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NTE4098B
Integrated Circuit
CMOS, Dual Monostable Multivibrator

Description:

The NTE40898B is a dual monostable multivibrator in a 16–Lead DIP type package that provides stable retriggerable/resetable one–shot operation for any fixed–voltage timing application.

An external resistor (R_X) and an external capacitor (C_X) control the timing for the circuit. Adjustment of R_X and C_X provides a wide range of output pulse widths from the Q an $\overline{Q}$ terminals. The time delay from trigger input to output transition (trigger propagation delay) and the time delay from reset input to output transition (reset propagation delay) are independent of R_X and C_X.

Leading–edge–triggering (+TR) and trailing–edge–triggering (–TR) inputs are provided for triggering from either edge of an input pulse. An unused +TR input should be tied to V_{SS}, An unused –TR input should be tied to V_{DD}. A RESET (on low level) is provided for immediate termination of the output pulse or to prevent output pulses when power is turned on. An unused RESET input should be tied to V_{DD}. However, if an entire section of the NTE4098B is not used, its RESET should be tied to V_{SS}.

In normal operation the circuit triggers (extends the output pulse one period) on the application of each new trigger pulse. For operation in the non–retriggerable mode, $\overline{Q}$ is connected to –TR when leading–edge triggering (+TR) is used or Q is connected to +TR when trailing–edge triggering (–TR) is used.

The time period (T) for this multivibrator can be approximated by: $T_X = 1/2\ R_XC_X$ for $C_X \geq 0.01\mu F$. The minimum value of external resistance, R_X, is $5k\Omega$. The maximum value of external capacitance, C_X, is $100\mu F$.

The output pulse width has variations of ±2.5% typically, over the temperature range of –55° to +125°C for C_X = 1000pF and $R_X = 100k\Omega$.

For power supply variations of ±5%, the output pulse width has variations of ±0.5% typically, for V_{DD} = 10V and 15V and ±1% typically, for V_{DD} = 5V at C_X = 1000pF and $R_X = 5k\Omega$.

Features:

- Retriggerable/Resetable Capability
- Trigger and Reset Propagation Delays Independent of R_X and C_X
- Triggering from Leading or Trailing Edge
- Q and $\overline{Q}$ Buffered Outputs Available
- Separate Resets
- Wide Range of Output–Pulse Widths
- Maximum Input Current of 1μA at 18V over Full Package Temperature Range; 100nA at 18V and +25°C
- Margin (Full Package–Temperature Range):
  - 1V at V_{DD} = 5V
  - 2V at V_{DD} = 10V
  - 2.5V at V_{DD} = 15V
- 5V, 10V, and 15V Parametric Ratings
- Standardized, Symmetrical Output Characteristics

Applications:

- Pulse Delay and Timing
- Pulse Shaping
- Astable Multivibrator

Absolute Maximum Ratings:

DC Supply Voltage Range (Voltages referenced to V_{SS} terminal), V_{DD} . . . . . −0.5 to +20V
Input Voltage Range, All Inputs . . . . . −0.5 to V_{DD}+0.5V
DC Input Current, All Inputs . . . . . ±10mA
Power Dissipation (T_A = −55° to +100°C), P_D 500mW
T_A = +100° to +125°C . . . . . Derate Linearly at 12mW/°C to 200mW
Device Dissipation (Per Output Transistor)
For T_A = Full Package Temperature Range 100mW
Operating Temperature Range, T_A . . . . . −55° to +125°C
Storage Temperature Range, T_{stg} . . . . . −65° to +150°C
Lead Temperature (During Soldering, 1/16" ±1/32" from case, 10sec Max), T_L . . . . . +265°C

Recommended Operating Conditions: (T_A = +25°C, Note 1 unless otherwise specified)

Parameter	Min	Typ	Max	Unit
Supply Voltage Range (For T_A = Full package Temperature)	3	–	18	V
Trigger Pulse Width, t_S(TR)				
V_{DD} = 5V	140	–	–	ns
V_{DD} = 10V	60	–	–	ns
V_{DD} = 15V	40	–	–	ns
Reset Pulse Width (This is a function of C_X), t_W(R)	See Dynamic Characteristics Table			ns
Trigger Rise or Fall Time, t_r(TR), t_f(TR)				
V_{DD} = 5V	–	–	100	µs
V_{DD} = 10V	–	–	100	µs
V_{DD} = 15V	–	–	100	µs

Note 1. For maximum reliability, nominal operating conditions should be selected so that operation is always within the above ranges.

Static Electrical Characteristics:

Characteristic	Conditions			Limits at Indicated Temperature (°C)							Units
	V_O (V)	V_{IN} (V)	V_{DD} (V)	−55°C	−40°C	+85°C	+125°C	+25°C			
								Min.	Typ.	Max.	
Quiescent Device Current I_{DD} Max.	–	0,5	5	1	1	30	30	–	0.02	1	µA
	–	0,10	10	2	2	60	60	–	0.02	2	µA
	–	0,15	15	4	4	120	120	–	0.02	4	µA
	–	0,20	20	20	20	600	600	–	0.04	20	µA
Output Low (Sink) Current I_{OL} Min.	0.4	0,5	5	0.64	0.61	0.42	0.36	0.51	1.0	–	mA
	0.5	0,10	10	1.6	1.5	1.1	0.9	1.3	2.6	–	mA
	1.5	0,15	15	4.2	4.0	2.8	2.4	3.4	6.8	–	mA
Output High (Source) Current I_{OH} Min.	4.6	0,5	5	–0.64	–0.61	–0.42	–0.36	–0.51	–1.0	–	mA
	2.5	0,5	5	–2.0	–1.8	–1.3	–1.15	–1.6	–3.2	–	mA
	9.5	0,10	10	–1.6	–1.5	–1.1	–0.9	–1.3	–2.6	–	mA
	13.5	0,15	15	–4.2	–4.0	–2.8	–2.4	–3.4	–6.8	–	mA

Static Electrical Characteristics (Cont'd):

Characteristic	Conditions			Limits at Indicated Temperature (°C)							Units
	V_O (V)	V_{IN} (V)	V_{DD} (V)	–55°C	–40°C	+85°C	+125°C	+25°C			
								Min.	Typ.	Max.	
Output Voltage Low–Level V_{OL} Max.	–	0,5	5	0.05				–	0	0.05	V
	–	0,10	10	0.05				–	0	0.05	V
	–	0,15	15	0.05				–	0	0.05	V
Output Voltage High–Level V_{OH} Min.	–	0,5	5	4.95				4.95	5	–	V
	–	0,10	10	9.95				9.95	10	–	V
	–	0,15	15	14.95				14.95	15	–	V
Input Low Voltage V_{IL} Max.	0.5,4.5	–	5	1.5				–	–	1.5	V
	1,9	–	10	3.0				–	–	3.0	V
	1.5,13.5	–	15	4.0				–	–	4.0	V
Input High Voltage V_{IH} Min.	0.5,4.5	–	5	3.5				3.5	–	–	V
	1.9	–	10	7.0				7.0	–	–	V
	1.5,13.5	–	15	11.0				11.0	–	–	V
Input Current, I_{IN} Max.	–	0,18	18	±0.1	±0.1	±1.0	±1.0	–	$\pm 10^{-5}$	±0.1	µA

Dynamic Electrical Characteristics:

(T_A = +25°C, C_L = 50pF, R_L = 200kΩ, t_r and t_f = 20ns unless otherwise specified)

Parameter	Symbol	Test Conditions			Min	Typ	Max	Unit
		R_X (kΩ)	C_X (pF)	V_{DD} (V)				
Trigger Propagation Delay Time +TR, –TR to Q, $\overline{Q}$	t_{PHL}, t_{PLH}	5 to 10,000	≥15	V_{DD} = 5V	–	250	500	ns
				V_{DD} = 10V	–	125	250	ns
				V_{DD} = 15V	–	100	200	ns
Minimum Trigger Pulse Width	t_{WH}, t_{WL}	5 to 10,000	≥15	V_{DD} = 5V	–	70	140	ns
				V_{DD} = 10V	–	30	60	ns
				V_{DD} = 15V	–	20	40	ns
Transition Time	t_{TLH}	5 to 10,000	≥15	V_{DD} = 5V	–	100	200	ns
				V_{DD} = 10V	–	50	100	ns
				V_{DD} = 15V	–	40	80	ns
	t_{THL}	5 to 10,000	15 to 10,000	V_{DD} = 5V	–	100	200	ns
				V_{DD} = 10V	–	50	100	ns
				V_{DD} = 15V	–	40	80	ns
			0.01µF to 0.1µF	V_{DD} = 5V	–	150	300	ns
				V_{DD} = 10V	–	75	150	ns
				V_{DD} = 15V	–	65	130	ns
			0.1µF to 1µF	V_{DD} = 5V	–	250	500	ns
				V_{DD} = 10V	–	150	300	ns
				V_{DD} = 15V	–	80	160	ns
Reset Propagation Delay Time	t_{PHL}, t_{PLH}	5 to 10,000	≥15	V_{DD} = 5V	–	225	450	ns
				V_{DD} = 10V	–	125	250	ns
				V_{DD} = 15V	–	75	150	ns

Dynamic Electrical Characteristics (Cont'd): (T_A = +25°C, C_L = 50pF, R_L = 200kΩ, t_r and t_f = 20ns unless otherwise specified)

Parameter	Symbol	Test Conditions			Min	Typ	Max	Unit
		R_X (kΩ)	C_X (pF)	V_{DD} (V)				
Minimum Reset Pulse Width	t_WR	100	15	V_{DD} = 5V	–	100	200	ns
				V_{DD} = 10V	–	40	80	ns
				V_{DD} = 15V	–	30	60	ns
			1000	V_{DD} = 5V	–	600	1200	ns
				V_{DD} = 10V	–	300	600	ns
				V_{DD} = 15V	–	250	500	ns
			0.1μF	V_{DD} = 5V	–	25	50	μs
				V_{DD} = 10V	–	15	30	μs
				V_{DD} = 15V	–	10	20	μs
Trigger Rise or Fall Time	t_r(TR), t_f(TR)	–	–	V_{DD} = 5V	–	–	100	μs
				V_{DD} = 10V	–	–	100	μs
				V_{DD} = 15V	–	–	100	μs
Pulse Width Match Between Circuits in Same Package		10	10,000	V_{DD} = 5V	–	5.0	10	%
				V_{DD} = 10V	–	7.5	15	%
				V_{DD} = 15V	–	7.5	15	%
Input Capacitance	C_{IN}	Any Input			–	5.0	7.5	pF

Functional Terminal Connections

Function	V_{DD} to Pin No.		V_{SS} to Pin No.		Input Pulse to Pin No.		Other Connections	
	$MONO_1$	$MONO_2$	$MONO_1$	$MONO_2$	$MONO_1$	$MONO_2$	$MONO_1$	$MONO_2$
Leading–Edge Trigger/ Retriggerable	3, 5	11, 13			4	12		
Leading–Edge Trigger/ Non–Retriggerable	3	13			4	12	5 – 7	11 – 9
Trailing–Edge Trigger/ Retriggerable	3	13	4	12	5	11		
Trailing–Edge Trigger/ Non–Retriggerable	3	13			5	11	4 – 6	12 – 10
Unused Section	5	11	3, 4	12, 13				

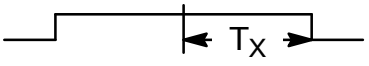
Note 2. A retriggerable one–shot multivibrator has an output pulse width which is extended on full time period (T_X) after application of the last trigger pulse.

The minimum time between retriggering edges (or trigger and retrigger edges) is 40% of (T_X).

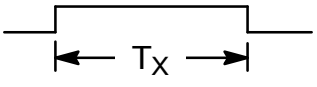
Note 3. A non–triggerable one–shot multivibrator has a time period (T_X) referenced from the application of the first trigger pulse.

Input Pulse Train

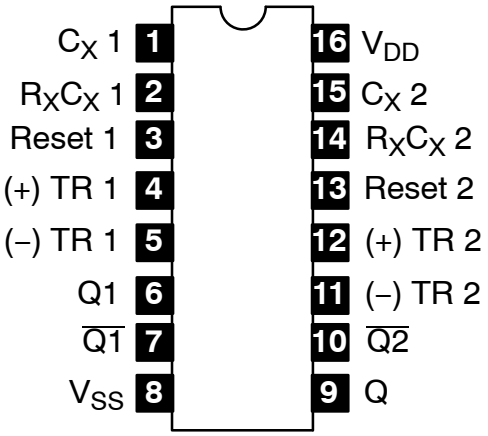
Retriggerable Mode Pulse Width (+TR Mode)



Non–Retriggerable Mode Pulse Width (–TR Mode)



Pin Connection Diagram



Note: Pin1, Pin8, and Pin15 are electrically connected internally