



SGS-THOMSON
MICROELECTRONICS

HCC4011B/12B/23B
HCF4011B/12B/23B

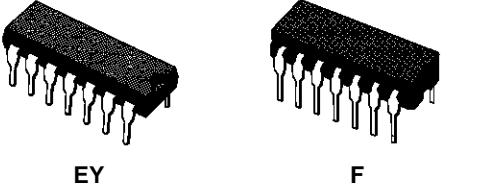
NAND GATES

QUAD 2 INPUT HCC/HCF 4011B

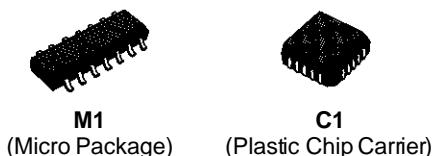
DUAL 4 INPUT HCC/HCF 4012B

TRIPLE 3 INPUT HCC/HCF 4023B

- PROPAGATION DELAY TIME = 60ns (typ.) AT $C_L = 50\text{pF}$, $V_{DD} = 10\text{V}$
- BUFFERED INPUTS AND OUTPUTS
- 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 RATINGS
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N°. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"



EY
(Plastic Package) **F**
(Ceramic Frit Seal Package)



M1
(Micro Package) **C1**
(Plastic Chip Carrier)

ORDER CODES:

HCC40XXBF HCF40XXBM1
HCF40XXBEY HCF40XXBC1

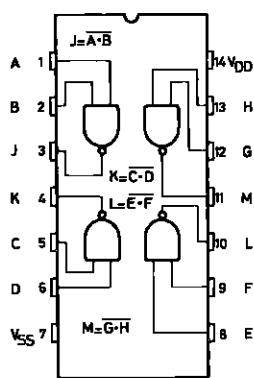
DESCRIPTION

The **HCC4011B**, **HCC4012B** and **HCC4023B** (extended temperature range) and **HCF4011B**, **HCF4012B** and **HCF4023B** (intermediate temperature range) are monolithic, integrated circuit, available in 14-lead dual in-line plastic or ceramic package and plastic micropackage.

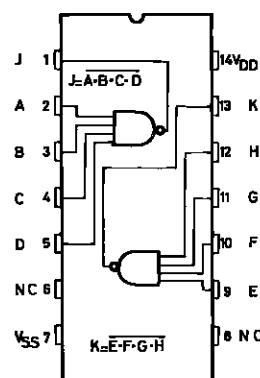
The **HCC/HCF4011B**, **HCC/HCF4012B** and **HCC/HCF4023B** NAND gates provide the system designer with direct implementation of the NAND function and supplement the existing family of COS/MOS gates. All inputs and outputs are buffered.

PIN CONNECTIONS

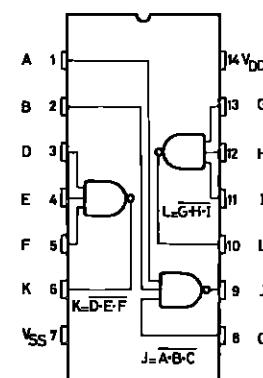
4011B



4012B



4023B



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}^*	Supply Voltage : HCC Types HCF 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)	± 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 : HCC Types HCF Types	– 55 to + 125 – 40 to + 85	°C °C
T_{stg}	Storage Temperature	– 65 to + 150	°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.

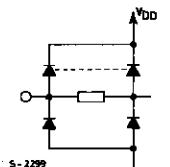
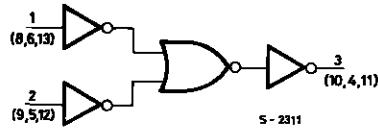
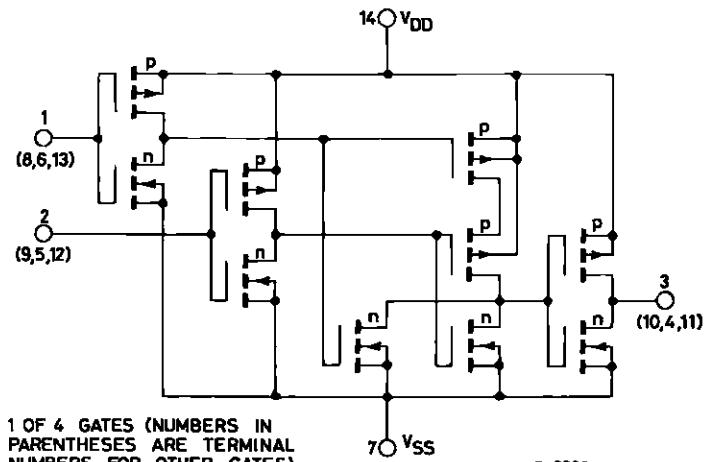
* All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : HCC Types HCF Types	3 to 18 3 to 15	V V
V_i	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : HCC Types HCF Types	– 55 to + 125 – 40 to + 85	°C °C

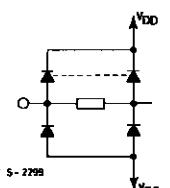
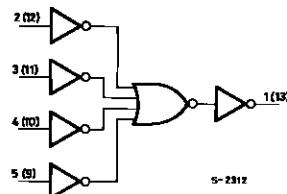
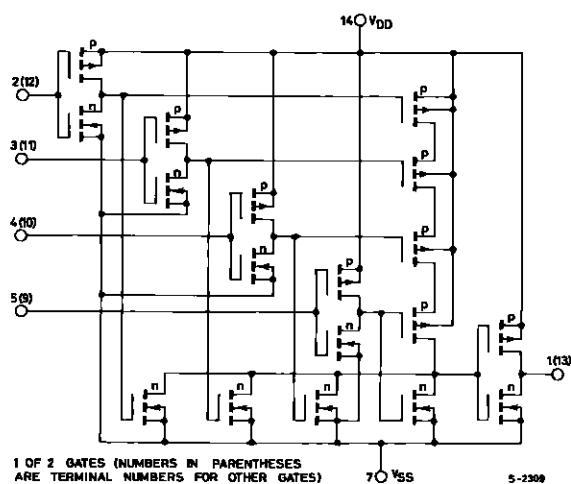
SCHEMATIC AND LOGIC DIAGRAMS

4011B



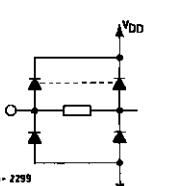
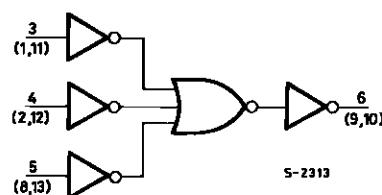
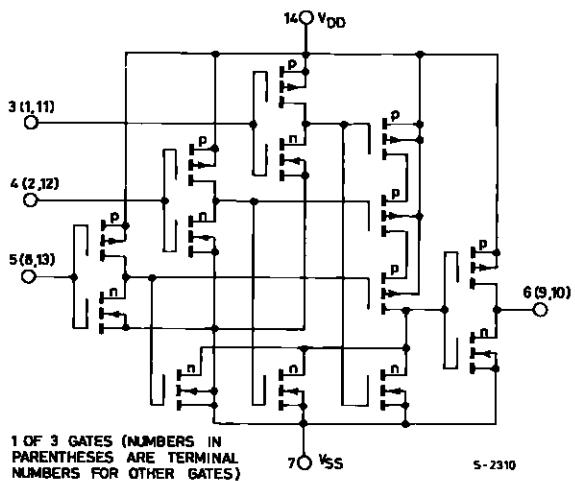
ALL INPUTS ARE PROTECTED BY COS/MOS PROTECTION NETWORK

4012B



ALL INPUTS ARE PROTECTED BY COS/MOS PROTECTION NETWORK

4023B



ALL INPUTS ARE PROTECTED BY COS/MOS PROTECTION NETWORK

HCC/HFC4011B/12B/23B

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter	Test Conditions				Value						Unit		
		V_I (V)	V_o (V)	$ I_{IO} $ (μ A)	V_{DD} (V)	T_{Low}^*		$25^\circ C$			T_{High}^*			
						Min.	Max.	Min.	Typ.	Max.	Min.	Max.		
I_L	Quiescent Current	HCC Types	0/5		5		0.25		0.01	0.25		7.5	μA	
			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_{OH}	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_{OL}	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_{IH}	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_{IL}	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_{OH}	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_{OL}	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_{IH}, I_{IL}	Input Leakage Current	HCC Types	0/18		18		± 0.1		$\pm 10^{-5}$	± 0.1		± 1	μA	
		HCF Types	0/15		15		± 0.3		$\pm 10^{-5}$	± 0.3		± 1		
C_I	Input Capacitance		Any Input						5	7.5			pF	

* $T_{Low} = -55^\circ C$ for HCC device ; $-40^\circ C$ for HCF device.

* $T_{High} = +125^\circ C$ for HCC device ; $+85^\circ C$ for HCF device.

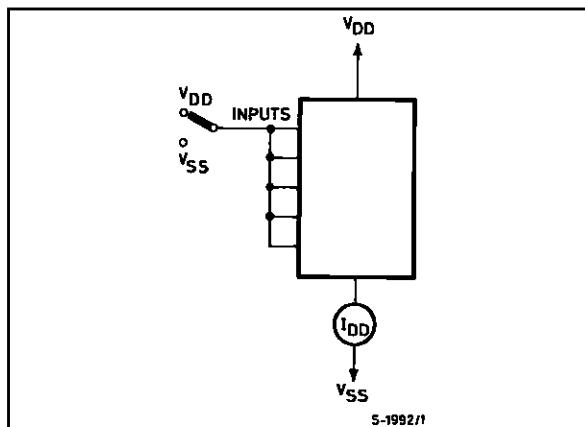
The Noise Margin for both "1" and "0" level is : 1V min. with $V_{DD} = 5V$, 2V min. with $V_{DD} = 10V$, 2.5V with $V_{DD} = 15V$.

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

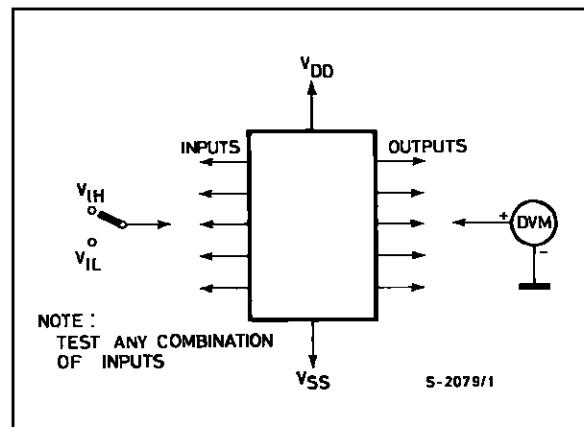
Symbol	Parameter	Test Conditions		Value		Unit	
			V_{DD} (V)	Min.	Typ.		
t_{PLH}, t_{PHL}	Propagation Delay Time		5		125	250	ns
			10		60	120	
			15		45	90	
t_{THL}, t_{TLH}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

TEST CIRCUITS

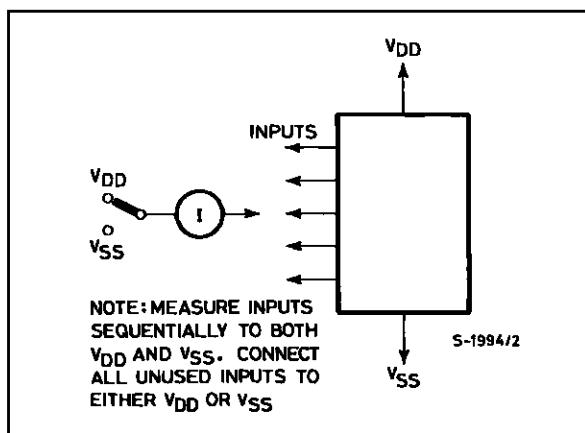
Quiescent Device Current



Noise Immunity.

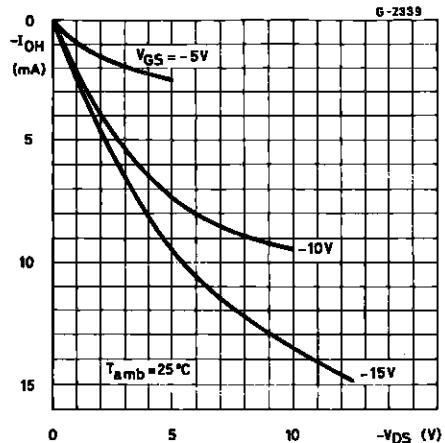


Input Leakage Current.

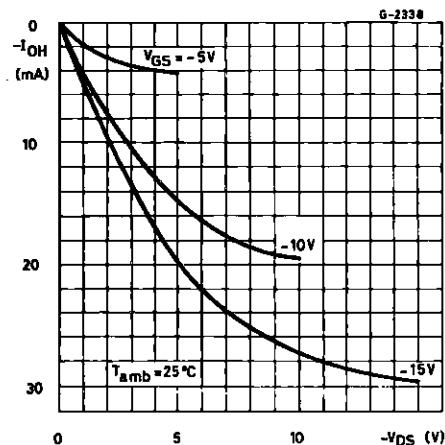


HCC/HFC4011B/12B/23B

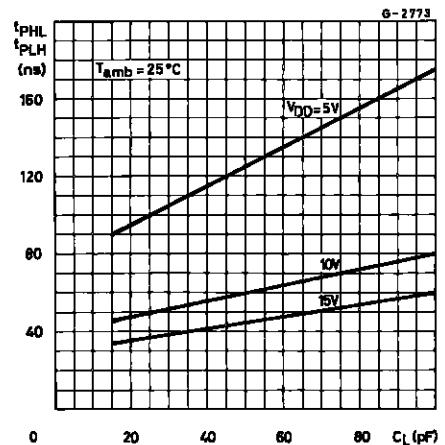
Minimum Output High (source) Current Characteristics.



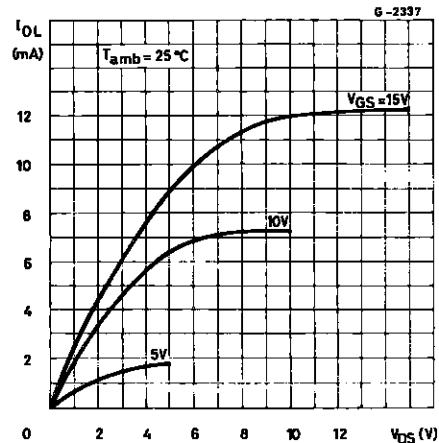
Typical Output High (source) Current Characteristics.



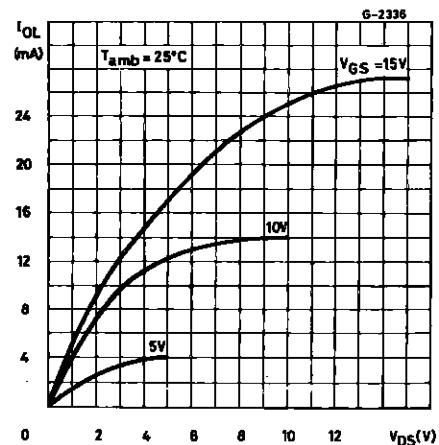
Typical Propagation Delay Time per Gate as a Function of Load Capacitance.



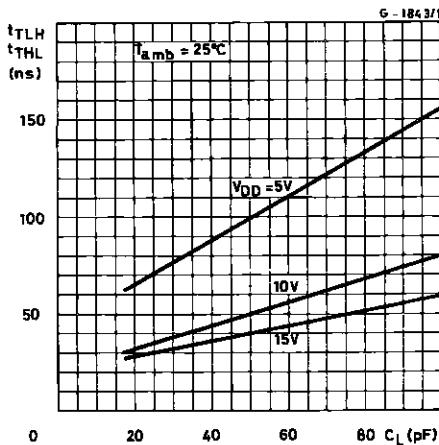
Minimum Output Low (sink) Current Characteristics.



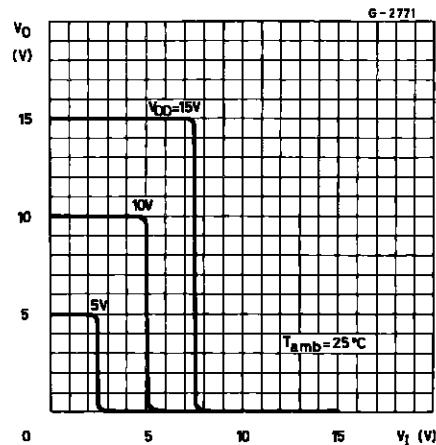
Typical Output Low (sink) Current Characteristics.



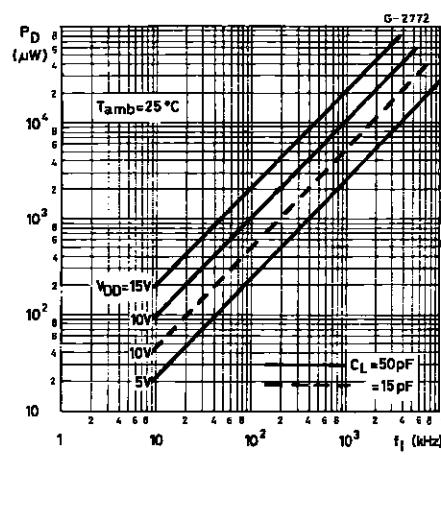
Typical Transition Time vs. Load Capacitance.



Typical Voltage Transfer Characteristics.

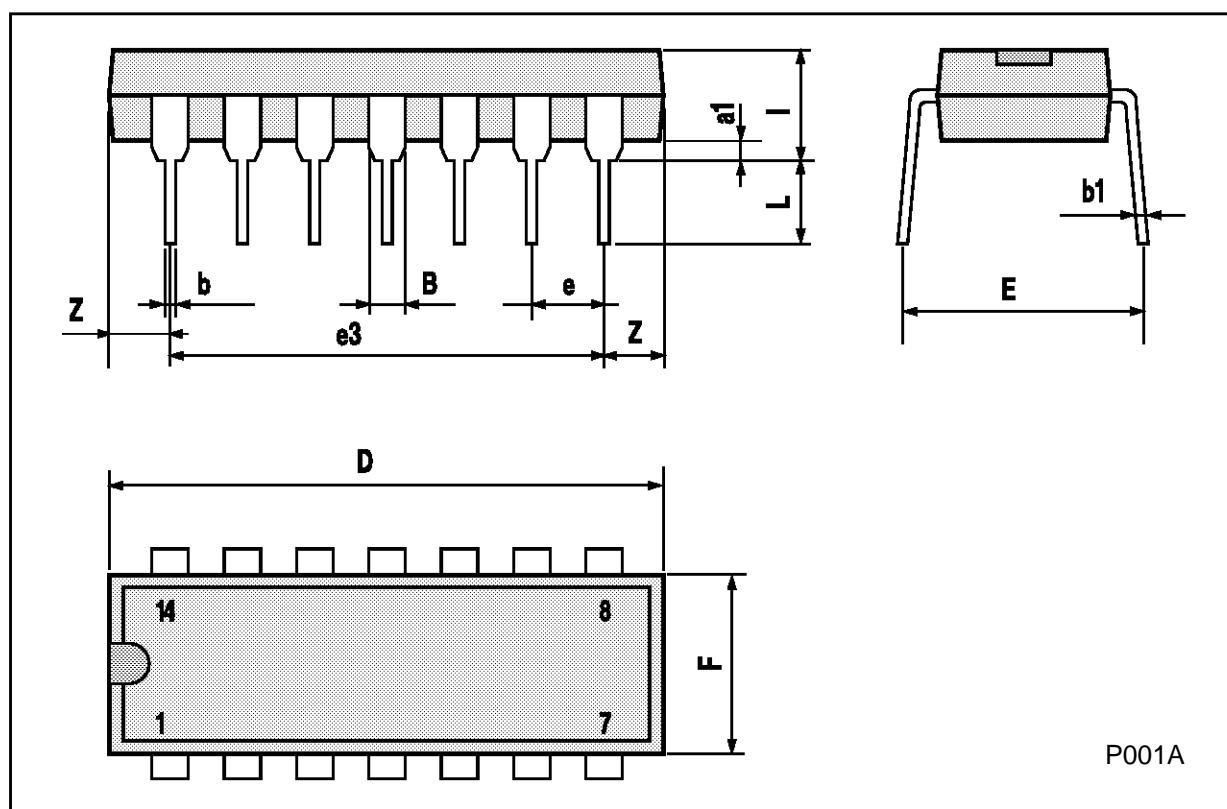


Typical Power Dissipation/gate vs Frequency.



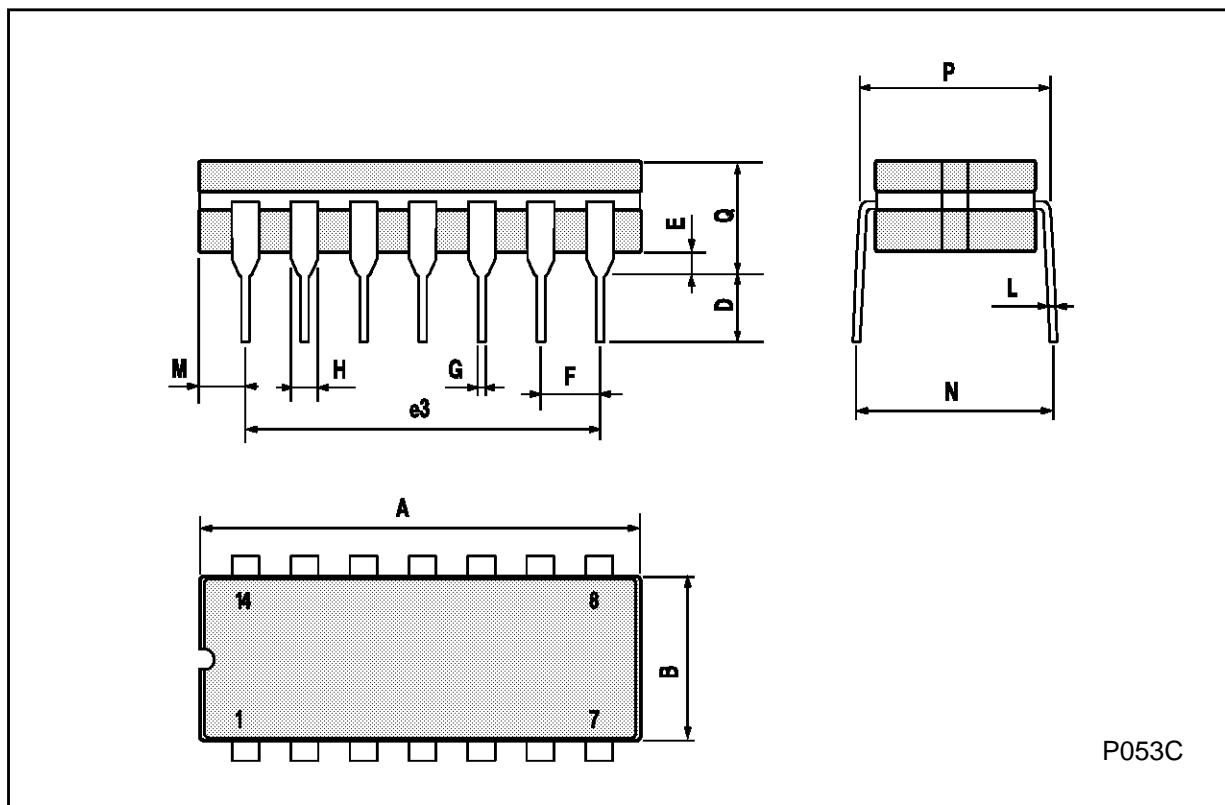
Plastic DIP14 MECHANICAL DATA

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



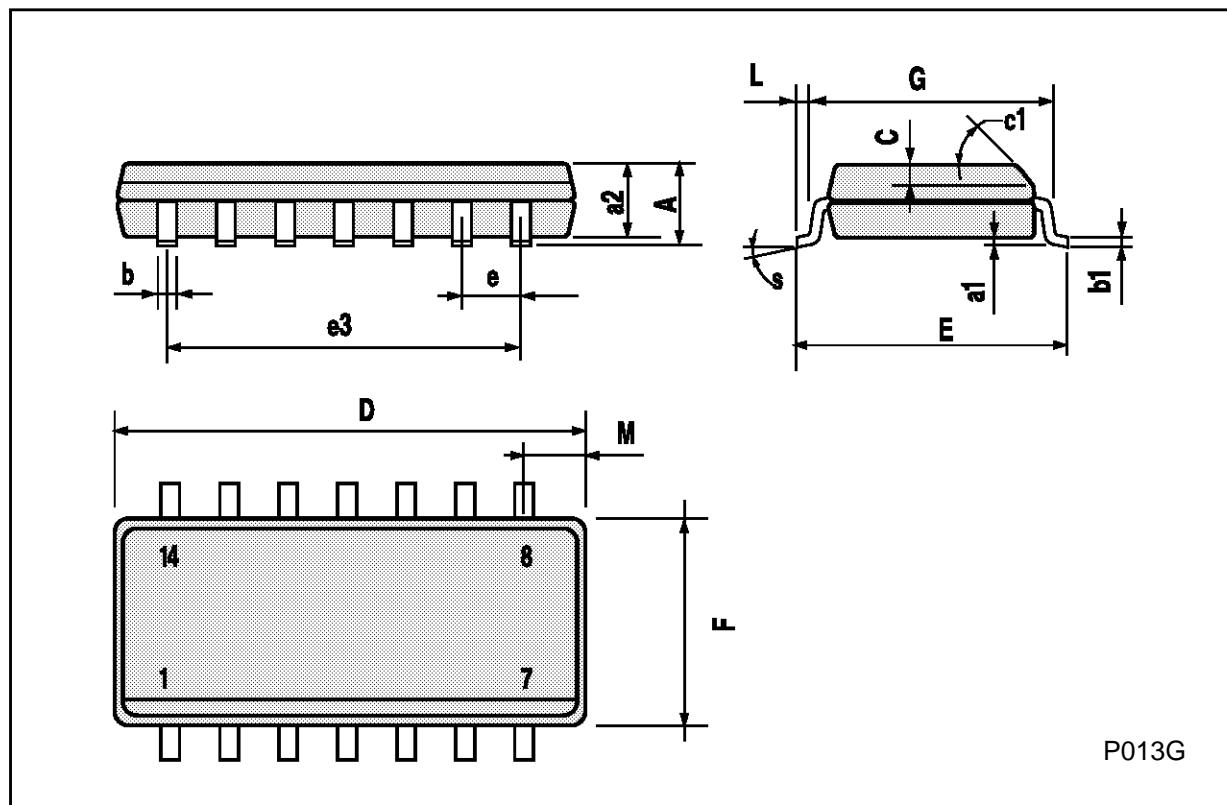
Ceramic DIP14/1 MECHANICAL DATA

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



SO14 MECHANICAL DATA

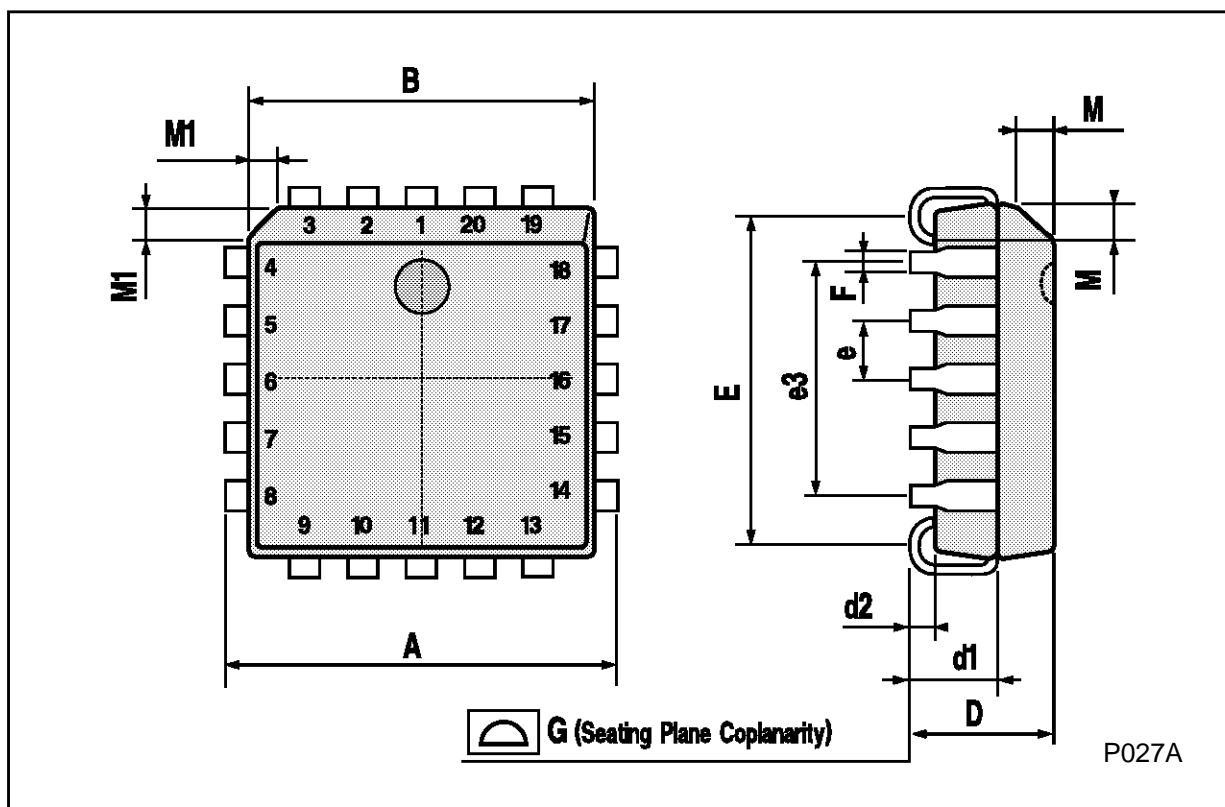
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1			45° (typ.)			
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157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



HCC/HFC4011B/12B/23B

Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A