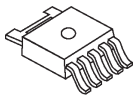
LOW DROPOUT VOLTAGE REGULATOR WITH ON/OFF CONTROL

■ GENERAL DESCRIPTION

The NJM2386A is a general purpose low dropout voltage regulators with ON/OFF control.
The output current is up to 1.0A and dropout voltage is up 0.2V typical at 500mA load.
It features high maximum input voltage of 30V for a wide application range including TV, home appliance and power modules.
Compared with the NJM2386, Off control quiescent current is significantly reduces for current sensitive applications.

■ PACKAGE OUTLINE

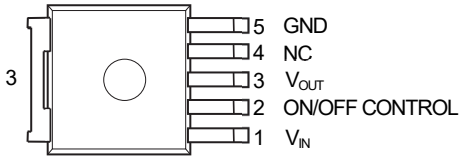


NJM2386ADL3

■ FEATURES

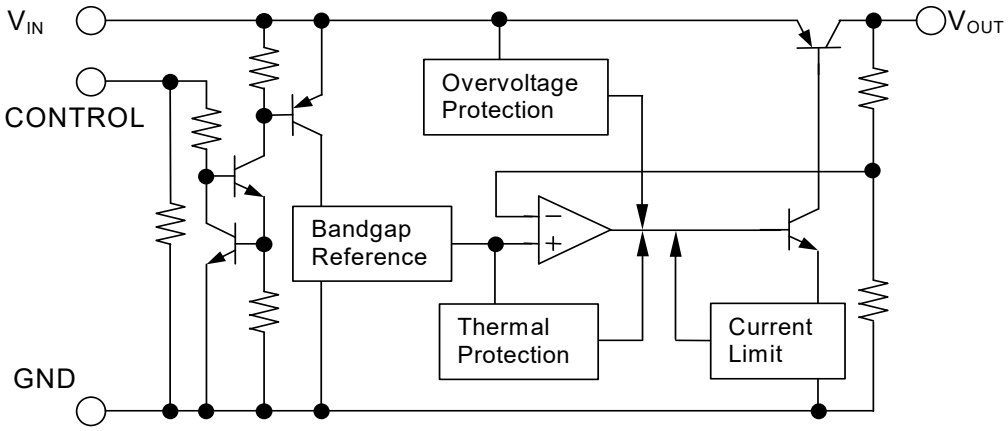
- ●High Maximum Input Voltage Up to 30V
- ● Low Dropout Voltage — 0.2V typ. at Io=0.5A
- ● Output Current — Io(max.)=1.0A
- ● ON/OFF Control
- ● OFF Control Quiescent Current — 1μA max.
- ● Internal Short Circuit Current Limit
- ● Internal Overvoltage Protection
- ● Internal Thermal Overload Protection
- ● Bipolar Technology
- ● Package Outline — TO-252-5

■ PIN CONFIGURATION



NJM2386ADL3

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}	Device Name	V_{OUT}
NJM2386ADL3-33	3.3V	NJM2386ADL3-10	10.0V
NJM2386ADL3-05	5.0V	NJM2386ADL3-12	12.0V
NJM2386ADL3-06	6.0V		
NJM2386ADL3-08	8.0V		
NJM2386ADL3-09	9.0V		

■ 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	1190(*2)	mW
		3125(*3)	
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, Tj=25°C)

Measurement is conducted by pulse testing.

PARAMETER		SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage		V_{IN}		-	-	30	V
Output Voltage		Vo		-2%	-	+2%	V
Line Regulation		$\Delta Vo/\Delta V_{IN}$	V_{IN}=V_O+1V ~ V_O+17V	-	0.04	0.16	%/V
Load Regulation		$\Delta Vo/\Delta Io$	V_{IN}=V_O+2V,Io=0A ~1.0A	-	0.2	1.4	%/A
Average Temperature Coefficient of Output Voltage		$\Delta Vo/\Delta T$	Tj=0 ~ +125°C	-	±0.02	-	%/°C
Quiescent Current		I_Q	Io=0A, V_{CONT}=2.7V Except I_{CONT}	-	-	5	mA
OFF Control Quiescent Current		$I_{Q(OFF)}$	V_{CONT}=0V	-	-	1	µA
Dropout Voltage		ΔV_{I-O}	Io=0.5A	-	0.2	0.5	V
Ripple Rejection	NJM2386ADL3-33	RR	V_{IN}=V_O+2V, ein=0.5Vrms,f=120Hz	54	67	-	dB
	NJM2386ADL3-05			54	67	-	
	NJM2386ADL3-06			54	67	-	
	NJM2386ADL3-08			52	65	-	
	NJM2386ADL3-09			52	65	-	
	NJM2386ADL3-10			50	63	-	
	NJM2386ADL3-12			50	63	-	
ON Control Voltage		$V_{CONT(ON)}$		2.0(*4)			
OFF Control Voltage		$V_{CONT(OFF)}$		-	-	0.4	V
ON Control Current		$I_{CONT(ON)}$	V_C=2.7V	10	30	50	µA
OFF Control Current		$I_{CONT(OFF)}$	V_C=0.4V	1	3	5	µA

(*4): When ON/OFF CONTROL pin is open, Output Voltage is OFF.

■ THERMAL CHARACTERISTICS

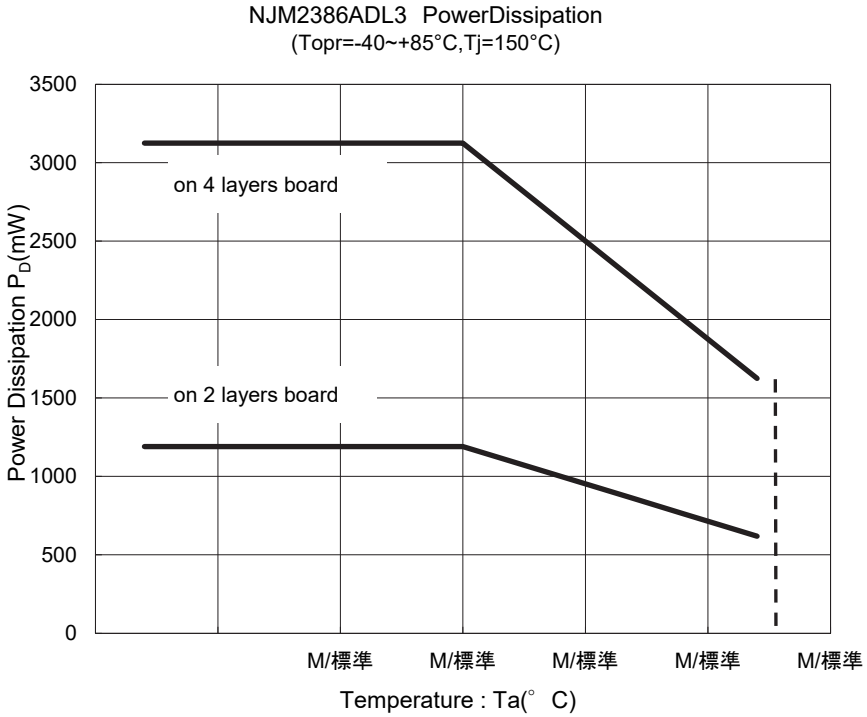
PARAMETER	SYMBOL	VALUE	UNIT
Junction-to-Ambient thermal resistance	θja	105 (*5) 40 (*6)	°C/W
Junction-to-Top of package characterization parameter	ψjt	17 (*5) 12 (*6)	°C/W

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

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

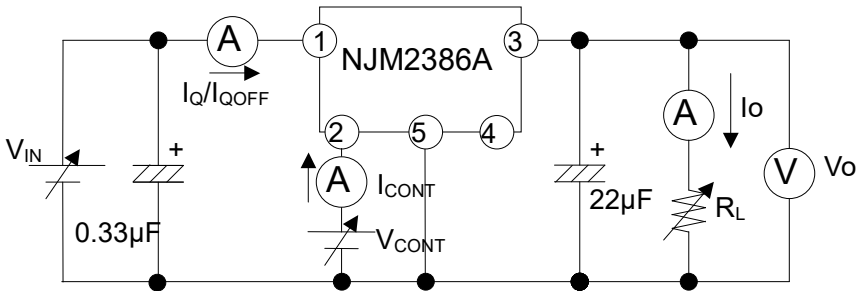
(For 4Layers: Applying 74.2 × 74.2mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

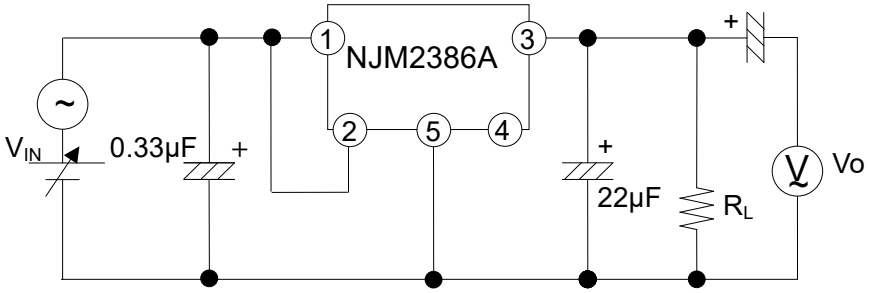


■ TEST CIRCUIT

● Standard Test Circuit

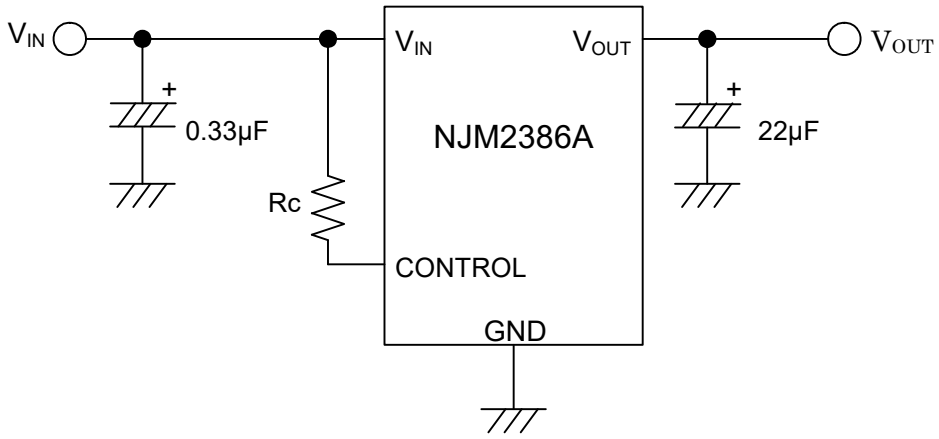


● Ripple Rejection Test Circuit



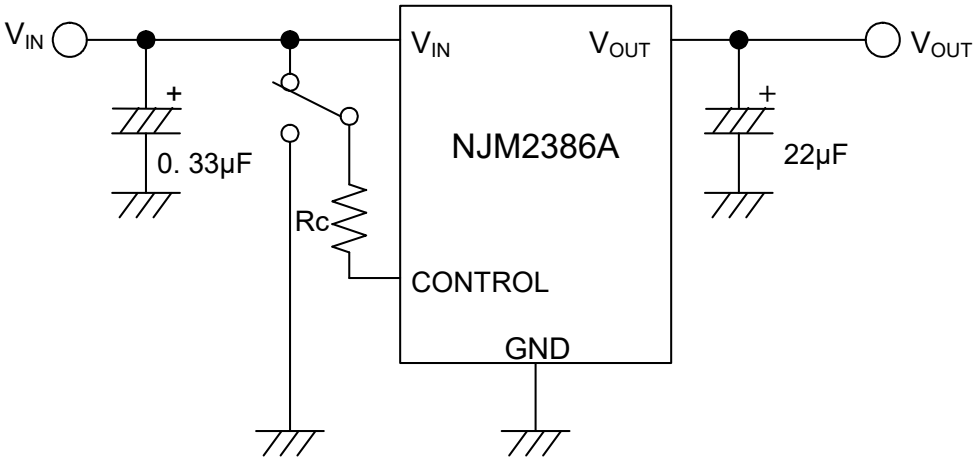
■ TYPICAL APPLICATION

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



Connect control pin to V_{IN} pin.

② In use of ON/OFF CONTROL:



State of control pin:

- "H" → output is enabled.
- "L" or "open" → output is disabled.

*In the case of using a resistance "Rc" 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 pin should set to consider voltage drop through the resistor "Rc" 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 "Rc" 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.

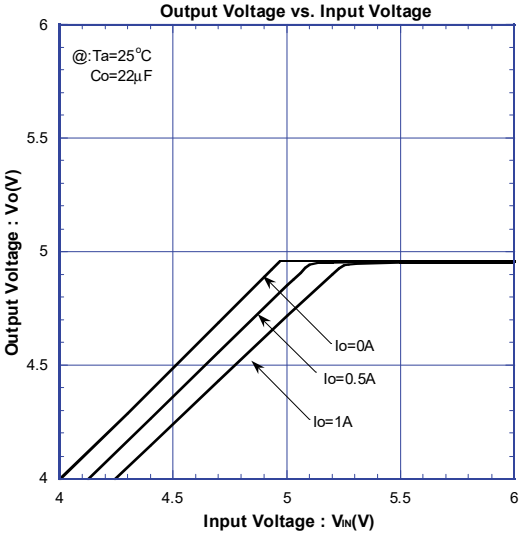
On the other hand, Use of a larger C_O reduces output noise and ripple output, and also improves output transient response when rapid load change.

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

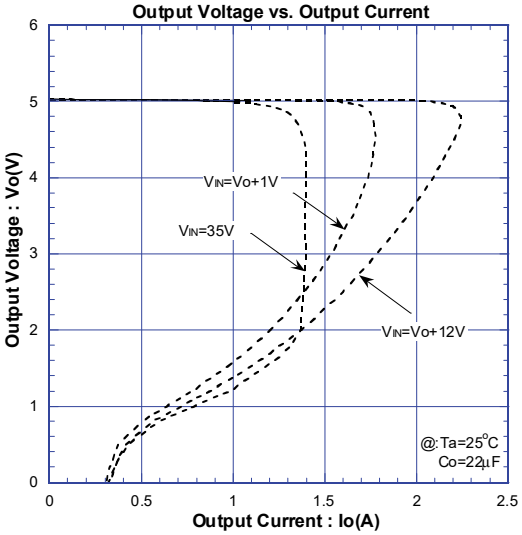
In addition, Please choose an appropriate capacitor in considering varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, and so on) when selecting C_O.

■ TYPICALCHARACTERISTICS

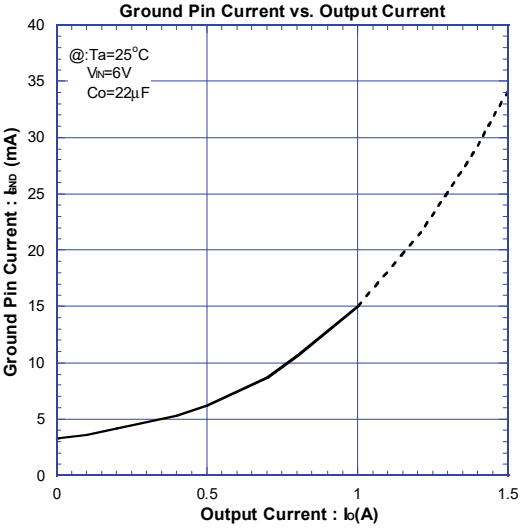
NJM2386A_5.0V
Output Voltage vs. Input Voltage



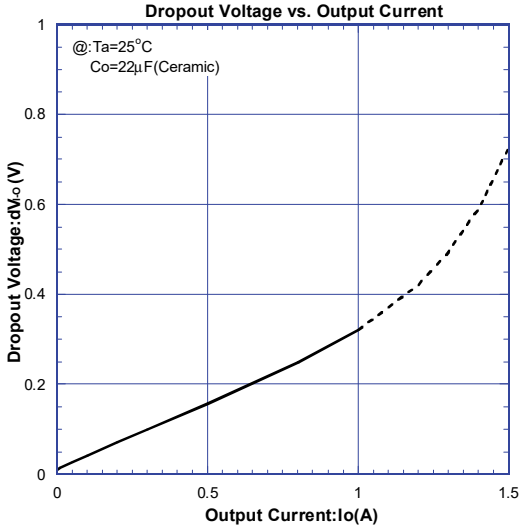
NJM2386A_5.0V
Output Voltage vs. Output Current



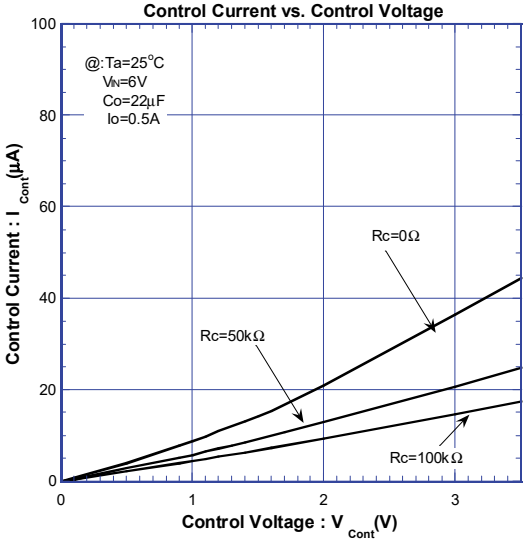
NJM2386A_5.0
Ground Pin Current vs. Output Current



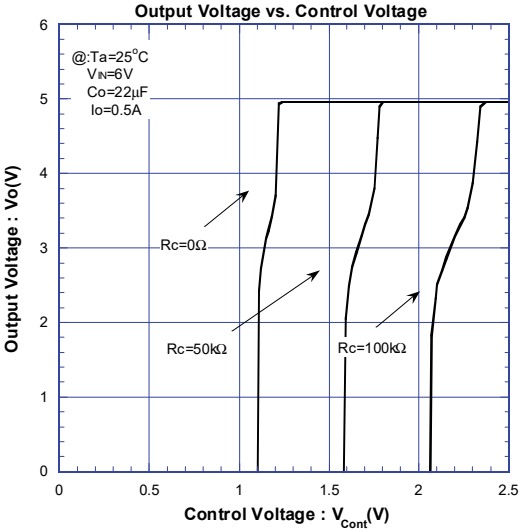
NJM2386A_5.0V
Dropout Voltage vs. Output Current



NJM2386A_5.0V
Control Current vs. Control Voltage

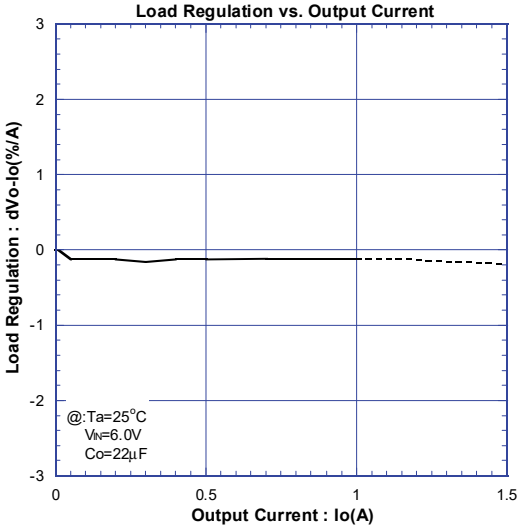


NJM2386A_5.0V
Output Voltage vs. Control Voltage

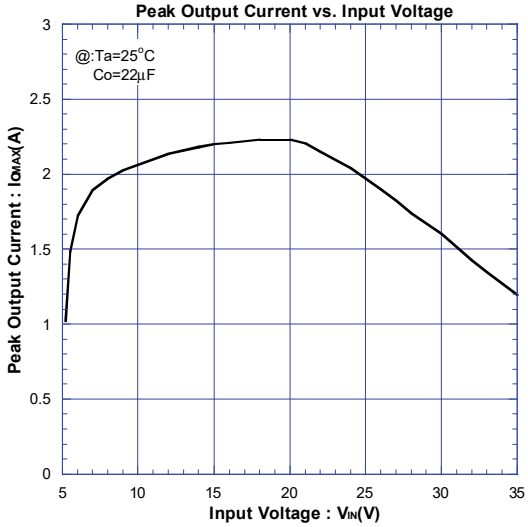


■ TYPICALCHARACTERISTICS

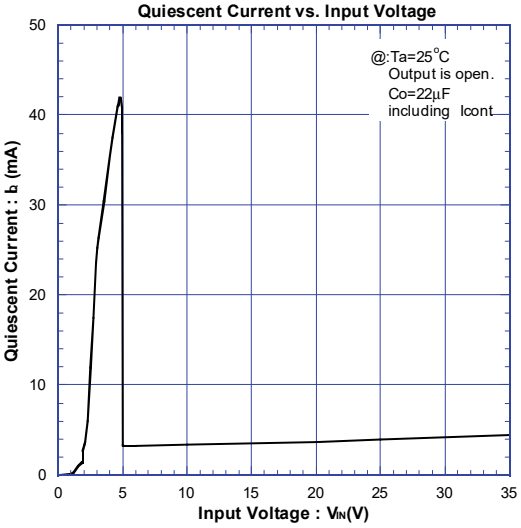
NJM2386A_5.0V
Load Regulation vs. Output Current



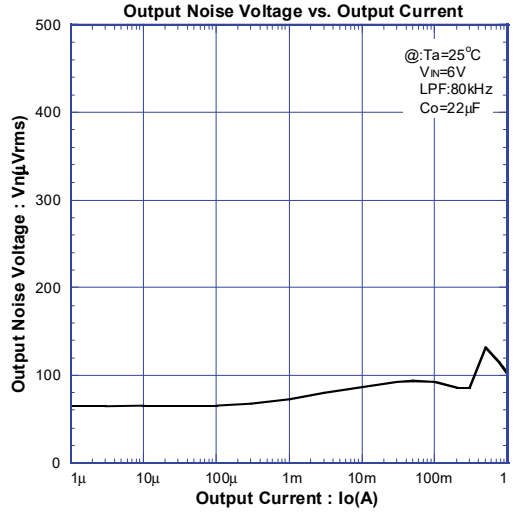
NJM2386A_5.0V
Peak Output Current vs. Input Voltage



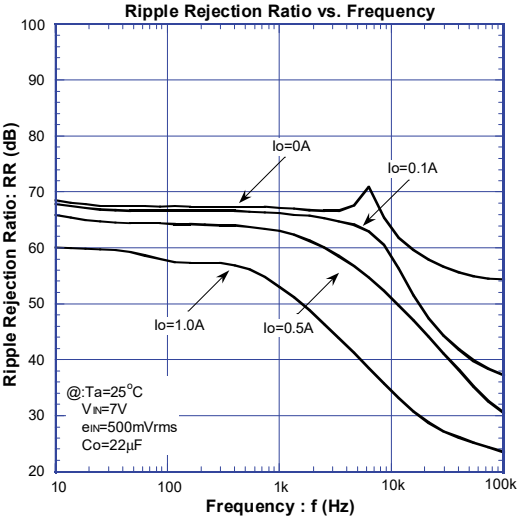
NJM2386A_5.0V
Quiescent Current vs. Input Voltage



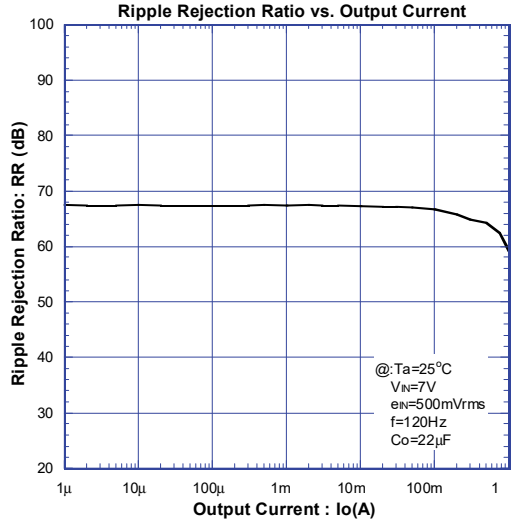
NJM2386A_5.0V
Output Noise Voltage vs. Output Current



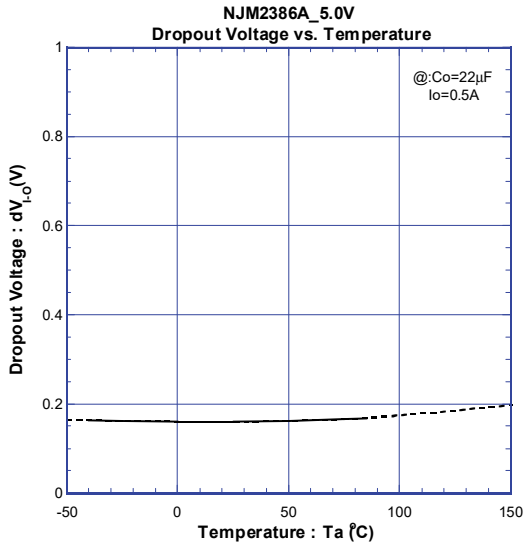
NJM2386A_5.0V
Ripple Rejection Ratio vs. Frequency

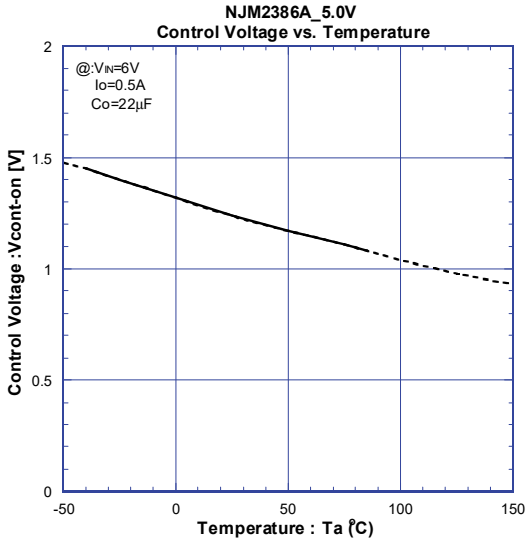


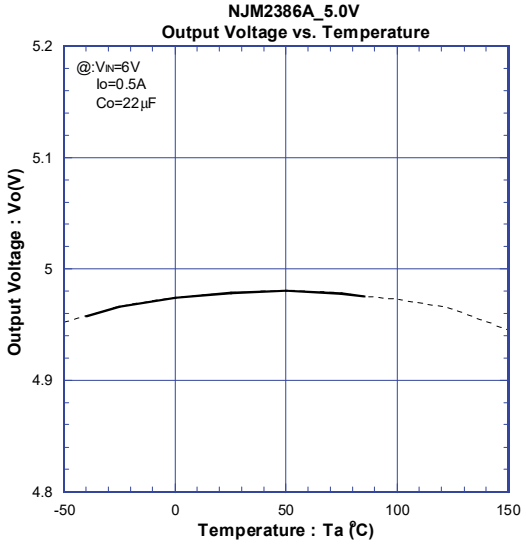
NJM2386A_5.0V
Ripple Rejection Ratio vs. Output Current

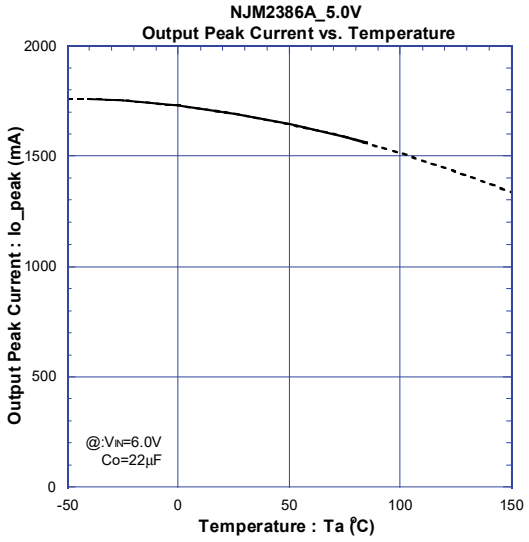


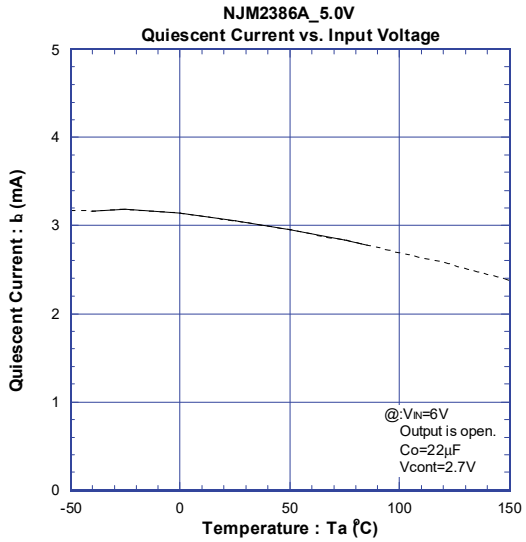
■ TYPICALCHARACTERISTICS



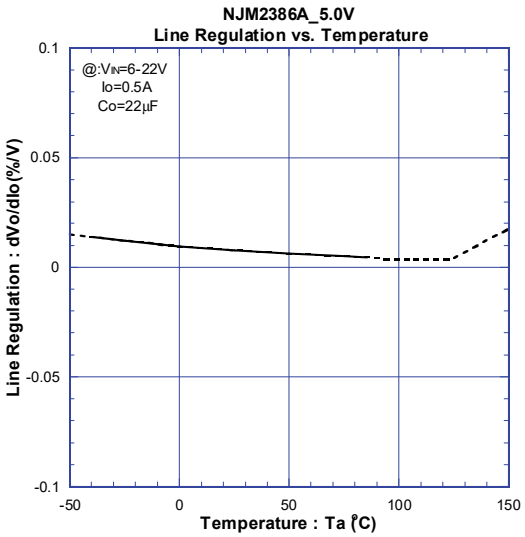


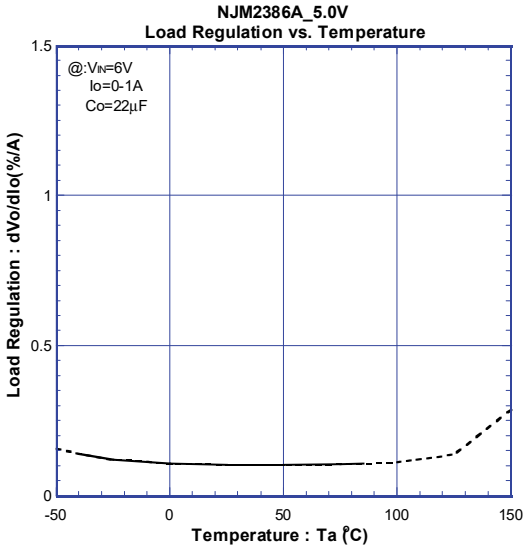


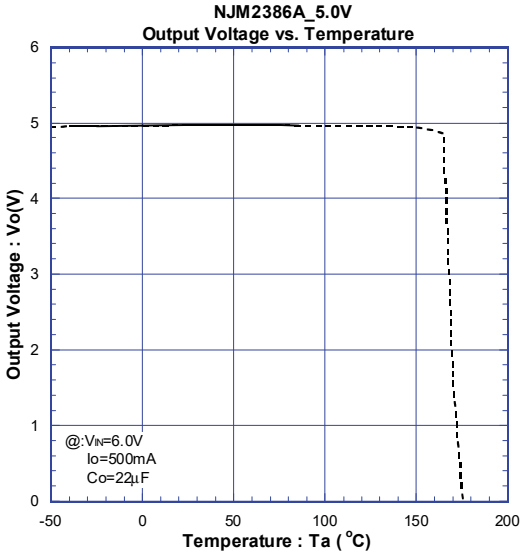


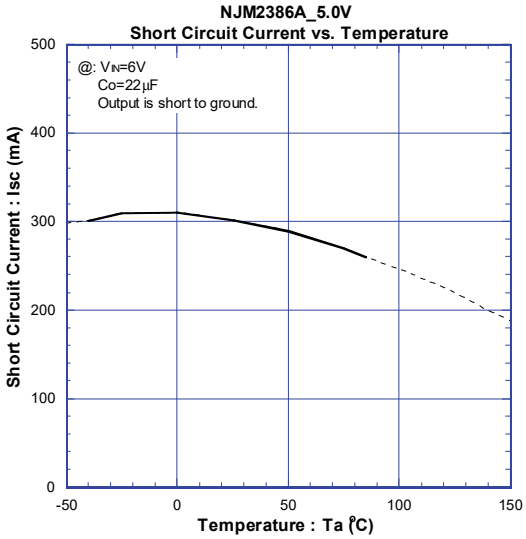


■ TYPICALCHARACTERISTICS



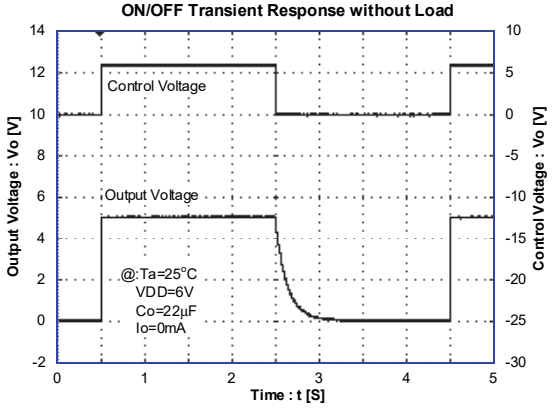




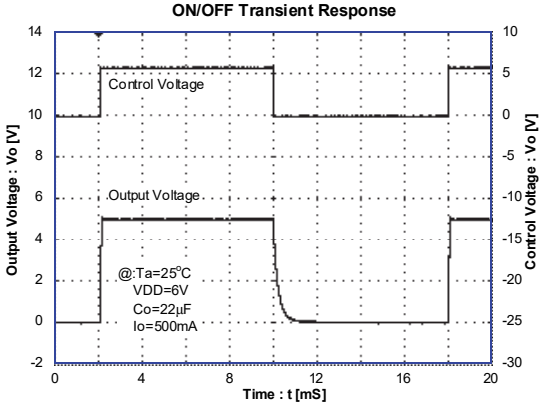


■ TYPICALCHARACTERISTICS

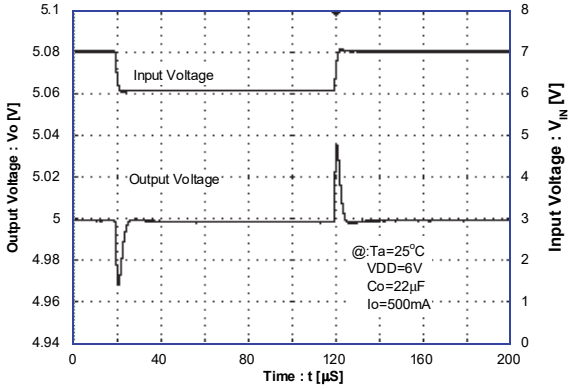
NJM2386A_5.0V
ON/OFF Transient Response without Load



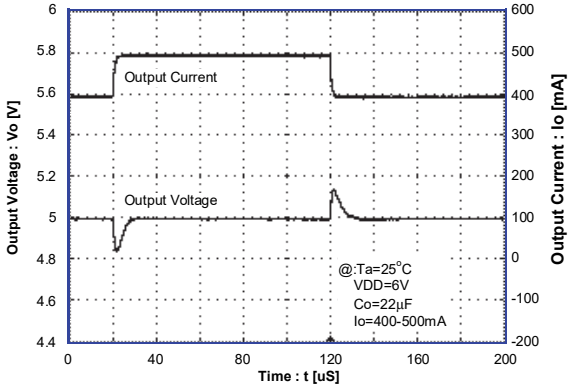
NJM2386A_5.0V
ON/OFF Transient Response



NJM2386A_5.0V
Input Transient Response



NJM2386A_5.0V
Load Transient Response



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