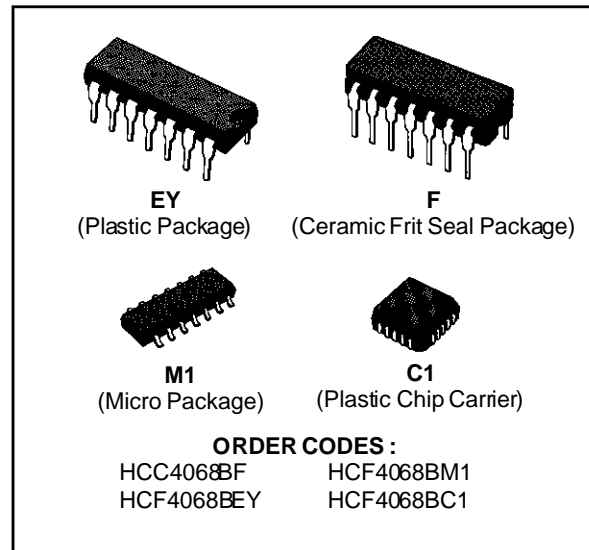


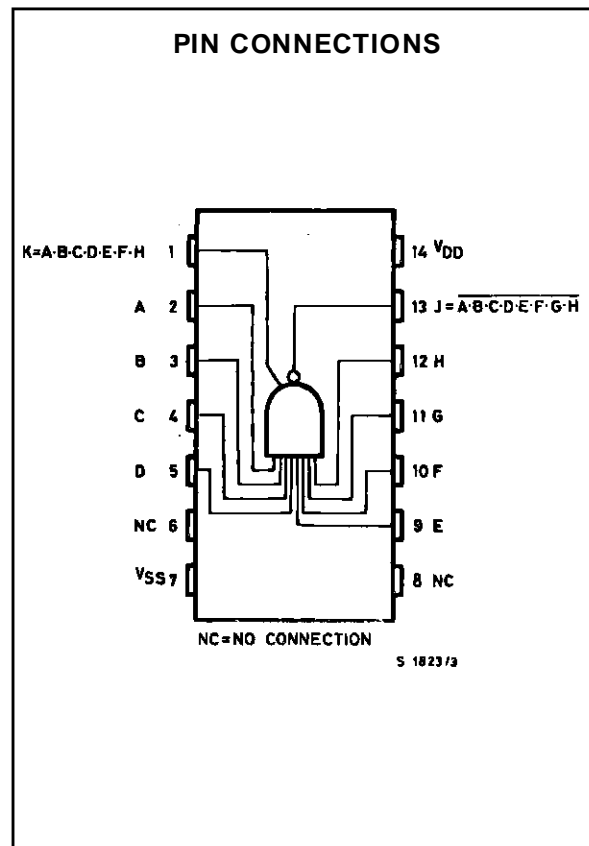
8-INPUT NAND/AND GATE

- MEDIUM-SPEED OPERATION – t_{PHL} , t_{PLH} = 75ns (typ.) AT 10V
- BUFFERED OUTPUT
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"



DESCRIPTION

The **HCC4068B** (extended temperature range) and **HCF4068B** (intermediate temperature range) are monolithic integrated circuit, available in 14-lead dual in-line plastic or ceramic package and plastic micro package. The **HCC/HCF4068B** NAND/AND gate provides the system designer with direct implementation of the positive-logic 8-input NAND and AND functions and supplements the existing family of COS/MOS gates.



HCC/HCF4068B

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-------------------|--|--------------------------------|------|
| V _{DD} * | Supply Voltage : HCC Types HCF Types | - 0.5 to + 20 | V |
| | | - 0.5 to + 18 | V |
| V _i | Input Voltage | - 0.5 to V _{DD} + 0.5 | V |
| I _I | DC Input Current (any one input) | ± 10 | mA |
| P _{tot} | Total Power Dissipation (per package) Dissipation per Output Transistor for T _{op} = Full Package-temperature Range | 200 | mW |
| | | 100 | mW |
| T _{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 | °C |
| | | - 40 to + 85 | °C |
| T _{stg} | Storage Temperature | - 65 to + 150 | °C |

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

* All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit |
|-----------------|--|----------------------|------|
| V _{DD} | Supply Voltage : HCC Types HCF Types | 3 to 18 | V |
| | | 3 to 15 | V |
| V _I | Input Voltage | 0 to V _{DD} | V |
| T _{op} | Operating Temperature : HCC Types HCF Types | - 55 to 125 | °C |
| | | - 40 to 85 | °C |

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

| Symbol | Parameter | Test Conditions | | | | Value | | | | | | Unit | | |
|-----------------|---------------------|-----------------------|-----------------------|--------------------------|------------------------|--------------------|------|-------|------|------|---------------------|------|------|----|
| | | V _I (V) | V _O (V) | I _O (μA) | V _{DD} (V) | T _{Low} * | | 25°C | | | T _{High} * | | | |
| | | | | | | Min. | Max. | Min. | Typ. | Max. | Min. | | Max. | |
| I _L | Quiescent Current | HCC Types | 0/ 5 | | | 5 | | 0.25 | | 0.01 | 0.25 | | 7.5 | μA |
| | | | 0/10 | | | 10 | | 0.5 | | 0.01 | 0.5 | | 15 | |
| | | | 0/15 | | | 15 | | 1 | | 0.01 | 1 | | 30 | |
| | | | 0/20 | | | 20 | | 5 | | 0.02 | 5 | | 150 | |
| | | HCF Types | 0/ 5 | | | 5 | | 1 | | 0.01 | 1 | | 7.5 | |
| | | | 0/10 | | | 10 | | 2 | | 0.01 | 2 | | 15 | |
| | | | 0/15 | | | 15 | | 4 | | 0.01 | 4 | | 30 | |
| V _{OH} | Output High Voltage | 0/ 5 | | < 1 | 5 | 4.95 | | 4.95 | | | 4.95 | | V | |
| | | 0/10 | | < 1 | 10 | 9.95 | | 9.95 | | | 9.95 | | | |
| | | 0/15 | | < 1 | 15 | 14.95 | | 14.95 | | | 14.95 | | | |
| V _{OL} | Output Low Voltage | 5/0 | | < 1 | 5 | | 0.05 | | | 0.05 | | 0.05 | V | |
| | | 10/0 | | < 1 | 10 | | 0.05 | | | 0.05 | | 0.05 | | |
| | | 15/0 | | < 1 | 15 | | 0.05 | | | 0.05 | | 0.05 | | |
| V _{IH} | Input High Voltage | | 0.5/4.5 | < 1 | 5 | 3.5 | | 3.5 | | | 3.5 | | V | |
| | | | 1/9 | < 1 | 10 | 7 | | 7 | | | 7 | | | |
| | | | 1.5/13.5 | < 1 | 15 | 11 | | 11 | | | 11 | | | |

* T_{Low} = - 55°C for **HCC** device : - 40°C for **HCF** device.

* T_{High} = + 125°C for **HCC** device : + 85°C for **HCF** device.

The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

STATIC ELECTRICAL CHARACTERISTICS (continued)

| Symbol | Parameter | Test Conditions | | | | Value | | | | | | Unit | |
|-----------------------------------|-----------------------|-----------------------|-----------------------|--------------------------------|------------------------|--------------------|-----------|------|---------------|-----------|---------------------|---------|---------|
| | | V _I (V) | V _O (V) | I _O (μ A) | V _{DD} (V) | T _{Low} * | | 25°C | | | T _{High} * | | |
| | | | | | | Min. | Max. | Min. | Typ. | Max. | Min. | | Max. |
| V _{IL} | Input Low Voltage | | 4.5/0.5 | < 1 | 5 | | 1.5 | | | 1.5 | | 1.5 | V |
| | | | 9/1 | < 1 | 10 | | 3 | | | 3 | | 3 | |
| | | | 13.5/1.5 | < 1 | 15 | | 4 | | | 4 | | 4 | |
| I _{OH} | Output Drive Current | HCC Types | 0/ 5 | 2.5 | | 5 | - 2 | | - 1.6 | - 3.2 | | - 1.15 | mA |
| | | | 0/ 5 | 4.6 | | 5 | - 0.64 | | - 0.51 | - 1 | | - 0.36 | |
| | | | 0/10 | 9.5 | | 10 | - 1.6 | | - 1.3 | - 2.6 | | - 0.9 | |
| | | | 0/15 | 13.5 | | 15 | - 4.2 | | - 3.4 | - 6.8 | | - 2.4 | |
| | | HCF Types | 0/ 5 | 2.5 | | 5 | - 1.53 | | - 1.36 | - 3.2 | | - 1.1 | |
| | | | 0/ 5 | 4.6 | | 5 | - 0.52 | | - 0.44 | - 1 | | - 0.36 | |
| | | | 0/10 | 9.5 | | 10 | - 1.3 | | - 1.1 | - 2.6 | | - 0.9 | |
| | | | 0/15 | 13.5 | | 15 | - 3.6 | | - 3.0 | - 6.8 | | - 2.4 | |
| I _{OL} | Output Sink Current | HCC Types | 0/ 5 | 0.4 | | 5 | 0.64 | | 0.51 | 1 | | 0.36 | mA |
| | | | 0/10 | 0.5 | | 10 | 1.6 | | 1.3 | 2.6 | | 0.9 | |
| | | | 0/15 | 1.5 | | 15 | 4.2 | | 3.4 | 6.8 | | 2.4 | |
| | | HCF Types | 0/ 5 | 0.4 | | 5 | 0.52 | | 0.44 | 1 | | 0.36 | |
| | | | 0/10 | 0.5 | | 10 | 1.3 | | 1.1 | 2.6 | | 0.9 | |
| | | | 0/15 | 1.5 | | 15 | 3.6 | | 3.0 | 6.8 | | 2.4 | |
| I _{IH} , I _{IL} | Input leakage Current | HCC Types | 0/18 | Any Input | 18 | | ± 0.1 | | $\pm 10^{-5}$ | ± 0.1 | | ± 1 | μ A |
| | | HCF Types | 0/15 | | 15 | | ± 0.3 | | $\pm 10^{-5}$ | ± 0.3 | | ± 1 | |
| C _I | Input Capacitance | | Any Input | | | | | | 5 | 7.5 | | pF | |

* T_{Low} = - 55°C for HCC device : - 40°C for HCF device.

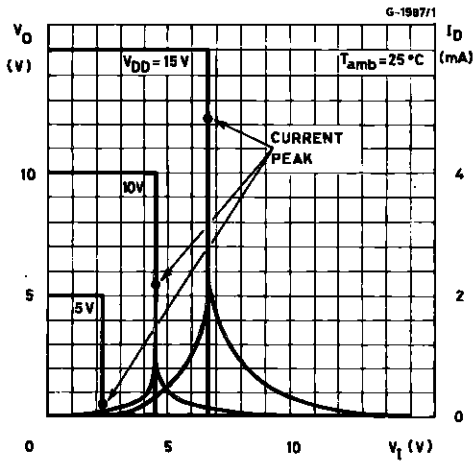
* T_{High} = + 125°C for HCC device : + 85°C for HCF device.

The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

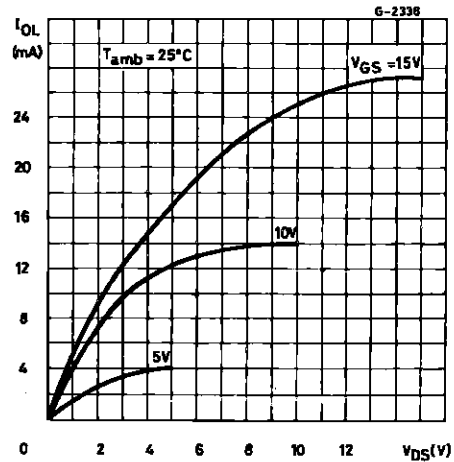
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200k Ω , typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall times = 20ns)

| Symbol | Parameter | Test Conditions | | Value | | | Unit |
|-------------------------------------|------------------------|-----------------|---------------------|-------|------|------|------|
| | | | V _{DD} (V) | Min. | Typ. | Max. | |
| t _{PHL} , t _{PLH} | Propagation Delay Time | | 5 | | 150 | 300 | ns |
| | | | 10 | | 75 | 150 | |
| | | | 15 | | 55 | 110 | |
| t _{TLH} , t _{THL} | Transition Time | | 5 | | 100 | 200 | ns |
| | | | 10 | | 50 | 100 | |
| | | | 15 | | 40 | 80 | |

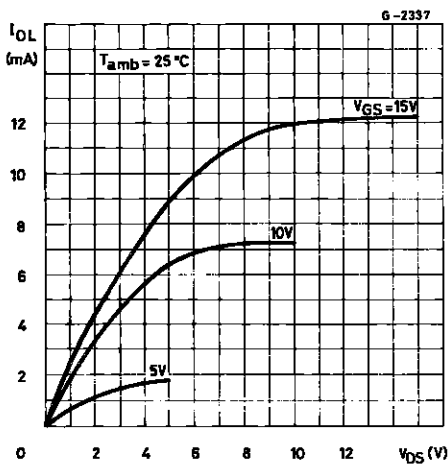
Typical Voltage and Current Transfer Characteristics.



Typical Output Low (sink) Current Characteristics.

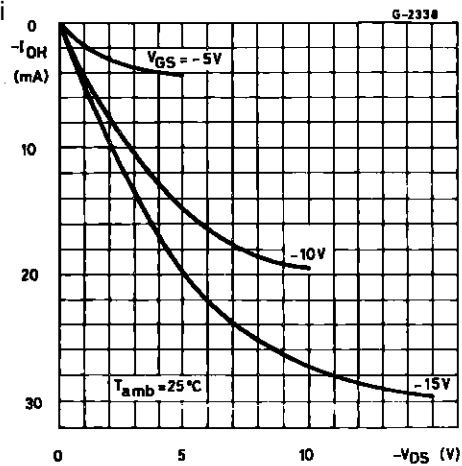


Minimum Output Low (sink) Current Charac-

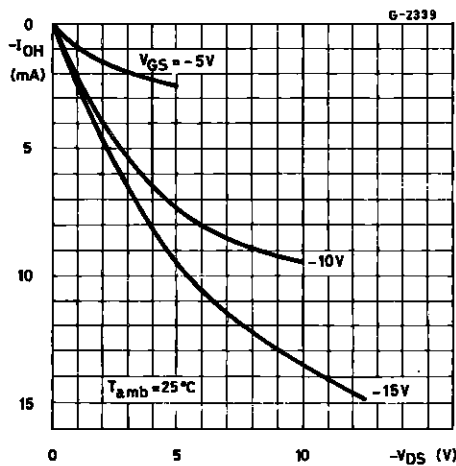


teristics.

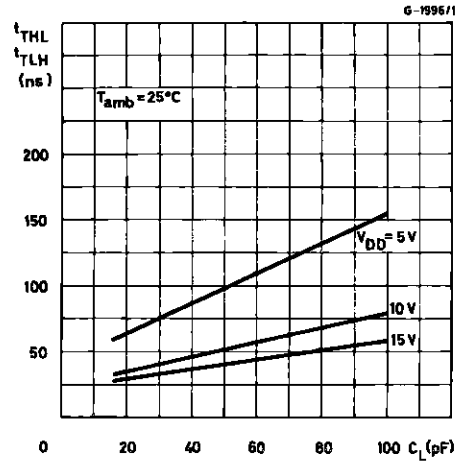
Typi



Minimum Output-p-channel Drain Characteristics.

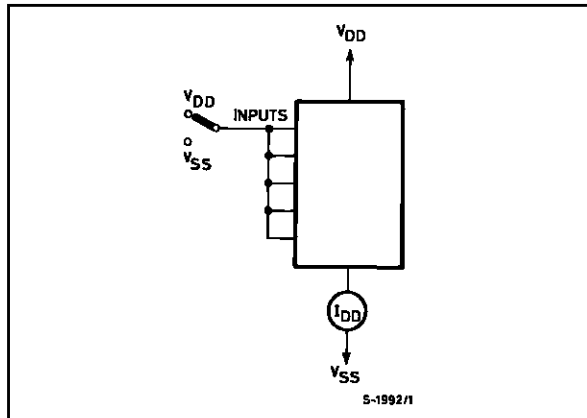


Typical Transition Time vs. C_L .

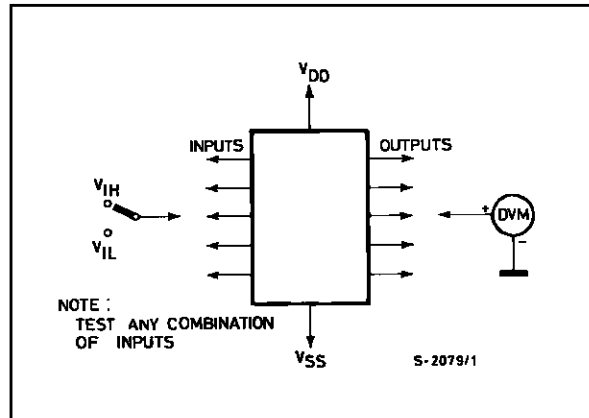


TEST CIRCUITS

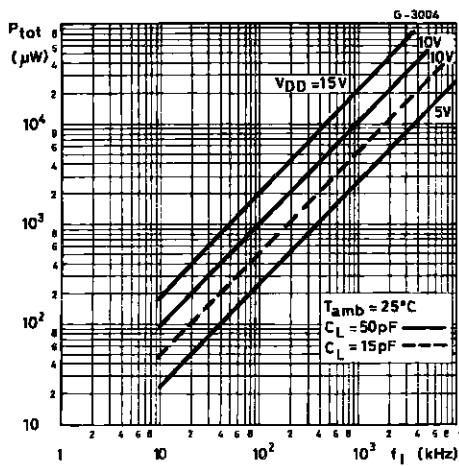
Quiescent Device Current



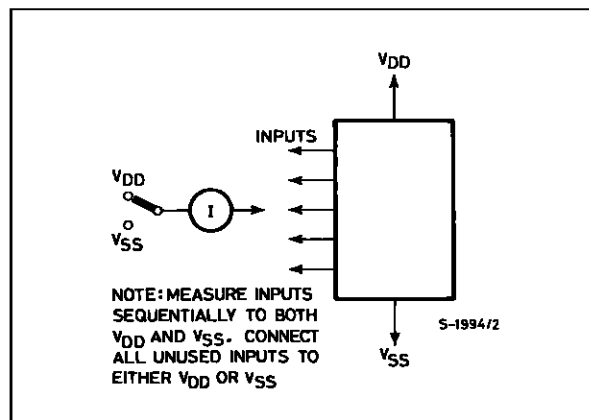
Input Voltage.



Typical Dynamic Power Dissipation vs. Frequency.

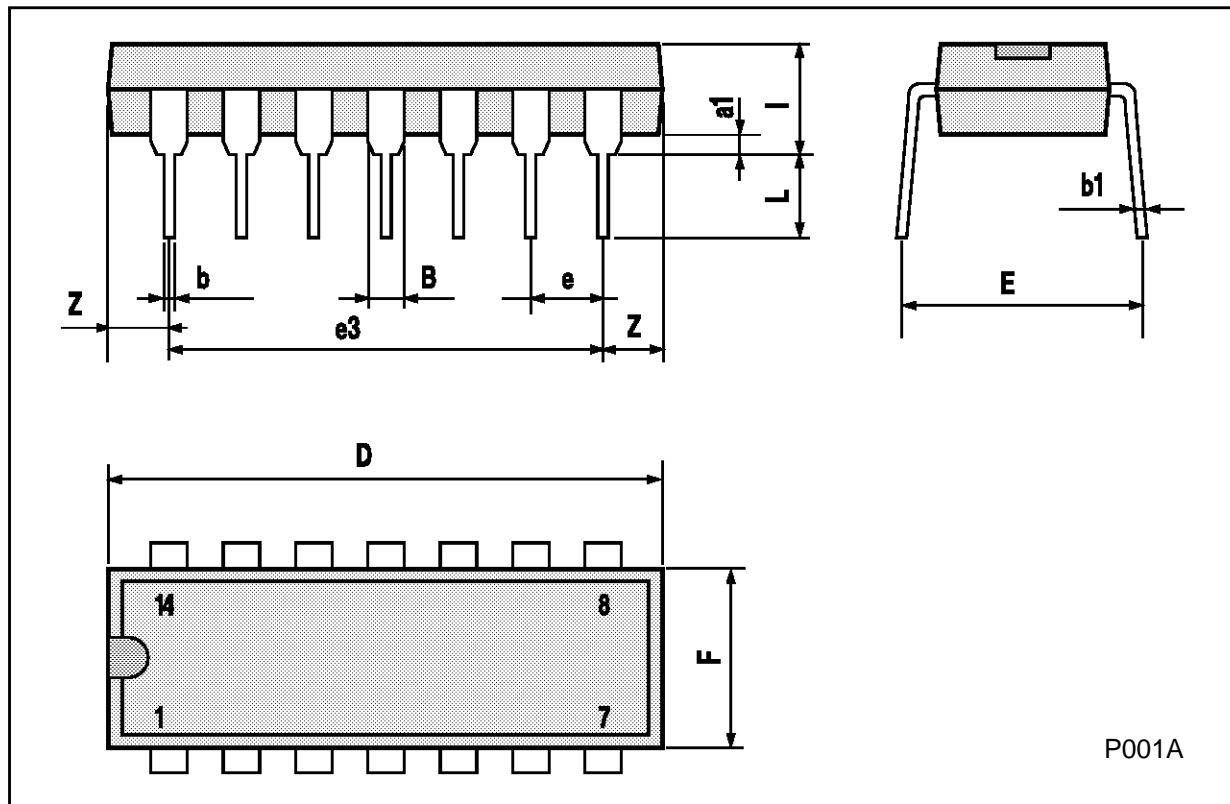


Input Current.



Plastic DIP14 MECHANICAL DATA

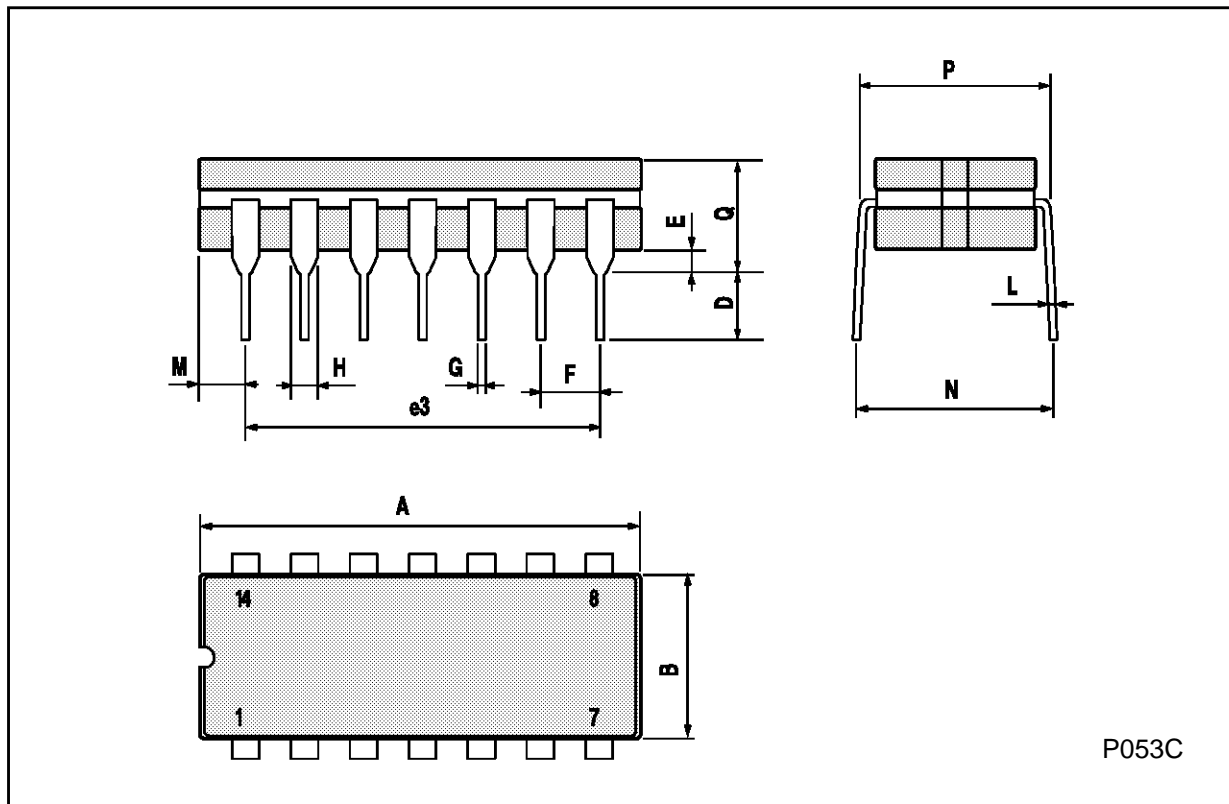
| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 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 |



P001A

Ceramic DIP14/1 MECHANICAL DATA

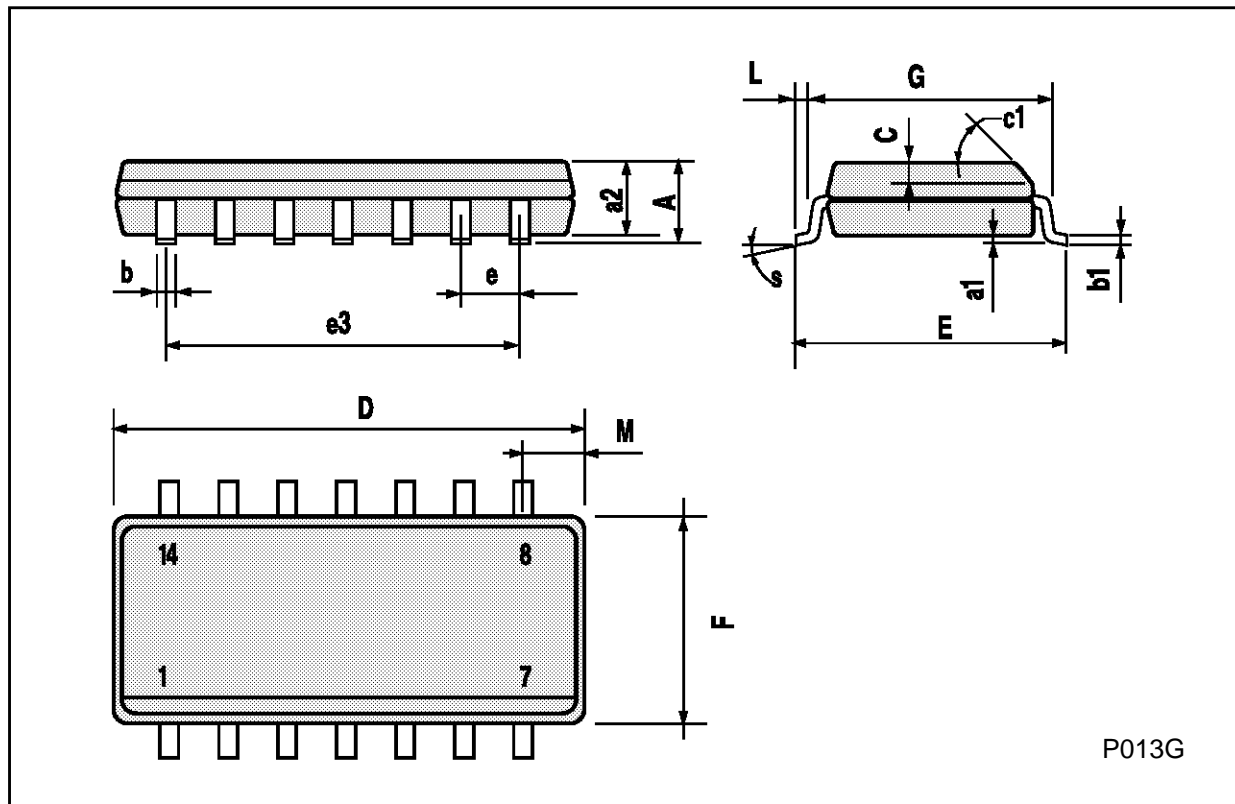
| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 20 | | | 0.787 |
| B | | | 7.0 | | | 0.276 |
| D | | 3.3 | | | 0.130 | |
| E | 0.38 | | | 0.015 | | |
| e3 | | 15.24 | | | 0.600 | |
| F | 2.29 | | 2.79 | 0.090 | | 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

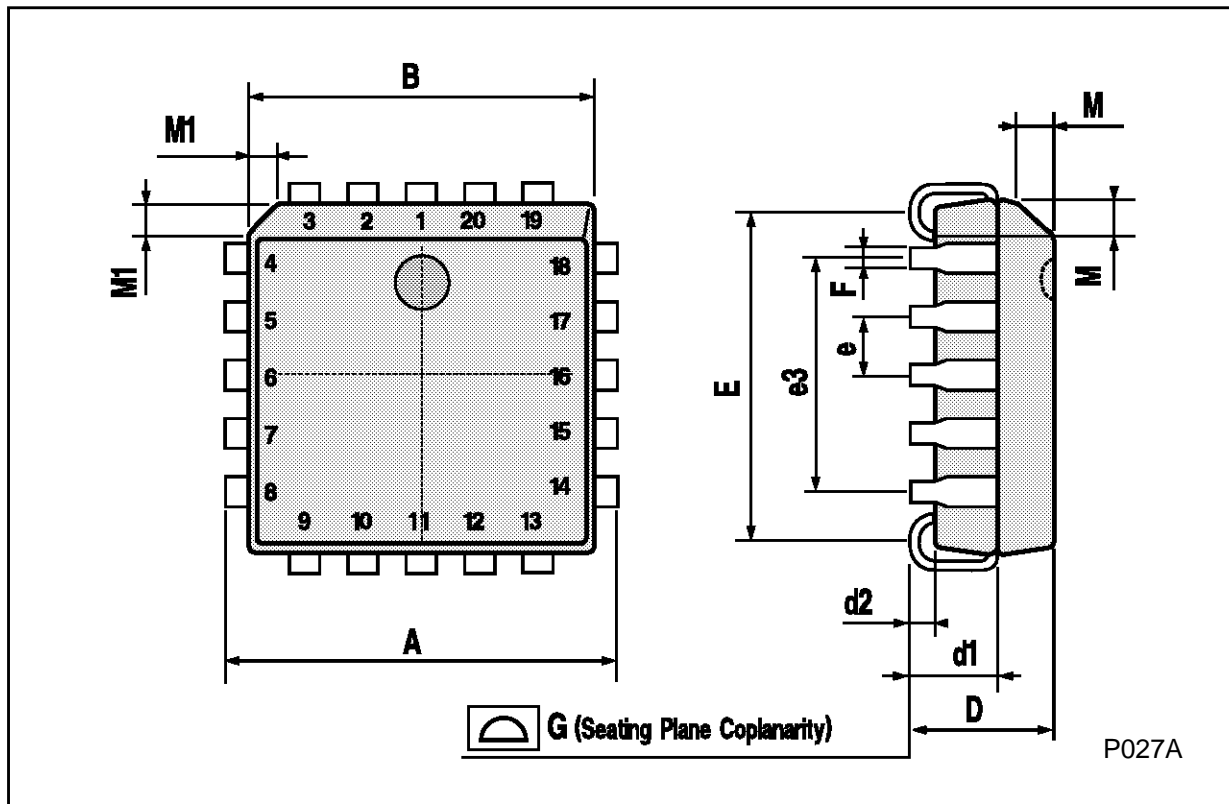
| DIM. | mm | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 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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