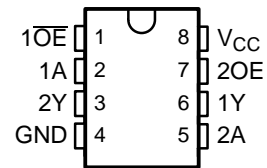


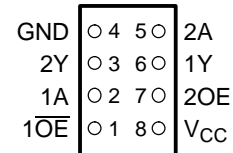
## FEATURES

- 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 1.9 ns at 1.8 V
- Low Power Consumption, 10  $\mu$ A at 1.8 V
- $\pm 8$ -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)

DCT OR DCU PACKAGE  
(TOP VIEW)



YEP OR YZP PACKAGE  
(BOTTOM VIEW)



## DESCRIPTION/ORDERING INFORMATION

This dual 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 SN74AUC2G241 is designed specifically to improve the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

The device is organized as two 1-bit line drivers with separate output-enable ( $\overline{1OE}$ , 2OE) inputs. When  $\overline{1OE}$  is low or 2OE is high, the device passes data from the A inputs to the Y outputs. When  $\overline{1OE}$  is high or 2OE is low, the outputs are in the high-impedance state.

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

## ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING <sup>(2)</sup>
–40°C to 85°C	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP	Tape and reel	SN74AUC2G241YEPR	_ _ _ U2_
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)	Tape and reel	SN74AUC2G241YZPR	
	SSOP – DCT	Tape and reel	SN74AUC2G241DCTR	U41_ _ _
	VSSOP – DCU	Tape and reel	SN74AUC2G241DCUR	U2_

(1) 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).

(2) DCT: The actual top-side marking has three additional characters that designate the year, month, and assembly/test site.

DCU: The actual top-side marking has one additional character that designates the assembly/test site.

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, NanoFree are trademarks of Texas Instruments.

**SN74AUC2G241**  
**DUAL BUFFER/DRIVER**  
**WITH 3-STATE OUTPUTS**

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**DESCRIPTION/ORDERING INFORMATION (CONTINUED)**

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor, and OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking/current-sourcing capability of the driver.

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.

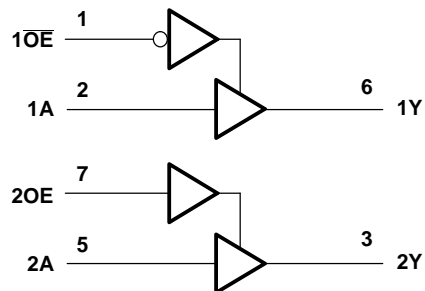
For more information about AUC Little Logic devices, please refer to the TI application report, *Applications of Texas Instruments AUC Sub-1-V Little Logic Devices*, literature number SCEA027.

**FUNCTION TABLES**

INPUTS		OUTPUT 1Y
1OE	1A	
L	H	H
L	L	L
H	X	Z

INPUTS		OUTPUT 2Y
2OE	2A	
H	H	H
H	L	L
L	X	Z

**LOGIC DIAGRAM (POSITIVE LOGIC)**



**Absolute Maximum Ratings<sup>(1)</sup>**

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

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage range	–0.5	3.6	V
$V_I$	Input voltage range <sup>(2)</sup>	–0.5	3.6	V
$V_O$	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	–0.5	3.6	V
$V_O$	Output voltage range <sup>(2)</sup>	–0.5	$V_{CC} + 0.5$	V
$I_{IK}$	Input clamp current	$V_I < 0$	–50	mA
$I_{OK}$	Output clamp current	$V_O < 0$	–50	mA
$I_O$	Continuous output current		±20	mA
	Continuous current through $V_{CC}$ or GND		±100	mA
$\theta_{JA}$	Package thermal impedance <sup>(3)</sup>	DCT package	220	°C/W
		DCU package	227	
		YEP/YZP package	102	
$T_{stg}$	Storage temperature range	–65	150	°C

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

**SN74AUC2G241**  
**DUAL BUFFER/DRIVER**  
**WITH 3-STATE OUTPUTS**

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**Recommended Operating Conditions<sup>(1)</sup>**

		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	Active state	0	V <sub>CC</sub>
		3-state	0	3.6
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	V <sub>CC</sub> = 0.8 V to 1.65 V <sup>(2)</sup>	20	ns/V
		V <sub>CC</sub> = 1.65 V to 1.95 V <sup>(3)</sup>	20	
		V <sub>CC</sub> = 2.3 V to 2.7 V <sup>(3)</sup>	20	
T <sub>A</sub>	Operating free-air temperature	–40	85	°C

(1) 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.

(2) The data was taken at C<sub>L</sub> = 15 pF, R<sub>L</sub> = 2 kΩ (see Figure 1).

(3) The data was taken at C<sub>L</sub> = 30 pF, R<sub>L</sub> = 500 Ω (see Figure 1).

## Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	V <sub>CC</sub>	MIN	TYP <sup>(1)</sup>	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>	All inputs	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>OZ</sub>		V <sub>O</sub> = V <sub>CC</sub> or GND	2.7 V			±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	2.5			pF
C <sub>o</sub>		V <sub>O</sub> = V <sub>CC</sub> or GND	2.5 V	5.5			pF

(1) 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	5.1	1	3.5	0.8	2.3	0.7	1.2	1.9	0.6	1.4	ns
t <sub>en</sub>	$\overline{OE}$ or OE	Y	5.9	1.2	4.2	1	2.7	0.9	1.3	2	0.8	1.6	ns
t <sub>dis</sub>	$\overline{OE}$ or OE	Y	6.2	2.2	4.8	2.5	4.4	1	2.9	4.2	1.6	3.3	ns

## Switching Characteristics

over recommended operating free-air temperature range, C<sub>L</sub> = 30 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 1.8 V ± 0.15 V			V <sub>CC</sub> = 2.5 V ± 0.2 V		UNIT
			MIN	TYP	MAX	MIN	MAX	
t <sub>pd</sub>	A	Y	0.9	1.6	2.5	0.8	1.8	ns
t <sub>en</sub>	$\overline{OE}$ or OE	Y	1.1	1.7	2.8	1	2	ns
t <sub>dis</sub>	$\overline{OE}$ or OE	Y	1.9	2.3	3.6	0.9	2.1	ns

# SN74AUC2G241

## DUAL BUFFER/DRIVER WITH 3-STATE OUTPUTS

SCES535A–DECEMBER 2003–REVISED MARCH 2005

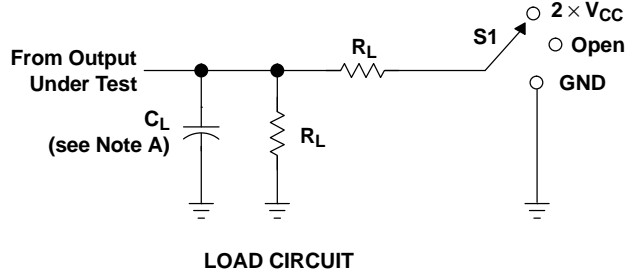
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### Operating Characteristics

$T_A = 25^\circ\text{C}$

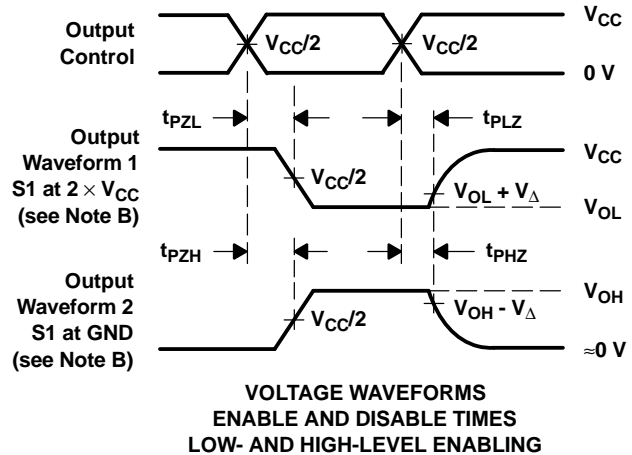
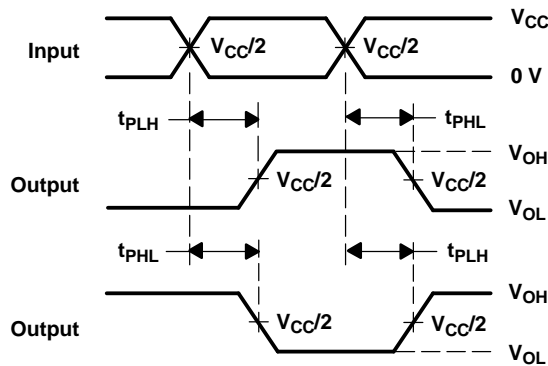
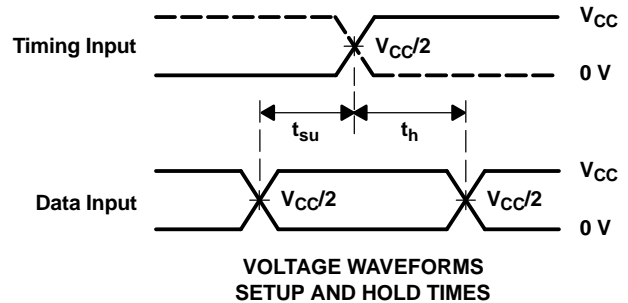
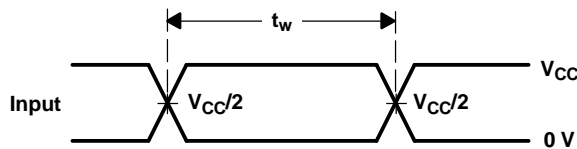
PARAMETER	TEST CONDITIONS	$V_{CC} = 0.8\text{ V}$	$V_{CC} = 1.2\text{ V}$	$V_{CC} = 1.5\text{ V}$	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	UNIT
		TYP	TYP	TYP	TYP	TYP	
$C_{pd}$ Power dissipation capacitance	$f = 10\text{ MHz}$	16	16	16	17	18	pF

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

**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>
74AUC2G241DCURE4	ACTIVE	US8	DCU	8	3000	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC2G241DCTR	ACTIVE	SM8	DCT	8	3000	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC2G241DCUR	ACTIVE	US8	DCU	8	3000	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC2G241YEPR	ACTIVE	WCSP	YEP	8	3000	TBD	SNPB	Level-1-260C-UNLIM
SN74AUC2G241YZPR	ACTIVE	WCSP	YZP	8	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 - The planned eco-friendly classification: Pb-Free (RoHS) 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.

**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.

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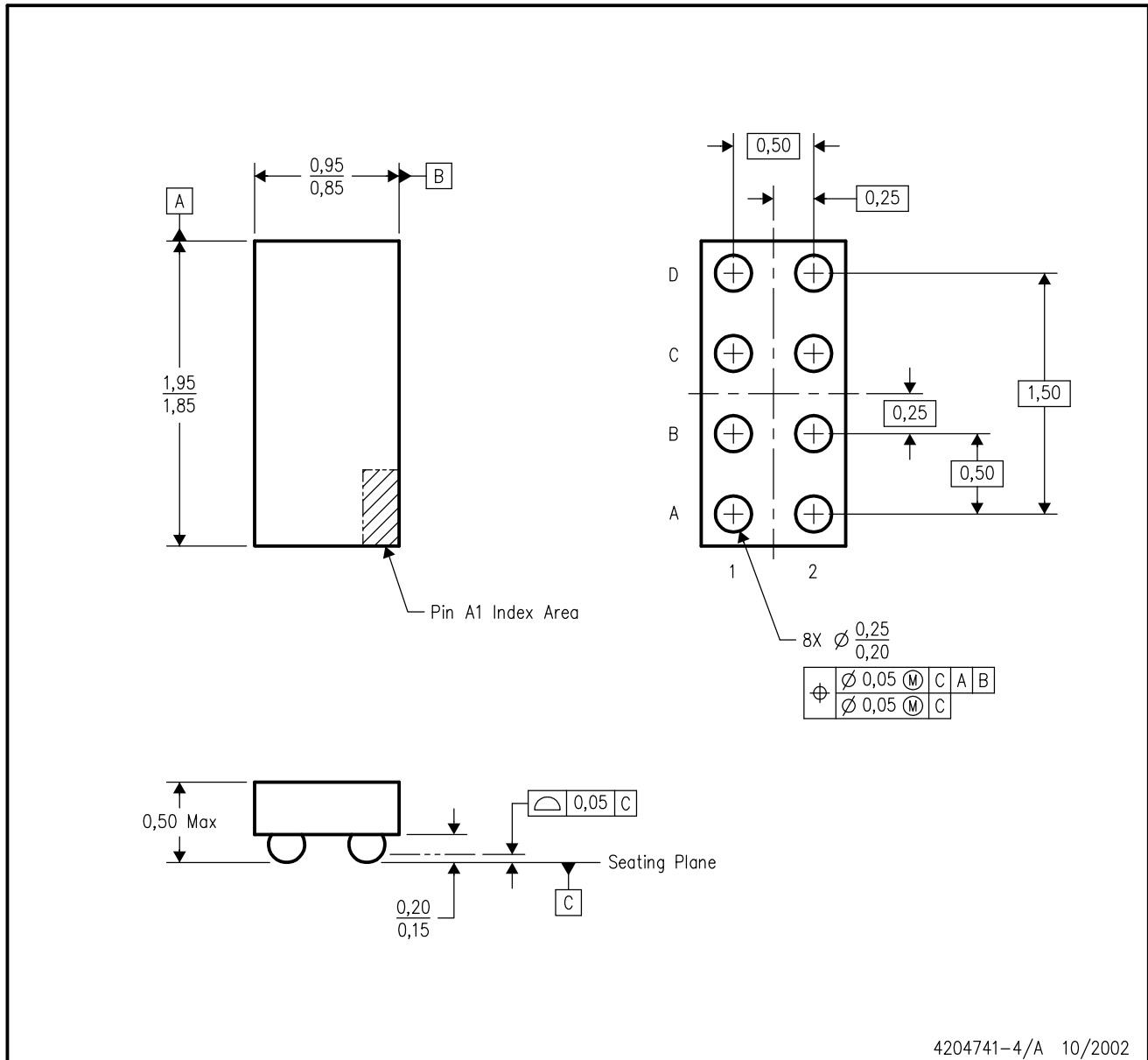






YZP (R-XBGA-N8)

DIE-SIZE BALL GRID ARRAY



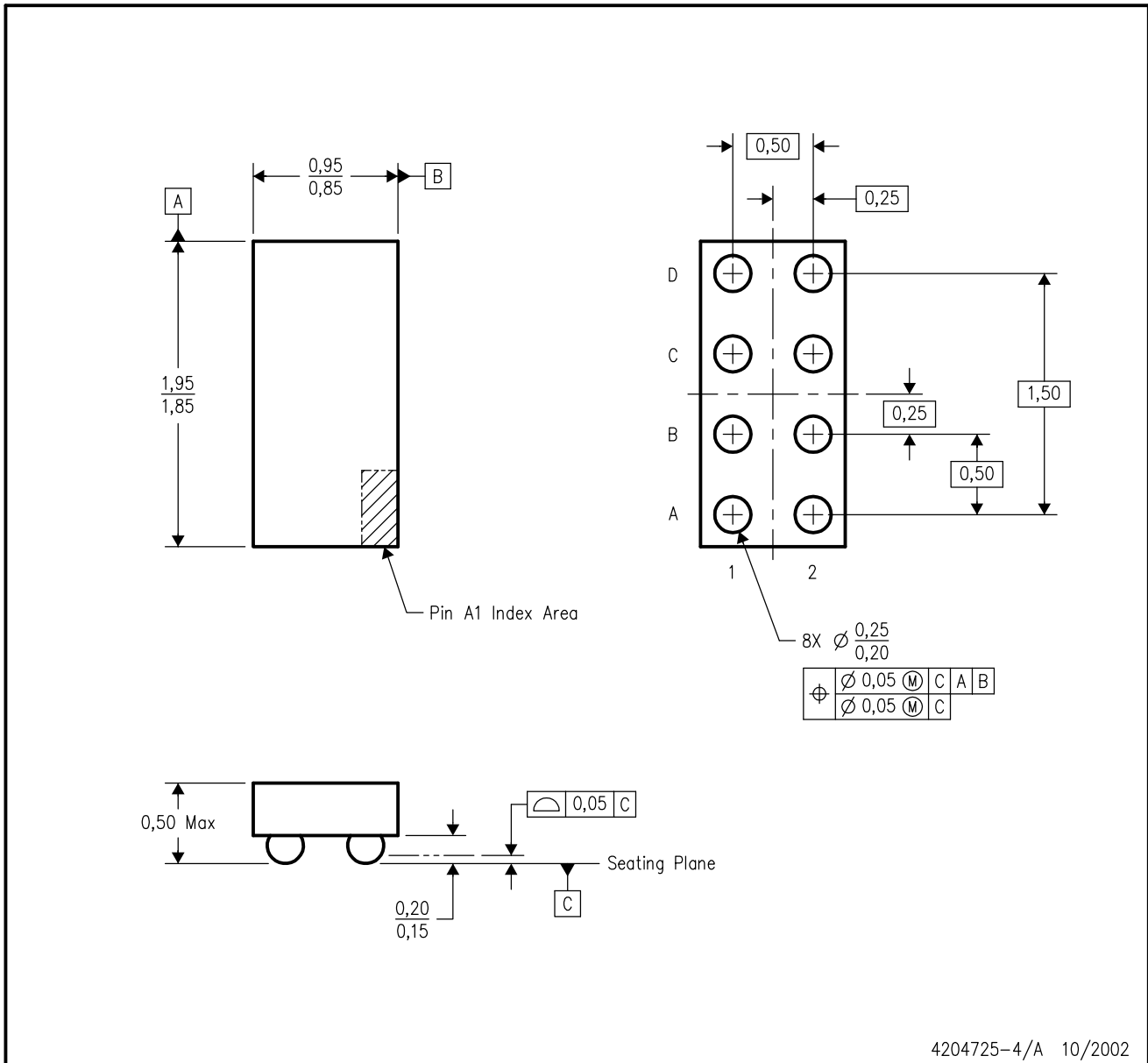
4204741-4/A 10/2002

- 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 8 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.

YEP (R-XBGA-N8)

DIE-SIZE BALL GRID ARRAY



4204725-4/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 8 YZP package (drawing 4204741) for lead-free.

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		Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
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