

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74HC540AP, TC74HC540AF, TC74HC540AFW
TC74HC541AP, TC74HC541AF, TC74HC541AFW

OCTAL BUS BUFFER

TC74HC540AP / AF / AFW INVERTING, 3-STATE OUTPUTS
TC74HC541AP / AF / AFW NON-INVERTING, 3-STATE OUTPUTS

(Note) The JEDEC SOP (FW) is not available in Japan.

The TC74HC540A/TC74HC541A are high speed CMOS OCTAL BUS BUFFERS fabricated with silicon gate C²MOS technology.

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

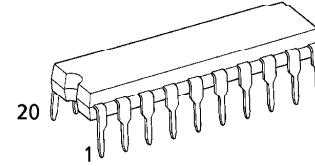
The TC74HC540A is a non-inverting type, and the TC74HC541A is an inverting type.

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

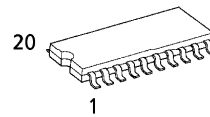
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

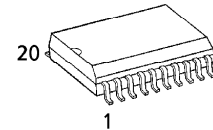
- High Speed..... $t_{pd} = 10\text{ns}(\text{typ.})$ at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 4\mu\text{A}(\text{Max.})$ at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC}(\text{Min.})$
- Output Drive Capability..... 15 LSTTL Loads
- Symmetrical Output Impedance... $|I_{OH}| = |I_{OL}| = 6\text{mA}(\text{Min.})$
- Balanced Propagation Delays..... $t_{PLH} \approx t_{PHL}$
- Wide Operating Voltage Range..... $V_{CC}(\text{opr.}) = 2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 74LS540/541



P (DIP20-P-300-2.54A)
Weight: 1.30g (Typ.)



F (SOP20-P-300-1.27)
Weight: 0.22g (Typ.)



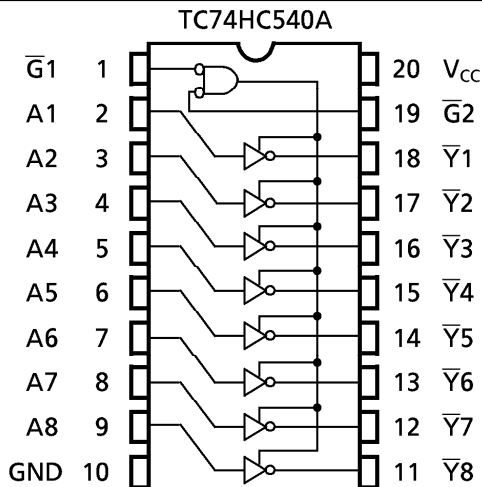
FW (SOL20-P-300-1.27)
Weight: 0.46g (Typ.)

TRUTH TABLE

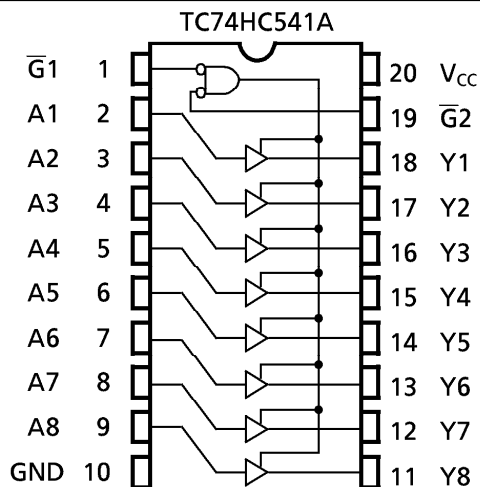
INPUTS			OUTPUTS	
$\bar{G}1$	$\bar{G}2$	A_n	Y_n^*	$\bar{Y}_n^*$
H	X	X	Z	Z
X	H	X	Z	Z
L	L	H	H	L
L	L	L	L	H

X : Don't Care
 Z : High Impedance
 * : Y_n HC541
 $\bar{Y}_n$ HC540

PIN ASSIGNMENT



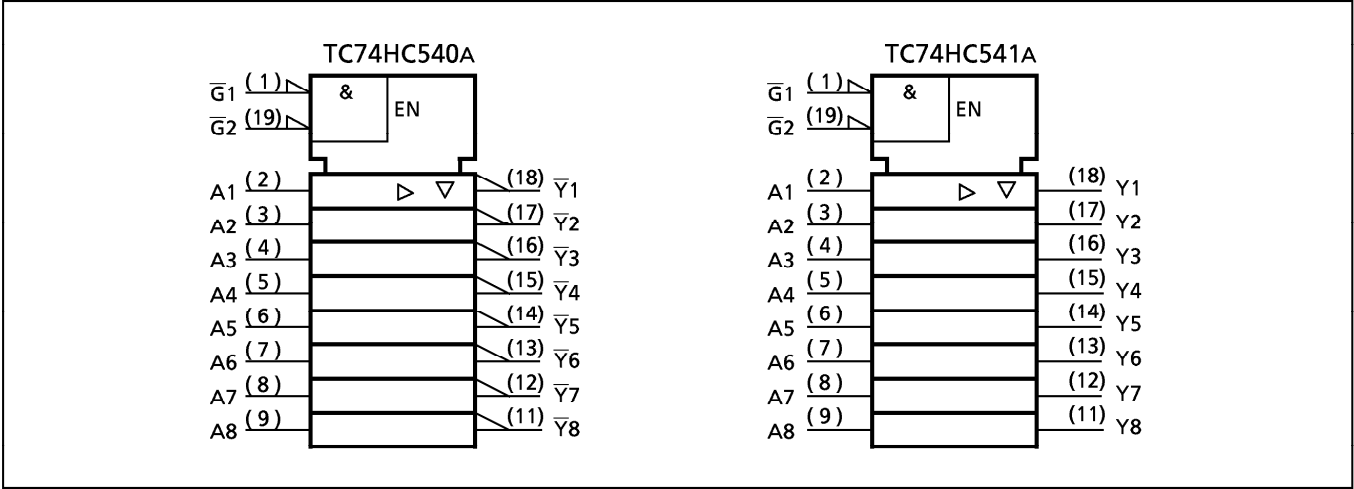
(TOP VIEW)



961001EBA2

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IEC LOGIC SYMBOL



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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7$	V
DC Input Voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	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)* / 180 (SOP)	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	°C

*500mW in the range of $T_a = -40^\circ\text{C} \sim 65^\circ\text{C}$. From $T_a = 65^\circ\text{C}$ to 85°C a derating factor of $-10\text{mW}/^\circ\text{C}$ shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	$2 \sim 6$	V
Input Voltage	V_{IN}	$0 \sim V_{CC}$	V
Output Voltage	V_{OUT}	$0 \sim V_{CC}$	V
Operating Temperature	T_{opr}	$-40 \sim 85$	°C
Input Rise and Fall Time	t_r, t_f	$0 \sim 1000 (V_{CC} = 2.0\text{V})$ $0 \sim 500 (V_{CC} = 4.5\text{V})$ $0 \sim 400 (V_{CC} = 6.0\text{V})$	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
High - Level Input Voltage	V_{IH}		2.0 4.5 6.0	1.50 3.15 4.20	— — —	— — —	1.50 3.15 4.20	— — —	V
Low - Level Input Voltage	V_{IL}		2.0 4.5 6.0	— — —	— — —	0.50 1.35 1.80	— — —	0.50 1.35 1.80	V
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -20\mu\text{A}$	2.0 4.5 6.0	1.9 4.4 5.9	2.0 4.5 6.0	— — —	1.9 4.4 5.9	V
			$I_{OH} = -6 \text{ mA}$ $I_{OH} = -7.8 \text{ mA}$	4.5 6.0	4.18 5.68	4.31 5.80	— —	4.13 5.63	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 20\mu\text{A}$	2.0 4.5 6.0	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	V
			$I_{OL} = 6 \text{ mA}$ $I_{OL} = 7.8 \text{ mA}$	4.5 6.0	— —	0.17 0.18	0.26 0.26	— —	
3 - State Output Off - State Current	I_{OZ}	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or GND}$	6.0	—	—	± 0.5	—	± 5.0	μA
Input Leakage Current	I_{IN}	$V_{IN} = V_{CC} \text{ or GND}$	6.0	—	—	± 0.1	—	± 1.0	
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$	6.0	—	—	4.0	—	40.0	

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 6\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	CL (pF)	V _{CC} (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}		50	2.0 4.5 6.0	— — —	25 7 6	60 12 10	— — —	75 15 13	ns
Propagation Delay Time	t_{PLH}		50	2.0 4.5 6.0	— — —	36 12 10	90 18 15	— — —	115 23 20	
	t_{PHL}		150	2.0 4.5 6.0	— — —	51 17 14	130 26 22	— — —	165 33 28	
Output Enable Time	t_{pZL}	$R_L = 1\text{k}\Omega$	50	2.0 4.5 6.0	— — —	45 14 12	125 25 21	— — —	155 31 26	
	t_{pZH}		150	2.0 4.5 6.0	— — —	60 19 16	165 33 28	— — —	205 41 35	
Output Disable time	t_{pLZ} t_{pHZ}	$R_L = 1\text{k}\Omega$	50	2.0 4.5 6.0	— — —	40 16 14	125 25 21	— — —	155 31 26	
Input Capacitance	C_{IN}				—	5	10	—	10	pF
Output Capacitance	C_{OUT}				—	10	—	—	—	
Power Dissipation Capacitance	C_{PD} (1)	TC74HC540A			—	32	—	—	—	
		TC74HC541A			—	35	—	—	—	

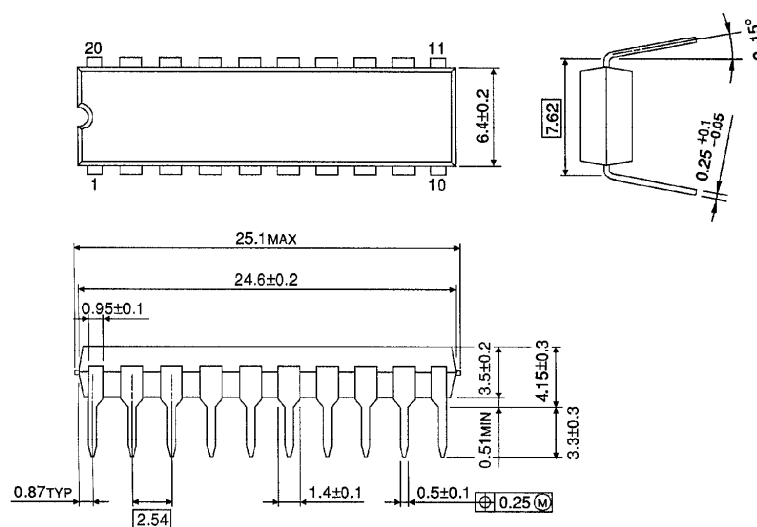
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)

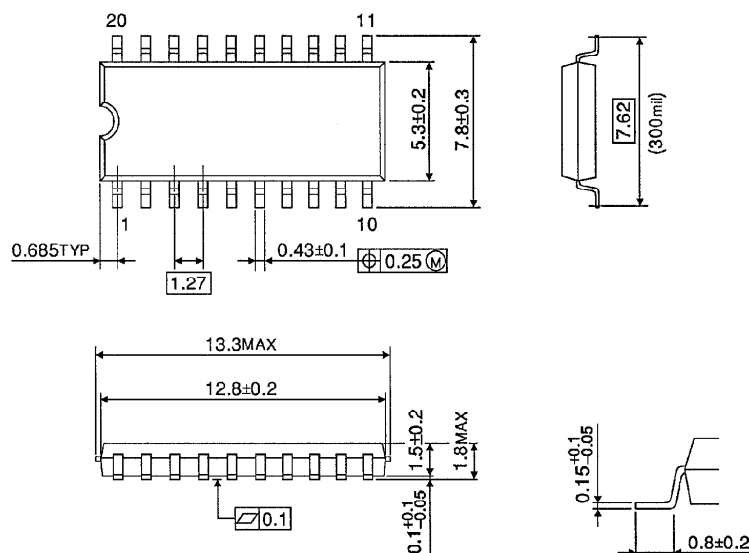
Unit in mm



Weight : 1.30g (Typ.)

SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)

Unit in mm

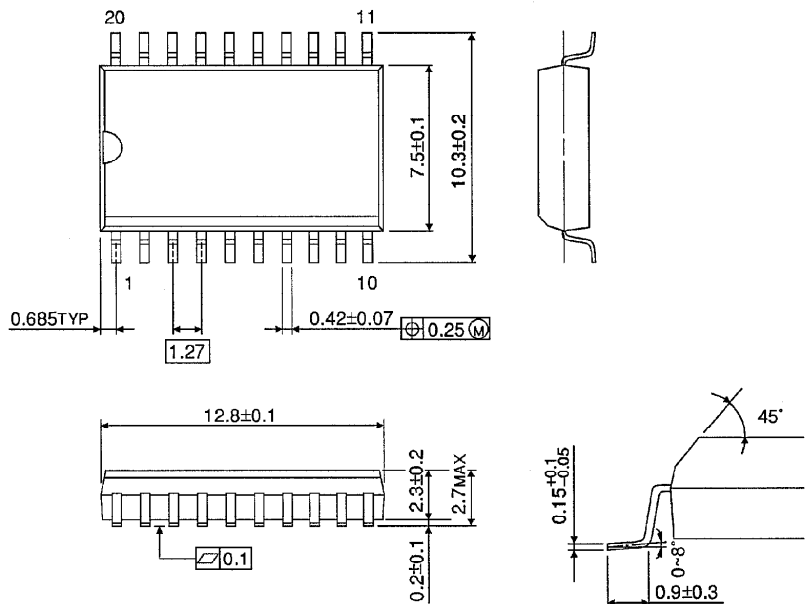


Weight : 0.22g (Typ.)

SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)