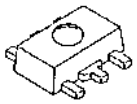
LOW DROPOUT VOLTAGE REGULATOR

■ FEATURES

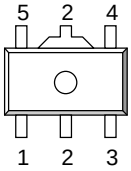
- Output voltage options available 2.1 to 15.5V (0.1V step)
- High Ripple Rejection 75dB typ. (f=1kHz Vo=3V Version)
- Output Noise Voltage Vno=50μVrms typ. (Vo=3V Version)
- Output capacitor with 1.0μF ceramic capacitor (Vo≥5.6V)
- Output Current Io(max.)=300mA
- High Precision Output Vo±1.0% (Ta=25°C)
  Vo±2.5% (Ta= -40°C to +125°C)
- 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
- AEC-Q100 This product meets the reliability level required by AEC-Q100.

■ PACKAGE OUTLINE



NJM2830U2-xx-T1
*xx: Voltage Rank

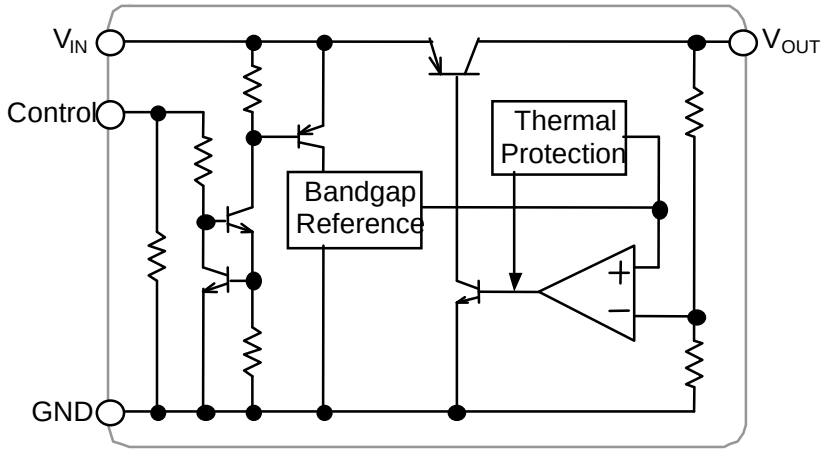
■ PIN CONFIGURATION



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

NJM2830U2-xx-T1

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}
NJM2830U2-33-T1	3.3V
NJM2830U2-05-T1	5.0V
NJM2830U2-06-T1	6.0V

■ 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) 2400 (*2)	mW
Operating Temperature	Topr	-40 to +125	°C
Storage Temperature	Tstg	-40 to +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)

■ ELECTRICAL CHARACTERISTICS

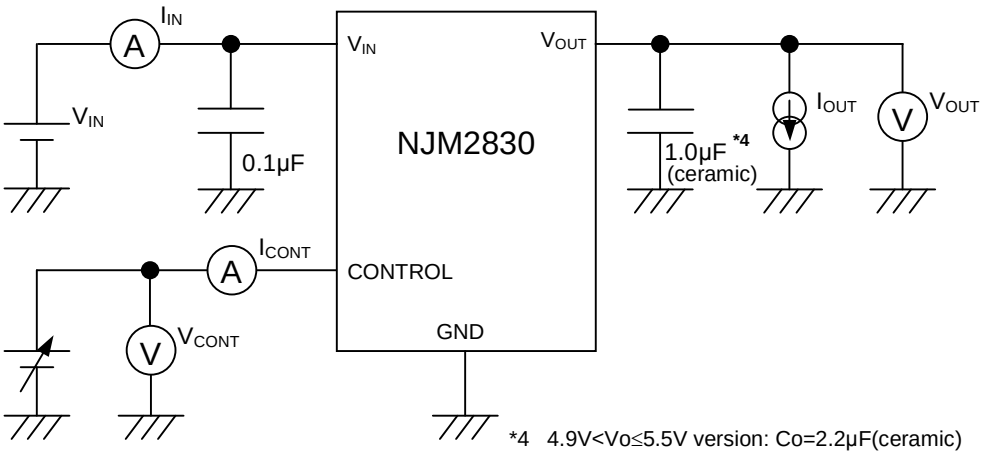
($V_{IN=}$ Vo+1V, C_{IN}=0.1μF, Co=1.0μF (4.9V<Vo≤5.5V:Co=2.2μF, 2.9V<Vo≤4.9V:Co=4.7μF, Vo≤2.9V: Co=10μF),Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Io=30mA	-1.0%	–	+1.0%	V
		Io=30mA, Ta= -40°C to +125°C	-2.5%	–	+2.5%	
Quiescent Current	I_Q	Io=0mA, except Icont, Vo≤5V Version	–	130	180	μA
		Io=0mA, except Icont, Ta= -40°C to +125°C, Vo≤5V Version,	–	–	240	
		Io=0mA, except Icont, 5V≤Vo≤10V Version	–	145	195	μA
		Io=0mA, except Icont, Ta= -40°C to +125°C, 5V≤Vo≤10V Version	–	–	255	
		Io=0mA, except Icont, 10V<Vo≤15V Version	–	160	210	μA
		Io=0mA, except Icont, Ta= -40°C to +125°C, 10V<Vo≤15V Version	–	–	270	
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V	–	–	100	nA
		V_{CONT}=0V, Ta= -40°C to +125°C	–	–	250	
Output Current	Io	Vo-0.3V	300	400	–	mA
		Vo-0.3V, Ta= -40°C to +125°C	300	–	–	
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V to Vo+6V (Vo≤12V Version) V_{IN}=Vo+1V to 18V (Vo>12V Version), Io=30mA	–	–	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 to 300mA	–	–	0.009	%/mA
Dropout Voltage(*3)	ΔV_{I-O}	Io=100mA	–	0.10	0.18	V
		Io=100mA, Ta= -40°C to +125°C	–	–	0.23	
Ripple Rejection	RR	ein=200mVrms,f=1kHz,Io=10mA,Vo=3V Version	–	75	–	dB
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
		V_{CONT}=2.1V, Ta= -40°C to +125°C	–	–	20	
Control Voltage for ON-state	$V_{CONT(ON)}$		1.6	–	–	V
		Ta= -40°C to +125°C	2.1	–	–	
Control Voltage for OFF-state	$V_{CONT(OFF))}$		–	–	0.6	V
		Ta= -40°C to +125°C	–	–	0.5	
Input Voltage	V_{IN}		–	–	18	V
		Ta= -40°C to +125°C	–	–	18	

(*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.

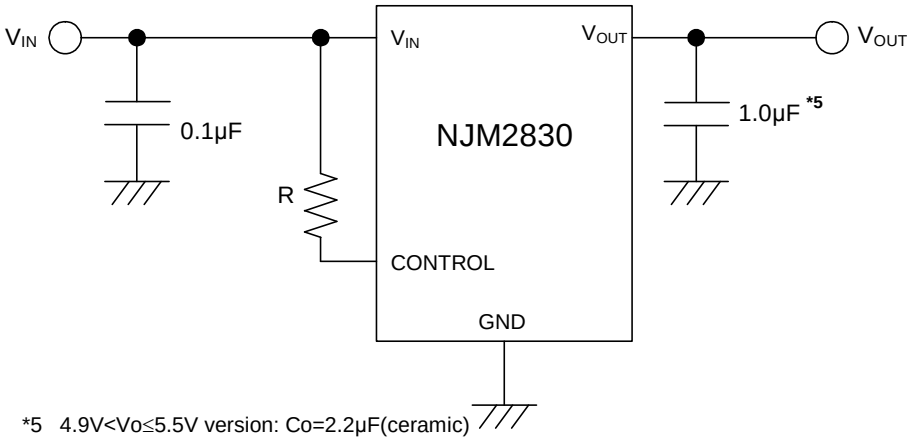
■ TEST CIRCUIT



*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

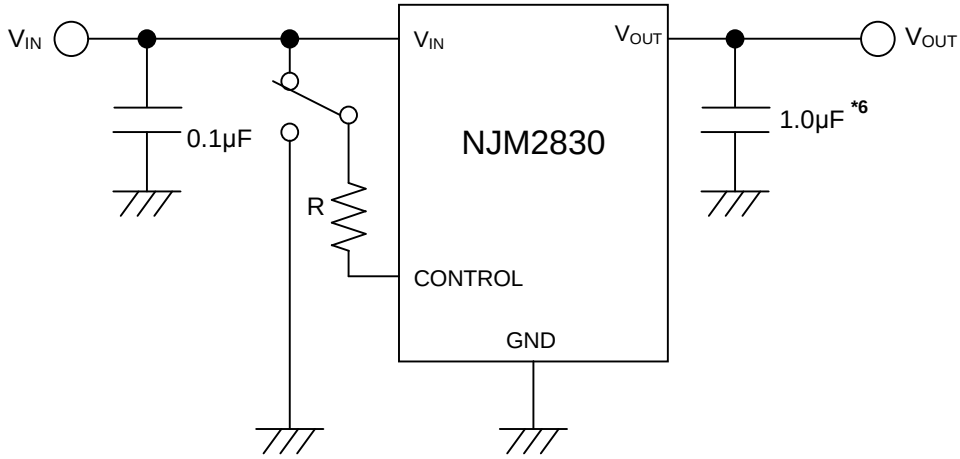
① In the case where ON/OFF Control is not required:



*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 terminal to V_{IN} terminal.
By connecting resistance between Control and $V_{IN,}$ current decrease and minimum operation voltage increase.

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 terminal:
•"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 Capacitance C_{IN}

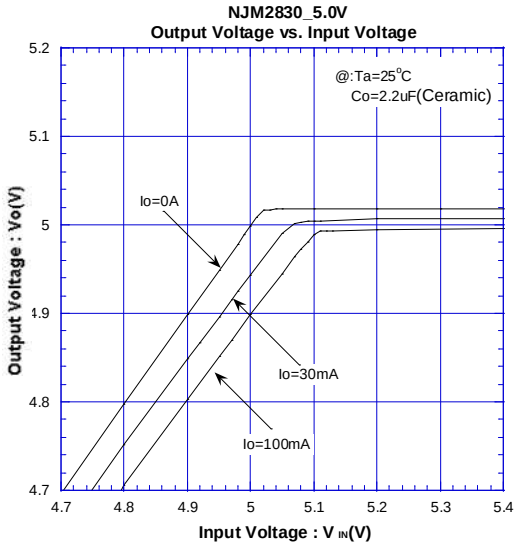
Input Capacitor C_{IN} is required to prevent oscillation and reduce power supply ripple for applications when high power supply impedance or a long power supply line. Therefore, use the recommended C_{IN} value (refer to conditions of ELECTRIC CHARACTERISTIC) or larger and should connect between GND and V_{IN} as shortest path as possible to avoid the problem.

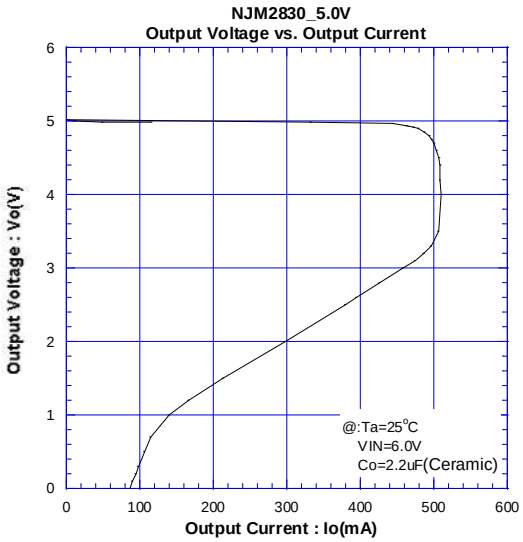
∗Output Capacitance C_O

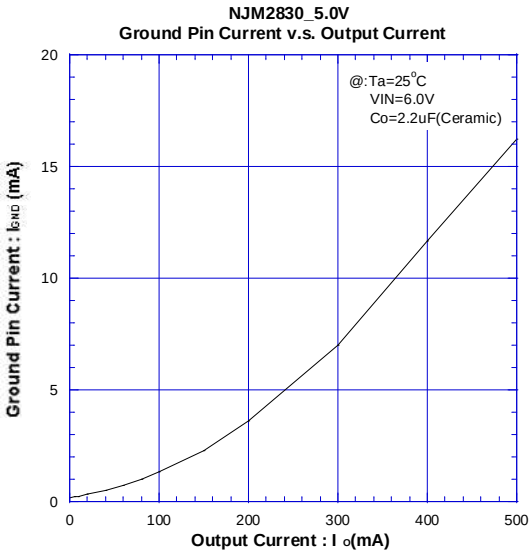
Output capacitor (C_O) will be required for a phase compensation of the internal error amplifier.
The capacitance and the equivalent series resistance (ESR) influence to stable operation of the regulator.
Use of a smaller C_O may cause excess output noise or oscillation of the regulator due to lack of 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.

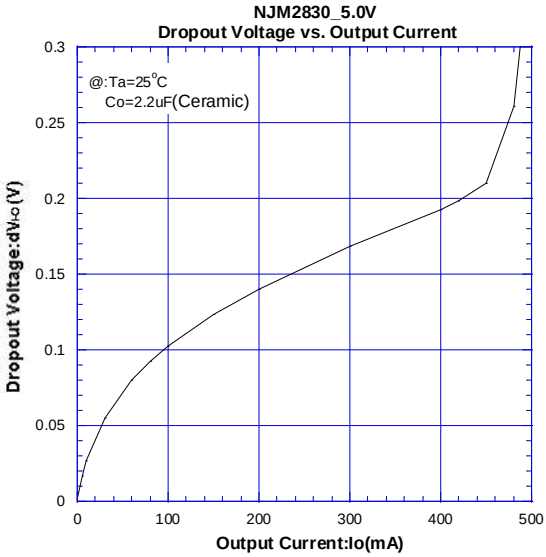
■ TYPICAL CHARACTERISTICS

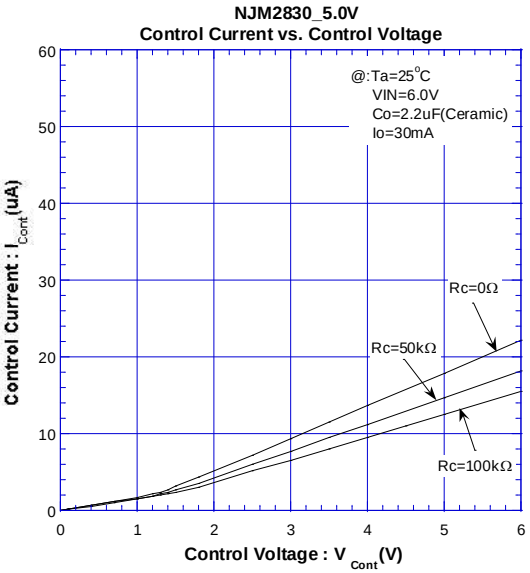
●DC CHARACTERISTICS (5V Version)

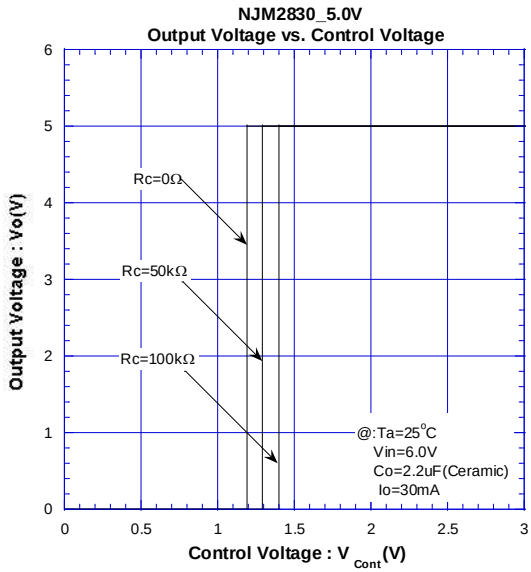




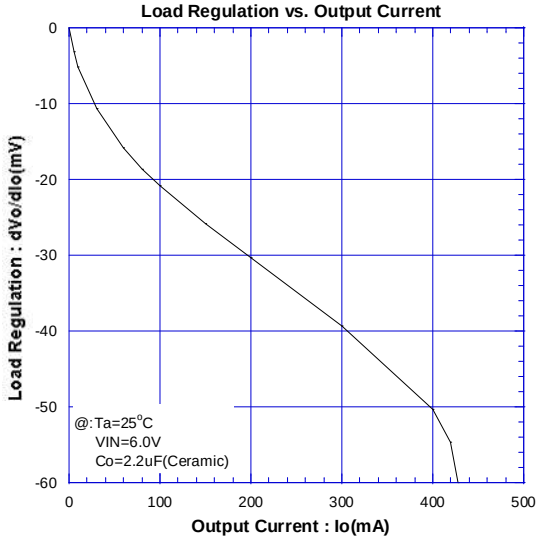




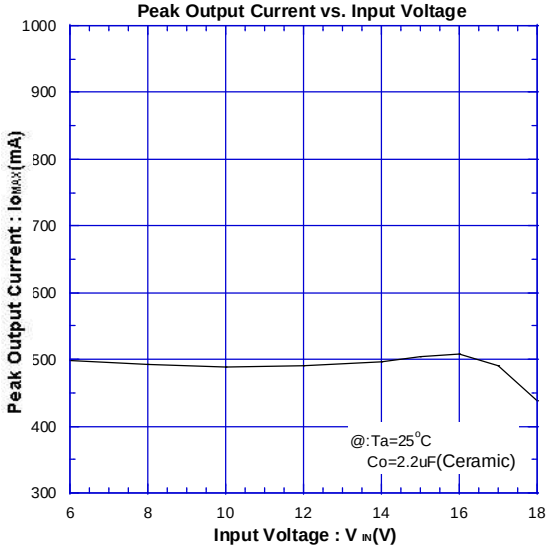




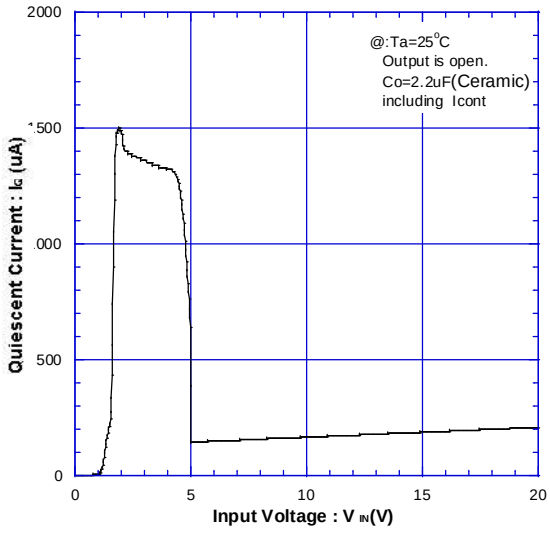
NJM2830_5.0V
Load Regulation vs. Output Current



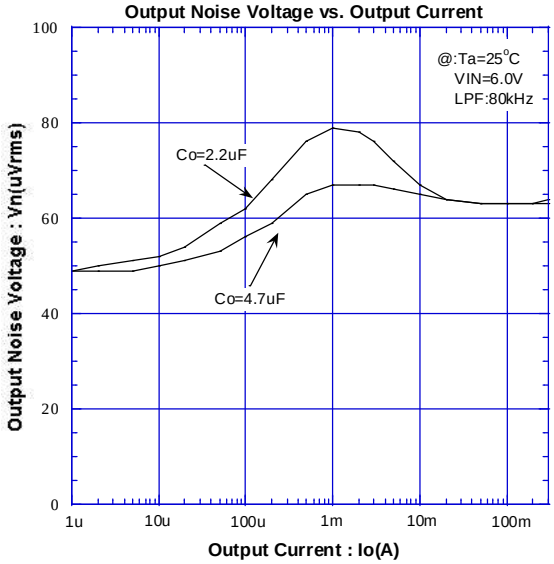
NJM2830_5.0V
Peak Output Current vs. Input Voltage



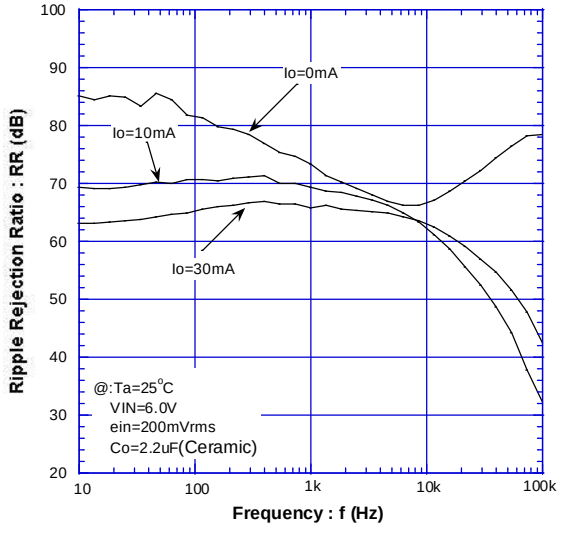
NJM2830_5.0V
Quiescent Current v.s. Input Voltage



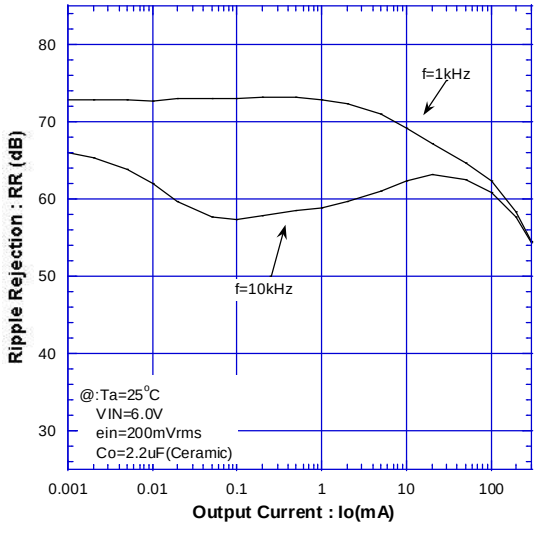
NJM2830_5.0V
Output Noise Voltage vs. Output Current



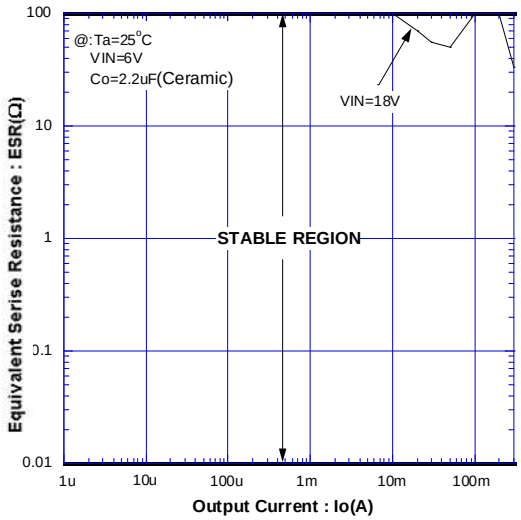
NJM2830_5.0V
Ripple Rejection Ratio v.s. Frequency



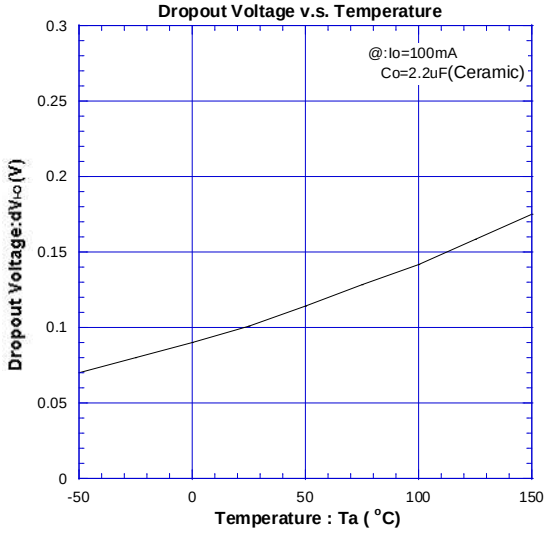
NJM2830_5.0V
Ripple Rejection vs. Output Current



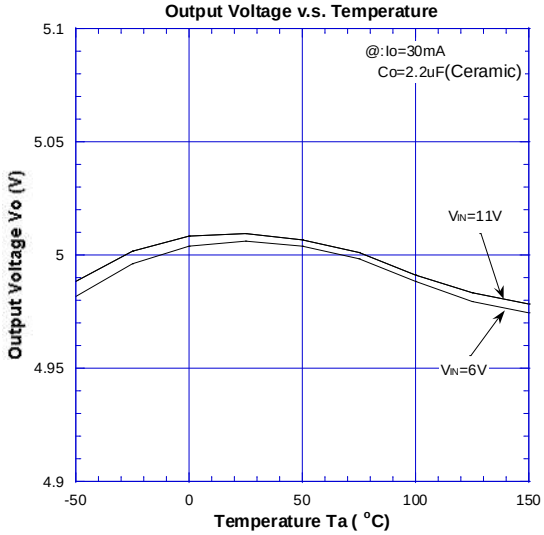
NJM2830_5.0V
Equivalent Serise Resistance vs. Output Current



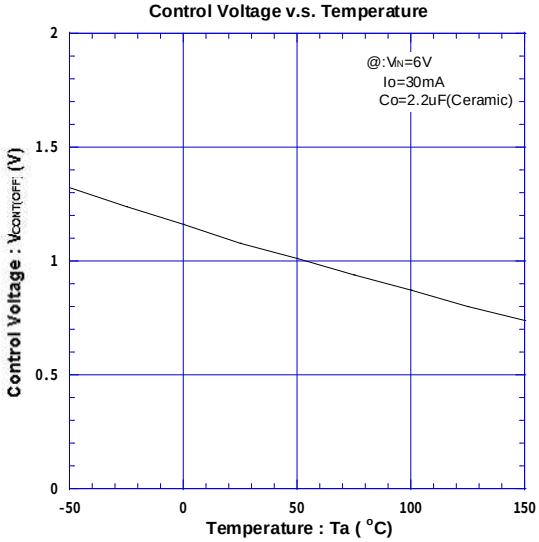
NJM2830_5.0V
Dropout Voltage v.s. Temperature



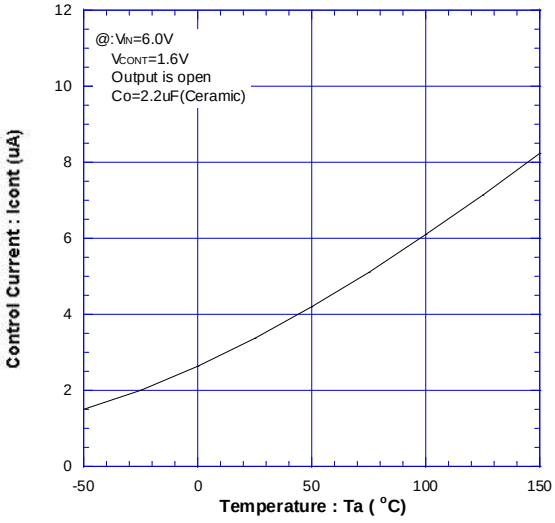
NJM2830_5.0V
Output Voltage v.s. Temperature



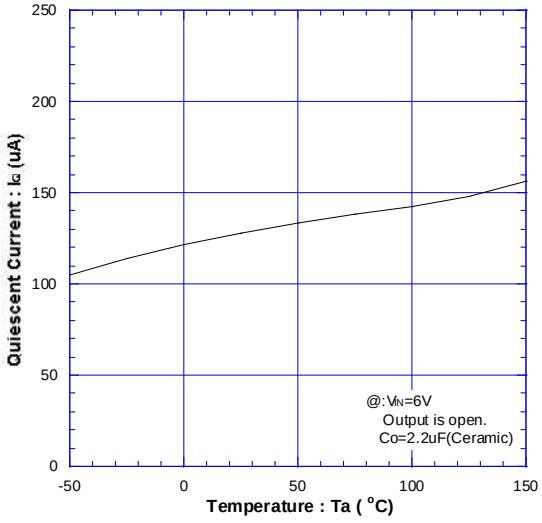
NJM2830_5.0V
Control Voltage v.s. Temperature

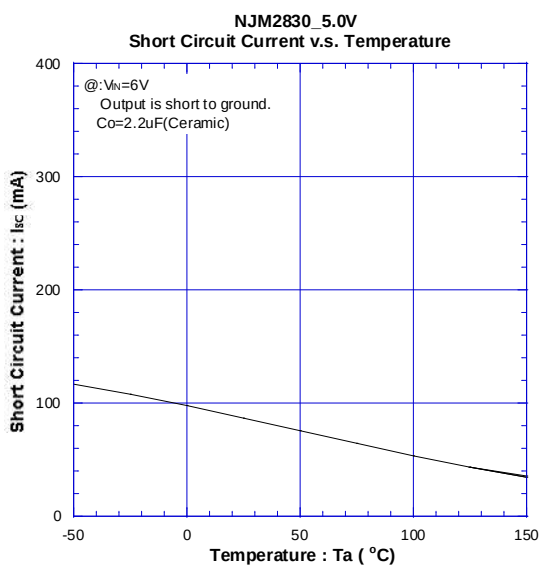


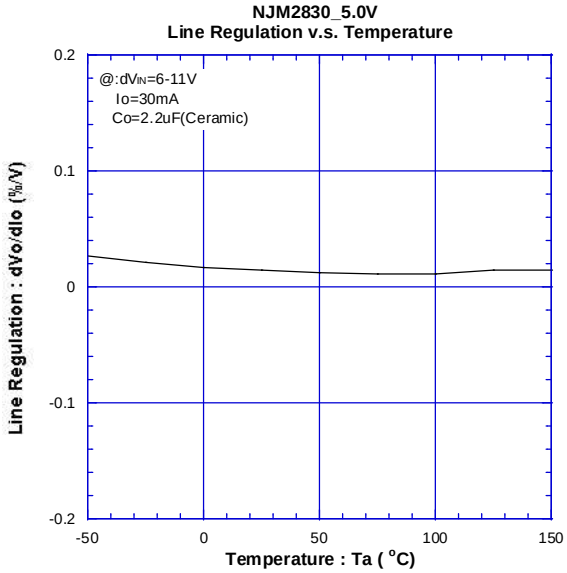
NJM2830_5.0V
Control Current v.s. Temperature

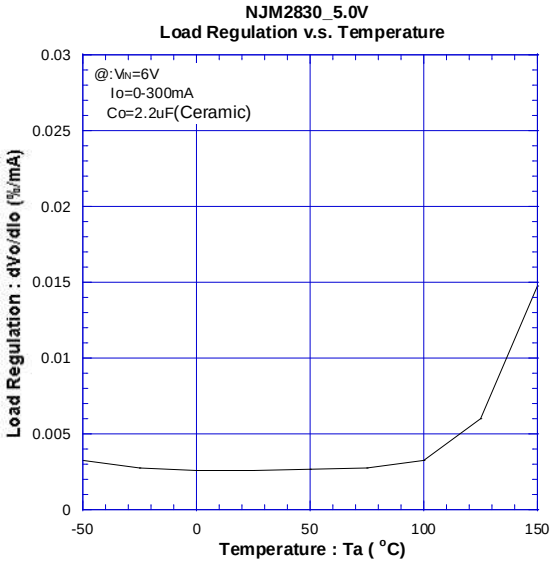


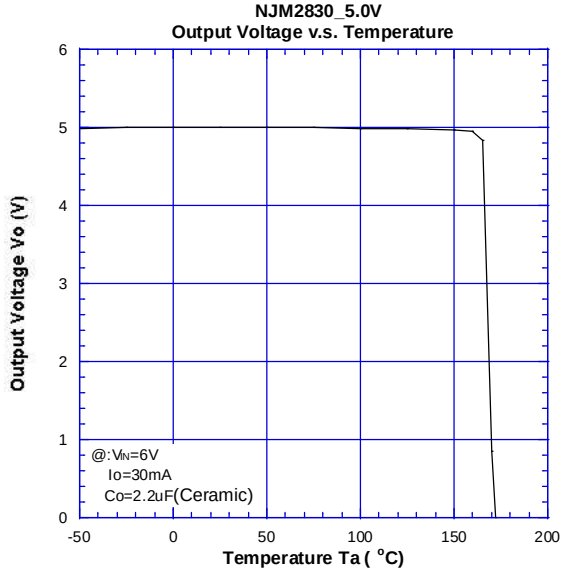
NJM2830_5.0V
Quiescent Current v.s. Temperature



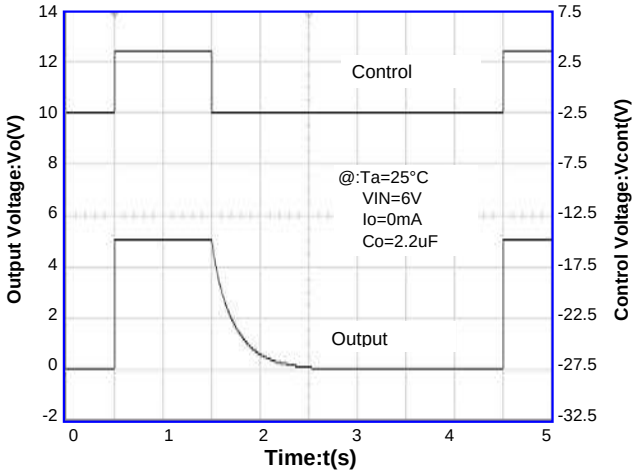

NJM2830_5.0V
Short Circuit Current v.s. Temperature
@:VIN=6V
Output is short to ground.
Co=2.2uF(Ceramic)
Short Circuit Current : Isc (mA)
Temperature : Ta (°C)


NJM2830_5.0V
Line Regulation v.s. Temperature
@:dVIN=6-11V
Io=30mA
Co=2.2uF(Ceramic)
Line Regulation : dVo/dIo (%/V)
Temperature : Ta (°C)

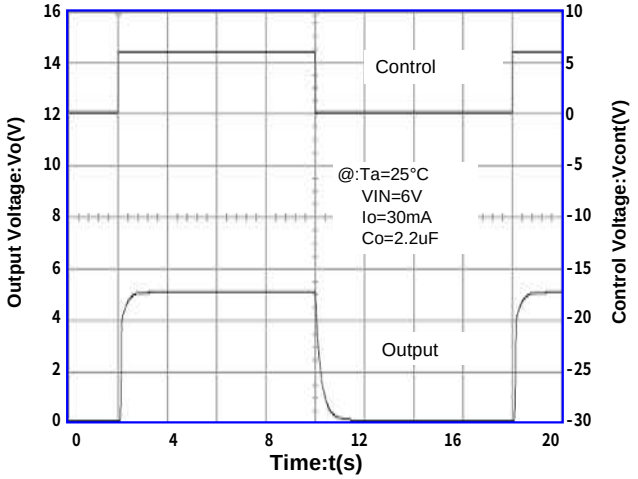

NJM2830_5.0V
Load Regulation v.s. Temperature
@:VIN=6V
Io=0-300mA
Co=2.2uF(Ceramic)
Load Regulation : dVo/dIo (%/mA)
Temperature : Ta (°C)


NJM2830_5.0V
Output Voltage v.s. Temperature
@:VIN=6V
Io=30mA
Co=2.2uF(Ceramic)
Output Voltage Vo (V)
Temperature Ta (°C)

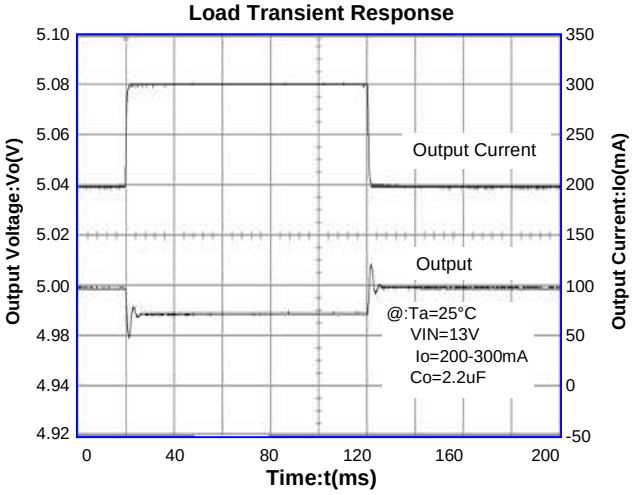
NJM2830_5.0V
ON/OFF Transient Resonse without Load



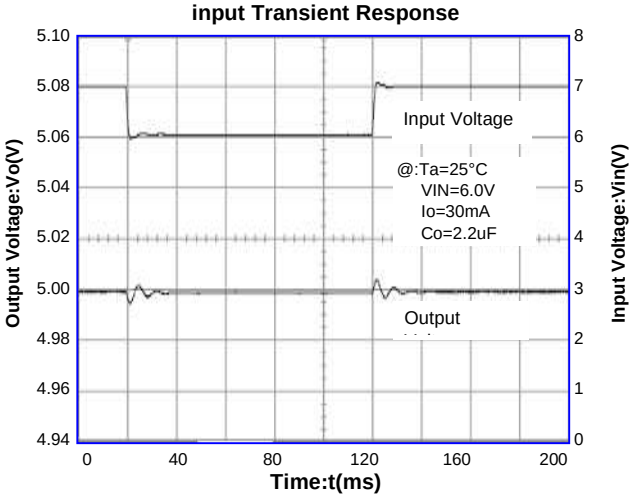
NJM2830_5.0V
ON/OFF Transient Resonse



NJM2830_5.0V
Load Transient Response



NJM2830_5.0V
input Transient Response



[CAUTION]
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