



SERVO MOTOR CONTROLLER

■ GENERAL DESCRIPTION

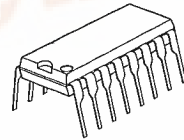
The NJM2611 is an integrated circuit to be applied on servo motor of radio controlled operation. Wide range of operating voltage, and the NJM2611 has the feature of internal circuit of maintaining constant voltage which helps stabilizing from fluctuation caused by voltage source and the ambient temperature.

■ FEATURES

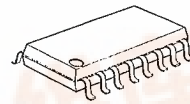
- Wide Operating Voltage
- Setting up the dead band by the internal constant
- Internal Output NPN Power Transistor
- Internal Constant Voltage Circuit
- Package Outline
- Bipolar Technology

DIP16, DMP16

■ PACKAGE OUTLINE

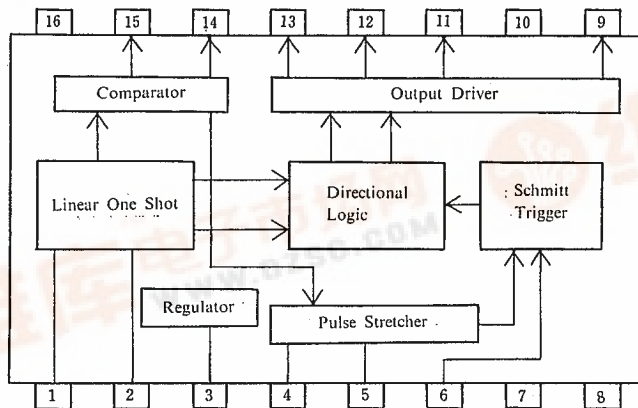


NJM2611D



NJM2611M

■ BLOCK DIAGRAM



NJM2611D/M

■ ABSOLUTE MAXIMUM RATINGS

($V^+=6V$, $T_a=25^\circ C$)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-----------------------------|------------|----------------------------|------------|
| Supply Voltage | V^+ | 10.0 | V |
| Power Dissipation | P_D | (DIP16) 700 (DMP16) 350 | mW |
| Output Sink Current | I_{sink} | 600(note) | mA |
| Operating Temperature Range | T_{opr} | -20 ~ +75 | $^\circ C$ |
| Storage Temperature Range | T_{stg} | -40 ~ +125 | $^\circ C$ |

(note) Due to the pulse driving, the peak current must be maintained within the range of the maximum ratings.

■ ELECTRICAL CHARACTERISTICS

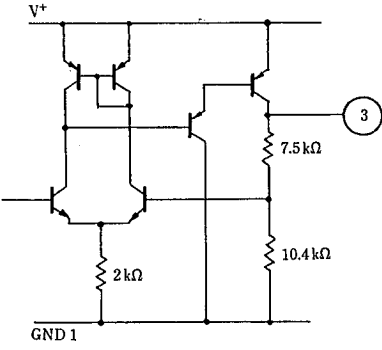
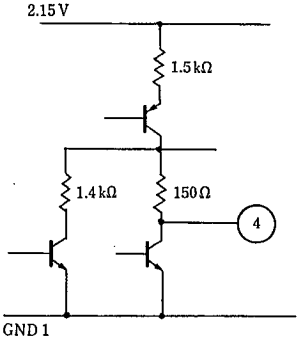
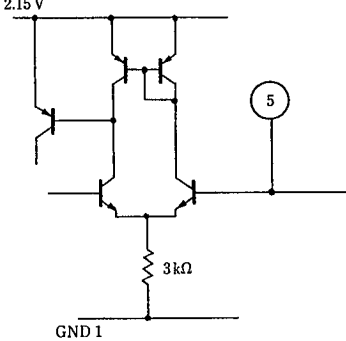
($V^+=6V$, $T_a=25^\circ C$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------------------------------|-----------|------------------------|------|------|------|---------|
| Operating Voltage | V^+ | | 2.5 | — | 7.5 | V |
| Operating Current | I_{CC} | | — | 7.5 | 10.0 | mA |
| Minimum Input Pulse Voltage Range | V_{IN} | At the balanced output | 1.85 | — | — | V |
| Regulator Voltage | V_{reg} | | 2.0 | 2.15 | 2.3 | V |
| Line Regulation | V_{lin} | $V^+=2.5\sim 8.5V$ | — | — | 30 | mV |
| Output Saturation Voltage | V_{sat} | Load 12Ω | — | — | 0.5 | V |
| Dead Band | T_{DB} | | — | 4.0 | — | μs |

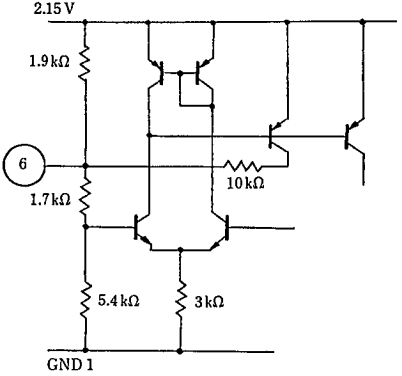
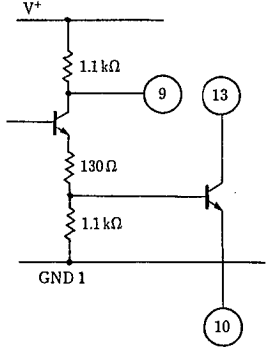
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PIN DISCIPTION

| PIN NO. | PIN FUNCTION | DESCRIPTION | INSIDE EQUIVALENT CIRCUIT |
|---------|------------------|---|---------------------------|
| 1 | V _{IN} | Input the positive pulse of more than 1.85V. | |
| 2 | R _{REF} | Constant output voltage of 1.25V (typical). Through the resistor which is connected to this pin, and setting up the constant current to make the saw tooth sweep at pin 14. Connect the capacitor of approximately 1000 pF with the resistor on parallel. | |

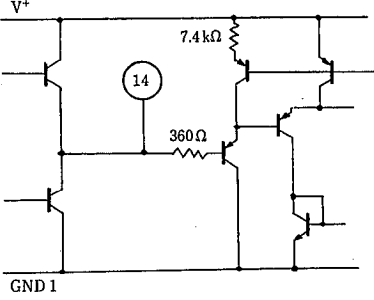
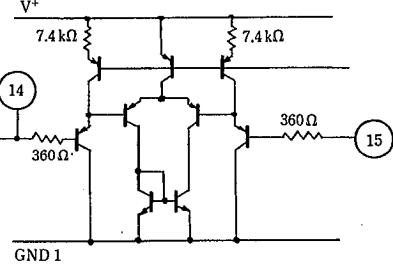
| PIN NO. | PIN FUNCTION | DESCRIPTION | INSIDE EQUIVALENT CIRCUIT |
|---------|--------------|--|--|
| 3 | V_{reg} | Connect the resistors along to the motor interlocking potentiometer pulse stretcher. Connect the capacitor of more than $0.1\mu F$. |  |
| 4 | PS1 | Connect the resistor between V_{ref} . The pulse gain can be decided by this resistor and the capacitor connected to pin 5. |  |
| 5 | PS2 | Connect the capacitor between GND. The pulse gain can be decided by this condenser and the resistor connected to pin 4. |  |

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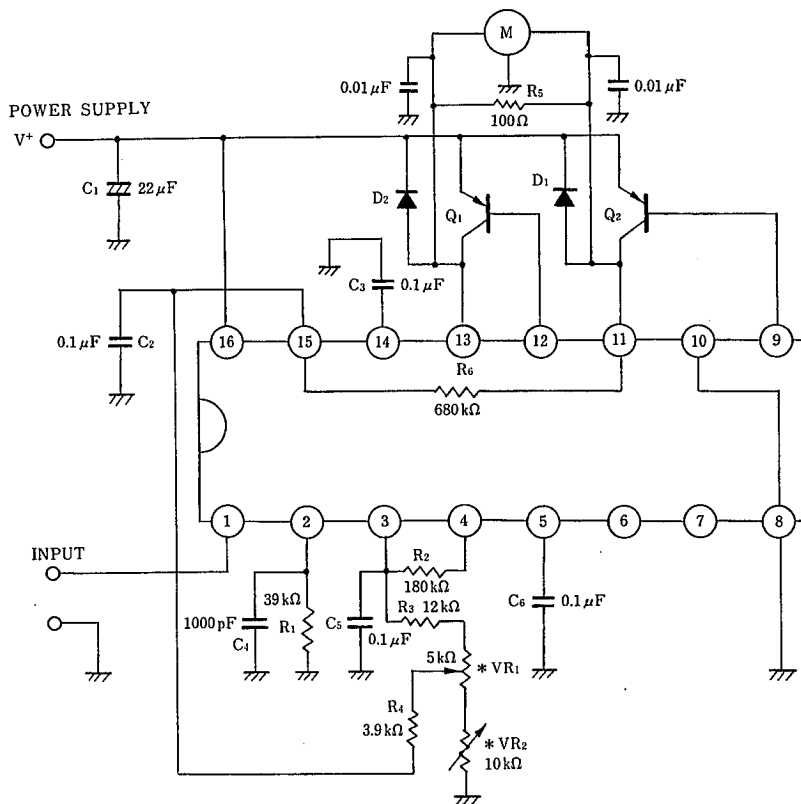
| PIN NO. | PIN FUNCTION | DESCRIPTION | INSIDE EQUIVALENT CIRCUIT |
|---------|--------------|---|---|
| 6 | PSV | <p>Nomally, this pin is used on the open state of operation. Especially, when it is required to make the adjustment of the dead band, connect the resistor between GND and then the dead band can be made it's expansion.</p> <p>(Refere to, dead band pin 6 voltage vs. pin 6 sink current characteristic)</p> |  <p>The diagram shows an internal bridge circuit. A 2.15V supply is connected to the top of a bridge. The bridge consists of four resistors: 1.9kΩ on the left, 1.7kΩ on the right, 5.4kΩ at the bottom, and 3kΩ at the top. The node between the 1.9kΩ and 1.7kΩ resistors is connected to pin 6. The node between the 5.4kΩ and 3kΩ resistors is connected to a 10kΩ resistor, which is in turn connected to the base of a PNP transistor. The emitter of this transistor is connected to GND1. The collector of this transistor is connected to the base of another PNP transistor, whose emitter is also connected to GND1.</p> |
| 7 | NC | No connect | |
| 8 | GND1 | System GND. | |
| 9 | PNP1 | Connect the external PNP transistor (Q_2) base. |  <p>The diagram shows an external PNP transistor Q_2. Its emitter is connected to V+. Its base is connected to pin 9. Its collector is connected to pin 10. A 1.1kΩ resistor is connected between V+ and the base (pin 9). A 130Ω resistor is connected between the base (pin 9) and the collector (pin 10). A 1.1kΩ resistor is connected between the collector (pin 10) and GND1. Pin 13 is also shown connected to the collector (pin 10).</p> |
| 10 | GND2 | <p>Power GND</p> <p>Large pulse current is running, therefore, connect the line by separating from the sytem GND.</p> | |

| PIN NO. | PIN FUNCTION | DESCRIPTION | INSIDE EQUIVALENT CIRCUIT |
|---------|--------------|---|---------------------------|
| 11 | OUT1 | Connect the collector of the external PNP transistor, the base of which is connected to pin 9. Connect the motor between pin 13. | |
| 12 | PNP2 | Connect the external PNP transistor (Q ₁) base. | |
| 13 | OUT2 | Connect the collector of the external PNP transistor, the base of which is connected to pin 12. Connect the motor between pin 11. | |

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| PIN NO. | PIN FUNCTION | DESCRIPTION | INSIDE EQUIVALENT CIRCUIT |
|---------|----------------|---|---|
| 14 | C _P | <p>Connect the sawtooth wave generating capacitor. The motor's position shall be decided at the peak point of sawtooth wave, so that it is advisable to select the higher precision capacitor as well as the resistor connected to pin 2.</p> |  |
| 15 | COMP | <p>The center part of potentiometer of motor motion is to be connected. The capacitor of about 0.1μF is to be connected between GND for preventing noise. The center location can be adjusted by putting the resistor in series with the potentiometer.</p> |  |
| 16 | V ⁺ | Power Supply | |

■ TYPICAL APPLICATION



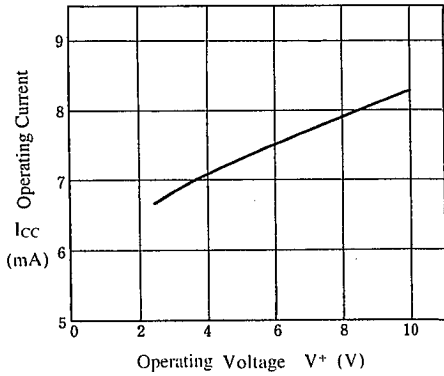
Notes

- (1) VR₁ : Potentiometer coupled mechanically to the servo motor
- (2) VR₂ : Adjusting the motor center location
- (3) Hunching prevention
 - 0.01 μF Capacitor between pin 11 and GND
 - 0.01 μF Capacitor between pin 13 and GND
 - Diode between pin 11 and power supply
 - Diode between pin 13 and power supply
 - 100 Ω Resistor between pin 11 and pin 13
 - 680 kΩ Resistor between pin 11 and GND

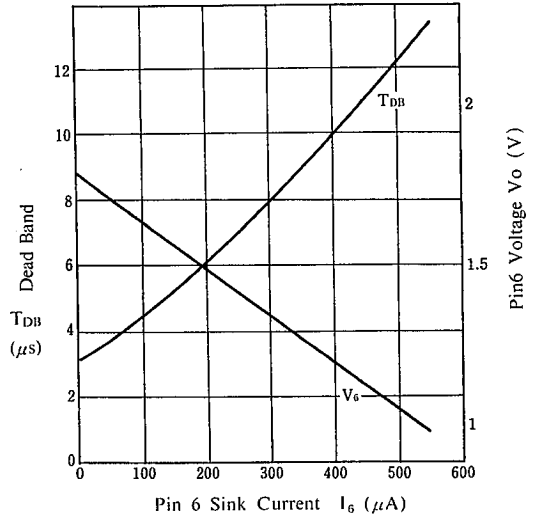
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■ TYPICAL CHARACTERISTICS

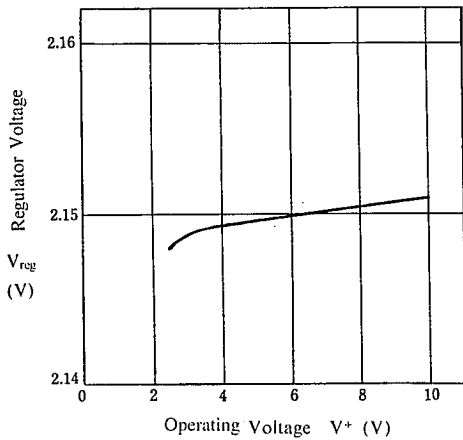
Operating Current vs. Operating Voltage
($T_a = 25^\circ\text{C}$)



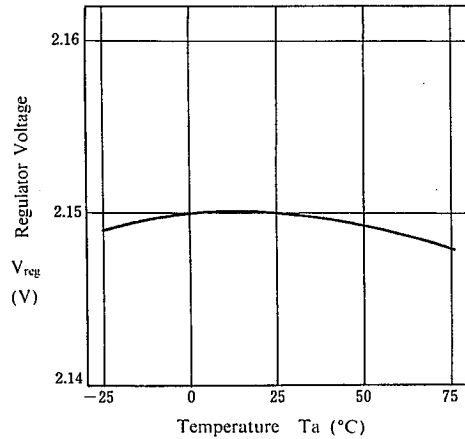
Dead Band Pin 6 Voltage vs. Pin 6 Sink Current



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



Regulator Voltage vs. Temperature
($V^+ = 6\text{V}$)



NJM2611

MEMO

[CAUTION]

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