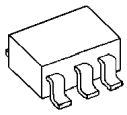
# LOW DROPOUT VOLTAGE REGULATOR

## ■ 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

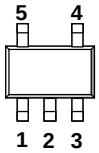


NJM2870F

## ■ FEATURES

- ●High Ripple Rejection 56dB ≤ RR (DC < f < 60kHz)
  66dB typ. (f=100Hz)
  60dB typ. (f=1kHz)
- ●Output Noise Voltage Vno=30μV typ.(Cp=0.01μF)
- ●Output Current Io(max.)=150mA
- ●High Precision Output Vo±2%
- ●Low Dropout Voltage $\Delta V_{I-O}$=0.12V typ. (Io=60mA, Vo≥1.8V)
- ●Input Voltage range +2~+14V (Vo=1.5V 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

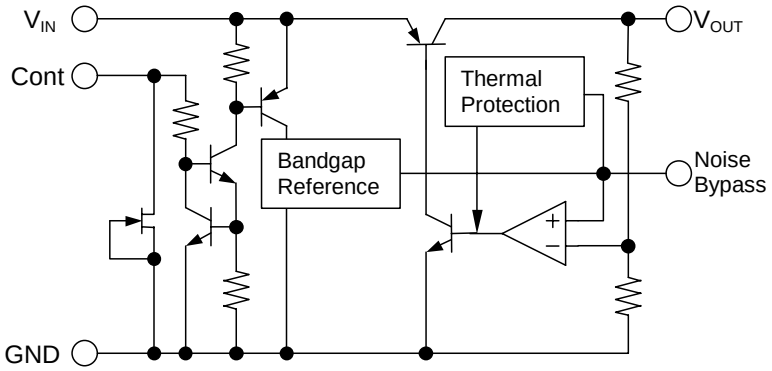
## ■ PIN CONFIGURATION




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) | mW |
| | | | 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 ($V_{IN}$=Vo+1V, $C_{IN}$=0.1µF, Co=4.7µF, Cp=0.01µF, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | Vo | Io=30mA | –2% | – | +2% | V |
| Quiescent Current | $I_Q$ | Io=0mA, expect Icont | – | 200 | 300 | µA |
| Quiescent Current at Control OFF | $I_{Q(OFF)}$ | $V_{CONT}$=0V | – | – | 100 | nA |
| Output Current | Io | Vo–0.3V | 150 | 200 | – | mA |
| Line Regulation | $\Delta Vo/\Delta V_{IN}$ | $V_{IN}$=Vo+1V ~ Vo+6V, Io=30mA | – | – | 0.10 | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | Io=0 ~ 100mA | – | – | 0.03 | %/mA |
| Dropout Voltage | $\Delta V_{I-O}$ | Io=60mA | – | 0.12 | 0.2 | V |
| Ripple Rejection | RR | ein=200mVrms,f=1kHz, Io=10mA $V_{IN}$=Vo+2V, Vo=3V Version | – | 60 | – | dB |
| Average Temperature Coefficient of Output Voltage | $\Delta Vo/\Delta Ta$ | Ta=0~85°C, Io=10mA, Vo=3V Version | – | 0.2 | – | mV/°C |
| Output Noise Voltage | $V_{NO}$ | f=10Hz~80kHz, Io=10mA, Vo=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

(Vo=1.5V Version, $V_{IN}$=2.4V, $C_{IN}$=0.1µF, Co=4.7µF, Cp=0.01µF, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | Vo | Io=30mA | –2% | – | +2% | V |
| Quiescent Current | $I_Q$ | Io=0mA, expect Icont | – | 200 | 300 | µA |
| Quiescent Current at Control OFF | $I_{Q(OFF)}$ | $V_{CONT}$=0V | – | – | 100 | nA |
| Output Current | Io | Vo–0.3V | 150 | 200 | – | mA |
| Line Regulation | $\Delta Vo/\Delta V_{IN}$ | $V_{IN}$=Vo+1V ~ Vo+6V, Io=30mA | – | – | 0.10 | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | Io=0 ~ 100mA | – | – | 0.03 | %/mA |
| Ripple Rejection | RR | ein=200mVrms,f=1kHz, Io=10mA $V_{IN}$=Vo+2V | – | 64 | – | dB |
| Average Temperature Coefficient of Output Voltage | $\Delta Vo/\Delta Ta$ | Ta=0~85°C, Io=10mA | – | 0.13 | – | mV/°C |
| Output Noise Voltage | $V_{NO}$ | f=10Hz~80kHz, Io=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 |

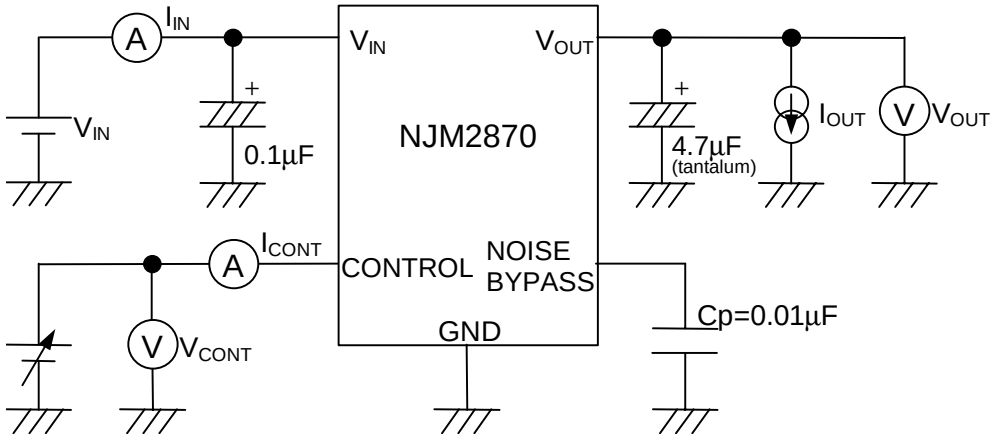
■ OUTPUT VOLTAGE RANK LIST

| 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 |

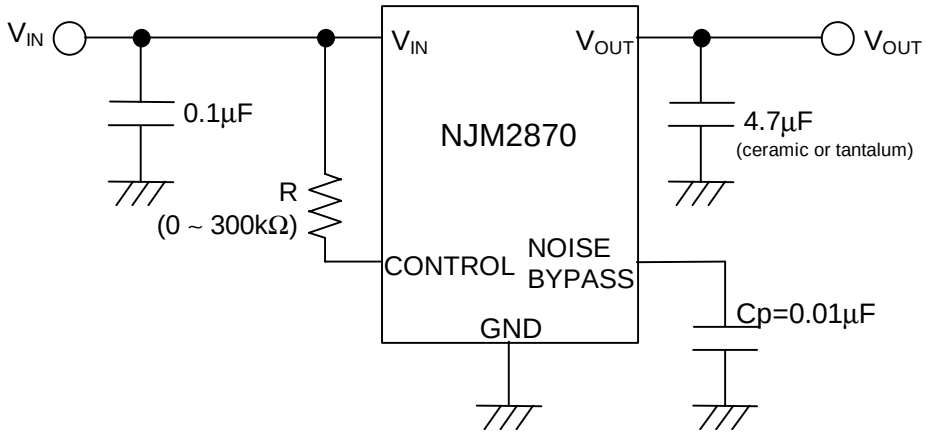
| Device Name | $V_{OUT}$ |
|---|---|
| NJM2870F35 | 3.5V |
| NJM2870F36 | 3.6V |
| NJM2870F38 | 3.8V |
| NJM2870F04 | 4.0V |
| NJM2870F45 | 4.5V |
| NJM2870F46 | 4.6V |
| NJM2870F47 | 4.7V |
| NJM2870F48 | 4.8V |
| NJM2870F05 | 5.0V |

■ TEST CIRCUIT



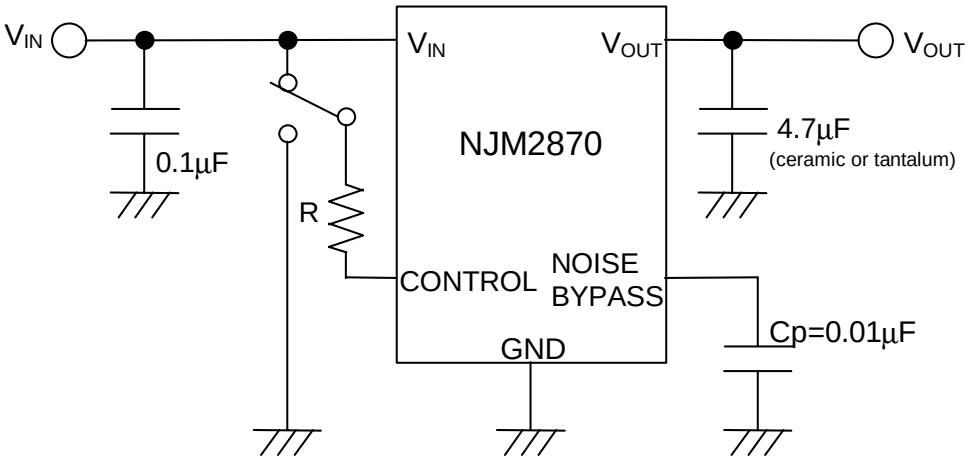
■ TYPICAL APPLICATION

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 Cp

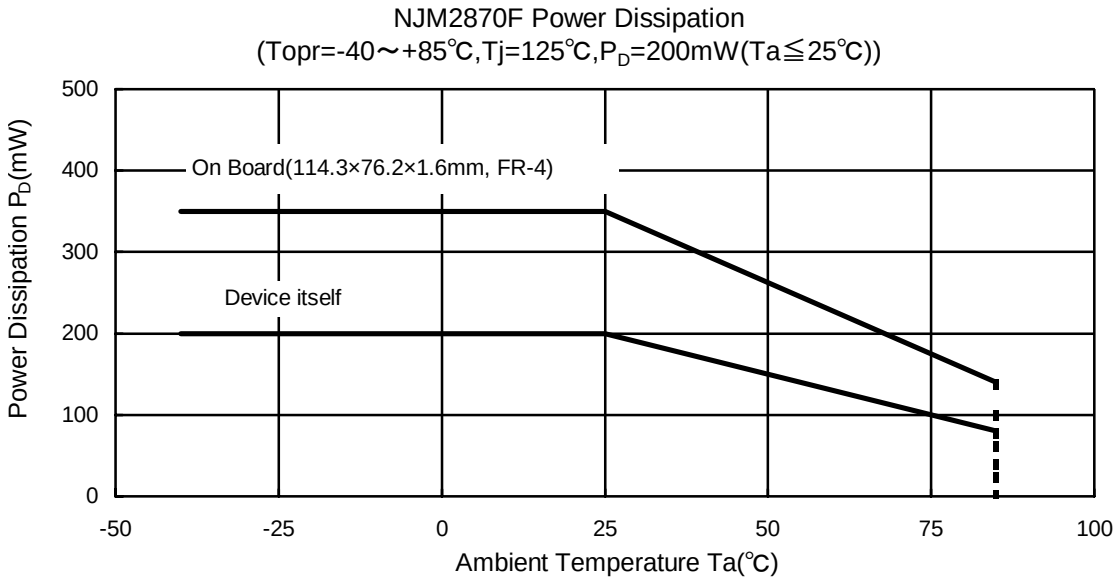
Noise bypass capacitance Cp reduces noise generated by band-gap reference circuit. Noise level and ripple rejection will be improved when larger Cp is used. Use of smaller Cp value may cause oscillation. Use the Cp value of 0.01µF greater to avoid the problem.

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

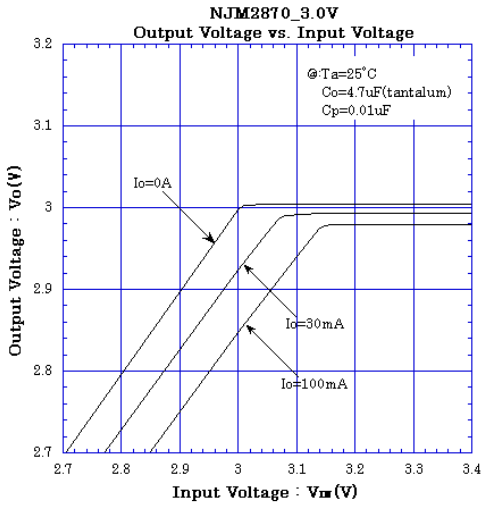
The current flow into the control terminal while the IC is ON state ($I_{CONT}$) can be reduced when a pull up resistance "R" is inserted between $V_{IN}$ and the control terminal.

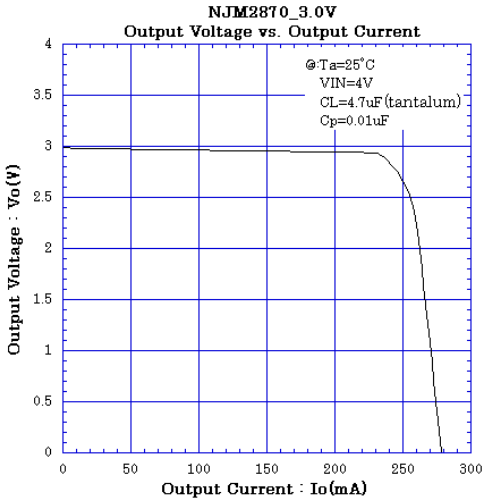
The minimum control voltage for ON state ($V_{CONT\ (ON)}$) is increased due to the voltage drop caused by $I_{CONT}$ and the resistance "R". The $I_{CONT}$ is temperature dependence as shown in the "Control Current vs. Temperature" characteristics. Therefore, the resistance "R" should be carefully selected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

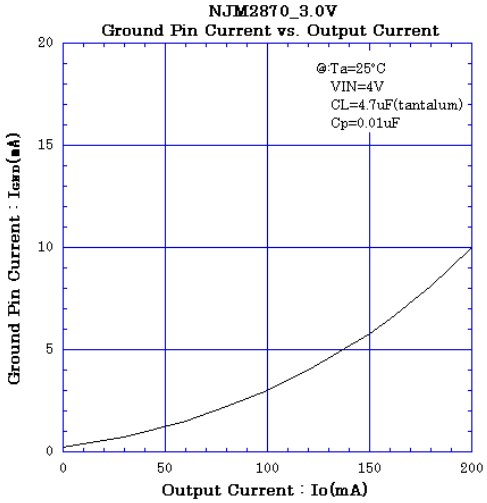
■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

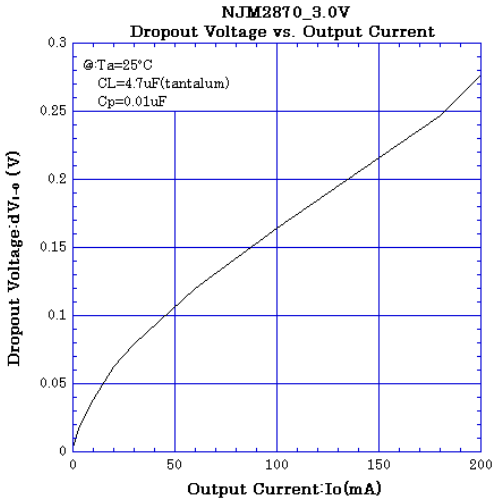


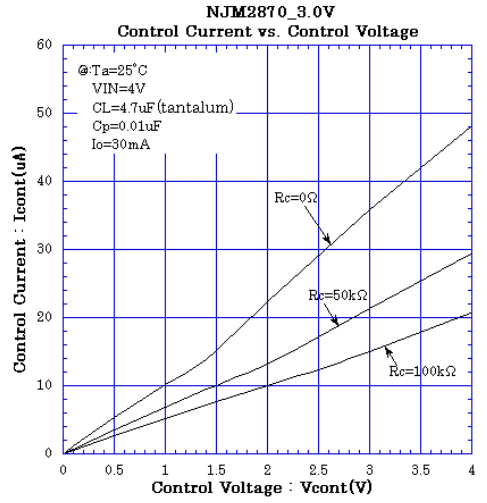
## ■ TYPICAL CHARACTERISTICS

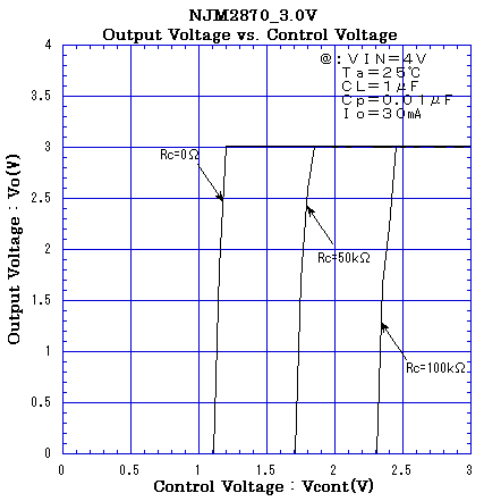


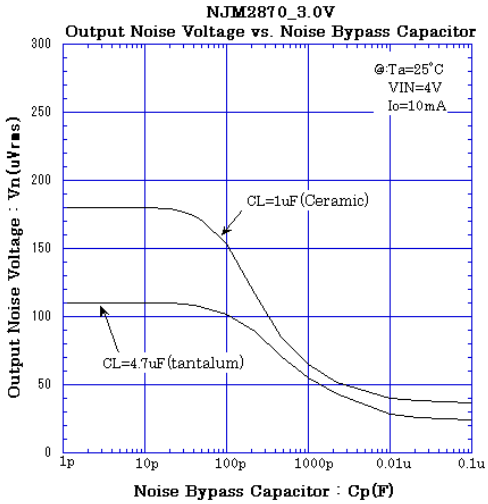



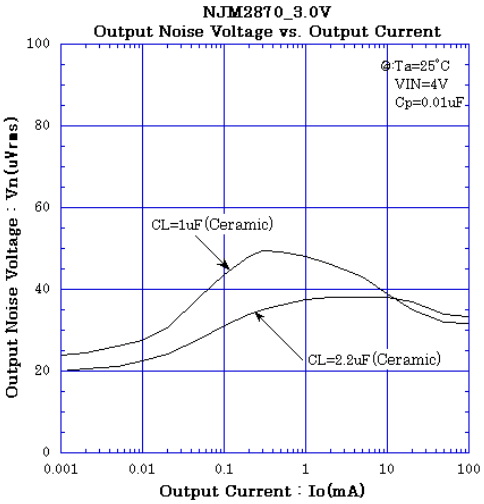



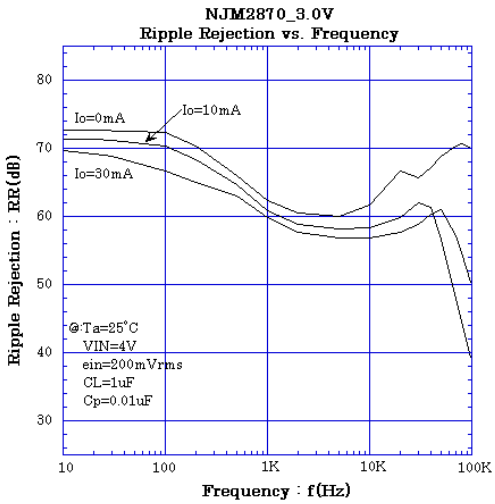



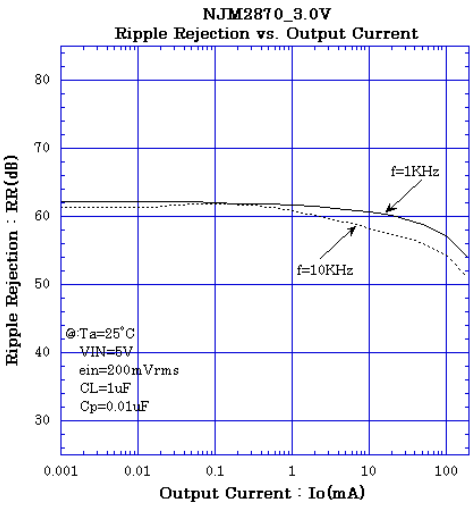



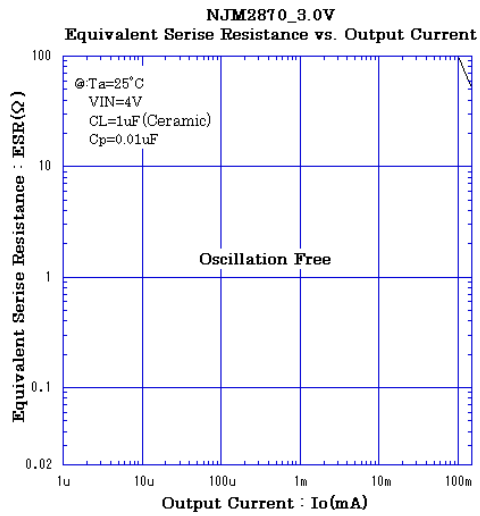
## ■ TYPICAL CHARACTERISTICS



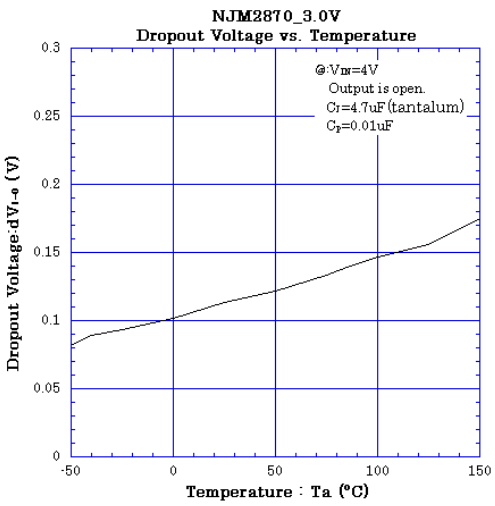



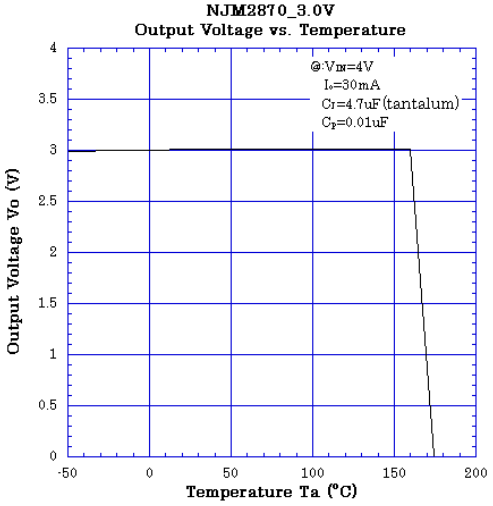



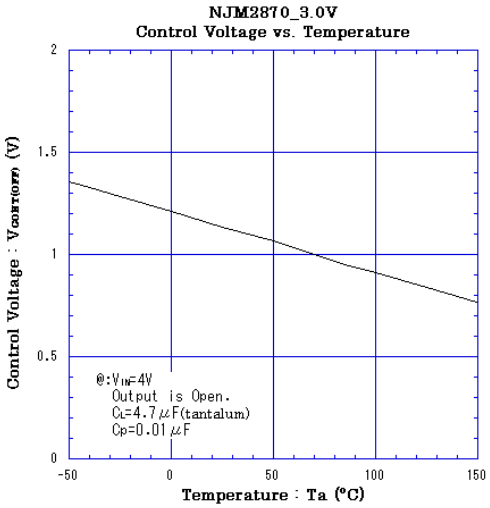



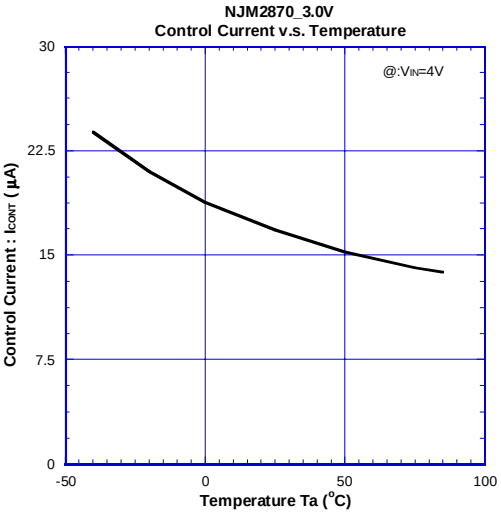



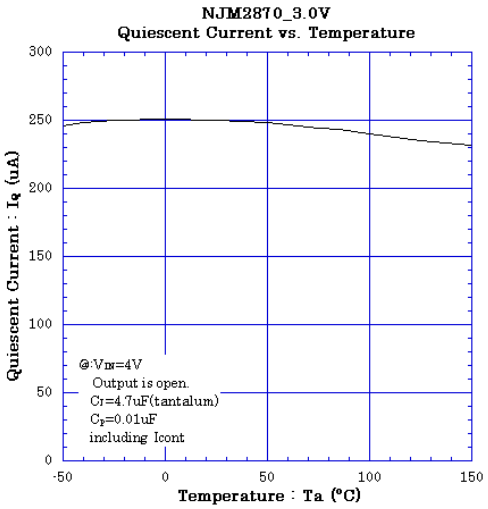
## ■ TYPICAL CHARACTERISTICS



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