

General Description

These devices are monolithic timer circuits capable of producing accurate time delays or oscillation. In the time delay mode of operation, the timed interval is controlled by a single external resistor and capacitor network. In the astable mode of operation, the frequency and duty cycle may be independently controlled with two external resistors and a single external capacitor.

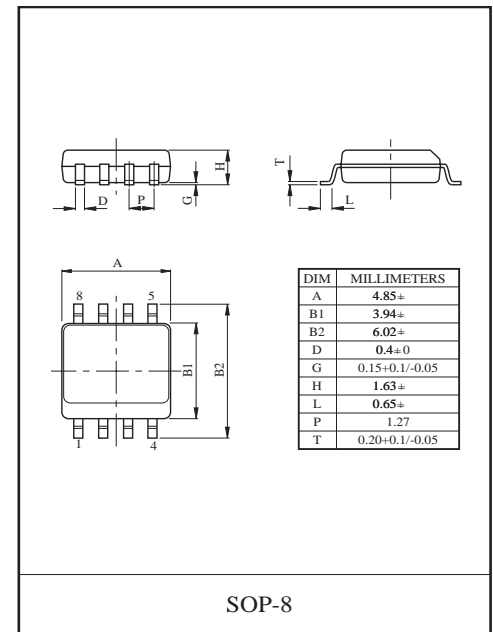
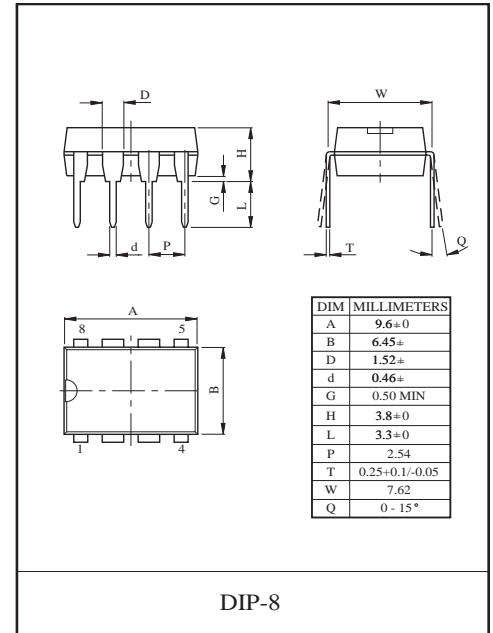
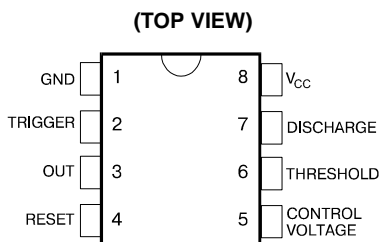
Features

- Timing from Microseconds to Hours
- Astable or Monostable Operation
- Adjustable Duty Cycle
- TTL - Compatible Output Can Sink or Source Up to 200 mA
- Temperature Stability of 0.005% per °C
- Direct Replacement for Signetics NE555 Timer

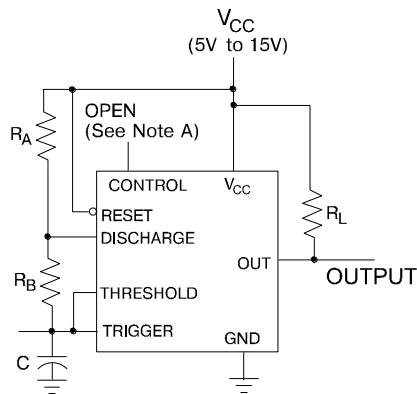
Applications

- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Missing pulse detector

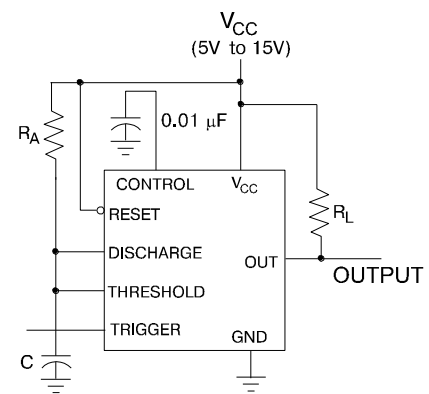
Pin Configuration (Top View)



TYPICAL APPLICATION DATA



Circuit for astable operation



Circuit for monostable operation

Note A: Bypassing the control voltage input to ground with a capacitor may improve operation. This should be evaluated for individual applications.



NE555BF/BP

ABSOLUTE MAXIMUM RATINGS (T_A =25 °C, unless otherwise specified)

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V _{CC}	4.5	16	V
Input Voltage (control, reset, threshold and trigger)	V _{IN}		V _{CC}	
Output Current	I _O		±200	mA
Operating Free-Air Temperature	T _a	-40	+85	°C
Storage Temperature Range	T _{STG}	-65	+150	

Function Table

Reset	Trigger Voltage*	Threshold Voltage *	Output	Discharge Switch
Low	Irrelevant	Irrelevant	Low	On
High	< 1/3 V _{CC}	High	High	Off
High	> 1/3 V _{CC}	> 2/3 V _{CC}	Low	On
High	> 1/3 V _{CC}	< 2/3 V _{CC}	As previously established	

*Voltage levels shown are nominal

ELECTRICAL CHARACTERISTICS

(T_A=25 °C, V_{CC}=+5V to +15V, unless otherwise specified)

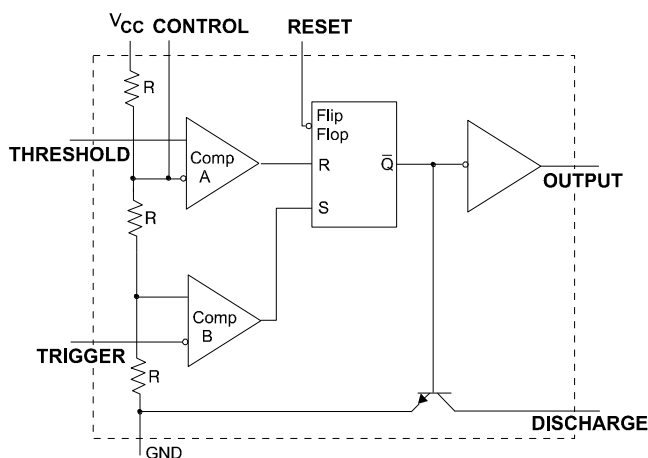
Parameter	Symbol	Conditions (see Note 2)	Min	Typ	Max	Unit
Operating Supply Voltage Range	V _{CC}		4.5		16	V
Threshold Voltage Level	V _{TH}	V _{CC} = 15V	8.8	10	11.2	V
		V _{CC} = 5 V	2.4	3.3	4.2	
Threshold Current (see Note 1)	I _{TH}	(see Note 1)		30	250	nA
Trigger Voltage Level	V _{TR}	V _{CC} = 15V	4.5	5	5.6	V
		V _{CC} = 5 V	1.1	1.67	2.2	
Trigger Current	I _{TR}	Trigger at 0V		0.5	2	µA
Reset Voltage Level	V _{RST}		0.3	0.7	1	V
Reset Current	I _{RST}	Reset at V _{CC}		0.1	0.4	mA
		Reset at 0V		-0.4	-1.5	
Discharge Leakage Current	I _{LKG}			20	100	nA
Control Voltage Level	V _C	V _{CC} = 15V	9	10	11	
		V _{CC} = 5V	2.6	3.3	4.0	
Low-level Output Voltage	V _{OL}	V _{CC} = 15V	I _{OL} =10mA	0.1	0.25	V
			I _{OL} =50mA	0.4	0.75	
			I _{OL} =100mA	2	2.5	
			I _{OL} =200mA	2.5		
		V _{CC} = 5V	I _{OL} =5mA	0.25	0.35	
			I _{OL} =8mA	0.3	0.4	
High-level Output Voltage	V _{OH}	V _{CC} = 15V	I _{OL} =-100mA	12.75	13.3	
			I _{OL} =200mA	12.5		
		V _{CC} = 5V	I _{OL} =-100mA	2.75	3.3	
Supply Current	I _{CC}	Output Low, No Load	V _{CC} =15V	10	15	mA
			V _{CC} =5V	3	6	
		Output High, No Load	V _{CC} =15V	9	13	
			V _{CC} =5V	2	5	

Initial Error of Timing Interval (see Note 3)	monostable (see Note 4)	Accur	$T_A = 25^\circ\text{C}$		1	3	%
	astable (see Note 5)				5	13	
Temperature Coefficient of Timing Interval	monostable	$\Delta t/T$	$T_A = \text{MIN to MAX}$		50	150	ppm / $^\circ\text{C}$
	astable				150	500	
Supply Voltage Sensitivity of Timing Interval	monostable	$\Delta t/\Delta V_{cc}$	$T_A = 25^\circ\text{C}$		0.1	0.5	%/V
	astable				0.3	1	
Output Pulse Rise Time		t_r	$C_L = 15\text{pF}, T_A = 25^\circ\text{C}$		100	300	ns
Output Pulse Fall Time		t_f			100	300	

Notes:

1. This parameter influences the maximum value of the timing resistors R_A and R_B in the circuit on Fig 1. For example, when $V_{cc}=5\text{V}$, the maximum value is $R=R_A+R_B=3.4\text{ M}\Omega$, and $V_{cc}=15\text{V}$, the maximum value is $10\text{ M}\Omega$.
2. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
3. Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.
4. Values specified are for a device in a monostable circuit similar to Fig. 2, with component values as follow: $R_A=2\text{K}\Omega$ to $100\text{ K}\Omega$, $C=0.1\mu\text{F}$.
5. Values specified are for a device in an astable circuit similar to Fig. 1, with component values as follow: $R_A, R_B=1\text{K}\Omega$ to $100\text{ K}\Omega$, $C=0.1\mu\text{F}$.

BLOCK DIAGRAM



Typical Characteristics

Data for temperatures below -40°C and above 105°C are applicable for NE555B circuits only.

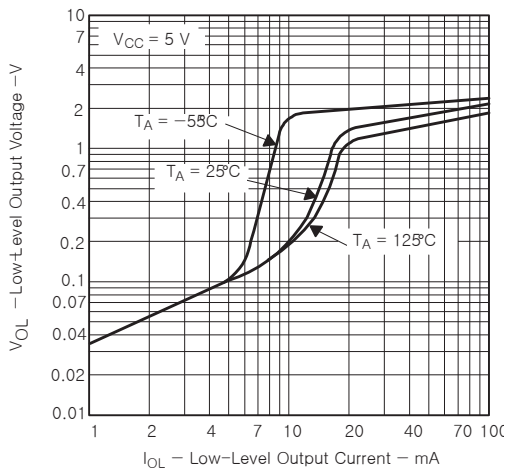


Figure 1. Low-Level Output Voltage vs Low-Level Output Current

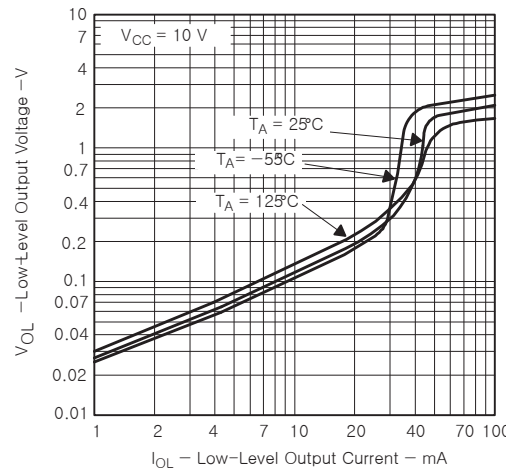


Figure 2. Low-Level Output Voltage vs Low-Level Output Current

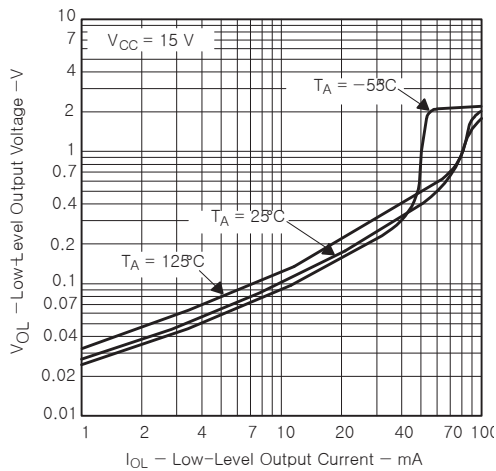


Figure 3. Low-Level Output Voltage vs Low-Level Output Current

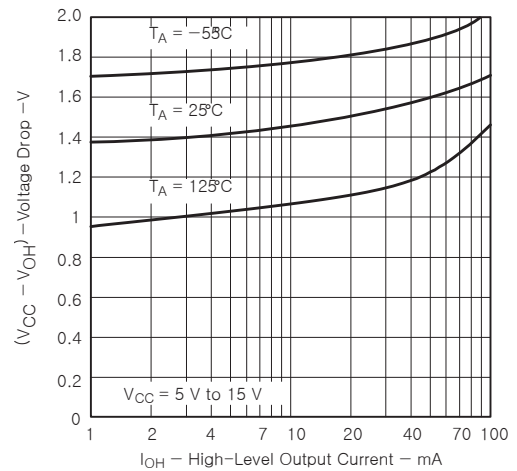


Figure 4. Drop Between Supply Voltage and Output vs High-Level Output Current

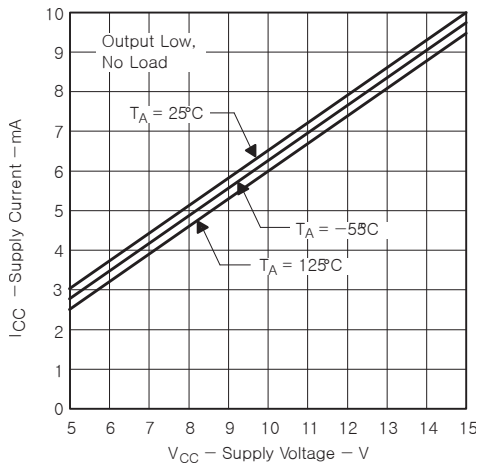


Figure 5. Supply Current vs Supply Voltage

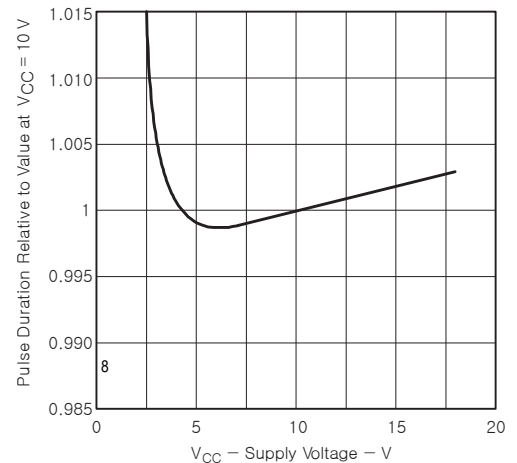


Figure 6. Normalized Output Pulse Duration (Monostable Operation) vs Supply Voltage

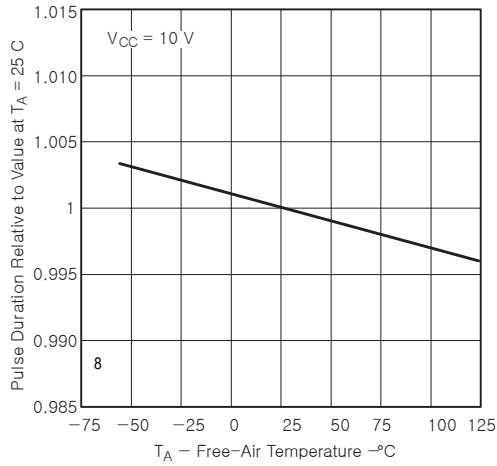


Figure 7. Normalized Output Pulse Duration (Monostable Operation) vs Free-Air Temperature

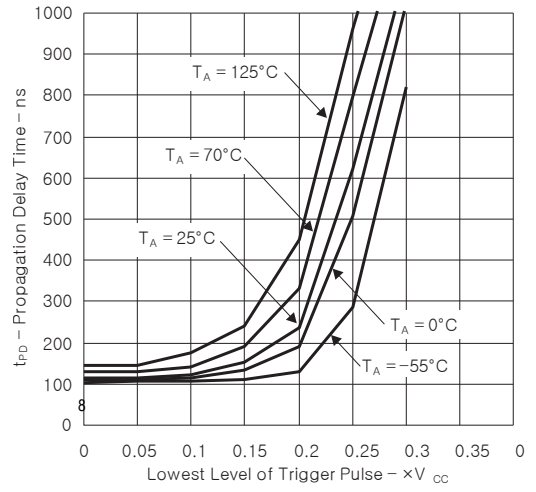


Figure 8. Propagation Delay Time vs Lowest Voltage Level of Trigger Pulse