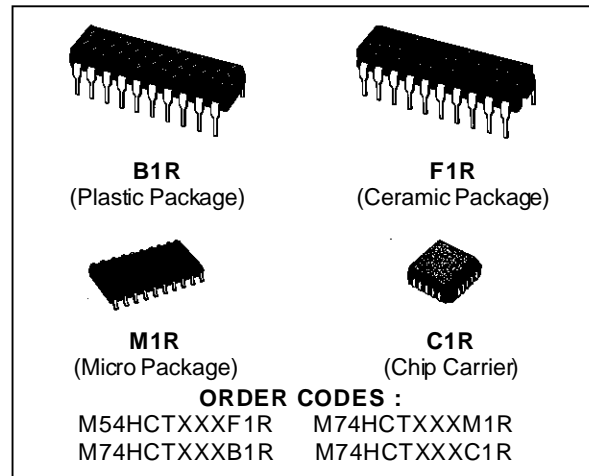


**OCTAL BUS BUFFER WITH 3 STATE OUTPUTS**  
**HCT540: INVERTED - HCT541 NON INVERTED**

- HIGH SPEED  
 $t_{PD} = 10 \text{ ns (TYP.) at } V_{CC} = 5V$
- LOW POWER DISSIPATION  
 $I_{CC} = 4 \mu A \text{ (MAX.) at } T_A = 25 \text{ }^\circ C$
- COMPATIBLE WITH TTL OUTPUTS  
 $V_{IH} = 2V \text{ (MIN.) } V_{IL} = 0.8V \text{ (MAX.)}$
- OUTPUT DRIVE CAPABILITY  
 15 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE  
 $|I_{OH}| = I_{OL} = 6 \text{ mA (MIN)}$
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- PIN AND FUNCTION COMPATIBLE  
 WITH 54/74LS540/541



**DESCRIPTION**

The M54/74HCT540 and HCT541 are high speed CMOS OCTAL BUS BUFFERS (3-STATE) fabricated in silicon gate C<sup>2</sup>MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The HCT540 is an inverting buffer and HCT541 is a non inverting buffer.

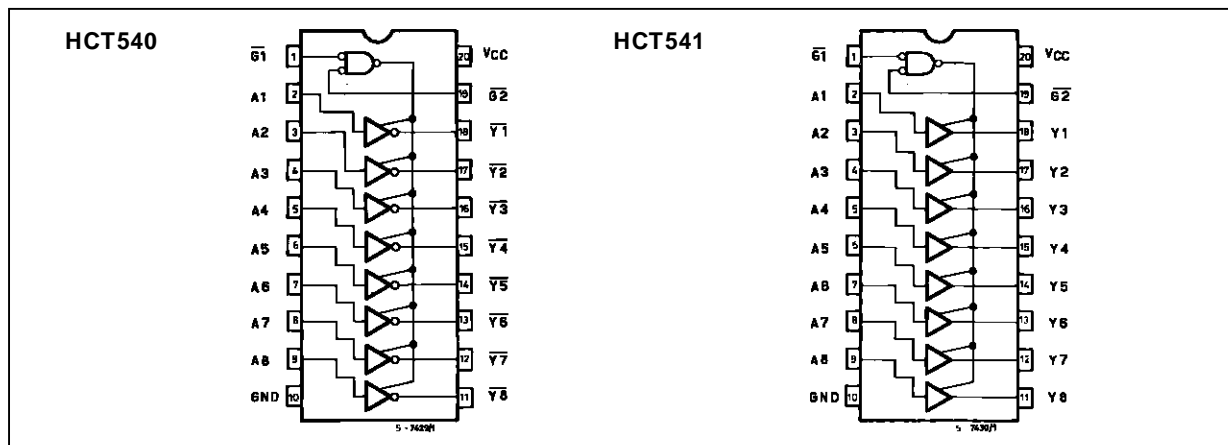
The 3 STATE control gate operates as a two input AND such that if either  $\overline{G1}$  and  $\overline{G2}$  are high, all eight outputs are in the high impedance state. In order to enhance PC board layout, the HCT540 and HCT541 offers a pinout having inputs and outputs on opposite sides of the package. All inputs are equipped with protection circuits against static

discharge and transient excess voltage.

This integrated circuit has input and output characteristics that are fully compatible with 54/74 LSTTL logic families. M54/74HCT devices are designed to directly interface HSC<sup>2</sup>MOS systems with TTL and NMOS components. They are also plug in replacements for LSTTL devices giving a reduction of power consumption.

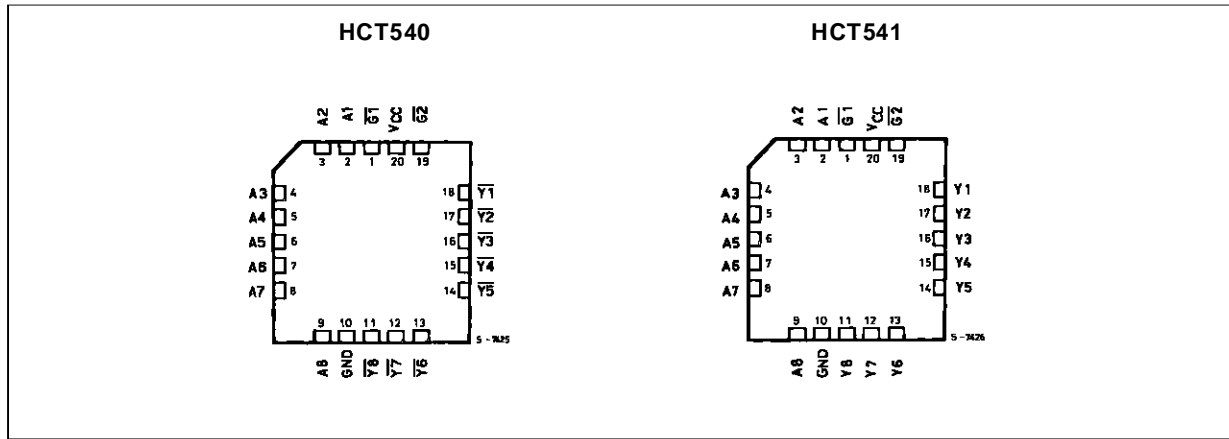
IT IS PROHIBITED TO APPLY A SIGNAL TO BUS TERMINAL WHEN IT IS IN OUTPUT MODE. WHEN A BUS TERMINAL IS FLOATING (HIGH IMPEDANCE STATE) IT IS REQUESTED TO FIX THE INPUT LEVEL BY MEANS OF EXTERNAL PULL DOWN OR PULL UP RESISTOR.

**PIN CONNECTION (top view)**

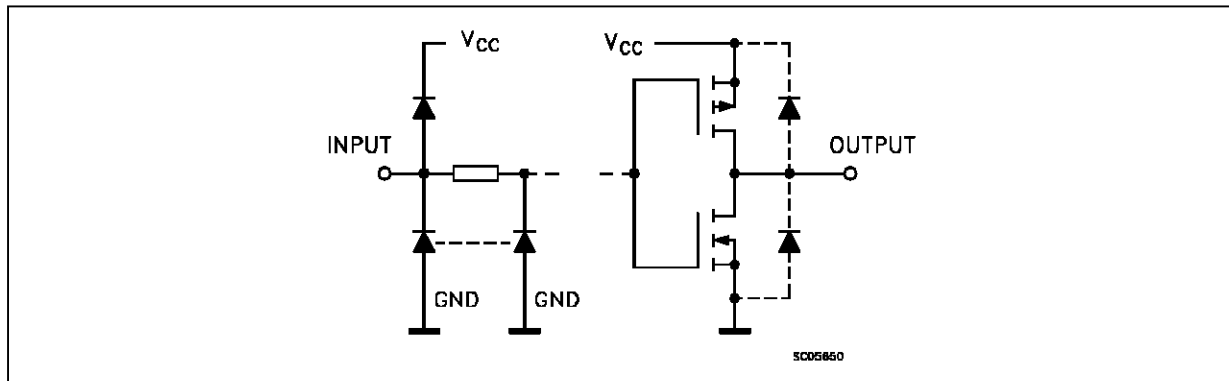


# M54/M74HCT540/541

## CHIP CARRIER



## INPUT AND OUTPUT EQUIVALENT CIRCUIT



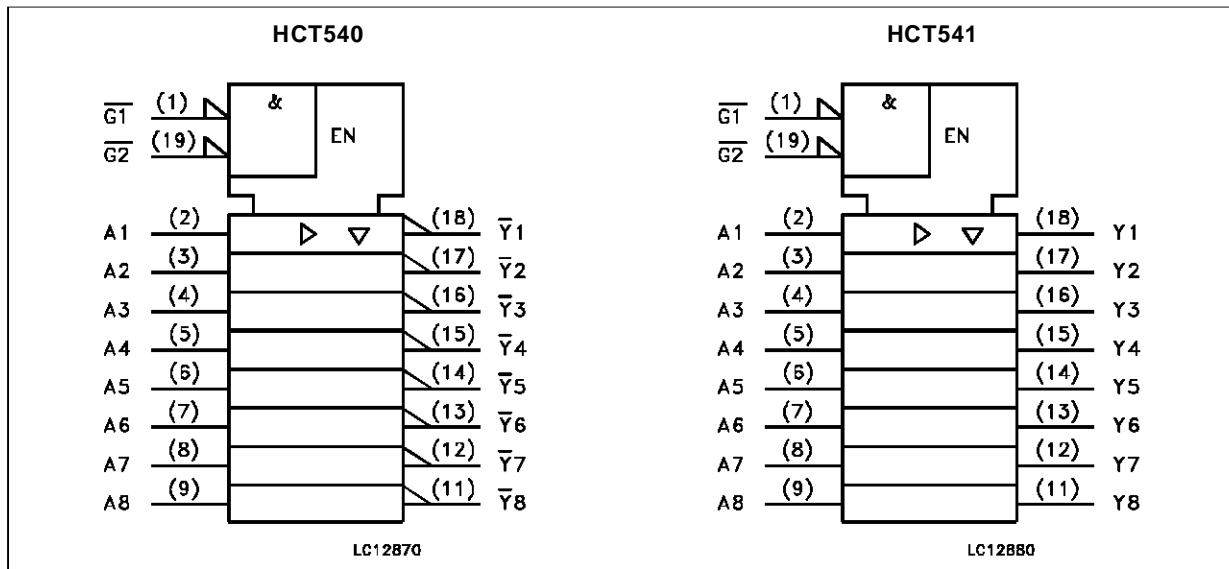
### PIN DESCRIPTION (HCT540)

PIN No	SYMBOL	NAME AND FUNCTION
1, 19	$\overline{G1}, \overline{G2}$	Output Enable Inputs
2, 3, 4, 5, 6, 7, 8, 9	A1 to A8	Data Inputs
18, 17, 16, 15, 14, 13, 11, 12	$\overline{Y1}$ to $\overline{Y8}$	Bus Outputs
10	GND	Ground (0V)
20	V <sub>cc</sub>	Positive Supply Voltage

### PIN DESCRIPTION (HCT541)

PIN No	SYMBOL	NAME AND FUNCTION
1, 19	$\overline{G1}, \overline{G2}$	Output Enable Inputs
2, 3, 4, 5, 6, 7, 8, 9	A1 to A8	Data Inputs
18, 17, 16, 15, 14, 13, 11, 12	Y1 to Y8	Bus Outputs
10	GND	Ground (0V)
20	V <sub>cc</sub>	Positive Supply Voltage

IEC LOGIC SYMBOLS

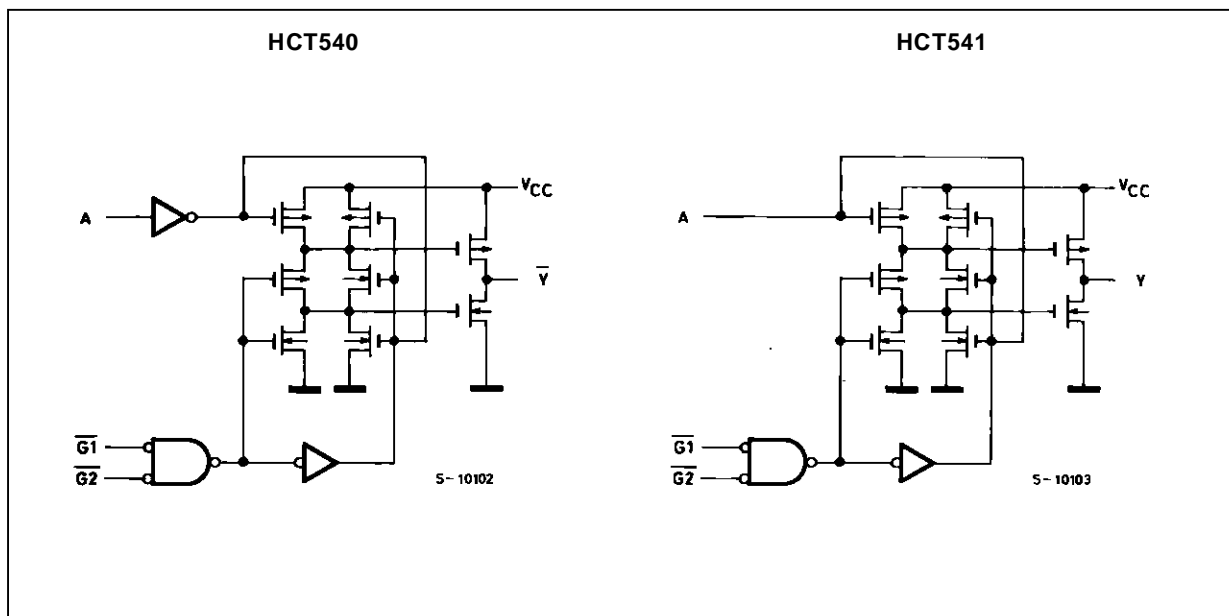


TRUTH TABLE

INPUT			OUTPUT	
$\overline{G1}$	$\overline{G2}$	$A_n$	$\overline{Y_n}$ (HCT540)	$Y_n$ (HCT541)
H	X	X	Z	Z
X	H	X	Z	Z
L	L	H	L	H
L	L	L	H	L

X: "H" or "L"  
Z: High impedance

CIRCUIT SCHEMATIC (Per Circuit)



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Source Sink Current Per Output Pin	± 35	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 70	mA
P <sub>D</sub>	Power Dissipation	500 (*)	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

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

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

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	4.5 to 5.5	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature: <b>M54HC Series</b> <b>M74HC Series</b>	-55 to +125 -40 to +85	°C °C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (V <sub>CC</sub> = 4.5 to 5.5V)	0 to 500	ns

## DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value						Unit		
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
V <sub>IH</sub>	High Level Input Voltage	4.5 to 5.5		2.0			2.0		2.0		V	
V <sub>IL</sub>	Low Level Input Voltage	4.5 to 5.5				0.8		0.8		0.8	V	
V <sub>OH</sub>	High Level Output Voltage	4.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -20 μA	4.4	4.5		4.4		4.4	V	
				I <sub>O</sub> = -6.0 mA	4.18	4.31		4.13		4.10		
V <sub>OL</sub>	Low Level Output Voltage	4.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 20 μA		0.0	0.1		0.1		0.1	V
				I <sub>O</sub> = 6.0 mA		0.17	0.26		0.33		0.4	
I <sub>I</sub>	Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	μA	
I <sub>OZ</sub>	3 State Output Off State Current	5.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND			±0.5		±5		±10	μA	
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	μA	
ΔI <sub>CC</sub>	Additional worst case supply current	5.5	Per Input pin V <sub>I</sub> = 0.5V or V <sub>I</sub> = 2.4V Other Inputs at V <sub>CC</sub> or GND			2.0		2.9		3.0	mA	

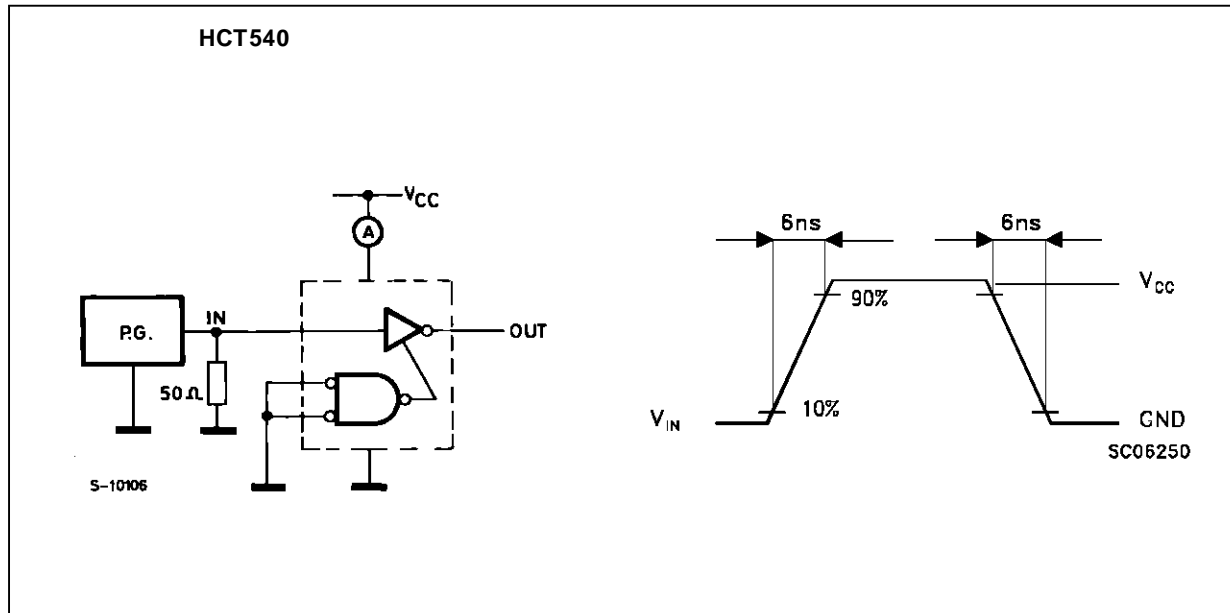
# M54/M74HCT540/541

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

Symbol	Parameter	Test Conditions			Value						Unit	
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	4.5	50			6	12		15		18	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (for HCT540)	4.5	50			12	20		25		30	ns
		4.5	150			16	25		31		38	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (for HCT541)	4.5	50			14	23		29		35	ns
		4.5	150			18	28		35		42	ns
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time	4.5	50	R <sub>L</sub> = 1KΩ		18	30		38		45	ns
		4.5	150	R <sub>L</sub> = 1KΩ		22	34		43		51	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time	4.5	50	R <sub>L</sub> = 1KΩ		19	27		34		41	ns
C <sub>IN</sub>	Input Capacitance					5	10		10		10	pF
C <sub>PD</sub> (*)	Power Dissipation Capacitance					34						pF

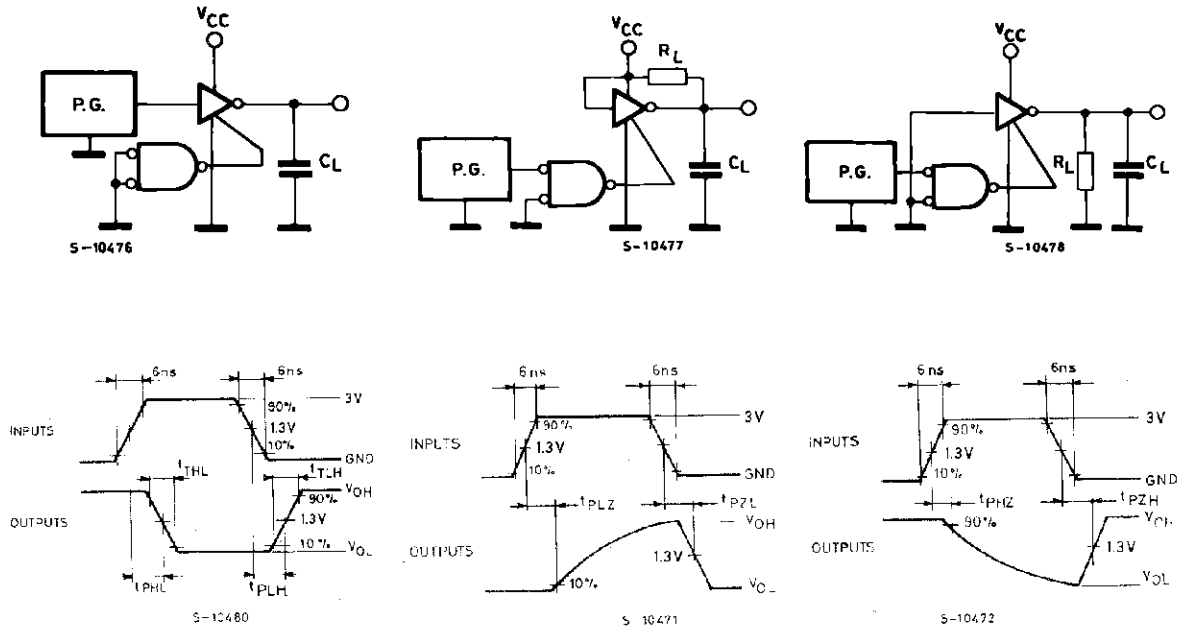
(\*) C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I<sub>CC(opr)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>IN</sub> + I<sub>CC</sub>/8 (per gate)

## TEST CIRCUIT I<sub>CC</sub> (Opr.)

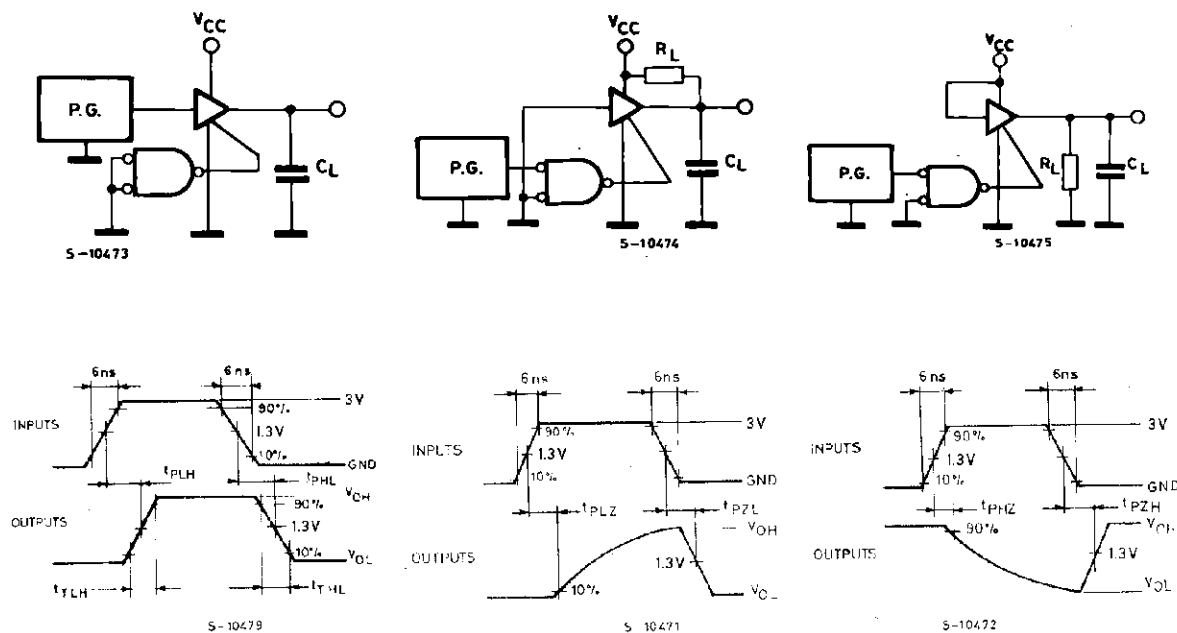


SWITCHING CHARACTERISTICS TEST CIRCUIT

HCT540

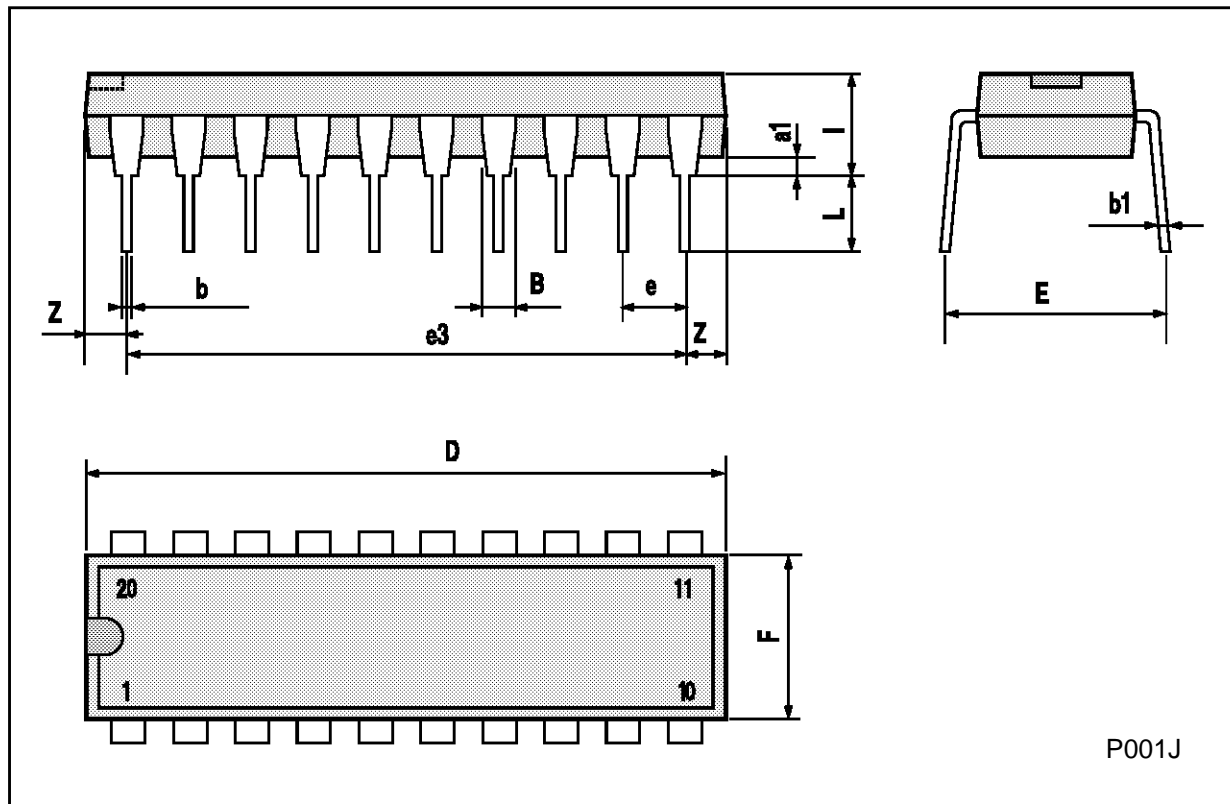


HCT541



**Plastic DIP20 (0.25) MECHANICAL DATA**

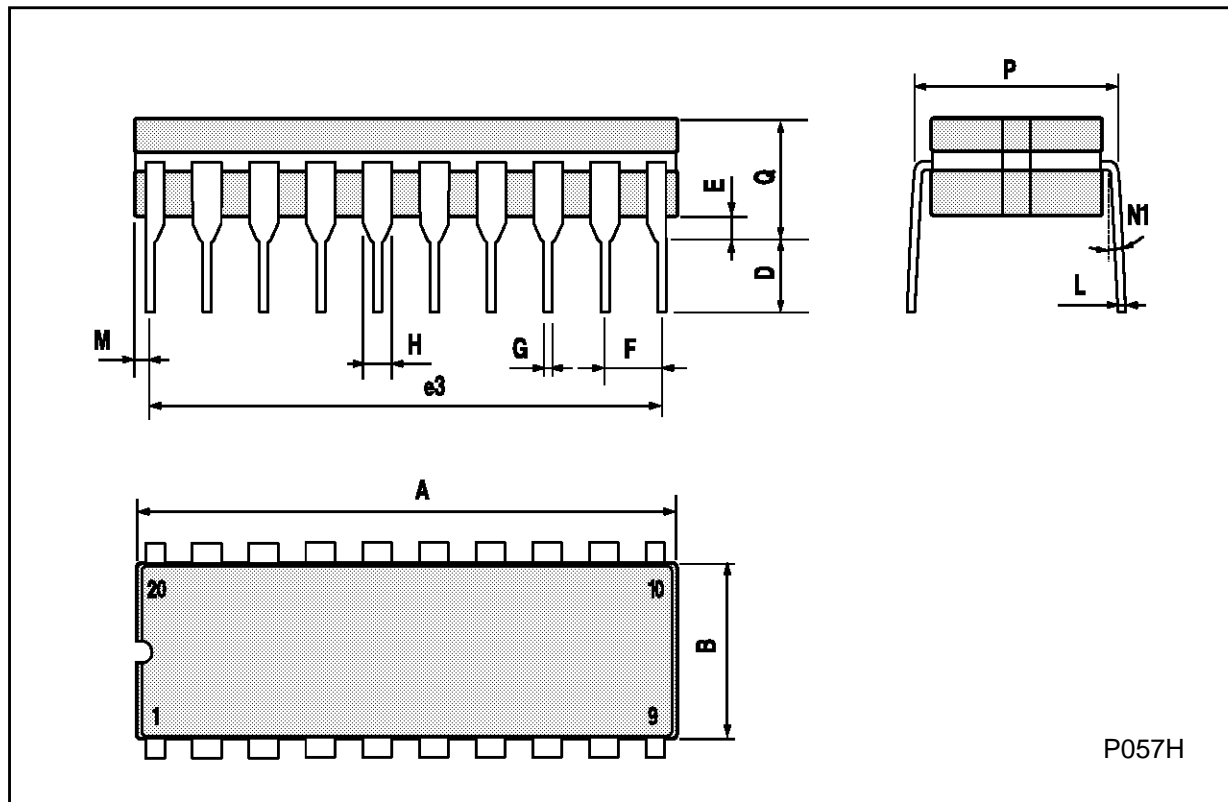
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053





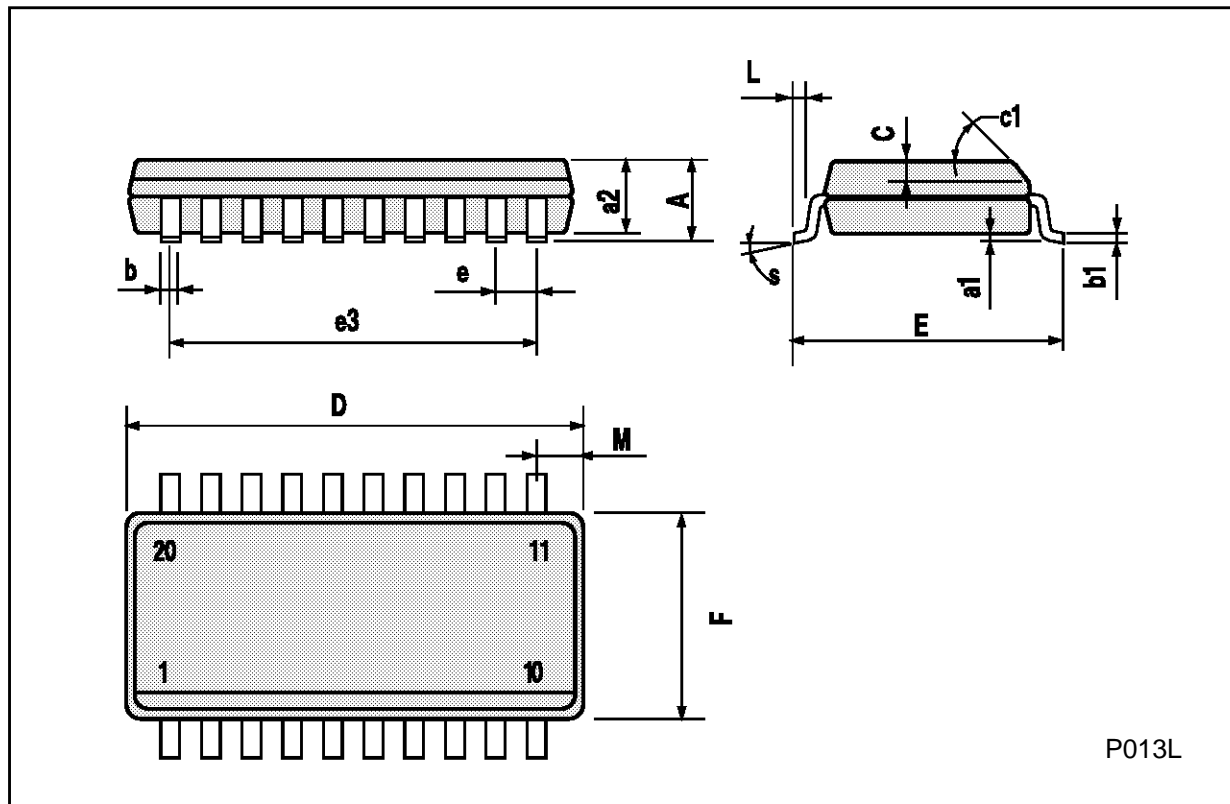
## Ceramic DIP20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			25			0.984
B			7.8			0.307
D		3.3			0.130	
E	0.5		1.78	0.020		0.070
e3		22.86			0.900	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
I	1.27		1.52	0.050		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N1	4° (min.), 15° (max.)					
P	7.9		8.13	0.311		0.320
Q			5.71			0.225



**SO20 MECHANICAL DATA**

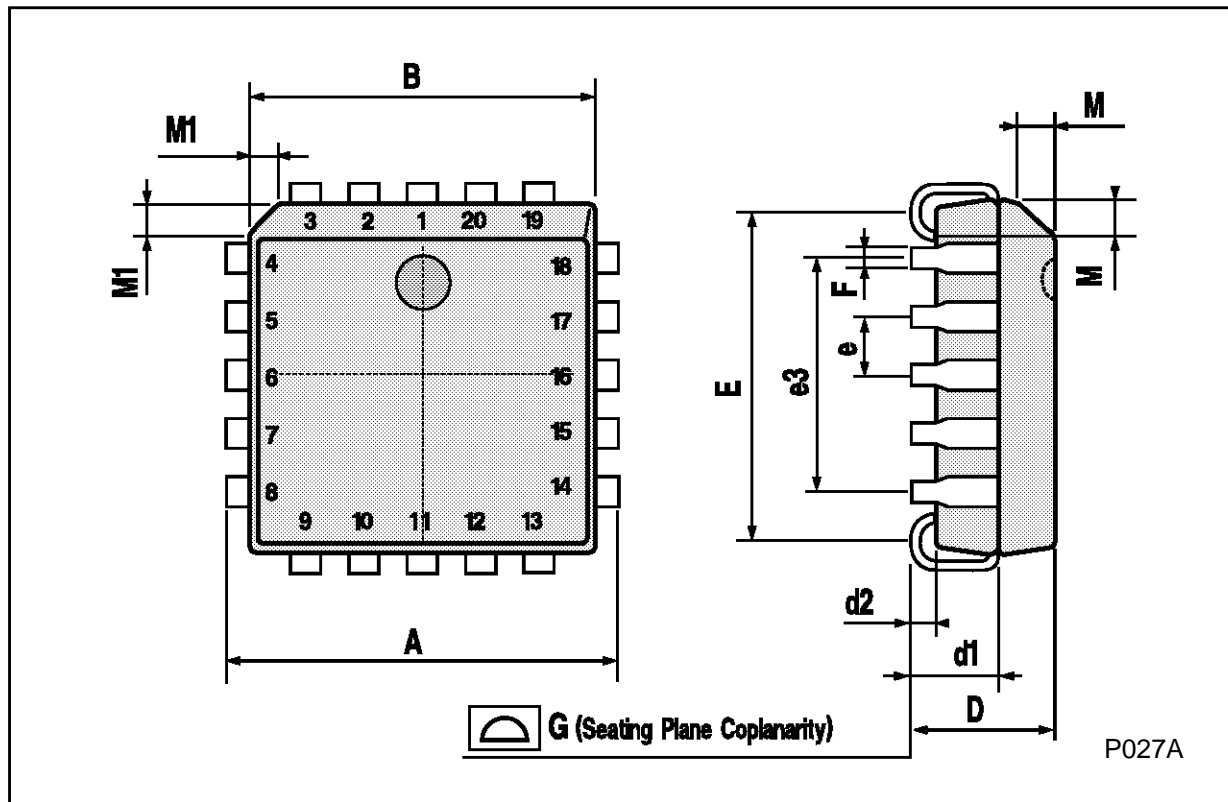
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
S	8° (max.)					



P013L

## PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	



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