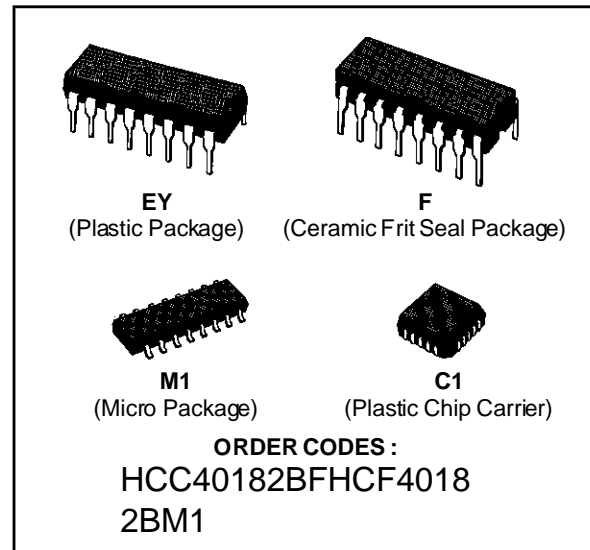


LOOK-AHEAD CARRY GENERATOR

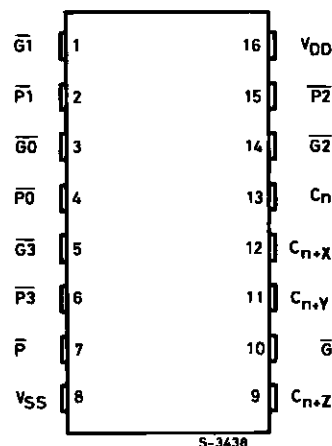
- GENERATES HIGH-SPEED CARRY ACROSS FOUR ADDERS OF ADDER GROUPS
- HIGH-SPEED OPERATIONAL : $t_{PHL} = t_{PLH} = 100\text{ns}$ (typ.) @ $V_{DD} = 10\text{V}$
- CASCADABLE FOR FAST CARRIES OVER N BITS
- DESIGNED FOR USE WITH **HCC/HCF40181B** ALU
- STANDARDIZED, SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT 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.

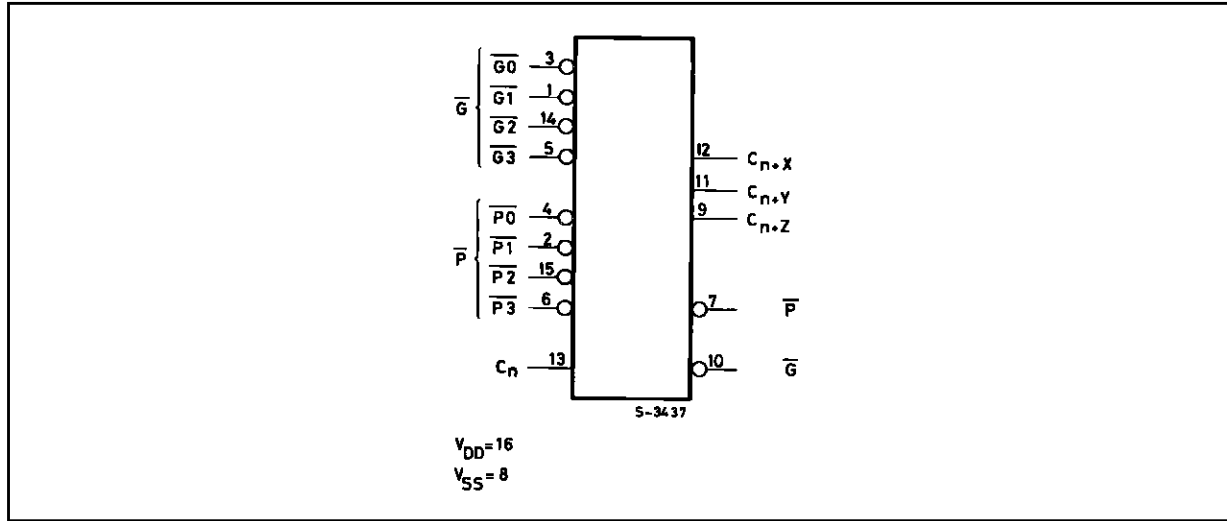


PIN CONNECTIONS



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

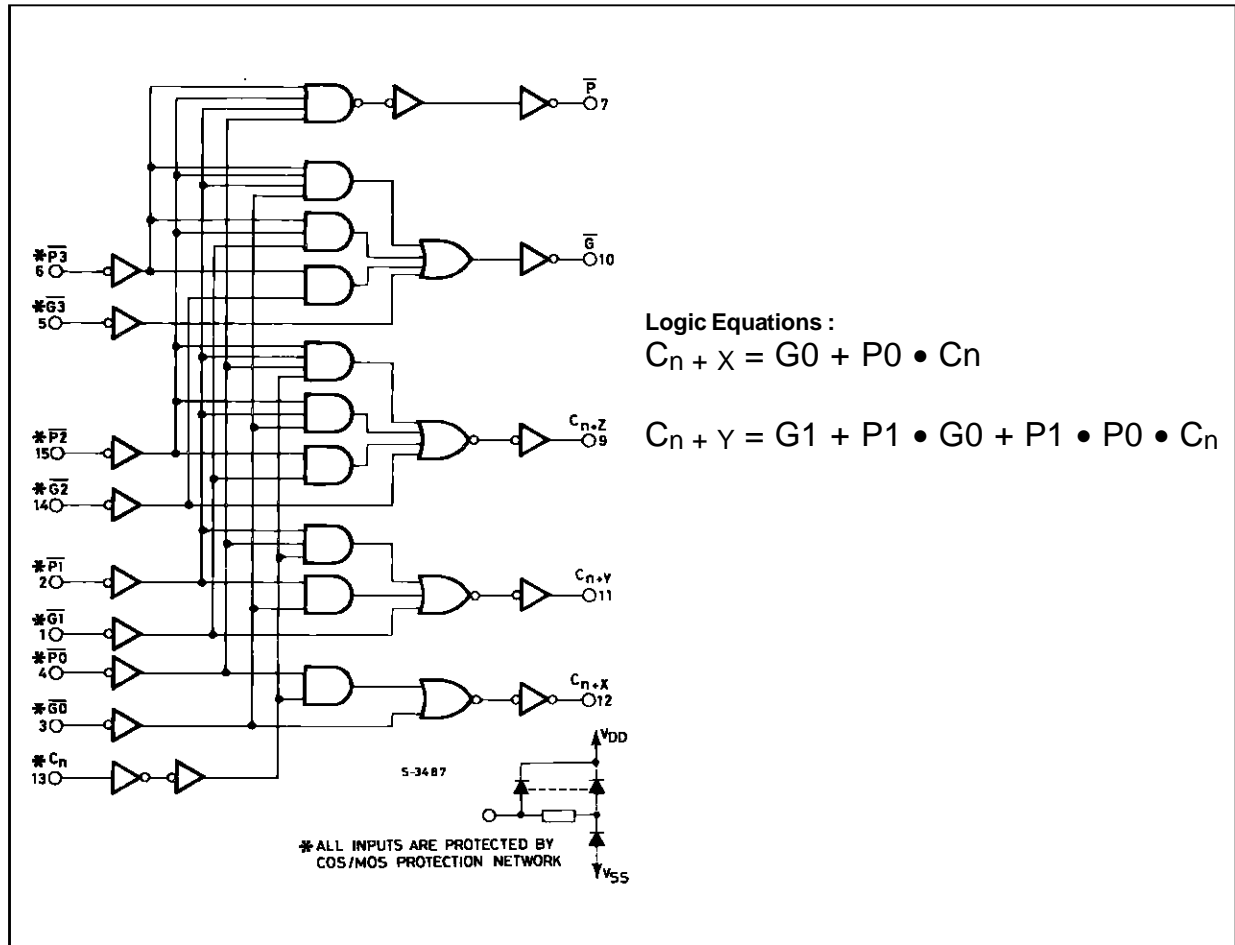
| Symbol | Parameter | Value | Unit |
|------------|---|-------------------------|-------------|
| V_{DD}^* | Supply Voltage : HCC Types HCF Types | - 0.5 to + 20 | V |
| | | - 0.5 to + 18 | V |
| V_i | Input Voltage | - 0.5 to $V_{DD} + 0.5$ | V |
| I_i | DC Input Current (any one input) | ± 10 | mA |
| 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 _{DD} | Supply Voltage : HCC Types | 3 to 18 | V |
| | HCF Types | 3 to 15 | V |
| V _I | Input Voltage | 0 to V _{DD} | V |
| T _{op} | 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 _I (V) | V _O (V) | I _O (μ A) | 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 | μ 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 _{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 | | \pm 0.1 | | \pm 10 ⁻⁵ | \pm 0.1 | | \pm 1 | μ A |
| | | HCF Types | 0/15 | Any Input | | 15 | | \pm 0.3 | | \pm 10 ⁻⁵ | \pm 0.3 | | \pm 1 | |
| C _I | Input Capacitance | | Any Input | | | | | | 5 | 7.5 | | | pF | |

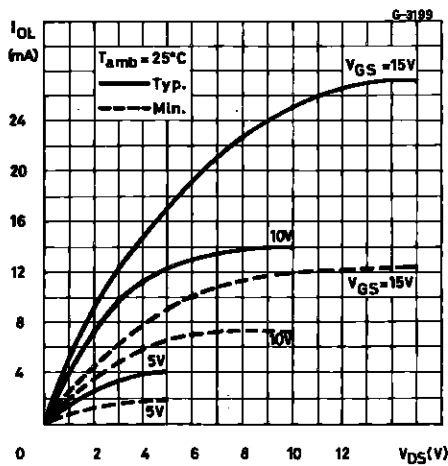
* T_{Low} = - 55°C for HCC device : - 40°C for HCF device.

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

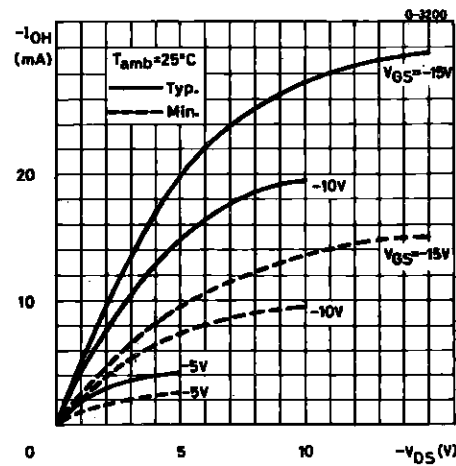
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}\text{C}$, all input rise and fall time = 20ns)

| 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 | |

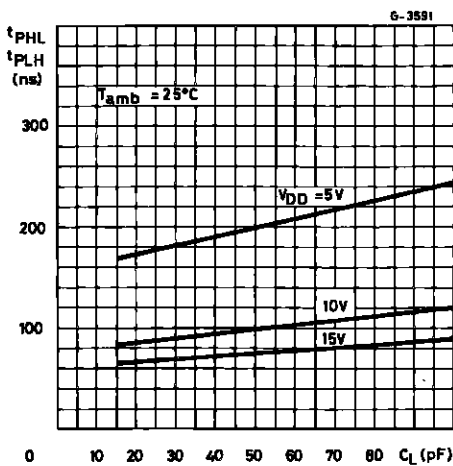
Output Low (sink) Current Characteristics.



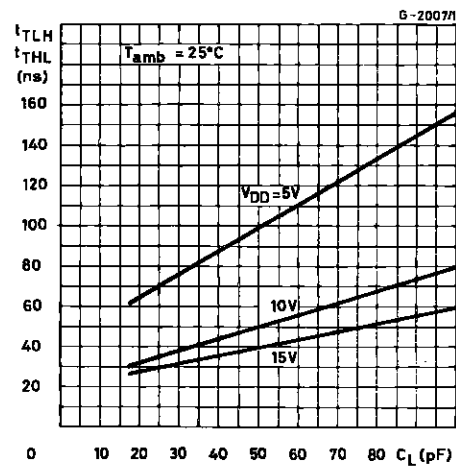
Output High (source) Current Characteristics.



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

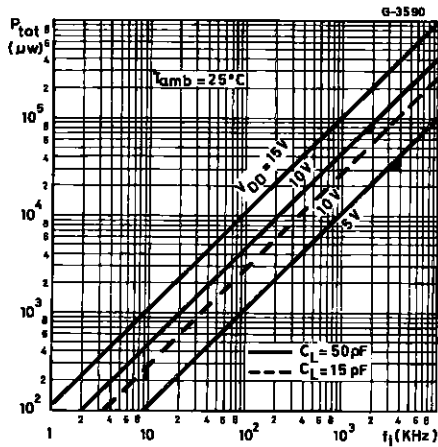


Typical Transition Time vs. Load Capacitance.



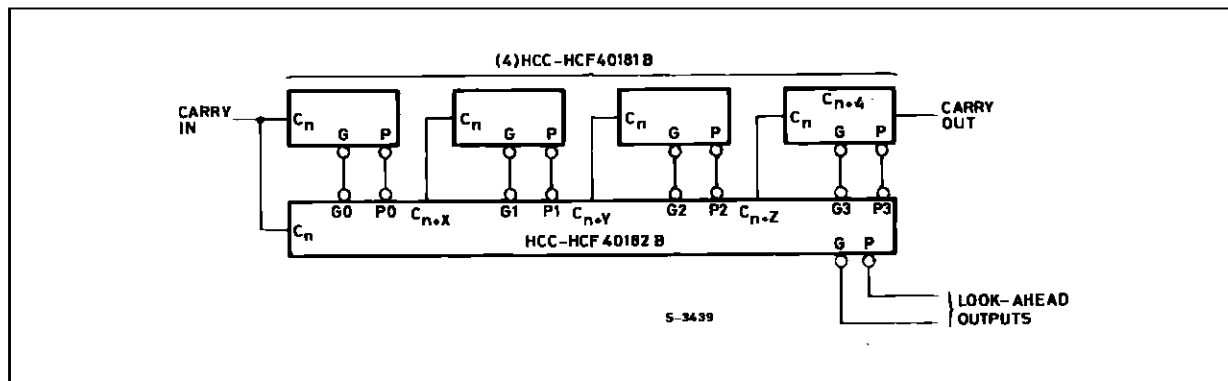
HCC/HCF40182B

Typical Dynamic Power Dissipation vs. Input Frequency.

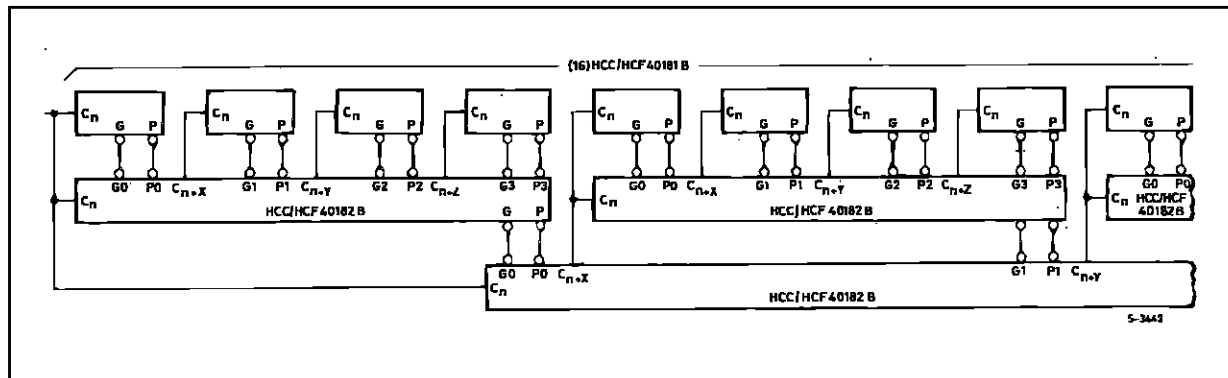


TYPICAL APPLICATIONS

16-BIT TWO-LEVEL LOOK-AHEAD ALU

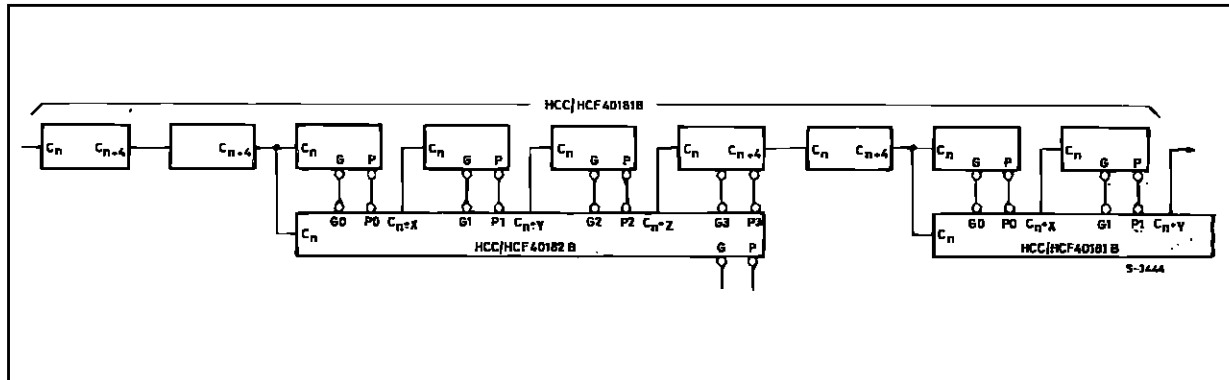


64-BIT FULL CARRY LOOK-AHEAD ALU IN 3 LEVELS



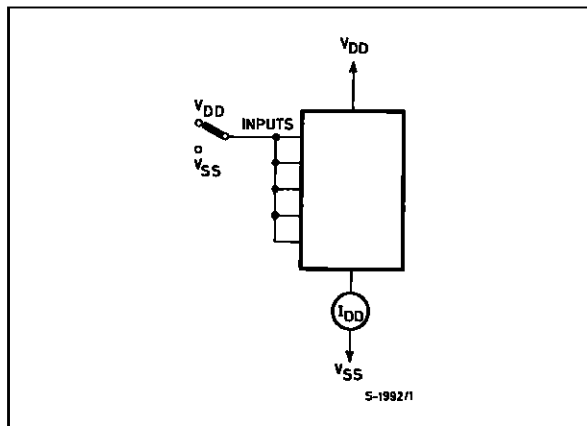
TYPICAL APPLICATIONS (continued)

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

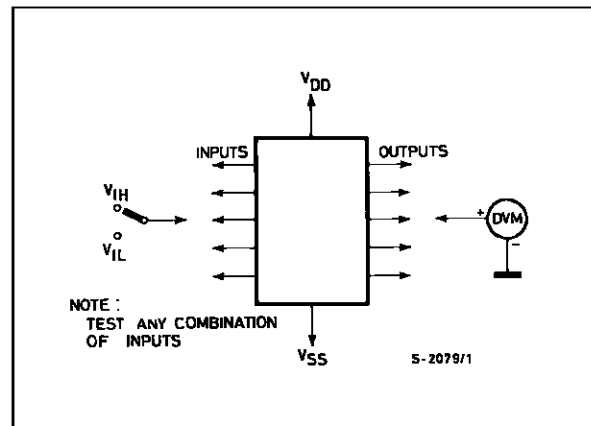


TEST CIRCUITS

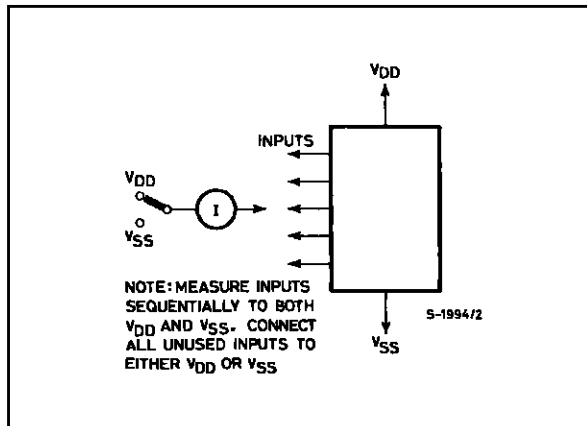
Quiescent Device Current.



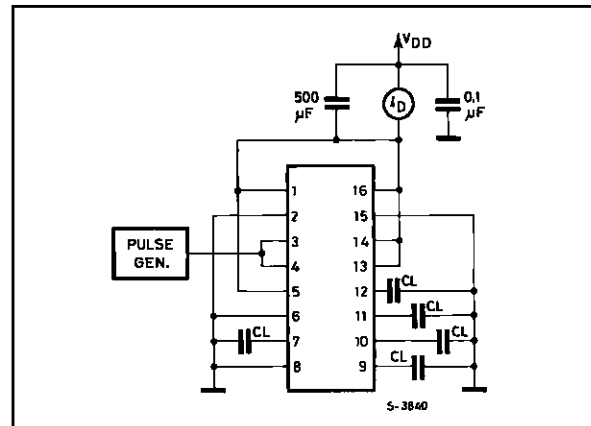
Input Voltage.



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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