

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74HC245AP, TC74HC245AF, TC74HC245AFW  
TC74HC640AP, TC74HC640AF**

**OCTAL BUS TRANSCEIVER**

**TC74HC245AP / AF / AFW 3— STATE, NON—INVERTING**  
**TC74HC640AP / AF 3— STATE, INVERTING**

(Note) The JEDEC SOP (FW) is not available in Japan.

The TC74HC245A, 640A are high speed CMOS OCTAL BUS TRANSCEIVERS fabricated with silicon gate C<sup>2</sup>MOS technology.

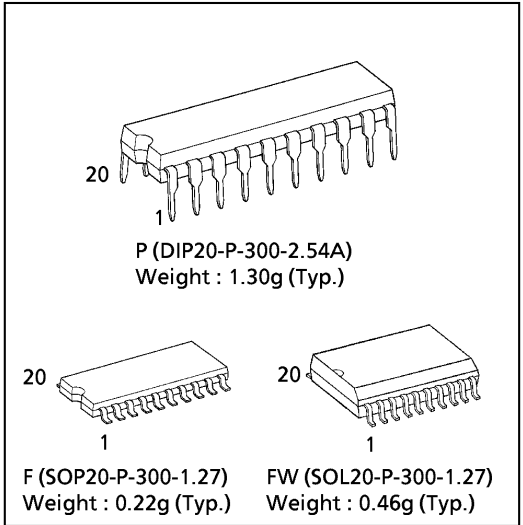
They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. They are intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the DIR input.

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

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

**FEATURES :**

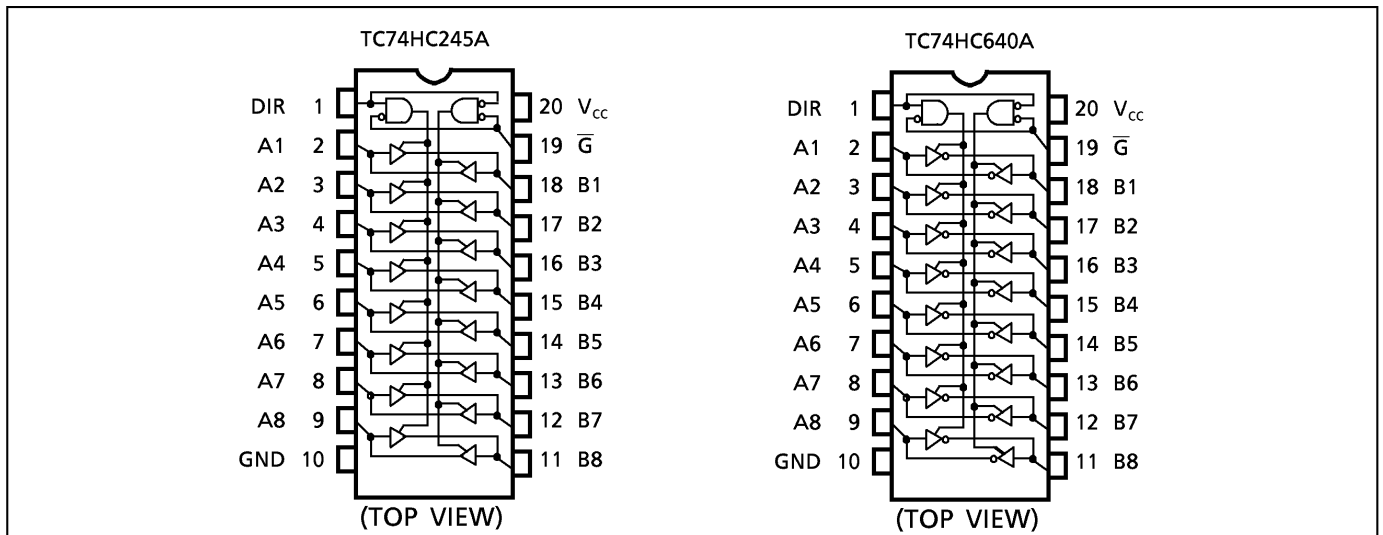
- High Speed..... $t_{pd} = 10ns$ (typ.) at  $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A$ (Max.) at  $T_a = 25^\circ C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Output Drive Capability..... 15 LSTTL Loads
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 6mA$ (Min.)
- Balanced Propagation Delays.....  $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range...  $V_{CC}$  (opr.) = 2V~6V
- Pin and Function Compatible with 74LS 245 / 640



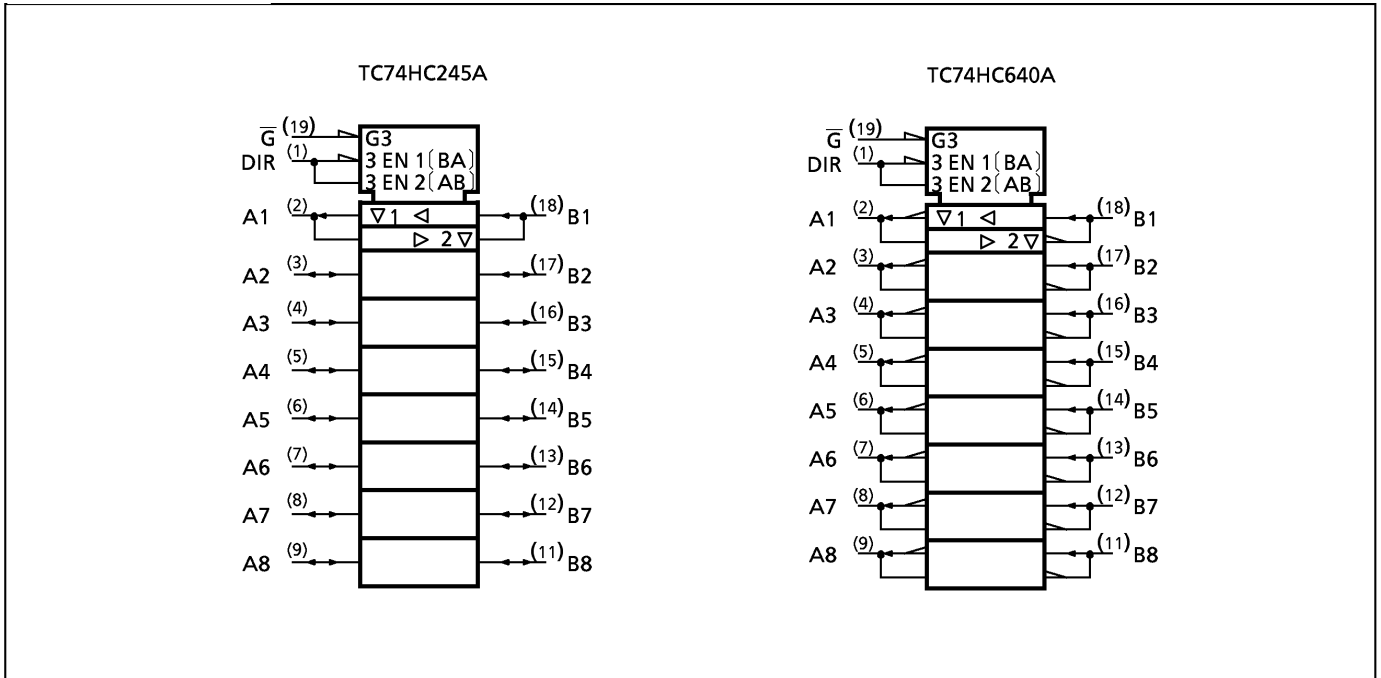
**APPLICATION NOTES**

- 1) Do not apply a signal to any bus terminal when it is in the output 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.

**PIN ASSIGNMENT**



IEC LOGIC SYMBOL



TRUTH TABLE

INPUTS		FUNCTION		OUTPUTS	
$\bar{G}$	DIR	A BUS	B BUS	HC245A	HC640A
L	L	OUTPUT	INPUT	$A = B$	$A = \bar{B}$
L	H	INPUT	OUTPUT	$B = A$	$B = \bar{A}$
H	X	High Impedance		Z	Z

X : "H" or "L"  
Z : High Impedance

## 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	$V_{OUT}$	-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	$I_{CC}$	±75	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°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	$V_{OUT}$	0~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40~85	°C
Input Rise and Fall Time	$t_r, t_f$	0~1000 ( $V_{CC} = 2.0\text{V}$ ) 0~500 ( $V_{CC} = 4.5\text{V}$ ) 0~400 ( $V_{CC} = 6.0\text{V}$ )	ns

## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^{\circ}\text{C}$			$T_a = -40 \sim 85^{\circ}\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	$V_{IH}$		2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low - Level Input Voltage	$V_{IL}$		2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\mu\text{A}$	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	—	
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\mu\text{A}$	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	
3 - State Output Off - State Current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND	6.0	—	—	±0.5	—	±5.0	$\mu\text{A}$	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	±0.1	—	±1.0	$\mu\text{A}$	
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	4.0	—	40.0		

AC ELECTRICAL CHARACTERISTICS ( Input  $t_r = t_f = 6ns$  )

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	$t_{TLH}$ $t_{THL}$		50	2.0	—	52	60	—	75	ns
				4.5	—	7	12	—	15	
				6.0	—	6	10	—	13	
Propagation Delay Time	$t_{pLH}$ $t_{pHL}$		50	2.0	—	33	90	—	115	
				4.5	—	12	18	—	23	
				6.0	—	10	15	—	20	
			150	2.0	—	48	120	—	150	
				4.5	—	16	24	—	30	
				6.0	—	14	20	—	26	
3 -State Output Enable time	$t_{pZL}$ $t_{pZH}$	$R_L = 1k\Omega$	50	2.0	—	48	150	—	190	
				4.5	—	16	30	—	38	
				6.0	—	14	26	—	32	
			150	2.0	—	63	180	—	225	
				4.5	—	21	36	—	45	
				6.0	—	18	31	—	38	
3 -State Output Disable time	$t_{pLZ}$ $t_{pHZ}$	$R_L = 1k\Omega$	50	2.0	—	37	150	—	190	
				4.5	—	17	30	—	38	
				6.0	—	15	26	—	32	
Input Capacitance	$C_{IN}$	DIR,G			—	5	10	—	10	pF
Bus Input Capacitance	$C_{OUT}$	An,Bn			—	13	—	—	—	
Power Dissipation Capacitance	$C_{PD}(1)$	TC74HC245A			—	39	—	—	—	
		TC74HC640A			—	37	—	—	—	

Note(1)  $C_{PD}$  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 :

$$I_{CC}(\text{opr}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 8 \text{ (per bit)}$$

**DIP 20PIN PACKAGE DIMENSIONS (DIP20-P-300-2.54A)**

Unit in mm



**SOP 20PIN (200mil BODY) PACKAGE DIMENSIONS (SOP20-P-300-1.27)**

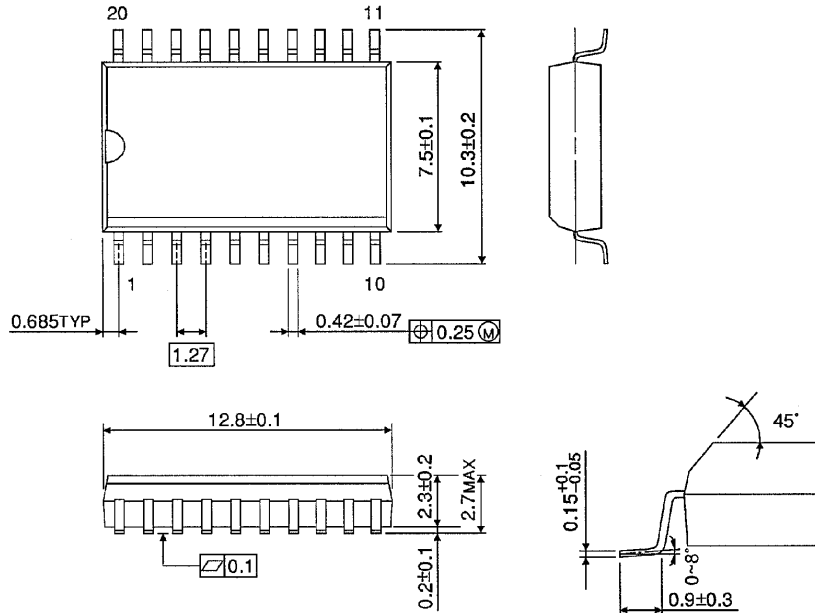
Unit in mm



**SOP 20PIN (300mil BODY) PACKAGE DIMENSIONS (SOL20-P-300-1.27)**

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

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