

LOW DROPOUT VOLTAGE REGULATOR

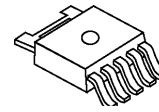
■ GENERAL DESCRIPTION

The NJM2836 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, 2.2 μ F small decoupling capacitor, built-in noise bypass capacitor make the NJM2836 suitable for various applications.

■ PACKAGE OUTLINE

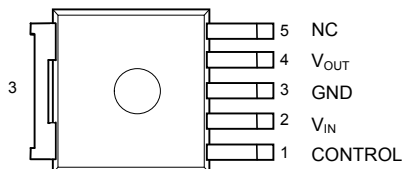


NJM2836DL3

■ FEATURES

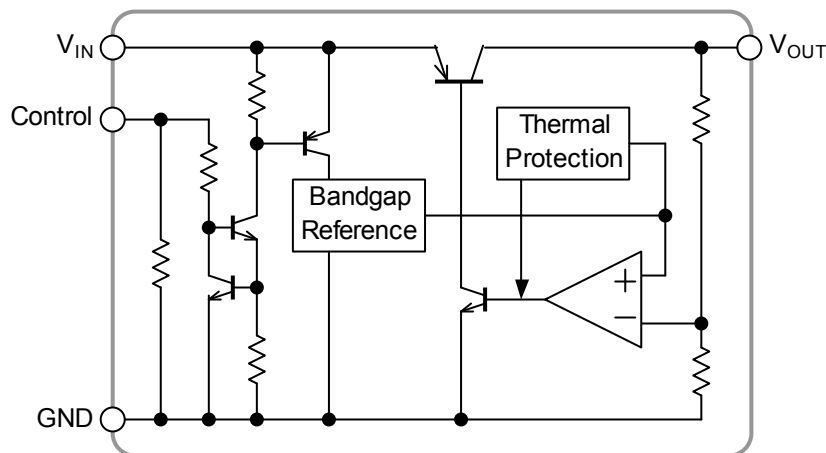
- Output voltage options available 2.1 ~ 15.5V
- High Ripple Rejection 75dB typ. (f=1kHz,Vo=3V Version)
- Low Output Noise Voltage Vno=45 μ Vrms typ.
- Output Current Io(max.)=500mA
- High Precision Output Voltage Vo \pm 1.0%
- Output capacitor with 2.2 μ F ceramic capacitor (Vo \geq 5.1V)
- Low Dropout Voltage 0.18V typ. (Io=300mA)
- ON/OFF Control
- Internal Thermal Overload Protection
- Internal Over Current Protection
- Bipolar Technology
- Package Outline TO-252-5

■ PIN CONFIGURATION



NJM2836DL3

■ BLOCK DIAGRAM



■ OUTPUT VOLTAGE RANK LIST

The WHITE column shows applicable Voltage Rank(s)

| Device Name | Vout | Device Name | Vout | Device Name | Vout |
|---------------|------|---------------|------|----------------|-------|
| NJM2836DL3-21 | 2.1V | NJM2836DL3-36 | 3.6V | NJM2836DL3-08 | 8.0V |
| NJM2836DL3-22 | 2.2V | NJM2836DL3-37 | 3.7V | NJM2836DL3-85 | 8.5V |
| NJM2836DL3-23 | 2.3V | NJM2836DL3-38 | 3.8V | NJM2836DL3-09 | 9.0V |
| NJM2836DL3-24 | 2.4V | NJM2836DL3-39 | 3.9V | NJM2836DL3-10 | 10.0V |
| NJM2836DL3-25 | 2.5V | NJM2836DL3-04 | 4.0V | NJM2836DL3-12 | 12.0V |
| NJM2836DL3-26 | 2.6V | NJM2836DL3-41 | 4.1V | NJM2836DL3-125 | 12.5V |
| NJM2836DL3-27 | 2.7V | NJM2836DL3-42 | 4.2V | NJM2836DL3-13 | 13.0V |
| NJM2836DL3-28 | 2.8V | NJM2836DL3-43 | 4.3V | NJM2836DL3-15 | 15.0V |
| NJM2836DL3-29 | 2.9V | NJM2836DL3-44 | 4.4V | | |
| NJM2836DL3-03 | 3.0V | NJM2836DL3-45 | 4.5V | | |
| NJM2836DL3-31 | 3.1V | NJM2836DL3-46 | 4.6V | | |
| NJM2836DL3-32 | 3.2V | NJM2836DL3-47 | 4.7V | | |
| NJM2836DL3-33 | 3.3V | NJM2836DL3-48 | 4.8V | | |
| NJM2836DL3-34 | 3.4V | NJM2836DL3-49 | 4.9V | | |
| NJM2836DL3-35 | 3.5V | NJM2836DL3-05 | 5.0V | | |

■ 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 | 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 100mm²)

(*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 |
| Quiescent Current at Control OFF | I _{Q(OFF)} | V _{CONT} =0V | - | - | 100 | nA | |
| Output Current | Io | Vo-0.3V | 500 | 650 | - | mA | |
| Line Regulation | ΔVo/ΔV _{IN} | V _{IN} =Vo+1V ~ Vo+6V (Vo≤12V), V _{IN} =Vo+1V ~ 18V (Vo>12V), Io=30mA | - | - | 0.10 | %/V | |
| Load Regulation | ΔVo/ΔIo | 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 | ΔVo/ΔTa | Ta=0 ~ 85°C, Io=10mA | - | ± 50 | - | ppm/°C | |
| Output Noise Voltage | V _{NO} | f=10Hz ~ 80kHz, Io=10mA, Vo=3V Version | - | 45 | - | 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 | |

(*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

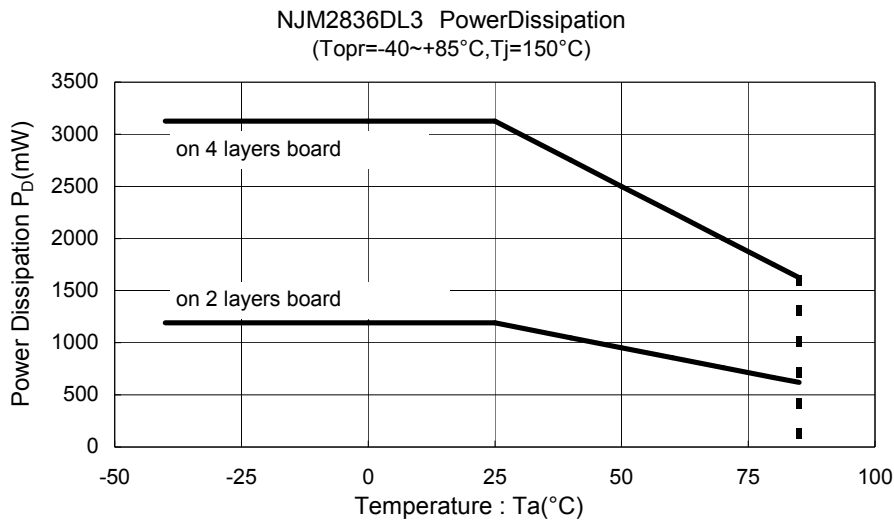
| PARAMETER | SYMBOL | VALUE | UNIT |
|---|---------------|---------------------|-----------------------------|
| Junction-to-ambient thermal resistance | θ_{ja} | 105 (*3) 40 (*4) | $^{\circ}\text{C}/\text{W}$ |
| Junction-to-Top of package characterization parameter | ψ_{jt} | 17 (*3) 12 (*4) | $^{\circ}\text{C}/\text{W}$ |

(*4): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard size, 2Layers, Cu area 100mm²)

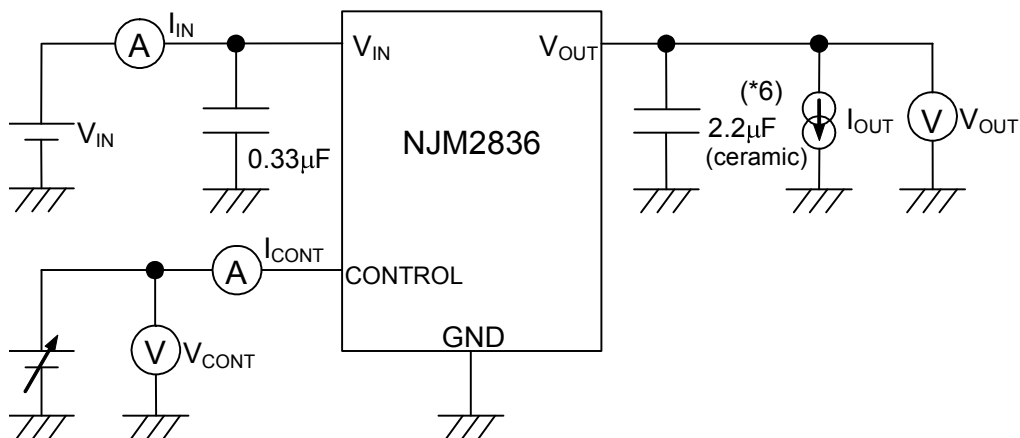
(*5): Mounted on glass epoxy board. (76.2 × 114.3 × 1.6mm:based on EIA/JDEC standard, 4Layers)

(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



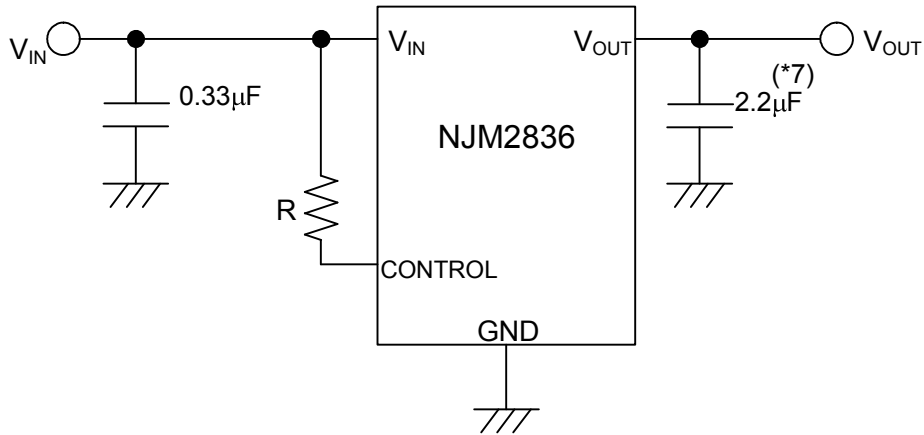
■ TEST CIRCUIT



(*6) 2.9V < V_o ≤ 5V version : C_o = 4.7µF (ceramic)
 V_o ≤ 2.9V version : C_o = 10µF (ceramic)

■ TYPICAL APPLICATIONS

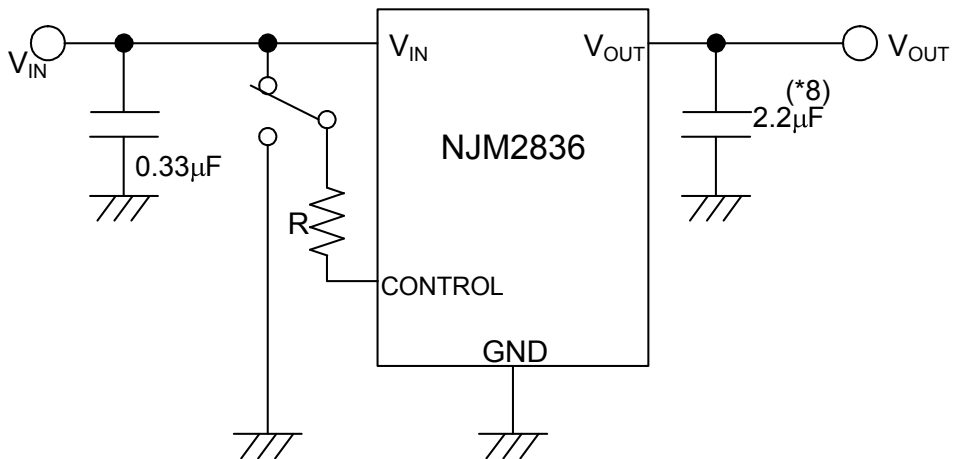
① In the case where ON/OFF Control is not required



(*7): 2.9V < Vo ≤ 5V version : Co = 4.7µF
 Vo ≤ 2.9V version : Co = 10µF

Connect control pin to VIN pin

② In use of ON/OFF CONTROL



(*8) : 2.9V < Vo ≤ 5V version : Co = 4.7µF
 Vo ≤ 2.9V version : Co = 10µF

State of control pin:

- “H” → output is enabled.
- “L” or “open” → output is disabled.

*In the case of using a resistor "R" between V_{IN} and control.

If this resistor is inserted, the control current could be reduced when the control voltage is high.

The applied voltage to control pin 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 resistor "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

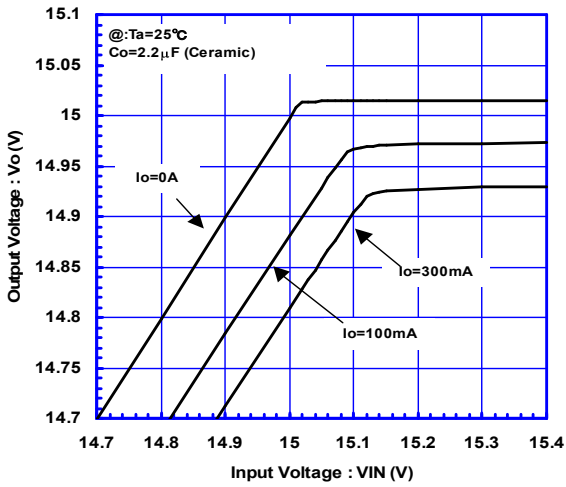
The recommended capacitance depends on the output voltage rank. Especially, low voltage regulator requires larger C_O value.

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.

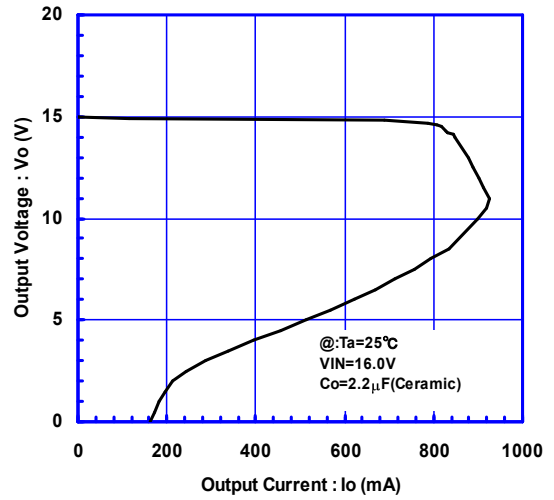
When selecting C_O , recommend that have withstand voltage margin against output voltage and superior temperature characteristic though this product is designed stability works with wide range ESR of capacitor including low ESR products.

TYPICAL CHARACTERISTICS

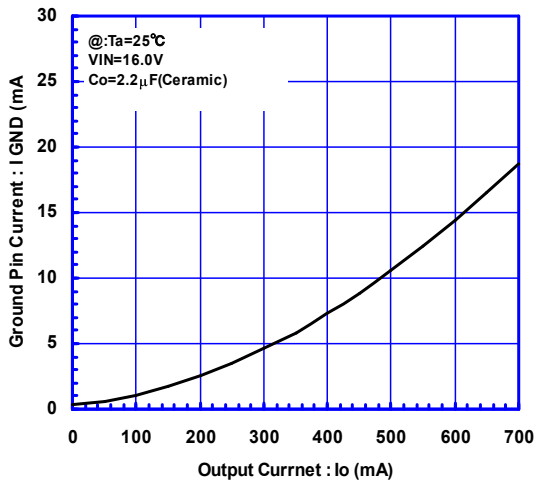
NJM2836_15V
Output Voltage vs Input Voltage



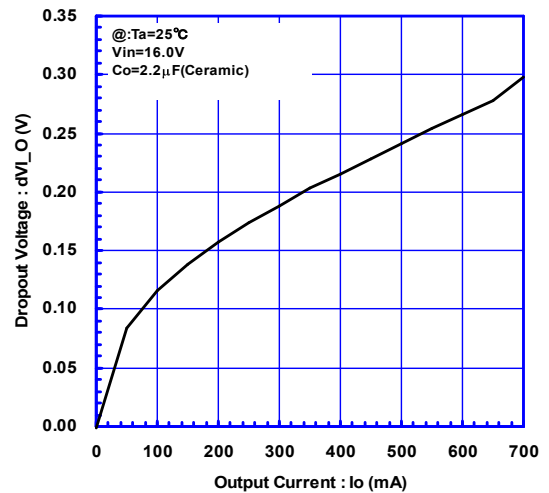
NJM2836_15V
Over Current Protection vs Output Current



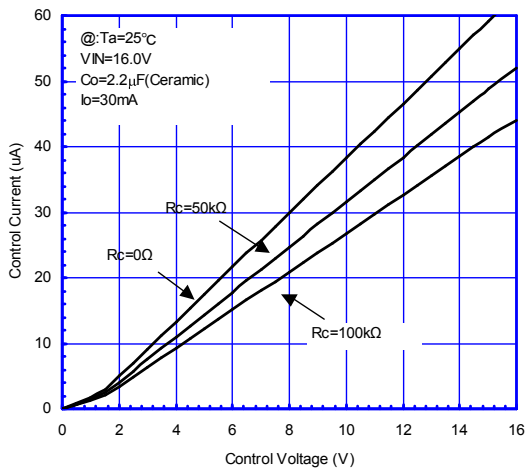
NJM2836_15V
Ground Current vs Output Current



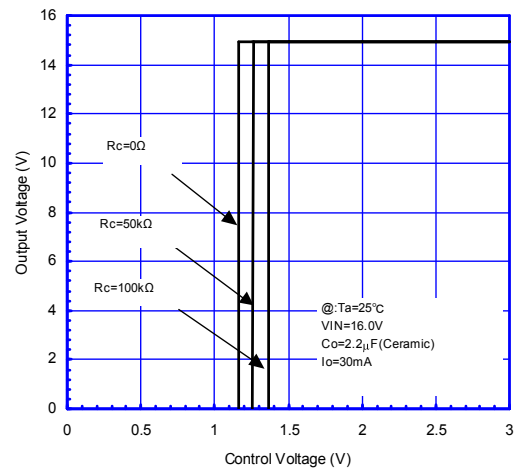
NJM2836_15V
Dropout Voltage VS Output Current



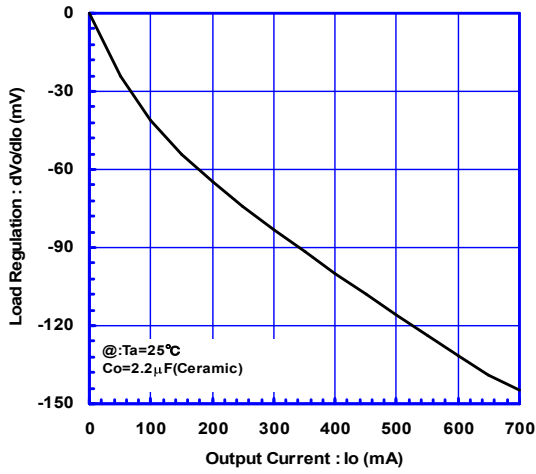
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Control Voltage vs Control Current



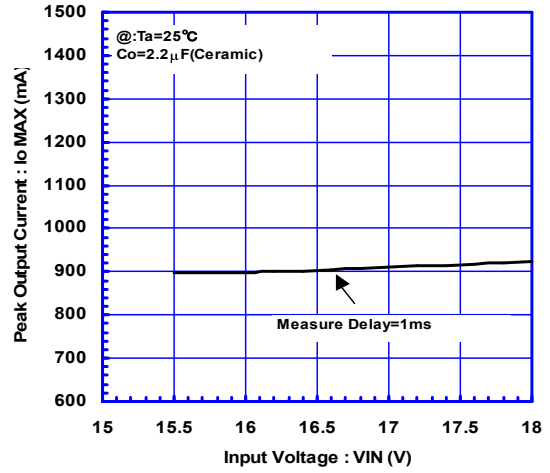
NJM2836_15V
Control Voltage vs Output Voltage



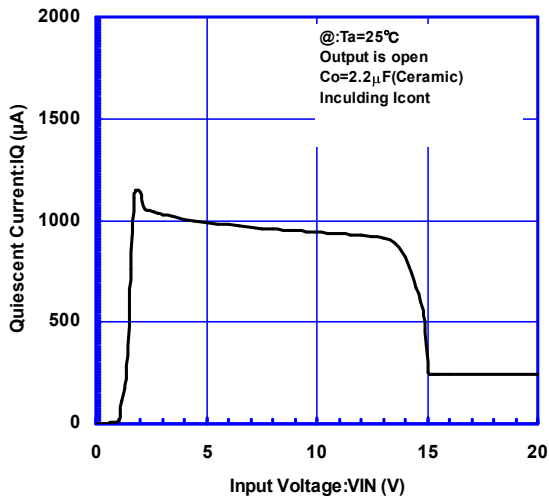
NJM2836_15V
Dropout Voltage VS Output Current



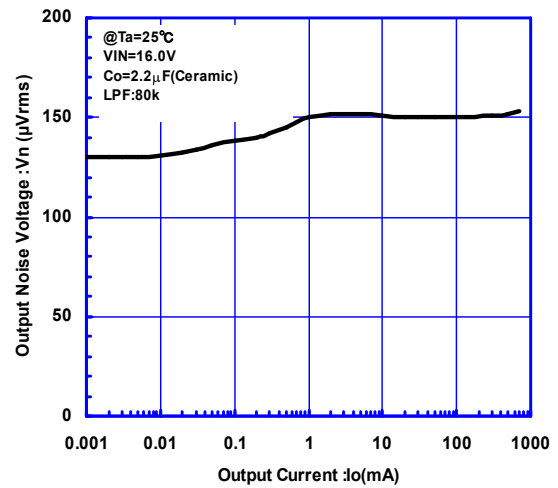
NJM2836_15V
Output Current vs Input Voltage



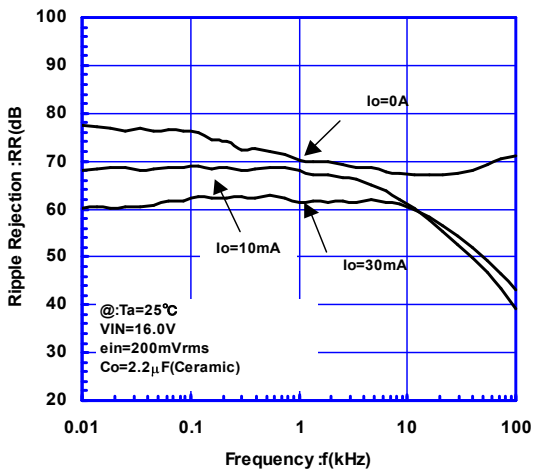
NJM2836_15V
Quiescent Current vs Input Voltage



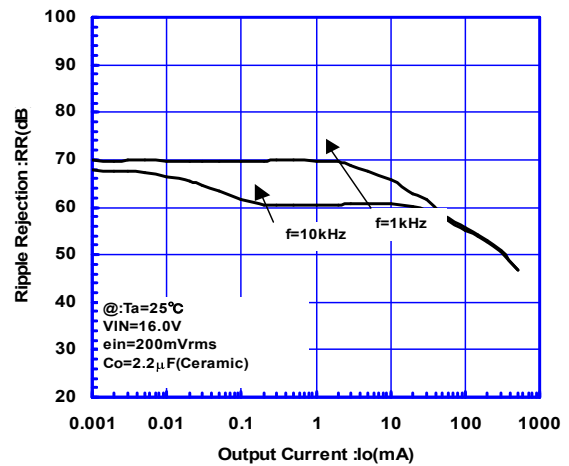
NJM2836_15V
Output Noise Voltage vs Output Current

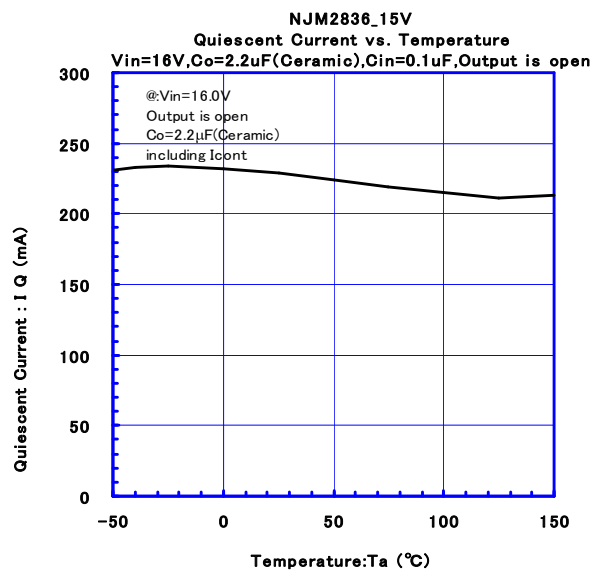
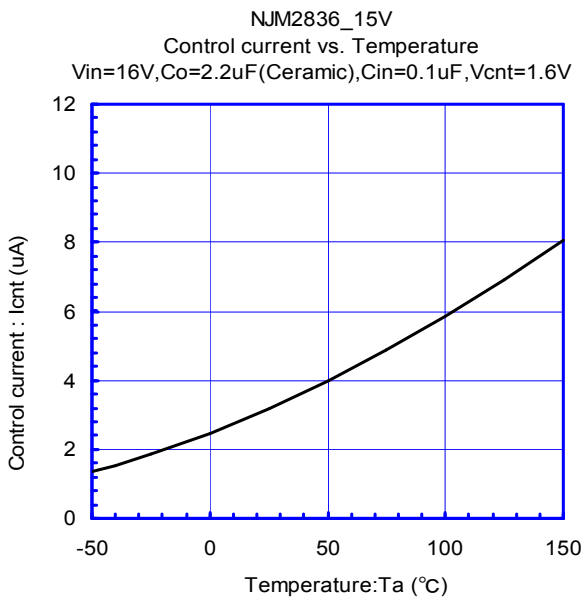
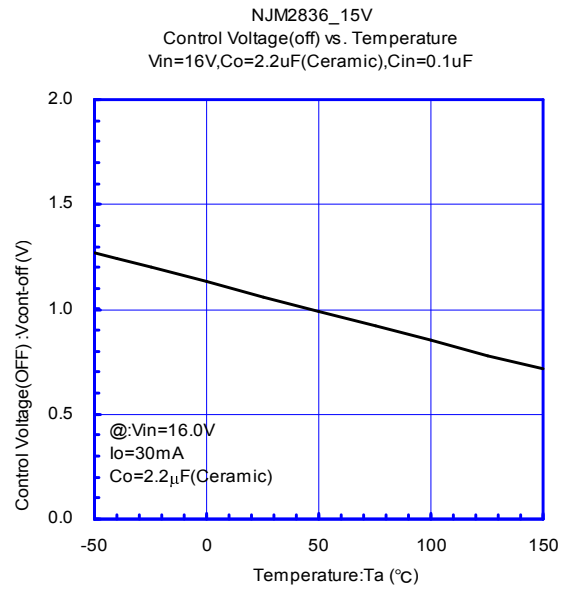
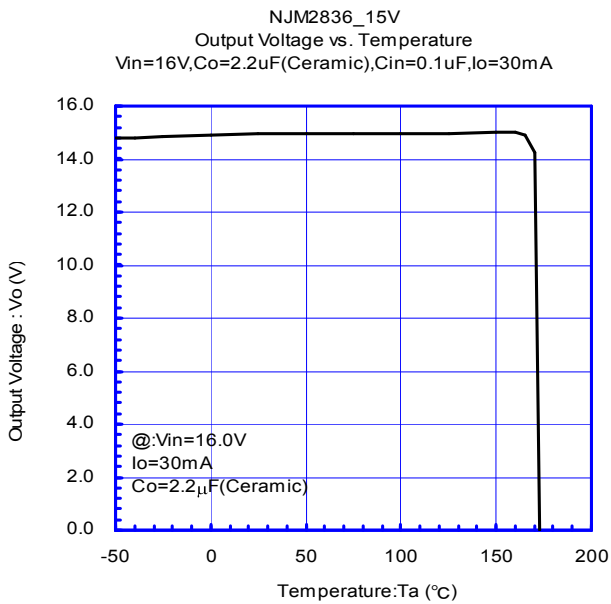
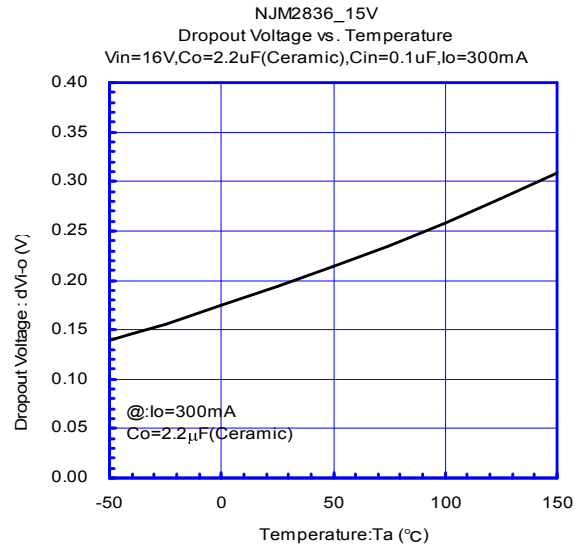
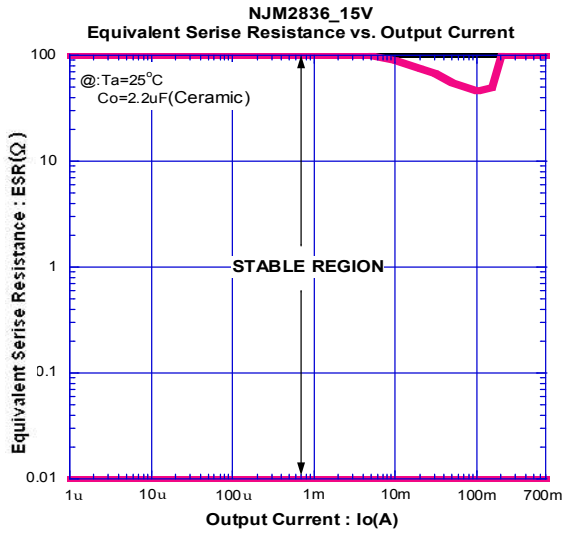


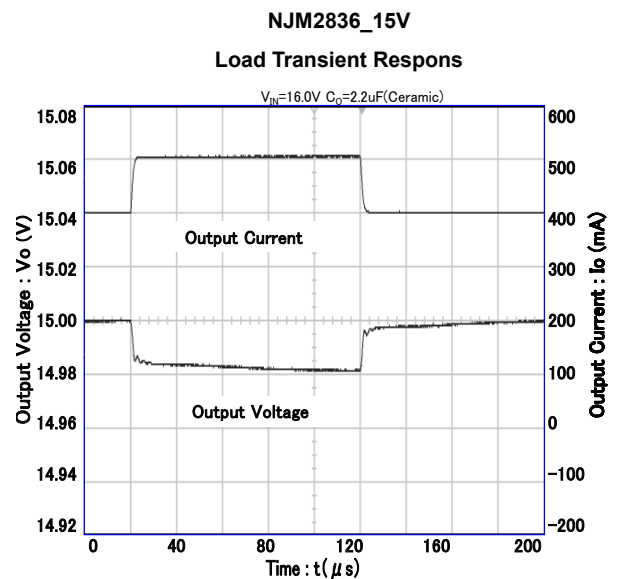
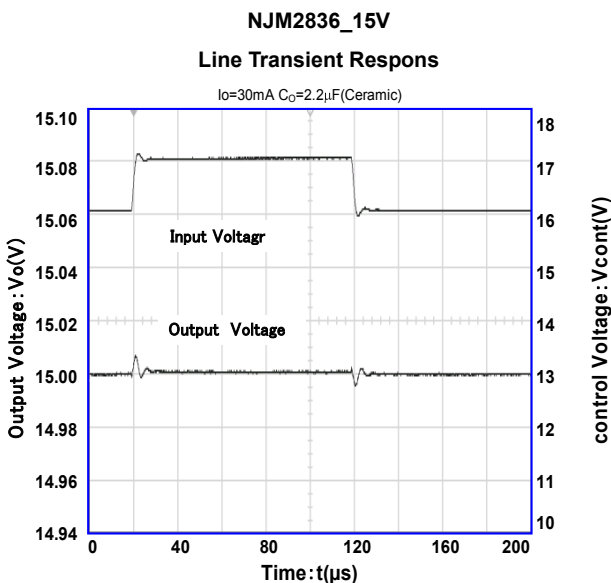
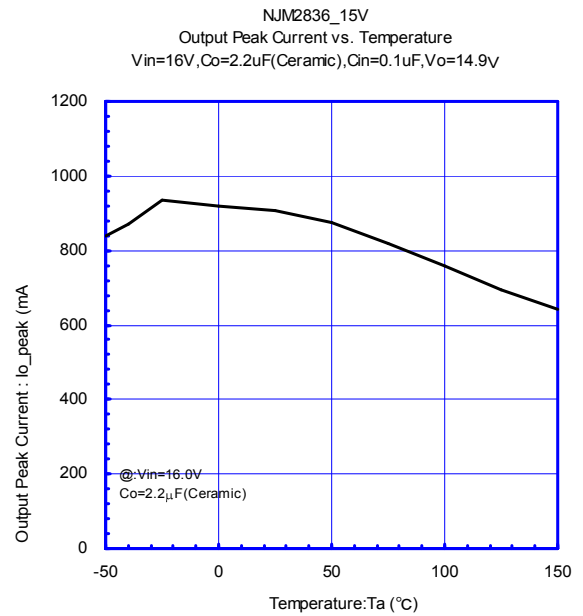
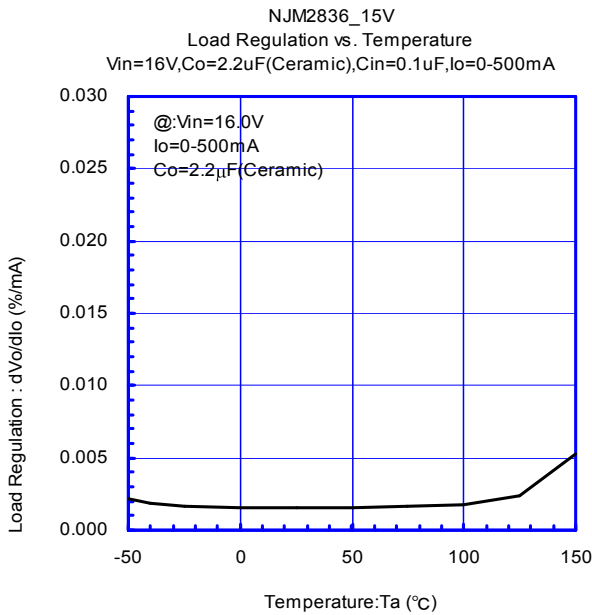
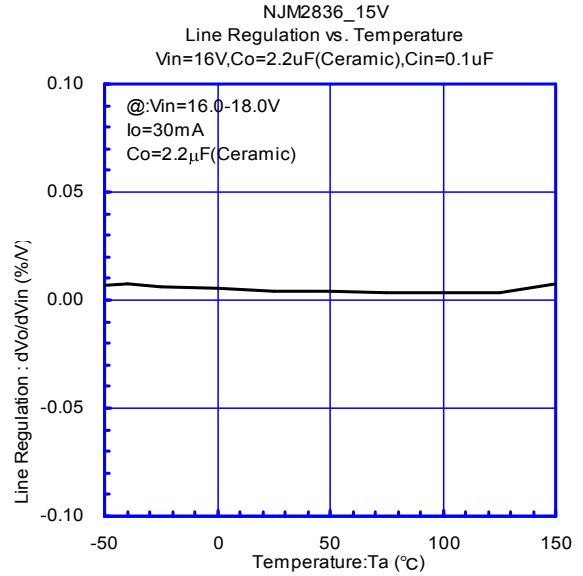
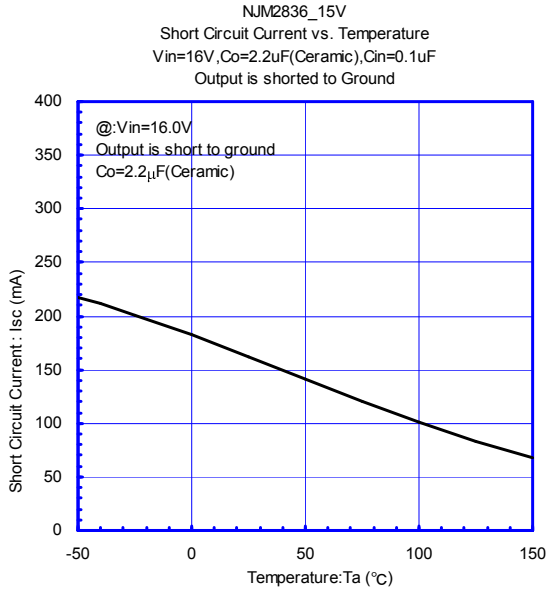
NJM2836_15V
Ripple Rejection



NJM2836_15V
Output Current vs Ripple Rejection







[CAUTION]

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