

HCC/HCF4034B

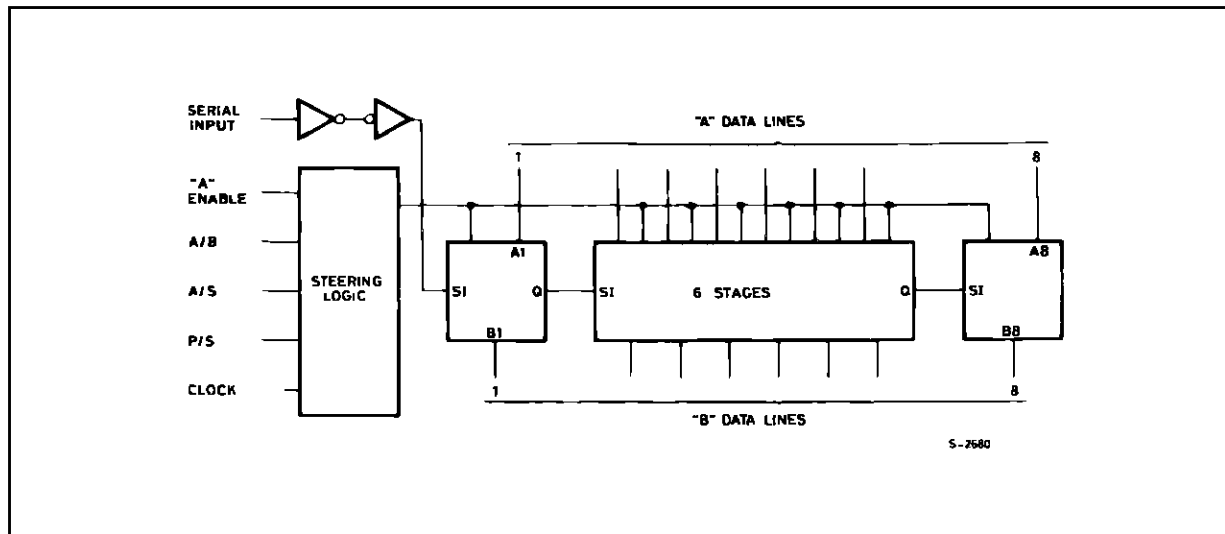
inputs generated internally to allow synchronous or asynchronous data transfer from master to slave. Isolation from external noise and the effects of loading is provided by output buffering.

PARALLEL OPERATION – A high P/S input signal allows data transfer into the register via the parallel data lines synchronously with the positive transition of the clock provided the A/S input is low. If the A/S input is high the transfer is independent of the clock. The direction of data flow is controlled by the A/B input. When this signal is high the A data lines are inputs (and B data lines are outputs) ; a low A/B signal reverses the direction of data flow. The AE-input is an additional feature which allows many registers to feed data to a common bus. The A DATA lines are

enabled only when this signal is high. Data storage through recirculation of data in each register stage is accomplished by making the A/B signal high and the AE signal low.

SERIAL OPERATION – A low P/S signal allows serial data to transfer into the register synchronously with the positive transition of the clock. The A/S input is internally disabled when the register is in the serial mode (asynchronous serial operation is not allowed). The serial data appears as output data on either the B lines (when A/B is high) or the A lines (when A/B is low and the AE signal is high). Register expansion can be accomplished by simply cascading **HCC/HCF4034B** packages.

FUNCTIONAL DIAGRAM



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_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 |
| T_{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 - 40 to + 85 | $^{\circ}$ C |
| T_{stg} | Storage Temperature | - 65 to + 150 | $^{\circ}$ C |

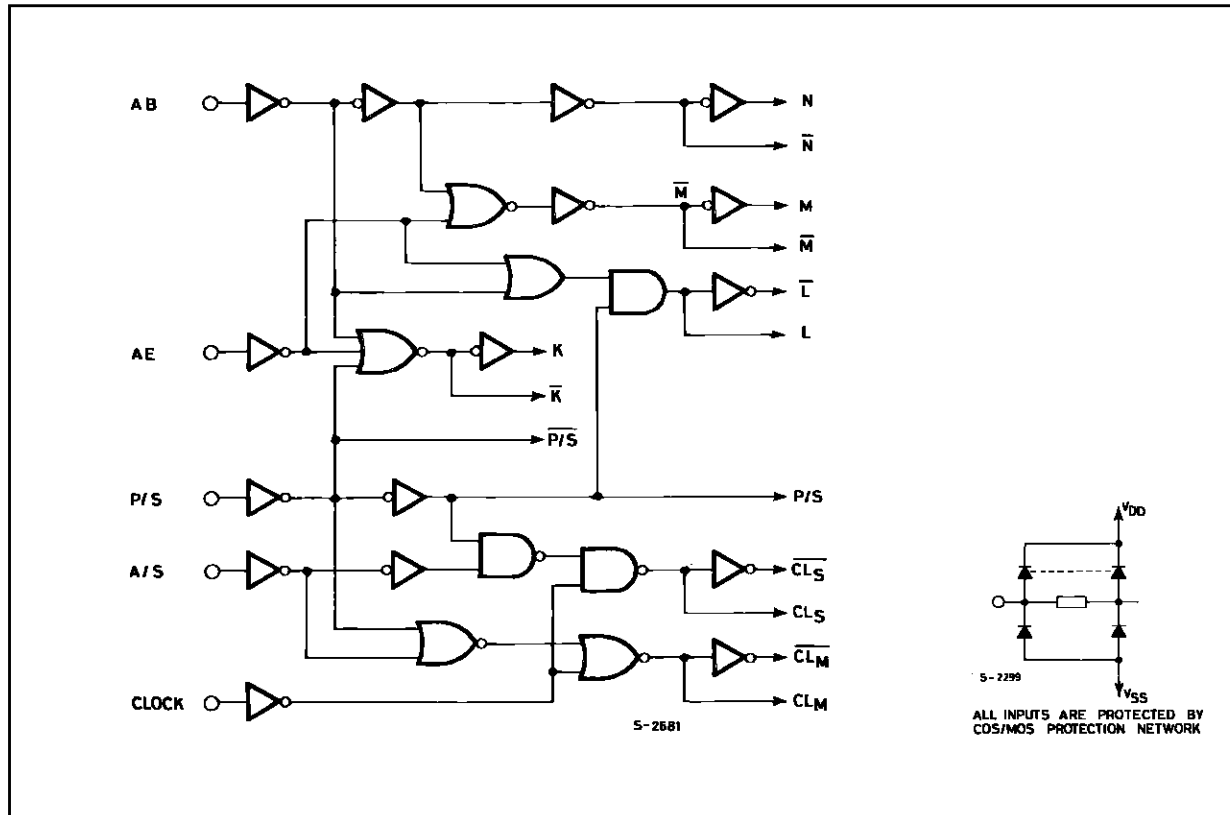
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure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

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 |

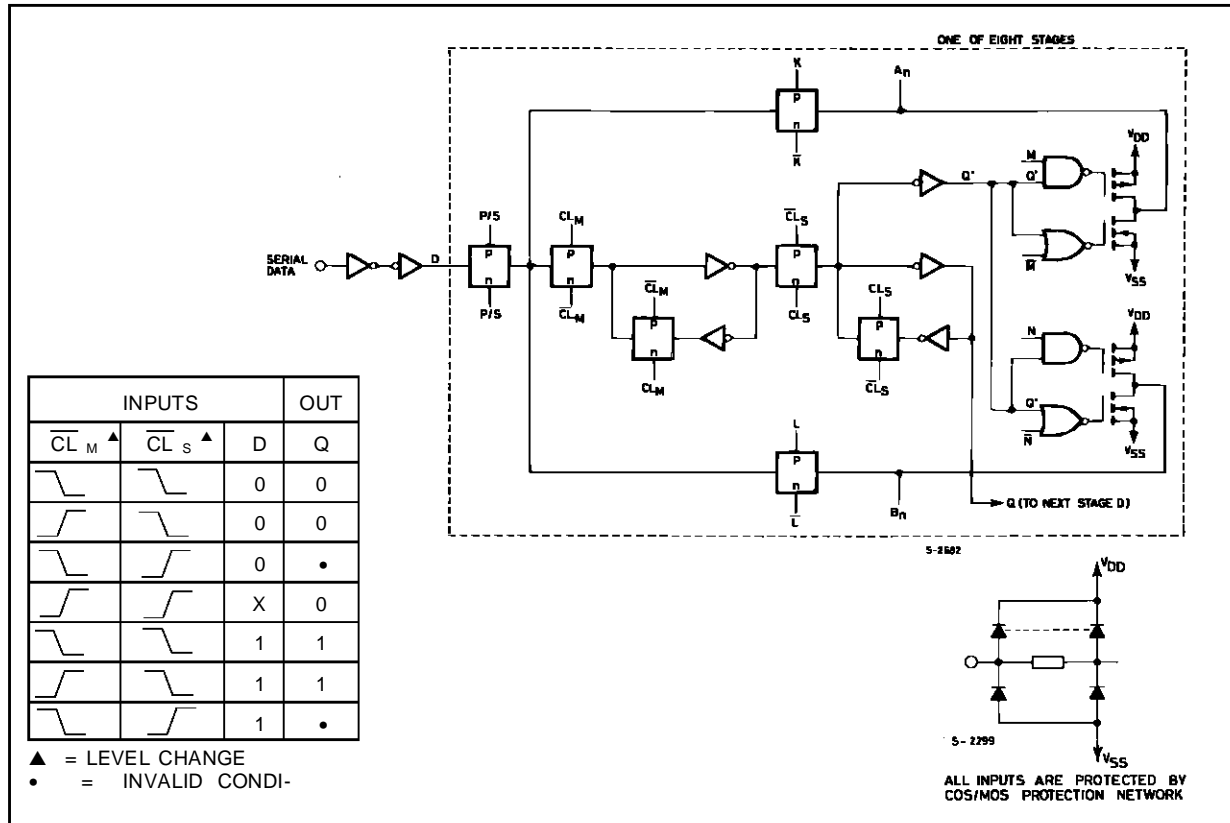
LOGIC DIAGRAMS

STEERING LOGIC



LOGIC DIAGRAM AND TRUTH TABLE

REGISTER STAGE (1 of 8 stages)

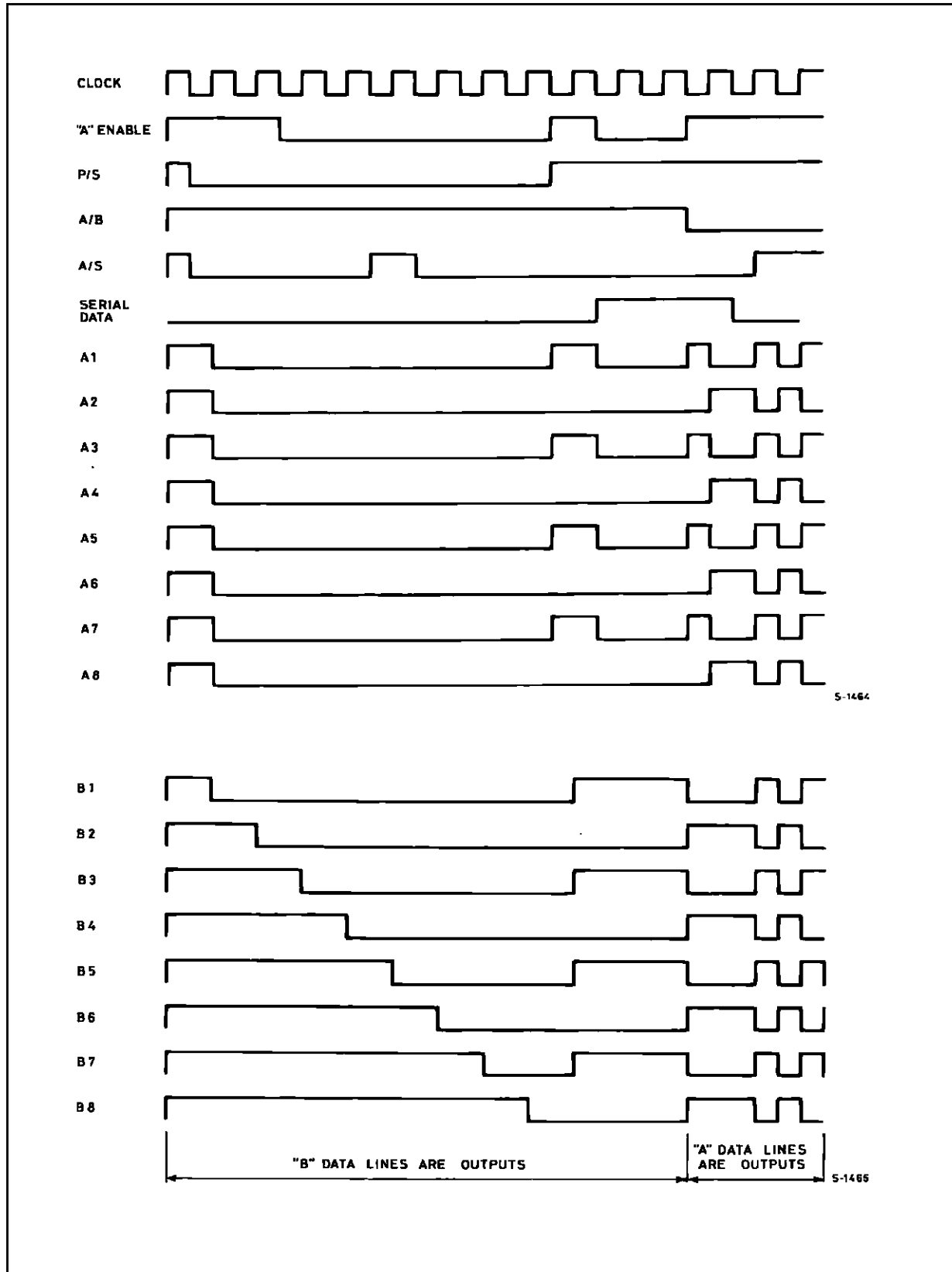


FOR REGISTER INPUT-LEVELS AND RESULTING REGISTER OPERATION

| "A" Enable | P/S | A/B | A/S | Operation* |
|------------|-----|-----|-----|--|
| 0 | 0 | 0 | X | Serial Mode ; Synch. Serial Data Input, "A" Parallel Data Outputs Disabled |
| 0 | 0 | 1 | X | Serial Mode ; Synch. Serial Data Input, "B" Parallel Data Output |
| 0 | 1 | 0 | 0 | Parallel Mode ; "B" Synch. Parallel Data Inputs, "A" Parallel Data Outputs Disabled |
| 0 | 1 | 0 | 1 | Parallel Mode ; "B" Asynch. Parallel Data Inputs, "A" Parallel Data Outputs Disabled |
| 0 | 1 | 1 | 0 | Parallel Mode ; "A" Parallel Data Inputs Disabled, "B" Parallel Data Outputs, Synch. Data Recirculation |
| 0 | 1 | 1 | 1 | Parallel Mode ; "A" Parallel Data Inputs Disabled, "B" Parallel Data Outputs, Asynch. Data Recirculation |
| 1 | 0 | 0 | X | Serial Mode ; Synch. Serial Data Input, "A" Parallel Data Output |
| 1 | 0 | 1 | X | Serial Mode ; Synch. Serial Data Input, "B" Parallel Data Output |
| 1 | 1 | 0 | 0 | Parallel Mode ; "B" Synch. Parallel Data Input, "A" Parallel Data Output |
| 1 | 1 | 0 | 1 | Parallel Mode ; "B" Asynch. Parallel Data Input, "A" Parallel Data Output |
| 1 | 1 | 1 | 0 | Parallel Mode ; "A" Synch. Parallel Data Input, "B" Parallel Data Output |
| 1 | 1 | 1 | 1 | Parallel Mode ; "A" Asynch. Parallel Data Input, "B" Parallel Data Output |

* Outputs change at positive transition of clock in the serial mode and when the A/S control inputs is "low" in the parallel mode.

TIMING DIAGRAM



HCC/HCF4034B

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

| Symbol | Parameter | | Test Conditions | | | | Values | | | | | | 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 | |
| | | | 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 | | | |
| | | 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 | | |
| | | 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 | | | |
| | | | 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 | | |
| | | | 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 | | |
| | | | 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 | | |
| | | | 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 | |
| | | HCF Types | 0/15 | Any Input | | 15 | | ± 0.3 | | $\pm 10^{-5}$ | ± 0.3 | | ± 1 | |
| I _{OH} | 3-State Output Leakage Current | HCC Types | 0/18 | 0/18 | | 18 | | ± 0.4 | | $\pm 10^{-4}$ | ± 0.4 | | ± 12 | |
| | | HCF Types | 0/15 | 0/15 | | 15 | | ± 1.0 | | $\pm 10^{-4}$ | ± 1.0 | | ± 7.5 | |
| 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.

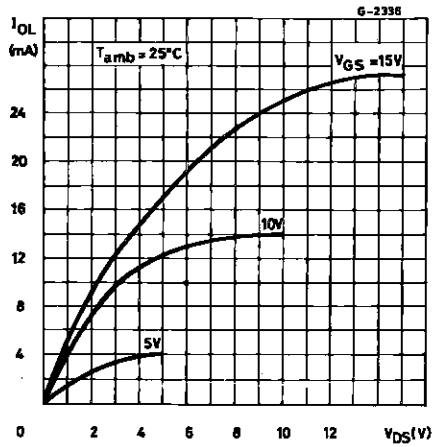
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}\text{C}$, all input rise and fall times = 20ns)

| Symbol | Parameter | Test Conditions | | Value | | | Unit |
|--|--|-----------------|--------------|-------|------|------|---------------|
| | | | V_{DD} (V) | Min. | Typ. | Max. | |
| t_{PHL} , t_{PLH} | Propagation Delay Time : A (B) Parallel Data in to B (A) Parallel Data Out | | 5 | | 350 | 700 | ns |
| | | | 10 | | 120 | 240 | |
| | | | 15 | | 85 | 170 | |
| t_{PLZ} , t_{PHZ} t_{PZL} , t_{PZH} | 3-state Propagation Delay Time A/B or AE to "A" OUT | | 5 | | 200 | 400 | ns |
| | | | 10 | | 80 | 160 | |
| | | | 15 | | 60 | 120 | |
| t_{THL} , t_{TLH} | Transition Time | | 5 | | 100 | 200 | ns |
| | | | 10 | | 50 | 100 | |
| | | | 15 | | 40 | 80 | |
| t_{setup} | Data Setup Time Serial Data to Clock | | 5 | | 80 | 160 | ns |
| | | | 10 | | 30 | 60 | |
| | | | 15 | | 20 | 40 | |
| | Parallel Data to Clock | | 5 | | 25 | 50 | ns |
| | | | 10 | | 15 | 30 | |
| | | | 15 | | 10 | 20 | |
| t_w | High-level Pulse Width, AE, P/S, A/S | | 5 | | 175 | 350 | ns |
| | | | 10 | | 70 | 140 | |
| | | | 15 | | 40 | 80 | |
| f_{CL} | Maximum Clock Frequency | | 5 | 2 | 4 | | MHz |
| | | | 10 | 5 | 10 | | |
| | | | 15 | 7 | 14 | | |
| t_w | Clock Pulse Width | | 5 | | 125 | 250 | ns |
| | | | 10 | | 50 | 100 | |
| | | | 15 | | 35 | 70 | |
| t_r , t_f^* | Clock Input Rise or Fall Time | | 5,10,15 | | | 15 | μs |

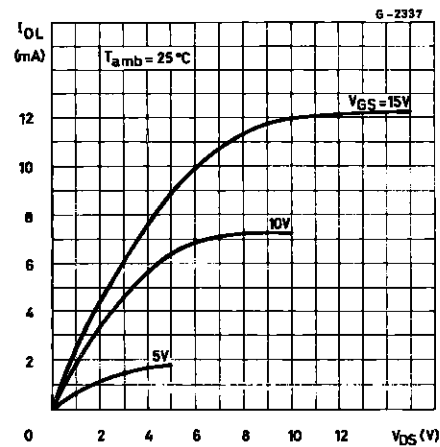
* If more than one unit is cascaded. t_r should be made less than or equal to the sum of the transition time and the fixed propagation delay of the output of the driving stage for the estimated capacitive load.

HCC/HCF4034B

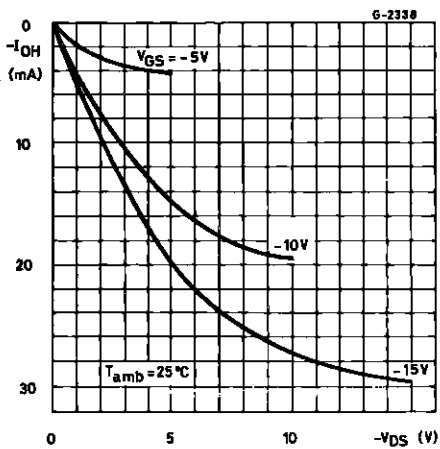
Typical Output Low (sink) Current Characteristics.



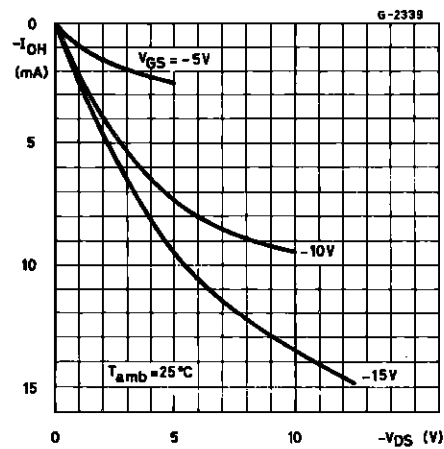
Minimum Output Low (sink) Current Characteristics.



Typical Output High (source) Current Characteristics.

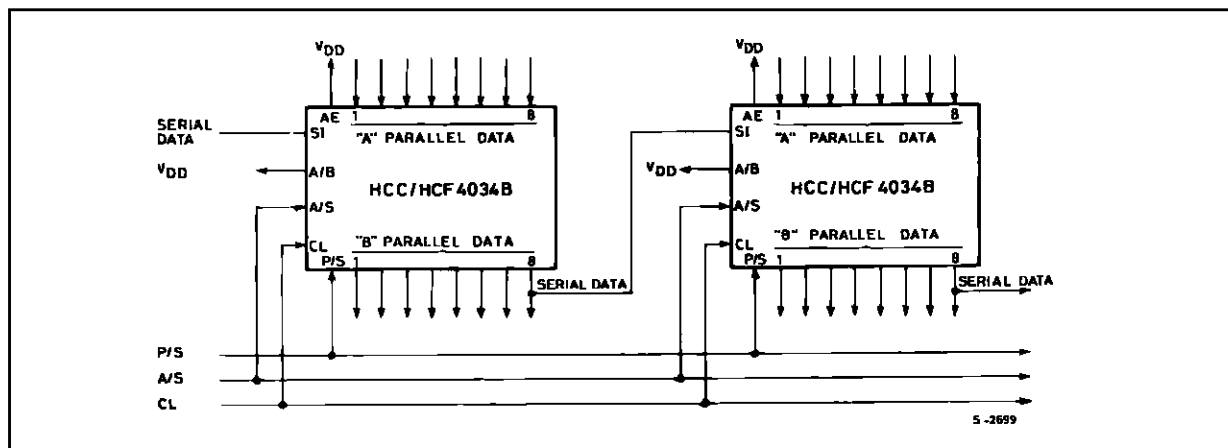


Minimum Output High (source) Current Characteristics.



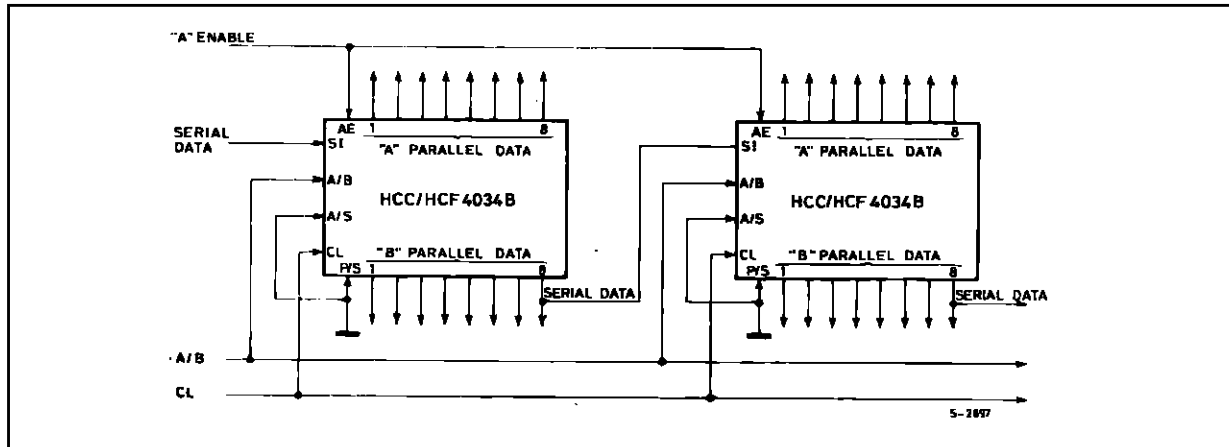
TYPICAL APPLICATIONS

16-BIT PARALLEL IN/PARALLEL OUT PARALLEL IN/SERIAL OUT, SERIAL IN/PARALLEL OUT, SERIAL IN/SERIAL OUT REGISTER.

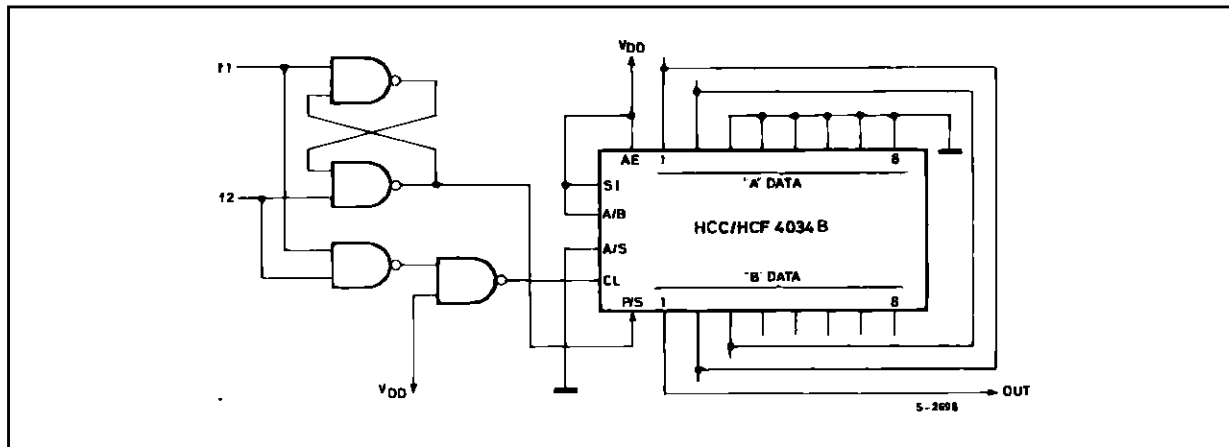


TYPICAL APPLICATIONS (continued)

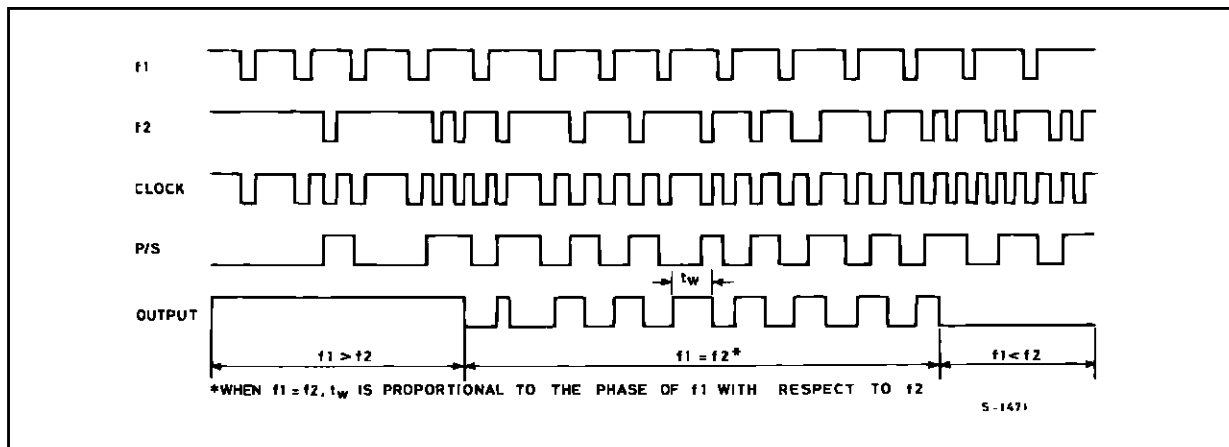
16-BIT SERIAL IN/GATED PARALLEL OUT REGISTER



FREQUENCY AND PHASE COMPARATOR.

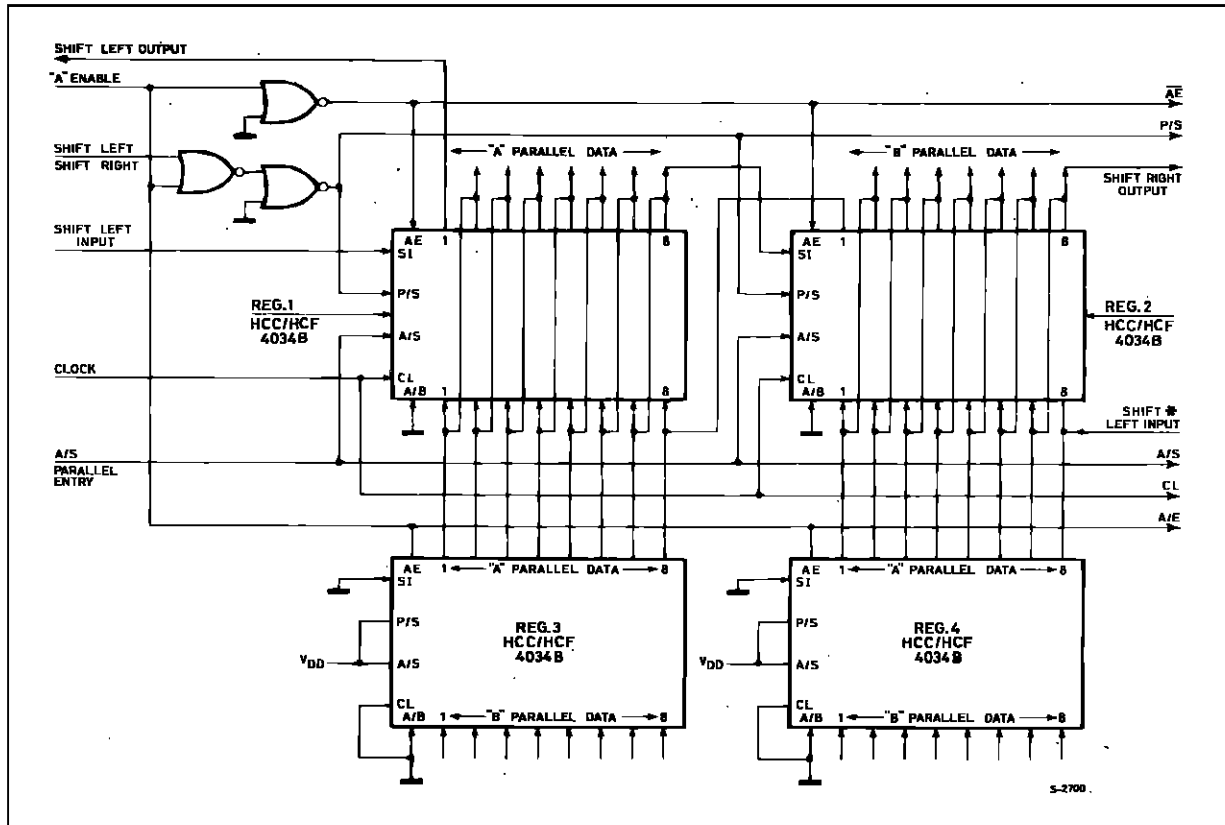


TIMING DIAGRAM



TYPICAL APPLICATIONS (continued)

SHIFT RIGHT/SHIFT LEFT WITH PARALLEL INPUTS

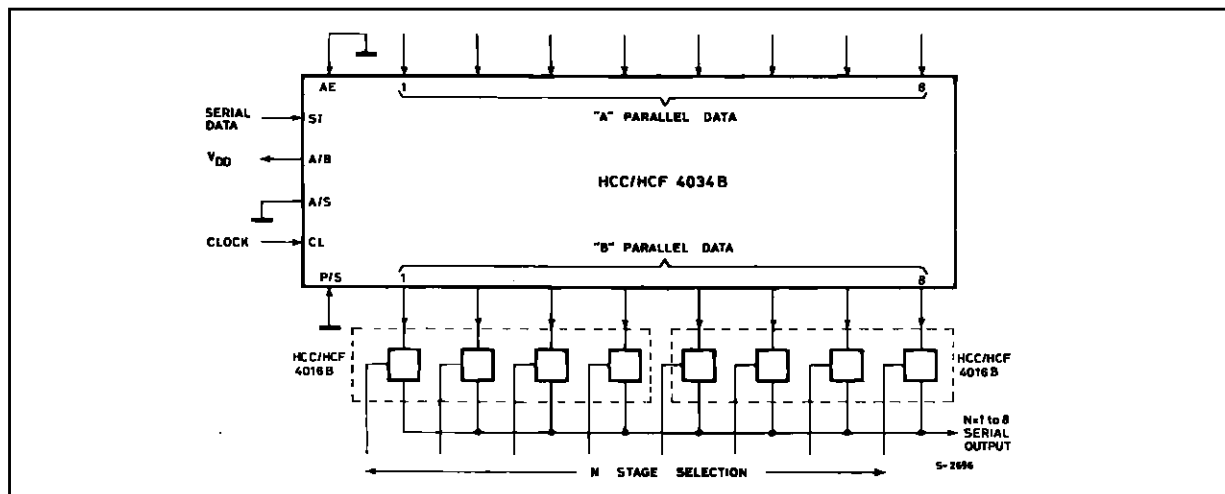


A "High" ("Low") on the Shift Left/Shift Right input allows serial data on the Shift Left Input (Shift Right Input) to enter the register on the positive transition of the clock signal. A "high" on the "A" Enable Input disables the "A" parallel data lines on Reg. 1 and 2 and enables the "A" data lines on registers 3 and 4 and allows parallel data into registers 1 and 2. Other

logic schemes may be used in place of registers 3 and 4 for parallel loading. When parallel inputs are not used Reg. 3 and 4 and associated logic are not required.

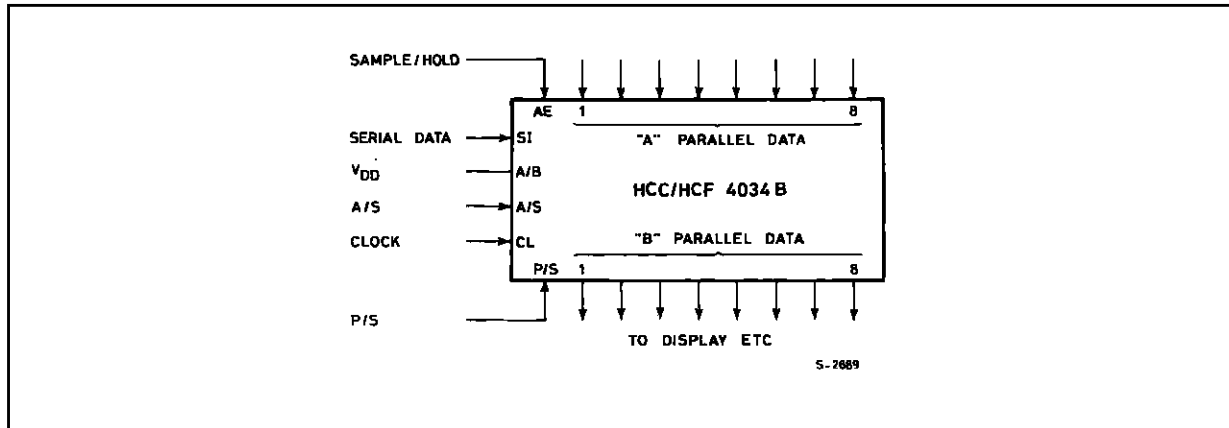
* Shift Left input must be disabled during parallel entry.

N-STAGE REGISTER WITH FIXED SERIAL OUTPUT LINE

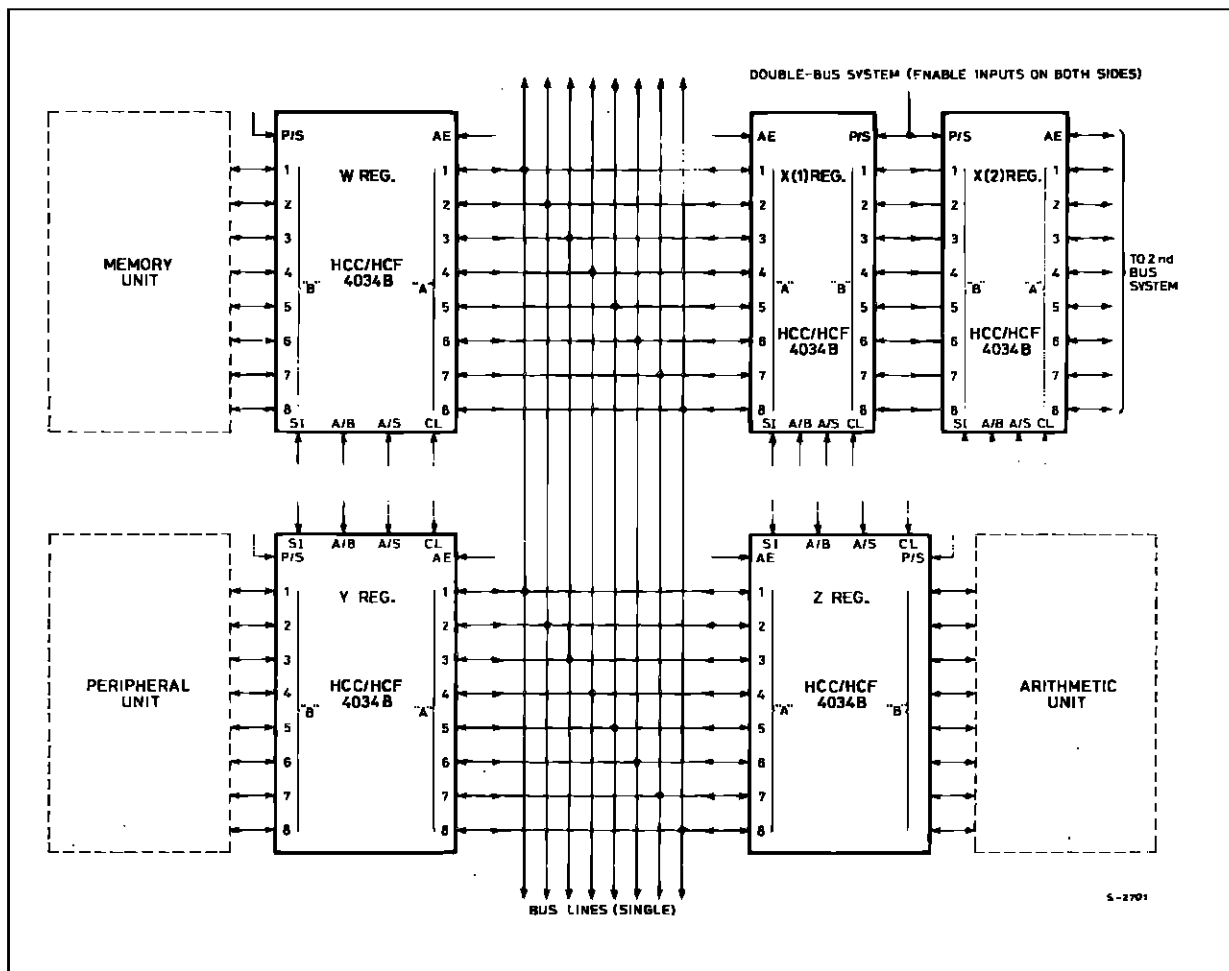


TYPICAL APPLICATIONS (continued)

SAMPLE AND HOLD REGISTER-SERIAL/PARALLEL IN-PARALLEL OUT



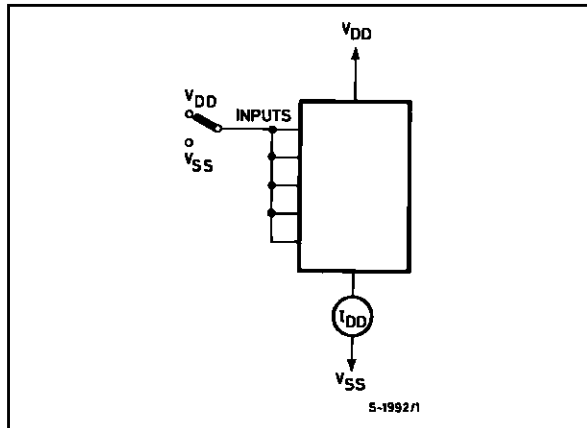
SINGLE-AND DOUBLE-BUS SYSTEMS



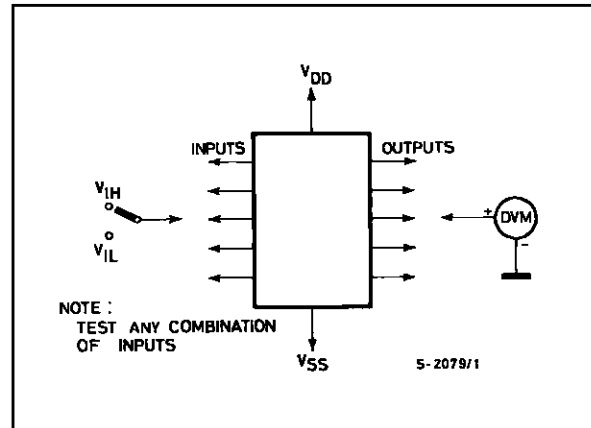
The "A" enable (AE) and A/B signals control all combinations of transfer between the registers and bus systems.

TEST CIRCUITS

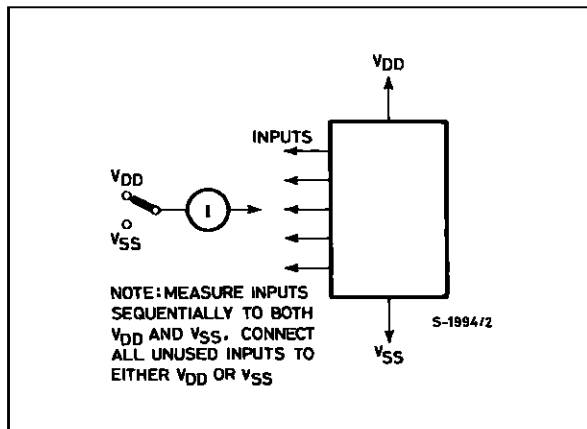
Quiescent Device Current.



Noise Immunity.

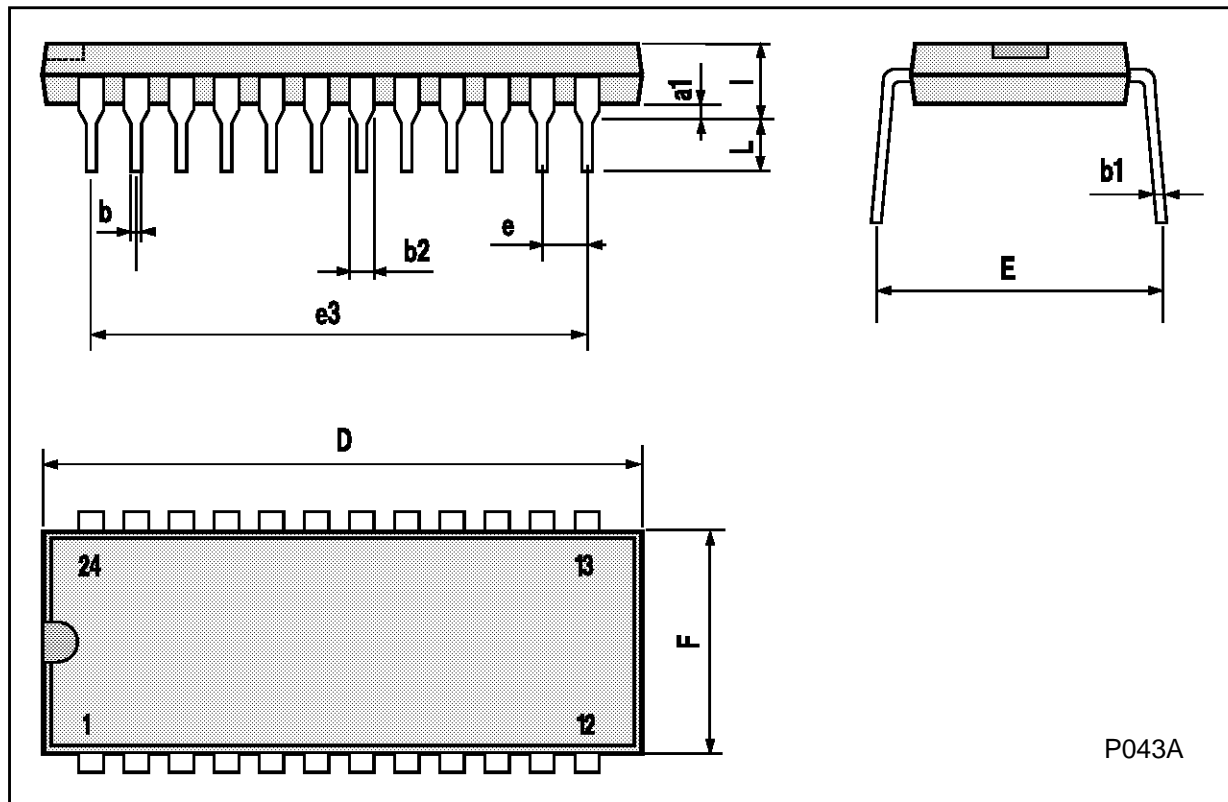


Input Leakage Current.



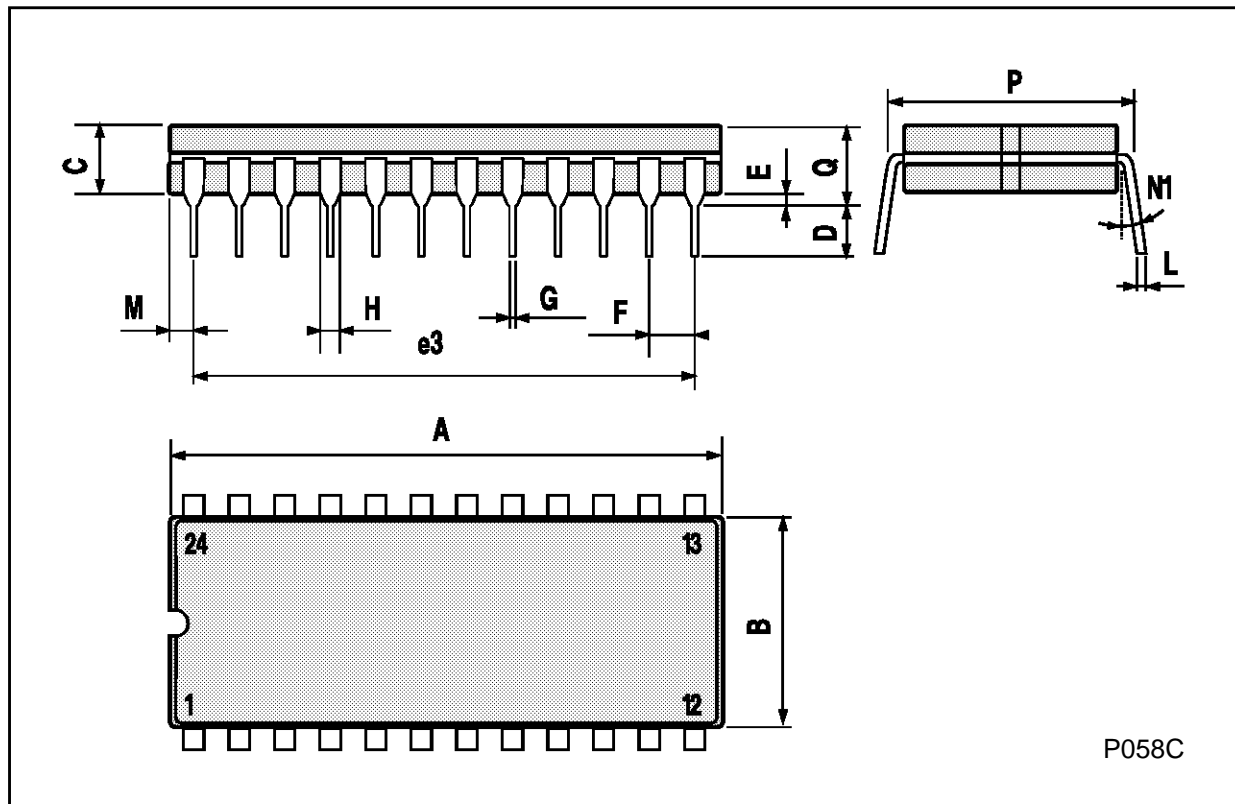
Plastic DIP24 (0.25) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | | 0.63 | | | 0.025 | |
| b | | 0.45 | | | 0.018 | |
| b1 | 0.23 | | 0.31 | 0.009 | | 0.012 |
| b2 | | 1.27 | | | 0.050 | |
| D | | | 32.2 | | | 1.268 |
| E | 15.2 | | 16.68 | 0.598 | | 0.657 |
| e | | 2.54 | | | 0.100 | |
| e3 | | 27.94 | | | 1.100 | |
| F | | | 14.1 | | | 0.555 |
| l | | 4.445 | | | 0.175 | |
| L | | 3.3 | | | 0.130 | |



Ceramic DIP24 MECHANICAL DATA

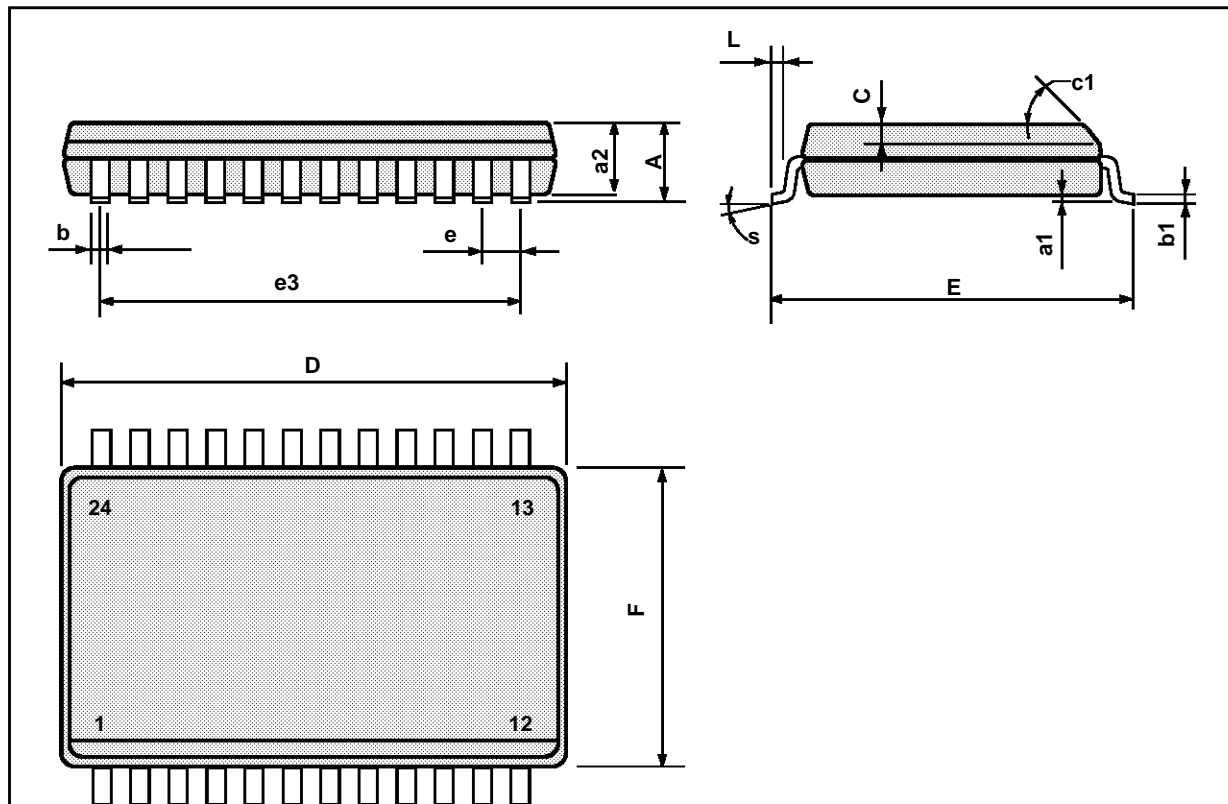
| DIM. | mm | | | inch | | |
|------|-----------------------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 32.3 | | | 1.272 |
| B | 13.05 | | 13.36 | 0.514 | | 0.526 |
| C | 3.9 | | 5.08 | 0.154 | | 0.200 |
| D | 3 | | | 0.118 | | |
| E | 0.5 | | 1.78 | 0.020 | | 0.070 |
| e3 | | 27.94 | | | 1.100 | |
| F | 2.29 | | 2.79 | 0.090 | | 0.110 |
| G | 0.4 | | 0.55 | 0.016 | | 0.022 |
| I | 1.17 | | 1.52 | 0.046 | | 0.060 |
| L | 0.22 | | 0.31 | 0.009 | | 0.012 |
| M | 1.52 | | 2.49 | 0.060 | | 0.098 |
| N1 | 4° (min.), 15° (max.) | | | | | |
| P | 15.4 | | 15.8 | 0.606 | | 0.622 |
| Q | | | 5.71 | | | 0.225 |



P058C

SO24 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 2.65 | | | 0.104 |
| a1 | 0.10 | | 0.20 | 0.004 | | 0.007 |
| a2 | | | 2.45 | | | 0.096 |
| b | 0.35 | | 0.49 | 0.013 | | 0.019 |
| b1 | 0.23 | | 0.32 | 0.009 | | 0.012 |
| C | | 0.50 | | | 0.020 | |
| c1 | 45° (typ.) | | | | | |
| D | 15.20 | | 15.60 | 0.598 | | 0.614 |
| E | 10.00 | | 10.65 | 0.393 | | 0.420 |
| e | | 1.27 | | | 0.05 | |
| e3 | | 13.97 | | | 0.55 | |
| F | 7.40 | | 7.60 | 0.291 | | 0.299 |
| L | 0.50 | | 1.27 | 0.19 | | 0.050 |
| S | 8° (max.) | | | | | |



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