- Inputs Are TTL-Voltage Compatible
- Designed Specifically for High-Speed Memory Decoders and Data-Transmission Systems
- Incorporate Two Enable Inputs to Simplify Cascading and/or Data Reception
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

description/ordering information

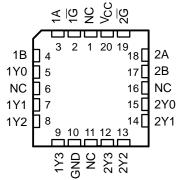
The 'AHCT139 devices are dual 2-line to 4-line decoders/demultiplexers designed for 4.5-V to 5.5-V V_{CC} operation. These devices are designed to be used in high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, these decoders can be used to minimize the effects of system decoding. When used with high-speed memories utilizing a fast enable circuit, the delay times of these decoders and the enable time of the memory usually are less than the typical access time of the memory. This means that the effective system delay introduced by the decoders is negligible.

| SN54AHCT139 J OR W PACKAGE |
|--|
| SN74AHCT139 D, DB, DGV, N, NS, OR PW PACKAGE |
| (TOP VIEW) |

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| | (| , | |
|------------------------|---|----------|------------------------|
| 1 <mark>G</mark> 1A | 1 | |] V <u>c</u> c] 2G |
| 1B | | 14 | 2A |
| 1Y0 | | 13 | 2B |
| 1Y1 1Y2 | | 12 11 |] 2Y0] 2Y1 |
| 1Y3 | | 10 |] 2Y2 |
| GND | | 9 | 2Y3 |

SN54AHCT139 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

| TA | PACKA | GE† | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|---------------|--------------------------|---------------------|
| | PDIP – N | Tube | SN74AHCT139N | SN74AHCT139N |
| | SOIC – D | Tube | SN74AHCT139D | AHCT139 |
| | 3010 - 0 | Tape and reel | SN74AHCT139DR | Anorita |
| –40°C to 85°C | SOP – NS | Tape and reel | SN74AHCT139NSR | AHCT139 |
| -40 C 10 85 C | SSOP – DB | Tape and reel | SN74AHCT139DBR | HB139 |
| | TSSOP – PW | Tube | SN74AHCT139PW | HB139 |
| | 13306 - FW | Tape and reel | SN74AHCT139PWR | прізэ |
| | TVSOP – DGV | Tape and reel | SN74AHCT139DGVR | HB139 |
| | CDIP – J | Tube | SNJ54AHCT139J | SNJ54AHCT139J |
| –55°C to 125°C | CFP – W | Tube | SNJ54AHCT139W | SNJ54AHCT139W |
| | LCCC – FK | Tube | SNJ54AHCT13FK | SNJ54AHCT139FK |

ORDERING INFORMATION

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



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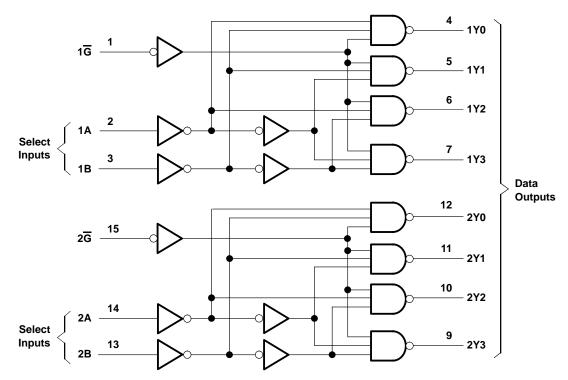
description/ordering information (continued)

The active-low enable (\overline{G}) input can be used as a data line in demultiplexing applications. These decoders/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit.

| | (ea | ch deco | der/den | nultiplex | er) | |
|---|--------|---------|---------|-----------|------|----|
| | INPUTS | | PUTS | | | |
| G | SEL | ECT | | 001 | -015 | |
| G | В | Α | Y0 | Y1 | Y2 | Y3 |
| Н | Х | Х | Н | Н | Н | Н |
| L | L | L | L | Н | н | н |
| L | L | н | н | L | н | н |
| L | н | L | н | Н | L | н |
| L | Н | Н | Н | Н | Н | L |

FUNCTION TABLE (each decoder/demultiplexe

logic diagram (positive logic)



Pin numbers shown are for the D, DB, DGV, J, N, NS, PW, and W packages.



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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

| Input voltage range, V _I (see Note 1) Output voltage range, V _O (see Note 1) Input clamp current, I _{IK} (V _I < 0) Output clamp current, I _{OK} (V _O < 0 or V _O > V _{CC}) Continuous output current, I _O (V _O = 0 to V _{CC}) . Continuous current through V _{CC} or GND Package thermal impedance, θ_{JA} (see Note 2): | -0.5 V to 7 V -0.5 V to 7 V -0.5 V to 7 V -0.5 V to V _{CC} + 0.5 V -20 mA ±20 mA ±25 mA ±25 mA ±75 mA D package 73°C/W DB package 82°C/W DGV package 67°C/W N package 64°C/W PW package 108°C/W |
|--|---|
| Storage temperature range, T _{stg} | |

[†] 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)

| | | SN54AH | CT139 | SN74AH | CT139 | UNIT |
|---------------------|------------------------------------|-----------|-------|--------|-------|------|
| | | MIN | MAX | MIN | MAX | UNIT |
| Vcc | Supply voltage | 4.5 | 5.5 | 4.5 | 5.5 | V |
| VIH | High-level input voltage | 2 | Ŋ | 2 | | V |
| VIL | Low-level input voltage | | 0.8 | | 0.8 | V |
| VI | Input voltage | 0 | 5.5 | 0 | 5.5 | V |
| Vo | Output voltage | 0 | VCC | 0 | VCC | V |
| ЮН | High-level output current | D_{n_c} | -8 | | -8 | mA |
| IOL | Low-level output current | 101 | 8 | | 8 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 4 | 20 | | 20 | ns/V |
| ТĄ | Operating free-air temperature | -55 | 125 | -40 | 85 | °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.



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

| PARAMETER | TEST CONDITIONS | Vcc | Τ, | ₄ = 25°C | ; | SN54AHCT139 | | SN74AHCT139 | | UNIT |
|-----------|---|--------------|------|-----------------|------|-------------|------|-------------|-----|------|
| FARAWETER | TEST CONDITIONS | VCC | MIN | TYP | MAX | MIN | MAX | MIN | MAX | UNIT |
| Veri | I _{OH} = -50 μA | 4.5 V | 4.4 | 4.5 | | 4.4 | | 4.4 | | V |
| VOH | I _{OH} = –8 mA | 4.5 V | 3.94 | | | 3.8 | M: | 3.8 | | v |
| Ve | I _{OL} = 50 μA | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | V |
| VOL | I _{OL} = 8 mA | 4.5 V | | | 0.36 | i i | 0.44 | 0.44 | | v |
| lj | V _I = 5.5 V or GND | 0 V to 5.5 V | | | ±0.1 | 6 | ±1* | | ±1 | μA |
| ICC | $V_{I} = V_{CC} \text{ or GND}, \qquad I_{O} = 0$ | 5.5 V | | | 2 | na | 20 | | 20 | μA |
| ∆lcc‡ | One input at 3.4 V, Other inputs at V_{CC} or GND | 5.5 V | | | 1.35 | PRO | 1.5 | | 1.5 | mA |
| Ci | $V_I = V_{CC}$ or GND | 5 V | | 2 | 10 | | | | 10 | pF |

* On products compliant to MIL-PRF-38535, this parameter is not production tested at $V_{CC} = 0$ V.

[†] This is the increase in supply current for each input at one of the specified TTL voltage levels rather than 0 V or V_{CC}.

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

| PARAMETER | FROM | то | LOAD | Τ ₄ | λ = 25°C | ; | SN54AH | CT139 | SN74AH | CT139 | UNIT |
|------------------|---------|----------|-------------------------|----------------|----------|-------|---------------------|-------|--------|-------|------|
| PARAMETER | (INPUT) | (OUTPUT) | CAPACITANCE | MIN | TYP | MAX | MIN | MAX | MIN | MAX | UNIT |
| ^t PLH | A or B | Y | C _L = 15 pF | | 5** | 7.2** | 1** | 8.5** | 1 | 8.5 | ns |
| ^t PHL | AOIB | I | 0L = 13 pr | | 5** | 7.2** | 1** | 8.5** | 1 | 8.5 | |
| ^t PLH | D | Y | C: _ 15 pF | | 4.4** | 6.3** | 1** | 7.5** | 1 | 7.5 | - |
| ^t PHL | G | T | C _L = 15 pF | | 4.4** | 6.3** | 1** 🭳 | 7.5** | 1 | 7.5 | ns |
| ^t PLH | A or B | Y | $C_{1} = 50 \text{ pF}$ | | 6.5 | 9.2 | 6 | 10.5 | 1 | 10.5 | |
| ^t PHL | AUB | T | C _L = 50 pF | | 6.5 | 9.2 | \tilde{Q}_{0}^{1} | 10.5 | 1 | 10.5 | ns |
| ^t PLH | 0I | Y | $C_{1} = 50 \text{ pc}$ | | 5.9 | 8.3 | 4 | 9.5 | 1 | 9.5 | |
| ^t PHL | G | T | C _L = 50 pF | | 5.9 | 8.3 | 1 | 9.5 | 1 | 9.5 | ns |

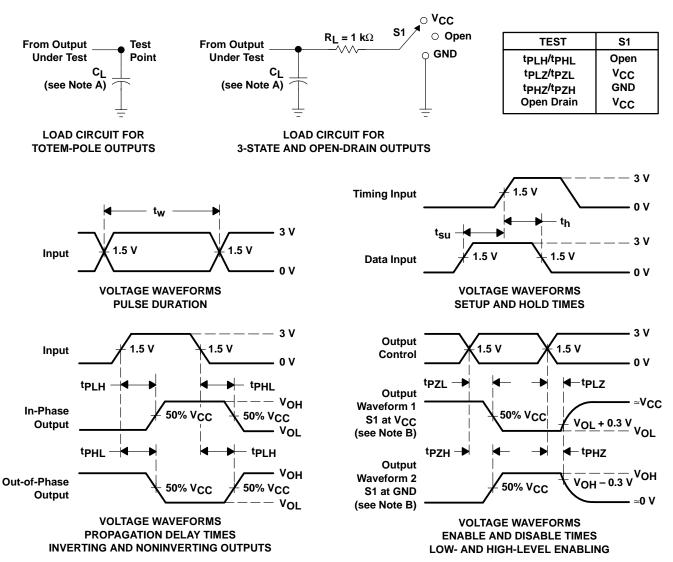
** On products compliant to MIL-PRF-38535, this parameter is not production tested.

operating characteristics, V_{CC} = 5 V, T_A = 25° C

| | PARAMETER | TEST CO | ONDITIONS | TYP | UNIT |
|-----|-------------------------------|----------|-----------|-----|------|
| Cpd | Power dissipation capacitance | No load, | f = 1 MHz | 13 | pF |



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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 MHz, Z_O = 50 Ω , t_f \leq 3 ns, t_f \leq 3 ns.
- D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms





10-Jun-2014

PACKAGING INFORMATION

| Orderable Device | Status | Package Type | • | | • | Eco Plan | Lead/Ball Finish | MSL Peak Temp | Op Temp (°C) | Device Marking | Samples |
|------------------|----------|--------------|---------|----|------|----------------------------|------------------|--------------------|--------------|----------------|---------|
| | (1) | | Drawing | _ | Qty | (2) | (6) | (3) | | (4/5) | |
| SN74AHCT139D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AHCT139 | Samples |
| SN74AHCT139DBLE | OBSOLETE | SSOP | DB | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| SN74AHCT139DBR | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HB139 | Samples |
| SN74AHCT139DG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AHCT139 | Samples |
| SN74AHCT139DGVR | ACTIVE | TVSOP | DGV | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HB139 | Samples |
| SN74AHCT139DR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AHCT139 | Samples |
| SN74AHCT139N | ACTIVE | PDIP | Ν | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | SN74AHCT139N | Samples |
| SN74AHCT139NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | SN74AHCT139N | Samples |
| SN74AHCT139PW | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HB139 | Samples |
| SN74AHCT139PWLE | OBSOLETE | TSSOP | PW | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| SN74AHCT139PWR | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HB139 | Samples |
| SN74AHCT139PWRE4 | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HB139 | Samples |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.



PACKAGE OPTION ADDENDUM

10-Jun-2014

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above. Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

⁽⁶⁾ Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



| Device | Package Type | Package Drawing | | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|-----------------|--------------------|----|------|--------------------------|--------------------------|------------|------------|------------|------------|-----------|------------------|
| SN74AHCT139DBR | SSOP | DB | 16 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74AHCT139DGVR | TVSOP | DGV | 16 | 2000 | 330.0 | 12.4 | 6.8 | 4.0 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AHCT139DR | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74AHCT139PWR | TSSOP | PW | 16 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

TEXAS INSTRUMENTS

www.ti.com

PACKAGE MATERIALS INFORMATION

26-Jan-2013



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHCT139DBR | SSOP | DB | 16 | 2000 | 367.0 | 367.0 | 38.0 |
| SN74AHCT139DGVR | TVSOP | DGV | 16 | 2000 | 367.0 | 367.0 | 35.0 |
| SN74AHCT139DR | SOIC | D | 16 | 2500 | 333.2 | 345.9 | 28.6 |
| SN74AHCT139PWR | TSSOP | PW | 16 | 2000 | 367.0 | 367.0 | 35.0 |

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

- A. All linear dimensions are in inches (millimeters).B. This drawing is subject to change without notice.
- Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
- \triangle The 20 pin end lead shoulder width is a vendor option, either half or full width.



MECHANICAL DATA

PLASTIC SMALL-OUTLINE

MPDS006C - FEBRUARY 1996 - REVISED AUGUST 2000

DGV (R-PDSO-G**)

24 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
- D. Falls within JEDEC: 24/48 Pins MO-153

14/16/20/56 Pins – MO-194



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.



4211283-4/E 08/12

D (R-PDSO-G16) PLASTIC SMALL OUTLINE Stencil Openings (Note D) Example Board Layout (Note C) –16x0,55 -14x1,27 -14x1,27 16x1,50 5,40 5.40 Example Non Soldermask Defined Pad Example Pad Geometry (See Note C) 0,60 .55 Example 1. Solder Mask Opening (See Note E) -0,07 All Around

NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES:

A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994. β . This drawing is subject to change without notice.

Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



MECHANICAL DATA

MSSO002E - JANUARY 1995 - REVISED DECEMBER 2001

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



NOTES: A. All linear dimensions are in millimeters.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
- D. Falls within JEDEC MO-150



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