

## 500mA Low Dropout Voltage Regulator

### ■ GENERAL DESCRIPTION

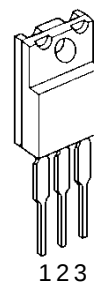
The NJU7223 series is a high precision output voltage, low drop output, low current consumption and high output current 3-terminal positive voltage regulator with a over current protection and a thermal shutdown.

Low dropout voltage is realized at high current output.

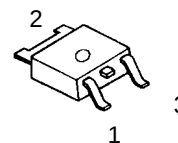
### ■ FEATURES

- High Precision Output  $\pm 2.0\%$
- Output Current  $I_o(\text{max.})=500\text{mA}$
- Low Current Consumption  $I_q=30\mu\text{A}$
- Low Dropout Voltage  $0.4\text{V typ. } (I_o=500\text{mA}, V_o=5.0\text{V})$
- Internal Over Current Protection
- Internal Thermal Shutdown Protection
- CMOS Technology
- Package Outline TO-220F, TO-252

### ■ PACKAGE OUTLINE



NJU7223F

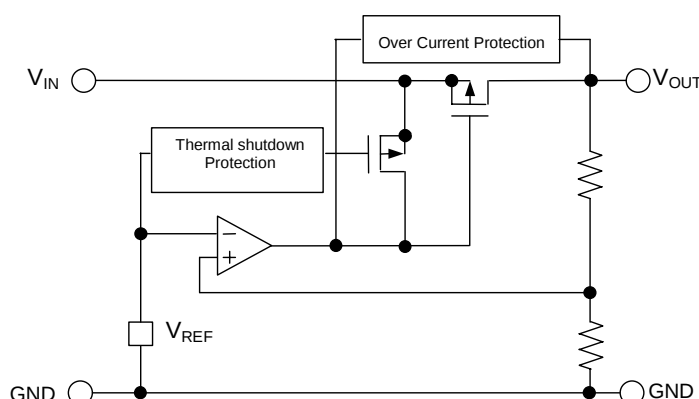


NJU7223DL1

### ■ PIN CONFIGURATION

1.  $V_{OUT}$
2.  $V_{IN}$
3. GND

### ■ EQUIVALENT CIRCUIT



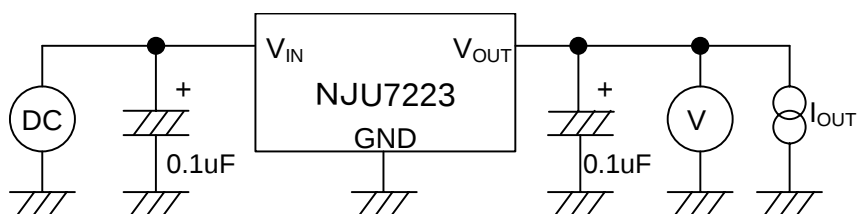
### ■ OUTPUT VOLTAGE RANK LIST

| $V_{OUT}$ | TO-220F    | TO-252        |
|-----------|------------|---------------|
| +1.8V     | NJU7223F18 | NJU7223DL1-18 |
| +2.5V     | NJU7223F25 | NJU7223DL1-25 |
| +3.0V     | NJU7223F30 | NJU7223DL1-30 |
| +3.3V     | NJU7223F33 | NJU7223DL1-33 |
| +5.0V     | NJU7223F50 | NJU7223DL1-50 |

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

| PARAMETER                   | SYMBOL    | RATINGS                                                     | UNIT |
|-----------------------------|-----------|-------------------------------------------------------------|------|
| Input Voltage               | $V_{IN}$  | +18                                                         | V    |
| Output Voltage              | $V_{OUT}$ | GND-0.3 ~ $V_{IN} + 0.3$                                    | V    |
| Output Current              | $I_{OUT}$ | 700                                                         | mA   |
| Power Dissipation           | $P_D$     | TO-220F 7.5(Tc≤85°C)<br>TO-252 7.5(Tc≤56°C)<br>1.0(Ta=25°C) | W    |
| Operating Temperature Range | Topr      | -40 ~ 85                                                    | °C   |
| Storage Temperature Range   | Tstg      | -55 ~ 150                                                   | °C   |

## ■ TEST CIRCUIT



■ ELECTRICAL CHARACTERISTICS ( $C_{IN}=C_O=0.1\mu F$ ,  $T_j=25^\circ C$ )

Measurement is to be conducted in pulse testing.

| PARAMETER                         | SYMBOL                               | TEST CONDITION                                               | MIN.  | TYP. | MAX.  | UNIT    |
|-----------------------------------|--------------------------------------|--------------------------------------------------------------|-------|------|-------|---------|
| Vo=1.8V Version<br>Output Voltage | $V_O$                                | $V_{IN}=3.8V$ , $I_O=300mA$                                  | 1.764 | 1.80 | 1.836 | V       |
| Input Voltage                     | $V_{IN}$                             |                                                              | -     | -    | 14    | V       |
| Dropout Voltage                   | $\Delta V_{IO}$                      | $I_O=150mA$                                                  | -     | 0.4  | 0.6   | V       |
| Line Regulation                   | $\Delta V_O/\Delta V_{IN} \cdot V_O$ | $V_{IN}=2.8V \sim 12.0V$                                     | -     | 0.10 | -     | %/V     |
| Load Regulation                   | $\Delta V_O/\Delta I_O$              | $V_{IN}=3.8V$ , $I_O=1 \sim 500mA$                           | -     | 120  | 160   | mV      |
| Quiescent Current                 | $I_{DD}$                             | $V_{IN}=3.8V$                                                | -     | 30   | 60    | $\mu A$ |
| Ripple Rejection                  | RR                                   | $V_{IN}=3.8V$ , $e_{in}=1V_{P-P}$<br>$f=120Hz$ , $I_O=300mA$ | -     | 57   | -     | dB      |
| Output Noise Voltage              | $V_{NO}$                             | $V_{IN}=3.8V$ , $I_O=300mA$<br>$BW=10Hz \sim 100kHz$         | -     | 65   | -     | $\mu V$ |
| Vo=2.5V Version<br>Output Voltage | $V_O$                                | $V_{IN}=4.5V$ , $I_O=300mA$                                  | 2.45  | 2.50 | 2.55  | V       |
| Input Voltage                     | $V_{IN}$                             |                                                              | -     | -    | 14    | V       |
| Dropout Voltage                   | $\Delta V_{IO}$                      | $I_O=300mA$                                                  | -     | 0.4  | 0.6   | V       |
| Line Regulation                   | $\Delta V_O/\Delta V_{IN} \cdot V_O$ | $V_{IN}=3.5V \sim 12.0V$                                     | -     | 0.10 | -     | %/V     |
| Load Regulation                   | $\Delta V_O/\Delta I_O$              | $V_{IN}=4.5V$ , $I_O=1 \sim 500mA$                           | -     | 120  | 160   | mV      |
| Quiescent Current                 | $I_{DD}$                             | $V_{IN}=4.5V$                                                | -     | 30   | 60    | $\mu A$ |
| Ripple Rejection                  | RR                                   | $V_{IN}=4.5V$ , $e_{in}=1V_{P-P}$<br>$f=120Hz$ , $I_O=300mA$ | -     | 57   | -     | dB      |
| Output Noise Voltage              | $V_{NO}$                             | $V_{IN}=4.5V$ , $I_O=300mA$<br>$BW=10Hz \sim 100kHz$         | -     | 110  | -     | $\mu V$ |
| Vo=3.0V Version<br>Output Voltage | $V_O$                                | $V_{IN}=5.0V$ , $I_O=300mA$                                  | 2.94  | 3.00 | 3.06  | V       |
| Input Voltage                     | $V_{IN}$                             |                                                              | -     | -    | 14    | V       |
| Dropout Voltage                   | $\Delta V_{IO}$                      | $I_O=300mA$                                                  | -     | 0.4  | 0.6   | V       |
| Line Regulation                   | $\Delta V_O/\Delta V_{IN} \cdot V_O$ | $V_{IN}=4.0V \sim 12.0V$                                     | -     | 0.10 | -     | %/V     |
| Load Regulation                   | $\Delta V_O/\Delta I_O$              | $V_{IN}=5.0V$ , $I_O=1 \sim 500mA$                           | -     | 120  | 160   | mV      |
| Quiescent Current                 | $I_{DD}$                             | $V_{IN}=5.0V$                                                | -     | 30   | 60    | $\mu A$ |
| Ripple Rejection                  | RR                                   | $V_{IN}=5.0V$ , $e_{in}=1V_{P-P}$<br>$f=120Hz$ , $I_O=300mA$ | -     | 57   | -     | dB      |
| Output Noise Voltage              | $V_{NO}$                             | $V_{IN}=5.0V$ , $I_O=300mA$<br>$BW=10Hz \sim 100kHz$         | -     | 115  | -     | $\mu V$ |

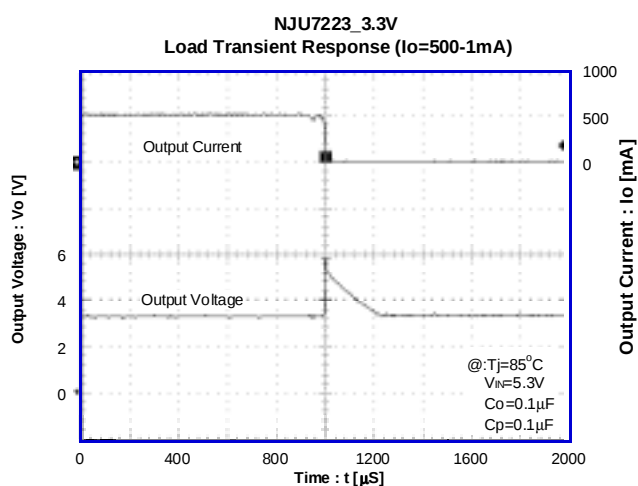
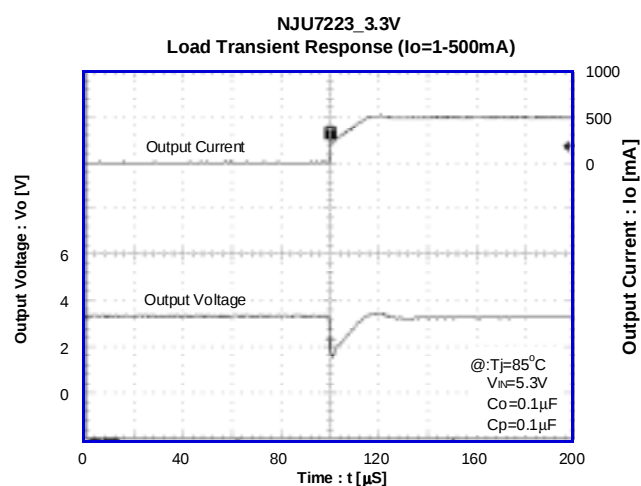
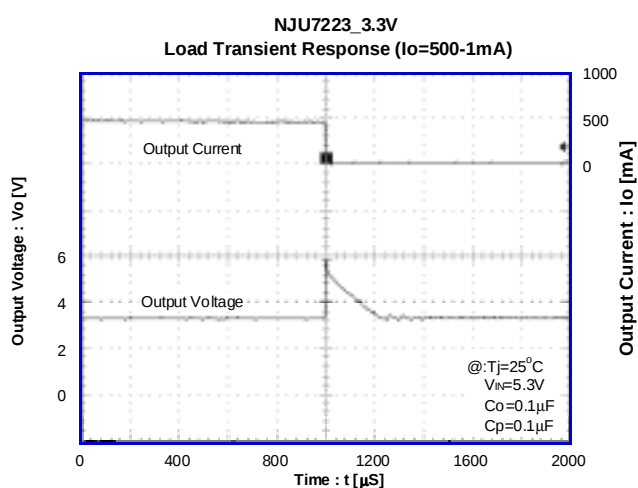
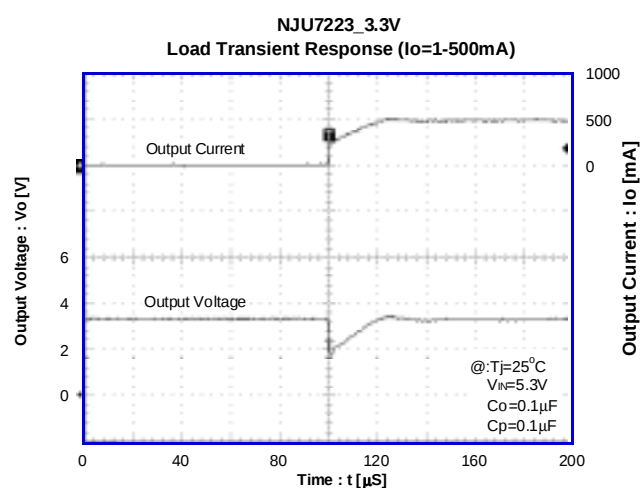
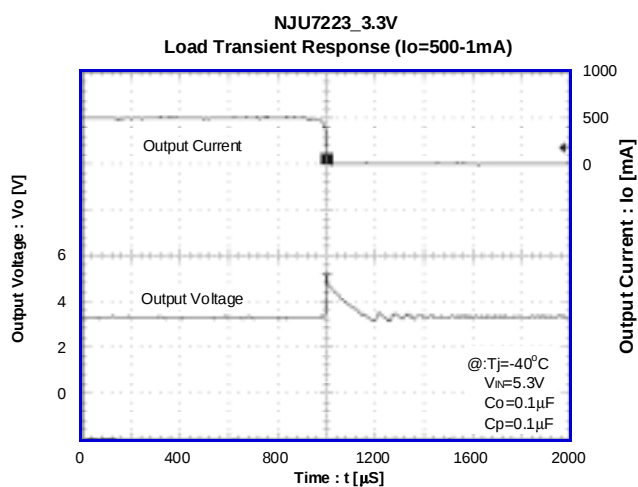
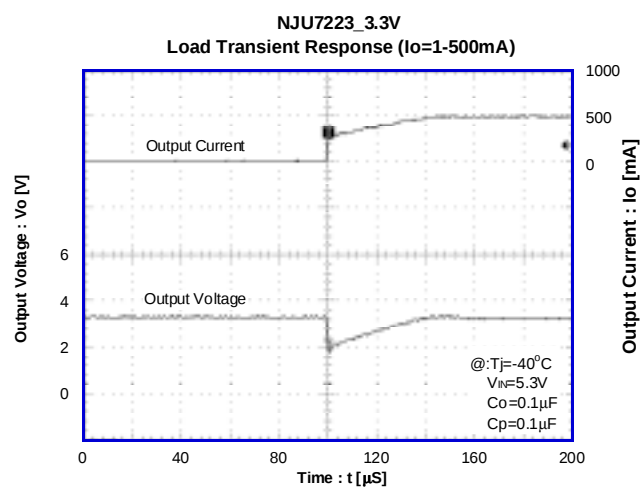
## ■ ELECTRICAL CHARACTERISTICS ( $C_{IN}=C_O=0.1\mu F$ , $T_j=25^\circ C$ )

Measurement is to be conducted in pulse testing.

| PARAMETER                         | SYMBOL                               | TEST CONDITION                                               | MIN.  | TYP. | MAX.  | UNIT    |
|-----------------------------------|--------------------------------------|--------------------------------------------------------------|-------|------|-------|---------|
| Vo=3.3V Version<br>Output Voltage | $V_O$                                | $V_{IN}=5.3V$ , $I_O=300mA$                                  | 3.234 | 3.30 | 3.366 | V       |
| Input Voltage                     | $V_{IN}$                             |                                                              | -     | -    | 14    | V       |
| Dropout Voltage                   | $\Delta V_{IO}$                      | $I_O=300mA$                                                  | -     | 0.4  | 0.6   | V       |
| Line Regulation                   | $\Delta V_O/\Delta V_{IN} \cdot V_O$ | $V_{IN}=4.3V \sim 12.0V$                                     | -     | 0.10 | -     | %/V     |
| Load Regulation                   | $\Delta V_O/\Delta I_O$              | $V_{IN}=5.3V$ , $I_O=1 \sim 500mA$                           | -     | 120  | 160   | mV      |
| Quiescent Current                 | $I_{DD}$                             | $V_{IN}=5.3V$                                                | -     | 30   | 60    | $\mu A$ |
| Ripple Rejection                  | RR                                   | $V_{IN}=5.3V$ , $e_{in}=1V_{P-P}$<br>$f=120Hz$ , $I_O=300mA$ | -     | 56   | -     | dB      |
| Output Noise Voltage              | $V_{NO}$                             | $V_{IN}=5.3V$ , $I_O=300mA$<br>$BW=10Hz \sim 100kHz$         | -     | 117  | -     | $\mu V$ |
| Vo=5.0V Version<br>Output Voltage | $V_O$                                | $V_{IN}=7.0V$ , $I_O=500mA$                                  | 4.90  | 5.00 | 5.10  | V       |
| Input Voltage                     | $V_{IN}$                             |                                                              | -     | -    | 14    | V       |
| Dropout Voltage                   | $\Delta V_{IO}$                      | $I_O=500mA$                                                  | -     | 0.4  | 0.6   | V       |
| Line Regulation                   | $\Delta V_O/\Delta V_{IN} \cdot V_O$ | $V_{IN}=6.0V \sim 12.0V$                                     | -     | 0.10 | -     | %/V     |
| Load Regulation                   | $\Delta V_O/\Delta I_O$              | $V_{IN}=7.0V$ , $I_O=1 \sim 500mA$                           | -     | 120  | 160   | mV      |
| Quiescent Current                 | $I_{DD}$                             | $V_{IN}=7.0V$                                                | -     | 30   | 60    | $\mu A$ |
| Ripple Rejection                  | RR                                   | $V_{IN}=7.0V$ , $e_{in}=1V_{P-P}$<br>$f=120Hz$ , $I_O=300mA$ | -     | 55   | -     | dB      |
| Output Noise Voltage              | $V_{NO}$                             | $V_{IN}=7.0V$ , $I_O=300mA$<br>$BW=10Hz \sim 100kHz$         | -     | 122  | -     | $\mu V$ |

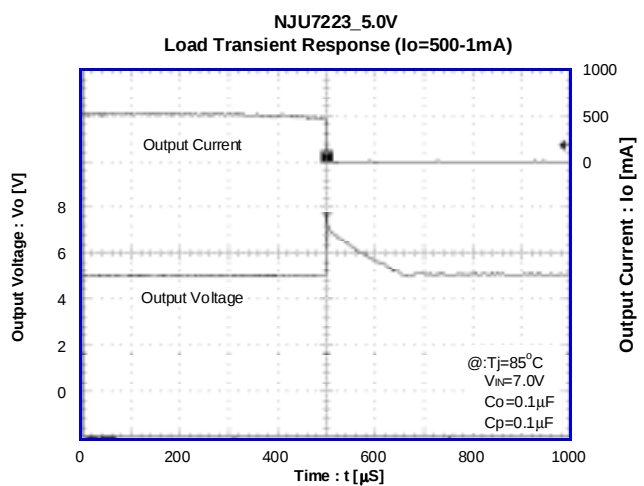
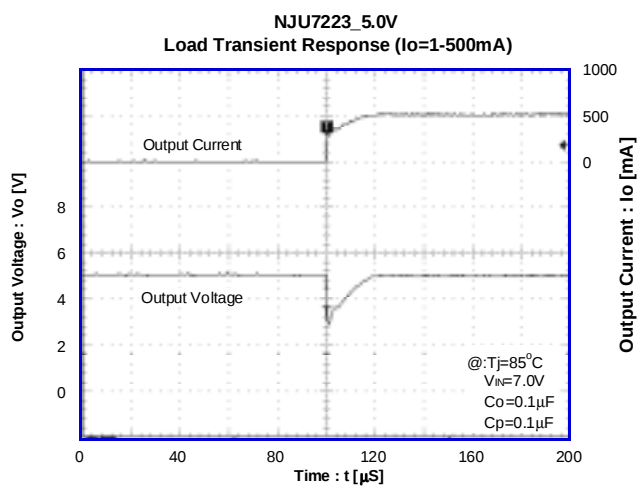
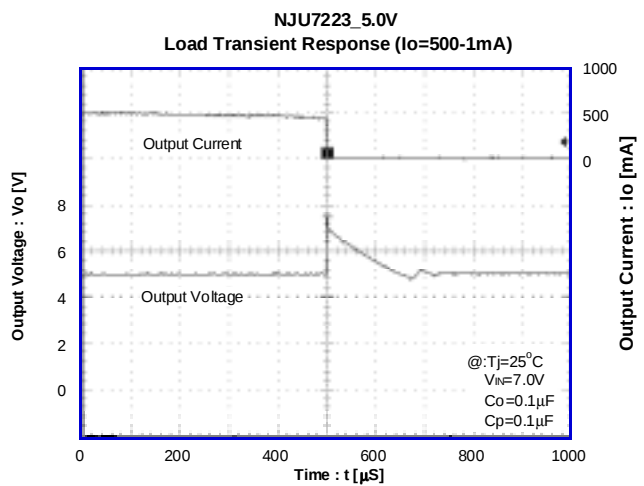
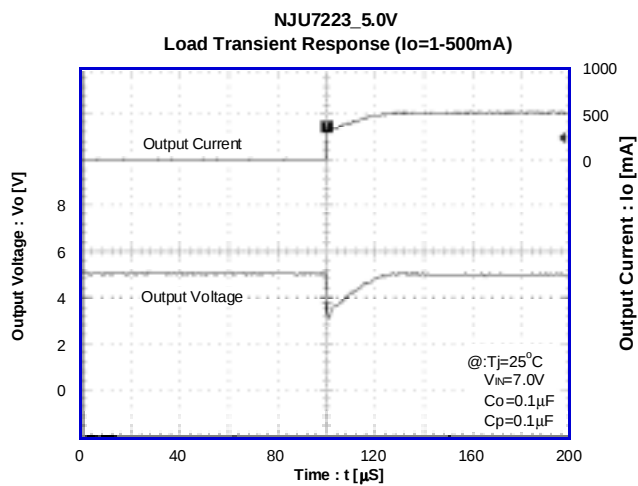
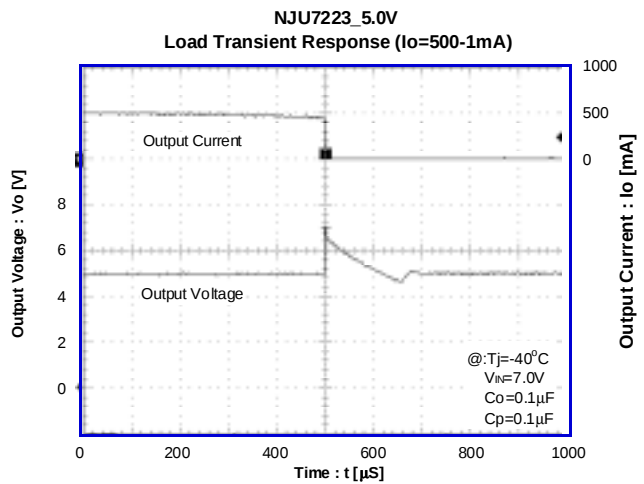
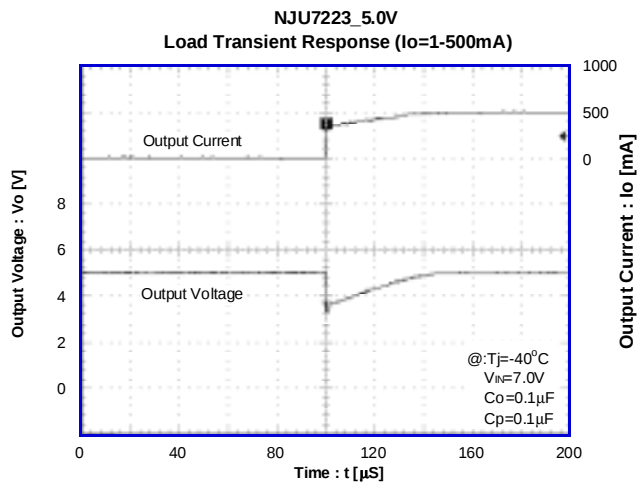
## ■ TYPICAL CHARACTERISTICS

### Load Transient Response (Vo=3.3V version)



## TYPICAL CHARACTERISTICS

### Load Transient Response (Vo=5.0V version)



#### [CAUTION]

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