

Low Dropout Voltage Regulator

■ GENERAL DESCRIPTION

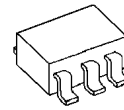
The NJM2877 is a 150mA output low dropout voltage regulator with ON/OFF control.

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 0.47 μ F small decoupling capacitor make the NJM2877 suitable for space conscious applications.

■ PACKAGE OUTLINE



NJM2877F

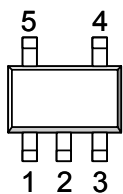


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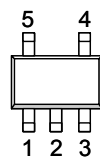
■ FEATURES

- High Ripple Rejection 75dB typ. (f=1kHz Vo=3V version)
- Output Noise Voltage Vno=30 μ Vrms typ. (Cp=0.01 μ F)
- Output capacitor with 0.47 μ F ceramic capacitor (Vo \geq 2.7V Version)
- Output Current Io(max.)=150mA
- High Precision Output Vo \pm 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



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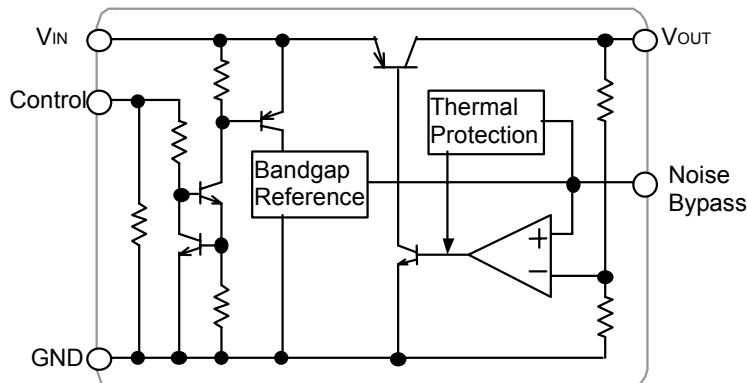


NJM2877F3

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

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

■ EQUIVALENT CIRCUIT



NJM2877

■ 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	T_{opr}	-40 ~ +85		°C
Storage Temperature	T_{stg}	-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

$V_{IN}=+2.3 \sim +9V$ (In case of $V_o < 2.1V$ version)

■ ELECTRICAL CHARACTERISTICS

($V_{IN}=V_o+1V$, $C_{IN}=0.1\mu F$, $C_o=0.47\mu F$: $V_o \geq 2.7V$ ($C_o=1.0\mu F$: $1.8V < V_o \leq 2.6V$, $C_o=2.2\mu F$: $V_o \leq 1.8V$), $C_p=0.01\mu F$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_o	$I_o=30mA$	-1.0%	-	+1.0%	V
Input Voltage	V_{IN}		-	-	9	V
Quiescent Current	I_Q	$I_o=0mA$, except I_{cont}	-	120	180	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 (*4)	ΔV_{L-O}	$I_o=60mA$	-	0.10	0.18	V
Ripple Rejection	RR	$e_{in}=200mV_{rms}$, $f=1kHz$, $I_o=10mA$, $V_o=3V$ version	-	75	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta V_o / \Delta T_a$	$T_a=0 \sim +85^\circ C$, $I_o=10mA$	-	± 50	-	ppm/°C
Output Noise Voltage	V_{NO}	$f=10Hz \sim 80kHz$, $I_o=10mA$, $V_o=3V$ Version	-	30	-	μV_{rms}
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

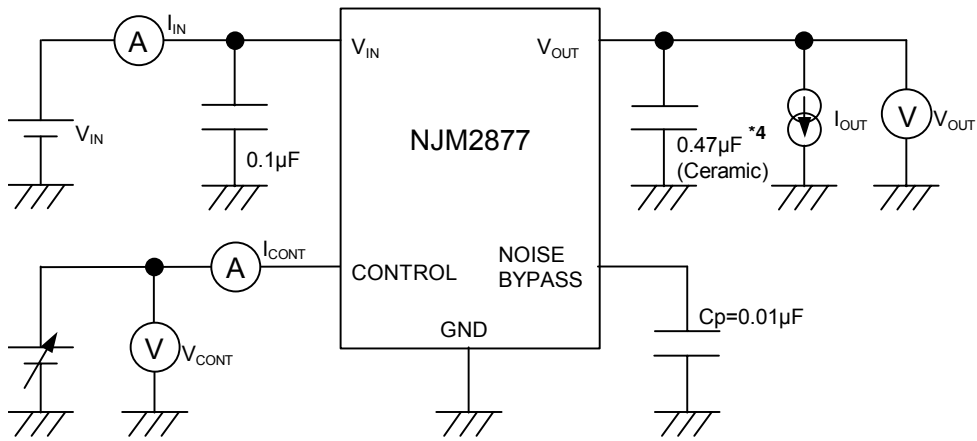
(*4): The output voltage excludes under 2.1V.

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.

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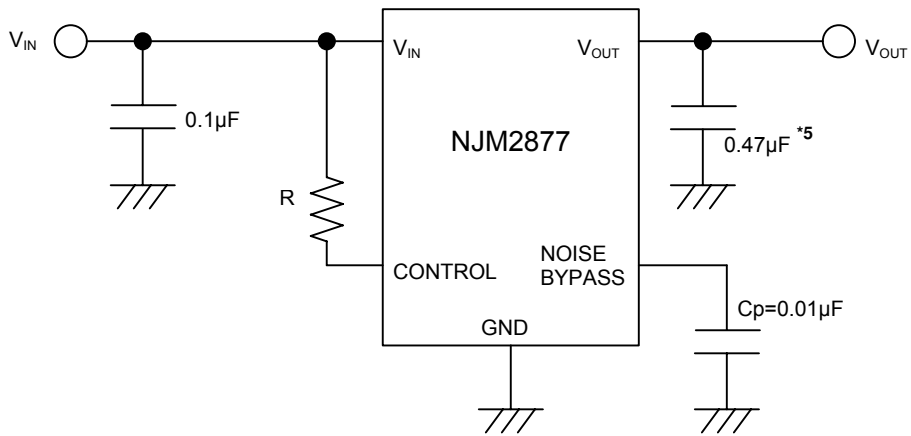
TEST CIRCUIT



*4: $1.8V < V_o \leq 2.6V$ version: $C_o = 1.0\mu F$ (Ceramic)
 $V_o \leq 1.8V$ version: $C_o = 2.2\mu F$ (Ceramic)

TYPICAL APPLICATIONS

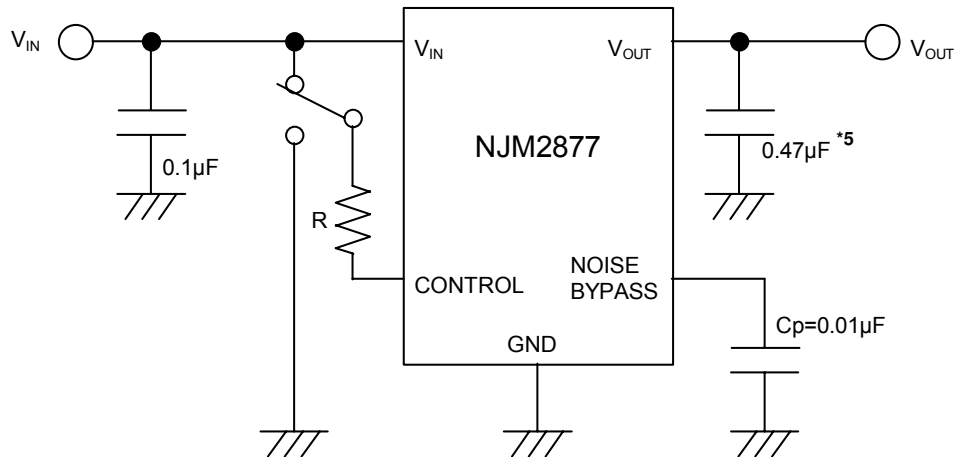
① In the case where ON/OFF Control is not required:



*5: $1.8V < V_o \leq 2.6V$ version: $C_o = 1.0\mu F$
 $V_o \leq 1.8V$ version: $C_o = 2.2\mu F$

Connect control terminal to V_{IN} terminal

② In use of ON/OFF CONTROL:



*5 : 1.8V < V_o ≤ 2.6V version : $C_o = 1.0\mu\text{F}$
 $V_o \leq 1.8\text{V}$ version : $C_o = 2.2\mu\text{F}$

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 $0.01\mu\text{F}$ 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 $0.1\mu\text{F}$ 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 C_o

Output capacitor (C_o) 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 C_o ; however, use of recommended capacitance or greater value is essential for stable operation.

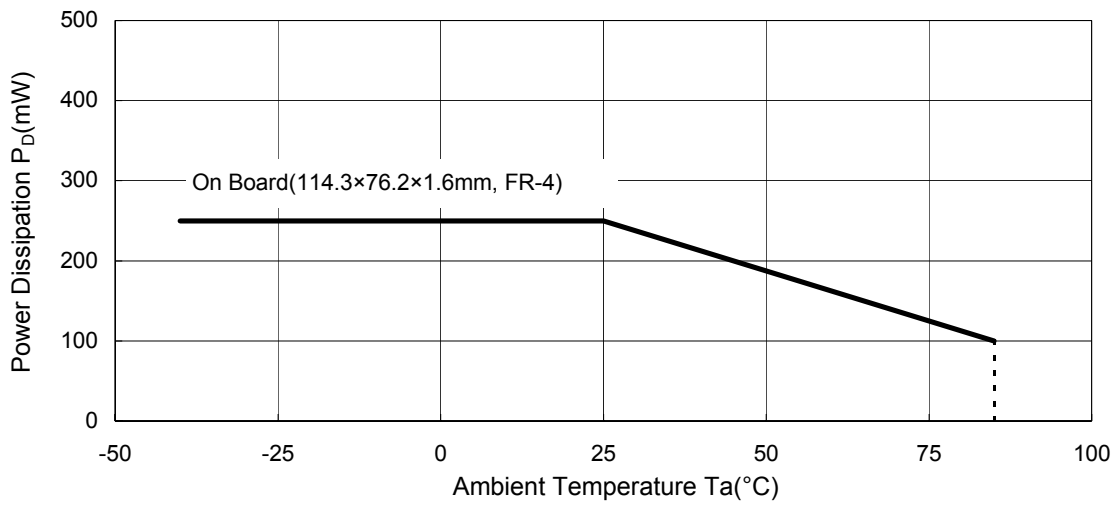
Use of a smaller C_o may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.

Therefore, use C_o with the recommended capacitance or greater value and connect between V_o terminal and GND terminal with minimal wiring. The recommended capacitance depends on the output voltage. Low voltage regulator requires greater value of the C_o . Thus, check the recommended capacitance for each output voltage.

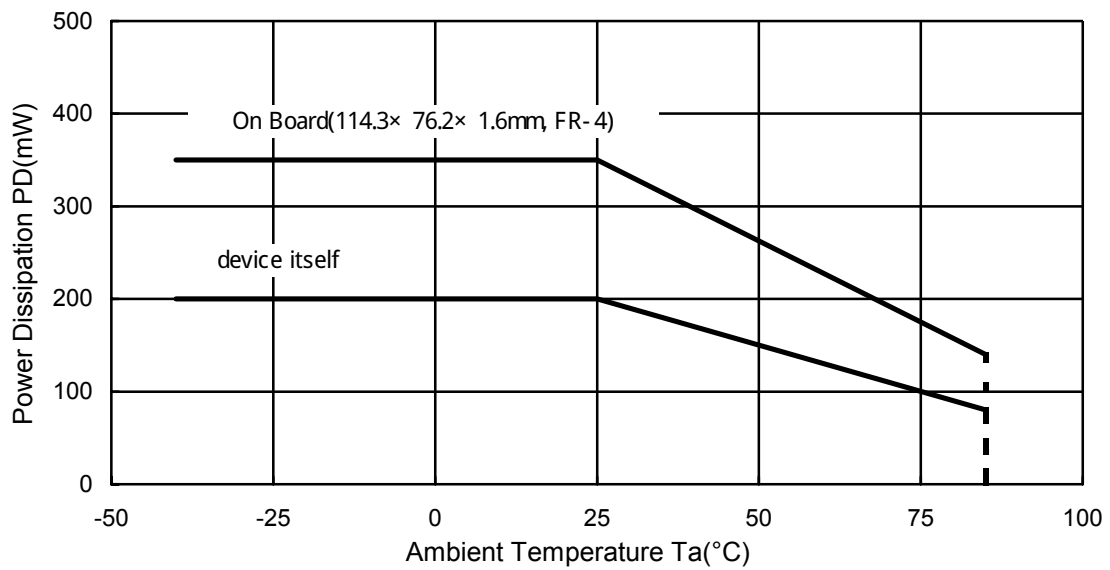
Use of a greater C_o reduces output noise and ripple output, and also improves transient response of the output voltage against rapid load change.

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

NJM2877F3 Power Dissipation
($T_{opr} = -40 \sim +85^{\circ}\text{C}$, $T_j = 125^{\circ}\text{C}$)

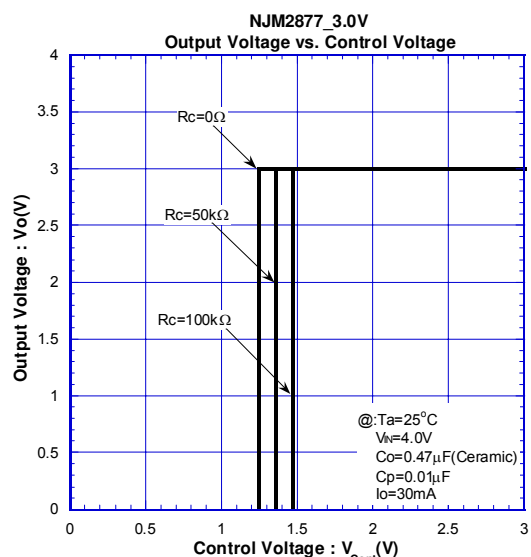
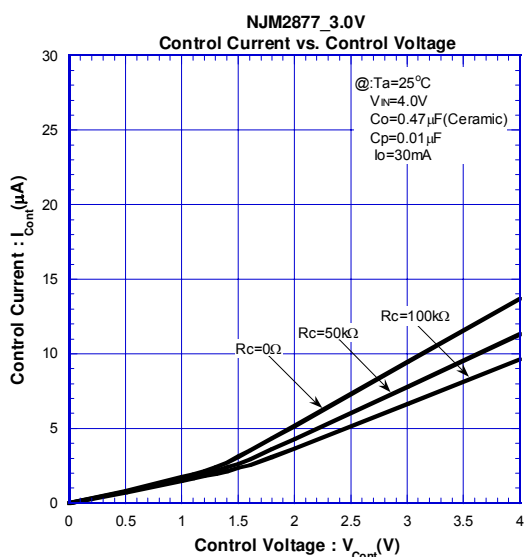
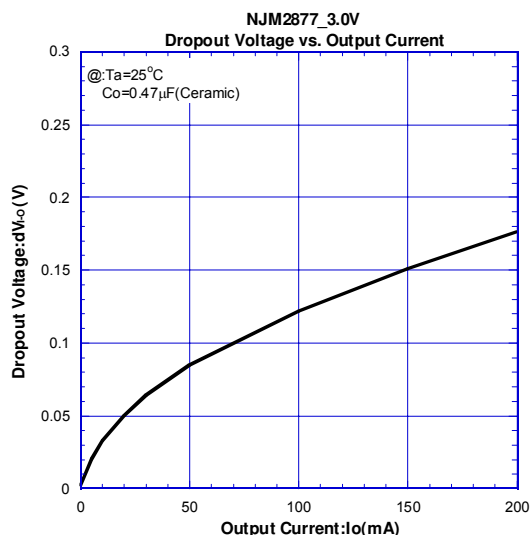
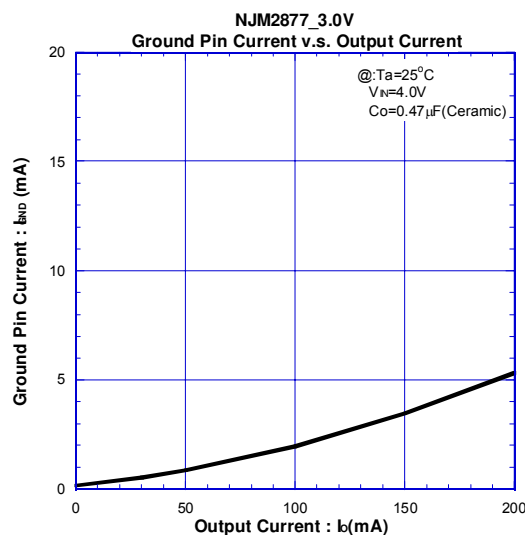
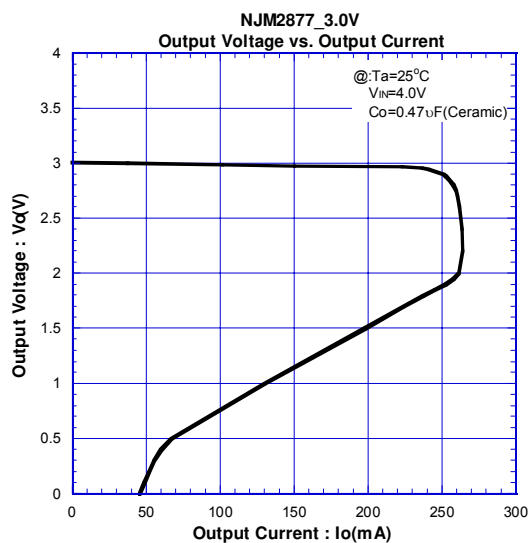
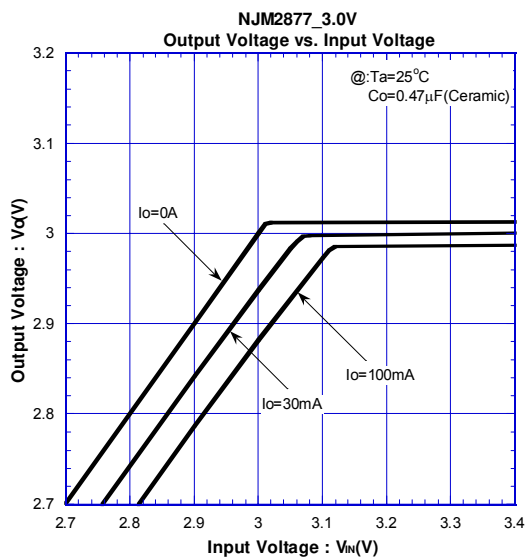


NJM2877F Power Dissipation
($T_{opr} = -40 \sim +85^{\circ}\text{C}$, $T_j = 125^{\circ}\text{C}$)

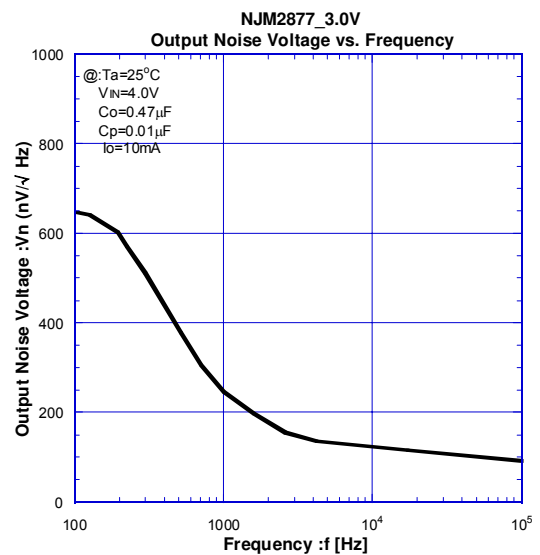
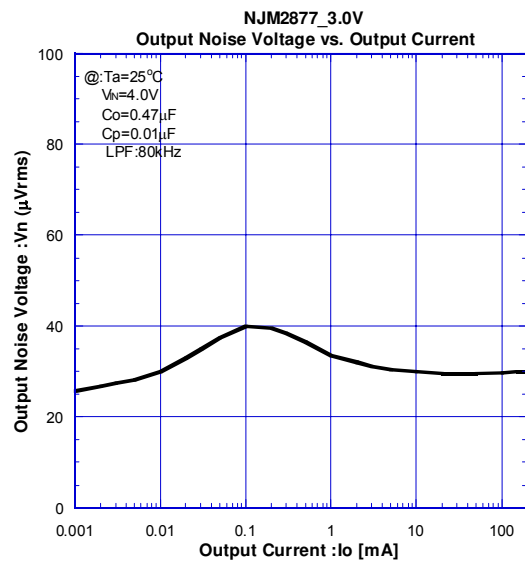
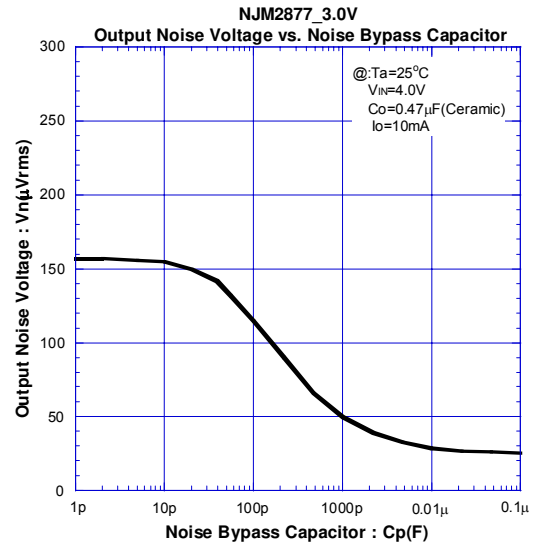
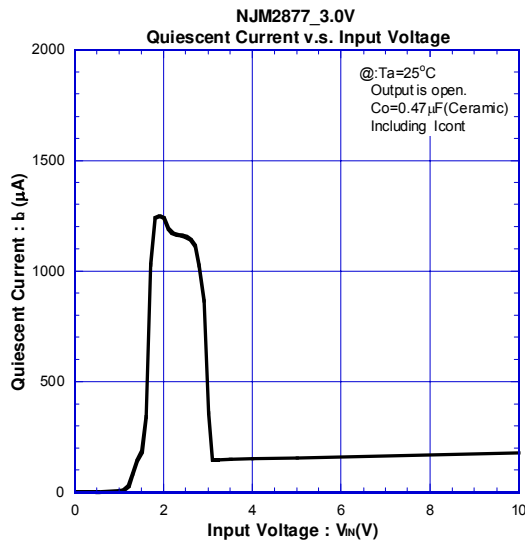
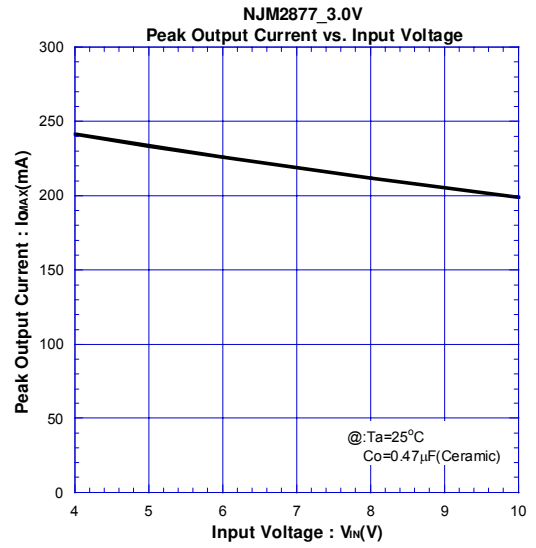
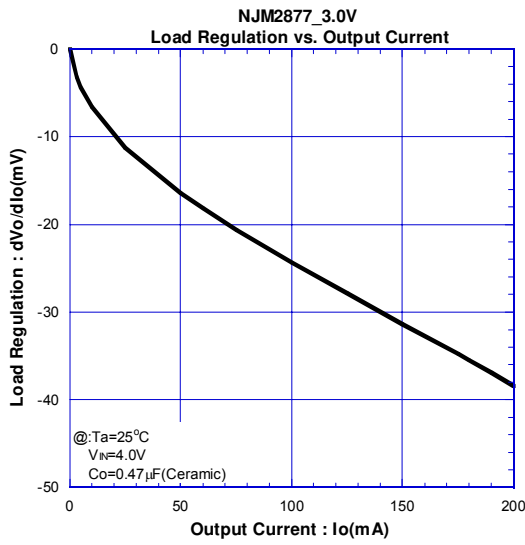


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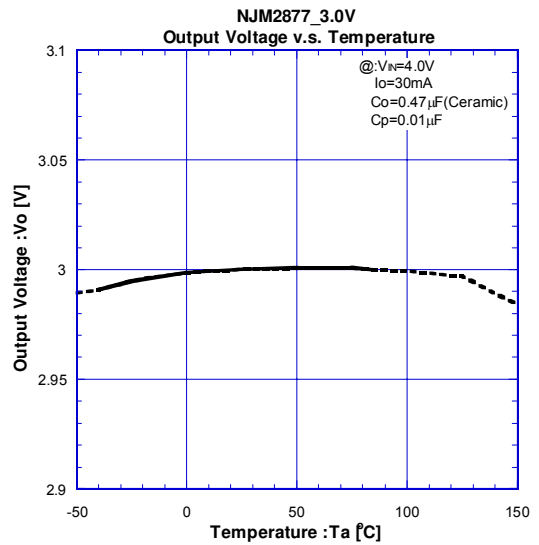
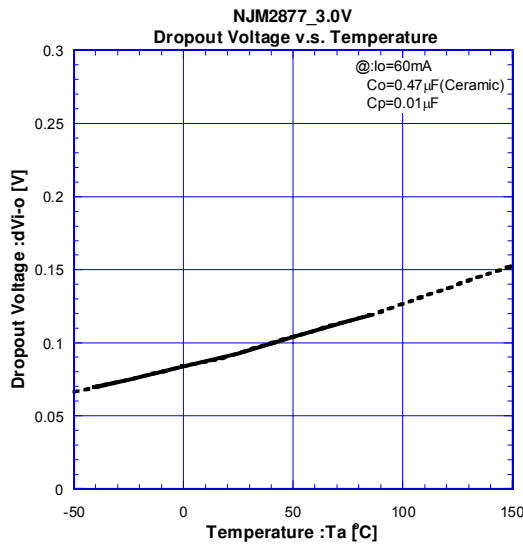
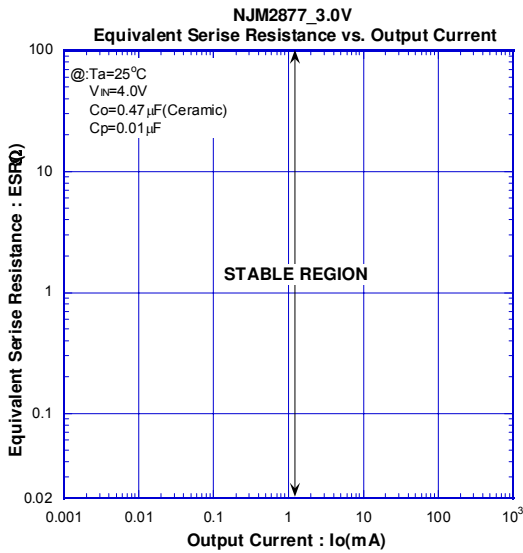
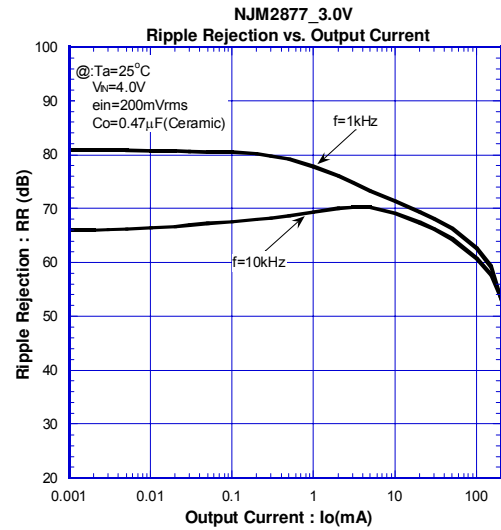
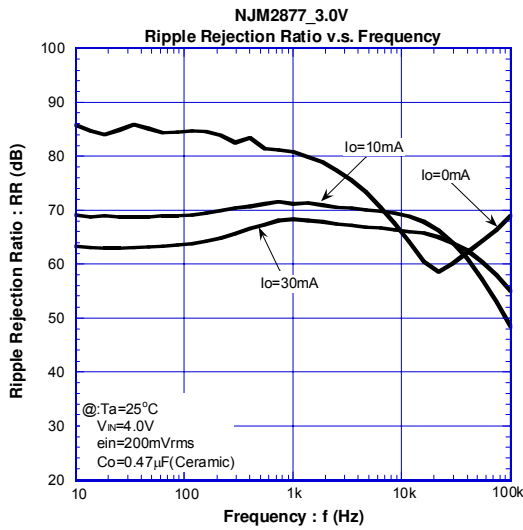
■ TYPICAL CHARACTERISTICS



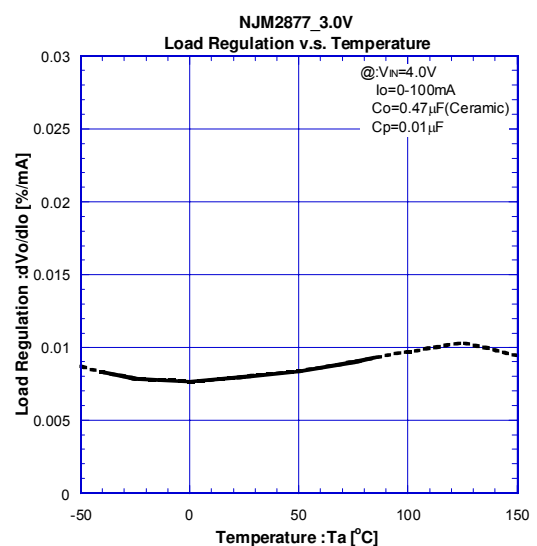
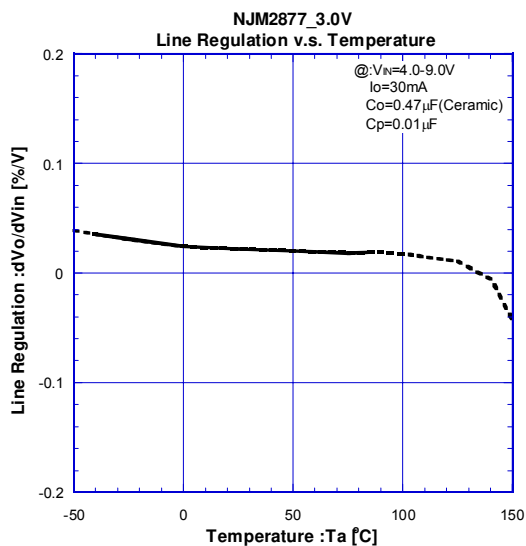
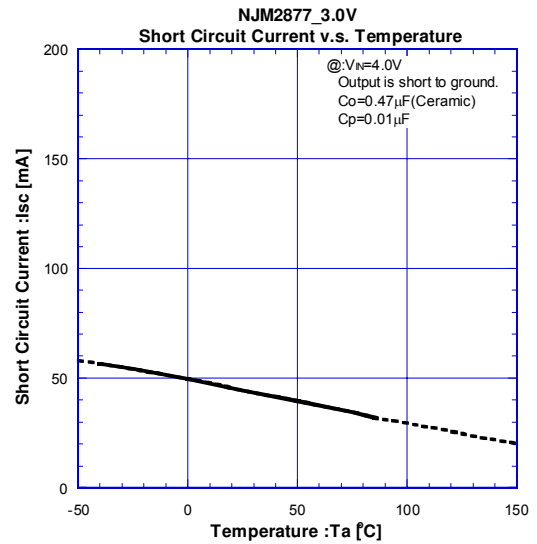
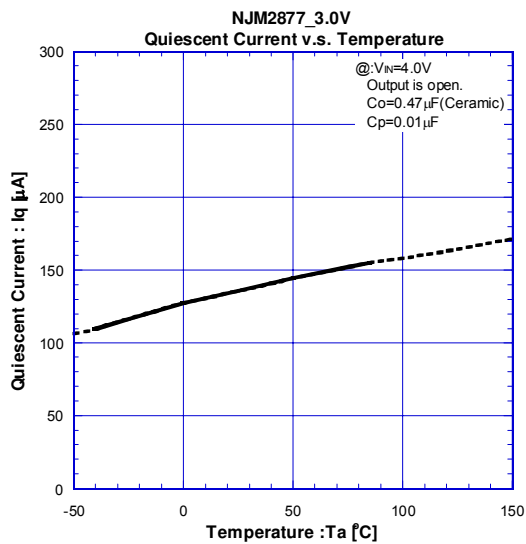
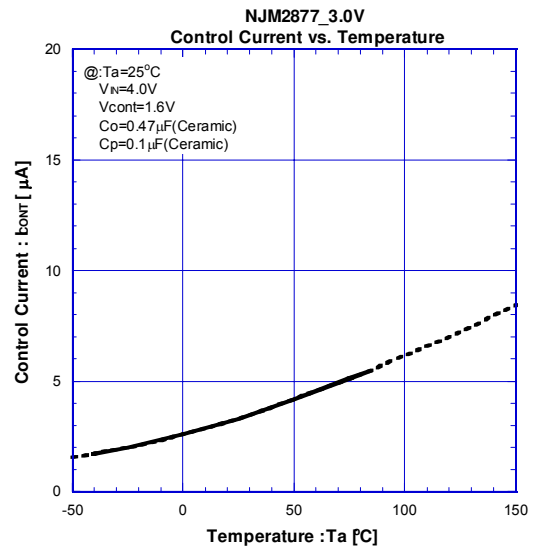
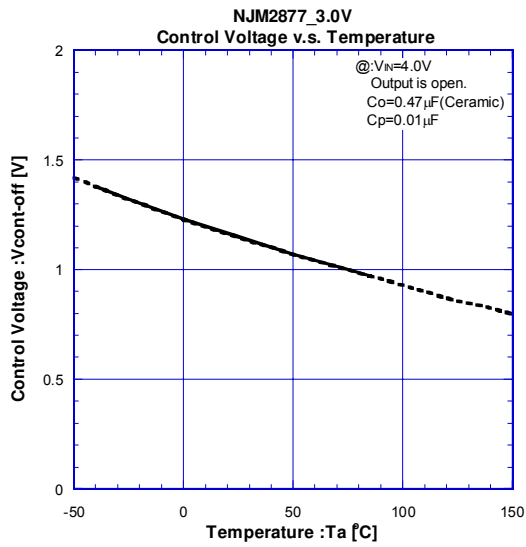
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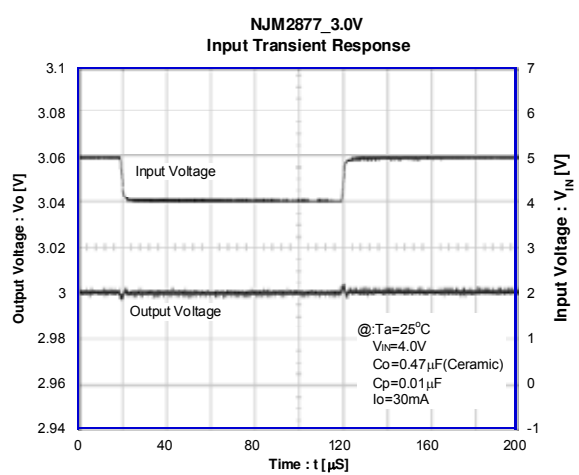
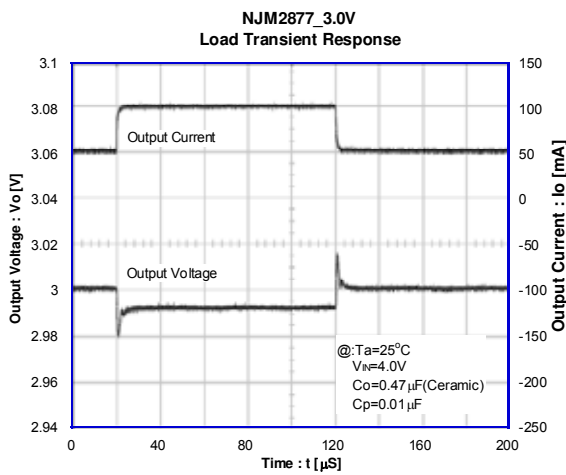
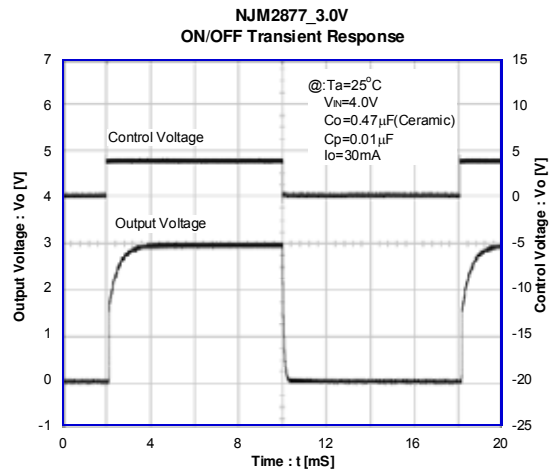
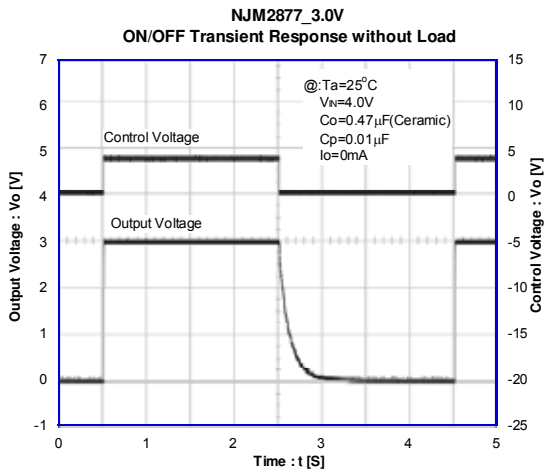
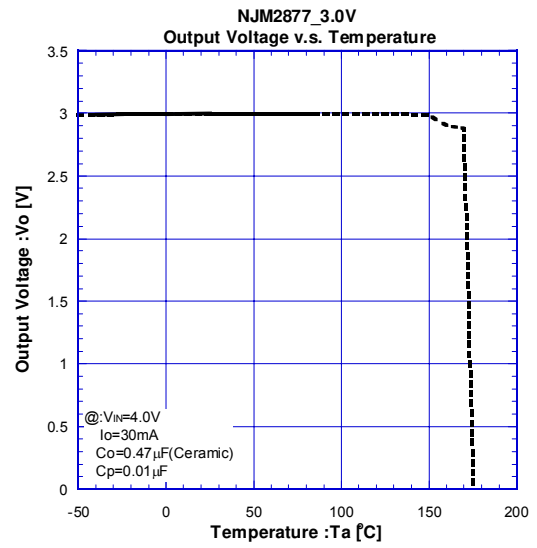
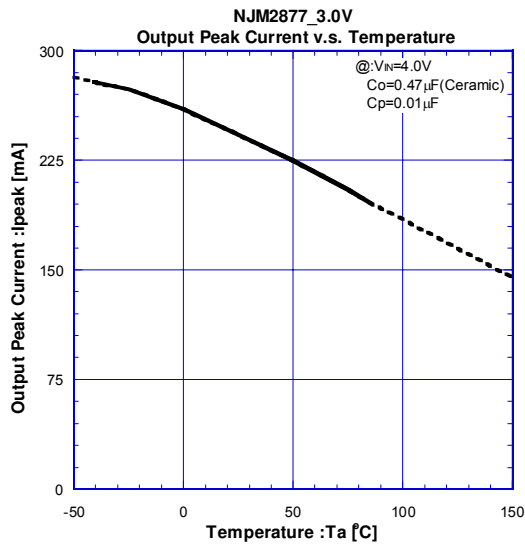


■ TYPICAL CHARACTERISTICS



NJM2877

■ TYPICAL CHARACTERISTICS



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