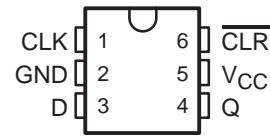
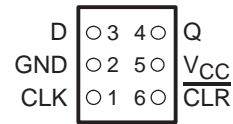


- Available in the Texas Instruments NanoStar™ and NanoFree™ Packages
- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 4.3 ns at 3.3 V
- Low Power Consumption, 10- $\mu$ A Max  $I_{CC}$
- $\pm 24$ -mA Output Drive at 3.3 V
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

DBV OR DCK PACKAGE  
(TOP VIEW)



YEP OR YZP PACKAGE  
(BOTTOM VIEW)



### description/ordering information

This single D-type flip-flop is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC1G175 has an asynchronous clear ( $\overline{CLR}$ ) input. When  $\overline{CLR}$  is high, data from the input pin (D) is transferred to the output pin (Q) on the clock's (CLK) rising edge. When  $\overline{CLR}$  is low, Q is forced into the low state, regardless of the clock edge or data on D.

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.

### ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING‡
–40°C to 85°C	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP	Reel of 3000	SN74LVC1G175YEPR	---D6_
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74LVC1G175YZPR	
	SOT (SOT-23) – DBV	Reel of 3000	SN74LVC1G175DBVR	C75_
		Reel of 250	SN74LVC1G175DBVT	
	SOT (SC-70) – DCK	Reel of 3000	SN74LVC1G175DCKR	D6_
		Reel of 250	SN74LVC1G175DCKT	

† 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).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

NanoStar and NanoFree are trademarks of Texas Instruments.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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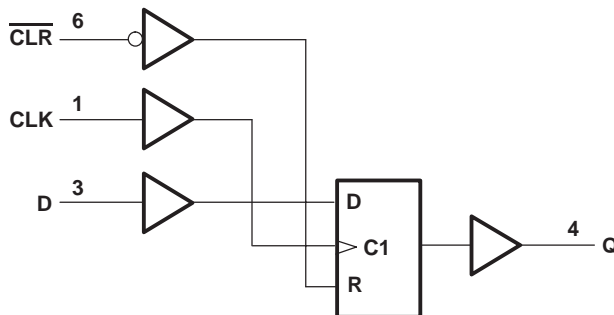
**SN74LVC1G175**  
**SINGLE D-TYPE FLIP-FLOP**  
**WITH ASYNCHRONOUS CLEAR**

SCES560A – MARCH 2004 – REVISED AUGUST 2004

FUNCTION TABLE

INPUTS			OUTPUTS
$\overline{\text{CLR}}$	CLK	D	Q
H	↑	L	L
H	↑	H	H
H	H or L	X	$Q_O$
L	X	X	L

logic diagram (positive logic)



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

Supply voltage range, $V_{CC}$	-0.5 V to 6.5 V
Input voltage range, $V_I$ (see Note 1)	-0.5 V to 6.5 V
Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1)	-0.5 V to 6.5 V
Voltage range applied to any output in the high or low state, $V_O$ (see Notes 1 and 2)	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ )	-50 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ )	-50 mA
Continuous output current, $I_O$	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND	$\pm 100$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 3): DBV package	165°C/W
DCK package	259°C/W
YEP/YZP package	123°C/W
Storage temperature range, $T_{stg}$	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. The value of  $V_{CC}$  is provided in the recommended operating conditions table.  
 3. The package thermal impedance is calculated in accordance with JEDEC 51-7.



**recommended operating conditions (see Note 4)**

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.65 × V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7		
		V <sub>CC</sub> = 3 V to 3.6 V	2		
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.7 × V <sub>CC</sub>		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V	0.35 × V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7		
		V <sub>CC</sub> = 3 V to 3.6 V	0.8		
		V <sub>CC</sub> = 4.5 V to 5.5 V	0.3 × V <sub>CC</sub>		
V <sub>I</sub>	Input voltage	0	5.5	V	
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	V	
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 1.65 V	–4		mA
		V <sub>CC</sub> = 2.3 V	–8		
		V <sub>CC</sub> = 3 V	–16		
		V <sub>CC</sub> = 4.5 V	–24		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 1.65 V	4		mA
		V <sub>CC</sub> = 2.3 V	8		
		V <sub>CC</sub> = 3 V	16		
		V <sub>CC</sub> = 4.5 V	32		
Δt/Δv	Input transition rise or fall rate	V <sub>CC</sub> = 1.8 V ± 0.15 V, 2.5 V ± 0.2 V	20		ns/V
		V <sub>CC</sub> = 3.3 V ± 0.3 V	10		
		V <sub>CC</sub> = 5 V ± 0.5 V	10		
T <sub>A</sub>	Operating free-air temperature	–40	85	°C	

NOTE 4: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN74LVC1G175

## SINGLE D-TYPE FLIP-FLOP

### WITH ASYNCHRONOUS CLEAR

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	MIN	TYP†	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA	1.65 V to 5.5 V	V <sub>CC</sub> - 0.1			V
	I <sub>OH</sub> = -4 mA	1.65 V	1.2			
	I <sub>OH</sub> = -8 mA	2.3 V	1.9			
	I <sub>OH</sub> = -16 mA	3 V	2.4			
	I <sub>OH</sub> = -24 mA		2.3			
	I <sub>OH</sub> = -32 mA	4.5 V	3.8			
V <sub>OL</sub>	I <sub>OL</sub> = 100 μA	1.65 V to 5.5 V			0.1	V
	I <sub>OL</sub> = 4 mA	1.65 V			0.45	
	I <sub>OL</sub> = 8 mA	2.3 V			0.3	
	I <sub>OL</sub> = 16 mA	3 V			0.4	
	I <sub>OL</sub> = 24 mA				0.55	
	I <sub>OL</sub> = 32 mA	4.5 V			0.55	
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 to 5.5 V			±1	μA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 5.5 V	0			±10	μA
I <sub>CC</sub>	V <sub>I</sub> = 5.5 V or GND, I <sub>O</sub> = 0	1.65 V to 5.5 V			10	μA
ΔI <sub>CC</sub>	One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	3 V to 5.5 V			500	μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V			3	pF

† All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		V <sub>CC</sub> = 1.8 V ± 0.15 V		V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		V <sub>CC</sub> = 5 V ± 0.5 V		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>clock</sub>	Clock frequency	100		125		150		175		MHz
t <sub>w</sub>	Pulse duration	CLR	Low	5.6	3	2.8	2.5			ns
		CLK	High or Low	3.5	3	2.8	2.5			
t <sub>su</sub>	Setup time, before CLK↑	Data		3	2.5	2	1.5			ns
		CLR inactive		0	0	0.5	0.5			
t <sub>h</sub>	Hold time, data after CLK↑	0		0		0.5		0.5		ns

switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 15 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 1.8 V ± 0.15 V		V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		V <sub>CC</sub> = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
f <sub>max</sub>			100		125		150		175		MHz
t <sub>pd</sub>	CLK	Q	2.5	12.9	2	6.5	1.4	4.6	1	3	ns
	CLR		2.5	12.4	2	6	1.2	4.3	1	3.2	



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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$f_{max}$			100		125		150		175		MHz
$t_{pd}$	CLK	Q	2.7	13.4	2.2	7.1	1.6	5.7	1.5	4	ns
	$\overline{\text{CLR}}$		2.7	12.9	2.2	7	1.5	5.8	1.3	4.1	

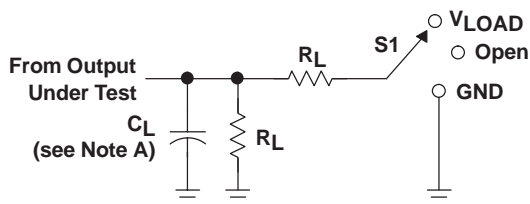
operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	$V_{CC} = 1.8\text{ V}$	$V_{CC} = 2.5\text{ V}$	$V_{CC} = 3.3\text{ V}$	$V_{CC} = 5\text{ V}$	UNIT
			TYP	TYP	TYP	TYP	
$C_{pd}$	Power dissipation capacitance	$f = 10\text{ MHz}$	18	19	19	21	pF

# SN74LVC1G175 SINGLE D-TYPE FLIP-FLOP WITH ASYNCHRONOUS CLEAR

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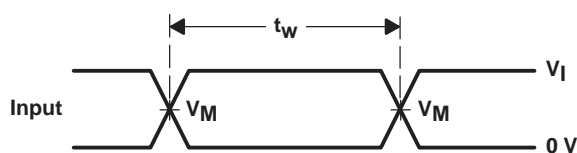
## PARAMETER MEASUREMENT INFORMATION



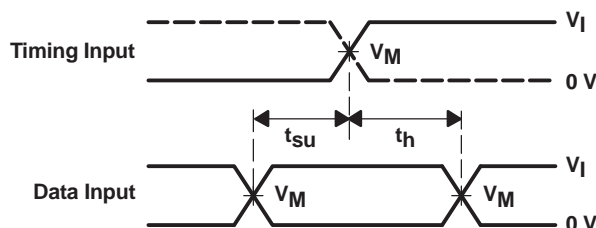
LOAD CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

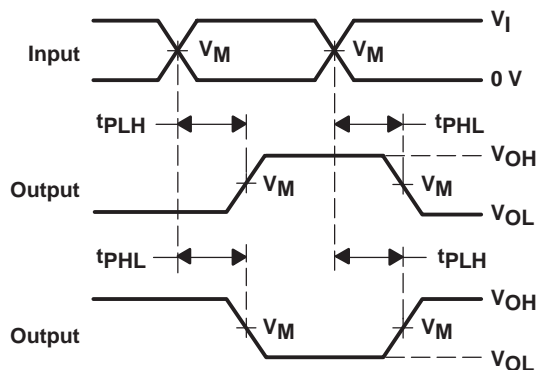
$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8\text{ V} \pm 0.15\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M $\Omega$	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M $\Omega$	0.15 V
$3.3\text{ V} \pm 0.3\text{ V}$	3 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	15 pF	1 M $\Omega$	0.3 V
$5\text{ V} \pm 0.5\text{ V}$	$V_{CC}$	$\leq 2.5\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M $\Omega$	0.3 V



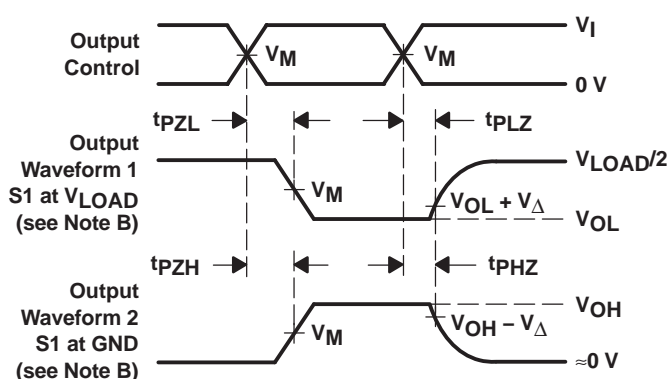
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



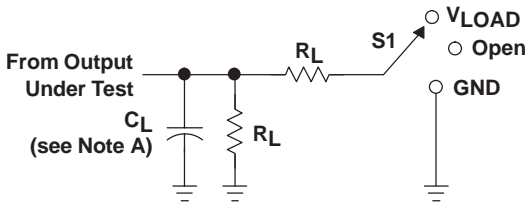
VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - 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



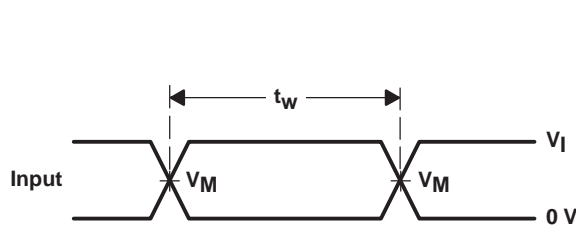
**PARAMETER MEASUREMENT INFORMATION**



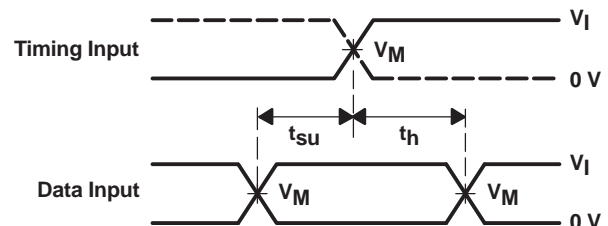
**LOAD CIRCUIT**

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

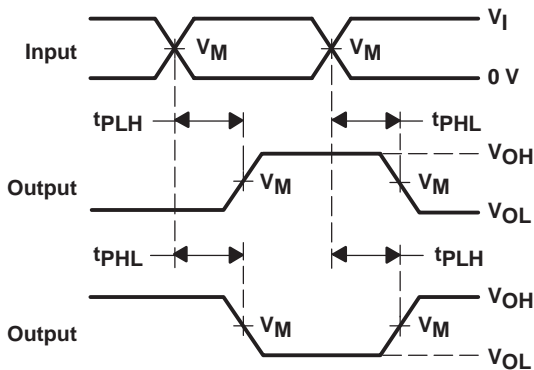
$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8\text{ V} \pm 0.15\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k $\Omega$	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 $\Omega$	0.15 V
$3.3\text{ V} \pm 0.3\text{ V}$	3 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V
$5\text{ V} \pm 0.5\text{ V}$	$V_{CC}$	$\leq 2.5\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	50 pF	500 $\Omega$	0.3 V



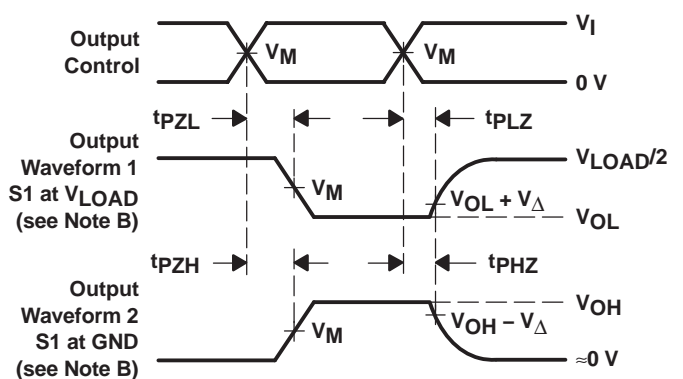
**VOLTAGE WAVEFORMS  
PULSE DURATION**



**VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES**



**VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS**



**VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING**

- NOTES:
- 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:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - 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.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - H. All parameters and waveforms are not applicable to all devices.

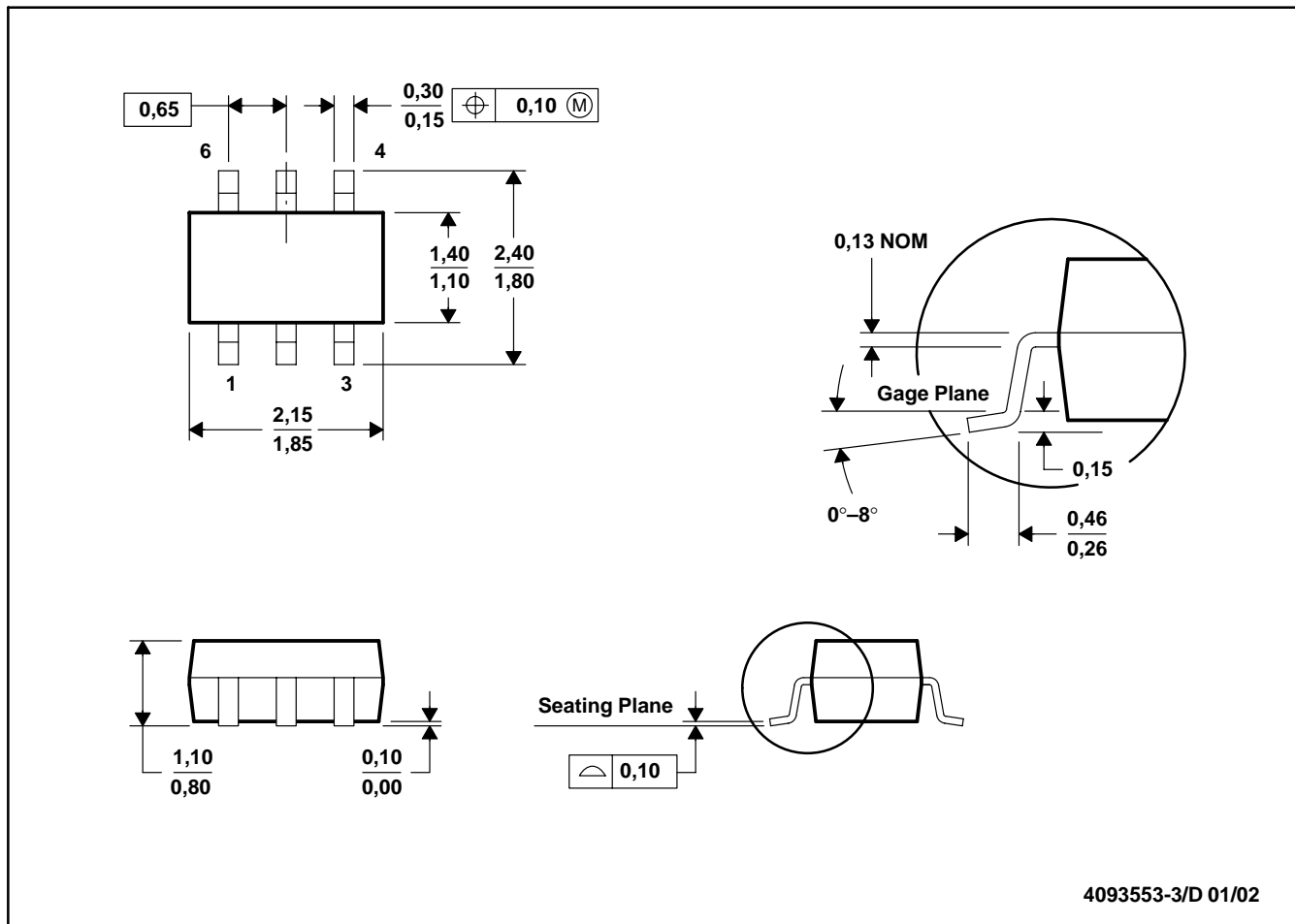
**Figure 2. Load Circuit and Voltage Waveforms**





DCK (R-PDSO-G6)

PLASTIC SMALL-OUTLINE PACKAGE

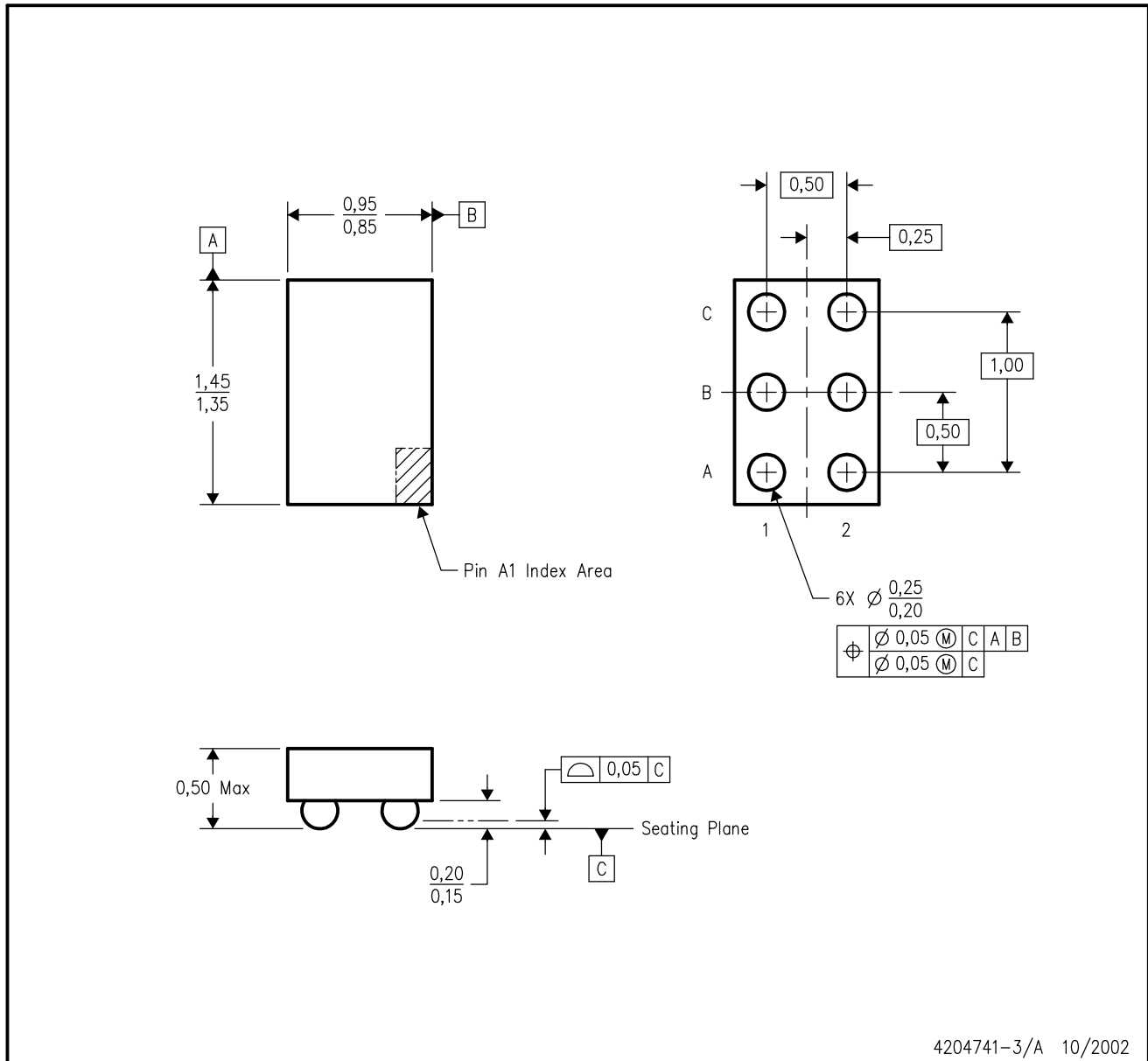


4093553-3/D 01/02

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion.  
 D. Falls within JEDEC MO-203

YZP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY

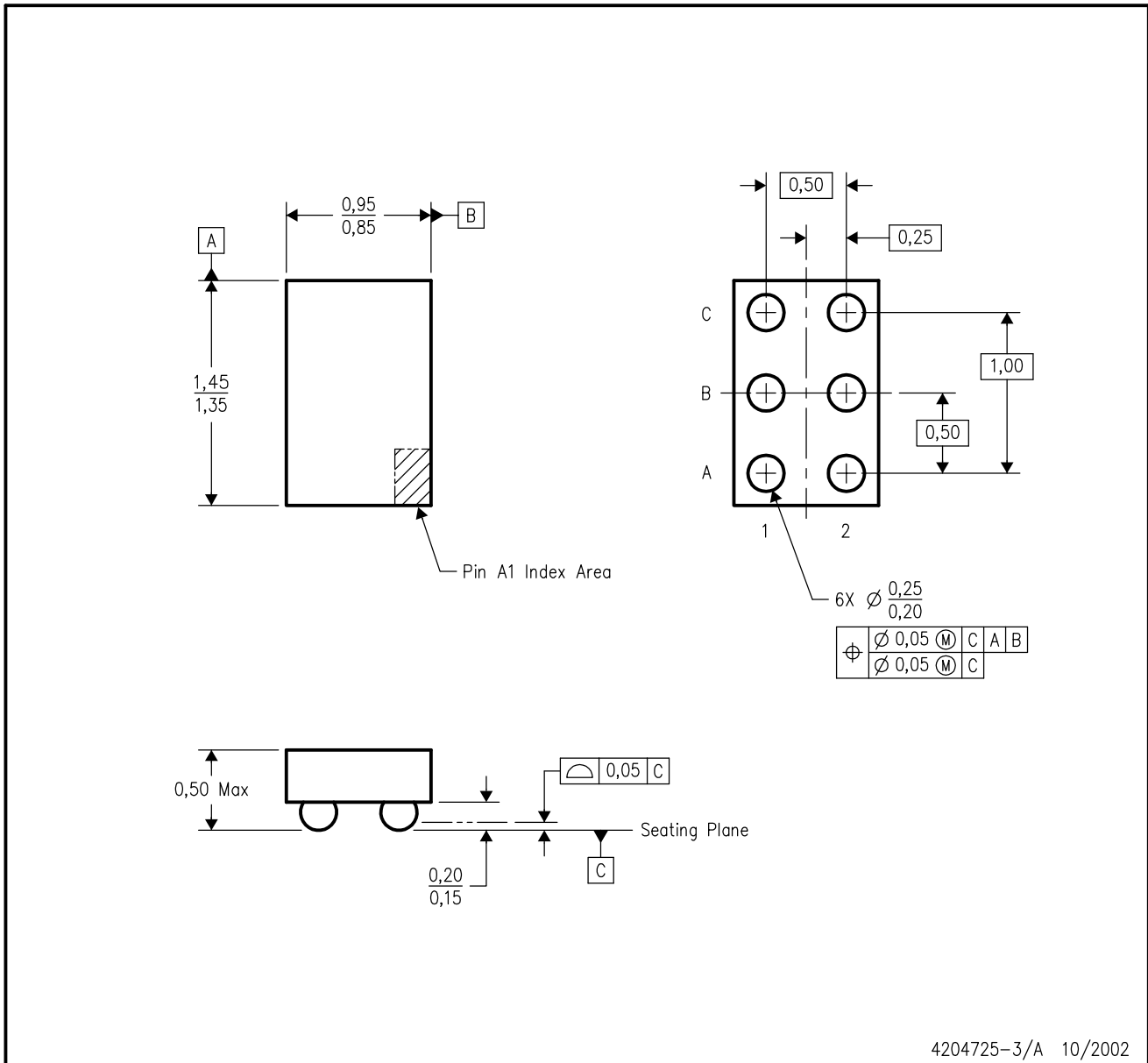


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoFree™ package configuration.
  - D. This package is lead-free. Refer to the 6 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.

YEP (R-XBGA-N6)

DIE-SIZE BALL GRID ARRAY



- 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 6 YZP package (drawing 4204741) for lead-free.

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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
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Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
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