# 500mA Low Dropout Voltage Regulator

## ■ GENERAL DESCRIPTION

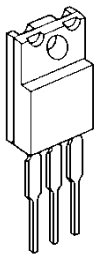
The NJU7223 series is a high precision output voltage, low drop output, low current consumption and high output current 3-terminal positive voltage regulator with a over current protection and a thermal shutdown.

Low dropout voltage is realized at high current output.

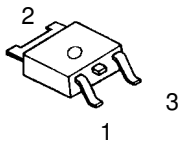
## ■ FEATURES

- High Precision Output ±2.0%
- Output Current Io(max.)=500mA
- Low Current Consumption Iq=30μA
- Low Dropout Voltage 0.4V typ. (Io=500mA,Vo=5.0V)
- Internal Over Current Protection
- Internal Thermal Shutdown Protection
- CMOS Technology
- Package Outline TO-220F, TO-252

## ■ PACKAGE OUTLINE




NJU7223F

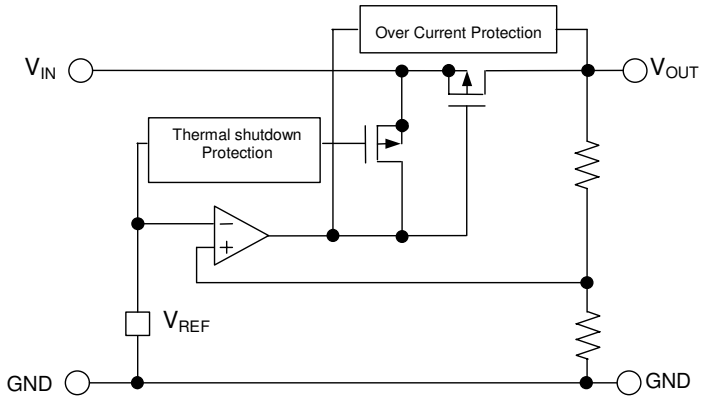



NJU7223DL1

## ■ PIN CONFIGURATION

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

## ■ EQUIVALENT CIRCUIT



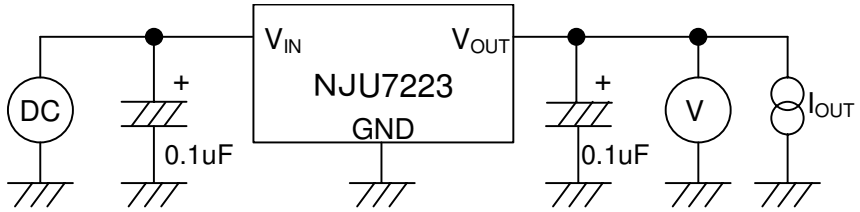

## ■ OUTPUT VOLTAGE RANK LIST

| $V_{OUT}$ | 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 ($C_{IN}$=Co=0.1μF, Tj=25°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, Io=300mA | 1.764 | 1.80 | 1.836 | V |
| Input Voltage | $V_{IN}$ | | - | - | 14 | V |
| Dropout Voltage | $\Delta V_{IO}$ | Io=150mA | - | 0.4 | 0.6 | V |
| Line Regulation | $\Delta Vo/\Delta V_{IN}$·Vo | $V_{IN}$=2.8V ~ 12.0V | - | 0.10 | - | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | $V_{IN}$=3.8V, Io=1 ~ 500mA | - | 120 | 160 | mV |
| Quiescent Current | $I_{DD}$ | $V_{IN}$=3.8V | - | 30 | 60 | μA |
| Ripple Rejection | RR | $V_{IN}$=3.8V, ein=1$V_{P-P}$<br>f=120Hz, Io=300mA | - | 57 | - | dB |
| Output Noise Voltage | $V_{NO}$ | $V_{IN}$=3.8V, Io=300mA<br>BW=10Hz ~ 100kHz | - | 65 | - | μV |
| Vo=2.5V Version<br>Output Voltage | $V_O$ | $V_{IN}$=4.5V, Io=300mA | 2.45 | 2.50 | 2.55 | V |
| Input Voltage | $V_{IN}$ | | - | - | 14 | V |
| Dropout Voltage | $\Delta V_{IO}$ | Io=300mA | - | 0.4 | 0.6 | V |
| Line Regulation | $\Delta Vo/\Delta V_{IN}$·Vo | $V_{IN}$=3.5V ~ 12.0V | - | 0.10 | - | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | $V_{IN}$=4.5V, Io=1 ~ 500mA | - | 120 | 160 | mV |
| Quiescent Current | $I_{DD}$ | $V_{IN}$=4.5V | - | 30 | 60 | μA |
| Ripple Rejection | RR | $V_{IN}$=4.5V, ein=1$V_{P-P}$<br>f=120Hz, Io=300mA | - | 57 | - | dB |
| Output Noise Voltage | $V_{NO}$ | $V_{IN}$=4.5V, Io=300mA<br>BW=10Hz ~ 100kHz | - | 110 | - | μV |
| Vo=3.0V Version<br>Output Voltage | $V_O$ | $V_{IN}$=5.0V, Io=300mA | 2.94 | 3.00 | 3.06 | V |
| Input Voltage | $V_{IN}$ | | - | - | 14 | V |
| Dropout Voltage | $\Delta V_{IO}$ | Io=300mA | - | 0.4 | 0.6 | V |
| Line Regulation | $\Delta Vo/\Delta V_{IN}$·Vo | $V_{IN}$=4.0V ~ 12.0V | - | 0.10 | - | %/V |
| Load Regulation | $\Delta Vo/\Delta Io$ | $V_{IN}$=5.0V, Io=1 ~ 500mA | - | 120 | 160 | mV |
| Quiescent Current | $I_{DD}$ | $V_{IN}$=5.0V | - | 30 | 60 | μA |
| Ripple Rejection | RR | $V_{IN}$=5.0V, ein=1$V_{P-P}$<br>f=120Hz, Io=300mA | - | 57 | - | dB |
| Output Noise Voltage | $V_{NO}$ | $V_{IN}$=5.0V, Io=300mA<br>BW=10Hz ~ 100kHz | - | 115 | - | μV |

■ ELECTRICAL CHARACTERISTICS ($C_{IN}$=Co=0.1μF, Tj=25°C)

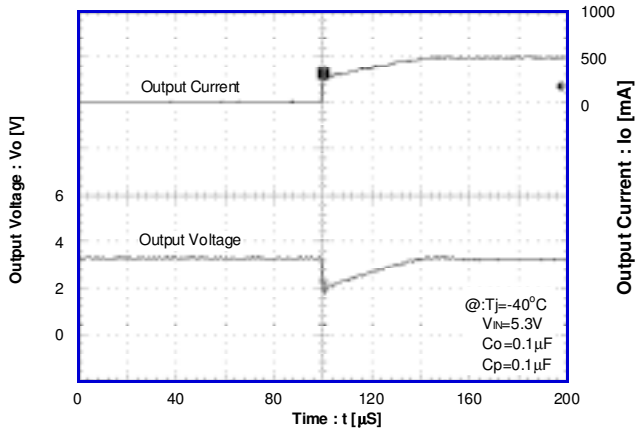
Measurement is to be conducted in pulse testing.

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

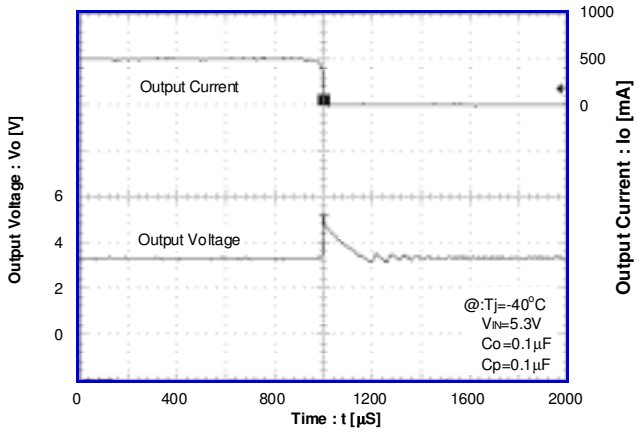
## ■ TYPICAL CHARACTERISTICS

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

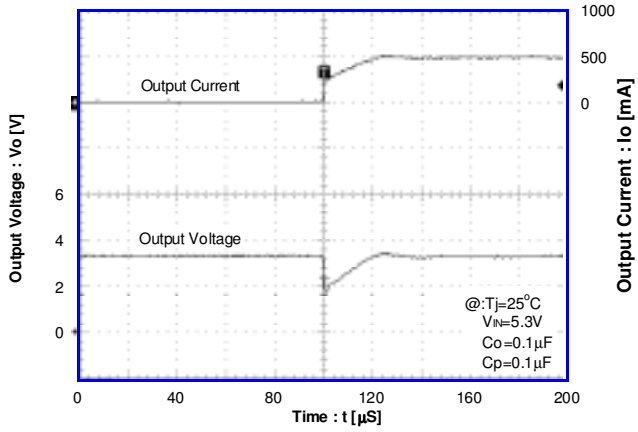
NJU7223_3.3V
Load Transient Response (Io=1-500mA)



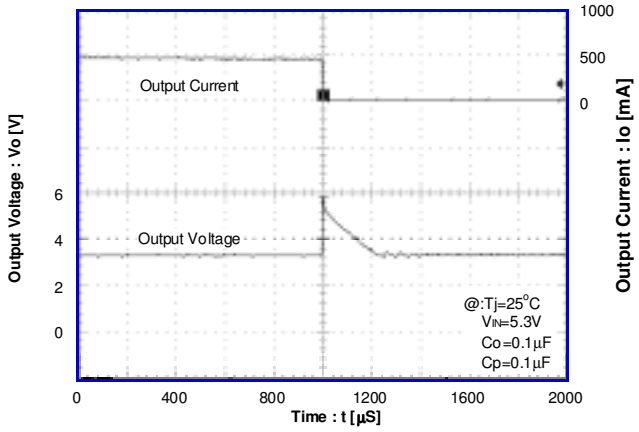

NJU7223_3.3V
Load Transient Response (Io=500-1mA)



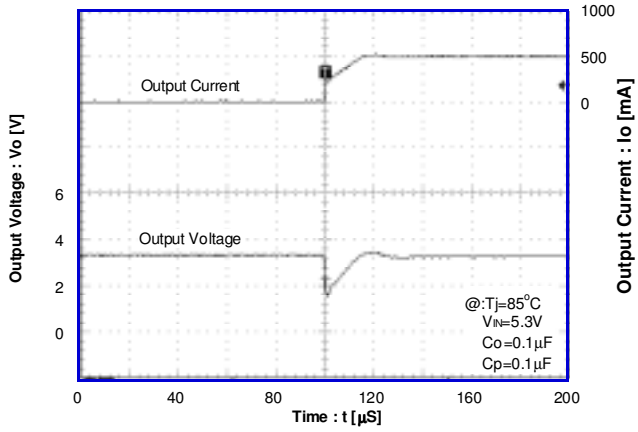

NJU7223_3.3V
Load Transient Response (Io=1-500mA)



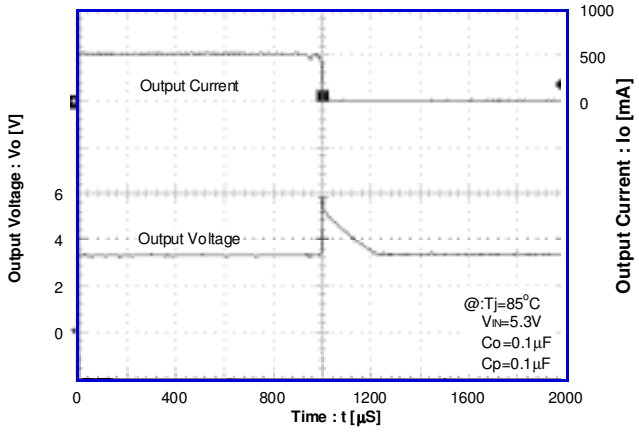

NJU7223_3.3V
Load Transient Response (Io=500-1mA)




NJU7223_3.3V
Load Transient Response (Io=1-500mA)



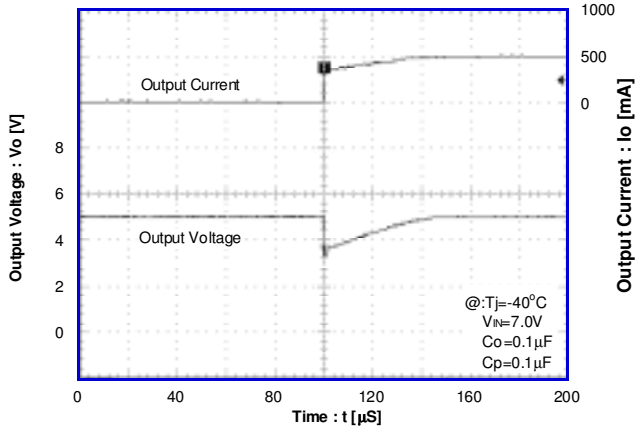

NJU7223_3.3V
Load Transient Response (Io=500-1mA)



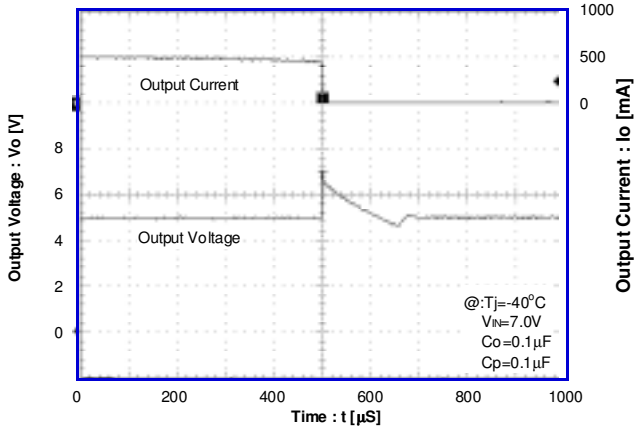
## ■ TYPICAL CHARACTERISTICS

Load Transient Response (Vo=5.0V version)

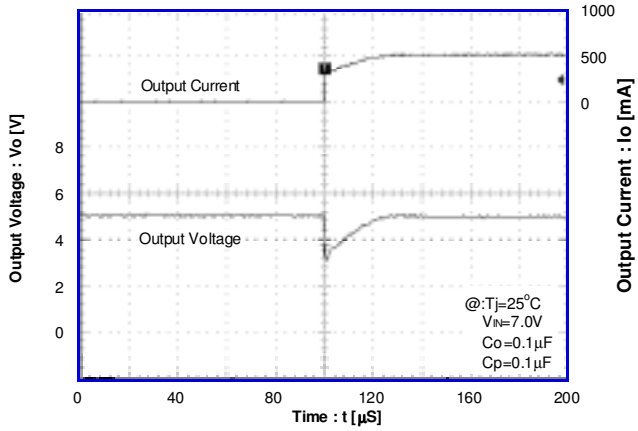
NJU7223_5.0V
Load Transient Response (Io=1-500mA)



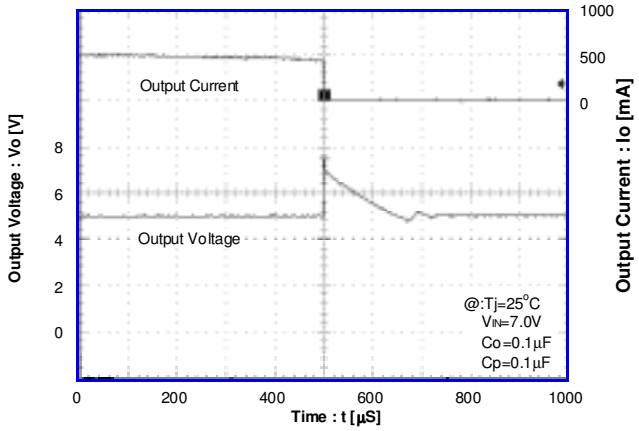

NJU7223_5.0V
Load Transient Response (Io=500-1mA)



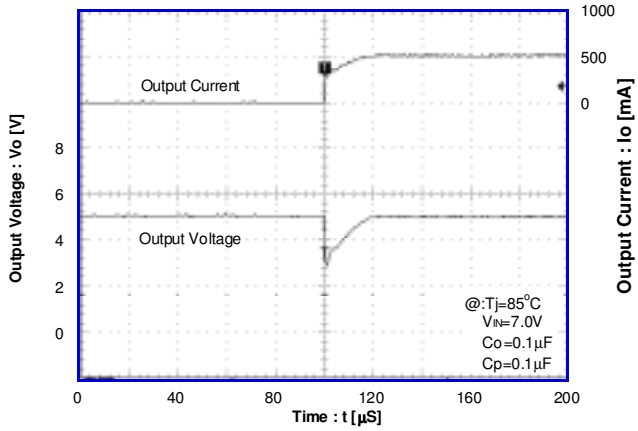

NJU7223_5.0V
Load Transient Response (Io=1-500mA)




NJU7223_5.0V
Load Transient Response (Io=500-1mA)




NJU7223_5.0V
Load Transient Response (Io=1-500mA)




NJU7223_5.0V
Load Transient Response (Io=500-1mA)