

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 TC74AC245A, 640A are high speed CMOS OCTAL BUS TRANSCEIVERS fabricated with silicon gate C²MOS technology.

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

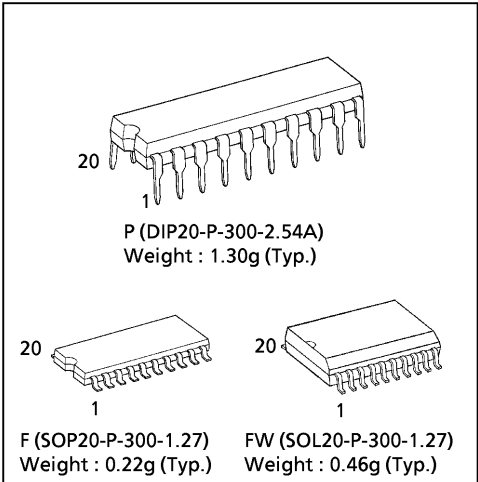
They are intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the DIR input.

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 :

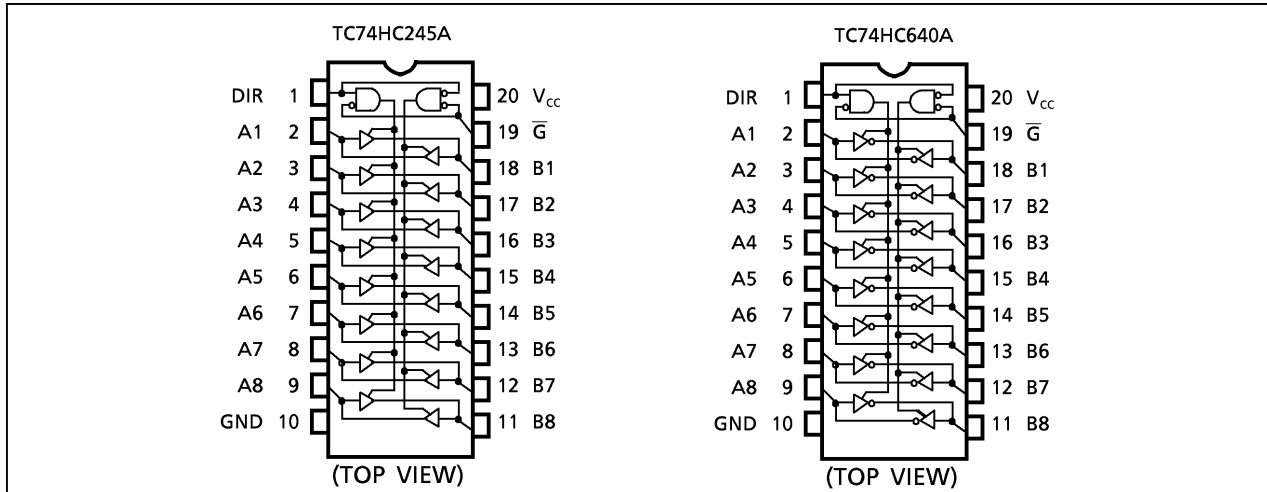
- High Speed..... $t_{pd} = 10\text{ns}(\text{typ.})$ at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 4\mu\text{A}(\text{Max.})$ at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Output Drive Capability 15 LSTTL Loads
- Symmetrical Output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

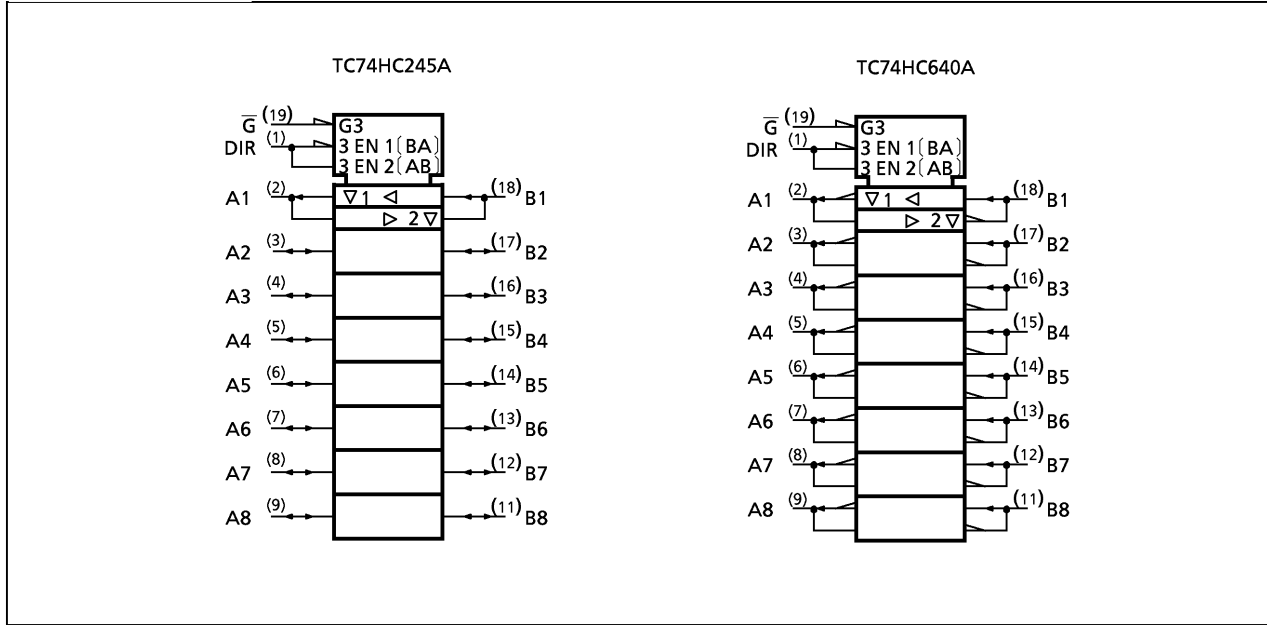
PIN ASSIGNMENT



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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

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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_{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 $T_a = -40^{\circ}C \sim 65^{\circ}C$. From $T_a = 65^{\circ}C$ to $85^{\circ}C$ a derating factor of $-10mW/^{\circ}C$ 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 ($V_{CC} = 2.0V$) 0~ 500 ($V_{CC} = 4.5V$) 0~ 400 ($V_{CC} = 6.0V$)	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	$T_a = 25^{\circ}C$			$T_a = -40 \sim 85^{\circ}C$		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}	$I_{OH} = -20\mu A$	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	—		
			$I_{OH} = -6$ mA $I_{OH} = -7.8$ mA	4.5	4.18	4.31	—	4.13	—	
6.0	5.68	5.80		—	5.63	—				
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\mu A$	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		
			$I_{OL} = 6$ mA $I_{OL} = 7.8$ mA	4.5	—	0.17	0.26	—	0.33	
6.0	—	0.18		0.26	—	0.33				
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	μA	
Input Leakage 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		

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

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V _{CC} (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 = 1kΩ	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 = 1kΩ	50	2.0	—	37	150	—	190	
				4.5	—	17	30	—	38	
				6.0	—	15	26	—	32	
Input Capacitance	C _{IN}	DIR,G			—	5	10	—	pF	
Bus Input Capacitance	C _{OUT}	An,Bn			—	13	—	—		
Power Dissipation Capacitance	C _{PD} (1)	TC74HC245A			—	39	—	—		—
		TC74HC640A			—	37	—	—		—

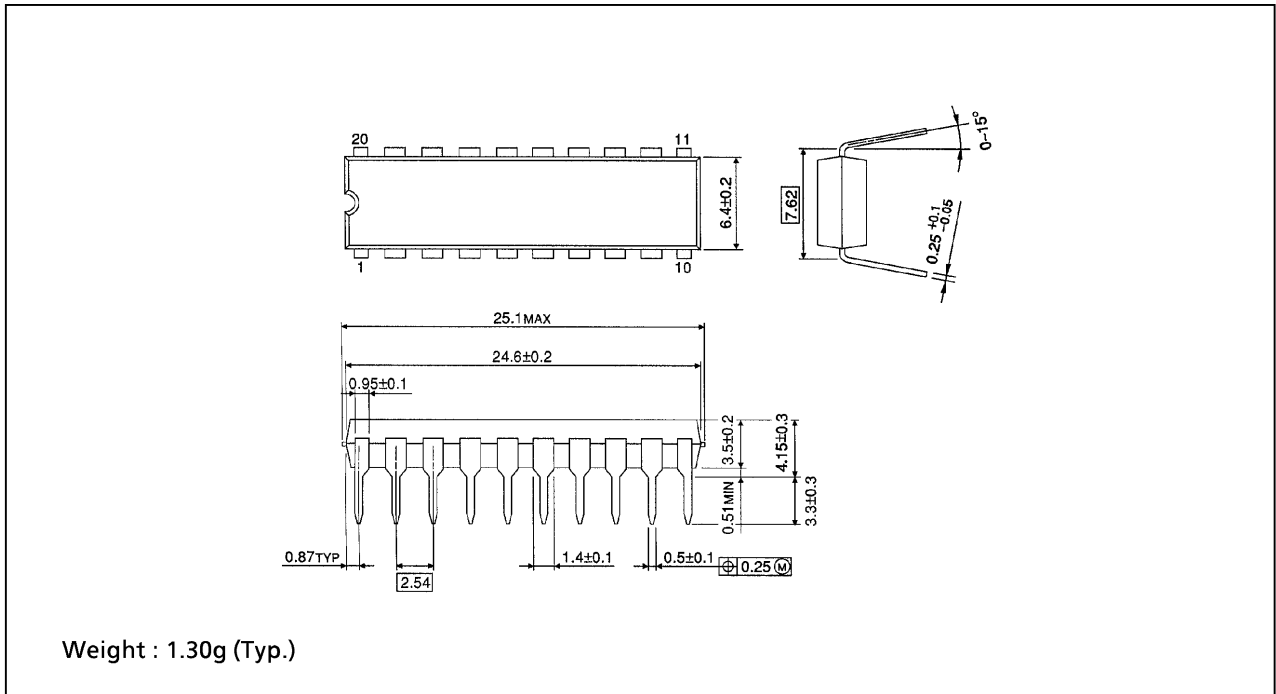
Note(1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

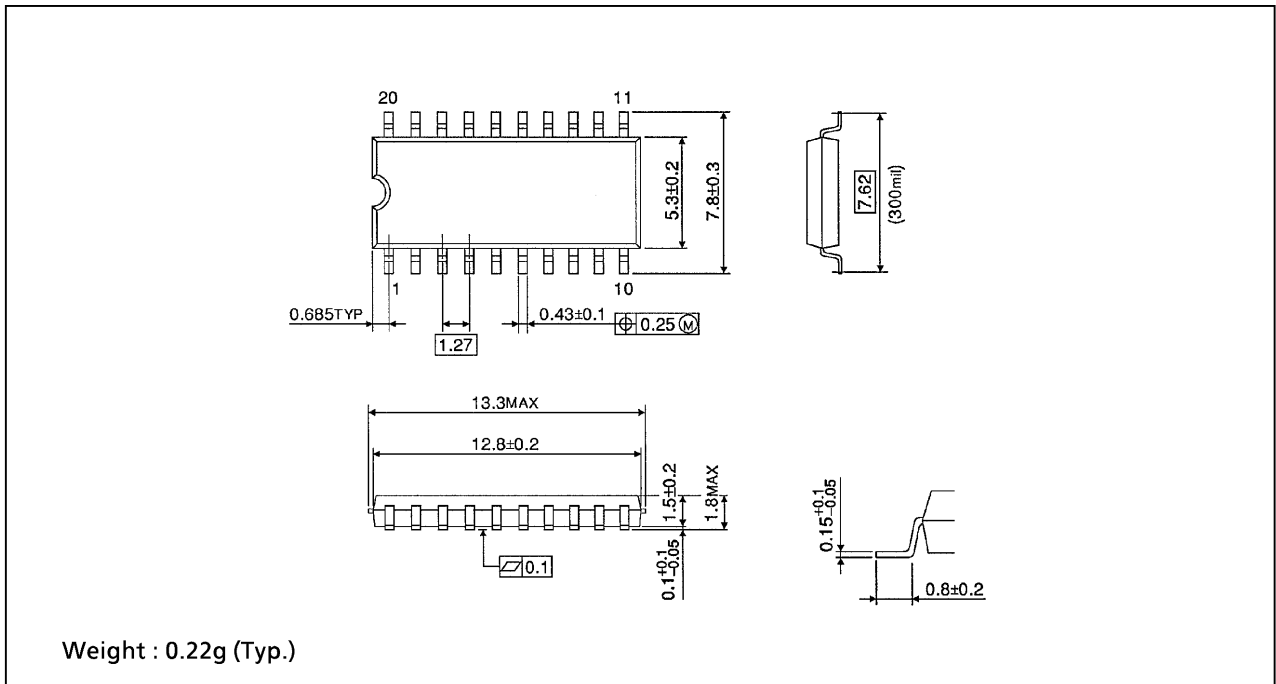
DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)

Unit in mm



SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)

Unit in mm



SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27)

Unit in mm

(Note) This package is not available in Japan.

