LOW DROPOUT VOLTAGE REGULATOR WITH ON/OFF CONTROL

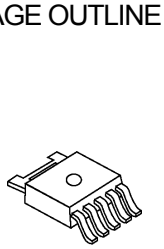
■ GENERAL DESCRIPTION

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

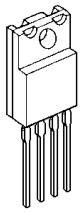
The output current is up to 1.0A and dropout voltage is 0.2V typical at 500mA load.

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

■ PACKAGE OUTLINE



NJM2386DL3

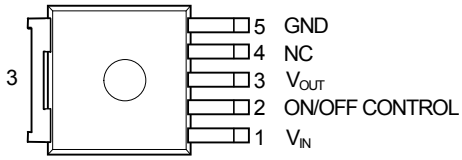


NJM2388F

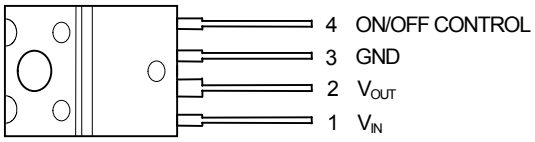
■ FEATURES

- High Maximum Input Voltage Up to 35V
- Low Dropout Voltage 0.2V typ. at Io=0.5A
- Output Current Io(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

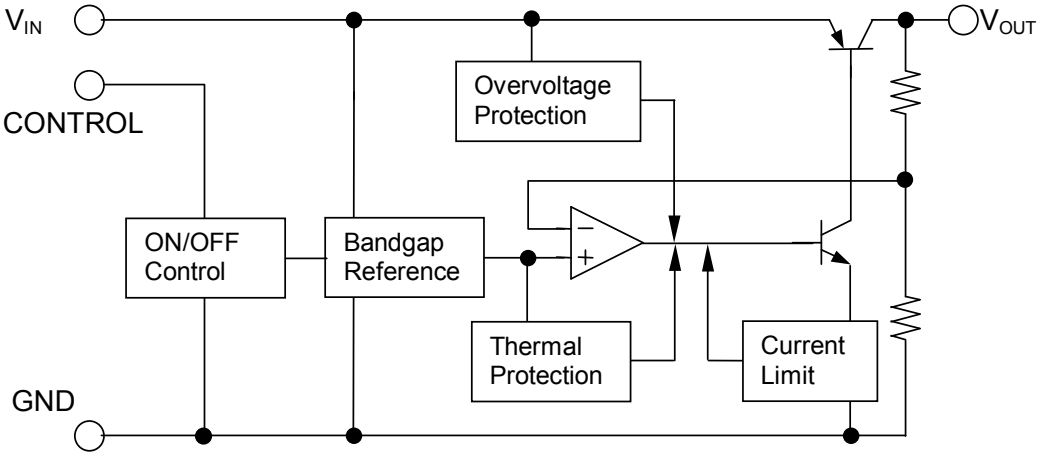


NJM2386DL3



NJM2388F

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

NJM2386DL3 NJM2388F

Device Name	V_{OUT}	Device Name	V_{OUT}
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_{IN}	+35		V
Control Voltage	V_{CONT}	+35(*1)		V
Power Dissipation	P_D	NJM2386	1190(*2) / 3125(*3)	mW
		NJM2388	18(Tc<50°C)	W
Operating Junction Temperature Range	Tj	-40 ~ +150		°C
Operating Temperature Range	Topr	-40 ~ +85		°C
Storage Temperature Range	Tstg	-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^2)

(*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, Io=0.5A, C_{IN}=0.33μF, Co=22μF, Ta=25°C)

Measurement is to be conducted is pulse testing.

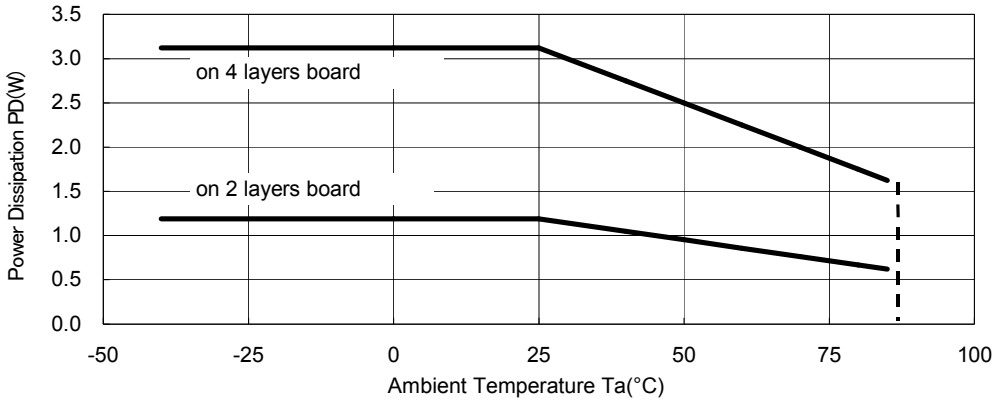
PARAMETER		SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage		Vo	V_{IN}=V_O+1V	-2%	-	+2%	V
Line Regulation		ΔVo/ΔV_{IN}	V_{IN}=V_O+1V ~ V_O+17V	-	0.04	0.16	%/V
Load Regulation		ΔVo/ΔIo	V_{IN}=V_O+2V,Io=0A ~1.0A	-	0.2	1.4	%/A
Average Temperature Coefficient of Output Voltage		ΔVo/ΔT	Tj=0 ~ +125°C	-	± 0.02	-	%/°C
Quiescent Current		I_Q	Io=0A	-	-	5	mA
Quiescent Current at Control OFF(*4)		$I_{Q(OFF)}$	V_{CONT}=0V	-	-	500	μA
Dropout Voltage		ΔV$_{I-O}$	Io=0.5A	-	0.2	0.5	V
Ripple Rejection	NJM238**33	RR	V_{IN}=V_O+2V, ein=0.5Vrms,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	μA
OFF Control Current		$I_{CONT(OFF)}$	V_C=0.4V	-	-	-20	μA

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

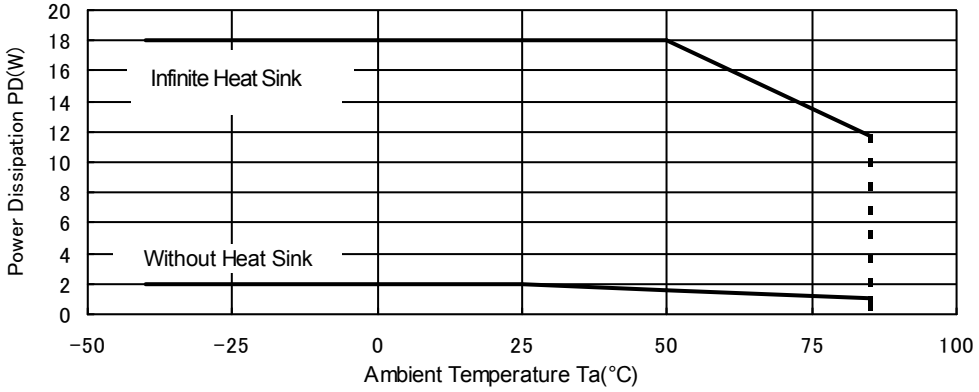
(*5): When ON/OFF CONTROL Terminal is open, Output Voltage is ON.

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

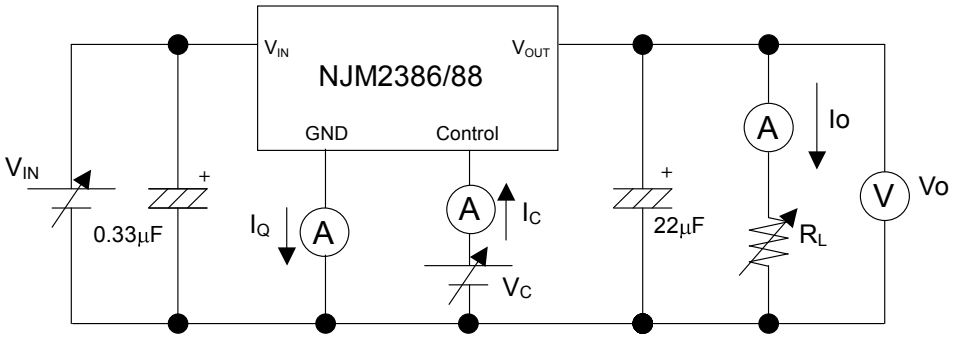
NJM2386DL3
(Topr=-40~+85°C,Tj=150°C)



NJM2388F
(Topr=-40~+85°C,Tj=~+150°C,P_D=18W(T_C<50°C))

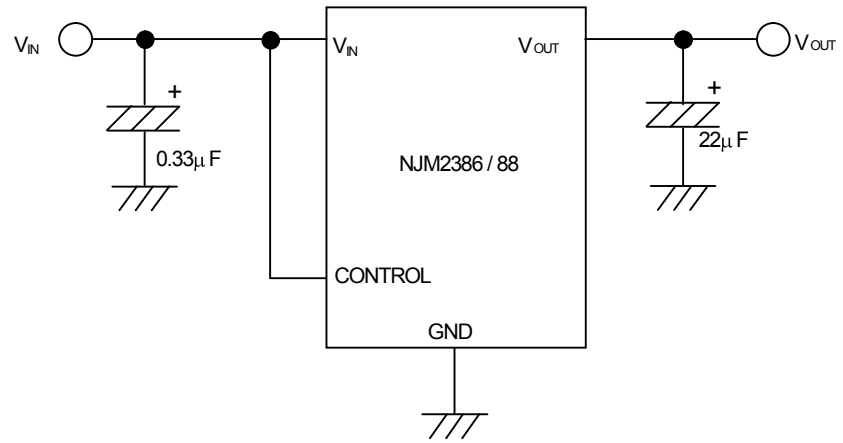


■ TEST CIRCUIT



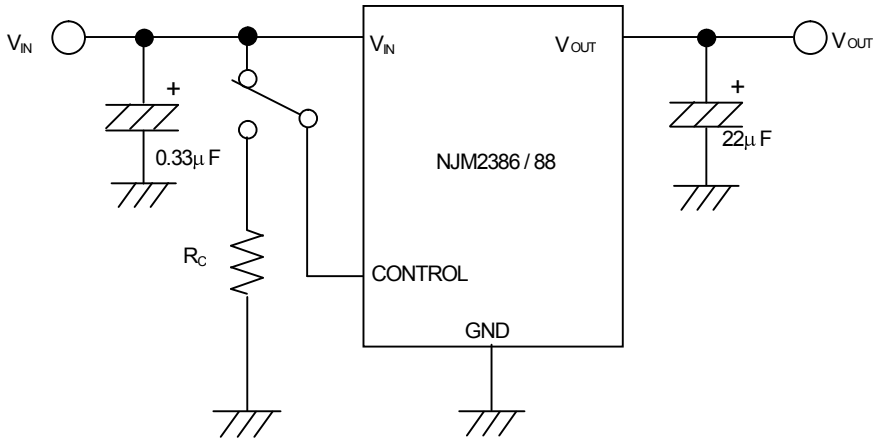
■ TYPICAL APPLICATION

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.

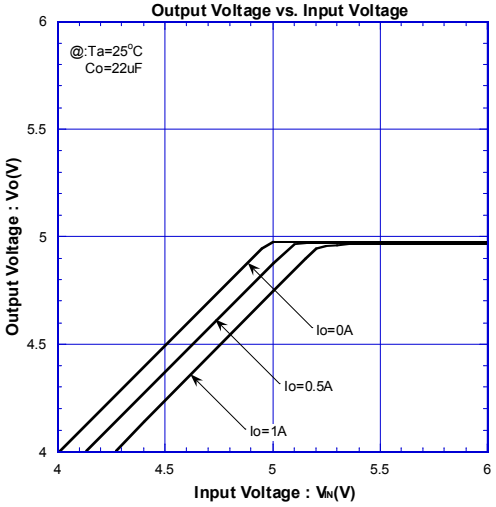
Therefore, use the recommended C_O value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and V_{OUT} as shortest path as possible for stable operation

The recommended capacitance depends on the output voltage rank. Especially, low voltage regulator requires larger C_O value.

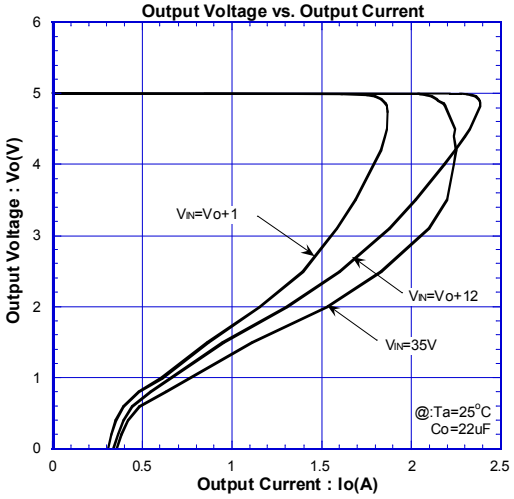
In addition, Please choose an appropriate capacitor in considering varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, and so on) when selecting C_O.

■ TYPICAL CHARACTERISTICS

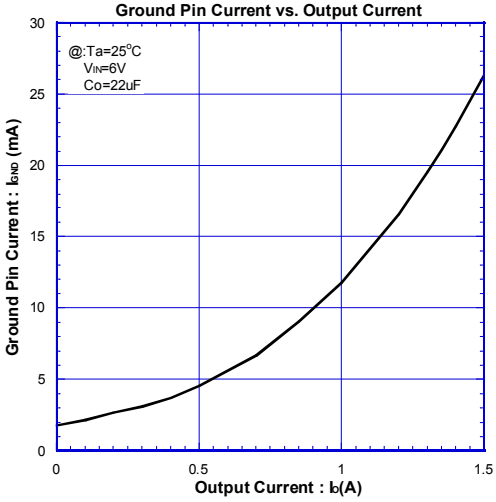
NJM2386/88_5.0V
Output Voltage vs. Input Voltage



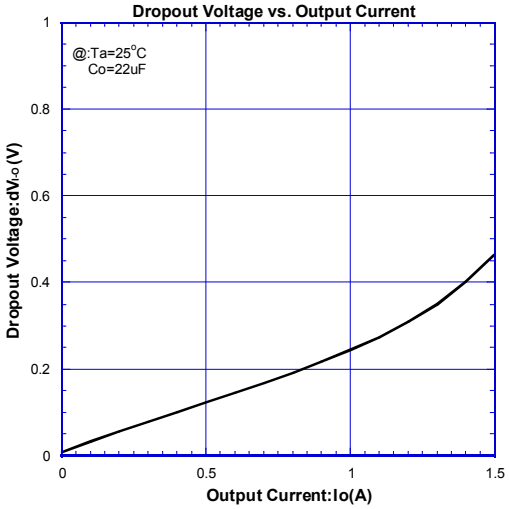
NJM2386/88_5.0V
Output Voltage vs. Output Current



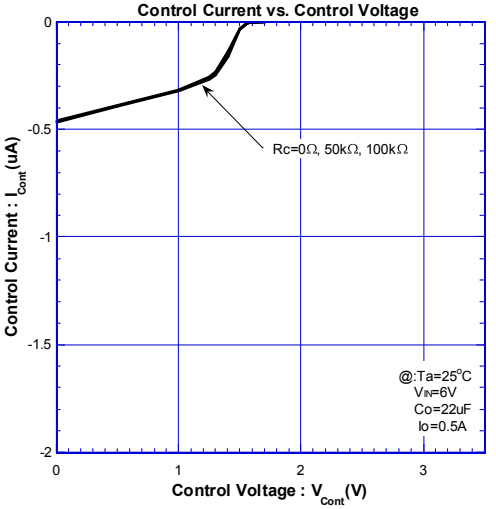
NJM2386/88_5.0V
Ground Pin Current vs. Output Current



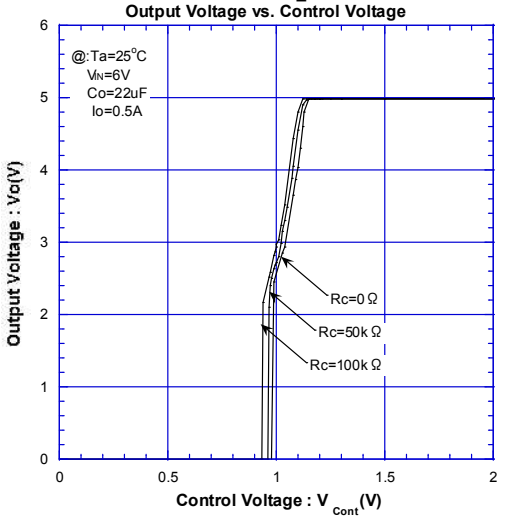
NJM2386/88_5.0V
Dropout Voltage vs. Output Current



NJM2386/88_5.0V
Control Current vs. Control Voltage

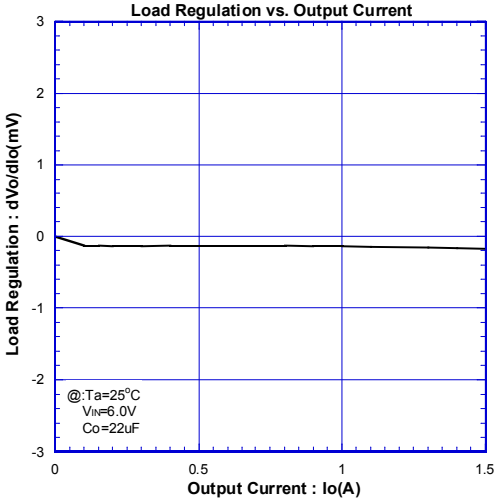


NJM2386/88_5.0V
Output Voltage vs. Control Voltage

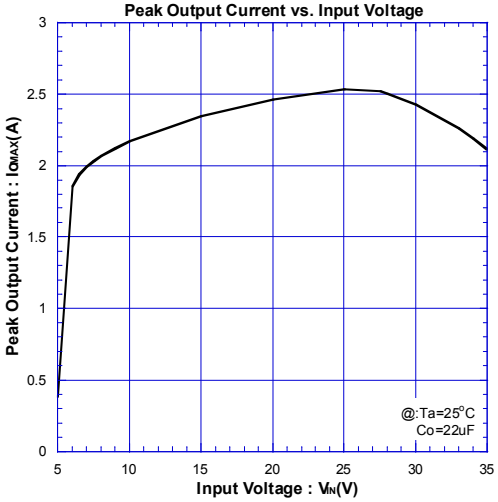


■ TYPICAL CHARACTERISTICS

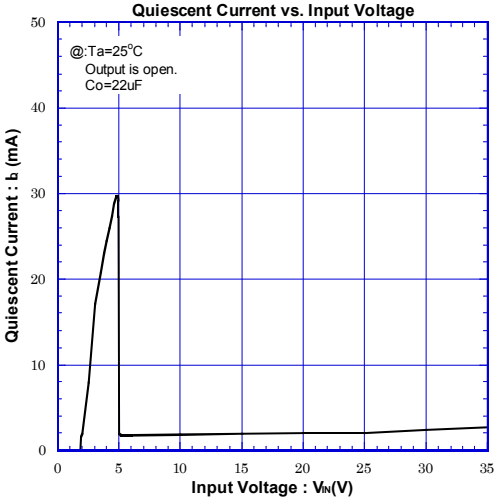
NJM2386/88_5.0V
Load Regulation vs. Output Current



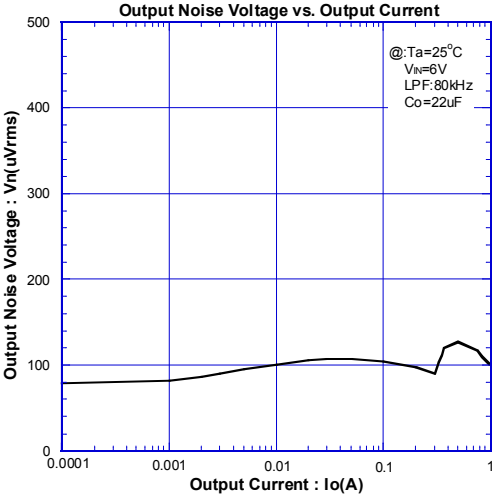
NJM2386/88_5.0V
Peak Output Current vs. Input Voltage



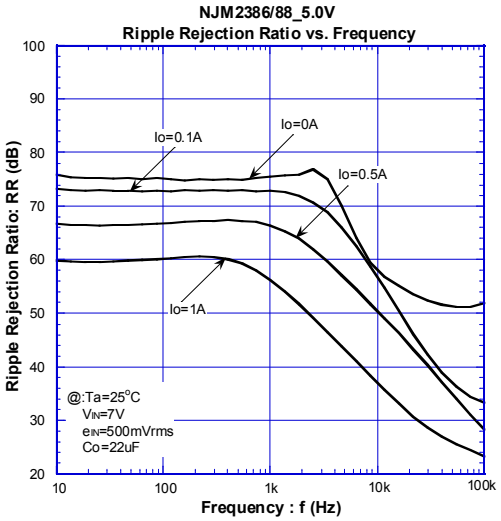
NJM2386/88_5.0V
Quiescent Current vs. Input Voltage



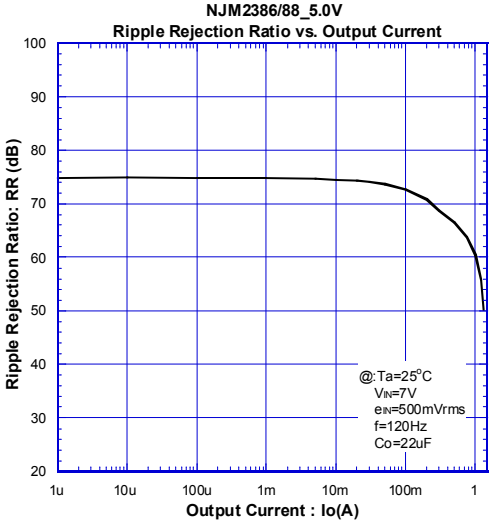
NJM2386/88_5.0V
Output Noise Voltage vs. Output Current



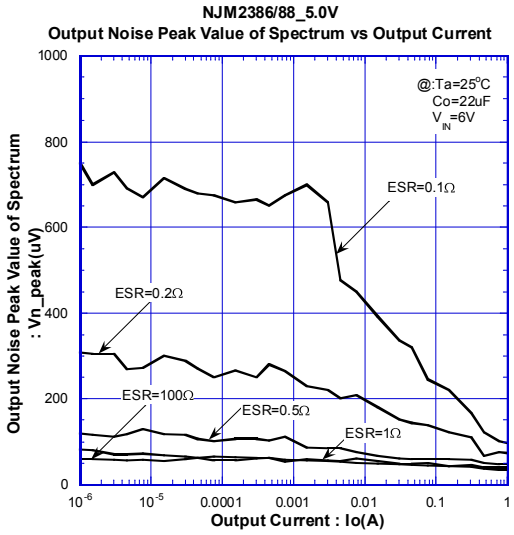
NJM2386/88_5.0V
Ripple Rejection Ratio vs. Frequency

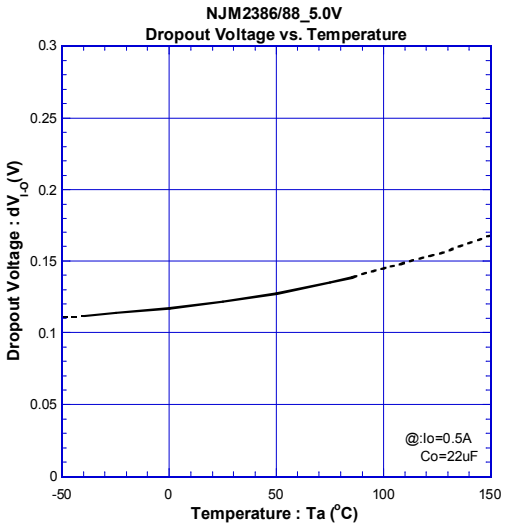


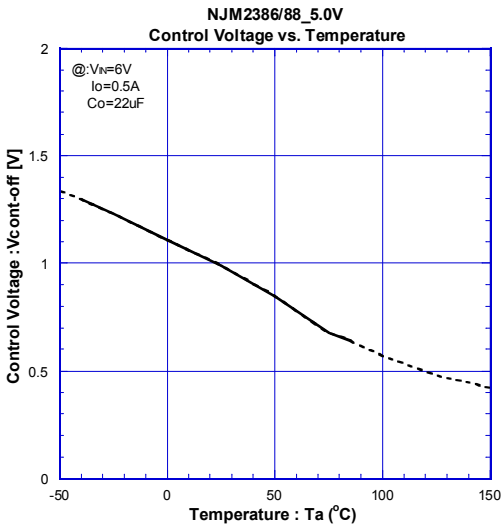
NJM2386/88_5.0V
Ripple Rejection Ratio vs. Output Current

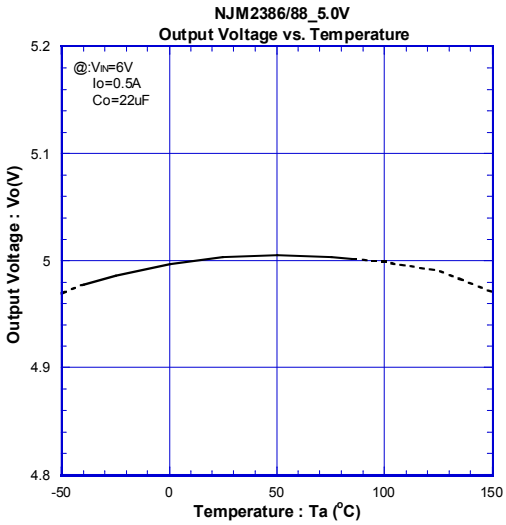


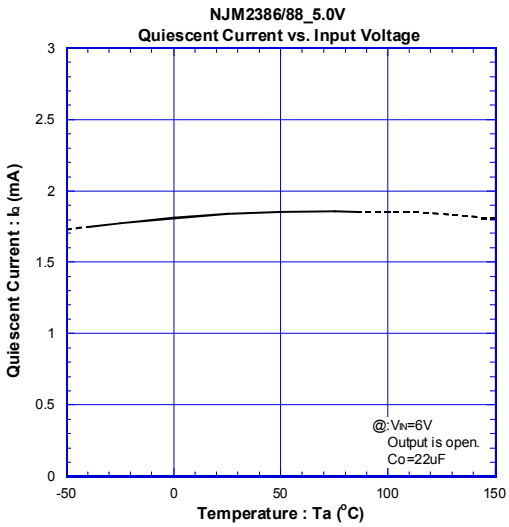
■ TYPICAL CHARACTERISTICS

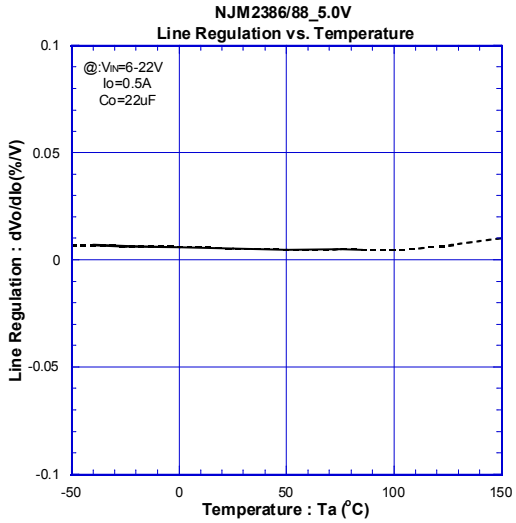




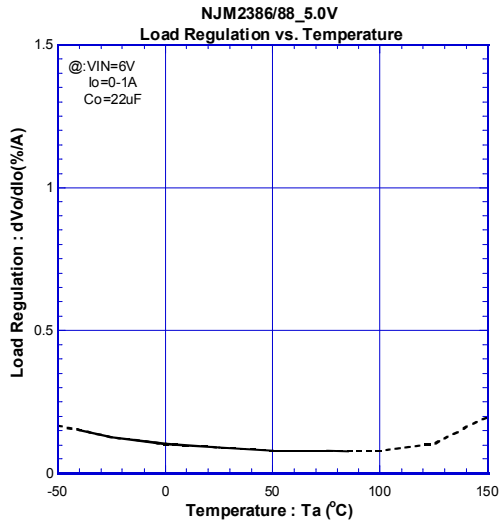


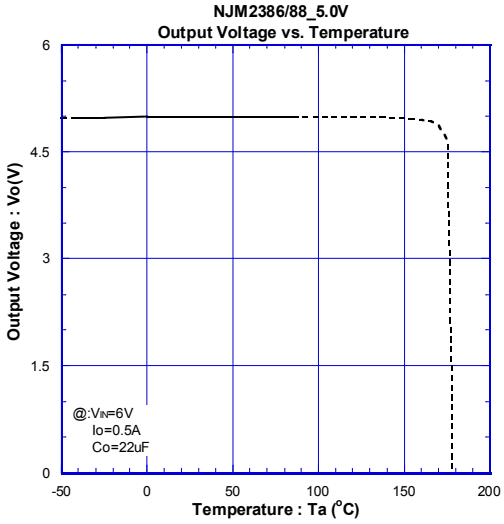


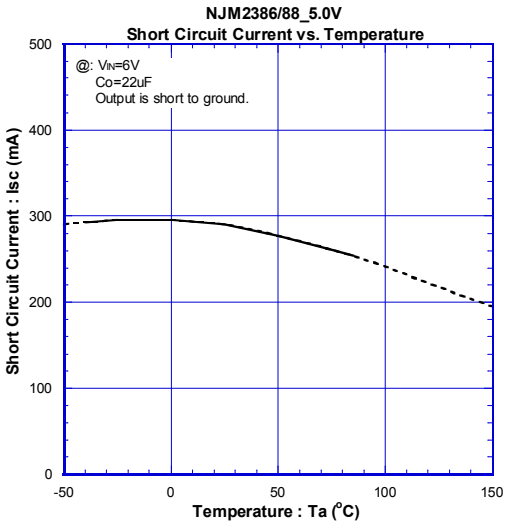


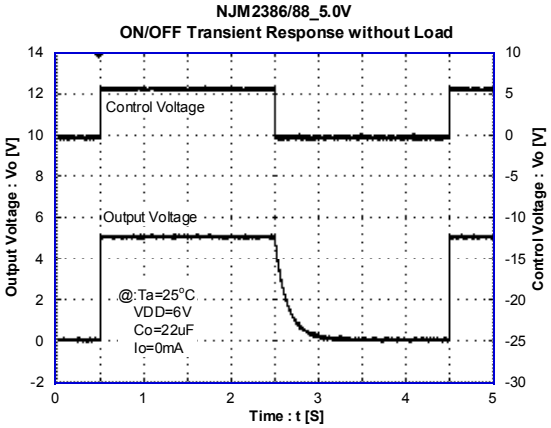


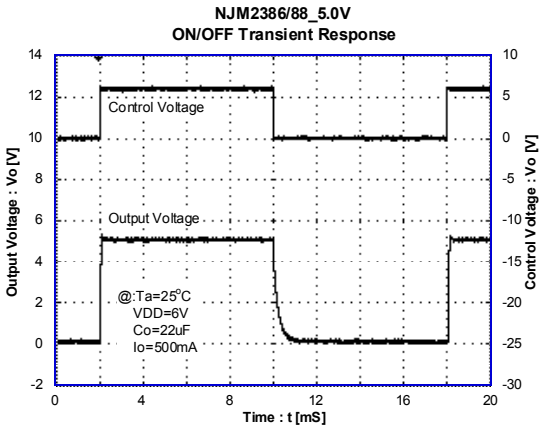
■ TYPICAL CHARACTERISTICS











■ TYPICAL CHARACTERISTICS