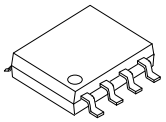
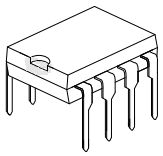
# USA555

**LINEAR INTEGRATED CIRCUIT**

## PRECISION TIMERS



SOP-8



DIP-8

## ■ 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

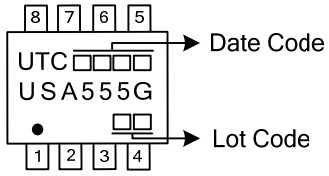
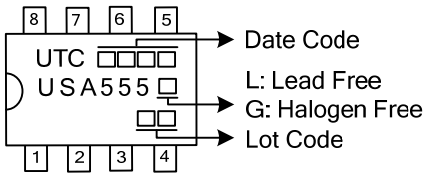
| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| - | USA555G-S08-R | SOP-8 | Tape Reel |
| USA555L-D08-T | USA555G-D08-T | DIP-8 | Tube |

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

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


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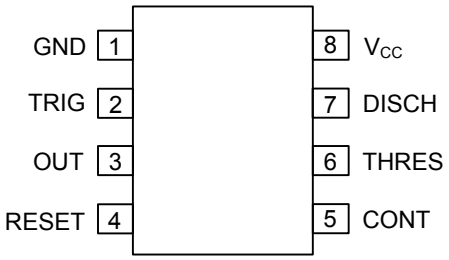
## ■ MARKING

| SOP-8 | DIP-8 |
|---|---|
|  |  |





## ■ PIN CONFIGURATION





## ■ PIN DESCRIPTION

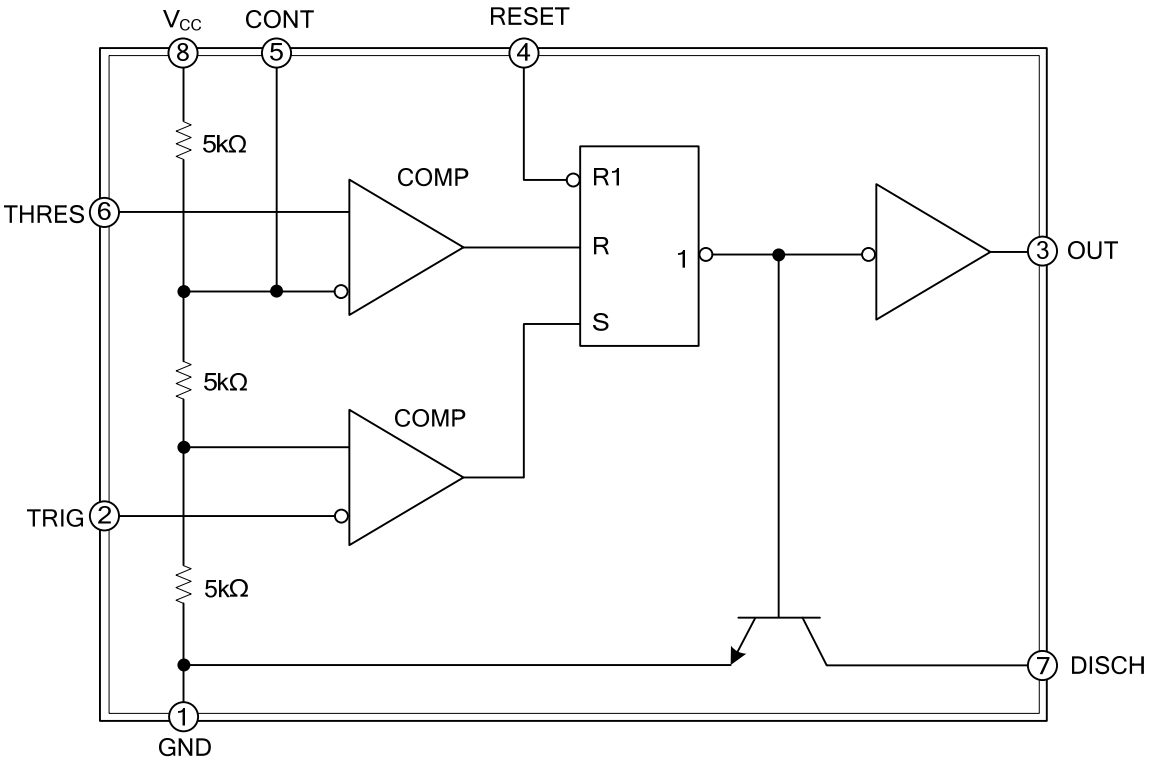
| PIN NO. | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | GND | Ground |
| 2 | TRIG | Trigger signal |
| 3 | OUT | Output terminal |
| 4 | RESET | Reset terminal |
| 5 | CONT | Control voltage |
| 6 | THRES | Threshold |
| 7 | DISCH | Discharge |
| 8 | $V_{CC}$ | Power supply |

## ■ 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 | $V_I$ | $V_{CC}$ | 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 | $\theta_{JA}$ | 97 | °C/W |
| | DIP-8 | | 85 | °C/W |

Notes: 1. Maximum power dissipation is a function of $T_{J(max)}$, $\theta_{JA}$, 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~15V, $T_A$=25°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 | VOL | $V_{CC}$=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 | VOH | $V_{CC}$=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 $R=R_A+R_B\neq3.4M\Omega$, and for $V_{CC}$=15V, the maximum value is 10MΩ.

■ OPERATING CHARACTERISTICS ($V_{CC}$=5V~15V, $T_A$=25°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°C | | 1 | 3 | % |
| | Each Timer, Astable (Note 4) | | | | 2.25 | | % |
| Temperature Coefficient of Timing Interval | Each Timer, Monostable (Note 3) | | $T_A$=MIN~MAX | | 50 | | ppm/°C |
| | Each Timer, Astable (Note 4) | | | | 150 | | ppm/°C |
| Supply-Voltage Sensitivity of Timing Interval | Each Timer, Monostable (Note 3) | | $T_A$=25°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°C | | 100 | 300 | ns |
| Output-Pulse Fall Time | | $T_F$ | $C_L$=15pF, $T_A$=25°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: $R_A$=2kΩ~100kΩ, C=0.1μF.
4. Values specified are for a device in an astable circuit similar to Figure 2, with the following component values: $R_A$=1kΩ~100kΩ, C=0.1μF.

## ■ TYPICAL APPLICATION CIRCUIT

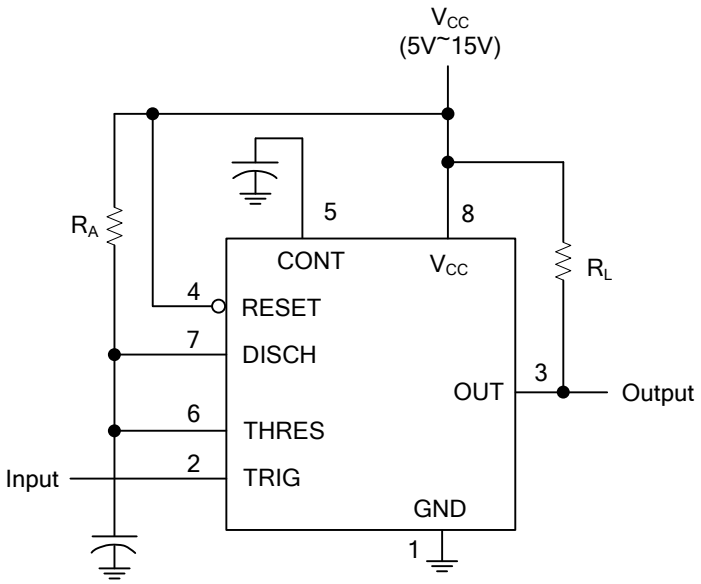
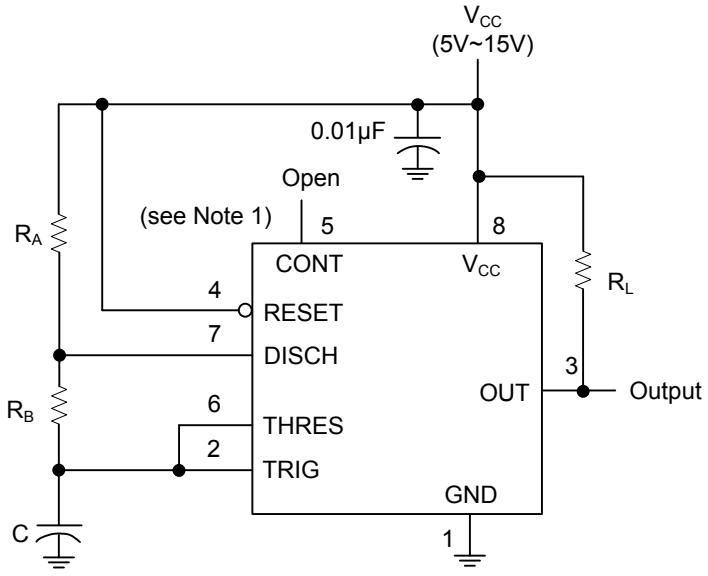



Figure 1. Circuit for Monostable Operation




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

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

   $T2 = 0.693 \times R_B \times C1$

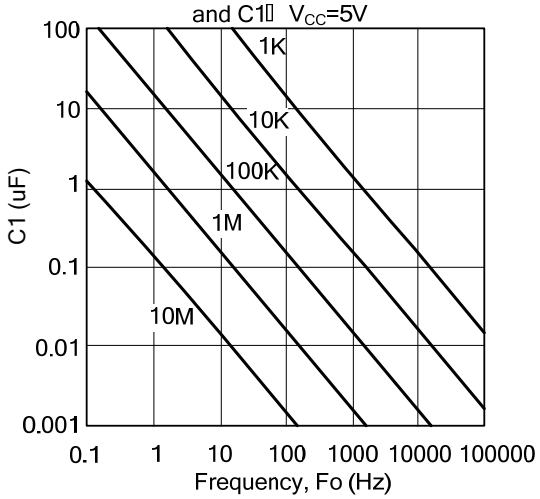
$$f = \frac{1}{T} = \frac{1.44}{(R_A + 2R_B) \times C1}$$

3. Formula 0.693 values for reference only.

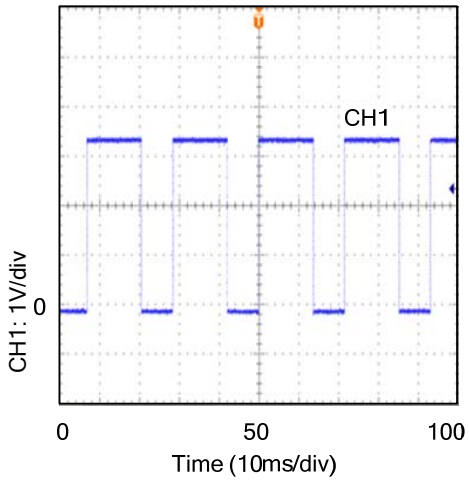
Figure 2. Circuit for Astable Operation

## ■ TYPICAL CHARACTERISTICS

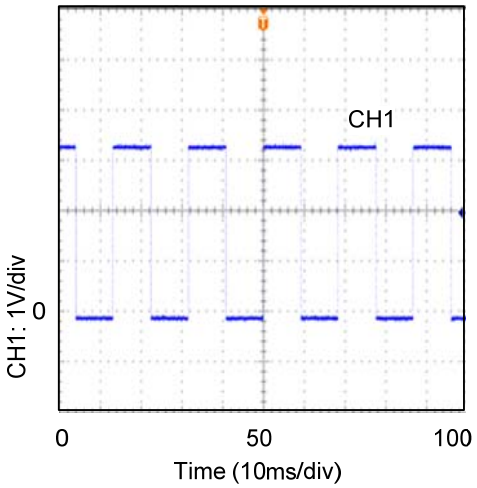
Free Running Frequency versus RA, RB and C1， $V_{CC}$=5V



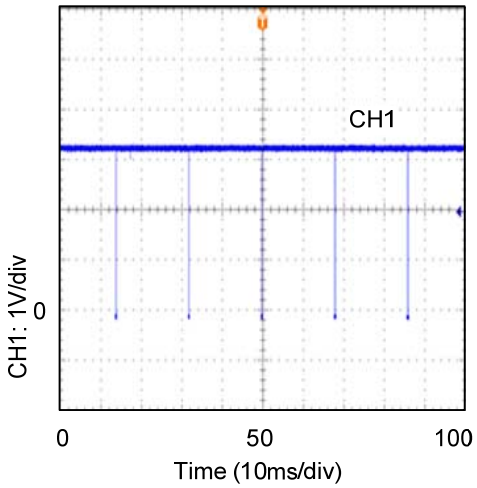

$V_{CC}$=5V,$T_A$=25， , RA=10KΩ, RB=13KΩ, C1=1uF



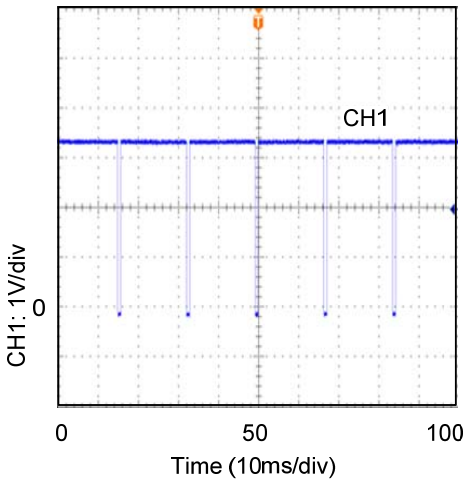

$V_{CC}$=5V,$T_A$=25℃, RA=15KΩ, RB=1.3MΩ, C1=10nF




$V_{CC}$=5V,$T_A$=25℃, RA=2.5MΩ, RB=30KΩ, C1=10nF




$V_{CC}$=5V,$T_A$=25℃, RA=2.6KΩ, RB=0Ω, C1=10nF



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