

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 C<sup>2</sup>MOS technology.

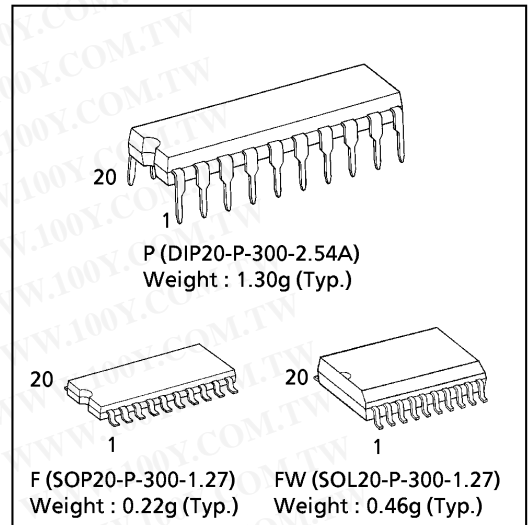
They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. The TC74HC540A is an inverting type, and the TC74HC541A is a non-inverting type.

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

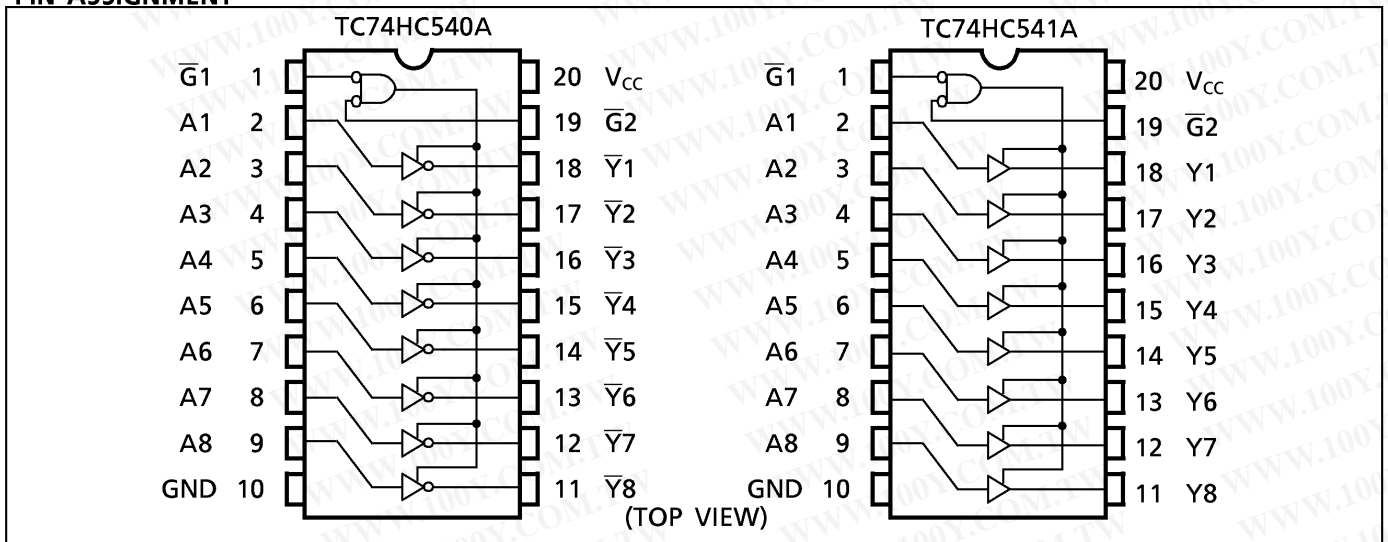


**TRUTH TABLE**

INPUTS			OUTPUTS	
$\bar{G}1$	$\bar{G}2$	An	Yn*	$\bar{Y}n^*$
H	X	X	Z	Z
X	H	X	Z	Z
L	L	H	H	L
L	L	L	L	H

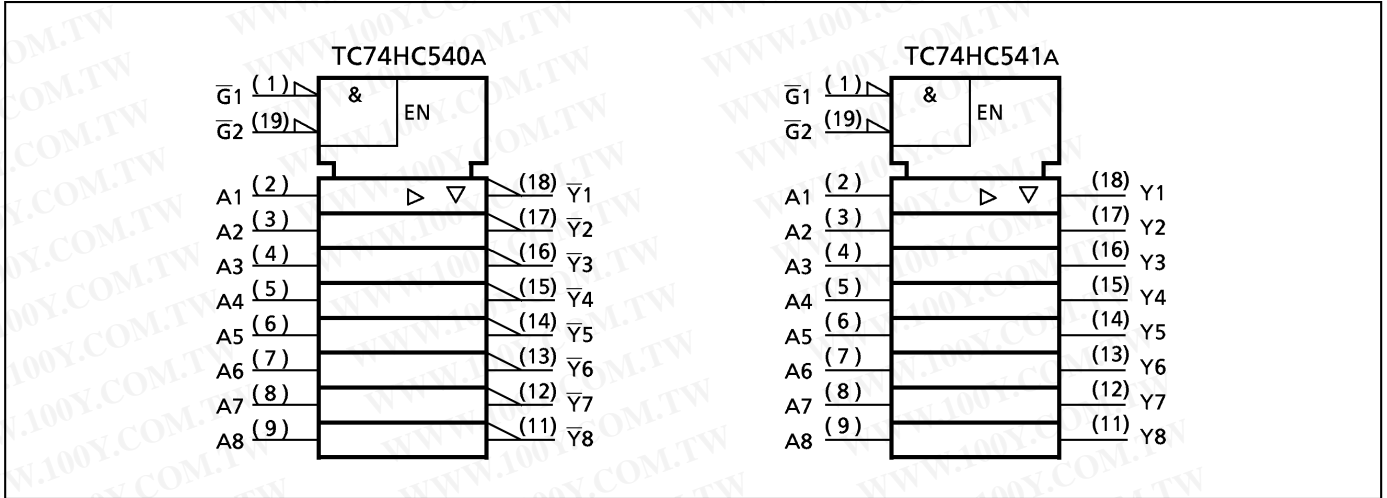
X : Don't Care  
 Z : High Impedance  
 \* : Yn ..... HC541  
       Yn ..... HC540

**PIN ASSIGNMENT**



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**IEC LOGIC SYMBOL**



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**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V <sub>CC</sub>	-0.5~7	V
DC Input Voltage	V <sub>IN</sub>	-0.5~V <sub>CC</sub> +0.5	V
DC Output Voltage	V <sub>OUT</sub>	-0.5~V <sub>CC</sub> +0.5	V
Input Diode Current	I <sub>IK</sub>	±20	mA
Output Diode Current	I <sub>OK</sub>	±20	mA
DC Output Current	I <sub>OUT</sub>	±35	mA
DC V <sub>CC</sub> /Ground Current	I <sub>CC</sub>	±75	mA
Power Dissipation	P <sub>D</sub>	500 (DIP)* / 180 (SOP)	mW
Storage Temperature	T <sub>stg</sub>	-65~150	°C

\*500mW in the range of Ta = -40°C~65°C. From Ta = 65°C to 85°C a derating factor of -10mW/°C shall be applied until 300mW.

**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V <sub>CC</sub>	2~6	V
Input Voltage	V <sub>IN</sub>	0~V <sub>CC</sub>	V
Output Voltage	V <sub>OUT</sub>	0~V <sub>CC</sub>	V
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Input Rise and Fall Time	t <sub>r</sub> , t <sub>f</sub>	0~1000 (V <sub>CC</sub> =2.0V) 0~500 (V <sub>CC</sub> =4.5V) 0~400 (V <sub>CC</sub> =6.0V)	ns

**DC ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	V <sub>IH</sub>		2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low - Level Input Voltage	V <sub>IL</sub>		2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High - Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20μA	2.0	1.9	2.0	—	1.9	V	
				4.5	4.4	4.5	—	4.4		—
				6.0	5.9	6.0	—	5.9		—
			I <sub>OH</sub> = -6 mA	4.5	4.18	4.31	—	4.13	V	
				6.0	5.68	5.80	—	5.63		—
Low - Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			I <sub>OL</sub> = 6 mA	4.5	—	0.17	0.26	—	0.33	V
				6.0	—	0.18	0.26	—	0.33	
3 - State Output Off - State Current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND	6.0	—	—	±0.5	—	±5.0	μA	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0	—	—	±0.1	—	±1.0		
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> 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 <sub>CC</sub> (V)	Ta = 25°C			Ta = -40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	$t_{TLH}$ $t_{THL}$		50	2.0	—	25	60	—	75	ns
				4.5	—	7	12	—	15	
				6.0	—	6	10	—	13	
Propagation Delay Time	$t_{pLH}$ $t_{pHL}$		50	2.0	—	36	90	—	115	ns
				4.5	—	12	18	—	23	
				6.0	—	10	15	—	20	
			150	2.0	—	51	130	—	165	
				4.5	—	17	26	—	33	
				6.0	—	14	22	—	28	
Output Enable Time	$t_{pZL}$ $t_{pZH}$	$R_L = 1\text{k}\Omega$	50	2.0	—	45	125	—	155	ns
				4.5	—	14	25	—	31	
				6.0	—	12	21	—	26	
			150	2.0	—	60	165	—	205	
				4.5	—	19	33	—	41	
				6.0	—	16	28	—	35	
Output Disable time	$t_{pLZ}$ $t_{pHZ}$	$R_L = 1\text{k}\Omega$	50	2.0	—	40	125	—	155	ns
				4.5	—	16	25	—	31	
				6.0	—	14	21	—	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.

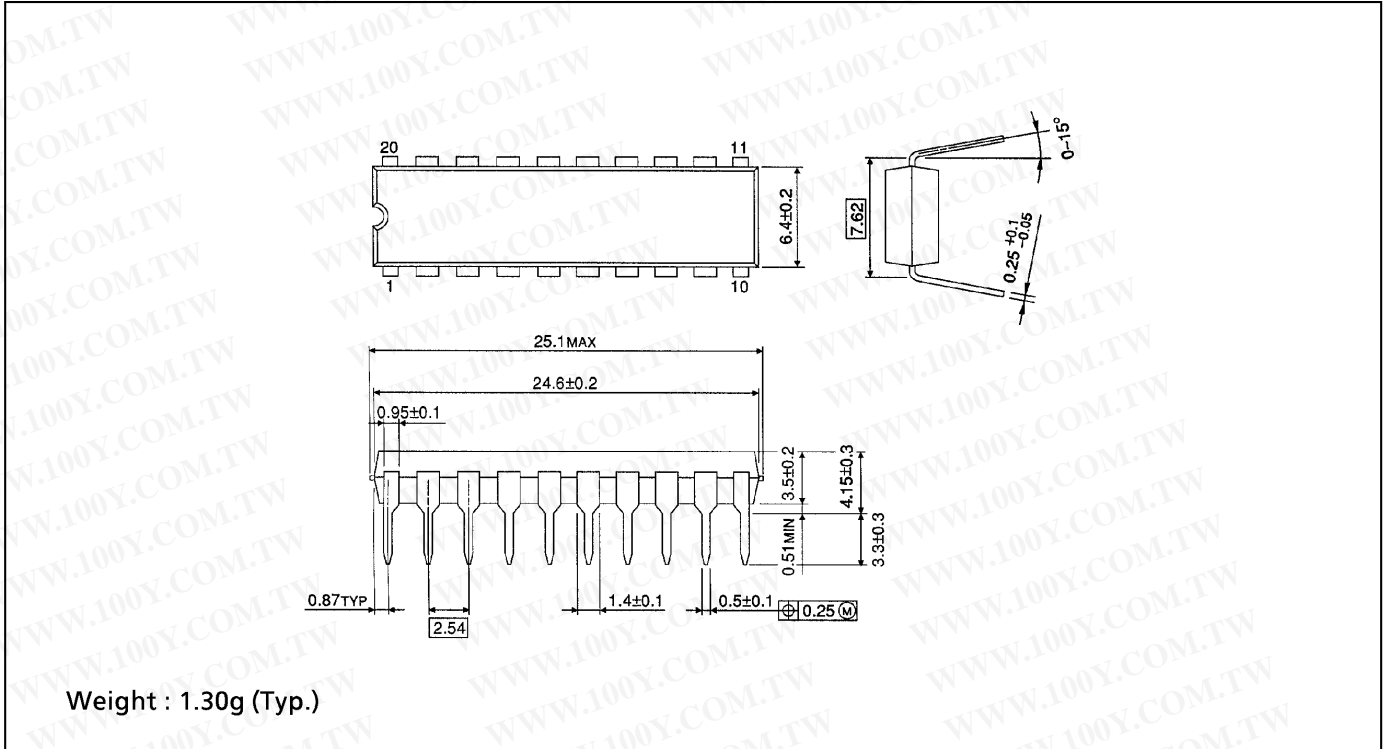
Average operating current can be obtained by the equation :

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

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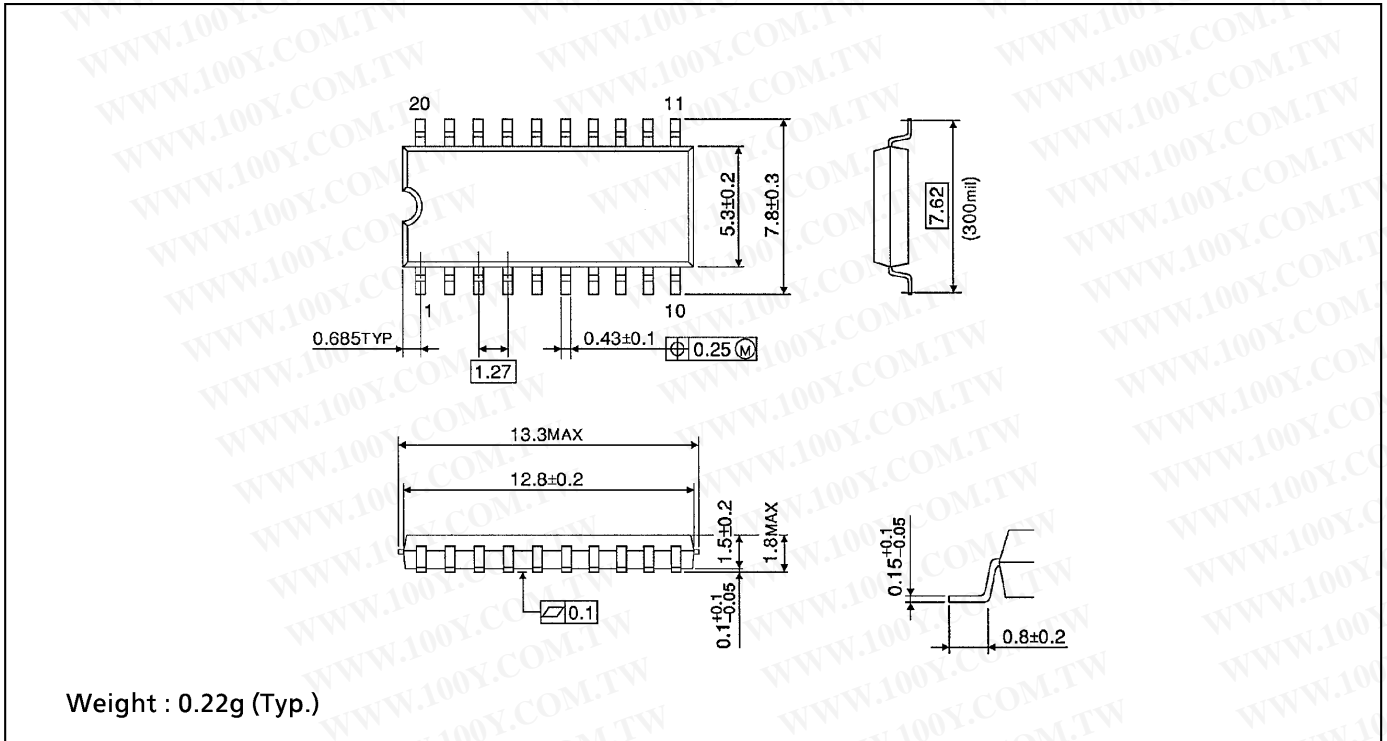
**DIP 20PIN PACKAGE DIMENSIONS (DIP20-P-300-2.54A)**

Unit in mm



**SOP 20PIN (200mil BODY) PACKAGE DIMENSIONS (SOP20-P-300-1.27)**

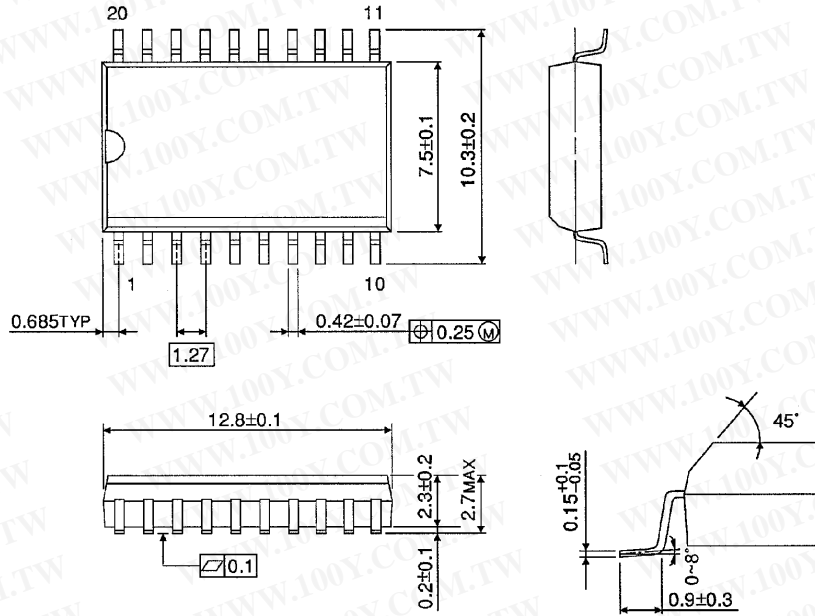
Unit in mm



**SOP 20PIN (300mil BODY) PACKAGE DIMENSIONS (SOL20-P-300-1.27)**

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

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