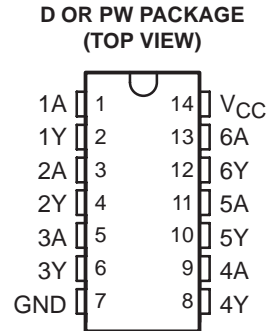


- **Controlled Baseline**
 - One Assembly/Test Site, One Fabrication Site
- **Extended Temperature Performance of**
–55°C to 125°C
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree†**
- **EPIC™ (Enhanced-Performance Implanted CMOS) Process**
- **Operating Range 2-V to 5.5-V V_{CC}**
- **ESD Protection Exceeds 1500 V Per MIL-STD-883C, Method 3015; Exceeds 150 V Using Machine Model (C = 200 pF, R = 0)**



† Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

description/ordering information

The SN74AHC04 contains six independent inverters. This device performs the Boolean function $Y = \bar{A}$.

ORDERING INFORMATION

| T _A | PACKAGE‡ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------|---------------|-----------------------|------------------|
| –55°C to 125°C | SOIC – D | Tape and reel | SN74AHC04MDREP | AHC04MEP |
| | TSSOP – PW | Tape and reel | SN74AHC04MPWREP | AHC04EP |

‡ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

(each inverter)

| INPUT A | OUTPUT Y |
|------------|-------------|
| H | L |
| L | H |



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

EPIC is a trademark of Texas Instruments.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



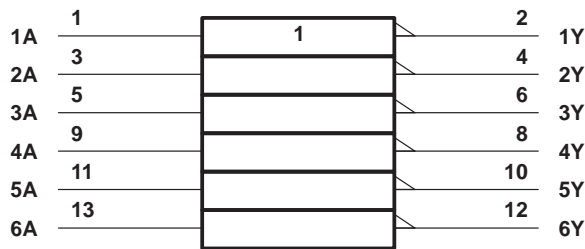
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2003, Texas Instruments Incorporated

SN74AHC04-EP
HEX INVERTER

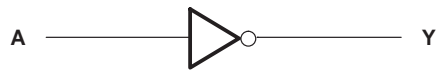
SCLS483A – JUNE 2003 – REVISED SEPTEMBER 2003

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram, each inverter (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

| | |
|--|----------------------------|
| Supply voltage range, V_{CC} | –0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | –0.5 V to 7 V |
| Output voltage range, V_O (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$) | –20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ±20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±25 mA |
| Continuous current through V_{CC} or GND | ±50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): D package | 86°C/W |
| PW package | 113°C/W |
| Storage temperature range, T_{stg} | –65°C to 150°C |

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

| | | | MIN | MAX | UNIT |
|---------------------|------------------------------------|--|------|----------|--------------------|
| V_{CC} | Supply voltage | | 2 | 5.5 | V |
| V_{IH} | High-level input voltage | $V_{CC} = 2\text{ V}$ | 1.5 | | V |
| | | $V_{CC} = 3\text{ V}$ | 2.1 | | |
| | | $V_{CC} = 5.5\text{ V}$ | 3.85 | | |
| V_{IL} | Low-level input voltage | $V_{CC} = 2\text{ V}$ | | 0.5 | V |
| | | $V_{CC} = 3\text{ V}$ | | 0.9 | |
| | | $V_{CC} = 5.5\text{ V}$ | | 1.65 | |
| V_I | Input voltage | | 0 | 5.5 | V |
| V_O | Output voltage | | 0 | V_{CC} | V |
| I_{OH} | High-level output current | $V_{CC} = 2\text{ V}$ | | -50 | μA |
| | | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ | | -4 | mA |
| | | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ | | -8 | |
| I_{OL} | Low-level output current | $V_{CC} = 2\text{ V}$ | | 50 | μA |
| | | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ | | 4 | mA |
| | | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ | | 8 | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ | | 100 | ns/V |
| | | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ | | 20 | |
| T_A | Operating free-air temperature | | -55 | 125 | $^{\circ}\text{C}$ |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

SN74AHC04-EP HEX INVERTER

SCLS483A – JUNE 2003 – REVISED SEPTEMBER 2003

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | MIN | MAX | UNIT |
|-----------------|---|-----------------|-----------------------|-----|------|------|-----|------|
| | | | MIN | TYP | MAX | | | |
| V _{OH} | I _{OH} = –50 µA | 2 V | 1.9 | 2 | | 1.9 | | V |
| | | 3 V | 2.9 | 3 | | 2.9 | | |
| | | 4.5 V | 4.4 | 4.5 | | 4.4 | | |
| | I _{OH} = –4 mA | 3 V | 2.58 | | | 2.48 | | |
| | I _{OH} = –8 mA | 4.5 V | 3.94 | | | 3.8 | | |
| V _{OL} | I _{OL} = 50 µA | 2 V | | | 0.1 | | 0.1 | V |
| | | 3 V | | | 0.1 | | 0.1 | |
| | | 4.5 V | | | 0.1 | | 0.1 | |
| | I _{OL} = 4 mA | 3 V | | | 0.36 | | 0.5 | |
| | I _{OL} = 8 mA | 4.5 V | | | 0.36 | | 0.5 | |
| I _I | V _I = 5.5 V or GND | 0 V to 5.5 V | | | ±0.1 | | ±1 | µA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 2 | | 20 | µA |
| C _i | V _I = V _{CC} or GND | 5 V | | 2 | 10 | | | pF |

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|--------------|-------------|------------------------|-----------------------|-----|------|-----|------|------|
| | | | | MIN | TYP | MAX | | | |
| t _{PLH} | A | Y | C _L = 15 pF | | 5 | 8.9 | 1 | 10.5 | ns |
| t _{PHL} | | | | | 5 | 8.9 | 1 | 10.5 | |
| t _{PLH} | A | Y | C _L = 50 pF | | 7.5 | 11.4 | 1 | 13 | ns |
| t _{PHL} | | | | | 7.5 | 11.4 | 1 | 13 | |

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|--------------|-------------|------------------------|-----------------------|-----|-----|-----|-----|------|
| | | | | MIN | TYP | MAX | | | |
| t _{PLH} | A | Y | C _L = 15 pF | | 3.8 | 5.5 | 1 | 6.5 | ns |
| t _{PHL} | | | | | 3.8 | 5.5 | 1 | 6.5 | |
| t _{PLH} | A | Y | C _L = 50 pF | | 5.3 | 7.5 | 1 | 8.5 | ns |
| t _{PHL} | | | | | 5.3 | 7.5 | 1 | 8.5 | |

noise characteristics, V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C (see Note 4)

| PARAMETER | | MIN | TYP | MAX | UNIT |
|--------------------|---|-----|------|-----|------|
| V _{OL(P)} | Quiet output, maximum dynamic V _{OL} | | 0.4 | | V |
| V _{OL(V)} | Quiet output, minimum dynamic V _{OL} | | –0.4 | | V |
| V _{OH(V)} | Quiet output, minimum dynamic V _{OH} | | 4.8 | | V |
| V _{IH(D)} | High-level dynamic input voltage | | 3.5 | | V |
| V _{IL(D)} | Low-level dynamic input voltage | | | 1.5 | V |

NOTE 4: Characteristics are for surface-mount packages only.

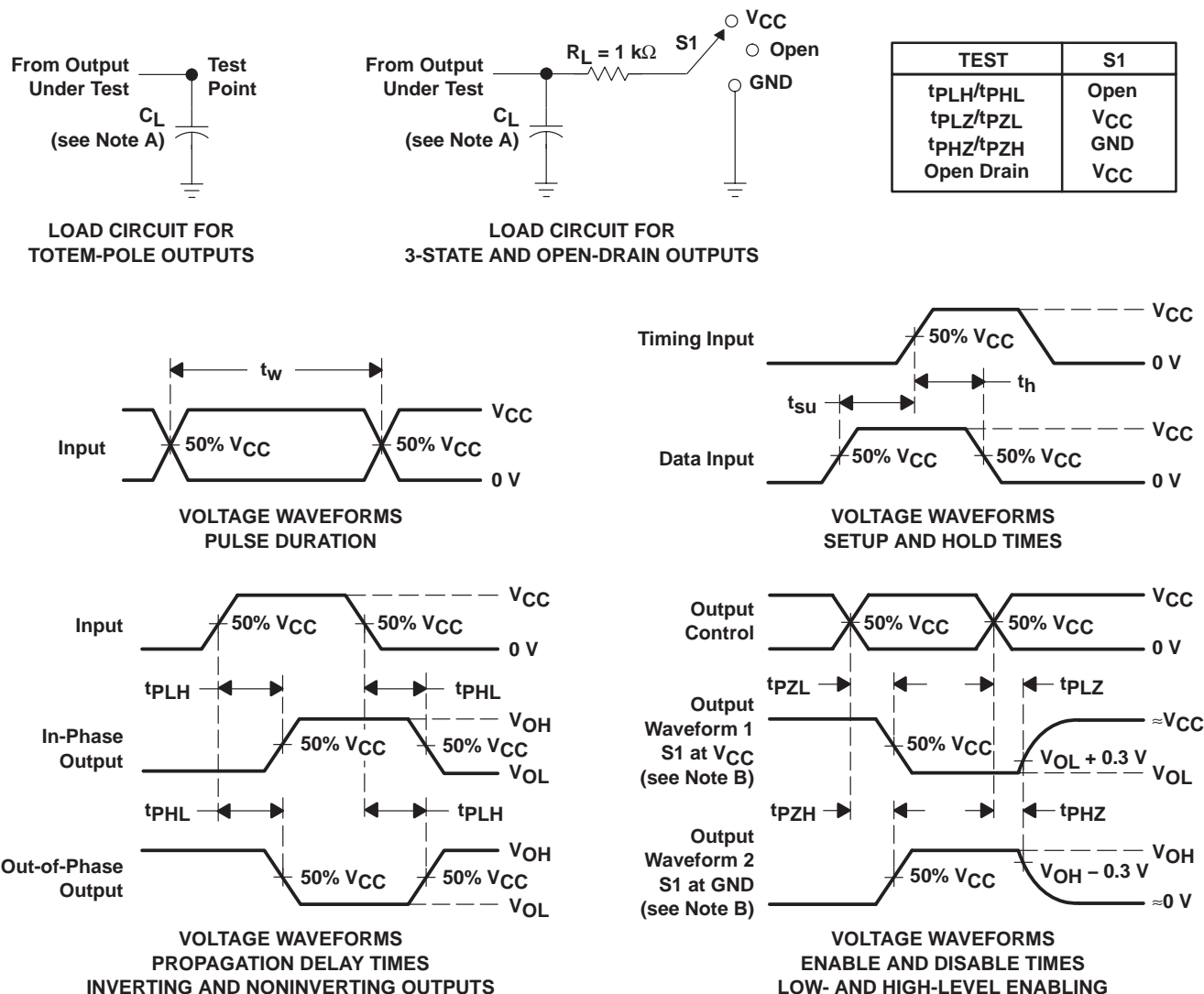


POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------------------|-----|------|
| C_{pd} Power dissipation capacitance | No load, $f = 1\text{ MHz}$ | 12 | pF |

PARAMETER MEASUREMENT INFORMATION



- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 - D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| SN74AHC04MDREP | Active | Production | SOIC (D) 14 | 2500 LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | AHC04MEP |
| SN74AHC04MPWREP | Active | Production | TSSOP (PW) 14 | 2000 LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | -55 to 125 | AHC04EP |

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN74AHC04-EP :

- Catalog : [SN74AHC04](#)

- Automotive : [SN74AHC04-Q1](#)
- Military : [SN54AHC04](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC04MDREP | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74AHC04MPWREP | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC04MDREP | SOIC | D | 14 | 2500 | 340.5 | 336.1 | 32.0 |
| SN74AHC04MPWREP | TSSOP | PW | 14 | 2000 | 356.0 | 356.0 | 35.0 |

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2025, Texas Instruments Incorporated