SN54HC640, SN54HC643, SN54HC645
SN74HC640, SN74HC643, SN74HC645
OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

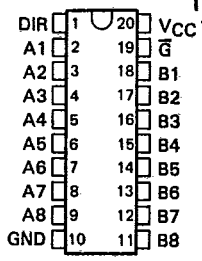
D2684, DECEMBER 1982—REVISED JUNE 1989

- Choice of True or Inverting Logic
- High-Current 3-State Outputs Can Drive Up to 15 LSTTL Loads
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

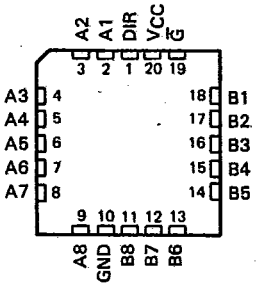
DEVICE	LOGIC
'HC640	Inverting
'HC643	True and Inverting
'HC645	True

SN54HC' . . . J PACKAGE
SN74HC' . . . DW OR N PACKAGE
(TOP VIEW)

T-52-31



SN54HC' . . . FK PACKAGE
(TOP VIEW)



description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The devices transmit data from the A bus to the B bus or from the B bus to the A bus depending upon the level at the direction control (DIR) input. The enable input ($\overline{G}$) can be used to disable the device so the buses are effectively isolated.

The SN54HC640, SN54HC643, and SN54HC645 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74HC640, SN74HC643, and SN74HC645 are characterized for operation from −40°C to 85°C.

FUNCTION TABLE

CONTROL INPUTS		OPERATION		
$\overline{G}$	DIR	'HC640	'HC643	'HC645
L	L	$\overline{B}$ data to A bus	B data to A bus	B data to A bus
L	H	$\overline{A}$ data to B bus	$\overline{A}$ data to B bus	A data to B bus
H	X	Isolation	Isolation	Isolation

NOTICE
SEE ORDER OF DATA FOR ERRATA INFORMATION

SN54HC640, SN54HC643, SN54HC645
SN74HC640, SN74HC643, SN74HC645
OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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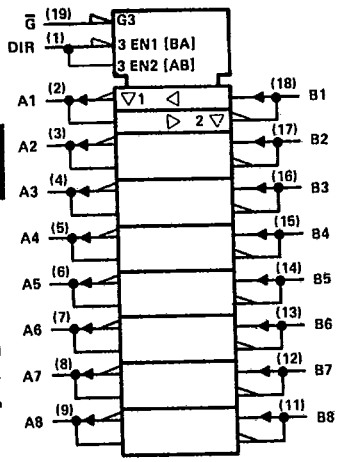
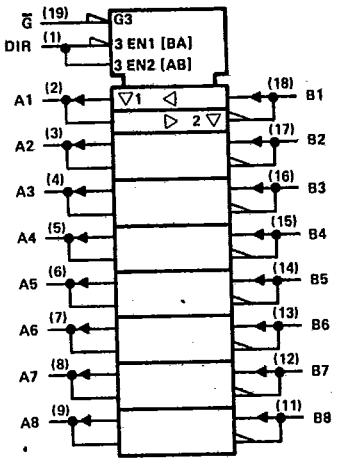
logic symbols†

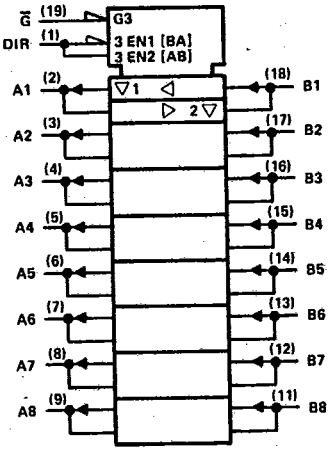
'HC640



'HC643



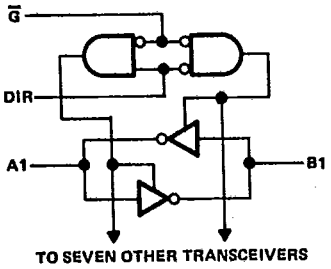
'HC645



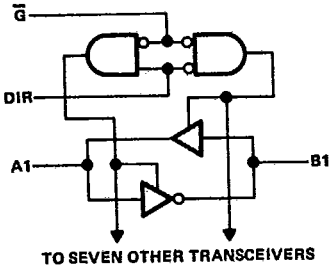
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)

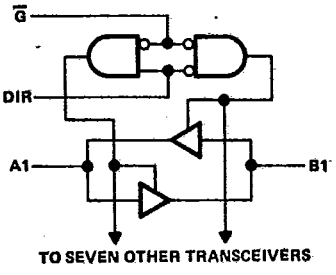
'HC640



'HC643



'HC645



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absolute maximum ratings over operating free-air temperature range†

Supply voltage, V_{CC} . . . . . −0.5 V to 7 V
Input clamp current, I_{IK} (V_I < 0 or V_I > V_{CC}) . . . . . ±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}) . . . . . ±35 mA
Continuous current through V_{CC} or GND pins . . . . . ±70 mA
Lead temperature 1,6 mm (1/16 in) from case for 60 s: FK or J package . . . . . 300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: DW or N package . . . . . 260°C
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.

recommended operating conditions

		SN54HC640 SN54HC643 SN54HC645			SN74HC640 SN74HC643 SN74HC645			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage		2	5	6	2	5	6	V
V_{IH} High-level input voltage	V_{CC} = 2 V	1.5			1.5			V
	V_{CC} = 4.5 V	3.15			3.15			
	V_{CC} = 6 V	4.2			4.2			
V_{IL} Low-level input voltage	V_{CC} = 2 V	0		0.3	0		0.3	V
	V_{CC} = 4.5 V	0		0.9	0		0.9	
	V_{CC} = 6 V	0		1.2	0		1.2	
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) times	V_{CC} = 2 V	0		1000	0		1000	ns
	V_{CC} = 4.5 V	0		500	0		500	
	V_{CC} = 6 V	0		400	0		400	
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°C			SN54HC640 SN54HC643 SN54HC645		SN74HC640 SN74HC643 SN74HC645		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}		V_I = V_{IH} or V_{IL}, I_{OH} = −20 μA	2 V	1.9	1.998		1.9		1.9		V
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		V_I = V_{IH} or V_{IL}, I_{OH} = −6 mA	4.5 V	3.98	4.30		3.7		3.84		
		V_I = V_{IH} or V_{IL}, I_{OH} = −7.8 mA	6 V	5.48	5.80		5.2		5.34		
V_{OL}		V_I = V_{IH} or V_{IL}, I_{OL} = 20 μA	2 V		0.002	0.1		0.1		0.1	V
			4.5 V		0.001	0.1		0.1		0.1	
			6 V		0.001	0.1		0.1		0.1	
		V_I = V_{IH} or V_{IL}, I_{OL} = 6 mA	4.5 V		0.17	0.26		0.4		0.33	
		V_I = V_{IH} or V_{IL}, I_{OL} = 7.8 mA	6 V		0.15	0.26		0.4		0.33	
I_I	DIR or $\overline{G}$	V_I = V_{CC} or 0	6 V			±0.1	±100		±1000		±1000	nA
I_{OZ}	A or B	V_O = V_{CC} or 0	6 V			±0.01	±0.5		±10		±5	μA
I_{CC}		V_I = V_{CC} or 0, I_O = 0	6 V			8		160		80	μA
C_I	DIR or $\overline{G}$		2 to 6 V		3	10		10		10	pF

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC640		SN74HC640		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	2 V		29	105		160		130	ns
			4.5 V		10	21		32		26	
			6 V		8	18		27		22	
t_{en}	$\overline{G}$	A or B	2 V		109	230		340		290	ns
			4.5 V		27	46		68		58	
			6 V		20	39		58		49	
t_{dis}	$\overline{G}$	A or B	2 V		40	150		225		190	ns
			4.5 V		18	30		45		38	
			6 V		16	26		38		32	
t_t		A or B	2 V		20	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	

C_{pd}	Power dissipation capacitance per transceiver	No load, T_A = 25°C	40 pF typ

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 150 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC640		SN74HC640		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	2 V		44	190		290		235	ns
			4.5 V		14	38		58		47	
			6 V		11	33		49		41	
t_{en}	$\overline{G}$	A or B	2 V		124	315		470		395	ns
			4.5 V		31	63		94		79	
			6 V		23	54		80		68	
t_t		A or B	2 V		45	210		315		265	ns
			4.5 V		17	42		63		53	
			6 V		13	36		53		45	

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC643		SN74HC643		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	2 V		29	110		165		140	ns
			4.5 V		10	22		33		28	
			6 V		8	19		28		24	
t_{en}	$\overline{G}$	A or B	2 V		109	230		340		290	ns
			4.5 V		27	46		68		58	
			6 V		20	39		58		49	
t_{dis}	$\overline{G}$	A or B	2 V		40	150		225		190	ns
			4.5 V		18	30		45		38	
			6 V		16	26		38		32	
t_t		A or B	2 V		20	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	

C_{pd}	Power dissipation capacitance per transceiver	No load, T_A = 25°C	40 pF typ

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 150 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC643		SN74HC643		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	2 V		44	195		295		245	ns
			4.5 V		14	39		59		49	
			6 V		11	34		50		43	
t_{en}	$\overline{G}$	A or B	2 V		124	315		470		395	ns
			4.5 V		31	63		94		79	
			6 V		23	54		80		68	
t_t		A or B	2 V		45	210		315		265	ns
			4.5 V		17	42		63		53	
			6 V		13	36		53		45	

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 50 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC645		SN74HC645		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	2 V		40	105		160		130	ns
			4.5 V		15	21		32		26	
			6 V		12	18		27		22	
t_{en}	$\overline{G}$	A or B	2 V		125	230		340		290	ns
			4.5 V		23	46		68		58	
			6 V		20	39		58		49	
t_{dis}	$\overline{G}$	A or B	2 V		74	200		300		250	ns
			4.5 V		25	40		60		50	
			6 V		21	34		51		43	
t_t		A or B	2 V		20	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	

C_{pd}	Power dissipation capacitance per transceiver	No load, T_A = 25°C	40 pF typ

switching characteristics over recommended operating free-air temperature range (unless otherwise noted), C_L = 150 pF (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	T_A = 25°C			SN54HC645		SN74HC645		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	2 V		54	135		200		170	ns
			4.5 V		18	27		40		34	
			6 V		15	23		34		29	
t_{en}	$\overline{G}$	A or B	2 V		150	270		405		335	ns
			4.5 V		31	54		81		67	
			6 V		25	46		69		56	
t_t		A or B	2 V		45	210		315		265	ns
			4.5 V		17	42		63		53	
			6 V		13	36		53		45	

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.

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