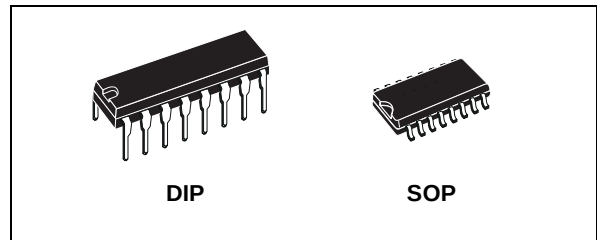


## PRESETTABLE DIVIDE-BY-N COUNTER

- MEDIUM SPEED OPERATION 10 MHz (Typ.) at  $V_{DD} - V_{SS} = 10V$
- FULLY STATIC OPERATION
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT  
 $I_l = 100nA$  (MAX) AT  $V_{DD} = 18V$   $T_A = 25^\circ C$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



### ORDER CODES

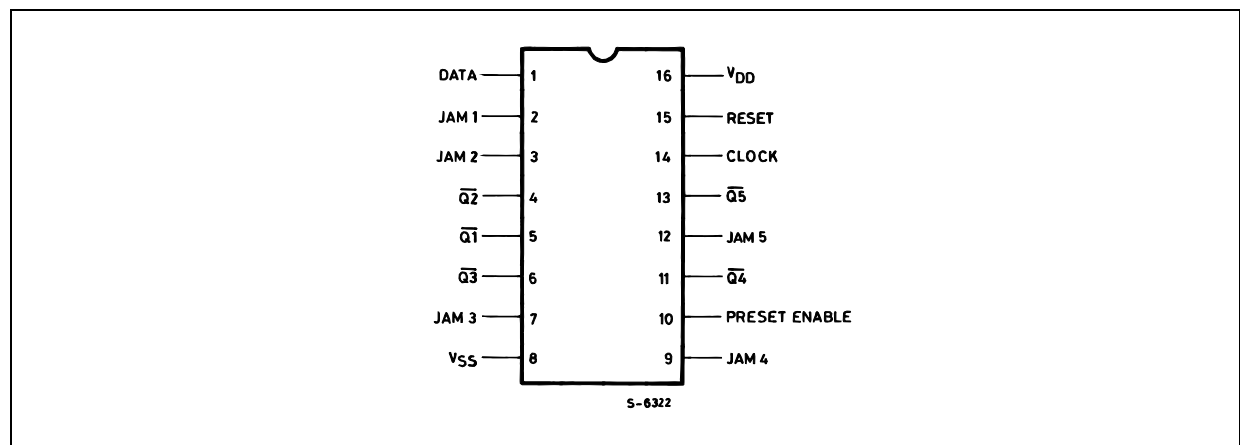
| PACKAGE | TUBE       | T & R         |
|---------|------------|---------------|
| DIP     | HCF4018BEY |               |
| SOP     | HCF4018BM1 | HCF4018M013TR |

### DESCRIPTION

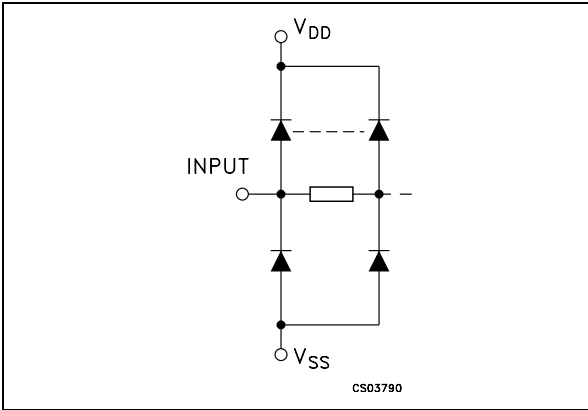
The HCF4018B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. The HCF4018B consist of 5 Johnson counter stages, buffered Q outputs from each stage, and counter preset control gating. CLOCK, RESET, DATA, PRESET ENABLE, and 5 individual JAM inputs are provided. Divide by 10, 8, 6, 4 or 2 counter configuration can be implemented by feeding the  $\overline{Q_5}$ ,  $\overline{Q_4}$ ,  $\overline{Q_3}$ ,  $\overline{Q_2}$ ,  $\overline{Q_1}$  signals, respectively, back to the data input. Divide-by-9, 7, 5, or 3 counter configurations can be implemented by the use of a HCF4011B gate

package to properly gate the feedback connection to the DATA input. Divide-by-functions greater than 10 can be achieved by use of multiple HCF4018B units. The counter is advanced one count at the positive clock signal transition. Schmitt trigger action on the clock line permits unlimited clock rise and fall times. A high RESET signal clears the counter to an all-zero condition. A high PRESENT-ENABLE signal allows information on the JAM inputs to preset the counter. Anti-lock gating is provided to assure the proper counting sequence.

### PIN CONNECTION



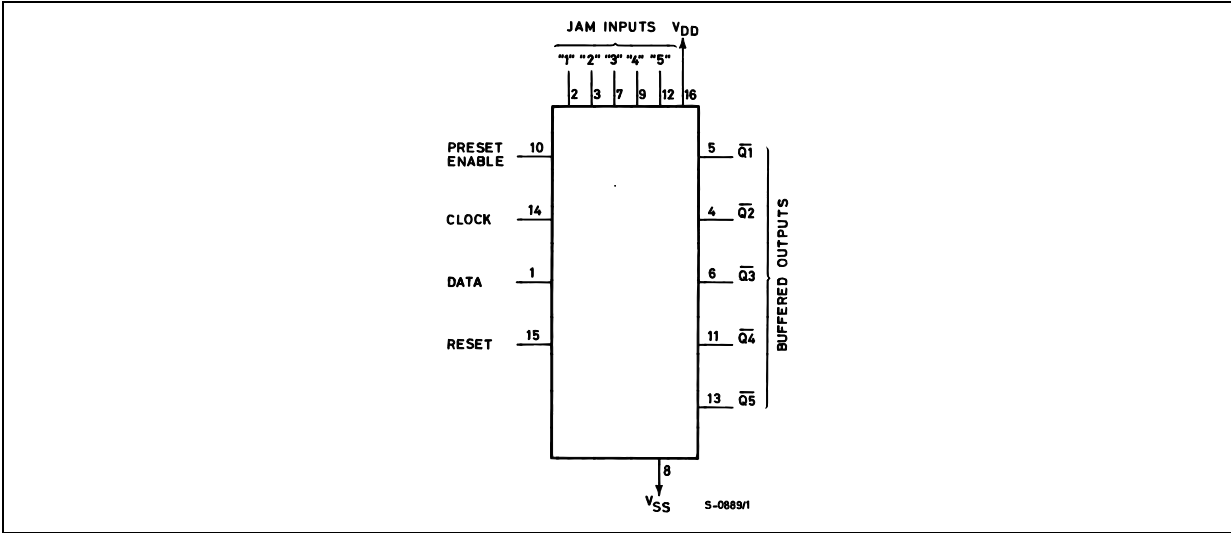
INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No          | SYMBOL                             | NAME AND FUNCTION       |
|-----------------|------------------------------------|-------------------------|
| 2, 3, 7, 9, 12  | JAM1 to JAM5                       | Jam Inputs              |
| 1               | DATA                               | Data Input              |
| 4, 5, 6, 11, 13 | $\overline{Q1}$ to $\overline{Q5}$ | Buffered Outputs        |
| 15              | RESET                              | Reset Input             |
| 14              | CLOCK                              | Clock Input             |
| 10              | PRESET ENABLE                      | Preset Enable Input     |
| 8               | $V_{SS}$                           | Negative Supply Voltage |
| 16              | $V_{DD}$                           | Positive Supply Voltage |

FUNCTIONAL DIAGRAM





**ABSOLUTE MAXIMUM RATINGS**

| Symbol    | Parameter                               | Value                  | Unit |
|-----------|-----------------------------------------|------------------------|------|
| $V_{DD}$  | Supply Voltage                          | -0.5 to +22            | V    |
| $V_I$     | DC Input Voltage                        | -0.5 to $V_{DD} + 0.5$ | V    |
| $I_I$     | DC Input Current                        | $\pm 10$               | mA   |
| $P_D$     | Power Dissipation per Package           | 200                    | mW   |
|           | Power Dissipation per Output Transistor | 100                    | mW   |
| $T_{op}$  | Operating Temperature                   | -55 to +125            | °C   |
| $T_{stg}$ | Storage Temperature                     | -65 to +150            | °C   |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

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

**RECOMMENDED OPERATING CONDITIONS**

| Symbol   | Parameter             | Value         | Unit |
|----------|-----------------------|---------------|------|
| $V_{DD}$ | Supply Voltage        | 3 to 20       | V    |
| $V_I$    | Input Voltage         | 0 to $V_{DD}$ | V    |
| $T_{op}$ | Operating Temperature | -55 to 125    | °C   |

## DC SPECIFICATIONS

| Symbol          | Parameter                 | Test Condition        |                       |                          |                        | 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>A</sub> = 25°C |                   |      | -40 to 85°C |      | -55 to 125°C |      |    |      |
|                 |                           |                       |                       |                          |                        | Min.                  | Typ.              | Max. | Min.        | Max. | Min.         | Max. |    |      |
| I <sub>L</sub>  | Quiescent Current         | 0/5                   |                       |                          | 5                      |                       | 0.04              | 5    |             | 150  |              | 150  | μA |      |
|                 |                           | 0/10                  |                       |                          | 10                     |                       | 0.04              | 10   |             | 300  |              | 300  |    |      |
|                 |                           | 0/15                  |                       |                          | 15                     |                       | 0.04              | 20   |             | 600  |              | 600  |    |      |
|                 |                           | 0/20                  |                       |                          | 20                     |                       | 0.08              | 100  |             | 3000 |              | 3000 |    |      |
| V <sub>OH</sub> | High Level Output 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> | Low Level Output 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 <sub>IH</sub> | High Level Input 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           |      |    |      |
| V <sub>IL</sub> | Low Level Input 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 <sub>OH</sub> | Output Drive Current      | 0/5                   | 2.5                   | <1                       | 5                      | -1.36                 | -3.2              |      | -1.1        |      | -1.1         |      | mA |      |
|                 |                           | 0/5                   | 4.6                   | <1                       | 5                      | -0.44                 | -1                |      | -0.36       |      | -0.36        |      |    |      |
|                 |                           | 0/10                  | 9.5                   | <1                       | 10                     | -1.1                  | -2.6              |      | -0.9        |      | -0.9         |      |    |      |
|                 |                           | 0/15                  | 13.5                  | <1                       | 15                     | -3.0                  | -6.8              |      | -2.4        |      | -2.4         |      |    |      |
| I <sub>OL</sub> | Output Sink Current       | 0/5                   | 0.4                   | <1                       | 5                      | 0.44                  | 1                 |      | 0.36        |      | 0.36         |      | mA |      |
|                 |                           | 0/10                  | 0.5                   | <1                       | 10                     | 1.1                   | 2.6               |      | 0.9         |      | 0.9          |      |    |      |
|                 |                           | 0/15                  | 1.5                   | <1                       | 15                     | 3.0                   | 6.8               |      | 2.4         |      | 2.4          |      |    |      |
| I <sub>I</sub>  | Input Leakage Current     | 0/18                  | Any Input             |                          | 18                     |                       | ±10 <sup>-5</sup> | ±0.1 |             | ±1   |              | ±1   | μA |      |
| C <sub>I</sub>  | Input Capacitance         |                       | Any Input             |                          |                        |                       | 5                 | 7.5  |             |      |              |      | pF |      |

The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub>=5V, 2V min. with V<sub>DD</sub>=10V, 2.5V min. with V<sub>DD</sub>=15V

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{K}\Omega$ ,  $t_r = t_f = 20\text{ ns}$ )

| Symbol                                   | Parameter                                    | Test Condition      |  | Value (*) |      |      | Unit |
|------------------------------------------|----------------------------------------------|---------------------|--|-----------|------|------|------|
|                                          |                                              | V <sub>DD</sub> (V) |  | Min.      | Typ. | Max. |      |
| t <sub>PLH</sub> t <sub>PHL</sub>        | Propagation Delay Time                       | 5                   |  |           | 200  | 400  | ns   |
|                                          |                                              | 10                  |  |           | 90   | 180  |      |
|                                          |                                              | 15                  |  |           | 65   | 130  |      |
| t <sub>THL</sub> t <sub>TLH</sub>        | Transition Time                              | 5                   |  |           | 100  | 200  | ns   |
|                                          |                                              | 10                  |  |           | 50   | 100  |      |
|                                          |                                              | 15                  |  |           | 40   | 80   |      |
| f <sub>CL</sub>                          | Maximum Clock Input Frequency                | 5                   |  | 3         | 6    |      | MHz  |
|                                          |                                              | 10                  |  | 7         | 14   |      |      |
|                                          |                                              | 15                  |  | 8.5       | 17   |      |      |
| t <sub>W</sub>                           | Minimum Clock Pulse Width                    | 5                   |  | 160       | 80   |      | ns   |
|                                          |                                              | 10                  |  | 70        | 35   |      |      |
|                                          |                                              | 15                  |  | 50        | 25   |      |      |
| t <sub>r</sub> , t <sub>f</sub>          | Clock Input Rise or Fall Time                | 5                   |  | unlimited |      |      | μs   |
|                                          |                                              | 10                  |  |           |      |      |      |
|                                          |                                              | 15                  |  |           |      |      |      |
| t <sub>setup</sub>                       | Data Setup Time Minimum Clock Inhibit        | 5                   |  | 40        | 20   |      | ns   |
|                                          |                                              | 10                  |  | 12        | 6    |      |      |
|                                          |                                              | 15                  |  | 6         | 3    |      |      |
| t <sub>H</sub>                           | Data Input Hold-Time                         | 5                   |  | 140       | 70   |      | ns   |
|                                          |                                              | 10                  |  | 80        | 40   |      |      |
|                                          |                                              | 15                  |  | 60        | 30   |      |      |
| PRESET <sup>(1)</sup> or RESET OPERATION |                                              |                     |  |           |      |      |      |
| t <sub>PLH</sub> , t <sub>PHL</sub>      | Propagation Delay Time (reset or reset to Q) | 5                   |  |           | 275  | 550  | ns   |
|                                          |                                              | 10                  |  |           | 125  | 250  |      |
|                                          |                                              | 15                  |  |           | 90   | 180  |      |
| t <sub>W</sub>                           | Preset or Reset Pulse Width                  | 5                   |  | 160       | 80   |      | ns   |
|                                          |                                              | 10                  |  | 70        | 35   |      |      |
|                                          |                                              | 15                  |  | 50        | 25   |      |      |
| t <sub>REM</sub>                         | Preset or Reset Removal Time                 | 5                   |  | 80        | 40   |      | ns   |
|                                          |                                              | 10                  |  | 30        | 15   |      |      |
|                                          |                                              | 15                  |  | 20        | 10   |      |      |

(\*) Typical temperature coefficient for all  $V_{DD}$  value is 0.3 %/°C.

(1) At PRESET ENABLE or JAM inputs

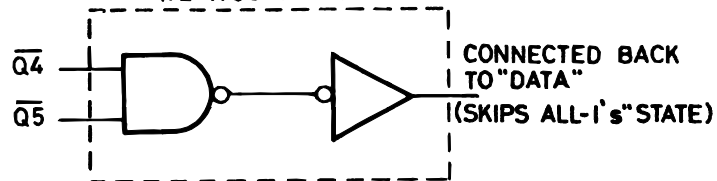
**TYPICAL APPLICATION**

External connections for divide by 10, 9, 8, 7, 6, 5, 4, 3, 2 operation

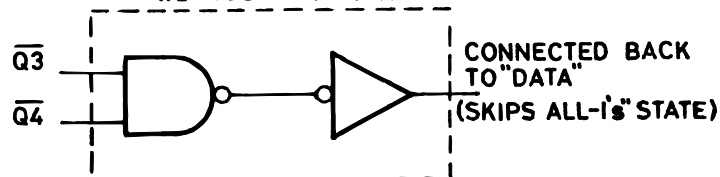
|                              |                          |                                    |
|------------------------------|--------------------------|------------------------------------|
| DIVIDE BY 10 $\overline{Q5}$ | CONNECTED BACK TO "DATA" | NO EXTERNAL COMPONENTS<br>REQUIRED |
| DIVIDE BY 8 $\overline{Q4}$  |                          |                                    |
| DIVIDE BY 6 $\overline{Q3}$  |                          |                                    |
| DIVIDE BY 4 $\overline{Q2}$  |                          |                                    |
| DIVIDE BY 2 $\overline{Q1}$  | NO CONNECTED             |                                    |

**DIVIDE BY 9**

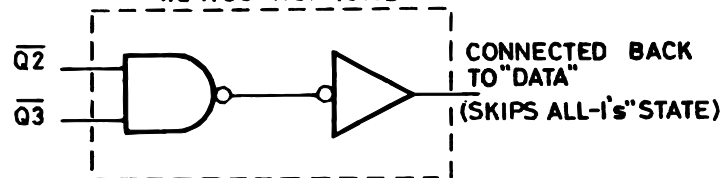
1/2 HCC - HCF 4011B

**DIVIDE BY 7**

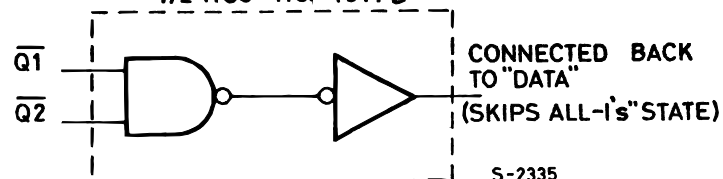
1/2 HCC - HCF 4011B

**DIVIDE BY 5**

1/2 HCC - HCF 4011B

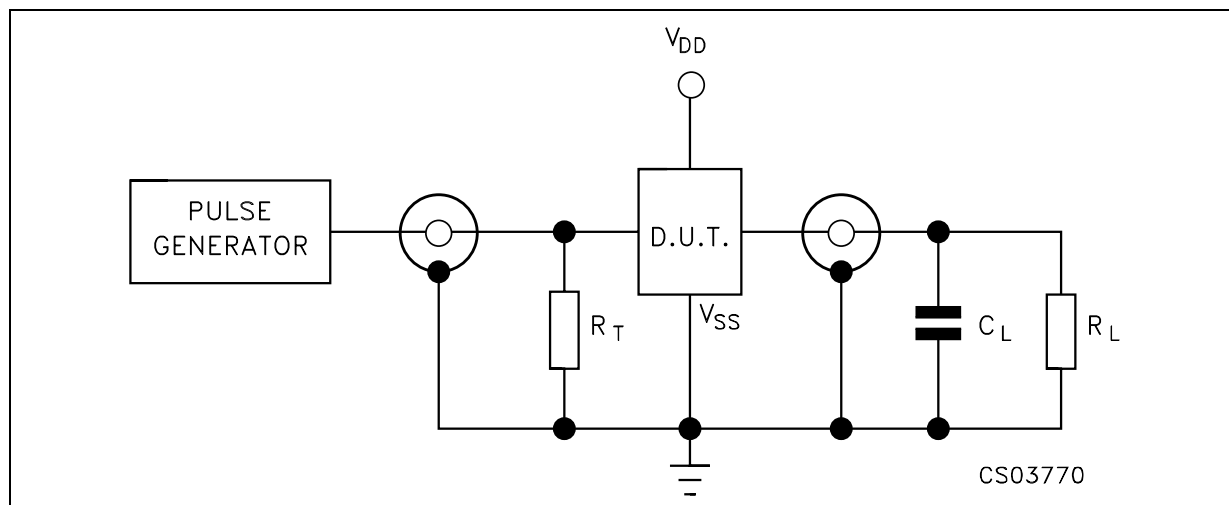
**DIVIDE BY 3**

1/2 HCC - HCF 4011 B



S-2335

## TEST CIRCUIT



$C_L$  = 50pF or equivalent (includes jig and probe capacitance)

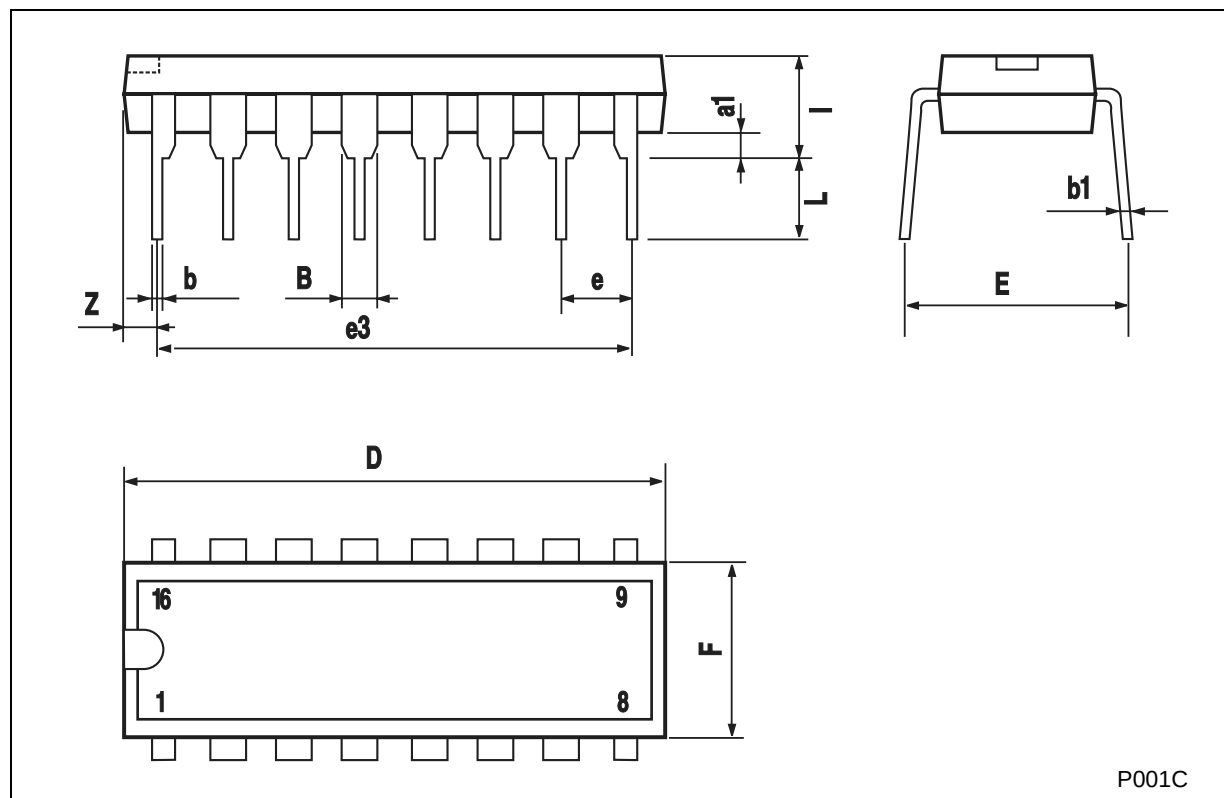
$R_L$  = 200K $\Omega$

$R_T$  =  $Z_{OUT}$  of pulse generator (typically 50 $\Omega$ )



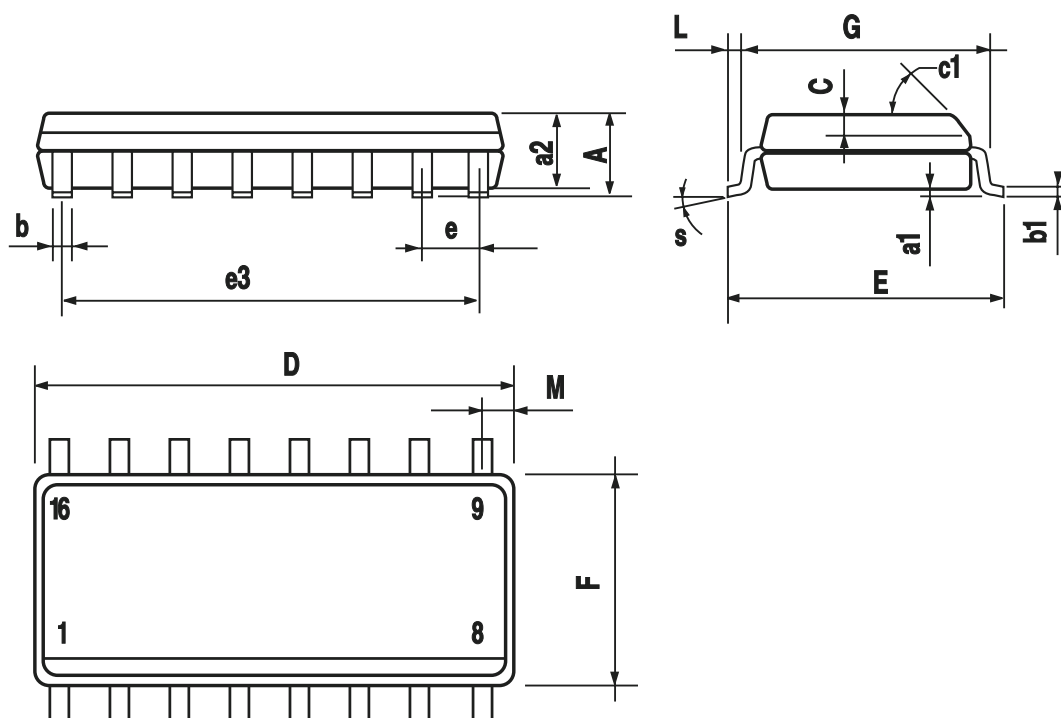
**Plastic DIP-16 (0.25) MECHANICAL DATA**

| DIM. | mm.  |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP   | MAX. | MIN.  | TYP.  | MAX.  |
| a1   | 0.51 |       |      | 0.020 |       |       |
| B    | 0.77 |       | 1.65 | 0.030 |       | 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   |      | 17.78 |      |       | 0.700 |       |
| F    |      |       | 7.1  |       |       | 0.280 |
| I    |      |       | 5.1  |       |       | 0.201 |
| L    |      | 3.3   |      |       | 0.130 |       |
| Z    |      |       | 1.27 |       |       | 0.050 |



## SO-16 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    | 9.8        |      | 10   | 0.385 |       | 0.393 |
| E    | 5.8        |      | 6.2  | 0.228 |       | 0.244 |
| e    |            | 1.27 |      |       | 0.050 |       |
| e3   |            | 8.89 |      |       | 0.350 |       |
| 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    |            |      | 0.62 |       |       | 0.024 |
| S    | 8° (max.)  |      |      |       |       |       |



PO13H

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