

TIMER**SE/NE555/SE555C****DC ELECTRICAL CHARACTERISTICS** $T_A = 25^\circ\text{C}$, $V_{CC} = +5\text{V}$ to $+15$ unless otherwise specified.

PARAMETER	TEST CONDITIONS	SE555			NE555/SE555C			UNIT
		Min	Typ	Max	Min	Typ	Max	
Supply voltage		4.5		18	4.5		16	V
Supply current (low state) ¹	$V_{CC} = 5\text{V}$ $R_L = \infty$		3	5		3	6	mA
	$V_{CC} = 15\text{V}$ $R_L = \infty$		10	12		10	15	mA
Timing error (monostable)	$R_A = 2\text{k}\Omega$ to $100\text{k}\Omega$ $C = 0.1\mu\text{F}$							
Initial accuracy ²			0.5	2.0		1.0	3.0	%
Drift with temperature			30	100		50	150	ppm/ $^\circ\text{C}$
Drift with supply voltage			0.05	0.2		0.1	0.5	%/V
Timing error (astable)	$R_A, R_B = 1\text{k}\Omega$ to $100\text{k}\Omega$ $C = 0.1\mu\text{F}$ $V_{CC} = 15\text{V}$							
Initial accuracy ²			4	6		5	13	%
Drift with temperature				500			500	ppm/ $^\circ\text{C}$
Drift with supply voltage			0.15	0.6		0.3	1	%/V
Control voltage level	$V_{CC} = 15\text{V}$	9.6	10.0	10.4	9.0	10.0	11.0	V
	$V_{CC} = 5\text{V}$	2.9	3.33	3.8	2.6	3.33	4.0	V
Threshold voltage	$V_{CC} = 15\text{V}$	9.4	10.0	10.6	8.8	10.0	11.2	V
	$V_{CC} = 5\text{V}$	2.7	3.33	4.0	2.4	3.33	4.2	V
Threshold current ³			0.1	0.25		0.1	0.25	μA
Trigger voltage	$V_{CC} = 15\text{V}$	4.8	5.0	5.2	4.5	5.0	5.6	V
	$V_{CC} = 5\text{V}$	1.45	1.67	1.9	1.1	1.67	2.2	V
Trigger current	$V_{TRIG} = 0\text{V}$		0.5	0.9		0.5	2.0	μA
Reset voltage ⁴		0.3		1.0	0.3		1.0	V
Reset current			0.1	0.4		0.1	0.4	mA
Reset current	$V_{RESET} = 0\text{V}$		0.4	1.0		0.4	1.5	mA
Output voltage (low)	$V_{CC} = 15\text{V}$							
	$I_{SINK} = 10\text{mA}$		0.1	0.15		0.1	0.25	V
	$I_{SINK} = 50\text{mA}$		0.4	0.5		0.4	0.75	V
	$I_{SINK} = 100\text{mA}$		2.0	2.2		2.0	2.5	V
	$I_{SINK} = 200\text{mA}$		2.5			2.5		V
	$V_{CC} = 5\text{V}$							
	$I_{SINK} = 8\text{mA}$		0.1	0.25		0.3	0.4	V
	$I_{SINK} = 5\text{mA}$		0.05	0.2		0.25	0.35	V
Output voltage (high)	$V_{CC} = 15\text{V}$							
	$I_{SOURCE} = 200\text{mA}$		12.5			12.5		V
	$I_{SOURCE} = 100\text{mA}$	13.0	13.3		12.75	13.3		V
	$V_{CC} = 5\text{V}$							
	$I_{SOURCE} = 100\text{mA}$	3.0	3.3		2.75	3.3		V
Turn off time ⁵	$V_{RESET} = V_{CC}$		0.5	2.0		0.5	2.0	μs
Rise time of output			100	200		100	300	ns
Fall time of output			100	200		100	300	ns
Discharge leakage current			20	100		20	100	na

NOTES

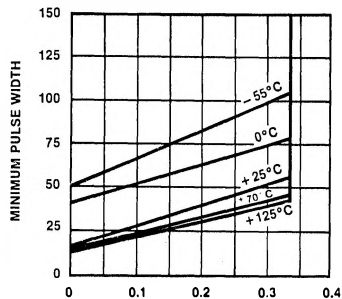
1. Supply current when output high typically 1mA less.
2. Tested at $V_{CC} = 5\text{V}$ and $V_{CC} = 15\text{V}$.
3. This will determine the maximum value of $R_A + R_B$, for 15V operation, the max total $R \sim 10$ megohm, and for 5V operation, the max total $R \sim 3.4$ megohm.
4. Specified with trigger input high.
5. Time measured from a positive going input pulse from 0 to $0.8 \times V_{CC}$ into the threshold to the drop from high to low of the output. Trigger is tied to threshold.

TIMER

SE/NE555/SE555C

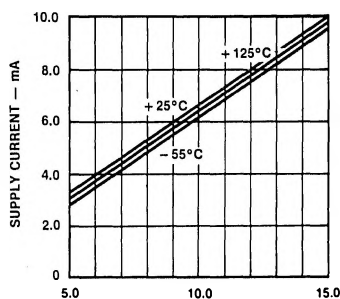
TYPICAL PERFORMANCE CHARACTERISTICS

**MINIMUM PULSE WIDTH
REQUIRED FOR TRIGGERING**



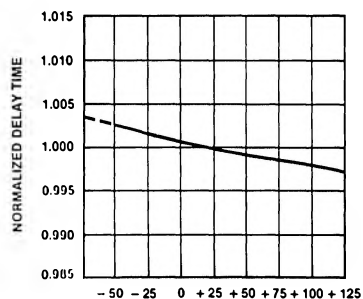
LOWEST VOLTAGE LEVEL OF TRIGGER PULSE

**SUPPLY CURRENT
vs SUPPLY VOLTAGE**



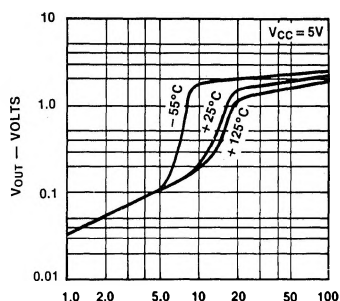
SUPPLY VOLTAGE — VOLTS

**DELAY TIME
vs TEMPERATURE**



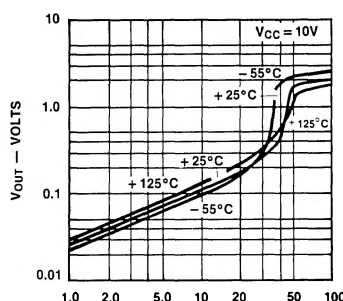
TEMPERATURE — °C

**LOW OUTPUT VOLTAGE
vs OUTPUT SINK CURRENT**



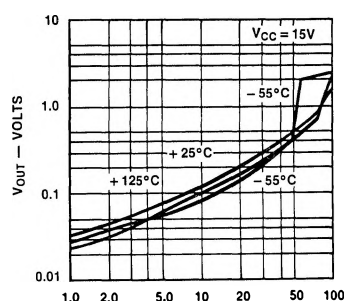
I_{SINK} — mA

**LOW OUTPUT VOLTAGE
vs OUTPUT SINK CURRENT**



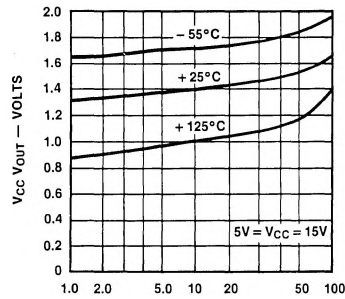
I_{SINK} — mA

**LOW OUTPUT VOLTAGE
vs OUTPUT SINK CURRENT**



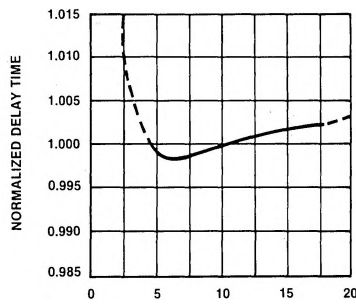
I_{SINK} — mA

**HIGH OUTPUT VOLTAGE DROP
vs OUTPUT SOURCE CURRENT**



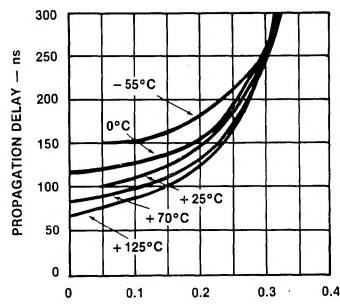
I_{SOURCE} — mA

**DELAY TIME vs
SUPPLY VOLTAGE**



SUPPLY VOLTAGE — V

**PROPAGATION DELAY
vs VOLTAGE LEVEL
OF TRIGGER PULSE**



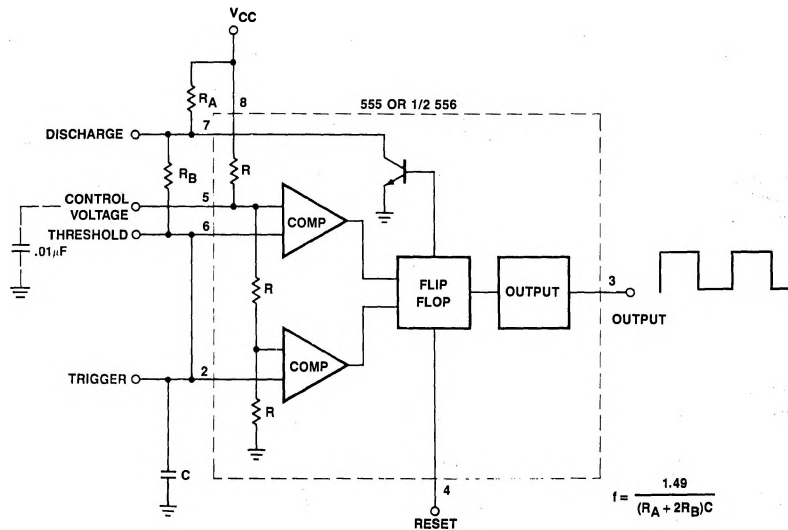
LOWEST VOLTAGE LEVEL
OF TRIGGER PULSE — $X V_{CC}$

TIMER

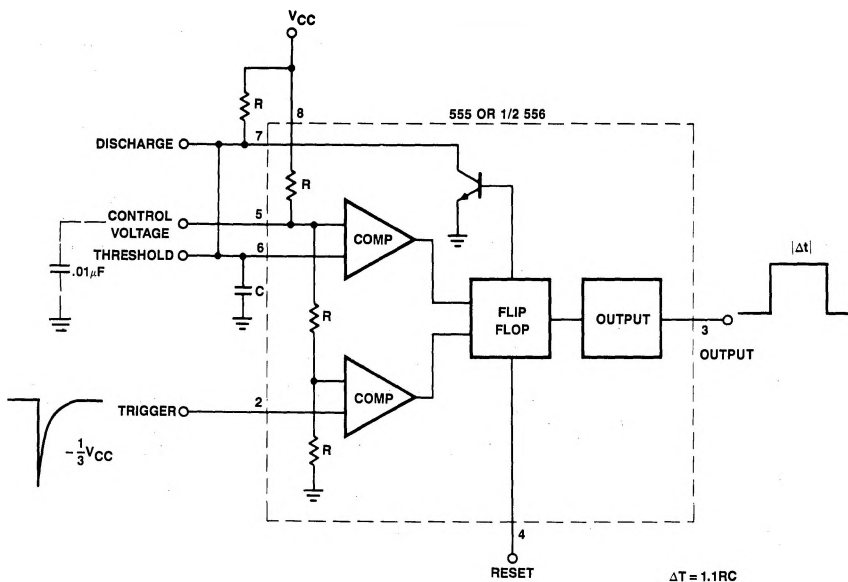
SE/NE555/SE555C

TYPICAL APPLICATIONS

ASTABLE OPERATION



MONOSTABLE OPERATION



TIMER

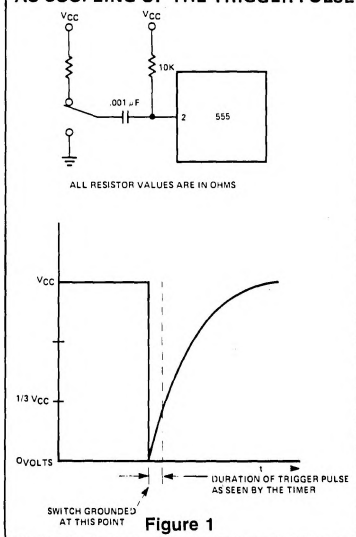
SE/NE555/SE555C

Trigger Pulse Width Requirements and Time Delays

Due to the nature of the trigger circuitry, the timer will trigger on the negative going edge of the input pulse. For the device to time out properly, it is necessary that the trigger voltage level be returned to some voltage greater than one third of the supply before the time out period. This can be achieved by making either the trigger pulse sufficiently short or by AC coupling into the trigger. By AC coupling the trigger, see Figure 1, a short negative going pulse is achieved when the trigger signal goes to ground. AC coupling is most frequently used in conjunction with a switch or a signal that goes to ground which initiates the timing cycle. Should the trigger be held low, without AC coupling, for a longer duration than the timing cycle the output will remain in a high state for the duration of the low trigger signal, without regard to the threshold comparator state. This is due to the predominance of Q_{15} on the base of Q_{16} , controlling the state of the bi-stable flip-flop. When the trigger signal then returns to a high level, the output will fall immediately. Thus, the output signal will follow the trigger signal in this case.

TYPICAL APPLICATIONS

AC COUPLING OF THE TRIGGER PULSE



Another consideration is the "turn off time". This is the measurement of the amount of time required after the threshold reaches $2/3 V_{CC}$ to turn the output low. To explain further, Q_1 at the threshold input turns on after reaching $2/3 V_{CC}$, which then turns on Q_5 , which turns on Q_6 . Current from Q_6 turns on Q_{16} which turns Q_{17} off. This allows current from Q_{19} to turn on Q_{20} and Q_{24} to give an output low. These steps cause the $2\mu s$ maximum delay as stated in the data sheet.

Also, a delay comparable to the turn off time is the trigger release time. When the trigger is low, Q_{10} is on and turns on Q_{11} which turns on Q_{15} . Q_{15} turns off Q_{16} and allows Q_{17} to turn on. This turns off current to Q_{20} and Q_{24} , which results in output high. When the trigger is released, Q_{10} and Q_{11} shut off, Q_{15} turns off, Q_{16} turns on and the circuit then follows the same path and time delay explained as "turn off time". This trigger release time is very important in designing the trigger pulse width so as not to interfere with the output signal as explained previously.

SCHEMATIC 555 OR 1/2 556 DUAL TIMER

