



3-TERMINAL POSITIVE VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

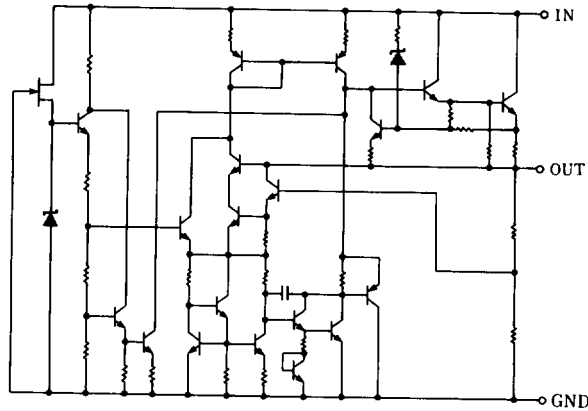
The NJM7800 series of monolithic 3-Terminal Positive Voltage Regulators is constructed using the New JRC Planar epitaxial process. These regulators employ internal current-limiting, thermal-shutdown and safe-area compensation making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. They are intended as fixed voltage regulators in a wide range of applications including local (on card) regulation for elimination of distribution problems associated with single point regulation. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents.

■ FEATURES

- Operating Voltage
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Excellent Ripple Rejection
- Guarantee'd 1.5A Output Current
- Package Outline
- Bipolar Technology

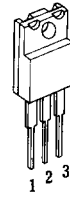
TO-220F, TO-252

■ EQUIVALENT CIRCUIT



■ PACKAGE OUTLINE

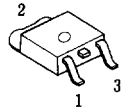
(TO-220F)



NJM7800FA

- 1. IN
- 2. GND
- 3. OUT

(TO-252)



NJM7800DLA

- 1. IN
- 2. GND
- 3. OUT

(note) The radiation fin is connected pin2.



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER | SYMBOL | MAXIMUM RATINGS | | UNIT |
|-----------------------------|--------------------------------|------------------|---------------------------|------|
| Input Voltage | V _{IN} | 7805~7809 | 35 | V |
| | | 7812~7815 | 35 | |
| | | 7818~7824 | 40 | |
| Storage Temperature Range | T _{stg} | -40 ~ +150 | | °C |
| Operating Temperature Range | Operating Junction Temperature | T _j | -30~+150 | °C |
| | | T _{opr} | -30~+75 | |
| Power Dissipation | P _D | TO220F | 16 (T _c ≤70°C) | W |
| | | TO252 | 10 (T _c =25°C) | |
| | | | 1 (T _a ≤25°C) | |

■ THERMAL CHARACTERISTICS

| Thermal Resistance | Junction-to-Ambient Temperature | θ _{ja} | TO220F | TO252 | °C/W |
|--------------------|---------------------------------|-----------------|--------|-------|------|
| | | | 60 | 125 | |
| | Junction-to-Case | θ _{jc} | 5 | 12.5 | |

■ ELECTRICAL CHARACTERISTICS (C₁=0.33 μF, C₀=0.1 μF, T_j=25°C) Measurement is to be conducted in pulse testing.

| PARAMETER | SYMBOL | TEST CONDITIONS | F TYP. | | | DL TYP. | | | UNIT |
|---|----------------------------------|--|--------|------|------|---------|------|------|-------|
| | | | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | |
| NJM7805A | | | | | | | | | |
| Output Voltage | V _O | V _{IN} =10V, I _O =0.5A | 4.8 | 5.0 | 5.2 | 4.8 | 5.0 | 5.2 | V |
| Quiescent Current | I _Q | V _{IN} =10V, I _O =0mA | — | 4.2 | 6.0 | — | 4.2 | 6.0 | mA |
| Load Regulation | ΔV _O -I _O | V _{IN} =10V, I _O =0.005~1.5A | — | 15 | 50 | — | 15 | 100 | mV |
| Line Regulation | ΔV _O -V _{IN} | V _{IN} =7~25V, I _O =0.5A | — | 3 | 50 | — | 3 | 100 | mV |
| Ripple Rejection | RR | V _{IN} =10V, I _O =0.5A, e _{in} =2V _{p-p} , f=120Hz | 68 | 78 | — | 68 | 78 | — | dB |
| Output Noise Voltage | V _{No} | V _{IN} =10V, BW=10Hz~100kHz, I _O =0.5A | — | 45 | — | — | 45 | — | μV |
| Average Temperature Coefficient of Output Voltage | ΔV _O /ΔT | V _{IN} =10V, I _O 5mA | — | -0.5 | — | — | -0.5 | — | mV/°C |

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■ **ELECTRICAL CHARACTERISTICS** ($C_1=0.33\ \mu\text{F}$, $C_0=0.1\ \mu\text{F}$, $T_j=25^\circ\text{C}$) Measurement is to be conducted in pulse testing.

| PARAMETER | SYMBOL | TEST CONDITIONS | F TYP. | | | DL TYP. | | | UNIT |
|---|-----------------------|---|--------|------|------|---------|------|------|---------------|
| | | | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | |
| NJM7806A | | | | | | | | | |
| Output Voltage | V_O | $V_{IN}=11\text{V}$, $I_O=0.5\text{A}$ | 5.75 | 6.0 | 6.25 | 5.75 | 6.0 | 6.25 | V |
| Quiescent Current | I_Q | $V_{IN}=11\text{V}$, $I_O=0\text{mA}$ | — | 4.3 | 6.0 | — | 4.3 | 6.0 | mA |
| Load Regulation | ΔV_{O-I_O} | $V_{IN}=11\text{V}$, $I_O=0.005\sim 1.5\text{A}$ | — | 15 | 60 | — | 15 | 120 | mV |
| Line Regulation | $\Delta V_{O-V_{IN}}$ | $V_{IN}=8\sim 25\text{V}$, $I_O=0.5\text{A}$ | — | 5 | 60 | — | 5 | 120 | mV |
| Ripple Rejection | RR | $V_{IN}=11\text{V}$, $I_O=0.5\text{A}$, $e_{in}=2\text{V}_{P-P}$, $f=120\text{Hz}$ | 65 | 75 | — | 65 | 75 | — | dB |
| Output Noise Voltage | V_{NO} | $V_{IN}=11\text{V}$, $BW=10\text{Hz}\sim 100\text{kHz}$, $I_O=0.5\text{A}$ | — | 45 | — | — | 45 | — | μV |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=11\text{V}$, $I_O\ 5\text{mA}$ | — | -0.6 | — | — | -0.6 | — | mV/°C |
| NJM7808A | | | | | | | | | |
| Output Voltage | V_O | $V_{IN}=14\text{V}$, $I_O=0.5\text{A}$ | 7.7 | 8.0 | 8.3 | 7.7 | 8.0 | 8.3 | V |
| Quiescent Current | I_Q | $V_{IN}=14\text{V}$, $I_O=0\text{mA}$ | — | 4.3 | 6.0 | — | 4.3 | 6.0 | mA |
| Load Regulation | ΔV_{O-I_O} | $V_{IN}=14\text{V}$, $I_O=0.005\sim 1.5\text{A}$ | — | 15 | 80 | — | 15 | 160 | mV |
| Line Regulation | $\Delta V_{O-V_{IN}}$ | $V_{IN}=10.5\sim 25\text{V}$, $I_O=0.5\text{A}$ | — | 6 | 80 | — | 6 | 160 | mV |
| Ripple Rejection | RR | $V_{IN}=14\text{V}$, $I_O=0.5\text{A}$, $e_{in}=2\text{V}_{P-P}$, $f=120\text{Hz}$ | 62 | 72 | — | 62 | 72 | — | dB |
| Output Noise Voltage | V_{NO} | $V_{IN}=14\text{V}$, $BW=10\text{Hz}\sim 100\text{kHz}$, $I_O=0.5\text{A}$ | — | 55 | — | — | 55 | — | μV |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=14\text{V}$, $I_O\ 5\text{mA}$ | — | -0.8 | — | — | -0.8 | — | mV/°C |
| NJM7809A | | | | | | | | | |
| Output Voltage | V_O | $V_{IN}=15\text{V}$, $I_O=0.5\text{A}$ | 8.65 | 9.0 | 9.35 | 8.65 | 9.0 | 9.35 | V |
| Quiescent Current | I_Q | $V_{IN}=15\text{V}$, $I_O=0\text{mA}$ | — | 4.3 | 6.0 | — | 4.3 | 6.0 | mA |
| Load Regulation | ΔV_{O-I_O} | $V_{IN}=15\text{V}$, $I_O=0.005\sim 1.5\text{A}$ | — | 15 | 90 | — | 15 | 180 | mV |
| Line Regulation | $\Delta V_{O-V_{IN}}$ | $V_{IN}=11.5\sim 25\text{V}$, $I_O=0.5\text{A}$ | — | 7 | 90 | — | 7 | 180 | mV |
| Ripple Rejection | RR | $V_{IN}=15\text{V}$, $I_O=0.5\text{A}$, $e_{in}=2\text{V}_{P-P}$, $f=120\text{Hz}$ | 62 | 72 | — | 62 | 72 | — | dB |
| Output Noise Voltage | V_{NO} | $V_{IN}=15\text{V}$, $BW=10\text{Hz}\sim 100\text{kHz}$, $I_O=0.5\text{A}$ | — | 60 | — | — | 60 | — | μV |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=15\text{V}$, $I_O\ 5\text{mA}$ | — | -0.9 | — | — | -0.9 | — | mV/°C |
| NJM7812A | | | | | | | | | |
| Output Voltage | V_O | $V_{IN}=19\text{V}$, $I_O=0.5\text{A}$ | 11.5 | 12.0 | 12.5 | 11.5 | 12.0 | 12.5 | V |
| Quiescent Current | I_Q | $V_{IN}=19\text{V}$, $I_O=0\text{mA}$ | — | 4.3 | 6.0 | — | 4.3 | 6.0 | mA |
| Load Regulation | ΔV_{O-I_O} | $V_{IN}=19\text{V}$, $I_O=0.005\sim 1.5\text{A}$ | — | 25 | 120 | — | 25 | 240 | mV |
| Line Regulation | $\Delta V_{O-V_{IN}}$ | $V_{IN}=14.5\sim 30\text{V}$, $I_O=0.5\text{A}$ | — | 10 | 120 | — | 10 | 240 | mV |
| Ripple Rejection | RR | $V_{IN}=19\text{V}$, $I_O=0.5\text{A}$, $e_{in}=2\text{V}_{P-P}$, $f=120\text{Hz}$ | 61 | 71 | — | 61 | 71 | — | dB |
| Output Noise Voltage | V_{NO} | $V_{IN}=19\text{V}$, $BW=10\text{Hz}\sim 100\text{kHz}$, $I_O=0.5\text{A}$ | — | 75 | — | — | 75 | — | μV |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O/\Delta T$ | $V_{IN}=19\text{V}$, $I_O\ 5\text{mA}$ | — | -1.2 | — | — | -1.2 | — | mV/°C |

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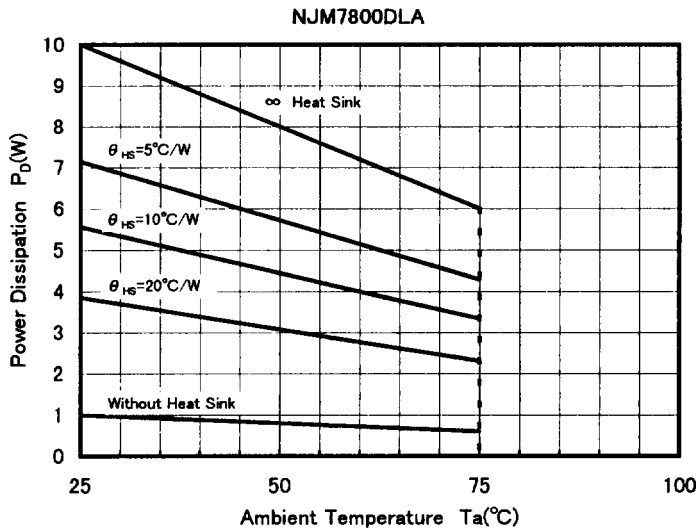
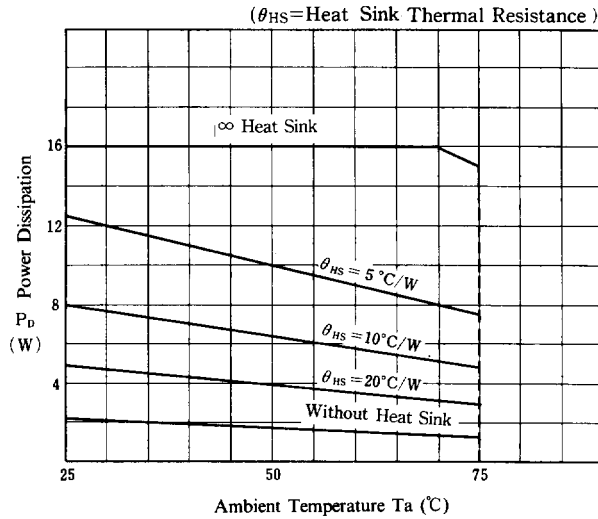
■ ELECTRICAL CHARACTERISTICS (C₁=0.33 μF, C₀=0.1 μF, T_j=25°C) Measurement is to be conducted in pulse testing.

| PARAMETER | SYMBOL | TEST CONDITIONS | F TYP. | | | DL TYP. | | | UNIT |
|---|----------------------------------|--|--------|------|------|---------|------|------|-------|
| | | | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | |
| NJM7815A | | | | | | | | | |
| Output Voltage | V _O | V _{IN} =23V, I _O =0.5A | 14.4 | 15.0 | 15.6 | 14.4 | 15.0 | 15.6 | V |
| Quiescent Current | I _Q | V _{IN} =23V, I _O =0mA | — | 4.4 | 6.0 | — | 4.4 | 6.0 | mA |
| Load Regulation | ΔV _O -I _O | V _{IN} =23V, I _O =0.005~1.5A | — | 35 | 150 | — | 35 | 300 | mV |
| Line Regulation | ΔV _O -V _{IN} | V _{IN} =17.5~30V, I _O =0.5A | — | 11 | 150 | — | 11 | 300 | mV |
| Ripple Rejection | RR | V _{IN} =23V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz | 60 | 70 | — | 60 | 70 | — | dB |
| Output Noise Voltage | V _{NO} | V _{IN} =23V, BW=10Hz~100kHz, I _O =0.5A | — | 90 | — | — | 90 | — | μV |
| Average Temperature Coefficient of Output Voltage | ΔV _O /ΔT | V _{IN} =23V, I _O 5mA | — | -1.5 | — | — | -1.5 | — | mV/°C |
| NJM7818A | | | | | | | | | |
| Output Voltage | V _O | V _{IN} =27V, I _O =0.5A | 17.3 | 18.0 | 18.7 | 17.3 | 18.0 | 18.7 | V |
| Quiescent Current | I _Q | V _{IN} =27V, I _O =0mA | — | 4.5 | 6.0 | — | 4.5 | 6.0 | mA |
| Load Regulation | ΔV _O -I _O | V _{IN} =27V, I _O =0.005~1.5A | — | 55 | 180 | — | 55 | 360 | mV |
| Line Regulation | ΔV _O -V _{IN} | V _{IN} =21~33V, I _O =0.5A | — | 15 | 180 | — | 15 | 360 | mV |
| Ripple Rejection | RR | V _{IN} =27V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz | 59 | 69 | — | 59 | 69 | — | dB |
| Output Noise Voltage | V _{NO} | V _{IN} =27V, BW=10Hz~100kHz, I _O =0.5A | — | 100 | — | — | 100 | — | μV |
| Average Temperature Coefficient of Output Voltage | ΔV _O /ΔT | V _{IN} =27V, I _O 5mA | — | -1.8 | — | — | -1.8 | — | mV/°C |
| NJM7820A | | | | | | | | | |
| Output Voltage | V _O | V _{IN} =29V, I _O =0.5A | 19.2 | 20.0 | 20.8 | 19.2 | 20.0 | 20.8 | V |
| Quiescent Current | I _Q | V _{IN} =29V, I _O =0mA | — | 4.5 | 6.0 | — | 4.5 | 6.0 | mA |
| Load Regulation | ΔV _O -I _O | V _{IN} =29V, I _O =0.005~1.5A | — | 61 | 200 | — | 61 | 400 | mV |
| Line Regulation | ΔV _O -V _{IN} | V _{IN} =23~35V, I _O =0.5A | — | 16 | 200 | — | 16 | 400 | mV |
| Ripple Rejection | RR | V _{IN} =29V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz | 58 | 68 | — | 58 | 68 | — | dB |
| Output Noise Voltage | V _{NO} | V _{IN} =29V, BW=10Hz~100kHz, I _O =0.5A | — | 120 | — | — | 120 | — | μV |
| Average Temperature Coefficient of Output Voltage | ΔV _O /ΔT | V _{IN} =29V, I _O 5mA | — | -2.0 | — | — | -2.0 | — | mV/°C |
| NJM7824A | | | | | | | | | |
| Output Voltage | V _O | V _{IN} =33V, I _O =0.5A | 23.0 | 24.0 | 25.0 | 23.0 | 24.0 | 25.0 | V |
| Quiescent Current | I _Q | V _{IN} =33V, I _O =0mA | — | 4.6 | 6.0 | — | 4.6 | 6.0 | mA |
| Load Regulation | ΔV _O -I _O | V _{IN} =33V, I _O =0.005~1.5A | — | 65 | 240 | — | 65 | 480 | mV |
| Line Regulation | ΔV _O -V _{IN} | V _{IN} =27~38V, I _O =0.5A | — | 18 | 240 | — | 18 | 480 | mV |
| Ripple Rejection | RR | V _{IN} =33V, I _O =0.5A, e _{in} =2V _{P-P} , f=120Hz | 56 | 66 | — | 56 | 66 | — | dB |
| Output Noise Voltage | V _{NO} | V _{IN} =33V, BW=10Hz~100kHz, I _O =0.5A | — | 120 | — | — | 120 | — | μV |
| Average Temperature Coefficient of Output Voltage | ΔV _O /ΔT | V _{IN} =33V, I _O 5mA | — | -2.4 | — | — | -2.4 | — | mV/°C |

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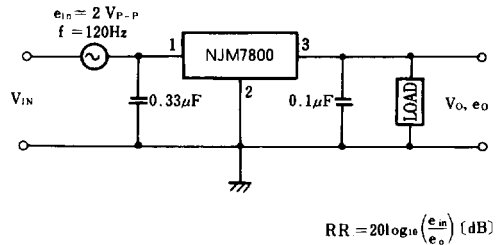
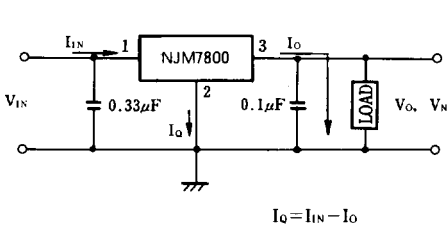


POWER DISSIPATION VS. AMBIENT TEMPERATURE



TEST CIRCUIT

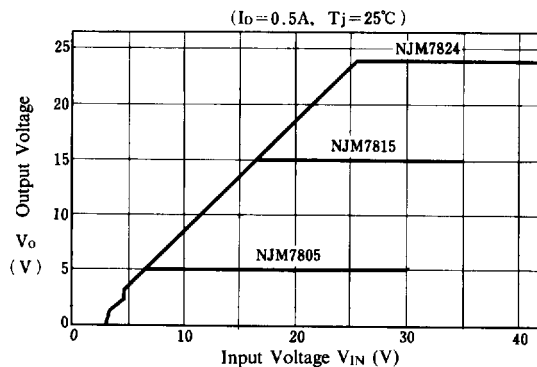
1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage
2. Ripple Rejection



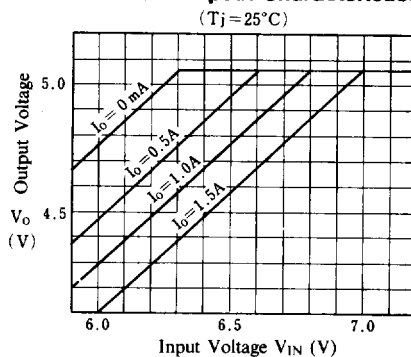


■ TYPICAL CHARACTERISTICS

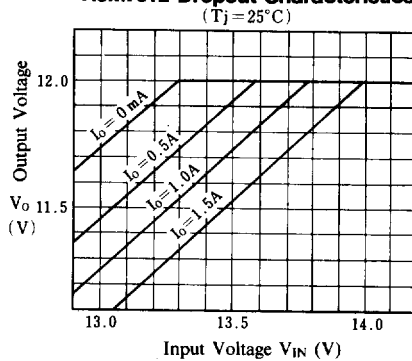
NJM7805/15/24 Output Characteristics



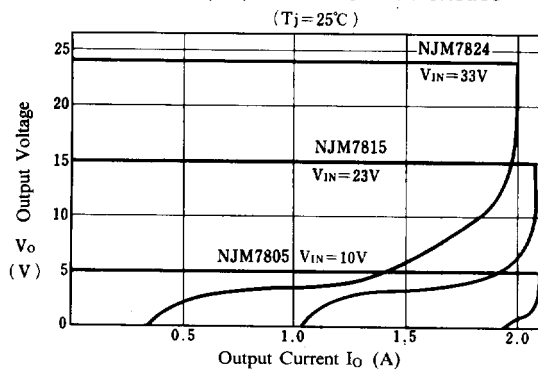
NJM7805 Dropout Characteristics



NJM7812 Dropout Characteristics



NJM7805/15/24 Load Characteristics

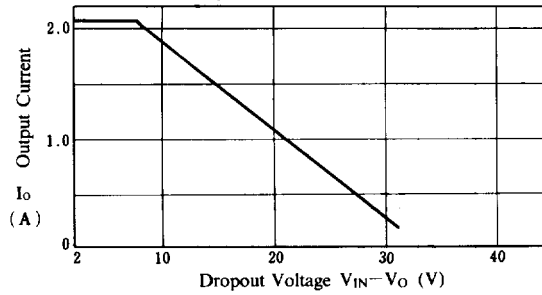




■ TYPICAL CHARACTERISTICS

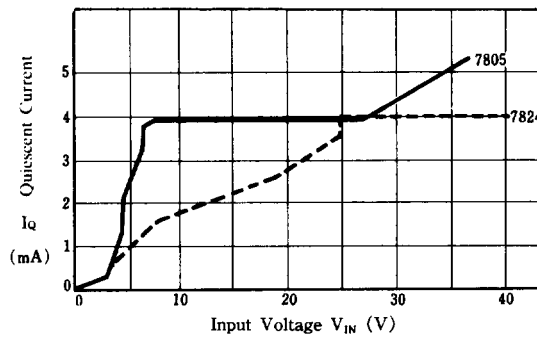
NJM7800 Series Short Circuit Output Current

($T_j = 25^\circ\text{C}$, ∞ Heat Sink)

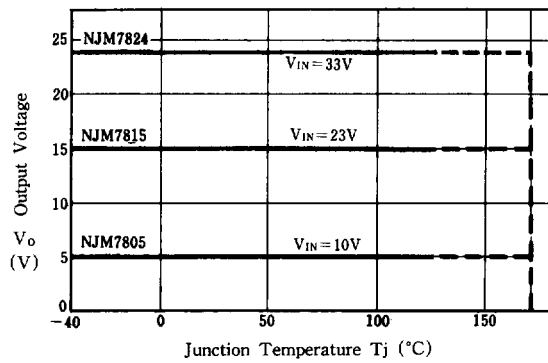


NJM7805/24 Quiescent Current vs. Input Voltage

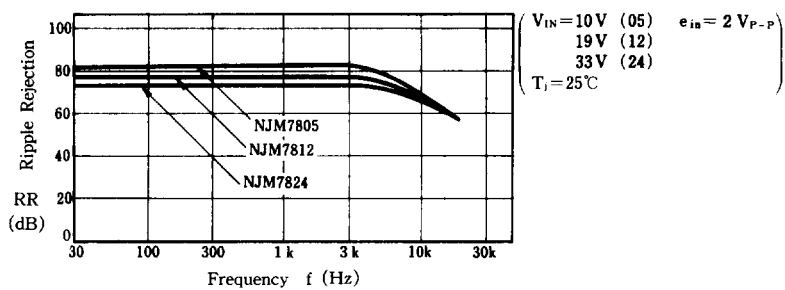
($T_j = 25^\circ\text{C}$)



NJM7805/15/24 Output Voltage vs. Junction Temperature



NJM7805/12/24 Ripple Rejection vs. Frequency

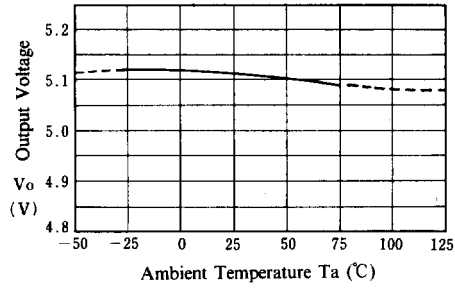


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■ TYPICAL CHARACTERISTICS

NJM7805 Output Voltage vs. Temperature



NJM7808 Output Voltage vs. Temperature

