



**THE DATASHEET OF  
SN74AUC1G32YZAR**

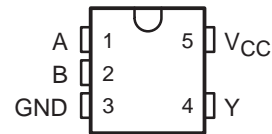


# SN74AUC1G32 SINGLE 2-INPUT POSITIVE-OR GATE

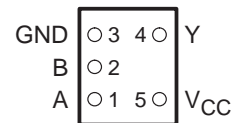
SCES3771 – SEPTEMBER 2001 – REVISED NOVEMBER 2003

- 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 2.4 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)



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



## description/ordering information

This single 2-input positive-OR gate 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 SN74AUC1G32 performs the Boolean function  $Y = A + B$  or  $Y = \overline{\overline{A} \cdot \overline{B}}$  in positive logic.

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) 0.17-mm Small Bump – YEA	Tape and reel	SN74AUC1G32YEAR	_ _ _ UG _	
	NanoFree™ – WCSP (DSBGA) 0.17-mm Small Bump – YZA (Pb-free)		SN74AUC1G32YZAR		
	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP		SN74AUC1G32YEPR		
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74AUC1G32YZPR		
	SOT (SOT-23) – DBV	Tape and reel	SN74AUC1G32DBVR		U32_
	SOT (SC-70) – DCK	Tape and reel	SN74AUC1G32DCKR		UG_

† 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).



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# SN74AUC1G32

## SINGLE 2-INPUT POSITIVE-OR GATE

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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

INPUTS		OUTPUT
A	B	Y
H	X	H
X	H	H
L	L	L

### logic diagram (positive logic)



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

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
Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1) .....	-0.5 V to 3.6 V
Output voltage range, $V_O$ (see Note 1) .....	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-50 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	-50 mA
Continuous output current, $I_O$ .....	$\pm 20$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 100$ 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

† 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.

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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	V <sub>CC</sub>	V
I <sub>OH</sub>	High-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	
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		20	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>OH</sub>	I <sub>OH</sub> = -100 μA	0.8 V to 2.7 V	V <sub>CC</sub> -0.1			V
	I <sub>OH</sub> = -0.7 mA	0.8 V		0.55		
	I <sub>OH</sub> = -3 mA	1.1 V	0.8			
	I <sub>OH</sub> = -5 mA	1.4 V	1			
	I <sub>OH</sub> = -8 mA	1.65 V	1.2			
	I <sub>OH</sub> = -9 mA	2.3 V	1.8			
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 or B input	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		4	pF

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



# SN74AUC1G32

## SINGLE 2-INPUT POSITIVE-OR GATE

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switching characteristics over recommended operating free-air temperature range,  $C_L = 15 \text{ pF}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 0.8 \text{ V}$	$V_{CC} = 1.2 \text{ V} \pm 0.1 \text{ V}$	$V_{CC} = 1.5 \text{ V} \pm 0.1 \text{ V}$	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$	$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$	UNIT					
			TYP	MIN	MAX	MIN	MAX		MIN	TYP	MAX	MIN	MAX
$t_{pd}$	A or B	Y	4.8	1	3.5	0.6	2.3	†	†	†	†	†	ns

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

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

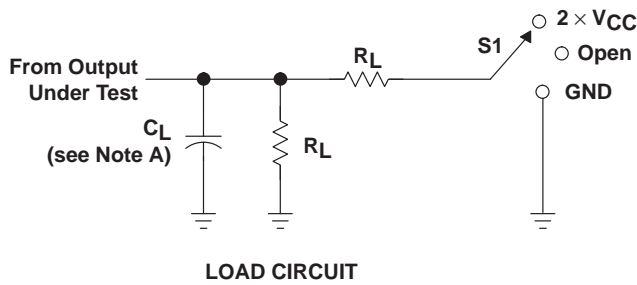
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$			$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$		UNIT
			MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A or B	Y	0.8	1.4	2.4	0.6	2.1	ns

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

PARAMETER	TEST CONDITIONS	$V_{CC} = 0.8 \text{ V}$	$V_{CC} = 1.2 \text{ V}$	$V_{CC} = 1.5 \text{ V}$	$V_{CC} = 1.8 \text{ V}$	$V_{CC} = 2.5 \text{ V}$	UNIT
		TYP	TYP	TYP	TYP	TYP	
$C_{pd}$	Power dissipation capacitance $f = 10 \text{ MHz}$	14	14	15	15	20	pF

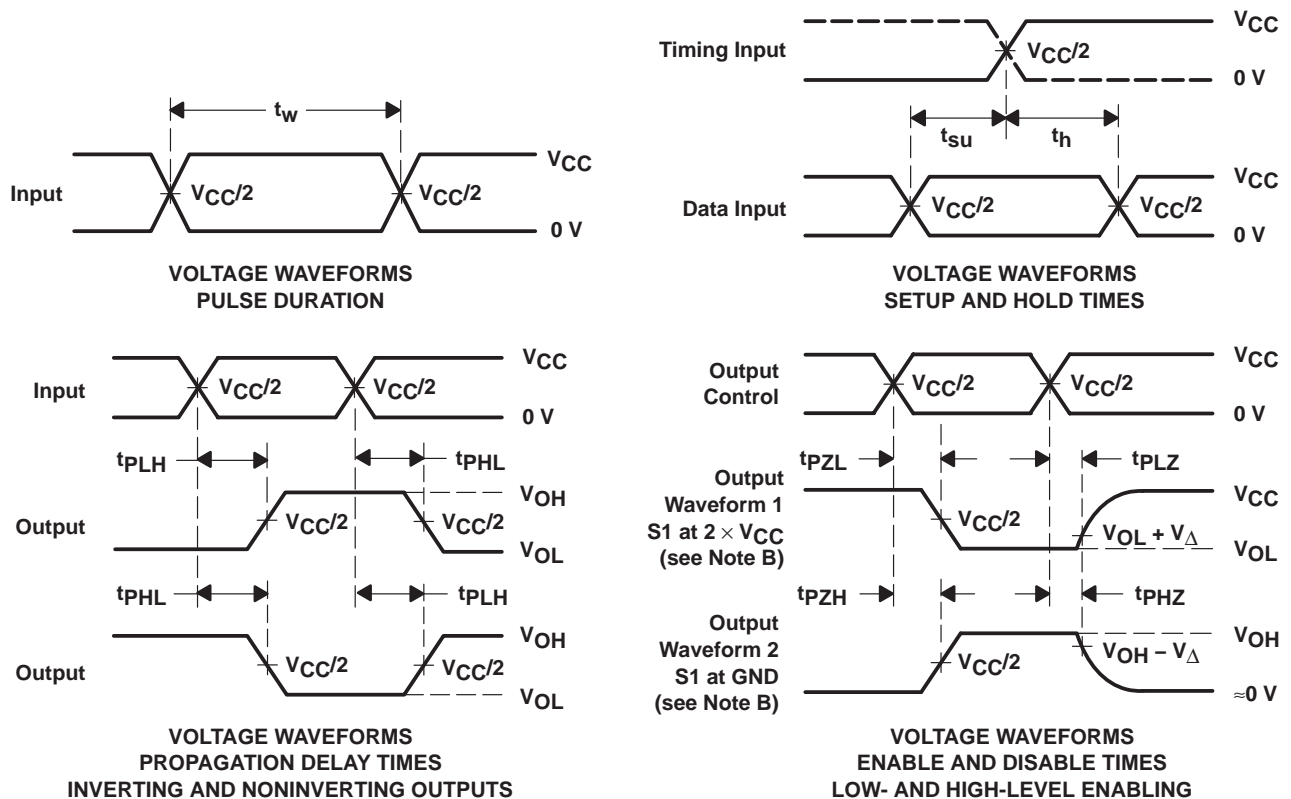


PARAMETER MEASUREMENT INFORMATION



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



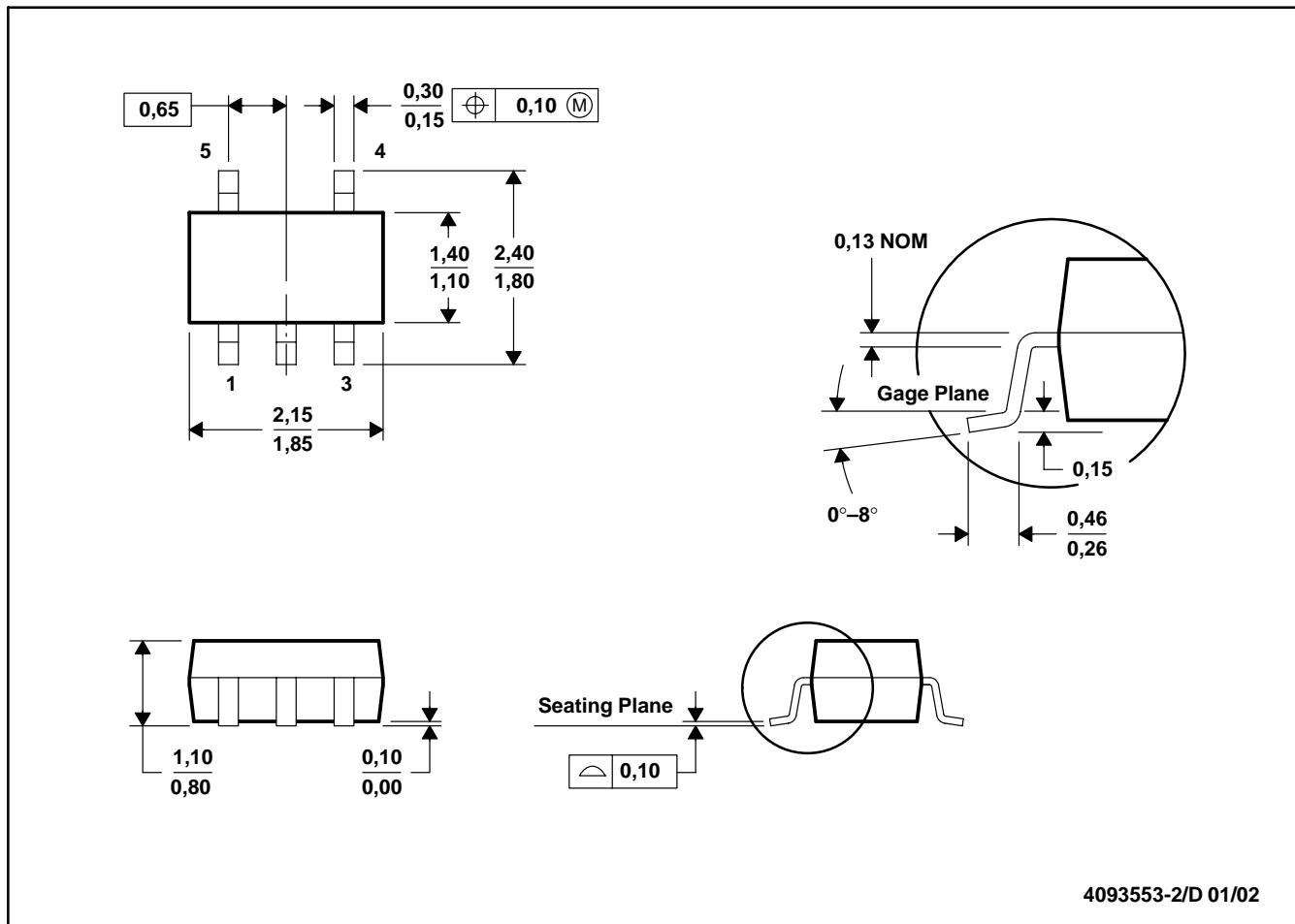
- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_O = 50 \Omega$ , slew rate  $\geq$  1 V/ns.
  - D. The outputs are measured one at a time with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms



DCK (R-PDSO-G5)

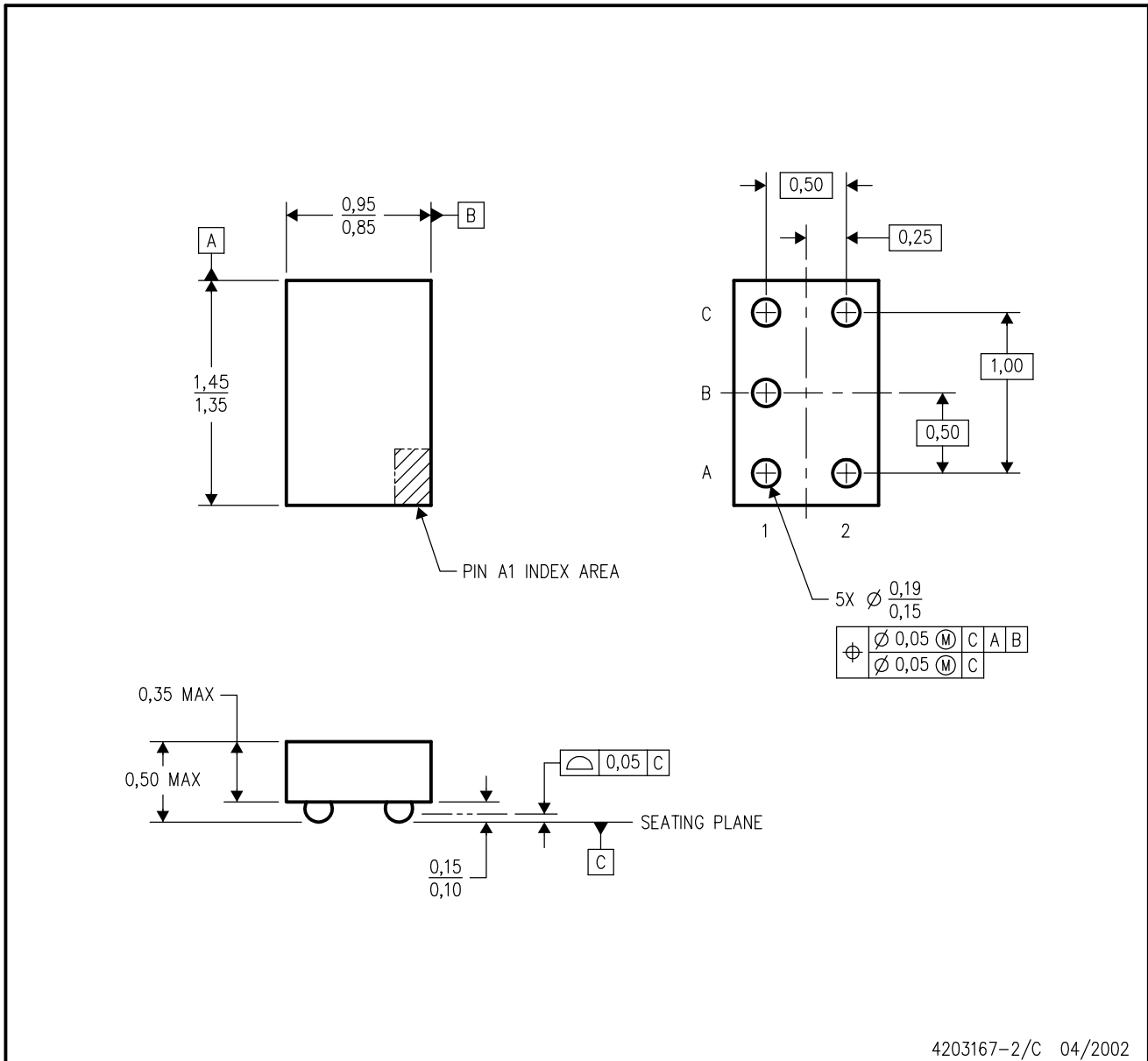
PLASTIC SMALL-OUTLINE PACKAGE



- 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-203

YEA (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY

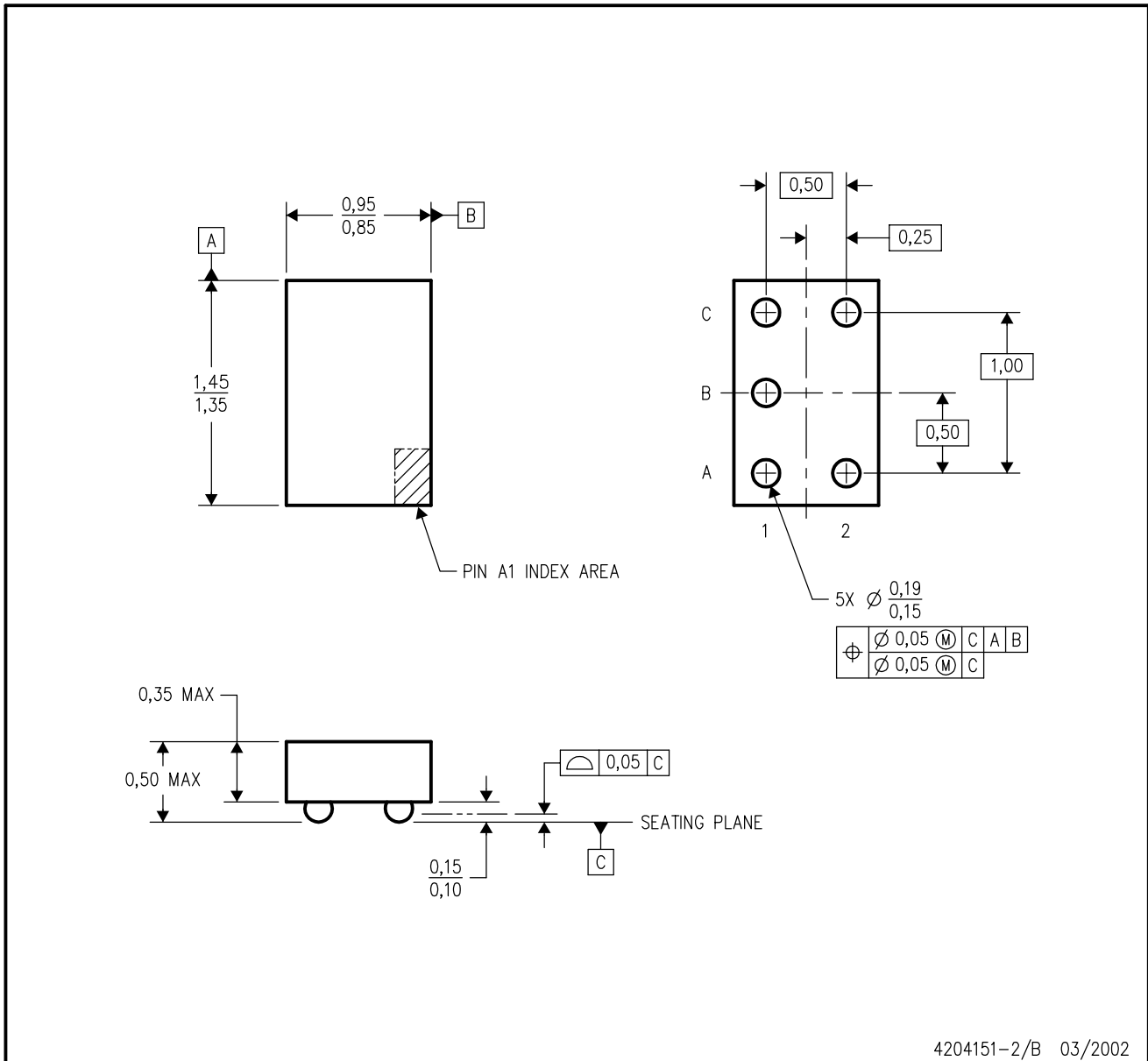


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoStar™ package configuration.
  - D. Package complies to JEDEC MO-211 variation EA.
  - E. This package is tin-lead (SnPb). Refer to the 5 YZA package (drawing 4204151) for lead-free.

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YZA (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY

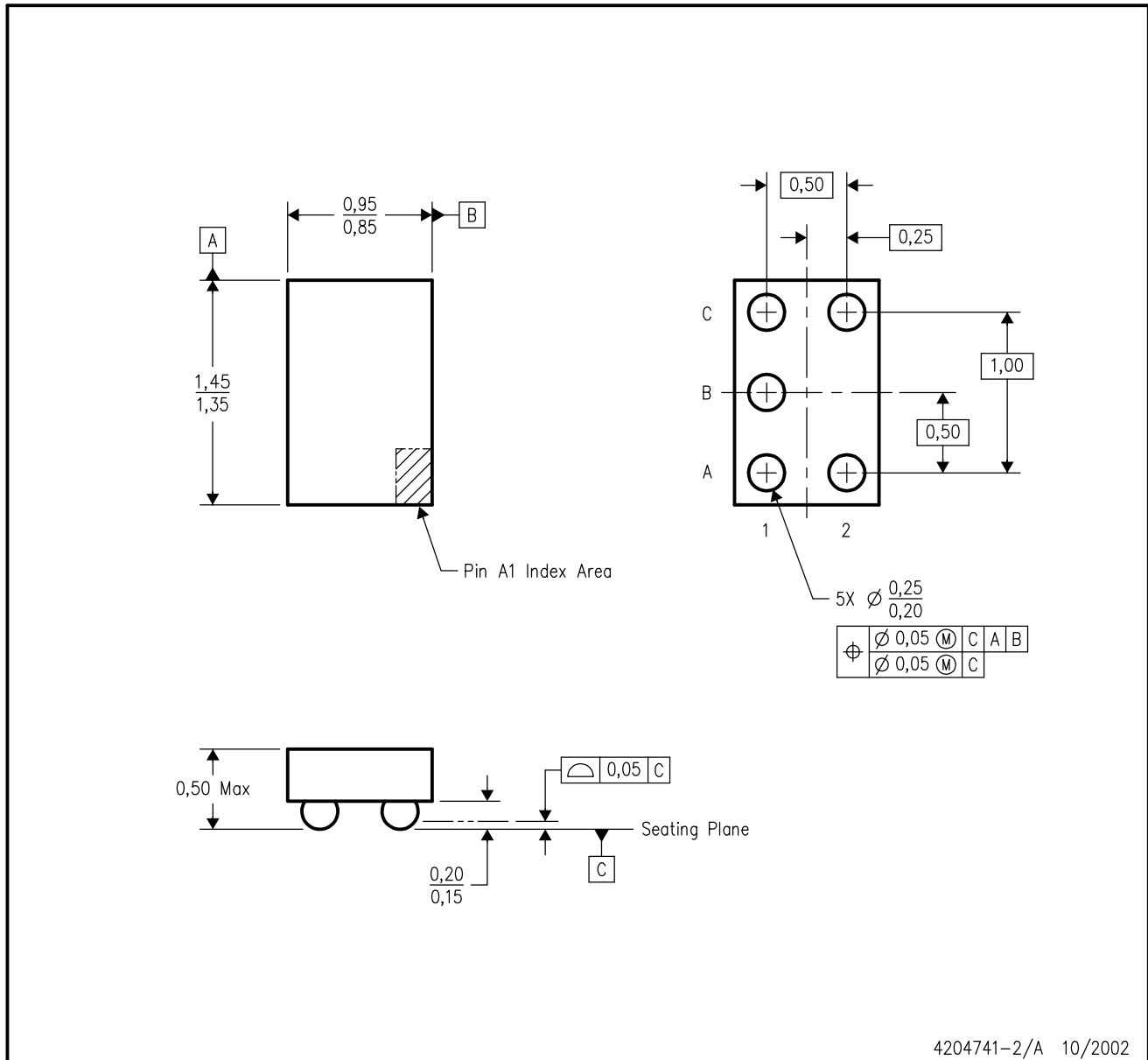


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - D. Package complies to JEDEC MO-211 variation EA.
  - E. This package is lead-free. Refer to the 5 YEA package (drawing 4203167) for tin-lead (SnPb).

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YZP (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY

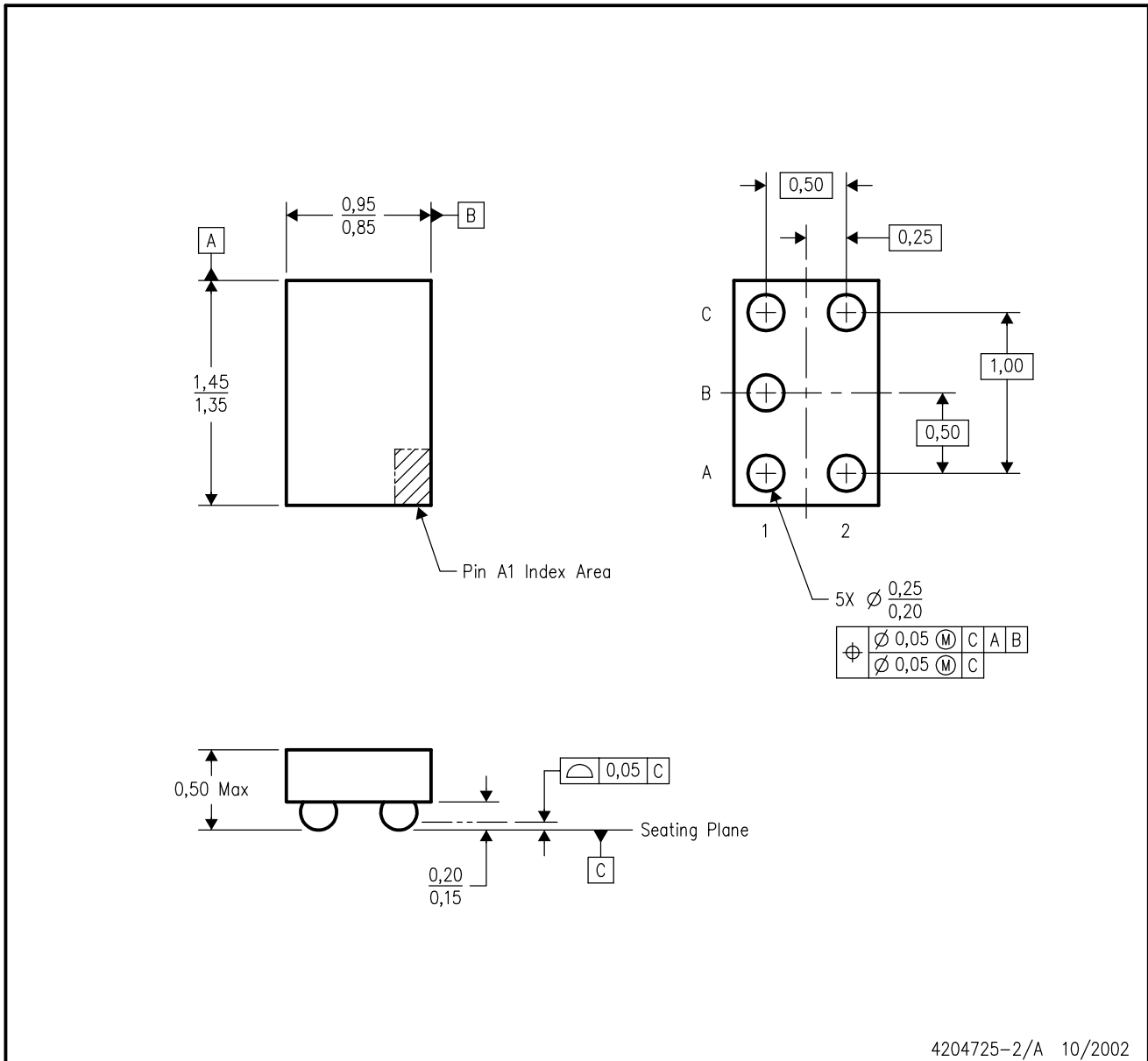


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - D. This package is lead-free. Refer to the 5 YEP package (drawing 4204725) for tin-lead (SnPb).

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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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