LOW DROPOUT VOLTAGE REGULATOR

■ GENERAL DESCRIPTION

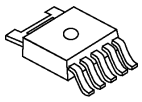
The NJM2817 is a low dropout voltage regulator with ON/OFF control.

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

It delivers up to 5V/3A output power with the maximum input voltage of 8V.

The NJM2817 is suitable for audio/video and digital applications.

■ PACKAGE OUTLINE

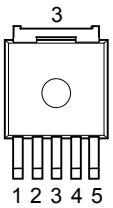


NJM2817DL3

■ FEATURES

- High Ripple Rejection 65dB typ. (f=1kHz,3V Version)
- Output Noise Voltage Vno=42μVrms typ. (Vo=3V Version)
- Output capacitor with 4.7μF ceramic capacitor (Vo≥2.1V)
- Output Current Io(max.)=3.0A
- High Precision Output Vo ±1.0%
- Low Dropout Voltage 0.12V typ. (Io=1.5A, 3.0V Version)
- ON/OFF Control
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Package Outline TO-252-5

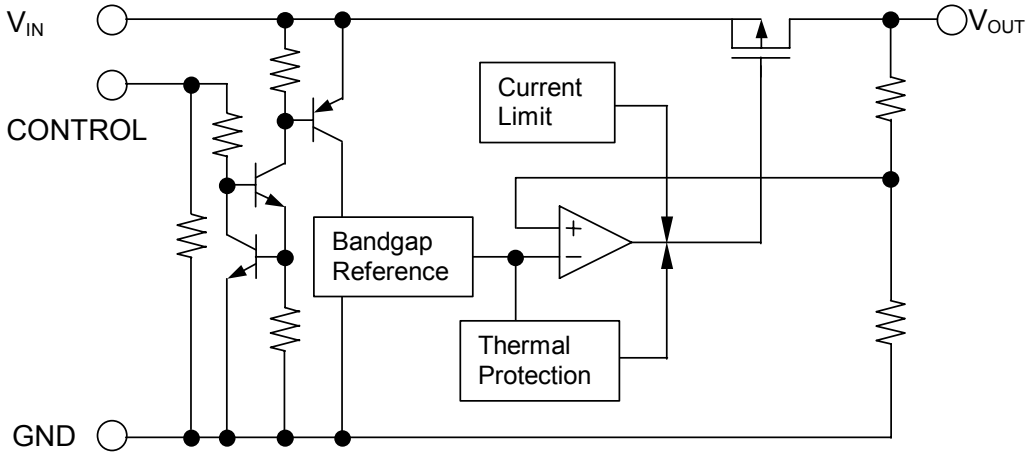
■ PIN CONFIGURATION



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

NJM2817DL3

■ EQUIVALENT CIRCUIT



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}
NJM2817DL3-18	1.8V
NJM2817DL3-21	2.1V
NJM2817DL3-03	3.0V
NJM2817DL3-05	5.0V

Output voltage options available : 1.8 ~ 5.0V (0.1V step)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+8	V
Control Voltage	V_{CONT}	+8	V
Power Dissipation	P_D	1190(*1) 3125(*2)	mW
Operating Temperature	Topr	-40 ~ +85	°C
Storage Temperature	Tstg	-40 ~ +150	°C

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

■ OPERATING VOLTAGE

$V_{IN}=V_O + \Delta V_{I-O}$ ~ +7V (In case of 2.1V ≤ V_O ≤ 5.0V version)
V_{IN}=2.3V ~ +7V (In case of V_O < 2.1V version)

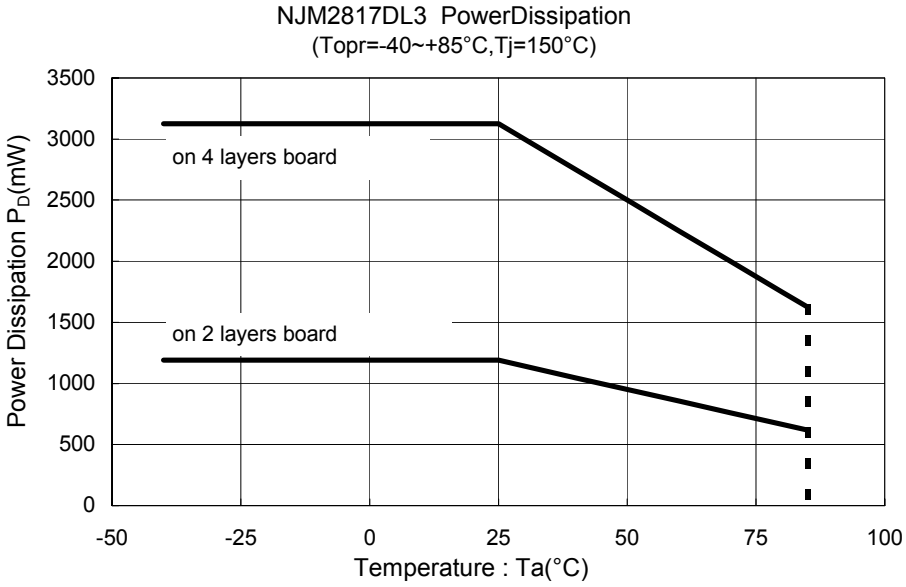
■ ELECTRICAL CHARACTERISTICS

(V_{IN}=Vo+1V, C_{IN}=4.7µF(C_{IN}=10µF:Vo<2.1V), Co=4.7µF(Co=33µF : Vo<2.1V), Ta=25°C)

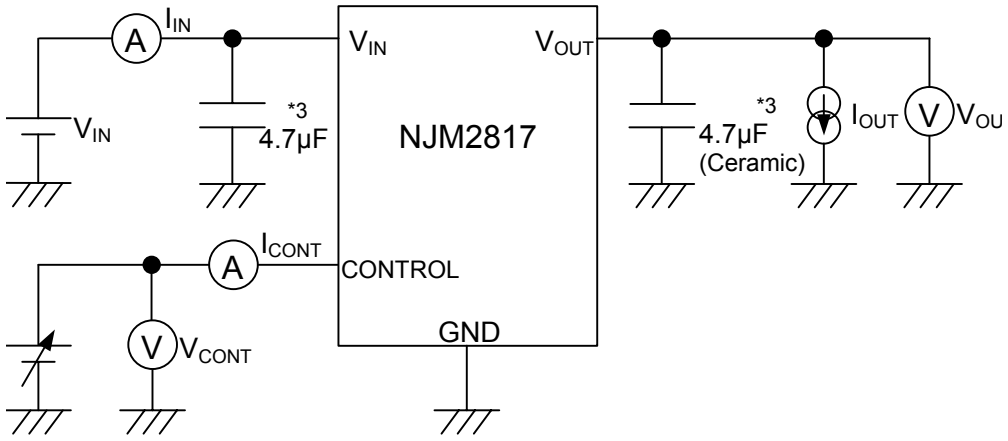
PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage	Vo	Io=100mA		-1.0%	-	+1.0%	V
Quiescent Current	I_Q	Io=0mA, except I_{CONT}		-	700	1200	µA
Quiescent Current at Control OFF	$I_{Q\,(OFF)}$	V_{CONT}=0V		-	-	1	µA
Output Current	Io	Vo x 0.9V		3	5	-	A
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V ~ 7V, Io=100mA		-	0.01	0.05	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 ~ 3.0A		-	0.05	0.3	%/A
Dropout Voltage(*2)	ΔV_{I-O}	Io=1.0A	2.1V ≤ Vo < 2.5V	-	0.16	0.27	V
			2.5V ≤ Vo < 2.8V	-	0.13	0.22	
			2.8V ≤ Vo < 3.4V	-	0.12	0.20	
			3.4V ≤ Vo ≤ 5.0V	-	0.11	0.18	
Ripple Rejection	RR	ein=200mVrms,f=1kHz, Io=100mA,Vo=3V Version		-	65	-	dB
Average Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta Ta$	Ta=0 ~ 85°C, Io=100mA		-	±50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz ~ 80kHz, Io=100mA, Vo=3V Version		-	42	-	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
Minimum Input Voltage	$V_{IN\,(MIN.)}$	Vo<2.1V	Io≤1.5A, Vo×0.96	2.3	-	-	V
			1.5A<Io≤2.0A, Vo×0.96	2.4	-	-	V

(*2): The output voltage excludes under 2.1V.
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.

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



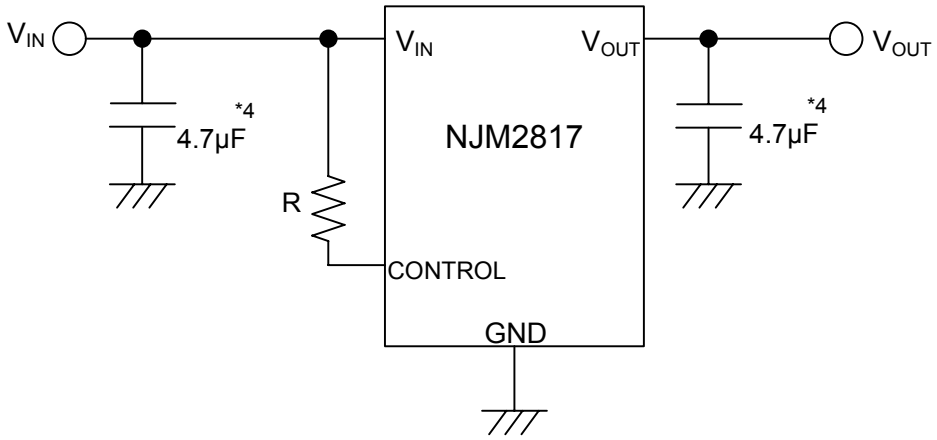
■ TEST CIRCUIT



*3 : Vo < 2.1V version : C_{IN}=10µF
Vo < 2.1V version : Co=33µF(Ceramic)

■ TYPICAL APPLICATION

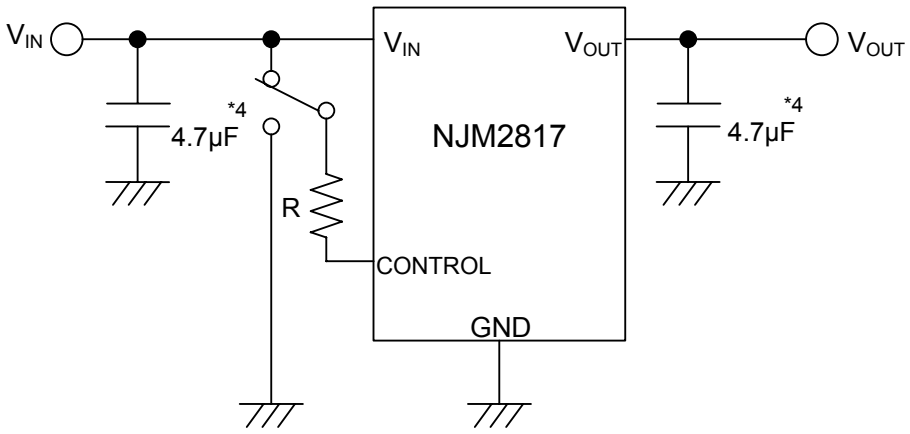
① In the case where ON/OFF Control is not required:



*4 : Vo < 2.1V version : C_{IN}=10μF
Vo < 2.1V version : Co=33μF

Connect control terminal to V_{IN} terminal

② In use of ON/OFF CONTROL:



*4 : Vo < 2.1V version : C_{IN}=10μF
Vo < 2.1V version : Co=33μF

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.

The current flow into the control terminal while the IC is ON state (I_{CONT}) can be reduced when a pull up resistance "R" is inserted between V_{IN} and the control terminal.

The minimum control voltage for ON state ($V_{CONT\,(ON)}$) is increased due to the voltage drop caused by I_{CONT} and the resistance "R". The I_{CONT} is temperature dependence as shown in the "Control Current vs. Temperature" characteristics. Therefore, the resistance "R" should be carefully selected to ensure the control voltage exceeds the $V_{CONT\,(ON)}$ over the required temperature range.

∗Input Capacitance C_{IN}

Input Capacitance C_{IN} is required to prevent oscillation and reduce power supply ripple for applications with high power supply impedance or a long power supply line.
Use the C_{IN} value of 4.7µF greater to avoid the problem.
C_{IN} should connect between GND and V_{IN} as short as possible.

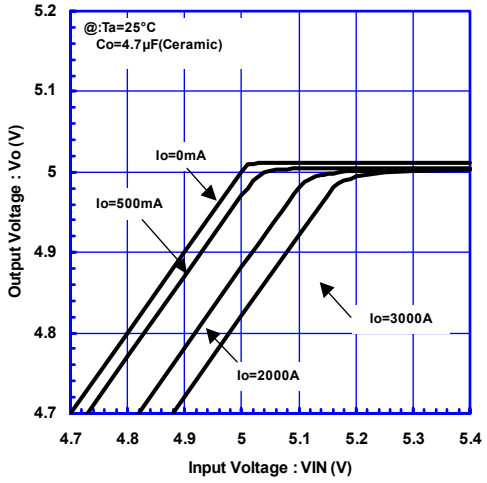
∗Output Capacitance C_O

Output capacitor (Co) is required for a phase compensation of the internal error amplifier. The capacitance and the equivalent series resistance (ESR) influence stability of the regulator.
If use a smaller Co, it may cause excess output noise or oscillation of the regulator due to lack of the phase compensation. Therefore, use Co with the recommended capacitance or greater value and connect between Vo terminal and GND terminal with minimal wiring.
The recommended capacitance depends on the output voltage. Low voltage regulator requires greater value of the Co. Thus, check the recommended capacitance for each output voltage.
Use of a greater Co reduces output noise and ripple output, and also improves transient response of the output voltage against rapid load change.
This product is designed to work with any capacitor including a low ESR capacitor for the Co; however, refer "Equivalent Series Resistance vs. Output Current" and choose suitable capacitor.

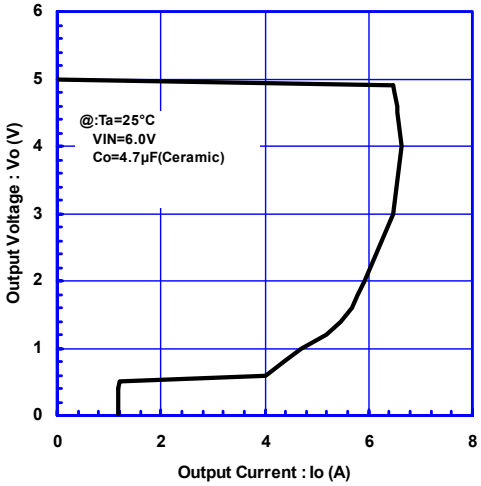
∗ When distance from an IC to load is long, an IC may cause malfunction by wiring capacity and an L ingredient Please use it after having evaluated it enough.

■ TYPICAL CHARACTERISTICS

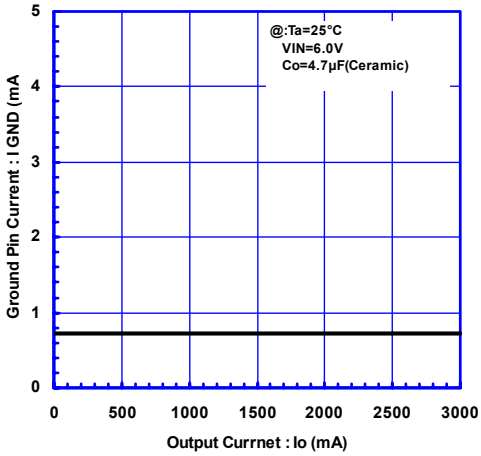
NJM2817_5.0V
Output Voltage vs.Input Voltage



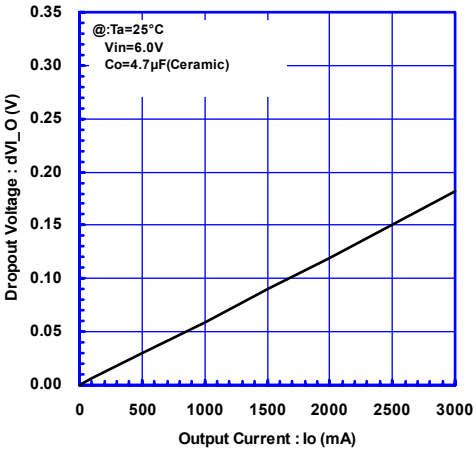
NJM2817_5.0V
Output Voltage vs.Output Current



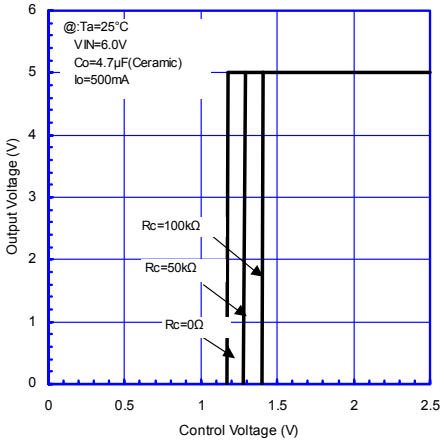
NJM2817_5.0V
Ground Pin Current vs.OutputCurrent



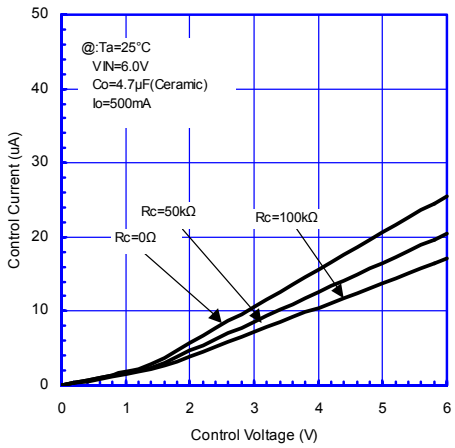
NJM2817_5.0V
Dropout Voltage vs.Output Current



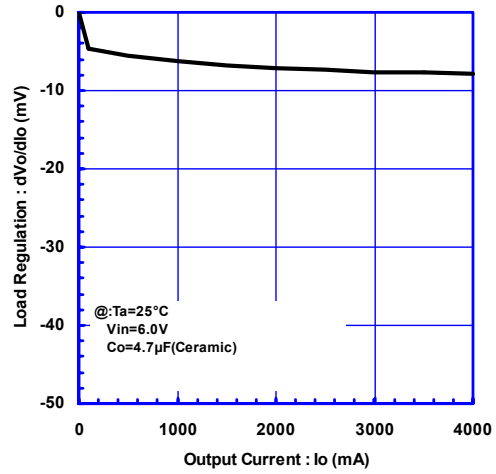
NJM2817_5.0V
Output Voltage vs.Control Voltage



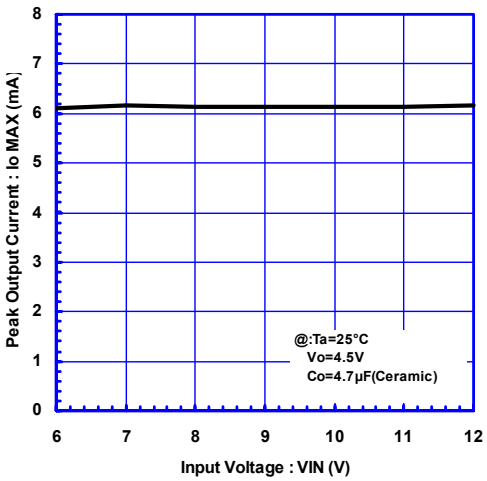
NJM2817_5.0V
Control Current vs.Control Voltage



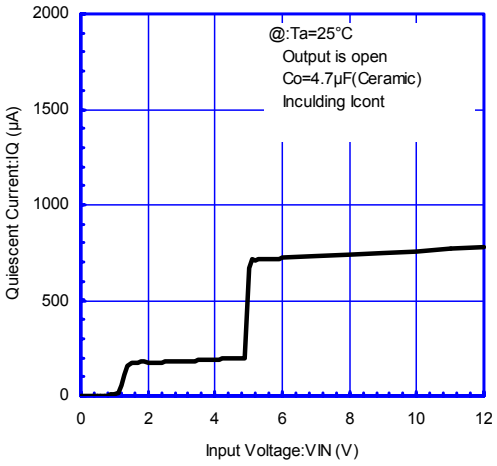
NJM2817_5.0V
Load Regulation vs.Output Current



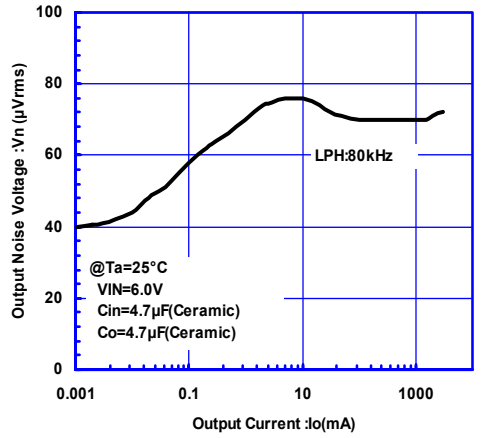
NJM2817_5.0V
Peak Output Current vs.Input Voltage



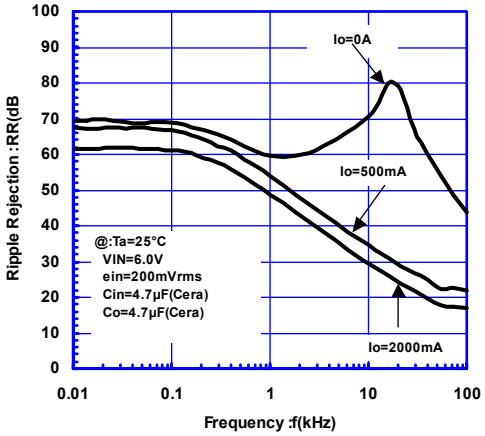
NJM2817_5.0V
Quiesient Current vs.Input Voltage



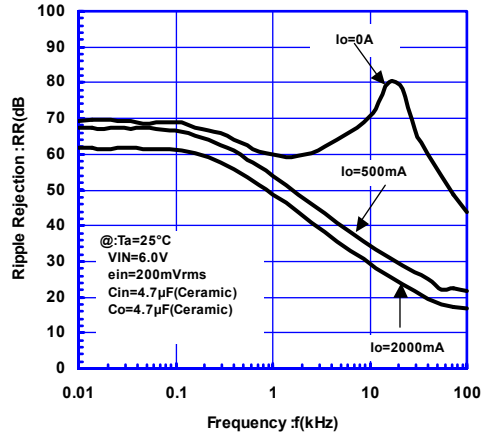
NJM2817_5.0V
Output Noize Voltage vs.Output Current



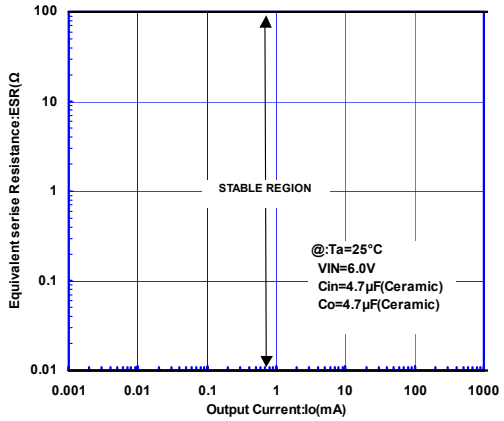
NJM2817_5.0V
Ripple Rejection Ratio vs.Frequency



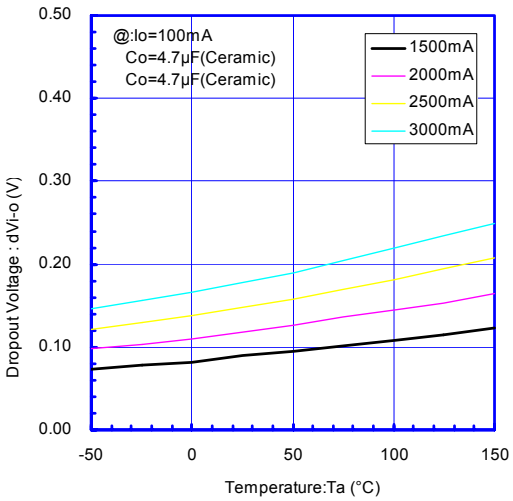
NJM2817_5.0V
Ripple Rejection Ratio vs.Frequency



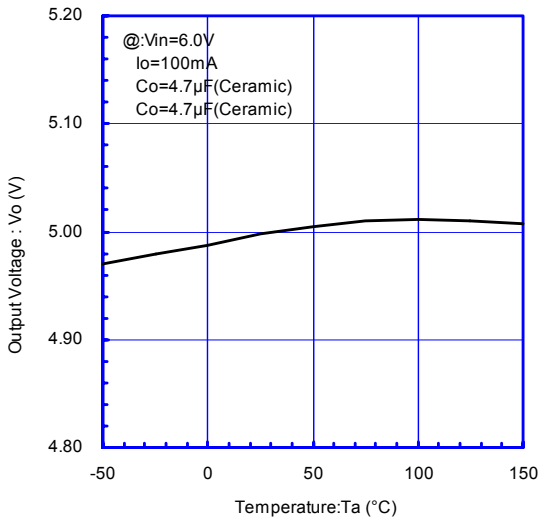
NJM2817_5.0V
Equivalent Serise Resistance vs. Output Current



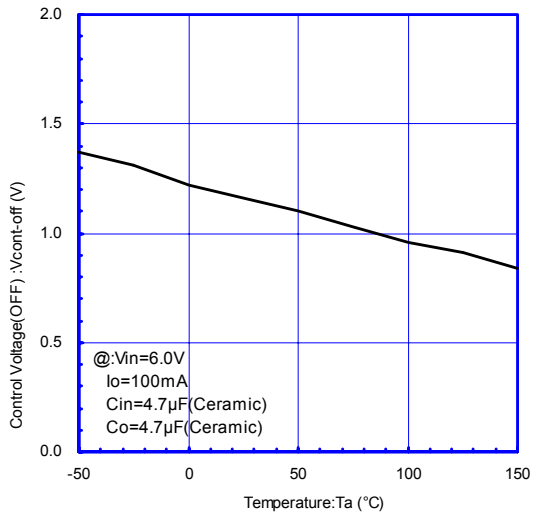
NJM2817_5.0V
Dropout Voltage vs.Temperature



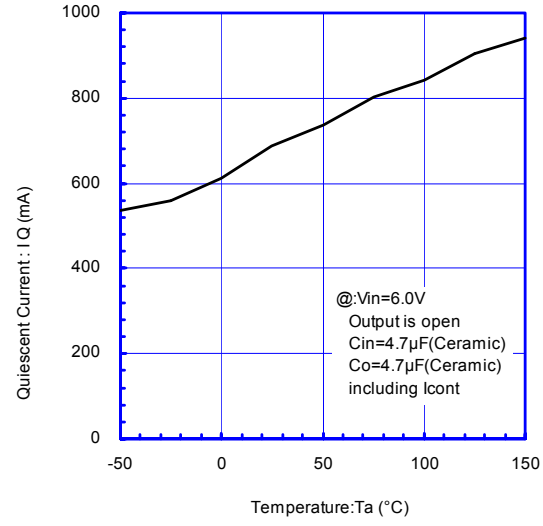
NJM2817_5.0V
Output Voltage vs.Temperature



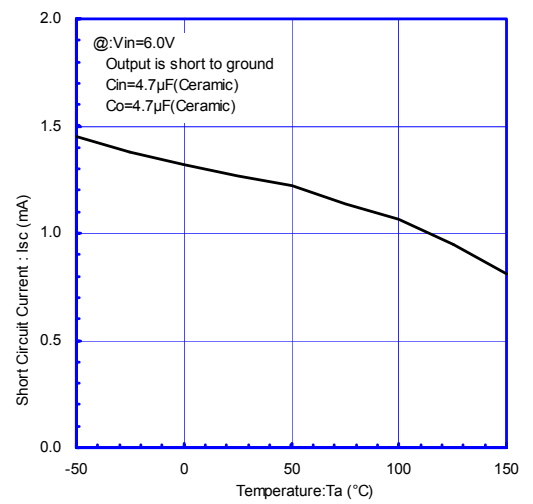
NJM2817_5.0V
Control Voltage vs.Temperature



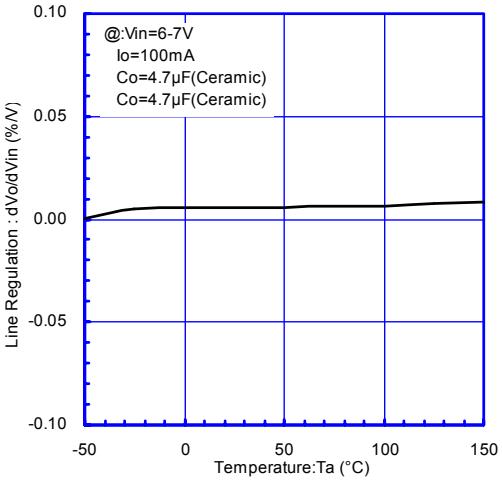
NJM2817_5.0V
Quiescent Current vs.Temperature



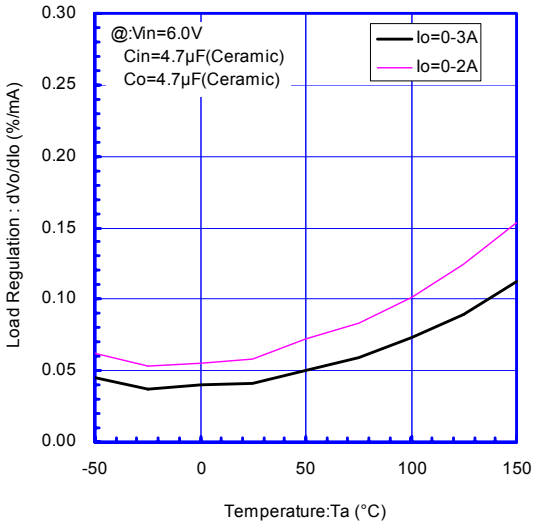
NJM2817_5.0V
Short Circuit Current vs.Temperature



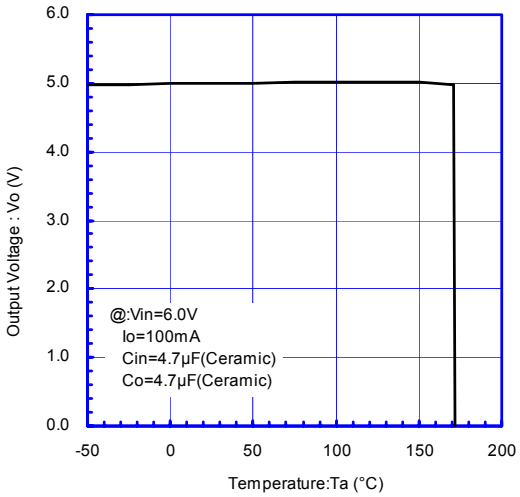
NJM2817_5.0V
Line Regulation vs.Temperature



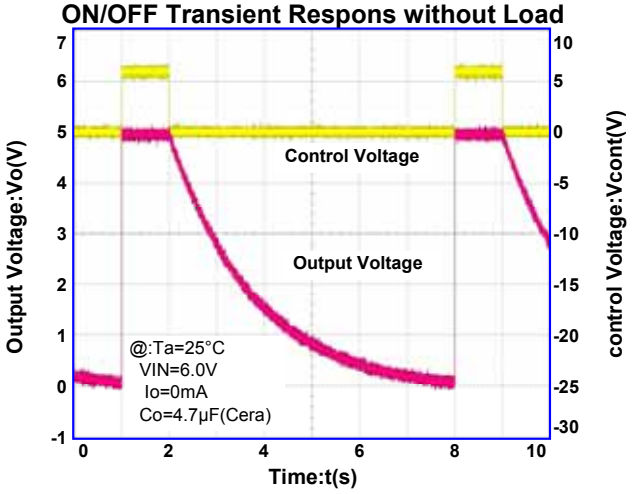
NJM2817_5.0V
Load Regulation vs.Temperature



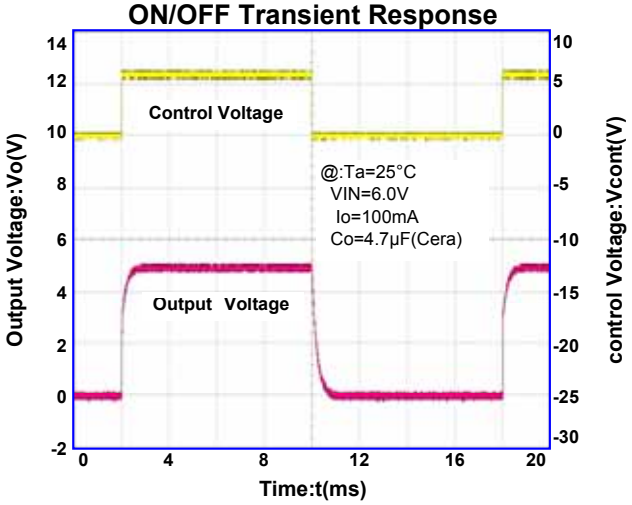
NJM2817_5.0V
Output Voltage vs.Temperature



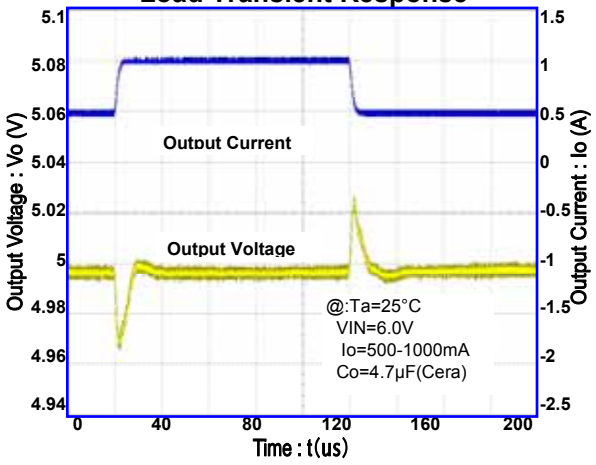
NJM2817_5.0V
ON/OFF Transient Respons without Load



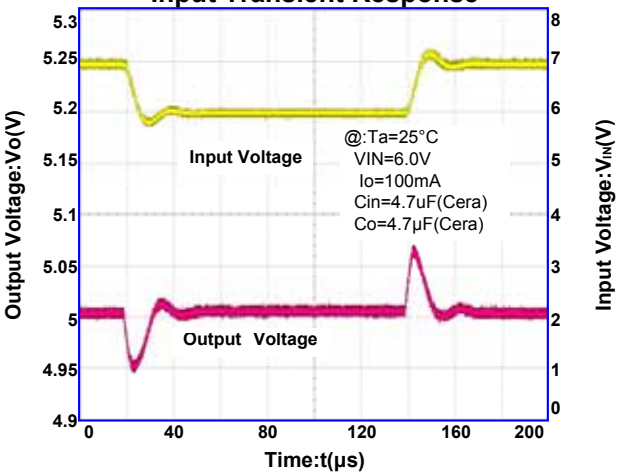
NJM2817_5.0V
ON/OFF Transient Response



NJM2817_5.0V
Load Transient Response



NJM2817_5.0V
Input Transient Response



[CAUTION]
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