

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

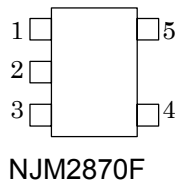


NJM2870F

■ 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 $V_{\text{no}}=30\mu\text{V} (C_p=0.01\mu\text{F})$
- 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~+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 MTP5 (MTP5: 2.8×2.9×1.1mm)

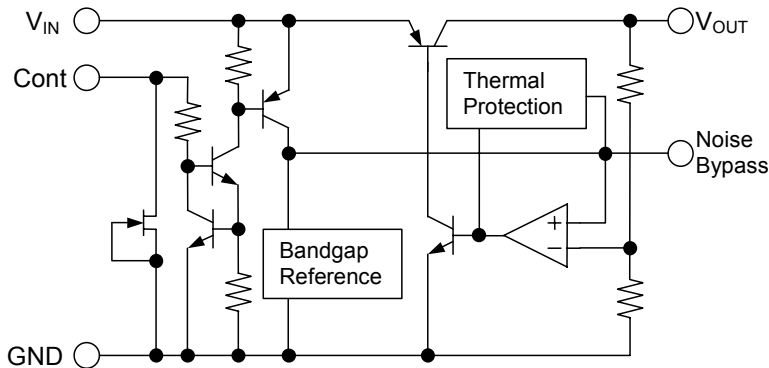
■ PIN CONFIGURATION



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

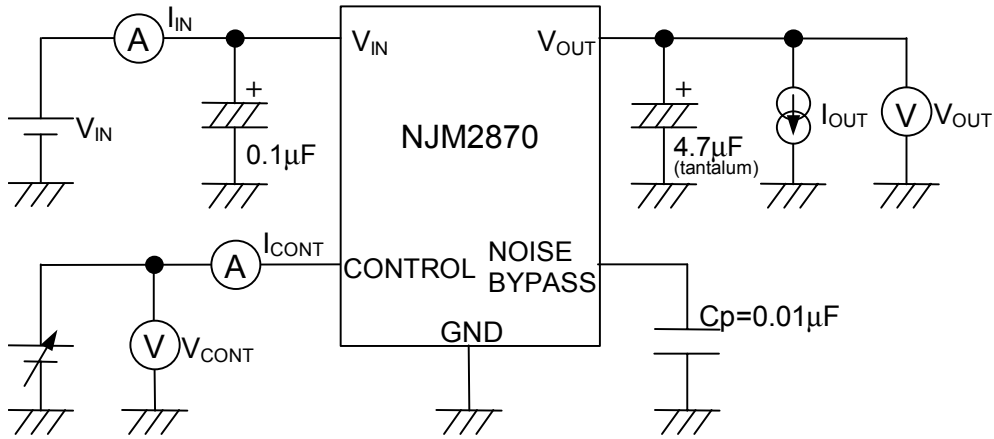
■ OUTPUT VOLTAGE RANK LIST

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

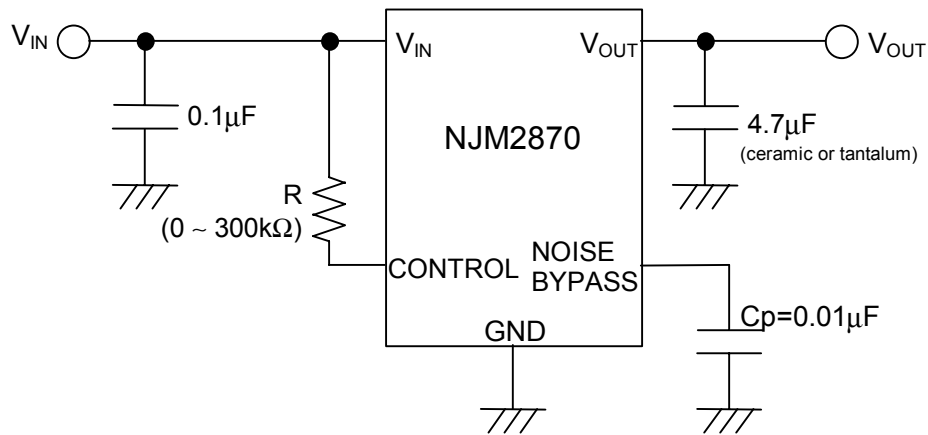
Device Name	V _{OUT}
NJM2870F35	3.5V
NJM2870F36	3.6V
NJM2870F38	3.8V
NJM2870F04	4.0V
NJM2870F45	4.5V
NJM2870F46	4.6V
NJM2870F47	4.7V
NJM2870F48	4.8V
NJM2870F05	5.0V

■ TEST CIRCUIT



■ TYPICAL APPLICATION

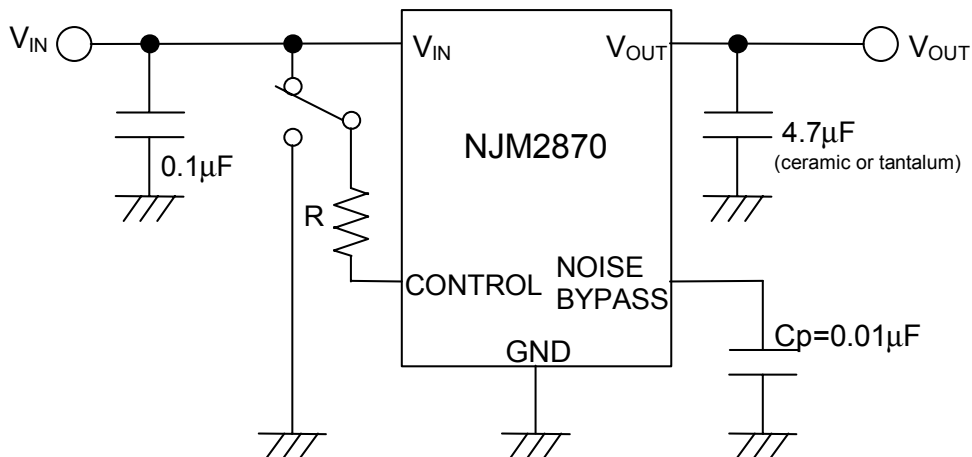
① In case that ON/OFF Control is not required:



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

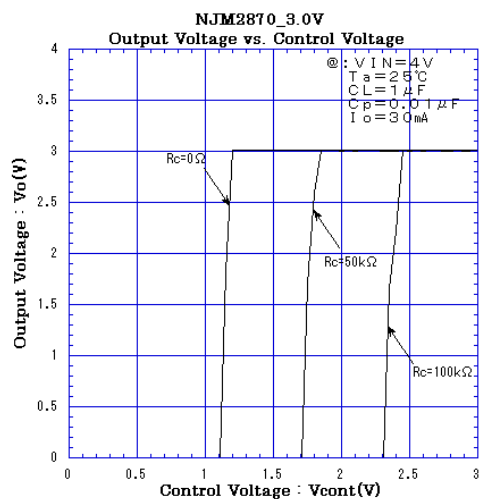
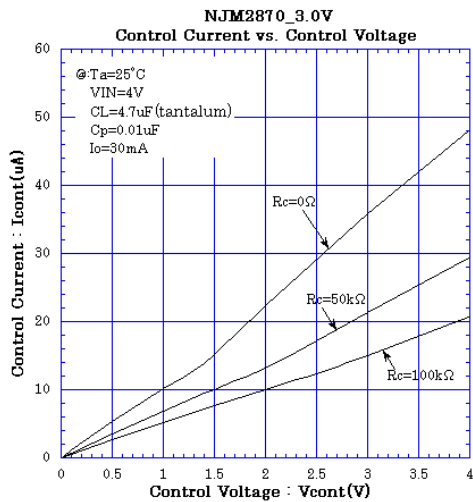
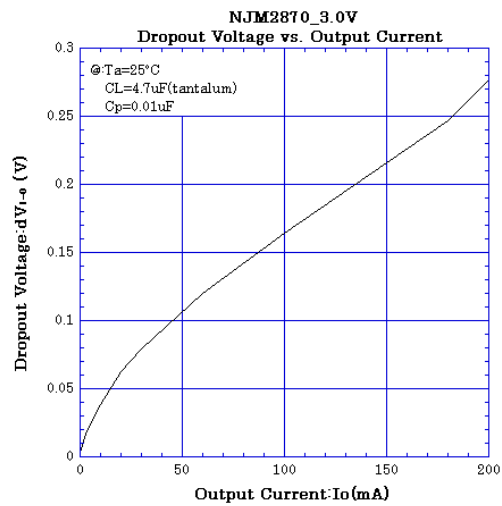
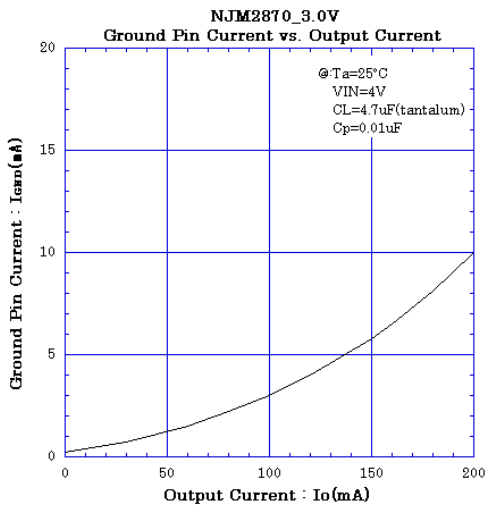
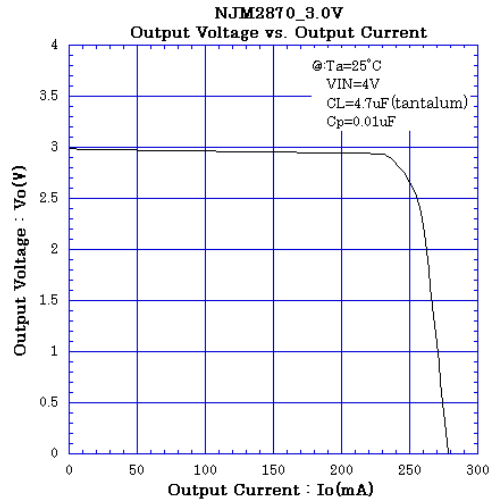
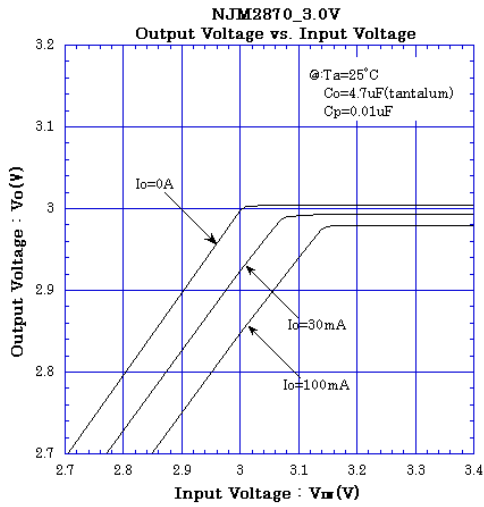
Noise bypass capacitance C_p reduces noise generated by band-gap reference circuit.

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

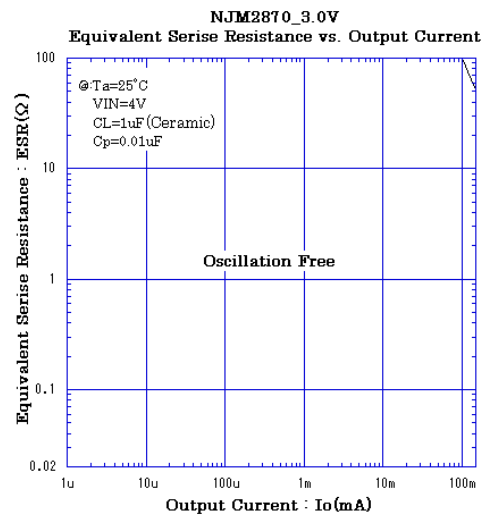
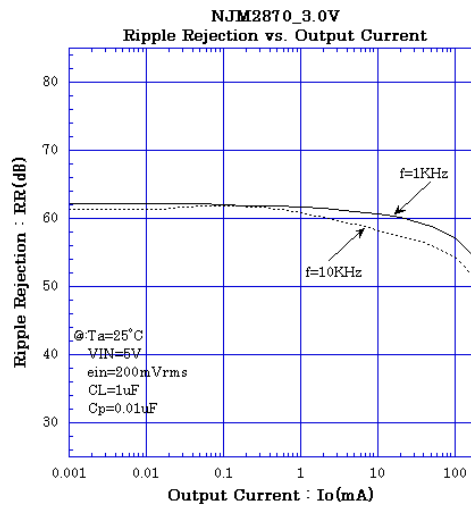
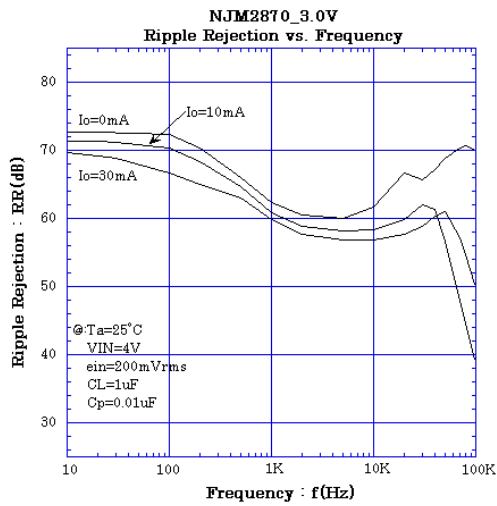
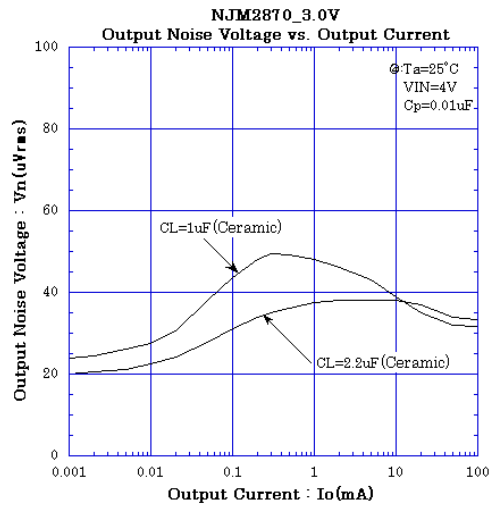
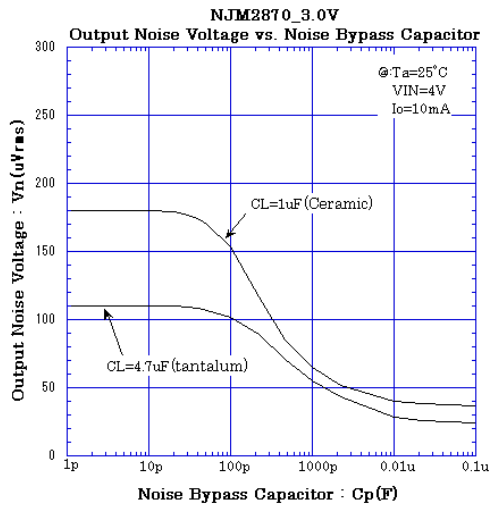
Use of smaller C_p value may cause oscillation.

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

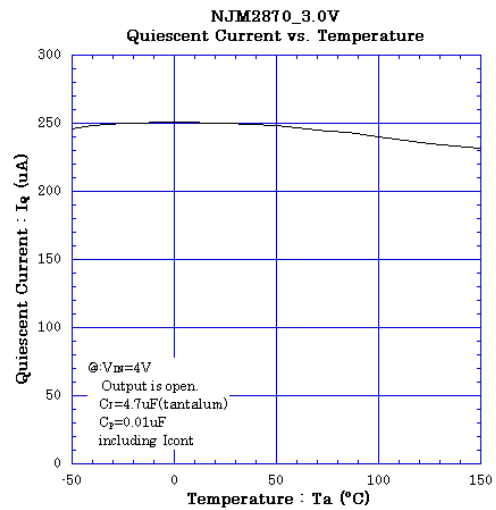
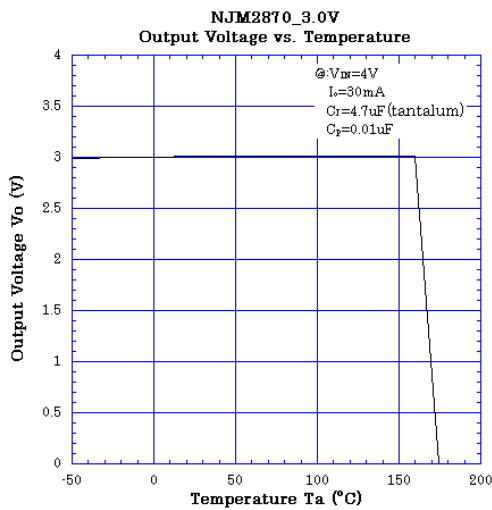
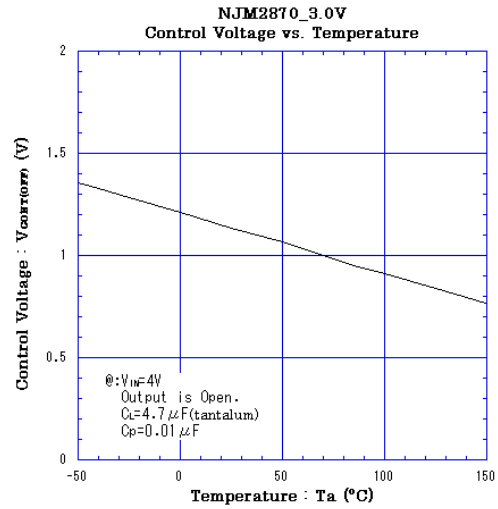
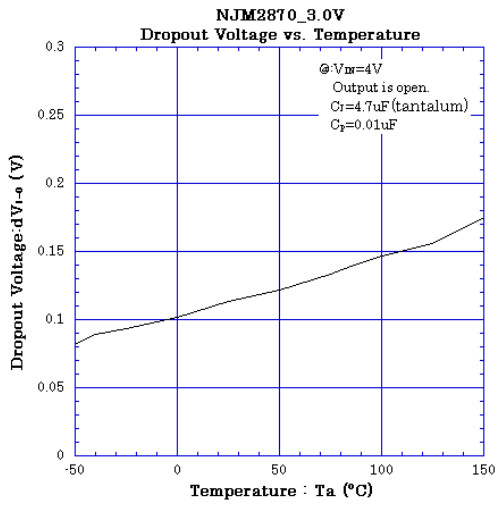
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.