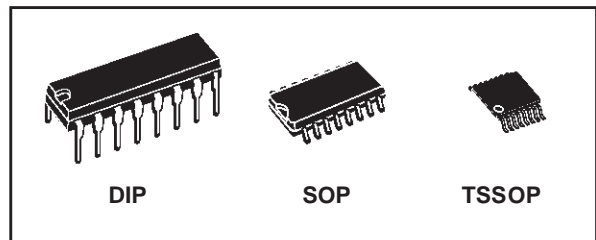




# M74HC151

## 8 CHANNEL MULTIPLEXER

- HIGH SPEED:  
 $t_{PD} = 17\text{ns}$  (TYP.) at  $V_{CC} = 6\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu\text{A}$ (MAX.) at  $T_A=25^\circ\text{C}$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 4\text{mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH  
 74 SERIES 151



### ORDER CODES

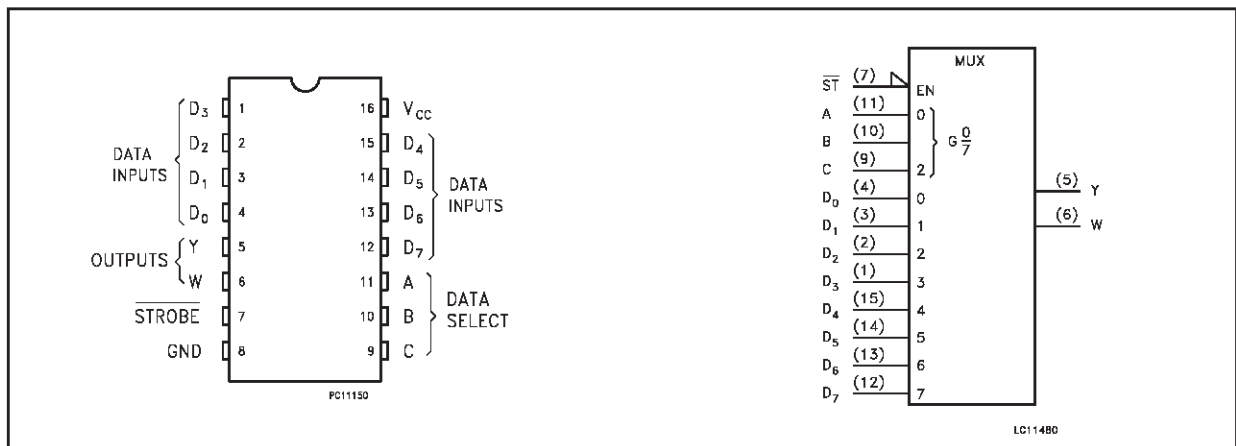
| PACKAGE | TUBE        | T & R          |
|---------|-------------|----------------|
| DIP     | M74HC151B1R |                |
| SOP     | M74HC151M1R | M74HC151RM13TR |
| TSSOP   |             | M74HC151TTR    |

### DESCRIPTION

The M74HC151 is an high speed CMOS 8 CHANNEL MULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology. It provides, in one package, the ability to select one bit of data from up to eight sources. The M74HC151 can be used as a universal function generator to generate any logic function of four variables. Outputs Y and W are complementary;

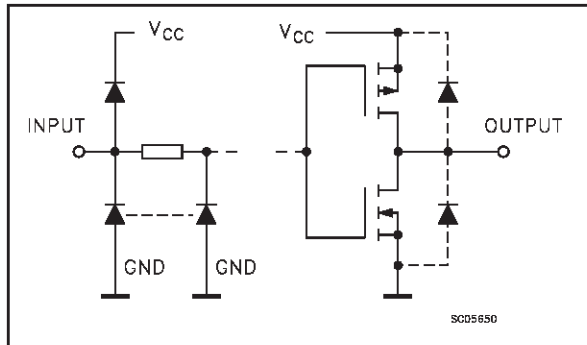
the selection depends on the address inputs A, B, and C. The strobe input must be taken low to enable this device, when the strobe is high W output is forced high and consequently Y output goes low. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



# M74HC151

## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

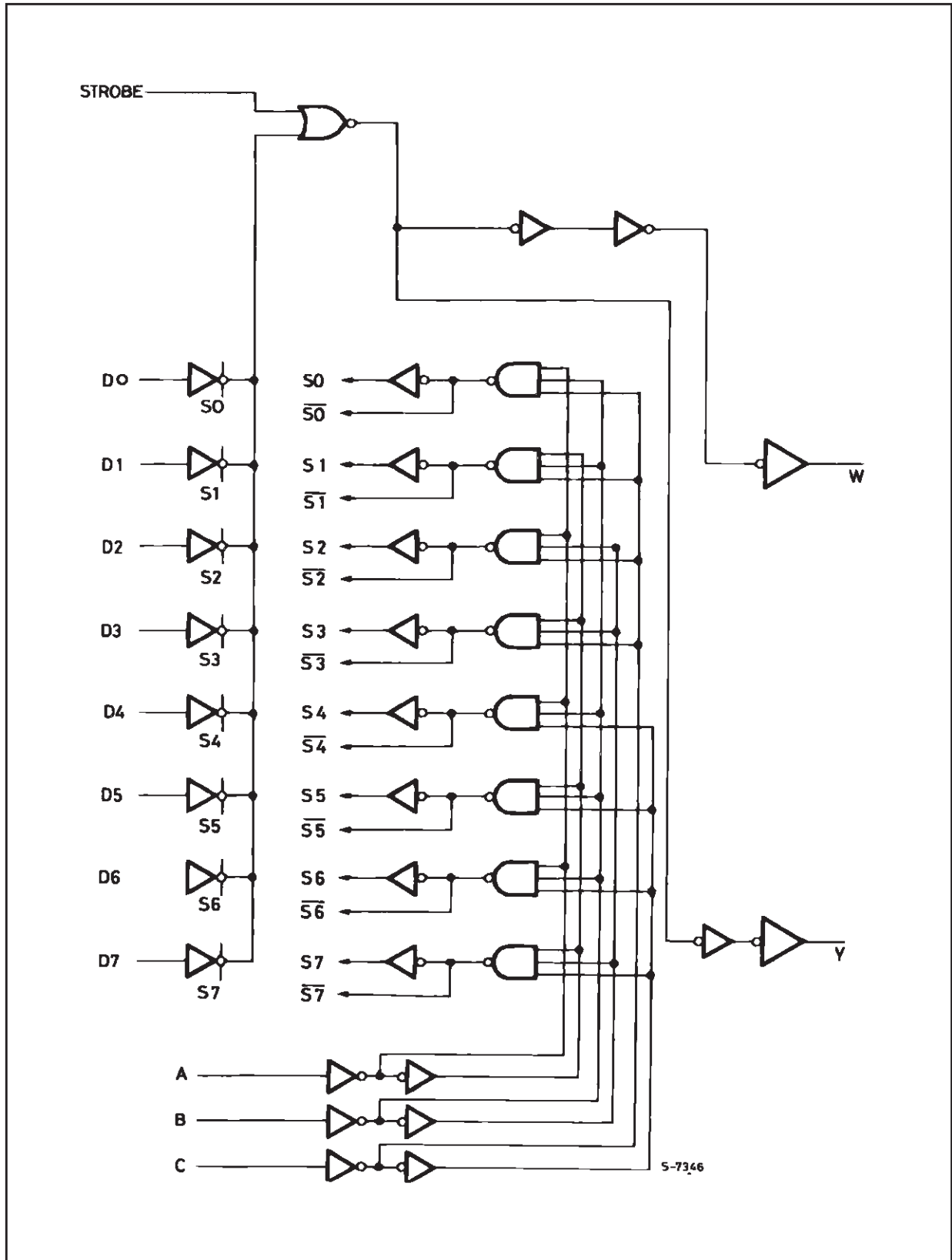
| PIN No                     | SYMBOL                           | NAME AND FUNCTION                |
|----------------------------|----------------------------------|----------------------------------|
| 4, 3, 2, 1, 15, 14, 13, 12 | D <sub>0</sub> to D <sub>7</sub> | Multiplexer Inputs               |
| 5                          | Y                                | Multiplexer Output               |
| 6                          | W                                | Complementary Multiplexer Output |
| 7                          | STROBE                           | Strobe Input                     |
| 11, 10, 9                  | A, B, C                          | Select Inputs                    |
| 8                          | GND                              | Ground (0V)                      |
| 16                         | V <sub>CC</sub>                  | Positive Supply Voltage          |

## TRUTH TABLE

| INPUTS |   |   |        | OUTPUTS        |                |
|--------|---|---|--------|----------------|----------------|
| SELECT |   |   | STROBE | Y              | W              |
| C      | B | A | S      |                |                |
| X      | X | X | H      | L              | H              |
| L      | L | L | L      | D <sub>0</sub> | D <sub>0</sub> |
| L      | L | H | L      | D <sub>1</sub> | D <sub>1</sub> |
| L      | H | L | L      | D <sub>2</sub> | D <sub>2</sub> |
| L      | H | H | L      | D <sub>3</sub> | D <sub>3</sub> |
| H      | L | L | L      | D <sub>4</sub> | D <sub>4</sub> |
| H      | L | H | L      | D <sub>5</sub> | D <sub>5</sub> |
| H      | H | L | L      | D <sub>6</sub> | D <sub>6</sub> |
| H      | H | H | L      | D <sub>7</sub> | D <sub>7</sub> |

X : Don't Care

## LOGIC DIAGRAM



This logic diagram has not been used to estimate propagation delays

## ABSOLUTE MAXIMUM RATINGS

| Symbol                | Parameter                     | Value                  | Unit |
|-----------------------|-------------------------------|------------------------|------|
| $V_{CC}$              | Supply Voltage                | -0.5 to +7             | V    |
| $V_I$                 | DC Input Voltage              | -0.5 to $V_{CC} + 0.5$ | V    |
| $V_O$                 | DC Output Voltage             | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IK}$              | DC Input Diode Current        | $\pm 20$               | mA   |
| $I_{OK}$              | DC Output Diode Current       | $\pm 20$               | mA   |
| $I_O$                 | DC Output Current             | $\pm 25$               | mA   |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current | $\pm 50$               | mA   |
| $P_D$                 | Power Dissipation             | 500(*)                 | mW   |
| $T_{stg}$             | Storage Temperature           | -65 to +150            | °C   |
| $T_L$                 | Lead Temperature (10 sec)     | 300                    | °C   |

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

(\*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

## RECOMMENDED OPERATING CONDITIONS

| Symbol     | Parameter                | Value           | Unit      |    |
|------------|--------------------------|-----------------|-----------|----|
| $V_{CC}$   | Supply Voltage           | 2 to 6          | V         |    |
| $V_I$      | Input Voltage            | 0 to $V_{CC}$   | V         |    |
| $V_O$      | Output Voltage           | 0 to $V_{CC}$   | V         |    |
| $T_{op}$   | Operating Temperature    | -55 to 125      | °C        |    |
| $t_r, t_f$ | Input Rise and Fall Time | $V_{CC} = 2.0V$ | 0 to 1000 | ns |
|            |                          | $V_{CC} = 4.5V$ | 0 to 500  | ns |
|            |                          | $V_{CC} = 6.0V$ | 0 to 400  | ns |

## DC SPECIFICATIONS

| Symbol          | Parameter                 | Test Condition         |   | Value                 |      |       |             |      |              | Unit |      |
|-----------------|---------------------------|------------------------|---|-----------------------|------|-------|-------------|------|--------------|------|------|
|                 |                           | V <sub>CC</sub><br>(V) |   | T <sub>A</sub> = 25°C |      |       | -40 to 85°C |      | -55 to 125°C |      |      |
|                 |                           |                        |   | Min.                  | Typ. | Max.  | Min.        | Max. | Min.         |      | Max. |
| V <sub>IH</sub> | High Level Input Voltage  | 2.0                    |   | 1.5                   |      |       | 1.5         |      | 1.5          |      | V    |
|                 |                           | 4.5                    |   | 3.15                  |      |       | 3.15        |      | 3.15         |      |      |
|                 |                           | 6.0                    |   | 4.2                   |      |       | 4.2         |      | 4.2          |      |      |
| V <sub>IL</sub> | Low Level Input Voltage   | 2.0                    |   |                       |      | 0.5   |             | 0.5  |              | 0.5  | V    |
|                 |                           | 4.5                    |   |                       |      | 1.35  |             | 1.35 |              | 1.35 |      |
|                 |                           | 6.0                    |   |                       |      | 1.8   |             | 1.8  |              | 1.8  |      |
| V <sub>OH</sub> | High Level Output Voltage | 2.0                    | I <sub>O</sub> =-20 μA                  | 1.9                   | 2.0  |       | 1.9         |      | 1.9          |      | V    |
|                 |                           | 4.5                    | I <sub>O</sub> =-20 μA                  | 4.4                   | 4.5  |       | 4.4         |      | 4.4          |      |      |
|                 |                           | 6.0                    | I <sub>O</sub> =-20 μA                  | 5.9                   | 6.0  |       | 5.9         |      | 5.9          |      |      |
|                 |                           | 4.5                    | I <sub>O</sub> =-4.0 mA                 | 4.18                  | 4.31 |       | 4.13        |      | 4.10         |      |      |
|                 |                           | 6.0                    | I <sub>O</sub> =-5.2 mA                 | 5.68                  | 5.8  |       | 5.63        |      | 5.60         |      |      |
| V <sub>OL</sub> | Low Level Output Voltage  | 2.0                    | I <sub>O</sub> =20 μA                   |                       | 0.0  | 0.1   |             | 0.1  |              | 0.1  | V    |
|                 |                           | 4.5                    | I <sub>O</sub> =20 μA                   |                       | 0.0  | 0.1   |             | 0.1  |              | 0.1  |      |
|                 |                           | 6.0                    | I <sub>O</sub> =20 μA                   |                       | 0.0  | 0.1   |             | 0.1  |              | 0.1  |      |
|                 |                           | 4.5                    | I <sub>O</sub> =4.0 mA                  |                       | 0.17 | 0.26  |             | 0.33 |              | 0.40 |      |
|                 |                           | 6.0                    | I <sub>O</sub> =5.2 mA                  |                       | 0.18 | 0.26  |             | 0.33 |              | 0.40 |      |
| I <sub>I</sub>  | Input Leakage Current     | 6.0                    | V <sub>I</sub> = V <sub>CC</sub> or GND |                       |      | ± 0.1 |             | ± 1  |              | ± 1  | μA   |
| I <sub>CC</sub> | Quiescent Supply Current  | 6.0                    | V <sub>I</sub> = V <sub>CC</sub> or GND |                       |      | 4     |             | 40   |              | 80   | μA   |

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

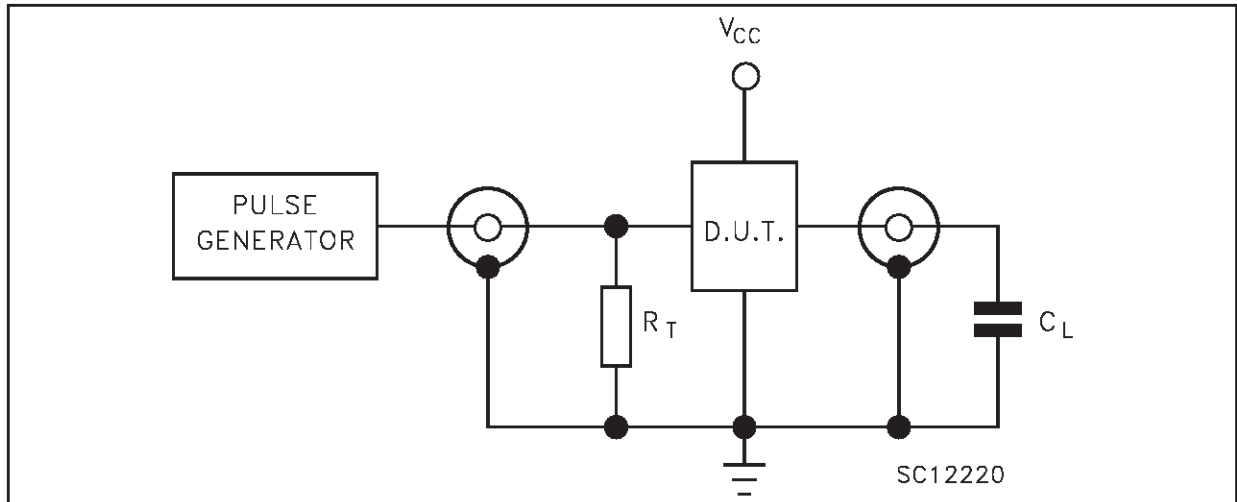
| Symbol              | Parameter                            | Test Condition  |  | Value                    |      |      |                                    |      |                                     | Unit |      |
|---------------------|--------------------------------------|-----------------|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
|                     |                                      | $V_{CC}$<br>(V) |  | $T_A = 25^\circ\text{C}$ |      |      | $-40 \text{ to } 85^\circ\text{C}$ |      | $-55 \text{ to } 125^\circ\text{C}$ |      |      |
|                     |                                      |                 |  | Min.                     | Typ. | Max. | Min.                               | Max. | Min.                                |      | Max. |
| $t_{TLH}$ $t_{THL}$ | Output Transition Time               | 2.0             |  |                          | 30   | 75   |                                    | 95   |                                     | 110  | ns   |
|                     |                                      | 4.5             |  |                          | 8    | 15   |                                    | 19   |                                     | 22   |      |
|                     |                                      | 6.0             |  |                          | 7    | 13   |                                    | 16   |                                     | 19   |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (D - W)       | 2.0             |  |                          | 56   | 130  |                                    | 165  |                                     | 190  | ns   |
|                     |                                      | 4.5             |  |                          | 16   | 26   |                                    | 33   |                                     | 38   |      |
|                     |                                      | 6.0             |  |                          | 14   | 22   |                                    | 28   |                                     | 32   |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (D - Y)       | 2.0             |  |                          | 56   | 130  |                                    | 165  |                                     | 190  | ns   |
|                     |                                      | 4.5             |  |                          | 16   | 26   |                                    | 33   |                                     | 38   |      |
|                     |                                      | 6.0             |  |                          | 14   | 22   |                                    | 28   |                                     | 32   |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (STROBE-W)    | 2.0             |  |                          | 30   | 85   |                                    | 105  |                                     | 125  | ns   |
|                     |                                      | 4.5             |  |                          | 10   | 17   |                                    | 21   |                                     | 25   |      |
|                     |                                      | 6.0             |  |                          | 9    | 14   |                                    | 18   |                                     | 21   |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (STROBE-Y)    | 2.0             |  |                          | 30   | 85   |                                    | 105  |                                     | 125  | ns   |
|                     |                                      | 4.5             |  |                          | 10   | 17   |                                    | 21   |                                     | 25   |      |
|                     |                                      | 6.0             |  |                          | 9    | 14   |                                    | 18   |                                     | 21   |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (A, B, C - W) | 2.0             |  |                          | 72   | 160  |                                    | 200  |                                     | 235  | ns   |
|                     |                                      | 4.5             |  |                          | 20   | 32   |                                    | 40   |                                     | 47   |      |
|                     |                                      | 6.0             |  |                          | 17   | 27   |                                    | 34   |                                     | 40   |      |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (A, B, C - Y) | 2.0             |  |                          | 72   | 160  |                                    | 200  |                                     | 235  | ns   |
|                     |                                      | 4.5             |  |                          | 20   | 32   |                                    | 40   |                                     | 47   |      |
|                     |                                      | 6.0             |  |                          | 17   | 27   |                                    | 34   |                                     | 40   |      |

## CAPACITIVE CHARACTERISTICS

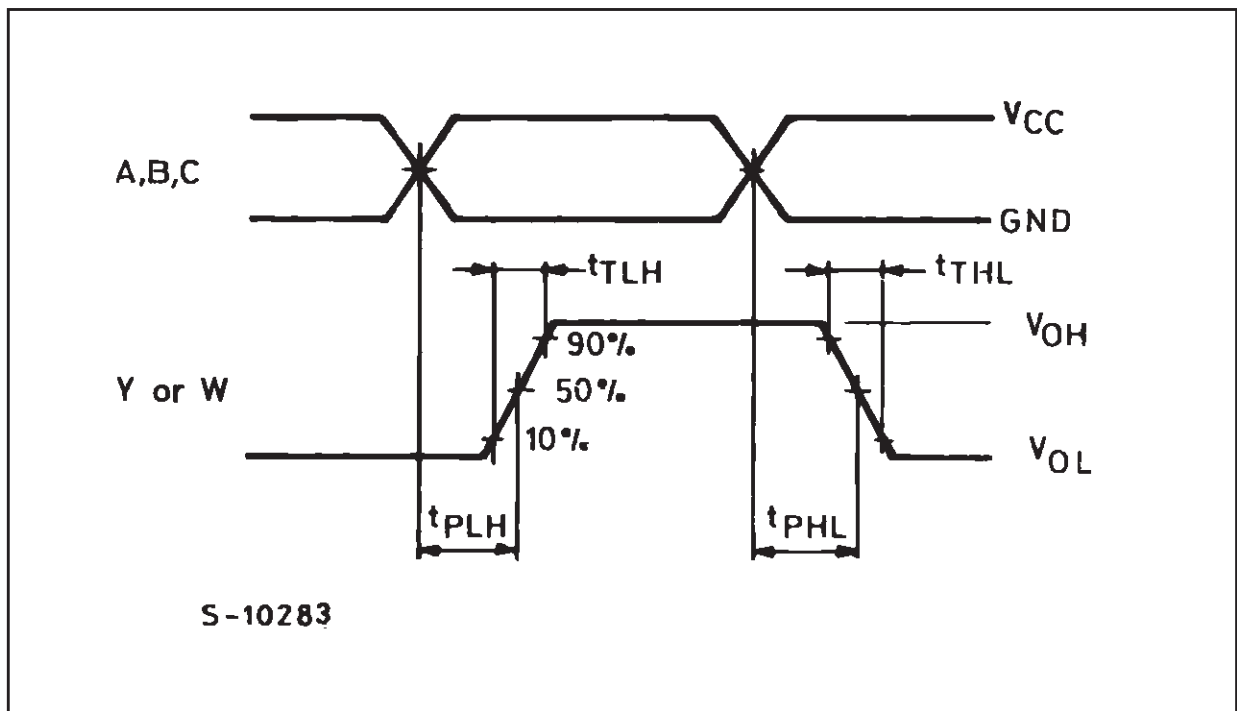
| Symbol   | Parameter                              | Test Condition  |  | Value                    |      |      |                                    |      |                                     | Unit |      |
|----------|--|-----------------|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
|          |  | $V_{CC}$<br>(V) |  | $T_A = 25^\circ\text{C}$ |      |      | $-40 \text{ to } 85^\circ\text{C}$ |      | $-55 \text{ to } 125^\circ\text{C}$ |      |      |
|          |  |                 |  | Min.                     | Typ. | Max. | Min.                               | Max. | Min.                                |      | Max. |
| $C_{IN}$ | Input Capacitance                      | 5.0             |  |                          | 5    | 10   |                                    | 10   |                                     | 10   | pF   |
| $C_{PD}$ | Power Dissipation Capacitance (note 1) | 5.0             |  |                          | 63   |      |                                    |      |                                     |      | pF   |

1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

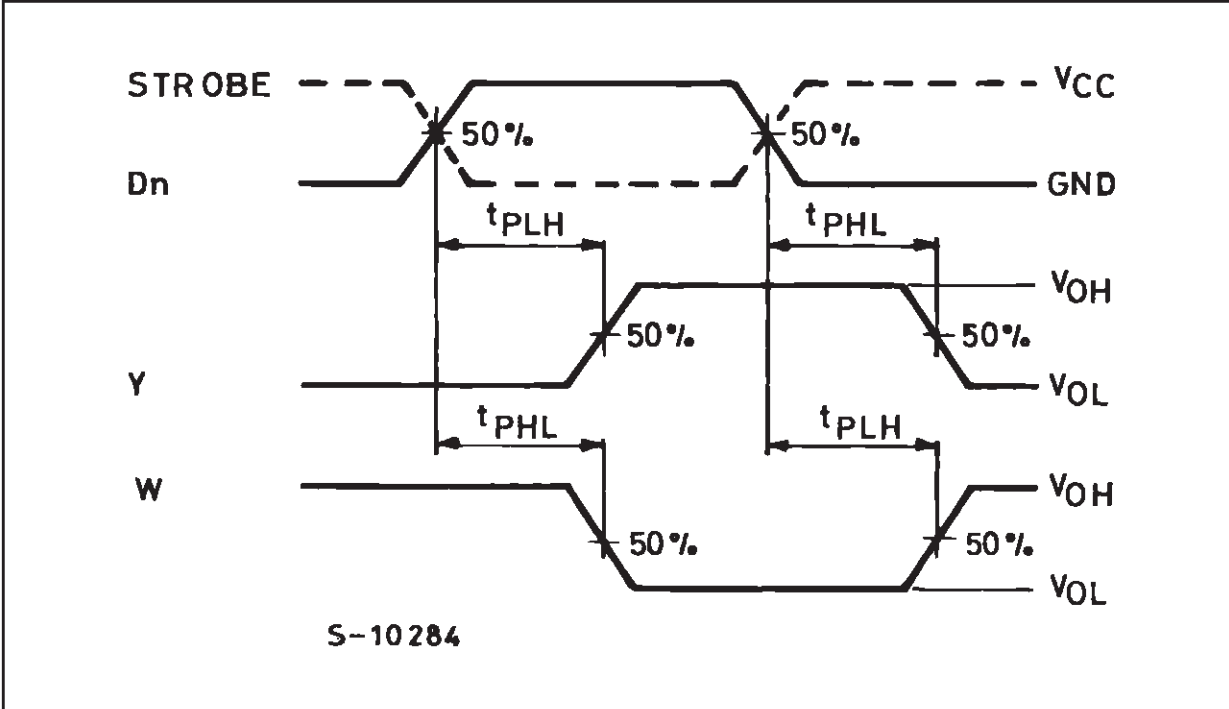
## TEST CIRCUIT



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

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

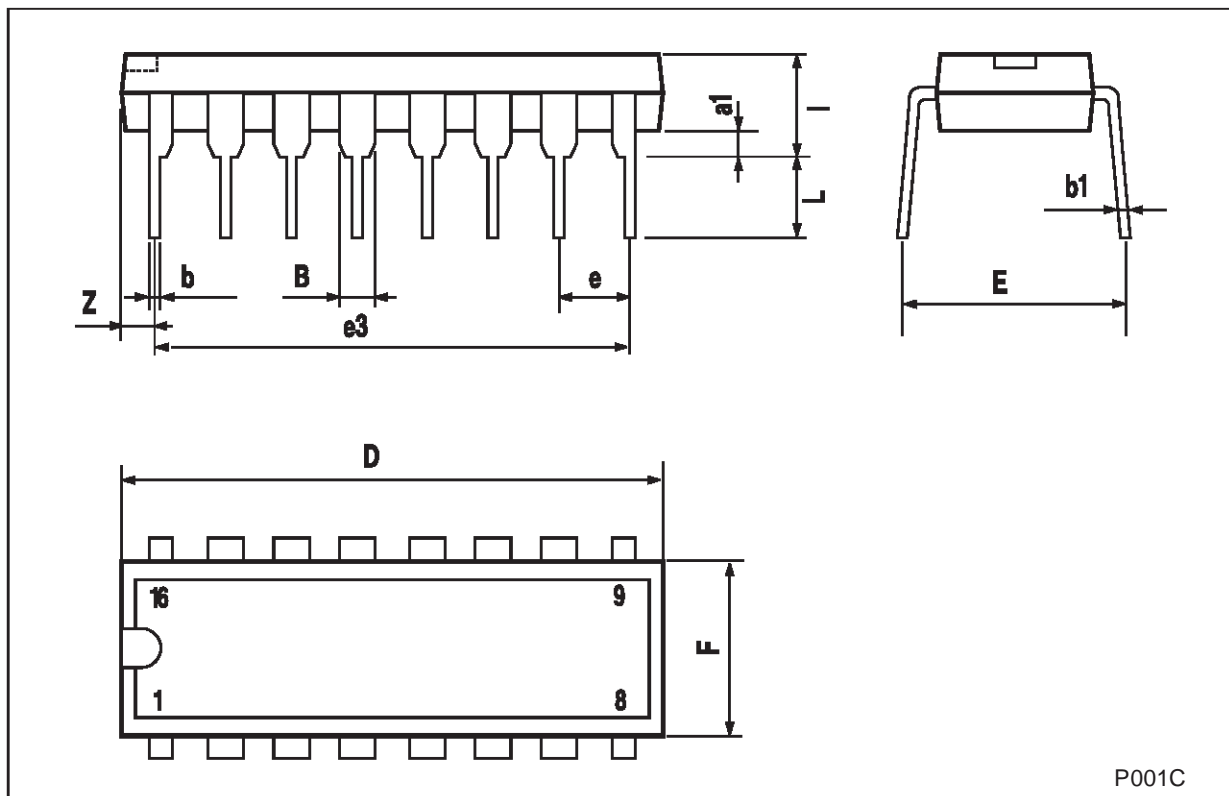
WAVEFORM 2 : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)





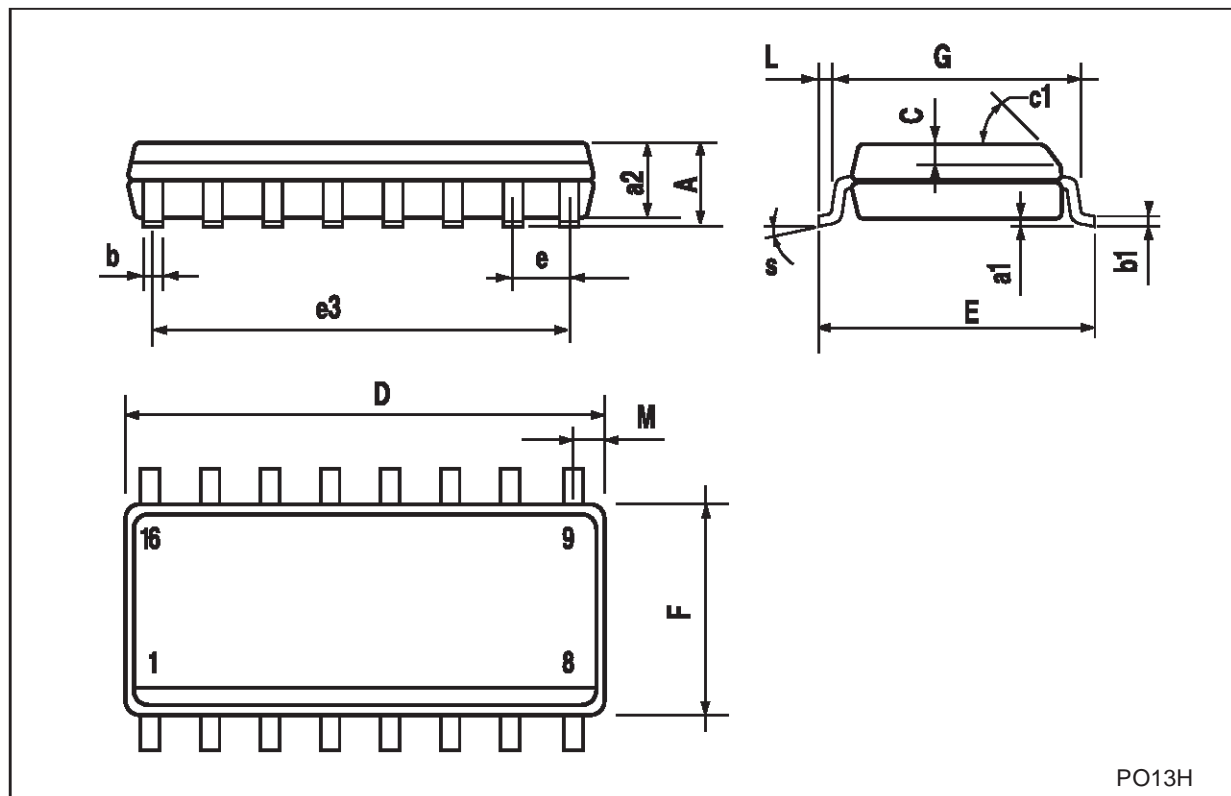
**Plastic DIP-16 (0.25) MECHANICAL DATA**

| 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

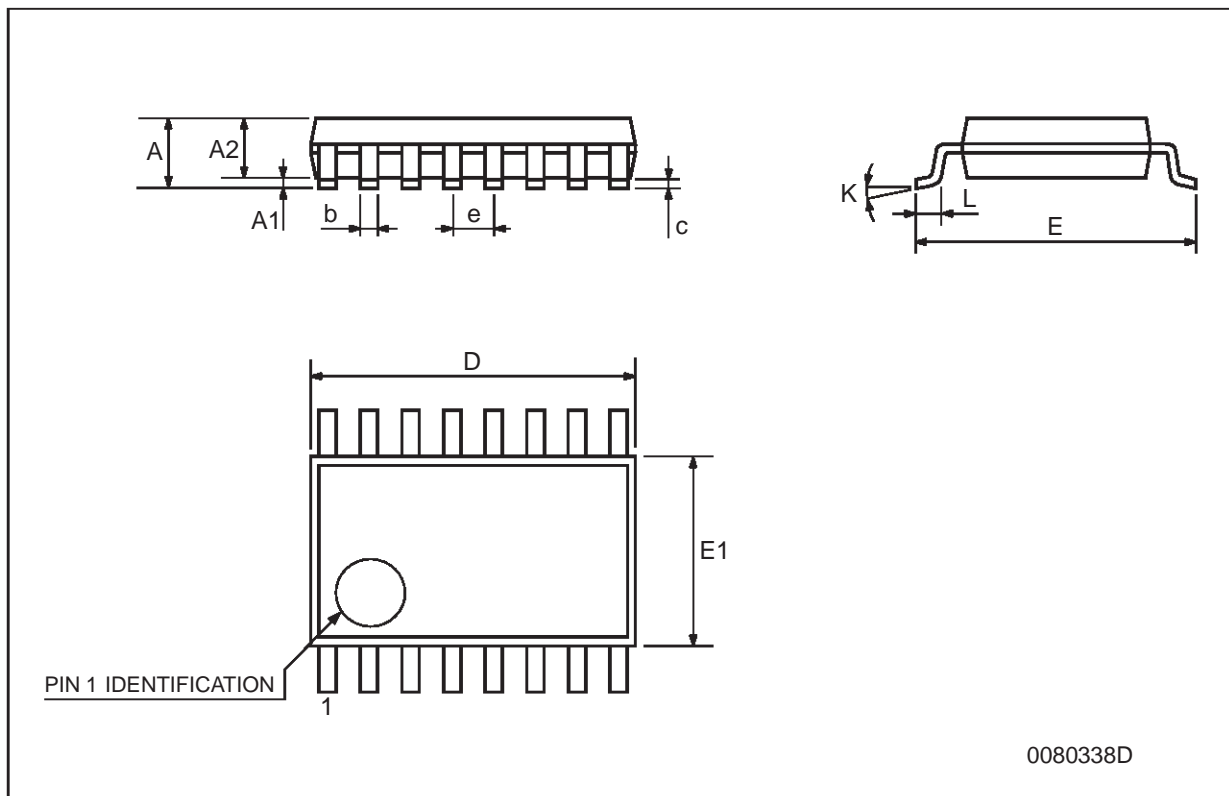
| DIM. | mm.        |      |      | inch  |       |       |
|------|------------|------|------|-------|-------|-------|
|      | MIN.       | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |            |      | 1.75 |       |       | 0.068 |
| a1   | 0.1        |      | 0.2  | 0.003 |       | 0.007 |
| 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

## TSSOP16 MECHANICAL DATA

| DIM. | mm.  |          |      | inch  |            |        |
|------|------|----------|------|-------|------------|--------|
|      | MIN. | TYP      | MAX. | MIN.  | TYP.       | MAX.   |
| A    |      |          | 1.2  |       |            | 0.047  |
| A1   | 0.05 |          | 0.15 | 0.002 | 0.004      | 0.006  |
| A2   | 0.8  | 1        | 1.05 | 0.031 | 0.039      | 0.041  |
| b    | 0.19 |          | 0.30 | 0.007 |            | 0.012  |
| c    | 0.09 |          | 0.20 | 0.004 |            | 0.0089 |
| D    | 4.9  | 5        | 5.1  | 0.193 | 0.197      | 0.201  |
| E    | 6.2  | 6.4      | 6.6  | 0.244 | 0.252      | 0.260  |
| E1   | 4.3  | 4.4      | 4.48 | 0.169 | 0.173      | 0.176  |
| e    |      | 0.65 BSC |      |       | 0.0256 BSC |        |
| K    | 0°   |          | 8°   | 0°    |            | 8°     |
| L    | 0.45 | 0.60     | 0.75 | 0.018 | 0.024      | 0.030  |



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