LOW DROPOUT VOLTAGE REGULATOR

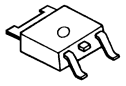
■ GENERAL DESCRIPTION

The NJM2835 is a 500mA output low dropout voltage regulator.

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

2.1V to 15.5V output voltage range, 2.2μF small decoupling capacitor, built-in noise bypass capacitor make the NJM2835 suitable for various applications.

■ PACKAGE OUTLINE

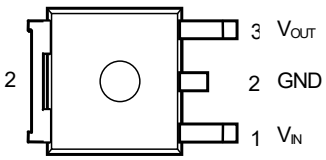


NJM2835DL1

■ FEATURES

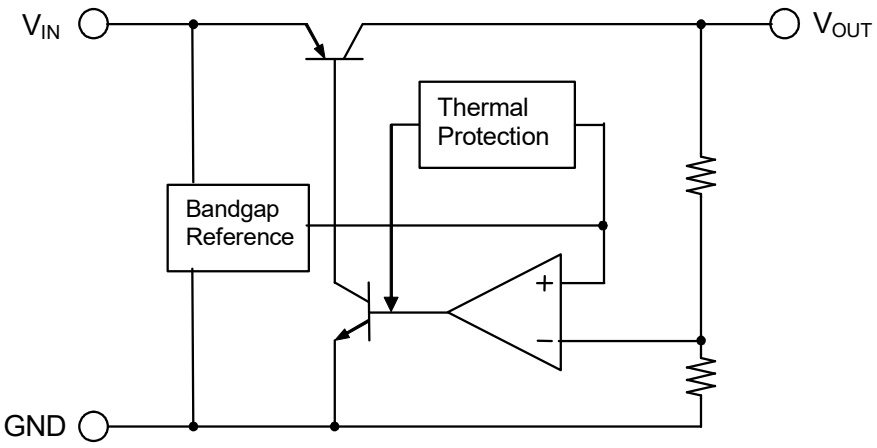
- Output voltage options available 2.1 ~ 15.5V
- High Ripple Rejection 75dB typ. (f=1kHz,Vo=3V Version)
- Output Noise Voltage Vno=45μVrms typ.
- Output capacitor with 2.2μF ceramic capacitor (Vo≥5.1V)
- Output Current Io(max.)=500mA
- High Precision Output Vo±1.0%
- Low Dropout Voltage 0.18V typ. (Io=300mA)
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Bipolar Technology
- Package Outline TO-252-3

■ PIN CONFIGURATION



NJM2835DL1

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

The WHITE column shows applicable Voltage Rank(s)

Device Name	Vout	Device Name	Vout	Device Name	Vout
NJM2835DL1-21	2.1V	NJM2835DL1-36	3.6V	NJM2835DL1-08	8.0V
NJM2835DL1-22	2.2V	NJM2835DL1-37	3.7V	NJM2835DL1-85	8.5V
NJM2835DL1-23	2.3V	NJM2835DL1-38	3.8V	NJM2835DL1-09	9.0V
NJM2835DL1-24	2.4V	NJM2835DL1-39	3.9V	NJM2835DL1-10	10.0V
NJM2835DL1-25	2.5V	NJM2835DL1-04	4.0V	NJM2835DL1-12	12.0V
NJM2835DL1-26	2.6V	NJM2835DL1-41	4.1V	NJM2835DL1-15	15.0V
NJM2835DL1-27	2.7V	NJM2835DL1-42	4.2V		
NJM2835DL1-28	2.8V	NJM2835DL1-43	4.3V		
NJM2835DL1-29	2.9V	NJM2835DL1-44	4.4V		
NJM2835DL1-03	3.0V	NJM2835DL1-45	4.5V		
NJM2835DL1-31	3.1V	NJM2835DL1-46	4.6V		
NJM2835DL1-32	3.2V	NJM2835DL1-47	4.7V		
NJM2835DL1-33	3.3V	NJM2835DL1-48	4.8V		
NJM2835DL1-34	3.4V	NJM2835DL1-49	4.9V		
NJM2835DL1-35	3.5V	NJM2835DL1-05	5.0V		

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	+20	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: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

$V_{IN=}$ Vo+1V, C_{IN}=0.33μF, Co=2.2μF (2.9V<Vo≤5V: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	Vo≤5V Version	-	200	300	μA
			5V<Vo≤10V Version	-	215	315	μA
			10V<Vo≤15V Version	-	230	330	μA
Output Current	Io	Vo-0.3V		500	650	-	mA
Line Regulation	$\Delta Vo/\Delta V_{IN}$	V_{IN}=Vo+1V ~ Vo+6V(Vo≤12V), V_{IN}=Vo+1V ~ 18V(Vo>12V), Io=30mA		-	-	0.10	%/V
Load Regulation	$\Delta Vo/\Delta Io$	Io=0 ~ 500mA		-	-	0.007	%/mA
Dropout Voltage(*3)	ΔV_{I-O}	Io=300mA		-	0.18	0.28	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		-	45	-	μVrms
Input Voltage	V_{IN}			-	-	18	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.

■ THERMAL CHARACTERISTICS

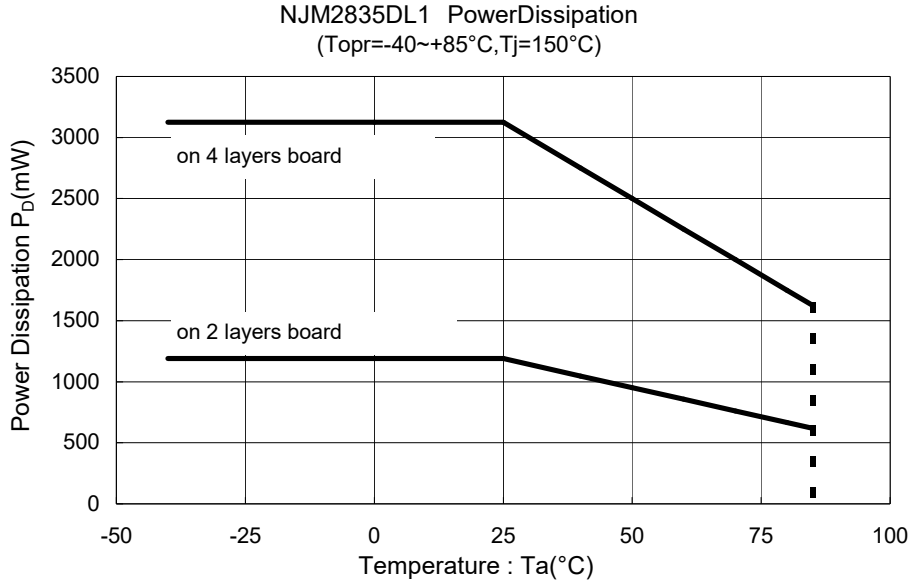
PARAMETER	SYMBOL	VALUE	UNIT
Junction-to-Ambient thermal resistance	θja	105 (*4) 40 (*5)	°C/W
Junction-to-Top of package characterization parameter	ψjt	17 (*4) 12 (*5)	°C/W

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

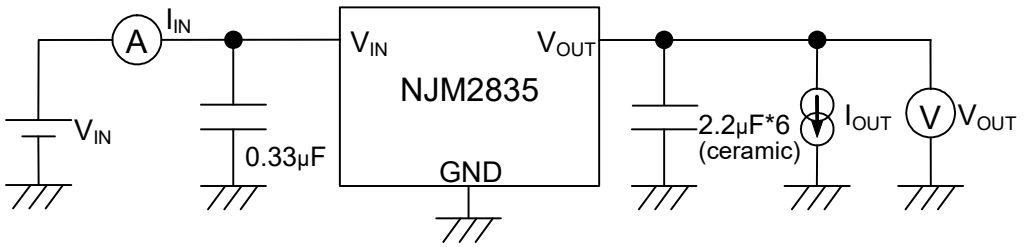
(*5): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 4Layers)

(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



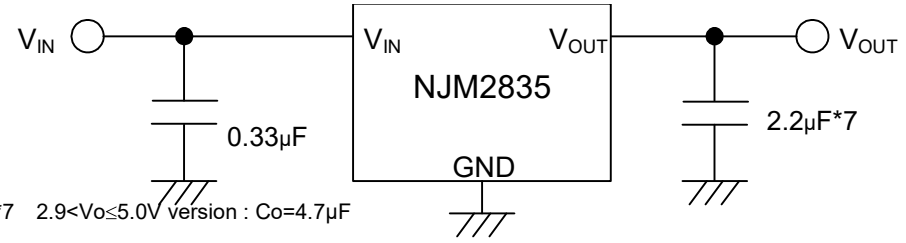
■ TEST CIRCUIT



*6 2.9<Vo≤5.0V version : Co=4.7μF(ceramic)

Vo≤2.9V version : Co=10μF(ceramic)

■ TYPICAL APPLICATION



*7 2.9<Vo≤5.0V version : Co=4.7μF

Vo≤2.9V version : Co=10μF

*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

The 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 an output noise or an oscillation of the regulator due to lack of the phase compensation.

On the other hand, use of a larger C_O reduces an output noise and a ripple output, and also improves an output transient response when load rapidly changes.

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, a low voltage regulator requires larger C_O value.

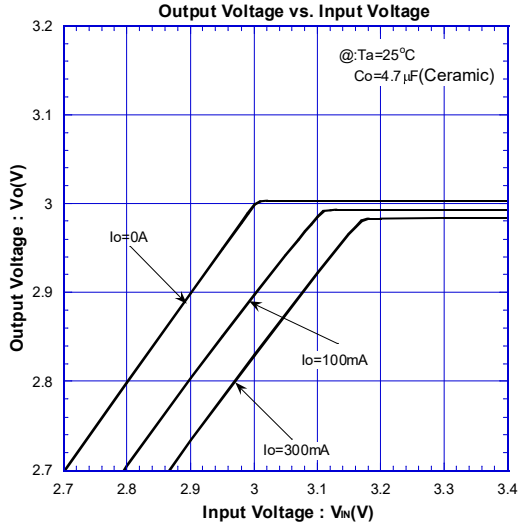
In addition, you should consider varied characteristics of capacitor (a frequency characteristic, a temperature characteristic, a DC bias characteristic and so on) and unevenness peculiar to a capacitor supplier enough.

When selecting C_O, recommend that have withstand voltage margin against an output voltage and superior temperature characteristic.

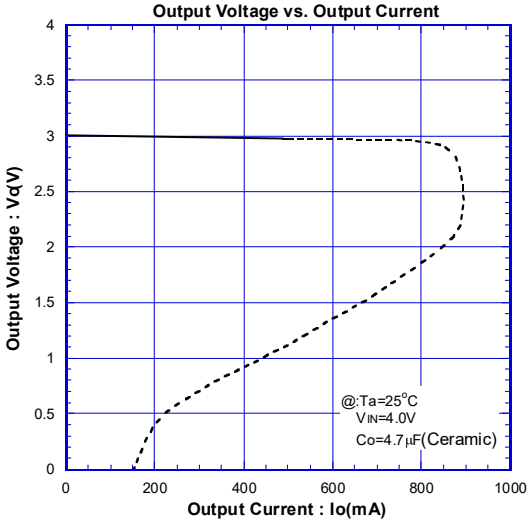
■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (3V Version)

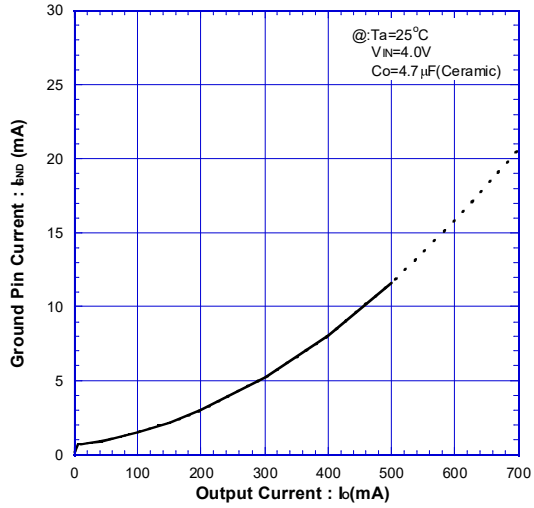
NJM2835_3.0V
Output Voltage vs. Input Voltage



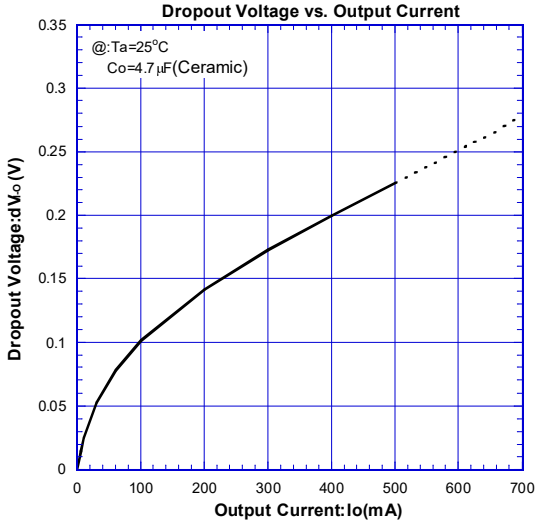
NJM2835_3.0V
Output Voltage vs. Output Current



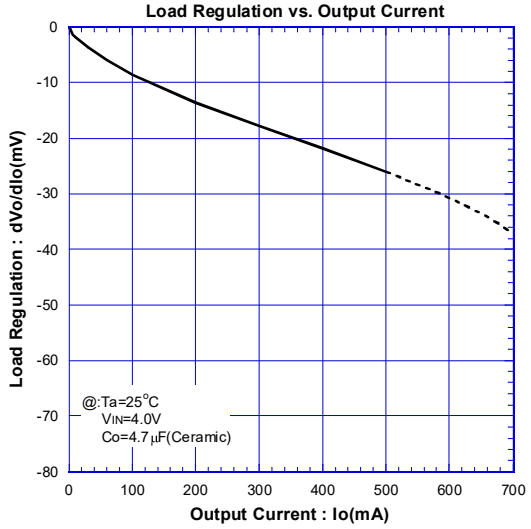
NJM2835_3.0V
Ground Pin Current v.s. Output Current



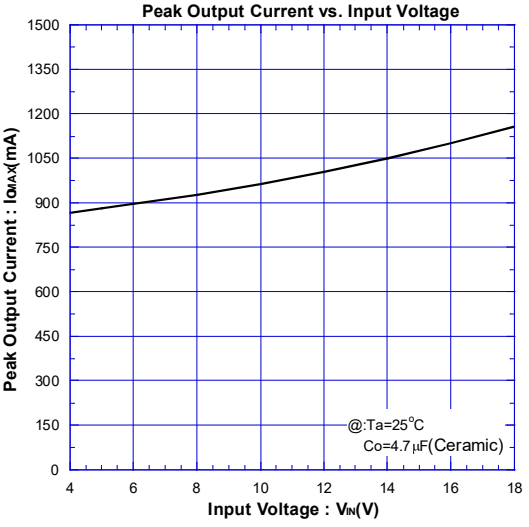
NJM2835_3.0V
Dropout Voltage vs. Output Current



NJM2835_3.0V
Load Regulation vs. Output Current

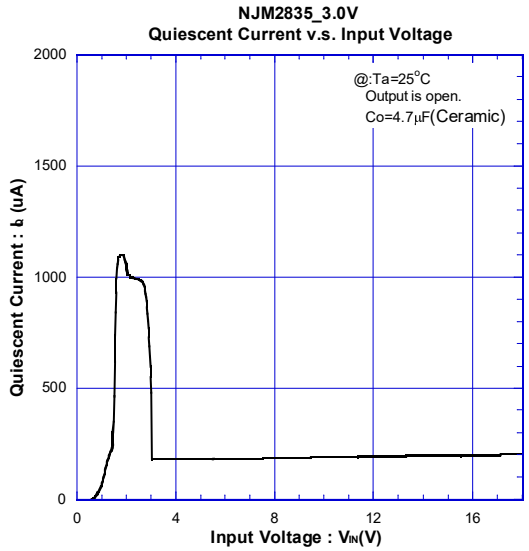


NJM2835_3.0V
Peak Output Current vs. Input Voltage

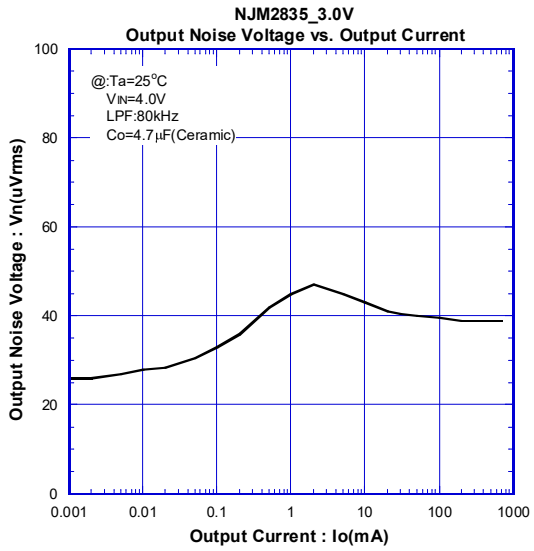


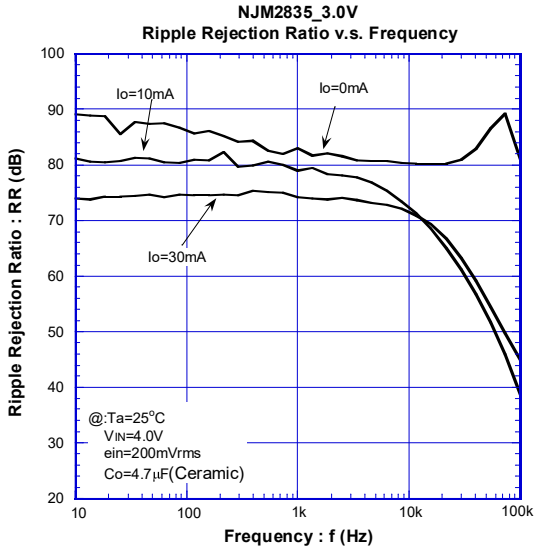
■ TYPICAL CHARACTERISTICS

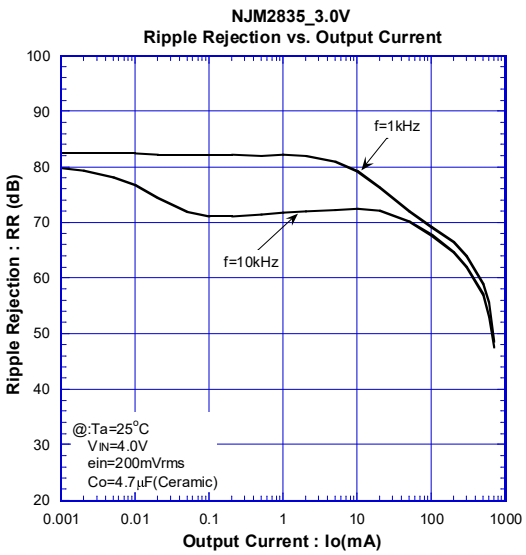
●DC CHARACTERISTICS (3V Version)

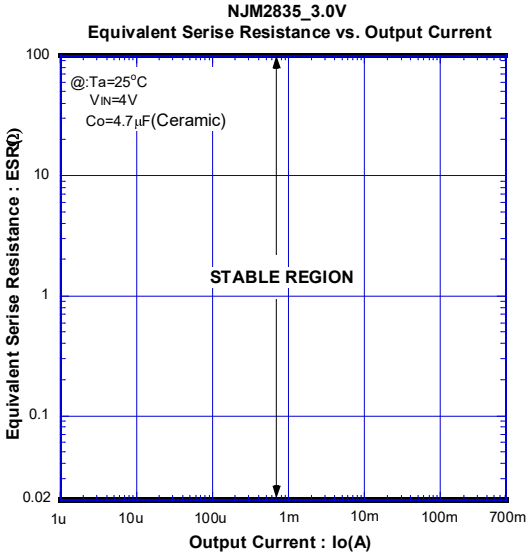


●AC CHARACTERISTICS (3V Version)





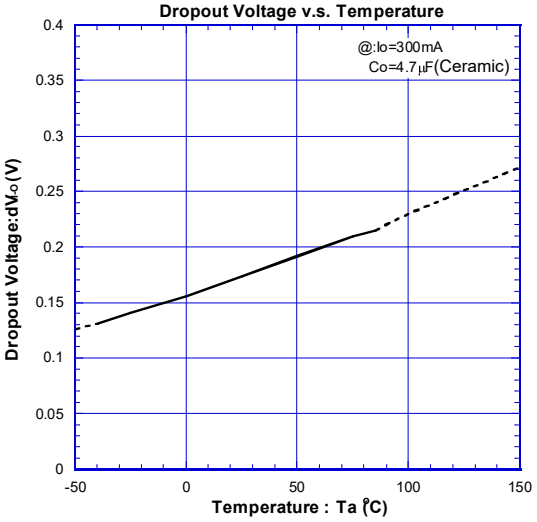

NJM2835_3.0V
Ripple Rejection vs. Output Current
Ripple Rejection : RR (dB)
Output Current : Io(mA)
f=1kHz
f=10kHz
@:Ta=25°C
VIN=4.0V
ein=200mVrms
Co=4.7μF(Ceramic)
100
90
80
70
60
50
40
30
20
0.001
0.01
0.1
1
10
100
1000


NJM2835_3.0V
Equivalent Serise Resistance vs. Output Current
Equivalent Serise Resistance : ESR(Ω)
Output Current : Io(A)
@:Ta=25°C
VIN=4V
Co=4.7μF(Ceramic)
STABLE REGION
100
10
1
0.1
0.02
1u
10u
100u
1m
10m
100m
700m

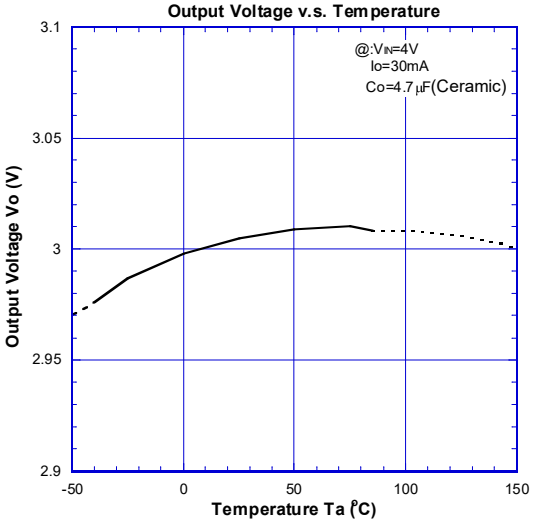
■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (3V Version)

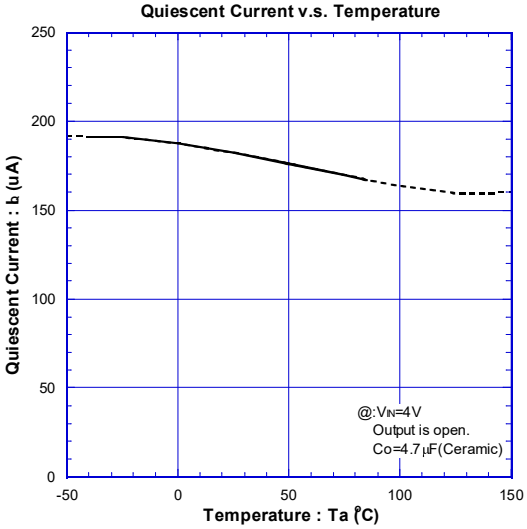
NJM2835_3.0V
Dropout Voltage v.s. Temperature



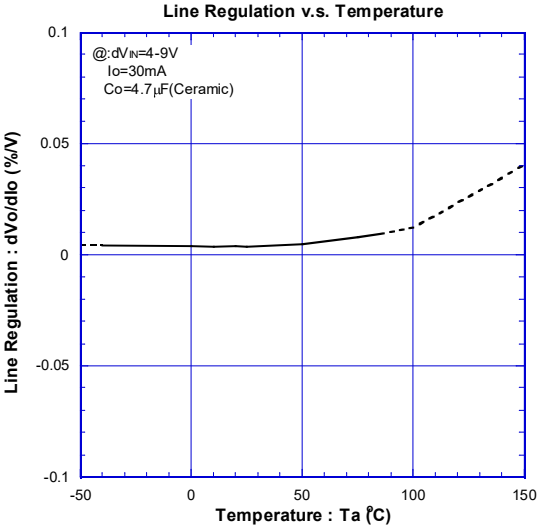
NJM2835_3.0V
Output Voltage v.s. Temperature



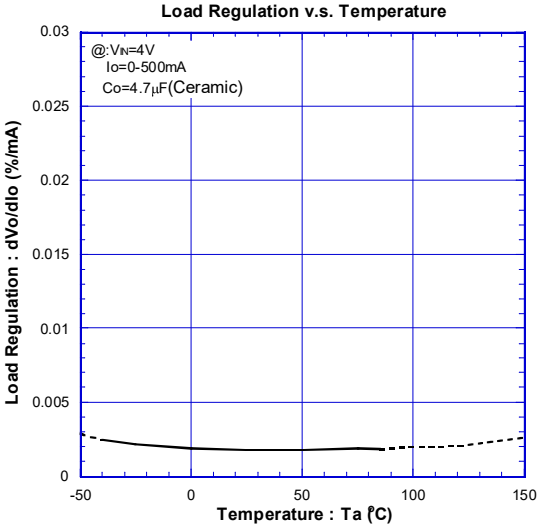
NJM2835_3.0V
Quiescent Current v.s. Temperature



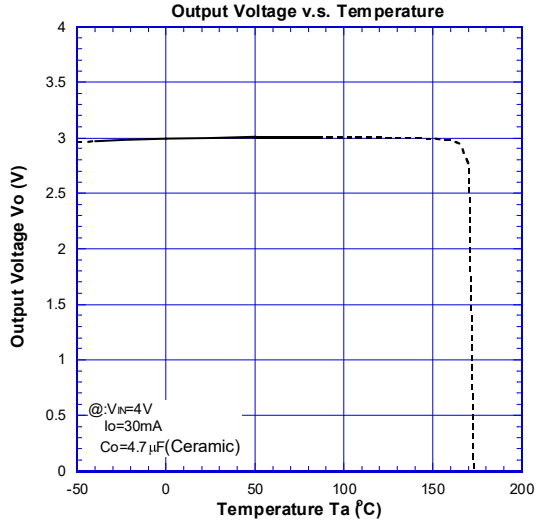
NJM2835_3.0V
Line Regulation v.s. Temperature



NJM2835_3.0V
Load Regulation v.s. Temperature

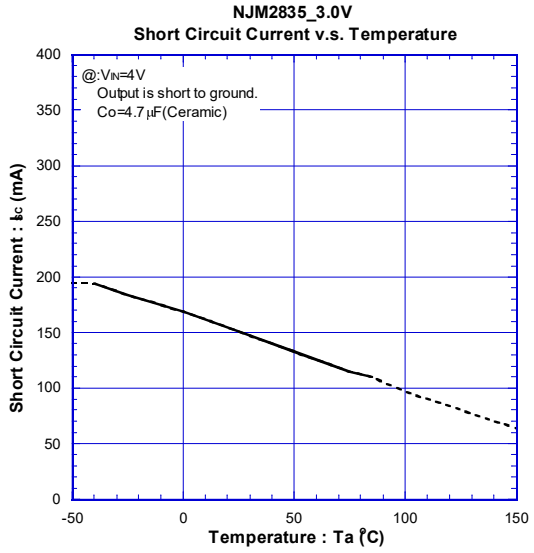


NJM2835_3.0V
Output Voltage v.s. Temperature



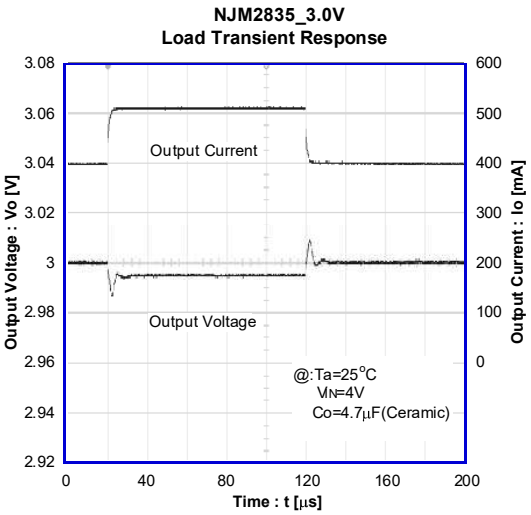
■ TYPICAL CHARACTERISTICS

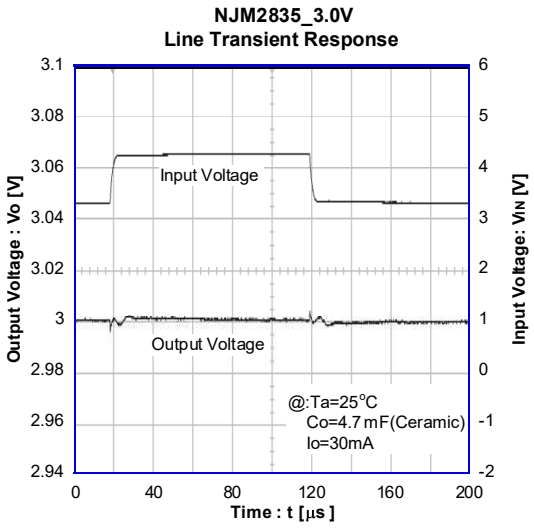
●TEMPERATURE CHARACTERISTICS (3V Version)



■ TYPICAL CHARACTERISTICS

●TRANSIENT RESPONSE (3V Version)

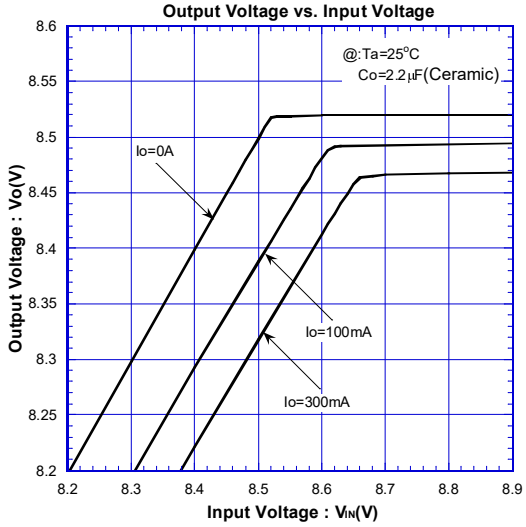




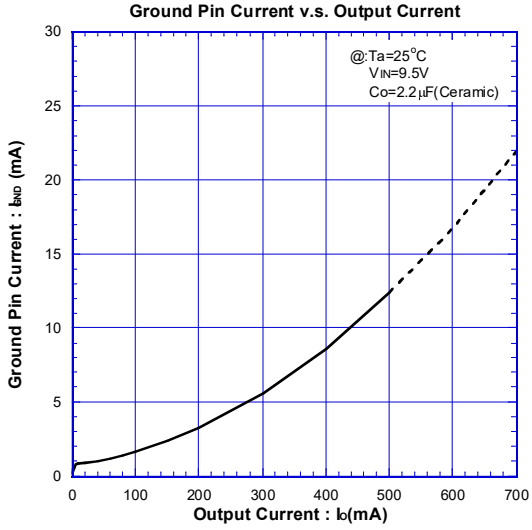
■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (8.5V Version)

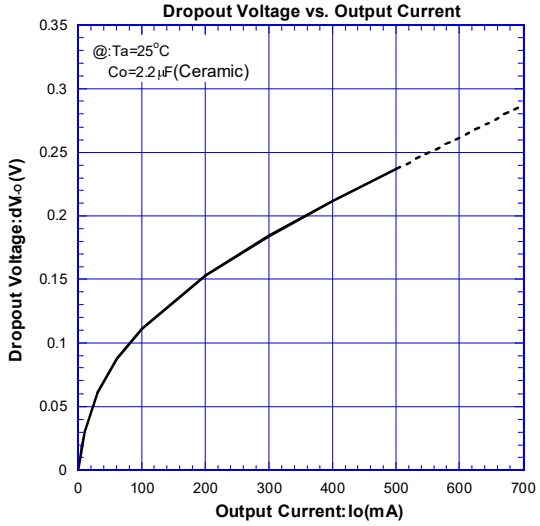
NJM2835_8.5V
Output Voltage vs. Input Voltage



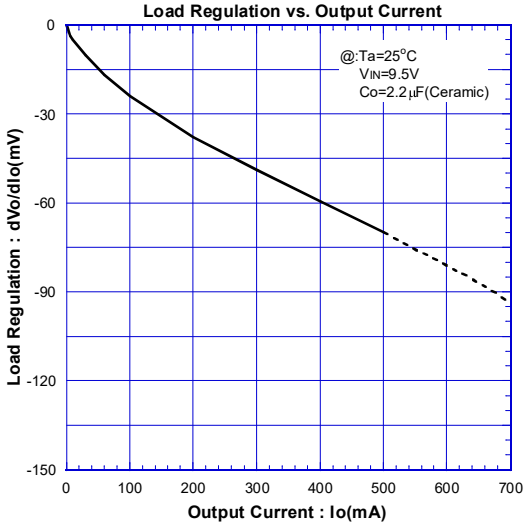
NJM2835_8.5V
Ground Pin Current v.s. Output Current



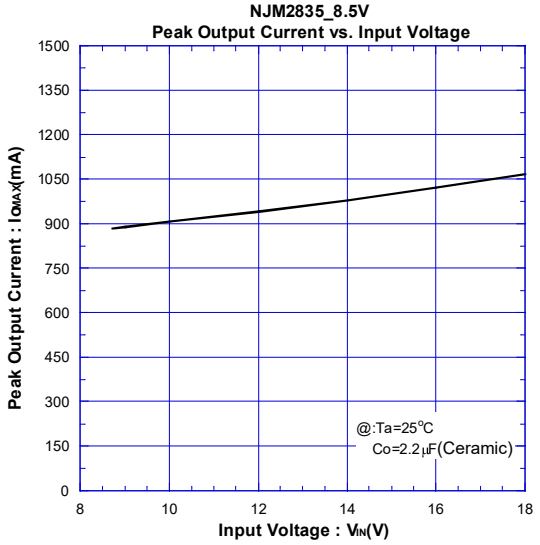
NJM2835_8.5V
Dropout Voltage vs. Output Current



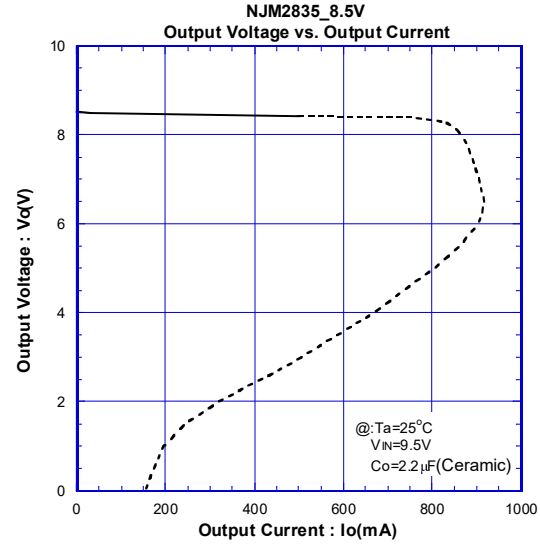
NJM2830_8.5V
Load Regulation vs. Output Current



NJM2835_8.5V
Peak Output Current vs. Input Voltage

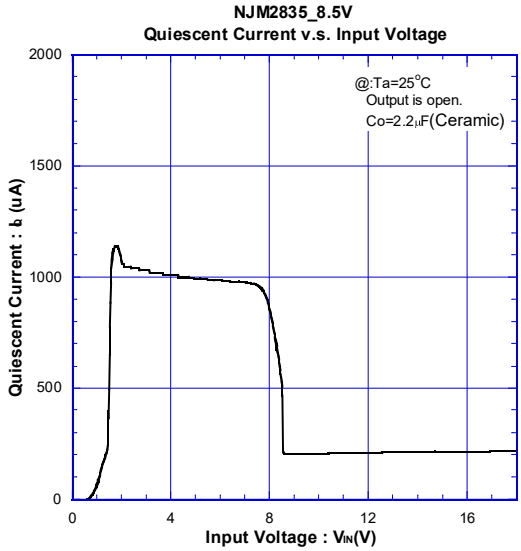


NJM2835_8.5V
Output Voltage vs. Output Current

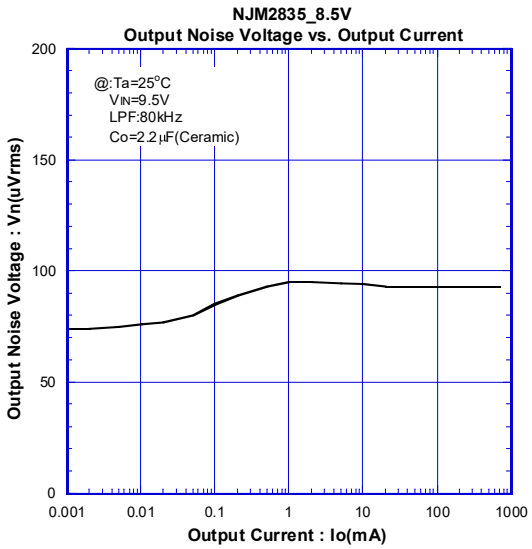


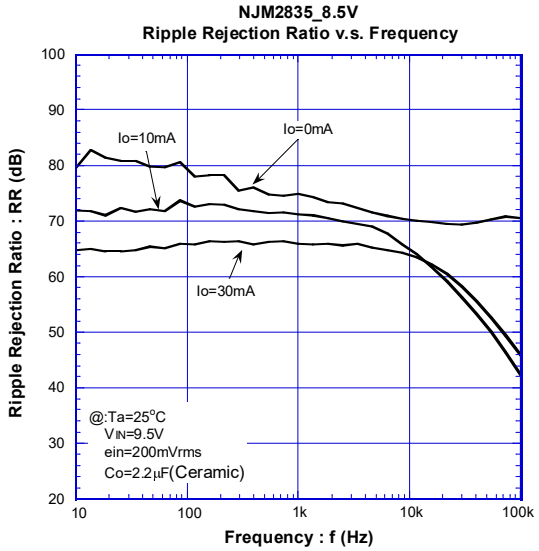
■ TYPICAL CHARACTERISTICS

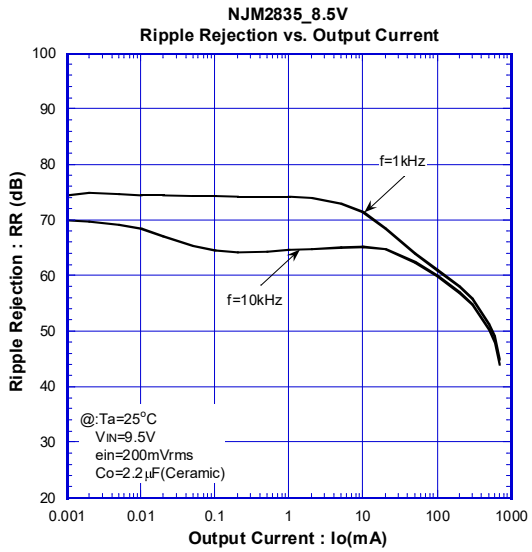
●DC CHARACTERISTICS (8.5V Version)

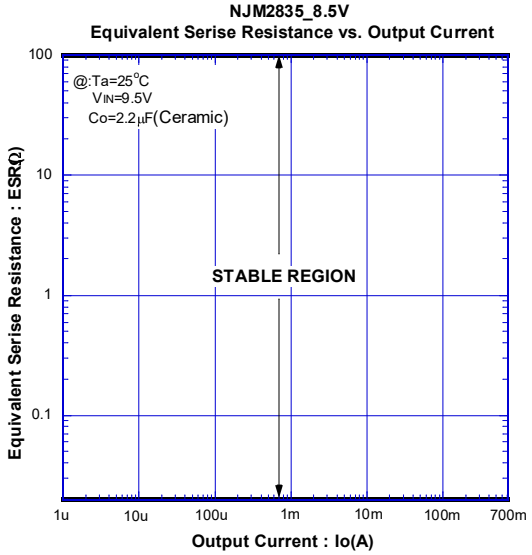


●AC CHARACTERISTICS (8.5V Version)





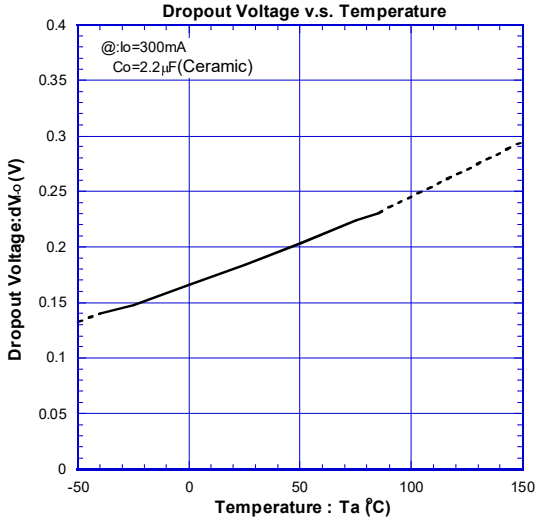




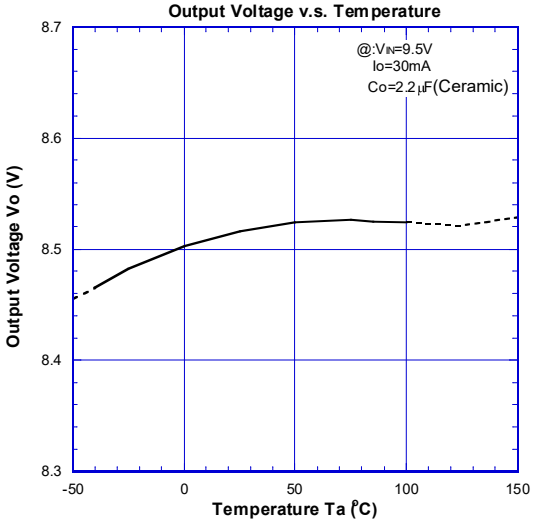
■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (8.5V Version)

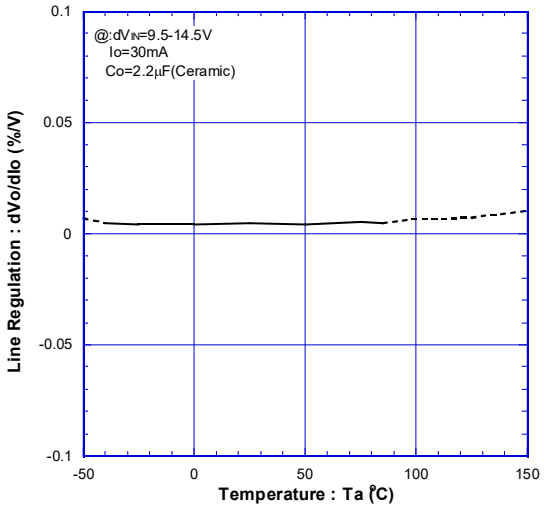
NJM2835_8.5V
Dropout Voltage v.s. Temperature



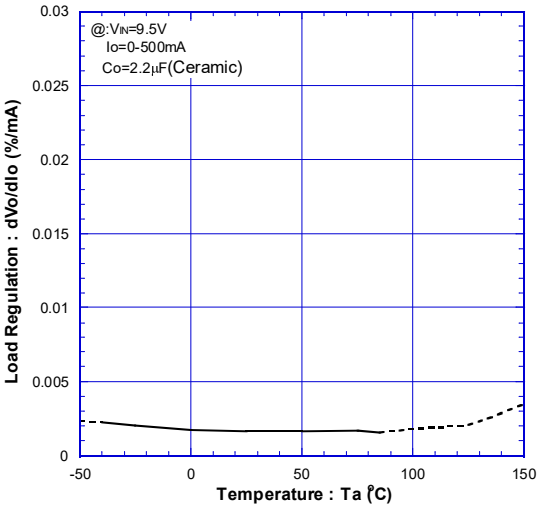
NJM2835_8.5V
Output Voltage v.s. Temperature



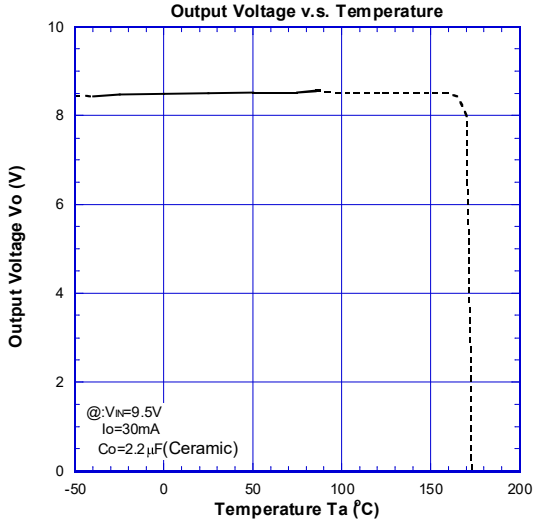
NJM2835_8.5V
Line Regulation v.s. Temperature



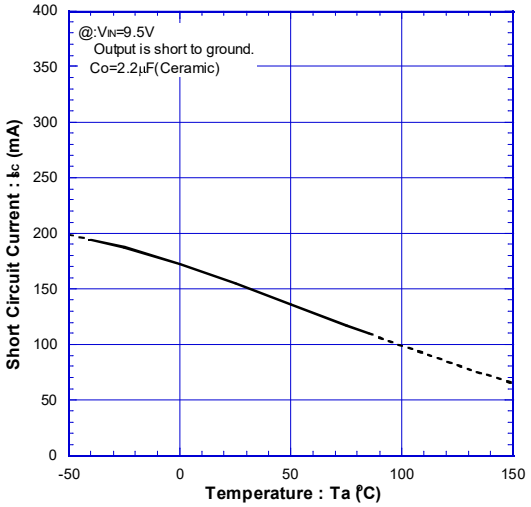
NJM2835_8.5V
Load Regulation v.s. Temperature



NJM2835_8.5V
Output Voltage v.s. Temperature

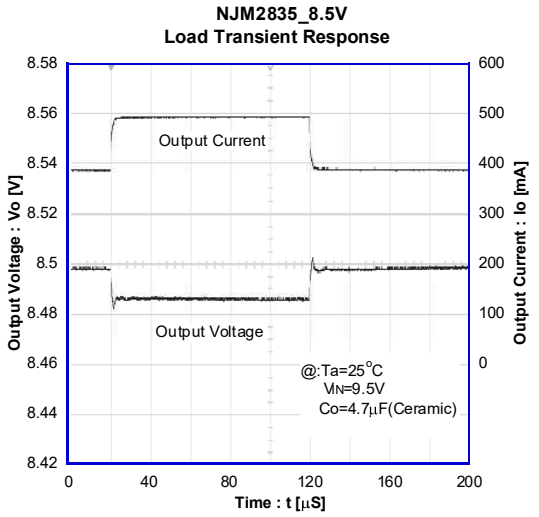


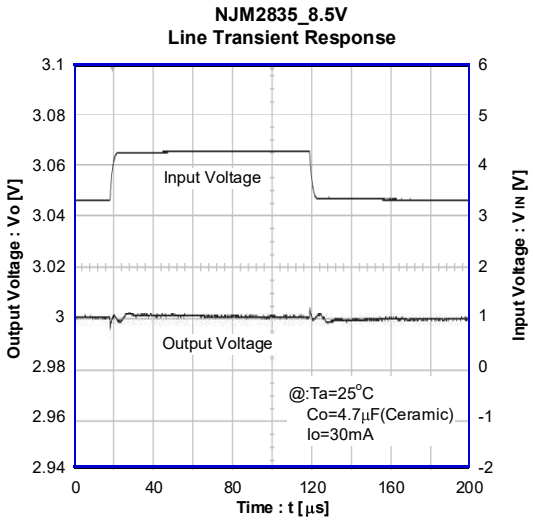
NJM2830_8.5V
Short Circuit Current v.s. Temperature



■ TYPICAL CHARACTERISTICS

●TRANSIENT RESPONSE (8.5V Version)

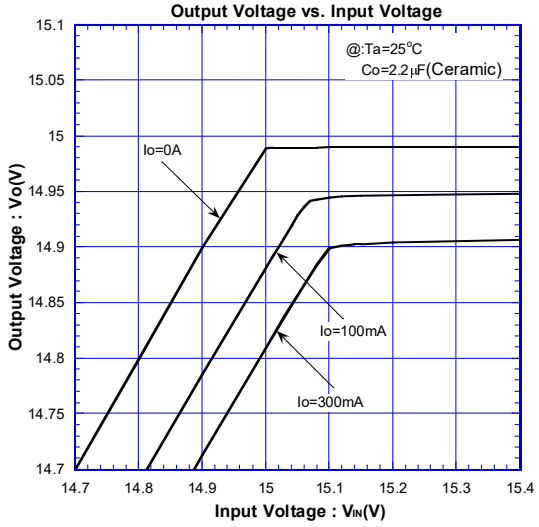




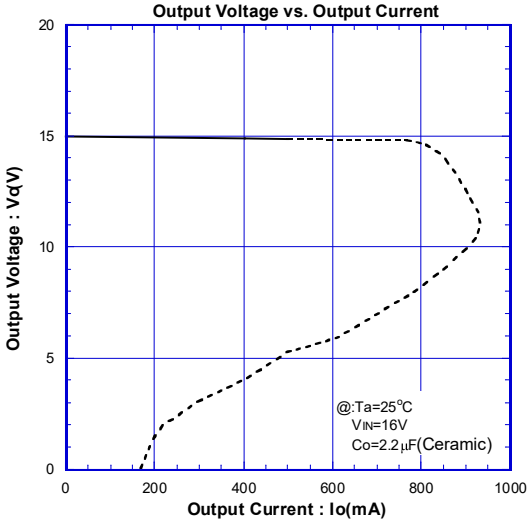
■ TYPICAL CHARACTERISTICS

●DC CHARACTERISTICS (15V Version)

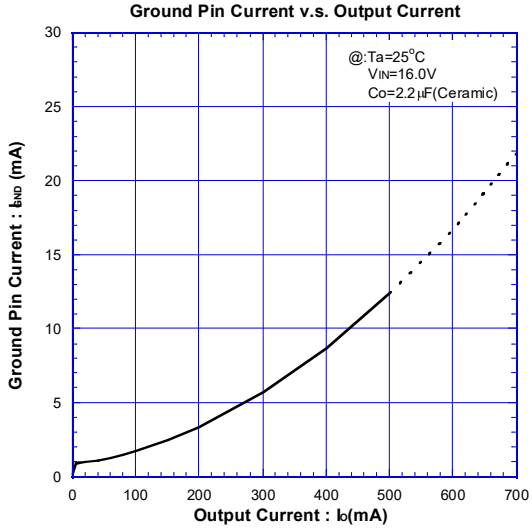
NJM2835_15V
Output Voltage vs. Input Voltage



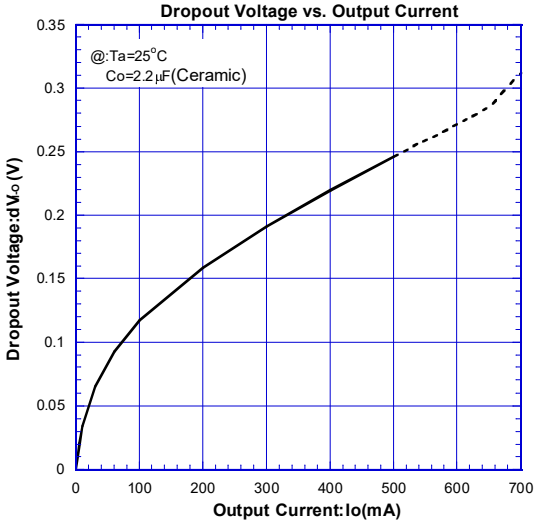
NJM2835_15V
Output Voltage vs. Output Current



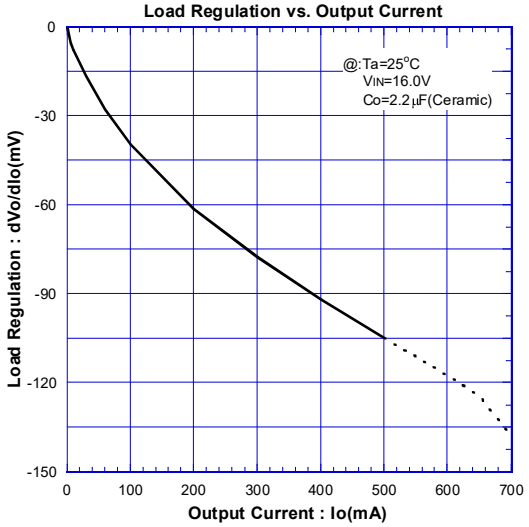
NJM2835_15V
Ground Pin Current v.s. Output Current



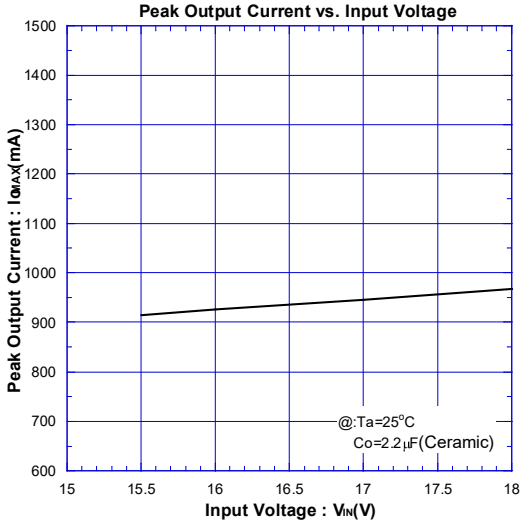
NJM2835_15V
Dropout Voltage vs. Output Current



NJM2835_15V
Load Regulation vs. Output Current

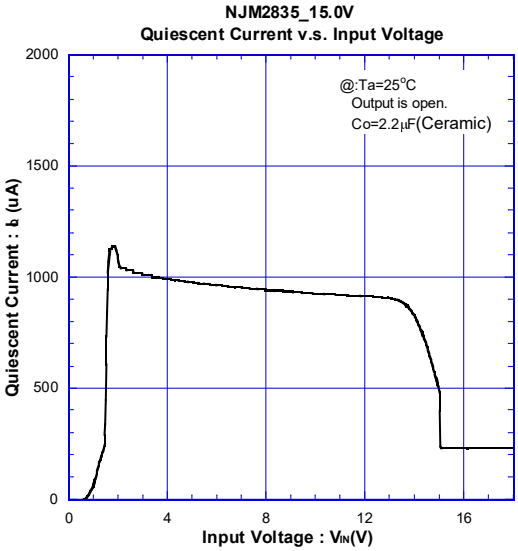


NJM2835_15V
Peak Output Current vs. Input Voltage

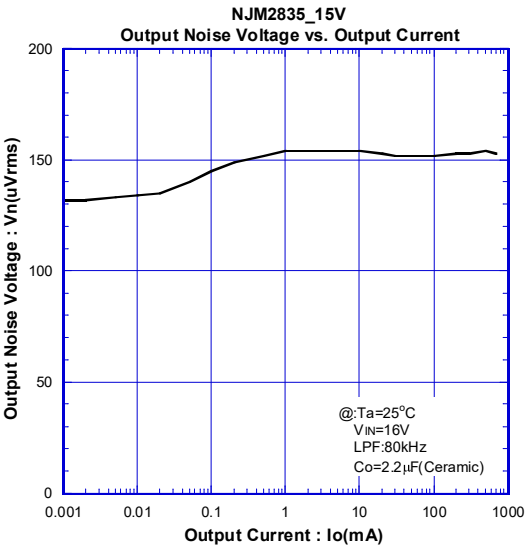


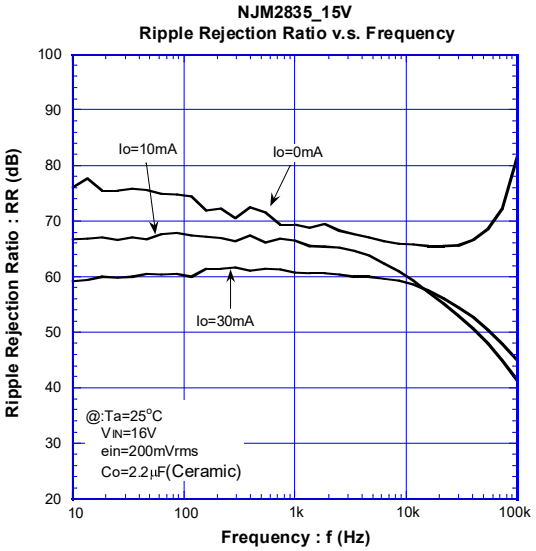
■ TYPICAL CHARACTERISTICS

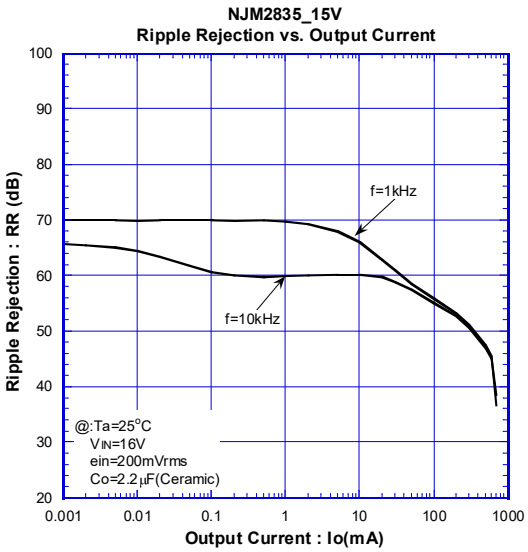
●DC CHARACTERISTICS (15V Version)

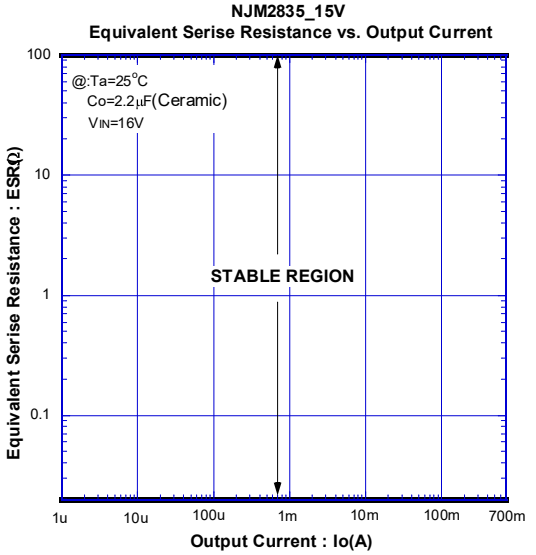


●AC CHARACTERISTICS (15V Version)





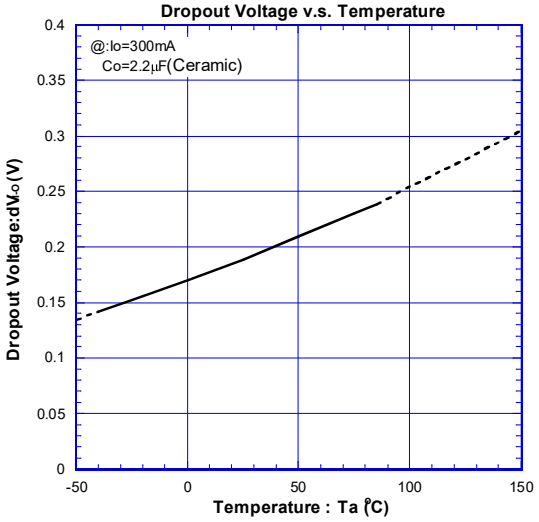




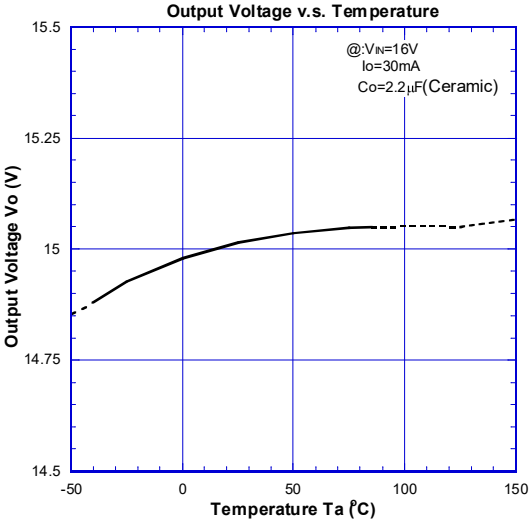
■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (15V Version)

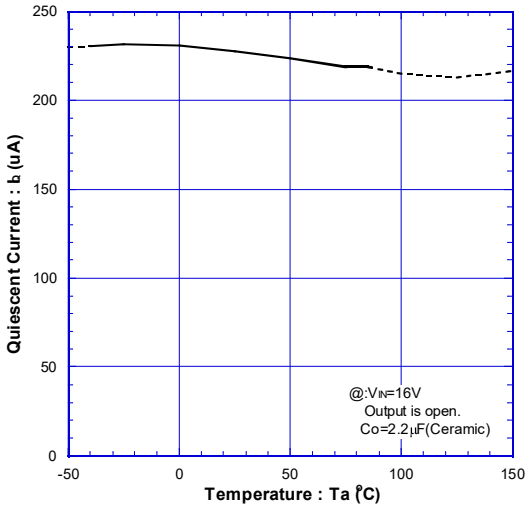
NJM2835_15V
Dropout Voltage v.s. Temperature



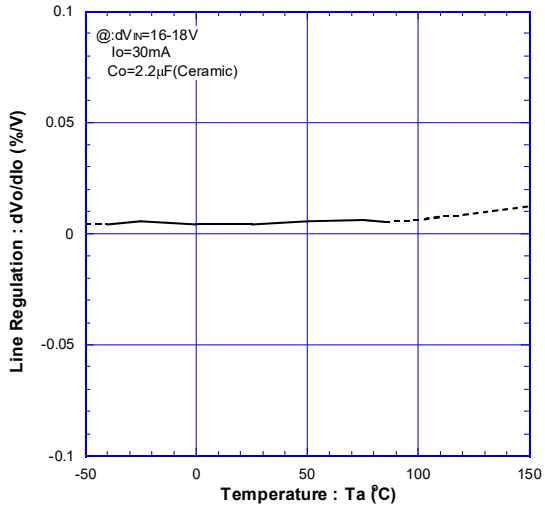
NJM2835_15V
Output Voltage v.s. Temperature



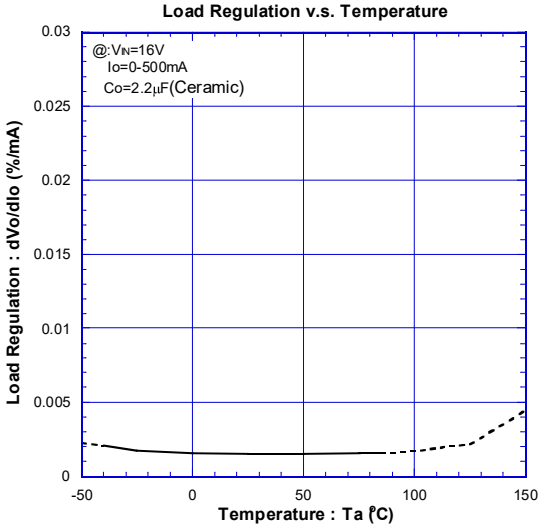
NJM2835_15V
Quiescent Current v.s. Temperature



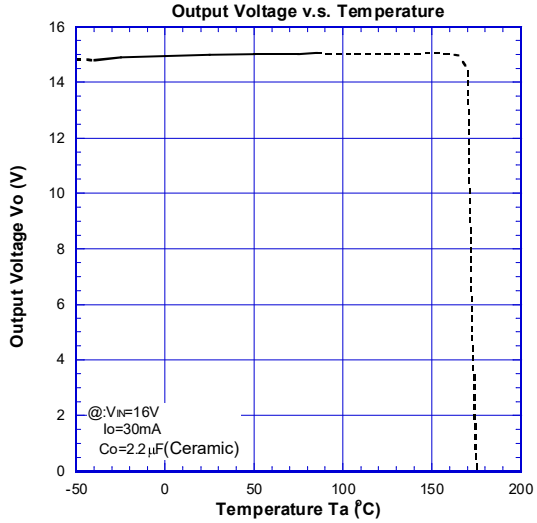
NJM2835_15V
Line Regulation v.s. Temperature



NJM2835_15V
Load Regulation v.s. Temperature

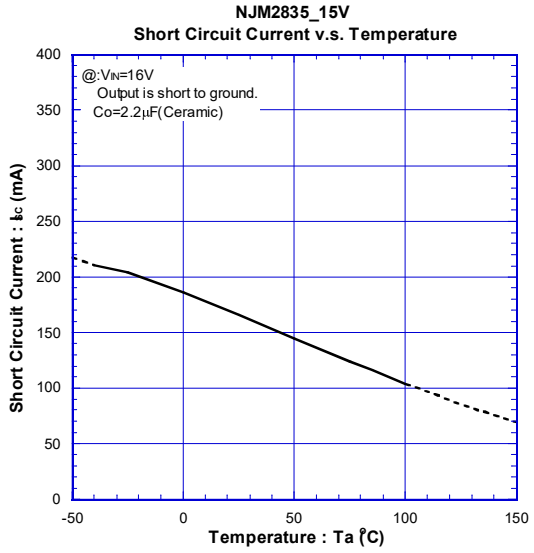


NJM2835_15V
Output Voltage v.s. Temperature



■ TYPICAL CHARACTERISTICS

●TEMPERATURE CHARACTERISTICS (15V Version)



■ TYPICAL CHARACTERISTICS

●TRANSIENT RESPONSE (15V Version)