μPC1555 PRECISION TIMER CIRCUIT

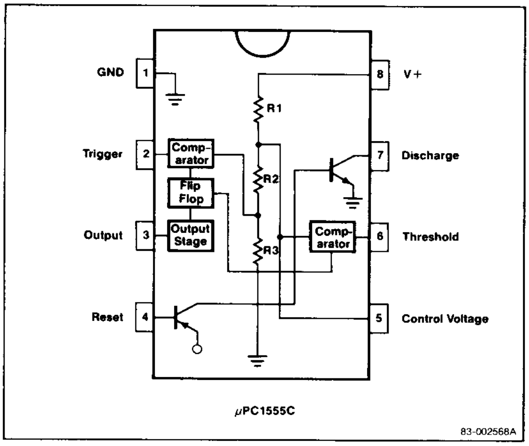
Description

The μPC1555 is a highly stable precision timer capable of producing oscillation in the astable mode and accurate time delays in the monostable mode. In the astable mode as an oscillator, the free running frequency and duty cycle are accurately controlled using two resistors and a capacitor. In the monostable or time delay mode, only one external resistor and capacitor is required. The totem pole output drivers can sink or source up to 200 mA making these devices ideal for driving small speakers, transducers, and single ended AC/DC converters.

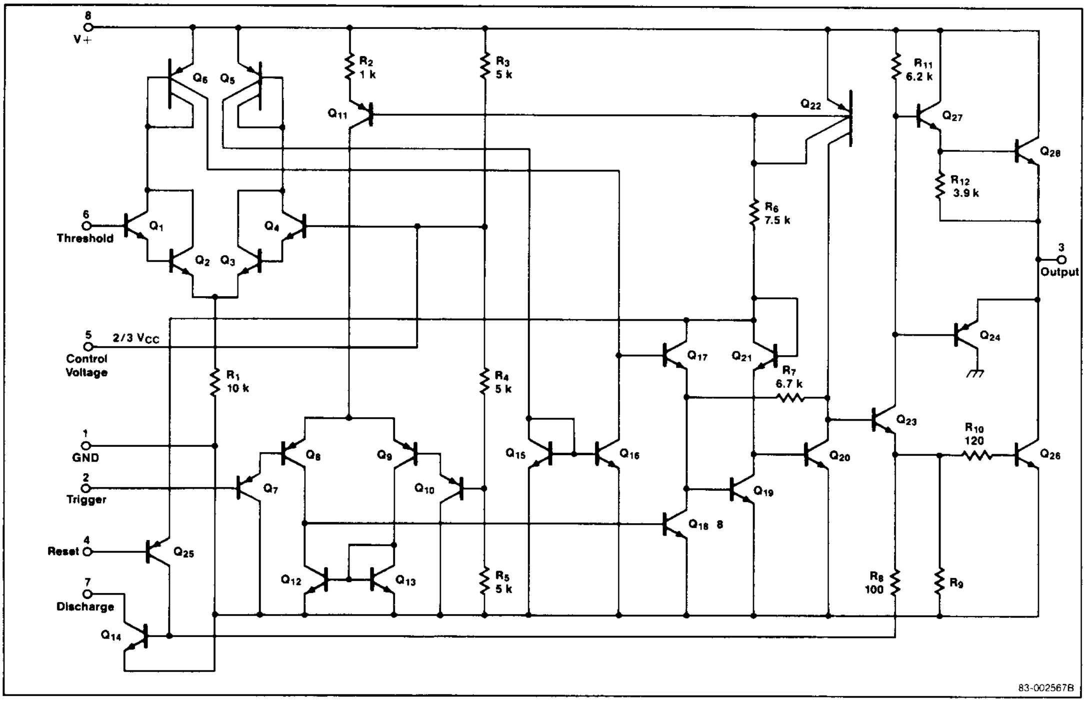
Features

- ☐ Operates in both astable and monostable mode
- ☐ Output can drive TTL loads
- ☐ Adjustable duty cycle
- ☐ NE555 direct replacement

Pin Configuration



Equivalent Circuit



Absolute Maximum Ratings

$T_A = 25°C$

Voltage Between V+ and GND	18 V
Power Dissipation, C Package	600 mW
Power Dissipation, G2 Package	440 mW
Operating Temperature Range	0 to +70°C
Storage Temperature Range	−55 to +125°C

Comment: Stress above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Ordering Information

Part Number	Package	Operating Temperature Range
μPC1555C	Plastic DIP	0°C to +70°C
μPC1555G2	Plastic Miniflat	0°C to +70°C

Electrical Characteristics

$T_A = 25°C$, $V^+ = +5$ V to $+15$ V

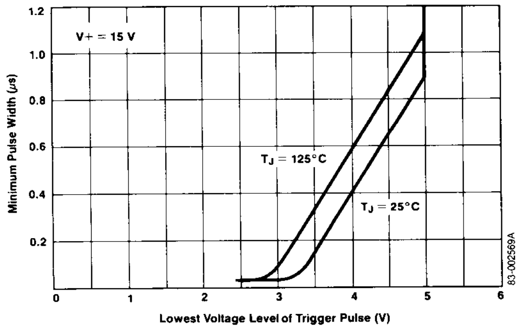
Parameter	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Test Conditions
Supply Voltage	V+	4.5		16	V	
Supply Current	I_{CC}		3	6	mA	V+ = 5 V, $R_L = \infty$, $V_O = 0$ V
			10	15	mA	V+ = 15 V, $R_L = \infty$, $V_O = 0$ V
Threshold Voltage	V_{th}		2/3 V+		V	
Threshold Current	I_{th}		0.1	0.25	μA	Note 1
Trigger Voltage	V_{TRIG}		5		V	V+ = 15 V
			1.67		V	V+ = 5 V
Trigger Current	I_{TRIG}		0.5		μA	
Reset Voltage	V_{RST}	0.4	0.7	1.0	V	
Reset Current	I_{RST}		0.1		mA	
Control Voltage Level		9.0	10	11	V	V+ = 15 V
		2.6	3.33	4	V	V+ = 5 V
Output Voltage Drop (Low)	V_{OL}		0.1	0.25	V	V+ = 15 V, $I_{SINK} = 10$ mA
			0.4	0.75	V	V+ = 15 V, $I_{SINK} = 50$ mA
			2.0	2.5	V	V+ = 15 V, $I_{SINK} = 100$ mA
			2.5		V	V+ = 15 V, $I_{SINK} = 200$ mA
			0.1	0.35	V	V+ = 5 V, $I_{SINK} = 5$ mA
Output Voltage Drop (High)	V_{OH}		12.5		V	V+ = 15 V, $I_{SOURCE} = 200$ mA
		12.75	13.3		V	V+ = 15 V, $I_{SOURCE} = 100$ mA
		2.75	3.3		V	V+ = 5 V, $I_{SOURCE} = 100$ mA
Rise Time Output	t_R		100		ns	
Fall Time Output	t_F		100		ns	
Timing Error, Astable: Initial Accuracy			1		%	R_A, R_B = 1 k to 100 kΩ, C = 0.1 μF
Drift with Temperature			50		ppm/°C	
Drift with Supply			0.01		%/V	

Notes: 1. This will determine the maximum value of $R_A + R_B$ for 15 V operation. The maximum total resistance is 20 MΩ.

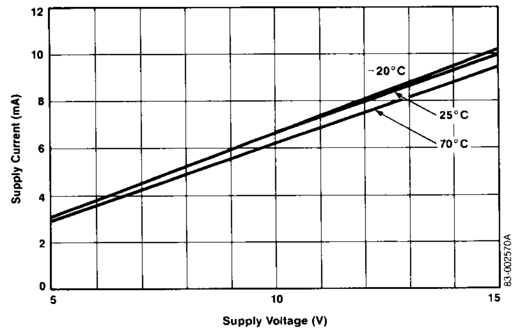
Operating Characteristics

$T_A = 25°C$

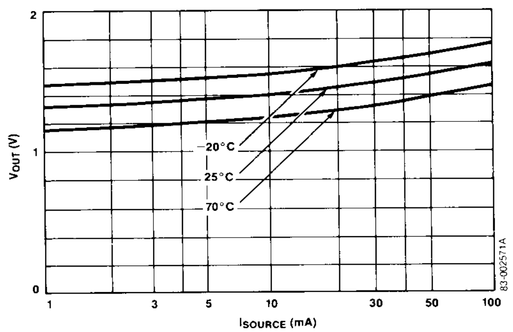
Minimum Pulse Width Required for Triggering



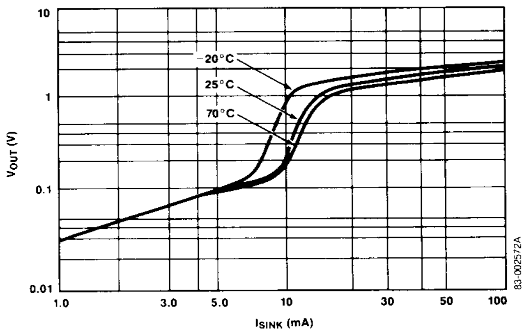
Supply Current vs. Supply Voltage



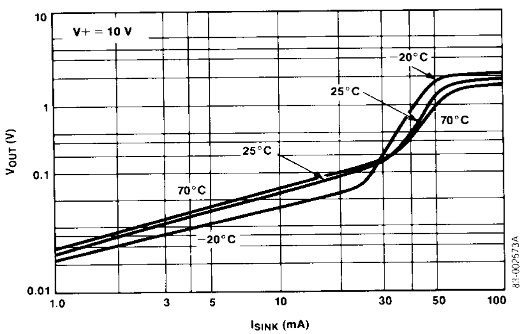
High Output Voltage Drop vs. Output Source Current



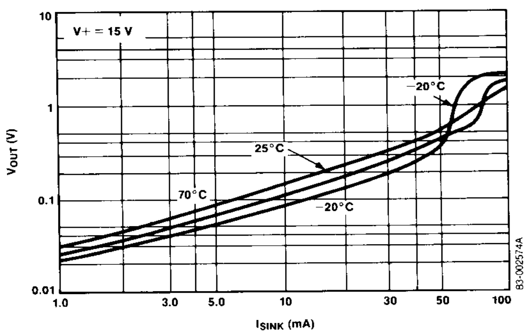
Low Output Voltage vs. Output Sink Current



Low Output Voltage vs. Output Sink Current

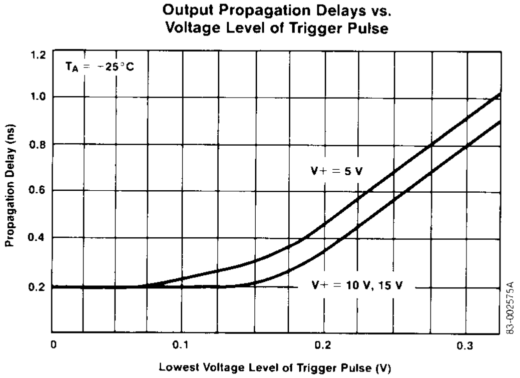


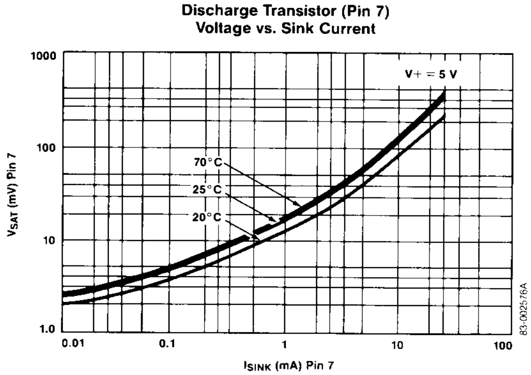
Low Output Voltage vs. Output Sink Current



Operating Characteristics (Cont.)

$T_A = 25°C$





Applications

Monostable Operation

When the timer is operated as a monostable multivibrator, one external capacitor (C_1), and one external resistor (R_1), are used as shown in figure 1. When the trigger input is reduced below 1/3 V+, the timer internal flip-flop is set. This releases the short circuit across the external capacitor and the Q output goes HIGH. The voltage across the capacitor voltage reaches 2/3 V+, the internal comparator resets the flip-flop and the external capacitor (C_1), is rapidly discharged, provided the trigger voltage is returned above 1/3 V+ (figure 2). The output is now in LOW state and a new timing cycle may be initiated. The time that the output is in the HIGH state is given by 1.1 R.C., or can be taken directly from figure 3. Both the charge rate and internal threshold are directly proportional to the supply voltage. Thus, the timer output pulse width is independent of the power supply voltage. If a LOW is applied to the reset input, the output is forced LOW and the external capacitor discharged regardless of the other inputs.

Astable Operation

When the timer is operated in the astable mode, two external resistors (R_1 and R_2), and one external capacitor (C_1), are used as shown in figure 4. With this connection scheme, the external capacitor (C_1), charges and discharges between 1/3 V+ and 2/3 V+. The charge time (output HIGH) is:

$$t = 0.693(R_1 + R_2)C_1$$

The discharge time (output LOW) is:

$$t_2 = 0.693R_2C_1$$

The total period for one cycle of output HIGH and output LOW is:

$$t = t_1 + t_2 = 0.693\,(R_1 + R_2)C_1$$

The frequency for this period, T, is:

$$f = \frac{1}{t} = \frac{1}{0.693(R_1 + R_2)C_1}$$

The astable free-running frequency can also be found from the graph shown in figure 6. The duty cycle, the time the output is LOW divided by the period, is given by:

$$D = \frac{t_2}{t_1 + t_2} = \frac{R_2}{R_1 + R_2}$$

Figure 1. Monostable Circuit

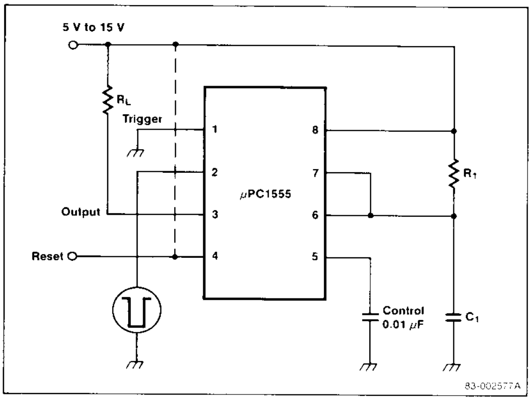


Figure 2. Monostable Waveforms

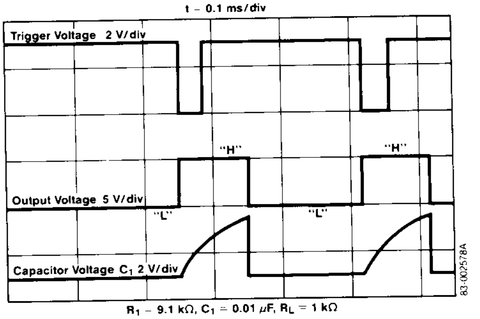


Figure 5. Astable Waveform

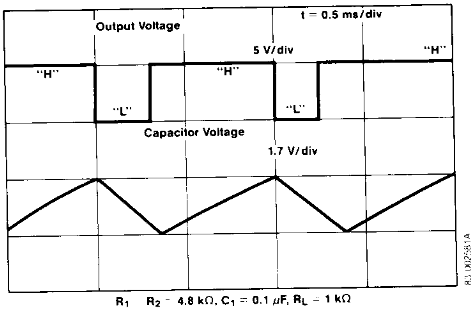


Figure 3. Time Delay

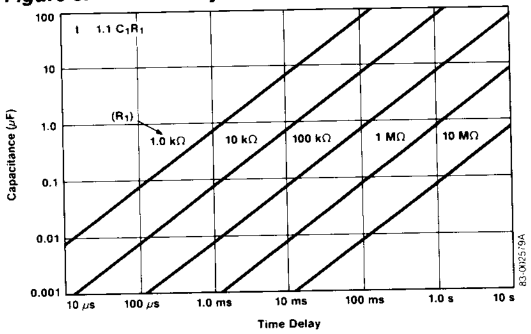


Figure 6. Free Running Frequency

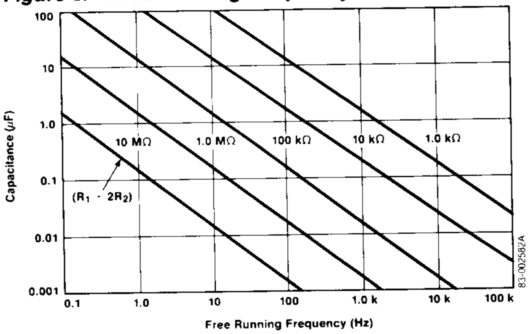


Figure 4. Astable Circuit