TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HCT540AP,TC74HCT540AF,TC74HCT540AFW
TC74HCT541AP,TC74HCT541AF,TC74HCT541AFW

Octal Bus Buffer with TTL Input Level

TC74HCT540AP/AF/AFW	Inverting, 3-State Outputs
TC74HCT541AP/AF/AFW	Non-Inverting, 3-State Outputs

The TC74HCT540A/TC74HCT541A are high speed CMOS OCTAL BUS BUFFERs fabricated with silicon gate C^2MOS technology.

These devices may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

They achive the high speed operation similar to equivalent LSTTL while maintaing the CMOS low power dissipation.

The TC74HCT540A is an inverting type, and the TC74HCT541A is a non-inverting type.

When either $\overline{G}1$ or $\overline{G}2$ are high, the terminal outputs are in the high-impedance state.

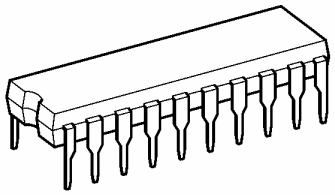
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Features

- High speed: t_{pd} = 10 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 4 μA (max) at Ta = 25°C
- Compatible with TTL outputs: V_{IL} = 0.8 V (max)
  V_{IH} = 2.0 V (min)
- Wide interfacing ability: LSTTL, NMOS, CMOS
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL}$ = 6 mA (min)
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Pin and function compatible with 74LS540/541

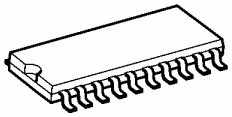
Note: xxxFW (JEDEC SOP) is not available in Japan.

TC74HCT540AP, TC74HCT541AP

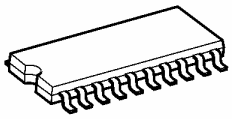


DIP20-P-300-2.54A

TC74HCT540AF, TC74HCT541AF

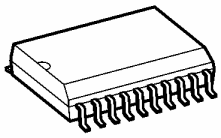


SOP20-P-300-1.27A



SOP20-P-300-1.27

TC74HCT540AFW, TC74HCT541AFW



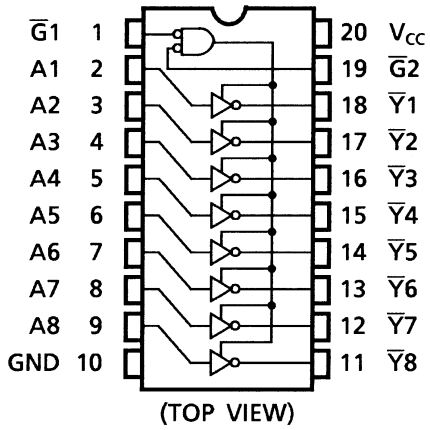
SOL20-P-300-1.27

Weight

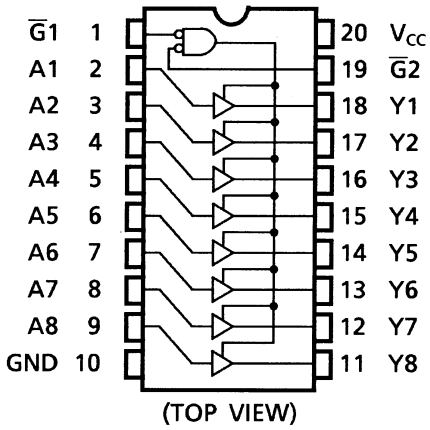
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)
SOP20-P-300-1.27	: 0.22 g (typ.)
SOL20-P-300-1.27	: 0.46 g (typ.)

Pin Assignment

TC74HCT540A

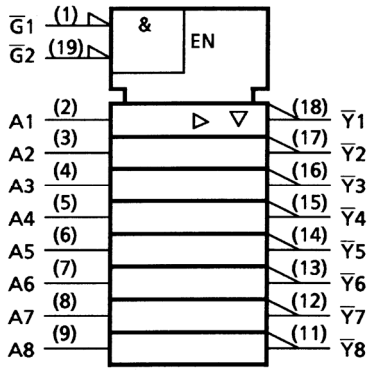


TC74HCT541A



IEC Logic Symbol

TC74HCT540A



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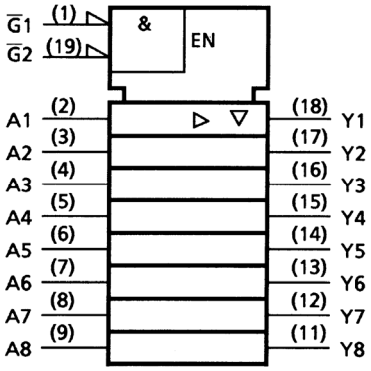


Truth Table

Inputs			Outputs	
$\overline{G}1$	$\overline{G}2$	An	Yn*	$\overline{Y}n$ *
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

*: Yn HCT541A

$\overline{Y}n$ HCT540A

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5~7	V
DC input voltage	V_{IN}	−0.5~V_{CC} + 0.5	V
DC output voltage	V_{OUT}	−0.5~V_{CC} + 0.5	V
Input diode current	I_{IK}	±20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±35	mA
DC V_{CC}/ground current	I_{CC}	±75	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{stg}	−65~150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: 500 mW in the range of Ta = −40 to 65°C. From Ta = 65 to 85°C a derating factor of −10 mW/°C shall be applied until 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.5~5.5	V
Input voltage	V_{IN}	0~V_{CC}	V
Output voltage	V_{OUT}	0~V_{CC}	V
Operating temperature	T_{opr}	−40~85	°C
Input rise and fall time	t_r, t_f	0~500	ns

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V_{CC} (V)	Ta = 25°C Min	Ta = 25°C Typ.	Ta = 25°C Max	Ta = −40~85°C Min	Ta = −40~85°C Max	Unit
High-level input voltage	V_{IH}	—		4.5~5.5	2.0	—	—	2.0	—	V
Low-level input voltage	V_{IL}	—		4.5~5.5	—	—	0.8	—	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	—	4.4	—	V
			I_{OH} = −6 mA	4.5	4.18	4.31	—	4.13	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	4.5	—	0.0	0.1	—	0.1	V
			I_{OL} = 6 mA	4.5	—	0.17	0.26	—	0.33	
3-state output off-state current	I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND		5.5	—	—	±0.5	—	±5.0	μA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	4.0	—	40.0	μA
	I_C	Per input: V_{IN} = 0.5 V or 2.4 V Other input: V_{CC} or GND		5.5	—	—	2.0	—	2.9	mA

AC Characteristics (input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = –40~85°C		Unit
			CL (pF)	V_{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH}	—	50	4.5	—	7	12	—	15	ns
	t_{THL}			5.5	—	6	11	—	14	
Propagation delay time (TC74HCT540A)	t_{pLH}	—	50	4.5	—	12	20	—	25	ns
				5.5	—	9	18	—	23	
	t_{pHL}		150	4.5	—	17	26	—	33	
				5.5	—	14	24	—	30	
Propagation delay time (TC74HCT541A)	t_{pLH}	—	50	4.5	—	14	23	—	29	ns
				5.5	—	11	21	—	27	
	t_{pHL}		150	4.5	—	19	29	—	36	
				5.5	—	16	27	—	33	
Output enable time	t_{pZL}	$R_L = 1$ kΩ	50	4.5	—	18	30	—	38	ns
				5.5	—	16	27	—	35	
	t_{pZH}		150	4.5	—	23	36	—	45	
				5.5	—	21	33	—	41	
Output disable time	t_{pLZ}	$R_L = 1$ kΩ	50	4.5	—	18	30	—	38	ns
	t_{pHZ}			5.5	—	16	27	—	35	
Input capacitance	C_{IN}	—			—	5	10	—	10	pF
Output capacitance	C_{OUT}	—			—	10	—	—	—	pF
Power dissipation capacitance	C_{PD} (Note)	TC74HCT540A			—	35	—	—	—	pF
		TC74HCT541A			—	31	—	—	—	

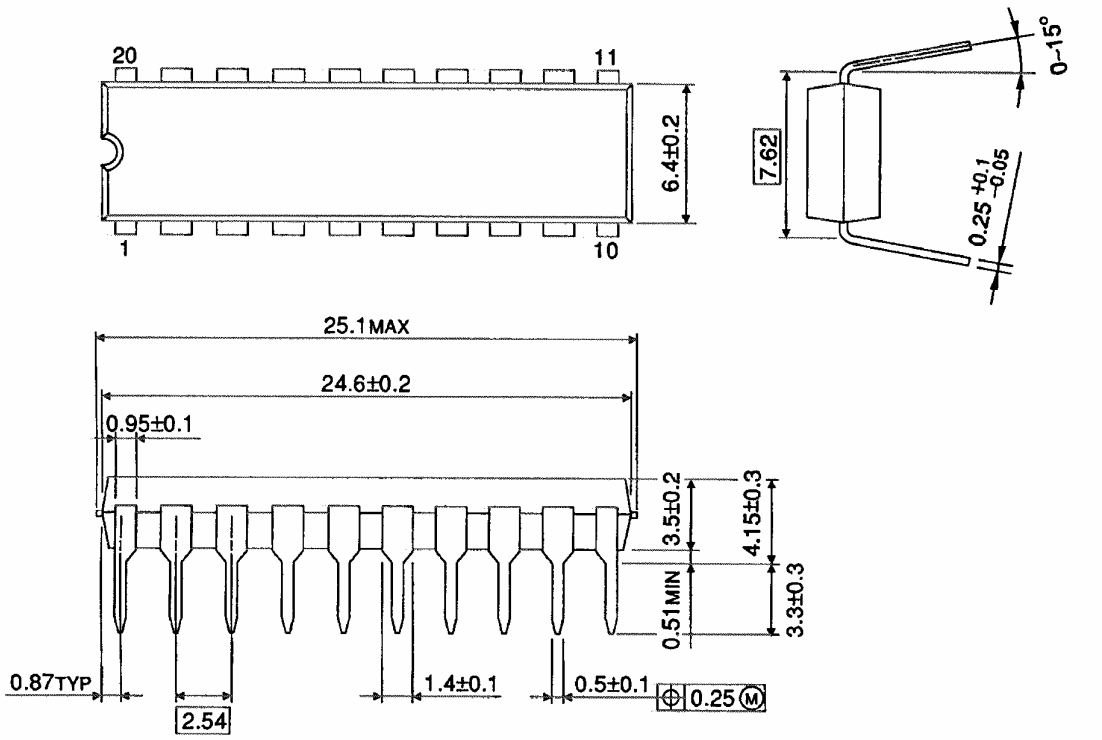
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

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

Package Dimensions

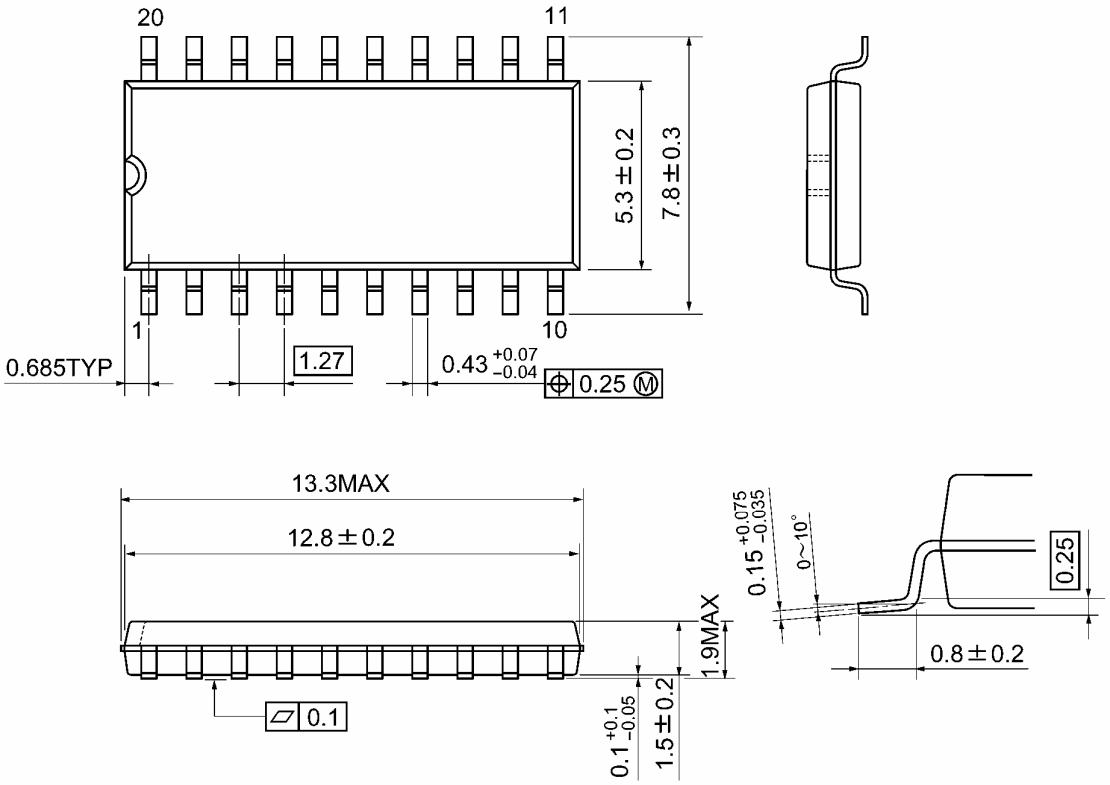
DIP20-P-300-2.54A Unit : mm



Weight: 1.30 g (typ.)

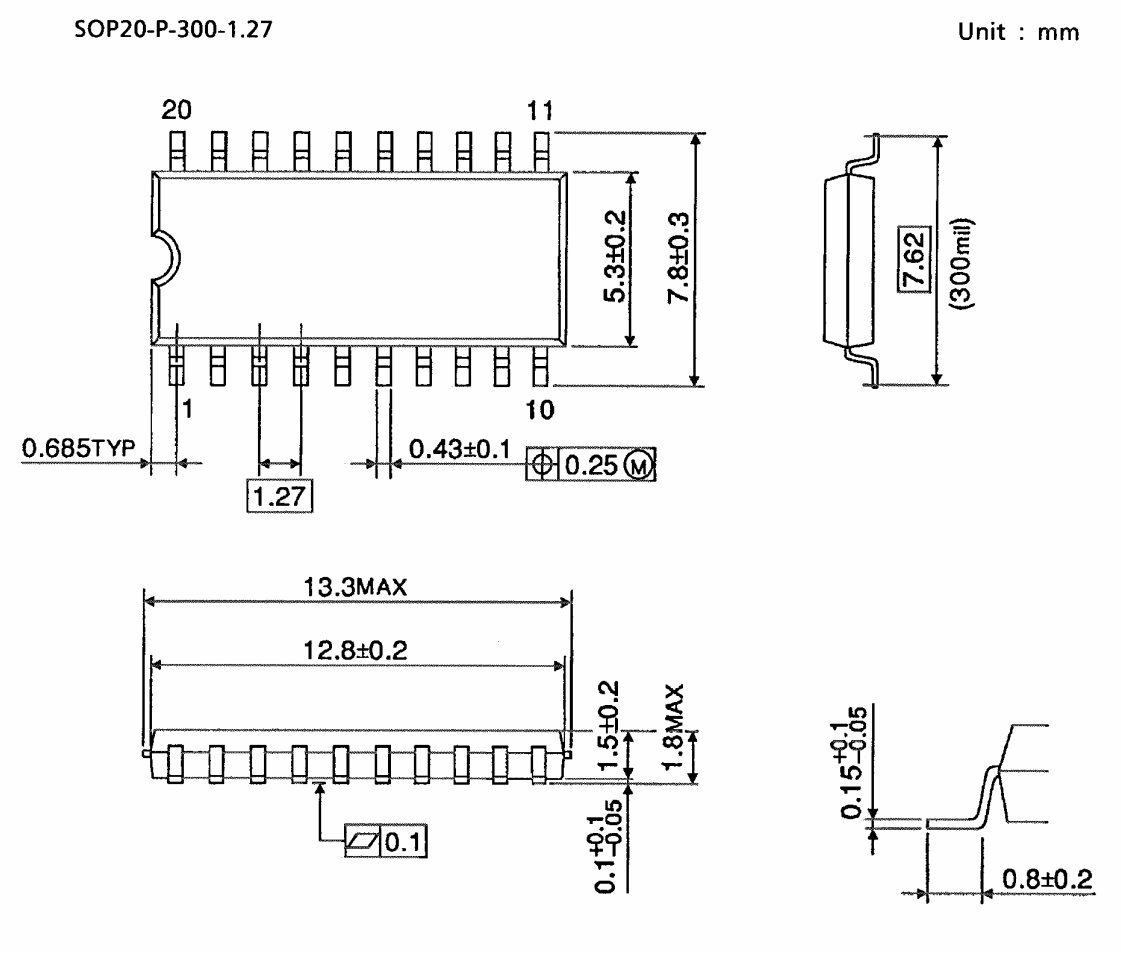
Package Dimensions

SOP20-P-300-1.27A Unit: mm



Weight: 0.22 g (typ.)

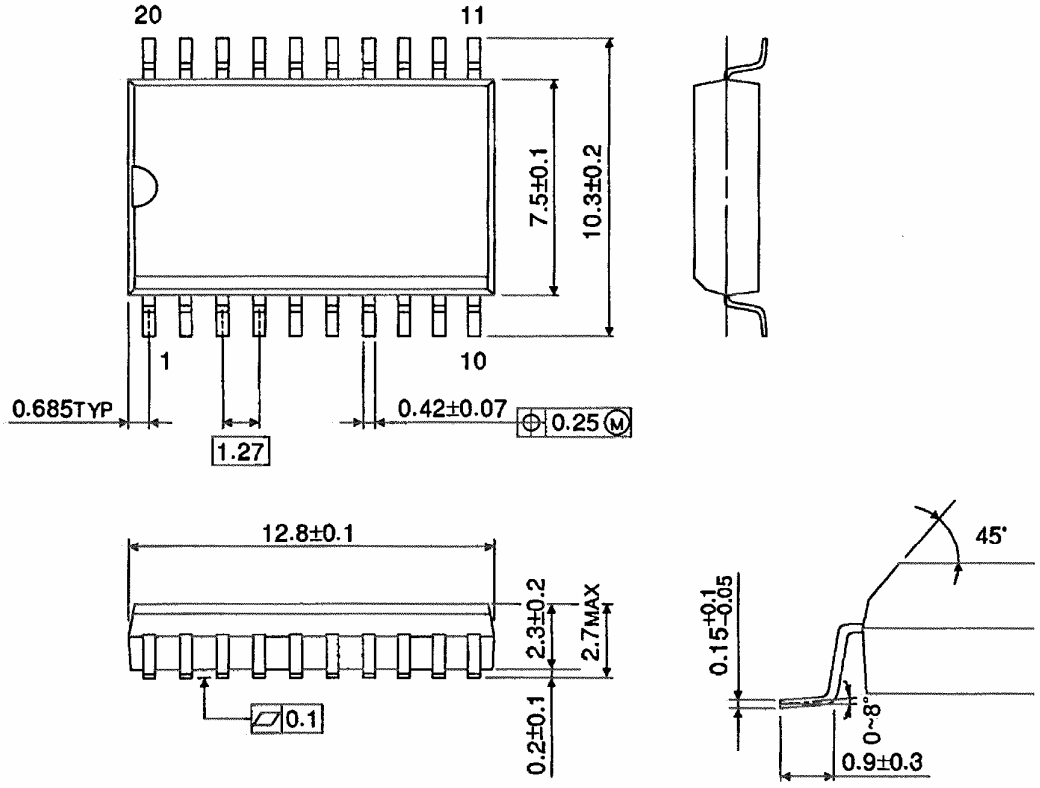
Package Dimensions



Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27 Unit : mm



Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Note: Lead (Pb)-Free Packages

DIP20-P-300-2.54A SOP20-P-300-1.27A

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