

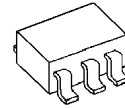
## LOW DROPOUT VOLTAGE REGULATOR

### ■ GENERAL DESCRIPTION

The NJM2871/A, NJM2872/A are low dropout voltage regulators designed for cellular phone application.

Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

### ■ PACKAGE OUTLINE

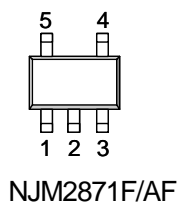


NJM2871F/AF  
NJM2872F/AF

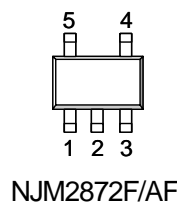
### ■ FEATURES

- High Ripple Rejection      70dB typ. ( $f=1\text{kHz}, V_o=3\text{V}$  Version)
- Output Noise Voltage       $V_{no}=30\mu\text{Vrms}$  typ. ( $C_p=0.01\mu\text{F}$ )
- Output capacitor with 1.0 $\mu\text{F}$  ceramic capacitor ( $V_o\geq 2.7\text{V}$ )
- Output Current               $I_o(\text{max.})=150\text{mA}$
- High Precision Output       $V_o\pm 2\%$   
    $V_o\pm 1\%$ : A Version
- Low Dropout Voltage        0.10V typ. ( $I_o=60\text{mA}$ )
- ON/OFF Control              (Active High)
- Operating Voltage Range     $+2.5\text{V}\sim +14\text{V}$  ( $V_o\leq 2.0\text{V}$  version)
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline              SOT-23-5

### ■ PIN CONFIGURATION

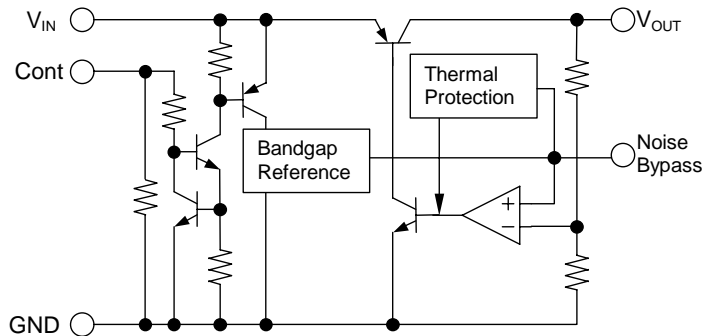


PIN FUNCTION  
1. CONTROL (Active High)  
2. GND  
3. NOISE BYPASS  
4.  $V_{OUT}$   
5.  $V_{IN}$



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

### ■ EQUIVALENT CIRCUIT



# NJM2871/A, NJM2872/A

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT	
Input Voltage	V <sub>IN</sub>	+14	V	
Control Voltage	V <sub>CONT</sub>	+14(*1)	V	
Power Dissipation	P <sub>D</sub>	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.

## ■ Operating voltage

V<sub>IN</sub>=+2.5 ~ +14V (In case of Vo<2.1V version)

## ■ ELECTRICAL CHARACTERISTICS

(Vo>2.0V version : V<sub>IN</sub>=Vo+1V, C<sub>IN</sub>=0.1μF, Co=1.0μF: Vo≥2.7V (Co=2.2μF: Vo<2.6V), Cp=0.01μF, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Io=30mA	-2%	-	+2%	V
		Io=30mA, A Version	-1%	-	+1%	V
Quiescent Current	I <sub>Q</sub>	Io=0mA, expect Icont	-	120	180	μA
Quiescent Current at Control OFF	I <sub>Q(OFF)</sub>	V <sub>CONT</sub> =0V	-	-	100	nA
Output Current	Io	Vo-0.3V	150	200	-	mA
Line Regulation	ΔVo/ΔV <sub>IN</sub>	V <sub>IN</sub> =Vo+1V ~ Vo+6V, Io=30mA	-	-	0.10	%/V
Load Regulation	ΔVo/ΔIo	Io=0 ~ 100mA	-	-	0.03	%/mA
Dropout Voltage	ΔV <sub>LO</sub>	Io=60mA	-	0.10	0.18	V
Ripple Rejection	RR	ein=200mVrms, f=1kHz, Io=10mA Vo=3V Version	-	70	-	dB
Average Temperature Coefficient of Output Voltage	ΔVo/ΔTa	Ta=0~85°C, Io=10mA, Vo=3V Version	-	±50	-	ppm/°C
Output Noise Voltage	V <sub>NO</sub>	f=10Hz~80kHz, Io=10mA, Vo=3V Version	-	30	-	μVrms
Control Voltage for ON-state	V <sub>CONT(ON)</sub>		1.6	-	-	V
Control Voltage for OFF-state	V <sub>CONT(OFF)</sub>		-	-	0.6	V

# NJM2871/A, NJM2872/A

( $V_o \leq 2.0V$  version :  $V_{IN}=V_o+1V$ ,  $C_{IN}=0.1\mu F$ ,  $C_o=4.7\mu F$ ,  $C_p=0.01\mu F$ ,  $T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$	$I_o=30mA$	-2%	-	+2%	V
		$I_o=30mA$ , A Version	-1%	-	+1%	V
Quiescent Current	$I_Q$	$I_o=0mA$ , expect $I_{cont}$	-	120	180	$\mu A$
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	$e_{in}=200mV_{rms}$ , $f=1kHz$ , $I_o=10mA$ $V_o=1.8V$ Version	-	75	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T_a$	$T_a=0\sim 85^\circ C$ , $I_o=10mA$ , $V_o=1.8V$ Version	-	$\pm 50$	-	ppm/ $^\circ C$
Output Noise Voltage	$V_{NO}$	$f=10Hz\sim 80kHz$ , $I_o=10mA$ , $V_o=1.8V$ Version	-	22	-	$\mu V_{rms}$
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		-	-	0.6	V

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.

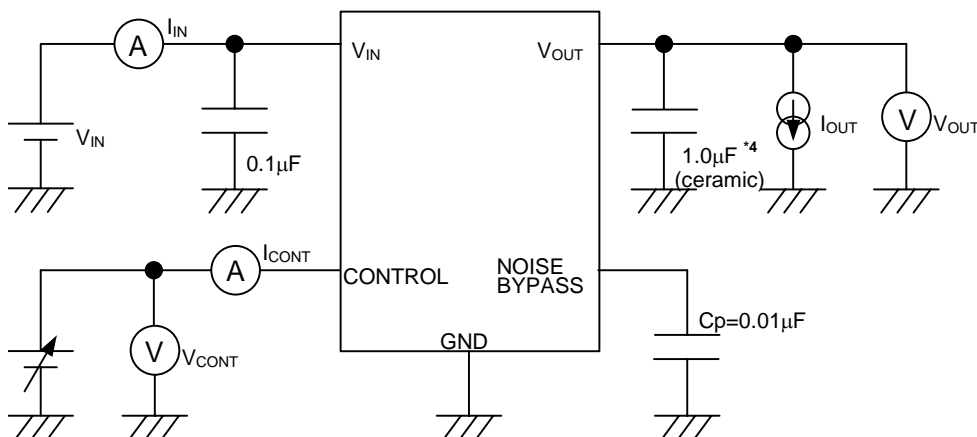
## OUTPUT VOLTAGE RANK LIST

Device Name	$V_{OUT}$
NJM287xx15	1.5V
NJM287xx18	1.8V
NJM287xx21	2.1V
NJM287xx23	2.3V
NJM287xx25	2.5V
NJM287xx26	2.6V
NJM287xx27	2.7V
NJM287xx28	2.8V

Device Name	$V_{OUT}$
NJM287xx285	2.85V
NJM287xx29	2.9V
NJM287xx03	3.0V
NJM287xx31	3.1V
NJM287xx32	3.2V
NJM287xx33	3.3V
NJM287xx34	3.4V
NJM287xx35	3.5V

Device Name	$V_{OUT}$
NJM287xx355	3.55V
NJM287xx38	3.8V
NJM287xx04	4.0V
NJM287xx45	4.5V
NJM287xx46	4.6V
NJM287xx47	4.7V
NJM287xx05	5.0V

## TEST CIRCUIT

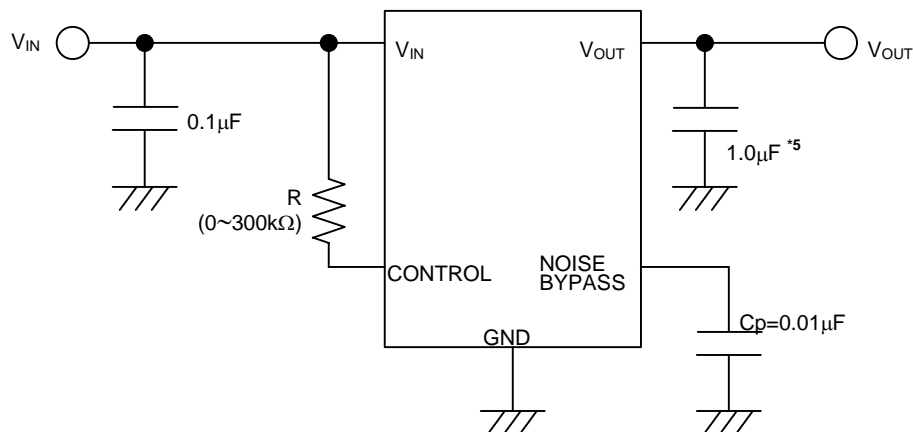


\*4  $2.0V < V_o \leq 2.6V$  version :  $C_o=2.2\mu F$ (ceramic)  
 $V_o \leq 2.0V$  version :  $C_o=4.7\mu F$ (ceramic)

# NJM2871/A, NJM2872/A

## TYPICAL APPLICATION

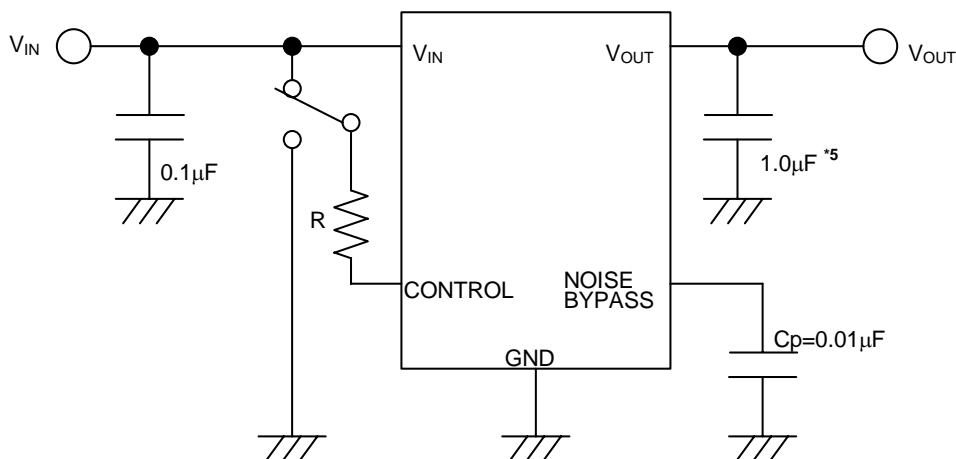
① In case that ON/OFF Control is not required:



\*5 2.0V < Vo ≤ 2.6V version : Co=2.2µF  
Vo ≤ 2.0V version : Co=4.7µF

Connect control terminal to VIN terminal

② In use of ON/OFF CONTROL:



\*5 2.0V < Vo ≤ 2.6V version : Co=2.2µF  
Vo ≤ 2.0V version : Co=4.7µF

State of control terminal:

- "H" → output is enabled.
- "L" or "open" → output is disabled.

### \*Noise bypass Capacitor Cp

Noise bypass capacitor 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 recommended value larger (refer to conditions of ELECTRIC CHARACTERISTIC) to avoid the problem.

### \*In the case of using a resistance "R" between VIN and control.

If this resistor is inserted, it can reduce the control current when the control voltage is high.

The applied voltage to control terminal should set to consider voltage drop through the resistor "R" and the minimum control voltage for ON-state.

The V<sub>CONT(ON)</sub> and I<sub>CONT</sub> have temperature dependence as shown in the "Control Current vs. Temperature" and "

Control Voltage vs. Temperature" characteristics. Therefore, the resistance "R" should be selected to consider the temperature characteristics.

## \*Input Capacitor $C_{IN}$

Input Capacitor  $C_{IN}$  is required to prevent oscillation and reduce power supply ripple for applications when high power supply impedance or a long power supply line.

Therefore, use the recommended  $C_{IN}$  value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and  $V_{IN}$  as shortest path as possible to avoid the problem.

## \*Output Capacitor $C_O$

Output capacitor ( $C_O$ ) will be required for a phase compensation of the internal error amplifier.

The capacitance and the equivalent series resistance (ESR) influence to stable operation of the regulator.

Use of a smaller  $C_O$  may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.

On the other hand, Use of a larger  $C_O$  reduces output noise and ripple output, and also improves output transient response when rapid load change.

Therefore, use the recommended  $C_O$  value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and  $V_{OUT}$  as shortest path as possible for stable operation

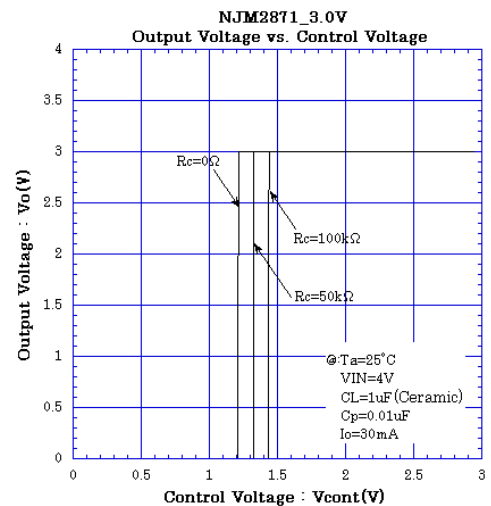
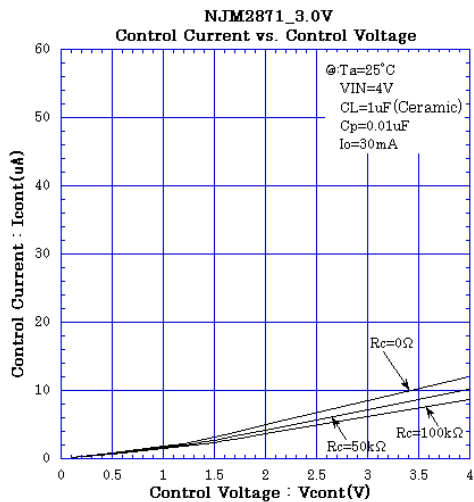
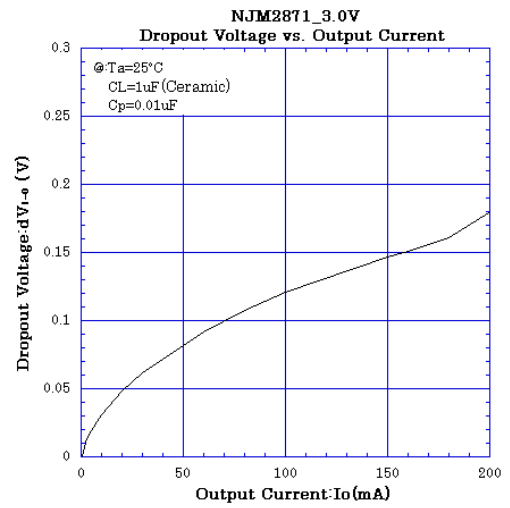
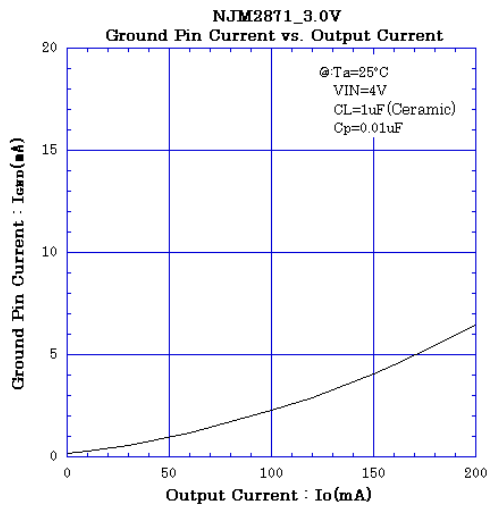
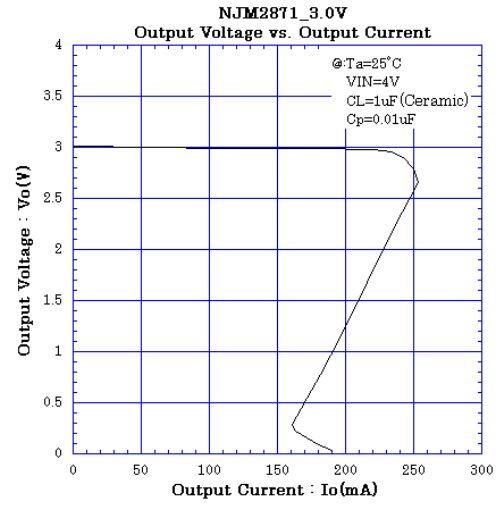
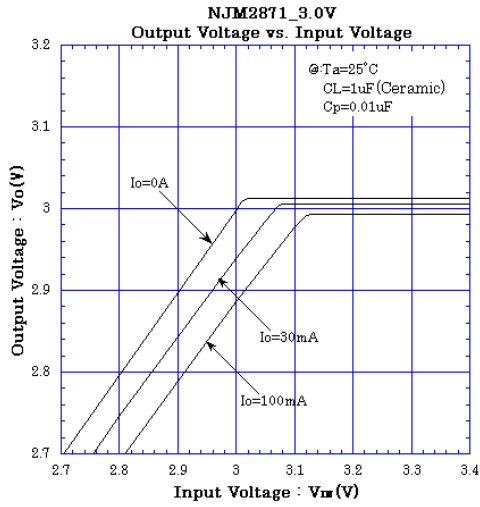
The recommended capacitance depends on the output voltage rank. Especially, low voltage regulator requires larger  $C_O$  value.

In addition, you should consider varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, a DC bias characteristic and so on) and unevenness peculiar to a capacitor supplier enough.

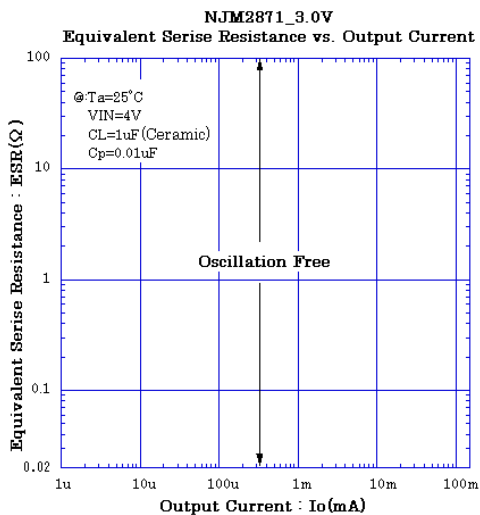
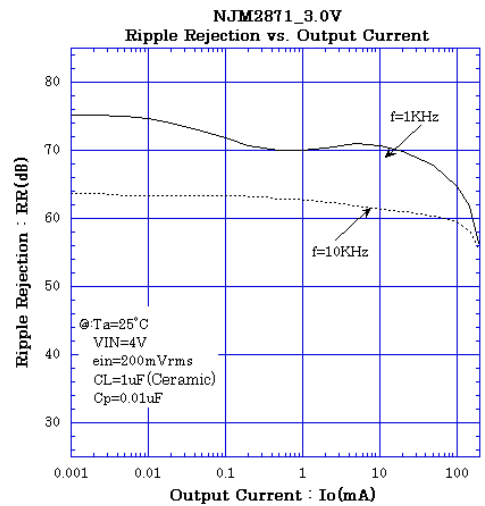
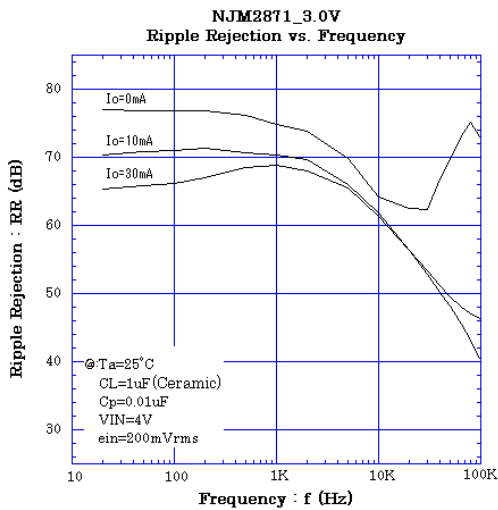
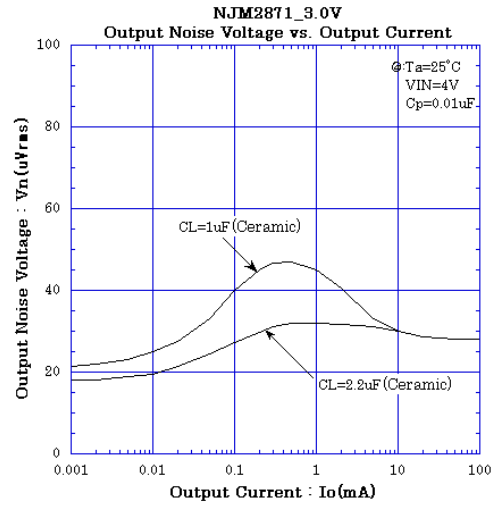
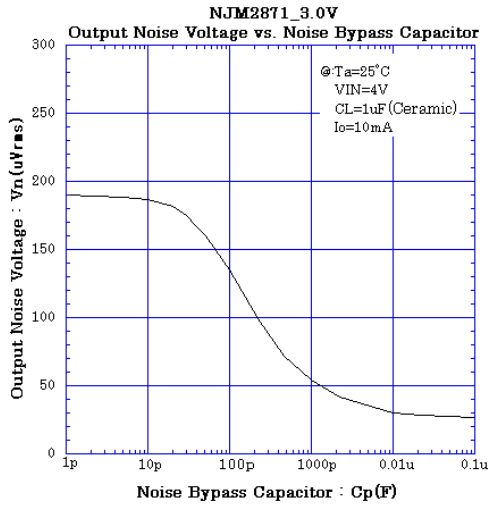
When selecting  $C_O$ , recommend that have withstand voltage margin against output voltage and superior temperature characteristic though this product is designed stability works with wide range ESR of capacitor including low ESR products.

# NJM2871/A, NJM2872/A

## ELECTRICAL CHARACTERISTICS

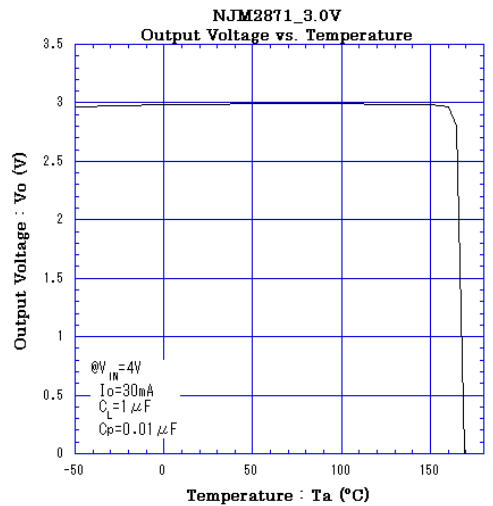
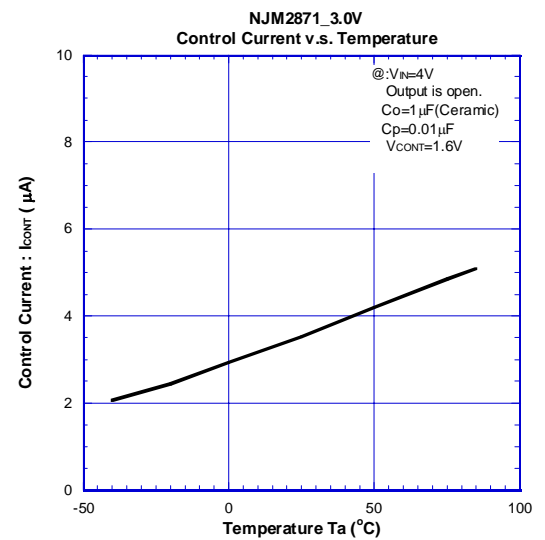
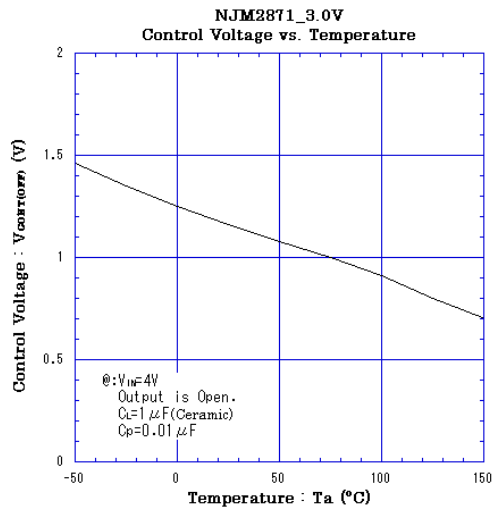
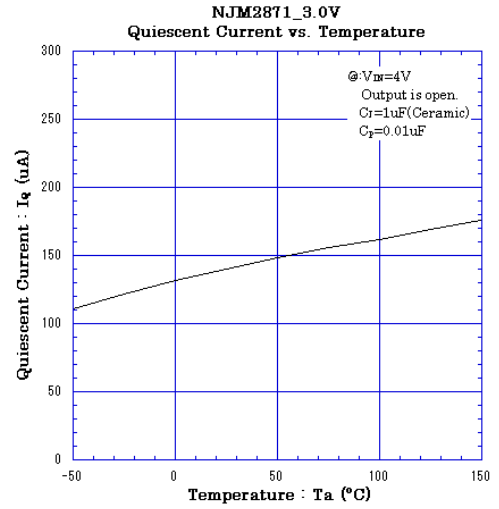
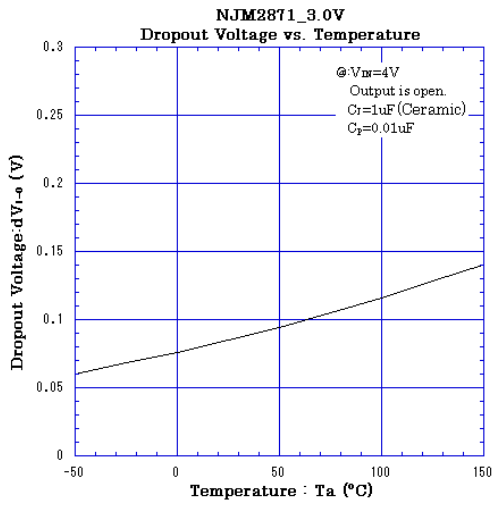


## ELECTRICAL CHARACTERISTICS



# NJM2871/A, NJM2872/A

## ELECTRICAL CHARACTERISTICS





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