

## CMOS QUAD 3-STATE R-S LATCHES

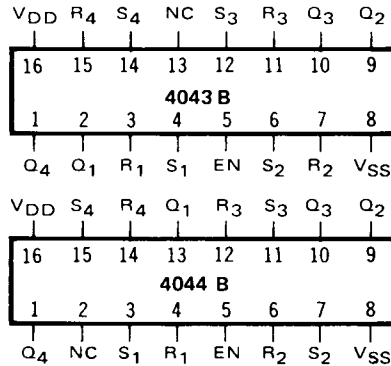
### FEATURES

- ◆ Separate Set and Reset Inputs for each Latch
- ◆ Active-High (4043 B) or Active-Low (4044 B) Inputs
- ◆ 3-State Outputs with Common Enable

### DESCRIPTION

4043 B types are Quad cross-coupled 3-state CMOS NOR Latches, and the 4044 B types are Quad cross-coupled 3-state CMOS NAND Latches. Each latch has a separate Q output and individual Set and Reset inputs. The Q outputs are gated through transmission gates controlled by a common Enable input. A logic "1" or "high" on the Enable input connects the latch states to the Q outputs. A logic "0" or "low" on the Enable input disconnects the latch states from the Q outputs, resulting in an open circuit condition on the Q outputs. The open circuit feature allows common bussing of the outputs. The logic operation of the latches is summarized in the truth table below.

### CONNECTION DIAGRAMS (all packages)



#### Add suffix for package:

- |   |                |   |             |
|---|----------------|---|-------------|
| C | 16-pin Cerdip  | F | 16-pin Flat |
| D | 16-pin Ceramic | H | Chip        |
| E | 16-pin Epoxy   |   |             |

### TRUTH TABLES

#### 4043 B

| S | R | E | Q   |
|---|---|---|-----|
| X | X | 0 | OC* |
| 0 | 0 | 1 | NC† |
| 1 | 0 | 1 | 1   |
| 0 | 1 | 1 | 0   |
| 1 | 1 | 1 | Δ   |

- \* OPEN CIRCUIT
- † NO CHANGE
- Δ DOMINATED BY S = 1 INPUT

#### 4044 B

| S | R | E | Q   |
|---|---|---|-----|
| X | X | X | OC* |
| 1 | 1 | 1 | NC† |
| 0 | 1 | 1 | 1   |
| 1 | 0 | 1 | 0   |
| 0 | 0 | 1 | ΔΔ  |

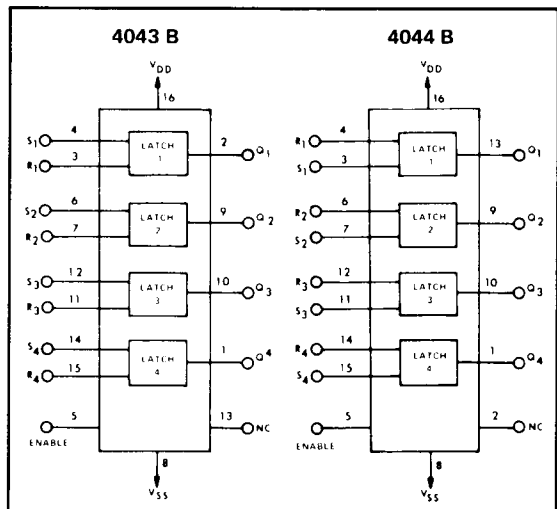
- \* OPEN CIRCUIT
- † NO CHANGE
- ΔΔ DOMINATED BY R = 0 INPUT

### RECOMMENDED OPERATING CONDITIONS

For maximum reliability:

|                       |                   |             |     |
|-----------------------|-------------------|-------------|-----|
| DC Supply Voltage     | $V_{DD} - V_{SS}$ | 3 to 15     | Vdc |
| Operating Temperature | $T_A$             | -55 to +125 | °C  |
| C, D, F, H Device     |                   | -40 to +85  | °C  |
| E Device              |                   |             |     |

### BLOCK DIAGRAMS



## ELECTRICAL CHARACTERISTICS

### STATIC CHARACTERISTICS <sup>1</sup>

| PARAMETER                      | V <sub>DD</sub> (Vdc) | CONDITIONS  | T <sub>LOW</sub> <sup>2</sup> |      | +25°C |                   |      | T <sub>HIGH</sub> <sup>2</sup> |      | Units            |
|--------------------------------|-----------------------|---|-------------------------------|------|-------|-------------------|------|--------------------------------|------|------------------|
|                                |                       |   | Min.                          | Max. | Min.  | Typ.              | Max. | Min.                           | Max. |                  |
| QUIESCENT DEVICE CURRENT       | I <sub>DD</sub>       | V <sub>IN</sub> =V <sub>SS</sub> or V <sub>DD</sub><br>All valid input combinations | —                             | 1.0  | —     | 0.005             | 1.0  | —                              | 30   | μA <sub>dc</sub> |
|                                |                       |   | —                             | 2.0  | —     | 0.01              | 2.0  | —                              | 60   |                  |
|                                |                       |   | —                             | 4.0  | —     | 0.02              | 4.0  | —                              | 120  |                  |
| 3-STATE OUTPUT LEAKAGE CURRENT | I <sub>ZL</sub>       | Enable = V <sub>SS</sub>  | —                             | ±0.1 | —     | ±10 <sup>-4</sup> | ±0.1 | —                              | ±1.0 | μA <sub>dc</sub> |

NOTES: <sup>1</sup> Remaining Static Electrical Characteristics are listed under "4000B Series Family Specifications".

<sup>2</sup> T<sub>LOW</sub> = -55°C for C, D, F, H device.

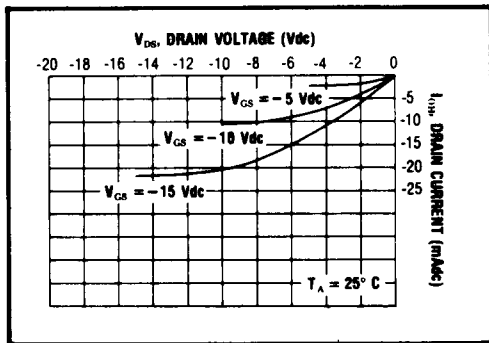
= -40°C for E device.

T<sub>HIGH</sub> = +125°C for C, D, F, H device.

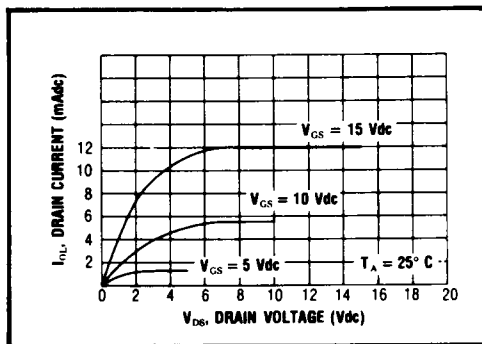
= + 85°C for E device.

### DYNAMIC CHARACTERISTICS (C<sub>L</sub> = 50pF, T<sub>A</sub> = 25°C)

| PARAMETER                                    | V <sub>DD</sub> (Vdc)               | Min.   | Typ. | Max. | Units |     |    |
|--|-------------------------------------|--|------|------|-------|-----|----|
| PROPAGATION DELAY TIME<br>From S or R Inputs | t <sub>PLH</sub> , t <sub>PHL</sub> | 5  | —    | 150  | 300   | ns  |    |
|  |                                     | 10   | —    | 70   | 140   |     |    |
|  |                                     | 15   | —    | 50   | 100   |     |    |
|  | From Enable Input                   | t <sub>PZH</sub> , t <sub>PZL</sub><br>t <sub>PZH</sub> , t <sub>PZL</sub> | 5    | —    | 75    | 150 | ns |
|  |                                     |  | 10   | —    | 35    | 70  |    |
|  |                                     |  | 15   | —    | 30    | 60  |    |
| OUTPUT TRANSITION TIME                       | t <sub>TLH</sub> , t <sub>THL</sub> | 5  | —    | 100  | 200   | ns  |    |
| MINIMUM SET OR RESET PULSE WIDTH             | PW <sub>S</sub> , PW <sub>R</sub>   | 5  | —    | 80   | 160   | ns  |    |
|  |                                     | 10   | —    | 40   | 80    |     |    |
|  |                                     | 15   | —    | 30   | 60    |     |    |
| SET OR RESET REMOVAL TIME                    | t <sub>tran</sub>                   | 5  | —    | 25   | 50    | ns  |    |
|  |                                     | 10   | —    | 15   | 30    |     |    |
|  |                                     | 15   | —    | 10   | 20    |     |    |

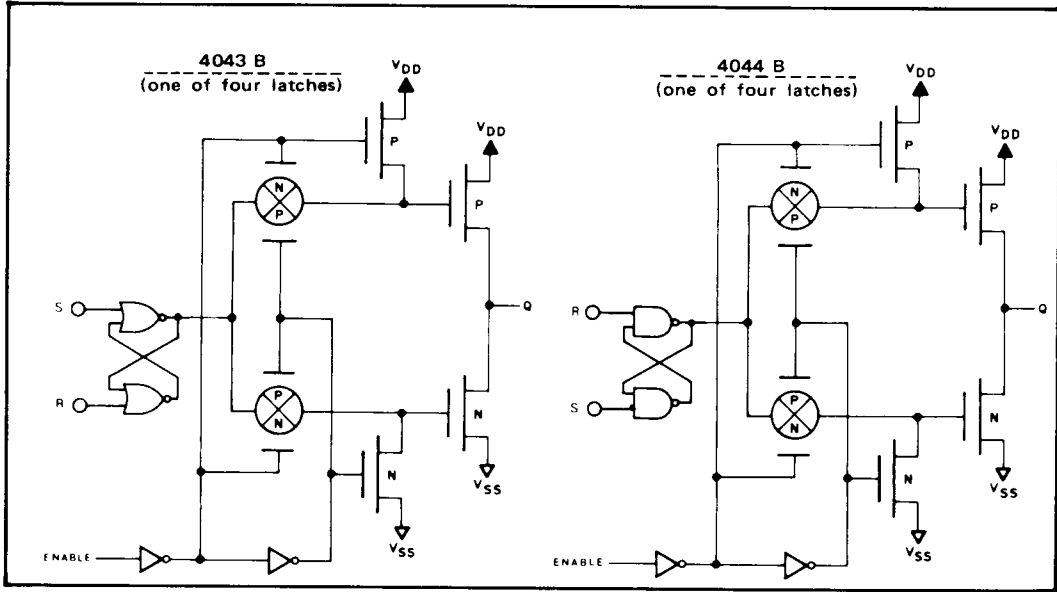


**Typical P-Channel  
Source Current Characteristics**



**Typical N-Channel  
Sink Current Characteristics**

LOGIC DIAGRAMS



APPLICATIONS INFORMATION

