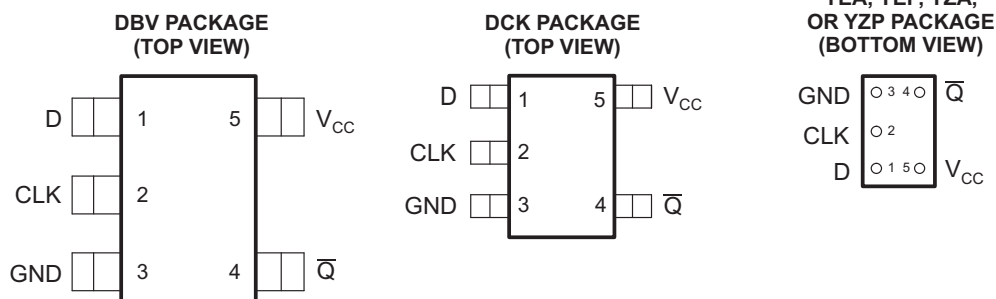


FEATURES

- 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- μ A Max I_{CC}
- ± 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 positive-edge-triggered D-type flip-flop 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.

ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽²⁾
–40°C to 85°C	NanoStar™ – WCSP (DSBGA) 0.17-mm Small Bump – YEA	Reel of 3000	SN74AUC1G80YEAR	__UX__
	NanoFree™ – WCSP (DSBGA) 0.17-mm Small Bump – YZA (Pb-free)		SN74AUC1G80YZAR	
	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP	Reel of 3000	SN74AUC1G80YEPR	
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74AUC1G80YZPR	
	SOT (SOT-23) – DBV	Reel of 3000	SN74AUC1G80DBVR	U80__
	SOT (SC-70) – DCK	Reel of 3000	SN74AUC1G80DCKR	UX__

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

(2) 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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SN74AUC1G80

SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCES388J—MARCH 2002—REVISED JUNE 2006

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

When data at the data (D) input meets the setup time requirement, the data is transferred to the \bar{Q} output on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

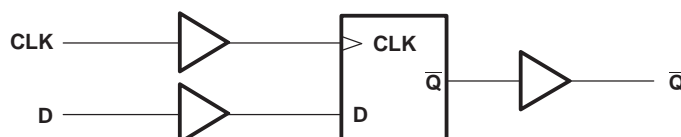
NanoStar™ and NanoFree™ package technology is a major breakthrough in IC packaging concepts, using the die as the package.

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.

FUNCTION TABLE

INPUTS		OUTPUT \bar{Q}
CLK	D	
↑	H	L
↑	L	H
L	X	\bar{Q}_0

LOGIC DIAGRAM (POSITIVE LOGIC)



Absolute Maximum Ratings⁽¹⁾

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 ⁽²⁾	−0.5	3.6	V
V_O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	−0.5	3.6	V
V_O	Output voltage range ⁽²⁾	−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
θ_{JA}	Package thermal impedance ⁽³⁾	DBV package	206	°C/W
		DCK package	252	
		YEA/YZA package	154	
		YEP/YZP package	132	
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.

Recommended Operating Conditions⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage		0.8	2.7	V
V _{IH}	High-level input voltage	V _{CC} = 0.8 V	V _{CC}		V
		V _{CC} = 1.1 V to 1.95 V	0.65 × V _{CC}		
		V _{CC} = 2.3 V to 2.7 V	1.7		
V _{IL}	Low-level input voltage	V _{CC} = 0.8 V	0		V
		V _{CC} = 1.1 V to 1.95 V	0.35 × V _{CC}		
		V _{CC} = 2.3 V to 2.7 V	0.7		
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 V	−0.7		mA
		V _{CC} = 1.1 V	−3		
		V _{CC} = 1.4 V	−5		
		V _{CC} = 1.65 V	−8		
		V _{CC} = 2.3 V	−9		
I _{OL}	Low-level output current	V _{CC} = 0.8 V	0.7		mA
		V _{CC} = 1.1 V	3		
		V _{CC} = 1.4 V	5		
		V _{CC} = 1.65 V	8		
		V _{CC} = 2.3 V	9		
Δt/Δv	Input transition rise or fall rate			20	ns/V
T _A	Operating free-air temperature		−40	85	°C

(1) 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	V _{CC}	MIN	TYP ⁽¹⁾	MAX	UNIT
V _{OH}		I _{OH} = −100 μA	0.8 V to 2.7 V	V _{CC} − 0.1			V
		I _{OH} = −0.7 mA	0.8 V	0.55			
		I _{OH} = −3 mA	1.1 V	0.8			
		I _{OH} = −5 mA	1.4 V	1			
		I _{OH} = −8 mA	1.65 V	1.2			
		I _{OH} = −9 mA	2.3 V	1.8			
V _{OL}		I _{OL} = 100 μA	0.8 V to 2.7 V			0.2	V
		I _{OL} = 0.7 mA	0.8 V	0.25			
		I _{OL} = 3 mA	1.1 V			0.3	
		I _{OL} = 5 mA	1.4 V			0.4	
		I _{OL} = 8 mA	1.65 V			0.45	
		I _{OL} = 9 mA	2.3 V			0.6	
I _I	D or CLK input	V _I = V _{CC} or GND	0 to 2.7 V			±5	μA
I _{off}		V _I or V _O = 2.7 V	0			±10	μA
I _{CC}		V _I = V _{CC} or GND, I _O = 0	0.8 V to 2.7 V			10	μA
C _i		V _I = V _{CC} or GND	2.5 V	2.5			pF

(1) All typical values are at T_A = 25°C.

SN74AUC1G80

SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCES388J – MARCH 2002 – REVISED JUNE 2006

Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 1](#))

		$V_{CC} = 0.8\text{ V}$	$V_{CC} = 1.2\text{ V} \pm 0.1\text{ V}$	$V_{CC} = 1.5\text{ V} \pm 0.1\text{ V}$	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$	$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$	UNIT
		TYP	MIN MAX	MIN MAX	MIN MAX	MIN MAX	
f_{clock}	Clock frequency	50	200	225	250	275	MHz
t_w	Pulse duration, CLK high or low	4.6	1.7	1.7	1.7	1.7	ns
t_{su}	Setup time before CLK \uparrow , data high or low	1.6	1.1	0.8	0.6	0.5	ns
t_h	Hold time, data after CLK \uparrow	0	0	0.1	0.1	0.1	ns

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	
f_{max}			50	200	225	250	275	MHz
t_{pd}	CLK	\overline{Q}	5	1 3.9	0.8 2.5	0.3 1 1.9	0.3 1.3	ns

Switching Characteristics

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

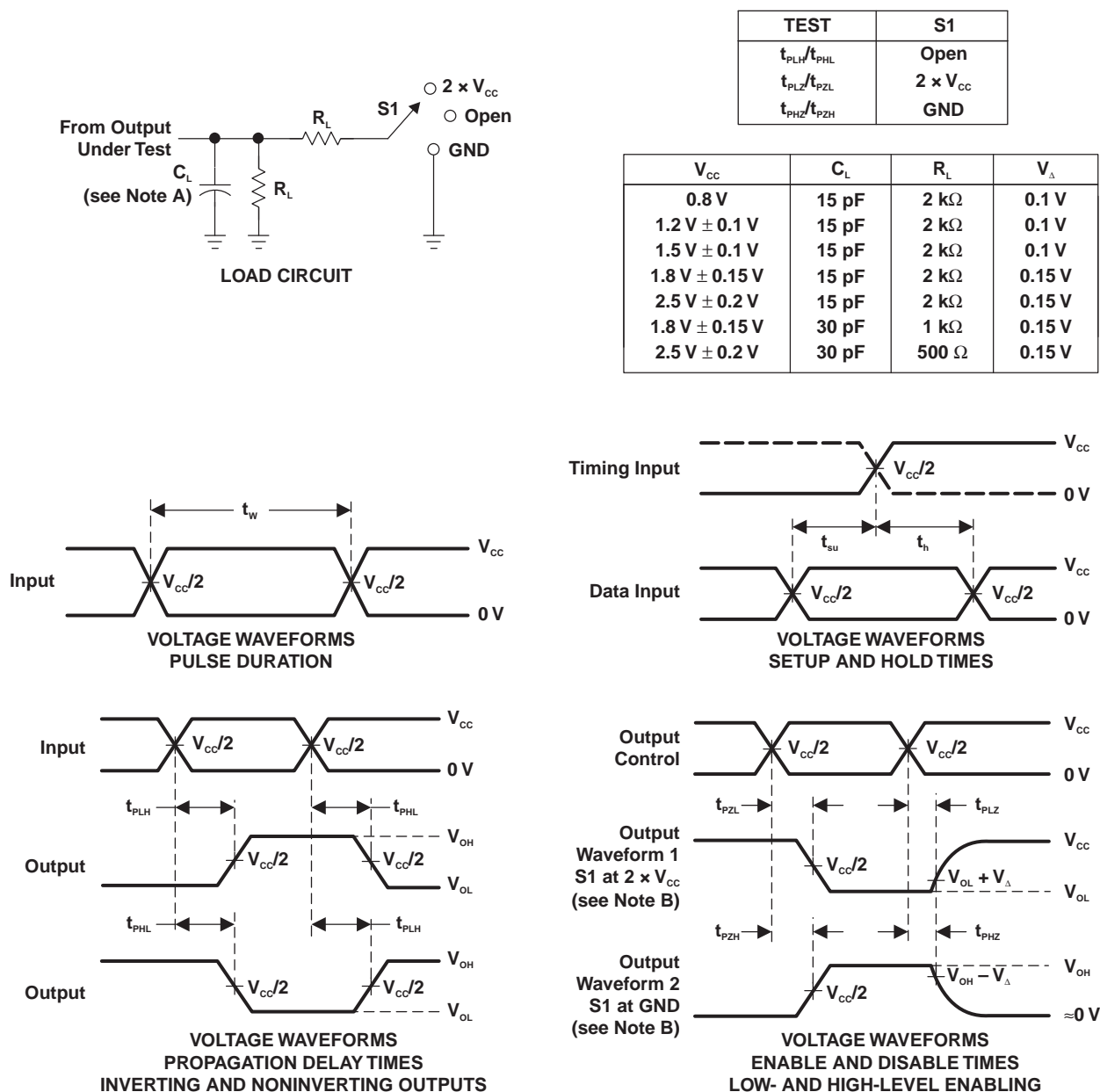
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$			$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		UNIT
			MIN	TYP	MAX	MIN	MAX	
f_{max}			250			275		ns
t_{pd}	CLK	\overline{Q}	0.8	1.5	2.4	0.6	1.8	ns

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 $f = 10\text{ MHz}$	18	18	18	18.5	20.5	pF

PARAMETER MEASUREMENT INFORMATION



- 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 ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74AUC1G80DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G80DBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G80DCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G80DCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G80DCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUC1G80YEAR	NRND	WCSP	YEA	5	3000	TBD	SNPB	Level-1-260C-UNLIM
SN74AUC1G80YEPR	NRND	WCSP	YEP	5	3000	TBD	SNPB	Level-1-260C-UNLIM
SN74AUC1G80YZAR	NRND	WCSP	YZA	5	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM
SN74AUC1G80YZPR	ACTIVE	WCSP	YZP	5	3000	Green (RoHS & no Sb/Br)	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 - 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)

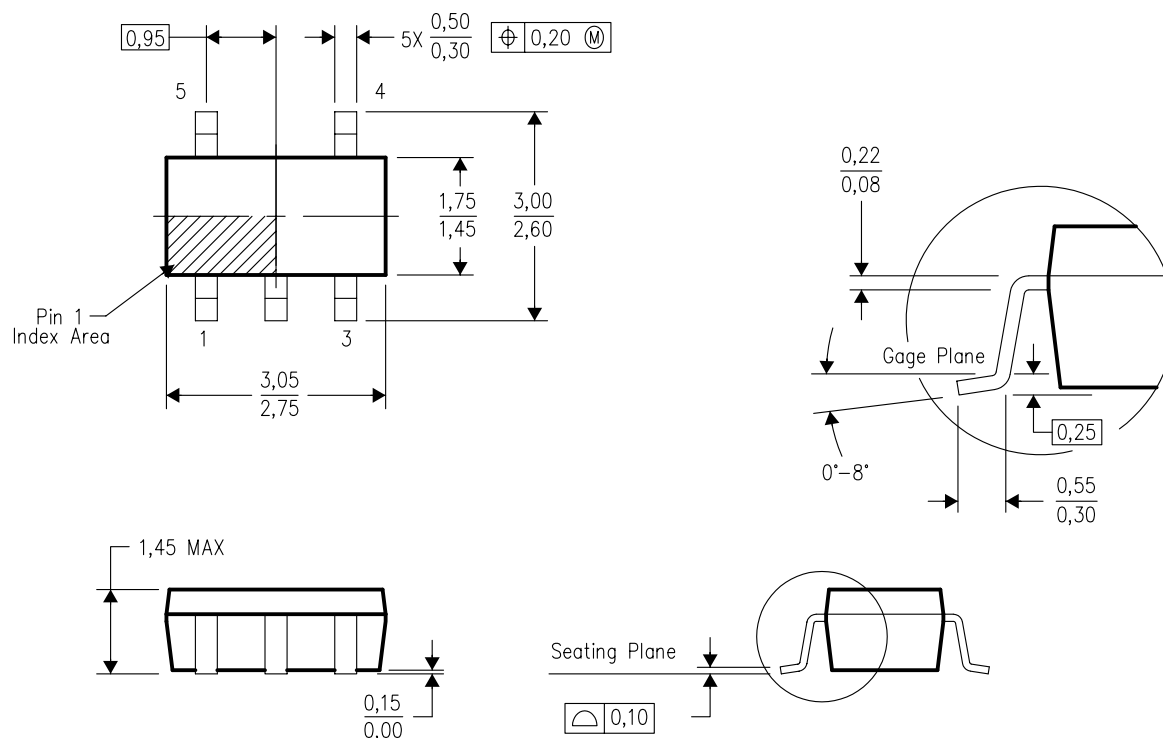
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DBV (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE

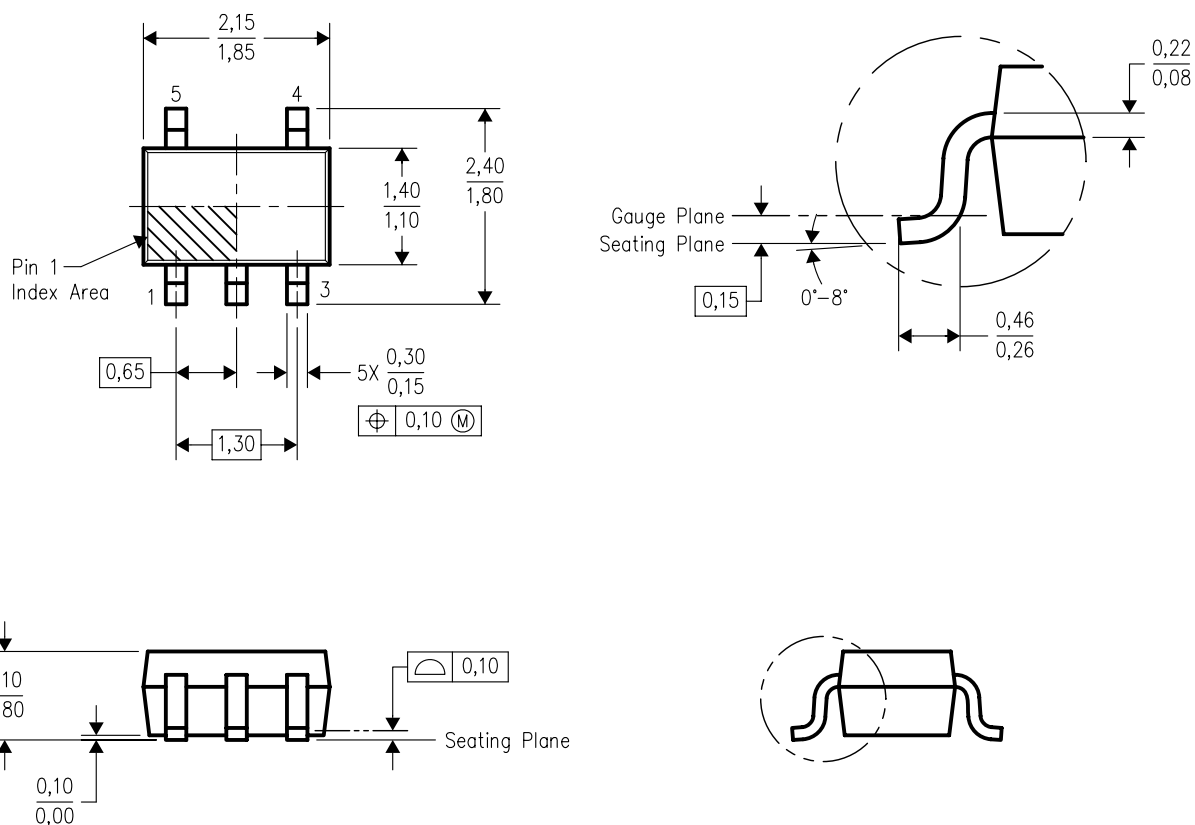


4073253-4/K 03/2006

- 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-178 Variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL-OUTLINE PACKAGE

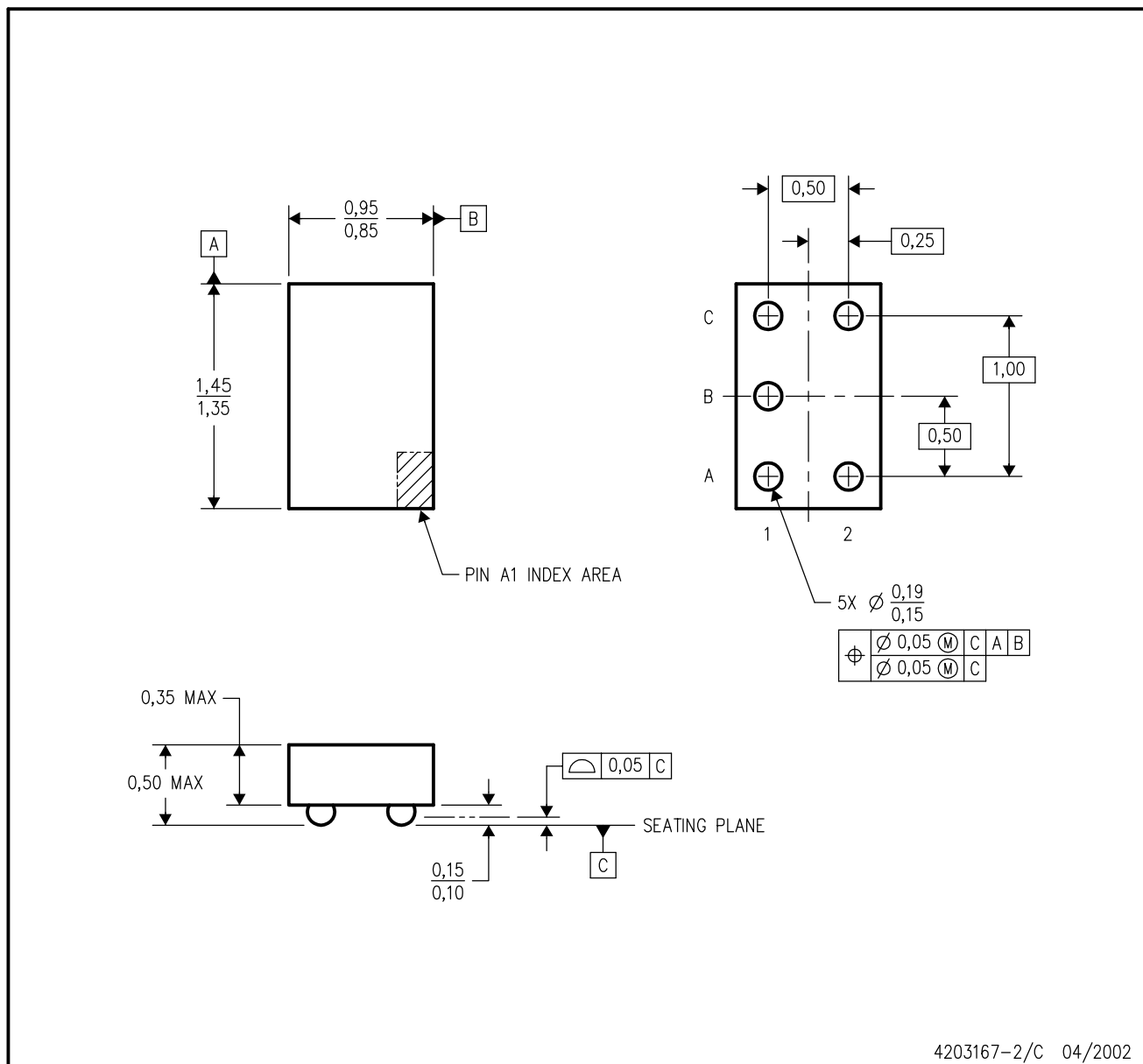


4093553-3/F 07/2006

- 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-203 variation AA.

YEA (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY



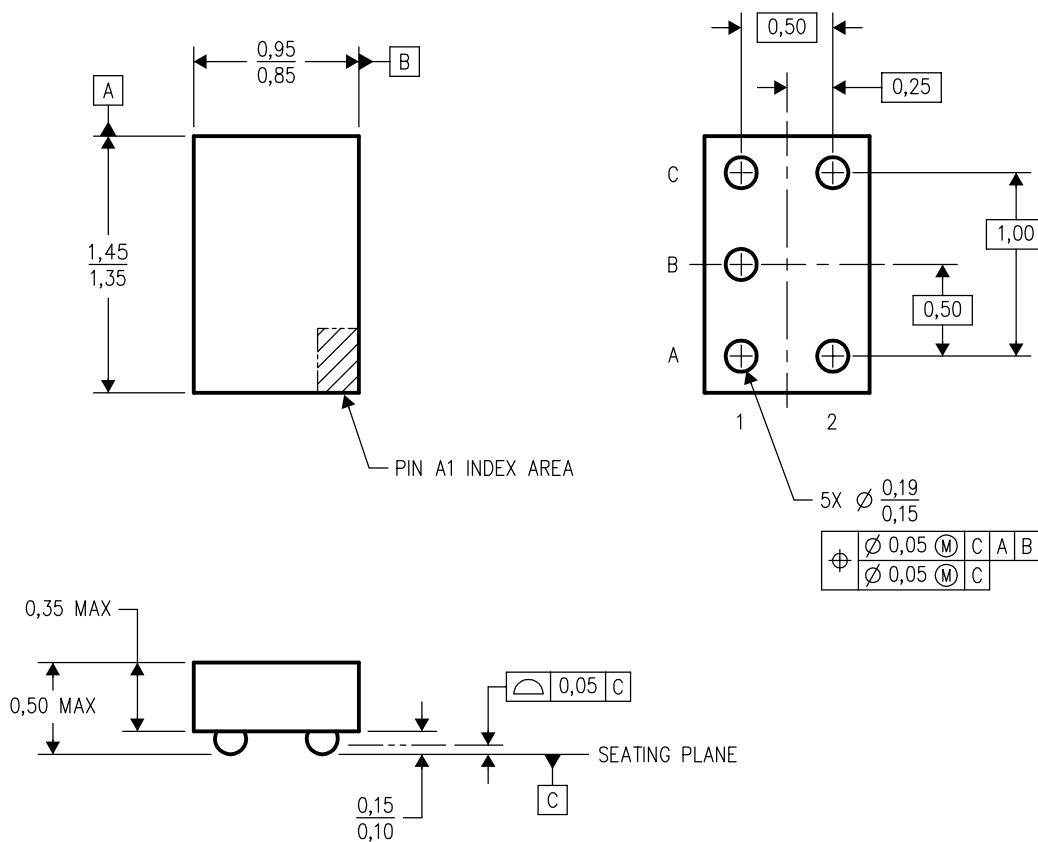
4203167-2/C 04/2002

- 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



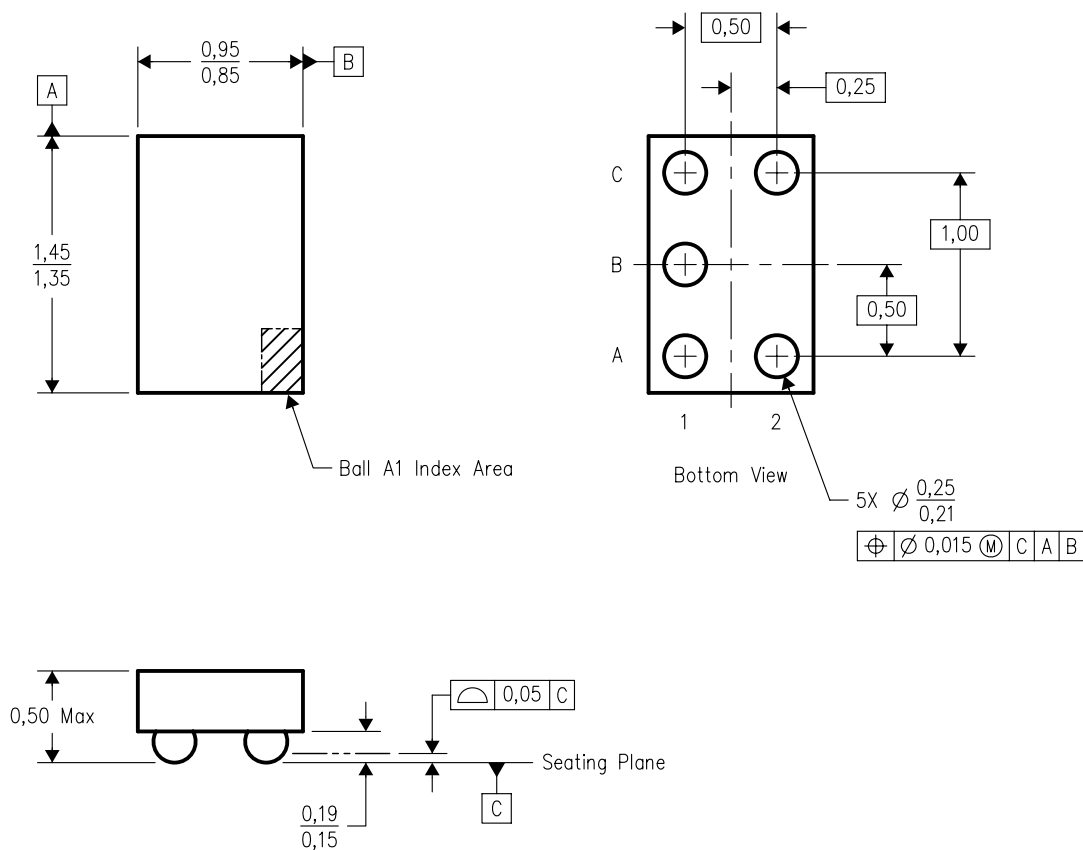
4204151-2/B 03/2002

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - NanoFree™ package configuration.
 - Package complies to JEDEC MO-211 variation EA.
 - 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



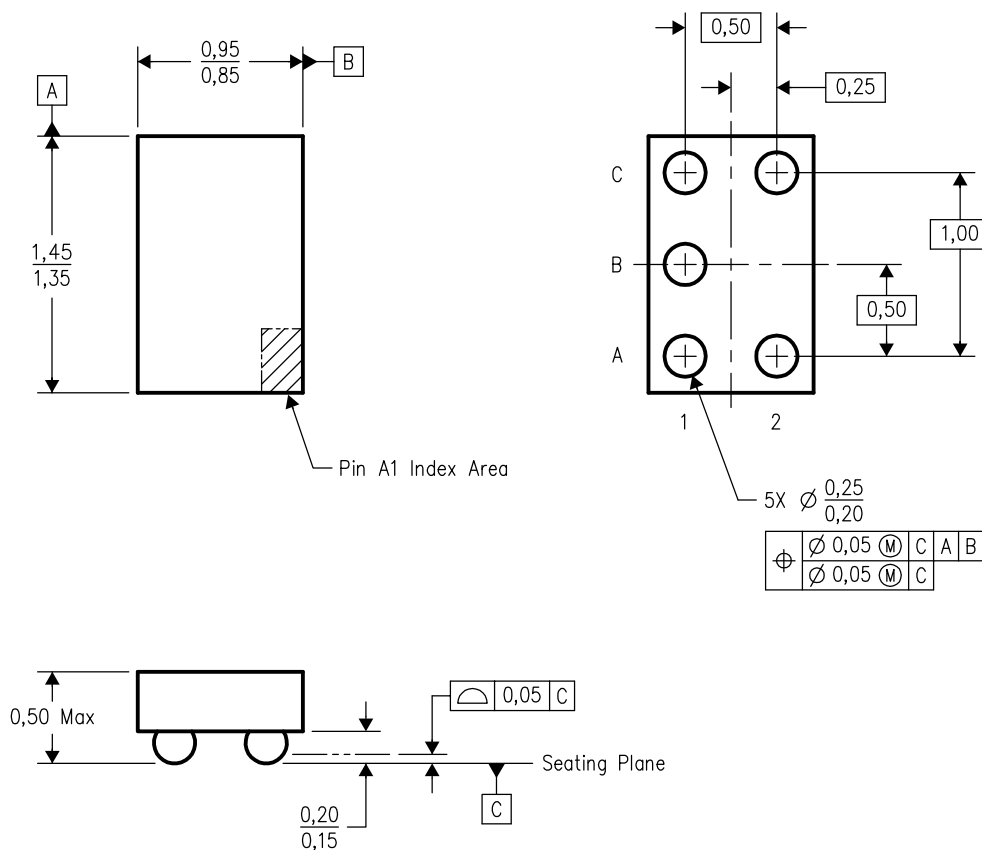
4204741-2/D 10/2006

- 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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