# Very Low Output Voltage Series Regulator

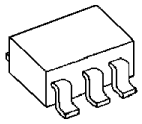
## ■ GENERAL DESCRIPTION

The NJM2847 is a series voltage regulator that delivers up to 150mA output current with the output voltage of 0.8 to 1.4V with ON/OFF control.

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

Small packaging and 2.2μF small decoupling capacitor make the NJM2847 suitable for space conscious applications.

## ■ PACKAGE OUTLINE

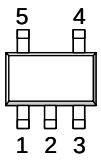


NJM2847F3

## ■ FEATURES

- Output Voltage Range 0.8V to 1.4V
- Input Voltage Range 2.3V to 9.0V
- High Ripple Rejection 85dB typ. (f=1kHz, $V_O$=0.8V version)
- Very Output Noise Voltage $V_{NO}$=20μVrms typ. (Cp=0.01μF)
- Output Current $I_O$(max)=150mA
- High Precision Output $V_O$±1.0%
- Output Capacitor with 2.2μF ceramic capacitor ($V_O$>1.0V)
- ON/OFF Control
- Built-in Thermal Overload Protection and Short Circuit Current Limit Protection
- Bipolar Technology
- Package Outline SC-88A

## ■ PIN CONNECTION




1. CONTROL
2. GND
3. NOISE BYPASS
4. $V_{OUT}$
5. $V_{IN}$

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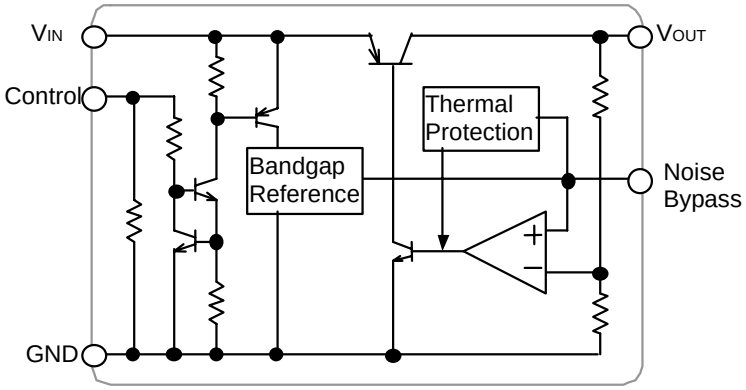
## ■ BLOCK DIAGRAM



## ■ OUTPUT VOLTAGE LANK LIST

The WHITE column shows applicable Voltage Rank(s).

| Device Name | $V_{out}$ |
|---|---|
| NJM2847F3 -008 | 0.8V |
| NJM2847F3 -009 | 0.9V |
| NJM2847F3 -010 | 1.0V |
| NJM2847F3 -011 | 1.1V |
| NJM2847F3 -012 | 1.2V |
| NJM2847F3 -013 | 1.3V |
| NJM2847F3 -014 | 1.4V |

Output Voltage Range: 0.8V to 1.4V (0.1V step)

## ■ ABABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | +10 | V |
| Control Voltage | $V_{CONT}$ | +10 | V |
| Power Dissipation | $P_D$ | 250(*1) | mW |
| Operating Temperature | Topr | - 40 ~ +85 | °C |
| Storage Temperature | Tstg | - 40 ~ +125 | °C |

Note1: EIA/JEDEC STANDARD Test board (76.2*114.3*1.6mm, 2layers, FR-4) mounting

## ■ BIAS VOLTAGE INPUT RANGE

$V_{IN}$=+2.3 ~ +9V

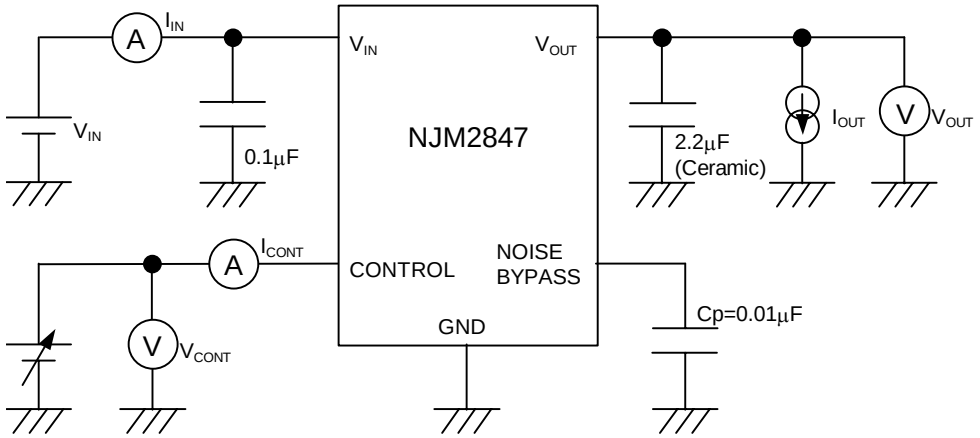
## ■ ELECTRICAL CHARACTERISTICS ($V_{IN}$=2.5V, $C_{IN}$=0.1μF, Co=2.2μF, Cp=0.01μF, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAV. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | Vo | Io=30mA | -1.0% | – | +1.0% | V |
| Input Voltage | $V_{IN}$ | | 2.3 | – | 9 | V |
| Quiescent Current | $I_Q$ | Io=0mA, except Icont | – | 140 | 200 | μA |
| Quiescent Current at Control OFF | $I_{Q(OFF)}$ | $V_{CONT}$=0V | – | – | 100 | nA |
| Output Current | Io | Vo ×0.9V | 150 | 200 | – | mA |
| Line Regulation | $\Delta Vo/\Delta V_{IN}$ | $V_{IN}$=2.5V to 9.0V, Io=30mA | – | – | 0.10 | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | Io=0mA to 100mA | – | – | 0.03 | %/mA |
| Dropout Voltage | $\Delta V_{I-O}$ | Io=60mA | – | 0.10 | 0.18 | V |
| Ripple Rejection | RR | ein=200mVrms, f=1kHz, Io=10mA, Vo=0.8V version | – | 85 | – | dB |
| Average Temperature Coefficient of Output Voltage | $\Delta Vo/\Delta Ta$ | Ta=0°C to +85°C, Io=10mA | – | ± 50 | – | ppm/°C |
| Output Noise Voltage | $V_{NO}$ | f=10Hz to 80kHz, Io=10mA, Vo=0.8Vversion | – | 20 | – | μVrms |
| Control Current | $I_{CONT}$ | $V_{CONT}$=1.6V | – | 3 | 12 | μA |
| Control Current for ON-state | $V_{CONT(ON)}$ | | 1.6 | – | – | V |
| Control Current for OFF-state | $V_{CONT(OFF)}$ | | – | – | 0.6 | V |

The above specification is a common specification for all output voltages.

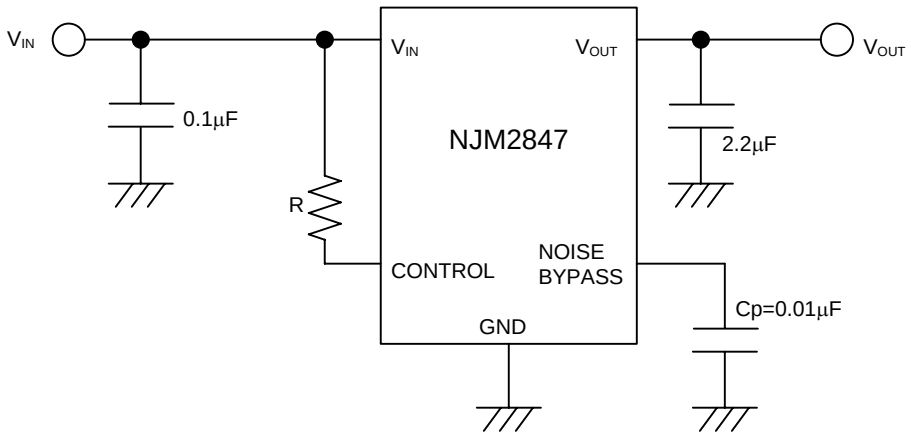
Therefore, it may be different from the individual specification for a specific output voltage.

## ■ TEST CIRCUIT




## ■ TYPICAL APPLICATION

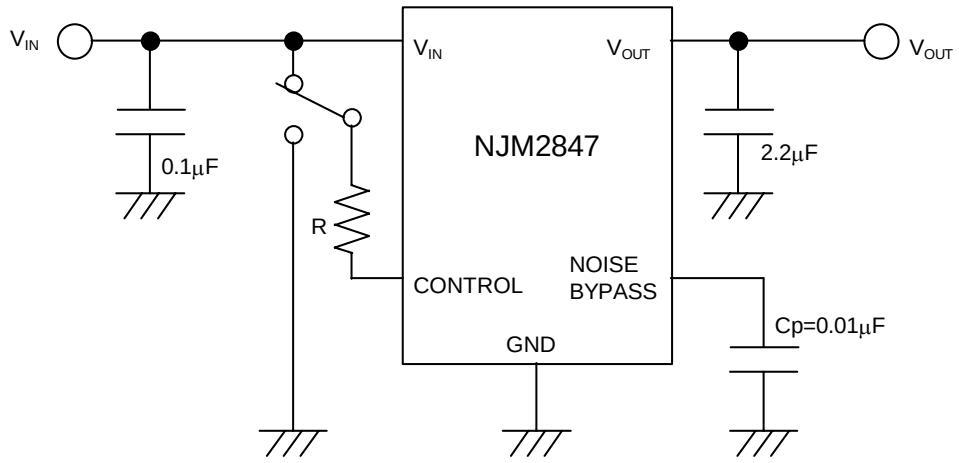
a) In case of where ON/OFF control is not required:




You shall connect control terminal to $V_{IN}$ terminal.

Though the $I_{CONT}$ decreases by inserting "R" to between Control terminal and $V_{BIAS}$ terminal, the minimum operating voltage is increased due to the resister "R".

b) In use of ON/OFF control:




State of control terminal:

- "H"→ output is enabled.
- "L" or "open" → output is disabled.

* Noise bypass Capacitance Cp

Noise bypass capacitance Cp reduces noise generated by band-gap reference circuit.
Noise level and ripple rejection will be improved when larger Cp is used.
Use of smaller Cp value may cause oscillation.
Use the Cp value of 0.01μF greater to avoid the problem.

* 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 0.1μF greater 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.