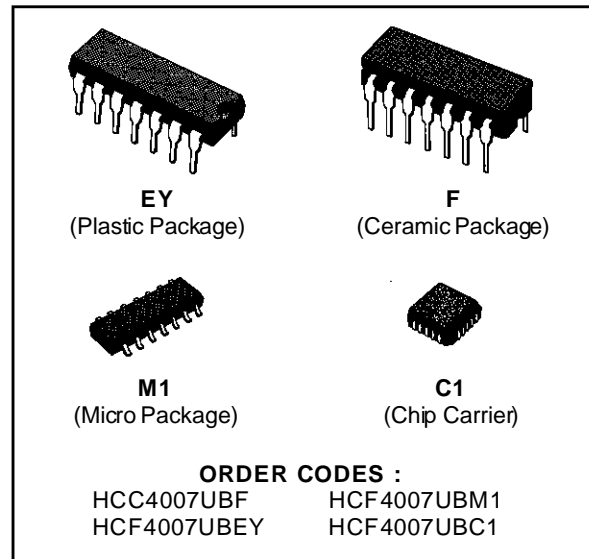


**DUAL COMPLEMENTARY PAIR PLUS INVERTER**

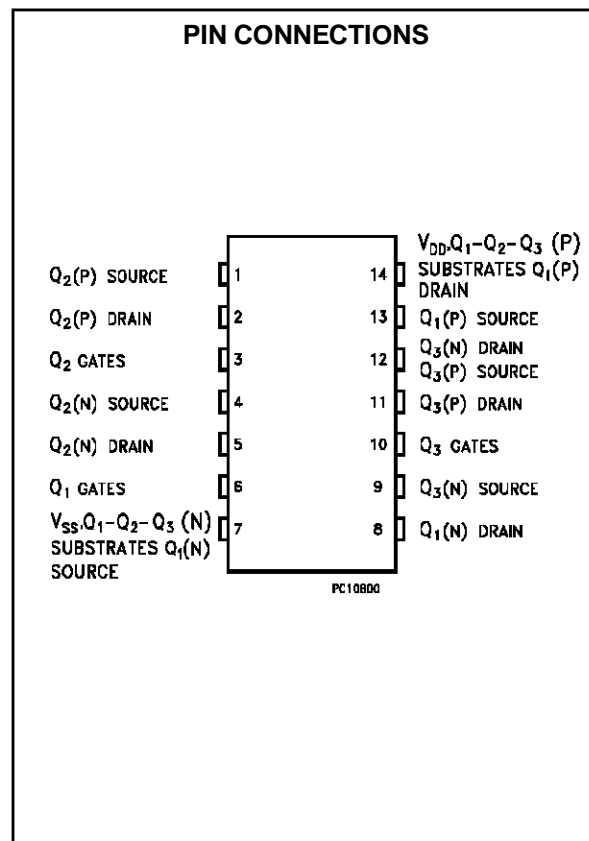
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- MEDIUM SPEED OPERATION  $t_{pHL}$ ,  $t_{pLH} = 30\text{ns}$  (typ.) AT 10V
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



**DESCRIPTION**

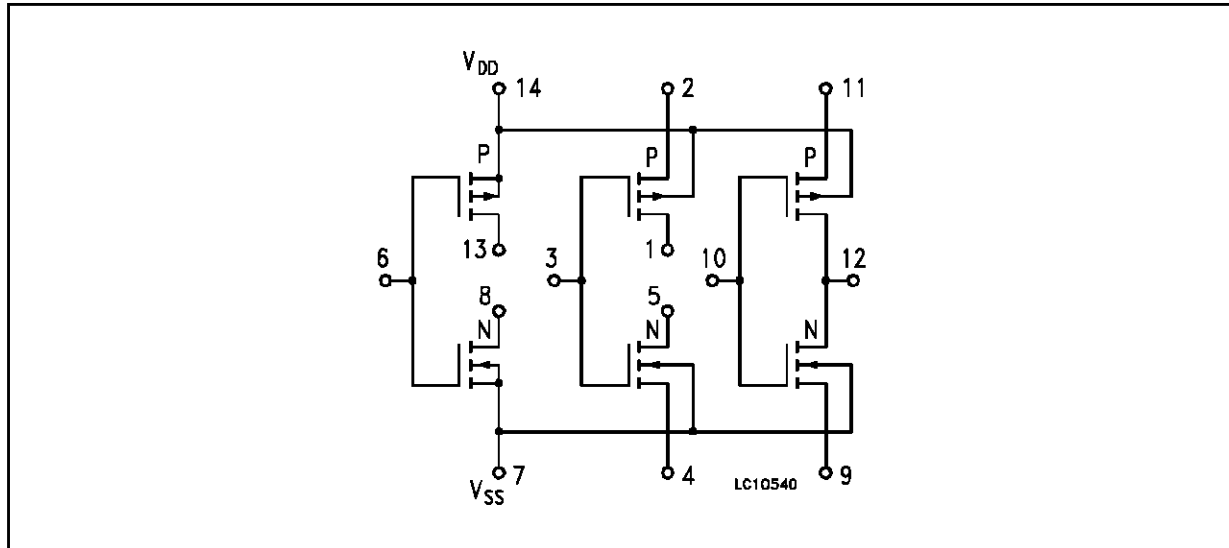
The HCC4007UB is a monolithic integrated circuit, available in 14-lead dual in-line plastic or ceramic package and plastic micropackage.

The HCC4007UB type is comprised of three n-channel and three p-channel enhancement type MOS transistors. The transistor elements are accessible through the package terminals to provide a convenient means for constructing the various typical circuits as shown in typical applications. More complex functions are possible using multiple packages. Numbers shown in parentheses indicate terminals that are connected together to form the various configurations listed.



# HCC/HCF4007UB

## FUNCTIONAL DIAGRAM



## ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage: <b>HCC</b> Types <b>HCF</b> Types	-0.5 to +20	V
		-0.5 to +18	V
$V_i$	Input Voltage	-0.5 to $V_{DD} + 0.5$	V
$I_i$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package) Dissipation per Output Transistor for $T_{op}$ = Full Package Temperature Range	200	mW
		100	mW
$T_{op}$	Operating Temperature: <b>HCC</b> Types <b>HCF</b> Types	-55 to +125	$^{\circ}\text{C}$
		-40 to +85	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}\text{C}$

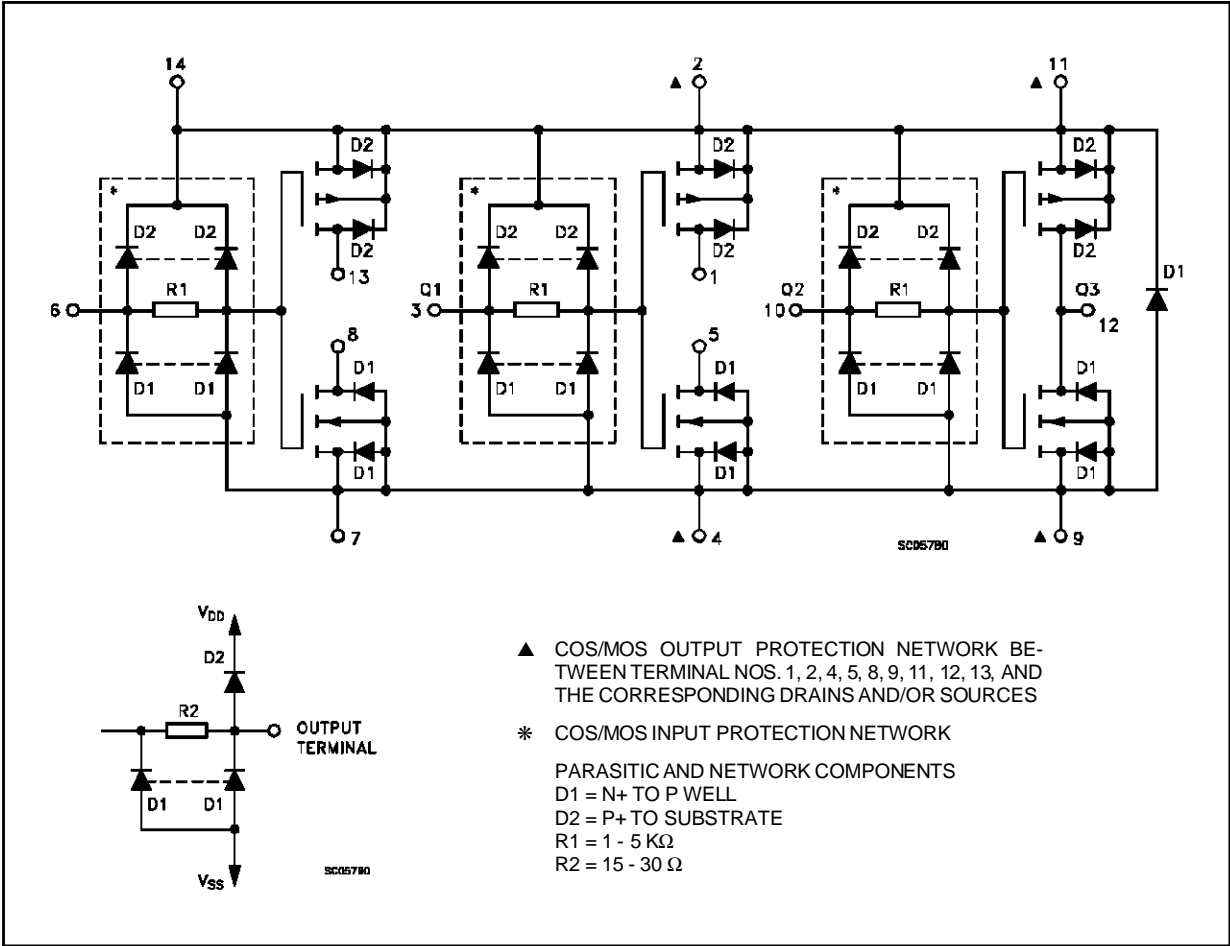
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

\* All voltage values are referred to  $V_{SS}$  pin voltage.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage: <b>HCC</b> Types <b>HCF</b> Types	3 to 18	V
		3 to 15	V
$V_i$	Input Voltage	0 to $V_{DD}$	V
$T_{op}$	Operating Temperature: <b>HCC</b> Types <b>HCF</b> Types	-55 to +125	$^{\circ}\text{C}$
		-40 to +85	$^{\circ}\text{C}$

**SCHEMATIC DIAGRAM** (showing input, output and parasitic diodes)



# HCC/HCF4007UB

## STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		Test Conditions				Value						Unit	
			V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   ( $\mu$ A)	V <sub>DD</sub> (V)	T <sub>LOW</sub> *		25 °C			T <sub>HIGH</sub> *		
							Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I <sub>L</sub>	Quiescent Current	HCC Types	0/5			5		0.25		0.01	0.25		7.5	$\mu$ A
			0/10			10		0.5		0.01	0.5		15	
			0/15			15		1		0.01	1		30	
		0/20			20		5		0.02	5		150		
		HCF Types	0/5			5		1		0.01	1		7.5	
			0/10			10		2		0.01	2		15	
0/15				15		4		0.01	4		30			
V <sub>OH</sub>	Output High Voltage	0/5		< 1	5	4.95		4.95			4.95		V	
		0/10		< 1	10	9.95		9.95			9.95			
		0/15		< 1	15	14.95		14.95			14.95			
V <sub>OL</sub>	Output Low Voltage	5/0		< 1	5		0.05			0.05		0.05	V	
		10/0		< 1	10		0.05			0.05		0.05		
		15/0		< 1	15		0.05			0.05		0.05		
V <sub>IH</sub>	Input High Voltage	0.5/4.5	< 1	5	4		4				4		V	
		1/9	< 1	10	8		8				8			
		1.5/13.5	< 1	15	12.5		12.5				12.5			
V <sub>IL</sub>	Input Low Voltage	4.5/0.5	< 1	5		1				1		1	V	
		9/1	< 1	10		2				2		2		
		13.5/1.5	< 1	15		2.5				2.5		2.5		
I <sub>OH</sub>	Output Drive Current	HCC Types	0/5	2.5		5	-2		-1.6	-3.2		-1.15	mA	
			0/5	4.6		5	-0.64		-0.51	-1		-0.36		
			0/10	9.5		10	-1.6		-1.3	-2.6		-0.9		
			0/15	13.5		15	-4.2		-3.4	-6.8		-2.4		
		HCF Types	0/5	2.5		5	-1.53		-1.36	-3.2		-1.1		
			0/5	4.6		5	-0.52		-0.44	-1		-0.36		
			0/10	9.5		10	-1.3		-1.1	-2.6		-0.9		
			0/15	13.5		15	-3.6		-3.0	-6.8		-2.4		
I <sub>OL</sub>	Output Sink Current	HCC Types	0/5	0.4		5	0.64		0.51	1		0.36	mA	
			0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
		HCF Types	0/5	0.4		5	0.52		0.44	1		0.36		
			0/10	0.5		10	1.3		1.1	2.6		0.9		
			0/15	1.5		15	3.6		3.0	6.8		2.4		
I <sub>IH</sub> , I <sub>IL</sub>	Input Leakage Current	HCC Types	0/18	Any Input	18		$\pm$ 0.1		$\pm$ 10 <sup>-5</sup>	$\pm$ 0.1		$\pm$ 1	$\mu$ A	
		HCF Types	0/15		15		$\pm$ 0.3		$\pm$ 10 <sup>-5</sup>	$\pm$ 0.3		$\pm$ 1		
C <sub>I</sub>	Input Capacitance			Any Input					5	7.5			pF	

\* T<sub>LOW</sub> = -55 °C for HCC device; -40 °C for HCF device.

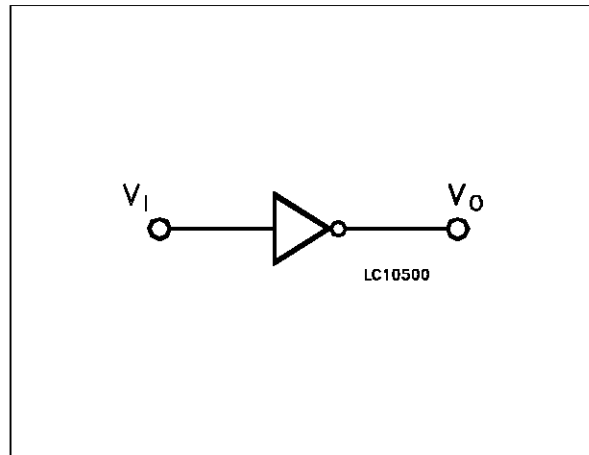
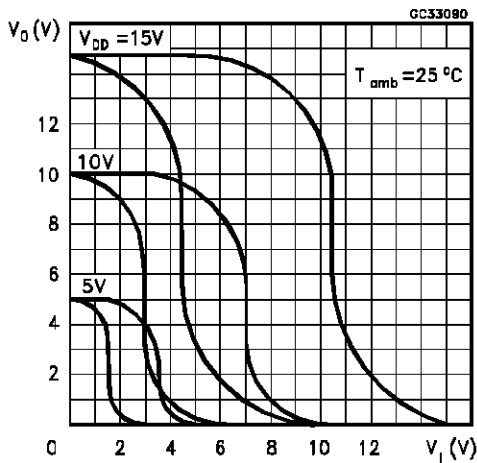
\* T<sub>HIGH</sub> = +125 °C for HCC device; +85 °C for HCF device.

The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub> = 5V, 2V min. with V<sub>DD</sub> = 10V, 2.5V min. with V<sub>DD</sub> = 15V

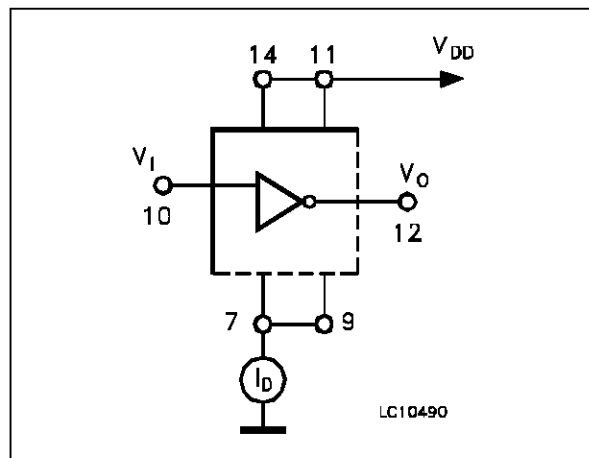
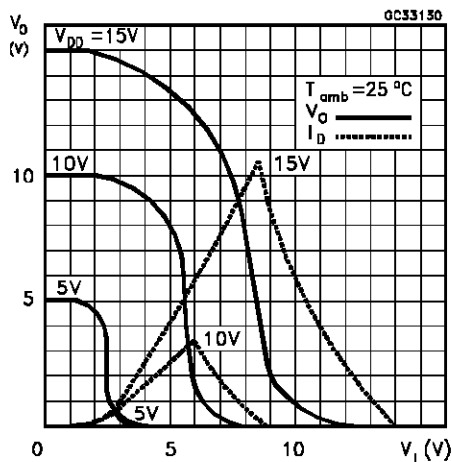
**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ K}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $03\text{ } \%/^{\circ}\text{C}$ , all input rise and fall times =  $20\text{ ns}$ )

Symbol	Parameter	Test Conditions		Value			Unit
			$V_{DD}$ (V)	Min.	Typ.	Max.	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time		5		55	110	ns
			10		30	60	
			15		25	50	
$t_{TLH}$ $t_{THL}$	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

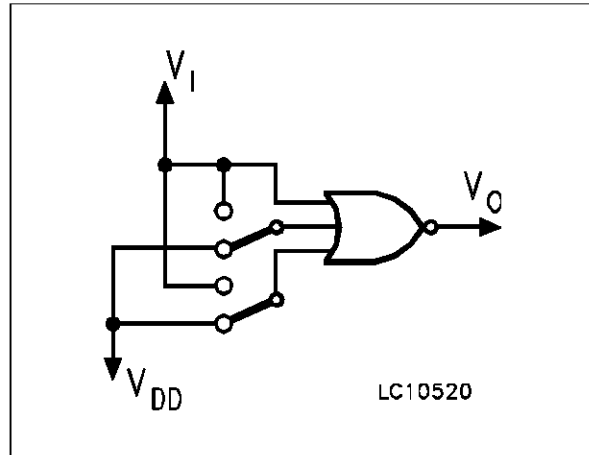
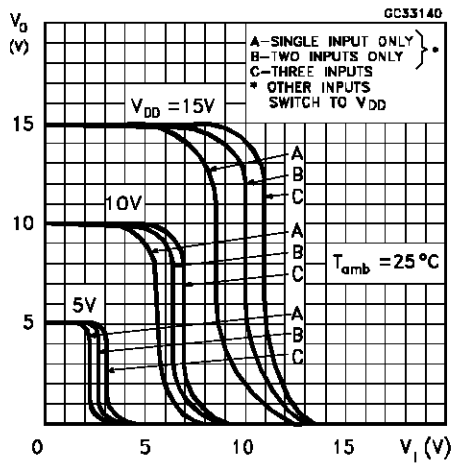
Minimum and Maximum Voltage Transfer Characteristics for Inverter and test Circuit



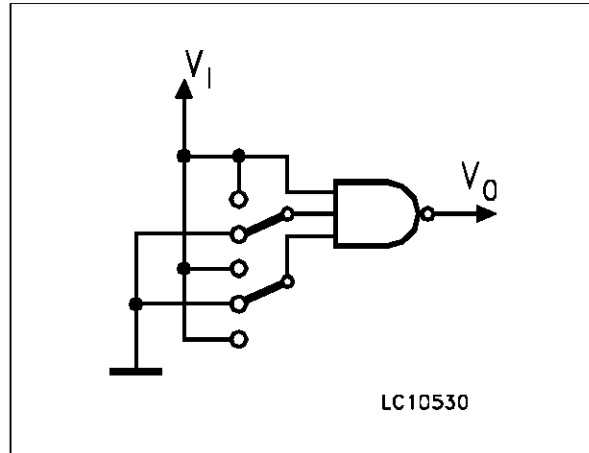
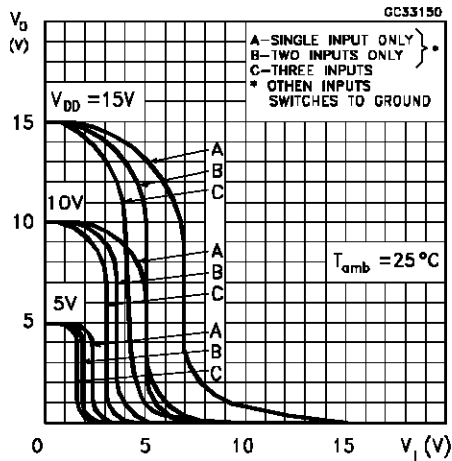
Typical Current and Voltage Transfer Characteristics for Inverter and Test Circuit



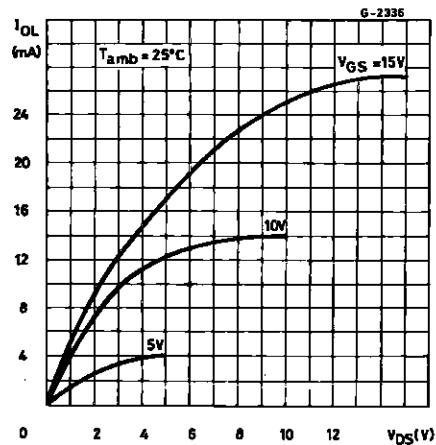
Typical Voltage Transfer Characteristics for NAND Gate and Test Circuit



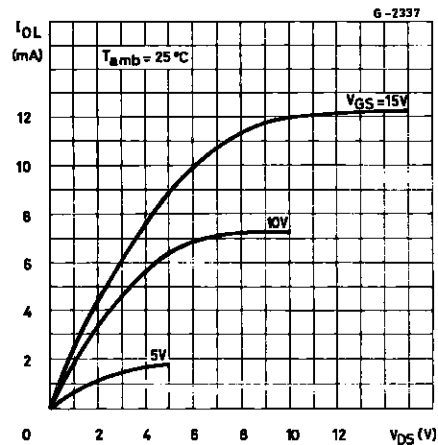
Typical Voltage Transfer Characteristics for NOR Gate and Test Circuit



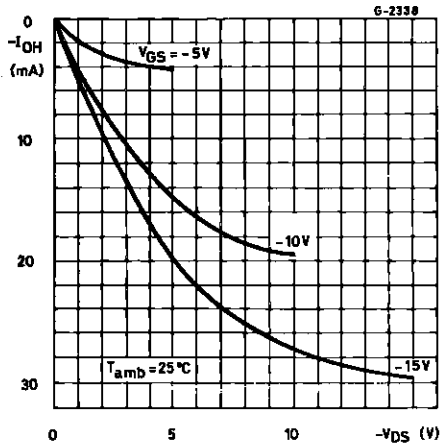
Typical Output Low (Sink) Current Characteristics



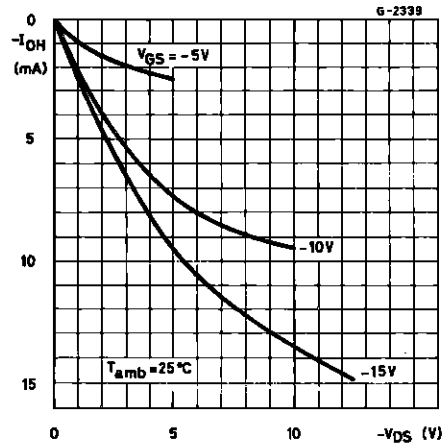
Minimum Output Low (Sink) Current Characteristics



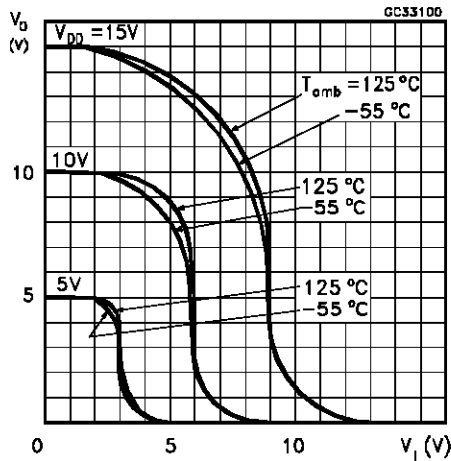
Typical Output High (Source) Current Characteristics



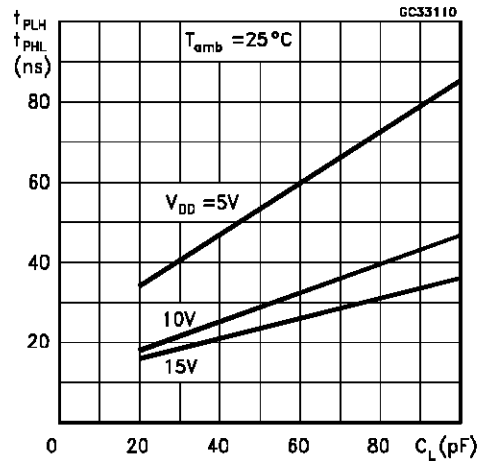
Minimum Output High (Source) Current Characteristics



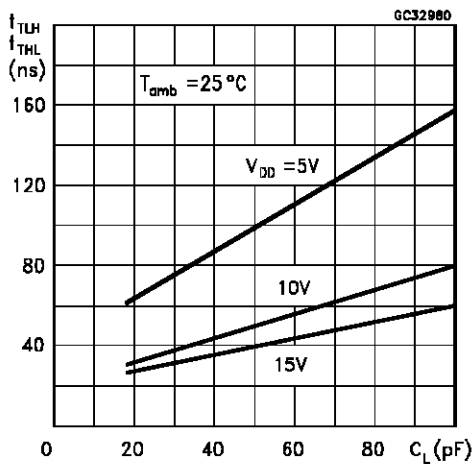
Typical Voltage Transfer Characteristics as a Function of Temperature



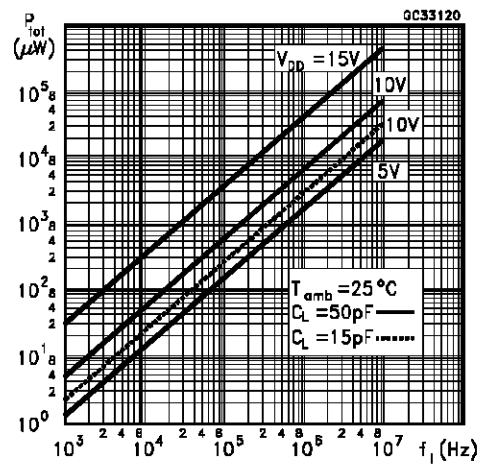
Typical Propagation Delay Time vs. Load Capacitance



Typical Transition Time vs. Load Capacitance



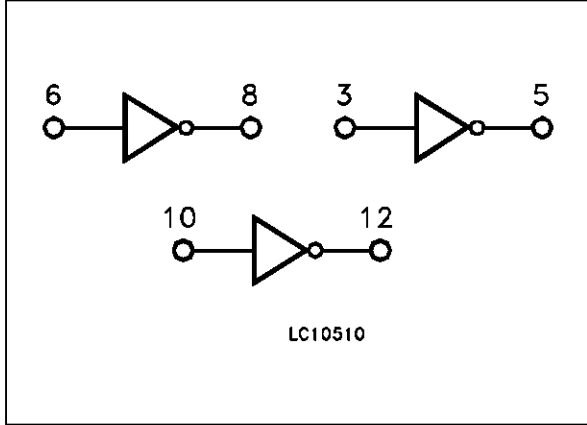
Typical Dissipation Per Gate vs. Frequency Characteristics



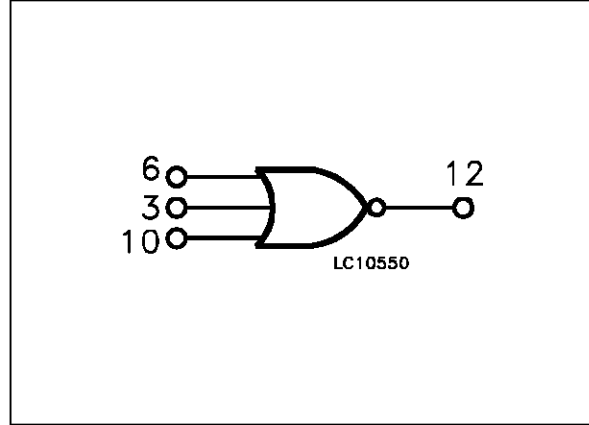
# HCC/HCF4007UB

## TYPICAL APPLICATIONS (Sample COS/MOS logic circuit arrangements using type 4007UB)

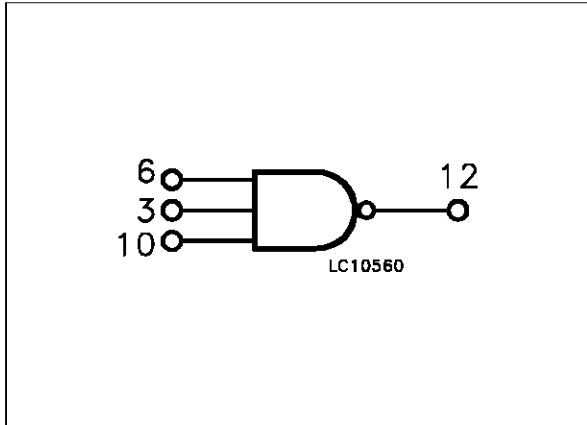
Triple Inverters: (14, 2, 11); (8, 13); (1, 5); (4, 7, 9).



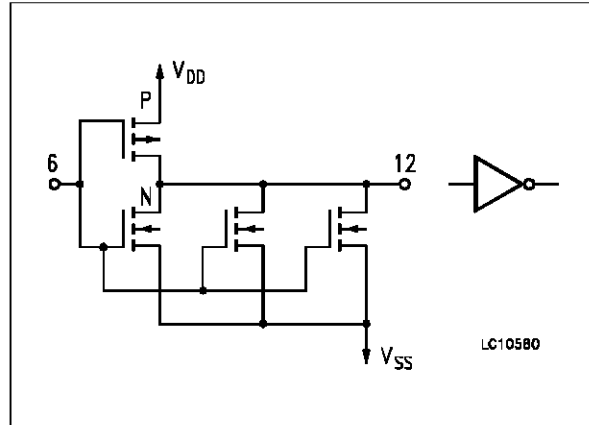
3-Input NOR Gate: (13, 2); (1, 11); (12, 5, 8); (4, 7, 9).



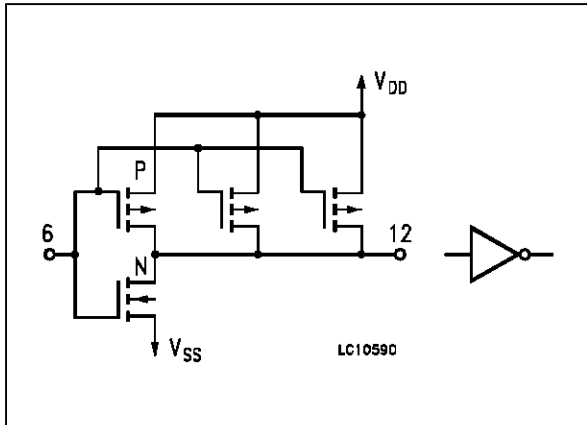
3-Input NAND Gate: (1, 12, 13); (2, 14, 11); (4, 8); (5, 9).



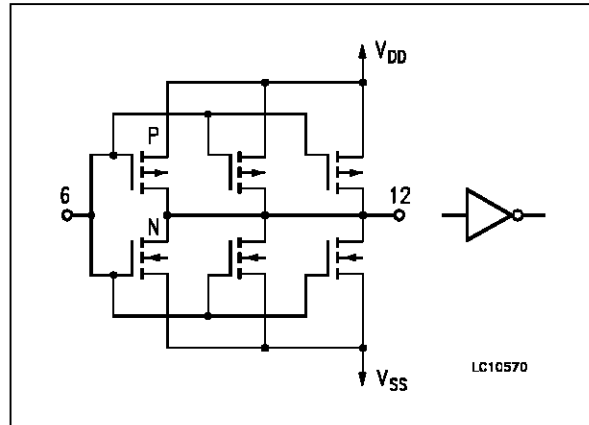
High Sink Current Driver: (6, 3, 10); (8, 5, 12); (11, 14); (4, 7, 9).



High Source Current Driver: (6, 3, 10); (13, 1, 12); (14, 2, 11); (7, 9).

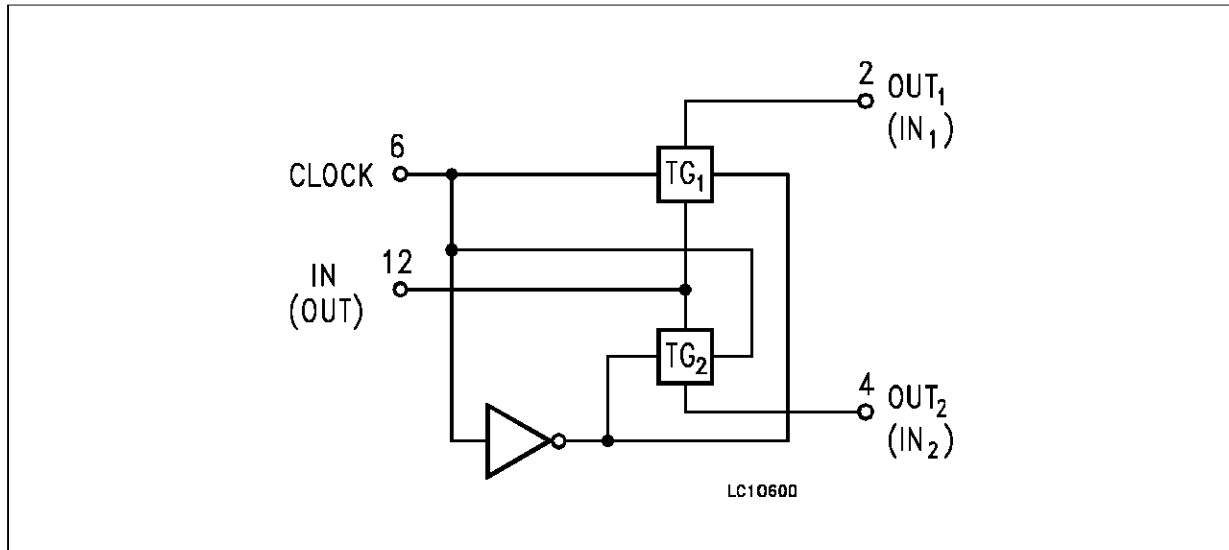


High Sink and Source Current Driver: (6, 3, 10); (14, 2, 11); (7, 4, 9); (13, 8, 1, 5, 12).



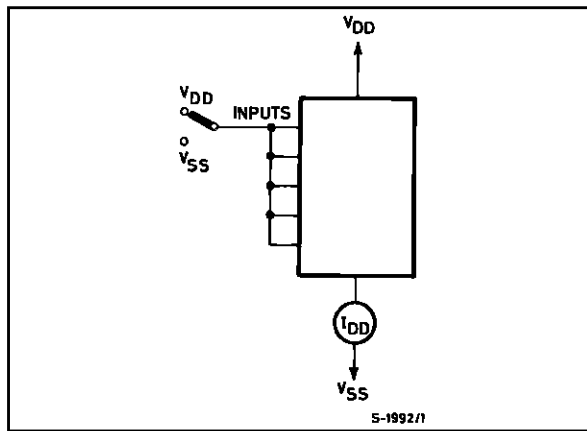


Dual Bidirectional Transmission Gating: (1, 5, 12); (2, 9); (11, 4); (8, 13, 10); (6, 3).

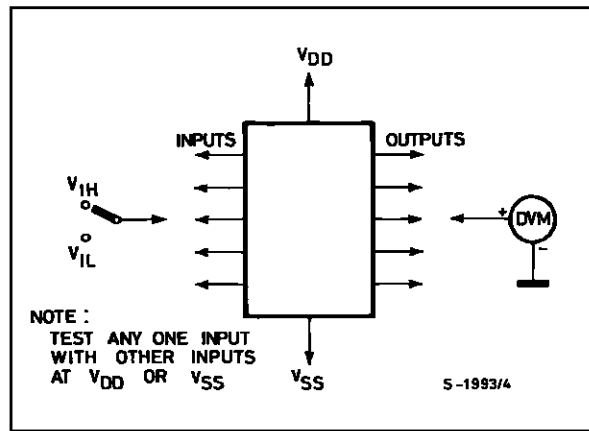


**TEST CIRCUIT**

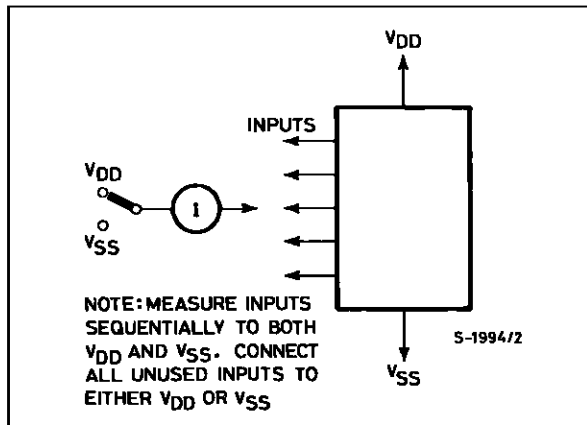
Quiescent Device Current



Input Voltage.

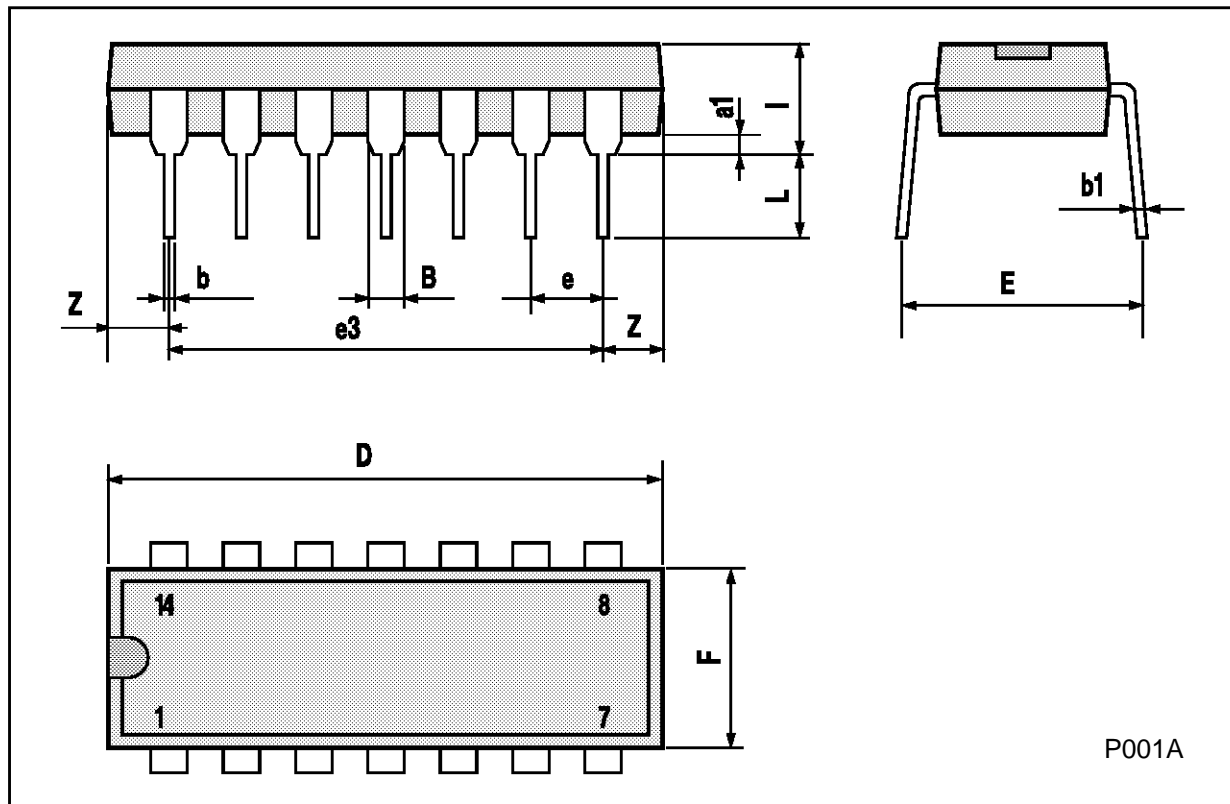


Input Leakage Current.



**Plastic DIP14 MECHANICAL DATA**

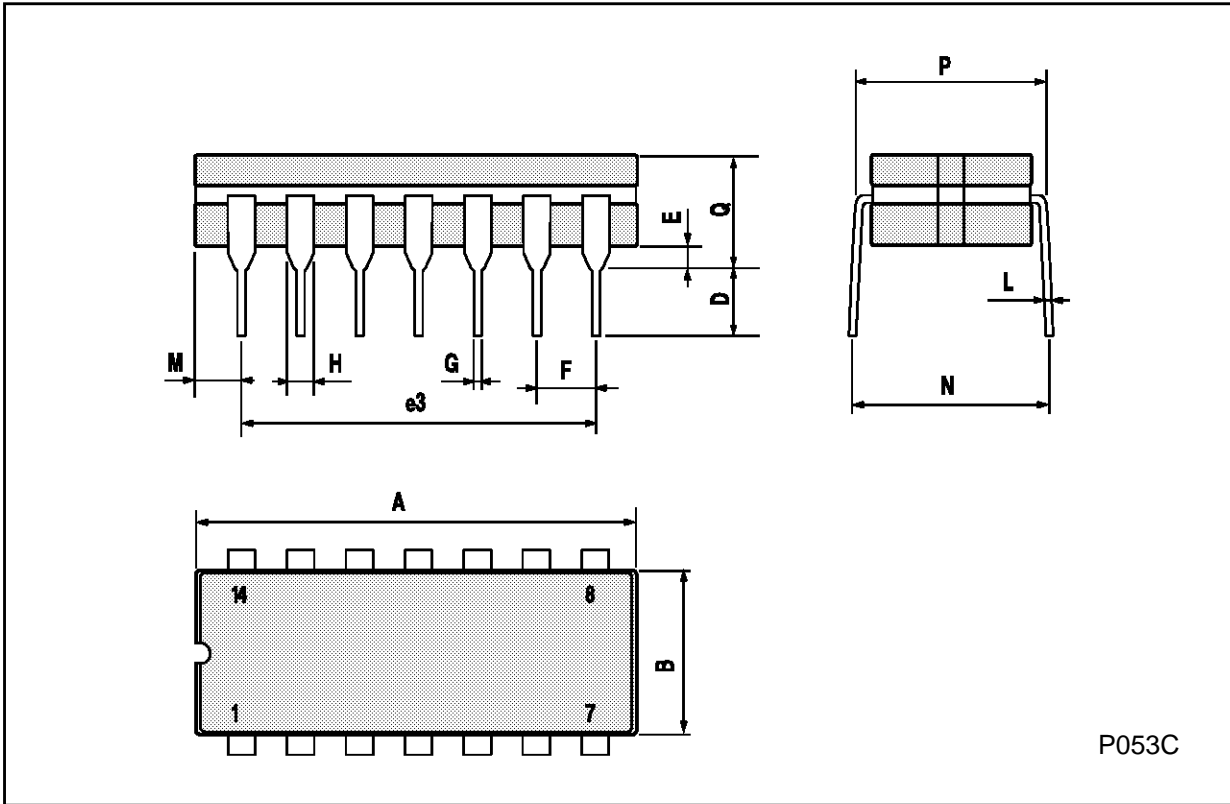
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

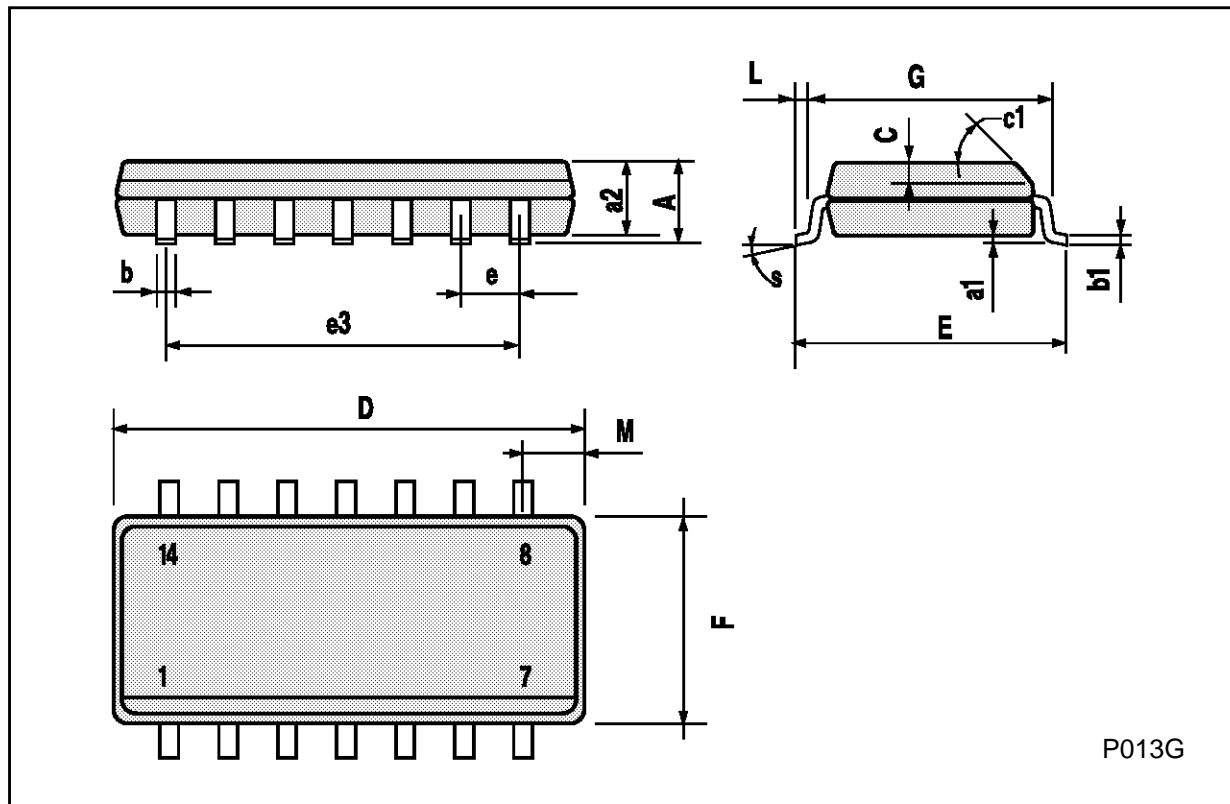
**Ceramic DIP14/1 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



SO14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



P013G

**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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