

## 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

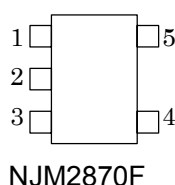


NJM2870F

### ■ FEATURES

- High Ripple Rejection       $56\text{dB} \leq \text{RR} (\text{DC} < f < 60\text{kHz})$   
66dB typ. ( $f=100\text{Hz}$ )  
60dB typ. ( $f=1\text{kHz}$ )
- Output Noise Voltage       $V_{\text{no}}=30\mu\text{V} (C_p=0.01\mu\text{F})$
- Output Current               $I_{\text{o(max)}}=150\text{mA}$
- High Precision Output       $V_{\text{o}}\pm 2\%$
- Low Dropout Voltage       $\Delta V_{\text{I-O}}=0.12\text{V typ.} (I_{\text{o}}=60\text{mA}, V_{\text{o}}\geq 1.8\text{V})$
- Input Voltage range       $+2\sim +14\text{V} (V_{\text{o}}=1.5\text{V Version})$
- 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              MTP5 (MTP5:  $2.8\times 2.9\times 1.1\text{mm}$ )

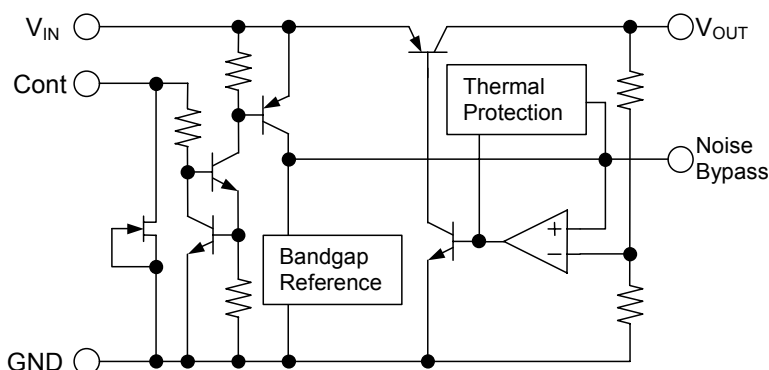
### ■ PIN CONFIGURATION



#### PIN FUNCTION

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

### ■ EQUIVALENT CIRCUIT



# **■ ABSOLUTE MAXIMUM RATINGS** (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	$V_{IN}$	+14	V
Control Voltage	$V_{CONT}$	+14(note 1)	V
Power Dissipation	$P_D$	200	mW
Operating Temperature	$T_{opr}$	-40 ~ +85	°C
Storage Temperature	$T_{stg}$	-40 ~ +125	°C

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

# **■ ELECTRICAL CHARACTERISTICS** ( $V_{IN}=V_o+1V$ , $C_{IN}=0.1\mu F$ , $C_o=4.7\mu F$ , $C_p=0.01\mu F$ , 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	$\mu A$
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	$\Delta V_o/\Delta V_{IN}$	$V_{IN}=V_o+1V \sim V_o+6V$ , $I_o=30mA$	-	-	0.10	%/V
Load Regulation	$\Delta V_o/\Delta I_o$	$I_o=0 \sim 100mA$	-	-	0.03	%/mA
Dropout Voltage	$\Delta V_{I-O}$	$I_o=60mA$	-	0.12	0.2	V
Ripple Rejection	RR	$e_{in}=200mV_{rms}$ , $f=1kHz$ , $I_o=10mA$ $V_{IN}=V_o+2V$ , $V_o=3V$ Version	-	60	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T_a$	Ta=0~85°C, $I_o=10mA$ , $V_o=3V$ Version	-	0.2	-	mV/°C
Output Noise Voltage	$V_{NO}$	$f=10Hz \sim 80kHz$ , $I_o=10mA$ , $V_o=3V$ Version	-	30	-	$\mu V_{rms}$
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		-	-	0.6	V

(note 2) 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,  $V_{IN}=2.4V$ ,  $C_{IN}=0.1\mu F$ ,  $C_o=4.7\mu F$ ,  $C_p=0.01\mu F$ , 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	$\mu A$
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	$\Delta V_o/\Delta V_{IN}$	$V_{IN}=V_o+1V \sim V_o+6V$ , $I_o=30mA$	-	-	0.10	%/V
Load Regulation	$\Delta V_o/\Delta I_o$	$I_o=0 \sim 100mA$	-	-	0.03	%/mA
Ripple Rejection	RR	$e_{in}=200mV_{rms}$ , $f=1kHz$ , $I_o=10mA$ $V_{IN}=V_o+2V$	-	64	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T_a$	Ta=0~85°C, $I_o=10mA$	-	0.13	-	mV/°C
Output Noise Voltage	$V_{NO}$	$f=10Hz \sim 80kHz$ , $I_o=10mA$ ,	-	15	-	$\mu V_{rms}$
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		-	-	0.6	V

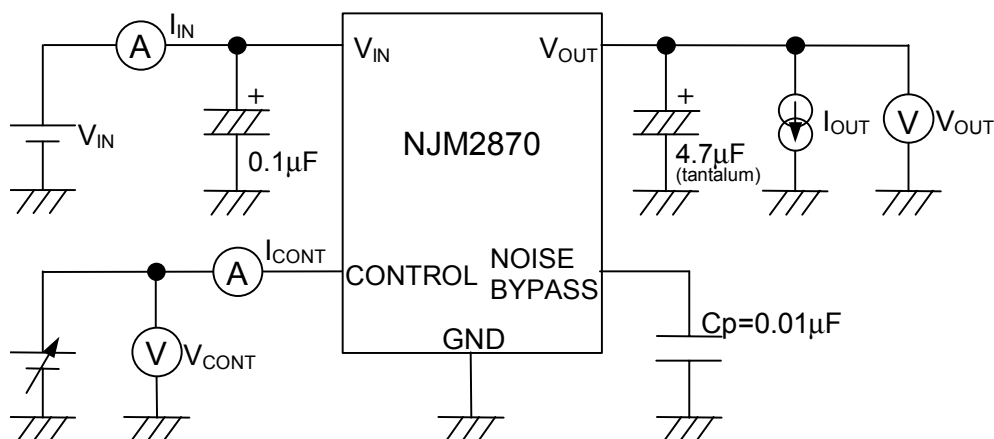
## ■ OUTPUT VOLTAGE RANK LIST

Device Name	V <sub>OUT</sub>
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 <sub>OUT</sub>
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

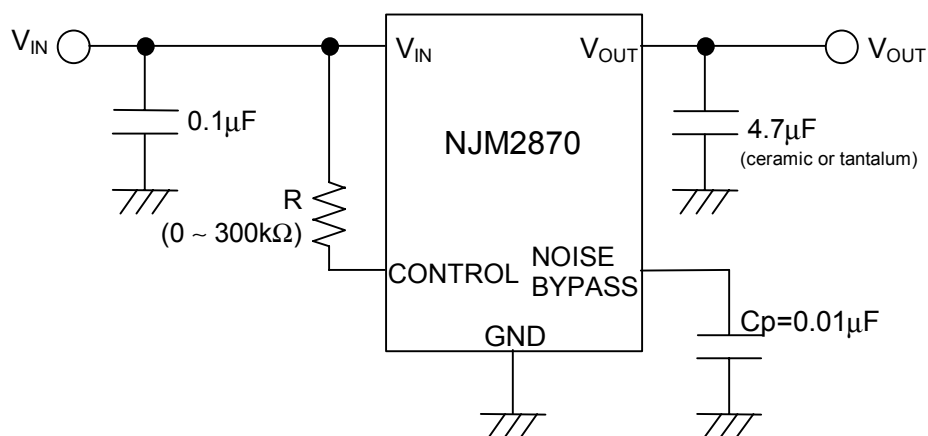
Device Name	V <sub>OUT</sub>
NJM2870F35	3.5V
NJM2870F36	3.6V
NJM2870F38	3.8V
NJM2870F04	4.0V
NJM2870F45	4.5V
NJM2870F46	4.6V
NJM2870F47	4.7V
NJM2870F48	4.8V
NJM2870F05	5.0V

## ■ TEST CIRCUIT



## ■ TYPICAL APPLICATION

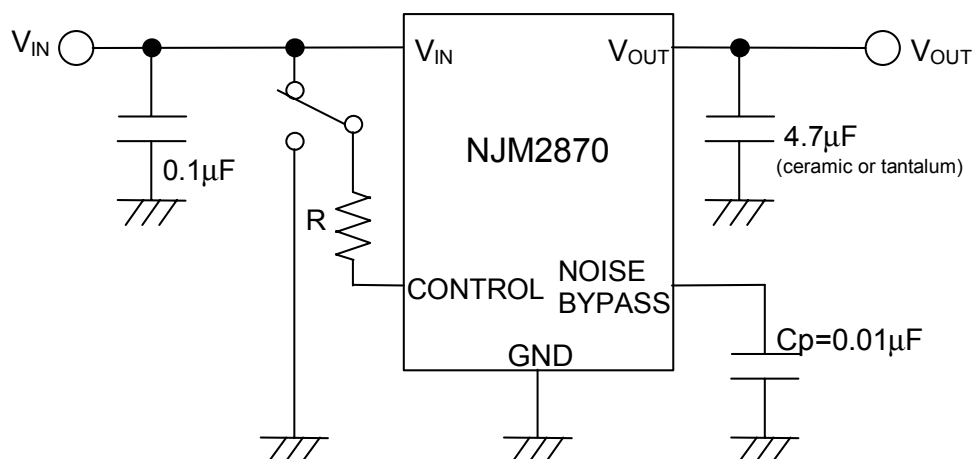
① In case that ON/OFF Control is not required:



Connect control terminal to  $V_{IN}$  terminal

The quiescent current can be reduced by using a resistance “R”. Instead, it increases the minimum operating voltage. For further information, please refer to Figure “Output Voltage vs. Control Voltage”.

② In use of ON/OFF CONTROL:



State of control terminal:

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

### \*Noise bypass Capacitance $C_p$

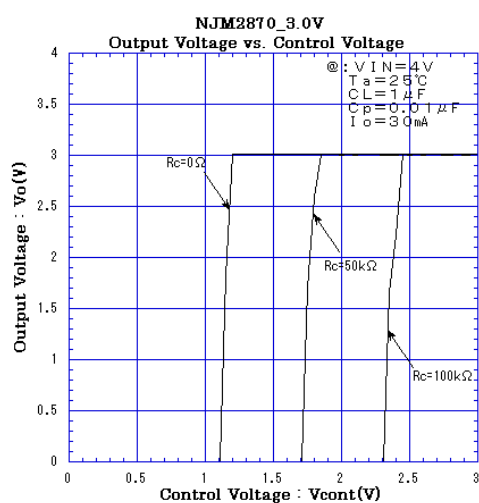
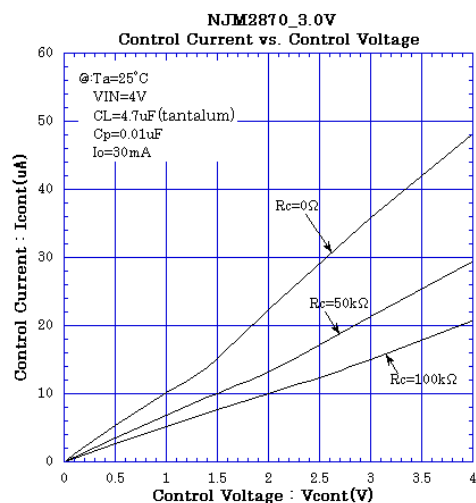
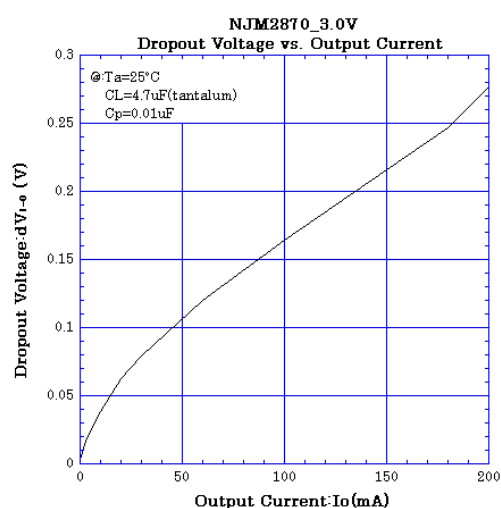
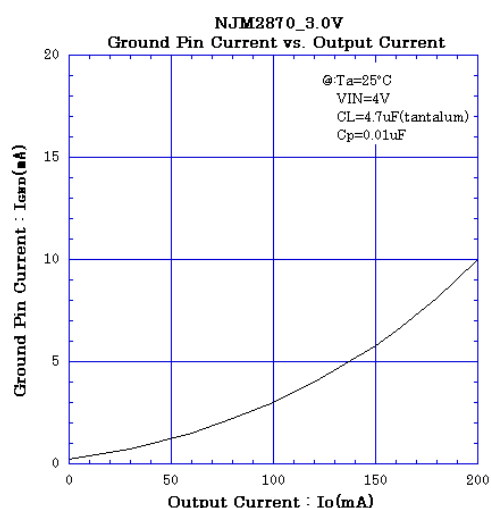
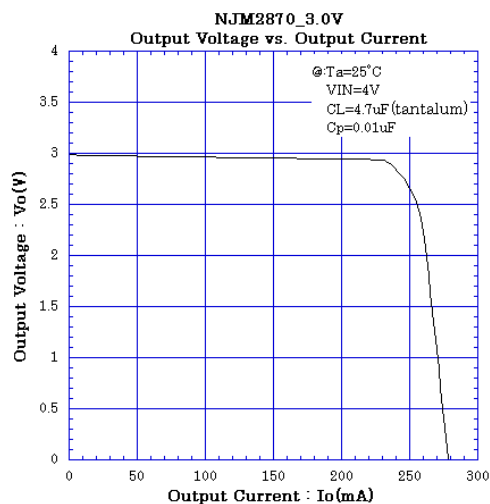
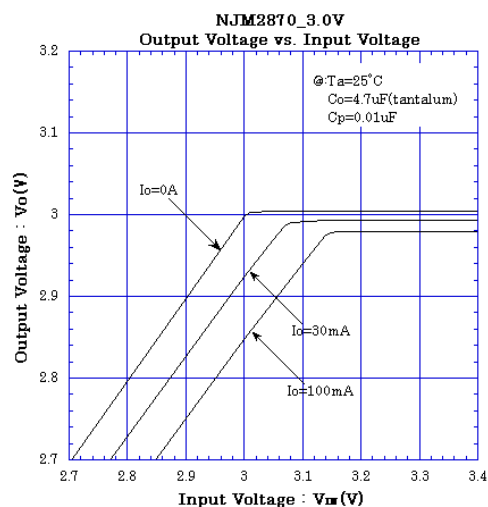
Noise bypass capacitance  $C_p$  reduces noise generated by band-gap reference circuit.

Noise level and ripple rejection will be improved when larger  $C_p$  is used.

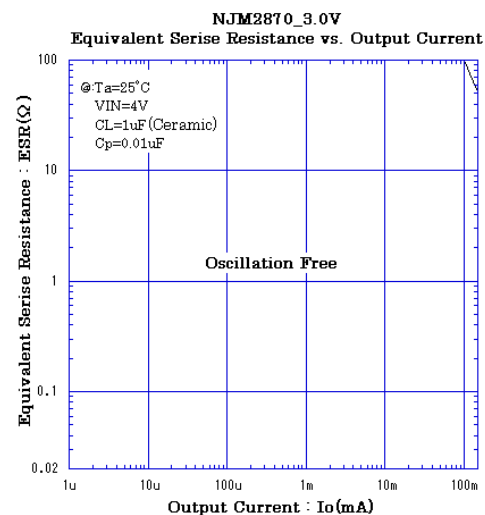
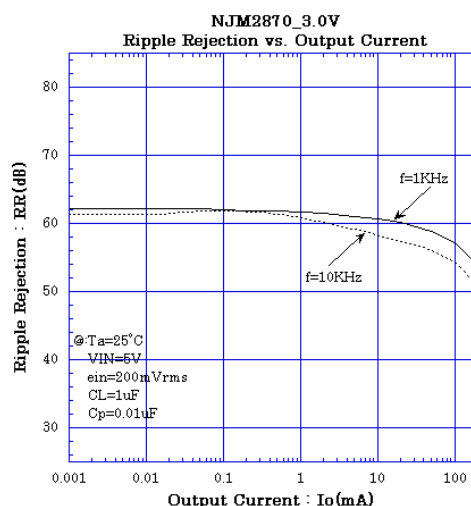
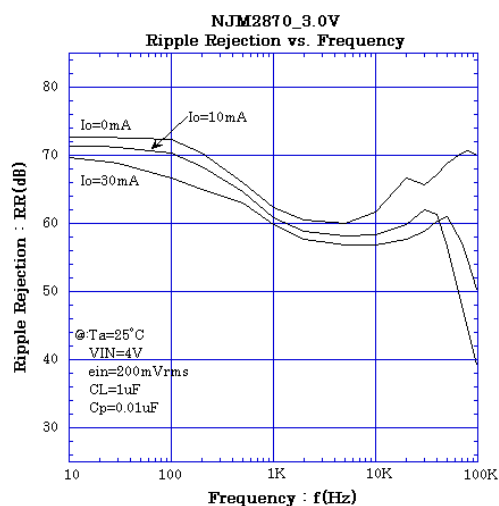
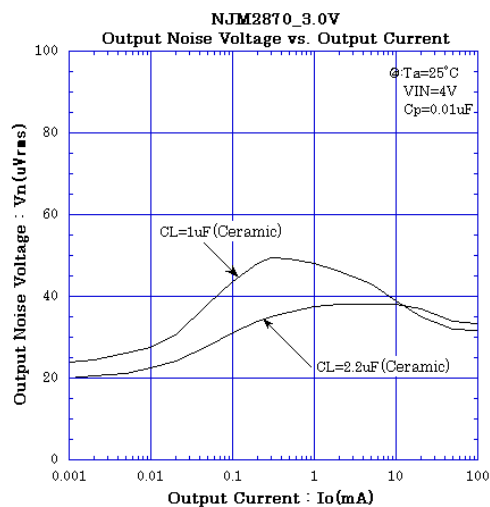
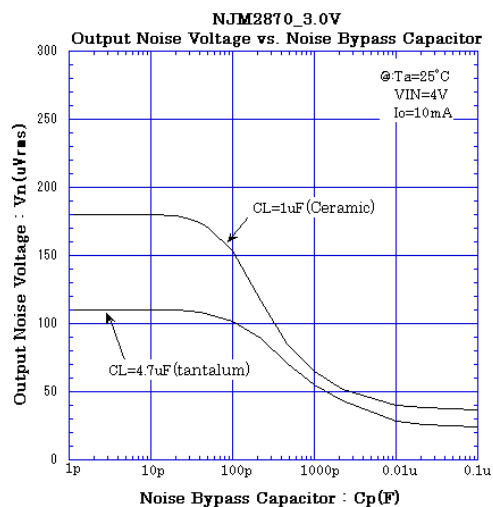
Use of smaller  $C_p$  value may cause oscillation.

Use the  $C_p$  value of 0.01μF greater to avoid the problem.

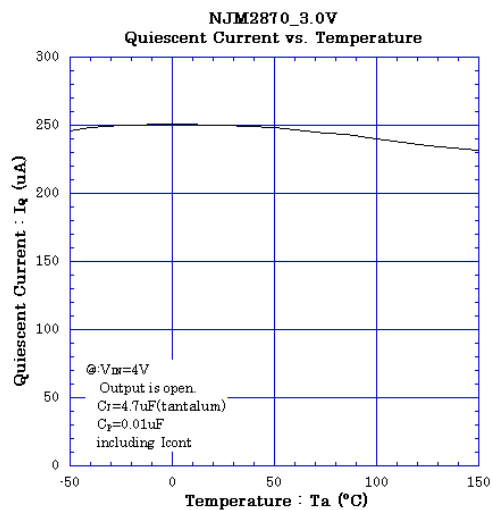
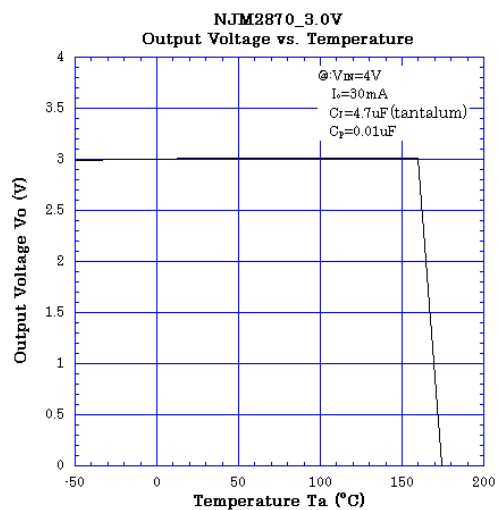
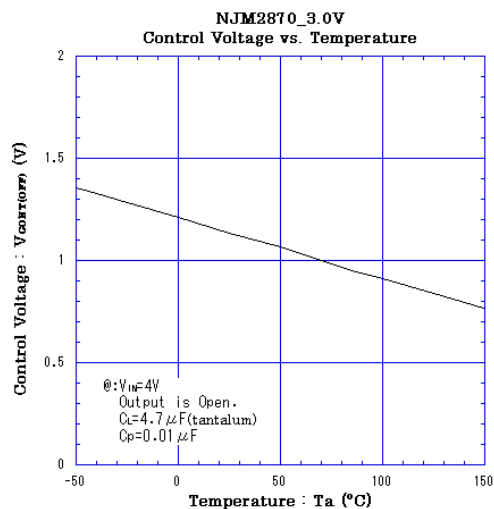
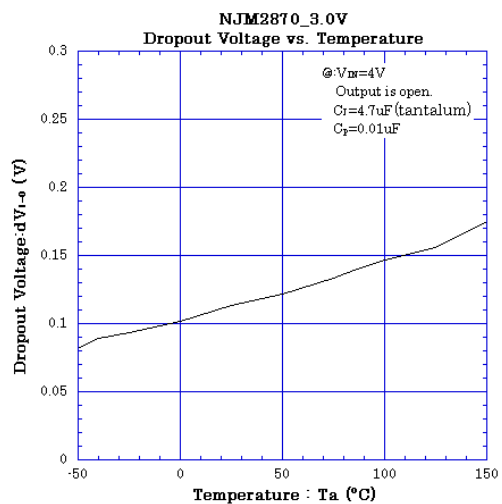
## ■ TYPICAL CHARACTERISTICS



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[CAUTION]

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