

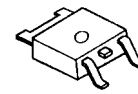
## LOW DROPOUT VOLTAGE REGULATOR

### ■ GENERAL DESCRIPTION

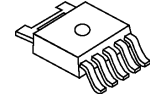
The NJM2845/46 is low dropout voltage regulator. Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

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

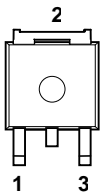


NJM2846DL3

### ■ FEATURES

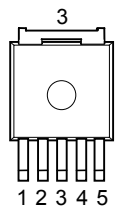
- High Ripple Rejection           75dB typ. (f=1kHz,3V Version)
- Output Noise Voltage           V<sub>no</sub>=45μVrms typ. (V<sub>o</sub>=3V Version)
- Output capacitor with 2.2μF ceramic capacitor (V<sub>o</sub>≥2.6V)
- Output Current                   I<sub>o</sub>(max.)=800mA
- High Precision Output           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

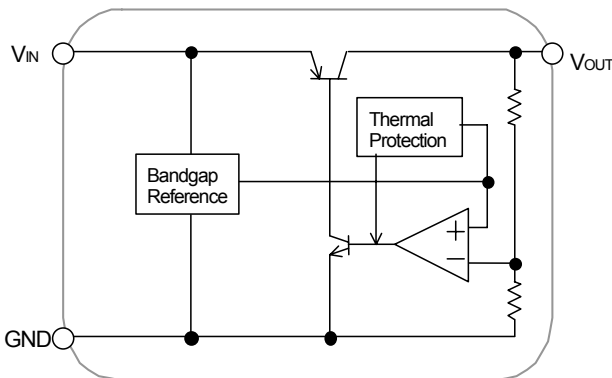
- 1.V<sub>IN</sub>
- 2.GND
- 3.V<sub>OUT</sub>



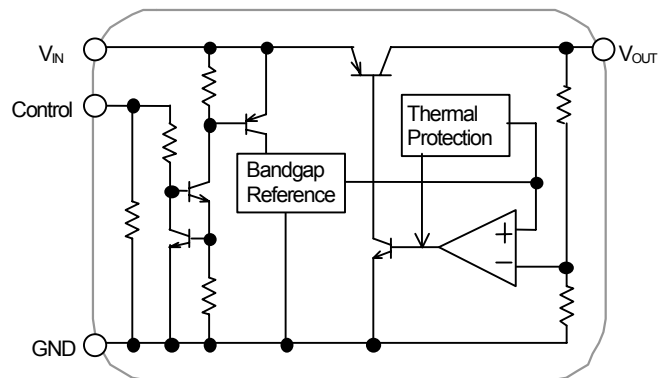
NJM2846DL3

- 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*-02	2.0V
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*-04	4.0V
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) 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

$$V_{IN}=+2.5V(\text{In case of } V_o < 2.3V) \sim +(V_o+9V)$$

## ■ NJM2845

## ■ ELECTRICAL CHARACTERISTICS

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

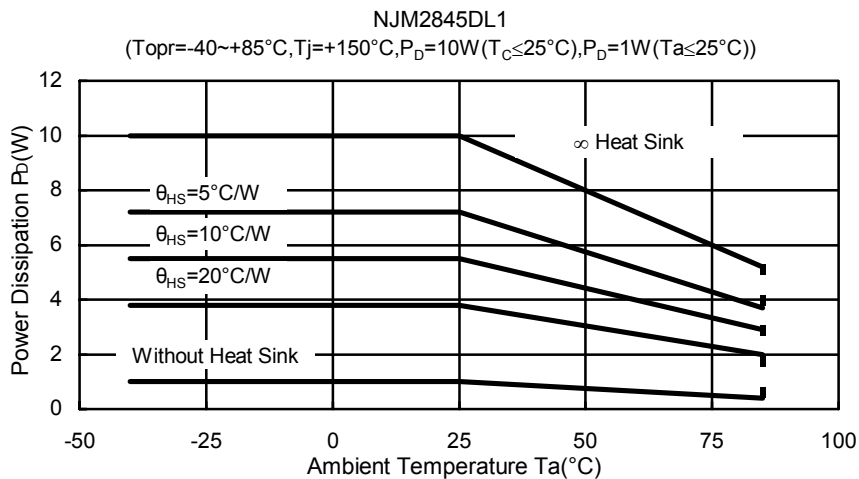
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V <sub>o</sub>	I <sub>o</sub> =30mA	-1.0%	-	+1.0%	V
Quiescent Current	I <sub>Q</sub>	I <sub>o</sub> =0mA	-	400	600	μA
Output Current	I <sub>o</sub>	V <sub>o</sub> - 0.3V	800	1050	-	mA
Line Regulation	ΔV <sub>o</sub> /ΔV <sub>IN</sub>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

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

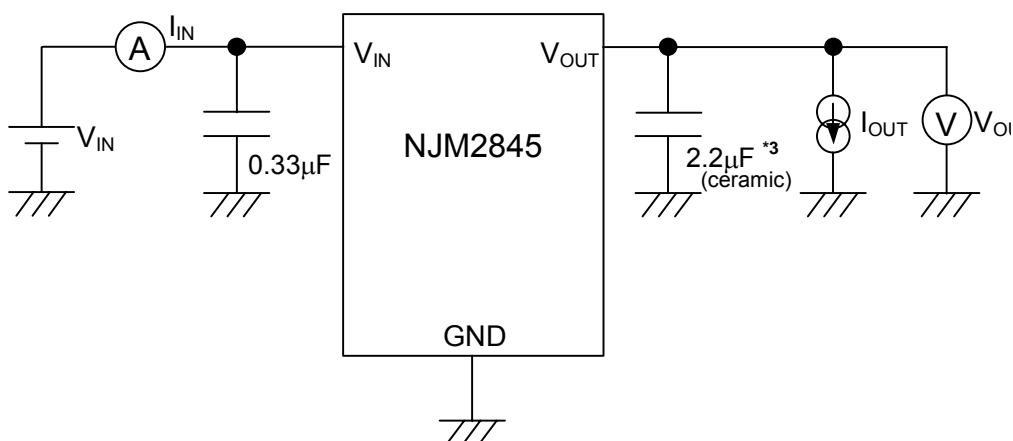
The above specification is a common specification for all output voltages.

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

## POWER DISSIPATION vs. AMBIENT TEMPERATURE

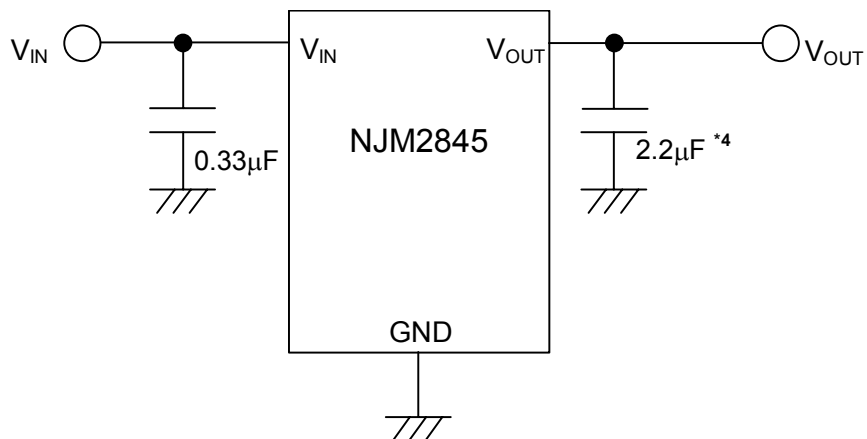


## TEST CIRCUIT



\*3 1.7V <  $V_o \leq 2.6\text{V}$  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 <  $V_o \leq 2.6\text{V}$  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< $V_o\leq 2.6V$  version:  $C_o=4.7\mu F$ ,  $V_o\leq 1.7V$ :  $C_o=10\mu F$ ),  $T_a=25^\circ C$ )

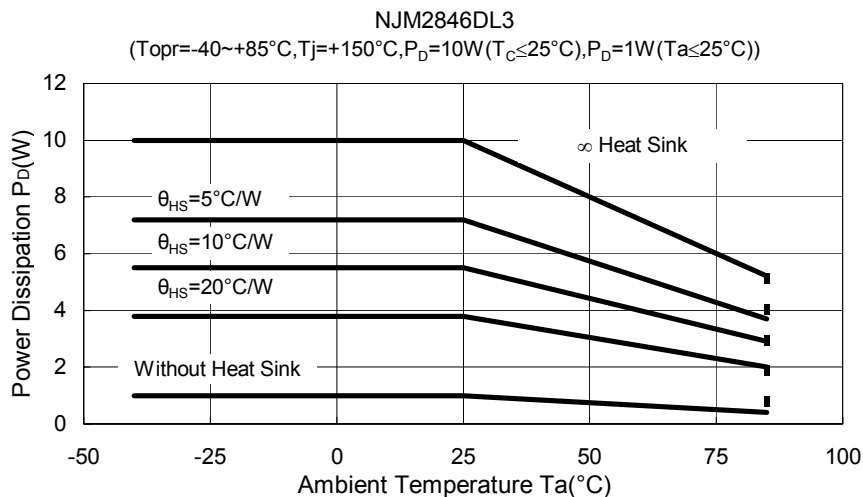
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_o$	$I_o=30mA$	-1.0%	-	+1.0%	V
Quiescent Current	$I_Q$	$I_o=0mA$	-	400	600	$\mu A$
Quiescent Current at Control OFF	$I_{Q(OFF)}$	$V_{CONT}=0V$	-	-	100	nA
Line Regulation	$I_o$	$V_o - 0.3V$	800	1050	-	mA
Line Regulation	$\Delta V_o/\Delta V_{IN}$	$V_{IN}=V_o+1V \sim V_o+6V$ , $I_o=30mA$	-	-	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.

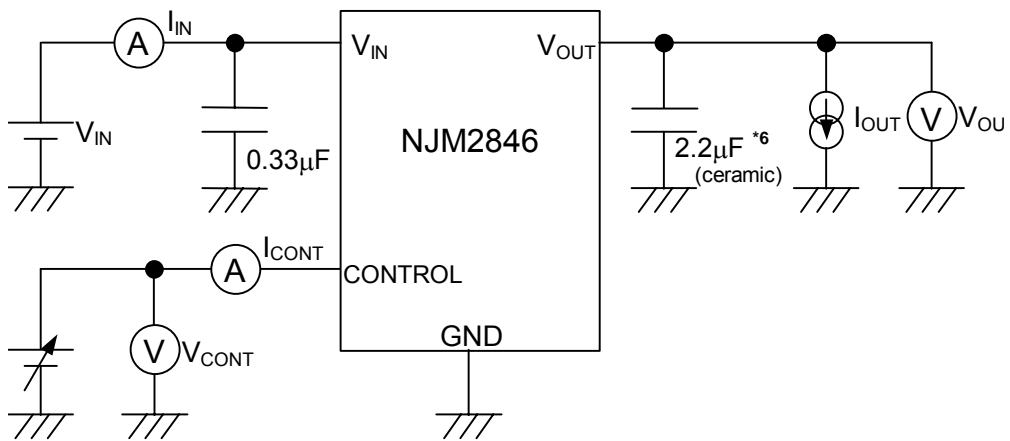
The above specification is a common specification for all output voltages.

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

### ■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



## ■ TEST CIRCUIT

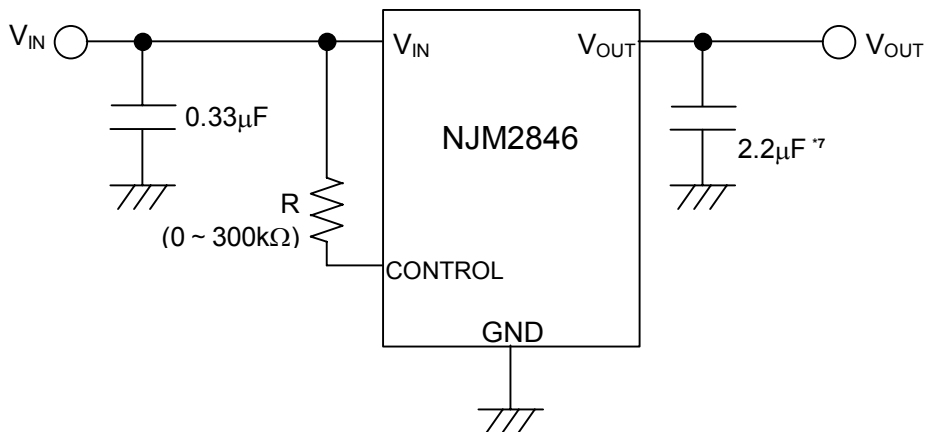


\*6  $1.7\text{V} < V_o \leq 2.6\text{V}$  version:  $C_o = 4.7\mu\text{F}$ ,  $V_o \leq 1.7\text{V}$ :  $C_o = 10\mu\text{F}$

# NJM2845/46

## ■ TYPICAL APPLICATIONS

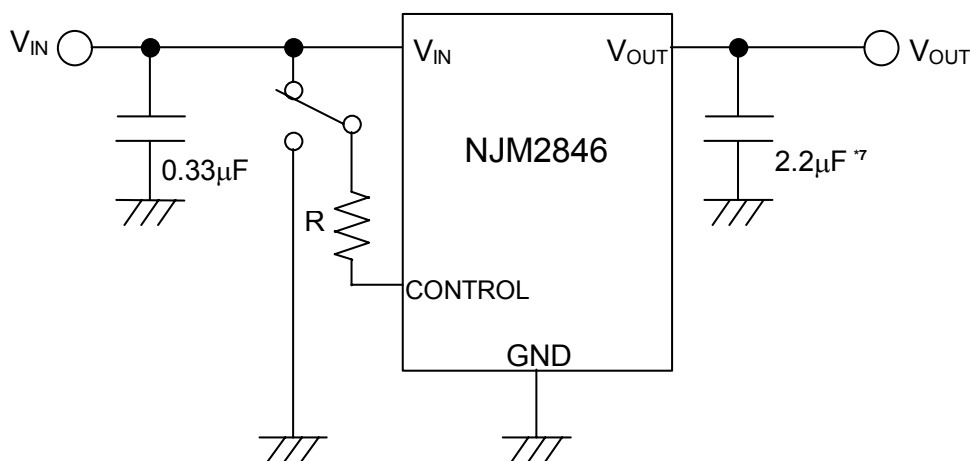
① In the case where ON/OFF Control is not required:



\*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 0.33 $\mu$ 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.

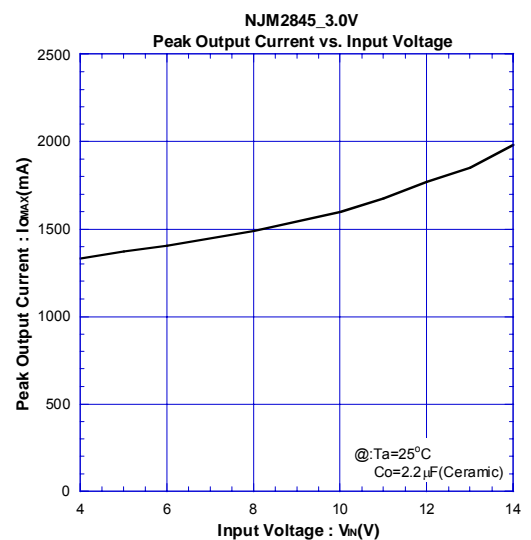
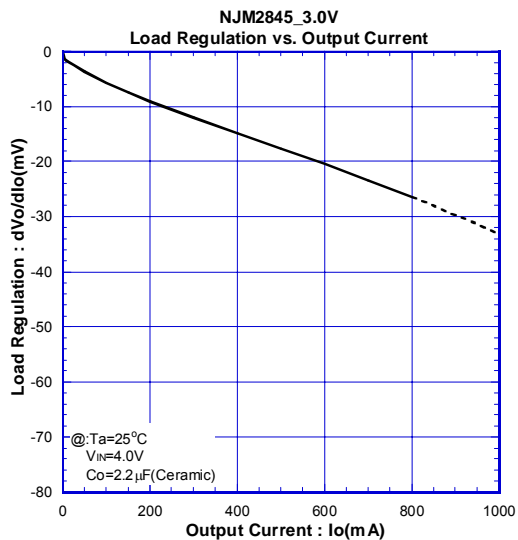
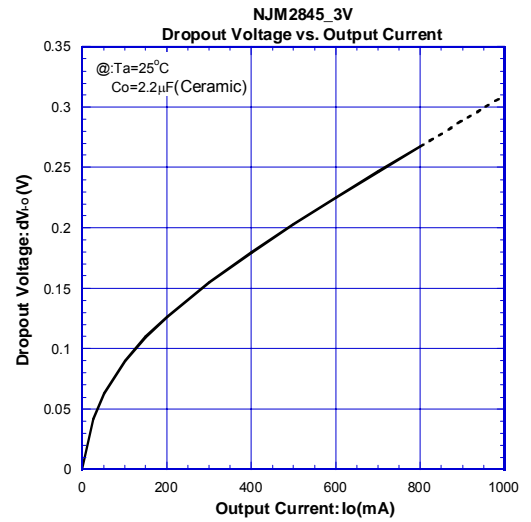
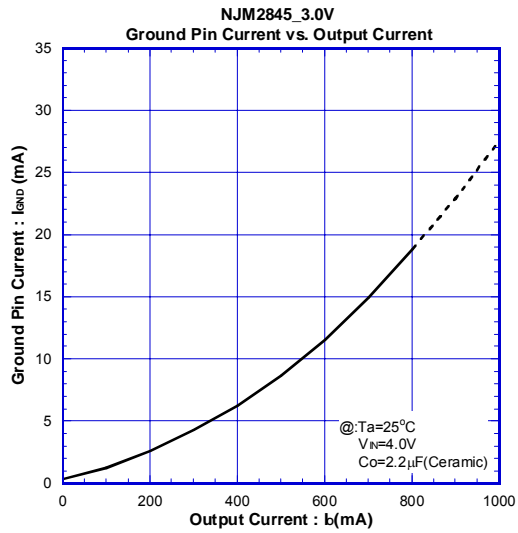
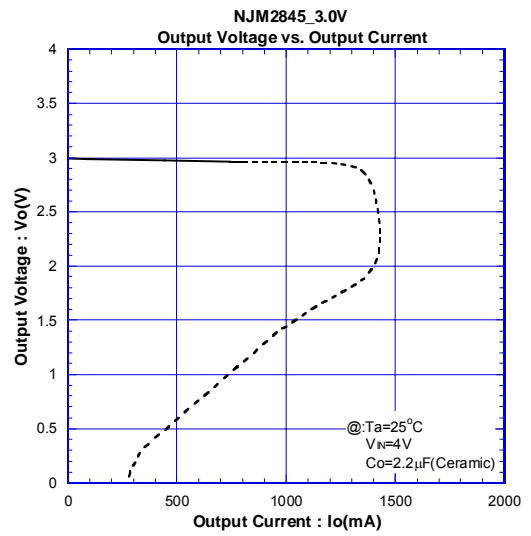
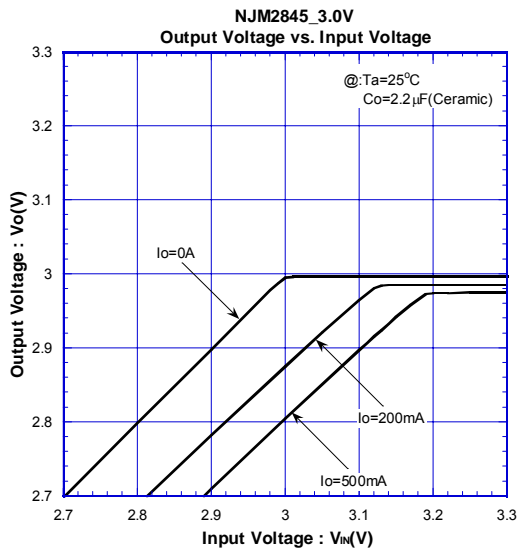
Use of a smaller  $C_O$  may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.

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.

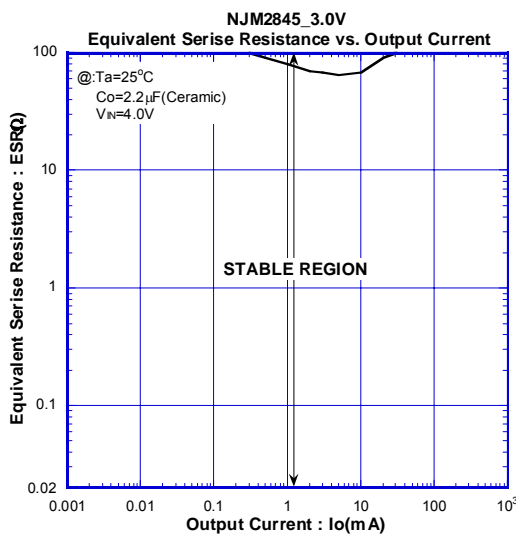
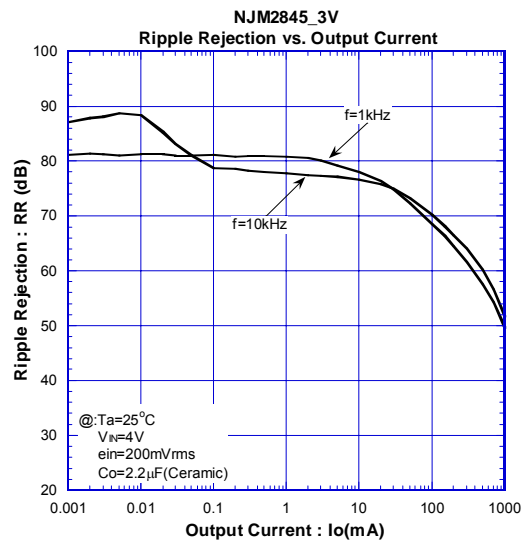
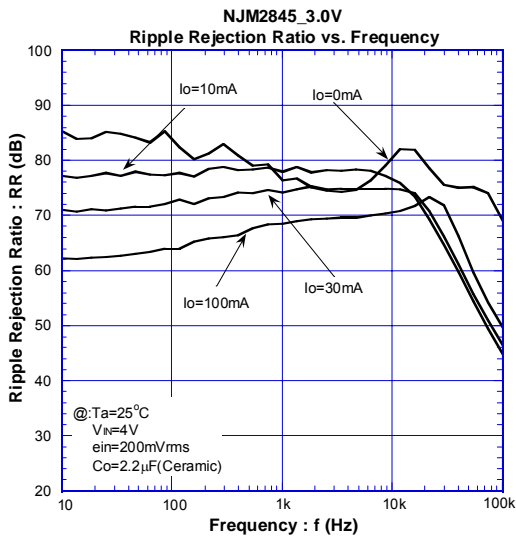
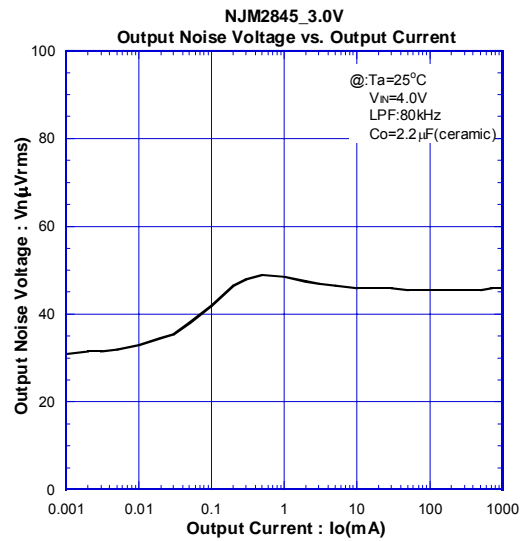
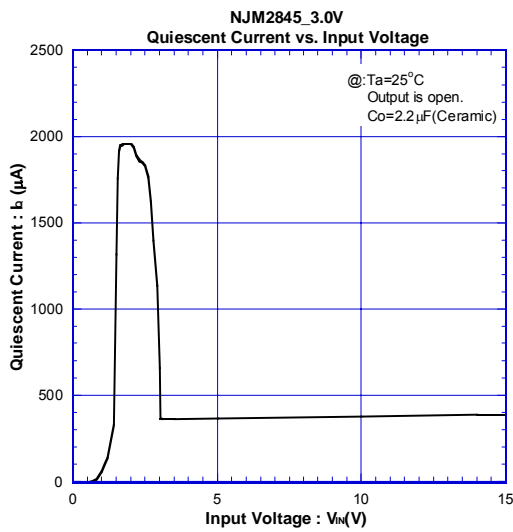
Use of a greater  $C_O$  reduces output noise and ripple output, and also improves transient response of the output voltage against rapid load change.

# NJM2845/46

## ■ TYPICAL CHARACTERISTICS (NJM2845)

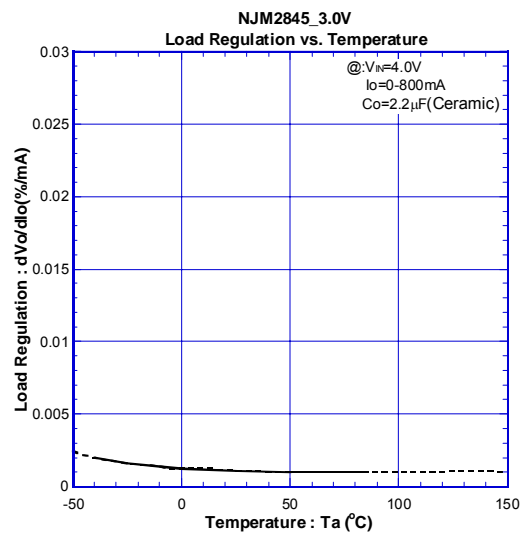
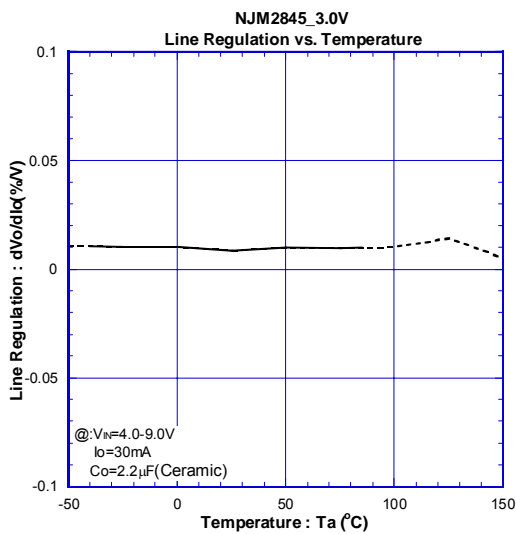
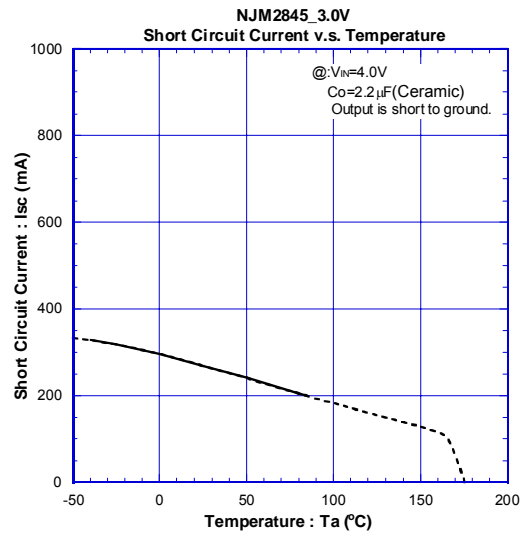
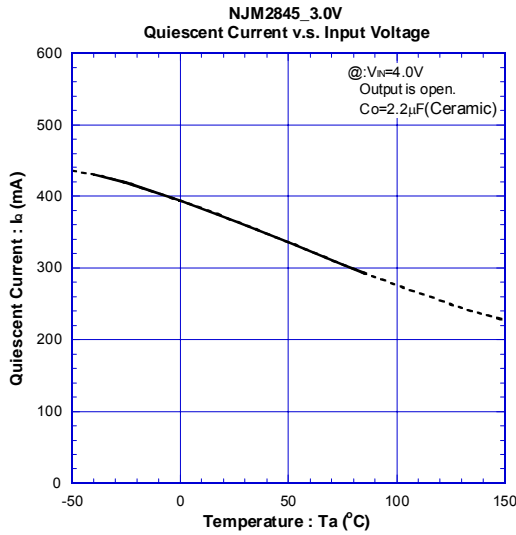
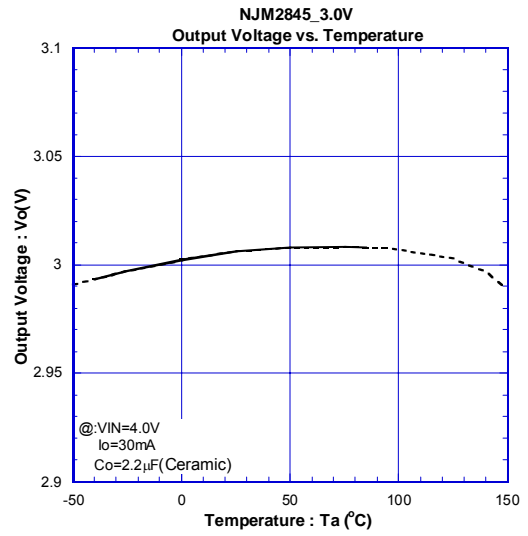
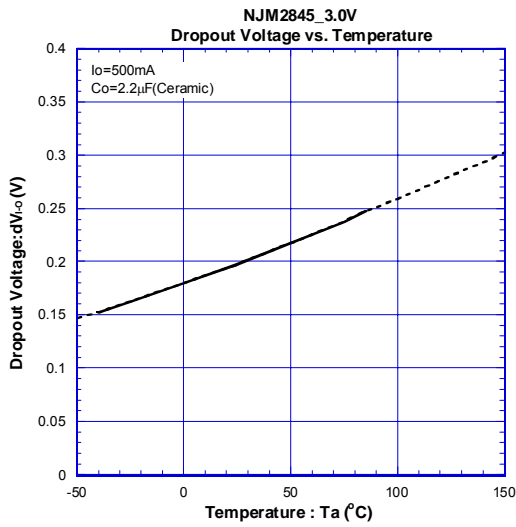


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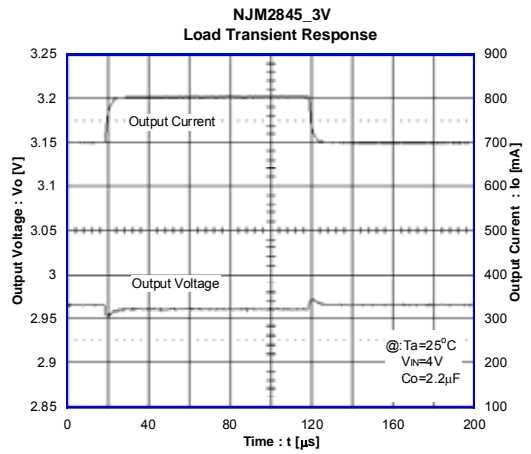
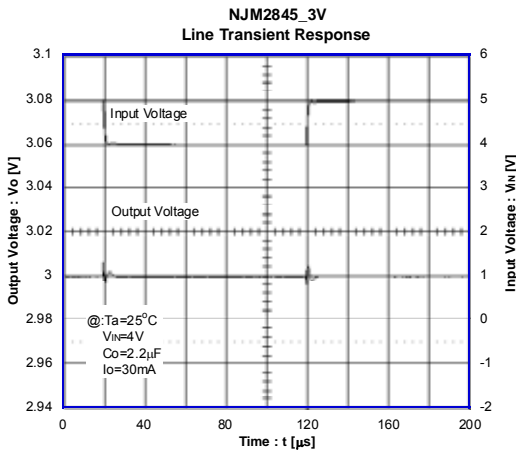
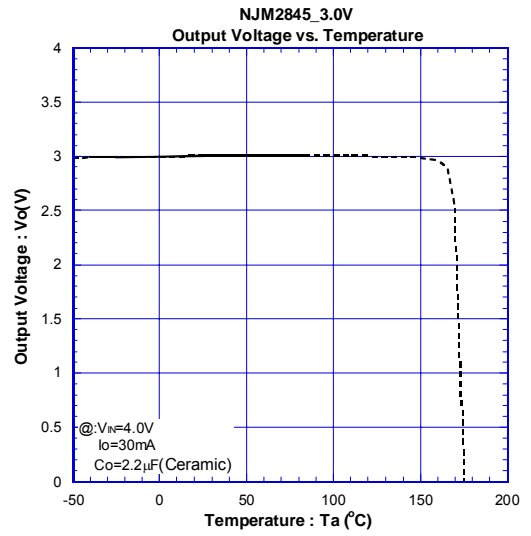
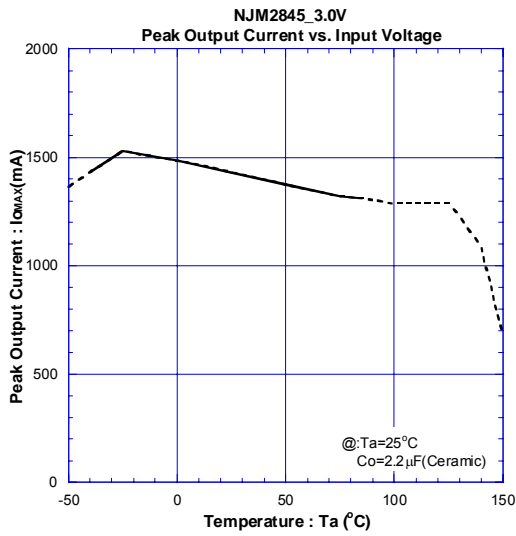


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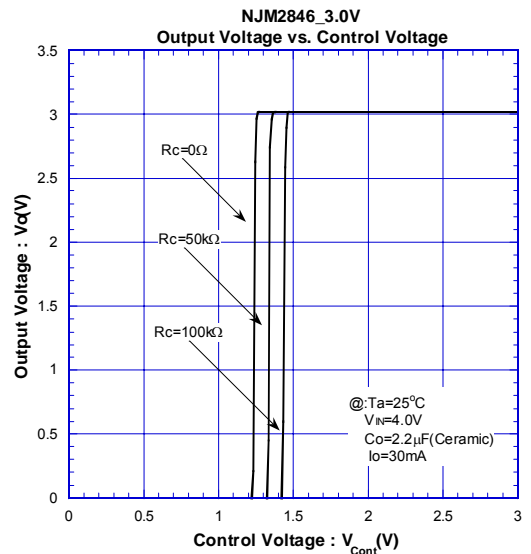
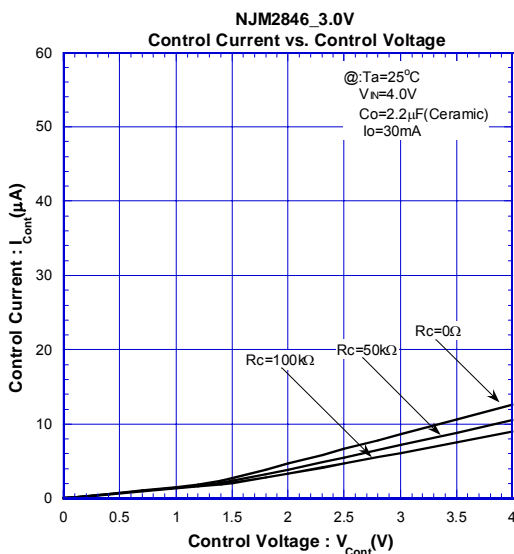
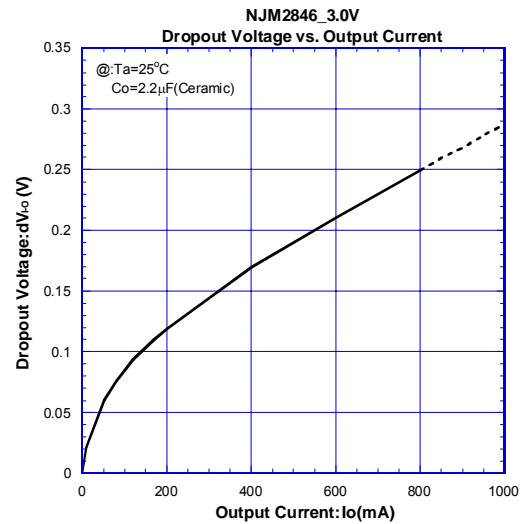
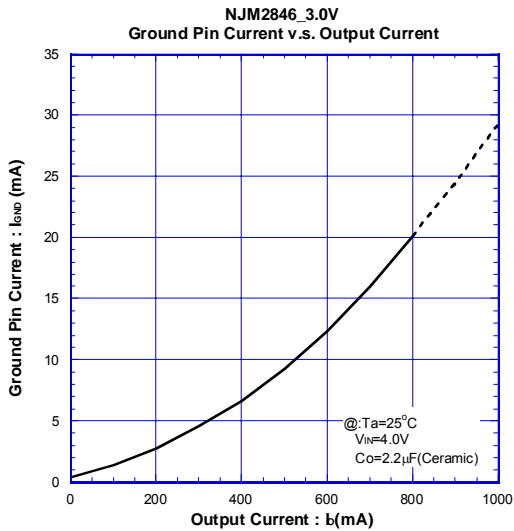
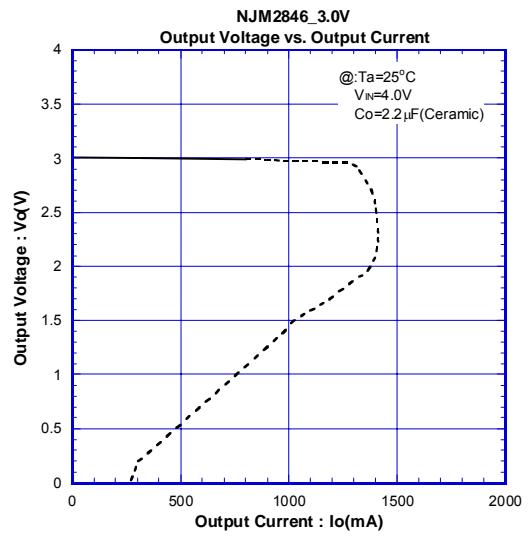
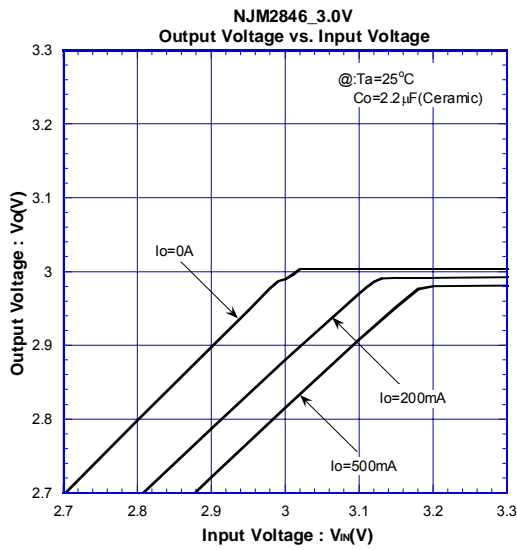


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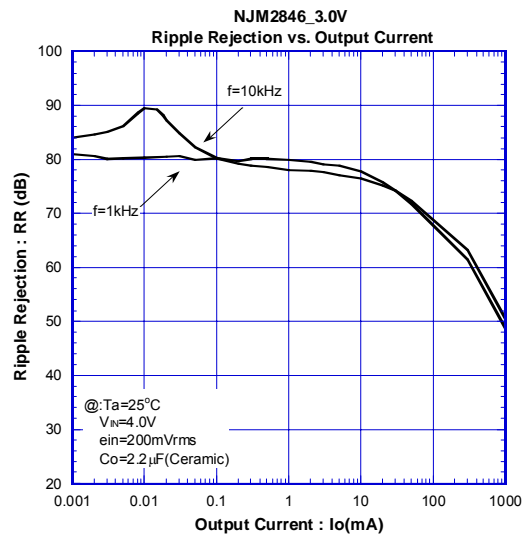
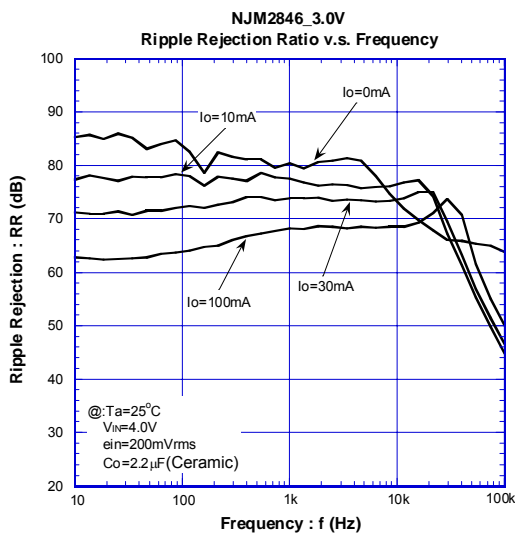
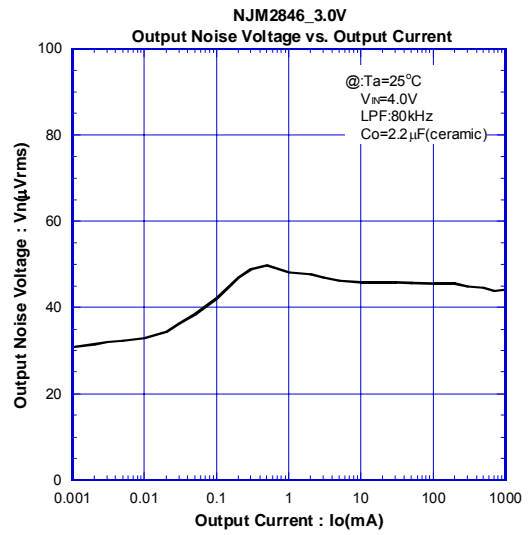
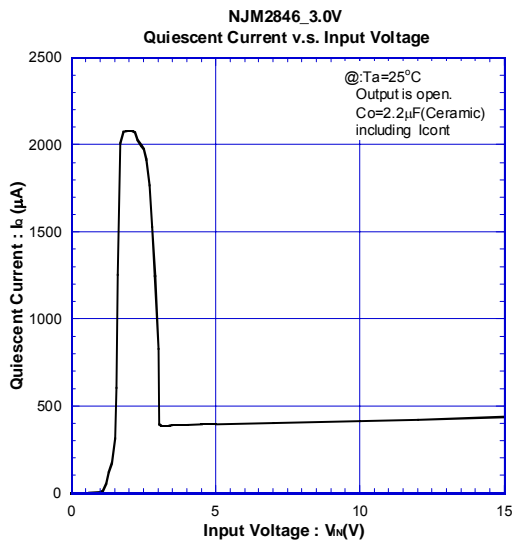
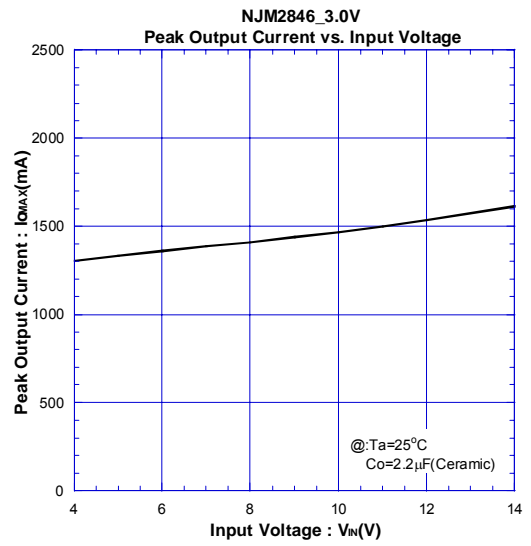
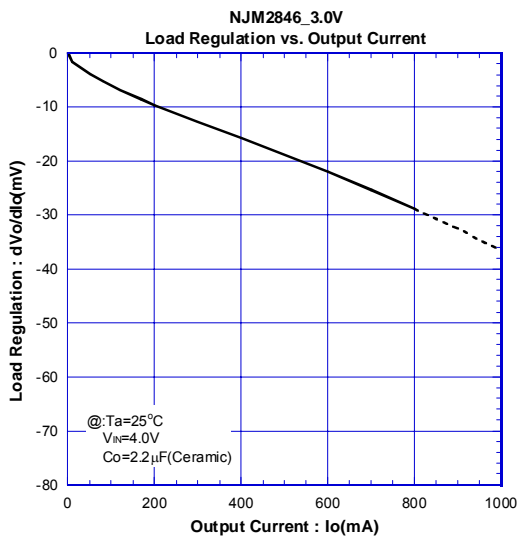


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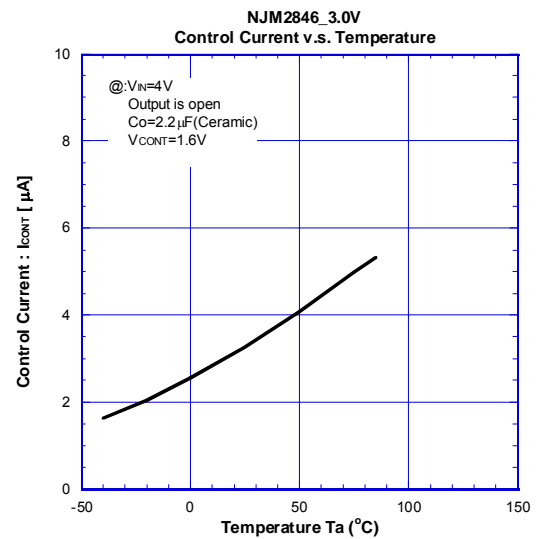
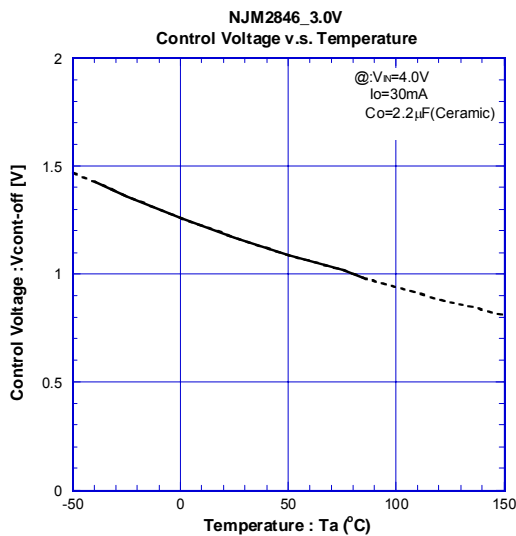
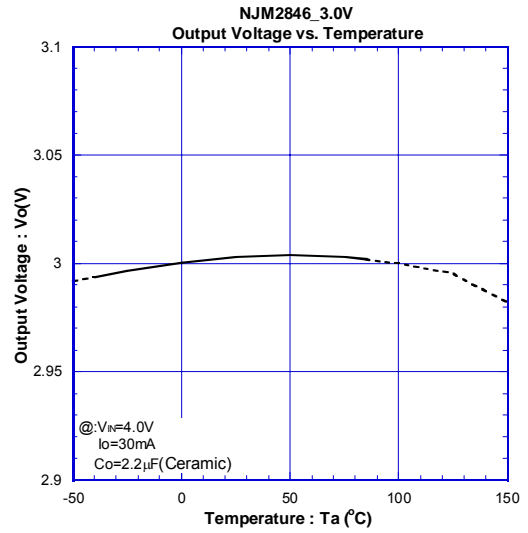
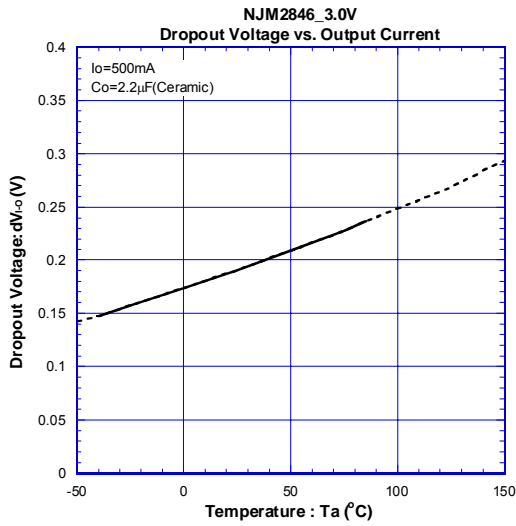
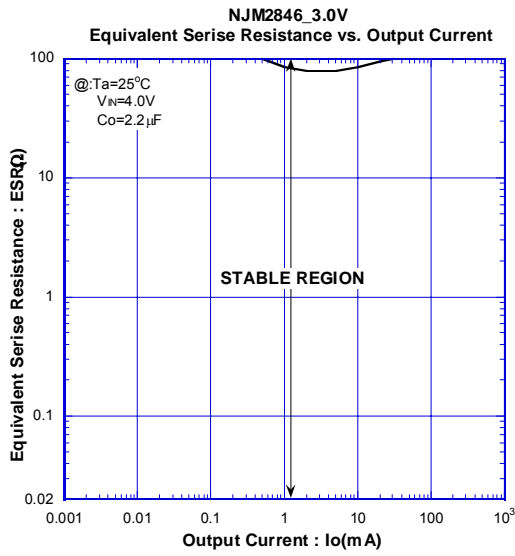


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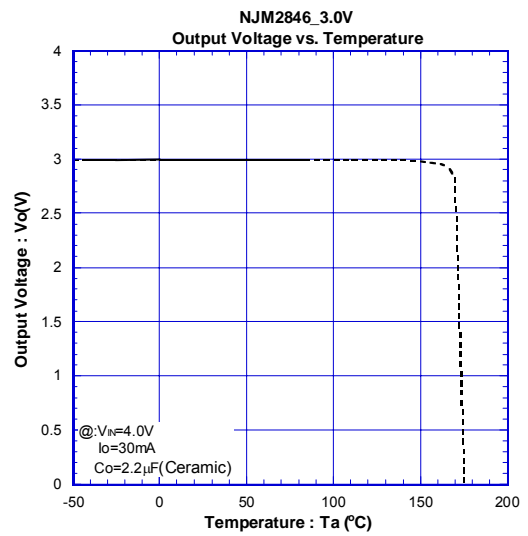
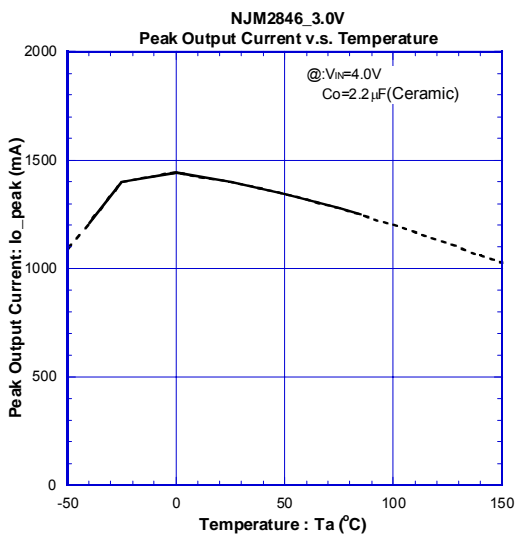
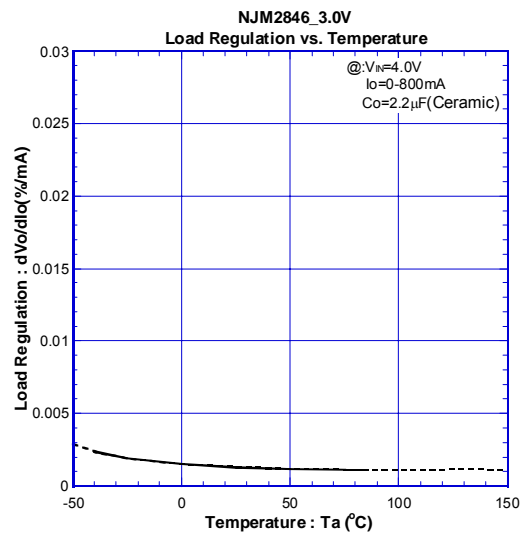
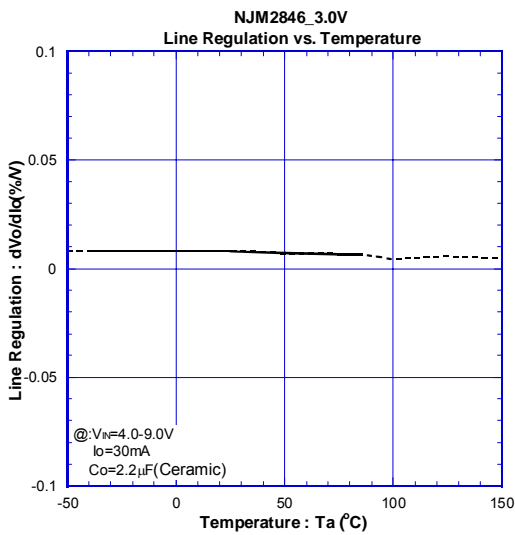
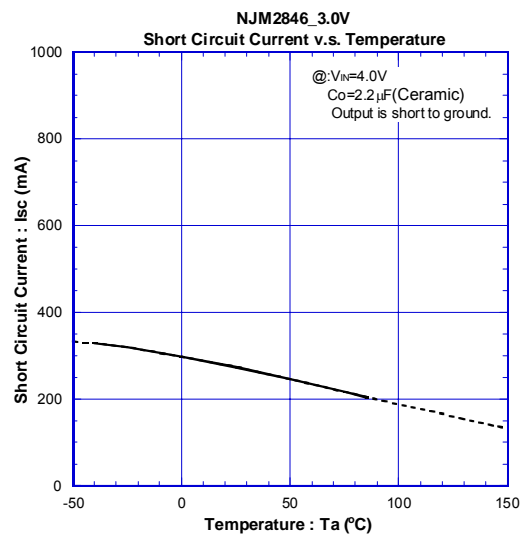
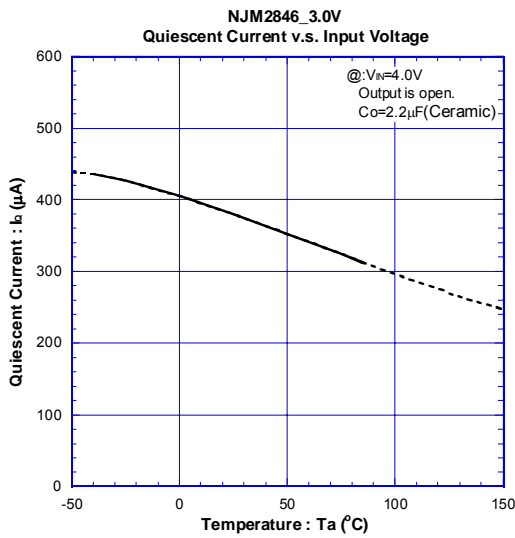


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## ■ TYPICAL CHARACTERISTICS (NJM2846)

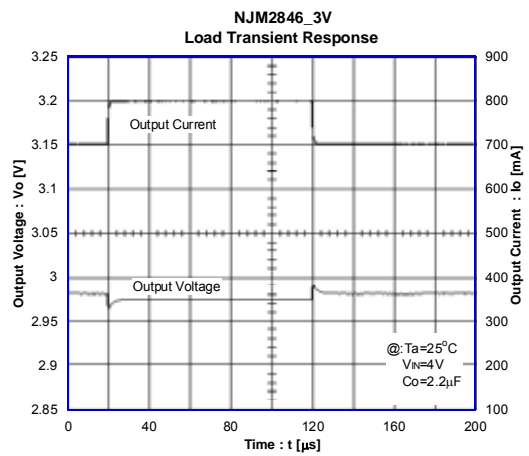
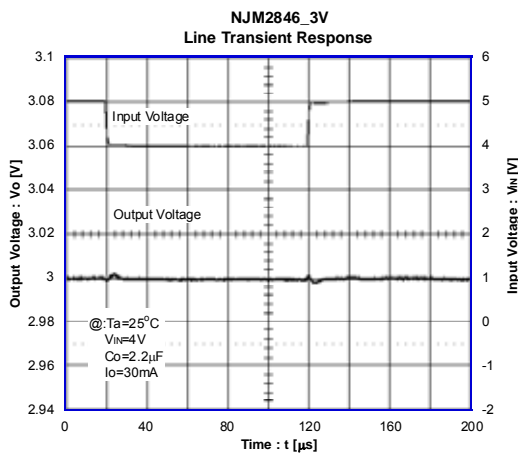
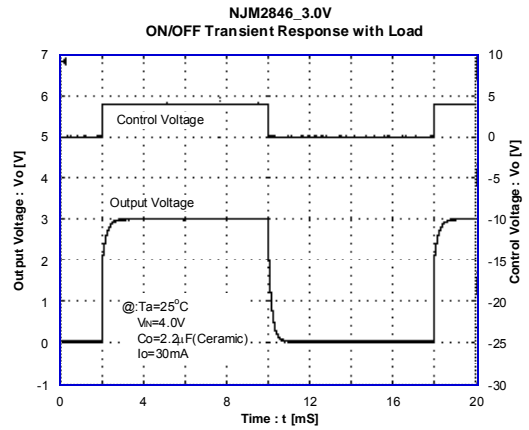
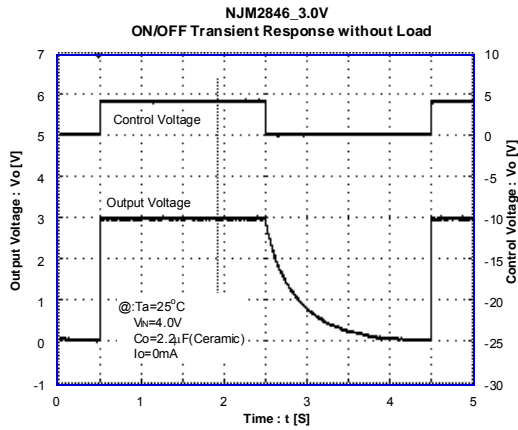


## ■ TYPICAL CHARACTERISTICS (NJM2846)



# NJM2845/46

## ■ TYPICAL CHARACTERISTICS (NJM2846)



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