# LOW DROPOUT VOLTAGE REGULATOR

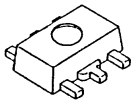
## ■ GENERAL DESCRIPTION

The NJM2830 is a 300mA 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, 1μF small decoupling capacitor, built-in noise bypass capacitor make the NJM2830 suitable for various applications.

## ■ PACKAGE OUTLINE

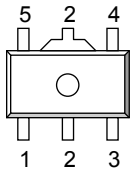


NJM2830U1

## ■ 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=50μVrms typ. (Vo=3V Version)
- Output capacitor with 1.0μF ceramic capacitor (Vo≥5.6V)
- 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 Thermal Overload Protection
- Internal Over Current Protection
- Bipolar Technology
- Package Outline SOT-89-5

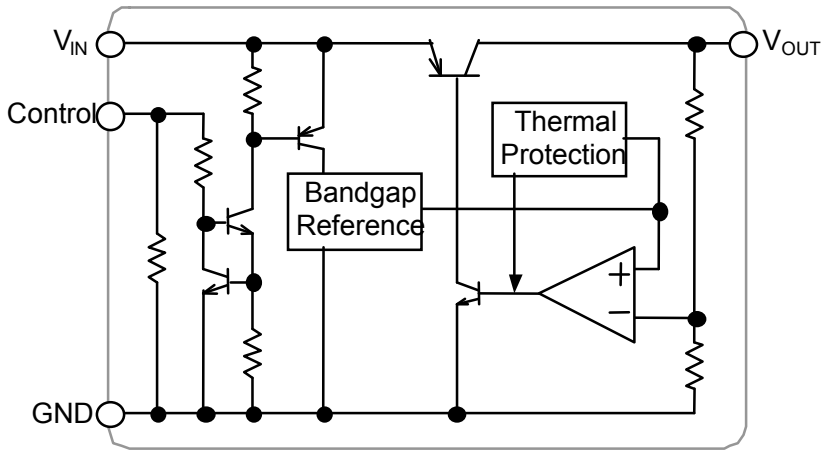
## ■ PIN CONFIGURATION




NJM2830U1

1. CONTROL
2. GND
3. N.C.
4. $V_{OUT}$
5. $V_{IN}$

## ■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

| Device Name | Vout |
|---|---|
| NJM2830U1-21 | 2.1V |
| NJM2830U1-25 | 2.5V |
| NJM2830U1-03 | 3.0V |
| NJM2830U1-33 | 3.3V |
| NJM2830U1-05 | 5.0V |
| NJM2830U1-57 | 5.7V |
| NJM2830U1-58 | 5.8V |
| NJM2830U1-06 | 6.0V |
| NJM2830U1-08 | 8.0V |
| NJM2830U1-85 | 8.5V |
| NJM2830U1-86 | 8.6V |
| NJM2830U1-09 | 9.0V |
| NJM2830U1-12 | 12.0V |
| NJM2830U1-15 | 15.0V |

The WHITE column shows applicable Voltage Rank(s)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | +20 | V |
| Control Voltage | $V_{CONT}$ | +20 | V |
| Power Dissipation | $P_D$ | 625(*1)<br>960(*2) | mW |
| Operating Temperature | Topr | -40~+85 | °C |
| Storage Temperature | Tstg | -40~+150 | °C |

(*1): Mounted on glass epoxy board. (76.2 x114.3 x 1.6mm:based on EIA/JDEC standard size, 2Layers, Cu area 100mm$^2$)

(*2): Mounted on glass epoxy board. (76.2 x 114.3 x 1.6mm:based on EIA/JDEC standard, 4Layers)

( 4Layers: Applying 74.2×74.2mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

■ INPUT VOLTAGE RANGE

$V_{IN}$=+2.3V~18V (In case of Vo < 2.2V)

■ ELECTRICAL CHARACTERISTICS

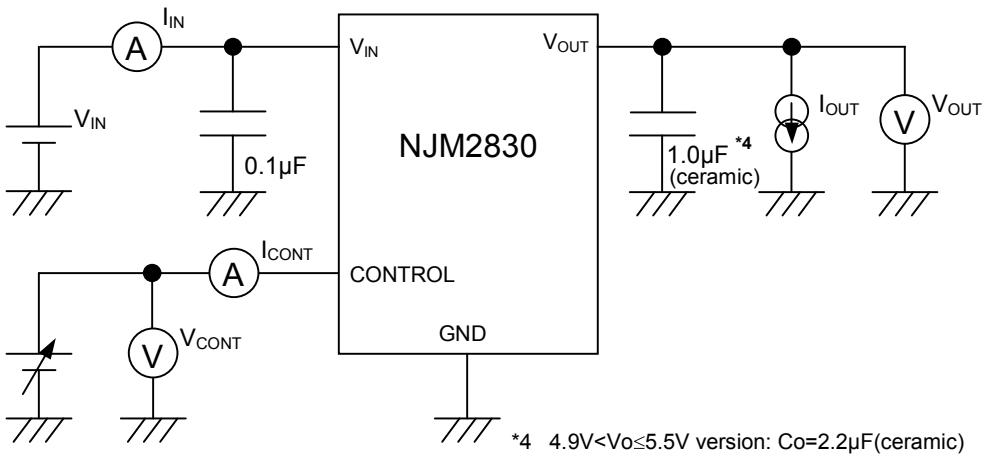
($V_{IN}$= Vo+1V, $C_{IN}$=0.1μF, Co=1.0μF (4.9V<Vo≤5.5V:Co=2.2μF, 2.9V<Vo≤4.9V:Co=4.7μF, Vo≤2.9V: Co=10μF),Ta=25°C)

| 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 | Vo≤5V Version | - | 130 | 180 | μA |
| | | | 5V<Vo≤10V Version | - | 145 | 195 | μA |
| | | | 10V<Vo≤15V Version | - | 160 | 210 | 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(Vo≤12V Version)<br>$V_{IN}$=Vo+1V ~ 18V(Vo>12V Version),<br>Io=30mA | | - | - | 0.10 | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | Io=0 ~ 300mA | | - | - | 0.009 | %/mA |
| Dropout Voltage(*1) | $\Delta V_{I-O}$ | Io=100mA | | - | 0.10 | 0.18 | V |
| Ripple Rejection | RR | ein=200mVrms,f=1kHz,Io=10mA,<br>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<br>Vo=3V Version | | - | 50 | - | 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 |

(*3): 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.

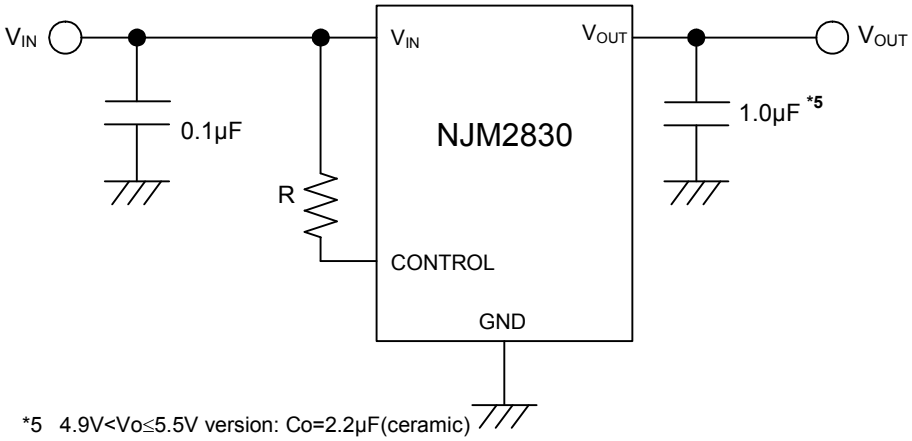
■ TEST CIRCUIT




*4 4.9V<Vo≤5.5V version: Co=2.2μF(ceramic)
2.9V<Vo≤4.9V version: Co=4.7μF(ceramic)
Vo≤2.9V version: Co=10μF(ceramic)

■ TYPICAL APPLICATIONS

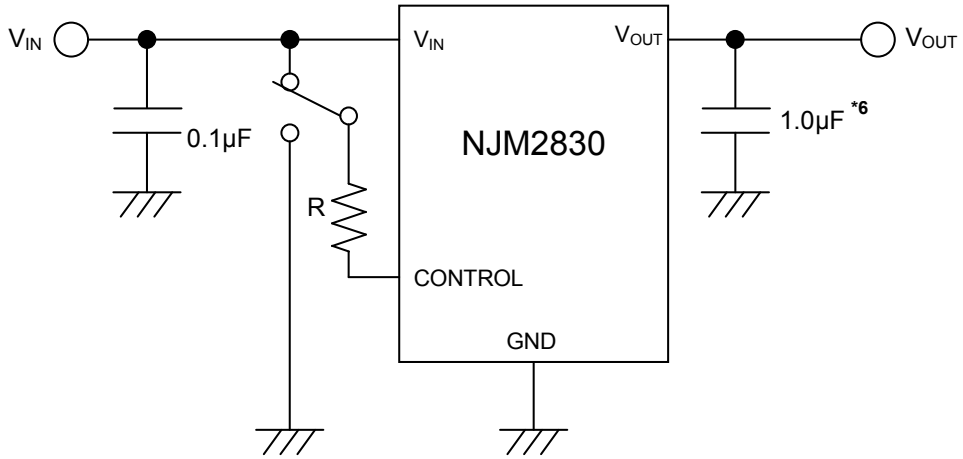
① In the case where ON/OFF Control is not required:




*5 4.9V<Vo≤5.5V version: Co=2.2μF(ceramic)
2.9V<Vo≤4.9V version: Co=4.7μF(ceramic)
Vo≤2.9V version: Co=10μF(ceramic)

Connect control pin to $V_{IN}$ pin

② In use of ON/OFF CONTROL:




*6 4.9V<Vo≤5.5V version: Co=2.2μF(ceramic)
2.9V<Vo≤4.9V version: Co=4.7μF(ceramic)
Vo≤2.9V version: Co=10μF(ceramic)

State of control pin:
•"H"→ output is enabled.
•"L" or "open" → output is disabled.

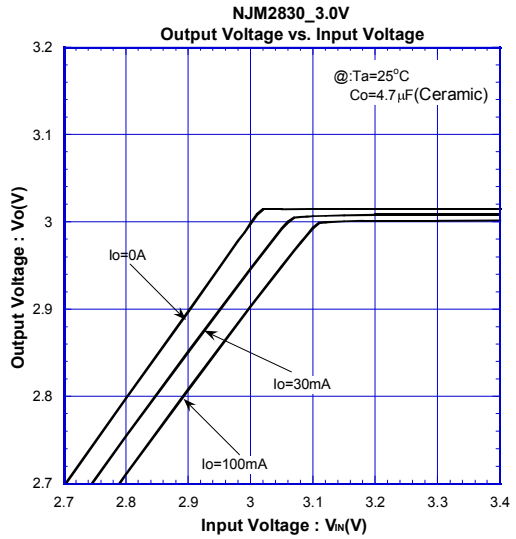
∗In the case of using a resistance "R" between $V_{IN}$ and control.
If this resistor is inserted, it can reduce the control current when the control voltage is high. The applied voltage to control terminal should set to consider voltage drop through the resistor "R" and the minimum control voltage for 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.

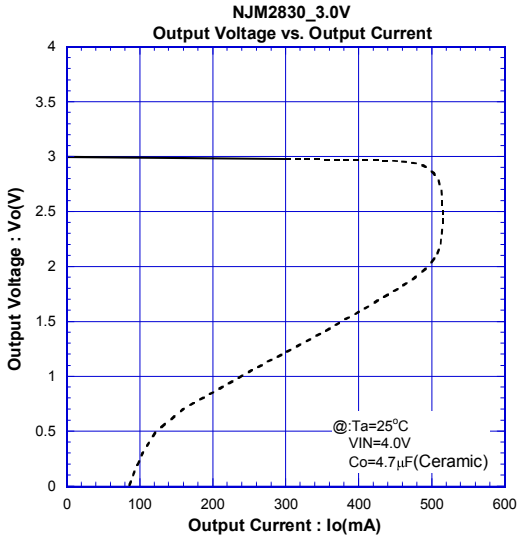
∗Input Capacitor $C_{IN}$
Input Capacitor $C_{IN}$ is required to prevent oscillation and reduce power supply ripple for applications when high power supply impedance or a long power supply line. Therefore, use the recommended $C_{IN}$ value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and $V_{IN}$ as shortest path as possible to avoid the problem.

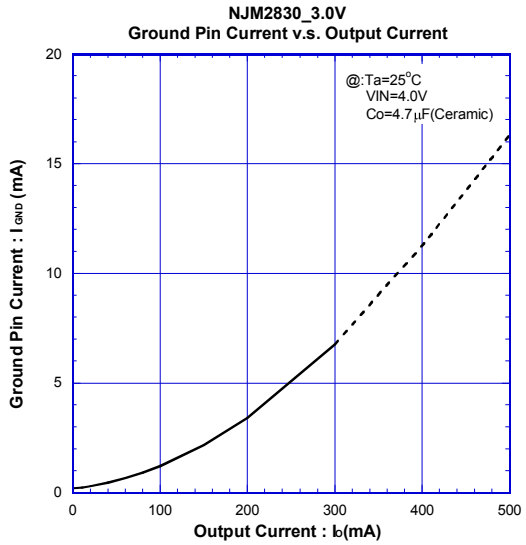
∗Output Capacitor $C_O$
Output capacitor ($C_O$) will be required for a phase compensation of the internal error amplifier.
The capacitance and the equivalent series resistance (ESR) influence to stable operation of the regulator.
Use of a smaller $C_O$ may cause excess output noise or oscillation of 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.
The recommended capacitance depends on the output voltage rank. Especially, low voltage regulator requires larger $C_O$ value. 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.

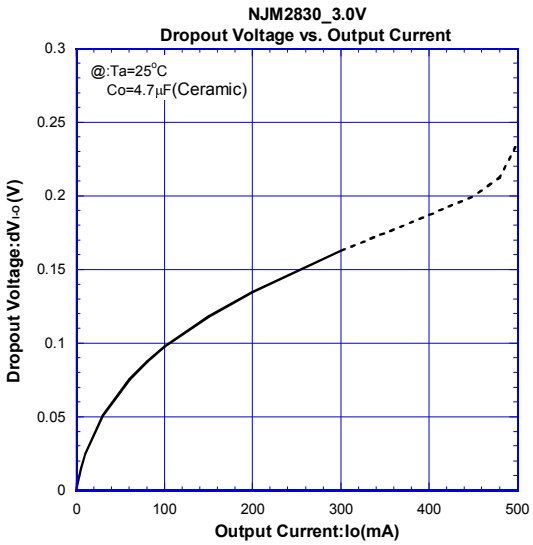
## ■ TYPICAL CHARACTERISTICS

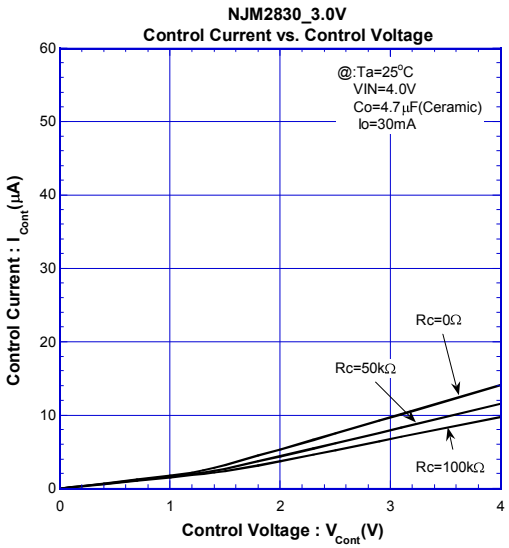
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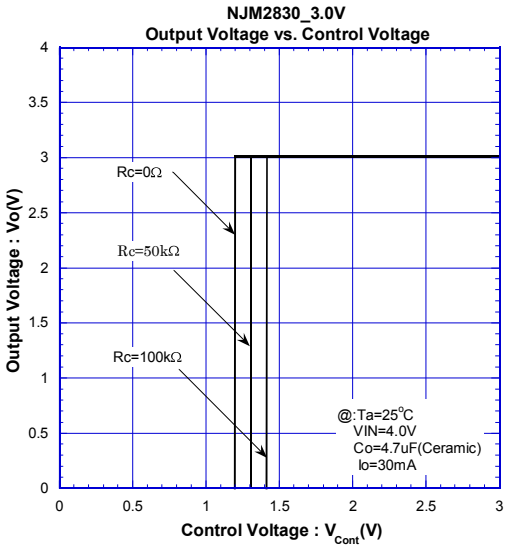


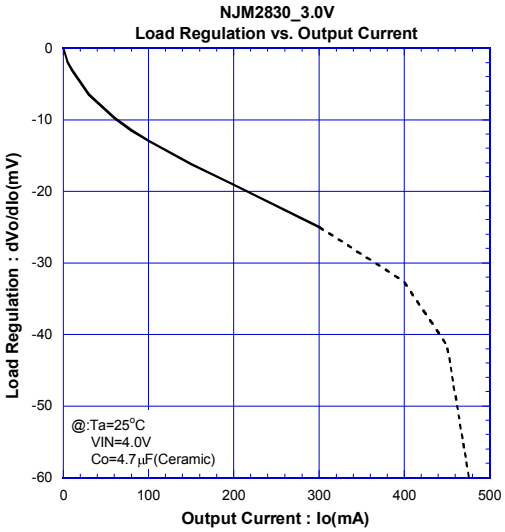



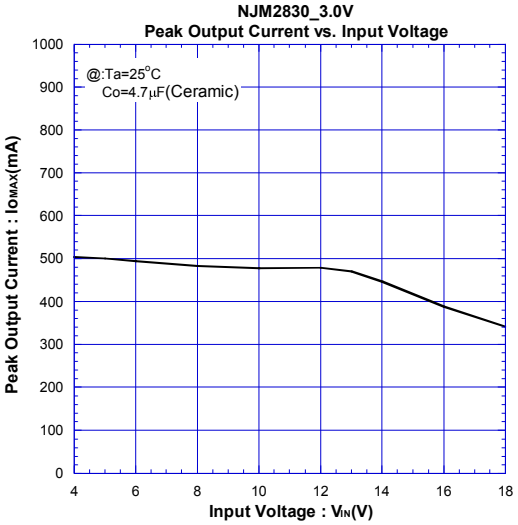



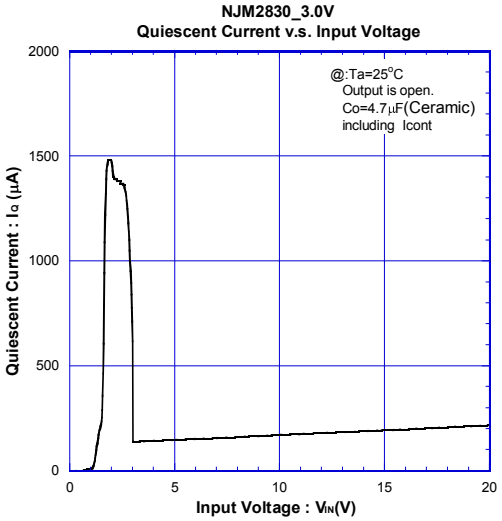



## ■ TYPICAL CHARACTERISTICS

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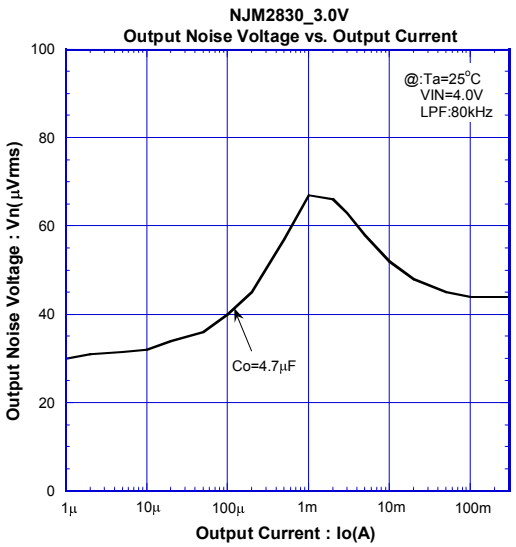


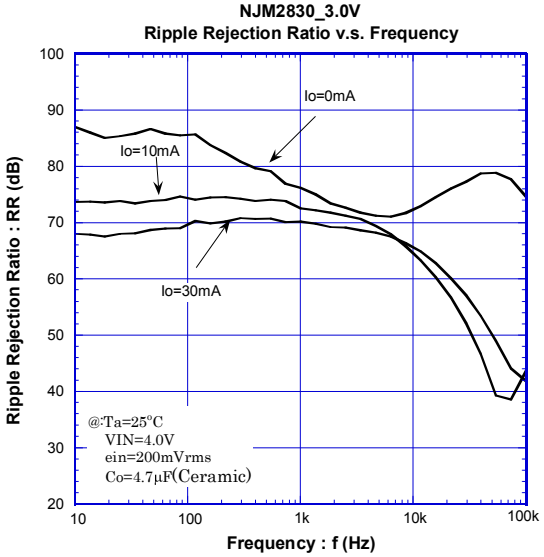



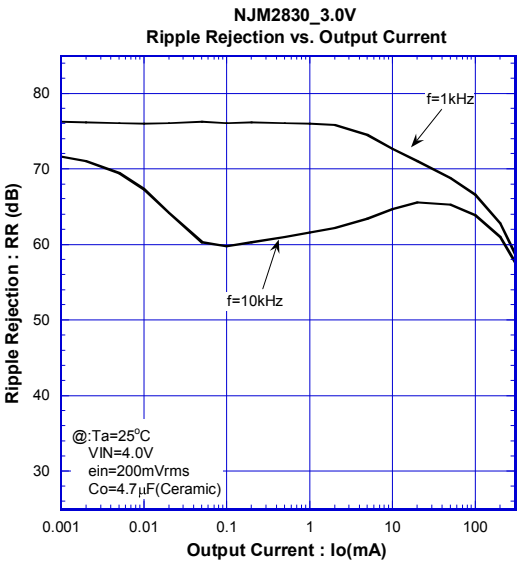



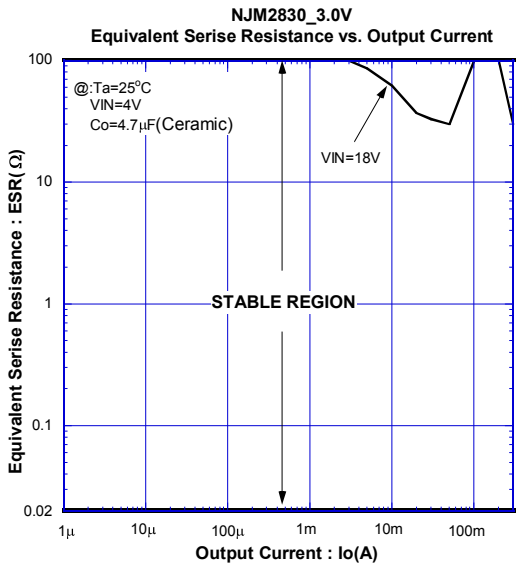
## ■ TYPICAL CHARACTERISTICS

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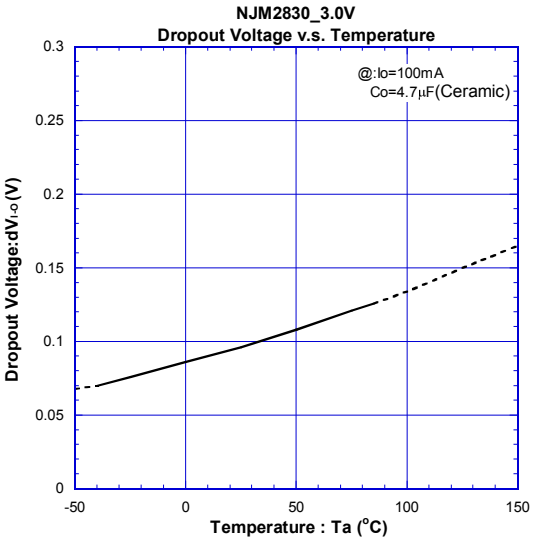



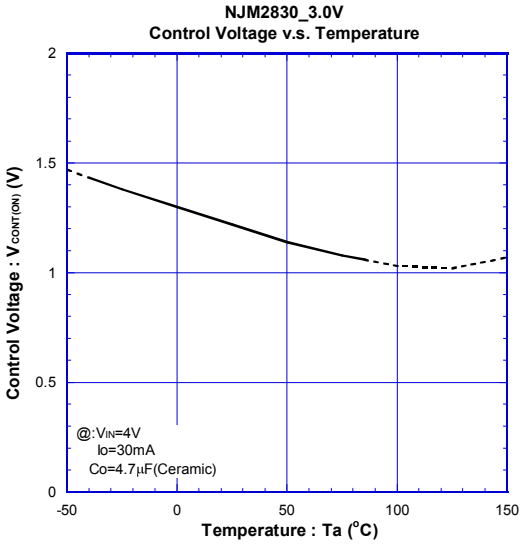



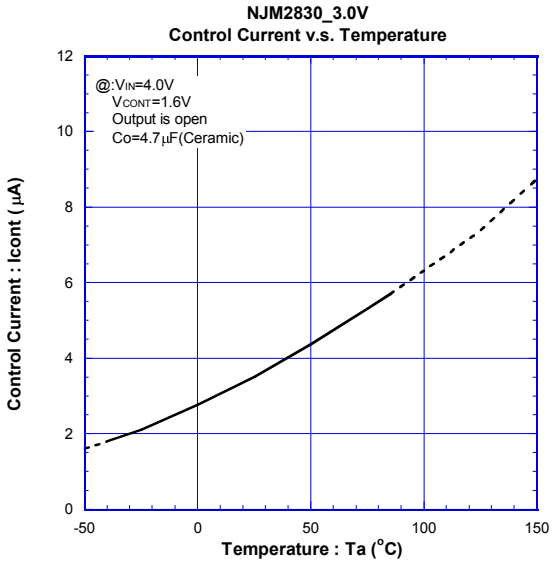



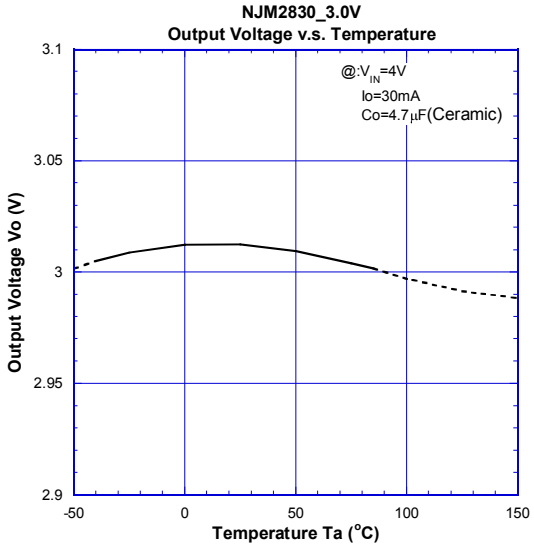
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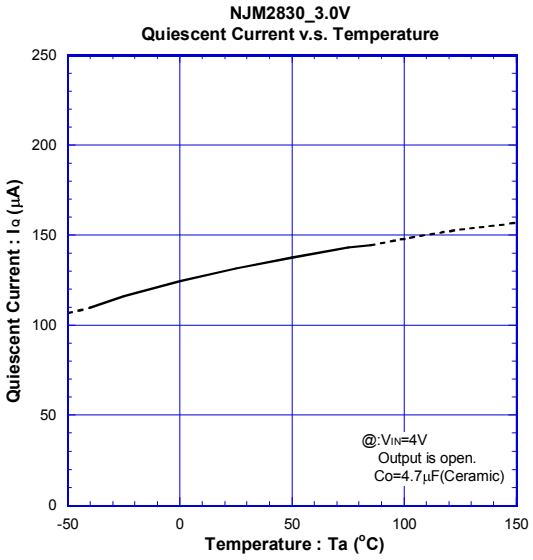
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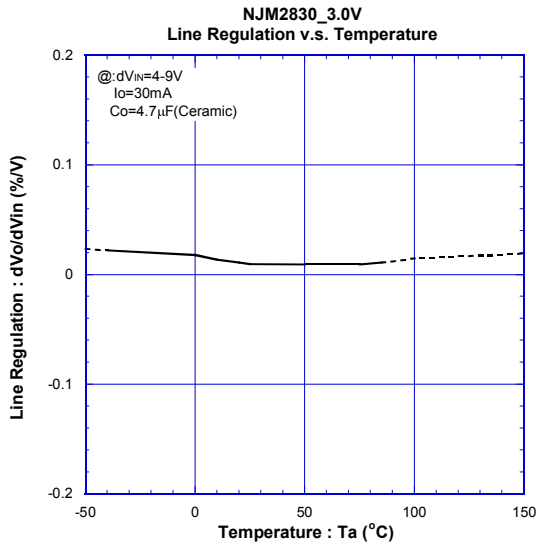



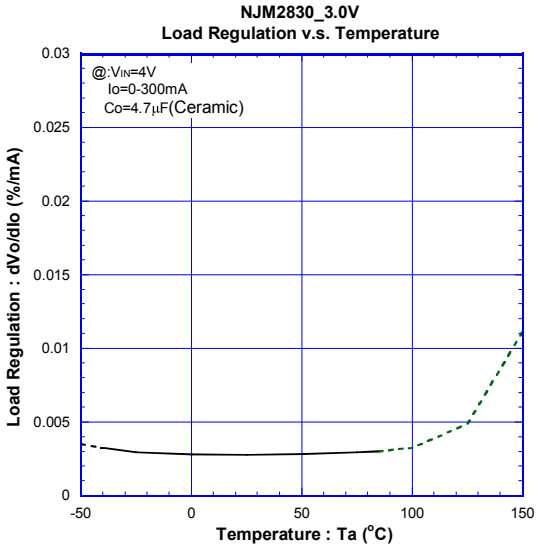



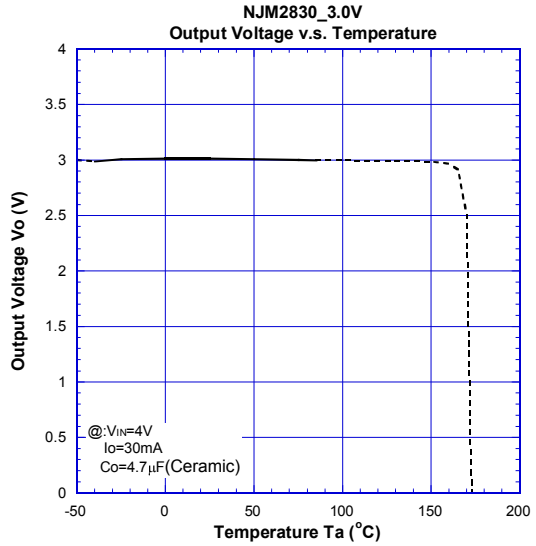



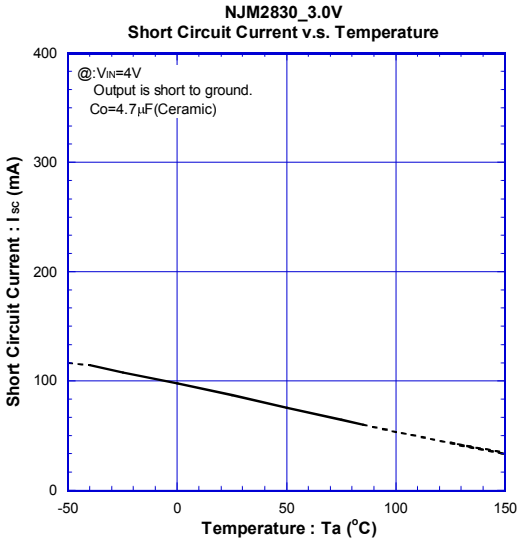
## ■ TYPICAL CHARACTERISTICS

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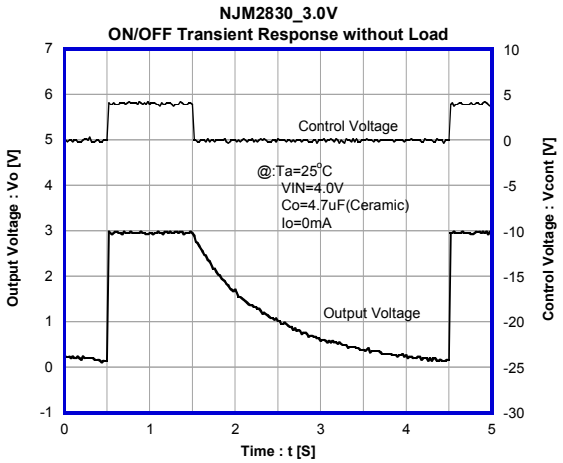



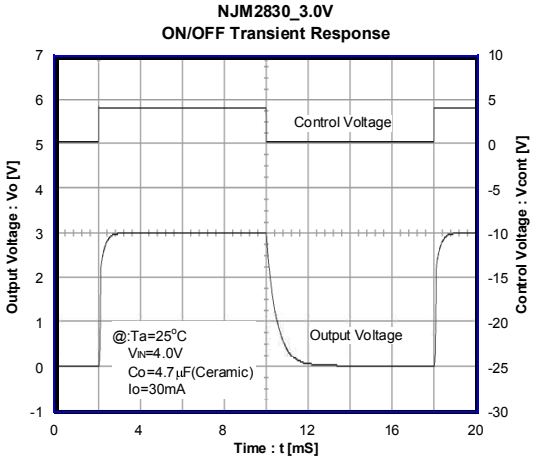



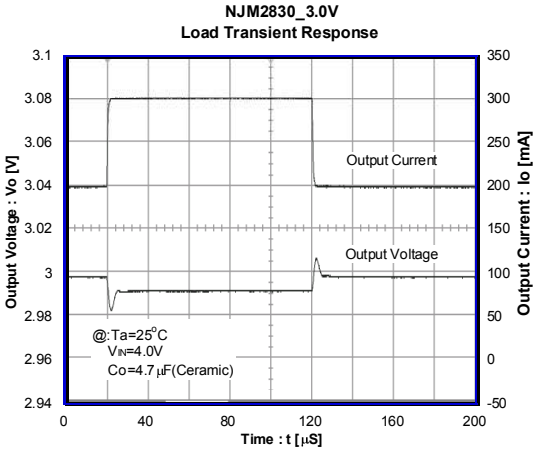



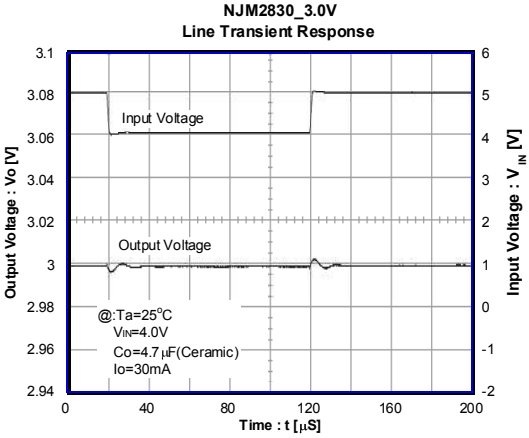
## ■ TYPICAL CHARACTERISTICS

### ●TRANSIENT RESPONSE (3V Version)



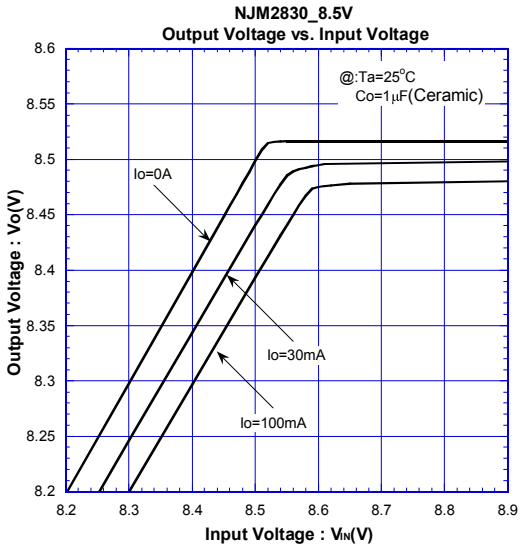



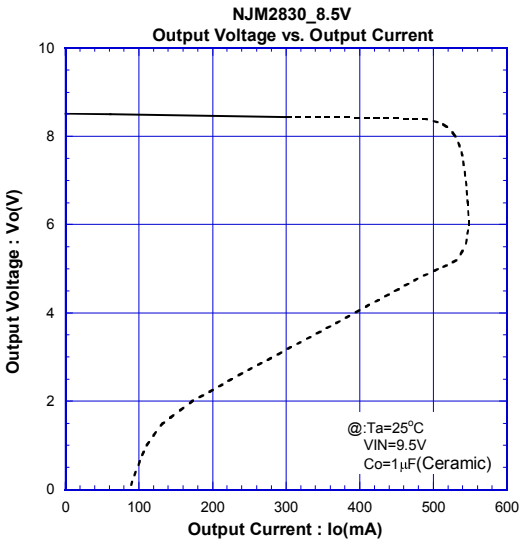



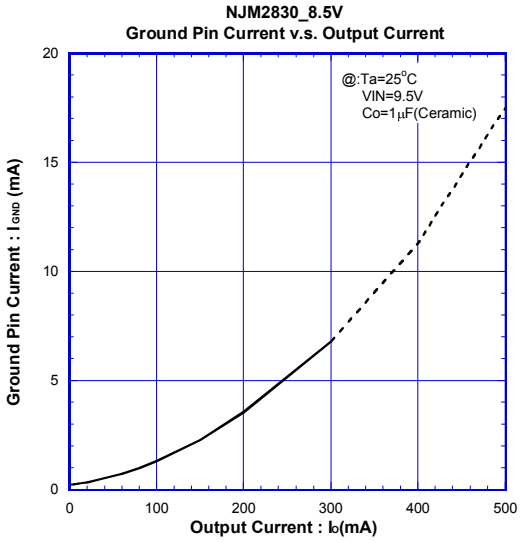



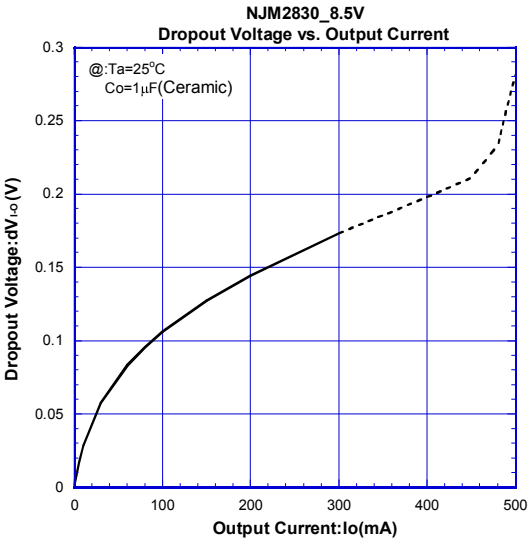
## ■ TYPICAL CHARACTERISTICS

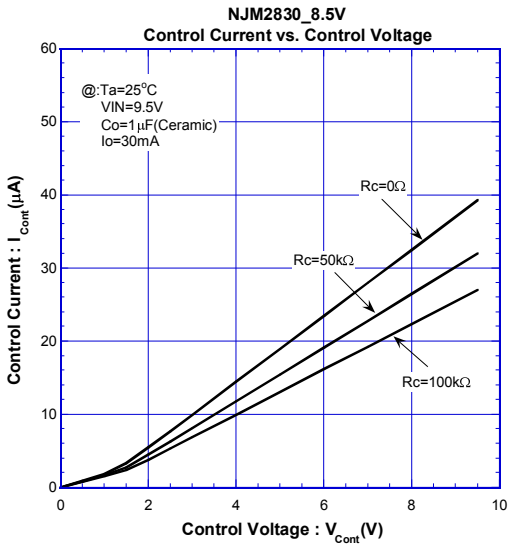
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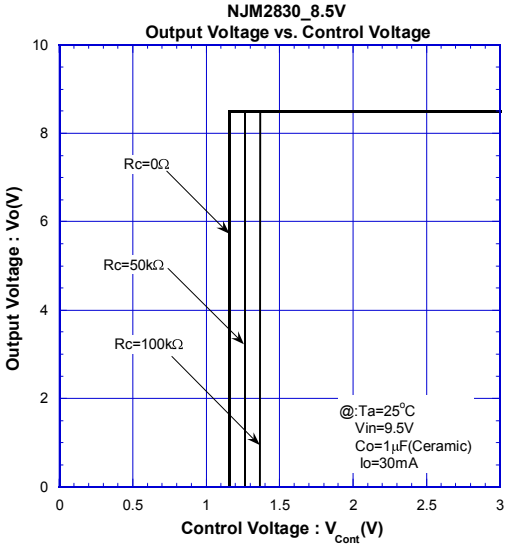


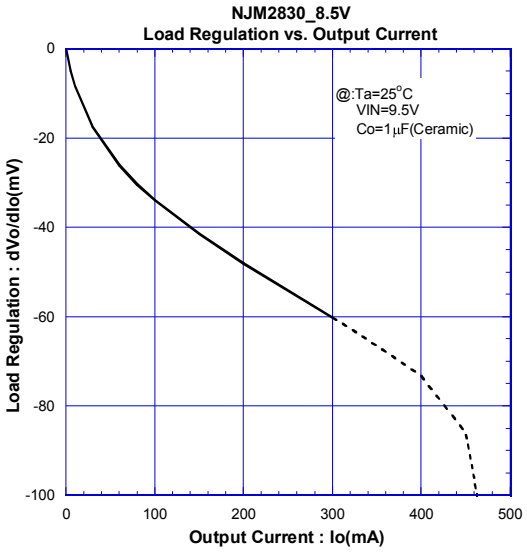



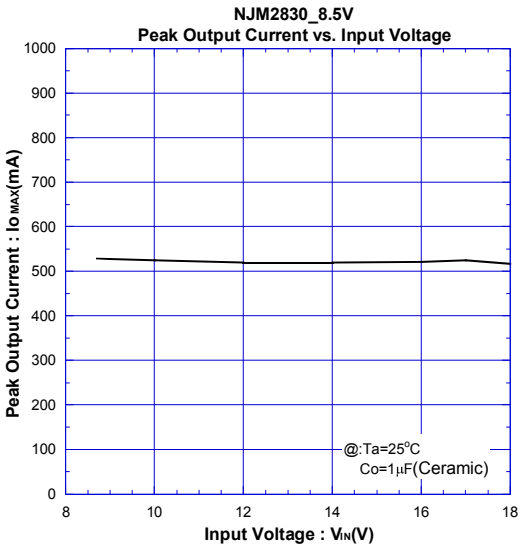



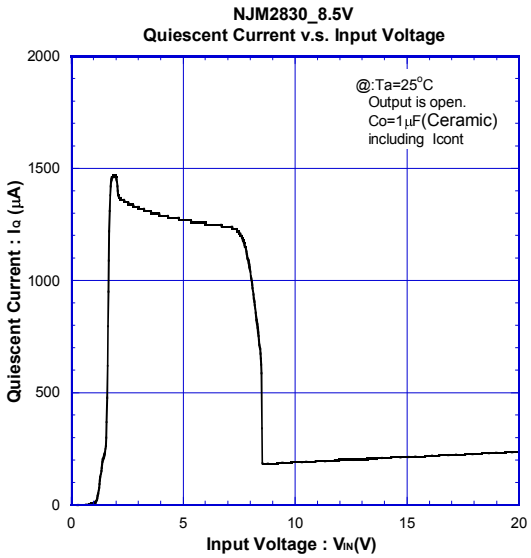



## ■ TYPICAL CHARACTERISTICS

### ●DC CHARACTERISTICS (8.5V Version)

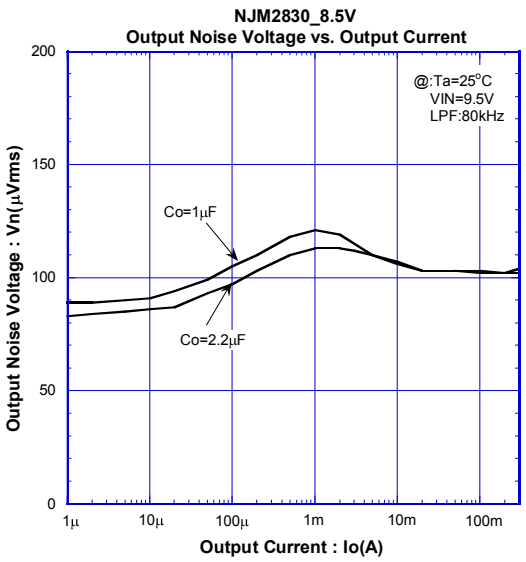


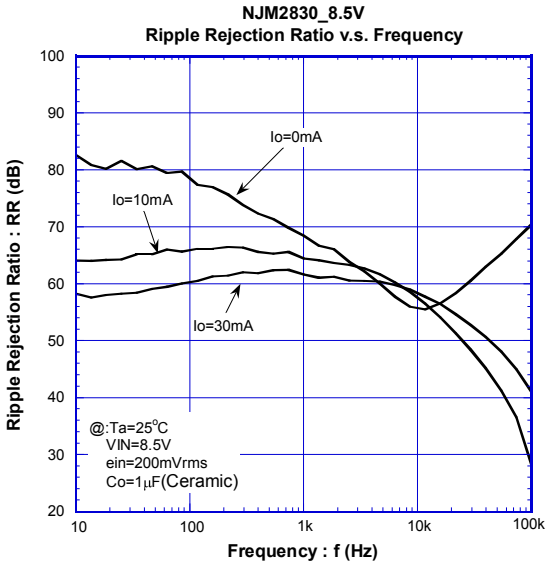



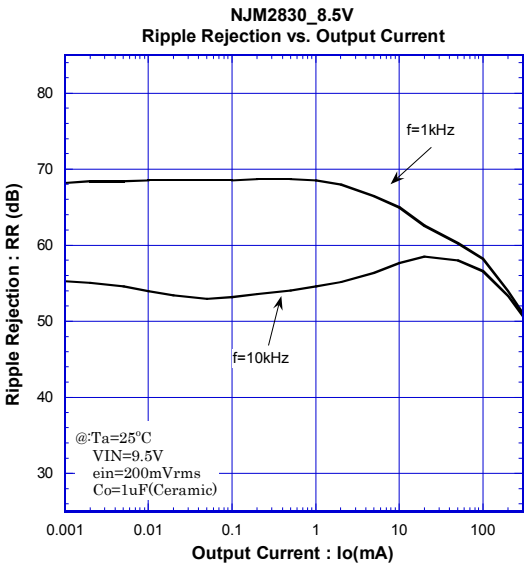



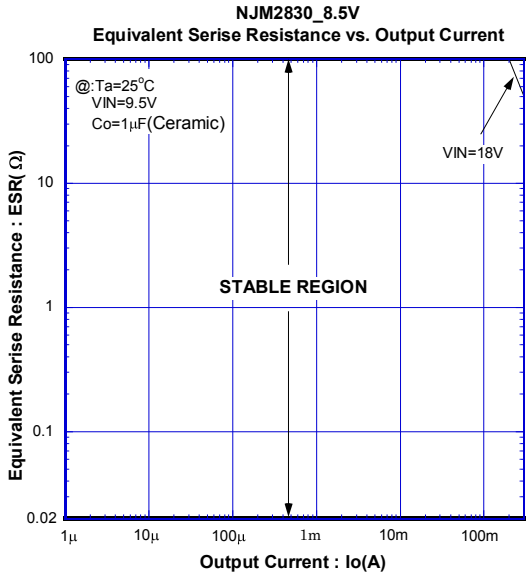
## ■ TYPICAL CHARACTERISTICS

### ●AC CHARACTERISTICS (8.5V Version)



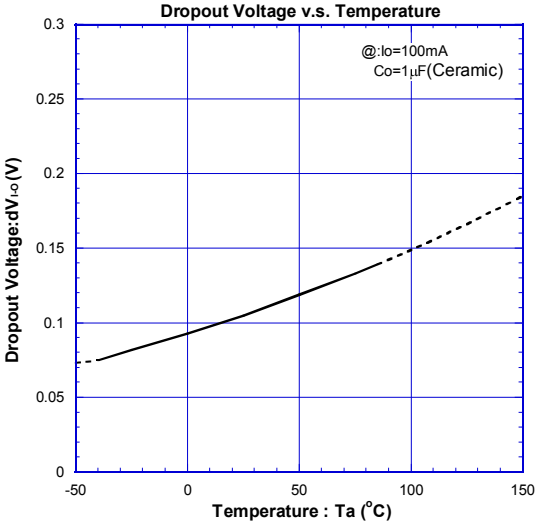



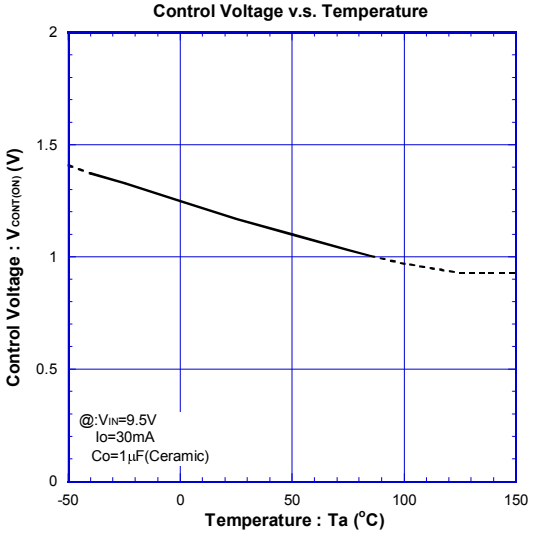
## ■ TYPICAL CHARACTERISTICS

### ●TEMPERATURE CHARACTERISTICS (8.5V Version)

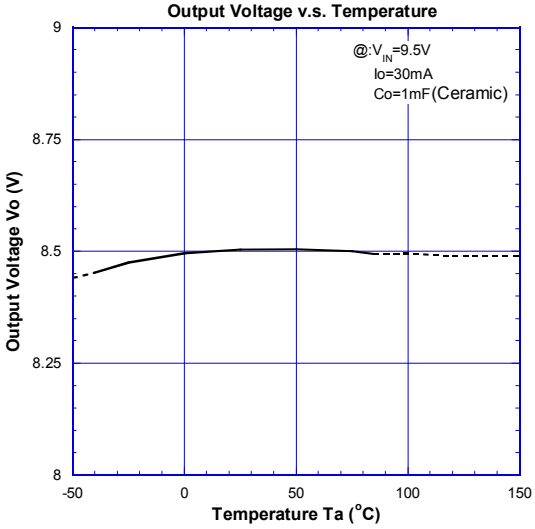
NJM2830_8.5V
Dropout Voltage v.s. Temperature



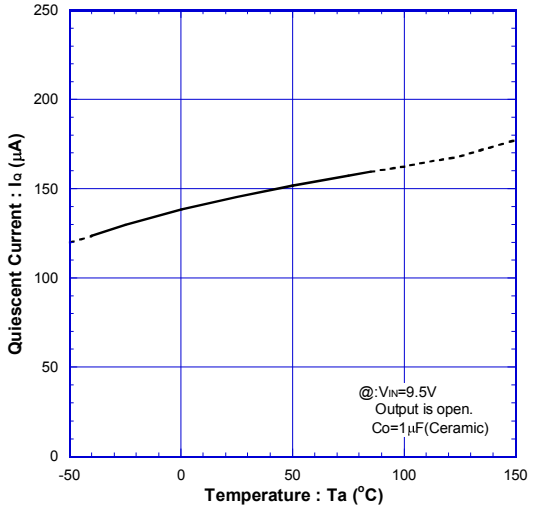

NJM2830_8.5V
Control Voltage v.s. Temperature



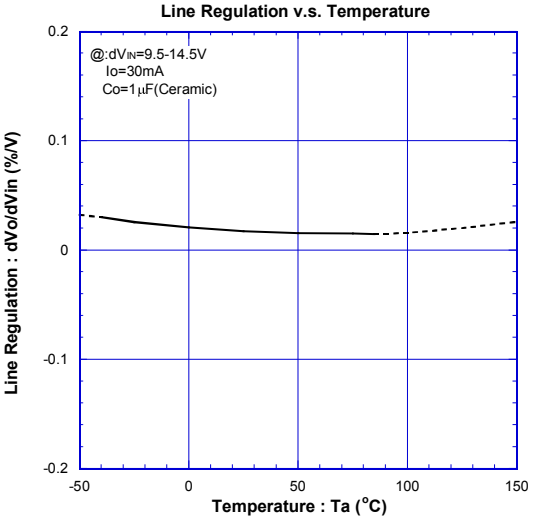

NJM2830_8.5V
Output Voltage v.s. Temperature



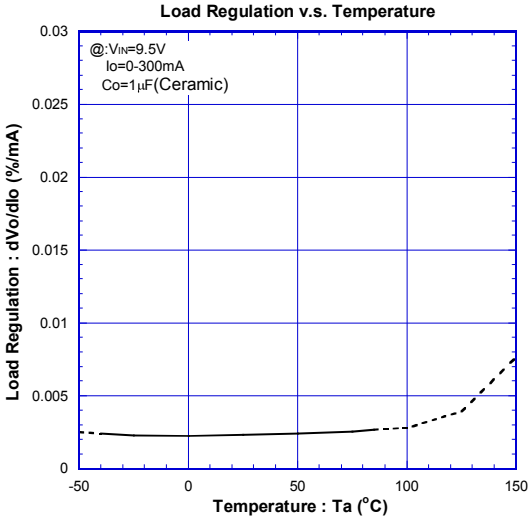

NJM2830_8.5V
Quiescent Current v.s. Temperature




NJM2830_8.5V
Line Regulation v.s. Temperature

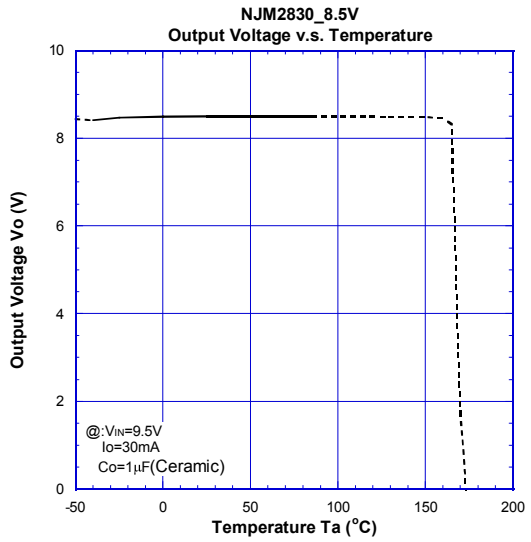


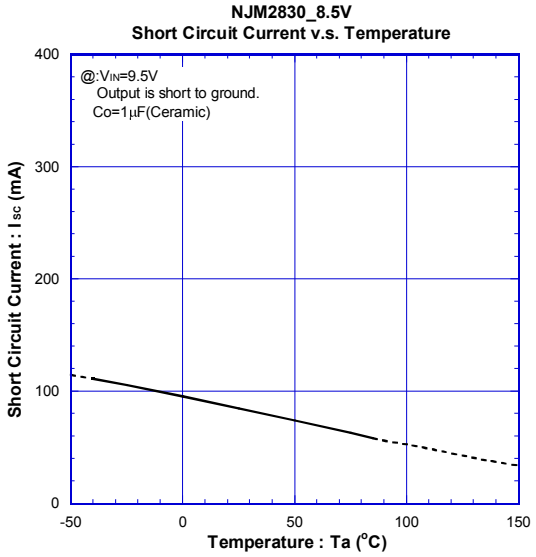

NJM2830_8.5V
Load Regulation v.s. Temperature



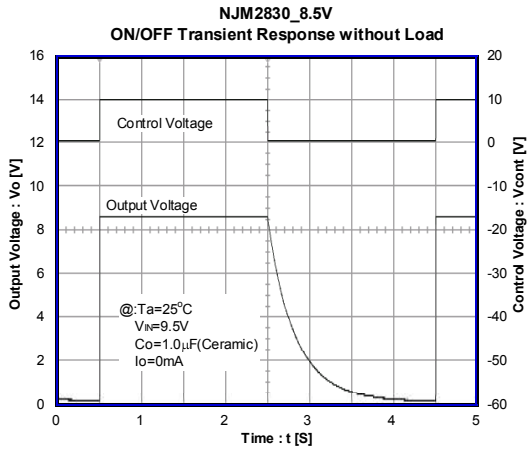
## ■ TYPICAL CHARACTERISTICS

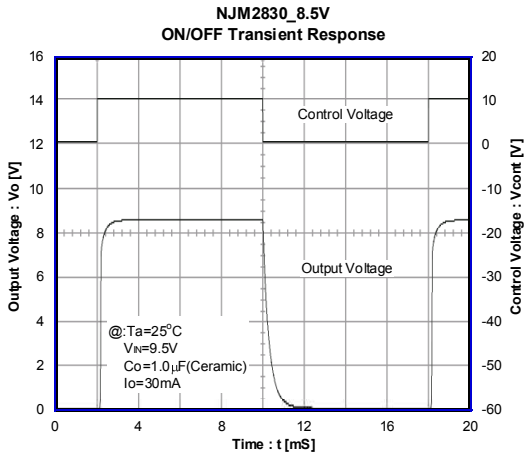
### ●TEMPERATURE CHARACTERISTICS (8.5V Version)

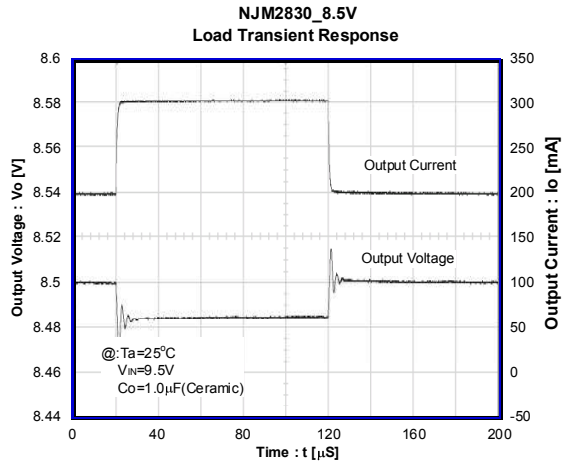


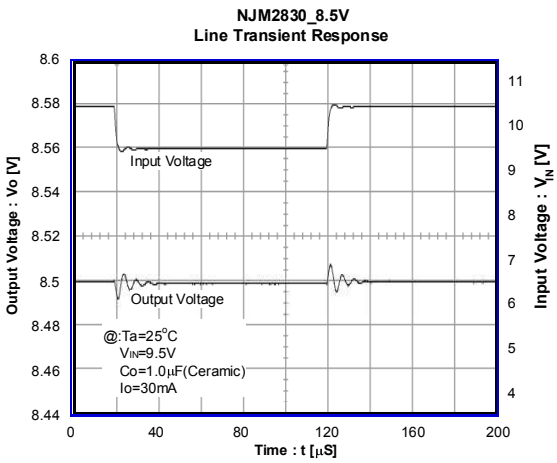




### ●TRANSIENT RESPONSE (8.5V Version)



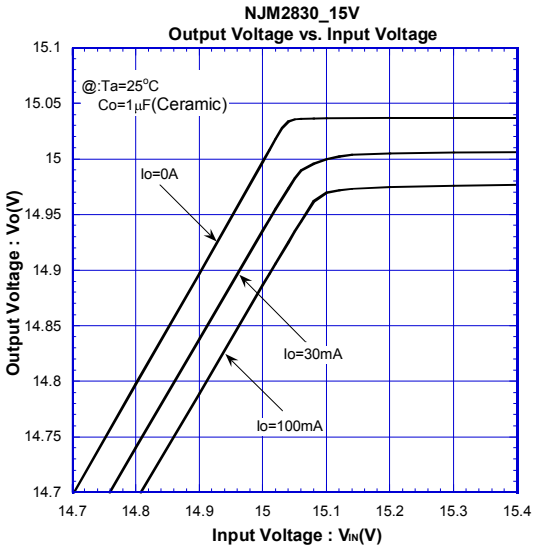



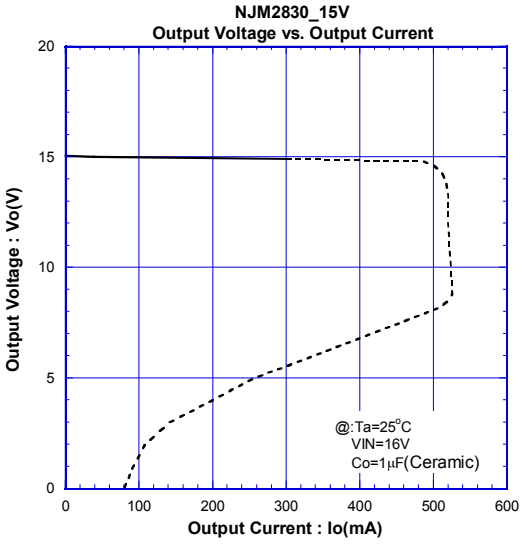



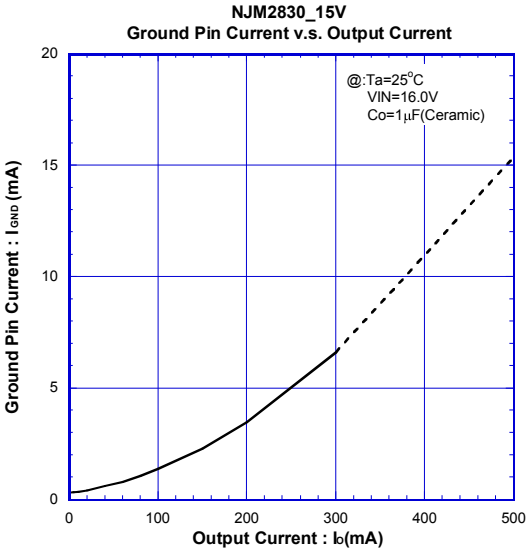



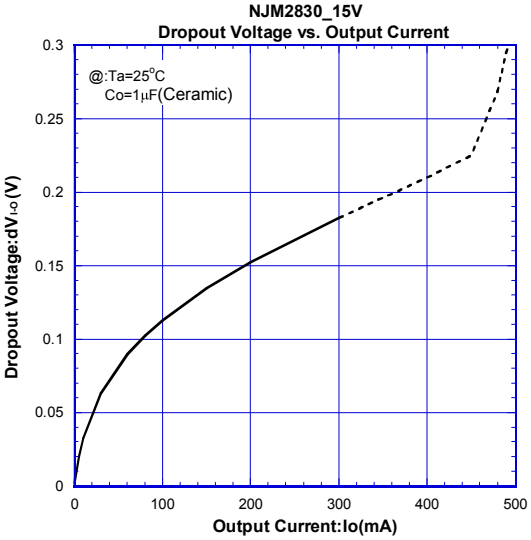
## ■ TYPICAL CHARACTERISTICS

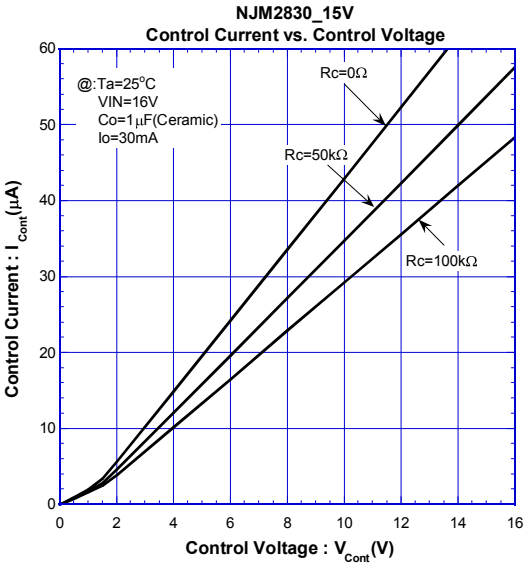
### ●DC CHARACTERISTICS (15V Version)

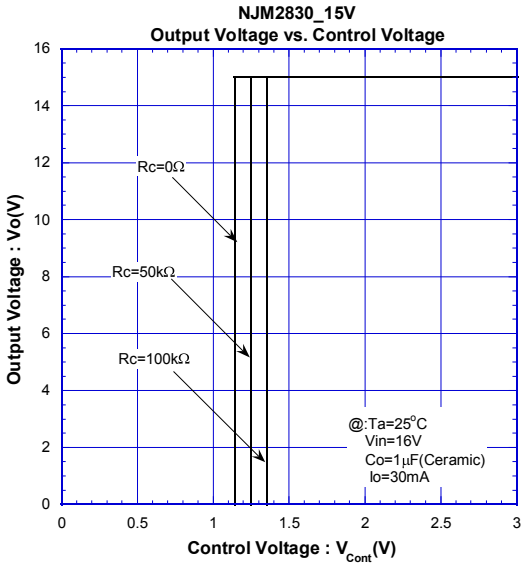


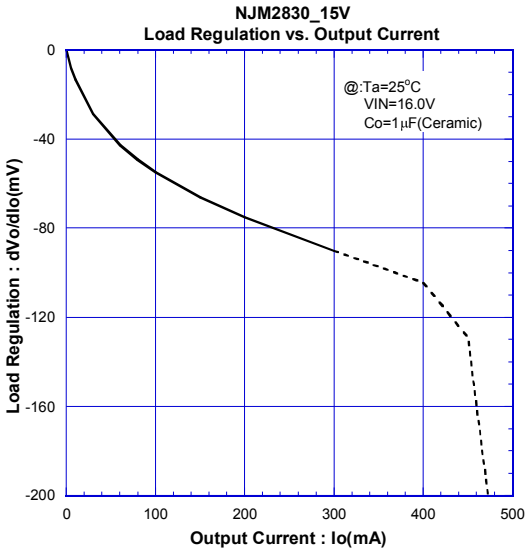



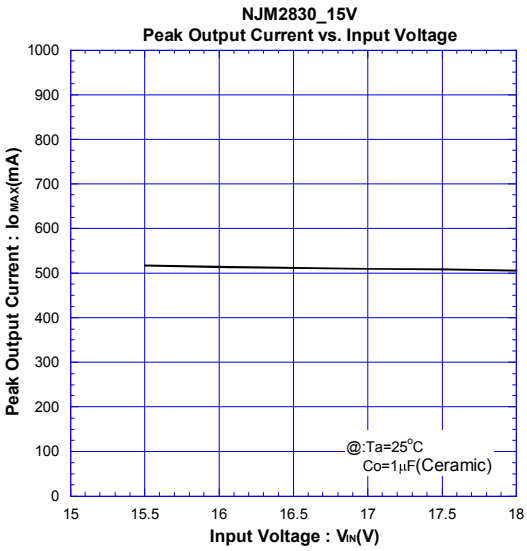



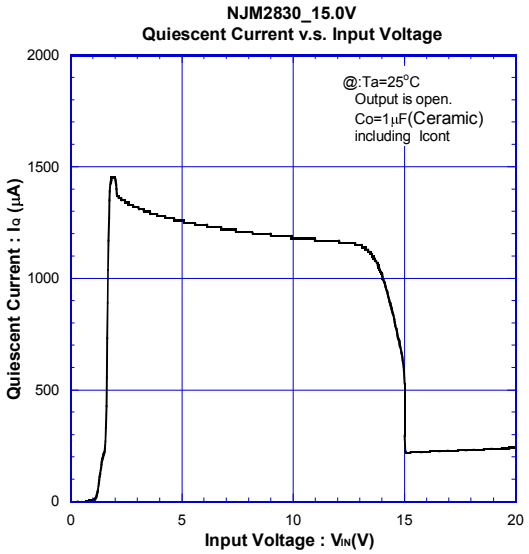



## ■ TYPICAL CHARACTERISTICS

### ●DC CHARACTERISTICS (15V Version)

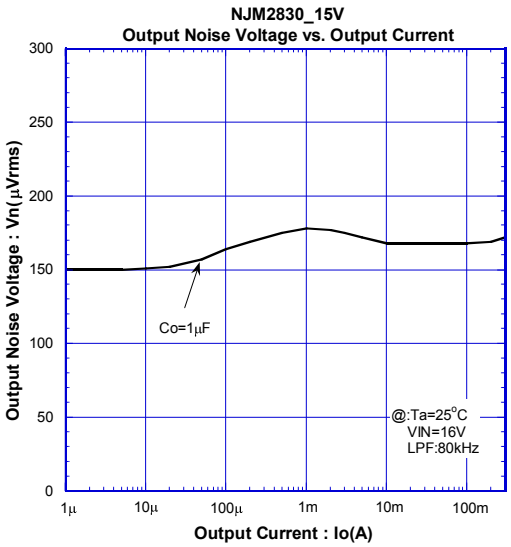


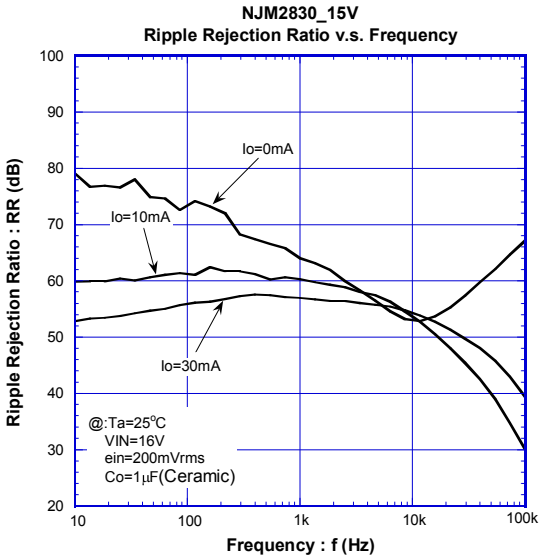



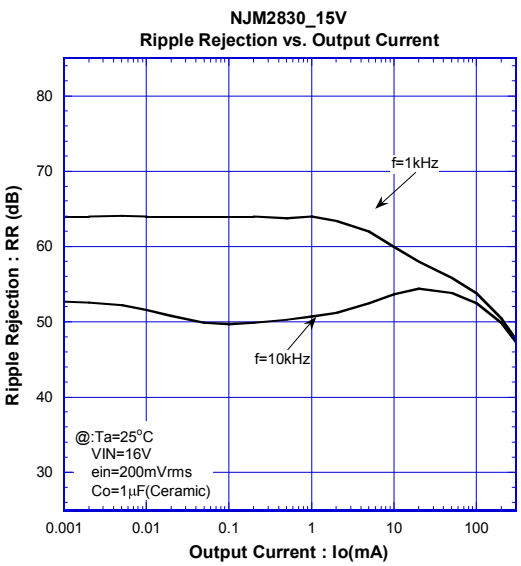



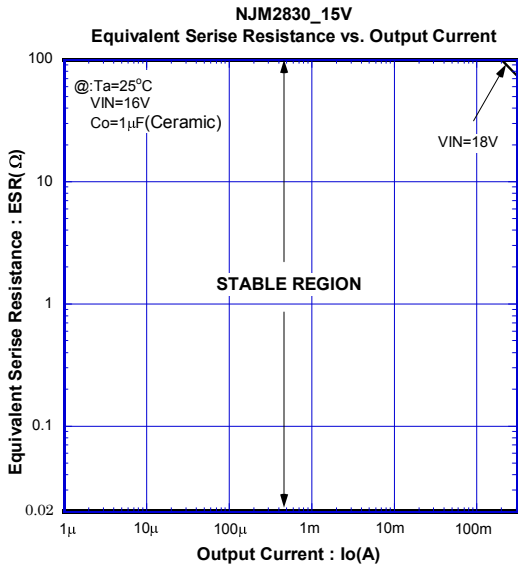
## ■ TYPICAL CHARACTERISTICS

### ●AC CHARACTERISTICS (15V Version)



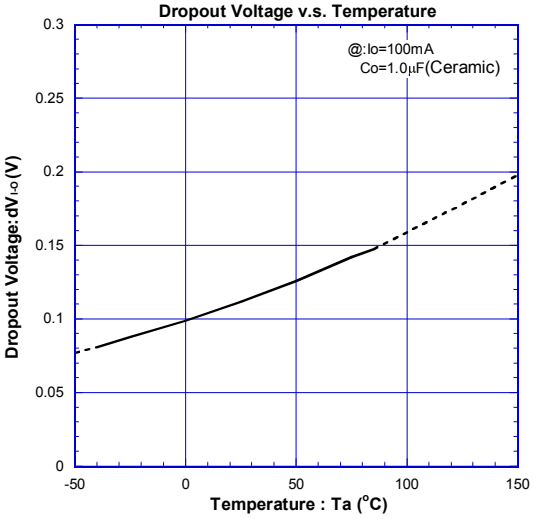



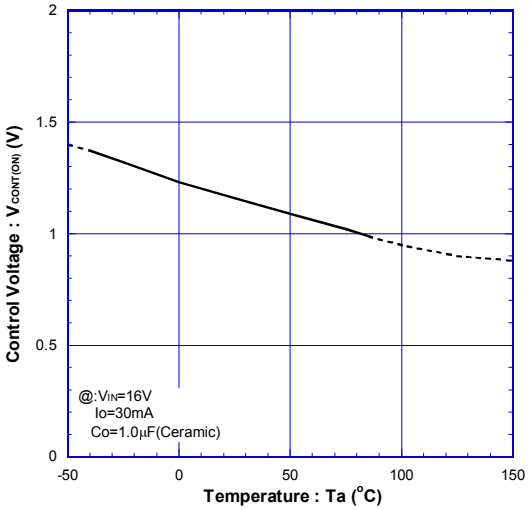
## ■ TYPICAL CHARACTERISTICS

### ●TEMPERATURE CHARACTERISTICS (15V Version)

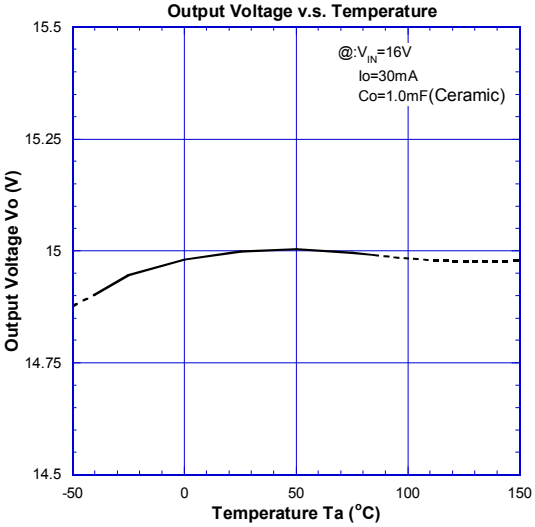
NJM2830_15V
Dropout Voltage v.s. Temperature



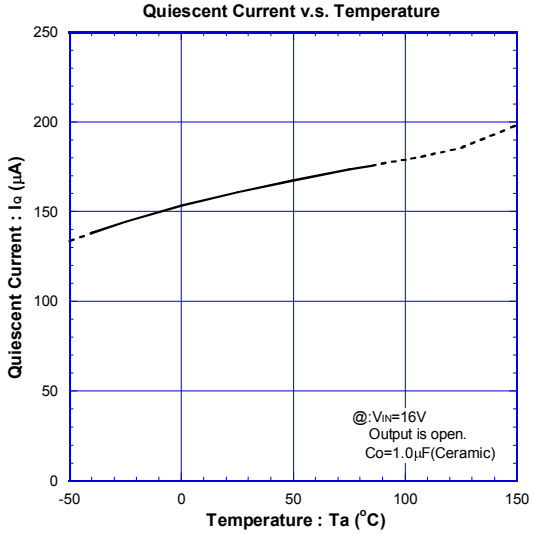

NJM2830_15V
Control Voltage v.s. Temperature



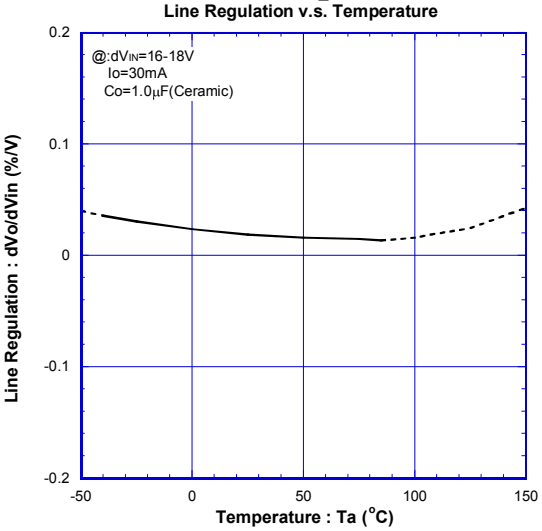

NJM2830_15V
Output Voltage v.s. Temperature



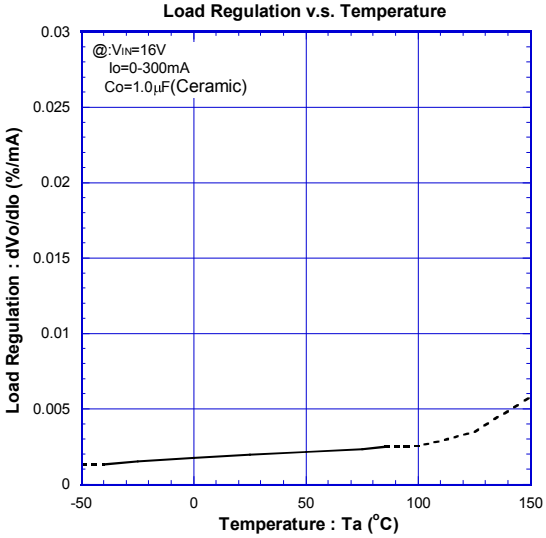

NJM2830_15V
Quiescent Current v.s. Temperature




NJM2830_15V
Line Regulation v.s. Temperature

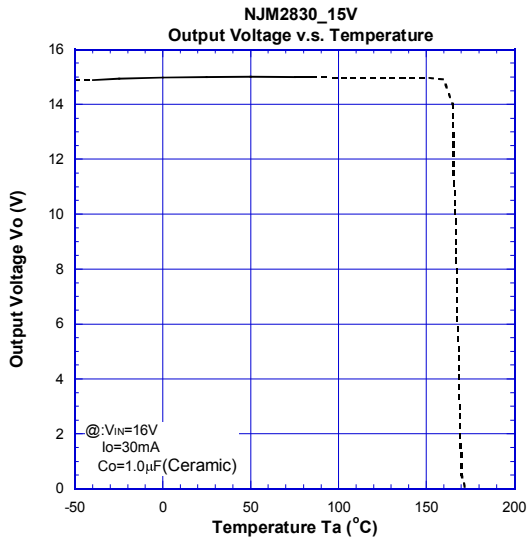


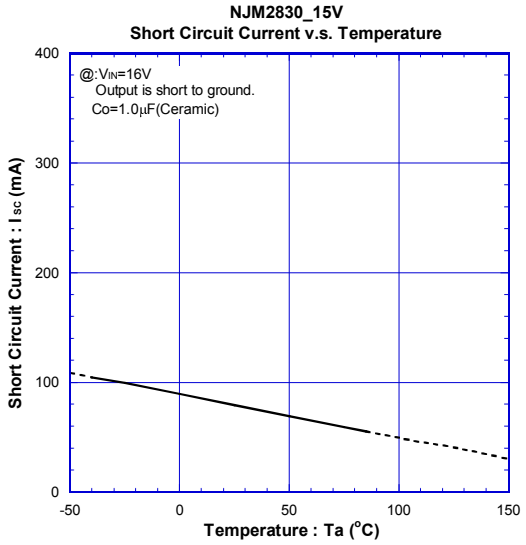

NJM2830_15V
Load Regulation v.s. Temperature



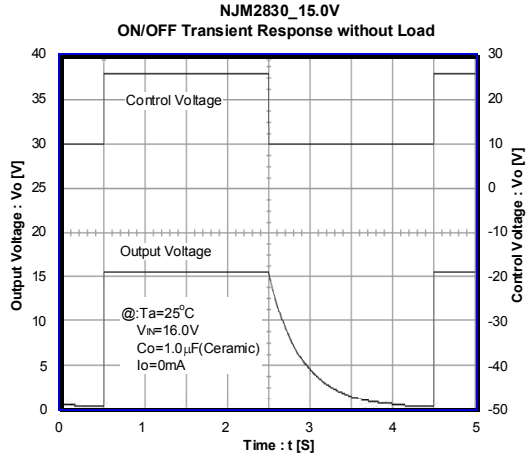
## ■ TYPICAL CHARACTERISTICS

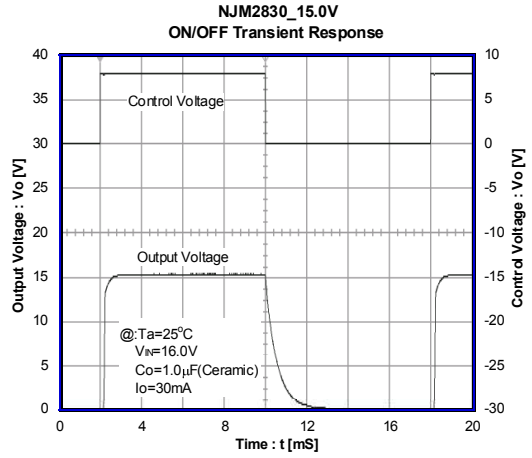
### ●TEMPERATURE CHARACTERISTICS (15V Version)

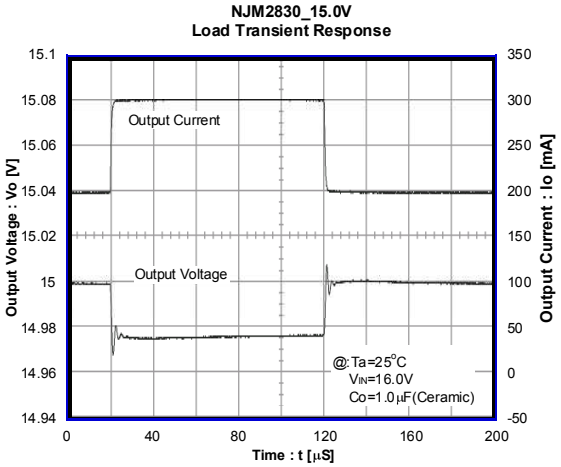


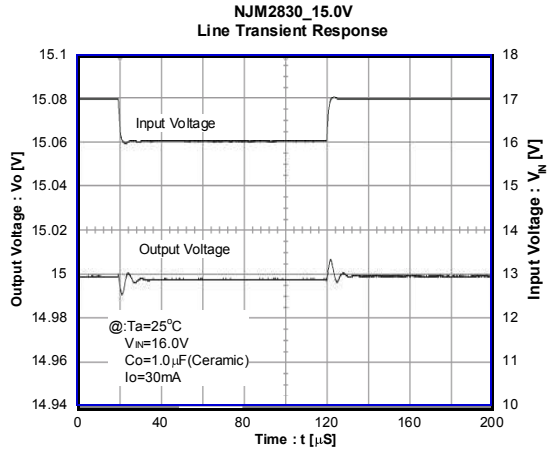




### ●TRANSIENT RESPONSE (15V Version)



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