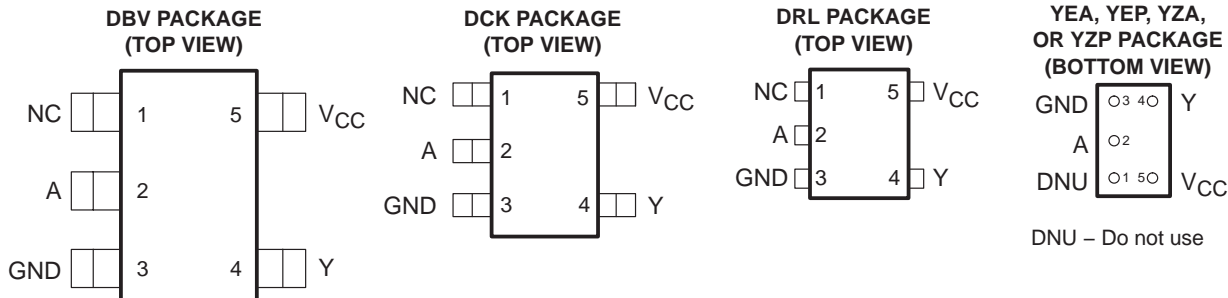


# SN74AUC1G17 SINGLE SCHMITT-TRIGGER BUFFER

SCES376L – SEPTEMBER 2001 – REVISED MAY 2005

- 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<sub>off</sub> Supports Partial-Power-Down Mode Operation
- Sub 1-V Operable
- Max t<sub>pd</sub> of 2.4 ns at 1.8 V
- Low Power Consumption, 10-μA Max I<sub>CC</sub>
- ±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)



See mechanical drawings for dimensions.

## description/ordering information

This single Schmitt-trigger buffer is operational at 0.8-V to 2.7-V V<sub>CC</sub>, but is designed specifically for 1.65-V to 1.95-V V<sub>CC</sub> operation.

The SN74AUC1G17 contains one buffer and performs the Boolean function Y = A. The device functions as an independent buffer, but because of Schmitt action, it may have different input threshold levels for positive-going (V<sub>T+</sub>) and negative-going (V<sub>T-</sub>) signals.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING‡
–40°C to 85°C	NanoStar™ – WCSP (DSBGA) 0.17-mm Small Bump – YEA	Tape and reel	SN74AUC1G17YEAR	__ _U7_
	NanoFree™ – WCSP (DSBGA) 0.17-mm Small Bump – YZA (Pb-free)		SN74AUC1G17YZAR	
	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP		SN74AUC1G17YEPR	
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74AUC1G17YZPR	
	SOT (SOT-23) – DBV	Tape and reel	SN74AUC1G17DBVR	U17_
	SOT (SC-70) – DCK	Tape and reel	SN74AUC1G17DCKR	U7_
	SOT (SOT-553) – DRL	Reel of 4000	SN74AUC1G17DRLR	U7_

† 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/DRL: 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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SN74AUC1G17  
SINGLE SCHMITT-TRIGGER BUFFER

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description/ordering information (continued)

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

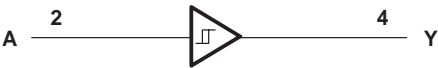
This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

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 A	OUTPUT Y
H	H
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, $I_O$	±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
DRL package	142°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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## SINGLE SCHMITT-TRIGGER BUFFER

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### recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	0.8	2.7	V
$V_I$	Input voltage	0	3.6	V
$V_O$	Output voltage	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 0.8\text{ V}$	–0.7	mA
		$V_{CC} = 1.1\text{ V}$	–3	
		$V_{CC} = 1.4\text{ V}$	–5	
		$V_{CC} = 1.65\text{ V}$	–8	
		$V_{CC} = 2.3\text{ V}$	–9	
$I_{OL}$	Low-level output current	$V_{CC} = 0.8\text{ V}$	0.7	mA
		$V_{CC} = 1.1\text{ V}$	3	
		$V_{CC} = 1.4\text{ V}$	5	
		$V_{CC} = 1.65\text{ V}$	8	
		$V_{CC} = 2.3\text{ V}$	9	
$T_A$	Operating free-air temperature	–40	85	°C

NOTE 3: 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.

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## SINGLE SCHMITT-TRIGGER BUFFER

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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>T+</sub> Positive-going input threshold voltage			0.8 V	0.5		V	
			1.1 V	0.51	0.86		
			1.4 V	0.65	1		
			1.65 V	0.79	1.16		
			2.3 V	1.11	1.56		
V <sub>T–</sub> Negative-going input threshold voltage			0.8 V	0.3		V	
			1.1 V	0.22	0.53		
			1.4 V	0.3	0.58		
			1.65 V	0.39	0.62		
			2.3 V	0.58	0.87		
$\Delta V_T$ Hysteresis (V <sub>T+</sub> – V <sub>T–</sub> )			0.8 V	0.21		V	
			1.1 V	0.25	0.38		
			1.4 V	0.31	0.5		
			1.65 V	0.37	0.62		
			2.3 V	0.48	0.77		
V <sub>OH</sub>		I <sub>OH</sub> = –100 μA I <sub>OH</sub> = –0.7 mA I <sub>OH</sub> = –3 mA I <sub>OH</sub> = –5 mA I <sub>OH</sub> = –8 mA I <sub>OH</sub> = –9 mA	0.8 V to 2.7 V	V <sub>CC</sub> –0.1		V	
			0.8 V	0.55			
			1.1 V	0.8			
			1.4 V	1			
			1.65 V	1.2			
			2.3 V	1.8			
V <sub>OL</sub>		I <sub>OL</sub> = 100 μA I <sub>OL</sub> = 0.7 mA I <sub>OL</sub> = 3 mA I <sub>OL</sub> = 5 mA I <sub>OL</sub> = 8 mA I <sub>OL</sub> = 9 mA	0.8 V to 2.7 V	0.2		V	
			0.8 V	0.25			
			1.1 V	0.3			
			1.4 V	0.4			
			1.65 V	0.45			
			2.3 V	0.6			
I <sub>I</sub>	A 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	3		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	5.7	0.8	3.9	0.7	2.1	0.6	1.1	1.9	0.5	1.5	ns



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## SINGLE SCHMITT-TRIGGER BUFFER

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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 (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	Y	0.8	1.4	2.4	0.7	2.5	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	$f = 10 \text{ MHz}$	15	15	16	16	20	pF

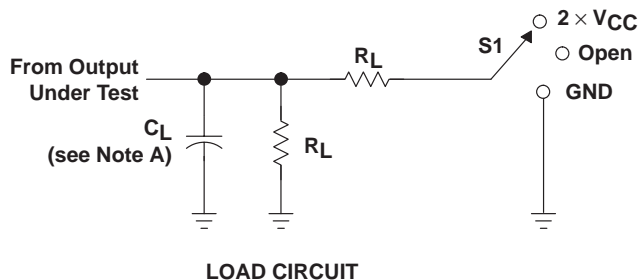


# SN74AUC1G17

## SINGLE SCHMITT-TRIGGER BUFFER

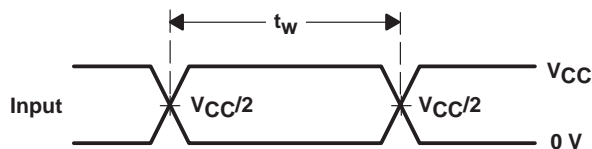
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### PARAMETER MEASUREMENT INFORMATION

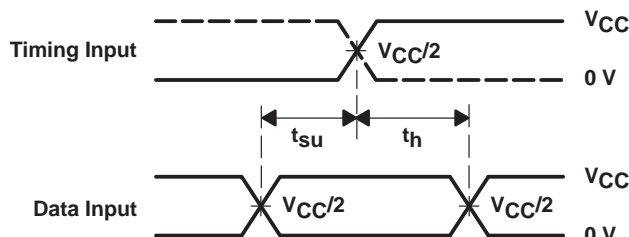


TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND

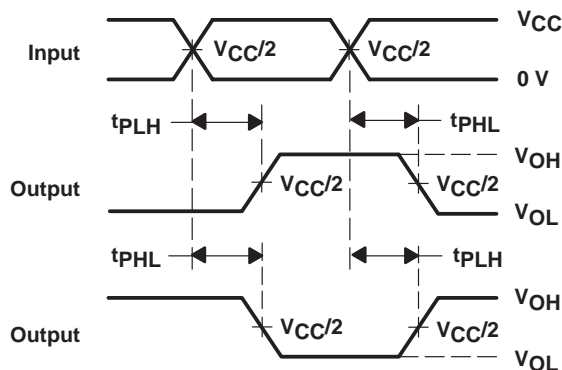
$V_{CC}$	$C_L$	$R_L$	$V_{\Delta}$
0.8 V	15 pF	2 k $\Omega$	0.1 V
1.2 V $\pm$ 0.1 V	15 pF	2 k $\Omega$	0.1 V
1.5 V $\pm$ 0.1 V	15 pF	2 k $\Omega$	0.1 V
1.8 V $\pm$ 0.15 V	15 pF	2 k $\Omega$	0.15 V
2.5 V $\pm$ 0.2 V	15 pF	2 k $\Omega$	0.15 V
1.8 V $\pm$ 0.15 V	30 pF	1 k $\Omega$	0.15 V
2.5 V $\pm$ 0.2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



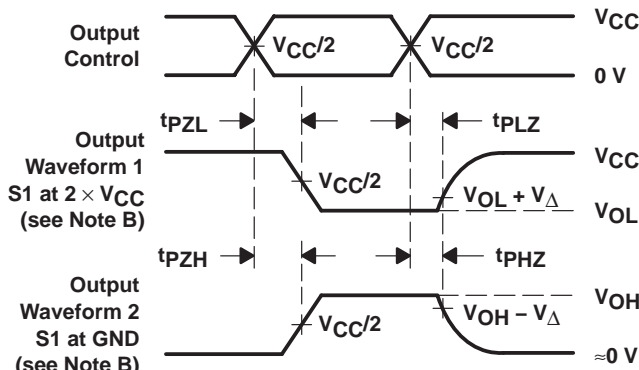
VOLTAGE WAVEFORMS  
PULSE DURATION



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>
SN74AUC1G17DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17DBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17DCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17DCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17DCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17DRLR	ACTIVE	SOP	DRL	5	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17DRLRG4	ACTIVE	SOP	DRL	5	4000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G17YEAR	NRND	WCSP	YEA	5	3000	TBD	SNPB	Level-1-260C-UNLIM
SN74AUC1G17YEPR	NRND	WCSP	YEP	5	3000	TBD	SNPB	Level-1-260C-UNLIM
SN74AUC1G17YZAR	NRND	WCSP	YZA	5	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM
SN74AUC1G17YZPR	ACTIVE	WCSP	YZP	5	3000	Green (RoHS & no Sb/Br)	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), Pb-Free (RoHS Exempt), 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.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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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## DBV (R-PDSO-G5)

## PLASTIC SMALL-OUTLINE PACKAGE

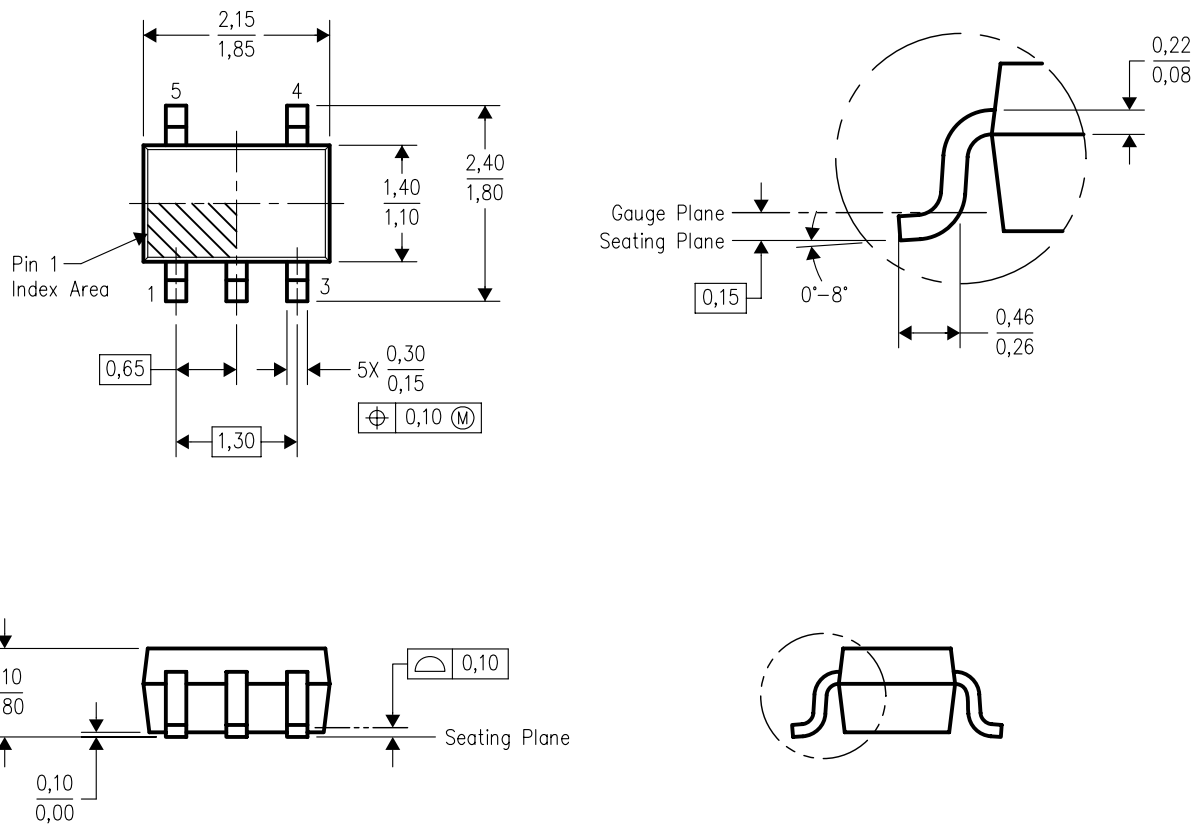


- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - Falls within JEDEC MO-178 Variation AA.



## DCK (R-PDSO-G5)

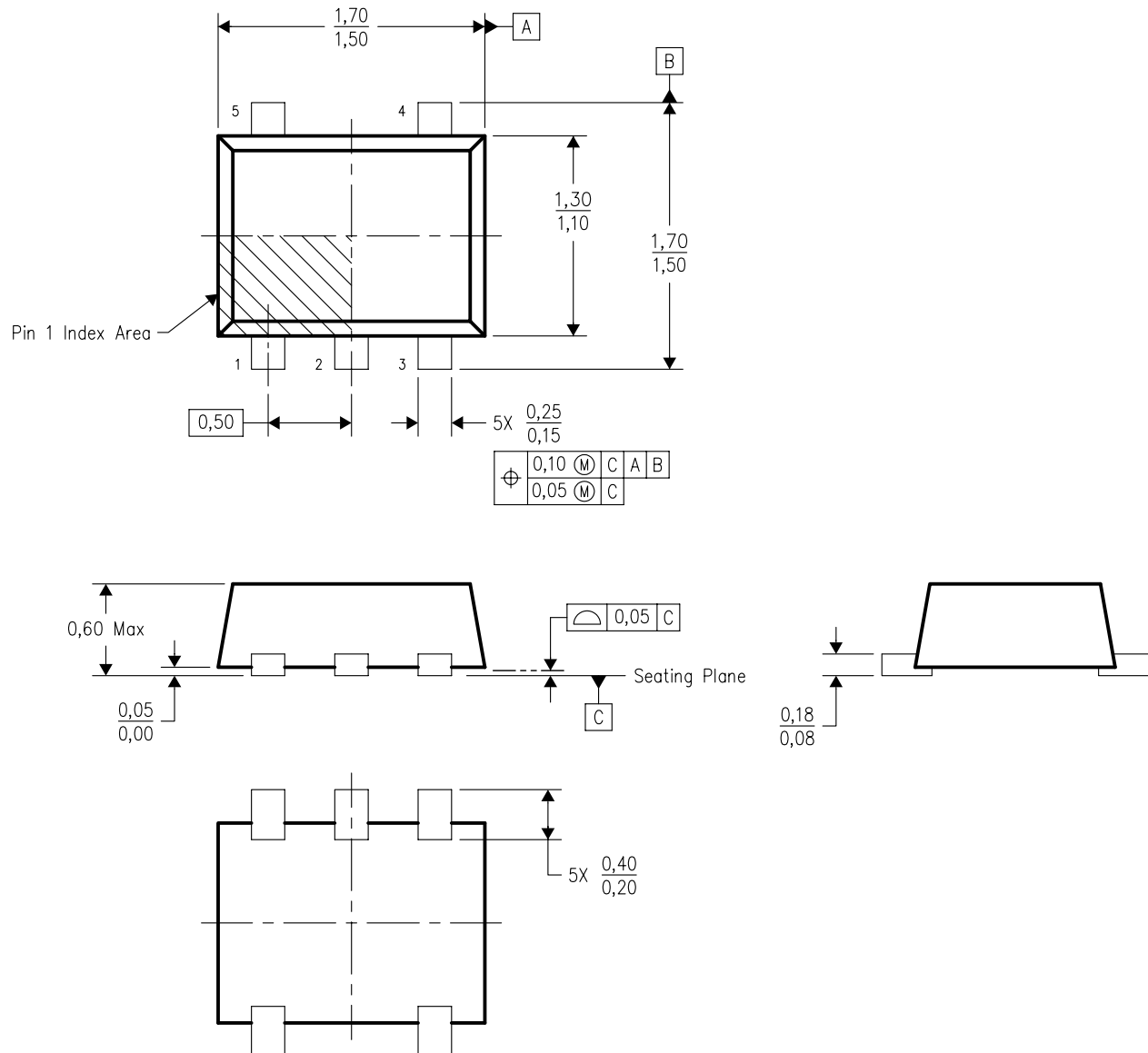
# PLASTIC SMALL-OUTLINE PACKAGE



4093553-3/F 07/2006

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. Mold flash and protrusion shall not exceed 0.15 per side.  
D. Falls within JEDEC MO-203 variation AA.

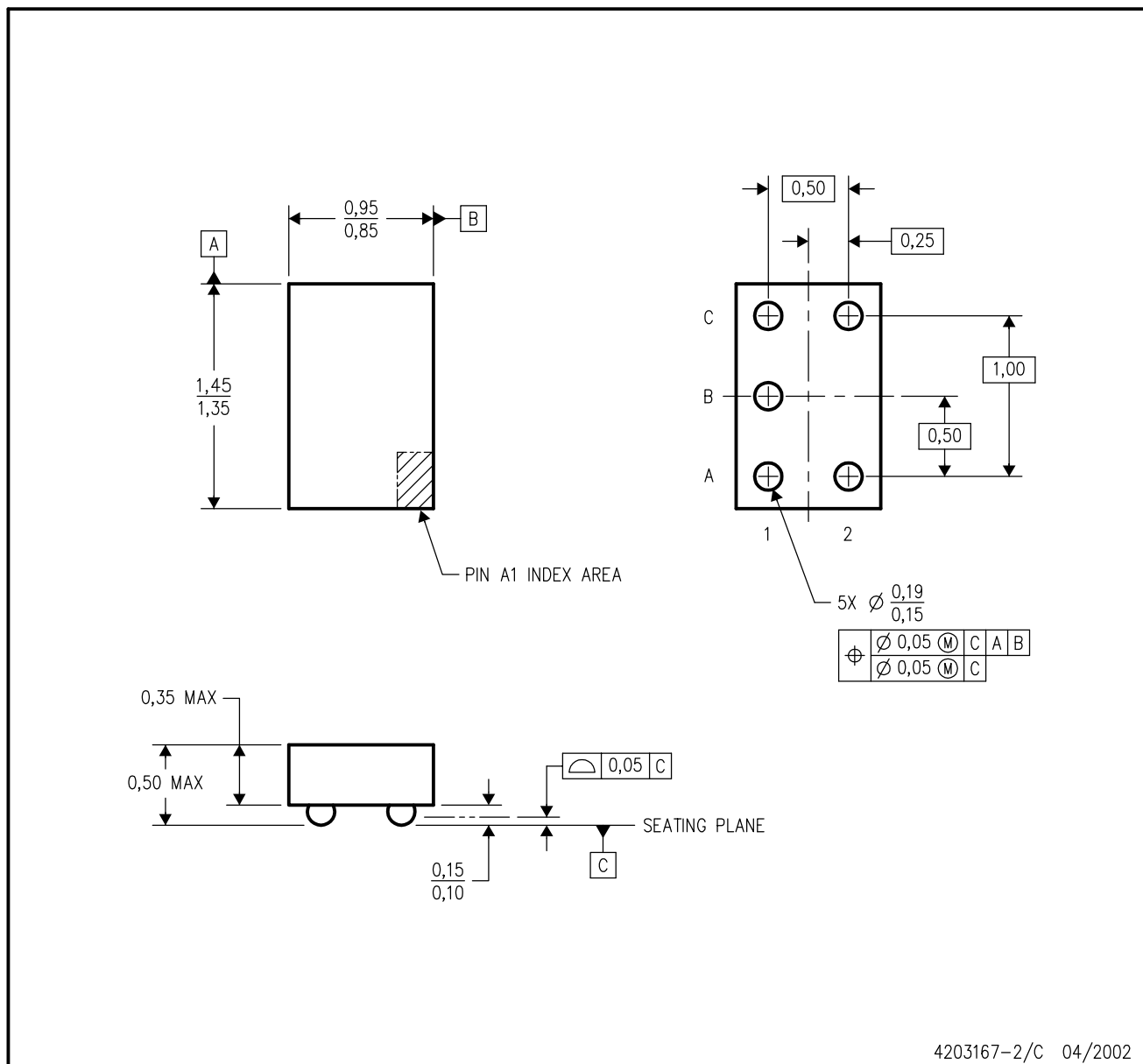


4205622-2/B 07/2004

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. JEDEC package registration is pending.

## YEA (R-XBGA-N5)

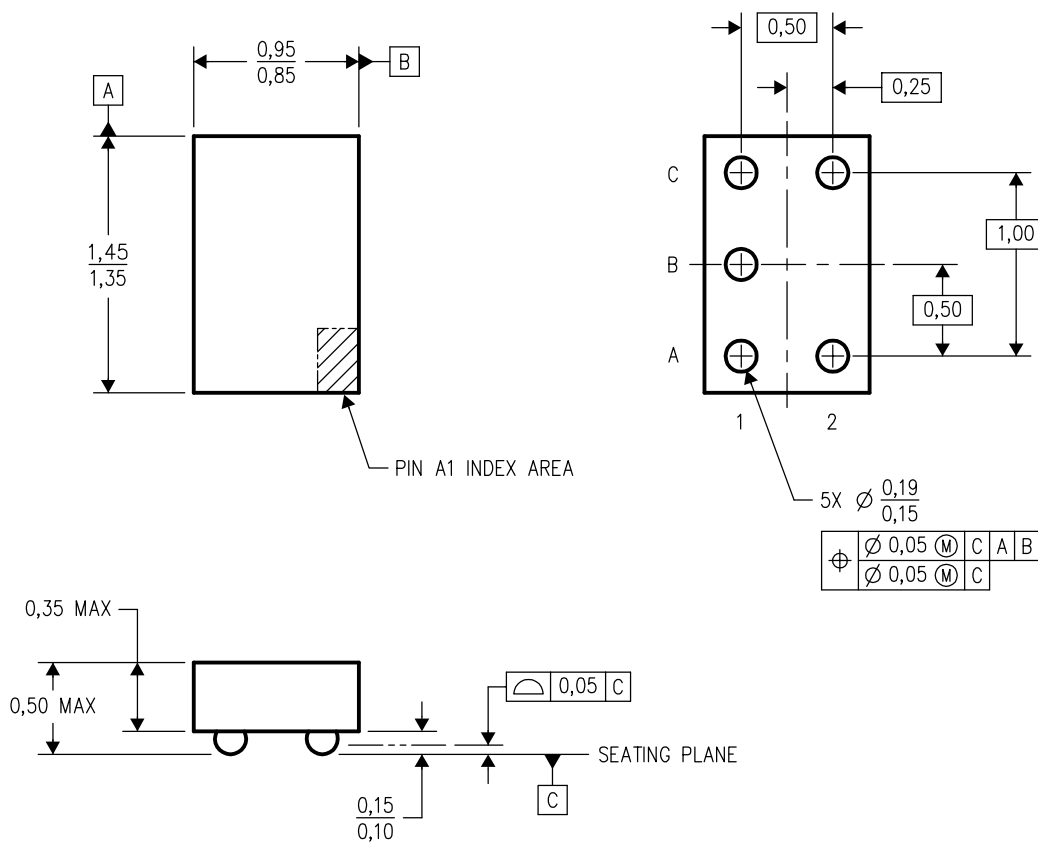
## DIE-SIZE BALL GRID ARRAY



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

## YZA (R-XBGA-N5)

## DIE-SIZE BALL GRID ARRAY



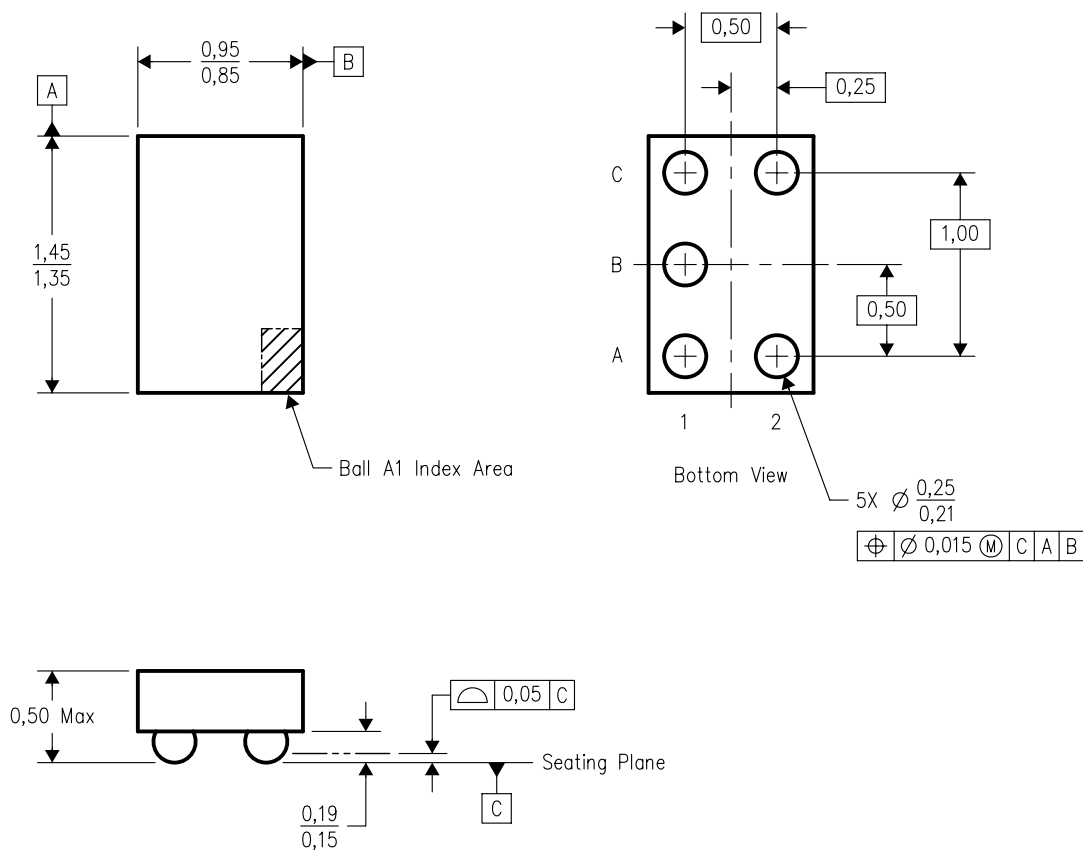
4204151-2/B 03/2002

- 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).

NanoFree is a trademark of Texas Instruments.

## YZP (R-XBGA-N5)

## DIE-SIZE BALL GRID ARRAY



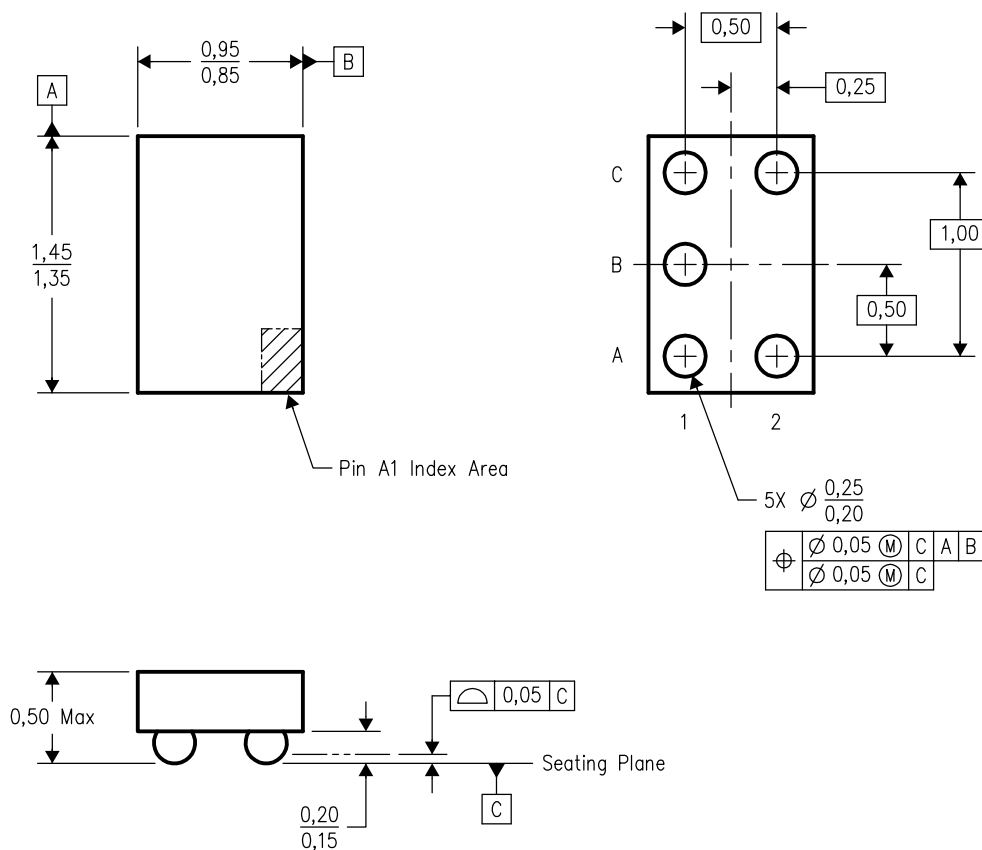
4204741-2/D 10/2006

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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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DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
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