Low Dropout Voltage Regulator

■ GENERAL DESCRIPTION

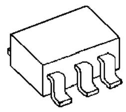
The NJM2877 is a 150mA output low dropout voltage regulator with ON/OFF control.

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

Package line-up is very small package: SC88A and standard package: SOT23-5.

Small packaging and 0.47µF small decoupling capacitor make the NJM2877 suitable for space conscious applications.

■ PACKAGE OUTLINE



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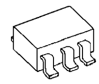
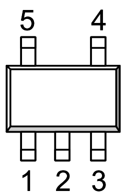


NJM2877F3

■ FEATURES

- High Ripple Rejection 75dB typ. (f=1kHz Vo=3V version)
- Output Noise Voltage Vno=30µVrms typ. (Cp=0.01µF)
- Output capacitor with 0.47µF ceramic capacitor (Vo≥2.7V Version)
- Output Current Io(max.)=150mA
- High Precision Output Vo ±1.0%
- Low Dropout Voltage 0.10V typ. (Io=60mA)
- ON/OFF Control (Active High)
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Bipolar Technology
- Package Outline SC88A, SOT23-5

■ PIN CONFIGURATION



1. CONTROL
2. GND
3. NOISE BYPASS
4. V_{OUT}
5. V_{IN}

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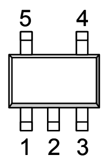
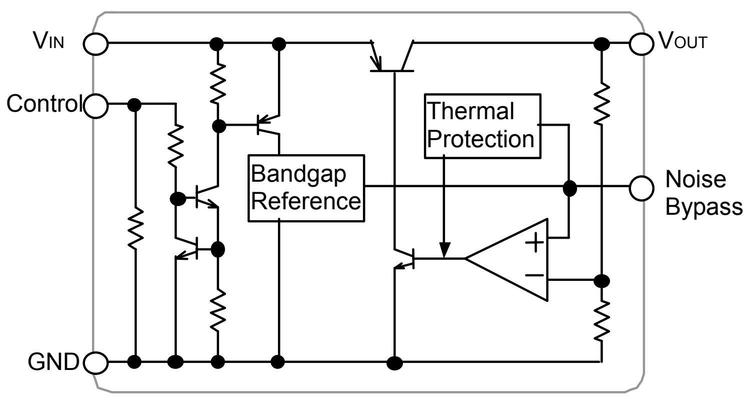


1. CONTROL
2. GND
3. NOISE BYPASS
4. V_{OUT}
5. V_{IN}

NJM2877F3

■ EQUIVALENT CIRCUIT



■ OUTPUT VOLTAGE RANK LIST

SC88A Package

Device Name	V_{out}	Device Name	V_{out}
NJM2877F3 -15	1.5V	NJM2877F3 -33	3.3V
NJM2877F3 -18	1.8V	NJM2877F3 -34	3.4V
NJM2877F3 -21	2.1V	NJM2877F3 -345	3.45V
NJM2877F3 -22	2.2V	NJM2877F3 -35	3.5V
NJM2877F3 -23	2.3V	NJM2877F3 -355	3.55V
NJM2877F3 -24	2.4V	NJM2877F3 -36	3.6V
NJM2877F3 -25	2.5V	NJM2877F3 -38	3.8V
NJM2877F3 -255	2.55V	NJM2877F3 -04	4.0V
NJM2877F3 -26	2.6V	NJM2877F3 -42	4.2V
NJM2877F3 -27	2.7V	NJM2877F3 -45	4.5V
NJM2877F3 -28	2.8V	NJM2877F3 -46	4.6V
NJM2877F3 -285	2.85V	NJM2877F3 -47	4.7V
NJM2877F3 -29	2.9V	NJM2877F3 -48	4.8V
NJM2877F3 -03	3.0V	NJM2877F3 -05	5.0V
NJM2877F3 -31	3.1V		
NJM2877F3 -32	3.2V		

SOT23-5 Package

Device Name	V_{out}
NJM2877F15	1.5V
NJM2877F28	2.8V
NJM2877F03	3.0V
NJM2877F33	3.3V
NJM2877F05	5.0V

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS		UNIT
Input Voltage	V_{IN}	+10		V
Control Voltage	V_{CONT}	+10(*1)		V
Power Dissipation	P_D	SC88A	250(*2)	mW
		SOT23-5	350(*2)	
			200(*3)	
Operating Temperature	Topr	–40 ~ +85		°C
Storage Temperature	Tstg	–40 ~ +125		°C

(*1): When input voltage is less than +10V, the absolute maximum control voltage is equal to the input voltage.
(*2): Mounted on glass epoxy board based on EIA/JEDEC. (114.3 × 76.2 × 1.6mm: 2Layers FR-4)
(*3): Device itself.

■ Operating voltage

V_{IN}=+2.3 ~ +9V (In case of Vo<2.1V version)

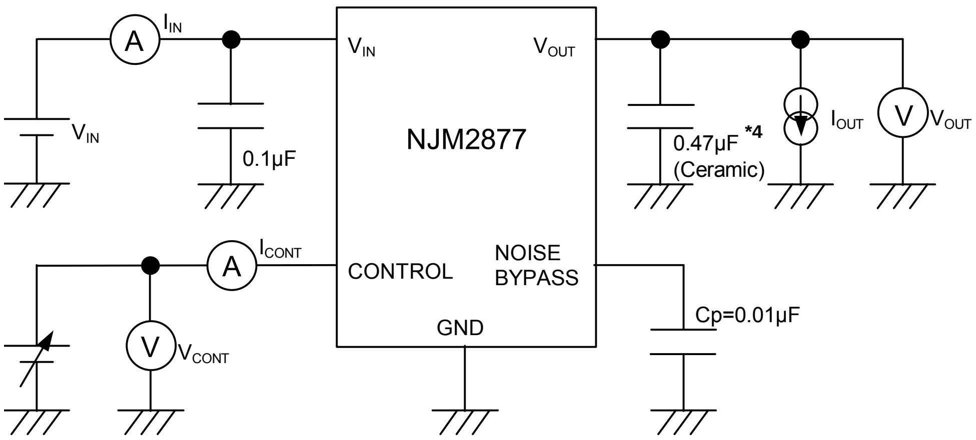
■ ELECTRICAL CHARACTERISTICS

(V_{IN}=Vo+1V, C_{IN}=0.1µF, Co=0.47µF: Vo≥2.7V (Co=1.0µF : 1.8V<Vo≤2.6V, Co=2.2µF : Vo≤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
Input Voltage	V_{IN}		–	–	9	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	150	200	–	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 ~ 100mA	–	–	0.03	%/mA
Dropout Voltage (*4)	ΔV_{I-O}	Io=60mA	–	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 Current	I_{CONT}	V_{CONT}=1.6V	–	3	12	µA
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	–	–	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$		–	–	0.6	V

(*4): The output voltage excludes under 2.1V.
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.

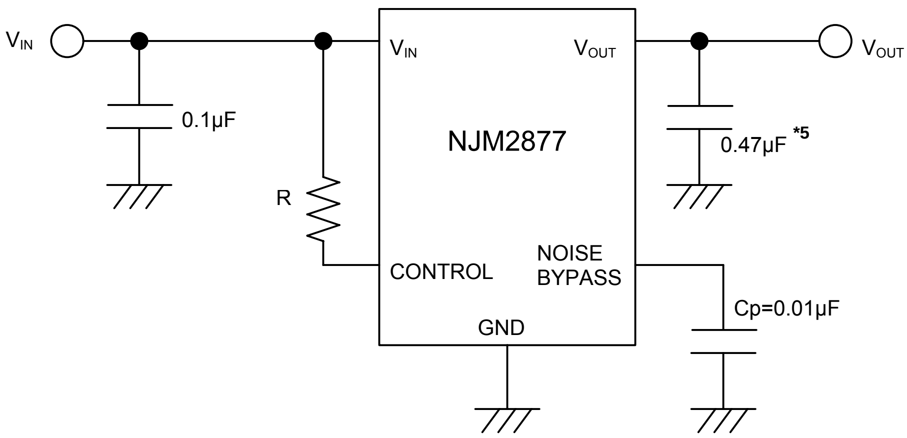
■ TEST CIRCUIT



*4: 1.8V<Vo≤2.6V version: Co=1.0µF(Ceramic)
Vo≤1.8V version: Co=2.2µF(Ceramic)

■ TYPICAL APPLICATIONS

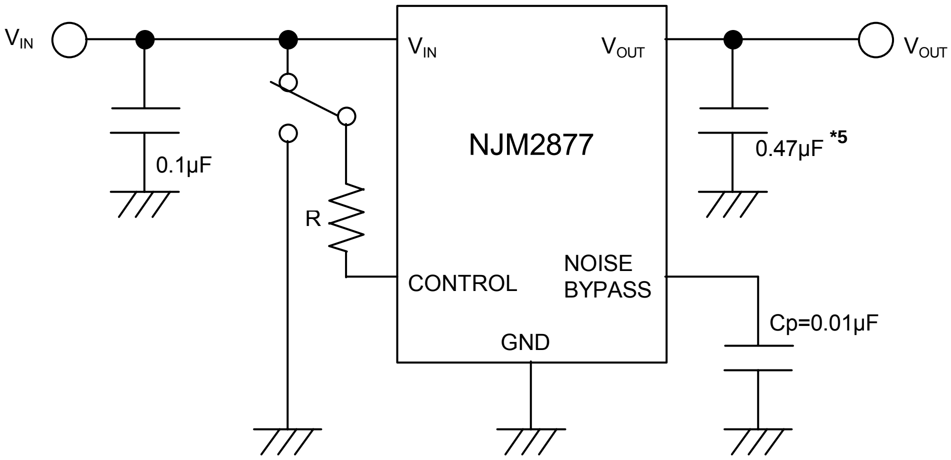
① In the case where ON/OFF Control is not required:



*5: 1.8V<Vo≤2.6V version: Co=1.0µF
Vo≤1.8V version: Co=2.2µF

Connect control terminal to V_{IN} terminal

② In use of ON/OFF CONTROL:



*5 : 1.8V<Vo≤2.6V version : Co=1.0µF
Vo≤1.8V version : Co=2.2µF

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.

∗Input Capacitance C_{IN}

Input Capacitance C_{IN} is required to prevent oscillation and reduce power supply ripple for applications with high power supply impedance or a long power supply line.
Use the C_{IN} value of 0.1µF greater to avoid the problem.
C_{IN} should connect between GND and V_{IN} as short as possible.

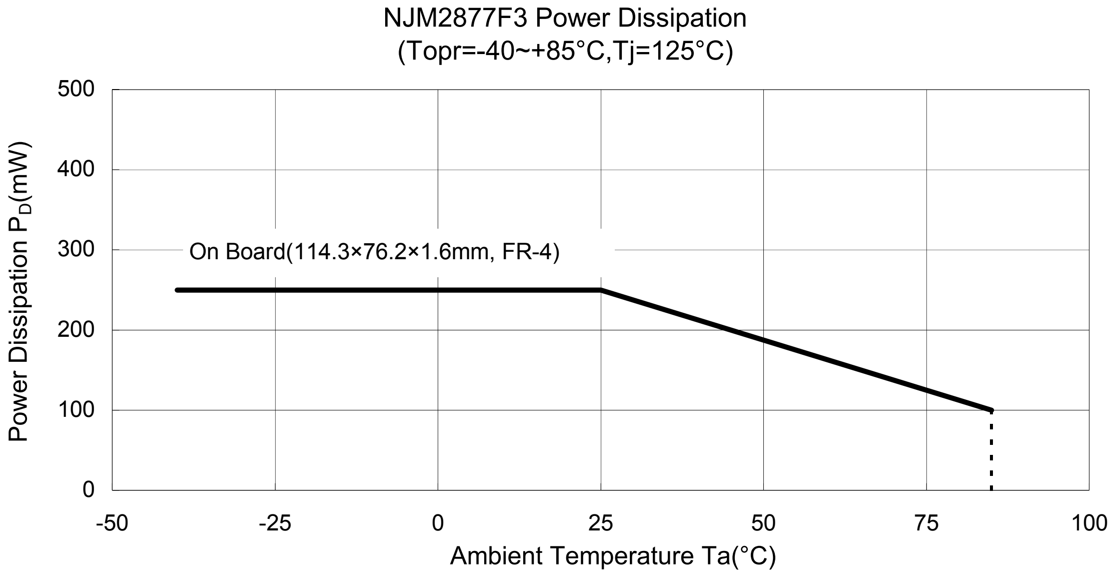
∗In the case of using a resistance "R" between V_{IN} and control.

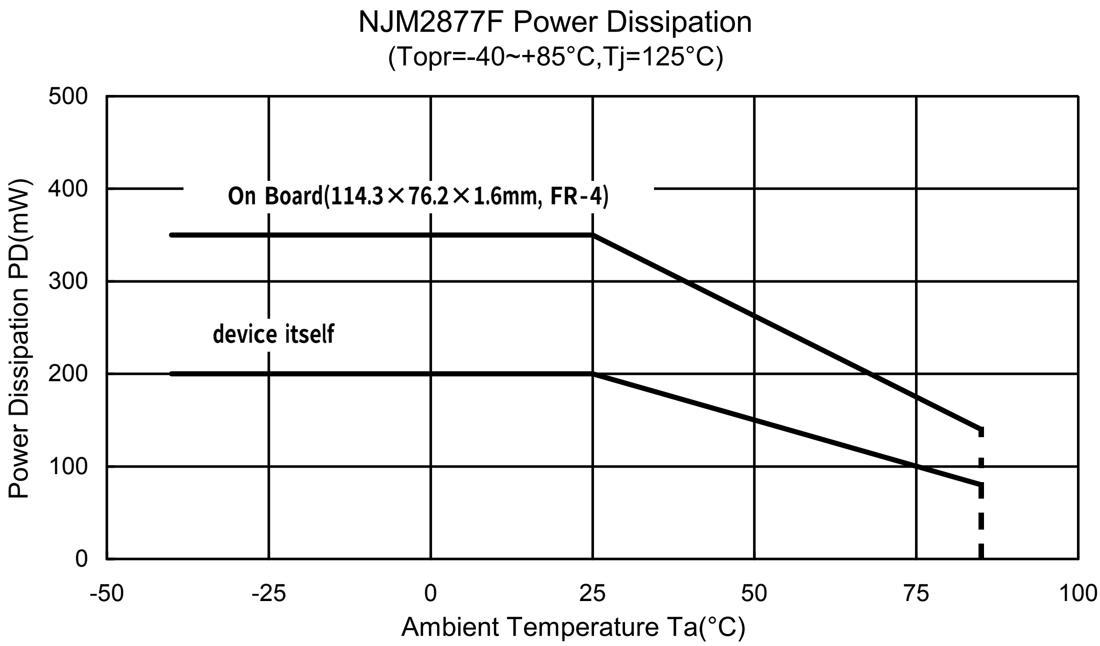
The current flow into the control terminal while the IC is ON state (I_{CONT}) can be reduced when a pull up resistance "R" is inserted between V_{IN} and the control terminal.
The minimum control voltage for ON state ($V_{CONT(ON)}$) is increased due to the voltage drop caused by I_{CONT} and the resistance "R". The I_{CONT} is temperature dependence as shown in the "Control Current vs. Temperature" characteristics. Therefore, the resistance "R" should be carefully selected to ensure the control voltage exceeds the $V_{CONT(ON)}$ over the required temperature range.

∗Output Capacitance Co

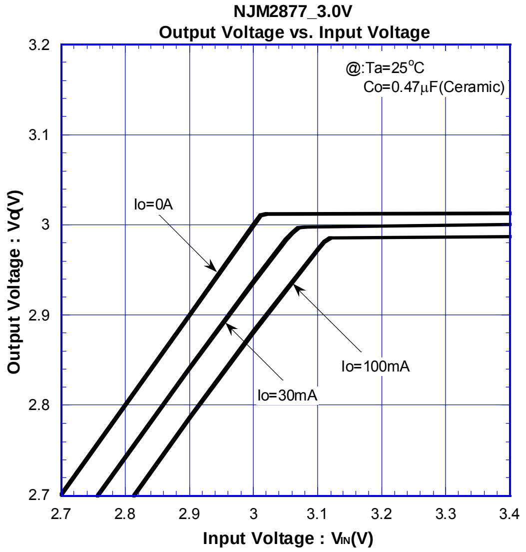
Output capacitor (Co) is required for a phase compensation of the internal error amplifier. The capacitance and the equivalent series resistance (ESR) influences stability of the regulator.
This product is designed to work with a low ESR capacitor for the Co; however, use of recommended capacitance or greater value is essential for stable operation.
Use of a smaller Co may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.
Therefore, use Co with the recommended capacitance or greater value and connect between Vo terminal and GND terminal with minimal wiring. The recommended capacitance depends on the output voltage. Low voltage regulator requires greater value of the Co. Thus, check the recommended capacitance for each output voltage.
Use of a greater Co reduces output noise and ripple output, and also improves transient response of the output voltage against rapid load change.

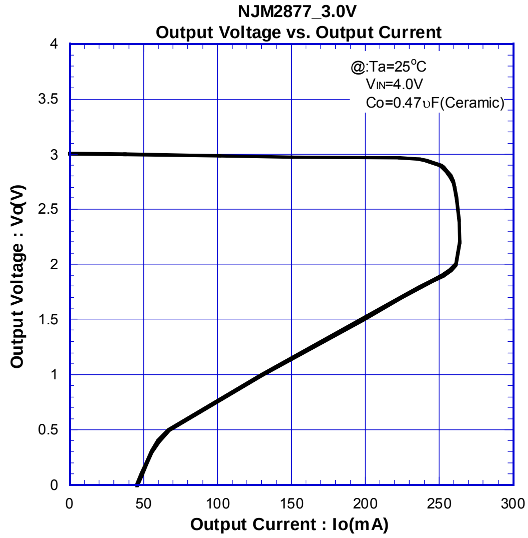
■ POWER DISSIPATION vs. AMBIENT TEMPERATURE (SC-88A)

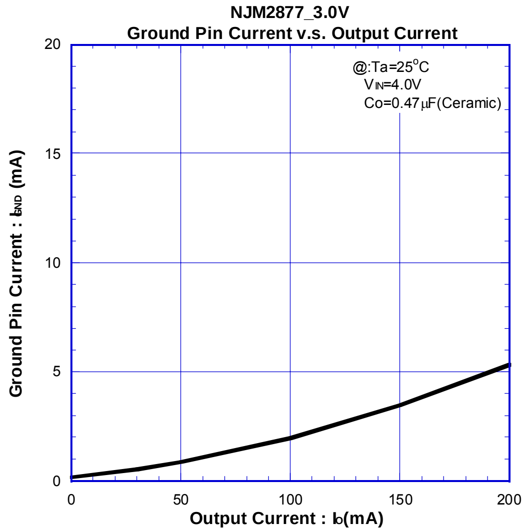


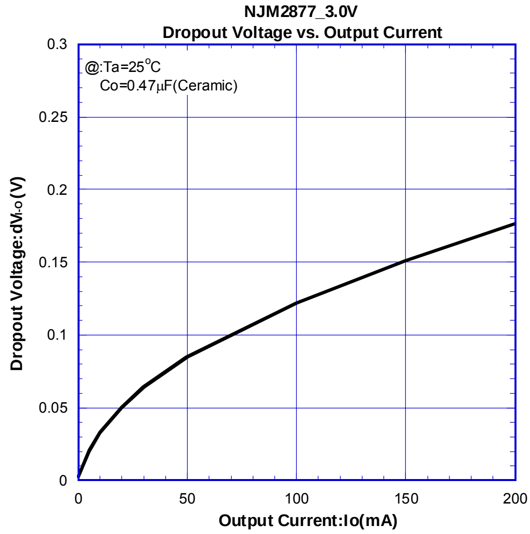


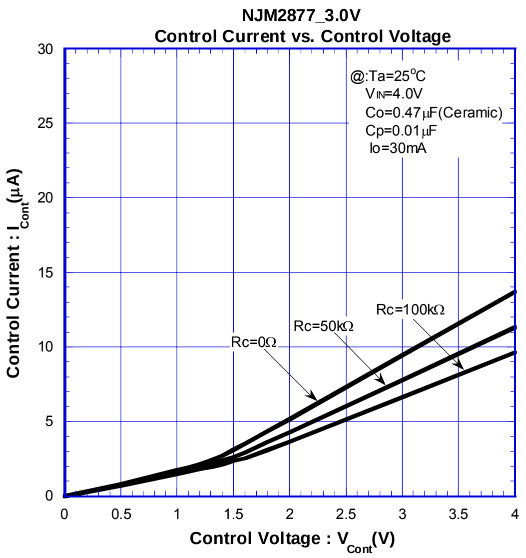
■ TYPICAL CHARACTERISTICS

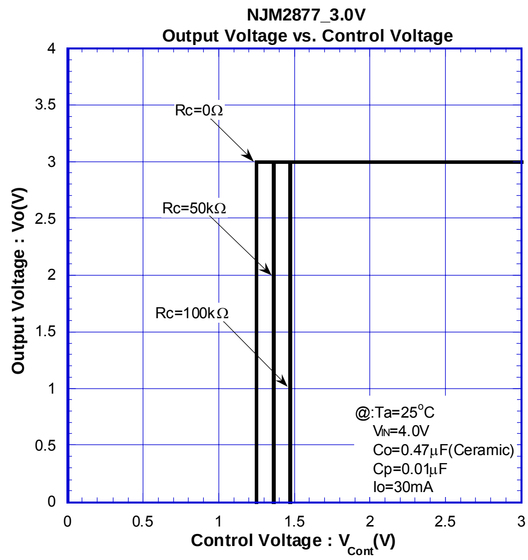












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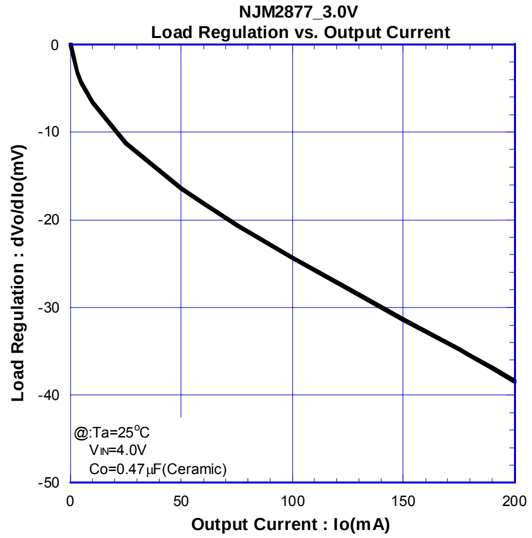

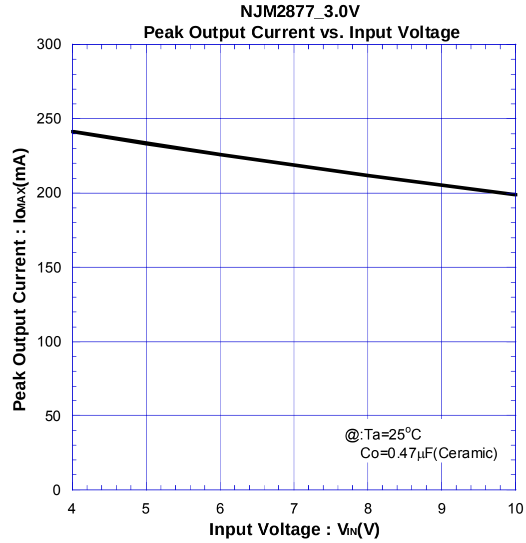

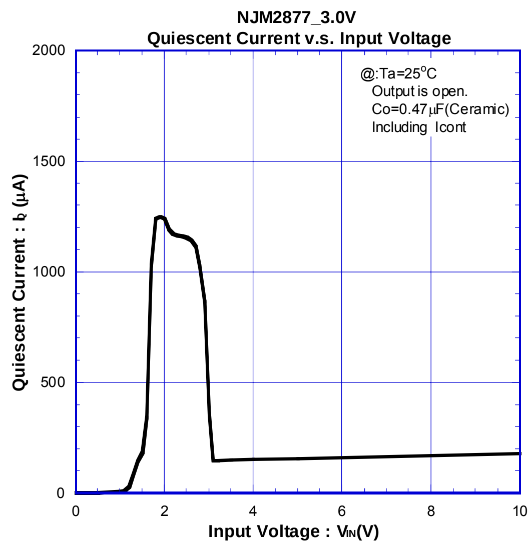

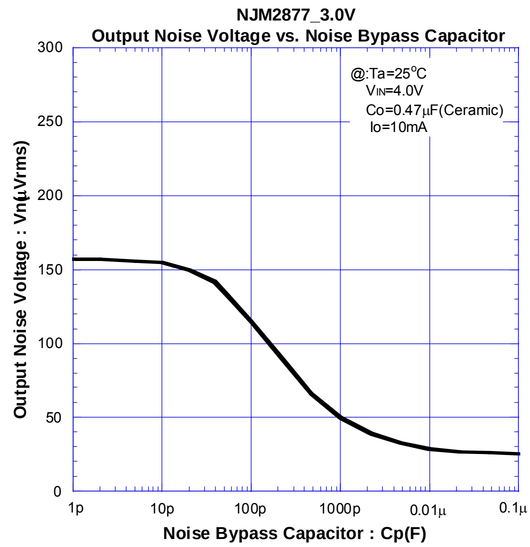

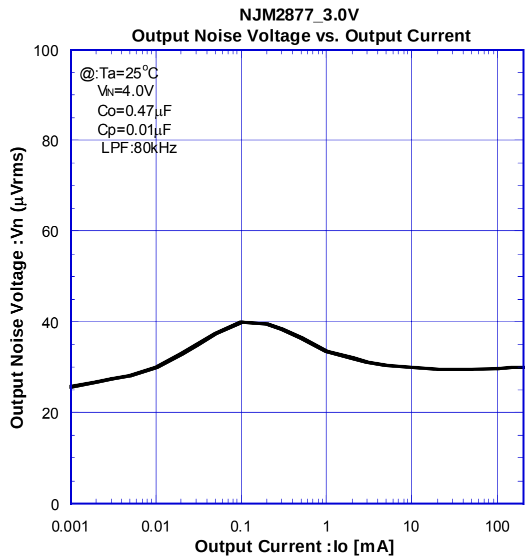

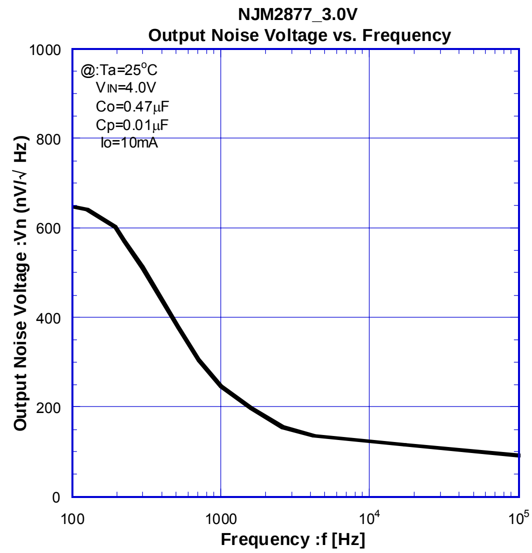

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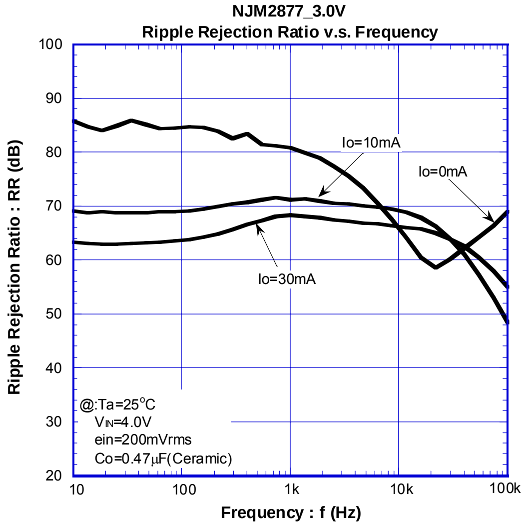

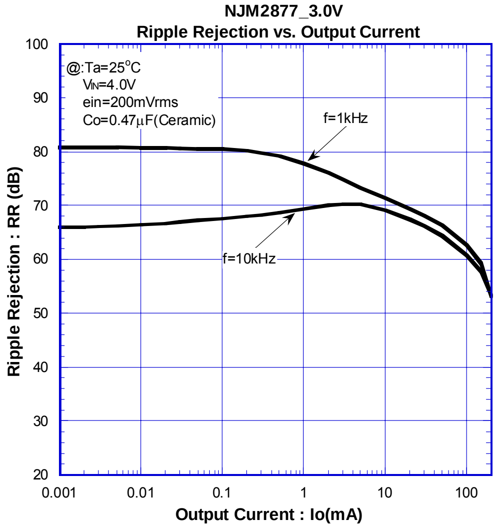

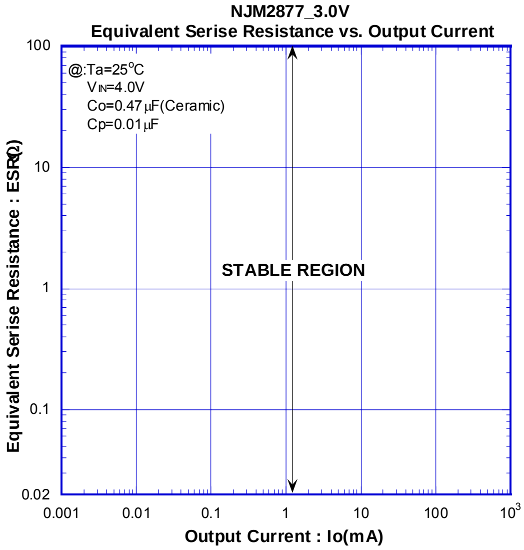

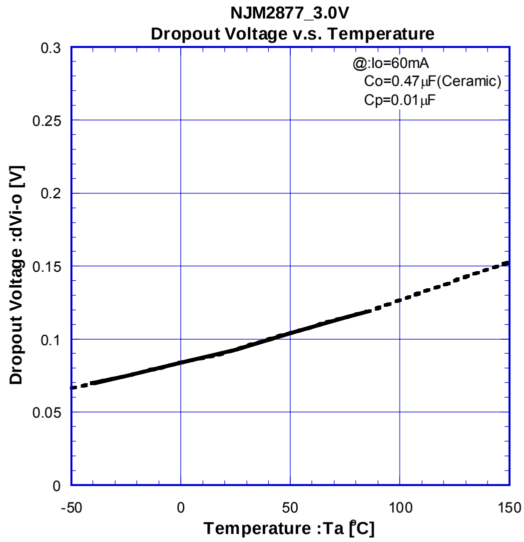

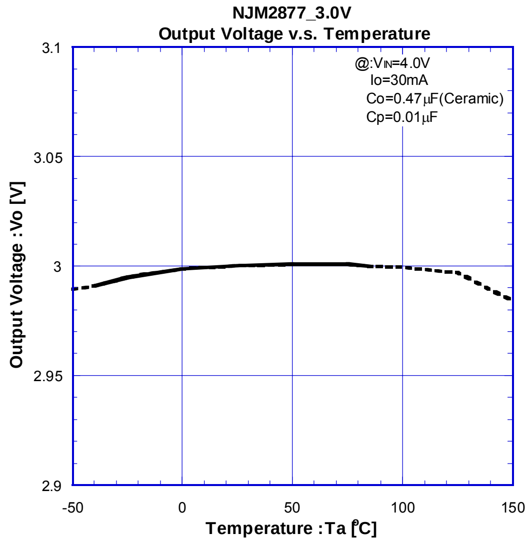

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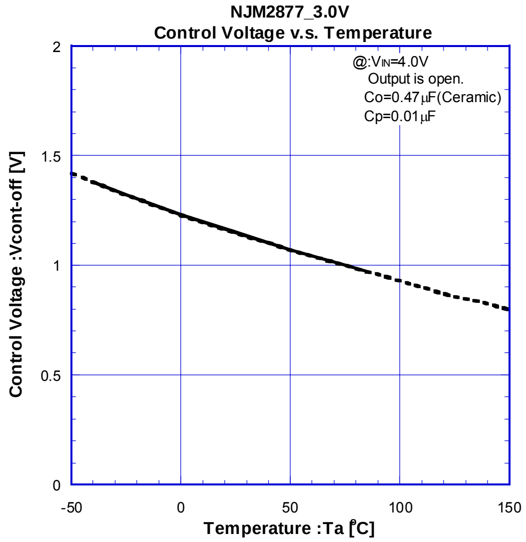

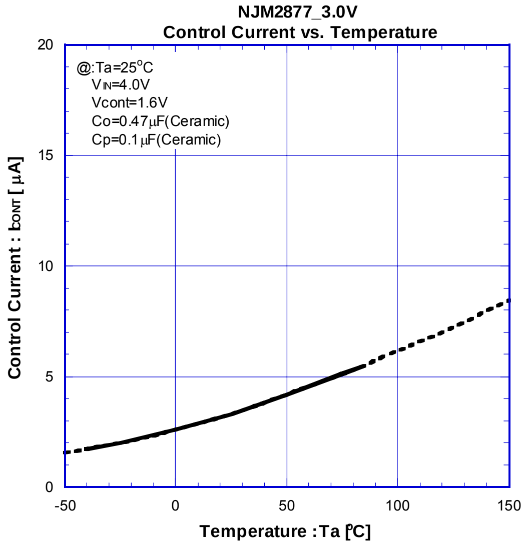

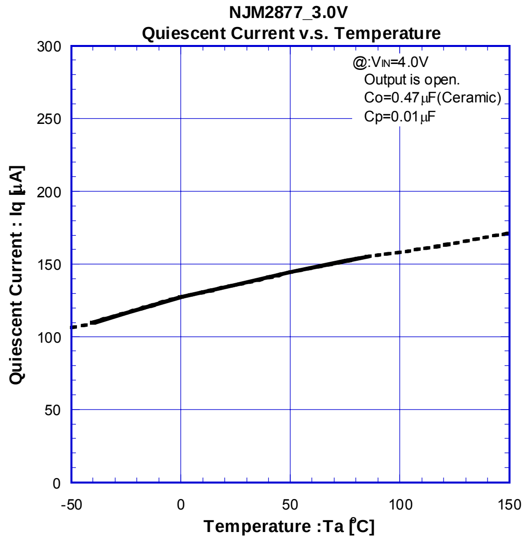

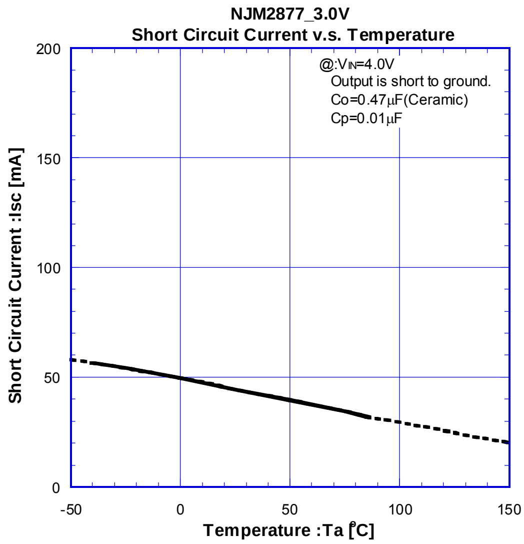

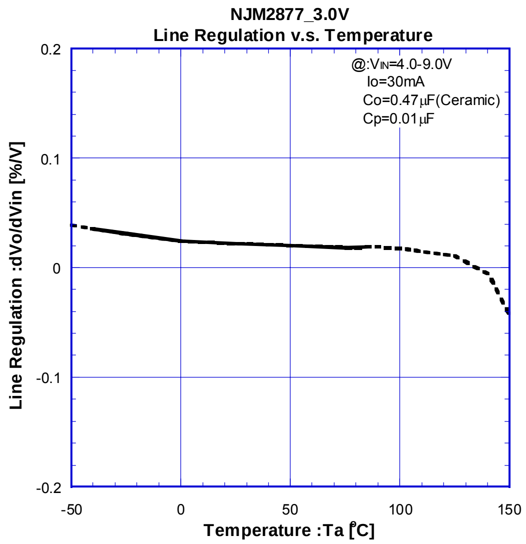

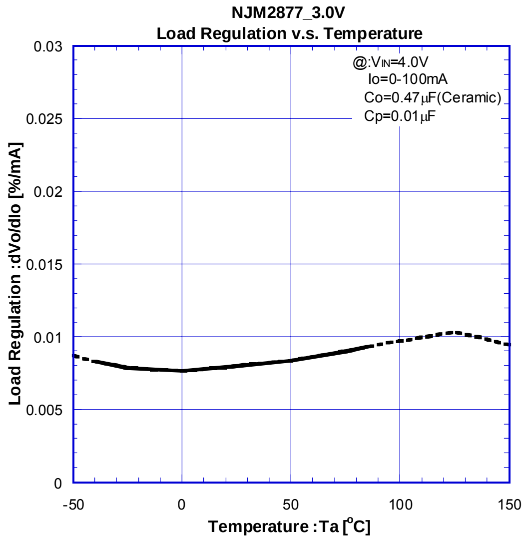

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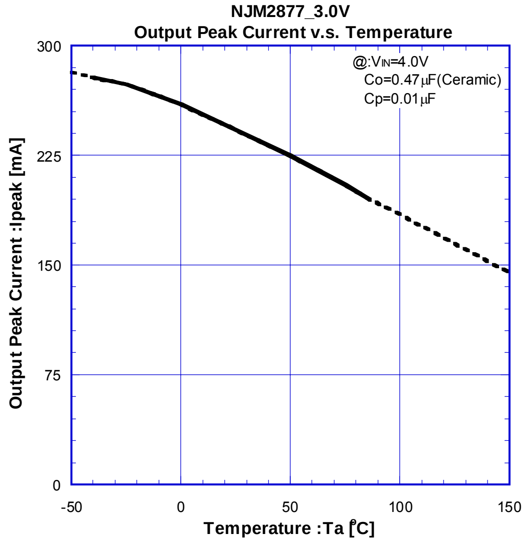

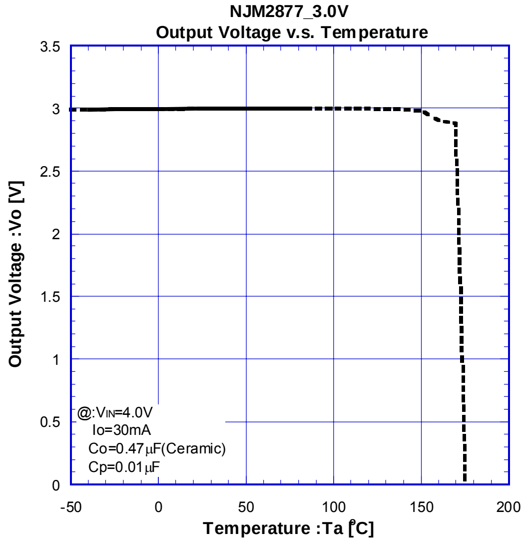

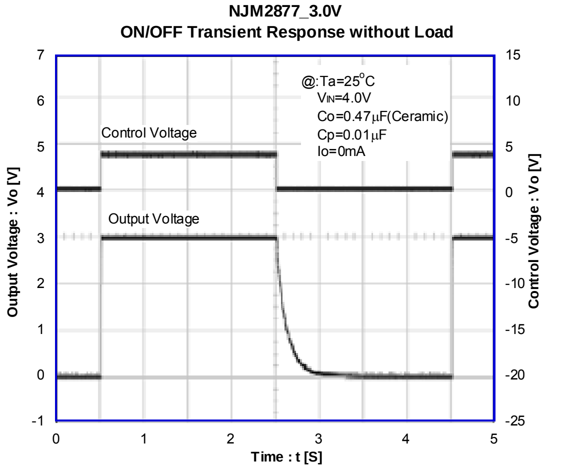

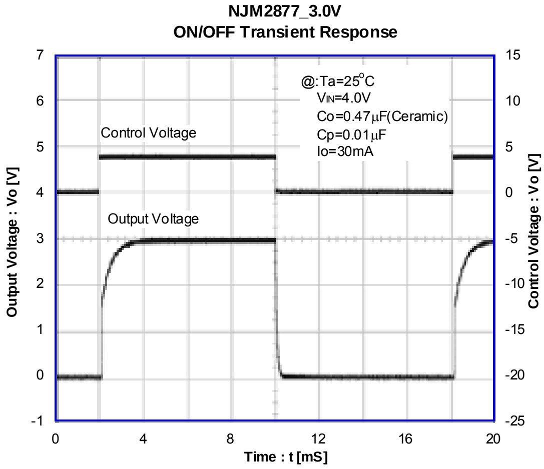

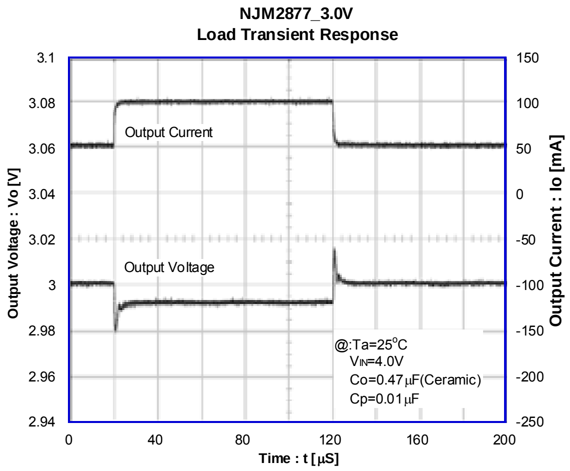

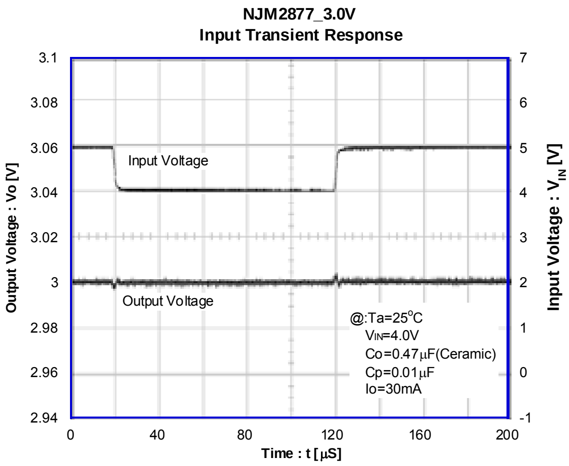

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