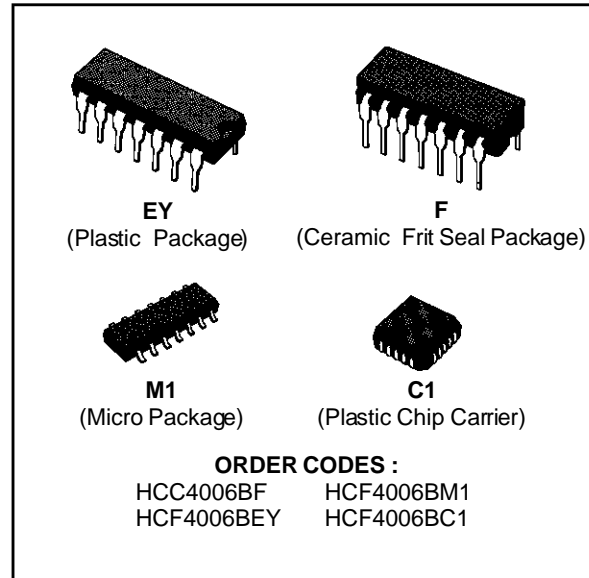


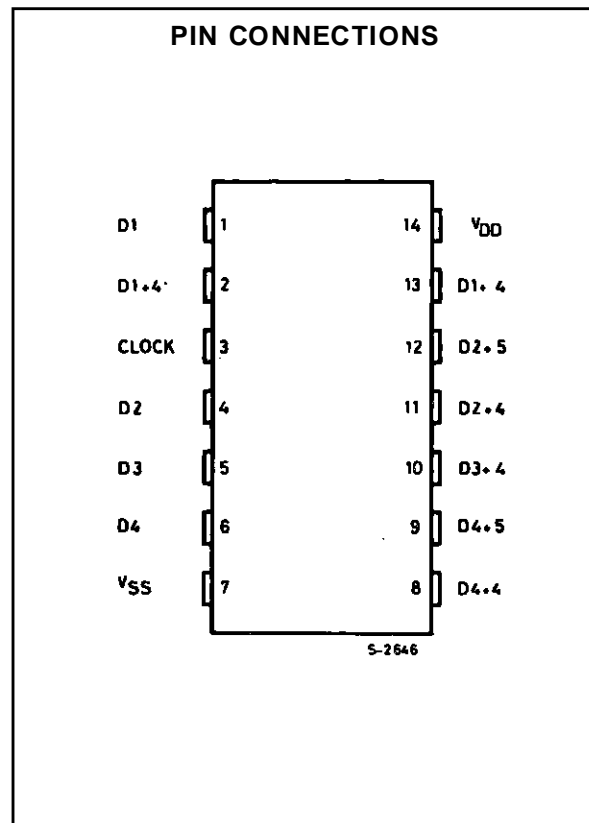
**18-STAGE STATIC SHIFT REGISTER**

- PERMANENT REGISTER STORAGE WITH CLOCKLINE "HIGH" OR "LOW" ... NO INFORMATION RECIRCULATION REQUIRED
- FULLY STATIC OPERATION
- SHIFTING RATES UP TO 12MHz @ 10V (typ.)
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- 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
- 5V, 10V, AND 15V PARAMETRIC RATING
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

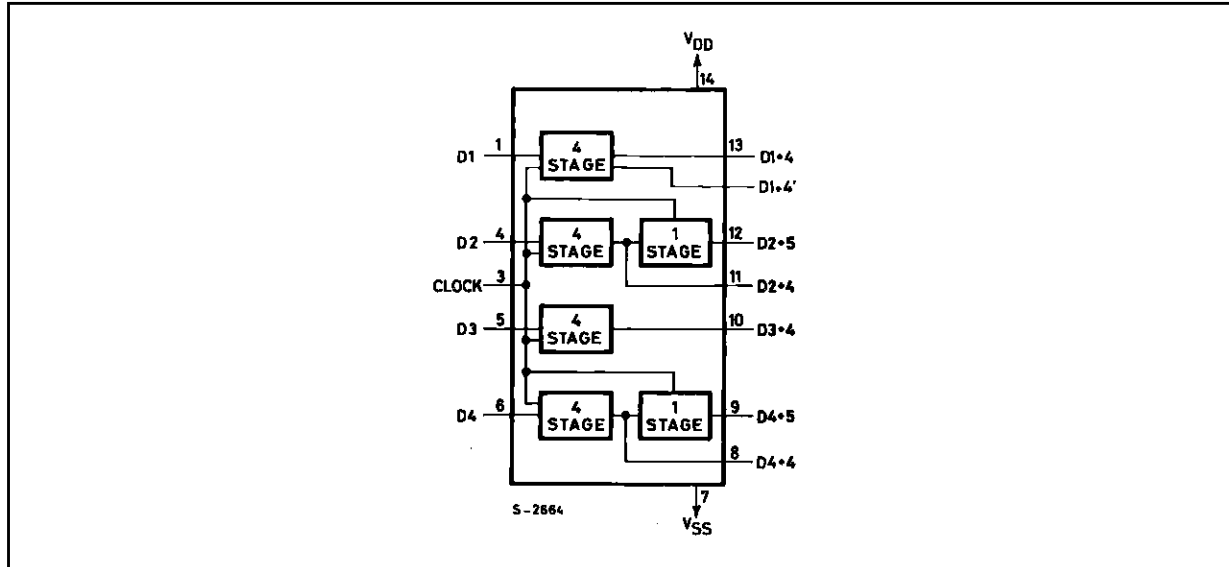


**DESCRIPTION**

The **HCC4006B** (extended temperature range) and the **HCF4006B** (standard temperature range), are monolithic integrated circuits, available in 14-lead dual in-line plastic or ceramic package and plastic micro package. The types are comprised of 4 separate "shift register" sections ; two sections of four stages and two sections of five stages with an output tap at the fourth stage. Each section has an independent "single rail" data path. A common clock signal is used for all stages. Data is shifted to the next stage on negative-going transitions of the clock. Through appropriate connections of inputs and outputs, multiple register sections of 4, 5, 8, and 9 stages or single register sections of 10, 12, 13, 14, 16, 17 and 18 can be implemented using one **HCC/HCF4006B** package. Longer shift register sections can be assembled by using more than one **HCC/HCF4006B**. To facilitate cascading stages when clock rise and fall times are slow, an optional output ( $D_1 + 4'$ ) that is delayed one-half clock-cycle, is provided (see truth table for output from pin 2).



FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

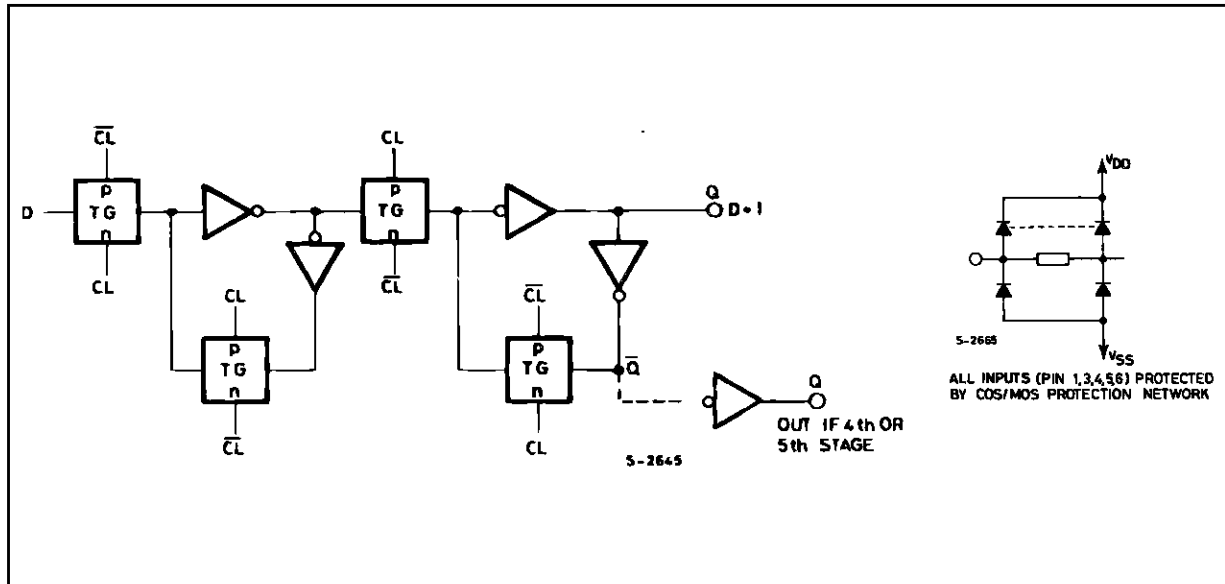
Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage : <b>HCC</b> Types <b>HCF</b> Types	- 0.5 to + 20 - 0.5 to + 18	V V
$V_i$	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
$I_I$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package) Dissipation per Output Transistor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

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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage : <b>HCC</b> Types <b>HCF</b> Types	3 to 18 3 to 15	V 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 - 40 to + 85	$^{\circ}C$ $^{\circ}C$

LOGIC DIAGRAM AND TRUTH TABLES (one register stage)



TRUTH TABLE FOR OUTPUT FROM PIN 2

$D_1 + 4$	$CL^\Delta$	$D_1 + 4'$
0	$\neg$	0
1	$\neg$	1
X	$\neg$	NC

TRUTH TABLE FOR SHIFT REGISTER STAGE

D	$CL^\Delta$	D + 1
0	$\neg$	0
1	$\neg$	1
X	$\neg$	NC

1 = HIGH  
 0 = LOW  
 NC = NO CHANGE

X = DON'T CARE  
 $\Delta$  = LEVEL CHANGE

# HCC/HCF4006B

## 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		5		0.04	5		150	$\mu$ A
			0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
			0/20			20		100		0.08	100		3000	
		HCF Types	0/ 5			5		20		0.04	20		150	
			0/10			10		40		0.04	40		300	
			0/15			15		80		0.04	80		600	
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	3.5		3.5			3.5		V	
			1/9	< 1	10	7		7			7			
			1.5/13.5	< 1	15	11		11			11			
V <sub>IL</sub>	Input Low Voltage		4.5/0.5	< 1	5		1.5			1.5		1.5	V	
			9/1	< 1	10		3			3		3		
			13.5/1.5	< 1	15		4			4		4		
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.

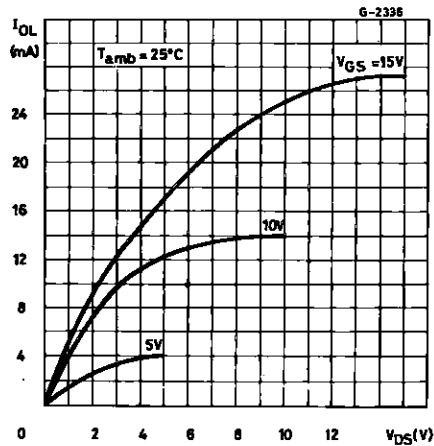
The Noise Margin for both "1" and "0" level is : 1V min. with V<sub>DD</sub> = 5V, 2V min. with V<sub>DD</sub> = 10V, 2.5 V min. with V<sub>DD</sub> = 15V.

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $0.3\%/^{\circ}\text{C}$ , all input rise and fall times = 20ns)

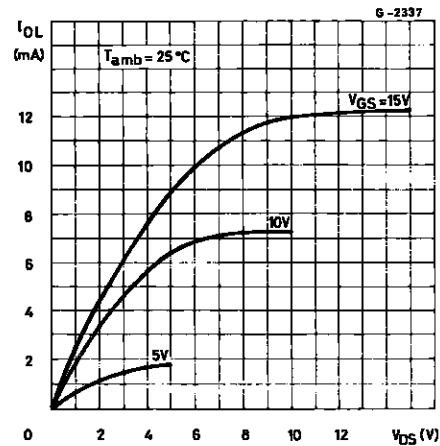
Symbol	Parameter	Test Conditions		Value			Unit
			$V_{DD}$ (V)	Min.	Typ.	Max.	
$t_{PLH}, t_{PHL}$	Propagation Delay Time		5		200		ns
			10		100		
			15		80		
$t_{THL}, t_{TLH}$	Transition Time		5		100		ns
			10		50		
			15		40		
$t_w$	Clock Pulse Width		5		100		ns
			10		45		
			15		30		
$t_r, t_f$	Clock Input Rise or Fall Time*		5		15		$\mu\text{s}$
			10		15		
			15		15		
$t_{setup}$	Data Setup Time		5		50		ns
			10		25		
			15		20		
$f_{max}$	Maximum Clock Input Frequency		5		5		MHz
			10		12		
			15		16		

\* If more than unit is cascaded  $t_{CL}$  should be made less than or equal to the sum of the transition time and the fixed propagation delay of the output of the driving stage for the estimated capacitive load.

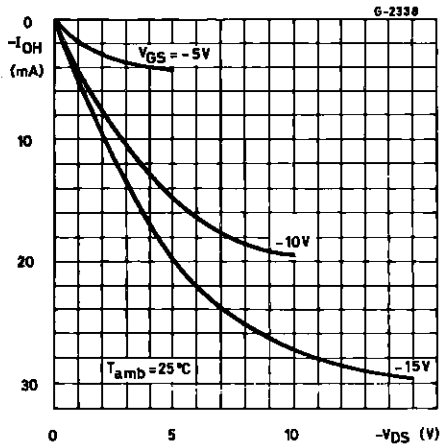
Typical Output Low (sink) Current Characteristics.



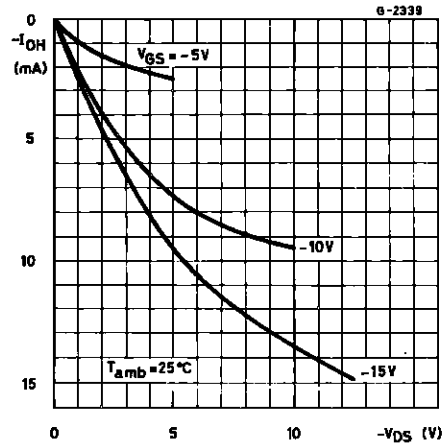
Minimum Output Low (sink) Current Characteristics.



Typical Output High (source) Current Characteristics.

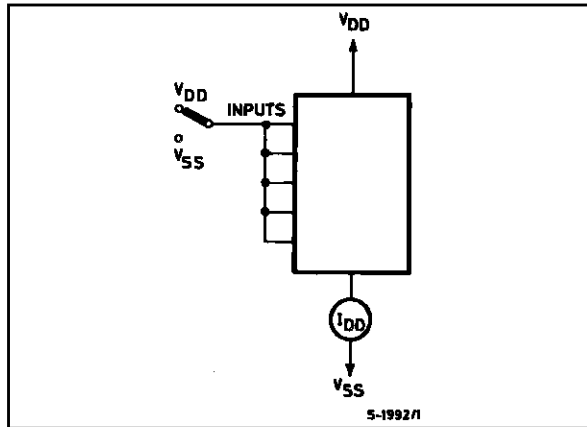


Minimum Output High (source) Current Characteristics.

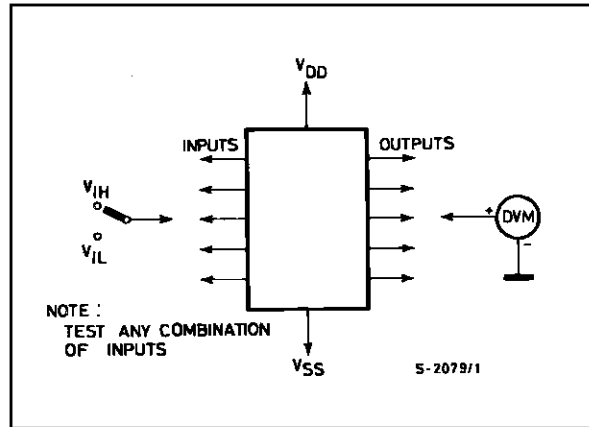


TEST CIRCUITS

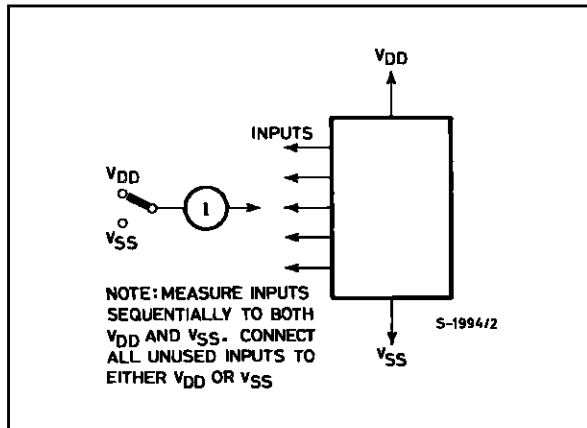
Quiescent Device Current.



Input Voltage.

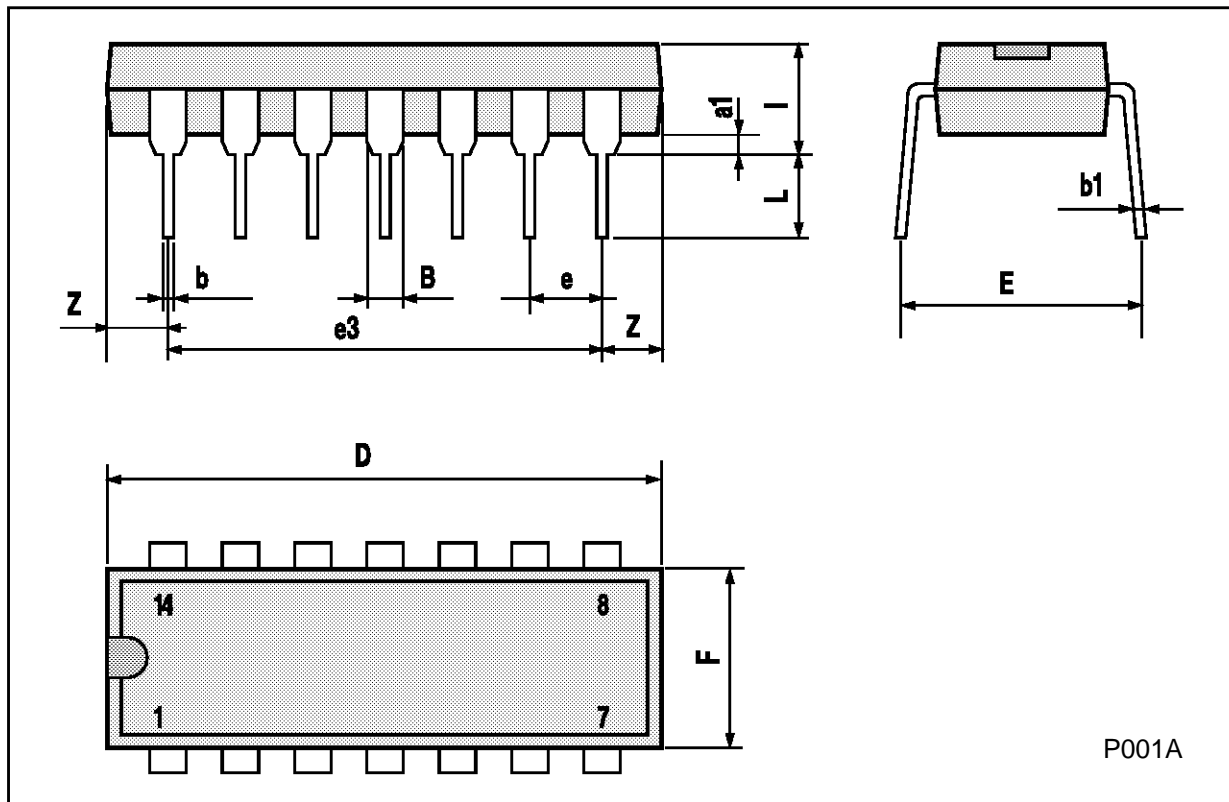


Input Current.



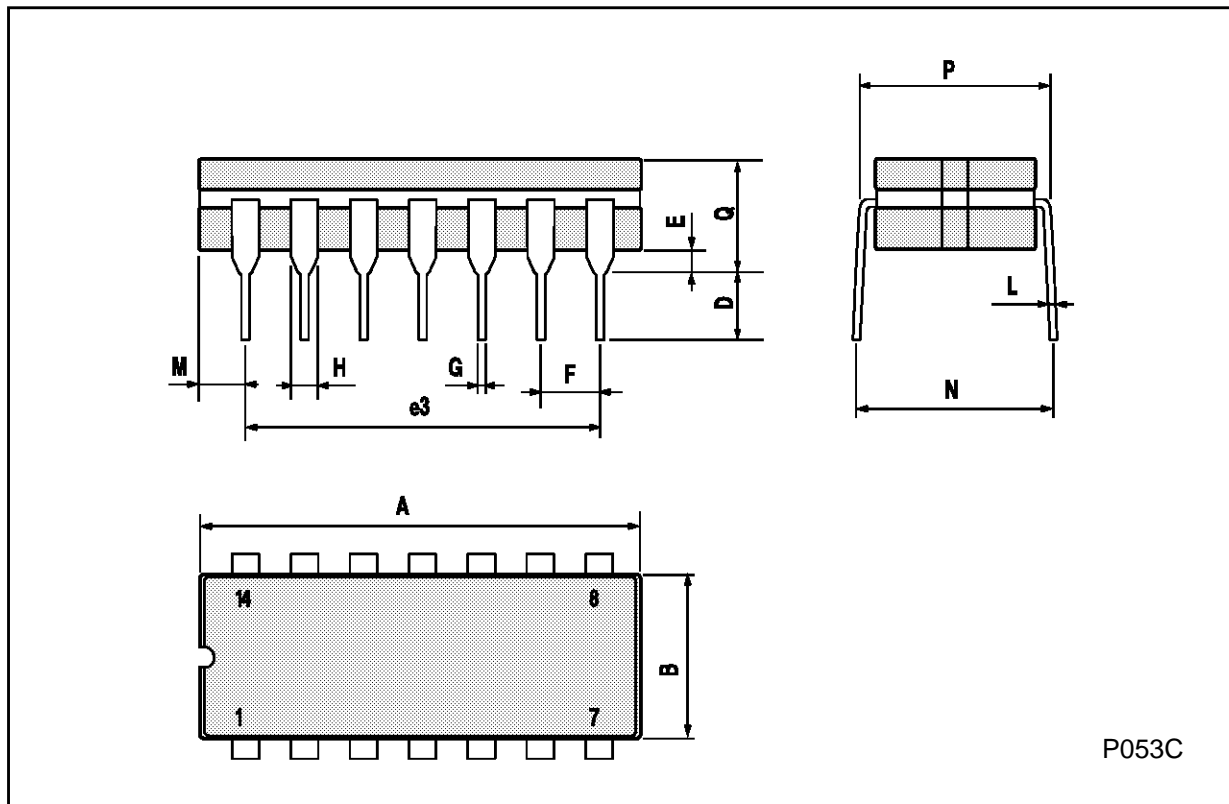
**Plastic DIP14 MECHANICAL DATA**

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



**Ceramic DIP14/1 MECHANICAL DATA**

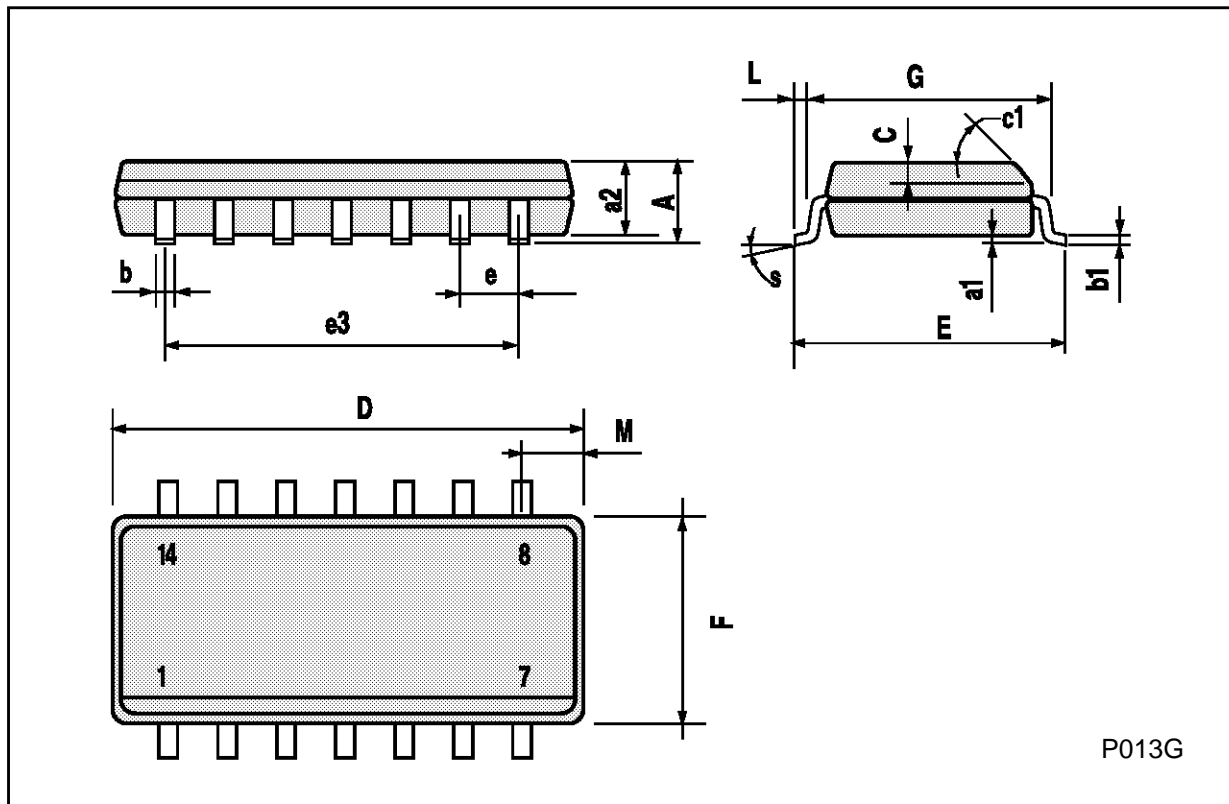
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317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



P053C

**SO14 MECHANICAL DATA**

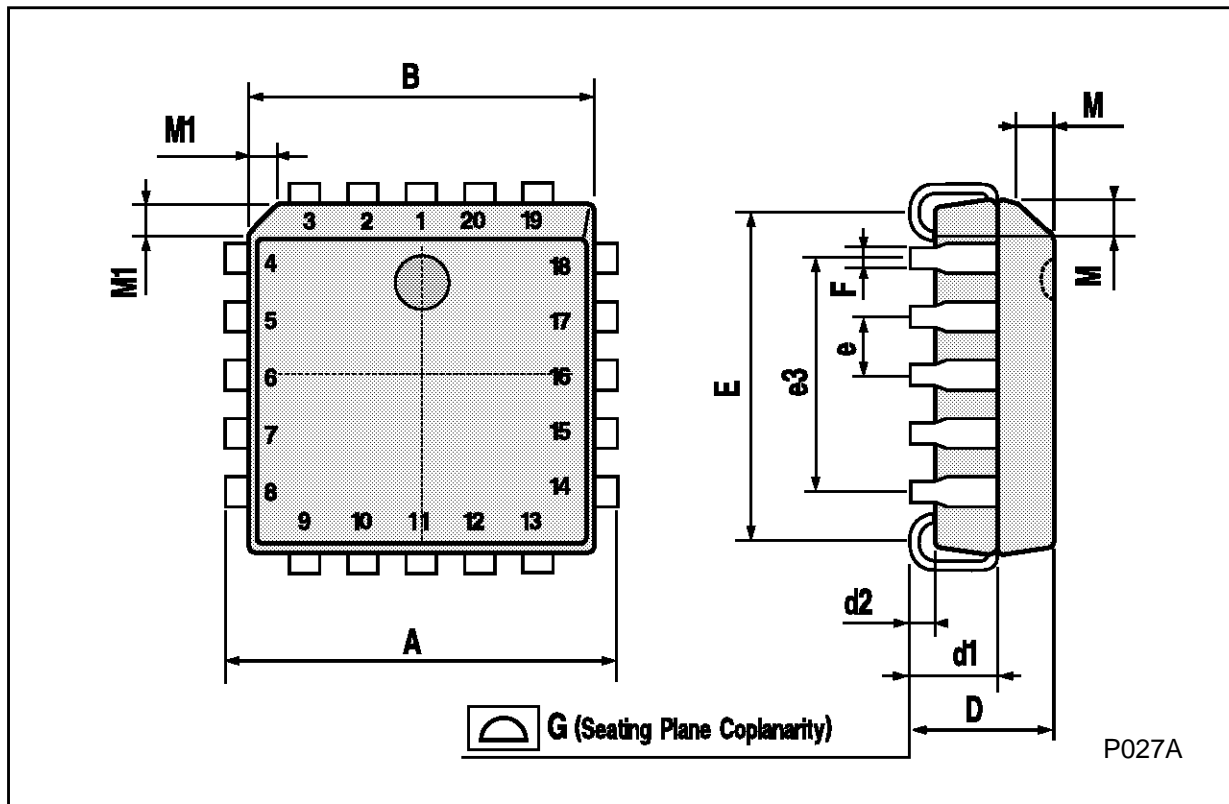
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157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