- Inputs are TTL-Voltage Compatible

- Bus Transceivers with Inverting Outputs ('HCT664) or True Outputs ('HCT665)

- Generates a Parity Bit for A Bus and B Bus

- Easily Cascadable

- Internal Active Pull-Ups and Pull-Downs

- 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

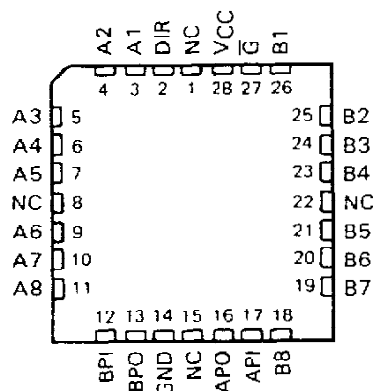- Dependable Texas Instruments Quality and Reliability

description

These octal bus transceivers are designed for asynchronous, bidirectional 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 on the level at the direction control input, DIR. The enable input, $\overline{G}$, can be used to disable the device so that the buses are isolated. These devices will also generate parity outputs, APO and BPO, which reflect the number of high levels at the A Bus and B Bus, respectively, taking into account the parity inputs API and BPI.

The bidirectional I/O ports feature active circuitry on the input stage that, when the output shared by that pin is disabled, will maintain the input in the last state taken by the output. This state will be maintained until changed by the activity on the bus. The advantage of this arrangement is that when all outputs on the bus are disabled, the inputs will be prevented from floating, resulting in minimum power dissipation and minimum susceptibility to noise. This eliminates any need for external pull-up or pull-down resistors. The parity inputs API and BPI have similar circuitry. For further information, see the Typical Application Data on the 'HC664, and 'HC665 data sheet.

The input threshold voltages on these devices are adjusted to be TTL compatible, allowing direct interface to TTL levels on the bus or to memories with TTL output voltage levels.

The SN54HCT664 and SN54HCT665 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74HCT664 and SN74HCT665 are characterized for operation from −40°C to 85°C.

SN54HCT664, SN54HCT665 . . . JT PACKAGE
SN74HCT664, SN74HCT665 . . . DW OR NT PACKAGE
(TOP VIEW)

DIR	1	VCC 24
A1	2	$\overline{G}$ 23
A2	3	B1 22
A3	4	B2 21
A4	5	B3 20
A5	6	B4 19
A6	7	B5 18
A7	8	B6 17
A8	9	B7 16
BPI	10	B8 15
BPO	11	API 14
GND	12	APO 13

SN54HCT664, SN54HCT665 . . . FK PACKAGE
(TOP VIEW)

NC — No internal connection

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FUNCTION TABLE

CONTROL INPUTS		NUMBER OF HIGH INPUTS ON	NUMBER OF HIGH INPUTS ON	OUTPUTS		OPERATION	
$\overline{G}$	DIR	B BUS AND BPI	A BUS AND API	APO	BPO	'HCT664	'HCT665
L	L	X	0, 2, 4, 6, 8	Z	H	$\overline{B}$ Data to A Bus	B Data to A Bus
		X	1, 3, 5, 7, 9	Z	L		
L	H	0, 2, 4, 6, 8	X	H	Z	$\overline{A}$ Data to B Bus	A Data to B Bus
		1, 3, 5, 7, 9	X	L	Z		
H	X	X	X	Z	Z	Isolation	Isolation

logic symbols[†]
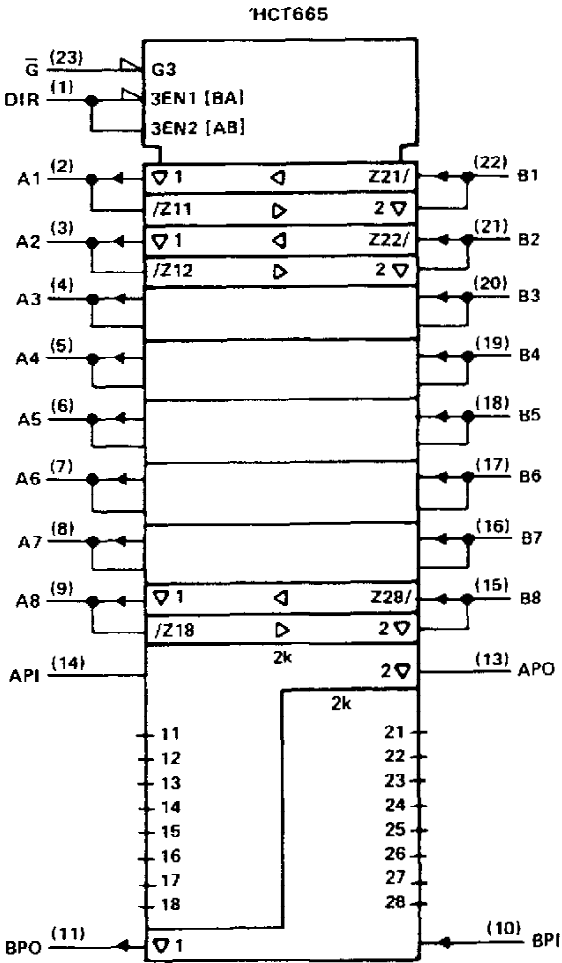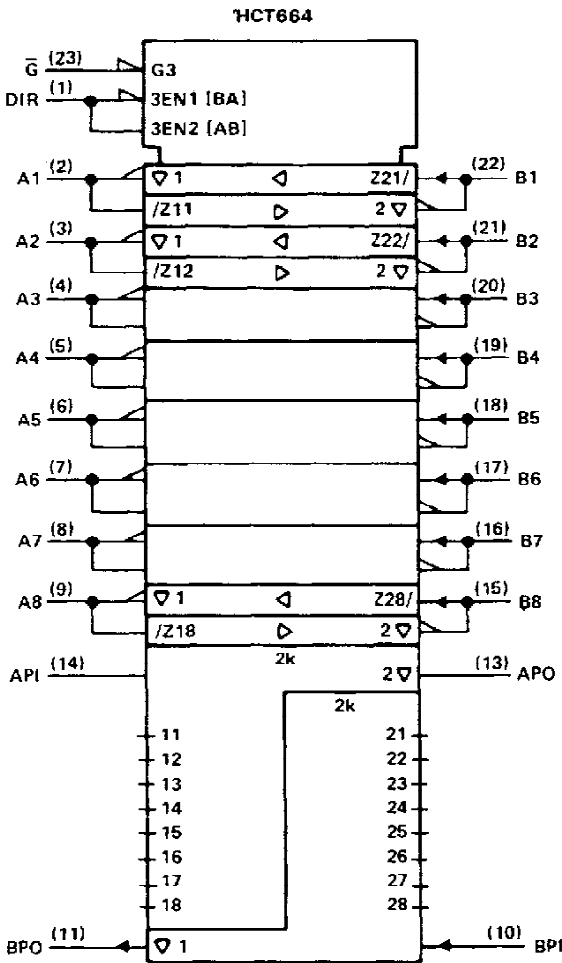
'HCT664

'HCT665

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

Pin numbers shown are for DW, JT, and NT packages.

logic diagram (positive logic)

Pin numbers shown are for DW, JT, and NT packages.
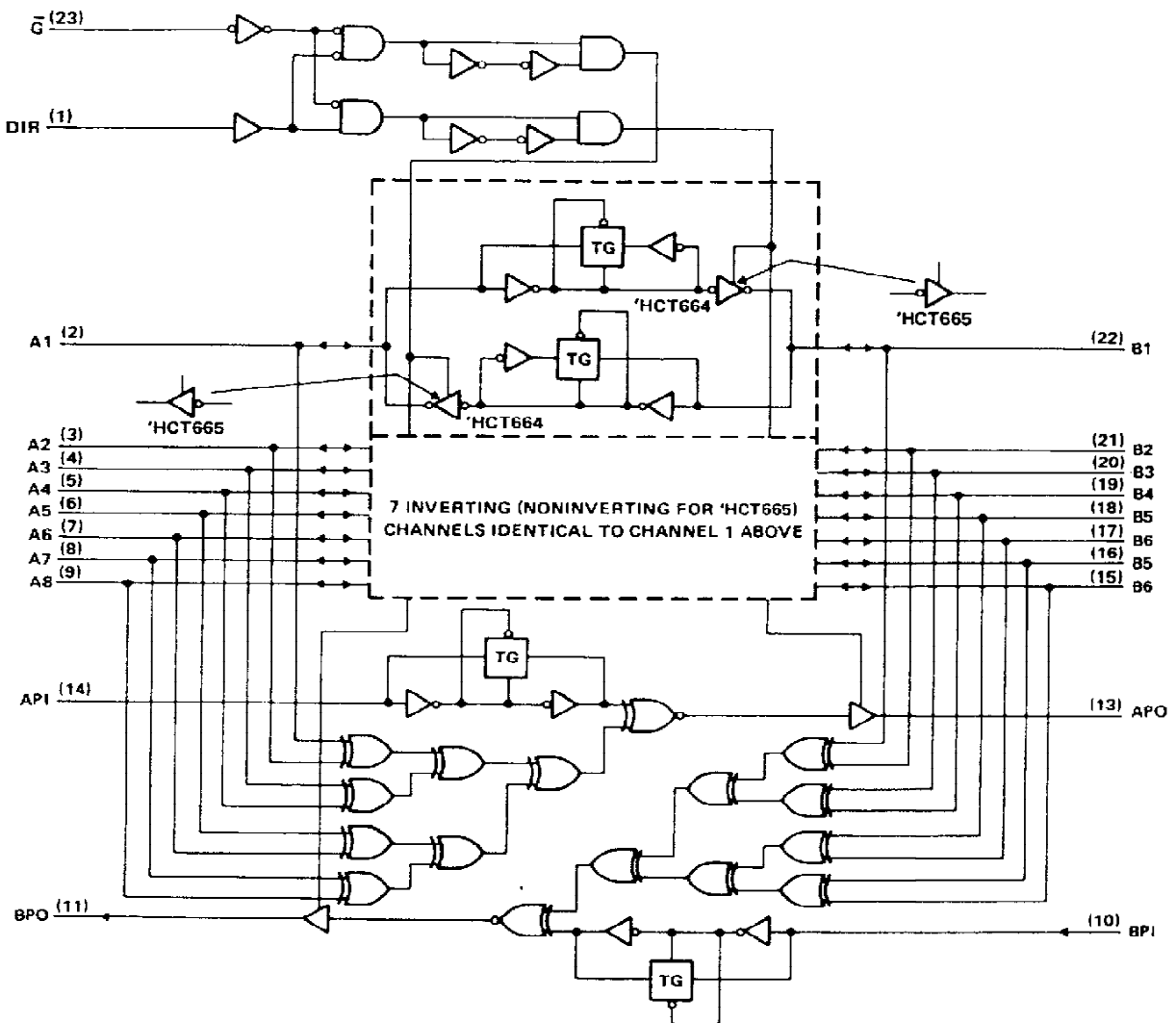
absolute maximum ratings over operating free-air temperature range[†]

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 JT package .... 300°C
Lead temperature 1,6 mm (1/16 in) from case for 10 s: DW or NT 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

			SN54HCT664 SN54HCT665			SN74HCT664 SN74HCT665			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 V to 5.5 V	2			2			V
V_{IL}	Low-level input voltage	V_{CC} = 4.5 V to 5.5 V	0		0.8	0		0.8	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) times		0		500	0		500	ns
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			SN54HCT664 SN54HCT665		SN74HCT664 SN74HCT665		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	V_I = V_{IH} or V_{IL}, I_{OH} = −20 µA	4.5 V	4.4	4.499		4.4		4.4		V
	V_I = V_{IH} or V_{IL}, I_{OH} = −6 mA	4.5 V	3.98	4.30		3.7		3.84		
V_{OL}	V_I = V_{IH} or V_{IL}, I_{OL} = 20 µA	4.5 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	
I_I	V_I = V_{CC} or 0	5.5 V		±0.1	±100		±1000		±1000	nA
I_{OZ}	V_O = V_{CC} or 0, V_I = V_{IH} or V_{IL}	5.5 V		±0.01	±0.5		±10		±5	µA
I_{CC}	V_I = V_{CC} or 0, I_O = 0	5.5 V			8		160		80	µA
ΔI_{CC}[‡]	One input at 0.5 V or 2.4 V Other inputs at 0 V or V_{CC}	5.5 V		1.4	2.4		3		2.9	mA
C_i[§]		4.5 to 5.5 V		3	10		10		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}.
[§] This parameter, C_i, does not apply to I/O ports.

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			SN54HCT664		SN74HCT664		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	4.5 V		15	30		45		38	ns
			5.5 V		13	27		41		34	
t_{pd}	A or B	APO or BPO	4.5 V		23	46		69		58	ns
			5.5 V		20	41		62		52	
t_{pd}	API or BPI	APO or BPO	4.5 V		15	31		47		39	ns
			5.5 V		14	28		42		35	
t_{en}	$\overline{G}$	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_{dis}	$\overline{G}$	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_{en}	DIR	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_{dis}	DIR	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_t		Any	4.5 V		8	12		18		15	ns
			5.5 V		7	11		16		14	

C_{pd}	Power dissipation capacitance	No load, T_A = 25°C	62 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			SN54HCT664		SN74HCT664		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A or B	B or A	4.5 V		23	47		71		59	ns
			5.5 V		21	42		64		53	
t_{pd}	A or B	APO or BPO	4.5 V		31	63		95		79	ns
			5.5 V		28	56		85		71	
t_{pd}	API or BPI	APO or BPO	4.5 V		24	48		73		60	ns
			5.5 V		21	43		65		54	
t_{en}	$\overline{G}$	A or B	4.5 V		34	68		103		85	ns
			5.5 V		30	61		92		77	
t_{en}	DIR	A or B	4.5 V		34	68		103		85	ns
			5.5 V		30	61		92		77	
t_t		Any	4.5 V		17	42		63		53	ns
			5.5 V		14	38		57		48	

Note 1: Load circuits and voltage waveforms are shown in Section 1.

For typical application data and a description of the unique input structure, see the 'HC664 series data sheet.

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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 MIN	TYP	MAX	SN54HCT665 MIN	MAX	SN74HCT665 MIN	MAX	UNIT
t_{pd}	A or B	B or A	4.5 V		14	28		61		50	ns
			5.5 V		12	25		42		35	
t_{pd}	A or B	APO or BPO	4.5 V		23	46		69		58	ns
			5.5 V		20	41		62		52	
t_{pd}	API or BPI	APO or BPO	4.5 V		15	31		47		39	ns
			5.5 V		14	28		42		35	
t_{en}	$\overline{G}$	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_{dis}	$\overline{G}$	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_{en}	DIR	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_{dis}	DIR	A or B	4.5 V		25	51		77		64	ns
			5.5 V		23	46		69		58	
t_t		Any	4.5 V		8	12		18		15	ns
			5.5 V		7	11		16		14	

C_{pd}	Power dissipation capacitance	No load, T_A = 25°C	62 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	SN54HCT665 MIN	MAX	SN74HCT665 MIN	MAX	UNIT
t_{pd}	A or B	B or A	4.5 V		22	45		84		69	ns
			5.5 V		20	40		68		56	
t_{pd}	A or B	APO or BPO	4.5 V		31	63		95		79	ns
			5.5 V		28	56		85		71	
t_{pd}	API or BPI	APO or BPO	4.5 V		24	48		73		60	ns
			5.5 V		21	43		65		54	
t_{en}	$\overline{G}$	A or B	4.5 V		34	68		103		85	ns
			5.5 V		30	61		92		77	
t_{en}	DIR	A or B	4.5 V		34	68		103		85	ns
			5.5 V		30	61		92		77	
t_t		Any	4.5 V		17	42		63		53	ns
			5.5 V		14	38		57		48	

Note 1: Load circuits and voltage waveforms are shown in Section 1.

For typical application data and a description of the unique input structure, see the 'HC664 series data sheet.

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