

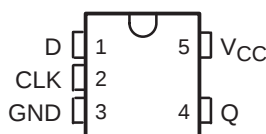
# SN74AUP1G79

## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

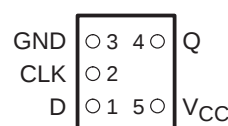
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- Available in the Texas Instruments NanoStar™ and NanoFree™ Packages
- Low Static-Power Consumption;  $I_{CC} = 0.9 \mu A$  Max
- Low Dynamic-Power Consumption;  $C_{pd} = 3 pF$  Typ at 3.3 V
- Low Input Capacitance;  $C_i = 1.5 pF$  Typ
- Low Noise – Overshoot and Undershoot  $<10\%$  of  $V_{CC}$
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Input Hysteresis Allows Slow Input Transition and Better Switching Noise Immunity at the Input ( $V_{hys} = 250 mV$  Typ at 3.3 V)
- 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
- $t_{pd} = 3.6 ns$  Max at 3.3 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)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)
- ESD Protection Exceeds  $\pm 5000 V$  With Human-Body Model

DBV OR DCK PACKAGE  
(TOP VIEW)



YEP OR YZP PACKAGE  
(BOTTOM VIEW)



### 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 Figures 1 and 2).

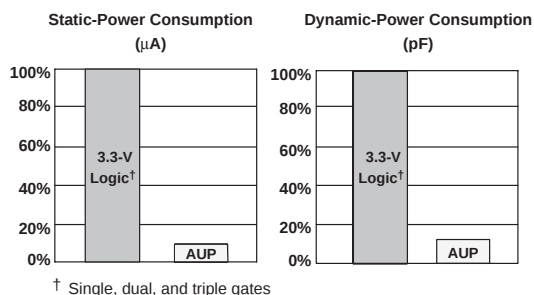


Figure 1. AUP – The Lowest-Power Family

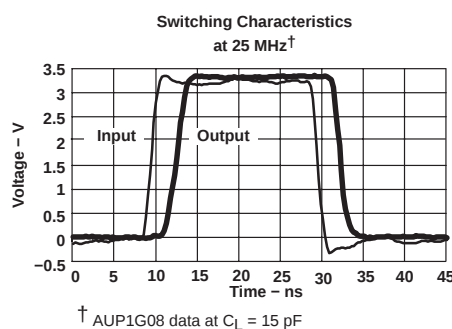


Figure 2. Excellent Signal Integrity

This is a single positive-edge-triggered D-type flip-flop. When data at the data (D) input meets the setup time requirement, the data is transferred to the 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.



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

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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<sub>off</sub>. The I<sub>off</sub> circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

ORDERING INFORMATION

| T <sub>A</sub> | PACKAGE†                                                       |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING‡ |
|----------------|----------------------------------------------------------------|--------------|-----------------------|-------------------|
| –40°C to 85°C  | NanoStar™ – WCSP (DSBGA)<br>0.23-mm Large Bump – YEP           | Reel of 3000 | SN74AUP1G79YEPR       | ___HW_            |
|                | NanoFree™ – WCSP (DSBGA)<br>0.23-mm Large Bump – YZP (Pb-free) |              | SN74AUP1G79YZPR       |                   |
|                | SOT (SOT-23) – DBV                                             | Reel of 3000 | SN74AUP1G79DBVR       | H79_              |
|                |                                                                | Reel of 250  | SN74AUP1G79DBVT       |                   |
|                | SOT (SC-70) – DCK                                              | Reel of 3000 | SN74AUP1G79DCKR       | HW_               |
|                |                                                                | Reel of 250  | SN74AUP1G79DCKT       |                   |

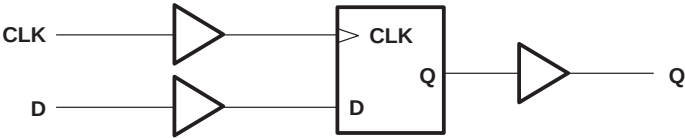
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

‡ DBV/DCK: The actual top-side marking has one additional character that designates the assembly/test site.  
 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).

FUNCTION TABLE

| INPUTS |   | OUTPUT         |
|--------|---|----------------|
| CLK    | D | Q              |
| ↑      | H | H              |
| ↑      | L | L              |
| L or H | X | Q <sub>0</sub> |

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                                                     |       |                            |
|-----------------------------------------------------------------------------------------------------|-------|----------------------------|
| Supply voltage range, $V_{CC}$                                                                      | ..... | -0.5 V to 4.6 V            |
| Input voltage range, $V_I$ (see Note 1)                                                             | ..... | -0.5 V to 4.6 V            |
| Voltage range applied to any output in the high-impedance or power-off state, $V_O$<br>(see Note 1) | ..... | -0.5 V to 4.6 V            |
| Output voltage range in the high or low state, $V_O$ (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, $I_O$                                                                    | ..... | $\pm 20$ mA                |
| Continuous current through $V_{CC}$ or GND                                                          | ..... | $\pm 50$ mA                |
| Package thermal impedance, $\theta_{JA}$ (see Note 2):                                              |       |                            |
| DBV package                                                                                         | ..... | 206°C/W                    |
| DCK package                                                                                         | ..... | 252°C/W                    |
| YEP/YZP package                                                                                     | ..... | 132°C/W                    |
| Storage temperature range, $T_{sta}$                                                                | ..... | -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 JEDEC 51-7.

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## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

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### recommended operating conditions (see Note 3)

|                     |                                    | MIN                                      | MAX                  | UNIT             |
|---------------------|------------------------------------|------------------------------------------|----------------------|------------------|
| $V_{CC}$            | Supply voltage                     | 0.8                                      | 3.6                  | V                |
| $V_{IH}$            | High-level input voltage           | $V_{CC} = 0.8\text{ V}$                  | $V_{CC}$             | V                |
|                     |                                    | $V_{CC} = 1.1\text{ V to }1.95\text{ V}$ | $0.65 \times V_{CC}$ |                  |
|                     |                                    | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$  | 1.6                  |                  |
|                     |                                    | $V_{CC} = 3\text{ V to }3.6\text{ V}$    | 2                    |                  |
| $V_{IL}$            | Low-level input voltage            | $V_{CC} = 0.8\text{ V}$                  | 0                    | V                |
|                     |                                    | $V_{CC} = 1.1\text{ V to }1.95\text{ V}$ | $0.35 \times V_{CC}$ |                  |
|                     |                                    | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$  | 0.7                  |                  |
|                     |                                    | $V_{CC} = 3\text{ V to }3.6\text{ V}$    | 0.9                  |                  |
| $V_I$               | Input voltage                      | 0                                        | 3.6                  | V                |
| $V_O$               | Output voltage                     | 0                                        | $V_{CC}$             | V                |
| $I_{OH}^\dagger$    | High-level output current          | $V_{CC} = 0.8\text{ V}$                  | -20                  | $\mu\text{A}$    |
|                     |                                    | $V_{CC} = 1.1\text{ V}$                  | -1.1                 | mA               |
|                     |                                    | $V_{CC} = 1.4\text{ V}$                  | -1.7                 |                  |
|                     |                                    | $V_{CC} = 1.65$                          | -1.9                 |                  |
|                     |                                    | $V_{CC} = 2.3\text{ V}$                  | -3.1                 |                  |
|                     |                                    | $V_{CC} = 3\text{ V}$                    | -4                   |                  |
| $I_{OL}^\dagger$    | Low-level output current           | $V_{CC} = 0.8\text{ V}$                  | 20                   | $\mu\text{A}$    |
|                     |                                    | $V_{CC} = 1.1\text{ V}$                  | 1.1                  | mA               |
|                     |                                    | $V_{CC} = 1.4\text{ V}$                  | 1.7                  |                  |
|                     |                                    | $V_{CC} = 1.65\text{ V}$                 | 1.9                  |                  |
|                     |                                    | $V_{CC} = 2.3\text{ V}$                  | 3.1                  |                  |
|                     |                                    | $V_{CC} = 3\text{ V}$                    | 4                    |                  |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | $V_{CC} = 0.8\text{ V to }3.6\text{ V}$  | 200                  | ns/V             |
| $T_A$               | Operating free-air temperature     | -40                                      | 85                   | $^\circ\text{C}$ |

<sup>†</sup> Defined by the signal integrity requirements and design-goal priorities

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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## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

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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>    | D or CLK 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>CC</sub>   |                | V <sub>I</sub> = GND or V <sub>CC</sub> to 3.6 V, I <sub>O</sub> = 0      | 0.8 V to 3.6 V  | 0.5                    |     |     | 0.9                            |     | μA   |
| ΔI <sub>CC</sub>  |                | V <sub>I</sub> = V <sub>CC</sub> - 0.6 V, <sup>†</sup> I <sub>O</sub> = 0 | 3.3 V           | 40                     |     |     | 50                             |     | μA   |
| 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> = GND                                                      | 0 V             | 3                      |     |     |                                |     | pF   |

† One-input switching

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## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

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timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 3)

|                    |                                 | V <sub>CC</sub> | T <sub>A</sub> = 25°C | T <sub>A</sub> = -40°C<br>TO 85°C |     | UNIT |
|--------------------|---------------------------------|-----------------|-----------------------|-----------------------------------|-----|------|
|                    |                                 |                 | TYP                   | MIN                               | MAX |      |
| f <sub>clock</sub> | Clock frequency                 | 0.8 V           |                       |                                   | 20  | ns   |
|                    |                                 | 1.2 V ± 0.1 V   |                       |                                   | 80  |      |
|                    |                                 | 1.5 V ± 0.1 V   |                       |                                   | 100 |      |
|                    |                                 | 1.8 V ± 0.15 V  |                       |                                   | 140 |      |
|                    |                                 | 2.5 V ± 0.2 V   |                       |                                   | 210 |      |
|                    |                                 | 3.3 V ± 0.3 V   |                       |                                   | 260 |      |
| t <sub>w</sub>     | Pulse duration, CLK high or low | 0.8 V           |                       |                                   | 4.8 | ns   |
|                    |                                 | 1.2 V ± 0.1 V   |                       |                                   | 2.2 |      |
|                    |                                 | 1.5 V ± 0.1 V   |                       |                                   | 1.5 |      |
|                    |                                 | 1.8 V ± 0.15 V  |                       |                                   | 1.6 |      |
|                    |                                 | 2.5 V ± 0.2 V   |                       |                                   | 1.7 |      |
|                    |                                 | 3.3 V ± 0.3 V   |                       |                                   | 1.9 |      |
| t <sub>su</sub>    | Data high                       | 0.8 V           | 2.9                   |                                   | 4.2 | ns   |
|                    |                                 | 1.2 V ± 0.1 V   |                       |                                   | 1.4 |      |
|                    |                                 | 1.5 V ± 0.1 V   |                       |                                   | 1   |      |
|                    |                                 | 1.8 V ± 0.15 V  |                       |                                   | 0.9 |      |
|                    |                                 | 2.5 V ± 0.2 V   |                       |                                   | 0.7 |      |
|                    |                                 | 3.3 V ± 0.3 V   |                       |                                   | 0.6 |      |
|                    | Data low                        | 0.8 V           | 3.5                   |                                   | 5.3 |      |
|                    |                                 | 1.2 V ± 0.1 V   |                       |                                   | 1.8 |      |
|                    |                                 | 1.5 V ± 0.1 V   |                       |                                   | 1.2 |      |
|                    |                                 | 1.8 V ± 0.15 V  |                       |                                   | 1.1 |      |
|                    |                                 | 2.5 V ± 0.2 V   |                       |                                   | 1   |      |
|                    |                                 | 3.3 V ± 0.3 V   |                       |                                   | 1   |      |
| t <sub>h</sub>     | Hold time, data after CLK↑      | 0.8 V           | 0                     |                                   | 0   | ns   |
|                    |                                 | 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   |      |

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## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

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switching characteristics over recommended operating free-air temperature range,  $C_L = 5 \text{ pF}$  (unless otherwise noted) (see Figures 3 and 4)

| PARAMETER  | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC}$           | $T_A = 25^\circ\text{C}$ |      |     | $T_A = -40^\circ\text{C}$<br>TO $85^\circ\text{C}$ |      | UNIT |
|------------|-----------------|----------------|--------------------|--------------------------|------|-----|----------------------------------------------------|------|------|
|            |                 |                |                    | MIN                      | TYP  | MAX | MIN                                                | MAX  |      |
| $f_{\max}$ |                 |                | 0.8 V              |                          | 93   |     | 90                                                 |      | MHz  |
|            |                 |                | 1.2 V $\pm$ 0.1 V  |                          | 199  |     | 220                                                |      |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  |                          | 250  |     | 230                                                |      |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V |                          | 271  |     | 240                                                |      |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  |                          | 280  |     | 250                                                |      |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  |                          | 280  |     | 260                                                |      |      |
| $t_{pd}$   | CLK             | Q              | 0.8 V              |                          | 15.9 |     |                                                    |      | ns   |
|            |                 |                | 1.2 V $\pm$ 0.1 V  | 3.7                      | 6.9  | 11  | 2.6                                                | 13.1 |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  | 3                        | 4.8  | 7.6 | 2                                                  | 8.8  |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V | 2.4                      | 3.8  | 6.1 | 1.5                                                | 7.1  |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  | 1.8                      | 2.7  | 4.4 | 1.1                                                | 5    |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  | 1.5                      | 2.1  | 3.6 | 0.9                                                | 4    |      |

switching characteristics over recommended operating free-air temperature range,  $C_L = 10 \text{ pF}$  (unless otherwise noted) (see Figures 3 and 4)

| PARAMETER  | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC}$           | $T_A = 25^\circ\text{C}$ |     |      | $T_A = -40^\circ\text{C}$<br>TO $85^\circ\text{C}$ |      | UNIT |
|------------|-----------------|----------------|--------------------|--------------------------|-----|------|----------------------------------------------------|------|------|
|            |                 |                |                    | MIN                      | TYP | MAX  | MIN                                                | MAX  |      |
| $f_{\max}$ |                 |                | 0.8 V              |                          | 62  |      | 50                                                 |      | MHz  |
|            |                 |                | 1.2 V $\pm$ 0.1 V  |                          | 147 |      | 160                                                |      |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  |                          | 189 |      | 200                                                |      |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V |                          | 180 |      | 240                                                |      |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  |                          | 260 |      | 250                                                |      |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  |                          | 280 |      | 260                                                |      |      |
| $t_{pd}$   | CLK             | Q              | 0.8 V              |                          | 18  |      |                                                    |      | ns   |
|            |                 |                | 1.2 V $\pm$ 0.1 V  | 4.3                      | 7.8 | 12.3 | 3.2                                                | 14.4 |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  | 3.5                      | 5.5 | 8.4  | 2.5                                                | 9.8  |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V | 2.8                      | 4.4 | 6.8  | 1.9                                                | 8    |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  | 2.2                      | 3.2 | 5    | 1.5                                                | 5.7  |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  | 1.8                      | 2.6 | 4.1  | 1.3                                                | 4.5  |      |



switching characteristics over recommended operating free-air temperature range,  $C_L = 15$  pF (unless otherwise noted) (see Figures 3 and 4)

| PARAMETER  | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC}$           | $T_A = 25^\circ\text{C}$ |      |      | $T_A = -40^\circ\text{C}$<br>TO $85^\circ\text{C}$ |      | UNIT |
|------------|-----------------|----------------|--------------------|--------------------------|------|------|----------------------------------------------------|------|------|
|            |                 |                |                    | MIN                      | TYP  | MAX  | MIN                                                | MAX  |      |
| $f_{\max}$ |                 |                | 0.8 V              |                          | 48   |      | 30                                                 |      | MHz  |
|            |                 |                | 1.2 V $\pm$ 0.1 V  |                          | 112  |      | 120                                                |      |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  |                          | 151  |      | 160                                                |      |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V |                          | 194  |      | 220                                                |      |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  |                          | 248  |      | 250                                                |      |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  |                          | 280  |      | 260                                                |      |      |
| $t_{pd}$   | CLK             | Q              | 0.8 V              |                          | 20.3 |      |                                                    |      | ns   |
|            |                 |                | 1.2 V $\pm$ 0.1 V  | 5                        | 8.7  | 13.6 | 3.9                                                | 15.6 |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  | 4.1                      | 6.3  | 9.3  | 3.1                                                | 10.7 |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V | 3.3                      | 4    | 7.6  | 2.4                                                | 8.7  |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  | 2.6                      | 3.6  | 5.5  | 1.9                                                | 6.3  |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  | 2.2                      | 3    | 4.5  | 1.6                                                | 5    |      |

switching characteristics over recommended operating free-air temperature range,  $C_L = 30$  pF (unless otherwise noted) (see Figures 3 and 4)

| PARAMETER  | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC}$           | $T_A = 25^\circ\text{C}$ |      |      | $T_A = -40^\circ\text{C}$<br>TO $85^\circ\text{C}$ |      | UNIT |
|------------|-----------------|----------------|--------------------|--------------------------|------|------|----------------------------------------------------|------|------|
|            |                 |                |                    | MIN                      | TYP  | MAX  | MIN                                                | MAX  |      |
| $f_{\max}$ |                 |                | 0.8 V              |                          | 24   |      | 20                                                 |      | MHz  |
|            |                 |                | 1.2 V $\pm$ 0.1 V  |                          | 72   |      | 80                                                 |      |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  |                          | 100  |      | 100                                                |      |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V |                          | 127  |      | 140                                                |      |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  |                          | 185  |      | 210                                                |      |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  |                          | 266  |      | 260                                                |      |      |
| $t_{pd}$   | CLK             | Q              | 0.8 V              |                          | 27.2 |      |                                                    |      | ns   |
|            |                 |                | 1.2 V $\pm$ 0.1 V  | 7                        | 11.5 | 17.3 | 5.9                                                | 24   |      |
|            |                 |                | 1.5 V $\pm$ 0.1 V  | 5.7                      | 8.3  | 11.8 | 4.6                                                | 15.9 |      |
|            |                 |                | 1.8 V $\pm$ 0.15 V | 4.7                      | 6.7  | 9.6  | 3.8                                                | 13   |      |
|            |                 |                | 2.5 V $\pm$ 0.2 V  | 3.7                      | 4.9  | 7    | 2.9                                                | 9    |      |
|            |                 |                | 3.3 V $\pm$ 0.3 V  | 3.2                      | 4.1  | 5.8  | 2.6                                                | 7.2  |      |

operating characteristics,  $T_A = 25^\circ\text{C}$

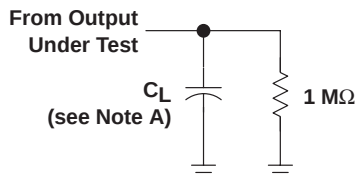
| PARAMETER |                               | TEST CONDITIONS | $V_{CC}$           | TYP | UNIT |
|-----------|-------------------------------|-----------------|--------------------|-----|------|
| $C_{pd}$  | Power dissipation capacitance | $f = 10$ MHz    | 0.8 V              | 2.5 | pF   |
|           |                               |                 | 1.2 V $\pm$ 0.1 V  | 2.5 |      |
|           |                               |                 | 1.5 V $\pm$ 0.1 V  | 2.5 |      |
|           |                               |                 | 1.8 V $\pm$ 0.15 V | 2.5 |      |
|           |                               |                 | 2.5 V $\pm$ 0.2 V  | 3   |      |
|           |                               |                 | 3.3 V $\pm$ 0.3 V  | 3   |      |

# SN74AUP1G79

## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

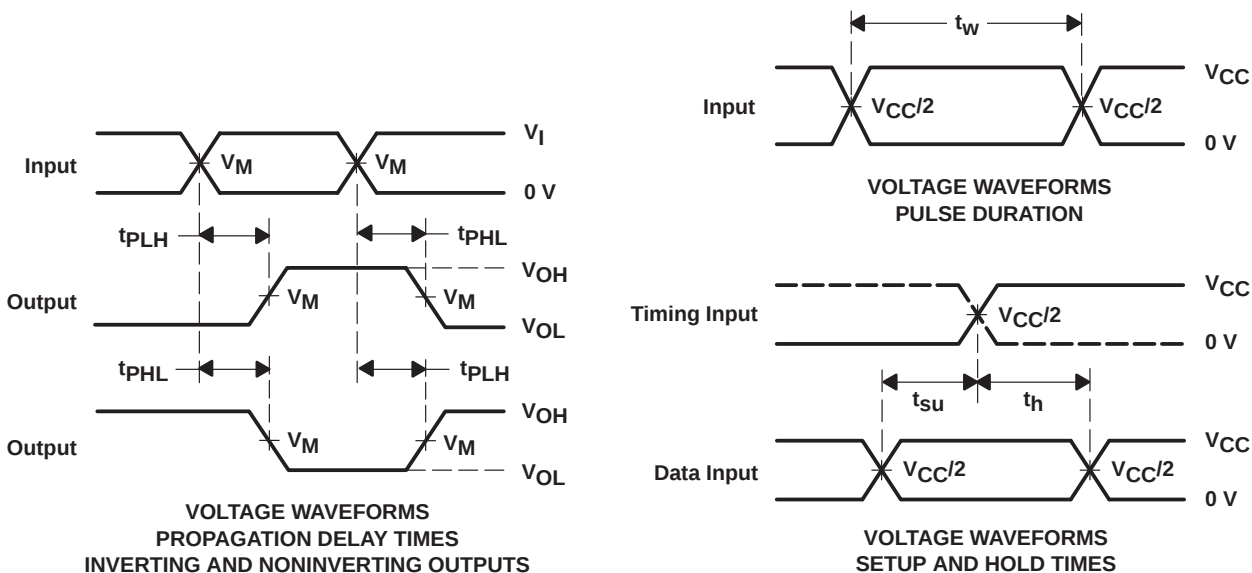
SCES592A – JULY 2004 – REVISED SEPTEMBER 2005

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



LOAD CIRCUIT

|       | $V_{CC} = 0.8\text{ V}$ | $V_{CC} = 1.2\text{ V}$<br>$\pm 0.1\text{ V}$ | $V_{CC} = 1.5\text{ V}$<br>$\pm 0.1\text{ V}$ | $V_{CC} = 1.8\text{ V}$<br>$\pm 0.15\text{ V}$ | $V_{CC} = 2.5\text{ V}$<br>$\pm 0.2\text{ V}$ | $V_{CC} = 3.3\text{ V}$<br>$\pm 0.3\text{ V}$ |
|-------|-------------------------|-----------------------------------------------|-----------------------------------------------|------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| $C_L$ | 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  $\leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r/t_f = 3\text{ ns}$ .
  - 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.

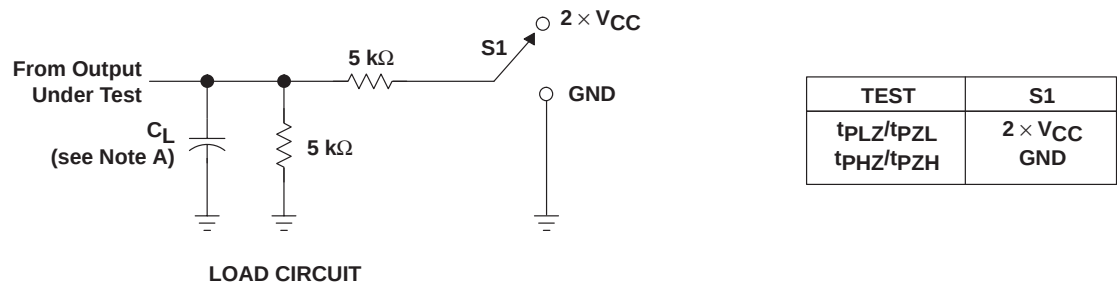
**Figure 3. Load Circuit and Voltage Waveforms**

# SN74AUP1G79

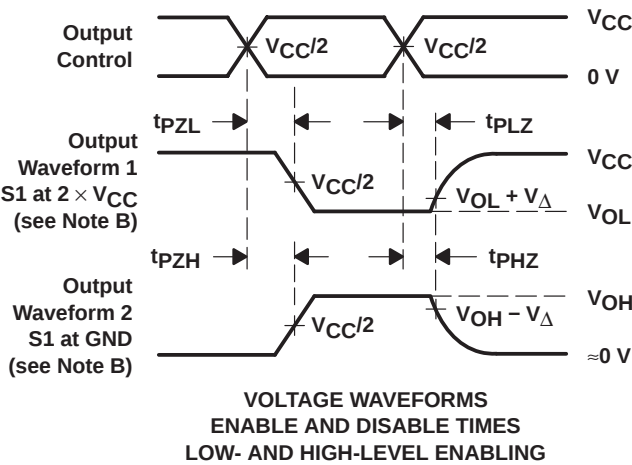
## LOW-POWER SINGLE POSITIVE-EDGE-TRIGGERED D-TYPE FLIP-FLOP

SCES592A – JULY 2004 – REVISED SEPTEMBER 2005

### PARAMETER MEASUREMENT INFORMATION (Enable and Disable Times)



|              | $V_{CC} = 0.8\text{ V}$ | $V_{CC} = 1.2\text{ V}$<br>$\pm 0.1\text{ V}$ | $V_{CC} = 1.5\text{ V}$<br>$\pm 0.1\text{ V}$ | $V_{CC} = 1.8\text{ V}$<br>$\pm 0.15\text{ V}$ | $V_{CC} = 2.5\text{ V}$<br>$\pm 0.2\text{ V}$ | $V_{CC} = 3.3\text{ V}$<br>$\pm 0.3\text{ V}$ |
|--------------|-------------------------|-----------------------------------------------|-----------------------------------------------|------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| $C_L$        | 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                                         |



- 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> |
|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74AUP1G79DBVR   | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVRE4 | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVT   | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVTE4 | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKR   | ACTIVE                | SC70         | DCK             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKRE4 | ACTIVE                | SC70         | DCK             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKT   | ACTIVE                | SC70         | DCK             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKTE4 | ACTIVE                | SC70         | DCK             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | 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.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

**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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**PACKAGING INFORMATION**

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|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74AUP1G79DBVR   | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVRE4 | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVRG4 | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVT   | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DBVTE4 | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKR   | ACTIVE                | SC70         | DCK             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKRE4 | ACTIVE                | SC70         | DCK             | 5    | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKT   | ACTIVE                | SC70         | DCK             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74AUP1G79DCKTE4 | ACTIVE                | SC70         | DCK             | 5    | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

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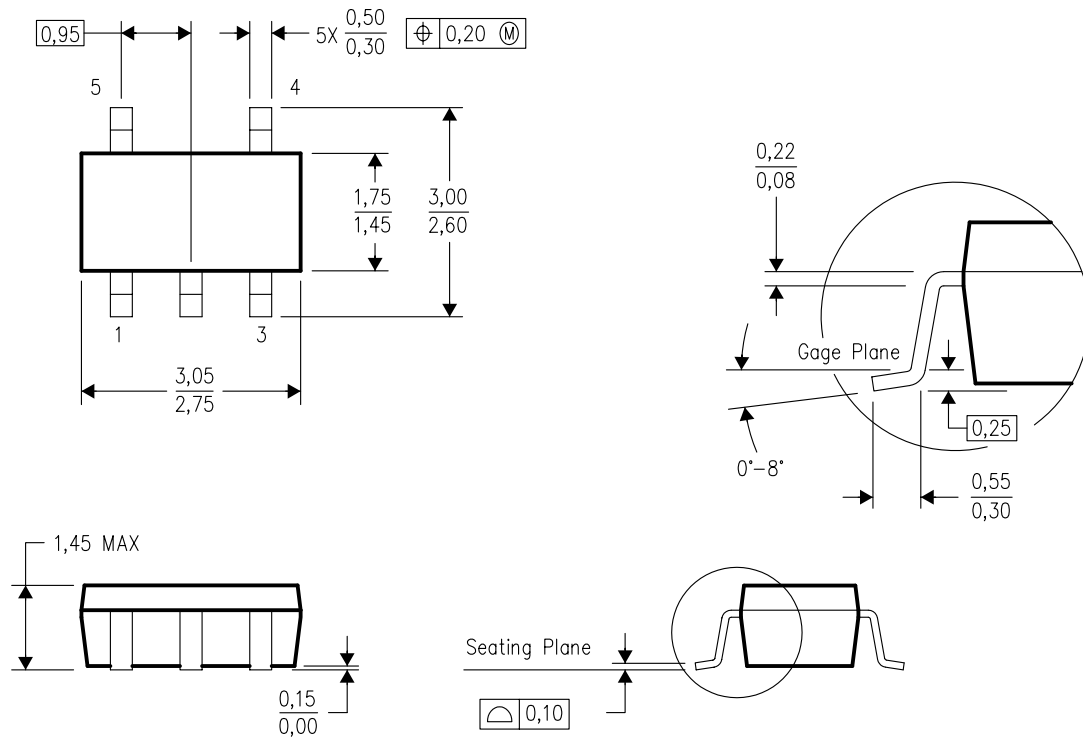
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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## DBV (R-PDSO-G5)

## PLASTIC SMALL-OUTLINE PACKAGE

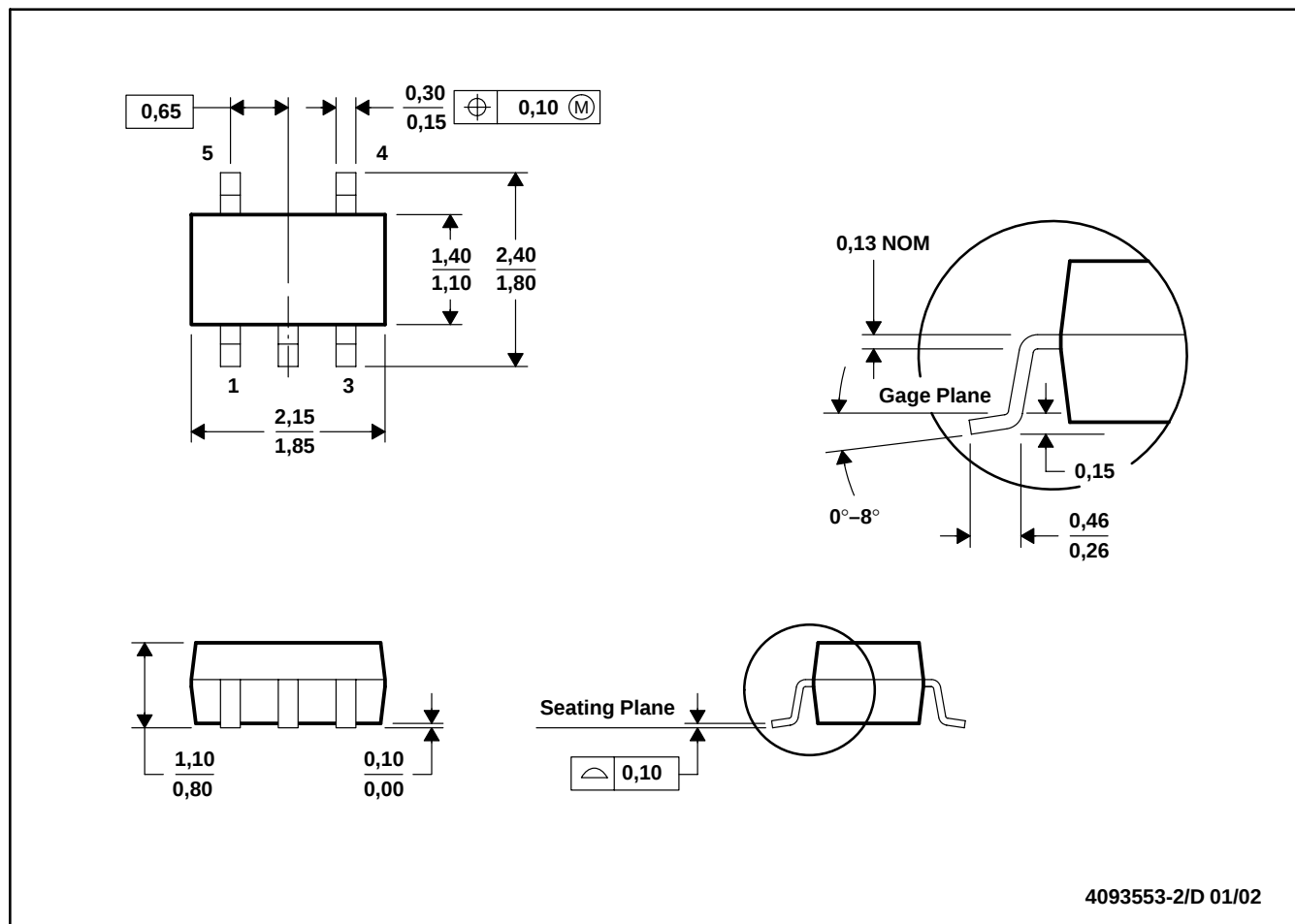


4073253-4/J 10/2005

- 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.  
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