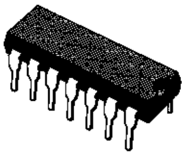
SGS-THOMSON
MICROELECTRONICS

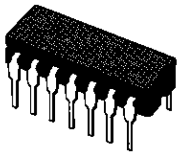
# M54HC07
# M74HC07

## HEX BUFFER (OPEN DRAIN)

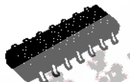
- HIGH SPEED
  $t_{PD}$ = 5 ns (TYP.) AT $V_{CC}$ = 5 V
- LOW POWER DISSIPATION
  $I_{CC}$ = 1 μA (MAX.) AT $T_A$ = 25 °C
- HIGH NOISE IMMUNITY
  $V_{NIH} = V_{NIL}$ = 28 % $V_{CC}$ (MIN.)
- OUTPUT DRIVE CAPABILITY
  10 LSTTL LOADS
- WIDE OPERATING VOLTAGE RANGE
  $V_{CC}$ (OPR) = 2 V TO 6 V
- PIN AND FUNCTION COMPATIBLE WITH 54/74LS07



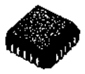
**B1R**
(Plastic Package)



**F1R**
(Ceramic Package)



**M1R**
(Micro Package)



**C1R**
(Chip Carrier)

**ORDER CODES :**

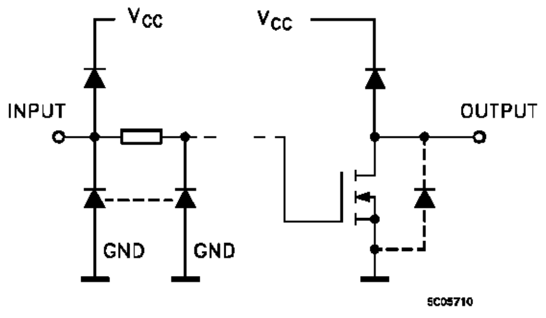
| | |
|---|---|
| M54HC07F1R | M74HC07M1R |
| M74HC07B1R | M74HC07C1R |

### DESCRIPTION

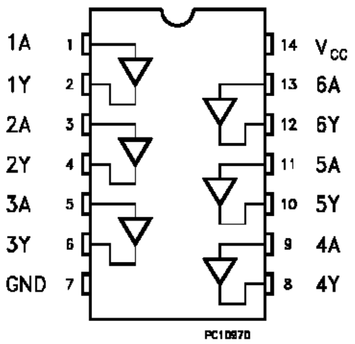
The M54/74HC07 is a high speed CMOS HEX OPEN DRAIN BUFFER fabricated in silicon gate $C^2$MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

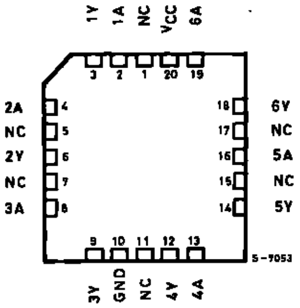
The internal circuit is composed of 2 stages including buffer output, which enables high noise immunity and stable output. All inputs are equipped with circuits against static discharge and transient excess voltage.

### INPUT AND OUTPUT EQUIVALENT CIRCUIT



**PIN CONNECTIONS** (top view)





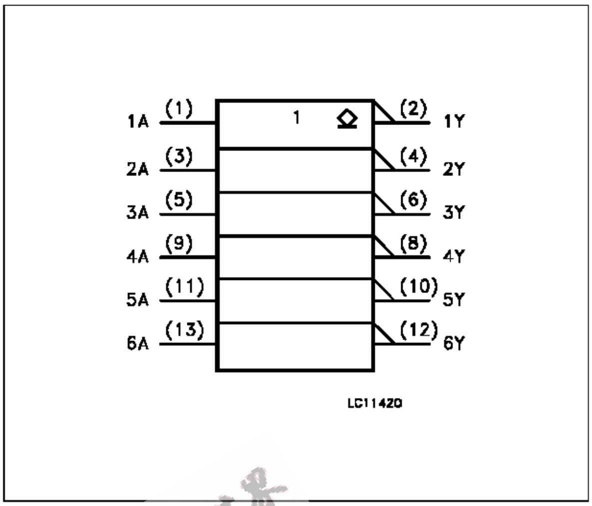
NC =
No Internal
Connection

## TRUTH TABLE

| A | Y |
|---|---|
| L | L |
| H | Z |

Z = High impedance

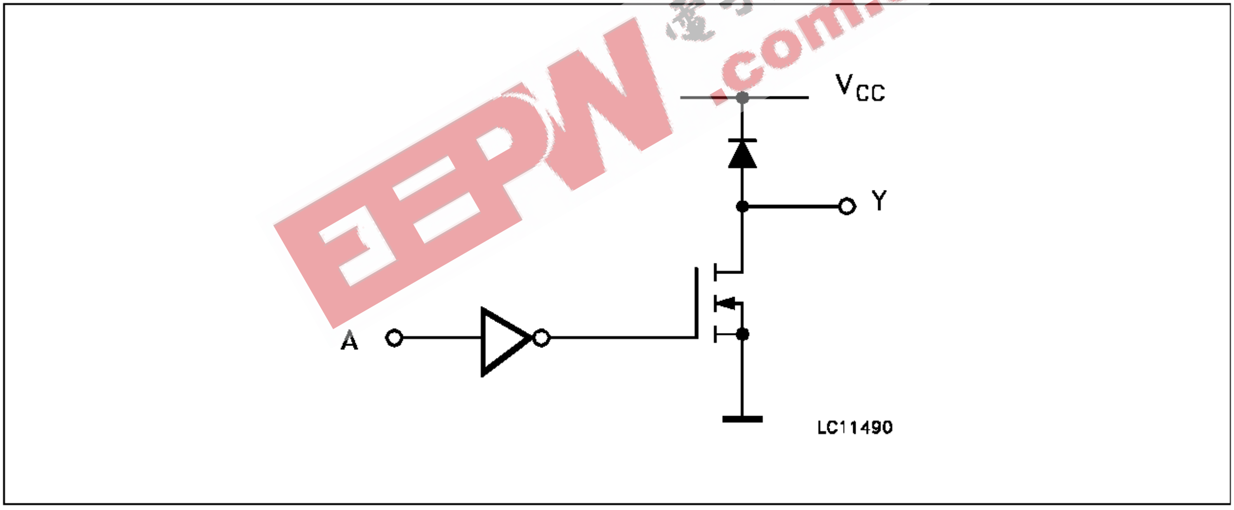
## IEC LOGIC SYMBOL



## PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|---|---|---|
| 1, 3, 5, 9, 11, 13 | 1A to 6A | Data Inputs |
| 2, 4, 6, 8, 10, 12 | 1Y to 6Y | Data Outputs |
| 7 | GND | Ground (0V) |
| 14 | $V_{CC}$ | Positive Supply Voltage |

## LOGIC DIAGRAM (Per Gate)



## 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 | ± 20 | mA |
| $I_{OK}$ | DC Output Diode Current | ± 20 | mA |
| $I_O$ | DC Output Sink Current Per Output Pin | 25 | mA |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current | ± 50 | mA |
| $P_D$ | Power Dissipation | 500 (*) | mW |
| $T_{stg}$ | Storage Temperature | -65 to +150 | $^oC$ |
| $T_L$ | Lead Temperature (10 sec) | 300 | $^oC$ |

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 $^oC$ derate to 300 mW by 10mW/$^oC$: 65 $^oC$ to 85 $^oC$

## 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: **M54HC** Series<br>**M74HC** Series | | -55 to +125<br>-40 to +85 | °C<br>°C |
| $t_r$, $t_f$ | Input Rise and Fall Time | $V_{CC}$ = 2 V | 0 to 1000 | ns |
| | | $V_{CC}$ = 4.5 V | 0 to 500 | |
| | | $V_{CC}$ = 6 V | 0 to 400 | |

## DC SPECIFICATIONS

| Symbol | Parameter | Test Conditions | | | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | | $T_A$ = 25 °C 54HC and 74HC | | | -40 to 85 °C 74HC | | -55 to 125 °C 54HC | | |
| | | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $V_{IH}$ | 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 | | |
| $V_{IL}$ | 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 | |
| $V_{OL}$ | Low Level Output Voltage | 2.0 | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_O$= 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 | | $I_O$= 4.0 mA | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| | | 6.0 | | $I_O$= 5.2 mA | | 0.18 | 0.26 | | 0.33 | | 0.40 | |
| $I_I$ | Input Leakage Current | 6.0 | $V_I$ = $V_{CC}$ or GND | | | | ±0.1 | | ±1 | | ±1 | µA |
| $I_{OZ}$ | Output Leakage Current | 6.0 | $V_I$ = $V_{IH}$ or $V_{IL}$<br>$V_O$ = $V_{CC}$ or GND | | | | ±0.5 | | ±5 | | ±10 | µA |
| $I_{CC}$ | Quiescent Supply Current | 6.0 | $V_I$ = $V_{CC}$ or GND | | | | 1 | | 10 | | 20 | µA |

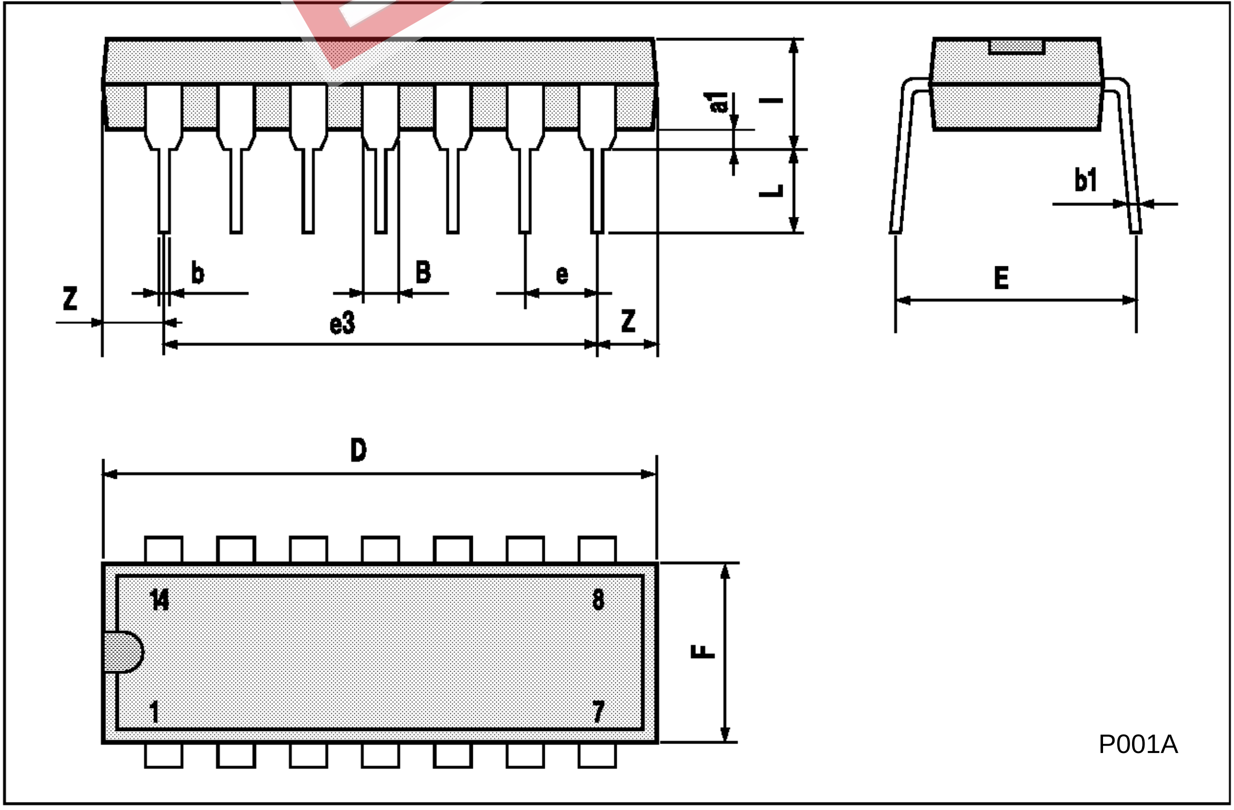
## AC ELECTRICAL CHARACTERISTICS ($C_L$ = 50 pF, Input $t_r$ = $t_f$ = 6 ns)

| Symbol | Parameter | Test Conditions | | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25 °C 54HC and 74HC | | | -40 to 85 °C 74HC | | -55 to 125 °C 54HC | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $t_{THL}$ | Output Transition Time | 2.0 | | | 30 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 8 | 15 | | 19 | | 22 | |
| | | 6.0 | | | 7 | 13 | | 16 | | 19 | |
| $t_{PLZ}$ | Propagation Delay Time | 2.0 | $R_L$ = 1KΩ | | 10 | 90 | | 115 | | 135 | ns |
| | | 4.5 | | | 7 | 18 | | 23 | | 27 | |
| | | 6.0 | | | 6 | 15 | | 20 | | 23 | |
| $t_{PZL}$ | Propagation Delay Time | 2.0 | $R_L$ = 1KΩ | | 17 | 90 | | 115 | | 135 | ns |
| | | 4.5 | | | 7 | 18 | | 23 | | 27 | |
| | | 6.0 | | | 5 | 15 | | 20 | | 23 | |
| $C_{IN}$ | Input Capacitance | | | | 5 | 10 | | 10 | | 10 | pF |
| $C_{OUT}$ | Output Capacitance | | | | 3 | | | | | | pF |
| $C_{PD}$ (*) | Power Dissipation Capacitance | | | | 4 | | | | | | 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 operting current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/6$ (per Gate)

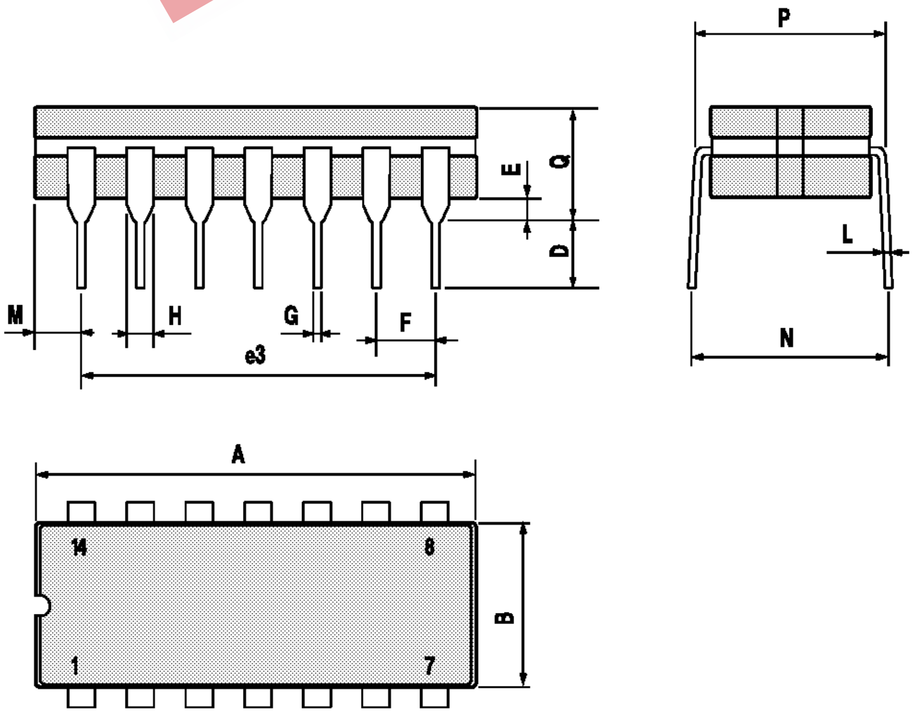
## Plastic DIP14 MECHANICAL DATA

| 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 |



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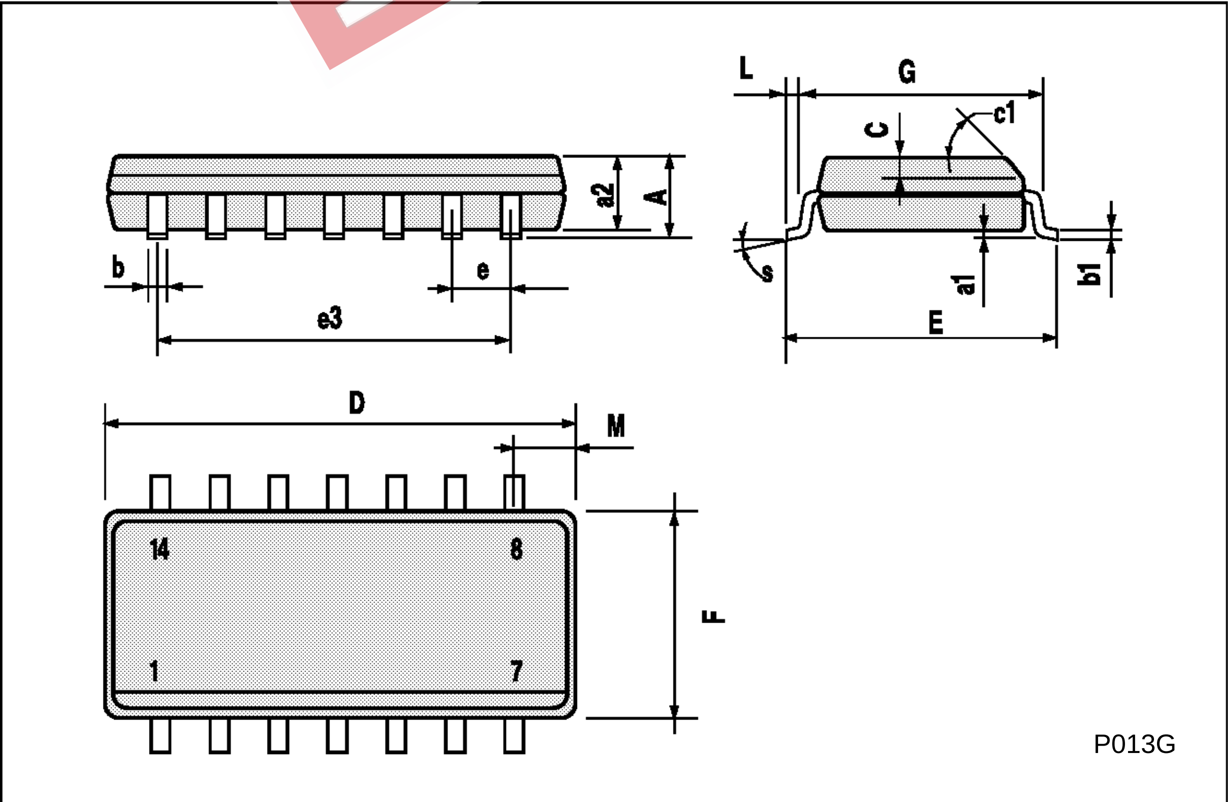
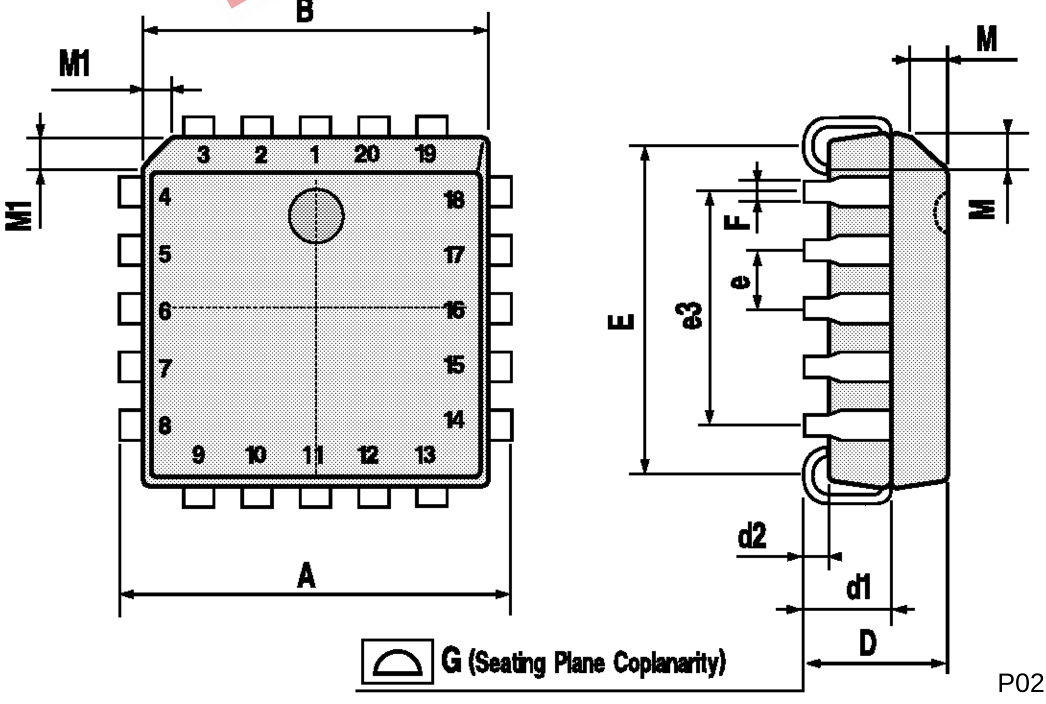
## SO14 MECHANICAL DATA

| 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.) | | | | | |



## 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 |  |



P027A

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