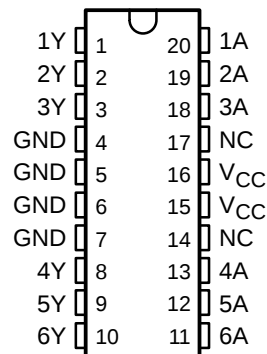


- Inputs Are TTL-Voltage Compatible
- Flow-Through Architecture Optimizes PCB Layout
- Center-Pin  $V_{CC}$  and GND Configurations Minimize High-Speed Switching Noise
- **EPIC™** (Enhanced-Performance Implanted CMOS) 1- $\mu$ m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages and Standard Plastic (N) 300-mil DIPs

DB, DW, N, OR PW PACKAGE  
(TOP VIEW)



NC – No internal connection

## description

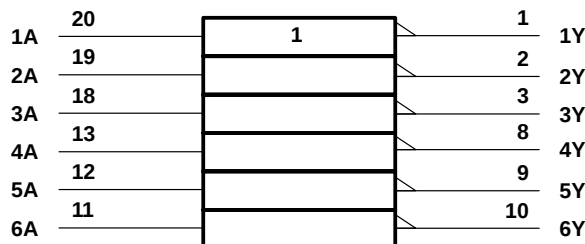
This device contains six independent inverters. It performs the Boolean function  $Y = \bar{A}$ .

The 74ACT11004 is characterized for operation from –40°C to 85°C.

FUNCTION TABLE  
(each inverter)

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | L           |
| L          | H           |

## logic symbol†



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



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**TEXAS  
INSTRUMENTS**

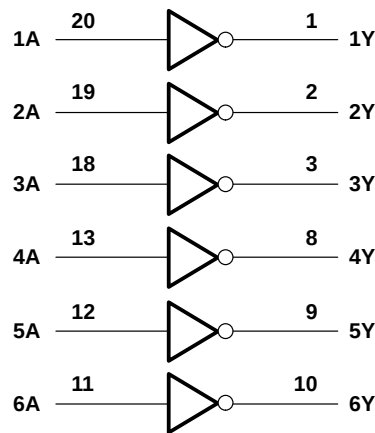
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74ACT11004  
HEX INVERTER

SCAS215B – JANUARY 1988 – REVISED JUNE 1997

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                |                            |
|----------------------------------------------------------------|----------------------------|
| Supply voltage range, $V_{CC}$                                 | –0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 1)                        | –0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range, $V_O$ (see Note 1)                       | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ )  | ±20 mA                     |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) | ±50 mA                     |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )     | ±50 mA                     |
| Continuous current through $V_{CC}$ or GND                     | ±150 mA                    |
| Package thermal impedance, $\theta_{JA}$ (see Note 2):         |                            |
| DB package                                                     | 115°C/W                    |
| DW package                                                     | 97°C/W                     |
| N package                                                      | 67°C/W                     |
| PW package                                                     | 128°C/W                    |
| Storage temperature range, $T_{Stg}$                           | –65°C to 150°C             |

<sup>†</sup> 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, except for through-hole packages, which use a trace length of zero.

recommended operating conditions

|                                                        | MIN | MAX      | UNIT |
|--------------------------------------------------------|-----|----------|------|
| $V_{CC}$ Supply voltage                                | 4.5 | 5.5      | V    |
| $V_{IH}$ High-level input voltage                      | 2   |          | V    |
| $V_{IL}$ Low-level input voltage                       |     | 0.8      | V    |
| $V_I$ Input voltage                                    | 0   | $V_{CC}$ | V    |
| $V_O$ Output voltage                                   | 0   | $V_{CC}$ | V    |
| $I_{OH}$ High-level output current                     |     | –24      | mA   |
| $I_{OL}$ Low-level output current                      |     | 24       | mA   |
| $\Delta t/\Delta v$ Input transition rise or fall rate | 0   | 10       | ns/V |
| $T_A$ Operating free-air temperature                   | –40 | 85       | °C   |

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

| PARAMETER                     | TEST CONDITIONS                                             | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |      | MIN  | MAX  | UNIT |
|-------------------------------|-------------------------------------------------------------|-----------------|-----------------------|-----|------|------|------|------|
|                               |                                                             |                 | MIN                   | TYP | MAX  |      |      |      |
| V <sub>OH</sub>               | I <sub>OH</sub> = -50 µA                                    | 4.5 V           | 4.4                   |     |      | 4.4  |      | V    |
|                               |                                                             | 5.5 V           | 5.4                   |     |      | 5.4  |      |      |
|                               | I <sub>OH</sub> = -24 mA                                    | 4.5 V           | 3.94                  |     |      | 3.8  |      |      |
|                               |                                                             | 5.5 V           | 4.94                  |     |      | 4.8  |      |      |
|                               | I <sub>OH</sub> = -75 mA <sup>†</sup>                       | 5.5 V           |                       |     |      | 3.85 |      |      |
|                               |                                                             |                 |                       |     |      |      |      |      |
| V <sub>OL</sub>               | I <sub>OL</sub> = 50 µA                                     | 4.5 V           |                       |     | 0.1  |      | 0.1  | V    |
|                               |                                                             | 5.5 V           |                       |     | 0.1  |      | 0.1  |      |
|                               | I <sub>OL</sub> = 24 mA                                     | 4.5 V           |                       |     | 0.36 |      | 0.44 |      |
|                               |                                                             | 5.5 V           |                       |     | 0.36 |      | 0.44 |      |
|                               | I <sub>OL</sub> = 75 mA <sup>†</sup>                        | 5.5 V           |                       |     |      |      | 1.65 |      |
|                               |                                                             |                 |                       |     |      |      |      |      |
| I <sub>I</sub>                | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 5.5 V           |                       |     | ±0.1 |      | ±1   | µA   |
| I <sub>CC</sub>               | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 5.5 V           |                       |     | 4    |      | 40   | µA   |
| ΔI <sub>CC</sub> <sup>‡</sup> | One input at 3.4 V, Other inputs at GND or V <sub>CC</sub>  | 5.5 V           |                       |     | 0.9  |      | 1    | mA   |
| C <sub>i</sub>                | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 5 V             |                       | 3.5 |      |      |      | pF   |

<sup>†</sup> Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ns.

<sup>‡</sup> This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or V<sub>CC</sub>.

**switching characteristics over recommended ranges of supply voltage and free-air temperature (unless otherwise noted) (see Figure 1)**

| PARAMETER        | FROM (INPUT) | TO (OUTPUT) | T <sub>A</sub> = 25°C |     |     | MIN | MAX | UNIT |
|------------------|--------------|-------------|-----------------------|-----|-----|-----|-----|------|
|                  |              |             | MIN                   | TYP | MAX |     |     |      |
| t <sub>PLH</sub> | A            | Y           | 1.5                   | 5.3 | 9   | 1.5 | 9.7 | ns   |
| t <sub>PHL</sub> |              |             | 1.5                   | 6.4 | 8.7 | 1.5 | 9.6 |      |

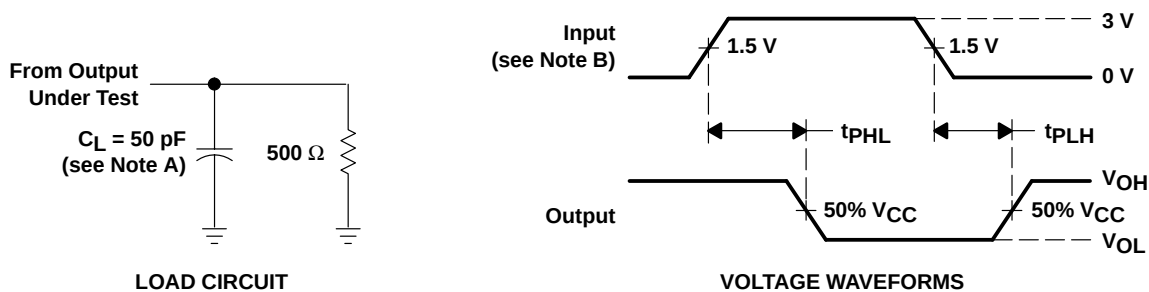
**operating characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**

| PARAMETER                                                  | TEST CONDITIONS                   | TYP | UNIT |
|------------------------------------------------------------|-----------------------------------|-----|------|
| C <sub>pd</sub> Power dissipation capacitance per inverter | C <sub>L</sub> = 50 pF, f = 1 MHz | 32  | pF   |

# 74ACT11004 HEX INVERTER

SCAS215B – JANUARY 1988 – REVISED JUNE 1997

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. Input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r = 3 \text{ ns}$ ,  $t_f = 3 \text{ ns}$ .  
 C. The outputs are measured one at a time with one input transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| 74ACT11004DBLE   | OBSOLETE      | SSOP         | DB                 | 20   |             | TBD                        | Call TI          | Call TI              | -40 to 85    |                          |                         |
| 74ACT11004DBR    | ACTIVE        | SSOP         | DB                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AT004                    | <a href="#">Samples</a> |
| 74ACT11004DBRE4  | ACTIVE        | SSOP         | DB                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AT004                    | <a href="#">Samples</a> |
| 74ACT11004DBRG4  | ACTIVE        | SSOP         | DB                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AT004                    | <a href="#">Samples</a> |
| 74ACT11004DW     | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | ACT11004                 | <a href="#">Samples</a> |
| 74ACT11004DWG4   | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | ACT11004                 | <a href="#">Samples</a> |
| 74ACT11004DWR    | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | -40 to 85    | ACT11004                 |                         |
| 74ACT11004DWRE4  | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | -40 to 85    |                          |                         |
| 74ACT11004DWRG4  | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | -40 to 85    |                          |                         |
| 74ACT11004N      | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | -40 to 85    | 74ACT11004N              | <a href="#">Samples</a> |
| 74ACT11004NE4    | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | -40 to 85    | 74ACT11004N              | <a href="#">Samples</a> |
| 74ACT11004PW     | ACTIVE        | TSSOP        | PW                 | 20   | 70          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AT004                    | <a href="#">Samples</a> |
| 74ACT11004PWE4   | ACTIVE        | TSSOP        | PW                 | 20   | 70          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AT004                    | <a href="#">Samples</a> |
| 74ACT11004PWG4   | ACTIVE        | TSSOP        | PW                 | 20   | 70          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AT004                    | <a href="#">Samples</a> |

(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.

**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)

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

<sup>(4)</sup> Only one of markings shown within the brackets will appear on the physical device.

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## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

### 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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74ACT11004DBR | SSOP         | DB              | 20   | 2000 | 330.0              | 16.4               | 8.2     | 7.5     | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



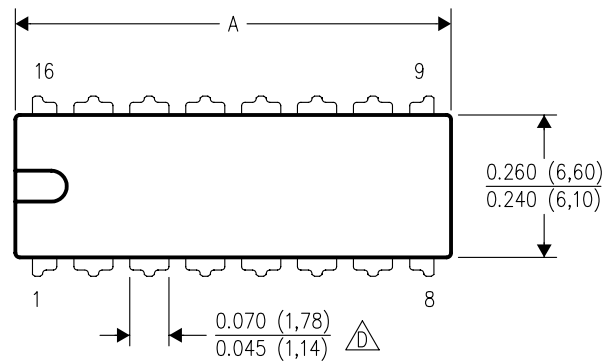
\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74ACT11004DBR | SSOP         | DB              | 20   | 2000 | 367.0       | 367.0      | 38.0        |

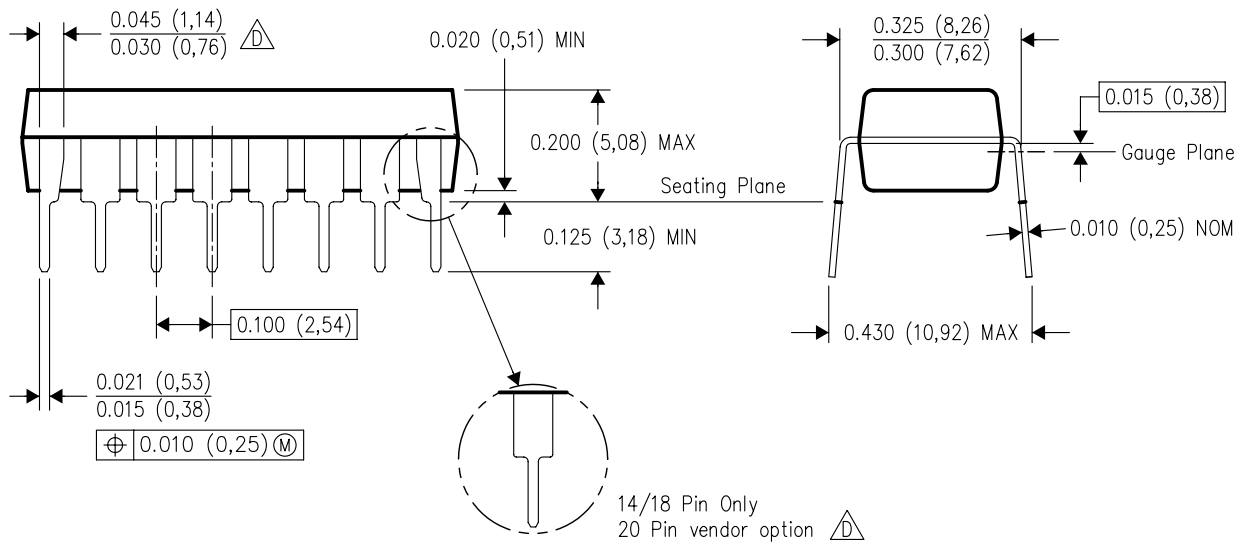
N (R-PDIP-T\*\*)

16 PINS SHOWN

# PLASTIC DUAL-IN-LINE PACKAGE



| DIM \ PINS **       | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



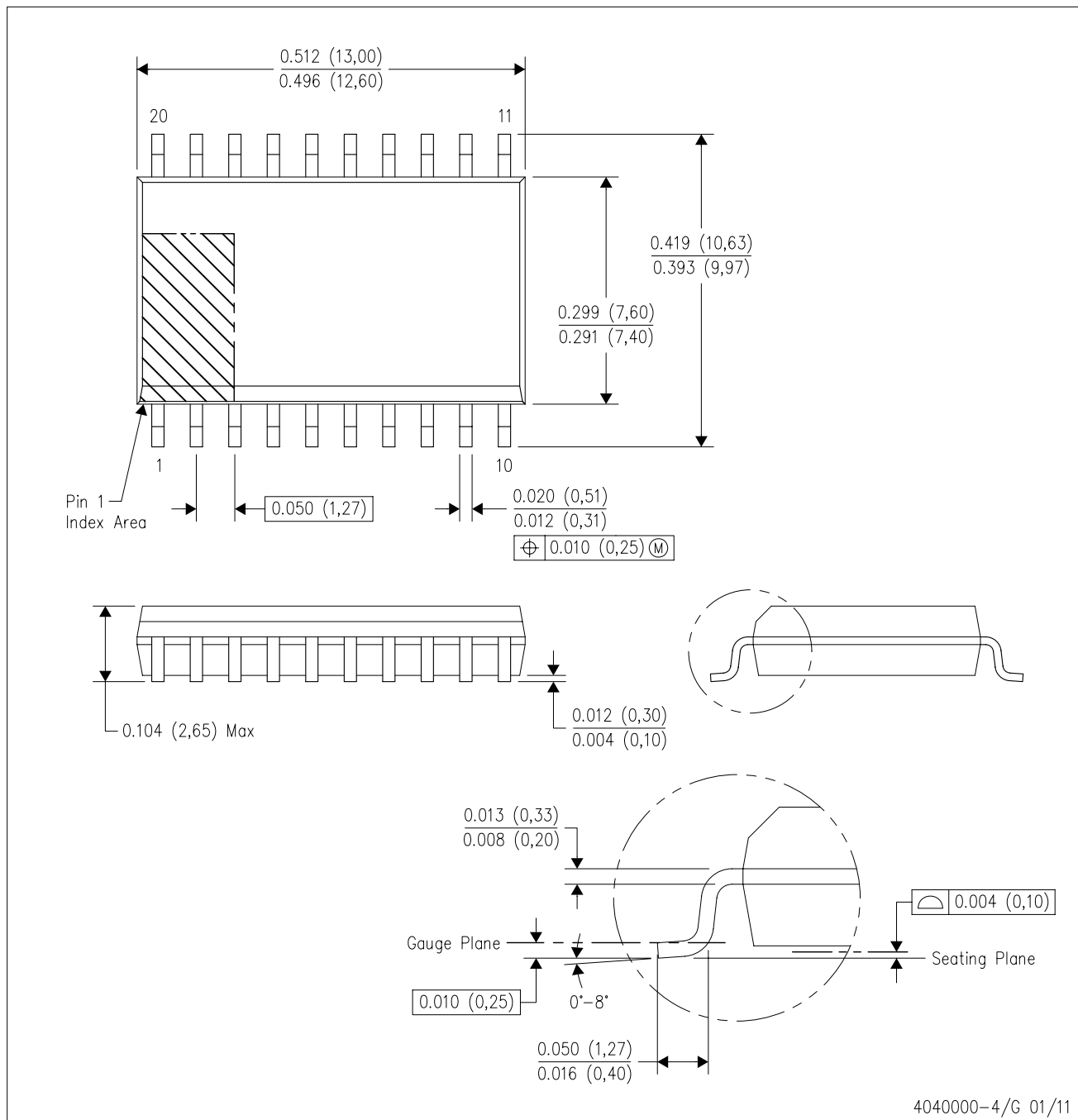
4040049/E 12/2002

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).  
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G20)

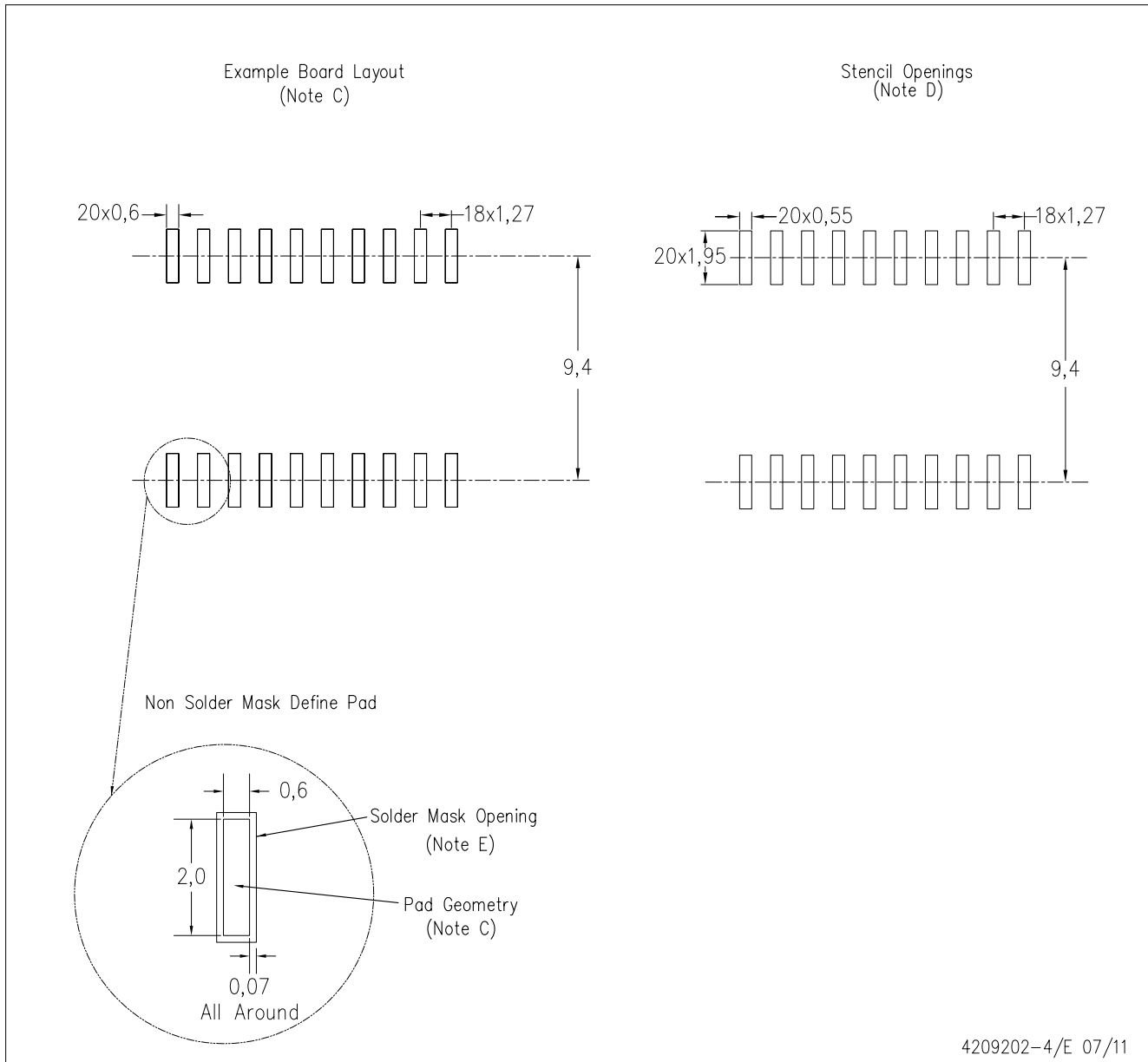
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - 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
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4040064-5/G 02/11

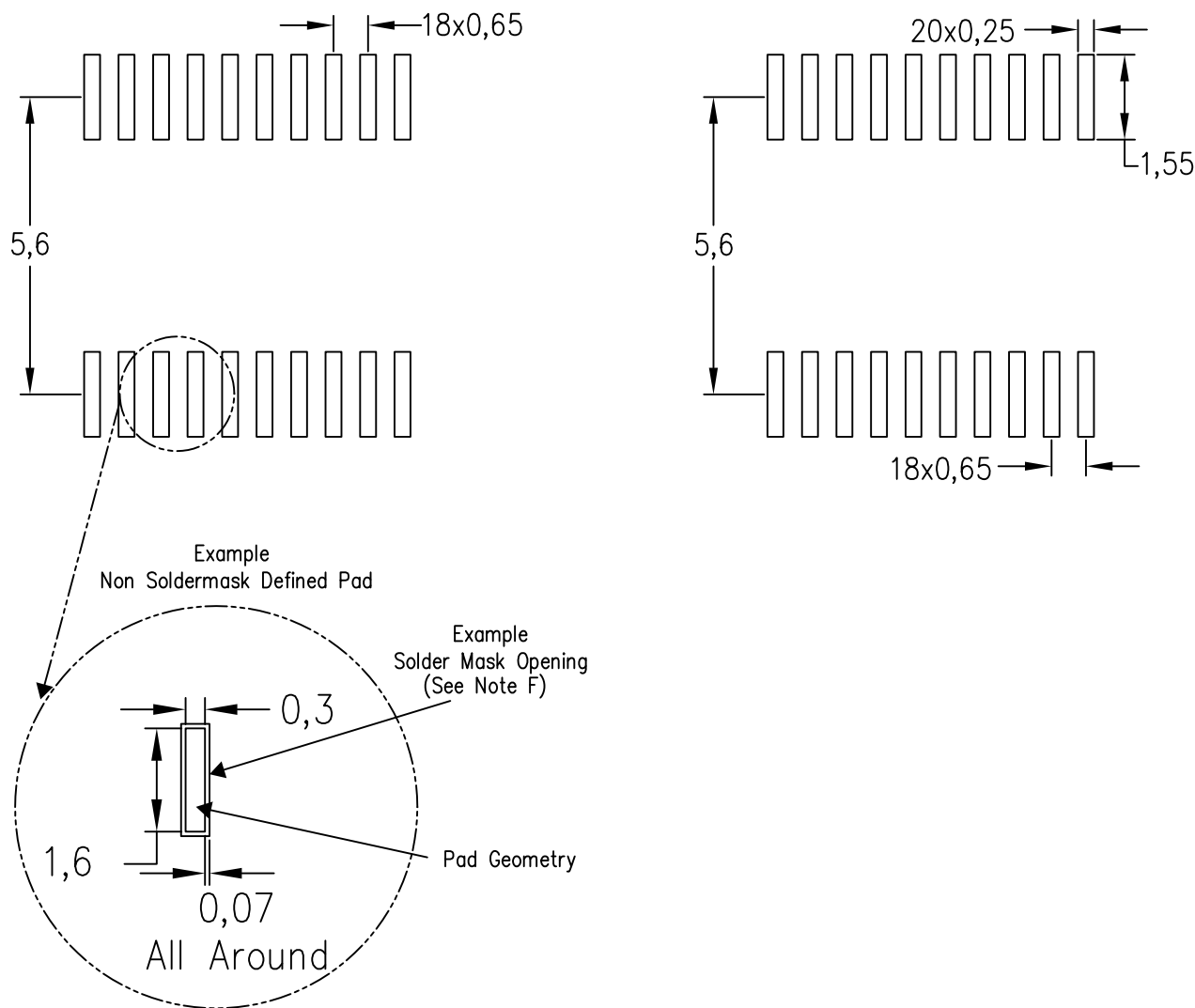
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. 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-G20)

PLASTIC SMALL OUTLINE

Example Board Layout

Based on a stencil thickness  
of .127mm (.005inch).



4211284-5/F 12/12

- 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 design.
  - 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.

## 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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|------------------------------|--------------------------------------------------------------------------------------|
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| Amplifiers                   | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters              | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products                | <a href="http://www.dlp.com">www.dlp.com</a>                                         |
| DSP                          | <a href="http://dsp.ti.com">dsp.ti.com</a>                                           |
| Clocks and Timers            | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface                    | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                        | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt                   | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers             | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                         | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Applications Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity        | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| Automotive and Transportation | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
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