LOW DROPOUT VOLTAGE REGULATOR

**GENERAL DESCRIPTION**

The NJM2819A 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 7V/2A output power with the maximum input voltage of 10V.
The NJM2819A is suitable for audio/video and digital applications.

**FEATURES**

- High Ripple Rejection 65dB typ. (f=1kHz,3V Version)
- Output Noise Voltage $V_{no}=42\mu V$ rms typ. (Vo=3V Version)
- Output capacitor with 4.7µF ceramic capacitor (Vo≥2.1V)
- Output Current $I_{o}(\text{max.})=2.0A$
- High Precision Output $V_{o} \pm 1.0\%$
- Low Dropout Voltage 0.1V typ. ($I_{o}=1.0A$, 3.0V Version)
- ON/OFF Control
- Internal Short Circuit Current Limit
- Internal Thermal Overload Protection
- Package Outline TO-252-5

**PIN CONFIGURATION**

```
1. VIN
2. CONTROL
3. Vo
4. N.C.
5. GND
```

**EQUIVALENT CIRCUIT**
NJM2819A

■ OUTPUT VOLTAGE RANK LIST

<table>
<thead>
<tr>
<th>Device Name</th>
<th>V_{OUT}</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJM2819ADL3-18</td>
<td>1.8V</td>
</tr>
<tr>
<td>NJM2819ADL3-21</td>
<td>2.1V</td>
</tr>
<tr>
<td>NJM2819ADL3-03</td>
<td>3.0V</td>
</tr>
<tr>
<td>NJM2819ADL3-33</td>
<td>3.3V</td>
</tr>
<tr>
<td>NJM2819ADL3-05</td>
<td>5.0V</td>
</tr>
<tr>
<td>NJM2819ADL3-52</td>
<td>5.2V</td>
</tr>
<tr>
<td>NJM2819ADL3-07</td>
<td>7.0V</td>
</tr>
</tbody>
</table>

Output voltage options available: 1.8 ~ 7.0V

■ ABSOLUTE MAXIMUM RATINGS  (Ta=25°C)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>RATINGS</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>V_{IN}</td>
<td>V_{O} &gt; 6.0V: +10</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.0V &lt; V_{O} ≤ 6.0V: +9V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{O} ≤ 5.0V: +8</td>
<td></td>
</tr>
<tr>
<td>Control Voltage</td>
<td>V_{CONT}</td>
<td>V_{O} &gt; 6.0V: +10</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.0V &lt; V_{O} ≤ 6.0V: +9V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{O} ≤ 5.0V: +8</td>
<td></td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>P_{D}</td>
<td>1190(*)</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3125(*2)</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>Topr</td>
<td>-40 ~ +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tstg</td>
<td>-40 ~ +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

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

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

(4Layers inner foil: 74.2 x 74.2mm  Applying a thermal beer hall to a board based on JEDEC standard JESD51-5)

■ OPERATING VOLTAGE

\[ V_{\text{IN}} = V_{O} + \Delta V_{I\text{O}} \sim 9V \] (In case of \( V_{O} > 6.0V \) version)

\[ V_{\text{IN}} = V_{O} + \Delta V_{I\text{O}} \sim 8V \] (In case of \( 5.0V < V_{O} \leq 6.0V \) version)

\[ V_{\text{IN}} = V_{O} + \Delta V_{I\text{O}} \sim 7V \] (In case of \( 2.1V \leq V_{O} \leq 5.0V \) version)

\[ V_{\text{IN}} = 2.3V \sim 7V \] (In case of \( V_{O} < 2.1V \) version)

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New Japan Radio Co., Ltd.
Ver.2010-02-08
## ELECTRICAL CHARACTERISTICS (VIN=Vo+1V, CIN=4.7µF, Co=4.7µF(Co=10µF : 1.8V≤Vo<2.1V), Ta=25°C)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>TEST CONDITION</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage</td>
<td>Vo</td>
<td>Io=100mA</td>
<td>-1.0%</td>
<td>-</td>
<td>+1.0%</td>
<td>V</td>
</tr>
<tr>
<td>Quiescent Current</td>
<td>Io</td>
<td>Io=0mA, exclude ICONT</td>
<td>-</td>
<td>500</td>
<td>800</td>
<td>µA</td>
</tr>
<tr>
<td>Quiescent Current at Control OFF</td>
<td>Io(OFF)</td>
<td>VCONT=0V</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>µA</td>
</tr>
<tr>
<td>Output Current</td>
<td>Io</td>
<td>Vo - 0.3V</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>Line Regulation</td>
<td>ΔVo/ΔVIN</td>
<td>Vo&gt;5.0V : VIN=Vo+1V ~ 9V, 5.0V &lt; Vo ≤ 6.0V : VIN=Vo+1V ~ 8V, Vo≤5.0V : VIN=Vo+1V ~ 7V, Io=100mA</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>%/V</td>
</tr>
<tr>
<td>Load Regulation</td>
<td>ΔVo/Io</td>
<td>Io=0 ~ 2.0A</td>
<td>-</td>
<td>0.05</td>
<td>0.4</td>
<td>%/A</td>
</tr>
<tr>
<td>Dropout Voltage(*2)</td>
<td>ΔVo</td>
<td>Io=1.0A</td>
<td>2.1V ≤ Vo &lt; 2.5V</td>
<td>-</td>
<td>0.14</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.5V ≤ Vo &lt; 2.8V</td>
<td>-</td>
<td>0.11</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.8V ≤ Vo &lt; 3.4V</td>
<td>-</td>
<td>0.10</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.4V ≤ Vo ≤ 7.0V</td>
<td>-</td>
<td>0.09</td>
<td>0.16</td>
</tr>
<tr>
<td>Ripple Rejection</td>
<td>RR</td>
<td>ein=200mVrms, f=1kHz, Io=100mA, Vo=3V Version</td>
<td>-</td>
<td>65</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>Average Temperature</td>
<td>ΔVo/Ta</td>
<td>Ta=0 ~ 85°C, Io=100mA</td>
<td>-</td>
<td>± 50</td>
<td>-</td>
<td>ppm/^C</td>
</tr>
<tr>
<td>Coefficient of Output Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Noise Voltage</td>
<td>VNO</td>
<td>f=10Hz ~ 80kHz, Io=100mA, Vo=3V Version</td>
<td>-</td>
<td>42</td>
<td>-</td>
<td>µVrms</td>
</tr>
<tr>
<td>Control Current</td>
<td>ICONT</td>
<td>VCONT=1.6V</td>
<td>-</td>
<td>3</td>
<td>12</td>
<td>µA</td>
</tr>
<tr>
<td>Control Voltage for ON-state</td>
<td>VCONT(ON)</td>
<td>1.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Control Voltage for OFF-state</td>
<td>VCONT(OFF)</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Minimum Input Voltage</td>
<td>VIN(MIN.)</td>
<td>Vo&lt;2.1V</td>
<td>Io≤1.5A, Vo×0.96</td>
<td>2.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.5A&lt;Io≤2.0A, Vo×0.96</td>
<td>2.4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(*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

NJM2819ADL3 Power Dissipation
(Topr=-40~+85°C, Tj=150°C)

0 500 1000 1500 2000 2500 3000 3500
Power Dissipation P_D (mW)

-50 -25 0 25 50 75 100
Temperature : Ta(°C)
on 4 layers board
on 2 layers board

TEST CIRCUIT

NJM2819A

VIN VOUT
CONTROL GND

4.7µF

IIN ICONT

*3 : 1.8 ≤ Vo < 2.6V version : Co=10µF (Ceramic)
TYPICAL APPLICATION

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

![Diagram showing NJM2819A with components and connections]

Connect control terminal to VIN terminal

2 In use of ON/OFF CONTROL:

![Diagram showing NJM2819A with components and connections]

State of control terminal:

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

* In the case of using a resistance "R" between VIN 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 VIN 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 ($C_{O}$) 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 $C_{O}$, it 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 greater value and connect between $V_{O}$ terminal and GND terminal with minimal wiring.

The recommended capacitance depends on the output voltage. Low voltage regulator requires greater value of the $C_{O}$. Thus, check the recommended capacitance for each output voltage.

Use of a greater $C_{O}$ 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 $C_{O}$; 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

**Output Voltage vs. Input Voltage**

- **Input Voltage (VIN)**: 2.7 V to 3.4 V
- **Output Voltage (Vo)**: 2.7 V to 3.4 V
- **Current Levels**: Io = 0A, Io = 500mA, Io = 2000mA
- **Conditions**: Ta = 25°C, Co = 4.7uF (Ceramic)

**Ground Pin Current vs. Output Current**

- **Output Current (Io)**: 0 mA to 3000 mA
- **Ground Pin Current**: 0 mA to 5 mA
- **Conditions**: Ta = 25°C, VIN = 4.0V, Co = 4.7uF (Ceramic)

**Dropout Voltage vs. Output Current**

- **Output Current (Io)**: 0 mA to 3000 mA
- **Dropout Voltage (dVI_O)**: 0.00 V to 0.40 V
- **Conditions**: Ta = 25°C, Vin = 2.5V, Co = 2.2uF (Ceramic)

**Control Current vs. Control Voltage**

- **Control Voltage**: 0 V to 4 V
- **Control Current (IC)**: 0 uA to 50 uA
- **Conditions**: Ta = 25°C, VIN = 4.0V, Co = 4.7uF (Ceramic), Io = 500mA

**Output Voltage vs. Output Current**

- **Output Current (Io)**: 0.1 mA to 3.5 mA
- **Output Voltage (Vo)**: 2.5 V to 3.5 V
- **Conditions**: Ta = 25°C, VIN = 4.0V, Co = 4.7uF (Ceramic)

**New Japan Radio Co., Ltd.**

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NJM2819A_3.0V
Load Regulation vs. Output Current

Output Current: Io (mA)
Load Regulation: dVo/dIo (mV)

@: Ta=25°C
Vin=2.5V
Co=4.7µF (Ceramic)

NJM2819A_3.0V
Peak Output Current vs. Input Voltage

Input Voltage: VIN (V)
Peak Output Current: Io MAX (mA)

@: Ta=25°C
Co=4.7µF (Ceramic)

NJM2819A_3.0V
Quiescent Current vs. Input Voltage

Input Voltage: VIN (V)
Quiescent Current: IQ (µA)

@: Ta=25°C
Output is open
Co=4.7µF (Ceramic)
Including Icont

NJM2819A_3.0V
Output Noise Voltage vs. Output Current

Output Current: Io (mA)
Output Noise Voltage: Vn (µVrms)

@ Ta=25°C
VIN =4.0V
Cin=4.7µF (Ceramic)
Co=4.7µF (Ceramic)
LPH: 80kHz

NJM2819A_3.0V
Ripple Rejection Ratio vs. Frequency

Frequency: f (kHz)
Ripple Rejection: RR (dB)

@ Ta=25°C
VIN=4.0V
ein=200mVrms
Cin=4.7µF
Co=4.7µF
Io=0A
Io=100mA
Io=2000mA

NJM2819A_3.0V
Ripple Rejection vs. Output Current

Output Current: Io (mA)
Ripple Rejection: RR (dB)

@ Ta=25°C
VIN=4.0V
ein=200mVrms
Cin=4.7µF
Co=4.7µF
f=1kHz
f=10kHz
NJM2819A_3.0V
Short Circuit Current vs. Temperature

@: VIN=4.0V
Output is short to Ground
Co=4.7uF(Ceramic)

Line Regulation vs. Temperature

@: VIN=4.0-9.0V
Io=100mA
Co=4.7uF(Ceramic)

Load Regulation vs. Temperature

@: VIN=4.0
Io=0-2000mA
Co=4.7uF(Ceramic)

Output Peak Current vs. Temperature

@: VIN=4.0V
Co=4.7uF(Ceramic)

Output Voltage vs. Temperature

@: VIN=4.0V
Io=100mA
Co=4.7uF(Ceramic)
[CAUTION]
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