S-802, 812, 813 series

VOLTAGE REGULATOR

Outline

The S-802, S-812 and S-813 Series are series of three-terminal voltage regulators that use a CMOS process. The output voltage is fixed internally : the S-802 Series outputs negative voltage, and the S-812 and S-813 Series output positive voltage. Since the S-802/S-812/S-813 Series consume less current and need a smaller input/output voltage difference than existing three-terminal voltage regulators, battery-powered portable equipment is afforded a higher capacity and a longer service life.

Features

- No supplementary components are necessary.
- Low power consumption (S-81230AG : 2.5μA typ.)
- Small input/output voltage difference
  (S-81250HG : 30mV typ. I_{OUT}=1mA)
  (S-81350AG : 200mV typ. I_{OUT}=40mA)
- Low temperature coefficient of output voltage
  (S-81230AG : ±0.375mV/°C typ.)
- Wide operating voltage range
  (S-81250HG : 12V max.)
- Good input stability (0.1%/V typ.)
- TO-92 or SOT-89 mini-power mold plastic packages are available.

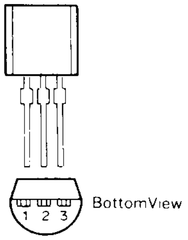
Applications

- Constant voltage power supply of battery-powered equipment, communications equipment, video equipment and others.

Pin Arrangement

(1) TO-92

1. S-802, S-812 Series



1 GND*
2 V_{IN}
3 V_{OUT}

* S-802XXAG: V_{DD}
S-812XXAG HG: V_{SS}
S-813XXAG: V_{SS}

Figure 1

2. S-813 Series

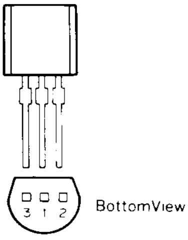
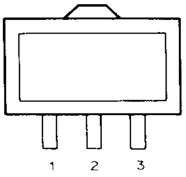


Figure 2

(2) SOT-89 mini-power mold

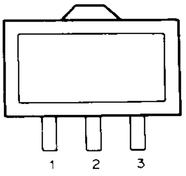
1. S-802 series



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

Figure 3

2. S-812 Series



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

Figure 4

Block Diagram

1. S-802 Series

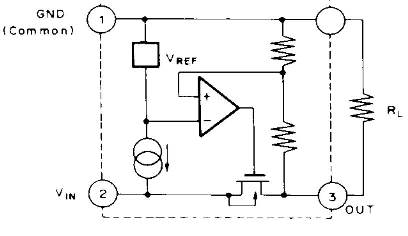


Figure 5 (TO-92)

2. S-812,S-813 Series

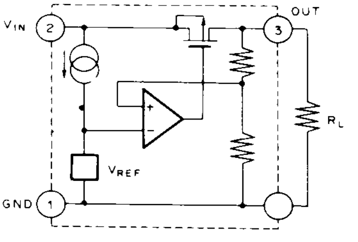


Figure 6

Absolute Maximum Ratings

Table 1

Item		Symbol	Ratings	Unit
Input voltage	S-802 Series	V_{IN}	−12	V
	S-812, 813 Series		12	
	S-81250HG		18	
Output voltage	S-802 Series	V_{OUT}	$V_{IN}-0.3$ to $V_{SS}+0.3$	V
	S-812, 813 Series		$V_{IN}+0.3$ to $V_{SS}-0.3$	
Output current		I_{OUT}	100	mA
Power dissipation		P_D	200	mW
Operating ambient temperature		T_{opr}	−20 to +70	°C
Storage temperature		T_{stg}	−40 to +125	
Soldering condition		T_{sol}	260°C for 10 seconds	

Caution: Keep static electricity to a minimum.

Selection Guide

Table 2

Output voltage	Model name	
	TO-92	SOT-89 mini-power mold*
−3V± 5%	S-80230AG	S-80230AG-GA-X
−5V± 5%	S-80250AG	S-80250AG-GB-X
1.1V ± 5%	S-81211AG	—
1.5V ± 5%	—	S-81215AG-RK-X
2.5V ± 5%	—	S-81225AG-RH-X
3.0V ± 5%	S-81230AG	S-81230AG-RB-X
3.5V ± 5%	—	S-81235AG-RI-X
3.7V ± 5%	S-81237AG	S-81237AG-RE-X
4.0V ± 5%	—	S-81240AG-RJ-X
5.0V ± 5%	S-81250HG	S-81250HG-RD-X
5.2V ± 5%	S-81252HG	—
5.0V ± 5%	S-81350AG	—

*The last part of the model name changes according to the packing form when it is a mini-power mold plastic package product.
X=S: Stick
X=T1: Tape
X=T2: Tape

■ Electrical Characteristics

1. S-802 Series

1.1 S-80230AG, S-80230AG-GA-X (−3V output type)

Table 3

(Unless otherwise specified : Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=-5V, I_{OUT}=10mA	−3.15	−3.00	−2.85	V	1
Output current	I_{OUT}	V_{IN}=−5V	20	30	—	mA	1
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦20mA V_{IN}=−5V	—	60	100	mV	—
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	60	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=−5V, No load	—	2.5	6.0	μA	—
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	−10V≦V_{IN}≦−4V	—	0.1	—	%/V	1
Input voltage	V_{IN}		−10	—	—	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.375	—	mV/°C	—

1.2 S-80250AG, S-80250AG-GB-X (−5V output type)

Table 4

(Unless otherwise specified : Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=−7V, I_{OUT}=10mA	−5.25	−5.00	−4.75	V	1
Output current	I_{OUT}	V_{IN}=−7V	40	50	—	mA	1
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦40mA V_{IN}=−7V	—	40	80	mV	1
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	30	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=−7V, No load	—	3.0	7.0	μA	2
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	−10V≦V_{IN}≦−6V	—	0.1	—	%/V	1
Input voltage	V_{IN}		−10	—	—	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.625	—	mV/°C	—

2. S-812 Series

2.1 S-81211AG (+1.1V output type)

Table 5

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=1.5V, I_{OUT}=0.5mA	1.045	1.100	1.150	V	3
Output current	I_{OUT}	V_{IN}=1.5V	0.5	—	—	mA	3
Load stability	$\triangle V_{OUT}$	40μA≦I_{OUT}≦500μA V_{IN}=1.5V	—	—	100	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	250	400	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=1.5V, No load	—	2.2	5.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	1.55V≦V_{IN}≦10V	—	—	1.0	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=0.5mA −20°C≦Ta≦70°C	—	±0.138	—	mV/°C	—

2.2 S-81215AG-RK-X (+1.5V output type)

Table 6

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=3.5V, I_{OUT}=0.5mA	1.425	1.50	1.575	V	3
Output current	I_{OUT}	V_{IN}=3.5V	7.0	—	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦7mA V_{IN}=3.5V	—	80	—	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=0.5mA	—	300	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=3.5V, No load	—	2.2	5.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	2.5V≦V_{IN}≦10V I_{OUT}=0.5mA	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=0.5mA −20°C≦Ta≦70°C	—	±0.19	—	mV/°C	—

2.3 S-81225AG-RH-X (+2.5V output type)

Table 7

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=4.5V, I_{OUT}=10mA	2.375	2.500	2.625	V	3
Output current	I_{OUT}	V_{IN}=4.5V	10	25	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦10mA V_{IN}=4.5V	—	80	120	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	100	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=4.5V	—	2.5	6.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	3.5V≦V_{IN}≦10V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.31	—	mV/°C	—

2.4 S-81230AG, S-81230AG-RB-X (+3.0V output type)

Table 8

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=5V, I_{OUT}=10mA	2.85	3.00	3.15	V	3
Output current	I_{OUT}	V_{IN}=5V	20	30	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦20mA V_{IN}=5V	—	60	100	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	60	—	mV	—
V_{SS} supply current	V_{SS}	V_{IN}=5V, No load	—	2.5	6.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	4V≦V_{IN}≦10V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.375	—	mV/°C	—

2.5 S-81235AG-RI-X (+3.5V output type)

Table 9

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=5.5V, I_{OUT}=10mA	3.325	3.50	3.675	V	3
Output current	I_{OUT}	V_{IN}=5.5V	20	30	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦30mA V_{IN}=5.5V	—	60	100	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	60	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=5.5V, No load	—	2.5	6.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	4.5V≦V_{IN}≦10V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.438	—	mV/°C	—

2.6 S-81237AG, S-81237AG-RE-X (+3.7V output type)

Table 10

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=5.7V, I_{OUT}=10mA	3.50	3.70	3.90	V	3
Output current	I_{OUT}	V_{IN}=5.7V	20	30	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦20mA V_{IN}=5.7V	—	60	100	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	60	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=5.7V, No load	—	2.0	4.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	4.7V≦V_{IN}≦10V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.46	—	mV/°C	—

2.7 S-81240AG-RJ-X (+4.0V output type)

Table 11

(Unless otherwise specified : Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=6V, I_{OUT}=10mA	3.80	4.0	4.20	V	3
Output current	I_{OUT}	V_{IN}=6V	30	40	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦30mA V_{IN}=6V	—	50	90	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	50	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=6V, No load	—	3.0	7.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	5V≦V_{IN}≦10V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.5	—	mV/°C	—

2.8 S-81250HG, S-81250HG-RD-X (+5.0V high-pressure-proof output type)

Table 12

(Unless otherwise specified : Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=7V, I_{OUT}=10mA	4.75	5.00	5.25	V	3
Output current	I_{OUT}	V_{IN}=7V	40	50	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦40mA V_{IN}=7V	—	40	80	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	30	—	mV	—
V_{SS} supply current	I_{SS}	V_{IN}=7V, No load	—	3.0	7.0	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	6V≦V_{IN}≦10V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	12	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.625	—	mV/°C	—

2.9 S-81252HG (+5.2V high-pressure-proof output type)

Table 13

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=7.2V, I_{OUT}=10mA	5.00	5.20	5.40	V	3
Output current	I_{OUT}	V_{IN}=7.2V	40	50	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦40mA V_{IN}=7.2V	—	40	80	mV	3
I/O voltage difference	V_{dif}	I_{OUT}=1mA	—	30	—	mV	3
V_{SS} supply current	I_{SS}	V_{IN}=7.2V, No load	—	3.0	7.0	μA	4
Input stability	$\frac{\triangle VOUT}{\triangle V_{IN} \cdot V_{OUT}}$	6.2V≦V_{IN}≦15V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	15	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −20°C≦Ta≦70°C	—	±0.68	—	mV/°C	—

3. S-813 Series

3.1 S-81350AG (+5.0V high-output current type)

Table 14

(Unless otherwise specified: Ta=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	Test circuit
Output voltage	V_{OUT}	V_{IN}=7V, I_{OUT}=10mA	4.75	5.00	5.25	V	3
Output current	I_{OUT}	V_{IN}=V_{OUT}+0.2V	25	40	—	mA	3
Load stability	$\triangle V_{OUT}$	1mA≦I_{OUT}≦40mA V_{IN}=7V	—	—	120	mV	3
V_{SS} supply current	I_{SS}	V_{IN}=7V, No load	—	25	40	μA	4
Input stability	$\frac{\triangle V_{OUT}}{\triangle V_{IN} \cdot V_{OUT}}$	6.3V≦V_{IN}≦8V	—	0.1	—	%/V	3
Input voltage	V_{IN}		—	—	10	V	—
Temperature characteristic of $\triangle V_{OUT}$	$\frac{\triangle V_{OUT}}{\triangle Ta}$	I_{OUT}=10mA −15°C≦Ta≦45°C	—	±0.38	—	mV/°C	—

Test Circuit

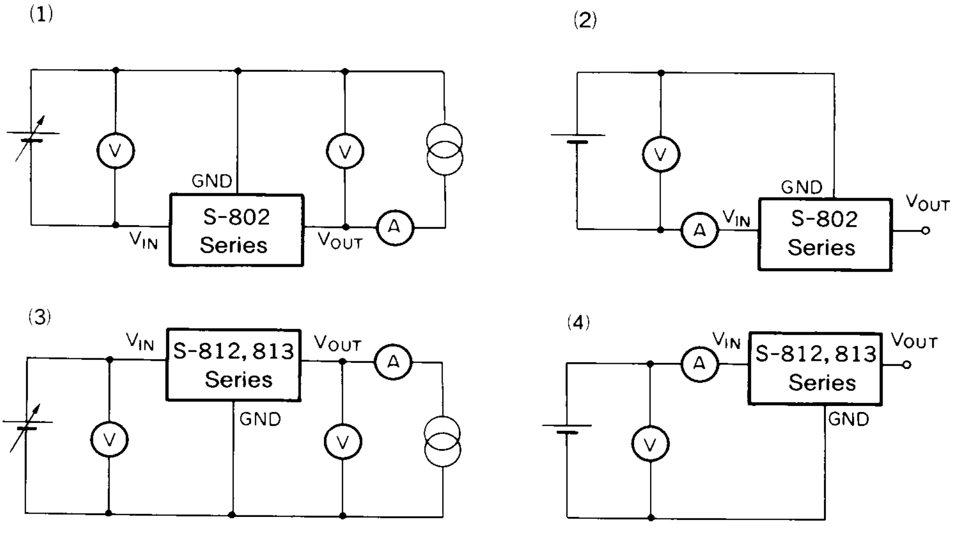


Figure 7 Test circuit

Dimensions

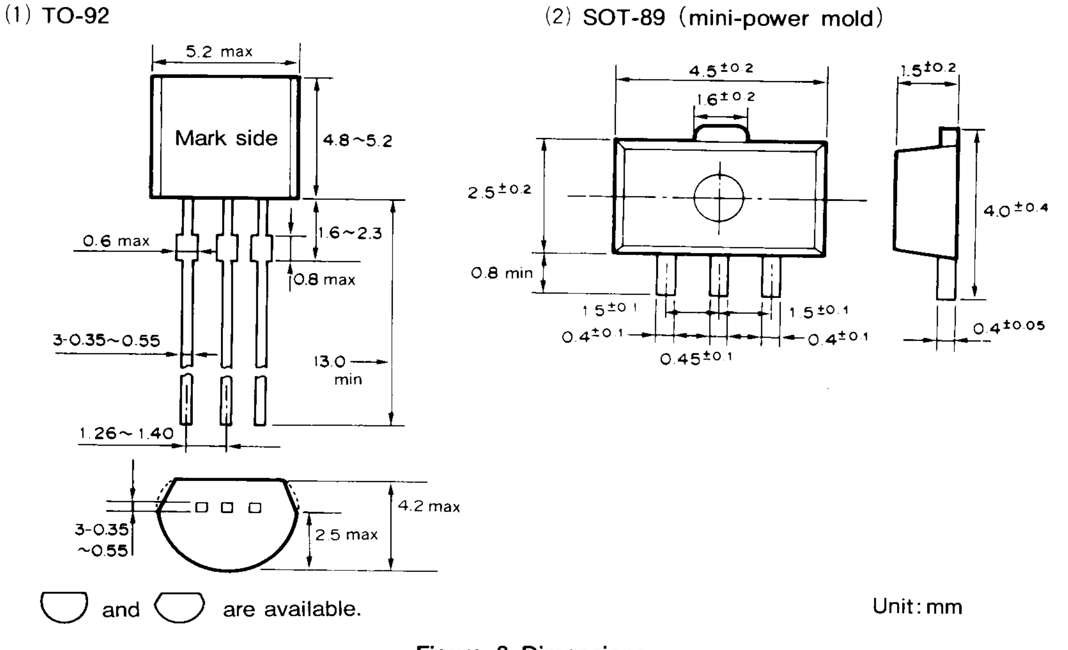


Figure 8 Dimensions

■ Taping Dimensions

1. Tape specifications

T1 and T2 types are available with the tape in the direction of the electrode when pulled out.

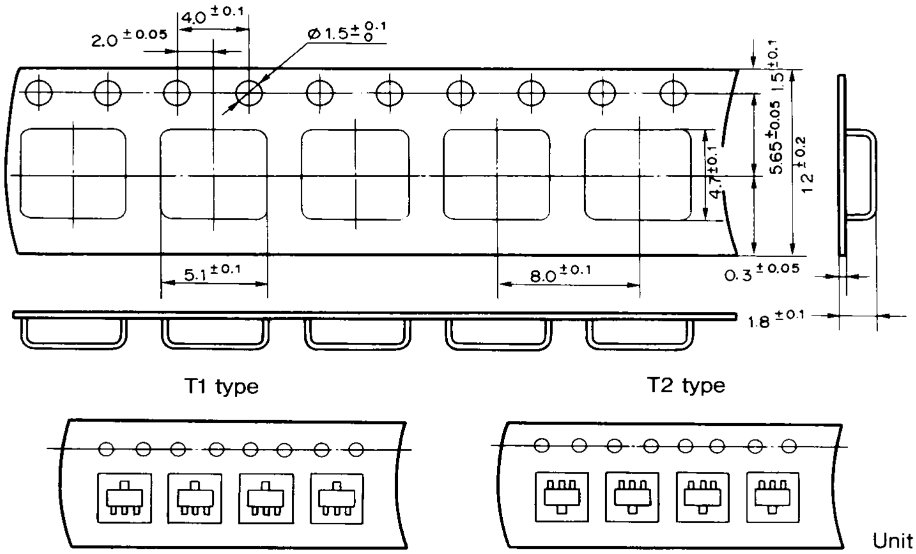


Figure 9

2. Reel specifications

1 reel has 1000 regulators.

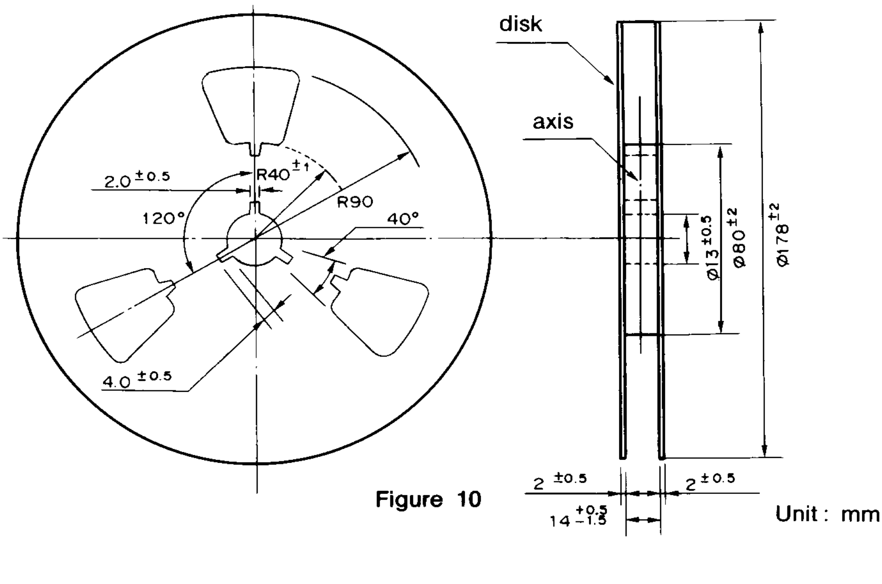
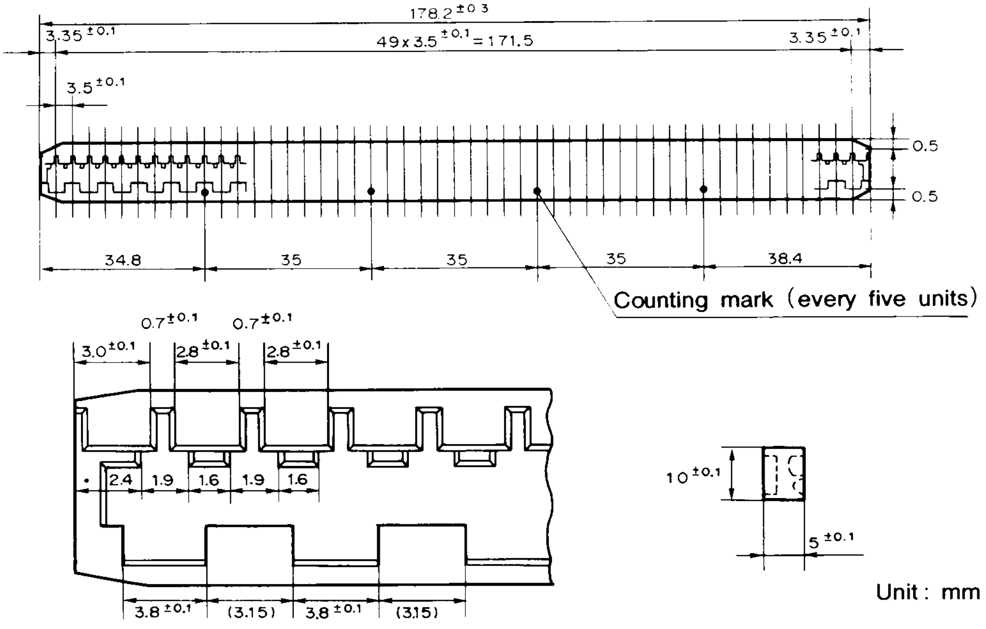


Figure 10

Magazine Dimensions

1 stick has 25 regulators.

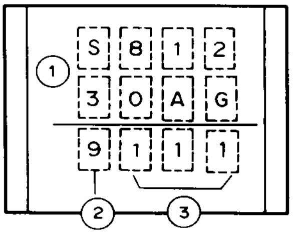


Unit : mm

Figure 11

Markings

(1) TO-92

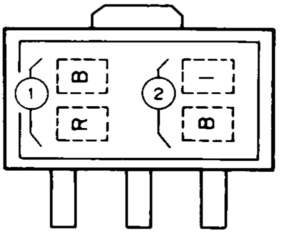


① Model No.

② The last digit of the year

③ Lot No.

(2) SOT-89 mini-power mold



① Model No. (abbreviation)

② Lot No.

Figure 12 S-81230AG marking example

■ Operation

1. Basic operation

Figure 13 shows the block diagram of the S-802, S-812 and S-813 Series. The error amplifier compares a standard voltage V_{REF} with the part of the output voltage fed back by the feedback resistance R_A and R_B. It supplies the control transistor with the base current needed to keep a stable output voltage range not influenced by input voltage or temperature fluctuation.

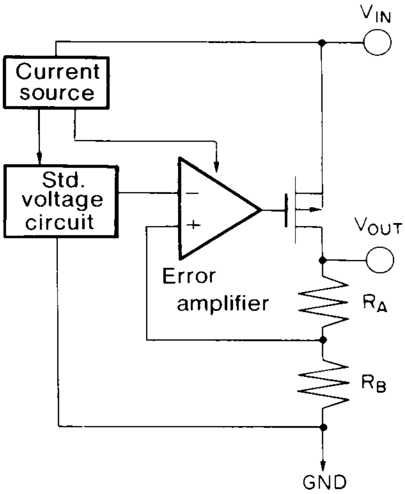


Figure 13 Std. block diagram

2. Internal Circuit

2.1 Standard voltage circuit

In a voltage regulator, the standard voltage circuit plays a very important role because any abnormality will show up directly at an output.

The S-802, S-812 and S-813 Series have a 0.8V typical stable voltage circuit (Figure 14) using a depression transistor and an enhancement transistor as a highly stable standard voltage source.

Features :

- Low power consumption
- Good temperature characteristic

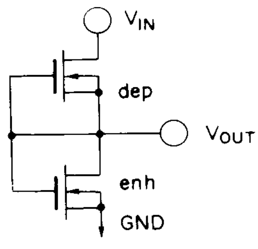


Figure 14 Std. voltage circuit

2.2 Error amplifier

The error amplifier consumes 0.5μA of current because it is a differential amplifier in a stable current circuit.

Features :

- Good relation characteristic
- Wide operating voltage range
- Low offset voltage

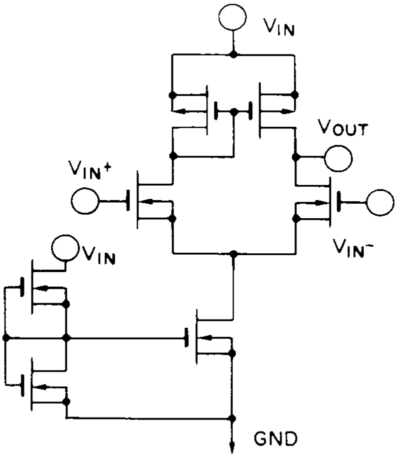


Figure 15 Error amplifier

2.3 Control transistor

The S-802, S-812 and S-813 Series have a Pch MOS transistor as the current control transistor (shown in Figure 16). Therefore, an output current I_{OUT} is expressed by the following formula where there is only a small difference between input and output voltages:

$I_{OUT}=KP\ \{2(V_{GS}-V_{TP})(V_{IN}-V_O)-(V_{IN}-V_O)^2\}$

*KP: Conductive coefficiency

V_{TP}: Threshold voltage of the control transistor

Setting KP to the large value results in a voltage regulator with 30mV typical output voltage.

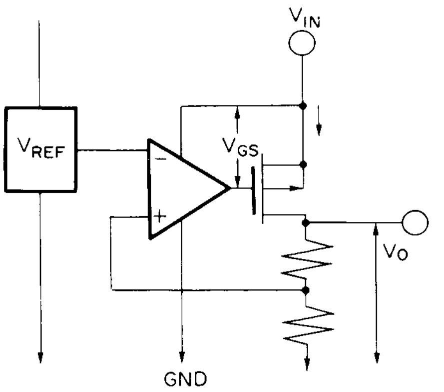


Figure 16 Control transistor

3. Other characteristics

(1) Temperature characteristic of output voltage

The temperature characteristic of the output voltage is expressed by the following formula in a range of −20°C to 70°C.

$\frac{V_{OUT}}{V_{REF}}\times(\pm0.1)$mV/°C typ.

*V_{REF} is 0.7Vmin., 0.8V typ., 0.9V max.

(2) Input stability

The output voltage typically changes 0.1%/V with a change of input voltage V_{IN}.

On this occasion the condition of the input voltage is:

$V_{OUT}+1.0V\leqq V_{IN}\leqq 10V$

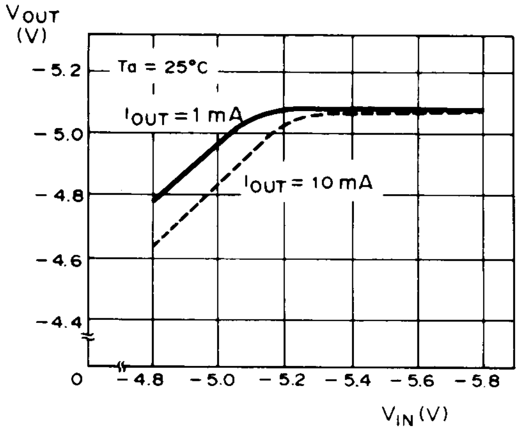
$I_{OUT}=0.1mA$

Note: This condition may vary according to the model.

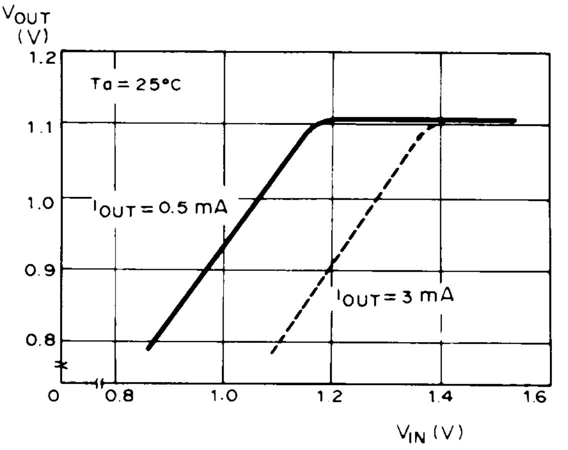
Characteristics

1. Input voltage-output voltage

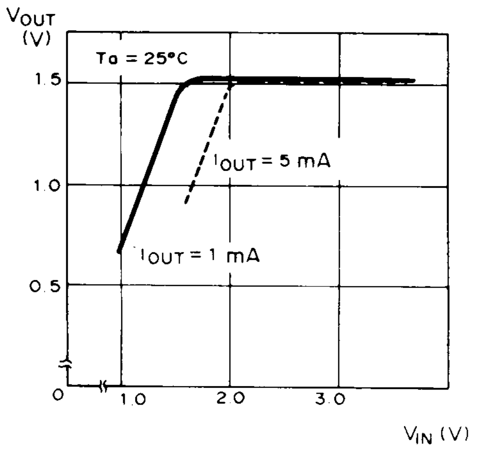
1.1 S-80250AG, S-80250AG-GB-X



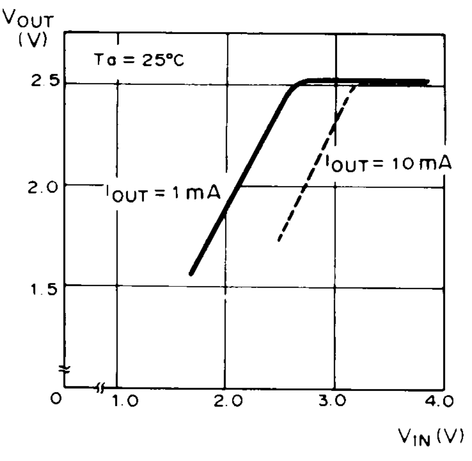
1.2 S-81211AG



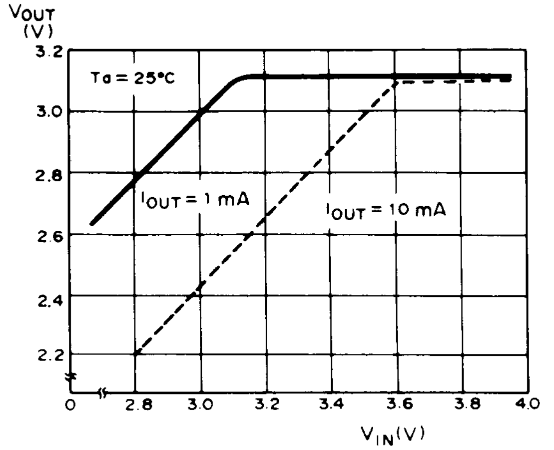
1.3 S-81215AG-RK-X



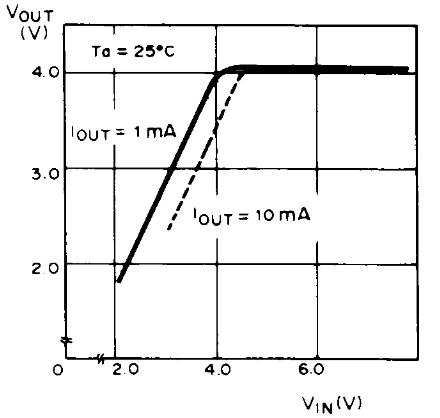
1.4 S-81225AG-RH-X



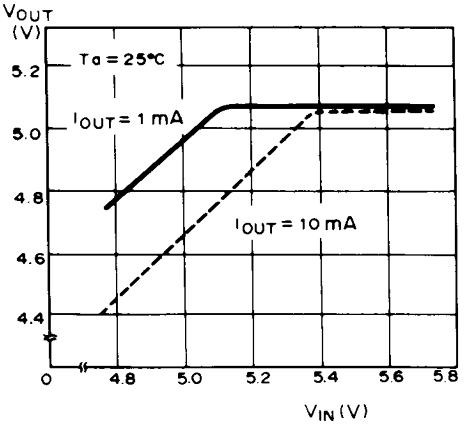
1.5 S-81230AG, S-81230AG-RB-X



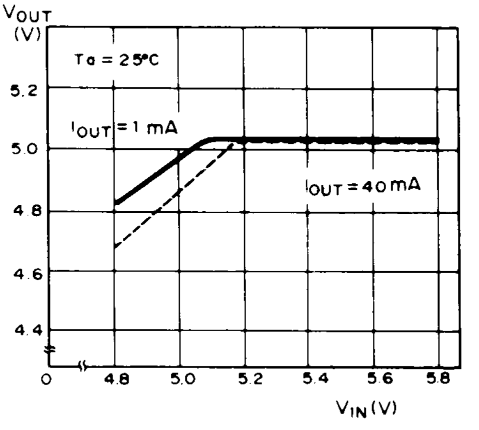
1.6 S-81240AG-RJ-X



1.7 S-81250HG, S-81250HG-RD-X

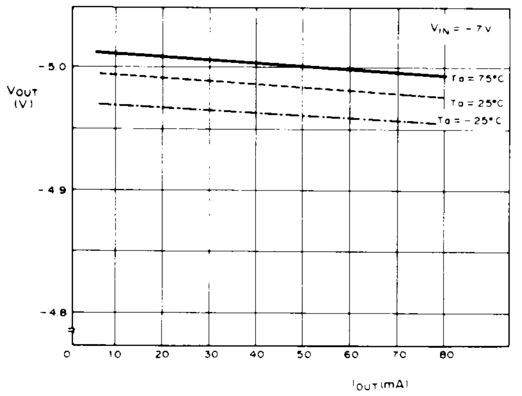


1.8 S-81350AG

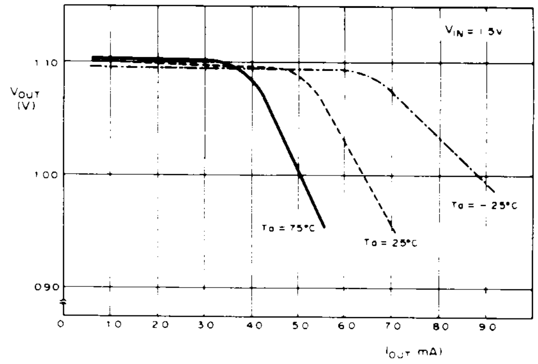


2. Output current-output voltage

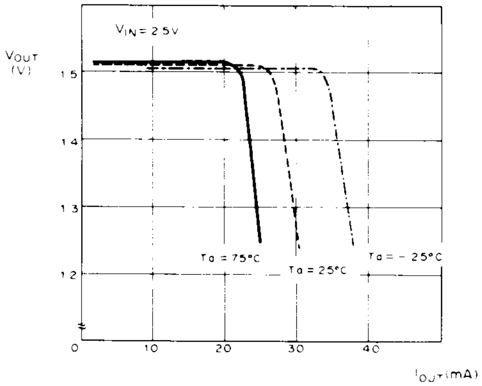
2.1 S-80250AG, S-80250AG-GB-X



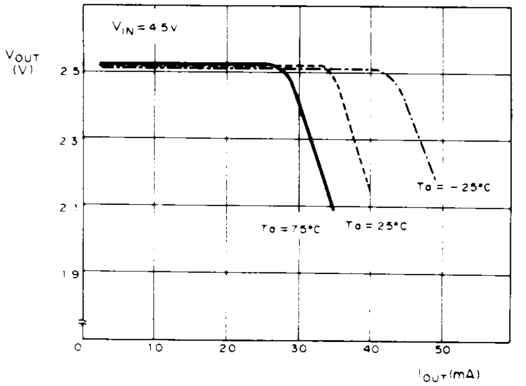
2.2 S-81211AG



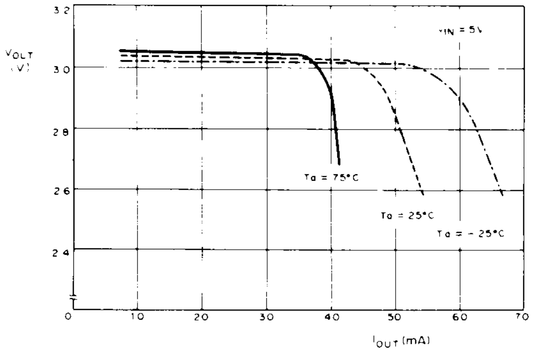
2.3 S-81215AG-RK-X



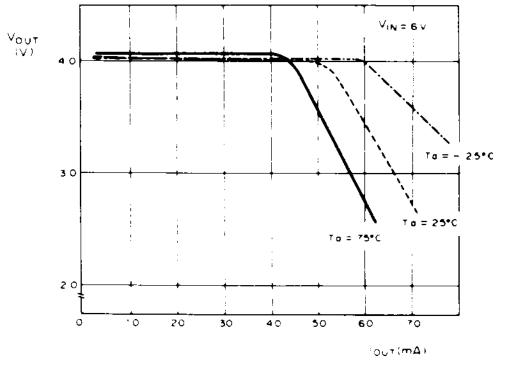
2.4 S-81225AG-RH-X



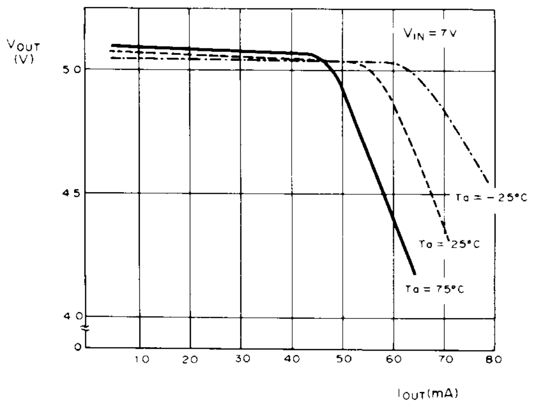
2.5 S-81250HG, S-81250HG-RD-X



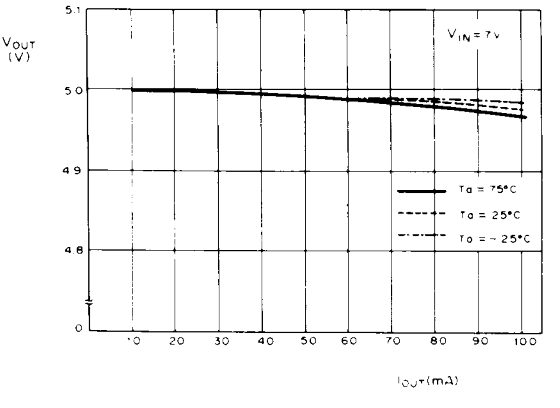
2.6 S-81350AG



2.7 S-81230AG, S-81230AG-RB-X

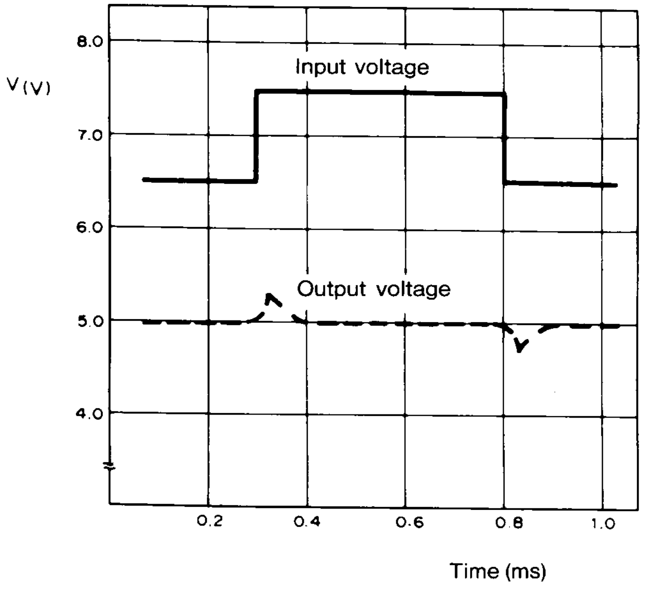


2.8 S-81240AG-RJ-X

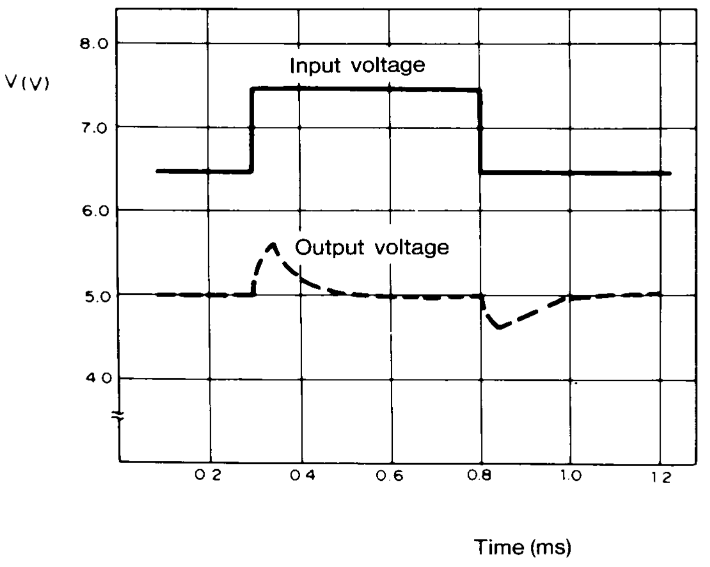


3. Input excess response characteristics (Ta=25°C) (S-81250HG)

3.1 I_{OUT}=1mA

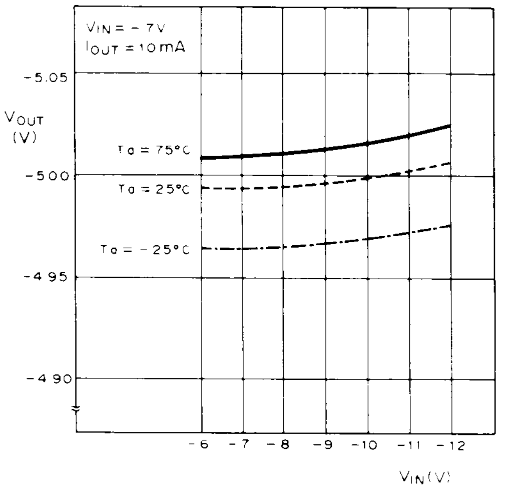


3.2 I_{OUT}=10mA

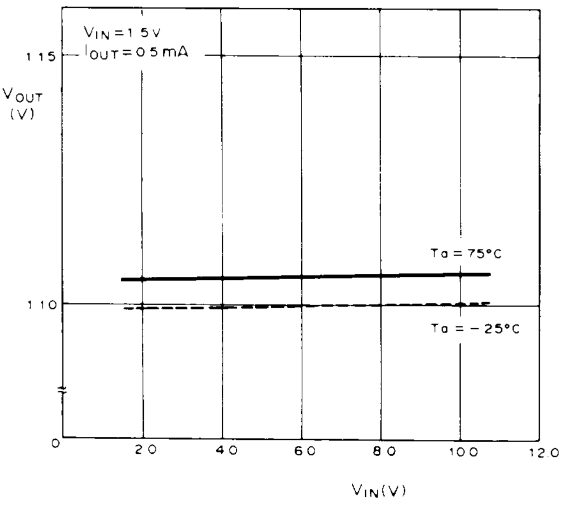


4. Input voltage-output voltage

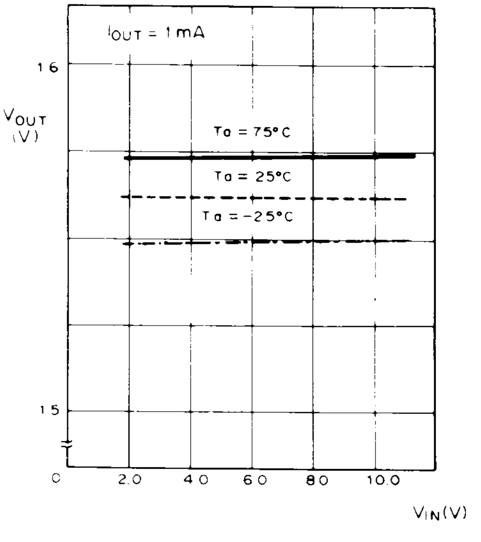
4.1 S-80250A



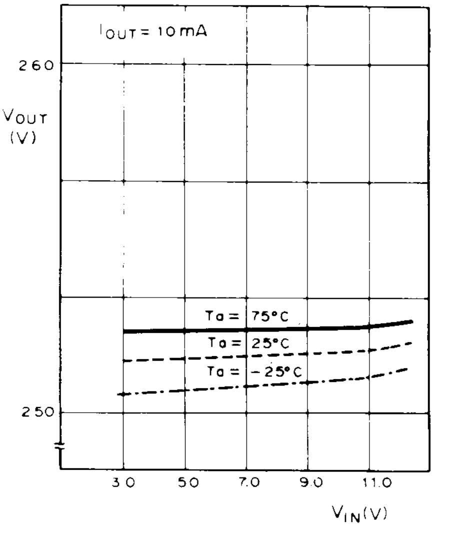
4.2 S-81211AG



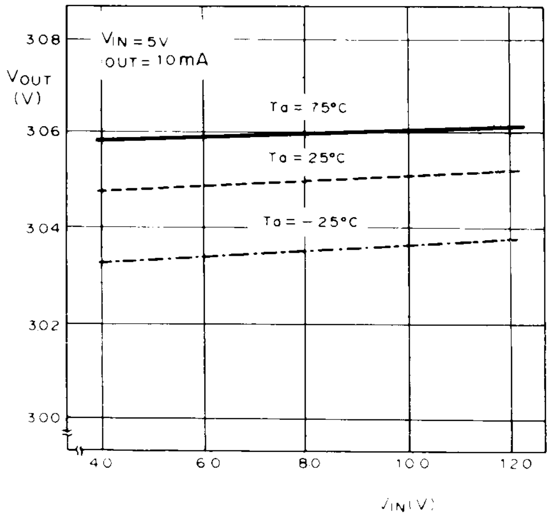
4.3 S-81215AG-RK-X



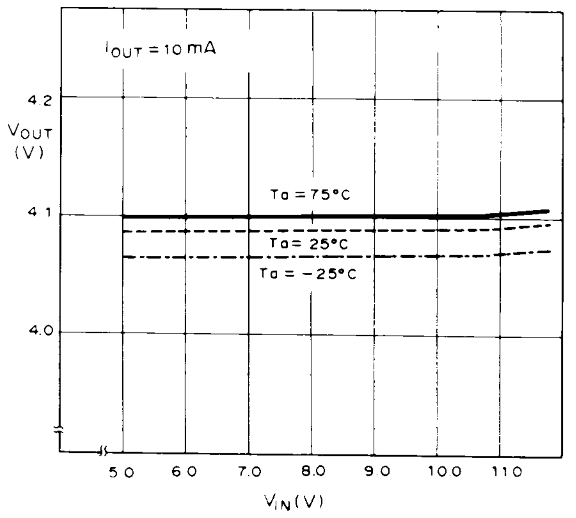
4.4 S-81225AG-RH-X



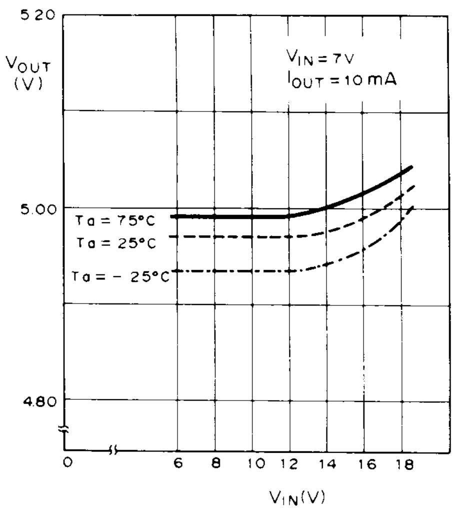
4.5 S-81230AG



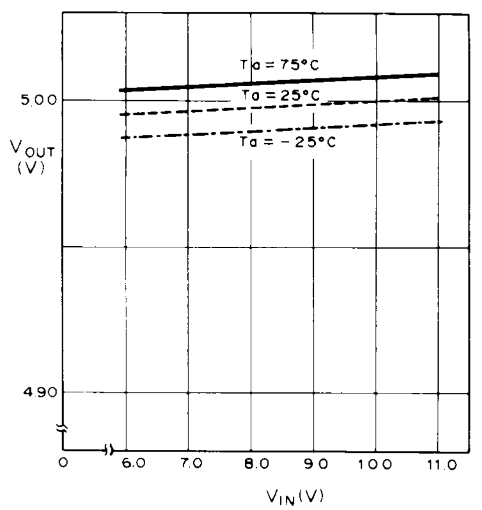
4.6 S-81240AG-RJ-X



4.7 S-81250HG

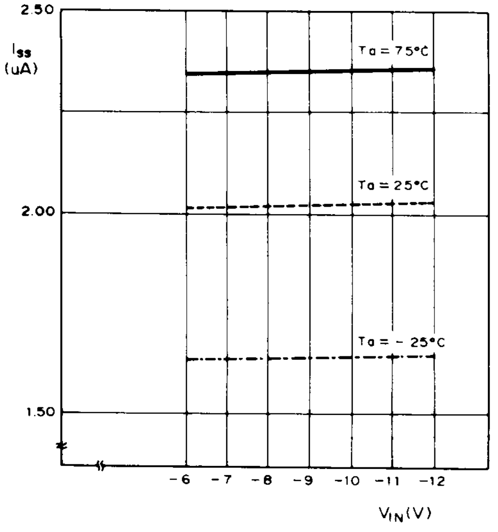


4.8 S-81350AG

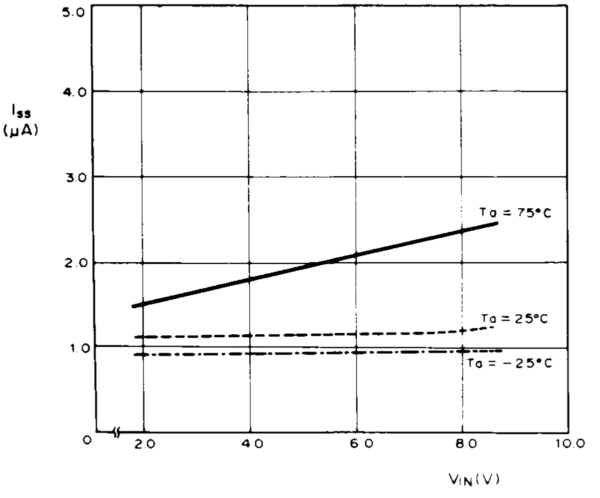


5. Supply current characteristics

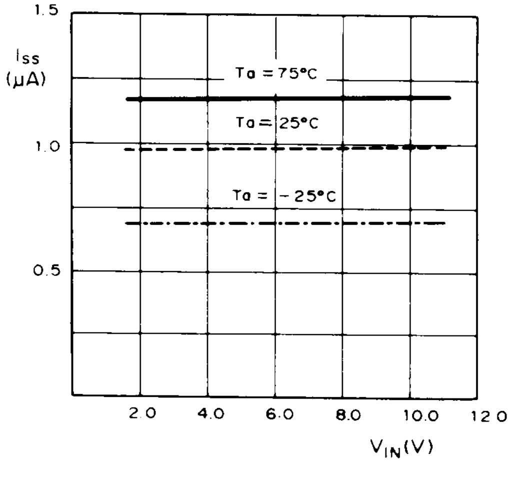
5.1 S-80250AG



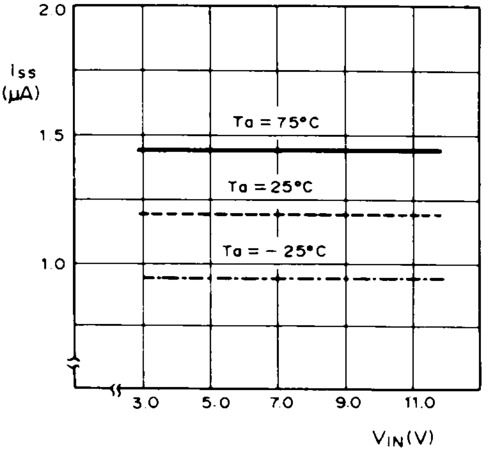
5.2 S-81211AG



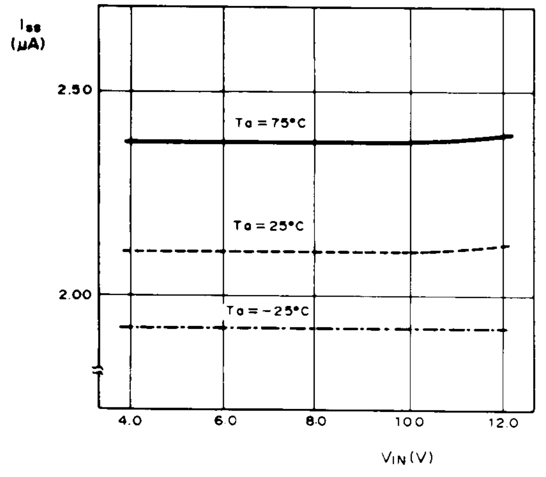
5.3 S-81215AG-RK-X



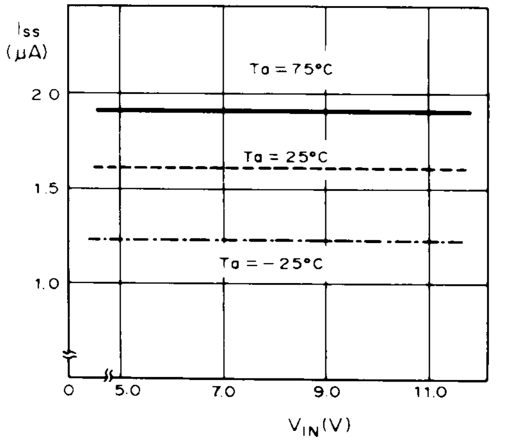
5.4 S-81225AG-RH-X



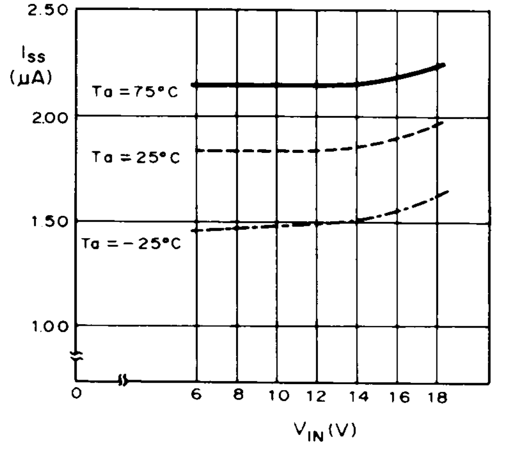
5.5 S-81230AG



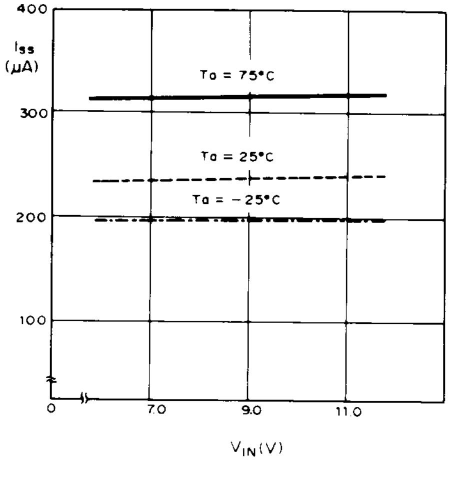
5.6 S-81240AG-RJ-X



5.7 S-81250HG

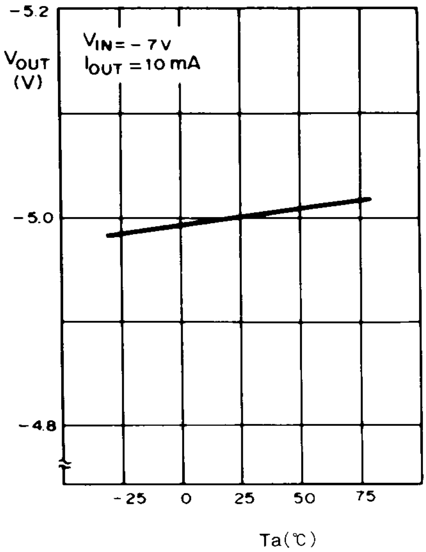


5.8 S-81350AG

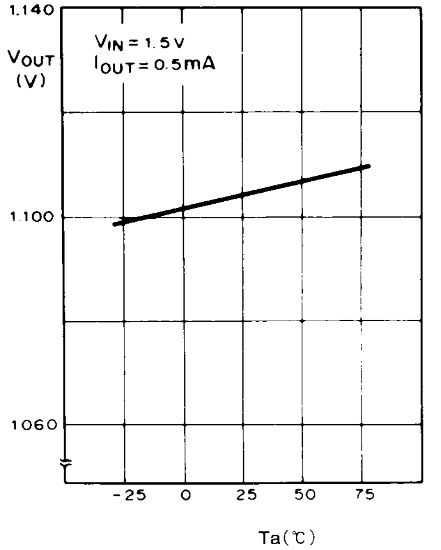


6. Temperature characteristics of output voltages

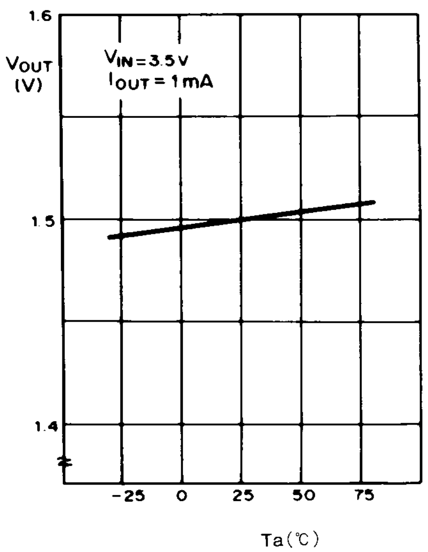
6.1 S-80250AG



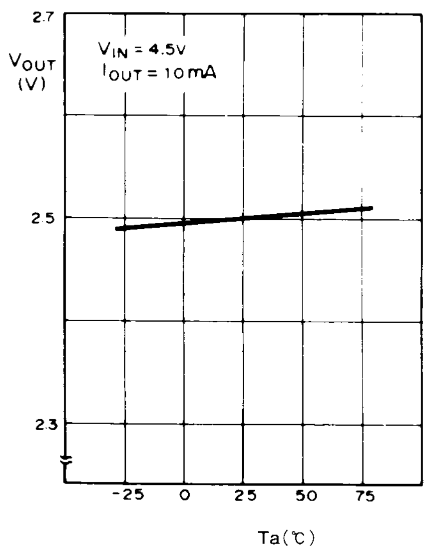
6.2 S-81211AG



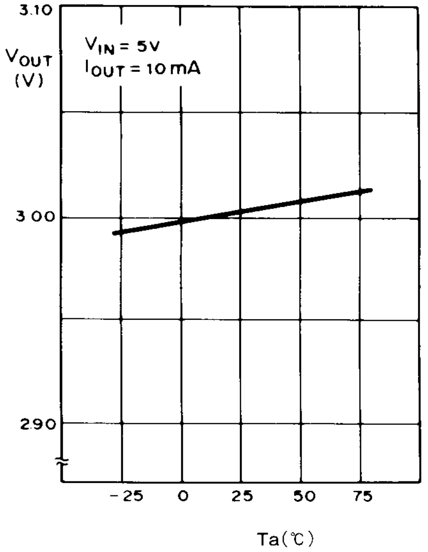
6.3 S-81215AG-RK-X



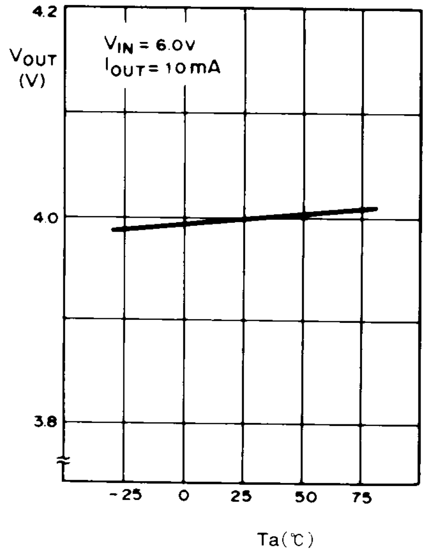
6.4 S-81225AG-RH-X



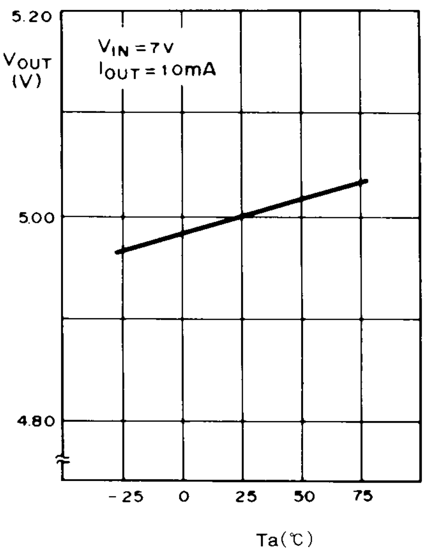
6.5 S-81230AG



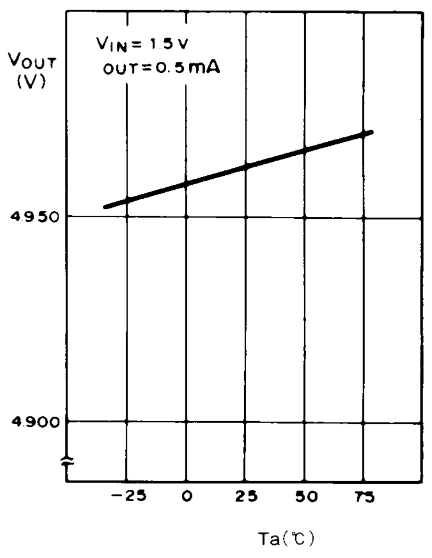
6.6 S-81240AG-RJ-X



6.7 S-81250HG

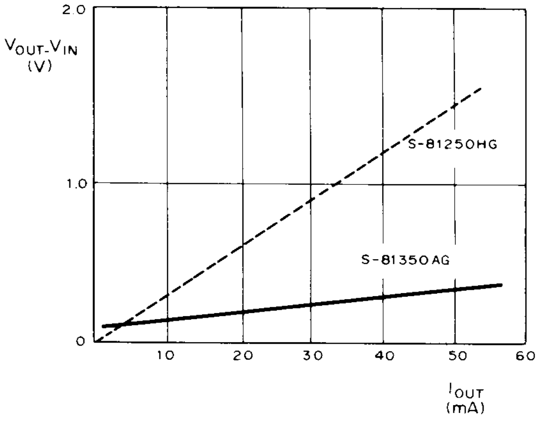


6.8 S-81350AG

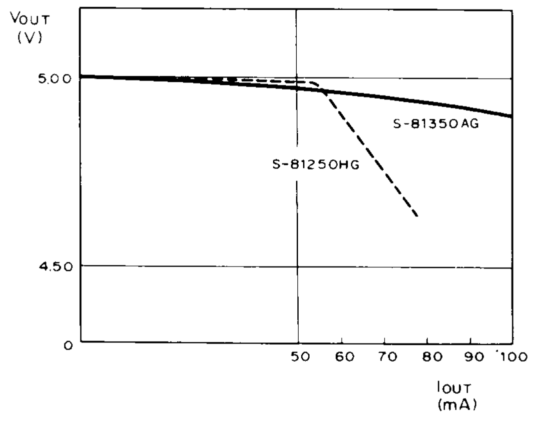


7. S-81250HG and S-81350AG characteristics comparison

7.1 Output current-input/output voltage

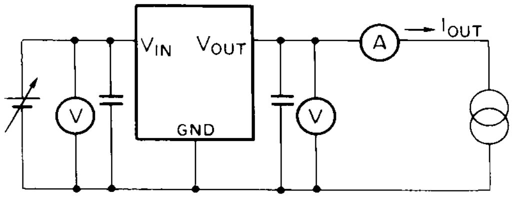


7.2 Output current-output voltage

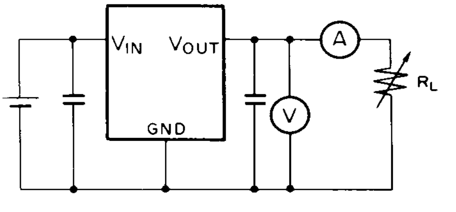


8. Measuring circuits

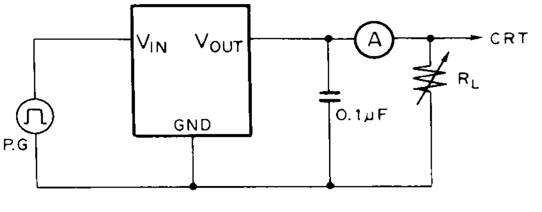
(1) Input voltage-output voltage



(2) Output current-output voltage



(3) Input excess response



(4) Supply current

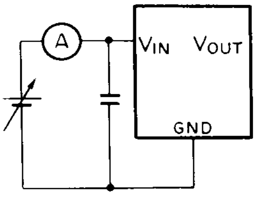
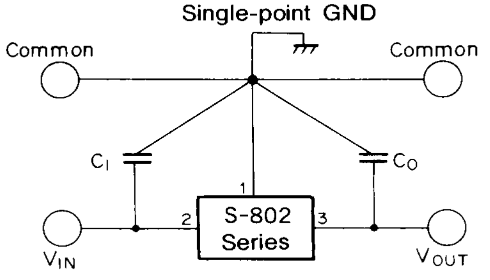


Figure 17 Measuring circuits

■ Standard Circuits

(1) S-802 Series



(2) S-812, S-813 Series

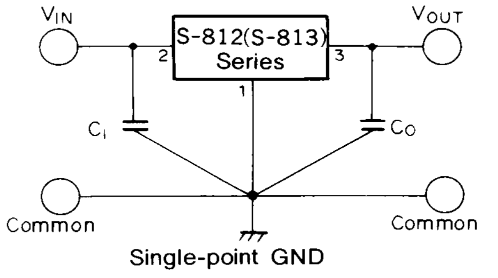


Figure 18 Basic circuits with a by-pass capacitor

Application Circuit Examples

1. High output current positive voltage regulator

Figure 19 shows a circuit for increasing the output current capacity.

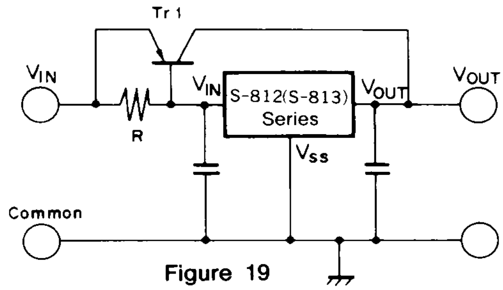


Figure 19

Short-circuit protection of T_r1 is possible by adding the sense resistance R_S and the PNP transistor shown in Figure 20.

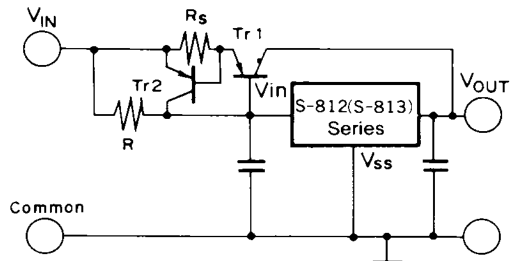


Figure 20

2. Circuits for increasing output voltage

If the output voltage you need cannot be found in our product lineup, the designs in Figures 21 and 22 will increase output voltage easily.

$$V_{OUT}=V_{XX}(1+\frac{R_2}{R_1})+I_{SS}R_2=V_{XX}(1+\frac{R_2}{R_1})$$

Because of their low current consumption, the S-812 and S-813 Series can set the resistance values R_1 and R_2 high to lower the power consumption of whole systems. Current flows to the Zener diode (D) through the quiescent current (I_{SS}) of the S-812 and S-813 Series, and the GND terminal rises for the voltage of D. When D cannot drive with a quiescent current, connection of the resistance R increases the current flowing through D.

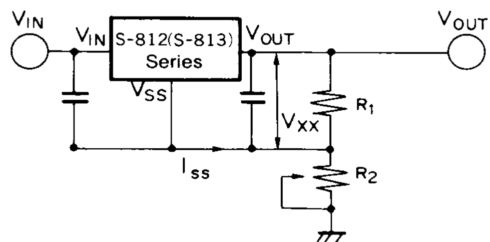


Figure 21

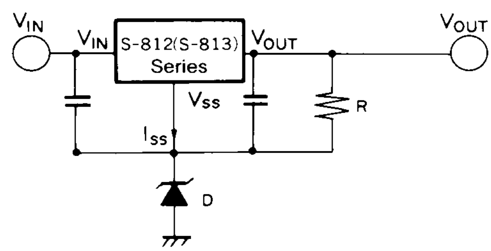


Figure 22

3. Constant current regulator

The S-812 and S-813 Series can be used as constant-current regulators within allowable dissipation limits.

$$I_{OUT}=\frac{V_{XX}}{R_A}+I_{SS}$$

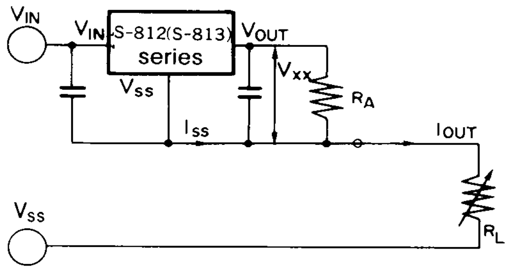


Figure 23 Constant-current regulator

4. Dual supply

A dual supply can be formed using the S-812 and S-813 Series.
Figure 24 shows a circuit example for receiving two outputs (5V and 8V) with the S-81230AG and the S-81250HG. As the resistance R lets the quiescent current of IC1 pass, R is unnecessary if the minimum load current of IC2 is more than the IC1 quiescent current.

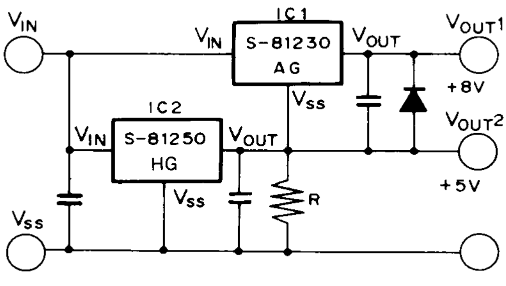


Figure 24 Dual power source

■ Notes

- Voltage regulators may oscillate if small or zero capacity is connected to IC input when the impedance of the power source is high and a large capacity is connected to the IC output.
- In TO-92 products, since there are projections and resin burr on the roots of lead terminals formed at tiebar cuts, do not solder these roots.
- When designing for mass production using an application circuit described here, be careful of deviations in components and temperature characteristics.
- Seiko Instruments cannot take any responsibility for the patents on the circuits described here.