LOW DROPOUT VOLTAGE REGULATOR

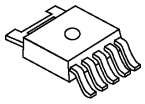
■ GENERAL DESCRIPTION

The NJM2837 is a 1A output low dropout voltage regulator. This product has Reverse Current Protection without external SBD

Advanced Bipolar technology achieves low noise, high ripple rejection and high supply voltage.

2.4V to 15V output voltage range, 2.2μF small decoupling capacitor, built-in noise bypass capacitor make the NJM2837 suitable for various applications.

■ PACKAGE OUTLINE

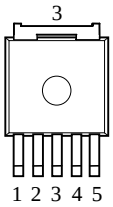


NJM2837DL3

■ FEATURES

- Output voltage options available 2.4 to 15.0V
- High Ripple Rejection 80dB typ. (f=1kHz,V_O=3V Version)
- Output Noise Voltage Vno=45μVrms typ.
- Output capacitor with 2.2μF ceramic capacitor ($V_O \geq 5.1V$)
- Output Current I_O(max.)=1A
- High Precision Output $V_O \pm 1.0\%$
- Low Dropout Voltage 0.2V typ. (I_O=600mA)
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Bipolar Technology
- Package Outline TO-252-5

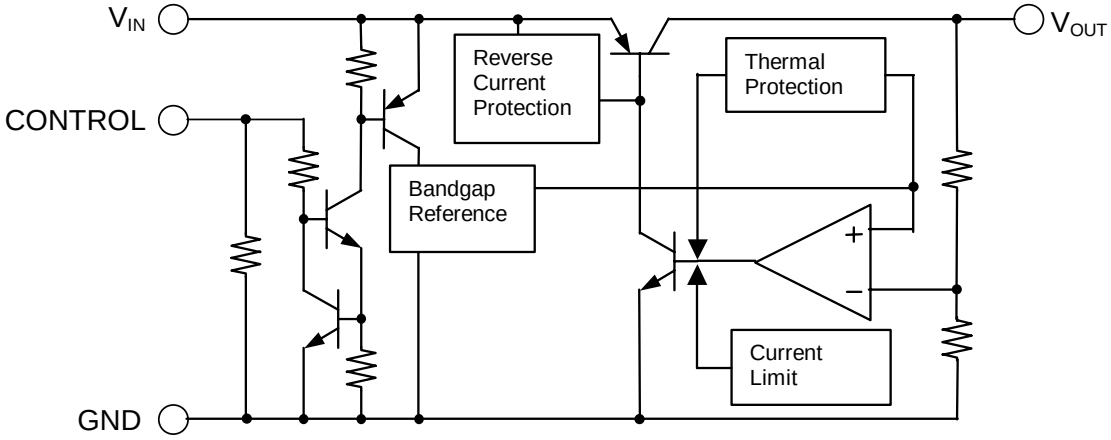
■ PIN CONFIGURATION



NJM2837DL3

PIN FUNCTION
1.CONTROL
2.V_{IN}
3.GND
4.V_O
5.NC

■ EQUIVALENT CIRCUIT



■ OUTPUT VOLTAGE RANK LIST

Device Name	V_{OUT}	Device Name	V_{OUT}
NJM2837DL3-24	2.4V	NJM2837DL3-85	8.5V
NJM2837DL3-03	3.0V	NJM2837DL3-12	12.0V
NJM2837DL3-05	5.0V	NJM2837DL3-15	15.0V

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+20	V
Control Voltage	V_{CONT}	+20	V
Output Terminal Voltage	$V_{o.max}$	V_O+1	V
Power Dissipation	P_D	1190 (*1) 3125(*2)	mW
Operating Temperature	Topr	-40 to +85	°C
Storage Temperature	Tstg	-40 to +150	°C

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

(*2): 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

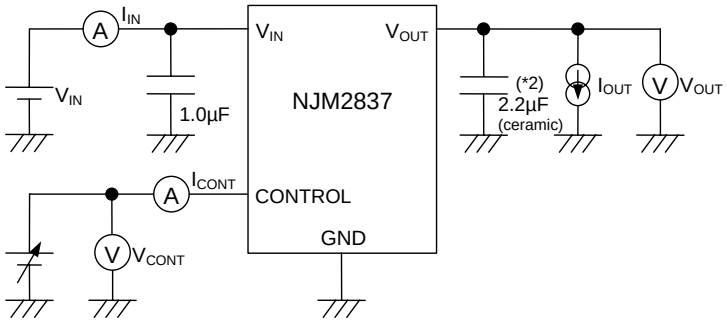
($V_{IN=}$ V_O+1V, C_{IN}=1.0μF, C_O=2.2μF (2.9V<V_O≤5V: C_O=4.7μF,V_O≤2.9V:C_O=10μF), Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION		MIN	TYP	MAX	UNIT
Output Voltage	V_O	I_O=30mA		-1.0%	-	+1.0%	V
Quiescent Current	I_Q	I_O=0mA	V_O≤5V Version	-	420	570	μA
			5V<V_O≤10V Version	-	435	585	μA
			10V<V_O≤15V Version	-	450	600	μA
Quiescent Current at Control OFF	$I_{Q(OFF)}$	V_{CONT}=0V		-	-	100	nA
Output Current	I_O	V_O×0.9V		1000	1300	-	mA
Line Regulation	$\Delta V_O/\Delta V_{IN}$	V_{IN}=V_O+1V to V_O+6V(V_O≤12V), V_{IN}=V_O+1V to 18V(V_O>12V), I_O=30mA		-	-	0.10	%/V
Load Regulation	$\Delta V_O/\Delta I_O$	I_O=0 to 1000mA		-	-	0.004	%/mA
Dropout Voltage	ΔV_{I-O}	I_O=600mA		-	0.20	0.28	V
Ripple Rejection	RR	ein=200mVrms, f=1kHz, I_O=10mA		See Fig.1			dB
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta Ta$	Ta=0 to 85°C, I_O=10mA		-	± 50	-	ppm/°C
Output Noise Voltage	V_{NO}	f=10Hz to 80kHz, I_O=10mA		See Fig.1			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
Input Voltage	V_{IN}			-	-	18	V

Fig. 1

Output Voltage	Ripple Rejection				Output Noise Voltage			
	MIN.	TYP.	MAX.	Unit	MIN.	TYP.	MAX.	Unit
2.4V	-	82	-	dB	-	41	-	μVrms
3.0V	-	80	-		-	45	-	
5.0V	-	77	-		-	68	-	
8.5V	-	73	-		-	107	-	
12.0V	-	70	-		-	148	-	
15.0V	-	68	-		-	173	-	

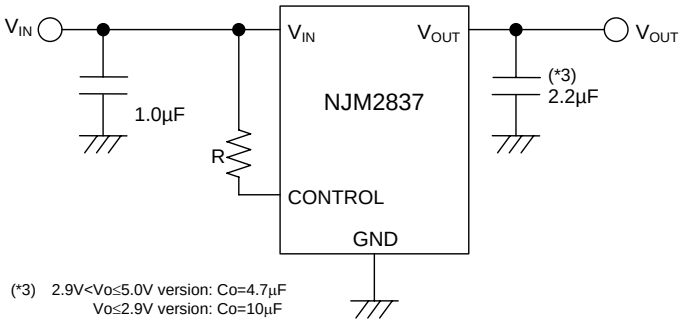
■ TEST CIRCUIT



(*2) 2.9V<Vo≤5.0V version: Co=4.7μF (ceramic)
Vo≤2.9V version: Co=10μF (ceramic)

■ TYPICAL APPLICATION

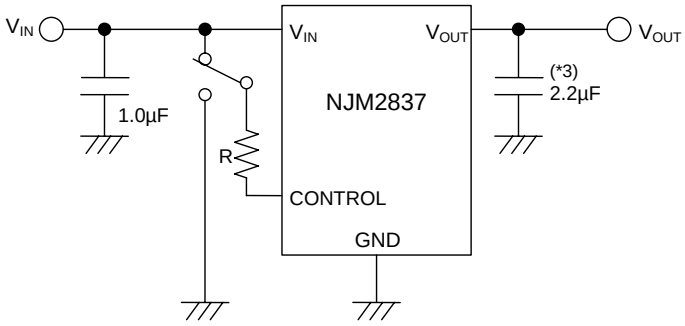
① In the case where ON/OFF Control is not required:



(*3) 2.9V<Vo≤5.0V version: Co=4.7μF
Vo≤2.9V version: Co=10μF

Connect control terminal to V_{IN} terminal

② In use of ON/OFF CONTROL:



(*3) 2.9V<Vo≤5.0V version: Co=4.7μF
Vo≤2.9V version: Co=10μF

State of control terminal: “H”→ output is enabled. “L” or “open” → output is disabled.

*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.
You should use the C_{IN} value of 0.1µF larger to avoid the problem.
C_{IN} should connect between GND and V_{IN} as short as possible.

*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.

*Output Capacitance C_O

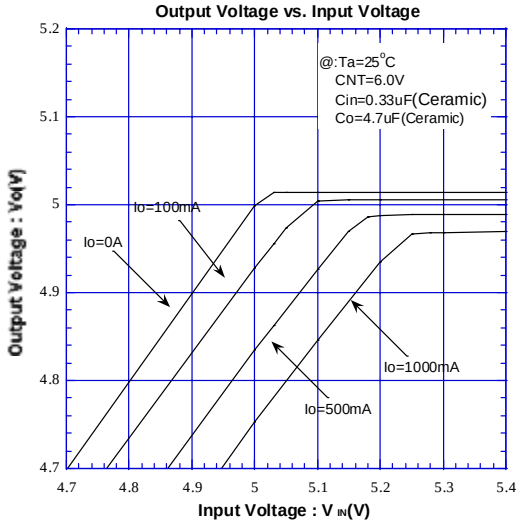
Output capacitor (C_O) will be required for a phase compensation of the internal error amplifier.
The capacitance and the equivalent series resistance (ESR) influence to stable operation of the regulator.
This product is designed to work with a low ESR capacitor (C_O). However use of recommended capacitance or larger value is effective for stable operation.
Use of a smaller C_O may cause excess output noise or oscillation of the regulator due to lack of the phase compensation.
Therefore use C_O with the recommended capacitance or larger value and connect between V_O terminal and GND terminal with shortest path. The recommended capacitance depends on the output voltage rank. Low voltage regulator requires larger value C_O. Thus, check the recommended capacitance for each output voltage rank.
Use of a larger C_O reduces output noise and ripple output, and also improves output transient response against rapid load change.

*Reverse Current Protection

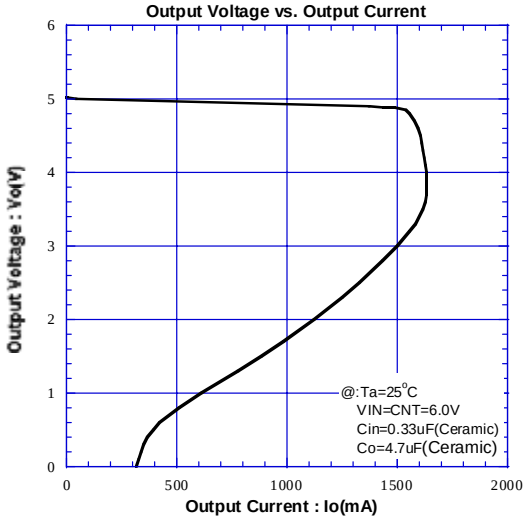
A reverse current protection circuit is built-in to this product and prevents a current inflow from an Output terminal to the Input terminal when the input terminal voltage became lower than the output terminal voltage.
When a regulator is controlled by off (V_{CONT}<0.6V), the reverse current protection circuit functions.

■ TYPICAL CHARACTERISTICS

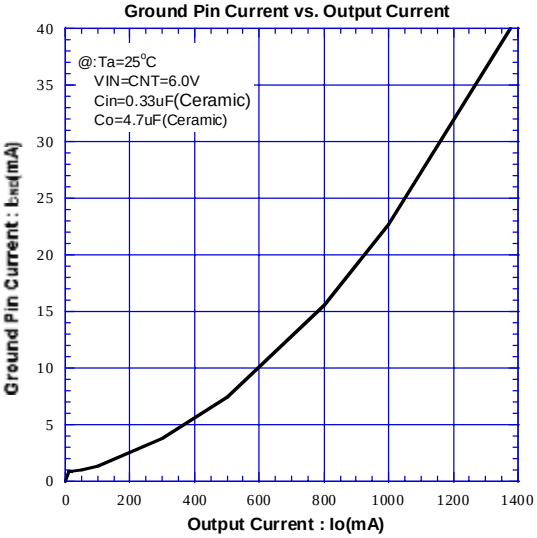
NJM2837_5.0V
Output Voltage vs. Input Voltage



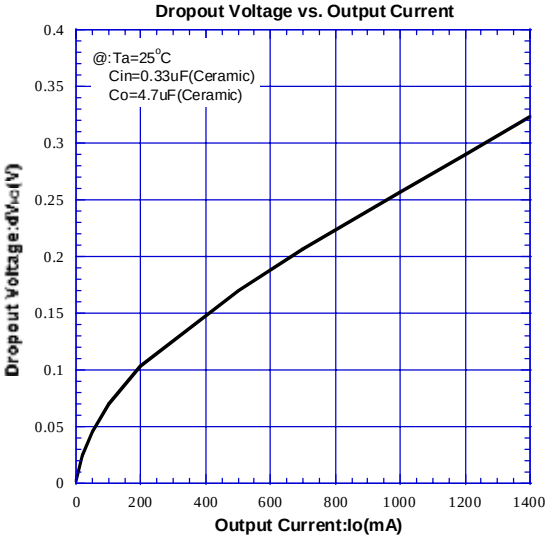
NJM2837_5.0V
Output Voltage vs. Output Current



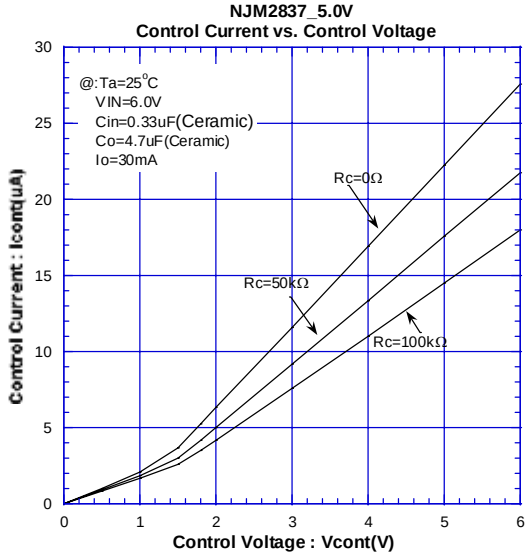
NJM2837_5.0V
Ground Pin Current vs. Output Current



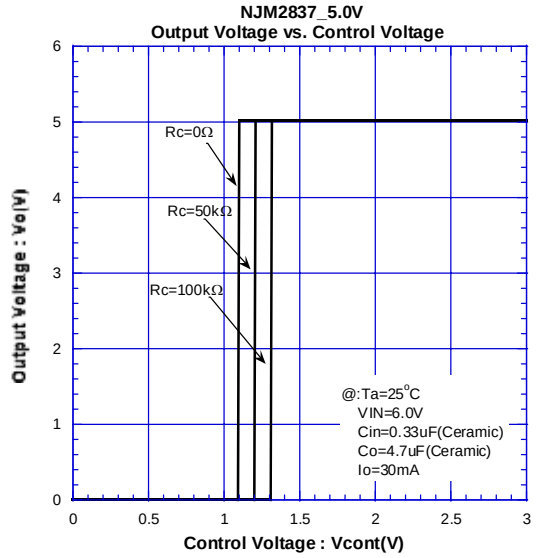
NJM2837_5.0V
Dropout Voltage vs. Output Current



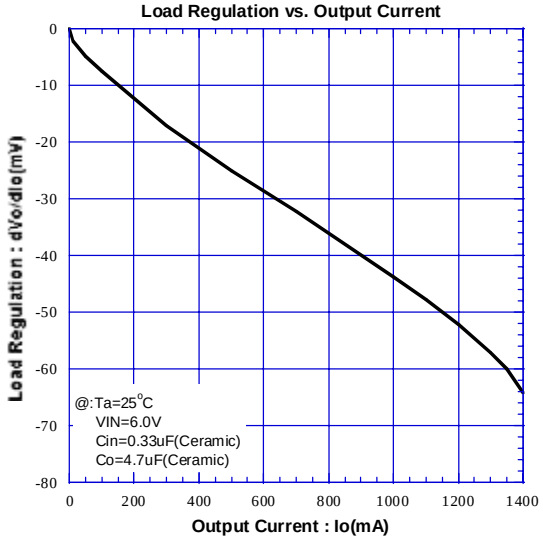
NJM2837_5.0V
Control Current vs. Control Voltage



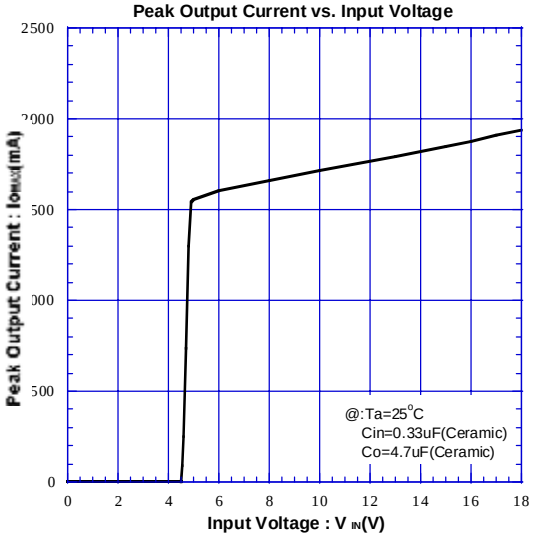
NJM2837_5.0V
Output Voltage vs. Control Voltage



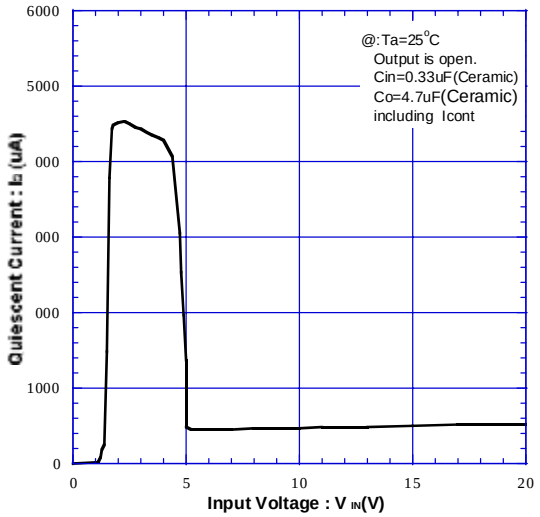
NJM2837_5.0V
Load Regulation vs. Output Current



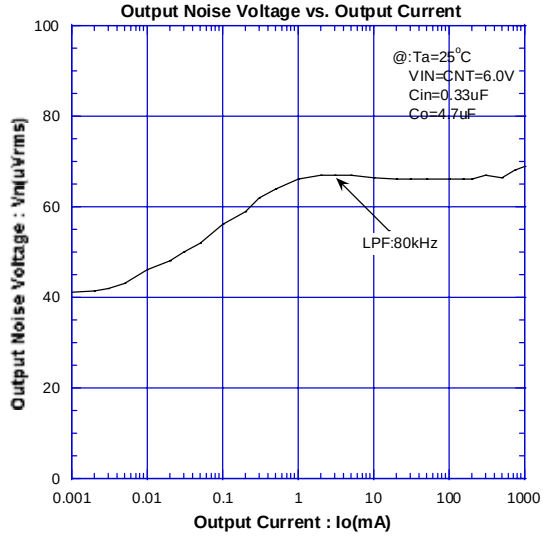
NJM2837_5.0V
Peak Output Current vs. Input Voltage



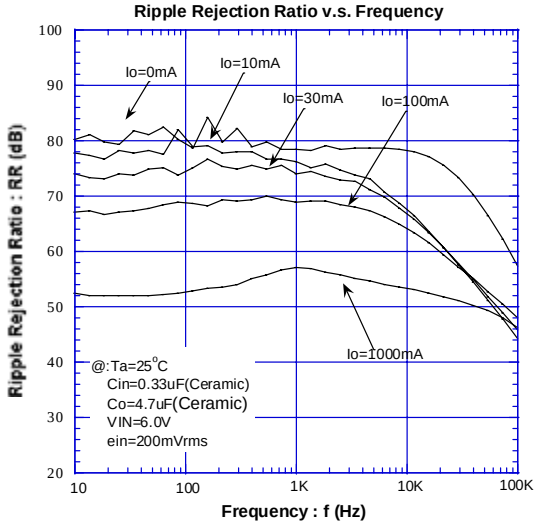
NJM2837_5.0V
Quiescent Current v.s. Input Voltage



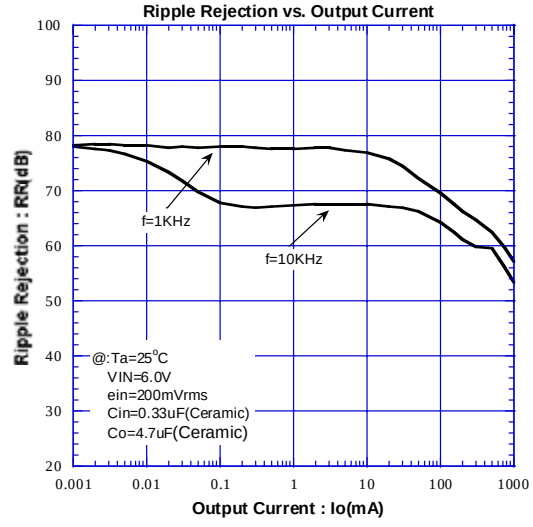
NJM2837_5.0V
Output Noise Voltage vs. Output Current



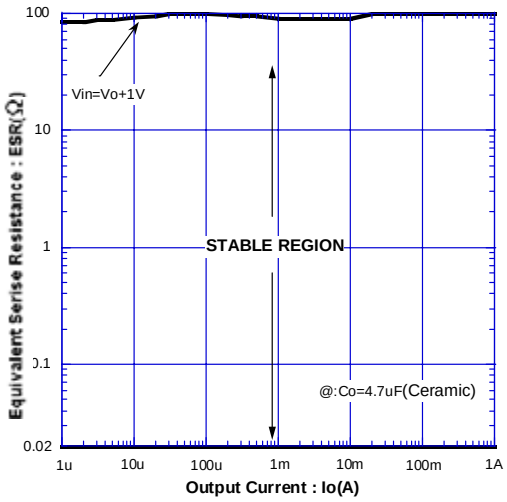
NJM2837_5.0V
Ripple Rejection Ratio v.s. Frequency



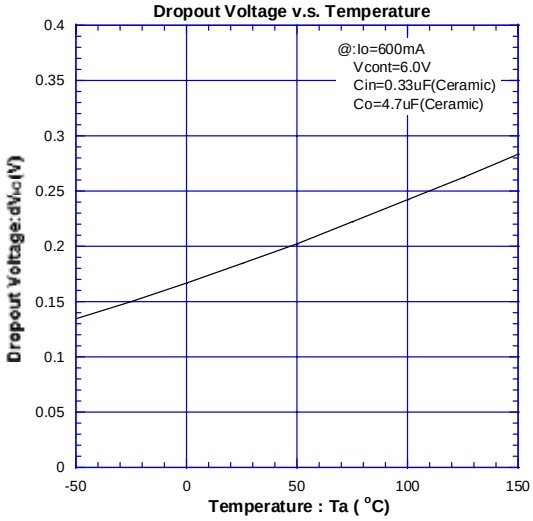
NJM2837_5.0V
Ripple Rejection vs. Output Current



NJM2837_5.0V
Equivalent Serise Resistance vs. Output Current



NJM2837_5.0V
Dropout Voltage v.s. Temperature



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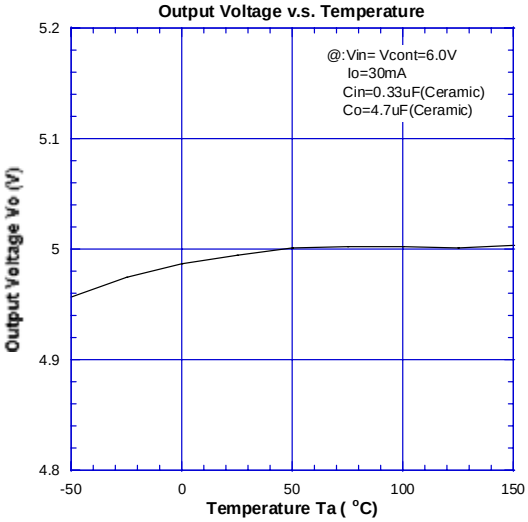
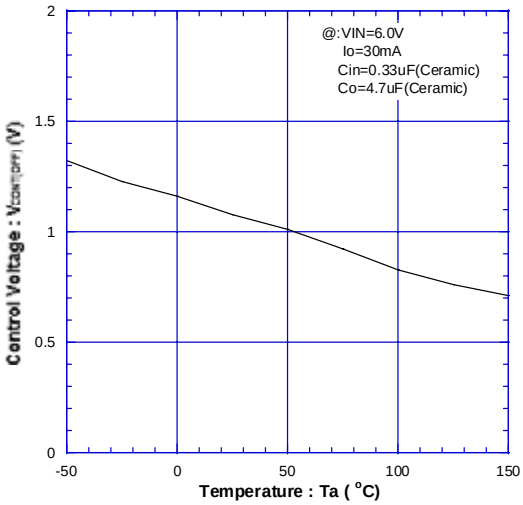
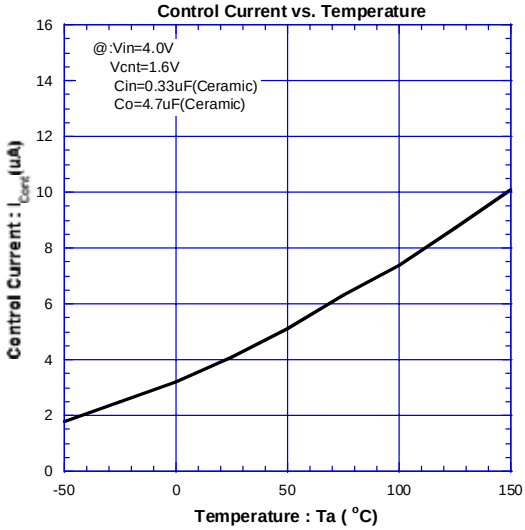
Output Voltage v.s. Temperature



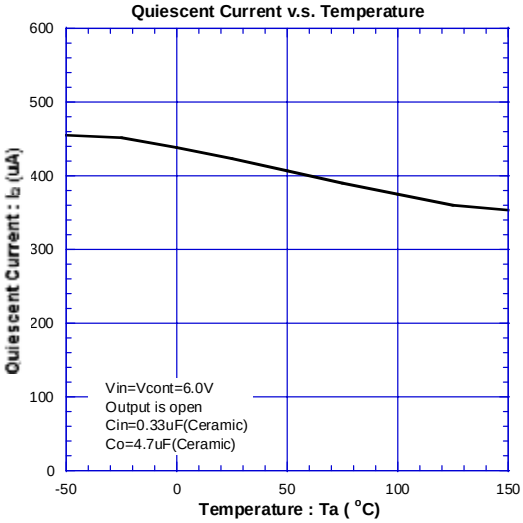
NJM237_5.0V
Control Voltage v.s. Temperature



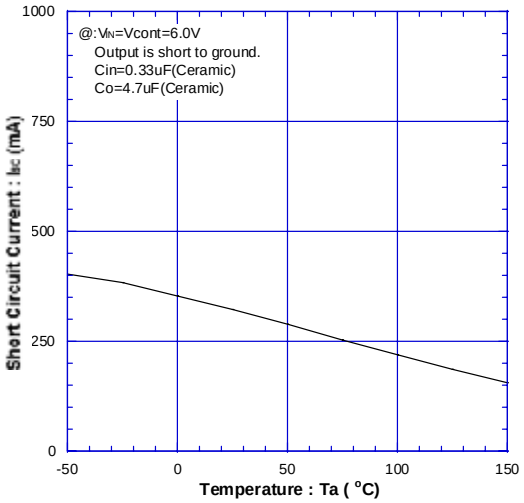
NJM2837_5.0V
Control Current vs. Temperature



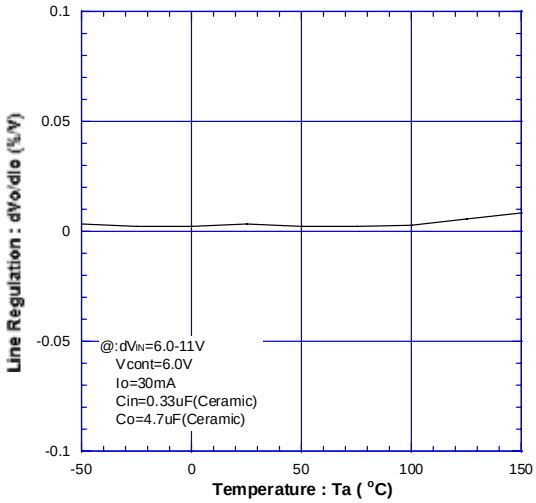
NJM2837_5.0V
Quiescent Current v.s. Temperature



NJM2837_5.0V
Short Circuit Current v.s. Temperature



NJM2837_5.0V
Line Regulation v.s. Temperature



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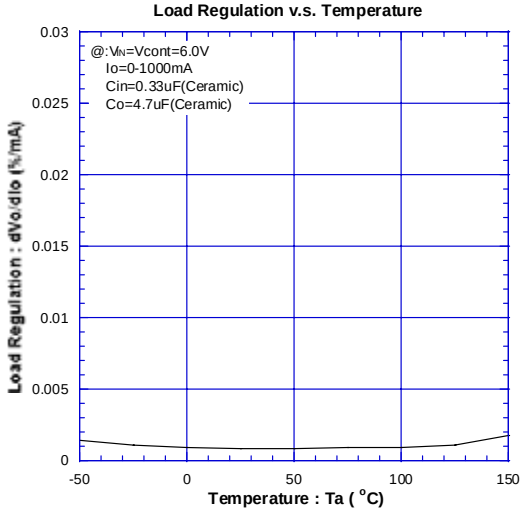
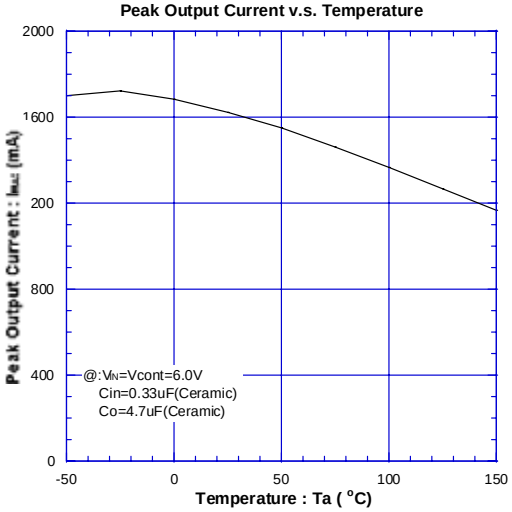
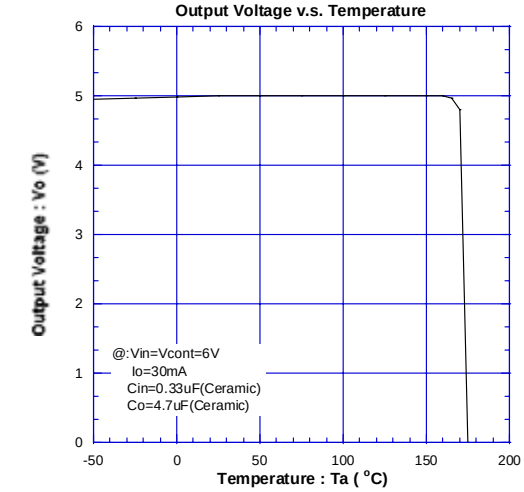
Load Regulation v.s. Temperature



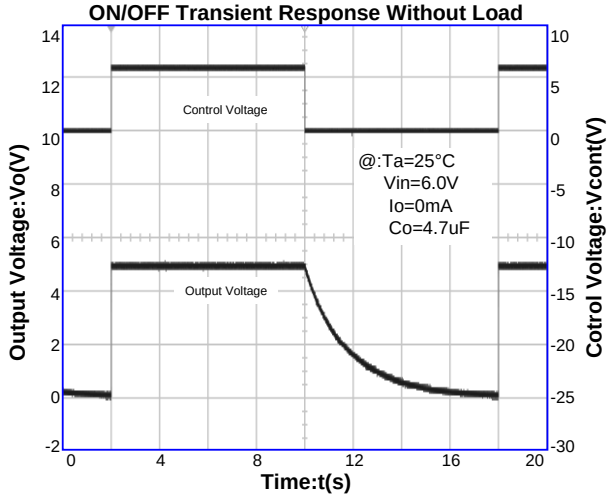
NJM2837_5.0V
Peak Output Current v.s. Temperature



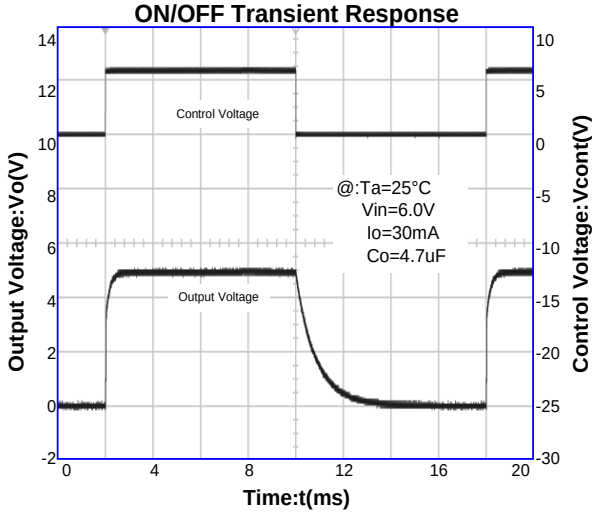
NJM2837_5.0V
Output Voltage v.s. Temperature



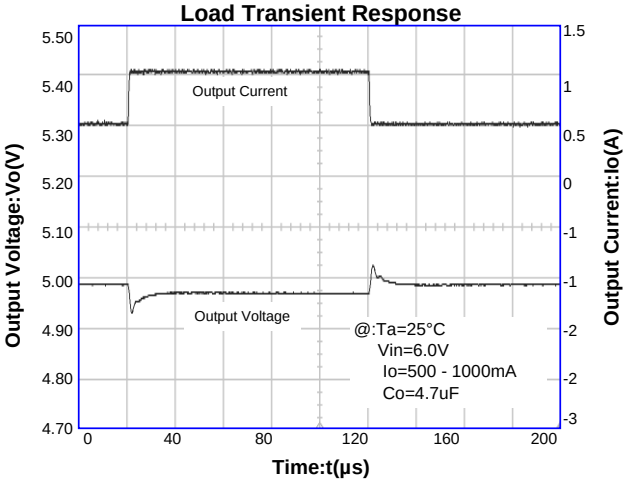
NJM2837_5.0V
ON/OFF Transient Response Without Load



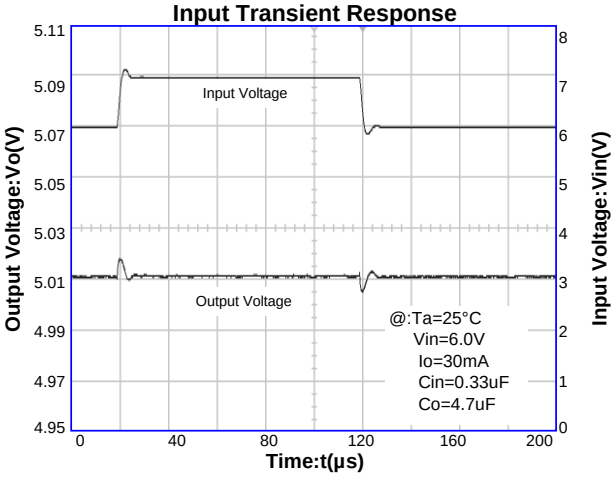
NJM2837_5.0V
ON/OFF Transient Response



NJM2837_5.0V
Load Transient Response



NJM2837_5.0V
Input Transient Response



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