

## 3-TERMINAL POSITIVE VOLTAGE REGULATOR

### ■ GENERAL DESCRIPTION

The **NJM78L00** series of 3-Terminal Positive Voltage Regulators is constructed using the New JRC Planar epitaxial process. These regulators employ internal current-limiting and thermal-shutdown, making them essentially indestructible. If adequate heat sinking is provided, they can deliver up to 100mA output current. They are intended as fixed voltage regulators in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power pass elements to make high-current voltage regulators. The **NJM78L00** series used as a Zener diode/resistor combination replacement, offers an effective output impedance improvement of typically two orders of magnitude, along with lower quiescent current and lower noise.

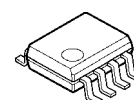
### ■ PACKAGE OUTLINE

(SOT-89)



**NJM78L00UA**

(EMP8)



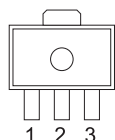
**NJM78L00EA**  
(5V, 9V, 12V Version Only)

### ■ FEATURES

- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Excellent Ripple Rejection
- Guarantee'd 100mA Output Current
- Package Outline
- Bipolar Technology

SOT-89, EMP8

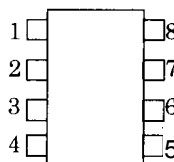
### ■ PIN CONFIGURATION



**NJM78L00UA**

PIN CONFIGURATION

1. OUT
2. GND
3. IN

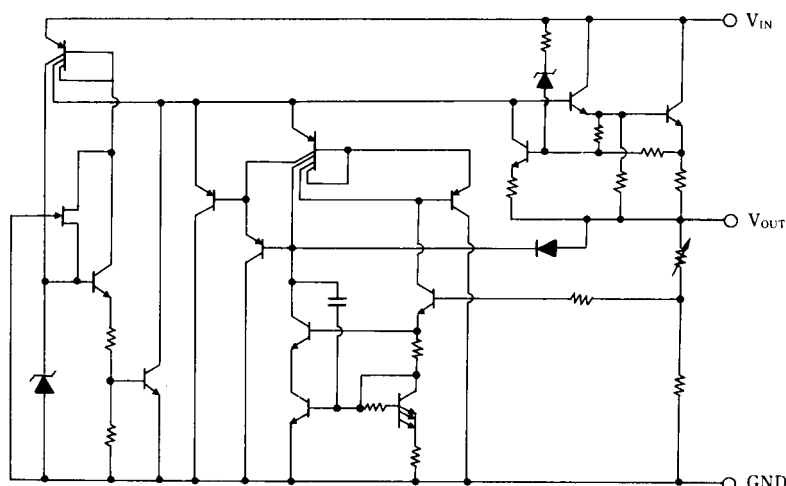


**NJM78L00EA**

PIN CONFIGURATION

1. OUT
2. GND
3. GND
4. NC
5. NC
6. GND
7. GND
8. IN

### ■ EQUIVALENT CIRCUIT



# NJM78L00

## ■ ABSOLUTE MAXIMUM RATINGS

(T<sub>a</sub>=25°C)

| PARAMETER                   | SYMBOL           | MAXIMUM RATINGS                                                         | UNIT |
|-----------------------------|------------------|-------------------------------------------------------------------------|------|
| Input Voltage               | V <sub>IN</sub>  | (78L02A to 78L09A) 30<br>(78L12A to 78L15A) 35<br>(78L18A to 78L24A) 40 | V    |
| Power Dissipation           | P <sub>D</sub>   | (EMP8) 350<br>(SOT-89) 300                                              | mW   |
| Operating Temperature Range | T <sub>opr</sub> | -40 to +85                                                              | °C   |
| Storage Temperature Range   | T <sub>stg</sub> | -40 to +150                                                             | °C   |

## ■ ELECTRICAL CHARACTERISTICS(C<sub>IN</sub>=0.33μF, C<sub>O</sub>=0.1μF, T<sub>J</sub>=25°C)

Measurement is to be conducted is pulse testing.

| PARAMETER                                         | SYMBOL                            | TEST CONDITION                                                                                 | MIN. | TYP. | MAX. | UNIT  |
|---------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------|------|------|------|-------|
| NJM78L02UA                                        |                                   |                                                                                                |      |      |      |       |
| Output Voltage                                    | V <sub>O</sub>                    | V <sub>IN</sub> =9V, I <sub>O</sub> =40mA                                                      | 2.47 | 2.6  | 2.73 | V     |
| Line Regulation 1                                 | ΔV <sub>O</sub> -V <sub>IN1</sub> | V <sub>IN</sub> =4.75V to 20V, I <sub>O</sub> =40mA                                            | -    | -    | 125  | mV    |
| Line Regulation 2                                 | ΔV <sub>O</sub> -V <sub>IN2</sub> | V <sub>IN</sub> =5V to 20V, I <sub>O</sub> =40mA                                               | -    | -    | 100  | mV    |
| Load Regulation 1                                 | ΔV <sub>O</sub> -I <sub>O1</sub>  | V <sub>IN</sub> =9V, I <sub>O</sub> =1 to 40mA                                                 | -    | -    | 25   | mV    |
| Load Regulation 2                                 | ΔV <sub>O</sub> -I <sub>O2</sub>  | V <sub>IN</sub> =9V, I <sub>O</sub> =1 to 100mA                                                | -    | -    | 50   | mV    |
| Quiescent Current                                 | I <sub>Q</sub>                    | V <sub>IN</sub> =9V, I <sub>O</sub> =0mA                                                       | -    | 2.0  | 6    | mA    |
| Average Temperature Coefficient of Output Voltage | ΔV <sub>O</sub> /ΔT               | V <sub>IN</sub> =9V, I <sub>O</sub> =1mA                                                       | -    | 0.2  | -    | mV/°C |
| Ripple Rejection                                  | RR                                | 6V < V <sub>IN</sub> < 16V, I <sub>O</sub> =40mA, e <sub>IN</sub> =1V <sub>P-P</sub> , f=120Hz | 43   | 73   | -    | dB    |
| Output Noise Voltage                              | V <sub>NO</sub>                   | V <sub>IN</sub> =9V, BW=10Hz to 100kHz, I <sub>O</sub> =40mA                                   | -    | 35   | -    | μV    |
| NJM78L03UA                                        |                                   |                                                                                                |      |      |      |       |
| Output Voltage                                    | V <sub>O</sub>                    | V <sub>IN</sub> =9V, I <sub>O</sub> =40mA                                                      | 2.85 | 3.0  | 3.15 | V     |
| Line Regulation 1                                 | ΔV <sub>O</sub> -V <sub>IN1</sub> | V <sub>IN</sub> =5V to 20V, I <sub>O</sub> =40mA                                               | -    | -    | 125  | mV    |
| Line Regulation 2                                 | ΔV <sub>O</sub> -V <sub>IN2</sub> | V <sub>IN</sub> =6V to 20V, I <sub>O</sub> =40mA                                               | -    | -    | 100  | mV    |
| Load Regulation 1                                 | ΔV <sub>O</sub> -I <sub>O1</sub>  | V <sub>IN</sub> =9V, I <sub>O</sub> =1 to 40mA                                                 | -    | -    | 25   | mV    |
| Load Regulation 2                                 | ΔV <sub>O</sub> -I <sub>O2</sub>  | V <sub>IN</sub> =9V, I <sub>O</sub> =1 to 100mA                                                | -    | -    | 50   | mV    |
| Quiescent Current                                 | I <sub>Q</sub>                    | V <sub>IN</sub> =9V, I <sub>O</sub> =0mA                                                       | -    | 2.0  | 6    | mA    |
| Average Temperature Coefficient of Output Voltage | ΔV <sub>O</sub> /ΔT               | V <sub>IN</sub> =9V, I <sub>O</sub> =1mA                                                       | -    | 0.2  | -    | mV/°C |
| Ripple Rejection                                  | RR                                | 6V < V <sub>IN</sub> < 16V, I <sub>O</sub> =40mA, e <sub>IN</sub> =1V <sub>P-P</sub> , f=120Hz | 43   | 72   | -    | dB    |
| Output Noise Voltage                              | V <sub>NO</sub>                   | V <sub>IN</sub> =9V, BW=10Hz to 100kHz, I <sub>O</sub> =40mA                                   | -    | 40   | -    | μV    |
| NJM78L05UA/EA                                     |                                   |                                                                                                |      |      |      |       |
| Output Voltage                                    | V <sub>O</sub>                    | V <sub>IN</sub> =10V, I <sub>O</sub> =40mA                                                     | 4.75 | 5.0  | 5.25 | V     |
| Line Regulation 1                                 | ΔV <sub>O</sub> -V <sub>IN1</sub> | V <sub>IN</sub> =7V to 20V, I <sub>O</sub> =40mA                                               | -    | -    | 200  | mV    |
| Line Regulation 2                                 | ΔV <sub>O</sub> -V <sub>IN2</sub> | V <sub>IN</sub> =8V to 20V, I <sub>O</sub> =40mA                                               | -    | -    | 150  | mV    |
| Load Regulation 1                                 | ΔV <sub>O</sub> -I <sub>O1</sub>  | V <sub>IN</sub> =10V, I <sub>O</sub> =1 to 40mA                                                | -    | -    | 30   | mV    |
| Load Regulation 2                                 | ΔV <sub>O</sub> -I <sub>O2</sub>  | V <sub>IN</sub> =10V, I <sub>O</sub> =1 to 100mA                                               | -    | -    | 60   | mV    |
| Quiescent Current                                 | I <sub>Q</sub>                    | V <sub>IN</sub> =10V, I <sub>O</sub> =0mA                                                      | -    | 2.0  | 6    | mA    |
| Average Temperature Coefficient of Output Voltage | ΔV <sub>O</sub> /ΔT               | V <sub>IN</sub> =10V, I <sub>O</sub> =1mA                                                      | -    | 0.4  | -    | mV/°C |
| Ripple Rejection                                  | RR                                | 8V < V <sub>IN</sub> < 18V, I <sub>O</sub> =40mA, e <sub>IN</sub> =1V <sub>P-P</sub> , f=120Hz | 40   | 69   | -    | dB    |
| Output Noise Voltage                              | V <sub>NO</sub>                   | V <sub>IN</sub> =10V, BW=10Hz to 100kHz, I <sub>O</sub> =40mA                                  | -    | 70   | -    | μV    |

## ■ ELECTRICAL CHARACTERISTICS( $C_{IN}=0.33\mu F$ , $C_O=0.1\mu F$ , $T_J=25^\circ C$ )

Measurement is to be conducted is pulse testing.

| PARAMETER                                         | SYMBOL                | TEST CONDITION                                                    | MIN. | TYP. | MAX. | UNIT           |
|---------------------------------------------------|-----------------------|-------------------------------------------------------------------|------|------|------|----------------|
| NJM78L06UA                                        |                       |                                                                   |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=12V$ , $I_O=40mA$                                         | 5.7  | 6.0  | 6.3  | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=8.5V$ to $20V$ , $I_O=40mA$                               | -    | -    | 200  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=9V$ to $20V$ , $I_O=40mA$                                 | -    | -    | 150  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_O1$     | $V_{IN}=12V$ , $I_O=1$ to $40mA$                                  | -    | -    | 40   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_O2$     | $V_{IN}=12V$ , $I_O=1$ to $100mA$                                 | -    | -    | 80   | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=12V$ , $I_O=0mA$                                          | -    | 2.0  | 6    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=12V$ , $I_O=1mA$                                          | -    | 0.5  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $9V < V_{IN} < 20V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$  | 40   | 67   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=12V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                 | -    | 80   | -    | $\mu V$        |
| NJM78L07UA                                        |                       |                                                                   |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=13V$ , $I_O=40mA$                                         | 6.65 | 7.0  | 7.35 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=9.5V$ to $22V$ , $I_O=40mA$                               | -    | -    | 210  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=10V$ to $22V$ , $I_O=40mA$                                | -    | -    | 160  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_O1$     | $V_{IN}=13V$ , $I_O=1$ to $40mA$                                  | -    | -    | 45   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_O2$     | $V_{IN}=13V$ , $I_O=1$ to $100mA$                                 | -    | -    | 90   | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=13V$ , $I_O=0mA$                                          | -    | 2.1  | 6    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=13V$ , $I_O=1mA$                                          | -    | 0.55 | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $10V < V_{IN} < 20V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$ | 39   | 66   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=13V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                 | -    | 100  | -    | $\mu V$        |
| NJM78L08UA                                        |                       |                                                                   |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=14V$ , $I_O=40mA$                                         | 7.6  | 8.0  | 8.4  | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=10.5V$ to $23V$ , $I_O=40mA$                              | -    | -    | 225  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=11V$ to $23V$ , $I_O=40mA$                                | -    | -    | 175  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_O1$     | $V_{IN}=14V$ , $I_O=1$ to $40mA$                                  | -    | -    | 50   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_O2$     | $V_{IN}=14V$ , $I_O=1$ to $100mA$                                 | -    | -    | 100  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=14V$ , $I_O=0mA$                                          | -    | 2.1  | 6    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=14V$ , $I_O=1mA$                                          | -    | 0.6  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $11V < V_{IN} < 20V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$ | 39   | 66   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=14V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                 | -    | 115  | -    | $\mu V$        |

# NJM78L00

## ■ ELECTRICAL CHARACTERISTICS( $C_{IN}=0.33\mu F$ , $C_O=0.1\mu F$ , $T_J=25^\circ C$ )

Measurement is to be conducted is pulse testing.

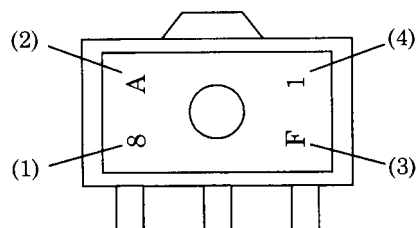
| PARAMETER                                         | SYMBOL                | TEST CONDITION                                                        | MIN. | TYP. | MAX. | UNIT           |
|---------------------------------------------------|-----------------------|-----------------------------------------------------------------------|------|------|------|----------------|
| NJM78L09UA/EA                                     |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=15V$ , $I_O=40mA$                                             | 8.55 | 9.0  | 9.45 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=11.5V$ to $23V$ , $I_O=40mA$                                  | -    | -    | 250  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=12V$ to $23V$ , $I_O=40mA$                                    | -    | -    | 200  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=15V$ , $I_O=1$ to $40mA$                                      | -    | -    | 50   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=15V$ , $I_O=1$ to $100mA$                                     | -    | -    | 100  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=15V$ , $I_O=0mA$                                              | -    | 2.1  | 6    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=15V$ , $I_O=1mA$                                              | -    | 0.65 | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $12V < V_{IN} < 21V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$     | 38   | 65   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=15V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 125  | -    | $\mu V$        |
| NJM78L10UA                                        |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=16V$ , $I_O=40mA$                                             | 9.5  | 10.0 | 10.5 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=13V$ to $25V$ , $I_O=40mA$                                    | -    | -    | 250  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=14V$ to $25V$ , $I_O=40mA$                                    | -    | -    | 200  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=16V$ , $I_O=1$ to $40mA$                                      | -    | -    | 50   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=16V$ , $I_O=1$ to $100mA$                                     | -    | -    | 100  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=16V$ , $I_O=0mA$                                              | -    | 2.1  | 6    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=16V$ , $I_O=1mA$                                              | -    | 0.7  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $13V < V_{IN} < 22V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$     | 37   | 64   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=16V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 135  | -    | $\mu V$        |
| NJM78L12UA/EA                                     |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=19V$ , $I_O=40mA$                                             | 11.4 | 12.0 | 12.6 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=14.5V$ to $27V$ , $I_O=40mA$                                  | -    | -    | 250  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=16V$ to $27V$ , $I_O=40mA$                                    | -    | -    | 200  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=19V$ , $I_O=1$ to $40mA$                                      | -    | -    | 50   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=19V$ , $I_O=1$ to $100mA$                                     | -    | -    | 100  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=19V$ , $I_O=0mA$                                              | -    | 2.1  | 6.5  | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=19V$ , $I_O=1mA$                                              | -    | 0.9  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $15V < V_{IN} < 25V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$     | 37   | 62   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=19V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 160  | -    | $\mu V$        |
| NJM78L15UA                                        |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=23V$ , $I_O=40mA$                                             | 14.3 | 15.0 | 15.7 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=17.5V$ to $30V$ , $I_O=40mA$                                  | -    | -    | 300  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=20V$ to $30V$ , $I_O=40mA$                                    | -    | -    | 250  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=23V$ , $I_O=1$ to $40mA$                                      | -    | -    | 75   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=23V$ , $I_O=1$ to $100mA$                                     | -    | -    | 150  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=23V$ , $I_O=0mA$                                              | -    | 2.2  | 6.5  | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=23V$ , $I_O=1mA$                                              | -    | 1.0  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $18.5V < V_{IN} < 28.5V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$ | 34   | 60   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=23V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 190  | -    | $\mu V$        |

## ■ ELECTRICAL CHARACTERISTICS( $C_{IN}=0.33\mu F$ , $C_O=0.1\mu F$ , $T_J=25^\circ C$ )

Measurement is to be conducted is pulse testing.

| PARAMETER                                         | SYMBOL                | TEST CONDITION                                                        | MIN. | TYP. | MAX. | UNIT           |
|---------------------------------------------------|-----------------------|-----------------------------------------------------------------------|------|------|------|----------------|
| <b>NJM78L18UA</b>                                 |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=27V$ , $I_O=40mA$                                             | 17.1 | 18.0 | 18.9 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=22V$ to $33V$ , $I_O=40mA$                                    | -    | -    | 320  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=22V$ to $33V$ , $I_O=40mA$                                    | -    | -    | 270  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=27V$ , $I_O=1$ to $40mA$                                      | -    | -    | 80   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=27V$ , $I_O=1$ to $100mA$                                     | -    | -    | 160  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=27V$ , $I_O=0mA$                                              | -    | 2.2  | 6.5  | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=27V$ , $I_O=1mA$                                              | -    | 1.1  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $23V < V_{IN} < 33V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$     | 33   | 59   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=27V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 230  | -    | $\mu V$        |
| <b>NJM78L20UA</b>                                 |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=29V$ , $I_O=40mA$                                             | 19.0 | 20.0 | 21.0 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=23V$ to $34V$ , $I_O=40mA$                                    | -    | -    | 330  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=24V$ to $34V$ , $I_O=40mA$                                    | -    | -    | 280  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=29V$ , $I_O=1$ to $40mA$                                      | -    | -    | 90   | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=29V$ , $I_O=1$ to $100mA$                                     | -    | -    | 180  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=29V$ , $I_O=0mA$                                              | -    | 2.3  | 7    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=29V$ , $I_O=1mA$                                              | -    | 1.2  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $24V < V_{IN} < 34V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$     | 32   | 58   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=29V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 250  | -    | $\mu V$        |
| <b>NJM78L24UA</b>                                 |                       |                                                                       |      |      |      |                |
| Output Voltage                                    | $V_O$                 | $V_{IN}=33V$ , $I_O=40mA$                                             | 22.8 | 24   | 25.2 | V              |
| Line Regulation 1                                 | $\Delta V_O-V_{IN1}$  | $V_{IN}=27V$ to $38V$ , $I_O=40mA$                                    | -    | -    | 350  | mV             |
| Line Regulation 2                                 | $\Delta V_O-V_{IN2}$  | $V_{IN}=28V$ to $38V$ , $I_O=40mA$                                    | -    | -    | 300  | mV             |
| Load Regulation 1                                 | $\Delta V_O-I_{O1}$   | $V_{IN}=33V$ , $I_O=1$ to $40mA$                                      | -    | -    | 100  | mV             |
| Load Regulation 2                                 | $\Delta V_O-I_{O2}$   | $V_{IN}=33V$ , $I_O=1$ to $100mA$                                     | -    | -    | 200  | mV             |
| Quiescent Current                                 | $I_Q$                 | $V_{IN}=33V$ , $I_O=0mA$                                              | -    | 2.3  | 7    | mA             |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=33V$ , $I_O=1mA$                                              | -    | 1.4  | -    | mV/ $^\circ C$ |
| Ripple Rejection                                  | RR                    | $27.5V < V_{IN} < 37.5V$ , $I_O=40mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$ | 32   | 57   | -    | dB             |
| Output Noise Voltage                              | $V_{NO}$              | $V_{IN}=33V$ , $BW=10Hz$ to $100kHz$ , $I_O=40mA$                     | -    | 280  | -    | $\mu V$        |

## ■ SOT-89 MARK



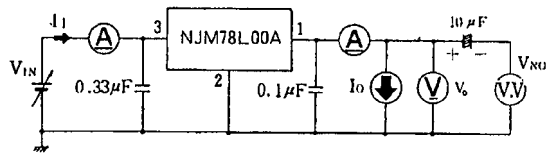
- (1) 8 : Positive Output  
 (2)  $V_O$  Rank  
 (3) The end of A.D.  
 (4) Production Mouth  
 Oct. ...X  
 Nov. ...Y  
 Dec. ...Z

|            |   |   |
|------------|---|---|
| NJM78L02UA | 8 | A |
| NJM78L03UA | 8 | B |
| NJM78L05UA | 8 | C |
| NJM78L06UA | 8 | E |
| NJM78L07UA | 8 | F |
| NJM78L08UA | 8 | G |
| NJM78L09UA | 8 | H |
| NJM78L10UA | 8 | J |
| NJM78L12UA | 8 | K |
| NJM78L15UA | 8 | L |
| NJM78L18UA | 8 | M |
| NJM78L20UA | 8 | N |
| NJM78L24UA | 8 | P |

# NJM78L00

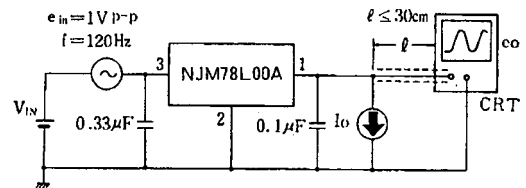
## ■ TEST CIRCUIT

1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage, Peak Output/Short-Circuit Current



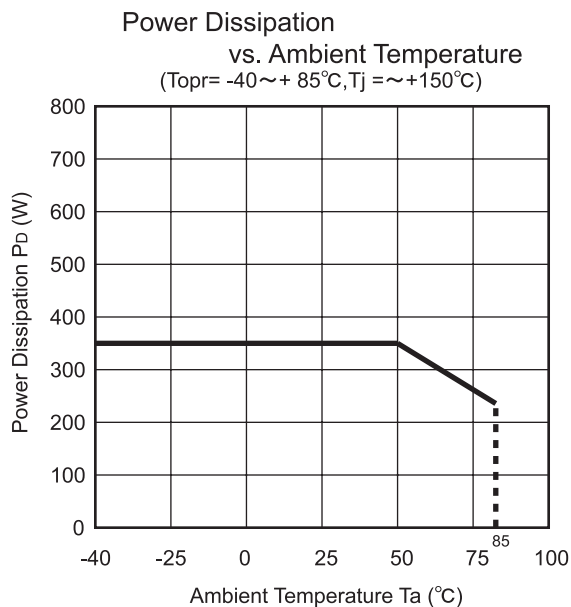
- Measurement is to be conducted in pulse testing.
- $I_Q = I_I - I_O$

2. Ripple Rejection



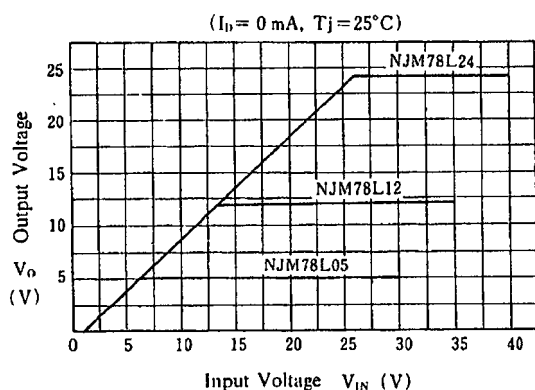
$$RR = 20 \log_{10} \left( \frac{e_{in}}{e_o} \right) \text{ (dB)}$$

## ■ POWER DISSIPATION VS. AMBIENT TEMPERATURE

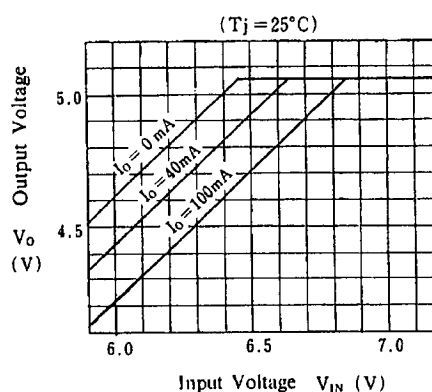


## ■ TYPICAL CHARACTERISTICS

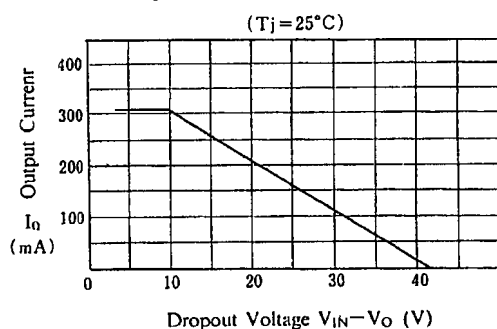
**NJM78L05 / L12 / L24**  
**Output Characteristics**



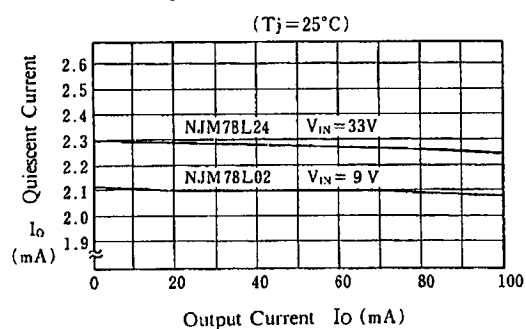
**NJM78L05 Dropout Characteristics**



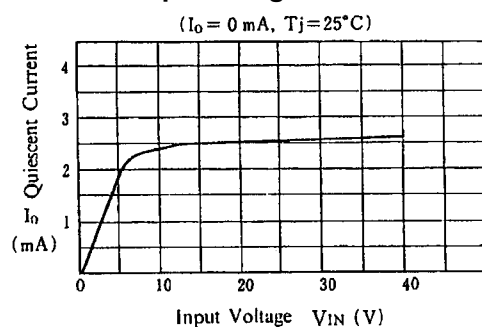
**NJM78L00 Series Short Circuit**  
**Output Current**



**NJM78L02 / L24 Quiescent Current**  
**vs. Output Current**



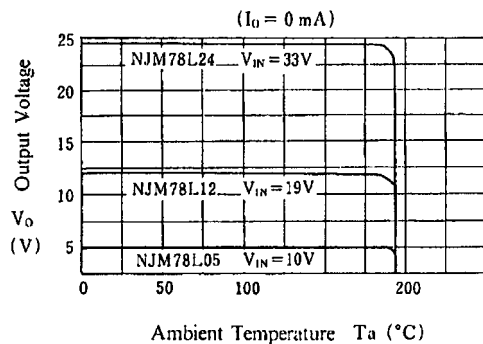
**NJM78L05 Quiescent Current**  
**vs. Input Voltage**



## ■ TYPICAL CHARACTERISTICS

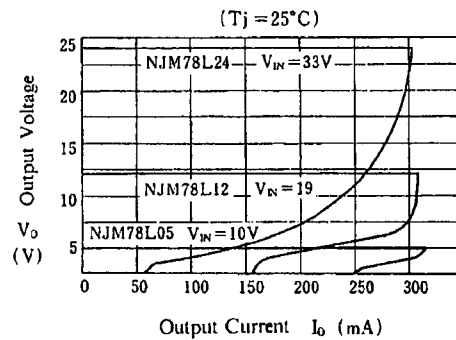
### NJM78L05 / L12 / L24

#### Thermal Shutdown Characteristics

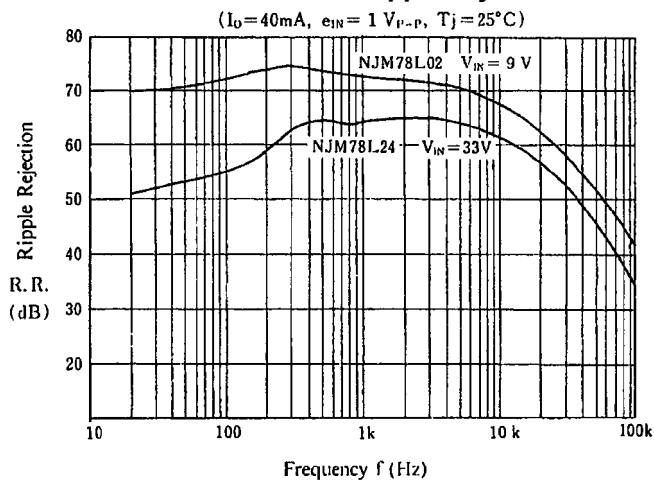


### NJM78L05 / L12 / L24

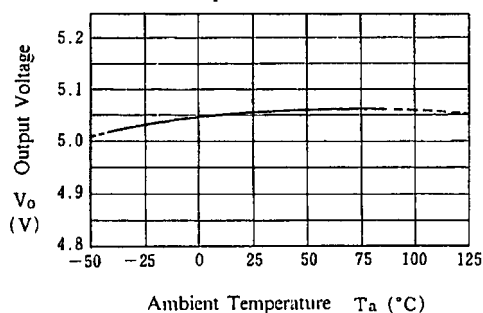
#### Load Characteristics



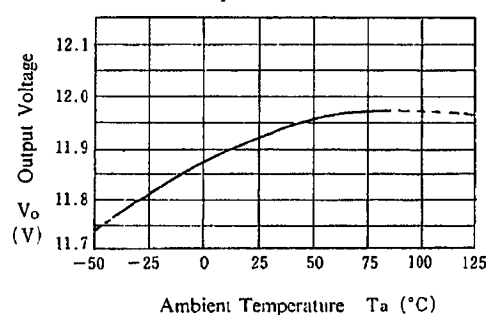
### NJM78L02 / L24 Ripple Rejection



### NJM78L05 Output Voltage vs. Temperature



### NJM78L12 Output Voltage vs. Temperature



#### [CAUTION]

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[NJM78L06UA-TE1](#) [NJM78L02UA-TE2](#) [NJM78L15UA-TE2](#) [NJM78L24UA-TE1](#) [NJM78L20UA-TE1](#) [NJM78L05UA-TE1](#)  
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[NJM78L03A-T3](#) [NJM78L06A-T2](#) [NJM78L06A-T1](#) [NJM78L06A-T3](#) [NJM78L02A-T1](#) [NJM78L02A-T3](#) [NJM78L05A-T3](#)  
[NJM78L05A-T1](#) [NJM78L18UA](#) [NJM78L09A](#) [NJM78L06A](#) [NJM78L08A](#) [NJM78L02A](#) [NJM78L03UA](#) [NJM78L10A](#)  
[NJM78L12A](#) [NJM78L18A](#) [NJM78L15A](#) [NJM78L20UA](#) [NJM78L18A-TE1](#) [NJM78L24A](#) [NJM78L20A](#) [NJM78L05EA-](#)  
[TE1](#) [NJM78L15A-T3](#) [NJM78L15A-T1](#) [NJM78L09A-T3](#) [NJM78L09A-T1](#) [NJM78L09UA-TE2](#) [NJM78L08UA-TE2](#)  
[NJM78L09UA-TE3](#) [NJM78L09UA-TE1](#) [NJM78L08UA-TE1](#) [NJM78L24A-TE1](#) [NJM78L18UA-TE1](#) [NJM78L08UA](#)  
[NJM78L09UA](#) [NJM78L09EA](#) [NJM78L05A](#) [NJM78L05UATE1 TAPE & REEL 1000](#) [NJM78L08UATE1 TAPE & REEL](#)  
[1000](#) [NJM78L09UATE1 TAPE & REEL 1000](#) [NJM78L24UA](#) [NJM78L24UA-TE2](#)