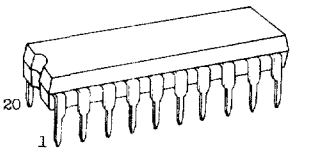
TC74HC620P
TC74HC623P

OCTAL BUS TRANSCEIVER
TC74HC620P 3-STATE, INVERTING
TC74HC623P 3-STATE, NON-INVERTING

The TC74HC620 and TC74HC623 are high speed CMOS QUAD TRANSCEIVER fabricated with silicon gate C^2MOS technology. They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. These IC's are intended for two-way asynchronous communication between data buses, and direction of data transmission is determined by GAB, $\overline{GBA}$, GAB and $\overline{GBA}$ inputs are equipped with protection circuits against static discharge or transient excess voltage.



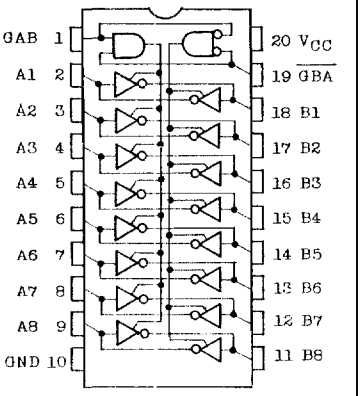
DIP20(3D20A-P)

FEATURES:

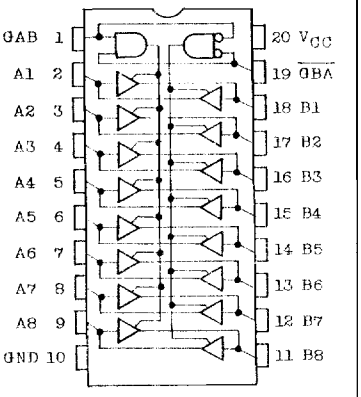
- High Speed ..... t_{pd}=10ns(Typ.) at V_{CC}=5V
- Low Power Disspation ..... I_{CC}=4μA(Max.) at Ta=25°C
- High Noise Immunity ..... $V_{NIH}=V_{NIL}$=28% V_{CC} (Min.)
- Output Drive Capability ..... 15 LSTTL Loads
- Symmetrical Output Impedance .. $|I_{OH}|=I_{OL}$=6mA (Min.)
- Balanced Propagation Delays ..... $t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range ..... V_{CC}(Opr.)=2V ∿ 6V
- Pin and Function Compatible with 74LS620/623

PIN ASSIGNMENT (TOP VIEW)

TC74HC620



TC74HC623



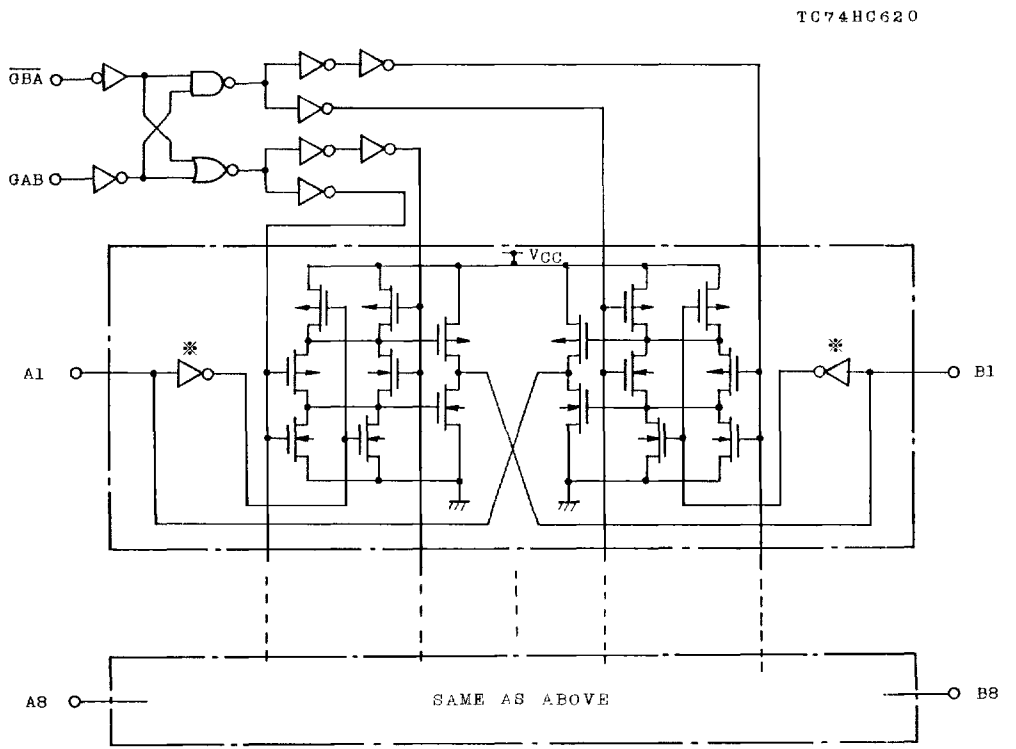
NOTICE FOR APPLICATION

It is prohibited to apply a signal to a bus terminal when it is in output mode. And when a bus terminal is floating (high impedance state), it is requested to fix the input level by means of external pull down or pull up resistor or BUS TERMINATOR IC (TC40117BP).

TRUTH TABLE

INPUTS		FUNCTION		OUTPUTS	
GAB	$\overline{GBA}$	A Bus	B Bus	HC620	HC623
L	L	Output	Input	$A = \overline{B}$	A = B
H	H	Input	Output	$B = \overline{A}$	B = A
L	H	High Impedance		Z	Z
H	L	High Impedance		Z	Z

LOGIC DIAGRAM



Note: In case of TC74HC623, input inverters marked ※ at A bus and B bus are eliminated respectively.

ABSOLUTE MAXIMUM RATINGS

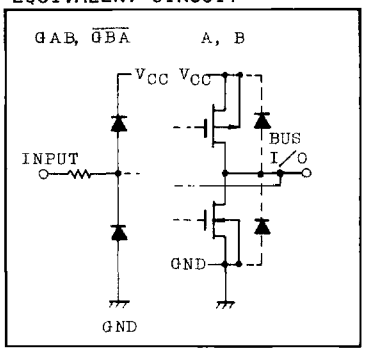
PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	-0.5 ∿ 7	V
DC Input Voltage	V_{IN}	-0.5 ∿ V_{CC}+0.5	V
Bus Terminal Voltage	$V_{I/O}$	-0.5 ∿ V_{CC}+0.5	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±35	mA
DC V_{CC}/Ground Current	I_{CC}	±70	mA
Power Dissipation	P_D	500*	mW
Storage Temperature	T_{stg}	-65 ∿ 150	°C
Lead Temperature 10sec	T_L	300	°C

* 500mW in the range of Ta=-40°C ∿ 65°C and from Ta=65°C up to 85°C derating factor of -10mW/°C shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply Voltage	V_{CC}	2 ∿ 6	V
Input Voltage	V_{IN}	0 ∿ V_{CC}	V
Bus Terminal Voltage	$V_{I/O}$	0 ∿ V_{CC}	V
Operating Temperature	T_{opr}	-40 ∿ 85	°C
Input Rise and Fall Time	t_r, t_f	0 ∿ 1000 (V_{CC}=2.0V) 0 ∿ 500 (V_{CC}=4.5V) 0 ∿ 400 (V_{CC}=6.0V)	ns

INPUT and OUTPUT EQUIVALENT CIRCUIT



DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC}	Ta=25°C MIN.	Ta=25°C TYP.	Ta=25°C MAX.	Ta=-40∿85°C MIN.	Ta=-40∿85°C MAX.	UNIT
High-Level Input Voltage	V_{IH}			2.0	1.5	-	-	1.5	-	V
				4.5	3.15	-	-	3.15	-	
				6.0	4.2	-	-	4.2	-	
Low-Level Input Voltage	V_{IL}			2.0	-	-	0.5	-	0.5	V
				4.5	-	-	1.35	-	1.35	
				6.0	-	-	1.8	-	1.8	
High-Level Output Voltage	V_{OH}	V_{IN}=V_{IH} or V_{IL}	I_{OH}=-20μA	2.0	1.9	2.0	-	1.9	-	V
				4.5	4.4	4.5	-	4.4	-	
				6.0	5.9	6.0	-	5.9	-	
			I_{OH}=-6mA	4.5	4.18	4.31	-	4.13	-	
			I_{OH}=-7.8mA	6.0	5.68	5.80	-	5.63	-	

DC ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	SYMBOL	TEST CONDITION		V_{CC}	Ta=25°C MIN.	Ta=25°C TYP.	Ta=25°C MAX.	Ta=-40~85°C MIN.	Ta=-40~85°C MAX.	UNIT
Low-Level Output Voltage	V_{OL}	$V_{IN}=V_{IH}$ or V_{IL}	I_{OL}=20μA	2.0	-	0.0	0.1	-	0.1	V
				4.5	-	0.0	0.1	-	0.1	
				6.0	-	0.0	0.1	-	0.1	
			I_{OL}=6mA	4.5	-	0.17	0.26	-	0.33	
			I_{OL}=7.8mA	6.0	-	0.18	0.26	-	0.33	
Bus Terminal 3-State Off-State Current	I_{OZ}	$V_{IN}=V_{IH}$ or V_{IL} $V_{OUT}=V_{CC}$ or GND		6.0	-	-	±0.5	-	±5.0	μA
Input Lekage Current	I_{IN}	$V_{IN}=V_{CC}$ or GND *		6.0	-	-	±0.1	-	±1.0	
Quiescent Supply Current	I_{CC}	$V_{IN}=V_{CC}$ or GND		6.0	-	-	4.0	-	40.0	

* Applicable only to GAB, $\overline{GBA}$ input.

AC ELECTRICAL CHARACTERISTICS (C_L=50pF, Input $t_r=t_f$=6ns)

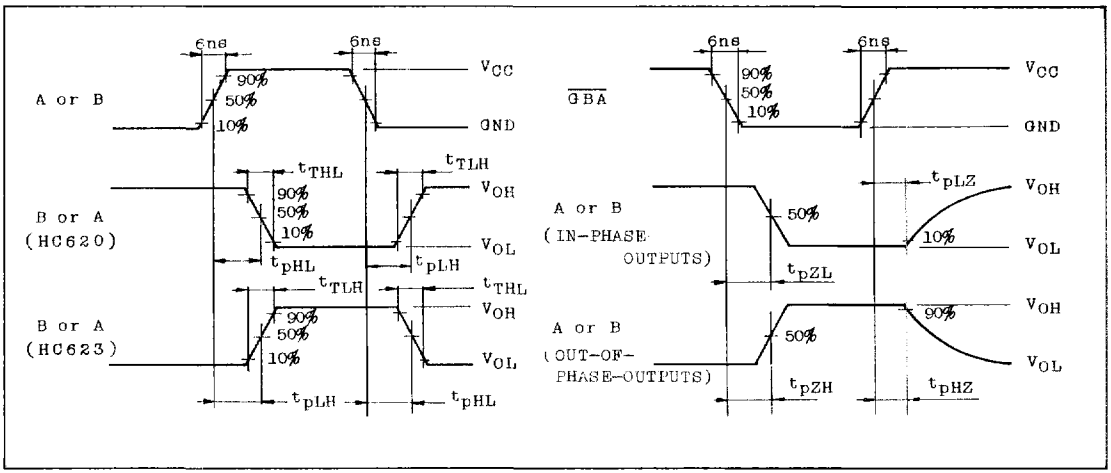
PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta=25°C MIN.	Ta=25°C TYP.	Ta=25°C MAX.	Ta=-40~85°C MIN.	Ta=-40~85°C MAX.	UNIT
Output Transition Time	t_{TLH}		2.0	-	25	60	-	75	ns
	t_{THL}		4.5	-	7	12	-	15	
			6.0	-	6	11	-	13	
Propagation Delay Time *	t_{pLH}		2.0	-	48	100	-	125	
	t_{pHL}		4.5	-	12	20	-	25	
			6.0	-	10	17	-	21	
Propagation Dealy Time **	t_{pLH}		2.0	-	40	85	-	105	
	t_{pHL}		4.5	-	11	17	-	21	
			6.0	-	10	14	-	18	
3-State Output Enable Time	t_{pZL}	R_L=1kΩ	2.0	-	74	150	-	190	
	t_{pZH}		4.5	-	19	30	-	38	
			6.0	-	10	26	-	33	
3-State Output Disable Time	t_{pLZ}	R_L=1kΩ	2.0	-	100	180	-	225	
	t_{pHZ}		4.5	-	25	36	-	45	
			6.0	-	21	31	-	38	
Input Capacitance	C_{IN}	GAB, $\overline{GBA}$		-	5	10	-	10	pF
Bus Terminal Input Capacitance	$C_{I/O}$	An, Bn		-	13	-	-	-	
Power Dissipation Capacitance	C_{PD}(1)	TC74HC620		-	40	-	-	-	
		TC74HC623		-	35	-	-	-	

Note (1) C_{PD} is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit). Average operating current can be obtained by the equation hereunder.

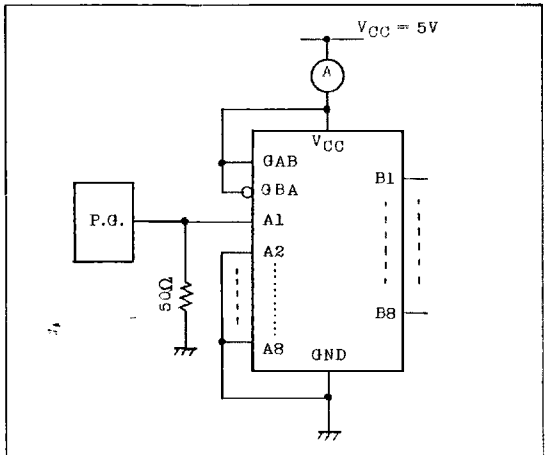
$$I_{CC(Opr.)}=C_{PD} \cdot V_{CC} \cdot f_{IN}$$

(2) * TC74HC620 ** TC74HC623

SWITCHING CHARACTERISTICS TEST WAVEFORM



$I_{CC(Opr.)}$ TEST CIRCUIT



Input waveform is the same as that in case of switching characteristics test.

C_{PD} CALCULATION

C_{PD} is to be calculated with the formula hereunder by using the measured value of $I_{CC(Opr.)}$ in the test circuit drawn left side.

$$C_{PD} = \frac{I_{CC(Opr.)}}{f_{IN} \cdot V_{CC}}$$

At determining the typical value of C_{PD}, a relatively high frequency 1MHz was applied for f_{IN}, in order to eliminate the error from the quiescent supply current.