



## USA555

## LINEAR INTEGRATED CIRCUIT

### 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.

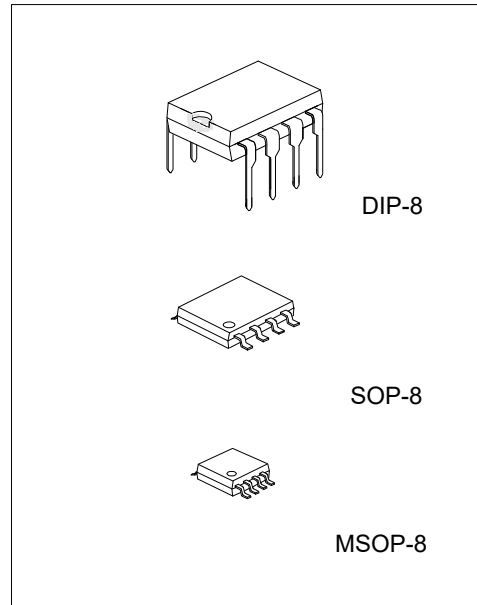
#### FEATURES

- \* 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

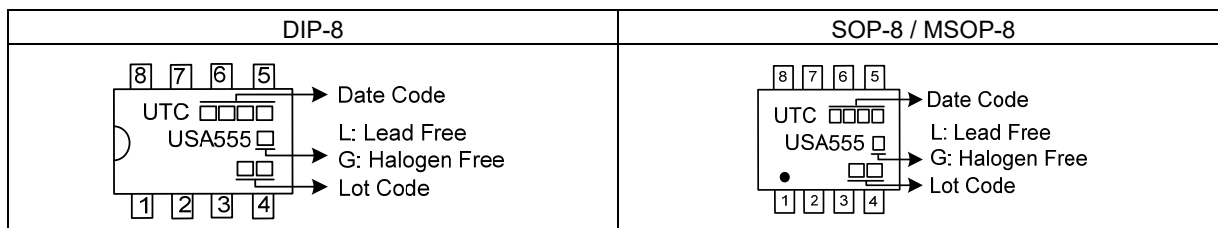
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
USA555L-D08-T	USA555G-D08-T	DIP-8	Tube
USA555L-S08-R	USA555G-S08-R	SOP-8	Tape Reel
USA555L-SM1-R	USA555G-SM1-R	MSOP-8	Tape Reel

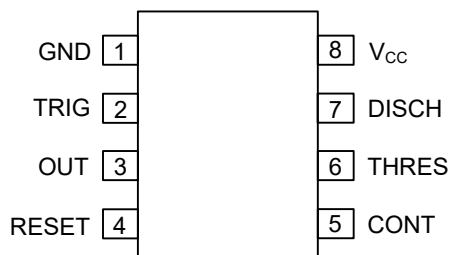
<p>USA555G-D08-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) D08: DIP-8, S08: SOP-8, SM1: MSOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING



### PIN CONFIGURATION



### PIN DESCRIPTION

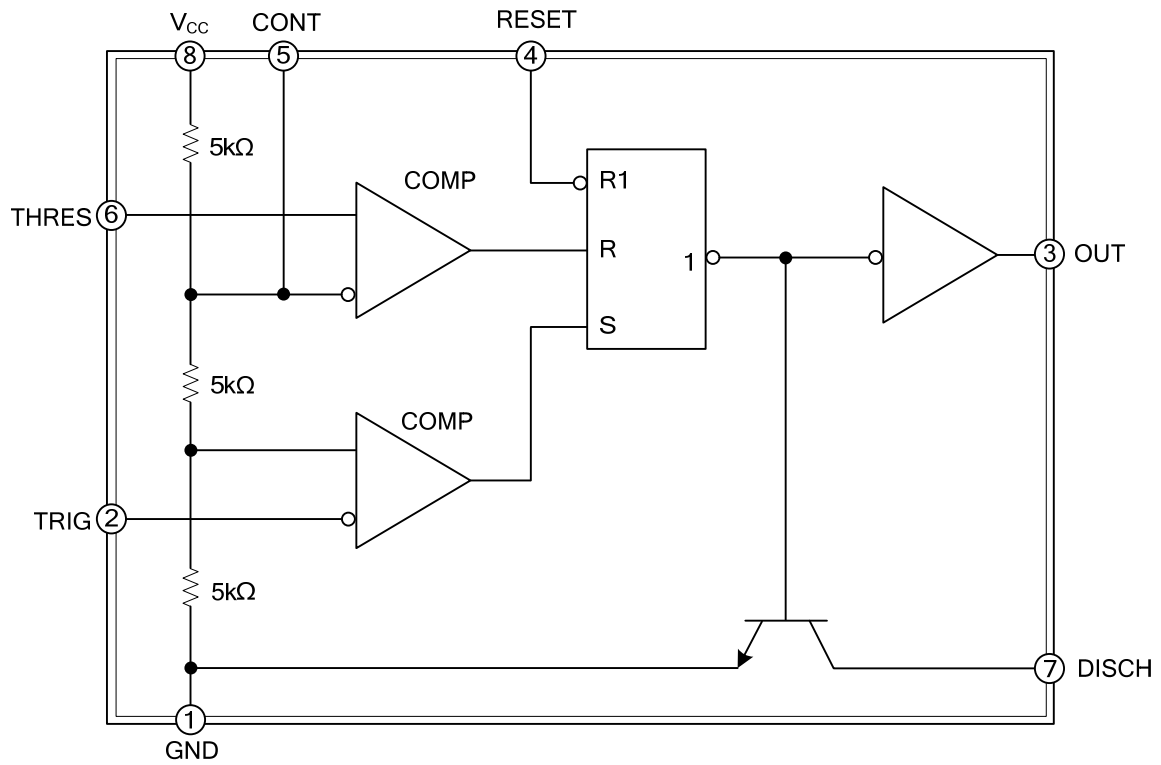
PIN NO.	PIN NAME	DESCRIPTION
1	GND	Ground
2	TRIG	Trigger signal
3	OUT	Output terminal
4	RESET	Reset terminal
5	CONT	Control voltage
6	THRES	Threshold
7	DISCH	Discharge
8	V <sub>CC</sub>	Power supply

### FUNCTION TABLE

RESET	TRIGGER VOLTAGE (Note)	THRESHOLD VOLTAGE (Note)	OUTPUT	DISCHARGE SWITCH
Low	Irrelevant	Irrelevant	Low	On
High	< 1/3 V <sub>CC</sub>	Irrelevant	High	Off
High	> 1/3 V <sub>CC</sub>	> 2/3 V <sub>CC</sub>	Low	On
High	> 1/3 V <sub>CC</sub>	< 2/3 V <sub>CC</sub>	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 <sub>CC</sub>	18	V
Input Voltage	CONT, RESET, THRES, TRIG	V <sub>CC</sub>	V
Output Current	I <sub>O</sub>	±225	mA
Operating Virtual Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature	T <sub>STG</sub>	-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 <sub>CC</sub>	4.5~16	V
Input Voltage	V <sub>I</sub>	V <sub>CC</sub>	V
Output Current	I <sub>O</sub>	±200	mA
Operating Free-Air Temperature	T <sub>A</sub>	-40~85	°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Package Thermal Impedance (Note 1, 2)	DIP-8	85	°C/W
	SOP-8	97	°C/W
	MSOP-8	149	°C/W

Notes: 1. Maximum power dissipation is a function of T<sub>J(max)</sub>, θ<sub>JA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub>=(T<sub>J(max)</sub>-T<sub>A</sub>)/θ<sub>JA</sub>. Operating at the absolute maximum T<sub>J</sub> of 150°C can affect reliability.  
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

■ ELECTRICAL CHARACTERISTICS (V<sub>CC</sub>=5V~15V, T<sub>A</sub>=25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
THRES Voltage Level	V <sub>TH</sub>	V <sub>CC</sub> =15V	8.8	10	11.2	V
		V <sub>CC</sub> =5V	2.4	3.3	4.2	V
THRES Current (Note)	I <sub>TH</sub>			30	250	nA
TRIG Voltage Level	V <sub>TRIG</sub>	V <sub>CC</sub> =15V	4.5	5	5.6	V
		V <sub>CC</sub> =5V	1.1	1.67	2.2	V
TRIG Current	I <sub>TRIG</sub>	TRIG at 0V		0.5	2	µA
RESET Voltage Level	V <sub>RESET</sub>		0.3	0.7	1	V
RESET Current	I <sub>RESET</sub>	RESET at V <sub>CC</sub>		0.1	0.4	mA
		RESET at 0V		-0.4	-1.5	mA
DISCH Switch Off-State Current	I <sub>DISCH</sub>			20	100	nA
CONT Voltage (Open Circuit)	V <sub>CONT</sub>	V <sub>CC</sub> =15V	9	10	11	V
		V <sub>CC</sub> =5V	2.6	3.3	4	V
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> =15V, I <sub>OL</sub> =10mA		0.1	0.25	V
		V <sub>CC</sub> =15V, I <sub>OL</sub> =50mA		0.4	0.75	V
		V <sub>CC</sub> =15V, I <sub>OL</sub> =100mA		2	2.5	V
		V <sub>CC</sub> =15V, I <sub>OL</sub> =200mA		2.5		V
		V <sub>CC</sub> =5V, I <sub>OL</sub> =5mA		0.1	0.35	V
		V <sub>CC</sub> =5V, I <sub>OL</sub> =8mA		0.15	0.4	V
High-Level Output Voltage	V <sub>OH</sub>	V <sub>CC</sub> =15V, I <sub>OH</sub> =-100mA	12.75	13.3		V
		V <sub>CC</sub> =15V, I <sub>OH</sub> =-200mA		12.5		V
		V <sub>CC</sub> =5V, I <sub>OH</sub> =-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  $R=R_A+R_B\approx 3.4M\Omega$ , 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.

- Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.
- Values specified are for a device in a monostable circuit similar to Figure 1, with the following component values:  $R_A=2k\Omega\sim 100k\Omega$ ,  $C=0.1\mu F$ .
- 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

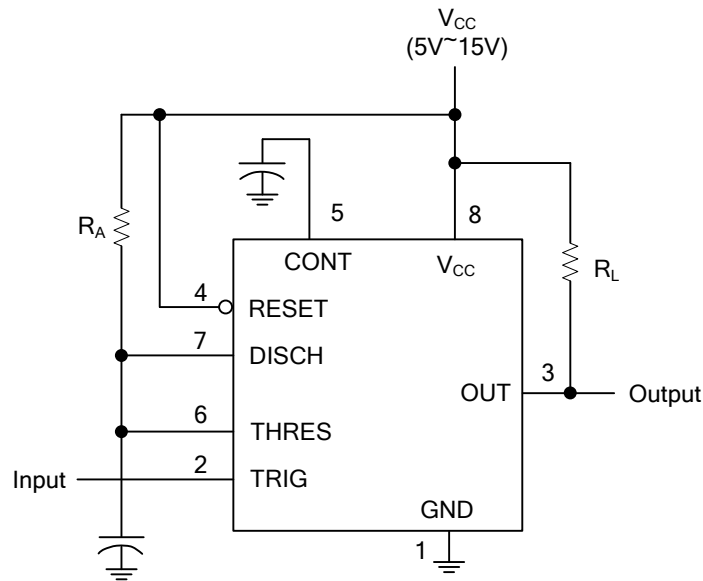
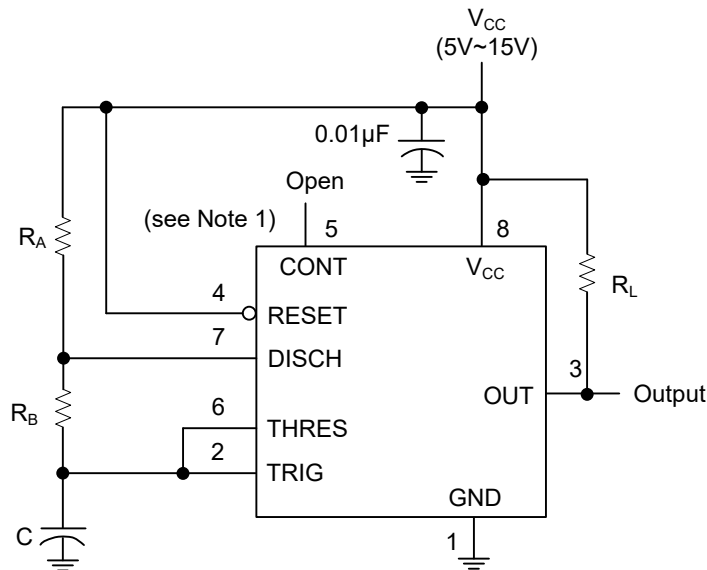


Figure 1. Circuit for Monostable Operation



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

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

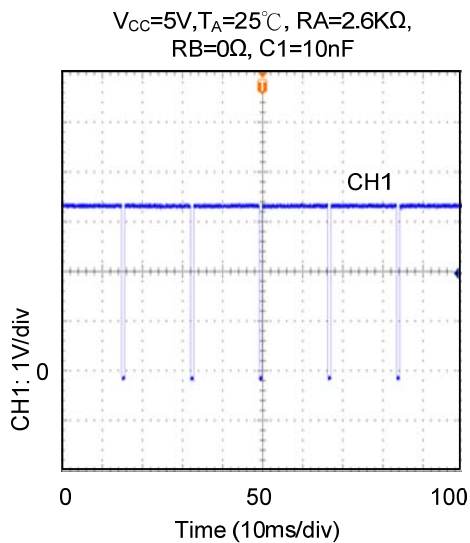
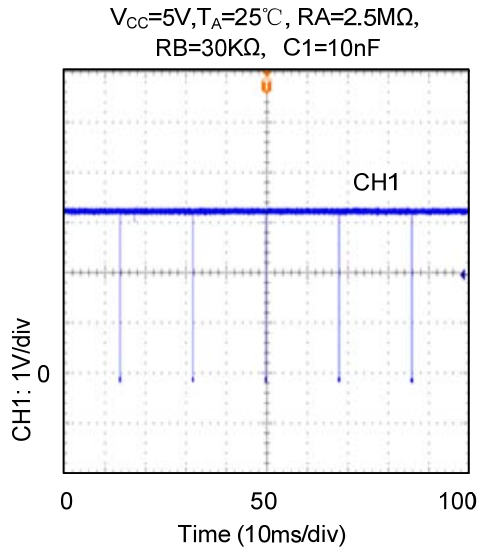
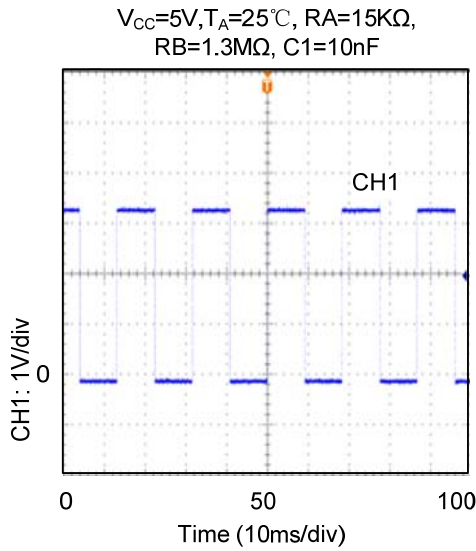
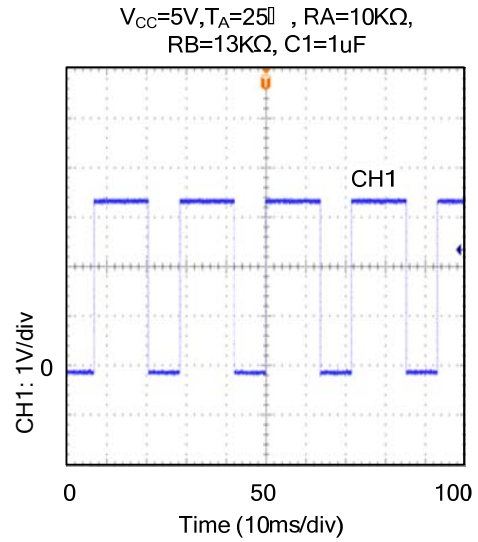
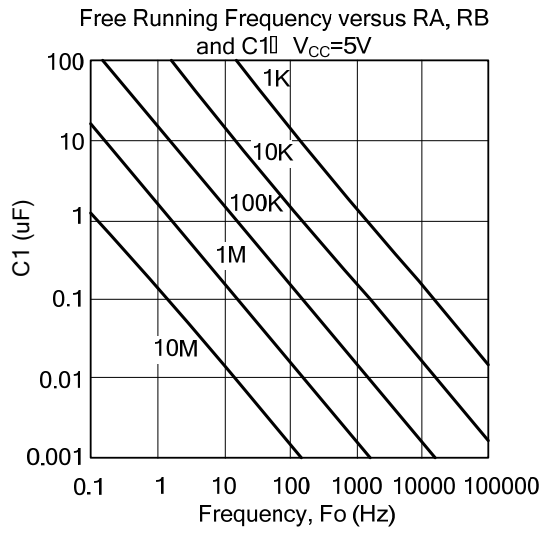
$$T2 = 0.693 \times R_B \times C1$$

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

3. Formula 0.693 values for reference only.

Figure 2. Circuit for Astable Operation

■ TYPICAL CHARACTERISTICS



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