TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74ACT245P, TC74ACT245F, TC74ACT245FT
TC74ACT640P, TC74ACT640F, TC74ACT640FT

Octal Bus Transceiver

TC74ACT245P/F/FT	3-State, Non-Inverting
TC74ACT640P/F/FT	3-State, Inverting

The TC74ACT245 and 640 are advanced high speed CMOS OCTAL BUS TRANSCEIVERs fabricated with silicon gate and double-layer metal wiring C^2MOS technology.

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

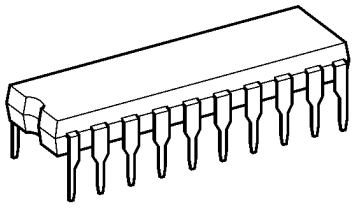
These devices may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

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.

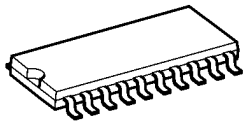
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

TC74ACT245P, TC74ACT640P



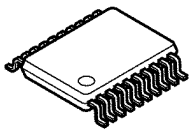
DIP20-P-300-2.54A

TC74ACT245F, TC74ACT640F



SOP20-P-300-1.27A

TC74ACT245FT, TC74ACT640FT



TSSOP20-P-0044-0.65A

Weight

DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)
TSSOP20-P-0044-0.65A	: 0.08 g (typ.)

Features (Note 1) (Note 2)

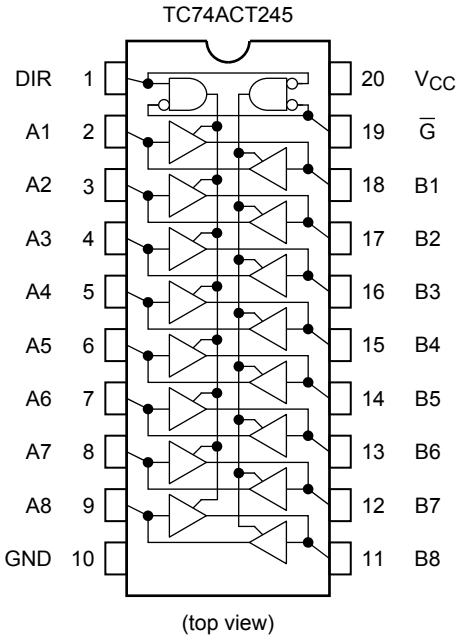
- High speed: t_{pd} = 4.7 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 8 μA (max) at Ta = 25°C
- Compatible with TTL outputs
  : V_{IL} = 0.8 V (max), V_{IH} = 2.0 V (min)
- Symmetrical output impedance
  : $|I_{OH}| = I_{OL}$ = 24 mA (min)
  Capability of driving 50 Ω transmission lines.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Pin and function compatible with 74F245/640

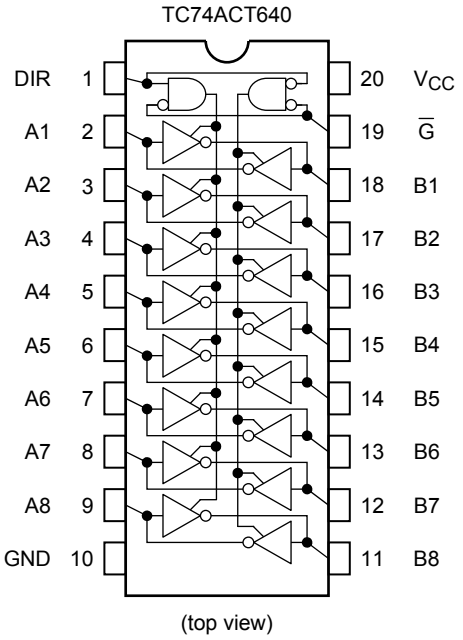
Note 1: Do not apply a signal to any bus terminal when it is in the output mode. Damage may result.

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

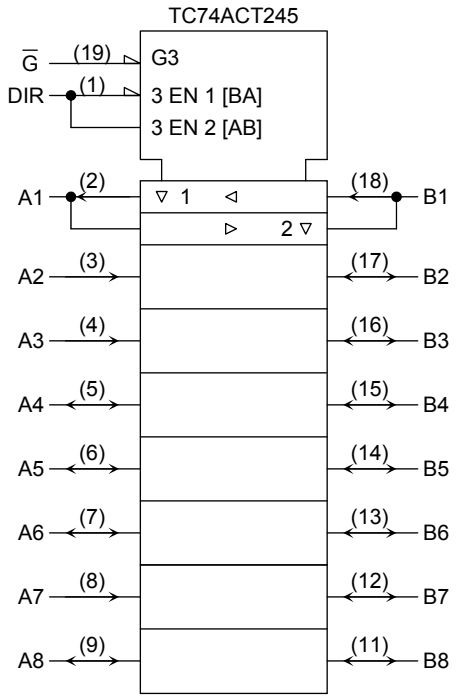
Start of commercial production
1988-10

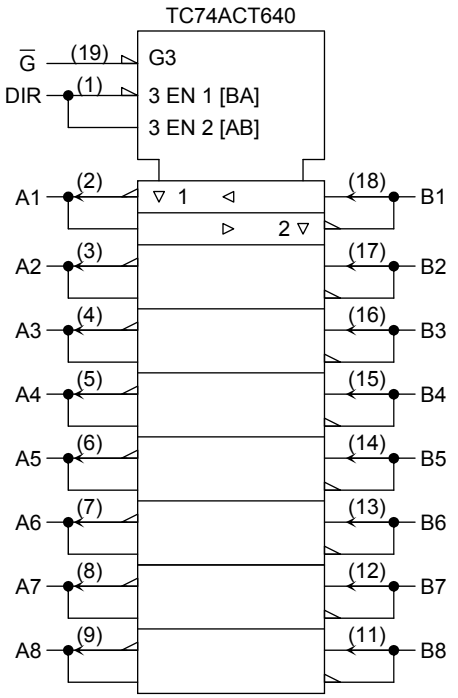
Pin Assignment





IEC Logic Symbol





Truth Table

Inputs		Function		Outputs	
$\overline{G}$	DIR	A Bus	B Bus	ACT245	ACT640
L	L	Output	Input	A = B	A = $\overline{B}$
L	H	Input	Output	B = A	B = $\overline{A}$
H	X	Z		Z	Z

X: Don't care

Z: High impedance

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7.0	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}	±50	mA
DC output current	I_{OUT}	±50	mA
DC V_{CC}/ground current	I_{CC}	±200	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP/TSSOP)	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°C to 65°C. From Ta = 65°C to 85°C a derating factor of −10 mW/°C should be applied up to 300 mW.

Operating Range (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	dt/dV	0 to 10	ns/V

Note: The operating range is 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			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} = −50 μA	4.5	4.4	4.5	—	4.4	—	V
			I_{OH} = −24 mA	4.5	3.94	—	—	3.80	—	
			I_{OH} = −75 mA (Note)	5.5	—	—	—	3.85	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50 μA	4.5	—	0.0	0.1	—	0.1	V
			I_{OL} = 24 mA	4.5	—	—	0.36	—	0.44	
			I_{OL} = 75 mA (Note)	5.5	—	—	—	—	1.65	
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	—	—	8.0	—	80.0	μA
	I_C	Per input: V_{IN} = 3.4 V Other input: V_{CC} or GND		5.5	—	—	1.35	—	1.5	mA

Note: This spec indicates the capability of driving 50 Ω transmission lines.

One output should be tested at a time for a 10 ms maximum duration.

AC Characteristics (C_L = 50 pF, R_L = 500 Ω, input: $t_r = t_f$ = 3 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Propagation delay time (Note 2)	t_{pLH} t_{pHL}	—	5.0 ± 0.5	—	5.0	8.0	1.0	9.0	ns
Propagation delay time (Note 3)	t_{pLH} t_{pHL}	—	5.0 ± 0.5	—	5.7	8.5	1.0	9.5	ns
Output enable time	t_{pZL} t_{pZH}	—	5.0 ± 0.5	—	7.3	12.3	1.0	14.0	ns
Output disable time	t_{pLZ} t_{pHZ}	—	5.0 ± 0.5	—	6.3	9.7	1.0	11.0	ns
Input capacitance	C_{IN}	DIR, $\overline{G}$		—	5	10	—	10	pF
Bus input capacitance	$C_{I/O}$	A_n, Bn		—	13	—	—	—	pF
Power dissipation capacitance	C_{PD} (Note 1)	TC74ACT245		—	38	—	—	—	pF
		TC74ACT640		—	43	—	—	—	

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:

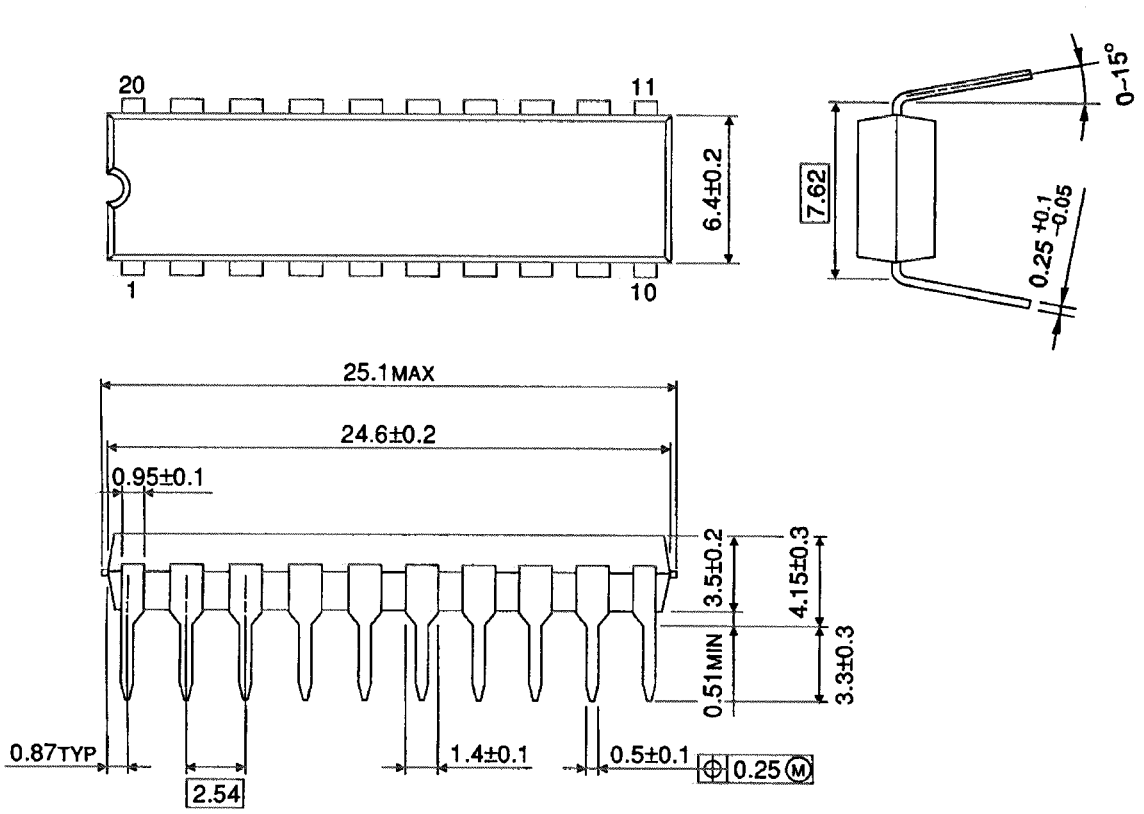
$$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

Note 2: For TC74ACT245 only

Note 3: For TC74ACT640 only

Package Dimensions

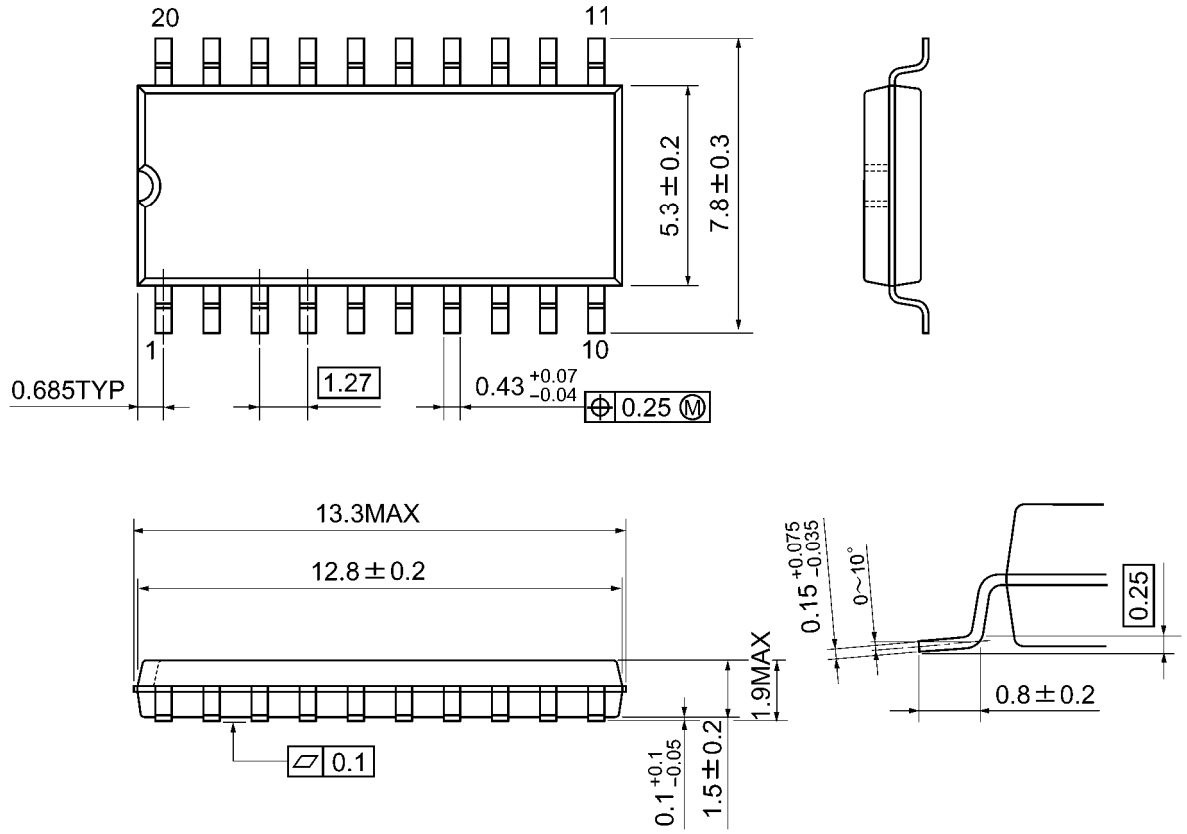
DIP20-P-300-2.54A Unit : mm



Weight: 1.30 g (typ.)

Package Dimensions

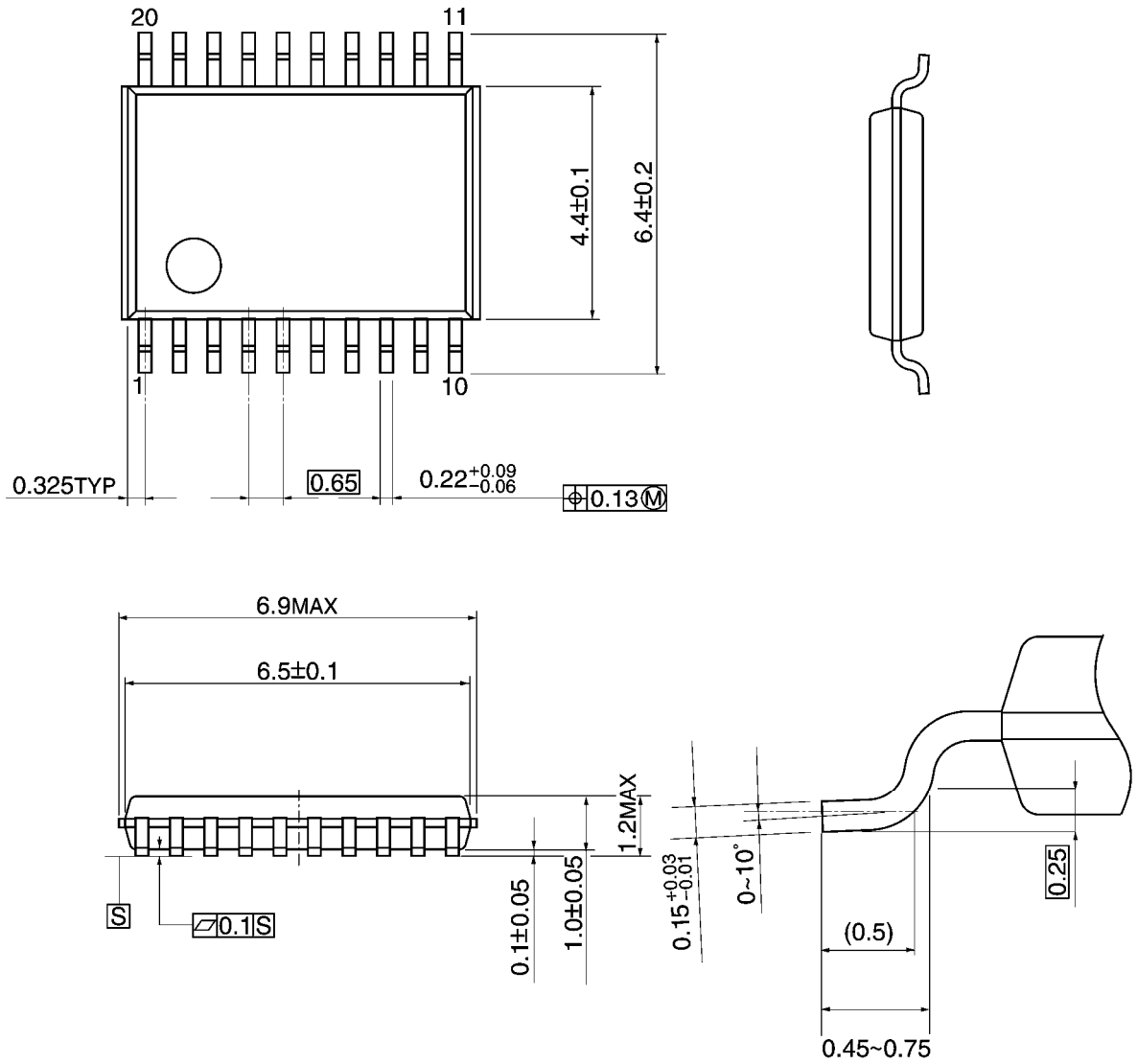
SOP20-P-300-1.27A Unit: mm



Weight: 0.22 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65A Unit: mm



Weight: 0.08 g (typ.)

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