



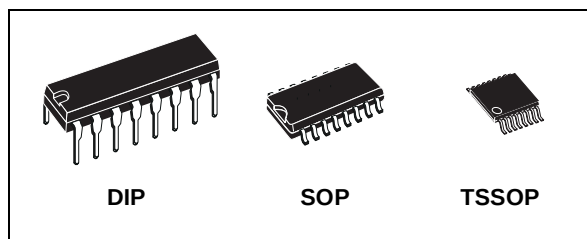
# M74HC253

## DUAL 4 CHANNEL MULTIPLEXER 3 STATE OUTPUT

- HIGH SPEED:  
 $t_{PD} = 16ns$  (TYP.) at  $V_{CC} = 6V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu A$  (MAX.) at  $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 4mA$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH  
74 SERIES 253

### DESCRIPTION

The M74HC253 is an high speed CMOS DUAL 4 CHANNEL MULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology. Each of these data (1C0-1C3, 2C0-2C3) is selected by the two address inputs A and B. Separate strobe inputs (1G, 2G) are provided for each of the two four-line sections. The strobe input

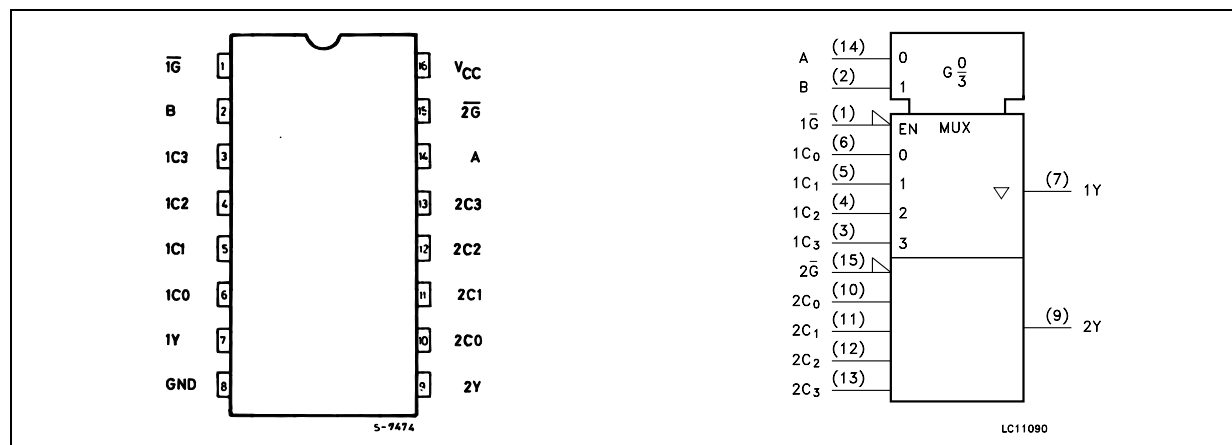


### ORDER CODES

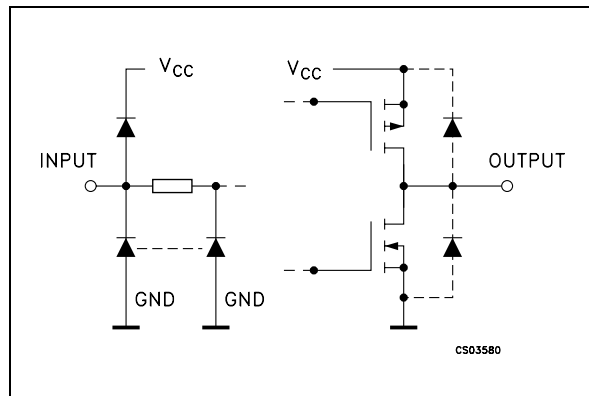
| PACKAGE | TUBE        | T & R          |
|---------|-------------|----------------|
| DIP     | M74HC253B1R |                |
| SOP     | M74HC253M1R | M74HC253RM13TR |
| TSSOP   |             | M74HC253TTR    |

(nG) can be used to inhibit the data output; the output of M74HC253 is a high impedance while the strobe input is held high. 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

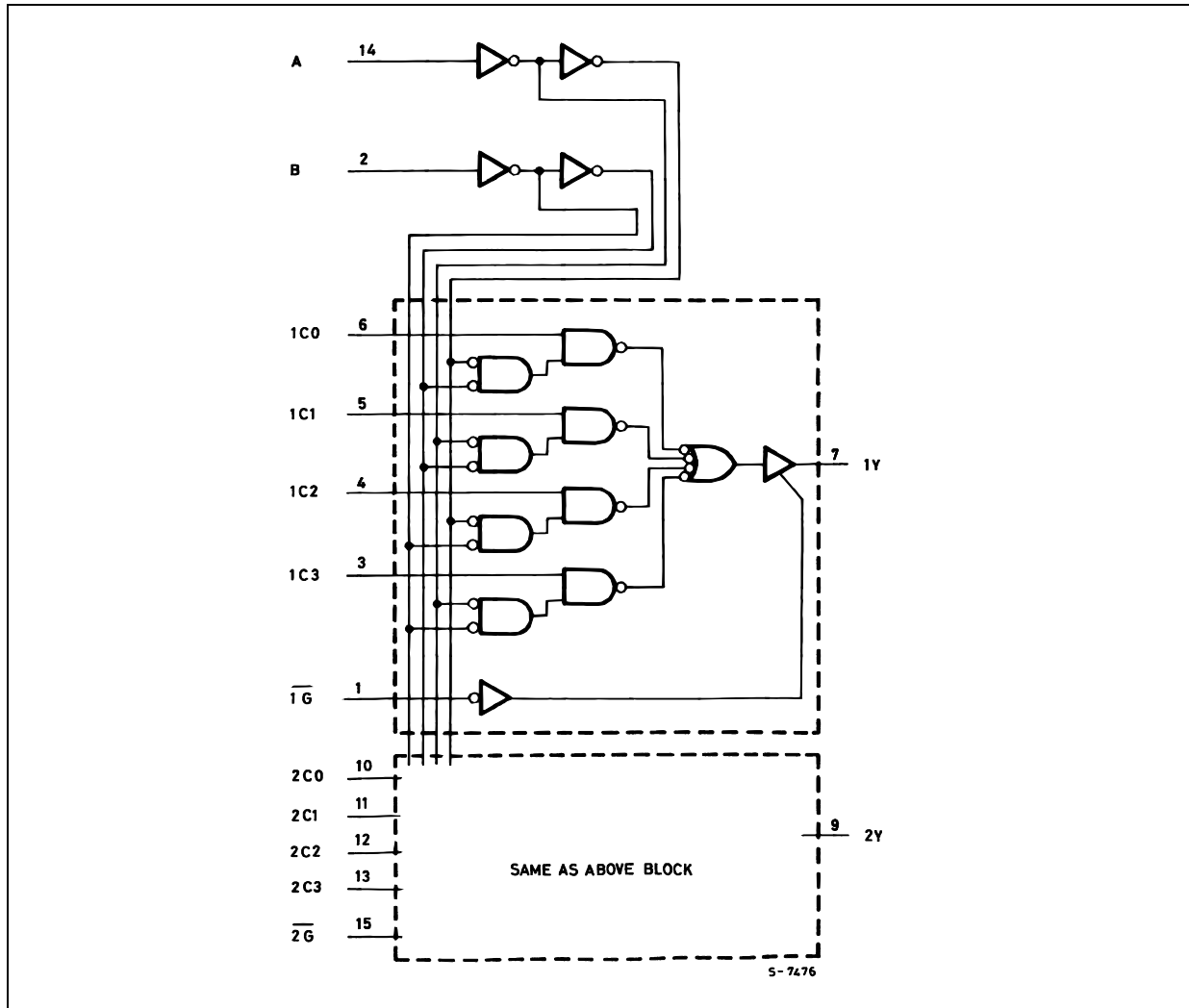
| PIN No         | SYMBOL                         | NAME AND FUNCTION           |
|----------------|--------------------------------|-----------------------------|
| 1, 15          | $\overline{1G}, \overline{2G}$ | Output Enable Inputs        |
| 14, 2          | A, B                           | Common Data Select Inputs   |
| 6, 5, 4, 3     | 1C0 to 1C3                     | Data Inputs From Source 1   |
| 7, 9           | 1Y, 2Y                         | 3 State Multiplexer Outputs |
| 10, 11, 12, 13 | 2C0 to 2C3                     | Data Inputs From Source 2   |
| 8              | GND                            | Ground (0V)                 |
| 16             | V <sub>CC</sub>                | Positive Supply Voltage     |

## TRUTH TABLE

| SELECT INPUTS |   | DATA INPUTS    |                |                |                | STROBE         | OUTPUT Y |
|---------------|---|----------------|----------------|----------------|----------------|----------------|----------|
| B             | A | C <sub>0</sub> | C <sub>1</sub> | C <sub>2</sub> | C <sub>3</sub> | $\overline{G}$ |          |
| X             | X | X              | X              | X              | X              | H              | Z        |
| L             | L | L              | X              | X              | X              | L              | L        |
| L             | L | H              | X              | X              | X              | L              | H        |
| L             | H | X              | L              | X              | X              | L              | L        |
| L             | H | X              | H              | X              | X              | L              | H        |
| H             | L | X              | X              | L              | X              | L              | L        |
| H             | L | X              | X              | H              | X              | L              | H        |
| H             | H | X              | X              | X              | L              | L              | L        |
| H             | H | X              | X              | X              | H              | L              | H        |

X : Don't Care  
Z : High Impedance

## LOGIC DIAGRAM



This logic diagram has not be 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>OZ</sub> | High Impedance Output Leakage Current | 6.0                    | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>O</sub> = V <sub>CC</sub> or GND |                       |      | ± 0.5 |             | ± 5  |              | ± 5  | 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  $t_r = t_f = 6 \text{ ns}$ )

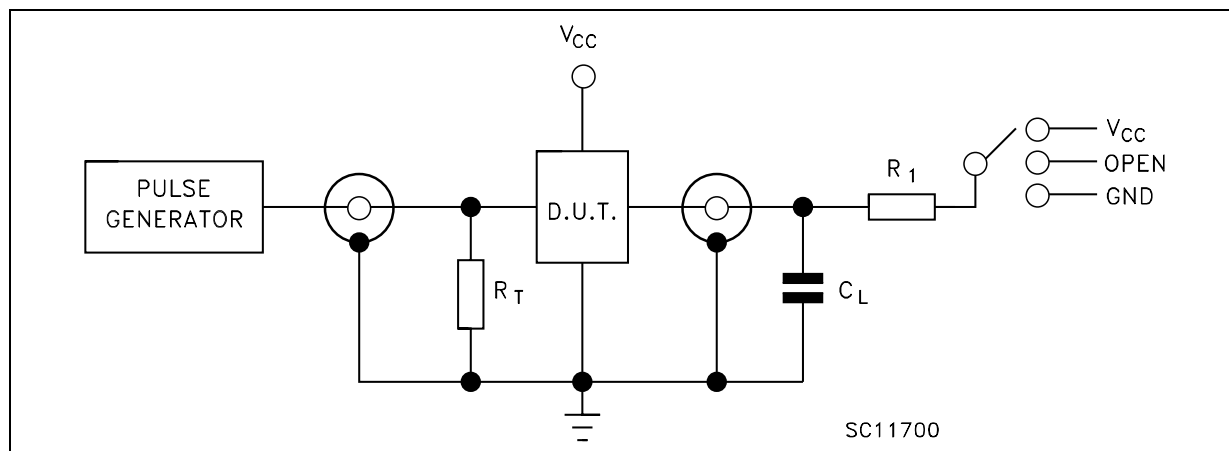
| Symbol                            | Parameter                                  | Test Condition         |                      | Value                 |      |      |             |      |              | Unit |      |
|-----------------------------------|--------------------------------------------|------------------------|----------------------|-----------------------|------|------|-------------|------|--------------|------|------|
|                                   |                                            | V <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. |
| t <sub>TLH</sub> t <sub>THL</sub> | Output Transition Time                     | 2.0                    |                      |                       | 30   | 75   |             | 95   |              | 110  | ns   |
|                                   |                                            | 4.5                    |                      |                       | 8    | 15   |             | 19   |              | 22   |      |
|                                   |                                            | 6.0                    |                      |                       | 7    | 13   |             | 16   |              | 19   |      |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation Delay Time (Cn - Y)            | 2.0                    |                      |                       | 48   | 115  |             | 145  |              | 175  | ns   |
|                                   |                                            | 4.5                    |                      |                       | 15   | 23   |             | 29   |              | 35   |      |
|                                   |                                            | 6.0                    |                      |                       | 12   | 20   |             | 25   |              | 30   |      |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation Delay Time (A, B - Y)          | 2.0                    |                      |                       | 68   | 150  |             | 190  |              | 225  | ns   |
|                                   |                                            | 4.5                    |                      |                       | 20   | 30   |             | 38   |              | 45   |      |
|                                   |                                            | 6.0                    |                      |                       | 16   | 26   |             | 32   |              | 38   |      |
| t <sub>PZL</sub> t <sub>PZH</sub> | High Impedance Output Enable Time (G - Y)  | 2.0                    | R <sub>1</sub> = 1KΩ |                       | 36   | 100  |             | 125  |              | 150  | ns   |
|                                   |                                            | 4.5                    |                      |                       | 12   | 20   |             | 25   |              | 30   |      |
|                                   |                                            | 6.0                    |                      |                       | 9    | 17   |             | 21   |              | 26   |      |
| t <sub>PLZ</sub> t <sub>PHZ</sub> | High Impedance Output Disable Time (G - Y) | 2.0                    | R <sub>1</sub> = 1KΩ |                       | 22   | 100  |             | 125  |              | 150  | ns   |
|                                   |                                            | 4.5                    |                      |                       | 11   | 20   |             | 25   |              | 30   |      |
|                                   |                                            | 6.0                    |                      |                       | 9    | 17   |             | 21   |              | 26   |      |

**CAPACITIVE CHARACTERISTICS**

| 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. |
| C <sub>IN</sub> | Input Capacitance                      | 5.0                    |  |                       | 5    | 10   |             | 10   |              | 10   | pF   |
| C <sub>PD</sub> | Power Dissipation Capacitance (note 1) | 5.0                    |  |                       | 58   |      |             |      |              |      | 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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$  (per circuit)

## TEST CIRCUIT

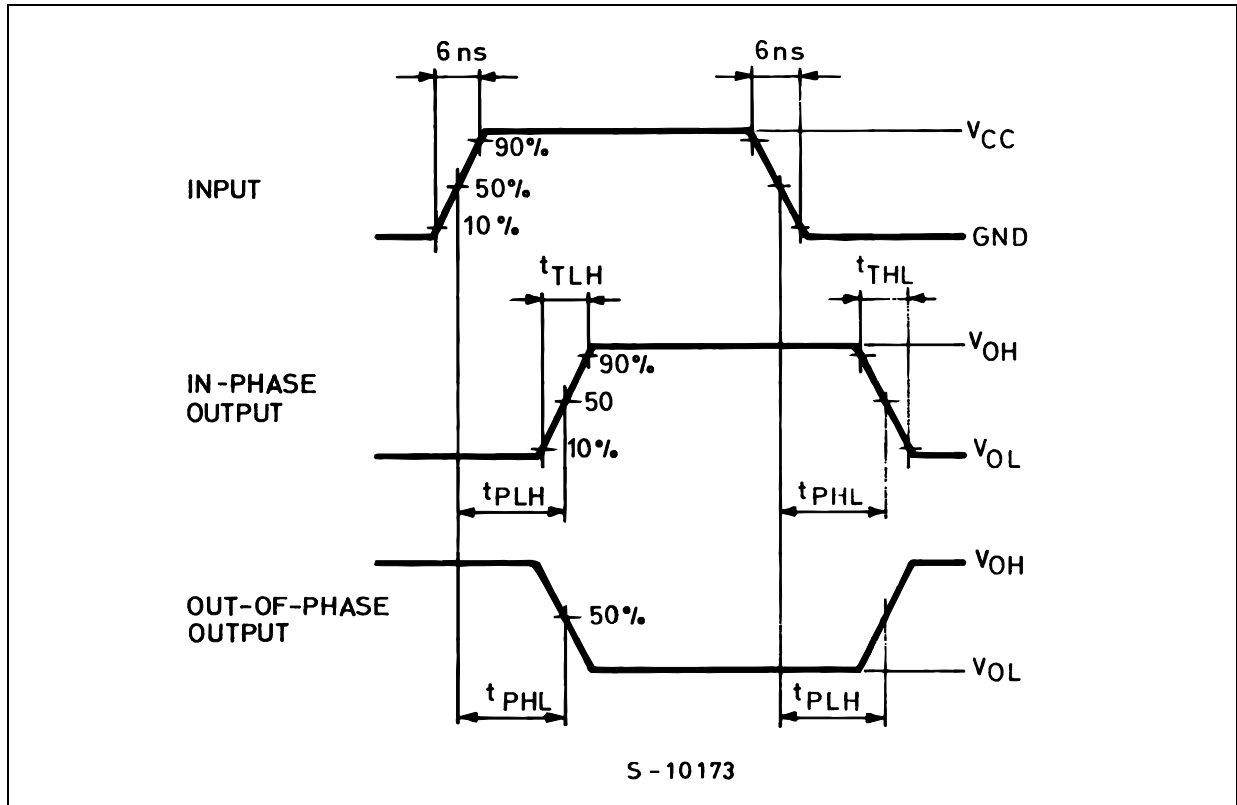
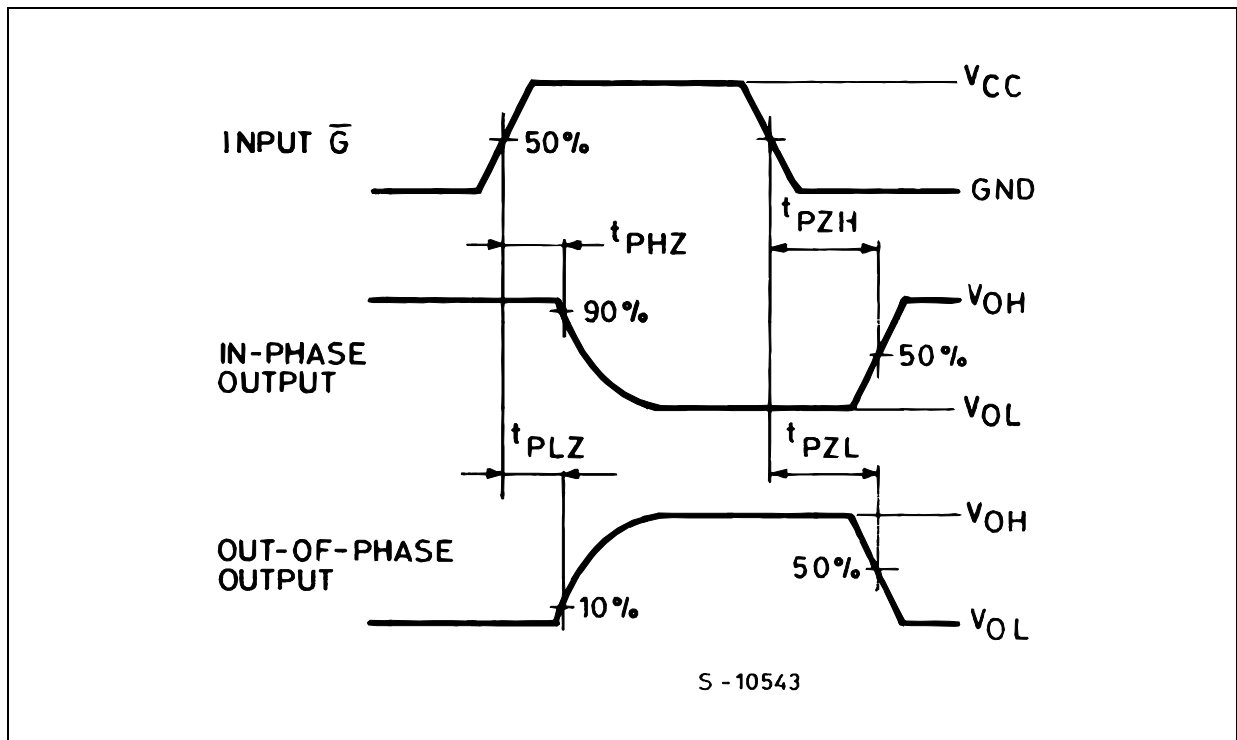


| TEST                  | SWITCH   |
|-----------------------|----------|
| $t_{PLH}$ , $t_{PHL}$ | Open     |
| $t_{PZL}$ , $t_{PLZ}$ | $V_{CC}$ |
| $t_{PZH}$ , $t_{PHZ}$ | GND      |

$C_L = 50\text{pF}/150\text{pF}$  or equivalent (includes jig and probe capacitance)

$R_1 = 1\text{K}\Omega$  or equivalent

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

**WAVEFORM 1 : PROPAGATION DELAY TIMES** ( $f=1\text{MHz}$ ; 50% duty cycle)**WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME** ( $f=1\text{MHz}$ ; 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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