AiP555
General Purpose Timers

Product   Specification

Specification Revision History ：

| Version	Data	Description
2017-11-A1	2017-11	New-made

1、General Description

The AiP555 is a CMOS RC timer providing significantly improved performance over the standard SE/NE 555 timer, while at the same time being a direct replacement for those devices in most applications. Improved parameters include low supply current, wide operating supply voltage range, low Threshold, Trigger and Reset currents, no crowbarring of the supply current during output transitions, higher frequency performance and no requirement to decouple Control Voltage for stable operation.

Specifically, the AiP555 is a stable controller capable of producing accurate time delays or frequencies. In the one shot mode, the pulse width of each circuit is precisely controlled by one external resistor and capacitor. For astable operation as an oscillator, the free running frequency and the duty cycle are both accurately controlled by two external resistors and one capacitor. Unlike the regular bipolar 555 device, the Control Voltage terminal need not be decoupled with a capacitor. The circuits are triggered and reset on falling (negative) waveforms, and the output inverter can source or sink currents large enough to drive TTL loads, or provide minimal offsets to drive CMOS loads.
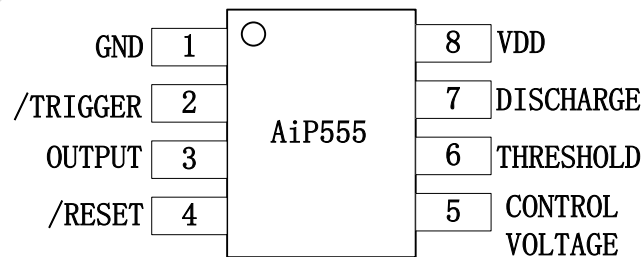
2、Block Diagram And Pin Description

2.1、Block Diagram
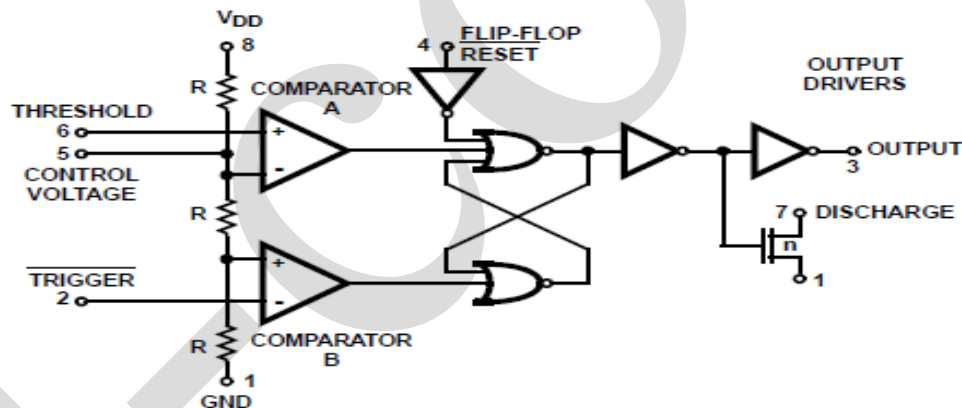
NOTE:

UNUSED INPUTS SHOULD BE CONNECTED TO APPROPRIATE VOLTAGE FROM TRUTH TABLE

2.2、Pin Configurations

2.3、Pin Description

Pin No.	Pin Name	Description
1	GND	Ground
2	/TRIGGER	Trigger Voltage Input
3	OUTPUT	Voltage Signal Output
4	/RESET	Reset Voltage Input
5	CONTROL VOLTAGE	Control Voltage Input
6	THRESHOLD	Threshold Voltage Input
7	DISCHARGE	Discharge Switch
8	VDD	Power

3、Electrical Parameter

3.1、 Absolute Maximum Ratings

(Tamb=25℃, All voltage referenced to Vss, unless otherwise specified)

Characteristic	Symbol	Conditions	Value	Unit
Power Supply Voltage	VDD		+18	V
Input Voltage	VIN	Trigger，Control Voltage, Threshold, Reset	$-0.3 \sim V_{DD}+0.3$	V
Output Current	I_{OUT}		100	mA
Operating Temperature	Topr		$-25 \sim 85$	℃
Storage Temperature	Tstg		$-55 \sim 125$	℃
Power Dissipation	P_D		500	mW
Soldering Temperature	T_L	10s	245	℃

3.2、Electrical Characteristics

(Tamb=25℃, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Supply Current	I_{DD}	$V_{DD}=5V$		40	200	μA
		$V_{DD}=15V$		60	300	μA
Monostable Timing Accuracy		$R_A=10k$, C=0.1μF, $V_{DD}=5V$		2		%
Drift with Supply		$V_{DD}=5V$ to 15V		0.5		%/V
Astable Timing Accuracy		$R_A=R_B=10k$, C=0.1μF, $V_{DD}=5V$		2		%
Drift with Supply		$V_{DD}=5V$ to 15V		0.5		%/V
Threshold Voltage	V_{TH}	$V_{DD}=15V$	62	67	71	$\%V_{DD}$
Trigger Voltage	V_{TRIG}	$V_{DD}=15V$	28	32	36	$\%V_{DD}$

Threshold Current	I_{TH}	V_{DD}=15V			10	nA
Trigger Current	I_{TRIG}	V_{DD}=15V			10	nA
Control Voltage	V_{CV}	V_{DD}=15V	62	67	71	%V_{DD}
Reset Voltage	V_{RST}	V_{DD}=2V to 15V	0.4		1.0	V
Reset Current	I_{RST}	V_{DD}=15V			10	nA
Discharge Leakage	I_{DIS}	V_{DD}=15V			10	nA
Output Voltage	V_{OL}	V_{DD}=15V，I_{SINK}=20mA		0.4	1.0	V
		V_{DD}=5V，I_{SINK}=3.2mA		0.2	0.4	V
	V_{OH}	V_{DD}=15V，I_{SOURSE}=0.8mA	14.3	14.6		V
		V_{DD}=5V，I_{SOURSE}=0.8mA	4.0	4.3		V
Discharge Output Voltage	V_{DIS}	V_{DD}=5V, I_{SINK}=15mA		0.2	0.4	V
Supply Voltage	V_{DD}	Functional Operation	2.0		18.0	V
Output Rise Time	t_R	R_L=10M, C_L=10pF, V_{DD}=5V		75		ns
Output Fall Time	t_F	R_L=10M, C_L=10pF, V_{DD}=5V		75		ns
Oscillator Frequency	f_{MAX}	V_{DD}=5 V,R_A=470Ω， R_B=270Ω，		1		MHz

3.3、Truth Table

Threshold Voltage	Trigger Voltage	Reset	Output	Discharge Switch
Don't Care	Don't Care	Low	Low	On
>2/3(V+)	>1/3(V+)	High	Low	On
<2/3(V+)	>1/3(V+)	High	Stable	Stable
Don't Care	<1/3(V+)	High	High	Off

NOTE: Reste will dominate all other inputs: Trigger will dominate over Threshold.

4、Function Description

4.1、General

The AiP555 device is, in most instances, a direct replacement for the NE/SE555 device. However, it is possible to effect economies in the external component count using the AiP555. Because the bipolar 555 device produces large crowbar currents in the output driver, it is necessary to decouple the power supply lines with a good capacitor close to the device. The AiP555 device produces no such transients. See Figure 1.

The AiP555 produces supply current spikes of only 2-3mA instead of 300-400mA and supply decoupling is normally not necessary. Secondly, in most instances, the Control Voltage decoupling

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capacitors are not required since the input impedance of the CMOS comparators on chip are very high. Thus, for many applications, 2 capacitors can be saved using an AiP555.

Figure 1. Supply Current Transient Compared With a Standard Bipolar 555 During an Output Transition
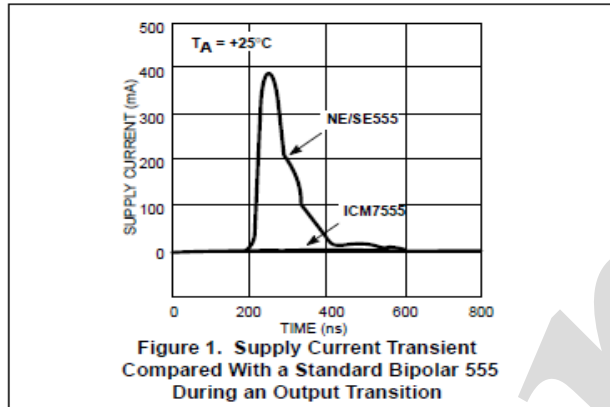
4.2、Power Supply Considerations

Although the supply current consumed by the AiP555 device is very low, the total system supply can be high unless the timing components are high impedance. Therefore, high values for R and low values for C in Figures 2 and 3 are recommended
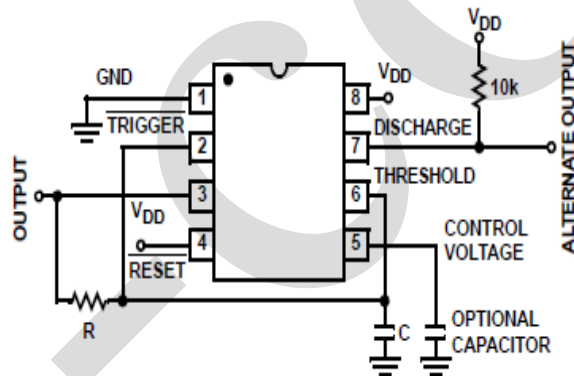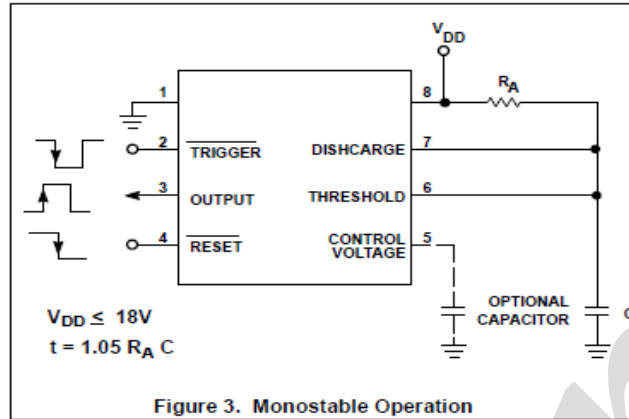

Figure2 ASTABLE OPERATION

Figure 3. Monostable Operation

4.3、Output Drive Capability

The output driver consists of a CMOS inverter capable of driving most logic families including CMOS and TTL. As such, if driving CMOS, the output swing at all supply voltages will equal the supply voltage. At a supply voltage of 4.5V or more, the AiP555 will drive at least 2 standard TTL loads.

4.4、Astable Operation

The circuit can be connected to trigger itself and free run as a multivibrator, see Figure 2. The output swings from rail-to-rail, and is a true 50% duty cycle square wave. Trip points and output swings are symmetrical. Less than a 1% frequency variation is observed over a voltage range of +5V to +15V.
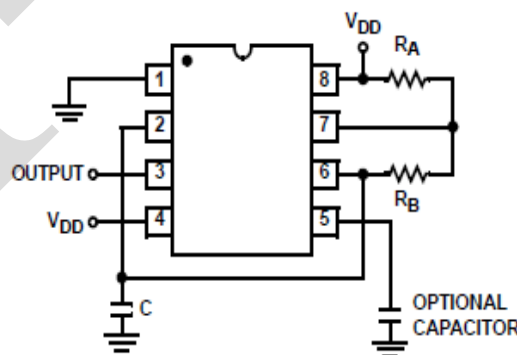
$$F=1/1.4RC \qquad\qquad (EQ.1)$$

The timer can also be connected as shown in Figure 4. In this circuit, the frequency is as shown by Equation 2:

$$F=1.44/(R_A+2R_B)C \qquad (EQ.2)$$

The duty cycle is controlled by the values of R_A and R_B, by Equation 3:

$$D=(R_A+R_B)/(R_A+2R_B) \qquad (EQ.3)$$

Figure4 ALTERNATE ASTABLE CONFIGURATION

4.5、Monostable Operation

In this mode of operation, the timer functions as a one-shot. Initially, the external capacitor (C) is held discharged by a transistor inside the timer. Upon application of a negative pulse to Pin 2,Trigger, the internal flip-flop is set which releases the low impedance on Discharge; the external capacitor charges and drives the Output High. The voltage across the capacitor increases exponentially with a time constant t = R_AC. When the voltage across the capacitor equals 2/3 V+, the comparator resets the flip-flop, which in turn discharges the capacitor rapidly and also drives the OUTPUT to its low state. /Trigger must return to a high state before the OUTPUT can return to a low state.

4.6、Control Voltage

The Control Voltage terminal permits the two trip voltages for the Threshold and /Trigger internal comparators to be controlled. This provides the possibility of oscillation frequency modulation in the astable mode, or even inhibition of oscillation, depending on the applied voltage. In the monostable mode, delay times can be changed by varying the applied voltage to the Control Voltage pin.

4.7、/RESET

The /Reset terminal is designed to have essentially the same trip voltage as the standard bipolar 555, i.e., 0.6 to 0.7V. At all supply voltages it represents an extremely high input impedance. The mode of operation of the /Reset function is, however, much improved over the standard bipolar 555 in that it controls only the internal flip-flop, which in turn controls simultaneously the state of the Output and Discharge pins. This avoids the multiple threshold problems sometimes encountered with slow falling edges in the bipolar devices.
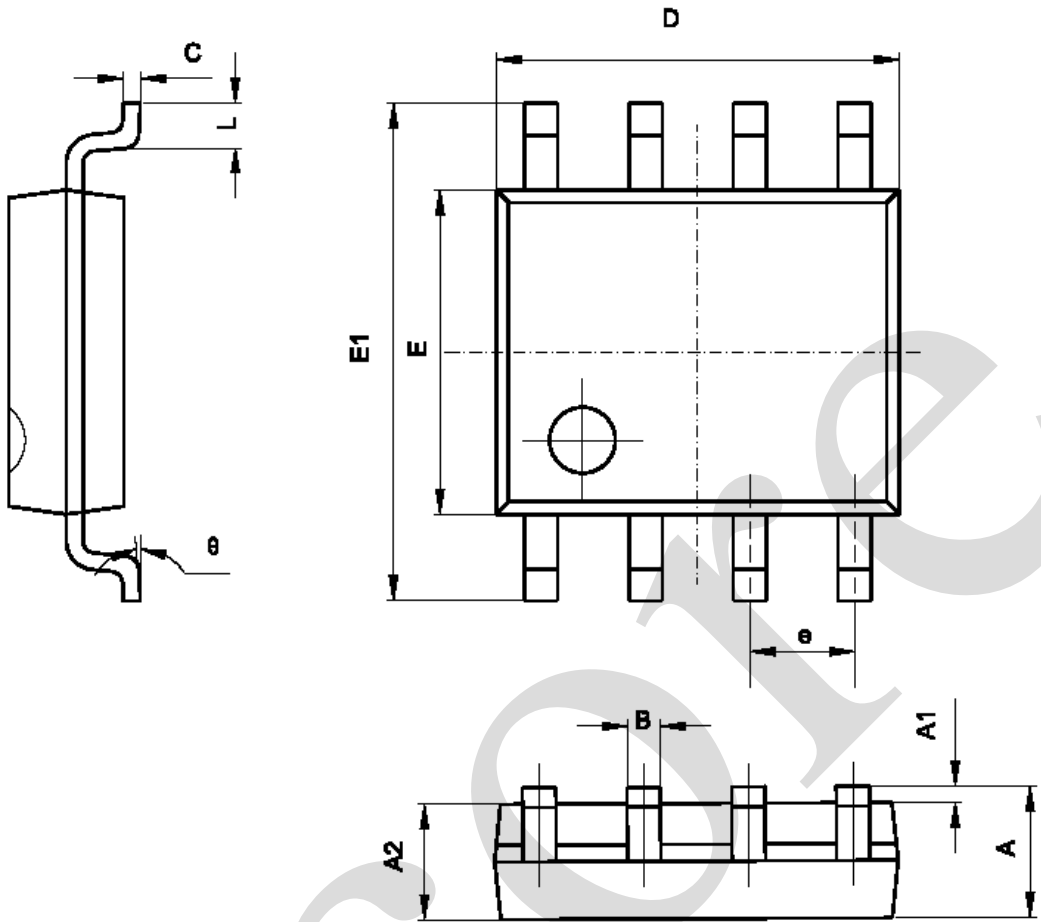
5、Package Information

5.1、DIP8
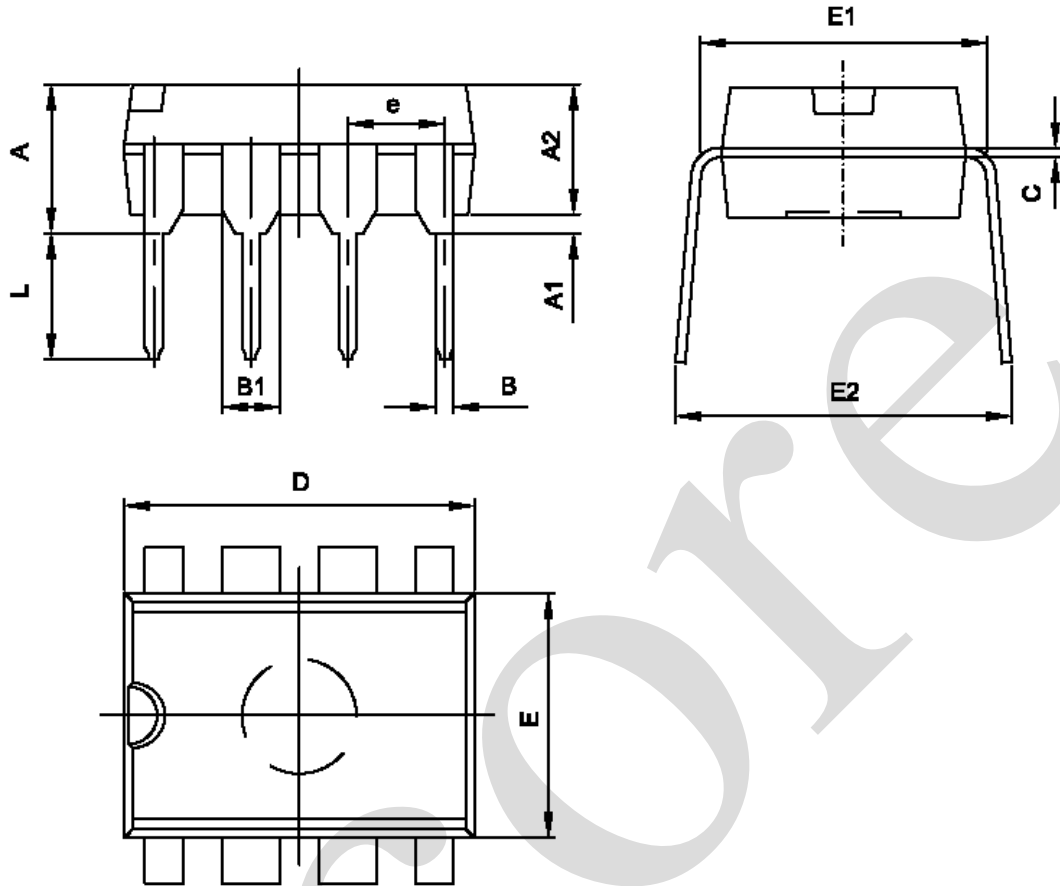
Symbol	Dimension In Millimeters		Dimension In Inches	
	Min	Max	Min	Max
A	3.610	4.310	0.142	0.170
A1	0.510		0.020	
A2	3.100	3.600	0.122	0.142
B	0.360	0.560	0.014	0.022
B1	1.524(TYP)		0.060(TYP)	
C	0.200	0.360	0.008	0.014
D	9.000	9.500	0.354	0.374
E	6.100	6.600	0.240	0.260
E1	7.620(TYP)		0.300(TYP)	
e	2.540(TYP)		0.100(TYP)	
L	3.000	3.600	0.118	0.142
E2	8.200	9.400	0.323	0.370

5. 2、SOP8

Symbol	Dimension In Millimeters		Dimension In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.170	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270(TYP)		0.050(TYP)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

10、Statements And Notes：

10.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○：Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard。 ×：Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements。									

10.2、Notion:

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