

## LOW DROPOUT VOLTAGE REGULATOR WITH ON/OFF CONTROL

### ■ GENERAL DESCRIPTION

The **NJM2370** is a low dropout voltage regulator with ON/OFF control.

It features dropout voltage of 0.1V at  $I_O=30\text{mA}$ , low output noise and high ripple rejection by connecting an external capacitor to noise bypass terminal.

It's suitable for portable items such as cellular phones, video camera and others.

### ■ PACKAGE OUTLINE



**NJM2730U**

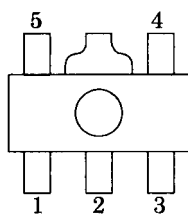


**NJM2730R**

### ■ FEATURES

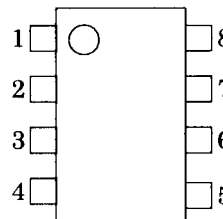
- Output Current (150mA min. ( $V_O=0.3\text{V}$ ))
- Low Dropout Voltage (0.1V typ. ( $I_O=30\text{mA}$ ))
- External Capacitor for Noise Bypass
- ON / OFF Control Function
- Over Current Limit
- Thermal Shutdown
- Bipolar Technology
- Package Outline SOT-89 (5pin), VSP8

### ■ PIN CONFIGURATION



**NJM2730U**

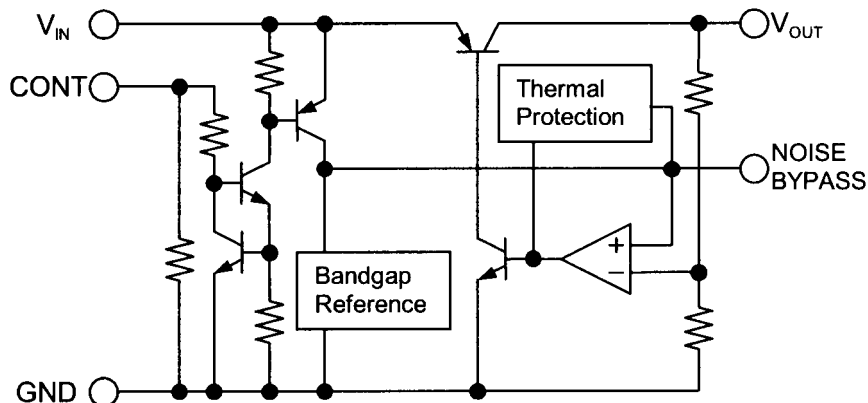
- PIN FUNCTION**
1. CONTROL
  2. GND
  3. NOISE BYPASS
  4.  $V_{OUT}$
  5.  $V_{IN}$



**NJM2730R**

- PIN FUNCTION**
1. CONTROL
  2. GND
  3. NC
  4. NOISE BYPASS
  5.  $V_{OUT}$
  6. NC
  7. NC
  8.  $V_{IN}$

### ■ EQUIVALENT CIRCUIT



# NJM2370

## ■ ABSOLUTE MAXIMUM RATINGS

( $T_a=25^\circ\text{C}$ )

| PARAMETER                   | SYMBOL     | RATINGS                    | UNIT             |
|-----------------------------|------------|----------------------------|------------------|
| Input Voltage               | $V_{IN}$   | 20                         | V                |
| Control Voltage             | $V_{CONT}$ | 20 (note 1)                | V                |
| Power Dissipation           | $P_D$      | (SOT-89) 350<br>(VSP8) 320 | mW               |
| Operating Temperature Range | $T_{opr}$  | -40 to +85                 | $^\circ\text{C}$ |
| Storage Temperature Range   | $T_{stg}$  | -40 to +125                | $^\circ\text{C}$ |

(note 1) When input voltage is less than +20V, the absolute maximum control voltage is equal to the input voltage.

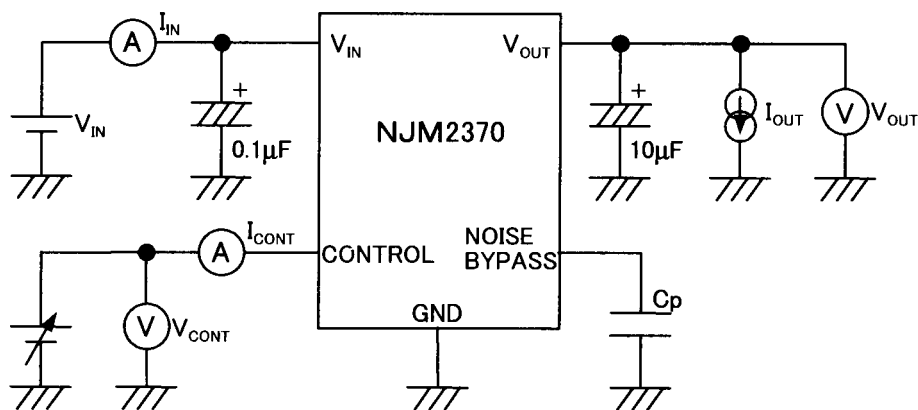
## ■ ELECTRICAL CHARACTERISTICS

( $T_a=25^\circ\text{C}$ )

| PARAMETER   | SYMBOL                       | CONDITIONS   | MIN. | TYP. | MAX. | UNIT                         |
|---|------------------------------|--|------|------|------|------------------------------|
| Output Voltage                                    | $V_O$                        | $V_{IN}=V_O+1\text{V}$ , $I_O=30\text{mA}$   | -3%  | -    | +3%  | V                            |
| Quiescent Current 1                               | $I_{Q1}$                     | $I_O=0\text{mA}$ , expect $I_{CONT}$   | -    | 180  | -    | $\mu\text{A}$                |
| Quiescent Current 2                               | $I_{Q2}$                     | CONTROL-GND short  | -    | -    | 100  | nA                           |
| Output Current                                    | $I_O$                        | ( $V_O-0.3\text{V}$ )  | 150  | 180  | -    | mA                           |
| Line Regulation                                   | $\Delta V_O / \Delta V_{IN}$ | $V_{IN}=(V_O+1\text{V})$ to ( $V_O+6\text{V}$ )<br>$V_O=2\text{V}$ to $14\text{V}$             | -    | -    | 0.12 | % / V                        |
|   |                              | $V_{IN}=(V_O+1\text{V})$ to ( $V_O+5\text{V}$ )<br>$V_O=15\text{V}$                            | -    | -    | 0.12 | % / V                        |
| Load Regulation                                   | $\Delta V_O / \Delta I_O$    | $I_O=0$ to $60\text{mA}$   | -    | -    | 0.03 | % / mA                       |
| Dropout Voltage                                   | $\Delta V_{IO}$              | $I_O=30\text{mA}$  | -    | 0.1  | 0.3  | V                            |
| Ripple Rejection                                  | R-R                          | $f=400\text{Hz}$ , $e_{in}=100\text{mV}_{P-P}$<br>$V_{IN}=V_O+1.5\text{V}$ , $I_O=10\text{mA}$ | -    | 60   | -    | dB                           |
| Average Temperature Coefficient of Output Voltage | $\Delta V_O / \Delta T_a$    | $T_a=-20$ to $75^\circ\text{C}$ , $I_O=10\text{mA}$<br>$V_{IN}=V_O+1.5\text{V}$                | -    | 0.2  | -    | $\text{mV} / ^\circ\text{C}$ |
| Output Noise Voltage                              | $V_{NO}$                     | $10\text{Hz} < f < 80\text{kHz}$ , $I_O=10\text{mA}$ , $V_O=3\text{V}$                         | -    | 30   | -    | $\mu\text{V}_{rms}$          |

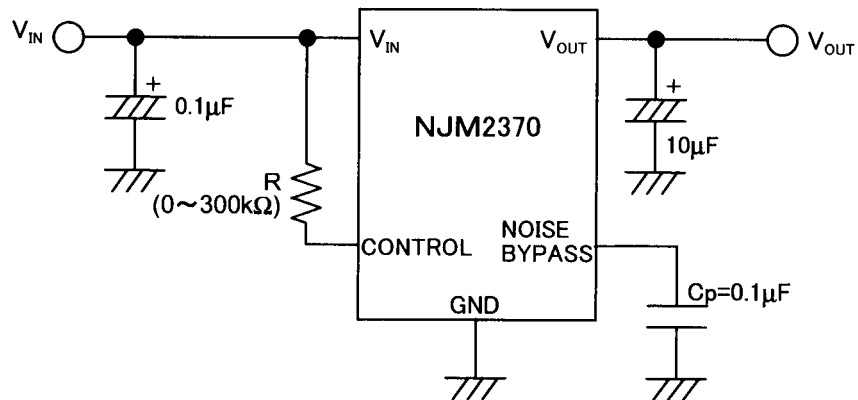
(note 2) Please confirm the specification separately because some parameters depend on output voltage.

## ■ TEST CIRCUIT



## ■ TYPICAL APPLICATION

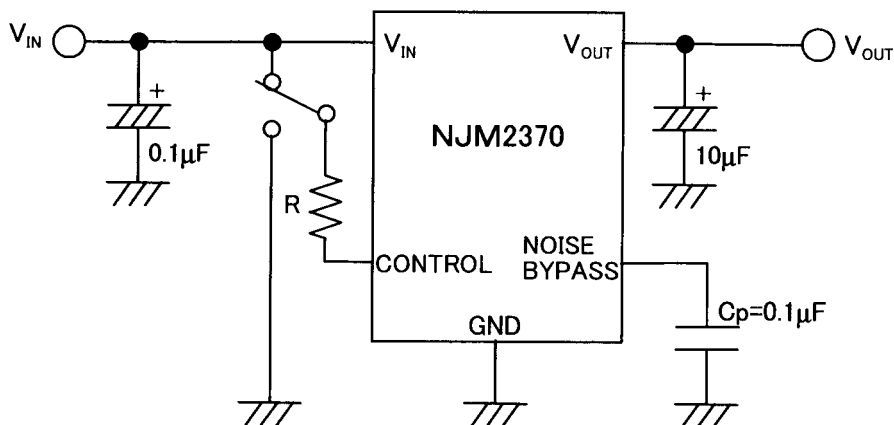
### ① In Nonuse of ON / OFF Control



Connect control terminal (1Pin) to  $V_{IN}$  terminal (5Pin)

When a resistance "R" is connected, the quiescent current decreases, but minimum operating voltage increases. Please refer to a figure of Output Voltage vs. Control Voltage.

### ② In Use of ON / OFF CONTROL



When the control terminal is "H", it is ON.

When the control terminal is "L" or "open", it is OFF.

#### \*Noise bypass Capacitance $C_p$

Noise bypass capacitance  $C_p$  reduces noise generated by band-gap reference circuit.

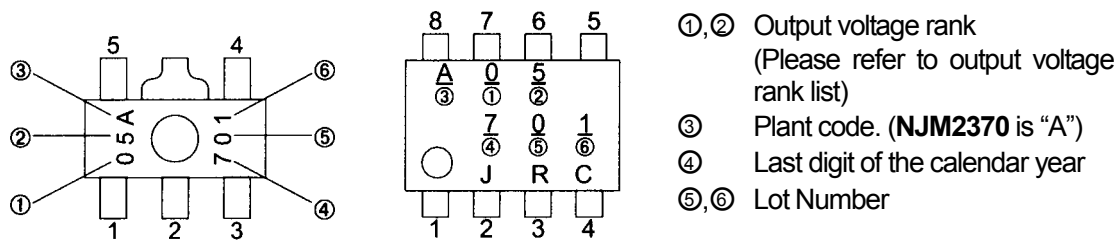
Noise level and ripple rejection will be improved when larger  $C_p$  is used. Please refer to the typical characteristics to determine the value.

Use of smaller  $C_p$  value may induce oscillation.

Please make sure to use  $C_p$  value of greater than 0.1µF to avoid the problem.

# NJM2370

## ■ PACKAGE MARKING



## ■ OUTPUT VOLTAGE RANK LIST

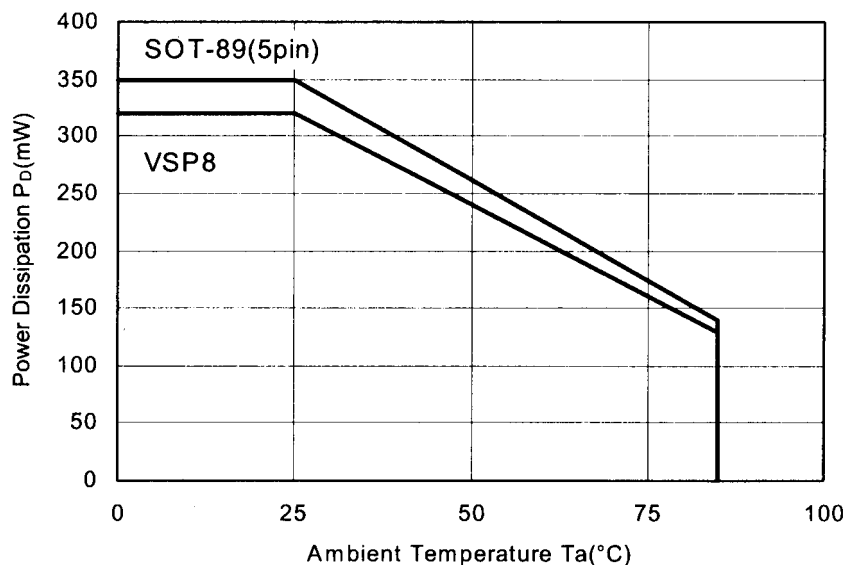
| Output Voltage | Part Number | Marking |   |
|----------------|-------------|---------|---|
|                |             | ①       | ② |
| 2.0V           | NJM2370X02  | 0       | 2 |
| 2.1V           | NJM2370X21  | 2       | 1 |
| 2.2V           | NJM2370X22  | 2       | 2 |
| 2.3V           | NJM2370X23  | 2       | 3 |
| 2.4V           | NJM2370X24  | 2       | 4 |
| 2.5V           | NJM2370X25  | 2       | 5 |
| 2.6V           | NJM2370X26  | 2       | 6 |
| 2.7V           | NJM2370X27  | 2       | 7 |
| 2.8V           | NJM2370X28  | 2       | 8 |
| 2.9V           | NJM2370X29  | 2       | 9 |
| 3.0V           | NJM2370X03  | 0       | 3 |
| 3.1V           | NJM2370X31  | 3       | 1 |
| 3.2V           | NJM2370X32  | 3       | 2 |
| 3.3V           | NJM2370X33  | 3       | 3 |
| 3.5V           | NJM2370X35  | 3       | 5 |

| Output Voltage | Part Number | Marking |   |
|----------------|-------------|---------|---|
|                |             | ①       | ② |
| 3.6V           | NJM2370X36  | 3       | 6 |
| 3.7V           | NJM2370X37  | 3       | 7 |
| 3.8V           | NJM2370X38  | 3       | 8 |
| 3.9V           | NJM2370X39  | 3       | 9 |
| 4.0V           | NJM2370X04  | 0       | 4 |
| 4.7V           | NJM2370X47  | 4       | 7 |
| 5.0V           | NJM2370X05  | 0       | 5 |
| 6.0V           | NJM2370X06  | 0       | 6 |
| 8.0V           | NJM2370X08  | 0       | 8 |
| 9.0V           | NJM2370X09  | 0       | 9 |
| 10.0V          | NJM2370X10  | 1       | 0 |
| 12.0V          | NJM2370X12  | 1       | 2 |
| 13.0V          | NJM2370X13  | 1       | 3 |
| 15.0V          | NJM2370X15  | 1       | 5 |

(\*1) : SOT-89 (5pin) ONLY

(\*2) : VSP8 ONLY

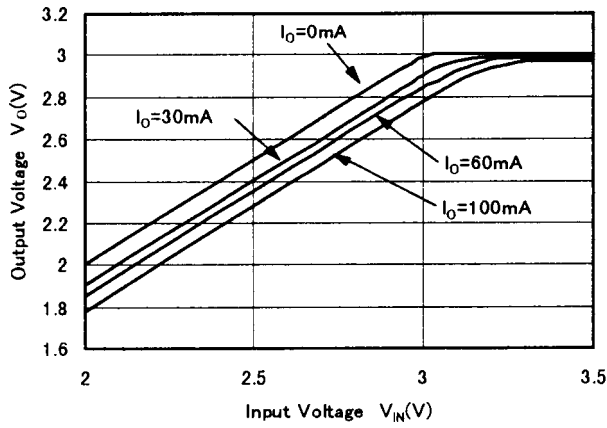
## ■ POWER DISSIPATION VS. AMBIENT TEMPERATURE



## ■ TYPICAL CHARACTERISTICS

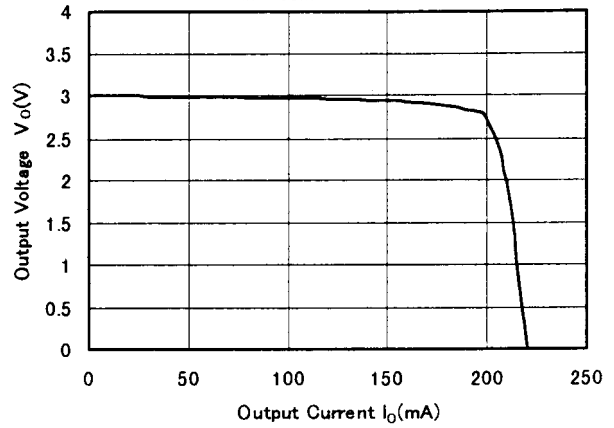
### NJM2370U03 / R03 Dropout Voltage

( $V_{IN}=V_{CONT}$ ,  $T_a=25^\circ\text{C}$ )



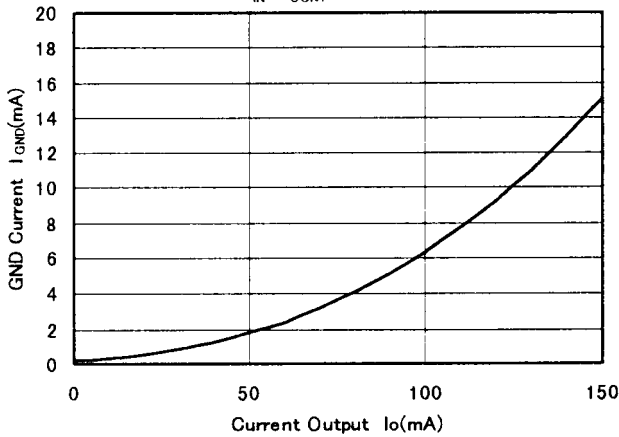
### NJM2370U03 / R03 Load Regulation

( $V_{IN}=V_{CONT}=4\text{V}$ ,  $T_a=25^\circ\text{C}$ )



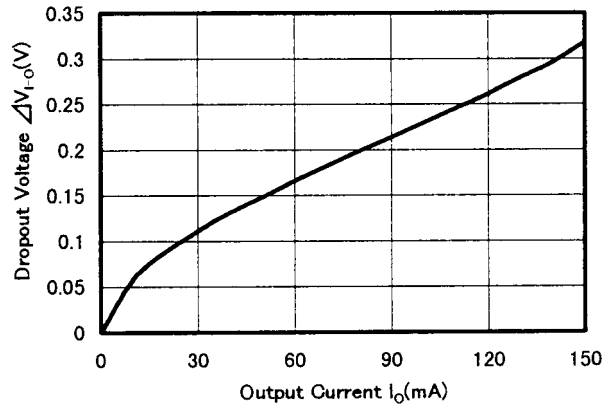
### NJM2370U03/R03 GND Current vs. Output Current

( $V_{IN}=V_{CONT}=4\text{V}$ ,  $T_a=25^\circ\text{C}$ )



### NJM2370U03/R03 Dropout Voltage vs. Output Current

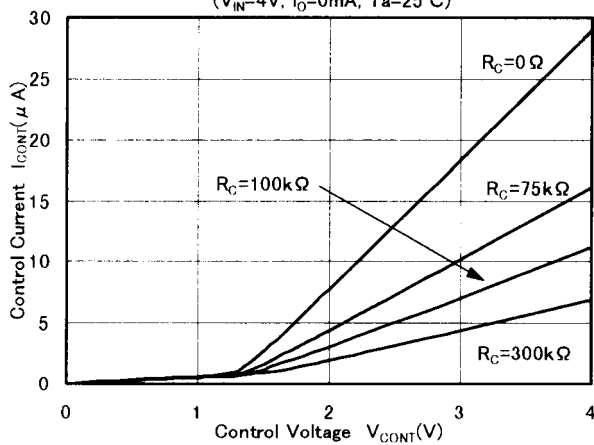
( $T_a=25^\circ\text{C}$ )



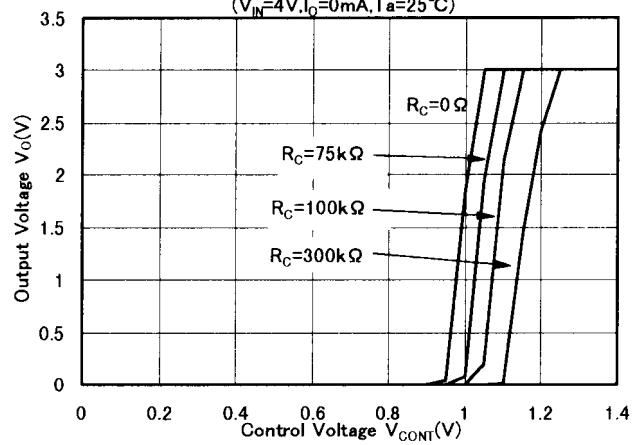
# NJM2370

## ■ TYPICAL CHARACTERISTICS

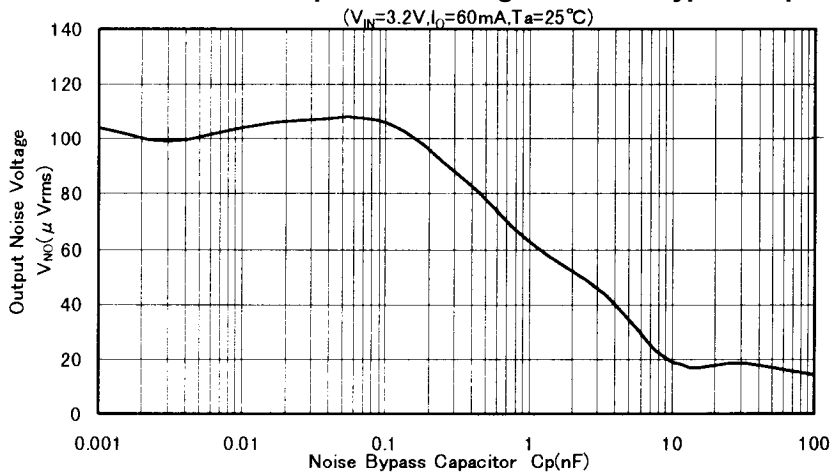
**NJM2370U03 / R03 Control Current vs. Control Voltage**  
( $V_{IN}=4V, I_O=0mA, T_a=25^\circ C$ )



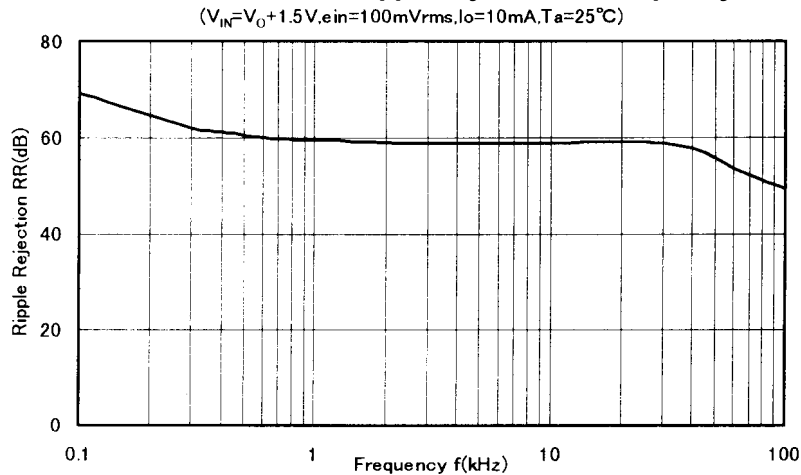
**NJM2370U03 / R03 Output Voltage vs. Control Voltage**  
( $V_{IN}=4V, I_O=0mA, T_a=25^\circ C$ )



**NJM2370U03/R03 Output Noise Voltage vs. Noise Bypass Capacitor**

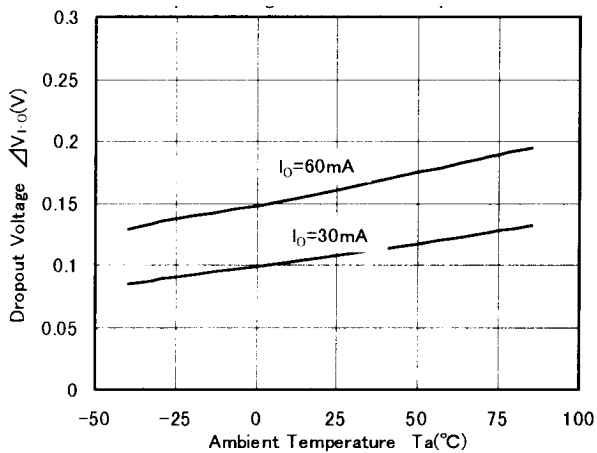


**NJM2370U03/R03 Ripple Rejection vs. Frequency**



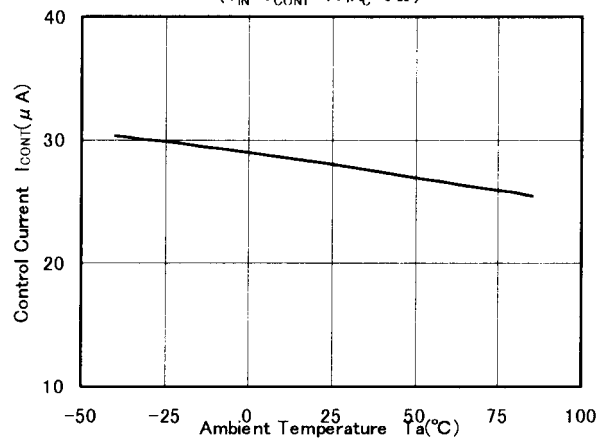
## ■ TYPICAL CHARACTERISTICS

### Dropout Voltage vs. Ambient Temperature



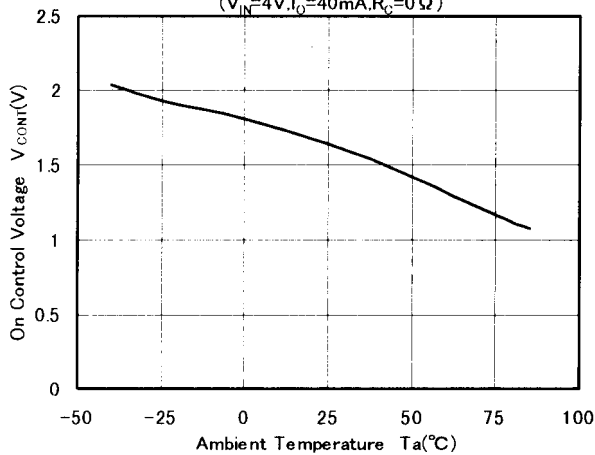
### NJM2370U03 / R03 Control Current vs. Ambient Temperature

( $V_{IN}=V_{CONT}=4\text{V}, R_C=0\Omega$ )



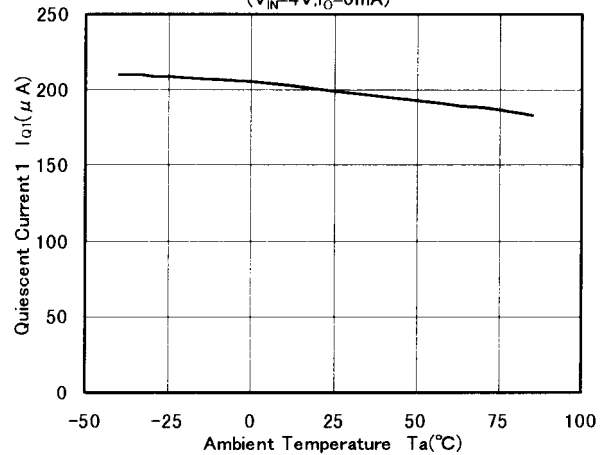
### On Control Voltage vs. Temperature

( $V_{IN}=4\text{V}, I_o=40\text{mA}, R_C=0\Omega$ )



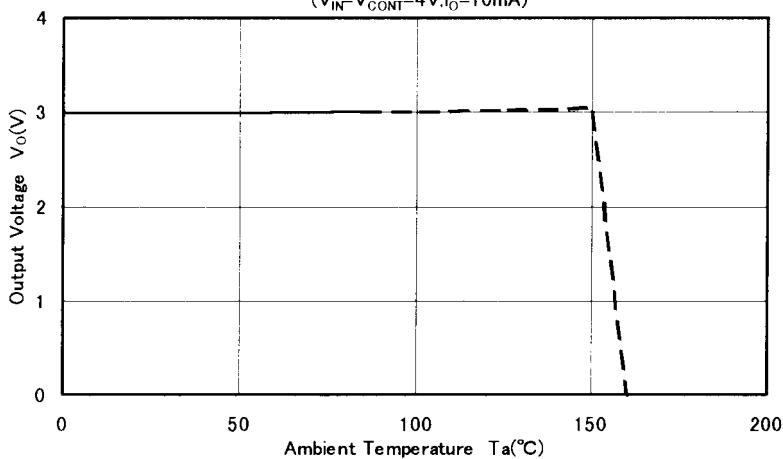
### NJM2370U03 / R03 Quiescent Current 1 vs. Ambient Temperature

( $V_{IN}=4\text{V}, I_o=0\text{mA}$ )



### Thermal Shutdown

( $V_{IN}=V_{CONT}=4\text{V}, I_o=10\text{mA}$ )



#### [CAUTION]

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