

General Description

is a highly stable device for generating accurate time delays or oscillation. Additional terminals are provided for triggering or resetting if desired. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For astable operation as an oscillator, the free running frequency and duty cycle are accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output circuit can source or sink up to 200mA or drive TTL circuits.

Features

- Direct replacement for SE555/NE555
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Adjustable duty cycle
- Output can source or sink 200 mA
- Output and supply TTL compatible
- Normally on and normally off output

Applications

- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Linear ramp generator



($T_A = 25^\circ\text{C}$, $V_{CC} = +5\text{V}$ to $+15\text{V}$, unless otherwise specified)

Parameter	Conditions	Limits			Units
		Min	Typ	Max	
Supply Voltage		4.5		16	V
Supply Current	$V_{CC} = 5\text{V}, R_L = \infty$ $V_{CC} = 15\text{V}, R_L = \infty$		3 10	6 15	mA
Timing Error, Monostable					
Initial Accuracy			1		%
Drift with Temperature	$R_A = 1\text{k to }100\text{k}\Omega$, $C = 0.1\mu\text{F}$, (Note 5)		50		ppm/ $^\circ\text{C}$
Accuracy over Temperature			1.5		%
Drift with Supply			0.1		%/V
Timing Error, Astable					
Initial Accuracy			2.25		%
Drift with Temperature	$R_A, R_B = 1\text{k to }100\text{k}\Omega$, $C = 0.1\mu\text{F}$, (Note 5)		150		ppm/ $^\circ\text{C}$
Accuracy over Temperature			3.0		%
Drift with Supply			0.30		%/V
Threshold Voltage			0.667		$\times V_{CC}$
Trigger Voltage	$V_{CC} = 15\text{V}$ $V_{CC} = 5\text{V}$		5 1.67		V V
Trigger Current					
Reset Voltage					
Reset Current			0.1	0.4	mA
Threshold Current	(Note 6)				
Control Voltage Level	$V_{CC} = 15\text{V}$ $V_{CC} = 5\text{V}$	9 2.6	10 3.33	11 4	V
Pin 7 Leakage Output High			1	100	nA
Pin 7 Sat (Note 7)					
Output Low	$V_{CC} = 15\text{V}, I_7 = 15\text{mA}$		180		mV
Output Low	$V_{CC} = 4.5\text{V}, I_7 = 4.5\text{mA}$		80	200	mV



Electrical Characteristics (Notes 1, 2) (Continued)

($T_A = 25^\circ\text{C}$, $V_{CC} = +5\text{V}$ to $+15\text{V}$, unless otherwise specified)

Parameter	Conditions	Limits			Units
		Min	Typ	Max	
Output Voltage Drop (Low)	$V_{CC} = 15\text{V}$				
	$I_{SINK} = 10\text{mA}$		0.1	0.25	V
	$I_{SINK} = 50\text{mA}$		0.4	0.75	V
	$I_{SINK} = 100\text{mA}$		2	2.5	V
	$I_{SINK} = 200\text{mA}$		2.5		V
	$V_{CC} = 5\text{V}$				
Output Voltage Drop (High)	$I_{SOURCE} = 200\text{mA}$, $V_{CC} = 15\text{V}$		12.5		V
	$I_{SOURCE} = 100\text{mA}$, $V_{CC} = 15\text{V}$	12.75	13.3		V
	$V_{CC} = 5\text{V}$	2.75	3.3		V
Rise Time of Output			100		ns
Fall Time of Output			100		ns

Note 1: All voltages are measured with respect to the ground pin, unless otherwise specified.

Note 2: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Note 3: For operating at elevated temperatures the device must be derated above 25°C based on a $+150^\circ\text{C}$ maximum junction temperature and a thermal resistance 170°C/W (S0-8), junction to ambient.

Note 4: Supply current when output high typically

Note 5: Tested at $V_{CC} = 5\text{V}$ and $V_{CC} = 15\text{V}$.

Note 6: This will determine the maximum value of $R_A + R_B$ for 15V operation. The maximum total ($R_A + R_B$) is $20\text{M}\Omega$.

Note 7: No protection against excessive pin 7 current is necessary providing the package dissipation rating will not be exceeded.



Applications Information

MONOSTABLE OPERATION

In this mode of operation, the timer functions as a one-shot (Figure 1). The external capacitor is initially held discharged by a transistor inside the timer. Upon application of a negative trigger pulse of less than $1/3 V_{CC}$ to pin 2, the flip-flop is set which both releases the short circuit across the capacitor and drives the output high.

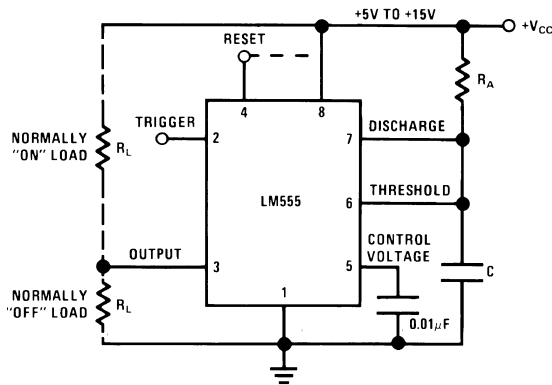
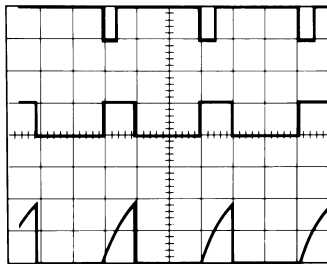


FIGURE 1. Monostable

The voltage across the capacitor then increases exponentially for a period of $t = 1.1 R_A C$, at the end of which time the voltage equals $2/3 V_{CC}$. The comparator then resets the flip-flop which in turn discharges the capacitor and drives the output to its low state. Figure 2 shows the waveforms generated in this mode of operation. Since the charge and the threshold level of the comparator are both directly proportional to supply voltage, the timing interval is independent of supply.



$V_{CC} = 5V$
 TIME = 0.1 ms/DIV.
 $R_A = 9.1k\Omega$
 $C = 0.01\mu F$

Top Trace: Input 5V/Div.
 Middle Trace: Output 5V/Div.
 Bottom Trace: Capacitor Voltage 2V/Div.

FIGURE 2. Monostable Waveforms

During the timing cycle when the output is high, the further application of a trigger pulse will not effect the circuit so long as the trigger input is returned high at least $10\mu s$ before the end of the timing interval. However the circuit can be reset during this time by the application of a negative pulse to the reset terminal (pin 4). The output will then remain in the low state until a trigger pulse is again applied.

When the reset function is not in use, it is recommended that it be connected to V_{CC} to avoid any possibility of false triggering.

Figure 3 is a nomograph for easy determination of R, C values for various time delays.

NOTE: In monostable operation, the trigger should be driven high before the end of timing cycle.

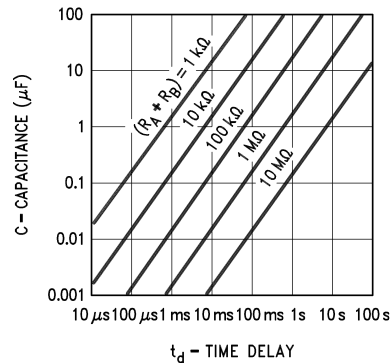


FIGURE 3. Time Delay

ASTABLE OPERATION

If the circuit is connected as shown in Figure 4 (pins 2 and 6 connected) it will trigger itself and free run as a multivibrator. The external capacitor charges through $R_A + R_B$ and discharges through R_B . Thus the duty cycle may be precisely set by the ratio of these two resistors.

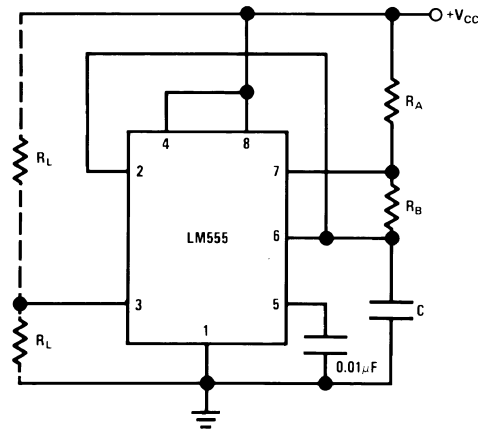


FIGURE 4. Astable

In this mode of operation, the capacitor charges and discharges between $1/3 V_{CC}$ and $2/3 V_{CC}$. As in the triggered mode, the charge and discharge times, and therefore the frequency are independent of the supply voltage.



Physical Dimensions inches (millimeters) unless otherwise noted

