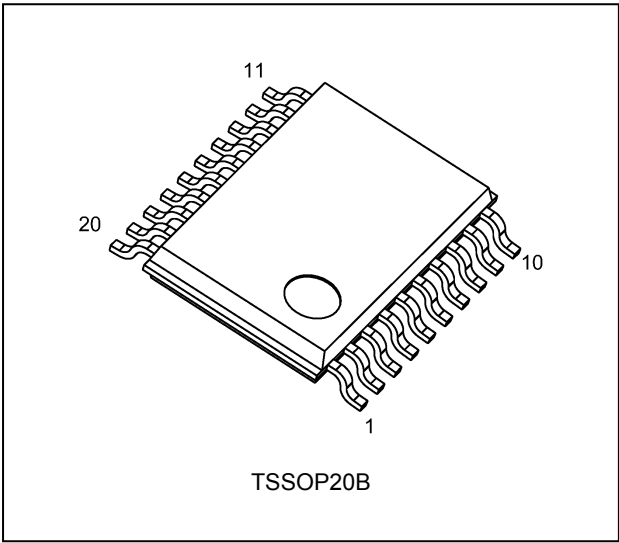
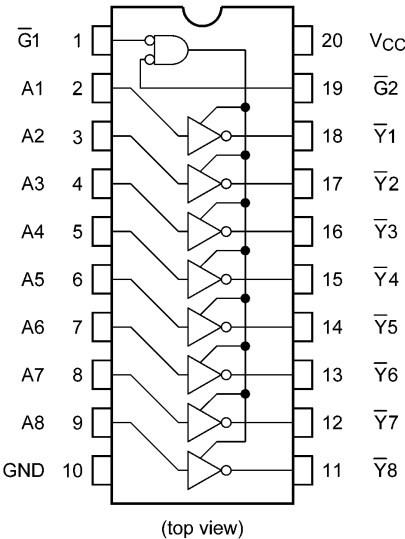


4. Packaging

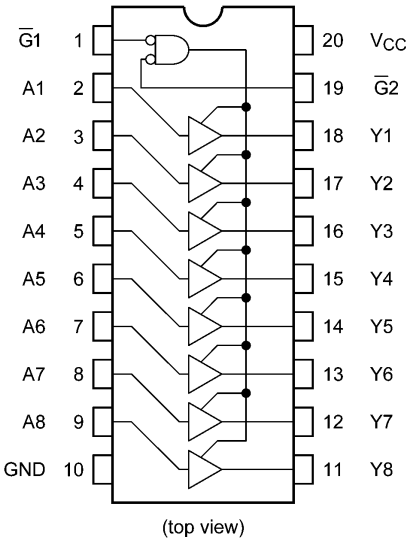


5. Pin Assignment

74VHCT540AFT

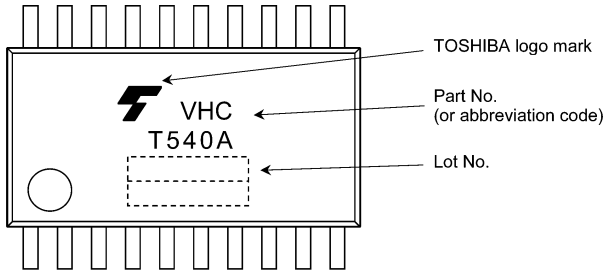


74VHCT541AFT

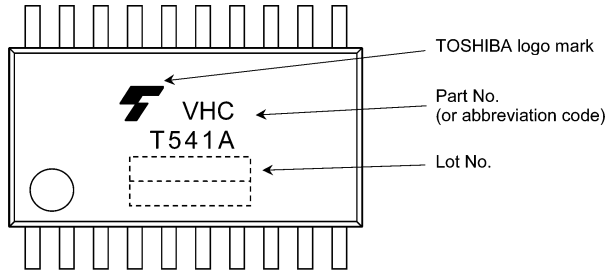


6. Marking

74VHCT540AFT

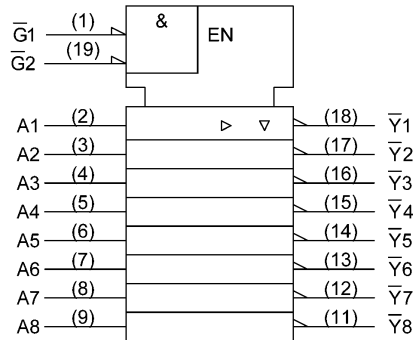


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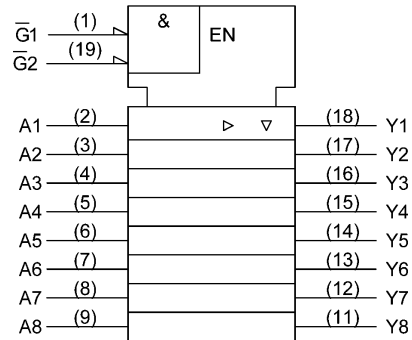


7. IEC Logic Symbol

74VHCT540AFT



74VHCT541AFT



8. Truth Table

Input $\bar{G}1$	Input $\bar{G}2$	Input A_n	Output Y_n	Output $\bar{Y}_n$
H	X	X	Z	Z
X	H	X	Z	Z
L	L	H	H	L
L	L	L	L	H

X: Don't care
 Z: High impedance
 Y_n : 74VHCT541AFT
 $\bar{Y}_n$: 74VHCT540AFT

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 7.0	
Output voltage	V_{OUT}	(Note1) (Note2)	-0.5 to 7.0 -0.5 to $V_{CC} + 0.5$	
Input diode current	I_{IK}		-20	mA
Output diode current	I_{OK}	(Note3)	± 20	
Output current	I_{OUT}		± 25	
V_{CC} /ground current	I_{CC}		± 75	
Power dissipation	P_D	(Note4)	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).

Note1: Output in OFF state.

Note2: High (H) or Low (L) state. I_{OUT} absolute maximum rating must be observed.

Note3: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Note4: 180 mW in the range of $T_a = -40$ to $85^{\circ}C$. From $T_a = 85$ to $125^{\circ}C$ a derating factor of -3.25 mW/ $^{\circ}C$ shall be applied until 50 mW.

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 5.5	
Output voltage	V_{OUT}	(Note1) (Note2)	0 to 5.5 0 to V_{CC}	
Operating temperature	T_{opr}		-40 to 125	°C
Input rise and fall times	dt/dv		0 to 20	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.

Note1: Output in OFF state.

Note2: High (H) or Low (L) state.

11. Electrical Characteristics

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

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
			$I_{OH} = -8\text{ mA}$	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	V
			$I_{OL} = 8\text{ mA}$	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	—	—	± 0.25	μA
Input leakage current	I_{IN}	$V_{IN} = 5.5\text{ V}$ or GND	0 to 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: $V_{IN} = 3.4\text{ V}$ Other input: V_{CC} or GND	5.5	—	—	1.35	mA
Output leakage current (Power-OFF)	I_{OPD}	$V_{OUT} = 5.5\text{ V}$	0	—	—	0.5	μA

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

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}	$I_{OH} = -50\text{ }\mu\text{A}$	4.5	4.4	V
			$I_{OH} = -8\text{ mA}$	4.5	3.80	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 50\text{ }\mu\text{A}$	4.5	—	V
			$I_{OL} = 8\text{ mA}$	4.5	—	
3-state output OFF-state leakage current	I_{OZ}	$V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = V_{CC}$ or GND	5.5	—	± 2.50	μA
Input leakage current	I_{IN}	$V_{IN} = 5.5\text{ V}$ or GND	0 to 5.5	—	± 1.0	μA
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND	5.5	—	40.0	μA
Quiescent supply current	I_{CCT}	Per input: $V_{IN} = 3.4\text{ V}$ Other input: V_{CC} or GND	5.5	—	1.50	mA
Output leakage current (Power-OFF)	I_{OPD}	$V_{OUT} = 5.5\text{ V}$	0	—	5.0	μA

11.3. DC Characteristics (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}	$I_{OH} = -50$ μ A	4.5	4.4	V
			$I_{OH} = -8$ mA	4.5	3.70	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 50$ μ A	4.5	—	V
			$I_{OL} = 8$ mA	4.5	0.55	
3-state output OFF-state leakage current	I_{OZ}	$V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = V_{CC}$ or GND	5.5	—	± 10.0	μ A
Input leakage current	I_{IN}	$V_{IN} = 5.5$ V or GND	0 to 5.5	—	± 2.0	μ A
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND	5.5	—	80.0	μ A
	I_{CCT}	Per input: $V_{IN} = 3.4$ V Other input: V_{CC} or GND	5.5	—	1.50	mA
Output leakage current (Power-OFF)	I_{OPD}	$V_{OUT} = 5.5$ V	0	—	20.0	μ A

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

Characteristics	Part Number	Symbol	Note	Test Condition	V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Unit
Propagation delay time	74VHCT540AFT	t_{PLH}, t_{PHL}		—	5.0 ± 0.5	15	—	5.4	7.4	ns
						50	—	5.9	8.4	
	74VHCT541AFT	t_{PLH}, t_{PHL}		—	5.0 ± 0.5	15	—	5.0	6.9	ns
						50	—	5.5	7.9	
3-state output enable time		t_{PZL}, t_{PZH}		$R_L = 1$ k Ω	5.0 ± 0.5	15	—	8.3	11.3	ns
						50	—	8.8	12.3	
3-state output disable time		t_{PLZ}, t_{PHZ}		$R_L = 1$ k Ω	5.0 ± 0.5	50	—	9.4	11.9	ns
Output skew		t_{osLH}, t_{osHL}	(Note 1)	—	5.0 ± 0.5	50	—	—	1.0	ns
Input capacitance		C_{IN}		—			—	4	10	pF
Output capacitance		C_{OUT}		—			—	9	—	pF
Power dissipation capacitance		C_{PD}	(Note 2)	—			—	19	—	pF

Note 1: Parameter guaranteed by design. ($t_{osLH} = |t_{PLHm} - t_{PLHn}|$, $t_{osHL} = |t_{PHLm} - t_{PHLn}|$)

Note 2: 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.

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

11.5. AC Characteristics

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

Characteristics	Part Number	Symbol	Note	Test Condition	V_{CC} (V)	C_L (pF)	Min	Max	Unit
Propagation delay time	74VHCT540AFT	t_{PLH}, t_{PHL}		—	5.0 ± 0.5	15	1.0	8.5	ns
						50	1.0	9.5	
	74VHCT541AFT	t_{PLH}, t_{PHL}		—	5.0 ± 0.5	15	1.0	8.0	ns
						50	1.0	9.0	
3-state output enable time		t_{PZL}, t_{PZH}		$R_L = 1$ k Ω	5.0 ± 0.5	15	1.0	13.0	ns
						50	1.0	14.0	
3-state output disable time		t_{PLZ}, t_{PHZ}		$R_L = 1$ k Ω	5.0 ± 0.5	50	1.0	13.5	ns
Output skew		t_{osLH}, t_{osHL}	(Note 1)	—	5.0 ± 0.5	50	—	1.0	ns
Input capacitance		C_{IN}		—			—	10	pF

Note 1: Parameter guaranteed by design. ($t_{osLH} = |t_{PLHm} - t_{PLHn}|$, $t_{osHL} = |t_{PHLm} - t_{PHLn}|$)

11.6. AC Characteristics

(Unless otherwise specified, $T_a = -40$ to 125 °C, Input: $t_r = t_f = 3$ ns)

Characteristics	Part Number	Symbol	Note	Test Condition	V_{CC} (V)	C_L (pF)	Min	Max	Unit
Propagation delay time	74VHCT540AFT	t_{PLH}, t_{PHL}		—	5.0 ± 0.5	15	1.0	9.5	ns
						50	1.0	10.5	
	74VHCT541AFT	t_{PLH}, t_{PHL}		—	5.0 ± 0.5	15	1.0	9.0	ns
						50	1.0	10.0	
3-state output enable time		t_{PZL}, t_{PZH}		$R_L = 1$ k Ω	5.0 ± 0.5	15	1.0	14.5	ns
						50	1.0	15.5	
3-state output disable time		t_{PLZ}, t_{PHZ}		$R_L = 1$ k Ω	5.0 ± 0.5	50	1.0	15.0	ns
Output skew		t_{osLH}, t_{osHL}	(Note 1)	—	5.0 ± 0.5	50	—	1.0	ns
Input capacitance		C_{IN}		—			—	10	pF

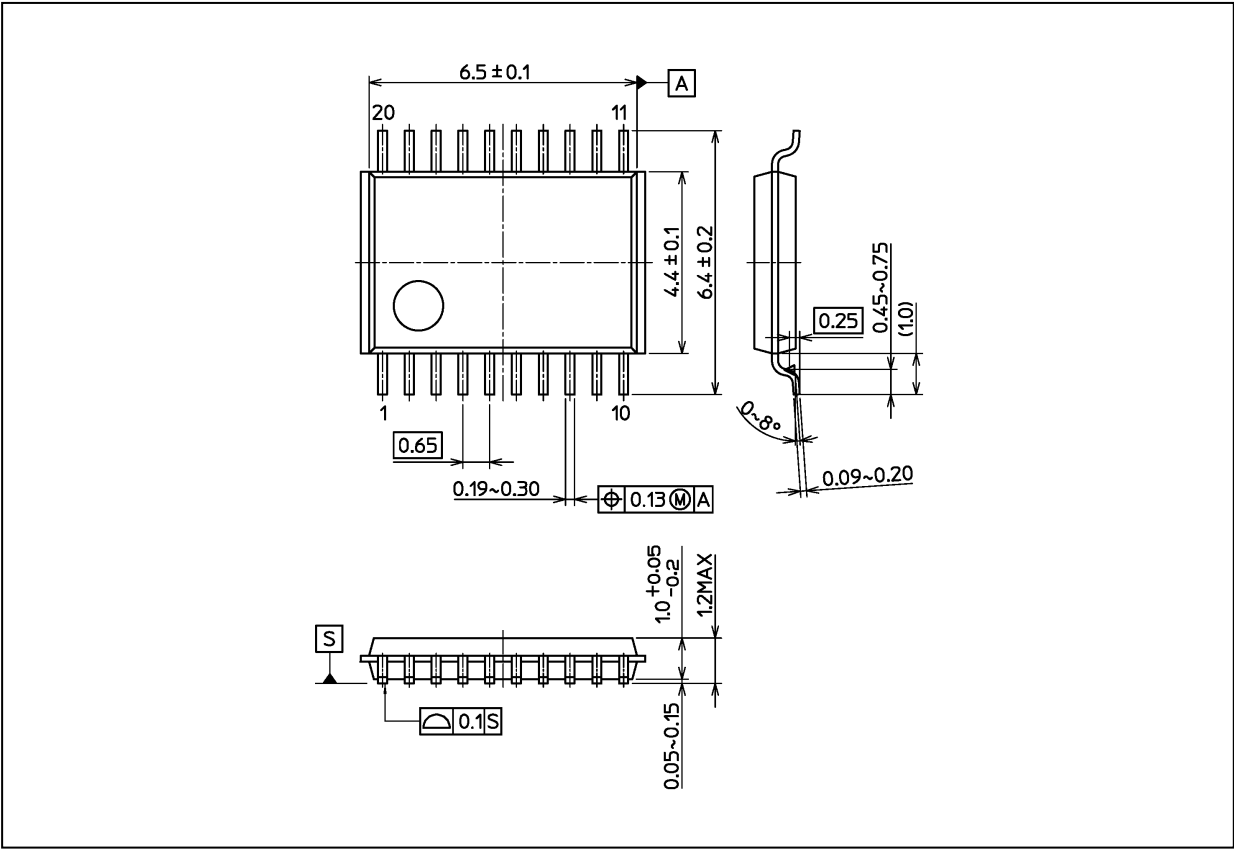
Note 1: Parameter guaranteed by design. ($t_{osLH} = |t_{PLHM} - t_{PLHN}|$, $t_{osHL} = |t_{PHLM} - t_{PHLN}|$)

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

Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Limit	Unit
Quiet output maximum dynamic V_{OL}	V_{OLP}	$C_L = 50$ pF	5.0	1.1	1.5	V
Quiet output minimum dynamic V_{OL}	V_{OLV}	$C_L = 50$ pF	5.0	-1.1	-1.5	
Minimum high-level dynamic input voltage	V_{IHD}	$C_L = 50$ pF	5.0	—	2.0	
Maximum low-level dynamic input voltage	V_{ILD}	$C_L = 50$ pF	5.0	—	0.8	

Package Dimensions

Unit: mm



Weight: 0.071 g (typ.)

Package Name(s)
Nickname: TSSOP20B

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