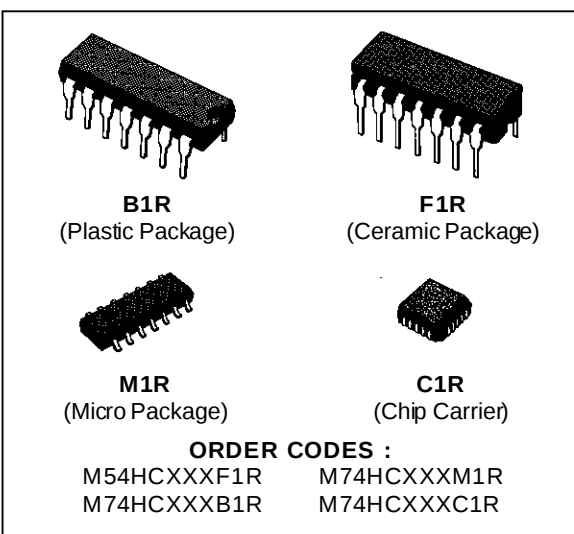


## QUAD BUS BUFFERS (3-STATE)

- **HIGH SPEED**  
 $t_{PD} = 8 \text{ ns (TYP.) AT } V_{CC} = 5 \text{ V}$
- **LOW POWER DISSIPATION**  
 $I_{CC} = 4 \mu\text{A (MAX.) AT } 25^\circ\text{C}$
- **OUTPUT DRIVE CAPABILITY**  
 15 LSTTL LOADS
- **BALANCED PROPAGATION DELAYS**  
 $t_{PLH} = t_{PHL}$
- **SYMMETRICAL OUTPUT IMPEDANCE**  
 $I_{OL} = |I_{OH}| = 6 \text{ mA (MIN.)}$
- **HIGH NOISE IMMUNITY**  
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (MIN.)}$
- **WIDE OPERATING VOLTAGE RANGE**  
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- **PIN AND FUNCTION COMPATIBLE**  
 WITH 54/74LS125/126



### DESCRIPTION

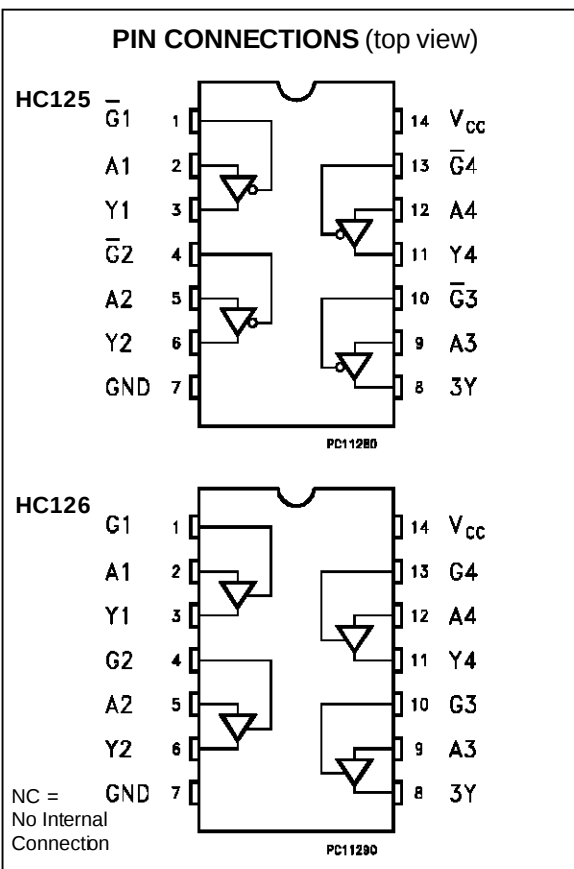
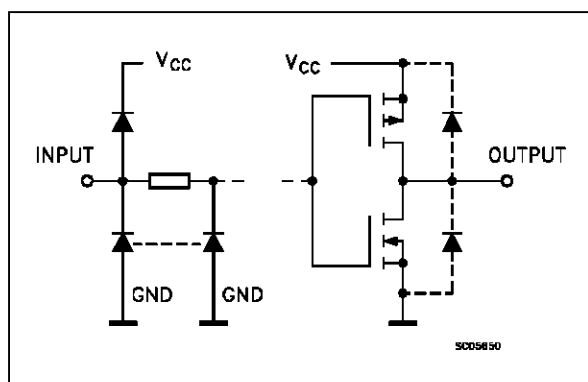
The M54/74HC125/126 are high speed CMOS QUAD BUS BUFFER (3-STATE) FABRICATED IN SILICON GATE C<sup>2</sup>MOS technology.

They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

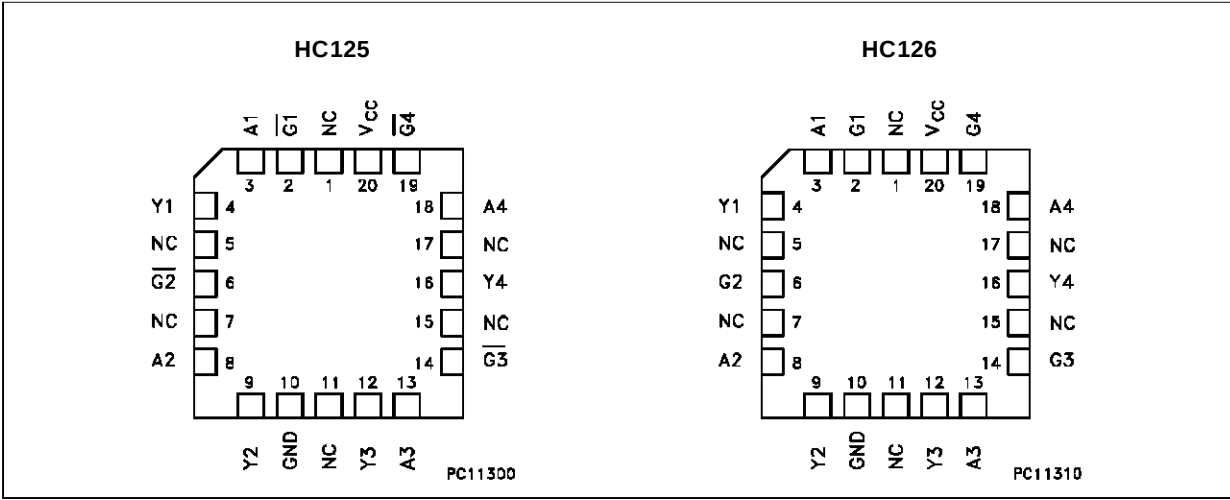
These devices require the same 3-STATE control input G to be taken high to make the output go into the high impedance state.

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

### INPUT AND OUTPUT EQUIVALENT CIRCUIT



CHIP CARRIER



TRUTH TABLE (HC125)

| A | $\overline{G}$ | Y |
|---|----------------|---|
| X | H              | Z |
| L | L              | L |
| H | L              | H |

TRUTH TABLE (HC126)

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

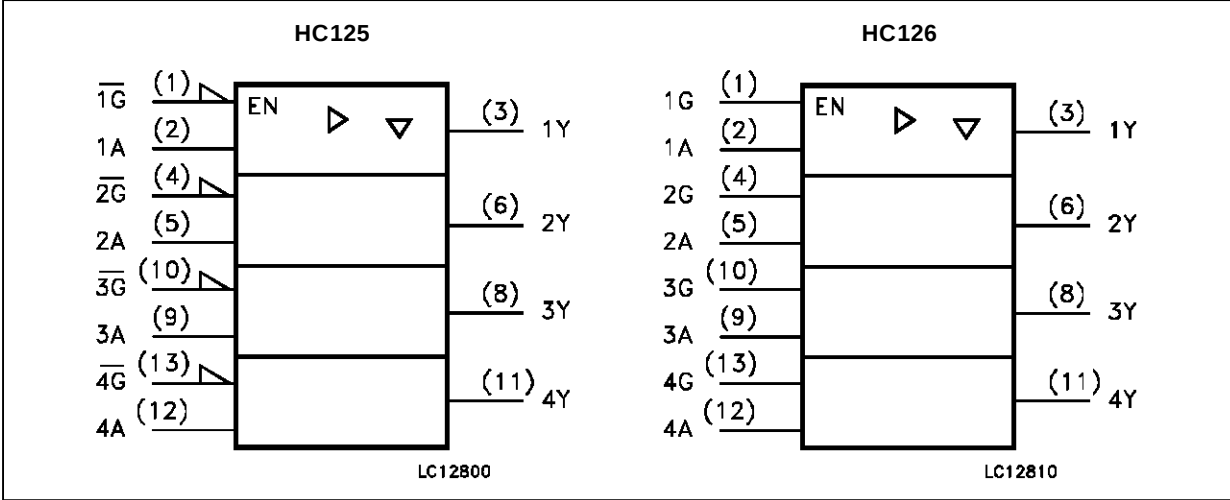
PIN DESCRIPTION (HC125)

| PIN No       | SYMBOL                             | NAME AND FUNCTION       |
|--------------|------------------------------------|-------------------------|
| 1, 4, 10, 13 | $\overline{G1}$ to $\overline{G4}$ | Output Enable Input     |
| 2, 5, 9, 12  | A1 to A4                           | Data Inputs             |
| 3, 6, 8, 11  | Y1 to Y4                           | Data Outputs            |
| 7            | GND                                | Ground (0V)             |
| 14           | V <sub>CC</sub>                    | Positive Supply Voltage |

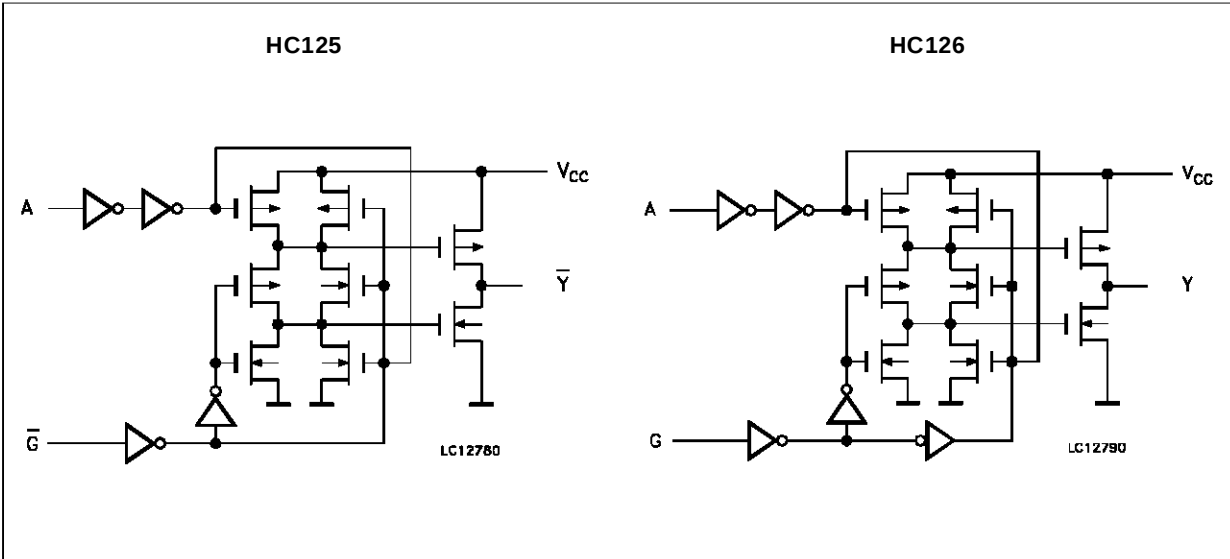
PIN DESCRIPTION (HC126)

| PIN No       | SYMBOL          | NAME AND FUNCTION       |
|--------------|-----------------|-------------------------|
| 1, 4, 10, 13 | G1 to G4        | Output Enable Input     |
| 2, 5, 9, 12  | A1 to A4        | Data Inputs             |
| 3, 6, 8, 11  | Y1 to Y4        | Data Outputs            |
| 7            | GND             | Ground (0V)             |
| 14           | V <sub>CC</sub> | Positive Supply Voltage |

IEC LOGIC SYMBOLS



# CIRCUIT DIAGRAM



# 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 Source Sink Current Per Output Pin | $\pm 35$               | mA                 |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current                | $\pm 70$               | mA                 |
| $P_D$                 | Power Dissipation                            | 500 (*)                | mW                 |
| $T_{stg}$             | Storage Temperature                          | -65 to +150            | $^{\circ}\text{C}$ |
| $T_L$                 | Lead Temperature (10 sec)                    | 300                    | $^{\circ}\text{C}$ |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.  
 (\*) 500 mW:  $\pm 65^{\circ}\text{C}$  derate to 300 mW by 10mW/ $^{\circ}\text{C}$ :  $65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

# 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: <b>M54HC Series</b><br><b>M74HC Series</b> | -55 to +125<br>-40 to +85 | $^{\circ}\text{C}$<br>$^{\circ}\text{C}$ |
| $t_r, t_f$ | Input Rise and Fall Time                                          | $V_{CC} = 2\text{ V}$     | ns                                       |
|            |                                                                   | $V_{CC} = 4.5\text{ V}$   |                                          |
|            |                                                                   | $V_{CC} = 6\text{ V}$     |                                          |

**DC SPECIFICATIONS**

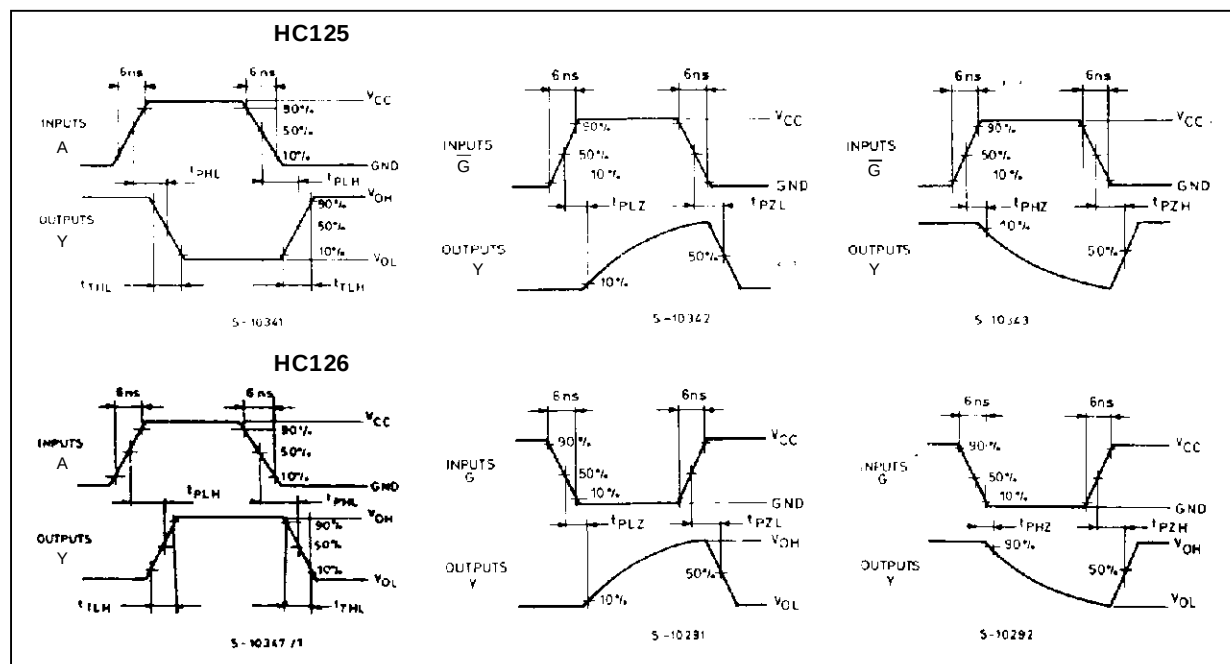
| Symbol          | Parameter                        | Test Conditions        |                                                                                                |                         | Value                                   |      |      |                      |      |                       | Unit |      |
|-----------------|----------------------------------|------------------------|------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------|------|------|----------------------|------|-----------------------|------|------|
|                 |                                  | V <sub>CC</sub><br>(V) |                                                                                                |                         | T <sub>A</sub> = 25 °C<br>54HC and 74HC |      |      | -40 to 85 °C<br>74HC |      | -55 to 125 °C<br>54HC |      |      |
|                 |                                  |                        |                                                                                                |                         | 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                    | V <sub>I</sub> =<br>V <sub>IH</sub><br>or<br>V <sub>IL</sub>                                   | I <sub>O</sub> =-20 μA  | 1.9                                     | 2.0  |      | 1.9                  |      | 1.9                   |      | V    |
|                 |                                  | 4.5                    |                                                                                                |                         | 4.4                                     | 4.5  |      | 4.4                  |      | 4.4                   |      |      |
|                 |                                  | 6.0                    |                                                                                                |                         | 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                    | V <sub>I</sub> =<br>V <sub>IH</sub><br>or<br>V <sub>IL</sub>                                   | I <sub>O</sub> = 20 μA  |                                         | 0.0  | 0.1  |                      | 0.1  |                       | 0.1  | V    |
|                 |                                  | 4.5                    |                                                                                                |                         |                                         | 0.0  | 0.1  |                      | 0.1  |                       | 0.1  |      |
|                 |                                  | 6.0                    |                                                                                                |                         |                                         | 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> | 3 State Output Off-state 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  $t_r = t_f = 6$  ns)

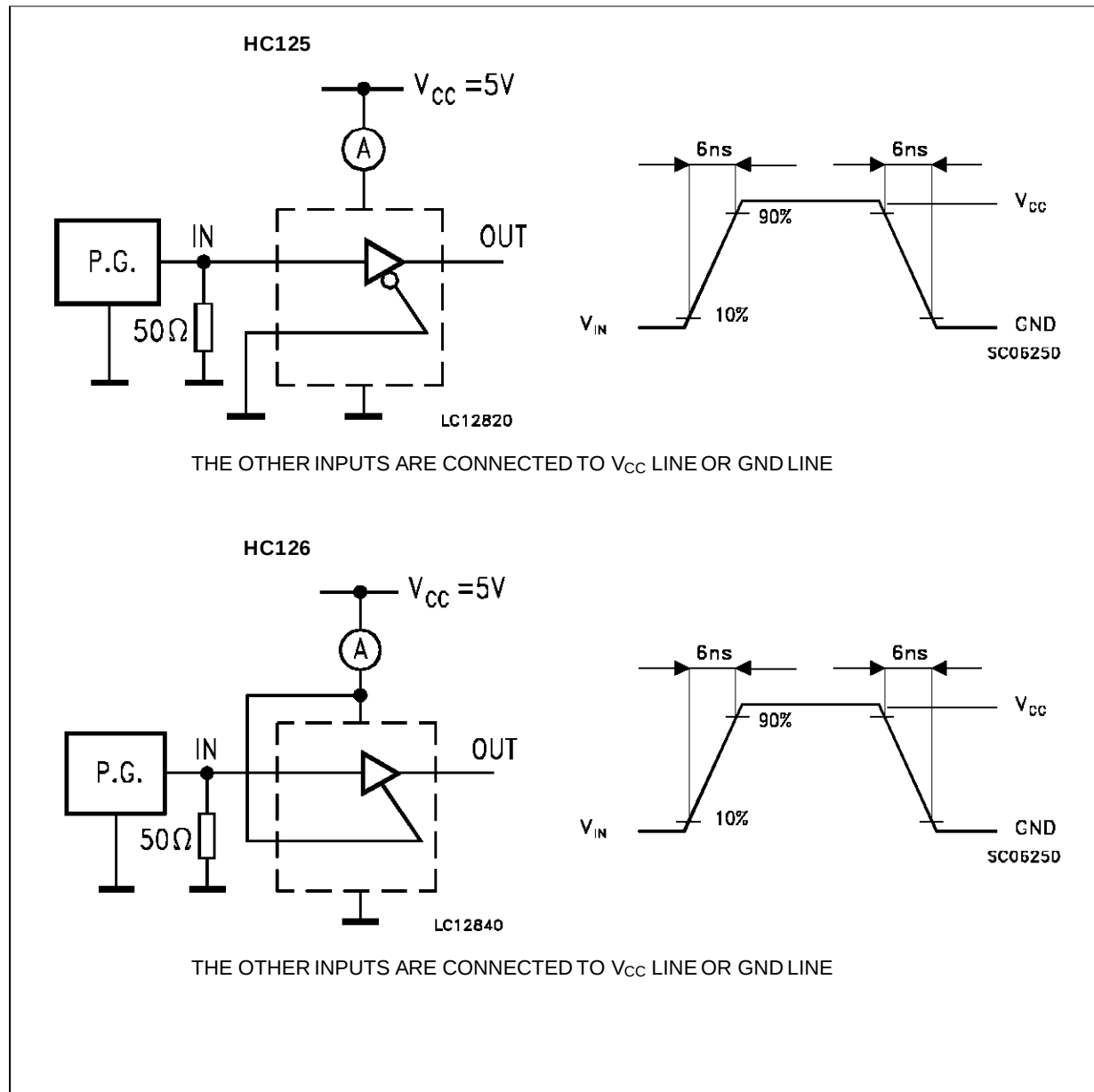
| Symbol                               | Parameter                     | Test Conditions        |                        |                       | Value                                   |                 |      |                      |      |                       | Unit |      |
|--------------------------------------|-------------------------------|------------------------|------------------------|-----------------------|-----------------------------------------|-----------------|------|----------------------|------|-----------------------|------|------|
|                                      |                               | V <sub>CC</sub><br>(V) | C <sub>L</sub><br>(pF) |                       | T <sub>A</sub> = 25 °C<br>54HC and 74HC |                 |      | -40 to 85 °C<br>74HC |      | -55 to 125 °C<br>54HC |      |      |
|                                      |                               |                        |                        |                       | Min.                                    | Typ.            | Max. | Min.                 | Max. | Min.                  |      | Max. |
| t <sub>TLH</sub><br>t <sub>THL</sub> | Output Transition Time        | 2.0<br>4.5<br>6.0      | 50                     |                       | 20<br>6<br>5                            | 60<br>12<br>10  |      | 75<br>15<br>13       |      | 90<br>18<br>15        | ns   |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time        | 2.0<br>4.5<br>6.0      | 50                     |                       | 36<br>9<br>8                            | 75<br>15<br>13  |      | 95<br>19<br>16       |      | 110<br>22<br>19       | ns   |      |
|                                      |                               | 2.0<br>4.5<br>6.0      | 150                    |                       | 52<br>13<br>11                          | 105<br>21<br>18 |      | 130<br>26<br>22      |      | 160<br>32<br>27       | ns   |      |
| t <sub>PZL</sub><br>t <sub>PZH</sub> | 3 State Output Enable Time    | 2.0<br>4.5<br>6.0      | 50                     | R <sub>L</sub> = 1 KΩ | 36<br>9<br>8                            | 75<br>15<br>13  |      | 95<br>19<br>16       |      | 110<br>22<br>19       | ns   |      |
|                                      |                               | 2.0<br>4.5<br>6.0      | 150                    | R <sub>L</sub> = 1 KΩ | 52<br>13<br>11                          | 105<br>21<br>18 |      | 130<br>26<br>22      |      | 160<br>32<br>27       | ns   |      |
| t <sub>PLZ</sub><br>t <sub>PHZ</sub> | 3 State Output Disable Time   | 2.0<br>4.5<br>6.0      | 50                     | R <sub>L</sub> = 1 KΩ | 48<br>12<br>10                          | 80<br>16<br>14  |      | 100<br>20<br>17      |      | 120<br>24<br>20       | ns   |      |
| C <sub>IN</sub>                      | Input Capacitance             |                        |                        |                       | 5                                       | 10              |      | 10                   |      | 10                    | pF   |      |
| C <sub>PD</sub> (*)                  | Power Dissipation Capacitance |                        |                        |                       | 35                                      |                 |      |                      |      |                       | pF   |      |

(\*)  $C_{PD}$  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.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

## SWITCHING CHARACTERISTICS TEST WAVEFORM

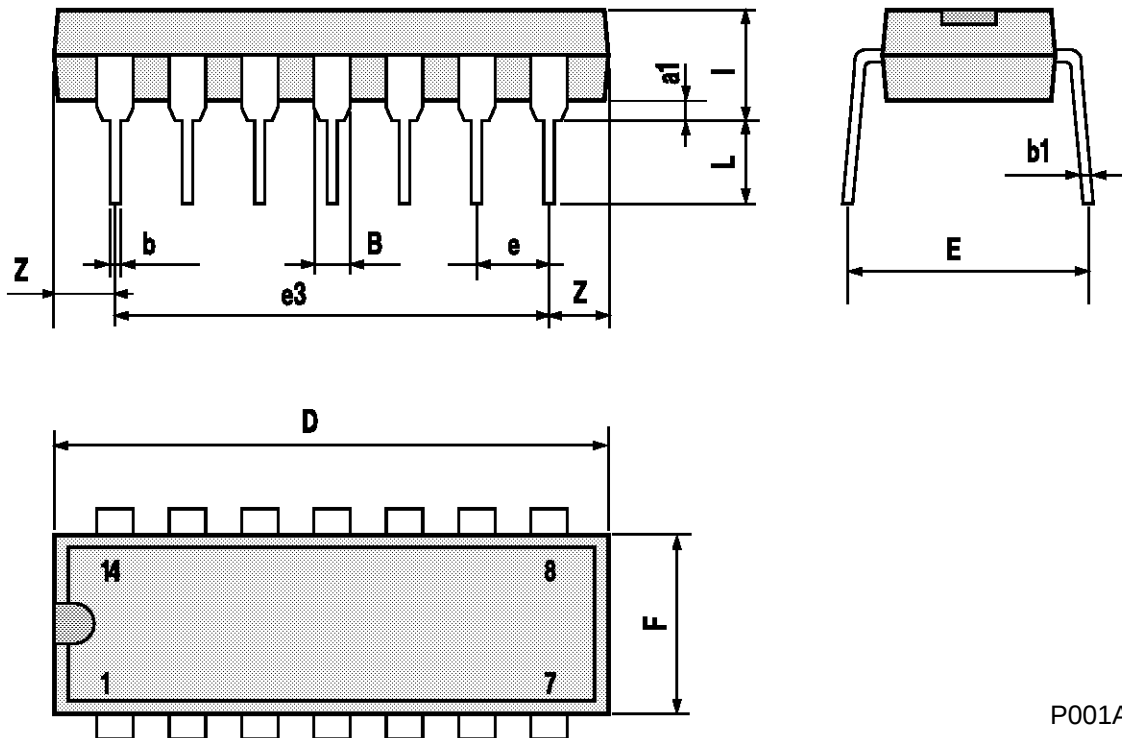


TEST CIRCUIT  $I_{CC}$  (Opr.)



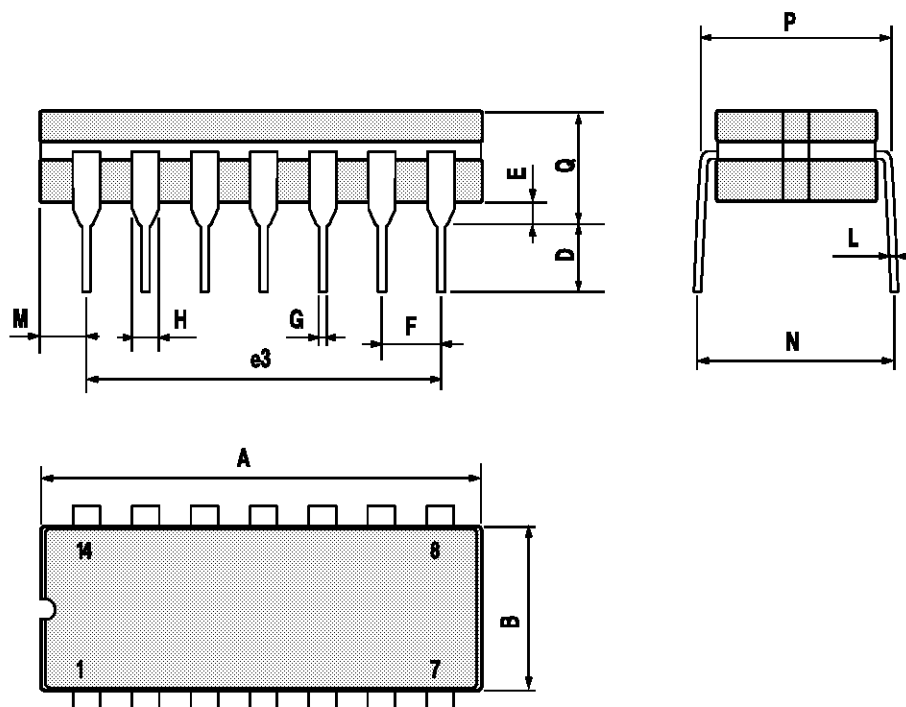
## Plastic DIP14 MECHANICAL DATA

| 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 |



## Ceramic DIP14/1 MECHANICAL DATA

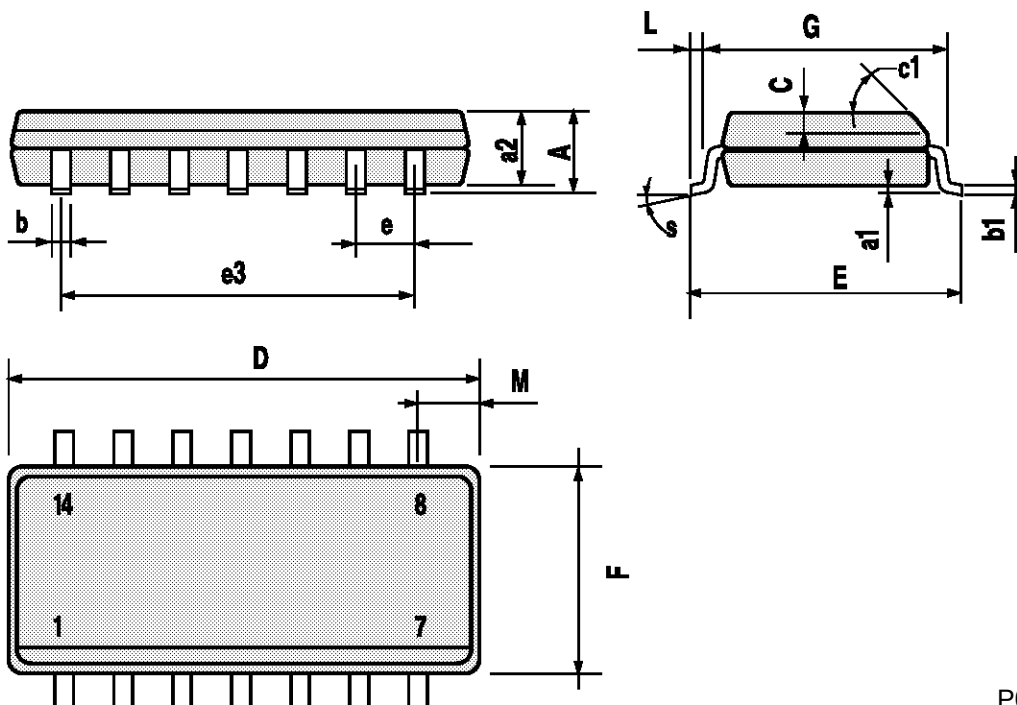
| DIM. | mm   |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP.  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      |       | 20   |       |       | 0.787 |
| B    |      |       | 7.0  |       |       | 0.276 |
| D    |      | 3.3   |      |       | 0.130 |       |
| E    | 0.38 |       |      | 0.015 |       |       |
| e3   |      | 15.24 |      |       | 0.600 |       |
| F    | 2.29 |       | 2.79 | 0.090 |       | 0.110 |
| G    | 0.4  |       | 0.55 | 0.016 |       | 0.022 |
| H    | 1.17 |       | 1.52 | 0.046 |       | 0.060 |
| L    | 0.22 |       | 0.31 | 0.009 |       | 0.012 |
| M    | 1.52 |       | 2.54 | 0.060 |       | 0.100 |
| N    |      |       | 10.3 |       |       | 0.406 |
| P    | 7.8  |       | 8.05 | 0.307 |       | 0.317 |
| Q    |      |       | 5.08 |       |       | 0.200 |



P053C

## SO14 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.)  |      |      |       |       |       |



P013G

## PLCC20 MECHANICAL DATA

| DIM. | mm   |      |       | inch  |       |       |
|------|------|------|-------|-------|-------|-------|
|      | MIN. | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 9.78 |      | 10.03 | 0.385 |       | 0.395 |
| B    | 8.89 |      | 9.04  | 0.350 |       | 0.356 |
| D    | 4.2  |      | 4.57  | 0.165 |       | 0.180 |
| d1   |      | 2.54 |       |       | 0.100 |       |
| d2   |      | 0.56 |       |       | 0.022 |       |
| E    | 7.37 |      | 8.38  | 0.290 |       | 0.330 |
| e    |      | 1.27 |       |       | 0.050 |       |
| e3   |      | 5.08 |       |       | 0.200 |       |
| F    |      | 0.38 |       |       | 0.015 |       |
| G    |      |      | 0.101 |       |       | 0.004 |
| M    |      | 1.27 |       |       | 0.050 |       |
| M1   |      | 1.14 |       |       | 0.045 |       |



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