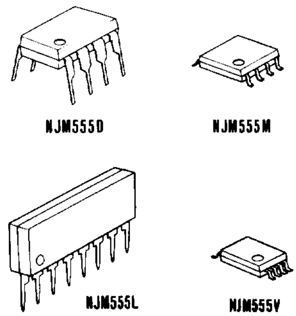
TIMER

■ GENERAL DESCRIPTION

The NJM555 monolithic timing circuit is a highly stable controller capable of producing accruate 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.

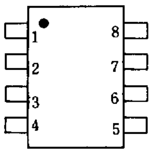
■ PACKAGE OUTLINE



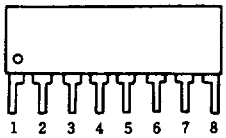
■ FEATURES

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

■ PIN CONFIGURATION



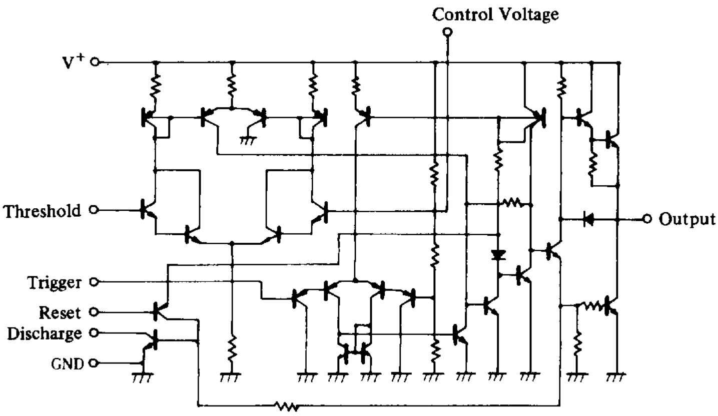
NJM555D
NJM555M
NJM555V



NJM555L

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

■ EQUIVALENT CIRCUIT



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■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

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}	−20～+75	℃
Storage Temperature Range	T_{stg}	−40～+125	℃

■ ELECTRICAL CHARACTERISTICS

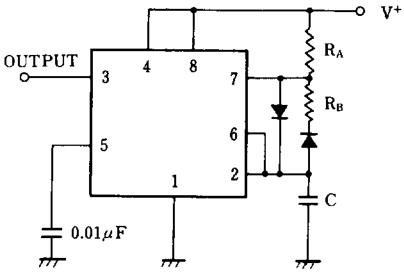
(V^+=5～15V, Ta=25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V^+		4.5	—	16	V
Operating Current (Note 1)	I_{CC}	V^+=5V, $R_L=\infty$	—	3.0	6.0	mA
Operating Current (Note 1)	I_{CC}	V^+=15V, $R_L=\infty$	—	10	15	mA
Timing Error (Note 2)						
Initial Accuracy	E_t	Ta=−20～75°C, V^+=5～15V	—	1.0	—	%
Drift with Temperature	E_t	Ta=−20～75°C, V^+=5～15V	—	50	—	ppm/°C
Drift with Supply Voltage	E_t	Ta=−20～75°C, V^+=5～15V	—	0.1	—	%/V
Threshold Voltage	V_{th}		—	2/3	—	$\times V^+$
Trigger Voltage	V_T	V^+=15V	—	5.0	—	V
Trigger Voltage	V_T	V^+=5V	—	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^+=15V	9	10	11	V
Control Voltage Level	V_{CL}	V^+=5V	2.6	3.33	4.0	V
Output Voltage (Low)	V_{OL}	V^+=15V Isink=10mA	—	0.1	0.25	V
Output Voltage (Low)	V_{OL}	V^+=15V Isink=50mA	—	0.4	0.75	V
Output Voltage (Low)	V_{OL}	V^+=15V Isink=100mA (Note 3)	—	2.0	2.5	V
Output Voltage (Low)	V_{OL}	V^+=15V Isink=200mA (Note 3)	—	2.5	—	V
Output Voltage (Low)	V_{OL}	V^+=5V Isink=5mA	—	0.25	0.35	V
Output Voltage (High)	V_{OH}	V^+=15V Isource=200mA (Note 3)	—	12.5	—	V
Output Voltage (High)	V_{OH}	V^+=15V Isource=100mA (Note 3)	12.75	13.3	—	V
Output Voltage (High)	V_{OH}	V^+=15V Isource=40mA	—	5	—	V
Output Voltage (High)	V_{OH}	V^+=5V Isource=100mA	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=1k～100kΩ, C=0.1μF, V^+=15V from 5V
Note 3: Not specified for NJM555M/NJM555E

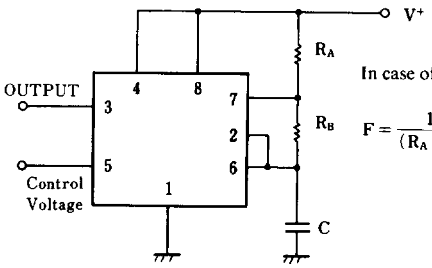
■ TYPICAL APPLICATION

(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%.

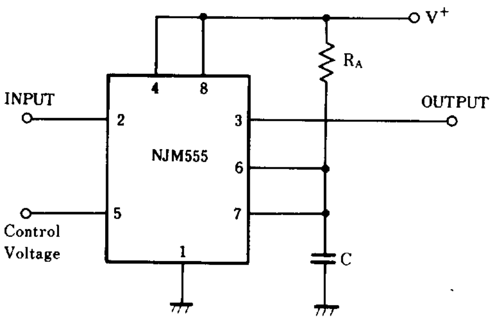
(2) Oscillatoion frequency can be changed by changing the control voltage.



In case of 5pin open

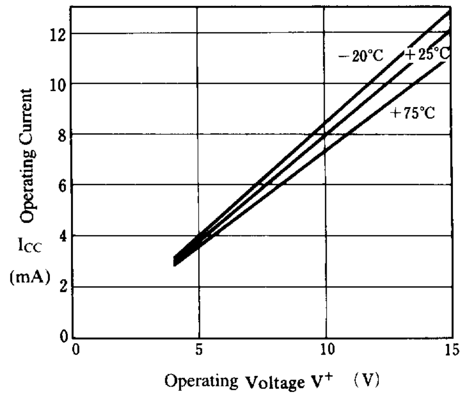
$$F = \frac{1.44}{(R_A + 2R_B)\cdot C}$$

(3) Pulse Width Modulation

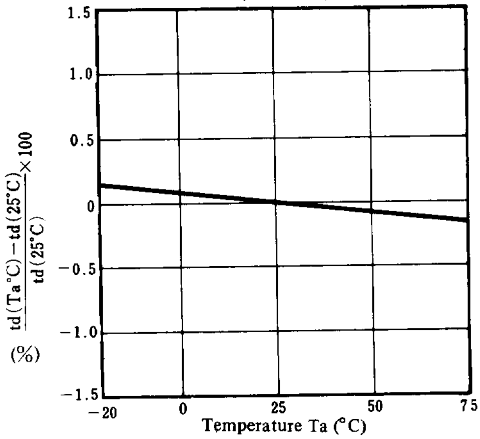


■ TYPICAL CHARACTERISTICS

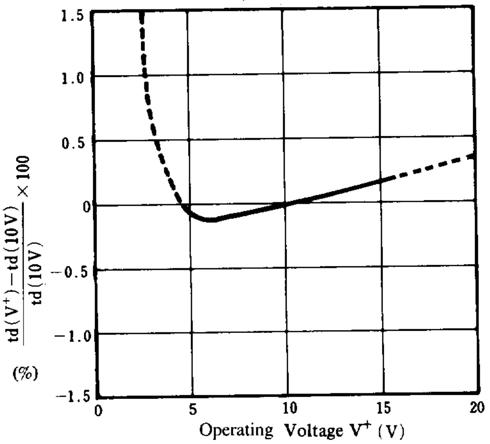
Operating Current vs. Operating Voltage
(V_{OUT}=LOW STATE)



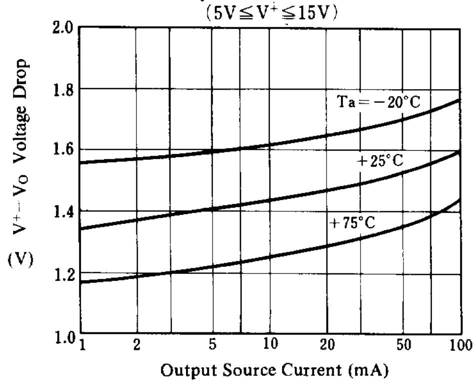
Delay Time vs. Temperature
(V^+=10V)



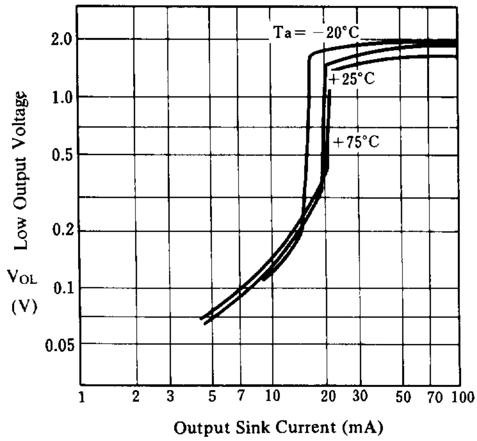
Delay Time vs. Operating Voltage
(Ta=25°C)



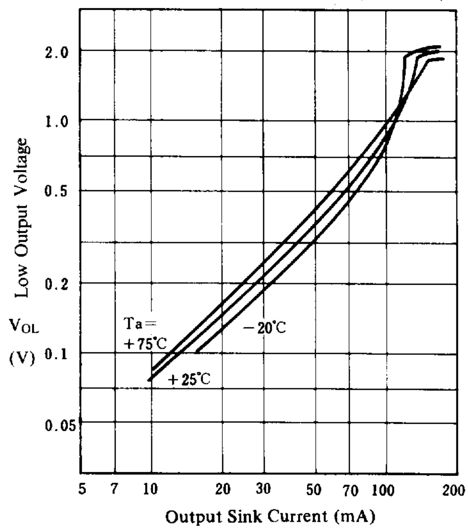
High Output Voltage Drop vs. Output Source Current
(5V≦V^+≦15V)



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



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



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■ TYPICAL CHARACTERISTICS

1. Monostable Operation

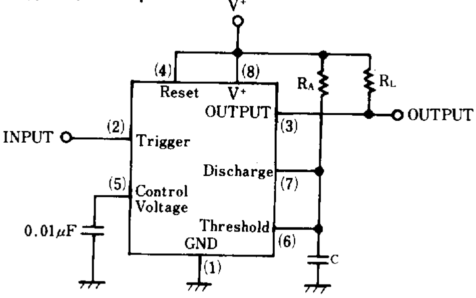


Fig. 1

2. Free Running Operation

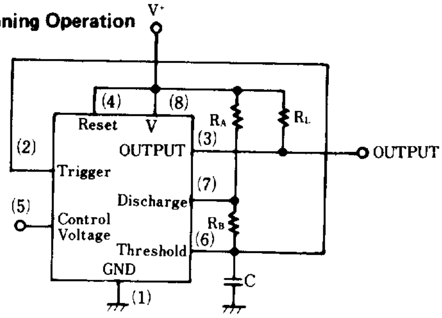


Fig. 3

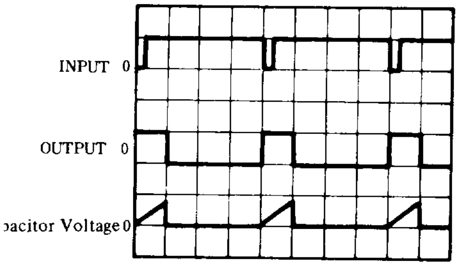


Fig.2 Wave Form

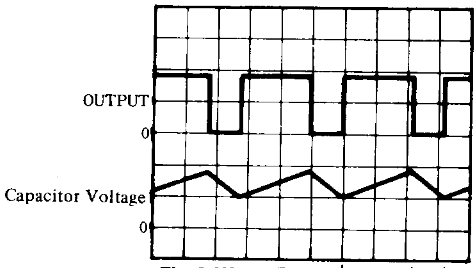
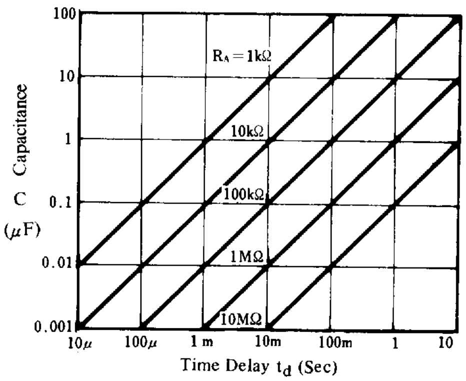
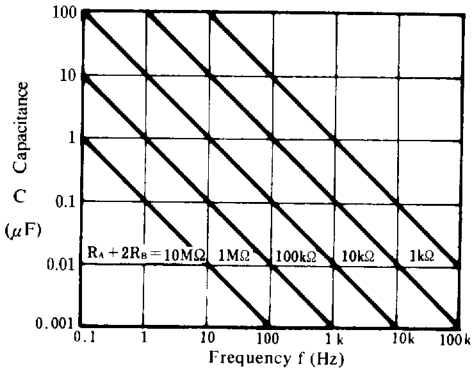


Fig.4 Wave Form T_H T_L



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:

$$T_L = 0.693R_B\cdot C$$

The frequency of oscillation is:

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

The duty cycle is:

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