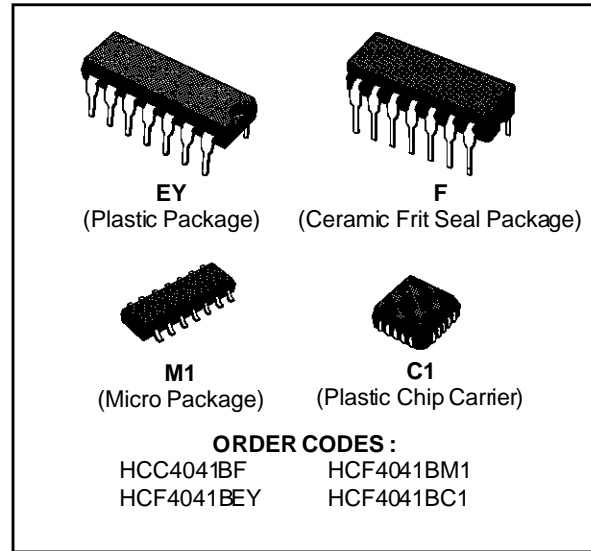


QUAD TRUE/COMPLEMENT BUFFER

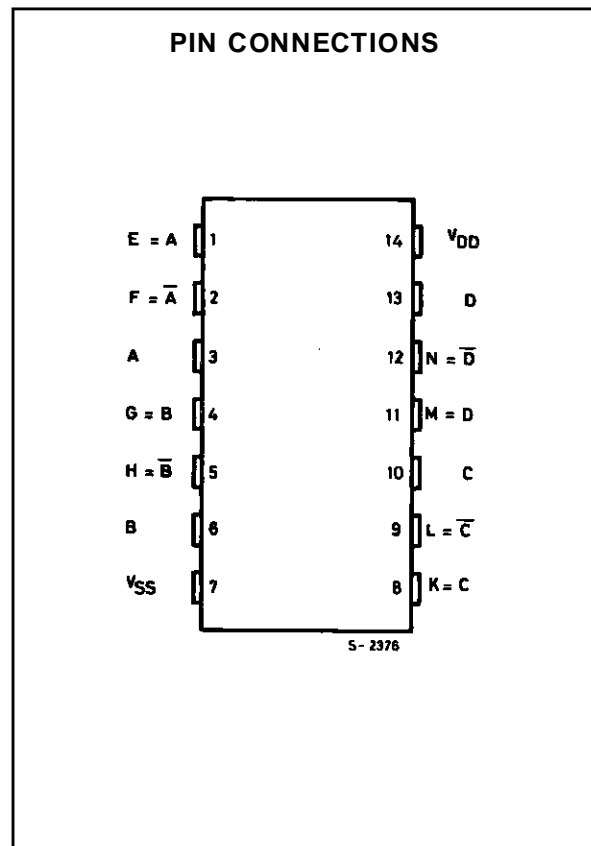
- BALANCED SINK AND SOURCE CURRENT ; APPROXIMATELY 4 TIMES STANDARD "B" DRIVE
- EQUALIZED DELAY TO TRUE AND COMPLEMENT OUTPUTS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100 % TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"



DESCRIPTION

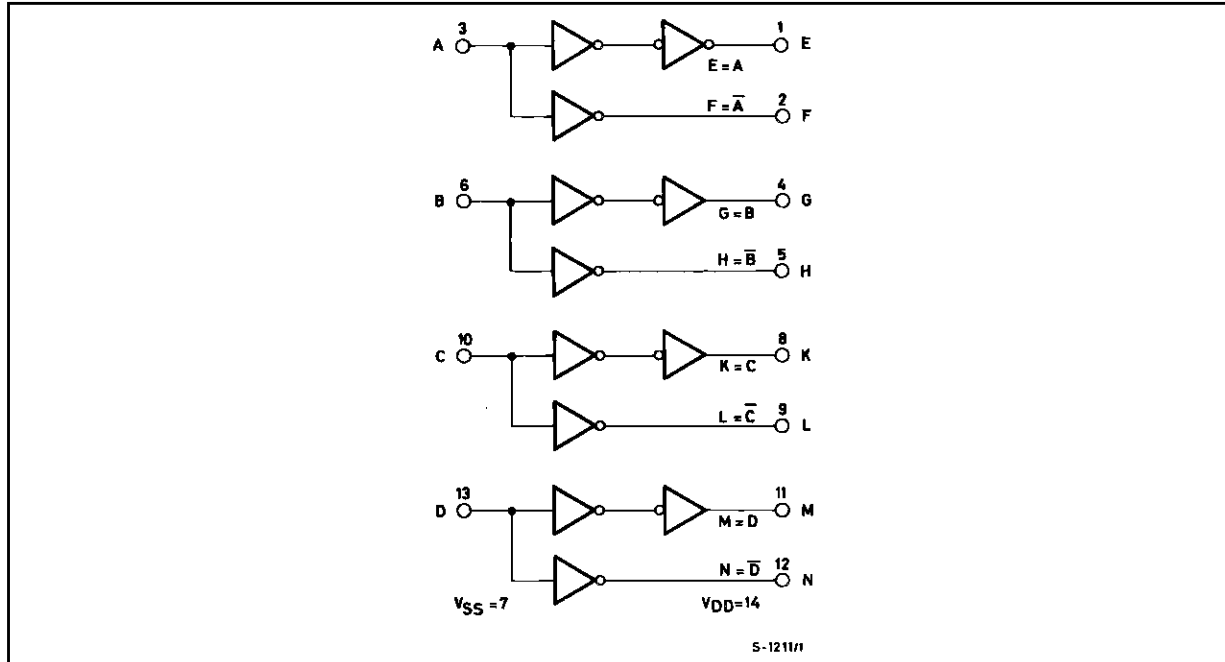
The **HCC4041UB** (extended temperature range) and **HCF4041UB** (intermediate temperature range) are monolithic integrated circuits, available in 14-lead dual in-line plastic or ceramic package and plastic micro package.

The **HCC/HCF4041UB** types are quad true/complement buffers consisting of n- and p-channel units having low channel resistance and high current (sourcing and sinking) capability. The **HCC/HCF4041UB** is intended for use as a buffer, line driver, or COS/MOS-to-TTL driver. It can be used as an ultra-low power resistor-network driver for A/D and D/A conversion, as a transmission-line driver, and in other applications where high noise immunity and low-power dissipation are primary design requirements.



HCC/HCF4041UB

FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|------------|---|--------------------------------|----------------------------|
| V_{DD}^* | Supply Voltage : HCC Types HCF Types | - 0.5 to + 20 - 0.5 to + 18 | V 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 | 200 100 | mW mW |
| T_{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 - 40 to + 85 | $^{\circ}C$ $^{\circ}C$ |
| T_{stg} | Storage Temperature | - 65 to + 150 | $^{\circ}C$ |

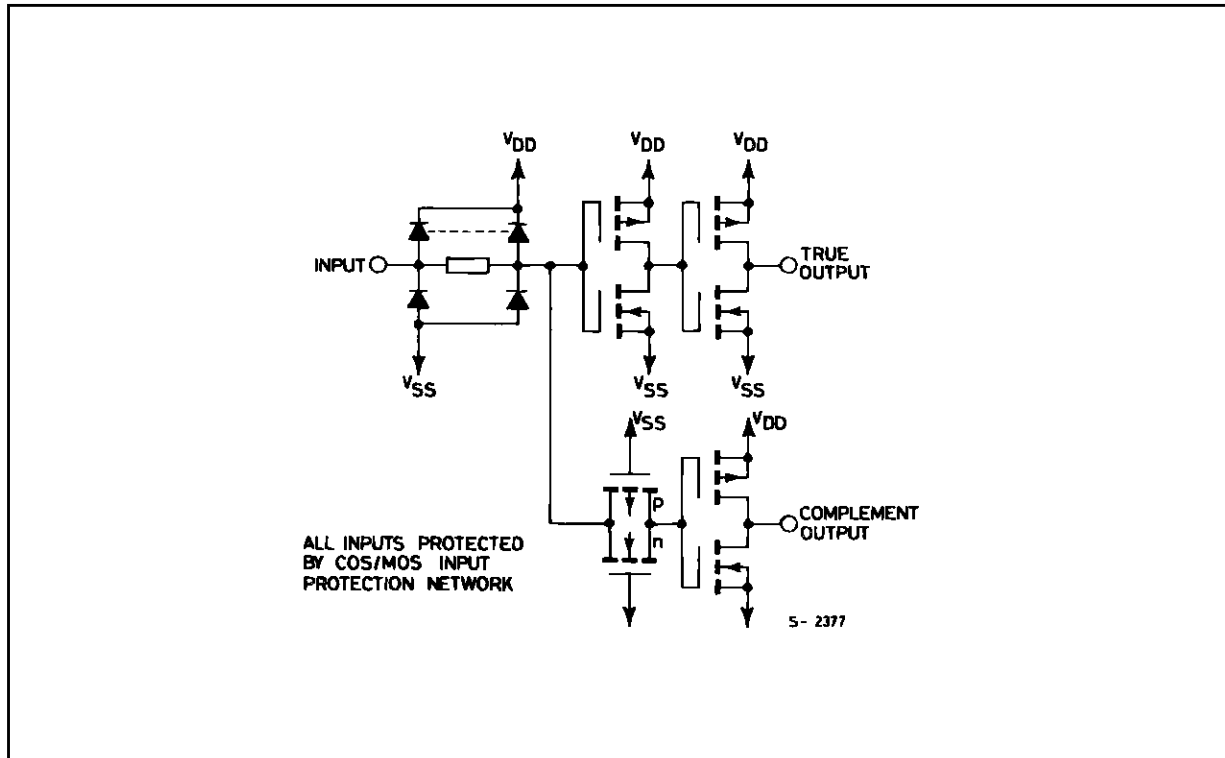
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure 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 3 to + 15 | V V |
| V_i | Input Voltage | 0 to V_{DD} | V |
| T_{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 - 40 to + 85 | $^{\circ}C$ $^{\circ}C$ |

SCHEMATIC DIAGRAM



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} * Min. Max. | | 25°C Min. Typ. Max. | | | T _{High} * Min. Max. | | | | | |
| | | | | | | | | | | | | | | | | |
| I _L | Quiescent Current | | | | 5 | | | 0.02 | 1 | | | 30 | μA | | | |
| | | | | | | HCC Types | 0/ 5 | | | 1 | | 0.02 | | 1 | | 30 |
| | | | | | | | 0/10 | | | 2 | | 0.02 | | 2 | | 60 |
| | | | | | | | 0/15 | | | 4 | | 0.02 | | 4 | | 120 |
| | | | | | | | 0/20 | | | 20 | | 0.04 | | 20 | | 600 |
| | | | | | | HCF Types | 0/ 5 | | | 4 | | 0.02 | | 4 | | 30 |
| 0/10 | | | 8 | | 0.02 | | 8 | | 60 | | | | | | | |
| V _{OH} | Output High Voltage | | | < 1 | 5 | 4.95 | | 4.95 | | 4.95 | | V | | | | |
| | | | | | 10 | 9.95 | | 9.95 | | 9.95 | | | | | | |
| | | | | | 15 | 14.95 | | 14.95 | | 14.95 | | | | | | |
| V _{OL} | Output Low Voltage | | | < 1 | 5 | | 0.05 | | 0.05 | | 0.05 | V | | | | |
| | | | | | 10 | | 0.05 | | 0.05 | | 0.05 | | | | | |
| | | | | | 15 | | 0.05 | | 0.05 | | 0.05 | | | | | |
| V _{IH} | Input High Voltage | | | < 1 | 5 | 4 | | 4 | | 4 | | V | | | | |
| | | | | | 10 | 8 | | 8 | | 8 | | | | | | |
| | | | | | 15 | 12.5 | | 12.5 | | 12.5 | | | | | | |

* 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.

HCC/HCF4041UB

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 | | | 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 | - 8.4 | | - 6.4 | - 12.8 | | - 4.6 | mA |
| | | | 0/ 5 | 4.6 | | 5 | - 2.1 | | - 1.6 | - 3.2 | | - 1.2 | |
| | | | 0/10 | 9.5 | | 10 | - 6.25 | | - 5 | - 10 | | - 3.5 | |
| | | | 0/15 | 13.5 | | 15 | - 24 | | - 19 | - 38 | | - 13 | |
| | | HCF Types | 0/ 5 | 2.5 | | 5 | - 6.8 | | - 5.44 | - 12.8 | | - 4.08 | |
| | | | 0/ 5 | 4.6 | | 5 | - 1.7 | | - 1.36 | - 3.2 | | - 1.02 | |
| | | | 0/10 | 9.5 | | 10 | - 5.31 | | - 4.25 | - 10 | | - 3.18 | |
| | | | 0/15 | 13.5 | | 15 | -20.18 | | -16.15 | -38 | | -12.11 | |
| I _{OL} | Output Sink Current | HCC Types | 0/ 5 | 0.4 | | 5 | 2.1 | | 1.6 | 3.2 | | 1.2 | |
| | | | 0/10 | 0.5 | | 10 | 6.25 | | 5 | 10 | | 3.5 | |
| | | | 0/15 | 1.5 | | 15 | 24 | | 19 | 38 | | 13 | |
| | | HCF Types | 0/ 5 | 0.4 | | 5 | 1.7 | | 1.36 | 3.2 | | 1.02 | |
| | | | 0/10 | 0.5 | | 10 | 5.31 | | 4.25 | 10 | | 3.18 | |
| | | | 0/15 | 1.5 | | 15 | 20.18 | | 16.15 | 38 | | 12.11 | |
| I _{IH} , I _{IL} | Input leakage Current | HCC Types | 0/18 | Any Input | 18 | | \pm 0.1 | | \pm 10 ⁻⁵ | \pm 0.1 | | \pm 1 | μ A |
| | | HCF Types | 0/15 | | 15 | | \pm 0.3 | | \pm 10 ⁻⁵ | \pm 0.3 | | \pm 1 | |
| C _I | Input Capacitance | Any Input | | | | | | 15 | 22.5 | | | pF | |

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

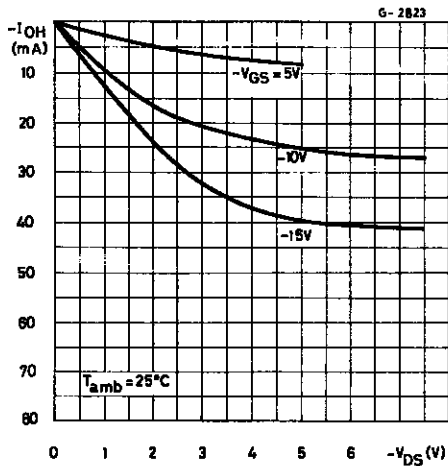
* T_{High} = + 125°C for HCC device : + 85°C for HCF device.

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.

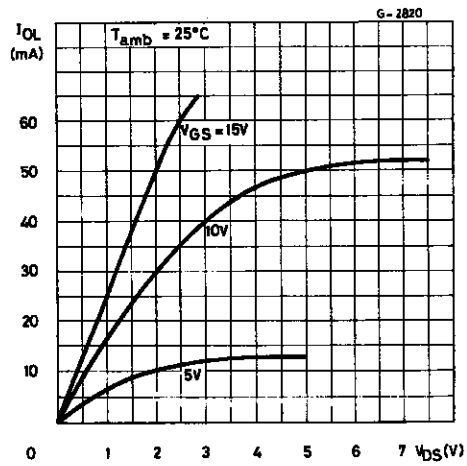
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200k Ω , typical temperature coefficient for all V_{DD} values is 0.3 %/°C, all input rise and fall times = 20ns)

| Symbol | Parameter | Test Conditions | | Value | | | Unit |
|-------------------------------------|------------------------|-----------------|---------------------|-------|------|------|------|
| | | | V _{DD} (V) | Min. | Typ. | Max. | |
| t _{PLH} , t _{PHL} | Propagation Delay Time | | 5 | | 60 | 120 | ns |
| | | | 10 | | 35 | 70 | |
| | | | 15 | | 25 | 50 | |
| t _{THL} , t _{TLH} | Transition Time | | 5 | | 40 | 80 | ns |
| | | | 10 | | 20 | 40 | |
| | | | 15 | | 15 | 30 | |

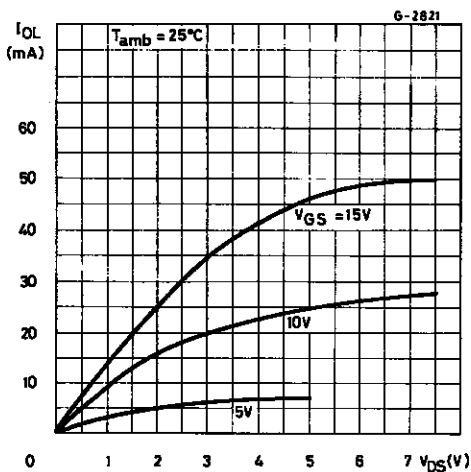
Minimum Output High (source) Current Characteristics.



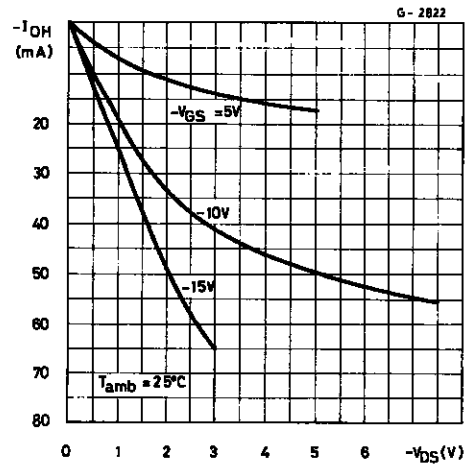
Typical Output Low (sink) Current.



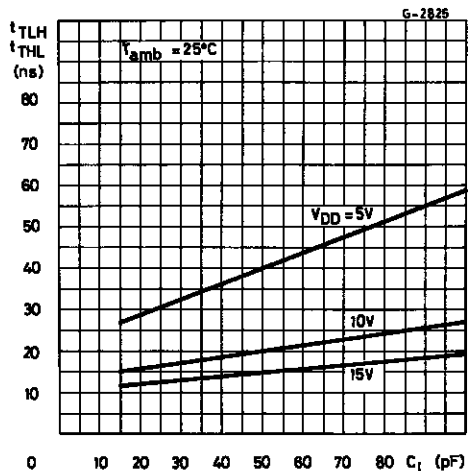
Minimum Output Low (sink) Current Characteristics.



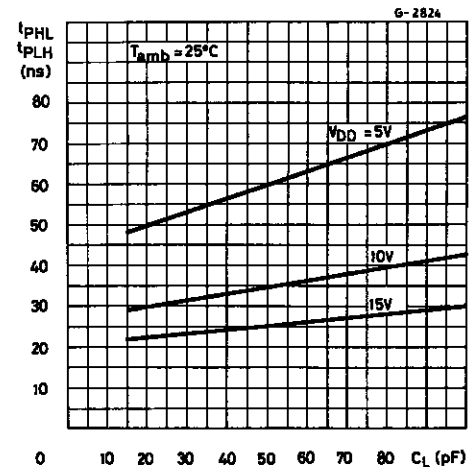
Typical Output High (source) Current Characteristics.



Typical Transition Time vs. Load Capacitance.

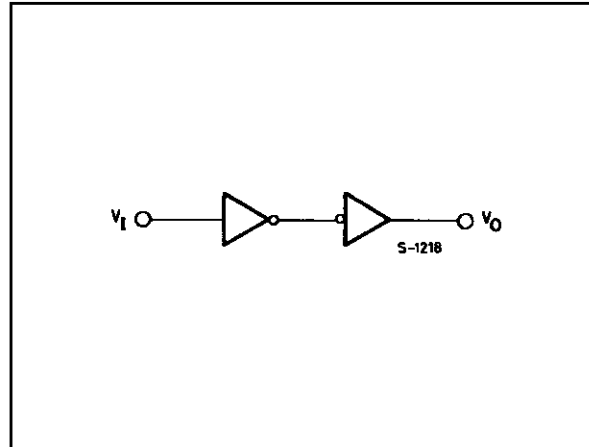
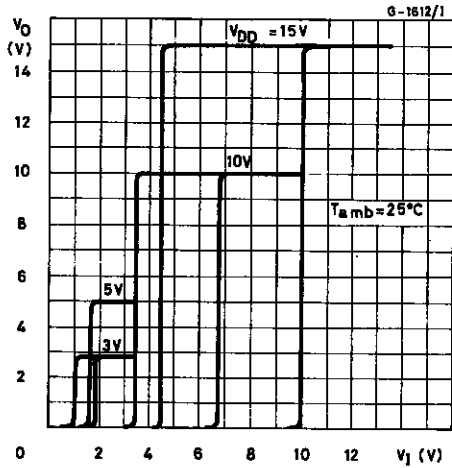


Typical Propagation Delay Time vs. Load Capacitance.

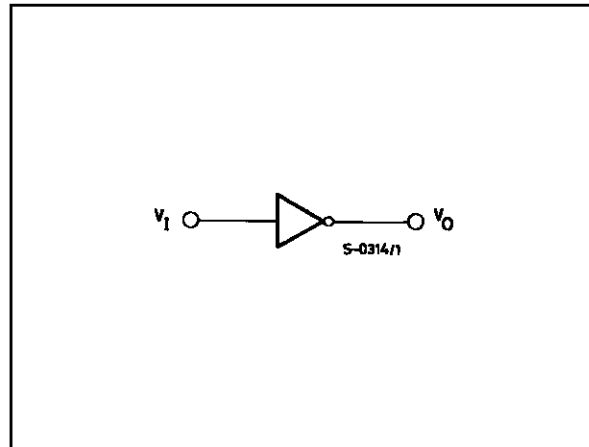
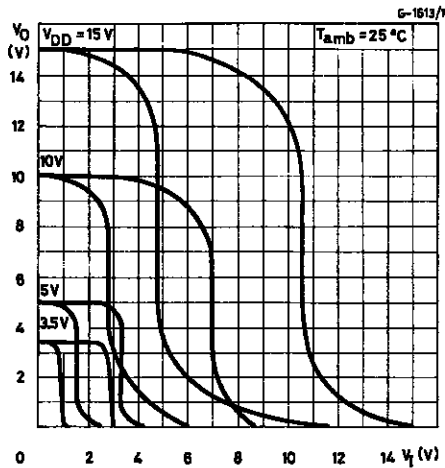


HCC/HCF4041UB

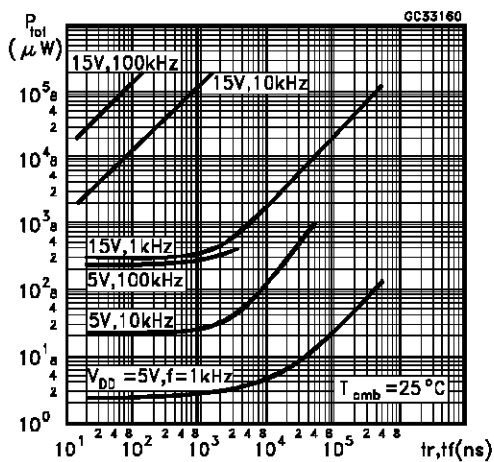
Minimum and Maximum Transfer Characteristics-true Output-and Test Circuit.



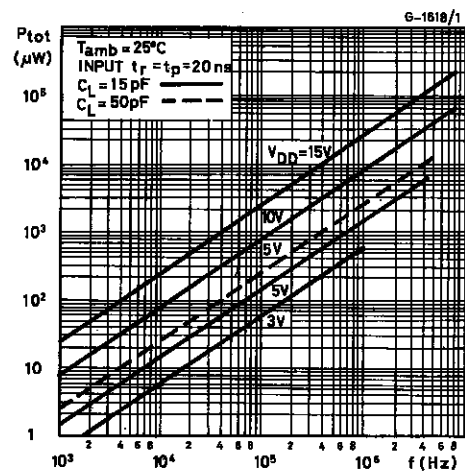
Minimum Maximum Transfer Characteristics Complement Output-and Test Circuit.



Typical Power Dissipation vs. Input Rise and Fall Time per Output Pair.

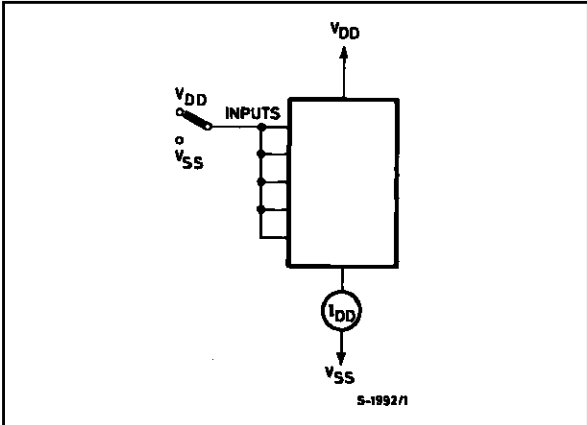


Typical Power Dissipation vs. Frequency per Output Pair.

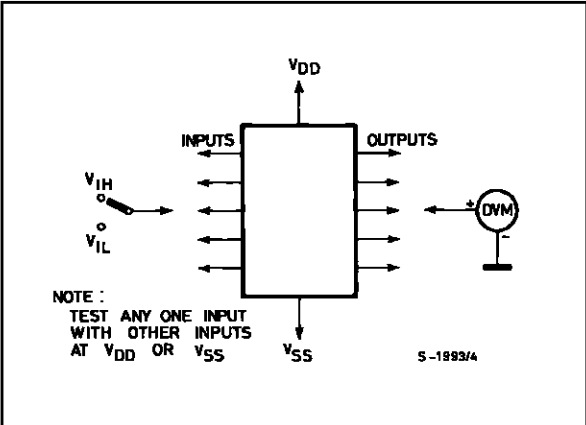


TEST CIRCUITS

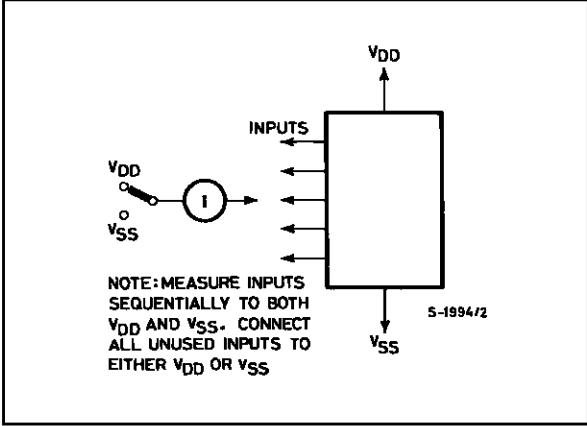
Quiescent Device Current.



Noise Immunity.

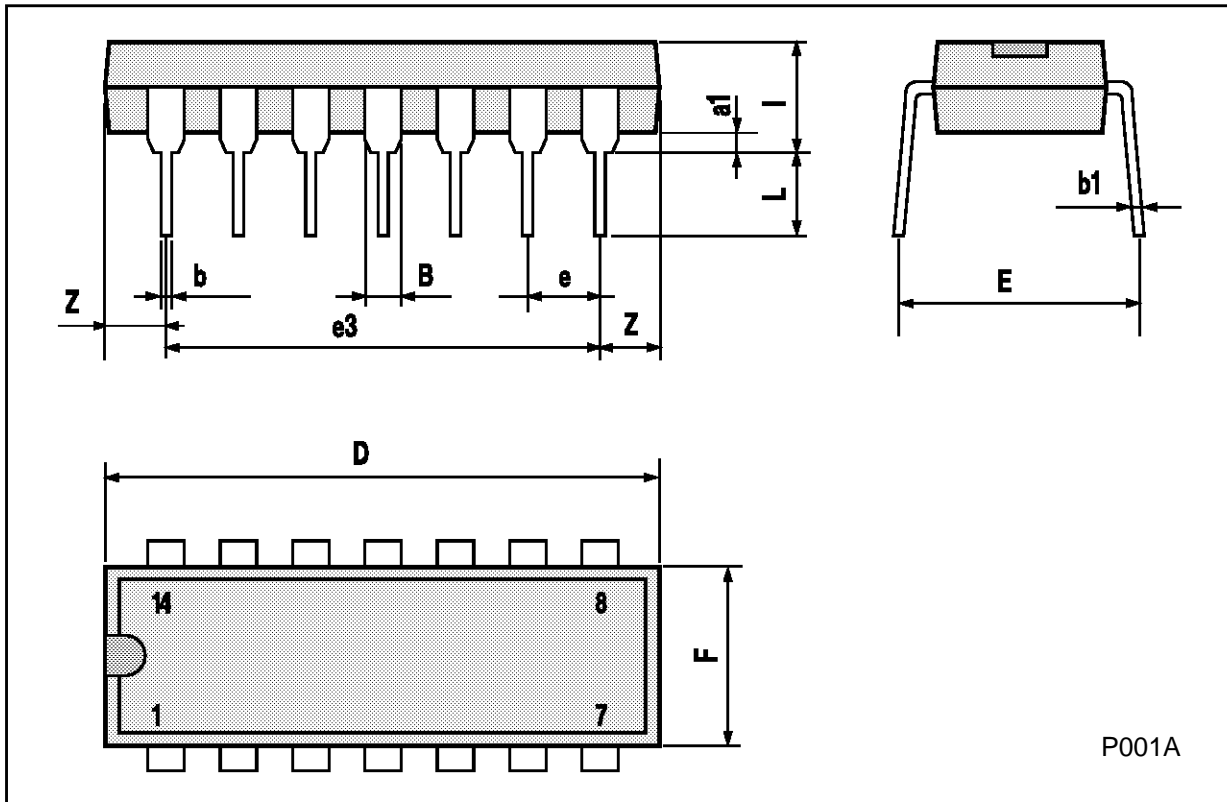


Input Leakage Current.



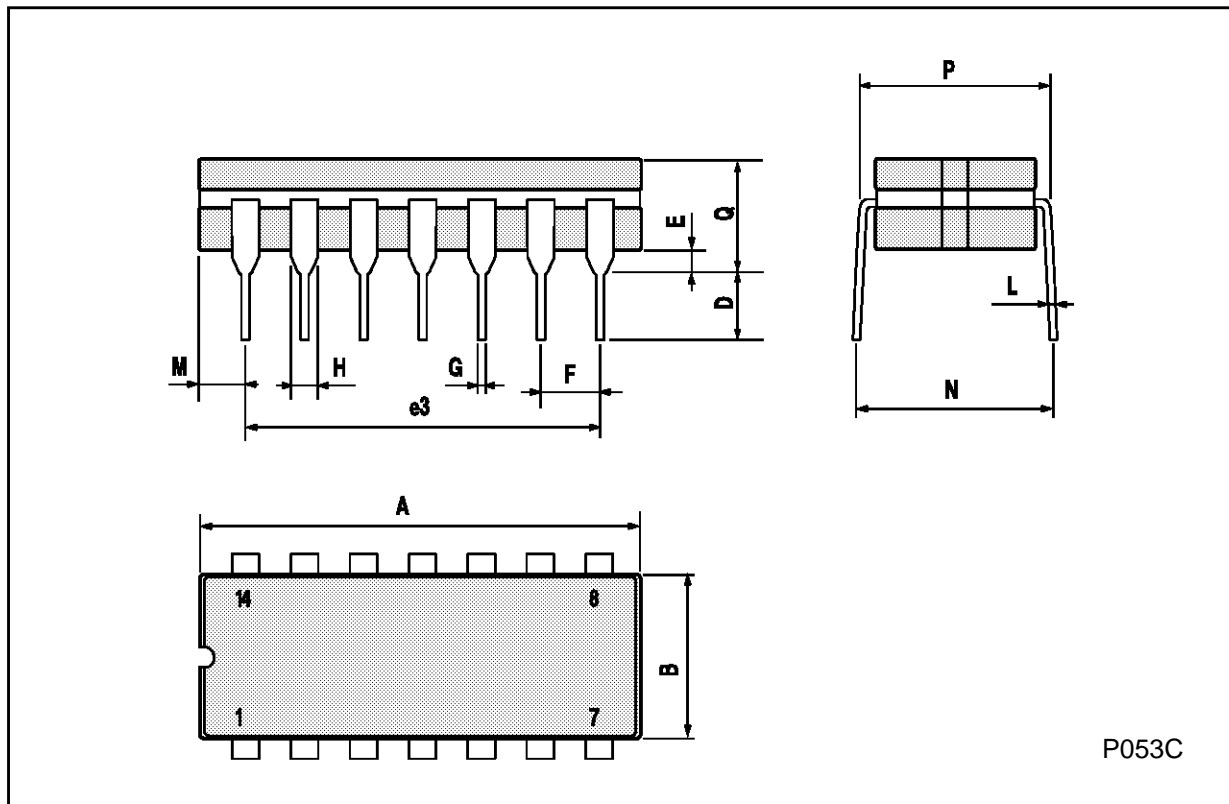
Plastic DIP14 MECHANICAL DATA

| 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 |



Ceramic DIP14/1 MECHANICAL DATA

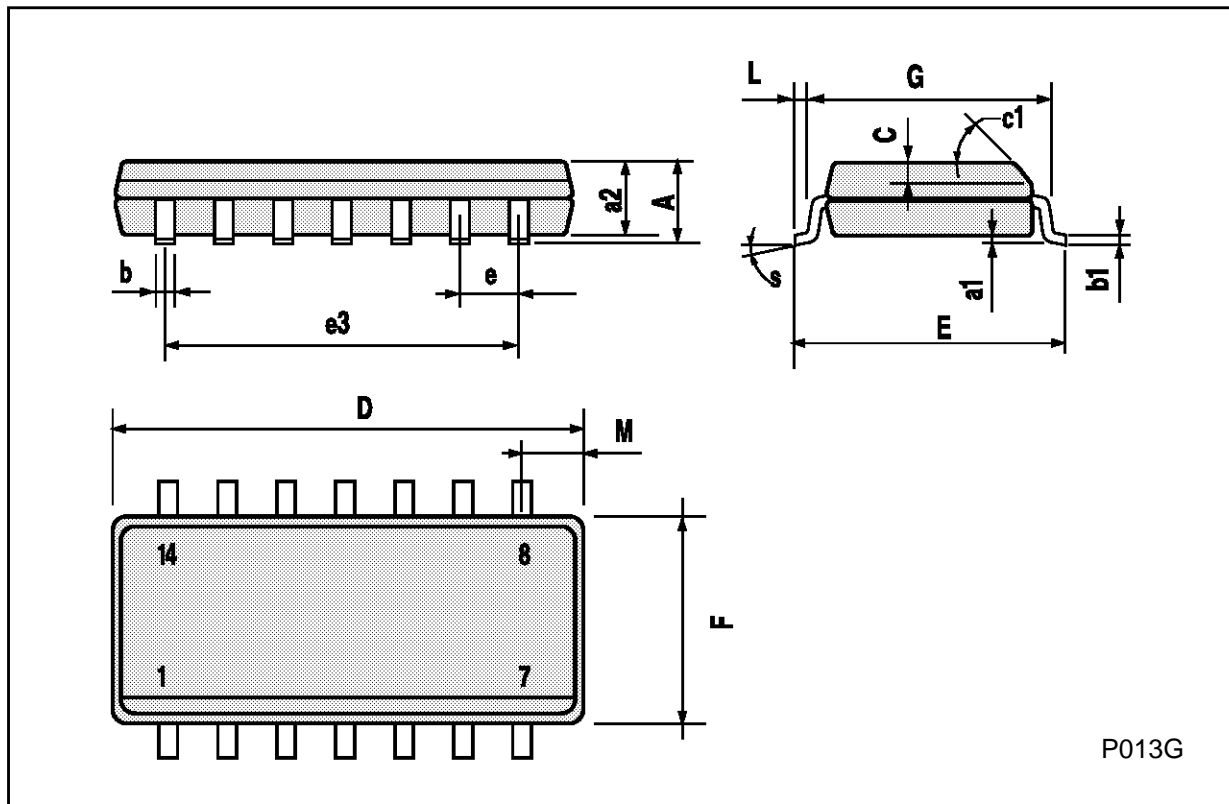
| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 20 | | | 0.787 |
| B | | | 7.0 | | | 0.276 |
| D | | 3.3 | | | 0.130 | |
| E | 0.38 | | | 0.015 | | |
| e3 | | 15.24 | | | 0.600 | |
| F | 2.29 | | 2.79 | 0.090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