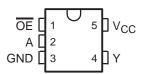
SCES223L - APRIL 1999 - REVISED SEPTEMBER 2003

- 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 3.7 ns at 3.3 V
- Low Power Consumption, 10-µA Max ICC
- ±24-mA Output Drive at 3.3 V
- **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)

DBV OR DCK PACKAGE (TOP VIEW)



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



description/ordering information

This bus buffer gate is designed for 1.65-V to 5.5-V V_{CC} operation.

The SN74LVC1G125 is a single line driver with a 3-state output. The output is disabled when the output-enable (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

TA	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING‡	
	NanoStar™ – WCSP (DSBGA) 0.17-mm Small Bump – YEA	` '			
	NanoFree™ – WCSP (DSBGA) 0.17-mm Small Bump – YZA (Pb-free)	Reel of 3000	SN74LVC1G125YZAR	СМ	
	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP	Reel of 3000	SN74LVC1G125YEPR	CIVI_	
-40°C to 85°C	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74LVC1G125YZPR		
	SOT (SOT-23) – DBV	Reel of 3000	SN74LVC1G125DBVR	C25	
	301 (301-23) – DBV	Reel of 250	SN74LVC1G125DBVT	C25_	
	SOT (SC-70) – DCK	Reel of 3000	SN74LVC1G125DCKR	CM	
	301 (30-70) = BCK	Reel of 250	SN74LVC1G125DCKT	CM_	

Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.

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description/ordering information (continued)

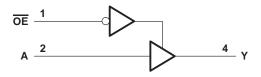
This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ 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.

FUNCTION TABLE

INP	JTS	OUTPUT
OE	Α	Υ
L	Н	Н
L	L	L
Н	Χ	Z

logic diagram (positive logic)



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

Supply voltage range, V _{CC}	
Voltage range applied to any output in the high-impedance or power-off state, V _O	0 E V to 6 E V
(see Note 1)	0.5 V 10 6.5 V
(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, IO	±50 mA
Continuous current through V _{CC} or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 3): 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 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.



recommended operating conditions (see Note 4)

			MIN	MAX	UNIT
\/	Cupality soltoge	Operating	1.65	5.5	V
VCC	Supply voltage	Data retention only	1.5		V
		V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}		
V	High-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7		V
VIH	nigh-level input voltage	V _{CC} = 3 V to 3.6 V	2		V
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}		
		V _{CC} = 1.65 V to 1.95 V		0.35 × V _{CC}	
\/	Low-level input voltage	V _{CC} = 2.3 V to 2.7 V		0.7	V
VIL		V _{CC} = 3 V to 3.6 V		0.8	V
		V _{CC} = 4.5 V to 5.5 V		0.3 × V _{CC}	
٧ı	Input voltage		0	5.5	V
۷o	Output voltage		0	VCC	V
		V _{CC} = 1.65 V		-4	
		V _{CC} = 2.3 V		-8	
loh	High-level output current	tnut current		-16	mA
		VCC = 3 V		-24	
		V _{CC} = 4.5 V		-32	
		V _{CC} = 1.65 V		4	
		V _{CC} = 2.3 V		8	
loL	Low-level output current	V 2V		16	mA
		VCC = 3 V		24	
		V _{CC} = 4.5 V		32	
		V_{CC} = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V		20	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		10	ns/V
		V _{CC} = 5 V ± 0.5 V		5	
TA	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.



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

PARAMETER	TEST CONDITIONS	VCC	MIN	TYP [†]	MAX	UNIT		
	I _{OH} = -100 μA	1.65 V to 5.5 V	V _{CC} -0.1					
	$I_{OH} = -4 \text{ mA}$	1.65 V	1.2					
l	$I_{OH} = -8 \text{ mA}$	2.3 V	1.9					
VOH	$I_{OH} = -16 \text{ mA}$	3 V	2.4			V		
	I _{OH} = -24 mA	3 V	2.3					
	$I_{OH} = -32 \text{ mA}$	4.5 V	3.8					
	I _{OL} = 100 μA	1.65 V to 5.5 V			0.1			
	I _{OL} = 4 mA	1.65 V			0.45			
l	I _{OL} = 8 mA	2.3 V			0.3	١ ,,		
VOL	I _{OL} = 16 mA	2.1/			0.4	V		
	I _{OL} = 24 mA	3 V			0.55			
	I _{OL} = 32 mA	4.5 V			0.55			
I _I A or OE inputs	V _I = 5.5 V or GND	0 to 5.5 V			±5	μΑ		
l _{off}	V_I or $V_O = 5.5 V$	0			±10	μΑ		
loz	V _O = 0 to 5.5 V	3.6 V			10	μΑ		
Icc	$V_I = 5.5 \text{ V or GND}, \qquad I_O = 0$	1.65 V to 5.5 V			10	μА		
ΔICC	One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND	3 V to 5.5 V			500	μА		
Ci	V _I = V _{CC} or GND	3.3 V		4		pF		

[†] All typical values are at $V_{CC} = 3.3 \text{ V}$, $T_A = 25^{\circ}\text{C}$.

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

PARAMETER	I FROM I IO I		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
	(INFOT)	(0011 01)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
^t pd	А	Υ	1.9	6.9	0.7	4.6	0.6	3.7	0.5	3.4	ns

switching characteristics over recommended operating free-air temperature range, C_L = 30 pF or 50 pF (unless otherwise noted) (see Figure 2)

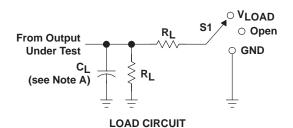
PARAMETER	AMETER FROM TO (OUTPUT)		V _{CC} = ± 0.1		V _{CC} = ± 0.	2.5 V 2 V	V _{CC} = ± 0.		V _{CC} :		UNIT
	(IIII O1)	(0011 01)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
^t pd	А	Υ	2.8	9	1.2	5.5	1	4.5	1	4	ns
t _{en}	ŌĒ	Υ	3.3	10.1	1.5	6.6	1	5.3	1	5	ns
^t dis	ŌĒ	Y	1.3	9.2	1	5	1	5	1	4.2	ns

operating characteristics, T_A = 25°C

	PARAMETER		TEST	V _{CC} = 1.8 V	$V_{CC} = 2.5 \text{ V}$	V _{CC} = 3.3 V	V _{CC} = 5 V	UNIT
			CONDITIONS	TYP	TYP	TYP	TYP	UNIT
Const	Power dissipation	Outputs enabled	f = 10 MHz	18	18	19	21	pF
Cpd	capacitance	Outputs disabled	1 = 10 MHZ	2	2	2	4	PΓ

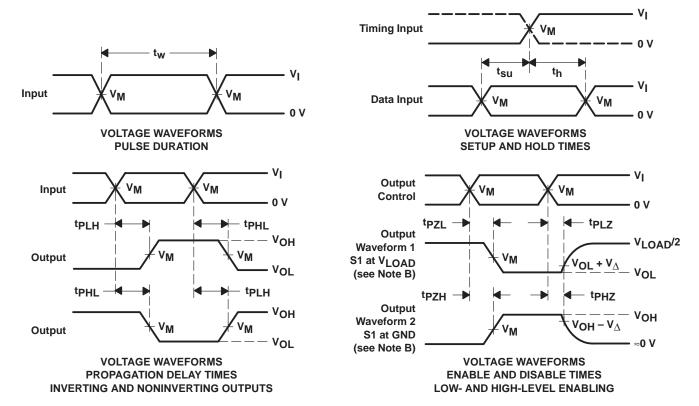


PARAMETER MEASUREMENT INFORMATION



TEST	S1
tPLH/tPHL	Open
tPLZ/tPZL	VLOAD
tPHZ/tPZH	GND

W	INF	PUTS		V	0.	D.	V
VCC	٧ _I	t _r /t _f	VM	VLOAD	CL	RL	$v_{\scriptscriptstyle\Delta}$
1.8 V \pm 0.15 V	VCC	≤2 ns	V _{CC} /2	2×V _{CC}	15 pF	1 M Ω	0.15 V
2.5 V \pm 0.2 V	VCC	≤2 ns	V _{CC} /2	2×VCC	15 pF	1 M Ω	0.15 V
3.3 V \pm 0.3 V	3 V	≤2.5 ns	1.5 V	6 V	15 pF	1 M Ω	0.3 V
5 V \pm 0.5 V	VCC	≤2.5 ns	V _{CC} /2	2×V _{CC}	15 pF	1 M Ω	0.3 V

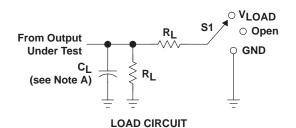


- NOTES: A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_Ω = 50 Ω.
 - D. The outputs are measured one at a time with one transition per measurement.
 - E. tpLz and tpHz are the same as tdis.
 - F. tpzL and tpzH are the same as ten.
 - G. tpLH and tpHL are the same as tpd.
 - H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

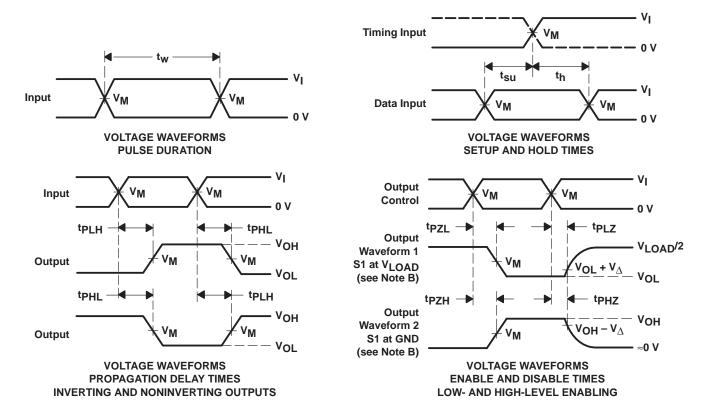


PARAMETER MEASUREMENT INFORMATION



TEST	S1
tPLH/tPHL	Open
tPLZ/tPZL	VLOAD
tPHZ/tPZH	GND

W	INF	PUTS	Vaa Vi oan		0-	D.	V
VCC	٧ _I	t _r /t _f	VM	VLOAD	CL	RL	$v_{\scriptscriptstyle\Delta}$
1.8 V \pm 0.15 V	VCC	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	1 k Ω	0.15 V
2.5 V \pm 0.2 V	VCC	≤ 2 ns	V _{CC} /2	2×VCC	30 pF	500 Ω	0.15 V
3.3 V \pm 0.3 V	3 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V
5 V \pm 0.5 V	VCC	≤2.5 ns	V _{CC} /2	2×V _{CC}	50 pF	500 Ω	0.3 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 ≤ 10 MHz, Z_O = 50 Ω.
 - D. The outputs are measured one at a time with one transition per measurement.
 - E. tpLz and tpHz are the same as tdis.
 - F. tpzL and tpzH are the same as ten.
 - G. tplH and tpHL are the same as tpd.
 - H. All parameters and waveforms are not applicable to all devices.

Figure 2. Load Circuit and Voltage Waveforms







i.com 18-Feb-2005

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LVC1G125DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G125DBVT	ACTIVE	SOT-23	DBV	5	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G125DCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G125DCKT	ACTIVE	SC70	DCK	5	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G125YEAR	ACTIVE	WCSP	YEA	5	3000	None	SNPB	Level-1-260C-UNLIM
SN74LVC1G125YEPR	ACTIVE	WCSP	YEP	5	3000	None	SNPB	Level-1-260C-UNLIM
SN74LVC1G125YZAR	ACTIVE	WCSP	YZA	5	3000	None	Call TI	Call TI
SN74LVC1G125YZPR	ACTIVE	WCSP	YZP	5	3000	Pb-Free (RoHS)	SNAGCU	Level-1-260C-UNLIM

(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 - 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.

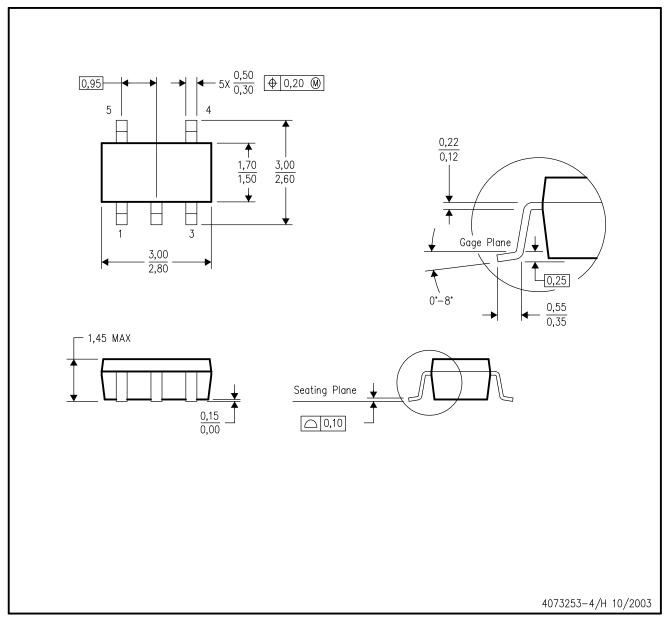
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDECindustry standard classifications, and peak solder temperature.

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DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE



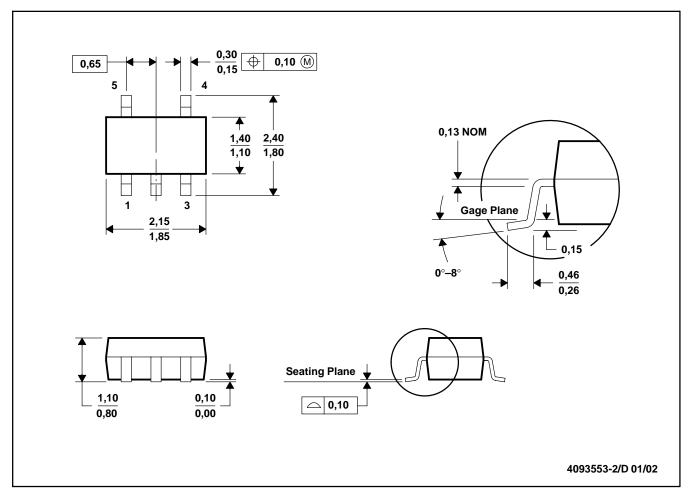
NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- C. Body dimensions do not include mold fla D. Falls within JEDEC MO—178 Variation AA. Body dimensions do not include mold flash or protrusion.



DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE

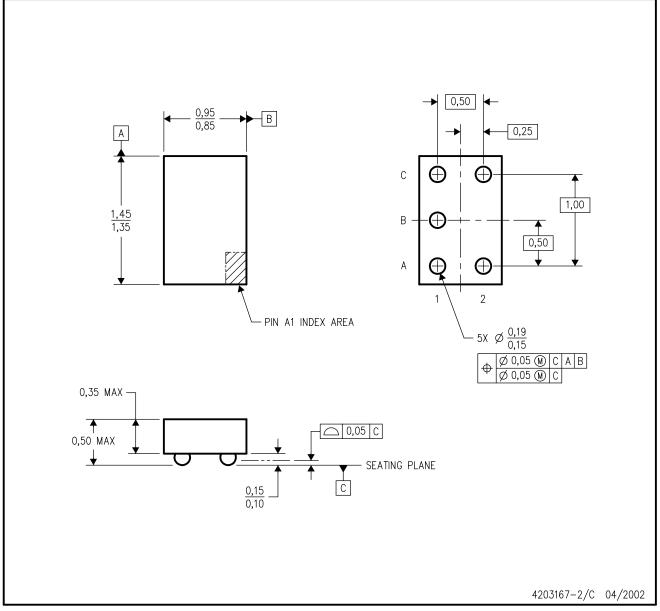


NOTES: A. All linear dimensions are in millimeters.

- 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.

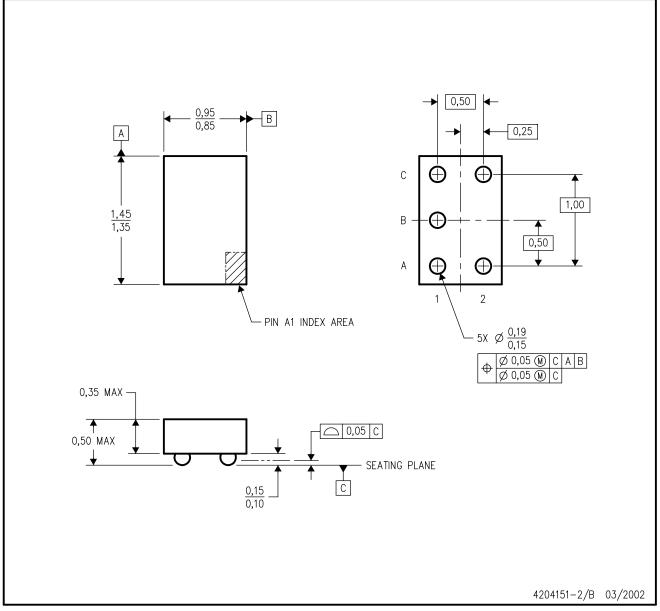
- B. This drawing is subject to change without notice.
- C. NanoStar \mathbf{M} package configuration.
- D. Package complies to JEDEC MO-211 variation EA.
- E. This package is tin-lead (SnPb). Refer to the 5 YZA package (drawing 4204151) for lead-free.

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YZA (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY



NOTES: A. All linear dimensions are in millimeters.

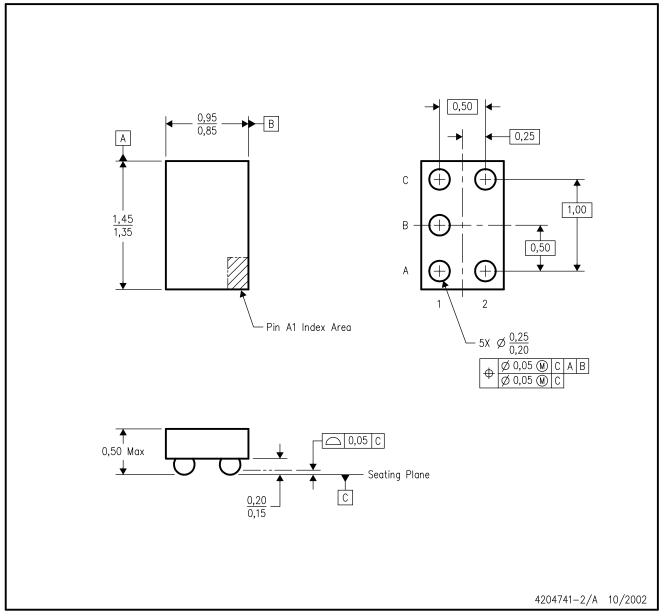
- B. This drawing is subject to change without notice.
- C. NanoFree $^{\text{TM}}$ package configuration.
- D. Package complies to JEDEC MO-211 variation EA.
- E. This package is lead-free. Refer to the 5 YEA package (drawing 4203167) for tin-lead (SnPb).

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YZP (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY



NOTES: A. All linear dimensions are in millimeters.

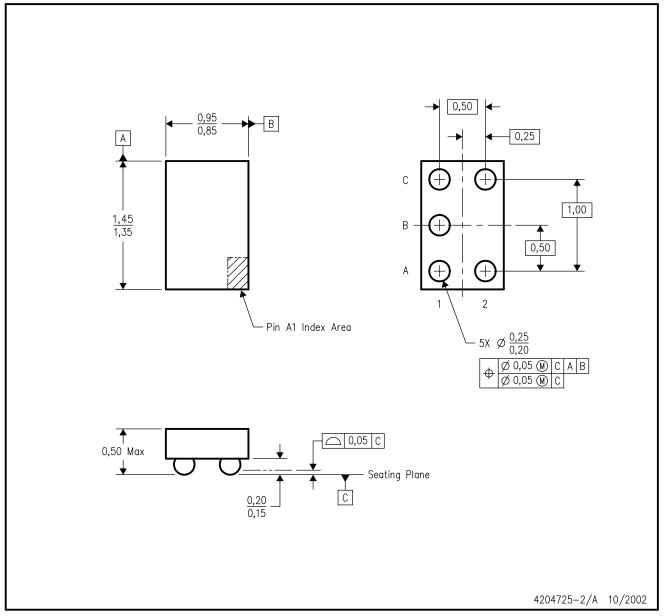
- B. This drawing is subject to change without notice.
- C. NanoFree™ package configuration.
- D. This package is lead-free. Refer to the 5 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.



YEP (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 \mathbf{M} package configuration.
- D. This package is tin-lead (SnPb). Refer to the 5 YZP package (drawing 4204741) for lead-free.

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