

TIMER

■ GENERAL DESCRIPTION

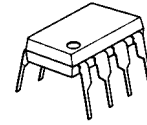
The **NJM555** monolithic timing circuit is a highly stable controller capable of producing accurate time delays or oscillation. In the time delay mode, delay time is precisely controlled by only two external parts : a resistor and a capacitor. For operation as an oscillator, both the free running frequency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

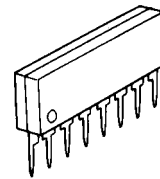
■ PACKAGE OUTLINE



NJM555D



NJM555M

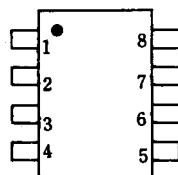


NJM555L

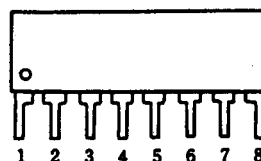


NJM555V

■ PIN CONFIGURATION



NJM555D
NJM555M
NJM555V

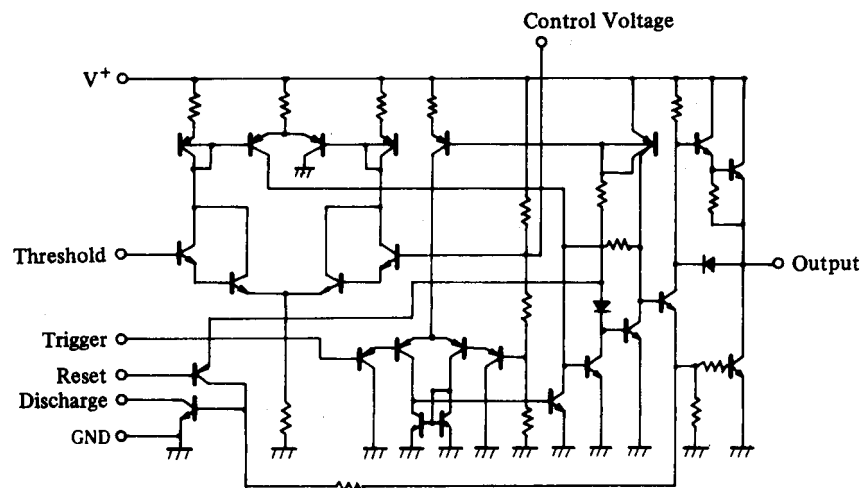


NJM555L

PIN FUNCTION

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

■ EQUIVALENT CIRCUIT



NJM555

■ ABSOLUTE MAXIMUM RATINGS

($T_a=25^{\circ}\text{C}$)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	18	V
Power Dissipation	P_D	(DIP8) 500	mW
		(DMP8) 300	mW
		(SSOP8) 250	mW
		(SIP8) 800	mW
Operating Temperature Range	T_{opr}	-40 to +85	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-40 to +125	$^{\circ}\text{C}$

■ ELECTRICAL CHARACTERISTICS

($V^+=5$ to 15V, $T_a=25^{\circ}\text{C}$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V^+		4.5	-	16	V
Operating Current (Note 1)	I_{CC}	$V^+=5\text{V}$, $R_L=\infty$	-	3.0	6.0	mA
Operating Current (Note 1)	I_{CC}	$V^+=15\text{V}$, $R_L=\infty$	-	10	15	mA
Timing Error (Note 2)						
Initial Accuracy	E_t	$T_a=-20$ to 75°C , $V^+=5$ to 15V	-	1.0	-	%
Drift with Temperature	E_t	$T_a=-20$ to 75°C , $V^+=5$ to 15V	-	50	-	ppm / $^{\circ}\text{C}$
Drift with Supply Voltage	E_t	$T_a=-20$ to 75°C , $V^+=5$ to 15V	-	0.1	-	% / V
Threshold Voltage	V_{th}		-	2 / 3	-	$\times V^+$
Trigger Voltage	V_T	$V^+=15\text{V}$	-	5.0	-	V
Trigger Voltage	V_T	$V^+=5\text{V}$	-	1.67	-	V
Trigger Current	I_T		-	0.5	-	μA
Reset Voltage	V_R		0.4	0.5	1.0	V
Reset Current	I_R		-	0.1	-	mA
Threshold Current	I_{th}		-	0.1	0.25	μA
Control Voltage Level	V_{CL}	$V^+=15\text{V}$	9	10	11	V
Control Voltage Level	V_{CL}	$V^+=5\text{V}$	2.6	3.33	4.0	V
Output Voltage (Low)	V_{OL}	$V^+=15\text{V}$ $I_{sink}=10\text{mA}$	-	0.1	0.25	V
Output Voltage (Low)	V_{OL}	$V^+=15\text{V}$ $I_{sink}=50\text{mA}$	-	0.4	0.75	V
Output Voltage (Low)	V_{OL}	$V^+=15\text{V}$ $I_{sink}=100\text{mA}$ (Note 3)	-	2.0	2.5	V
Output Voltage (Low)	V_{OL}	$V^+=15\text{V}$ $I_{sink}=200\text{mA}$ (Note 3)	-	2.5	-	V
Output Voltage (Low)	V_{OL}	$V^+=5\text{V}$ $I_{sink}=5\text{mA}$	-	0.25	0.35	V
Output Voltage (High)	V_{OH}	$V^+=15\text{V}$ $I_{source}=200\text{mA}$ (Note 3)	-	12.5	-	V
Output Voltage (High)	V_{OH}	$V^+=15\text{V}$ $I_{source}=100\text{mA}$ (Note 3)	12.75	13.3	-	V
Output Voltage (High)	V_{OH}	$V^+=15\text{V}$ $I_{source}=40\text{mA}$	-	13.5	-	V
Output Voltage (High)	V_{OH}	$V^+=5\text{V}$ $I_{source}=100\text{mA}$	2.75	3.3	-	V
Rise time of Output	t_r	No Loading	-	100	-	ns
Fall time of Output	t_f	No Loading	-	100	-	ns

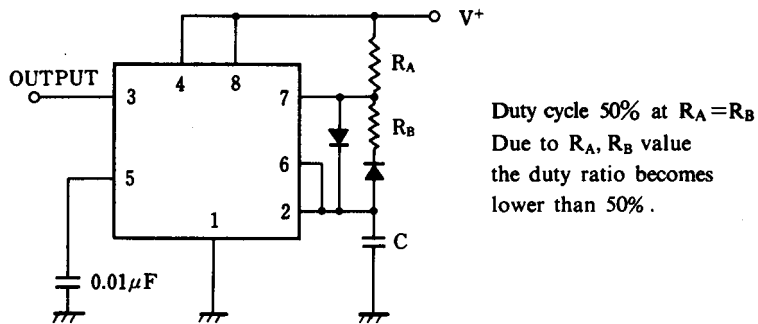
Note 1 : Low output condition (When the output is high, it is lower than the low output condition by 1mA in the standard specification.)

Note 2 : R_A , $R_B=1\text{k}$ to $100\text{k}\Omega$, $C=0.1\mu\text{F}$, $V^+=15\text{V}$ from 5V

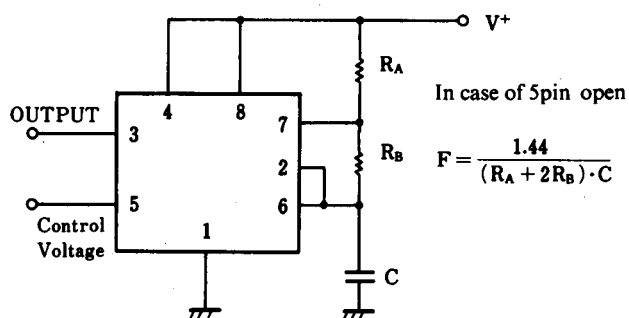
Note 3 : Not specified for NJM555M / NJM555E

■ TYPICAL APPLICATION

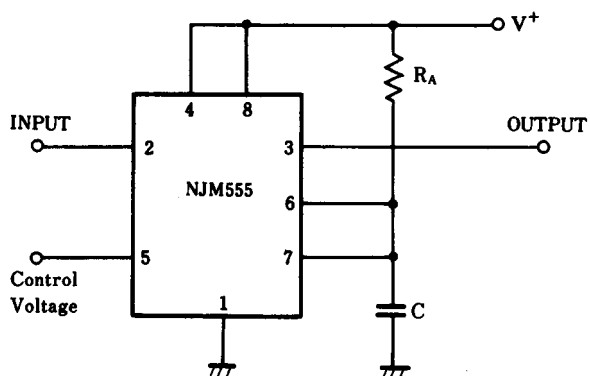
(1) 50% Duty Cycle Oscillator



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

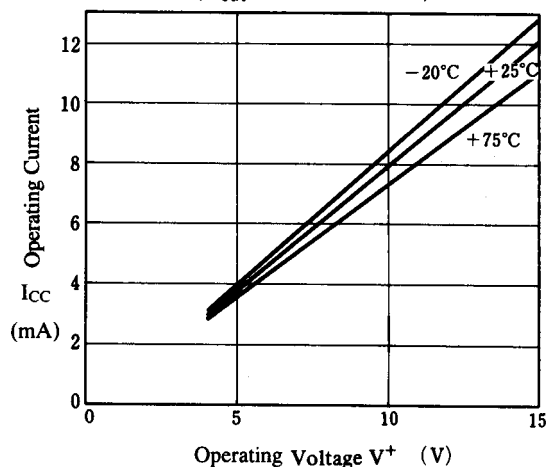


(3) Pulse Width Modulation

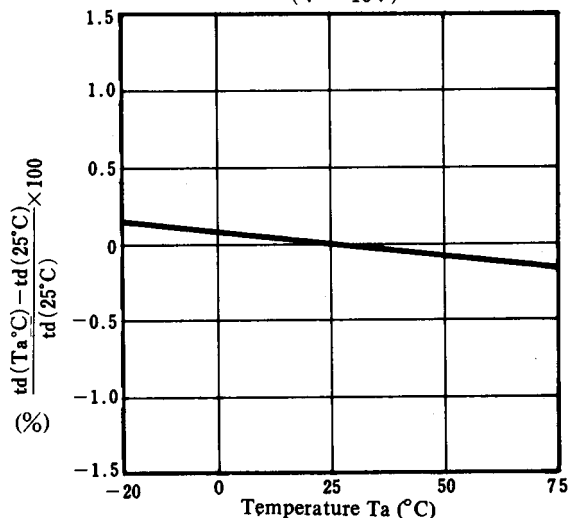


■ TYPICAL CHARACTERISTICS

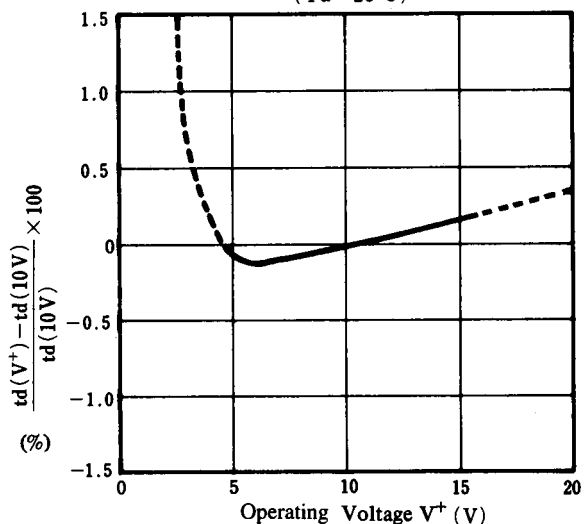
Operating Current vs. Operating Voltage
($V_{out} = \text{LOW STATE}$)



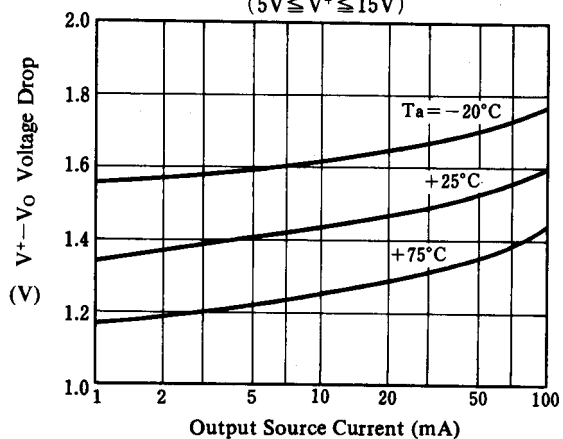
Delay Time vs. Temperature
($V^+ = 10V$)



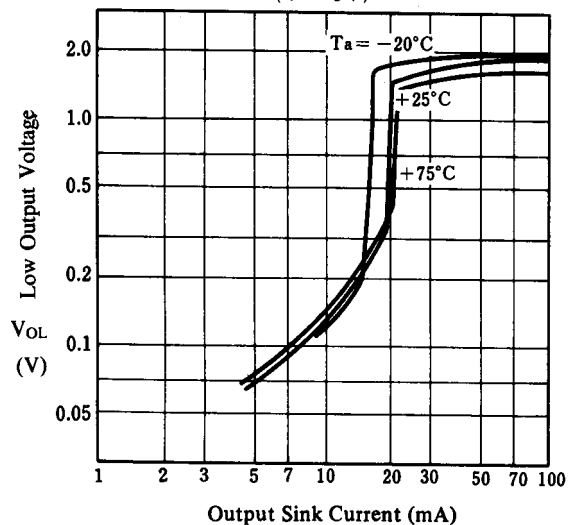
Delay Time vs. Operating Voltage
($T_a = 25^\circ\text{C}$)



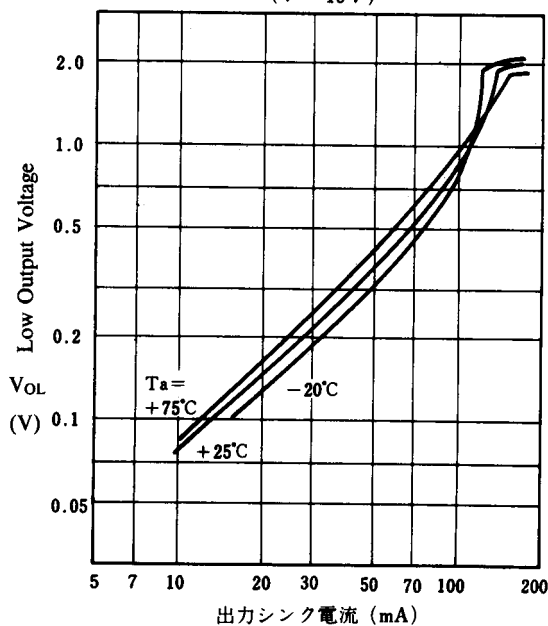
High Output Voltage Drop vs. Output Source Current
($5V \leq V^+ \leq 15V$)



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



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



■ TYPICAL CHARACTERISTICS

1. Monostable Operation

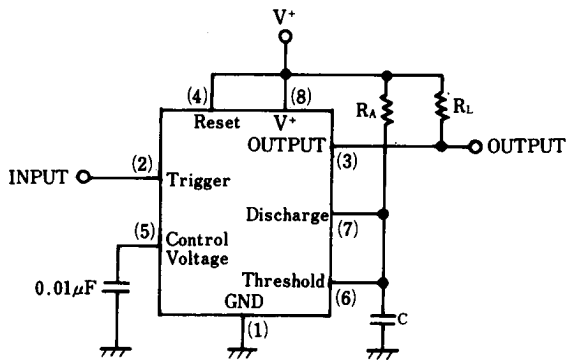


Fig. 1

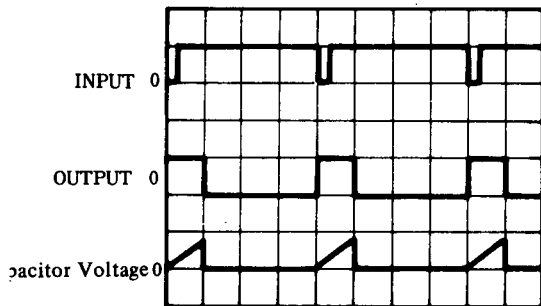
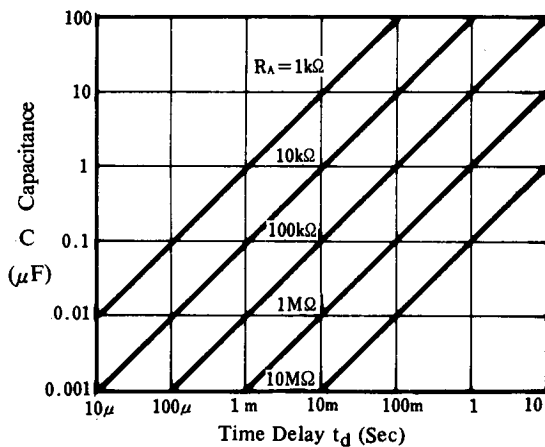


Fig.2 Wave Form



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

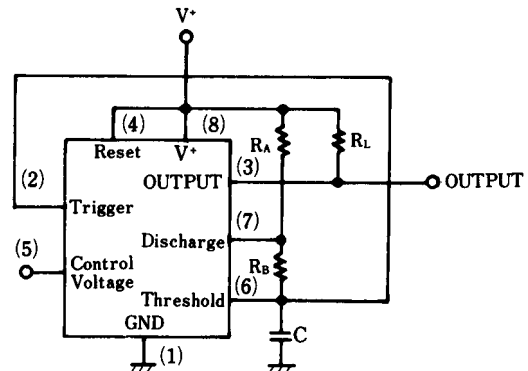


Fig. 3

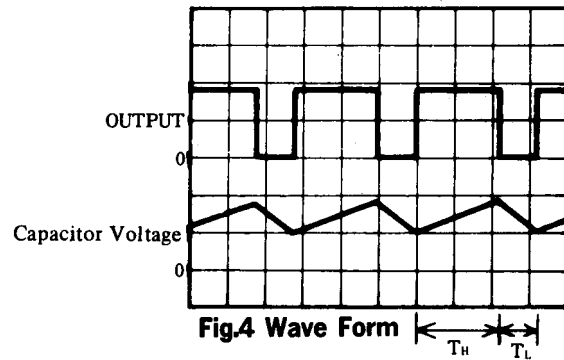
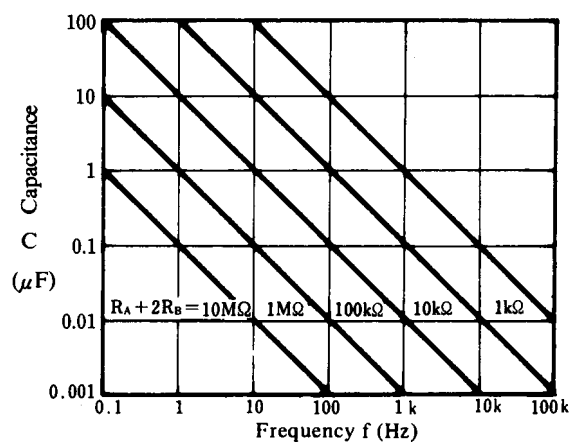


Fig.4 Wave Form



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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