



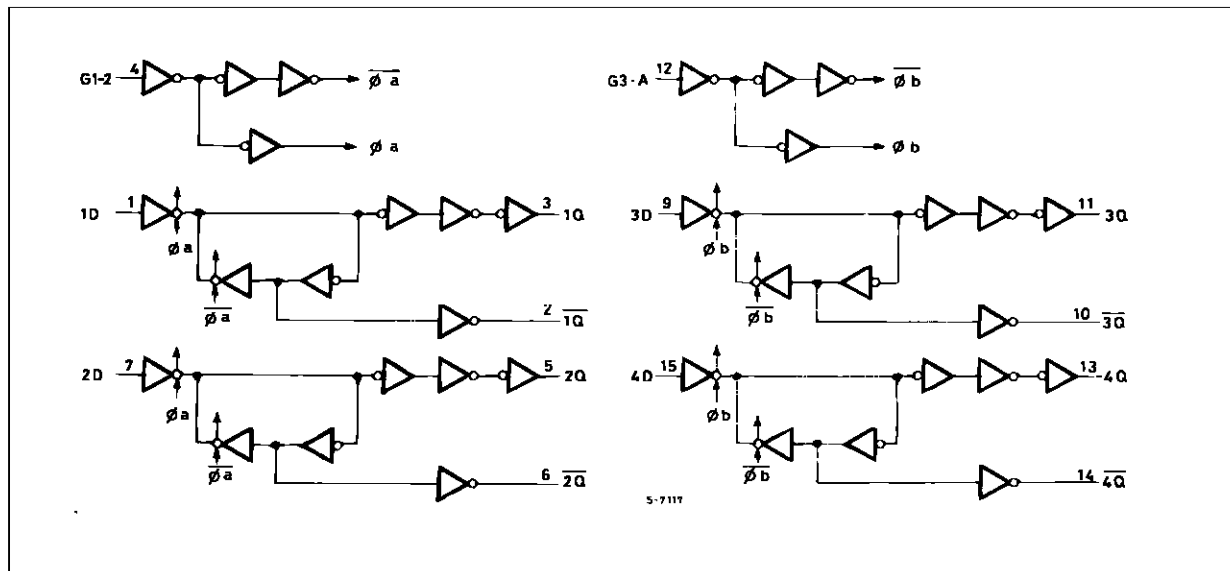
# M54/M74HC375

## TRUTH TABLE

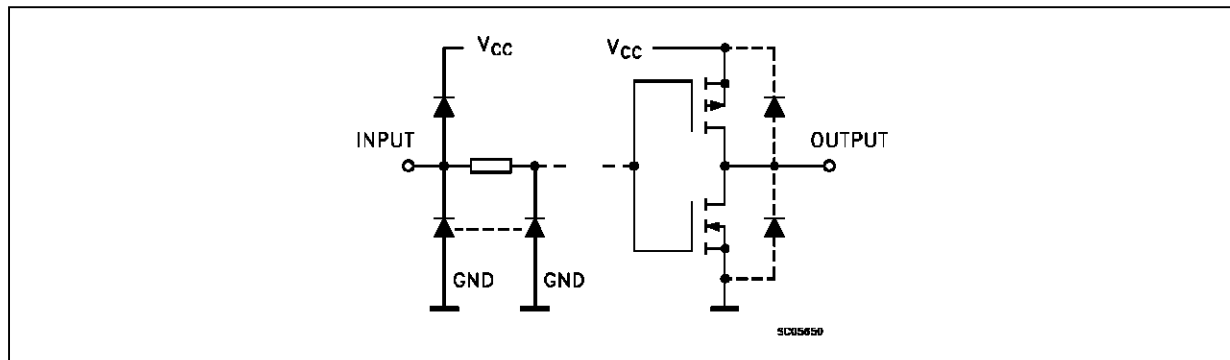
| INPUTS |   | OUTPUTS |                 | FUNCTION |
|--------|---|---------|-----------------|----------|
| D      | G | Q       | $\overline{Q}$  |          |
| L      | H | L       | H               |          |
| H      | H | H       | L               |          |
| X      | L | Qn      | $\overline{Qn}$ | LATCH    |

X: DON'T CARE

## LOGIC DIAGRAM



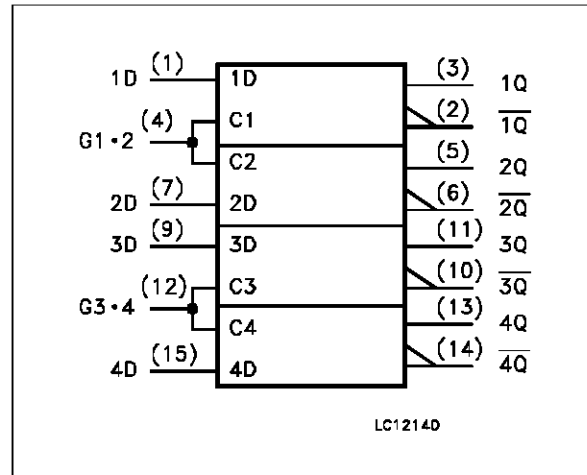
## INPUT AND OUTPUT EQUIVALENT CIRCUIT



**PIN DESCRIPTION**

| PIN No                        | SYMBOL                                                                   | NAME AND FUNCTION       |
|-------------------------------|--------------------------------------------------------------------------|-------------------------|
| 1, 7, 9, 15                   | 1D to 4D                                                                 | Data Inputs             |
| 3, 5, 11, 13,<br>2, 6, 10, 14 | $\overline{1Q}$ to $\overline{4Q}$<br>$\overline{1Q}$ to $\overline{4Q}$ | Outputs                 |
| 4                             | G1- 2                                                                    | Enable Input            |
| 12                            | G3 - 4                                                                   | Enable Input            |
| 8                             | GND                                                                      | Ground (0V)             |
| 16                            | V <sub>CC</sub>                                                          | Positive Supply Voltage |

**IEC LOGIC SYMBOL**



**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 Source Sink Current Per Output Pin | ± 25                          | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current         | ± 50                          | mA   |
| P <sub>D</sub>                      | Power Dissipation                            | 500 (*)                       | mW   |
| T <sub>stg</sub>                    | Storage Temperature                          | -65 to +150                   | °C   |
| T <sub>L</sub>                      | Lead Temperature (10 sec)                    | 300                           | °C   |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(\*) 500 mW: ≡ 65 °C derate to 300 mW by 10mW/°C: 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: <b>M54HC Series</b><br><b>M74HC Series</b> | -55 to +125<br>-40 to +85                                                 | °C<br>°C                          |    |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time                                          | V <sub>CC</sub> = 2 V<br>V <sub>CC</sub> = 4.5 V<br>V <sub>CC</sub> = 6 V | 0 to 1000<br>0 to 500<br>0 to 400 | ns |

**DC SPECIFICATIONS**

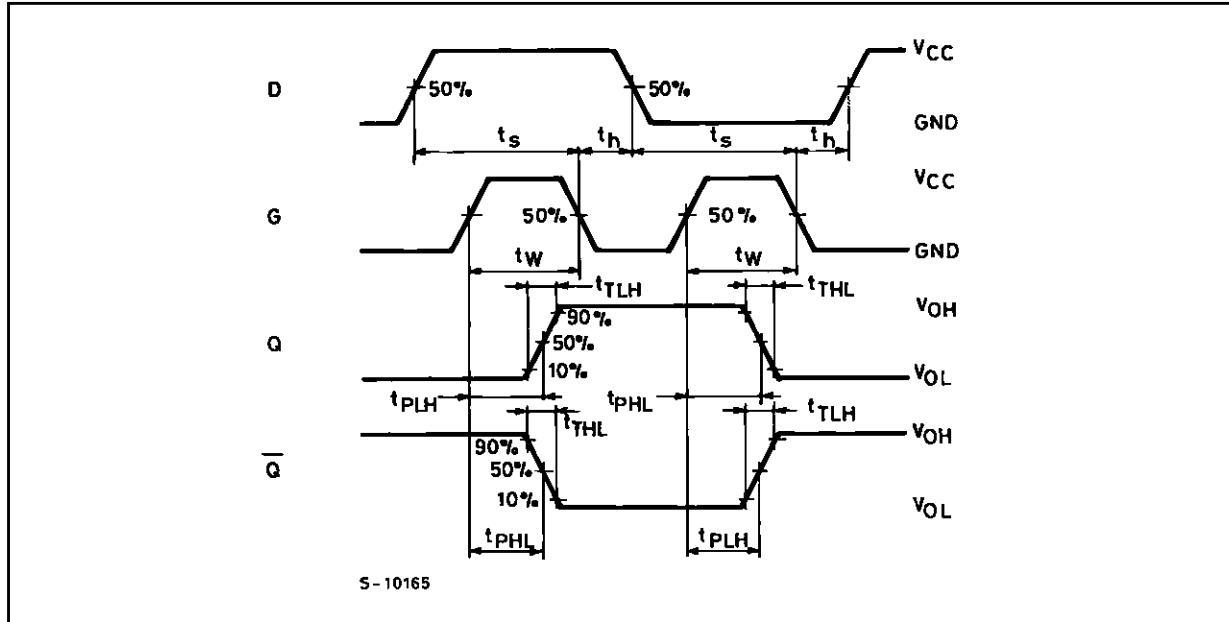
| Symbol          | Parameter                 | Test Conditions        |                                                              | Value                                   |                         |      |                      |      |                       | Unit |      |    |
|-----------------|---------------------------|------------------------|--------------------------------------------------------------|-----------------------------------------|-------------------------|------|----------------------|------|-----------------------|------|------|----|
|                 |                           | 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> = -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                    | 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> = 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 |      |    |
| I <sub>I</sub>  | Input Leakage Current     | 6.0                    | V <sub>I</sub> = V <sub>CC</sub> or GND                      |                                         |                         |      | ±0.1                 |      | ±1                    |      | ±1   | μA |
| I <sub>CC</sub> | Quiescent Supply Current  | 6.0                    | V <sub>I</sub> = V <sub>CC</sub> or GND                      |                                         |                         |      | 2                    |      | 20                    |      | 40   | μA |

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

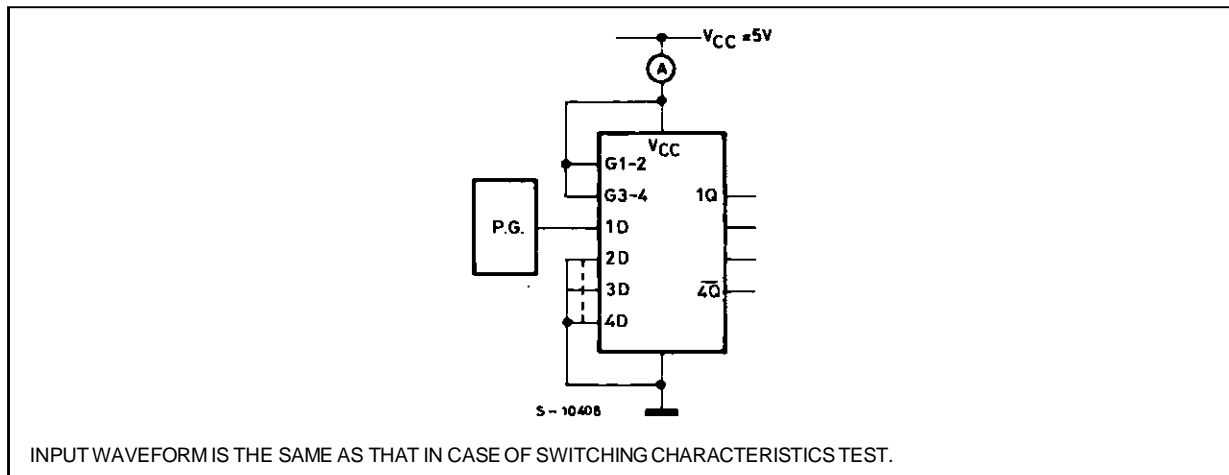
| Symbol                               | Parameter                                     | Test Conditions        |  | Value                                   |      |      |                      |      |                       | Unit |      |
|--------------------------------------|-----------------------------------------------|------------------------|--|-----------------------------------------|------|------|----------------------|------|-----------------------|------|------|
|                                      |                                               | 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. |
| t <sub>TLH</sub><br>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><br>t <sub>PHL</sub> | Propagation Delay Time (DATA - Q, $\bar{Q}$ ) | 2.0                    |  |                                         | 56   | 115  |                      | 145  |                       | 175  | ns   |
|                                      |                                               | 4.5                    |  |                                         | 14   | 23   |                      | 29   |                       | 35   |      |
|                                      |                                               | 6.0                    |  |                                         | 12   | 20   |                      | 25   |                       | 30   |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time (G - Q, $\bar{Q}$ )    | 2.0                    |  |                                         | 52   | 105  |                      | 130  |                       | 160  | ns   |
|                                      |                                               | 4.5                    |  |                                         | 13   | 21   |                      | 26   |                       | 32   |      |
|                                      |                                               | 6.0                    |  |                                         | 11   | 18   |                      | 22   |                       | 27   |      |
| t <sub>(W)H</sub>                    | Minimum Enable Pulse Width (G)                | 2.0                    |  |                                         | 12   | 75   |                      | 95   |                       | 115  | ns   |
|                                      |                                               | 4.5                    |  |                                         | 3    | 15   |                      | 19   |                       | 23   |      |
|                                      |                                               | 6.0                    |  |                                         | 3    | 13   |                      | 16   |                       | 20   |      |
| t <sub>s</sub>                       | Minimum Set-up Time (DATA - G)                | 2.0                    |  |                                         | 20   | 75   |                      | 95   |                       | 115  | ns   |
|                                      |                                               | 4.5                    |  |                                         | 5    | 15   |                      | 19   |                       | 23   |      |
|                                      |                                               | 6.0                    |  |                                         | 4    | 13   |                      | 16   |                       | 20   |      |
| t <sub>h</sub>                       | Minimum Hold Time (DATA - G)                  | 2.0                    |  |                                         |      | 0    |                      | 0    |                       | 0    | ns   |
|                                      |                                               | 4.5                    |  |                                         |      | 0    |                      | 0    |                       | 0    |      |
|                                      |                                               | 6.0                    |  |                                         |      | 0    |                      | 0    |                       | 0    |      |
| C <sub>IN</sub>                      | Input Capacitance                             |                        |  |                                         | 5    | 10   |                      | 10   |                       | 10   | pF   |
| C <sub>PD</sub> (*)                  | Power Dissipation Capacitance                 |                        |  |                                         | 52   |      |                      |      |                       |      | pF   |

(\*) C<sub>PD</sub> 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.)



INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST.

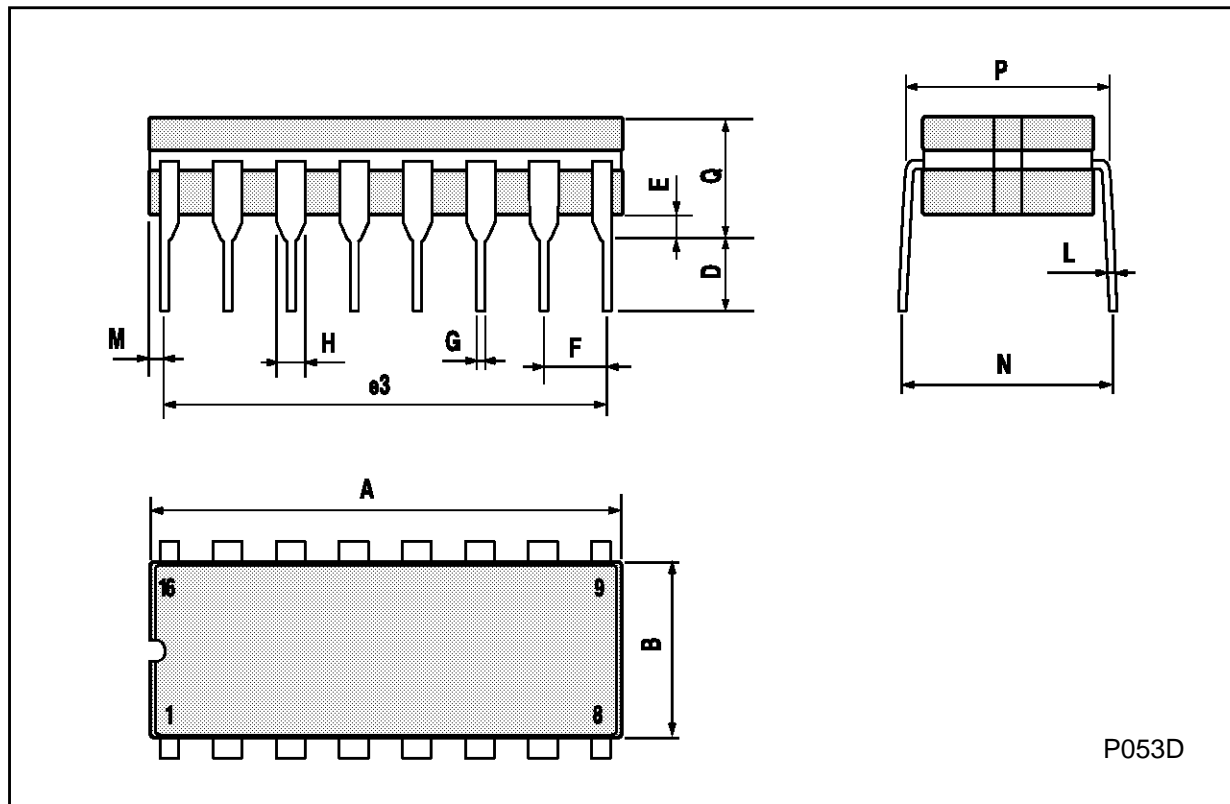
## Plastic DIP16 (0.25) MECHANICAL DATA

| 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 |



**Ceramic DIP16/1 MECHANICAL DATA**

| DIM. | mm   |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP.  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |      |       | 20   |       |       | 0.787 |
| B    |      |       | 7    |       |       | 0.276 |
| D    |      | 3.3   |      |       | 0.130 |       |
| E    | 0.38 |       |      | 0.015 |       |       |
| e3   |      | 17.78 |      |       | 0.700 |       |
| 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    | 0.51 |       | 1.27 | 0.020 |       | 0.050 |
| N    |      |       | 10.3 |       |       | 0.406 |
| P    | 7.8  |       | 8.05 | 0.307 |       | 0.317 |
| Q    |      |       | 5.08 |       |       | 0.200 |





## SO16 (Narrow) MECHANICAL DATA

| DIM. | mm         |      |      | inch  |       |       |
|------|------------|------|------|-------|-------|-------|
|      | MIN.       | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |            |      | 1.75 |       |       | 0.068 |
| a1   | 0.1        |      | 0.2  | 0.004 |       | 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.)  |      |      |       |       |       |



P013H

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 |       |



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics 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 SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -  
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A