

## LOW DROPOUT VOLTAGE REGULATOR

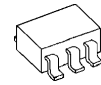
### ■ GENERAL DESCRIPTION

The NJM2831 is a 100mA output low dropout voltage regulator with ON/OFF control.

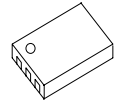
Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

2.1V to 15.5V output voltage range, 1 $\mu$ F small decoupling capacitor, built-in noise bypass capacitor make the NJM2831 suitable for various applications.

### ■ PACKAGE OUTLINE



NJM2831F

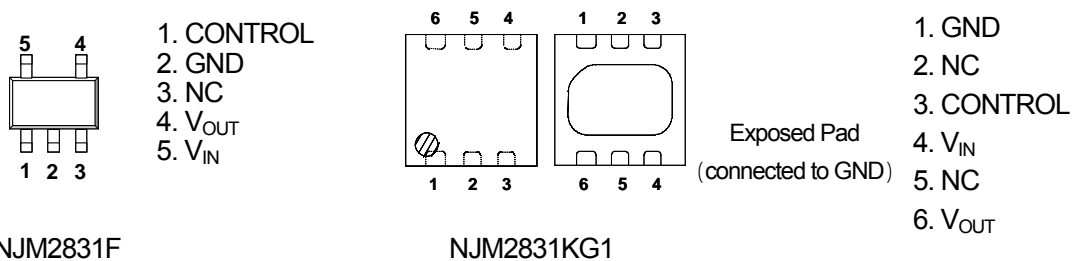


NJM2831KG1

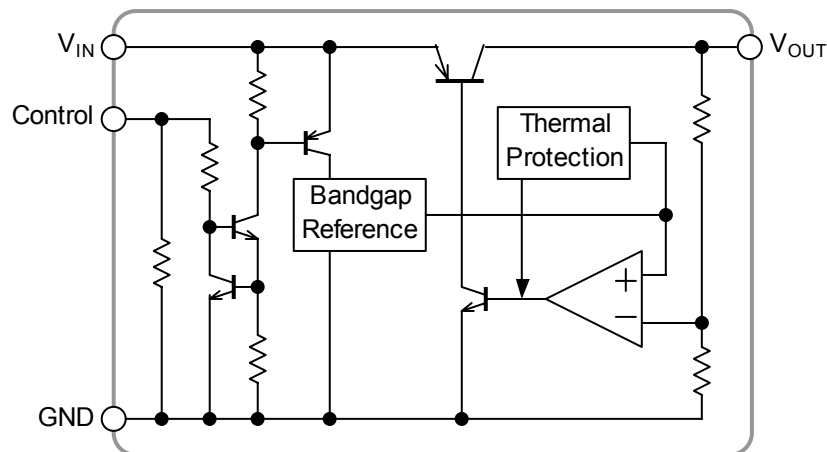
### ■ FEATURES

- Output voltage options available      2.1 ~ 15.5V (0.1V step)
- High Ripple Rejection                      75dB typ. (f=1kHz Vo=3V Version)
- Output Noise Voltage                        Vno=45 $\mu$ Vrms typ.
- Output capacitor with 1.0 $\mu$ F ceramic capacitor (Vo $\geq$ 5.1V)
- Output Current                                Io(max.)=100mA
- High Precision Output                        Vo $\pm$ 1.0%
- Low Dropout Voltage                         0.10V typ. (Io=60mA)
- ON/OFF Control                                (Active High)
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline                                SOT-23-5, ESON6-G1

### ■ PIN CONFIGURATION



### ■ EQUIVALENT CIRCUIT



# NJM2831

## ■ OUTPUT VOLTAGE

The WHITE column shows applicable Voltage Rank(s)

Device Name	Vout	Device Name	Vout	Device Name	Vout
NJM2831F-21	2.1V	NJM2831F-41	4.1V	NJM2831F-116	11.6V
NJM2831F-22	2.2V	NJM2831F-42	4.2V	NJM2831F-12	12.0V
NJM2831F-23	2.3V	NJM2831F-43	4.3V	NJM2831F-125	12.5V
NJM2831F-24	2.4V	NJM2831F-44	4.4V	NJM2831F-13	13.0V
NJM2831F-25	2.5V	NJM2831F-45	4.5V	NJM2831F-135	13.5V
NJM2831F-26	2.6V	NJM2831F-46	4.6V	NJM2831F-15	15.0V
NJM2831F-27	2.7V	NJM2831F-47	4.7V	NJM2831F-155	15.5V
NJM2831F-28	2.8V	NJM2831F-48	4.8V		
NJM2831F-29	2.9V	NJM2831F-49	4.9V		
NJM2831F-03	3.0V	NJM2831F-05	5.0V		
NJM2831F-31	3.1V	NJM2831F-53	5.3V		
NJM2831F-32	3.2V	NJM2831F-06	6.0V		
NJM2831F-33	3.3V	NJM2831F-64	6.4V		
NJM2831F-34	3.4V	NJM2831F-07	7.0V		
NJM2831F-35	3.5V	NJM2831F-08	8.0V		
NJM2831F-36	3.6V	NJM2831F-82	8.2V		
NJM2831F-37	3.7V	NJM2831F-85	8.5V		
NJM2831F-38	3.8V	NJM2831F-09	9.0V		
NJM2831F-39	3.9V	NJM2831F-92	9.2V		
NJM2831F-04	4.0V	NJM2831F-10	10.0V		

ESON Type Available Voltage Rank(s)

Device Name	Vout	Device Name	Vout	Device Name	Vout
NJM2831KG1-33	3.3V	NJM2831KG1-52	5.2V		

## ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT	
Input Voltage	$V_{IN}$	+20	V	
Control Voltage	$V_{CONT}$	+20(*1)	V	
Power Dissipation	$P_D$	SOT-23-5	500(*2)	mW
			250(*3)	
		ESON6	420(*4)	
			1135(*5)	
Operating Temperature	$T_{opr}$	-40~+85	°C	
Storage Temperature	$T_{stg}$	-40~+150	°C	

(\*1): When input voltage is less than +20V, 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.

(\*4): Mounted on glass epoxy board based on EIA/JEDEC STANDARD.

(101.5x114.5x1.6mm: 2Layers FR-4, copper area 100mm<sup>2</sup>)

(\*5): Mounted on glass epoxy board based on EIA/JEDEC STANDARD. (101.5 × 114.5 × 1.6mm: 4Layers FR-4,

Internal foil area size: 99.5 × 99.5mm, Applying a thermal via hole to a board based on JEDEC standard JESD51-5)

## ■ ELECTRICAL CHARACTERISTICS

( $V_{IN}=V_o+1V$ ,  $C_{IN}=0.1\mu F$ ,  $C_o=1.0\mu F$  (2.8V< $V_o$ ≤5.4V:  $C_o=2.2\mu F$ ,  $V_o$ ≤2.8V:  $C_o=4.7\mu F$ ),  $T_a=25^\circ C$ )

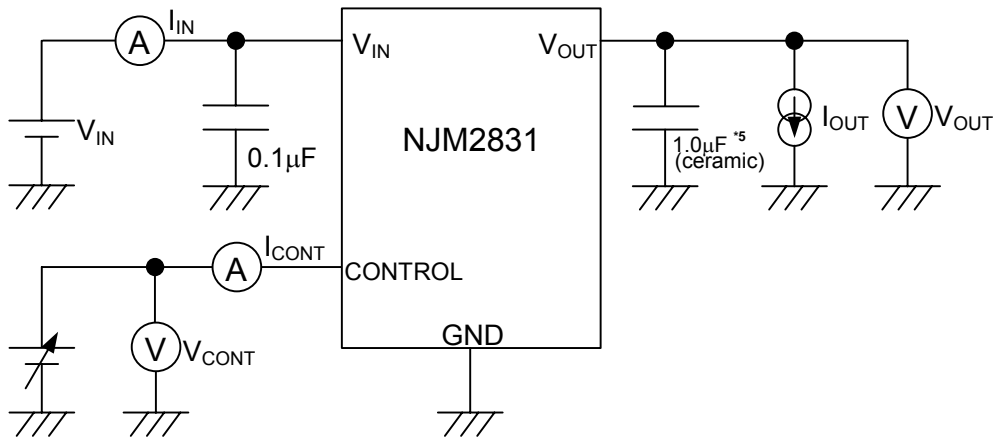
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_o$	$I_o=30mA$	-1.0%	–	+1.0%	V	
Quiescent Current	$I_Q$	$I_o=0mA$ , except $I_{cont}$	$V_o \leq 5V$ Version	–	120	180	$\mu A$
			$5V < V_o \leq 10V$ Version	–	135	195	$\mu A$
			$10V < V_o \leq 15V$ Version	–	150	210	$\mu A$
Quiescent Current at Control OFF	$I_{Q(OFF)}$	$V_{CONT}=0V$	–	–	100	nA	
Output Current	$I_o$	$V_o=0.3V$	100	130	–	mA	
Line Regulation	$\Delta V_o / \Delta V_{IN}$	$V_{IN}=V_o+1V \sim V_o+6V$ ( $V_o \leq 12V$ Version) $V_{IN}=V_o+1V \sim 18V$ ( $V_o > 12V$ Version), $I_o=30mA$	–	–	0.10	%/V	
Load Regulation	$\Delta V_o / \Delta I_o$	$I_o=0 \sim 60mA$	–	–	0.03	%/mA	
Dropout Voltage(*4)	$\Delta V_{I-O}$	$I_o=60mA$	–	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	–	45	–	$\mu V_{rms}$	
Control Current	$I_{cont}$	$V_{CONT}=1.6V$	–	3	12	$\mu A$	
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	–	–	V	
Control Voltage for OFF-state	$V_{CONT(OFF)}$		–	–	0.6	V	
Input Voltage	$V_{IN}$		–	–	18	V	

(\*4): 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.

# NJM2831

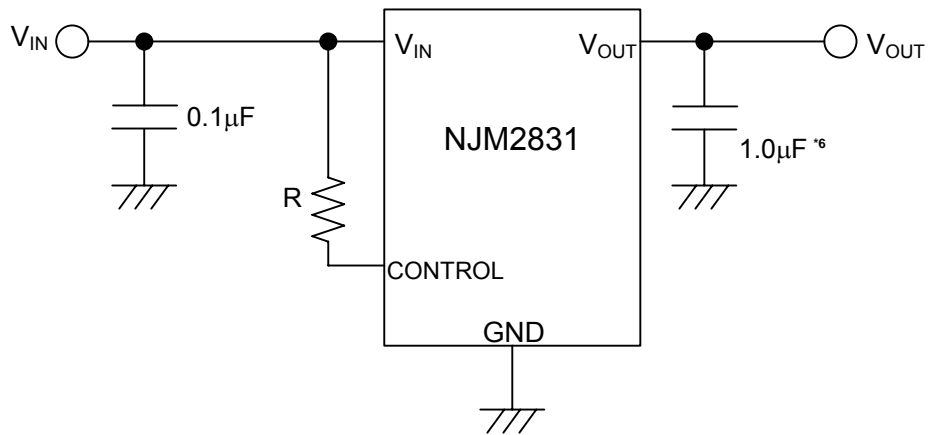
## ■ TEST CIRCUIT



\*5 2.8V <  $V_o$  ≤ 5.4V version:  $C_o$  = 2.2 μF (ceramic)  
 $V_o$  ≤ 2.8V version:  $C_o$  = 4.7 μF (ceramic)

## ■ TYPICAL APPLICATIONS

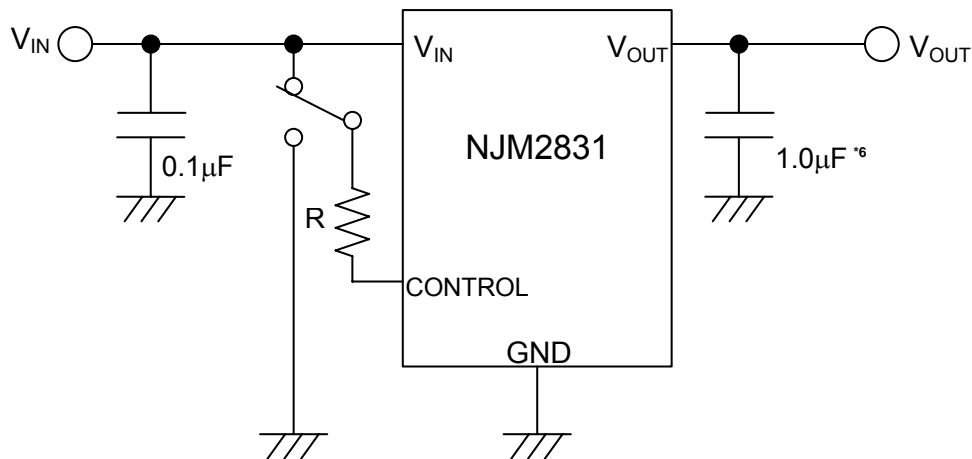
① In the case where ON/OFF Control is not required:



\*6 2.8V <  $V_o$  ≤ 5.4V version:  $C_o$  = 2.2 μF  
 $V_o$  ≤ 2.8V version:  $C_o$  = 4.7 μF

Connect control terminal to  $V_{IN}$  terminal

② In use of ON/OFF CONTROL:



\*6 2.8V <  $V_o$  ≤ 5.4V version:  $C_o = 2.2\mu\text{F}$   
 $V_o \leq 2.8\text{V}$  version:  $C_o = 4.7\mu\text{F}$

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.

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.

## \*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 $\mu$ F greater to avoid the problem.

$C_{IN}$  should connect between GND and  $V_{IN}$  as short as possible.

## \*Output Capacitance $C_O$

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.

This product is designed to work with a low ESR capacitor ( $C_O$ ). However use of recommended capacitance or larger value is effective 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.

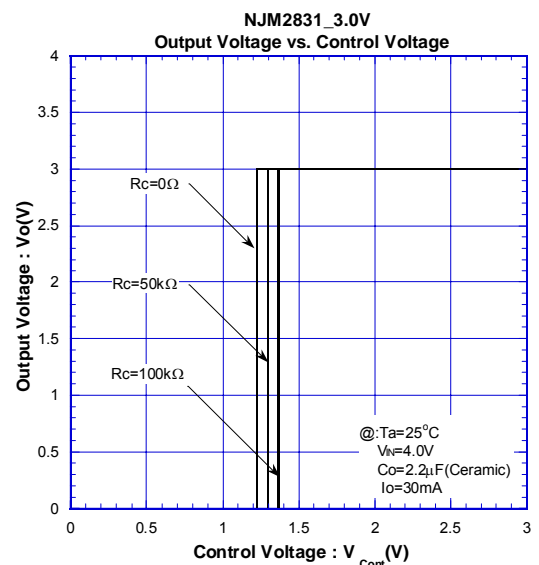
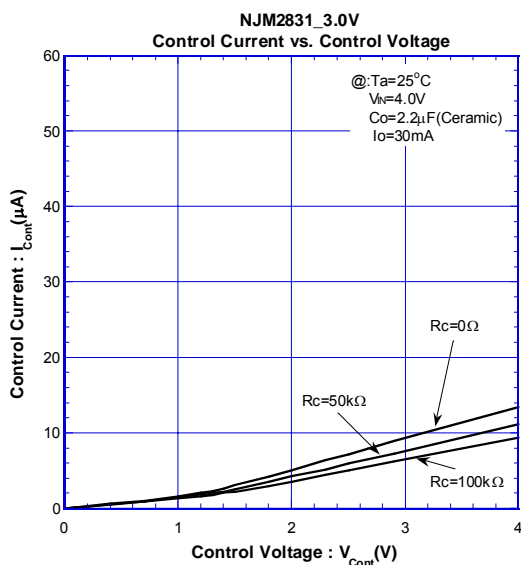
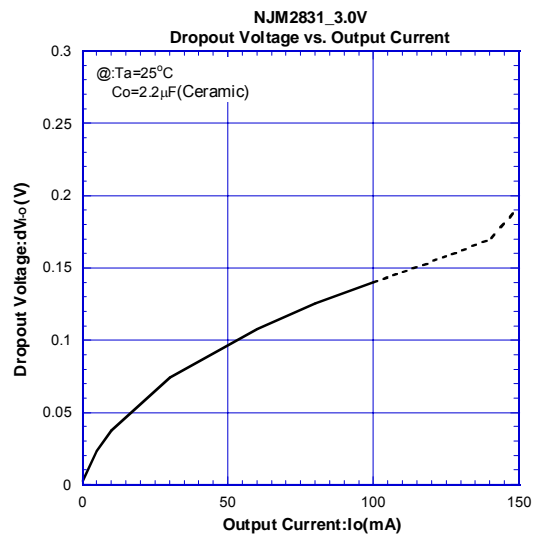
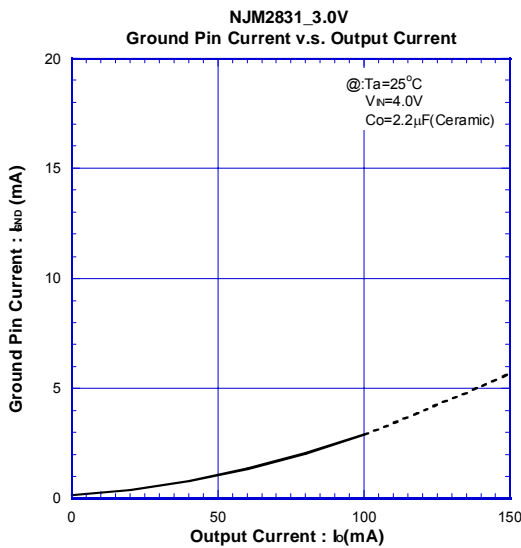
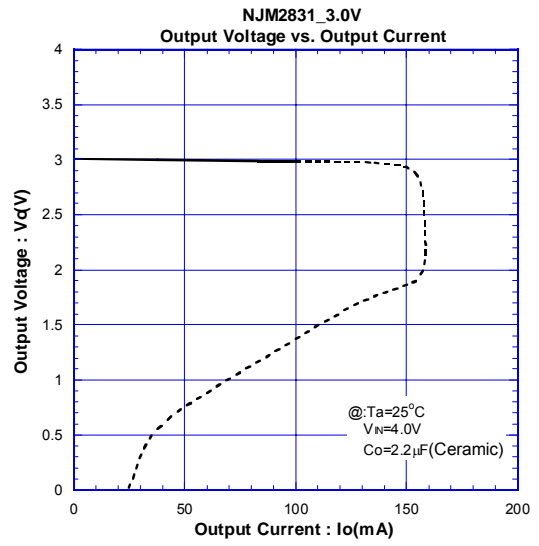
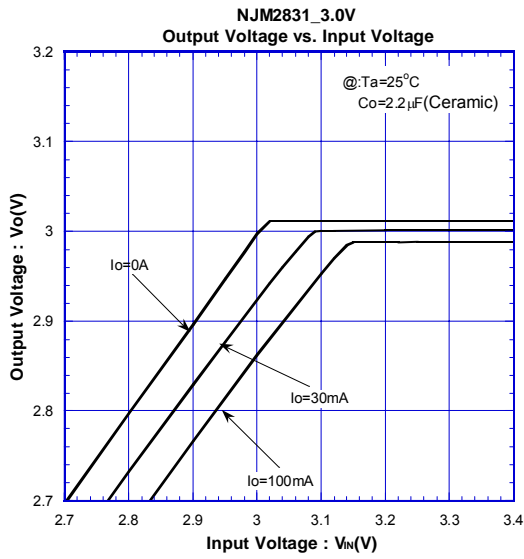
Therefore use  $C_O$  with the recommended capacitance or larger value and connect between  $V_O$  terminal and GND terminal with shortest path. The recommended capacitance depends on the output voltage rank. Low voltage regulator requires larger value  $C_O$ . Thus, check the recommended capacitance for each output voltage rank.

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. We recommend that withstand voltage margin against output voltage and superior in a temperature characteristic, when selecting Output capacitor.

Uses of a larger  $C_O$  reduces output noise and ripple output, and also improves output transient response against rapid load change.

## TYPICAL CHARACTERISTICS

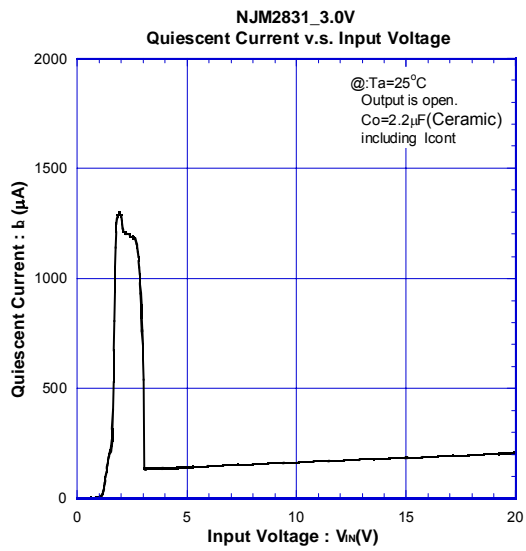
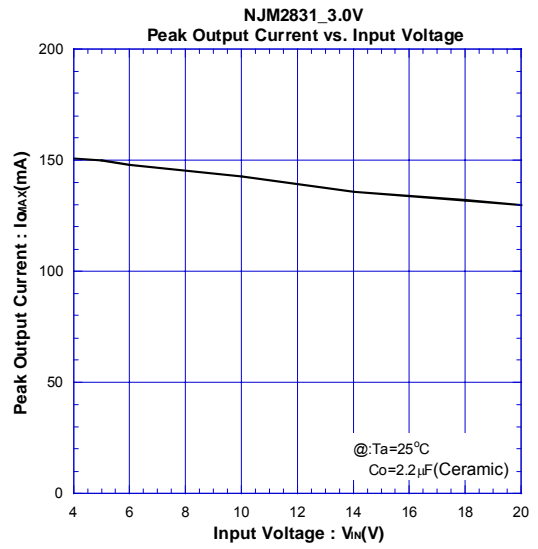
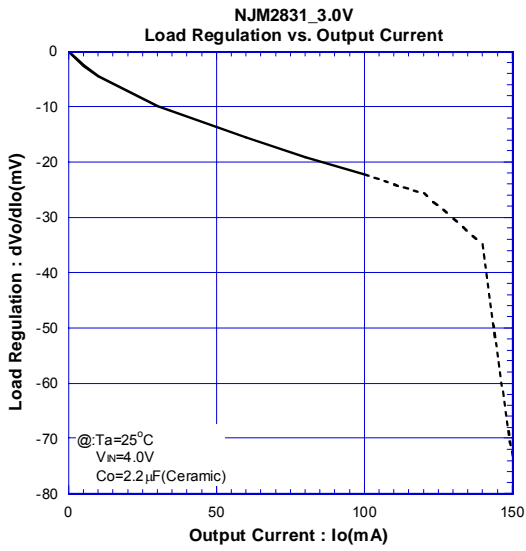
### DC CHARACTERISTICS (3V Version)



# NJM2831

## ■ TYPICAL CHARACTERISTICS

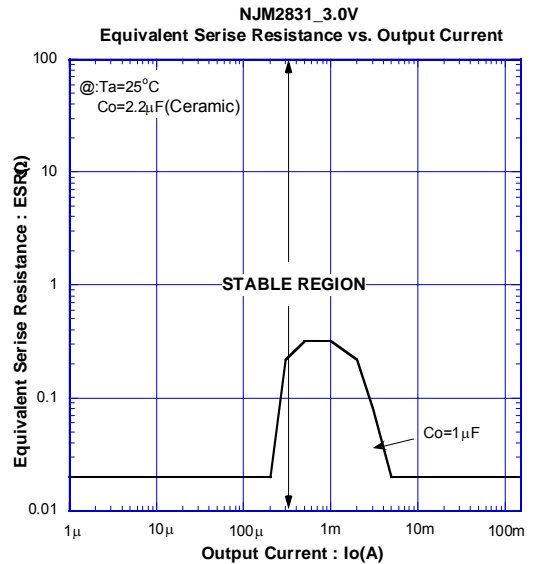
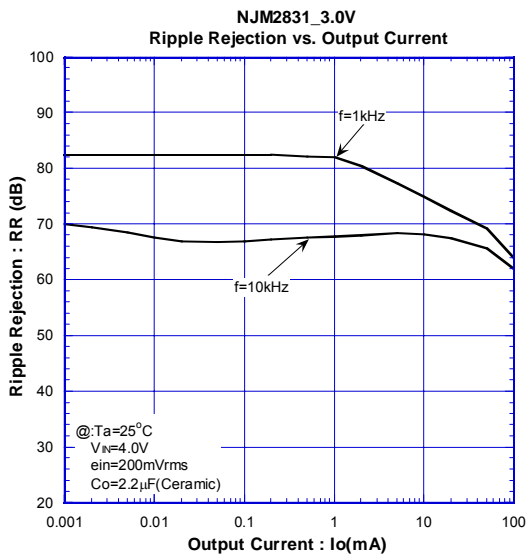
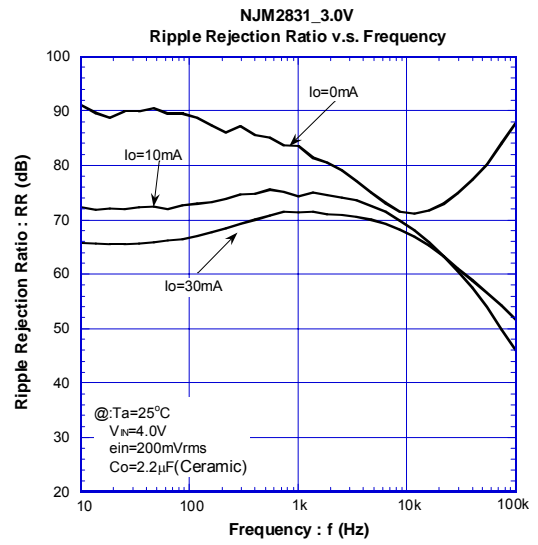
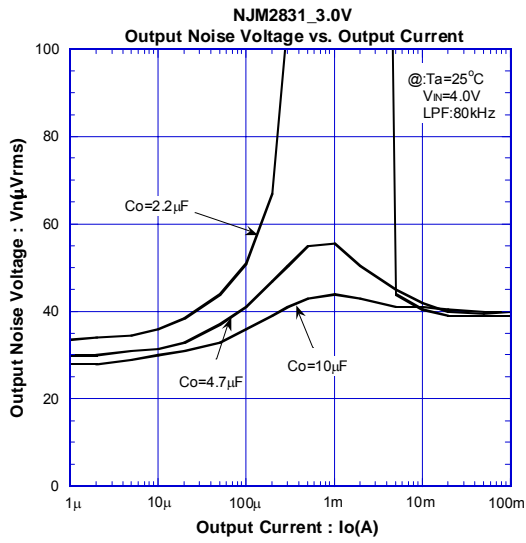
### ● DC CHARACTERISTICS (3V Version)





## TYPICAL CHARACTERISTICS

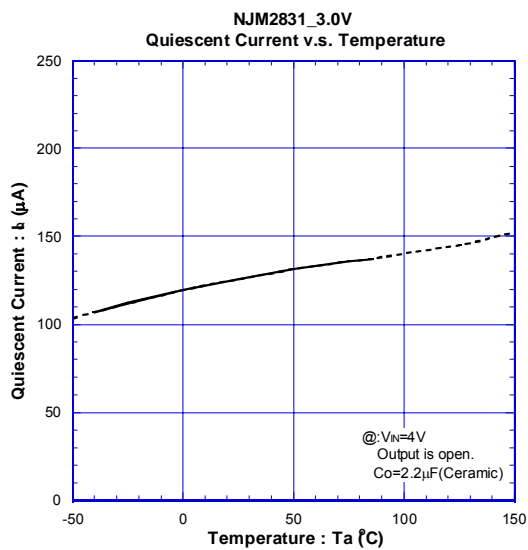
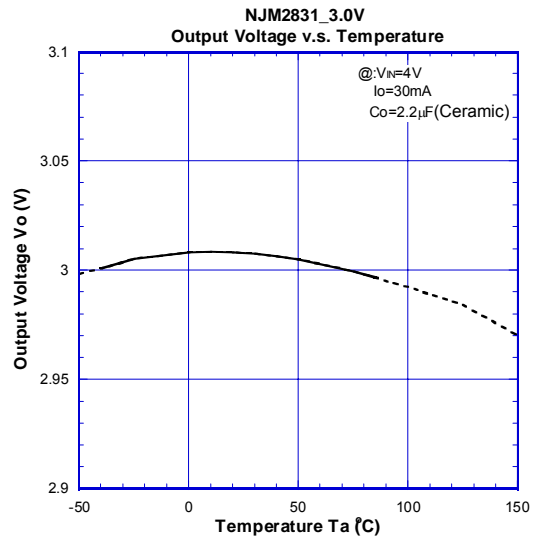
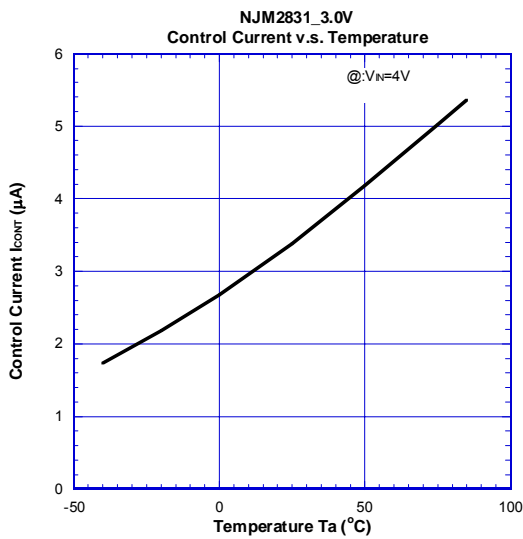
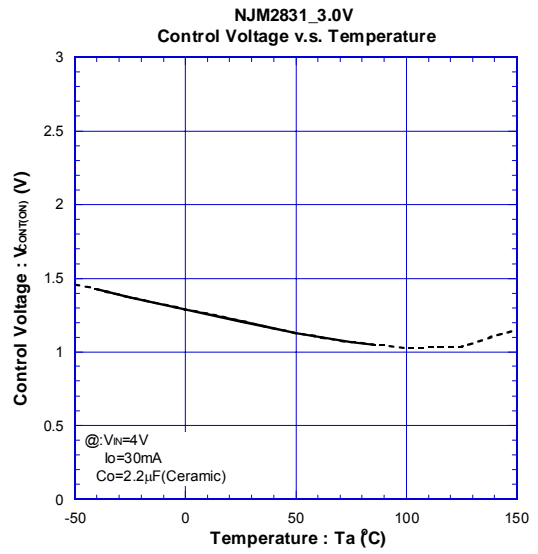
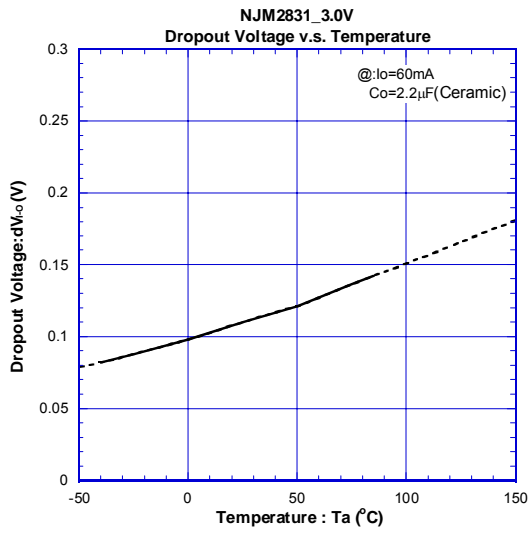
### AC CHARACTERISTICS (3V Version)



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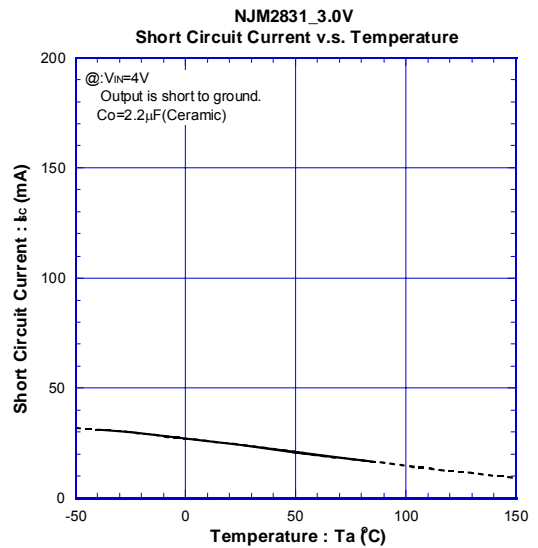
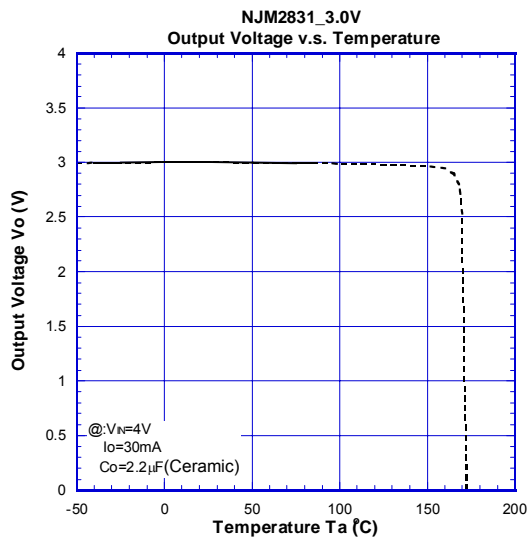
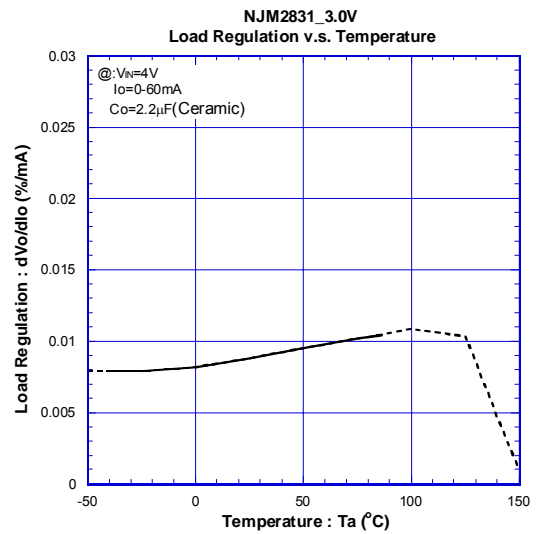
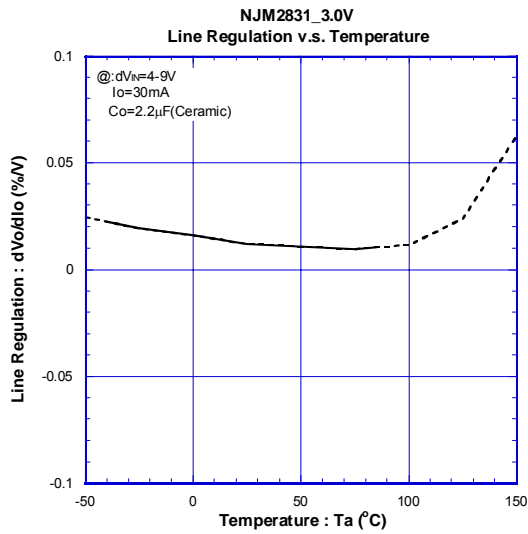
## ■ TYPICAL CHARACTERISTICS

### ● TEMPERATURE CHARACTERISTICS (3V Version)



## TYPICAL CHARACTERISTICS

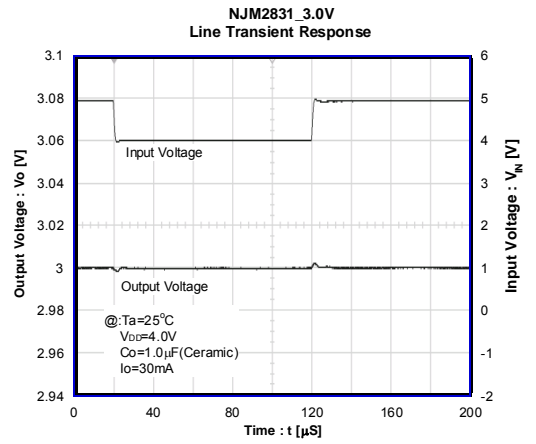
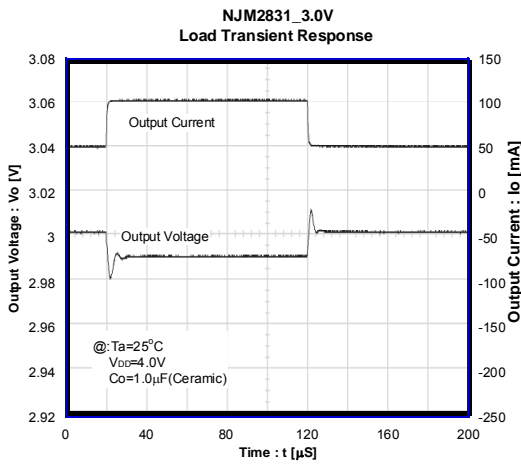
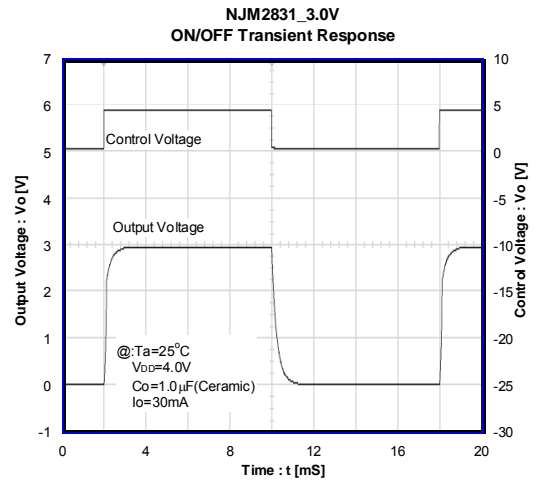
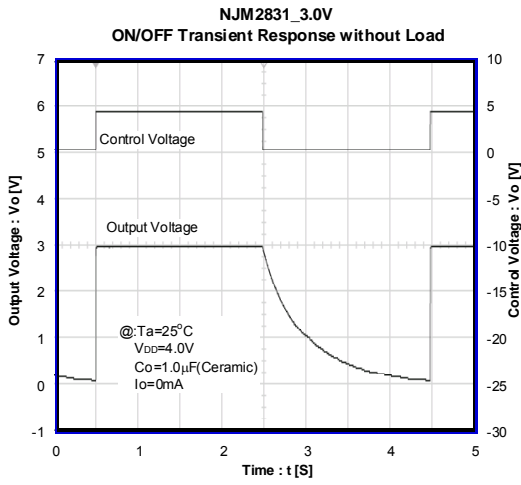
### ● TEMPERATURE CHARACTERISTICS (3V Version)



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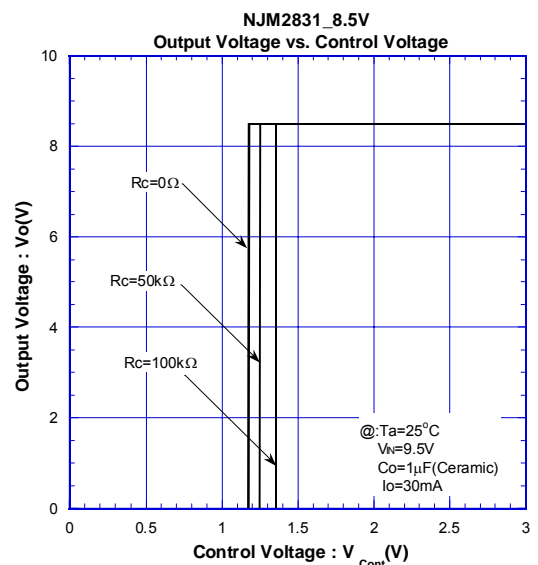
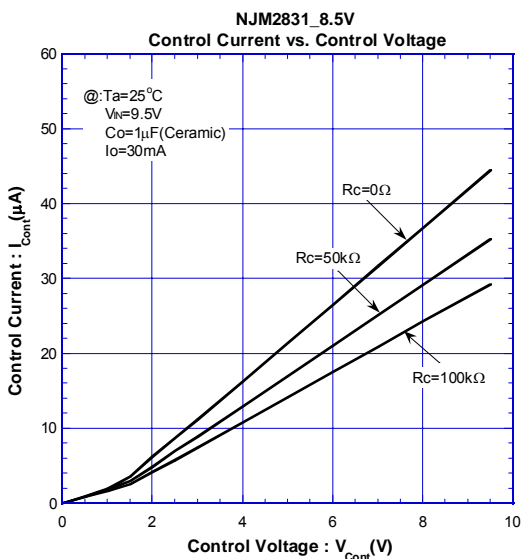
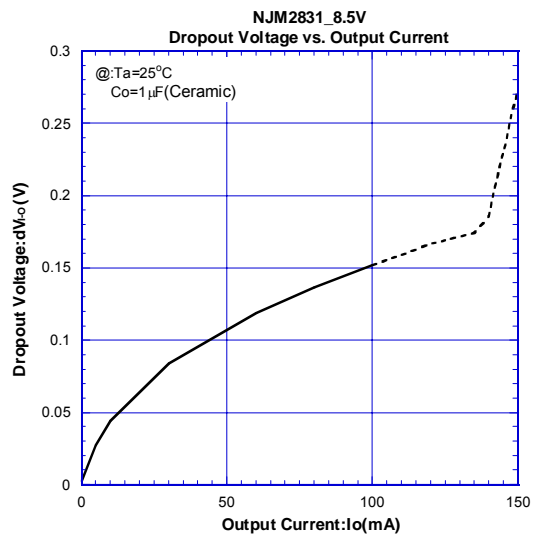
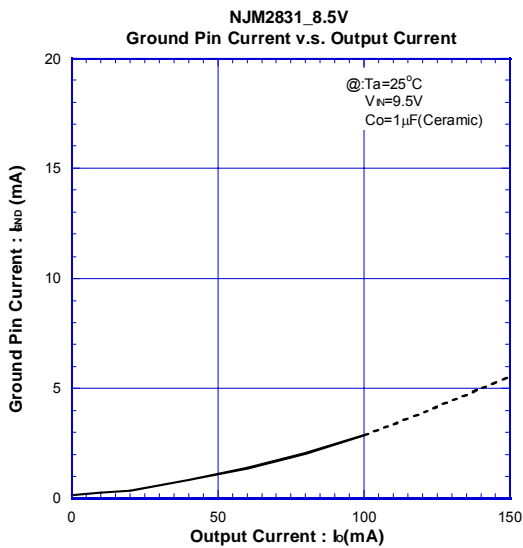
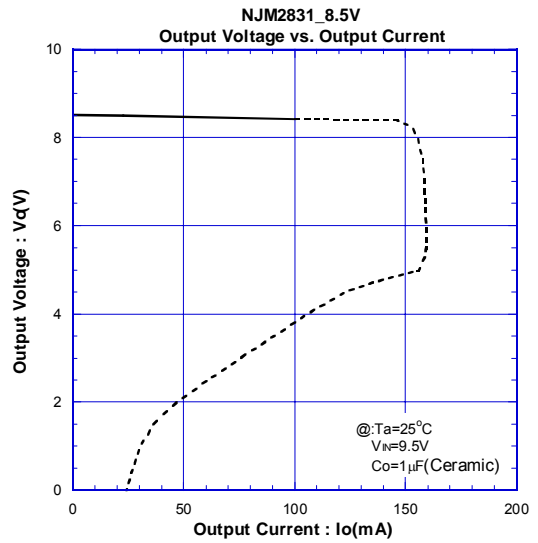
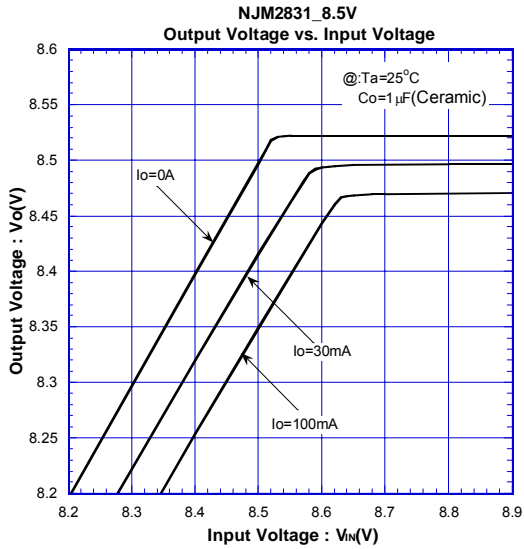
## TYPICAL CHARACTERISTICS

### TRANSIENT RESPONSE (3V Version)



## TYPICAL CHARACTERISTICS

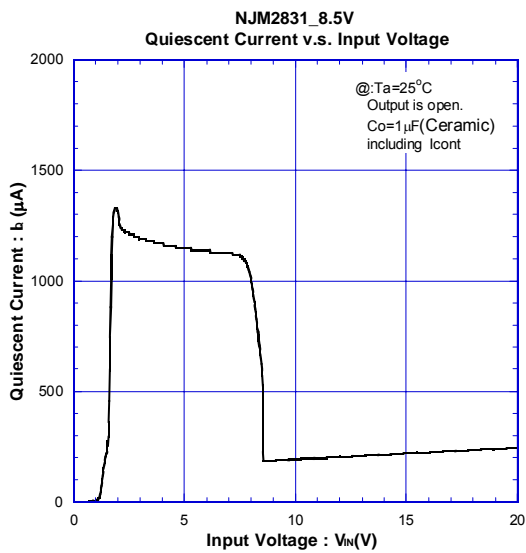
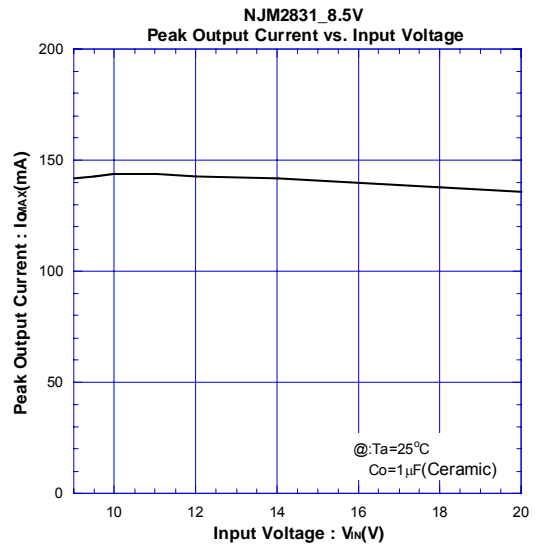
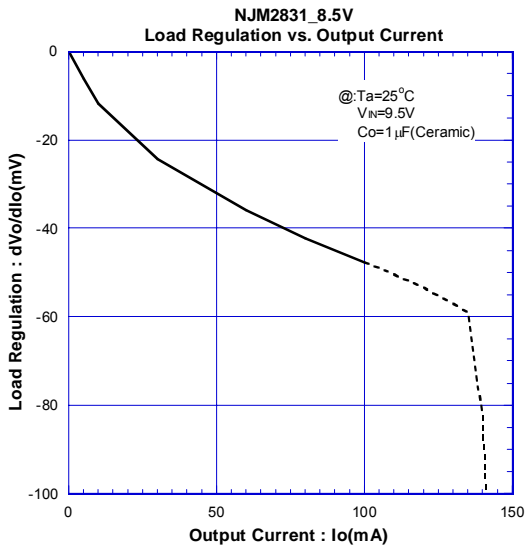
### DC CHARACTERISTICS (8.5V Version)



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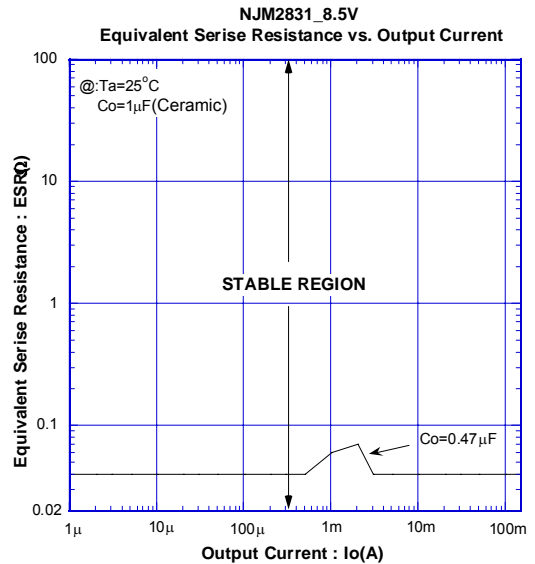
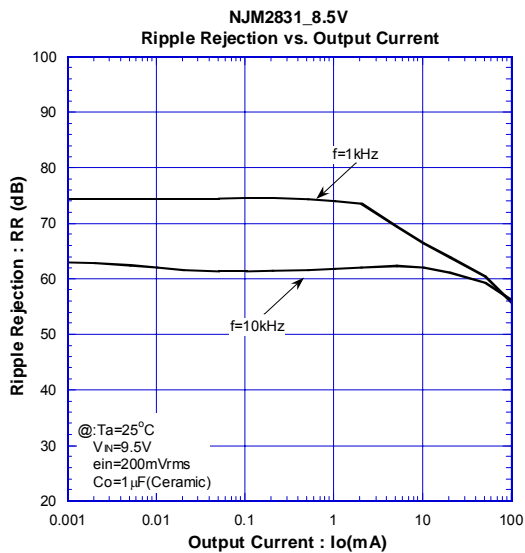
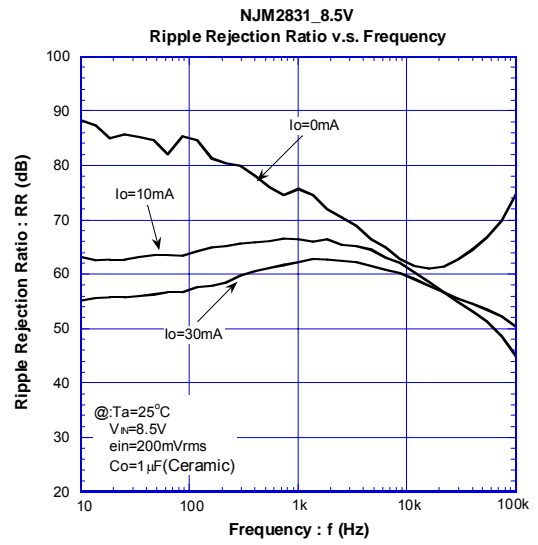
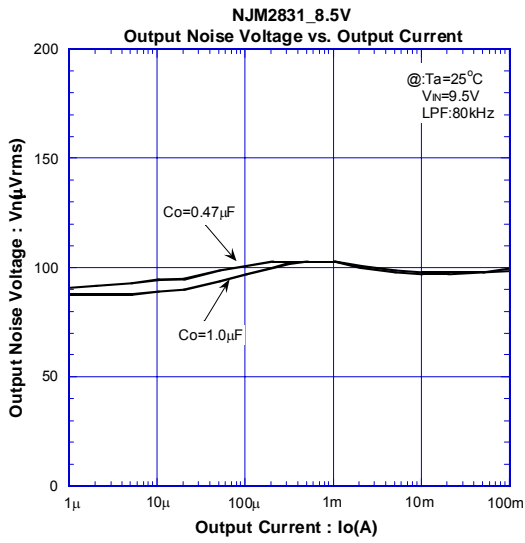
## ■ TYPICAL CHARACTERISTICS

### ● DC CHARACTERISTICS (8.5V Version)



## TYPICAL CHARACTERISTICS

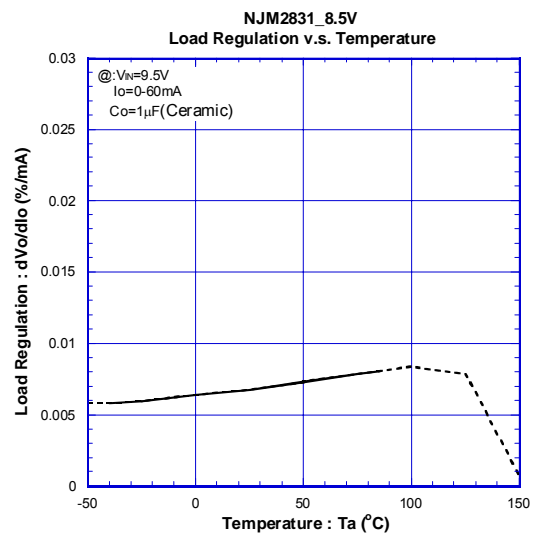
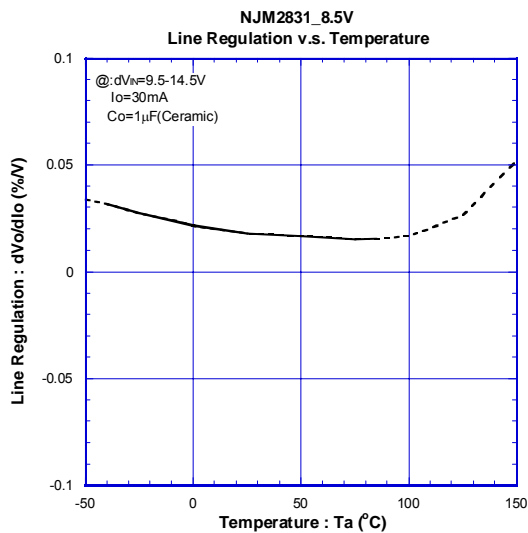
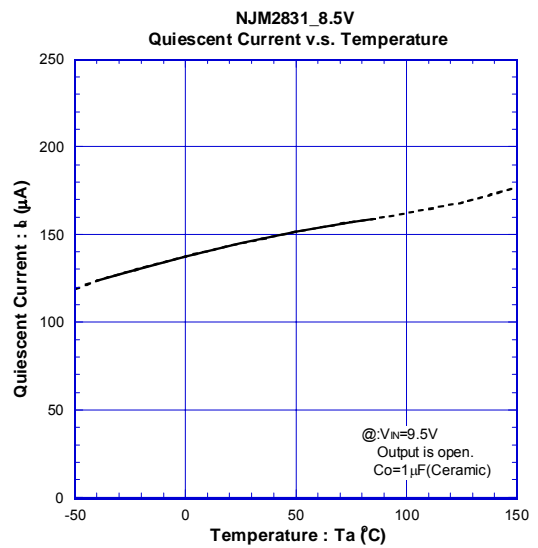
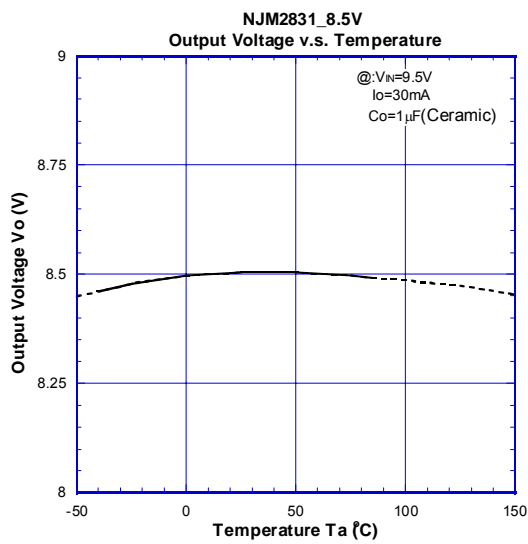
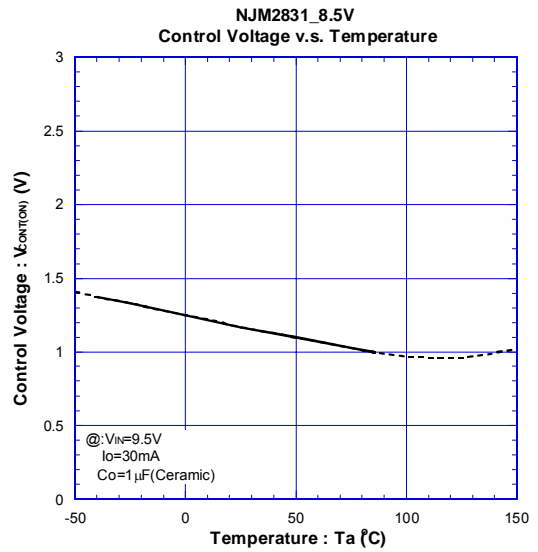
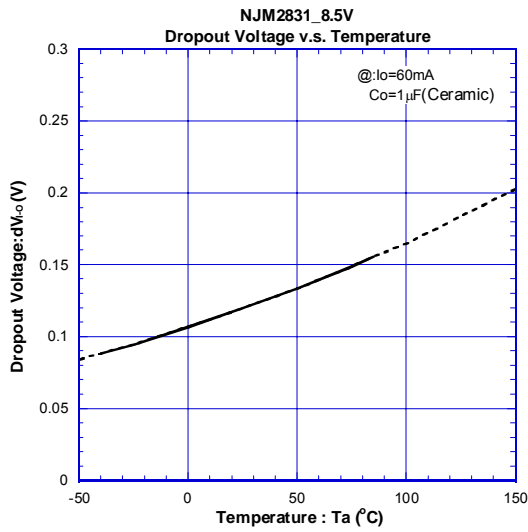
### ●AC CHARACTERISTICS (8.5V Version)



# NJM2831

## ■ TYPICAL CHARACTERISTICS

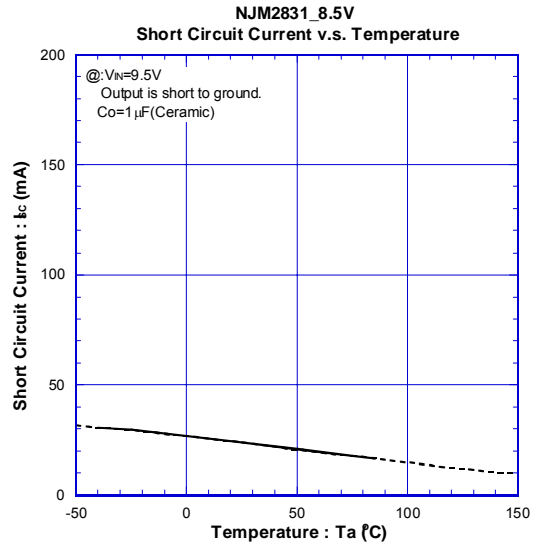
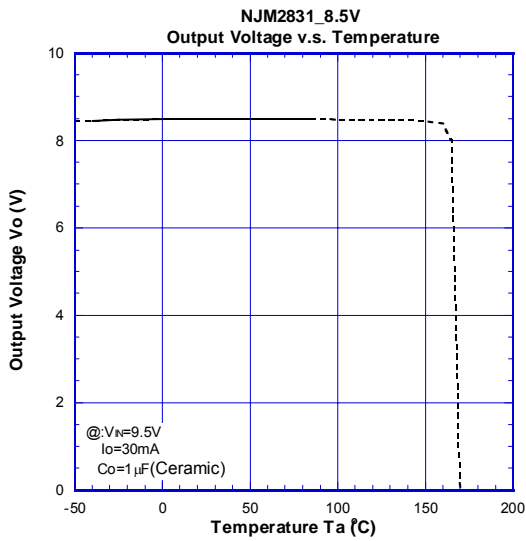
### ● TEMPERATURE CHARACTERISTICS (8.5V Version)



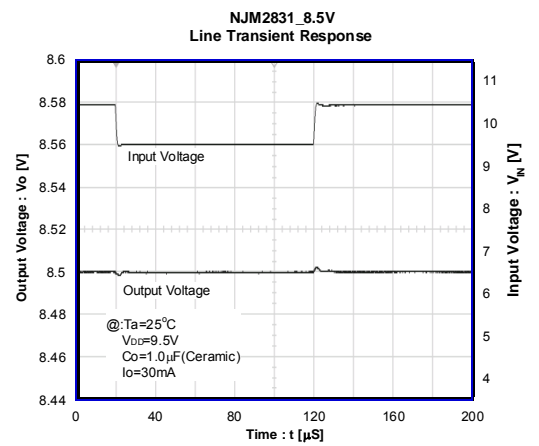
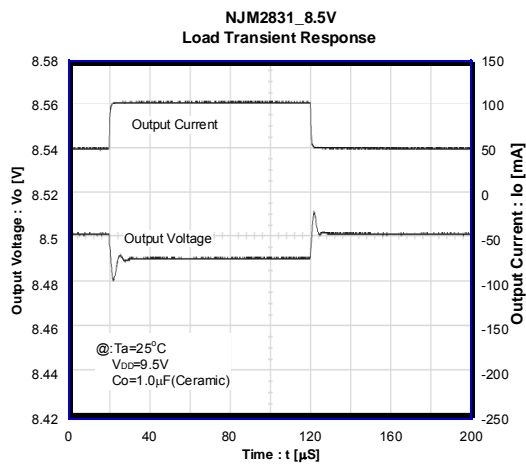
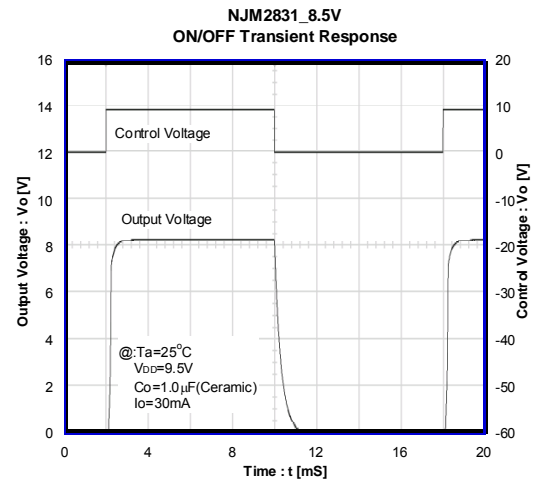
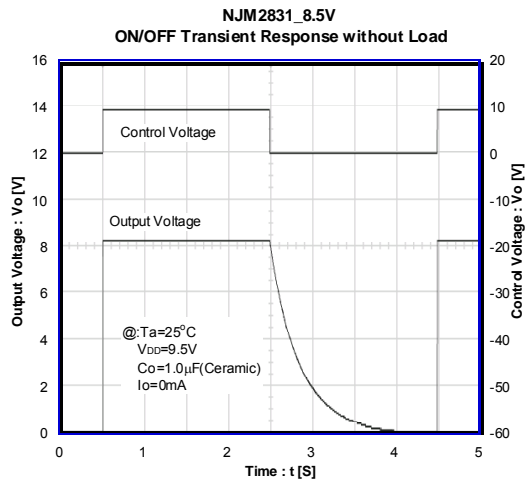


## ■ TYPICAL CHARACTERISTICS

### ● TEMPERATURE CHARACTERISTICS (8.5V Version)



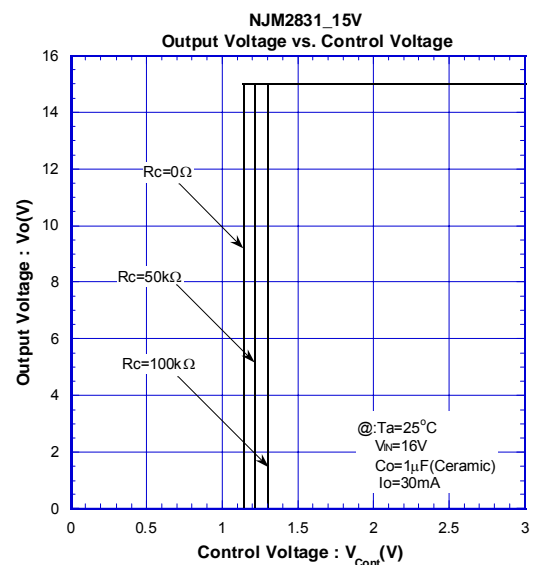
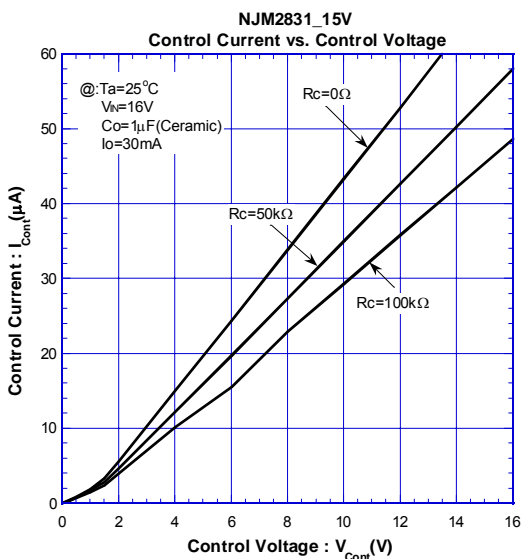
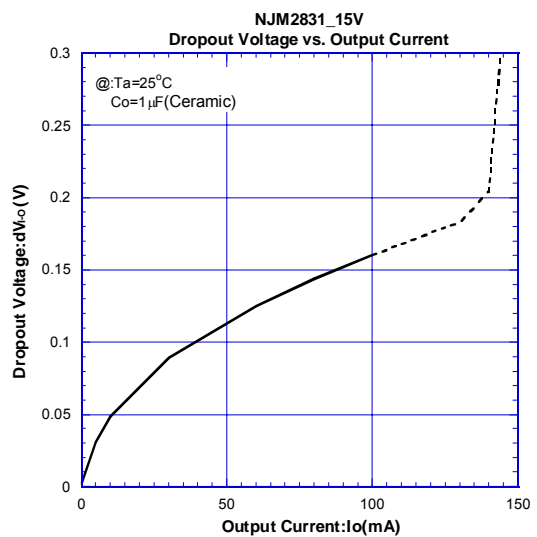
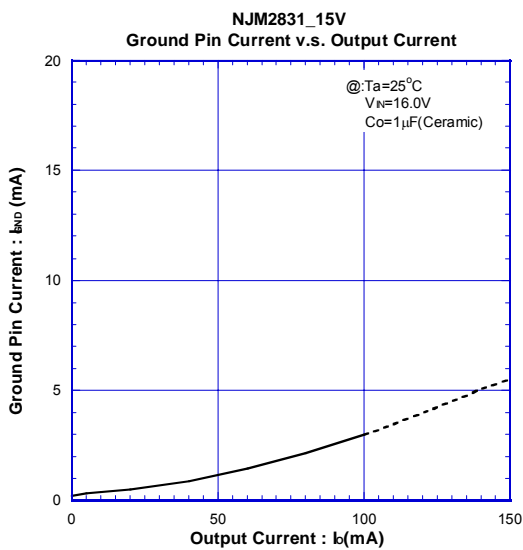
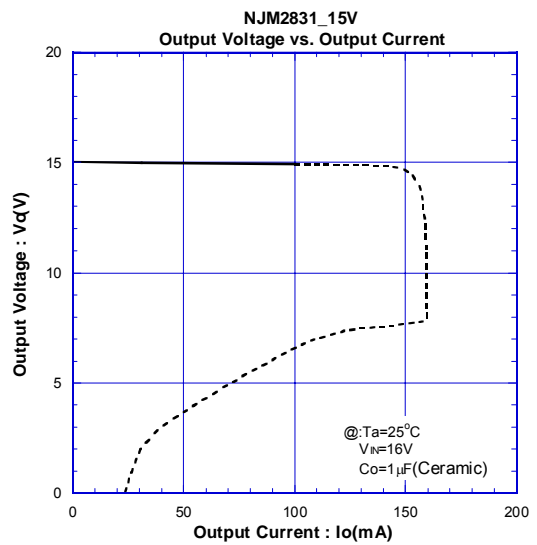
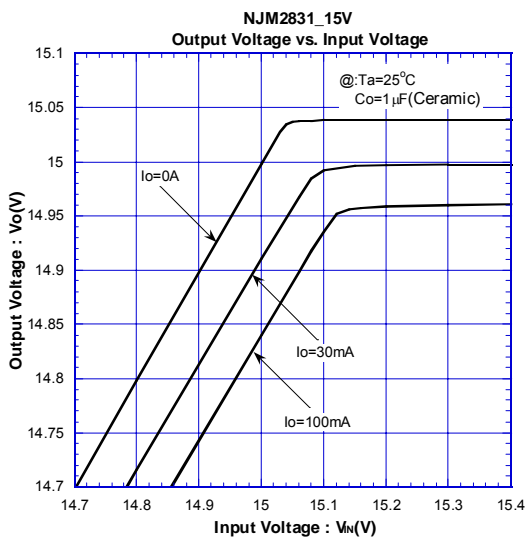
### ● TRANSIENT RESPONSE (8.5V Version)



# NJM2831

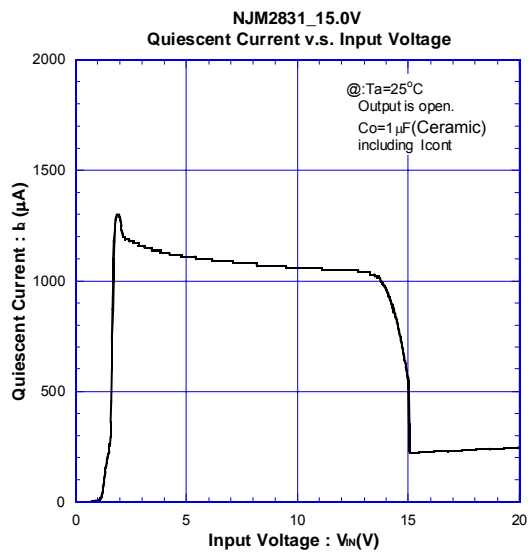
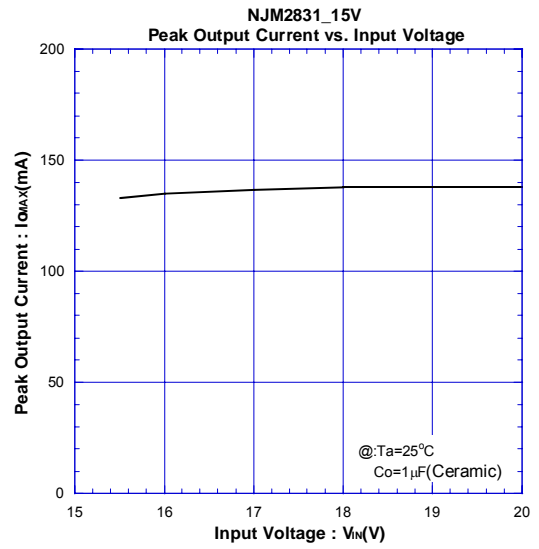
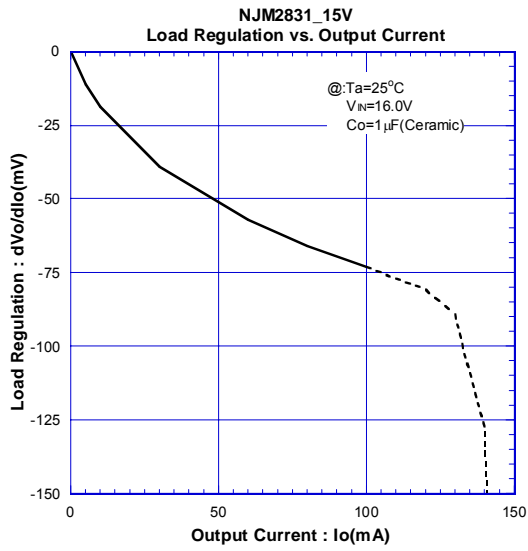
## ■ TYPICAL CHARACTERISTICS

### ● DC CHARACTERISTICS (15V Version)



## ■ TYPICAL CHARACTERISTICS

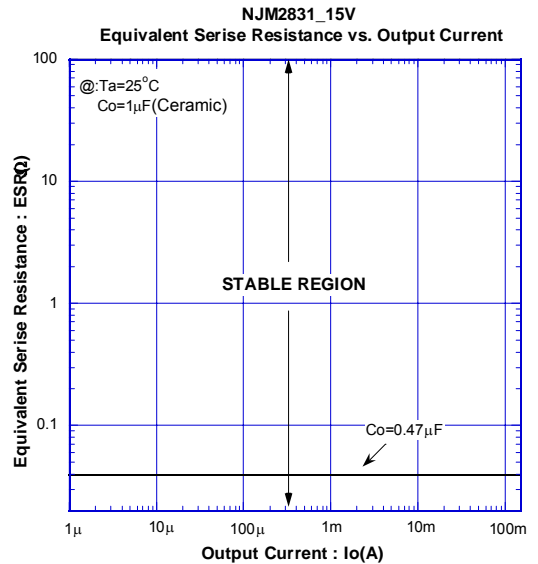
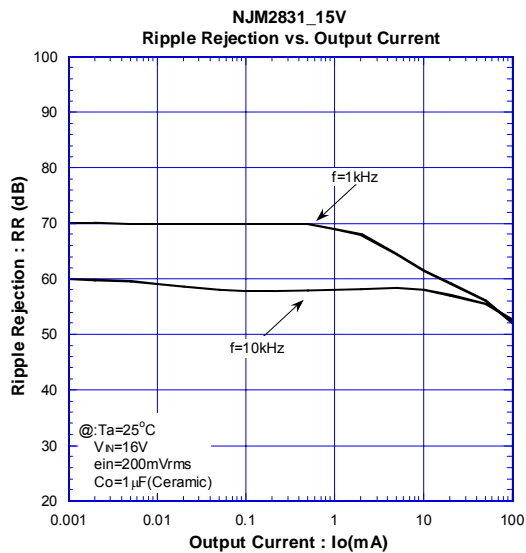
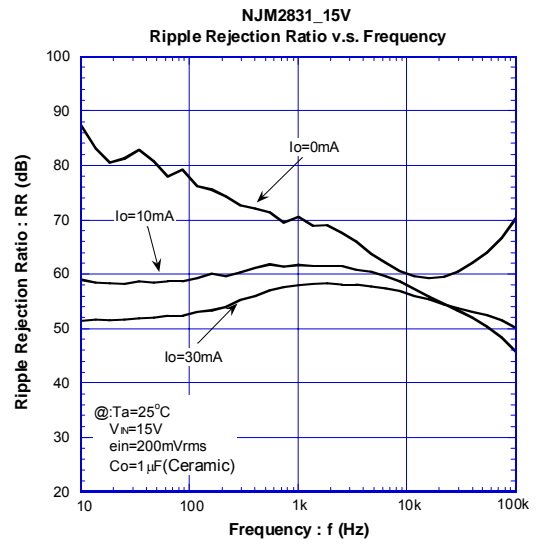
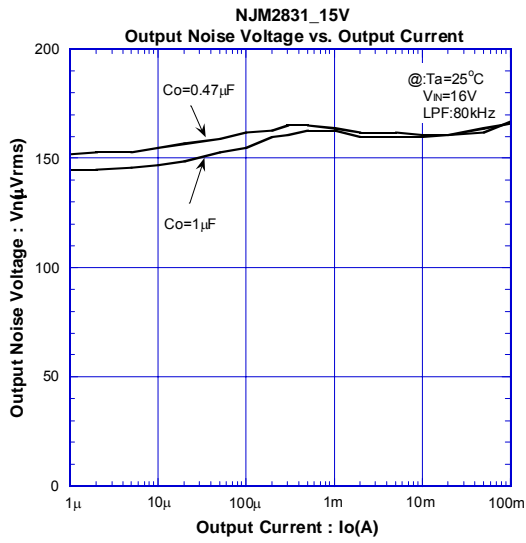
### ● DC CHARACTERISTICS (15V Version)



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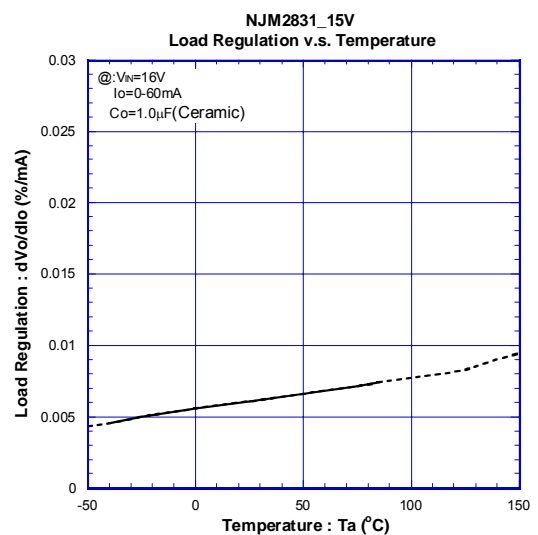
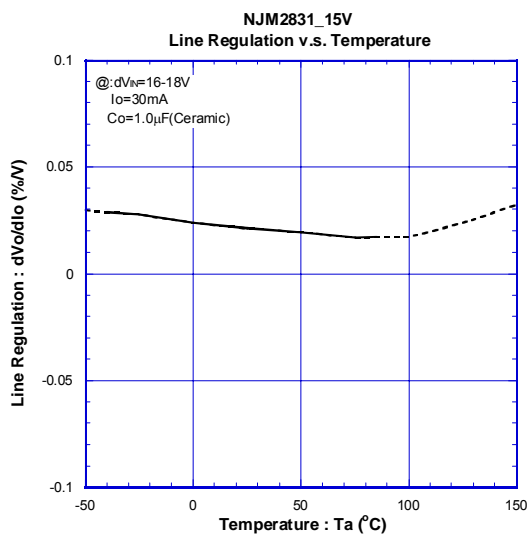
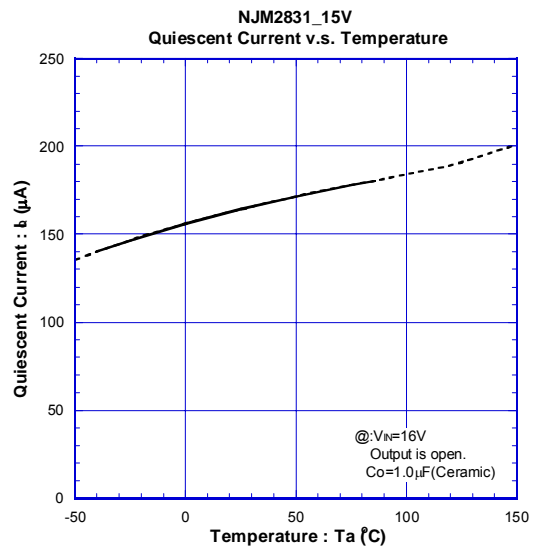
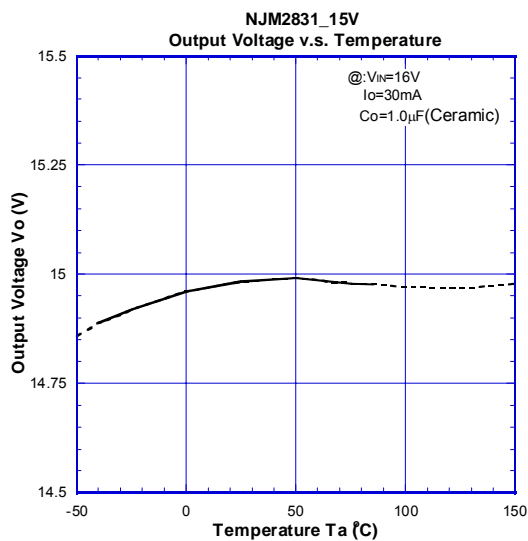
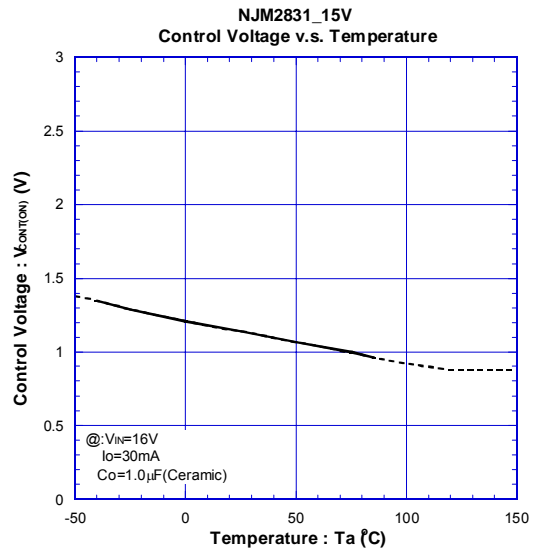
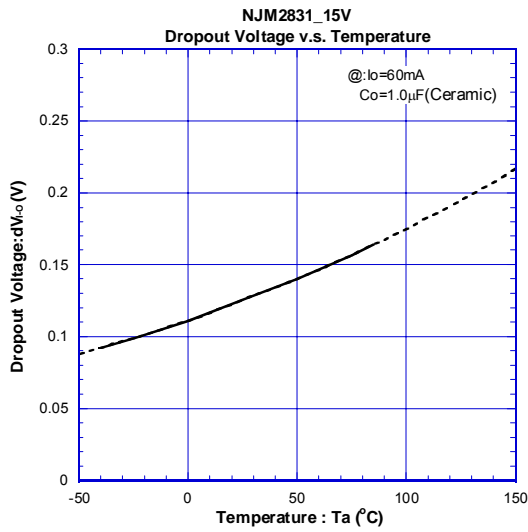
## TYPICAL CHARACTERISTICS

### AC CHARACTERISTICS (15V Version)



## ■ TYPICAL CHARACTERISTICS

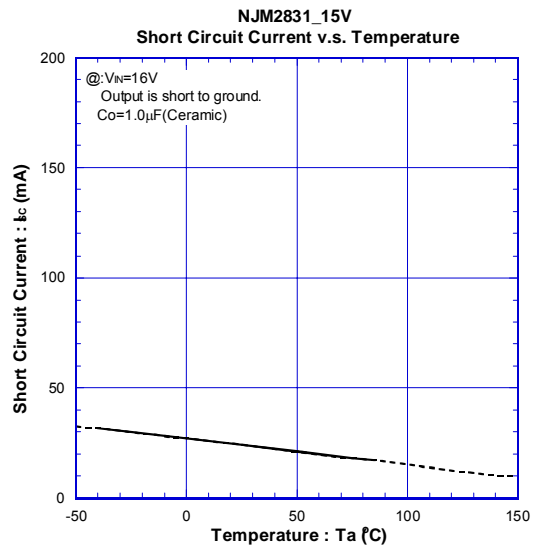
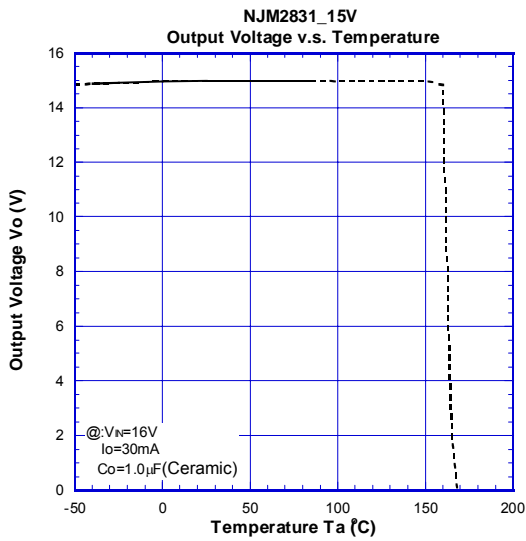
### ● TEMPERATURE CHARACTERISTICS (15V Version)



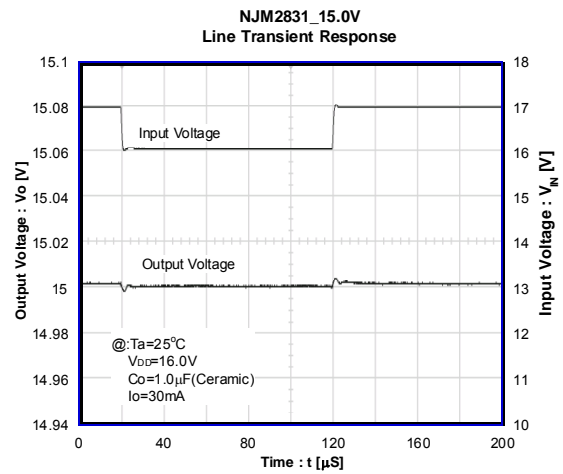
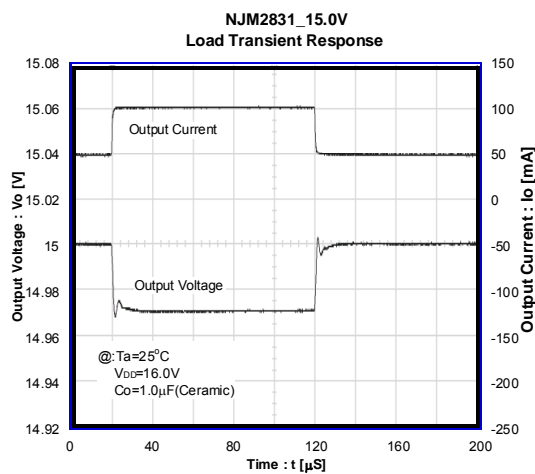
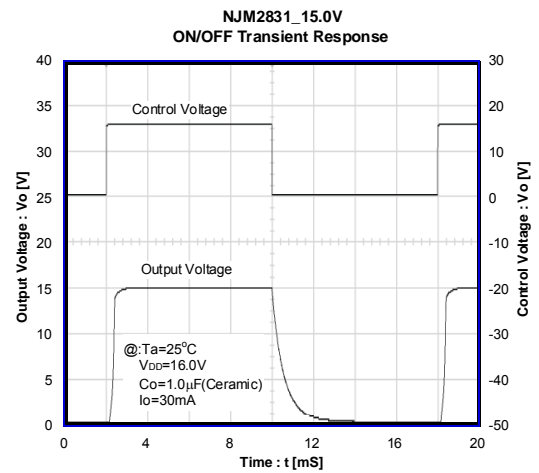
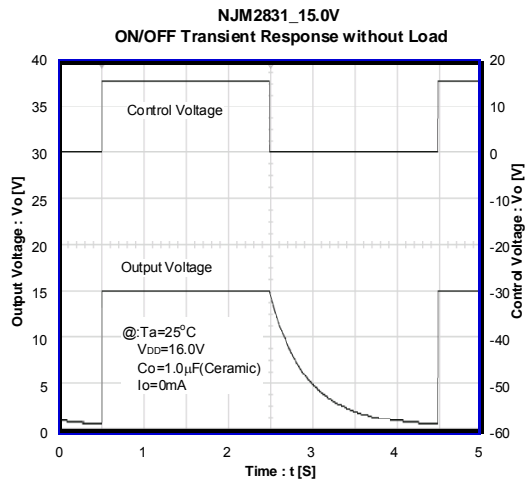
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## ■ TYPICAL CHARACTERISTICS

### ● TEMPERATURE CHARACTERISTICS (15V Version)



### ● TRANSIENT RESPONSE (15V Version)



**[CAUTION]**

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