

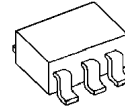
LOW DROPOUT VOLTAGE REGULATOR

■ 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

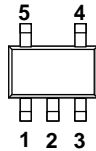


NJM2870F

■ 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 $V_{\text{no}}=30\mu\text{V typ. (Cp}=0.01\mu\text{F)}$
- 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~+14V ($V_{\text{o}}=1.5\text{V Version}$)
- 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 SOT-23-5

■ PIN CONFIGURATION

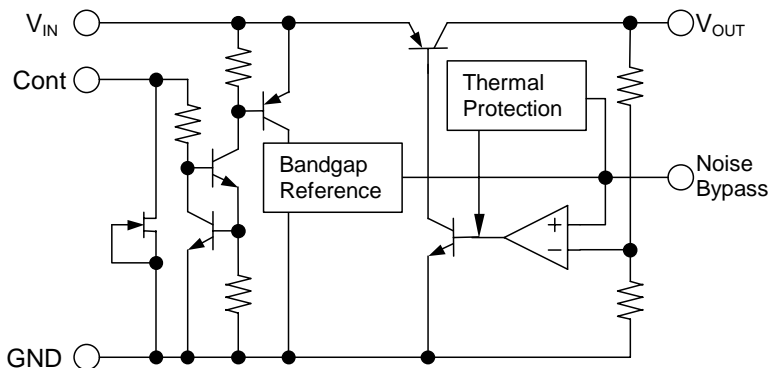


NJM2870F

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

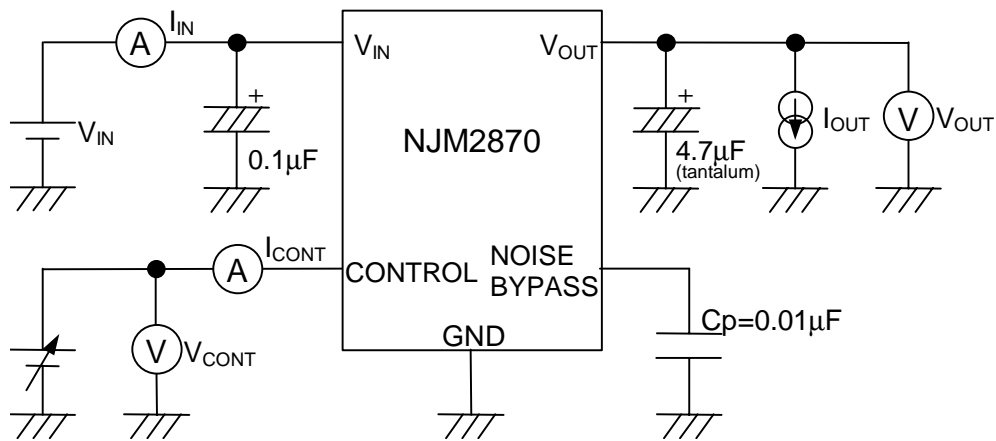
■ OUTPUT VOLTAGE RANK LIST

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

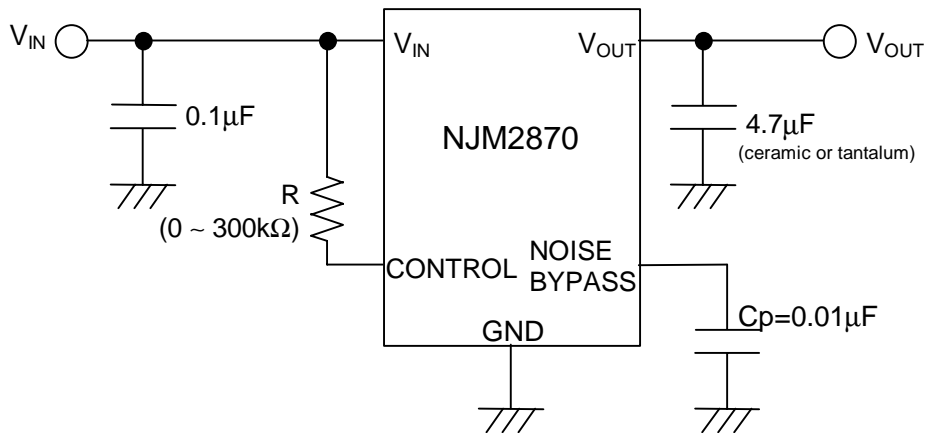
Device Name	V _{OUT}
NJM2870F35	3.5V
NJM2870F36	3.6V
NJM2870F38	3.8V
NJM2870F04	4.0V
NJM2870F45	4.5V
NJM2870F46	4.6V
NJM2870F47	4.7V
NJM2870F48	4.8V
NJM2870F05	5.0V

■ TEST CIRCUIT



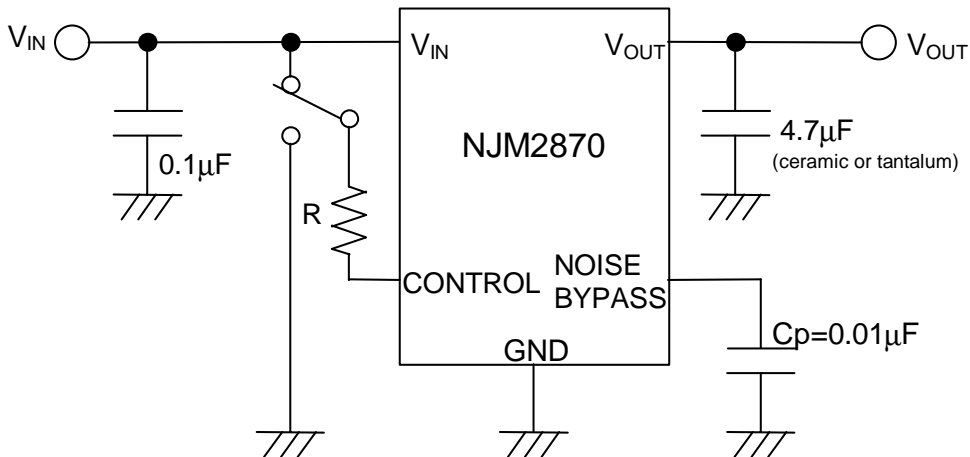
■ TYPICAL APPLICATION

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

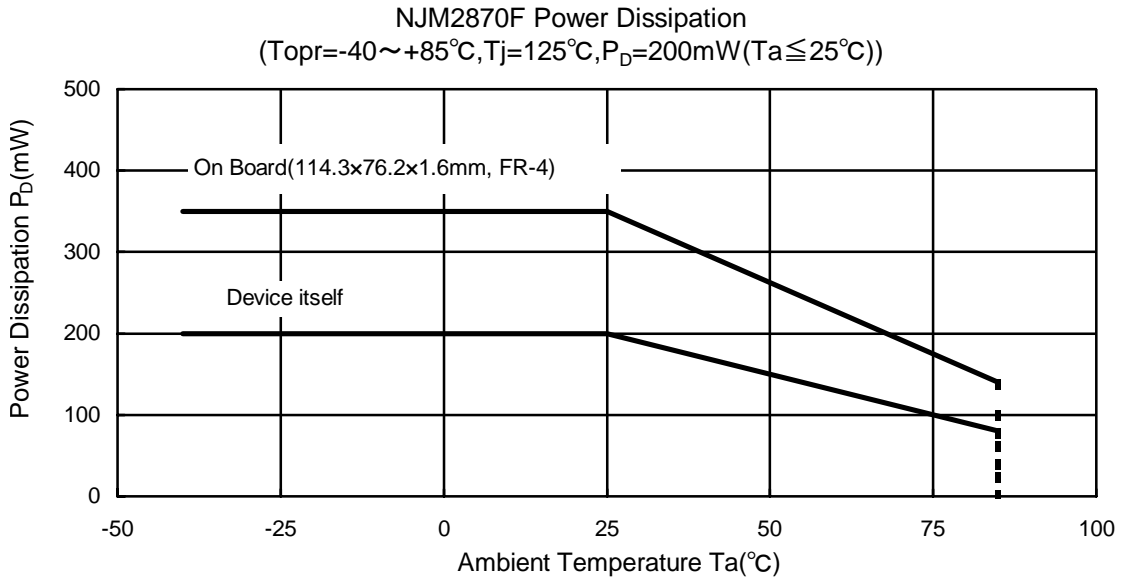
Noise bypass capacitance C_p reduces noise generated by band-gap reference circuit. Noise level and ripple rejection will be improved when larger C_p is used. Use of smaller C_p value may cause oscillation. Use the C_p value of $0.01\mu\text{F}$ greater to avoid the problem.

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

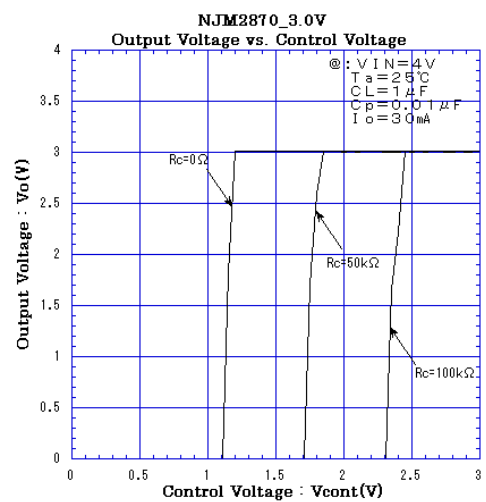
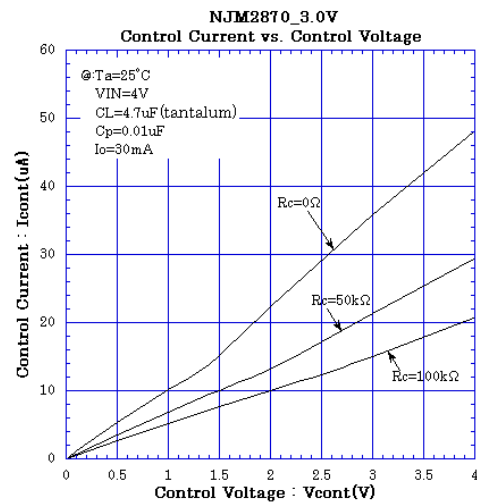
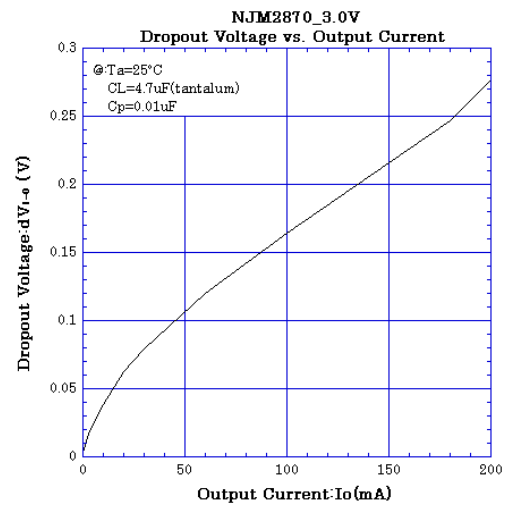
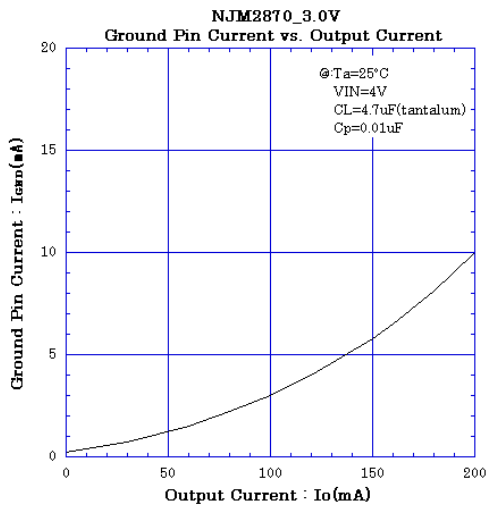
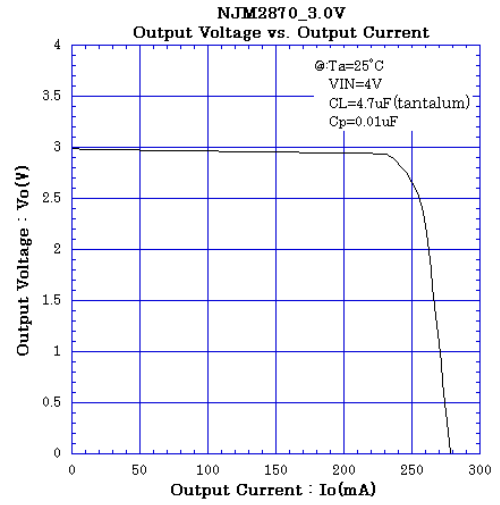
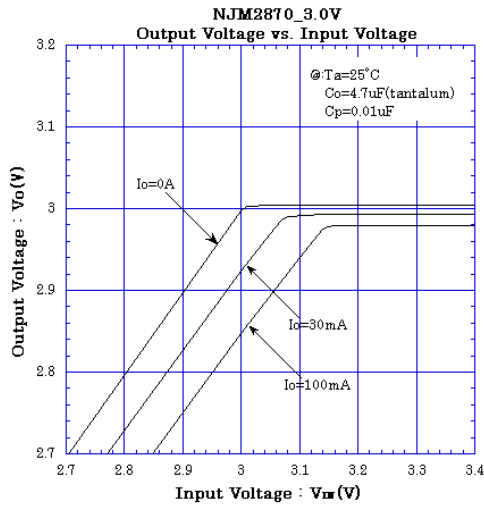
The current flow into the control terminal while the IC is ON state (I_{CONT}) can be reduced when a pull up resistance "R" is inserted between V_{IN} and the control terminal.

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.

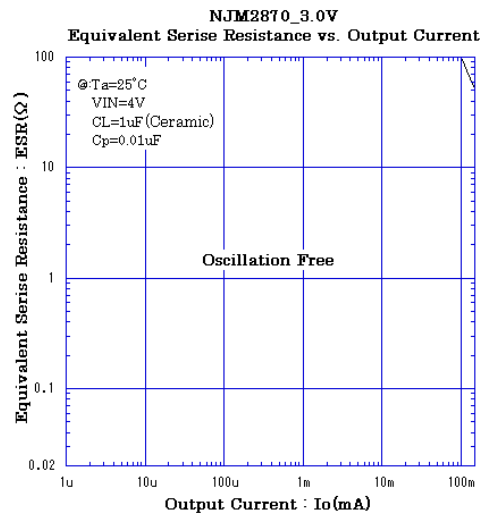
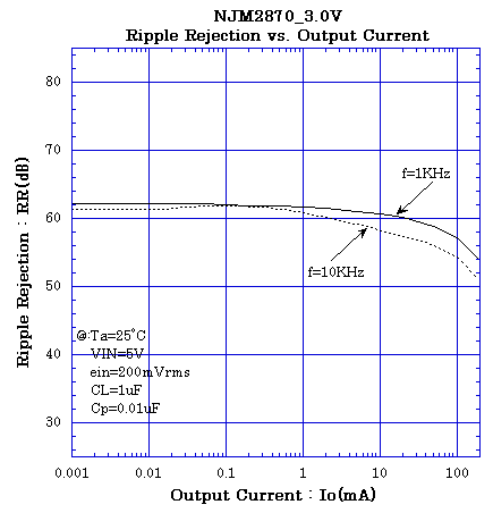
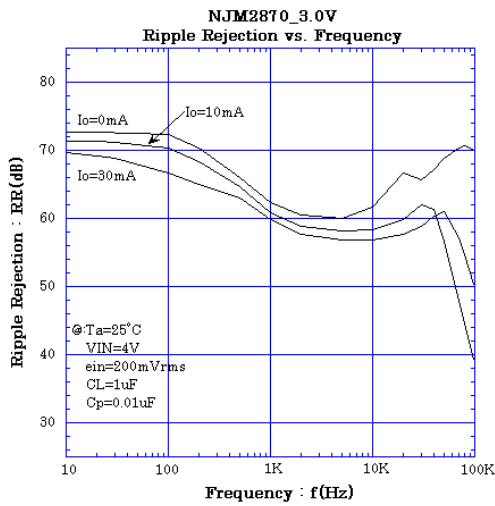
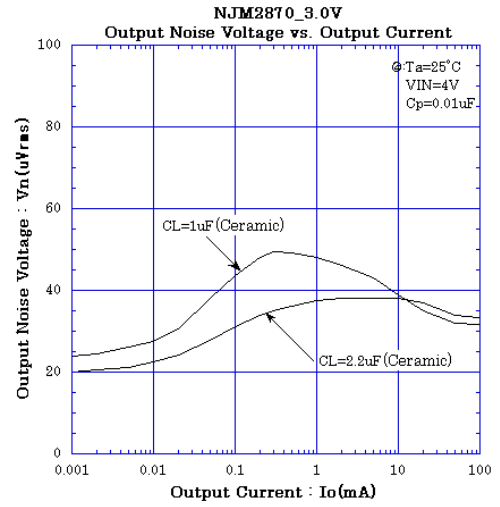
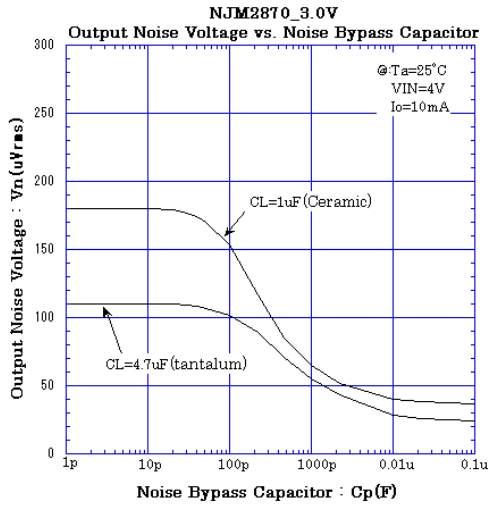
POWER DISSIPATION vs. AMBIENT TEMPERATURE



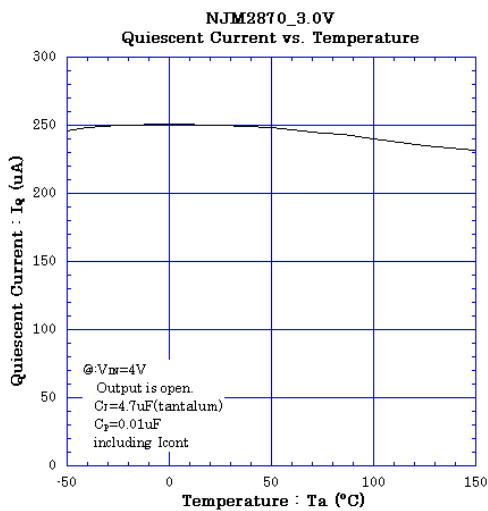
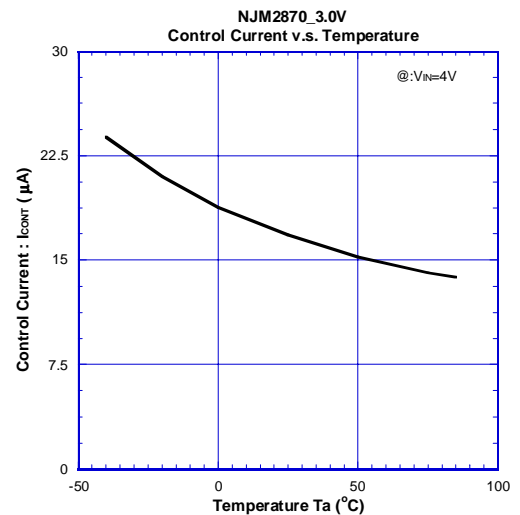
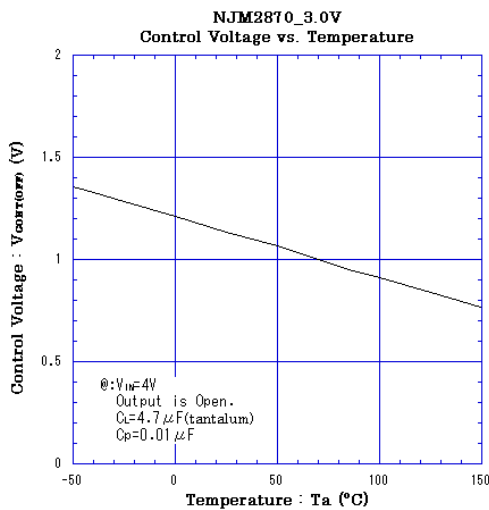
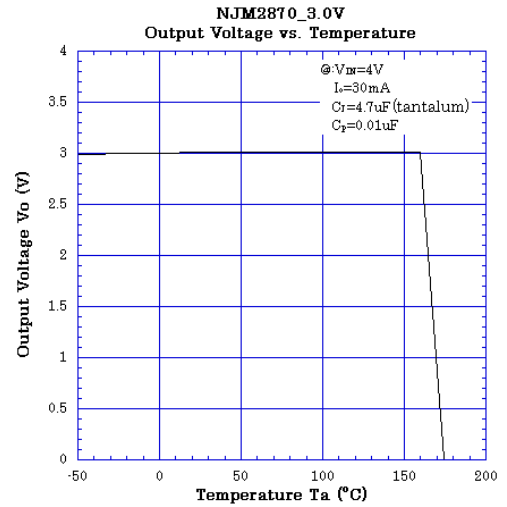
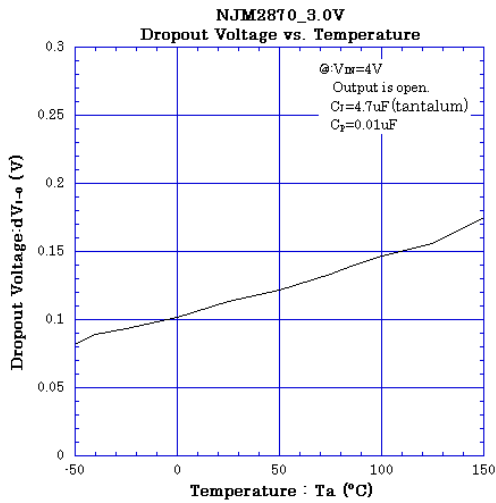
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



[CAUTION]

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