- 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

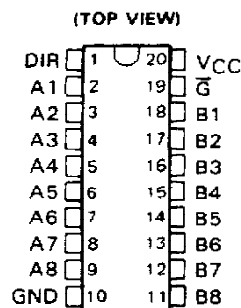- Dependable Texas Instruments Quality and Reliability

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

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

```
DIR  [ 1   20 ] VCC
A1   [ 2   19 ] G
A2   [ 3   18 ] B1
A3   [ 4   17 ] B2
A4   [ 5   16 ] B3
A5   [ 6   15 ] B4
A6   [ 7   14 ] B5
A7   [ 8   13 ] B6
A8   [ 9   12 ] B7
GND  [ 10  11 ] B8
```

SN54HC' . . . FK PACKAGE
(TOP VIEW)

```
        A2  A1  DIR  VCC  G
         3   2   1   20  19
A3 [ 4              18 ] B1
A4 [ 5              17 ] B2
A5 [ 6              16 ] B3
A6 [ 7              15 ] B4
A7 [ 8              14 ] B5
         9  10  11  12  13
        A8  GND  B8  B7  B6
```
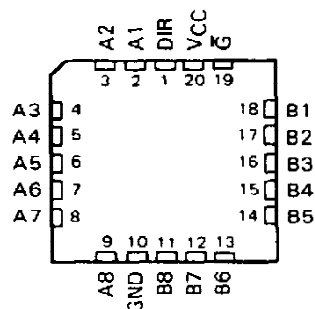
description

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 (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

TEXAS
INSTRUMENTS
POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

logic symbols†

'HC640   'HC643   'HC645
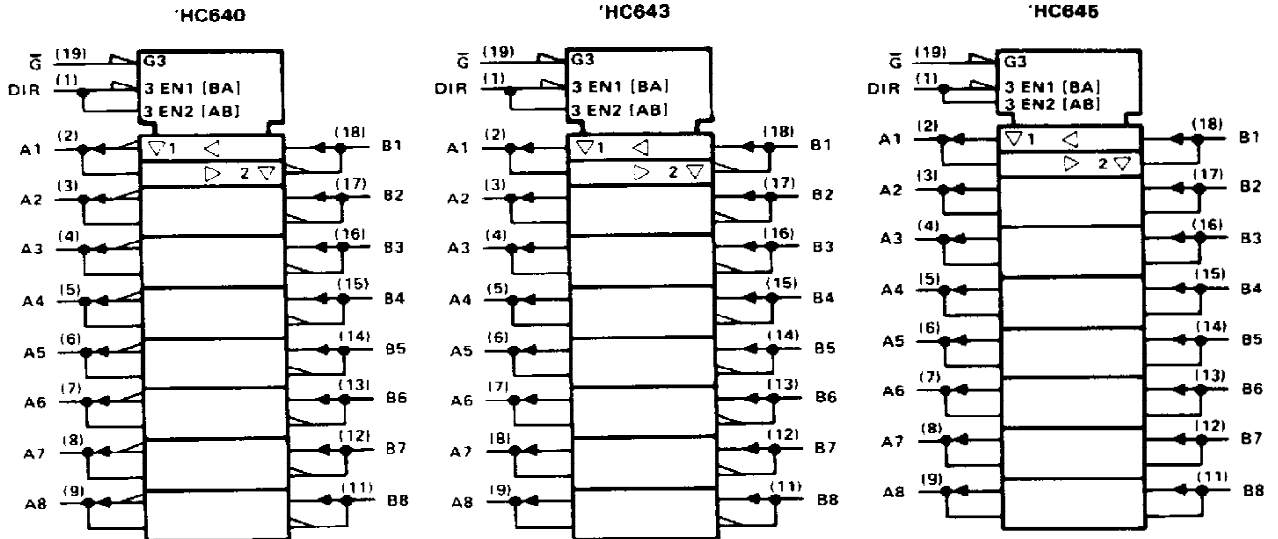
† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)
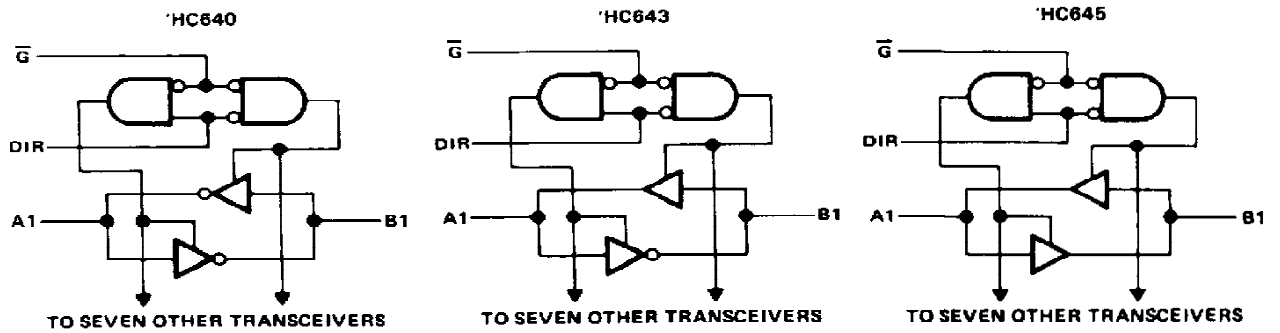
'HC640   'HC643   'HC645

TO SEVEN OTHER TRANSCEIVERS   TO SEVEN OTHER TRANSCEIVERS   TO SEVEN OTHER TRANSCEIVERS

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			
	$V_{CC} = 4.5$ V	3.15			3.15			V
	$V_{CC} = 6$ V	4.2			4.2			
V_{IL} Low-level input voltage	$V_{CC} = 2$ V	0		0.3	0		0.3	
	$V_{CC} = 4.5$ V	0		0.9	0		0.9	V
	$V_{CC} = 6$ 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	
	$V_{CC} = 4.5$ V	0		500	0		500	ns
	$V_{CC} = 6$ 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		
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		V
		$V_I = V_{IH}$ 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	
			4.5 V		0.001	0.1		0.1		0.1	
			6 V		0.001	0.1		0.1		0.1	V
		$V_I = V_{IH}$ 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

3

SN54HC640, SN74HC640
OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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

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.

SN54HC645, SN74HC645
OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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 MIN	TYP	MAX	SN54HC645 MIN	MAX	SN74HC645 MIN	MAX	UNIT
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 MIN	TYP	MAX	SN54HC645 MIN	MAX	SN74HC645 MIN	MAX	UNIT
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.

IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Certain applications using semiconductor products may involve potential risks of death, personal injury, or severe property or environmental damage ("Critical Applications").

TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.