

HC540 OCTAL BUS BUFFER INVERTING (3-STATE) HC541 OCTAL BUS BUFFER (3-STATE)

- **HIGH SPEED**
 $t_{PD} = 11 \text{ ns (TYP.) at } V_{CC} = 5V$
- **LOW POWER DISSIPATION**
 $I_{CC} = 4 \mu A \text{ (MAX.) at } T_A = 25^\circ C$
- **HIGH NOISE IMMUNITY**
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- **OUTPUT DRIVE CAPABILITY**
 15 LSTTL LOADS
- **SYMMETRICAL OUTPUT IMPEDANCE**
 $|I_{OH}| = |I_{OL}| = 6 \text{ mA (MIN.)}$
- **BALANCED PROPAGATION DELAYS**
 $t_{PLH} = t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE**
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- **PIN AND FUNCTION COMPATIBLE**
 WITH 54/74LS540/541

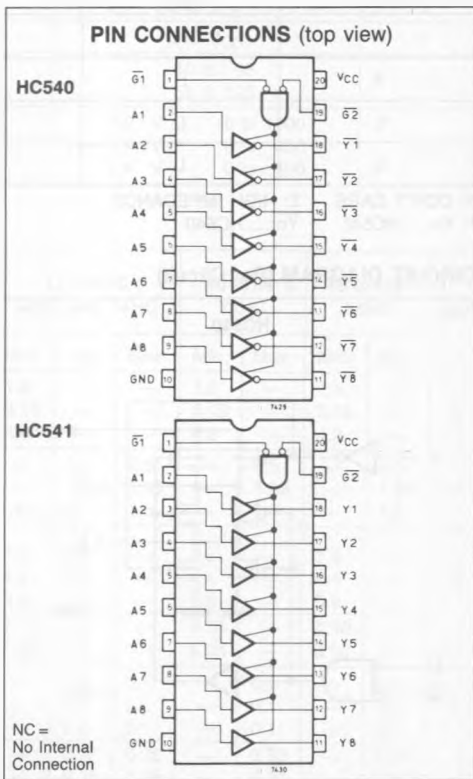
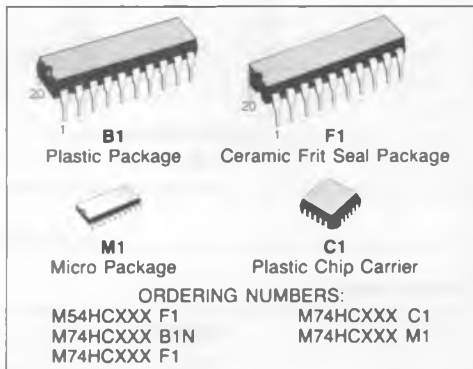
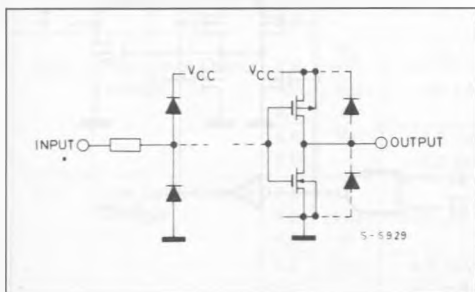
DESCRIPTION

The M54/74HC540/541 are high speed CMOS OCTAL BUS BUFFERS (3-STATE) fabricated in silicon gate C²MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The M54/74HC540 is an inverting buffer and the M54/74HC541 is a non-inverting buffer. The 3-STATE control gate operates as a two-input AND such that if either G1 or G2 are high, all eight outputs are in the high-impedance state.

In order to enhance PC board layout, the 'HC540 and 'HC541 offers a pinout having inputs and outputs on opposite sides of the package.

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

INPUT AND OUTPUT EQUIVALENT CIRCUIT



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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	- 0.5 to 7	V
V_I	DC Input Voltage	- 0.5 to $V_{CC} + 0.5$	V
V_O	DC Output Voltage	- 0.5 to $V_{CC} + 0.5$	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	- 65 to 150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(*) 500 mW: $\cong$ 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°C.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	2 to 6	V
V _I	Input Voltage	0 to V _{CC}	V
V _O	Output Voltage	0 to V _{CC}	V
T _A	Operating Temperature 74HC Series 54HC Series	- 40 to 85 - 55 to 125	°C
t _r , t _f	Input Rise and Fall Time	V _{CC} $\begin{cases} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5 \text{ V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{cases}$	ns

DC SPECIFICATIONS

Symbol	Parameter	V_{CC}	Test Condition	$T_A = 25^\circ\text{C}$ 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	2.0 4.5 6.0		1.5 3.15 4.2	— — —	— — —	1.5 3.15 4.2	— — —	1.5 3.15 4.2	— — —	V
V_{IL}	Low Level Input Voltage	2.0 4.5 6.0		— — —	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	V
V_{OH}	High Level Output Voltage	2.0	V_I	I_O	1.9	2.0	—	1.9	—	1.9	V
		4.5	V_{IH}	- 20 μA	4.4	4.5	—	4.4	—	4.4	
		6.0	V_{IH} or V_{IL}	—	5.9	6.0	—	5.9	—	5.9	
V_{OL}	Low Level Output Voltage	4.5	V_{IH}	- 4.0 mA	4.18	4.31	—	4.13	—	4.10	V
		6.0	V_{IL}	- 5.2 mA	5.68	5.8	—	5.63	—	5.60	
		6.0	V_{IL}	—	—	—	—	—	—	—	
V_{OL}	Low Level Output Voltage	2.0	V_{IH}	20 μA	—	0.0	0.1	—	0.1	—	V
		4.5	V_{IH} or V_{IL}	—	—	0.0	0.1	—	0.1	—	
		6.0	V_{IL}	—	—	0.0	0.1	—	0.1	—	
V_{OL}	Low Level Output Voltage	4.5	V_{IH}	4.0 mA	—	0.17	0.26	—	0.33	—	V
		6.0	V_{IL}	5.2 mA	—	0.18	0.26	—	0.33	—	
		6.0	V_{IL}	—	—	—	—	—	—	—	

DC SPECIFICATIONS (Continued)

Symbol	Parameter	V _{CC}	Test Condition	T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND	—	—	± 0.1	—	± 1.0	—	± 1.0	μA
I _{OZ}	3-State Output Off-State Current	6.0	V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND	—	—	± 0.5	—	± 5.0	—	± 10	μA
I _{CC}	Quiescent Supply Current	6.0	V _I = V _{CC} or GND	—	—	4	—	40	—	80	μA

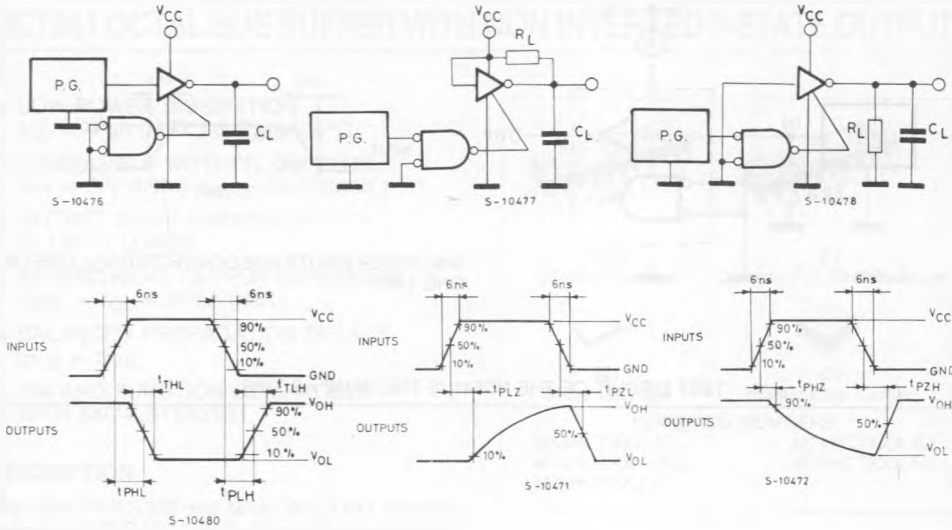
AC ELECTRICAL CHARACTERISTICS (C_L = 50pF, Input t_r = t_f = 6ns)

Symbol	Parameter	V _{CC}	Test Condition	T _A = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t _{TLH} t _{THL}	Output Transition Time	2.0 4.5 6.0		— — —	25 7 6	60 12 10	— — —	75 15 13		90 18 15	ns
t _{PLH} t _{PHL}	Propagation Delay Time	2.0 4.5 6.0	HC540	— — —	52 13 11	105 21 18	— — —	130 26 22		160 32 27	ns
t _{PLH} t _{PHL}	Propagation Delay Time	2.0 4.5 6.0	HC541		56 14 12	15 23 20	— — —	145 29 25	— — —	135 35 30	ns
t _{PLZ} t _{PHZ}	3-State Output Enable	2.0 4.5 6.0	R _L = 1KΩ	— — —	72 18 15	145 29 25	— — —	180 36 31	— — —	220 44 38	ns
t _{PLZ} t _{PHZ}	3-State Output Disable Time	2.0 4.5 6.0	R _L = 1KΩ	— — —	88 22 19	160 32 27	— — —	200 40 34	— — —	240 48 41	ns
C _{IN}	Input Capacitance			—	5	10	—	10		10	pF
C _{OUT}	Output Capacitance			—	10	—	—	—	—	—	pF
C _{PD} (1)	Power Dissipation Capacitance		HC540	—	33	—	—	—	—	—	pF
			HC541	—	36	—	—	—	—	—	

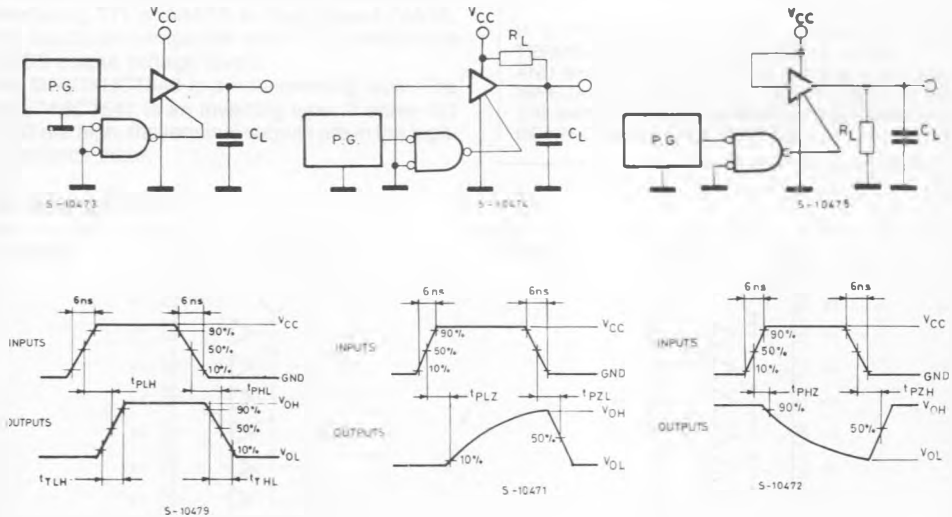
Note (1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the following equation.
I_{CC(OPR)} = C_{PD} · V_{CC} · f_{IN} + I_{CC}/8 (per Gate).

SWITCHING CHARACTERISTICS TEST CIRCUIT AND WAVEFORM

HC540

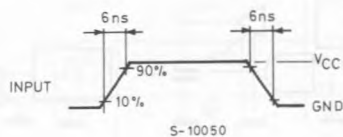
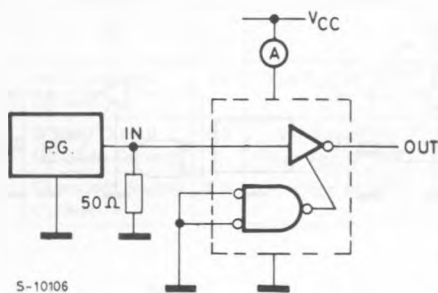


HC541



TEST CIRCUIT I_{CC} (Opr.)

HC540



THE OTHER INPUTS ARE CONNECTED V_{CC} LINE OR GND LINE.

TEST CIRCUIT OF THE HC541 IS THE SAME AS THIS