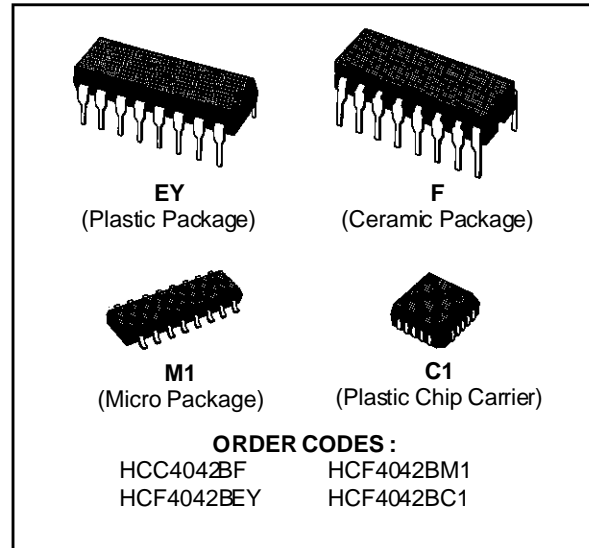


## QUAD CLOCKED "D" LATCH

- CLOCK POLARITY CONTROL
- Q AND  $\bar{Q}$  OUTPUTS
- COMMON CLOCK
- LOW POWER TTL COMPATIBLE
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- 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"



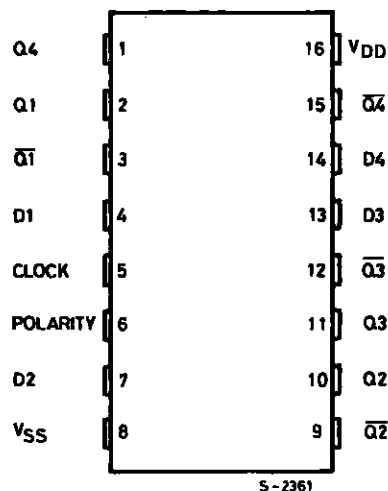
### DESCRIPTION

The **HCC4042B** (extended temperature range) and **HCF4042B** (intermediate temperature range) are monolithic integrated circuit, available in 16-lead dual in-line plastic or ceramic package and plastic micro package.

The **HCC/HCF4042B** types contain four latch circuits, each strobed by a common clock. Complementary buffered outputs are available from each circuit. The impedance of the n- and p-channel output devices is balanced and all outputs are electrically identical.

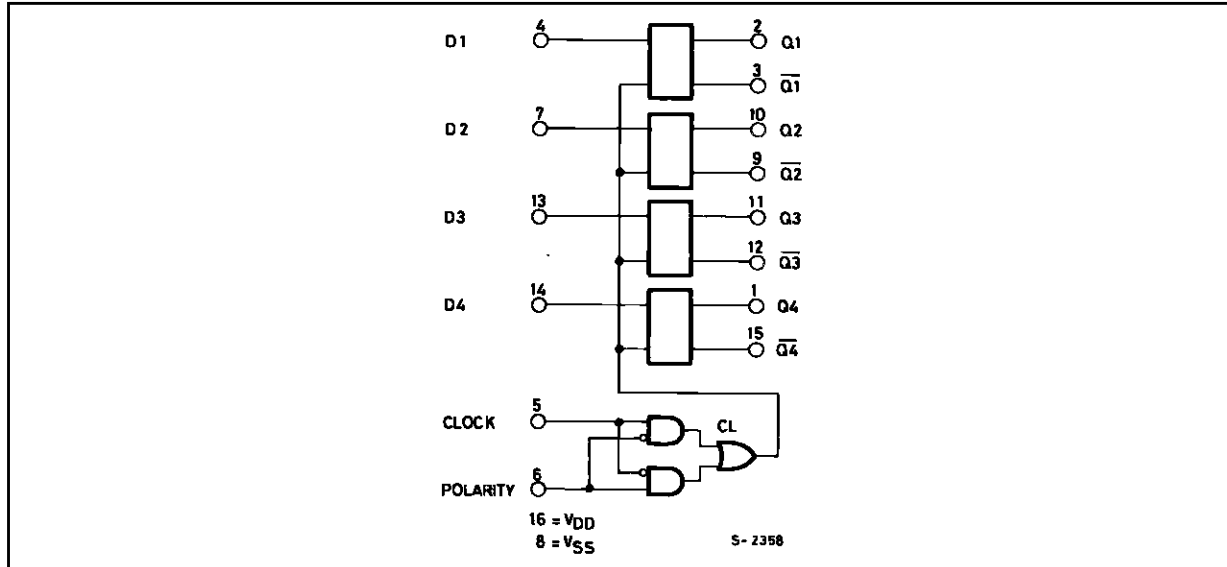
Information present at the data input is transferred to outputs Q and  $\bar{Q}$  during the CLOCK level which is programmed by the POLARITY input. For POLARITY = 0 the transfer occurs during the 0 CLOCK level and for POLARITY = 1 the transfer occurs during the 1 CLOCK level. The outputs follow the data input providing the CLOCK and POLARITY levels defined above are present. When a CLOCK transition occurs (positive for POLARITY = 0 and negative for POLARITY = 1) the information present at the input during the CLOCK transition is retained at the outputs until an opposite CLOCK transition occurs.

### PIN CONNECTIONS



# HCC/HCF4042B

## FUNCTIONAL DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

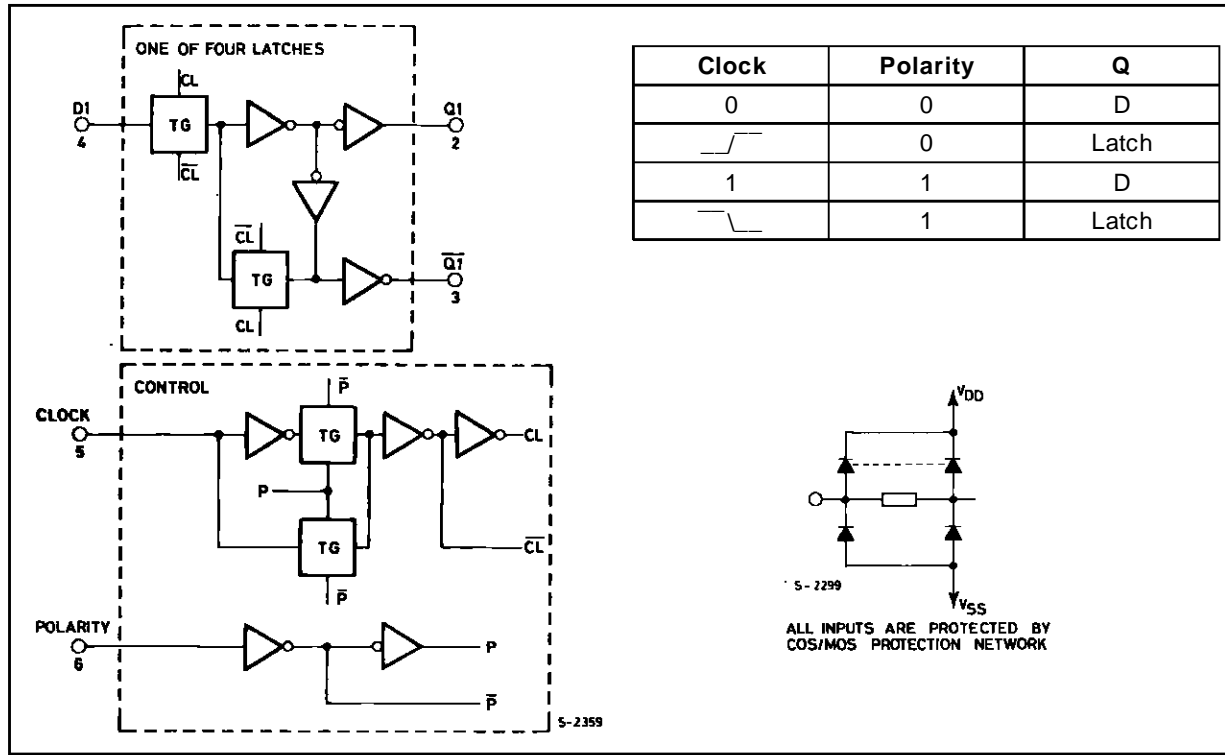
Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage : <b>HCC</b> Types <b>HCF</b> Types	- 0.5 to + 20 - 0.5 to + 18	V V
$V_i$	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
$I_i$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package) Dissipation per Output Transistor 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.  
\* 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 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 BLOCK DIAGRAM AND TRUTH TABLE



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>   (μA)	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				5	1		0.02	1		30	μA	
						HCC Types	10	2	0.02	2	60		
							15	4	0.02	4	120		
							20	20	0.04	20	600		
						HCF Types	5	4	0.02	4	30		
							10	8	0.02	8	60		
							15	16	0.02	16	120		
V <sub>OH</sub>	Output High Voltage			5	4.95		4.95			4.95	V		
					10	9.95		9.95					
					15	14.95		14.95					
V <sub>OL</sub>	Output Low Voltage			5		0.05			0.05	0.05	V		
					10		0.05		0.05	0.05			
					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			

\* 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.

# HCC/HCF4042B

## STATIC ELECTRICAL CHARACTERISTICS (continued)

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.
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		$\pm 0.1$		$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$	$\mu$ A
		HCF Types	0/15										
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.

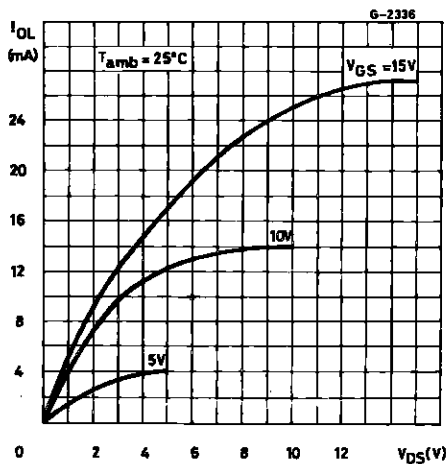
## DYNAMIC ELECTRICAL CHARACTERISTICS (T<sub>amb</sub> = 25°C, C<sub>L</sub> = 50pF, R<sub>L</sub> = 200k $\Omega$ , typical temperature coefficient for all V<sub>DD</sub> values is 0.3%/°C, all input rise and fall times = 20ns)

Symbol	Parameter	Test Conditions	Value			Unit		
			V <sub>DD</sub> (V)	Min.	Typ.		Max.	
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay Time	Data in to Q	5		110	220	ns	
			10		55	110		
			15		40	80		
			Data in to $\bar{Q}$	5		150		300
				10		75		150
				15		50		100
		Clock to Q	5		225	450		
			10		100	200		
			15		80	160		
			Clock to $\bar{Q}$	5		250		500
				10		115		230
				15		90		180

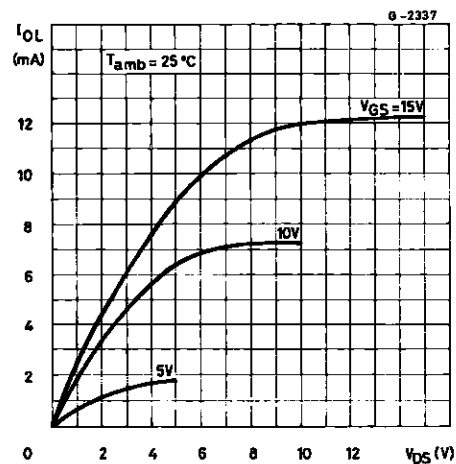
**DYNAMIC ELECTRICAL CHARACTERISTICS** (continued)

Symbol	Parameter	Test Conditions		Value			Unit
			V <sub>DD</sub> (V)	Min.	Typ.	Max.	
t <sub>THL</sub> , t <sub>TLH</sub>	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	
t <sub>w</sub>	Clock Pulse Width		5	200	100		ns
			10	100	50		
			15	60	30		
t <sub>setup</sub>	Setup Time		5	50	0		ns
			10	30	0		
			15	25	0		
t <sub>hold</sub>	Hold Time		5	120	60		ns
			10	60	30		
			15	50	25		
t <sub>r</sub> , t <sub>f</sub>	Clock Input Rise or Fall Time		5	Not Rise or Fall Time Sensitive			μs
			10				
			15				

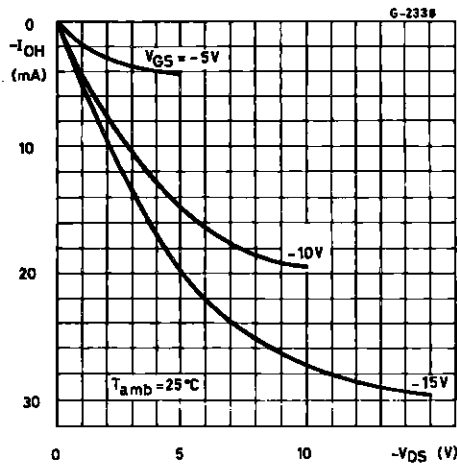
Typical Output Low (sink) Current Characteristics.



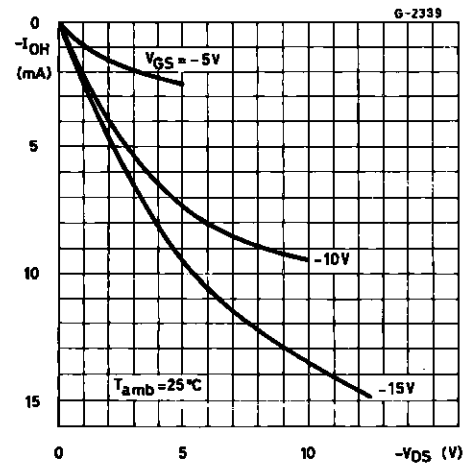
Minimum Output Low (sink) Current Characteristics.



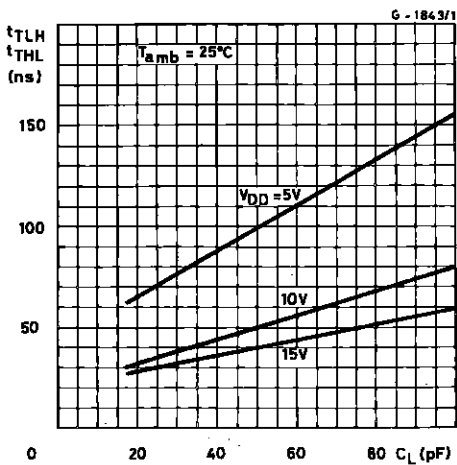
Typical Output High (source) Current Characteristics.



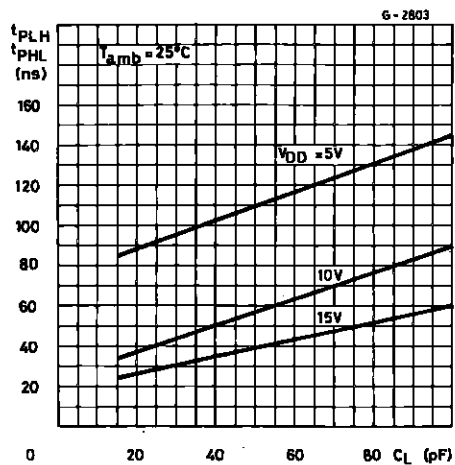
Minimum Output High (source) Current Characteristics.



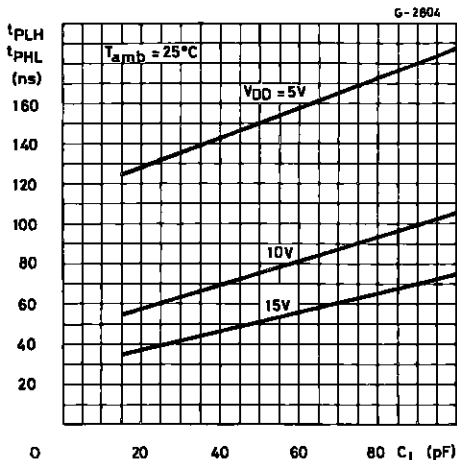
Typical Transition Time vs. Load Capacitance.



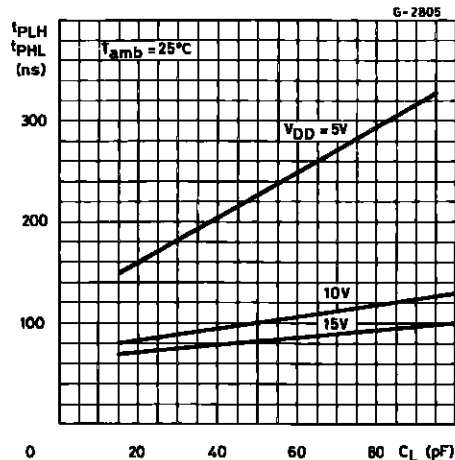
Typical Propagation Delay Time vs. Load Capacitance (data to Q).



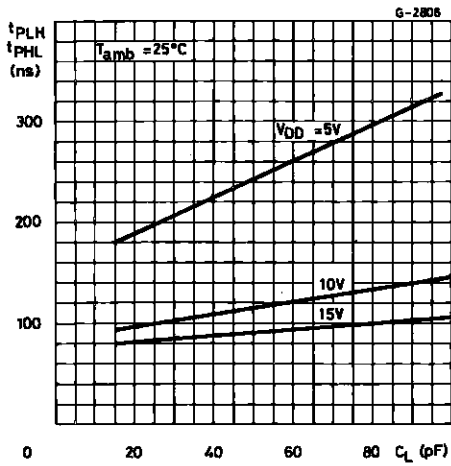
Typical Propagation Delay Time vs. Load Capacitance (data to Q).



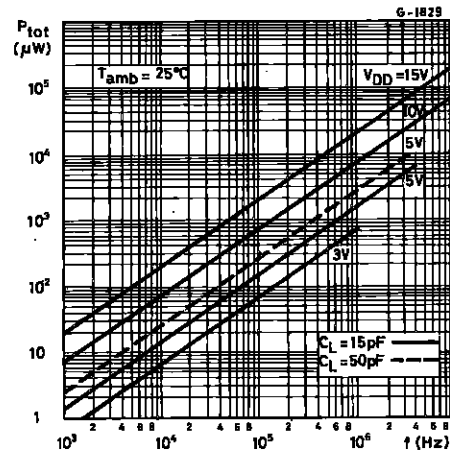
Typical Propagation Delay Time vs. Load Capacitance (clock to Q).



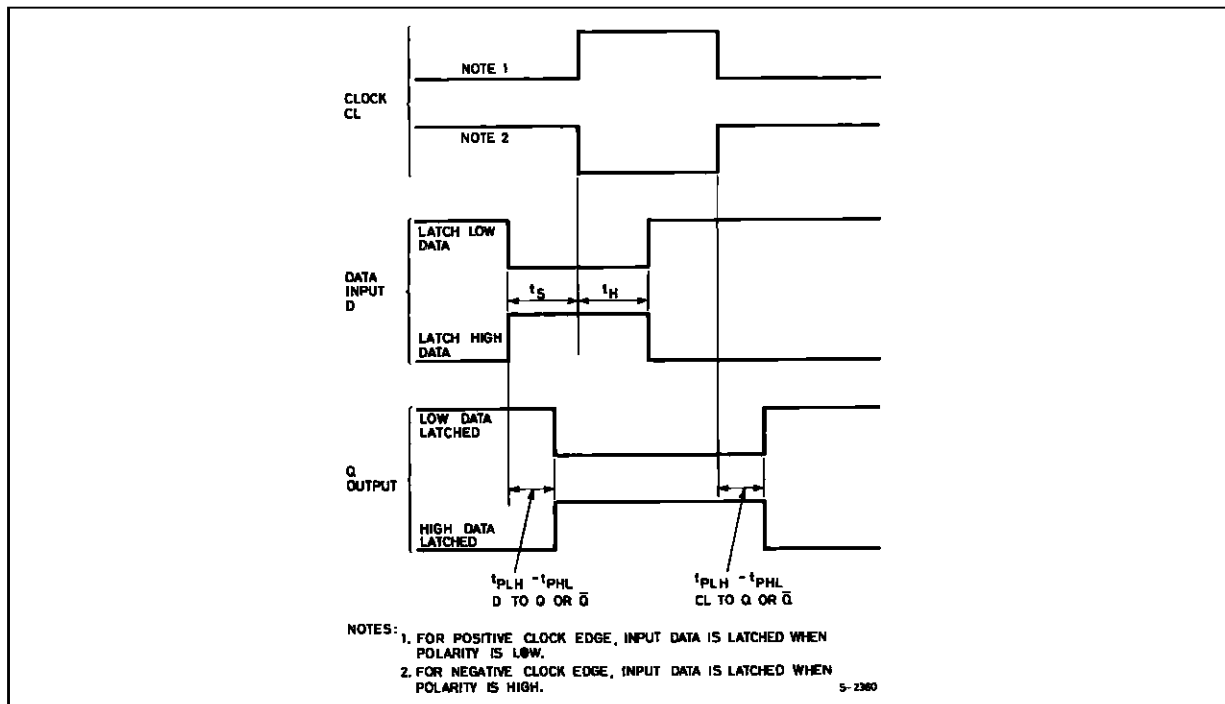
Typical Propagation Delay Time vs. Load Capacitance (clock to Q).



Typical Power Dissipation/device vs. Frequency.

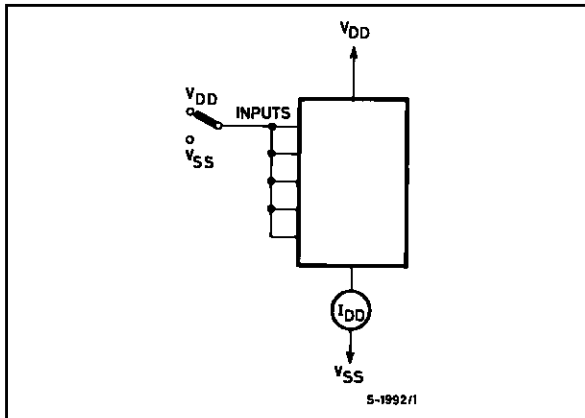


Dynamic Test Parameters.

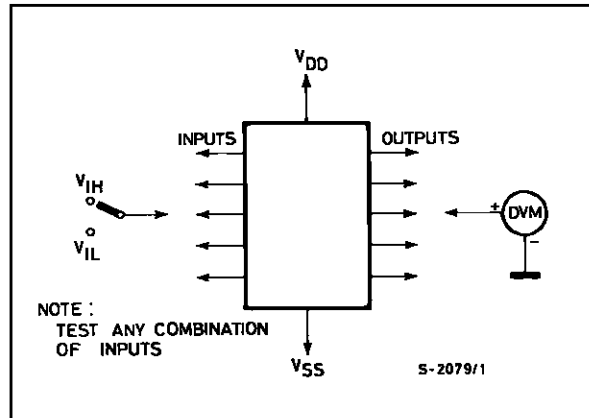


TEST CIRCUITS

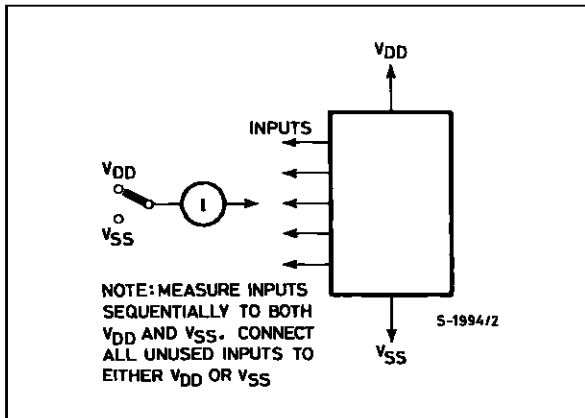
Quiescent Device Current.



Noise Immunity.



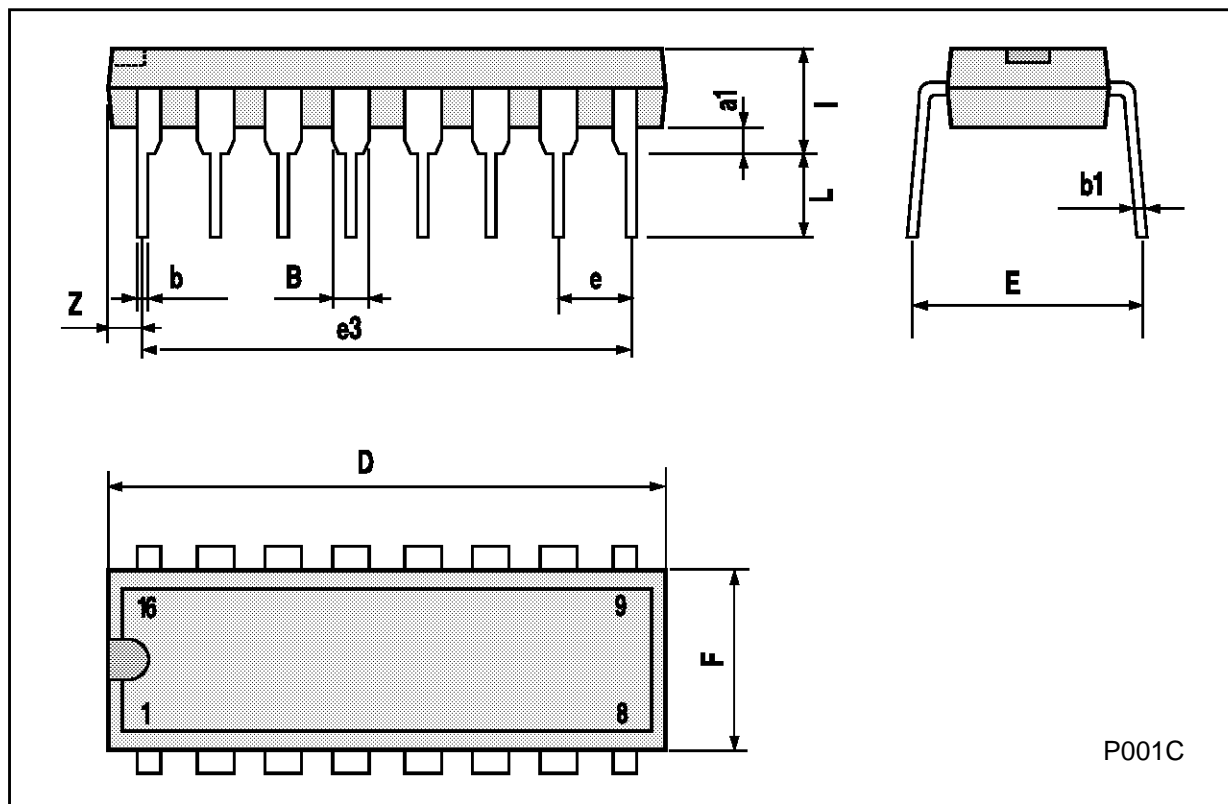
Input Leakage Current.





## Plastic DIP16 (0.25) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		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		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

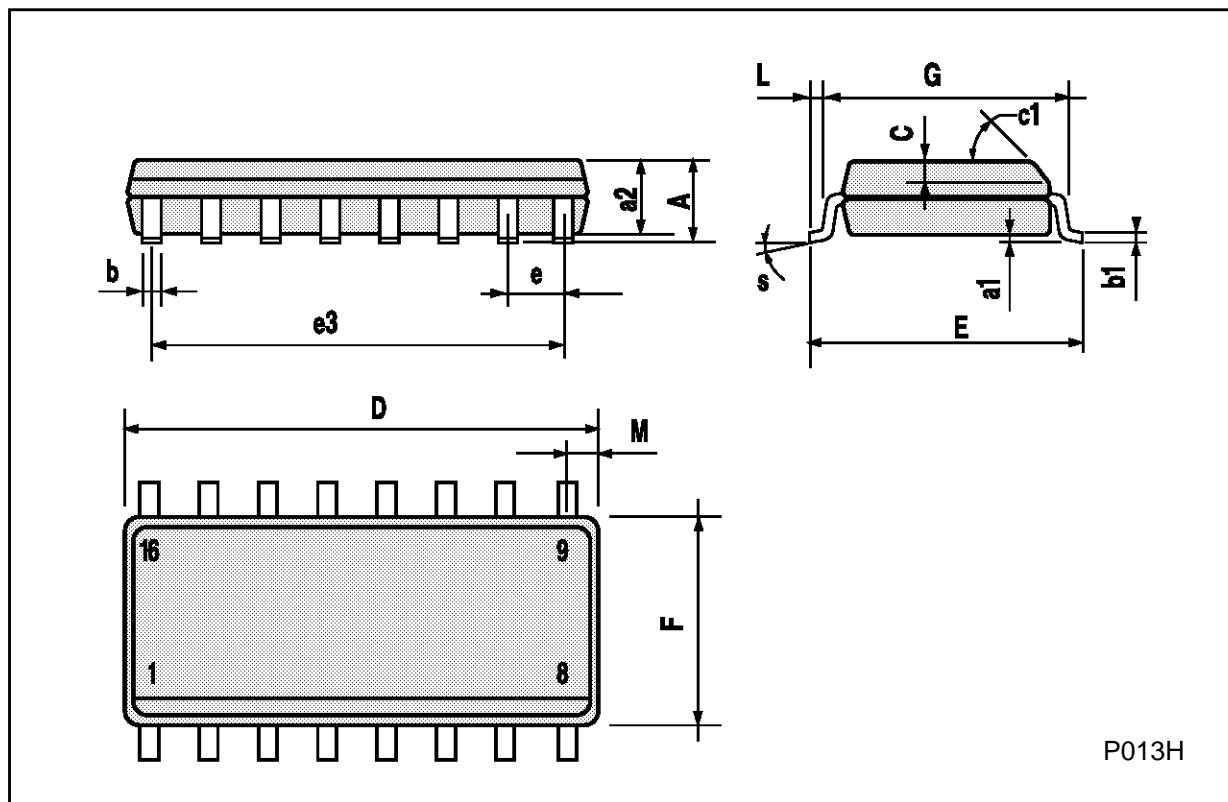
Ceramic DIP16/1 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
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	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



## SO16 (Narrow) MECHANICAL DATA

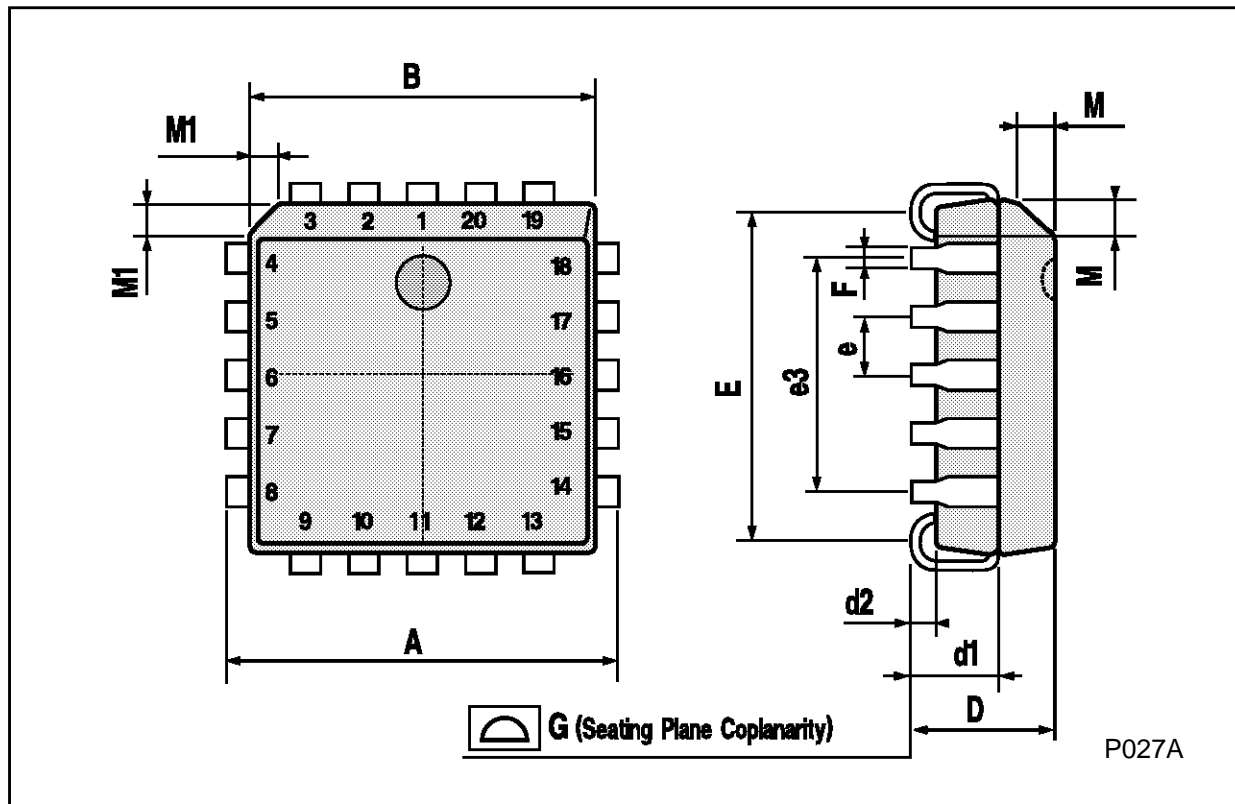
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



P013H

**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	



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