



PRECISION TIMERS

■ DESCRIPTION

The UTC **USA555** monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time-delay or monostable 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 can be controlled independently with two external resistors and a single external capacitor.

The threshold and trigger levels normally are two-thirds and one-third, respectively, of V_{CC} . These levels can be altered by use of the control-voltage terminal. When the trigger input falls below the trigger level, the flip-flop is set, and the output goes high. If the trigger input is above the trigger level and the threshold input is above the threshold level, the flip-flop is reset and the output is low. The reset (RESET) input can override all other inputs and can be used to initiate a new timing cycle. When RESET goes low, the flip-flop is reset, and the output goes low. When the output is low, a low-impedance path is provided between discharge (DISCH) and ground.

The circuit may be triggered and reset on falling waveforms, and the output structure can source or sink up to 200mA. Operation is specified for supplies of 5V~15V.

■ FEATURES

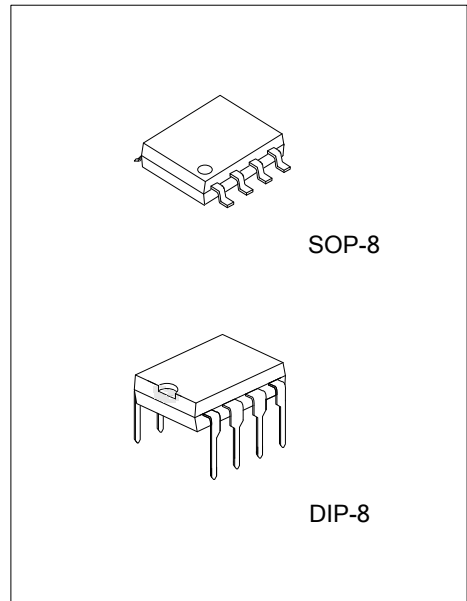
- * Astable or monostable operation
- * Low turn off time
- * Operates in both astable and monostable modes
- * Timing from microseconds to hours
- * Adjustable duty cycle
- * TTL-compatible output can sink or source up to 200mA

■ ORDERING INFORMATION

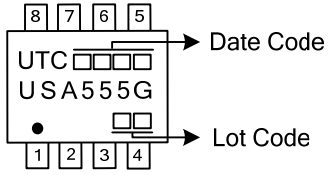
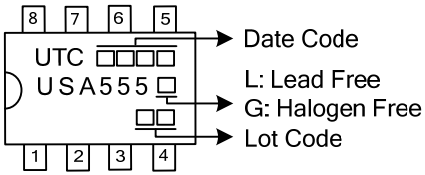
Ordering Number		Package	Packing
Lead Free	Halogen Free		
-	USA555G-S08-R	SOP-8	Tape Reel
USA555L-D08-T	USA555G-D08-T	DIP-8	Tube

Note: xx: Output Voltage, refer to Marking Information.

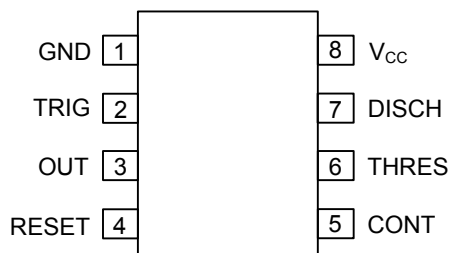
USA555L-D08-T	(1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) D08: DIP-8, S08: SOP-8 (3) L: Lead Free, G: Halogen Free and Lead Free
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■ MARKING

SOP-8	DIP-8
 UTC □□□□ → Date Code USA555G ● □□ → Lot Code	 UTC □□□□ → Date Code USA555 □□ → Lot Code L: Lead Free G: Halogen Free

■ PIN CONFIGURATION



■ PIN DESCRIPTION

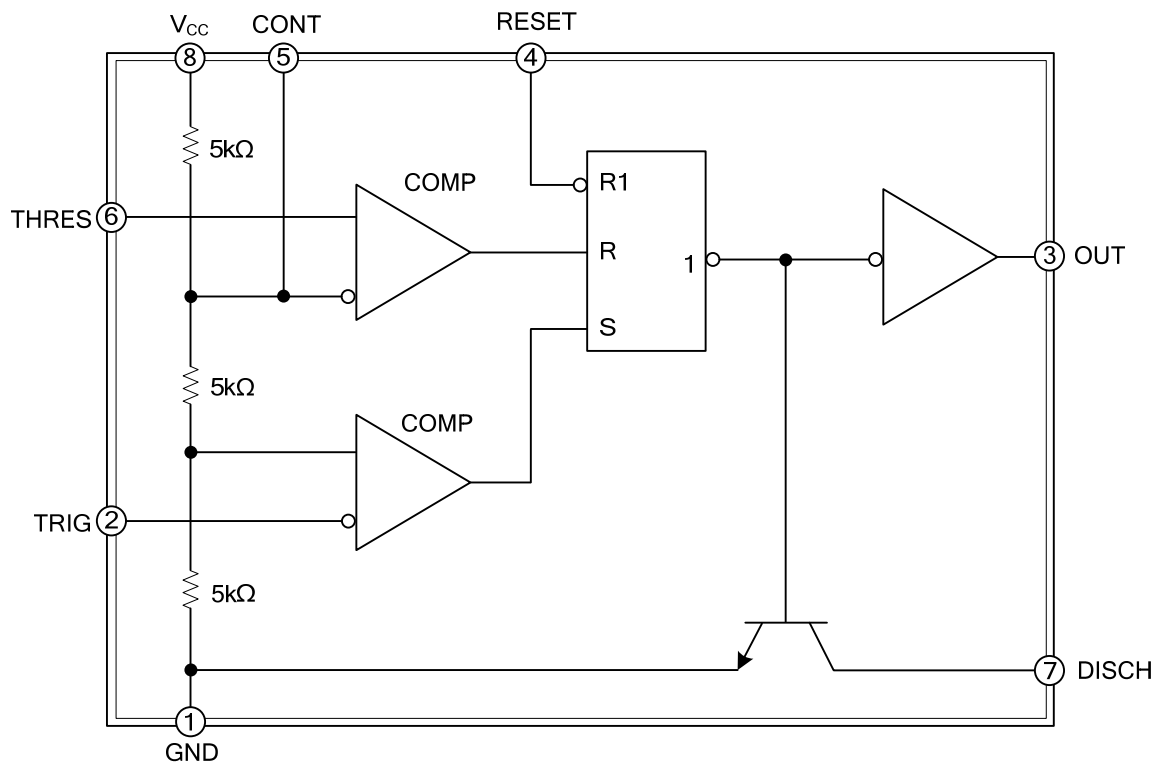
PIN NO.	PIN NAME	DESCRIPTION
1	GND	Ground
2	TRIG	Trigger signal
3	OUT	Output terminal
4	RESET	Reset terminal
5	CONT	Control voltage
6	THRES	Threshold
7	DISCH	Discharge
8	V _{CC}	Power supply

■ FUNCTION TABLE

RESET	TRIGGER VOLTAGE (Note)	THRESHOLD VOLTAGE (Note)	OUTPUT	DISCHARGE SWITCH
Low	Irrelevant	Irrelevant	Low	On
High	< 1/3 V _{CC}	Irrelevant	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	

Note: Voltage levels shown are nominal.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (over operating free-air temperature range, unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)	V_{CC}	18	V
Input Voltage	CONT, RESET, THRES, TRIG	V_{CC}	V
Output Current	I_O	± 225	mA
Operating Virtual Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65~150	°C

Note: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. All voltage values are with respect to GND.

■ RECOMMENDED OPERATING CONDITIONS (over operating free-air temperature range (unless otherwise noted))

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	4.5~16	V
Input Voltage	V_I	V_{CC}	V
Output Current	I_O	± 200	mA
Operating Free-Air Temperature	T_A	-40~85	°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Package Thermal Impedance (Note 1, 2)	SOP-8	θ_{JA}	97	°C/W
	DIP-8		85	°C/W

Notes: 1. Maximum power dissipation is a function of $T_{J(max)}$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_{J(max)} - T_A) / \theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.

2. The package thermal impedance is calculated in accordance with JESD 51-7.

■ ELECTRICAL CHARACTERISTICS ($V_{CC}=5V \sim 15V$, $T_A=25^\circ C$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
THRES Voltage Level	V_{TH}	$V_{CC}=15V$	8.8	10	11.2	V
		$V_{CC}=5V$	2.4	3.3	4.2	V
THRES Current (Note)	I_{TH}			30	250	nA
TRIG Voltage Level	V_{TRIG}	$V_{CC}=15V$	4.5	5	5.6	V
		$V_{CC}=5V$	1.1	1.67	2.2	V
TRIG Current	I_{TRIG}	TRIG at 0V		0.5	2	μA
RESET Voltage Level	V_{RESET}		0.3	0.7	1	V
RESET Current	I_{RESET}	RESET at V_{CC}		0.1	0.4	mA
		RESET at 0V		-0.4	-1.5	mA
DISCH Switch Off-State Current	I_{DISCH}			20	100	nA
CONT Voltage (Open Circuit)	V_{CONT}	$V_{CC}=15V$	9	10	11	V
		$V_{CC}=5V$	2.6	3.3	4	V
Low-Level Output Voltage	V_{OL}	$V_{CC}=15V, I_{OL}=10mA$		0.1	0.25	V
		$V_{CC}=15V, I_{OL}=50mA$		0.4	0.75	V
		$V_{CC}=15V, I_{OL}=100mA$		2	2.5	V
		$V_{CC}=15V, I_{OL}=200mA$		2.5		V
		$V_{CC}=5V, I_{OL}=5mA$		0.1	0.35	V
		$V_{CC}=5V, I_{OL}=8mA$		0.15	0.4	V
High-Level Output Voltage	V_{OH}	$V_{CC}=15V, I_{OL}=-100mA$	12.75	13.3		V
		$V_{CC}=15V, I_{OL}=-200mA$		12.5		V
		$V_{CC}=5V, I_{OL}=-100mA$	2.75	3.3		V

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current	I_{CC}	Output Low, No Load	$V_{CC}=15V$	10	15	mA
			$V_{CC}=5V$	3	6	mA
		Output High, No Load	$V_{CC}=15V$	9	13	mA
			$V_{CC}=5V$	2	5	mA

Note: This parameter influences the maximum value of the timing resistors R_A and R_B in the circuit of Figure 2. For example, when $V_{CC}=5V$, the maximum value is $R=R_A+R_B \leq 3.4M\Omega$, and for $V_{CC}=15V$, the maximum value is $10M\Omega$.

■ OPERATING CHARACTERISTICS ($V_{CC}=5V \sim 15V$, $T_A=25^\circ C$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS (Note 1)	MIN	TYP	MAX	UNIT
Initial Error of Timing Interval (Note 2)	Each Timer, Monostable (Note 3)	$T_A=25^\circ C$		1	3	%
	Each Timer, Astable (Note 4)			2.25		%
Temperature Coefficient of Timing Interval	Each Timer, Monostable (Note 3)	$T_A=MIN \sim MAX$		50		ppm/ $^\circ C$
	Each Timer, Astable (Note 4)			150		ppm/ $^\circ C$
Supply-Voltage Sensitivity of Timing Interval	Each Timer, Monostable (Note 3)	$T_A=25^\circ C$		0.1	0.5	%/V
	Each Timer, Astable (Note 4)			0.3		%/V
Output-Pulse Rise Time	T_R	$C_L=15pF$, $T_A=25^\circ C$		100	300	ns
Output-Pulse Fall Time	T_F	$C_L=15pF$, $T_A=25^\circ C$		100	300	ns

Notes: 1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

2. Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.

3. Values specified are for a device in a monostable circuit similar to Figure 1, with the following component values: $R_A=2k\Omega \sim 100k\Omega$, $C=0.1\mu F$.

4. Values specified are for a device in an astable circuit similar to Figure 2, with the following component values: $R_A=1k\Omega \sim 100k\Omega$, $C=0.1\mu F$.

■ TYPICAL APPLICATION CIRCUIT

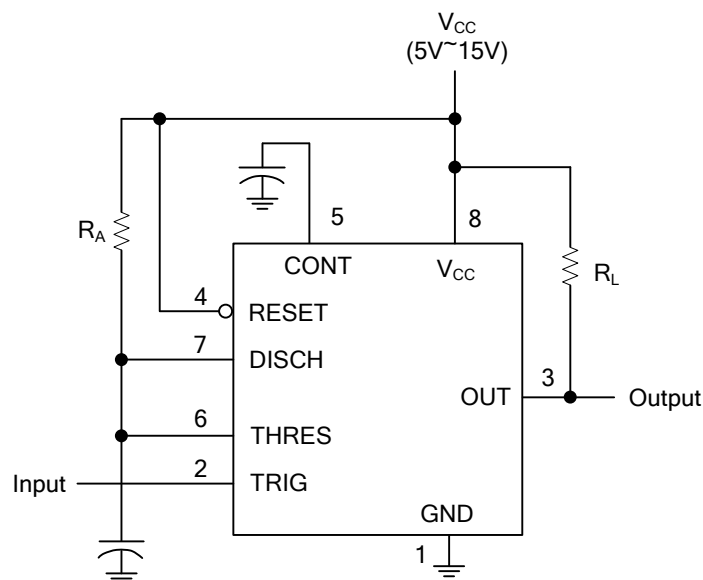
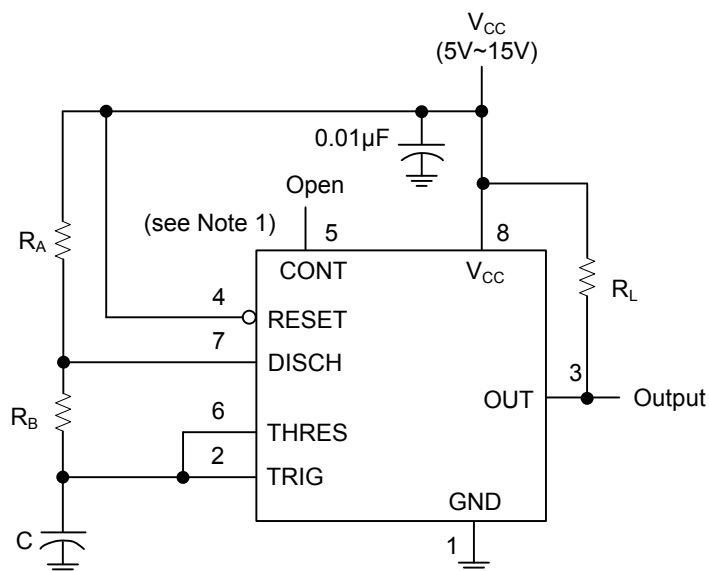


Figure 1. Circuit for Monostable Operation



Notes: 1. Decoupling CONT voltage to ground with a capacitor can improve operation.
This should be evaluated for individual applications.

$$2. T1 = 0.693 \times (R_A + R_B) \times C1$$

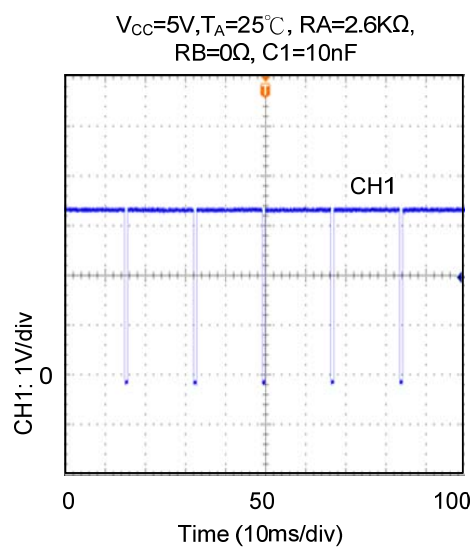
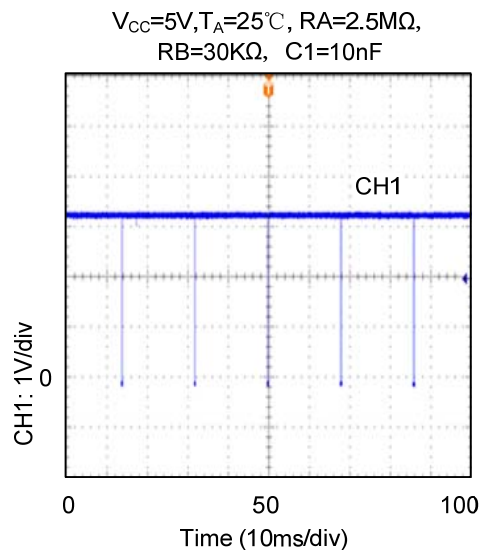
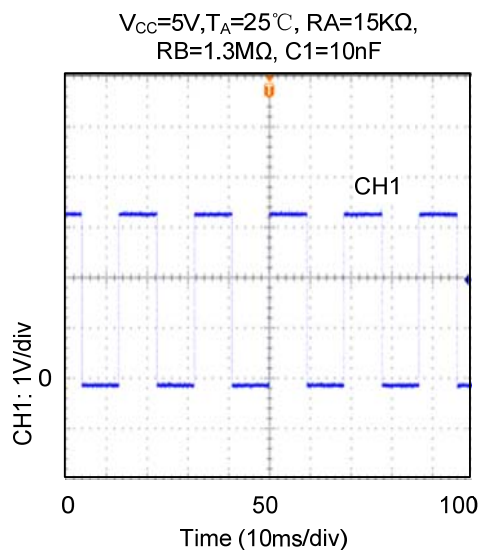
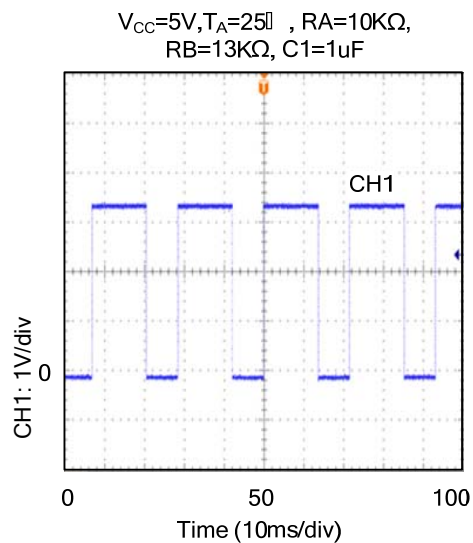
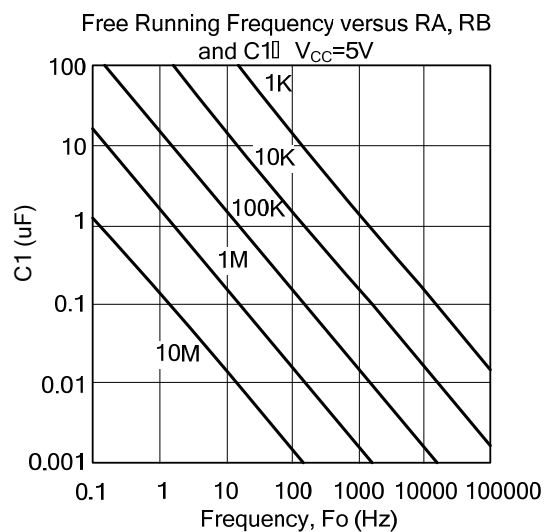
$$T2 = 0.693 \times R_B \times C1$$

$$f = \frac{1}{T} = \frac{1.44}{(R_A + 2R_B) \times C1}$$

3. Formula 0.693 values for reference only.

Figure 2. Circuit for Astable Operation

■ TYPICAL CHARACTERISTICS



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