



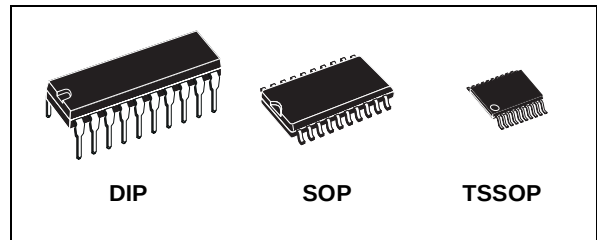
# M74HC241HV

## OCTAL BUS BUFFER WITH 3 STATE OUTPUTS (NON INVERTED)

- HIGH SPEED:  
 $t_{PD} = 11ns$  (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:  
 $|I_{OH}| = I_{OL} = 6mA$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- SAME FUNCTION OF HC241 PLUS HIGH TO LOW LEVEL LOGIC CONVERSION CAPABILITY
- LATCH UP FREE OPERATION ALSO WHEN  $V_{IH}$  IS HIGHER THAN  $V_{CC}$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 241

### DESCRIPTION

The 74HC241HV is an advanced high-speed CMOS OCTAL BUS BUFFER (3-STATE) fabricated with silicon gate C<sup>2</sup>MOS technology. Performing the same function of their non HV counterpart, they have a particular input configuration which allows all inputs to be driven by logic levels exceeding the supply voltage.



### ORDER CODES

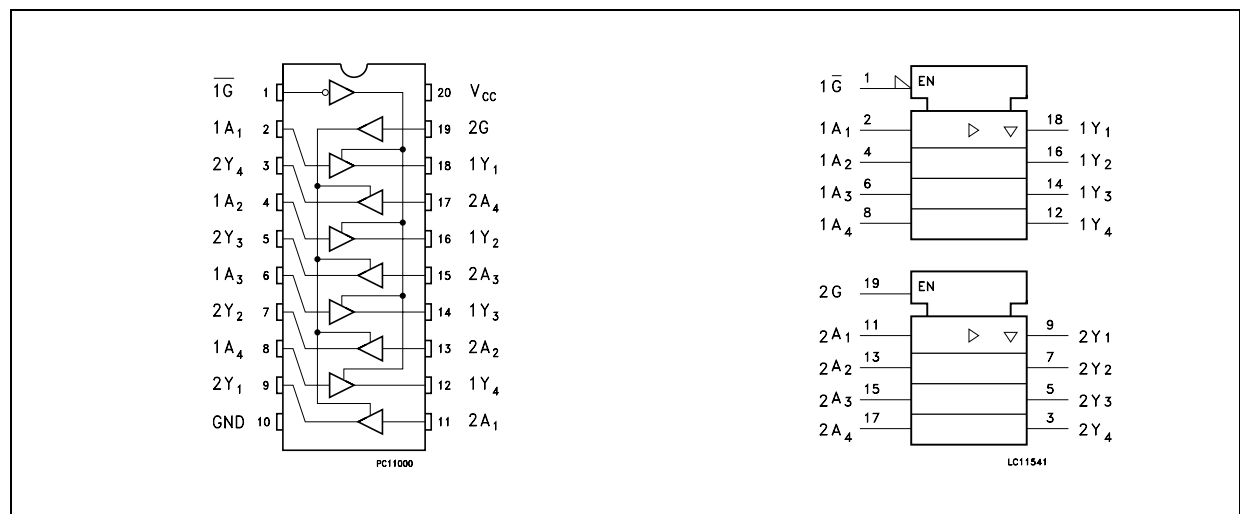
| PACK. | TUBE          | T & R            |
|-------|---------------|------------------|
| DIP   | M74HC241HVB1R |                  |
| SOP   | M74HC241HVM1R | M74HC241HVRM13TR |
| TSSOP |               | M74HC241HVTTR    |

This make them particularly suitable in systems where mixed 3V/5V logic devices need to be interfaced.

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

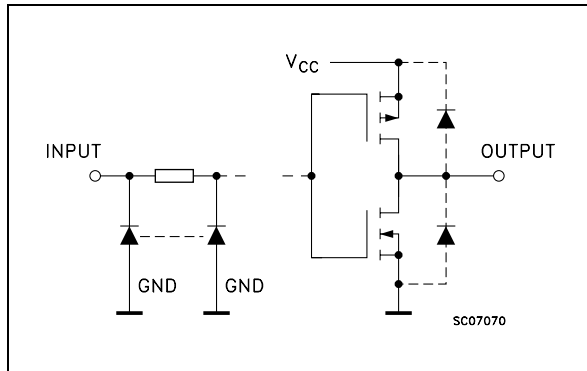
NOTE : BOTH DEVICES DO NOT MEET 2KV ESD RATING.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## M74HC241HV

### INPUT AND OUTPUT EQUIVALENT CIRCUIT



### PIN DESCRIPTION

| PIN No         | SYMBOL          | NAME AND FUNCTION       |
|----------------|-----------------|-------------------------|
| 1              | $\overline{1G}$ | Output Enable Input     |
| 2, 4, 6, 8     | 1A1 to 1A4      | Data Inputs             |
| 9, 7, 5, 3     | 2Y1 to 2Y4      | Data Outputs            |
| 11, 13, 15, 17 | 2A1 to 2A4      | Data Inputs             |
| 18, 16, 14, 12 | 1Y1 to 1Y4      | Data Outputs            |
| 19             | 2G              | Output Enable Input     |
| 10             | GND             | Ground (0V)             |
| 20             | V <sub>CC</sub> | Positive Supply Voltage |

### TRUTH TABLE

| INPUTS          |     | OUTPUT | INPUTS |     | OUTPUT |
|-----------------|-----|--------|--------|-----|--------|
| $\overline{1G}$ | 1An | 1Yn    | 2G     | 2An | 2Yn    |
| L               | L   | L      | H      | L   | L      |
| L               | H   | H      | H      | H   | H      |
| H               | X   | Z      | L      | X   | Z      |

X : Don't Care  
Z : High Impedance

### ABSOLUTE MAXIMUM RATINGS

| Symbol                              | Parameter                            | Value                         | Unit |
|-------------------------------------|--------------------------------------|-------------------------------|------|
| V <sub>CC</sub>                     | Supply Voltage                       | -0.5 to +13                   | V    |
| V <sub>I</sub>                      | DC Input Voltage                     | -0.5 to +13                   | 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              | ± 100                         | mA   |
| I <sub>O</sub>                      | DC Output Current                    | ± 35                          | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current | ± 100                         | 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 12                | 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 | 0 to 1000 |
|                                 |                          | V <sub>CC</sub> = 4.5V | 0 to 500  |
|                                 |                          | V <sub>CC</sub> = 6.0V | 0 to 400  |

## 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> =-6.0 mA                                                                        | 4.18                  | 4.31 |       | 4.13        |      | 4.10         |      |      |  |
|                 |                                       | 6.0                    | I <sub>O</sub> =-7.8 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> =6.0 mA                                                                         |                       | 0.17 | 0.26  |             | 0.33 |              | 0.40 |      |  |
|                 |                                       | 6.0                    | I <sub>O</sub> =7.8 mA                                                                         |                       | 0.18 | 0.26  |             | 0.33 |              | 0.40 |      |  |
| I <sub>I</sub>  | Input Leakage Current                 | 12.0                   | V <sub>I</sub> = V <sub>CC</sub> or GND                                                        |                       |      | ± 0.1 |             | ± 1  |              | ± 1  | μA   |  |
| I <sub>IH</sub> | Input Leakage Current                 | 2.0                    | V <sub>I</sub> = 12V                                                                           |                       |      | ± 0.1 |             | ± 1  |              | ± 1  | μA   |  |
| I <sub>OZ</sub> | High Impedance Output Leakage Current | 12.0                   | 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  |              | ± 10 | μA   |  |
| I <sub>CC</sub> | Quiescent Supply Current              | 12.0                   | V <sub>I</sub> = V <sub>CC</sub> or GND                                                        |                       |      | 4     |             | 40   |              | 80   | μA   |  |

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

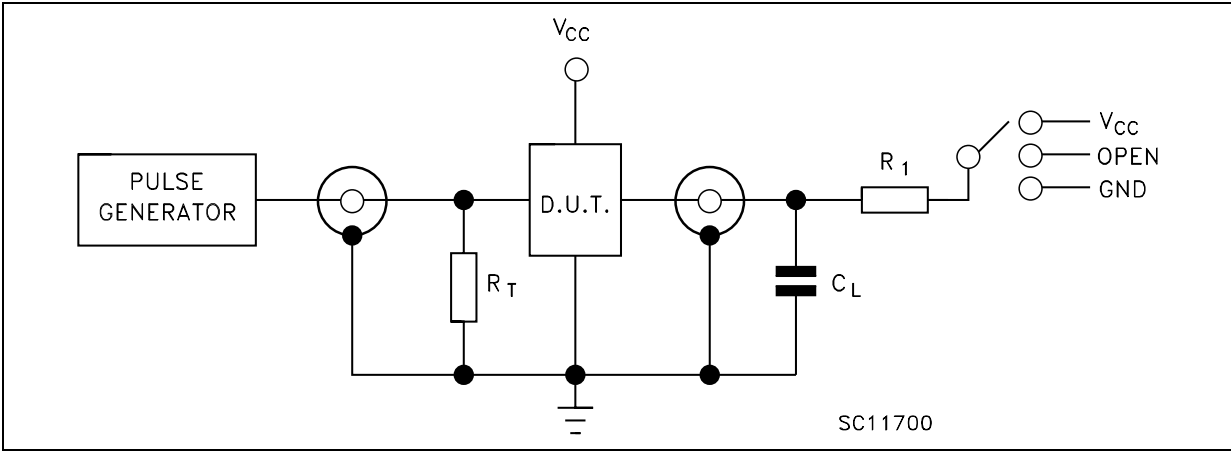
| Symbol                            | Parameter                          | Test Condition         |                        |                       | Value                 |      |      |             |      |              |      | Unit |     |     |                       |  |    |     |  |     |  |     |    |
|-----------------------------------|------------------------------------|------------------------|------------------------|-----------------------|-----------------------|------|------|-------------|------|--------------|------|------|-----|-----|-----------------------|--|----|-----|--|-----|--|-----|----|
|                                   |                                    | V <sub>CC</sub><br>(V) | C <sub>L</sub><br>(pF) |                       | 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                    | 50                     |                       |                       | 25   | 60   |             | 75   |              | 90   | ns   |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 4.5                    |                        |                       |                       | 7    | 12   |             | 19   |              | 18   |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 6.0                    |                        |                       |                       | 6    | 10   |             | 13   |              | 15   |      |     |     |                       |  |    |     |  |     |  |     |    |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation Delay Time             | 2.0                    | 50                     |                       |                       | 40   | 110  |             | 140  |              | 165  | ns   |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 4.5                    |                        |                       |                       | 13   | 22   |             | 28   |              | 33   |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 6.0                    |                        |                       |                       | 11   | 19   |             | 24   |              | 28   |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    |                        |                        |                       |                       |      |      |             |      |              |      |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    |                        |                        |                       |                       |      |      |             |      |              |      |      | 2.0 | 150 |                       |  | 52 | 135 |  | 170 |  | 205 | ns |
|                                   |                                    |                        |                        |                       |                       |      |      |             |      |              |      |      | 4.5 |     |                       |  | 17 | 27  |  | 34  |  | 41  |    |
| 6.0                               |                                    | 14                     | 23                     |                       | 29                    |      | 35   |             |      |              |      |      |     |     |                       |  |    |     |  |     |  |     |    |
| t <sub>PZL</sub> t <sub>PZH</sub> | High Impedance Output Enable Time  | 2.0                    | 50                     | R <sub>L</sub> = 1 KΩ |                       | 52   | 135  |             | 170  |              | 205  | ns   |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 4.5                    |                        |                       |                       | 17   | 27   |             | 34   |              | 41   |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 6.0                    |                        |                       |                       | 14   | 23   |             | 29   |              | 35   |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    |                        |                        |                       |                       |      |      |             |      |              |      |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    |                        |                        |                       |                       |      |      |             |      |              |      |      | 2.0 | 150 | R <sub>L</sub> = 1 KΩ |  | 63 | 165 |  | 205 |  | 250 | ns |
|                                   |                                    |                        |                        |                       |                       |      |      |             |      |              |      |      | 4.5 |     |                       |  | 21 | 33  |  | 41  |  | 50  |    |
| 6.0                               |                                    | 18                     | 28                     |                       | 35                    |      | 43   |             |      |              |      |      |     |     |                       |  |    |     |  |     |  |     |    |
| t <sub>PLZ</sub> t <sub>PHZ</sub> | High Impedance Output Disable Time | 2.0                    | 50                     | R <sub>L</sub> = 1 KΩ |                       | 40   | 135  |             | 170  |              | 205  | ns   |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 4.5                    |                        |                       |                       | 19   | 27   |             | 34   |              | 41   |      |     |     |                       |  |    |     |  |     |  |     |    |
|                                   |                                    | 6.0                    |                        |                       |                       | 15   | 23   |             | 29   |              | 35   |      |     |     |                       |  |    |     |  |     |  |     |    |

## 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>OUT</sub> | Output Capacitance                     | 5.0                    |  |  |                       | 10   |      |             |      |              |      | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance (note 1) | 5.0                    |  |  |                       | 33   |      |             |      |              |      | 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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/8$  (per circuit)

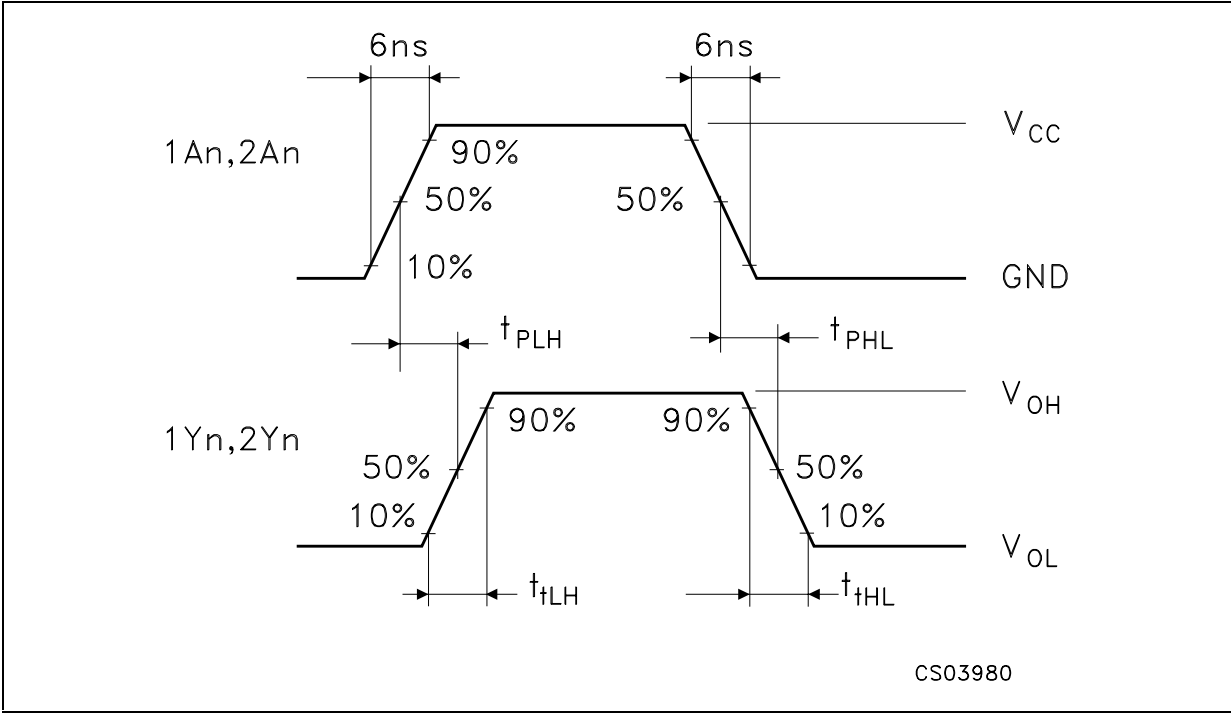
TEST CIRCUIT



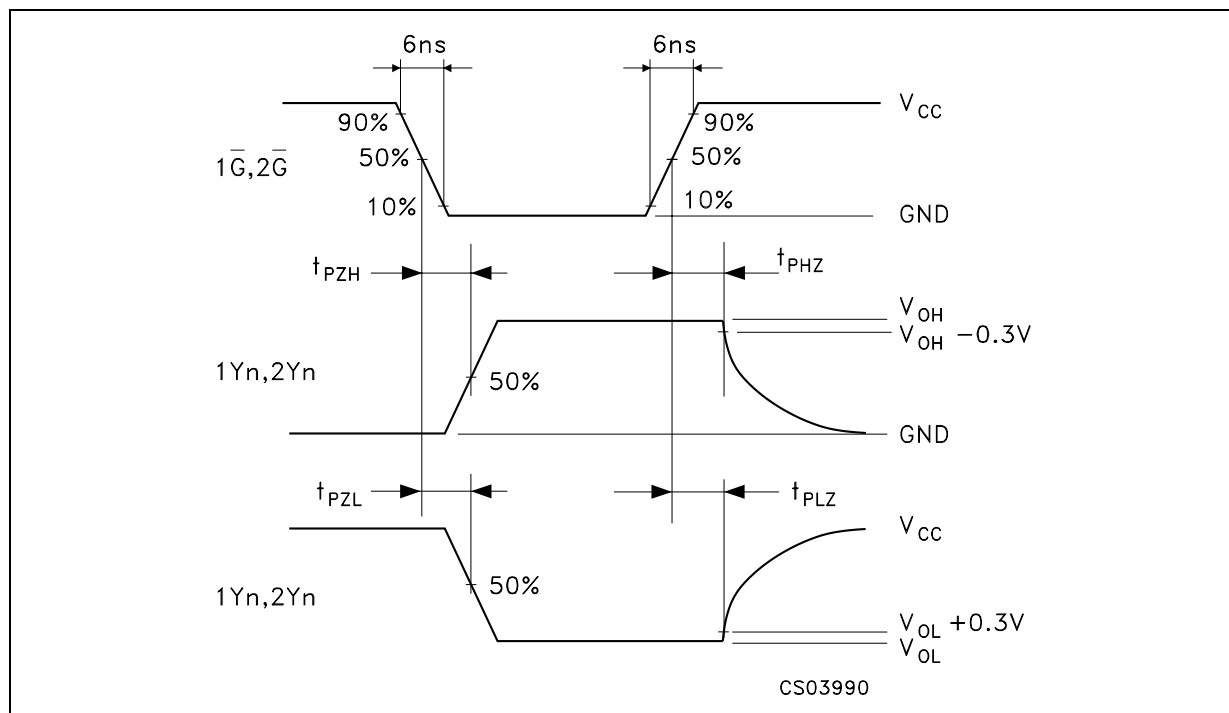
| TEST               | SWITCH   |
|--------------------|----------|
| $t_{PLH}, t_{PHL}$ | Open     |
| $t_{PZL}, t_{PLZ}$ | $V_{CC}$ |
| $t_{PZH}, t_{PHZ}$ | GND      |

$C_L = 50\text{pF}/150\text{pF}$  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 TIME (f=1MHz; 50% duty cycle)

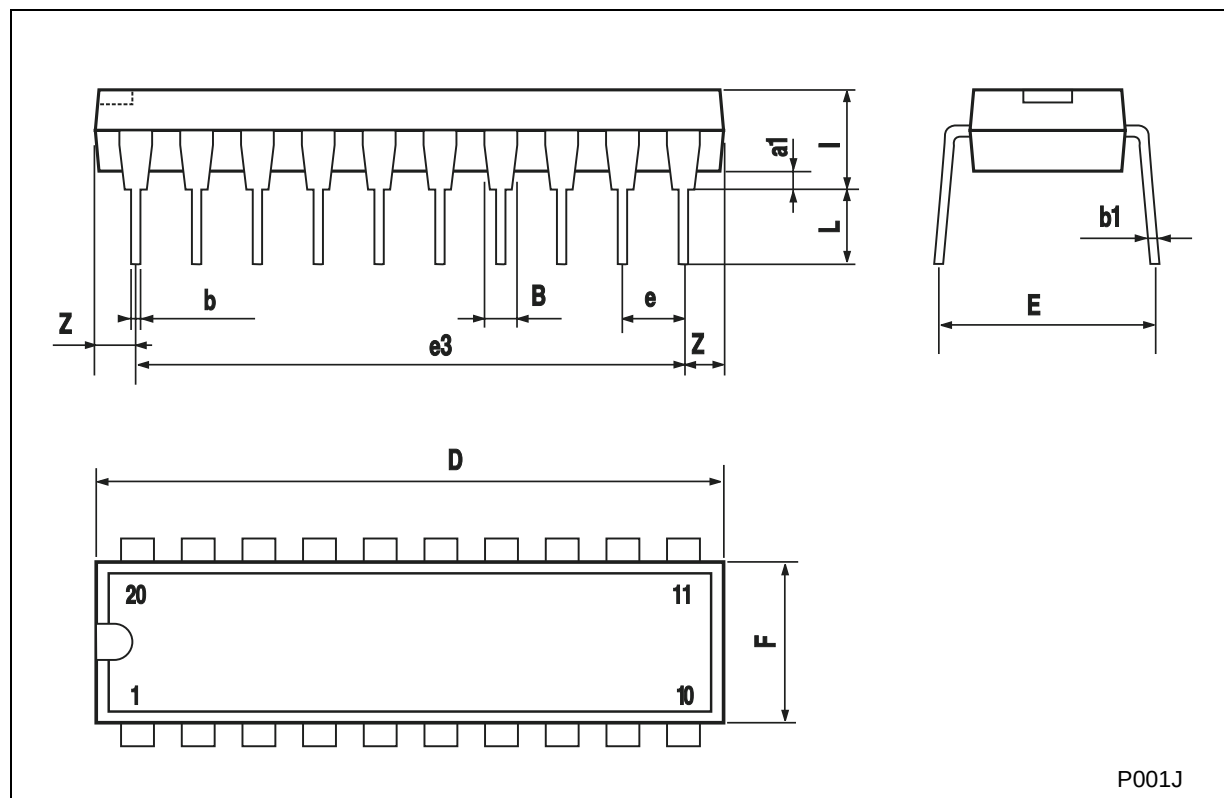


WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



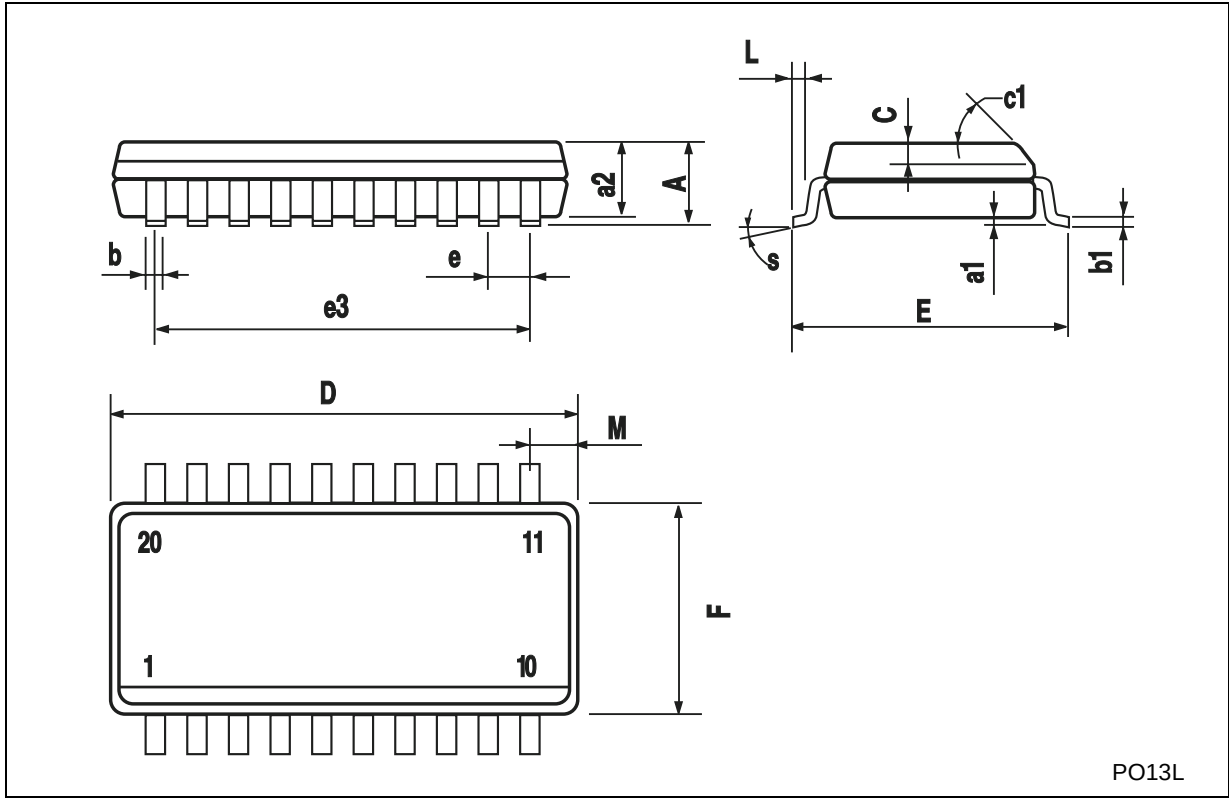
**Plastic DIP-20 (0.25) MECHANICAL DATA**

| DIM. | mm.   |       |      | inch  |       |       |
|------|-------|-------|------|-------|-------|-------|
|      | MIN.  | TYP   | MAX. | MIN.  | TYP.  | MAX.  |
| a1   | 0.254 |       |      | 0.010 |       |       |
| B    | 1.39  |       | 1.65 | 0.055 |       | 0.065 |
| b    |       | 0.45  |      |       | 0.018 |       |
| b1   |       | 0.25  |      |       | 0.010 |       |
| D    |       |       | 25.4 |       |       | 1.000 |
| E    |       | 8.5   |      |       | 0.335 |       |
| e    |       | 2.54  |      |       | 0.100 |       |
| e3   |       | 22.86 |      |       | 0.900 |       |
| F    |       |       | 7.1  |       |       | 0.280 |
| I    |       |       | 3.93 |       |       | 0.155 |
| L    |       | 3.3   |      |       | 0.130 |       |
| Z    |       |       | 1.34 |       |       | 0.053 |



SO-20 MECHANICAL DATA

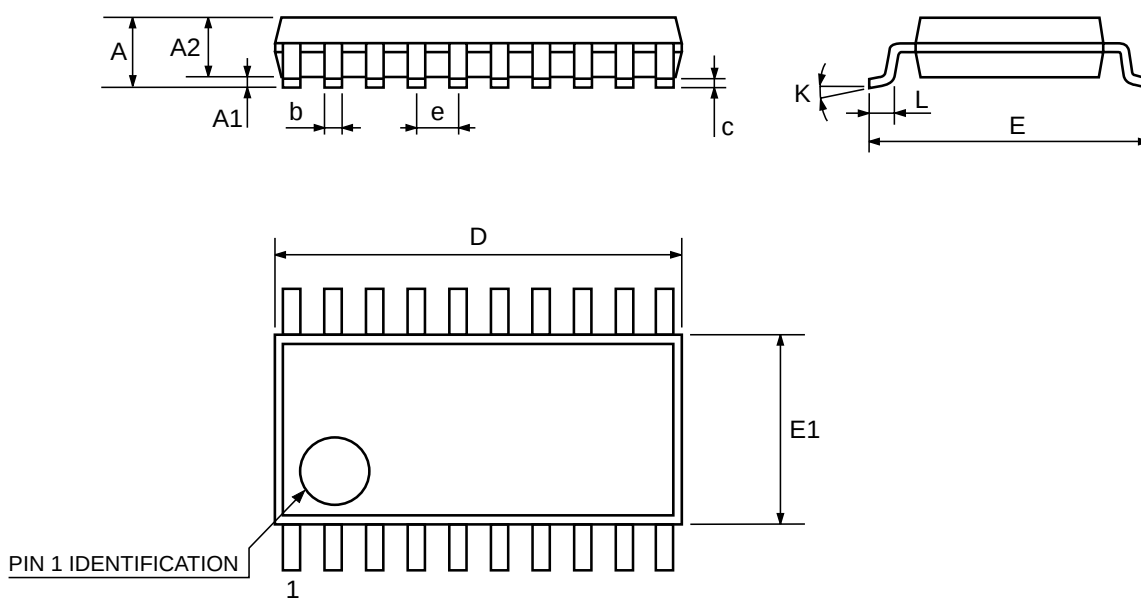
| DIM. | mm.        |       |       | inch  |       |       |
|------|------------|-------|-------|-------|-------|-------|
|      | MIN.       | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A    |            |       | 2.65  |       |       | 0.104 |
| a1   | 0.1        |       | 0.2   | 0.004 |       | 0.008 |
| a2   |            |       | 2.45  |       |       | 0.096 |
| b    | 0.35       |       | 0.49  | 0.014 |       | 0.019 |
| b1   | 0.23       |       | 0.32  | 0.009 |       | 0.012 |
| C    |            | 0.5   |       |       | 0.020 |       |
| c1   | 45° (typ.) |       |       |       |       |       |
| D    | 12.60      |       | 13.00 | 0.496 |       | 0.512 |
| E    | 10.00      |       | 10.65 | 0.393 |       | 0.419 |
| e    |            | 1.27  |       |       | 0.050 |       |
| e3   |            | 11.43 |       |       | 0.450 |       |
| F    | 7.40       |       | 7.60  | 0.291 |       | 0.300 |
| L    | 0.50       |       | 1.27  | 0.020 |       | 0.050 |
| M    |            |       | 0.75  |       |       | 0.029 |
| S    | 8° (max.)  |       |       |       |       |       |





## TSSOP20 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    | 6.4  | 6.5      | 6.6  | 0.252 | 0.256      | 0.260  |
| 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  |



0087225C

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2001 STMicroelectronics - Printed in Italy - All Rights Reserved  
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco  
Singapore - Spain - Sweden - Switzerland - United Kingdom

© <http://www.st.com>