

## 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.

### ■ FEATURES

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

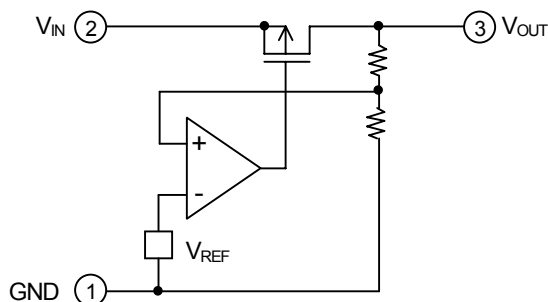
### ■ OUTPUT VOLTAGE LINE-UP

Output Voltage	SOT-89 Type	Output Voltage	SOT-89 Type
+1.0V	NJU7200U10	+3.2V	NJU7200U32
+1.1V	NJU7200U11	+3.3V	NJU7200U33
+1.2V	NJU7200U12	+3.5V	NJU7200U35
+1.5V	NJU7200U15	+4.0V	NJU7200U40
+2.1V	NJU7200U21*	+4.5V	NJU7200U45*
+2.5V	NJU7200U25	+4.8V	NJU7200U48
+2.6V	NJU7200U26	+5.0V	NJU7200U50
+2.7V	NJU7200U27	+5.2V	NJU7200U52*
+2.9V	NJU7200U29	+5.5V	NJU7200U55
+3.0V	NJU7200U30	+8.0V	NJU7200U80*

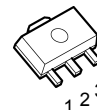
Note1) The SOT-89 type name is different from the marking, so it refer to attached paper correspondence table.

Note2) \*:Planning Products.

### ■ EQUIVALENT CIRCUIT



### ■ PACKAGE OUTLINE



NJU7200U (SOT-89)

### ■ TERMINAL DESCRIPTION

No.	Description
1	GND
2	Input
3	Output

# NJU7200 Series

## ■ ABSOLUTE MAXIMUM RATINGS

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

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	$P_D$	(SOT-89) 300	mW
Operating Temperature	$T_{opr}$	-25 to +75	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to +125	$^\circ\text{C}$

## ■ ELECTRICAL CHARACTERISTICS

+1.0V Version

( $C_{IN} = C_o = 0.1\mu\text{F}$ ,  $T_a = 25^\circ\text{C}$ )

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

+1.1V Version

( $C_{IN} = C_o = 0.1\mu\text{F}$ ,  $T_a = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_{OUT}$	$V_{IN} = 3.0\text{V}$ , $I_{OUT} = 5\text{mA}$	1.045	1.100	1.155	V
Dropout Voltage	$\Delta V_{IO}$	$I_{OUT} = 0.5\text{mA}$	-	0.06	0.18	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 3.0\text{V}$	-	0.90	2.40	$\mu\text{A}$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 3.0\text{V}$ , $I_{OUT} = 1\sim 15\text{mA}$	-	10	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 1.5\sim 12\text{V}$	-	0.10	-	%/V

+1.2V Version

( $C_{IN} = C_o = 0.1\mu\text{F}$ ,  $T_a = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_{OUT}$	$V_{IN} = 3.0\text{V}$ , $I_{OUT} = 5\text{mA}$	1.14	1.20	1.26	V
Dropout Voltage	$\Delta V_{IO}$	$I_{OUT} = 0.5\text{mA}$	-	0.06	0.18	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 3.0\text{V}$	-	0.90	2.40	$\mu\text{A}$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 3.0\text{V}$ , $I_{OUT} = 1\sim 15\text{mA}$	-	10	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 1.5\sim 12\text{V}$	-	0.10	-	%/V

+1.5V Version

( $C_{IN} = C_o = 0.1\mu\text{F}$ ,  $T_a = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_{OUT}$	$V_{IN} = 3.0\text{V}$ , $I_{OUT} = 5\text{mA}$	1.425	1.500	1.575	V
Dropout Voltage	$\Delta V_{IO}$	$I_{OUT} = 0.5\text{mA}$	-	0.04	0.12	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 3.0\text{V}$	-	0.90	2.40	$\mu\text{A}$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 3.0\text{V}$ , $I_{OUT} = 1\sim 15\text{mA}$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 1.8\sim 12\text{V}$	-	0.10	-	%/V

# NJU7200 Series

## +2.1V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 0.5mA$	-	0.04	0.12	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 4.1V$	-	0.90	2.40	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 4.1V$ , $I_{OUT} = 1\sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 2.5\sim 12V$	-	0.10	-	%/V

## +2.5V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.45	1.20	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 4.5V$	-	1.0	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 4.5V$ , $I_{OUT} = 1\sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 3.5\sim 12V$	-	0.10	-	%/V

## +2.6V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.45	1.20	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 4.6V$	-	1.0	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 4.6V$ , $I_{OUT} = 1\sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 3.6\sim 12V$	-	0.10	-	%/V

## +2.7V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.4	1.0	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 4.7V$	-	1.0	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 4.7V$ , $I_{OUT} = 1\sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 3.7\sim 12V$	-	0.10	-	%/V

## +2.9V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.4	1.0	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 4.9V$	-	1.0	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 4.9V$ , $I_{OUT} = 1\sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 3.9\sim 12V$	-	0.10	-	%/V

# NJU7200 Series

## +3.0V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.36	0.85	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 5.0V$	-	1.0	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 5.0V$ , $I_{OUT} = 1 \sim 20mA$	-	15	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 4.0 \sim 12V$	-	0.10	-	%/V

## +3.2V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.33	0.80	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 5.2V$	-	1.1	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 5.2V$ , $I_{OUT} = 1 \sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 4.2 \sim 12V$	-	0.10	-	%/V

## +3.3V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.33	0.80	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 5.3V$	-	1.1	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 5.3V$ , $I_{OUT} = 1 \sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 4.3 \sim 12V$	-	0.10	-	%/V

## +3.5V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.33	0.70	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 5.5V$	-	1.1	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 5.5V$ , $I_{OUT} = 1 \sim 20mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 4.5 \sim 12V$	-	0.10	-	%/V

## +4.0V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.26	0.60	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 6.0V$	-	1.1	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 6.0V$ , $I_{OUT} = 1 \sim 40mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 5.0 \sim 12V$	-	0.10	-	%/V

# NJU7200 Series

## +4.5V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.22	0.50	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 6.5V$	-	1.1	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 6.5V$ , $I_{OUT} = 1\sim 40mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 5.5\sim 12V$	-	0.10	-	%/V

## +4.8V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.22	0.50	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 6.8V$	-	1.2	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 6.8V$ , $I_{OUT} = 1\sim 40mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 5.8\sim 12V$	-	0.10	-	%/V

## +5.0V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.22	0.45	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 7.0V$	-	1.2	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 7.0V$ , $I_{OUT} = 1\sim 40mA$	-	35	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 6.0\sim 12V$	-	0.10	-	%/V

## +5.2V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.22	0.45	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 7.2V$	-	1.3	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 7.2V$ , $I_{OUT} = 1\sim 40mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 6.2\sim 12V$	-	0.10	-	%/V

## +5.5V Version

( $C_{IN} = C_o = 0.1\mu F$ ,  $T_a = 25^\circ C$ )

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	$\Delta V_{IO}$	$I_{OUT} = 10mA$	-	0.20	0.40	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 7.5V$	-	1.3	2.4	$\mu A$
Load Regulation	$\Delta V_{OUT} / \Delta I_{OUT}$	$V_{IN} = 7.5V$ , $I_{OUT} = 1\sim 40mA$	-	-	120	mV
Line Regulation	$\Delta V_{OUT} / (\Delta V_{IN} \cdot V_{OUT})$	$V_{IN} = 6.5\sim 12V$	-	0.10	-	%/V

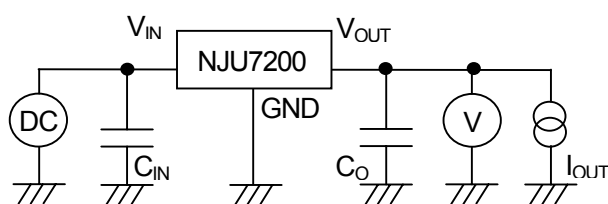
# NJU7200 Series

+8.0V Version

( $C_{IN} = C_o = 0.1\mu\text{F}$ ,  $T_a = 25^\circ\text{C}$ )

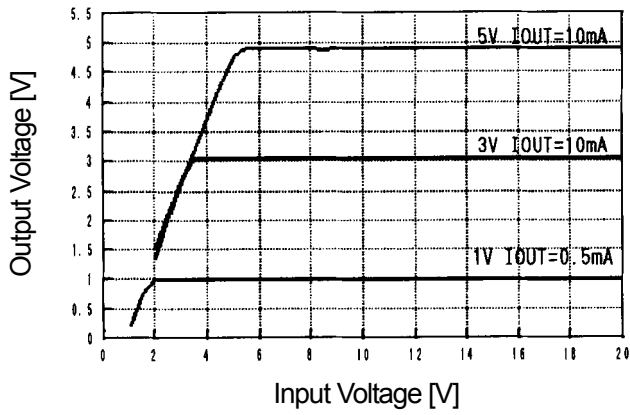
PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	$V_{OUT}$	$V_{IN} = 10.0\text{V}$ , $I_{OUT} = 30\text{mA}$	7.60	8.00	8.40	V
Dropout Voltage	$\Delta V_{IO}$	$I_{OUT} = 10\text{mA}$	-	0.20	0.40	V
Input Voltage	$V_{IN}$		-	-	12	V
Operating Current	$I_Q$	$V_{IN} = 10.0\text{V}$	-	2.0	4.0	$\mu\text{A}$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

## ■ MEASUREMENT CIRCUIT

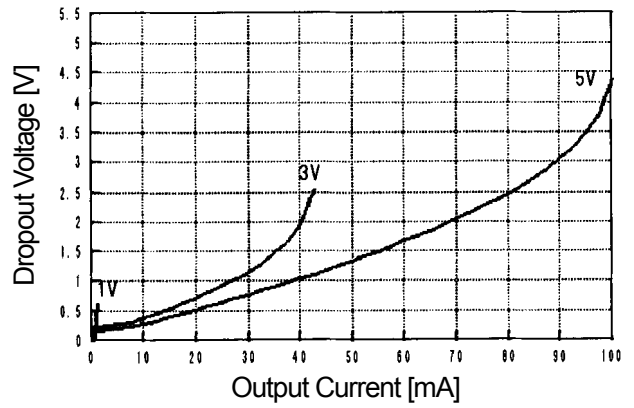


## ■ TYPICAL CHARACTERISTICS

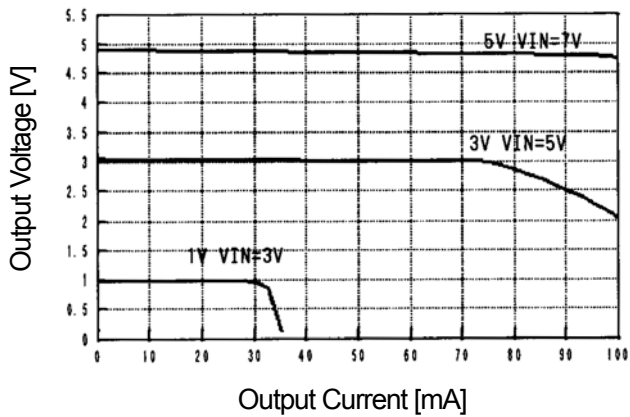
### Output Voltage vs. Input Voltage



### Dropout Voltage vs. Output Current



### Output Voltage vs. Output Current



**[CAUTION]**

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