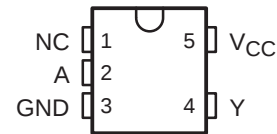


# SN74AUC1G07 SINGLE BUFFER/DRIVER WITH OPEN-DRAIN OUTPUT

SCES373L– SEPTEMBER 2001 – REVISED NOVEMBER 2003

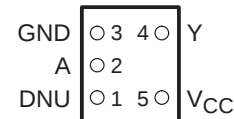
- Available in the Texas Instruments NanoStar™ and NanoFree™ Packages
- Optimized for 1.8-V Operation and Is 3.6-V I/O Tolerant to Support Mixed-Mode Signal Operation
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Sub 1-V Operable
- Max  $t_{pd}$  of 2.5 ns at 1.8 V
- Low Power Consumption, 10- $\mu$ A Max  $I_{CC}$
- $\pm 8$ -mA Output Drive at 1.8 V
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

DBV OR DCK PACKAGE  
(TOP VIEW)



NC – No internal connection

YEA, YEP, YZA, OR YZP PACKAGE  
(BOTTOM VIEW)



DNU – Do not use

## description/ordering information

This single buffer/driver is operational at 0.8-V to 2.7-V  $V_{CC}$ , but is designed specifically for 1.65-V to 1.95-V  $V_{CC}$  operation.

The output of the SN74AUC1G07 is open drain and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions.

NanoStar™ and NanoFree™ package technology is a major breakthrough in IC packaging concepts, using the die as the package.

## ORDERING INFORMATION

| $T_A$         | PACKAGE†                                                       |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING‡ |
|---------------|----------------------------------------------------------------|---------------|-----------------------|-------------------|
| –40°C to 85°C | NanoStar™ – WCSP (DSBGA)<br>0.17-mm Small Bump – YEA           | Tape and reel | SN74AUC1G07YEAR       | _ _ _ UV _        |
|               | NanoFree™ – WCSP (DSBGA)<br>0.17-mm Small Bump – YZA (Pb-free) |               | SN74AUC1G07YZAR       |                   |
|               | NanoStar™ – WCSP (DSBGA)<br>0.23-mm Large Bump – YEP           |               | SN74AUC1G07YEPR       |                   |
|               | NanoFree™ – WCSP (DSBGA)<br>0.23-mm Large Bump – YZP (Pb-free) |               | SN74AUC1G07YZPR       |                   |
|               | SOT (SOT-23) – DBV                                             | Tape and reel | SN74AUC1G07DBVR       | U07 _             |
|               | SOT (SC-70) – DCK                                              | Tape and reel | SN74AUC1G07DCKR       | UV _              |

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

‡ DBV/DCK: The actual top-side marking has one additional character that designates the assembly/test site.  
YEA/YZA, YEP/YZP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the assembly/test site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).



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.

NanoStar and NanoFree are trademarks 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.



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# SN74AUC1G07

## SINGLE BUFFER/DRIVER

### WITH OPEN-DRAIN OUTPUT

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#### description/ordering information (continued)

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

For more information about AUC Little Logic devices, please refer to the TI application report, *Applications of Texas Instruments AUC Sub-1-V Little Logic Devices*, literature number SCEA027.

FUNCTION TABLE

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

#### 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 3.6 V |
| Input voltage range, $V_I$ (see Note 1)                | –0.5 V to 3.6 V |
| Output voltage range, $V_O$ (see Note 1)               | –0.5 V to 3.6 V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ )            | –50 mA          |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ )           | –50 mA          |
| Continuous output current, $I_O$                       | ±20 mA          |
| Continuous current through $V_{CC}$ or GND             | ±100 mA         |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): |                 |
| DBV package                                            | 206°C/W         |
| DCK package                                            | 252°C/W         |
| YEA/YZA package                                        | 154°C/W         |
| YEP/YZP package                                        | 132°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 negative-voltage 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.

# SN74AUC1G07

## SINGLE BUFFER/DRIVER

### WITH OPEN-DRAIN OUTPUT

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#### recommended operating conditions (see Note 3)

|                 |                                    | MIN                               | MAX                    | UNIT |
|-----------------|------------------------------------|-----------------------------------|------------------------|------|
| V <sub>CC</sub> | Supply voltage                     | 0.8                               | 2.7                    | V    |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 0.8 V           | V <sub>CC</sub>        | V    |
|                 |                                    | V <sub>CC</sub> = 1.1 V to 1.95 V | 0.65 × V <sub>CC</sub> |      |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V  | 1.7                    |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 0.8 V           | 0                      | V    |
|                 |                                    | V <sub>CC</sub> = 1.1 V to 1.95 V | 0.35 × V <sub>CC</sub> |      |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V  | 0.7                    |      |
| V <sub>I</sub>  | Input voltage                      | 0                                 | 3.6                    | V    |
| V <sub>O</sub>  | Output voltage                     | 0                                 | 3.6                    | V    |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 0.8 V           | 0.7                    | mA   |
|                 |                                    | V <sub>CC</sub> = 1.1 V           | 3                      |      |
|                 |                                    | V <sub>CC</sub> = 1.4 V           | 5                      |      |
|                 |                                    | V <sub>CC</sub> = 1.65 V          | 8                      |      |
|                 |                                    | V <sub>CC</sub> = 2.3 V           | 9                      |      |
| Δt/Δv           | Input transition rise or fall rate |                                   | 15                     | ns/V |
| T <sub>A</sub>  | Operating free-air temperature     | –40                               | 85                     | °C   |

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

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

| PARAMETER        | TEST CONDITIONS                                             | V <sub>CC</sub> | MIN | TYP† | MAX  | UNIT |
|------------------|-------------------------------------------------------------|-----------------|-----|------|------|------|
| V <sub>OL</sub>  | I <sub>OL</sub> = 100 μA                                    | 0.8 V to 2.7 V  |     |      | 0.2  | V    |
|                  | I <sub>OL</sub> = 0.7 mA                                    | 0.8 V           |     | 0.25 |      |      |
|                  | I <sub>OL</sub> = 3 mA                                      | 1.1 V           |     |      | 0.3  |      |
|                  | I <sub>OL</sub> = 5 mA                                      | 1.4 V           |     |      | 0.4  |      |
|                  | I <sub>OL</sub> = 8 mA                                      | 1.65 V          |     |      | 0.45 |      |
|                  | I <sub>OL</sub> = 9 mA                                      | 2.3 V           |     |      | 0.6  |      |
| I <sub>I</sub>   | A input<br>V <sub>I</sub> = V <sub>CC</sub> or GND          | 0 to 2.7 V      |     |      | ±5   | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 2.7 V                    | 0               |     |      | ±10  | μA   |
| I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 0.8 V to 2.7 V  |     |      | 10   | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 2.5 V           |     | 3    |      | pF   |
| C <sub>o</sub>   | V <sub>O</sub> = V <sub>CC</sub> or GND                     | 2.5 V           |     | 3.5  |      | pF   |

† All typical values are at T<sub>A</sub> = 25°C.

#### switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 15 pF (unless otherwise noted) (see Figure 1)

| PARAMETER       | FROM (INPUT) | TO (OUTPUT) | V <sub>CC</sub> = 0.8 V | V <sub>CC</sub> = 1.2 V ± 0.1 V | V <sub>CC</sub> = 1.5 V ± 0.1 V | V <sub>CC</sub> = 1.8 V ± 0.15 V | V <sub>CC</sub> = 2.5 V ± 0.2 V | UNIT |
|-----------------|--------------|-------------|-------------------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|------|
|                 |              |             | TYP                     | MIN MAX                         | MIN MAX                         | MIN TYP MAX                      | MIN MAX                         |      |
| t <sub>pd</sub> | A            | Y           | 4.7                     | 0.3 3.3                         | 0.2 2.4                         | ‡ ‡ ‡                            | ‡ ‡                             | ns   |

‡ This information was not available at the time of publication.



# SN74AUC1G07

## SINGLE BUFFER/DRIVER

### WITH OPEN-DRAIN OUTPUT

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switching characteristics over recommended operating free-air temperature range,  $C_L = 30 \text{ pF}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8 \text{ V}$<br>$\pm 0.15 \text{ V}$ |     |     | $V_{CC} = 2.5 \text{ V}$<br>$\pm 0.2 \text{ V}$ |     | UNIT |
|-----------|-----------------|----------------|--------------------------------------------------|-----|-----|-------------------------------------------------|-----|------|
|           |                 |                | MIN                                              | TYP | MAX | MIN                                             | MAX |      |
| $t_{pd}$  | A               | Y              | 0.8                                              | 1.9 | 2.5 | 0.2                                             | 1.8 | ns   |

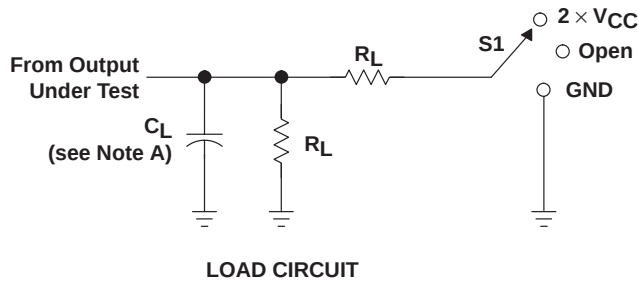
operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS      | $V_{CC} = 1.2 \text{ V}$ | $V_{CC} = 1.5 \text{ V}$ | $V_{CC} = 1.8 \text{ V}$ | $V_{CC} = 2.5 \text{ V}$ | UNIT |
|-----------|-------------------------------|----------------------|--------------------------|--------------------------|--------------------------|--------------------------|------|
|           |                               |                      | TYP                      | TYP                      | TYP                      | TYP                      |      |
| $C_{pd}$  | Power dissipation capacitance | $f = 10 \text{ MHz}$ | 2                        | 3                        | 3                        | 5                        | pF   |



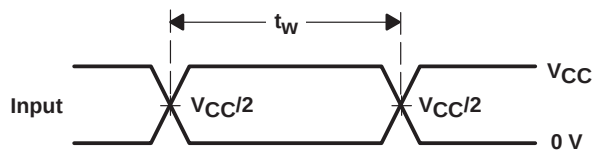
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## PARAMETER MEASUREMENT INFORMATION

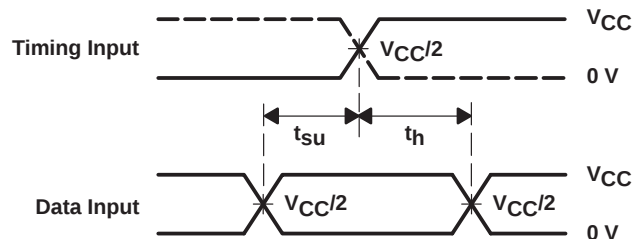


| TEST              | S1                |
|-------------------|-------------------|
| $t_{PLH}/t_{PHL}$ | Open              |
| $t_{PLZ}/t_{PZL}$ | $2 \times V_{CC}$ |
| $t_{PHZ}/t_{PZH}$ | GND               |

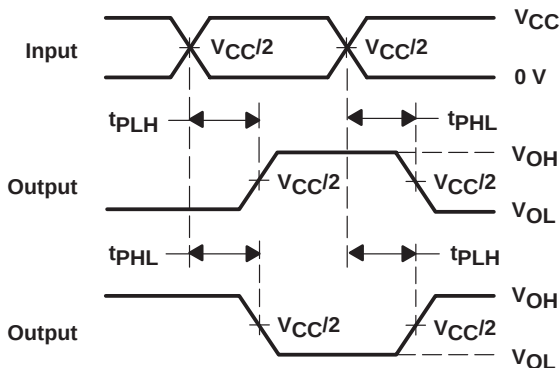
| $V_{CC}$           | $C_L$ | $R_L$        | $V_{\Delta}$ |
|--------------------|-------|--------------|--------------|
| 0.8 V              | 15 pF | 2 k $\Omega$ | 0.1 V        |
| 1.2 V $\pm$ 0.1 V  | 15 pF | 2 k $\Omega$ | 0.1 V        |
| 1.5 V $\pm$ 0.1 V  | 15 pF | 2 k $\Omega$ | 0.1 V        |
| 1.8 V $\pm$ 0.15 V | 15 pF | 2 k $\Omega$ | 0.15 V       |
| 2.5 V $\pm$ 0.2 V  | 15 pF | 2 k $\Omega$ | 0.15 V       |
| 1.8 V $\pm$ 0.15 V | 30 pF | 1 k $\Omega$ | 0.15 V       |
| 2.5 V $\pm$ 0.2 V  | 30 pF | 500 $\Omega$ | 0.15 V       |



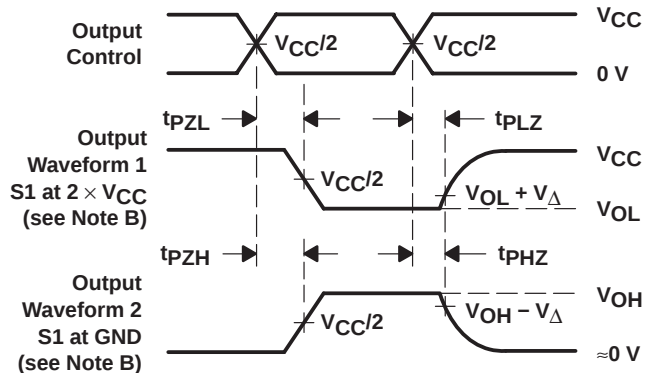
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $Z_O = 50 \Omega$ , slew rate  $\geq 1$  V/ns.
  - The outputs are measured one at a time with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

## PACKAGING INFORMATION

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74AUC1G07DBVR  | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUC1G07DBVT  | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUC1G07DCKR  | ACTIVE                | SC70         | DCK             | 5    | 3000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUC1G07DCKT  | ACTIVE                | SC70         | DCK             | 5    | 250         | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUC1G07YEAR  | ACTIVE                | WCSP         | YEA             | 5    | 3000        | None                    | SNPB             | Level-1-260C-UNLIM           |
| SN74AUC1G07YEPR  | ACTIVE                | WCSP         | YEP             | 5    | 3000        | None                    | SNPB             | Level-1-260C-UNLIM           |
| SN74AUC1G07YZAR  | ACTIVE                | WCSP         | YZA             | 5    | 3000        | None                    | Call TI          | Call TI                      |
| SN74AUC1G07YZPR  | ACTIVE                | WCSP         | YZP             | 5    | 3000        | Pb-Free (RoHS)          | SNAGCU           | Level-1-260C-UNLIM           |

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**None:** Not yet available Lead (Pb-Free).

**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.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

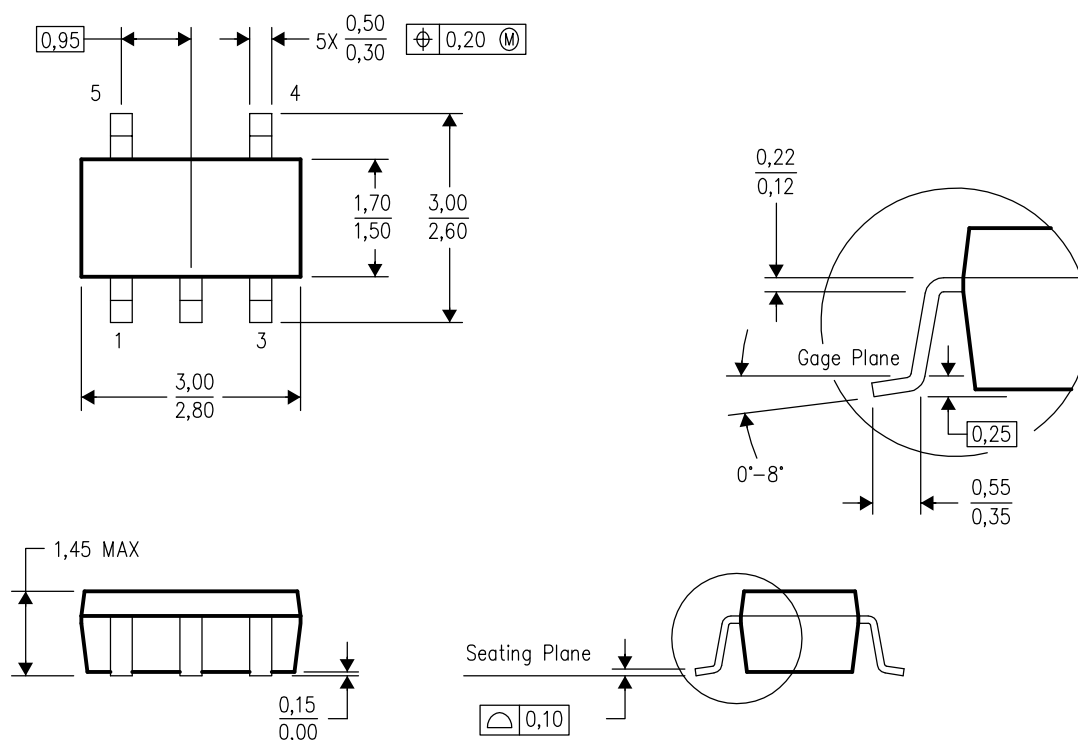
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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## DBV (R-PDSO-G5)

# PLASTIC SMALL-OUTLINE PACKAGE

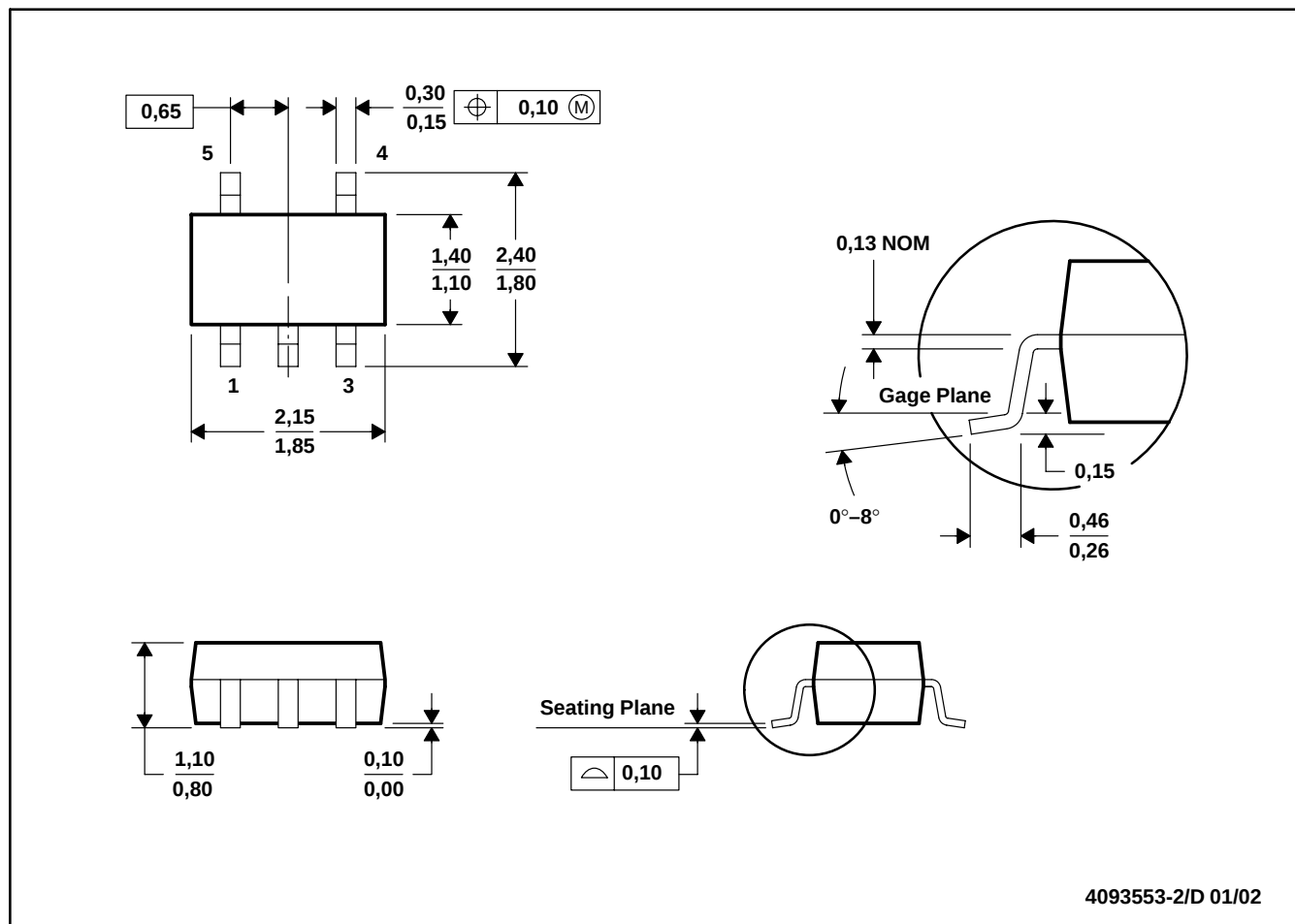


4073253-4/H 10/2003

- 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.
  - D. Falls within JEDEC MO-178 Variation AA.

## DCK (R-PDSO-G5)

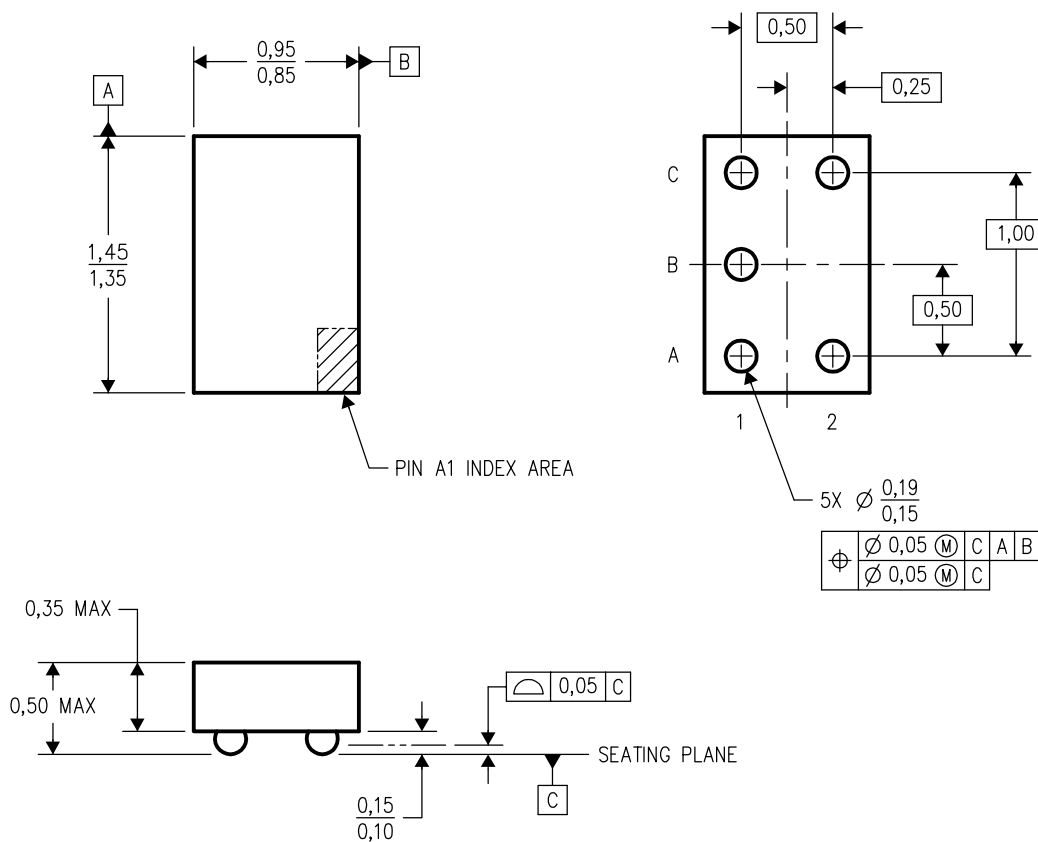
## PLASTIC SMALL-OUTLINE PACKAGE



4093553-2/D 01/02

YEA (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY



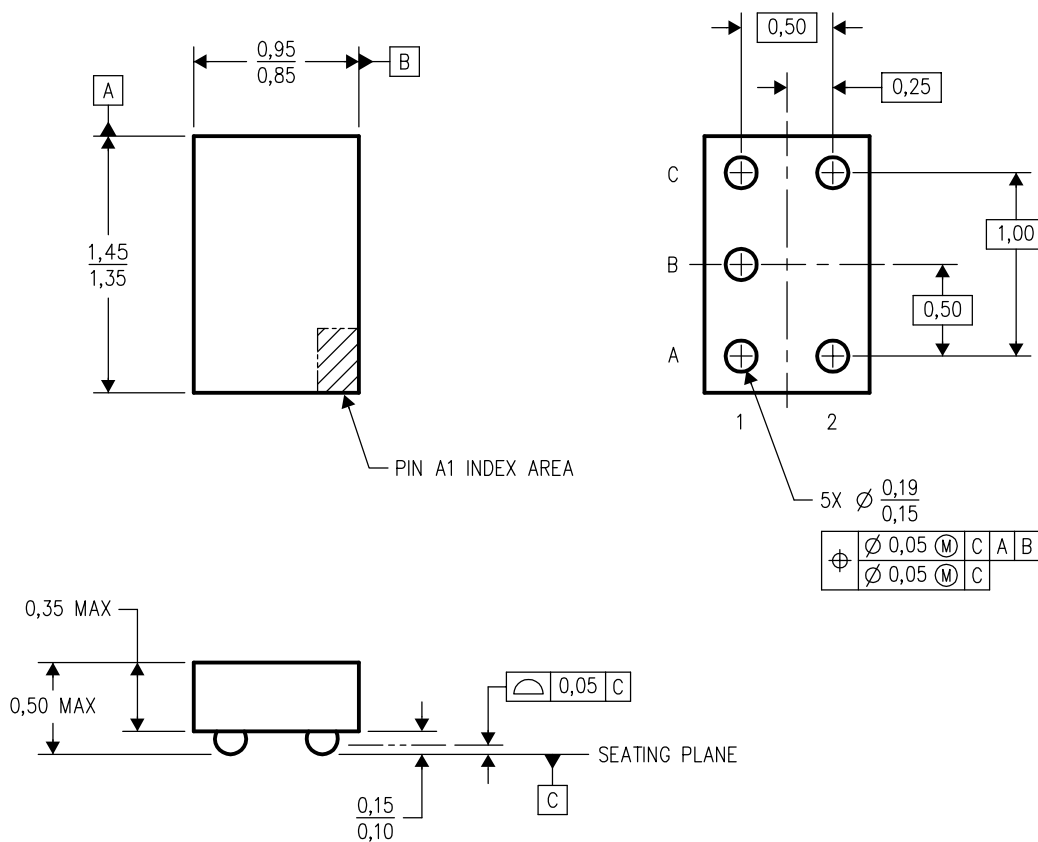
4203167-2/C 04/2002

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoStar™ package configuration.
  - D. Package complies to JEDEC MO-211 variation EA.
  - E. This package is tin-lead (SnPb). Refer to the 5 YZA package (drawing 4204151) for lead-free.

NanoStar is a trademark of Texas Instruments.

## YZA (R-XBGA-N5)

## DIE-SIZE BALL GRID ARRAY



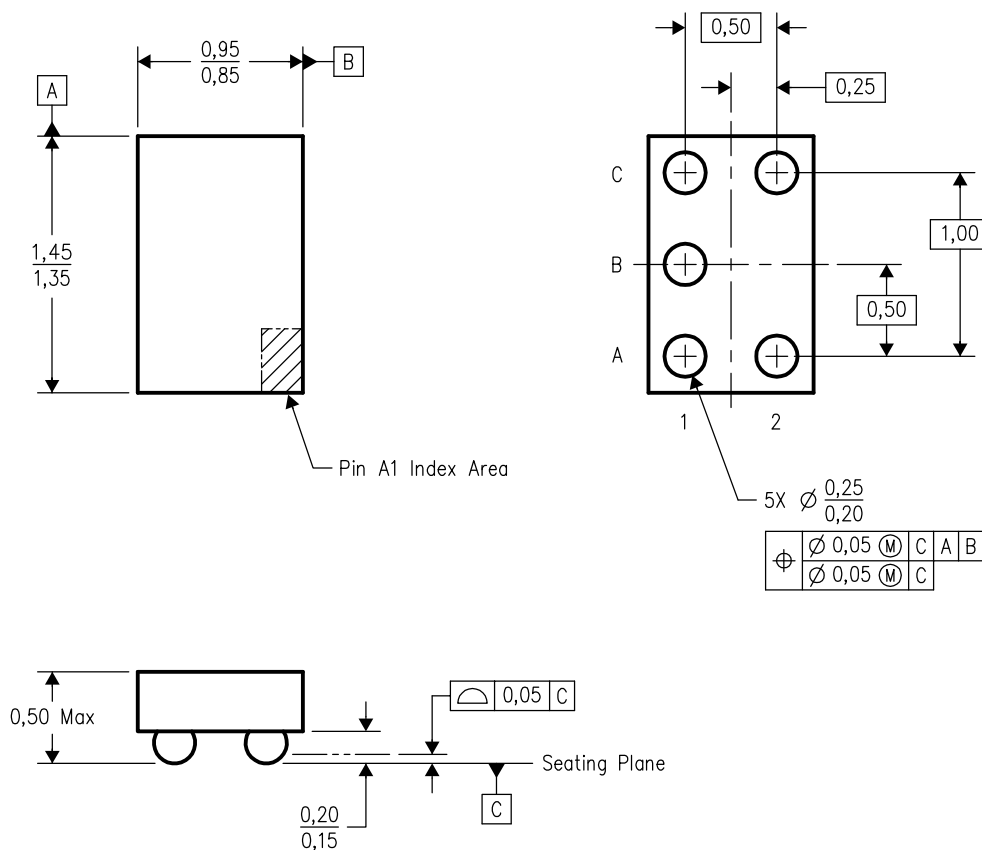
4204151-2/B 03/2002

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - D. Package complies to JEDEC MO-211 variation EA.
  - E. This package is lead-free. Refer to the 5 YEA package (drawing 4203167) for tin-lead (SnPb).

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## YZP (R-XBGA-N5)

## DIE-SIZE BALL GRID ARRAY



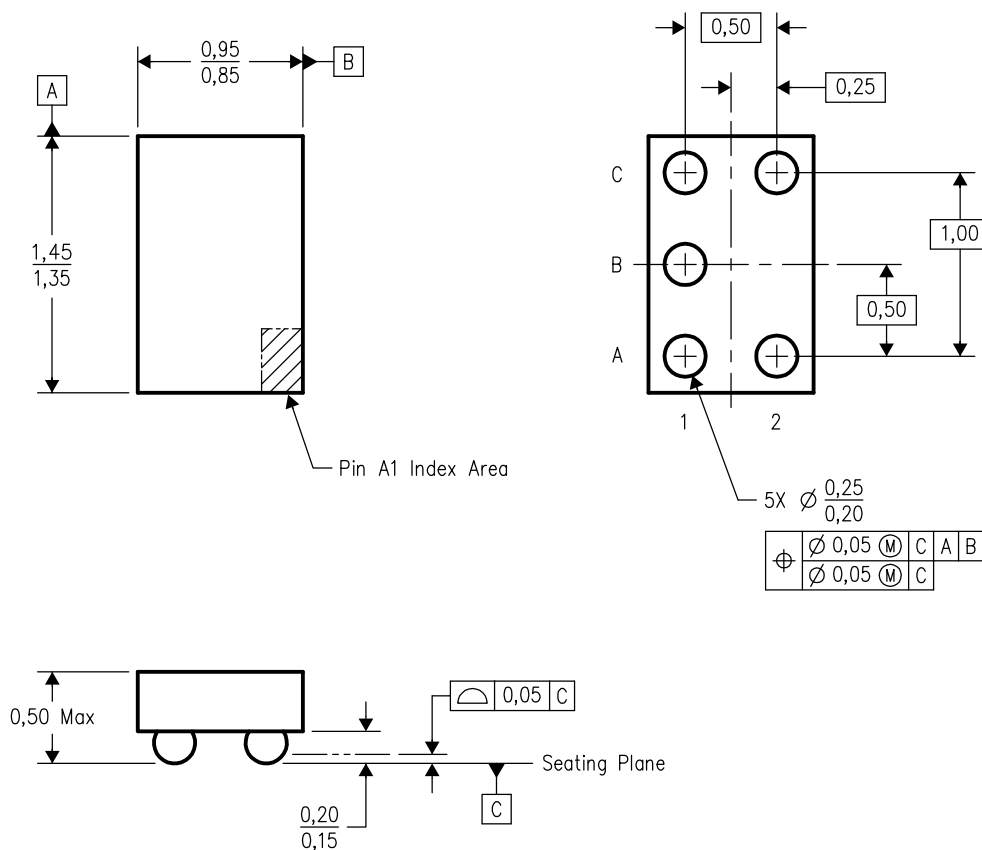
4204741-2/A 10/2002

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - D. This package is lead-free. Refer to the 5 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.

YEP (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY



4204725-2/A 10/2002

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoStar™ package configuration.
  - D. This package is tin-lead (SnPb). Refer to the 5 YZP package (drawing 4204741) for lead-free.

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