

TIMER

■ GENERAL DESCRIPTION

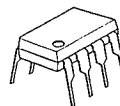
The NJM555 monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode, delay time is precisely controlled by only two external parts: a resistor and a capacitor. For operation as an oscillator, both the free running frequency and the duty cycle are accurately controlled by two external resistors and a capacitor.

Terminals are provided for triggering and resetting. The circuit will trigger and reset on falling waveforms. The output can source or sink up to 200mA or drive TTL circuits.

■ FEATURES

- Operating Voltage (4.5V ~ 16V)
- Less Number of External Components
- Package Outline DIP8, DMP8, SSOP8, SIP8
- Bipolar Technology

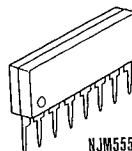
■ PACKAGE OUTLINE



NJM555D



NJM555M

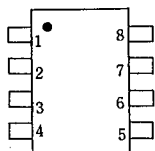


NJM555L

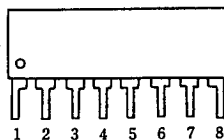


NJM555V

■ PIN CONFIGURATION



NJM555D  
NJM555M  
NJM555V

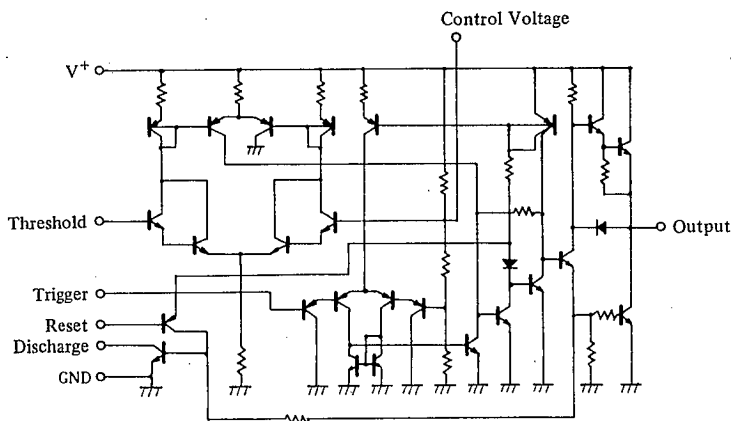


NJM555L

PIN FUNCTION

1. GND
2. Trigger
3. Output
4. Reset
5. Control Voltage
6. Threshold
7. Discharge
8. V<sup>+</sup>

■ EQUIVALENT CIRCUIT



## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	18	V
Power Dissipation	P <sub>d</sub>	(DIP8) 500	mW
		(DMP8) 300	mW
		(SSOP8) 250	mW
		(SIP8) 800	mW
Operating Temperature Range	T <sub>opr</sub>	-40~+85	°C
Storage Temperature Range	T <sub>stg</sub>	-40~+125	°C

## ■ ELECTRICAL CHARACTERISTICS

(V<sup>+</sup>=5~15V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V <sup>+</sup>		4.5	—	16	V
Operating Current (Note 1)	I <sub>cc</sub>	V <sup>+</sup> =5V, R <sub>L</sub> =∞	—	3.0	6.0	mA
Operating Current (Note 1)	I <sub>cc</sub>	V <sup>+</sup> =15V, R <sub>L</sub> =∞	—	10	15	mA
Timing Error (Note 2)						
Initial Accuracy	E <sub>t</sub>	Ta=-20~75°C, V <sup>+</sup> =5~15V	—	1.0	—	%
Drift with Temperature	E <sub>t</sub>	Ta=-20~75°C, V <sup>+</sup> =5~15V	—	50	—	ppm/°C
Drift with Supply Voltage	E <sub>t</sub>	Ta=-20~75°C, V <sup>+</sup> =5~15V	—	0.1	—	%/V
Threshold Voltage	V <sub>th</sub>		—	2/3	—	×V <sup>+</sup>
Trigger Voltage	V <sub>T</sub>	V <sup>+</sup> =15V	—	5.0	—	V
Trigger Voltage	V <sub>T</sub>	V <sup>+</sup> =5V	—	1.67	—	V
Trigger Current	I <sub>T</sub>		—	0.5	—	μA
Reset Voltage	V <sub>R</sub>		0.4	0.5	1.0	V
Reset Current	I <sub>R</sub>		—	0.1	—	mA
Threshold Current	I <sub>th</sub>		—	0.1	0.25	μA
Control Voltage Level	V <sub>CL</sub>	V <sup>+</sup> =15V	9	10	11	V
Control Voltage Level	V <sub>CL</sub>	V <sup>+</sup> =5V	2.6	3.33	4.0	V
Output Voltage (Low)	V <sub>OL</sub>	V <sup>+</sup> =15V I <sub>sink</sub> =10mA	—	0.1	0.25	V
Output Voltage (Low)	V <sub>OL</sub>	V <sup>+</sup> =15V I <sub>sink</sub> =50mA	—	0.4	0.75	V
Output Voltage (Low)	V <sub>OL</sub>	V <sup>+</sup> =15V I <sub>sink</sub> =100mA (Note 3)	—	2.0	2.5	V
Output Voltage (Low)	V <sub>OL</sub>	V <sup>+</sup> =15V I <sub>sink</sub> =200mA (Note 3)	—	2.5	—	V
Output Voltage (Low)	V <sub>OL</sub>	V <sup>+</sup> =5V I <sub>sink</sub> =5mA	—	0.25	0.35	V
Output Voltage (High)	V <sub>OHI</sub>	V <sup>+</sup> =15V I <sub>source</sub> =200mA (Note 3)	—	12.5	—	V
Output Voltage (High)	V <sub>OHI</sub>	V <sup>+</sup> =15V I <sub>source</sub> =100mA (Note 3)	12.75	13.3	—	V
Output Voltage (High)	V <sub>OHI</sub>	V <sup>+</sup> =15V I <sub>source</sub> =40mA	—	13.5	—	V
Output Voltage (High)	V <sub>OHI</sub>	V <sup>+</sup> =5V I <sub>source</sub> =100mA	2.75	3.3	—	V
Rise Time of Output	t <sub>r</sub>	No Loading	—	100	—	ns
Fall Time of Output	t <sub>f</sub>	No Loading	—	100	—	ns

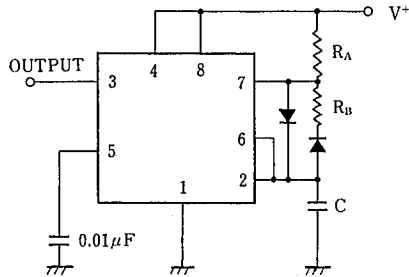
Note 1: Low output condition (When the output is high, it is lower than the low output condition by 1mA in the standard specification.)

Note 2: R<sub>A</sub>, R<sub>B</sub>=1k~100kΩ, C=0.1μF, V<sup>+</sup>=15V from 5V

Note 3: Not specified for NJM555M/NJM555E

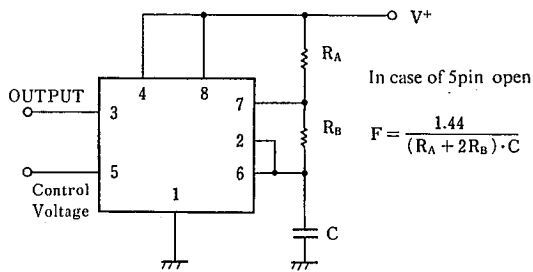
## ■ TYPICAL APPLICATION

### (1) 50% Duty Cycle Oscillator



Duty cycle 50% at  $R_A = R_B$   
 Due to  $R_A, R_B$  value  
 the duty ratio becomes  
 lower than 50%.

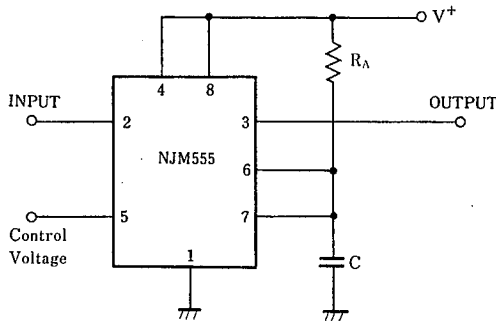
### (2) Oscillation frequency can be changed by changing the control voltage.



In case of 5pin open

$$F = \frac{1.44}{(R_A + 2R_B) \cdot C}$$

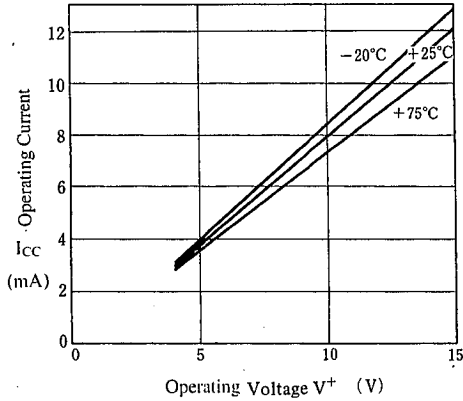
### (3) Pulse Width Modulation



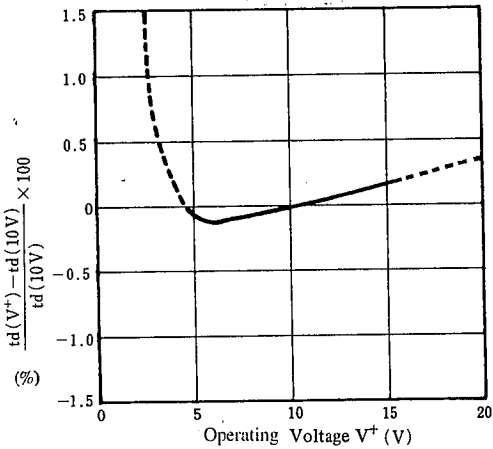
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■ TYPICAL CHARACTERISTICS

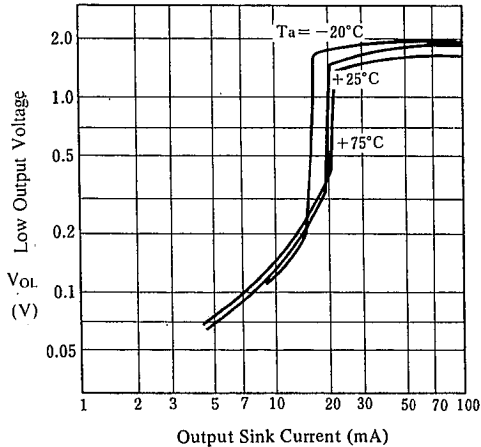
Operating Current vs. Operating Voltage  
( $V_{out} = \text{LOW STATE}$ )



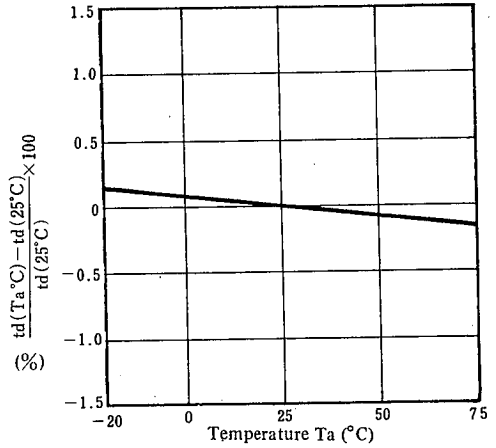
Delay Time vs. Operating Voltage  
( $T_a = 25^\circ\text{C}$ )



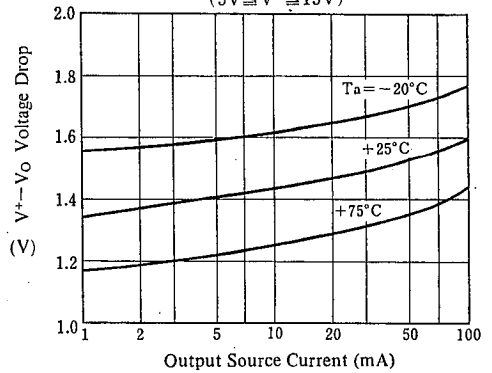
Low Output Voltage vs. Output Sink Current ( $V^+ = 5\text{V}$ )



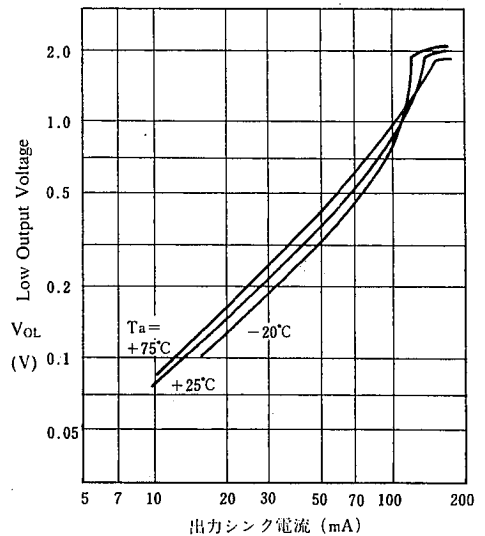
Delay Time vs. Temperature  
( $V^+ = 10\text{V}$ )



High Output Voltage Drop vs. Output Source Current  
( $5\text{V} \leq V^+ \leq 15\text{V}$ )



Low Output Voltage vs. Output Sink Current ( $V^+ = 15\text{V}$ )



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■ TYPICAL CHARACTERISTICS

1. Monostable Operation

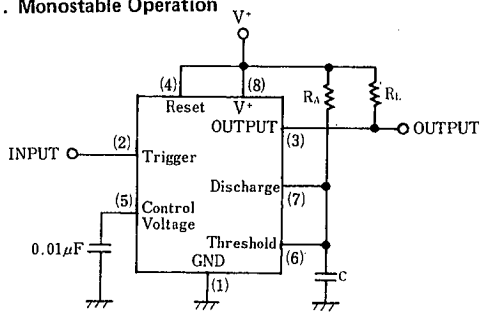


Fig. 1

2. Free Running Operation

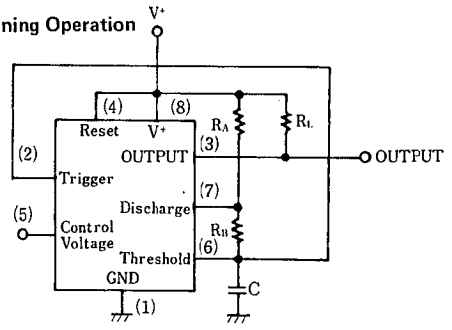


Fig. 3

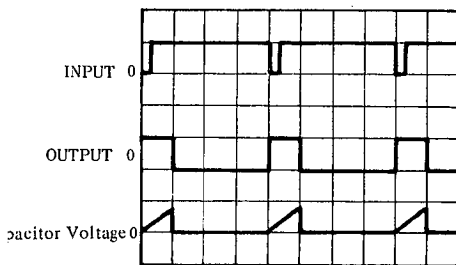


Fig.2 Wave Form

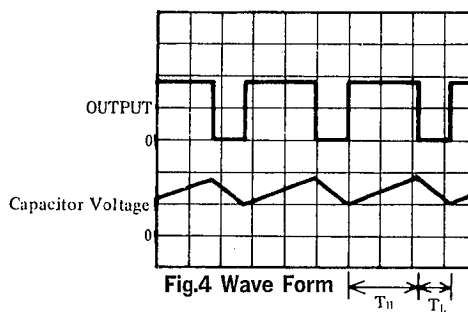
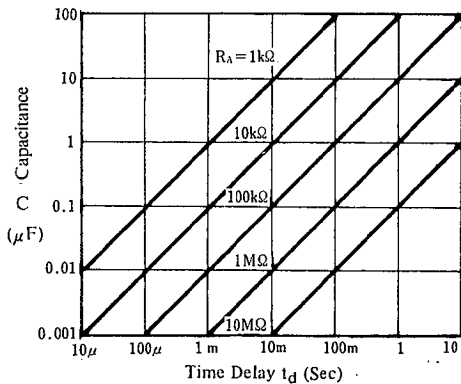
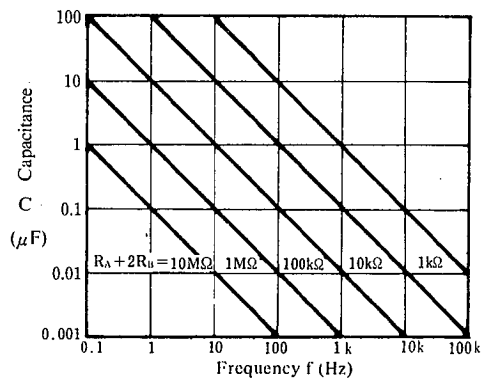


Fig.4 Wave Form



Time Delay vs.  $R_A$ ,  $R_B$  and  $C$

Fig. 2 shows a typical example of the monostable operation.  $T_H = 1.1R_A \cdot C$  assuming that  $T_H$  be the time at the high output level in this figure.



Free Running Frequency vs.  $R_A$ ,  $R_B$  and  $C$

Fig. 4 shows a typical example of the free running operation.

The charge time (output High) is given by:

$$T_H = 0.693 (R_A + R_B) \cdot C$$

And the discharge time (output Low) by:

$$T_L = 0.693 R_B \cdot C$$

The frequency of oscillation is:

$$F = \frac{1.44}{(R_A + 2R_B) \cdot C}$$

The duty cycle is:

$$D = \frac{T_H}{T_H + T_L} = \frac{R_A + R_B}{R_A + 2R_B}$$

## MEMO

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