LOW DROPOUT VOLTAGE REGULATOR

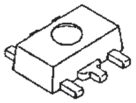
■ GENERAL DESCRIPTION

The NJM2830 is a 300mA output low dropout voltage regulator with ON/OFF control.

Advanced Bipolar technology achieves low noise, high ripple rejection and low quiescent current.

2.1V to 15.5V output voltage range, 1μF small decoupling capacitor, built-in noise bypass capacitor make the NJM2830 suitable for various applications.

■ PACKAGE OUTLINE

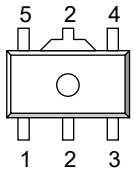


NJM2830U1

■ FEATURES

- Output voltage options available 2.1 ~ 15.5V (0.1V step)
- High Ripple Rejection 75dB typ. (f=1kHz Vo=3V Version)
- Output Noise Voltage Vno=50μVrms typ. (Vo=3V Version)
- Output capacitor with 1.0μF ceramic capacitor (Vo≥5.6V)
- Output Current Io(max.)=300mA
- High Precision Output Vo±1.0%
- Low Dropout Voltage 0.10V typ. (Io=100mA)
- ON/OFF Control (Active High)
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Bipolar Technology
- Package Outline SOT-89-5

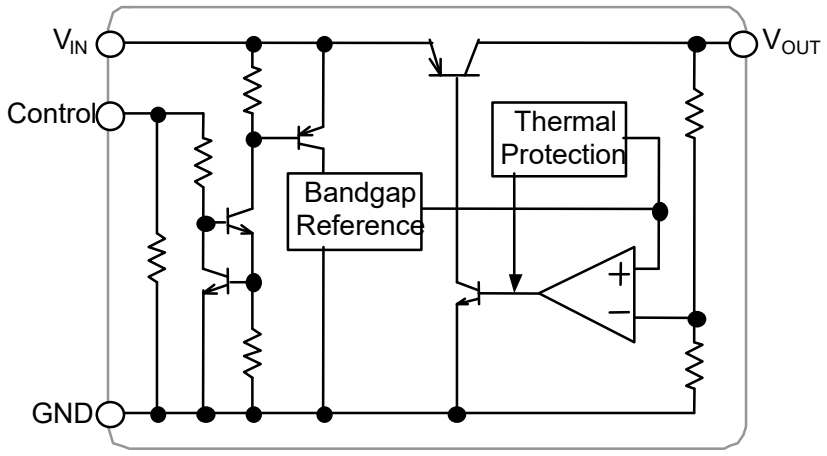
■ PIN CONFIGURATION



NJM2830U1

1. CONTROL
2. GND
3. N.C.
4. V_{OUT}
5. V_{IN}

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

Device Name	Vout
NJM2830U1-21	2.1V
NJM2830U1-25	2.5V
NJM2830U1-03	3.0V
NJM2830U1-33	3.3V
NJM2830U1-05	5.0V
NJM2830U1-57	5.7V
NJM2830U1-58	5.8V
NJM2830U1-06	6.0V
NJM2830U1-08	8.0V
NJM2830U1-85	8.5V
NJM2830U1-86	8.6V
NJM2830U1-09	9.0V
NJM2830U1-12	12.0V
NJM2830U1-15	15.0V

The WHITE column shows applicable Voltage Rank(s)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+20	V
Control Voltage	V_{CONT}	+20	V
Power Dissipation	P_D	625(*1) 960(*2)	mW
Operating Temperature	Topr	-40~+85	°C
Storage Temperature	Tstg	-40~+150	°C

(*1): Mounted on glass epoxy board. (76.2 x114.3 x 1.6mm:based on EIA/JDEC standard size, 2Layers, Cu area 100mm^2)
(*2): Mounted on glass epoxy board. (76.2 x 114.3 x 1.6mm:based on EIA/JDEC standard, 4Layers)
(4Layers: Applying 74.2×74.2mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5)

■ INPUT VOLTAGE RANGE

V_{IN}=+2.3V~18V (In case of Vo < 2.2V)

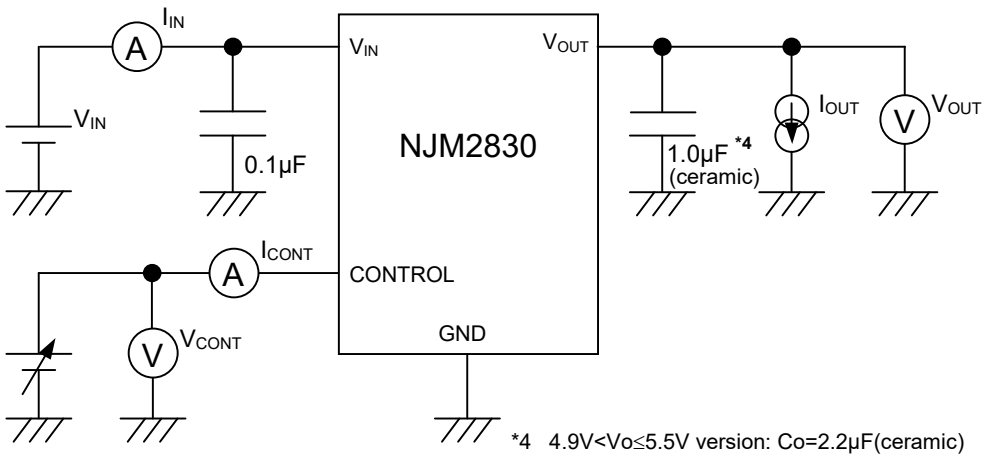
■ ELECTRICAL CHARACTERISTICS

(V_{IN}= Vo+1V, C_{IN}=0.1μF, Co=1.0μF (4.9V<Vo≤5.5V:Co=2.2μF, 2.9V<Vo≤4.9V:Co=4.7μF, Vo≤2.9V: 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_Q	Io=0mA, except Icont	Vo≤5V Version	-	130	180	μA
			5V<Vo≤10V Version	-	145	195	μA
			10V<Vo≤15V Version	-	160	210	μA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V		-	-	100	nA
Output Current	Io	Vo-0.3V		300	400	–	mA
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V ~ Vo+6V(Vo≤12V Version) V_{IN}=Vo+1V ~ 18V(Vo>12V Version), Io=30mA		-	-	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 ~ 300mA		-	-	0.009	%/mA
Dropout Voltage(*1)	ΔV_{I-O}	Io=100mA		-	0.10	0.18	V
Ripple Rejection	RR	ein=200mVrms,f=1kHz,Io=10mA, Vo=3V Version		-	75	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta Ta$	Ta=0 ~ 85°C, Io=10mA		-	±50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz ~ 80kHz, Io=10mA Vo=3V Version		-	50	-	μVrms
Control Current	I_{CONT}	V_{CONT}=1.6V			3	12	μA
Control Voltage for ON-state	$V_{CONT(ON)}$			1.6	-	-	V
Control Voltage for OFF-state	$V_{CONT(OFF)}$			-	-	0.6	V

(*3): 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.

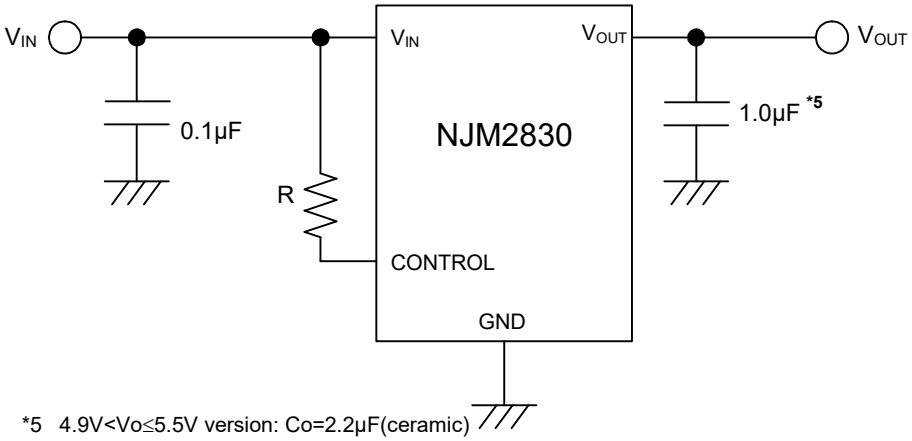
■ TEST CIRCUIT



*4 4.9V<Vo≤5.5V version: Co=2.2μF(ceramic)
2.9V<Vo≤4.9V version: Co=4.7μF(ceramic)
Vo≤2.9V version: Co=10μF(ceramic)

■ TYPICAL APPLICATIONS

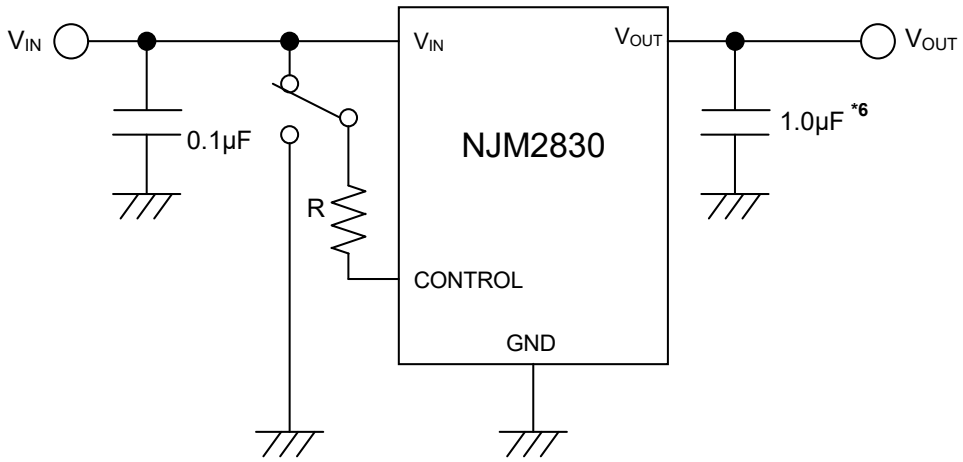
① In the case where ON/OFF Control is not required:



*5 4.9V<Vo≤5.5V version: Co=2.2μF(ceramic)
2.9V<Vo≤4.9V version: Co=4.7μF(ceramic)
Vo≤2.9V version: Co=10μF(ceramic)

Connect control pin to V_{IN} pin

② In use of ON/OFF CONTROL:



*6 4.9V<Vo≤5.5V version: Co=2.2μF(ceramic)
2.9V<Vo≤4.9V version: Co=4.7μF(ceramic)
Vo≤2.9V version: Co=10μF(ceramic)

State of control pin:
•"H"→ output is enabled.
•"L" or "open" → output is disabled.

∗In the case of using a resistance "R" 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 terminal should set to consider voltage drop through the resistor "R" 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 "R" should be selected to consider the temperature characteristics.

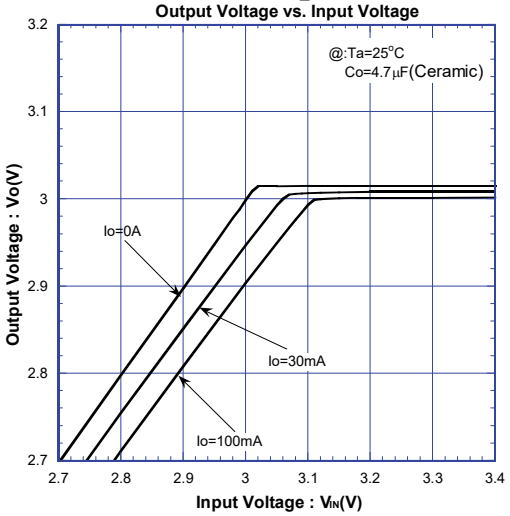
∗Input Capacitor C_{IN}
Input Capacitor C_{IN} is required to prevent oscillation and reduce power supply ripple for applications when high power supply impedance or a long power supply line. Therefore, use the recommended C_{IN} value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should 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.
The recommended capacitance depends on the output voltage rank. Especially, low voltage regulator requires larger C_O value. In addition, you should consider varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, a DC bias characteristic and so on) and unevenness peculiar to a capacitor supplier enough.
When selecting C_O, recommend that have withstand voltage margin against output voltage and superior temperature characteristic though this product is designed stability works with wide range ESR of capacitor including low ESR products.

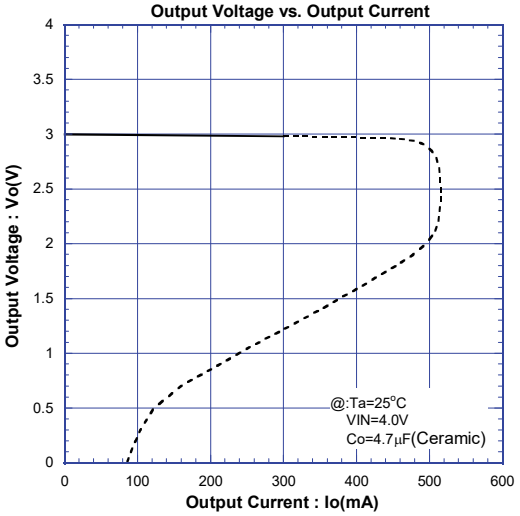
■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (3V Version)

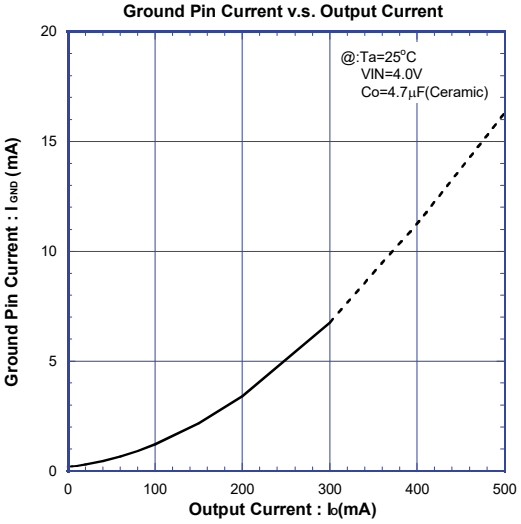
NJM2830_3.0V
Output Voltage vs. Input Voltage



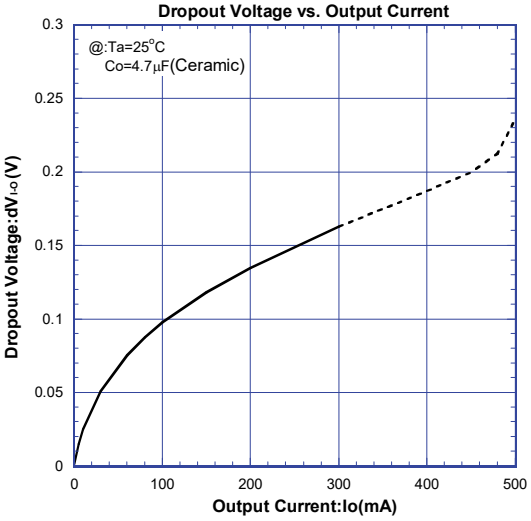
NJM2830_3.0V
Output Voltage vs. Output Current



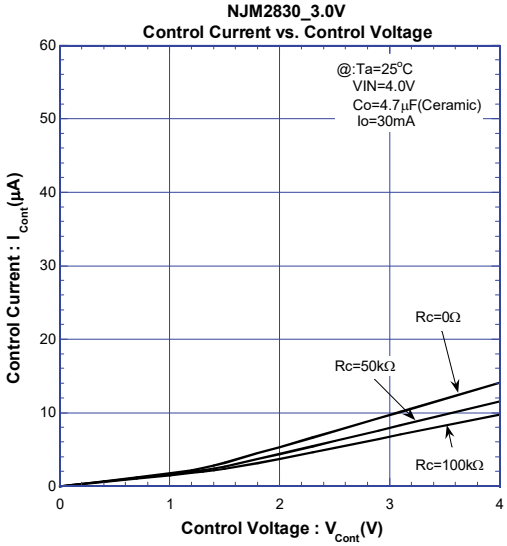
NJM2830_3.0V
Ground Pin Current v.s. Output Current



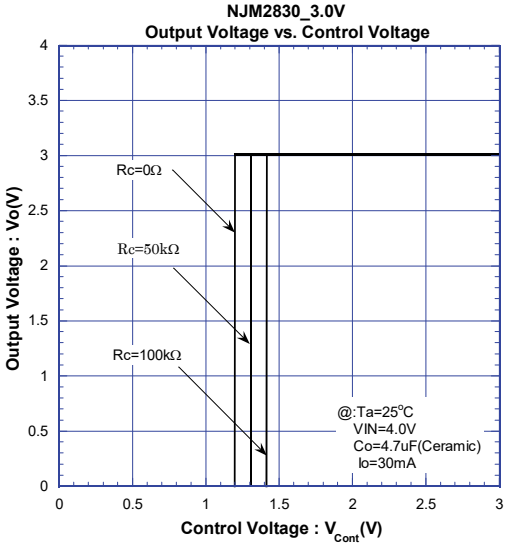
NJM2830_3.0V
Dropout Voltage vs. Output Current



NJM2830_3.0V
Control Current vs. Control Voltage

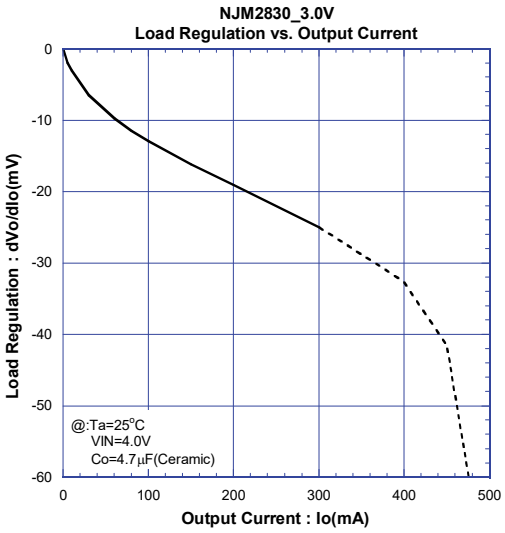


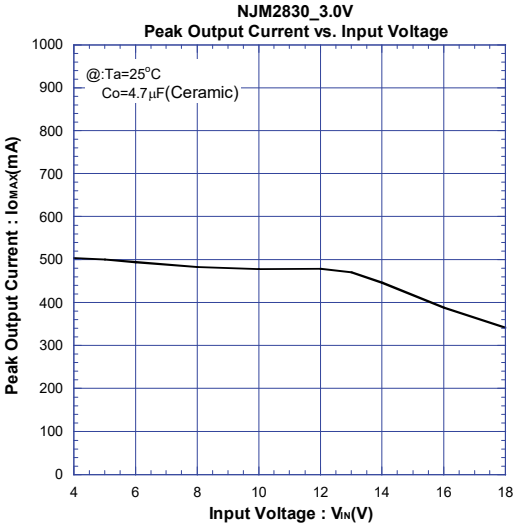
NJM2830_3.0V
Output Voltage vs. Control Voltage

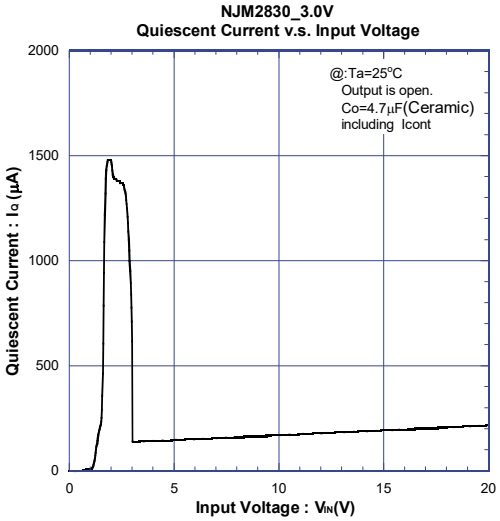


■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (3V Version)



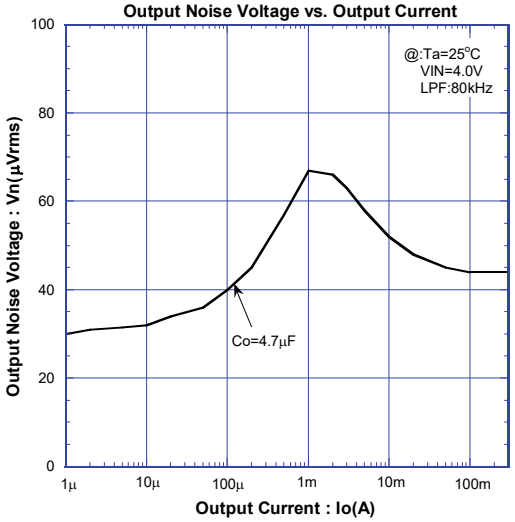




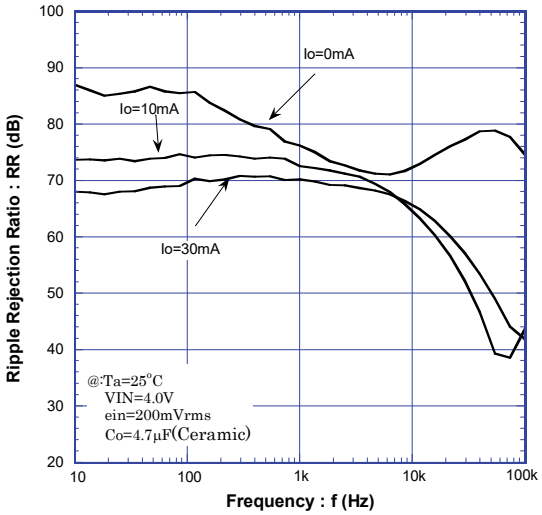
■ TYPICAL CHARACTERISTICS

●AC CHARACTERISTICS (3V Version)

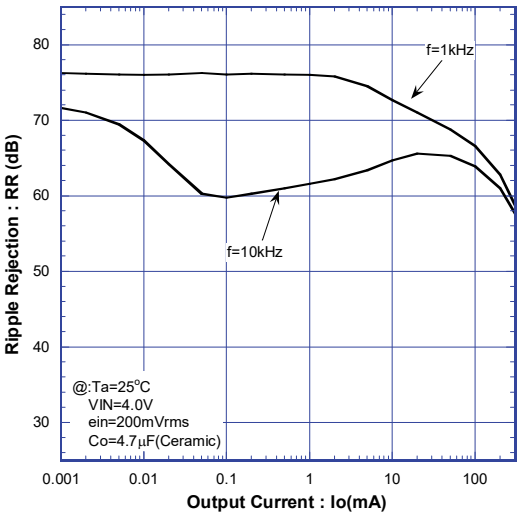
NJM2830_3.0V
Output Noise Voltage vs. Output Current



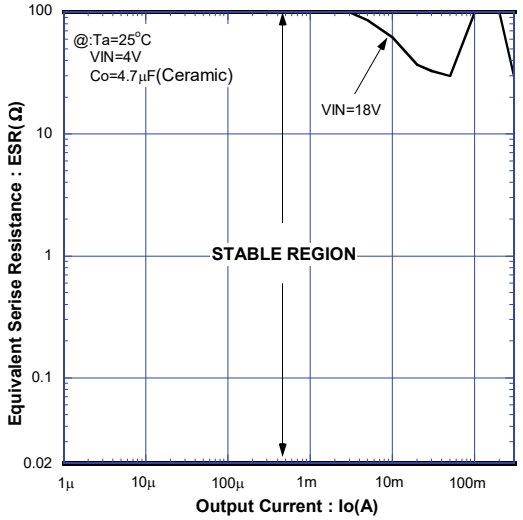
NJM2830_3.0V
Ripple Rejection Ratio v.s. Frequency



NJM2830_3.0V
Ripple Rejection vs. Output Current

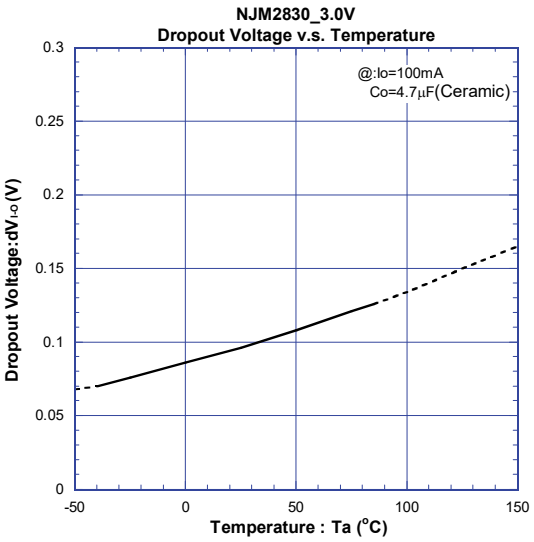


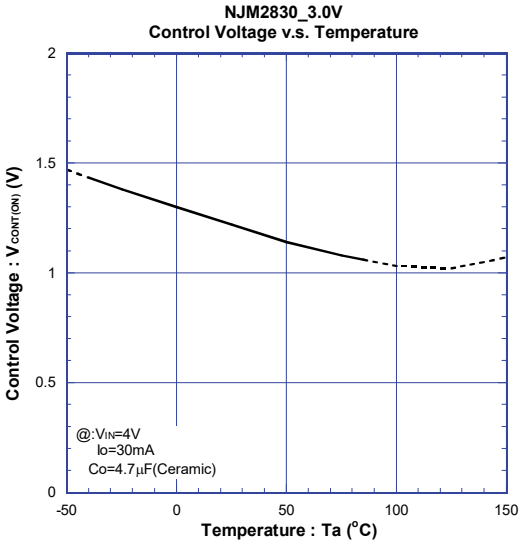
NJM2830_3.0V
Equivalent Serise Resistance vs. Output Current

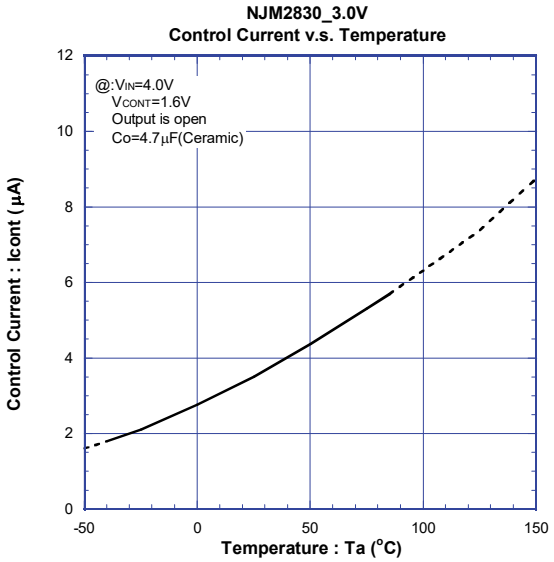


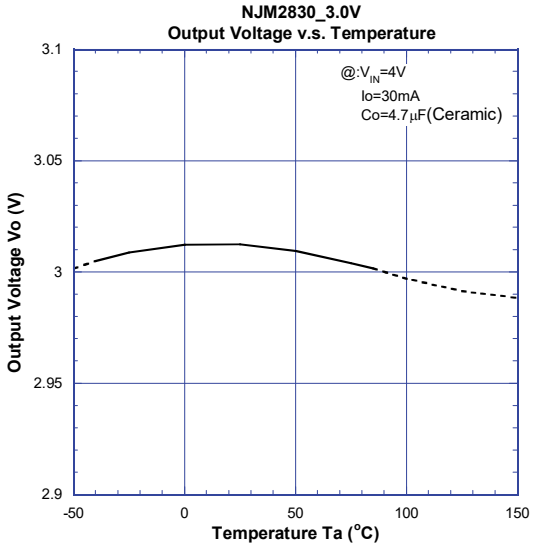
■ TYPICAL CHARACTERISTICS

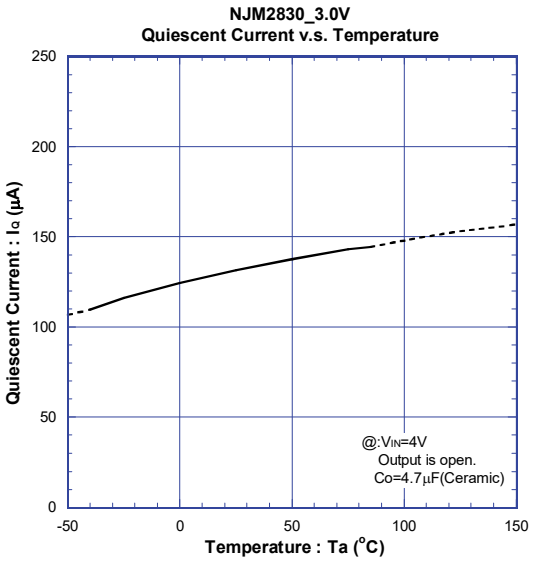
●TEMPERATURE CHARACTERISTICS (3V Version)





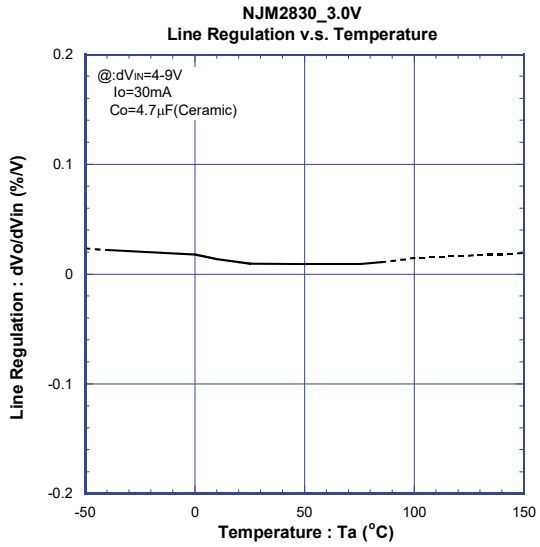


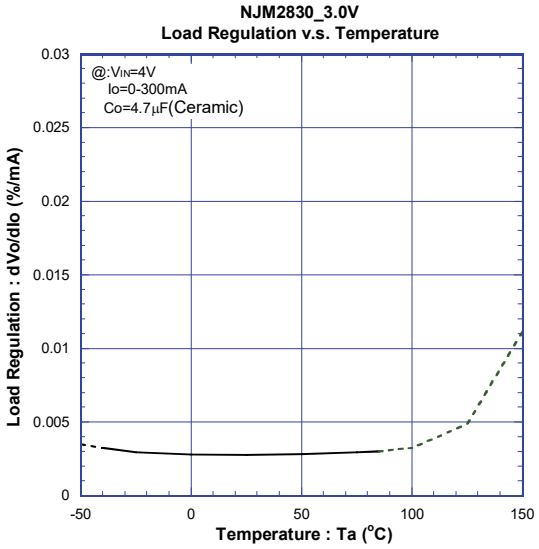


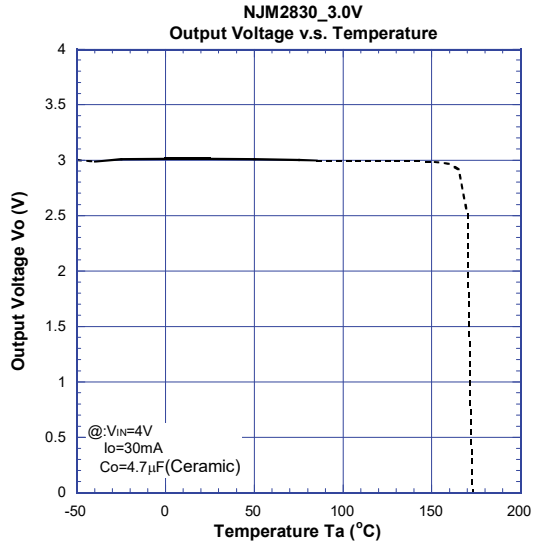


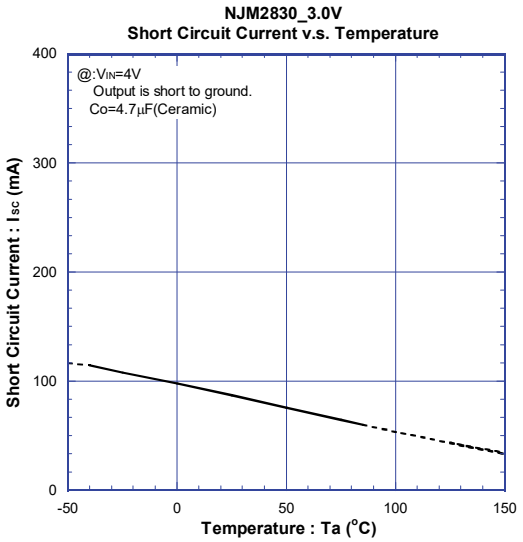
■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (3V Version)



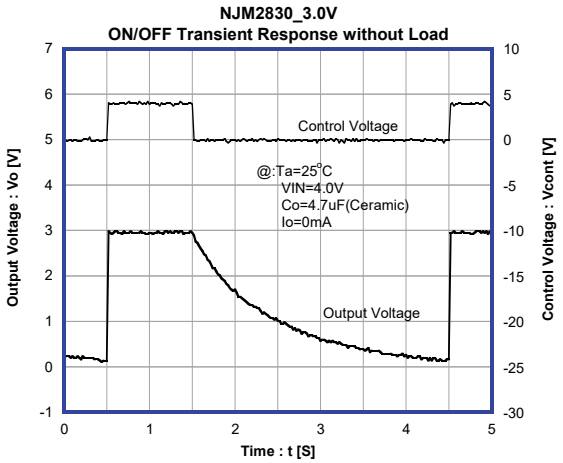


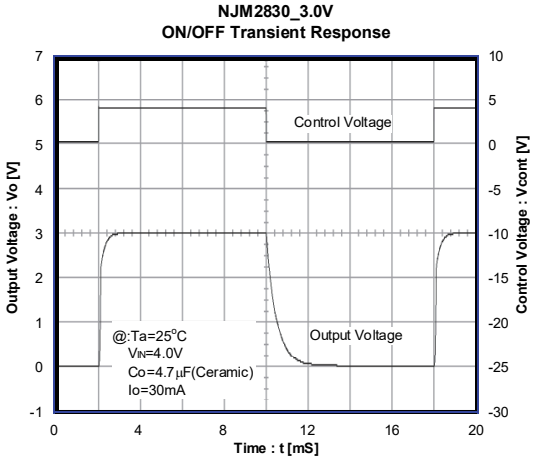


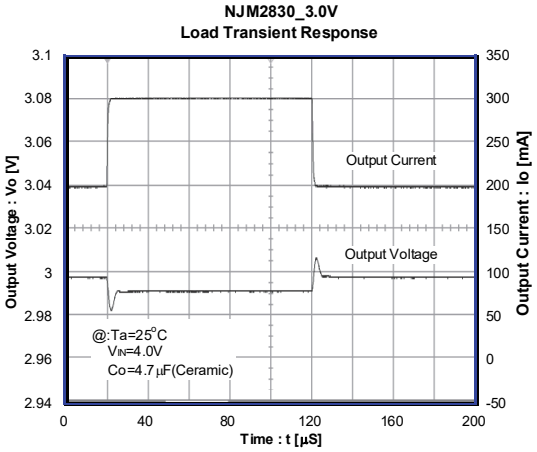


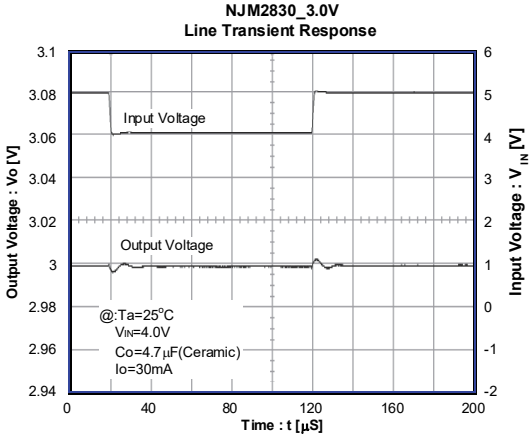
■ TYPICAL CHARACTERISTICS

●TRANSIENT RESPONSE (3V Version)





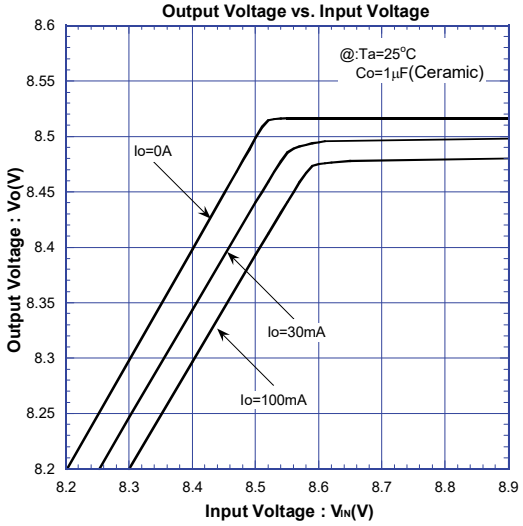




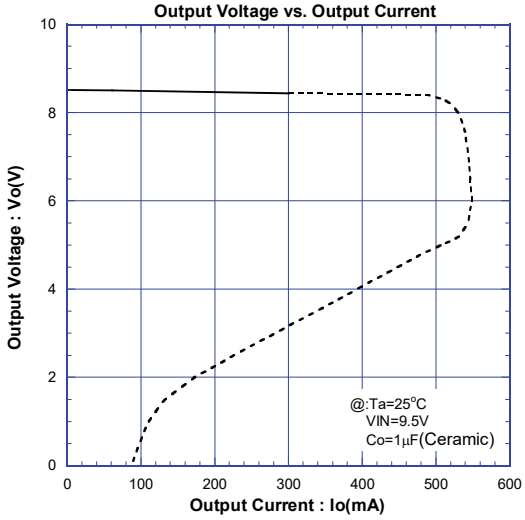
■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (8.5V Version)

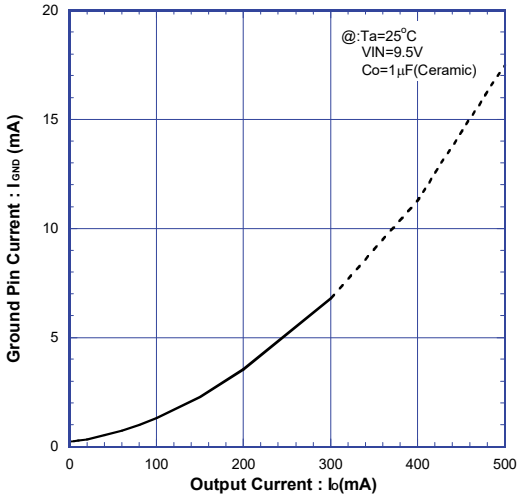
NJM2830_8.5V
Output Voltage vs. Input Voltage



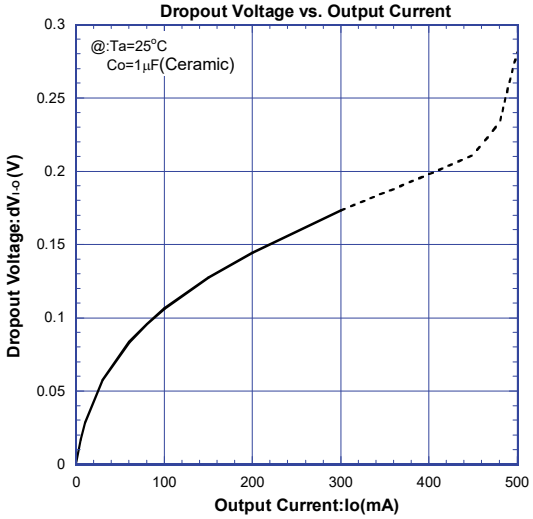
NJM2830_8.5V
Output Voltage vs. Output Current



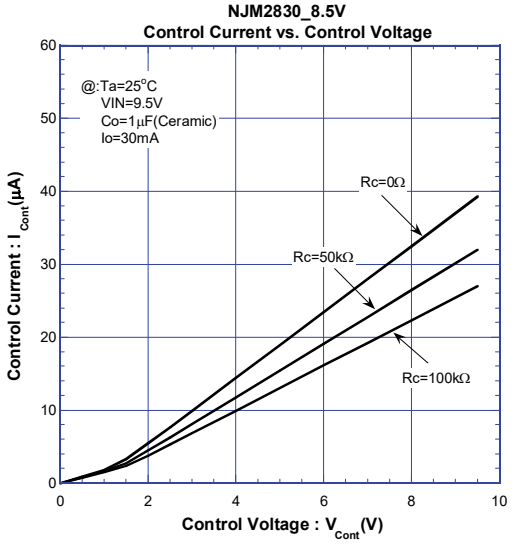
NJM2830_8.5V
Ground Pin Current v.s. Output Current



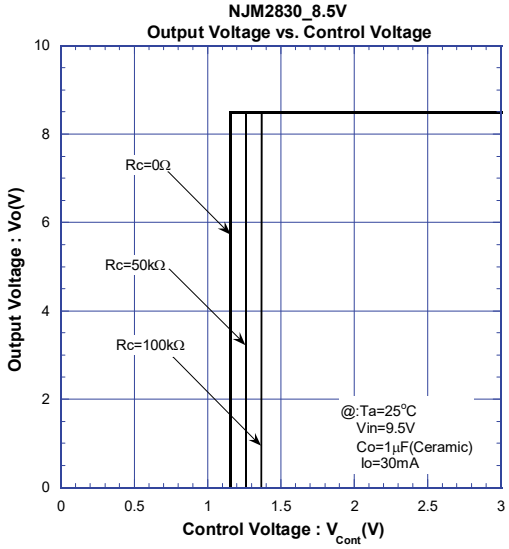
NJM2830_8.5V
Dropout Voltage vs. Output Current



NJM2830_8.5V
Control Current vs. Control Voltage

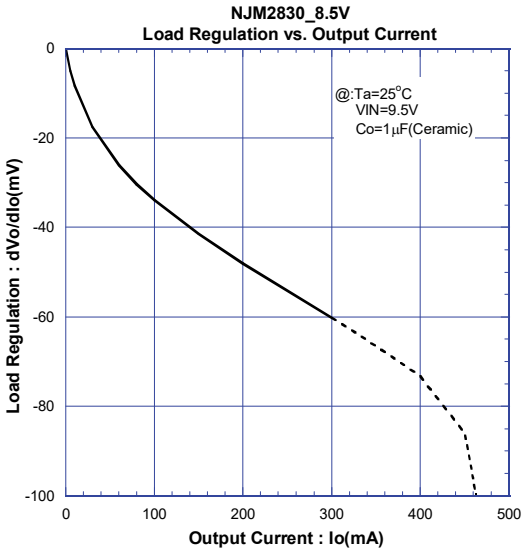


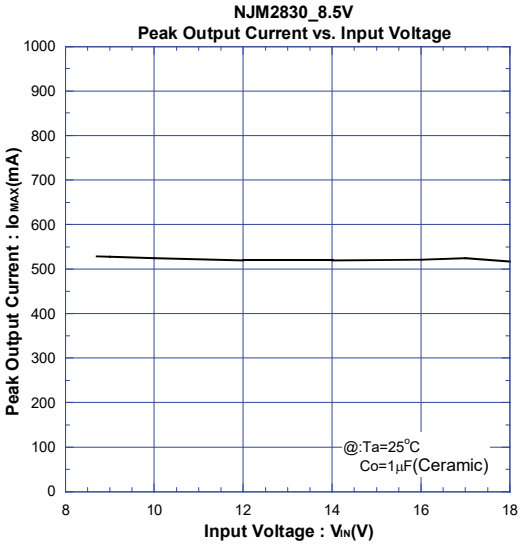
NJM2830_8.5V
Output Voltage vs. Control Voltage

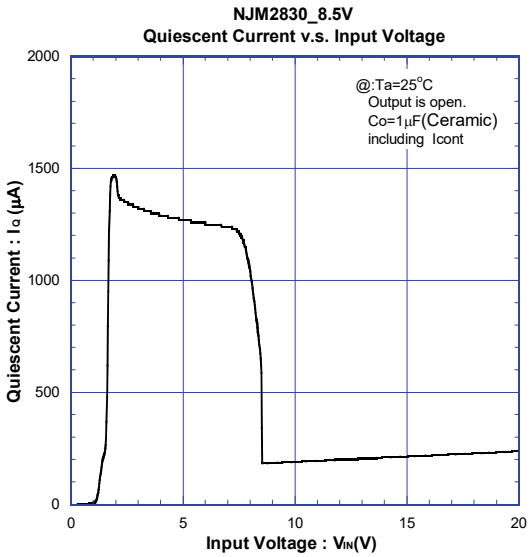


■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (8.5V Version)



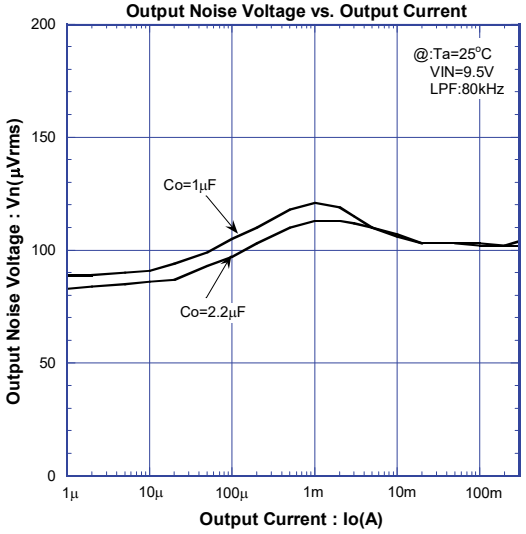




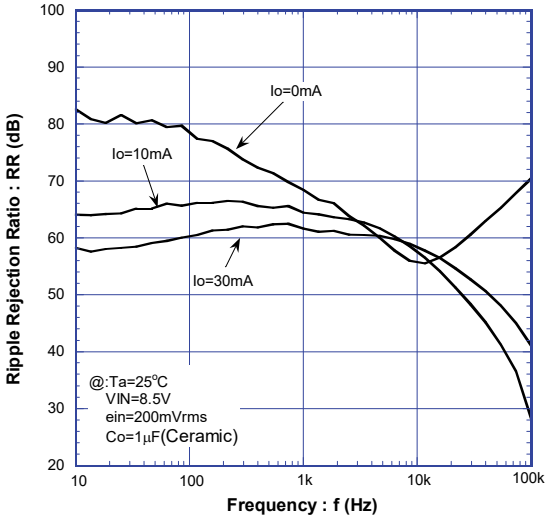
■ TYPICAL CHARACTERISTICS

●AC CHARACTERISTICS (8.5V Version)

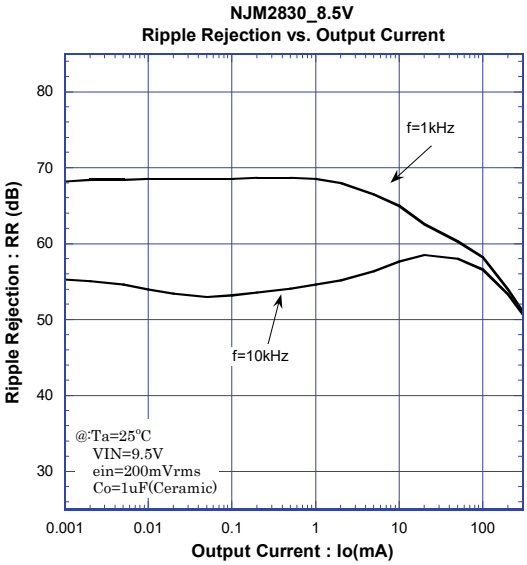
NJM2830_8.5V
Output Noise Voltage vs. Output Current



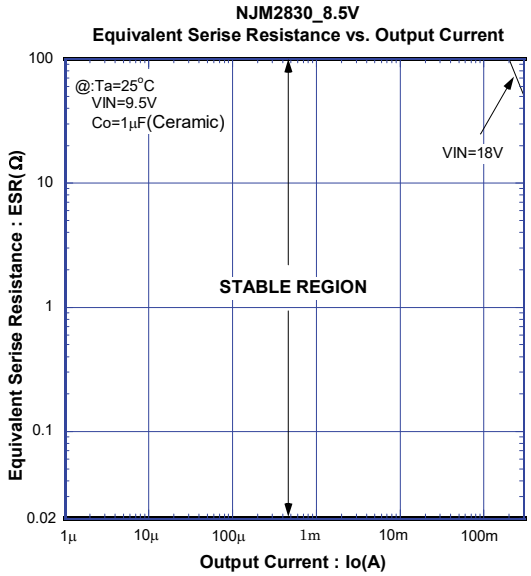
NJM2830_8.5V
Ripple Rejection Ratio v.s. Frequency



NJM2830_8.5V
Ripple Rejection vs. Output Current



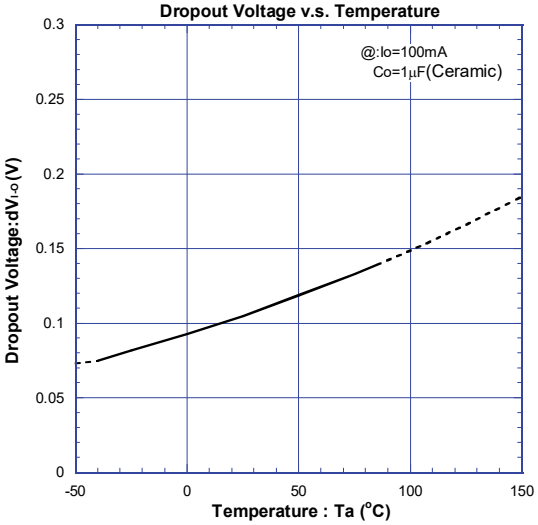
NJM2830_8.5V
Equivalent Serise Resistance vs. Output Current



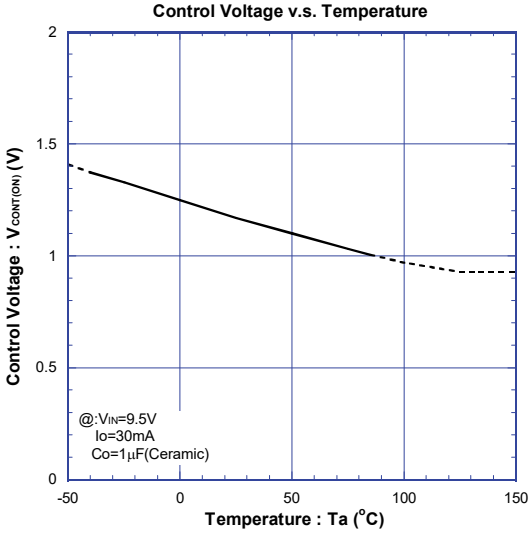
■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (8.5V Version)

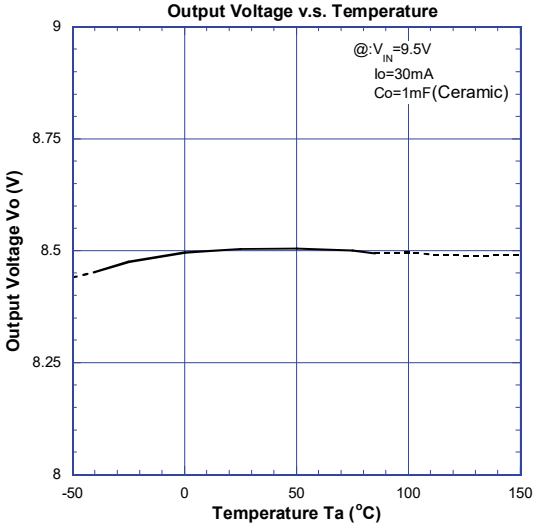
NJM2830_8.5V
Dropout Voltage v.s. Temperature



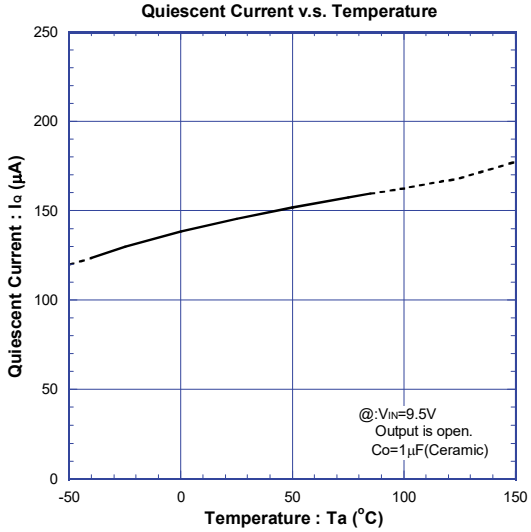
NJM2830_8.5V
Control Voltage v.s. Temperature



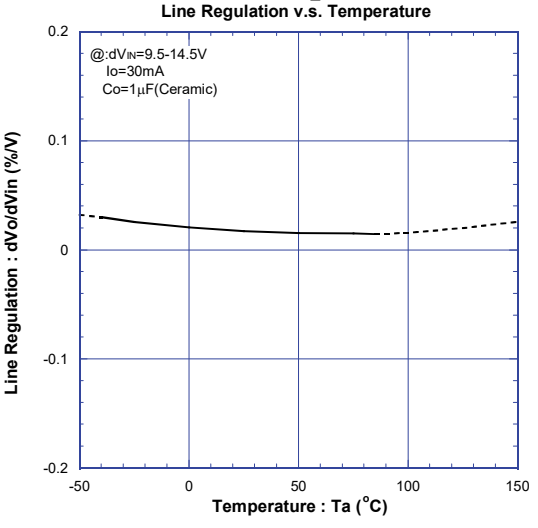
NJM2830_8.5V
Output Voltage v.s. Temperature



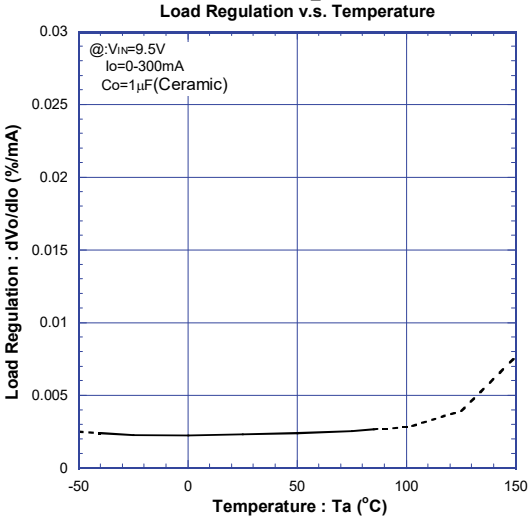
NJM2830_8.5V
Quiescent Current v.s. Temperature



NJM2830_8.5V
Line Regulation v.s. Temperature

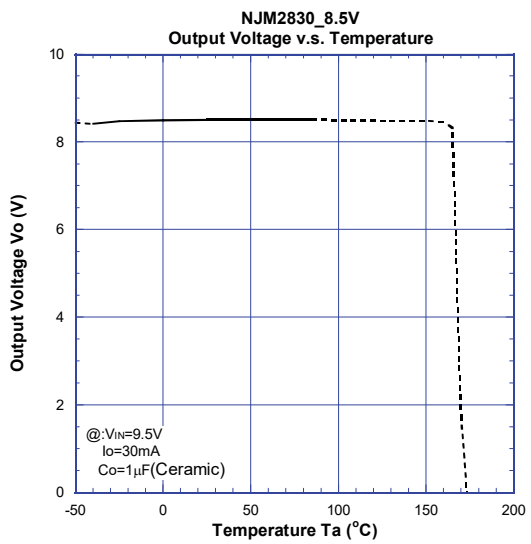


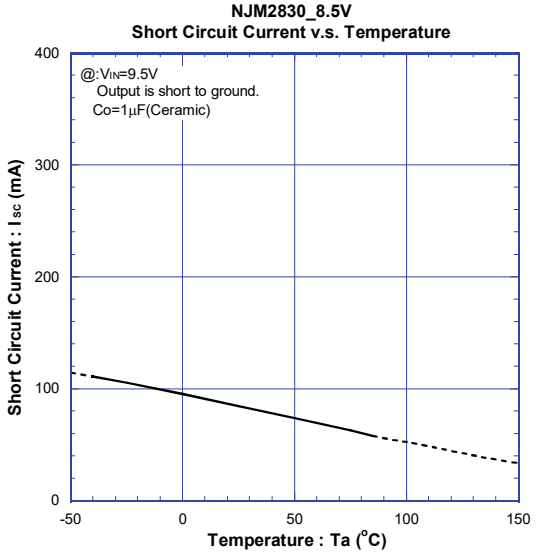
NJM2830_8.5V
Load Regulation v.s. Temperature



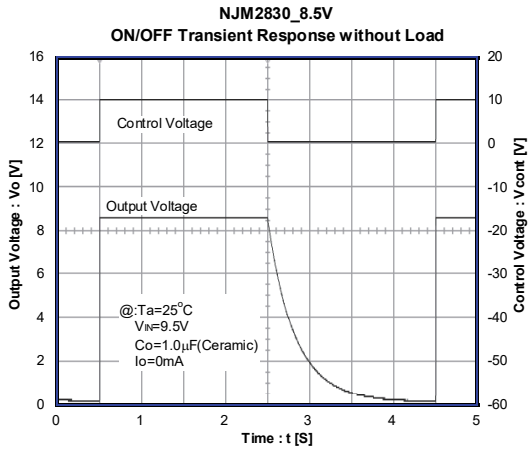
■ TYPICAL CHARACTERISTICS

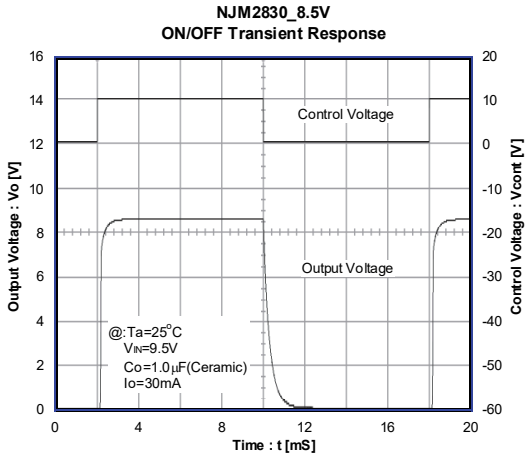
●TEMPERATURE CHARACTERISTICS (8.5V Version)

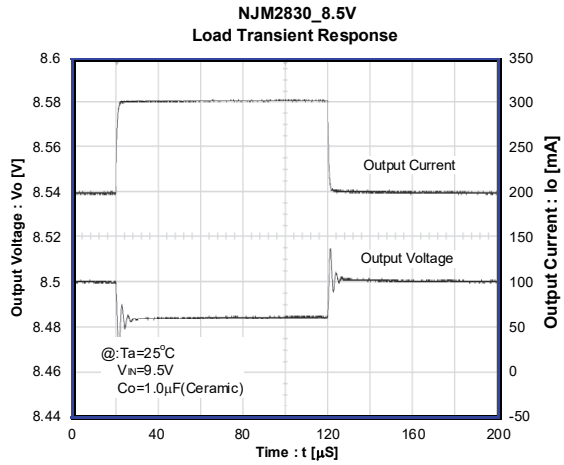


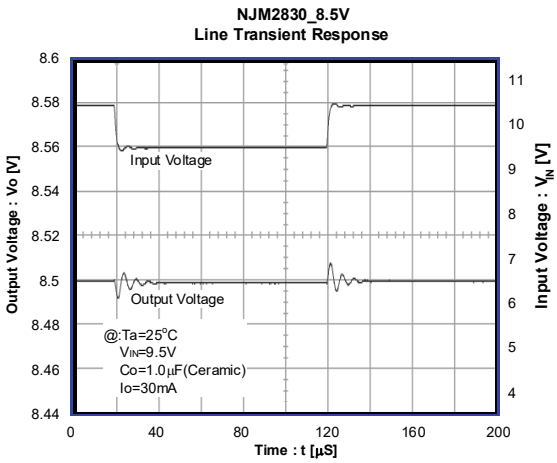


●TRANSIENT RESPONSE (8.5V Version)





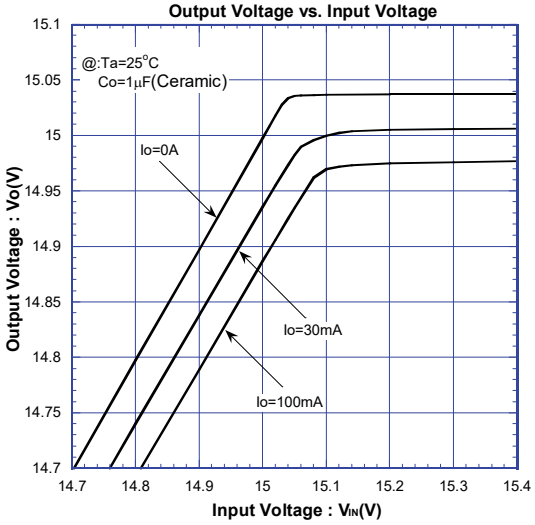




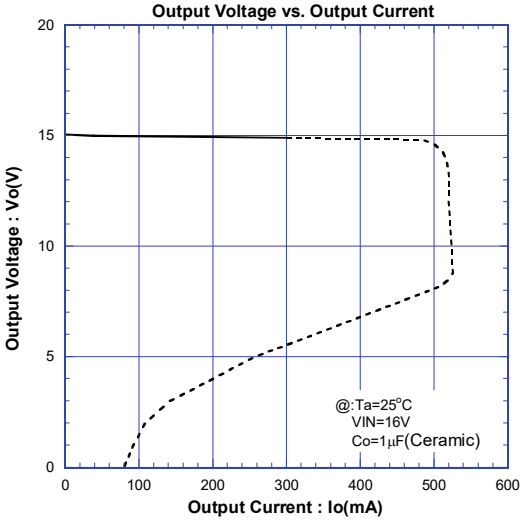
■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (15V Version)

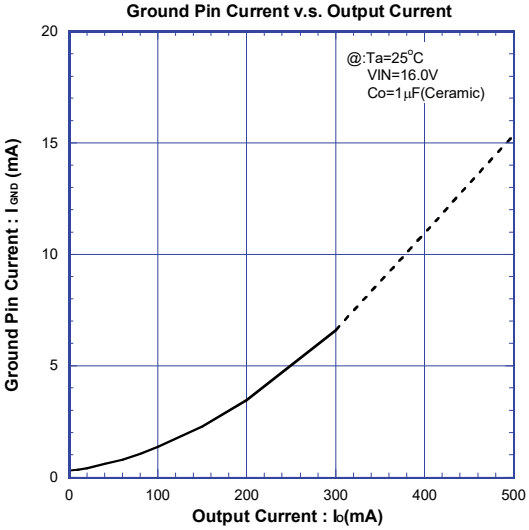
NJM2830_15V
Output Voltage vs. Input Voltage



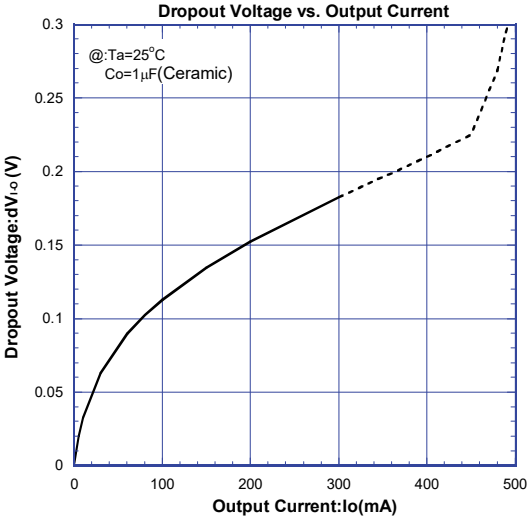
NJM2830_15V
Output Voltage vs. Output Current



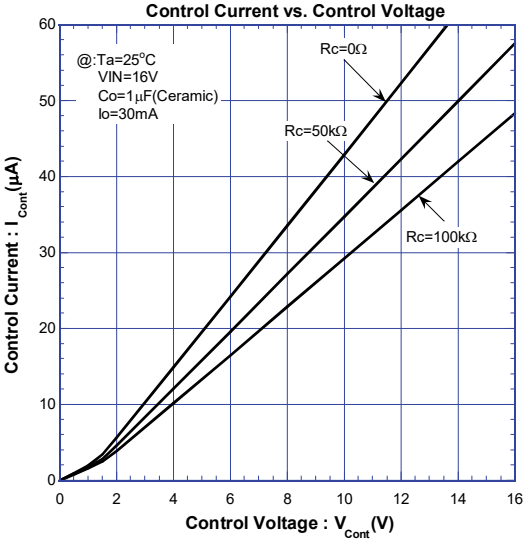
NJM2830_15V
Ground Pin Current v.s. Output Current



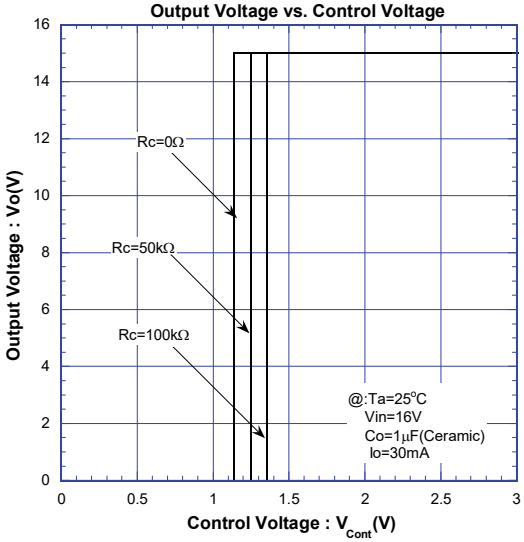
NJM2830_15V
Dropout Voltage vs. Output Current



NJM2830_15V
Control Current vs. Control Voltage

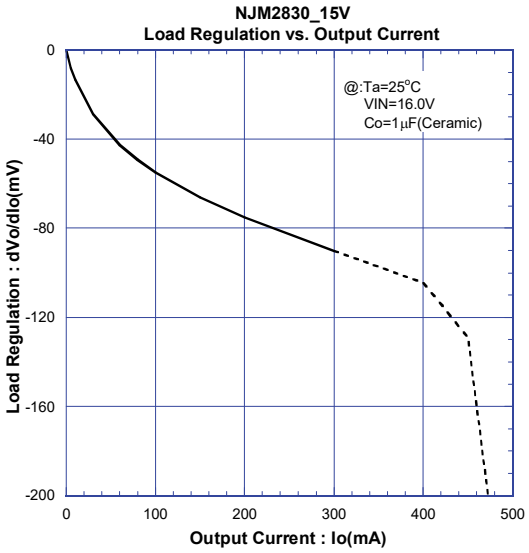


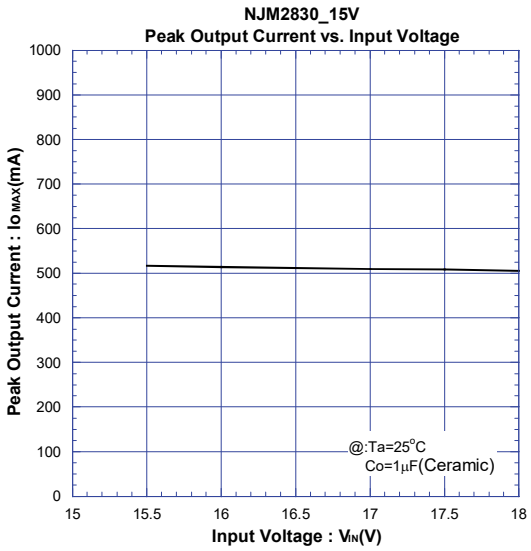
NJM2830_15V
Output Voltage vs. Control Voltage

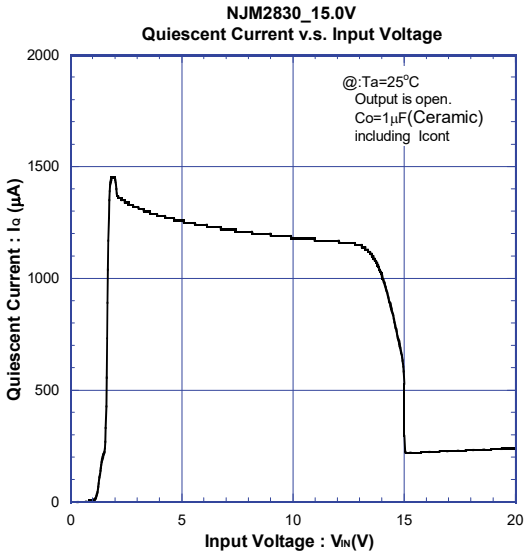


■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (15V Version)

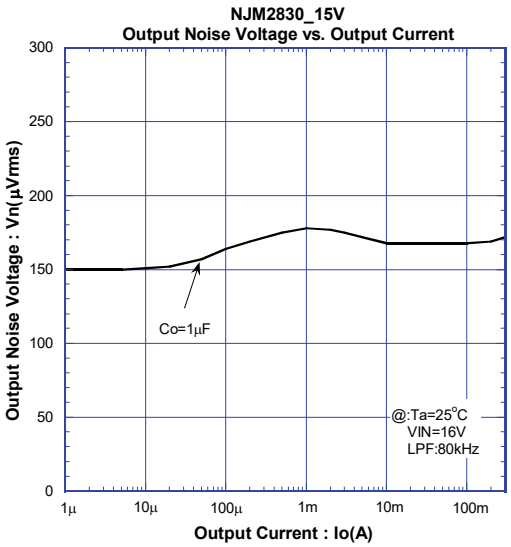


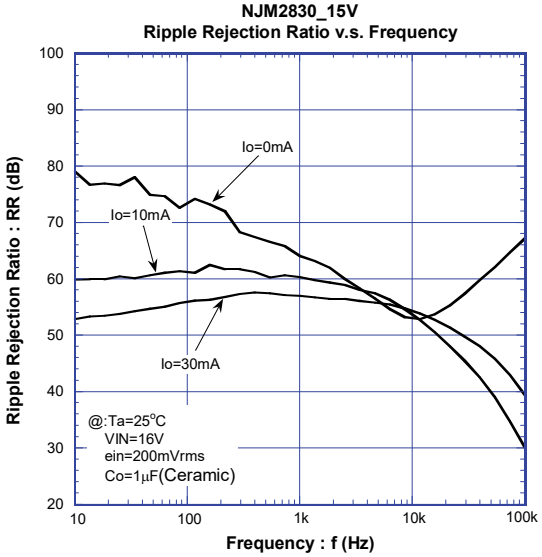


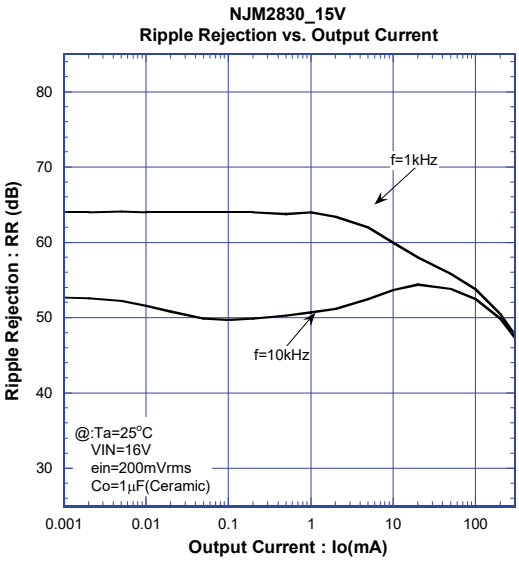


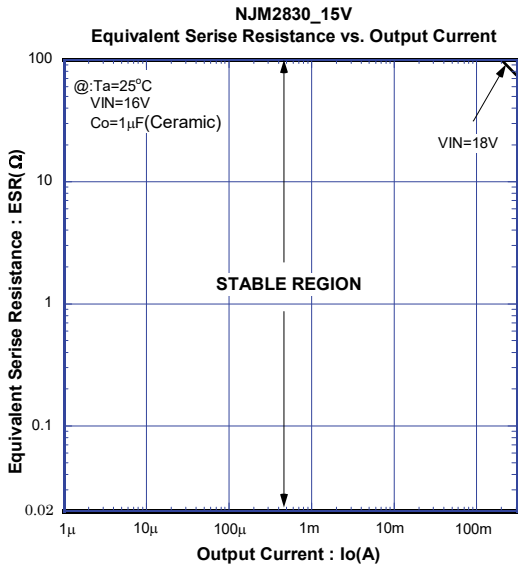
■ TYPICAL CHARACTERISTICS

●AC CHARACTERISTICS (15V Version)





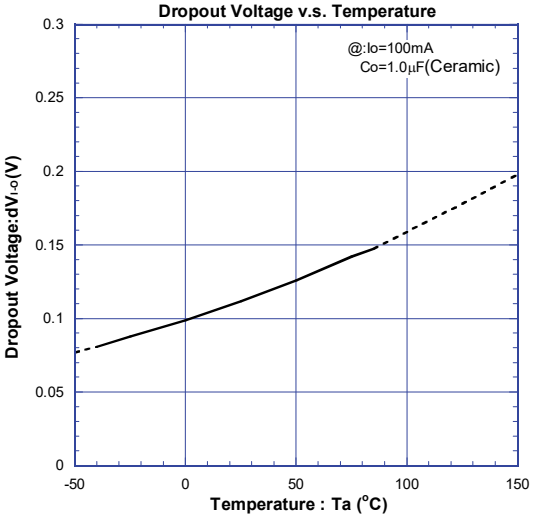




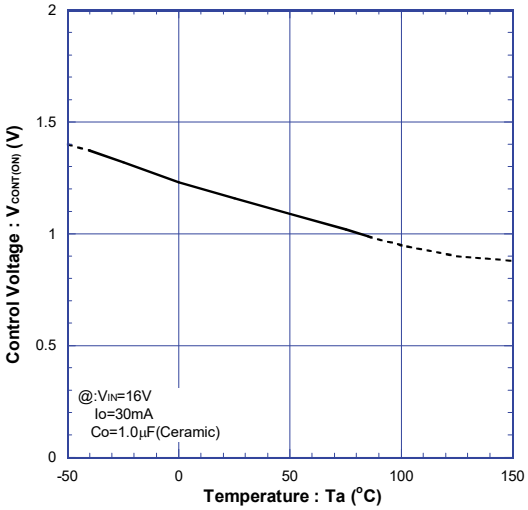
■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (15V Version)

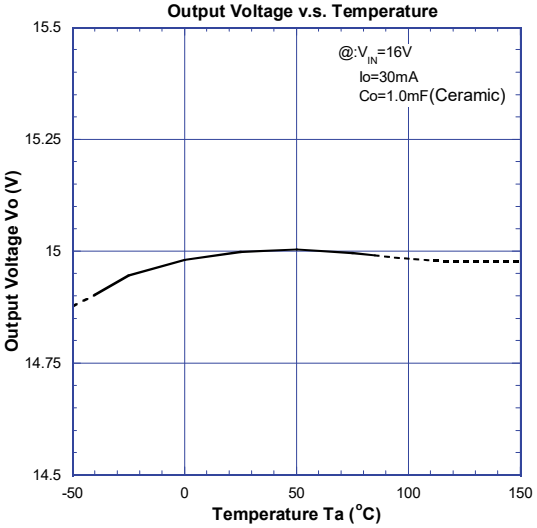
NJM2830_15V
Dropout Voltage v.s. Temperature



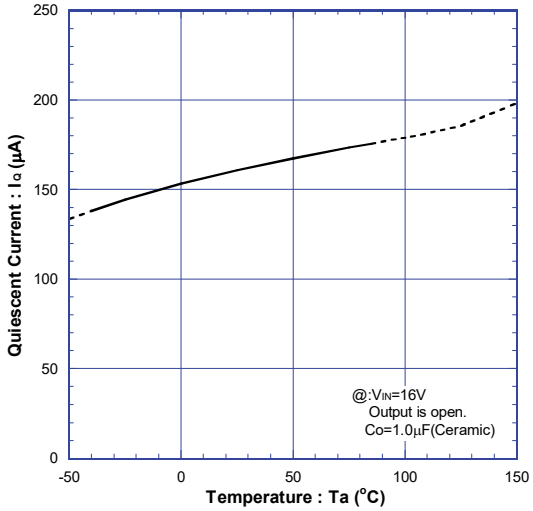
NJM2830_15V
Control Voltage v.s. Temperature



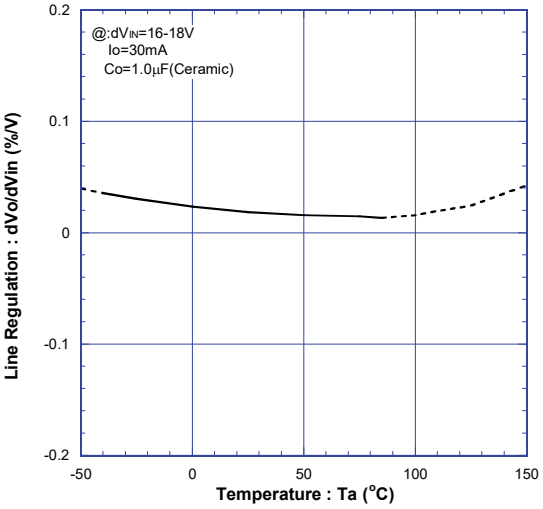
NJM2830_15V
Output Voltage v.s. Temperature



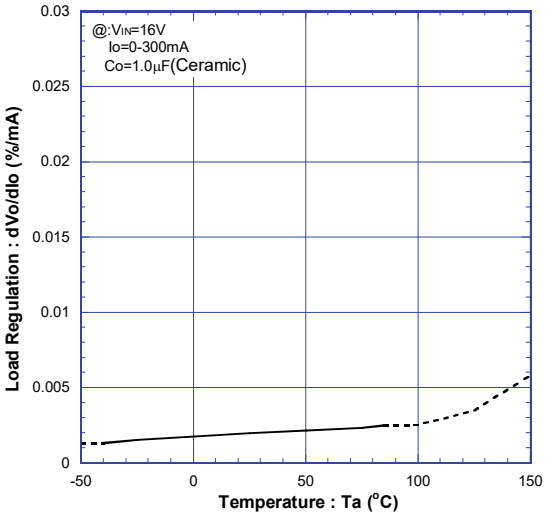
NJM2830_15V
Quiescent Current v.s. Temperature



NJM2830_15V
Line Regulation v.s. Temperature

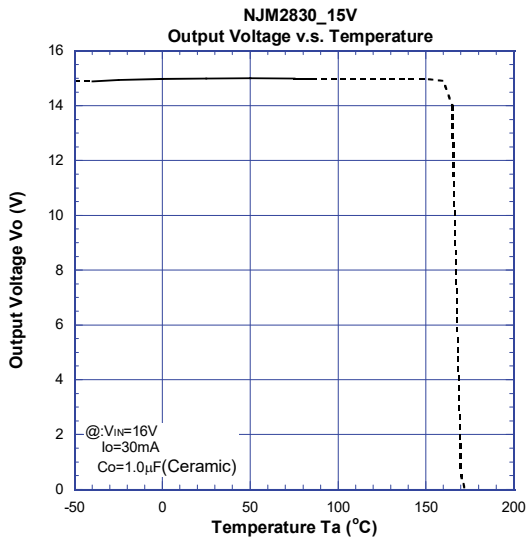


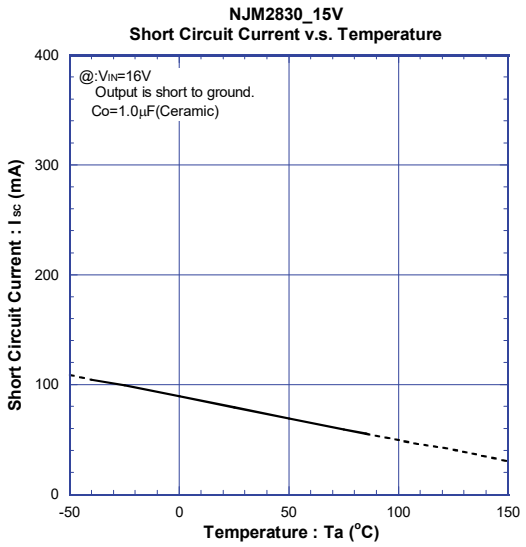
NJM2830_15V
Load Regulation v.s. Temperature



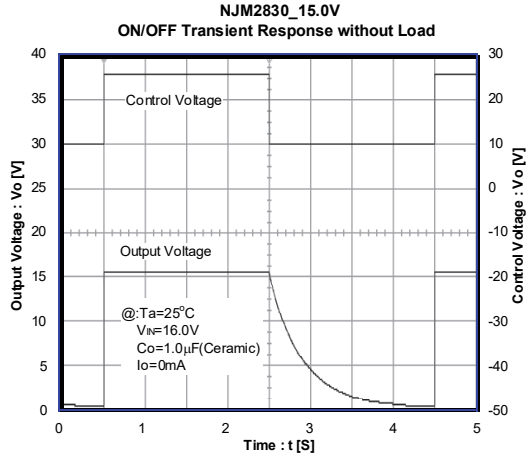
■ TYPICAL CHARACTERISTICS

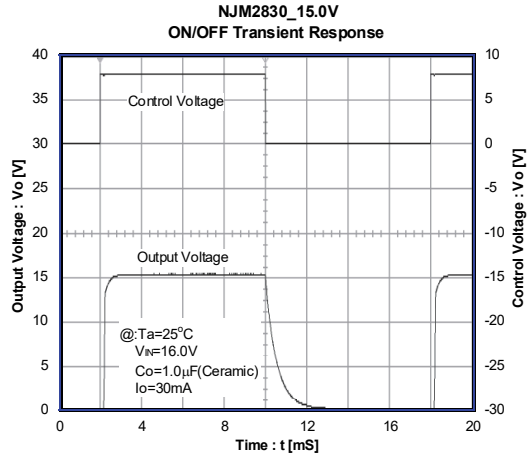
●TEMPERATURE CHARACTERISTICS (15V Version)

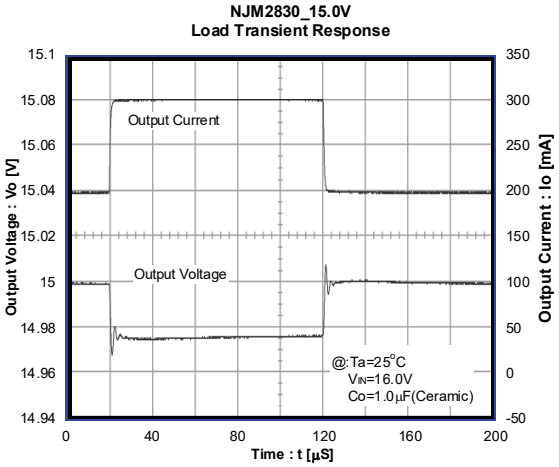


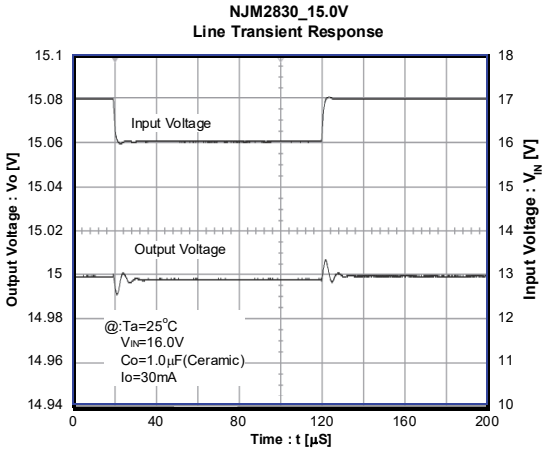


●TRANSIENT RESPONSE (15V Version)









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