

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

## TC74HCT245AP, TC74HCT245AF

### Octal Bus Transceiver (3-state)

The TC74HCT245A is high speed CMOS OCTAL BUS TRANSCEIVER fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

Its inputs are compatible with TTL, NMOS, and CMOS output voltage levels.

It is 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.

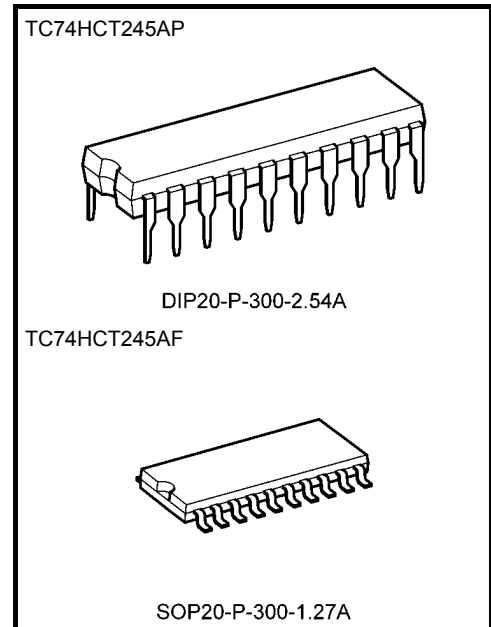
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### Features (Note 1) (Note 2)

- High speed:  $t_{pd} = 10 \text{ ns}$  (typ.) at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 4 \mu\text{A}$  (max) at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs:  $V_{IL} = 0.8 \text{ V}$  (max)  
 $V_{IH} = 2.0 \text{ V}$  (min)
- Wide interfacing ability: LSTTL, NMOS, CMOS
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance:  $|I_{OH}| = I_{OL} = 6 \text{ mA}$  (min)
- Balanced propagation delays:  $t_{pLH} \approx t_{pHL}$
- Pin and function compatible with 74LS245

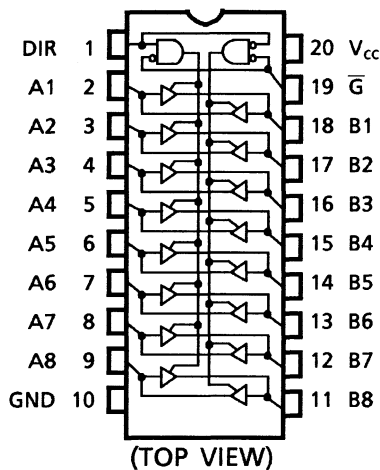
Note 1: Do not apply a signal to any bus terminal when it is the output mode. Damage may result.

Note 2: All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or down resistors.

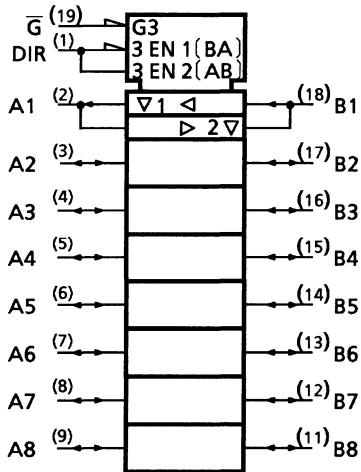


Weight		
DIP20-P-300-2.54A	:	1.30 g (typ.)
SOP20-P-300-1.27A	:	0.22 g (typ.)

### Pin Assignment



**IEC Logic Symbol**



**Truth Table**

Inputs		Function		Output
$\bar{G}$	DIR	A Bus	B Bus	
L	L	Output	Input	A = B
L	H	Input	Output	B = A
H	X	Z		Z

X: "H" or "L"

Z: High impedance

**Absolute Maximum Ratings (Note 1)**

Characteristics	Symbol	Rating	Unit
Supply voltage range	$V_{CC}$	-0.5 to 7	V
DC input voltage	$V_{IN}$	-0.5 to $V_{CC} + 0.5$	V
DC output voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Input diode current	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 35$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 75$	mA
Power dissipation	$P_D$	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	$T_{stg}$	-65 to 150	$^{\circ}C$

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: 500 mW in the range of  $T_a = -40$  to  $65^{\circ}C$ . From  $T_a = 65$  to  $85^{\circ}C$  a derating factor of  $-10$  mW/ $^{\circ}C$  shall be applied until 300 mW.

## Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	4.5 to 5.5	V
Input voltage	$V_{IN}$	0 to $V_{CC}$	V
Output voltage	$V_{OUT}$	0 to $V_{CC}$	V
Operating temperature	$T_{opr}$	-40 to 85	°C
Input rise and fall time	$t_r, t_f$	0 to 500	ns

Note: The operating ranges are required to ensure the normal operation of the device. Unused inputs and bus inputs must be tied to either  $V_{CC}$  or GND. Please connect both bus inputs and the bus outputs with  $V_{CC}$  or GND when the I/O of the bus terminal changes by the function. In this case, please note that the output is not short-circuited.

## Electrical Characteristics

### DC Characteristics

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit	
				Min	Typ.	Max	Min	Max		
High-level input voltage	$V_{IH}$	—	4.5 to 5.5	2.0	—	—	2.0	—	V	
Low-level input voltage	$V_{IL}$	—	4.5 to 5.5	—	—	0.8	—	0.8	V	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -20 \mu\text{A}$	4.5	4.4	4.5	—	4.4	—	V
			$I_{OH} = -6 \text{ mA}$	4.5	4.18	4.31	—	4.13	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 20 \mu\text{A}$	4.5	—	0.0	0.1	—	0.1	V
			$I_{OL} = 6 \text{ mA}$	4.5	—	0.17	0.26	—	0.33	
3-state output off-state current	$I_{OZ}$	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	$\pm 0.5$	—	$\pm 5.0$	$\mu\text{A}$	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC} \text{ or } \text{GND}$	5.5	—	—	4.0	—	40.0	$\mu\text{A}$	
	$I_C$	Per input: $V_{IN} = 0.5 \text{ V or } 2.4 \text{ V}$ Other input: $V_{CC} \text{ or } \text{GND}$	5.5	—	—	2.0	—	2.9	mA	

## AC Characteristics (input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
		CL (pF)	VCC (V)	Min	Typ.	Max	Min	Max		
Output transition time	$t_{TLH}$	—	50	4.5	—	7	12	—	15	ns
	$t_{THL}$			5.5	—	6	11	—	14	
Propagation delay time	$t_{pLH}$	—	50	4.5	—	13	22	—	28	ns
				5.5	—	11	20	—	25	
	$t_{pHL}$		150	4.5	—	18	30	—	38	
				5.5	—	16	27	—	34	
3-state output enable time	$t_{pZL}$	$R_L = 1$ k $\Omega$	50	4.5	—	19	30	—	38	ns
				5.5	—	16	27	—	34	
	$t_{pZH}$		150	4.5	—	24	38	—	48	
				5.5	—	22	34	—	43	
3-state output disable time	$t_{pLZ}$	$R_L = 1$ k $\Omega$	50	4.5	—	17	30	—	38	ns
	$t_{pHZ}$			5.5	—	16	27	—	34	
Input capacitance	$C_{IN}$	DIR, $\bar{G}$		—	5	10	—	10	pF	
Output capacitance	$C_{I/O}$	An, Bn		—	13	—	—	—	pF	
Power dissipation capacitance	$C_{PD}$ (Note)	—		—	41	—	—	—	pF	

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

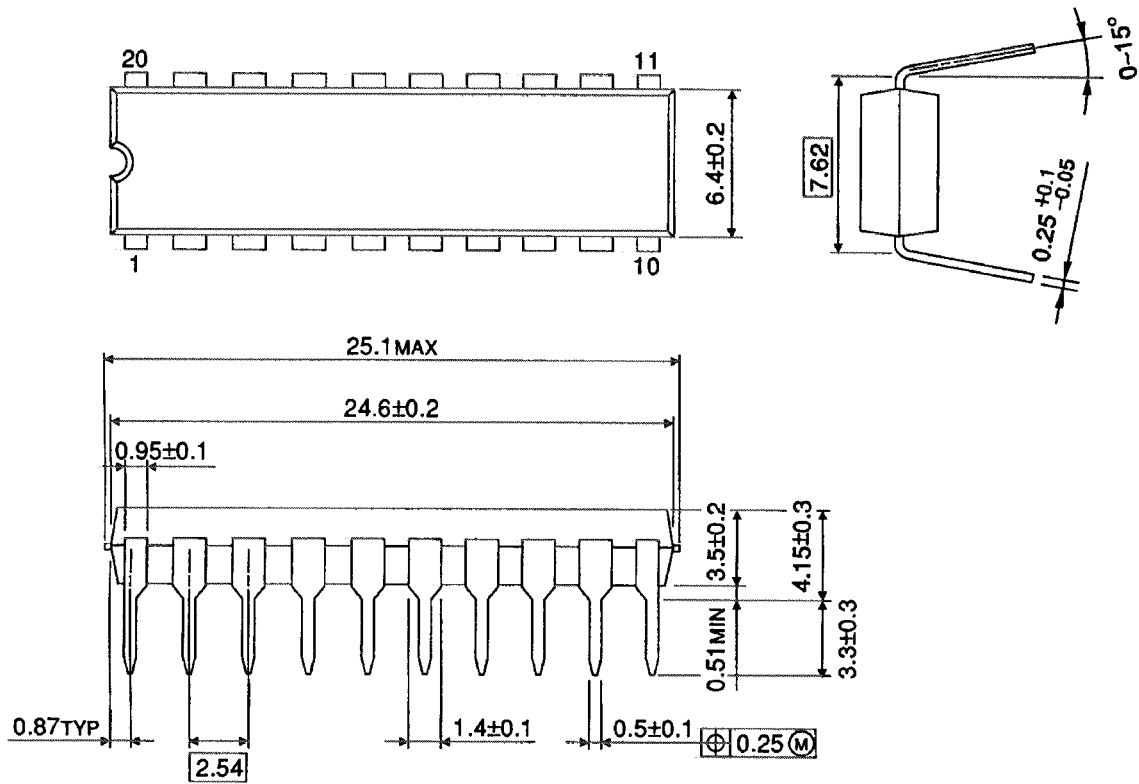
Average operating current can be obtained by the equation:

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

## Package Dimensions

DIP20-P-300-2.54A

Unit : mm

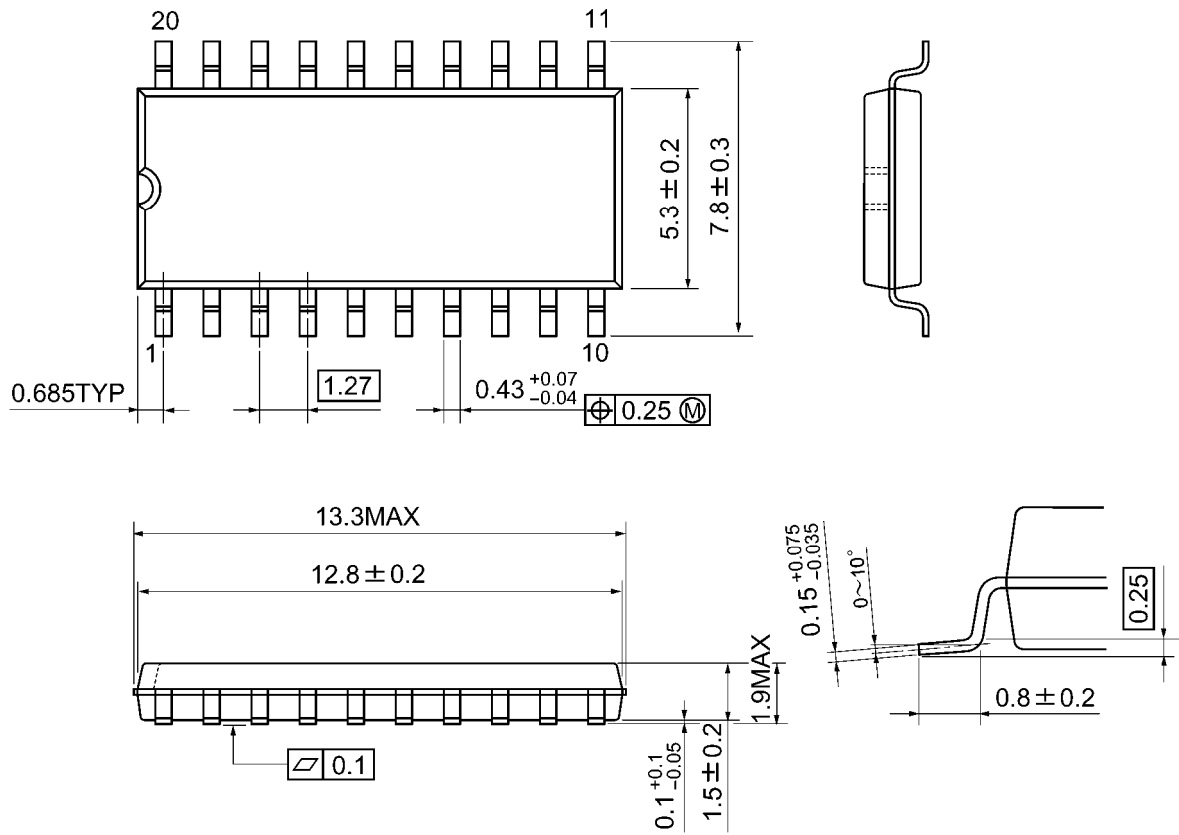


Weight: 1.30 g (typ.)

## Package Dimensions

SOP20-P-300-1.27A

Unit: mm



Weight: 0.22 g (typ.)

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