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 C²MOS technology.

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

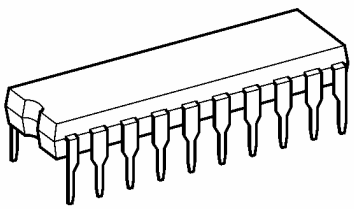
Its inputs are compatible with TTL, NMOS, and CMOS output voltage levels.

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

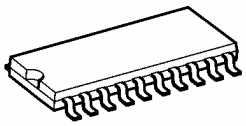
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

TC74HCT245AP



DIP20-P-300-2.54A

TC74HCT245AF



SOP20-P-300-1.27A

Weight

DIP20-P-300-2.54A : 1.30 g (typ.)

SOP20-P-300-1.27A : 0.22 g (typ.)

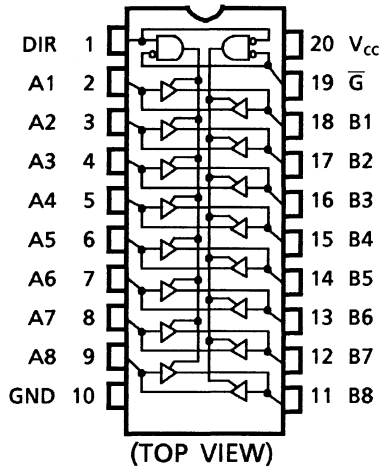
Features (Note 1) (Note 2)

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

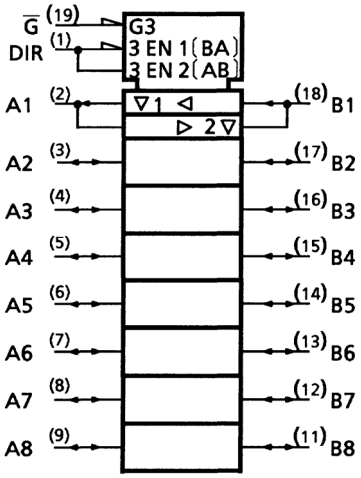
Note 1: Do not apply a signal to any bus terminal when it is the output mode. Damage may result.

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

Pin Assignment



IEC Logic Symbol



Truth Table

Inputs		Function		Output
$\overline{G}$	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}	±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) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	−65 to 150	°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 Ta = −40 to 65°C. From Ta = 65 to 85°C a derating factor of −10 mW/°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 VCC or GND. Please connect both bus inputs and the bus outputs with VCC 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		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	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} or V_{IL}	I_{OH} = −20 μA	4.5	4.4	4.5	—	4.4	—	V
			I_{OH} = −6 mA	4.5	4.18	4.31	—	4.13	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	4.5	—	0.0	0.1	—	0.1	V
			I_{OL} = 6 mA	4.5	—	0.17	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		5.5	—	—	±0.5	—	±5.0	μA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	4.0	—	40.0	μA
	I_C	Per input: V_{IN} = 0.5 V or 2.4 V Other input: V_{CC} or 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
			C_L (pF)	V_{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH} t_{THL}	—	50	4.5	—	7	12	—	15	ns
				5.5	—	6	11	—	14	
Propagation delay time	t_{pLH} t_{pHL}	—	50	4.5	—	13	22	—	28	ns
				5.5	—	11	20	—	25	
			150	4.5	—	18	30	—	38	
				5.5	—	16	27	—	34	
3-state output enable time	t_{pZL} t_{pZH}	R_L = 1 kΩ	50	4.5	—	19	30	—	38	ns
				5.5	—	16	27	—	34	
			150	4.5	—	24	38	—	48	
				5.5	—	22	34	—	43	
3-state output disable time	t_{pLZ} t_{pHZ}	R_L = 1 kΩ	50	4.5	—	17	30	—	38	ns
				5.5	—	16	27	—	34	
Input capacitance	C_{IN}	DIR, $\overline{G}$			—	5	10	—	10	pF
Output capacitance	$C_{I/O}$	An, Bn			—	13	—	—	—	pF
Power dissipation capacitance	C_{PD} (Note)	—			—	41	—	—	—	pF

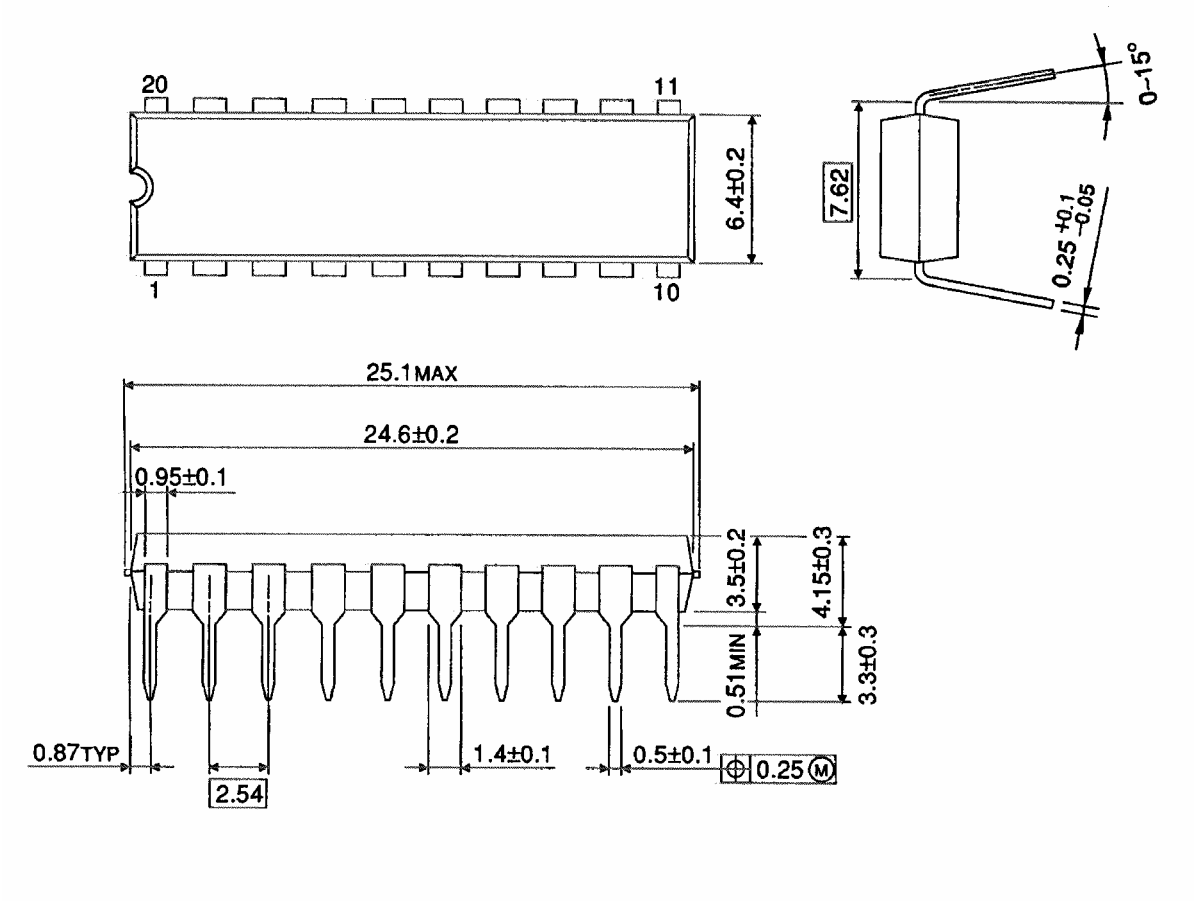
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

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

Package Dimensions

DIP20-P-300-2.54A Unit : mm



Weight: 1.30 g (typ.)

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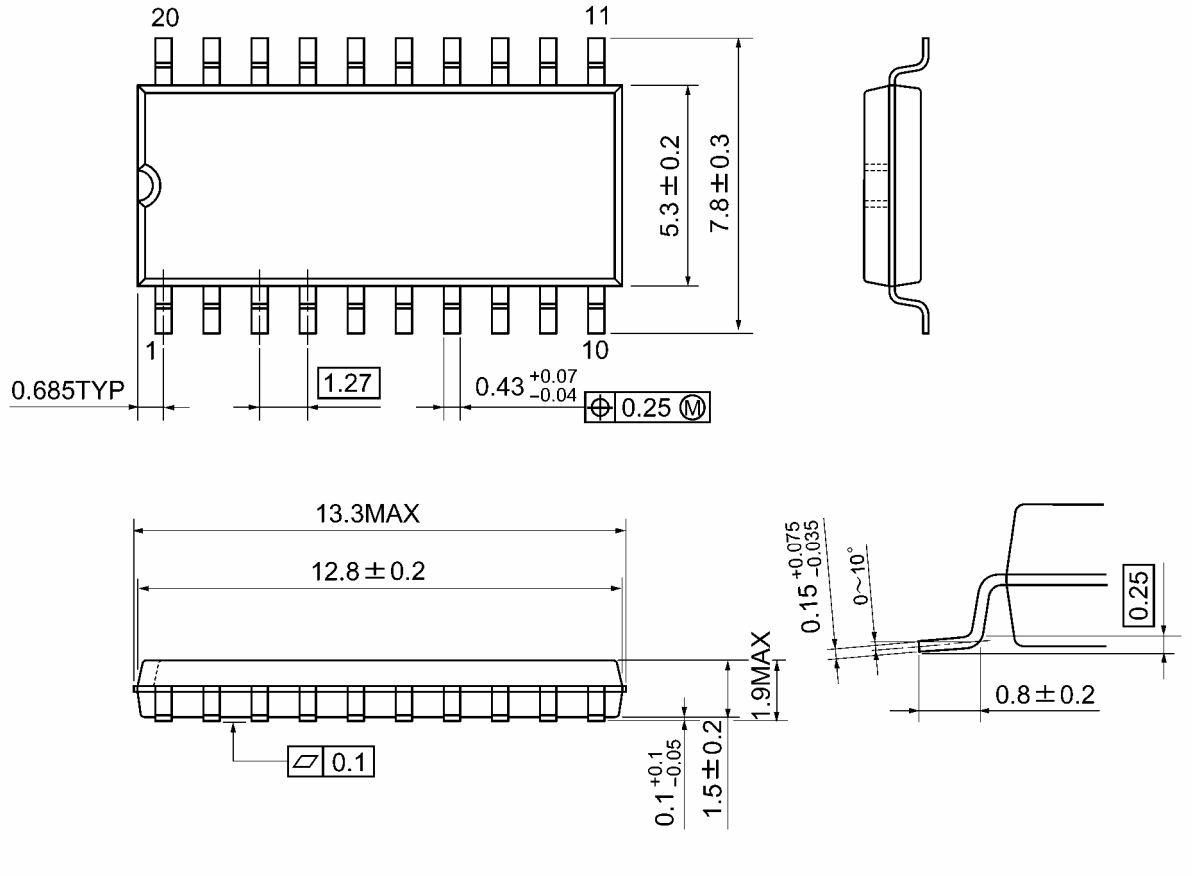
SOP20-P-300-1.27A Unit: mm



Weight: 0.22 g (typ.)

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20070701-EN

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