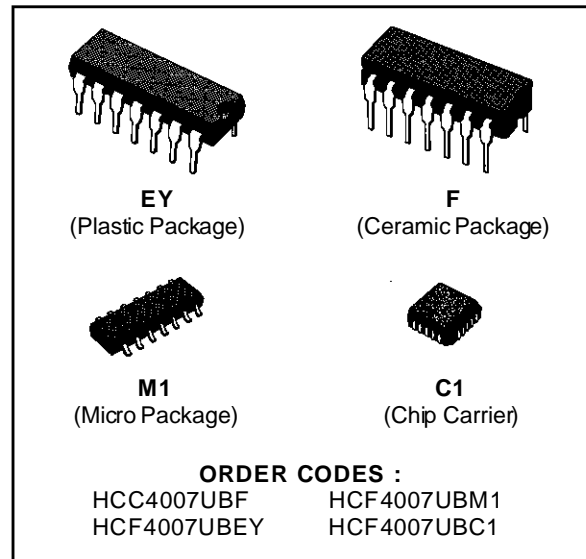


DUAL COMPLEMENTARY PAIR PLUS INVERTER

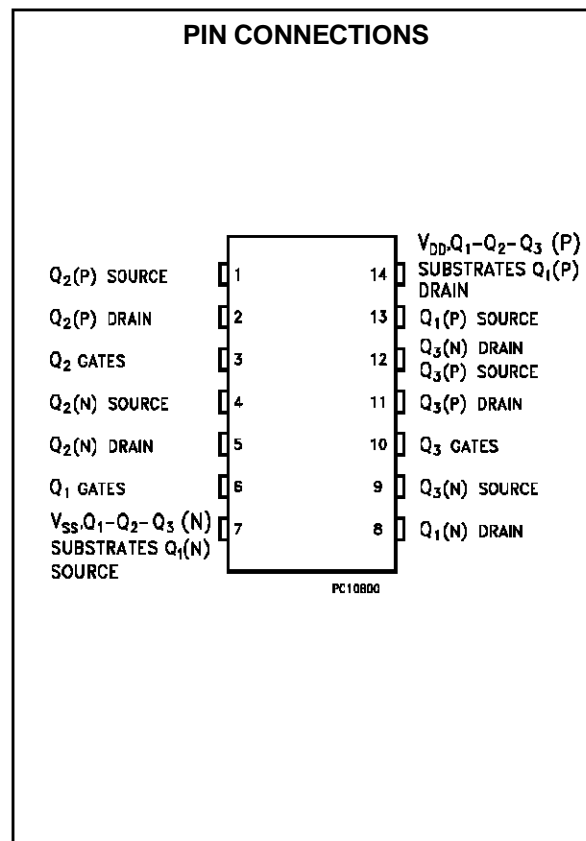
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- MEDIUM SPEED OPERATION t_{pHL} , $t_{pLH} = 30\text{ns}$ (typ.) AT 10V
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



DESCRIPTION

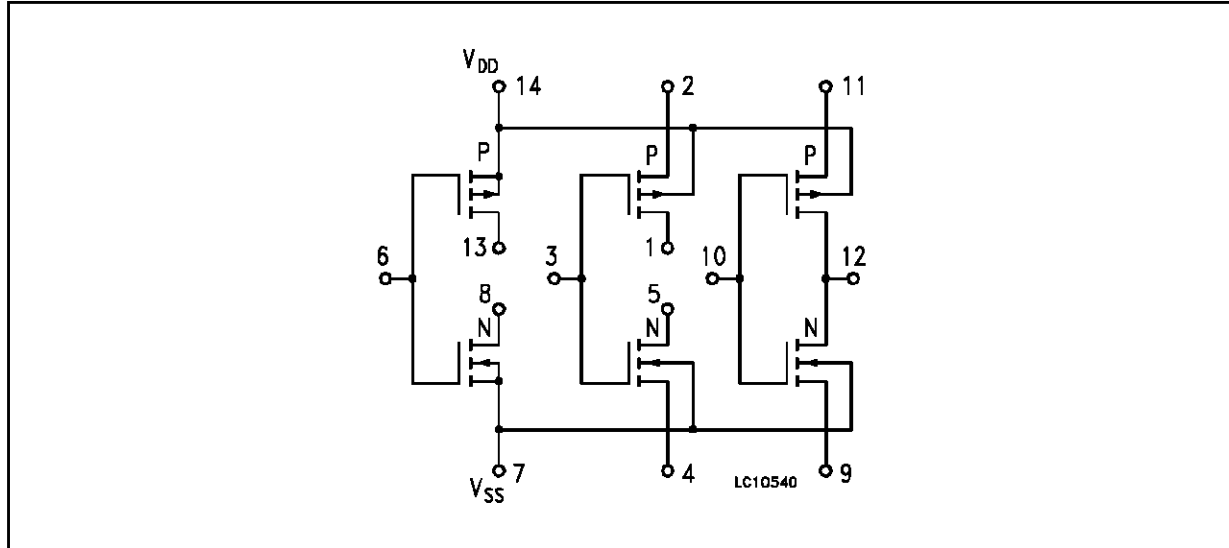
The HCC4007UB is a monolithic integrated circuit, available in 14-lead dual in-line plastic or ceramic package and plastic micropackage.

The HCC4007UB type is comprised of three n-channel and three p-channel enhancement type MOS transistors. The transistor elements are accessible through the package terminals to provide a convenient means for constructing the various typical circuits as shown in typical applications. More complex functions are possible using multiple packages. Numbers shown in parentheses indicate terminals that are connected together to form the various configurations listed.



HCC/HCF4007UB

FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATING

| 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 Top = 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 |

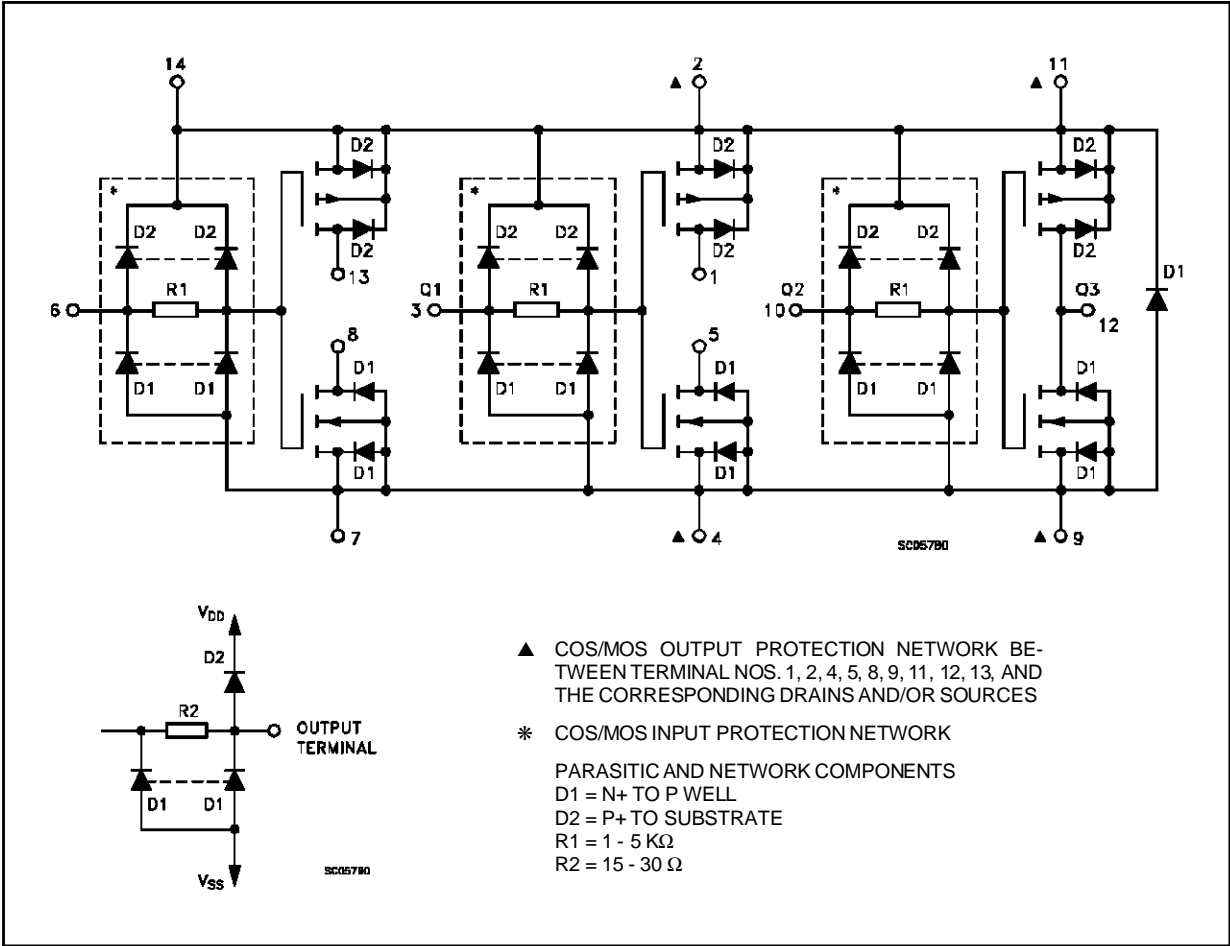
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure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

SCHEMATIC DIAGRAM (showing input, output and parasitic diodes)



HCC/HCF4007UB

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

| 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. |
| I _L | Quiescent Current | HCC Types | 0/5 | | | 5 | | 0.25 | | 0.01 | 0.25 | | 7.5 | μ A |
| | | | 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 | 4 | | 4 | | | | 4 | | V | |
| | | 1/9 | < 1 | 10 | 8 | | 8 | | | | 8 | | | |
| | | 1.5/13.5 | < 1 | 15 | 12.5 | | 12.5 | | | | 12.5 | | | |
| V _{IL} | Input Low Voltage | 4.5/0.5 | < 1 | 5 | | 1 | | | | 1 | | 1 | V | |
| | | 9/1 | < 1 | 10 | | 2 | | | | 2 | | 2 | | |
| | | 13.5/1.5 | < 1 | 15 | | 2.5 | | | | 2.5 | | 2.5 | | |
| 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.

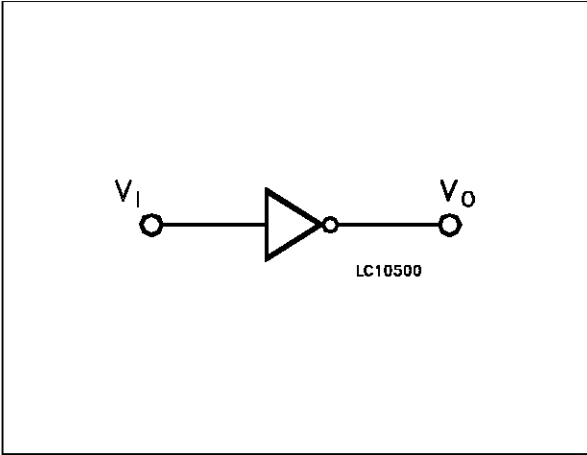
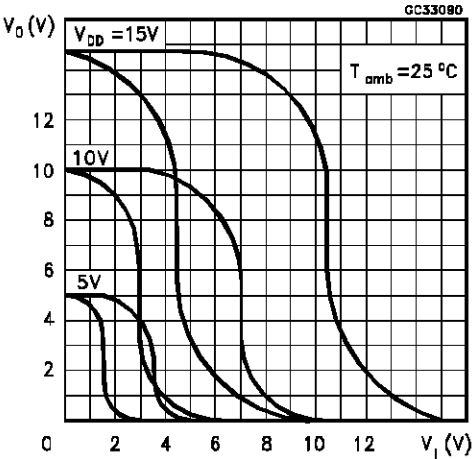
* T_{HIGH} = +125 °C for HCC device; +85 °C for HCF device.

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

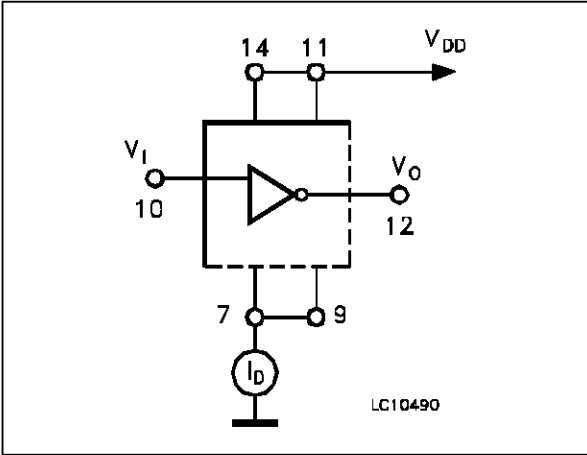
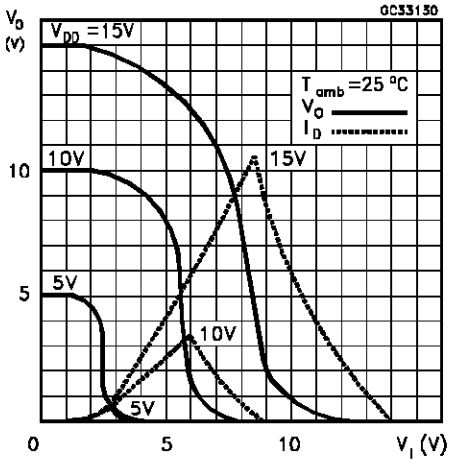
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ K}\Omega$, typical temperature coefficient for all V_{DD} values is $03\text{ } \%/^{\circ}\text{C}$, all input rise and fall times = 20 ns)

| Symbol | Parameter | Test Conditions | | Value | | | Unit |
|------------------------|------------------------|-----------------|--|-------|------|------|------|
| | | V_{DD} (V) | | Min. | Typ. | Max. | |
| t_{PLH} t_{PHL} | Propagation Delay Time | 5 | | | 55 | 110 | ns |
| | | 10 | | | 30 | 60 | |
| | | 15 | | | 25 | 50 | |
| t_{TLH} t_{THL} | Transition Time | 5 | | | 100 | 200 | ns |
| | | 10 | | | 50 | 100 | |
| | | 15 | | | 40 | 80 | |

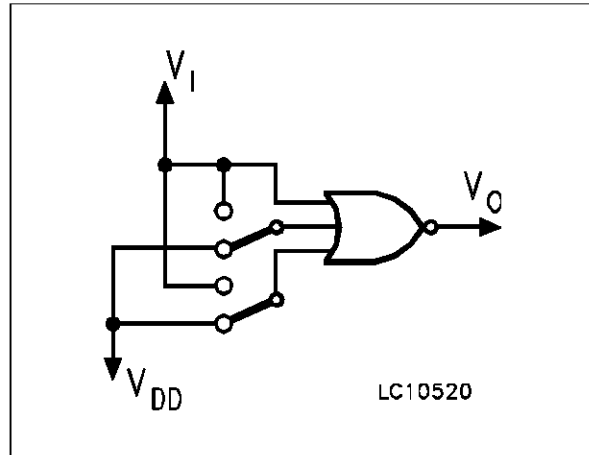
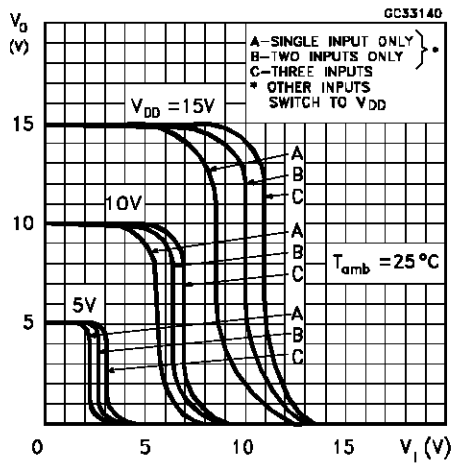
Minimum and Maximum Voltage Transfer Characteristics for Inverter and test Circuit



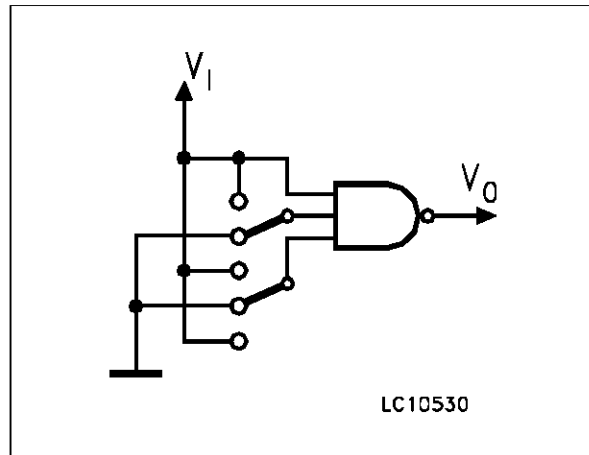
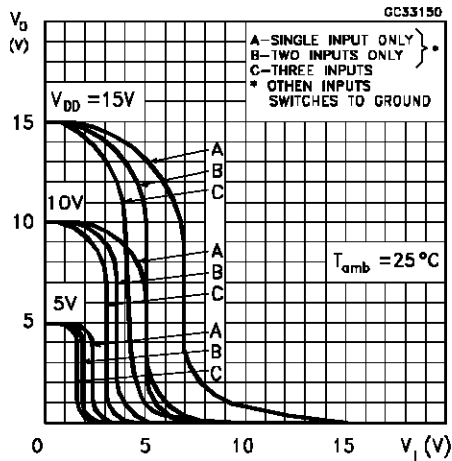
Typical Current and Voltage Transfer Characteristics for Inverter and Test Circuit



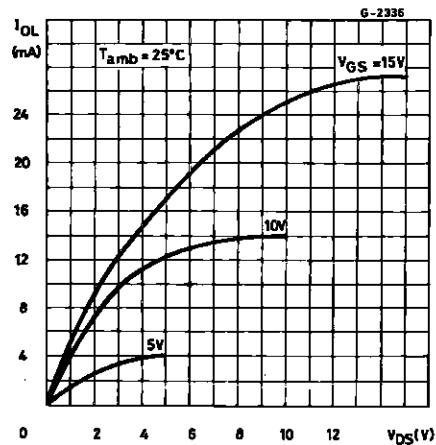
Typical Voltage Transfer Characteristics for NAND Gate and Test Circuit



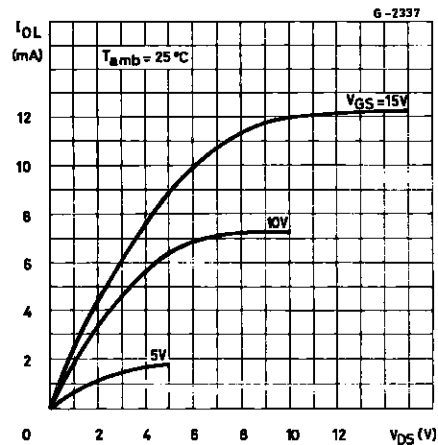
Typical Voltage Transfer Characteristics for NOR Gate and Test Circuit



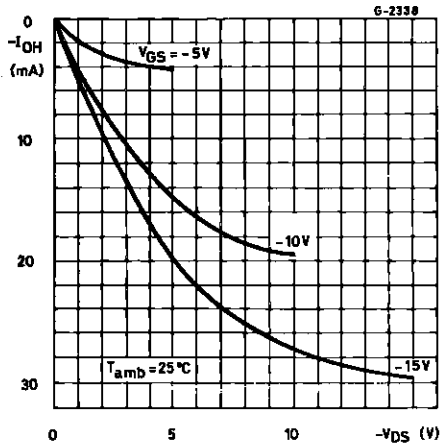
Typical Output Low (Sink) Current Characteristics



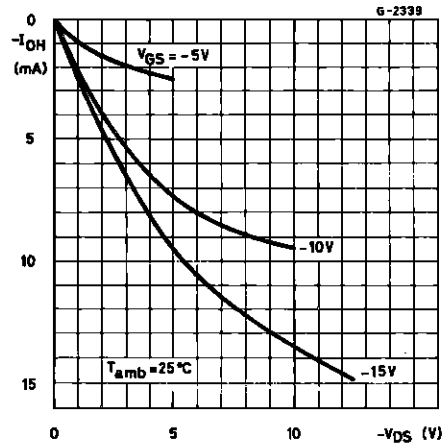
Minimum Output Low (Sink) Current Characteristics



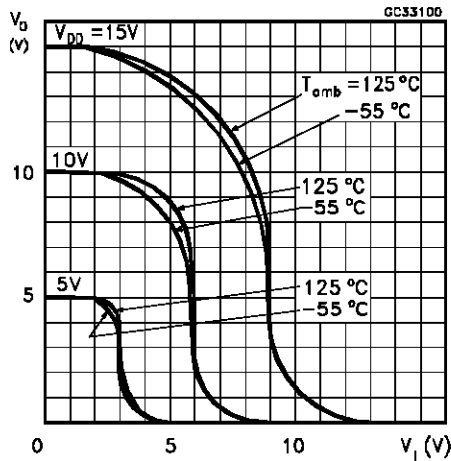
Typical Output High (Source) Current Characteristics



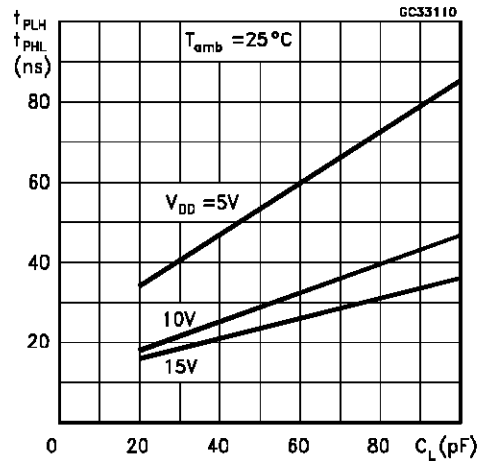
Minimum Output High (Source) Current Characteristics



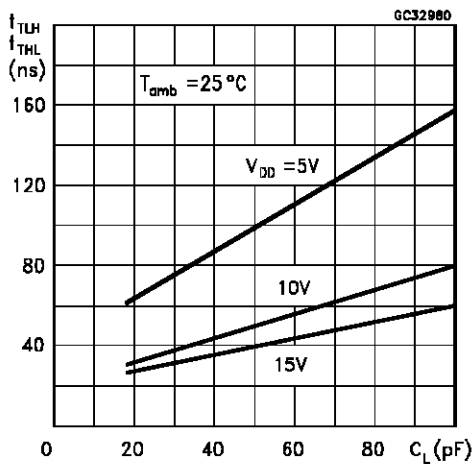
Typical Voltage Transfer Characteristics as a Function of Temperature



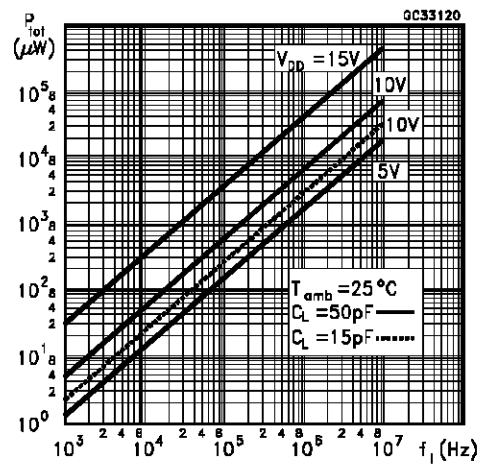
Typical Propagation Delay Time vs. Load Capacitance



Typical Transition Time vs. Load Capacitance



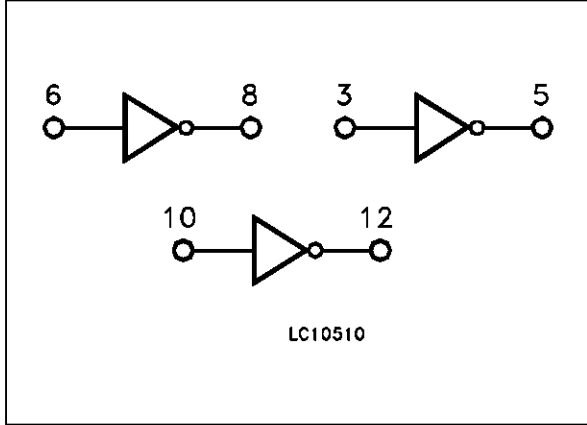
Typical Dissipation Per Gate vs. Frequency Characteristics



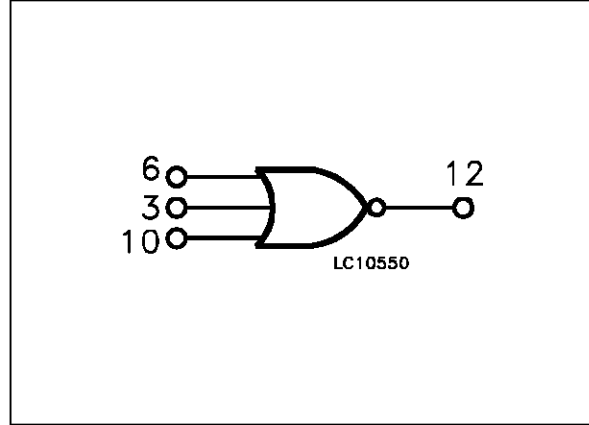
HCC/HCF4007UB

TYPICAL APPLICATIONS (Sample COS/MOS logic circuit arrangements using type 4007UB)

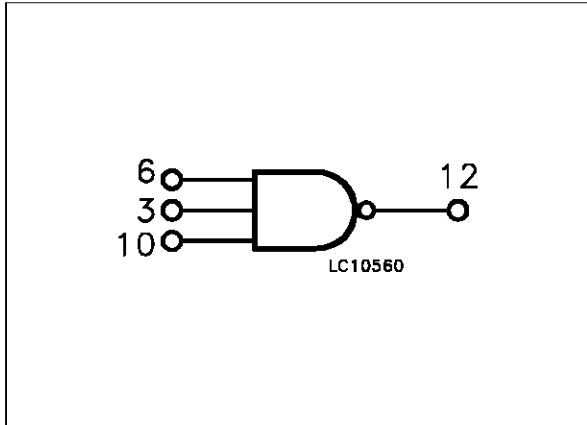
Triple Inverters: (14, 2, 11); (8, 13); (1, 5); (4, 7, 9).



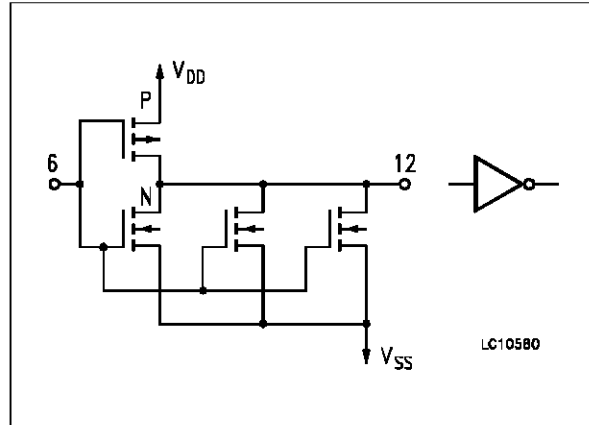
3-Input NOR Gate: (13, 2); (1, 11); (12, 5, 8); (4, 7, 9).



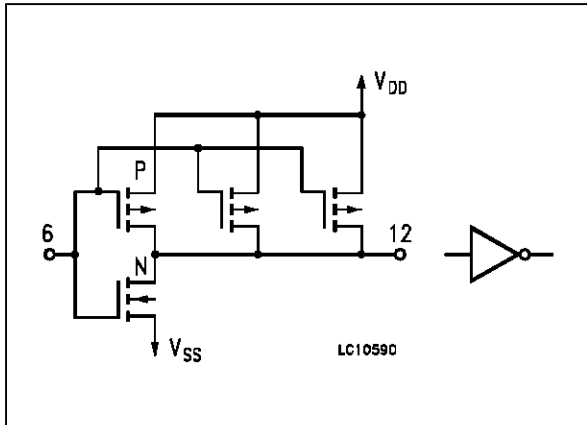
3-Input NAND Gate: (1, 12, 13); (2, 14, 11); (4, 8); (5, 9).



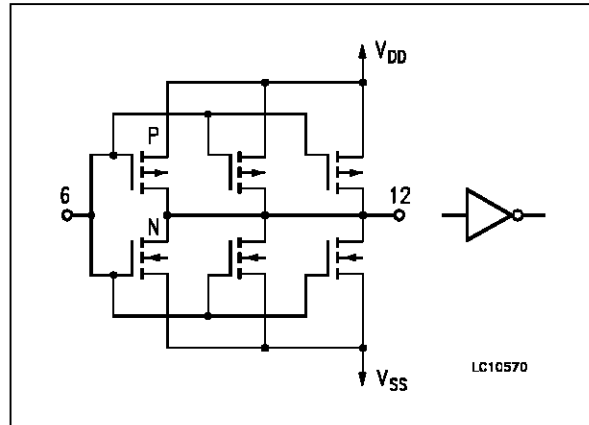
High Sink Current Driver: (6, 3, 10); (8, 5, 12); (11, 14); (4, 7, 9).



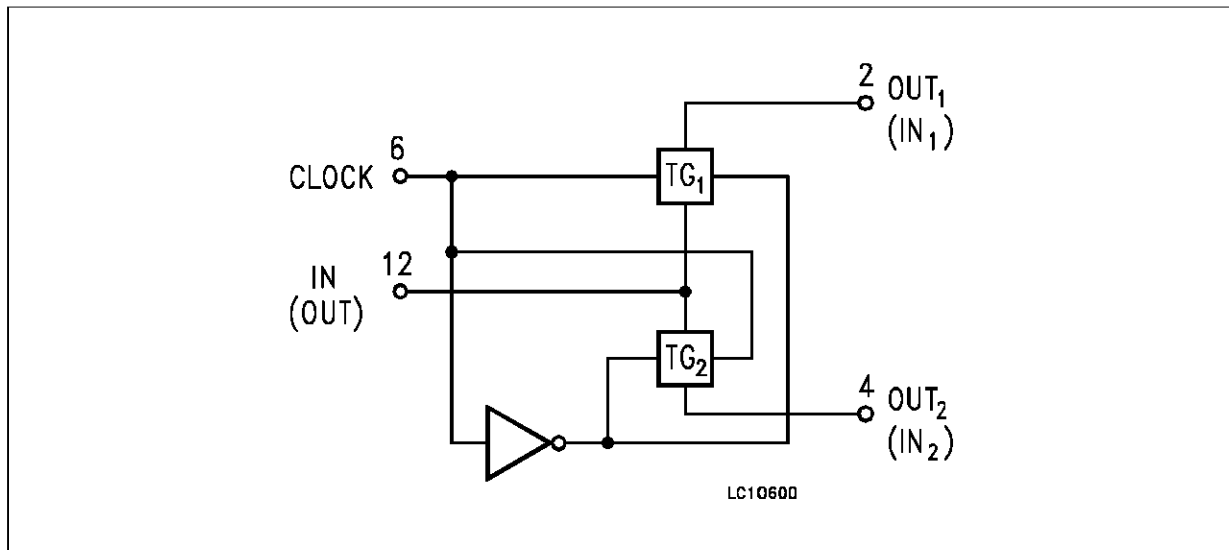
High Source Current Driver: (6, 3, 10); (13, 1, 12); (14, 2, 11); (7, 9).



High Sink and Source Current Driver: (6, 3, 10); (14, 2, 11); (7, 4, 9); (13, 8, 1, 5, 12).

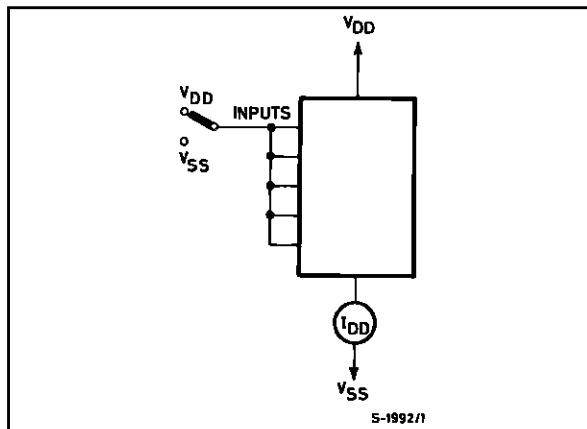


Dual Bidirectional Transmission Gating: (1, 5, 12); (2, 9); (11, 4); (8, 13, 10); (6, 3).

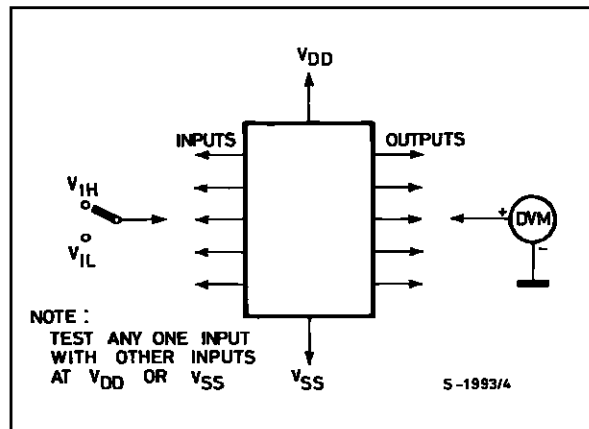


TEST CIRCUIT

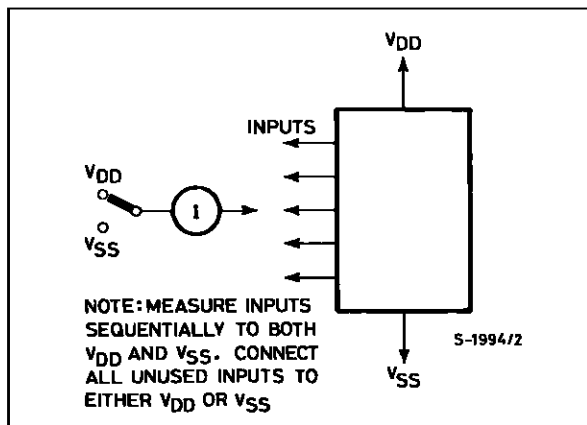
Quiescent Device Current



Input Voltage.

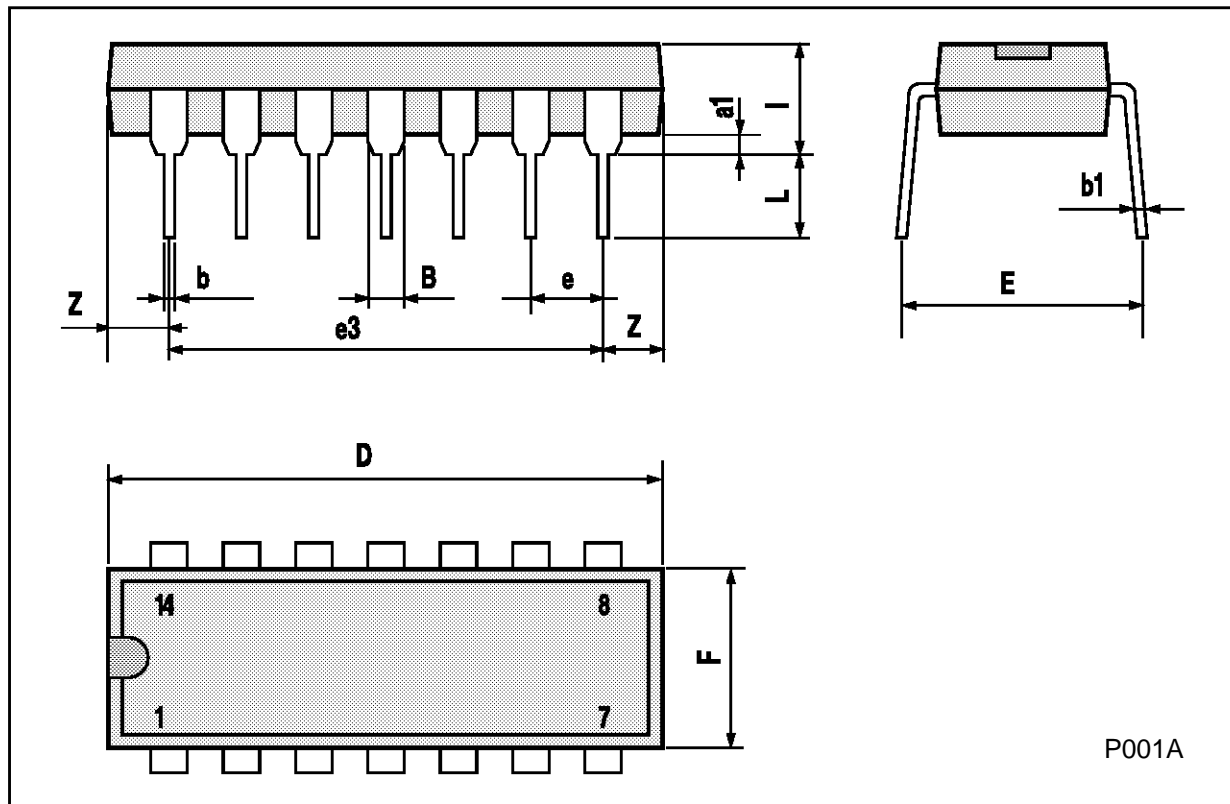


Input Leakage Current.



Plastic DIP14 MECHANICAL DATA

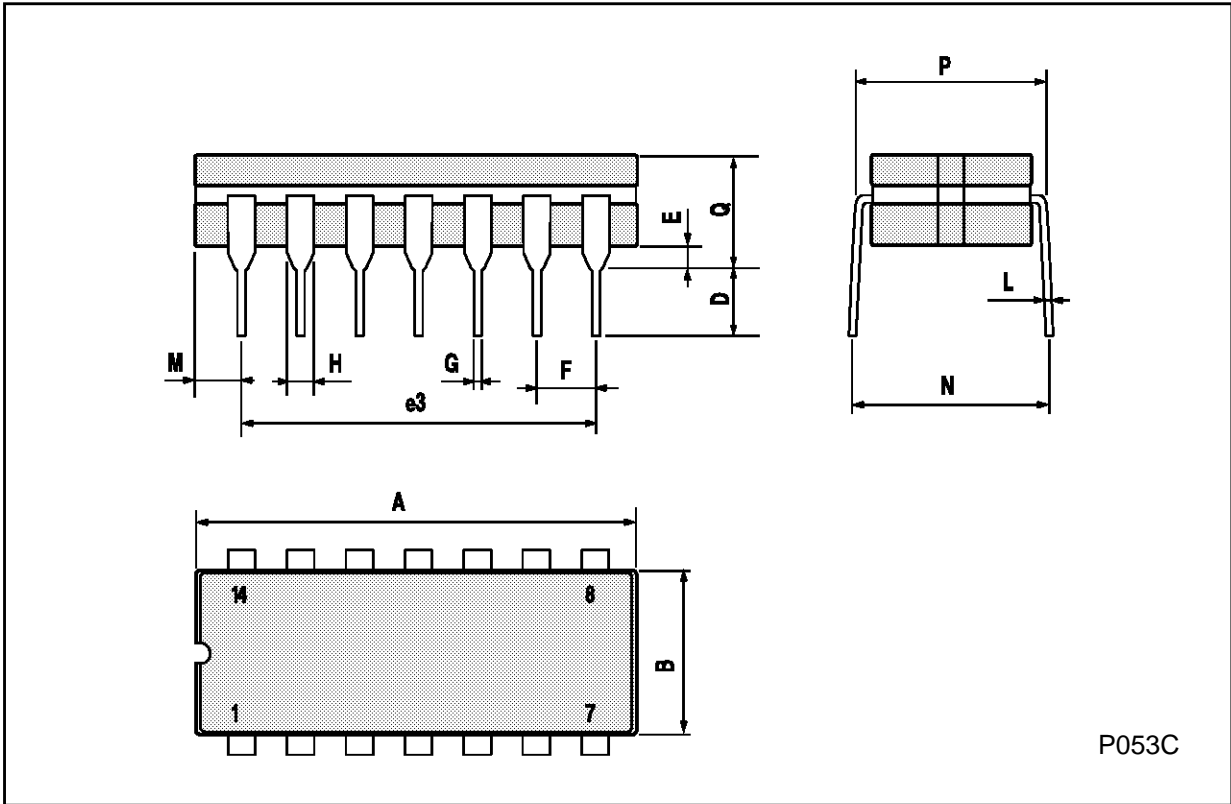
| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | |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

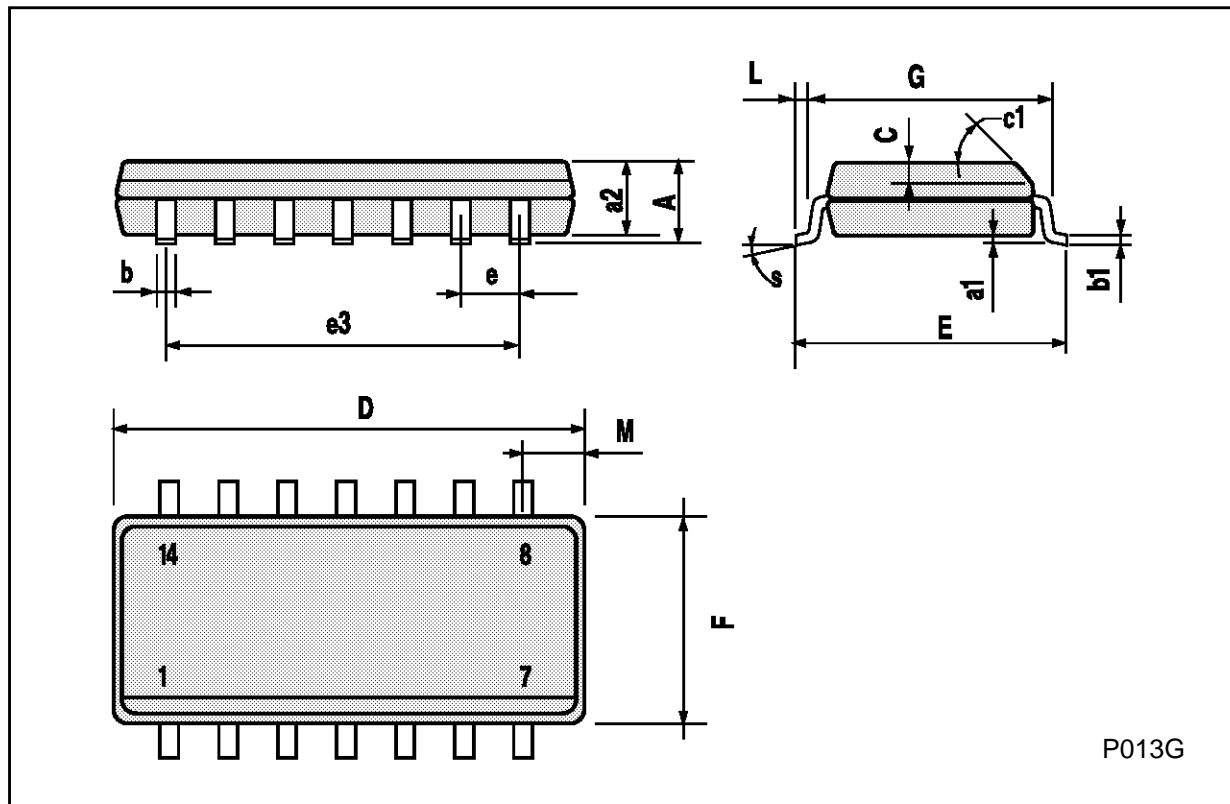
Ceramic DIP14/1 MECHANICAL DATA

| 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 |



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 | |



P027A

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