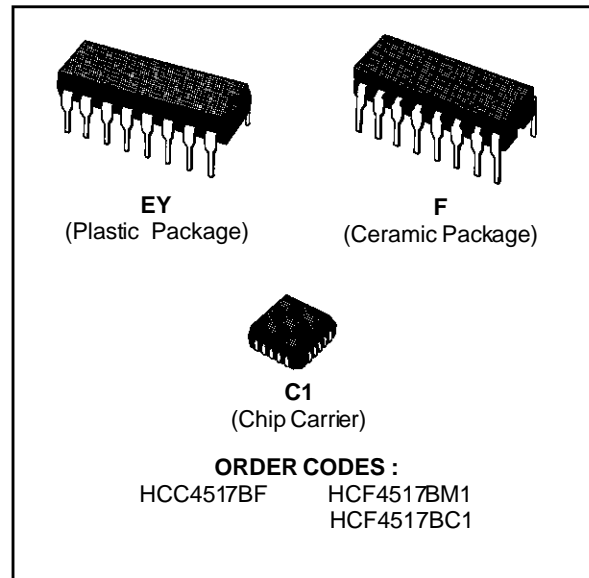


## DUAL 64-STAGE STATIC SHIFT REGISTER

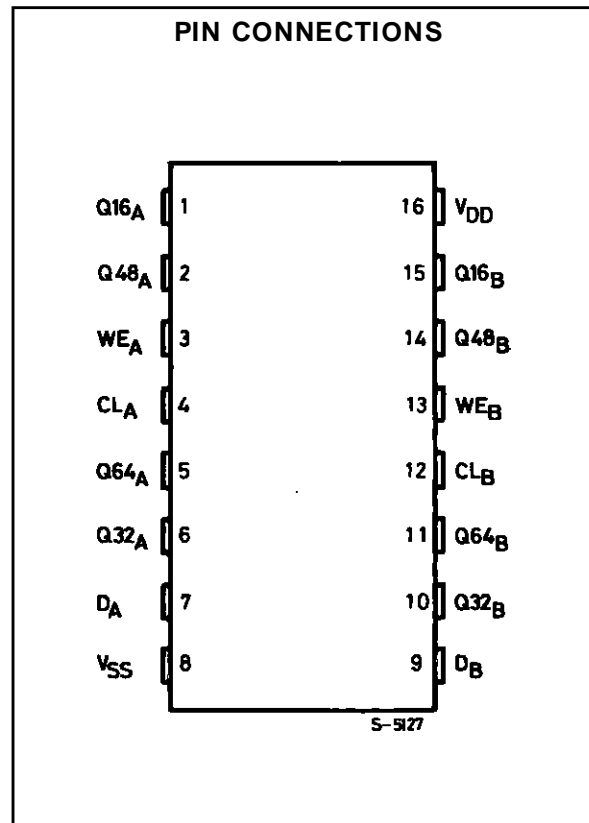
- CLOCK FREQUENCY 12MHz (TYP.) AT  $V_{DD} = 10V$
- SCHMITT TRIGGER CLOCK INPUTS ALLOW OPERATION WITH VERY SLOW CLOCK RISE AND FALL TIMES
- THREE-STATE OUTPUTS
- QUIESCENT CURRENT SPECIFIED AT 20V FOR HCC DEVICE
- STANDARDIZED, SYMMETRICAL OUTPUT CHARACTERISTICS
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURREN 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"



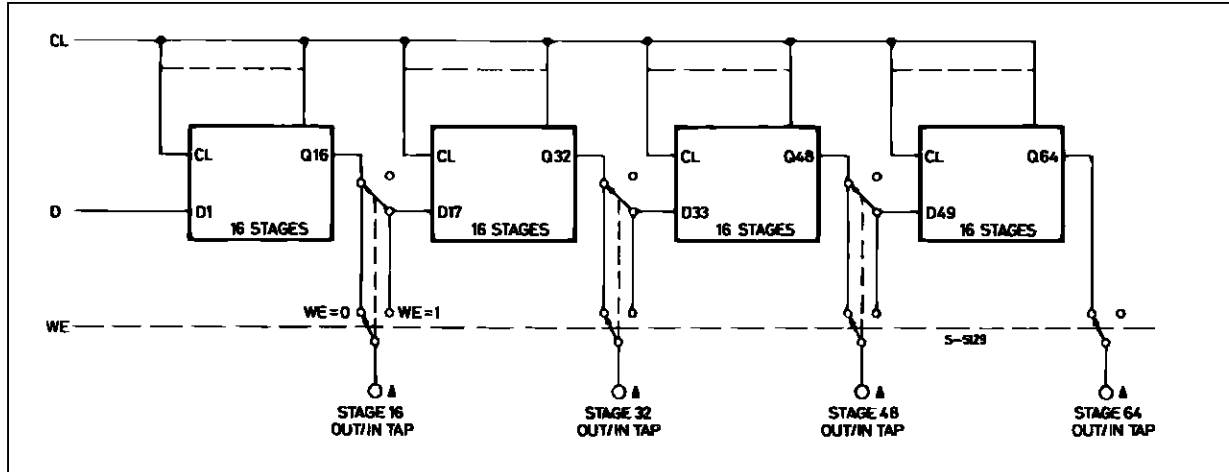
### DESCRIPTION

The **HCC4517B** (extended temperature range) and **HCF4517B** (intermediate temperature range) are monolithic integrated circuits, available in 16-lead dual in-line plastic or ceramic package.

The **HCC/HCF4517B** dual 64-stage static shift register consists of two independent registers each having a clock, data, and write enable input and outputs accessible at taps following the 16th, 32nd, 48th, and 64th stages. These taps also serve as input points allowing data to be inputted at the 17th, 33rd, and 49th stages when the write enable input is a logic 1 and the clock goes through a low-to-high transition. The truth table indicates how the clock and write enable inputs control the operation of the **HCC/HCF4517B**. Inputs at the intermediate taps allow entry of 64 bits into the register with 16 clock pulses. The 3-state outputs permit connection of this device to an external bus.



FUNCTIONAL DIAGRAM (one half)



ABSOLUTE MAXIMUM RATINGS

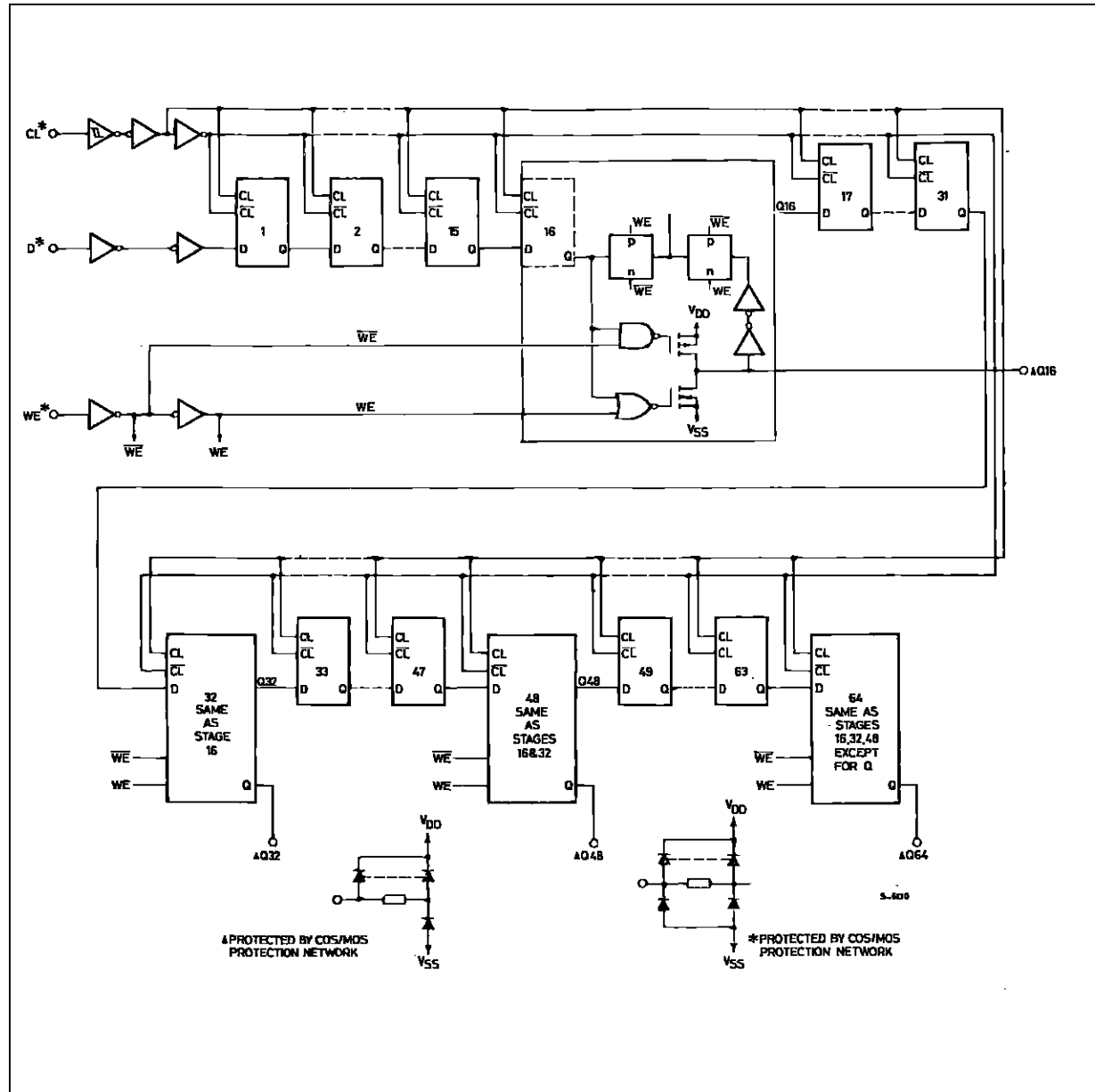
Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage : HCC Types HCF Types	- 0.5 to + 20 - 0.5 to + 18	V V
$V_i$	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
$I_i$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package)	200	mW
	Dissipation per Output Transistor for $T_{op} =$ Full Package-temperature Range	100	mW
$T_{op}$	Operating Temperature : HCC Types HCF Types	- 55 to + 125	$^{\circ}C$
		- 40 to + 85	$^{\circ}C$
$T_{stg}$	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 extended periods may affect device reliability.  
\* All voltages are with respect to  $V_{SS}$  (GND).

RECOMMENDED OPERATING CONDITIONS

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

LOGIC DIAGRAM AND TRUTH TABLE



Clock	Write Enable	Data	Stage 16 Tap	Stage 32 Tap	Stage 48 Tap	Stage 64 Tap
0	0	X	Q16	Q32	Q48	Q64
0	1	X	Z	Z	Z	Z
1	0	X	Q16	Q32	Q48	Q64
1	1	X	Z	Z	Z	Z
⌊	0	Di In	Q16	Q32	Q48	Q64
⌊	1	Di In	D17 In	D33 In	D49 In	Z
⌋	0	X	Q16	Q32	Q48	Q64
⌋	1	X	Z	Z	Z	Z

**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	
			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			
		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		
		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			
			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		
			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		
			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		
			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		$\pm 0.1$	$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$		
		HCF Types	0/15										15	
I <sub>OH</sub> , I <sub>OL</sub>	3-State Output Leakage Current	HCC Types	0/18			18		$\pm 0.4$	$\pm 10^{-4}$	$\pm 0.4$		$\pm 12$		
		HCF Types	0/18			15		$\pm 1.0$	$\pm 10^{-4}$	$\pm 1.0$		$\pm 7.5$		
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.

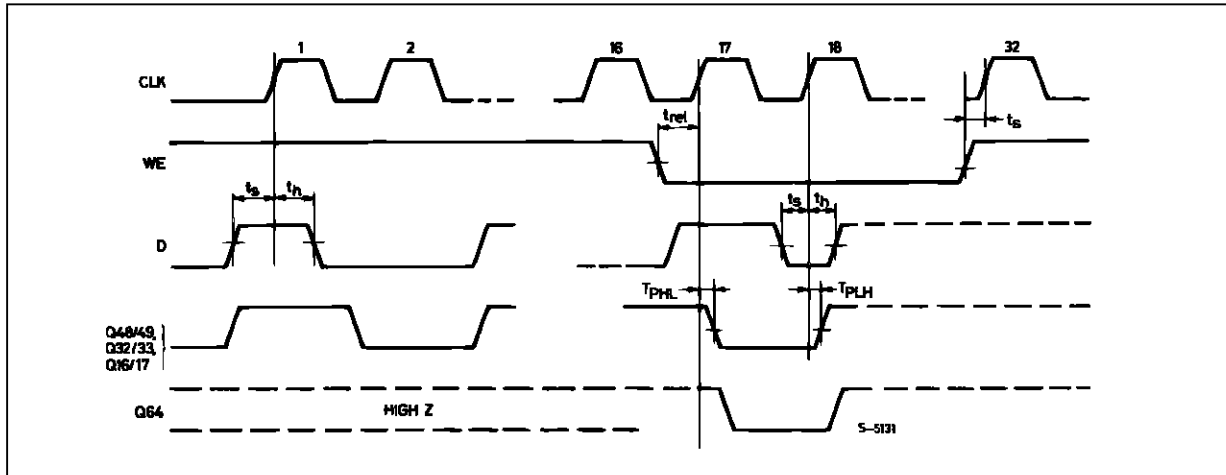
The Noise Margin for both "1" and "0" level is : 1V min. with V<sub>DD</sub> = 5V, 2V min. with V<sub>DD</sub> = 10V, 2.5V min. with V<sub>DD</sub> = 15V,

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ , Input  $t_r, t_f = 20\text{ns}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ )

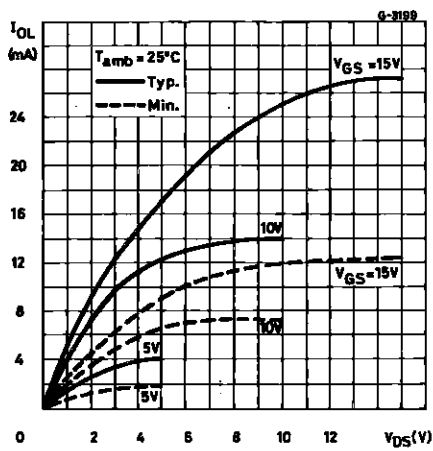
Symbol	Parameter	Test Conditions		Value			Unit
			V <sub>DD</sub> (V)	Min.	Typ.	Max.	
t <sub>PHL</sub> , t <sub>PLH</sub>	Propagation Delay Time : CL to Bit 16 Tap		5		200	400	ns
			10		110	220	
			15		90	180	
t <sub>PLZ</sub> , t <sub>PHZ</sub> t <sub>PZL</sub> , t <sub>PZH</sub>	3-State Output WE to Bit 16 Tap (see note)		5		75	150	ns
			10		40	80	
			15		30	60	
t <sub>THL</sub> , t <sub>TLH</sub>	Output Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	
t <sub>setup</sub>	Write Enable to Clock		5	- 100	- 50		ns
			10	- 50	- 25		
			15	- 30	- 15		
t <sub>setup</sub>	Data to Clock		5	- 100	- 50		ns
			10	- 60	- 30		
			15	- 30	- 15		
	Write Enable to Clock Release Time		5		50	100	ns
			10		25	50	
			15		20	40	
t <sub>hold</sub>	Data to Clock		5		100	200	ns
			10		50	100	
			15		25	50	
t <sub>w</sub>	Minimum Clock Pulse Width		5		90	180	ns
			10		40	80	
			15		25	50	
f <sub>CL</sub>	Maximum Clock Input Frequency		5	3	6		MHz
			10	6	12		
			15	8	15		
t <sub>r</sub> , t <sub>f</sub>	Maximum Clock Input Rise or Fall Time		5	UNLIMITED			μs
			10				
			15				

**Note** : Measured at the point of 10% change in output load of 50pF,  $R_L = 1\text{k}\Omega$  to  $V_{DD}$  for t<sub>PZL</sub>, t<sub>PLZ</sub> and  $R_L = 1\text{k}\Omega$  to  $V_{SS}$  for t<sub>PHZ</sub>.

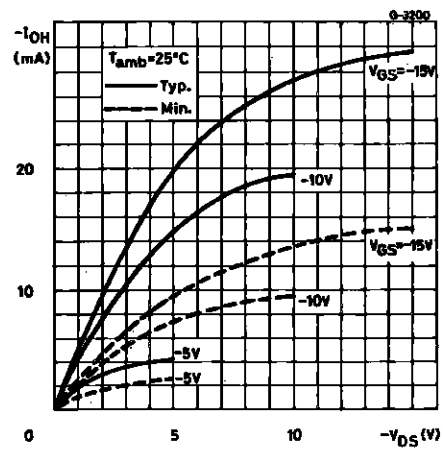
WAVEFORMS



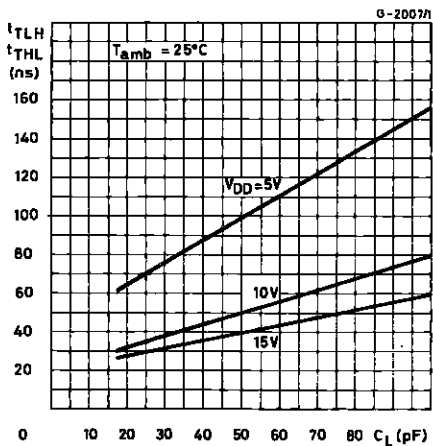
Output Low (sink) Current Characteristics.



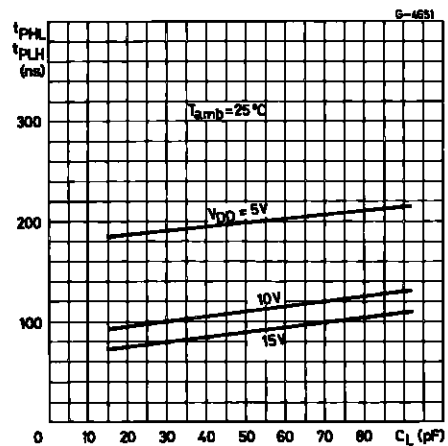
Output High (source) Current Characteristics.



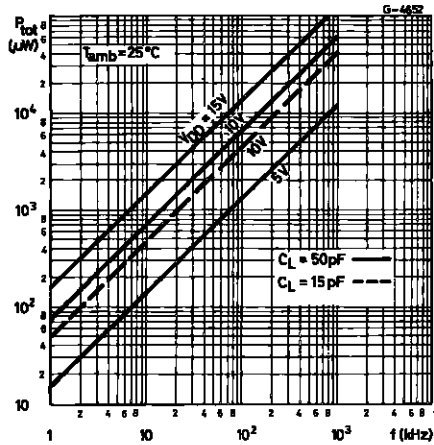
Typical Transition Time vs. Load Capacitance.



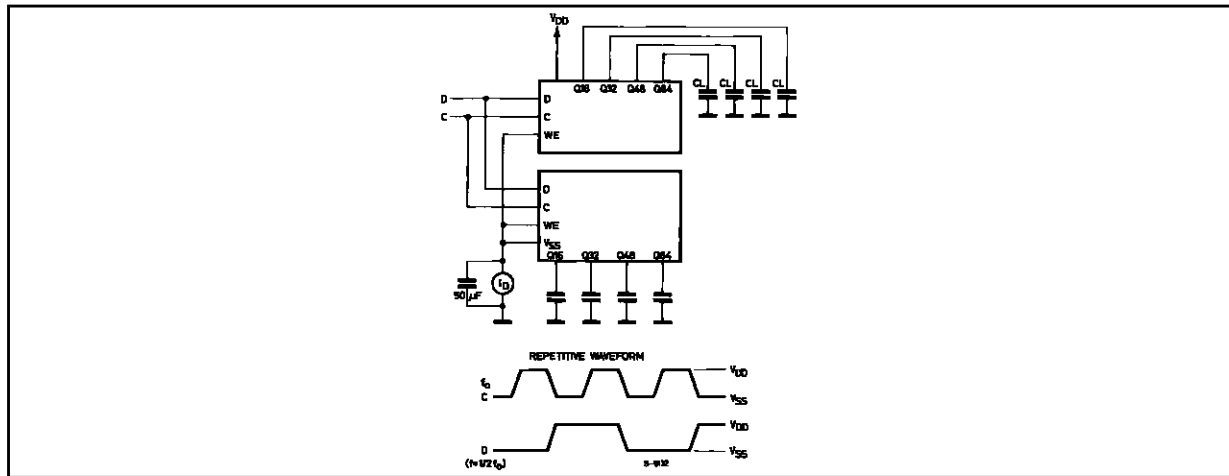
Typical Propagation Delay Time vs. Load Capacitance.



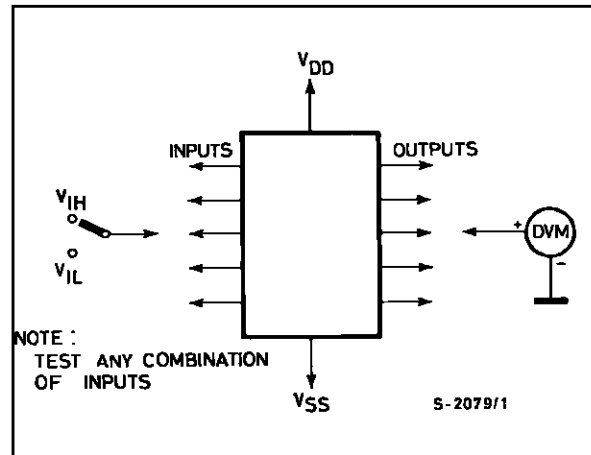
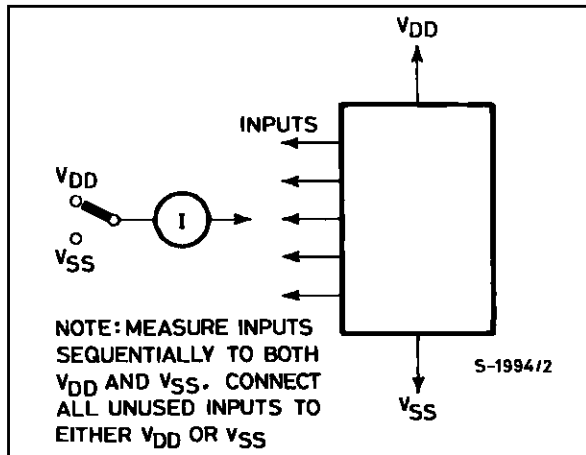
Typical Dynamic Power Dissipation vs. Frequency.



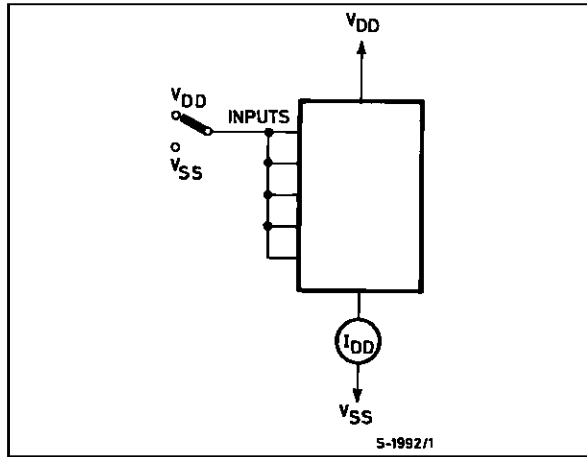
Dynamic Power Dissipation and Waveforms.



TEST CIRCUITS



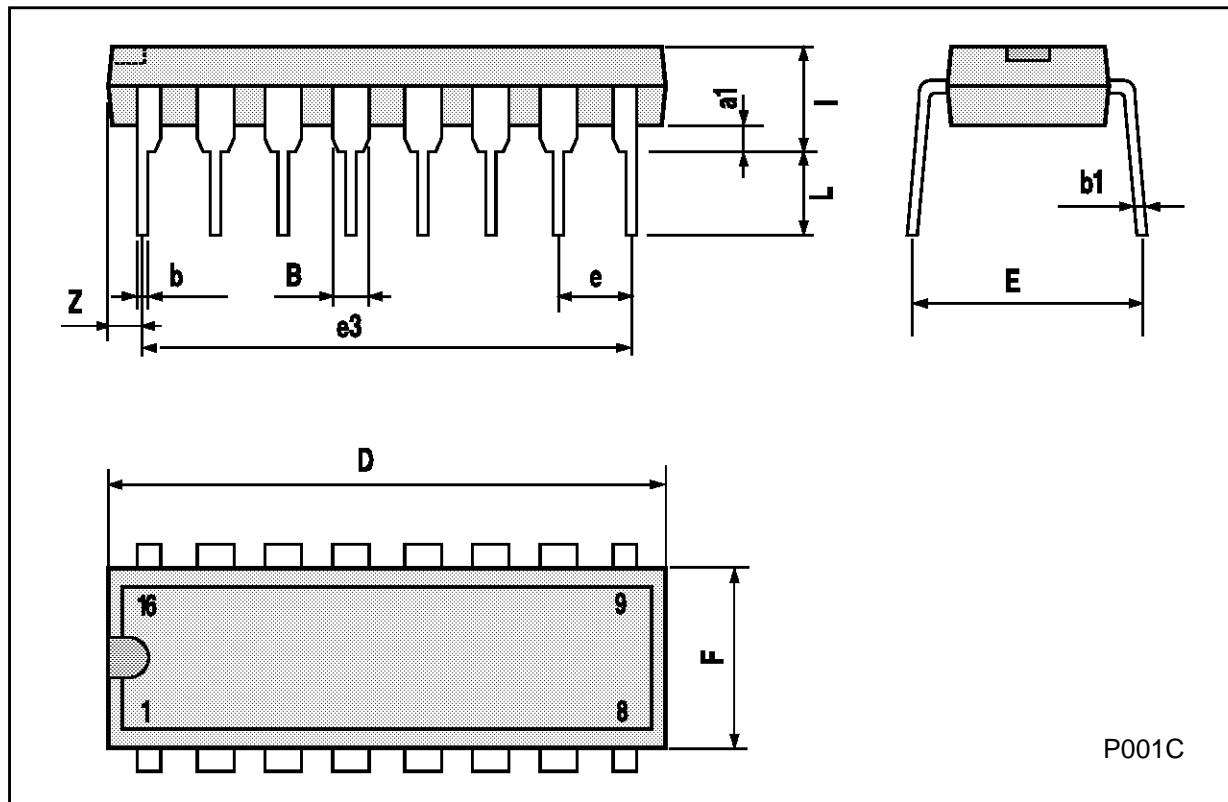
TEST CIRCUITS (continued)





### Plastic DIP16 (0.25) MECHANICAL DATA

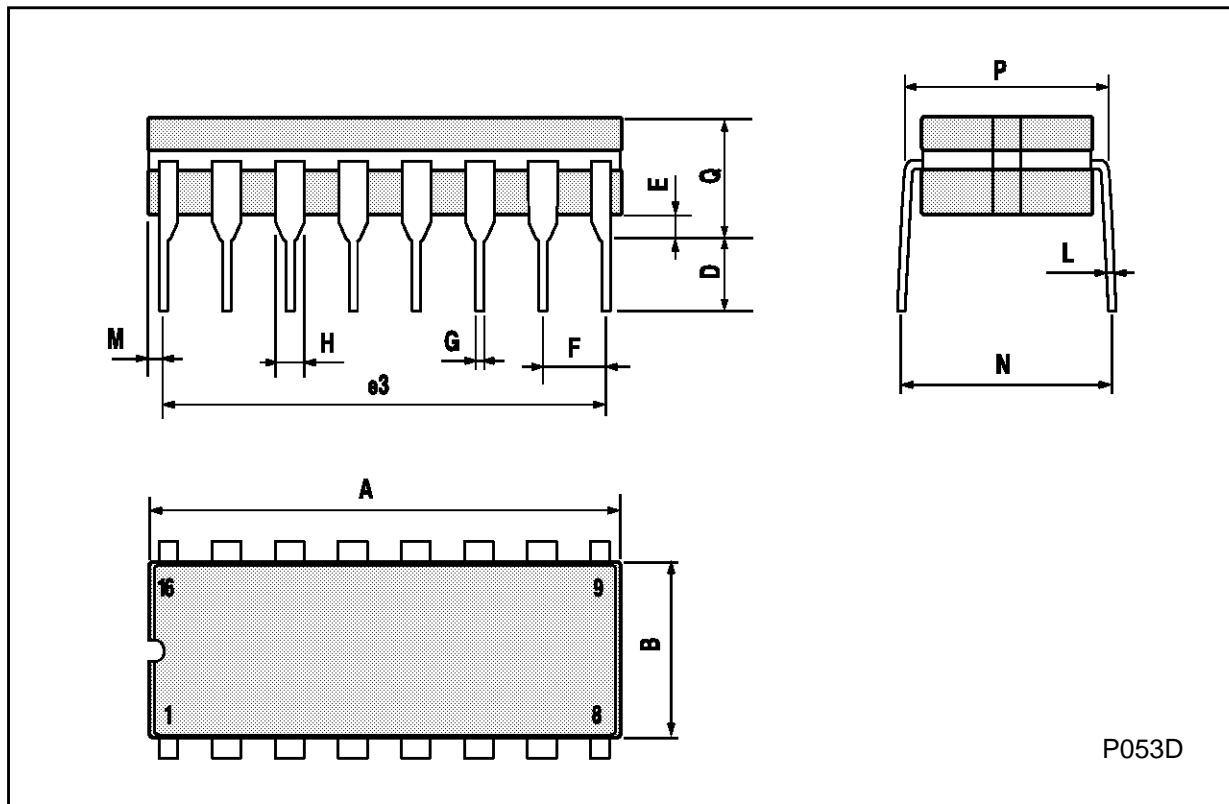
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

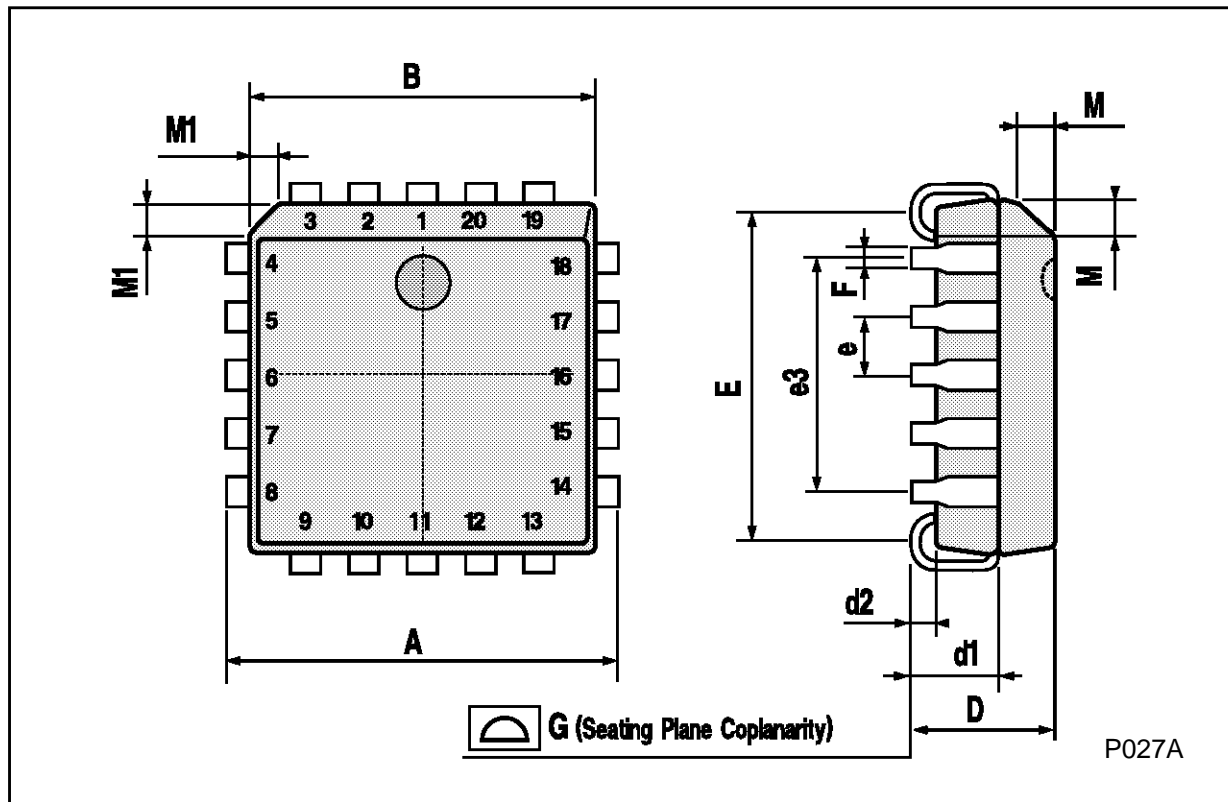
**Ceramic DIP16/1 MECHANICAL DATA**

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



## 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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