



# HCF4049UB

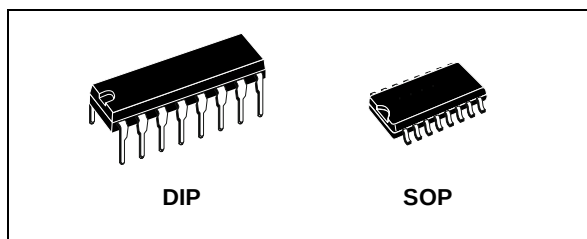
## HEX BUFFER/CONVERTER (INVERTING)

- PROPAGATION DELAY TIME:  
 $t_{PD} = 40\text{ns}$  (TYP.) at  $V_{DD} = 10\text{V}$   $C_L = 50\text{pF}$
- HIGH TO LOW LEVEL LOGIC CONVERSION
- HIGH "SINK" AND "SOURCE" CURRENT CAPABILITY
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT  
 $I_I = 100\text{nA}$  (MAX) AT  $V_{DD} = 18\text{V}$   $T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT

### DESCRIPTION

The HCF4049UB is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. It is an inverting Hex Buffer/Converter and feature logic level conversions using only one supply voltage ( $V_{DD}$ ).

The input high level signal ( $V_{IH}$ ) can exceed the  $V_{DD}$  supply voltage when these devices are used

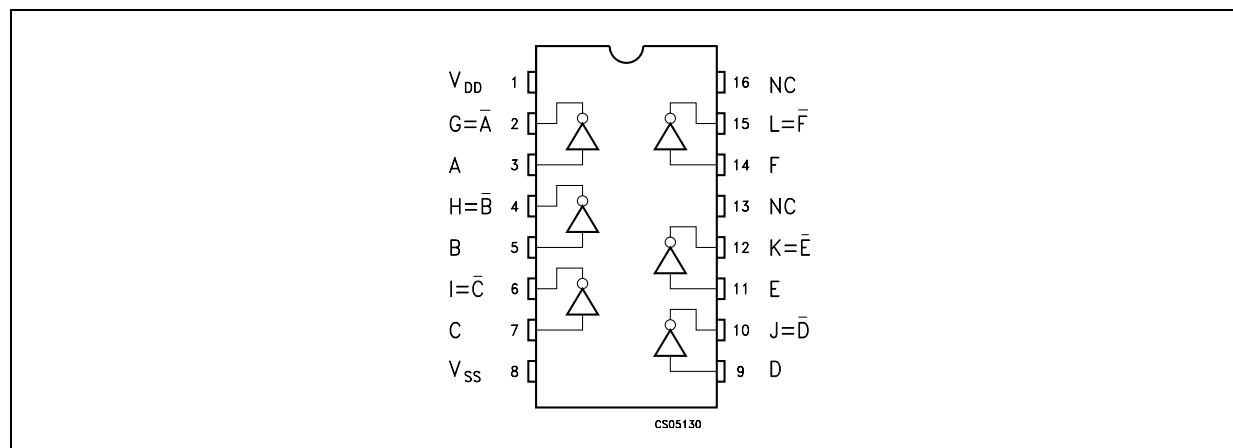


### ORDER CODES

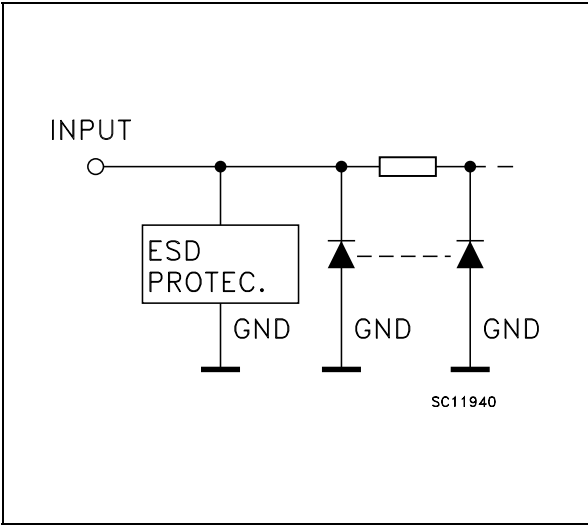
| PACKAGE | TUBE        | T & R          |
|---------|-------------|----------------|
| DIP     | HCF4049UBEY |                |
| SOP     | HCF4049UBM1 | HCF4049UM013TR |

for logic level conversions. This device is intended for use as CMOS to DTL/TTL converters and can drive directly two DTL/TTL loads ( $V_{DD} = 5\text{V}$ ,  $V_{OL} \leq 0.4\text{V}$  and  $I_{OL} \leq 3.2\text{mA}$ ).

### PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN N°              | SYMBOL           | NAME AND FUNCTION       |
|---------------------|------------------|-------------------------|
| 3, 5, 7, 9, 11, 14  | A, B, C, D, E, F | Data Inputs             |
| 2, 4, 6, 10, 12, 15 | G, H, I, J, K, L | Data Outputs            |
| 13, 16              | NC               | Not Connected           |
| 8                   | V <sub>SS</sub>  | Negative Supply Voltage |
| 1                   | V <sub>DD</sub>  | Positive Supply Voltage |

TRUTH TABLE

| INPUTS          | OUTPUTS          |
|-----------------|------------------|
| A, B, C, D,E, F | G, H, I, J, K, L |
| L               | H                |
| H               | L                |

ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter                               | Value       | Unit |
|------------------|-----------------------------------------|-------------|------|
| V <sub>DD</sub>  | Supply Voltage                          | -0.5 to +22 | V    |
| V <sub>I</sub>   | DC Input Voltage                        | -0.5 to +18 | V    |
| I <sub>I</sub>   | DC Input Current                        | ± 10        | mA   |
| P <sub>D</sub>   | Power Dissipation per Package           | 200         | mW   |
|                  | Power Dissipation per Output Transistor | 100         | mW   |
| T <sub>op</sub>  | Operating Temperature                   | -55 to +125 | °C   |
| T <sub>stg</sub> | 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<sub>SS</sub> pin voltage.

RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter             | Value       | Unit |
|-----------------|-----------------------|-------------|------|
| V <sub>DD</sub> | Supply Voltage        | 3 to 20     | V    |
| V <sub>I</sub>  | Input Voltage         | -0.5 to 15V | V    |
| T <sub>op</sub> | 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                      |                       | 0.02              | 1    |             | 30   |              | 30   | μA   |
|                 |                           | 0/10                  |                       |                          | 10                     |                       | 0.02              | 2    |             | 60   |              | 60   |      |
|                 |                           | 0/15                  |                       |                          | 15                     |                       | 0.02              | 4    |             | 120  |              | 120  |      |
|                 |                           | 0/20                  |                       |                          | 20                     |                       | 0.04              | 20   |             | 600  |              | 600  |      |
| 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                      | 4                     |                   |      | 4           |      | 4            |      | V    |
|                 |                           |                       | 1/9                   | <1                       | 10                     | 8                     |                   |      | 8           |      | 8            |      |      |
|                 |                           |                       | 1.5/13.5              | <1                       | 15                     | 12                    |                   |      | 12          |      | 12           |      |      |
| V <sub>IL</sub> | Low Level Input Voltage   |                       | 4.5/0.5               | <1                       | 5                      |                       |                   | 1    |             | 1    |              | 1    | V    |
|                 |                           |                       | 9/1                   | <1                       | 10                     |                       |                   | 2    |             | 2    |              | 2    |      |
|                 |                           |                       | 13.5/1.5              | <1                       | 15                     |                       |                   | 3    |             | 3    |              | 3    |      |
| I <sub>OH</sub> | Output Drive Current      | 0/5                   | 2.5                   | <1                       | 5                      | -1.25                 | -6.4              |      | -0.42       |      | -0.42        |      | mA   |
|                 |                           | 0/5                   | 4.6                   | <1                       | 5                      | -0.51                 | -1.6              |      | -0.38       |      | -0.38        |      |      |
|                 |                           | 0/10                  | 9.5                   | <1                       | 10                     | -1.25                 | -3.6              |      | -1          |      | -1           |      |      |
|                 |                           | 0/15                  | 13.5                  | <1                       | 15                     | -3.75                 | -12               |      | -3          |      | -3           |      |      |
| I <sub>OL</sub> | Output Sink Current       | 0/5                   | 0.4                   | <1                       | 5                      | 3.2                   | 6.4               |      | 2.6         |      | 2.6          |      | mA   |
|                 |                           | 0/10                  | 0.5                   | <1                       | 10                     | 8                     | 16                |      | 6.6         |      | 6.6          |      |      |
|                 |                           | 0/15                  | 1.5                   | <1                       | 15                     | 24                    | 48                |      | 19          |      | 19           |      |      |
| 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   |

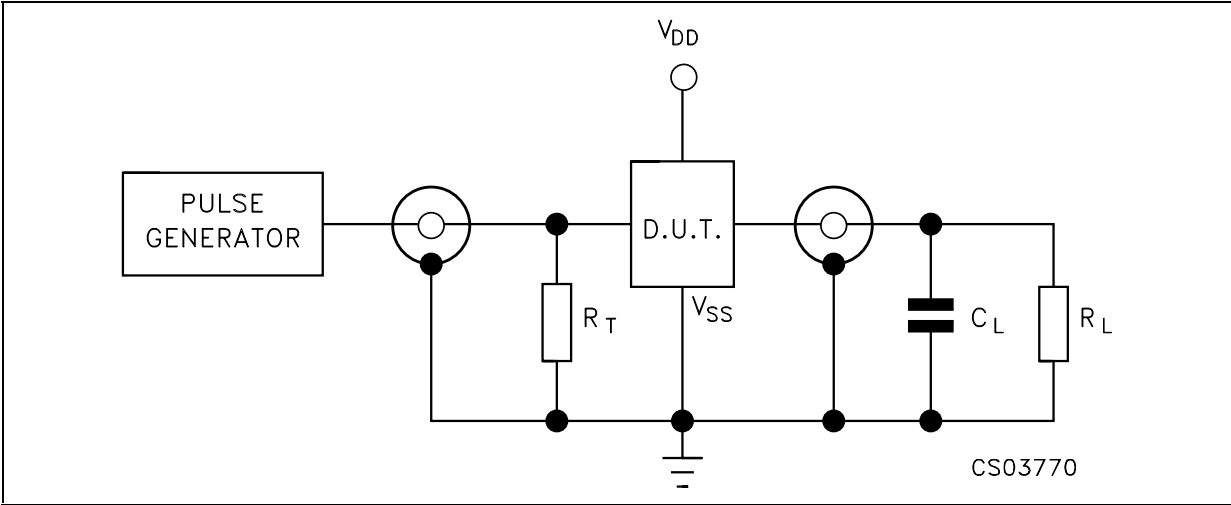
The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub>=5V, 2V min. with V<sub>DD</sub>=10V, 2.5V min. with V<sub>DD</sub>=15V

DYNAMIC ELECTRICAL CHARACTERISTICS (T<sub>amb</sub> = 25°C, C<sub>L</sub> = 50pF, R<sub>L</sub> = 200KΩ, t<sub>r</sub> = t<sub>f</sub> = 20 ns)

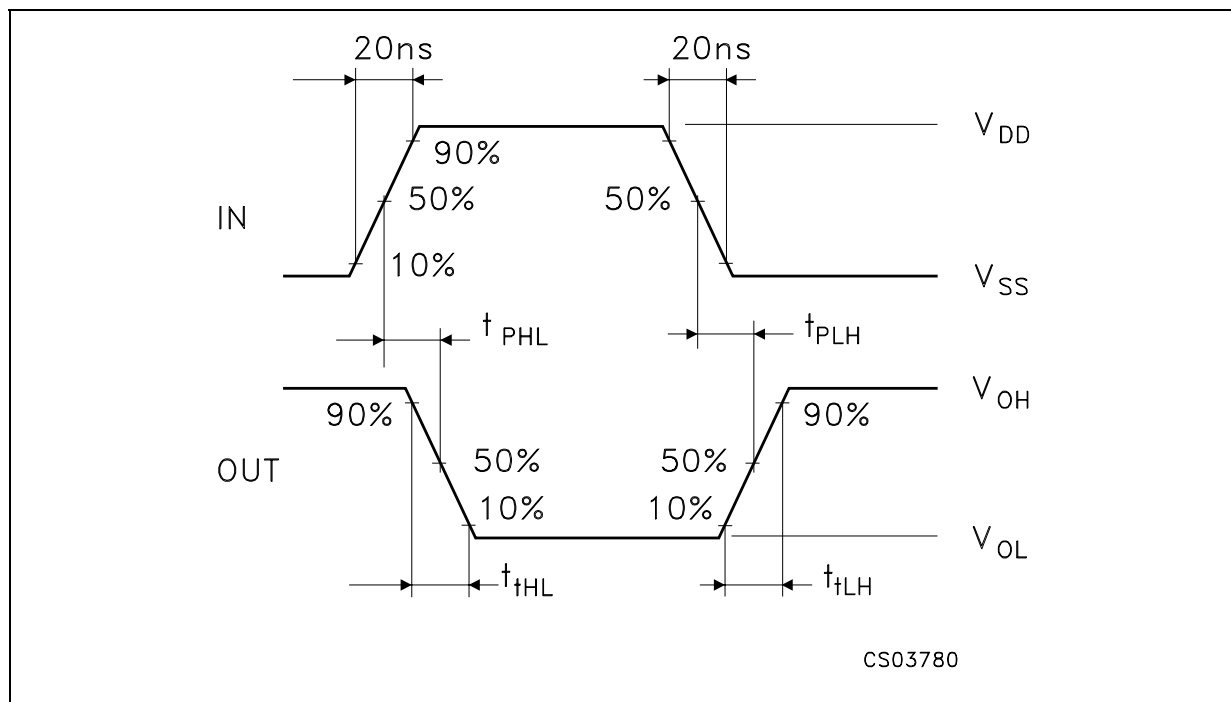
| Symbol           | Parameter              | Test Condition      |                    |  | Value (*) |      |      | Unit |
|------------------|------------------------|---------------------|--------------------|--|-----------|------|------|------|
|                  |                        | V <sub>DD</sub> (V) | V <sub>I</sub> (V) |  | Min.      | Typ. | Max. |      |
| t <sub>TLH</sub> | Output Transition Time | 5                   | 5                  |  |           | 80   | 160  | ns   |
|                  |                        | 10                  | 10                 |  |           | 40   | 80   |      |
|                  |                        | 15                  | 15                 |  |           | 30   | 60   |      |
| t <sub>THL</sub> | Output Transition Time | 5                   | 5                  |  |           | 30   | 60   | ns   |
|                  |                        | 10                  | 10                 |  |           | 20   | 40   |      |
|                  |                        | 15                  | 15                 |  |           | 15   | 30   |      |
| t <sub>PLH</sub> | Propagation Delay Time | 5                   | 5                  |  |           | 60   | 120  | ns   |
|                  |                        | 10                  | 10                 |  |           | 32   | 65   |      |
|                  |                        | 5                   | 10                 |  |           | 45   | 90   |      |
|                  |                        | 15                  | 15                 |  |           | 25   | 50   |      |
|                  |                        | 5                   | 15                 |  |           | 45   | 90   |      |
| t <sub>PHL</sub> | Propagation Delay Time | 5                   | 5                  |  |           | 32   | 65   | ns   |
|                  |                        | 10                  | 10                 |  |           | 20   | 40   |      |
|                  |                        | 5                   | 10                 |  |           | 15   | 30   |      |
|                  |                        | 15                  | 15                 |  |           | 15   | 30   |      |
|                  |                        | 5                   | 15                 |  |           | 10   | 20   |      |

(\*) Typical temperature coefficient for all V<sub>DD</sub> value is 0.3%/°C.

TEST CIRCUIT

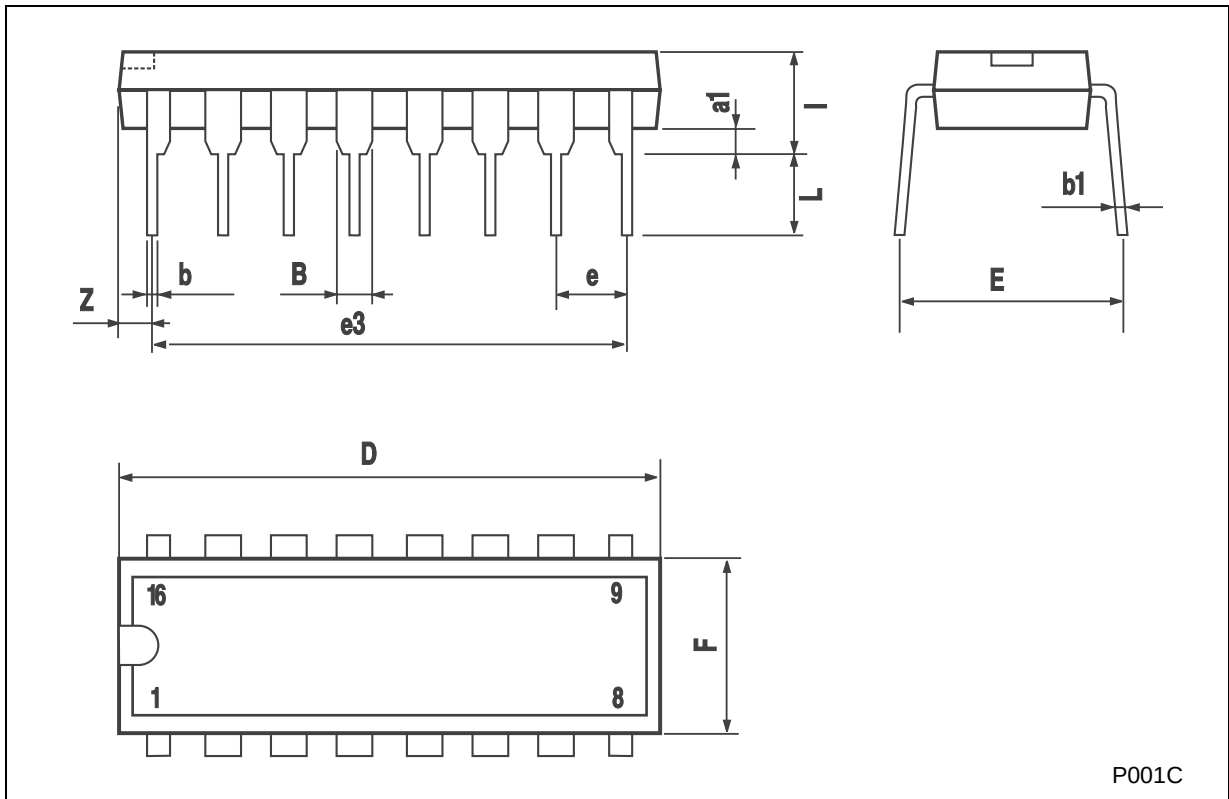


C<sub>L</sub> = 50pF or equivalent (includes jig and probe capacitance)  
R<sub>L</sub> = 200KΩ  
R<sub>T</sub> = Z<sub>OUT</sub> of pulse generator (typically 50Ω)

**WAVEFORM: PROPAGATION DELAY TIMES** ( $f=1\text{MHz}$ ; 50% duty cycle)

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 |

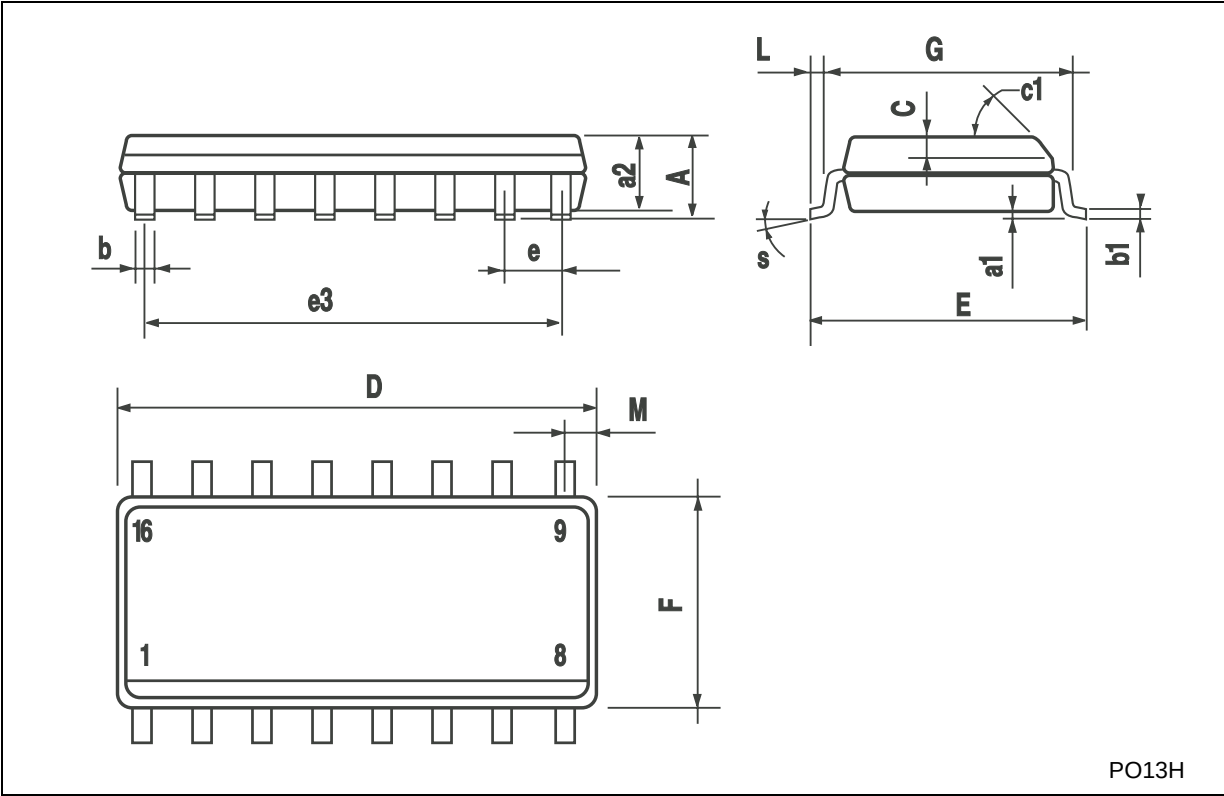


P001C



SO-16 MECHANICAL DATA

| DIM. | mm.        |      |      | inch  |       |       |
|------|------------|------|------|-------|-------|-------|
|      | MIN.       | TYP  | MAX. | MIN.  | TYP.  | MAX.  |
| A    |            |      | 1.75 |       |       | 0.068 |
| a1   | 0.1        |      | 0.2  | 0.004 |       | 0.008 |
| 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.)  |      |      |       |       |       |

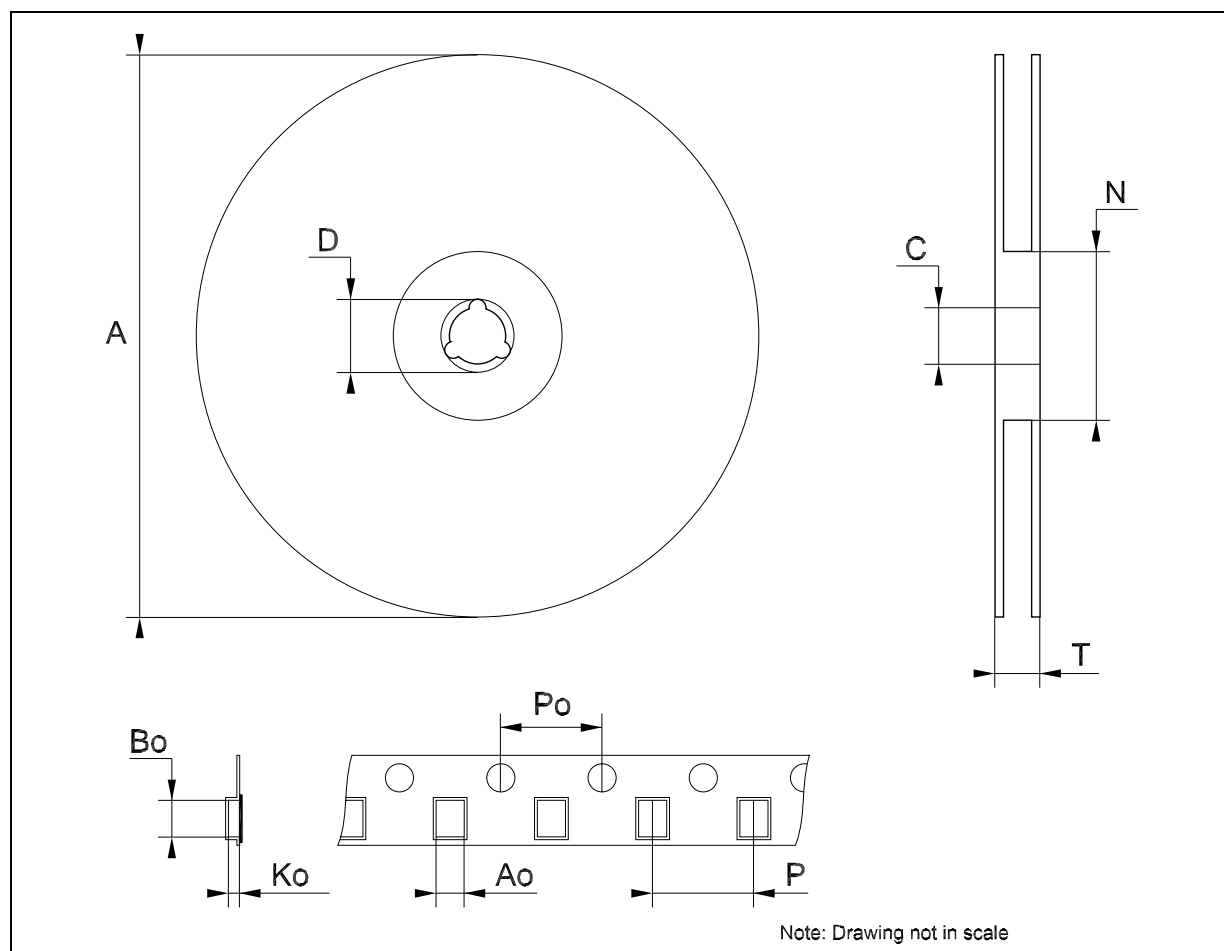


PO13H



## Tape &amp; Reel SO-16 MECHANICAL DATA

| DIM. | mm.  |     |      | inch  |      |        |
|------|------|-----|------|-------|------|--------|
|      | MIN. | TYP | MAX. | MIN.  | TYP. | MAX.   |
| A    |      |     | 330  |       |      | 12.992 |
| C    | 12.8 |     | 13.2 | 0.504 |      | 0.519  |
| D    | 20.2 |     |      | 0.795 |      |        |
| N    | 60   |     |      | 2.362 |      |        |
| T    |      |     | 22.4 |       |      | 0.882  |
| Ao   | 6.45 |     | 6.65 | 0.254 |      | 0.262  |
| Bo   | 10.3 |     | 10.5 | 0.406 |      | 0.414  |
| Ko   | 2.1  |     | 2.3  | 0.082 |      | 0.090  |
| Po   | 3.9  |     | 4.1  | 0.153 |      | 0.161  |
| P    | 7.9  |     | 8.1  | 0.311 |      | 0.319  |





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