SUPER LOW OPERATING CURRENT C-MOS 3-TERMINAL VOLTAGE REGULATOR

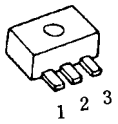
■ GENERAL DESCRIPTION

The **NJU7200 series** is a super low operating current 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 **NJU7200 series** is suitable for battery operated items and battery back-up systems because of low operating current and low dropout voltage.

■ PACKAGE OUTLINE



NJU7200L (TO-92) **NJU7200U** (SOT-89)

■ FEATURES

- Super Low Operating Current (0.9μA typ.@V_{OUT}=1.0V)
- Wide Range of Output Voltage Setting
- Low Dropout Voltage (ΔV_{IO} < 0.18V, @V_{OUT}=1.0V, I_O = 0.5mA)
- Small Temperature Coefficient of Output Voltage
- Package Outline (TO-92/SOT-89)
- C-MOS Technology

■ TERMINAL DESCRIPTION

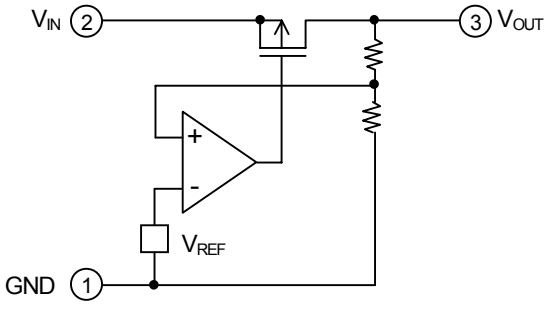
No.	Description
1	GND
2	Input
3	Output

■ OUTPUT VOLTAGE LINE-UP

Output Voltage	TO-92 Type	SOT-89 Type	Output Voltage	TO-92 Type	SOT-89 Type
+1.0V	NJU7200L10	NJU7200U10	+3.2V	NJU7200L32	NJU7200U32
+1.1V	NJU7200L11	NJU7200U11	+3.3V	NJU7200L33	NJU7200U33
+1.2V	NJU7200L12	NJU7200U12	+3.5V	NJU7200L35	NJU7200U35
+1.5V	NJU7200L15	NJU7200U15	+4.0V	NJU7200L40	NJU7200U40
+2.1V	NJU7200L21*	NJU7200U21*	+4.5V	NJU7200L45*	NJU7200U45*
+2.5V	NJU7200L25	NJU7200U25	+4.8V	NJU7200L48	NJU7200U48
+2.6V	NJU7200L26	NJU7200U26	+5.0V	NJU7200L50	NJU7200U50
+2.7V	NJU7200L27	NJU7200U27	+5.2V	NJU7200L52*	NJU7200U52*
+2.9V	NJU7200L29	NJU7200U29	+5.5V	NJU7200L55	NJU7200U55
+3.0V	NJU7200L30	NJU7200U30	+8.0V	NJU7200L80*	NJU7200U80*

Note1) The SOT-89 type name is different from the marking, so it refer to attached paper correspondence table.
Note2) *:Planning Products.

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(T_a = 25ºC)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	14	V
Output Voltage	V_{OUT}	GND-0.3 to V_{IN}+0.3	V
Output Current	I_{OUT}	100	mA
Power Dissipation	P_D	(TO-92) 500 (SOT-89) 300	mW
Operating Temperature	T_{opr}	-25 to + 75	ºC
Storage Temperature	T_{stg}	-40 to +125	ºC

■ ELECTRICAL CHARACTERISTICS

+1.0V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 3.0V, I_{OUT} = 5mA	0.95	1.00	1.05	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 0.5mA	-	0.06	0.18	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 3.0V	-	0.90	2.40	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 3.0V, I_{OUT} = 1～15mA	-	10	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 1.5～12V	-	0.10	-	%/V

+1.1V 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	1.045	1.100	1.155	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 0.5mA	-	0.06	0.18	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 3.0V	-	0.90	2.40	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 3.0V, I_{OUT} = 1～15mA	-	10	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 1.5～12V	-	0.10	-	%/V

+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	ΔV_{IO}	I_{OUT} = 0.5mA	-	0.06	0.18	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 3.0V	-	0.90	2.40	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 3.0V, I_{OUT} = 1～15mA	-	10	120	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	ΔV_{IO}	I_{OUT} = 0.5mA	-	0.04	0.12	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 3.0V	-	0.90	2.40	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 3.0V, I_{OUT} = 1～15mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 1.8～12V	-	0.10	-	%/V

+2.1V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 4.1V, I_{OUT} = 5mA	1.995	2.100	2.205	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 0.5mA	-	0.04	0.12	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 4.1V	-	0.90	2.40	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 4.1V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 2.5～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.45	1.20	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 4.5V	-	1.0	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 4.5V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 3.5～12V	-	0.10	-	%/V

+2.6V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 4.6V, I_{OUT} = 10mA	2.47	2.60	2.73	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.45	1.20	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 4.6V	-	1.0	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 4.6V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 3.6～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.4	1.0	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 4.7V	-	1.0	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 4.7V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 3.7～12V	-	0.10	-	%/V

+2.9V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 4.9V, I_{OUT} = 10mA	2.755	2.900	3.045	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.4	1.0	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 4.9V	-	1.0	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 4.9V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 3.9～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.36	0.85	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 5.0V	-	1.0	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 5.0V, I_{OUT} = 1～20mA	-	15	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 4.0～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.33	0.80	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 5.2V	-	1.1	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 5.2V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 4.2～12V	-	0.10	-	%/V

+3.3V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 5.3V, I_{OUT} = 10mA	3.135	3.300	3.465	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.33	0.80	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 5.3V	-	1.1	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 5.3V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 4.3～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.33	0.70	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 5.5V	-	1.1	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 5.5V, I_{OUT} = 1～20mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 4.5～12V	-	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	3.80	4.00	4.20	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.26	0.60	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 6.0V	-	1.1	2.4	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} = 5.0～12V	-	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	4.500	4.725	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.22	0.50	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 6.5V	-	1.1	2.4	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} = 5.5～12V	-	0.10	-	%/V

+4.8V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 6.8V, I_{OUT} = 30mA	4.56	4.80	5.04	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.22	0.50	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 6.8V	-	1.2	2.4	µA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 6.8V, I_{OUT} = 1～40mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 5.8～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.22	0.45	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 7.0V	-	1.2	2.4	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} = 6.0～12V	-	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	ΔV_{IO}	I_{OUT} = 10mA	-	0.22	0.45	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 7.2V	-	1.3	2.4	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} = 6.2～12V	-	0.10	-	%/V

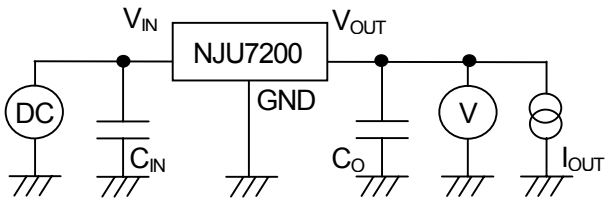
+5.5V Version (C_{IN} = C_o = 0.1µF, T_a = 25°C)

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	ΔV_{IO}	I_{OUT} = 10mA	-	0.20	0.40	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 7.5V	-	1.3	2.4	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} = 6.5～12V	-	0.10	-	%/V

+8.0V Version (C_{IN} = C_o = 0.1μF, T_a = 25°C)

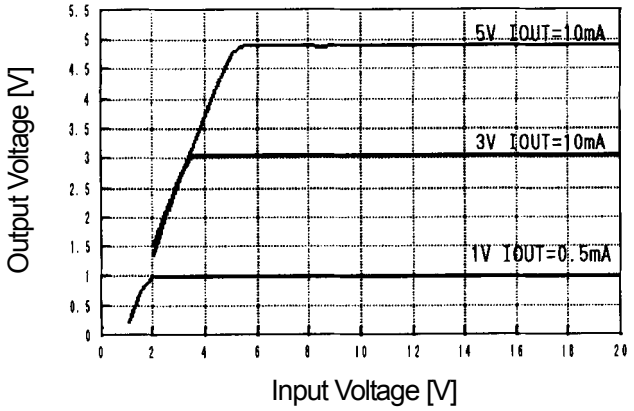
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	V_{IN} = 10.0V, I_{OUT} = 30mA	7.60	8.00	8.40	V
Dropout Voltage	ΔV_{IO}	I_{OUT} = 10mA	-	0.20	0.40	V
Input Voltage	V_{IN}		-	-	12	V
Operating Current	I_Q	V_{IN} = 10.0V	-	2.0	4.0	μA
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	V_{IN} = 10.0V, I_{OUT} = 1～40mA	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	V_{IN} = 9.0～12V	-	0.10	-	%/V

■ **MEASUREMENT CIRCUIT**

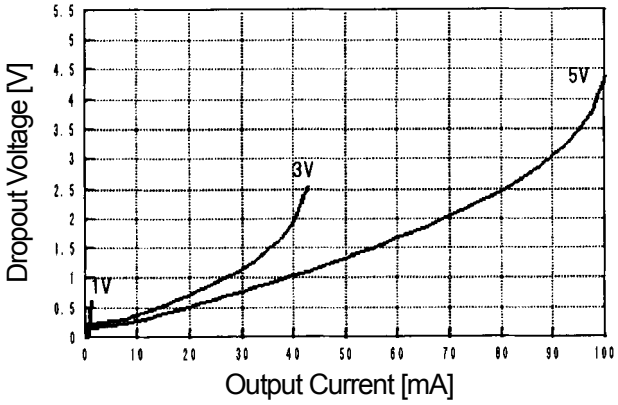


■ TYPICAL CHARACTERISTICS

Output Voltage vs. Input Voltage



Dropout Voltage vs. Output Current



Output Voltage vs. Output Current