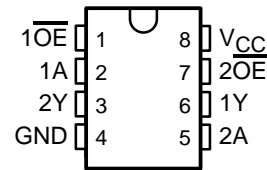


SN74LVC2G125 DUAL BUS BUFFER GATE WITH 3-STATE OUTPUTS

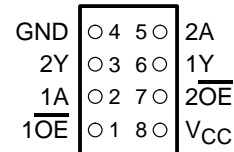
SCES204J – APRIL 1999 – REVISED JUNE 2003

- Available in the Texas Instruments NanoStar™ and NanoFree™ Packages
- Supports 5-V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 4.3 ns at 3.3 V
- Low Power Consumption, 10- μ A Max I_{CC}
- ± 24 -mA Output Drive at 3.3 V
- Typical V_{OLP} (Output Ground Bounce) < 0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Typical V_{OHV} (Output V_{OH} Undershoot) > 2 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- I_{off} Supports Partial-Power-Down Mode Operation
- 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)



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



description/ordering information

The SN74LVC2G125 is a dual bus buffer gate, designed for 1.65-V to 5.5-V V_{CC} operation. This device features dual line drivers with 3-state outputs. The outputs are disabled when the associated output-enable (\overline{OE}) input is high.

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	Reel of 3000	SN74LVC2G125YEAR	_ _ _ CM _
	NanoFree™ – WCSP (DSBGA) 0.17-mm Small Bump – YZA (Pb-free)		SN74LVC2G125YZAR	
	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP		SN74LVC2G125YEPR	
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74LVC2G125YZPR	
	SSOP – DCT	Reel of 3000	SN74LVC2G125DCTR	C25_ _ _
	VSSOP – DCU	Reel of 3000	SN74LVC2G125DCUR	C25_
		Reel of 250	SN74LVC2G125DCUT	

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

‡ 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.

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.



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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.

 **TEXAS
INSTRUMENTS**

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SN74LVC2G125
DUAL BUS BUFFER GATE
WITH 3-STATE OUTPUTS

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description/ordering information (continued)

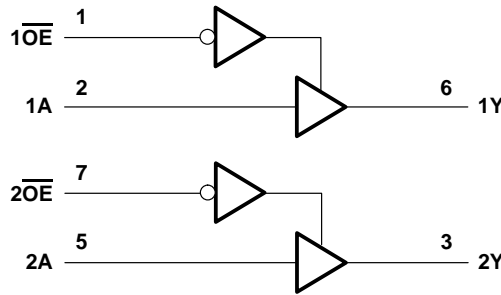
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

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.

FUNCTION TABLE
(each buffer)

INPUTS		OUTPUT
\overline{OE}	A	Y
L	H	H
L	L	L
H	X	Z

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 6.5 V
Input voltage range, V_I (see Note 1)	-0.5 V to 6.5 V
Voltage range applied to any output in the high-impedance or power-off state, V_O (see Note 1)	-0.5 V to 6.5 V
Voltage range applied to any output in the high or low state, V_O (see Notes 1 and 2)	-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	± 50 mA
Continuous current through V_{CC} or GND	± 100 mA
Package thermal impedance, θ_{JA} (see Note 3):	
DCT package	220°C/W
DCU package	227°C/W
YEA/YZA package	140°C/W
YEP/YZP package	102°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 value of V_{CC} is provided in the recommended operating conditions table.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.



SN74LVC2G125
DUAL BUS BUFFER GATE
WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 4)

		MIN	MAX	UNIT	
V _{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	1.7		
		V _{CC} = 3 V to 3.6 V	2		
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.35 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	0.7		
		V _{CC} = 3 V to 3.6 V	0.8		
		V _{CC} = 4.5 V to 5.5 V	0.3 × V _{CC}		
V _I	Input voltage	0	5.5	V	
V _O	Output voltage	High or low state	0	V _{CC}	V
		3-state	0	5.5	
I _{OH}	High-level output current	V _{CC} = 1.65 V	–4		mA
		V _{CC} = 2.3 V	–8		
		V _{CC} = 3 V	–16		
			–24		
		V _{CC} = 4.5 V	–32		
I _{OL}	Low-level output current	V _{CC} = 1.65 V	4		mA
		V _{CC} = 2.3 V	8		
		V _{CC} = 3 V	16		
			24		
		V _{CC} = 4.5 V	32		
Δt/Δv	Input transition rise or fall rate	V _{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V	20		ns/V
		V _{CC} = 3.3 V ± 0.3 V	10		
		V _{CC} = 5 V ± 0.5 V	5		
T _A	Operating free-air temperature	–40	85	°C	

NOTE 4: 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.

SN74LVC2G125
DUAL BUS BUFFER GATE
WITH 3-STATE OUTPUTS

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

PARAMETER		TEST CONDITIONS	V _{CC}	MIN	TYP†	MAX	UNIT
V _{OH}		I _{OH} = -100 μA	1.65 V to 5.5 V	V _{CC} -0.1			V
		I _{OH} = -4 mA	1.65 V	1.2			
		I _{OH} = -8 mA	2.3 V	1.9			
		I _{OH} = -16 mA	3 V	2.4			
		I _{OH} = -24 mA		2.3			
		I _{OH} = -32 mA	4.5 V	3.8			
V _{OL}		I _{OL} = 100 μA	1.65 V to 5.5 V			0.1	V
		I _{OL} = 4 mA	1.65 V			0.45	
		I _{OL} = 8 mA	2.3 V			0.3	
		I _{OL} = 16 mA	3 V			0.4	
		I _{OL} = 24 mA				0.55	
		I _{OL} = 32 mA	4.5 V			0.55	
I _I	A or \overline{OE} inputs	V _I = 5.5 V or GND	0 to 5.5 V			±5	μA
I _{off}		V _I or V _O = 5.5 V	0			±10	μA
I _{OZ}		V _O = 0 to 5.5 V	3.6 V			10	μA
I _{CC}		V _I = 5.5 V or GND, I _O = 0	1.65 V to 5.5 V			10	μA
ΔI _{CC}		One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	3 V to 5.5 V			500	μA
C _i	Data inputs	V _I = V _{CC} or GND	3.3 V			3.5	pF
	Control inputs					4	
C _o		V _O = V _{CC} or GND	3.3 V			6.5	pF

† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

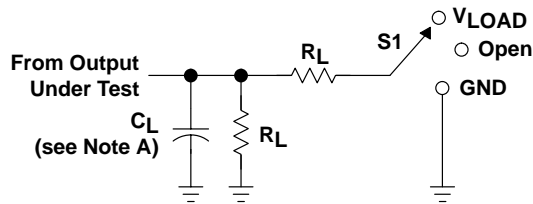
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A	Y	3.3	9.1	1.5	4.8	1.4	4.3	1	3.7	ns
t _{en}	\overline{OE}	Y	4	9.9	1.9	5.6	1.2	4.7	1.2	3.8	ns
t _{dis}	\overline{OE}	Y	1.5	11.6	1	5.8	1.4	4.6	1	3.4	ns

operating characteristics, T_A = 25°

PARAMETER		TEST CONDITIONS	V _{CC} = 1.8 V	V _{CC} = 2.5 V	V _{CC} = 3.3 V	V _{CC} = 5 V	UNIT	
			TYP	TYP	TYP	TYP		
C _{pd}	Power dissipation capacitance	Outputs enabled	f = 10 MHz	19	19	20	22	pF
		Outputs disabled		2	2	2	3	



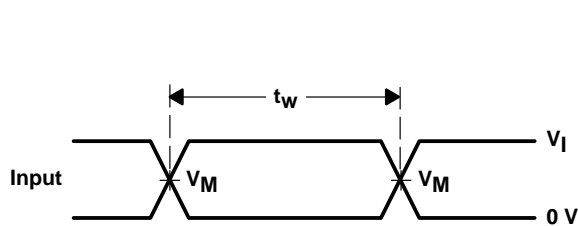
PARAMETER MEASUREMENT INFORMATION



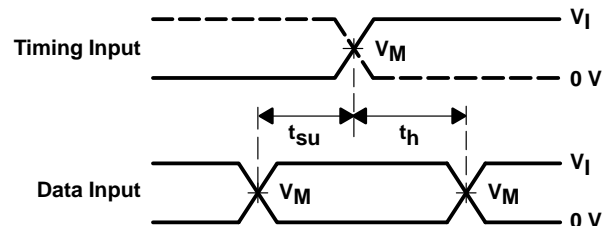
LOAD CIRCUIT

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

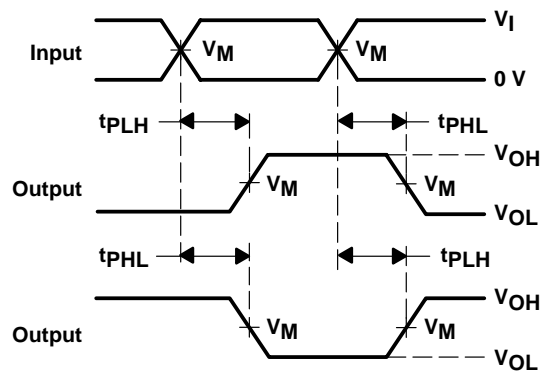
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8 V \pm 0.15 V$	V_{CC}	$\leq 2 \text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5 V \pm 0.2 V$	V_{CC}	$\leq 2 \text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
$3.3 V \pm 0.3 V$	3 V	$\leq 2.5 \text{ ns}$	1.5 V	6 V	50 pF	500 Ω	0.3 V
$5 V \pm 0.5 V$	V_{CC}	$\leq 2.5 \text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	50 pF	500 Ω	0.3 V



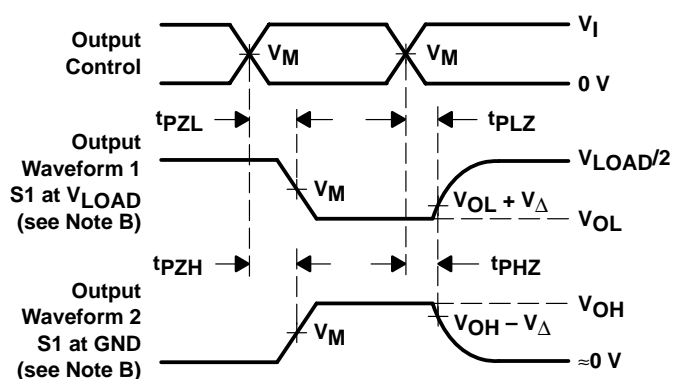
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



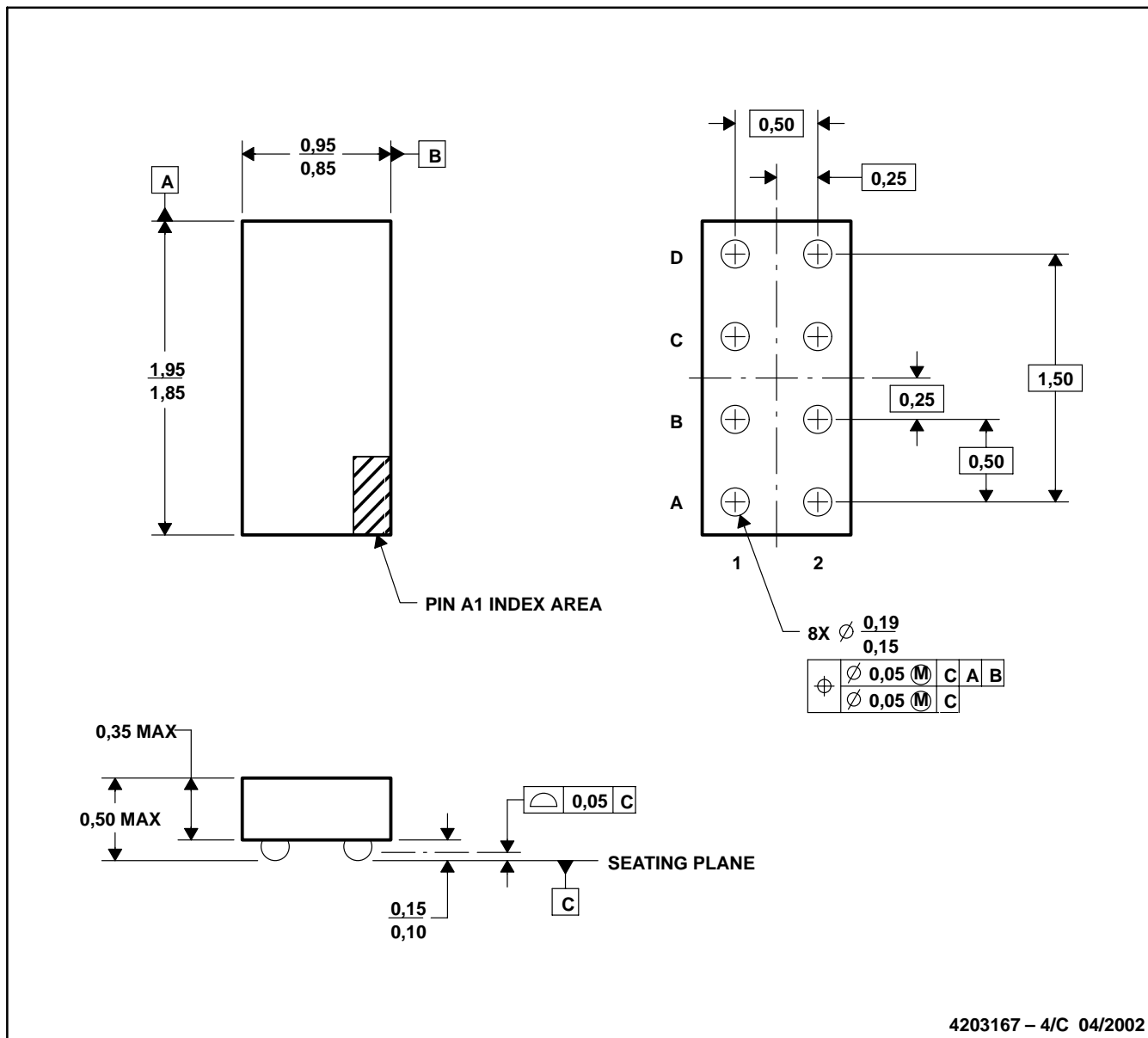
VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- 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 ≤ 10 MHz, $Z_O = 50 \Omega$.
 - 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

YEA (R-XBGA-N8)

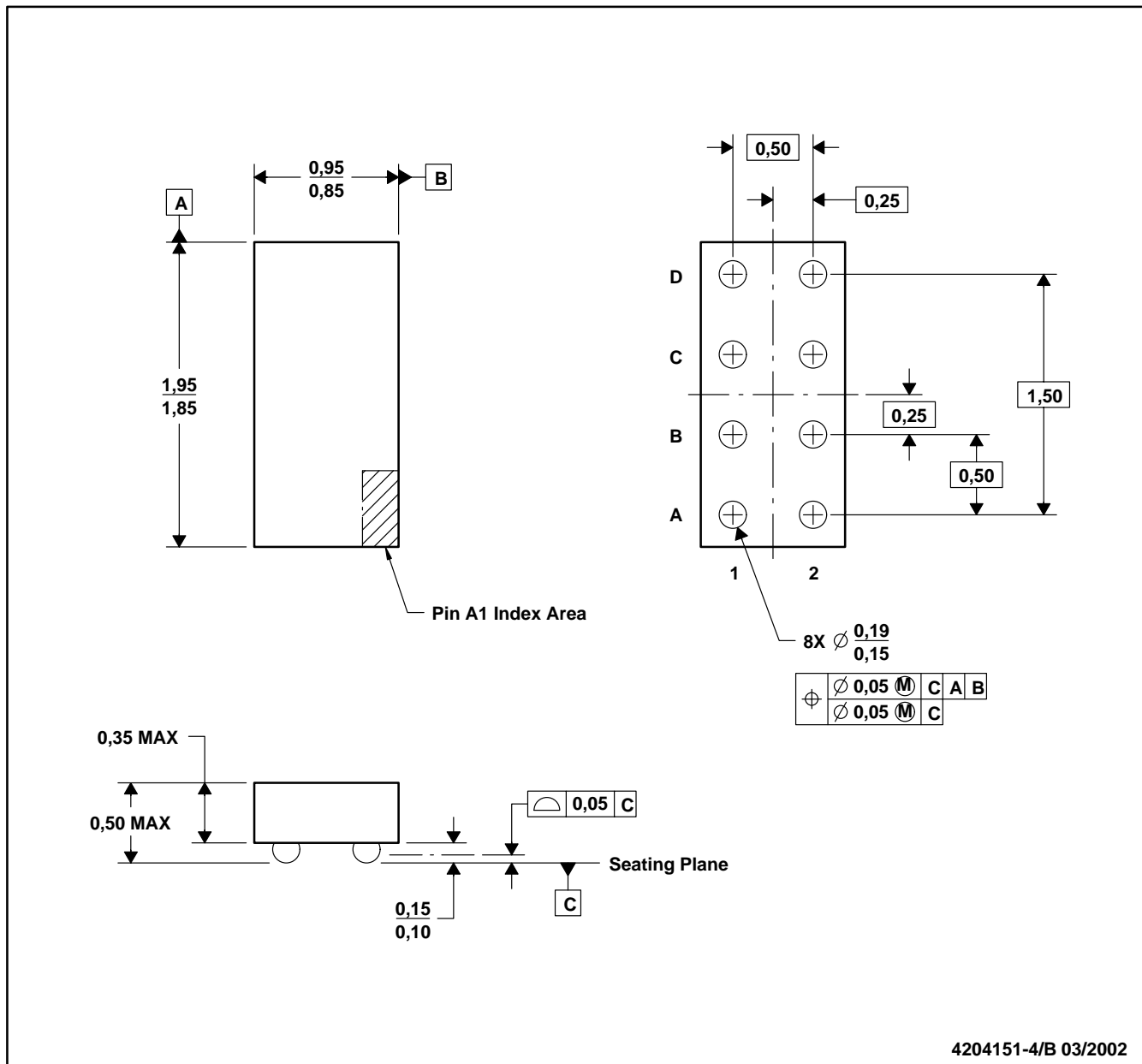
DIE-SIZE BALL GRID ARRAY



- 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 EB.
 E. This package is tin-lead (SnPb). Refer to the 8 YZA package (drawing 4204151) for lead-free.

YZA (R-XBGA-N8)

DIE-SIZE BALL GRID ARRAY

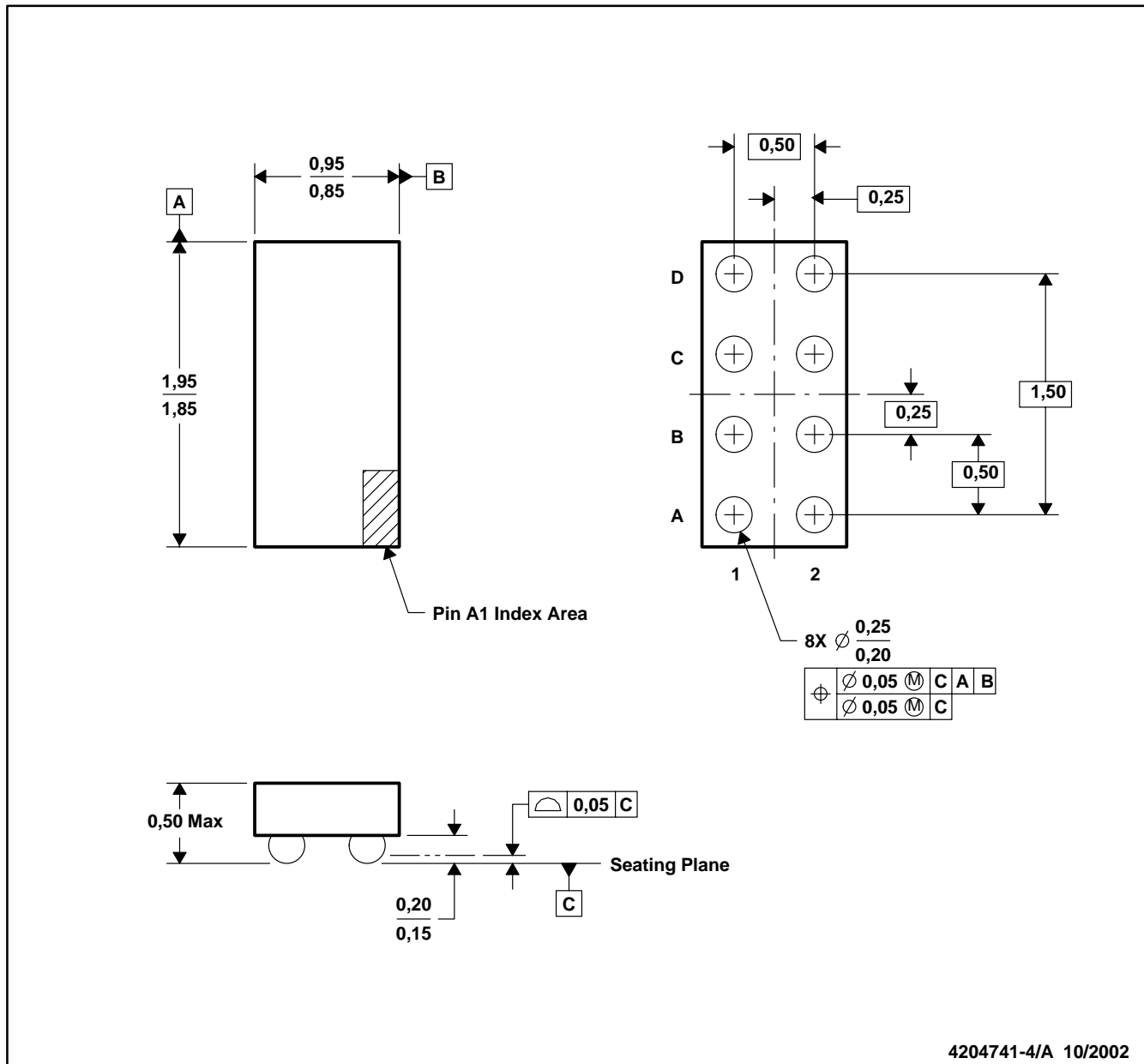


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. NanoFree™ package configuration.
 D. Package complies to JEDEC MO-211 variation EB.
 E. This package is lead-free. Refer to the 8 YEA package (drawing 4203167) for tin-lead (SnPb).

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YZP (R-XBGA-N8)

DIE-SIZE BALL GRID ARRAY



4204741-4/A 10/2002

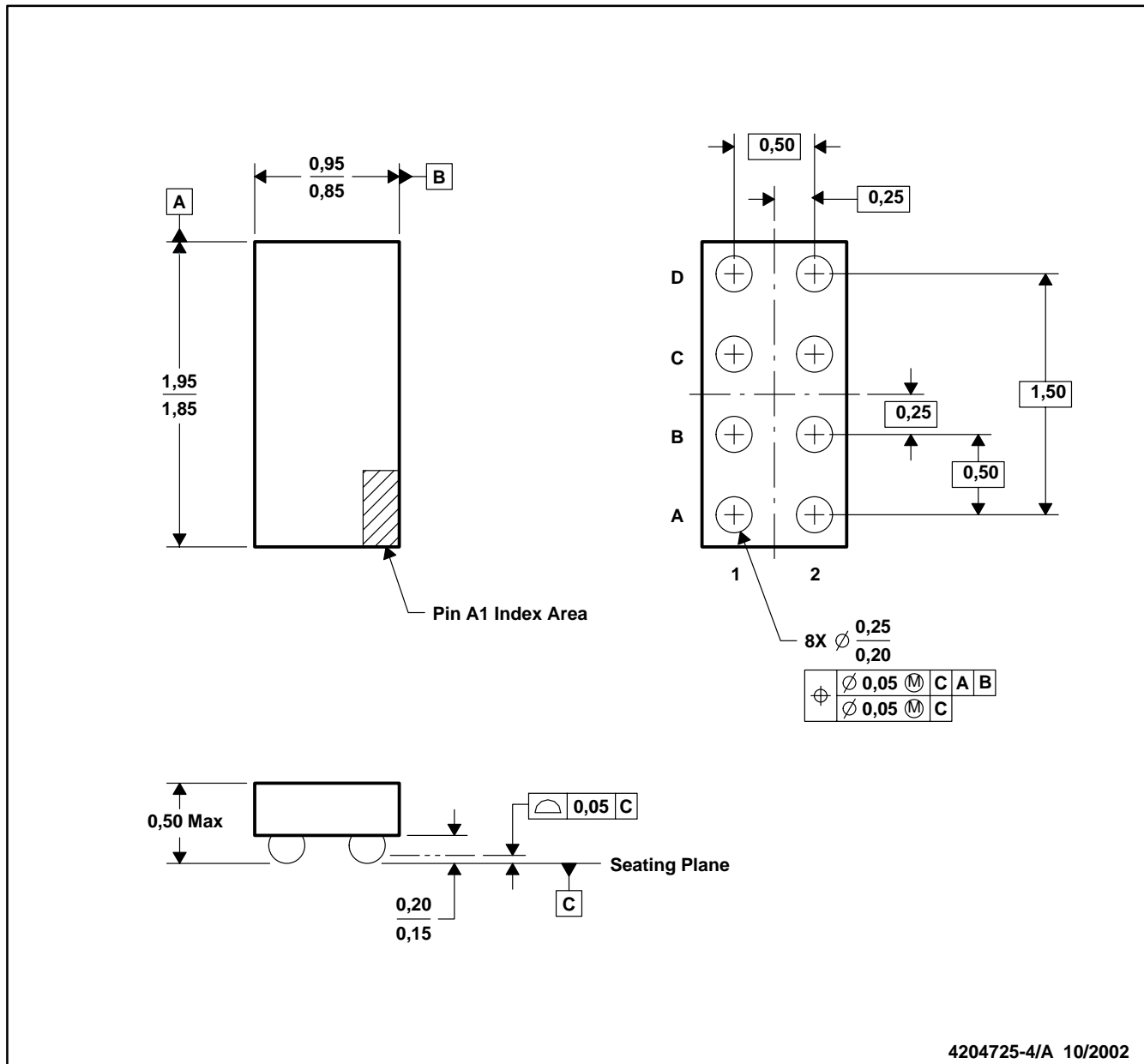
- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. NanoFree™ package configuration.
 D. This package is lead-free. Refer to the 8 YEP package (drawing 4204725) for tin-lead (SnPb).

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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. NanoFree™ package configuration.
 D. This package is tin-lead (SnPb). Refer to the 8 YZP package (drawing 420741) for lead-free.

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