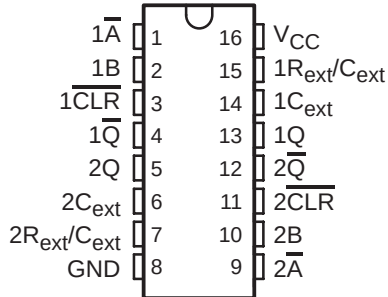


SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

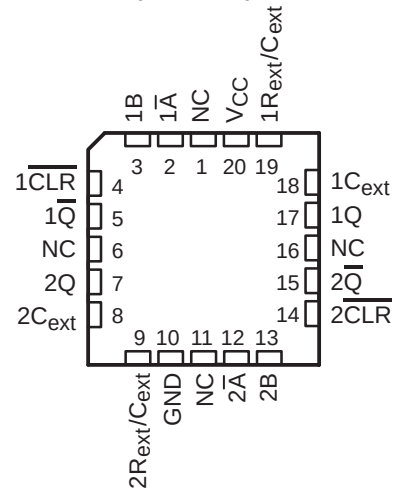
SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

- 2-V to 5.5-V V_{CC} Operation
- Max t_{pd} of 11 ns at 5 V
- Support Mixed-Mode Voltage Operation on All Ports
- Schmitt-Trigger Circuitry on $\overline{A}$, B, and $\overline{CLR}$ Inputs for Slow Input Transition Rates
- 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)

SN54LV221A . . . J OR W PACKAGE
SN74LV221A . . . D, DB, DGV, NS, OR PW PACKAGE
(TOP VIEW)



SN54LV221A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

ORDERING INFORMATION

T_A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – D	Tube of 40	SN74LV221AD	LV221A
		Reel of 2500	SN74LV221ADR	
	SOP – NS	Reel of 2000	SN74LV221ANSR	74LV221A
	SSOP – DB	Reel of 2000	SN74LV221ADBR	LV221A
	TSSOP – PW	Tube of 90	SN74LV221APW	LV221A
		Reel of 2000	SN74LV221APWR	
		Reel of 250	SN74LV221APWT	
–55°C to 125°C	TVSOP – DGV	Reel of 2000	SN74LV221ADGVR	LV221A
	CDIP – J	Tube of 25	SNJ54LV221AJ	SNJ54LV221AJ
	CFP – W	Tube of 150	SNJ54LV221AW	SNJ54LV221AW
	LCCC – FK	Tube of 55	SNJ54LV221AFK	SNJ54LV221AFK

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



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.

UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information 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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2005, Texas Instruments Incorporated

SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

description/ordering information (continued)

The 'LV221A devices are dual multivibrators designed for 2-V to 5.5-V V_{CC} operation. Each multivibrator has a negative-transition-triggered ($\bar{A}$) input and a positive-transition-triggered (B) input, either of which can be used as an inhibit input.

These edge-triggered multivibrators feature 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 ($\bar{CLR}$) input goes high.

The output pulse duration is programmable 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 resistor between R_{ext}/C_{ext} and V_{CC} . The output pulse duration also can be reduced by taking $\bar{CLR}$ low.

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

Once triggered, the outputs are independent of further transitions of the $\bar{A}$ and B inputs and are a function of the timing components, or the output pulses can be terminated by the overriding clear. Input pulses can be of any duration relative to the output pulse. Output pulse duration can be varied by choosing the appropriate timing components. Output rise and fall times are TTL compatible and independent of pulse duration. Typical triggering and clearing sequences are illustrated in the input/output timing diagram.

The variance in output pulse duration from device to device typically is less than $\pm 0.5\%$ for given external timing components. An example of this distribution for the 'LV221A is shown in Figure 8. Variations in output pulse duration versus supply voltage and temperature are shown in Figure 5.

During power up, Q outputs are in the low state, and $\bar{Q}$ outputs are in the high state. The outputs are glitch free, without applying a reset pulse.

These devices are fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

Pin assignments are identical to those of the 'AHC123A and 'AHCT123A devices, so the 'LV221A can be substituted for those devices not using the retrigger feature.

For additional application information on multivibrators, see the application report *Designing With The SN74AHC123A and SN74AHCT123A*, literature number SCLA014.

SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

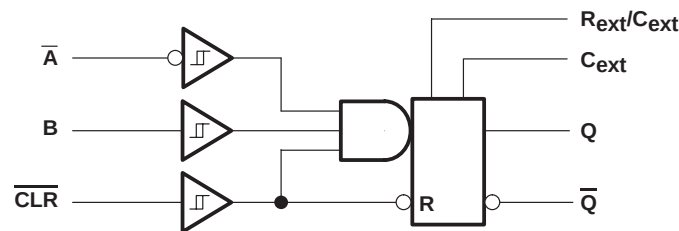
SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

FUNCTION TABLE
(each multivibrator)

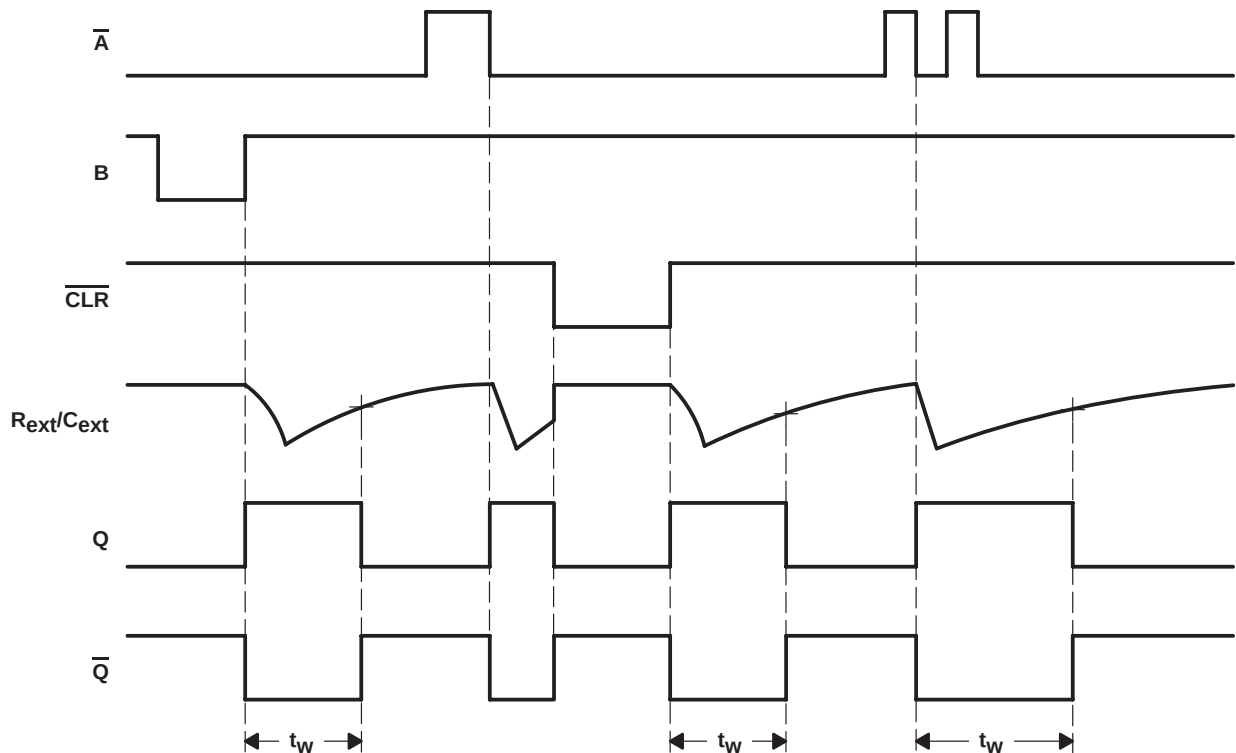
INPUTS			OUTPUTS		FUNCTION
CLR	$\bar{A}$	B	Q	$\bar{Q}$	
L	X	X	L	H	Reset
H	H	X	L	H	Inhibit
H	X	L	L	H	Inhibit
H	L	↑			Outputs enabled
H	↓	H			Outputs enabled
↑†	L	H			Outputs enabled

† This condition is true only if the output of the latch formed by the NAND gate has been conditioned to the logic 1 state prior to CLR going high. This latch is conditioned by taking either $\bar{A}$ high or B low while CLR is inactive (high).

logic diagram, each multivibrator (positive logic)



input/output timing diagram



SN54LV221A, SN74LV221A

DUAL MONOSTABLE MULTIVIBRATORS

WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Output voltage range in high or low state, V_O (see Notes 1 and 2)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range in power-off state, V_O (see Note 1)	–0.5 V to 7 V
Input clamp current, I_{IK} ($V_I < 0$)	–20 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Package thermal impedance, θ_{JA} (see Note 3): D package	73°C/W
DB package	82°C/W
DGV package	120°C/W
NS package	64°C/W
PW package	108°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 and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
 2. This value is limited to 5.5 V maximum.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.

SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

recommended operating conditions (see Note 4)

			SN54LV221A		SN74LV221A		UNIT
			MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage		2	5.5	2	5.5	V
V _{IH}	High-level input voltage	V _{CC} = 2 V	1.5		1.5		V
		V _{CC} = 2.3 V to 2.7 V	V _{CC} × 0.7		V _{CC} × 0.7		
		V _{CC} = 3 V to 3.6 V	V _{CC} × 0.7		V _{CC} × 0.7		
		V _{CC} = 4.5 V to 5.5 V	V _{CC} × 0.7		V _{CC} × 0.7		
V _{IL}	Low-level input voltage	V _{CC} = 2 V		0.5		0.5	V
		V _{CC} = 2.3 V to 2.7 V		V _{CC} × 0.3		V _{CC} × 0.3	
		V _{CC} = 3 V to 3.6 V		V _{CC} × 0.3		V _{CC} × 0.3	
		V _{CC} = 4.5 V to 5.5 V		V _{CC} × 0.3		V _{CC} × 0.3	
V _I	Input voltage		0	5.5	0	5.5	V
V _O	Output voltage		0	V _{CC}	0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 2 V		–50		–50	μA
		V _{CC} = 2.3 V to 2.7 V		–2		–2	mA
		V _{CC} = 3 V to 3.6 V		–6		–6	
		V _{CC} = 4.5 V to 5.5 V		–12		–12	
I _{OL}	Low-level output current	V _{CC} = 2 V		50		50	μA
		V _{CC} = 2.3 V to 2.7 V		2		2	mA
		V _{CC} = 3 V to 3.6 V		6		6	
		V _{CC} = 4.5 V to 5.5 V		12		12	
R _{ext}	External timing resistance	V _{CC} = 2 V	5k		5k		Ω
		V _{CC} ≥ 3 V	1k		1k		
C _{ext}	External timing capacitance		No restriction		No restriction		pF
Δt/ΔV _{CC}	Power-up ramp rate		1		1		ms/V
T _A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 4: 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.

SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

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

PARAMETER		TEST CONDITIONS	V _{CC}	SN54LV221A			SN74LV221A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V _{OH}		I _{OH} = -50 μA	2 V to 5.5 V	V _{CC} -0.1			V _{CC} -0.1			V
		I _{OH} = -2 mA	2.3 V	2			2			
		I _{OH} = -6 mA	3 V	2.48			2.48			
		I _{OH} = -12 mA	4.5 V	3.8			3.8			
V _{OL}		I _{OL} = 50 μA	2 V to 5.5 V	0.1			0.1			V
		I _{OL} = 2 mA	2.3 V	0.4			0.4			
		I _{OL} = 6 mA	3 V	0.44			0.44			
		I _{OL} = 12 mA	4.5 V	0.55			0.55			
I _I	R _{ext} /C _{ext} [†]	V _I = 5.5 V or GND	2 V to 5.5 V	±2.5			±2.5			μA
	$\overline{A}$, B, and $\overline{CLR}$	V _I = 5.5 V or GND	0	±1			±1			
			0 to 5.5 V	±1			±1			
I _{CC}	Quiescent	V _I = V _{CC} or GND, I _O = 0	5.5 V	20			20			μA
I _{CC}	Active state (per circuit)	V _I = V _{CC} or GND, R _{ext} /C _{ext} = 0.5 V _{CC}	2.3 V	220			220			μA
			3 V	280			280			
			4.5 V	650			650			
			5.5 V	975			975			
I _{off}		V _I or V _O = 0 to 5.5 V	0				5			μA
C _i		V _I = V _{CC} or GND	3.3 V	1.9			1.9			pF
			5 V	1.9			1.9			

[†] This test is performed with the terminal in the off-state condition.

timing requirements over recommended operating free-air temperature range, V_{CC} = 2.5 V ± 0.2 V (unless otherwise noted) (see Figure 1)

			T _A = 25°C		SN54LV221A		SN74LV221A		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration	$\overline{CLR}$	6		6.5		6.5		ns
		$\overline{A}$ or B trigger	6		6.5		6.5		

timing requirements over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

			T _A = 25°C		SN54LV221A		SN74LV221A		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration	$\overline{CLR}$	5		5		5		ns
		$\overline{A}$ or B trigger	5		5		5		

timing requirements over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

			T _A = 25°C		SN54LV221A		SN74LV221A		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration	$\overline{CLR}$	5		5		5		ns
		$\overline{A}$ or B trigger	5		5		5		

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54LV221A		SN74LV221A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 15\text{ pF}$	14.6*	31.4*		1*	37*	1	37	ns
	$\overline{\text{CLR}}$	Q or $\overline{Q}$		13.2*	25*		1*	29.5*	1	29.5	
	$\overline{\text{CLR}}$ trigger	Q or $\overline{Q}$		15.2*	33.4*		1*	39*	1	39	
t_{pd}	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 50\text{ pF}$	16.7	36		1	42	1	42	ns
	$\overline{\text{CLR}}$	Q or $\overline{Q}$		15	32.8		1	34.5	1	34.5	
	$\overline{\text{CLR}}$ trigger	Q or $\overline{Q}$		17.4	38		1	44	1	44	
$t_{w}^{\dagger}$		Q or $\overline{Q}$	$C_L = 50\text{ pF}$, $C_{ext} = 28\text{ pF}$, $R_{ext} = 2\text{ k}\Omega$	203	260			320		320	ns
			$C_L = 50\text{ pF}$, $C_{ext} = 0.01\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	90	100	110	90	110	90	110	μs
			$C_L = 50\text{ pF}$, $C_{ext} = 0.1\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	0.9	1	1.1	0.9	1.1	0.9	1.1	ms
$\Delta t_{w}^{\ddagger}$			$C_L = 50\text{ pF}$	± 1							%

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$\dagger t_w$ = Pulse duration at Q and $\overline{Q}$ outputs

$\ddagger \Delta t_w$ = Output pulse-duration variation (Q and $\overline{Q}$) between circuits in same package

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54LV221A		SN74LV221A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 15\text{ pF}$	10.2*	20.6*		1*	24*	1	24	ns
	$\overline{\text{CLR}}$	Q or $\overline{Q}$		9.3*	15.8*		1*	18.5*	1	18.5	
	$\overline{\text{CLR}}$ trigger	Q or $\overline{Q}$		10.6*	22.4*		1*	26*	1	26	
t_{pd}	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 50\text{ pF}$	11.8	24.1		1	27.5	1	27.5	ns
	$\overline{\text{CLR}}$	Q or $\overline{Q}$		10.6	19.3		1	22	1	22	
	$\overline{\text{CLR}}$ trigger	Q or $\overline{Q}$		12.3	25.9		1	29.5	1	29.5	
$t_{w}^{\dagger}$		Q or $\overline{Q}$	$C_L = 50\text{ pF}$, $C_{ext} = 28\text{ pF}$, $R_{ext} = 2\text{ k}\Omega$	186	240			300		300	ns
			$C_L = 50\text{ pF}$, $C_{ext} = 0.01\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	90	100	110	90	110	90	110	μs
			$C_L = 50\text{ pF}$, $C_{ext} = 0.1\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	0.9	1	1.1	0.9	1.1	0.9	1.1	ms
$\Delta t_{w}^{\ddagger}$			$C_L = 50\text{ pF}$	± 1							%

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$\dagger t_w$ = Pulse duration at Q and $\overline{Q}$ outputs

$\ddagger \Delta t_w$ = Output pulse-duration variation (Q and $\overline{Q}$) between circuits in same package

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SN54LV221A, SN74LV221A

DUAL MONOSTABLE MULTIVIBRATORS

WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54LV221A		SN74LV221A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 15\text{ pF}$	7.1*	12*		1*	14*	1	14	ns
	$\overline{CLR}$	Q or $\overline{Q}$		6.5*	9.4*		1*	11*	1	11	
	$\overline{CLR}$ trigger	Q or $\overline{Q}$		7.3*	12.9*		1*	15*	1	15	
t_{pd}	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 50\text{ pF}$	8.2	14		1	16	1	16	ns
	$\overline{CLR}$	Q or $\overline{Q}$		7.4	11.4		1	13	1	13	
	$\overline{CLR}$ trigger	Q or $\overline{Q}$		8.6	14.9		1	17	1	17	
$t_W^\dagger$		Q or $\overline{Q}$	$C_L = 50\text{ pF}$, $C_{ext} = 28\text{ pF}$, $R_{ext} = 2\text{ k}\Omega$	171	200			240		240	ns
			$C_L = 50\text{ pF}$, $C_{ext} = 0.01\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	90	100	110	90	110	90	110	μs
			$C_L = 50\text{ pF}$, $C_{ext} = 0.1\text{ }\mu\text{F}$, $R_{ext} = 10\text{ k}\Omega$	0.9	1	1.1	0.9	1.1	0.9	1.1	ms
$\Delta t_W^\ddagger$			$C_L = 50\text{ pF}$	± 1							%

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$^\dagger t_W$ = Pulse duration at Q and $\overline{Q}$ outputs

$^\ddagger \Delta t_W$ = Output pulse-duration variation (Q and $\overline{Q}$) between circuits in same package

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

PARAMETER	TEST CONDITIONS	V_{CC}	TYP	UNIT
C_{pd} Power dissipation capacitance	$C_L = 50\text{ pF}$, $f = 10\text{ MHz}$	3.3 V	50	pF
		5 V	51	

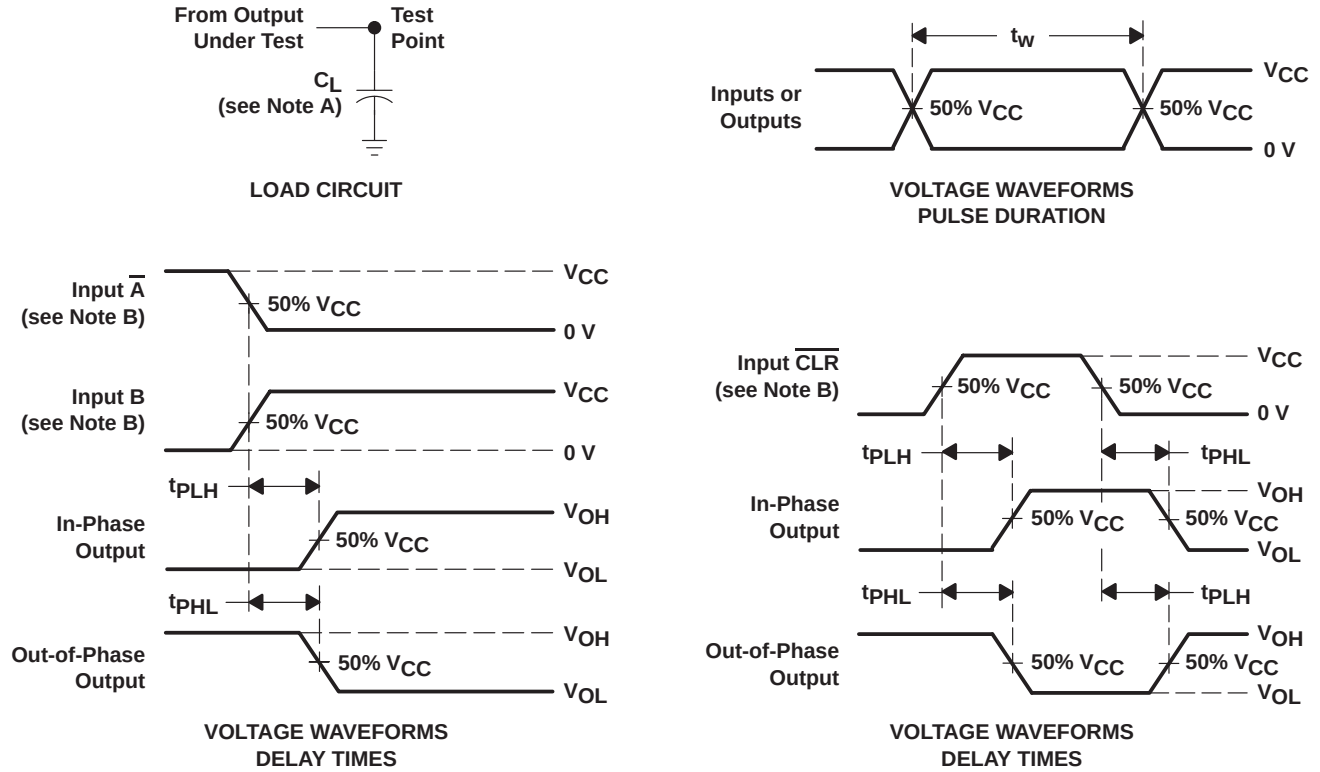
PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r = 3 \text{ ns}$, $t_f = 3 \text{ ns}$.
C. The outputs are measured one at a time, with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

APPLICATION INFORMATION

caution in use

To prevent malfunctions due to noise, connect a high-frequency capacitor between V_{CC} and GND, and keep the wiring between the external components and C_{ext} and R_{ext}/C_{ext} terminals as short as possible.

power-down considerations

Large values of C_{ext} can cause problems when powering down the 'LV221A because of the amount of energy stored in the capacitor. When a system containing this device is powered down, the capacitor can discharge from V_{CC} through the protection diodes at pin 2 or pin 14. Current through the input protection diodes must be limited to 30 mA; therefore, the turn-off time of the V_{CC} power supply must not be faster than $t = V_{CC} \times C_{ext} / 30 \text{ mA}$. For example, if $V_{CC} = 5 \text{ V}$ and $C_{ext} = 15 \text{ pF}$, the V_{CC} supply must turn off no faster than $t = (5 \text{ V}) \times (15 \text{ pF}) / 30 \text{ mA} = 2.5 \text{ ns}$. Usually, this is not a problem because power supplies are heavily filtered and cannot discharge at this rate. When a more rapid decrease of V_{CC} to zero occurs, the 'LV221A can sustain damage. To avoid this possibility, use external clamping diodes.

output pulse duration

The output pulse duration, t_w , is determined primarily by the values of the external capacitance (C_T) and timing resistance (R_T). The timing components are connected as shown in Figure 2.

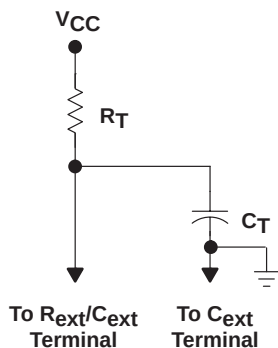


Figure 2. Timing-Component Connections

The pulse duration is given by:

$$t_w = K \times R_T \times C_T \quad (1)$$

if C_T is $\geq 1000 \text{ pF}$, $K = 1.0$

or

if C_T is $< 1000 \text{ pF}$, K can be determined from Figure 7

where:

t_w = pulse duration in ns

R_T = external timing resistance in $k\Omega$

C_T = external capacitance in pF

K = multiplier factor

Equation 1 and Figure 3 or 4 can be used to determine values for pulse duration, external resistance, and external capacitance.

APPLICATION INFORMATION†

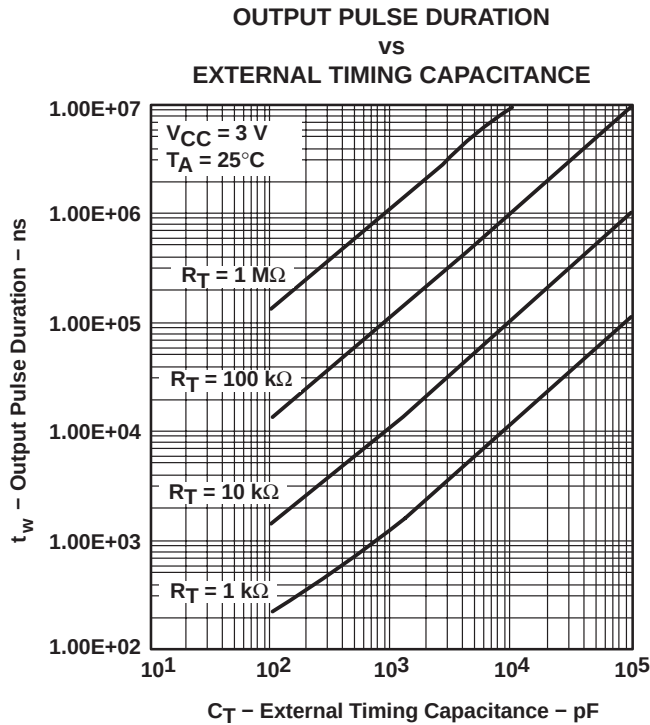


Figure 3

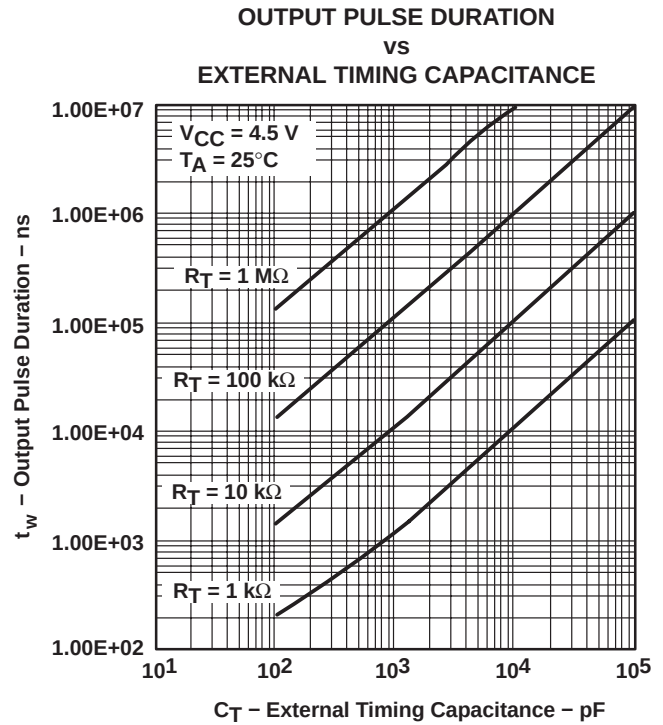


Figure 4

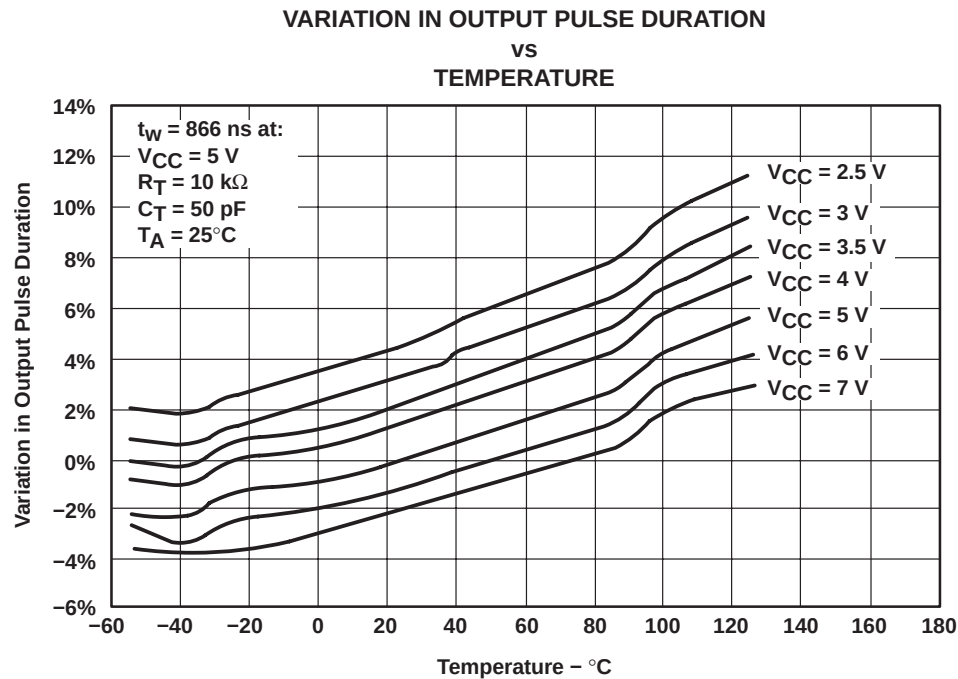


Figure 5

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

SN54LV221A, SN74LV221A DUAL MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS450G – DECEMBER 1999 – REVISED APRIL 2005

APPLICATION INFORMATION[†]

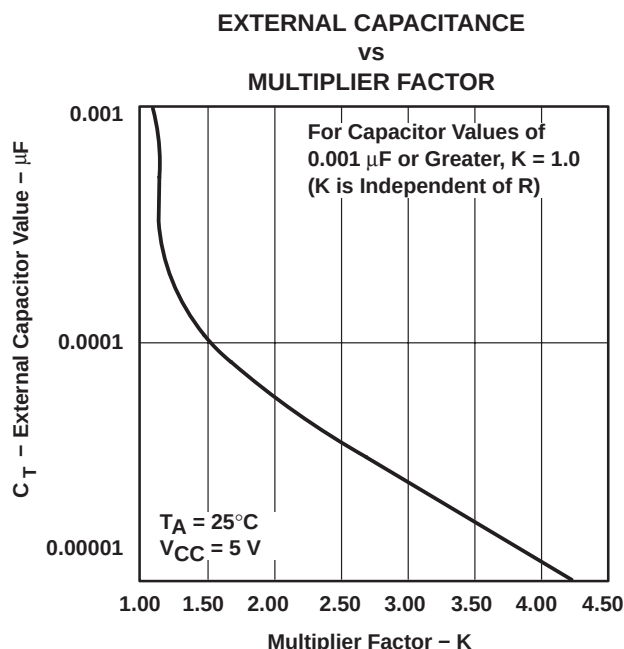


Figure 6

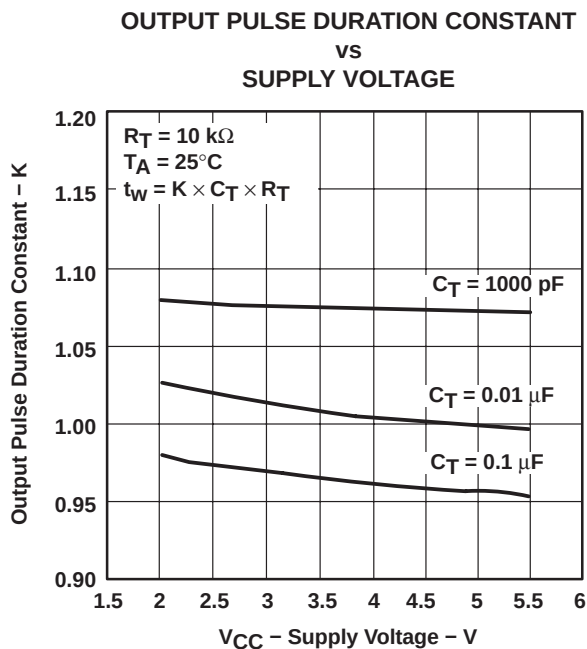


Figure 7

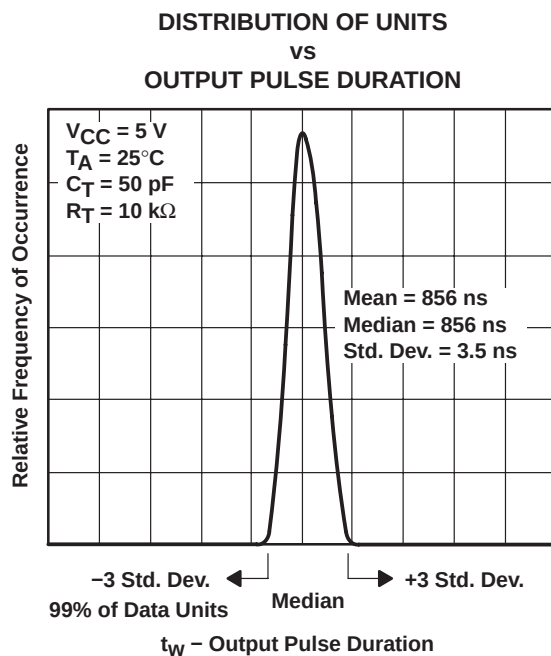


Figure 8

[†] Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74LV221AD	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADBRG4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADGVR	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADGVRE4	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADGVRG4	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ADRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ANSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ANSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221ANSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWTE4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV221APWTG4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

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

ACTIVE: Product device recommended for new designs.

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

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

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

OBsolete: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

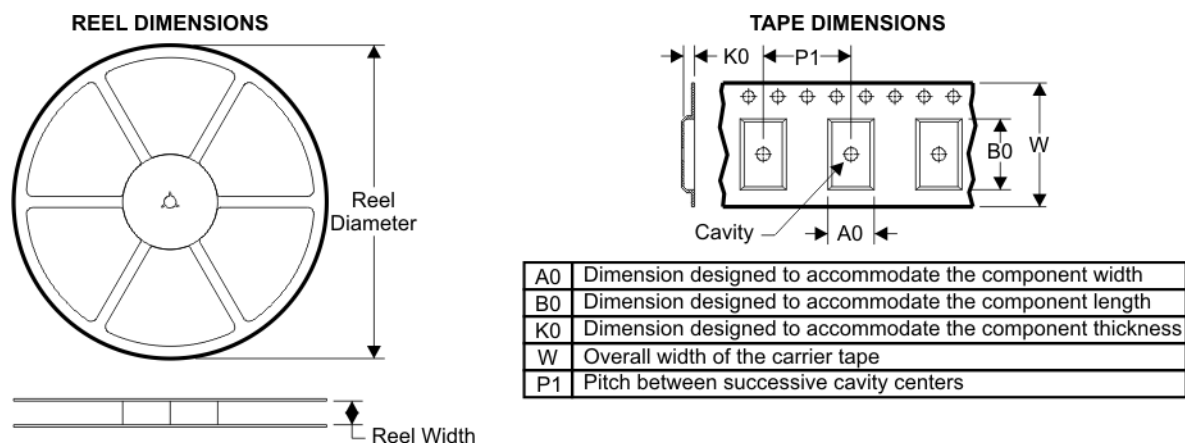
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

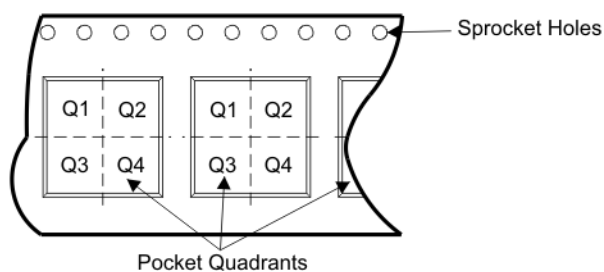
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL BOX INFORMATION

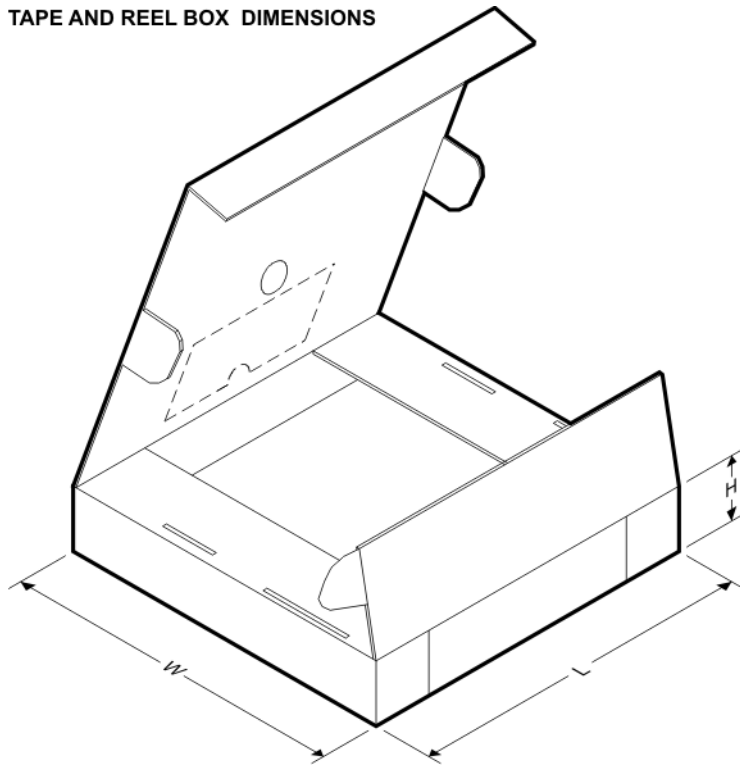


QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LV221ADBR	DB	16	SITE 41	330	16	8.2	6.6	2.5	12	16	Q1
SN74LV221ADGVR	DGV	16	SITE 41	330	12	6.8	4.0	1.6	8	16	Q1
SN74LV221ADR	D	16	SITE 27	330	16	6.5	10.3	2.1	8	16	Q1
SN74LV221ANSR	NS	16	SITE 41	330	16	8.2	10.5	2.5	12	16	Q1
SN74LV221APWR	PW	16	SITE 41	330	12	7.0	5.6	1.6	8	12	Q1

TAPE AND REEL BOX DIMENSIONS

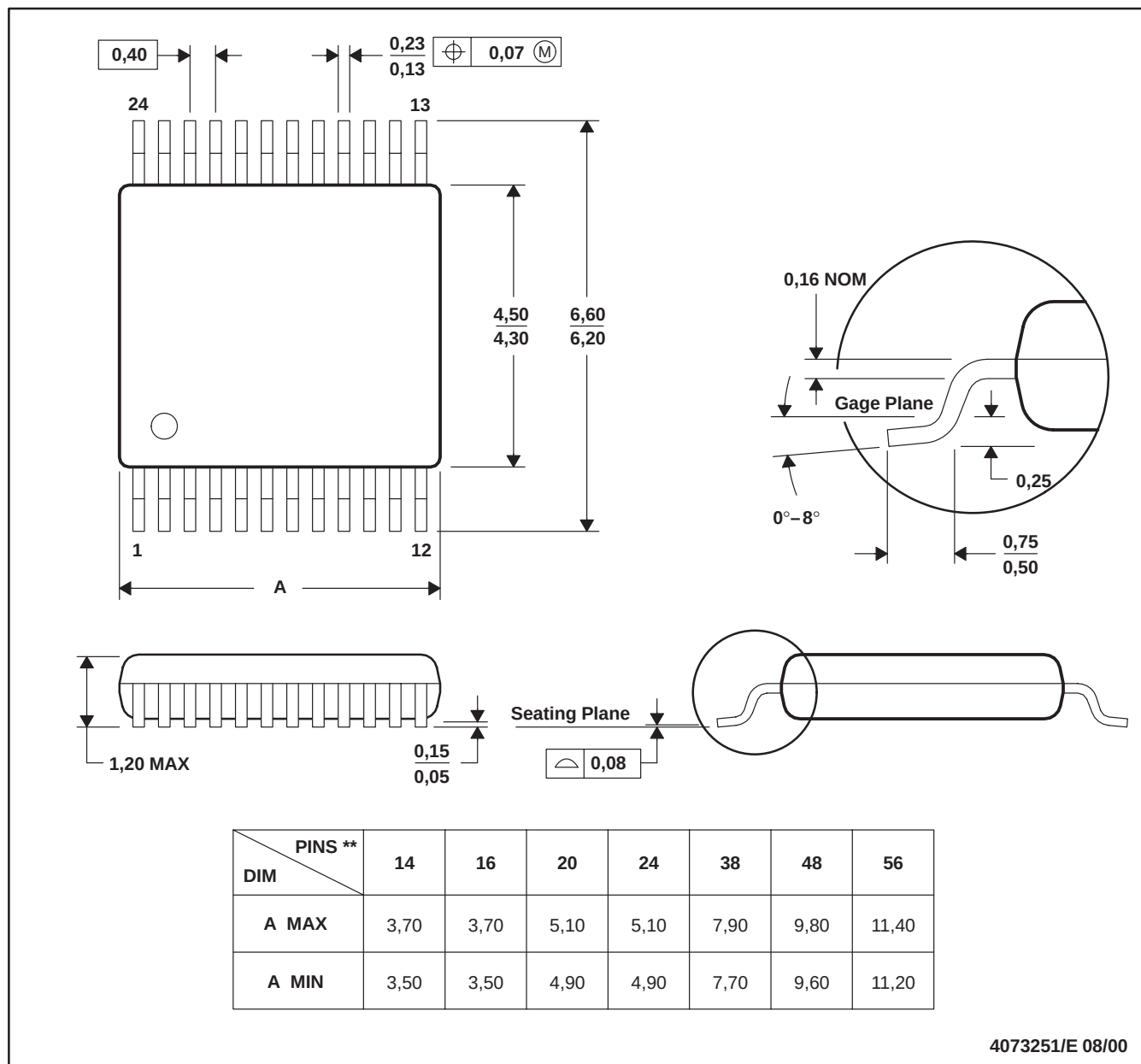


Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
SN74LV221ADBR	DB	16	SITE 41	346.0	346.0	33.0
SN74LV221ADGVR	DGV	16	SITE 41	346.0	346.0	29.0
SN74LV221ADR	D	16	SITE 27	342.9	336.6	28.58
SN74LV221ANSR	NS	16	SITE 41	346.0	346.0	33.0
SN74LV221APWR	PW	16	SITE 41	346.0	346.0	29.0

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

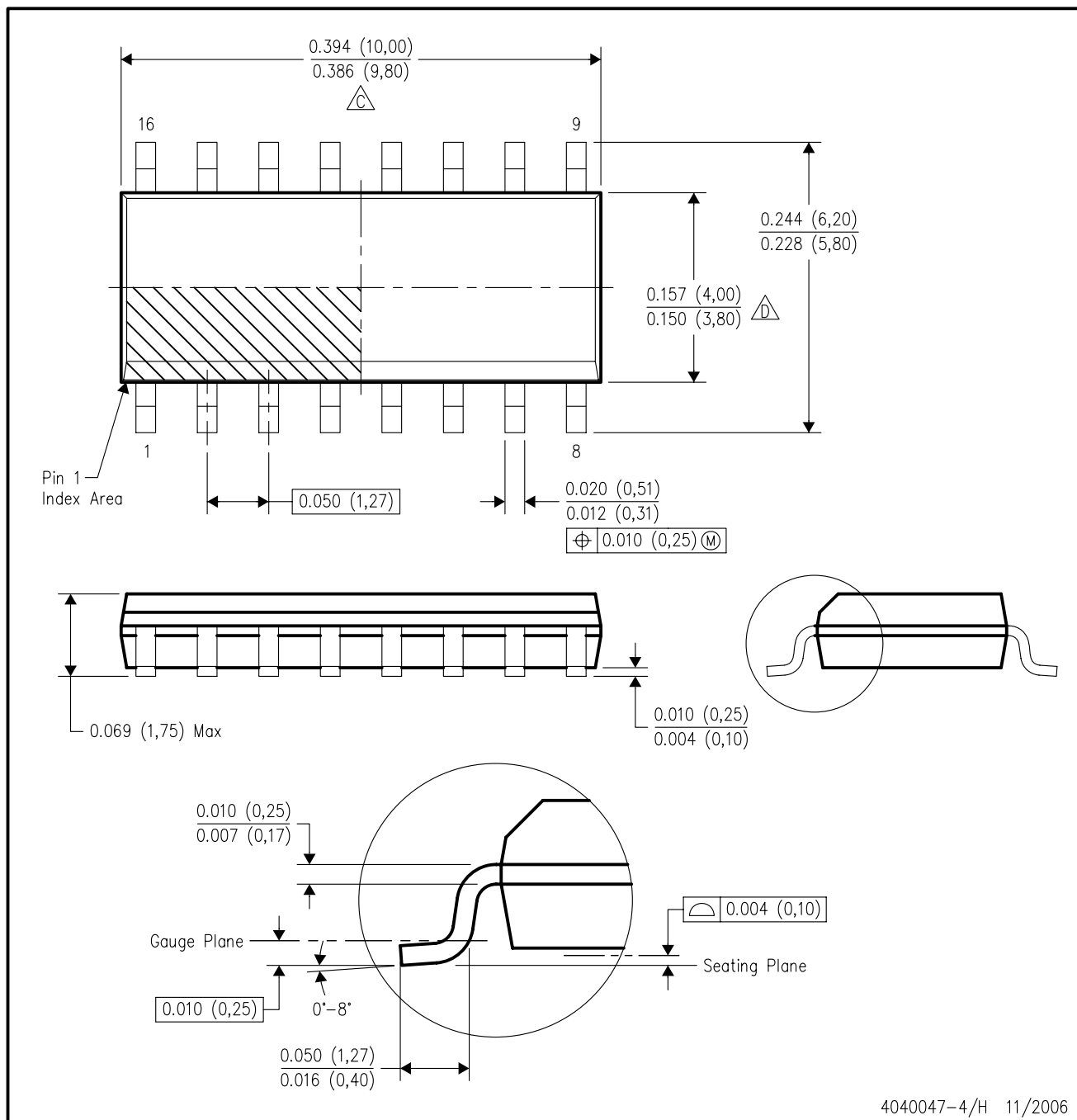
24 PINS SHOWN



- 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, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

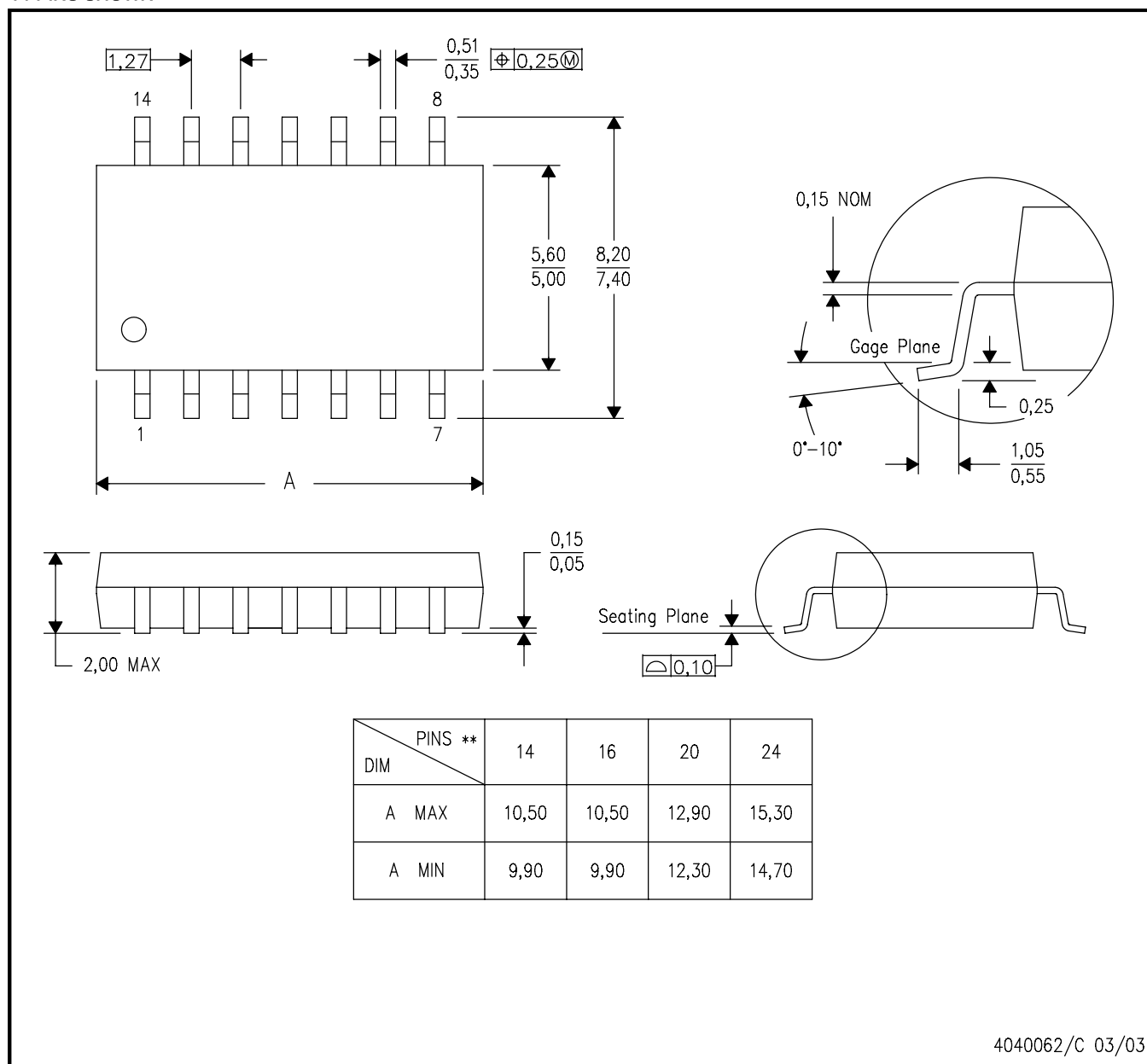
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

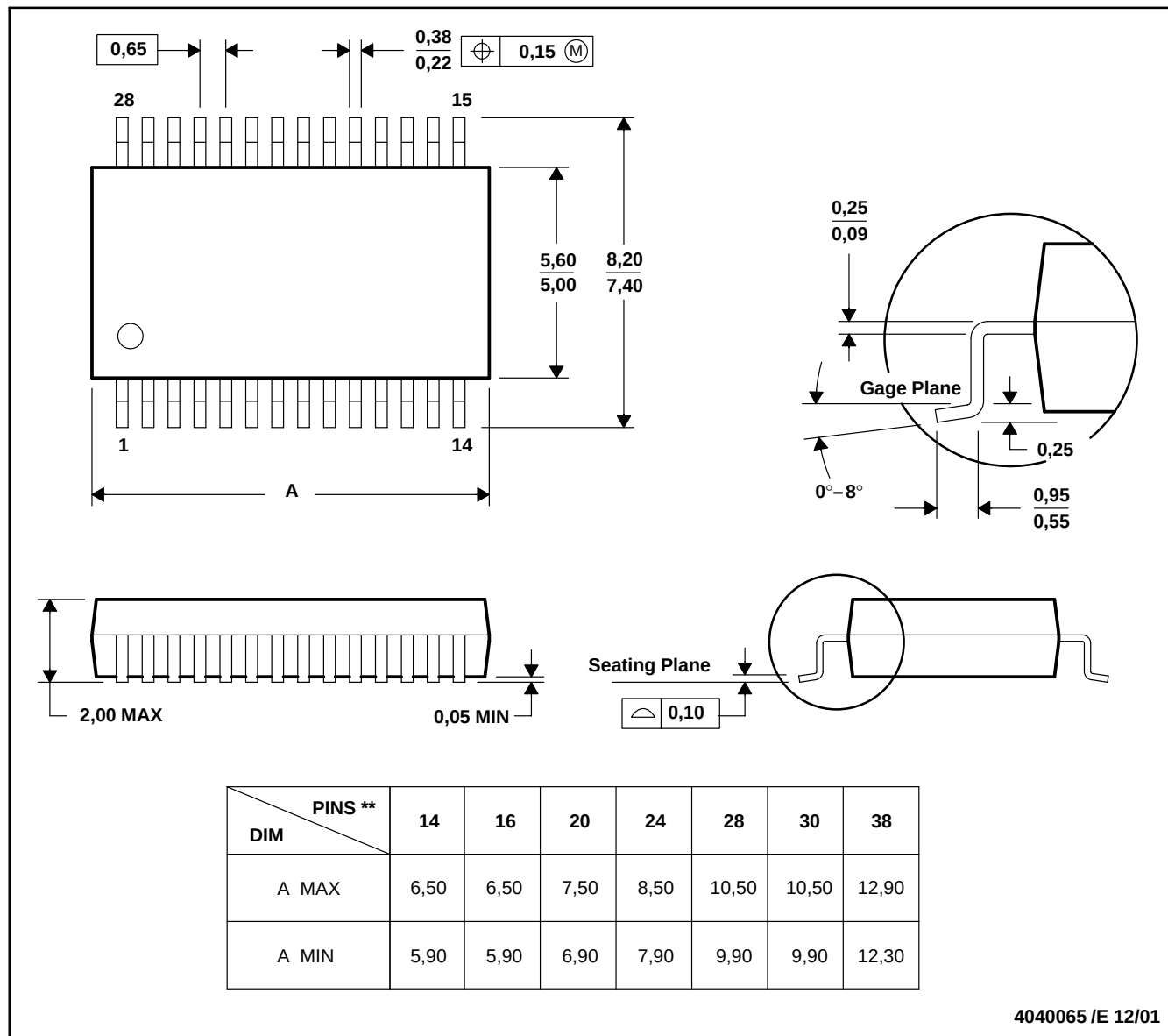


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN

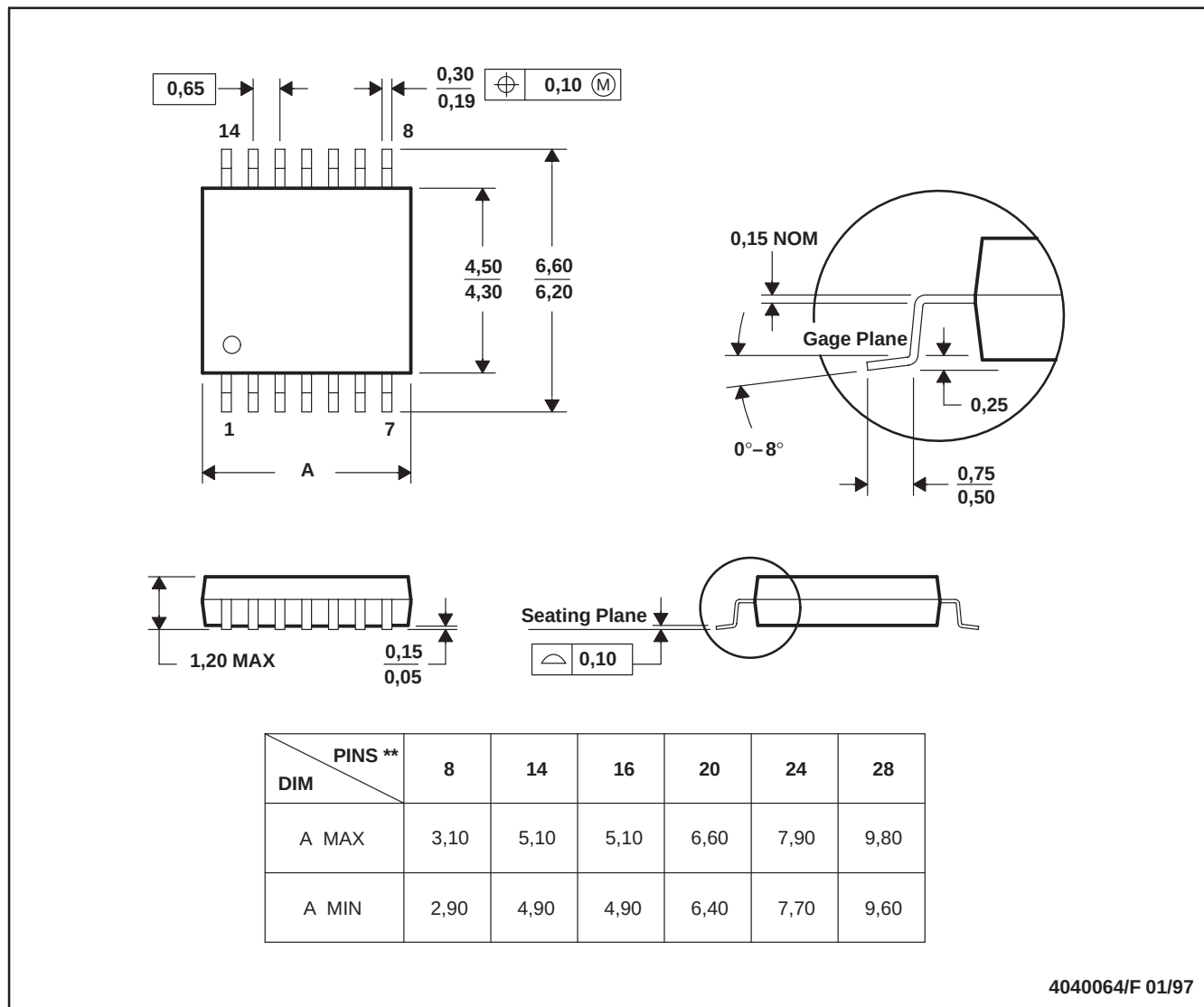


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-150

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



- 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 not to exceed 0,15.
 D. Falls within JEDEC MO-153

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
Low Power Wireless	www.ti.com/lpw

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated