

## LOW DROPOUT VOLTAGE REGULATOR WITH ON/OFF CONTROL

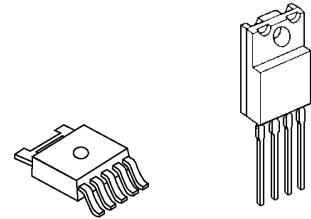
### ■ GENERAL DESCRIPTION

The NJM2386/88 is a general purpose low dropout voltage regulators with ON/OFF control.

The output current is up to 1.0A and dropout voltage is 0.2V typical at 500mA load.

It features high maximum input voltage of 35V for a wide application range including TV, home appliances and power modules.

### ■ PACKAGE OUTLINE



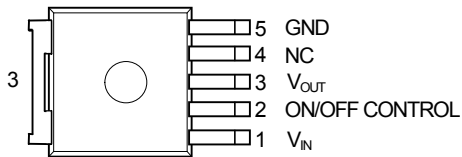
NJM2386DL3

NJM2388F

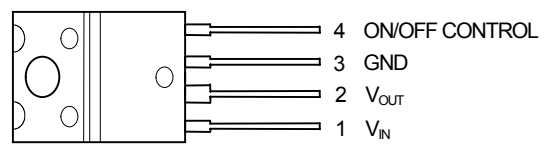
### ■ FEATURES

- High Maximum Input Voltage Up to 35V
- Low Dropout Voltage 0.2V typ. at  $I_o=0.5A$
- Output Current  $I_o(max.)=1.0A$
- ON/OFF Control (Active High)
- Internal Short Circuit Current Limit
- Internal Overvoltage Protection
- Internal Thermal Overload Protection
- Bipolar Technology
- Package Outline TO-252-5(NJM2386), TO-220F-4(NJM2388)

### ■ PIN CONFIGURATION

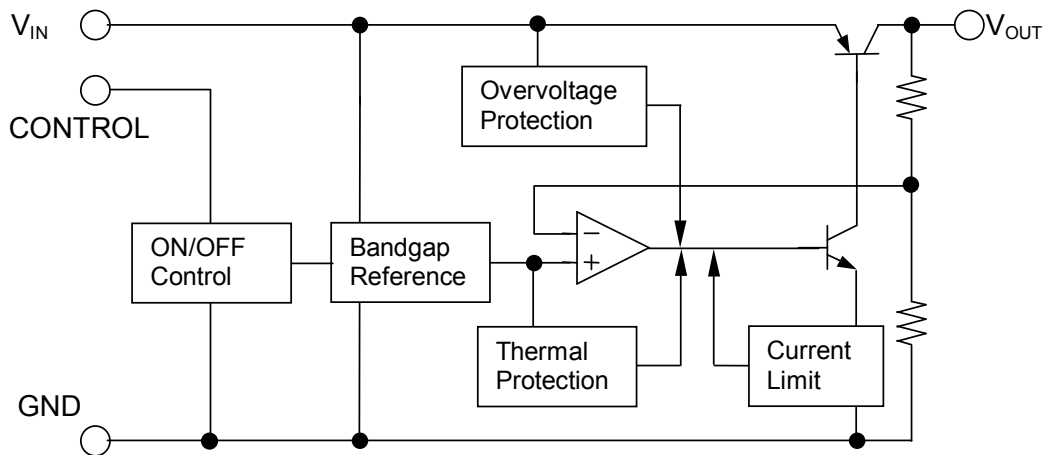


NJM2386DL3



NJM2388F

### ■ BLOCK DIAGRAM



# NJM2386/88

## ■ OUTPUT VOLTAGE RANK LIST

NJM2386DL3

NJM2388F

Device Name	V <sub>OUT</sub>	Device Name	V <sub>OUT</sub>
NJM2386DL3-33	3.3V	NJM2388F33	3.3V
NJM2386DL3-05	5.0V	NJM2388F05	5.0V
NJM2386DL3-63	6.3V	NJM2388F63	6.3V
NJM2386DL3-08	8.0V	NJM2388F08	8.0V
NJM2386DL3-09	9.0V	NJM2388F84	8.4V
NJM2386DL3-12	12.0V	NJM2388F09	9.0V
		NJM2388F10	10.0V
		NJM2388F12	12.0V

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS		UNIT
Input Voltage	V <sub>IN</sub>	+35		V
Control Voltage	V <sub>CONT</sub>	+35(*1)		V
Power Dissipation	P <sub>D</sub>	NJM2386	1190(*2) / 3125(*3)	mW
		NJM2388	18(Tc<50°C)	W
Operating Junction Temperature Range	T <sub>j</sub>	-40 ~ +150		°C
Operating Temperature Range	T <sub>opr</sub>	-40 ~ +85		°C
Storage Temperature Range	T <sub>stg</sub>	-50 ~ +150		°C

(\*1): When input voltage is less than +35V, the absolute maximum control voltage is equal to the input voltage.

(\*2): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard size, 2Layers, Cu area 100mm<sup>2</sup>)

(\*3): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 4Layers)

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

■ ELECTRICAL CHARACTERISTICS ( $V_{IN}=V_O+1V$ ,  $I_o=0.5A$ ,  $C_{IN}=0.33\mu F$ ,  $C_o=22\mu F$ ,  $T_a=25^\circ C$ )

Measurement is to be conducted is pulse testing.

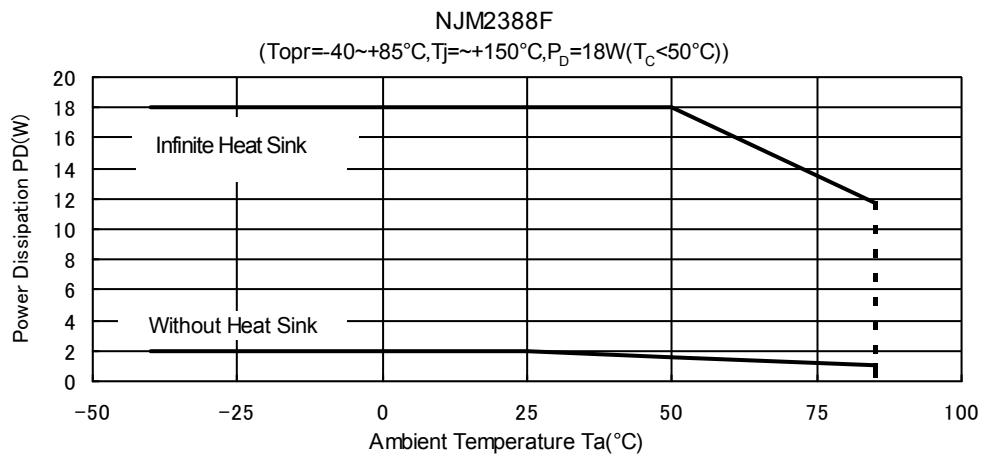
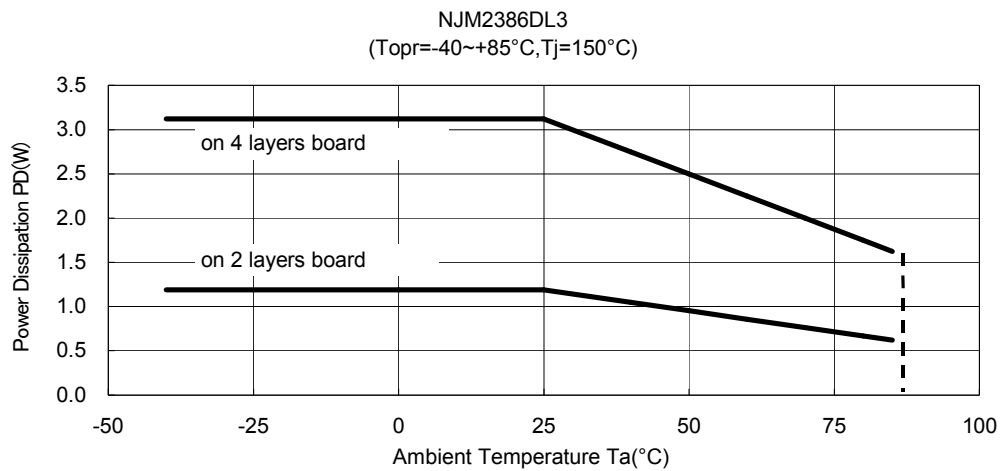
PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Output Voltage	$V_o$	$V_{IN}=V_O+1V$	-2%	-	+2%	V	
Line Regulation	$\Delta V_o/\Delta V_{IN}$	$V_{IN}=V_O+1V \sim V_O+17V$	-	0.04	0.16	%/V	
Load Regulation	$\Delta V_o/\Delta I_o$	$V_{IN}=V_O+2V, I_o=0A \sim 1.0A$	-	0.2	1.4	%/A	
Average Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$T_j=0 \sim +125^\circ C$	-	$\pm 0.02$	-	%/°C	
Quiescent Current	$I_Q$	$I_o=0A$	-	-	5	mA	
Quiescent Current at Control OFF(*4)	$I_{Q(OFF)}$	$V_{CONT}=0V$	-	-	500	$\mu A$	
Dropout Voltage	$\Delta V_{LO}$	$I_o=0.5A$	-	0.2	0.5	V	
Ripple Rejection	NJM238**33	RR	$V_{IN}=V_O+2V,$ $e_{in}=0.5V_{rms}, f=120Hz$	54	67	-	dB
	NJM238**05			54	67	-	
	NJM238**63			54	67	-	
	NJM238**08			52	65	-	
	NJM238**84			52	65	-	
	NJM238**09			52	65	-	
	NJM238**10			50	63	-	
	NJM238**12			50	63	-	
ON Control Voltage	$V_{CONT(ON)}$		2.0(*5)	-	-	V	
OFF Control Voltage	$V_{CONT(OFF)}$		-	-	0.4	V	
ON Control Current	$I_{CONT(ON)}$	$V_C=2.7V$	-	-	20	$\mu A$	
OFF Control Current	$I_{CONT(OFF)}$	$V_C=0.4V$	-	-	-20	$\mu A$	

(\*4) This electrical characteristics is applied to NJM2388.

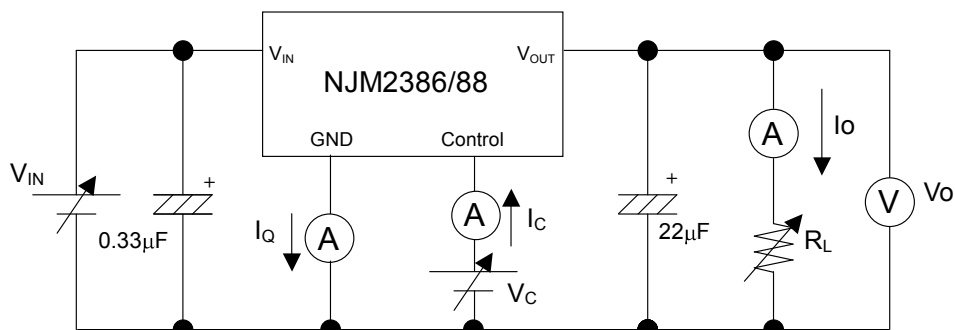
(\*5): When ON/OFF CONTROL Terminal is open, Output Voltage is ON.

# NJM2386/88

## POWER DISSIPATION vs. AMBIENT TEMPERATURE

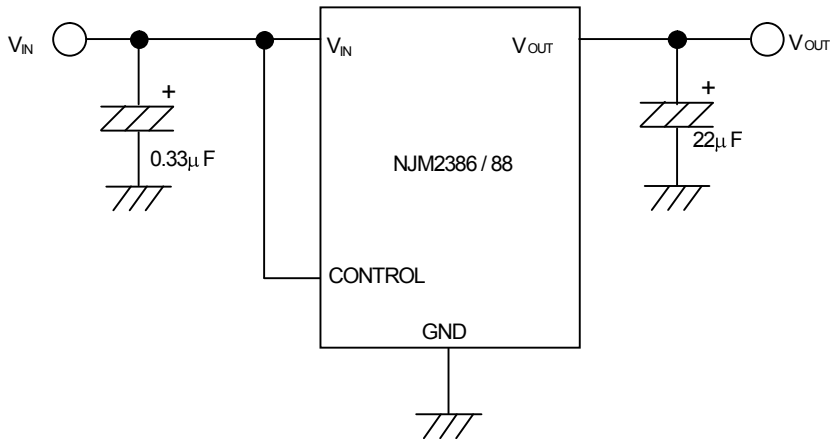


## TEST CIRCUIT



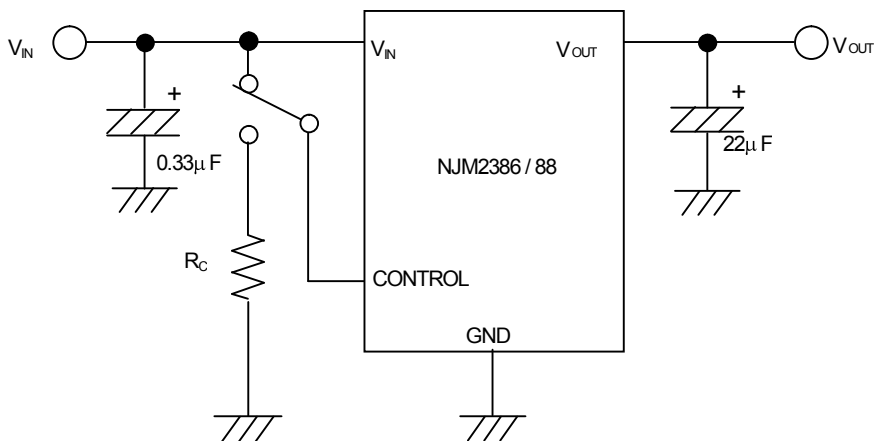
## ■ TYPICAL APPLICATION

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



Connect control pin to  $V_{IN}$  pin or open.

② In use of ON/OFF CONTROL:



State of control pin:

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

## \*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.

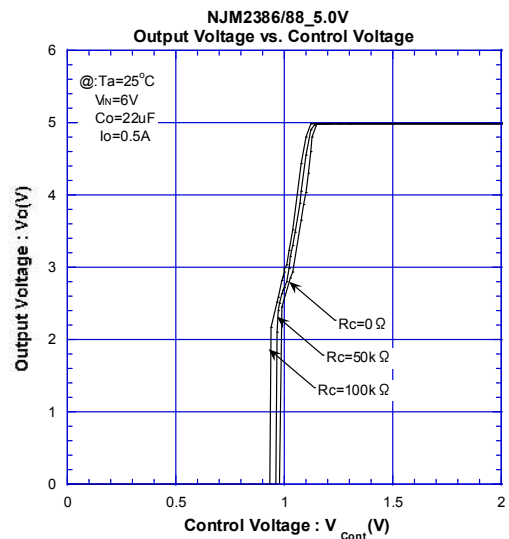
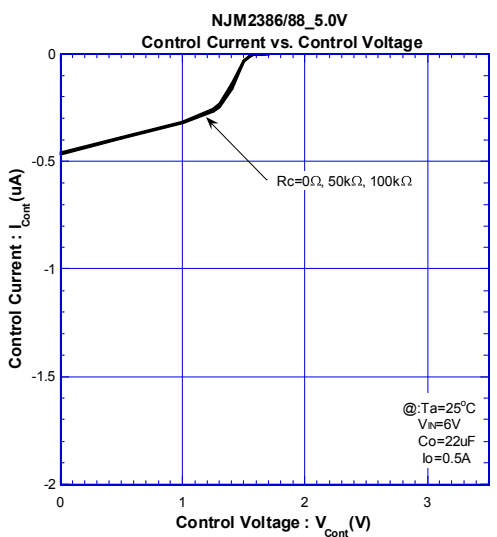
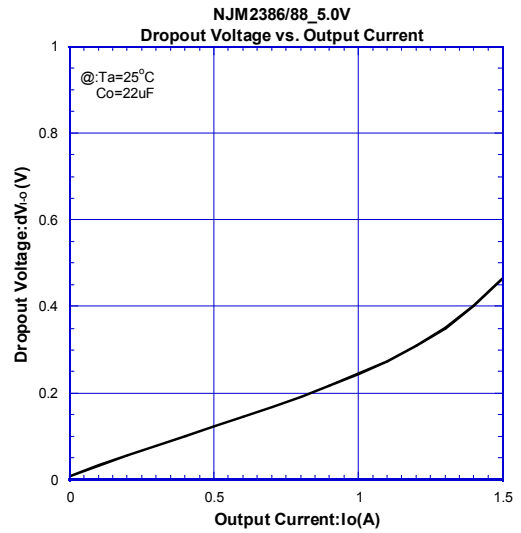
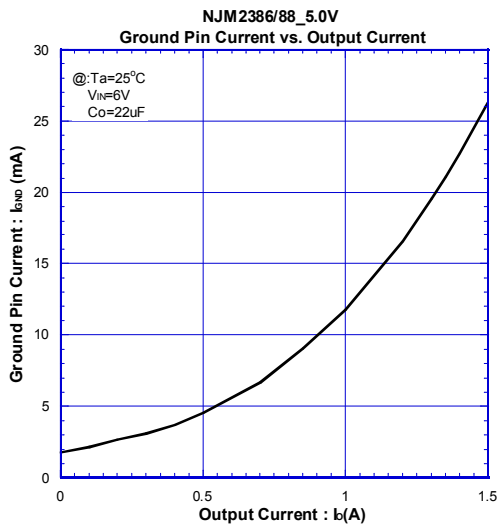
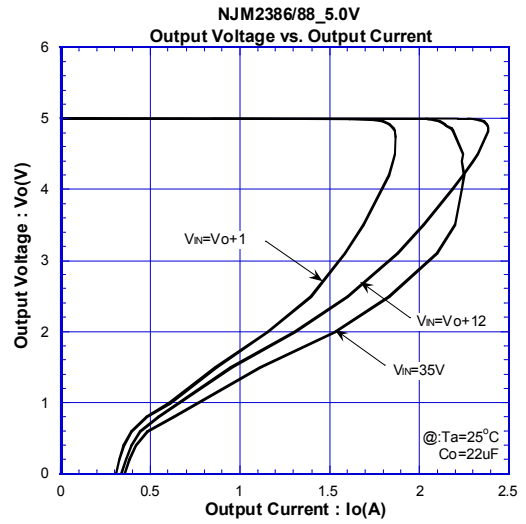
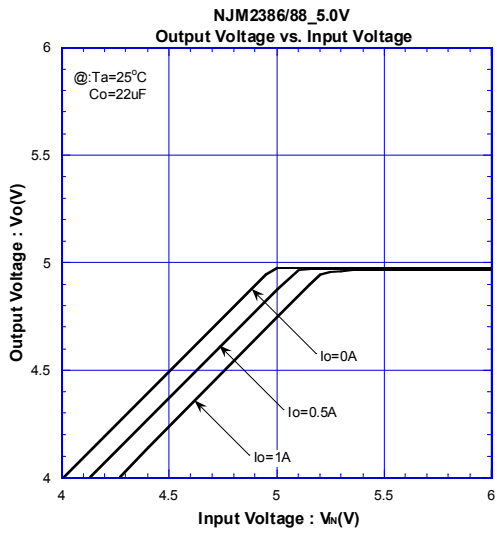
On the other hand, Use of a larger  $C_O$  reduces output noise and ripple output, and also improves output transient response when rapid load change.

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.

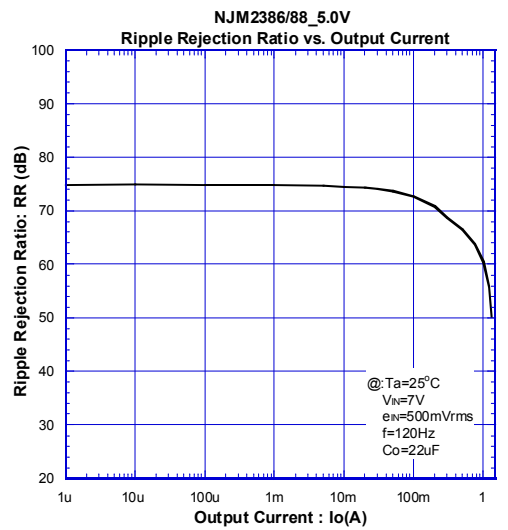
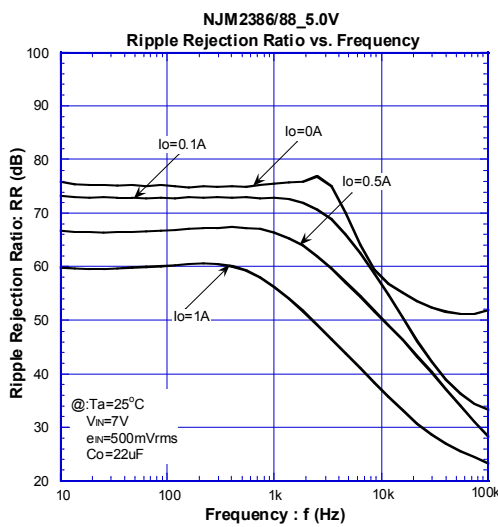
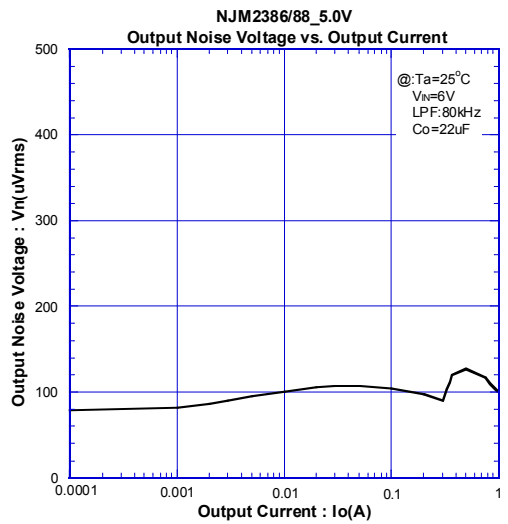
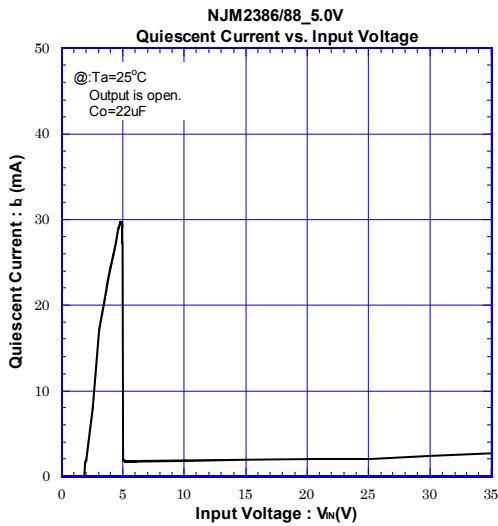
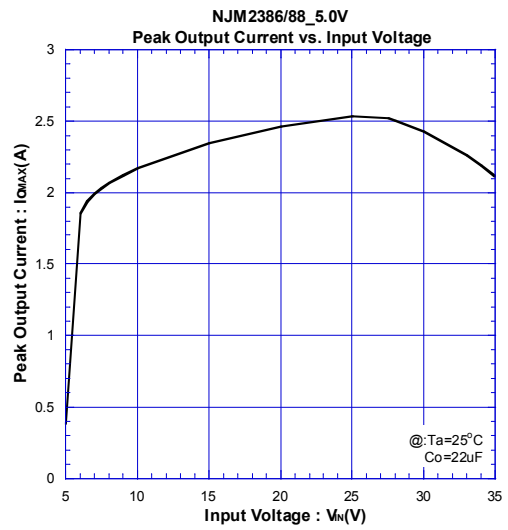
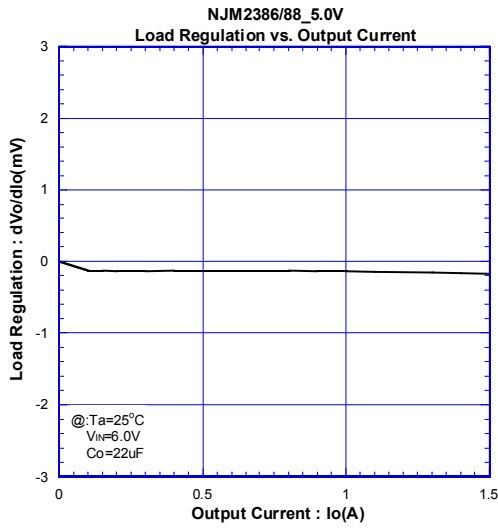
In addition, Please choose an appropriate capacitor in considering varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, and so on) when selecting  $C_O$ .

## ■ TYPICAL CHARACTERISTICS



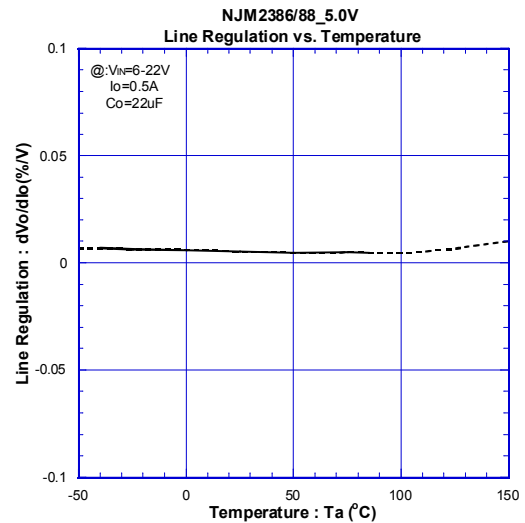
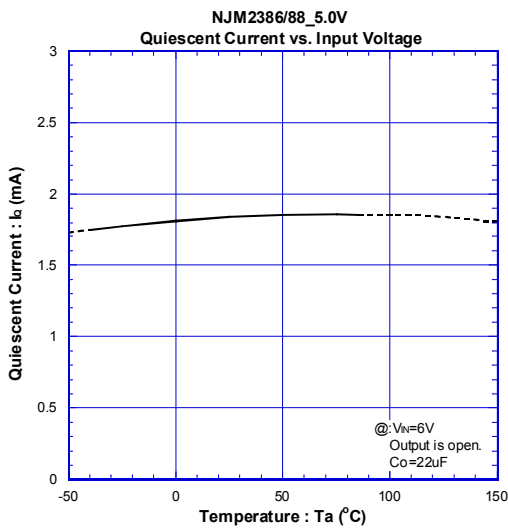
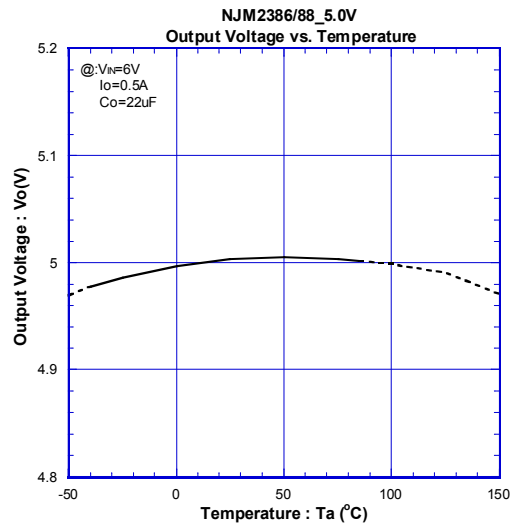
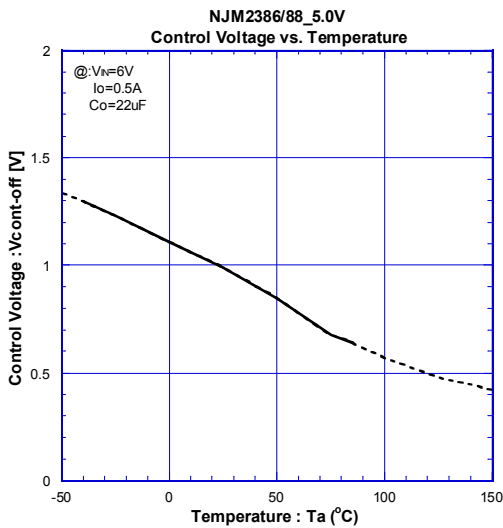
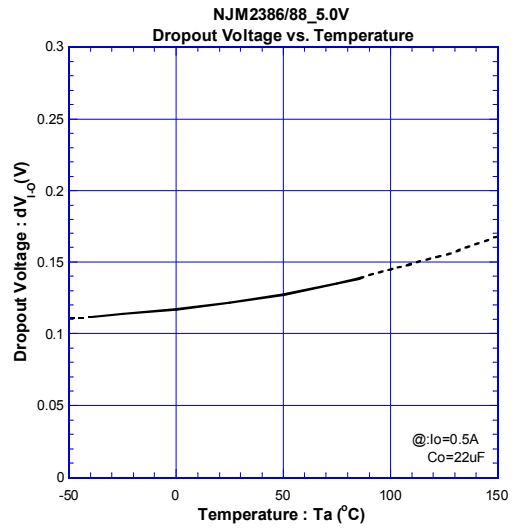
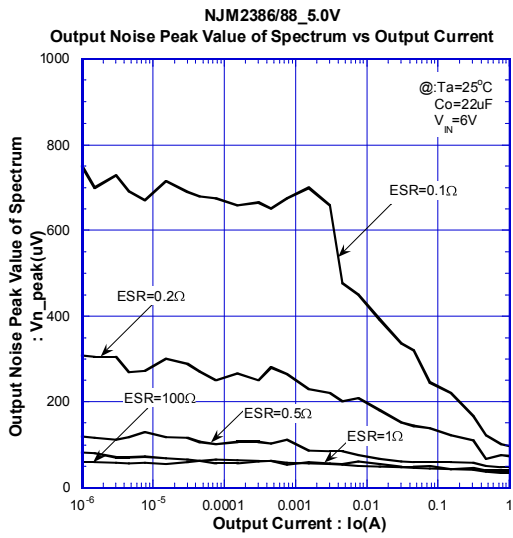
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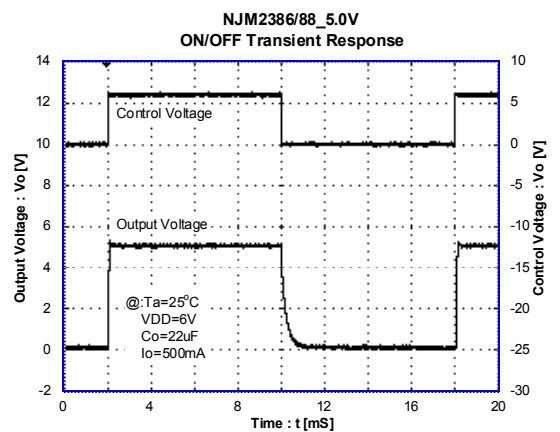
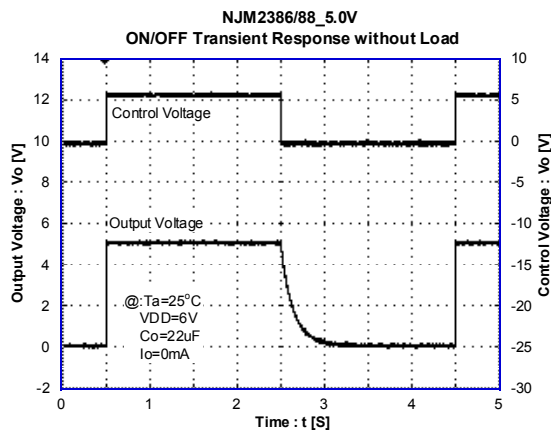
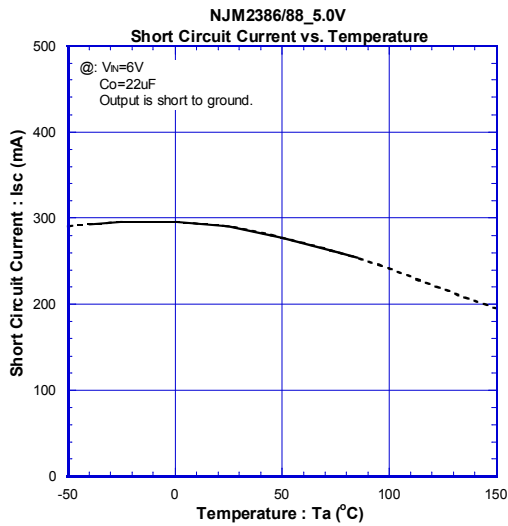
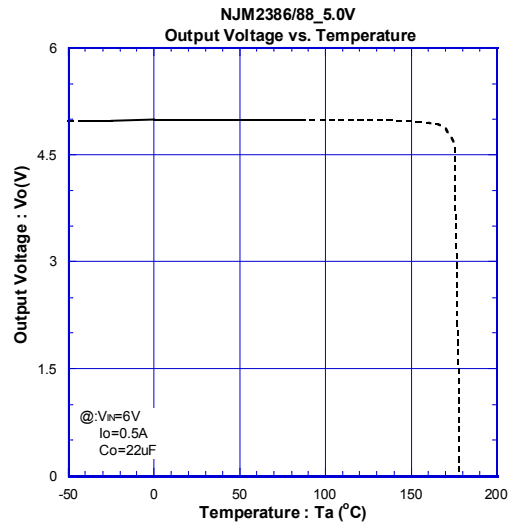
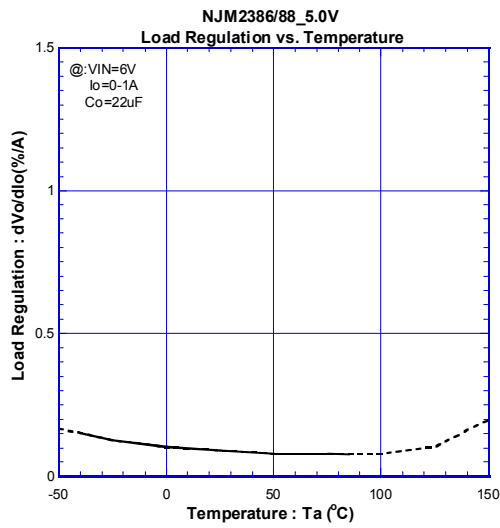


## TYPICAL CHARACTERISTICS

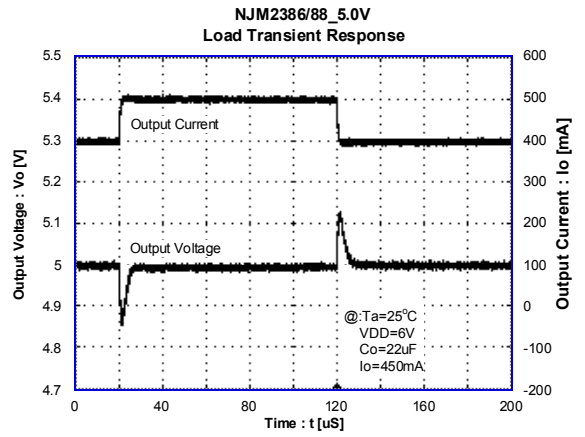
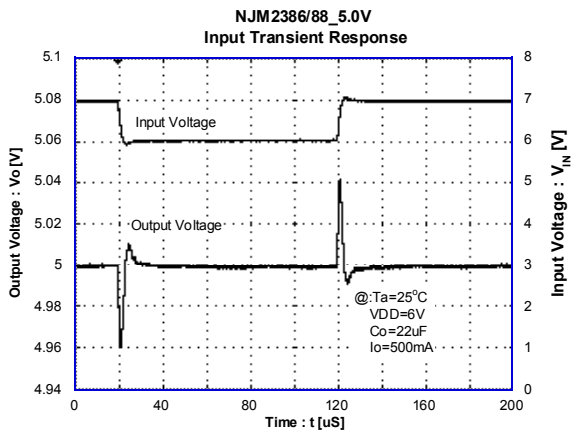


# NJM2386/88

## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS



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