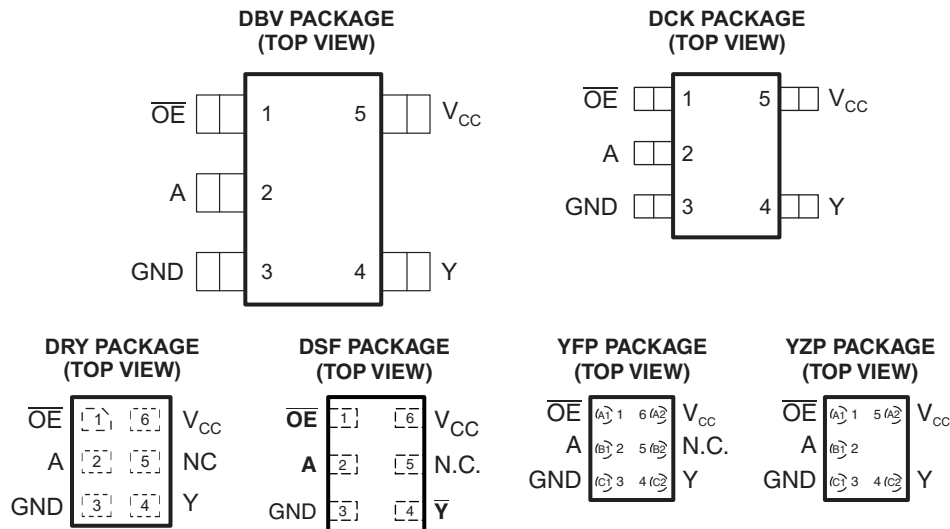


## LOW-POWER SINGLE BUFFER/DRIVER WITH 3-STATE OUTPUT

Check for Samples: [SN74AUP1G240](#)

### FEATURES

- Available in the Texas Instruments NanoStar™ Package
- Low Static-Power Consumption
  - $I_{CC} = 0.9 \mu\text{A Max}$
- Low Dynamic-Power Consumption
  - $C_{pd} = 4.2 \text{ pF at } 3.3 \text{ V Typ}$
- Low Input Capacitance
  - $C_i = 1.5 \text{ pF Typ}$
- Low Noise – Overshoot and Undershoot <10% of  $V_{CC}$
- Input-Disable Feature Allows Floating Input Conditions
- $I_{off}$  Supports Partial Power-Down-Mode Operation
- Input Hysteresis Allows Slow Input Transition and Better Switching Noise Immunity at the Input
- Wide Operating  $V_{CC}$  Range of 0.8 V to 3.6 V
- Optimized for 3.3-V Operation
- 3.6-V I/O Tolerant to Support Mixed-Mode Signal Operation
- $t_{pd} = 4.7 \text{ ns Max at } 3.3 \text{ V}$
- Suitable for Point-to-Point Applications
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Performance Tested Per JESD 22
  - 2000-V Human-Body Model (A114-B, Class II)
  - 1000-V Charged-Device Model (C101)



See mechanical drawings for dimensions.

N.C. – No internal connection

### DESCRIPTION/ORDERING INFORMATION

The AUP family is TI's premier solution to the industry's low power needs in battery-powered portable applications. This family ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range of 0.8 V to 3.6 V, resulting in an increased battery life. This product also maintains excellent signal integrity (see [Figure 1](#) and [Figure 2](#)).



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.

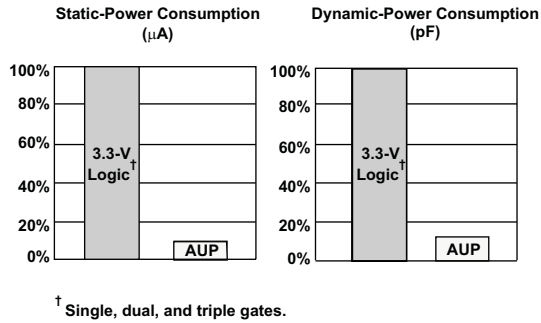


Figure 1. AUP – The Lowest-Power Family

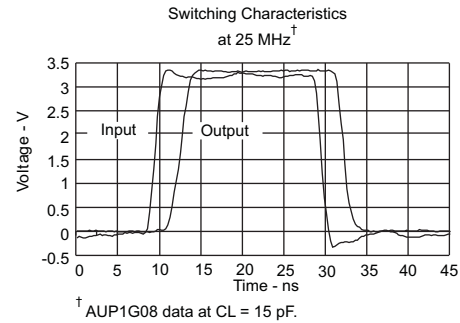


Figure 2. Excellent Signal Integrity

This buffer/driver is a single line driver with a 3-state output. The output is disabled when the output-enable ( $\overline{OE}$ ) input is high. This device has the input-disable feature, which allows floating input signals.

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.

NanoStar™ 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.

ORDERING INFORMATION<sup>(1)</sup>

$T_A$	PACKAGE <sup>(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING <sup>(3)</sup>
-40°C to 85°C	NanoStar – WCSP (DSBGA) 0.23-mm large bump – YFP	Reel of 3000	SN74AUP1G240YFPR	___HK_
	NanoStar – WCSP (DSBGA) 0.23-mm large bump – YZP (Pb-free)	Reel of 3000	SN74AUP1G240YZPR	___HK_
	QFN – DRY	Reel of 5000	SN74AUP1G240DRYR	HK
	uQFN – DSF	Reel of 5000	SN74AUP1G240DSFR	HK
	SOT (SOT-23) – DBV	Reel of 3000	SN74AUP1G240DBVR	H40_
	SOT (SC-70) – DCK	Reel of 3000	SN74AUP1G240DCKR	HK_

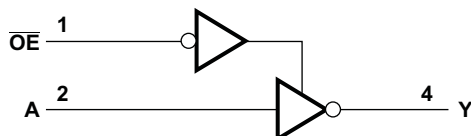
- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at [www.ti.com](http://www.ti.com).
- (2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).
- (3) DBV/DCK: The actual top-side marking has one additional character that designates the wafer fab/assembly site. YFP/YZP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the wafer fab/assembly site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).

FUNCTION TABLE

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	L
L	L	H
H	X <sup>(1)</sup>	Z

(1) Floating inputs allowed.

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	4.6	V
$V_I$	Input voltage range <sup>(2)</sup>	-0.5	4.6	V
$V_O$	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	-0.5	4.6	V
$V_O$	Output voltage range in the high or low state <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			±50 mA
$\theta_{JA}$	Package thermal impedance <sup>(3)</sup>	DBV package		206
		DCK package		252
		DSF package		300
		DRY package		234
		YFP/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<sup>(1)</sup>**

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	0.8	3.6	V
$V_{IH}$	High-level input voltage	$V_{CC} = 0.8$ V		$V_{CC}$ 3.6
		$V_{CC} = 1.1$ V to 1.95 V		$0.65 \times V_{CC}$ 3.6
		$V_{CC} = 2.3$ V to 2.7 V		1.6 3.6
		$V_{CC} = 3$ V to 3.6 V		2 3.6
$V_{IL}$	Low-level input voltage	$V_{CC} = 0.8$ V		0
		$V_{CC} = 1.1$ V to 1.95 V		0 $0.35 \times V_{CC}$
		$V_{CC} = 2.3$ V to 2.7 V		0 0.7
		$V_{CC} = 3$ V to 3.6 V		0 0.9
$V_O$	Output voltage	Active state		0 $V_{CC}$
		3-state		0 3.6
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 0.8$ V to 3.6 V		200 ns/V
$T_A$	Operating free-air temperature	-40	85	°C

- (1) The A data input pins may be floated if the  $\overline{OE}$  is high and the outputs are disabled; otherwise, 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 <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = –40°C to 85°C		UNIT
			MIN	TYP	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = –20 μA	0.8 V to 3.6 V	V <sub>CC</sub> – 0.1			V <sub>CC</sub> – 0.1		V
	I <sub>OH</sub> = –1.1 mA	1.1 V	0.75 × V <sub>CC</sub>			0.7 × V <sub>CC</sub>		
	I <sub>OH</sub> = –1.7 mA	1.4 V	1.11			1.03		
	I <sub>OH</sub> = –1.9 mA	1.65 V	1.32			1.3		
	I <sub>OH</sub> = –2.3 mA	2.3 V	2.05			1.97		
	I <sub>OH</sub> = –3.1 mA		1.9			1.85		
	I <sub>OH</sub> = –2.7 mA	3 V	2.72			2.67		
	I <sub>OH</sub> = –4 mA		2.6			2.55		
V <sub>OL</sub>	I <sub>OL</sub> = 20 μA	0.8 V to 3.6 V				0.1	0.1	V
	I <sub>OL</sub> = 1.1 mA	1.1 V	0.3 × V <sub>CC</sub>			0.3 × V <sub>CC</sub>		
	I <sub>OL</sub> = 1.7 mA	1.4 V	0.31			0.37		
	I <sub>OL</sub> = 1.9 mA	1.65 V	0.31			0.35		
	I <sub>OL</sub> = 2.3 mA	2.3 V	0.31			0.33		
	I <sub>OL</sub> = 3.1 mA		0.44			0.45		
	I <sub>OL</sub> = 2.7 mA	3 V	0.31			0.33		
	I <sub>OL</sub> = 4 mA		0.44			0.45		
I <sub>I</sub>	A or $\overline{OE}$ input V <sub>I</sub> = GND to 3.6 V	0 V to 3.6 V				0.1	0.5	μA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	0 V				0.2	0.6	μA
ΔI <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	0 V to 0.2 V				0.2	0.6	μA
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.6 V				0.1	0.5	μA
I <sub>CC</sub>	V <sub>I</sub> = GND or (V <sub>CC</sub> to 3.6 V), OE = GND, I <sub>O</sub> = 0	0.8 V to 3.6 V				0.5	0.9	μA
ΔI <sub>CC</sub>	A input	V <sub>I</sub> = V <sub>CC</sub> – 0.6 V, <sup>(1)</sup> I <sub>O</sub> = 0	3.3 V			40	50	μA
	$\overline{OE}$ input					110	120	
	All inputs	V <sub>I</sub> = GND to 3.6 V, $\overline{OE}$ = V <sub>CC</sub> <sup>(2)</sup>	0.8 V to 3.6 V			0	0	
C <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	0 V	1.5					pF
		3.6 V	1.5					
C <sub>O</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.6 V	3					pF

(1) One input at V<sub>CC</sub> – 0.6 V, other input at V<sub>CC</sub> or GND

(2) To show I<sub>CC</sub> is very low when  $\overline{OE}$  is high and the inputs and outputs are disabled

**SWITCHING CHARACTERISTICS**

 over recommended operating free-air temperature range,  $C_L = 5 \text{ pF}$  (unless otherwise noted) (see [Figure 3](#) and [Figure 4](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A	Y	0.8 V	17.1					ns
			$1.2 \text{ V} \pm 0.1 \text{ V}$	4.4	7.5	10.3	3.5	15.5	
			$1.5 \text{ V} \pm 0.1 \text{ V}$	3.3	5.4	6.9	2.3	10.3	
			$1.8 \text{ V} \pm 0.15 \text{ V}$	2.6	4.4	5.8	1.8	8.3	
			$2.5 \text{ V} \pm 0.2 \text{ V}$	1.9	3.3	4.3	1.3	5.8	
			$3.3 \text{ V} \pm 0.3 \text{ V}$	1.6	2.7	3.6	1	4.7	
$t_{en}$	$\overline{OE}$	Y	0.8 V	16.5					ns
			$1.2 \text{ V} \pm 0.1 \text{ V}$	4.5	8.1	13.4	3	18.6	
			$1.5 \text{ V} \pm 0.1 \text{ V}$	3.8	5.7	8.4	2.8	12.2	
			$1.8 \text{ V} \pm 0.15 \text{ V}$	3.1	4.5	6.3	2.3	9.7	
			$2.5 \text{ V} \pm 0.2 \text{ V}$	2.4	3.2	4.1	1.8	6.6	
			$3.3 \text{ V} \pm 0.3 \text{ V}$	2.1	2.7	3.3	1.5	5.6	
$t_{dis}$	$\overline{OE}$	Y	0.8 V	9					ns
			$1.2 \text{ V} \pm 0.1 \text{ V}$	2.6	2.6	4.7	2.2	8.4	
			$1.5 \text{ V} \pm 0.1 \text{ V}$	2	2.8	3.2	1.7	5.9	
			$1.8 \text{ V} \pm 0.15 \text{ V}$	1.8	2.5	3.1	1.6	5.5	
			$2.5 \text{ V} \pm 0.2 \text{ V}$	1.3	1.9	2.1	1.1	4	
			$3.3 \text{ V} \pm 0.3 \text{ V}$	1.6	2.4	2.9	1.4	4.1	

**SWITCHING CHARACTERISTICS**

 over recommended operating free-air temperature range,  $C_L = 10 \text{ pF}$  (unless otherwise noted) (see [Figure 3](#) and [Figure 4](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A	Y	0.8 V	19.5					ns
			$1.2 \text{ V} \pm 0.1 \text{ V}$	5.4	8.6	11.5	4.4	17.3	
			$1.5 \text{ V} \pm 0.1 \text{ V}$	4	6.2	7.7	3	11.3	
			$1.8 \text{ V} \pm 0.15 \text{ V}$	3.3	5.1	6.5	2.4	9.1	
			$2.5 \text{ V} \pm 0.2 \text{ V}$	2.5	3.8	4.9	1.8	6.3	
			$3.3 \text{ V} \pm 0.3 \text{ V}$	2	3.2	4.1	1.5	5.2	
$t_{en}$	$\overline{OE}$	Y	0.8 V	18.7					ns
			$1.2 \text{ V} \pm 0.1 \text{ V}$	5.1	8.9	14.4	3.7	20.9	
			$1.5 \text{ V} \pm 0.1 \text{ V}$	4.3	6.3	9.1	3.3	13.7	
			$1.8 \text{ V} \pm 0.15 \text{ V}$	3.6	5	6.8	2.8	10.9	
			$2.5 \text{ V} \pm 0.2 \text{ V}$	2.8	3.7	4.6	2.2	7.7	
			$3.3 \text{ V} \pm 0.3 \text{ V}$	2.5	3.1	3.7	1.9	6.3	
$t_{dis}$	$\overline{OE}$	Y	0.8 V	9.7					ns
			$1.2 \text{ V} \pm 0.1 \text{ V}$	4.1	5.3	6.6	3.9	12.9	
			$1.5 \text{ V} \pm 0.1 \text{ V}$	2.4	3.7	4.6	2.1	9.6	
			$1.8 \text{ V} \pm 0.15 \text{ V}$	2.7	3.6	3.9	2.4	10.1	
			$2.5 \text{ V} \pm 0.2 \text{ V}$	1.7	2.5	2.8	1.5	7.3	
			$3.3 \text{ V} \pm 0.3 \text{ V}$	2.5	3.2	3.8	2.2	9.1	

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $C_L = 15$  pF (unless otherwise noted) (see [Figure 3](#) and [Figure 4](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A	Y	0.8 V	22.4					ns
			$1.2\text{ V} \pm 0.1\text{ V}$	6.4	9.7	12.9	5.4	19.8	
			$1.5\text{ V} \pm 0.1\text{ V}$	4.8	7.1	8.7	3.8	13.3	
			$1.8\text{ V} \pm 0.15\text{ V}$	3.9	5.8	7.2	3.1	10.8	
			$2.5\text{ V} \pm 0.2\text{ V}$	2.9	4.4	5.4	2.3	7.6	
			$3.3\text{ V} \pm 0.3\text{ V}$	2.4	3.6	4.5	1.9	6.1	
$t_{en}$	$\overline{OE}$	Y	0.8 V	23.3					ns
			$1.2\text{ V} \pm 0.1\text{ V}$	6	10.1	15.8	4.6	22.9	
			$1.5\text{ V} \pm 0.1\text{ V}$	4.9	7	9.9	3.9	15	
			$1.8\text{ V} \pm 0.15\text{ V}$	4	5.5	7.5	3.3	12.1	
			$2.5\text{ V} \pm 0.2\text{ V}$	3.2	4	4.9	2.6	8.6	
			$3.3\text{ V} \pm 0.3\text{ V}$	2.8	3.4	4	2.2	7	
$t_{dis}$	$\overline{OE}$	Y	0.8 V	11.1					ns
			$1.2\text{ V} \pm 0.1\text{ V}$	4.1	5.3	5.8	3	14	
			$1.5\text{ V} \pm 0.1\text{ V}$	2.7	4	5.5	2.4	10.1	
			$1.8\text{ V} \pm 0.15\text{ V}$	3.1	4.5	5.4	2.9	10.9	
			$2.5\text{ V} \pm 0.2\text{ V}$	2.4	3	3.2	1.6	7.9	
			$3.3\text{ V} \pm 0.3\text{ V}$	3.3	4.7	5.4	3	10	

## SWITCHING CHARACTERISTICS

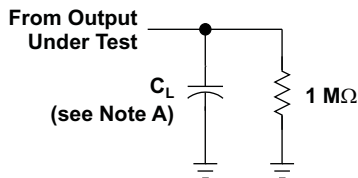
over recommended operating free-air temperature range,  $C_L = 30$  pF (unless otherwise noted) (see [Figure 3](#) and [Figure 4](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A	Y	0.8 V	29					ns
			$1.2\text{ V} \pm 0.1\text{ V}$	8.9	12.6	16.1	7.3	25.7	
			$1.5\text{ V} \pm 0.1\text{ V}$	6.8	9.2	11	5.5	17.1	
			$1.8\text{ V} \pm 0.15\text{ V}$	5.5	7.6	9.2	4.5	13.8	
			$2.5\text{ V} \pm 0.2\text{ V}$	4.2	5.7	6.8	3.5	9.7	
			$3.3\text{ V} \pm 0.3\text{ V}$	3.5	4.7	5.7	2.3	7.8	
$t_{en}$	$\overline{OE}$	Y	0.8 V	30.9					ns
			$1.2\text{ V} \pm 0.1\text{ V}$	8.2	12.6	18.5	6.8	27.4	
			$1.5\text{ V} \pm 0.1\text{ V}$	6.6	8.8	11.8	5.6	18	
			$1.8\text{ V} \pm 0.15\text{ V}$	5.5	7.1	9.1	4.7	14.2	
			$2.5\text{ V} \pm 0.2\text{ V}$	4.4	5.3	6.2	3.8	10.2	
			$3.3\text{ V} \pm 0.3\text{ V}$	3.9	4.5	5.1	3.1	8.2	
$t_{dis}$	$\overline{OE}$	Y	0.8 V	14					ns
			$1.2\text{ V} \pm 0.1\text{ V}$	5	6.2	7.4	4.8	14.8	
			$1.5\text{ V} \pm 0.1\text{ V}$	4.2	5.7	7.7	3.9	10.8	
			$1.8\text{ V} \pm 0.15\text{ V}$	5.1	7.2	9	4.9	11.7	
			$2.5\text{ V} \pm 0.2\text{ V}$	4.3	5.3	5.9	4.1	9.1	
			$3.3\text{ V} \pm 0.3\text{ V}$	7.4	8.3	9.4	4.3	11.6	

**OPERATING CHARACTERISTICS**
 $T_A = 25^\circ\text{C}$ 

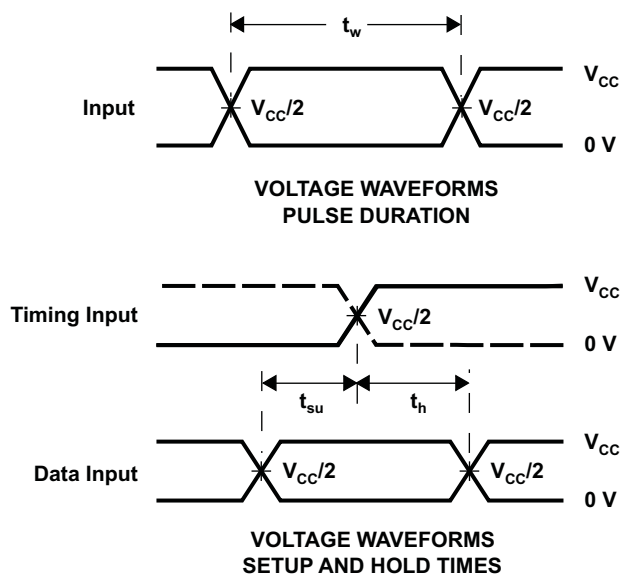
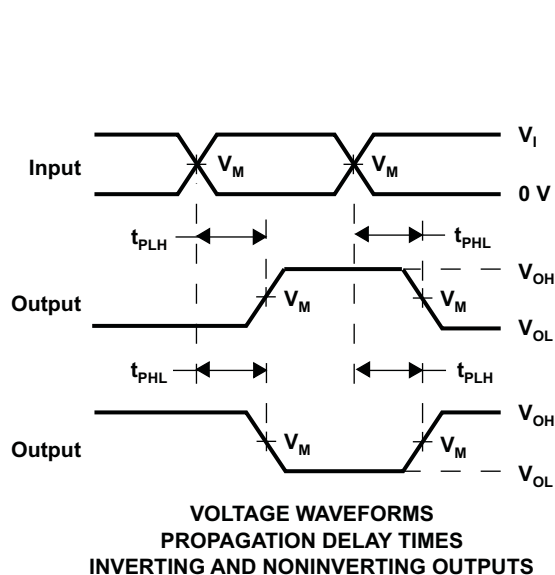
PARAMETER		TEST CONDITIONS	V <sub>CC</sub>	TYP	UNIT
C <sub>pd</sub> Power dissipation capacitance	Outputs enabled	f = 10 MHz	0.8 V	4	pF
			1.2 V ± 0.1 V	3.9	
			1.5 V ± 0.1 V	3.9	
			1.8 V ± 0.15 V	3.9	
			2.5 V ± 0.2 V	4	
			3.3 V ± 0.3 V	4.2	
	Outputs disabled		0.8 V	0	
			1.2 V ± 0.1 V	0	
			1.5 V ± 0.1 V	0	
			1.8 V ± 0.15 V	0	
			2.5 V ± 0.2 V	0	
			3.3 V ± 0.3 V	0	

**PARAMETER MEASUREMENT INFORMATION**  
**(Propagation Delays, Setup and Hold Times, and Pulse Width)**



LOAD CIRCUIT

	$V_{CC} = 0.8\text{ V}$	$V_{CC} = 1.2\text{ V}$ $\pm 0.1\text{ V}$	$V_{CC} = 1.5\text{ V}$ $\pm 0.1\text{ V}$	$V_{CC} = 1.8\text{ V}$ $\pm 0.15\text{ V}$	$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$	$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$
$C_L$	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_I$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$

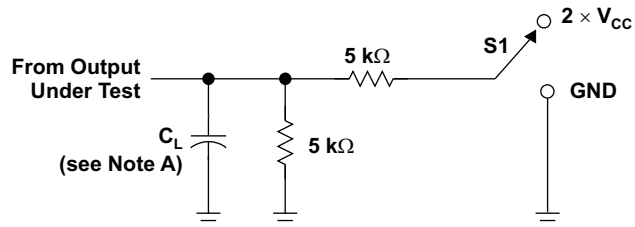


- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz,  $Z_O = 50\ \Omega$ ,  $t_r/t_f = 3\text{ ns}$ .  
 C. The outputs are measured one at a time, with one transition per measurement.  
 D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .  
 E. All parameters and waveforms are not applicable to all devices.

**Figure 3. Load Circuit and Voltage Waveforms**



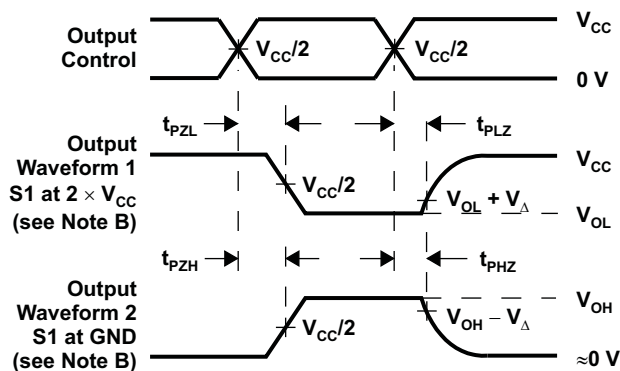
PARAMETER MEASUREMENT INFORMATION  
(Enable and Disable Times)



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

LOAD CIRCUIT

	$V_{CC} = 0.8\text{ V}$	$V_{CC} = 1.2\text{ V}$ $\pm 0.1\text{ V}$	$V_{CC} = 1.5\text{ V}$ $\pm 0.1\text{ V}$	$V_{CC} = 1.8\text{ V}$ $\pm 0.15\text{ V}$	$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$	$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$
$C_L$	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_I$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_{\Delta}$	0.1 V	0.1 V	0.1 V	0.15 V	0.15 V	0.3 V



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:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r/t_f = 3\text{ ns}$ .
  - 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. All parameters and waveforms are not applicable to all devices.

Figure 4. 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>
74AUP1G240DBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DCKTE4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AUP1G240DCKTG4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240DBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240DCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240DCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240DRYR	ACTIVE	SON	DRY	6	5000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240DSFR	ACTIVE	SON	DSF	6	5000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM
SN74AUP1G240YFPR	ACTIVE	DSBGA	YFP	6	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM
SN74AUP1G240YZPR	ACTIVE	DSBGA	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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**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74AUP1G240DBVR	SOT-23	DBV	5	3000	180.0	9.2	3.23	3.17	1.37	4.0	8.0	Q3
SN74AUP1G240DBVT	SOT-23	DBV	5	250	180.0	9.2	3.23	3.17	1.37	4.0	8.0	Q3
SN74AUP1G240DCKR	SC70	DCK	5	3000	180.0	9.2	2.24	2.34	1.22	4.0	8.0	Q3
SN74AUP1G240DCKT	SC70	DCK	5	250	180.0	9.2	2.24	2.34	1.22	4.0	8.0	Q3
SN74AUP1G240DRYR	SON	DRY	6	5000	180.0	8.4	1.25	1.6	0.7	4.0	8.0	Q1
SN74AUP1G240DSFR	SON	DSF	6	5000	180.0	8.4	1.16	1.16	0.63	4.0	8.0	Q2
SN74AUP1G240YFPR	DSBGA	YFP	6	3000	178.0	9.2	0.89	1.29	0.62	4.0	8.0	Q1
SN74AUP1G240YZPR	DSBGA	YZP	5	3000	180.0	8.4	1.02	1.52	0.63	4.0	8.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AUP1G240DBVR	SOT-23	DBV	5	3000	202.0	201.0	28.0
SN74AUP1G240DBVT	SOT-23	DBV	5	250	202.0	201.0	28.0
SN74AUP1G240DCKR	SC70	DCK	5	3000	202.0	201.0	28.0
SN74AUP1G240DCKT	SC70	DCK	5	250	202.0	201.0	28.0
SN74AUP1G240DRYR	SON	DRY	6	5000	202.0	201.0	28.0
SN74AUP1G240DSFR	SON	DSF	6	5000	202.0	201.0	28.0
SN74AUP1G240YFPR	DSBGA	YFP	6	3000	220.0	220.0	35.0
SN74AUP1G240YZPR	DSBGA	YZP	5	3000	220.0	220.0	34.0

DBV (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. 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



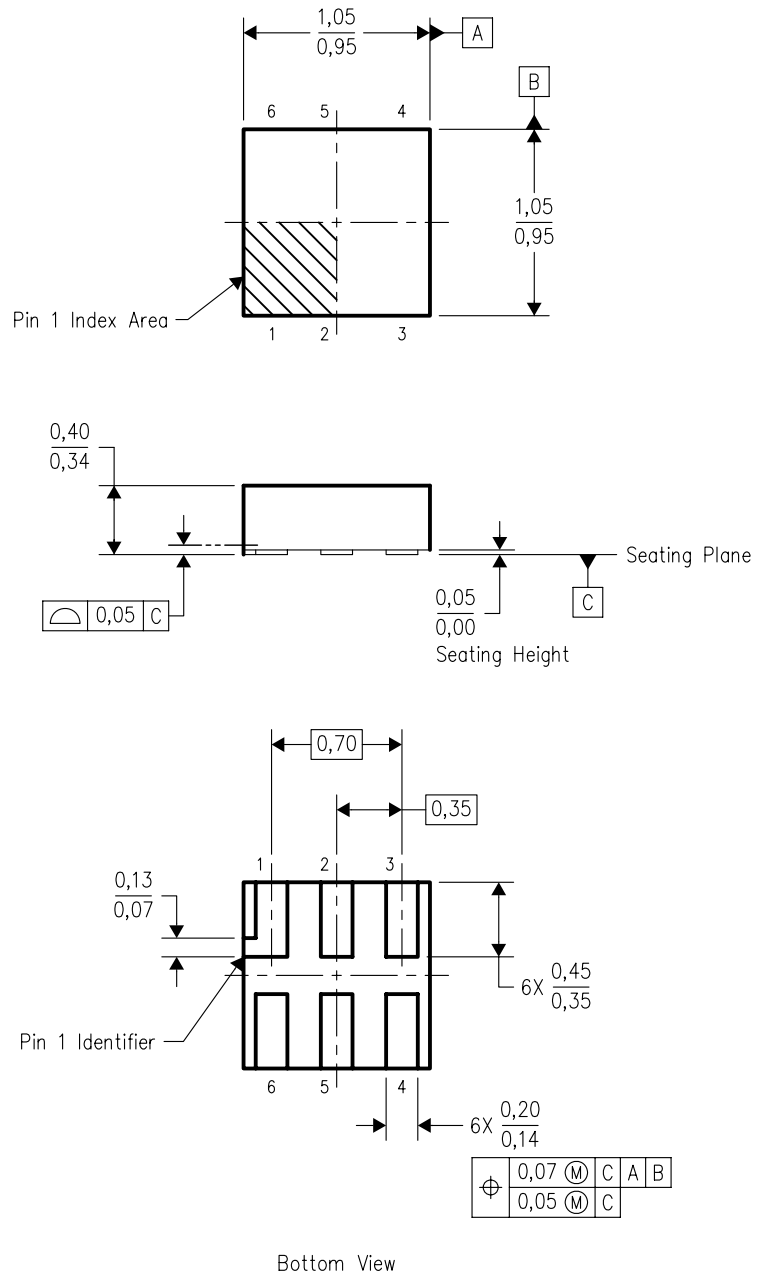
- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
  - D. Falls within JEDEC MO-203 variation AA.





DSF (S-PDSO-N6)

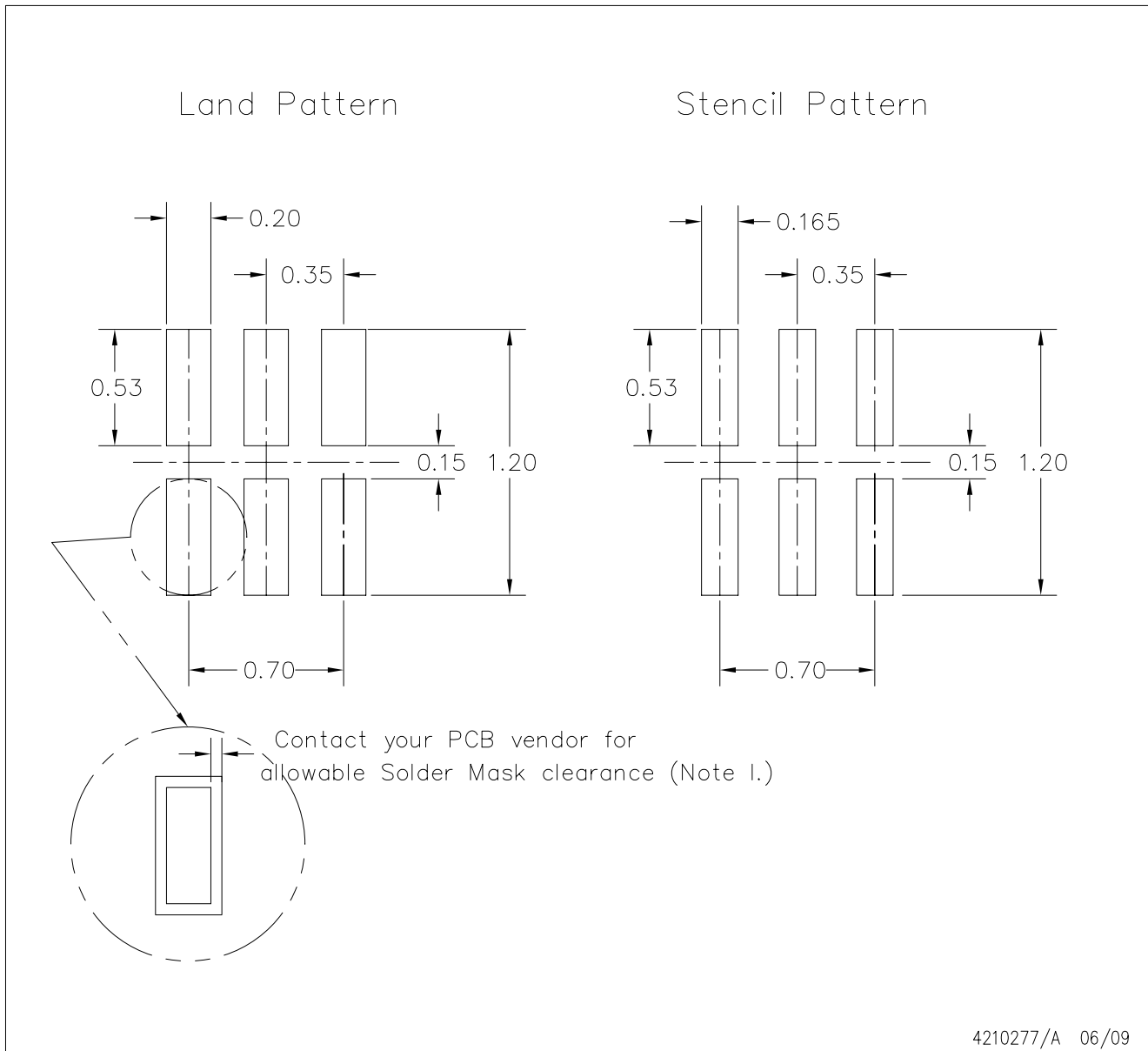
PLASTIC SMALL OUTLINE



4208186/D 11/2007

- 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. SON (Small Outline No-Lead) package configuration.
  - D. This package complies to JEDEC MO-287 variation X2AAF.

DSF (S-PDSO-N6)

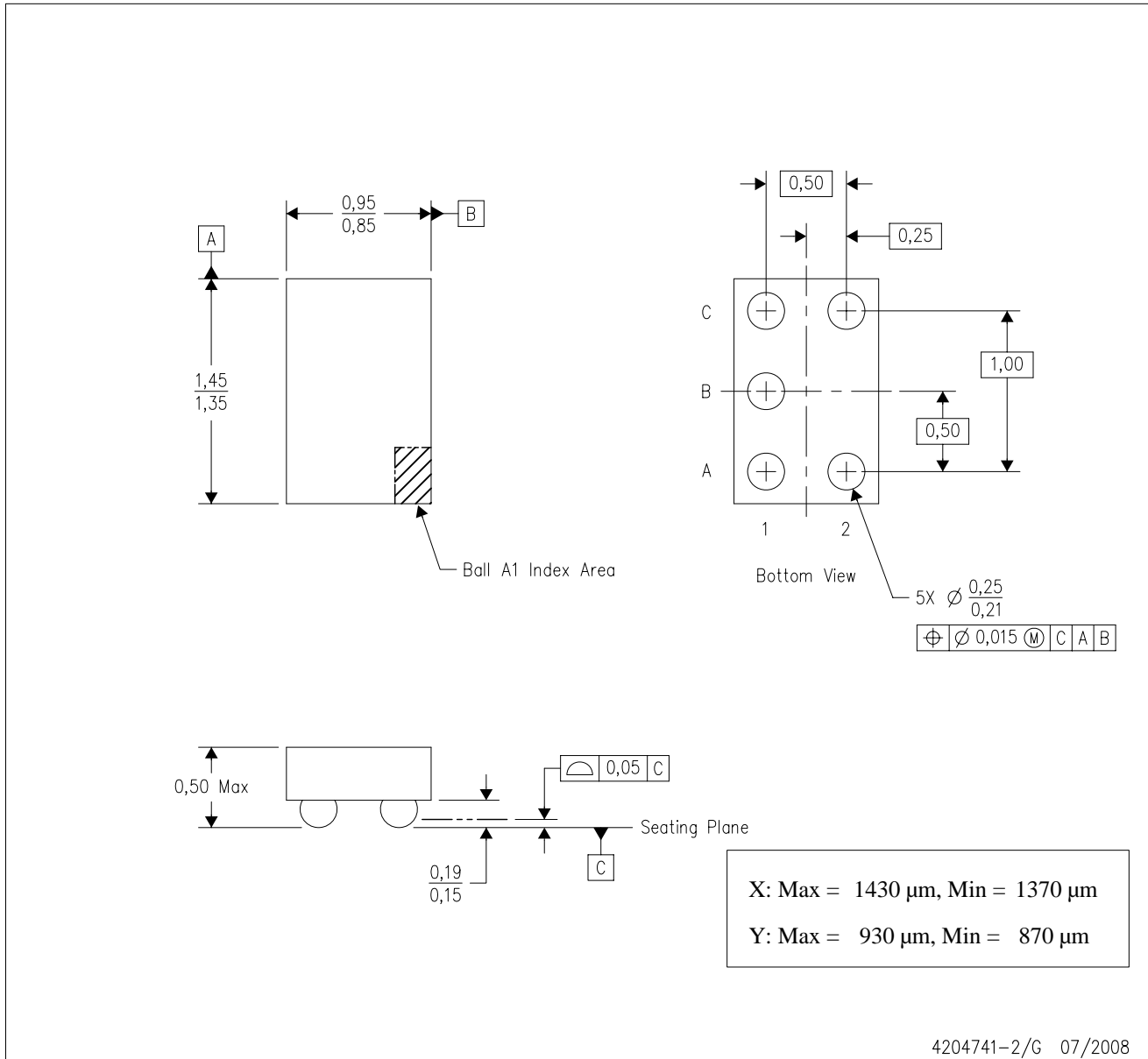


4210277/A 06/09

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads. If 2 mil solder mask is outside PCB vendor capability, it is advised to omit solder mask.
  - E. Maximum stencil thickness 0,1016 mm (4 mils). All linear dimensions are in millimeters.
  - F. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
  - G. Over-printing land for acceptable area ratio is not viable due to land width and bridging potential. Customer may further reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.
  - H. Suggest stencils cut with lasers such as Fiber Laser that produce the greatest positional accuracy.
  - I. Component placement force should be minimized to prevent excessive paste block deformation.

YZP (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY

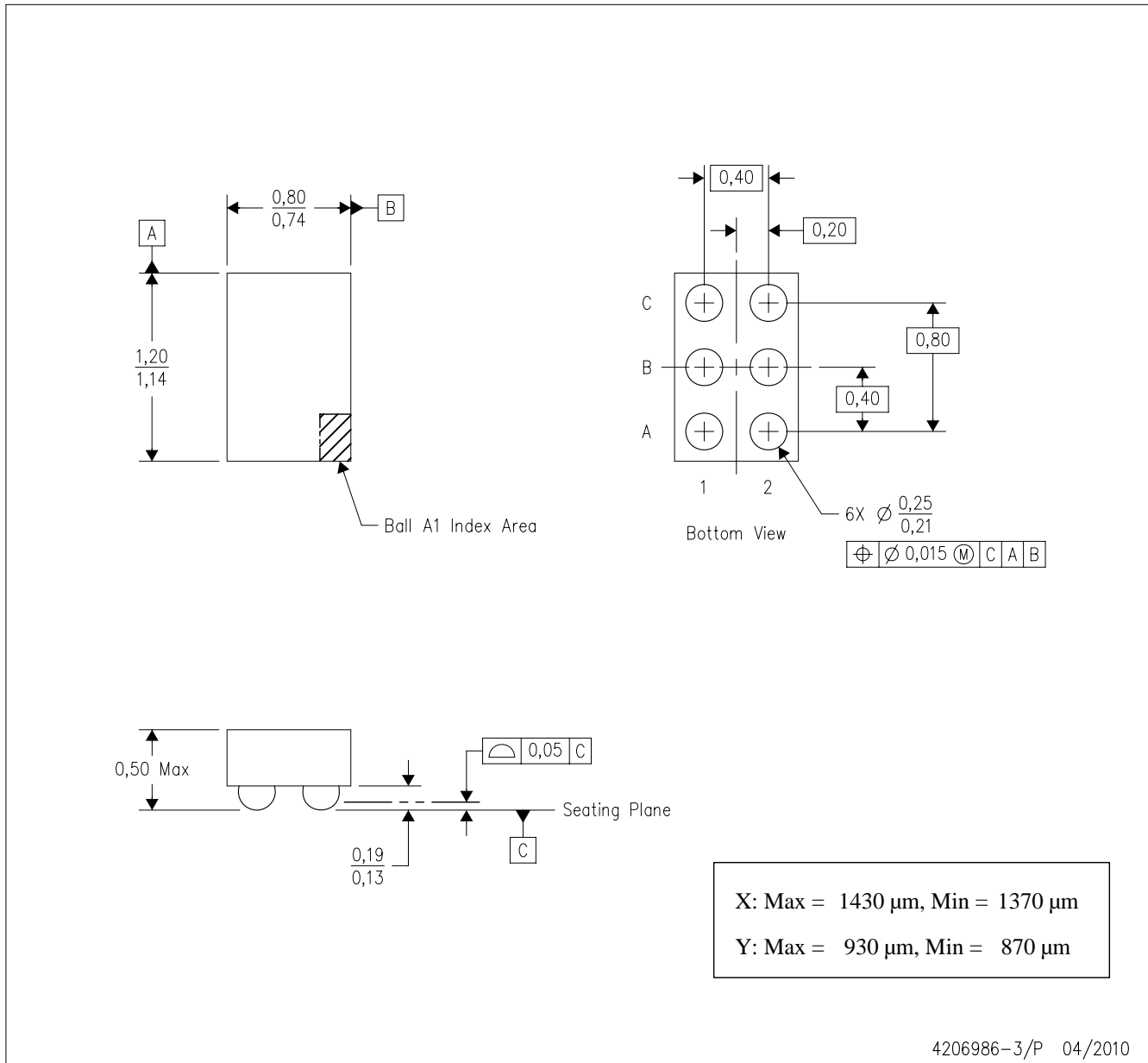


- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - D. This package is lead-free. Refer to the 5 YEP package (drawing 4204725) for tin-lead (SnPb).

# MECHANICAL DATA

YFP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- 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 is a Pb-free solder ball design.

NanoFree is a trademark of Texas Instruments.

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Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>	Space, Avionics & Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>	Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless-apps">www.ti.com/wireless-apps</a>