Description

SL555 is a bipolar integrated circuit capable of generating high-precision timing pulses. Internally, it consists of four circuits: threshold comparator, trigger comparator, RS flip-flop, and output circuit. It can be used with external resistors and capacitors to form timing trigger circuits, pulse width modulation circuits, audio oscillators, and more. It is widely used in toys, signal traffic, automation control, and other fields.

Feature

- High timing precision
- Maximum operating frequency up to 500 kHz
- Strong output driving capability
- Compatible with T_{TL} circuits
- Excellent temperature stability
- Package types: SOP8, DIP8
- Timing duration can range from microseconds to hours (precisely controlled via external resistors and capacitors).

Ordering information

PN	Package	PN	Packing
SL555D	DIP8	SL555D	tape
SL555S	SOP8	SL555S	reel

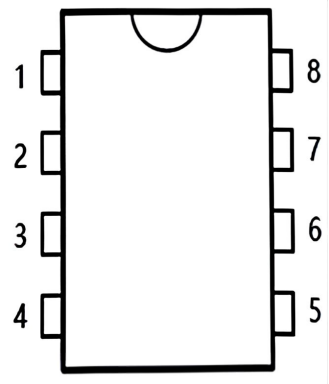
Application

- Audio pulse generator, divider
- Pulse width modulation, pulse phase modulation
- Device timing, traffic light control, access control
- Industrial control

Pin configuration and function

Pin No.	Name	Function
1	GND	power ground
2	Trig	trigger
3	Output	output
4	Reset	reset
5	Cont	control voltage
6	Thres	threshold
7	Disch	discharge
8	V_{CC}	power supply positive

DIP8/SOP8

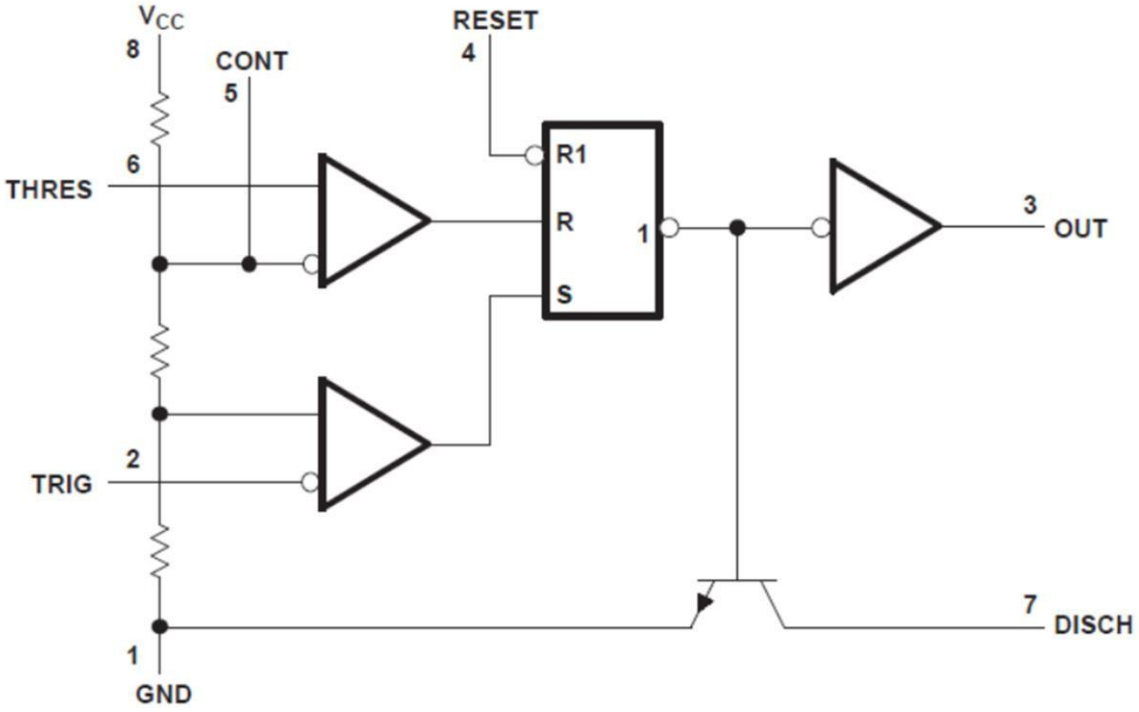


Absolute maximum rating

Parameter	Symbol	Value	Unit
power supply voltage	V_{CC}	18	V
input voltage	V_I (thre, trig, cont, reset)	V_{CC}	V
output current	I_o	±220	mA
power dissipation	P_D	400	mW
operating temperature	T_A	-20～70	℃
storage temperature	T_S	-65～150	℃
soldering temperature	T_W	260,10s	℃

Note：The limit parameters refer to values that must not be exceeded under any circumstances. Exceeding these limits may lead to physical damage or degradation of the product. Additionally, operating near these limit parameters does not guarantee normal chip functionality.

Schematic diagram



Recommended electrical parameters

Parameter	Symbol	Value	Unit
power supply voltage	V_{CC}	4.5～15	V
maximum input voltage	V_{th}, V_{trig}, V_{cont}, V_{reset}	V_{CC}	V
output current	I_o	±200	mA

Electrical Parameter（T_A=25℃, Unless otherwise specified）

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
power supply voltage	V_{CC}		4.5	-	15	V
operating current	I_{CC}	V_{CC} =5V, R_L =∝,V_O=V_{OL}	-	3	6	mA
		V_{CC} =5V, R_L =∝,V_O=V_{OH}	-	1.5	5	mA
		V_{CC} =15V, R_L =∝, V_O=V_{OL}	-	8	15	mA
		V_{CC} =15V, R_L =∝,V_O=V_{OH}	-	6	13	mA
control terminal voltage	V_{CL}	V_{CC} =15V	-	10.0	11	V
		V_{CC} =5V	-	3.3	4	V
threshold voltage terminal voltage	V_{TH}	V_{CC} =15V	-	10.0	11.2	V
		V_{CC} =5V	-	3.3	4.2	V
threshold voltage current	I_{TH} *note1	V_{CC} =15V, V_{TH} =0V	-	-	250	nA
trigger terminal voltage	V_{TRIG}	V_{CC} =15V	-	5.0	5.6	V
		V_{CC} =5V	-	1.6	2.2	V
trigger terminal current	I_{TRIG}	V_{CC} =15V, V_{TRIG} =0V,	-	-	2	uA
reset terminal high voltage	V_{RESETH}	V_{CC} =5V	1.5	-	VCC	V
reset terminal low voltage	V_{RESETL}	V_{CC} =5V	GND	-	0.5	V
reset terminal current	I_{RESET}	V_{RESET} =0.4V,V_{CC} =15V	-	0.13	0.4	mA
		V_{RESET} =0V,V_{CC} =15V	-	O.3	1.5	mA
output low voltage	V_{OL}	V_{CC} =15V, I_L =-5mA	-	0.02	0.25	V
		V_{CC} =15V, I_L =-50mA	-	0.04	0.75	
		V_{CC} =15V, I_L =-100mA	-	2.0	2.5	
		V_{CC} =15V, I_L =-200mA	-	2.8	-	
		V_{CC} =5V, I_L =-5mA	-	0.08	0.35	
		V_{CC} =5V, I_L =-8mA		0.15	0.4	
output high voltage	V_{OH}	V_{CC} =15V, I_L =-100mA	12.75	13.3	-	V
		V_{CC} =15V, I_L =-200mA	-	12.2	-	
		V_{CC} =5V, I_L =-100mA	2.75	3.3	-	
discharge tube leakage current when off	I_{dis} (off)	V_O=V_{OH}, V_{dis} = 10V	-	-	100	nA
saturation voltage of discharge tube	V_{dis}(sat)	V_O=V_{OL} V_{CC}=15V,Idis=15mA	-	140	480	mV
		V_O=V_{OL} V_{CC}=5V,Idis=4.5mA	-	100	200	mV
output rise time	t_R	C_L=15pF，	-	80	300	ns
output fall time	t_F	C_L=15pF	-	50	300	ns
timing error (monostable mode)	T_s *note2	R_A=2kΩ to 100kΩ C=0.1uF V_{CC}=15V,initial error	-	1	-	%
	T_v	drift with V_{CC}（4.5V～15V）	-	0.1	-	%/V
	T_t	V_{CC}=15V,drift with temp（0～60℃）	-	150	-	ppm℃
timing error (astable mode)	T_s *note2	R_A、R_B=1kΩ to 100kΩ C=0.1uF V_{CC}=15V,initial error	-	1	-	%
	T_v	drift with V_{CC}（4.5V～15V）	-	0.1	-	%/V
	T_t	V_{CC}=15V,drift with temp（0～60℃）	-	150	-	ppm℃

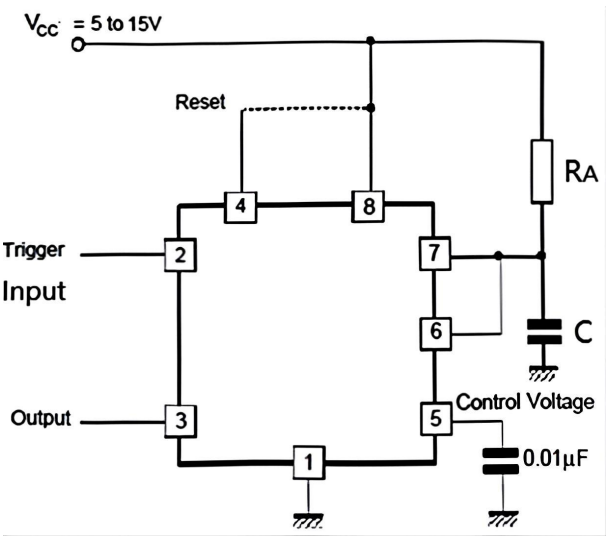
Notes：1. At V_{cc}=15V, the maximum value of Ra+Rb is 10MΩ; at V_{cc}=5V, the maximum value of Ra+Rb is 3.4MΩ.

2. Timing error is defined as the difference between the measured value and the average value of random samples. Additionally, timing error is influenced by errors in external capacitors and resistors.

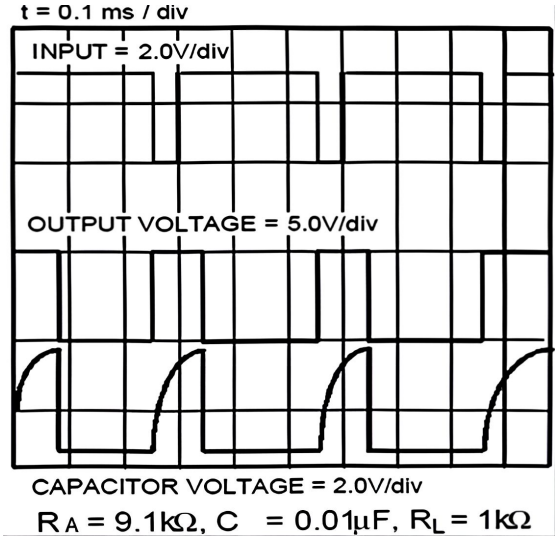
Typical application circuit

Monostable mode:

In monostable mode, when the input voltage reaches 1/3 V_{cc}, the circuit triggers to output a high level. After maintaining this state for a duration of t = 1.1*RA*C, the output switches to a low level. During this time period (t), the output state remains unaffected by the input voltage's state. Refer to Circuit and Waveform in Figures 3 and 4.



Monostable circuit



Monostable waveform diagram

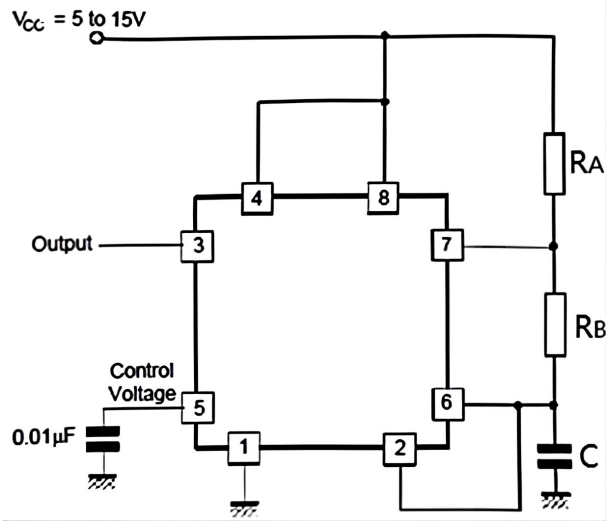
In transient state mode:

The circuit automatically triggers to generate a square wave multivibrator output. The frequency and duty cycle of the output square wave can be adjusted by the sizes of RA, RB, and C. The triggering mode, charging and discharging times, as well as the frequency, are independent of the supply voltage. Refer to Circuit and Waveform in Figures 5 and 6.

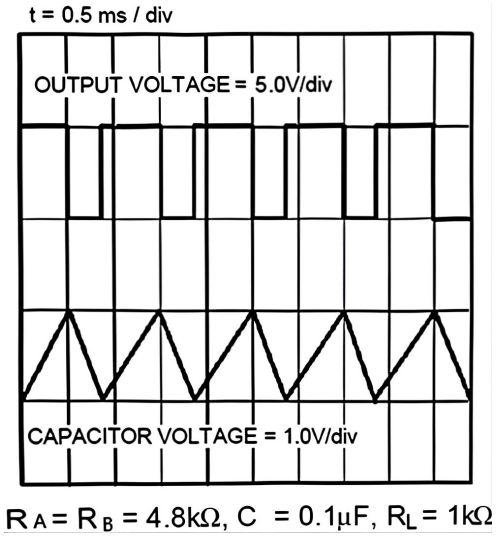
---High-level output pulse width: th = 0.693*(RA+RB)C ---Low-level output pulse width: tl = 0.693RBC

---Total period: T = th + tl = 0.693(RA+2RB)C ---Frequency: f = 1/T = 1.44/(RAC + 2RB*C)

---Duty cycle: D = tl/T = RB/(RA+2RB)



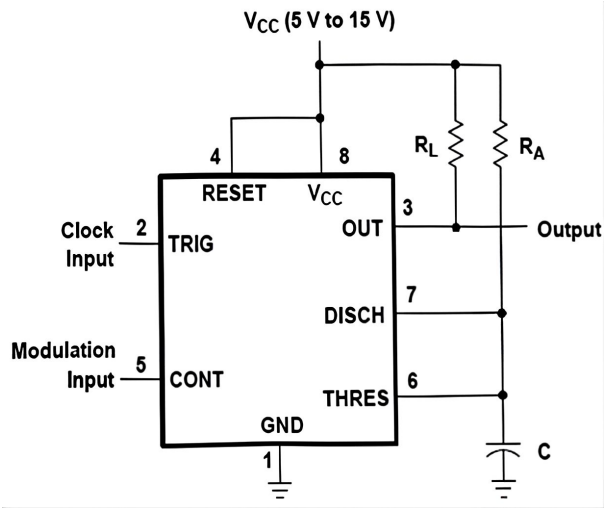
Transitional state circuit



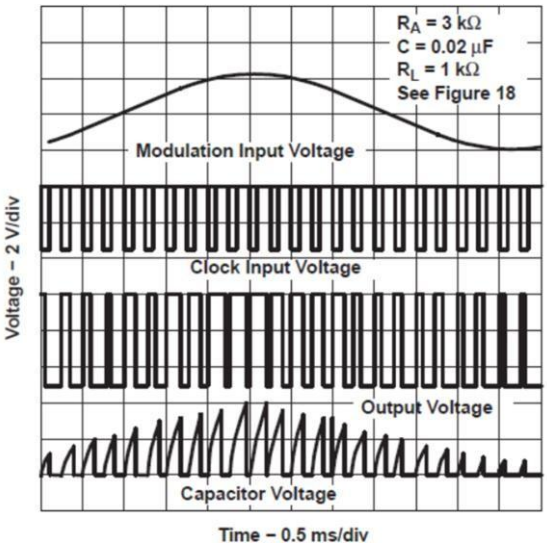
Transient state waveform

Pulse width modulation:

When the timer is configured in monostable mode and continuous pulse trains are applied to pin 2 for triggering, the output pulse width can be modulated by a signal applied to pin 5. Refer to Figures 7 and 8.



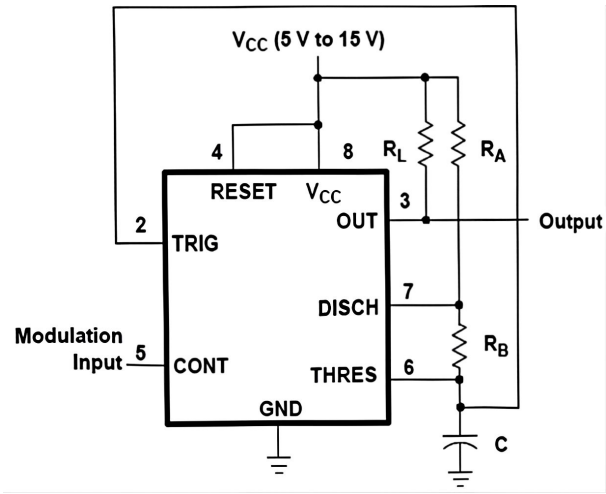
Pulse width modulation circuit



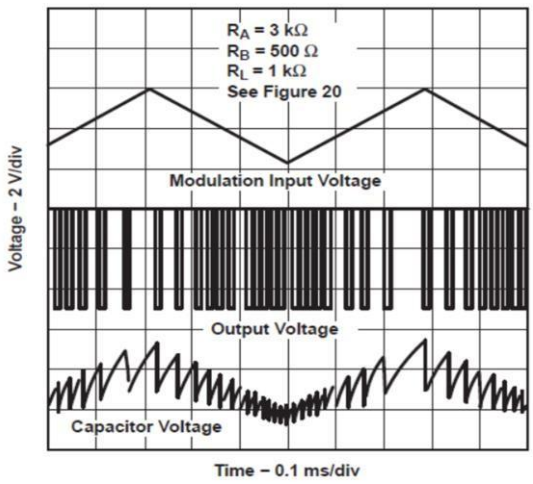
Pulse width modulation circuit waveform diagram

Pulse position modulation:

When the timer is connected as shown in Figure 9, the position of the output pulses can be modulated by a signal applied to pin 5. Refer to Figures 9 and 10.



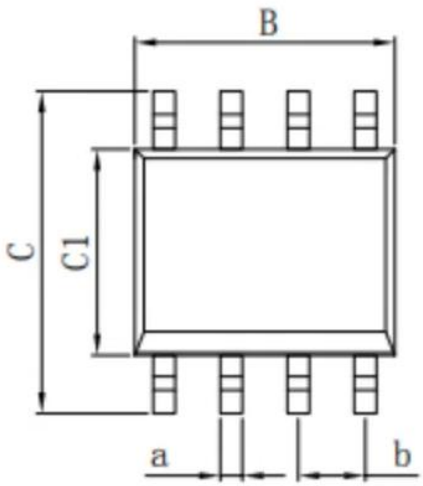
Pulse position modulation circuit

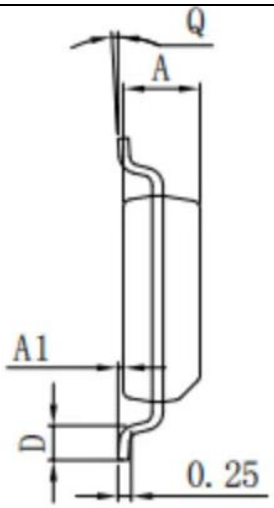


Pulse position modulation circuit waveform diagram

Package

SOP8

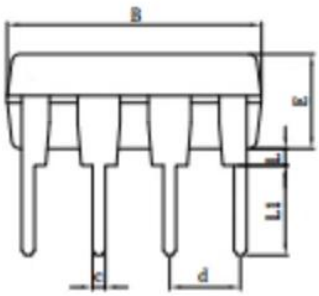


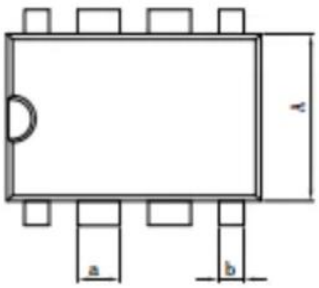


UNIT: mm

DIM.	MIN	TYP	MAX	DIM.	MIN	TYP	MAX
A	4.520	4.570	4.620	a	0.400	0.420	0.440
A1	0.100	-	0.250	b	1.260	1.270	1.280
B	4.800	4.920	5.100	Q	0°	-	8°
C	5.800	6.100	6.250				
C1	3.800	3.900	4.000				
D	0.400	-	0.950				

DIP8





UNIT: mm

DIM.	MIN	TYP	MAX	DIM.	MIN	TYP	MAX
A	6.100	6.300	6.680	a	1.504	1.524	1.544
B	9.000	9.200	9.500	b	-	0.889	-
D	8.400	8.700	9.000	c	0.437	0.457	0.477
D1	7.42	7.62	7.82	d	2.530	2.540	2.550
E	3.100	3.300	3.550	L	0.500	-	0.700
				L1	3.000	3.200	3.600