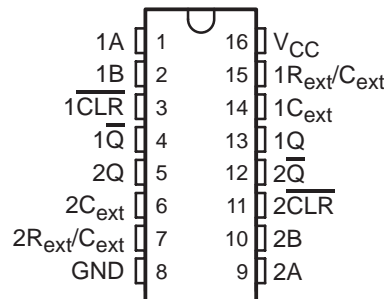- Dual Versions of Highly Stable SN54121 and SN74121 One Shots

- SN54221 and SN74221 Demonstrate Electrical and Switching Characteristics That Are Virtually Identical to the SN54121 and SN74121 One Shots

- Pinout Is Identical to the SN54123, SN74123, SN54LS123, and SN74LS123

- Overriding Clear Terminates Output Pulse

TYPE	MAXIMUM OUTPUT PULSE LENGTH(S)
SN54221	21
SN74221	28
SN54LS221	49
SN74LS221	70

SN54221, SN54LS221 . . . J PACKAGE
SN74221 . . . N PACKAGE
SN74LS221 . . . D, DB, N, OR NS PACKAGE
(TOP VIEW)

```
           _____
    1A  [ 1        16 ]  V_CC
    1B  [ 2        15 ]  1R_ext/C_ext
  1CLR  [ 3        14 ]  1C_ext
    1Q̄  [ 4        13 ]  1Q
    2Q  [ 5        12 ]  2Q̄
 2C_ext [ 6        11 ]  2CLR
2R_ext/C_ext [ 7    10 ]  2B
   GND  [ 8         9 ]  2A
           _____
```

SN54LS221 . . . FK PACKAGE
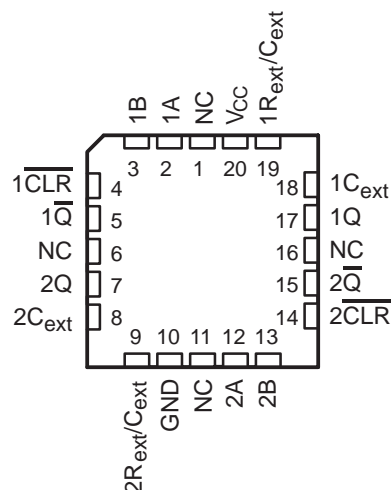**(TOP VIEW)**

NC – No internal connection

description/ordering information

The '221 and 'LS221 devices are dual multivibrators with performance characteristics virtually identical to those of the '121 devices. Each multivibrator features a negative-transition-triggered input and a positive-transition-triggered input, either of which can be used as an inhibit input.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74221N	SN74221N
			SN74LS221N	SN74LS221N
	SOIC – D	Tube	SN74LS221D	LS221
		Tape and reel	SN74LS221DR	
	SOP – NS	Tape and reel	SN74LS221NSR	74LS221
	SSOP – DB	Tape and reel	SN74LS221DBR	LS221
−55°C to 125°C	CDIP – J	Tube	SNJ54221J	SNJ54221J
			SNJ54LS221J	SNJ54LS221J
	LCCC – FK	Tube	SNJ54LS221FK	SNJ54LS221FK

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

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description/ordering information (continued)

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. Schmitt-trigger input circuitry (TTL hysteresis) for B input allows jitter-free triggering from inputs with transition at rates as slow as 1 V/s, providing the circuit with excellent noise immunity, typically of 1.2 V. A high immunity to V_{CC} noise, typically of 1.5 V, also is provided by internal latching circuitry.

Once fired, the outputs are independent of further transitions of the 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 length can be varied from 35 ns to the maximum by choosing appropriate timing components. With $R_{ext} = 2$ kΩ and $C_{ext} = 0$, an output pulse typically of 30 ns is achieved that can be used as a dc-triggered reset signal. Output rise and fall times are TTL compatible and independent of pulse length. Typical triggering and clearing sequences are shown as a part of the switching characteristics waveforms.

Pulse-width stability is achieved through internal compensation and is virtually independent of V_{CC} and temperature. In most applications, pulse stability is limited only by the accuracy of external timing components.

Jitter-free operation is maintained over the full temperature and V_{CC} ranges for more than six decades of timing capacitance (10 pF to 10 μF) and more than one decade of timing resistance (2 kΩ to 30 kΩ for the SN54221, 2 kΩ to 40 kΩ for the SN74221, 2 kΩ to 70 kΩ for the SN54LS221, and 2 kΩ to 100 kΩ for the SN74LS221). Throughout these ranges, pulse width is defined by the relationship: $t_w(out) = C_{ext}R_{ext} \ln 2 \approx 0.7\ C_{ext}R_{ext}$. In circuits where pulse cutoff is not critical, timing capacitance up to 1000 μF and timing resistance as low as 1.4 kΩ can be used. Also, the range of jitter-free output pulse widths is extended if V_{CC} is held to 5 V and free-air temperature is 25°C. Duty cycles as high as 90% are achieved when using maximum recommended R_T. Higher duty cycles are available if a certain amount of pulse-width jitter is allowed.

The variance in output pulse width from device to device typically is less than ±0.5% for given external timing components. An example of this distribution for the '221 is shown in Figure 3. Variations in output pulse width versus supply voltage and temperature for the '221 are shown in Figures 4 and 5, respectively.

Pin assignments for these devices are identical to those of the SN54123/SN74123 or SN54LS123/SN74LS123 so that the '221 or 'LS221 devices can be substituted for those products in systems not using the retrigger by merely changing the value of R_{ext} and/or C_{ext}; however, the polarity of the capacitor must be changed.

FUNCTION TABLE
(each monostable multivibrator)

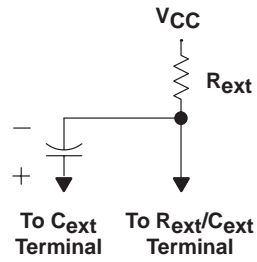| INPUTS			OUTPUTS	
$\overline{\text{CLR}}$	A	B	Q	$\overline{\text{Q}}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⎍†	⎍†
H	↓	H	⎍†	⎍†
↑‡	L	H	⎍†	⎍†

† Pulsed-output patterns are tested during AC switching at 25°C with $R_{ext} = 2$ kΩ, and $C_{ext} = 80$ pF.

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

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timing component connections

V_{CC}

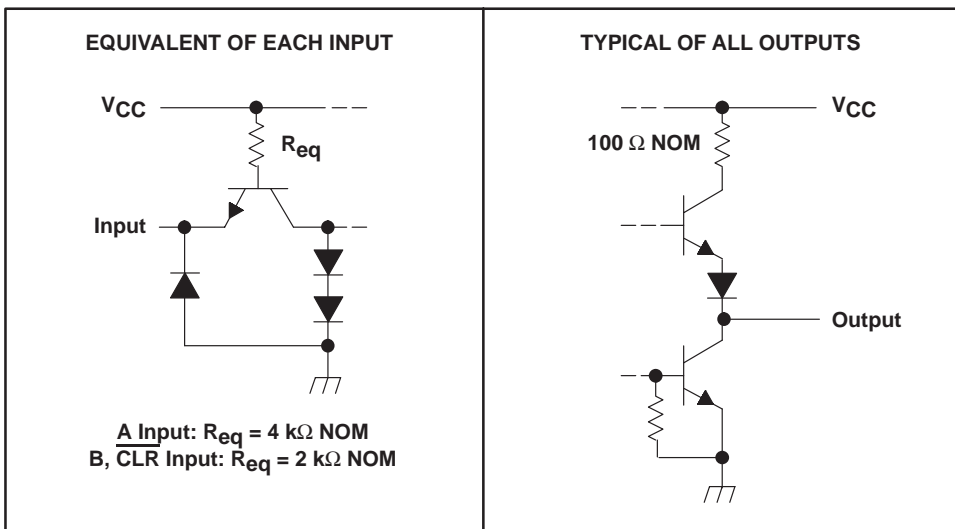R_{ext}

−

+

To C_{ext}
Terminal

To R_{ext}/C_{ext}
Terminal

NOTE: Due to the internal circuit, the R_{ext}/C_{ext} terminal never is more positive than the C_{ext} terminal.

schematics of inputs and outputs

SN54/74221

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS

V_{CC}

R_{eq}

Input

100 Ω NOM

V_{CC}

Output

A Input: R_{eq} = 4 kΩ NOM
B, $\overline{CLR}$ Input: R_{eq} = 2 kΩ NOM

SN54/74LS221

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS

V_{CC}

R_{eq}

Input

V_{CC}

120 Ω NOM

Output

A Input: R_{eq} = 25 kΩ NOM
B Input: R_{eq} = 15.4 kΩ NOM
$\overline{CLR}$: R_{eq} = 12.5 kΩ NOM

![Texas Instruments logo]

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

Supply voltage range, V_{CC} .... 7 V
Input voltage range, V_I (see Note 1): 'LS221 .... 7 V
                        '221 .... 5.5 V
Package thermal impedance, θ_{JA} (see Note 2): D package .... 73°C/W
                                    DB package .... 82°C/W
                                      N package .... 67°C/W
                                      NS package .... 64°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 clamp-current ratings are observed.
       2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

			SN54221			SN74221			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5	5.5	4.75	5	5.25	V
I_{OH}	High-level output current				−800			−800	µA
I_{OL}	Low-level output current				16			16	mA
$\Delta v/\Delta t$	Rise or fall of input pulse rate	B input	1*			1			V/s
		A input	1*			1			V/µs
T_A	Operating free-air temperature		−55		125	0		70	°C

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

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.

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

PARAMETER		TEST CONDITIONS†	SN54221 MIN	SN54221 TYP‡	SN54221 MAX	SN74221 MIN	SN74221 TYP‡	SN74221 MAX	UNIT
V_{T+}	Positive-going threshold voltage, B input	V_{CC} = MIN		1.55	2*		1.55	2	V
V_{T-}	Negative-going threshold voltage, B input	V_{CC} = MIN	0.8*	1.35		0.8	1.35		V
V_{IK}		V_{CC} = MIN, I_I = –12 mA			–1.5			–1.5	V
V_{OH}		V_{CC} = MIN, I_{OH} = –800 µA	2.4	3.4		2.4	3.4		V
V_{OL}		V_{CC} = MIN, I_{OL} = 16 mA		0.2	0.4		0.2	0.4	V
I_I		V_{CC} = MAX, V_I = 5.5 V			1			1	mA
I_{IH}	A input	V_{CC} = MAX, V_I = 2.4 V			40			40	µA
	$\overline{CLR}$, B input				80			80	
I_{IL}	A input	V_{CC} = MAX, V_I = 0.4 V			–1.6			–1.6	mA
	$\overline{CLR}$, B input				–3.2			–3.2	
I_{OS}§		V_{CC} = MAX	–20		–55	–18		–55	mA
I_{CC}	Quiescent	V_{CC} = MAX		26	50*		26	50	mA
	Triggered			46	80*		46	80	

∗ On products compliant to MIL-PRF-38535, this parameter is not production tested.
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

timing requirements over recommended ranges of supply voltage and operating free-air temperature

			SN54221 MIN	SN54221 MAX	SN74221 MIN	SN74221 MAX	UNIT
t_w	Pulse duration	A or B input	50		50		ns
		$\overline{CLR}$	20		20		
t_{su}	Setup time, inactive-state¶	$\overline{CLR}$	15		15		ns
R_{ext}	External timing resistance		1.4*	30*	1.4	40	kΩ
C_{ext}	External timing capacitance		0*	1000*	0	1000	µF
	Output duty cycle	R_{ext} = 2 kΩ		67%		67%	
		R_{ext} = MAX R_{ext}		90%		90%	

∗ On products compliant to MIL-PRF-38535, this parameter is not production tested.
¶ Inactive-state setup time also is referred to as recovery time.

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switching characteristics V_{CC} = 5 V, R_L = 400 Ω, T_A = 25°C (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		SN54221			SN74221			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	A	Q	C_{ext} = 80 pF, R_{ext} = 2 kΩ			45	70		45	70	ns
	B					35	55		35	55	
t_{PHL}	A	$\overline{Q}$				50	80		50	80	
	B					40	65		40	65	
t_{PHL}	$\overline{CLR}$	Q	C_{ext} = 80 pF, R_{ext} = 2 kΩ				27			27	ns
t_{PLH}		$\overline{Q}$					40			40	
t_W	A or B	Q or $\overline{Q}$	C_{ext} = 80 pF,	R_{ext} = 2 kΩ	70	110	150	70	110	150	ns
			C_{ext} = 0,	R_{ext} = 2 kΩ	17	30	50	17	30	50	
			C_{ext} = 100 pF,	R_{ext} = 10 kΩ	650	700	750	650	700	750	
			C_{ext} = 1 μF,	R_{ext} = 10 kΩ	6.5*	7	7.5*	6.5	7	7.5	ms

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

recommended operating conditions (see Note 4)

			SN54LS221			SN74LS221			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5	5.5	4.75	5	5.25	V
I_{OH}	High-level output current				−400			−400	μA
I_{OL}	Low-level output current				4			8	mA
$\Delta v/\Delta t$	Rise or fall of input pulse rate	B input	1*			1			V/s
		A input	1*			1			V/μs
T_A	Operating free-air temperature		−55		125	0		70	°C

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

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

PARAMETER		TEST CONDITIONS†		SN54LS221 MIN	SN54LS221 TYP‡	SN54LS221 MAX	SN74LS221 MIN	SN74LS221 TYP‡	SN74LS221 MAX	UNIT
V_{T+}	Positive-going threshold voltage, B input	V_{CC} = MIN			1	2*		1	2	V
V_{T-}	Negative-going threshold voltage, B input	V_{CC} = MIN		0.7*	0.9		0.8	0.9		V
V_{IK}		V_{CC} = MIN,	I_I = –18 mA			–1.5			–1.5	V
V_{OH}		V_{CC} = MIN,	I_{OH} = –400 µA	2.5	3.4		2.7	3.4		V
V_{OL}		V_{CC} = MIN	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 8 mA					0.35	0.5	
I_I		V_{CC} = MAX,	V_I = 7 V			0.1			0.1	mA
I_{IH}		V_{CC} = MAX,	V_I = 2.7 V			20			20	µA
I_{IL}	A input	V_{CC} = MAX,	V_I = 0.4 V			–0.4			–0.4	mA
	$\overline{CLR}$, B input					–0.8			–0.8	
I_{OS}§		V_{CC} = MAX		–20		–100	–20		–100	mA
I_{CC}	Quiescent	V_{CC} = MAX			4.7	11		4.7	11	mA
	Triggered				19	27*		19	27	

∗ On products compliant to MIL-PRF-38535, this parameter is not production tested.
† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

timing requirements over recommended ranges of supply voltage and operating free-air temperature

			SN54LS221 MIN	SN54LS221 MAX	SN74LS221 MIN	SN74LS221 MAX	UNIT
t_w	Pulse duration	A or B	50		50		ns
		$\overline{CLR}$	40		40		
t_{su}	Setup time, inactive state¶	$\overline{CLR}$	15		15		ns
R_{ext}	External timing resistance		1.4*	70*	1.4	100	kΩ
C_{ext}	External timing capacitance		0*	1000*	0	1000	µF
	Output duty cycle	R_T = 2 kΩ		50%		50%	
		R_T = MAX R_{ext}		90%		90%	

∗ On products compliant to MIL-PRF-38535, this parameter is not production tested.
¶ Inactive-state setup time also is referred to as recovery time.

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switching characteristics V_{CC} = 5 V, R_L = 2 kΩ, T_A = 25°C (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		SN54LS221			SN74LS221			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	A	Q	C_{ext} = 80 pF, R_{ext} = 2 kΩ			45	70		45	70	ns
	B					35	55		35	55	
t_{PHL}	A	$\overline{Q}$				50	80		50	80	
	B					40	65		40	65	
t_{PHL}	$\overline{CLR}$	Q	C_{ext} = 80 pF, R_{ext} = 2 kΩ			35	55		35	55	ns
t_{PLH}		$\overline{Q}$				44	65		44	65	
t_W	A or B	Q or $\overline{Q}$	C_{ext} = 80 pF,	R_{ext} = 2 kΩ	70	120	150	70	120	150	ns
			C_{ext} = 0,	R_{ext} = 2 kΩ	20	47	70	20	47	70	
			C_{ext} = 100 pF,	R_{ext} = 10 kΩ	670	740	810	670	740	810	
			C_{ext} = 1 μF,	R_{ext} = 10 kΩ	6*	6.9	7.5*	6	6.9	7.5	ms

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

PARAMETER MEASUREMENT INFORMATION
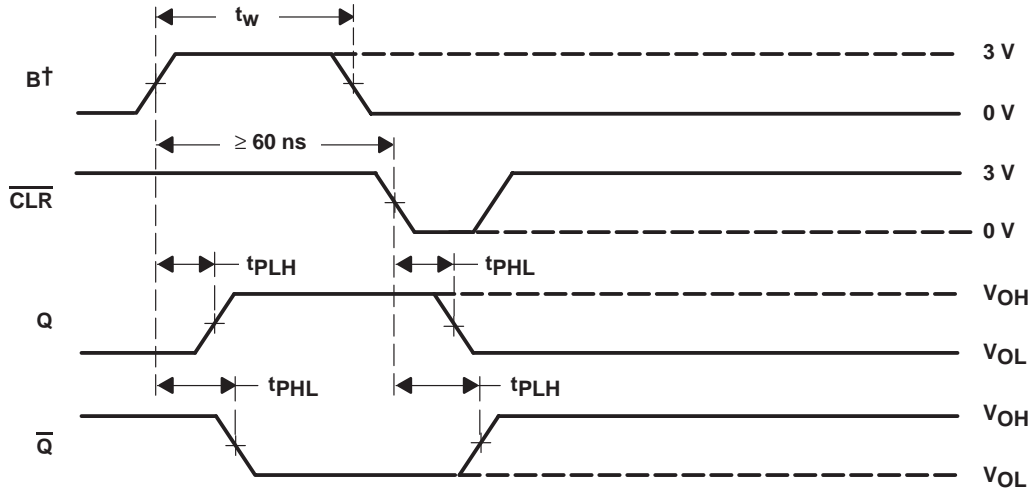
CONDITION 1: TRIGGER FROM B, THEN $\overline{\text{CLR}}$
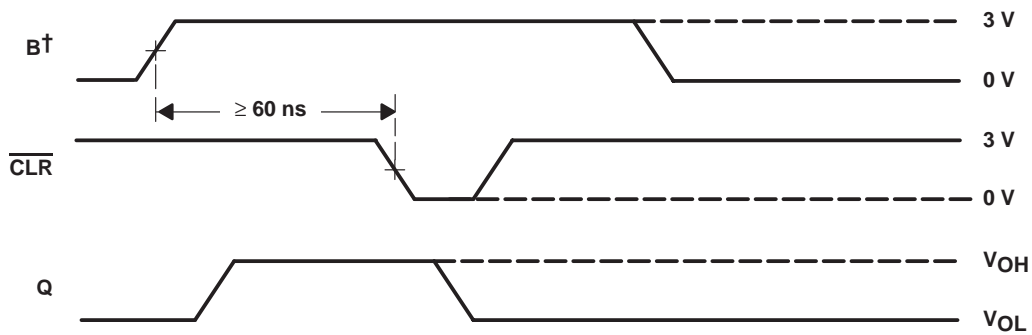
CONDITION 2: TRIGGER FROM B, THEN $\overline{\text{CLR}}$
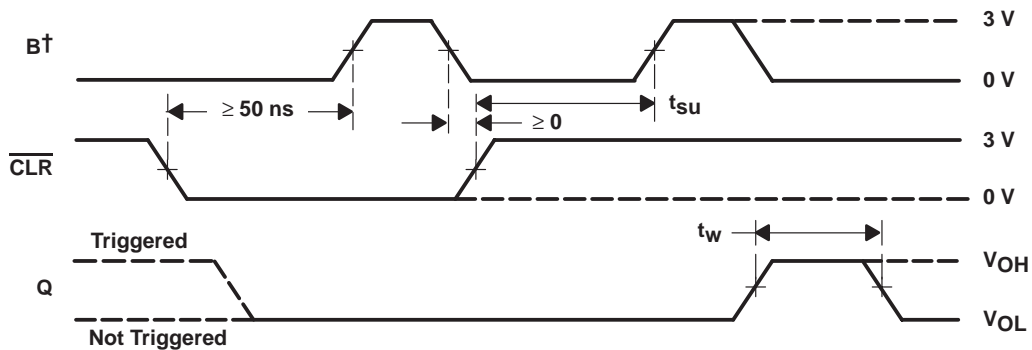
CONDITION 3: $\overline{\text{CLR}}$ OVERRIDING B, THEN TRIGGER FROM B
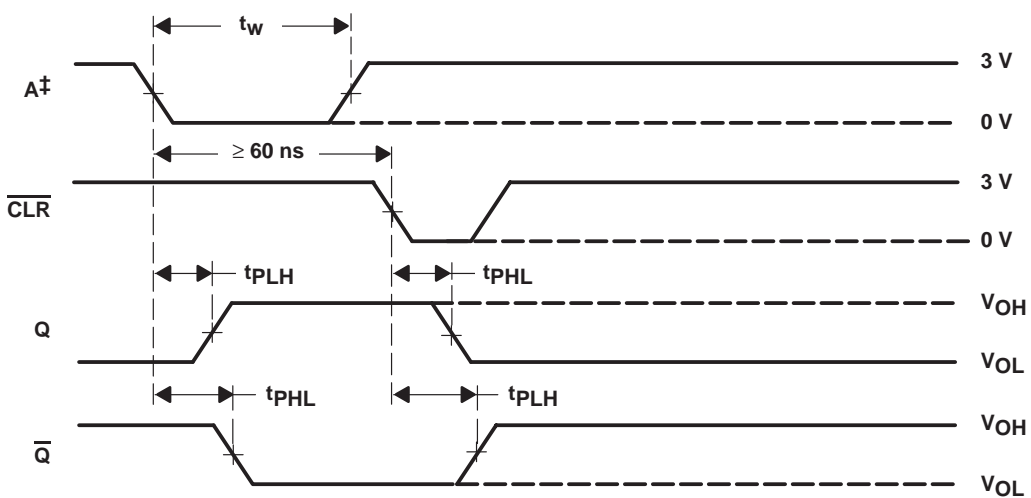
† A is low.

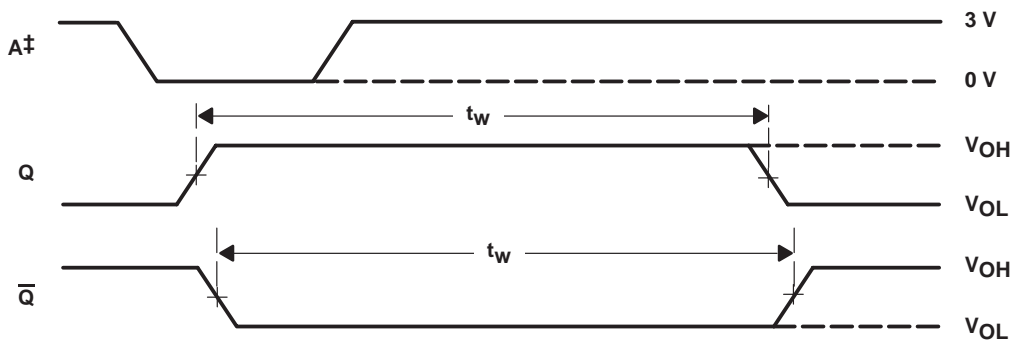**Figure 1. Switching Characteristics**

PARAMETER MEASUREMENT INFORMATION
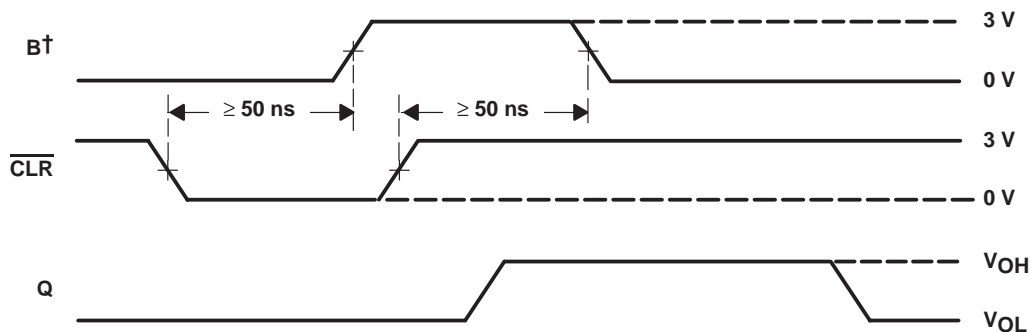
CONDITION 4: TRIGGERING FROM POSITIVE TRANSITION OF $\overline{\text{CLR}}$

CONDITION 5: TRIGGER FROM A, THEN $\overline{\text{CLR}}$

CONDITION 6: TRIGGER FROM A

† A is low.
‡ B and $\overline{\text{CLR}}$ are high.
NOTES: A. Input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O ≈ 50Ω; for SN54/74221, t_r ≤ 7 ns, t_f ≤ 7 ns, for SN54/74LS221, t_r ≤ 15 ns, t_f ≤ 6 ns.
         B. All measurements are made between the 1.5-V points of the indicated transitions for the SN54/74221 or between the 1.3-V points for the SN54/74LS221.

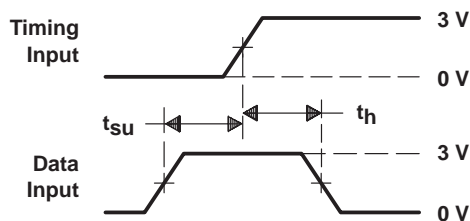**Figure 1. Switching Characteristics (Continued)**
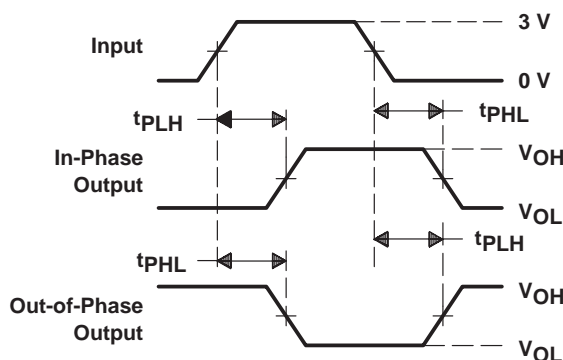
PARAMETER MEASUREMENT INFORMATION
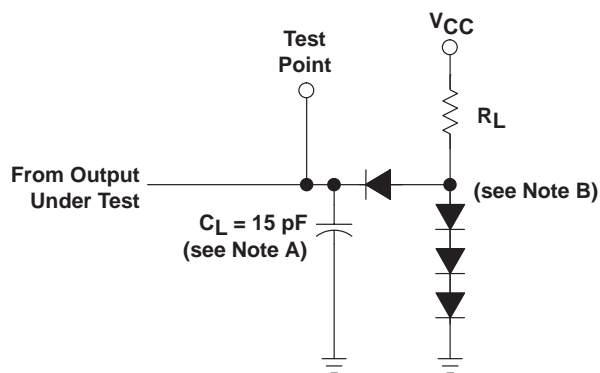
**LOAD CIRCUIT FOR
BI-STATE
TOTEM-POLE OUTPUTS**
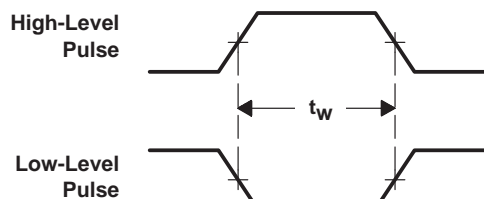
**VOLTAGE WAVEFORMS
PULSE DURATIONS**

**VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES**
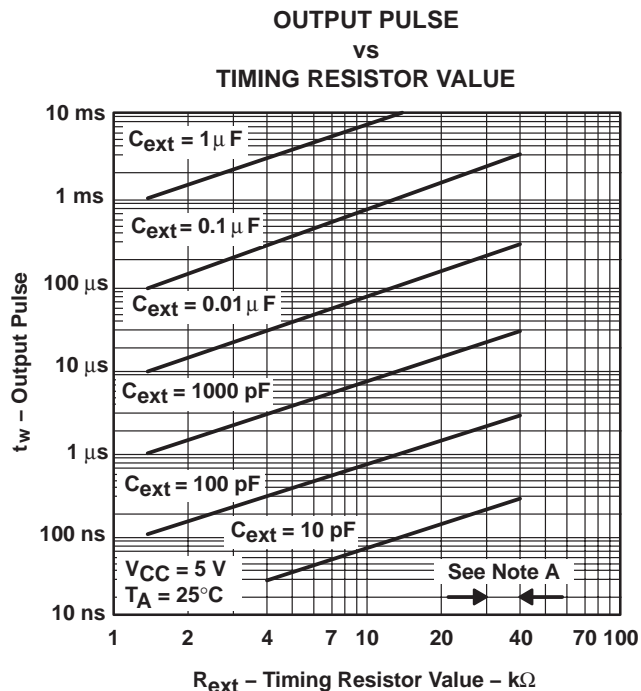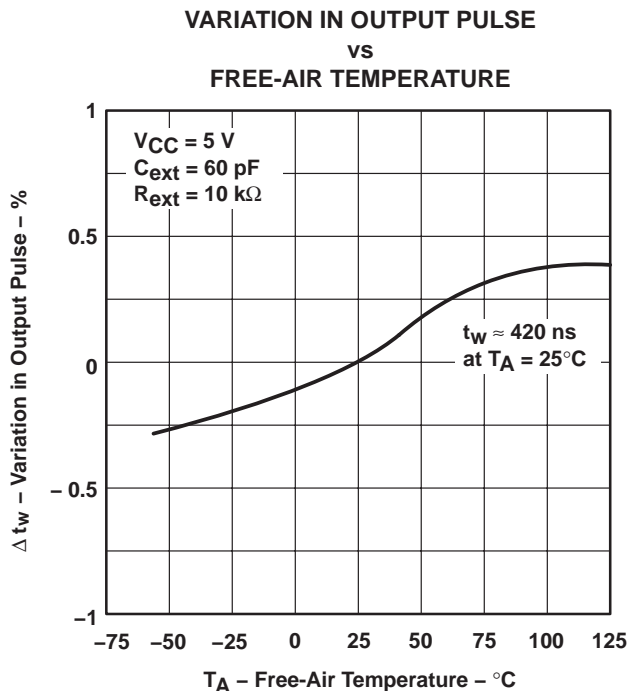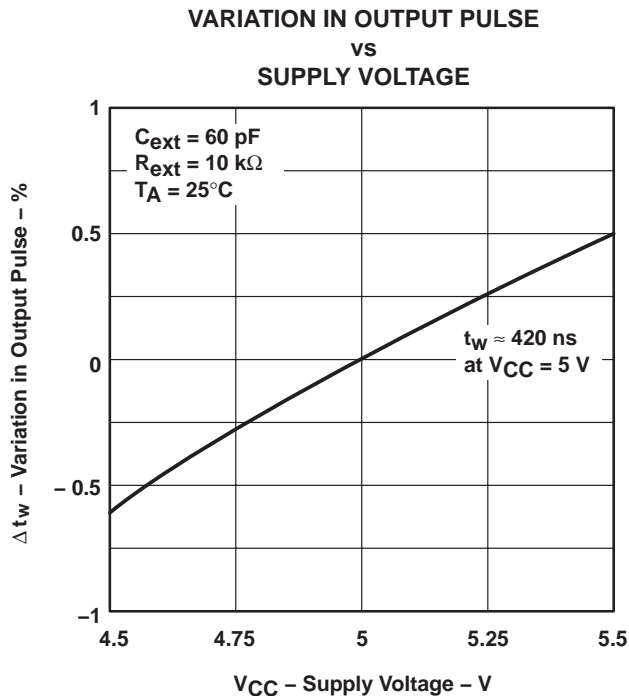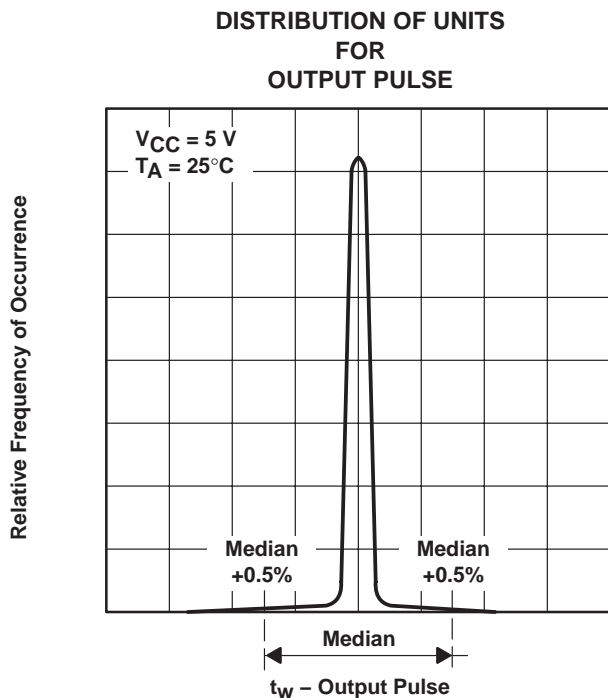
**VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES**

NOTES: A. C_L includes probe and jig capacitance.
B. All diodes are 1N3064 or equivalent.
C. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
D. All input pulses are supplied by generators having the following characteristics: PRR $\leq$ 1 MHz, $Z_O \approx$ 50 Ω and, for SN54/74221, $t_r \leq$ 7 ns, $t_f \leq$ 7 ns, for SN54/74LS221, $t_r \leq$ 15 ns, $t_f \leq$ 6 ns.
E. All measurements are made between the 1.5-V points of the indicated transitions for the SN54/74221 or between the 1.3-V points for the SN54/74LS221.

Figure 2. Load Circuits and Voltage Waveforms

TYPICAL CHARACTERISTICS (SN54/74221 ONLY)[†]

DISTRIBUTION OF UNITS
FOR
OUTPUT PULSE

Figure 3

VARIATION IN OUTPUT PULSE
vs
SUPPLY VOLTAGE

Figure 4

VARIATION IN OUTPUT PULSE
vs
FREE-AIR TEMPERATURE

Figure 5

OUTPUT PULSE
vs
TIMING RESISTOR VALUE

Figure 6

[†] Data for temperatures below 0°C and above 70°C, and for supply voltages below 4.75 V and above 5.25 V are applicable for the SN54221 only.
NOTE A: These values of resistance exceed the maximum recommended for use over the full military temperature range of the SN54221.

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8771101EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8771101EA SNJ54221J	Samples
76042012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	76042012A SNJ54LS 221FK	Samples
7604201EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7604201EA SNJ54LS221J	Samples
7604201FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7604201FA SNJ54LS221W	Samples
JM38510/31402B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 31402B2A	Samples
JM38510/31402BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 31402BEA	Samples
JM38510/31402BFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 31402BFA	Samples
M38510/31402B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 31402B2A	Samples
M38510/31402BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 31402BEA	Samples
M38510/31402BFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 31402BFA	Samples
SN54221J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54221J	Samples
SN54LS221J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS221J	Samples
SN74221N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74221N	Samples
SN74221NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74221N	Samples
SN74LS221D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LS221DBRG4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS221	Samples
SN74LS221N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS221N	Samples
SN74LS221N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS221NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS221N	Samples
SN74LS221NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS221	Samples
SN74LS221NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS221	Samples
SN74LS221NSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS221	Samples
SNJ54221J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-8771101EA SNJ54221J	Samples
SNJ54LS221FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	76042012A SNJ54LS 221FK	Samples
SNJ54LS221J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7604201EA SNJ54LS221J	Samples
SNJ54LS221W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7604201FA SNJ54LS221W	Samples

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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.

OTHER QUALIFIED VERSIONS OF SN54221, SN54LS221, SN74221, SN74LS221 :

● Catalog: SN74221, SN74LS221

● Military: SN54221, SN54LS221

NOTE: Qualified Version Definitions:

   ● Catalog - TI's standard catalog product

   ● Military - QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSIONS

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

TAPE AND REEL INFORMATION

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS221DBR	SSOP	DB	16	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74LS221DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74LS221NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS

*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS221DBR	SSOP	DB	16	2000	367.0	367.0	38.0
SN74LS221DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74LS221NSR	SO	NS	16	2000	367.0	367.0	38.0

J (R-GDIP-T**)   CERAMIC DUAL IN-LINE PACKAGE

14 LEADS SHOWN

DIM / PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	——	——	——	——
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

B

14   8

1   7

0.065 (1,65)
0.045 (1,14)

C

0.005 (0,13) MIN

0.060 (1,52)
0.015 (0,38)

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

0.026 (0,66)
0.014 (0,36)

0.100 (2,54)

A

0°-15°

0.014 (0,36)
0.008 (0,20)

4040083/F 03/03

NOTES: A. All linear dimensions are in inches (millimeters).
         B. This drawing is subject to change without notice.
         C. This package is hermetically sealed with a ceramic lid using glass frit.
         D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
         E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R−GDFP−F16)   CERAMIC DUAL FLATPACK
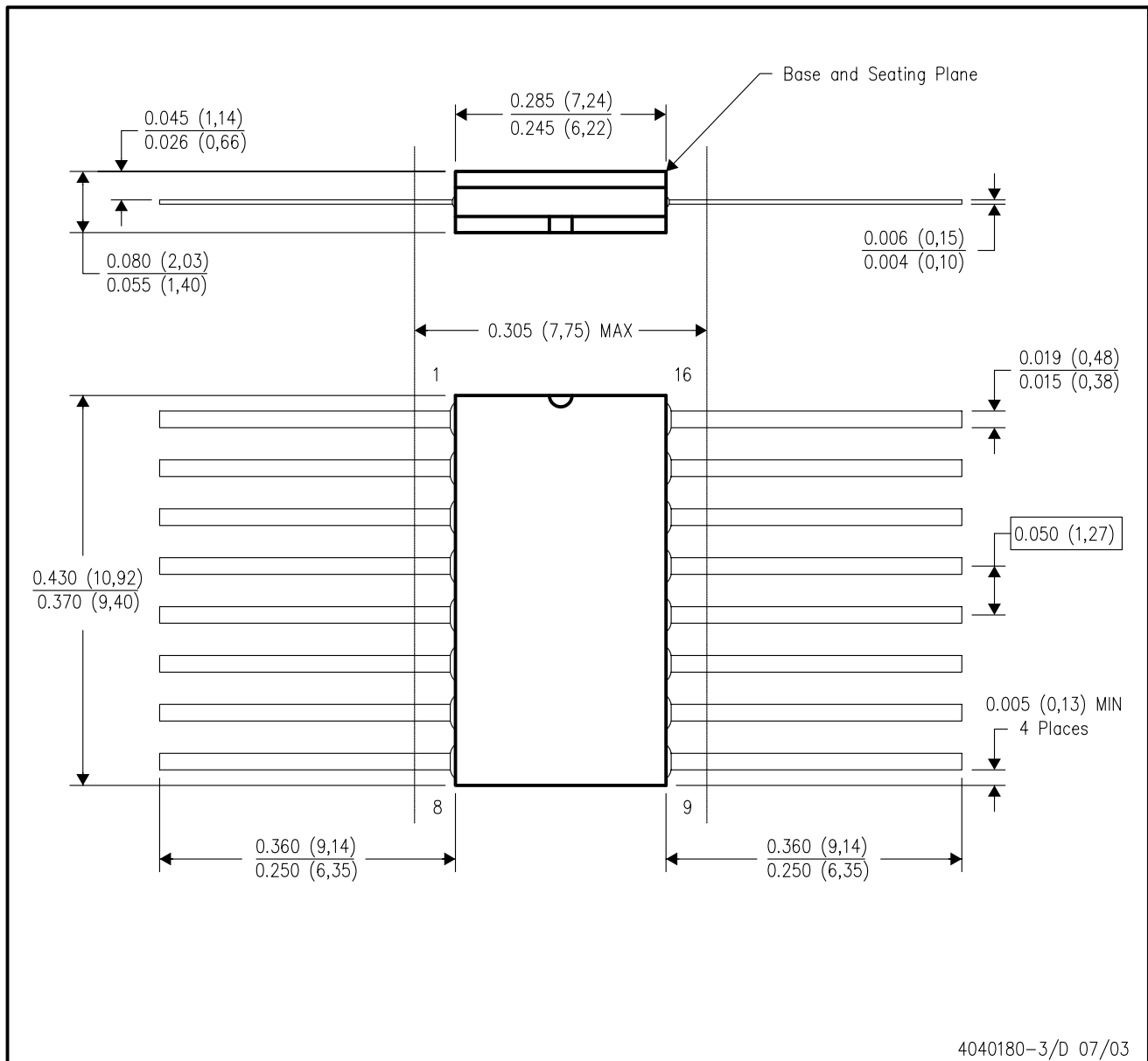
Base and Seating Plane

0.045 (1,14)
0.026 (0,66)

0.285 (7,24)
0.245 (6,22)

0.080 (2,03)
0.055 (1,40)

0.006 (0,15)
0.004 (0,10)

0.305 (7,75) MAX

0.019 (0,48)
0.015 (0,38)

1   16

0.050 (1,27)

0.430 (10,92)
0.370 (9,40)

0.005 (0,13) MIN
4 Places

8   9

0.360 (9,14)
0.250 (6,35)

0.360 (9,14)
0.250 (6,35)

4040180−3/D 07/03

NOTES: A. All linear dimensions are in inches (millimeters).
         B. This drawing is subject to change without notice.
         C. This package can be hermetically sealed with a ceramic lid using glass frit.
         D. Index point is provided on cap for terminal identification only.
         E. Falls within MIL STD 1835 GDFP1−F16 and JEDEC MO−092AC

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FK (S−CQCC−N**)   LEADLESS CERAMIC CHIP CARRIER
28 TERMINAL SHOWN

NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)

$\frac{0.020\ (0,51)}{0.010\ (0,25)}$

$\frac{0.020\ (0,51)}{0.010\ (0,25)}$

$\frac{0.080\ (2,03)}{0.064\ (1,63)}$

$\frac{0.055\ (1,40)}{0.045\ (1,14)}$

$\frac{0.045\ (1,14)}{0.035\ (0,89)}$

$\frac{0.028\ (0,71)}{0.022\ (0,54)}$ 0.050 (1,27) $\frac{0.045\ (1,14)}{0.035\ (0,89)}$

4040140/D 01/11

NOTES: A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
         C.   This package can be hermetically sealed with a metal lid.
         D.   Falls within JEDEC MS−004

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N (R−PDIP−T**)   **PLASTIC DUAL−IN−LINE PACKAGE**

16 PINS SHOWN

DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS−001 VARIATION ⚠C	AA	BB	AC	AD

0.260 (6,60)
0.240 (6,10)

0.070 (1,78)
0.045 (1,14) ⚠D

0.045 (1,14)
0.030 (0,76) ⚠D

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0.021 (0,53)
0.015 (0,38)

⊕ 0.010 (0,25) Ⓜ

14/18 Pin Only
20 Pin vendor option ⚠D

0.325 (8,26)
0.300 (7,62)

0.015 (0,38)

Gauge Plane

0.010 (0,25) NOM

0.430 (10,92) MAX

4040049/E 12/2002

NOTES: A. All linear dimensions are in inches (millimeters).
         B. This drawing is subject to change without notice.
     ⚠C   Falls within JEDEC MS−001, except 18 and 20 pin minimum body length (Dim A).
     ⚠D   The 20 pin end lead shoulder width is a vendor option, either half or full width.

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D (R−PDSO−G16)   PLASTIC SMALL OUTLINE

0.394 (10,00)
0.386 (9,80)
⚠C

16   9

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80) ⚠D

1   8

Pin 1
Index Area

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⊕ 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.005 (0,13)

0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)   0°–8°

0.050 (1,27)
0.016 (0,40)
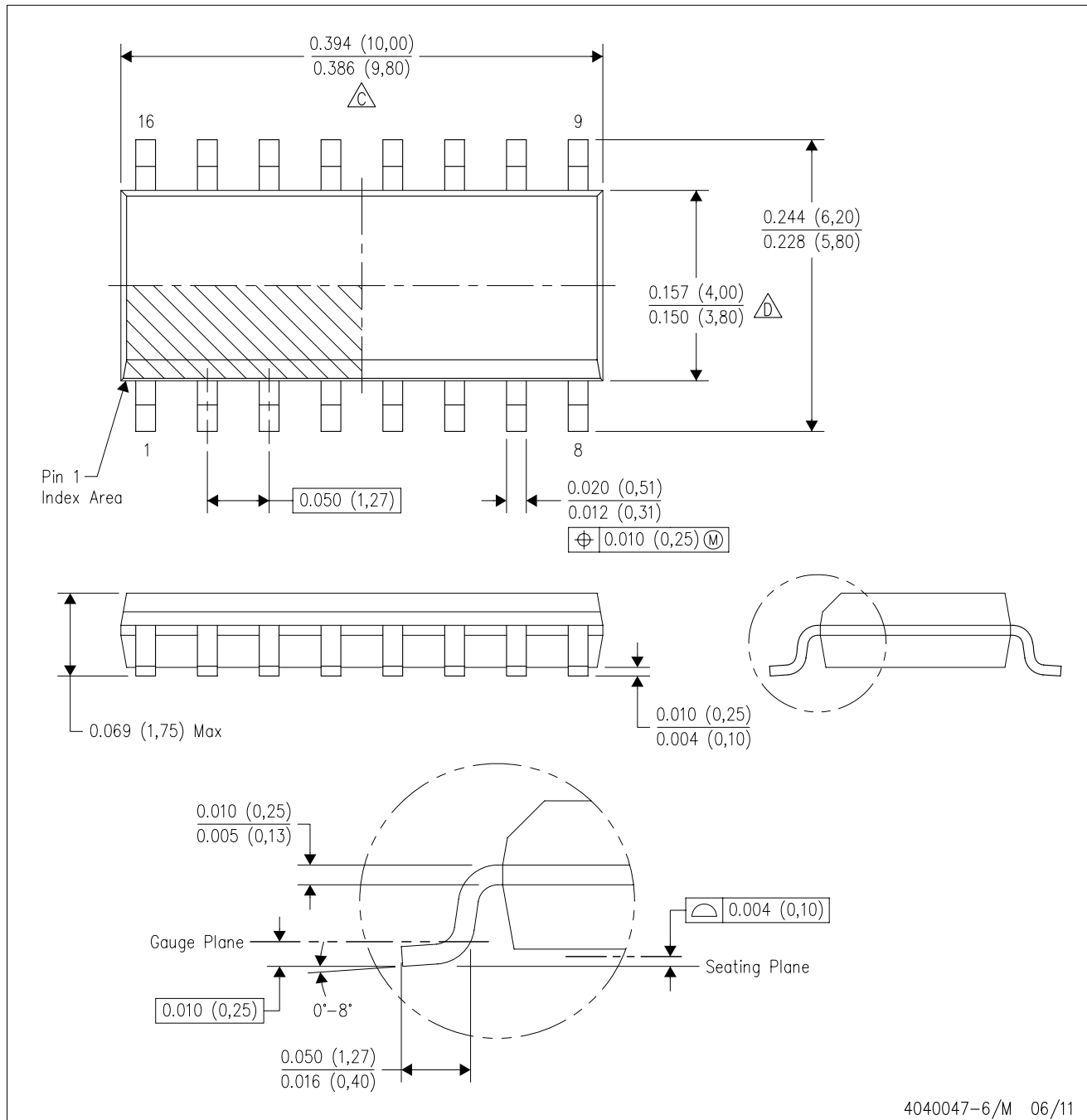
4040047-6/M   06/11

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 0.006 (0,15) each side.
       ⚠D Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
         E. Reference JEDEC MS−012 variation AC.

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D (R–PDSO–G16)   PLASTIC SMALL OUTLINE

Example Board Layout
(Note C)

Stencil Openings
(Note D)

14x1,27

16x0,55

14x1,27

16x1,50

5,40

5.40

Example
Non Soldermask Defined Pad

Example
Pad Geometry
(See Note C)

0,60

1,55

Example
Solder Mask Opening
(See Note E)

0,07

All Around

4211283–4/E 08/12

NOTES: A. All linear dimensions are in millimeters.
          B. This drawing is subject to change without notice.
          C. Publication IPC–7351 is recommended for alternate designs.
          D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should
              contact their board assembly site for stencil design recommendations. Refer to IPC–7525 for other stencil recommendations.
          E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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NS (R-PDSO-G)**   PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

	PINS **	14	16	20	24
DIM					
A MAX		10,50	10,50	12,90	15,30
A MIN		9,90	9,90	12,30	14,70

4040062/C 03/03

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

PINS ** DIM	14	16	20	24	28	30	38
A MAX	6,50	6,50	7,50	8,50	10,50	10,50	12,90
A MIN	5,90	5,90	6,90	7,90	9,90	9,90	12,30

4040065 /E 12/01

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

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