

**TC74AC240P, TC74AC240F, TC74AC240FT  
TC74AC244P, TC74AC244F, TC74AC244FT****Octal Bus Buffer**

TC74AC240P/F/FT	Inverted, 3-State Outputs
TC74AC244P/F/FT	Non-Inverted, 3-State Outputs

The TC74AC240 and 244 are advanced high speed CMOS OCTAL BUS BUFFERs 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.

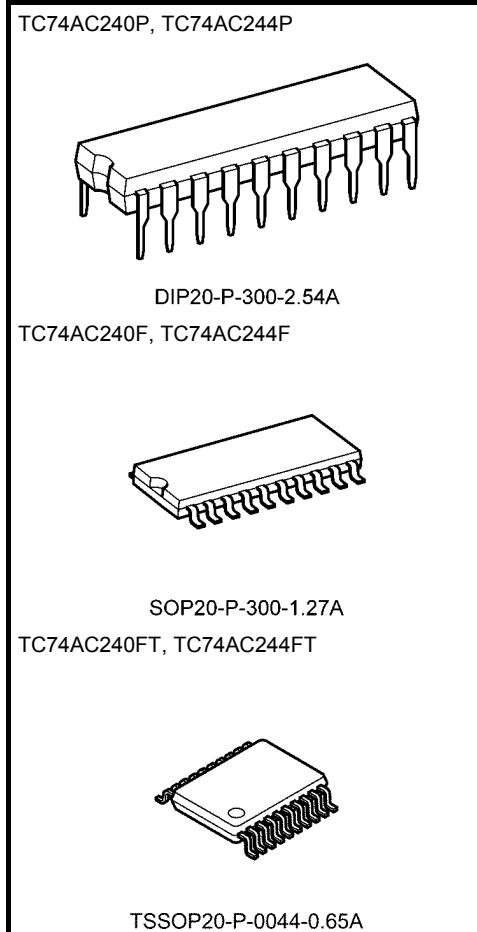
The 74AC240 is an inverting 3-state buffer while the 74AC244 is non-inverting. Both devices have two active-low output enables.

These devices are designed to be used in such applications as 3-state memory address drivers.

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

**Features**

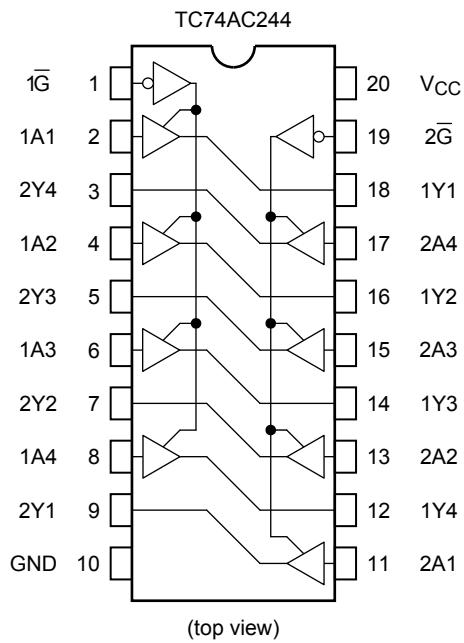
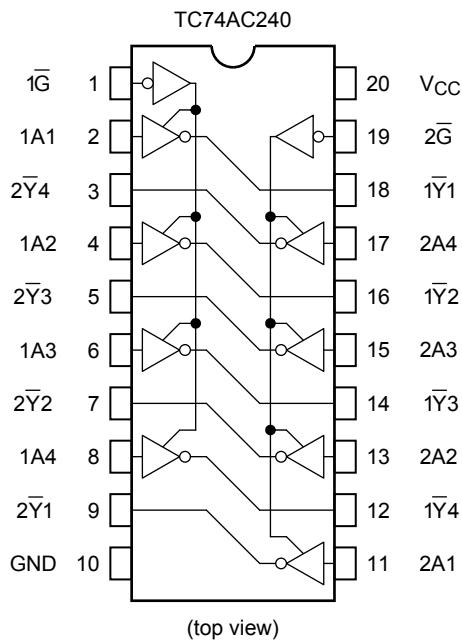
- High speed:  $t_{pd} = 4.0$  ns (typ.) at  $V_{CC} = 5$  V
- Low power dissipation:  $I_{CC} = 8 \mu A$  (max) at  $T_a = 25^\circ C$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (min)
- Symmetrical output impedance:  $|I_{OH}| = I_{OL} = 24$  mA (min)  
Capability of driving 50  $\Omega$  transmission lines.
- Balanced propagation delays:  $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range:  $V_{CC}$  (opr) = 2 to 5.5 V
- Pin and function compatible with 74F240/244

**Weight**

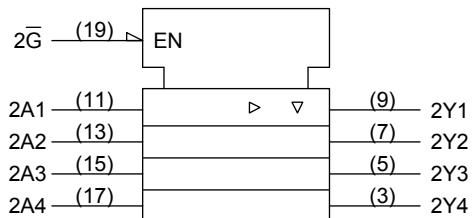
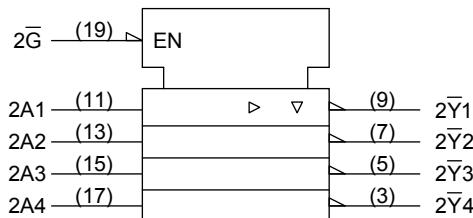
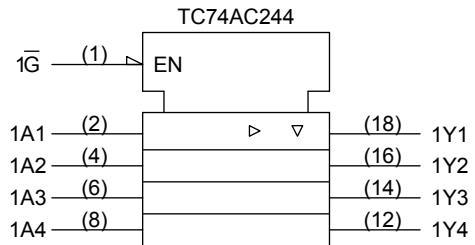
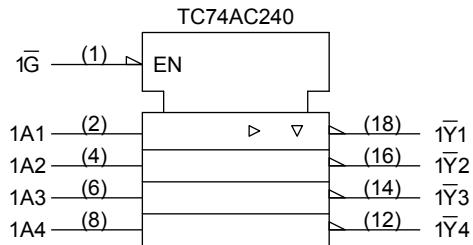
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)
TSSOP20-P-0044-0.65A	: 0.08 g (typ.)

Start of commercial production  
1986-05

## Pin Assignment



## IEC Logic Symbol



## Truth Table

Inputs		Outputs	
$\bar{G}$	$A_n$	$Y_n$ (244)	$\bar{Y}_n$ (240)
L	L	L	H
L	H	H	L
H	X	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	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 50$	mA
DC output current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 200$	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  $T_a = -40$  to  $65^\circ\text{C}$ . From  $T_a = 65$  to  $85^\circ\text{C}$ , a derating factor of  $-10 \text{ mW/}^\circ\text{C}$  should be applied up to 300 mW.

**Operating Ranges (Note)**

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	2.0 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 100 ( $V_{CC} = 3.3 \pm 0.3 \text{ V}$ ) 0 to 20 ( $V_{CC} = 5 \pm 0.5 \text{ V}$ )	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.  
Unused inputs must be tied to either  $V_{CC}$  or GND.

## Electrical Characteristics

## DC Characteristics

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to 85°C		Unit	
				Min	Typ.	Max	Min	Max		
High-level input voltage	V <sub>IH</sub>	—	2.0	1.50	—	—	1.50	—	V	
			3.0	2.10	—	—	2.10	—		
			5.5	3.85	—	—	3.85	—		
Low-level input voltage	V <sub>IL</sub>	—	2.0	—	—	0.50	—	0.50	V	
			3.0	—	—	0.90	—	0.90		
			5.5	—	—	1.65	—	1.65		
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50 µA	2.0	1.9	2.0	—	1.9	V	
			I <sub>OH</sub> = -4 mA	3.0	2.9	3.0	—	2.9		
			I <sub>OH</sub> = -24 mA	4.5	4.4	4.5	—	4.4		
		V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -75 mA (Note)	3.0	2.58	—	—	2.48	V	
			I <sub>OH</sub> = 50 µA	4.5	3.94	—	—	3.80		
			I <sub>OH</sub> = 12 mA	5.5	—	—	—	3.85		
			I <sub>OH</sub> = 24 mA	—	—	—	—	—		
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 75 mA (Note)	2.0	—	0.0	0.1	—	V	
			I <sub>OL</sub> = 50 µA	3.0	—	0.0	0.1	—		
			I <sub>OL</sub> = 12 mA	4.5	—	0.0	0.1	—		
3-state output off-state current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND		5.5	—	—	±0.5	—	µA	
		V <sub>IN</sub> = V <sub>CC</sub> or GND		—	—	—	—	±5.0		
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	±0.1	—	±1.0	µA
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	8.0	—	80.0	µA

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 ( $C_L = 50 \text{ pF}$ ,  $R_L = 500 \Omega$ , input:  $t_r = t_f = 3 \text{ ns}$ )

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit	
			V <sub>CC</sub> (V)	Min	Typ.	Max	Min		
Propagation delay time (Note 2)	t <sub>pLH</sub>	—	3.3 ± 0.3	—	6.3	10.5	1.0	12.0	ns
	t <sub>pHL</sub>		5.0 ± 0.5	—	4.8	7.0	1.0	8.0	
Propagation delay time (Note 3)	t <sub>pLH</sub>	—	3.3 ± 0.3	—	7.0	11.4	1.0	13.0	ns
	t <sub>pHL</sub>		5.0 ± 0.5	—	5.2	7.5	1.0	8.5	
Output enable time	t <sub>pZL</sub>	—	3.3 ± 0.3	—	8.4	14.0	1.0	16.0	ns
	t <sub>pZH</sub>		5.0 ± 0.5	—	5.9	8.7	1.0	10.0	
Output disable time	t <sub>pLZ</sub>	—	3.3 ± 0.3	—	6.4	10.5	1.0	12.0	ns
	t <sub>pHZ</sub>		5.0 ± 0.5	—	5.5	7.9	1.0	9.0	
Input capacitance	C <sub>IN</sub>	—	—	—	5	10	—	10	pF
Output capacitance	C <sub>OUT</sub>	—	—	—	10	—	—	—	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note 1)		—	30	—	—	—	pF

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:

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

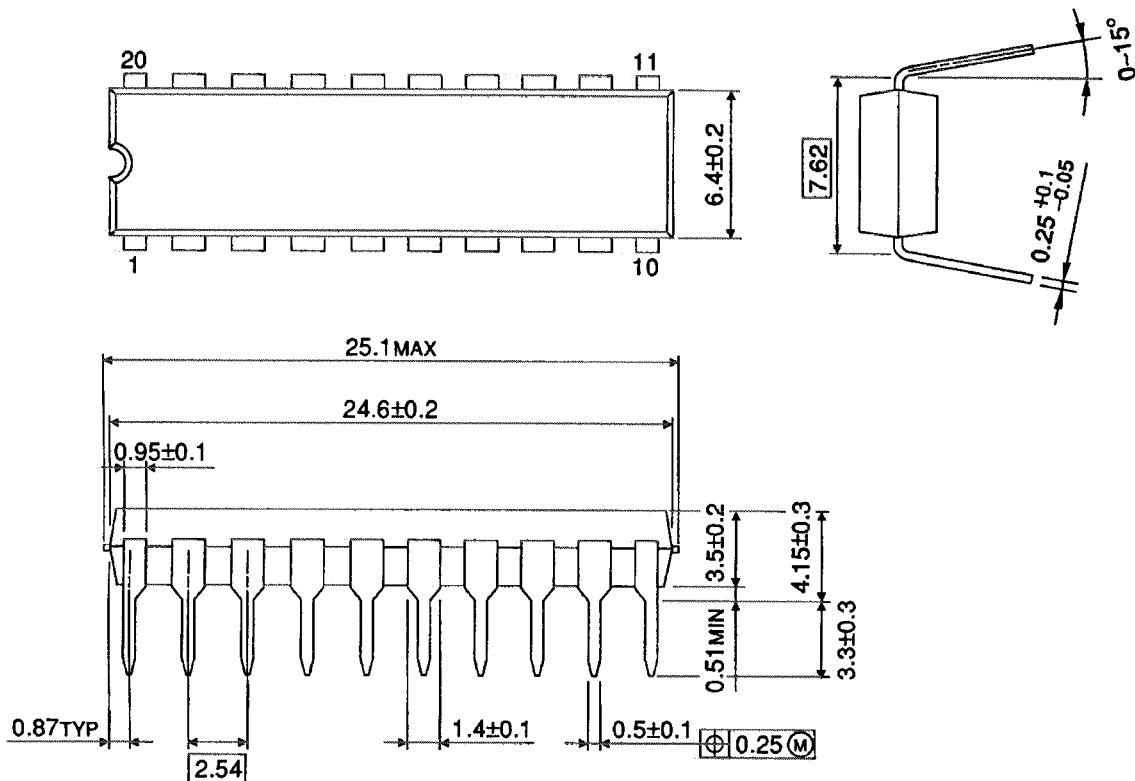
Note 2: For TC74AC240 only

Note 3: For TC74AC244 only

**Package Dimensions**

DIP20-P-300-2.54A

Unit : mm

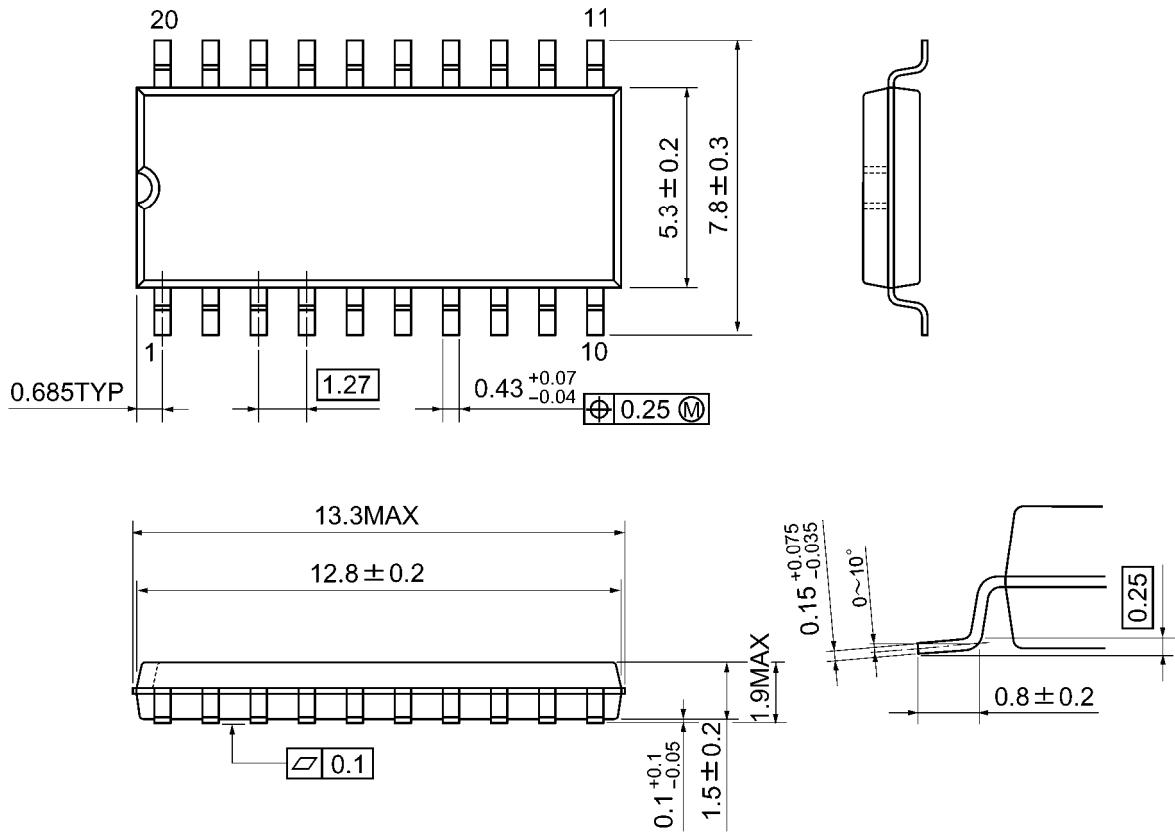


Weight: 1.30 g (typ.)

**Package Dimensions**

SOP20-P-300-1.27A

Unit: mm

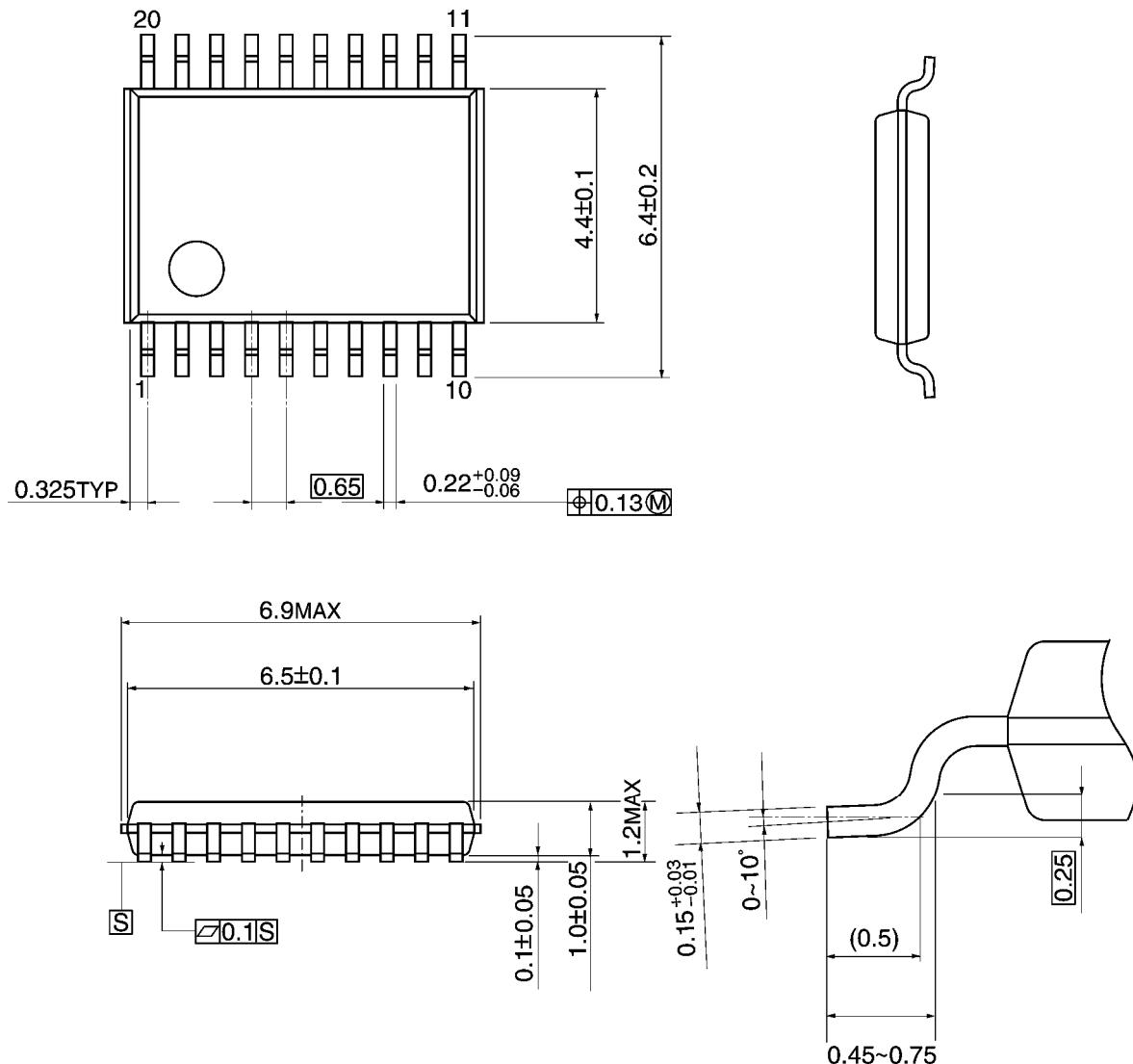


Weight: 0.22 g (typ.)

**Package Dimensions**

TSSOP20-P-0044-0.65A

Unit: mm



Weight: 0.08 g (typ.)

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