Very Low Output Voltage Series Regulator

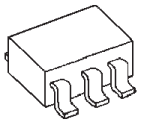
■ GENERAL DESCRIPTION

The NJM2847 is a series voltage regulator that delivers up to 150mA output current with the output voltage of 0.8 to 1.4V with ON/OFF control.

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

Small packaging and 2.2μF small decoupling capacitor make the NJM2847 suitable for space conscious applications.

■ PACKAGE OUTLINE

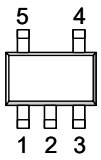


NJM2847F3

■ FEATURES

- Output Voltage Range 0.8V to 1.4V
- Input Voltage Range 2.3V to 9.0V
- High Ripple Rejection 85dB typ. (f=1kHz, V_O=0.8V version)
- Very Low Output Noise Voltage V_{NO}=20μVrms typ. (Cp=0.01μF)
- Output Current I_O(max)=150mA
- High Precision Output V_O±1.0%
- Output Capacitor with 2.2μF ceramic capacitor
- ON/OFF Control
- Built-in Thermal Overload Protection and Short Circuit Current Limit Protection
- Bipolar Technology
- Package Outline SC-88A

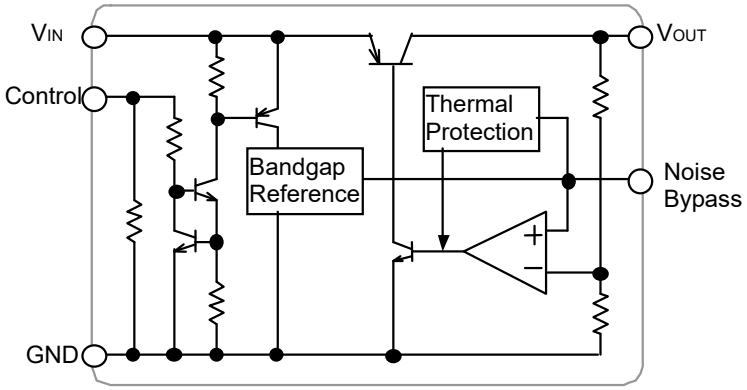
■ PIN CONNECTION



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

NJM2847F3

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

The WHITE column shows applicable Voltage Rank(s).

Device Name	V_{out}
NJM2847F3 -008	0.8V
NJM2847F3 -009	0.9V
NJM2847F3 -010	1.0V
NJM2847F3 -011	1.1V
NJM2847F3 -012	1.2V
NJM2847F3 -013	1.3V
NJM2847F3 -014	1.4V

Output Voltage Range: 0.8V to 1.4V (0.1V step)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

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

Note1: Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 2Layers)

■ INPUT VOLTAGE RANGE

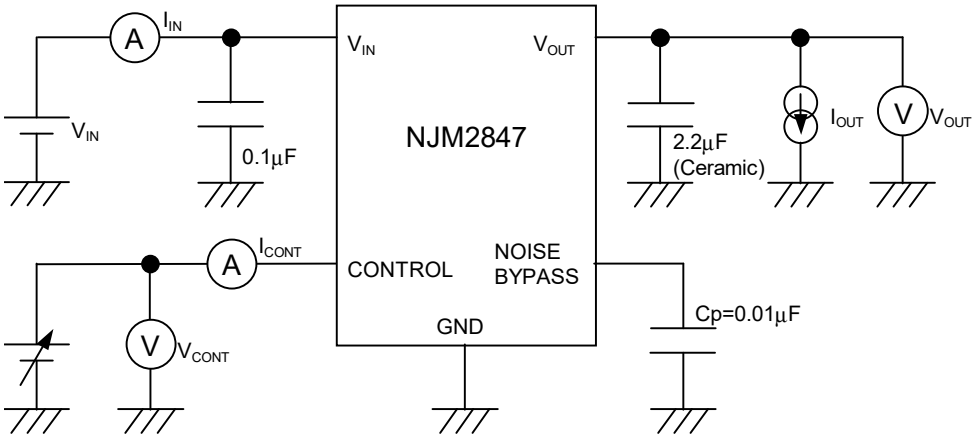
V_{IN}=+2.3 ~ +9V

■ ELECTRICAL CHARACTERISTICS (V_{IN}=2.5V, C_{IN}=0.1µF, Co=2.2µF, Cp=0.01µF, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAV.	UNIT
Output Voltage	Vo	Io=30mA	-1.0%	–	+1.0%	V
Input Voltage	V_{IN}		2.3	–	9	V
Quiescent Current	I_Q	Io=0mA, except Icont	–	140	200	µA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V	–	–	100	nA
Output Current	Io	Vo ×0.9V	150	200	–	mA
Line Regulation	ΔVo/ΔVIN	V_{IN}=2.5V to 9.0V, Io=30mA	–	–	0.10	%/V
Load Regulation	ΔVo/ΔIo	Io=0mA to 100mA	–	–	0.03	%/mA
Ripple Rejection	RR	ein=200mVrms, f=1kHz, Io=10mA, Vo=0.8V version	–	85	–	dB
Average Temperature Coefficient of Output Voltage	ΔVo/ΔTa	Ta=0°C to +85°C, Io=10mA	–	± 50	–	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz to 80kHz, Io=10mA, Vo=0.8Vversion	–	20	–	µVrms
Control Current	I_{CONT}	V_{CONT}=1.6V	–	3	12	µA
Control Current for ON-state	$V_{CONT(ON)}$		1.6	–	–	V
Control Current for OFF-state	$V_{CONT(OFF)}$		–	–	0.6	V

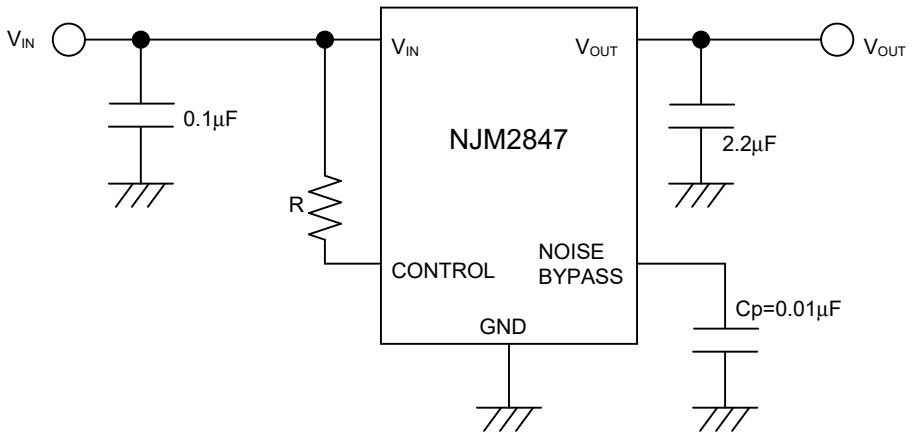
The above specification is a common specification for all output voltages.
Therefore, it may be different from the individual specification for a specific output voltage.

■ TEST CIRCUIT



■ TYPICAL APPLICATION

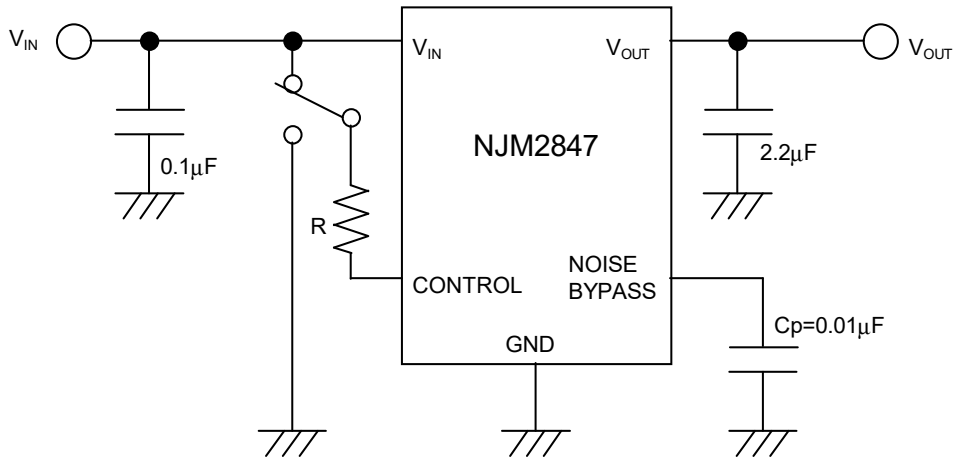
a) In case of where ON/OFF control is not required:



You shall connect control terminal to V_{IN} terminal.

Though the I_{CONT} decreases by inserting "R" to between Control terminal and V_{BIAS} terminal, the minimum operating voltage is increased due to the resister "R".

b) In use of ON/OFF control:



State of control terminal:

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

*In the case of using a resistance "R" between V_{IN} 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 $V_{CONT\ (ON)}$ and I_{CONT} 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.

*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.

*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.

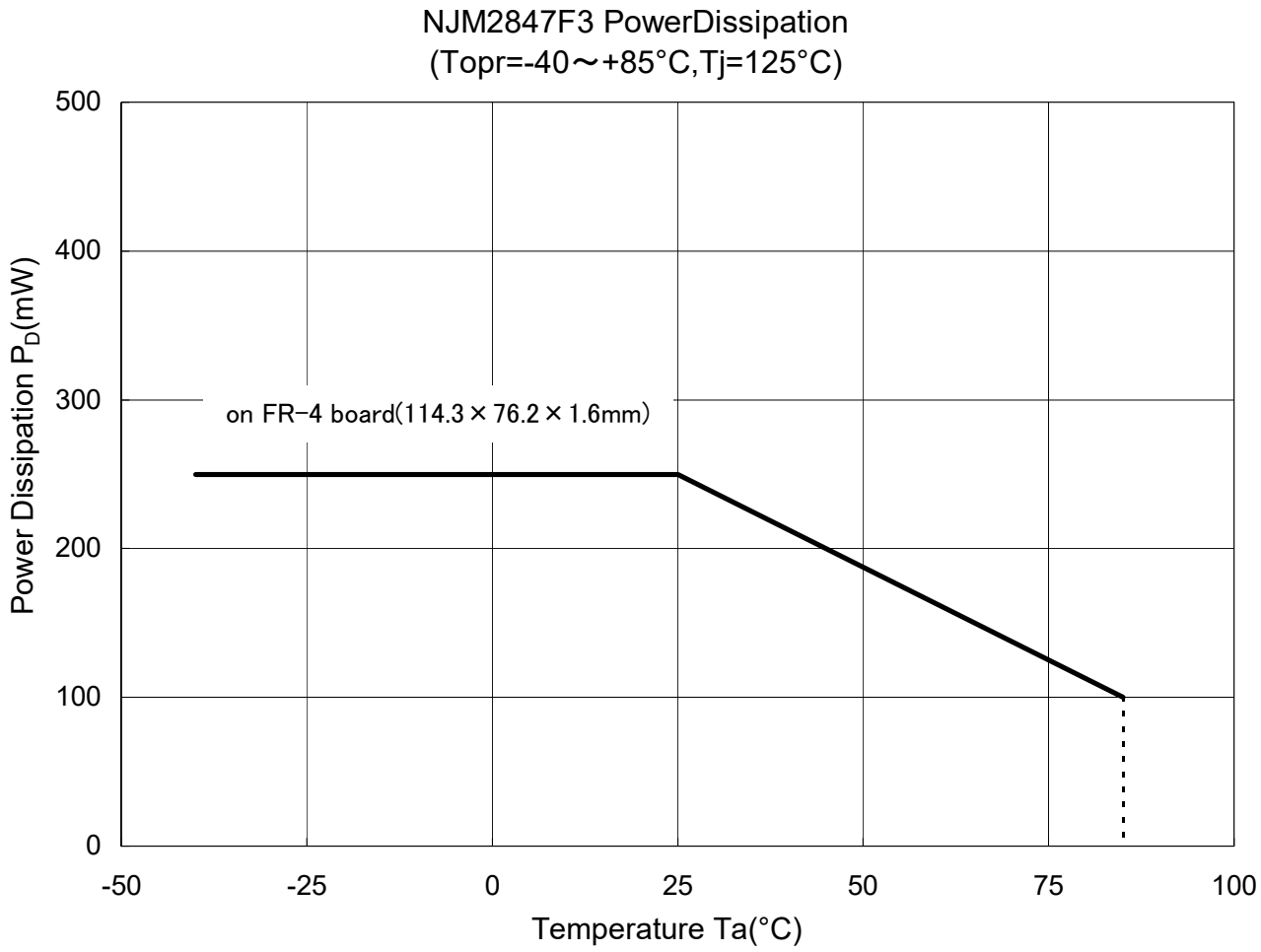
On the other hand, Use of a larger C_O reduces output noise and ripple output, and also improves output transient response when rapid load change.

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

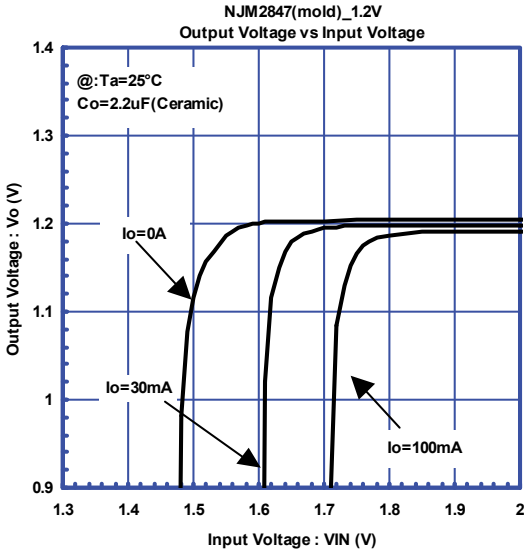
In addition, you should consider varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, a DC bias characteristic and so on) and unevenness peculiar to a capacitor supplier enough.

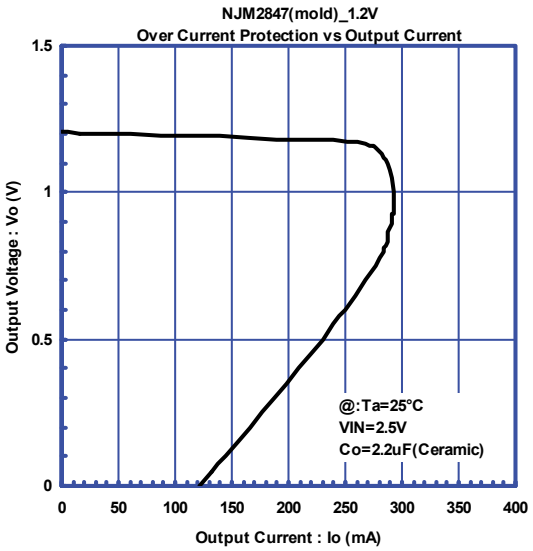
When selecting C_O, recommend that have withstand voltage margin against output voltage and superior temperature characteristic though this product is designed stability works with wide range ESR of capacitor including low ESR products.

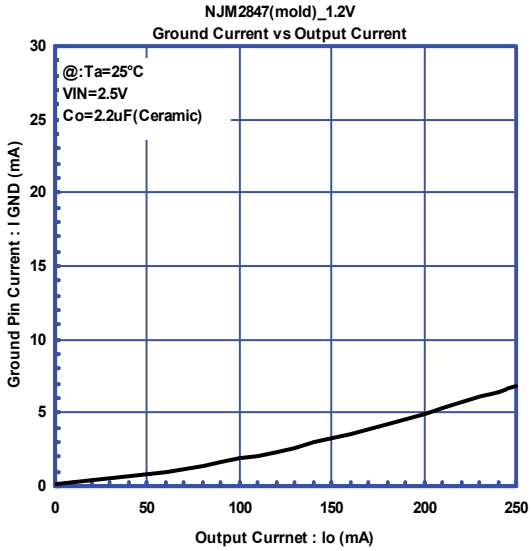
■ POWER DISSIPATION vs. AMBIENT TEMPERATURE(SC-88A)

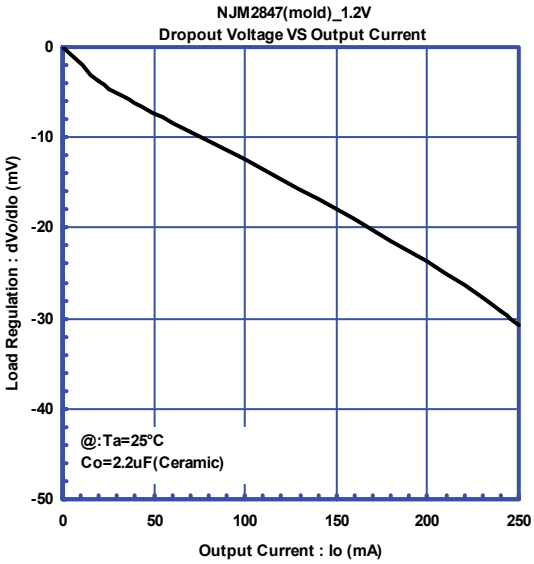


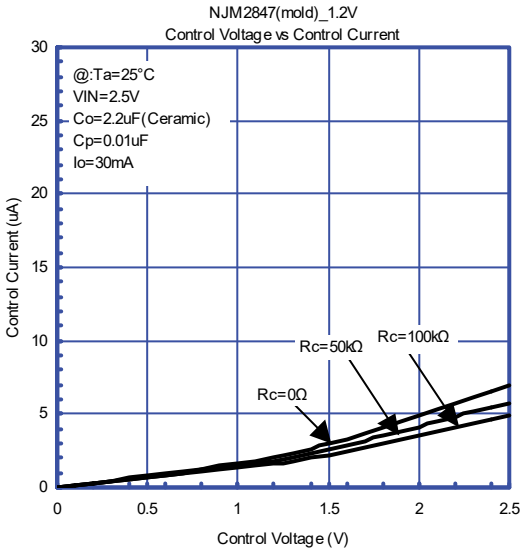
■ TYPICAL CHARACTERISTICS

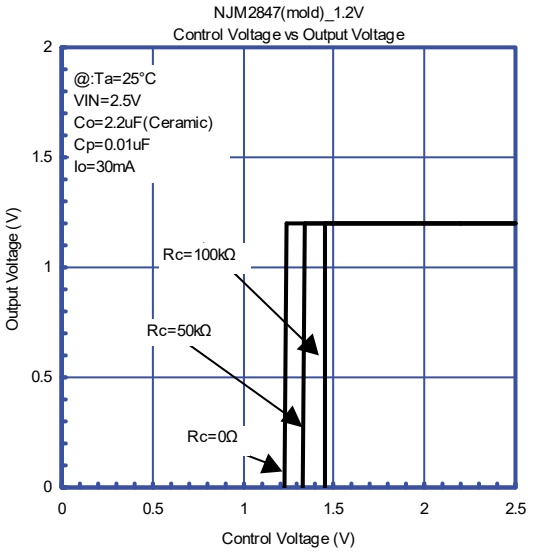




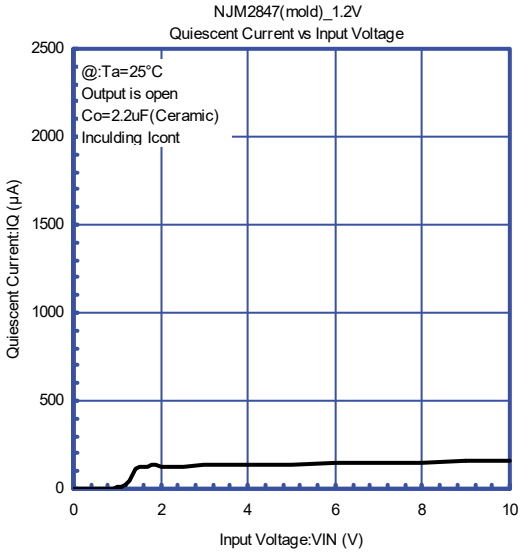


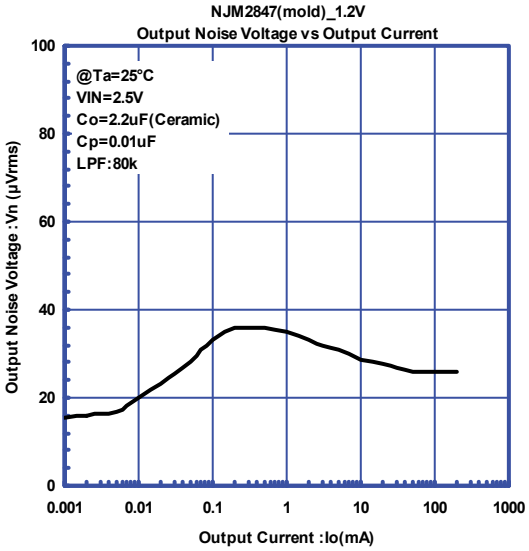


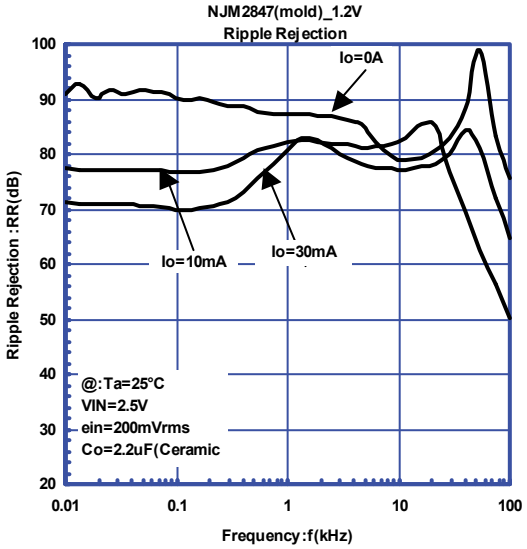


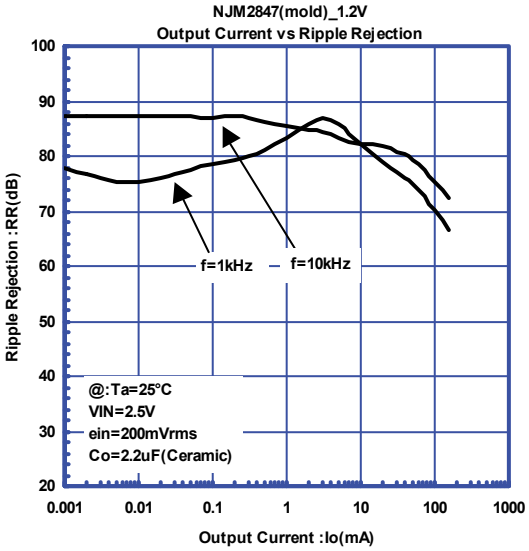


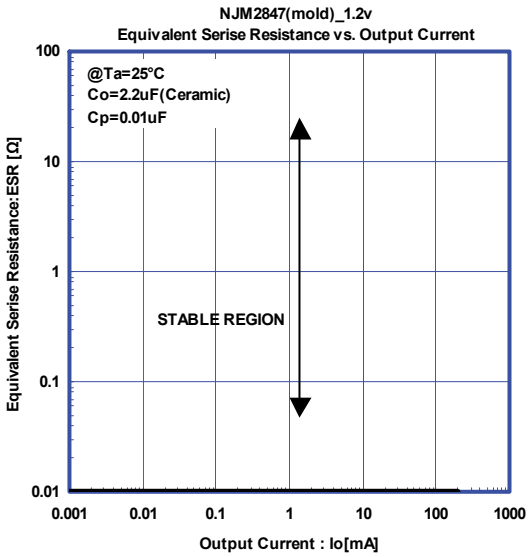
■ TYPICAL CHARACTERISTICS





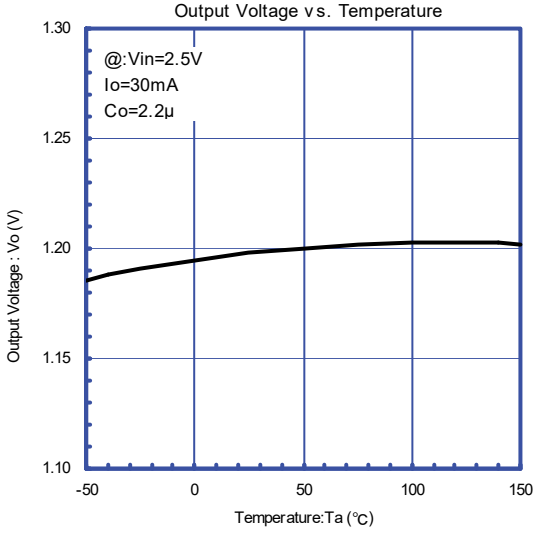




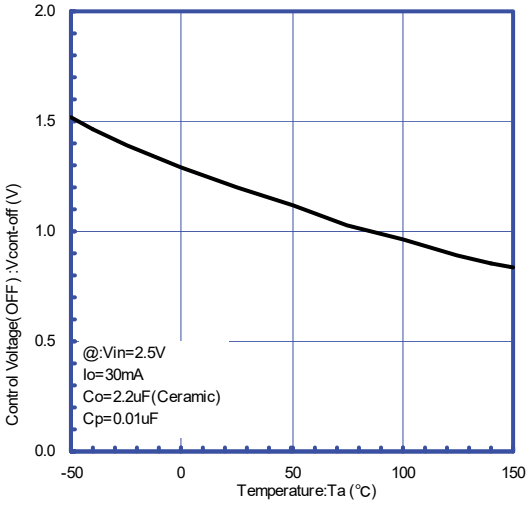


■ TYPICAL CHARACTERISTICS

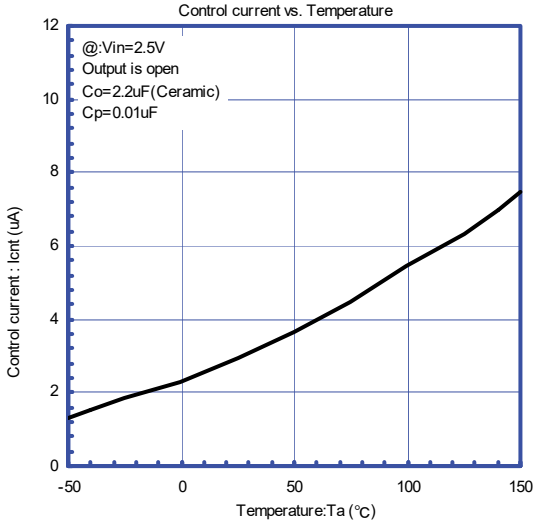
NJM2847(mold)_1.2V
Output Voltage vs. Temperature



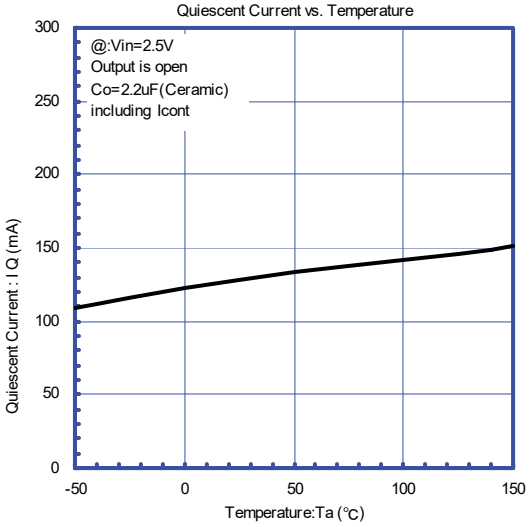
NJM2847(mold)_1.2V
Control Voltage(off) vs. Temperature



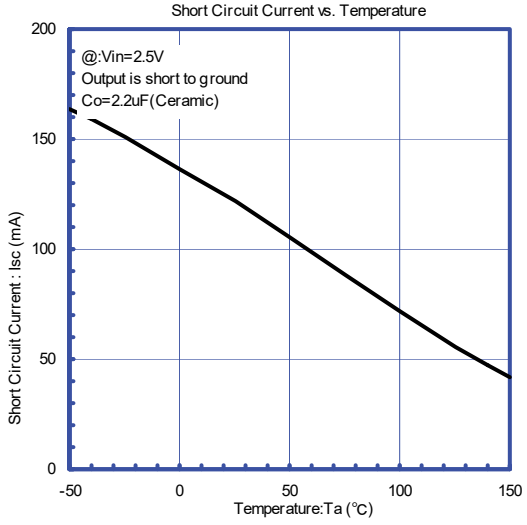
NJM2847(mold)_1.2V
Control current vs. Temperature



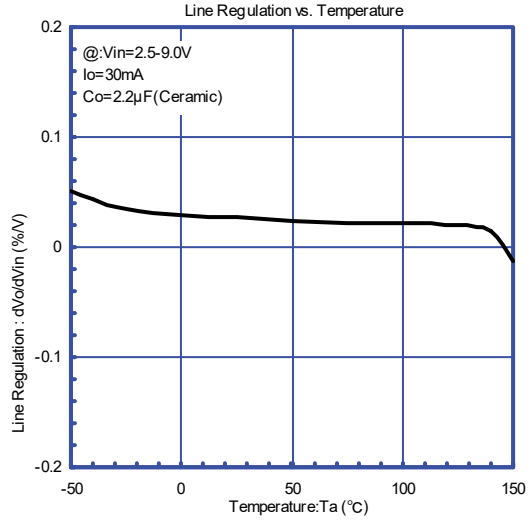
NJM2847(mold)_1.2V
Quiescent Current vs. Temperature



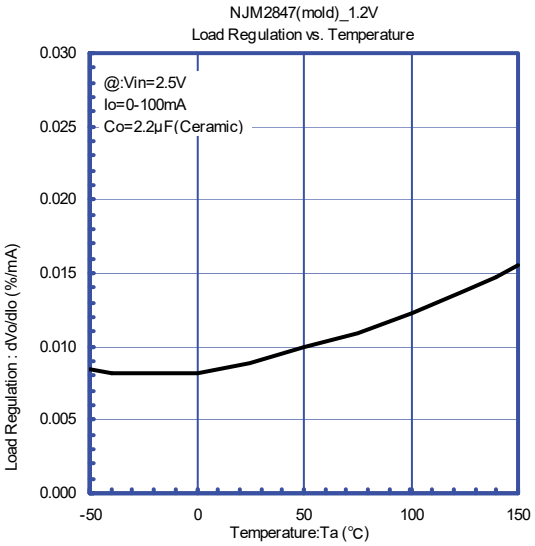
NJM2847(mold)_1.2V
Short Circuit Current vs. Temperature

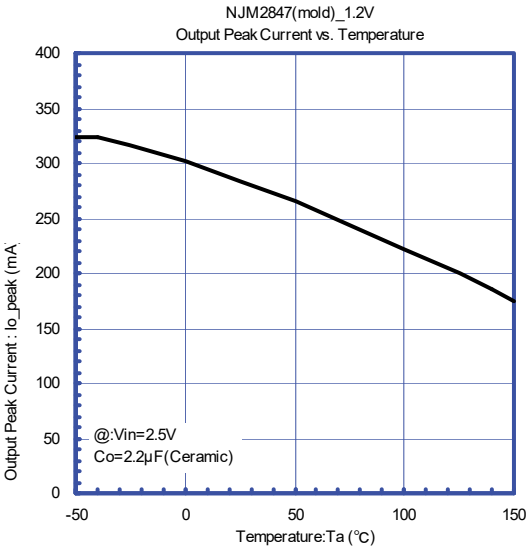


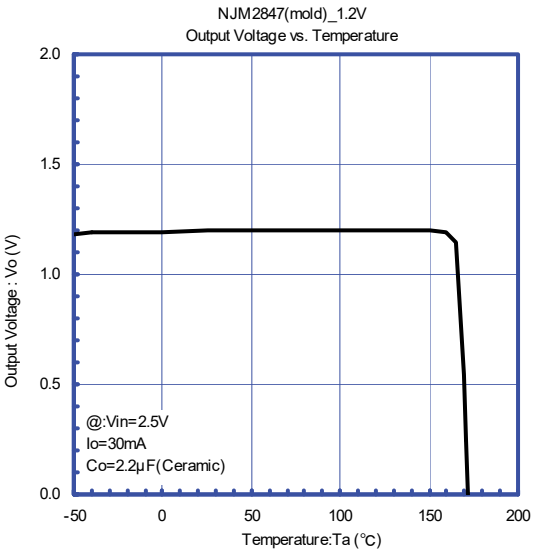
NJM2847(mold)_1.2V
Line Regulation vs. Temperature



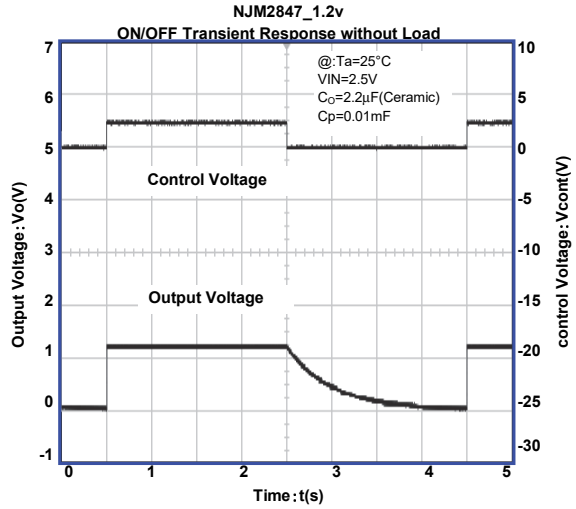
■ TYPICAL CHARACTERISTICS

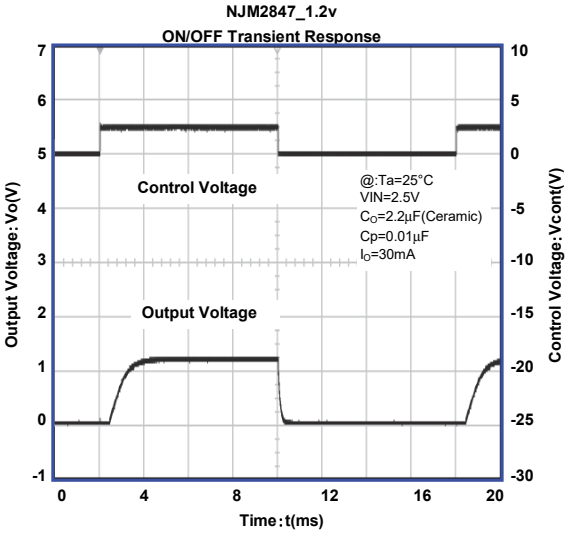


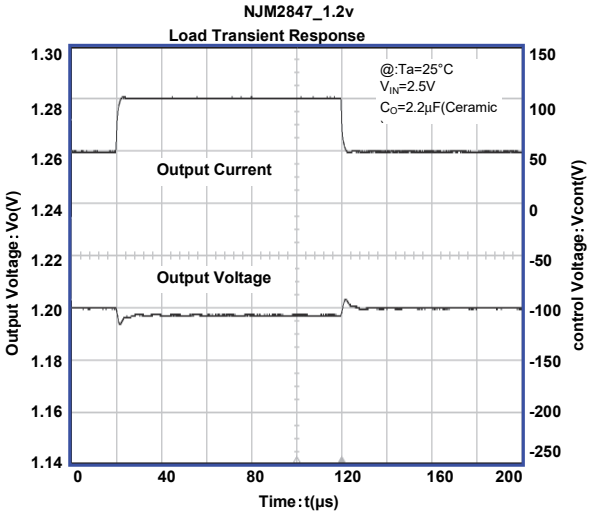


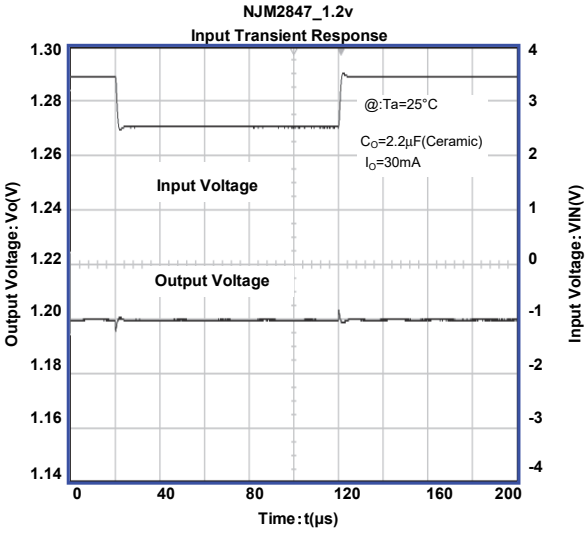


■ TYPICAL CHARACTERISTICS









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