CMOS Digital Integrated Circuits Silicon Monolithic

74HCT240D,74HCT244D

1. Functional Description

・ Octal Bus Buffer

74HCT240D: INVERTED, 3-STATE OUTPUTS
74HCT244D: NON-INVERTED, 3-STATE OUTPUTS

2. General

The 74HCT240D, and 74HCT244D are high speed CMOS OCTAL BUS BUFFERs fabricated with silicon gate C^2MOS technology.

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

Their inputs are compatible with TTL, NMOS, and CMOS output voltage levels. The 74HCT240D is an inverting 3-state buffer having two active-low output enables. The 74HCT244D is non-inverting 3-state buffer the HCT244A has two active-low output enables.

These devices are designed to be used with 3-state memory address drivers, etc.

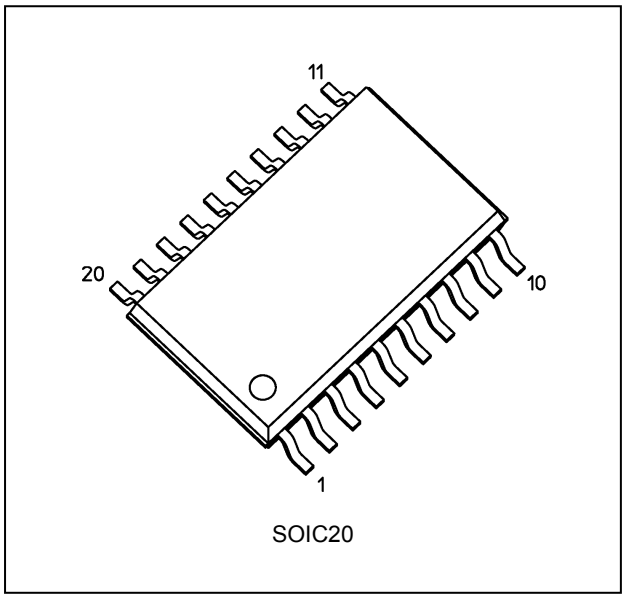
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

3. Features

(1) Wide operating temperature range: T_{opr} = -40 to 125 °C (Note 1)
(2) High speed: t_{pd} = 13 ns (typ.) at V_{CC} = 5.5 V
(3) Low power dissipation: I_{CC} = 4.0 μA (max) at T_a = 25 °C
(4) Compatible with TTL outputs: V_{IL} = 0.8 V(max)
V_{IH} = 2.0 V(min)
(5) Wide interfacing ability: LSTTL, NMOS, CMOS
(6) Balanced propagation delays: $t_{PLH} \approx t_{PHL}$

Note 1: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

4. Packaging

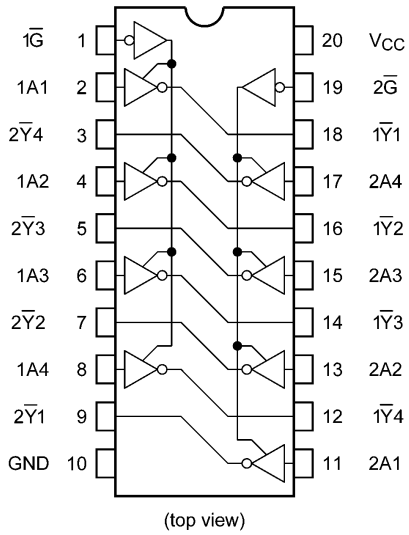


SOIC20

Start of commercial production
2020-07

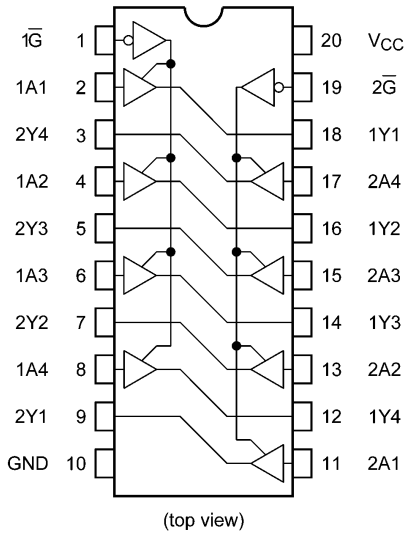
5. Pin Assignment

74HCT240D



(top view)

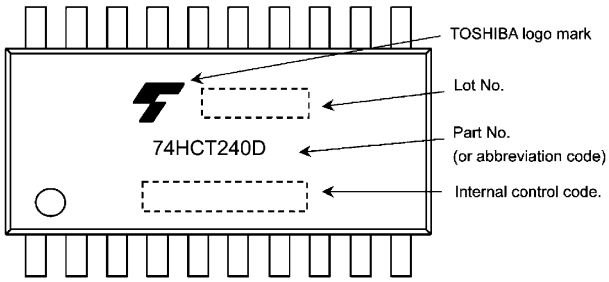
74HCT244D



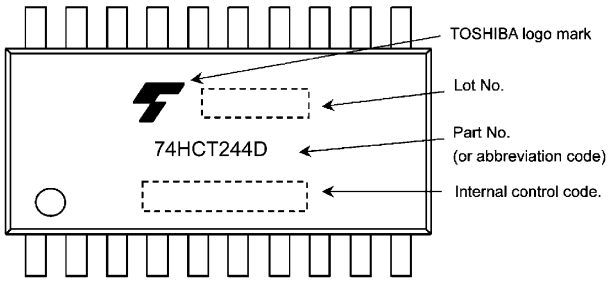
(top view)

6. Marking

74HCT240D

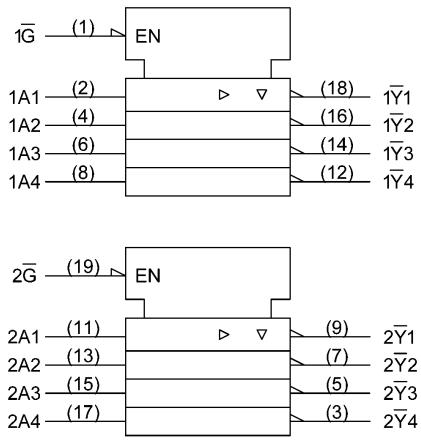


74HCT244D

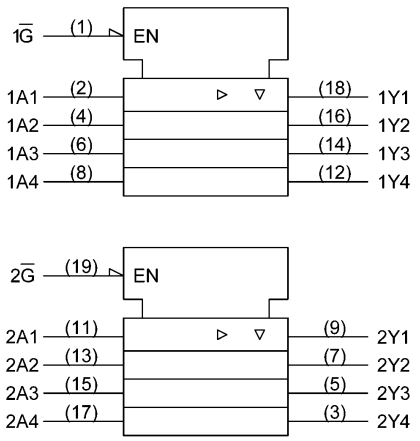


7. IEC Logic Symbol

74HCT240D



74HCT244D



8. Truth Table

Input $\overline{G}$	Input An	Output Yn	Output $\overline{Y}$n
L	L	L	H
L	H	H	L
H	X	Z	Z

X: Don't care
Z: High impedance
Yn: 74HCT244D
$\overline{Y}$n: 74HCT240D

9. Absolute Maximum Ratings (Note)

Characteristics	Symbol	Note	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}		±20	mA
Output current	I_{OUT}		±35	mA
V_{CC}/ground current	I_{CC}		±75	mA
Power dissipation	P_D	(Note 1)	500	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).

Note 1: P_D derates linearly with -8 mW/°C above 85 °C

10. Operating Ranges (Note)

Characteristics	Symbol	Note	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}	(Note 1)	-40 to 125	°C
Input rise and fall times	t_r,t_f		0 to 500	ns

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.

Note 1: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

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}	—		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} = -20 μA	4.5	4.4	4.5	—	V
			I_{OH} = -6 mA	4.5	4.18	4.31	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	4.5	—	0.0	0.1	V
			I_{OL} = 6 mA	4.5	—	0.17	0.26	
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	—	—	4.0	μA
	I_{CCT}	Per input: V_{IN} = 0.5 V or 2.4 V Other input: V_{CC} or GND		5.5	—	—	2.0	mA

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

Characteristics	Symbol	Test Condition		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} = -20 μA	4.5	4.4	—	V
			I_{OH} = -6 mA	4.5	4.13	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	4.5	—	0.1	V
			I_{OL} = 6 mA	4.5	—	0.33	
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	—	40.0	μA
	I_{CCT}	Per input: V_{IN} = 0.5 V or 2.4 V Other input: V_{CC} or GND		5.5	—	2.9	mA

11.3. DC Characteristics (Note) (Unless otherwise specified, T_a = -40 to 125 °C)

Characteristics	Symbol	Test Condition		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} = -20μA	4.5	4.4	—	V
			I_{OH} = -6 mA	4.5	3.7	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20μA	4.5	—	0.1	V
			I_{OL} = 6 mA	4.5	—	0.4	
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
	I_{CCT}	Per input: V_{IN} = 0.5 V or 2.4 V Other input: V_{CC} or GND		5.5	—	2.9	mA

Note: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

11.4. AC Characteristics (Unless otherwise specified, T_a = 25 °C, Input: $t_r = t_f$ = 6 ns)

Characteristics	Part Number	Symbol	Note	Test Condition	C_L (pF)	V_{CC} (V)	Min	Typ.	Max	Unit
Output transition time		t_{TLH},t_{THL}		—	50	4.5	—	7	12	ns
						5.5	—	6	11	
Propagation delay time	74HCT240D	t_{PLH},t_{PHL}		—	50	4.5	—	15	22	ns
						5.5	—	13	20	
					150	4.5	—	21	30	
						5.5	—	16	27	
Propagation delay time	74HCT244D	t_{PLH},t_{PHL}		—	50	4.5	—	15	25	ns
						5.5	—	13	22	
					150	4.5	—	21	33	
						5.5	—	18	29	
3-state output enable time		t_{PZL},t_{PZH}		R_L = 1 kΩ	50	4.5	—	17	30	ns
						5.5	—	14	27	
					150	4.5	—	23	38	
						5.5	—	20	34	
3-state output disable time		t_{PLZ},t_{PHZ}		R_L = 1 kΩ	50	4.5	—	16	30	ns
						5.5	—	13	27	
Input capacitance		C_{IN}		—			—	5	10	pF
Output capacitance		C_{OUT}		—			—	10	—	pF
Power dissipation capacitance	74HCT240D	C_{PD}	(Note 1)	—			—	33	—	pF
	74HCT244D	C_{PD}		—			—	31	—	

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)

11.5. AC Characteristics (Unless otherwise specified, T_a = -40 to 85 °C, Input: $t_r = t_f$ = 6 ns)

Characteristics	Part Number	Symbol	Test Condition	C_L (pF)	V_{CC} (V)	Min	Max	Unit
Output transition time		t_{TLH},t_{THL}	—	50	4.5	—	15	ns
					5.5	—	14	
Propagation delay time	74HCT240D	t_{PLH},t_{PHL}	—	50	4.5	—	28	ns
					5.5	—	25	
				150	4.5	—	38	
					5.5	—	34	
Propagation delay time	74HCT244D	t_{PLH},t_{PHL}	—	50	4.5	—	31	ns
					5.5	—	28	
				150	4.5	—	41	
					5.5	—	37	
3-state output enable time		t_{PZL},t_{PZH}	R_L = 1 kΩ	50	4.5	—	38	ns
					5.5	—	34	
				150	4.5	—	48	
					5.5	—	43	
3-state output disable time		t_{PLZ},t_{PHZ}	R_L = 1 kΩ	50	4.5	—	38	ns
					5.5	—	34	
Input capacitance		C_{IN}	—			—	10	pF

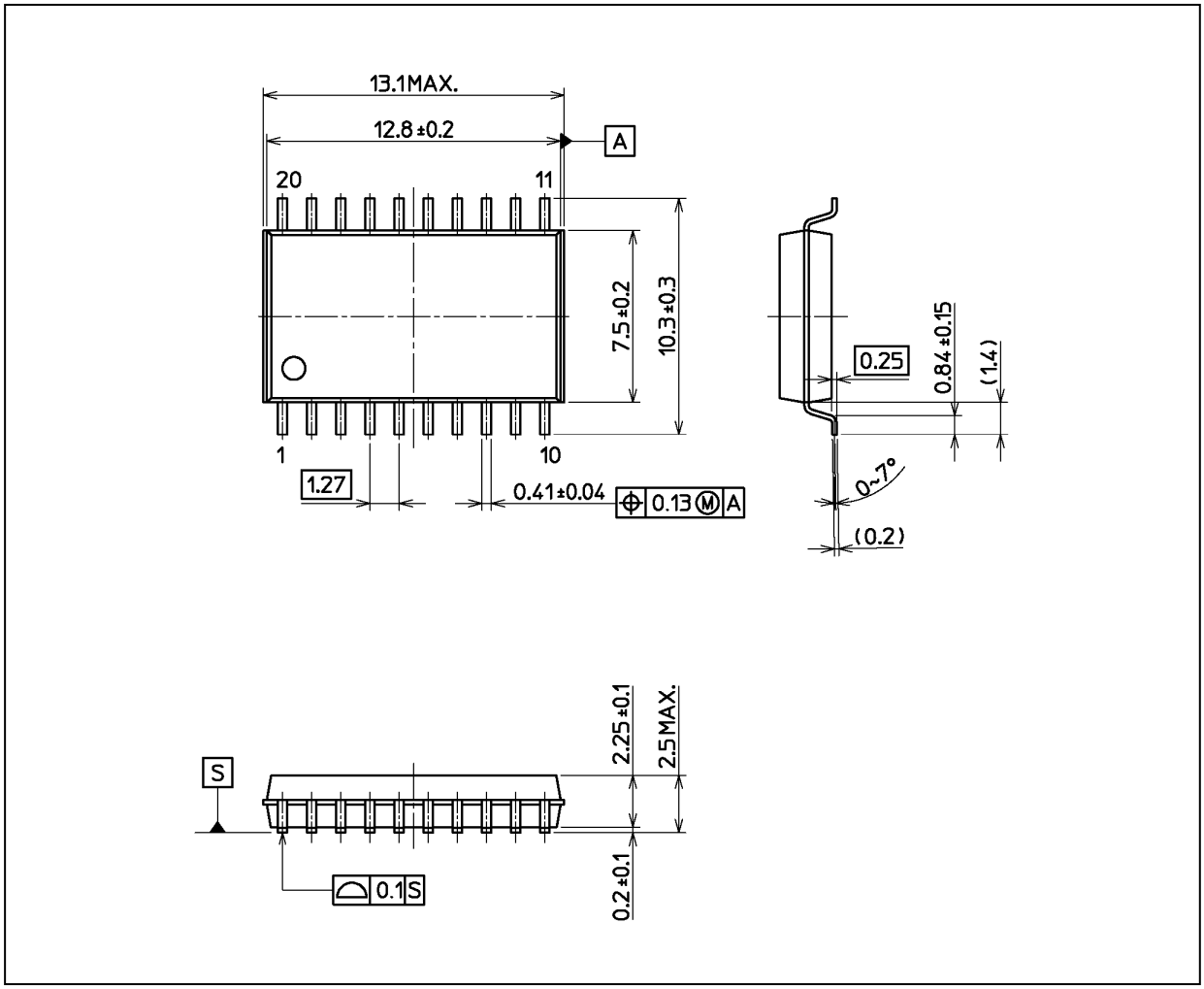
11.6. AC Characteristics (Note)
(Unless otherwise specified, T_a = -40 to 125 °C, Input: $t_r = t_f$ = 6 ns)

Characteristics	Part Number	Symbol	Test Condition	C_L (pF)	V_{CC} (V)	Min	Max	Unit
Output transition time		t_{TLH},t_{THL}		50	4.5	—	17	ns
					5.5	—	16	
Propagation delay time	74HCT240D	t_{PLH},t_{PHL}	—	50	4.5	—	32	ns
					5.5	—	29	
				150	4.5	—	44	
					5.5	—	39	
Propagation delay time	74HCT244D	t_{PLH},t_{PHL}	—	50	4.5	—	35	ns
					5.5	—	32	
				150	4.5	—	47	
					5.5	—	43	
3-state output enable time		t_{PZL},t_{PZH}	R_L = 1 kΩ	50	4.5	—	44	ns
					5.5	—	39	
				150	4.5	—	55	
					5.5	—	49	
3-state output disable time		t_{PLZ},t_{PHZ}	R_L = 1 kΩ	50	4.5	—	44	ns
					5.5	—	39	
Input capacitance		C_{IN}	—			—	10	pF

Note: Operating Range spec of T_{opr} = -40 °C to 125 °C is applicable only for the products which manufactured after July 2020.

Package Dimensions

Unit: mm



Weight: 0.51 g (typ.)

Package Name(s)
Nickname: SOIC20

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