

# ✓ TC74HC7640AP/AF ✓ TC74HC7643AP/AF ✓ TC74HC7645AP/AF

OCTAL BUS TRANSCEIVER (WITH SCHMITT TRIGGER INPUTS)  
 TC74HC7640AP/AF 3-STATE, INVERTING  
 TC74HC7643AP/AF 3-STATE, INVERTING AND NON-INVERTING  
 TC74HC7645AP/AF 3-STATE, NON-INVERTING

The TC74HC7640A, 7643A and 7645A are high speed CMOS OCTAL BUS TRANSCEIVERS fabricated with silicon gate C<sup>2</sup>MOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

The TC74HC7640A, 7643A and 7645A have the same configuration and function as the TC74HC640A, 643A and 245A respectively. They differ in that the former have Schmitt trigger inputs, making them ideal for such applications as line receivers, etc.

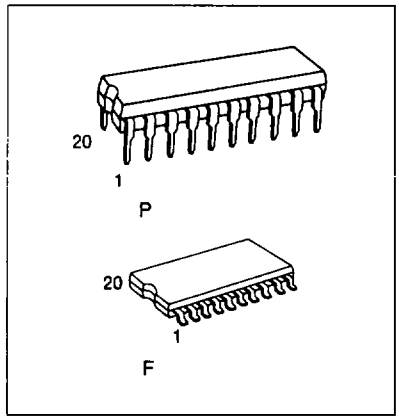
They are intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the Direction (DIR) input.

The Enable ( $\bar{G}$ ) input can be used to disable the device so that the busses are affectively isolated.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

**FEATURES:**

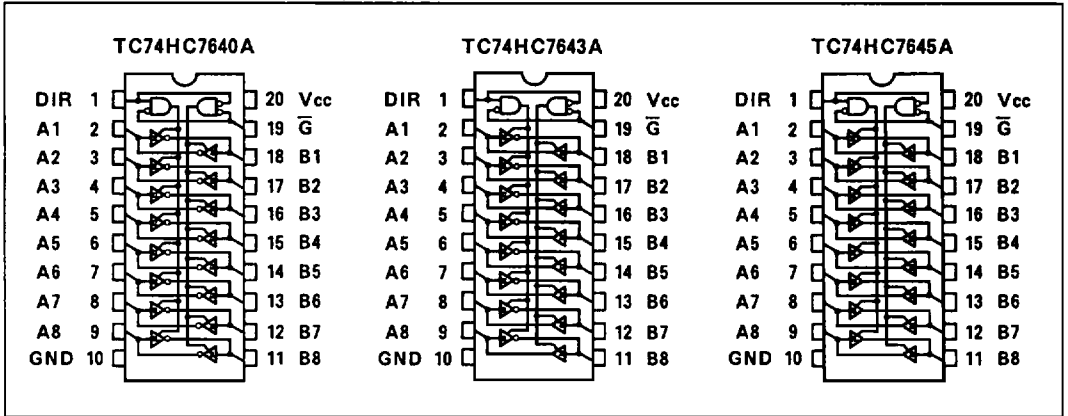
- High Speed .....  $t_{PI} = 14ns$  (typ.) at  $V_{CC} = 5V$
- Low Power Dissipation .....  $I_{CC} = 4\mu A$  (Max.) at  $T_a = 25^\circ C$
- High Noise Immunity .....  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Output Drive Capability ..... 15 LSTTL Loads
- Symmetrical Output Impedance .....  $|I_{OH}| = I_{OL} = 6mA$  (Min.)
- Balanced Propagation Delays .....  $t_{PLH} \approx t_{PHL}$
- Wide Operating Voltage Range .....  $V_{CC} (opr) = 2V \sim 6V$
- Pin and Function Compatible with 74LS640, 643, 245



**APPLICATION NOTES**

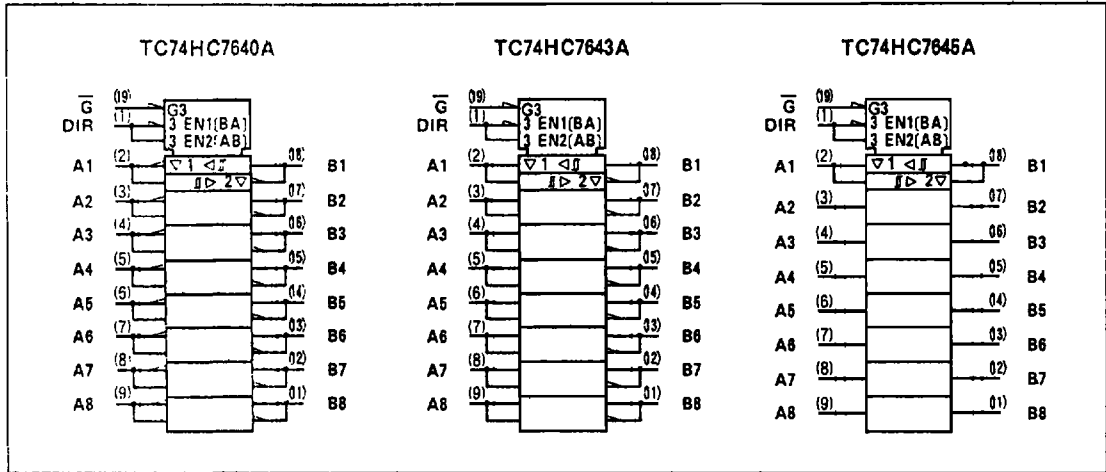
- 1) Do not apply a signal to any bus terminal when it is in the out put mode. Damage may result.
- 2) All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors or bus terminator IC's such as the TOSHIBA TC40117BP.

**PIN ASSIGNMENT(TOP VIEW)**



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IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS		FUNCTION		OUTPUTS		
$\bar{G}$	DIR	A BUS	B BUS	HC7640A	HC7643A	HC7645A
L	L	OUTPUT	INPUT	$A = \bar{B}$	$A = B$	$A = B$
L	H	INPUT	OUTPUT	$B = \bar{A}$	$B = \bar{A}$	$B = A$
H	X	High Impedance		Z	Z	Z

X : Don't care  
Z : High Impedance

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### 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
DC Output Voltage	$V_{OLT}$	-0.5 ~ $V_{CC}+0.5$	V
Input Diode Current	$I_{IK}$	±20	mA
Output Diode Current	$I_{OK}$	±20	mA
DC Output Current	$I_{OLT}$	±35	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	±75	mA
Power Dissipation	$P_D$	500(DIP)*/180(SOIC)	mW
Storage Temperature	$T_{stg}$	-65 ~ 150	°C
Lead Temperature 10sec	$T_L$	300	°C

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{mW}/^{\circ}\text{C}$  shall be applied until 300mW.

### RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	2 ~ 6	V
Input Voltage	$V_{IN}$	0 ~ $V_{CC}$	V
Output Voltage	$V_{OLT}$	0 ~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40 ~ 85	°C
Input Rise and Fall Time (DIR, $\bar{G}$ )	$t_r, t_f$	0 ~ 1000( $V_{CC}=2.0\text{V}$ )	ns
		0 ~ 500( $V_{CC}=4.5\text{V}$ )	
		0 ~ 400( $V_{CC}=6.0\text{V}$ )	

### DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub>	T <sub>a</sub> =25°C			T <sub>a</sub> =-40 ~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Input Voltage (DIR, G)	V <sub>IH</sub>		2.0	1.5	-	-	1.5	-	V	
			4.5	3.15	-	-	3.15	-		
			6.0	4.2	-	-	4.2	-		
Low-Level Input Voltage (DIR, G)	V <sub>IL</sub>		2.0	-	-	0.5	-	0.5	V	
			4.5	-	-	1.35	-	1.35		
			6.0	-	-	1.8	-	1.8		
Positive Threshold Voltage (An, Bn)	V <sub>P</sub>		2.0	1.0	1.25	1.5	1.0	1.5	V	
			4.5	2.3	2.7	3.15	2.3	3.15		
			6.0	3.0	3.5	4.2	3.0	4.2		
Negative Threshold Voltage (An, Bn)	V <sub>N</sub>		2.0	0.3	0.65	0.9	0.3	0.9	V	
			4.5	1.13	1.6	2.0	1.13	2.0		
			6.0	1.5	2.3	2.6	1.5	2.6		
Hysteresis Voltage (An, Bn)	V <sub>H</sub>		2.0	0.3	0.6	1.0	0.3	1.0	V	
			4.5	0.6	1.1	1.4	0.6	1.4		
			6.0	0.8	1.2	1.7	0.8	1.7		
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	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	-	
				4.5	4.18	4.31	-	4.13	-	
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = -6 mA	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	
				4.5	-	0.17	0.26	-	0.33	
3-State Output Off-State Current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND	6.0	-	-	±0.5	-	±5.0	μA	
			Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	-	-		±0.1
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	-	-	4.0	-	40.0		

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**AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)**

PARAMETER	SYMBOL	TEST CONDITION	CL	V <sub>CC</sub>	T <sub>a</sub> = 25°C			T <sub>a</sub> = -40 ~ 85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t <sub>TLH</sub> t <sub>THL</sub>		50	2.0	-	25	60	-	75	ns
				4.5	-	7	12	-	15	
				6.0	-	6	10	-	13	
Propagation Delay Time	t <sub>pLH</sub>	R <sub>L</sub> = 1 kΩ	50	2.0	-	50	125	-	155	
				4.5	-	17	25	-	31	
				6.0	-	15	21	-	26	
	t <sub>pHL</sub>		150	2.0	-	63	150	-	205	
				4.5	-	22	30	-	41	
				6.0	-	18	26	-	35	
3-State Output Enable Time	t <sub>pZL</sub>	R <sub>L</sub> = 1 kΩ	50	2.0	-	50	150	-	190	
				4.5	-	17	30	-	38	
				6.0	-	15	26	-	32	
	t <sub>pZt</sub>		150	2.0	-	63	180	-	225	
				4.5	-	22	36	-	45	
				6.0	-	19	31	-	38	
3-State Output Disable Time	t <sub>pLZ</sub> t <sub>pHZ</sub>	R <sub>L</sub> = 1 kΩ	50	2.0	-	45	150	-	190	
				4.5	-	20	30	-	38	
				6.0	-	19	26	-	32	
Input Capacitance	C <sub>IN</sub>		DIR, G	-	-	5	10	-	-	pF
Bus Input Capacitance	C <sub>I/O</sub>		An, Bn	-	-	13	-	-	-	
Power Dissipation Capacitance	C <sub>PD(1)</sub>		TC74HC7640A/7643A	-	-	48	-	-	-	
		TC74HC7645A	-	-	45	-	-	-		

Note(1) C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC(ave)} = C_{PD} \cdot V_{CC} \cdot f_N + I_{CC} / 8 (\text{per bit})$$

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