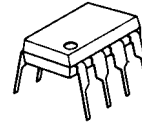


## LOW VOLTAGE DC MOTOR CONTROLLER

### ■ GENERAL DESCRIPTION

The **NJM2606/06A** are integrated circuits with wide operating supply voltage range for DC motor speed control. Especially, the **NJM2606A** is suited for the applications requiring low saturation output voltage.

### ■ PACKAGE OUTLINE



**NJM2606D**  
**NJM2606AD**

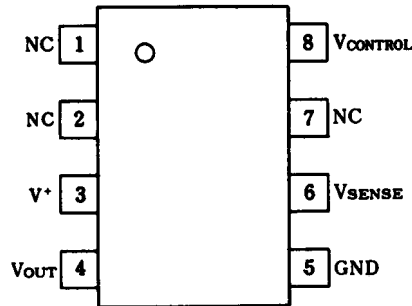


**NJM2606M**  
**NJM2606AM**

### ■ FEATURES

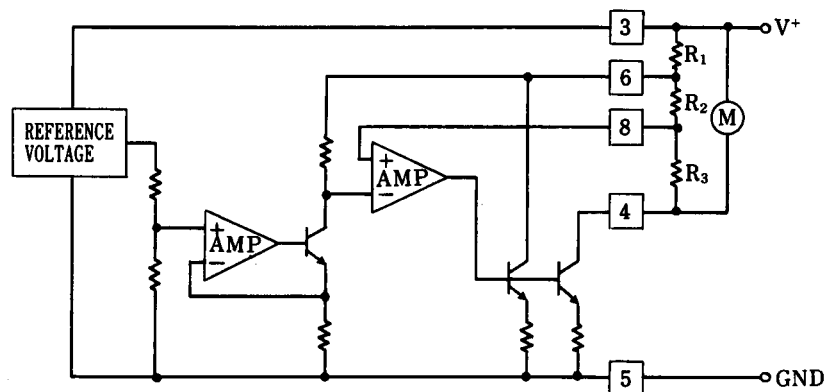
- Operating Voltage (1.8V to 8V)
- Internal Low Saturation Voltage Output Transistor
- Package Outline DIP8, DMP8
- Bipolar Technology

### ■ PIN CONFIGURATION



**NJM2606D**  
**NJM2606AD**  
**NJM2606M**  
**NJM2606AM**

### ■ BLOCK DIAGRAM



# NJM2606 / 2606A

## ■ ABSOLUTE MAXIMUM RATINGS

(T<sub>a</sub>=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	10	V
Peak-to-peak Output Current	I <sub>OP</sub>	700	mA
Power Dissipation	P <sub>D</sub>	(DIP) 500	mW
		(DMP8) 300	mW
Operating Temperature Range	T <sub>opr</sub>	-20 to 75	°C
Storage Temperature Range	T <sub>stg</sub>	-40 to 125	°C

(note)At SW ON. (3 sec. at motor locked or 100msec at duty factor less than 0.1%)

## ■ ELECTRICAL CHARACTERISTICS

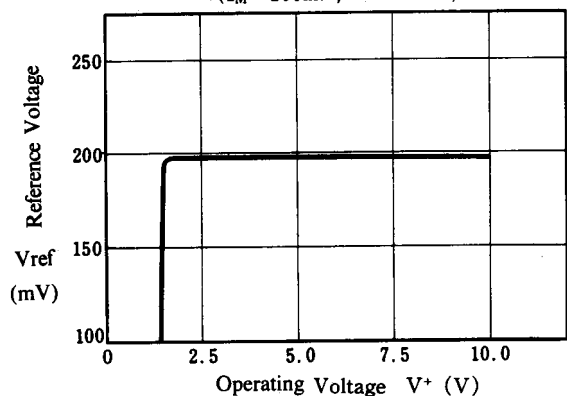
(T<sub>a</sub>=25°C, V<sup>+</sup>=3V, I<sub>M</sub>=100mA)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I <sub>CC</sub>		-	2.4	6.0	mA
Output Saturation Voltage						
NJM2606	V <sub>OSAT</sub>		-	0.18	0.3	V
NJM2606A	V <sub>OSAT</sub>		-	0.13	0.18	V
Reference Voltage	V <sub>REF</sub>		0.18	0.20	0.22	V
vs. Operating Voltage	ΔV <sub>RSV</sub>	V <sup>+</sup> =1.8V to 8.0V	-	0.7	8.0	mV
vs. Output Current	ΔV <sub>ROC</sub>	I <sub>M</sub> =20mA to 200mA	-	2.7	9.0	mV
vs. Ambient Temperature	ΔV <sub>RT</sub>	T <sub>a</sub> = -20°C to +75°C	-	0.04	-	mV / °C
Current Ratio	K	I <sub>M</sub> =50mA to 150mA	45	50	55	
vs. Operating Voltage	ΔK <sub>SV</sub>	V <sup>+</sup> =1.8V to 8.0V I <sub>M</sub> =50mA to 150mA	-	0.6	3.0	
vs. Output Current	ΔK <sub>OC</sub>	I <sub>M</sub> =(20 to 50)mA to (170 to 200)mA	-	1.0	4.0	
vs. Ambient Temperature	ΔK <sub>TC</sub>	T <sub>a</sub> = -20°C to +75°C I <sub>M</sub> =50mA to 150mA	-	1.0	-	1 / °C

## ■ TYPICAL CHARACTERISTICS

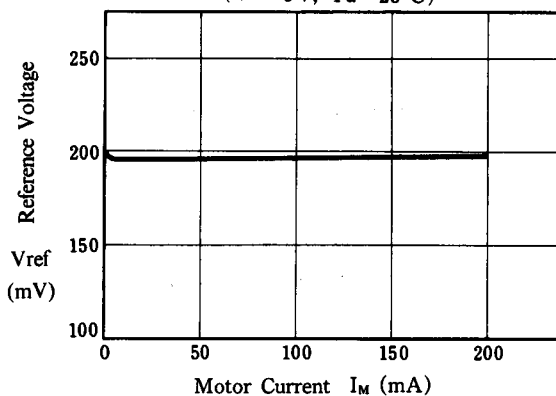
### Reference Voltage vs. Operating Voltage

( $I_M=100\text{mA}$ ,  $T_a=25^\circ\text{C}$ )



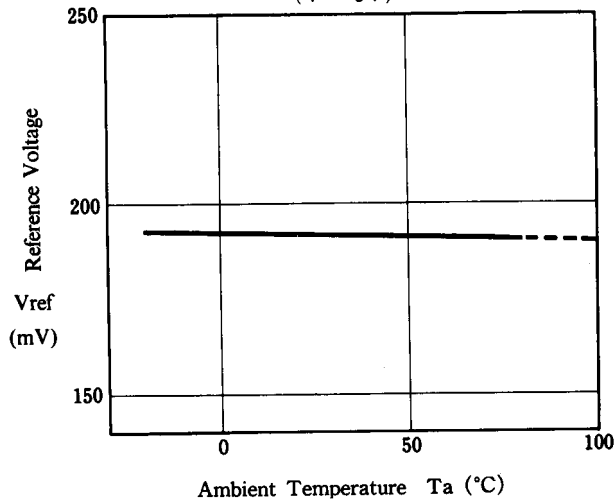
### Reference Voltage vs. Motor Current

( $V^+=3\text{V}$ ,  $T_a=25^\circ\text{C}$ )



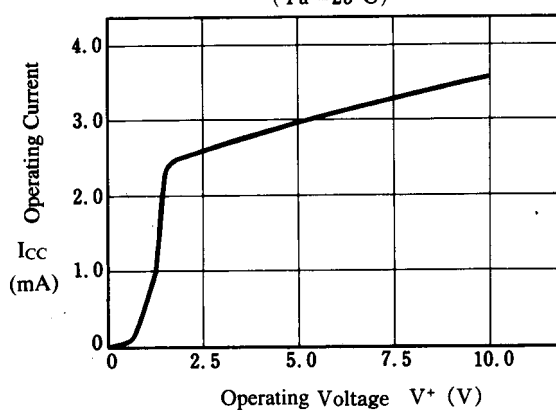
### Reference Voltage vs. Temperature

( $V^+=3\text{V}$ )



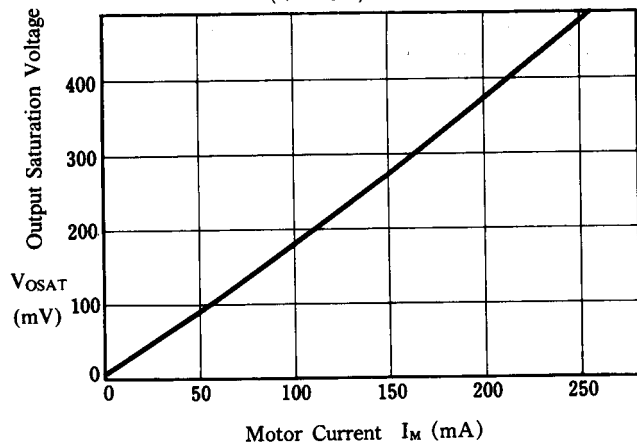
### Operating Current vs. Operating Voltage

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



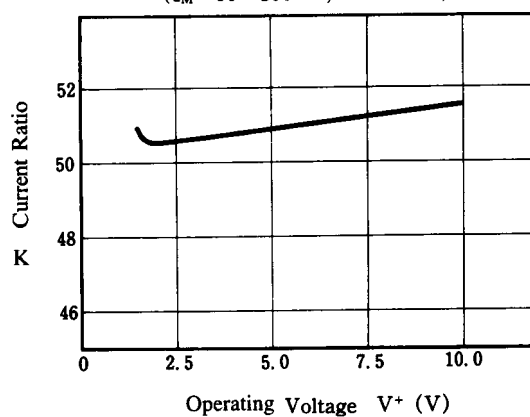
### Output Saturation Voltage vs. Motor Current

( $V^+=3\text{V}$ ,  $T_a=25^\circ\text{C}$ )



### Current Ratio vs. Operating Voltage

( $I_M=50-150\text{mA}$ ,  $T_a=25^\circ\text{C}$ )

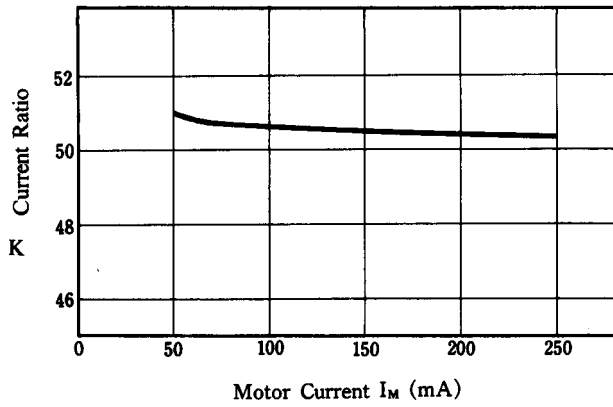


# NJM2606 / 2606A

## ■ TYPICAL CHARACTERISTICS

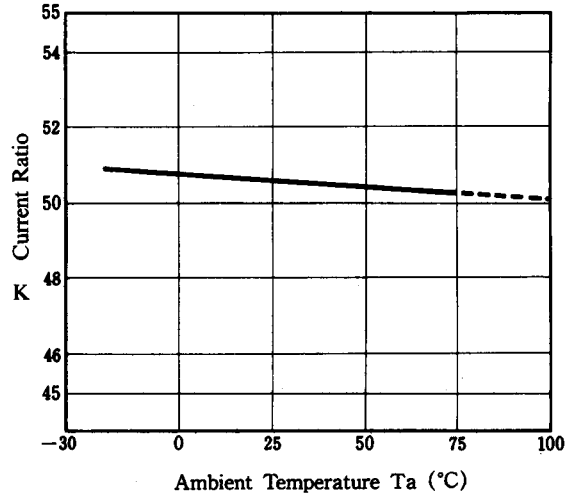
Current Ratio vs. Motor Current

( $V^+ = 3V$ ,  $T_a = 25^\circ C$ )



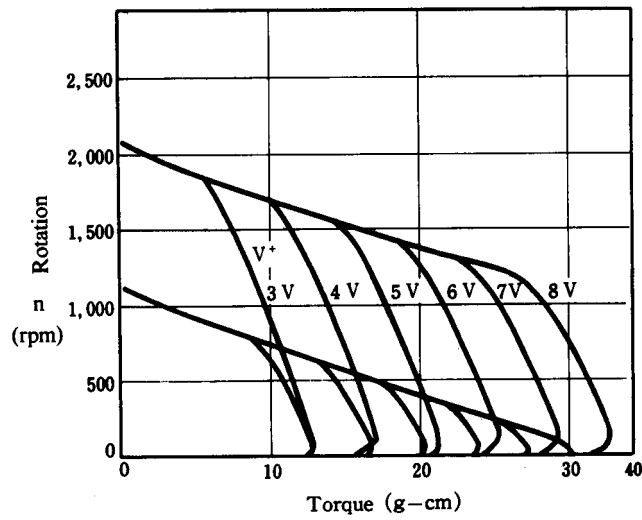
Current Ratio vs. Temperature

( $V^+ = 3V$ ,  $I_M = 50 \sim 150mA$ )

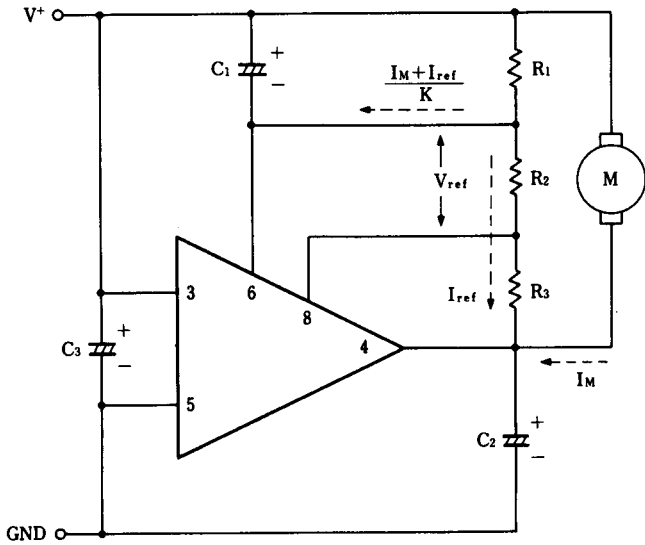


Rotation vs. Torque

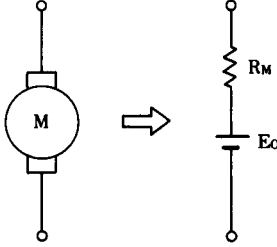
( $V^+ = 3V$ ,  $T_a = 25^\circ C$ )



■ TYPICAL APPLICATION



Select C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub> for each motor type.



- V<sub>ref</sub> : Reference Voltage
- K : Current Ratio
- I<sub>M</sub> : Motor Current
- R<sub>M</sub> : Internal Resistance of Motor
- E<sub>O</sub> : Motor Counter Electromotive Voltage

The voltage applied at the motor is set as V<sub>M</sub>, which brings the following formula.

$$V_M = (R_1 + R_2 + R_3) I_{ref} + R_1 \cdot \frac{I_M + I_{ref}}{K}$$

Now that, I<sub>ref</sub> = V<sub>ref</sub> / R<sub>2</sub> so that, (I<sub>ref</sub> ≐ 100μA setting is appropriate)

$$V_M = \frac{V_{ref}}{R_2} (R_1 + \frac{R_1}{K} + R_2 + R_3) + \frac{R_1}{K} I_M \quad (1)$$

On the other hand, the voltage applied at the motor itself will be as in the following.

$$V_M = E_O + R_M \cdot I_M \quad (2)$$

Through (1), (2), and then leading to stabilize the control system.

$$R_M \cdot I_M > \frac{R_1}{K} \cdot I_M$$

$$\therefore R_1 < K \cdot R_M \quad (3)$$

Taking in consideration of deviations, R<sub>1(MAX)</sub> < K<sub>(MIN)</sub> · R<sub>M(MIN)</sub> with the condition.

Items required checking in regard to the temperature coefficient

IC items

1. Reference voltage : Temperature coefficient of V<sub>ref</sub>.
2. Current Ratio : Temperature coefficient of K  
\*1 External component items
3. Temperature coefficient of R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub>  
The relation among these 3 parts takes the very important roll.
4. Temperature coefficient of motor internal resistance
5. Temperature coefficient of motor generative voltage
6. Temperature coefficient ratio of R<sub>1</sub> and R<sub>M</sub>  
Count up from 3.4.

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