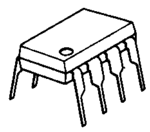
LOW VOLTAGE DC MOTOR CONTROLLER

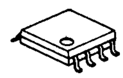
■ GENERAL DESCRIPTION

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 staturation output voltage.

■ PACKAGE OUTLINE



NJM2606D
NJM2606AD

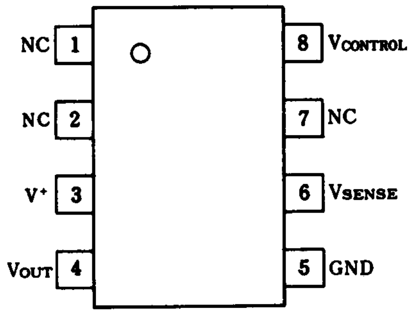


NJM2606M
NJM2606AM

■ FEATURES

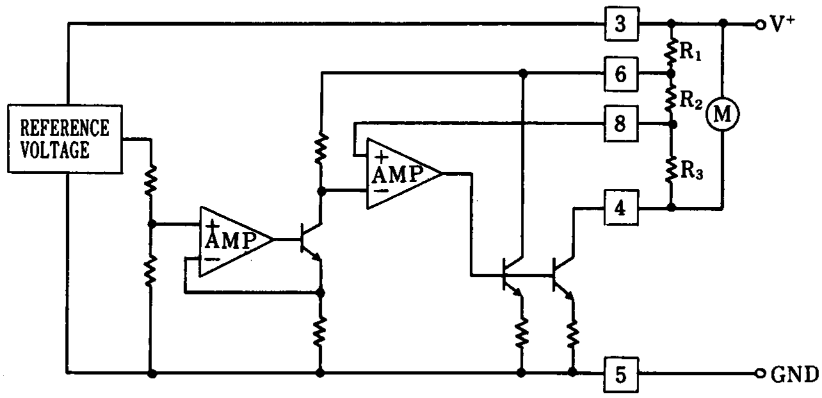
- Operating Voltage (1.8V to 8V)
- Internal Low Saturation Voltage Output Transistor
- Package Outline DIP8, DMP8
- Bipolar Technology

■ PIN CONFIGURATION



NJM2606D
NJM2606AD
NJM2606M
NJM2606AM

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

(T_a=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	10	V
Peak-to-peak Output Current	I_{OP}	700	mA
Power Dissipation	P_D	(DIP) 500	mW
		(DMP8) 300	mW
Operating Temperature Range	T_{opr}	-20 to 75	°C
Storage Temperature Range	T_{stg}	-40 to 125	°C

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

■ ELECTRICAL CHARACTERISTICS

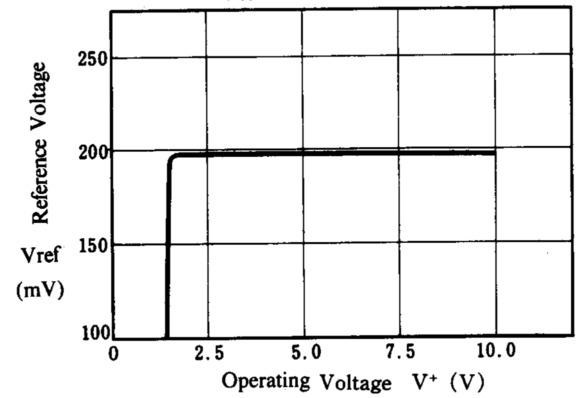
(T_a=25°C, V^+=3V, I_M=100mA)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{CC}		-	2.4	6.0	mA
Output Saturation Voltage						
NJM2606	V_{OSAT}		-	0.18	0.3	V
NJM2606A	V_{OSAT}		-	0.13	0.18	V
Reference Voltage	V_{REF}		0.18	0.20	0.22	V
vs. Operating Voltage	ΔV_{RSV}	V^+=1.8V to 8.0V	-	0.7	8.0	mV
vs. Output Current	ΔV_{ROC}	I_M=20mA to 200mA	-	2.7	9.0	mV
vs. Ambient Temperature	ΔV_{RT}	T_a= -20°C to +75°C	-	0.04	-	mV / °C
Current Ratio	K	I_M=50mA to 150mA	45	50	55	
vs. Operating Voltage	ΔK_{SV}	V^+=1.8V to 8.0V I_M=50mA to 150mA	-	0.6	3.0	
vs. Output Current	ΔK_{OC}	I_M=(20 to 50)mA to (170 to 200)mA	-	1.0	4.0	
vs. Ambient Temperature	ΔK_{TC}	T_a= -20°C to +75°C I_M=50mA to 150mA	-	1.0	-	1 / °C

■ TYPICAL CHARACTERISTICS

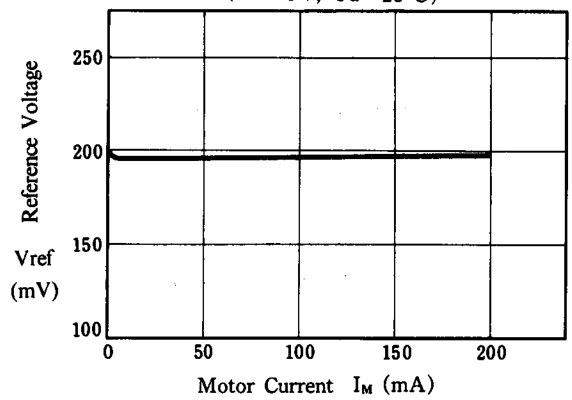
Reference Voltage vs. Operating Voltage

(I_M=100mA, Ta=25°C)



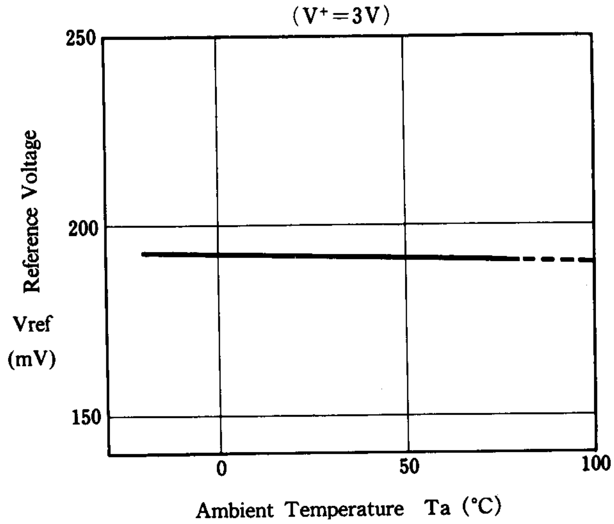
Reference Voltage vs. Motor Current

(V^+=3V, Ta=25°C)



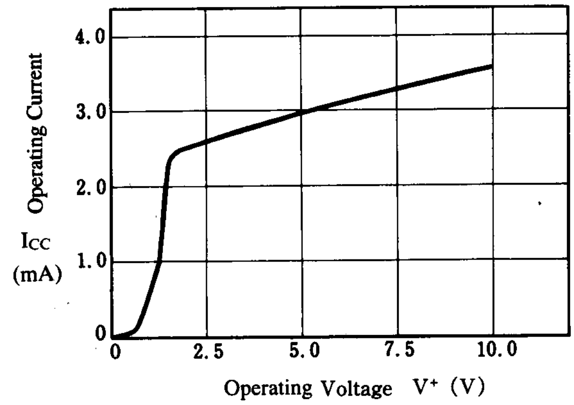
Reference Voltage vs. Temperature

(V^+=3V)



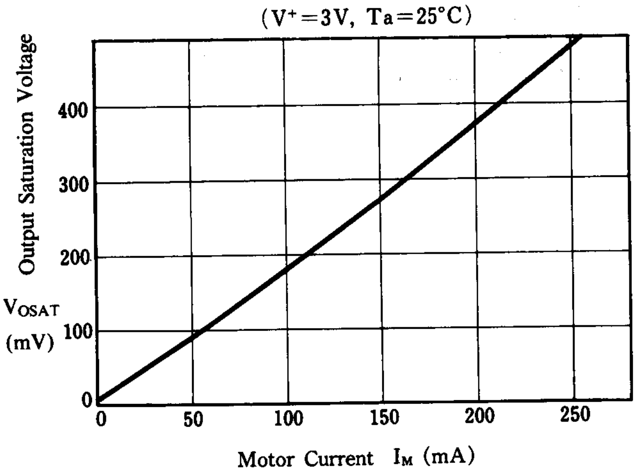
Operating Current vs. Operating Voltage

(Ta=25°C)



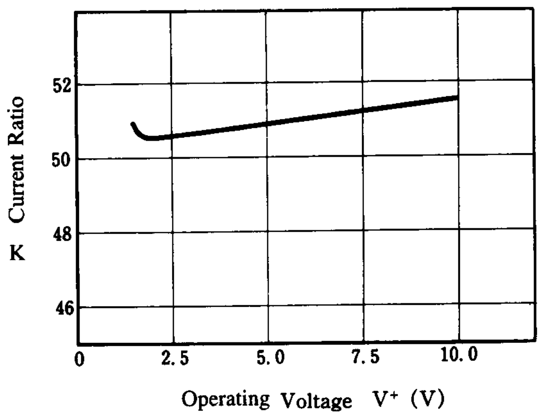
Output Staturation Voltage vs. Motor Current

(V^+=3V, Ta=25°C)



Current Ratio vs. Operating Voltage

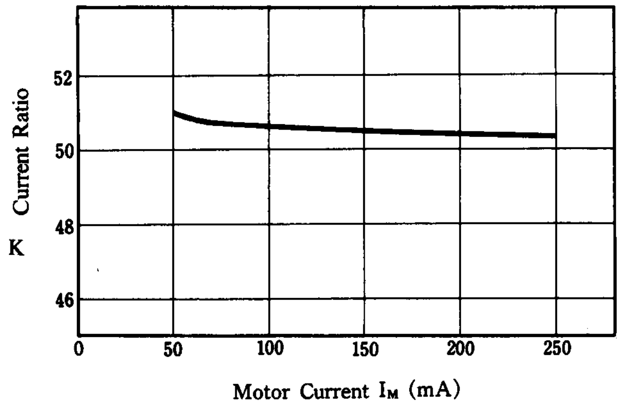
(I_M=50−150mA, Ta=25°C)



■ TYPICAL CHARACTERISTICS

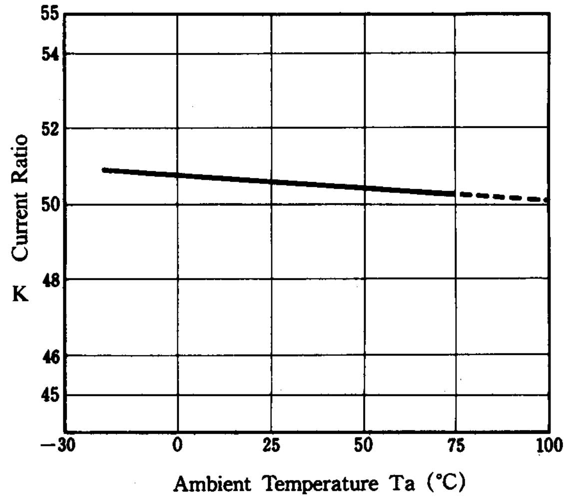
Current Ratio vs. Motor Current

(V^+=3V, Ta=25°C)



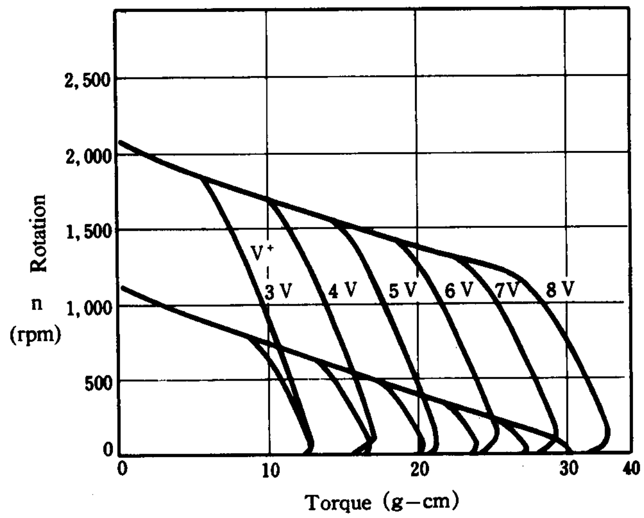
Current Ratio vs. Temperature

(V^+=3V, I_M=50~150mA)

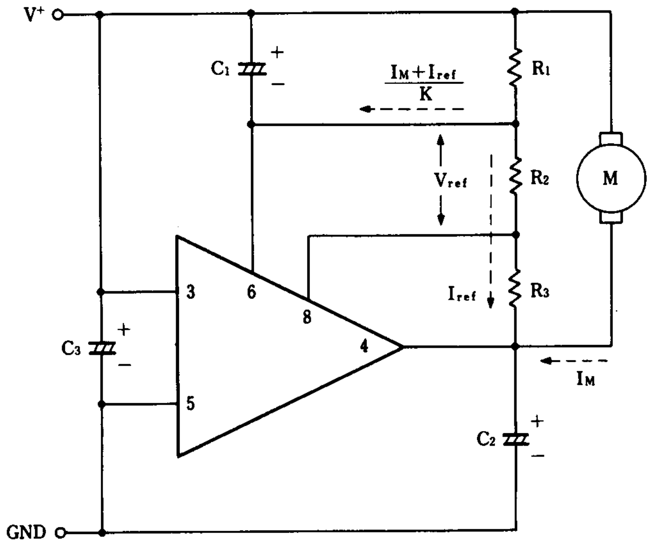


Rotation vs. Torque

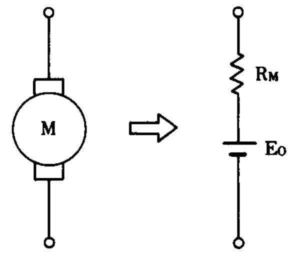
(V^+=3V, Ta=25°C)



■ TYPICAL APPLICATION



Select C_1, C_2, C_3 for each motor type.



V_{ref} : Reference Voltage
K : Current Ratio
I_M : Motor Current
R_M : Internal Resistance of Motor
E_O : Motor Counter Electromotive Voltage

The voltage applied at the motor is set as V_M, 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, $I_{ref} = V_{ref} / R_2$ *so that,* $(I_{ref}$ 100μA setting is appropriate)

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

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

$$V_M = E_O + R_M \cdot I_M \quad \text{.... (2)}$$

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

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

$$\therefore R_1 < K \cdot R_M \quad \text{.... (3)}$$

Taking in consideration of deviations, $R_{1(MAX)} < K_{(MIN)} \cdot R_{M(MIN)}$ *with the condition.*

Items required checking in regard to the temperature coefficient

IC items

1. Reference voltage : Temperature coefficient of V_{ref}.
2. Current Ratio : Temperature coefficient of K
   *1 External component items
3. Temperature coefficient of R_1, R_2 and R_3
   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_1 and R_M
   Count up from 3.4.