

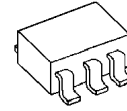
LOW DROPOUT VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

The NJM2870 is low dropout voltage regulator designed for cellular phone application.

Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

■ PACKAGE OUTLINE

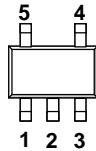


NJM2870F

■ FEATURES

- High Ripple Rejection $56\text{dB} \leq \text{RR} \text{ (DC} < f < 60\text{kHz)}$
66dB typ. (f=100Hz)
60dB typ. (f=1kHz)
- Output Noise Voltage $V_{no}=30\mu\text{V typ. (Cp}=0.01\mu\text{F)}$
- Output Current $I_o(\text{max.})=150\text{mA}$
- High Precision Output $V_o \pm 2\%$
- Low Dropout Voltage $\Delta V_{I-O}=0.12\text{V typ. (} I_o=60\text{mA, } V_o \geq 1.8\text{V)}$
- Input Voltage range +2~+14V ($V_o=1.5\text{V Version}$)
- ON/OFF Control (Active High)
- Output capacitor with 4.7uF ceramic capacitor
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline SOT-23-5

■ PIN CONFIGURATION

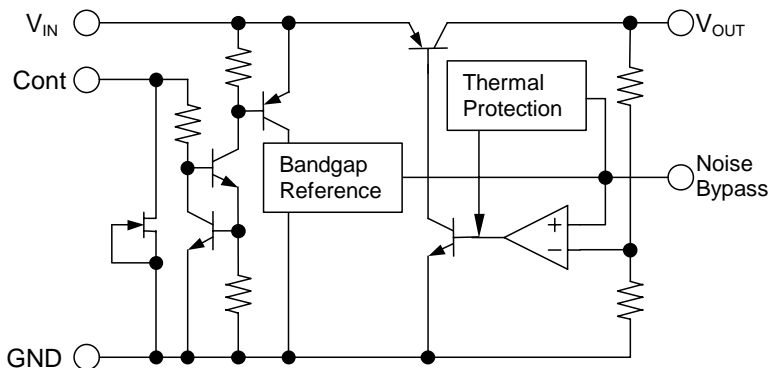


NJM2870F

PIN FUNCTION

1. CONTROL (Active High)
2. GND
3. NOISE BYPASS
4. V_{OUT}
5. V_{IN}

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS(Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|-----------------------|-------------------|------------|---------|
| Input Voltage | V _{IN} | +14 | V |
| Control Voltage | V _{CONT} | +14(*1) | V |
| Power Dissipation | P _D | SOT-23-5 | 350(*2) |
| | | | 200(*3) |
| Operating Temperature | Topr | -40 ~ +85 | °C |
| Storage Temperature | Tstg | -40 ~ +125 | °C |

(*1) When input voltage is less than +14V, the absolute maximum control voltage is equal to the input voltage.

(*2): Mounted on glass epoxy board based on EIA/JEDEC. (114.3x76.2x1.6mm: 2Layers)

(*3): Device itself.

■ ELECTRICAL CHARACTERISTICS (V_{IN}=V_o+1V, C_{IN}=0.1μF, C_o=4.7μF, C_p=0.01μF, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|-----------------------------------|--|------|------|------|-------|
| Output Voltage | V _o | I _o =30mA | -2% | - | +2% | V |
| Quiescent Current | I _Q | I _o =0mA, expect I _{cont} | - | 200 | 300 | μA |
| Quiescent Current at Control OFF | I _{Q(OFF)} | V _{CONT} =0V | - | - | 100 | nA |
| Output Current | I _o | V _o -0.3V | 150 | 200 | - | mA |
| Line Regulation | ΔV _o /ΔV _{IN} | V _{IN} =V _o +1V ~ V _o +6V, I _o =30mA | - | - | 0.10 | %/V |
| Load Regulation | ΔV _o /ΔI _o | I _o =0 ~ 100mA | - | - | 0.03 | %/mA |
| Dropout Voltage | ΔV _{I-O} | I _o =60mA | - | 0.12 | 0.2 | V |
| Ripple Rejection | RR | e _{in} =200mVrms, f=1kHz, I _o =10mA V _{IN} =V _o +2V, V _o =3V Version | - | 60 | - | dB |
| Average Temperature Coefficient of Output Voltage | ΔV _o /ΔTa | Ta=0~85°C, I _o =10mA, V _o =3V Version | - | 0.2 | - | mV/°C |
| Output Noise Voltage | V _{NO} | f=10Hz~80kHz, I _o =10mA, V _o =3V Version | - | 30 | - | μVrms |
| Control Voltage for ON-state | V _{CONT(ON)} | | 1.6 | - | - | V |
| Control Voltage for OFF-state | V _{CONT(OFF)} | | - | - | 0.6 | V |

The above specification is a common specification for all output voltages.

Therefore, it may be different from the individual specification for a specific output voltage.

■ ELECTRICAL CHARACTERISTICS

(V_o=1.5V Version, V_{IN}=2.4V, C_{IN}=0.1μF, C_o=4.7μF, C_p=0.01μF, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|-----------------------------------|--|------|------|------|-------|
| Output Voltage | V _o | I _o =30mA | -2% | - | +2% | V |
| Quiescent Current | I _Q | I _o =0mA, expect I _{cont} | - | 200 | 300 | μA |
| Quiescent Current at Control OFF | I _{Q(OFF)} | V _{CONT} =0V | - | - | 100 | nA |
| Output Current | I _o | V _o -0.3V | 150 | 200 | - | mA |
| Line Regulation | ΔV _o /ΔV _{IN} | V _{IN} =V _o +1V ~ V _o +6V, I _o =30mA | - | - | 0.10 | %/V |
| Load Regulation | ΔV _o /ΔI _o | I _o =0 ~ 100mA | - | - | 0.03 | %/mA |
| Ripple Rejection | RR | e _{in} =200mVrms, f=1kHz, I _o =10mA V _{IN} =V _o +2V | - | 64 | - | dB |
| Average Temperature Coefficient of Output Voltage | ΔV _o /ΔTa | Ta=0~85°C, I _o =10mA | - | 0.13 | - | mV/°C |
| Output Noise Voltage | V _{NO} | f=10Hz~80kHz, I _o =10mA, | - | 15 | - | μVrms |
| Control Voltage for ON-state | V _{CONT(ON)} | | 1.6 | - | - | V |
| Control Voltage for OFF-state | V _{CONT(OFF)} | | - | - | 0.6 | V |

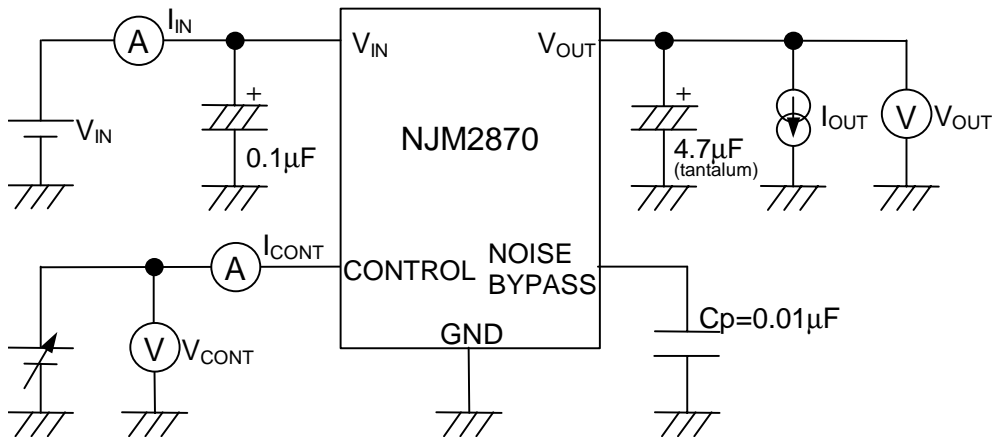
■ OUTPUT VOLTAGE RANK LIST

| Device Name | V _{OUT} |
|-------------|------------------|
| NJM2870F15 | 1.5V |
| NJM2870F18 | 1.8V |
| NJM2870F19 | 1.9V |
| NJM2870F02 | 2.0V |
| NJM2870F21 | 2.1V |
| NJM2870F23 | 2.3V |
| NJM2870F24 | 2.4V |
| NJM2870F25 | 2.5V |
| NJM2870F26 | 2.6V |

| Device Name | V _{OUT} |
|-------------|------------------|
| NJM2870F27 | 2.7V |
| NJM2870F28 | 2.8V |
| NJM2870F285 | 2.85V |
| NJM2870F29 | 2.9V |
| NJM2870F03 | 3.0V |
| NJM2870F31 | 3.1V |
| NJM2870F32 | 3.2V |
| NJM2870F33 | 3.3V |
| NJM2870F34 | 3.4V |

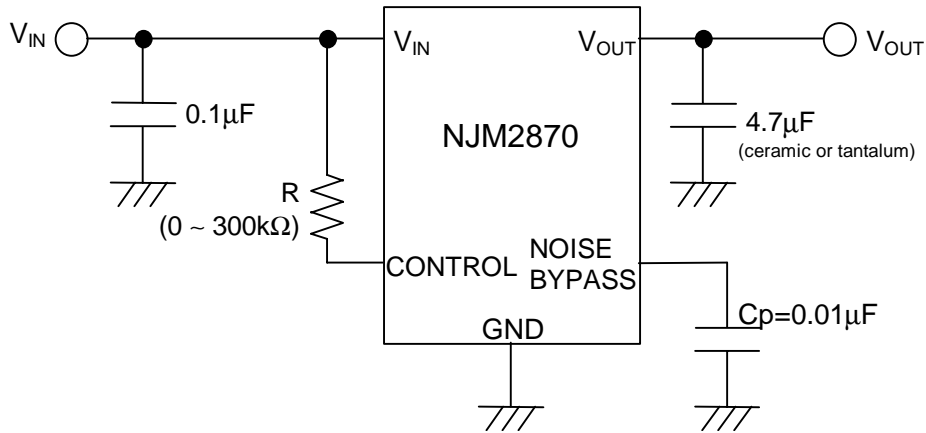
| Device Name | V _{OUT} |
|-------------|------------------|
| NJM2870F35 | 3.5V |
| NJM2870F36 | 3.6V |
| NJM2870F38 | 3.8V |
| NJM2870F04 | 4.0V |
| NJM2870F45 | 4.5V |
| NJM2870F46 | 4.6V |
| NJM2870F47 | 4.7V |
| NJM2870F48 | 4.8V |
| NJM2870F05 | 5.0V |

■ TEST CIRCUIT



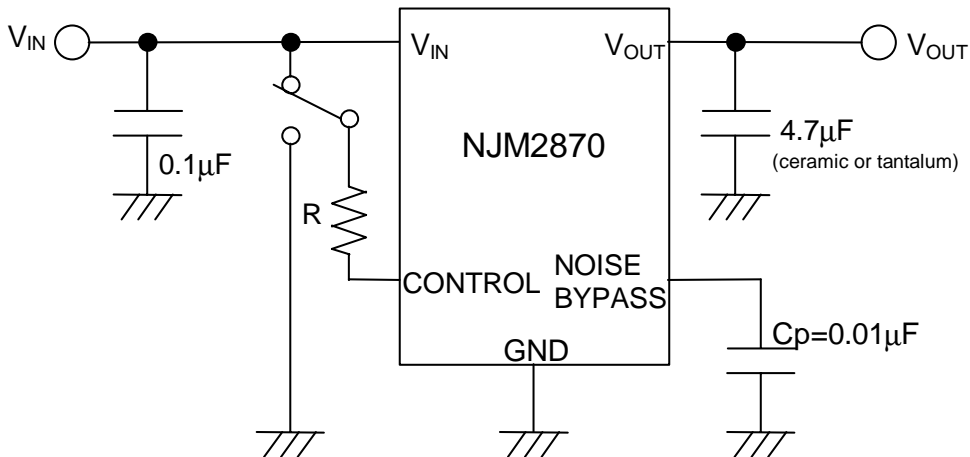
■ TYPICAL APPLICATION

① In case that ON/OFF Control is not required:



Connect control terminal to V_{IN} terminal

② In use of ON/OFF CONTROL:



State of control terminal:

- “H” → output is enabled.
- “L” or “open” → output is disabled.

*Noise bypass Capacitance C_p

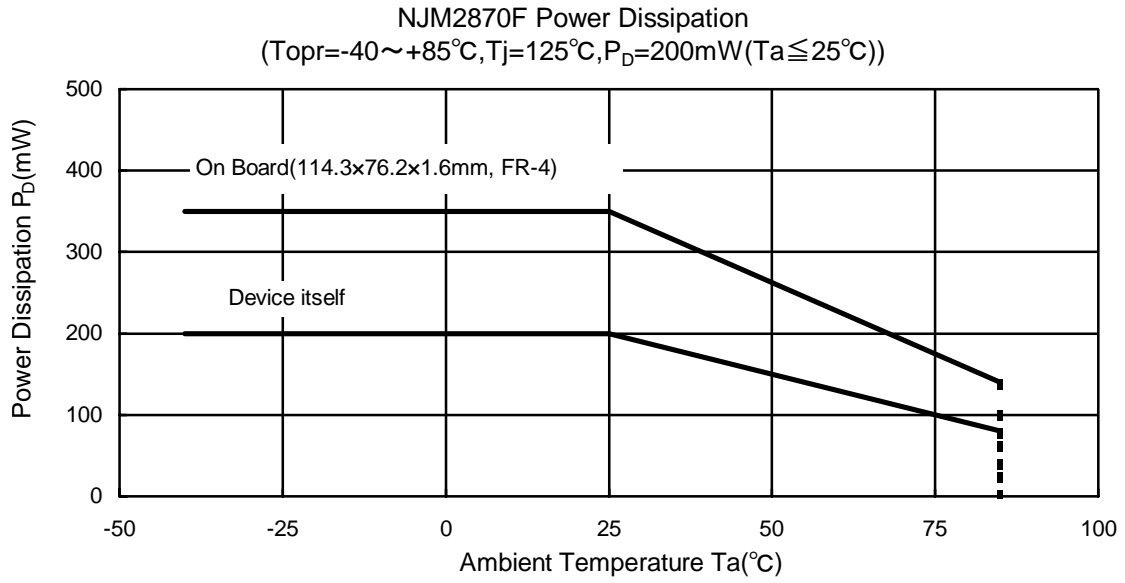
Noise bypass capacitance C_p reduces noise generated by band-gap reference circuit. Noise level and ripple rejection will be improved when larger C_p is used. Use of smaller C_p value may cause oscillation. Use the C_p value of $0.01\mu\text{F}$ greater to avoid the problem.

*In the case of using a resistance "R" between V_{IN} and control.

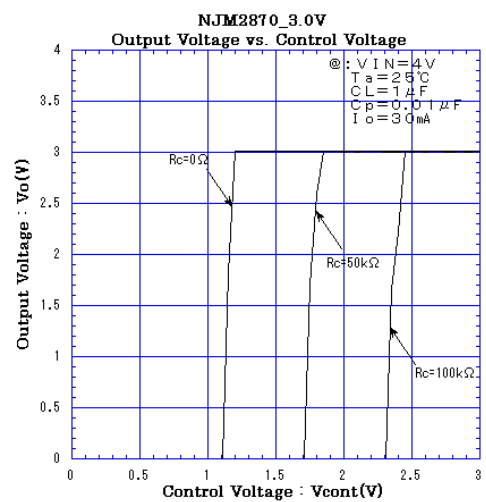
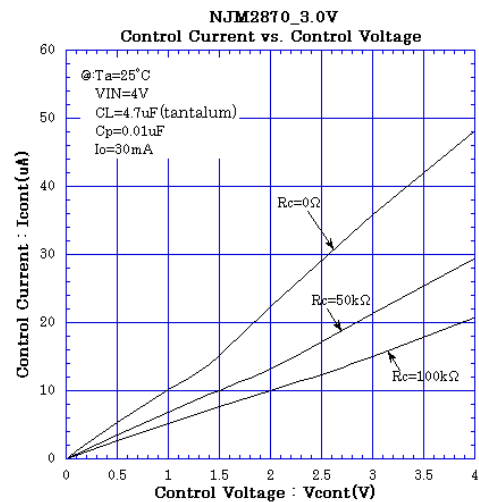
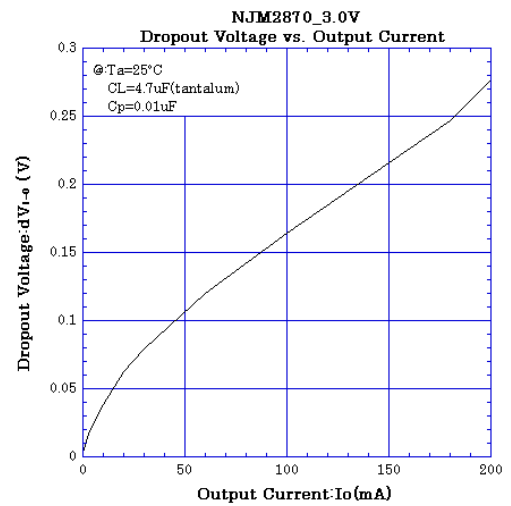
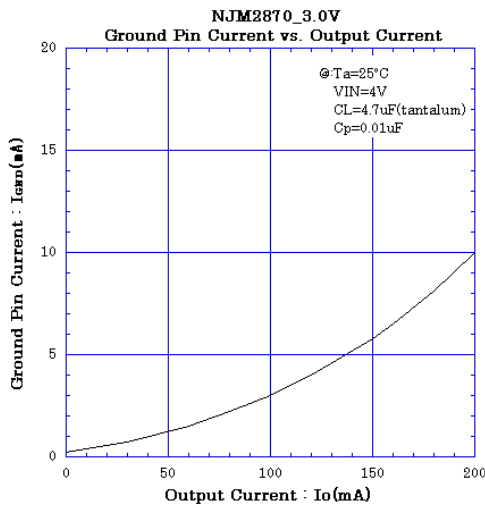
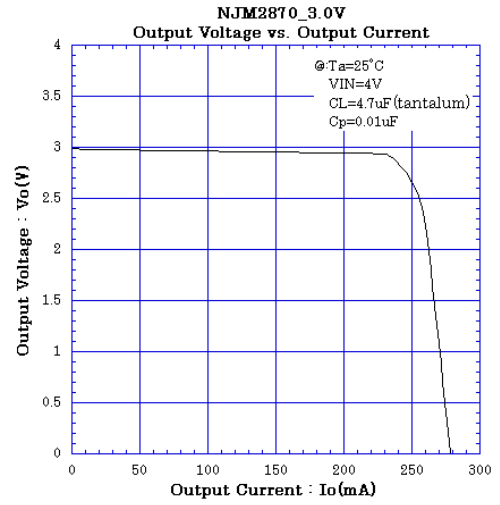
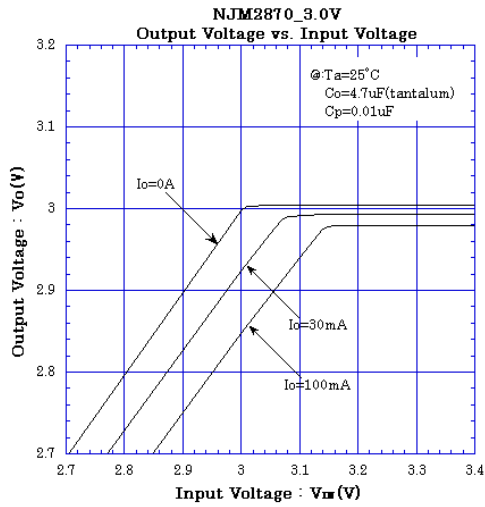
The current flow into the control terminal while the IC is ON state (I_{CONT}) can be reduced when a pull up resistance "R" is inserted between V_{IN} and the control terminal.

The minimum control voltage for ON state ($V_{CONT(ON)}$) is increased due to the voltage drop caused by I_{CONT} and the resistance "R". The I_{CONT} is temperature dependence as shown in the "Control Current vs. Temperature" characteristics. Therefore, the resistance "R" should be carefully selected to ensure the control voltage exceeds the $V_{CONT(ON)}$ over the required temperature range.

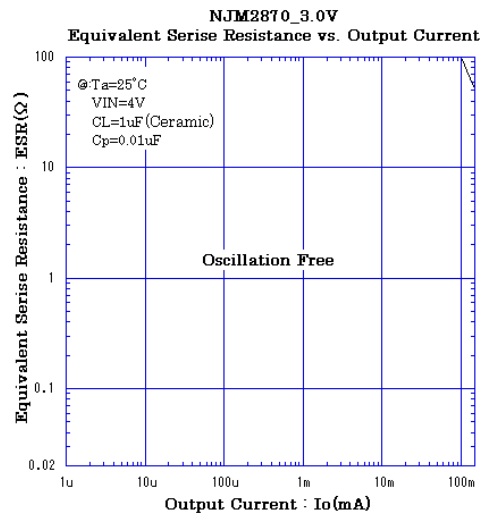
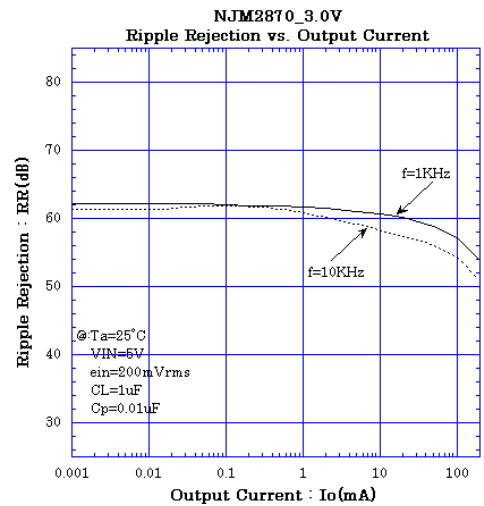
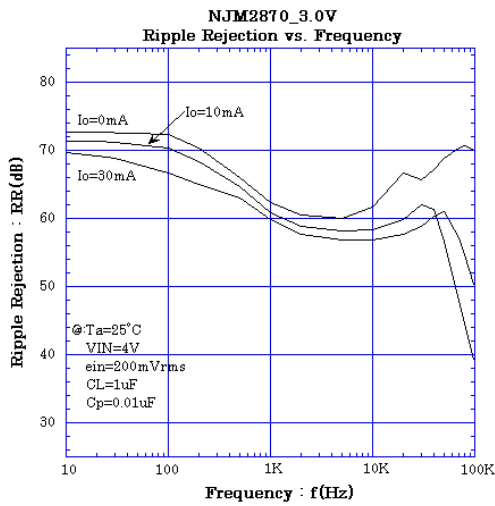
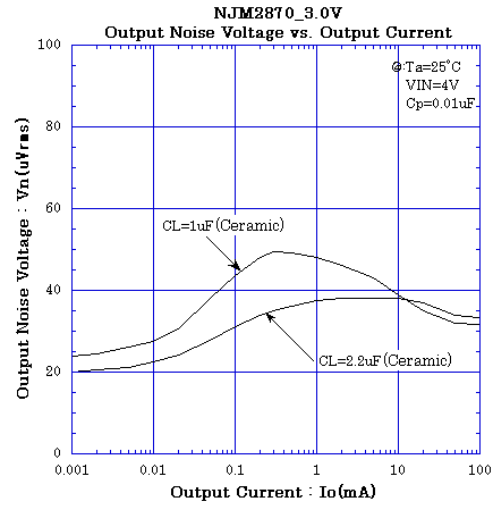
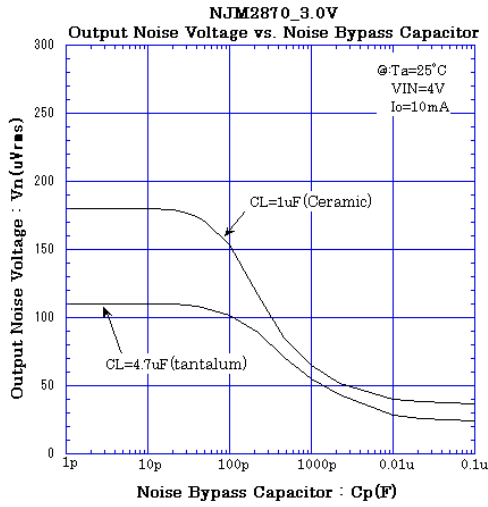
POWER DISSIPATION vs. AMBIENT TEMPERATURE



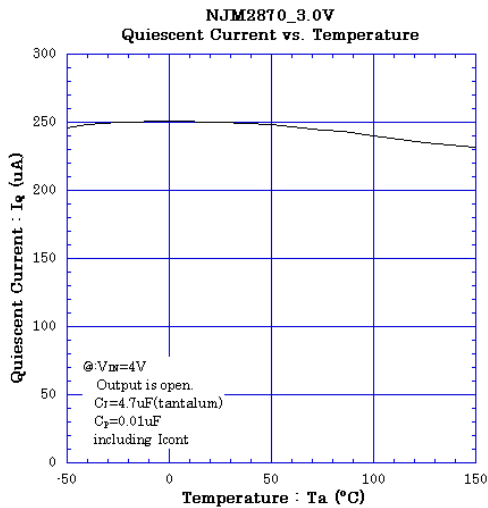
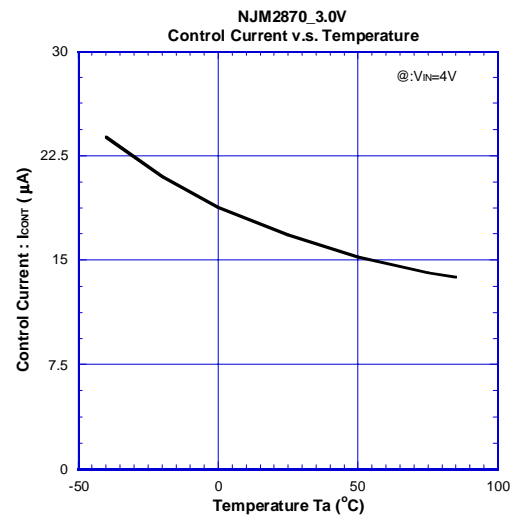
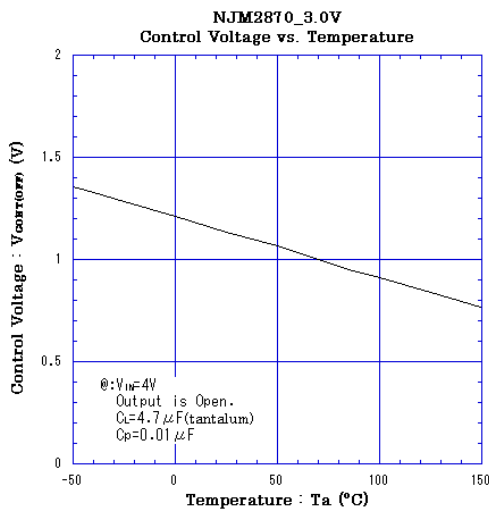
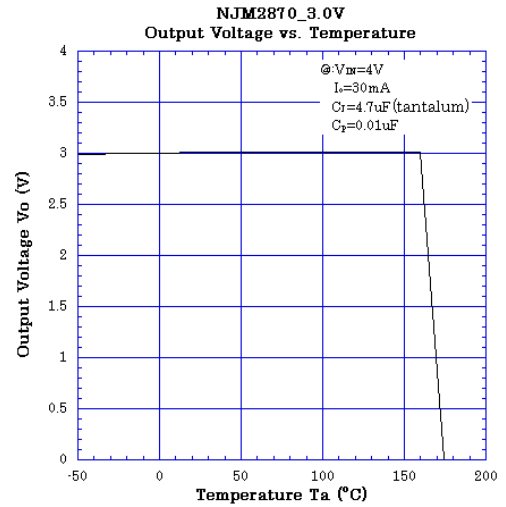
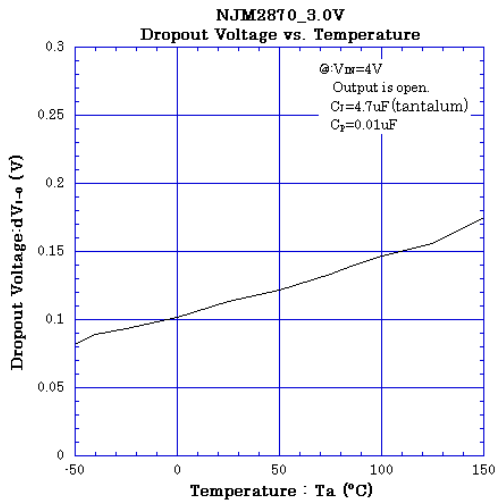
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS





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