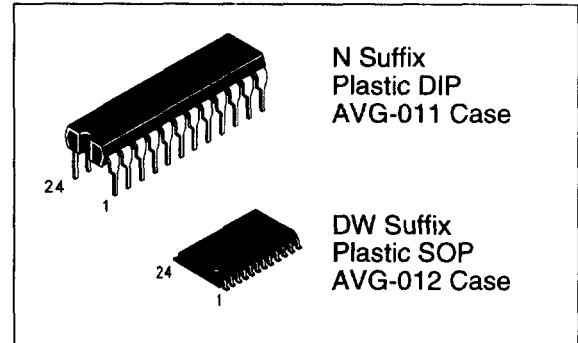


DV74HC651, DV74HC652 DV74HCT651, DV74HCT652

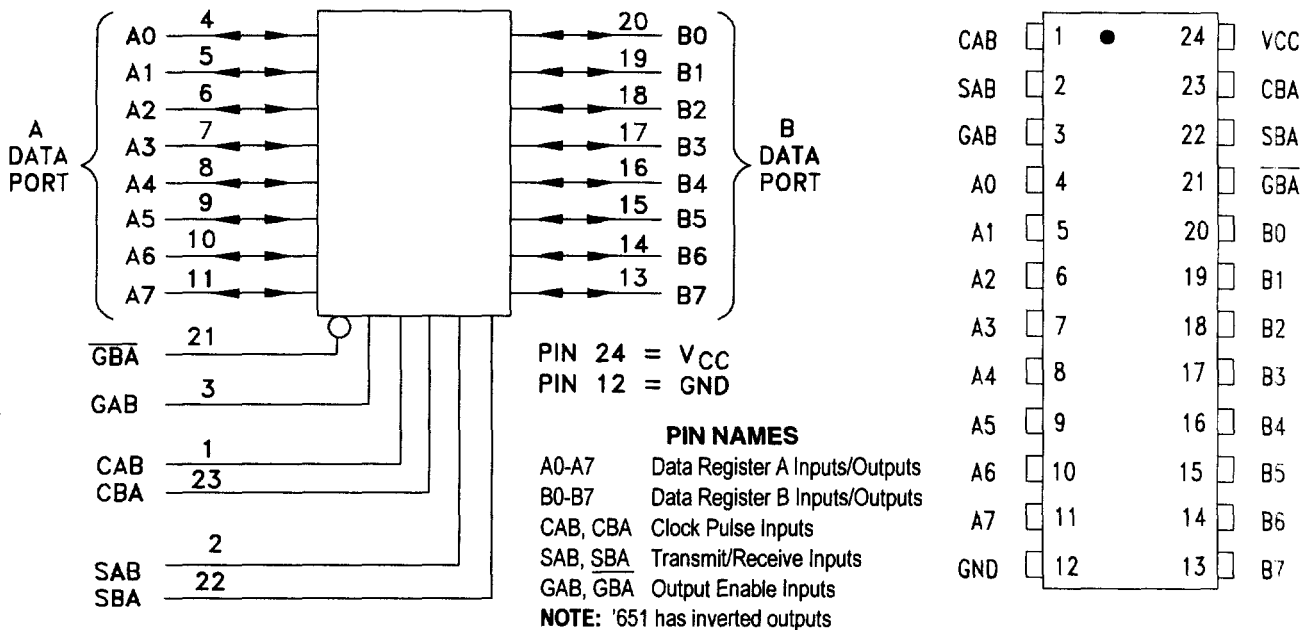
Octal Transceiver/Register with 3-State Outputs

This device is a high speed registered, bus transceiver circuit with outputs D-flip flops and control circuitry providing multiplexed transmission from the buses or from the internal registers. The 'HC/HCT 651 has inverted outputs. The 'HC/HCT 652 has normal outputs.

- Output Drive Capability: 10 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1mA
- High Noise Immunity Characteristic of CMOS Devices



651, 652



TRUTH TABLE

Inputs						Data I/O		Operation or Function
GAB	GBA	CAB	CBA	SAB	SBA	A0-A7	B0-B7	
L	H	H or L	H or L	X	X	Input	Input	Isolation
L	H	↑	↑	X	X	Input	Input	Store A and B Data
X	H	↑	H or L	X	X	Input	Unspecified*	Store A, Hold B
H	H	↑	↑	X**	X	Input	Output	Store A in Both Registers
L	X	H or L	↑	X	X	Unspecified*	Input	Hold A, Store B
L	L	↑	↑	X	X**	Output	Input	Store B in Both Registers
L	L	X	X	X	L	Output	Input	Real-Time B Data to A Bus
L	L	X	H or L	X	H	Output	Input	Stored B Data to A Bus
H	H	X	X	L	X	Input	Output	Real-Time A Data to B Bus
H	H	H or L	X	H	X	Input	Output	Stored A Data to B Bus
H	L	H or L	H or L	H	H	Output	Output	Stored A Data to B Bus and Stored B Data to A Bus

H=HIGH Voltage Level L=LOW Voltage Level X=Don't Care i=LOW-to-HIGH Transition

* The data output functions may be enabled or disabled by various signals at the GBA and GAB inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the appropriate clock inputs.

** Select control=L:Clocks can occur simultaneously

ABSOLUTE MAXIMUM RATINGS

Maximum ratings are those values beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V _{CC}	DC Supply Voltage (Referenced to GND)	- 0.5 to +7.0	V
V _{IN}	DC Input Voltage (Referenced to GND)	- 1.5 to V _{CC} +1.5	V
V _{OUT}	DC Output Voltage (Referenced to GND)	- 0.5 to V _{CC} +0.5	V
I _{IN}	DC Input Current, per Pin	± 20	mA
I _{OUT}	DC Output Sink/Source Current, per Pin	± 35	mA
I _{CC}	DC V _{CC} or GND Current Pin	± 75	mA
P _D	Power Dissipation in Still Air Plastic DIP SOP Package	750 500	mW
T _{stg}	Storage Temperature	- 65 to +150	°C
T _L	Lead Temperature, 1 mm from Case for 10 Seconds	260	°C

GUARANTEED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit	
V _{CC}	Supply Voltage	2.0	6.0	V	
V _{IN} , V _{OUT}	DC Input Voltage, Output Voltage, (Ref. to GND)	0	V _{CC}	V	
t _r , t _f	Input Rise and Fall Time	V _{CC} @ 2.0 to 6.0	100	100	ns
T _A	Operating Ambient Temperature Range	-55	+125	°C	

HC — 651, 652

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V _{CC} (V)	Guaranteed Limits			Unit	
				25°C to -55°C	≤ 85°C	≤ 125°C		
V _{IH}	Minimum High Level Input Voltage	V _{OUT} = V _{CC} - 0.1 V I _{OUT} ≤ 20 μA	2.0	1.50	1.50	1.50	V	
			4.5	3.15	3.15	3.15		
			6.0	4.20	4.20	4.20		
V _{IL}	Maximum Low Level Input Voltage	V _{OUT} = 0.1 V I _{OUT} ≤ 20 μA	2.0	0.50	0.50	0.50	V	
			4.5	1.35	1.35	1.35		
			6.0	1.80	1.80	1.80		
V _{OH}	Minimum High Level Output Voltage	V _{IN} = V _{IH} I _{OUT} ≤ 20 μA	2.0	1.90	1.90	1.90	V	
			4.5	4.40	4.40	4.40		
			6.0	5.90	5.90	5.90		
		V _{IL}	V _{IN} = V _{IH} I _{OUT} ≤ 6.0 mA I _{OUT} ≤ 7.8 mA	4.5	3.98	3.84	3.70	V
				6.0	5.48	5.34	5.20	
V _{OL}	Maximum Low Level Output Voltage	V _{IN} = V _{IL} I _{OUT} ≤ 20 μA	2.0	0.10	0.10	0.10	V	
			4.5	0.10	0.10	0.10		
			6.0	0.10	0.10	0.10		
		V _{IL}	V _{IN} = V _{IL} I _{OUT} ≤ 6.0 mA I _{OUT} ≤ 7.8 mA	4.5	0.26	0.33	0.40	V
				6.0	0.26	0.33	0.40	
I _{IN}	Maximum Input Leakage Current	V _{IN} = V _{CC} or GND	6.0	±0.1	±1.00	±1.00	μA	
I _{OZ}	Maximum 3-State Current (Output in High Impedance State)	V _{IN} = V _{IL} or V _{IH} V _{OUT} = V _{CC} or GND	6.0	±0.5	±5.0	±10.0	mA	
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND I _{OUT} = 0 μA	6.0	8	80	160	μA	

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AC CHARACTERISTICS (CL = 50 pF, Input tr = tr = 6 ns)

Symbol	Parameter (CL = 50 pF)	Vcc (V)	HC651, 652			Unit
			+25°C to -55°C	≤ 85°C	≤ 125°C	
tPLH tPHL	Propagation Delay, CPBA or CPAB to An or Bn	2.0	240	300	360	ns
		4.5	48	60	72	
		6.0	41	51	61	
tPLH tPHL	Propagation Delay, A or B to Bn or An	2.0	180	225	270	ns
		4.5	36	45	54	
		6.0	31	38	46	
tPLH tPHL	Propagation Delay, SBA or SAB to An or Bn	2.0	220	275	330	ns
		4.5	44	55	66	
		6.0	37	47	56	
tpZH tPHL	Output Enable Time, OEBA to An	2.0	180	225	270	ns
		4.5	36	45	54	
		6.0	31	38	46	
tPHZ tPLZ	Output Disable Time, OEBA to An	2.0	170	215	255	ns
		4.5	34	43	51	
		6.0	29	37	43	
ts	Setup Time, HIGH or LOW An or Bn to CPBA or CPAB	2.0	50	65	75	ns
		4.5	10	13	15	
		6.0	9	11	13	
th	Hold Time, HIGH or LOW An or Bn to CPBA or CPAB	2.0	25	30	40	ns
		4.5	5	6	8	
		6.0	5	5	7	
tw	CBAB, CPBA Pulse Width, HIGH or LOW	2.0	75	95	110	ns
		4.5	15	19	22	
		6.0	13	16	19	

CPD	Power Dissipation Capacitance (Per Buffer) Used to determine the no-load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$	Typical @ 25°C, Vcc = 5.0 V	pF
		60	

TIMING REQUIREMENTS (CL = 50 pF, Input tr = tr = 6.0 ns)

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HCT — 651, 652

DC ELECTRICAL CHARACTERISTICS

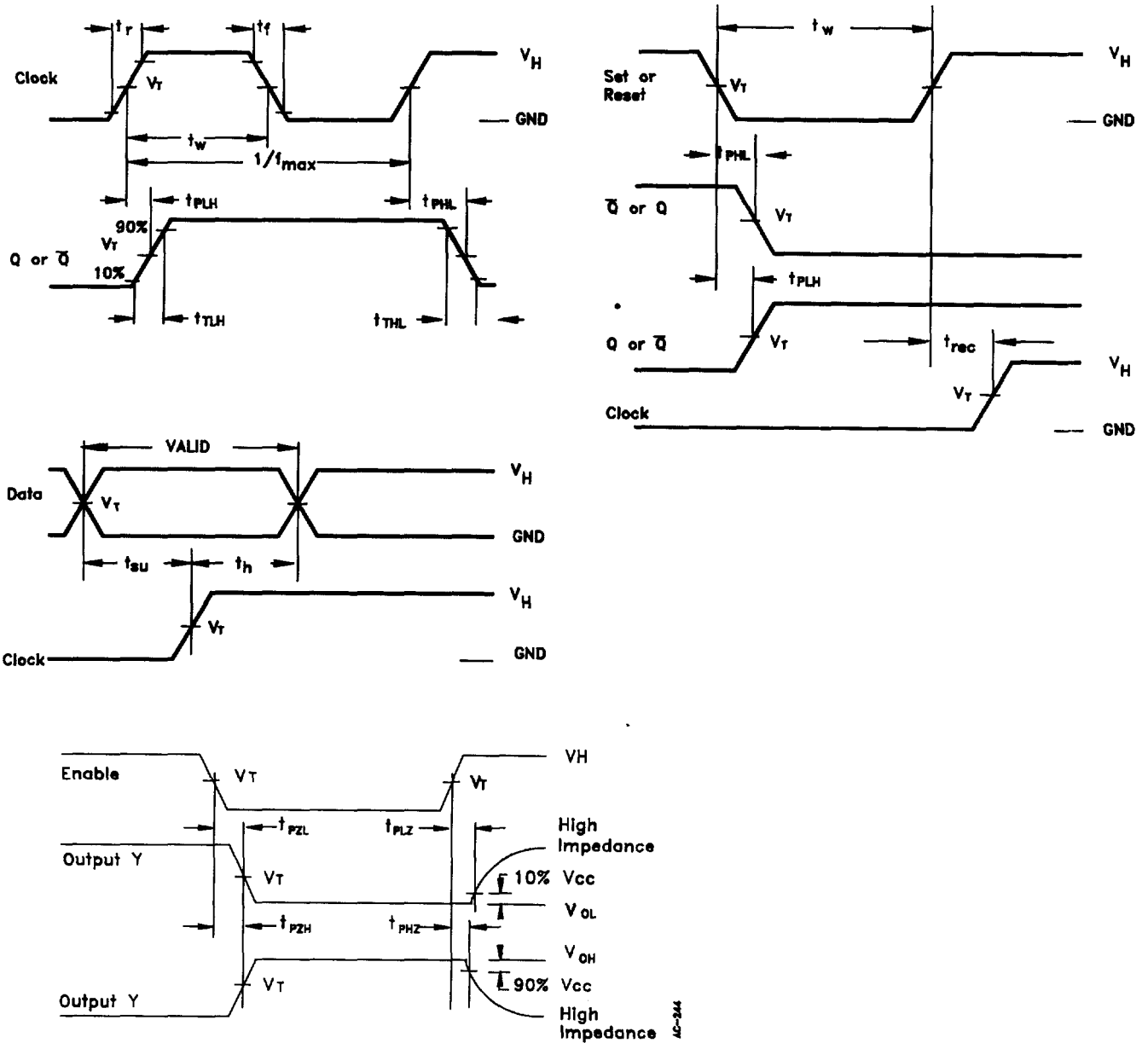
Symbol	Parameter	Conditions	Vcc (V)	HCT651,652			Unit
				TA = +25°C		TA = -40 to +85°C	
				Typ	Guaranteed Limits		
VIH	Minimum High Level Input Voltage	VOUT = 0.1V or VCC - 0.1 V	4.5	1.5	2.0	2.0	V
			5.5	1.5	2.0	2.0	
VIL	Maximum Low Level Input Voltage	VOUT = 0.1V or VCC - 0.1 V	4.5	1.5	0.8	0.8	V
			5.5	1.5	0.8	0.8	
VOH	Minimum High Level Output Voltage	IOUT = -50 µA	4.5	4.49	4.4	4.4	V
			5.5	5.49	5.4	5.4	
		VIN = VIL or VIH IOH = -24mA -24 mA	4.5		3.86	3.76	V
			5.5		4.86	4.76	

Symbol	Parameter	Conditions	V _{CC} (V)	HCT651,652			Unit
				TA = +25°C		TA = -40 to +85°C	
				Typ	Guaranteed Limits		
V _{OL}	Maximum Low Level Output Voltage	I _{OUT} = 50 μA	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V
		V _{IN} = V _{IL} or V _{IH} I _{OL} = 24mA 24 mA	4.5 5.5		0.36 0.36	0.44 0.44	V
I _{IN}	Maximum Input Leakage Current	V _I = V _{CC} , GND	5.5		±0.1	±1.0	μA
ΔI _{CC} T	Additional Max I _{CC} /Input	V _I = V _{CC} - 2.1 V	5.5	0.6		1.5	mA
I _{OZ}	Maximum 3-State Current	V _{OE} = V _{IH} V _I = V _{CC} or GND V = V _{CC} or GND	5.5		±0.6	±6.0	μA
I _{CC}	Maximum Quiescent Supply Current	V _{IN} = V _{CC} or GND	5.5		8.0	80	μA

AC CHARACTERISTICS (CL = 50 pF, Input t_r = t_f = 6 ns)

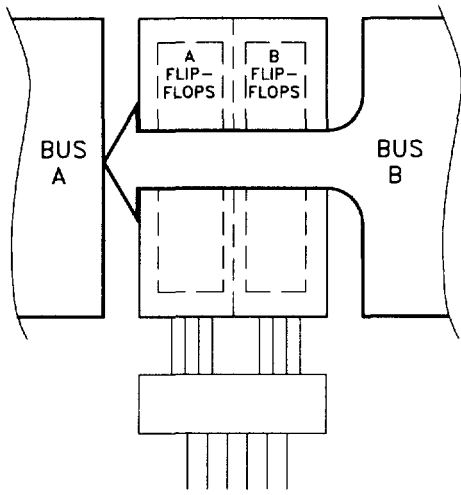
Symbol	Parameter (C _L = 50 pF)	V _{CC} (V)	HCT651, 652			Unit
			+25°C to -55°C	≤ 85°C	≤ 125°C	
t _{PLH}	Propagation Delay, CPBA or CPAB to A _n or B _n	5.0	47	58	71	ns
t _{PHL}						
t _{PLH}	Propagation Delay, A or B to B _n or A _n	5.0	31	39	47	ns
t _{PHL}						
t _{PLH}	Propagation Delay, SBA or SAB to A _n or B _n	5.0	48	60	72	ns
t _{PHL}						
t _{PZH}	Output Enable Time, OEBA to A _n	5.0	30	38	45	ns
t _{PZL}						
t _{PHZ}	Output Disable Time, OEBA to A _n	5.0	38	48	57	ns
t _{PLZ}						
t _{PZH}	Output Enable Time, OEAB to B _n	5.0	36	45	54	ns
t _{PZL}						
t _{PHZ}	Output Disable Time, OEAB to B _n	5.0	36	45	54	ns
t _{PLZ}						
t _s	Setup Time, HIGH or LOW A _n or B _n to CPBA or CPAB	5.0	10	13	15	ns
t _h	Hold Time, HIGH or LOW A _n or B _n to CPBA or CPAB	5.0	5	5	5	ns
t _w	CBAB, CPBA Pulse Width, HIGH or LOW	5.0	20	25	30	ns

SWITCHING WAVEFORMS



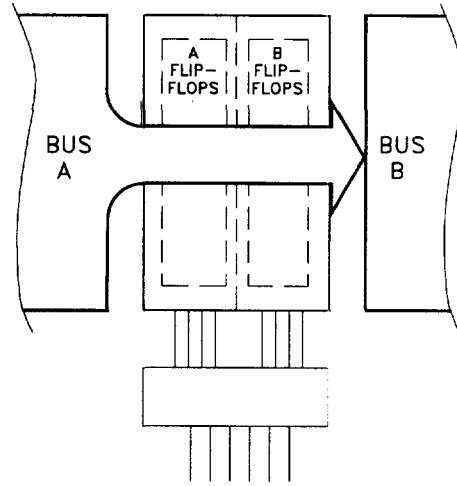
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Input and output threshold voltage:
 $V_T = 50\% V_{CC}$ for HC; 1.3V for HCT;
 $V_H = V_{CC}$ for HC, 3V for HCT



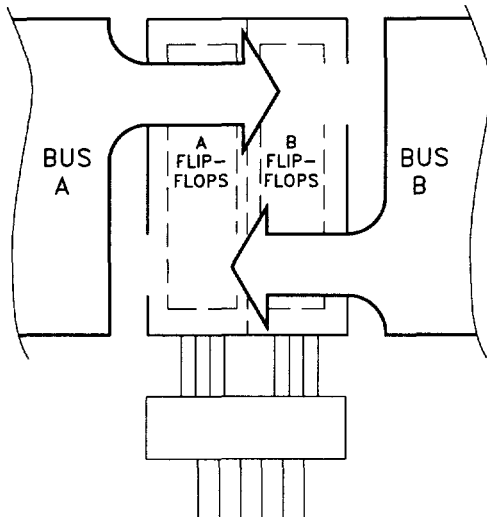
Real-Time Transfer
Bus B to Bus A

Real-Time Transfer Bus B to Bus A						
Pin #	21	3	1	23	2	22
Function	$\overline{\text{GBA}}$	GAB	CAB	CBA	SAB	SBA
Logic State	L	L	X	X	X	L



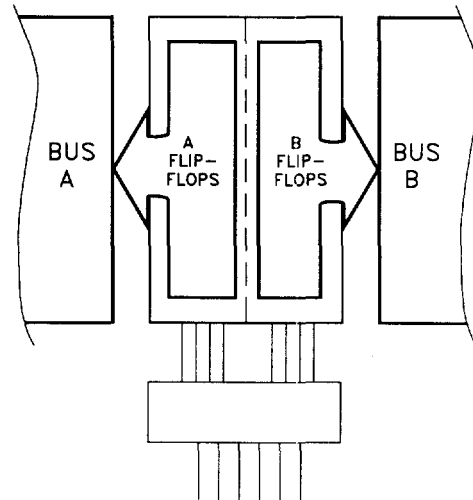
Real-Time Transfer
Bus A to Bus B

Real-Time Transfer Bus A to Bus B						
Pin #	21	3	1	23	2	22
Function	$\overline{\text{GBA}}$	GAB	CAB	CBA	SAB	SBA
Logic State	H	H	X	X	L	X



Storage From
A, B, or A and B

Storage From A, B or GAB						
Pin #	21	3	1	23	2	22
Function	$\overline{\text{GBA}}$	GAB	CAB	CBA	SAB	SBA
Logic State	L	H	↑	↑	X	X



Transfer Stored Data
To A or B

Transfer Stored Data to A or B						
Pin #	21	3	1	23	2	22
Function	$\overline{\text{GBA}}$	GAB	CAB	CBA	SAB	SBA
Logic State	L	H	X	X	H	H

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