

HEX BUFFER/CONVERTER (NON INVERTING)

- PROPAGATION DELAY TIME:
 $t_{PD} = 50\text{ns}$ (Typ.) at $V_{DD} = 10\text{V}$ $C_L = 50\text{pF}$
- HIGH TO LOW LEVEL LOGIC CONVERSION
- MULTIPLEXER: 1 TO 6 OR 6 TO 1
- HIGH "SINK" AND "SOURCE" CURRENT CAPABILITY
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT
 $I_l = 100\text{nA}$ (MAX) AT $V_{DD} = 18\text{V}$ $T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

DESCRIPTION

The HCF4010B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.

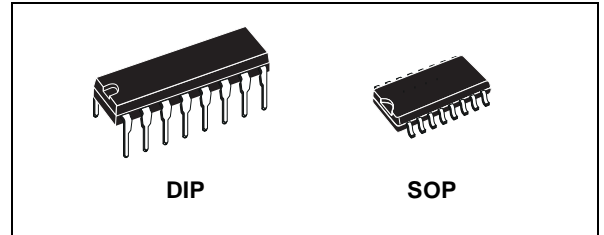


Table 1: Order Codes

| PACKAGE | TUBE | T & R |
|---------|------------|---------------|
| DIP | HCF4010BEY | |
| SOP | HCF4010BM1 | HCF4010M013TR |

It is a non inverting Hex Buffer/Converter and can be used as CMOS to TTL logic level converter as current "sink" or "source" driver or as multiplexer (1 to 6). It is a preferred replacement of HCF4050B in buffer applications.

Figure 1: Pin Connection

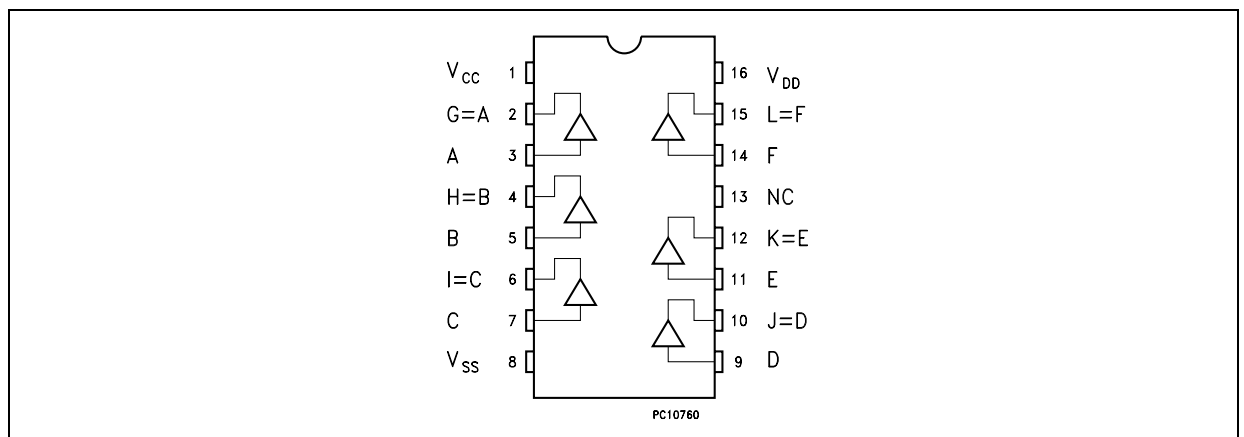


Figure 2: Input Equivalent Circuit

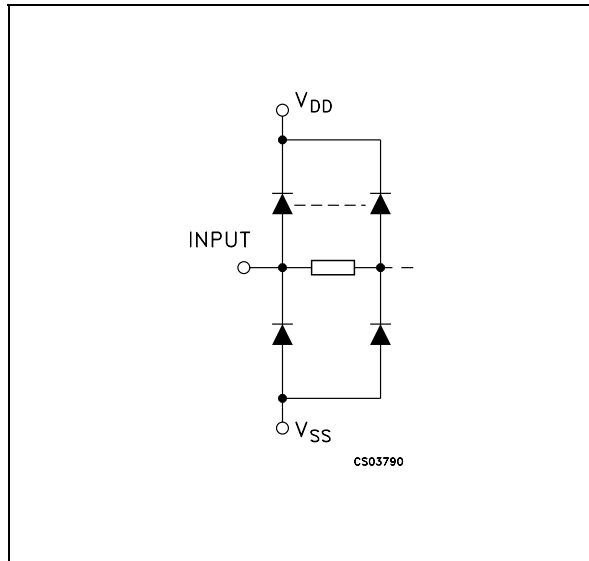


Table 2: Pin Description

| 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 | NC | Not Connected |
| 1 | V _{CC} | Positive Supply Voltage |
| 8 | V _{SS} | Negative Supply Voltage |
| 16 | V _{DD} | Positive Supply Voltage |

Table 3: Truth Table

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

Table 4: 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 | ± 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.

Table 5: 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 |

Table 6: DC Specifications

| Symbol | Parameter | Test Condition | | | | Value | | | | | | Unit | |
|-----------------|---------------------------|-----------------------|-----------------------|--------------------------------|---|-----------------------|---------------|-----------|-------------|---------|--------------|---------|---------|
| | | V _I (V) | V _O (V) | I _o (μ A) | V _{DD} = V _{CC} (V) | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| I _L | Quiescent Current | 0/5 | | | 5 | | 0.02 | 1 | | 30 | | 30 | μ A |
| | | 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 _{OH} | 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 _{OL} | 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 _{IH} | 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 _{IL} | 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 _{OH} | Output Drive Current | 0/5 | 2.5 | <1 | 5 | -0.8 | -1.6 | | -0.65 | | -0.65 | | mA |
| | | 0/5 | 4.6 | <1 | 5 | -0.2 | -0.4 | | -0.18 | | -0.18 | | |
| | | 0/10 | 9.5 | <1 | 10 | -0.45 | -0.9 | | -0.38 | | -0.38 | | |
| | | 0/15 | 13.5 | <1 | 15 | -1.5 | -3 | | -1.25 | | -1.25 | | |
| I _{OL} | Output Sink Current | 0/5 | 0.4 | <1 | 5 | 3 | 4 | | 2.4 | | 2.4 | | mA |
| | | 0/10 | 0.5 | <1 | 10 | 8 | 10 | | 6.4 | | 6.4 | | |
| | | 0/15 | 1.5 | <1 | 15 | 24 | 36 | | 19 | | 19 | | |
| I _I | Input Leakage Current | 0/18 | Any Input | | 18 | | $\pm 10^{-5}$ | ± 0.1 | | ± 1 | | ± 1 | μ A |
| C _I | Input Capacitance | | Any Input | | | | 5 | 7.5 | | | | | pF |

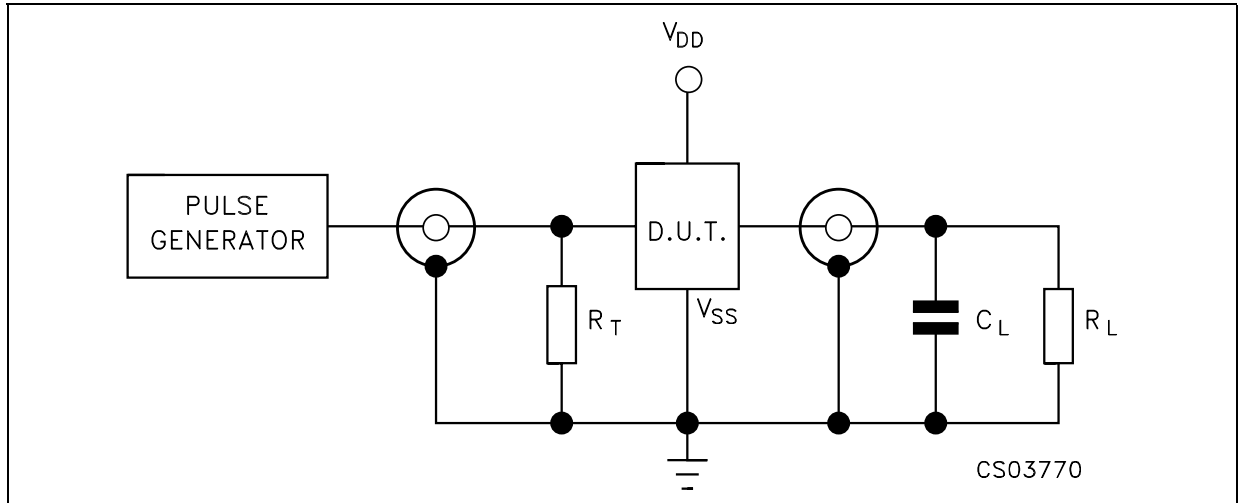
The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

Table 7: Dynamic Electrical Characteristics ($T_{amb} = 25^{\circ}C$, $C_L = 50pF$, $R_L = 200K\Omega$, $t_r = t_f = 20 ns$)

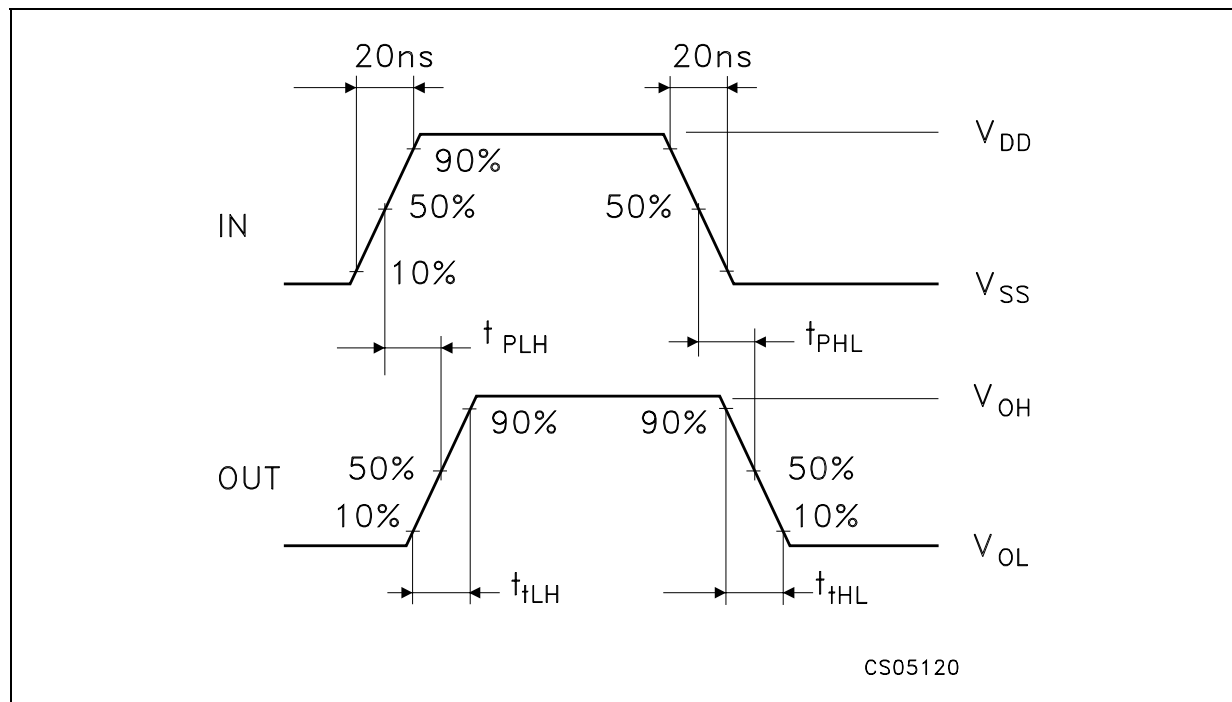
| Symbol | Parameter | Test Condition | | | Value (*) | | | Unit |
|------------------|------------------------|---------------------|--------------------|---------------------|-----------|------|------|------|
| | | V _{DD} (V) | V _I (V) | V _{CC} (V) | Min. | Typ. | Max. | |
| t _{TLH} | Output Transition Time | 5 | 5 | 5 | | 150 | 350 | ns |
| | | 10 | 10 | 10 | | 75 | 15 | |
| | | 15 | 15 | 15 | | 55 | 110 | |
| t _{THL} | Output Transition Time | 5 | 5 | 5 | | 35 | 70 | ns |
| | | 10 | 10 | 10 | | 20 | 40 | |
| | | 15 | 15 | 15 | | 15 | 30 | |
| t _{PLH} | Propagation Delay Time | 5 | 5 | 5 | | 100 | 200 | ns |
| | | 10 | 10 | 10 | | 50 | 100 | |
| | | 10 | 10 | 5 | | 50 | 100 | |
| | | 15 | 15 | 15 | | 35 | 70 | |
| | | 15 | 15 | 5 | | 35 | 70 | |
| t _{PHL} | Propagation Delay Time | 5 | 5 | 5 | | 65 | 130 | ns |
| | | 10 | 10 | 10 | | 35 | 70 | |
| | | 10 | 10 | 5 | | 30 | 70 | |
| | | 15 | 15 | 15 | | 25 | 50 | |
| | | 15 | 15 | 5 | | 20 | 40 | |

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

Figure 3: Test Circuit

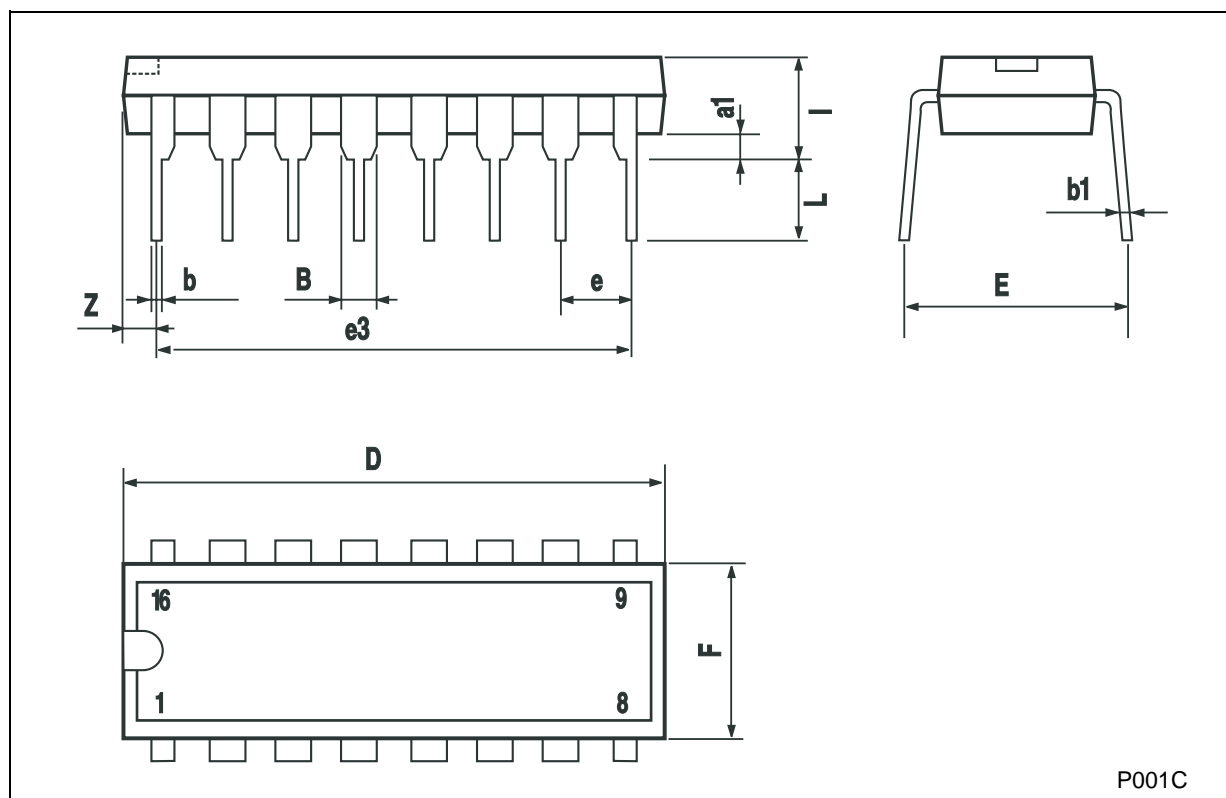


C_L = 50pF or equivalent (includes jig and probe capacitance)
 R_L = 200KΩ
 R_T = Z_{OUT} of pulse generator (typically 50Ω)

Figure 4: Waveform - Propagation Delay Times ($f=1\text{MHz}$; 50% duty cycle)

Plastic DIP-16 (0.25) MECHANICAL DATA

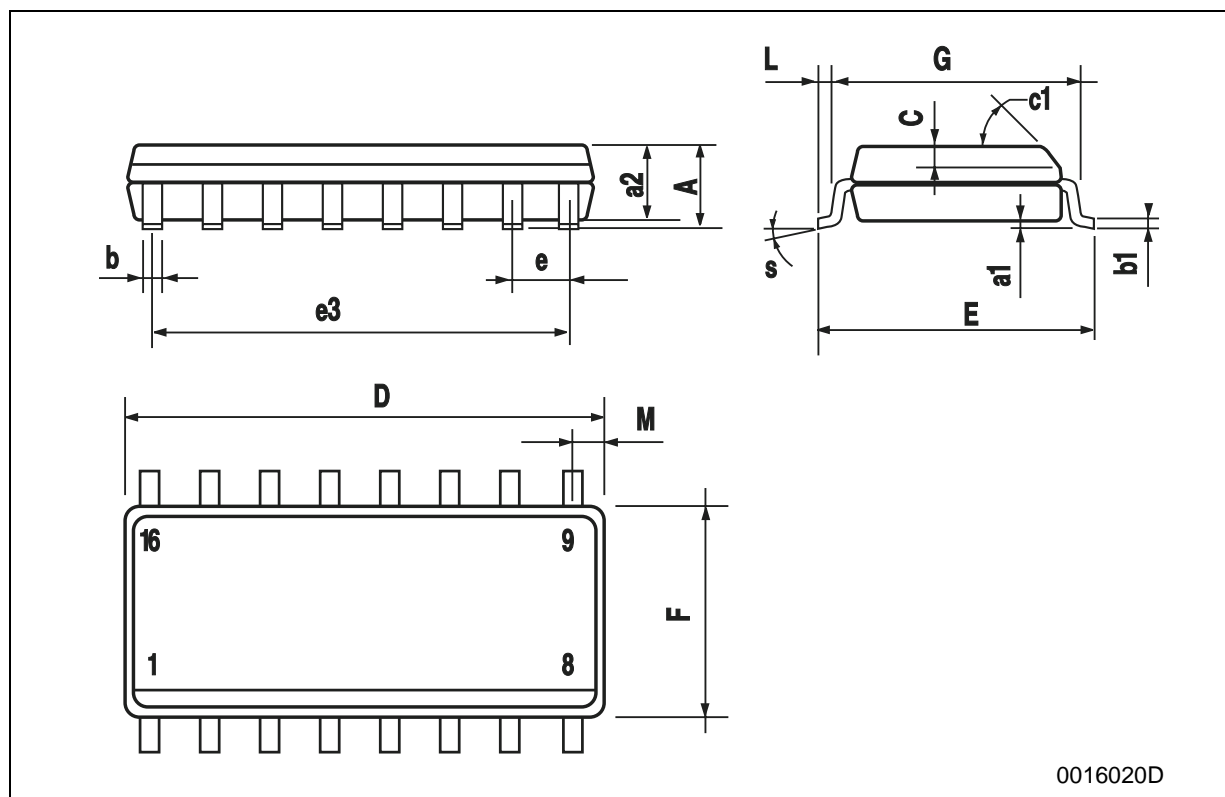
| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| l | | | 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 | | 0.25 | 0.004 | | 0.010 |
| a2 | | | 1.64 | | | 0.063 |
| 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.) | | | | | |



0016020D

Tape & 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 |

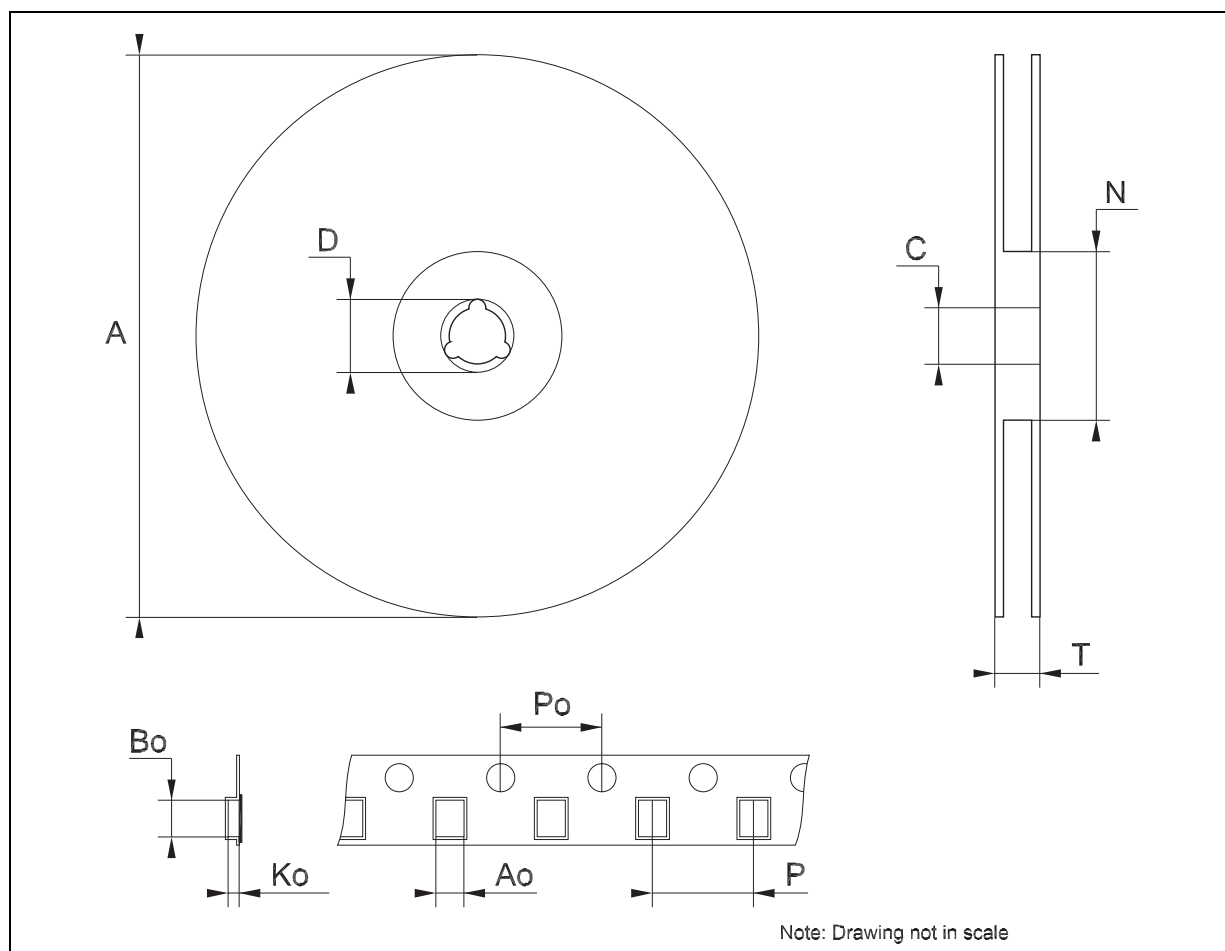


Table 8: Revision History

| Date | Revision | Description of Changes |
|-------------|----------|--------------------------|
| 16-Mar-2005 | 3 | Add V_{CC} on Table 6. |

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