000

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±75 mA
Package thermal impedance, θ_{JA} (see Note 2): DB package	70°C/W
DGV package	92°C/W
DW package	58°C/W
N package	69°C/W
PW package	83°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.

recommended operating conditions (see Note 3)

			SN54AHC245		SN74AHC245		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage		2	5.5	2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5		1.5		V
		$V_{CC} = 3$ V	2.1		2.1		
		$V_{CC} = 5.5$ V	3.85		3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V		0.5		0.5	V
		$V_{CC} = 3$ V		0.9		0.9	
		$V_{CC} = 5.5$ V		1.65		1.65	
V_I	Input voltage	\overline{OE} or DIR	0	5.5	0	5.5	V
V_O	Output voltage	A or B	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V		–50		–50	µA
		$V_{CC} = 3.3$ V ± 0.3 V		–4		–4	mA
		$V_{CC} = 5$ V ± 0.5 V		–8		–8	mA
I_{OL}	Low-level output current	$V_{CC} = 2$ V		50		50	µA
		$V_{CC} = 3.3$ V ± 0.3 V		4		4	mA
		$V_{CC} = 5$ V ± 0.5 V		8		8	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3$ V ± 0.3 V		100		100	ns/V
		$V_{CC} = 5$ V ± 0.5 V		20		20	ns/V
T_A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

SN54AHC245, SN74AHC245

OCTAL BUS TRANSCEIVERS

WITH 3-STATE OUTPUTS

SCLS230G – OCTOBER 1995 – REVISED JANUARY 2000

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

PARAMETER		TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54AHC245		SN74AHC245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = -50 µA		2 V	1.9	2		1.9		1.9		V
			3 V	2.9	3		2.9		2.9		
			4.5 V	4.4	4.5		4.4		4.4		
	I _{OH} = -4 mA		3 V	2.58			2.48		2.48		
			4.5 V	3.94			3.8		3.8		
V _{OL}	I _{OL} = 50 µA		2 V			0.1		0.1		0.1	V
			3 V			0.1		0.1		0.1	
			4.5 V			0.1		0.1		0.1	
	I _{OL} = 4 mA		3 V			0.36		0.5		0.44	
			4.5 V			0.36		0.5		0.44	
I _I	A or B inputs	V _I = V _{CC} or GND	5.5 V			±0.1		±1		±1	µA
	$\overline{\text{OE}}$ or DIR		0 V to 5.5 V			±0.1		±1*		±1	
I _{OZ} †		V _O = V _{CC} or GND, V _I ($\overline{\text{OE}}$) = V _{IL} or V _{IH}	5.5 V			±0.25		±2.5		±2.5	µA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	5.5 V			4		40		40	µA
C _i	$\overline{\text{OE}}$ or DIR	V _I = V _{CC} or GND	5 V		2.5	10				10	pF
C _{io}	A or B inputs	V _I = V _{CC} or GND	5 V		4						pF

* On products compliant to MIL-PRF-38535, this parameter is not production tested at V_{CC} = 0 V.

† The parameter I_{OZ} includes the input leakage current.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T _A = 25°C			SN54AHC245		SN74AHC245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A or B	B or A	C _L = 15 pF		5.8**	8.4**	1**	10**	1	10	ns
t _{PHL}					5.8**	8.4**	1**	10**	1	10	
t _{PZH}	$\overline{\text{OE}}$	A or B	C _L = 15 pF		8.5**	13.2**	1**	15.5**	1	15.5	ns
t _{PZL}					8.5**	13.2**	1**	15.5**	1	15.5	
t _{PHZ}	$\overline{\text{OE}}$	A or B	C _L = 15 pF		8.9**	12.5**	1**	15.5**	1	15.5	ns
t _{PLZ}					8.9**	12.5**	1**	15.5**	1	15.5	
t _{PLH}	A or B	B or A	C _L = 50 pF		8.3	11.9	1	13.5	1	13.5	ns
t _{PHL}					8.3	11.9	1	13.5	1	13.5	
t _{PZH}	$\overline{\text{OE}}$	A or B	C _L = 50 pF		11	16.7	1	19	1	19	ns
t _{PZL}					11	16.7	1	19	1	19	
t _{PHZ}	$\overline{\text{OE}}$	A or B	C _L = 50 pF		11.5	15.8	1	18	1	18	ns
t _{PLZ}					11.5	15.8	1	18	1	18	
t _{sk(o)}			C _L = 50 pF			1.5***				1.5	ns

** On products compliant to MIL-PRF-38535, this parameter is not production tested.

*** On products compliant to MIL-PRF-38535, this parameter does not apply.

SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS230G – OCTOBER 1995 – REVISED JANUARY 2000

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)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54AHC245		SN74AHC245		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	$C_L = 15\text{ pF}$		4*	5.5*	1*	6.5*	1	6.5	ns
t_{PHL}					4*	5.5*	1*	6.5*	1	6.5	
t_{PZH}	\overline{OE}	A or B	$C_L = 15\text{ pF}$		5.8*	8.5*	1*	10*	1	10	ns
t_{PZL}					5.8*	8.5*	1*	10*	1	10	
t_{PHZ}	\overline{OE}	A or B	$C_L = 15\text{ pF}$		5.6*	7.8*	1*	9.2*	1	9.2	ns
t_{PLZ}					5.6*	7.8*	1*	9.2*	1	9.2	
t_{PLH}	A or B	B or A	$C_L = 50\text{ pF}$		5.5	7.5	1	8.5	1	8.5	ns
t_{PHL}					5.5	7.5	1	8.5	1	8.5	
t_{PZH}	\overline{OE}	A or B	$C_L = 50\text{ pF}$		7.3	10.6	1	12	1	12	ns
t_{PZL}					7.3	10.6	1	12	1	12	
t_{PHZ}	\overline{OE}	A or B	$C_L = 50\text{ pF}$		7	9.7	1	11	1	11	ns
t_{PLZ}					7	9.7	1	11	1	11	
$t_{sk(o)}$			$C_L = 50\text{ pF}$			1**				1	ns

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

** On products compliant to MIL-PRF-38535, this parameter does not apply.

noise characteristics, $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 4)

PARAMETER		SN74AHC245			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic V_{OL}		0.9		V
$V_{OL(V)}$	Quiet output, minimum dynamic V_{OL}		-0.9		V
$V_{OH(V)}$	Quiet output, minimum dynamic V_{OH}		4.3		V
$V_{IH(D)}$	High-level dynamic input voltage		3.5		V
$V_{IL(D)}$	Low-level dynamic input voltage			1.5	V

NOTE 4: Characteristics are for surface-mount packages only.

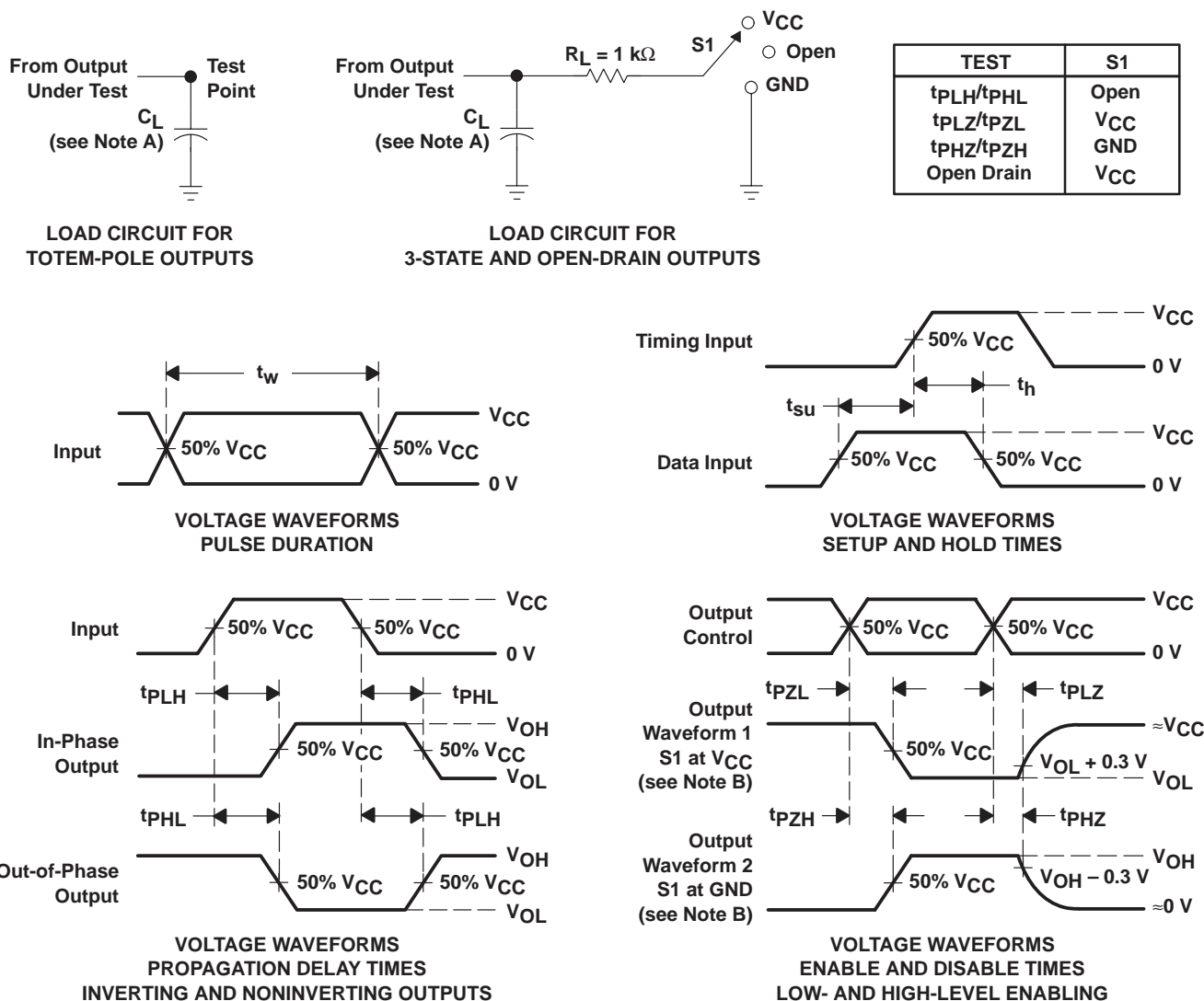
operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load, $f = 1\text{ MHz}$	14	pF

SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS230G – OCTOBER 1995 – REVISED JANUARY 2000

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
 B. 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.
 C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 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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