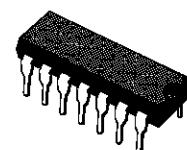
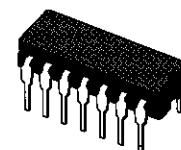


## HEX SCHMITT TRIGGERS

- SCHMITT-TRIGGER ACTION WITH NO EXTERNAL COMPONENTS
- HYSTERESIS VOLTAGE (TYP.) 0.9V AT  $V_{DD} = 5V$ , 2.3V AT  $V_{DD} = 10V$  AND 3.5V AT  $V_{DD} = 15V$
- NOISE IMMUNITY GREATER THAN 50%
- NO LIMIT ON INPUT RISE AND FALL TIME
- LOW  $V_{DD}$  TO  $V_{SS}$  CURRENT DURING SLOW INPUT RAMP
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED AT 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"



**EY**  
(Plastic Package)



**F**  
(Ceramic Frit Seal Package)



**M1**  
(Micro Package)



**C1**  
(Plastic Chip Carrier)

### ORDER CODES :

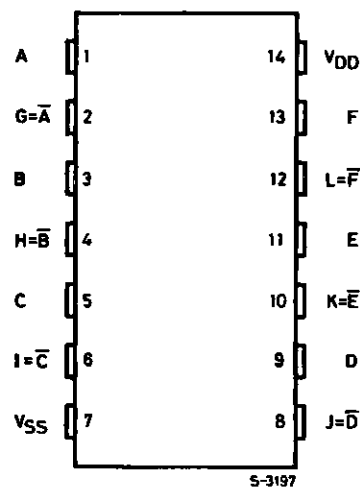
|             |             |
|-------------|-------------|
| HCC40106BF  | HCF40106BM1 |
| HCF40106BEY | HCF40106BC1 |

### DESCRIPTION

The **HCC40106B** (extended temperature range) and **HCF40106B** (intermediate temperature range) are monolithic integrated circuits, available in 14-lead dual in-line plastic or ceramic package and plastic micropackage.

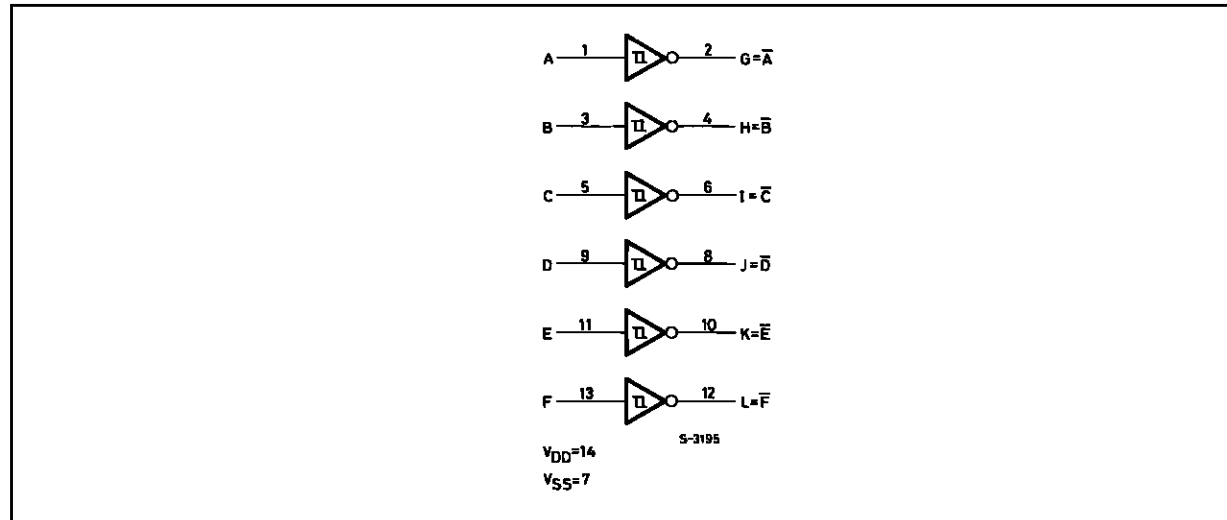
The **HCC/HCF40106B** consists of six Schmitt-trigger circuits. Each circuit functions as an inverter with Schmitt-trigger action on the input. The trigger switches at different points for positive and negative-going signals. The difference between the positive-going voltage ( $V_P$ ) and the negative-going voltage ( $V_N$ ) is defined as hysteresis voltage ( $V_H$ ).

### PIN CONNECTIONS



## HCC/HCF40106B

### FUNCTIONAL DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

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

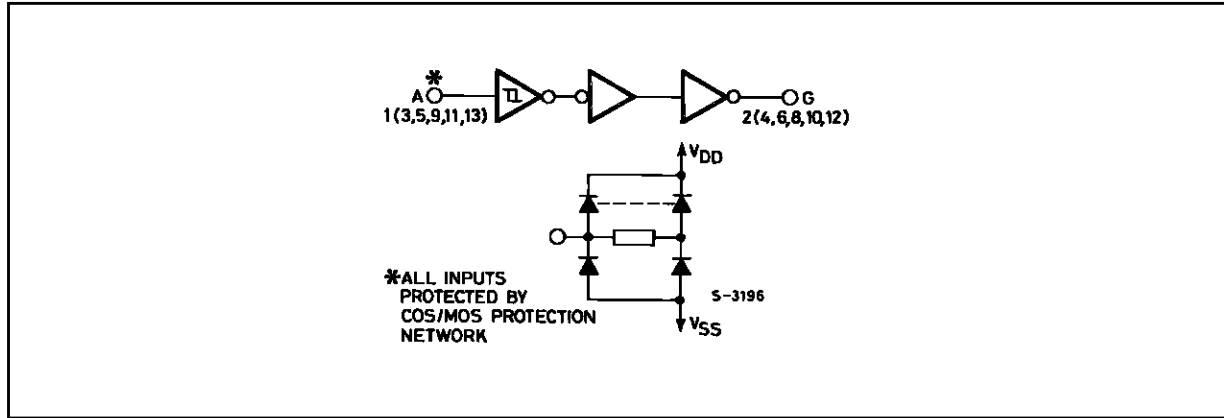
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure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

\* All voltage values are referred to V<sub>SS</sub> pin voltage.

### RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter                                                    | Value                         | Unit     |
|-----------------|--------------------------------------------------------------|-------------------------------|----------|
| V <sub>DD</sub> | Supply Voltage : <b>HCC</b> Types<br><b>HCF</b> Types        | 3 to 18<br>3 to 15            | V<br>V   |
| V <sub>I</sub>  | Input Voltage                                                | 0 to V <sub>DD</sub>          | V        |
| T <sub>op</sub> | Operating Temperature : <b>HCC</b> Types<br><b>HCF</b> Types | – 55 to + 125<br>– 40 to + 85 | °C<br>°C |

## LOGIC DIAGRAM



## STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

| Symbol          | Parameter                          |           | Test Conditions       |                       |                          |                        | Value              |       |      |      |       |                     |      | Unit |
|-----------------|------------------------------------|-----------|-----------------------|-----------------------|--------------------------|------------------------|--------------------|-------|------|------|-------|---------------------|------|------|
|                 |                                    |           | V <sub>I</sub><br>(V) | V <sub>O</sub><br>(V) | I <sub>O</sub>  <br>(μA) | V <sub>DD</sub><br>(V) | T <sub>Low</sub> * |       | 25°C |      |       | T <sub>High</sub> * |      |      |
|                 |                                    |           |                       |                       |                          |                        | Min.               | Max.  | Min. | Typ. | Max.  | Min.                | Max. |      |
| I <sub>L</sub>  | Quiescent Current                  | HCC Types | 0/ 5                  |                       |                          | 5                      |                    | 1     |      | 0.02 | 1     |                     | 30   | μA   |
|                 |                                    |           | 0/10                  |                       |                          | 10                     |                    | 2     |      | 0.02 | 2     |                     | 60   |      |
|                 |                                    |           | 0/15                  |                       |                          | 15                     |                    | 4     |      | 0.02 | 4     |                     | 120  |      |
|                 |                                    |           | 0/20                  |                       |                          | 20                     |                    | 20    |      | 0.04 | 20    |                     | 600  |      |
|                 |                                    | HCF Types | 0/ 5                  |                       |                          | 5                      |                    | 4     |      | 0.02 | 4     |                     | 30   |      |
|                 |                                    |           | 0/10                  |                       |                          | 10                     |                    | 8     |      | 0.02 | 8     |                     | 60   |      |
|                 |                                    |           | 0/15                  |                       |                          | 15                     |                    | 16    |      | 0.02 | 16    |                     | 120  |      |
| V <sub>OH</sub> | 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 <sub>OL</sub> | Output Low Voltage                 | 5/10      |                       | < 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 <sub>P</sub>  | Positive Trigger Threshold Voltage |           |                       |                       | 5                        | 2.2                    | 3.6                | 2.2   | 2.9  | 3.6  | 2.2   | 3.6                 | V    |      |
|                 |                                    |           |                       |                       | 10                       | 4.6                    | 7.1                | 4.6   | 5.9  | 7.1  | 4.6   | 7.1                 |      |      |
|                 |                                    |           |                       |                       | 15                       | 6.8                    | 10.8               | 6.8   | 8.8  | 10.8 | 6.8   | 10.8                |      |      |
| V <sub>N</sub>  | Negative Trigger Threshold Voltage |           |                       |                       | 5                        | 0.9                    | 2.8                | 0.9   | 1.9  | 2.8  | 0.9   | 2.8                 | V    |      |
|                 |                                    |           |                       |                       | 10                       | 2.5                    | 5.2                | 2.5   | 3.9  | 5.2  | 2.5   | 5.2                 |      |      |
|                 |                                    |           |                       |                       | 15                       | 4                      | 7.4                | 4     | 5.8  | 7.4  | 4     | 7.4                 |      |      |
| V <sub>H</sub>  | Hysteresis Voltage                 |           |                       |                       | 5                        | 0.3                    | 1.6                | 0.3   | 0.9  | 1.6  | 0.3   | 1.6                 | V    |      |
|                 |                                    |           |                       |                       | 10                       | 1.2                    | 3.4                | 1.2   | 2.3  | 3.4  | 1.2   | 3.4                 |      |      |
|                 |                                    |           |                       |                       | 15                       | 1.6                    | 5                  | 1.6   | 3.5  | 5    | 1.6   |                     |      |      |

\*  $T_{Low}$  = - 55°C for HCC device : - 40°C for HCF device.\*  $T_{High}$  = + 125°C for HCC device : + 85°C for HCF device.

## STATIC ELECTRICAL CHARACTERISTICS (continued)

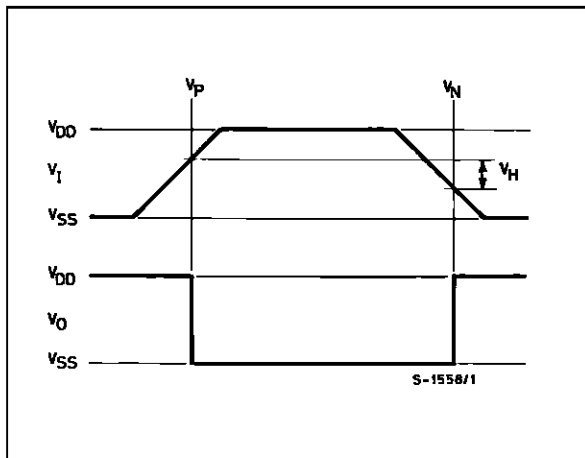
| Symbol                                          | Parameter             |           | Test Conditions       |                       |                          |                        | Value                         |      |                   |       |      |                                |      | Unit |
|-------------------------------------------------|-----------------------|-----------|-----------------------|-----------------------|--------------------------|------------------------|-------------------------------|------|-------------------|-------|------|--------------------------------|------|------|
|                                                 |                       |           | V <sub>I</sub><br>(V) | V <sub>O</sub><br>(V) | I <sub>O</sub>  <br>(μA) | V <sub>DD</sub><br>(V) | T <sub>Low</sub> <sup>*</sup> |      | 25°C              |       |      | T <sub>High</sub> <sup>*</sup> |      |      |
|                                                 |                       |           |                       |                       |                          |                        | Min.                          | Max. | Min.              | Typ.  | Max. | Min.                           | Max. |      |
| I <sub>OH</sub>                                 | 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 <sub>OL</sub>                                 | 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                  | 1.6                   |                          | 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   |      | 2.9                            |      |      |
| I <sub>IH</sub> , I <sub>IL</sub> <sup>**</sup> | Input Leakage Current | HCC Types | 0/18                  | Any Input             | 18                       |                        | ± 0.1                         |      | ±10 <sup>−5</sup> | ± 0.1 |      | ± 1                            | μA   |      |
|                                                 |                       | HCF Types | 0/15                  |                       | 15                       |                        | ± 0.3                         |      | ±10 <sup>−5</sup> | ± 0.3 |      | ± 1                            |      |      |
| C <sub>I</sub>                                  | Input Capacitance     |           |                       | Any Input             |                          |                        |                               |      | 5                 | 7.5   |      |                                | p    |      |

\*  $T_{Low}$  = - 55°C for HCC device : - 40°C for HCF device.\*  $T_{High}$  = + 125°C for HCC device : + 85°C for HCF device.

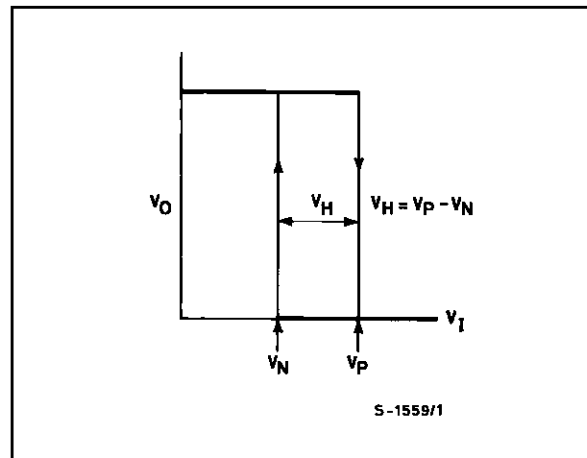
**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^\circ C$ ,  $C_L = 50pF$ ,  $R_L = 200k\Omega$ , typical temperature coefficient for all  $V_{DD}$  values is 0.3%/°C, all input rise and fall time = 20ns)

| Symbol             | Parameter              | Test Conditions |              | Value |      |      | Unit |
|--------------------|------------------------|-----------------|--------------|-------|------|------|------|
|                    |                        |                 | $V_{DD}$ (V) | Min.  | Typ. | Max. |      |
| $t_{PLH}, t_{PHL}$ | Propagation Delay Time |                 | 5            |       | 140  | 280  | ns   |
|                    |                        |                 | 10           |       | 70   | 140  |      |
|                    |                        |                 | 15           |       | 60   | 120  |      |
| $t_{THL}, t_{TLH}$ | Transition Time        |                 | 5            |       | 100  | 200  | ns   |
|                    |                        |                 | 10           |       | 50   | 100  |      |
|                    |                        |                 | 15           |       | 40   | 80   |      |

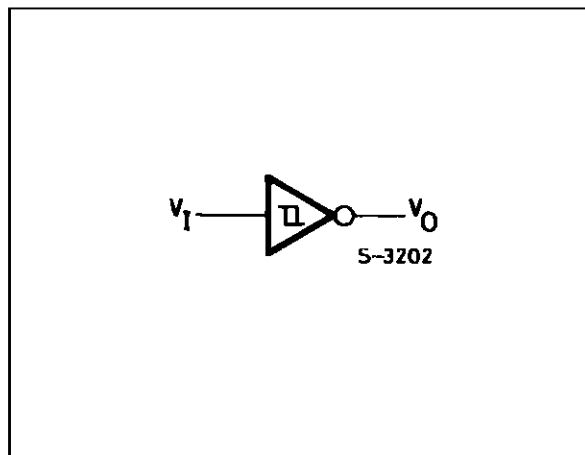
## HYSTERESIS DEFINITION, CHARACTERISTICS AND TEST SETUP

(a) Definition of  $V_P$ ,  $V_N$  and  $V_H$ .

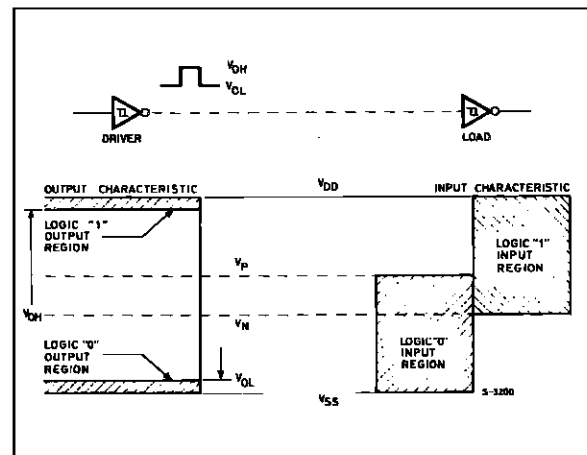
(b) Transfer Characteristic of 1 of 6 gates.



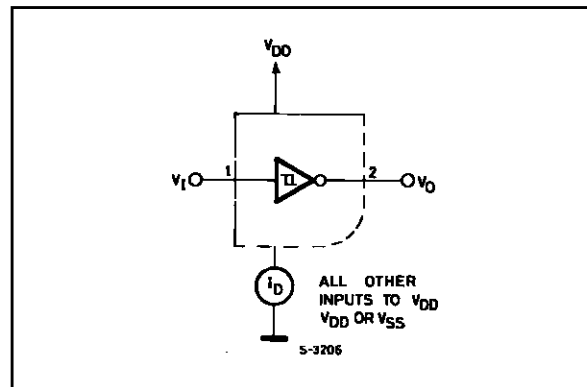
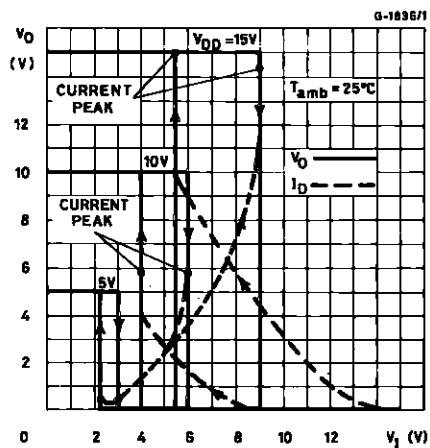
(c) Test Setup.



Input and Output Characteristics.

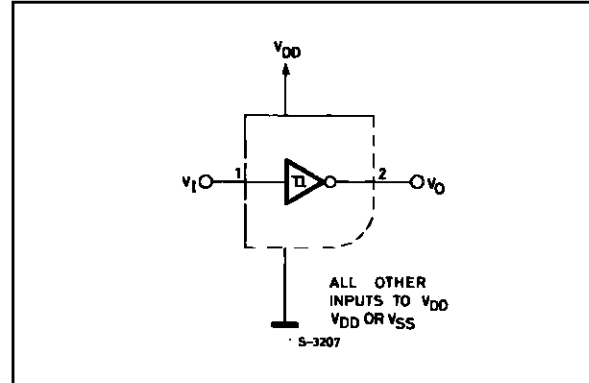
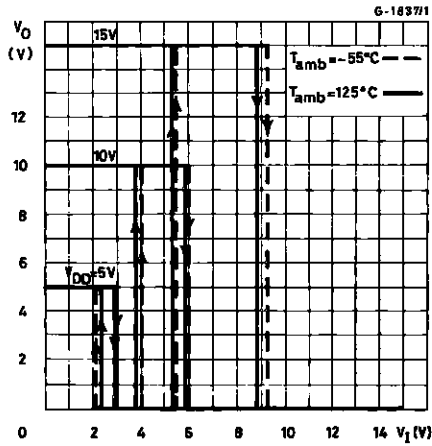


Typical Current Voltage Transfer Characteristics, and Test Circuit.

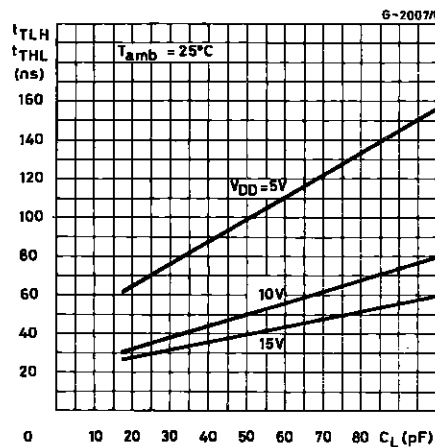


# HYSTERESIS DEFINITION, CHARACTERISTICS AND TEST SETUP

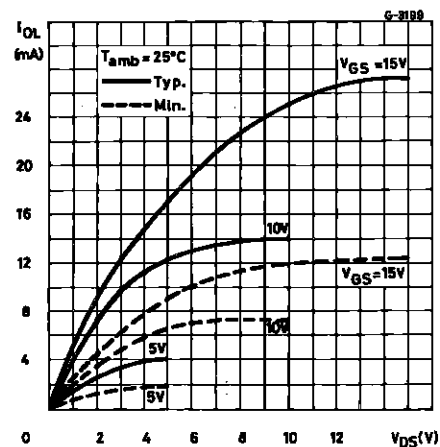
Typical Voltage Transfer Characteristics vs. Temperature, and Test Circuit.



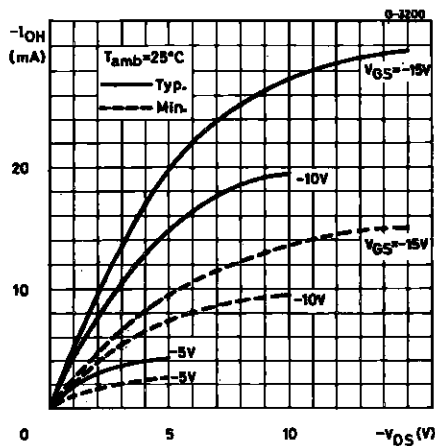
Typical Transition Time vs. Load Capacitance.



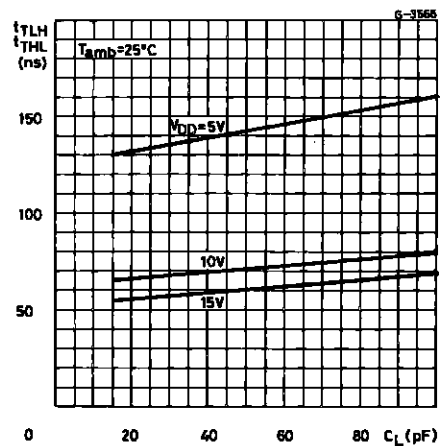
Output Low (sink) Current Characteristics.



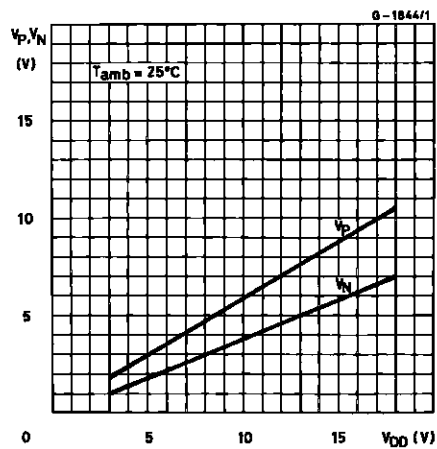
Output High (source) Current Characteristics.



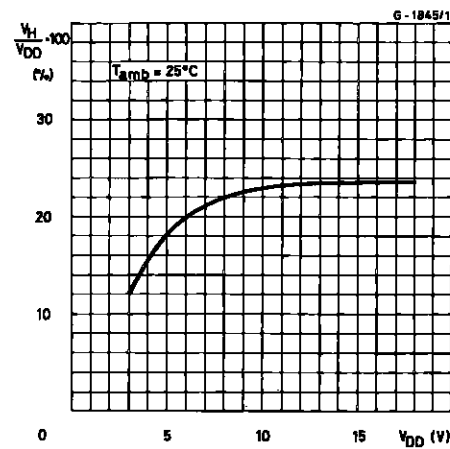
Typical Propagation Delay Time vs. Load Capacitance.



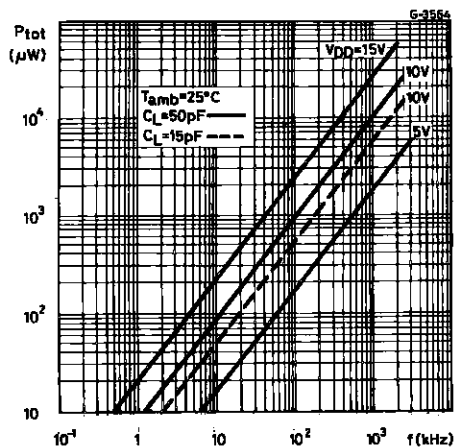
Typical Trigger Threshold Voltage vs. Supply Voltage.



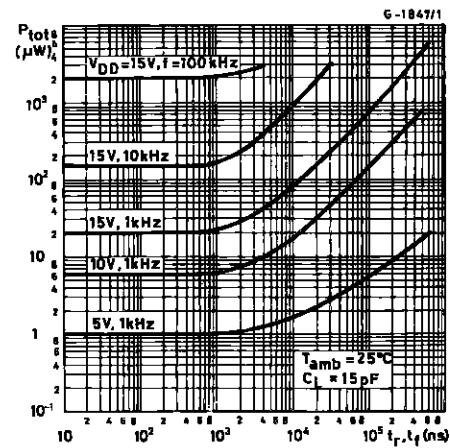
Typical per Cent Hysteresis vs. Supply Voltage.



Typical Power Dissipation per Trigger vs. Input Frequency.

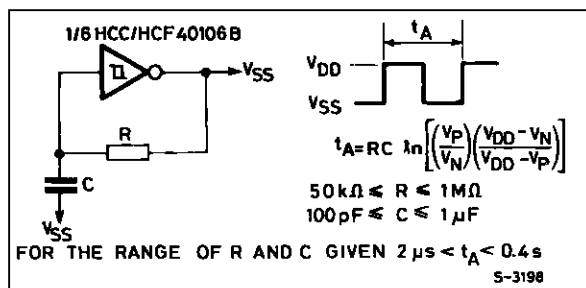


Typical Power Dissipation per Trigger vs. Input Frequency.

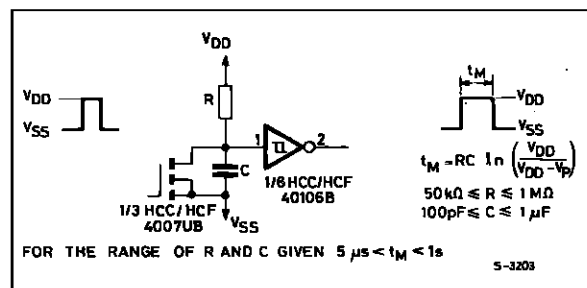


## TYPICAL APPLICATIONS

## ASTABLE MULTIVIBRATOR.

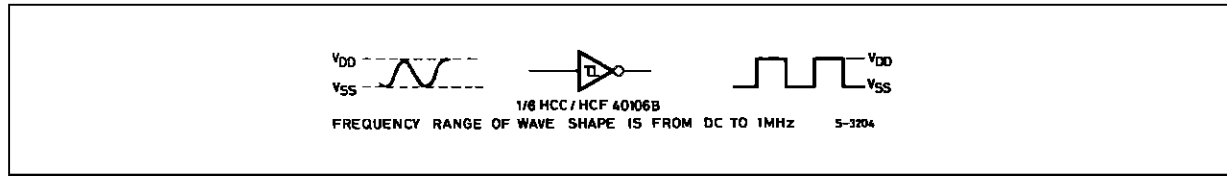


## MONOSTABLE MULTIVIBRATOR.



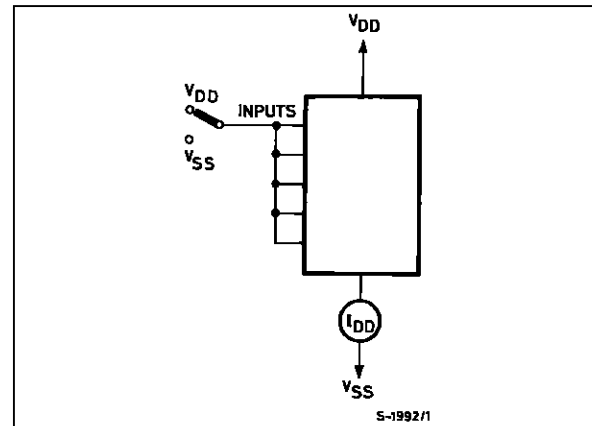
## TYPICAL APPLICATIONS (continued)

### WAVE SHAPER.

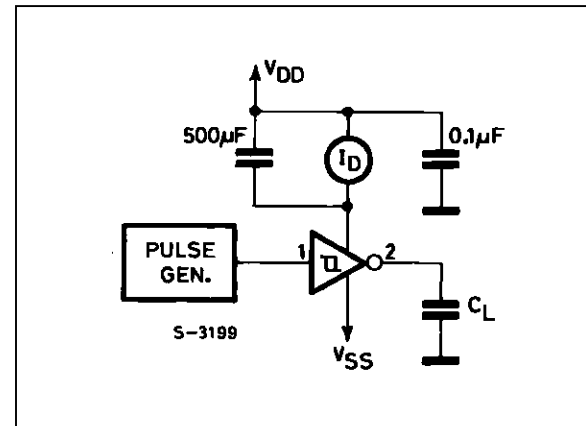


## TEST CIRCUITS

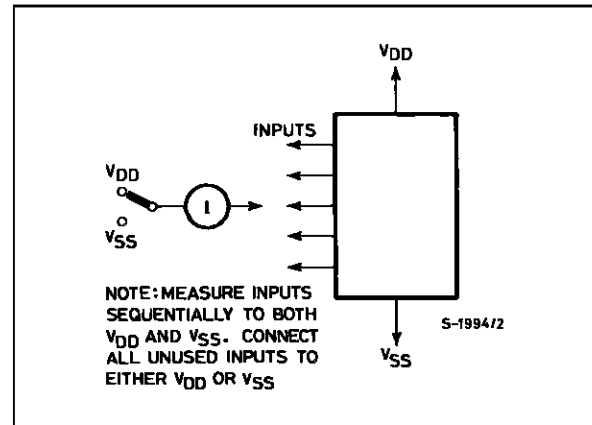
### Quiescent Device Current.



### Dynamic Power Dissipation.

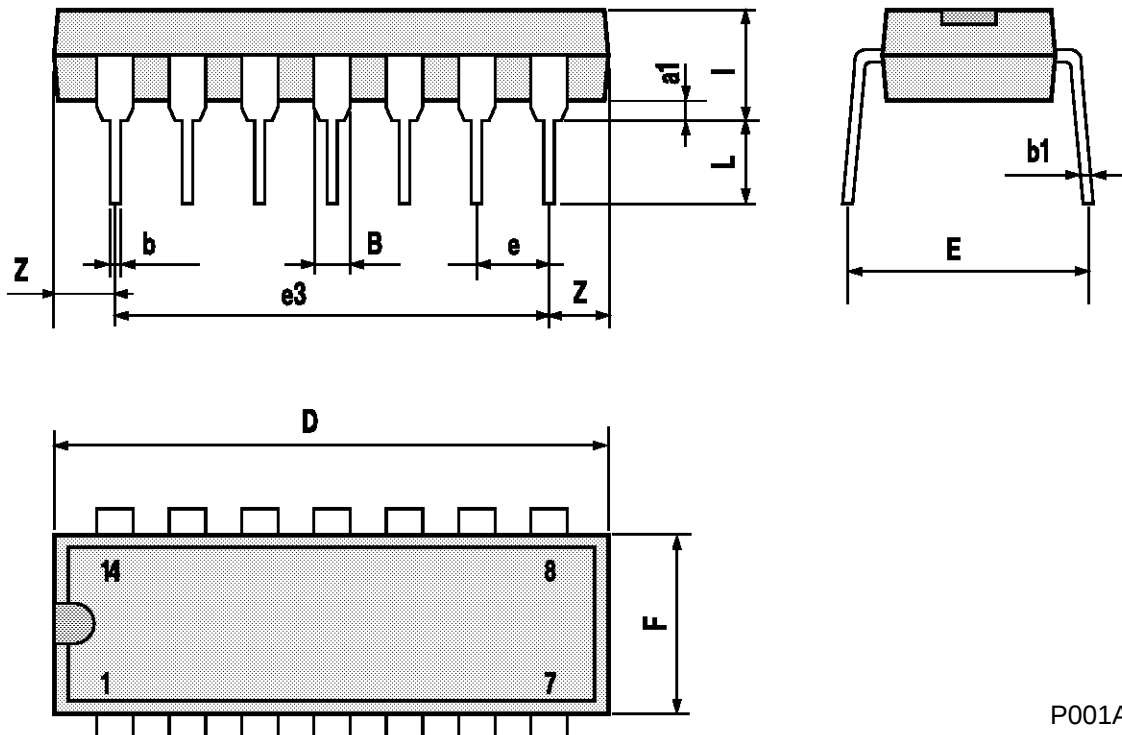


### Input Current .



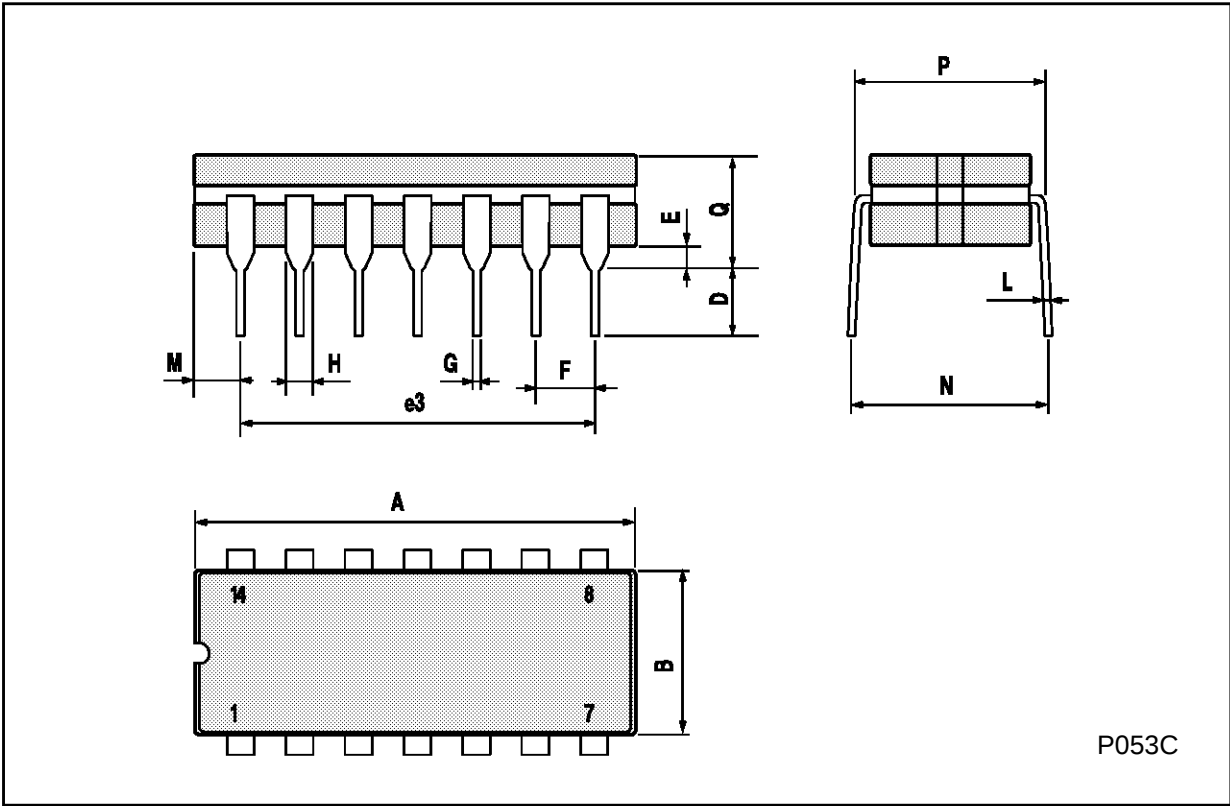
## Plastic DIP14 MECHANICAL DATA

| 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 |



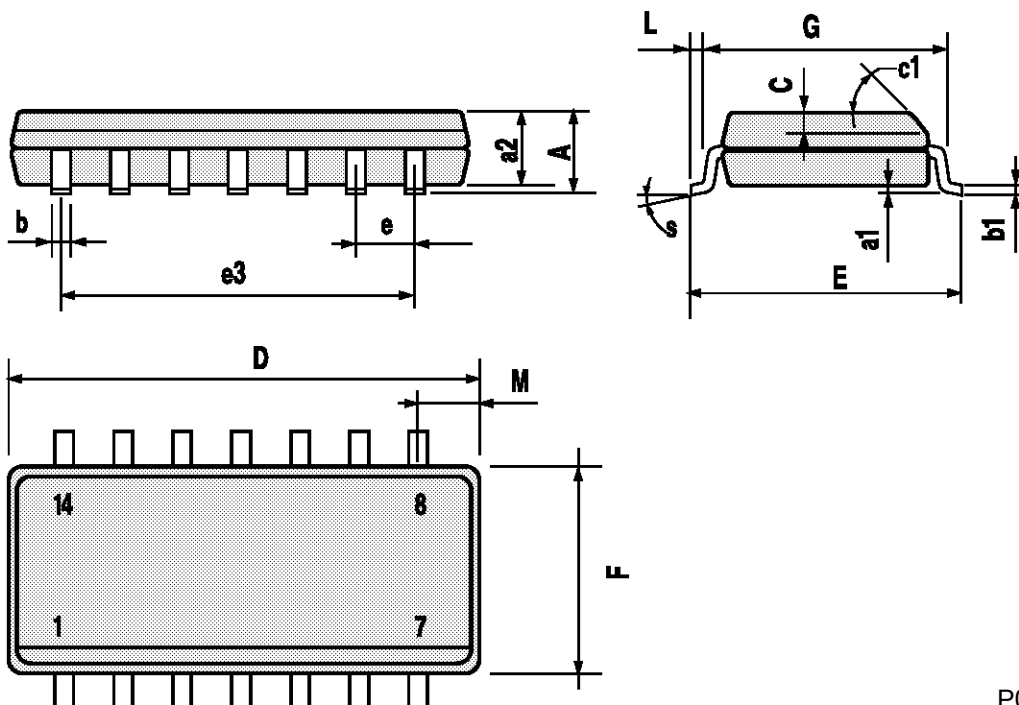
Ceramic DIP14/1 MECHANICAL DATA

| 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 |       |



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