LOW DROPOUT VOLTAGE REGULATOR

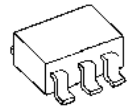
■ GENERAL DESCRIPTION

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 1.0µF ceramic capacitor is available. Therefore it is suitable for cellular phone, camcorder, IC decoder, camera, and other portable items.

■ PACKAGE OUTLINE

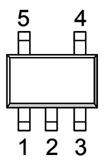


NJM2881/82F

■ FEATURES

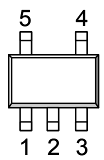
- High Ripple Rejection 75dB typ. (f=1kHz ,Vo=3V version)
- Low Output Noise Voltage Vno=30µVrms (Cp=0.01µF)
- Output capacitor with 1.0µF ceramic capacitor (Vo≥2.7V)
- Output Current Io(max.)=300mA
- High Precision Output Vo±1.0%
- Low Dropout Voltage 0.10V typ. (Io=100mA)
- ON/OFF Control (Active High)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

■ PIN CONFIGURATION



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

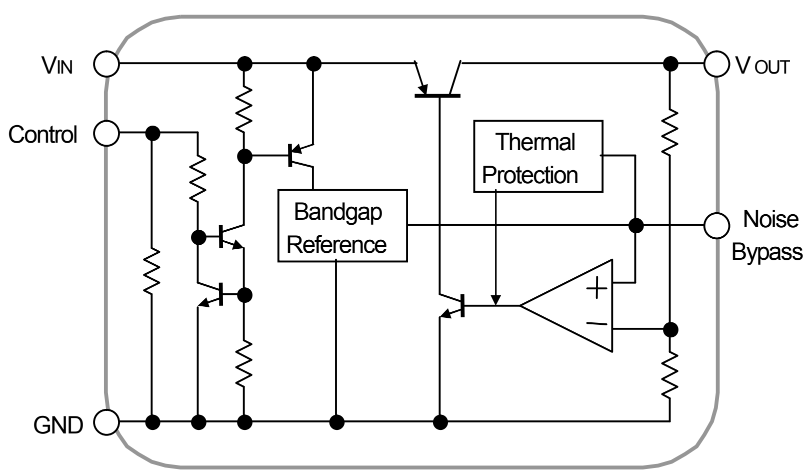
NJM2881F



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

NJM2882F

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}	Device Name	V_{OUT}	Device Name	V_{OUT}
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_{IN}	+14		V
Control Voltage	V_{CONT}	+14(*1)		V
Power Dissipation	P_D	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_{IN}=+2.3 ~ +6V (In case of Vo<2.1V)

■ ELECTRICAL CHARACTERISTICS

(Vo>2.0V version: V_{IN}=Vo+1V, C_{IN}=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_Q	Io=0mA, except Icont	-	120	180	µA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V	-	-	100	nA
Output Current	Io	Vo-0.3V	300	400	-	mA
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V ~ Vo+6V, Io=30mA	-	-	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 ~ 300mA	-	-	0.03	%/mA
Dropout Voltage	ΔV_{I-O}	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	$\Delta Vo/\Delta Ta$	Ta=0 ~ 85°C, Io=10mA	-	±50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz ~ 80kHz, Io=10mA, Vo=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

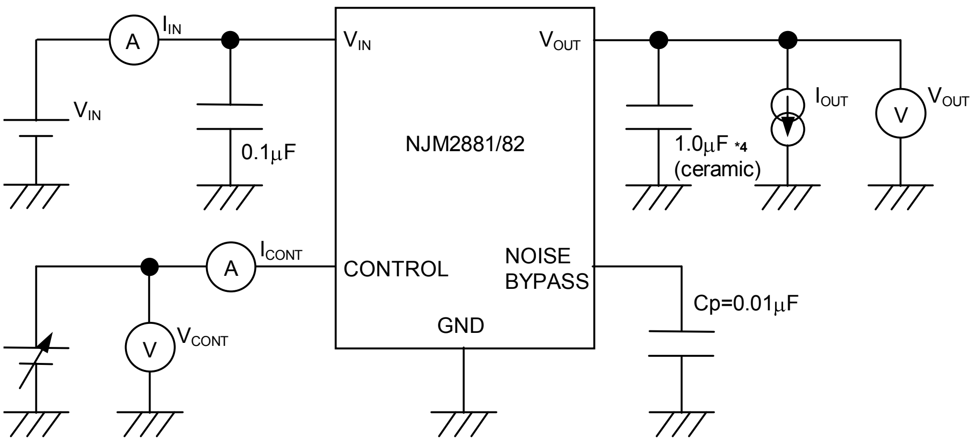
■ ELECTRICAL CHARACTERISTICS

($Vo \leq 2.0V$ version: V_{IN}=Vo+1V, C_{IN}=0.1μF, Co=2.2μF: $Vo \geq 1.9V$ (Co=4.7μF: $Vo \leq 1.8V$), 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_Q	Io=0mA, except I_{CONT}	-	120	180	μA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V	-	-	100	nA
Output Current	Io	Vo-0.3V	300	400	-	mA
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V ~ Vo+6V, Io=30mA	-	-	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 ~ 300mA	-	-	0.03	%/mA
Ripple Rejection	RR	ein=200mVrms,f=1kHz,Io=10mA, Vo=1.8V version	-	80	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta Ta$	Ta=0 ~ 85°C, Io=10mA	-	±50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz ~ 80kHz, Io=10mA, Vo=1.8V version	-	20	-	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.

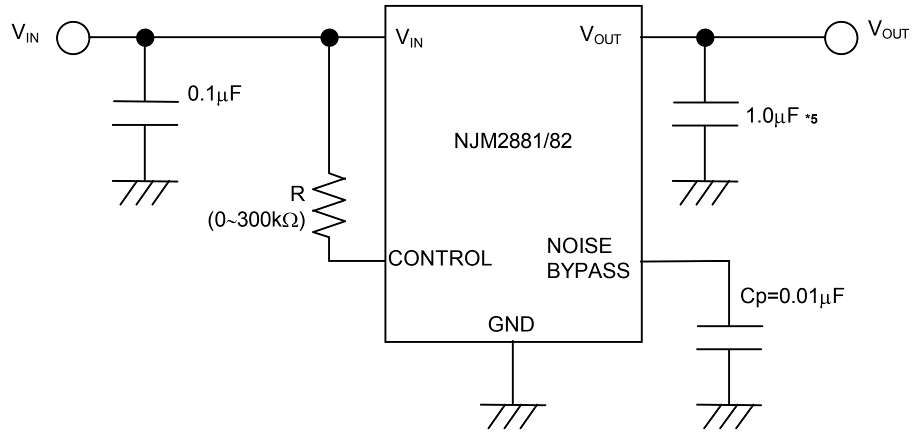
■ TEST CIRCUIT



*4 1.9V ≤ Vo ≤ 2.6V version: Co=2.2μF(ceramic)
Vo ≤ 1.8V version: Co=4.7μF(ceramic)

■ TYPICAL APPLICATION

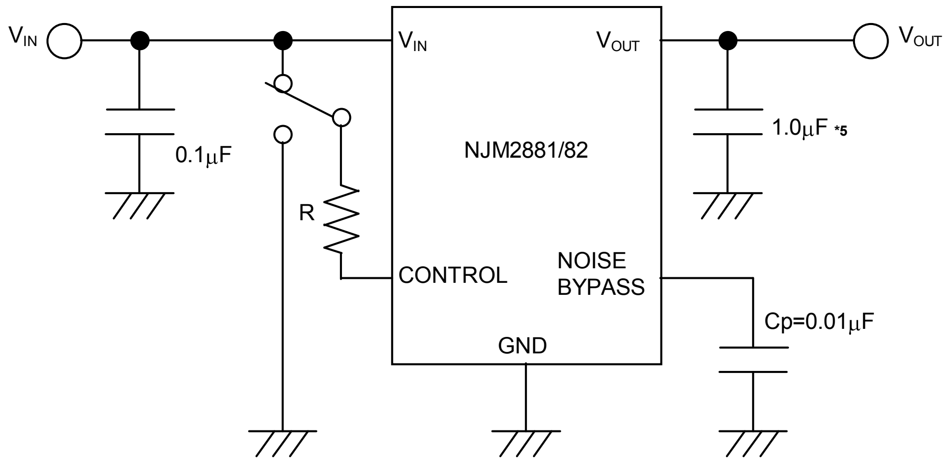
① In the case where ON/OFF Control is not required:



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

Connect control terminal to V_{IN} 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_{IN} 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 $V_{CONT\,(ON)}$ and I_{CONT} 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

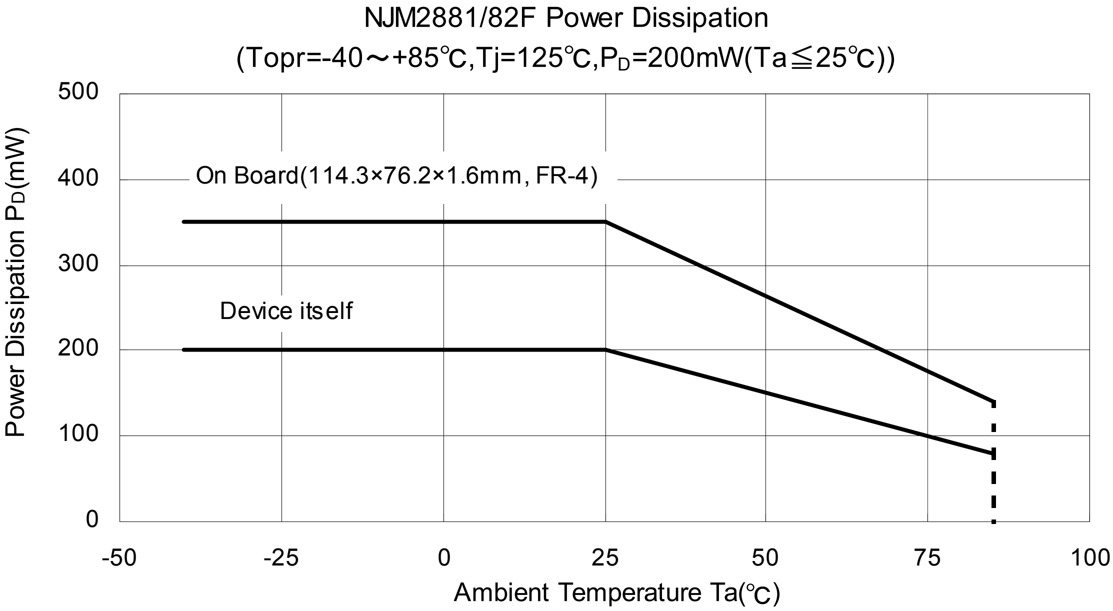
The output capacitor C_O is required for a phase compensation of the internal error amplifier, and the capacitance and the equivalent series resistance (ESR) influence stable operation of the regulator.

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.

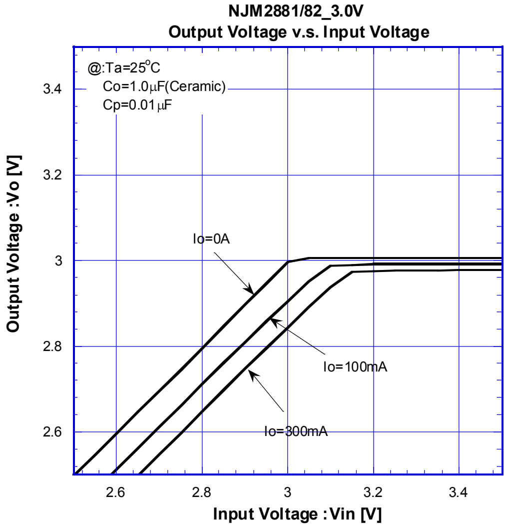
Furthermore, a larger output capacitor reduces output noise and ripple output, and also improves Output Transient Response when a load changes rapidly.

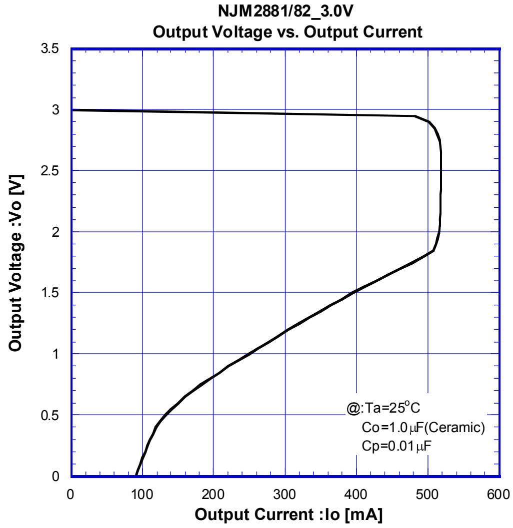
Selecting the output capacitor, should consider varied characteristics of a capacitor: frequency characteristics, temperature characteristics, DC bias characteristics and so on. Therefore, the capacitor that has a sufficient margin of the rated voltage against the output voltage and superior temperature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

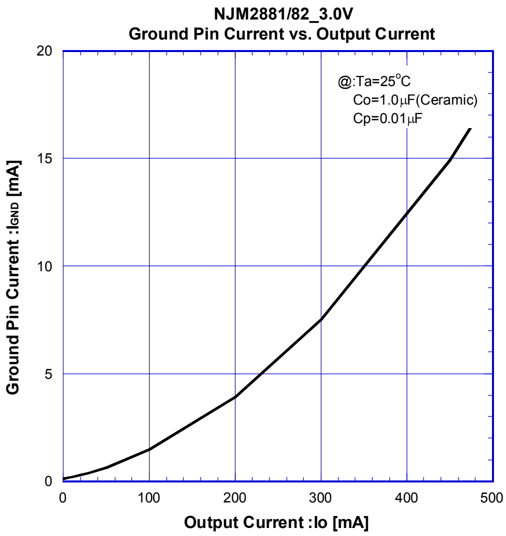
■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

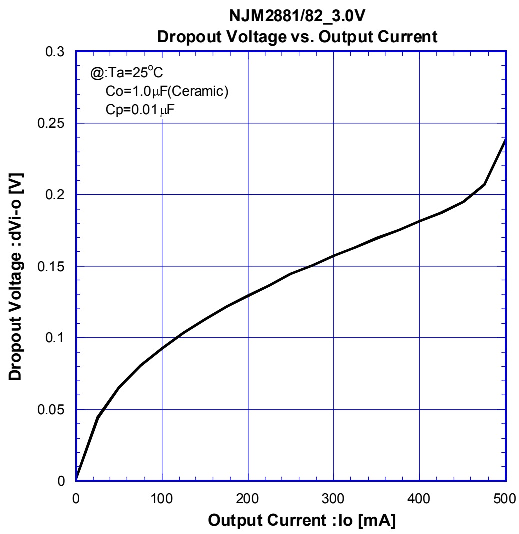


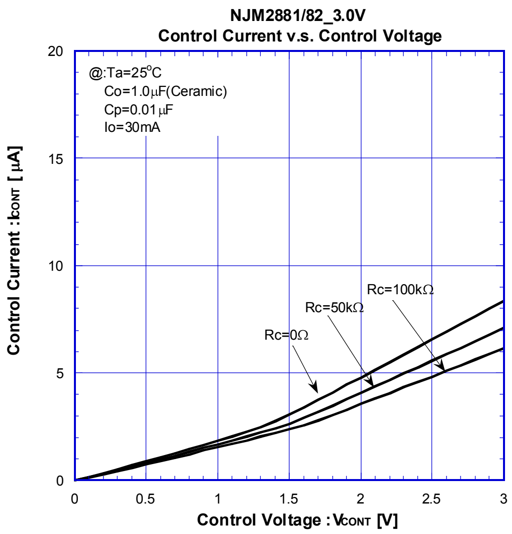
■ ELECTRICAL CHARACTERISTICS

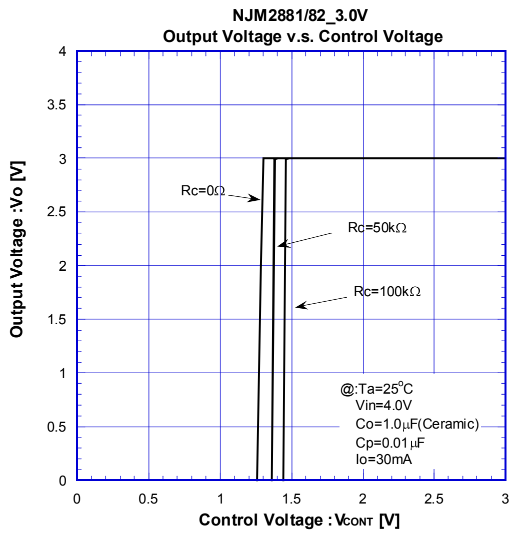






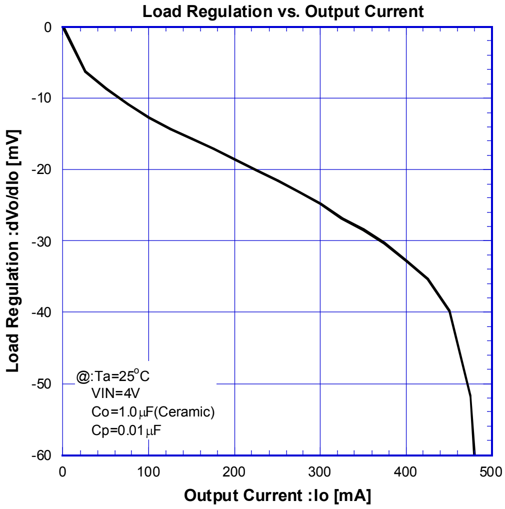




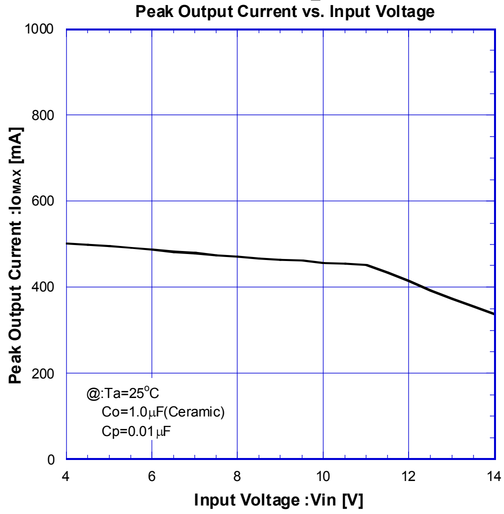


■ ELECTRICAL CHARACTERISTICS

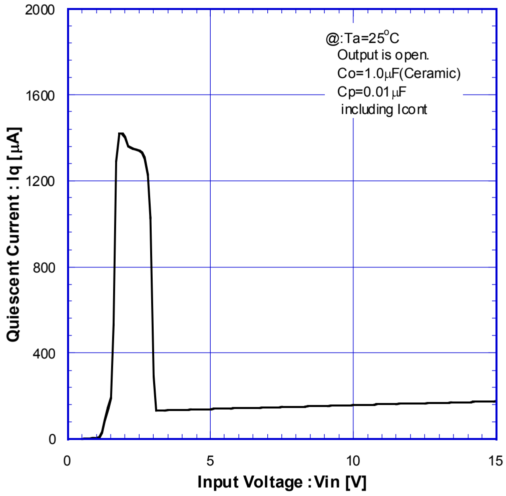
NJM2881/82_3.0V
Load Regulation vs. Output Current



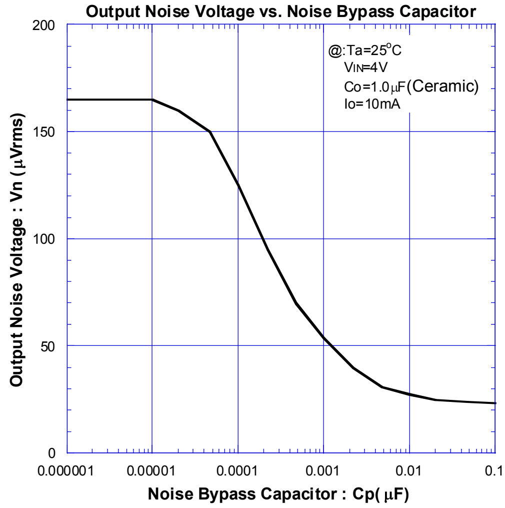
NJM2881/82_3.0V
Peak Output Current vs. Input Voltage



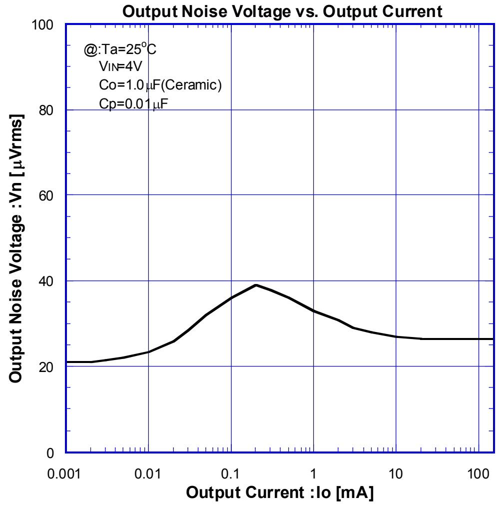
NJM2881/82_3.0V
Quiescent Current v.s. Input Voltage



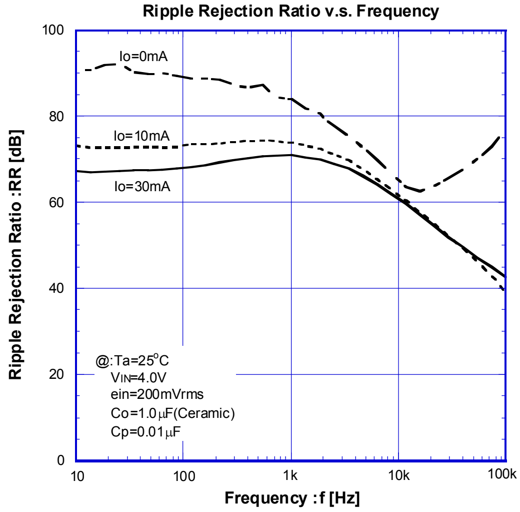
NJM2881/82_3.0V
Output Noise Voltage vs. Noise Bypass Capacitor



NJM2881/82_3.0V
Output Noise Voltage vs. Output Current

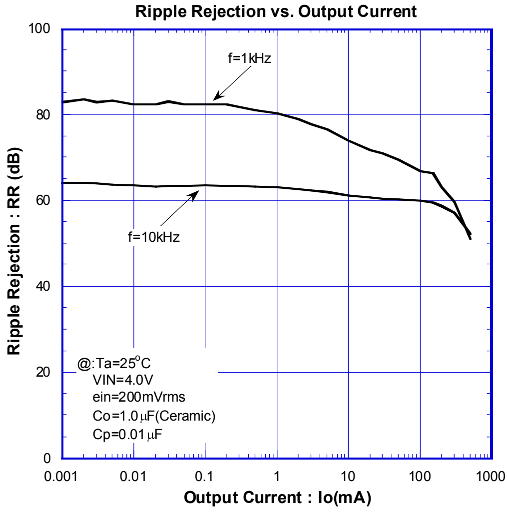


NJM2881/82_3.0V
Ripple Rejection Ratio v.s. Frequency

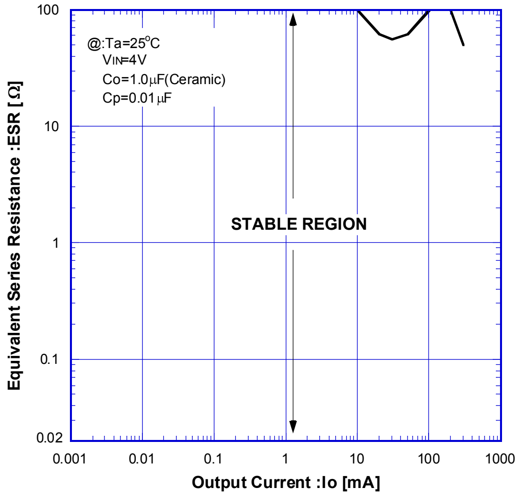


■ ELECTRICAL CHARACTERISTICS

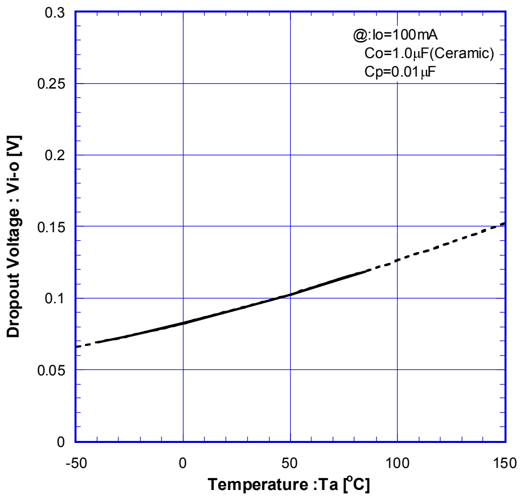
NJM2881/82_3.0V
Ripple Rejection vs. Output Current



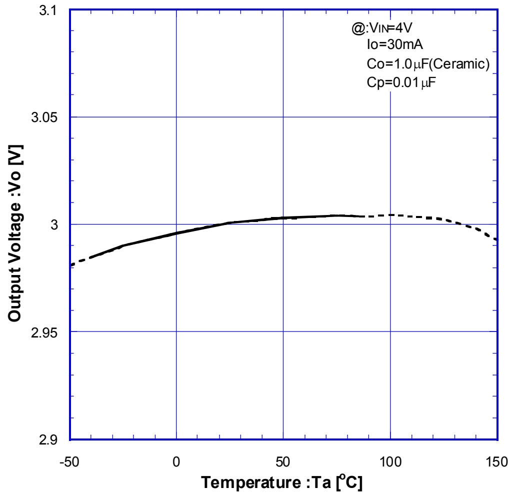
NJM2881/82_3.0V
Equivalent Series Resistance vs. Output Current



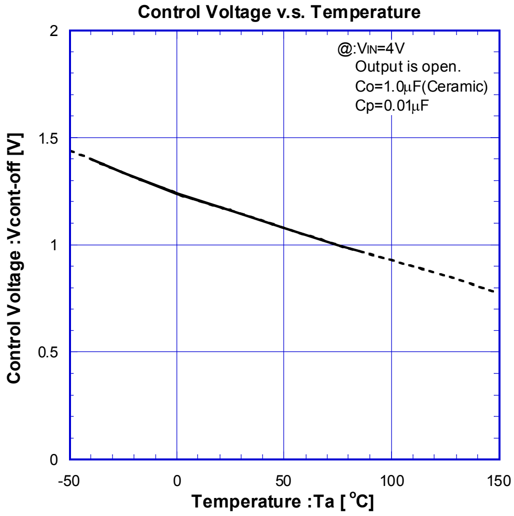
NJM2881/82_3.0V
Dropout Voltage v.s. Temperature



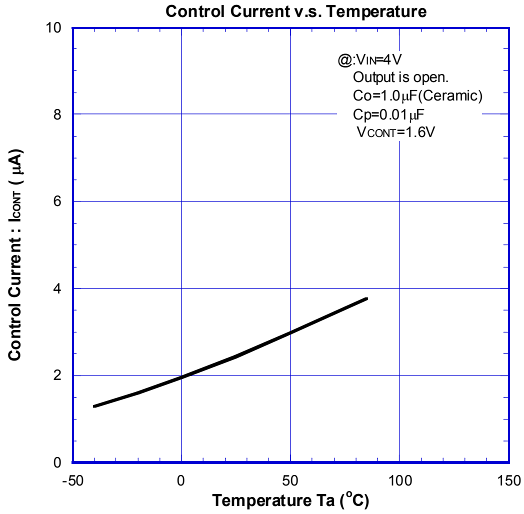
NJM2881/82_3.0V
Output Voltage v.s. Temperature



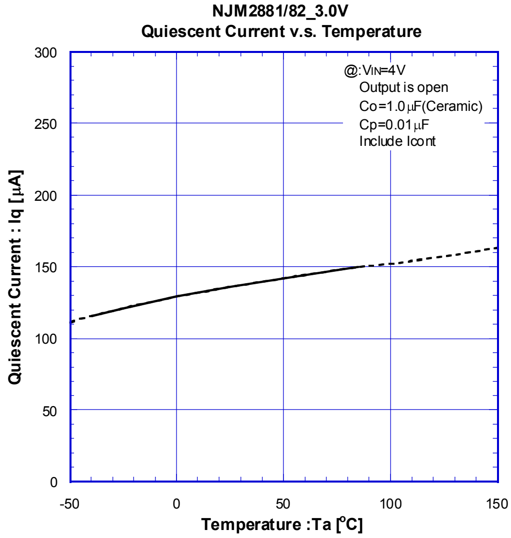
NJM2881/82_3.0V
Control Voltage v.s. Temperature

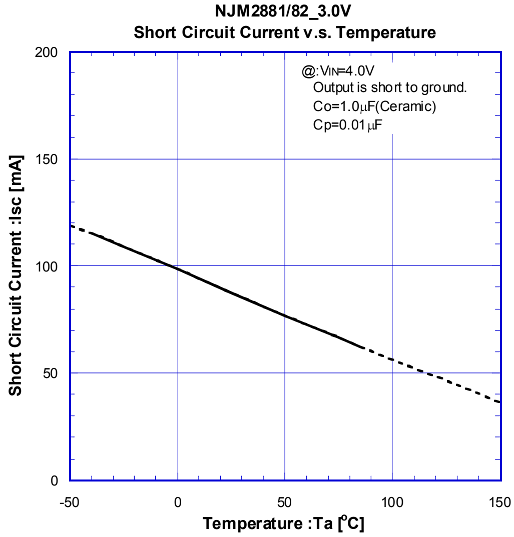


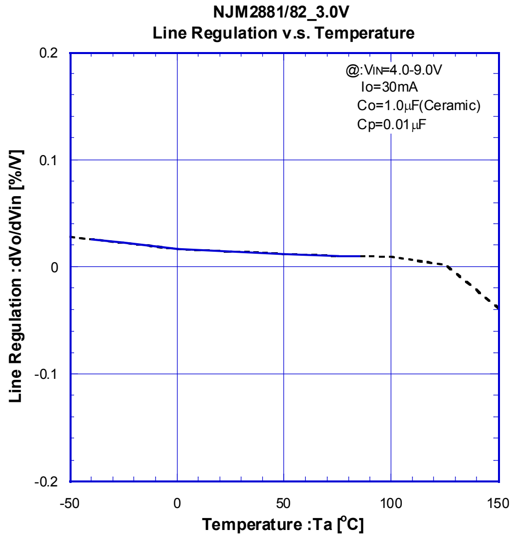
NJM2881/82_3.0V
Control Current v.s. Temperature

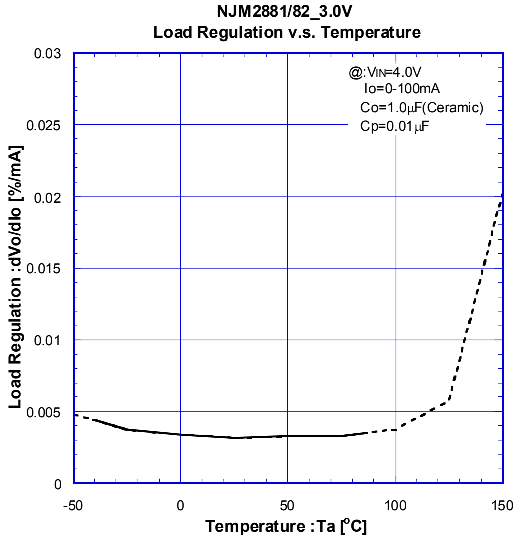


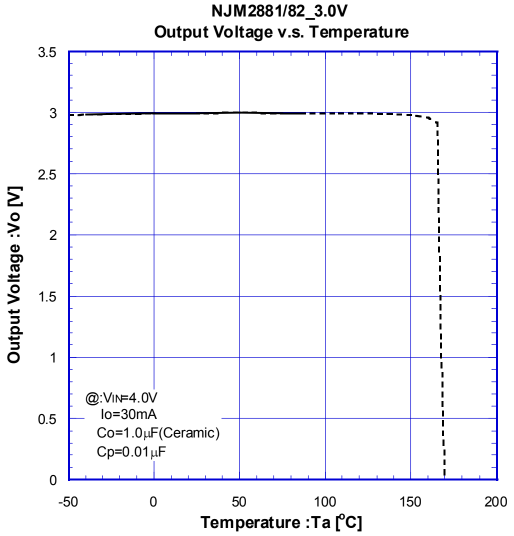
■ ELECTRICAL CHARACTERISTICS











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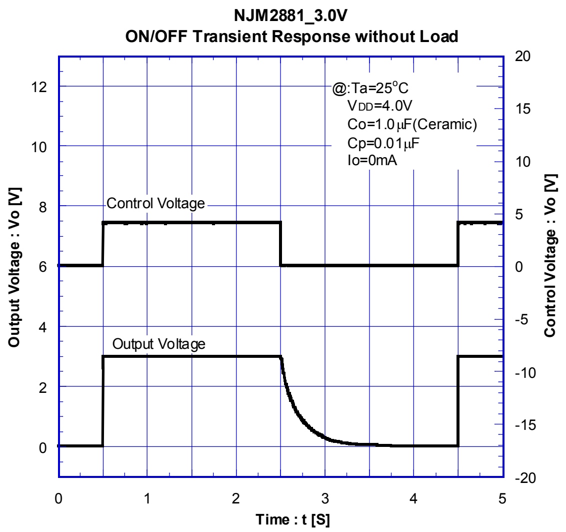

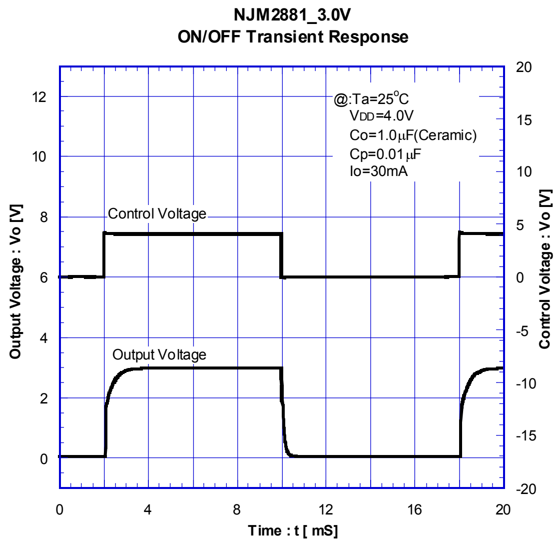

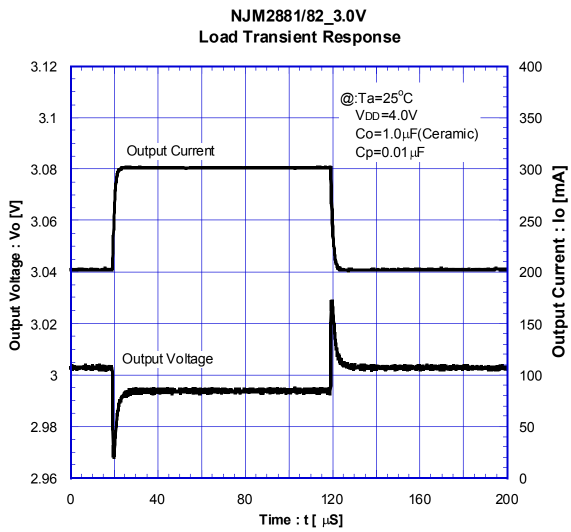

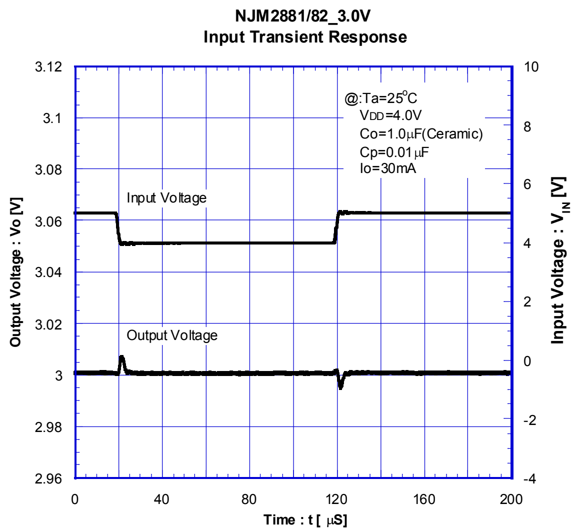

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