

# TC74HCT540P/F TC74HCT541P/F

T-52-09

TC74HCT540P/F OCTAL BUS BUFFER WITH INVERTED 3-STATE OUTPUTS  
TC74HCT541P/F OCTAL BUS BUFFER WITH NONINVERTED 3-STATE OUTPUTS

The TC74HCT540 and TC74HCT541 are high speed CMOS OCTAL BUS BUFFER fabricated with silicon gate C<sup>2</sup>MOS technology.  
This device 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 achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.  
The TC74HCT540 is non-inverting type. The TC74HCT541 is inverting type. If either  $\overline{G1}$  or  $\overline{G2}$  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 .....  $t_{pd}=13ns$ (T540) at  $V_{CC}=5V$   
16ns(T541)
- Low Power Dissipation .....  $I_{CC}=4\mu A$ (Max.) at  $T_a=25^\circ C$
- Compatible with TTL outputs .....  $V_{IH}=2V$ (Min.)  
 $V_{IL}=0.8V$ (Max.)
- Output Drive Capability ..... 15 LSTTL Loads
- Symmetrical Output Impedance .....  $|I_{OH}|=I_{OL}=6mA$ (Min.)
- Balanced Propagation Delays .....  $t_{PLH}=t_{PHL}$
- Pin and Function Compatible with 74LS540/541

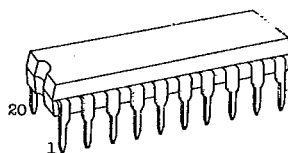
**NOTICE FOR APPLICATION**

It is prohibited to apply a signal to a bus terminal when it is in output mode.  
And when a bus terminal is floating (high impedance state), it is requested to fix the input level by means of external pull down or pull up resistor or BUS TERMINATOR IC (TC40117BP).

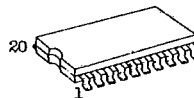
**TRUTH TABLE**

INPUTS			OUTPUTS	
$\overline{G1}$	$\overline{G2}$	$A_n$	$Y_n^*$	$\overline{Y_n}^*$
H	X	X	Z	Z
X	H	X	Z	Z
L	L	H	L	L
L	L	L	L	H

X: Don't Care  
Z: High Impedance  
\*:  $Y_n$  ..... HCT541  
 $\overline{Y_n}$  ..... HCT540

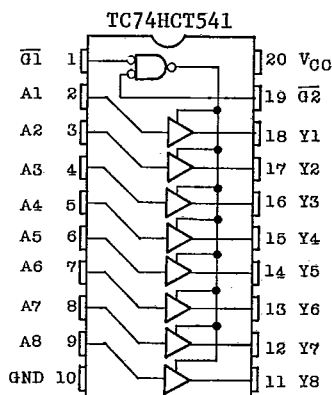
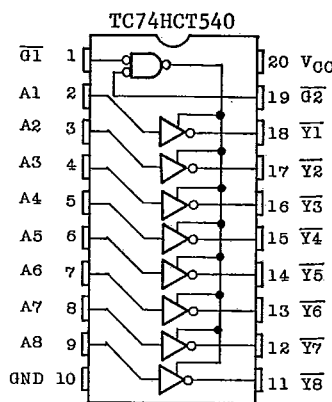


DIP20(3D20A-P)



MFP20(F20GA-P)

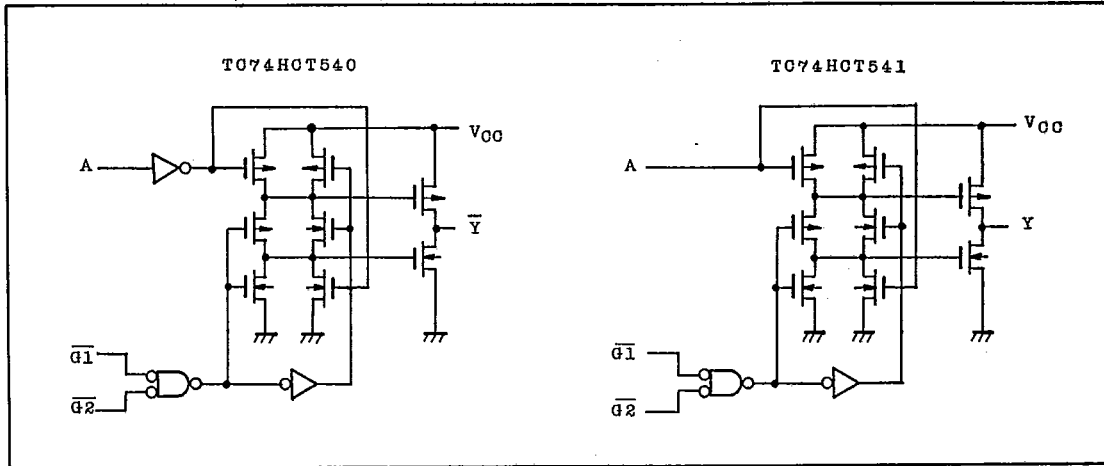
**PIN ASSIGNMENT (TOP VIEW)**



TC74HCT540P/F  
TC74HCT541P/F

T-52-09

CIRCUIT DIAGRAM (Per Circuit)



ABSOLUTE MAXIMUM RATINGS

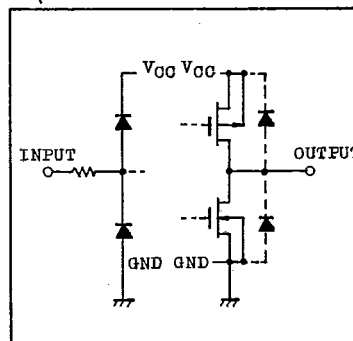
PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V <sub>CC</sub>	-0.5 ~ 7	V
DC Input Voltage	V <sub>IN</sub>	-0.5 ~ V <sub>CC</sub> +0.5	V
DC Output Voltage	V <sub>OUT</sub>	-0.5 ~ V <sub>CC</sub> +0.5	V
Input Diode Current	I <sub>IK</sub>	±20	mA
Output Diode Current	I <sub>OK</sub>	±20	mA
DC Output Current	I <sub>OUT</sub>	±35	mA
DC V <sub>CC</sub> /Ground Current	I <sub>CC</sub>	±70	mA
Power Dissipation	P <sub>D</sub>	500 (DIP)* 180 (MFP)	mW
Storage Temperature	T <sub>stg</sub>	-65 ~ 150	°C
Lead Temperature 10sec	T <sub>L</sub>	300	°C

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

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply Voltage	V <sub>CC</sub>	4.5 ~ 5.5	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 ~ 500	ns

INPUT and OUTPUT EQUIVALENT CIRCUIT



TC74HCT540P/F  
TC74HCT541P/F

F52-09

## DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub>	Ta=25°C			Ta=-40~85°C		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Input Voltage	V <sub>IH</sub>		4.5	2.0	-	-	2.0	-	V	
			5.5							
Low-Level Input Voltage	V <sub>IL</sub>		4.5	-	-	0.8	-	0.8	V	
			5.5							
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	4.5	4.4	4.5	-	4.4	-	V
			I <sub>OH</sub> =-6mA	4.5	4.18	4.31	-	4.13	-	
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	4.5	-	0.0	0.1	-	0.1	V
			I <sub>OL</sub> =6mA	4.5	-	0.17	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	5.5	-	-	±0.5	-	±5.0	μA	
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> =V <sub>CC</sub> or GND	5.5	-	-	±0.1	-	±1.0		
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> =V <sub>CC</sub> or GND	5.5	-	-	4.0	-	40.0		
	I <sub>C</sub>	Per Input: V <sub>IN</sub> =2.4V or 0.5V Other Input: V <sub>CC</sub> or GND	5.5	-	-	2.0	-	2.9	mA	

AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub>=50pF, Input t<sub>r</sub>=t<sub>f</sub>=6ns)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub>	Ta=25°C			Ta=-40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t <sub>TLH</sub>		4.5	-	7	12	-	15	ns
	t <sub>THL</sub>								
Propagation Delay Time	t <sub>pLH</sub>	TC74HCT540	4.5	-	16	26	-	32	
	t <sub>pHL</sub>								
Propagation Delay Time	t <sub>pLH</sub>	TC74HCT541	4.5	-	19	30	-	36	
	t <sub>pHL</sub>								
Output Enable Time	t <sub>pLZ</sub>	R <sub>L</sub> =1kΩ	4.5	-	23	36	-	44	
	t <sub>pZH</sub>								

TC74HCT540P/F  
TC74HCT541P/F

T-52-09

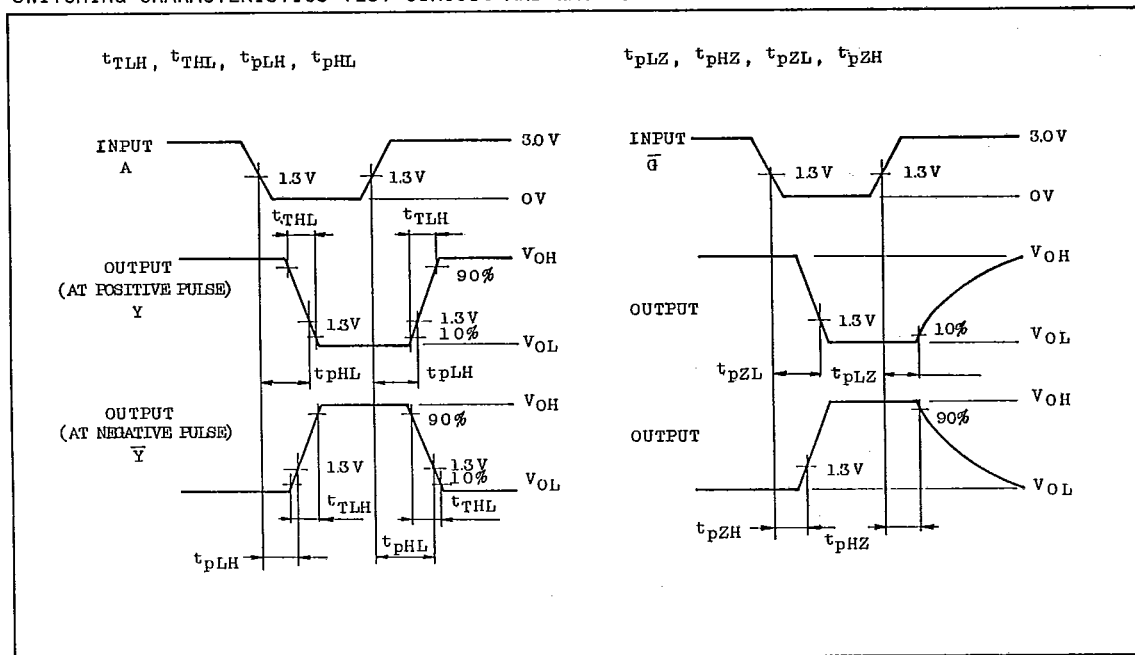
AC ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub>	Ta=25°C			Ta=-40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Disable Time	t <sub>pLZ</sub> t <sub>pHZ</sub>	R <sub>L</sub> =1kΩ	4.5	-	23	33	-	39	ns
Input Capacitance	C <sub>IN</sub>			-	5	10	-	10	pF
Output Capacitance	C <sub>OUT</sub>			-	10	-	-	-	
Power Dissipation Capacitance	C <sub>PD</sub> (1)	TC74HCT540		-	37	-	-	-	
		TC74HCT541		-	39	-	-	-	

Note (1): C<sub>PD</sub> is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit). Average operating current can be obtained by the equation hereunder.

$$I_{CC(Oper.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \quad (\text{per Gate})$$

SWITCHING CHARACTERISTICS TEST CIRCUIT AND WAVEFORM



TC74HCT540P/F  
TC74HCT541P/F

T-52-09

## ICC(0pr.) TEST CIRCUIT

