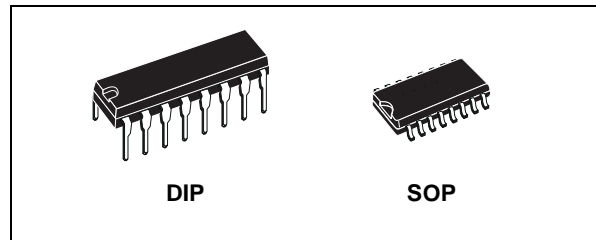




# HCF4043B

## QUAD NOR 3-STATE R-S LATCH

- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 3-LEVEL OUTPUTS WITH COMMON OUTPUT ENABLE
- SEPARATE SET AND RESET INPUT FOR EACH LATCH
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT  
 $I_l = 100\text{nA (MAX) AT } V_{DD} = 18\text{V } T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



### ORDER CODES

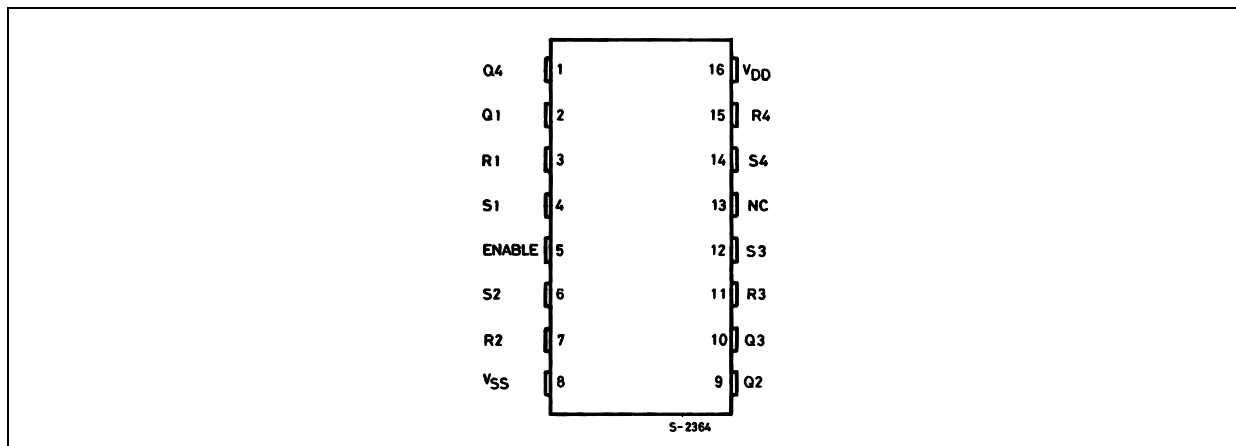
| PACKAGE | TUBE       | T & R         |
|---------|------------|---------------|
| DIP     | HCF4043BEY |               |
| SOP     | HCF4043BM1 | HCF4043M013TR |

### DESCRIPTION

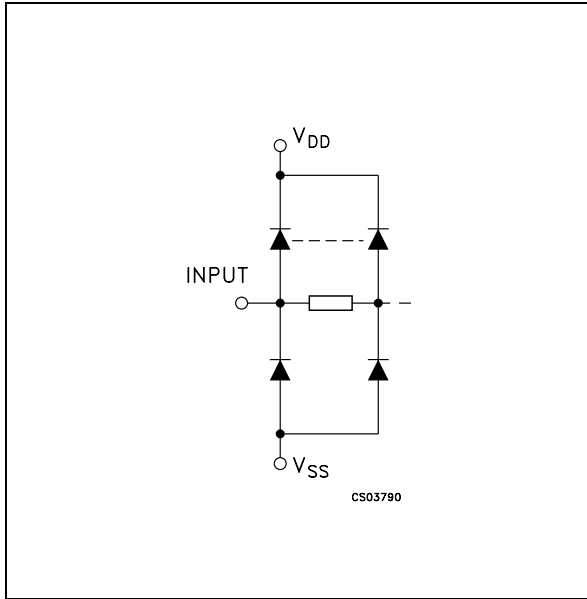
The HCF4043B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. The HCF4043B is a quad cross-coupled 3-state CMOS NOR latch. Each latch has a separate Q output and individual SET and RESET input. The Q outputs are

controlled by a common ENABLE input. A logic "1" or "high" on the ENABLE inputs 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.

### PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

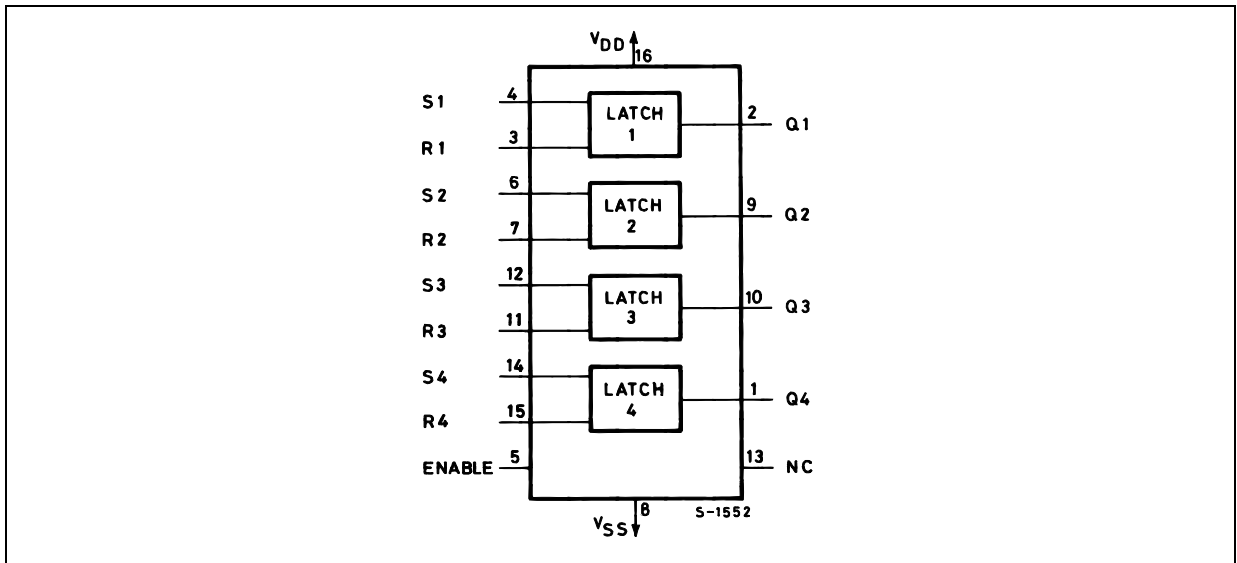
| PIN No       | SYMBOL          | NAME AND FUNCTION       |
|--------------|-----------------|-------------------------|
| 4, 6, 12, 14 | S1 to S4        | Set Inputs              |
| 3, 7, 11, 15 | R1 to R4        | Reset Inputs            |
| 5            | ENABLE          | Enable Input            |
| 2, 9, 10, 1  | Q1 to Q4        | Outputs                 |
| 13           | NC              | Not Connected           |
| 8            | V <sub>SS</sub> | Negative Supply Voltage |
| 16           | V <sub>DD</sub> | Positive Supply Voltage |

TRUTH TABLE

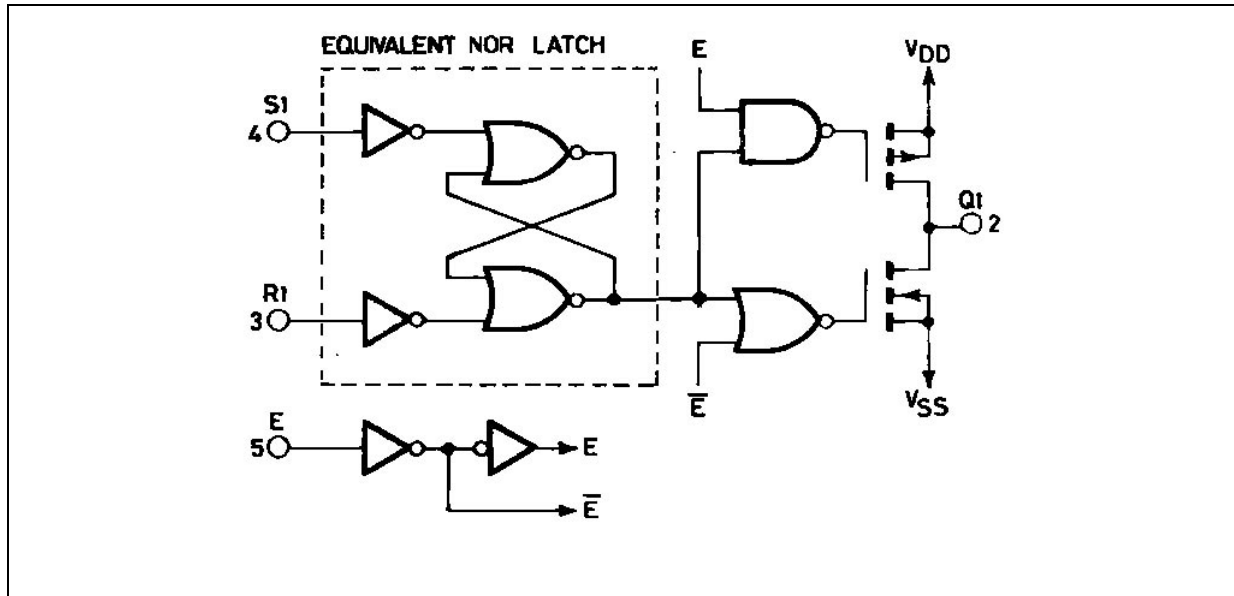
| INPUTS |                |                | OUTPUT Q <sub>n</sub> |
|--------|----------------|----------------|-----------------------|
| ENABLE | S <sub>n</sub> | R <sub>n</sub> |                       |
| L      | X              | X              | Z                     |
| H      | L              | H              | L                     |
| H      | H              | X              | H                     |
| H      | L              | L              | LATCHED               |

X : Don't Care

FUNCTIONAL DIAGRAM



## LOGIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                               | Value                  | Unit               |
|-----------|---|------------------------|--------------------|
| $V_{DD}$  | Supply Voltage                          | -0.5 to +22            | V                  |
| $V_I$     | DC Input Voltage                        | -0.5 to $V_{DD} + 0.5$ | V                  |
| $I_I$     | DC Input Current                        | $\pm 10$               | mA                 |
| $P_D$     | Power Dissipation per Package           | 200                    | mW                 |
|           | Power Dissipation per Output Transistor | 100                    | mW                 |
| $T_{op}$  | Operating Temperature                   | -55 to +125            | $^{\circ}\text{C}$ |
| $T_{stg}$ | Storage Temperature                     | -65 to +150            | $^{\circ}\text{C}$ |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

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

## RECOMMENDED OPERATING CONDITIONS

| Symbol   | Parameter             | Value         | Unit               |
|----------|-----------------------|---------------|--------------------|
| $V_{DD}$ | Supply Voltage        | 3 to 20       | V                  |
| $V_I$    | Input Voltage         | 0 to $V_{DD}$ | V                  |
| $T_{op}$ | Operating Temperature | -55 to 125    | $^{\circ}\text{C}$ |

## DC SPECIFICATIONS

| Symbol          | Parameter                 | Test Condition        |                       |                                 |                        | Value                 |               |           |             |          |              | Unit     |         |
|-----------------|---------------------------|-----------------------|-----------------------|---------------------------------|------------------------|-----------------------|---------------|-----------|-------------|----------|--------------|----------|---------|
|                 |                           | V <sub>I</sub><br>(V) | V <sub>O</sub><br>(V) | I <sub>OL</sub>  <br>( $\mu$ A) | V <sub>DD</sub><br>(V) | T <sub>A</sub> = 25°C |               |           | -40 to 85°C |          | -55 to 125°C |          |         |
|                 |                           |                       |                       |                                 |                        | Min.                  | Typ.          | Max.      | Min.        | Max.     | Min.         |          | Max.    |
| I <sub>L</sub>  | Quiescent Current         | 0/5                   |                       |                                 | 5                      |                       | 0.02          | 1         |             | 30       |              | 30       | $\mu$ A |
|                 |                           | 0/10                  |                       |                                 | 10                     |                       | 0.02          | 2         |             | 60       |              | 60       |         |
|                 |                           | 0/15                  |                       |                                 | 15                     |                       | 0.02          | 4         |             | 120      |              | 120      |         |
|                 |                           | 0/20                  |                       |                                 | 20                     |                       | 0.04          | 20        |             | 600      |              | 600      |         |
| V <sub>OH</sub> | High Level Output 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 <sub>OL</sub> | Low Level Output 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 <sub>IH</sub> | High Level Input 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 <sub>IL</sub> | Low Level Input 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 <sub>OH</sub> | Output Drive Current      | 0/5                   | 2.5                   | <1                              | 5                      | -1.36                 | -3.2          |           | -1.15       |          | -1.1         |          | mA      |
|                 |                           | 0/5                   | 4.6                   | <1                              | 5                      | -0.44                 | -1            |           | -0.36       |          | -0.36        |          |         |
|                 |                           | 0/10                  | 9.5                   | <1                              | 10                     | -1.1                  | -2.6          |           | -0.9        |          | -0.9         |          |         |
|                 |                           | 0/15                  | 13.5                  | <1                              | 15                     | -3.0                  | -6.8          |           | -2.4        |          | -2.4         |          |         |
| I <sub>OL</sub> | Output Sink Current       | 0/5                   | 0.4                   | <1                              | 5                      | 0.44                  | 1             |           | 0.36        |          | 0.36         |          | mA      |
|                 |                           | 0/10                  | 0.5                   | <1                              | 10                     | 1.1                   | 2.6           |           | 0.9         |          | 0.9          |          |         |
|                 |                           | 0/15                  | 1.5                   | <1                              | 15                     | 3.0                   | 6.8           |           | 2.4         |          | 2.4          |          |         |
| I <sub>I</sub>  | Input Leakage Current     | 0/18                  | Any Input             |                                 | 18                     |                       | $\pm 10^{-5}$ | $\pm 0.1$ |             | $\pm 1$  |              | $\pm 1$  | $\mu$ A |
| I <sub>OZ</sub> | 3-State Output            | 0/18                  | 0/18                  |                                 | 18                     |                       | $\pm 10^{-4}$ | $\pm 0.4$ |             | $\pm 12$ |              | $\pm 12$ | $\mu$ A |
| C <sub>I</sub>  | Input Capacitance         |                       | Any Input             |                                 |                        |                       | 5             | 7.5       |             |          |              |          | pF      |

The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub>=5V, 2V min. with V<sub>DD</sub>=10V, 2.5V min. with V<sub>DD</sub>=15V

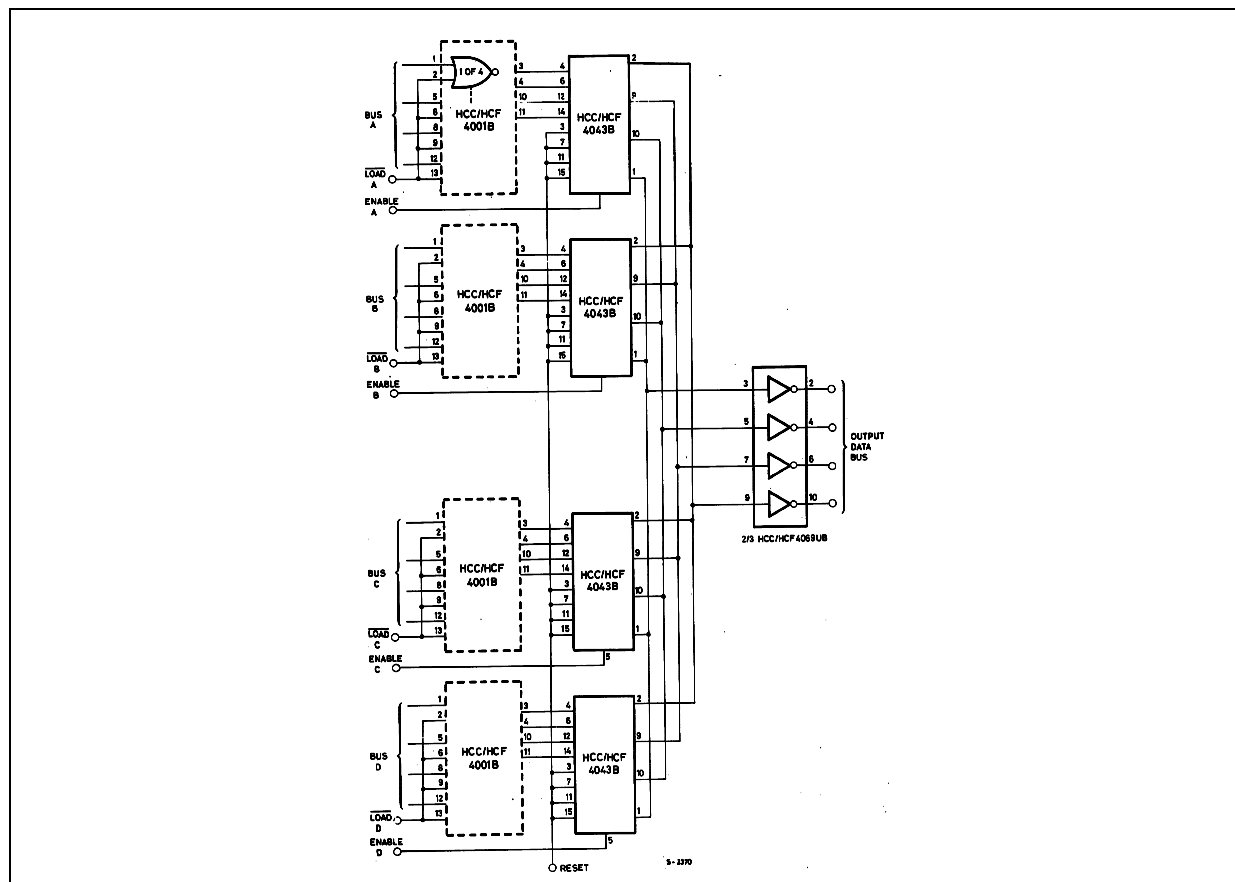
**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{K}\Omega$ ,  $t_r = t_f = 20\text{ ns}$ )

| Symbol              | Parameter                                     | Test Condition |  | Value (*) |      |      | Unit |
|---------------------|---|----------------|--|-----------|------|------|------|
|                     |   | $V_{DD}$ (V)   |  | Min.      | Typ. | Max. |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (SET or RESET to Q)    | 5              |  |           | 150  | 300  | ns   |
|                     |   | 10             |  |           | 70   | 140  |      |
|                     |   | 15             |  |           | 50   | 100  |      |
| $t_{PZH}$ $t_{PZL}$ | 3-State Propagation Delay Time (Enable to Q)  | 5              |  |           | 115  | 230  | ns   |
|                     |   | 10             |  |           | 55   | 110  |      |
|                     |   | 15             |  |           | 40   | 80   |      |
| $t_{PLZ}$ $t_{PHZ}$ | 3-State Propagation Delay Time (Disable to Q) | 5              |  |           | 90   | 180  | ns   |
|                     |   | 10             |  |           | 50   | 100  |      |
|                     |   | 15             |  |           | 35   | 70   |      |
| $t_{TLH}$ $t_{THL}$ | Transition Time                               | 5              |  |           | 100  | 200  | ns   |
|                     |   | 10             |  |           | 50   | 100  |      |
|                     |   | 15             |  |           | 40   | 80   |      |
| $t_W$               | Pulse Width (Set or Reset)                    | 5              |  | 160       | 80   |      | ns   |
|                     |   | 10             |  | 80        | 40   |      |      |
|                     |   | 15             |  | 40        | 20   |      |      |

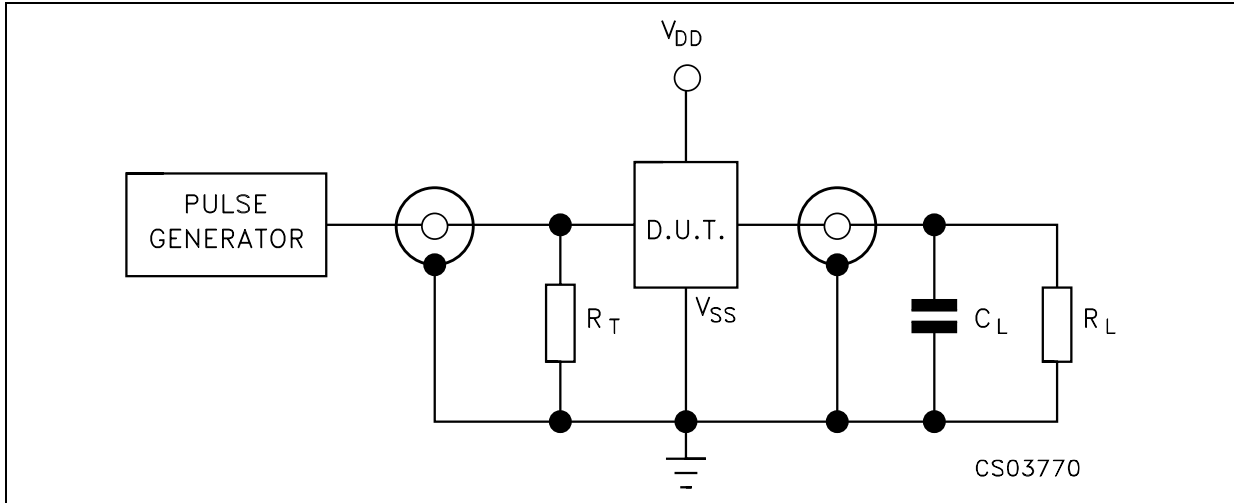
(\*) Typical temperature coefficient for all  $V_{DD}$  value is 0.3 %/°C.

**TYPICAL APPLICATIONS**

**MULTIPLE BUS STORAGE**

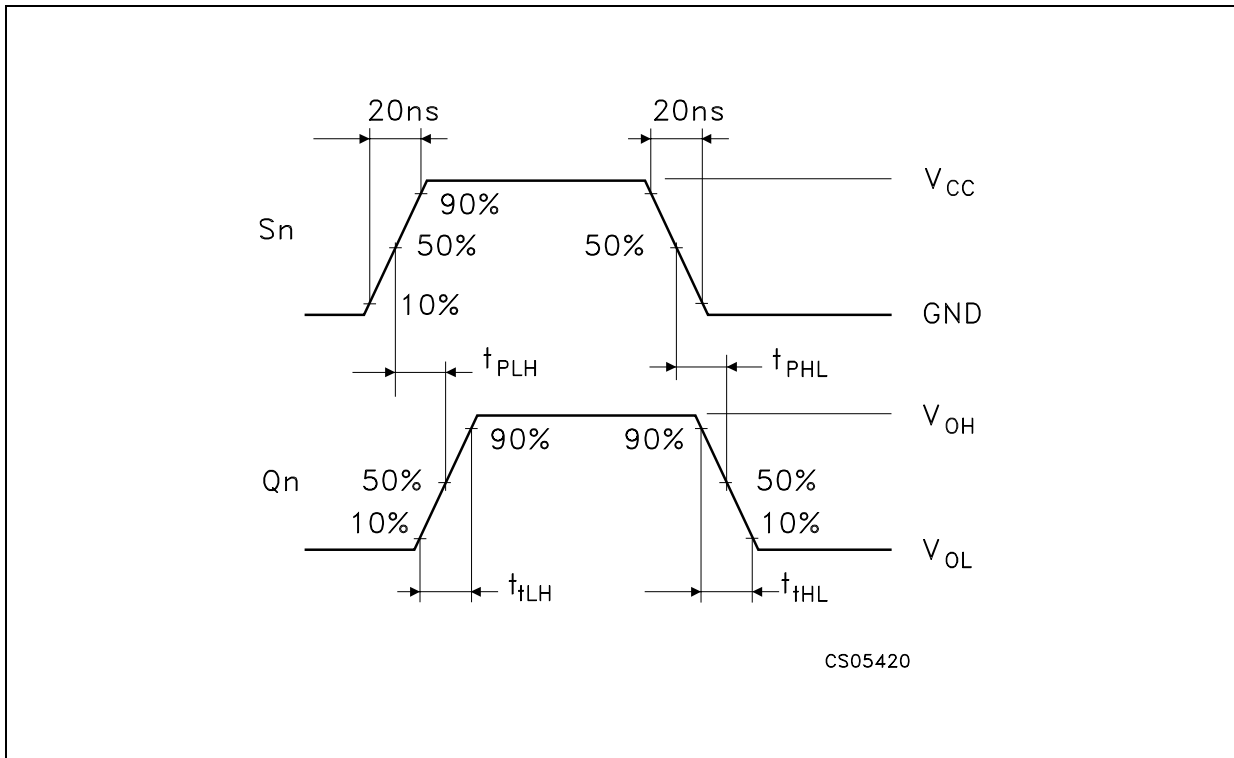


TEST CIRCUIT

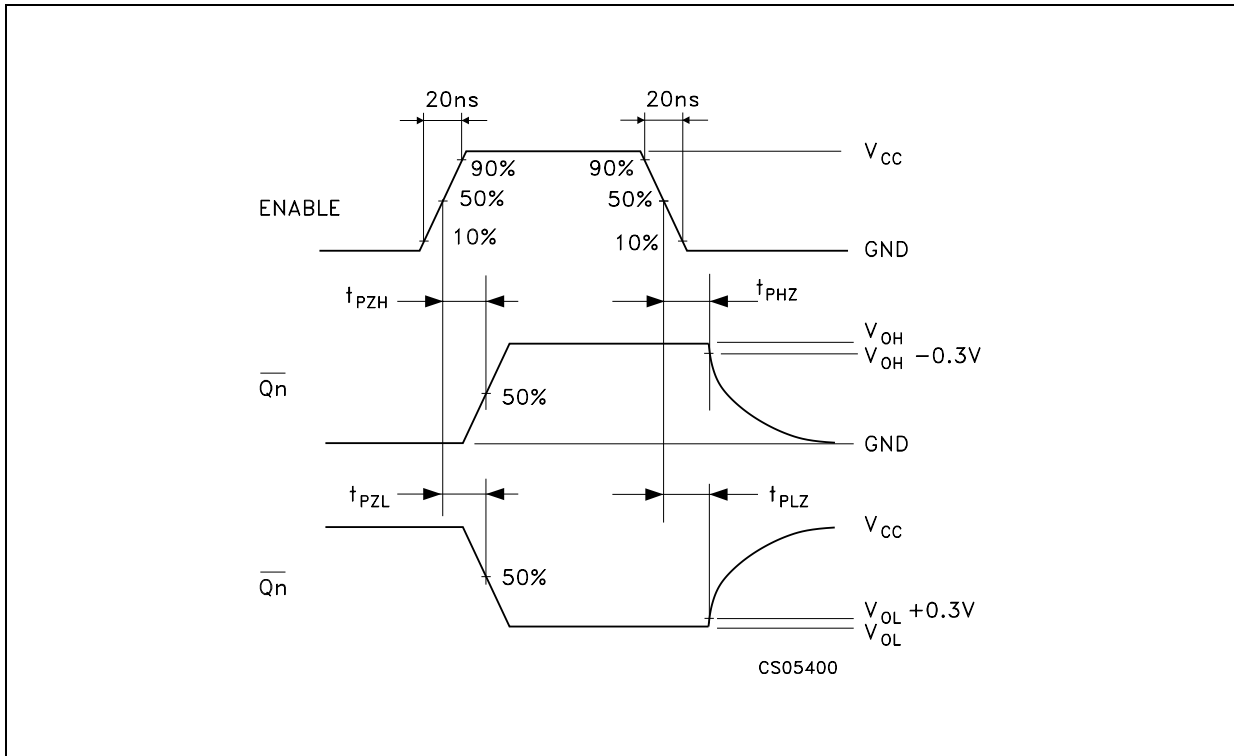


$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_L = 200\text{K}\Omega$   
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

WAVEFORM : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)

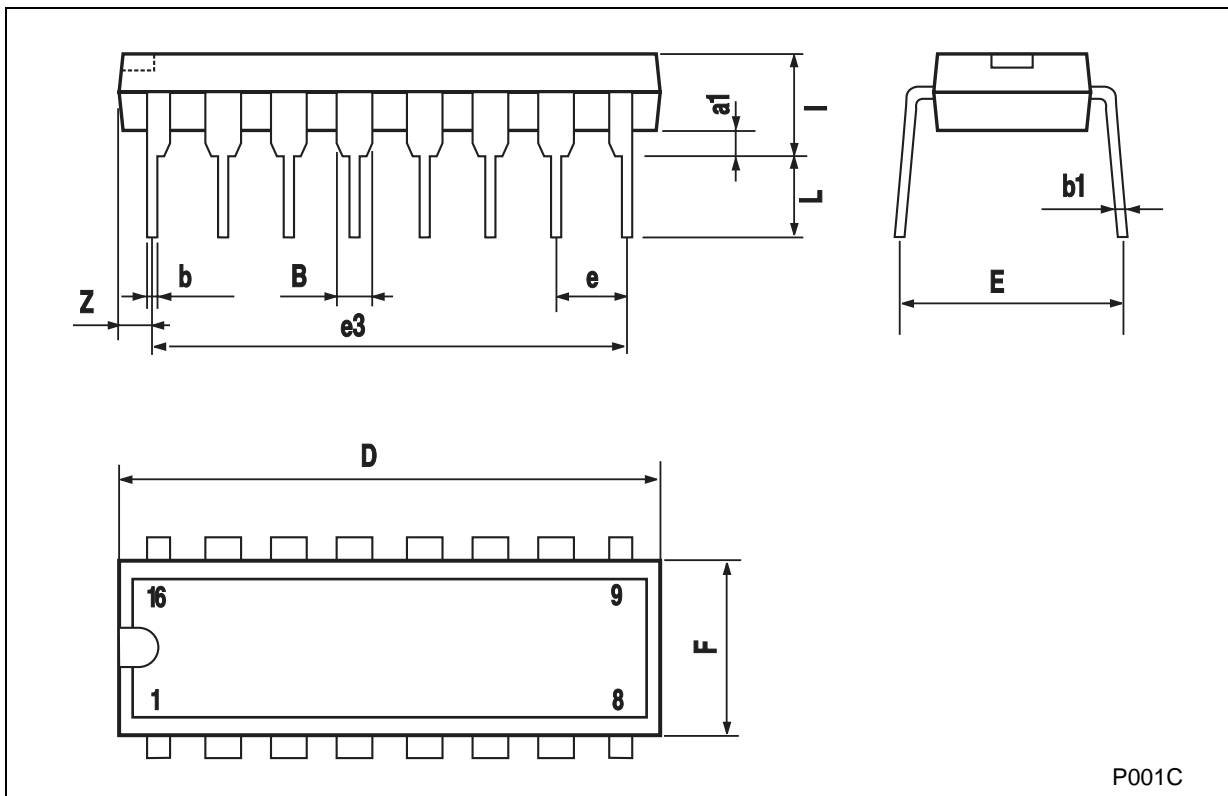


WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIMES (f=1MHz; 50% duty cycle)



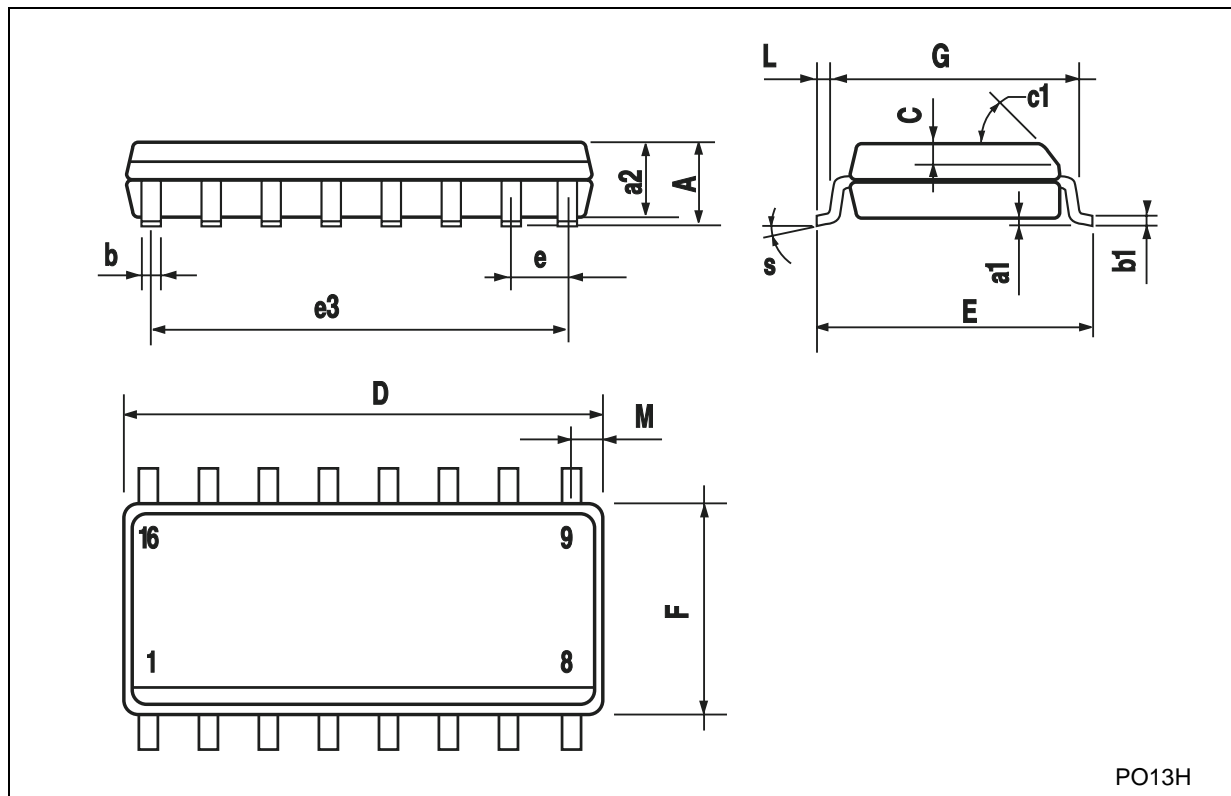
**Plastic DIP-16 (0.25) MECHANICAL DATA**

| 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 |



## SO-16 MECHANICAL DATA

| DIM. | mm.        |      |      | inch  |       |       |
|------|------------|------|------|-------|-------|-------|
|      | MIN.       | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |            |      | 1.75 |       |       | 0.068 |
| a1   | 0.1        |      | 0.2  | 0.003 |       | 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.)  |      |      |       |       |       |



PO13H

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