TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

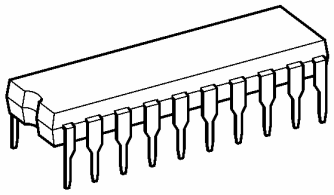
TC74HC245AP,TC74HC245AF,TC74HC245AFW TC74HC640AP,TC74HC640AF

Octal Bus Transceiver

TC74HC245AP/AF/AFW	3-State, Non-Inverting
TC74HC640AP/AF	3-State, Inverting

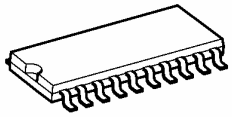
Note: xxxFW (JEDEC SOP) is not available in Japan.

TC74HC245AP, TC74HC640AP

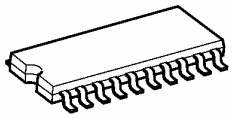


DIP20-P-300-2.54A

TC74HC245AF, TC74HC640AF

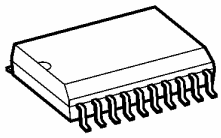


SOP20-P-300-1.27A



SOP20-P-300-1.27

TC74HC245AFW



SOL20-P-300-1.27

The TC74HC245A, 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 ($\overline{G}$) 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.

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
- 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 mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2~6 V
- Pin and function compatible with 74LS245/640

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

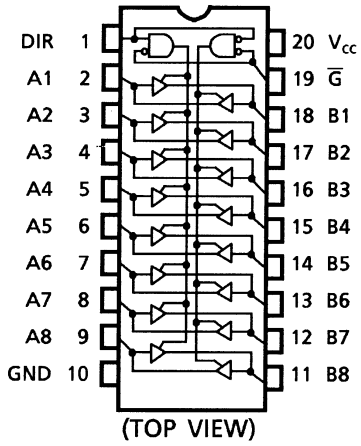
Note 2: All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors.

Weight

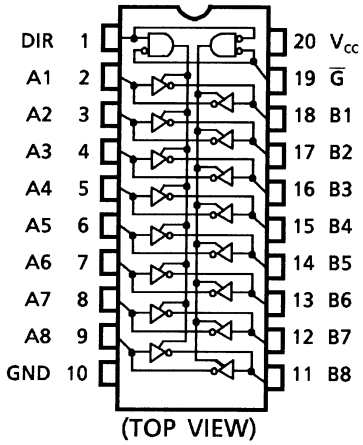
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)
SOP20-P-300-1.27	: 0.22 g (typ.)
SOL20-P-300-1.27	: 0.46 g (typ.)

Pin Assignment

TC74HC245A

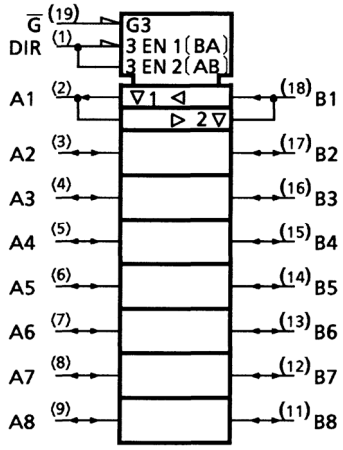


TC74HC640A

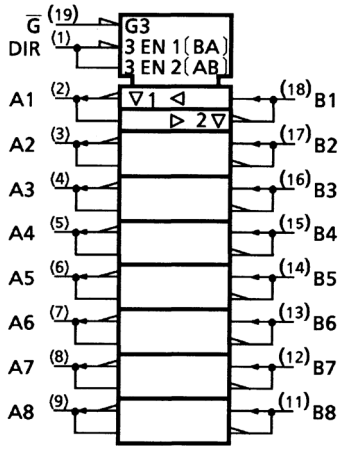


IEC Logic Symbol

TC74HC245A



TC74HC640A



Truth Table

Inputs		Function		Outputs	
$\overline{G}$	DIR	A Bus	B Bus	HC245A	HC640A
L	L	Output	Input	A = B	A = $\overline{B}$
L	H	Input	Output	B = A	B = $\overline{A}$
H	X	Z		Z	Z

X: “H” or “L”

Z: High impedance

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5~7	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) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	−65~150	°C

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

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.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	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 V) 0~500 (V_{CC} = 4.5 V) 0~400 (V_{CC} = 6.0 V)	ns

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V_{CC} (V)	Ta = 25°C Min	Ta = 25°C Typ.	Ta = 25°C Max	Ta = –40~85°C Min	Ta = –40~85°C Max	Unit
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 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	—	
			I_{OH} = –6 mA	4.5	4.18	4.31	—	4.13	—	
			I_{OH} = –7.8 mA	6.0	5.68	5.80	—	5.63	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	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	4.5	—	0.17	0.26	—	0.33	
			I_{OL} = 7.8 mA	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	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	—	4.0	—	40.0	μA

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

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = –40~85°C		Unit
			CL (pF)	V_{CC} (V)	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	ns
				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	ns
				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	ns
				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	—	—	—	pF
Power dissipation capacitance	C_{PD} (Note)	TC74HC245A			—	39	—	—	—	pF
		TC74HC640A			—	37	—	—	—	

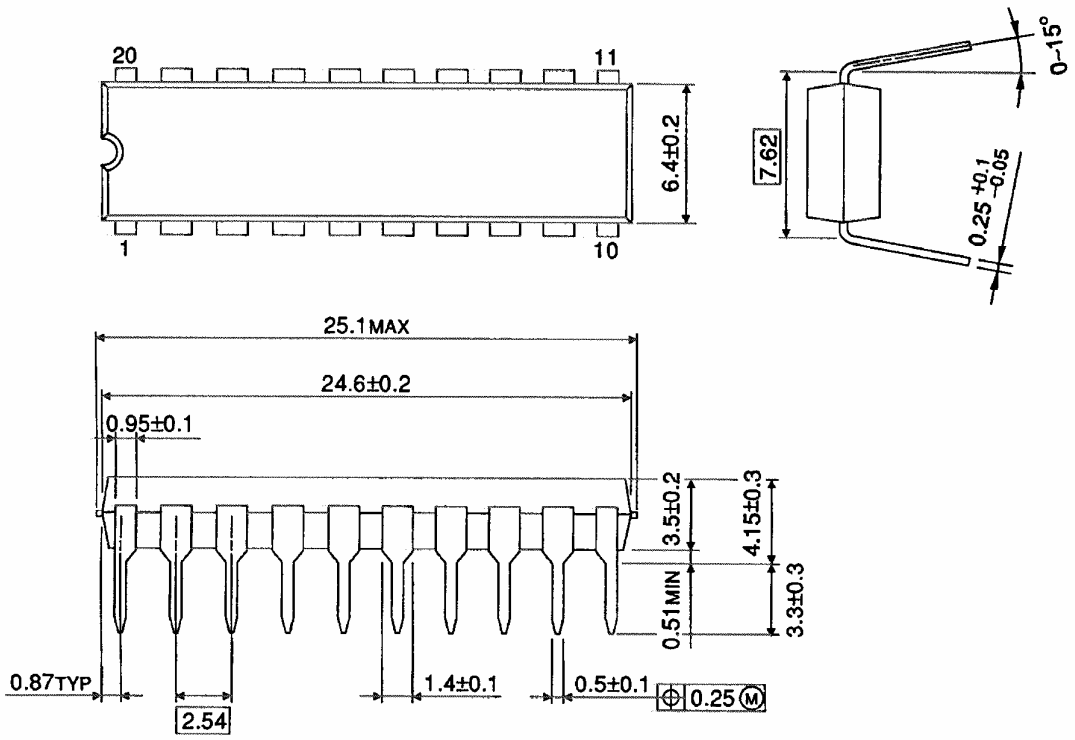
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

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

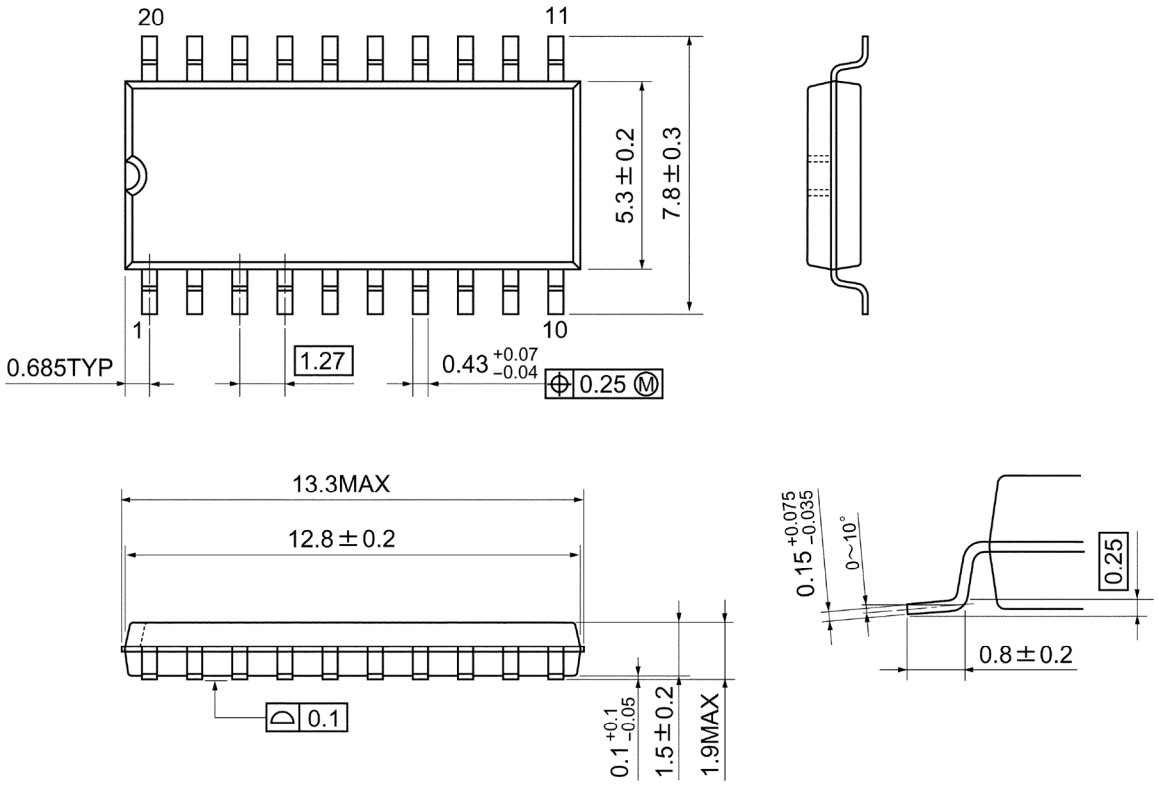
DIP20-P-300-2.54A Unit : mm



Weight: 1.30 g (typ.)

Package Dimensions

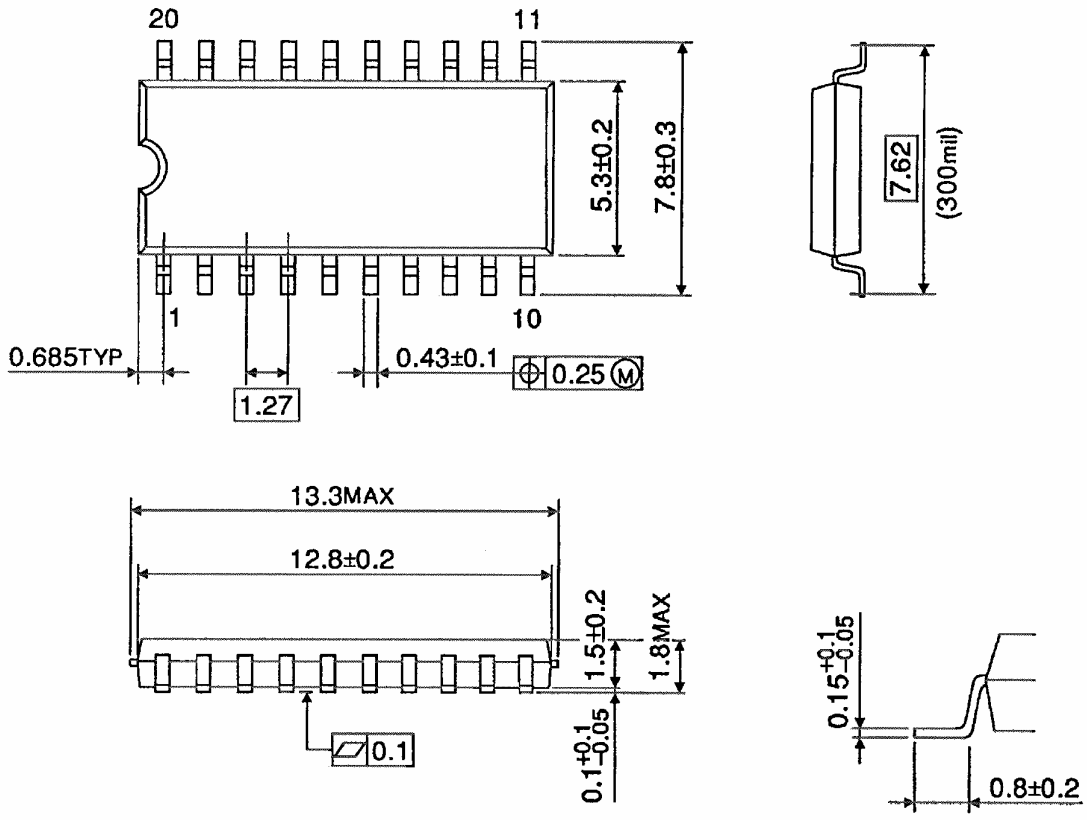
SOP20-P-300-1.27A Unit: mm



Weight: 0.22 g (typ.)

Package Dimensions

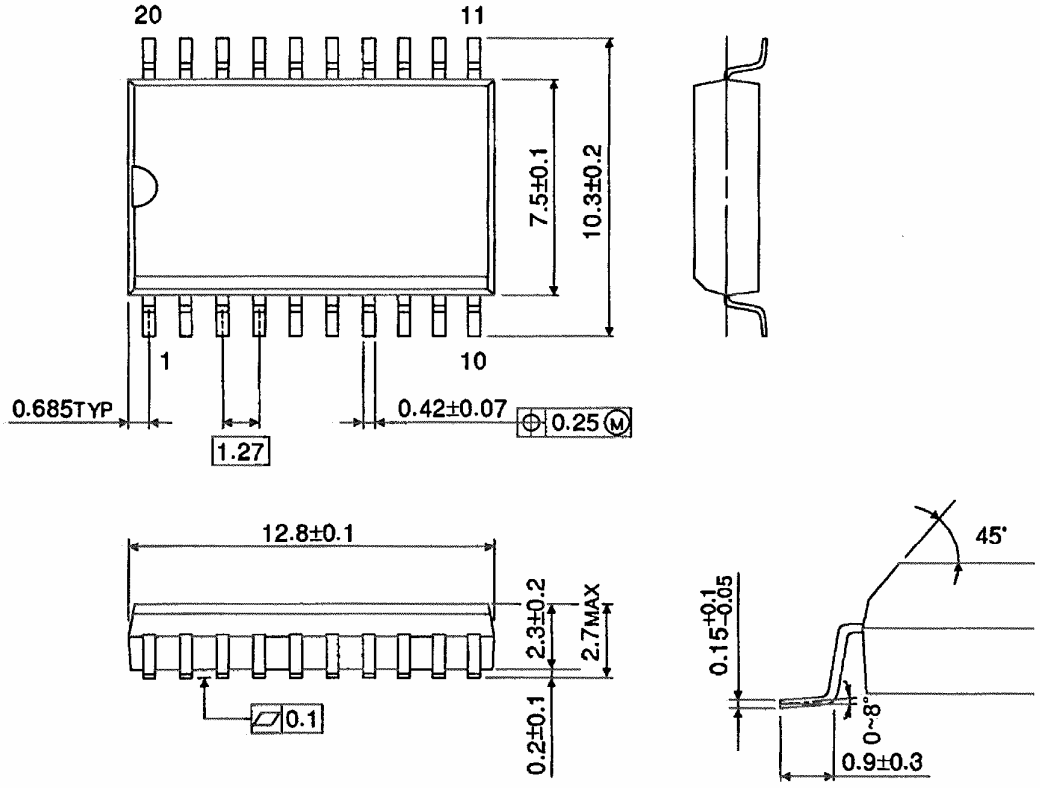
SOP20-P-300-1.27 Unit : mm



Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27 Unit : mm



Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Note: Lead (Pb)-Free Packages

DIP20-P-300-2.54A SOP20-P-300-1.27A

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