

MC74AC04, MC74ACT04

Hex Inverter

Features

- Outputs Source/Sink 24 mA
- 'ACT04 Has TTL Compatible Inputs
- Pb-Free Packages are Available

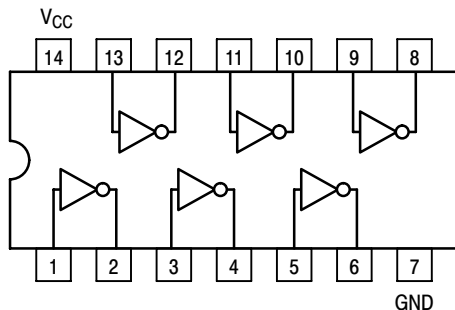


Figure 1. Pinout: 14-Lead Packages Conductors
(Top View)

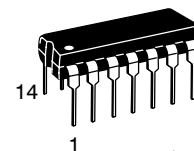
MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|-----------|------------------------|-------------|
| DC Supply Voltage (Referenced to GND) | V_{CC} | -0.5 to +7.0 | V |
| DC Input Voltage (Referenced to GND) | V_{in} | -0.5 to $V_{CC} + 0.5$ | V |
| DC Output Voltage (Referenced to GND) | V_{out} | -0.5 to $V_{CC} + 0.5$ | V |
| DC Input Current, per Pin | I_{in} | ± 20 | mA |
| DC Output Sink/Source Current, per Pin | I_{out} | ± 50 | mA |
| DC V_{CC} or GND Current per Output Pin | I_{CC} | ± 50 | mA |
| Storage Temperature | T_{stg} | -65 to +150 | $^{\circ}C$ |

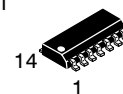
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



ON Semiconductor®



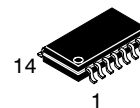
PDIP-14
N SUFFIX
CASE 646



SOIC-14
D SUFFIX
CASE 751A



TSSOP-14
DT SUFFIX
CASE 948G



SOEIAJ-14
M SUFFIX
CASE 965

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

MC74AC04, MC74ACT04

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Typ | Max | Unit | |
|------------------------------------|---|-------------------------|-----|-----------------|------|------|
| V _{CC} | Supply Voltage | 'AC | 2.0 | 5.0 | 6.0 | V |
| | | 'ACT | 4.5 | 5.0 | 5.5 | |
| V _{in} , V _{out} | DC Input Voltage, Output Voltage (Ref. to GND) | 0 | – | V _{CC} | V | |
| t _r , t _f | Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs | V _{CC} @ 3.0 V | – | 150 | – | ns/V |
| | | V _{CC} @ 4.5 V | – | 40 | – | |
| | | V _{CC} @ 5.5 V | – | 25 | – | |
| t _r , t _f | Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs | V _{CC} @ 4.5 V | – | 10 | – | ns/V |
| | | V _{CC} @ 5.5 V | – | 8.0 | – | |
| T _J | Junction Temperature (PDIP) | – | – | 140 | °C | |
| T _A | Operating Ambient Temperature Range | –40 | 25 | 85 | °C | |
| I _{OH} | Output Current – High | – | – | –24 | mA | |
| I _{OL} | Output Current – Low | – | – | 24 | mA | |

- V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
- V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | 74AC | | 74AC | Unit | Conditions |
|------------------|--------------------------------------|------------------------|------------------------|-------------------|---------------------------------------|------|---|
| | | | T _A = +25°C | | T _A = –40°C to +85°C | | |
| | | | Typ | Guaranteed Limits | | | |
| V _{IH} | Minimum High Level Input Voltage | 3.0 | 1.5 | 2.1 | 2.1 | V | V _{OUT} = 0.1 V or V _{CC} – 0.1 V |
| | | 4.5 | 2.25 | 3.15 | 3.15 | | |
| | | 5.5 | 2.75 | 3.85 | 3.85 | | |
| V _{IL} | Maximum Low Level Input Voltage | 3.0 | 1.5 | 0.9 | 0.9 | V | V _{OUT} = 0.1 V or V _{CC} – 0.1 V |
| | | 4.5 | 2.25 | 1.35 | 1.35 | | |
| | | 5.5 | 2.75 | 1.65 | 1.65 | | |
| V _{OH} | Minimum High Level Output Voltage | 3.0 | 2.99 | 2.9 | 2.9 | V | I _{OUT} = –50 μA |
| | | 4.5 | 4.49 | 4.4 | 4.4 | | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | |
| | | 3.0 | – | 2.56 | 2.46 | V | *V _{IN} = V _{IL} or V _{IH} –12 mA I _{OH} –24 mA –24 mA |
| | | 4.5 | – | 3.86 | 3.76 | | |
| 5.5 | – | 4.86 | 4.76 | | | | |
| V _{OL} | Maximum Low Level Output Voltage | 3.0 | 0.002 | 0.1 | 0.1 | V | I _{OUT} = 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 _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA |
| | | 4.5 | – | 0.36 | 0.44 | | |
| 5.5 | – | 0.36 | 0.44 | | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | – | ±0.1 | ±1.0 | μA | V _I = V _{CC} , GND |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | – | – | 75 | mA | V _{OLD} = 1.65 V Max |
| I _{OHD} | | 5.5 | – | – | –75 | mA | V _{OHD} = 3.85 V Min |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | – | 4.0 | 40 | μA | V _{IN} = V _{CC} 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_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

MC74AC04, MC74ACT04

AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

| Symbol | Parameter | V _{CC} * (V) | 74AC | | | 74AC | | Unit | Fig. No. |
|------------------|-------------------|--------------------------|--|------------|------------|--|------------|------|----------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = –40°C to +85°C C _L = 50 pF | | | |
| | | | Min | Typ | Max | Min | Max | | |
| t _{PLH} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 4.5 4.0 | 9.0 7.0 | 1.0 1.0 | 10 7.5 | ns | 3–5 |
| t _{PHL} | Propagation Delay | 3.3 5.0 | 1.5 1.5 | 4.5 3.5 | 8.5 6.5 | 1.0 1.0 | 9.5 7.0 | ns | 3–5 |

*Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

DC CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | 74ACT | | 74ACT | | Unit | Conditions |
|--------------------|--|------------------------|------------------------|-------------------|---------------------------------|-------------------|---|------------|
| | | | T _A = +25°C | | T _A = –40°C to +85°C | | | |
| | | | Typ | Guaranteed Limits | Typ | Guaranteed Limits | | |
| V _{IH} | Minimum High Level Input Voltage | 4.5 | 1.5 | 2.0 | 2.0 | V | V _{OUT} = 0.1 V or V _{CC} – 0.1 V | |
| | | 5.5 | 1.5 | 2.0 | 2.0 | | | |
| V _{IL} | Maximum Low Level Input Voltage | 4.5 | 1.5 | 0.8 | 0.8 | V | V _{OUT} = 0.1 V or V _{CC} – 0.1 V | |
| | | 5.5 | 1.5 | 0.8 | 0.8 | | | |
| V _{OH} | Minimum High Level Output Voltage | 4.5 | 4.49 | 4.4 | 4.4 | V | I _{OUT} = –50 μA | |
| | | 5.5 | 5.49 | 5.4 | 5.4 | | | |
| | | 4.5 | – | 3.86 | 3.76 | V | *V _{IN} = V _{IL} or V _{IH} –24 mA | |
| | | 5.5 | – | 4.86 | 4.76 | | | |
| V _{OL} | Maximum Low Level Output Voltage | 4.5 | 0.001 | 0.1 | 0.1 | V | I _{OUT} = 50 μA | |
| | | 5.5 | 0.001 | 0.1 | 0.1 | | | |
| | | 4.5 | – | 0.36 | 0.44 | V | *V _{IN} = V _{IL} or V _{IH} 24 mA | |
| | | 5.5 | – | 0.36 | 0.44 | | | |
| I _{IN} | Maximum Input Leakage Current | 5.5 | – | ±0.1 | ±1.0 | μA | V _I = V _{CC} , GND | |
| ΔI _{CC} T | Additional Max. I _{CC} /Input | 5.5 | 0.6 | – | 1.5 | mA | V _I = V _{CC} – 2.1 V | |
| I _{OLD} | †Minimum Dynamic Output Current | 5.5 | – | – | 75 | mA | V _{OLD} = 1.65 V Max | |
| I _{OHD} | | 5.5 | – | – | –75 | mA | V _{OHD} = 3.85 V Min | |
| I _{CC} | Maximum Quiescent Supply Current | 5.5 | – | 4.0 | 40 | μA | V _{IN} = V _{CC} 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.

MC74AC04, MC74ACT04

AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

| Symbol | Parameter | V _{CC} * (V) | 74ACT | | | 74ACT | | Unit | Fig. No. |
|------------------|-------------------|--------------------------|--|-----|-----|--|-----|------|----------|
| | | | T _A = +25°C C _L = 50 pF | | | T _A = -40°C to +85°C C _L = 50 pF | | | |
| | | | Min | Typ | Max | Min | Max | | |
| t _{PLH} | Propagation Delay | 5.0 | 1.5 | | 8.5 | 1.0 | 9.0 | ns | 3-6 |
| t _{PHL} | Propagation Delay | 5.0 | 1.5 | | 8.0 | 1.0 | 8.5 | ns | 3-6 |

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

| Symbol | Parameter | Value Typ | Unit | Test Conditions |
|-----------------|-------------------------------|--------------|------|-------------------------|
| C _{IN} | Input Capacitance | 4.5 | pF | V _{CC} = 5.0 V |
| C _{PD} | Power Dissipation Capacitance | 30 | pF | V _{CC} = 5.0 V |

MC74AC04, MC74ACT04

DEVICE ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|------------------------|------------------|
| MC74AC04N | PDIP-14 | 25 Units/Rail |
| MC74AC04NG | PDIP-14 (Pb-Free) | |
| MC74ACT04N | PDIP-14 | |
| MC74ACT04NG | PDIP-14 (Pb-Free) | |
| MC74AC04D | SOIC-14 | 55 Units/Rail |
| MC74AC04DG | SOIC-14 (Pb-Free) | |
| MC74AC04DR2 | SOIC-14 | 2500/Tape & Reel |
| MC74AC04DR2G | SOIC-14 (Pb-Free) | |
| MC74ACT04D | SOIC-14 | 55 Units/Rail |
| MC74ACT04DG | SOIC-14 (Pb-Free) | |
| MC74ACT04DR2 | SOIC-14 | 2500/Tape & Reel |
| MC74ACT04DR2G | SOIC-14 (Pb-Free) | |
| MC74AC04DT | TSSOP-14* | 96 Units/Rail |
| MC74AC04DTR2 | TSSOP-14* | 2500/Tape & Reel |
| MC74AC04DTR2G | TSSOP-14* | |
| MC74ACT04DT | TSSOP-14* | 96 Units/Rail |
| MC74ACT04DTR2 | TSSOP-14* | 2500/Tape & Reel |
| MC74ACT04DTR2G | TSSOP-14* | |
| MC74AC04MEL | SOEIAJ-14 | 2000/Tape & Reel |
| MC74AC04MELG | SOEIAJ-14 (Pb-Free) | |
| MC74ACT04M | SOEIAJ-14 | 50 Units/Rail |
| MC74ACT04MG | SOEIAJ-14 (Pb-Free) | |
| MC74ACT04MEL | SOEIAJ-14 | 2000/Tape & Reel |
| MC74ACT04MELG | SOEIAJ-14 (Pb-Free) | |

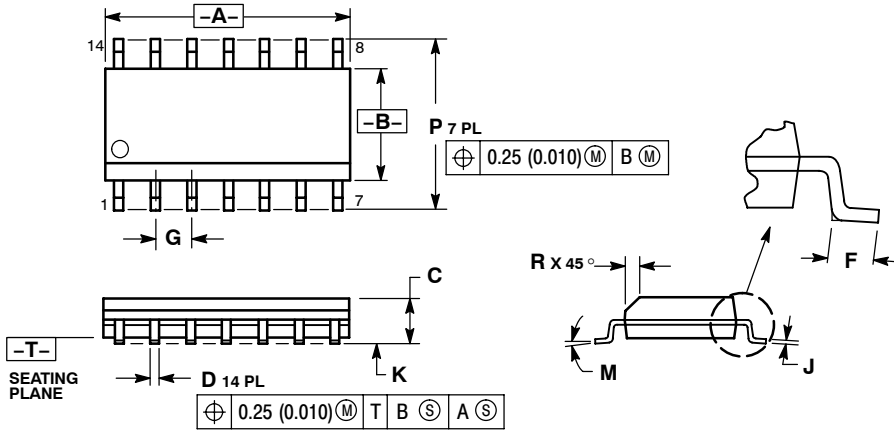
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

MC74AC04, MC74ACT04

PACKAGE DIMENSIONS

SOIC-14
CASE 751A-03
ISSUE H

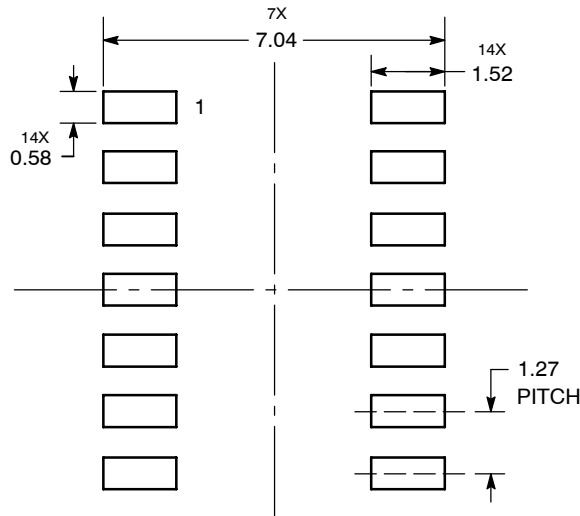


NOTES:

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 | 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 |

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.