

## LOW DROPOUT VOLTAGE REGULATOR

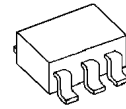
### ■ GENERAL DESCRIPTION

NJM2881/82 is a low dropout voltage regulator with ON/OFF control.

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

It is mounted on SOT-23-5 as small package and 1.0 $\mu$ F ceramic capacitor is available. Therefore it is suitable for cellular phone, camcorder, IC decoder, camera, and other portable items.

### ■ PACKAGE OUTLINE

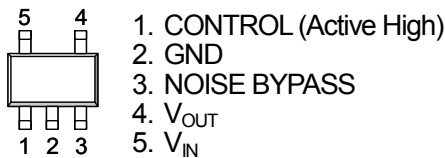


NJM2881/82F

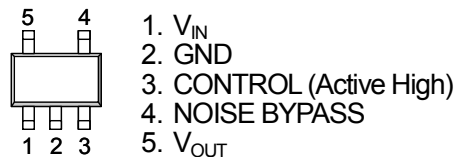
### ■ FEATURES

- High Ripple Rejection      75dB typ. (f=1kHz, Vo=3V version)
- Low Output Noise Voltage    Vno=30 $\mu$ Vrms (Cp=0.01 $\mu$ F)
- Output capacitor with 1.0 $\mu$ F ceramic capacitor (Vo $\geq$ 2.7V)
- Output Current                Io(max.)=300mA
- High Precision Output        Vo $\pm$ 1.0%
- Low Dropout Voltage         0.10V typ. (Io=100mA)
- ON/OFF Control                (Active High)
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline                SOT-23-5

### ■ PIN CONFIGURATION

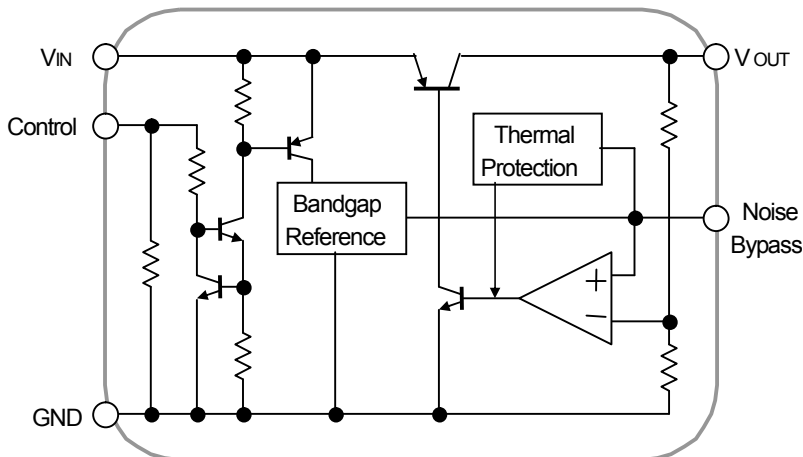


NJM2881F



NJM2882F

### ■ BLOCK DIAGRAM



# NJM2881/82

## ■ OUTPUT VOLTAGE RANK LIST

Device Name	V <sub>OUT</sub>	Device Name	V <sub>OUT</sub>	Device Name	V <sub>OUT</sub>
NJM288*F15	1.5V	NJM288*F29	2.9V	NJM288*F38	3.8V
NJM288*F17	1.7V	NJM288*F03	3.0V	NJM288*F04	4.0V
NJM288*F18	1.8V	NJM288*F31	3.1V	NJM288*F43	4.3V
NJM288*F21	2.1V	NJM288*F32	3.2V	NJM288*F47	4.7V
NJM288*F25	2.5V	NJM288*F33	3.3V	NJM288*F05	5.0V
NJM288*F28	2.8V	NJM288*F345	3.45V		
NJM288*F285	2.85V	NJM288*F35	3.5V		

## ■ 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) 200(*3)	mW
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>=+2.3 ~ +6V (In case of Vo<2.1V)

## ■ 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	-1.0%	-	+1.0%	V
Quiescent Current	I <sub>Q</sub>	Io=0mA, except 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	300	400	-	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 ~ 300mA	-	-	0.03	%/mA
Dropout Voltage	ΔV <sub>LO</sub>	Io=100mA	-	0.10	0.18	V
Ripple Rejection	RR	ein=200mVrms, f=1kHz, Io=10mA, Vo=3V version	-	75	-	dB
Average Temperature Coefficient of Output Voltage	ΔVo/ΔTa	Ta=0 ~ 85°C, Io=10mA	-	± 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

## ■ ELECTRICAL CHARACTERISTICS

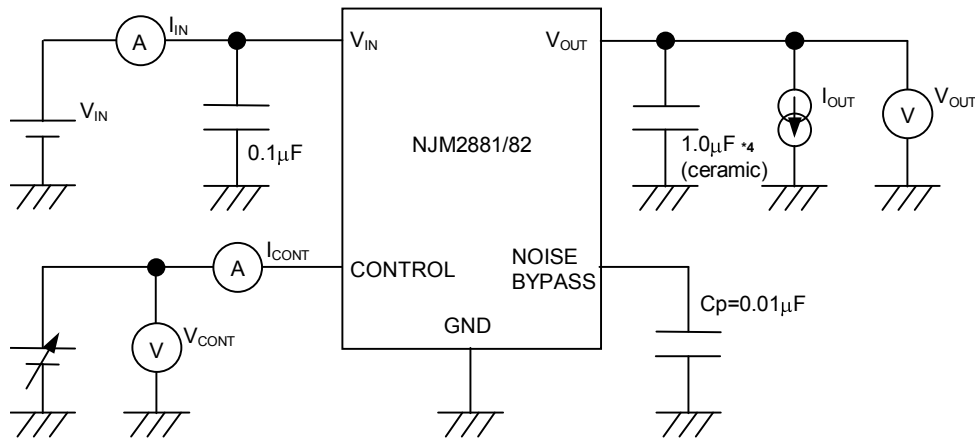
( $V_o \leq 2.0V$  version:  $V_{IN} = V_o + 1V$ ,  $C_{IN} = 0.1\mu F$ ,  $C_o = 2.2\mu F$ ;  $V_o \geq 1.9V$  ( $C_o = 4.7\mu F$ :  $V_o \leq 1.8V$ ),  $C_p = 0.01\mu F$ ,  $T_a = 25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$	$I_o = 30mA$	-1.0%	-	+1.0%	V
Quiescent Current	$I_Q$	$I_o = 0mA$ , except $I_{CONT}$	-	120	180	$\mu A$
Quiescent Current at Control OFF	$I_{Q(OFF)}$	$V_{CONT} = 0V$	-	-	100	nA
Output Current	$I_o$	$V_o = 0.3V$	300	400	-	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	$\Delta V_o / \Delta I_o$	$I_o = 0 \sim 300mA$	-	-	0.03	%/mA
Ripple Rejection	RR	$e_{in} = 200mV_{rms}$ , $f = 1kHz$ , $I_o = 10mA$ , $V_o = 1.8V$ version	-	80	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta V_o / \Delta T_a$	$T_a = 0 \sim 85^\circ C$ , $I_o = 10mA$	-	$\pm 50$	-	ppm/ $^\circ C$
Output Noise Voltage	$V_{NO}$	$f = 10Hz \sim 80kHz$ , $I_o = 10mA$ , $V_o = 1.8V$ version	-	20	-	$\mu V_{rms}$
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.

## ■ TEST CIRCUIT

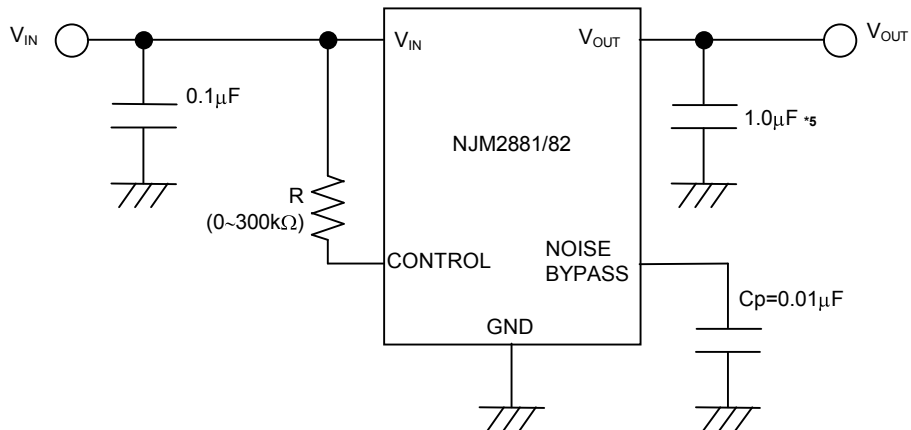


\*4  $1.9V \leq V_o \leq 2.6V$  version:  $C_o = 2.2\mu F$  (ceramic)  
 $V_o \leq 1.8V$  version:  $C_o = 4.7\mu F$  (ceramic)

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## ■ TYPICAL APPLICATION

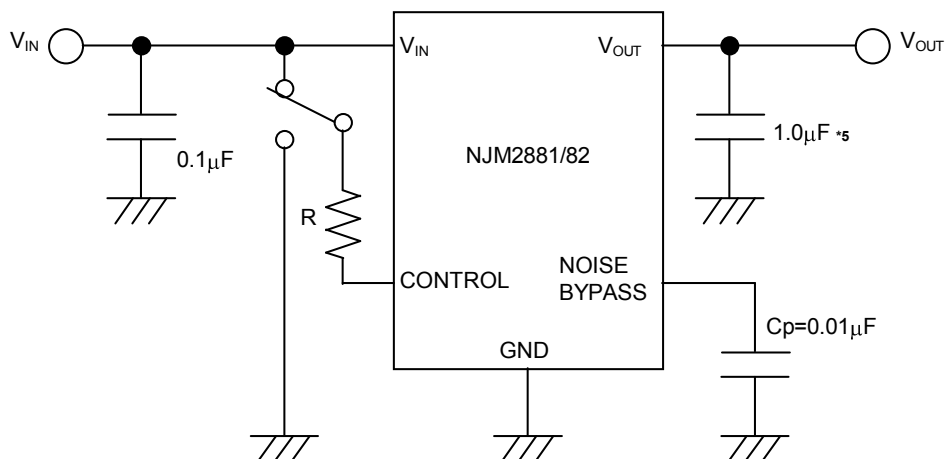
① In the case where ON/OFF Control is not required:



\*5 1.9V ≤ Vo ≤ 2.6V version: Co=2.2µF  
Vo ≤ 1.8V version: Co=4.7µF

Connect control terminal to V<sub>IN</sub> terminal

② In use of ON/OFF CONTROL:



\*5 1.9V ≤ Vo ≤ 2.6V version: Co=2.2µF  
Vo ≤ 1.8V version: Co=4.7µF

State of control terminal:

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

### \*Noise bypass Capacitance Cp

Noise bypass capacitance 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 value of 0.01µF greater to avoid the problem.

### \*In the case of using a resistance "R" between V<sub>IN</sub> and control.

If this resistor is inserted, the control current could be reduced when the control voltage is high.

The applied voltage to control pin 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 resistor "R" should be selected to consider the temperature characteristics.

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

The input capacitor  $C_{IN}$  is required in order to prevent oscillation and reduce power supply ripple of applications when high power supply impedance or a long power supply line.

Therefore, the recommended capacitance (refer to conditions of ELECTRIC CHARACTERISTIC) or larger input capacitor, connected between  $V_{IN}$  and GND as short path as possible, is recommended in order to avoid the problem.

## \*Output Capacitor $C_O$

The output capacitor  $C_O$  is required for a phase compensation of the internal error amplifier, and the capacitance and the equivalent series resistance (ESR) influence stable operation of the regulator.

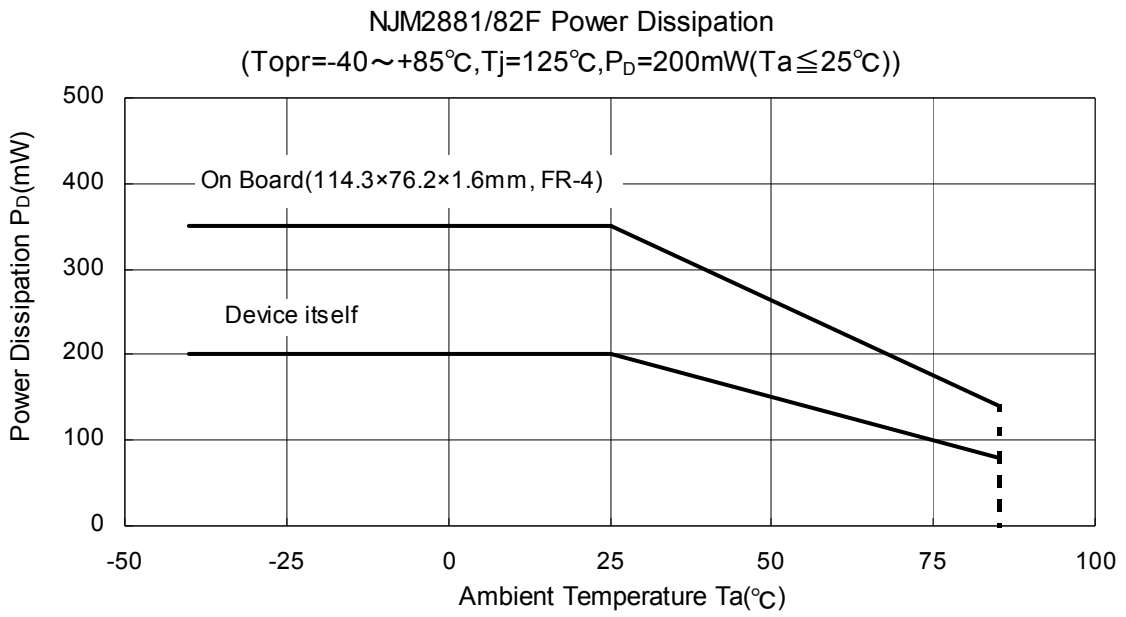
If use a smaller output capacitor than the recommended capacitance (refer to conditions of ELECTRIC CHARACTERISTIC), it may cause excess output noise or oscillation of the regulator due to lack of the phase compensation. Therefore, the recommended capacitance or larger output capacitor, connected between  $V_{OUT}$  and GND as short path as possible, is recommended for stable operation. The recommended capacitance may be different by output voltage, therefore confirm the recommended capacitance of the required output voltage.

Furthermore, a larger output capacitor reduces output noise and ripple output, and also improves Output Transient Response when a load changes rapidly.

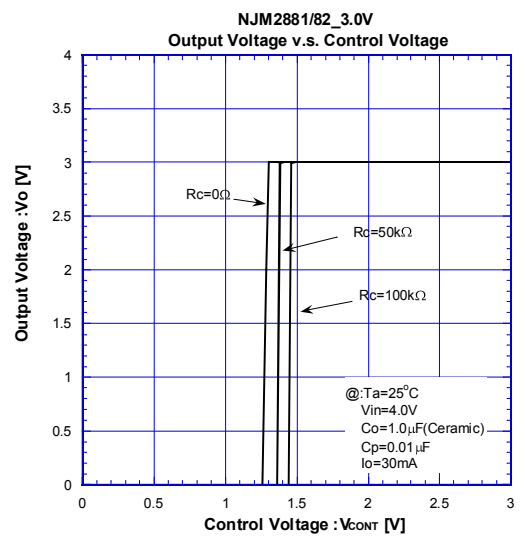
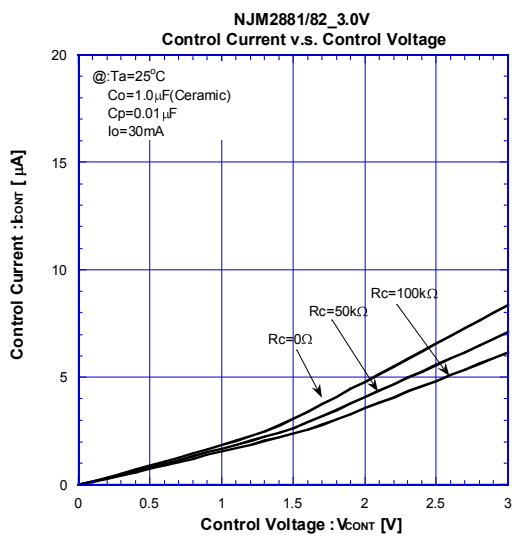
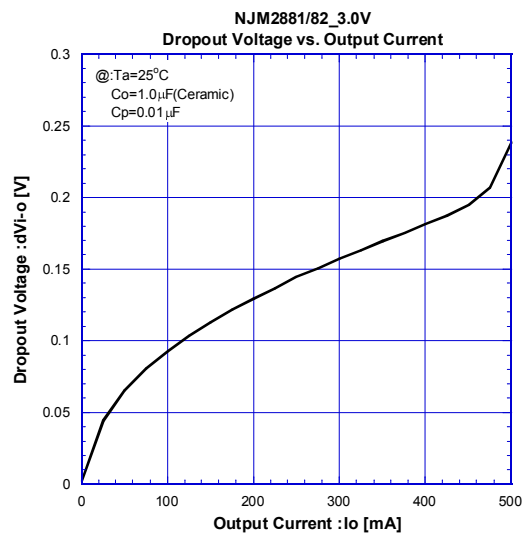
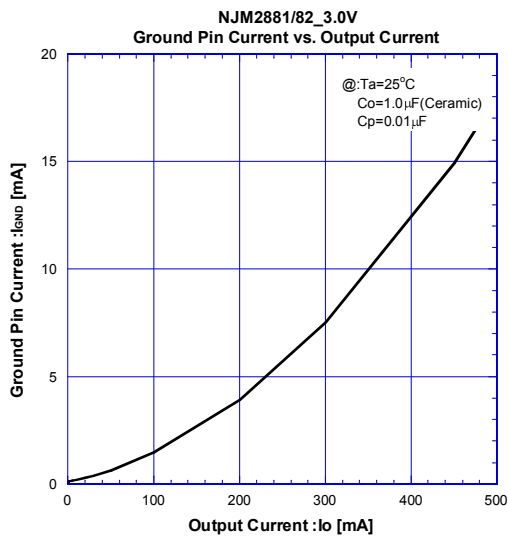
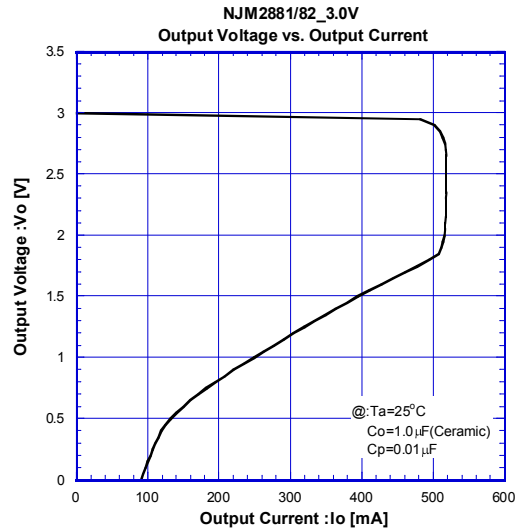
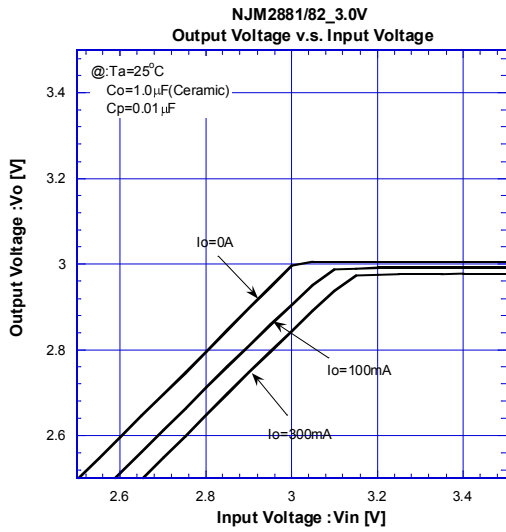
Selecting the output capacitor, should consider varied characteristics of a capacitor: frequency characteristics, temperature characteristics, DC bias characteristics and so on. Therefore, the capacitor that has a sufficient margin of the rated voltage against the output voltage and superior temperature characteristics, is recommended for  $C_O$ .

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## POWER DISSIPATION vs. AMBIENT TEMPERATURE

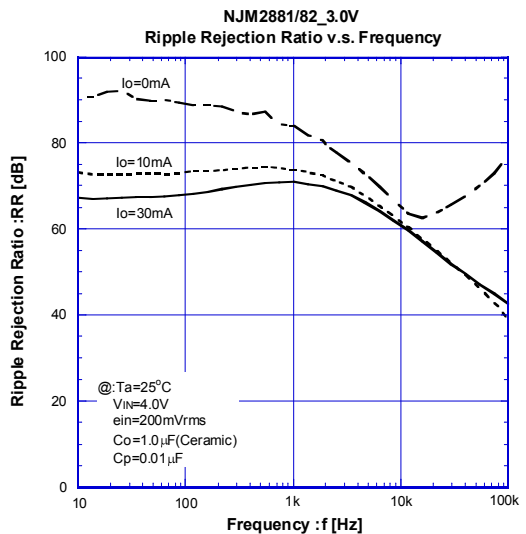
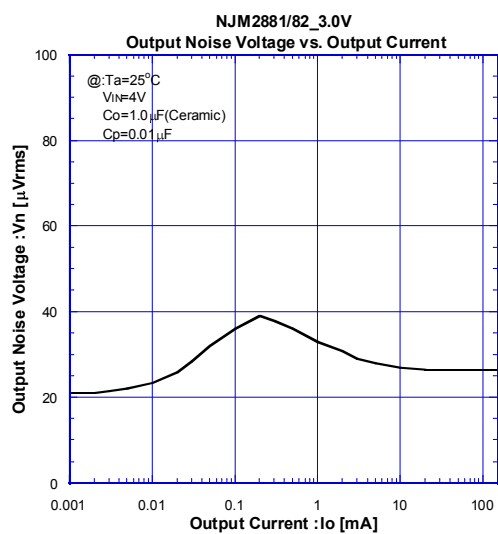
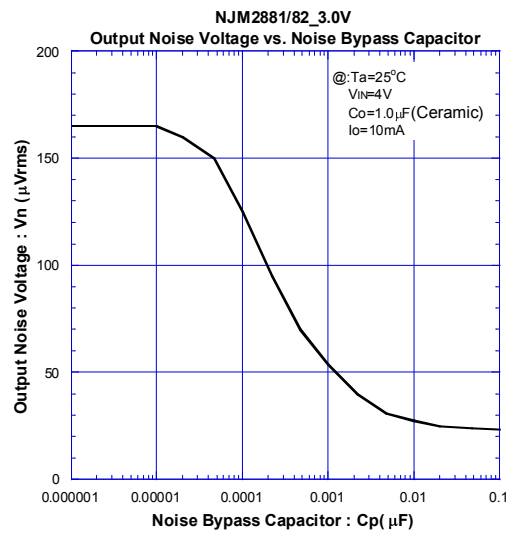
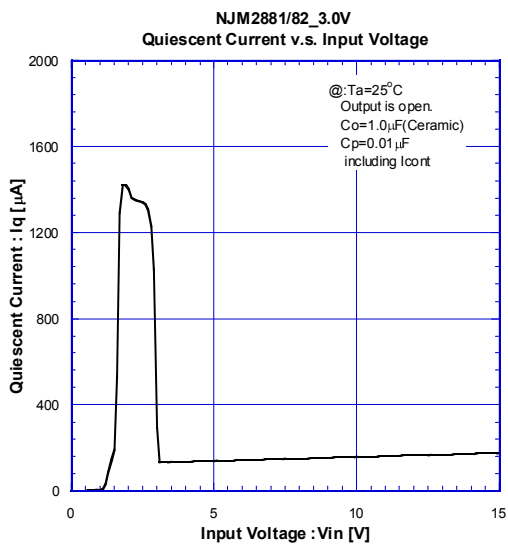
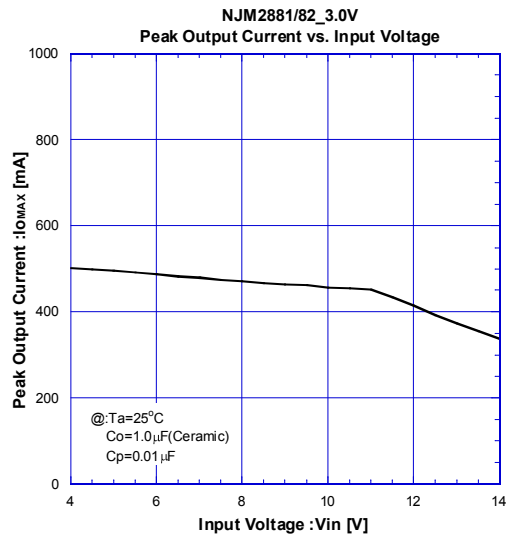
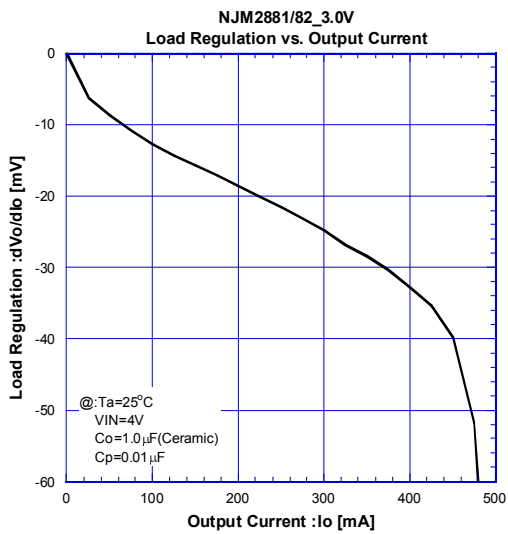


## ELECTRICAL CHARACTERISTICS

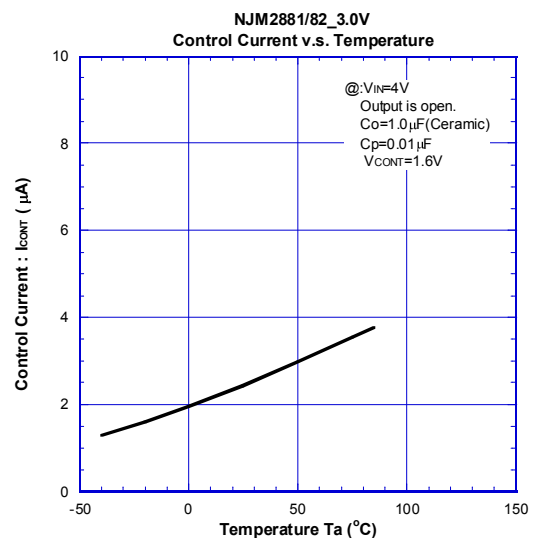
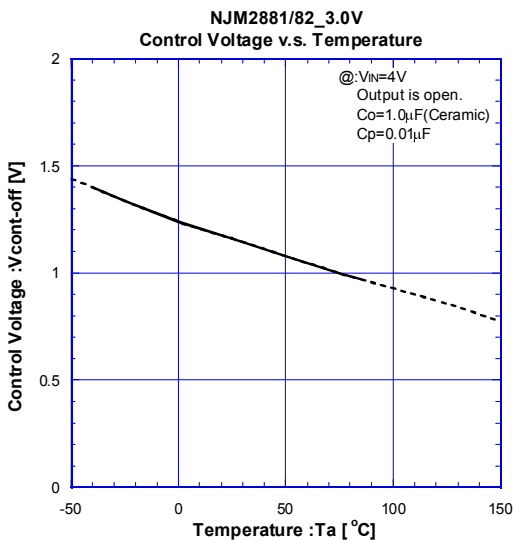
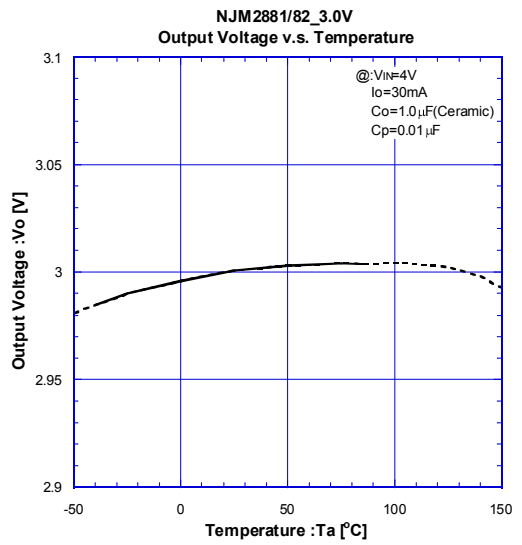
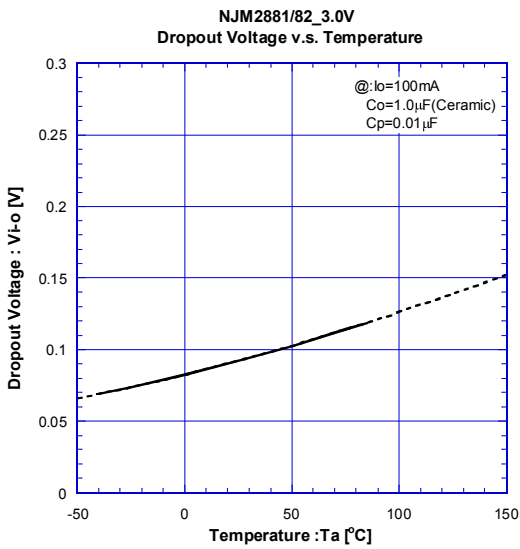
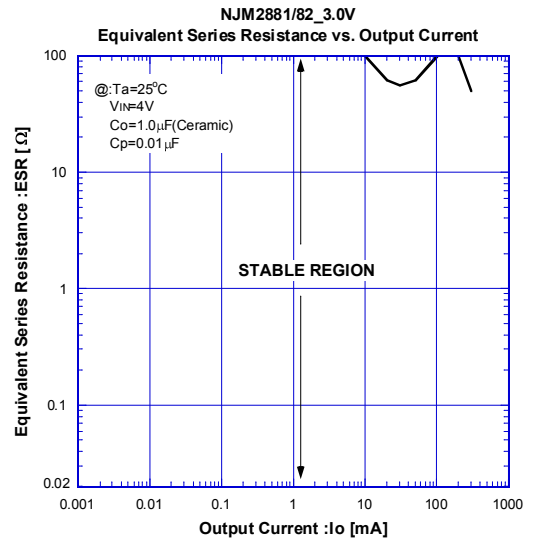
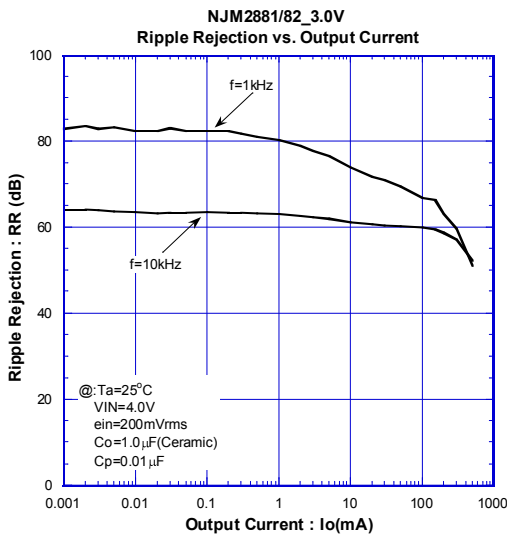


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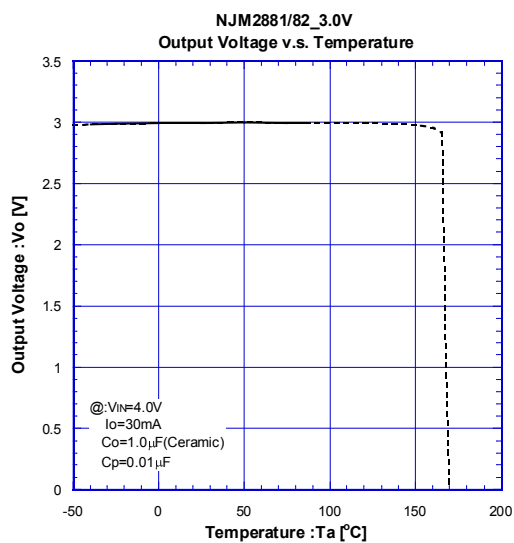
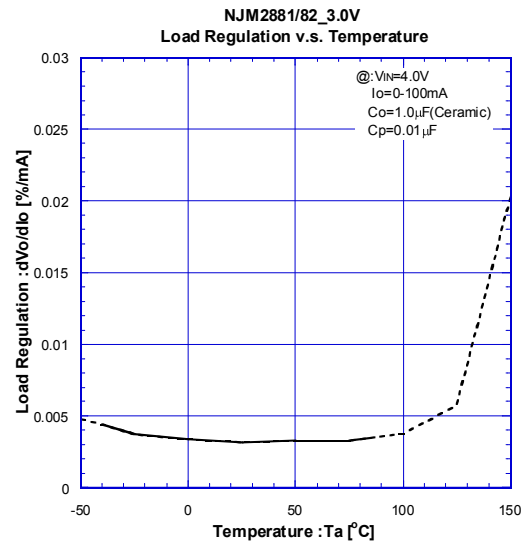
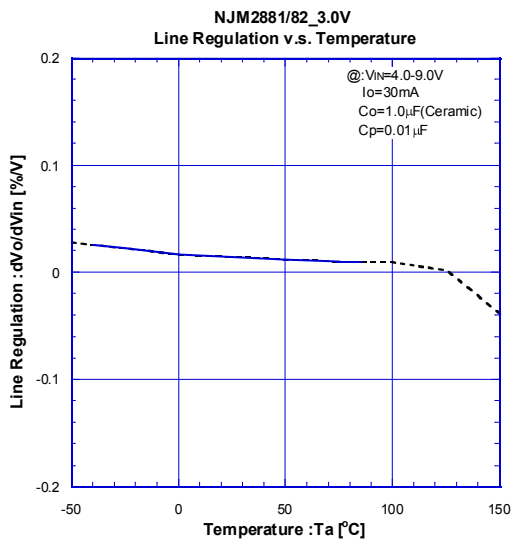
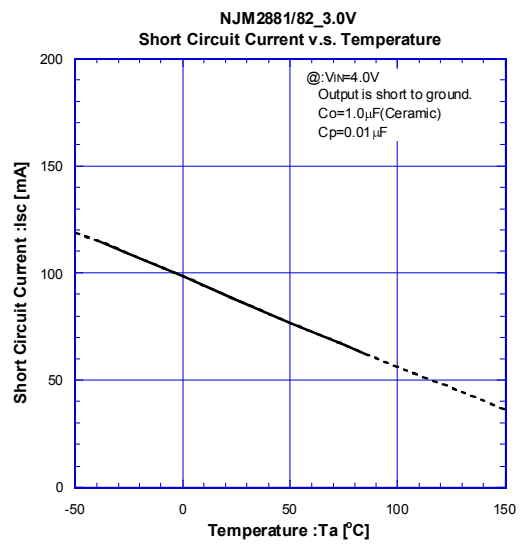
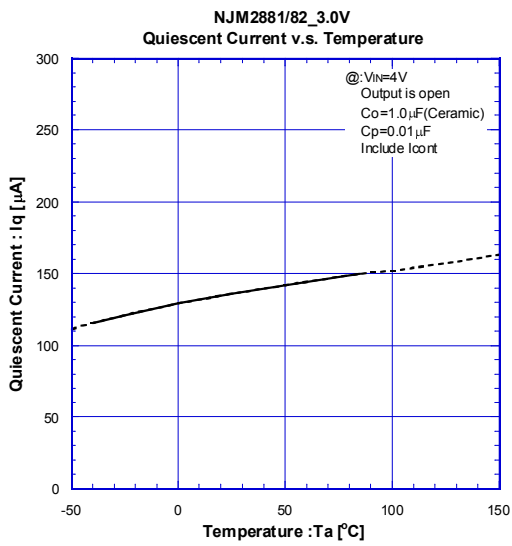


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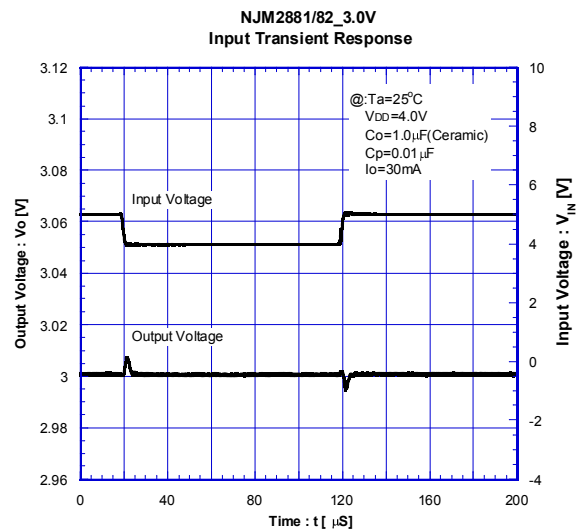
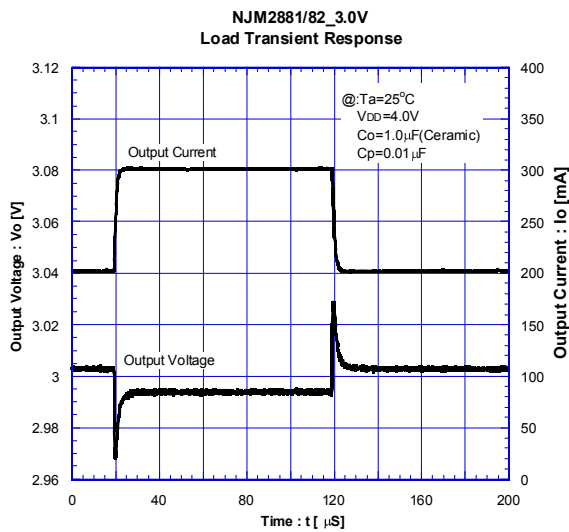
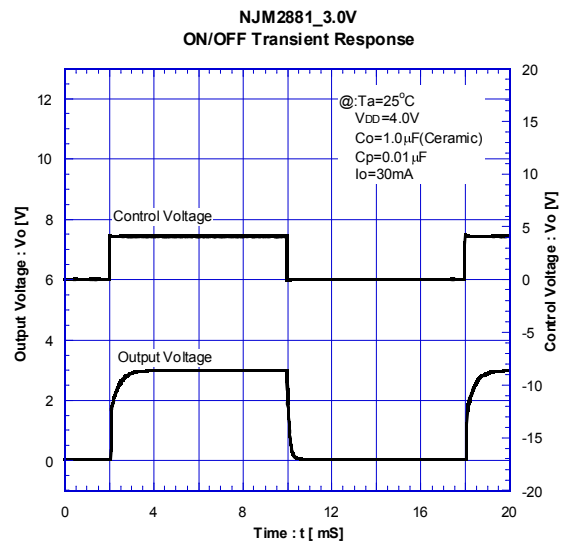
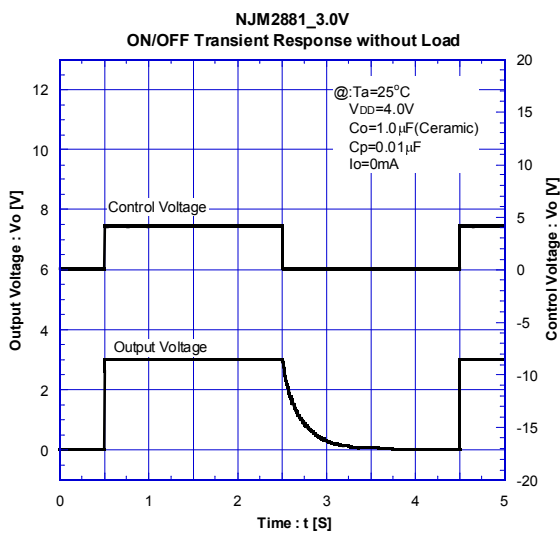


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## ELECTRICAL CHARACTERISTICS



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