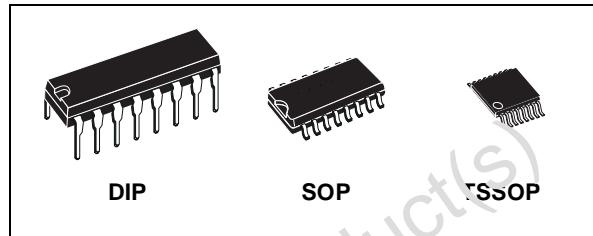


## 3 TO 8 LINE DECODER LATCH

- HIGH SPEED:  
 $t_{PD} = 16\text{ns}$  (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:  
 $|I_{OHI}| = I_{OL} = 4\text{mA}$  (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 237



### ORDER CODES

| PACKAGE | TYPE        | T & R          |
|---------|-------------|----------------|
| DIP     | M74HC237B1R |                |
| SOP     | M74HC237M1R | M74HC237RM13TR |
| TSSOP   |             | M74HC237TTR    |

### DESCRIPTION

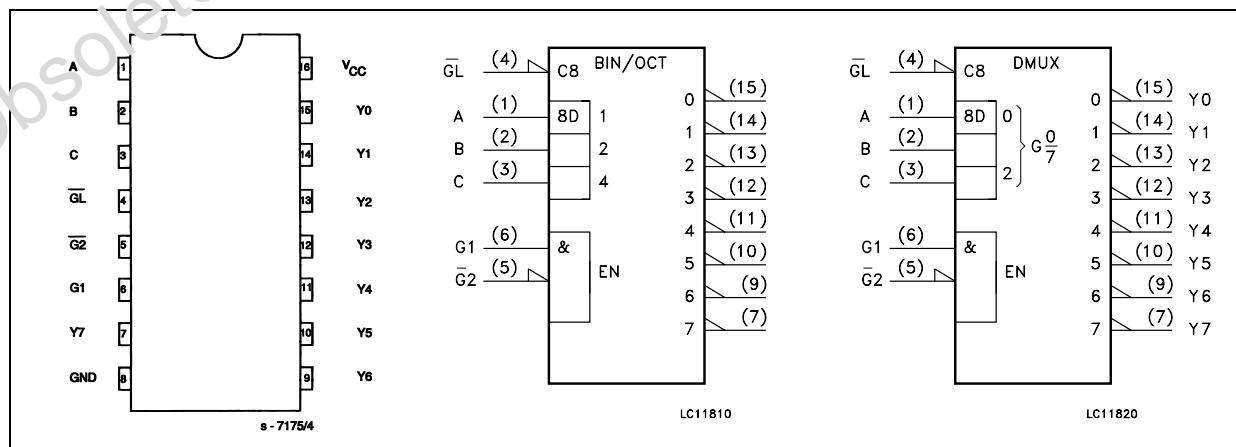
The M74HC237 is an high speed CMOS 3 TO 8 LINE DECODER fabricated with silicon gate C<sup>2</sup>MOS technology.

When  $\bar{GL}$  goes from low to high, the address present at the select inputs (A, B, C) is stored in the latches. As long as  $\bar{GL}$  remains high no address changes will be recognized. Output enable controls, G1 and G2 control the state of the outputs independently of the select or

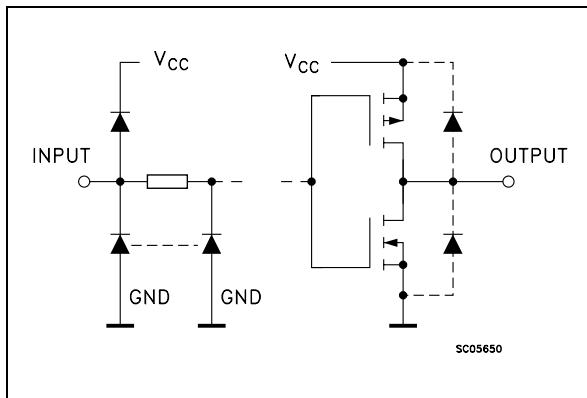
latch-enable inputs. All of the outputs are low unless G1 is high and G2 is low. The M74HC237 is ideally suited for the implementation of glitch-free decoders in stored-address applications in bus oriented systems.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



**INPUT AND OUTPUT EQUIVALENT CIRCUIT**



**PIN DESCRIPTION**

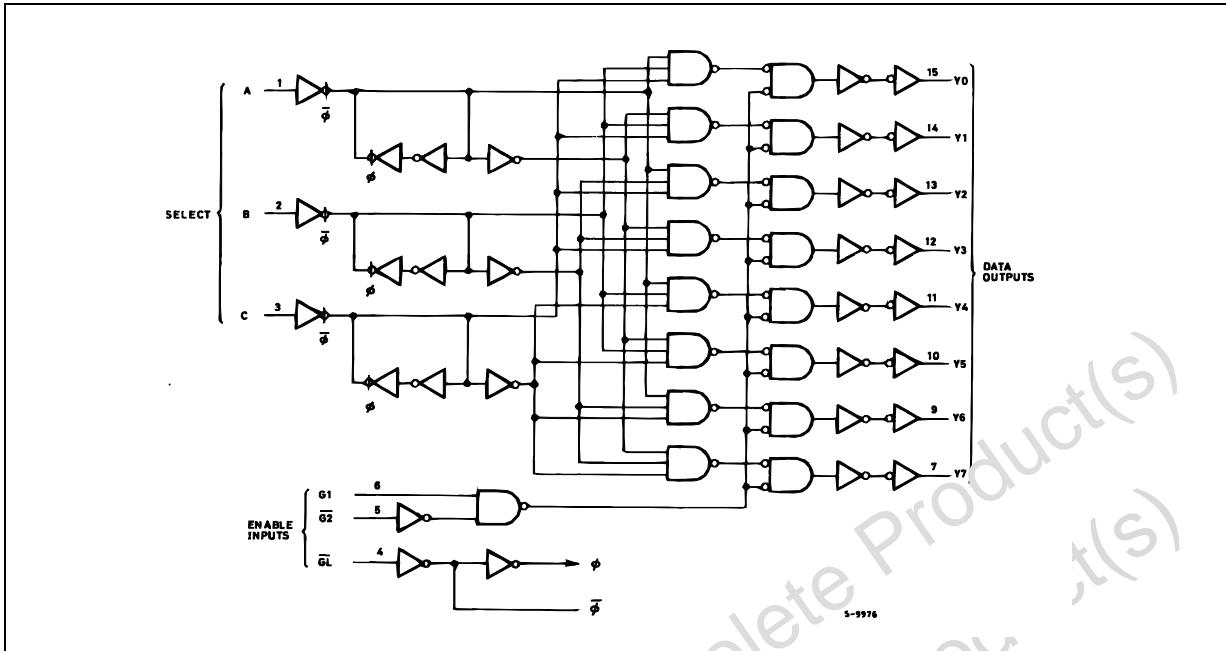
| PIN No                             | SYMBOL      | NAME AND FUNCTION               |
|------------------------------------|-------------|---------------------------------|
| 1, 2, 3                            | A, B, C     | Data Inputs                     |
| 4                                  | $\bar{G}_L$ | Latch Enable Input              |
| 5                                  | $G_2$       | Data Enable Input (Active LOW)  |
| 6                                  | $G_1$       | Data Enable Input (Active HIGH) |
| 15, 14, 13,<br>12, 11, 10, 9,<br>7 | Y0 to Y7    | Decoder Outputs                 |
| 8                                  | GND         | Ground (0V)                     |
| 16                                 | $V_{CC}$    | Positive Supply Voltage         |

**TRUTH TABLE**

| INPUTS      |             |       |        |   |   | OUTPUTS   |    |    |    |    |    |    |    |
|-------------|-------------|-------|--------|---|---|---|----|----|----|----|----|----|----|
| ENABLE      |             |       | SELECT |   |   | Y0  | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| $\bar{G}_L$ | $\bar{G}_2$ | $G_1$ | C      | B | A | Y0  | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X           | X           | L     | X      | X | X | L   | L  | L  | L  | L  | L  | L  | L  |
| X           | H           | X     | X      | X | X | L   | L  | L  | L  | L  | L  | L  | L  |
| L           | L           | H     | L      | L | L | H   | L  | L  | L  | L  | L  | L  | L  |
| L           | L           | H     | L      | L | H | L   | H  | L  | L  | L  | L  | L  | L  |
| L           | L           | H     | L      | H | L | L   | L  | H  | L  | L  | L  | L  | L  |
| L           | L           | H     | L      | H | R | L   | L  | L  | H  | L  | L  | L  | L  |
| L           | L           | H     | H      | L | L | L   | L  | L  | L  | H  | L  | L  | L  |
| L           | L           | H     | H      | L | H | L   | L  | L  | L  | L  | H  | L  | L  |
| L           | L           | H     | H      | H | L | L   | L  | L  | L  | L  | L  | H  | L  |
| L           | L           | H     | H      | H | H | L   | L  | L  | L  | L  | L  | L  | H  |
| H           | L           | H     | X      | X | X | Outputs corresponding to stored address H: all others L |    |    |    |    |    |    |    |

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 <sub>CC</sub>                     | Supply Voltage                       | -0.5 to +7                    | V    |
| V <sub>I</sub>                      | DC Input Voltage                     | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| V <sub>O</sub>                      | DC Output Voltage                    | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>                     | DC Input Diode Current               | ± 20                          | mA   |
| I <sub>OK</sub>                     | DC Output Diode Current              | ± 20                          | mA   |
| I <sub>O</sub>                      | DC Output Current                    | ± 25                          | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current | ± 50                          | mA   |
| P <sub>D</sub>                      | Power Dissipation                    | 500(*)                        | mW   |
| T <sub>stg</sub>                    | Storage Temperature                  | -65 to +150                   | °C   |
| T <sub>L</sub>                      | 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 <sub>CC</sub>                 | Supply Voltage           | 2 to 6   | V  |
| V <sub>I</sub>                  | Input Voltage            | 0 to V <sub>CC</sub>   | V  |
| V <sub>O</sub>                  | Output Voltage           | 0 to V <sub>CC</sub>   | V  |
| T <sub>op</sub>                 | Operating Temperature    | -55 to 125   | °C   |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time | V <sub>CC</sub> = 2.0V<br>V <sub>CC</sub> = 4.5V<br>V <sub>CC</sub> = 6.0V | 0 to 1000 ns<br>0 to 500 ns<br>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 = V <sub>CC</sub> or GND              |                       |      | 4     |             | 40   |              | 80   | µA |

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

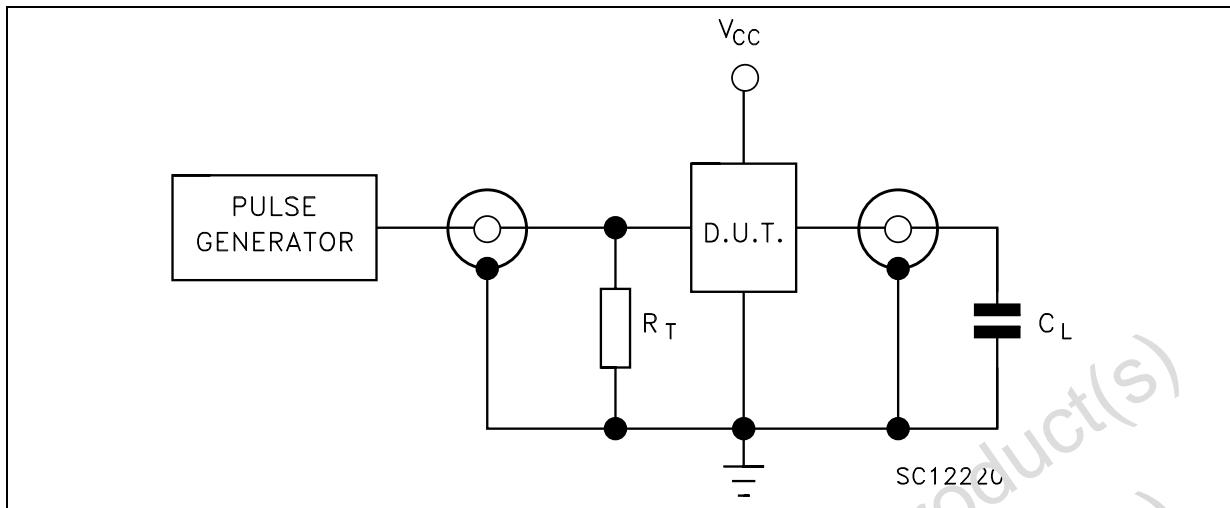
| Symbol              | Parameter                            | Test Condition  |  | Value                    |      |      |                                    |      |                                     | Unit |    |
|---------------------|--------------------------------------|-----------------|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|----|
|                     |                                      | $V_{CC}$<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.                                |      |    |
| $t_{TLH}$ $t_{THL}$ | 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 (A, B, C - Y) | 2.0             |  |                          | 60   | 180  |                                    | 225  |                                     | 270  | ns |
|                     |                                      | 4.5             |  |                          | 19   | 36   |                                    | 45   |                                     | 54   |    |
|                     |                                      | 6.0             |  |                          | 16   | 31   |                                    | 38   |                                     | 46   |    |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (G1 - Y)      | 2.0             |  |                          | 45   | 140  |                                    | 175  |                                     | 210  | ns |
|                     |                                      | 4.5             |  |                          | 15   | 28   |                                    | 35   |                                     | 42   |    |
|                     |                                      | 6.0             |  |                          | 13   | 24   |                                    | 30   |                                     | 36   |    |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (G2 - Y)      | 2.0             |  |                          | 45   | 140  |                                    | 175  |                                     | 210  | ns |
|                     |                                      | 4.5             |  |                          | 15   | 28   |                                    | 35   |                                     | 42   |    |
|                     |                                      | 6.0             |  |                          | 13   | 24   |                                    | 30   |                                     | 36   |    |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time (GL - Y)      | 2.0             |  |                          | 65   | 190  |                                    | 240  |                                     | 285  | ns |
|                     |                                      | 4.5             |  |                          | 21   | 33   |                                    | 48   |                                     | 57   |    |
|                     |                                      | 6.0             |  |                          | 18   | 32   |                                    | 41   |                                     | 48   |    |
| $t_{W(L)}$          | Minimum Pulse Width (GL)             | 2.0             |  |                          | 10   | 75   |                                    | 95   |                                     | 110  | ns |
|                     |                                      | 4.5             |  |                          | 6    | 15   |                                    | 19   |                                     | 22   |    |
|                     |                                      | 6.0             |  |                          | 6    | 13   |                                    | 16   |                                     | 19   |    |
| $t_s$               | Minimum Set-up Time (A, B, C - GL)   | 2.0             |  |                          | 12   | 50   |                                    | 65   |                                     | 75   | ns |
|                     |                                      | 4.5             |  |                          | 3    | 10   |                                    | 13   |                                     | 15   |    |
|                     |                                      | 6.0             |  |                          | 2    | 9    |                                    | 11   |                                     | 13   |    |
| $t_h$               | Minimum Hold Time (A, B, C - GL)     | 2.0             |  |                          |      | 25   |                                    | 30   |                                     | 40   | ns |
|                     |                                      | 4.5             |  |                          |      | 5    |                                    | 6    |                                     | 8    |    |
|                     |                                      | 6.0             |  |                          |      | 5    |                                    | 5    |                                     | 7    |    |

## 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.                                |      |    |
| $C_{IN}$ | Input Capacitance                      | 5.0             |  |                          | 5    | 10   |                                    | 10   |                                     | 10   | pF |
| $C_{PD}$ | Power Dissipation Capacitance (note 1) | 5.0             |  |                          | 52   |      |                                    |      |                                     |      | pF |

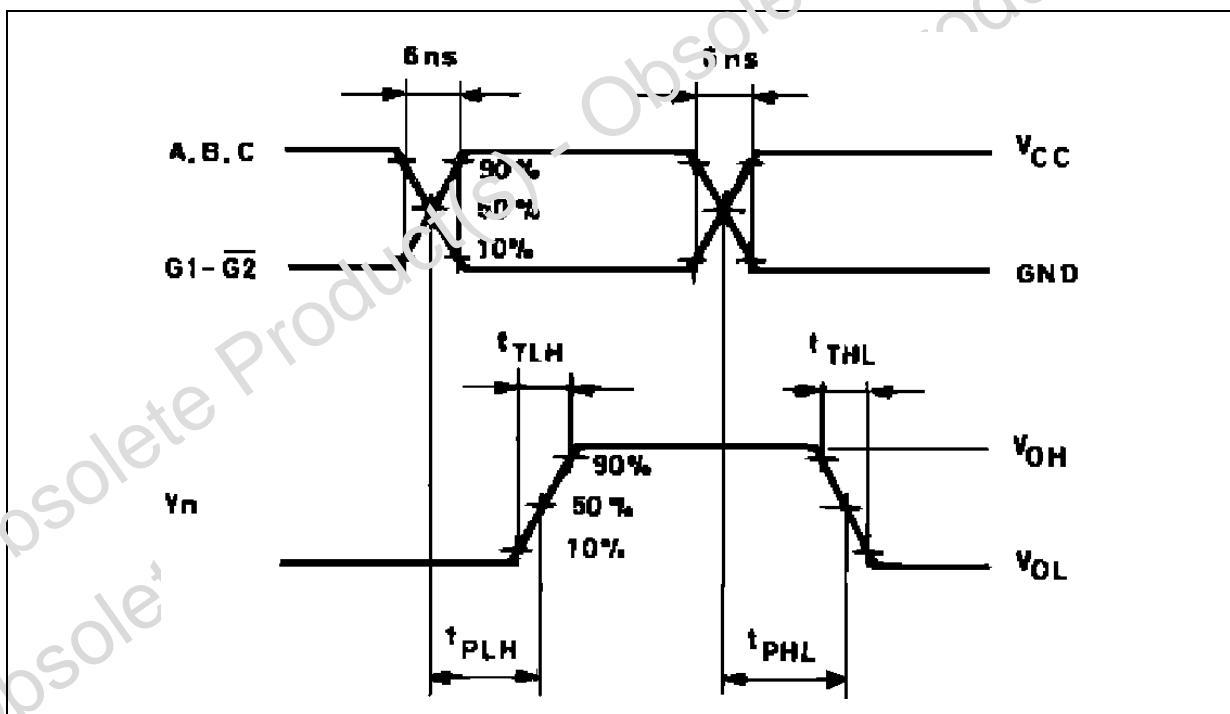
1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load.

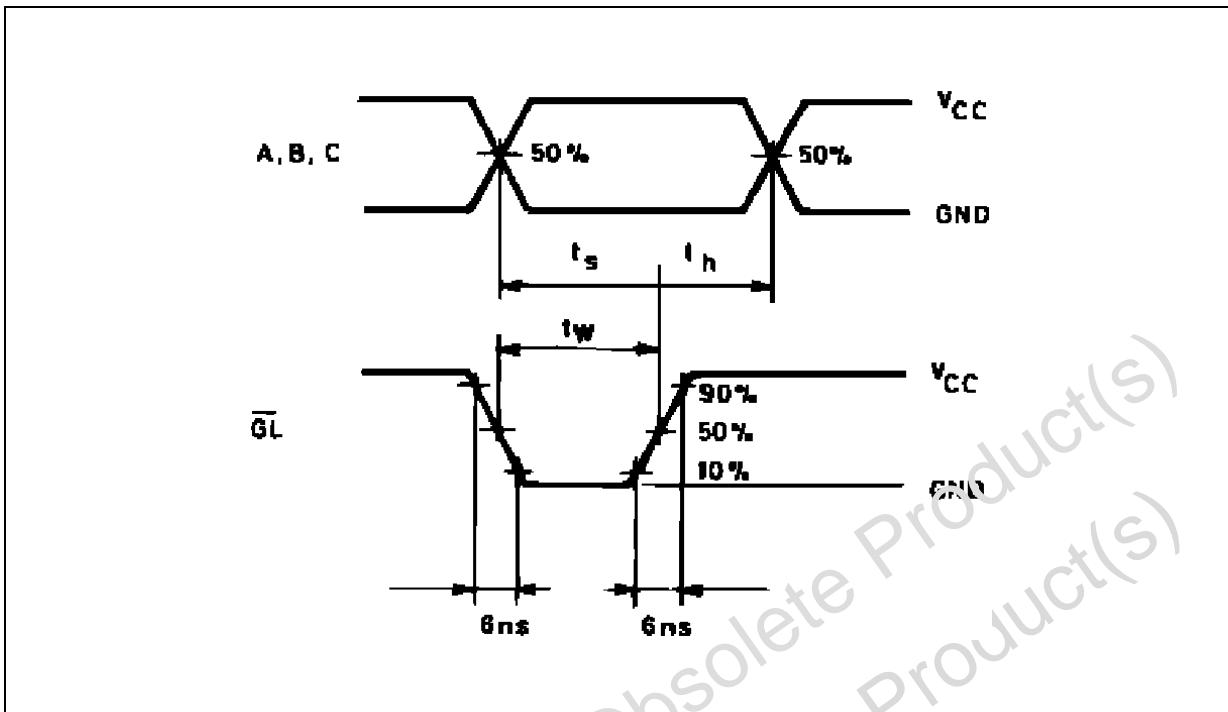
TEST CIRCUIT



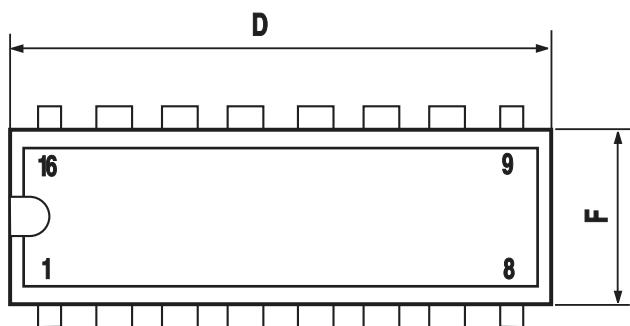
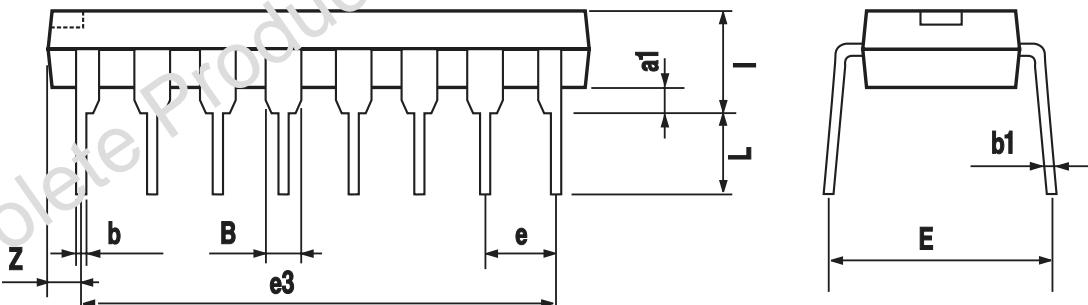
$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

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



WAVEFORM 2: SETUP AND HOLD TIME, MINIMUM PULSE WIDTH ( $\overline{GL}$ ) (f=1MHz; 50% duty cycle)

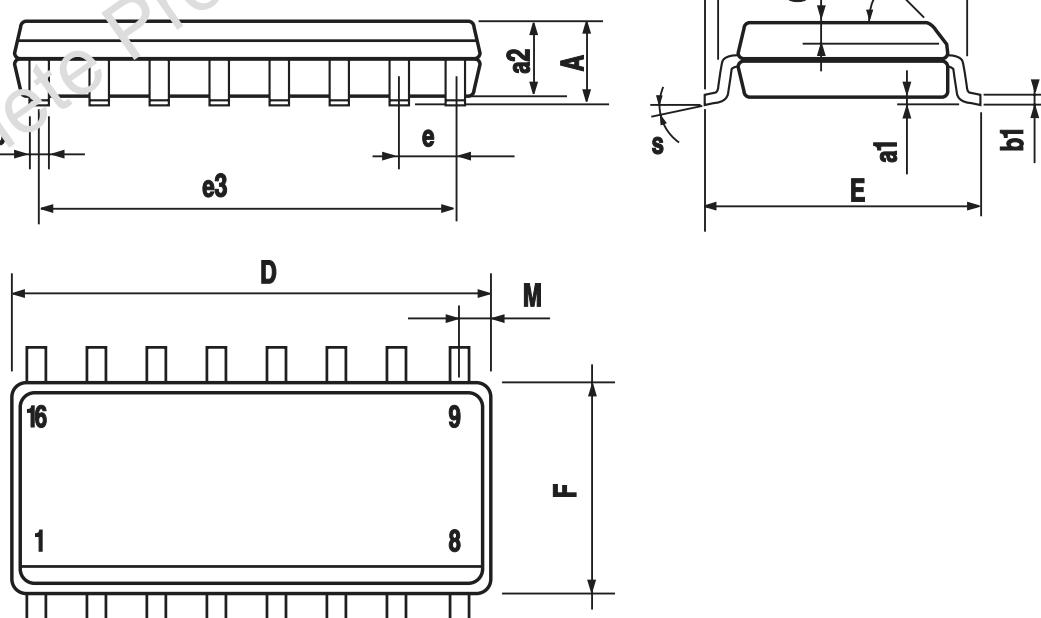
| Plastic DIP-16 (0.25) MECHANICAL DATA |      |       |      |       |       |       |
|---------------------------------------|------|-------|------|-------|-------|-------|
| DIM.                                  | mm.  |       |      | inch  |       |       |
|                                       | 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 |



P001C

## SO-16 MECHANICAL DATA

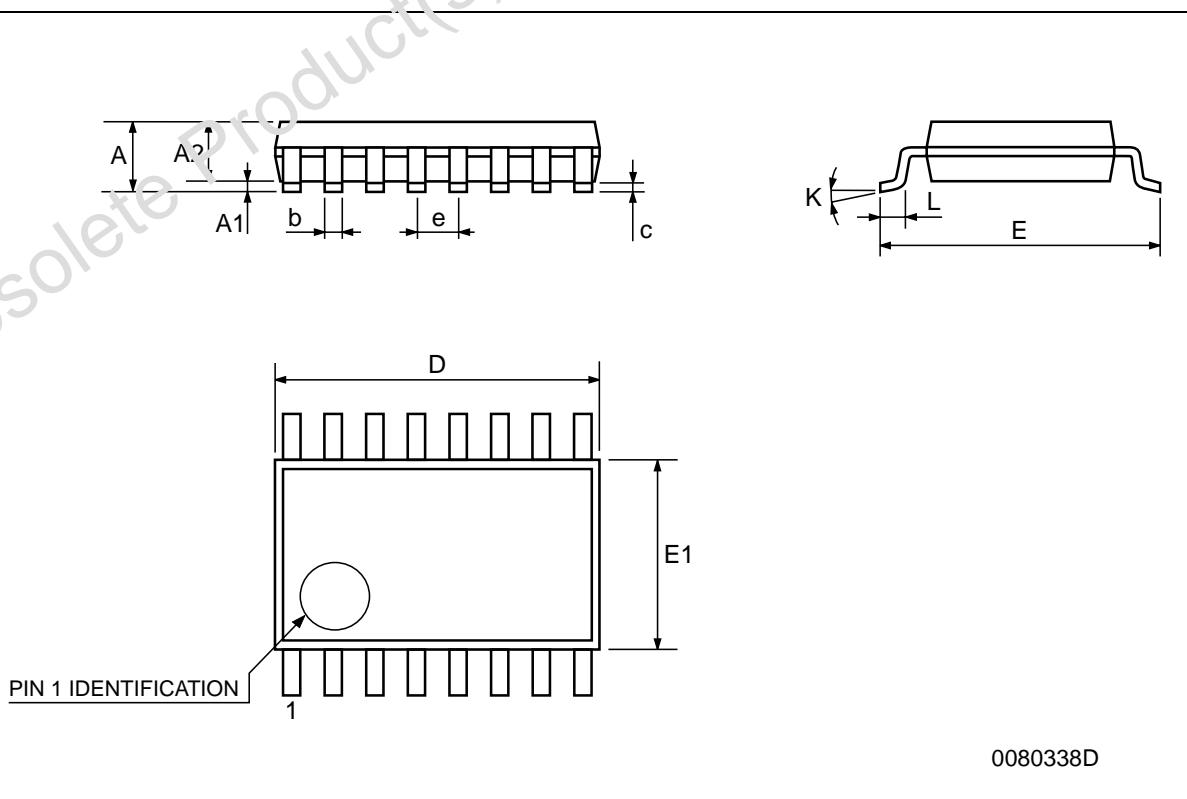
| DIM. | mm.  |            |      | inch  |       |       |
|------|------|------------|------|-------|-------|-------|
|      | MIN. | TYP.       | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      |            | 1.75 |       |       | 0.068 |
| a1   | 0.1  |            | 0.2  | 0.003 |       | 0.007 |
|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

## 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 | 0.163 | 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  |



0080338D

Obsolete Product(s) - Obsolete Product(s)  
Obsolete Product(s) - Obsolete Product(s)

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