

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

## TC74ACT245P, TC74ACT245F, TC74ACT245FW, TC74ACT245FT TC74ACT640P, TC74ACT640F, TC74ACT640FW, TC74ACT640FT

### OCTAL BUS TRANSCEIVER

TC74ACT245P/F/FW/FT 3-STATE, NON-INVERTING  
TC74ACT640P/F/FW/FT 3-STATE, INVERTING

(Note) The JEDEC SOP (FW) is not available in Japan.

The TC74ACT245 and 640 are advanced high speed CMOS OCTAL BUS TRANSCEIVERS fabricated with silicon gate and double-layer metal wiring C<sup>2</sup>MOS 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.

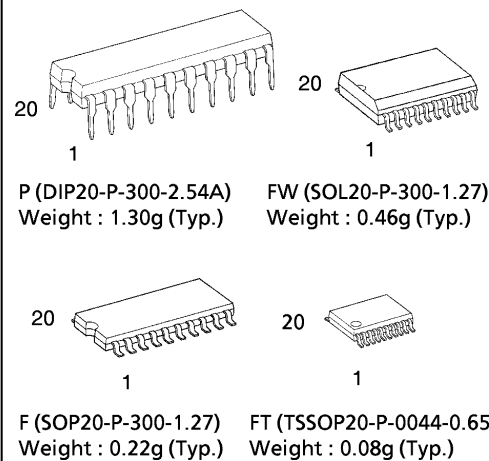
They are intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the DIR input.

The enable input ( $\bar{G}$ ) 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:

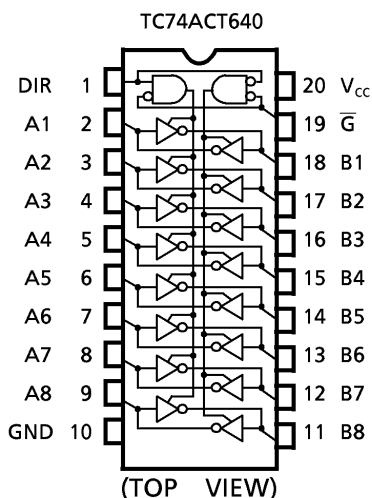
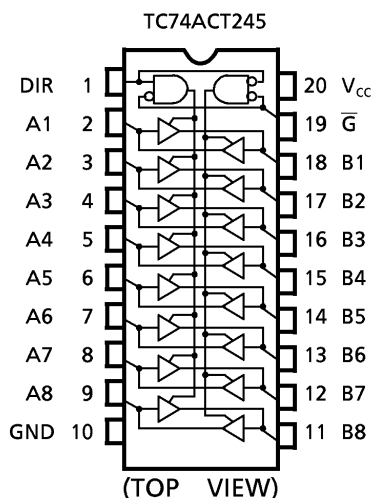
- High Speed.....  $t_{pd} = 4.7ns$ (typ.) at  $V_{CC} = 5V$
- Low Power Dissipation.....  $I_{CC} = 8\mu A$ (Max.) at  $T_a = 25^\circ C$
- Compatible with TTL outputs....  $V_{IL} = 0.8V$ (Max.)  
 $V_{IH} = 2.0V$ (Min.)
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24mA$ (Min.)  
Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays....  $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F245/640



#### 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.

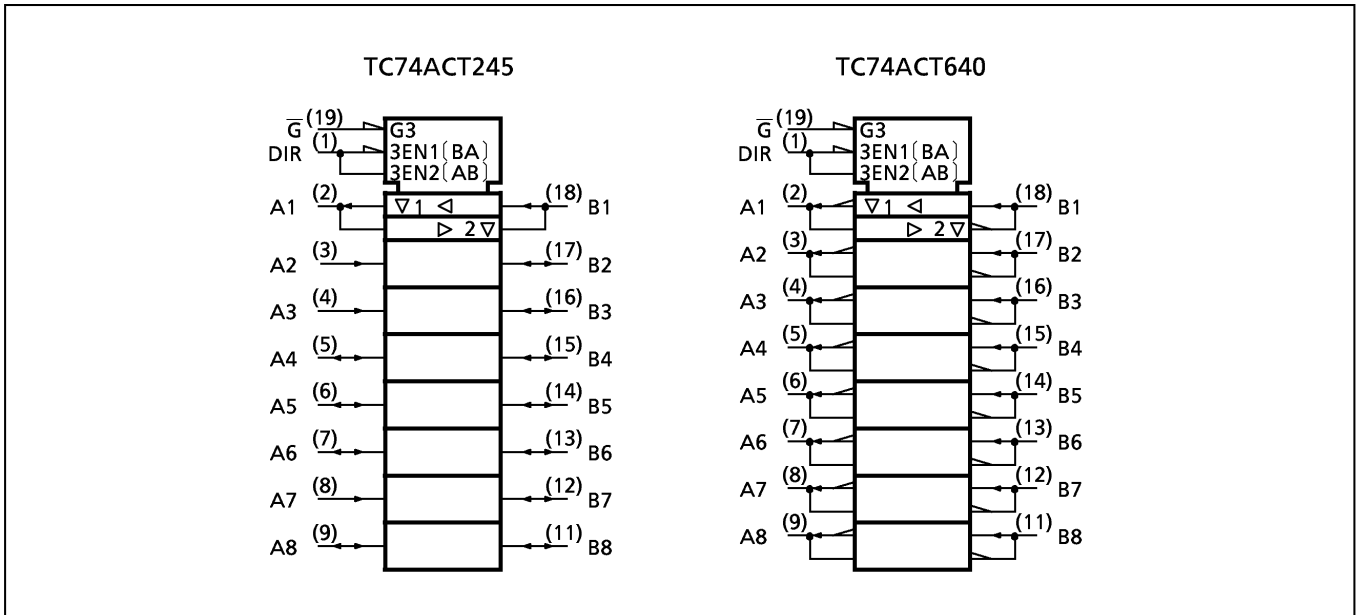
#### PIN ASSIGNMENT



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**IEC LOGIC SYMBOL**



**TRUTH TABLE**

INPUTS		FUNCTION		OUTPUTS	
$\bar{G}$	DIR	A BUS	B BUS	ACT245	ACT640
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 : Don't Care  
Z : High Impedance

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## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5~7.0	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	$I_{OK}$	±50	mA
DC Output Current	$I_{OUT}$	±50	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	±200	mA
Power Dissipation	$P_D$	500 (DIP)* / 180 (SOP/TSSOP)	mW
Storage Temperature	$T_{stg}$	-65~150	°C

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{mW}/^{\circ}\text{C}$  should be applied up to 300mW.

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	4.5~5.5	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	$dt / dV$	0~10	ns / V

## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	$V_{CC}$ (V)	$T_a = 25^{\circ}\text{C}$			$T_a = -40 \sim 85^{\circ}\text{C}$		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	$V_{IH}$		4.5 } 5.5	2.0	—	—	2.0	—	V
Low - Level Input Voltage	$V_{IL}$		4.5 } 5.5	—	—	0.8	—	0.8	V
High - Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OH} = -50\mu\text{A}$ $I_{OH} = -24\text{mA}$ $I_{OH} = -75\text{mA}^*$	4.5 4.5 5.5	4.4 3.94 —	4.5 — —	— — —	4.4 3.80 3.85	— — —	V
Low - Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $I_{OL} = 50\mu\text{A}$ $I_{OL} = 24\text{mA}$ $I_{OL} = 75\text{mA}^*$	4.5 4.5 5.5	— — —	0.0 — —	0.1 0.36 —	— — —	0.1 0.44 1.65	V
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	$\mu\text{A}$
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	±0.1	—	±1.0	
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	8.0	—	80.0	
	$I_C$	PER INPUT : $V_{IN} = 3.4\text{V}$ OTHER INPUT : $V_{CC}$ or GND	5.5	—	—	1.35	—	1.5	mA

\* : This spec indicates the capability of driving  $50\Omega$  transmission lines.  
One output should be tested at a time for a 10ms maximum duration.

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ ,  $R_L = 500\Omega$ , Input  $t_r = t_f = 3\text{ns}$  )

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT
			V <sub>CC</sub> (V)	MIN.	TYP.	MAX.	MIN.	
Propagation Delay Time*	t <sub>pLH</sub>		5.0 ± 0.5	—	5.0	8.0	1.0	ns
	t <sub>pHL</sub>		5.0 ± 0.5	—	5.0	8.0	1.0	
Propagation Delay Time**	t <sub>pLH</sub>		5.0 ± 0.5	—	5.7	8.5	1.0	
	t <sub>pHL</sub>		5.0 ± 0.5	—	5.7	8.5	1.0	
Output Enable Time	t <sub>pZL</sub>		5.0 ± 0.5	—	7.3	12.3	1.0	
	t <sub>pZH</sub>		5.0 ± 0.5	—	7.3	12.3	1.0	
Output Disable Time	t <sub>pLZ</sub>		5.0 ± 0.5	—	6.3	9.7	1.0	
	t <sub>pHZ</sub>		5.0 ± 0.5	—	6.3	9.7	1.0	
Input Capacitance	C <sub>IN</sub>	DIR, $\bar{G}$	—	5	10	—	10	pF
Bus Input Capacitance	C <sub>I/O</sub>	An, Bn	—	13	—	—	—	
Power Dissipation Capacitance	C <sub>PD</sub> (1)	TC74ACT245	—	38	—	—	—	
		TC74ACT640	—	43	—	—	—	

Note (1) C<sub>PD</sub> 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 :

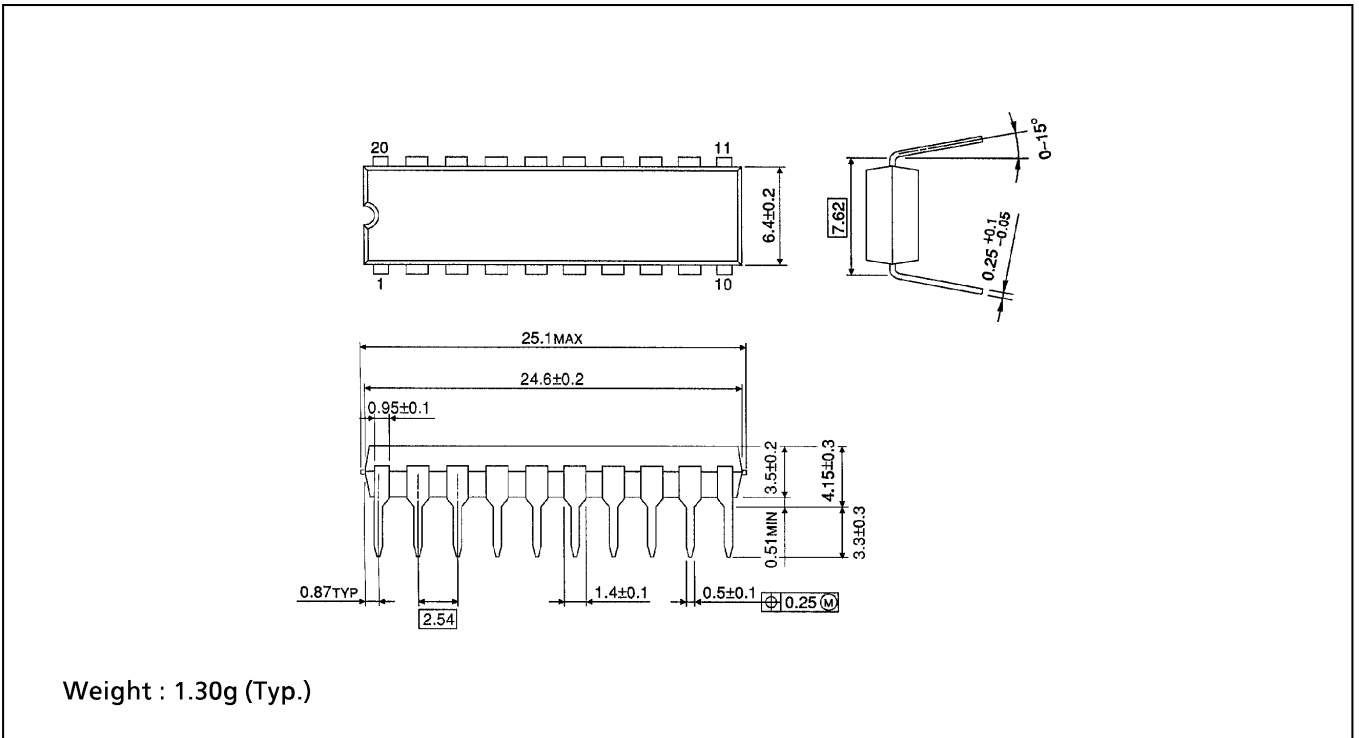
$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 (\text{per bit})$$

(2) \* for TC74ACT245 only

\*\* for TC74ACT640 only

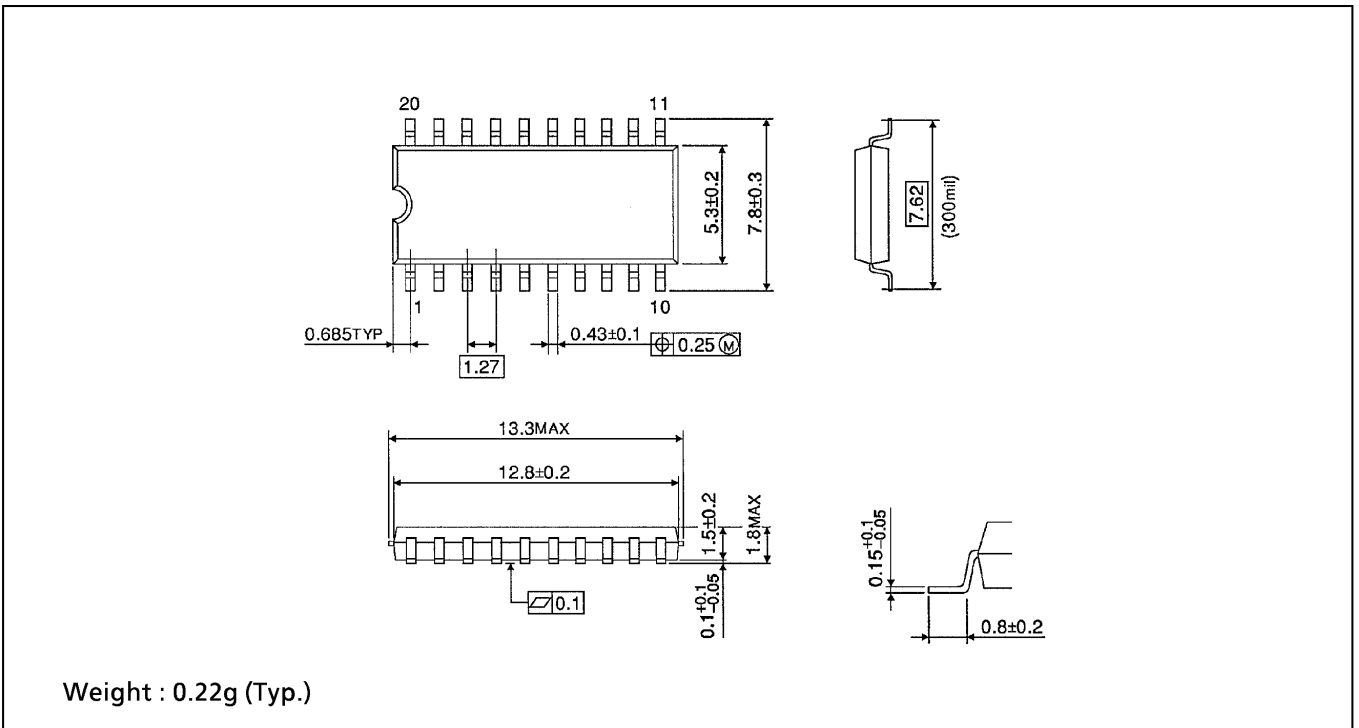
**DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)**

Unit in mm



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

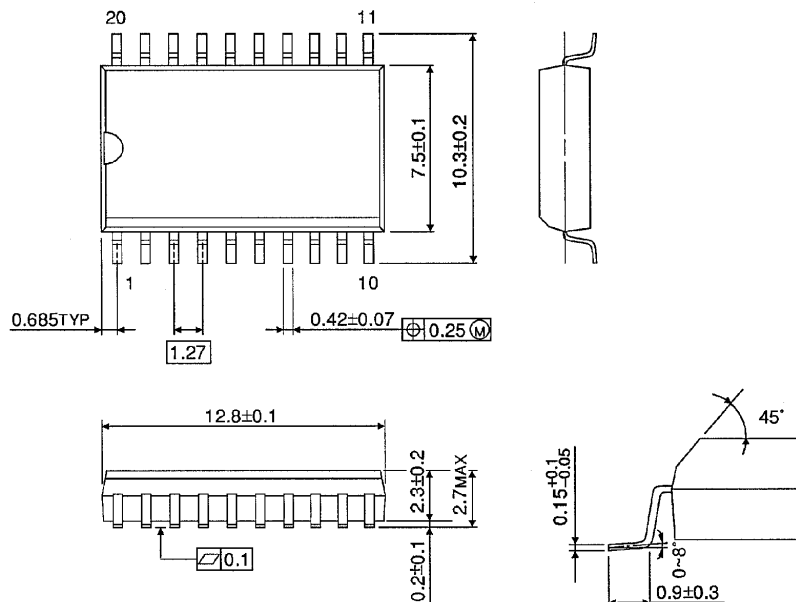
Unit in mm



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

Unit in mm

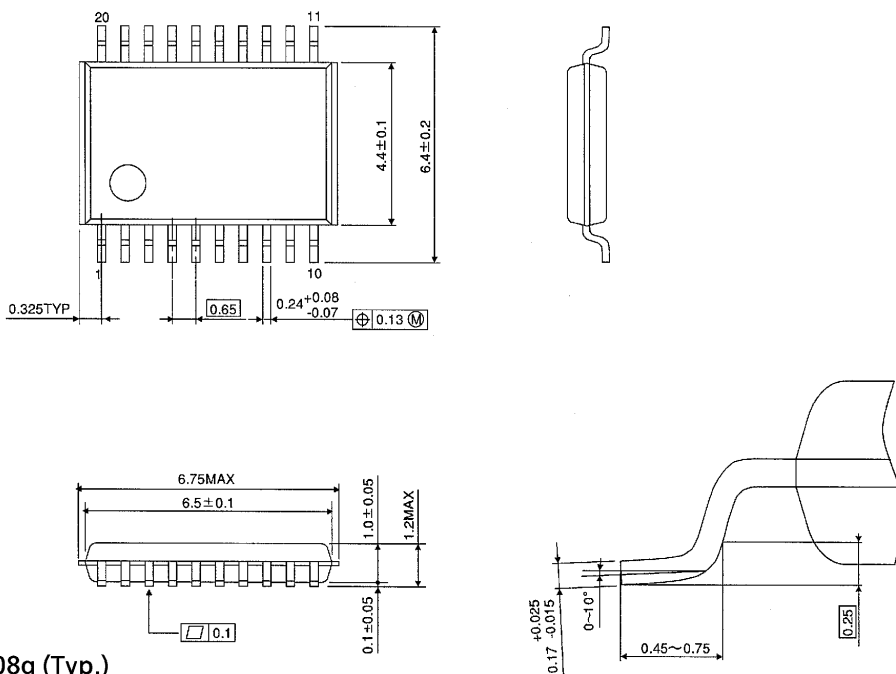
(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

**TSSOP 20PIN OUTLINE DRAWING (TSSOP20-P-0044-0.65)**

Unit in mm



Weight : 0.08g (Typ.)