

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

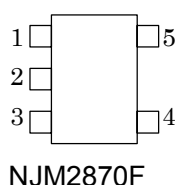


NJM2870F

■ 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 4.7 μF ceramic capacitor
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline MTP5 (MTP5: 2.8 $\times$ 2.9 $\times$ 1.1mm)

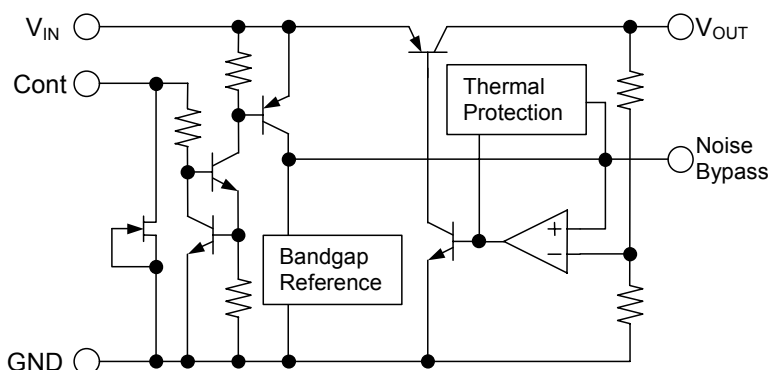
■ PIN CONFIGURATION



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(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 ($V_{IN}=V_o+1V$, $C_{IN}=0.1\mu F$, $C_o=4.7\mu F$, $C_p=0.01\mu F$, $T_a=25^\circ C$)

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	$\Delta V_o/\Delta V_{IN}$	$V_{IN}=V_o+1V \sim V_o+6V$, $I_o=30mA$	-	-	0.10	%/V
Load Regulation	$\Delta V_o/\Delta I_o$	$I_o=0 \sim 100mA$	-	-	0.03	%/mA
Dropout Voltage	ΔV_{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	$\Delta V_o/\Delta T_a$	$T_a=0-85^\circ C$, $I_o=10mA$, $V_o=3V$ Version	-	0.2	-	mV/°C
Output Noise Voltage	V_{NO}	$f=10Hz-80kHz$, $I_o=10mA$, $V_o=3V$ Version	-	30	-	μV_{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, $V_{IN}=2.4V$, $C_{IN}=0.1\mu F$, $C_o=4.7\mu F$, $C_p=0.01\mu F$, $T_a=25^\circ C$)

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	$\Delta V_o/\Delta V_{IN}$	$V_{IN}=V_o+1V \sim V_o+6V$, $I_o=30mA$	-	-	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	$\Delta V_o/\Delta T_a$	$T_a=0-85^\circ C$, $I_o=10mA$	-	0.13	-	mV/°C
Output Noise Voltage	V_{NO}	$f=10Hz-80kHz$, $I_o=10mA$,	-	15	-	μV_{rms}
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		-	-	0.6	V

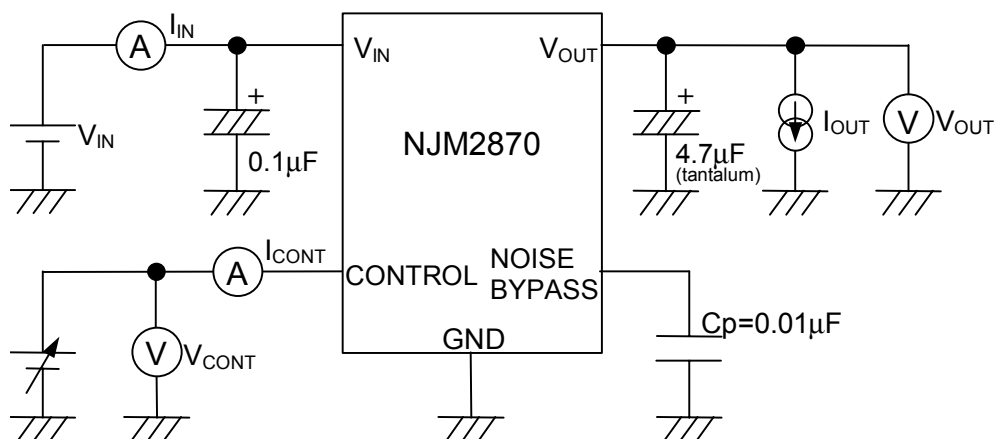
■ OUTPUT VOLTAGE RANK LIST

Device Name	V _{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

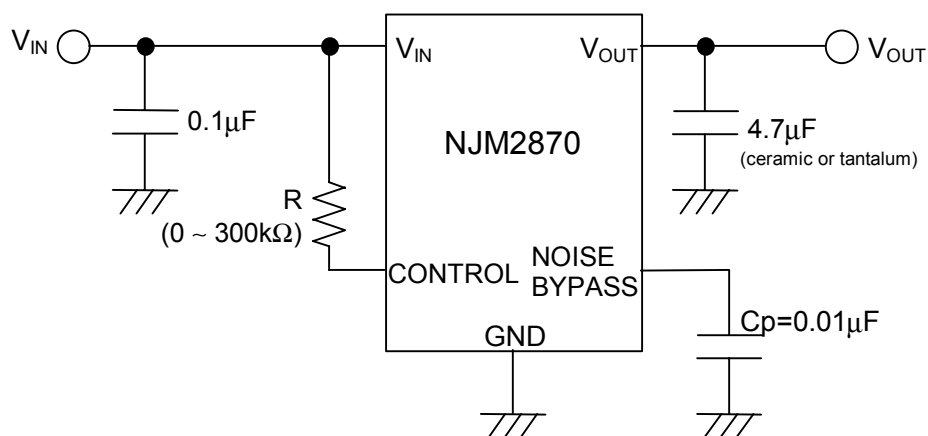
Device Name	V _{OUT}
NJM2870F35	3.5V
NJM2870F36	3.6V
NJM2870F38	3.8V
NJM2870F04	4.0V
NJM2870F45	4.5V
NJM2870F46	4.6V
NJM2870F47	4.7V
NJM2870F48	4.8V
NJM2870F05	5.0V

■ TEST CIRCUIT



■ TYPICAL APPLICATION

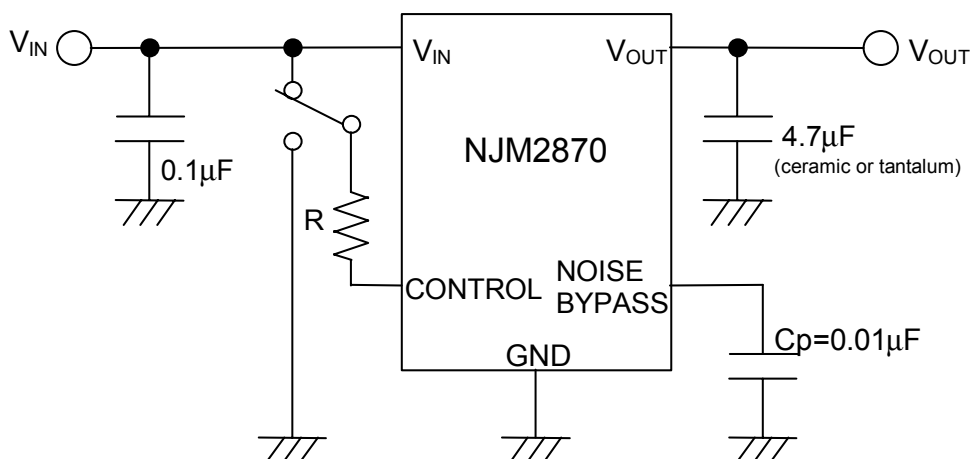
① In case that ON/OFF Control is not required:



Connect control terminal to V_{IN} terminal

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

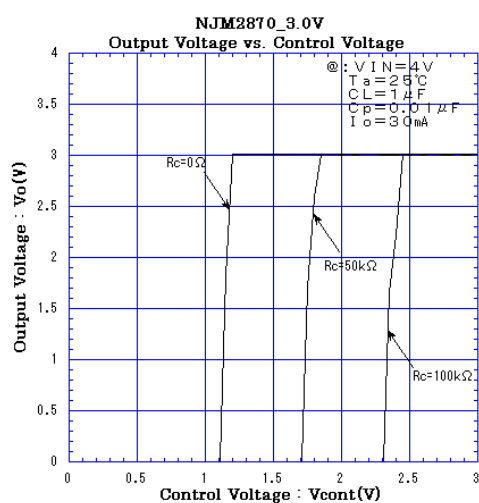
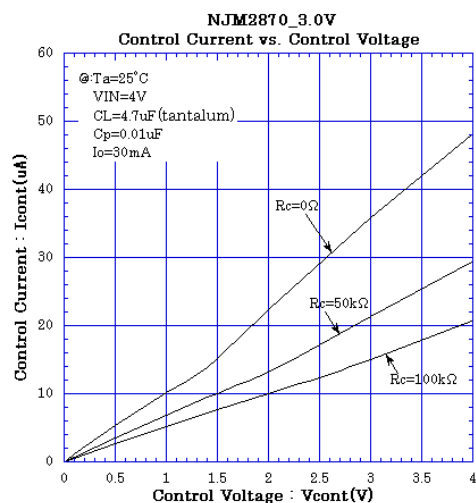
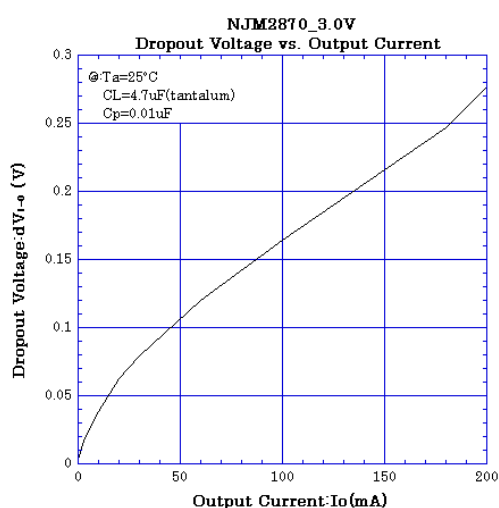
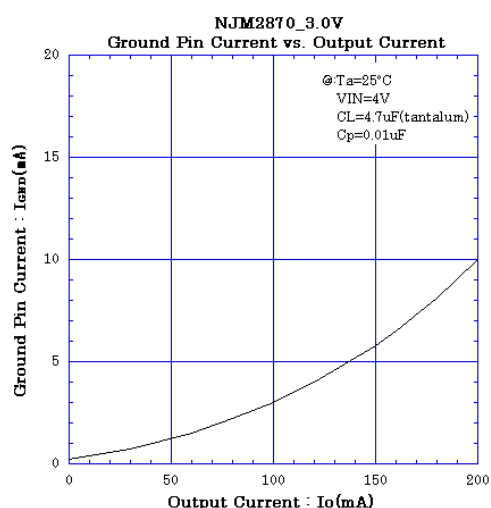
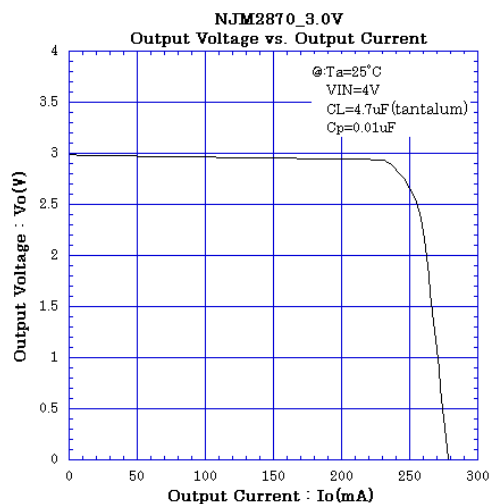
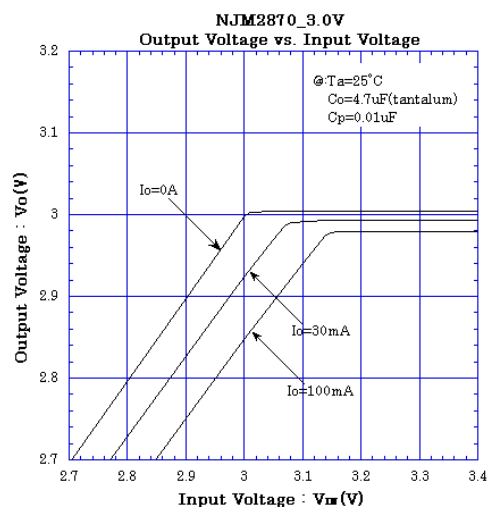
Noise bypass capacitance C_p reduces noise generated by band-gap reference circuit.

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

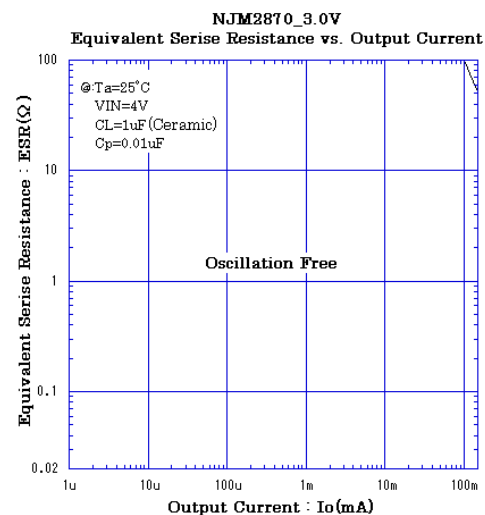
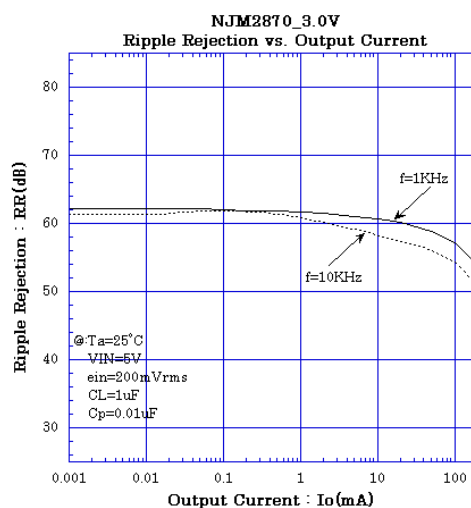
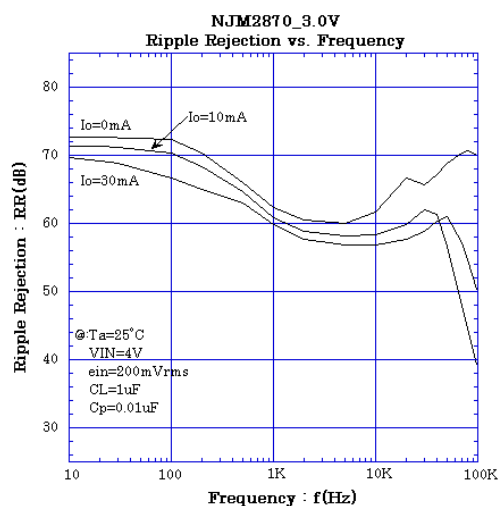
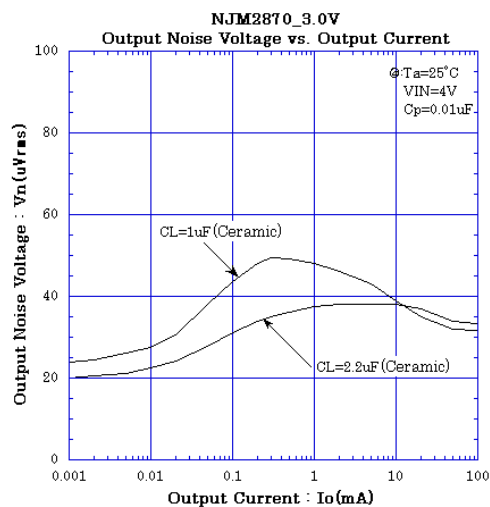
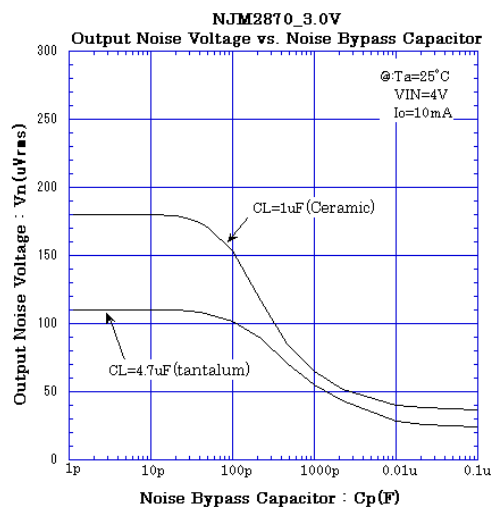
Use of smaller C_p value may cause oscillation.

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

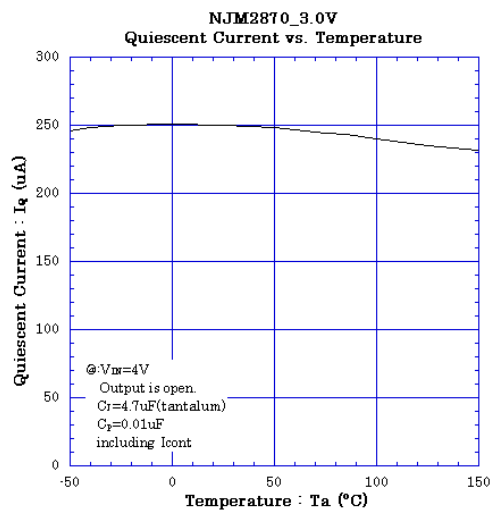
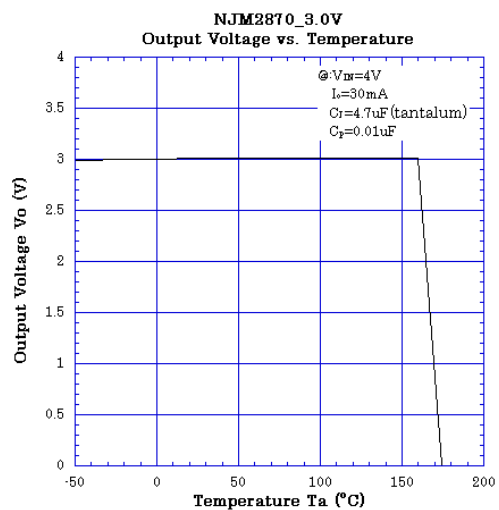
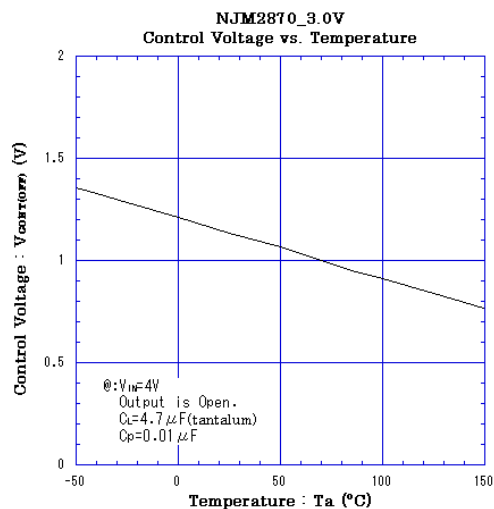
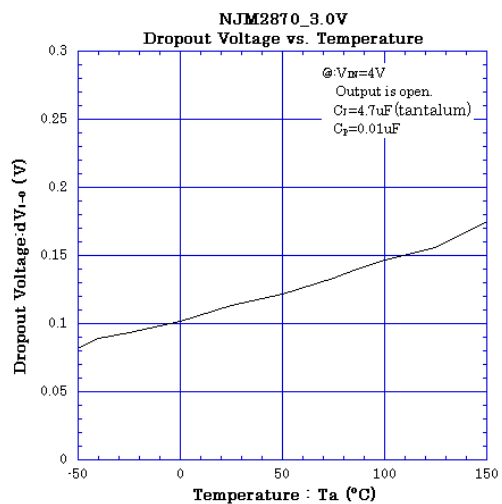
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



[CAUTION]
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