

# MC14174B

## Hex Type D Flip-Flop

The MC14174B hex type D flip-flop is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. Data on the D inputs which meets the setup time requirements is transferred to the Q outputs on the positive edge of the clock pulse. All six flip-flops share common clock and reset inputs. The reset is active low, and independent of the clock.

### Features

- Static Operation
- All Inputs and Outputs Buffered
- Diode Protection on All Inputs
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Functional Equivalent to TTL 74174
- These Devices are Pb-Free and are RoHS Compliant
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable

### MAXIMUM RATINGS (Voltages Referenced to $V_{SS}$ )

| Parameter                                         | Symbol               | Value                  | Unit |
|---------------------------------------------------|----------------------|------------------------|------|
| DC Supply Voltage Range                           | $V_{DD}$             | -0.5 to +18.0          | V    |
| Input or Output Voltage Range (DC or Transient)   | $V_{in}$ , $V_{out}$ | -0.5 to $V_{DD}$ + 0.5 | V    |
| Input or Output Current (DC or Transient) per Pin | $I_{in}$ , $I_{out}$ | $\pm 10$               | mA   |
| Power Dissipation, per Package (Note 1)           | $P_D$                | 500                    | mW   |
| Ambient Temperature Range                         | $T_A$                | -55 to +125            | °C   |
| Storage Temperature Range                         |                      | -65 to +150            | °C   |
| Lead Temperature (8-Second Soldering)             |                      | 260                    | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Temperature Derating: Plastic "P" and D/DW"

Packages: - 7.0 mW/°C From 65°C To 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{in}$  and  $V_{out}$  should be constrained to the range  $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$ .

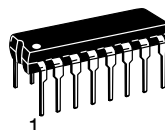
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.



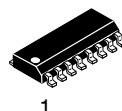
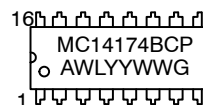
ON Semiconductor®

<http://onsemi.com>

### MARKING DIAGRAMS



PDIP-16  
P SUFFIX  
CASE 648



SOIC-16  
D SUFFIX  
CASE 751B



A = Assembly Location  
WL = Wafer Lot  
YY, Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

| Device        | Package           | Shipping†        |
|---------------|-------------------|------------------|
| MC14174BCPG   | PDIP-16 (Pb-Free) | 500 Units/Rail   |
| MC14174BDR2G  | SOIC-16 (Pb-Free) | 2500/Tape & Reel |
| NLV14174BDR2G | SOIC-16 (Pb-Free) | 2500/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MC14174B

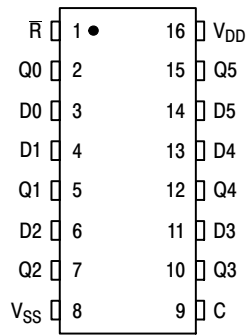
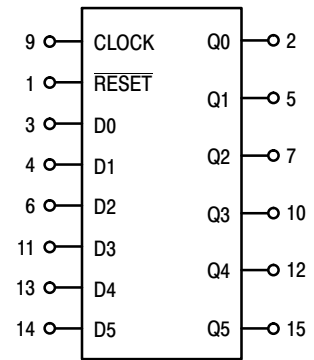


Figure 1. Pin Assignment



V<sub>DD</sub> = PIN 16  
V<sub>SS</sub> = PIN 8

Figure 2. Block Diagram

## TRUTH TABLE (Positive Logic)

| Inputs |      |       | Output |
|--------|------|-------|--------|
| Clock  | Data | Reset | Q      |
|        | 0    | 1     | 0      |
|        | 1    | 1     | 1      |
|        | X    | 1     | Q      |
| X      | X    | 0     | 0      |

No  
Change

X = Don't Care

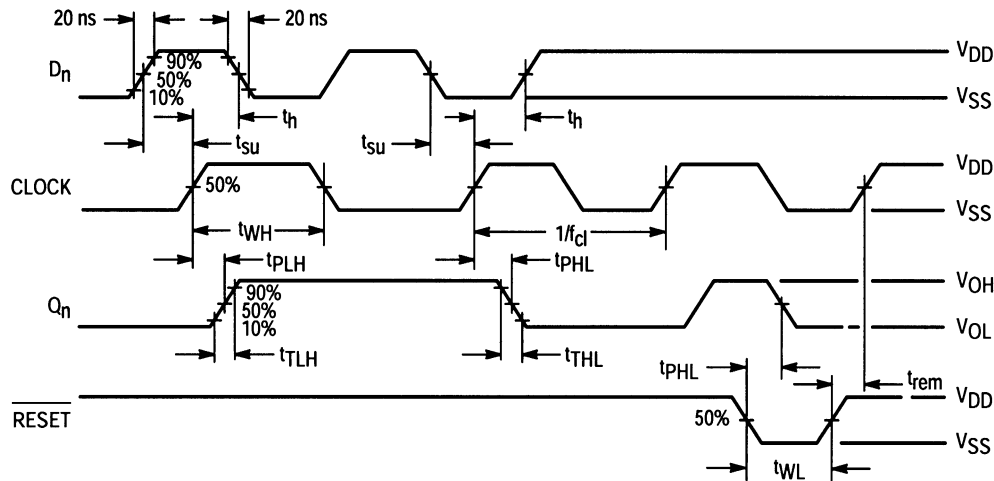


Figure 3. Timing Diagram

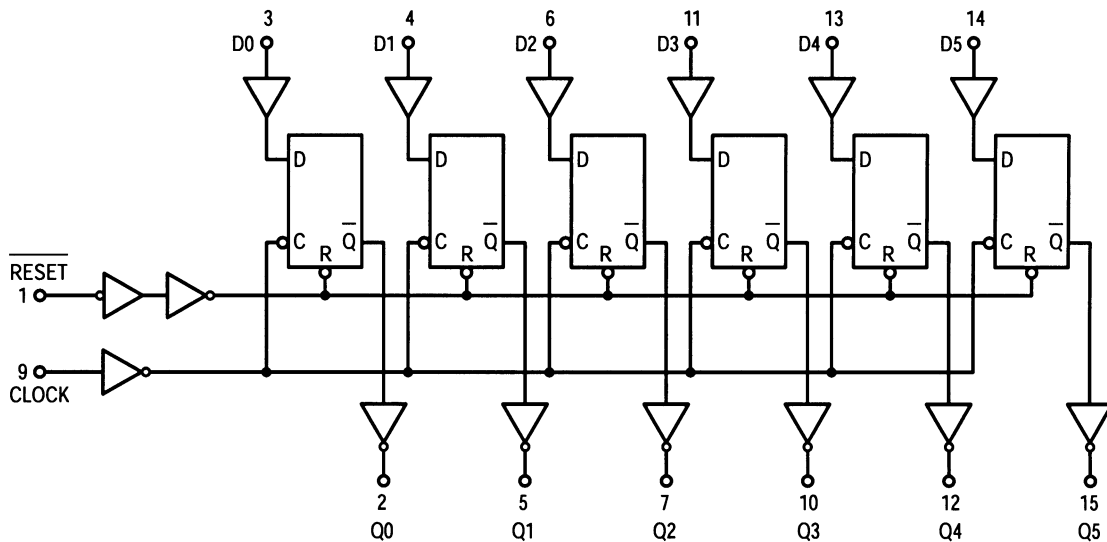


Figure 4. Functional Block Diagram

# MC14174B

## ELECTRICAL CHARACTERISTICS (Voltages Referenced to V<sub>SS</sub>)

| Characteristic                                                                                                                                                                                                                                     | Symbol                                 | V <sub>DD</sub><br>Vdc | - 55°C                                                                                                                                                      |       | 25°C  |                 |       | 125°C |       | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|-----------------|-------|-------|-------|------|
|                                                                                                                                                                                                                                                    |                                        |                        | Min                                                                                                                                                         | Max   | Min   | Typ<br>(Note 2) | Max   | Min   | Max   |      |
| Output Voltage<br>V <sub>in</sub> = V <sub>DD</sub> or 0<br><br>V <sub>in</sub> = 0 or V <sub>DD</sub>                                                                                                                                             | V <sub>OL</sub>                        | 5.0                    | –                                                                                                                                                           | 0.05  | –     | 0               | 0.05  | –     | 0.05  | Vdc  |
|                                                                                                                                                                                                                                                    |                                        | 10                     | –                                                                                                                                                           | 0.05  | –     | 0               | 0.05  | –     | 0.05  |      |
|                                                                                                                                                                                                                                                    |                                        | 15                     | –                                                                                                                                                           | 0.05  | –     | 0               | 0.05  | –     | 0.05  |      |
|                                                                                                                                                                                                                                                    | V <sub>OH</sub>                        | 5.0                    | 4.95                                                                                                                                                        | –     | 4.95  | 5.0             | –     | 4.95  | –     | Vdc  |
|                                                                                                                                                                                                                                                    |                                        | 10                     | 9.95                                                                                                                                                        | –     | 9.95  | 10              | –     | 9.95  | –     |      |
|                                                                                                                                                                                                                                                    |                                        | 15                     | 14.95                                                                                                                                                       | –     | 14.95 | 15              | –     | 14.95 | –     |      |
| Input Voltage<br>(V <sub>O</sub> = 4.5 or 0.5 Vdc)<br>(V <sub>O</sub> = 9.0 or 1.0 Vdc)<br>(V <sub>O</sub> = 13.5 or 1.5 Vdc)<br><br>(V <sub>O</sub> = 0.5 or 4.5 Vdc)<br>(V <sub>O</sub> = 1.0 or 9.0 Vdc)<br>(V <sub>O</sub> = 1.5 or 13.5 Vdc)  | V <sub>IL</sub>                        | 5.0                    | –                                                                                                                                                           | 1.5   | –     | 2.25            | 1.5   | –     | 1.5   | Vdc  |
|                                                                                                                                                                                                                                                    |                                        | 10                     | –                                                                                                                                                           | 3.0   | –     | 4.50            | 3.0   | –     | 3.0   |      |
|                                                                                                                                                                                                                                                    |                                        | 15                     | –                                                                                                                                                           | 4.0   | –     | 6.75            | 4.0   | –     | 4.0   |      |
|                                                                                                                                                                                                                                                    | V <sub>IH</sub>                        | 5.0                    | 3.5                                                                                                                                                         | –     | 3.5   | 2.75            | –     | 3.5   | –     | Vdc  |
|                                                                                                                                                                                                                                                    |                                        | 10                     | 7.0                                                                                                                                                         | –     | 7.0   | 5.50            | –     | 7.0   | –     |      |
|                                                                                                                                                                                                                                                    |                                        | 15                     | 11                                                                                                                                                          | –     | 11    | 8.25            | –     | 11    | –     |      |
| Output Drive Current<br>(V <sub>OH</sub> = 2.5 Vdc)<br>(V <sub>OH</sub> = 4.6 Vdc)<br>(V <sub>OH</sub> = 9.5 Vdc)<br>(V <sub>OH</sub> = 13.5 Vdc)<br><br>(V <sub>OL</sub> = 0.4 Vdc)<br>(V <sub>OL</sub> = 0.5 Vdc)<br>(V <sub>OL</sub> = 1.5 Vdc) | Source<br><br><br><br><br><br><br>Sink | I <sub>OH</sub>        | 5.0                                                                                                                                                         | –3.0  | –     | –2.4            | –4.2  | –     | –1.7  | mAdc |
|                                                                                                                                                                                                                                                    |                                        |                        | 5.0                                                                                                                                                         | –0.64 | –     | –0.51           | –0.88 | –     | –0.36 |      |
|                                                                                                                                                                                                                                                    |                                        |                        | 10                                                                                                                                                          | –1.6  | –     | –1.3            | –2.25 | –     | –0.9  |      |
|                                                                                                                                                                                                                                                    |                                        |                        | 15                                                                                                                                                          | –4.2  | –     | –3.4            | –8.8  | –     | –2.4  |      |
|                                                                                                                                                                                                                                                    | I <sub>OL</sub>                        | 5.0                    | 0.64                                                                                                                                                        | –     | 0.51  | 0.88            | –     | 0.36  | –     | mAdc |
|                                                                                                                                                                                                                                                    |                                        | 10                     | 1.6                                                                                                                                                         | –     | 1.3   | 2.25            | –     | 0.9   | –     |      |
| Input Current                                                                                                                                                                                                                                      | I <sub>in</sub>                        | 15                     | –                                                                                                                                                           | ±0.1  | –     | ±0.00001        | ±0.1  | –     | ±1.0  | μAdc |
|                                                                                                                                                                                                                                                    |                                        |                        |                                                                                                                                                             |       |       |                 |       |       |       |      |
| Input Capacitance, (V <sub>in</sub> = 0)                                                                                                                                                                                                           | C <sub>in</sub>                        | –                      | –                                                                                                                                                           | –     | –     | 5.0             | 7.5   | –     | –     | pF   |
| Quiescent Current<br>(Per Package)                                                                                                                                                                                                                 | I <sub>DD</sub>                        | 5.0                    | –                                                                                                                                                           | 5.0   | –     | 0.005           | 5.0   | –     | 150   | μAdc |
|                                                                                                                                                                                                                                                    |                                        | 10                     | –                                                                                                                                                           | 10    | –     | 0.010           | 10    | –     | 300   |      |
|                                                                                                                                                                                                                                                    |                                        | 15                     | –                                                                                                                                                           | 20    | –     | 0.015           | 20    | –     | 600   |      |
| Total Supply Current (Note 3, 4)<br>(Dynamic plus Quiescent,<br>Per Package)<br>(C <sub>L</sub> = 50 pF on all outputs, all<br>buffers switching)                                                                                                  | I <sub>T</sub>                         | 5.0<br>10<br>15        | I <sub>T</sub> = (1.1 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (2.3 μA/kHz) f + I <sub>DD</sub><br>I <sub>T</sub> = (3.7 μA/kHz) f + I <sub>DD</sub> |       |       |                 |       |       |       | μAdc |

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.
3. The formulas given are for the typical characteristics only at 25°C.
4. To calculate total supply current at loads other than 50 pF: I<sub>T</sub>(C<sub>L</sub>) = I<sub>T</sub>(50 pF) + (C<sub>L</sub> – 50) Vfk where: I<sub>T</sub> is in μA (per package), C<sub>L</sub> in pF, V = (V<sub>DD</sub> – V<sub>SS</sub>) in volts, f in kHz is input frequency, and k = 0.003.

# MC14174B

## SWITCHING CHARACTERISTICS (Note 5) ( $C_L = 50 \text{ pF}$ , $T_A = 25^\circ\text{C}$ )

| Characteristic                                                                                                                                                                                                                         | Symbol             | V <sub>DD</sub><br>V <sub>dc</sub> | All Types        |                   |                   | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------|------------------|-------------------|-------------------|------|
|                                                                                                                                                                                                                                        |                    |                                    | Min              | Typ<br>(Note 6)   | Max               |      |
| Output Rise and Fall Time<br>$t_{TLH}, t_{THL} = (1.35 \text{ ns/pF}) C_L + 32 \text{ ns}$<br>$t_{TLH}, t_{THL} = (0.6 \text{ ns/pF}) C_L + 20 \text{ ns}$<br>$t_{TLH}, t_{THL} = (0.4 \text{ ns/pF}) C_L + 20 \text{ ns}$             | $t_{TLH}, t_{THL}$ | 5.0<br>10<br>15                    | –<br>–<br>–      | 100<br>50<br>40   | 200<br>100<br>80  | ns   |
| Propagation Delay Time — Clock to Q<br>$t_{PLH}, t_{PHL} = (0.9 \text{ ns/pF}) C_L + 165 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 64 \text{ ns}$<br>$t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 52 \text{ ns}$ | $t_{PLH}, t_{PHL}$ | 5.0<br>10<br>15                    | –<br>–<br>–      | 210<br>85<br>65   | 400<br>160<br>120 | ns   |
| Propagation Delay Time — Reset to Q<br>$t_{PHL} = (0.9 \text{ ns/pF}) C_L + 205 \text{ ns}$<br>$t_{PHL} = (0.36 \text{ ns/pF}) C_L + 79 \text{ ns}$<br>$t_{PHL} = (0.26 \text{ ns/pF}) C_L + 62 \text{ ns}$                            | $t_{PHL}$          | 5.0<br>10<br>15                    | –<br>–<br>–      | 250<br>100<br>75  | 500<br>200<br>150 | ns   |
| Clock Pulse Width                                                                                                                                                                                                                      | $t_{WH}$           | 5.0<br>10<br>15                    | 150<br>90<br>70  | 75<br>45<br>35    | –<br>–<br>–       | ns   |
| Reset Pulse Width                                                                                                                                                                                                                      | $t_{WL}$           | 5.0<br>10<br>15                    | 200<br>100<br>80 | 100<br>50<br>40   | –<br>–<br>–       | ns   |
| Clock Pulse Frequency                                                                                                                                                                                                                  | $f_{cl}$           | 5.0<br>10<br>15                    | –<br>–<br>–      | 7.0<br>12<br>15.5 | 2.0<br>5.0<br>6.5 | mHz  |
| Clock Pulse Rise and Fall Time                                                                                                                                                                                                         | $t_{TLH}, t_{THL}$ | 5.0<br>10<br>15                    | –<br>–<br>–      | –<br>–<br>–       | 15<br>5.0<br>4.0  | μs   |
| Data Setup Time                                                                                                                                                                                                                        | $t_{su}$           | 5.0<br>10<br>15                    | 40<br>20<br>15   | 20<br>10<br>0     | –<br>–<br>–       | ns   |
| Data Hold Time                                                                                                                                                                                                                         | $t_h$              | 5.0<br>10<br>15                    | 80<br>40<br>30   | 40<br>20<br>15    | –<br>–<br>–       | ns   |
| Reset Removal Time                                                                                                                                                                                                                     | $t_{rem}$          | 5.0<br>10<br>15                    | 250<br>100<br>80 | 125<br>50<br>40   | –<br>–<br>–       | ns   |

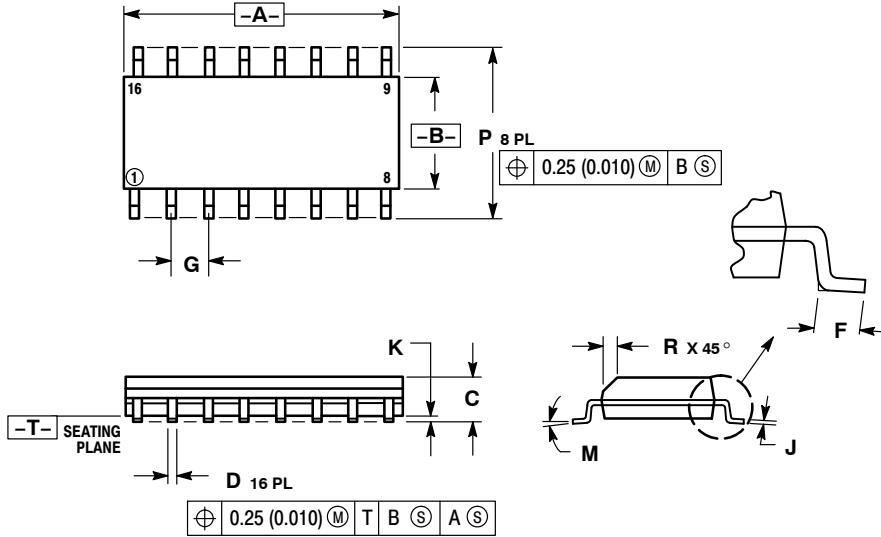
5. The formulas given are for the typical characteristics only at 25°C.

6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

# MC14174B

## PACKAGE DIMENSIONS

SOIC-16  
CASE 751B-05  
ISSUE K

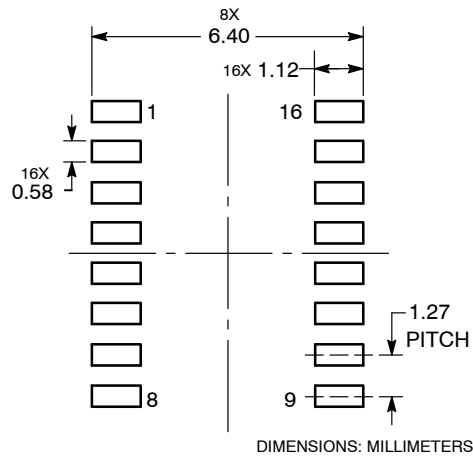


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 9.80        | 10.00 | 0.386     | 0.393 |
| B   | 3.80        | 4.00  | 0.150     | 0.157 |
| C   | 1.35        | 1.75  | 0.054     | 0.068 |
| D   | 0.35        | 0.49  | 0.014     | 0.019 |
| F   | 0.40        | 1.25  | 0.016     | 0.049 |
| G   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.19        | 0.25  | 0.008     | 0.009 |
| K   | 0.10        | 0.25  | 0.004     | 0.009 |
| M   | 0°          | 7°    | 0°        | 7°    |
| P   | 5.80        | 6.20  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

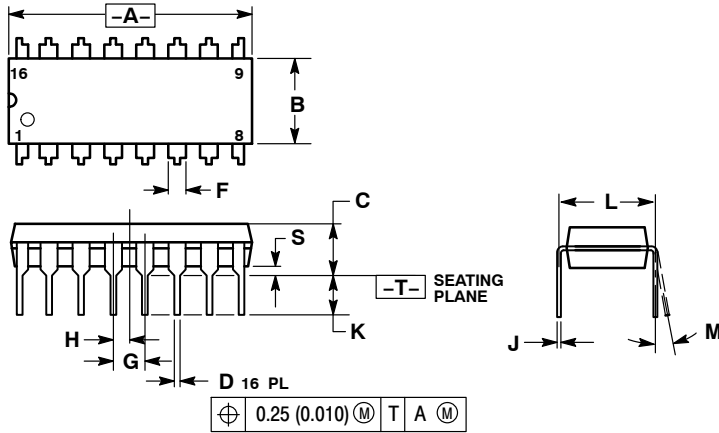
## SOLDERING FOOTPRINT



# MC14174B

## PACKAGE DIMENSIONS

PDIP-16  
CASE 648-08  
ISSUE T



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 0.145     | 0.175 | 3.69        | 4.44  |
| D   | 0.015     | 0.021 | 0.39        | 0.53  |
| F   | 0.040     | 0.70  | 1.02        | 1.77  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.050 BSC |       | 1.27 BSC    |       |
| J   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.110     | 0.130 | 2.80        | 3.30  |
| L   | 0.295     | 0.305 | 7.50        | 7.74  |
| M   | 0°        | 10°   | 0°          | 10°   |
| S   | 0.020     | 0.040 | 0.51        | 1.01  |

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marketing.pdf](http://www.onsemi.com/site/pdf/Patent-Marketing.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

#### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9