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LOW DROP OUT VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

The **NJM2930** 3-terminal positive voltage regulator features an ability to source 150mA of output current (100mA: L-Type) with an input-output differential of 0.6V or less. Efficient use of low input voltages obtained, for example, from an automotive battery during cold crank conditions, allows 5V circuitry to be properly powered with supply voltages as low as 5.6V.

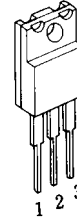
Familiar regulator features such as current limit and thermal overload protection are also provided.

■ FEATURES

- Operating Voltage
- Input-Output differential less 0.6V
- Output Current in Excess of 150mA
- 40V Load Dump Protection
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Package Outline TO-220F, TO-92
- Bipolar Technology

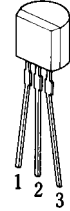
■ PACKAGE OUTLINE

(TO-220F)



NJM2930F

(TO-92)

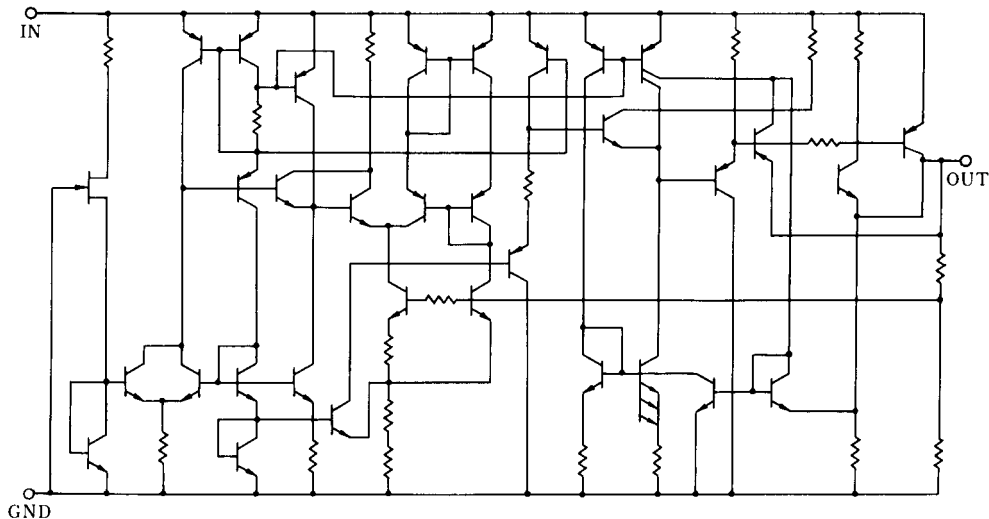


NJM2930L

1. Input
2. GND
3. Output

1. Output
2. GND
3. Input

■ EQUIVALENT CIRCUIT



NJM2930

■ ABSOLUTE MAXIMUM RATINGS

(T_a = 25°C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-------------------------------|---------------------------|-------------------------------------|----------|
| Operating Input Voltage Range | V _{IN} | 26 | V |
| Input Overvoltage Protection | V _{PR} | 40 | V |
| Input Reverse Voltage | V _{INR1} (100ms) | -12 | V |
| Input Reverse Voltage | V _{INR2} (DC) | -6 | V |
| Maximum Output Current | I _{OM} | (TO-92) 100 (TO-220F) 150 | mA mA |
| Power Dissipation | P _D | (TO-92) 500 (TO-220F) 7.5 (Note) | mW W |
| Operating Temperature Range | T _{opr} | -30 to 75 | °C |
| Storage Temperature Range | T _{stg} | -40 to 125 | °C |

(note) Case Temperature : T_{case} ≤ 75°C, Thermal Resistance : θ_{jc} = 5°C/W TYP.

■ ELECTRICAL CHARACTERISTICS

(All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques.)

NJM2930F05 (V_{IN} = 14V, C₂ = 10μF, T_j = 25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|----------------------------------|----------------------------------------------------------|------|------|------|------|
| Output Voltage | V _O | 6V ≤ V _{IN} ≤ 26V, 5mA ≤ I _O ≤ 100mA | 4.5 | 5 | 5.5 | V |
| Line Regulation | ΔV _O - V _I | 9V ≤ V _{IN} ≤ 16V, I _O = 5mA | - | 7 | 25 | mV |
| | ΔV _O - V _I | 6V ≤ V _{IN} ≤ 26V, I _O = 5mA | - | 30 | 80 | mV |
| Load Regulation | ΔV _O - I _O | 5mA ≤ I _O ≤ 150mA | - | 14 | 50 | mV |
| Quiescent Current | I _{Q1} | I _O = 10mA | - | 4 | 7 | mA |
| | I _{Q2} | I _O = 150mA | - | 30 | 40 | mA |
| Dropout Voltage | ΔV _I - o | I _O = 150mA | - | 0.3 | 0.6 | V |
| Output Noise Voltage | V _{NO} | 10Hz to 100kHz, I _O = 150mA | - | 100 | - | μV |
| Ripple Rejection | RR | f = 120Hz, I _O = 150mA | - | 60 | - | dB |

NJM2930L 05 (V_{IN} = 14V, C₂ = 10μF, T_j = 25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|----------------------------------|--------------------------------------------------------------|------|------|------|------|
| Output Voltage | V _O | 6V ≤ V _{IN} ≤ 26V, 5mA ≤ I _O ≤ 100mA | 4.5 | 5 | 5.5 | V |
| Line Regulation | ΔV _O - V _I | 9V ≤ V _{IN} ≤ 16V, I _O = 5mA | - | 7 | 25 | mV |
| | ΔV _O - V _I | 6V ≤ V _{IN} ≤ 26V, I _O = 5mA | - | 30 | 80 | mV |
| Load Regulation | ΔV _O - I _O | 5mA ≤ I _O ≤ 100mA | - | 14 | 50 | mV |
| Quiescent Current | I _{Q1} | I _O = 10mA | - | 4 | 7 | mA |
| | I _{Q2} | I _O = 100mA | - | 25 | 40 | mA |
| Dropout Voltage | ΔV _I - o | I _O = 100mA | - | 0.25 | 0.6 | V |
| Output Noise Voltage | V _{NO} | 10Hz to 100kHz, I _O = 40mA, V _{IN} = 10V | - | 100 | - | μV |
| Ripple Rejection | RR | f = 120Hz, I _O = 40mA, V _{IN} | - | 60 | - | dB |

NJM2930F08 ($V_{IN} = 14V, C_2 = 10\mu F, T_j = 25^\circ C$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|--------------------|------------------------------------------------------|------|------|------|---------|
| Output Voltage | V_O | $9.4V \leq V_{IN} \leq 26V, 5mA \leq I_O \leq 150mA$ | 7.2 | 8 | 8.8 | V |
| Line Regulation | $\Delta V_O - V_I$ | $9.4V \leq V_{IN} \leq 16V, I_O = 5mA$ | - | 12 | 50 | mV |
| | $\Delta V_O - V_I$ | $9.4V \leq V_{IN} \leq 26V, I_O = 5mA$ | - | 50 | 100 | mV |
| Load Regulation | $\Delta V_O - I_O$ | $5mA \leq I_O \leq 150mA$ | - | 25 | 50 | mV |
| Quiescent Current | I_{Q1} | $I_O = 10mA$ | - | 4 | 7 | mA |
| | I_{Q2} | $I_O = 150mA$ | - | 30 | 40 | mA |
| Dropout Voltage | $\Delta V_I - o$ | $I_O = 150mA$ | - | 0.3 | 0.6 | V |
| Output Noise Voltage | V_{NO} | 10Hz to 100kHz, $I_O = 150mA$ | - | 140 | - | μV |
| Ripple Rejection | RR | $f = 120Hz, I_O = 150mA$ | - | 57 | - | dB |

NJM2930L 08 ($V_{IN} = 14V, C_2 = 10\mu F, T_j = 25^\circ C$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|--------------------|------------------------------------------------------|------|------|------|---------|
| Output Voltage | V_O | $9.4V \leq V_{IN} \leq 26V, 5mA \leq I_O \leq 100mA$ | 7.2 | 8 | 8.8 | V |
| Line Regulation | $\Delta V_O - V_I$ | $9.4V \leq V_{IN} \leq 16V, I_O = 5mA$ | - | 12 | 50 | mV |
| | $\Delta V_O - V_I$ | $9.4V \leq V_{IN} \leq 26V, I_O = 5mA$ | - | 50 | 100 | mV |
| Load Regulation | $\Delta V_O - I_O$ | $5mA \leq I_O \leq 150mA$ | - | 25 | 50 | mV |
| Quiescent Current | I_{Q1} | $I_O = 10mA$ | - | 4 | 7 | mA |
| | I_{Q2} | $I_O = 100mA$ | - | 25 | 40 | mA |
| Dropout Voltage | $\Delta V_I - o$ | $I_O = 100mA$ | - | 0.25 | 0.6 | V |
| Output Noise Voltage | V_{NO} | 10Hz to 100kHz, $I_O = 40mA$ | - | 140 | - | μV |
| Ripple Rejection | RR | $f = 120Hz, I_O = 40mA$ | - | 57 | - | dB |

NJM2930F85 ($V_{IN} = 14V, C_2 = 10\mu F, T_j = 25^\circ C$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|--------------------|-------------------------------------------------------|------|------|------|---------|
| Output Voltage | V_O | $9.95V \leq V_{IN} \leq 26V, 5mA \leq I_O \leq 150mA$ | 7.65 | 8.5 | 9.35 | V |
| Line Regulation | $\Delta V_O - V_I$ | $9.95V \leq V_{IN} \leq 16V, I_O = 5mA$ | - | 12 | 50 | mV |
| | $\Delta V_O - V_I$ | $9.95V \leq V_{IN} \leq 26V, I_O = 5mA$ | - | 50 | 100 | mV |
| Load Regulation | $\Delta V_O - I_O$ | $5mA \leq I_O \leq 150mA$ | - | 25 | 50 | mV |
| Quiescent Current | I_{Q1} | $I_O = 10mA$ | - | 4 | 7 | mA |
| | I_{Q2} | $I_O = 150mA$ | - | 30 | 40 | mA |
| Dropout Voltage | $\Delta V_I - o$ | $I_O = 150mA$ | - | 0.3 | 0.6 | V |
| Output Noise Voltage | V_{NO} | 10Hz to 100kHz, $I_O = 150mA$ | - | 150 | - | μV |
| Ripple Rejection | RR | $f = 120Hz, I_O = 150mA$ | - | 56 | - | dB |

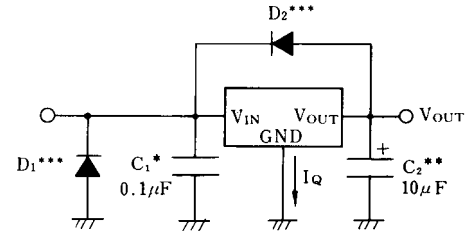
NJM2930L 85 ($V_{IN} = 14V, C_2 = 10\mu F, T_j = 25^\circ C$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|--------------------|-------------------------------------------------------|------|------|------|---------|
| Output Voltage | V_O | $9.95V \leq V_{IN} \leq 26V, 5mA \leq I_O \leq 100mA$ | 7.65 | 8.5 | 9.35 | V |
| Line Regulation | $\Delta V_O - V_I$ | $9.95V \leq V_{IN} \leq 16V, I_O = 5mA$ | - | 12 | 50 | mV |
| | $\Delta V_O - V_I$ | $9.4V \leq V_{IN} \leq 26V, I_O = 5mA$ | - | 50 | 100 | mV |
| Load Regulation | $\Delta V_O - I_O$ | $5mA \leq I_O \leq 100mA$ | - | 25 | 50 | mV |
| Quiescent Current | I_{Q1} | $I_O = 10mA$ | - | 4 | 7 | mA |
| | I_{Q2} | $I_O = 100mA$ | - | 25 | 40 | mA |
| Dropout Voltage | $\Delta V_I - o$ | $I_O = 100mA$ | - | 0.25 | 0.6 | V |
| Output Noise Voltage | V_{NO} | 10Hz to 100kHz, $I_O = 40mA$ | - | 150 | - | μV |
| Ripple Rejection | RR | $f = 120Hz, I_O = 40mA$ | - | 56 | - | dB |

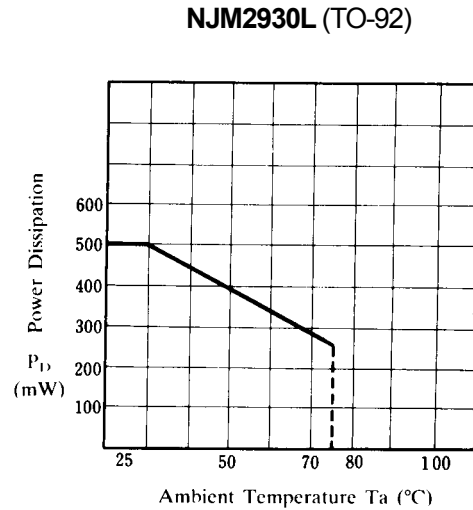
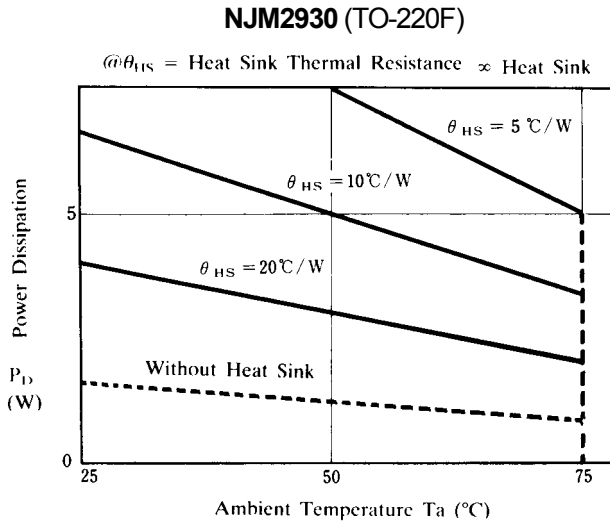
NJM2930

■ STANDARD APPLICATION EXAMPLES

- * This NJM2930 is required when the mounting position is separated from the power filter.
- ** Use an aluminum electrolytic capacitor or a tantalum capacitor as C_2 . The temperature guarantee range of capacitors should be down to -30°C . A capacity value of $10\mu\text{F}$ is a minimum requirement for improving the stability and transient response. Mount it at a position as close to the leads as possible.
- *** When application on automobile car operation, the minus pulse might be input on IC. In this case, however, the pulse might trigger to latch up. If it were that, this kind of latching up might be continued, the IC would burn up into defective in many cases. It is advisable to apply D1, D2 as described in the drawing, in order to prevent from making any troubles. It is important to make devices D1, D2 against V_{IN} to be able to stand for brake down voltage, current volume, and then less volume for Vf.



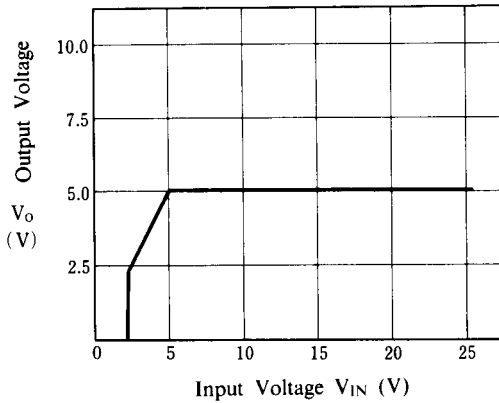
■ POWER DISSIPATION VS. AMBIENT TEMPERATURE



■ TYPICAL CHARACTERISTICS

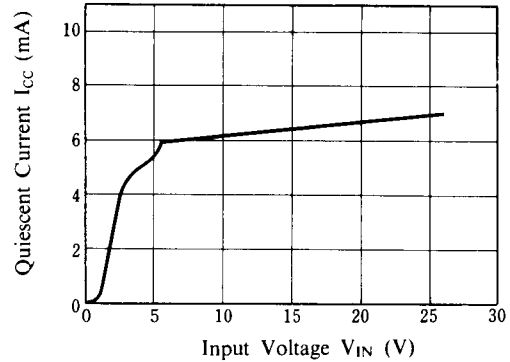
NJM2930F05/L05 Output Voltage

($T_j=25^\circ\text{C}$, $I_o=0\text{mA}$)



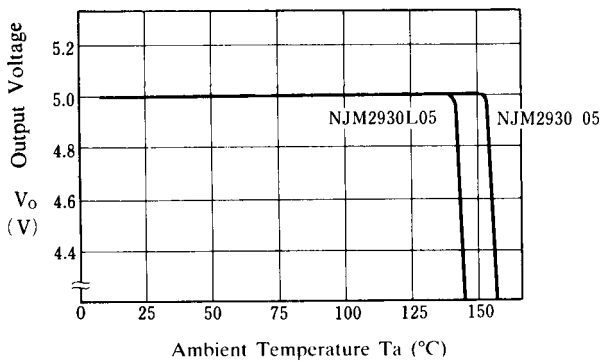
NJM2930F05/L05 $I_{cc}-V_{IN}$

($T_j=25^\circ\text{C}$, $I_o=0\text{mA}$)



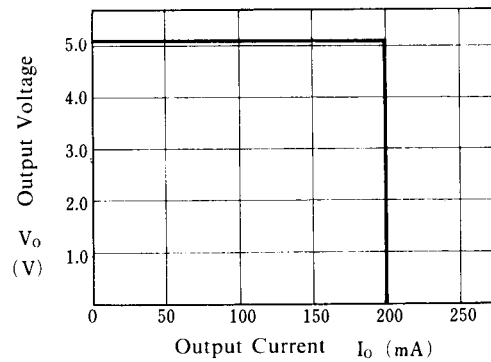
NJM2939F05/L05 Thermal Shutdown

($V_{IN}=14\text{V}$, $I_o=50\text{mA}$)



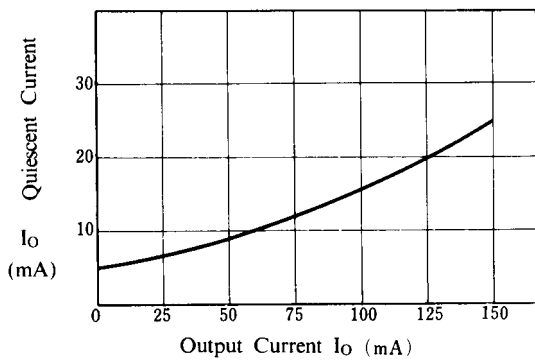
NJM2930F05/L05 Load Characteristics

($V_{IN}14\text{V}$, $T_j=25^\circ\text{C}$)



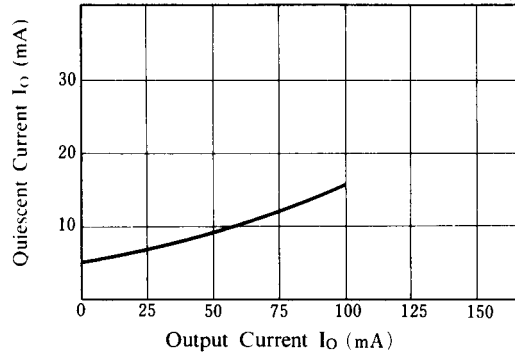
NJM2930L05 Output Current vs. Quiescent Current

($V_{IN}=14\text{V}$, $T_j=25^\circ\text{C}$)



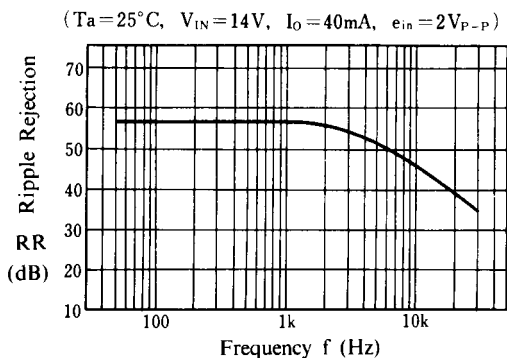
NJM2930F05 Output Current vs. Quiescent Current

($V_{IN}=14\text{V}$, $T_j=25^\circ\text{C}$)

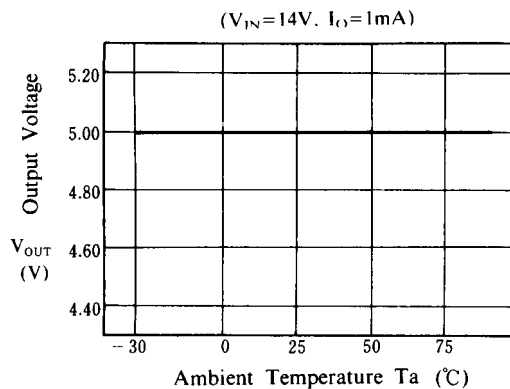


■ TYPICAL CHARACTERISTICS

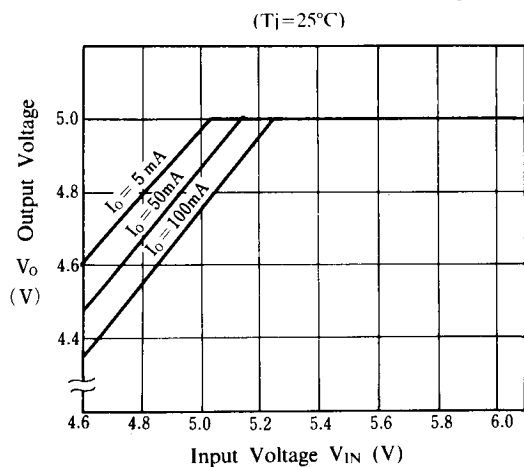
NJM2930F05/L05 Ripple Rejection vs. Frequency



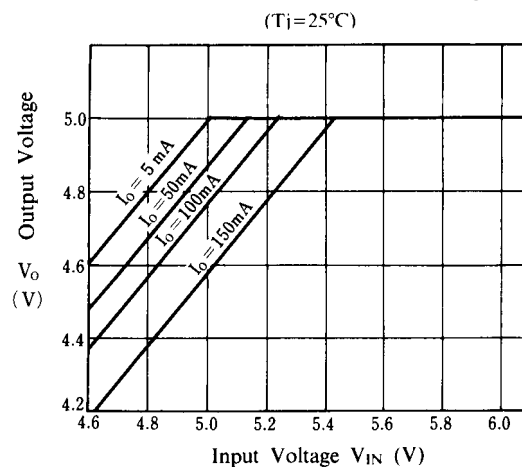
NJM2930F05/L05 Output Voltage



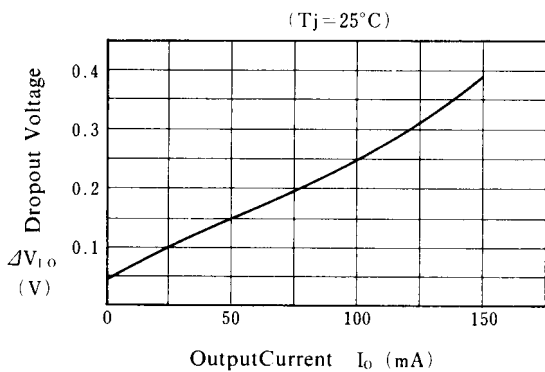
NJM2930L05 Dropout Voltage



NJM2930F05 Dropout Voltage



NJM2930F05 Dropout Voltage vs. Output Current



[CAUTION]

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