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# S-89110/89120 Series

## MINI ANALOG SERIES CMOS OPERATIONAL AMPLIFIER

[www.sii-ic.com](http://www.sii-ic.com)

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Rev.3.0\_00

The mini-analog series is a group of ICs that incorporate a general purpose analog circuit in a small package. The S-89110/89120 Series is a CMOS type operational amplifier that has a phase compensation circuit, and operates at a low voltage with low current consumption. These features make this product the ideal solution for small battery-powered portable equipment.

The S-89110A/89120A Series is a single operational amplifier (one circuit).

The S-89110B/89120B Series is a dual operational amplifier (two circuits).

### ■ Features

- Lower operating voltage than the conventional general-purpose:  
 $V_{DD} = 1.8 \text{ V to } 5.5 \text{ V}$
- Low current consumption (per circuit):  
 $I_{DD} = 50 \mu\text{A}$  (S-89110 Series)  
 $I_{DD} = 10 \mu\text{A}$  (S-89120 Series)
- Low input offset voltage:  
4.0 mV max.
- No external capacitors required for internal phase compensation
- Output full swing
- Lead-free, Sn 100%, halogen-free<sup>\*1</sup>

\*1. Refer to "■ Product Name Structure" for details.

### ■ Applications

- Mobile phone
- Notebook PC
- Digital camera
- Digital video camera

### ■ Packages

- SC-88A
- SOT-23-5
- SNT-8A
- TMSOP-8

■ Block Diagram

1. S-89110A/89120A Series single operational amplifier (one circuit)

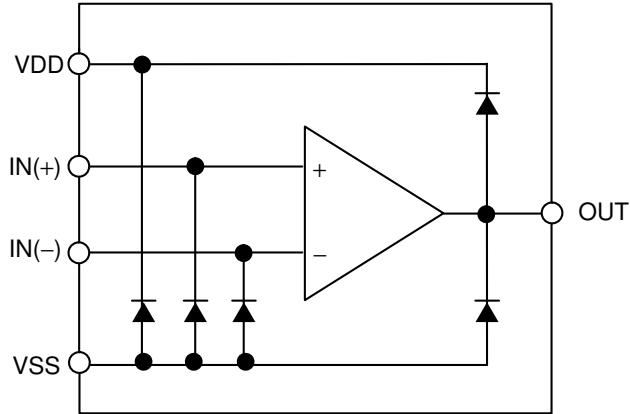


Figure 1

2. S-89110B/89120B Series dual operational amplifier (two circuits)

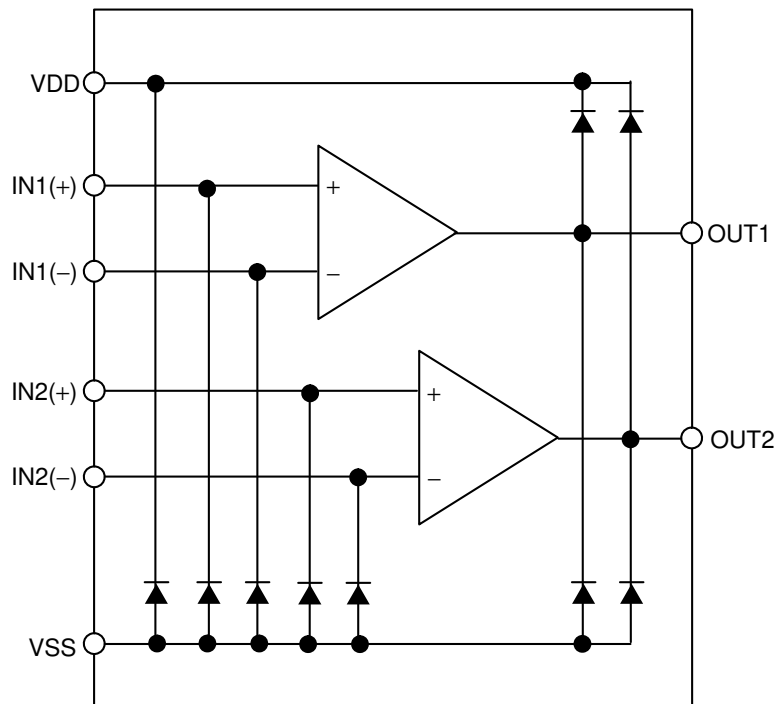


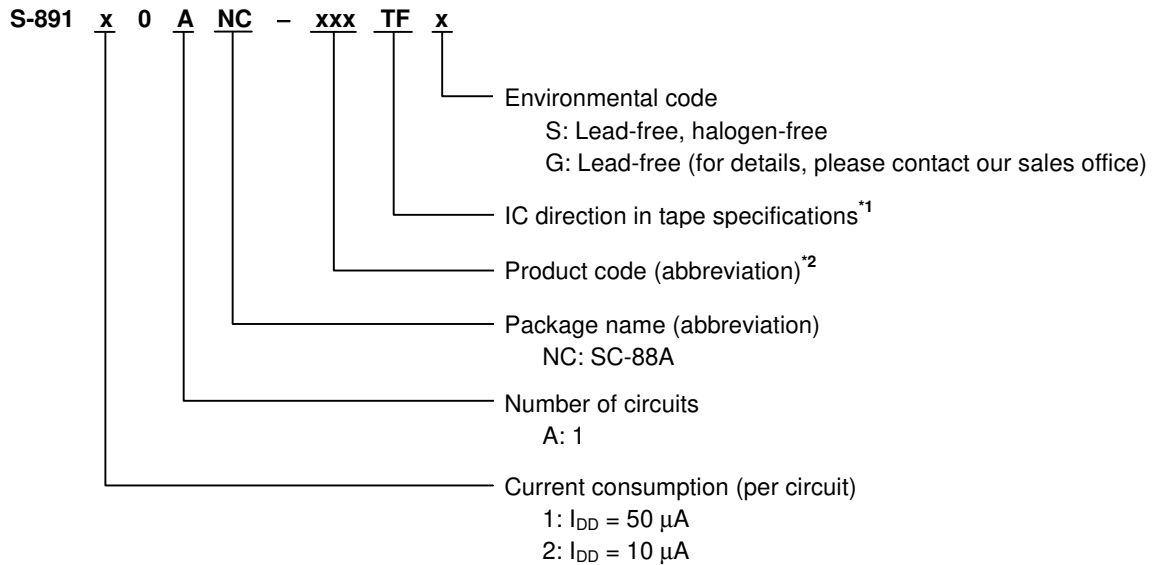
Figure 2

## ■ Product Name Structure

Users can select the product type for the S-89110/89120 Series. Refer to "1. Product name" regarding the contents of product name, "2. Packages" regarding the package drawings and "3. Product name list" regarding the product type.

### 1. Product name

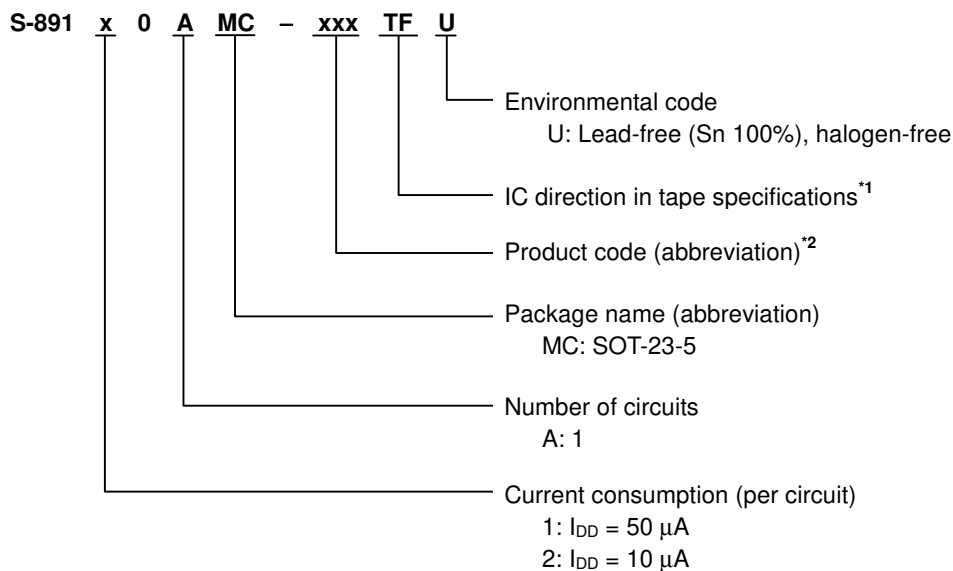
#### 1.1 SC-88A



\*1. Refer to the tape drawing.

\*2. Refer to "3. Product name list"

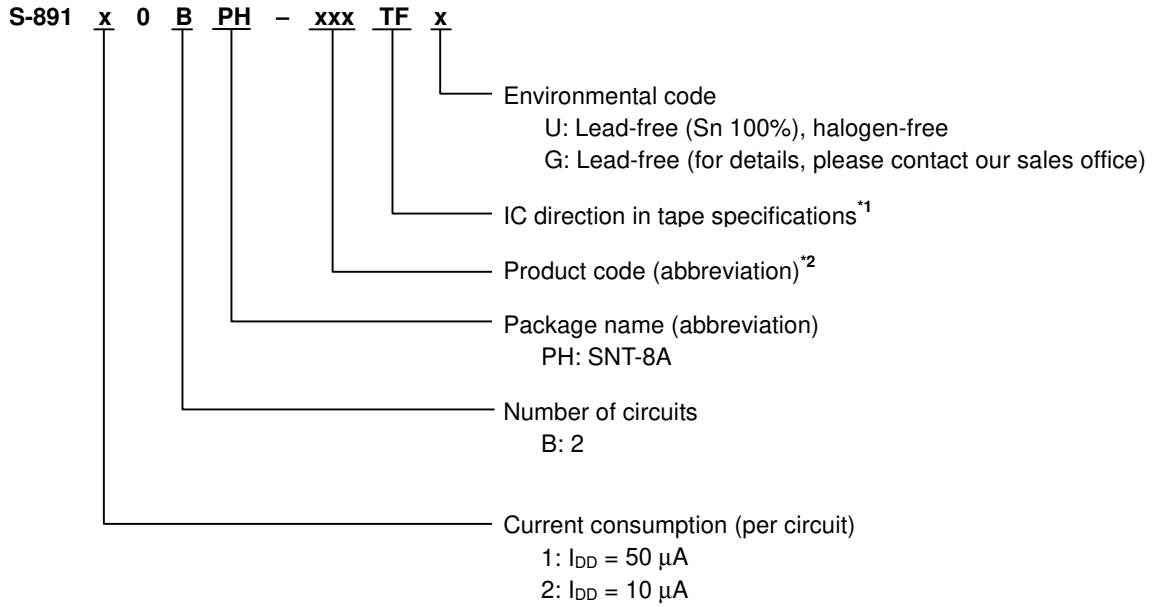
#### 1.2 SOT-23-5



\*1. Refer to the tape drawing.

\*2. Refer to "3. Product name list"

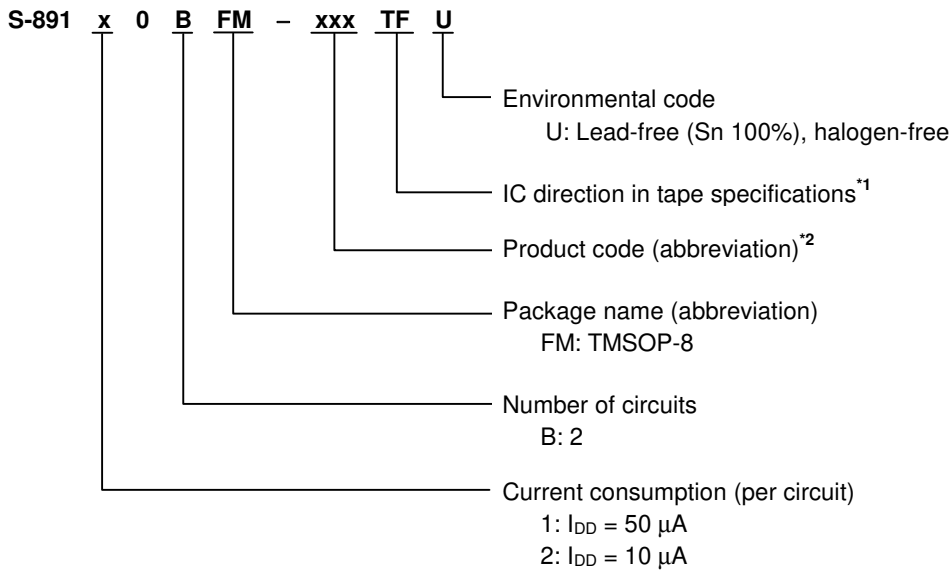
**1.3 SNT-8A**



\*1. Refer to the tape drawing.

\*2. Refer to "3. Product name list"

**1.4 TMSOP-8**



\*1. Refer to the tape drawing.

\*2. Refer to "3. Product name list"

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**2. Packages**

**Table 1 Package Drawing Codes**

Package Name	Dimension	Tape	Reel	Land
SC-88A	NP005-B-P-SD	NP005-B-C-SD	NP005-B-R-SD	—
SOT-23-5	MP005-A-P-SD	MP005-A-C-SD	MP005-A-R-SD	—
SNT-8A	PH008-A-P-SD	PH008-A-C-SD	PH008-A-R-SD	PH008-A-L-SD
TMSOP-8	FM008-A-P-SD	FM008-A-C-SD	FM008-A-R-SD	—

**3. Product name list**

**Table 2**

Product Name	Current Consumption (per circuit)	Gain-bandwidth <sup>*1</sup>	Number of Circuit	Package
S-89110ANC-1A1-TFz	50 $\mu$ A	175 kHz	1	SC-88A
S-89110AMC-1A1-TFU	50 $\mu$ A	175 kHz	1	SOT-23-5
S-89110BPH-H4A-TFx	50 $\mu$ A	175 kHz	2	SNT-8A
S-89110BFM-H4A-TFU	50 $\mu$ A	175 kHz	2	TMSOP-8
S-89120ANC-1A2-TFz	10 $\mu$ A	35 kHz	1	SC-88A
S-89120AMC-1A2-TFU	10 $\mu$ A	35 kHz	1	SOT-23-5
S-89120BPH-H4B-TFx	10 $\mu$ A	35 kHz	2	SNT-8A
S-89120BFM-H4B-TFU	10 $\mu$ A	35 kHz	2	TMSOP-8

\*1. The value when  $V_{DD} = 3.0$  V

**Remark 1.** x: G or U

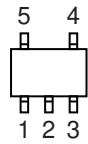
2. z: G or S

3. Please select products of environmental code = U for Sn 100%, halogen-free products.

■ **Pin Configurations**

**1. SC-88A**

Top view



**Figure 3**

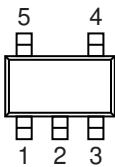
**Table 3**

(Product with 1 circuit)

Pin No.	Symbol	Description
1	IN(+)	Non-inverted input pin
2	VSS	GND pin
3	IN(-)	Inverted input pin
4	OUT	Output pin
5	VDD	Positive power supply pin

**2. SOT-23-5**

Top view



**Figure 4**

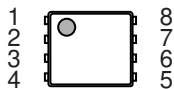
**Table 4**

(Product with 1 circuit)

Pin No.	Symbol	Description
1	IN(+)	Non-inverted input pin
2	VSS	GND pin
3	IN(-)	Inverted input pin
4	OUT	Output pin
5	VDD	Positive power supply pin

**3. SNT-8A**

Top view



**Figure 5**

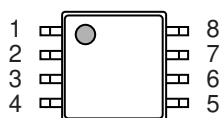
**Table 5**

(Product with 2 circuits)

Pin No.	Symbol	Description
1	OUT1	Output pin 1
2	IN1(-)	Inverted input pin 1
3	IN1(+)	Non-inverted input pin 1
4	VSS	GND pin
5	IN2(+)	Non-inverted input pin 2
6	IN2(-)	Inverted input pin 2
7	OUT2	Output pin 2
8	VDD	Positive power supply pin

**4. TMSOP-8**

Top view



**Figure 6**

**Table 6**

(Product with 2 circuits)

Pin No.	Symbol	Description
1	OUT1	Output pin 1
2	IN1(-)	Inverted input pin 1
3	IN1(+)	Non-inverted input pin 1
4	VSS	GND pin
5	IN2(+)	Non-inverted input pin 2
6	IN2(-)	Inverted input pin 2
7	OUT2	Output pin 2
8	VDD	Positive power supply pin

■ **Absolute Maximum Ratings**

**Table 7**

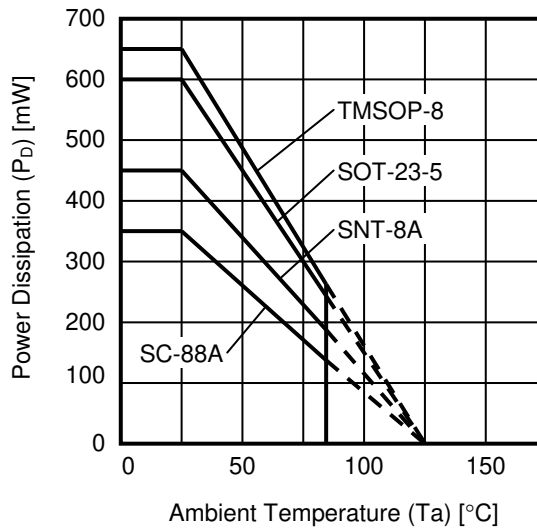
(Ta = +25°C unless otherwise specified)

Item	Symbol	Absolute Maximum Rating	Unit
Power supply voltage	V <sub>DD</sub>	V <sub>SS</sub> - 0.3 to V <sub>SS</sub> + 10.0	V
Input voltage	V <sub>IN</sub>	V <sub>SS</sub> - 0.3 to V <sub>SS</sub> + 7.0 (7.0 max.)	V
Output voltage	V <sub>OUT</sub>	V <sub>SS</sub> - 0.3 to V <sub>DD</sub> + 0.3 (7.0 max.)	V
Differential input voltage	V <sub>IND</sub>	±7.0	V
Output pin current	I <sub>SINK</sub>	13	mA
	I <sub>SOURCE</sub>	9	mA
Power dissipation	SC-88A	350 <sup>*1</sup>	mW
	SOT-23-5	600 <sup>*1</sup>	mW
	SNT-8A	450 <sup>*1</sup>	mW
	TMSOP-8	650 <sup>*1</sup>	mW
Operating ambient temperature	T <sub>opr</sub>	-40 to +85	°C
Storage temperature	T <sub>stg</sub>	-55 to +125	°C

\*1. When mounted on board  
 [Mounted board]

- (1) Board size: 114.3 mm × 76.2 mm × 1.6 mm
- (2) Board name: JEDEC STANDARD51-7

**Caution** The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.



**Figure 7 Power Dissipation of Package (When Mounted on Board)**



■ **Electrical Characteristics**

**Table 8**

(Ta = +25°C unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit
Range of operating power supply voltage	V <sub>DD</sub>	–	1.8	–	5.5	V	–

**1. V<sub>DD</sub> = 5.0 V**

**Table 9**

(Ta = +25°C unless otherwise specified)

**DC Electrical Characteristics (V<sub>DD</sub> = 5.0 V)**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Current consumption (per circuit)	I <sub>DD</sub>	S-89110 Series	–	50	120	μA	5	
		S-89120 Series	–	10	30	μA	5	
Input offset voltage	V <sub>IO</sub>	–	–4	±3	+4	mV	1	
Input offset voltage drift	$\frac{\Delta V_{IO}}{\Delta T_a}$	Ta = –40°C to +85°C	–	±10	–	μV/°C	1	
Input offset current	I <sub>IO</sub>	–	–	1	–	pA	–	
Input bias current	I <sub>BIAS</sub>	–	–	1	–	pA	–	
Common-mode input voltage range	V <sub>CMR</sub>	–	0	–	4.3	V	2	
Voltage gain (open loop)	A <sub>VOL</sub>	V <sub>SS</sub> + 0.5 V ≤ V <sub>OUT</sub> ≤ V <sub>DD</sub> – 0.5 V, V <sub>CMR</sub> = 2.5 V	70	80	–	dB	8	
Maximum output swing voltage	V <sub>OH</sub>	R <sub>L</sub> = 1.0 MΩ	4.9	–	–	V	3	
	V <sub>OL</sub>	R <sub>L</sub> = 1.0 MΩ	–	–	0.1	V	4	
Common-mode input signal rejection ratio	CMRR	–	60	70	–	dB	2	
Power supply voltage rejection ratio	PSRR	–	60	70	–	dB	1	
Source current	I <sub>SOURCE</sub>	V <sub>OUT</sub> = 0 V	S-89110 Series	120	–	–	μA	6
			S-89120 Series	25	–	–	μA	6
Sink current	I <sub>SINK</sub>	V <sub>OUT</sub> = 0.5 V	9	–	–	mA	7	

**Table 10**

(Ta = +25°C unless otherwise specified)

**AC Electrical Characteristics (V<sub>DD</sub> = 5.0 V)**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Slew rate	SR	R <sub>L</sub> = 1.0 MΩ, C <sub>L</sub> = 15 pF (Refer to <b>Figure 16</b> )	S-89110 Series	–	0.07	–	V/μs
			S-89120 Series	–	0.015	–	V/μs
Gain-bandwidth product	GBP	S-89110 Series	–	180	–	kHz	
		S-89120 Series	–	40	–	kHz	

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**2.  $V_{DD} = 3.0\text{ V}$**

**Table 11**

**DC Electrical Characteristics ( $V_{DD} = 3.0\text{ V}$ )** ( $T_a = +25^\circ\text{C}$  unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Current consumption (per circuit)	$I_{DD}$	S-89110 Series	–	50	120	$\mu\text{A}$	5	
		S-89120 Series	–	10	30	$\mu\text{A}$	5	
Input offset voltage	$V_{IO}$	–	–4	$\pm 3$	+4	mV	1	
Input offset voltage drift	$\frac{\Delta V_{IO}}{\Delta T_a}$	$T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$	–	$\pm 10$	–	$\mu\text{V}/^\circ\text{C}$	1	
Input offset current	$I_{IO}$	–	–	1	–	pA	–	
Input bias current	$I_{BIAS}$	–	–	1	–	pA	–	
Common-mode input voltage range	$V_{CMR}$	–	0	–	2.3	V	2	
Voltage gain (open loop)	$A_{VOL}$	$V_{SS} + 0.5\text{ V} \leq V_{OUT} \leq V_{DD} - 0.5\text{ V}$ , $V_{CMR} = 1.5\text{ V}$	70	80	–	dB	8	
Maximum output swing voltage	$V_{OH}$	$R_L = 1.0\text{ M}\Omega$	2.9	–	–	V	3	
	$V_{OL}$	$R_L = 1.0\text{ M}\Omega$	–	–	0.1	V	4	
Common-mode input signal rejection ratio	CMRR	–	60	70	–	dB	2	
Power supply voltage rejection ratio	PSRR	–	60	70	–	dB	1	
Source current	$I_{SOURCE}$	$V_{OUT} = 0\text{ V}$	S-89110 Series	120	–	–	$\mu\text{A}$	6
			S-89120 Series	25	–	–	$\mu\text{A}$	6
Sink current	$I_{SINK}$	$V_{OUT} = 0.5\text{ V}$	8	–	–	mA	7	

**Table 12**

**AC Electrical Characteristics ( $V_{DD} = 3.0\text{ V}$ )** ( $T_a = +25^\circ\text{C}$  unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Slew rate	SR	$R_L = 1.0\text{ M}\Omega$ , $C_L = 15\text{ pF}$ (Refer to <b>Figure 16</b> )	S-89110 Series	–	0.07	–	V/ $\mu\text{s}$
			S-89120 Series	–	0.015	–	V/ $\mu\text{s}$
Gain-bandwidth product	GBP	S-89110 Series	–	175	–	kHz	
		S-89120 Series	–	35	–	kHz	

**3.  $V_{DD} = 1.8\text{ V}$**

**Table 13**

**DC Electrical Characteristics ( $V_{DD} = 1.8\text{ V}$ )** (Ta = +25°C unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Test Circuit	
Current consumption (per circuit)	$I_{DD}$	S-89110 Series	–	50	120	$\mu\text{A}$	5	
		S-89120 Series	–	10	30	$\mu\text{A}$	5	
Input offset voltage	$V_{IO}$	–	–4	$\pm 3$	+4	mV	1	
Input offset voltage drift	$\frac{\Delta V_{IO}}{\Delta T_a}$	Ta = –40°C to +85°C	–	$\pm 10$	–	$\mu\text{V}/^\circ\text{C}$	1	
Input offset current	$I_{IO}$	–	–	1	–	pA	–	
Input bias current	$I_{BIAS}$	–	–	1	–	pA	–	
Common-mode input voltage range	$V_{CMR}$	–	0	–	1.1	V	2	
Voltage gain (open loop)	$A_{VOL}$	$V_{SS} + 0.5\text{ V} \leq V_{OUT} \leq V_{DD} - 0.5\text{ V}$ , $V_{CMR} = 0.9\text{ V}$	70	80	–	dB	8	
Maximum output swing voltage	$V_{OH}$	$R_L = 1.0\text{ M}\Omega$	1.7	–	–	V	3	
	$V_{OL}$	$R_L = 1.0\text{ M}\Omega$	–	–	0.1	V	4	
Common-mode input signal rejection ratio	CMRR	–	60	70	–	dB	2	
Power supply voltage rejection ratio	PSRR	–	60	70	–	dB	1	
Source current	$I_{SOURCE}$	$V_{OUT} = 0\text{ V}$	S-89110 Series	100	–	–	$\mu\text{A}$	6
			S-89120 Series	20	–	–	$\mu\text{A}$	6
Sink current	$I_{SINK}$	$V_{OUT} = 0.5\text{ V}$	5	–	–	mA	7	

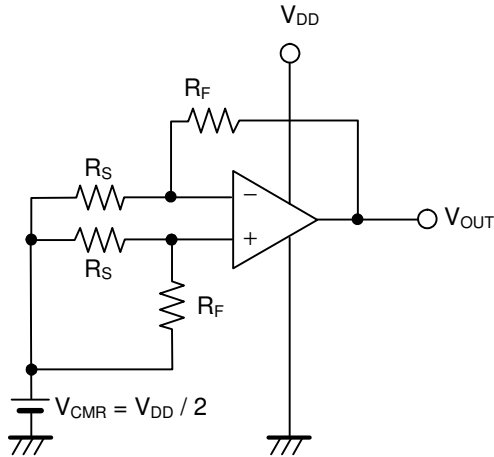
**Table 14**

**AC Electrical Characteristics ( $V_{DD} = 1.8\text{ V}$ )** (Ta = +25°C unless otherwise specified)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Slew rate	SR	$R_L = 1.0\text{ M}\Omega$ , $C_L = 15\text{ pF}$ (Refer to <b>Figure 16</b> )	S-89110 Series	–	0.07	–	V/ $\mu\text{s}$
			S-89120 Series	–	0.015	–	V/ $\mu\text{s}$
Gain-bandwidth product	GBP	S-89110 Series	–	160	–	kHz	
		S-89120 Series	–	30	–	kHz	

■ **Test Circuit (Per Circuit)**

**1. Power supply voltage rejection ratio, input offset voltage**



**Figure 8**

• **Power supply voltage rejection ratio (PSRR)**

The power supply voltage rejection ratio (PSRR) can be calculated by the following expression, with  $V_{OUT}$  measured at each  $V_{DD}$ .

Test conditions:

When  $V_{DD} = 1.8\text{ V}$ :  $V_{DD} = V_{DD1}$ ,  $V_{OUT} = V_{OUT1}$ ,

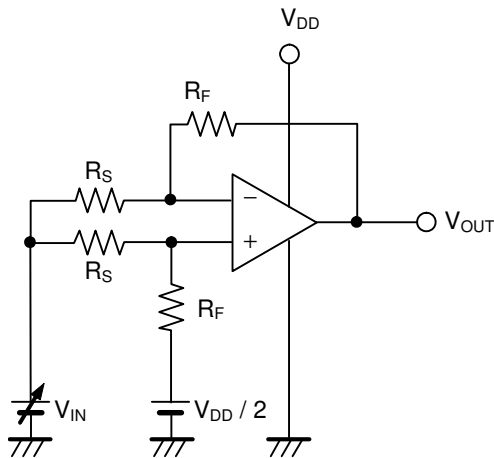
When  $V_{DD} = 5.0\text{ V}$ :  $V_{DD} = V_{DD2}$ ,  $V_{OUT} = V_{OUT2}$

$$PSRR = 20 \log \left( \left| \frac{V_{DD1} - V_{DD2}}{\left( V_{OUT1} - \frac{V_{DD1}}{2} \right) - \left( V_{OUT2} - \frac{V_{DD2}}{2} \right)} \right| \times \frac{R_F + R_S}{R_S} \right)$$

• **Input offset voltage ( $V_{IO}$ )**

$$V_{IO} = \left( V_{OUT} - \frac{V_{DD}}{2} \right) \times \frac{R_S}{R_F + R_S}$$

**2. Common-mode input signal rejection ratio, common-mode input voltage range**



**Figure 9**

• **Common-mode input signal rejection ratio (CMRR)**

The common-mode input signal rejection ratio (CMRR) can be calculated by the following expression, with  $V_{OUT}$  measured at each  $V_{IN}$ .

Test conditions:

When  $V_{IN} = V_{CMR\ Max.}$ :  $V_{IN} = V_{IN1}$ ,  $V_{OUT} = V_{OUT1}$ ,

When  $V_{IN} = V_{DD} / 2$ :  $V_{IN} = V_{IN2}$ ,  $V_{OUT} = V_{OUT2}$

$$CMRR = 20 \log \left( \left| \frac{V_{IN1} - V_{IN2}}{V_{OUT1} - V_{OUT2}} \right| \times \frac{R_F + R_S}{R_S} \right)$$

• **Common-mode input voltage range ( $V_{CMR}$ )**

The common-mode input voltage range is the range of  $V_{IN}$  in which  $V_{OUT}$  satisfies the common-mode input signal rejection ratio specifications.

**3. Maximum output swing voltage ( $V_{OH}$ )**

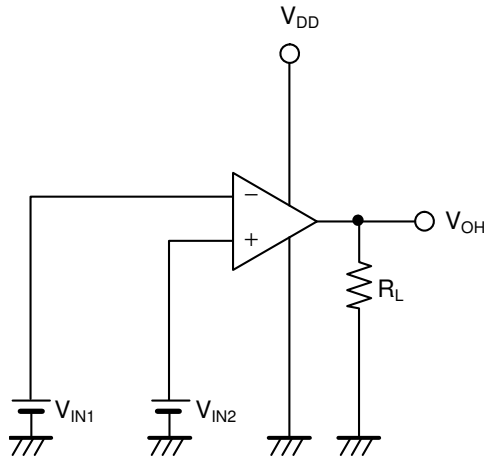


Figure 10

• **Maximum output swing voltage ( $V_{OH}$ )**

Test conditions:

$$V_{IN1} = \frac{V_{DD}}{2} - 0.1 \text{ V}$$

$$V_{IN2} = \frac{V_{DD}}{2} + 0.1 \text{ V}$$

$$R_L = 1 \text{ M}\Omega$$

**4. Maximum output swing voltage ( $V_{OL}$ )**

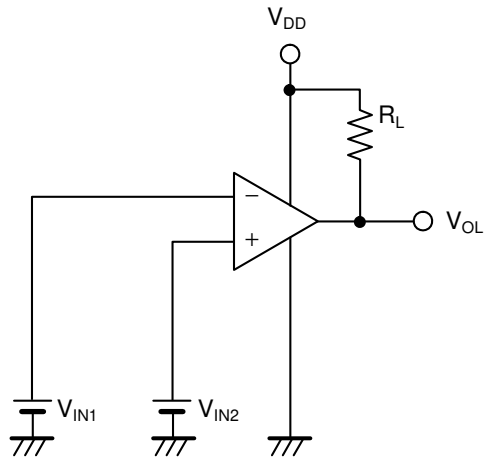


Figure 11

• **Maximum output swing voltage ( $V_{OL}$ )**

Test conditions:

$$V_{IN1} = \frac{V_{DD}}{2} + 0.1 \text{ V}$$

$$V_{IN2} = \frac{V_{DD}}{2} - 0.1 \text{ V}$$

$$R_L = 1 \text{ M}\Omega$$

**5. Current consumption**

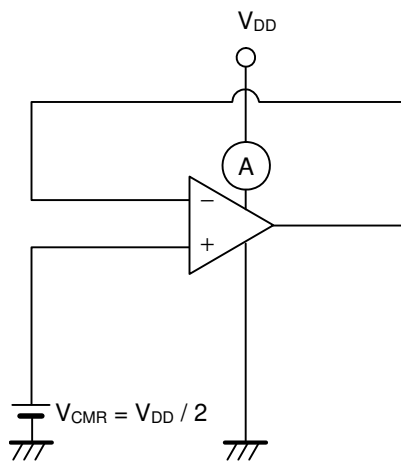
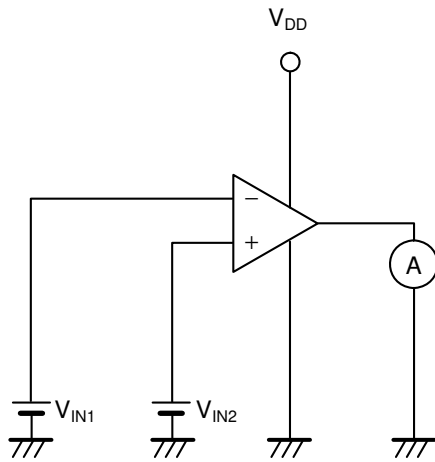


Figure 12

• **Current consumption ( $I_{DD}$ )**

**6. Source current**



**Figure 13**

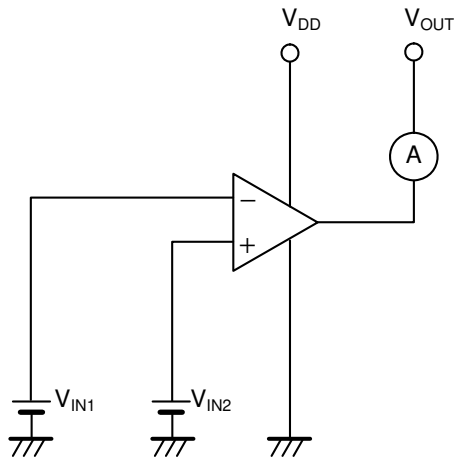
• **Source current ( $I_{SOURCE}$ )**

Test conditions:

$$V_{IN1} = \frac{V_{DD}}{2} - 0.5 \text{ V}$$

$$V_{IN2} = \frac{V_{DD}}{2} + 0.5 \text{ V}$$

**7. Sink current**



**Figure 14**

• **Sink current ( $I_{SINK}$ )**

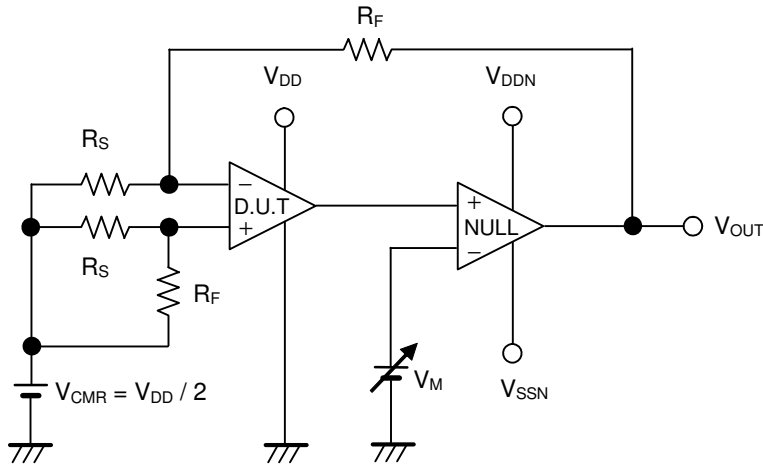
Test conditions:

$$V_{OUT} = V_{SS} + 0.5 \text{ V}$$

$$V_{IN1} = \frac{V_{DD}}{2} + 0.5 \text{ V}$$

$$V_{IN2} = \frac{V_{DD}}{2} - 0.5 \text{ V}$$

**8. Voltage gain (open loop)**



**Figure 15**

• **Voltage-gain (open loop) ( $A_{VOL}$ )**

The voltage gain ( $A_{VOL}$ ) can be calculated by the following expression, with measured  $V_{OUT}$  at each  $V_M$ .

Test conditions:

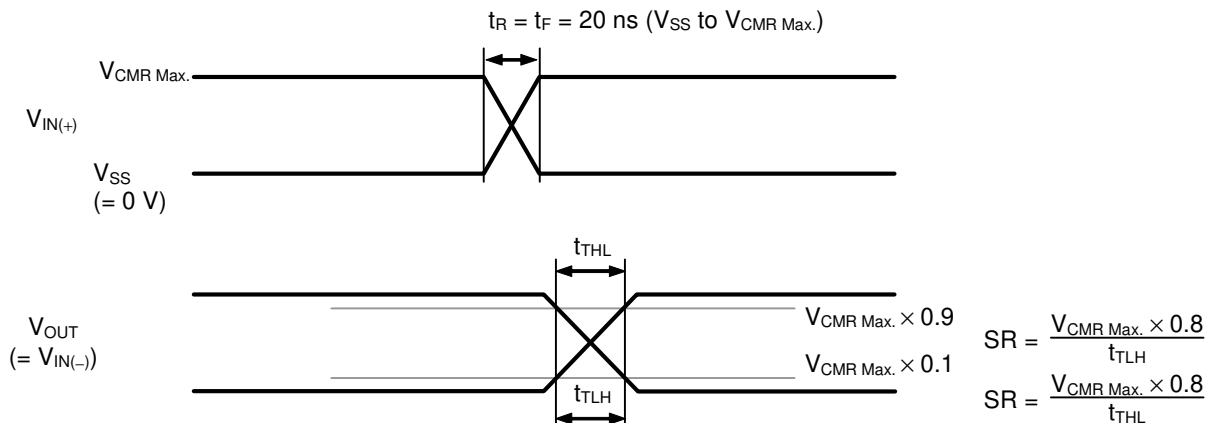
When  $V_M = V_{DD} - 0.5 V$ :  $V_M = V_{M1}$ ,  $V_{OUT} = V_{OUT1}$ ,

When  $V_M = V_{SS} + 0.5 V$ :  $V_M = V_{M2}$ ,  $V_{OUT} = V_{OUT2}$

$$A_{VOL} = 20 \log \left( \left| \frac{V_{M1} - V_{M2}}{V_{OUT1} - V_{OUT2}} \right| \times \frac{R_F + R_S}{R_S} \right)$$

**9. Slew rate (SR)**

Measured by the voltage follower circuit.



$$SR = \frac{V_{CMR Max.} \times 0.8}{t_{TLH}}$$

$$SR = \frac{V_{CMR Max.} \times 0.8}{t_{THL}}$$

**Figure 16**

## ■ Precautions

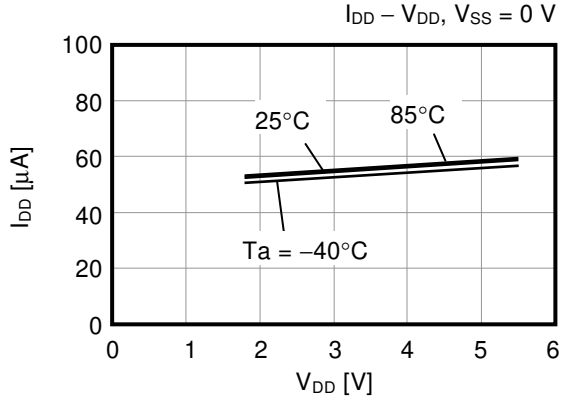
- Generally an operational amplifier may cause oscillation, depending on the selection of external parts. Perform thorough evaluation using the actual application to set the constant.
- Do not apply an electrostatic discharge to this IC that exceeds performance ratings of the built-in electrostatic protection circuit.
- SII claims no responsibility for any disputes arising out of or in connection with any infringement by products including this IC of patents owned by a third party.



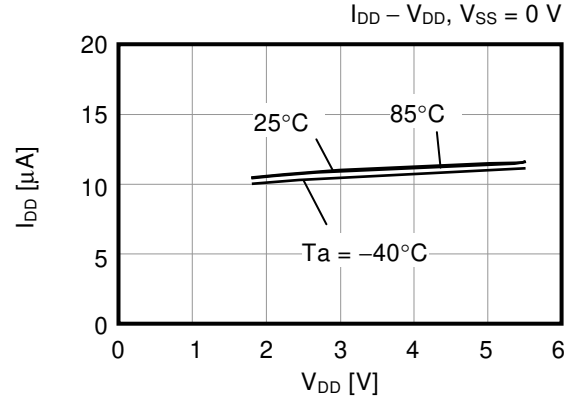
■ **Characteristics (Typical Data)**

**1. Current consumption (per circuit) vs. Power supply voltage**

**1.1 S-89110 Series**

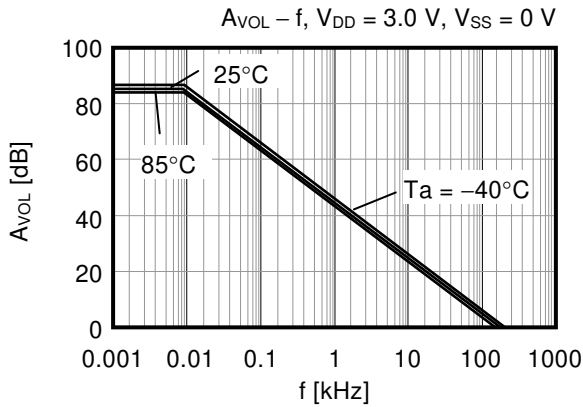


**1.2 S-89120 Series**

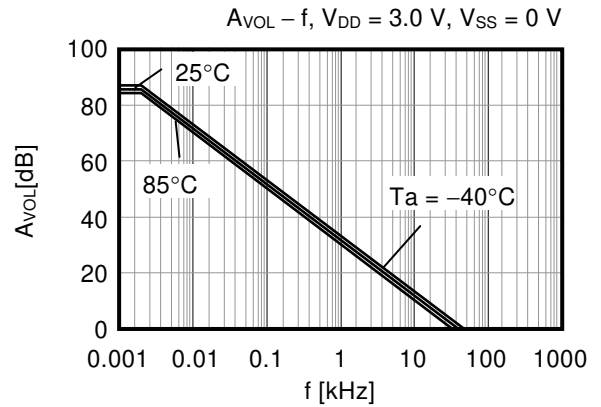


**2. Voltage gain vs. Frequency**

**2.1 S-89110 Series**



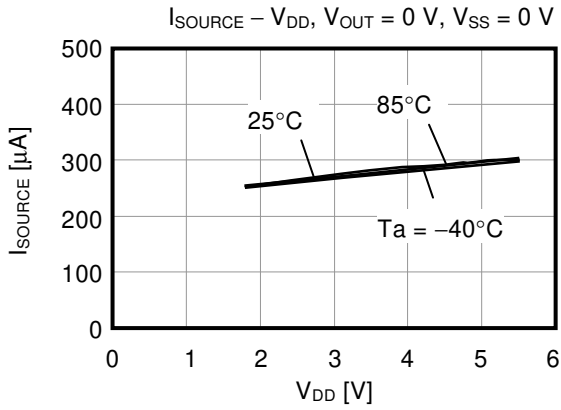
**2.2 S-89120 Series**



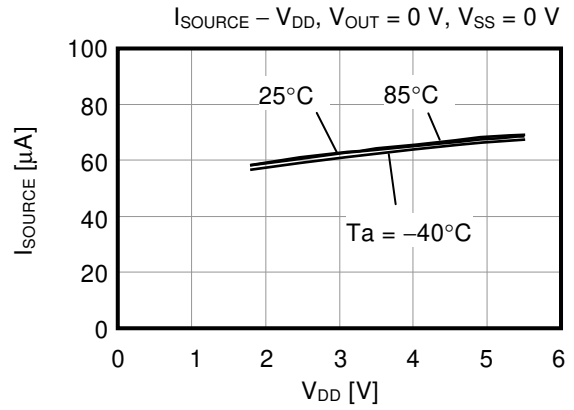
**3. Output current**

**3.1  $I_{SOURCE}$  vs. Power supply voltage**

**3.1.1 S-89110 Series**

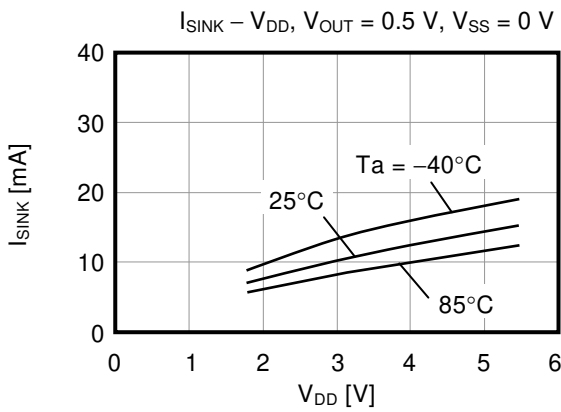


**3.1.2 S-89120 Series**

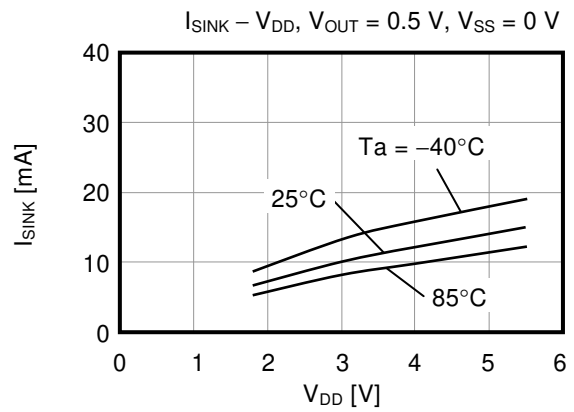


**3.2  $I_{SINK}$  vs. Power supply voltage**

**3.2.1 S-89110 Series**

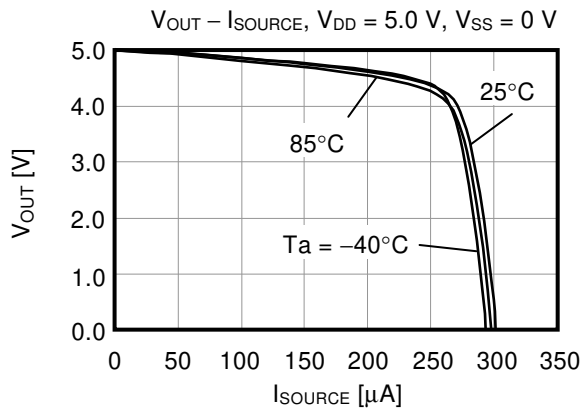
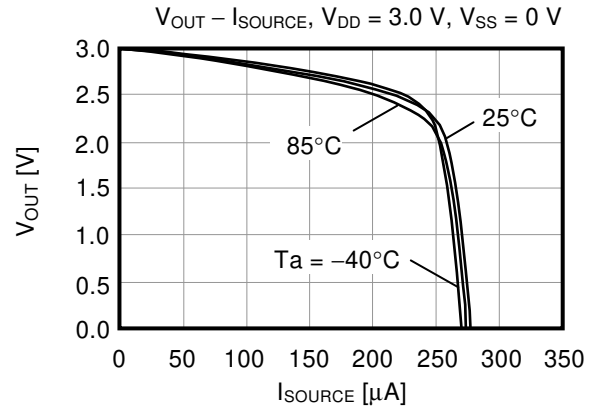
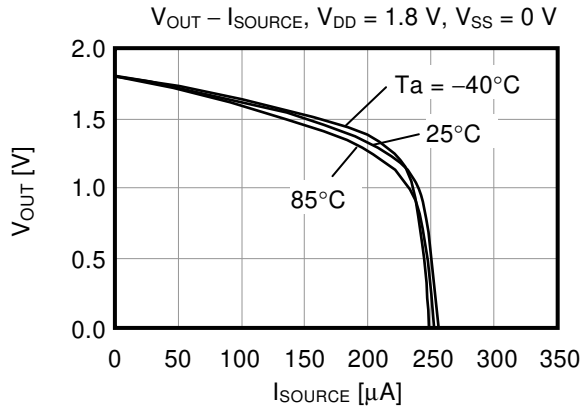


**3.2.2 S-89120 Series**

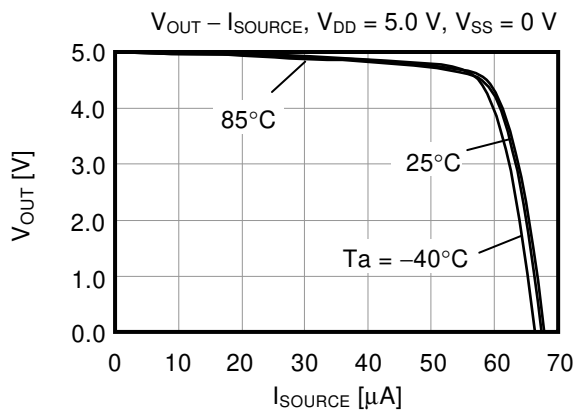
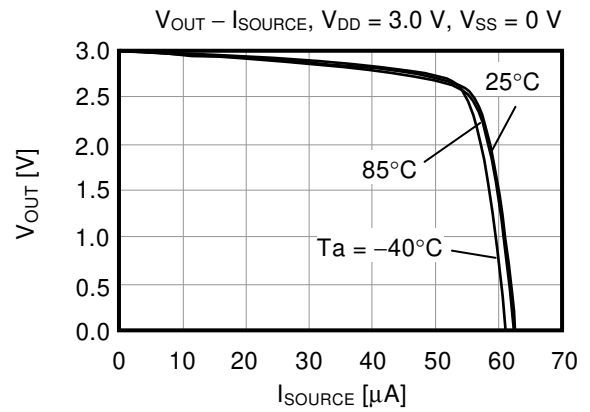
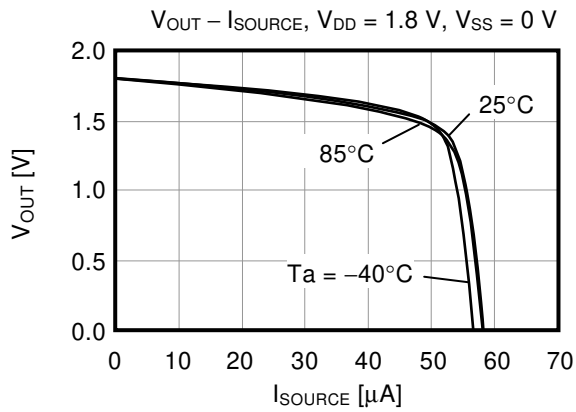


**3.3 Output voltage ( $V_{OUT}$ ) vs.  $I_{SOURCE}$**

**3.3.1 S-89110 Series**

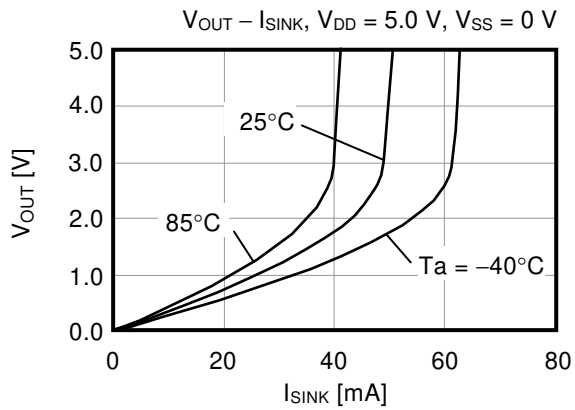
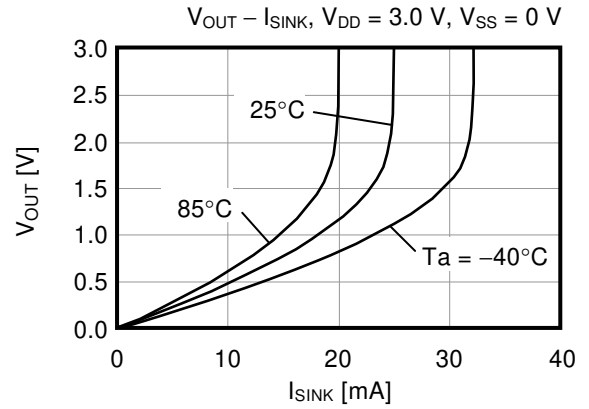
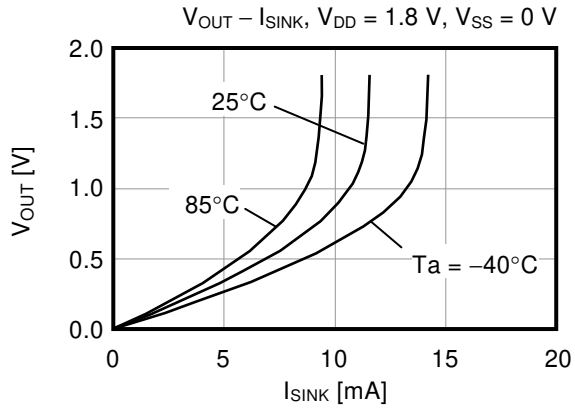


**3.3.2 S-89120 Series**

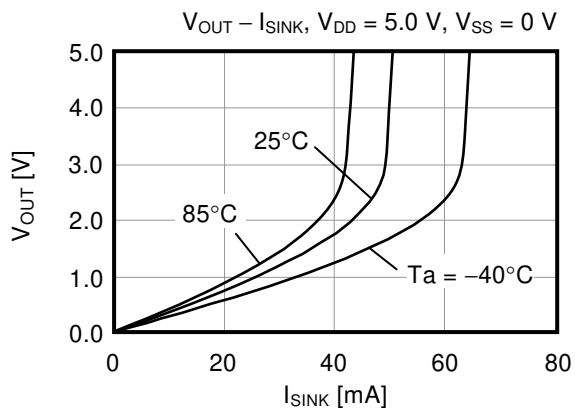
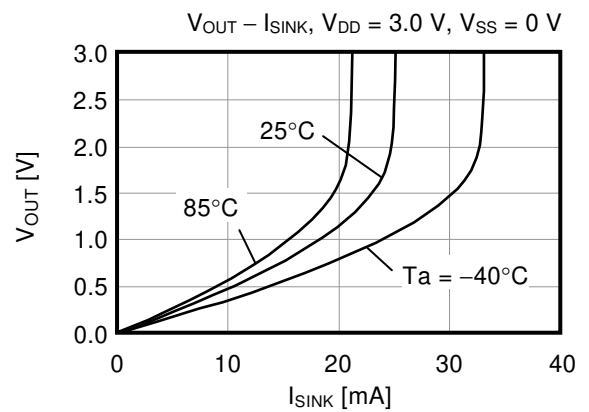
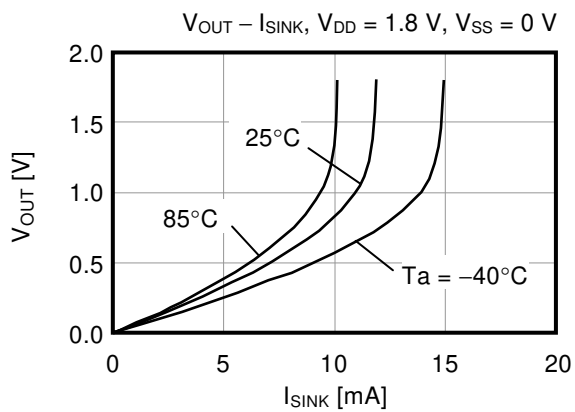


**3.4 Output voltage ( $V_{OUT}$ ) vs.  $I_{SINK}$**

**3.4.1 S-89110 Series**

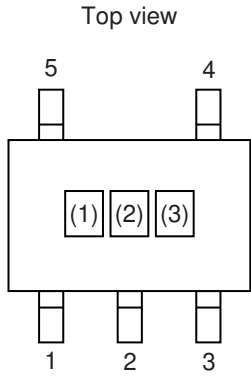


**3.4.2 S-89120 Series**



■ **Marking Specifications**

**1. SC-88A**



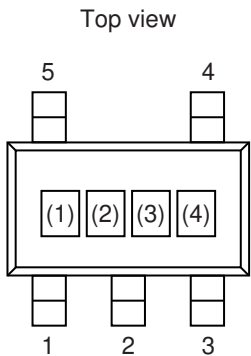
(1) to (3): Product Code (refer to **Product Name vs. Product Code**)

**Product Name vs. Product Code**

Product Name	Product Code		
	(1)	(2)	(3)
S-89110ANC-1A1-TFz	1	A	1
S-89120ANC-1A2-TFz	1	A	2

**Remark** z: G or S

**2. SOT-23-5**

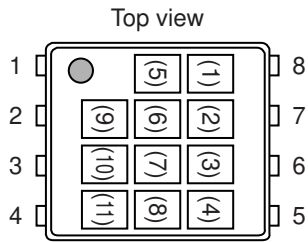


(1) to (3): Product Code (refer to **Product Name vs. Product Code**)  
 (4): Lot number

**Product Name vs. Product Code**

Product Name	Product Code		
	(1)	(2)	(3)
S-89110AMC-1A1-TFU	1	A	1
S-89120AMC-1A2-TFU	1	A	2

**3. SNT-8A**



- (1): Blank
- (2) to (4): Product Code (refer to **Product Name vs. Product Code**)
- (5), (6): Blank
- (7) to (11): Lot number

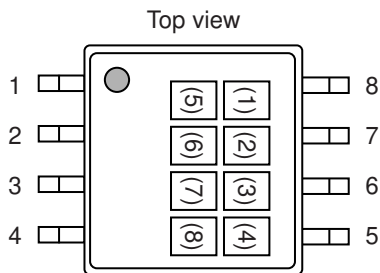
**Product Name vs. Product Code**

Product Name	Product Code		
	(2)	(3)	(4)
S-89110BPH-H4A-TFx	H	4	A
S-89120BPH-H4B-TFx	H	4	B

**Remark 1.** x: G or U

2. Please select products of environmental code = U for Sn 100%, halogen-free products.

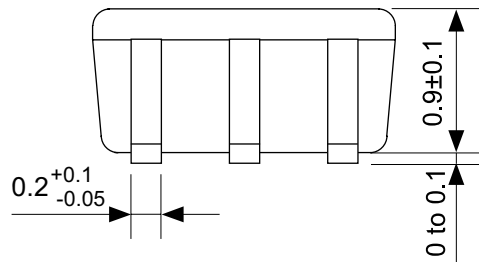
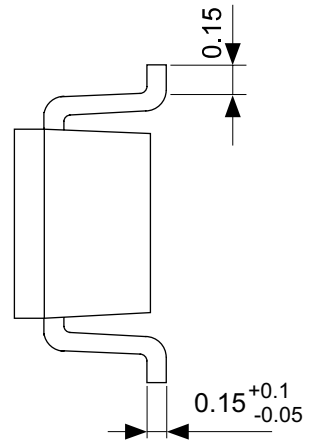
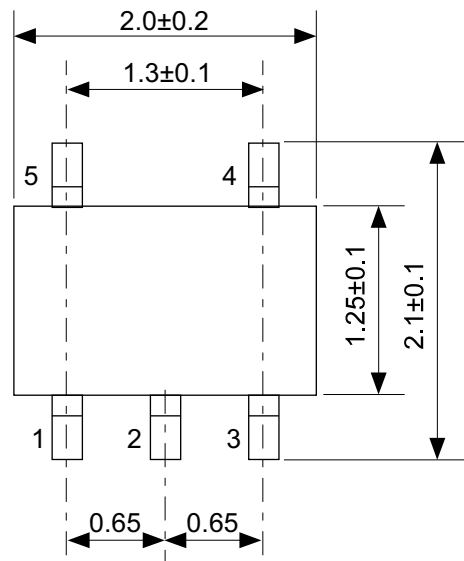
**4. TMSOP-8**



- (1): Blank
- (2) to (4): Product Code (refer to **Product Name vs. Product Code**)
- (5): Blank
- (6) to (8): Lot number

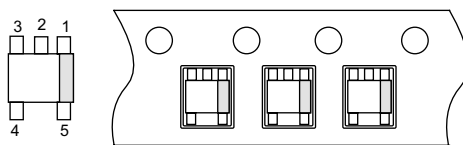
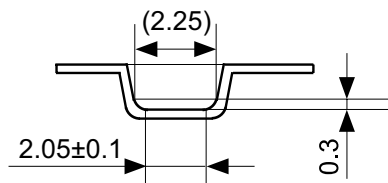
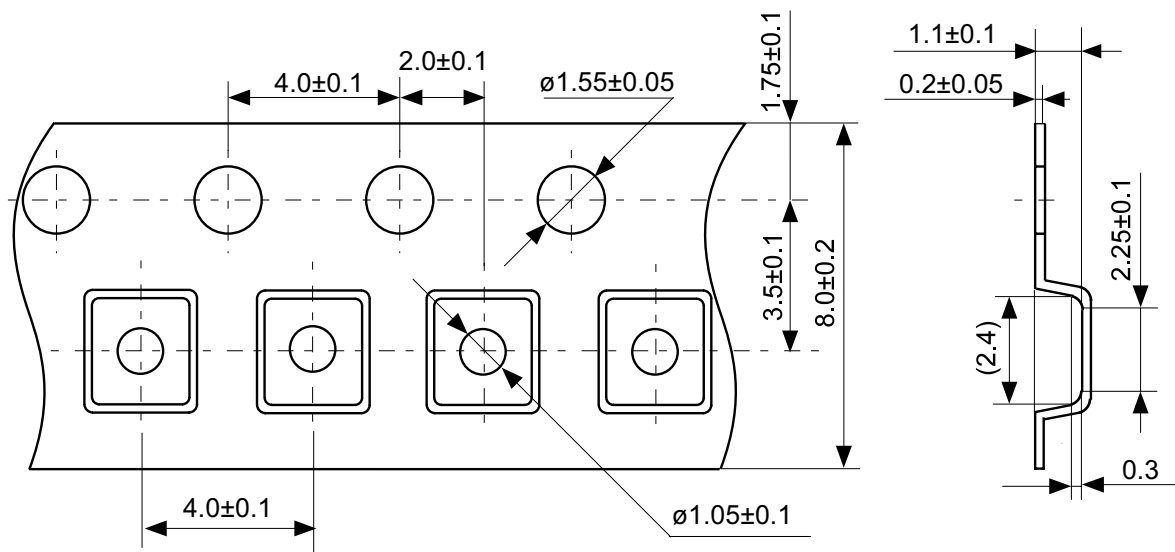
**Product Name vs. Product Code**

Product Name	Product Code		
	(2)	(3)	(4)
S-89110BFM-H4A-TFU	H	4	A
S-89120BFM-H4B-TFU	H	4	B



No. NP005-B-P-SD-1.1

TITLE	SC88A-B-PKG Dimensions
No.	NP005-B-P-SD-1.1
SCALE	
UNIT	mm
Seiko Instruments Inc.	

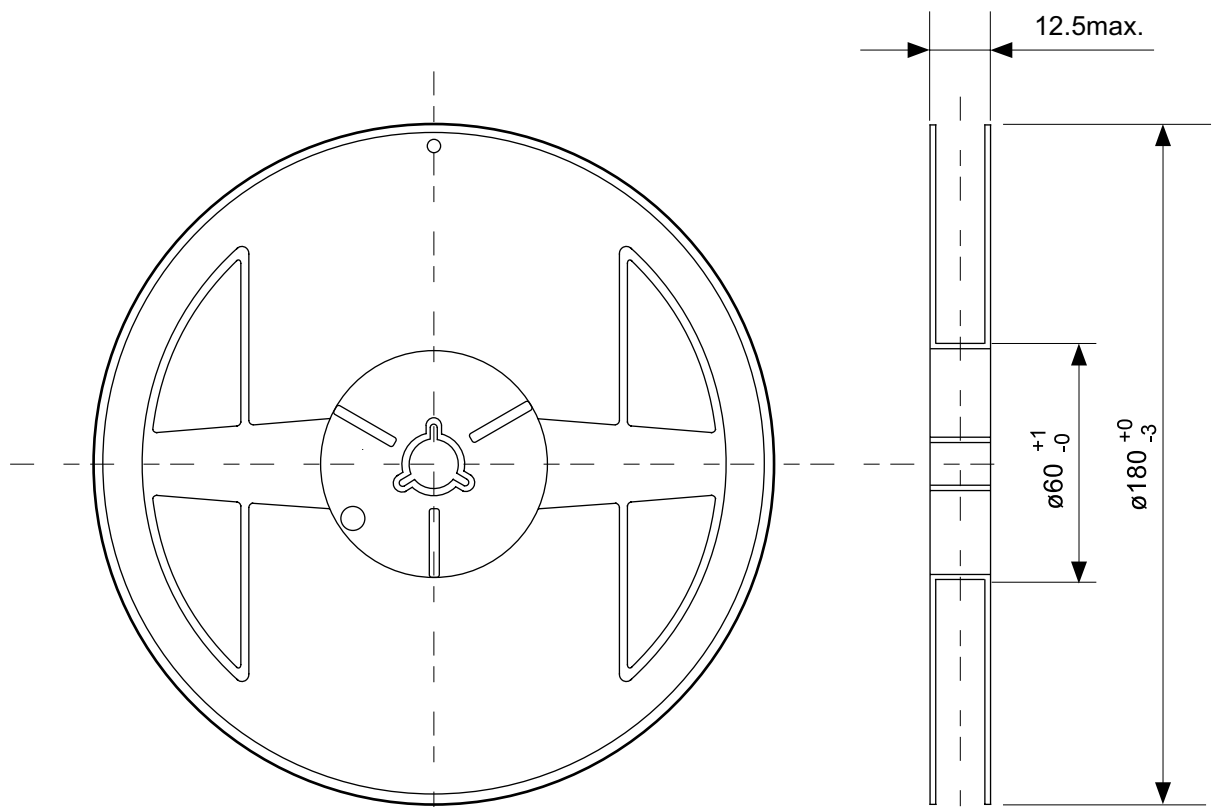


→  
Feed direction

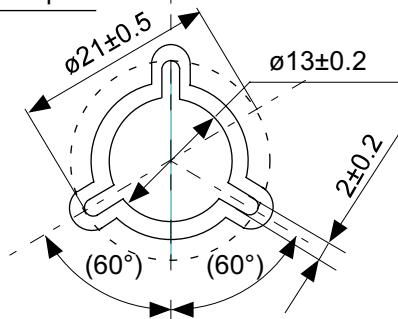
No. NP005-B-C-SD-2.0

TITLE	SC88A-B-Carrier Tape
No.	NP005-B-C-SD-2.0
SCALE	
UNIT	mm
Seiko Instruments Inc.	



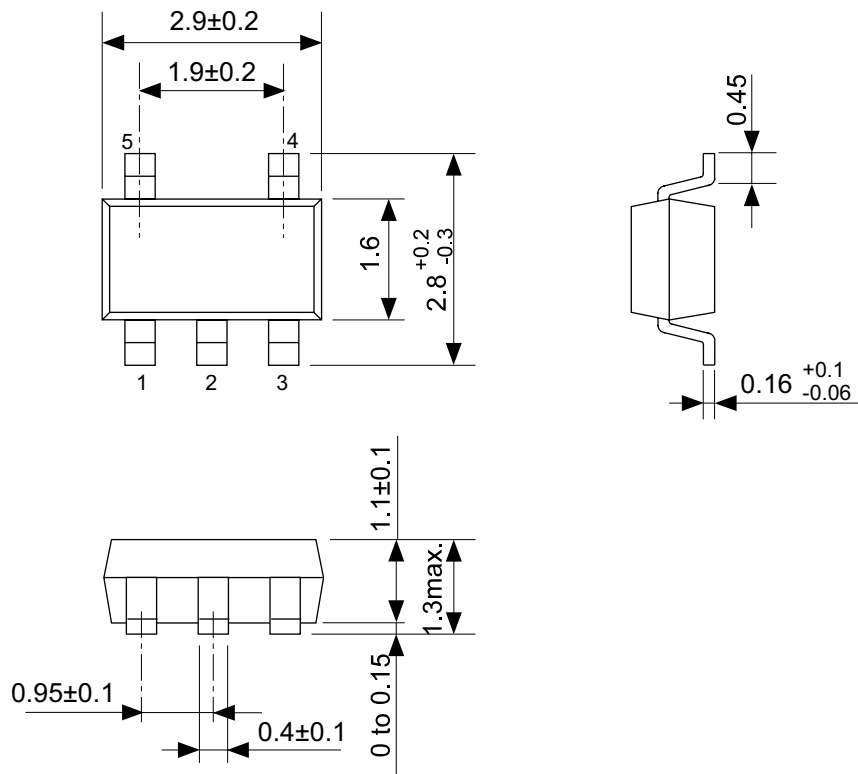


Enlarged drawing in the central part



No. NP005-B-R-SD-2.1

TITLE	SC88A-B-Reel		
No.	NP005-B-R-SD-2.1		
SCALE		QTY.	3000
UNIT	mm		
Seiko Instruments Inc.			



No. MP005-A-P-SD-1.2

TITLE	SOT235-A-PKG Dimensions
No.	MP005-A-P-SD-1.2
SCALE	
UNIT	mm
Seiko Instruments Inc.	