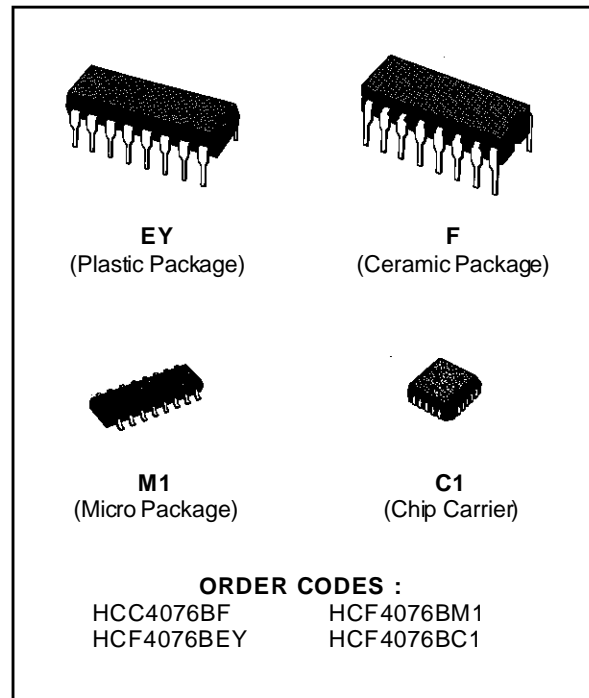


## 4 BIT D TYPE REGISTERS

- THREE STATE OUTPUTS
- INPUT DISABLE WITHOUT GATING THE CLOCK
- GATED OUTPUT CONTROL LINES FOR ENABLING OR DISABLING THE OUTPUTS
- 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"

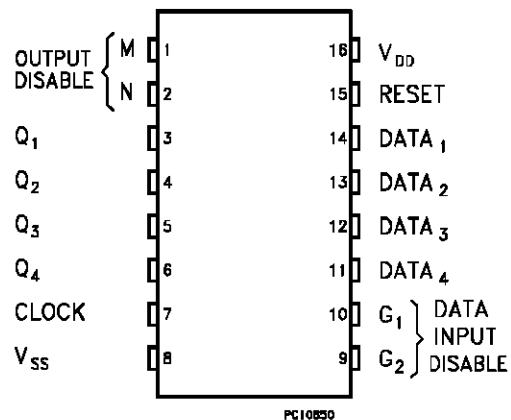


### DESCRIPTION

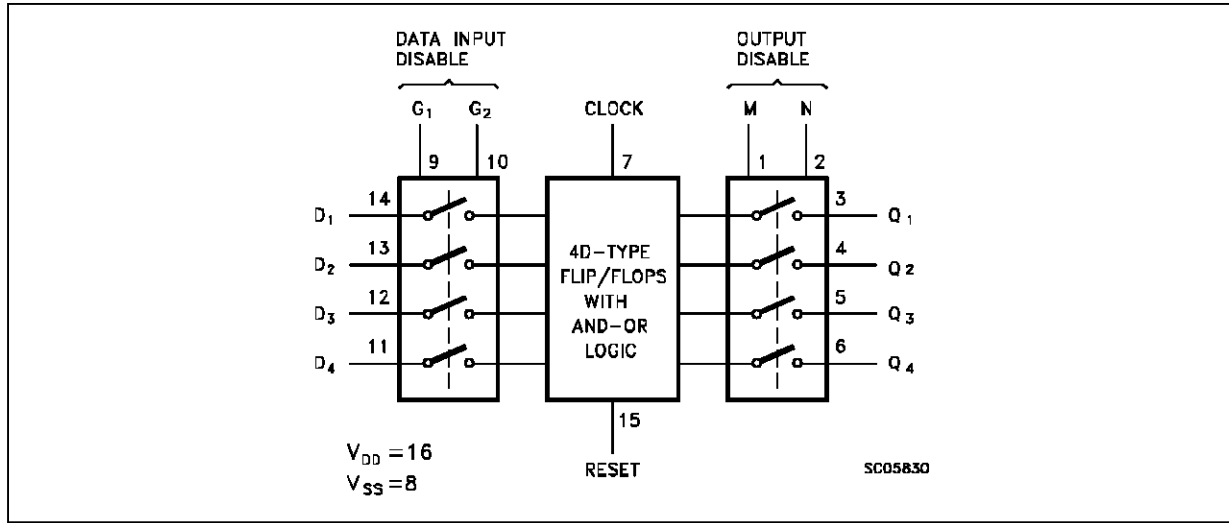
The **HCC4076B** (extended temperature range) and **HCC4076B** (intermediate temperature range) are monolithic integrated circuit, available in 16 lead dual in line plastic or ceramic package and plastic micropackage.

The **HCC/HCF4076B** types are four-bit registers consisting of D-type flip-flops that feature three-state outputs. Data Disable inputs are provided to control the entry of data into the flip-flops. When both Data Disable inputs are low, data at the D inputs are loaded into their respective flip-flops on the next positive transition of the clock input. Output Disable inputs are also provided. When the Output Disable inputs are both low, the normal logic states of the four outputs are available to the load. The outputs are disabled independently of the clock by a high logic level at either Output Disable input, and present a high impedance.

### PIN CONNECTIONS



FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V <sub>DD</sub> *	Supply Voltage: <b>HCC</b> Types <b>HCF</b> Types	-0.5 to +20 -0.5 to +18	V V
V <sub>i</sub>	Input Voltage	-0.5 to V <sub>DD</sub> + 0.5	V
I <sub>i</sub>	DC Input Current (any one input)	± 10	mA
P <sub>tot</sub>	Total Power Dissipation (per package) Dissipation per Output Transistor for T <sub>op</sub> = Full Package Temperature Range	200 100	mW mW
T <sub>op</sub>	Operating Temperature: <b>HCC</b> Types <b>HCF</b> Types	-55 to +125 -40 to +85	°C °C
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C

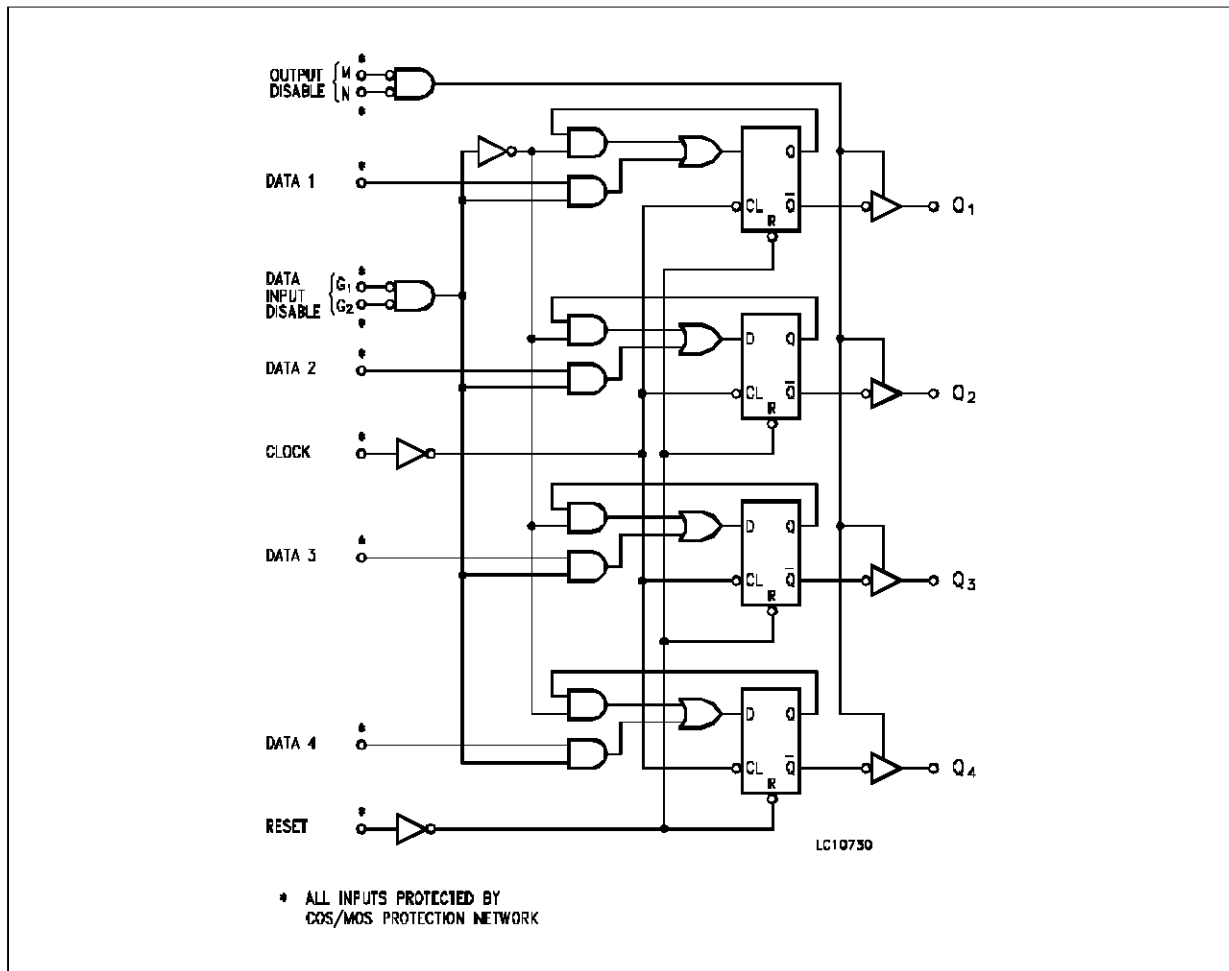
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure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

\* All voltage values are referred to V<sub>SS</sub> pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V <sub>DD</sub>	Supply Voltage: <b>HCC</b> Types <b>HCF</b> Types	3 to 18 3 to 15	V V
V <sub>i</sub>	Input Voltage	0 to V <sub>DD</sub>	V
T <sub>op</sub>	Operating Temperature: <b>HCC</b> Types <b>HCF</b> Types	-55 to +125 -40 to +85	°C °C

LOGIC DIAGRAM



TRUTH TABLE

RESET	CLOCK	DATA INPUT DISABLE		DATA D	NEXT STATE OUTPUT G	
		G1	G2			
1	X	X	X	X	0	
0	0	X	X	X	Q	NC
0		1	X	X	Q	NC
0		X	1	X	Q	NC
0		0	0	1	1	
0		0	0	0	0	
0	1	X	X	X	Q	NC
0		X	X	X	Q	NC

When either Output Disable M or N is high, the outputs are disabled (high impedance state); however sequential operation of the flip-flop is not affected. 1 = High Level, 0 = Low Level, X = Don't Care, NC = No Change

**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	0.61		0.44	1		0.36		
			0/10	0.5		10	1.		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	0/18	Any Input		18		$\pm 0.1$		$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$	$\mu$ A	
		0/15	Any Input		15		$\pm 0.3$		$\pm 10^{-5}$	$\pm 0.3$		$\pm 1$	$\mu$ A	
I <sub>OH</sub> , I <sub>OL</sub>	Input Leakage Current	HCC Types	0/18	0/18		18		$\pm 0.4$		$\pm 10^{-4}$	$\pm 0.4$		$\pm 12$	$\mu$ A
		HCF Types	0/15	0/15		15		$\pm 1.0$		$\pm 10^{-4}$	$\pm 1.0$		$\pm 7.5$	$\mu$ A
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.

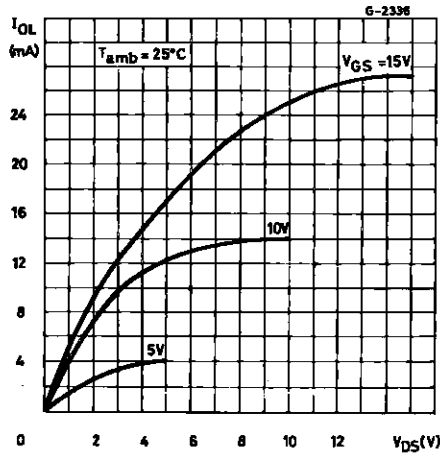
\* T<sub>HIGH</sub> = +125 °C for HCC device; +85 °C for HCF device.

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

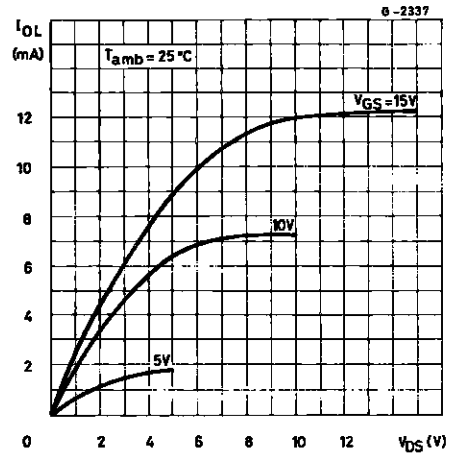
**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ K}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $03\text{ } \%/^{\circ}\text{C}$ , all input rise and fall times =  $20\text{ ns}$ )

Symbol	Parameter	Test Conditions	Value			Unit	
			$V_{DD}$ (V)	Min.	Typ.		Max.
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (Clock to Q Output)		5		300	600	ns
			10		125	250	
			15		90	180	
$t_{PHL(R)}$	Propagation Delay Time (Reset)		5		230	460	ns
			10		100	200	
			15		75	150	
$t_{P(1-H)}$ $t_{P(0-H)}$	3-State Output 1 or 0 to High Impedance	$R_L = 1\text{K}\Omega$	5		150	300	ns
			10		75	150	
			15		60	120	
$t_{P(H-1)}$ $t_{P(L-1)}$	3-State High Impedance to 1 or 0 Output	$R_L = 1\text{K}\Omega$	5		150	300	ns
			10		75	150	
			15		60	120	
$t_w$	Clock Pulse Width		5	200	100		ns
			10	100	50		
			15	80	40		
$t_w$	Reset Pulse Width		5	120	60		ns
			10	50	25		
			15	40	20		
$t_{setup}$	Data Setup Time		5	200	100		ns
			10	80	40		
			15	60	30		
$t_{setup}$	Data Input Disable Setup Time		5	180	90		ns
			10	100	50		
			15	70	35		
$f_{max}$	Maximum Clock Frequency		5	3	6		MHz
			10	6	12		
			15	8	16		
$t_r, t_f$	Clock Input Rise or Fall Time		5	15			$\mu\text{s}$
			10	5			
			15	5			

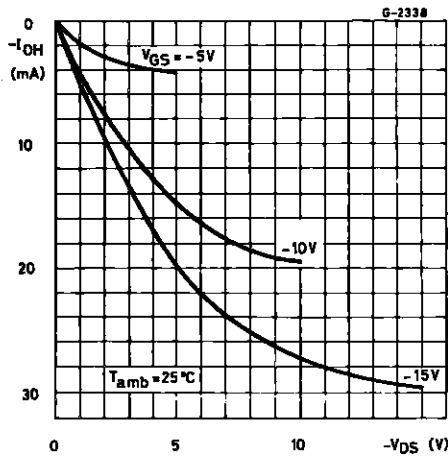
Typical Output Low (sink) Current Characteristics



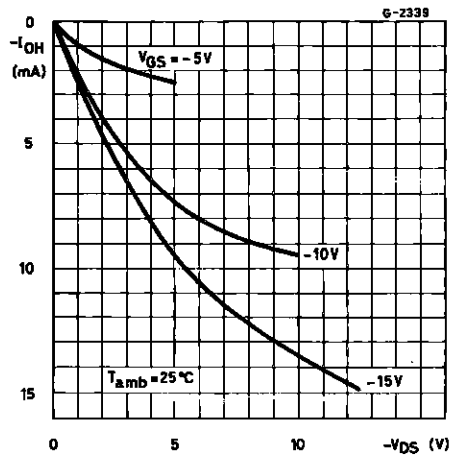
Minimum Output Low (sink) Current Characteristics



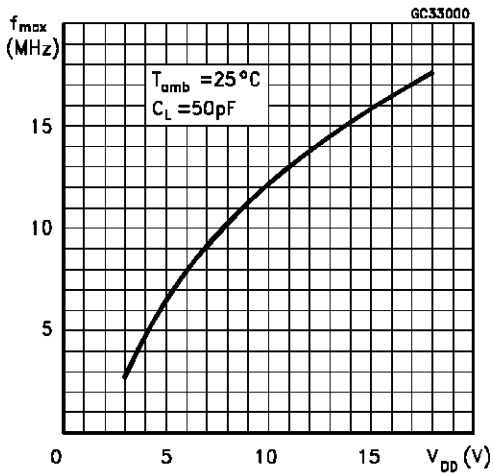
Typical Output High (source) Current Characteristics



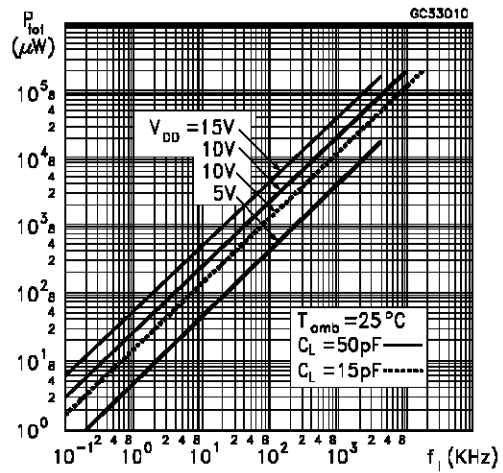
Minimum Output High (source) Current Characteristics



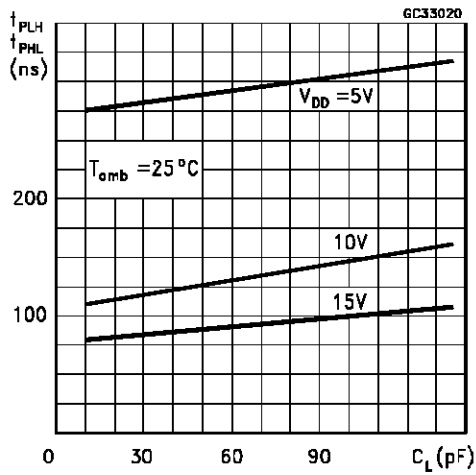
Typical Maximum Clock Input Frequency vs Supply Voltage



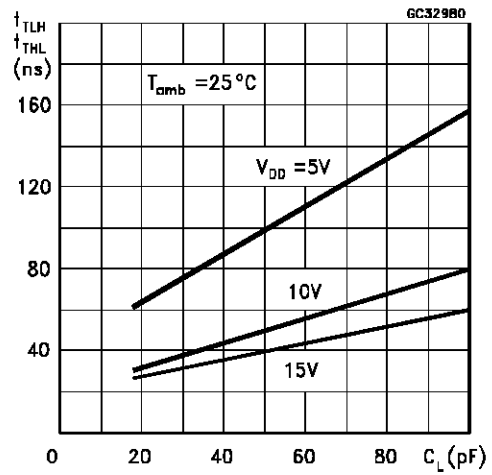
Typical Dynamic Power Dissipation vs Frequency



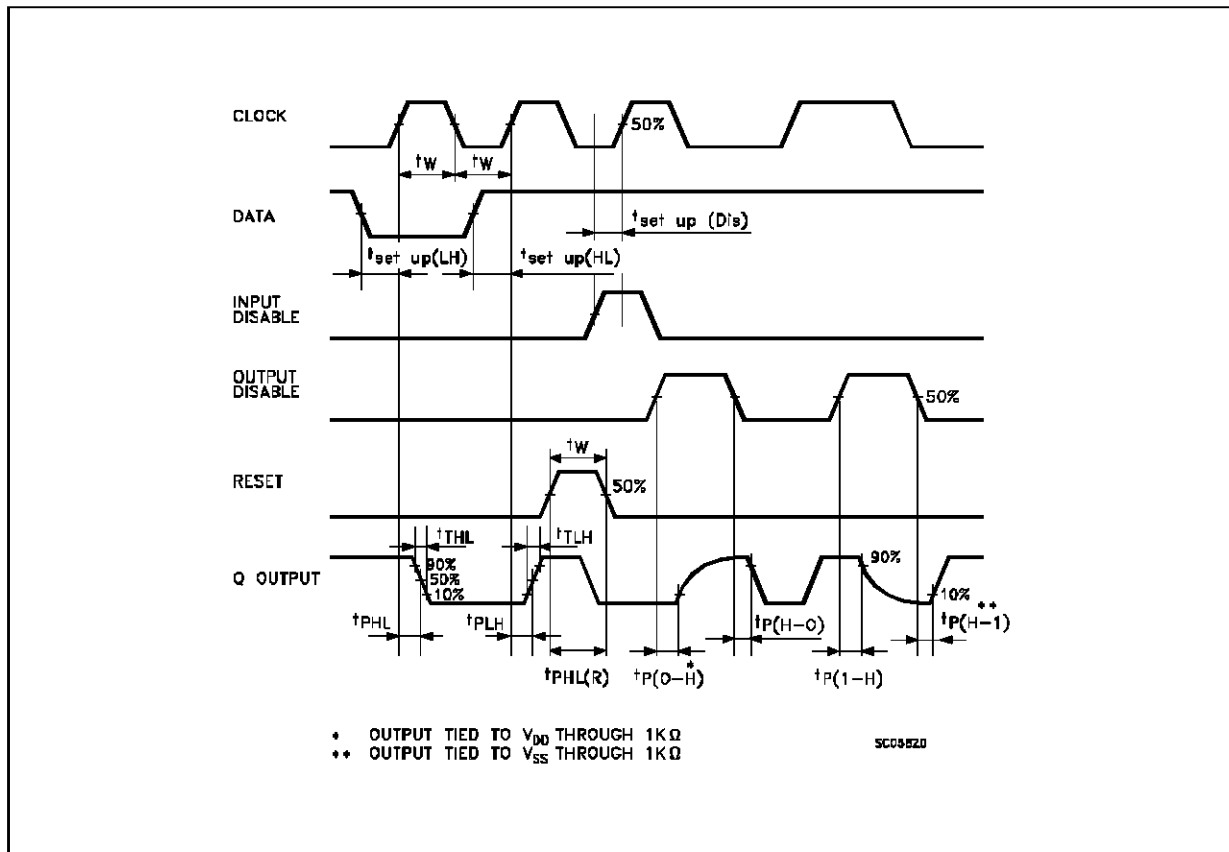
Typical Propagation Delay Time vs Capacitance



Typical Transition Time vs Load Capacitance

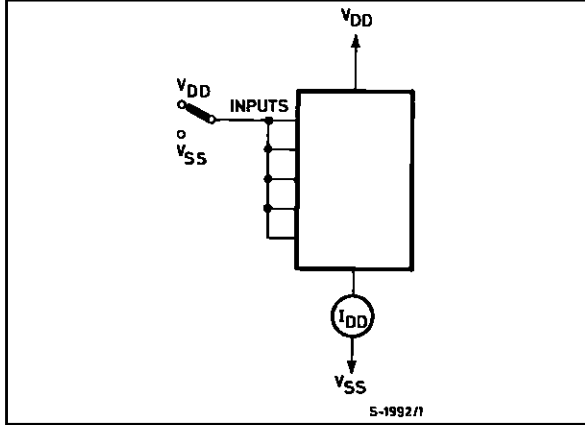


WAVEFORMS

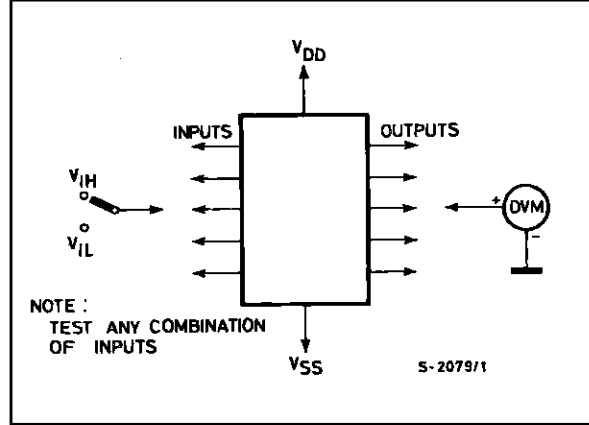


TEST CIRCUITS

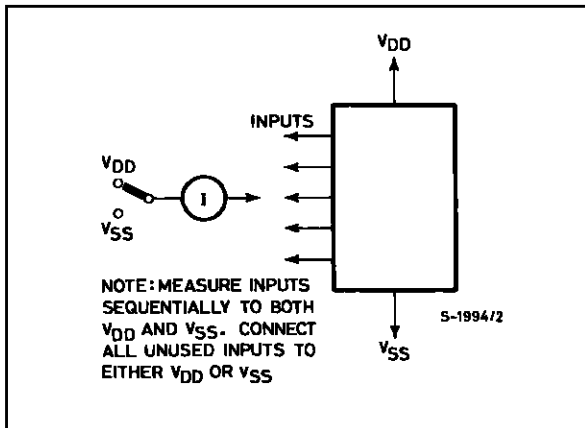
Quiescent Device Current



Noise Immunity.



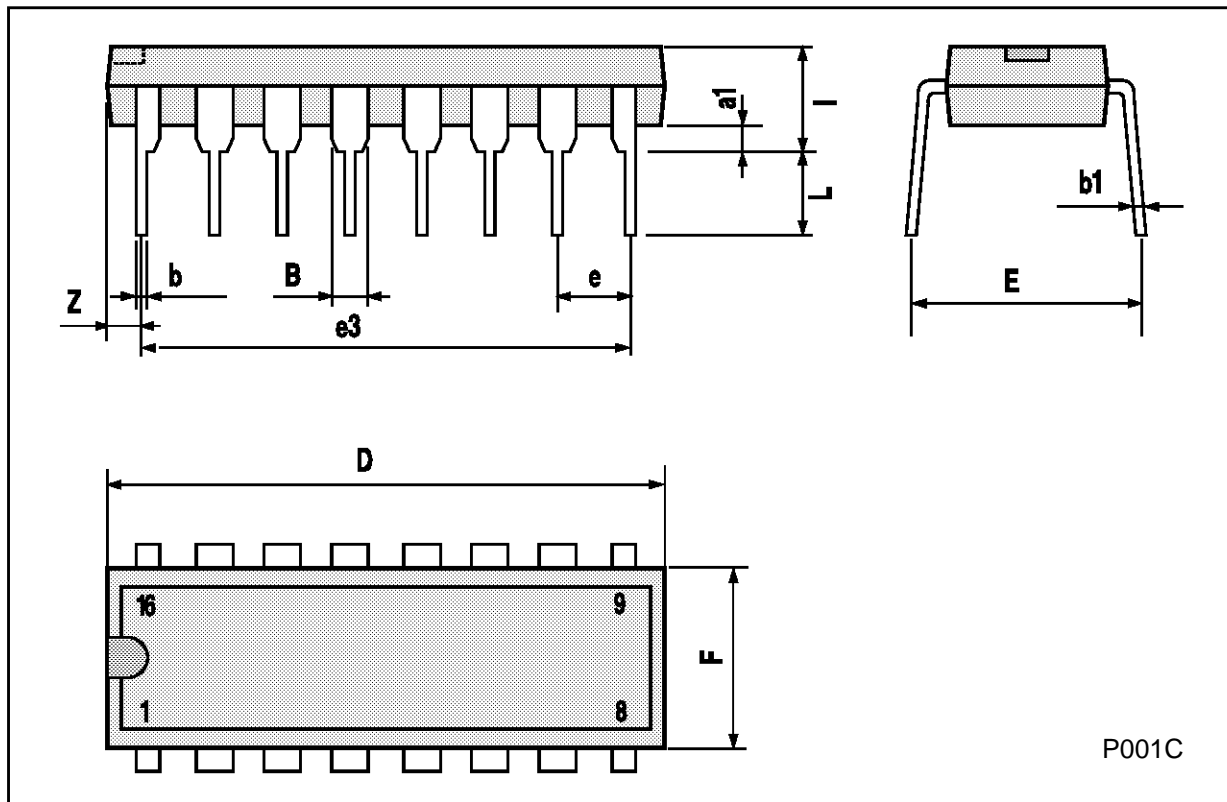
Input Leakage Current.





**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



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	



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