

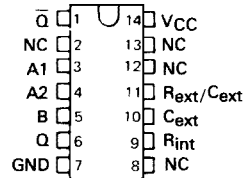
TYPES SN54121, SN54L121, SN74121 MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

REVISED MAY 1983

- Programmable Output Pulse Width
With R_{int} . . . 35 ns Typ
With R_{ext}/C_{ext} . . . 40 ns to 28 Seconds
- Internal Compensation for Virtual Temperature Independence
- Jitter-Free Operation up to 90% Duty Cycle
- Inhibit Capability

SN54121 . . . J OR W PACKAGE
SN54L121 . . . J PACKAGE
SN74121 . . . J OR N PACKAGE

(TOP VIEW)



NC - No internal connection.

FUNCTION TABLE

INPUTS			OUTPUTS	
A1	A2	B	Q	\bar{Q}
L	X	H	L	H
X	L	H	L \uparrow	H \uparrow
X	X	L	L \uparrow	H \uparrow
H	H	X	L \uparrow	H \uparrow
H	\downarrow	H		
\downarrow	H	H		
\downarrow	\downarrow	H		
L	X	\uparrow		
X	L	\uparrow		

For explanation of function table symbols, see page

\uparrow These lines of the function table assume that the indicated steady-state conditions at the A and B inputs have been setup long enough to complete any pulse started before the setup.

description

These multivibrators feature dual negative-transition-triggered inputs and a single positive-transition-triggered input which can be used as an inhibit input. Complementary output pulses are provided.

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 the B input allows jitter-free triggering from inputs with transition rates as slow as 1 volt/second, providing the circuit with an excellent noise immunity of typically 1.2 volts. A high immunity to V_{CC} noise of typically 1.5 volts is also provided by internal latching circuitry.

Once fired, the outputs are independent of further transitions of the inputs and are a function only of the timing components. Input pulses may be of any duration relative to the output pulse. Output pulse length may be varied from 40 nanoseconds to 28 seconds by choosing appropriate timing components. With no external timing components (i.e., R_{int} connected to V_{CC} , C_{ext} and R_{ext}/C_{ext} open), an output pulse of typically 30 or 35 nanoseconds is achieved which may be used as a d-c triggered reset signal. Output rise and fall times are TTL compatible and independent of pulse length.

Pulse width stability is achieved through internal compensation and is virtually independent of V_{CC} and temperature. In most applications, pulse stability will only be limited 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 μ F) and more than one decade of timing resistance (2 k Ω to 30 k Ω for the SN54121/SN54L121 and 2 k Ω to 40 k Ω for the SN74121). Throughout these ranges, pulse width is defined by the relationship $t_{w(out)} = C_{ext}RT \ln 2 \approx 0.7 C_{ext}RT$. In circuits where pulse cutoff is not critical, timing capacitance up to 1000 μ F and timing resistance as low as 1.4 k Ω may be used. Also, the range of jitter-free output pulse widths is extended if V_{CC} is held to 5 volts and free-air temperature is 25 $^{\circ}$ C. Duty cycles as high as 90% are achieved when using maximum recommended RT . Higher duty cycles are available if a certain amount of pulse-width jitter is allowed.

PRODUCTION DATA

This document contains 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.

TEXAS
INSTRUMENTS

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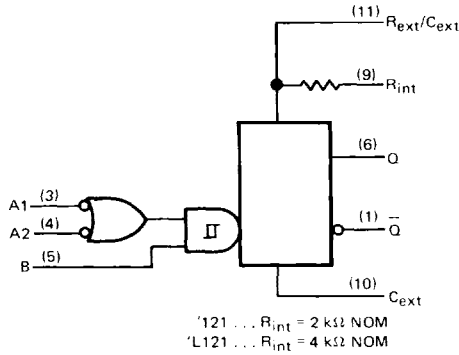
3

TTL DEVICES

3-471

TYPES SN54121, SN54L121, SN74121 MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

logic diagram (positive logic)



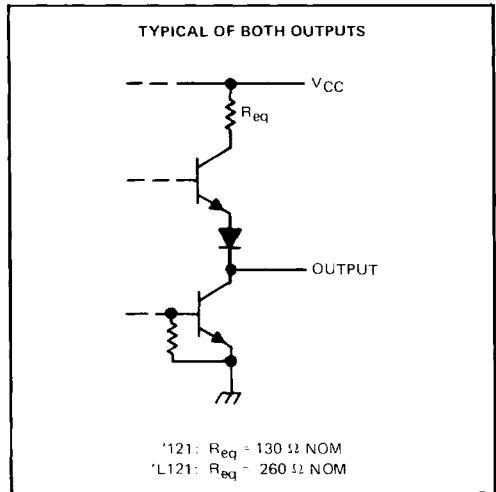
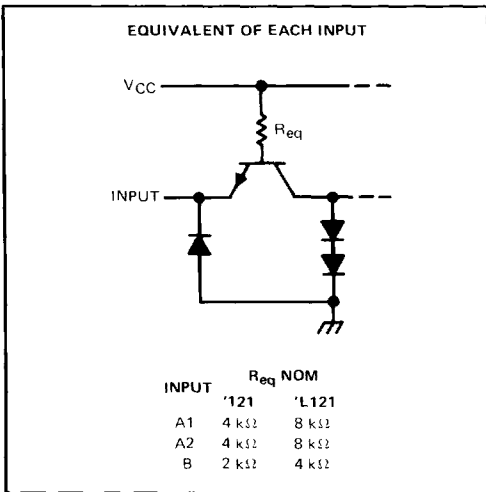
Pin numbers shown on logic notation are for J or N packages.

- NOTES: 1. An external capacitor may be connected between C_{ext} (positive) and R_{ext}/C_{ext} .
2. To use the internal timing resistor, connect R_{int} to V_{CC} . For improved pulse width accuracy and repeatability, connect an external resistor between R_{ext}/C_{ext} and V_{CC} with R_{int} open-circuited.

schematics of inputs and outputs

3

TTL DEVICES



TYPES SN54121, SN54L121, SN74121 MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

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

Supply voltage, V_{CC} (see Note 1) '121.....	7 V
'L121.....	8 V
Input voltage:	5.5 V
Operating free-air temperature range: SN54121, SN54L121	-55°C to 125°C
SN74121	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.

recommended operating conditions

		SN54121 SN74121			SN54L121			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	54 Family	4.5	5	5.5	4.5	5	5.5	V
	74 Family	4.75	5	5.25				
I_{OH} High-level output current				-0.4			-0.2	mA
I_{OL} Low-level output current				16			8	mA
dv/dt Rate of rise or fall of input pulse	Schmitt input, B	1			1			V/s
	Logic inputs, A1, A2	1			1			V/ μ s
$t_{w(in)}$ Input pulse width		50			100			ns
R_{ext} External timing capacitance	54 Family	1.4		30	1.4		30	k Ω
	74 Family	1.4		40				
C_{ext} External timing capacitance		0		1000	0		1000	μ F
Duty cycle	$R_T = 2\text{ k}\Omega$			67			67	%
	$R_T = \text{MAX } R_{ext}$			90			90	
T_A Operating free-air temperature	54 Family	-55		125	-55		125	°C
	74 Family	0		70				

3

TTL DEVICES

TYPES SN54121, SN54L121, SN74121

MONOSTABLE MULTIVIBRATORS

WITH SCHMITT-TRIGGER INPUTS

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

PARAMETER	TEST CONDITIONS†	SN54121 SN74121		SN54L121		UNIT	
		MIN	TYP‡	MAX	MIN		TYP‡
V _{T+}	Positive-going threshold voltage at A input	V _{CC} = MIN					V
V _{T-}	Negative-going threshold voltage at A input	V _{CC} = MIN					V
V _{T+}	Positive-going threshold voltage at B input	V _{CC} = MIN					V
V _{T-}	Negative-going threshold voltage at B input	V _{CC} = MIN					V
V _{IK}	Input clamp voltage	V _{CC} = MIN,		I _I = -12 mA		V	
V _{OH}	High-level output voltage	V _{CC} = MIN,		I _{OH} = MAX		V	
V _{OL}	Low-level output voltage	V _{CC} = MIN,		I _{OL} = MAX		V	
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 5.5 V					mA
I _{IH}	High-level input current	V _{CC} = MAX,		A1 or A2		μA	
		V _I = 2.4 V		B		μA	
I _{IL}	Low-level input current	V _{CC} = MAX,		A1 or A2		mA	
		V _I = 0.4 V		B		mA	
I _{OS}	Short-circuit output current*	V _{CC} = MAX					mA
		54 Family		-20	-55	-10	-27
I _{CC}	Supply current	V _{CC} = MAX					mA
		Quiescent		13	25	7	12
		Triggered		23	40	9	20

† 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.

3

TTL DEVICES

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	'121		'L121		UNIT		
		MIN	TYP	MAX	MIN		TYP	MAX
t _{PLH}	Propagation delay time, low-to-high-level Q output from either A input	C _L = 15 pF, R _L = 400 Ω for '121, R _L = 800 Ω for 'L121, See Note 2		45	70	140	ns	
t _{PLH}	Propagation delay time, low-to-high-level Q output from B input			35	55	110	ns	
t _{PHL}	Propagation delay time, high-to-low-level Q output from either A input			50	80	160	ns	
t _{PHL}	Propagation delay time, high-to-low-level Q output from B input			40	65	130	ns	
t _{w(out)}	Pulse width obtained using internal timing resistor			70	110	150	260	ns
t _{w(out)}	Pulse width obtained with zero timing capacitance			30	50	35	70	ns
t _{w(out)}	Pulse width obtained using external timing resistor			600	700	800	850	ns
				6	7	8	6	7

NOTE 2: See General Information Section for load circuits and voltage waveforms.

TYPES SN54121, SN54L121, SN74121 MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

TYPICAL CHARACTERISTICS[§]

DISTRIBUTION OF UNITS
for
OUTPUT PULSE WIDTH

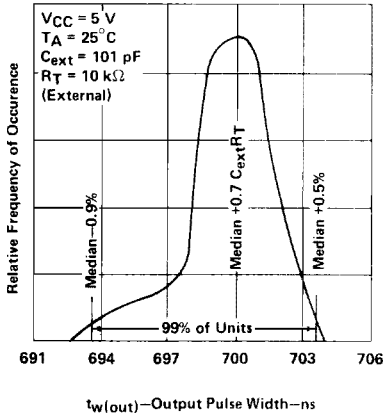


FIGURE 1

VARIATION IN INTERNAL TIMING RESISTOR VALUE
vs
FREE-AIR TEMPERATURE

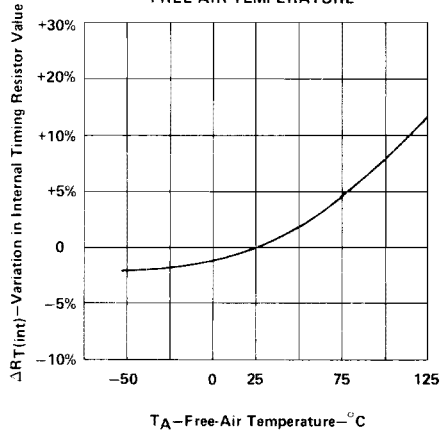


FIGURE 2

VARIATION IN OUTPUT PULSE WIDTH
vs
SUPPLY VOLTAGE

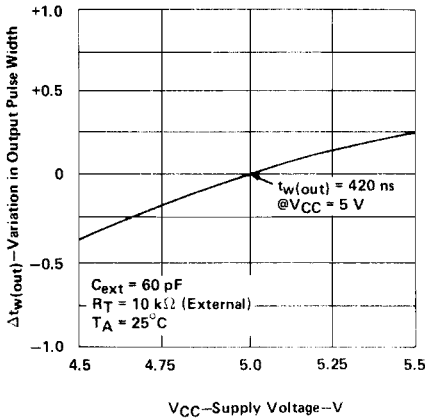


FIGURE 3

SCHMITT TRIGGER THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE

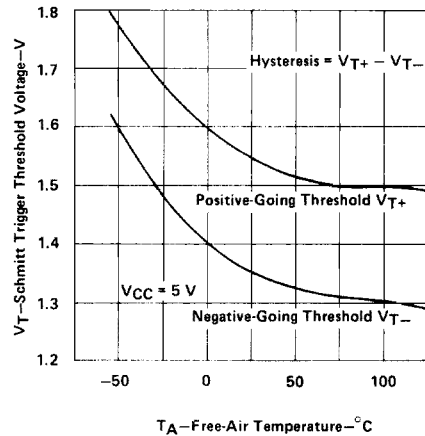


FIGURE 4

[§]Data for temperatures below 0°C and above 70°C are applicable for SN54121 and SN54L121.

3

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**TYPES SN54121, SN54L121, SN74121
MONOSTABLE MULTIVIBRATORS
WITH SCHMITT-TRIGGER INPUTS**

TYPICAL CHARACTERISTICS[§] (continued)

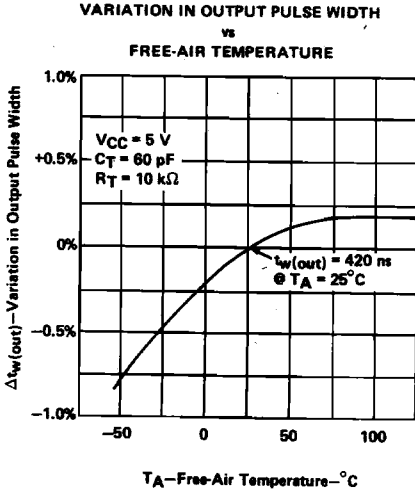


FIGURE 5

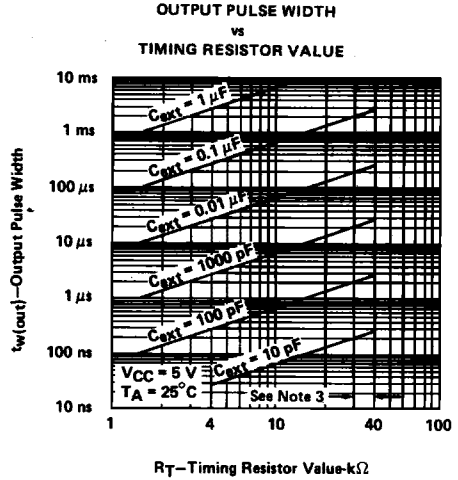


FIGURE 6

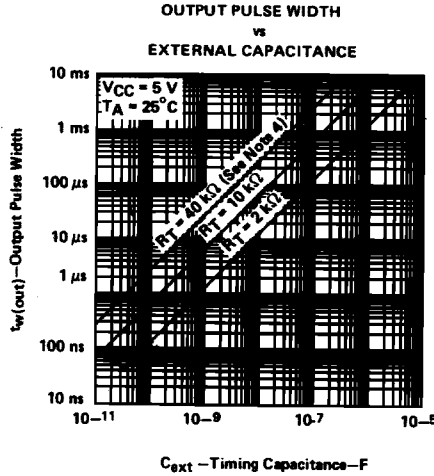


FIGURE 7

NOTE 3: These values of resistance exceed the maximum recommended use over the full temperature range of the SN54LS121.
§Data for temperatures below 0°C and above 70°C are applicable for SN54121 and SN54L121.

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