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New Japan Radio Co.,Ltd.

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## TIMER

### ■ GENERAL DESCRIPTION

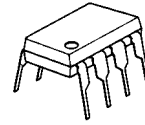
The **NJM555** monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode, delay time is precisely controlled by only two external parts : a resistor and a capacitor. For operation as an oscillator, both the free running frequency 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 to 16V)
- Less Number of External Components
- Package Outline DIP8, DMP8, SSOP8, SIP8
- Bipolar Technology

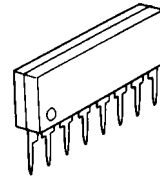
### ■ PACKAGE OUTLINE



NJM555D



NJM555M

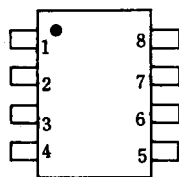


NJM555L

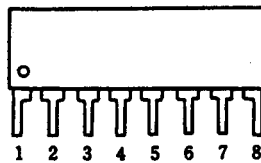


NJM555V

### ■ PIN CONFIGURATION



NJM555D  
NJM555M  
NJM555V

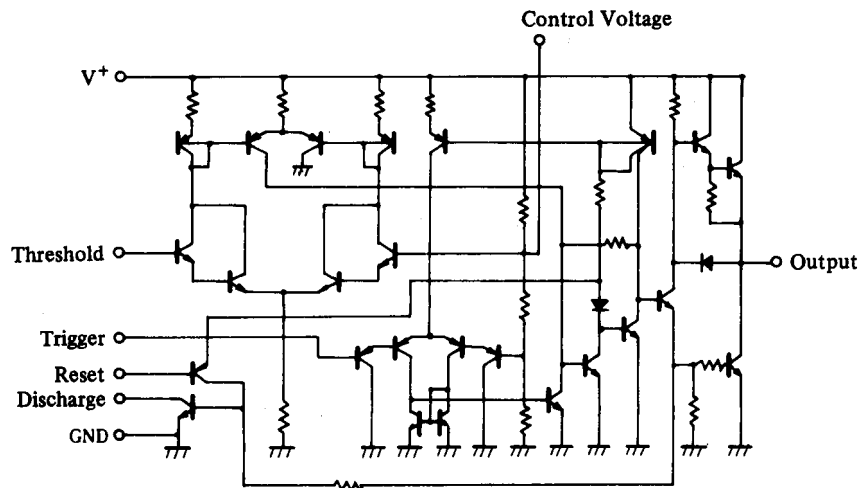


NJM555L

#### PIN FUNCTION

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

### ■ EQUIVALENT CIRCUIT



# NJM555

## ■ ABSOLUTE MAXIMUM RATINGS

(T<sub>a</sub>=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	18	V
Power Dissipation	P <sub>D</sub>	(DIP8) 1000(Note1)	mW
		(DMP8) 580(Note1)	mW
		(SSOP8) 480(Note1)	mW
		(SIP8) 1600(Note1)	mW
Operating Temperature Range	T <sub>opr</sub>	-40 to +85	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to +125	°C

Note1: Mounted on the EIA/JEDEC standard board (76.2×114.3×1.6mm, four layer, FR-4).

## ■ ELECTRICAL CHARACTERISTICS

(V<sup>+</sup>=5 to 15V, T<sub>a</sub>=25°C)

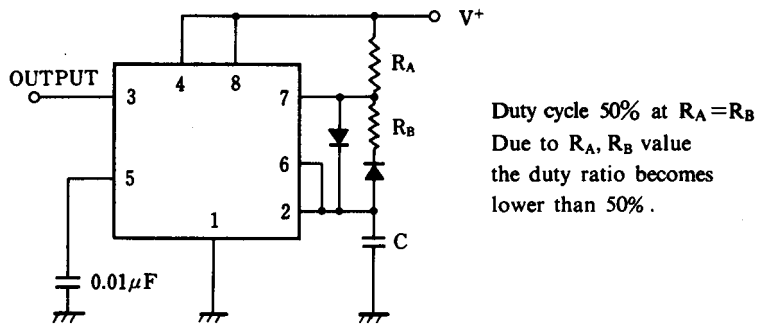
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V <sup>+</sup>		4.5	-	16	V
Operating Current	I <sub>CC</sub>	V <sup>+</sup> =5V, R <sub>L</sub> =∞(Note 2)	-	3.0	6.0	mA
Operating Current	I <sub>CC</sub>	V <sup>+</sup> =15V, R <sub>L</sub> =∞(Note 2)	-	10	15	mA
Timing Error						
Initial Accuracy	E <sub>t</sub>	T <sub>a</sub> =-20 to 75°C, V <sup>+</sup> =5 to 15V(Note 3)	-	1.0	-	%
Drift with Temperature	E <sub>t</sub>	T <sub>a</sub> =-20 to 75°C, V <sup>+</sup> =5 to 15V(Note 3)	-	50	-	ppm / °C
Drift with Supply Voltage	E <sub>t</sub>	T <sub>a</sub> =-20 to 75°C, V <sup>+</sup> =5 to 15V(Note 3)	-	0.1	-	% / V
Threshold Voltage	V <sub>th</sub>		-	2 / 3	-	xV <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	-	2.0	2.5	V
Output Voltage (Low)	V <sub>OL</sub>	V <sup>+</sup> =15V I <sub>sink</sub> =200mA	-	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>OH</sub>	V <sup>+</sup> =15V I <sub>source</sub> =200mA	-	12.5	-	V
Output Voltage (High)	V <sub>OH</sub>	V <sup>+</sup> =15V I <sub>source</sub> =100mA	12.75	13.3	-	V
Output Voltage (High)	V <sub>OH</sub>	V <sup>+</sup> =15V I <sub>source</sub> =40mA	-	13.5	-	V
Output Voltage (High)	V <sub>OH</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 2 : Low output condition (When the output is high, it is lower than the low output condition by 1mA in the standard specificatio.)

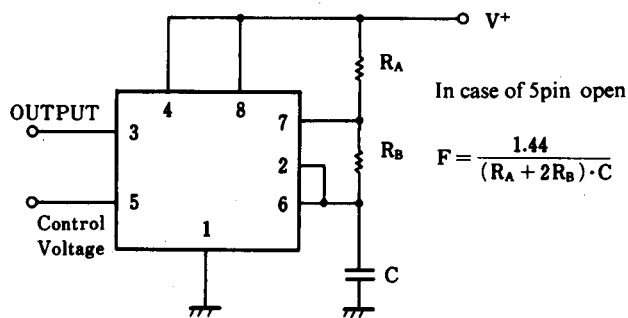
Note 3 : R<sub>A</sub>, R<sub>B</sub>=1k to 100kΩ, C=0.1μF, V<sup>+</sup>=15V from 5V

## ■ TYPICAL APPLICATION

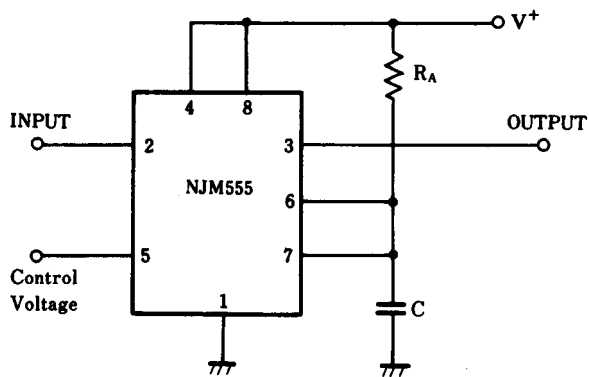
### (1) 50% Duty Cycle Oscillator



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

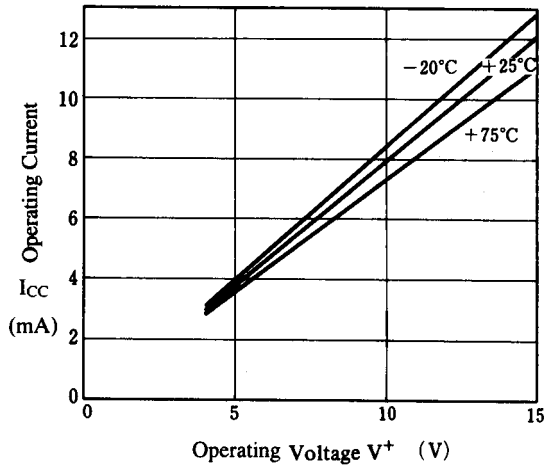


### (3) Pulse Width Modulation

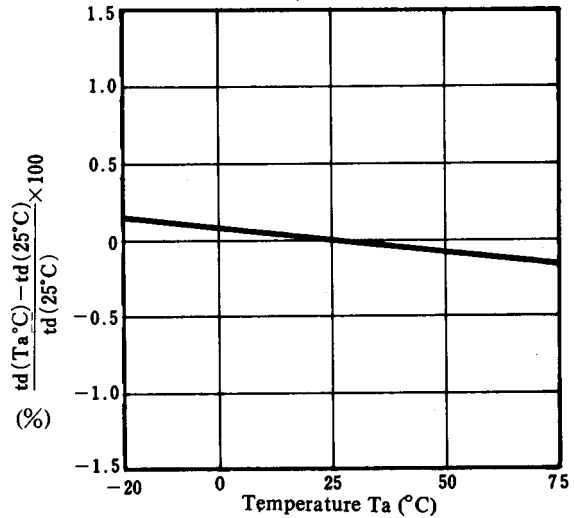


## ■ TYPICAL CHARACTERISTICS

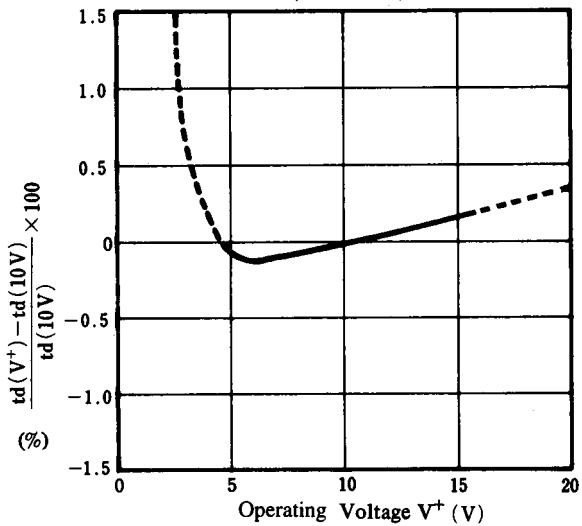
**Operating Current vs. Operating Voltage**  
( $V_{out} = \text{LOW STATE}$ )



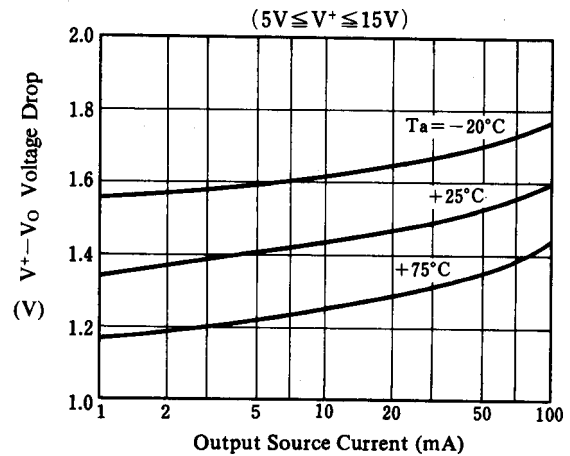
**Delay Time vs. Temperature**  
( $V^+ = 10V$ )



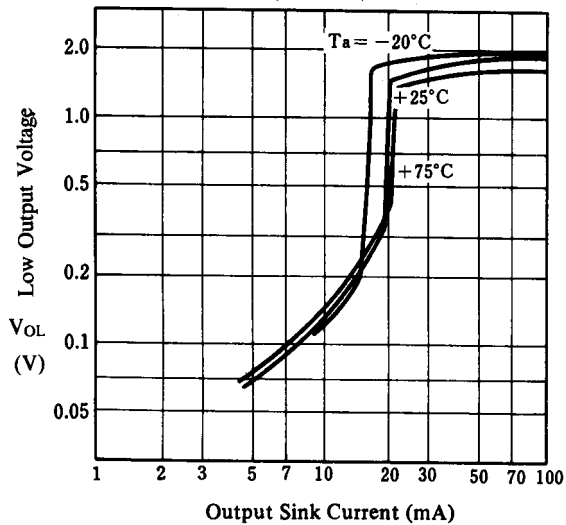
**Delay Time vs. Operating Voltage**  
( $T_a = 25^\circ\text{C}$ )



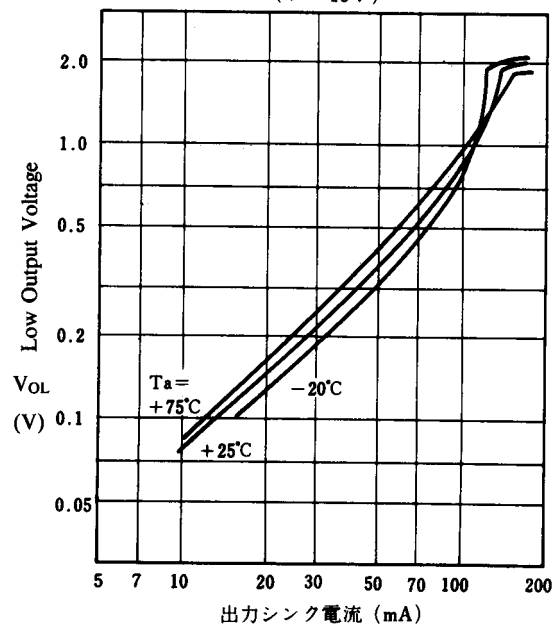
**High Output Voltage Drop vs. Output Source Current**  
( $5V \leq V^+ \leq 15V$ )



**Low Output Voltage vs. Output Sink Current**  
( $V^+ = 5V$ )

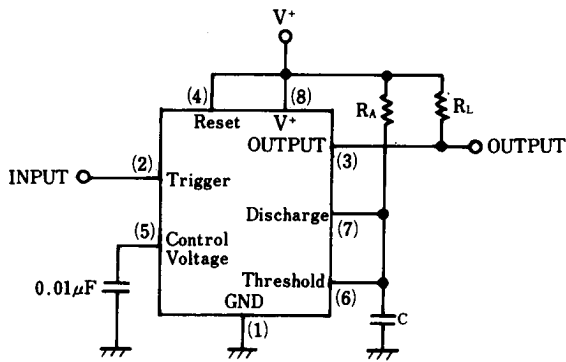


**Low Output Voltage vs. Output Sink Current**  
( $V^+ = 15V$ )

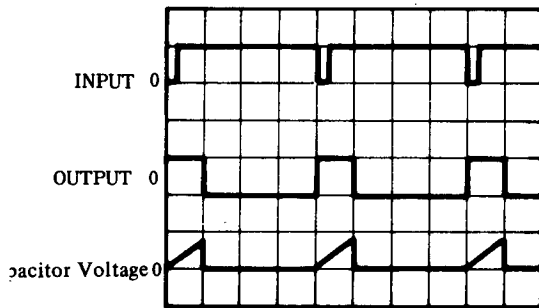


## ■ TYPICAL CHARACTERISTICS

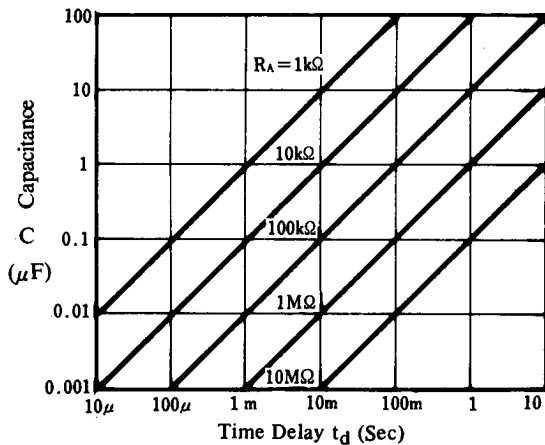
### 1. Monostable Operation



**Fig. 1**



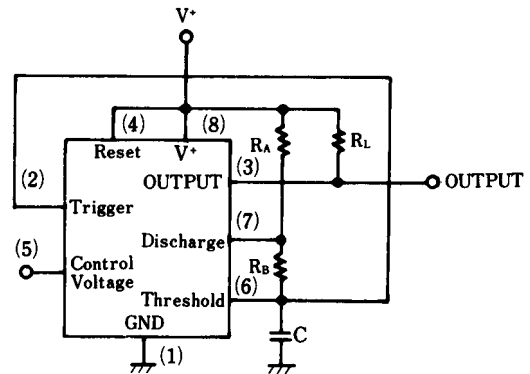
**Fig.2 Wave Form**



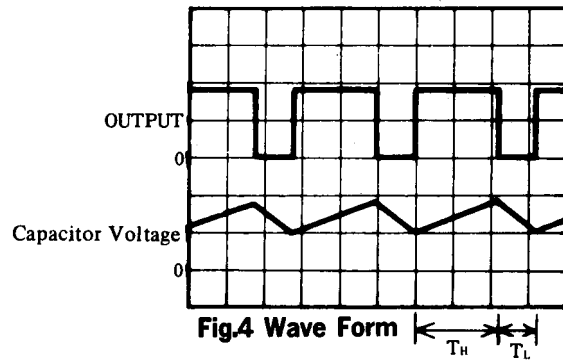
**Time Delay vs.  $R_A$ ,  $R_B$  and  $C$**

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.

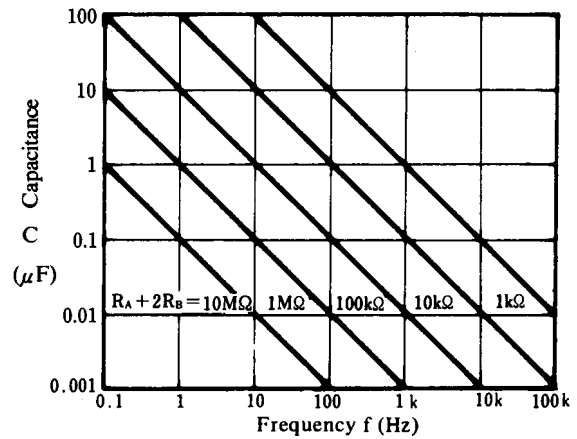
### 2. Free Running Operation



**Fig. 3**



**Fig.4 Wave Form**



**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:

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

[CAUTION]

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