

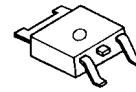
## LOW DROPOUT VOLTAGE REGULATOR

### ■ GENERAL DESCRIPTION

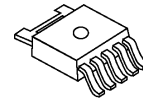
The NJM2845/46 is low dropout voltage regulator. Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

NJM2845 is 3 terminal type and NJM2846 is ON/OFF control built in type. These product can be selected according to the applications.

### ■ PACKAGE OUTLINE



NJM2845DL1

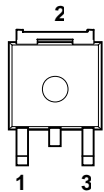


NJM2846DL3

### ■ FEATURES

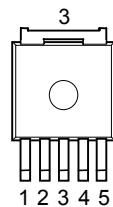
- High Ripple Rejection           75dB typ. (f=1kHz,3V Version)
- Output Noise Voltage           V<sub>no</sub>=45μV<sub>rms</sub> typ. (V<sub>o</sub>=3V Version)
- Output capacitor with 2.2μF ceramic capacitor (V<sub>o</sub>≥2.6V)
- Output Current                   I<sub>o(max.)</sub>=800mA
- High Precision Output           V<sub>o</sub> ±1.0%
- Low Dropout Voltage           0.18V typ. (I<sub>o</sub>=500mA)
- ON/OFF Control                 (NJM2846)
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline                 TO-252-3 (NJM2845DL1), TO-252-5 (NJM2846DL3)

### ■ PIN CONFIGURATION



NJM2845DL1

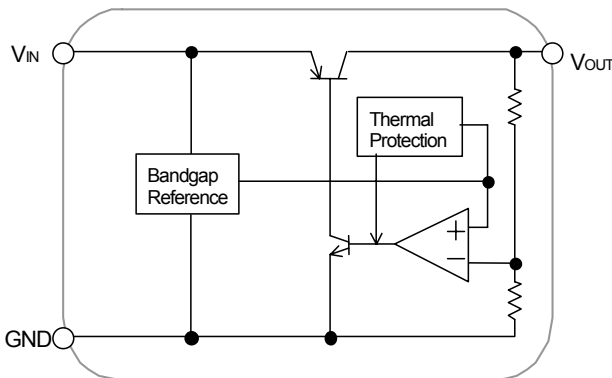
- 1.V<sub>IN</sub>
- 2.GND
- 3.V<sub>OUT</sub>



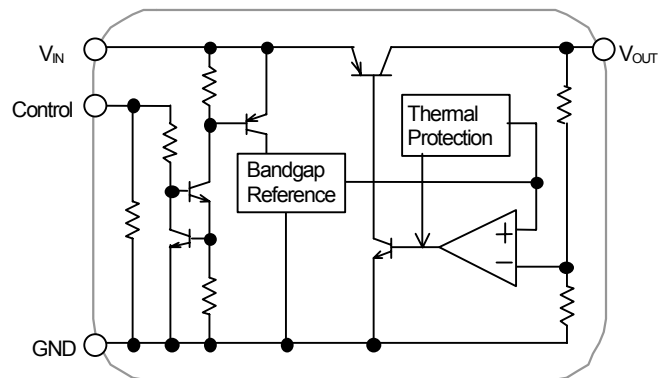
NJM2846DL3

- 1.CONTROL
- 2.V<sub>IN</sub>
- 3.GND
- 4.V<sub>o</sub>
- 5.NC

### ■ EQUIVALENT CIRCUIT



NJM2845DL1



NJM2846DL3

# NJM2845/46

## ■ OUTPUT VOLTAGE

| Device Name   | V <sub>OUT</sub> |
|---------------|------------------|
| NJM284*DL*-15 | 1.5V             |
| NJM284*DL*-18 | 1.8V             |
| NJM284*DL*-22 | 2.2V             |
| NJM284*DL*-23 | 2.3V             |
| NJM284*DL*-25 | 2.5V             |
| NJM284*DL*-03 | 3.0V             |
| NJM284*DL*-33 | 3.3V             |
| NJM284*DL*-05 | 5.0V             |

Output voltage options available : 1.5 ~ 5.0V (0.1V step)

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

| PARAMETER             | SYMBOL            | RATINGS                     | UNIT |
|-----------------------|-------------------|-----------------------------|------|
| Input Voltage         | V <sub>IN</sub>   | +14                         | V    |
| Control Voltage       | V <sub>CONT</sub> | +14(*1)                     | V    |
| Power Dissipation     | P <sub>D</sub>    | 10(Tc≤25°C)<br>1.0(Ta≤25°C) | W    |
| Operating Temperature | Topr              | -40 ~ +85                   | °C   |
| Storage Temperature   | Tstg              | -40 ~ +150                  | °C   |

(\*1): When input voltage is less than +14V, the absolute maximum control voltage is equal to the input voltage.

## ■ Operating voltage

V<sub>IN</sub>=+2.5V(In case of Vo<2.3V) ~ +(Vo+10V)

## ■ NJM2845

### ■ ELECTRICAL CHARACTERISTICS

(V<sub>IN</sub>=Vo+1V, C<sub>IN</sub>=0.33μF, Co=2.2μF(1.7V<Vo≤2.6V:Co=4.7μF, Vo≤1.7V: Co=10μF), Ta=25°C)

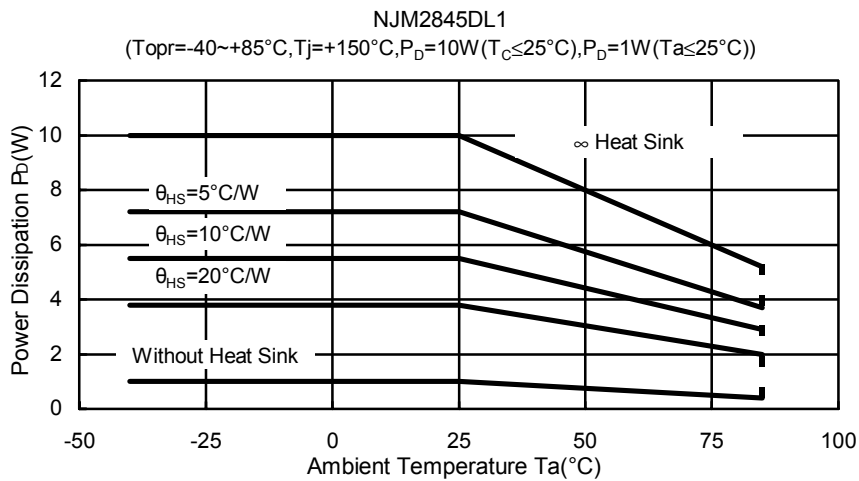
| PARAMETER   | SYMBOL               | TEST CONDITION                                  | MIN.  | TYP. | MAX.  | UNIT   |
|---|----------------------|---|-------|------|-------|--------|
| Output Voltage                                    | Vo                   | Io=30mA   | -1.0% | -    | +1.0% | V      |
| Quiescent Current                                 | I <sub>Q</sub>       | Io=0mA  | -     | 400  | 600   | μA     |
| Output Current                                    | Io                   | Vo - 0.3V                                       | 800   | 1050 | -     | mA     |
| Line Regulation                                   | ΔVo/ΔV <sub>IN</sub> | V <sub>IN</sub> =Vo+1V ~ Vo+6V, Io=30mA         | -     | -    | 0.10  | %/V    |
| Load Regulation                                   | ΔVo/ΔIo              | Io=0 ~ 800mA                                    | -     | -    | 0.004 | %/mA   |
| Dropout Voltage(*2)                               | ΔV <sub>I-O</sub>    | Io=500mA  | -     | 0.18 | 0.28  | V      |
| Ripple Rejection                                  | RR                   | ein=200mVrms, f=1kHz, Io=10mA,<br>Vo=3V Version | -     | 75   | -     | dB     |
| Average Temperature Coefficient of Output Voltage | ΔVo/ΔTa              | Ta=0 ~ 85°C, Io=10mA                            | -     | ± 50 | -     | ppm/°C |
| Output Noise Voltage                              | V <sub>NO</sub>      | f=10Hz ~ 80kHz, Io=10mA,<br>Vo=3V Version       | -     | 45   | -     | μVrms  |

(\*2): The output voltage excludes under 2.3V.

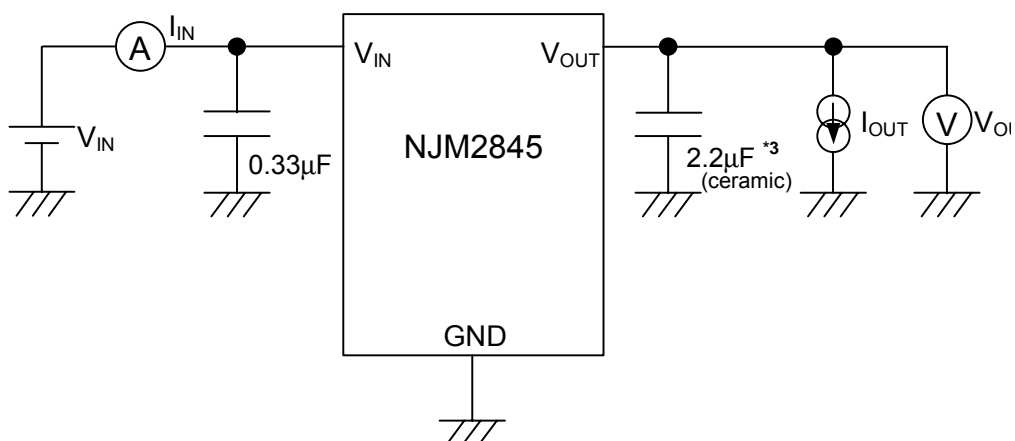
The above specification is a common specification for all output voltages.

Therefore, it may be different from the individual specification for a specific output voltage.

## POWER DISSIPATION vs. AMBIENT TEMPERATURE

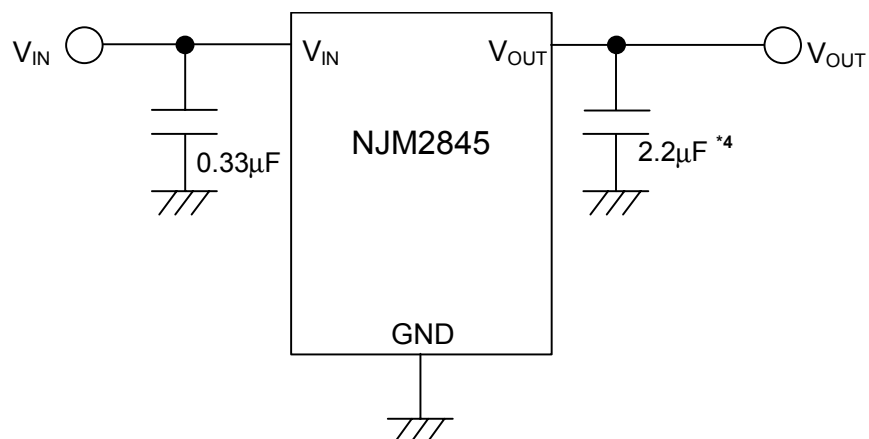


## TEST CIRCUIT



\*3 1.7V <  $V_o$  ≤ 2.6V version:  $C_o = 4.7\mu\text{F}$ ,  $V_o \leq 1.7\text{V}$ :  $C_o = 10\mu\text{F}$  (ceramic)

## TYPICAL APPLICATION



\*4 1.7V <  $V_o$  ≤ 2.6V version:  $C_o = 4.7\mu\text{F}$ ,  $V_o \leq 1.7\text{V}$ :  $C_o = 10\mu\text{F}$

# NJM2845/46

## ■ NJM2846

### ■ ELECTRICAL CHARACTERISTICS

( $V_{IN}=V_o+1V$ ,  $C_{IN}=0.33\mu F$ ,  $C_o=2.2\mu F$  (1.7V< $V_o$ ≤2.6V version:  $C_o=4.7\mu F$ ,  $V_o$ ≤1.7V:  $C_o=10\mu F$ ),  $T_a=25^\circ C$ )

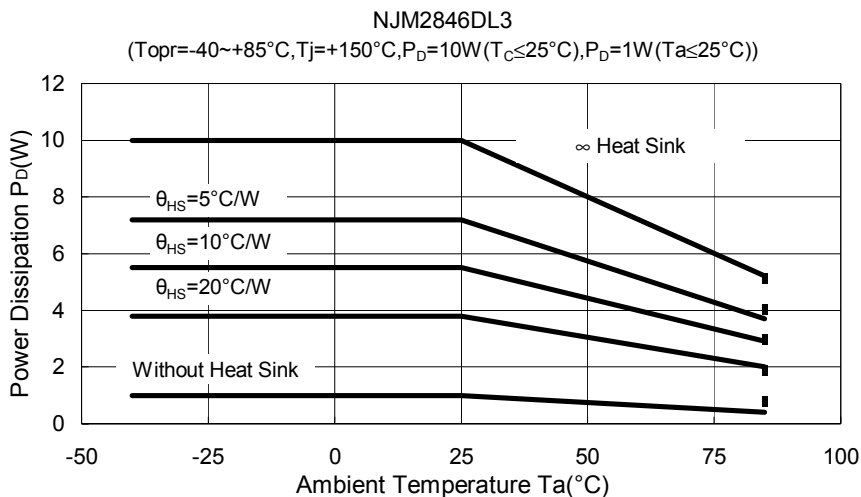
| PARAMETER   | SYMBOL                     | TEST CONDITION  | MIN.  | TYP.     | MAX.  | UNIT            |
|---|----------------------------|---|-------|----------|-------|-----------------|
| Output Voltage                                    | $V_o$                      | $I_o=30mA$  | -1.0% | -        | +1.0% | V               |
| Quiescent Current                                 | $I_Q$                      | $I_o=0mA$   | -     | 400      | 600   | $\mu A$         |
| Quiescent Current at Control OFF                  | $I_{Q(OFF)}$               | $V_{CONT}=0V$   | -     | -        | 100   | nA              |
| Line Regulation                                   | $I_o$                      | $V_o - 0.3V$  | 800   | 1050     | -     | 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                                   | $\Delta V_o/\Delta I_o$    | $I_o=0 \sim 800mA$  | -     | -        | 0.004 | %/mA            |
| Dropout Voltage(*5)                               | $\Delta V_{I-O}$           | $I_o=500mA$   | -     | 0.18     | 0.28  | 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 | $\Delta V_o/\Delta T_a$    | $T_a=0 \sim 85^\circ C$ , $I_o=10mA$                            | -     | $\pm 50$ | -     | ppm/ $^\circ C$ |
| Output Noise Voltage                              | $V_{NO}$                   | $f=10Hz \sim 80kHz$ , $I_o=10mA$ , $V_o=3V$ Version             | -     | 45       | -     | $\mu V_{rms}$   |
| Control Current                                   | $I_{CONT}$                 | $V_{CONT}=1.6V$ , $I_o=0mA$                                     | -     | 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               |

(\*5): The output voltage excludes under 2.3V.

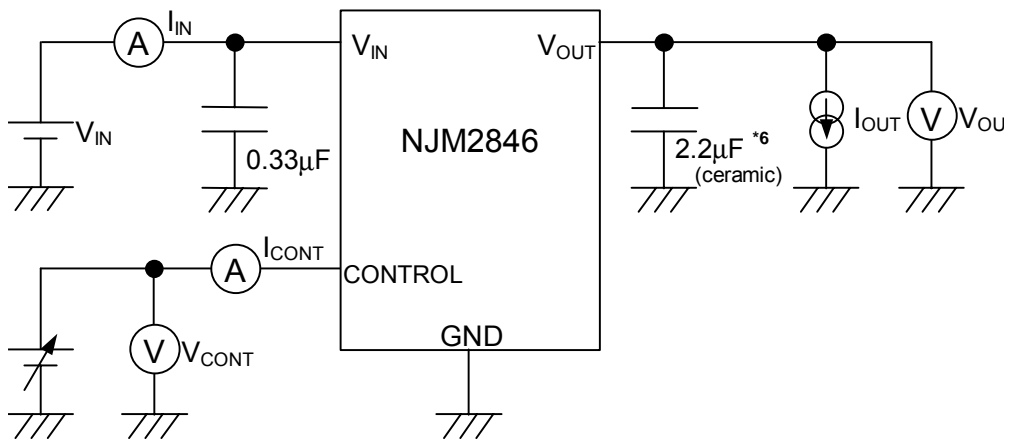
The above specification is a common specification for all output voltages.

Therefore, it may be different from the individual specification for a specific output voltage.

### ■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



## ■ TEST CIRCUIT

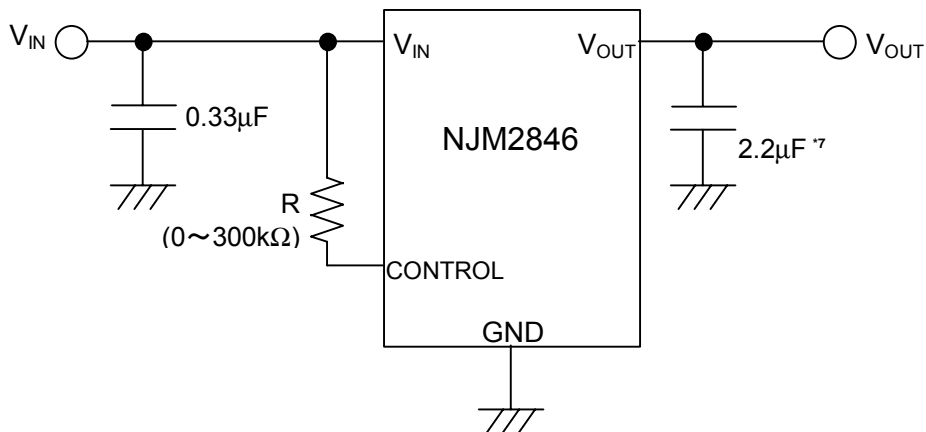


\*6 1.7V <  $V_o$  ≤ 2.6V version:  $C_o = 4.7\mu F$ ,  $V_o \leq 1.7V$ :  $C_o = 10\mu F$

# NJM2845/46

## ■ TYPICAL APPLICATIONS

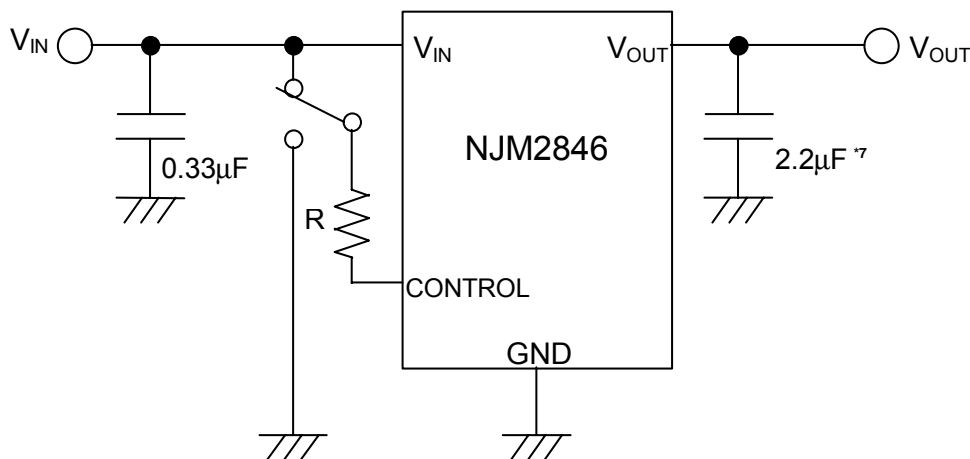
① In the case where ON/OFF Control is not required:



\*7 1.7V<V<sub>o</sub>≤2.6V version: C<sub>o</sub>=4.7µF, V<sub>o</sub>≤1.7V: C<sub>o</sub>=10µF

Connect control terminal to V<sub>IN</sub> terminal

② In use of ON/OFF CONTROL:



\*7 1.7V<V<sub>o</sub>≤2.6V version: C<sub>o</sub>=4.7µF, V<sub>o</sub>≤1.7V: C<sub>o</sub>=10µF

State of control terminal:

- “H” → output is enabled.
- “L” or “open” → output is disabled.

\*In the case of using a resistance "R" between V<sub>IN</sub> and control.

The current flow into the control terminal while the IC is ON state (I<sub>CONT</sub>) can be reduced when a pull up resistance "R" is inserted between V<sub>IN</sub> and the control terminal.

The minimum control voltage for ON state (V<sub>CONT(ON)</sub>) is increased due to the voltage drop caused by I<sub>CONT</sub> and the resistance "R". The I<sub>CONT</sub> 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<sub>CONT(ON)</sub> 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 ( $C_O$ ) 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.

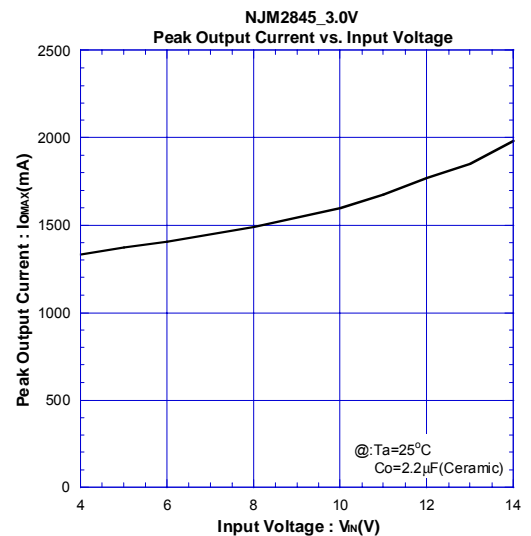
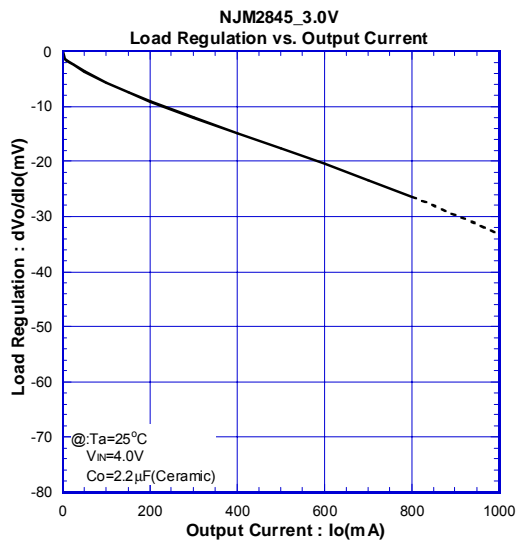
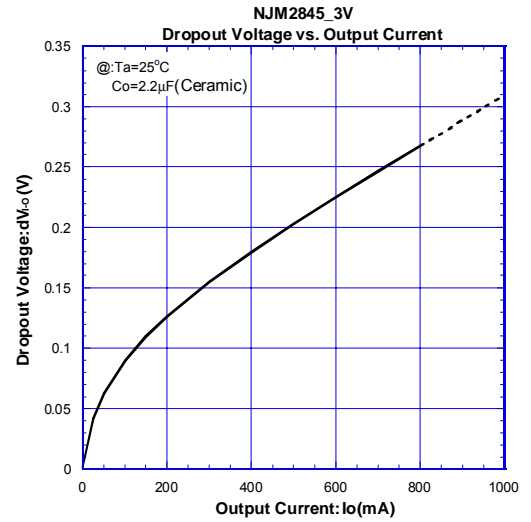
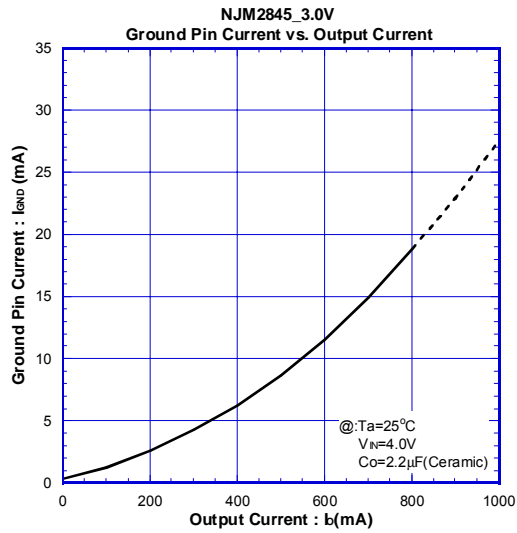
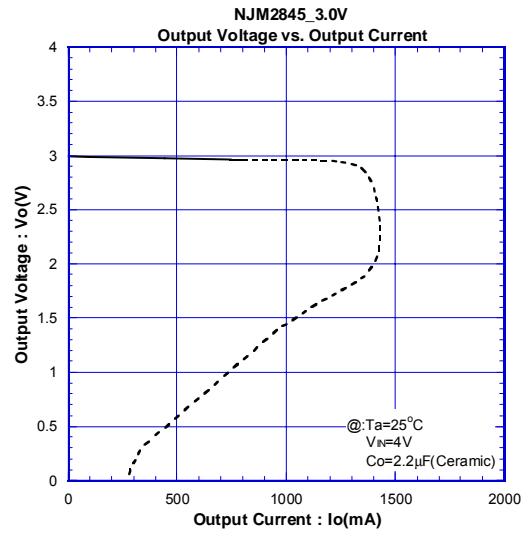
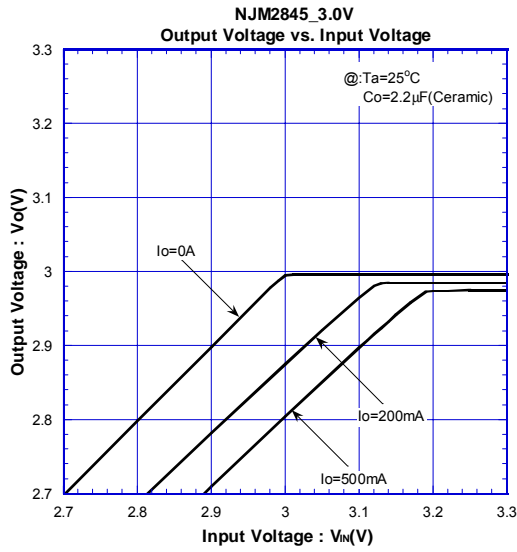
Use of a smaller  $C_O$  may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.

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.

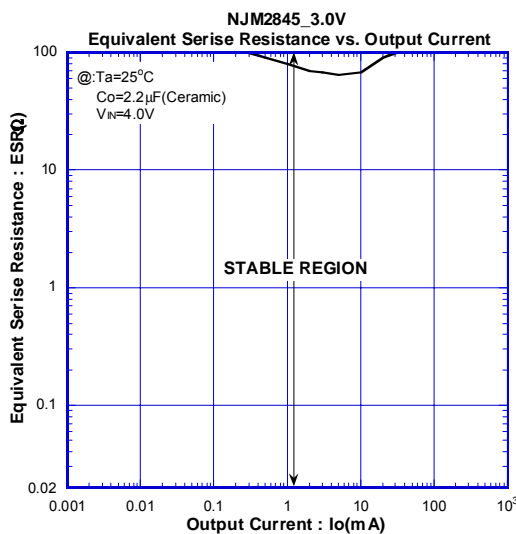
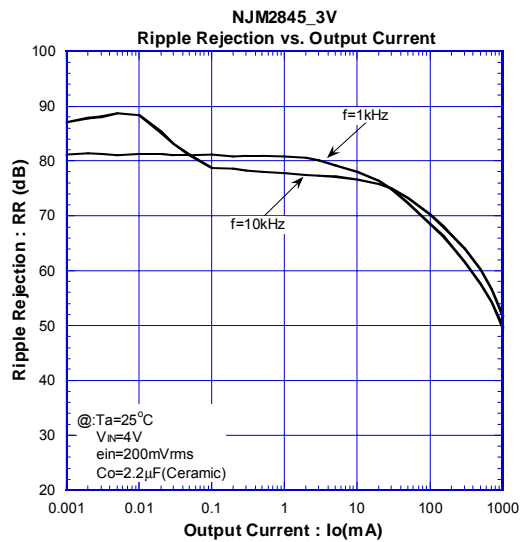
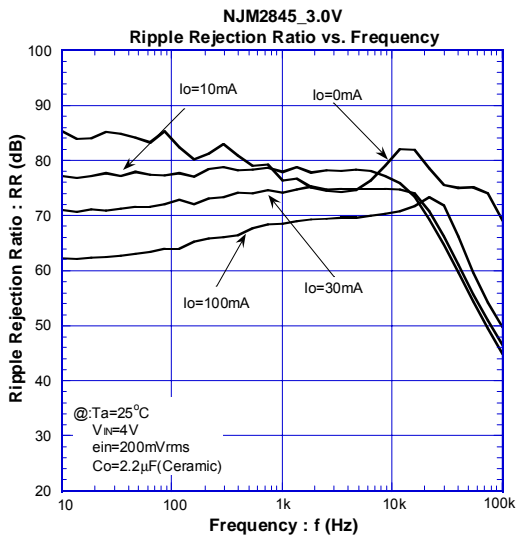
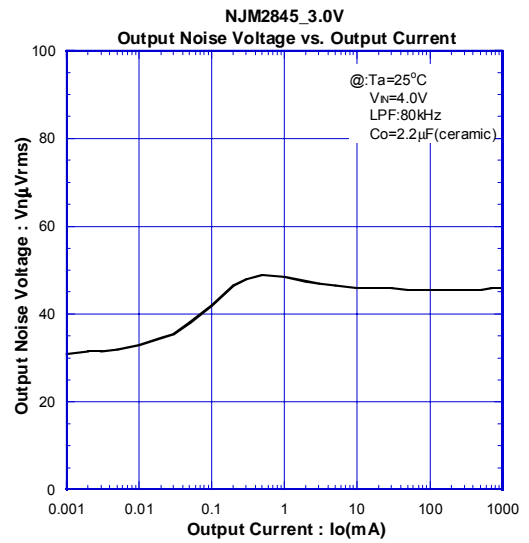
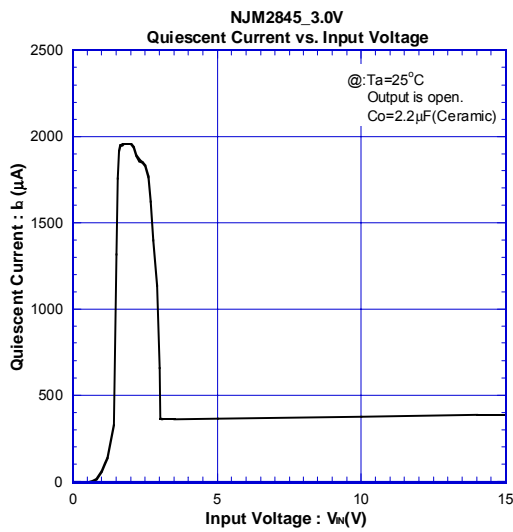
# NJM2845/46

## ■ TYPICAL CHARACTERISTICS (NJM2845)



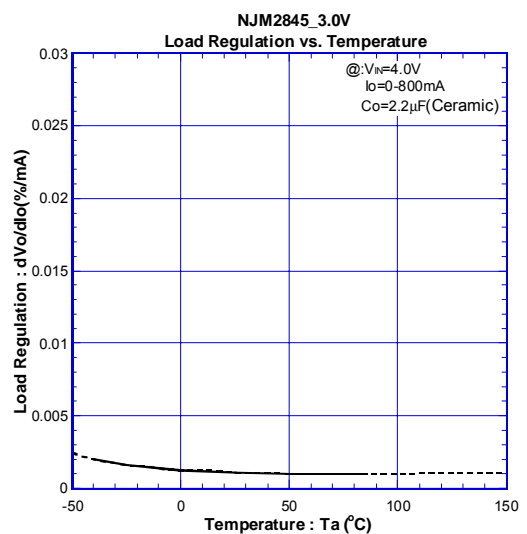
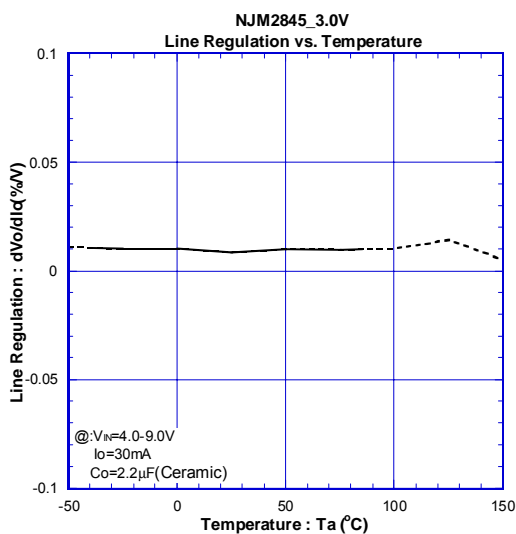
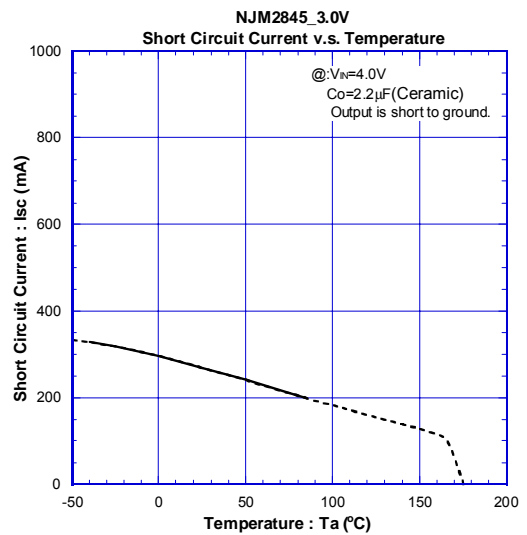
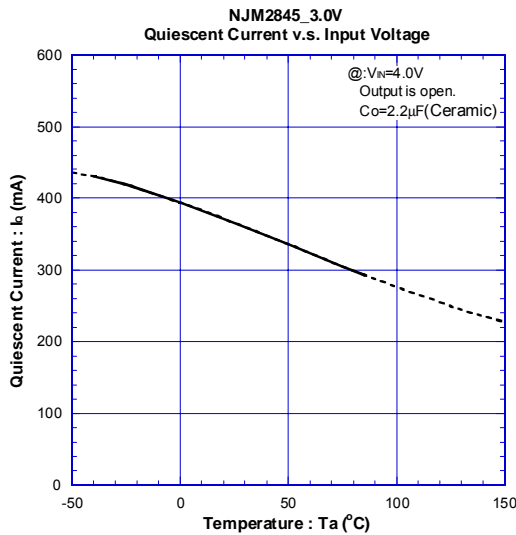
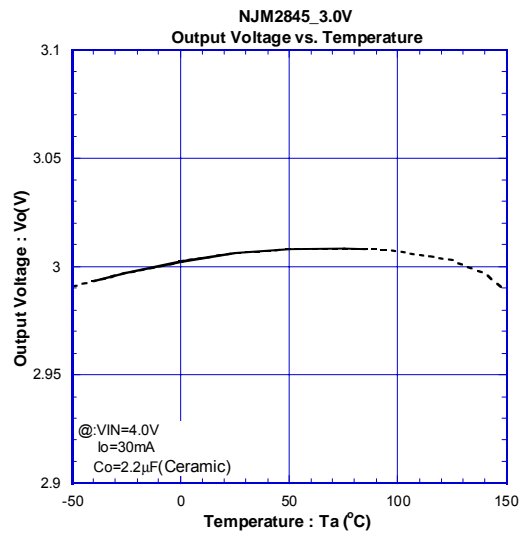
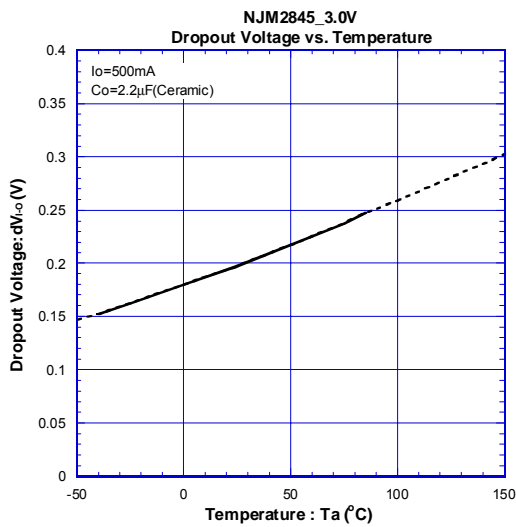


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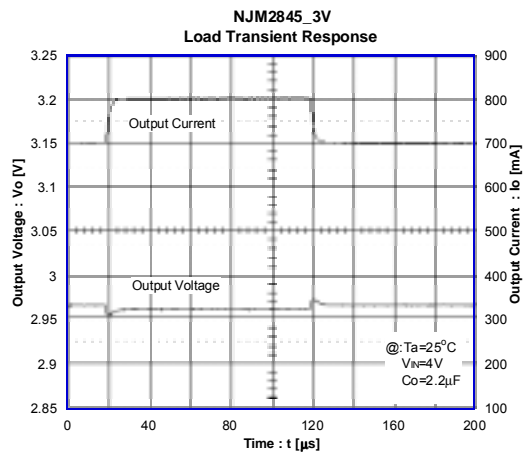
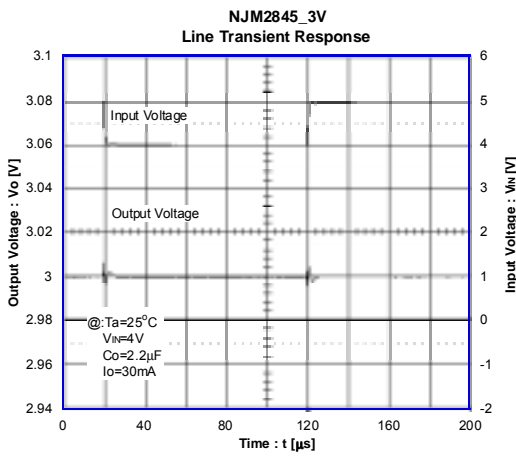
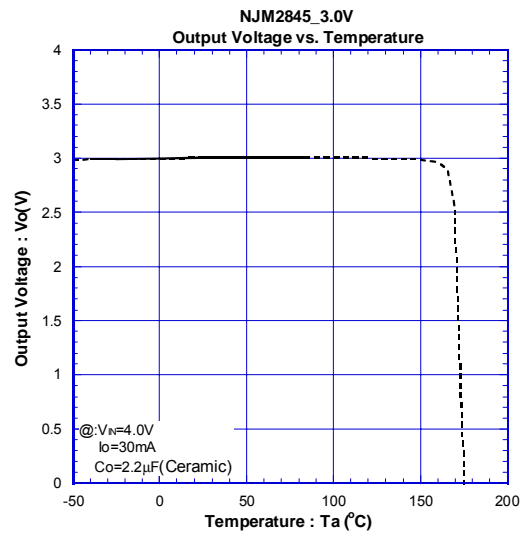
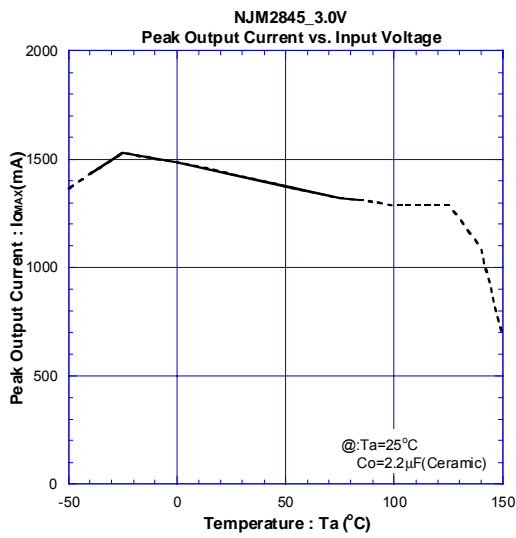


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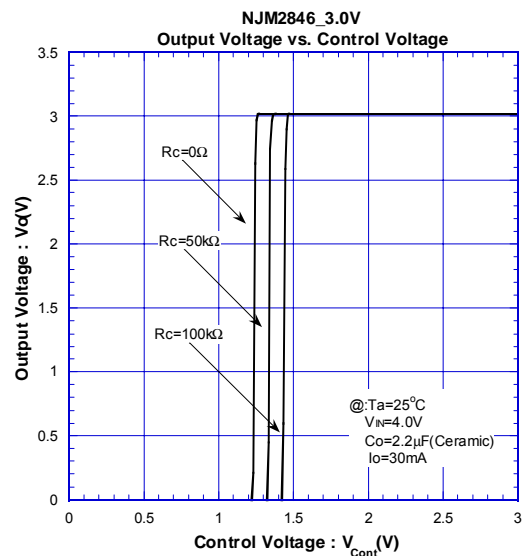
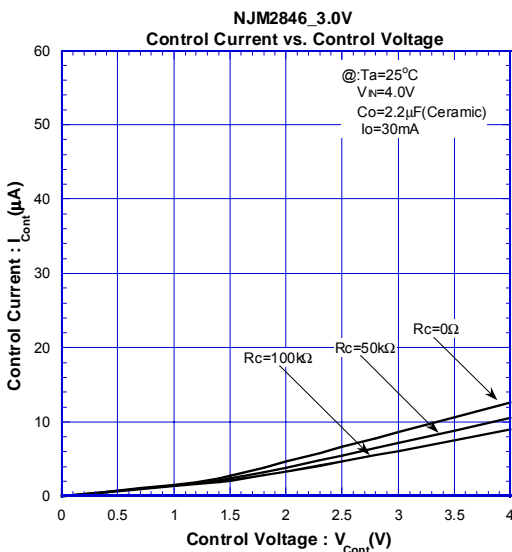
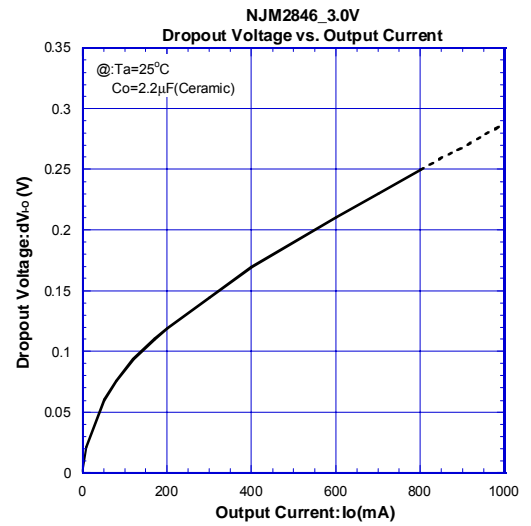
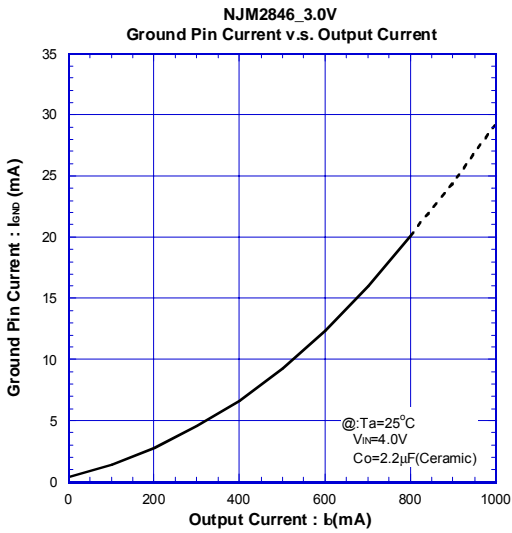
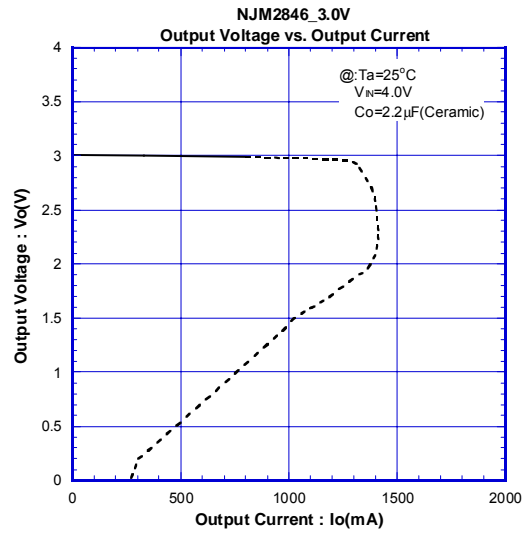
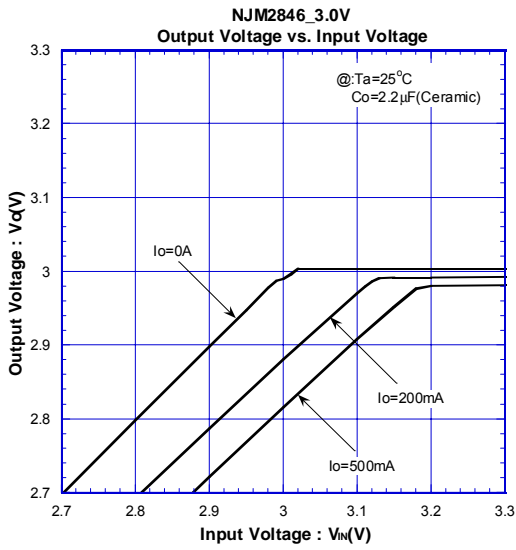


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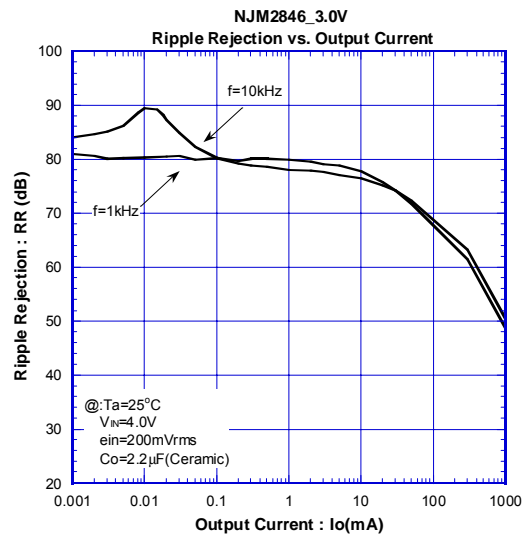
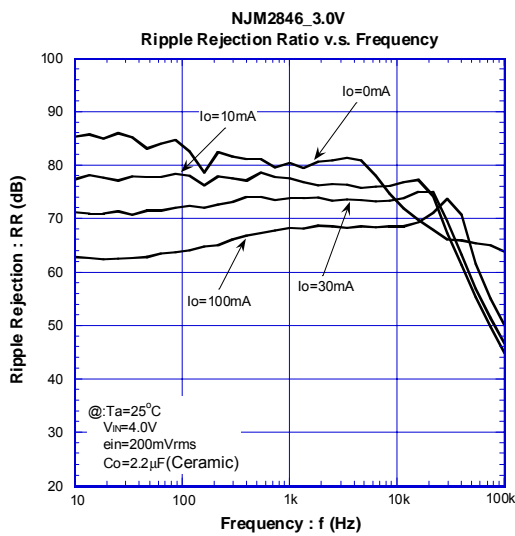
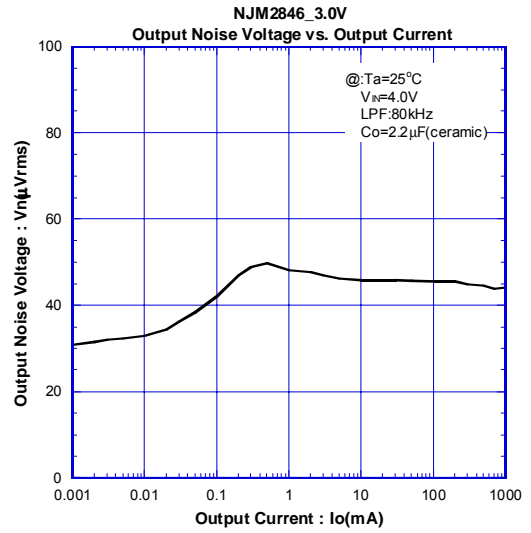
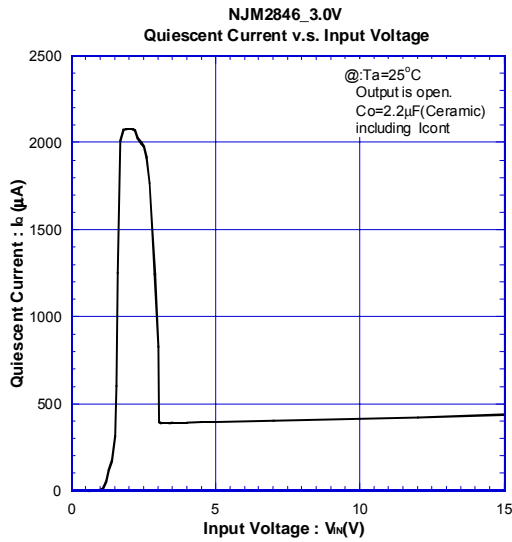
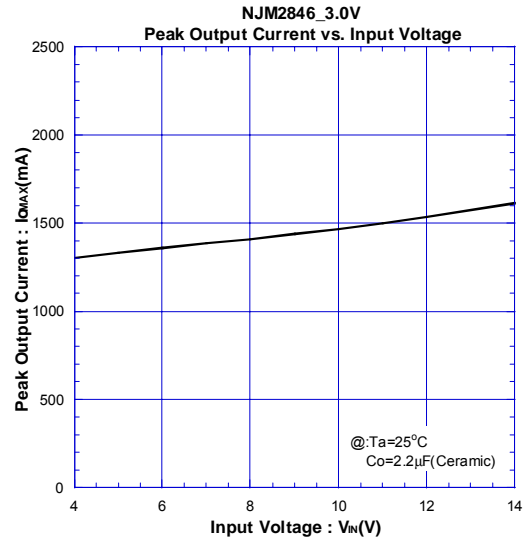
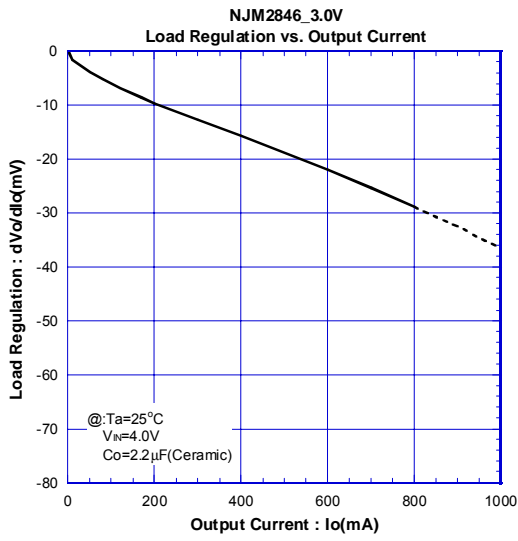


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## ■ TYPICAL CHARACTERISTICS (NJM2846)

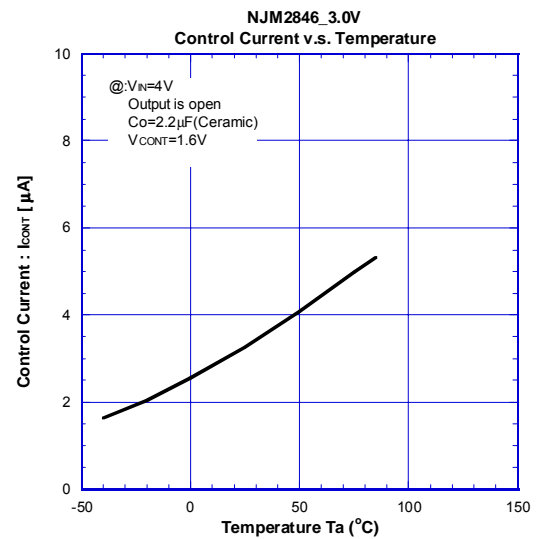
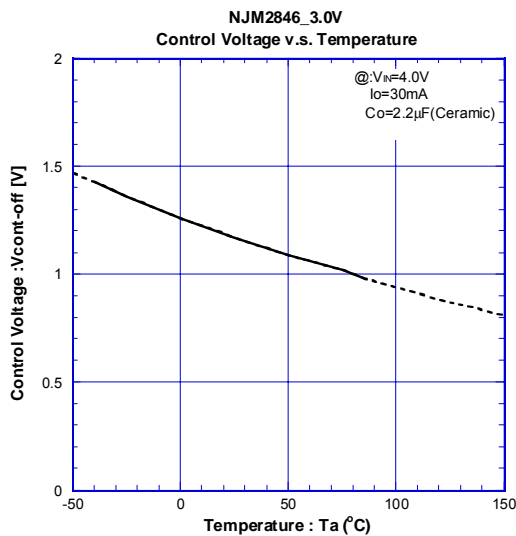
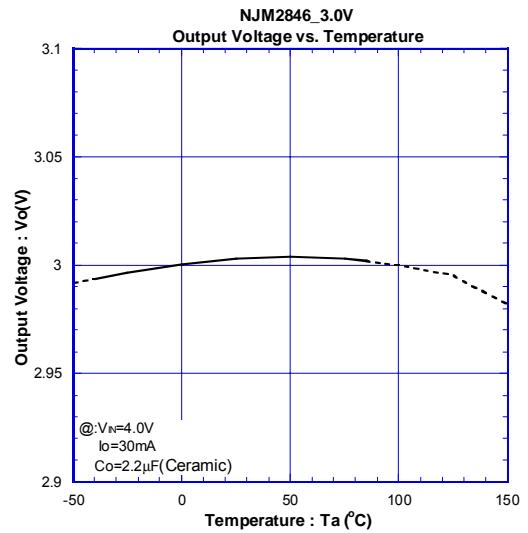
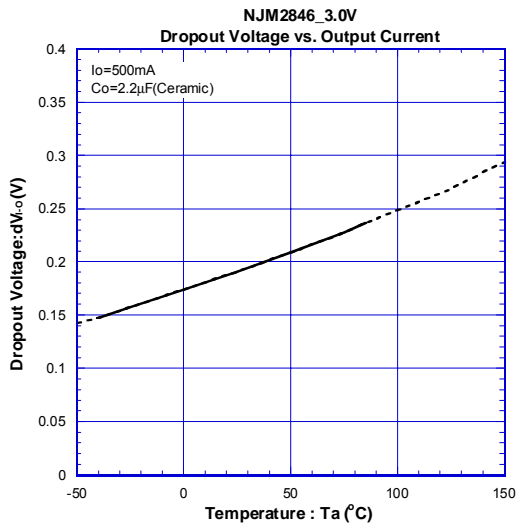
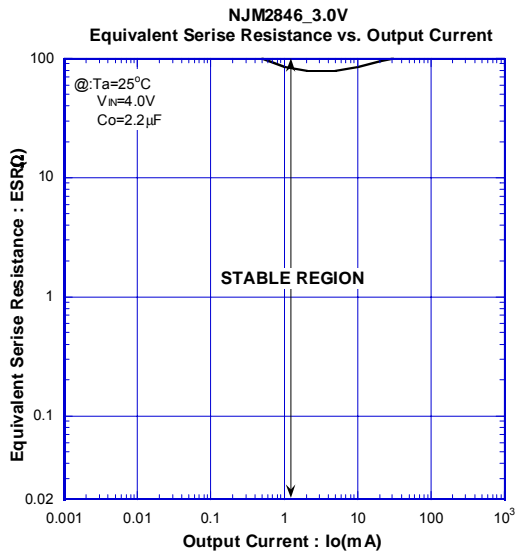


## ■ TYPICAL CHARACTERISTICS (NJM2846)

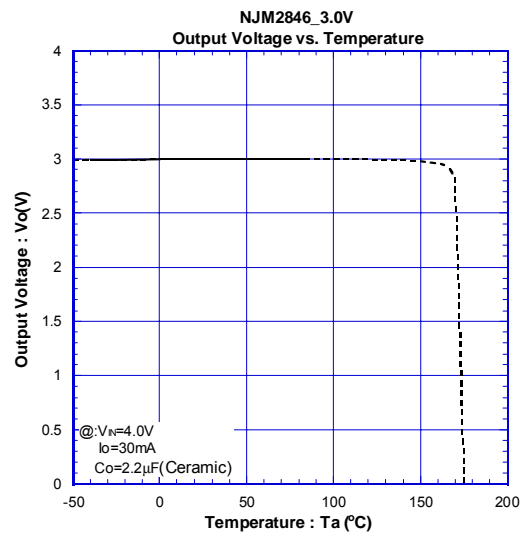
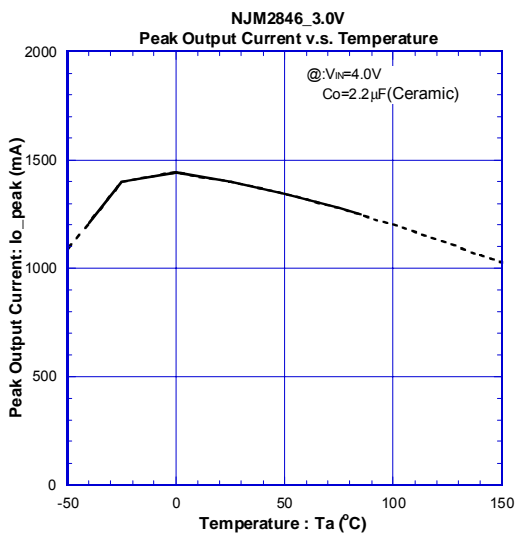
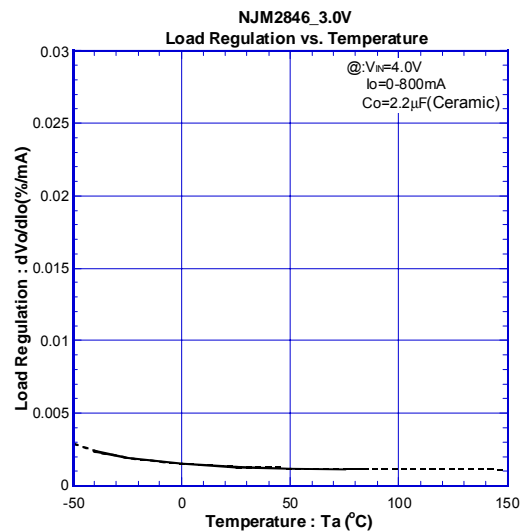
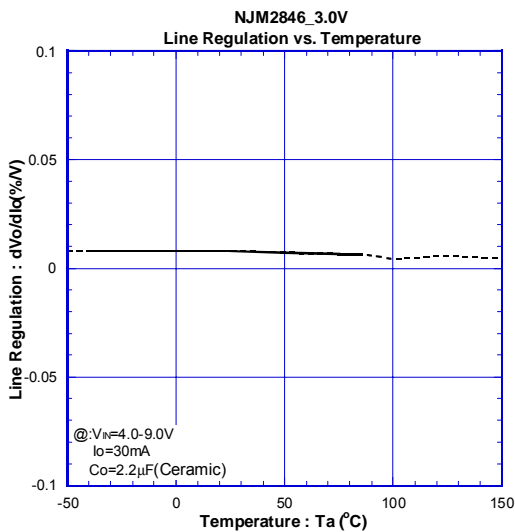
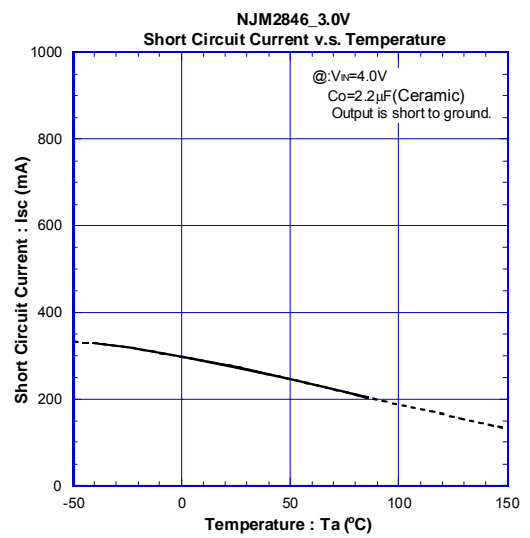
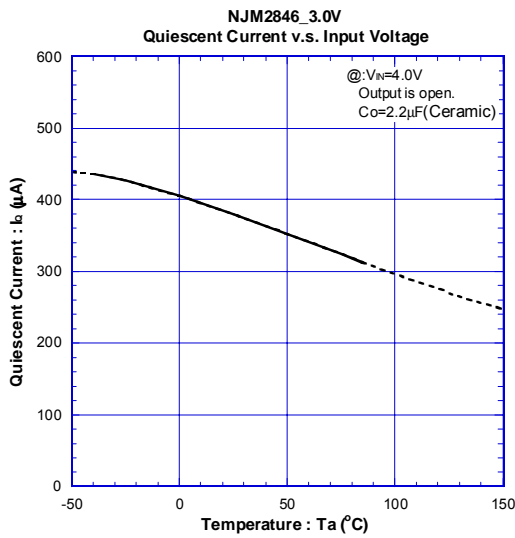


# NJM2845/46

## ■ TYPICAL CHARACTERISTICS (NJM2846)

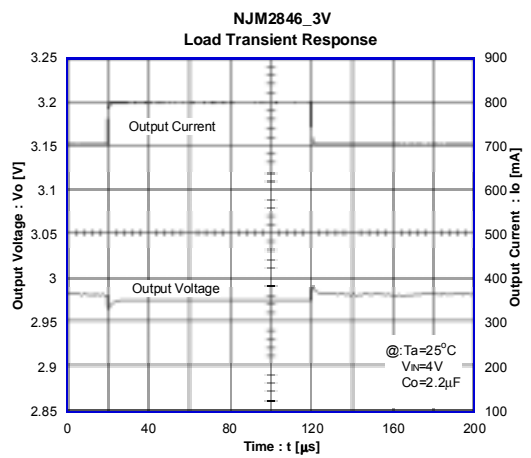
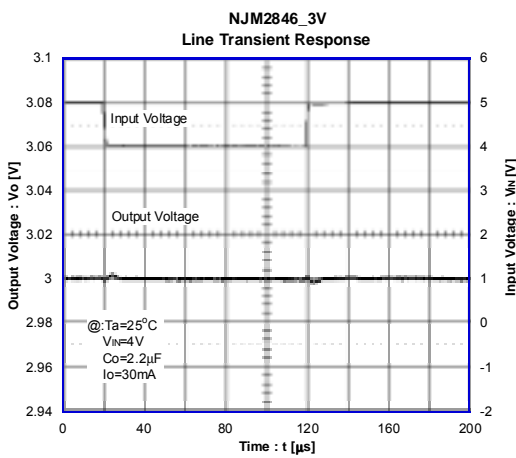
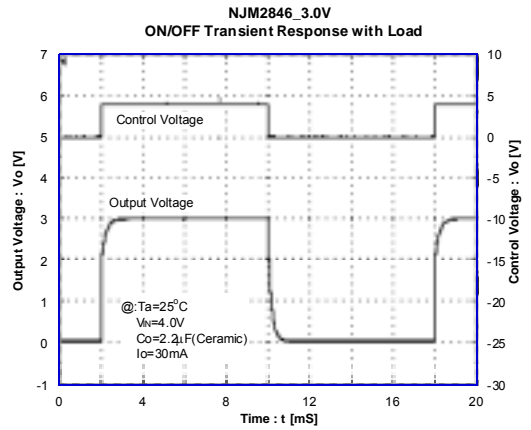
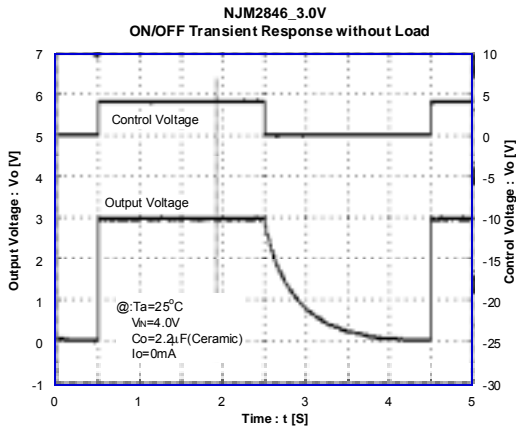


## ■ TYPICAL CHARACTERISTICS (NJM2846)



# NJM2845/46

## ■ TYPICAL CHARACTERISTICS (NJM2846)



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