CMOS Digital Integrated Circuits Silicon Monolithic

TC74AC240F,TC74AC244F

1. Functional Description

・ Octal Bus Buffer

TC74AC240F: INVERTED, 3-STATE OUTPUTS
TC74AC244F: NON-INVERTED, 3-STATE OUTPUTS

2. General

The TC74AC240F and TC74AC244F are advanced high speed CMOS OCTAL BUS BUFFERs 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.

The TC74AC240F is an inverting 3-state buffer while the TC74AC244F is non-inverting. Both devices have two active-low output enables.

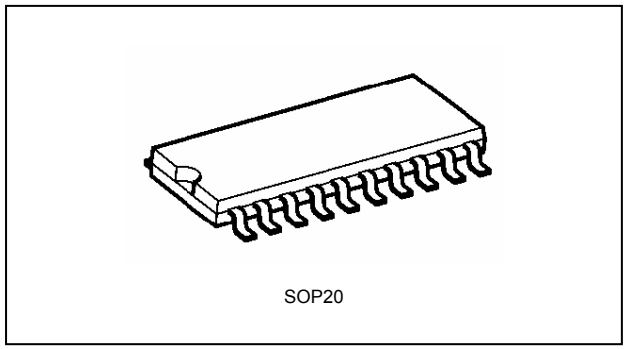
These devices are designed to be used in such applications as 3-state memory address drivers.

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

3. Features

(1) High speed: t_{pd} = 4.0 ns (typ.) at V_{CC} = 5.0 V
(2) Low power dissipation: I_{CC} = 8.0 μA (max) at T_a = 25 °C
(3) High noise immunity: $V_{NIH} = V_{NIL}$ = 28 % V_{CC} (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) Wide operating voltage range: $V_{CC(opr)}$ = 2.0 V to 5.5 V
(7) Pin and function compatible with 74F240/244

4. Packaging

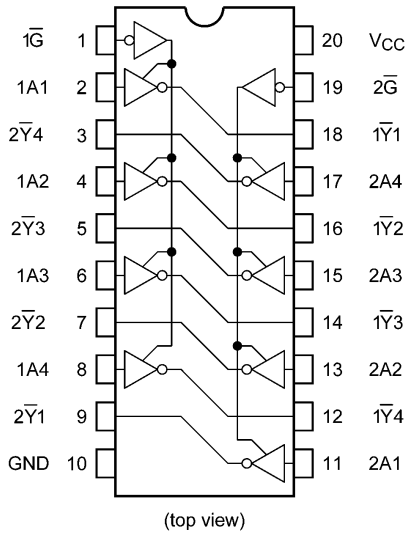


SOP20

Start of commercial production
1986-05

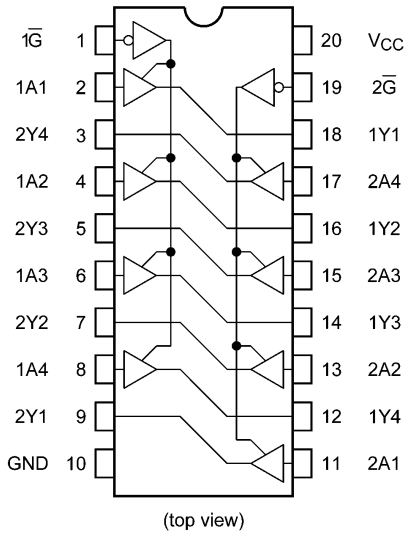
5. Pin Assignment

TC74AC240F



(top view)

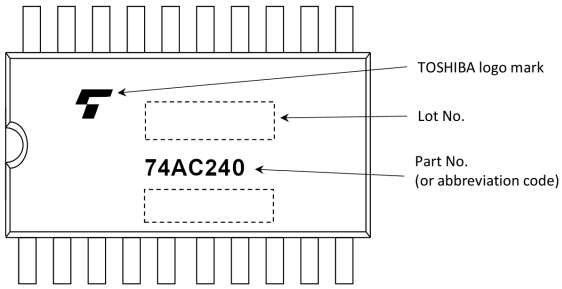
TC74AC244F



(top view)

6. Marking

TC74AC240F



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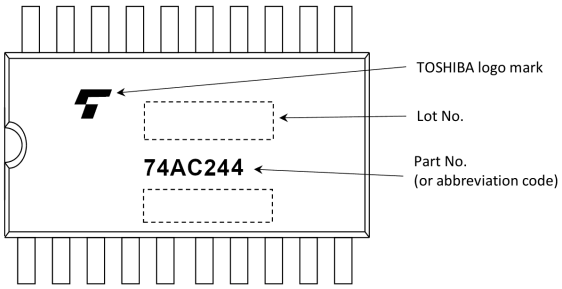
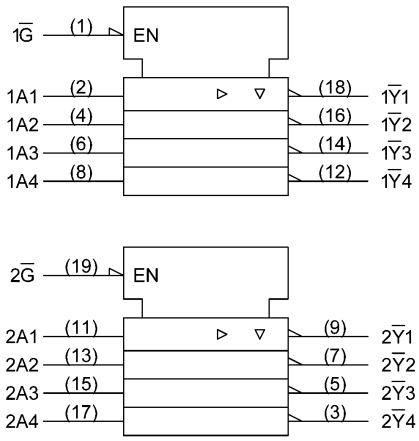
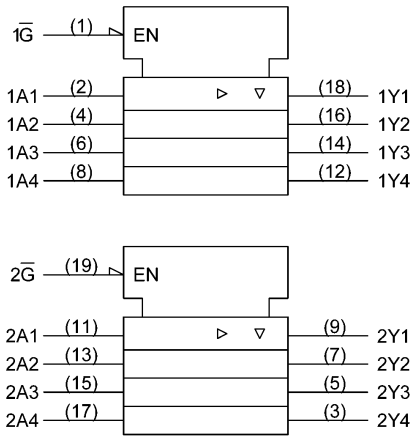


7. IEC Logic Symbol

TC74AC240F



TC74AC244F



8. Truth Table

Input $\overline{G}$	Input A_n	Output Y_n	Output $\overline{Y}_n$
L	L	L	H
L	H	H	L
H	X	Z	Z

X: Don't care
Z: High impedance
Y_n: TC74AC244F
$\overline{Y}_n$: TC74AC240F

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}	±20	mA
Output diode current	I_{OK}	±50	mA
Output current	I_{OUT}	±50	mA
V_{CC}/ground current	I_{CC}	±200	mA
Power dissipation	P_D	180	mW
Storage temperature	T_{stg}	-65 to 150	°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	Test Condition	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 times	dt/dv	V_{CC} = 3.3 ± 0.3 V	0 to 100	ns/V
		V_{CC} = 5.0 ± 0.5 V	0 to 20	

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 °C)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Min	Typ.	Max	Unit
High-level input voltage	V_{IH}	—		2.0	1.50	—	—	V
				3.0	2.10	—	—	
				5.5	3.85	—	—	
Low-level input voltage	V_{IL}	—		2.0	—	—	0.50	V
				3.0	—	—	0.90	
				5.5	—	—	1.65	
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -50 μA	2.0	1.9	2.0	—	V
				3.0	2.9	3.0	—	
				4.5	4.4	4.5	—	
			I_{OH} = -4 mA	3.0	2.58	—	—	
			I_{OH} = -24 mA	4.5	3.94	—	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50 μA	2.0	—	0.0	0.1	V
				3.0	—	0.0	0.1	
				4.5	—	0.0	0.1	
			I_{OL} = 12 mA	3.0	—	—	0.36	
			I_{OL} = 24 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	—	—	±0.5	μA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	8.0	μA

11.2. DC Characteristics (Unless otherwise specified, T_a = -40 to 85 °C)

Characteristics	Symbol	Test Condition		Note	V_{CC} (V)	Min	Max	Unit
High-level input voltage	V_{IH}	—			2.0	1.50	—	V
					3.0	2.10	—	
					5.5	3.85	—	
Low-level input voltage	V_{IL}	—			2.0	—	0.50	V
					3.0	—	0.90	
					5.5	—	1.65	
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -50 μA		2.0	1.9	—	V
					3.0	2.9	—	
					4.5	4.4	—	
			I_{OH} = -4 mA		3.0	2.48	—	
			I_{OH} = -24 mA		4.5	3.80	—	
			I_{OH} = -75 mA	(Note 1)	5.5	3.85	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50 μA		2.0	—	0.1	V
					3.0	—	0.1	
					4.5	—	0.1	
			I_{OL} = 12 mA		3.0	—	0.44	
			I_{OL} = 24 mA		4.5	—	0.44	
			I_{OL} = 75 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	—	±5.0	μA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND			5.5	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND			5.5	—	80.0	μA

Note 1: This spec indicates the capability of driving 50 Ω transmission lines.
One output should be tested within a 10 ms maximum duration.

11.3. AC Characteristics (Unless otherwise specified, T_a = 25 °C, Input: $t_r = t_f$ = 3 ns)

Characteristics	Symbol	Note	Test Condition	V_{CC} (V)	Min	Typ.	Max	Unit
Propagation delay time	t_{PLH},t_{PHL}	(Note 2)	C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	—	6.3	10.5	ns
				5.0 ± 0.5	—	4.8	7.0	
Propagation delay time	t_{PLH},t_{PHL}	(Note 3)	C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	—	7.0	11.4	ns
				5.0 ± 0.5	—	5.2	7.5	
3-state output enable time	t_{PZL},t_{PZH}		C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	—	8.4	14.0	ns
				5.0 ± 0.5	—	5.9	8.7	
3-state output disable time	t_{PLZ},t_{PHZ}		C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	—	6.4	10.5	ns
				5.0 ± 0.5	—	5.5	7.9	
Input capacitance	C_{IN}		—		—	5	10	pF
Output capacitance	C_{OUT}		—		—	10	—	pF
Power dissipation capacitance	C_{PD}	(Note 1)	—		—	30	—	pF

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.

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

Note 2: For TC74AC240F only

Note 3: For TC74AC244F only

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

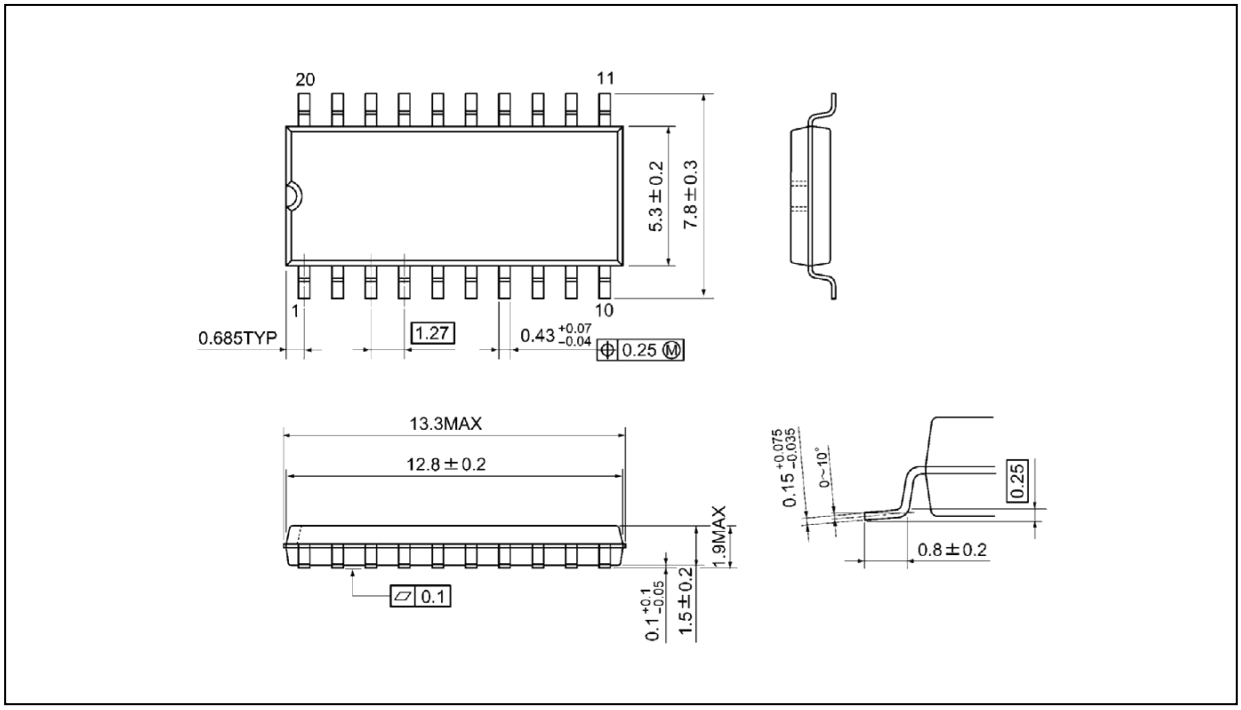
Characteristics	Symbol	Note	Test Condition	V_{CC} (V)	Min	Max	Unit
Propagation delay time	t_{PLH},t_{PHL}	(Note 1)	C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	1.0	12.0	ns
				5.0 ± 0.5	1.0	8.0	
Propagation delay time	t_{PLH},t_{PHL}	(Note 2)	C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	1.0	13.0	ns
				5.0 ± 0.5	1.0	8.5	
3-state output enable time	t_{PZL},t_{PZH}		C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	1.0	16.0	ns
				5.0 ± 0.5	1.0	10.0	
3-state output disable time	t_{PLZ},t_{PHZ}		C_L = 50 pF R_L = 500 Ω	3.3 ± 0.3	1.0	12.0	ns
				5.0 ± 0.5	1.0	9.0	
Input capacitance	C_{IN}		—		—	10	pF

Note 1: For TC74AC240F only

Note 2: For TC74AC244F only

Package Dimensions

Unit: mm



Weight: 0.22 g (typ.)

Package Name(s)
Nickname: SOP20

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