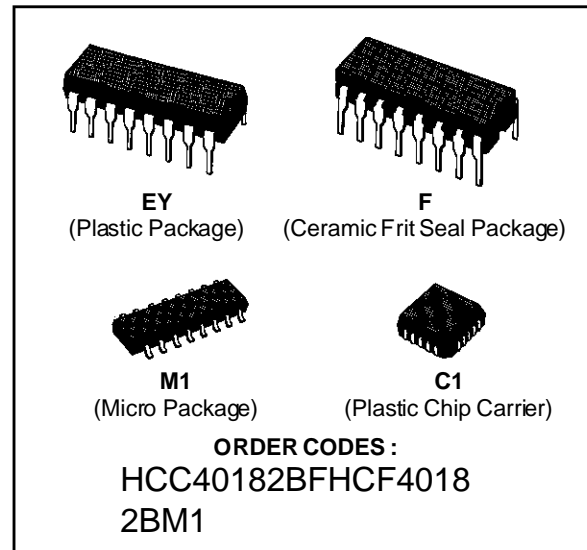


## LOOK-AHEAD CARRY GENERATOR

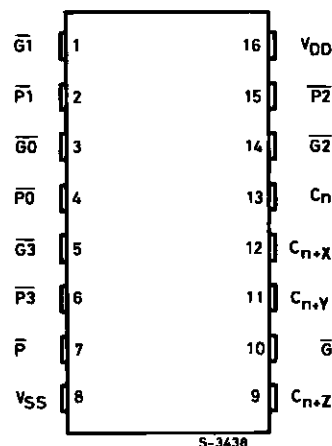
- GENERATES HIGH-SPEED CARRY ACROSS FOUR ADDERS OF ADDER GROUPS
- HIGH-SPEED OPERATIONAL :  $t_{PHL} = t_{PLH} = 100\text{ns}$  (typ.) @  $V_{DD} = 10\text{V}$
- CASCADABLE FOR FAST CARRIES OVER N BITS
- DESIGNED FOR USE WITH **HCC/HCF40181B** ALU
- STANDARDIZED, SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED AT 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 **HCC40182B** (extended temperature range) and **HCF40182B** (intermediate temperature range) are monolithic integrated circuits, available in 16-lead dual in-line plastic or ceramic package and plastic micro package. The **HCC/HCF40182B** is a high-speed look-ahead carry generator capable of anticipating a carry across four binary adders or groups of adders. The **HCC/HCF40182B** is cascadable to perform full look-ahead across n-bit adders. Carry, propagate-carry, and generate-carry functions are provided as enumerated in the terminal designation below. The **HCC/HCF40182B**, when used in conjunction with the **HCC/HCF40181B** arithmetic logic unit (ALU), provides full high-speed look-ahead carry capability for up to n-bit words. Each **HCC/HCF40182B** generates the look-ahead (anticipated carry) across a group of four ALU's. In addition, other **HCC/HCF40182B**'s may be employed to anticipate the carry across sections of four look-ahead blocks up to n-bits. Carry inputs and outputs of the **HCC/HCF40181B** are active-high logic, and carry-generate (G) and carry-propagate (P) outputs are active low. Therefore the inputs and outputs of the **HCC/HCF40182B** are compatible. The **HCC/HCF40182B** is similar to industry type MC14582.

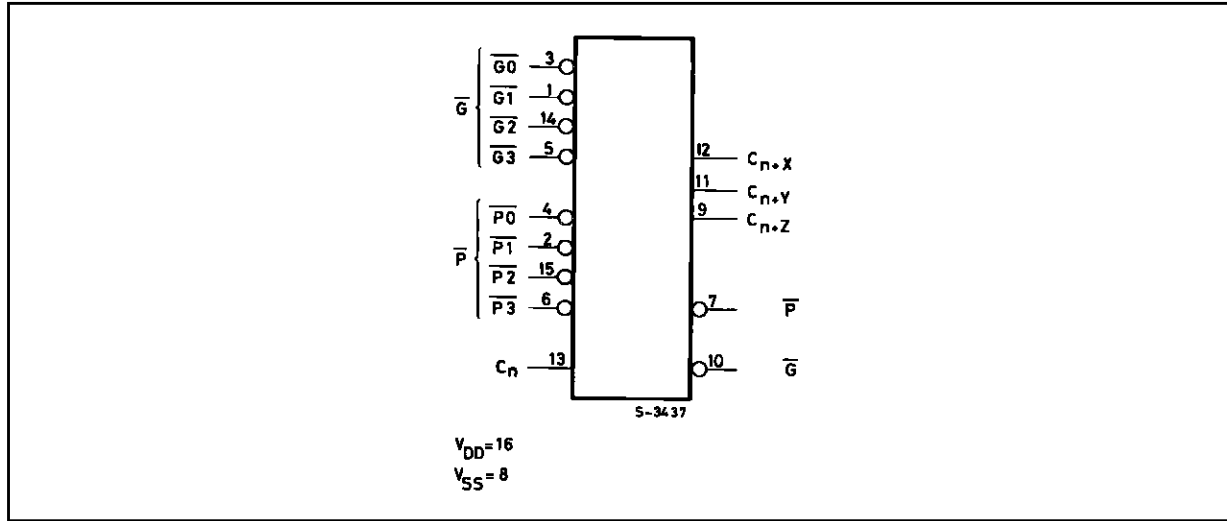


### PIN CONNECTIONS



# HCC/HCF40182B

## FUNCTIONAL DIAGRAM



## TERMINAL DESIGNATIONS TABLE

Pin Name	Pin	Function
$\overline{G0}, \overline{G1}, \overline{G2}, \overline{G3}$	3, 1, 14, 5	Active-low Carry-generate Inputs
$\overline{P0}, \overline{P1}, \overline{P2}, \overline{P3}$	4, 2, 15, 6	Active-low Carry-propagate Inputs
$C_n$	13	Active-high Carry Input
$C_{n+X}, C_{n+Y}, C_{n+Z}$	12, 11, 9	Active-high Carry Outputs
$\overline{G}$	10	Active-low Group Carry-generate Output
$\overline{P}$	7	Active-low Group Carry-propagate Output

## ABSOLUTE MAXIMUM RATINGS

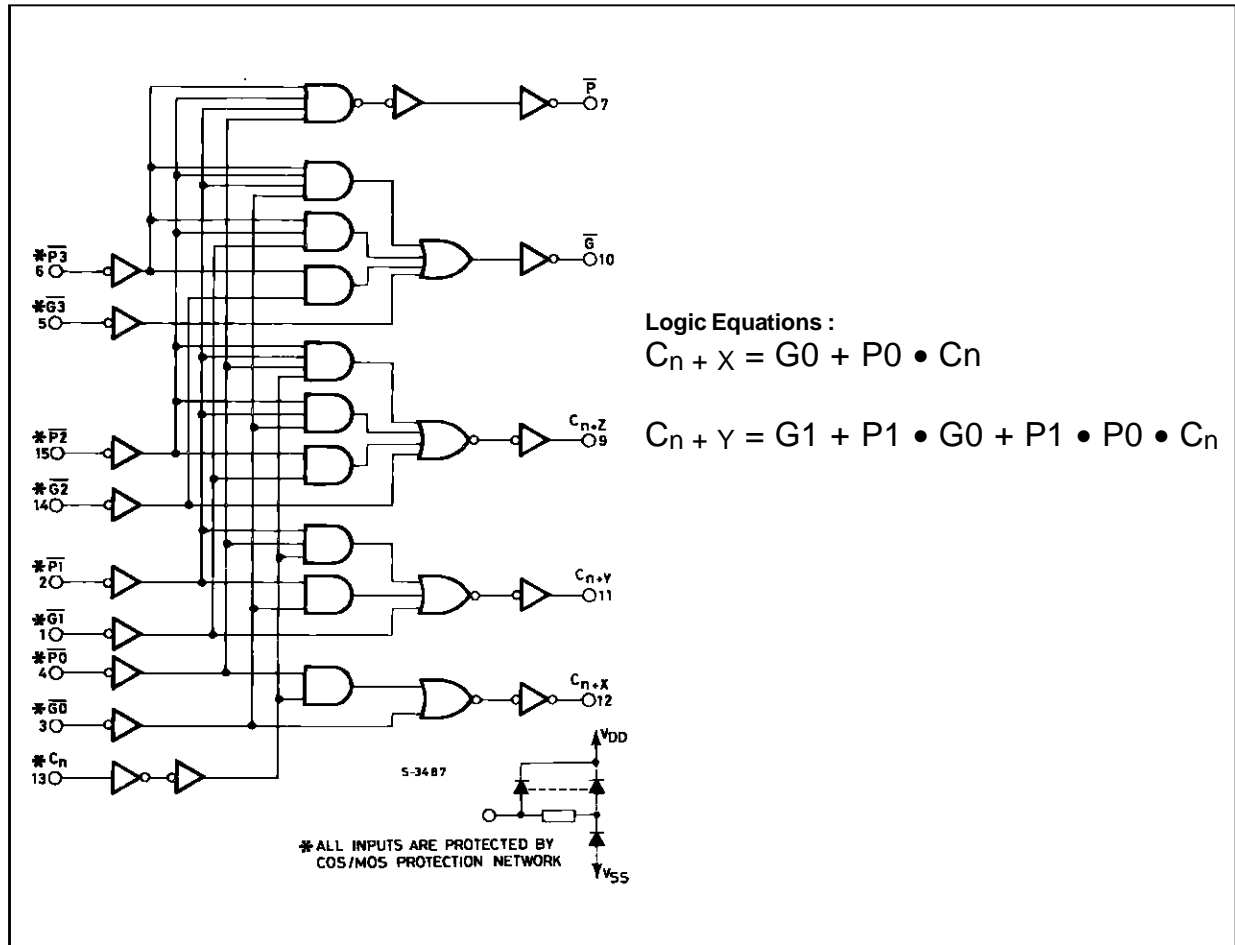
Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage : HCC Types HCF Types	- 0.5 to + 20	V
		- 0.5 to + 18	V
$V_i$	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
$I_i$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package) Dissipation per Output Transistor for $T_{op}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

RECOMMENDED OPERATING CONDITIONS

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

LOGIC DIAGRAM



# HCC/HCF40182B

## 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	5		4.95		V	
		0/10		< 1	10	9.95		9.95	10		9.95			
		0/15		< 1	15	14.95		14.95	15		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		$\pm 10^{-5}$	$\pm$ 0.1		$\pm$ 1	$\mu$ A
		HCF Types	0/15			15		$\pm$ 0.3		$\pm 10^{-5}$	$\pm$ 0.3		$\pm$ 1	
C <sub>I</sub>	Input Capacitance		Any Input						5	7.5			pF	

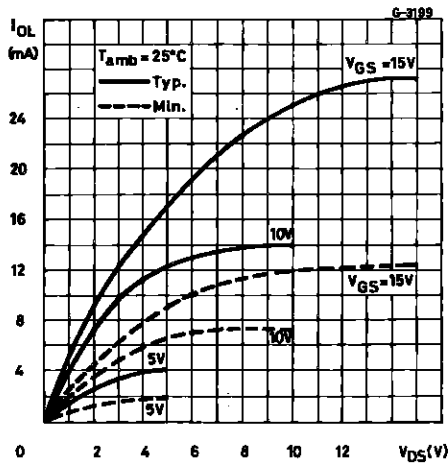
\* T<sub>Low</sub> = - 55°C for HCC device : - 40°C for HCF device.

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

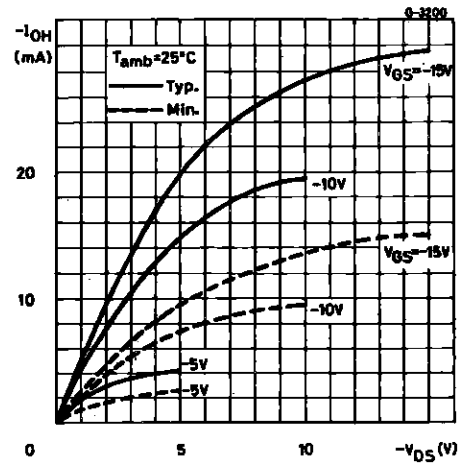
**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{k}\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is  $0.3\%/^{\circ}\text{C}$ , all input rise and fall time = 20ns)

Symbol	Parameter	Test Conditions		Value			Unit
			$V_{DD}$ (V)	Min.	Typ.	Max.	
$t_{PHL}$ $t_{PLH}$	Propagation Delay Time P, G, in to P G Out and Carry Outs		5		200	400	ns
			10		100	200	
			15		75	150	
	$C_n$ to Carry Outs		5		240	480	ns
			10		120	240	
			15		90	180	
$t_{THL}$ $t_{TLH}$	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

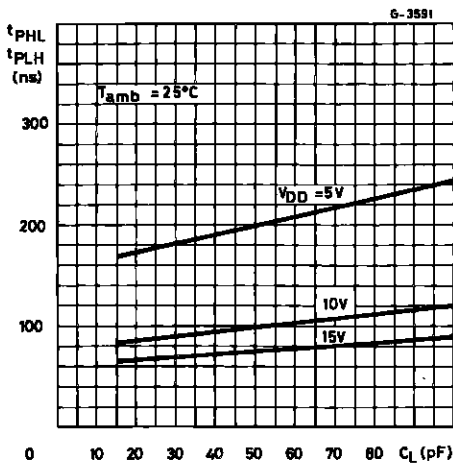
Output Low (sink) Current Characteristics.



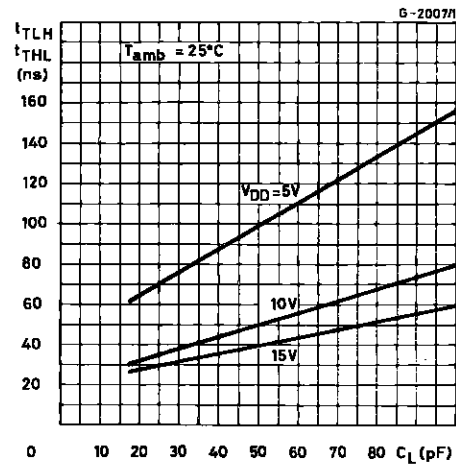
Output High (source) Current Characteristics.



Typical Propagation Delay Time (P, G In to P, G Out and Carry-outs) vs. Load Capacitance.

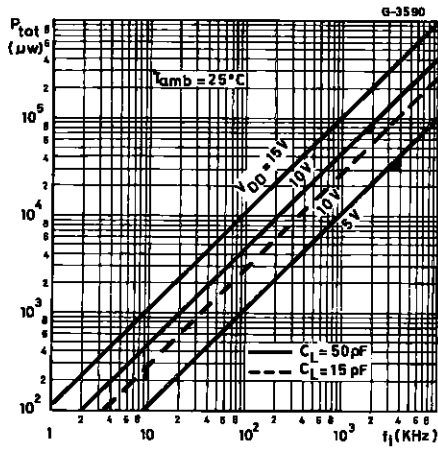


Typical Transition Time vs. Load Capacitance.



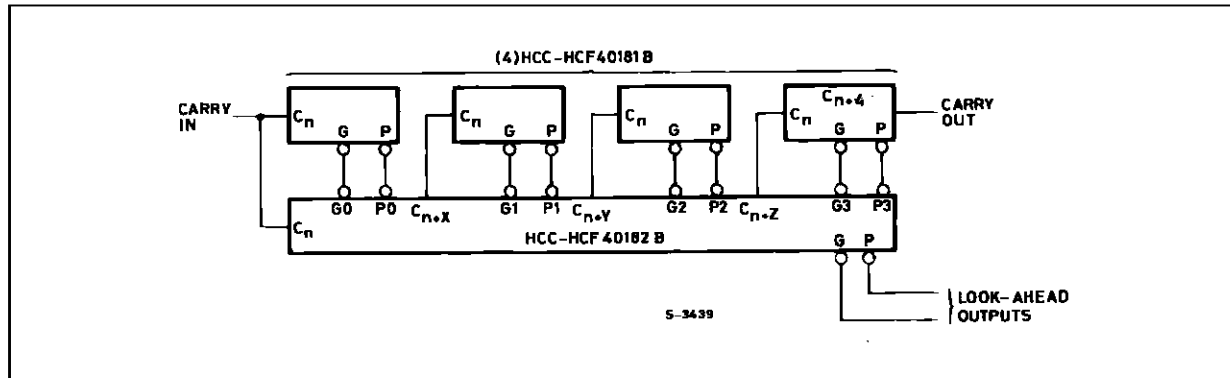
# HCC/HCF40182B

Typical Dynamic Power Dissipation vs. Input Frequency.

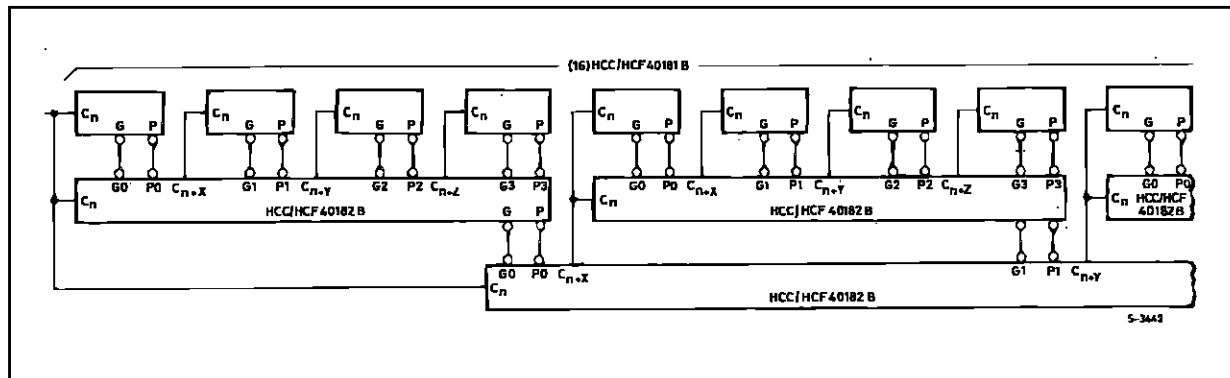


## TYPICAL APPLICATIONS

### 16-BIT TWO-LEVEL LOOK-AHEAD ALU

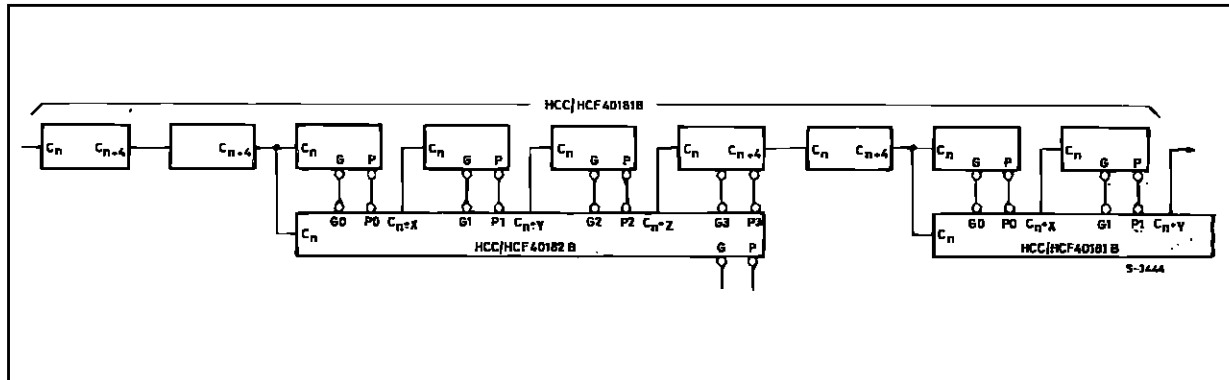


### 64-BIT FULL CARRY LOOK-AHEAD ALU IN 3 LEVELS



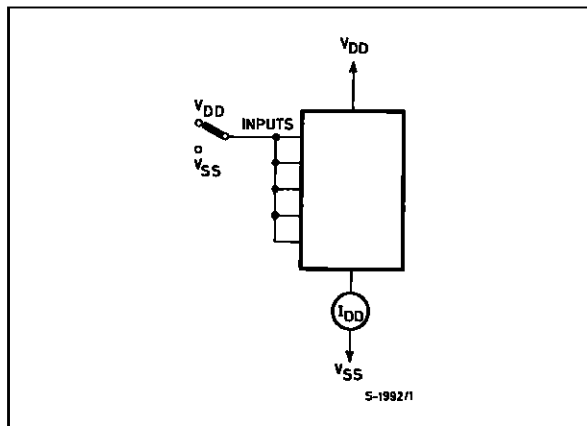
TYPICAL APPLICATIONS (continued)

COMBINED TWO-LEVEL LOOK-AHEAD AND RIPPLE-CARRY ALU

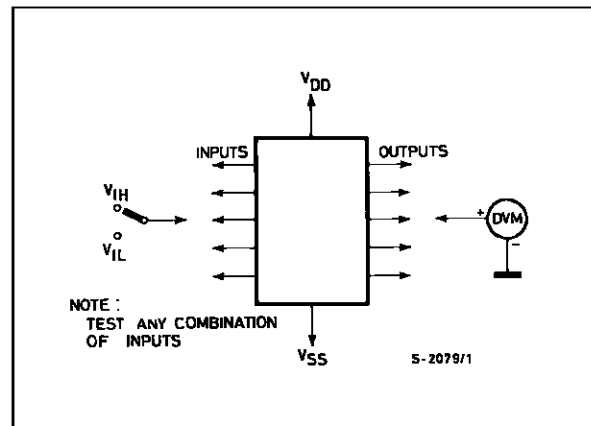


TEST CIRCUITS

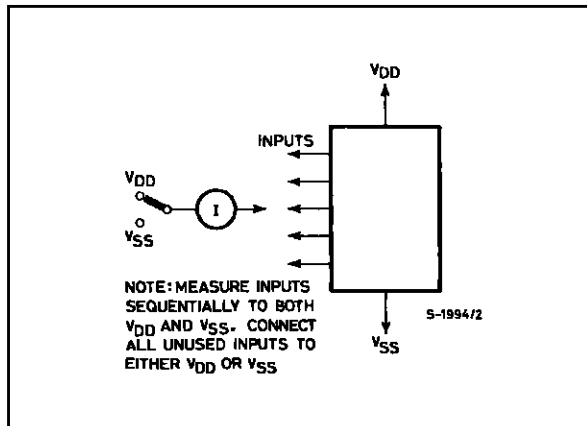
Quiescent Device Current



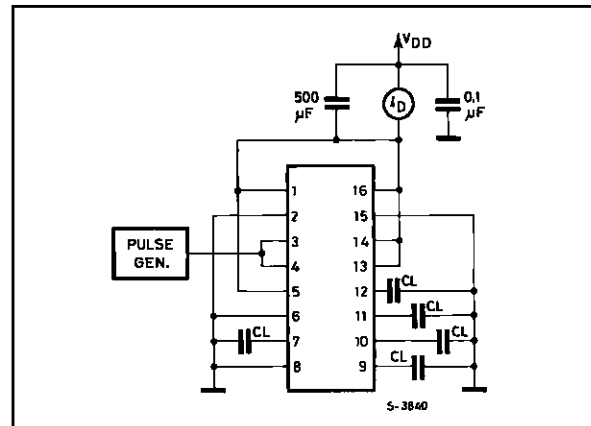
Input Voltage



Input Leakage Current



Dynamic Power Dissipation



**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	



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