# C-MOS 3-TERMINAL POSITIVE VOLTAGE REGULATOR

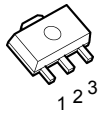
## ■ GENERAL DESCRIPTION

The **NJU7201 series** is a C-MOS 3-terminal positive voltage regulator which contains internal accurate voltage reference, error amplifier, control transistor and output voltage setting resistor.

The regulation voltage is fixed by internal circuits and the following line-up of different output voltage versions are available.

The **NJU7201 series** is suitable for battery operated items and battery back-up systems because of low operating current and low dropout voltage.

## ■ PACKAGE OUTLINE




**NJU7201U** (SOT-89)

## ■ FEATURES

- Low Operating Current (19μA typ.)
- Wide Operating Voltage Range
- Low Dropout Voltage
  ($\Delta V_{IO}$ < 0.3V 1.2 to 1.5V output, $I_{OUT}$ = 0.5mA)
  ($\Delta V_{IO}$ < 0.6V 2.5 to 3.5V output, $I_{OUT}$ = 20mA)
  ($\Delta V_{IO}$ < 0.6V 4.0 to 5.5V output, $I_{OUT}$ = 40mA)
- Small Temperature Coefficient of Output Voltage
- Package Outline (SOT-89)
- C-MOS Technology

## ■ TERMINAL DESCRIPTION

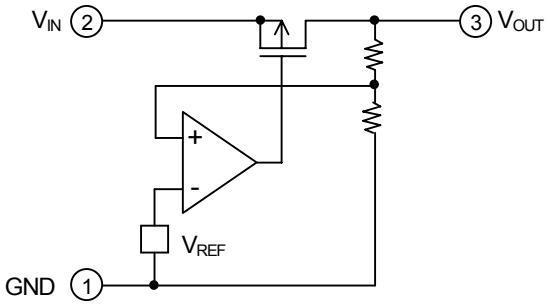
| No. | Description |
|---|---|
| 1 | GND |
| 2 | Input |
| 3 | Output |

## ■ OUTPUT VOLTAGE LINE-UP

| Output Voltage | SOT-89 Type | Output Voltage | SOT-89 Type |
|---|---|---|---|
| +1.2V | NJU7201U12 | +3.5V | NJU7201U35 |
| +1.5V | NJU7201U15 | +4.0V | NJU7201U40 |
| +2.5V | NJU7201U25 | +4.5V | NJU7201U45 |
| +2.7V | NJU7201U27 | +5.0V | NJU7201U50 |
| +3.0V | NJU7201U30 | +5.2V | NJU7201U52 |
| +3.2V | NJU7201U32 | +5.5V | NJU7201U55 |

Note1) The SOT-89 type name is different from the marking, so it refer to attached paper correspondence table.

## ■ EQUIVALENT CIRCUIT



## ■ ABSOLUTE MAXIMUM RATINGS

($T_a$ = 25ºC)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | 14 | V |
| Output Voltage | $V_{OUT}$ | $V_{IN}$+0.3 to GND-0.3 | V |
| Output Current | $I_{OUT}$ | 100 | mA |
| Power Dissipation | $P_D$ | 300 (SOT-89) | mW |
| Operating Temperature | $T_{opr}$ | -25 to + 75 | ºC |
| Storage Temperature | $T_{stg}$ | -40 to +125 | ºC |

## ■ ELECTRICAL CHARACTERISTICS

+1.2V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 3.0V, $I_{OUT}$ = 5mA | 1.14 | 1.20 | 1.26 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 0.5mA | - | 0.020 | 0.30 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 3.0V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 3.0V, $I_{OUT}$ = 1～15mA | - | 10 | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 1.5～12V | - | 0.10 | - | %/V |

+1.5V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 3.0V, $I_{OUT}$ = 5mA | 1.425 | 1.500 | 1.575 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 0.5mA | - | 0.020 | 0.30 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 3.0V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 3.0V, $I_{OUT}$ = 1～15mA | - | - | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 1.8～12V | - | 0.10 | - | %/V |

+2.5V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 4.5V, $I_{OUT}$ = 10mA | 2.375 | 2.500 | 2.625 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 20mA | - | 0.20 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 4.5V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 4.5V, $I_{OUT}$ = 1～20mA | - | - | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 3.5～12V | - | 0.10 | - | %/V |

+2.7V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 4.7V, $I_{OUT}$ = 10mA | 2.565 | 2.700 | 2.835 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 20mA | - | 0.20 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 4.7V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 4.7V, $I_{OUT}$ = 1～20mA | - | - | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 3.7～12V | - | 0.10 | - | %/V |

+3.0V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 5.0V, $I_{OUT}$ = 10mA | 2.85 | 3.00 | 3.15 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 20mA | - | 0.20 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 5.0V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 5.0V, $I_{OUT}$ = 1～20mA | - | 15 | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 4.0～12.0V | - | 0.10 | - | %/V |

+3.2V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 5.2V, $I_{OUT}$ = 10mA | 3.04 | 3.20 | 3.36 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 20mA | - | 0.20 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 5.0V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 5.0V, $I_{OUT}$ = 1～20mA | - | - | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 4.0～12.0V | - | 0.10 | - | %/V |

+3.5V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 5.5V, $I_{OUT}$ = 10mA | 3.325 | 3.500 | 3.675 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 20mA | - | 0.20 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 5.5V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 5.5V, $I_{OUT}$ = 1～20mA | - | - | 180 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 4.5～12.0V | - | 0.10 | - | %/V |

+4.0V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 6.0V, $I_{OUT}$ = 30mA | 3.8 | 4.0 | 4.2 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 40mA | - | 0.30 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 6.0V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 6.0V, $I_{OUT}$ = 1～40mA | - | - | 120 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 5.0～12.0V | - | 0.10 | - | %/V |

+4.5V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 6.5V, $I_{OUT}$ = 30mA | 4.275 | 4.5 | 4.725 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 40mA | - | 0.30 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 6.5V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 6.5V, $I_{OUT}$ = 1～40mA | - | - | 120 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 5.5～12.0V | - | 0.10 | - | %/V |

+5.0V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 7.0V, $I_{OUT}$ = 30mA | 4.75 | 5.00 | 5.25 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 40mA | - | 0.30 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 7.0V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 7.0V, $I_{OUT}$ = 1～40mA | - | 35 | 120 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 6.0～12.0V | - | 0.10 | - | %/V |

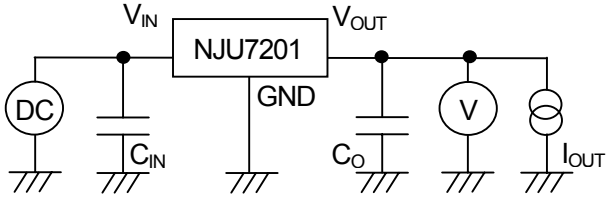
+5.2V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 7.2V, $I_{OUT}$ = 30mA | 4.94 | 5.20 | 5.46 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 40mA | - | 0.30 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 7.2V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 7.2V, $I_{OUT}$ = 1～40mA | - | - | 120 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 6.2～12.0V | - | 0.10 | - | %/V |

+5.5V Version ($C_{IN}$ = $C_o$ = 0.1µF, $T_a$ = 25°C)

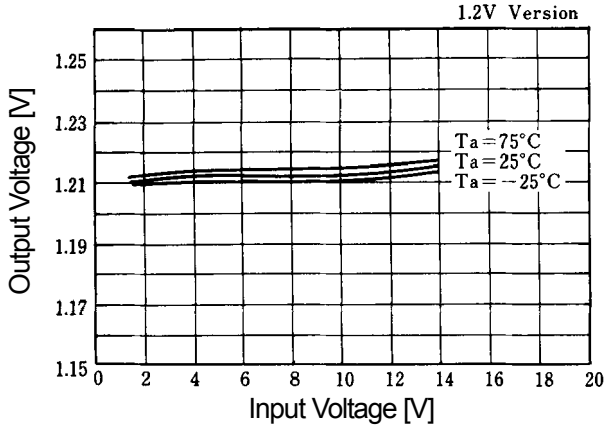
| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Voltage | $V_{OUT}$ | $V_{IN}$ = 7.5V, $I_{OUT}$ = 30mA | 5.225 | 5.500 | 5.775 | V |
| Dropout Voltage | $\Delta V_{IO}$ | $I_{OUT}$ = 40mA | - | 0.30 | 0.60 | V |
| Input Voltage | $V_{IN}$ | | - | - | 12 | V |
| Operating Current | $I_Q$ | $V_{IN}$ = 7.5V | - | 19 | 30 | µA |
| Load Regulation | $\Delta V_{OUT} / \Delta I_{OUT}$ | $V_{IN}$ = 7.5V, $I_{OUT}$ = 1～40mA | - | - | 120 | mV |
| Line Regulation | $\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$ | $V_{IN}$ = 6.5～12.0V | - | 0.10 | - | %/V |

## ■ MEASUREMENT CIRCUIT

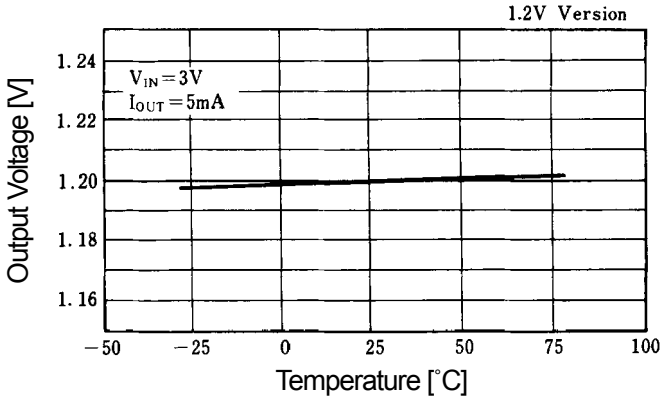


## ■ TYPICAL CHARACTERISTICS

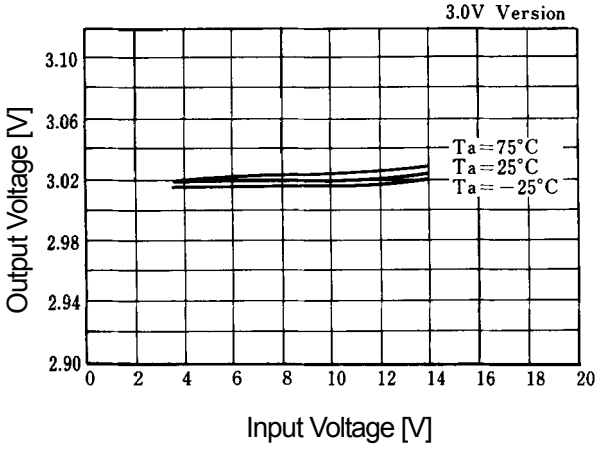
**Output Voltage vs. Input Voltage**



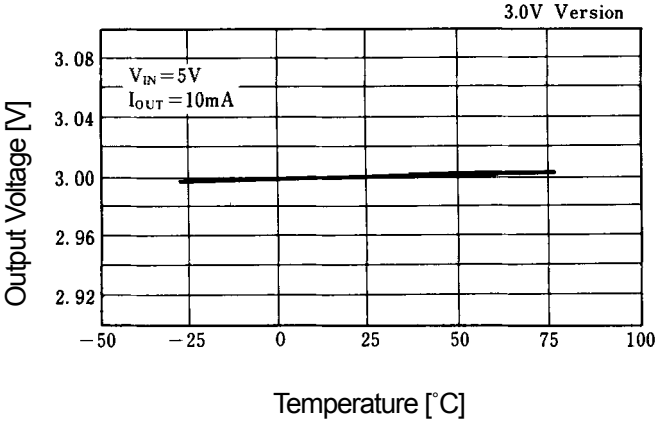

**Output Voltage vs. Input Temperature**



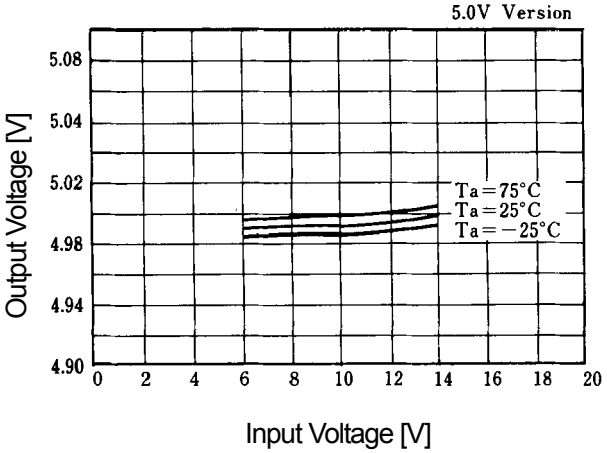

**Output Voltage vs. Input Voltage**



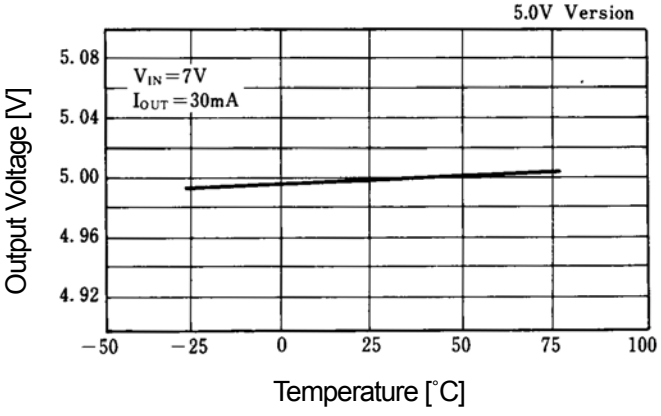

**Output Voltage vs. Input Temperature**




**Output Voltage vs. Input Voltage**

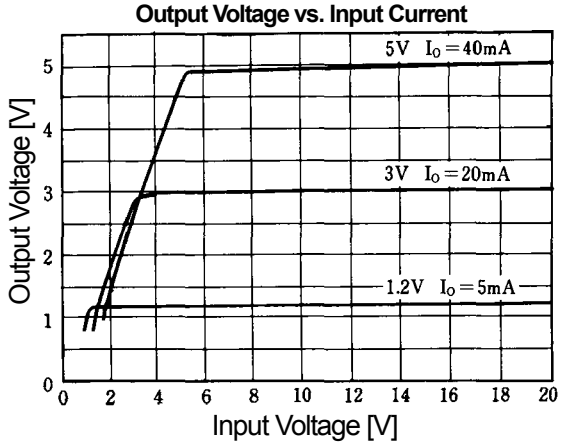



**Output Voltage vs. Input Temperature**

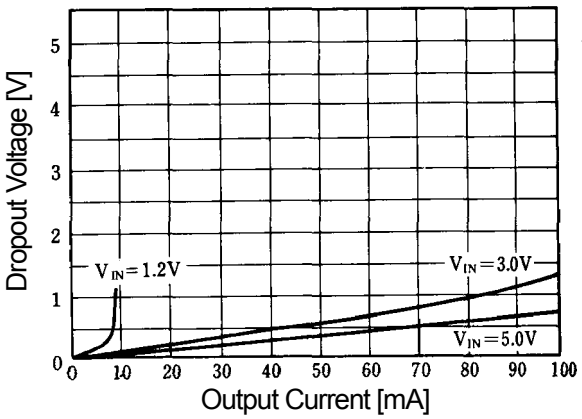


## ■ TYPICAL CHARACTERISTICS

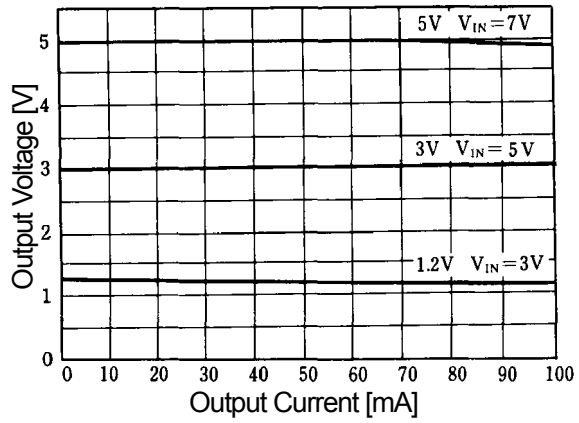
**Output Voltage vs. Input Current**



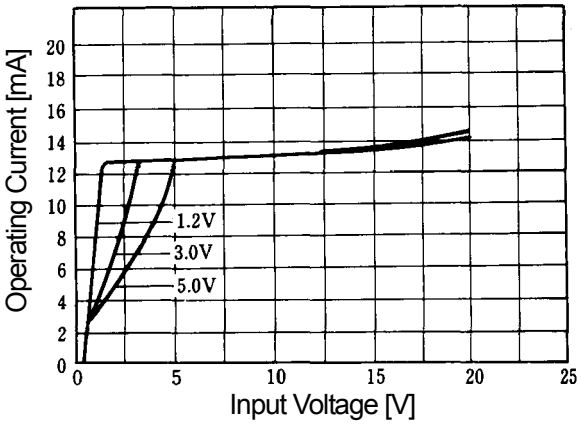

**Dropout Voltage vs. Output Current**



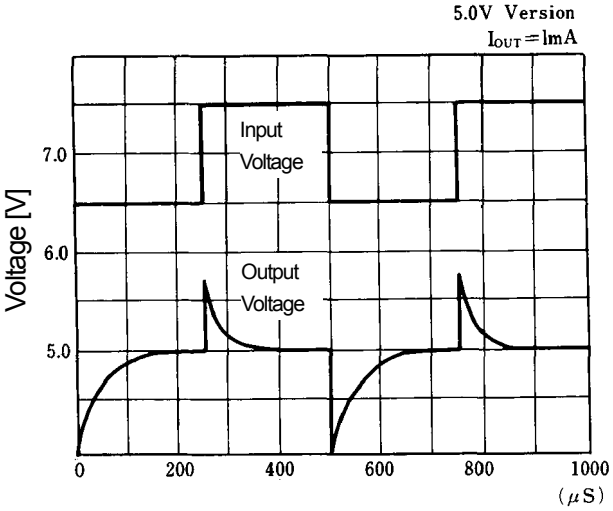

**Output Voltage vs. Output Current**




**Operating Current vs. Input Voltage $I_O$=0mA**




**Input Transient Responce**




**Input Transient Responce**