



**MOTOROLA**

# MC74AC05 MC74ACT05

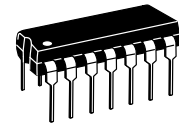
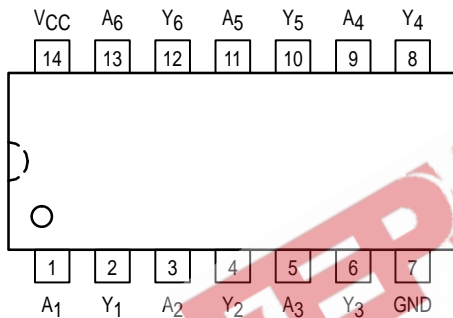
HEX INVERTER WITH  
OPEN-DRAIN OUTPUTS

## Hex Inverter With Open-Drain Outputs

The MC74AC/ACT05 is identical in pinout to the LS05. The device inputs are compatible with standard CMOS outputs; with pullup resistors, they are compatible with TTL outputs.

- Outputs Source/Sink 24 mA
- 'ACT05 Has TTL Compatible Inputs

Pinout: 14-Lead Packages (Top View)



N SUFFIX  
CASE 646-06  
PLASTIC PACKAGE



D SUFFIX  
CASE 751A-03  
PLASTIC PACKAGE

### FUNCTION TABLE

| Input A | Output Y |
|---------|----------|
| L       | Z        |
| H       | L        |

Z = High Impedance

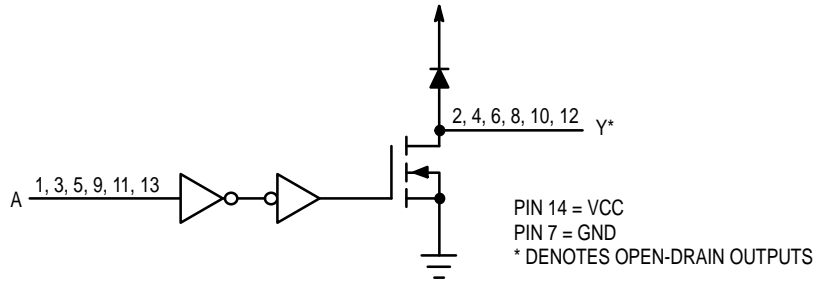
### MAXIMUM RATINGS\*

| Symbol           | Parameter  | Value                         | Unit |
|------------------|--|-------------------------------|------|
| V <sub>CC</sub>  | DC Supply Voltage (Referenced to GND)            | -0.5 to +7.0                  | V    |
| V <sub>in</sub>  | DC Input Voltage (Referenced to GND)             | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| V <sub>out</sub> | DC Output Voltage (Referenced to GND)            | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>in</sub>  | DC Input Current, per Pin                        | ± 20                          | mA   |
| I <sub>out</sub> | DC Output Sink/Source Current, per Pin           | ± 50                          | mA   |
| I <sub>CC</sub>  | DC V <sub>CC</sub> or GND Current per Output Pin | ± 50                          | mA   |
| T <sub>stg</sub> | Storage Temperature                              | -65 to +150                   | °C   |

\* Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

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## LOGIC DIAGRAM



## RECOMMENDED OPERATING CONDITIONS

| Symbol                          | Parameter   | Min                     | Typ | Min             | Unit |      |
|---------------------------------|---|-------------------------|-----|-----------------|------|------|
| V <sub>CC</sub>                 | Supply Voltage  | 'AC                     | 2.0 | 5.0             | 6.0  | V    |
|                                 |   | 'ACT                    | 4.5 | 5.0             | 5.5  |      |
| V <sub>REG</sub>                | DC Regulated Power Voltage (Ref. to GND)                                | 0                       |     | V <sub>CC</sub> | V    |      |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time (Note 1)<br>'AC Devices except Schmitt Inputs  | V <sub>CC</sub> @ 3.0 V |     | 150             |      | ns/V |
|                                 |   | V <sub>CC</sub> @ 4.5 V |     | 40              |      |      |
|                                 |   | V <sub>CC</sub> @ 5.5 V |     | 25              |      |      |
| t <sub>r</sub> , t <sub>f</sub> | Input Rise and Fall Time (Note 2)<br>'ACT Devices except Schmitt Inputs | V <sub>CC</sub> @ 4.5 V |     | 10              |      | ns/V |
|                                 |   | V <sub>CC</sub> @ 5.5 V |     | 8.0             |      |      |
| T <sub>J</sub>                  | Junction Temperature (PDIP)   |                         |     | 140             | °C   |      |
| T <sub>A</sub>                  | Operating Ambient Temperature Range                                     | -40                     | 25  | 85              | °C   |      |
| I <sub>OH</sub>                 | Output Current — HIGH   |                         |     | -24             | mA   |      |
| I <sub>OL</sub>                 | Output Current — LOW  |                         |     | 24              | mA   |      |

1. V<sub>in</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V<sub>in</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

## MC74AC05 MC74ACT05

### DC CHARACTERISTICS

| Symbol           | Parameter                           | V <sub>CC</sub><br>(V) | 74AC                   |                   | 74AC                               |  | Unit | Conditions   |
|------------------|-------------------------------------|------------------------|------------------------|-------------------|------------------------------------|--|------|--|
|                  |                                     |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>-40°C to +85°C |  |      |  |
|                  |                                     |                        | Typ                    | Guaranteed Limits |                                    |  |      |  |
| V <sub>IH</sub>  | Minimum High Level<br>Input Voltage | 3.0                    | 1.5                    | 2.1               | 2.1                                |  | V    | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> - 0.1 V   |
|                  |                                     | 4.5                    | 2.25                   | 3.15              | 3.15                               |  |      |  |
|                  |                                     | 5.5                    | 2.75                   | 3.85              | 3.85                               |  |      |  |
| V <sub>IL</sub>  | Maximum Low Level<br>Input Voltage  | 3.0                    | 1.5                    | 0.9               | 0.9                                |  | V    | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> - 0.1 V   |
|                  |                                     | 4.5                    | 2.25                   | 1.35              | 1.35                               |  |      |  |
|                  |                                     | 5.5                    | 2.75                   | 1.65              | 1.65                               |  |      |  |
| V <sub>OL</sub>  | Maximum Low Level<br>Output Voltage | 3.0                    | 0.002                  | 0.1               | 0.1                                |  | V    | I <sub>OUT</sub> = 50 μA   |
|                  |                                     | 4.5                    | 0.001                  | 0.1               | 0.1                                |  |      |  |
|                  |                                     | 5.5                    | 0.001                  | 0.1               | 0.1                                |  |      |  |
|                  |                                     | 3.0                    |                        | 0.36              | 0.44                               |  | V    | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>12 mA<br>I <sub>OL</sub> 24 mA<br>24 mA |
|                  |                                     | 4.5                    |                        | 0.36              | 0.44                               |  |      |  |
|                  |                                     | 5.5                    |                        | 0.36              | 0.44                               |  |      |  |
| I <sub>IN</sub>  | Maximum Input<br>Leakage Current    | 5.5                    |                        | ±0.1              | ±1.0                               |  | μA   | V <sub>I</sub> = V <sub>CC</sub> , GND   |
| I <sub>OLD</sub> | †Minimum Dynamic<br>Output Current  | 5.5                    |                        |                   | 75                                 |  | mA   | V <sub>OLD</sub> = 1.65 V Max  |
| I <sub>OHD</sub> |                                     | 5.5                    |                        |                   | -75                                |  | mA   | V <sub>OHD</sub> = 3.85 V Min  |
| I <sub>CC</sub>  | Maximum Quiescent<br>Supply Current | 5.5                    |                        | 4.0               | 40                                 |  | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND   |

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

Note: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V.

### AC CHARACTERISTICS

| Symbol           | Parameter                          | V <sub>CC</sub> *<br>(V) | 74AC   |     |     | 74AC   |     | Unit |
|------------------|------------------------------------|--------------------------|--|-----|-----|--|-----|------|
|                  |                                    |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |     | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |     |      |
|                  |                                    |                          | Min  | Typ | Max | Min  | Max |      |
| t <sub>PZL</sub> | Propagation Delay<br>Output Enable | 3.3                      | 1.5  |     | 8.0 | 1.0  | 9.0 | ns   |
|                  |                                    | 5.0                      | 1.5  |     | 6.0 | 1.0  | 6.5 |      |
| t <sub>PLZ</sub> | Propagation Delay<br>Output Enable | 3.3                      | 1.5  |     | 8.0 | 1.0  | 9.0 | ns   |
|                  |                                    | 5.0                      | 1.5  |     | 6.0 | 1.0  | 6.5 |      |

\* Voltage Range 3.3 V is 3.3 V ±0.3 V.

Voltage Range 5.0 V is 5.0 V ±0.5 V.

## MC74AC05 MC74ACT05

### DC CHARACTERISTICS

| Symbol             | Parameter                              | V <sub>CC</sub><br>(V) | 74ACT                  |                   | 74ACT                              |    | Unit  | Conditions |
|--------------------|--|------------------------|------------------------|-------------------|------------------------------------|----|---|------------|
|                    |  |                        | T <sub>A</sub> = +25°C |                   | T <sub>A</sub> =<br>-40°C to +85°C |    |   |            |
|                    |  |                        | Typ                    | Guaranteed Limits |                                    |    |   |            |
| V <sub>IH</sub>    | Minimum High Level Input Voltage       | 4.5<br>5.5             | 1.5<br>1.5             | 2.0<br>2.0        | 2.0<br>2.0                         | V  | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> - 0.1 V                                    |            |
| V <sub>IL</sub>    | Maximum Low Level Input Voltage        | 4.5<br>5.5             | 1.5<br>1.5             | 0.8<br>0.8        | 0.8<br>0.8                         | V  | V <sub>OUT</sub> = 0.1 V<br>or V <sub>CC</sub> - 0.1 V                                    |            |
| V <sub>OL</sub>    | Maximum Low Level Output Voltage       | 4.5<br>5.5             | 0.001<br>0.001         | 0.1<br>0.1        | 0.1<br>0.1                         | V  | I <sub>OUT</sub> = 50 μA  |            |
|                    |  | 4.5<br>5.5             |                        | 0.36<br>0.36      | 0.44<br>0.44                       | V  | *V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub><br>I <sub>OH</sub> = 24 mA<br>24 mA |            |
| I <sub>IN</sub>    | Maximum Input Leakage Current          | 5.5                    |                        | ±0.1              | ±1.0                               | μA | V <sub>I</sub> = V <sub>CC</sub> , GND  |            |
| ΔI <sub>CC</sub> T | Additional Max. I <sub>CC</sub> /Input | 5.5                    | 0.6                    |                   | 1.5                                | mA | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V  |            |
| I <sub>OLD</sub>   | †Minimum Dynamic Output Current        | 5.5                    |                        |                   | 75                                 | mA | V <sub>OLD</sub> = 1.65 V Max   |            |
| I <sub>OHD</sub>   |  | 5.5                    |                        |                   | -75                                | mA | V <sub>OHD</sub> = 3.85 V Min   |            |
| I <sub>CC</sub>    | Maximum Quiescent Supply Current       | 5.5                    |                        | 4.0               | 40                                 | μA | V <sub>IN</sub> = V <sub>CC</sub> or GND  |            |

\* All outputs loaded; thresholds on input associated with output under test.

† Maximum test duration 2.0 ms, one output loaded at a time.

### AC CHARACTERISTICS

| Symbol           | Parameter                       | V <sub>CC</sub> *<br>(V) | 74ACT  |     |     | 74ACT  |     | Unit |
|------------------|---------------------------------|--------------------------|--|-----|-----|--|-----|------|
|                  |                                 |                          | T <sub>A</sub> = +25°C<br>C <sub>L</sub> = 50 pF |     |     | T <sub>A</sub> = -40°C<br>to +85°C<br>C <sub>L</sub> = 50 pF |     |      |
|                  |                                 |                          | Min  | Typ | Max | Min  | Max |      |
| t <sub>pZL</sub> | Propagation Delay Output Enable | 5.0                      | 1.5  |     | 8.0 | 1.0  | 8.5 | ns   |
| t <sub>pLZ</sub> | Propagation Delay Output Enable | 5.0                      | 1.5  |     | 8.5 | 1.0  | 9.0 | ns   |

\* Voltage Range 5.0 V is 5.0 V ±0.5 V.

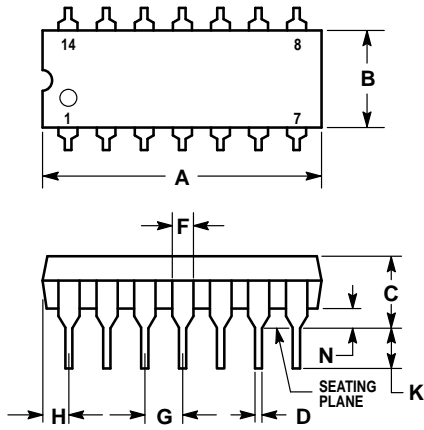
### CAPACITANCE

| Symbol          | Parameter                     | Value<br>Typ | Unit | Test Conditions         |
|-----------------|-------------------------------|--------------|------|-------------------------|
| C <sub>IN</sub> | Input Capacitance             | 4.5          | pF   | V <sub>CC</sub> = 5.0 V |
| C <sub>PD</sub> | Power Dissipation Capacitance | 30           | pF   | V <sub>CC</sub> = 5.0 V |

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## OUTLINE DIMENSIONS

### N SUFFIX PLASTIC DIP PACKAGE CASE 646-06 ISSUE L

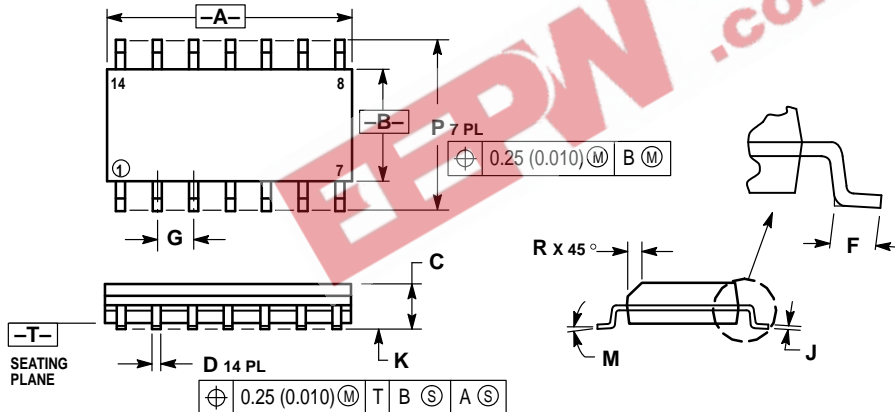


NOTES:

- LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION B DOES NOT INCLUDE MOLD FLASH.
- ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.715     | 0.770 | 18.16       | 19.56 |
| B   | 0.240     | 0.260 | 6.10        | 6.60  |
| C   | 0.145     | 0.185 | 3.69        | 4.69  |
| D   | 0.015     | 0.021 | 0.38        | 0.53  |
| F   | 0.040     | 0.070 | 1.02        | 1.78  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.052     | 0.095 | 1.32        | 2.41  |
| J   | 0.008     | 0.015 | 0.20        | 0.38  |
| K   | 0.115     | 0.135 | 2.92        | 3.43  |
| L   | 0.300 BSC |       | 7.62 BSC    |       |
| M   | 0°        | 10°   | 0°          | 10°   |
| N   | 0.015     | 0.039 | 0.39        | 1.01  |


### D SUFFIX PLASTIC SOIC PACKAGE CASE 751A-03 ISSUE F



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
- 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   | 8.55        | 8.75 | 0.337     | 0.344 |
| 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 | 0.228     | 0.244 |
| R   | 0.25        | 0.50 | 0.010     | 0.019 |

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MC74AC05/D

