

# MC74VHC574

## Octal D-Type Flip-Flop with 3-State Output

The MC74VHC574 is an advanced high speed CMOS octal flip-flop with 3-state output fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

This 8-bit D-type flip-flop is controlled by a clock input and an output enable input. When the output enable input is high, the eight outputs are in a high impedance state.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7 V, allowing the interface of 5 V systems to 3 V systems.

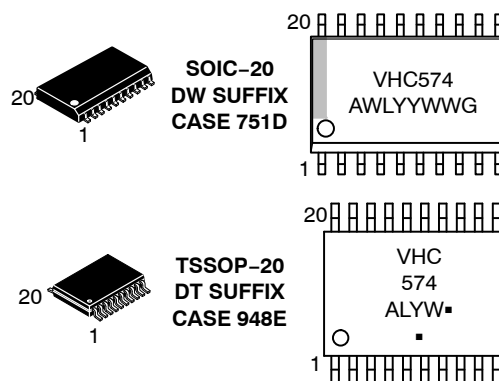
- High Speed:  $f_{\max} = 180 \text{ MHz}$  (Typ) at  $V_{CC} = 5 \text{ V}$
- Low Power Dissipation:  $I_{CC} = 4 \mu\text{A}$  (Max) at  $T_A = 25^\circ\text{C}$
- High Noise Immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2 V to 5.5 V Operating Range
- Low Noise:  $V_{OLP} = 1.2 \text{ V}$  (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: HBM > 2000 V; Machine Model > 200 V
- Chip Complexity: 266 FETs or 66.5 Equivalent Gates
- These Devices are Pb-Free and are RoHS Compliant



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### MARKING DIAGRAMS



VHC574 = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week  
G or ■ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device          | Package  | Shipping <sup>†</sup> |
|-----------------|----------|-----------------------|
| MC74VHC574DWR2G | SOIC-20  | 1000 / T&R            |
| MC74VHC574DWG   | SOIC-20  | 38 / Rail             |
| MC74VHC574DTR2G | TSSOP-20 | 2500 / T&R            |
| MC74VHC574DTG   | TSSOP-20 | 75 / Rail             |

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

MC74VHC574

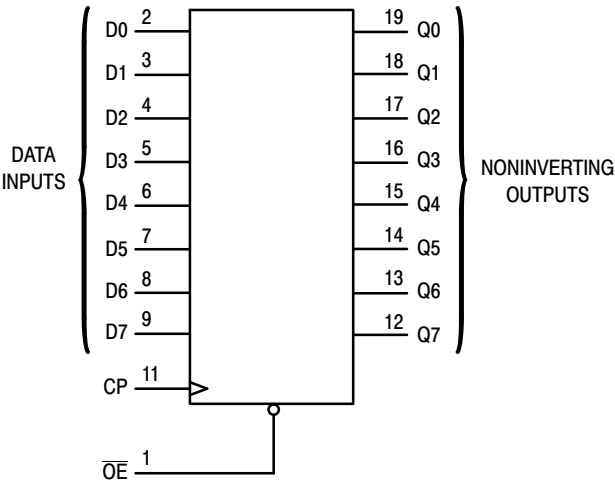


Figure 1. LOGIC DIAGRAM

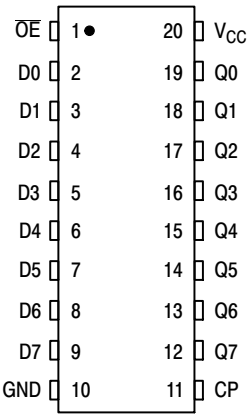


Figure 2. PIN ASSIGNMENT

FUNCTION TABLE

| INPUTS |       |   | OUTPUT    |
|--------|-------|---|-----------|
| OE     | CP    | D | Q         |
| L      |       | H | H         |
| L      |       | L | L         |
| L      | L, H, | X | No Change |
| H      | X     | X | Z         |

# MC74VHC574

## MAXIMUM RATINGS\*

| Symbol    | Parameter                                                        | Value                   | Unit |
|-----------|------------------------------------------------------------------|-------------------------|------|
| $V_{CC}$  | DC Supply Voltage                                                | – 0.5 to + 7.0          | V    |
| $V_{in}$  | DC Input Voltage                                                 | – 0.5 to + 7.0          | V    |
| $V_{out}$ | DC Output Voltage                                                | – 0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IK}$  | Input Diode Current                                              | – 20                    | mA   |
| $I_{OK}$  | Output Diode Current                                             | ± 20                    | mA   |
| $I_{out}$ | DC Output Current, per Pin                                       | ± 25                    | mA   |
| $I_{CC}$  | DC Supply Current, $V_{CC}$ and GND Pins                         | ± 75                    | mA   |
| $P_D$     | Power Dissipation in Still Air, SOIC Packages†<br>TSSOP Package† | 500<br>450              | mW   |
| $T_{stg}$ | Storage Temperature                                              | – 65 to + 150           | °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  $GND \leq (V_{in} \text{ or } V_{out}) \leq V_{CC}$ . Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or  $V_{CC}$ ). Unused outputs must be left open.

\* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

† Derating — SOIC Packages: – 7 mW/°C from 65° to 125°C  
TSSOP Package: – 6.1 mW/°C from 65° to 125°C

## RECOMMENDED OPERATING CONDITIONS

| Symbol     | Parameter                                                      | Min    | Max       | Unit |
|------------|----------------------------------------------------------------|--------|-----------|------|
| $V_{CC}$   | DC Supply Voltage                                              | 2.0    | 5.5       | V    |
| $V_{in}$   | DC Input Voltage                                               | 0      | 5.5       | V    |
| $V_{out}$  | DC Output Voltage                                              | 0      | $V_{CC}$  | V    |
| $T_A$      | Operating Temperature                                          | – 40   | + 85      | °C   |
| $t_r, t_f$ | Input Rise and Fall Time<br>$V_{CC} = 3.3V$<br>$V_{CC} = 5.0V$ | 0<br>0 | 100<br>20 | ns/V |

## DC ELECTRICAL CHARACTERISTICS

| Symbol   | Parameter                         | Test Conditions                                                            | $V_{CC}$<br>V     | $T_A = 25^\circ C$          |                   |                             | $T_A = -40 \text{ to } 85^\circ C$ |                             | Unit |
|----------|-----------------------------------|----------------------------------------------------------------------------|-------------------|-----------------------------|-------------------|-----------------------------|------------------------------------|-----------------------------|------|
|          |                                   |                                                                            |                   | Min                         | Typ               | Max                         | Min                                | Max                         |      |
| $V_{IH}$ | Minimum High-Level Input Voltage  |                                                                            | 2.0<br>3.0 to 5.5 | 1.50<br>$V_{CC} \times 0.7$ |                   |                             | 1.50<br>$V_{CC} \times 0.7$        |                             | V    |
| $V_{IL}$ | Maximum Low-Level Input Voltage   |                                                                            | 2.0<br>3.0 to 5.5 |                             |                   | 0.50<br>$V_{CC} \times 0.3$ |                                    | 0.50<br>$V_{CC} \times 0.3$ | V    |
| $V_{OH}$ | Minimum High-Level Output Voltage | $V_{in} = V_{IH} \text{ or } V_{IL}$<br>$I_{OH} = -50\mu A$                | 2.0<br>3.0<br>4.5 | 1.9<br>2.9<br>4.4           | 2.0<br>3.0<br>4.5 |                             | 1.9<br>2.9<br>4.4                  |                             | V    |
|          |                                   | $V_{in} = V_{IH} \text{ or } V_{IL}$<br>$I_{OH} = -4mA$<br>$I_{OH} = -8mA$ | 3.0<br>4.5        | 2.58<br>3.94                |                   |                             | 2.48<br>3.80                       |                             |      |
| $V_{OL}$ | Maximum Low-Level Output Voltage  | $V_{in} = V_{IH} \text{ or } V_{IL}$<br>$I_{OL} = 50\mu A$                 | 2.0<br>3.0<br>4.5 |                             | 0.0<br>0.0<br>0.0 | 0.1<br>0.1<br>0.1           |                                    | 0.1<br>0.1<br>0.1           | V    |
|          |                                   | $V_{in} = V_{IH} \text{ or } V_{IL}$<br>$I_{OL} = 4mA$<br>$I_{OL} = 8mA$   | 3.0<br>4.5        |                             |                   | 0.36<br>0.36                |                                    | 0.44<br>0.44                |      |

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## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter                           | Test Conditions                                                                                   | V <sub>CC</sub><br>V | T <sub>A</sub> = 25°C |     |        | T <sub>A</sub> = - 40 to 85°C |       | Unit |
|-----------------|-------------------------------------|---------------------------------------------------------------------------------------------------|----------------------|-----------------------|-----|--------|-------------------------------|-------|------|
|                 |                                     |                                                                                                   |                      | Min                   | Typ | Max    | Min                           | Max   |      |
| I <sub>in</sub> | Maximum Input Leakage Current       | V <sub>in</sub> = 5.5V or GND                                                                     | 0 to 5.5             |                       |     | ± 0.1  |                               | ± 1.0 | μA   |
| I <sub>OZ</sub> | Maximum Three-State Leakage Current | V <sub>in</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>V <sub>out</sub> = V <sub>CC</sub> or GND | 5.5                  |                       |     | ± 0.25 |                               | ± 2.5 | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply Current    | V <sub>in</sub> = V <sub>CC</sub> or GND                                                          | 5.5                  |                       |     | 4.0    |                               | 40.0  | μA   |

## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns)

| Symbol                                   | Parameter                                                              | Test Conditions                                                | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> = - 40 to 85°C |      | Unit |
|------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------|------|------|-------------------------------|------|------|
|                                          |                                                                        |                                                                | Min                   | Typ  | Max  | Min                           | Max  |      |
| f <sub>max</sub>                         | Maximum Clock Frequency<br>(50% Duty Cycle)                            | V <sub>CC</sub> = 3.3 ± 0.3V C <sub>L</sub> = 15pF             | 80                    | 125  | —    | 65                            | —    | ns   |
|                                          |                                                                        | C <sub>L</sub> = 50pF                                          | 50                    | 75   | —    | 45                            | —    |      |
|                                          |                                                                        | V <sub>CC</sub> = 5.0 ± 0.5V C <sub>L</sub> = 15pF             | 130                   | 180  | —    | 110                           | —    |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub>   | Maximum Propagation Delay,<br>CP to Q                                  | C <sub>L</sub> = 50pF                                          | 85                    | 115  | —    | 75                            | —    | ns   |
|                                          |                                                                        | V <sub>CC</sub> = 3.3 ± 0.3 C <sub>L</sub> = 15pF              | —                     | 8.5  | 13.2 | 1.0                           | 15.5 |      |
|                                          |                                                                        | C <sub>L</sub> = 50pF                                          | —                     | 11.0 | 16.7 | 1.0                           | 19.0 |      |
| t <sub>PZL</sub> ,<br>t <sub>PZH</sub>   | Output Enable Time,<br>OE to Q                                         | V <sub>CC</sub> = 3.3 ± 0.3V C <sub>L</sub> = 15pF             | —                     | 8.2  | 12.8 | 1.0                           | 15.0 | ns   |
|                                          |                                                                        | R <sub>L</sub> = 1kΩ C <sub>L</sub> = 50pF                     | —                     | 10.7 | 16.3 | 1.0                           | 18.5 |      |
|                                          |                                                                        | V <sub>CC</sub> = 5.0 ± 0.5V C <sub>L</sub> = 15pF             | —                     | 5.9  | 9.0  | 1.0                           | 10.5 |      |
| t <sub>PLZ</sub> ,<br>t <sub>PHZ</sub>   | Output Disable Time,<br>OE to Q                                        | R <sub>L</sub> = 1kΩ C <sub>L</sub> = 50pF                     | —                     | 7.4  | 11.0 | 1.0                           | 12.5 | ns   |
|                                          |                                                                        | V <sub>CC</sub> = 3.3 ± 0.3V C <sub>L</sub> = 50pF             | —                     | 11.0 | 15.0 | 1.0                           | 17.0 |      |
|                                          |                                                                        | R <sub>L</sub> = 1kΩ                                           | —                     | 7.1  | 10.1 | 1.0                           | 11.5 |      |
| t <sub>OSLH</sub> ,<br>t <sub>OSHL</sub> | Output to Output Skew                                                  | V <sub>CC</sub> = 3.3 ± 0.3V C <sub>L</sub> = 50pF<br>(Note 1) | —                     | —    | 1.5  | —                             | 1.5  | ns   |
|                                          |                                                                        | V <sub>CC</sub> = 5.0 ± 0.5V C <sub>L</sub> = 50pF<br>(Note 1) | —                     | —    | 1.0  | —                             | 1.0  | ns   |
| C <sub>in</sub>                          | Maximum Input Capacitance                                              |                                                                | —                     | 4    | 10   | —                             | 10   | pF   |
| C <sub>out</sub>                         | Maximum Three-State Output Capacitance, Output in High-Impedance State |                                                                | —                     | 6    | —    | —                             | —    | pF   |

| C <sub>PD</sub> | Power Dissipation Capacitance (Note 2) | Typical @ 25°C, V <sub>CC</sub> = 5.0V | pF |
|-----------------|----------------------------------------|----------------------------------------|----|
|                 |                                        | 28                                     |    |

- Parameter guaranteed by design. t<sub>OSLH</sub> = |t<sub>PLHm</sub> - t<sub>PLHn</sub>|, t<sub>OSHL</sub> = |t<sub>PHLm</sub> - t<sub>PHLn</sub>|.
- C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>/8 (per flip-flop). C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

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## NOISE CHARACTERISTICS (Input $t_r = t_f = 3.0\text{ns}$ , $C_L = 50\text{pF}$ , $V_{CC} = 5.0\text{V}$ )

| Symbol    | Parameter                                | $T_A = 25^\circ\text{C}$ |       | Unit |
|-----------|------------------------------------------|--------------------------|-------|------|
|           |                                          | Typ                      | Max   |      |
| $V_{OLP}$ | Quiet Output Maximum Dynamic $V_{OL}$    | 0.9                      | 1.2   | V    |
| $V_{OLV}$ | Quiet Output Minimum Dynamic $V_{OL}$    | - 0.9                    | - 1.2 | V    |
| $V_{IHD}$ | Minimum High Level Dynamic Input Voltage | —                        | 3.5   | V    |
| $V_{ILD}$ | Maximum Low Level Dynamic Input Voltage  | —                        | 1.5   | V    |

## TIMING REQUIREMENTS (Input $t_r = t_f = 3.0\text{ns}$ )

| Symbol   | Parameter                   | Test Conditions                                                    | $T_A = 25^\circ\text{C}$ |            | $T_A = -40$<br>to $85^\circ\text{C}$ | Unit |
|----------|-----------------------------|--------------------------------------------------------------------|--------------------------|------------|--------------------------------------|------|
|          |                             |                                                                    | Typ                      | Limit      | Limit                                |      |
| $t_{su}$ | Minimum Setup Time, D to CP | $V_{CC} = 3.3 \pm 0.3\text{ V}$<br>$V_{CC} = 5.0 \pm 0.5\text{ V}$ | —<br>—                   | 3.5<br>3.5 | 3.5<br>3.5                           | ns   |
| $t_h$    | Minimum Hold Time, CP to D  | $V_{CC} = 3.3 \pm 0.3\text{ V}$<br>$V_{CC} = 5.0 \pm 0.5\text{ V}$ | —<br>—                   | 1.5<br>1.5 | 1.5<br>1.5                           | ns   |
| $t_w$    | Minimum Pulse Width, CP     | $V_{CC} = 3.3 \pm 0.3\text{ V}$<br>$V_{CC} = 5.0 \pm 0.5\text{ V}$ | —<br>—                   | 5.0<br>5.0 | 5.5<br>5.0                           | ns   |

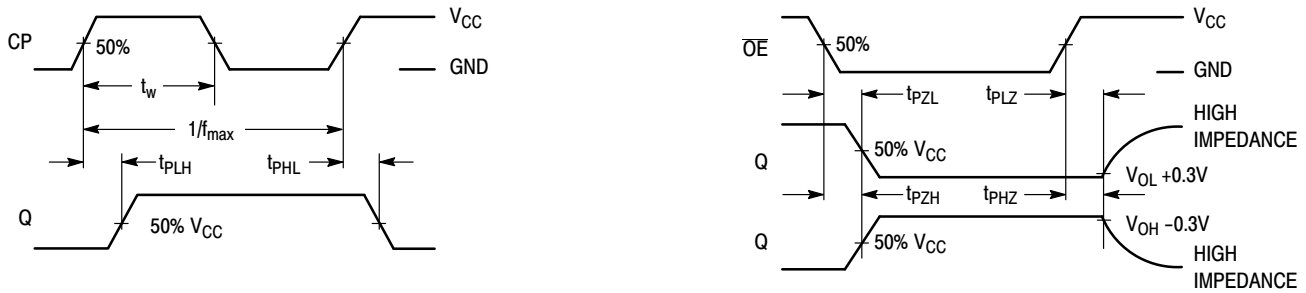


Figure 3. Switching Waveforms

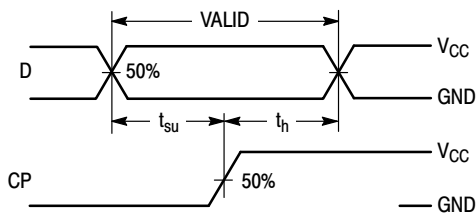
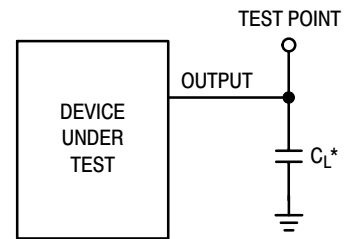


Figure 4.



\*Includes all probe and jig capacitance

Figure 5.

## MC74VHC574

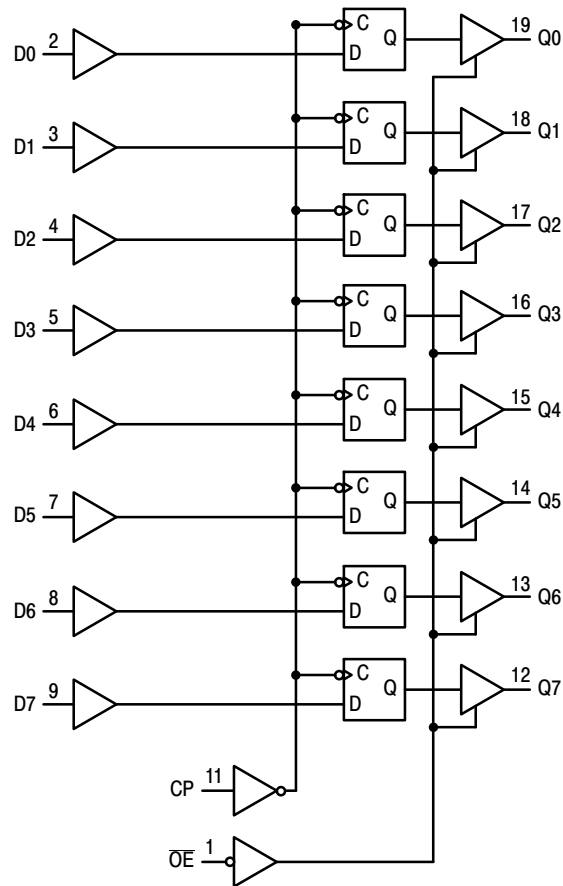
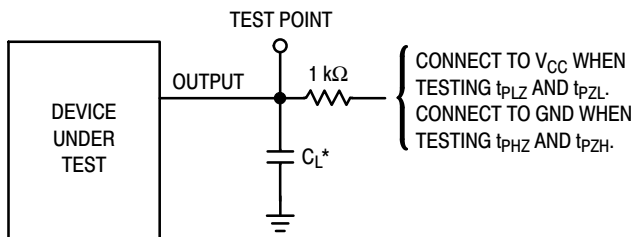


Figure 6. Expanded Logic Diagram



\*Includes all probe and jig capacitance

Figure 7. Test Circuit

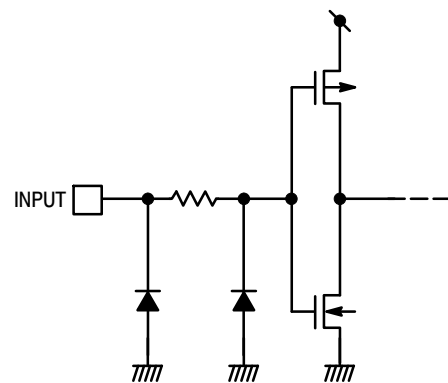


Figure 8. INPUT EQUIVALENT CIRCUIT

## PACKAGE DIMENSIONS

Technical drawing of a 20-pin connector. The drawing includes a top view, a side view, and a detail view of the pin. The top view shows a rectangular body with 20 pins (10 on each side) and a central pin 1. Dimensions include overall length A, overall width B, pin pitch L, and pin diameter D. The side view shows the profile of the connector with dimensions C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. The detail view shows the pin profile with dimensions A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z. The drawing also includes a table of dimensions and a table of materials.

| Feature        | Dimension   | Material                       |
|----------------|-------------|--------------------------------|
| Overall Length | A           | 20X K REF                      |
| Overall Width  | B           | 0.10 (0.004) (M) T U (S) V (S) |
| Pin Pitch      | L           | 0.15 (0.006) T U (S)           |
| Pin Diameter   | D           | 0.10 (0.004) (M) T U (S) V (S) |
| Pin 1 Ident    | PIN 1 IDENT | 0.15 (0.006) T U (S)           |
| Seating Plane  | -T-         | 0.100 (0.004)                  |

SECTION N-N

DETAIL E

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DETERMINED AT DIAL INDICATOR PLANE - |             |      |           |       |
|--------------------------------------|-------------|------|-----------|-------|
| DIM                                  | MILLIMETERS |      | INCHES    |       |
|                                      | MIN         | MAX  | MIN       | MAX   |
| A                                    | 6.40        | 6.60 | 0.252     | 0.260 |
| B                                    | 4.30        | 4.50 | 0.169     | 0.177 |
| C                                    | ---         | 1.20 | ---       | 0.047 |
| D                                    | 0.05        | 0.15 | 0.002     | 0.006 |
| F                                    | 0.50        | 0.75 | 0.020     | 0.030 |
| G                                    | 0.65 BSC    |      | 0.026 BSC |       |
| H                                    | 0.27        | 0.37 | 0.011     | 0.015 |
| J                                    | 0.09        | 0.20 | 0.004     | 0.008 |
| J1                                   | 0.09        | 0.16 | 0.004     | 0.006 |
| K                                    | 0.19        | 0.30 | 0.007     | 0.012 |
| K1                                   | 0.19        | 0.25 | 0.007     | 0.010 |
| L                                    | 6.40 BSC    |      | 0.252 BSC |       |
| M                                    | 0°          | 8°   | 0°        | 8°    |

16X  
0.36

7.06

1.26

0.65  
PITCH

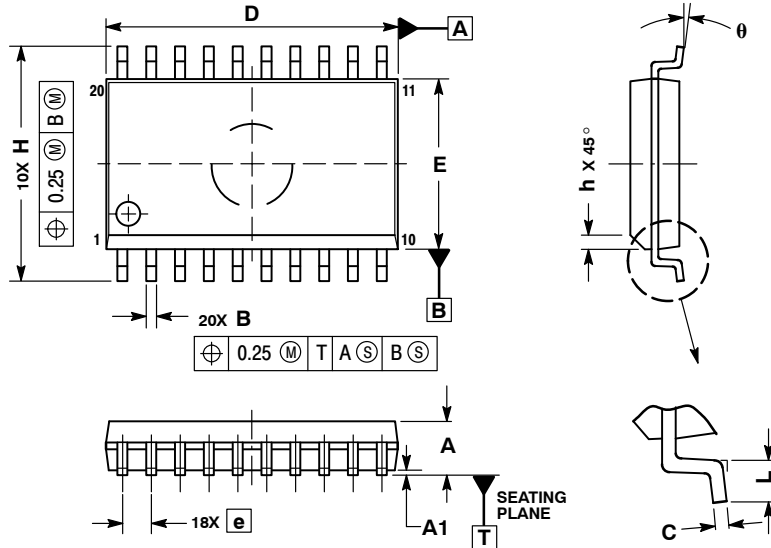
DIMENSIONS: MILLIMETERS

DIMENSIONS: MILLIMETERS

# MC74VHC574

## PACKAGE DIMENSIONS

SOIC-20  
DW SUFFIX  
CASE 751D-05  
ISSUE G



### NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 2.35        | 2.65  |
| A1  | 0.10        | 0.25  |
| B   | 0.35        | 0.49  |
| C   | 0.23        | 0.32  |
| D   | 12.65       | 12.95 |
| E   | 7.40        | 7.60  |
| e   | 1.27 BSC    |       |
| H   | 10.05       | 10.55 |
| h   | 0.25        | 0.75  |
| L   | 0.50        | 0.90  |
| θ   | 0°          | 7°    |

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MC74VHC574/D



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Связь**

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Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

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