

CMOS Digital Integrated Circuits Silicon Monolithic

# TC74ACT240F,TC74ACT244F

## 1. Functional Description

- Octal Bus Buffer

TC74ACT240F: INVERTED, 3-STATE OUTPUTS

TC74ACT244F: NON-INVERTED, 3-STATE OUTPUTS

## 2. General

The TC74ACT240F and TC74ACT244F 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 TC74ACT240F is an inverting 3-state buffer while the TC74ACT244F is non-inverting. Both devices have two active-low output enables.

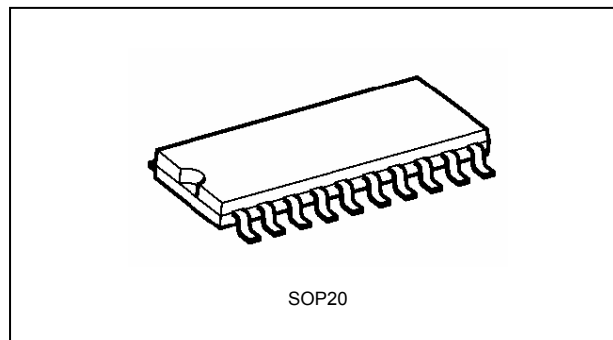
These devices are designed to be used in such applications as 3-state memory address drivers.

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

## 3. Features

- (1) High speed: Propagation delay time = 5.0 ns (typ.) at  $V_{CC} = 5.0$  V
- (2) Low power dissipation:  $I_{CC} = 8.0$   $\mu$ A (max) at  $T_a = 25$  °C
- (3) Compatible with TTL outputs:  $V_{IL} = 0.8$  V (max)  
 $V_{IH} = 2.0$  V (min)
- (4) Output current:  $|I_{OH}|/I_{OL} = 24$  mA (min) ( $V_{CC} = 4.5$  V)
- (5) Balanced propagation delays:  $t_{PLH} \approx t_{PHL}$
- (6) Pin and function compatible with 74F240/244.

## 4. Packaging

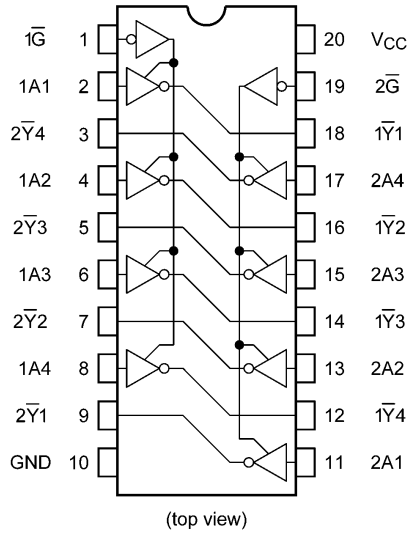


Start of commercial production

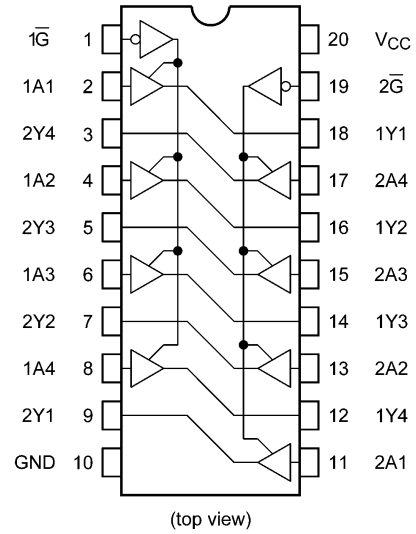
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### 5. Pin Assignment

TC74ACT240F

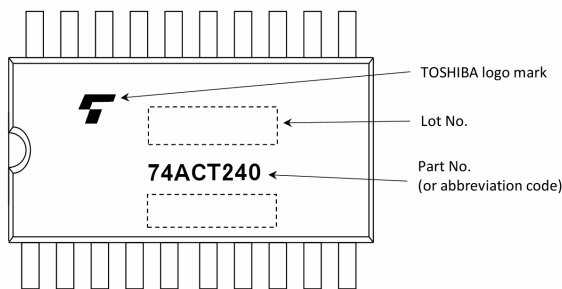


TC74ACT244F

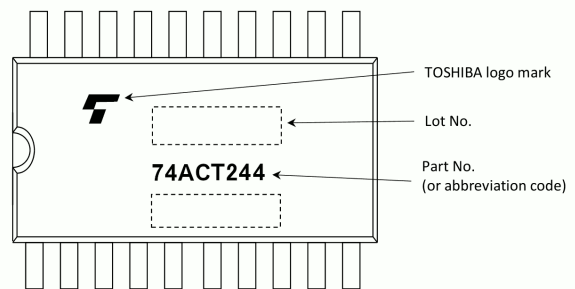


### 6. Marking

TC74ACT240F

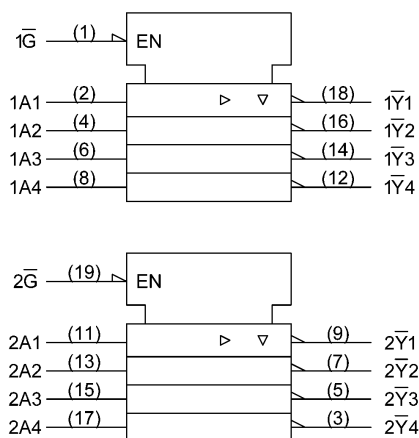


TC74ACT244F

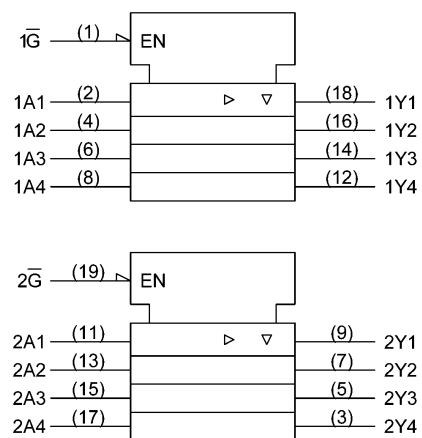


### 7. IEC Logic Symbol

TC74ACT240F



TC74ACT244F



### 8. Truth Table

Input $\bar{G}$	Input $A_n$	Output $Y_n$ (TC74ACT244F)	Output $\bar{Y}_n$ (TC74ACT240F)
L	L	L	H
L	H	H	L
H	X	Z	Z

X: Don't care

Z: High impedance

### 9. Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	-0.5 to 7.0	V
Input voltage	$V_{IN}$	-0.5 to $V_{CC} + 0.5$	V
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
Output current	$I_{OUT}$	$\pm 50$	mA
$V_{CC}$ /ground current	$I_{CC}$	$\pm 200$	mA
Power dissipation	$P_D$	180	mW
Storage temperature	$T_{stg}$	-65 to 150	$^{\circ}C$

Note: 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).

### 10. 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	$^{\circ}C$
Input rise and fall times	$dt/dv$	0 to 10	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.

### 11. Electrical Characteristics

#### 11.1. DC Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Typ.	Max	Unit	
High-level input voltage	$V_{IH}$	—	4.5 to 5.5	2.0	—	—	V	
Low-level input voltage	$V_{IL}$	—	4.5 to 5.5	—	—	0.8	V	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50\text{ }\mu\text{A}$	4.5	4.4	4.5	—	V
			$I_{OH} = -24\text{ mA}$	4.5	3.94	—	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 50\text{ }\mu\text{A}$	4.5	—	0.0	0.1	V
			$I_{OL} = 24\text{ mA}$	4.5	—	—	0.36	
3-state output OFF-state leakage current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND	5.5	—	—	$\pm 0.5$	$\mu\text{A}$	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	$\pm 0.1$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	5.5	—	—	8.0	$\mu\text{A}$	
	$I_{CCT}$	Per input: $V_{IN} = 3.4\text{ V}$ Other input: $V_{CC}$ or GND	5.5	—	—	1.35	mA	

#### 11.2. DC Characteristics (Unless otherwise specified, $T_a = -40$ to $85\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Note	$V_{CC}$ (V)	Min	Max	Unit	
High-level input voltage	$V_{IH}$	—		4.5 to 5.5	2.0	—	V	
Low-level input voltage	$V_{IL}$	—		4.5 to 5.5	—	0.8	V	
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -50\text{ }\mu\text{A}$		4.5	4.4	—	V
			$I_{OH} = -24\text{ mA}$		4.5	3.80	—	
			$I_{OH} = -75\text{ mA}$ (Note 1)		5.5	3.85	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 50\text{ }\mu\text{A}$		4.5	—	0.1	V
			$I_{OL} = 24\text{ mA}$		4.5	—	0.44	
			$I_{OL} = 75\text{ mA}$ (Note 1)		5.5	—	1.65	
3-state output OFF-state leakage current	$I_{OZ}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$ or GND		5.5	—	$\pm 5.0$	$\mu\text{A}$	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND		5.5	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND		5.5	—	80.0	$\mu\text{A}$	
	$I_{CCT}$	Per input: $V_{IN} = 3.4\text{ V}$ Other input: $V_{CC}$ or GND		5.5	—	1.50	mA	

Note 1: This spec indicates the capability of driving  $50\text{ }\Omega$  transmission lines.

One output should be tested within a 10 ms maximum duration.

#### 11.3. AC Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ , Input: $t_r = t_f = 3\text{ ns}$ )

Characteristics	Part Number	Symbol	Note	Test Condition	$V_{CC}$ (V)	Min	Typ.	Max	Unit
Propagation delay time		$t_{PLH}, t_{PHL}$		$C_L = 50\text{ pF}$ $R_L = 500\text{ }\Omega$	$5.0 \pm 0.5$	—	5.7	8.0	ns
3-state output enable time		$t_{PZL}, t_{PZH}$		$C_L = 50\text{ pF}$ $R_L = 500\text{ }\Omega$	$5.0 \pm 0.5$	—	6.0	9.0	ns
3-state output disable time		$t_{PLZ}, t_{PHZ}$		$C_L = 50\text{ pF}$ $R_L = 500\text{ }\Omega$	$5.0 \pm 0.5$	—	5.9	8.5	ns
Input capacitance		$C_{IN}$		—		—	5	10	pF
Output capacitance		$C_{OUT}$		—		—	10	—	pF
Power dissipation capacitance	TC74ACT240F	$C_{PD}$	(Note 1)	—		—	25	—	pF
	TC74ACT244F		(Note 1)	—		—	29	—	

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.

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

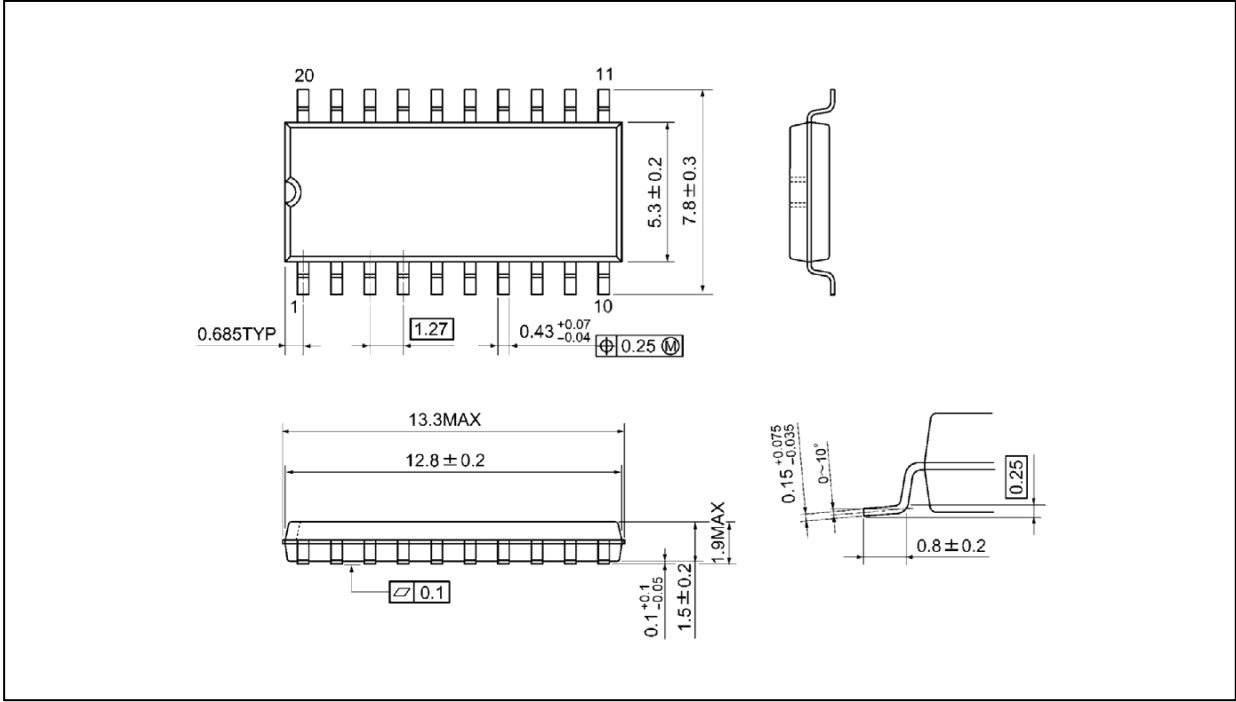
### 11.4. AC Characteristics

(Unless otherwise specified,  $T_a = -40$  to  $85$  °C, Input:  $t_r = t_f = 3$  ns)

Characteristics	Symbol	Test Condition	$V_{CC}$ (V)	Min	Max	Unit
Propagation delay time	$t_{PLH}, t_{PHL}$	$C_L = 50$ pF $R_L = 500$ $\Omega$	$5.0 \pm 0.5$	1.0	9.0	ns
3-state output enable time	$t_{PZL}, t_{PZH}$	$C_L = 50$ pF $R_L = 500$ $\Omega$	$5.0 \pm 0.5$	1.0	10.5	ns
3-state output disable time	$t_{PLZ}, t_{PHZ}$	$C_L = 50$ pF $R_L = 500$ $\Omega$	$5.0 \pm 0.5$	1.0	10.0	ns
Input capacitance	$C_{IN}$	—	—	—	10	pF

Package Dimensions

Unit: mm



Weight: 0.22 g (typ.)

Package Name(s)
Nickname: SOP20

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