



# M74HC126

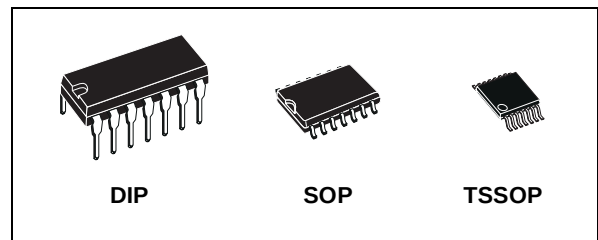
## QUAD BUS BUFFER (3-STATE)

- HIGH SPEED:  
 $t_{PD} = 8\text{ns}$  (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:  
 $|I_{OH}| = I_{OL} = 6\text{mA}$  (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 126

### DESCRIPTION

The M74HC126 is an high speed CMOS QUAD BUFFER (3-STATE) fabricated with silicon gate C<sup>2</sup>MOS technology.

The device requires the 3-STATE control input G to be set high to place the output into the high impedance state.

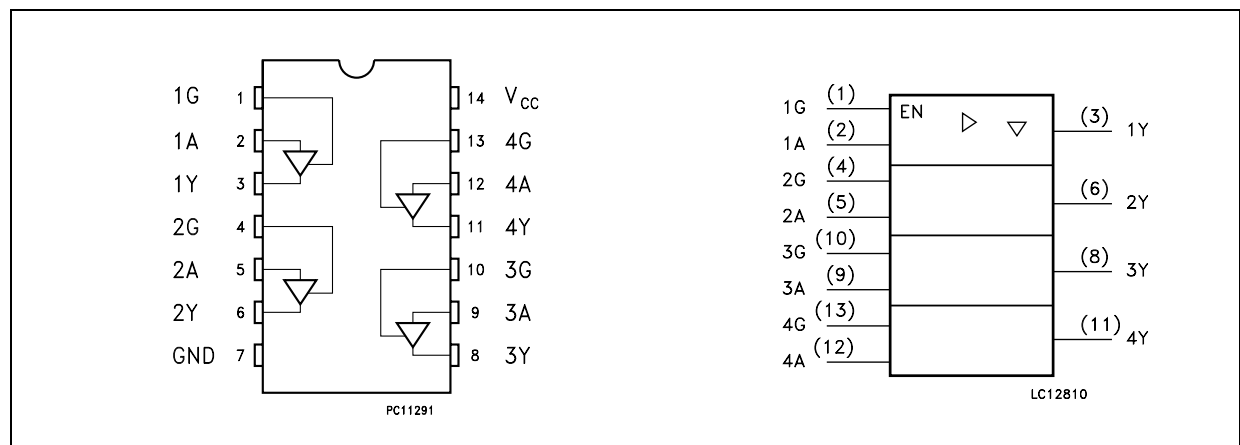


### ORDER CODES

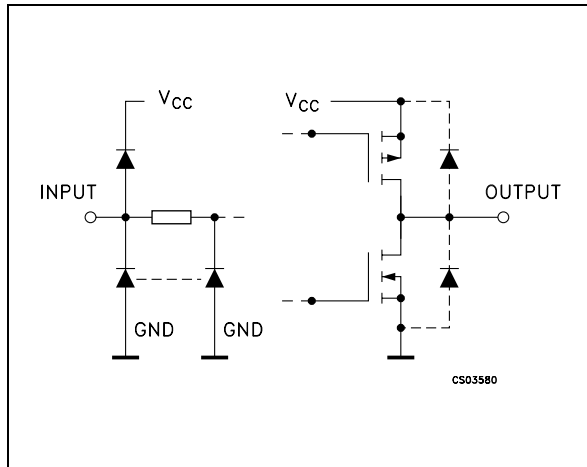
| PACKAGE | TUBE        | T & R          |
|---------|-------------|----------------|
| DIP     | M74HC126B1R |                |
| SOP     | M74HC126M1R | M74HC126RM13TR |
| TSSOP   |             | M74HC126TTR    |

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, 4, 10, 13 | 1G TO 4G        | Output Enable Input     |
| 2, 5, 9, 12  | 1A TO 4A        | Data Inputs             |
| 3, 6, 8, 11  | 1Y TO 4Y        | Data Outputs            |
| 7            | GND             | Ground (0V)             |
| 14           | V <sub>CC</sub> | Positive Supply Voltage |

## TRUTH TABLE

| A | G | Y |
|---|---|---|
| X | L | Z |
| L | H | L |
| H | H | H |

## 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                    | ± 35                          | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current | ± 70                          | 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 | 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                 | 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  |              | ± 10 | 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 (Input  $t_r = t_f = 6\text{ns}$ )

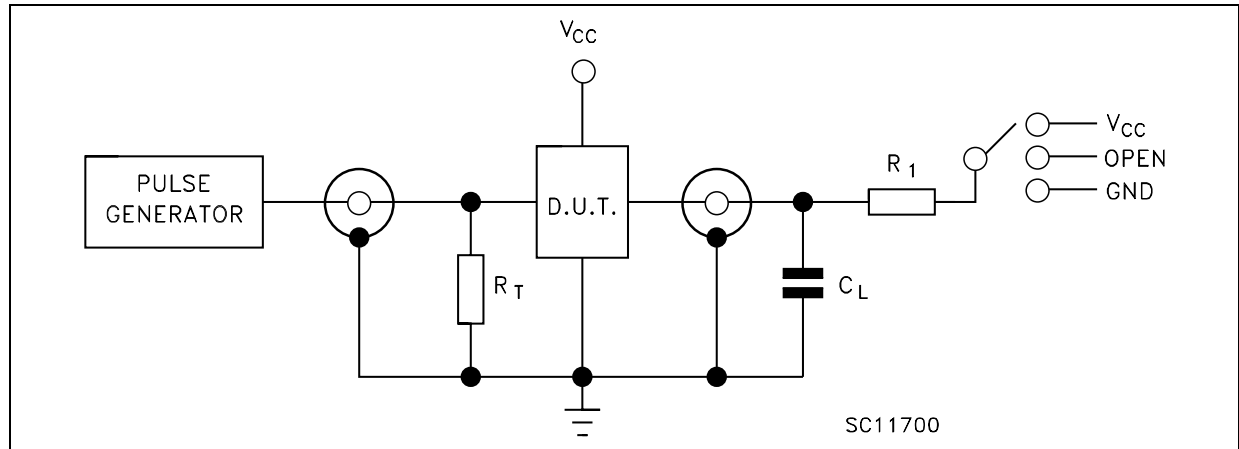
| Symbol                            | Parameter                          | Test Condition         |                        |                       | Value                 |      |      |             |      |              |      | Unit |
|-----------------------------------|------------------------------------|------------------------|------------------------|-----------------------|-----------------------|------|------|-------------|------|--------------|------|------|
|                                   |                                    | 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                     |                       |                       | 20   | 60   |             | 75   |              | 90   | ns   |
|                                   |                                    | 4.5                    |                        |                       |                       | 6    | 12   |             | 15   |              | 18   |      |
|                                   |                                    | 6.0                    |                        |                       |                       | 5    | 10   |             | 13   |              | 15   |      |
| t <sub>PLH</sub> t <sub>PHL</sub> | Propagation Delay Time             | 2.0                    | 50                     |                       |                       | 36   | 75   |             | 95   |              | 110  | ns   |
|                                   |                                    | 4.5                    |                        |                       |                       | 9    | 15   |             | 19   |              | 22   |      |
|                                   |                                    | 6.0                    |                        |                       |                       | 8    | 13   |             | 16   |              | 19   |      |
|                                   |                                    | 2.0                    | 150                    |                       |                       | 52   | 105  |             | 130  |              | 160  | ns   |
|                                   |                                    | 4.5                    |                        |                       |                       | 13   | 21   |             | 26   |              | 32   |      |
|                                   |                                    | 6.0                    |                        |                       |                       | 11   | 18   |             | 22   |              | 27   |      |
| t <sub>PZL</sub> t <sub>PZH</sub> | High Impedance Output Enable Time  | 2.0                    | 50                     | R <sub>L</sub> = 1 KΩ |                       | 36   | 75   |             | 95   |              | 110  | ns   |
|                                   |                                    | 4.5                    |                        |                       |                       | 9    | 15   |             | 19   |              | 22   |      |
|                                   |                                    | 6.0                    |                        |                       |                       | 8    | 13   |             | 16   |              | 19   |      |
|                                   |                                    | 2.0                    | 150                    | R <sub>L</sub> = 1 KΩ |                       | 52   | 105  |             | 130  |              | 160  | ns   |
|                                   |                                    | 4.5                    |                        |                       |                       | 13   | 21   |             | 26   |              | 32   |      |
|                                   |                                    | 6.0                    |                        |                       |                       | 11   | 18   |             | 22   |              | 27   |      |
| t <sub>PLZ</sub> t <sub>PHZ</sub> | High Impedance Output Disable Time | 2.0                    | 50                     | R <sub>L</sub> = 1 KΩ |                       | 48   | 80   |             | 100  |              | 120  | ns   |
|                                   |                                    | 4.5                    |                        |                       |                       | 12   | 16   |             | 20   |              | 24   |      |
|                                   |                                    | 6.0                    |                        |                       |                       | 10   | 14   |             | 17   |              | 20   |      |

## 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                    |  |                       | 35   |      |             |      |              |      | 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 buffer)

## TEST CIRCUIT

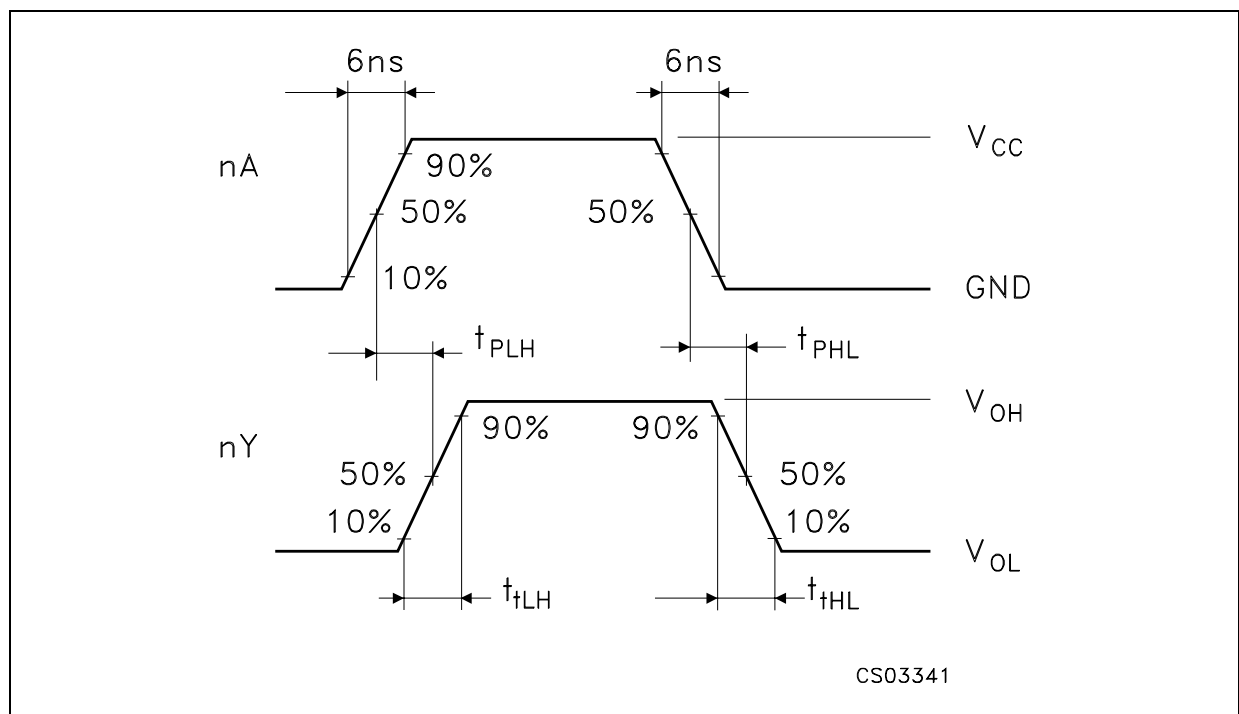


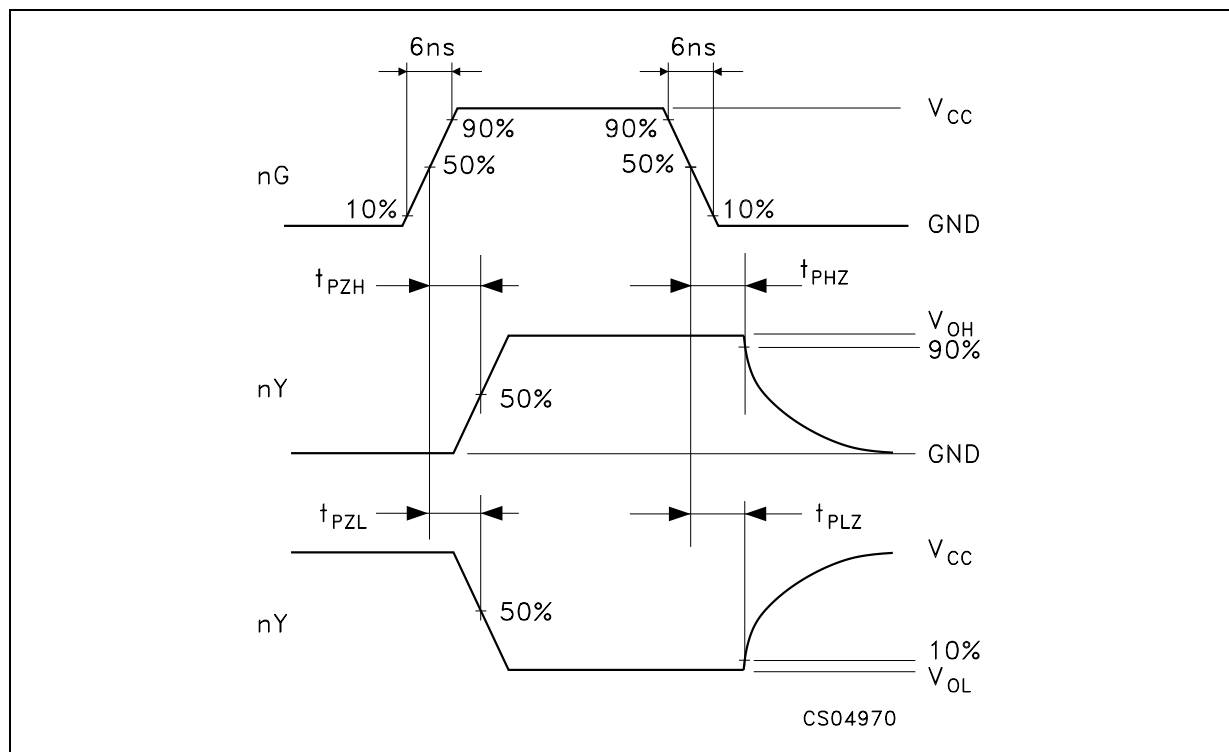
| TEST                  | SWITCH   |
|-----------------------|----------|
| $t_{PLH}$ , $t_{PHL}$ | Open     |
| $t_{PZL}$ , $t_{PLZ}$ | $V_{CC}$ |
| $t_{PZH}$ , $t_{PHZ}$ | GND      |

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

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

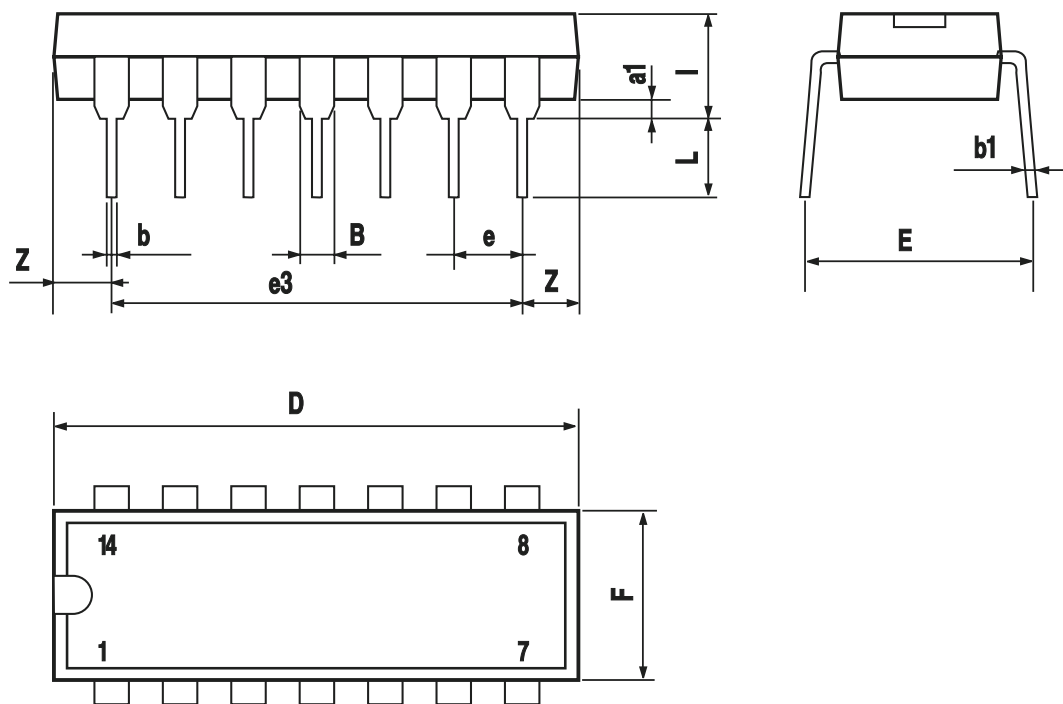
$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

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



## Plastic DIP-14 MECHANICAL DATA

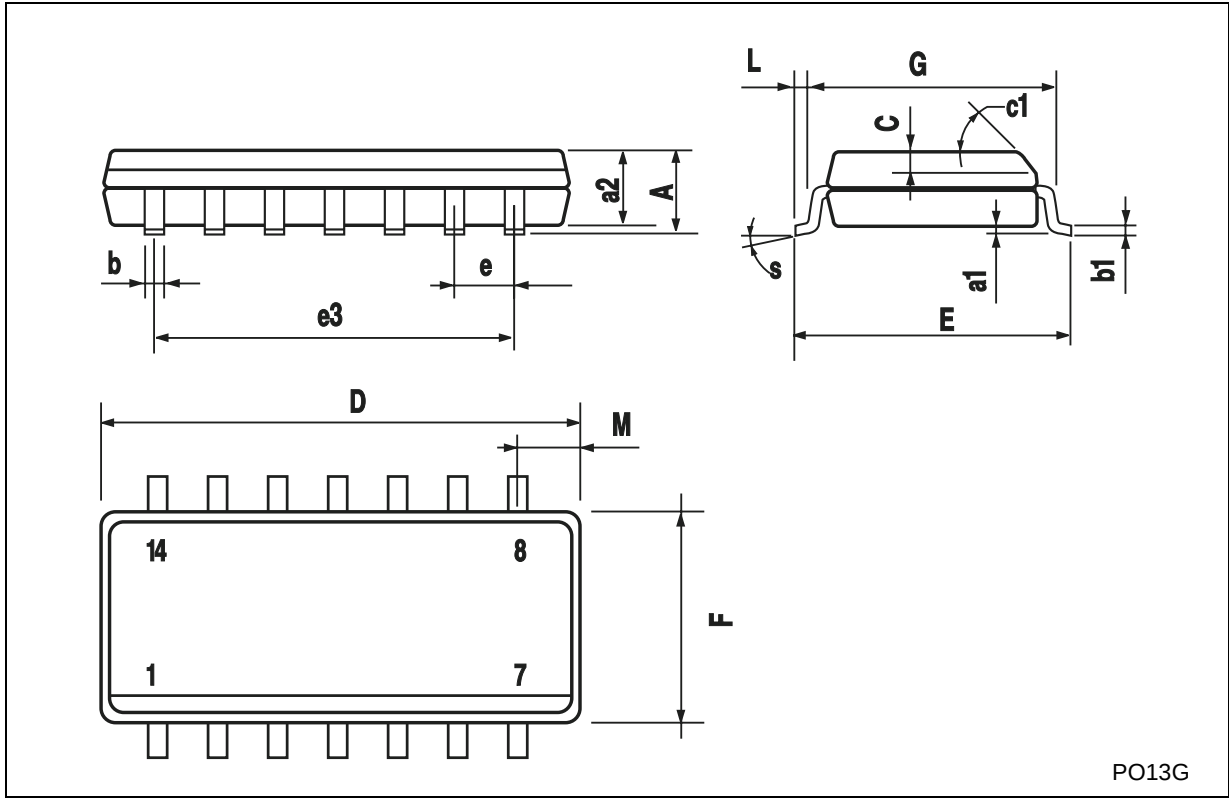
| DIM. | mm.  |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP   | MAX. | MIN.  | TYP.  | MAX.  |
| a1   | 0.51 |       |      | 0.020 |       |       |
| B    | 1.39 |       | 1.65 | 0.055 |       | 0.065 |
| b    |      | 0.5   |      |       | 0.020 |       |
| b1   |      | 0.25  |      |       | 0.010 |       |
| D    |      |       | 20   |       |       | 0.787 |
| E    |      | 8.5   |      |       | 0.335 |       |
| e    |      | 2.54  |      |       | 0.100 |       |
| e3   |      | 15.24 |      |       | 0.600 |       |
| F    |      |       | 7.1  |       |       | 0.280 |
| I    |      |       | 5.1  |       |       | 0.201 |
| L    |      | 3.3   |      |       | 0.130 |       |
| Z    | 1.27 |       | 2.54 | 0.050 |       | 0.100 |



P001A

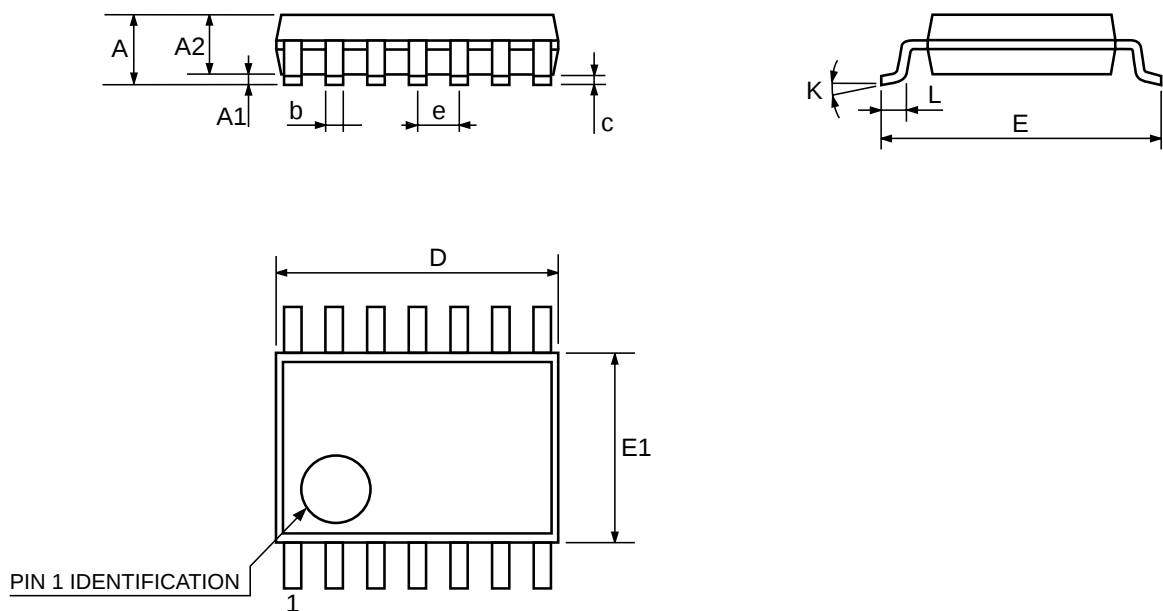
SO-14 MECHANICAL DATA

| 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    | 8.55       |      | 8.75 | 0.336 |       | 0.344 |
| E    | 5.8        |      | 6.2  | 0.228 |       | 0.244 |
| e    |            | 1.27 |      |       | 0.050 |       |
| e3   |            | 7.62 |      |       | 0.300 |       |
| 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    |            |      | 0.68 |       |       | 0.026 |
| S    | 8° (max.)  |      |      |       |       |       |



## TSSOP14 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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