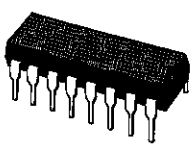
SGS-THOMSON MICROELECTRONICS

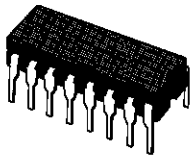
HCC/HCF40182B

LOOK-AHEAD CARRY GENERATOR

- GENERATES HIGH-SPEED CARRY ACROSS FOUR ADDERS OF ADDER GROUPS
- HIGH-SPEED OPERATIONAL : $t_{PHL} = t_{PLH}$ = 100ns (typ.) @ V_{DD} = 10V
- 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"



EY
(Plastic Package)



F
(Ceramic Frit Seal Package)

M1
(Micro Package)

C1
(Plastic Chip Carrier)

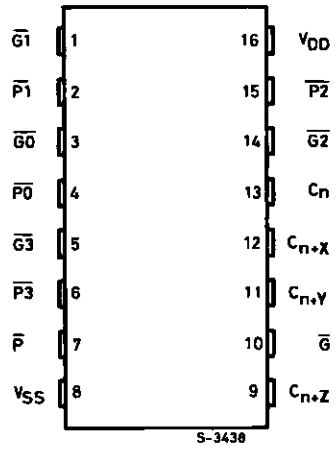
ORDER CODES :

HCC40182BFHCF4018
2BM1

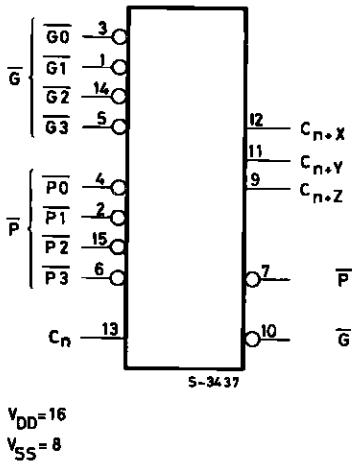
DESCRIPTION

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



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

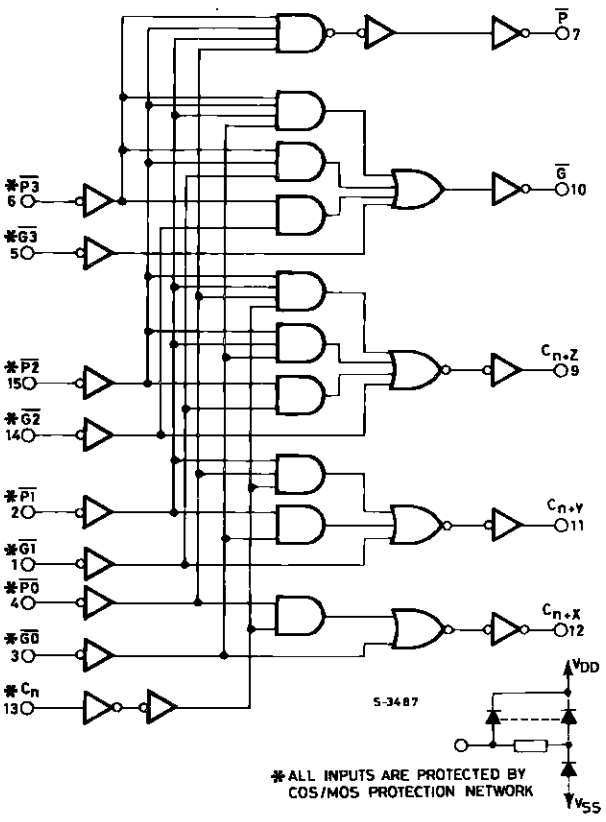
Symbol	Parameter	Value	Unit
V_{DD}*	Supply Voltage : **HCC** Types **HCF** Types	– 0.5 to + 20 – 0.5 to + 18	V V
V_i	Input Voltage	– 0.5 to V_{DD} + 0.5	V
I_I	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = Full Package-temperature 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 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 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

LOGIC DIAGRAM



Logic Equations :

$C_{n+X} = G0 + P0 \bullet Cn$

$C_{n+Y} = G1 + P1 \bullet G0 + P1 \bullet P0 \bullet C_n$

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		Test Conditions				Value							Unit
			V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_{Low}*		25°C			T_{High}*		
							Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_L	Quiescent Current	HCC Types	0/ 5			5		5		0.04	5		150	μA
			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_{OH}	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_{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	Any Input		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

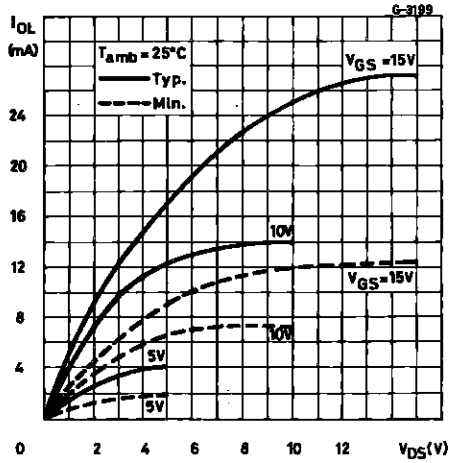
* T_{Low} = – 55°C for **HCC** device : – 40°C for **HCF** device.

* T_{High} = + 125°C for **HCC** device : + 85°C for **HCF** device.

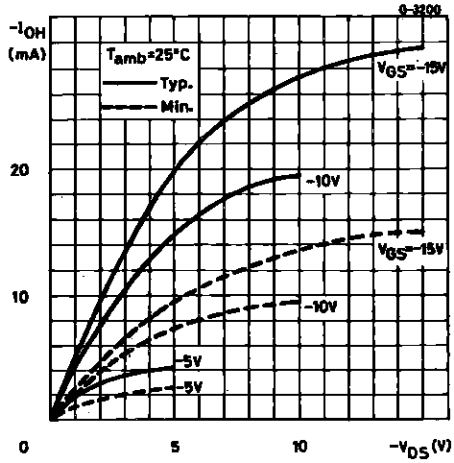
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200kΩ, typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall time = 20ns)

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	

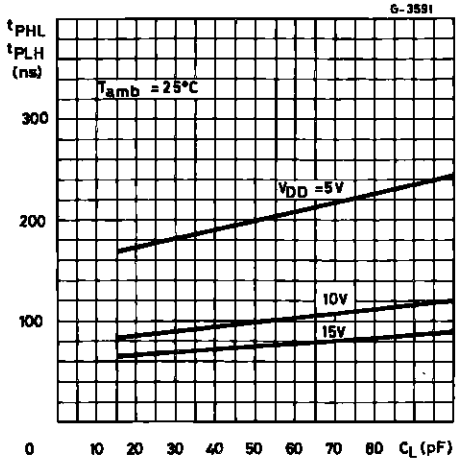
Output Low (sink) Current Characteristics.



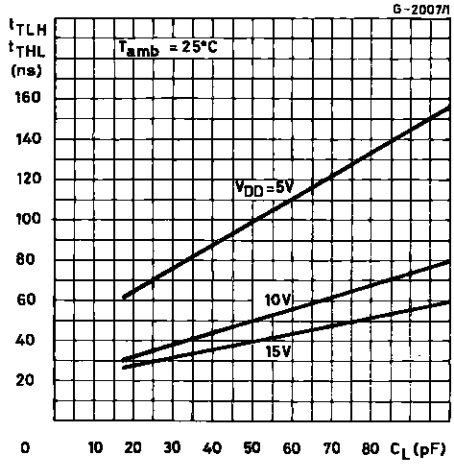
Output High (source) Current Characteristics.



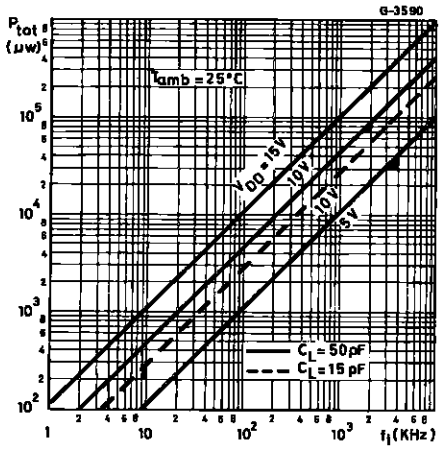
Typical Propagation Delay Time (P, G In to P, G Out and Carry-outs) vs. Load Capacitance.



Typical Transition Time vs. Load Capacitance.

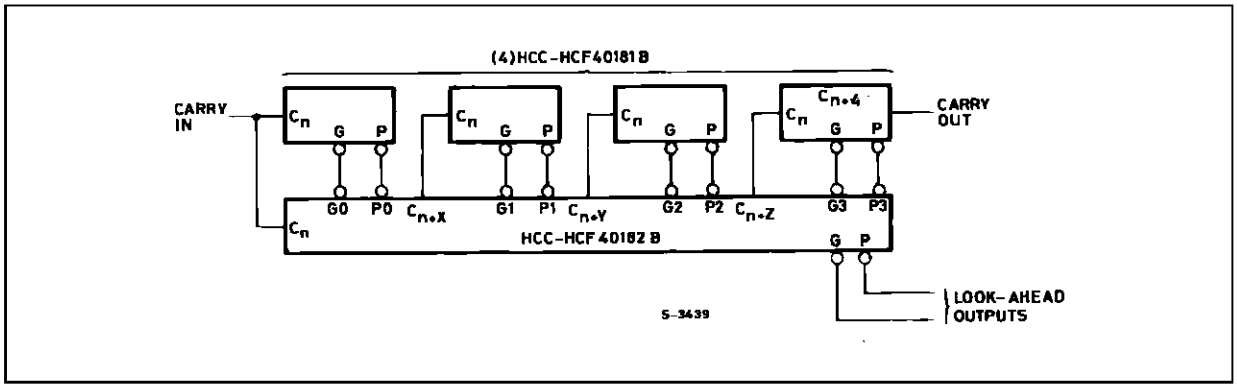


Typical Dynamic Power Dissipation vs. Input Frequency.

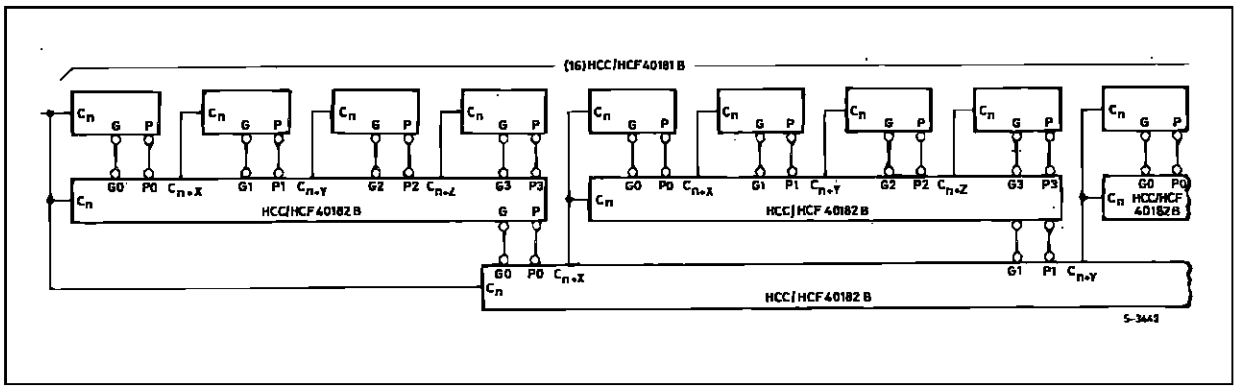


TYPICAL APPLICATIONS

16-BIT TWO-LEVEL LOOK-AHEAD ALU

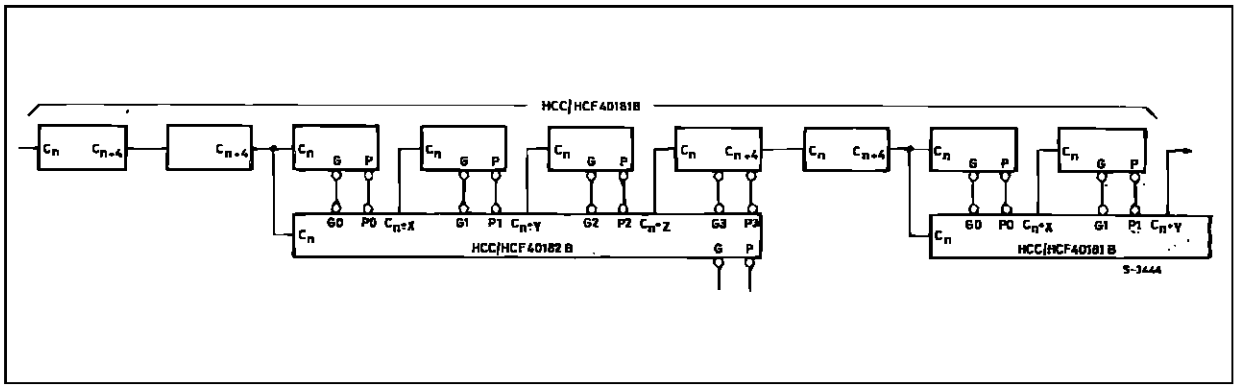


64-BIT FULL CARRY LOOK-AHEAD ALU IN 3 LEVELS



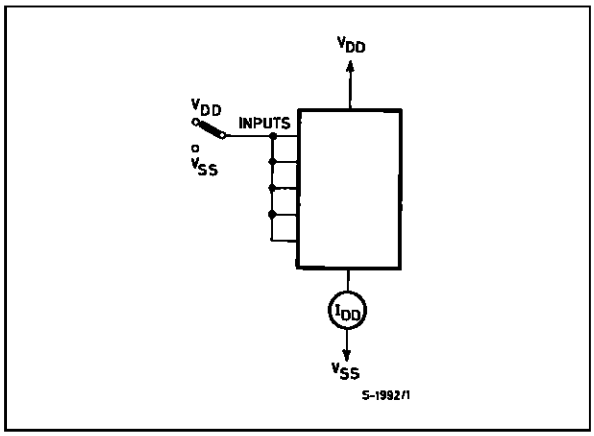
TYPICAL APPLICATIONS (continued)

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

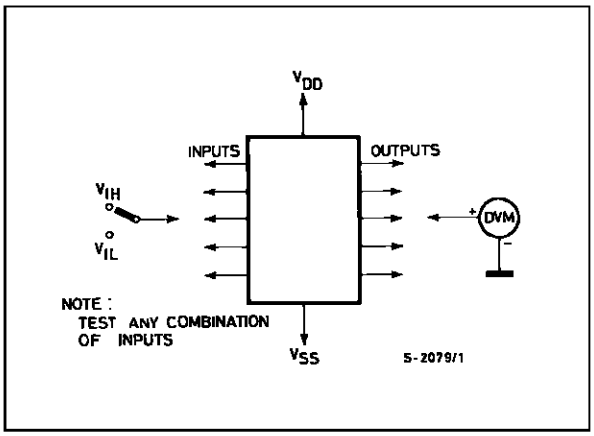


TEST CIRCUITS

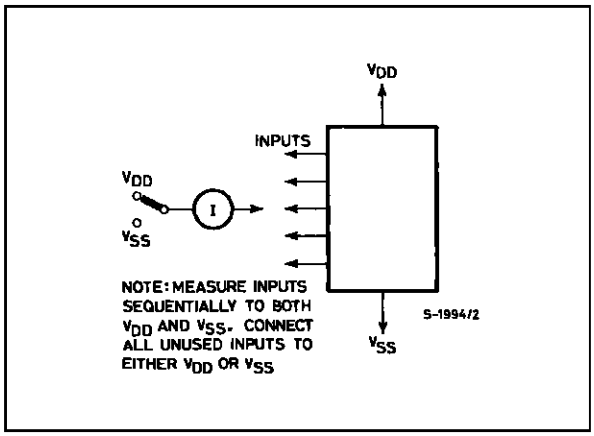
Quiescent Device Current.



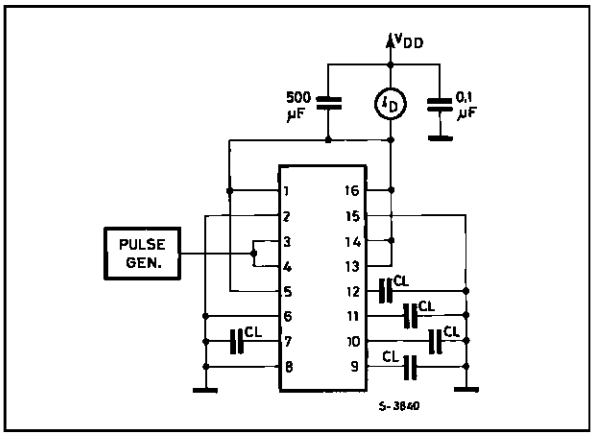
Input Voltage.



Input Leakage Current.

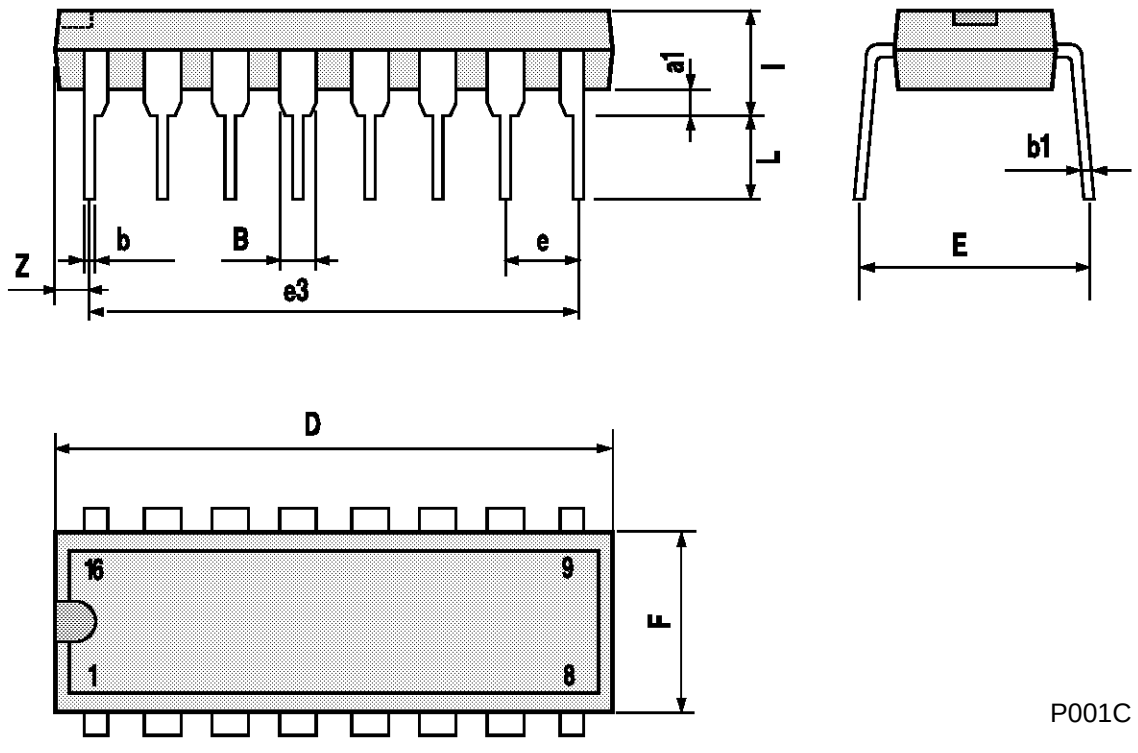


Dynamic Power Dissipation.



Plastic DIP16 (0.25) MECHANICAL DATA

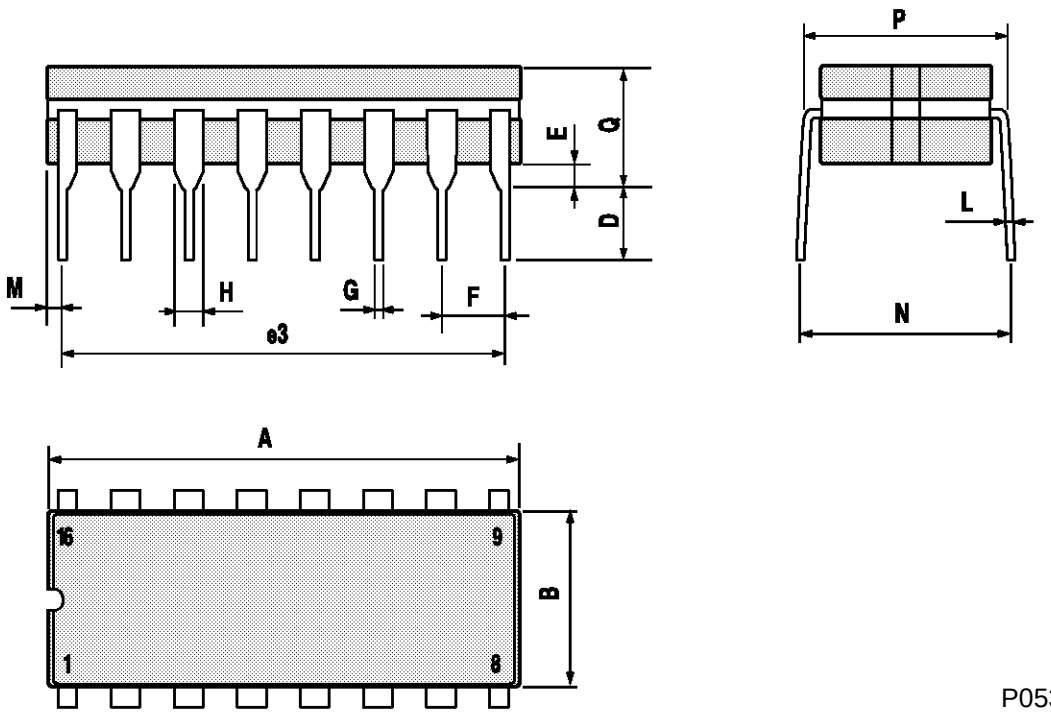
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

Ceramic DIP16/1 MECHANICAL DATA

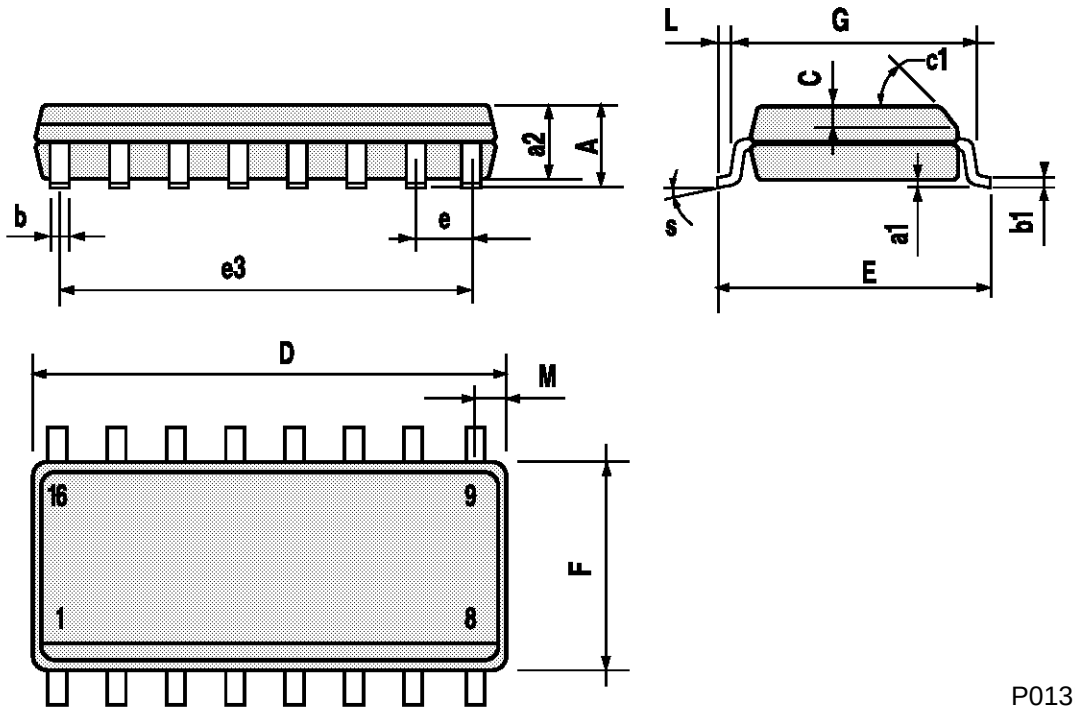
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



P053D

SO16 (Narrow) MECHANICAL DATA

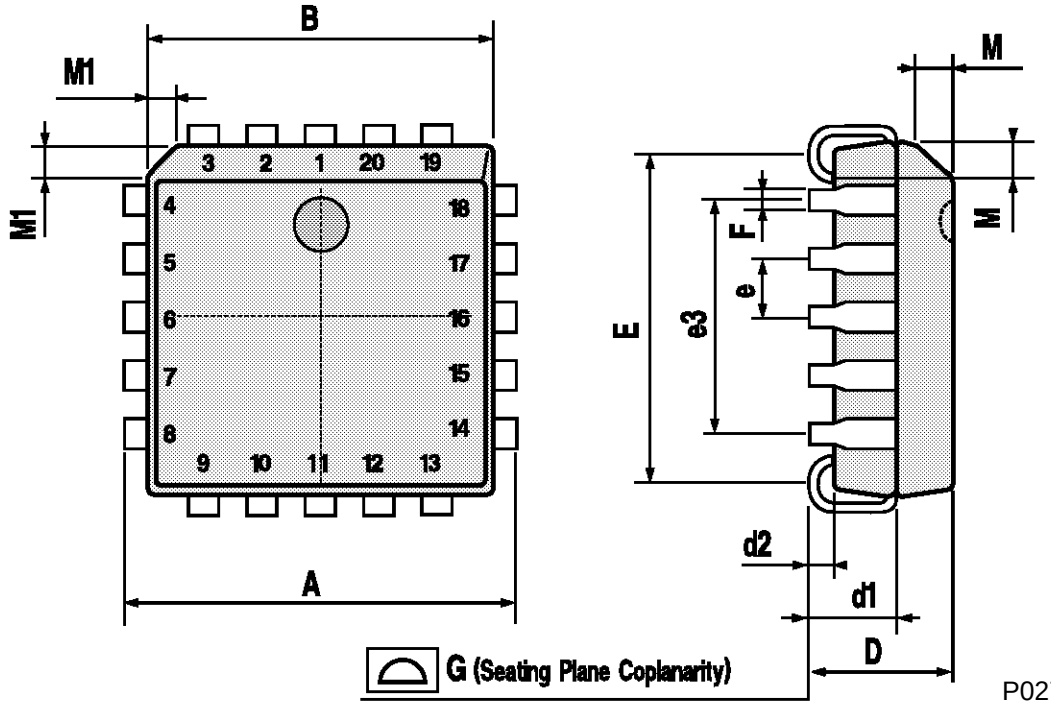
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157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



P027A