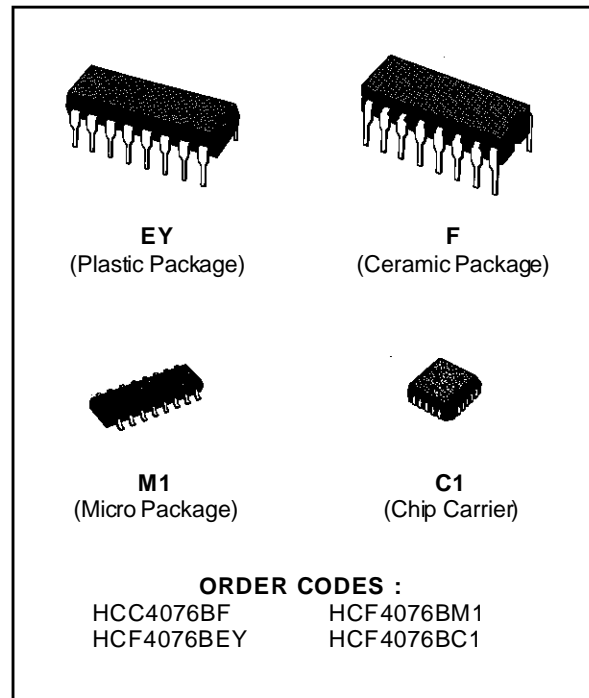


4 BIT D TYPE REGISTERS

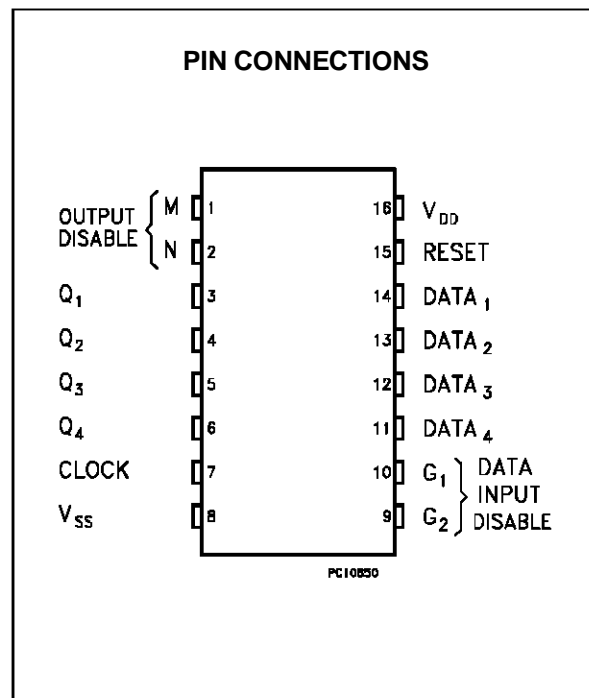
- THREE STATE OUTPUTS
- INPUT DISABLE WITHOUT GATING THE CLOCK
- GATED OUTPUT CONTROL LINES FOR ENABLING OR DISABLING THE OUTPUTS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



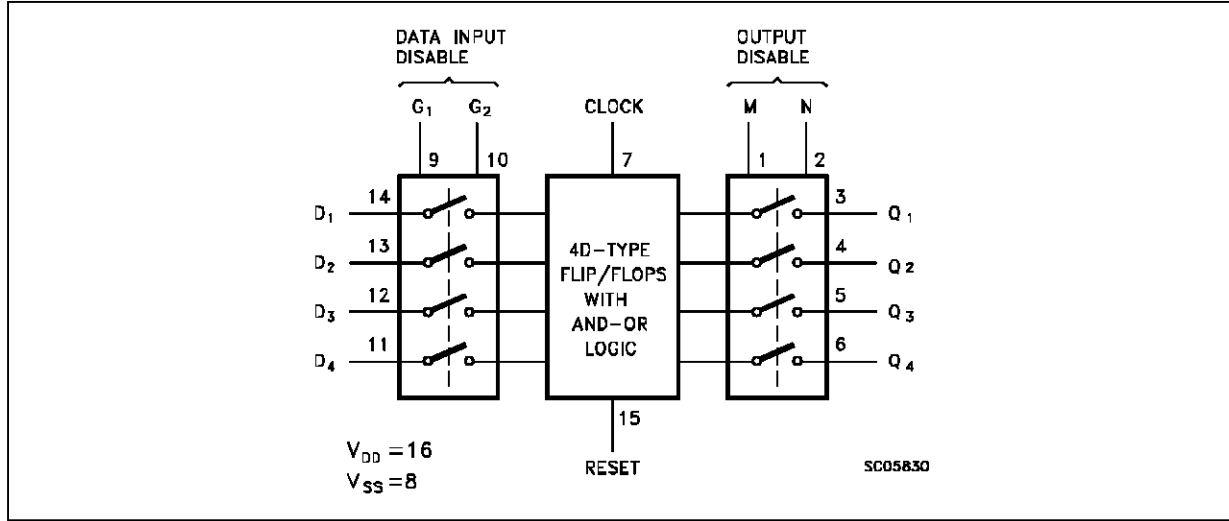
DESCRIPTION

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.



FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATING

| 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 Top = 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 |

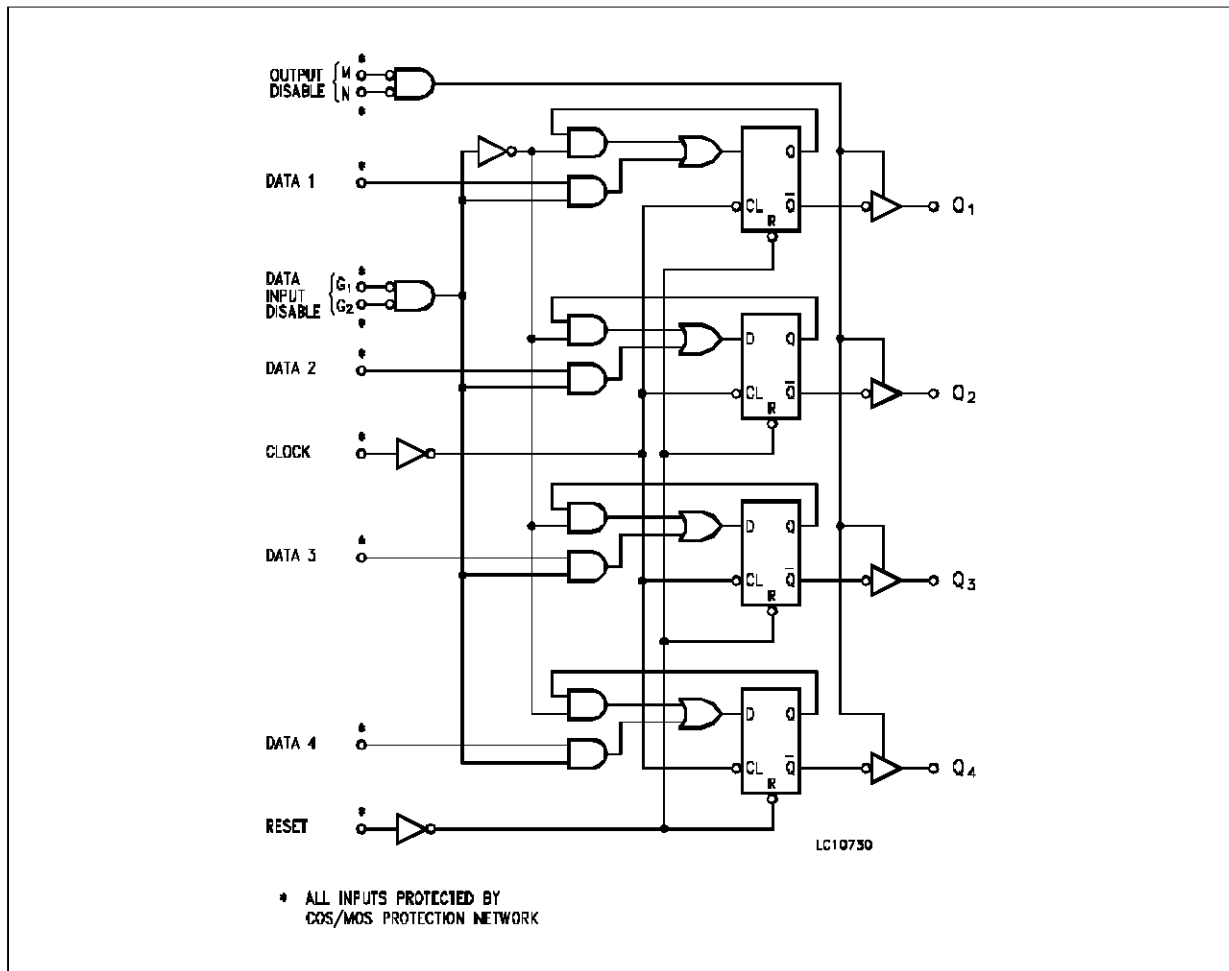
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure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

* All voltage values are referred to V_{SS} pin voltage.

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



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 _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 | | | 4.95 | | V | |
| | | 0/10 | | < 1 | 10 | 9.95 | | 9.95 | | | 9.95 | | | |
| | | 0/15 | | < 1 | 15 | 14.95 | | 14.95 | | | 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 | 0.61 | | 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 _{IH} , I _{IL} | Input Leakage Current | 0/18 | Any Input | | 18 | | ± 0.1 | | $\pm 10^{-5}$ | ± 0.1 | | ± 1 | μ A | |
| | | 0/15 | | | 15 | | ± 0.3 | | $\pm 10^{-5}$ | ± 0.3 | | ± 1 | μ A | |
| I _{OH} , I _{OL} | Input Leakage Current | HCC Types | 0/18 | 0/18 | | 18 | | ± 0.4 | | $\pm 10^{-4}$ | ± 0.4 | | ± 12 | μ A |
| | | HCF Types | 0/15 | 0/15 | | 15 | | ± 1.0 | | $\pm 10^{-4}$ | ± 1.0 | | ± 7.5 | μ A |
| C _I | Input Capacitance | | Any Input | | | | | | 5 | 7.5 | | | pF | |

* T_{LOW} = -55 °C for HCC device; -40 °C for HCF device.

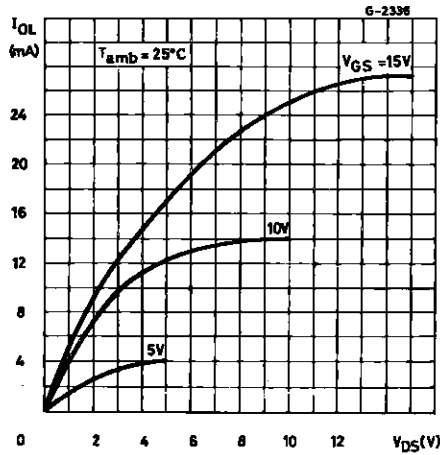
* T_{HIGH} = +125 °C for HCC device; +85 °C for HCF device.

The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V

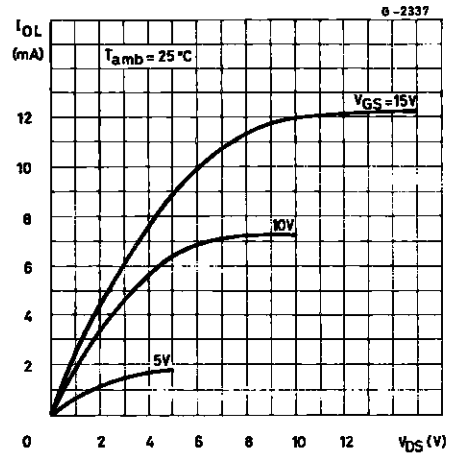
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ K}\Omega$, typical temperature coefficient for all V_{DD} values is $03\text{ } \%/^{\circ}\text{C}$, all input rise and fall times = 20 ns)

| 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 | $R_L = 1K\Omega$ | 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 | $R_L = 1K\Omega$ | 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 | | | μs |
| | | | 10 | 5 | | | |
| | | | 15 | 5 | | | |

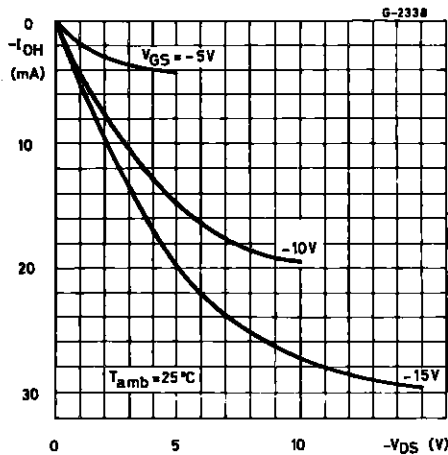
Typical Output Low (sink) Current Characteristics



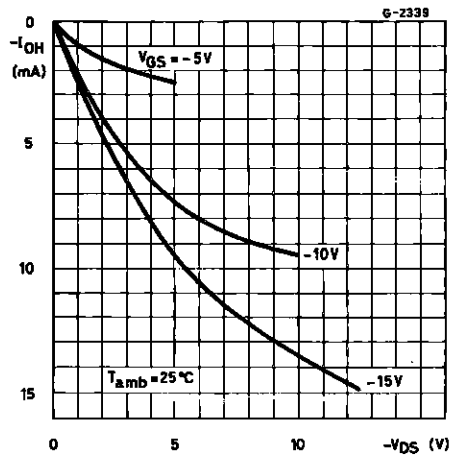
Minimum Output Low (sink) Current Characteristics



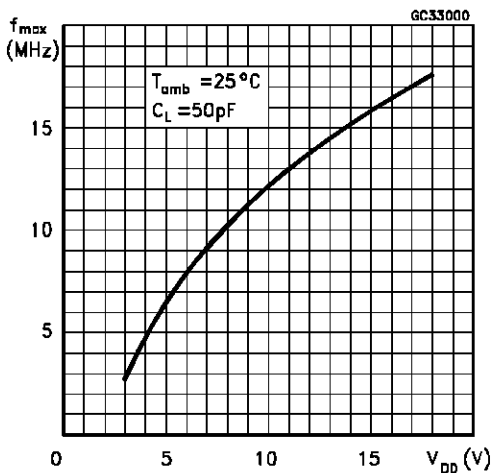
Typical Output High (source) Current Characteristics



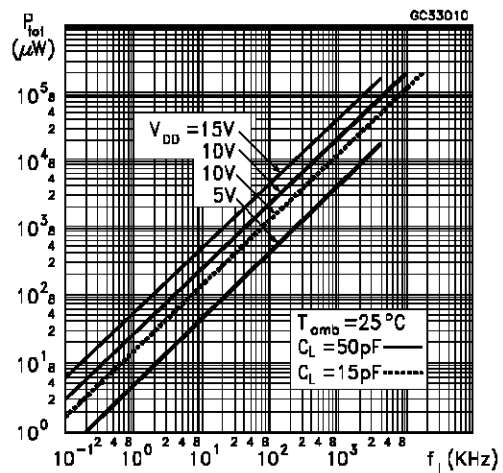
Minimum Output High (source) Current Characteristics



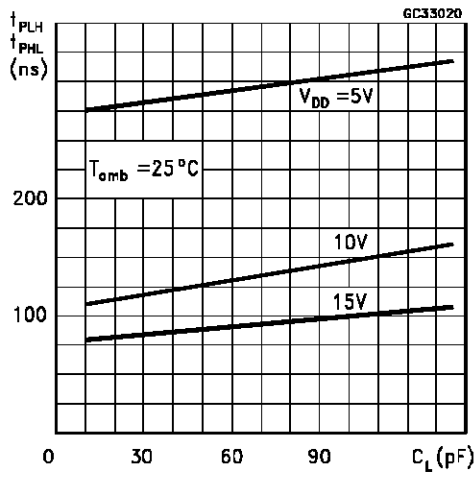
Typical Maximum Clock Input Frequency vs Supply Voltage



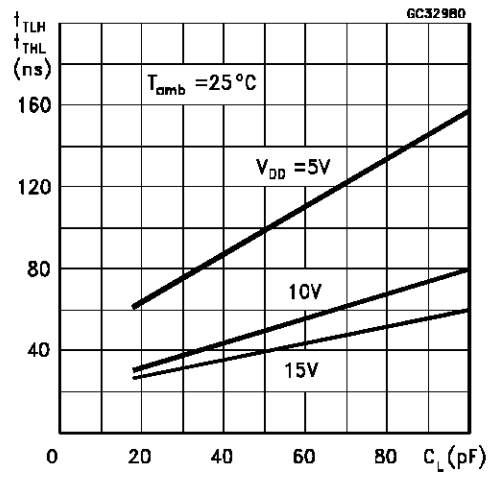
Typical Dynamic Power Dissipation vs Frequency



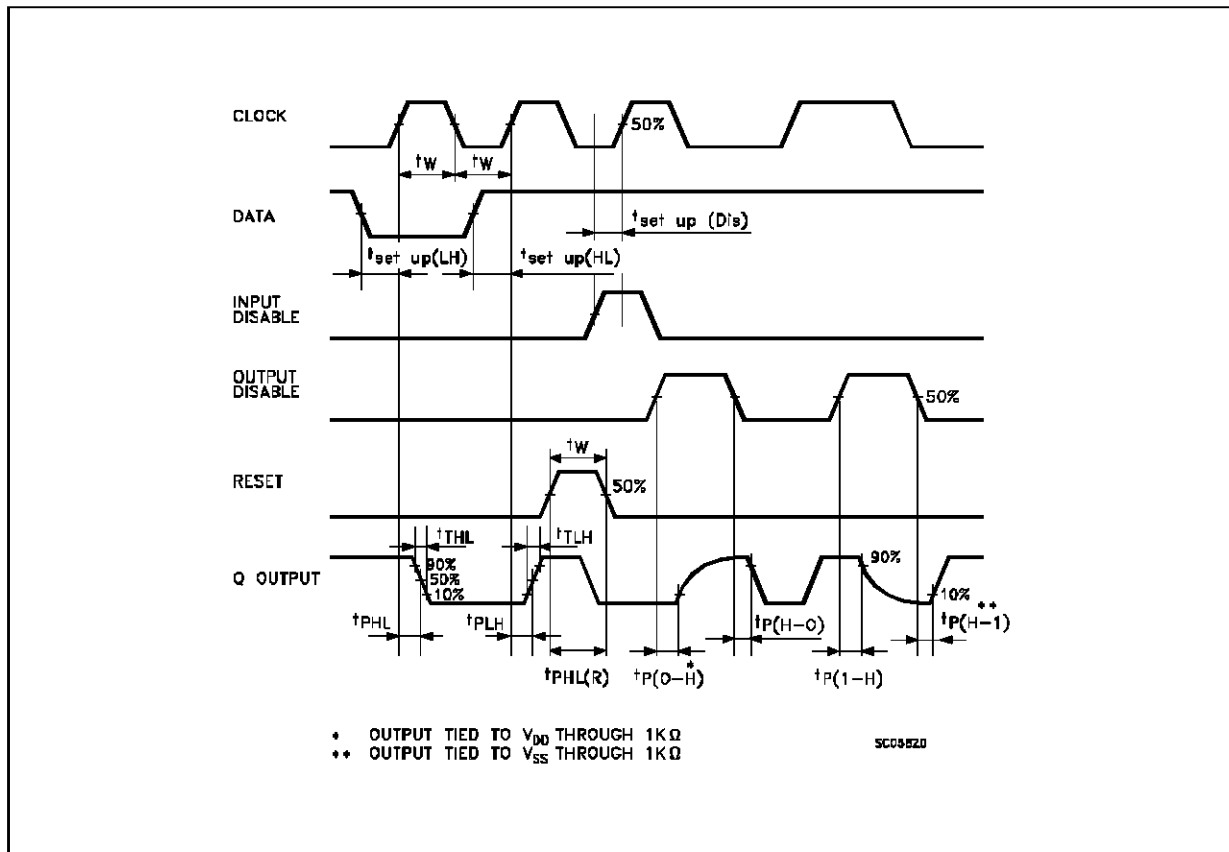
Typical Propagation Delay Time vs Capacitance



Typical Transition Time vs Load Capacitance

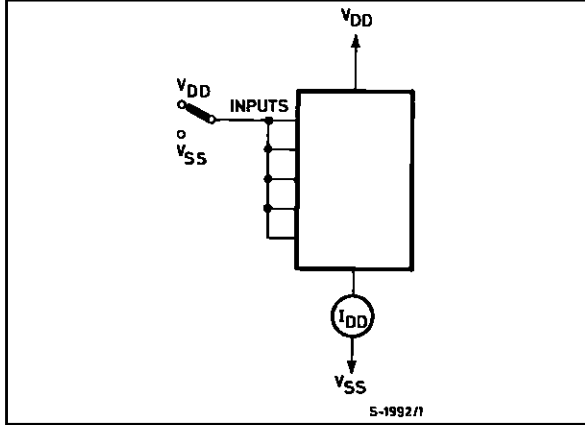


WAVEFORMS

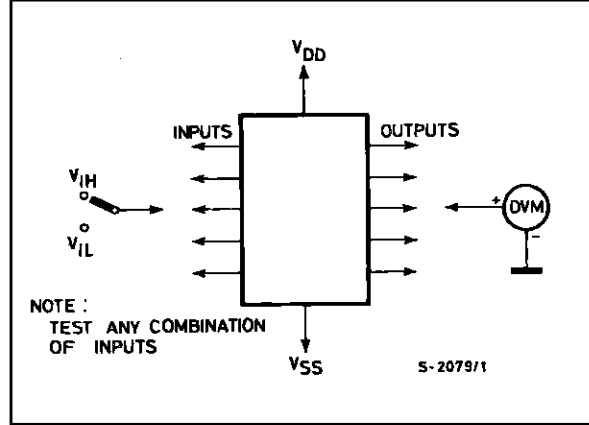


TEST CIRCUITS

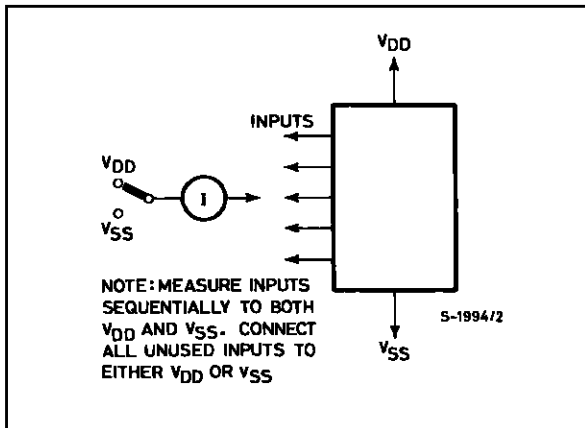
Quiescent Device Current



Noise Immunity.

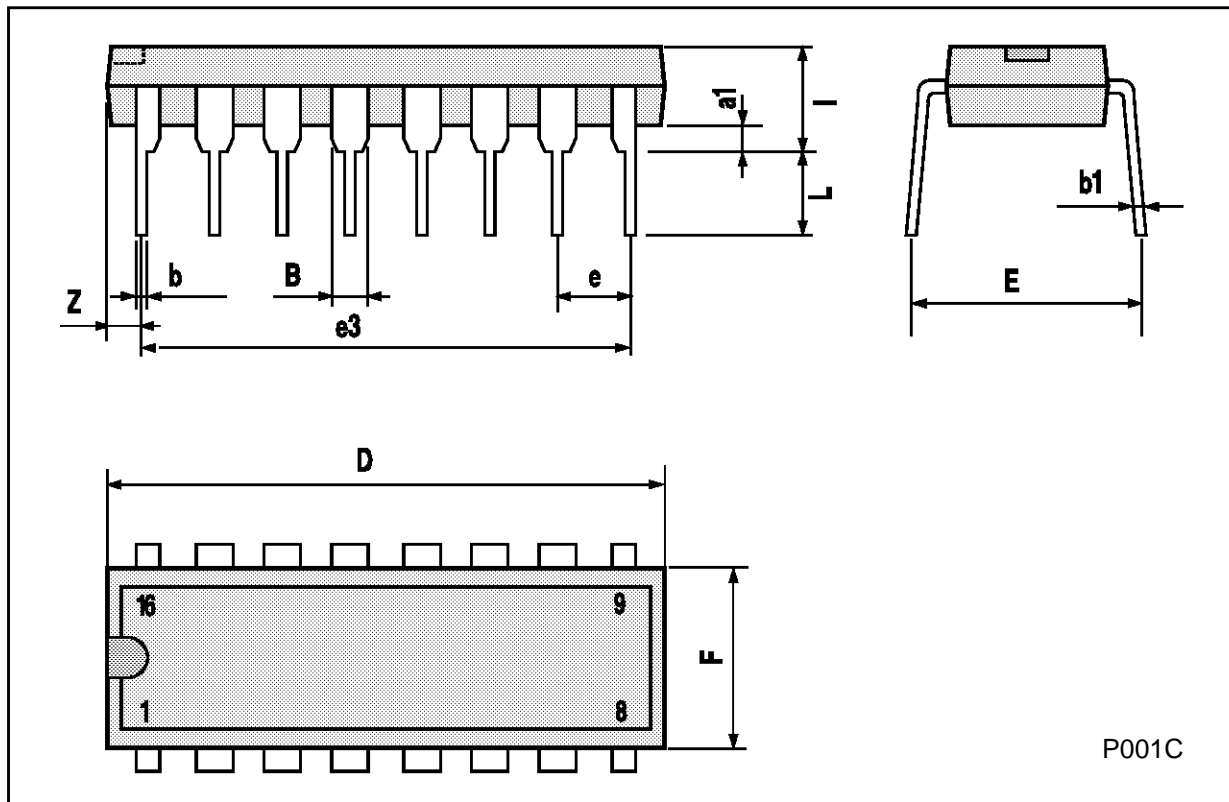


Input Leakage Current.



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 |



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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