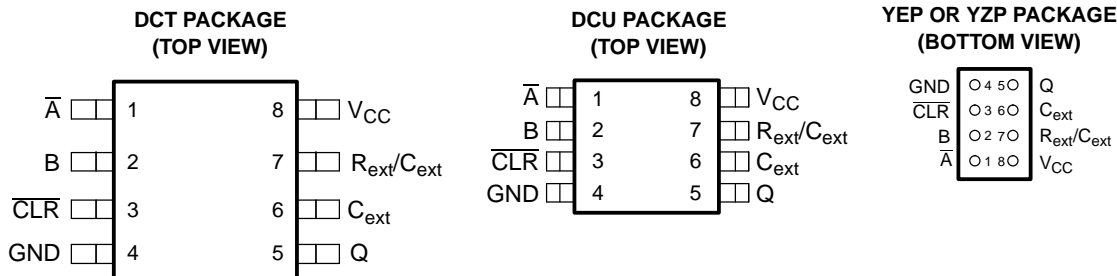


FEATURES

- 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 8 ns at 3.3 V
- Supports Mixed-Mode Voltage Operation on All Ports
- Schmitt-Trigger Circuitry on \bar{A} and B Inputs for Slow Input Transition Rates
- Edge Triggered From Active-High or Active-Low Gated Logic Inputs
- Retriggerable for Very Long Output Pulses, up to 100% Duty Cycle
- Overriding Clear Terminates Output Pulse
- Glitch-Free Power-Up Reset on Outputs
- 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)



See mechanical drawings for dimensions.

DESCRIPTION/ORDERING INFORMATION

The SN74LVC1G123 is a single retriggerable monostable multivibrator designed for 1.65-V to 5.5-V V_{CC} operation.

This monostable multivibrator features output pulse-duration control by three methods. In the first method, the \bar{A} input is low, and the B input goes high. In the second method, the B input is high, and the \bar{A} input goes low. In the third method, the \bar{A} input is low, the B input is high, and the clear (\overline{CLR}) input goes high.

ORDERING INFORMATION

T_A	PACKAGE ⁽¹⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽²⁾
–40°C to 85°C	NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YEP	Reel of 3000	SN74LVC1G123YEPR	_ _ _ D8_
	NanoFree™ – WCSP (DSBGA) 0.23-mm Large Bump – YZP (Pb-free)		SN74LVC1G123YZPR	
	SSOP – DCT	Reel of 3000	SN74LVC1G123DCTR	C23_
		Reel of 250	SN74LVC1G123DCTT	
	VSSOP – DCU	Reel of 3000	SN74LVC1G123DCUR	C23_
		Reel of 250	SN74LVC1G123DCUT	

- Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.
- DCT: The actual top-side marking has three additional characters that designate the year, month, and assembly/test site.
DCU: 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.

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SN74LVC1G123

SINGLE RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH SCHMITT-TRIGGER INPUTS

SCES586A–JULY 2004–REVISED JUNE 2005

DECSRIPTION/ORDERING INFORMATION (CONTINUED)

The output pulse duration is programmed by selecting external resistance and capacitance values. The external timing capacitor must be connected between C_{ext} and R_{ext}/C_{ext} (positive) and an external resistor connected between R_{ext}/C_{ext} and V_{CC} . To obtain variable pulse durations, connect an external variable resistance between R_{ext}/C_{ext} and V_{CC} . The output pulse duration also can be reduced by taking \overline{CLR} low.

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. The \overline{A} and B inputs have Schmitt triggers with sufficient hysteresis to handle slow input transition rates with jitter-free triggering at the outputs.

Once triggered, the basic pulse duration can be extended by retriggering the gated low-level-active (\overline{A}) or high-level-active (B) input. Pulse duration can be reduced by taking \overline{CLR} low. \overline{CLR} can be used to override \overline{A} or B inputs. The input/output timing diagram illustrates pulse control by retriggering the inputs and early clearing.

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.

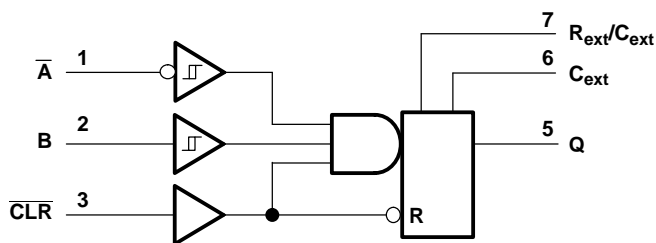
NanoStar™ and NanoFree™ package technology is a major breakthrough in IC packaging concepts, using the die as the package.

FUNCTION TABLE

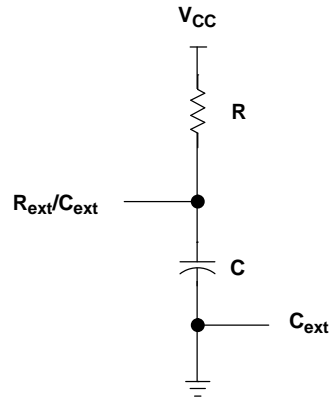
INPUTS			OUTPUTS Q
\overline{CLR}	\overline{A}	B	
L	X	X	L
X	H	X	L ⁽¹⁾
X	X	L	L ⁽¹⁾
H	L	↑	⌋
H	↓	H	⌋
↑	L	H	⌋

- (1) These outputs are based on the assumption that the indicated steady-state conditions at the A and B inputs have been set up long enough to complete any pulse started before the setup.

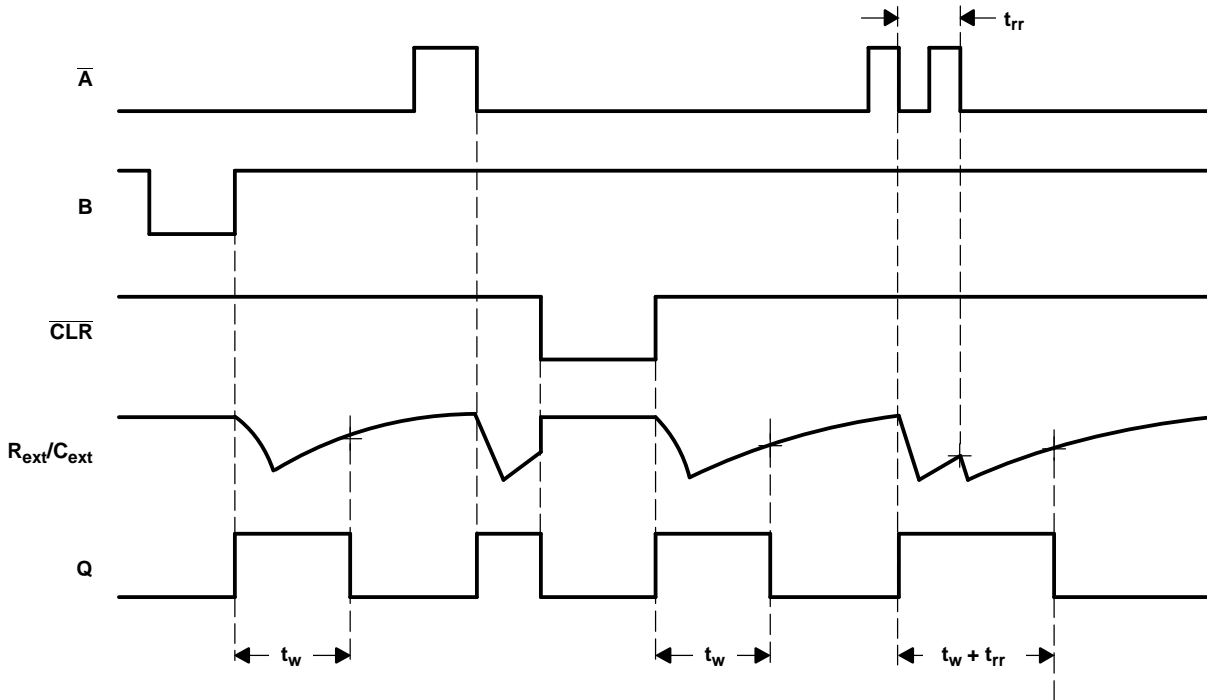
LOGIC DIAGRAM (POSITIVE LOGIC)



REQUIRED TIMING CIRCUIT



INPUT/OUTPUT TIMING DIAGRAM



SN74LVC1G123

SINGLE RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH SCHMITT-TRIGGER INPUTS

SCES586A–JULY 2004–REVISED JUNE 2005

Absolute Maximum Ratings⁽¹⁾

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

		MIN	MAX	UNIT
V_{CC}	Supply voltage range	-0.5	6.5	V
V_I	Input voltage range ⁽²⁾	-0.5	6.5	V
V_O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	-0.5	6.5	V
V_O	Voltage range applied to any output in the high or low state ⁽²⁾⁽³⁾	-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		±50	mA
	Continuous current through V_{CC} or GND		±100	mA
θ_{JA}	Package thermal impedance ⁽⁴⁾	DCT package	220	°C/W
		DCU package	227	
		YEP/YZP package	102	
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 and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (3) The value of V_{CC} is provided in the recommended operating conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions⁽¹⁾

			MIN	MAX	UNIT
V _{CC}	Supply voltage	Operating	1.65	5.5	V
		Data retention only	1.5		
V _{IH}	High-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}		V
		V _{CC} = 2.3 V to 2.7 V	1.7		
		V _{CC} = 3 V to 3.6 V	2		
		V _{CC} = 4.5 V to 5.5 V	0.7 × V _{CC}		
V _{IL}	Low-level input voltage	V _{CC} = 1.65 V to 1.95 V		0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V		0.7	
		V _{CC} = 3 V to 3.6 V		0.8	
		V _{CC} = 4.5 V to 5.5 V		0.3 × V _{CC}	
V _I	Input voltage		0	5.5	V
V _O	Output voltage		0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 1.65 V		–4	mA
		V _{CC} = 2.3 V		–8	
		V _{CC} = 3 V		–16	
				–24	
		V _{CC} = 4.5 V		–32	
I _{OL}	Low-level output current	V _{CC} = 1.65 V		4	mA
		V _{CC} = 2.3 V		8	
		V _{CC} = 3 V		16	
				24	
		V _{CC} = 4.5 V		32	
R _{ext} ⁽²⁾	External timing resistance	V _{CC} = 2 V	5 k		Ω
		V _{CC} ≥ 3 V	1 k		
T _A	Operating free-air temperature		–40	85	°C

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

(2) R_{ext}/C_{ext} is an I/O and must not be connected directly to GND or V_{CC}.

SN74LVC1G123

SINGLE RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH SCHMITT-TRIGGER INPUTS

SCE586A–JULY 2004–REVISED JUNE 2005

Electrical Characteristics

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

PARAMETER		TEST CONDITIONS		V _{CC}	MIN	TYP ⁽¹⁾	MAX	UNIT
V _{OH}		I _{OH} = -100 μA		1.65 V to 5.5 V	V _{CC} - 0.1			V
		I _{OH} = -4 mA		1.65 V	1.2			
		I _{OH} = -8 mA		2.3 V	1.9			
		I _{OH} = -16 mA		3 V	2.4			
		I _{OH} = -24 mA			2.3			
		I _{OH} = -32 mA		4.5 V	3.8			
V _{OL}		I _{OL} = 100 μA		1.65 V to 5.5 V	0.1			V
		I _{OL} = 4 mA		1.65 V	0.45			
		I _{OL} = 8 mA		2.3 V	0.3			
		I _{OL} = 16 mA		3 V	0.4			
		I _{OL} = 24 mA			0.55			
		I _{OL} = 32 mA		4.5 V	0.55			
I _I	R _{ext} /C _{ext} ⁽²⁾	B = GND, $\bar{A} = \bar{CLR} = V_{CC}$		1.65 V to 5.5 V	±0.25			μA
	\bar{A} , B, \bar{CLR}	V _I = 5.5 V or GND			±1			
I _{off}	\bar{A} , B, Q, \bar{CLR}	V _I or V _O = 5.5 V		0	±10			μA
I _{CC}	Quiescent	V _I = V _{CC} or GND, I _O = 0		5.5 V	20			μA
I _{CC}	Active state	V _I = V _{CC} or GND, R _{ext} /C _{ext} = 0.5 V _{CC}		1.65 V	165			μA
				2.3 V	220			
				3 V	280			
				4.5 V	650			
				5.5 V	975			
C _i		V _I = V _{CC} or GND		3.3 V	3			pF

(1) All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

(2) This test is performed with the terminal in the off-state condition.

Timing Requirements

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

PARAMETER		TEST CONDITIONS		V _{CC} = 1.8 V ± 0.15 V	V _{CC} = 2.5 V ± 0.2 V	V _{CC} = 3.3 V ± 0.3 V	V _{CC} = 5 V ± 0.5 V	UNIT			
				MIN	TYP	MIN	TYP				
t _w IN	Pulse duration	\bar{CLR}		8		4		3	2.5	ns	
		\bar{A} or B trigger		8		4		3	2.5		
t _{rr}	Pulse retrigger time	R _{ext} = 1 kΩ	C _{ext} = 100 pF					5.5	4.5	ns	
			C _{ext} = 100 μF					1.4	1.1	μs	
		R _{ext} = 5 kΩ	C _{ext} = 100 pF		75		45				ns
			C _{ext} = 100 μF		1.8		1.4				μs

Switching Characteristics

over recommended operating free-air temperature range, C_L = 15 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V			V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 5 V ± 0.5 V		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	\bar{A} or B	Q	7	18.5	52	4	17	3	11.5	2	7.6	ns
	\bar{CLR}		5	12.4	34	3	11.5	2	8	1.5	5.5	
	\bar{CLR} trigger		7	17.4	54	4	15.5	3	10.5	2	7	

Switching Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$			$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
				MIN	TYP ⁽¹⁾	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{pd}	\bar{A} or B	Q		6	18.6	57	3	18.5	2	12.5	1.5	8.2	ns
	\overline{CLR}			4	11.6	36.5	2	12.5	1.5	8.6	1.5	6	
	\overline{CLR} trigger			5	17.3	59	2.5	17	2	11.5	1.5	7.5	
$t_{wOUT}^{(2)}$		Q	$C_{ext} = 28\text{ pF}$, $R_{ext} = 2\text{ k}\Omega$	225	600		190	220	170	200	150	180	ns
			$C_{ext} = 0.01\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	100	110		100	110	100	110	100	110	μs
			$C_{ext} = 0.1\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	1	1.1		1	1.1	1	1.1	1	1.1	ms

(1) $T_A = 25^\circ\text{C}$

(2) t_w = Duration of pulse at Q output

Operating Characteristics

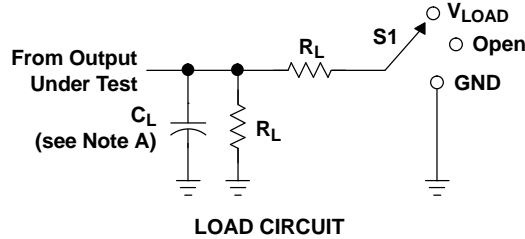
$T_A = 25^\circ\text{C}$

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		
Cpd Power dissipation capacitance	$\bar{A} = \text{low}$, $B = \text{high}$, $\overline{CLR} = 10\text{ MHz}$	$R_{ext} = 1\text{ k}\Omega$, No C_{ext}			35	37	pF
		$R_{ext} = 5\text{ k}\Omega$, No C_{ext}	41	40			

SN74LVC1G123 SINGLE RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH SCHMITT-TRIGGER INPUTS

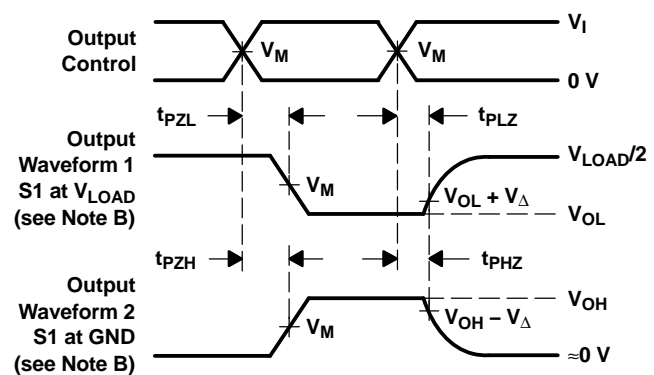
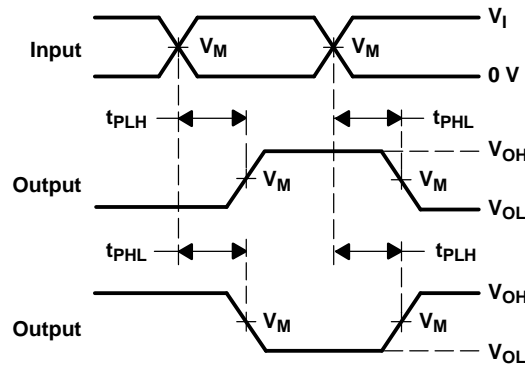
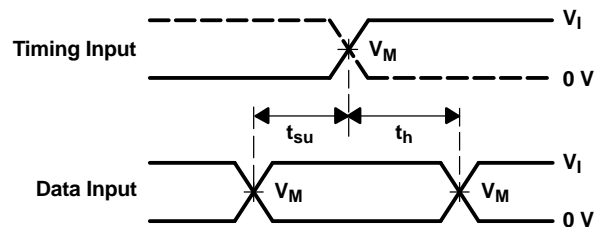
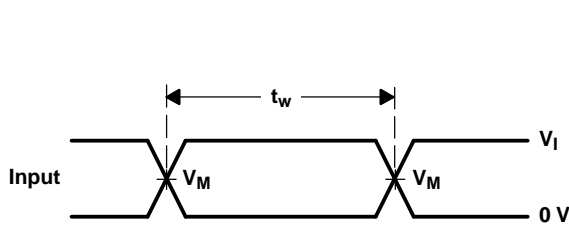
SCES586A—JULY 2004—REVISED JUNE 2005

PARAMETER MEASUREMENT INFORMATION



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

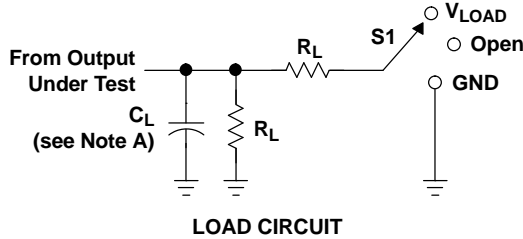
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	15 pF	1 M Ω	0.15 V
$3.3\text{ V} \pm 0.3\text{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



- 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.

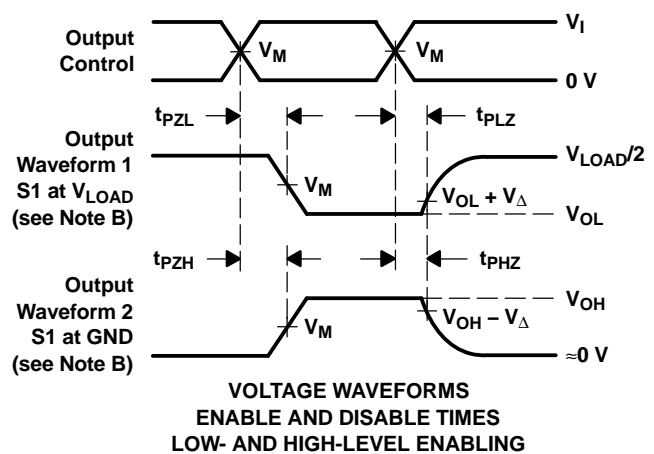
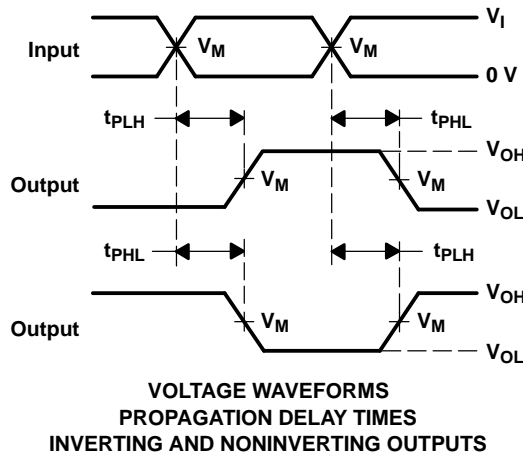
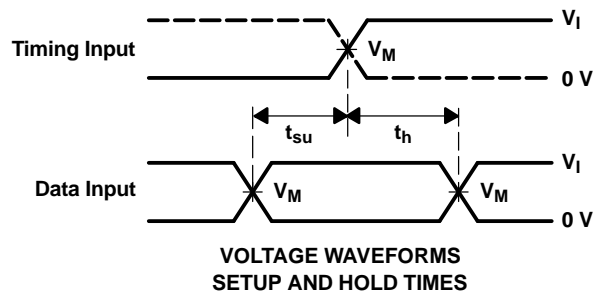
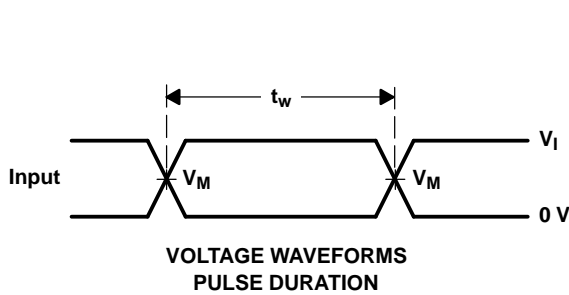
Figure 1. Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



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

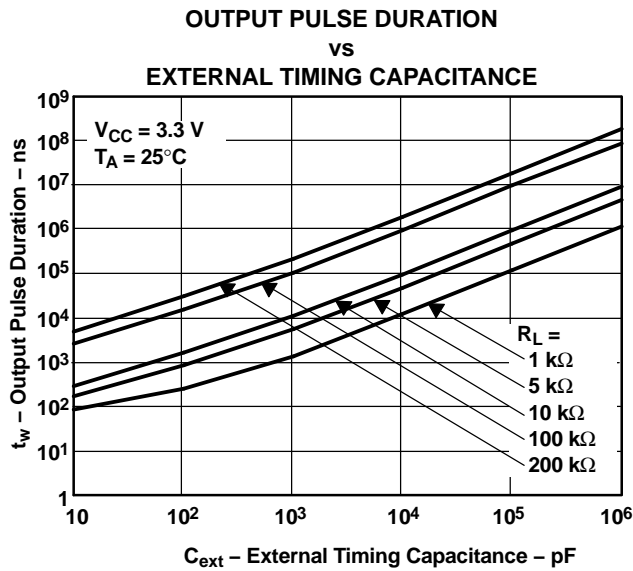
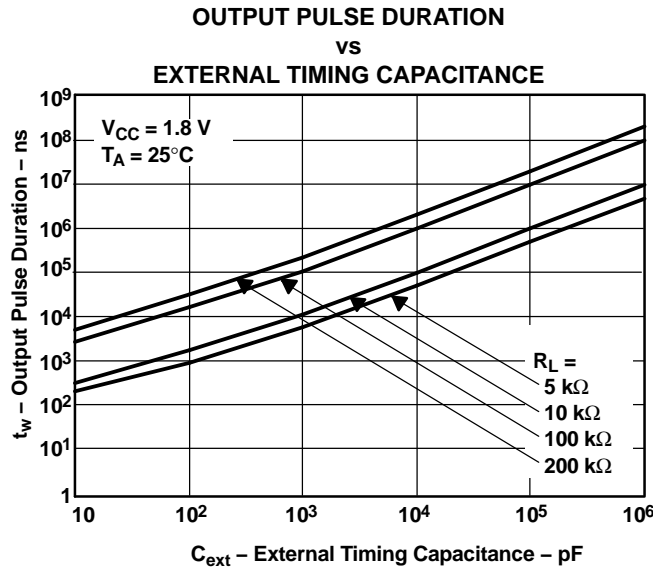
V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	t_r/t_f					
$1.8\text{ V} \pm 0.15\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k Ω	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	V_{CC}	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 Ω	0.15 V
$3.3\text{ V} \pm 0.3\text{ V}$	3 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 Ω	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 Ω	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 $\leq 10\text{ MHz}$, $Z_O = 50\ \Omega$.
 - 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

APPLICATION INFORMATION ⁽¹⁾



(1) Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

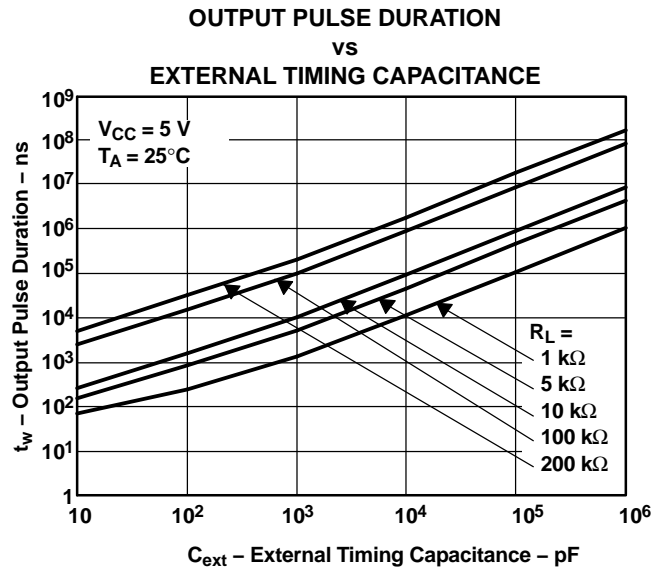


Figure 5.

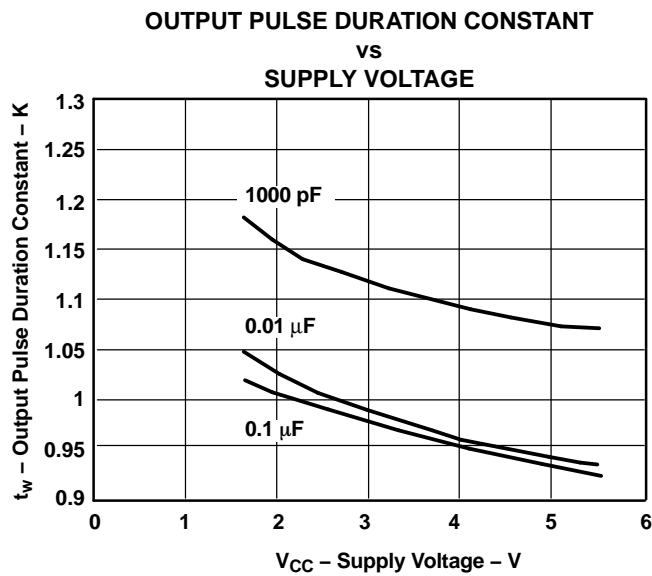


Figure 6.

SN74LVC1G123 SINGLE RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH SCHMITT-TRIGGER INPUTS

SCES586A—JULY 2004—REVISED JUNE 2005

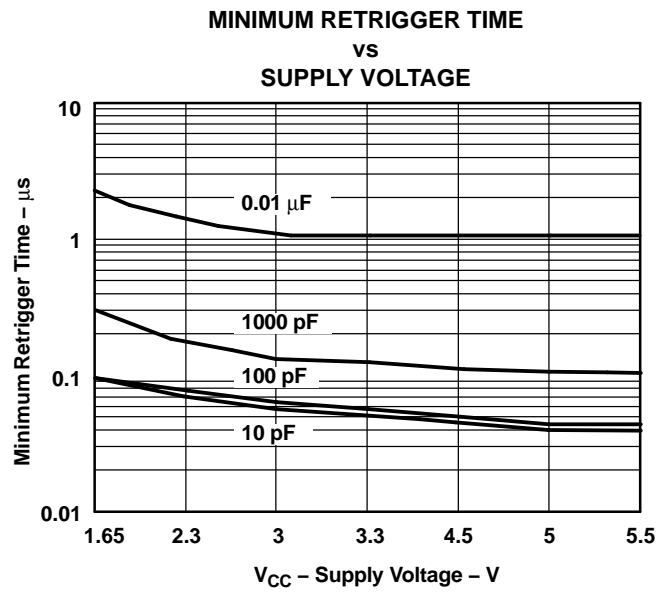


Figure 7.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74LVC1G123DCURE4	ACTIVE	US8	DCU	8	3000	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
74LVC1G123DCUTE4	ACTIVE	US8	DCU	8	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G123DCTR	ACTIVE	SM8	DCT	8	3000	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G123DCTT	ACTIVE	SM8	DCT	8	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G123DCUR	ACTIVE	US8	DCU	8	3000	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G123DCUT	ACTIVE	US8	DCU	8	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC1G123YEPR	ACTIVE	WCSP	YEP	8	3000	TBD	SNPB	Level-1-260C-UNLIM
SN74LVC1G123YZPR	ACTIVE	WCSP	YZP	8	3000	Pb-Free (RoHS)	SNAGCU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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)

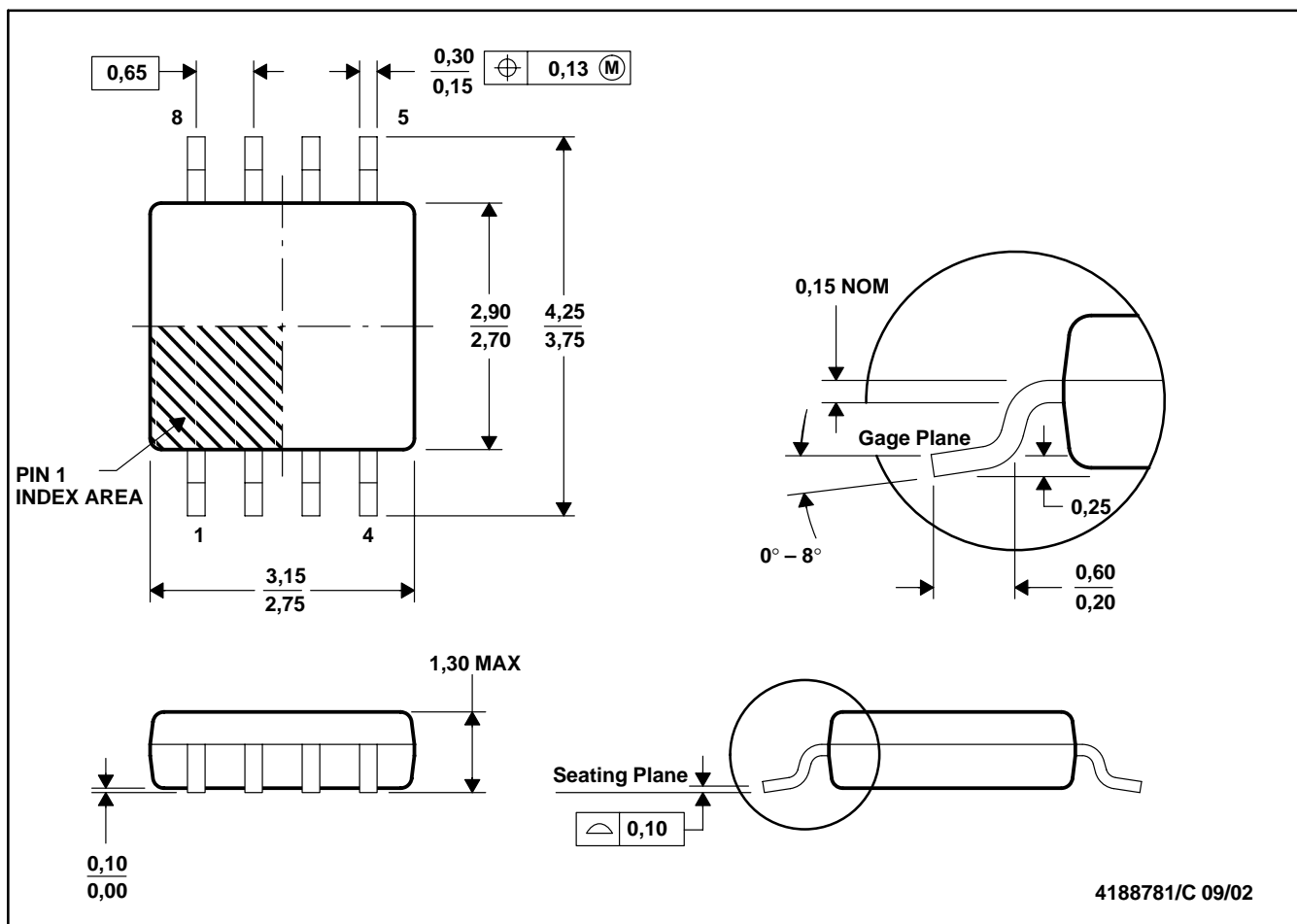
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DCT (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

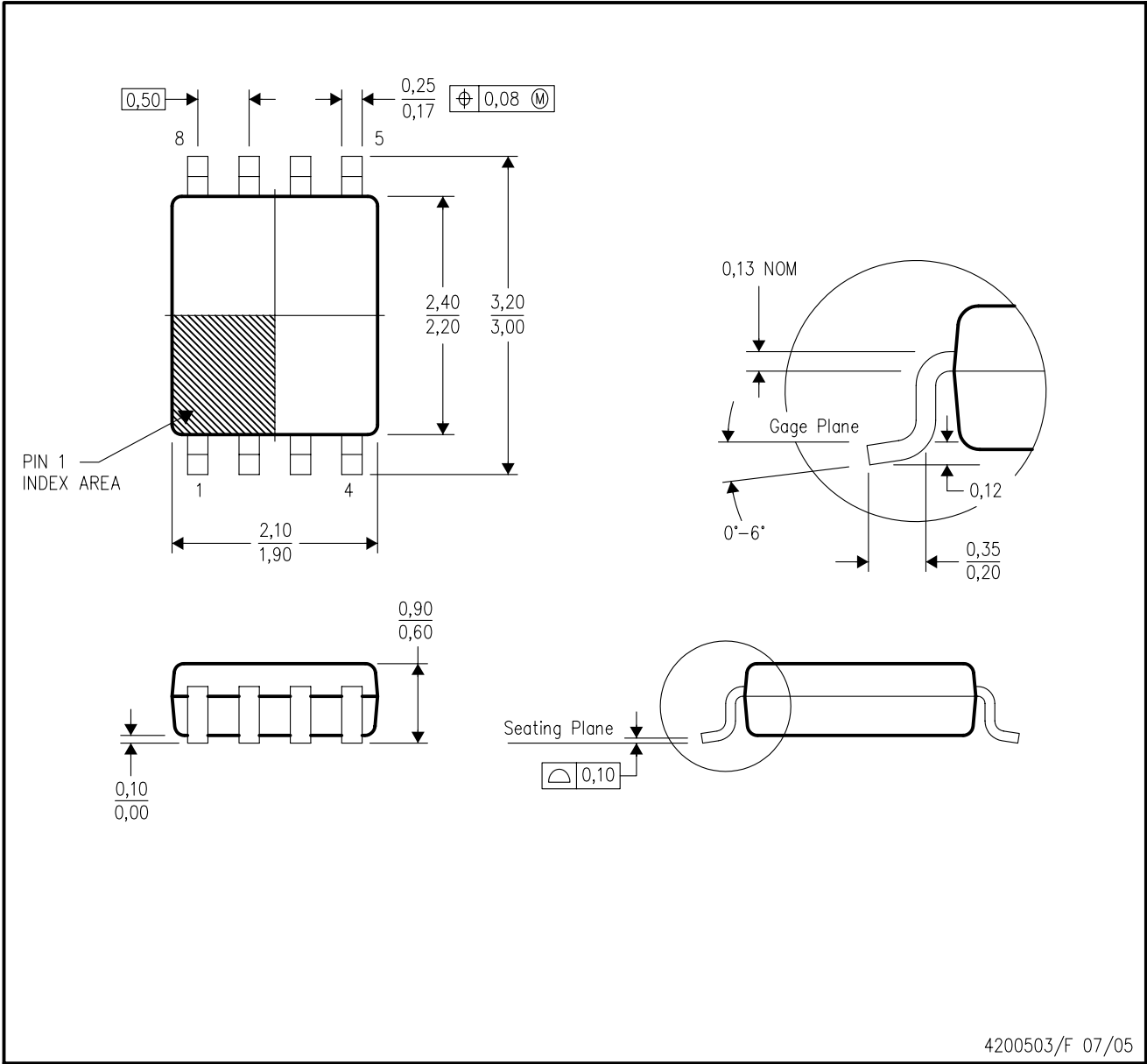


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- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion
 - D. Falls within JEDEC MO-187 variation DA.

DCU (R-PDSO-G8)

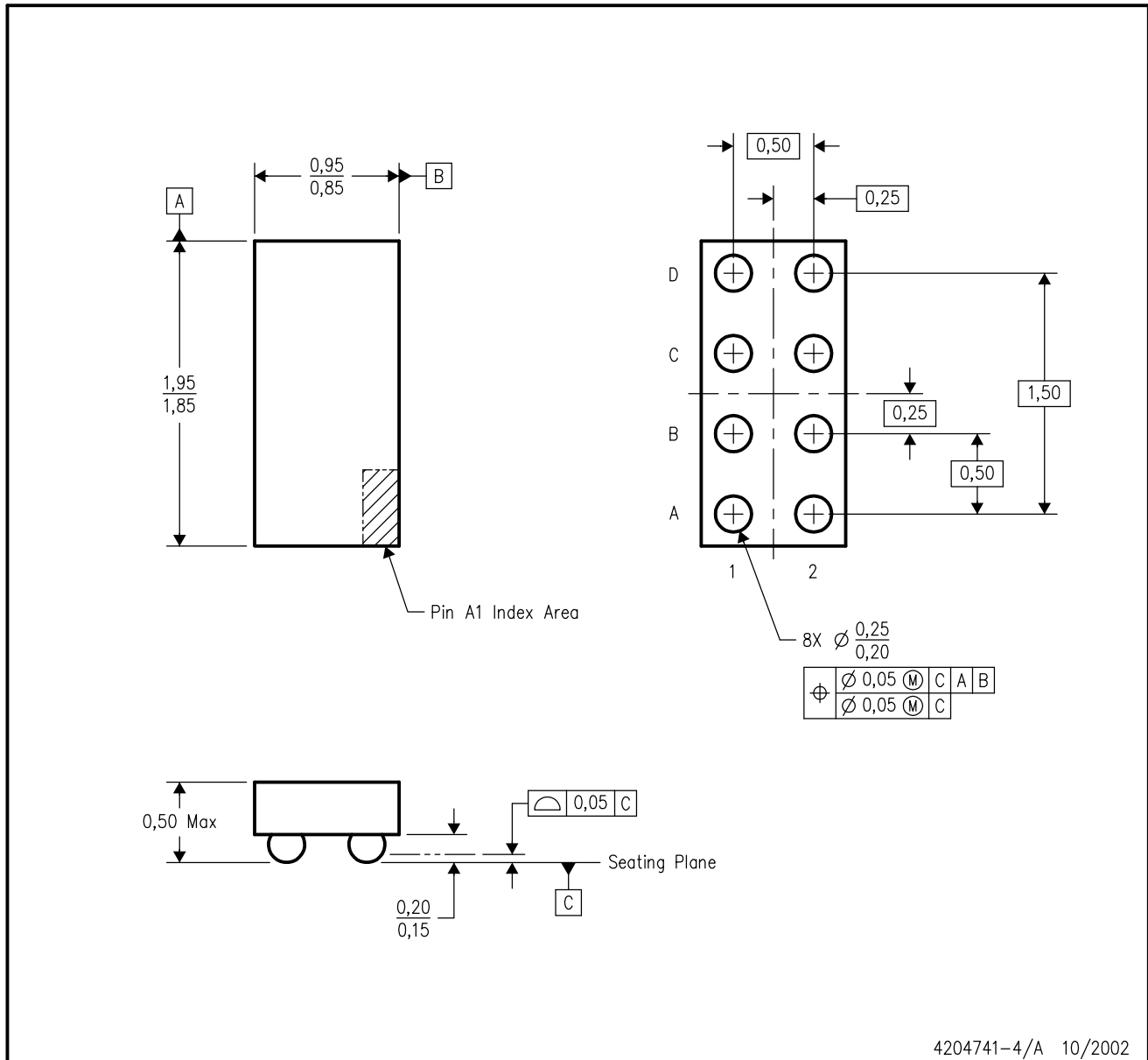
PLASTIC SMALL-OUTLINE PACKAGE (DIE DOWN)



- 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-187 variation CA.

YZP (R-XBGA-N8)

DIE-SIZE BALL GRID ARRAY

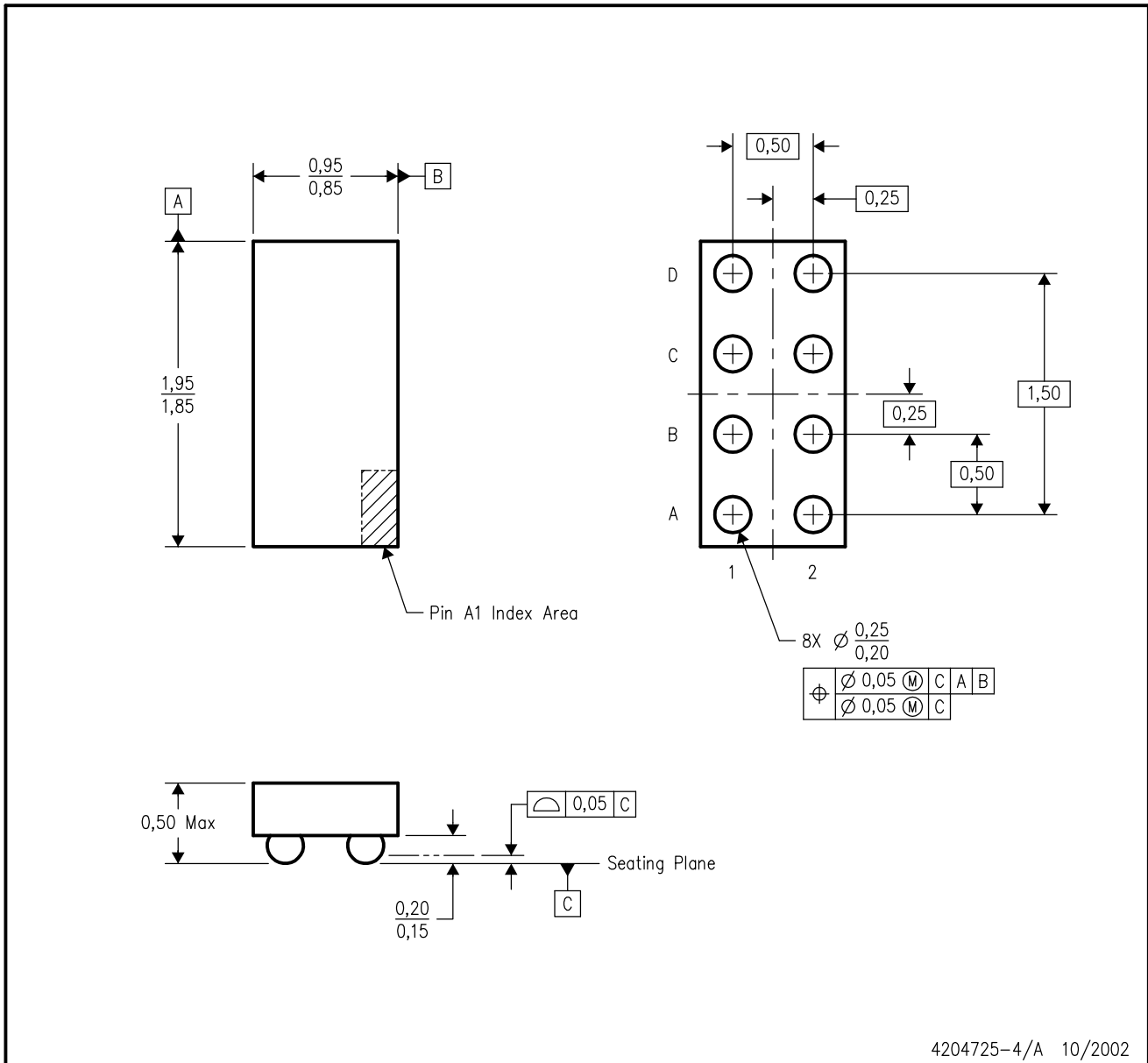


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. NanoFree™ package configuration.
 - D. This package is lead-free. Refer to the 8 YEP package (drawing 4204725) for tin-lead (SnPb).

NanoFree is a trademark of Texas Instruments.

YEP (R-XBGA-N8)

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

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