



# HCF4099B

## 8 BIT ADDRESSABLE LATCH

- SERIAL DATA INPUT - ACTIVE PARALLEL OUTPUT
- STORAGE REGISTER CAPABILITY - MASTER CLEAR
- CAN FUNCTION AS DEMULTIPLEXER
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- INPUT LEAKAGE CURRENT  
 $I_1 = 100\text{nA (MAX) AT } V_{DD} = 18\text{V } T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



### ORDER CODES

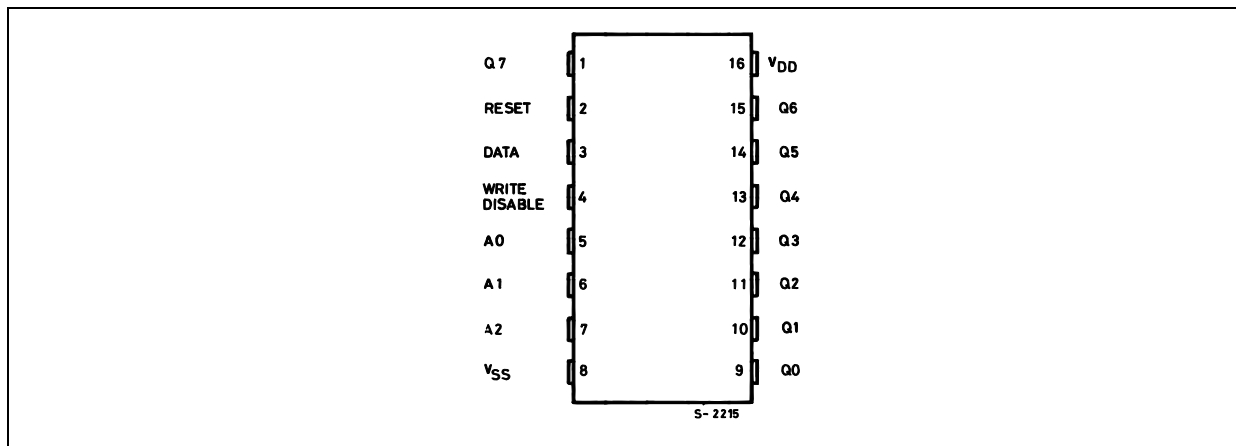
| PACKAGE | TUBE       | T & R         |
|---------|------------|---------------|
| DIP     | HCF4099BEY |               |
| SOP     | HCF4099BM1 | HCF4099M013TR |

### DESCRIPTION

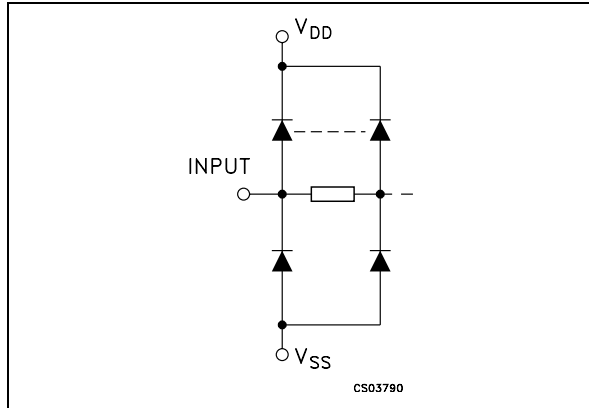
HCF4099B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. HCF4099B, an 8-bit addressable latch, is a serial-input, parallel output storage register that can perform a variety of functions. Data is input to a particular bit in the latch when that bit is addressed (by means of input A0, A1, A2) and when WRITE DISABLE is at a low level. When

WRITE DISABLE is high, data entry is inhibited; however, all 8 outputs can be continuously read independent of WRITE DISABLE and address inputs. A master RESET input is available, which resets all bits to a logic "0" level when RESET and WRITE DISABLE are at a high level. When RESET is at a high level, and WRITE DISABLE is at a low level, the latch acts as a 1-of-8 demultiplexer; the bit that is addressed has an active output which follows the data input, while all unaddressed bits are held to a logic "0" level.

### PIN CONNECTION



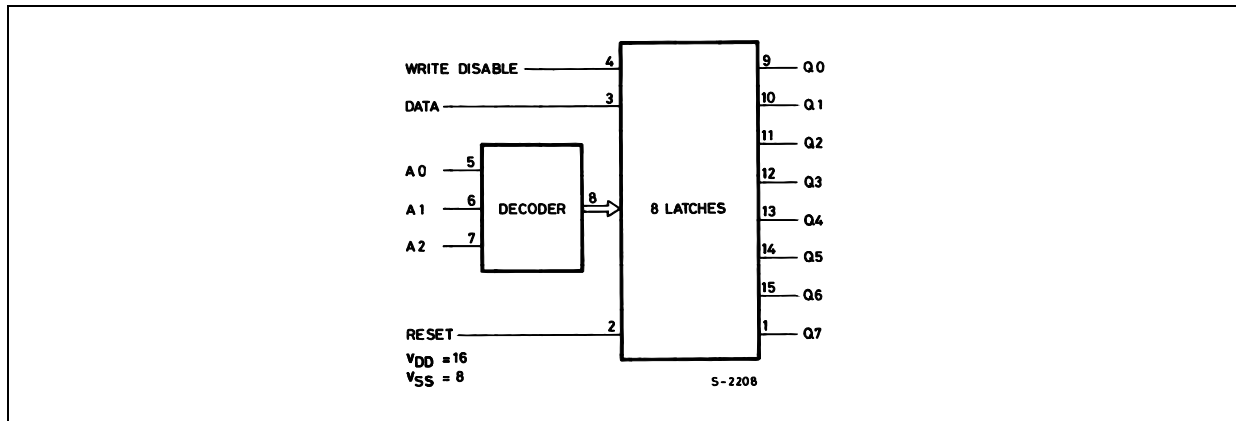
**IINPUT EQUIVALENT CIRCUIT**



**PIN DESCRIPTION**

| PIN No                       | SYMBOL          | NAME AND FUNCTION       |
|------------------------------|-----------------|-------------------------|
| 5, 6, 7                      | A0 to A2        | Address Inputs          |
| 9, 10, 11, 12, 13, 14, 15, 1 | Q0 to Q7        | Latch Outputs           |
| 3                            | DATA            | Data Inputs             |
| 2                            | RESET           | Reset Input             |
| 4                            | WRITE DISABLE   | Write Disable Input     |
| 8                            | V <sub>SS</sub> | Negative Supply Voltage |
| 16                           | V <sub>DD</sub> | Positive Supply Voltage |

**FUNCTIONAL DIAGRAM**



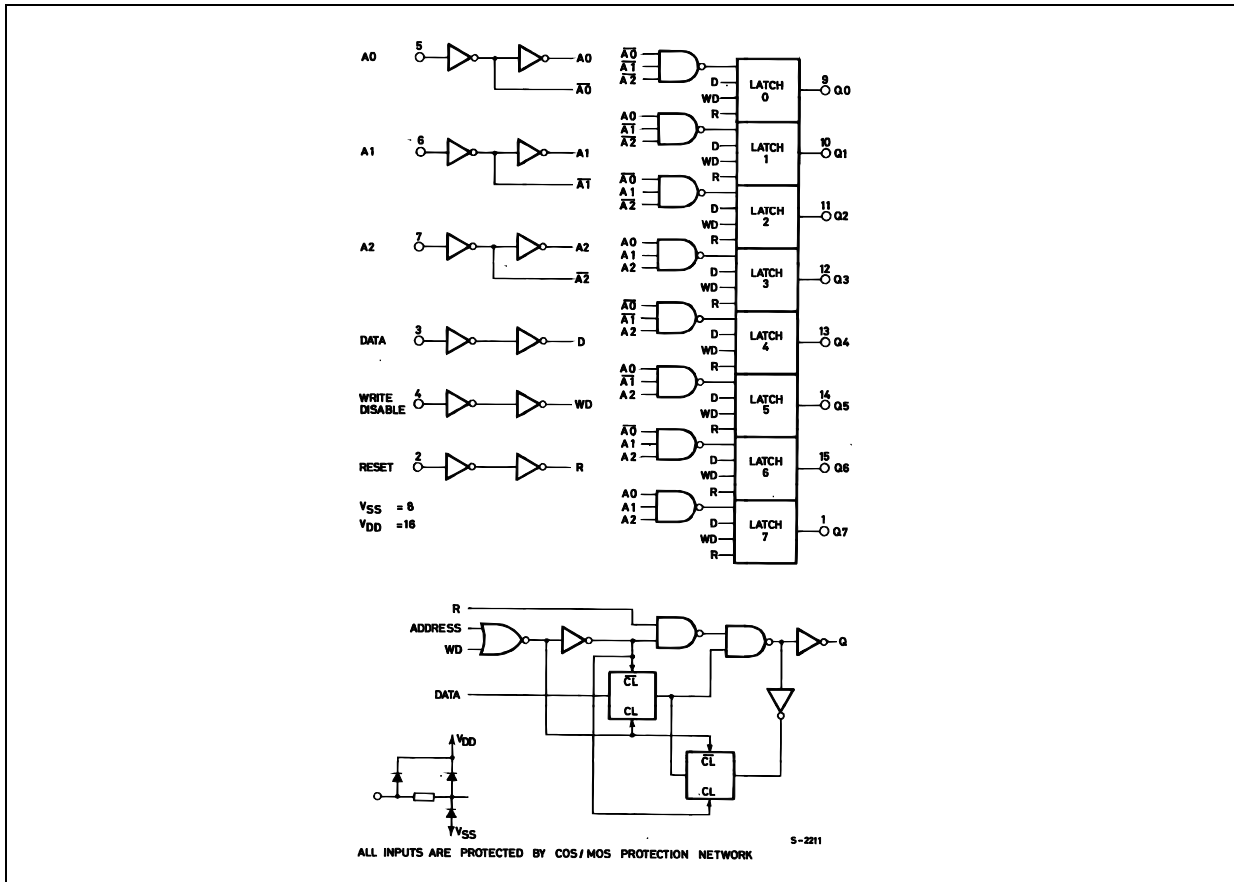
**TRUTH TABLE**

| SELECT INPUTS |   |   | LATCH ADDRESSED |
|---------------|---|---|-----------------|
| C             | B | A |                 |
| L             | L | L | Q0              |
| L             | L | H | Q1              |
| L             | H | L | Q2              |
| L             | H | H | Q3              |
| H             | L | L | Q4              |
| H             | L | H | Q5              |
| H             | H | L | Q6              |
| H             | H | H | Q7              |

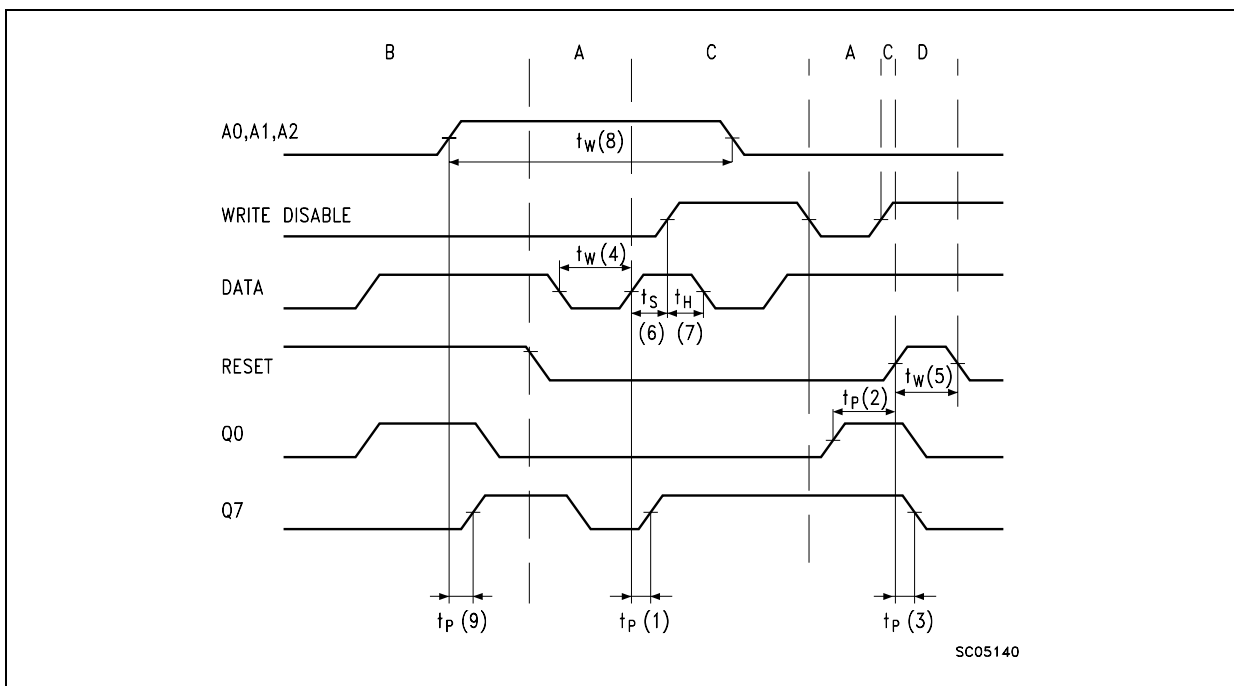
| INPUTS        |       | OUTPUTS OF ADDRESSED LATCH | EACH OTHER OUTPUT | FUNCTION              |
|---------------|-------|----------------------------|-------------------|-----------------------|
| WRITE DISABLE | RESET |                            |                   |                       |
| L             | L     | D                          | Q <sub>i0</sub>   | ADDRESSABLE LATCH     |
| L             | H     | Q <sub>i0</sub>            | Q <sub>i0</sub>   | MEMORY                |
| H             | L     | D                          | L                 | DEMULTIPLEXER         |
| H             | H     | L                          | L                 | CLEAR ALL BITS TO "0" |

D: The level at the data input ; Q<sub>i0</sub> The level before the indicated steady state input conditions were established, (i=0, 1,...7)

LOGIC DIAGRAM



TIMING CHART



**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            | °C   |
| $T_{stg}$ | Storage Temperature                     | -65 to +150            | °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    | °C   |

## DC SPECIFICATIONS

| Symbol          | Parameter                 | Test Conditions       |                       |                                |                        | Value                 |               |           |             |         |              | Unit    |         |
|-----------------|---------------------------|-----------------------|-----------------------|--------------------------------|------------------------|-----------------------|---------------|-----------|-------------|---------|--------------|---------|---------|
|                 |                           | V <sub>I</sub><br>(V) | V <sub>O</sub><br>(V) | I <sub>O</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                      |                       | 0.04          | 5         |             | 150     |              | 150     | $\mu$ A |
|                 |                           | 0/10                  |                       |                                | 10                     |                       | 0.04          | 10        |             | 300     |              | 300     |         |
|                 |                           | 0/15                  |                       |                                | 15                     |                       | 0.04          | 20        |             | 600     |              | 600     |         |
|                 |                           | 0/20                  |                       |                                | 20                     |                       | 0.08          | 100       |             | 3000    |              | 3000    |         |
| 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            |         |         |
|                 |                           |                       | 1.5/18.5              | <1                             | 15                     | 11                    |               |           | 11          |         | 11           |         |         |
| V <sub>IL</sub> | Low Level Input Voltage   |                       | 0.5/4.5               | <1                             | 5                      |                       |               | 1.5       |             | 1.5     |              | 1.5     | V       |
|                 |                           |                       | 9/1                   | <1                             | 10                     |                       |               | 3         |             | 3       |              | 3       |         |
|                 |                           |                       | 1.5/18.5              | <1                             | 15                     |                       |               | 4         |             | 4       |              | 4       |         |
| I <sub>OH</sub> | Output Drive Current      | 0/5                   | 2.5                   |                                | 5                      | -1.36                 | -3.2          |           | -1.1        |         | -1.1         |         | mA      |
|                 |                           | 0/5                   | 4.6                   |                                | 5                      | -0.44                 | -1            |           | -0.36       |         | -0.36        |         |         |
|                 |                           | 0/10                  | 9.5                   |                                | 10                     | -1.1                  | -2.6          |           | -0.9        |         | -0.9         |         |         |
|                 |                           | 0/15                  | 13.5                  |                                | 15                     | -3.0                  | -6.8          |           | -2.4        |         | -2.4         |         |         |
| I <sub>OL</sub> | Output Sink Current       | 0/5                   | 0.4                   |                                | 5                      | 0.44                  | 1             |           | 0.36        |         | 0.36         |         | mA      |
|                 |                           | 0/10                  | 0.5                   |                                | 10                     | 1.1                   | 2.6           |           | 0.9         |         | 0.9          |         |         |
|                 |                           | 0/15                  | 1.5                   |                                | 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 |
| 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

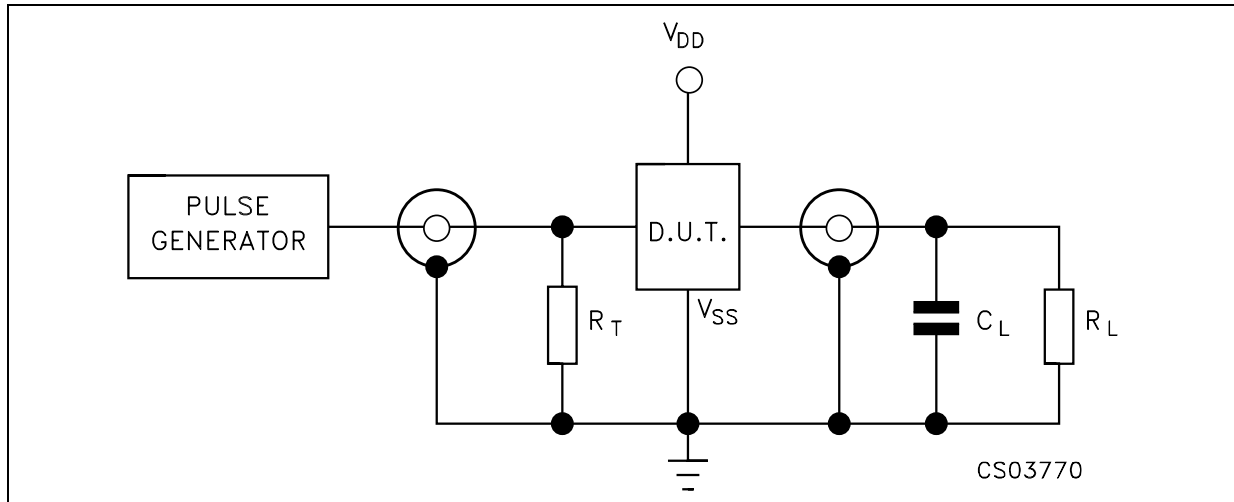
## HCF4099B

### 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)   | See Timing Chart | Min.      | Typ. | Max. |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time<br>(Data to Output)          | 5              | (1)              |           | 200  | 400  | ns   |
|                     |   | 10             |                  |           | 75   | 150  |      |
|                     |   | 15             |                  |           | 50   | 100  |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time<br>(Write Disable to Output) | 5              | (2)              |           | 200  | 400  | ns   |
|                     |   | 10             |                  |           | 80   | 160  |      |
|                     |   | 15             |                  |           | 60   | 120  |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time<br>(Address to Output)       | 5              | (9)              |           | 225  | 450  | ns   |
|                     |   | 10             |                  |           | 100  | 200  |      |
|                     |   | 15             |                  |           | 75   | 150  |      |
| $t_{PHL}$           | Propagation Delay Time<br>(Reset to Output)         | 5              | (3)              |           | 175  | 350  | ns   |
|                     |   | 10             |                  |           | 80   | 160  |      |
|                     |   | 15             |                  |           | 65   | 130  |      |
| $t_{THL}$ $t_{TLH}$ | Transition Time<br>(any output)                     | 5              |                  |           | 100  | 200  | ns   |
|                     |   | 10             |                  |           | 50   | 100  |      |
|                     |   | 15             |                  |           | 40   | 80   |      |
| $t_W$               | Pulse Width (Data)                                  | 5              | (4)              | 200       | 100  |      | ns   |
|                     |   | 10             |                  | 100       | 50   |      |      |
|                     |   | 15             |                  | 80        | 40   |      |      |
| $t_W$               | Pulse Width (Address)                               | 5              | (8)              | 400       | 200  |      | ns   |
|                     |   | 10             |                  | 200       | 100  |      |      |
|                     |   | 15             |                  | 125       | 65   |      |      |
| $t_W$               | Pulse Width (Reset)                                 | 5              | (5)              | 150       | 75   |      | ns   |
|                     |   | 10             |                  | 75        | 40   |      |      |
|                     |   | 15             |                  | 50        | 25   |      |      |
| $t_{setup}$         | Setup Time<br>(Data to Write Disable)               | 5              | (6)              | 100       | 50   |      | ns   |
|                     |   | 10             |                  | 50        | 25   |      |      |
|                     |   | 15             |                  | 35        | 20   |      |      |
| $t_{hold}$          | Hold Time<br>(Data to Write Disable)                | 5              | (7)              | 150       | 75   |      | ns   |
|                     |   | 10             |                  | 75        | 40   |      |      |
|                     |   | 15             |                  | 50        | 25   |      |      |

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

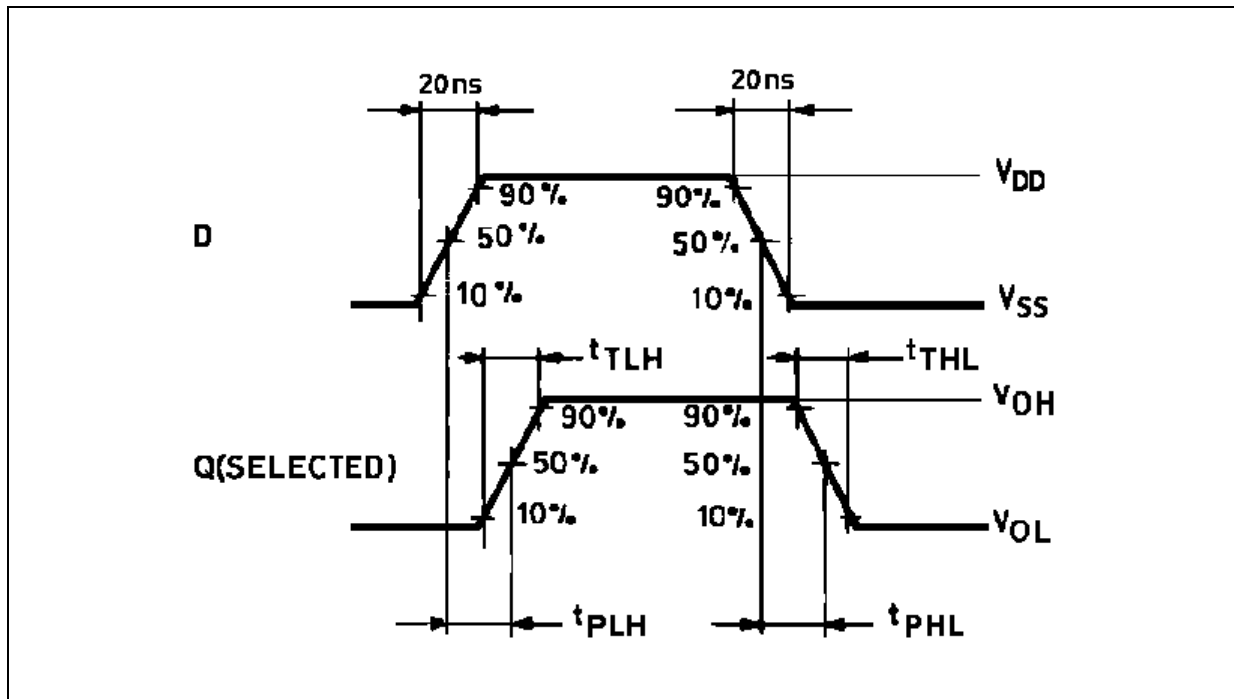
## TEST CIRCUIT



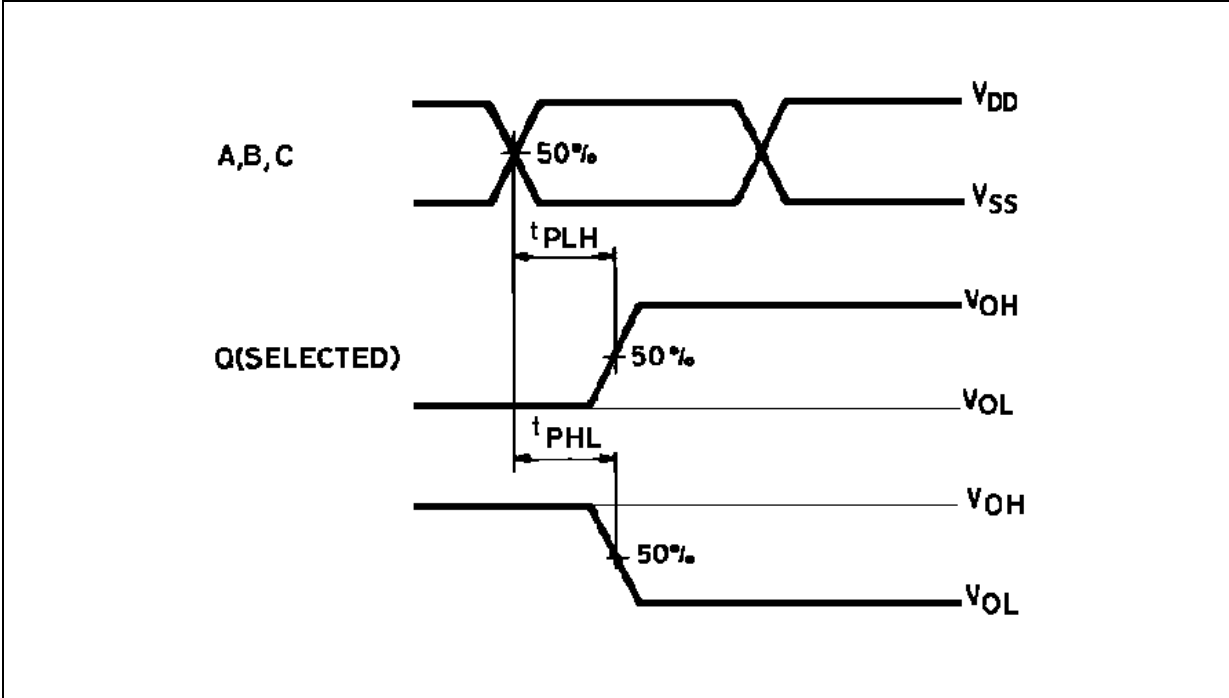
$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)

$R_L = 200\text{K}\Omega$

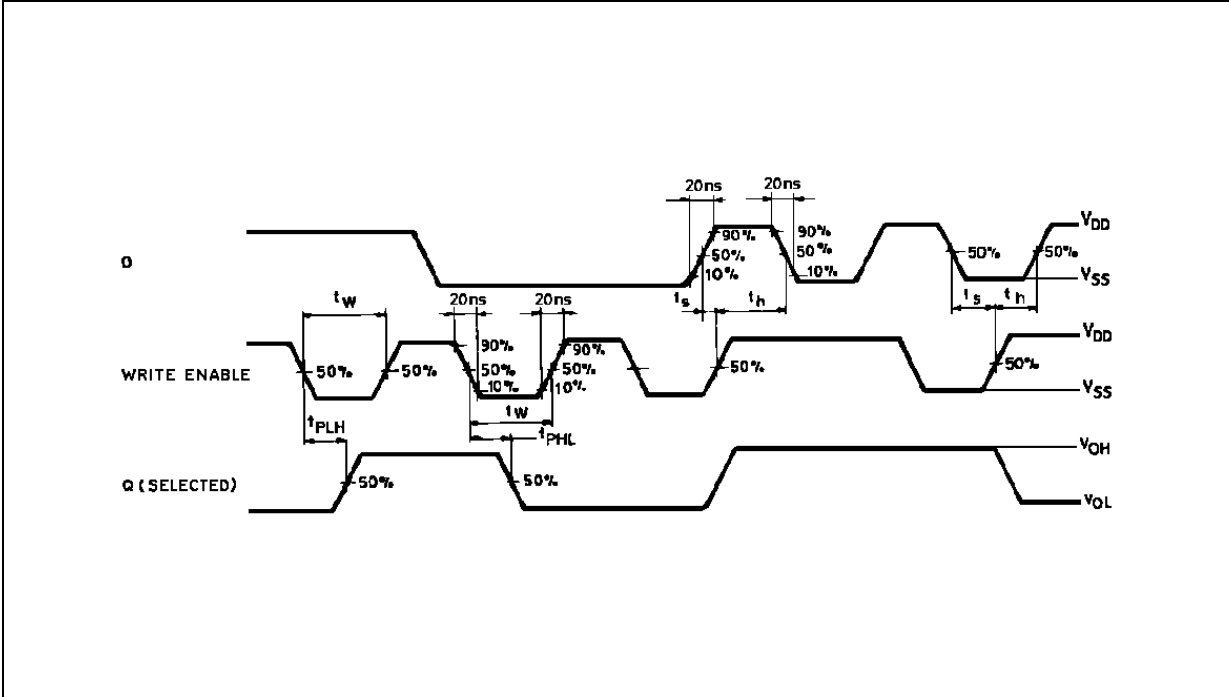
$R_T = Z_{\text{OUT}}$  of pulse generator (typically  $50\Omega$ )

**WAVEFORM 1 : PROPAGATION DELAY TIME ( $f=1\text{MHz}$ ; 50% duty cycle)**


WAVEFORM 2 : PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)

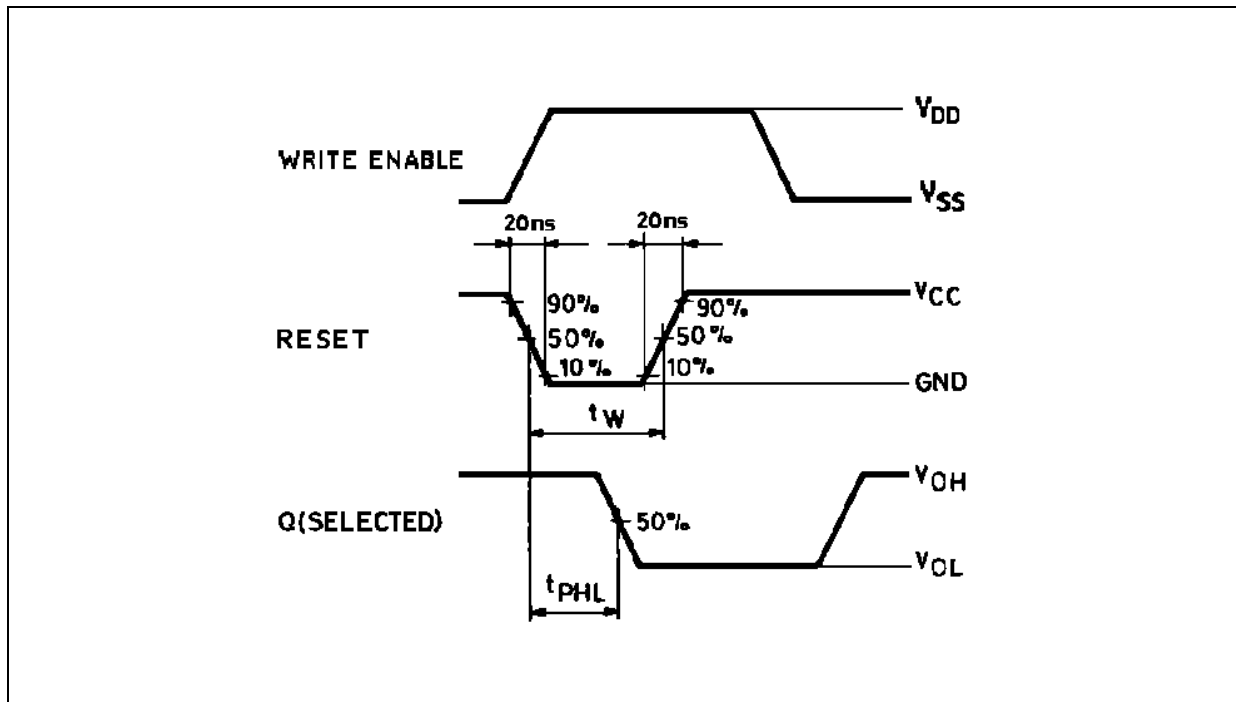


WAVEFORM 3 : MINIMUM PULSE WIDTH, SETUP AND HOLD TIME (f=1MHz; 50% duty cycle)

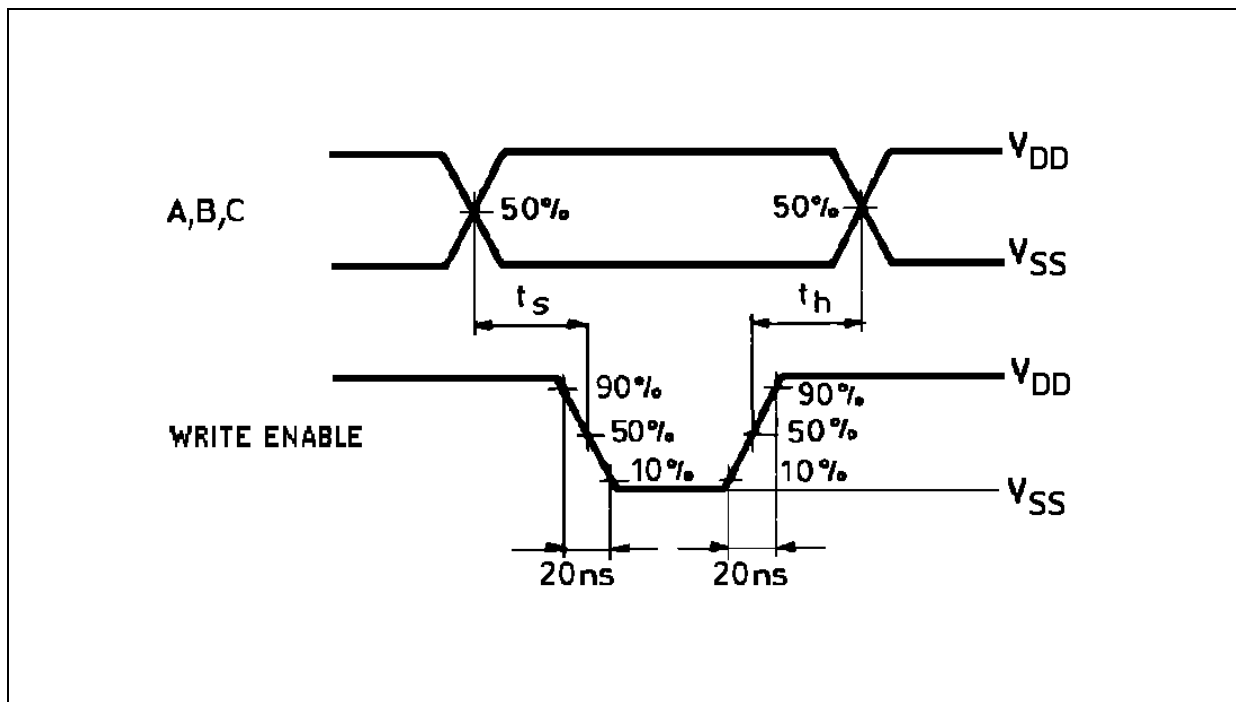




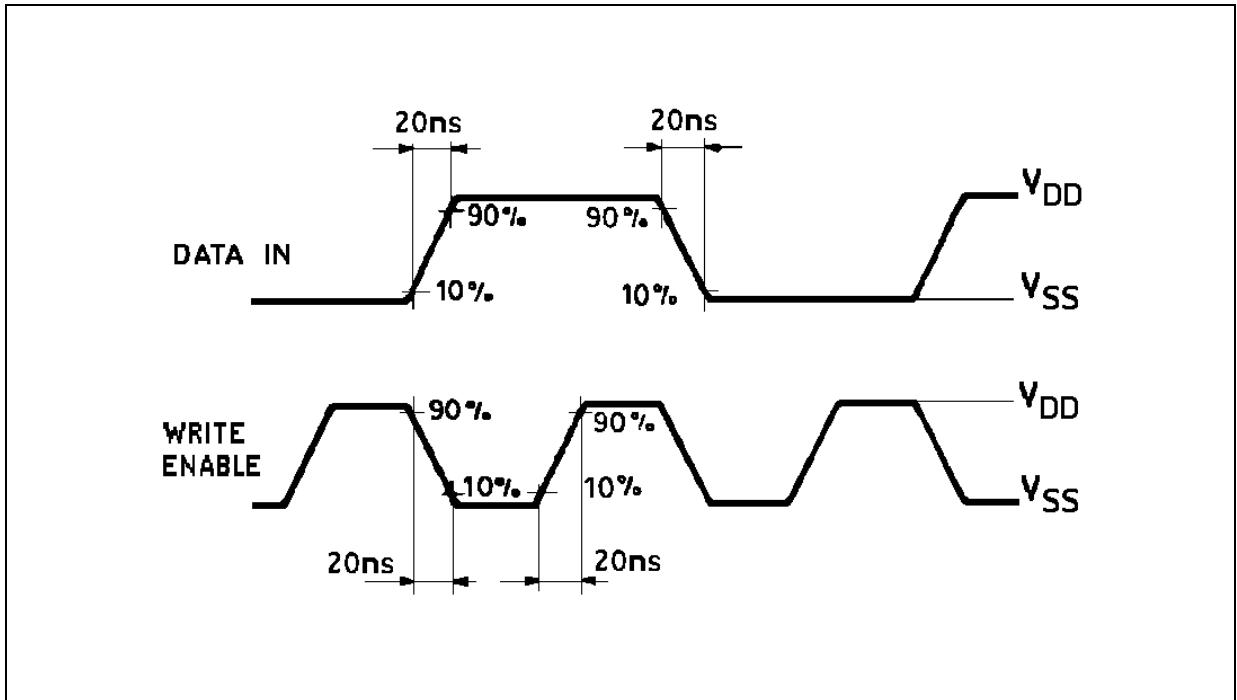
WAVEFORM 4 : MINIMUM PULSE WIDTH (f=1MHz; 50% duty cycle)



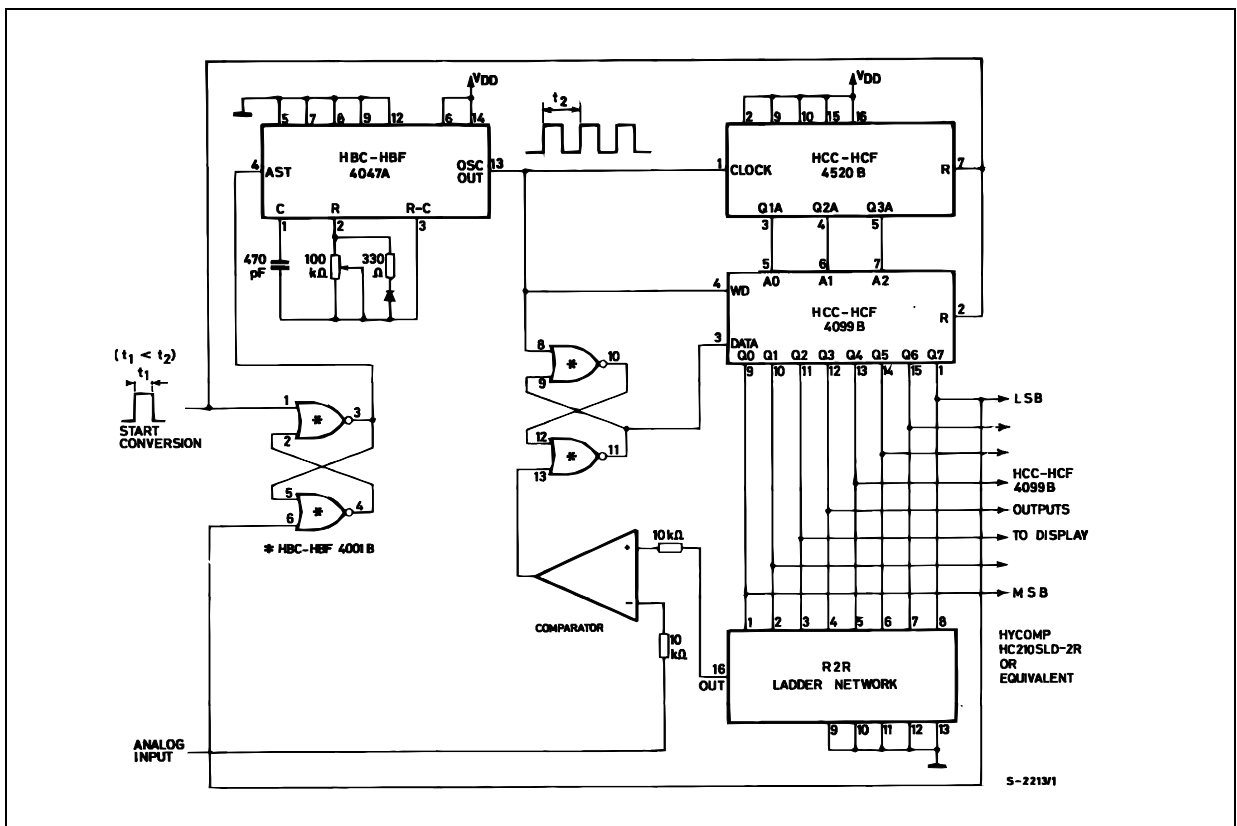
WAVEFORM 5 : SETUP AND HOLD TIME (f=1MHz; 50% duty cycle)



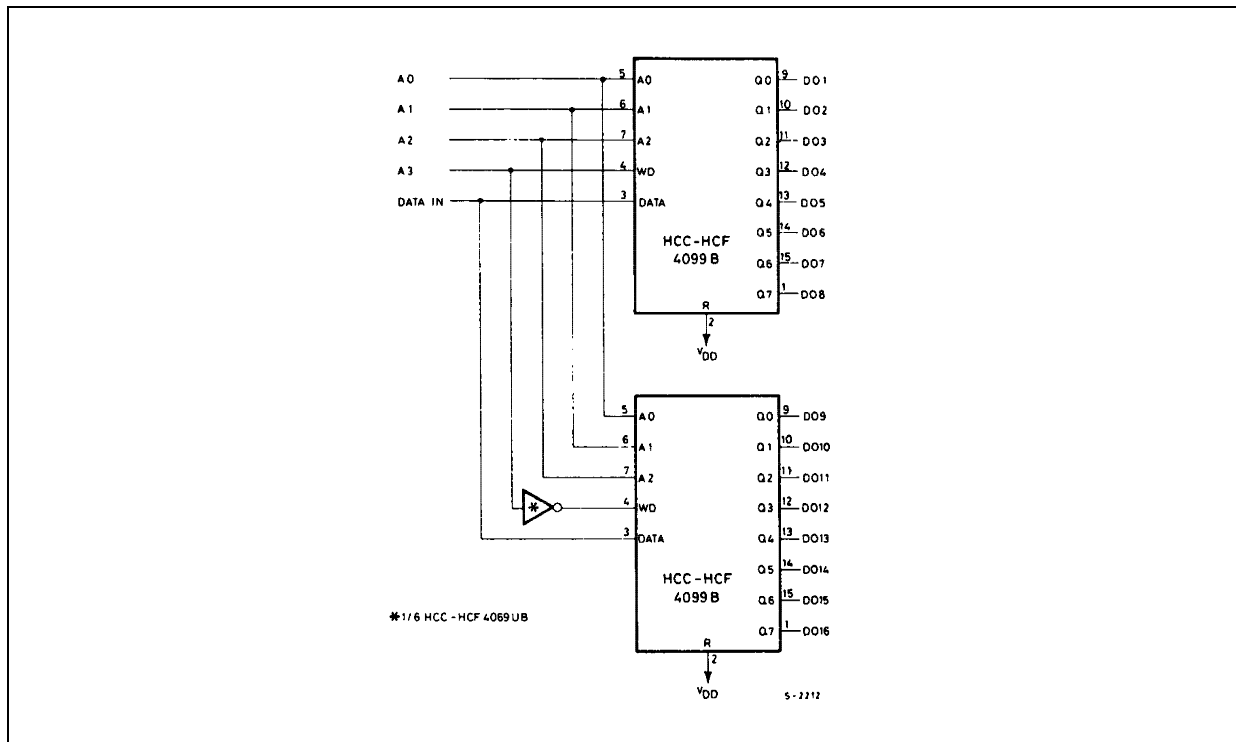
WAVEFORM 6 : INPUT WAVEFORMS (f=1MHz; 50% duty cycle)



TYPICAL APPLICATIONS

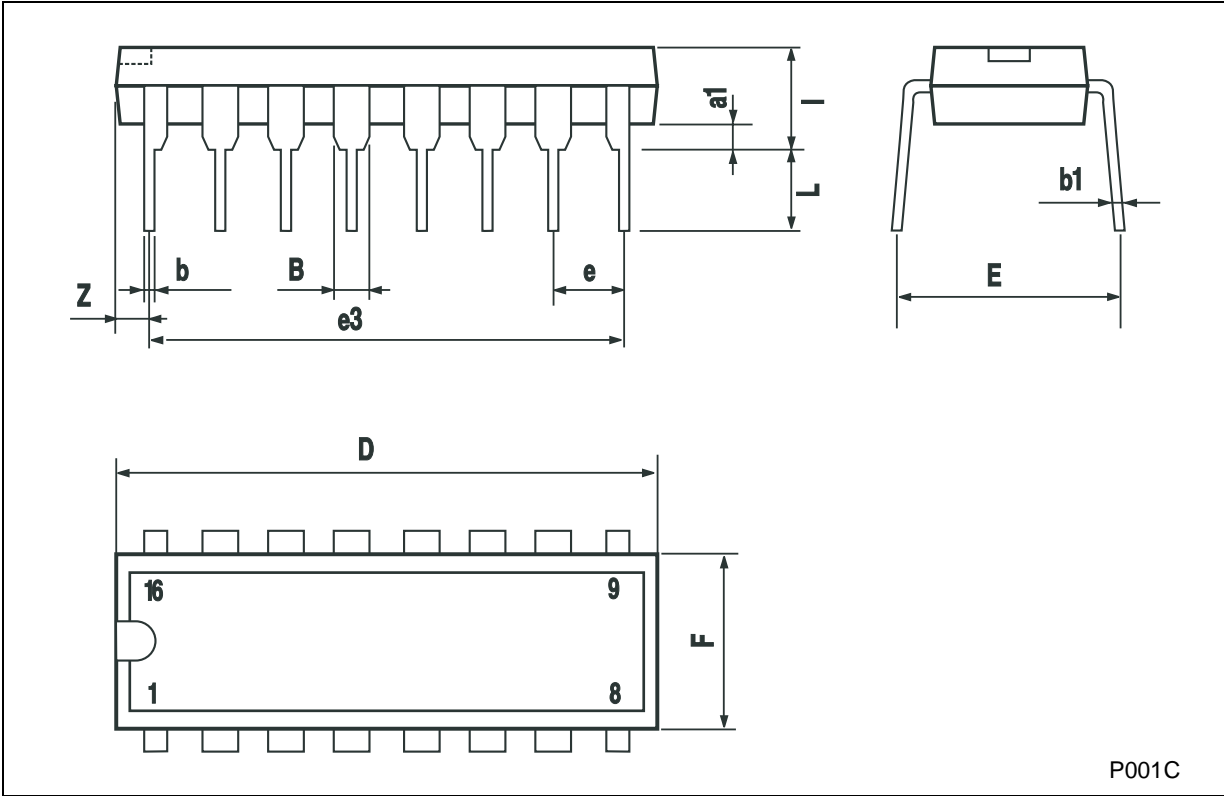


TYPICAL APPLICATIONS



**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 |
| l    |      |       | 5.1  |       |       | 0.201 |
| L    |      | 3.3   |      |       | 0.130 |       |
| Z    |      |       | 1.27 |       |       | 0.050 |

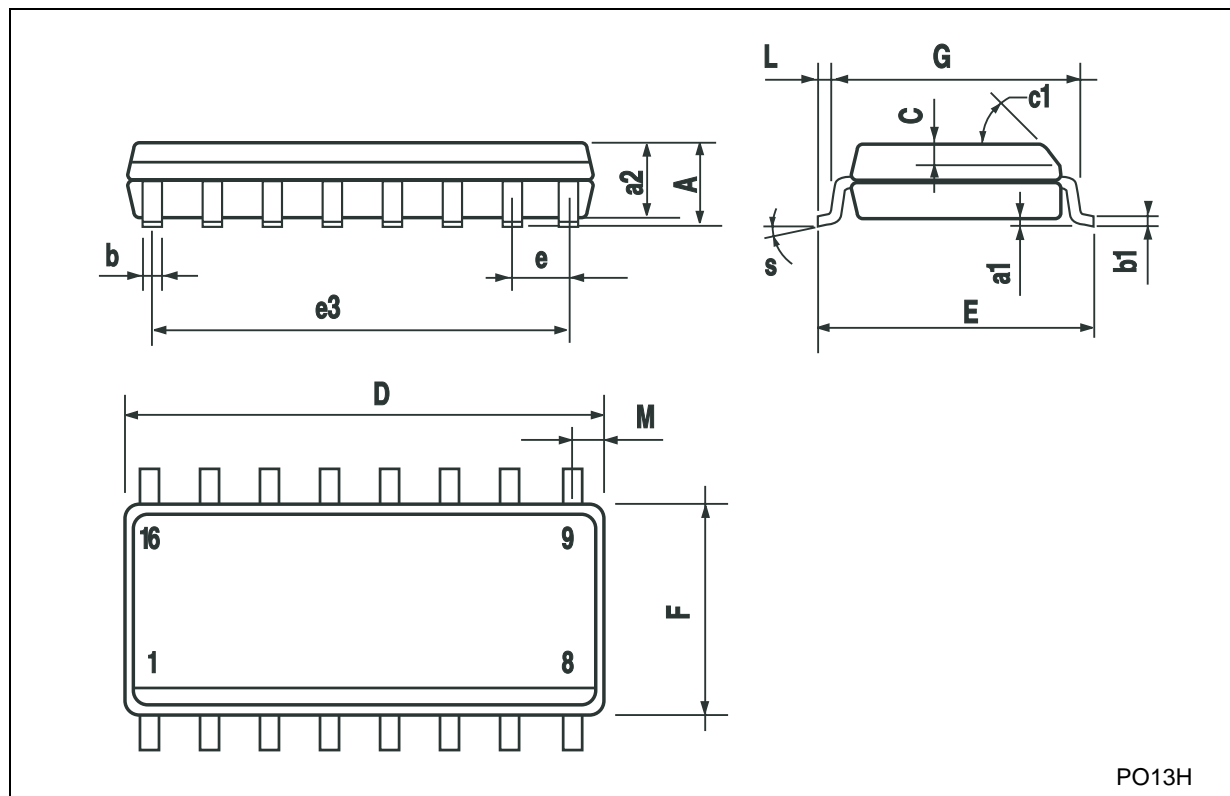


P001C



## 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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