MINI ANALOG SERIES CMOS OPERATIONAL AMPLIFIER AND COMPARATOR S-893XXA Series

The mini-analog series mounts a general purpose analog circuit within a small package.
The S-893XXA Series is a IC having a CMOS operational amplifier and comparator in one package that can be driven by lower voltage with lower consumption current.

■ Features

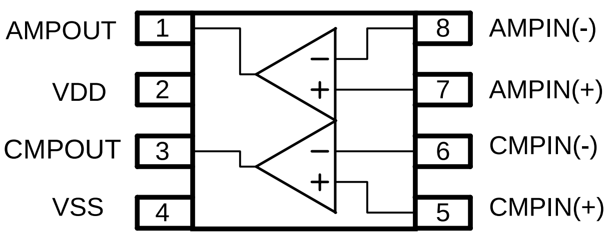
- CMOS operational amplifier/comparator
- Low operating voltage : VDD =1.8 to 5.5V
- Low current consumption
  : IDD=100µA (S-89310ACFN: Total current consumption of operational amplifier and comparator)
  : IDD=20µA (S-89320ACFN: Total current consumption of operational amplifier and comparator)
- Low input offset voltage (4.0mV max)
- No external capacitors required for internal phase compensation
- Small package (8-pin MSOP)

■ Application

- Cellular phone
- Camera
- Notebook PC
- Digital camera
- Digital video camera

■ Pin Configuration

8PIN MSOP



(S-89310ACFN S-89320ACFN)

Figure 1

Table 1

Pin No.	Symbol	Description
1	AMPOUT	Operational Amplifier Output pin
2	VDD	Positive power supply pin
3	CMPOUT	Comparator Output pin
4	VSS	GND pin
5	CMPIN(+)	Comparator Noninverting input pin
6	CMPIN(-)	Comparator Inverting input pin
7	AMPIN(+)	Operational Amplifier Noninverting input pin
8	AMPIN(-)	Operational Amplifier Inverting input pin

■ Package

8-pin MSOP (PKG drawing code: FN008-A)

■ Selection Guide

Current consumption	Model No.
IDD = 100μA[*1]	S-89310ACFN-2B0-T2
IDD = 20μA[*1]	S-89320ACFN-2B1-T2

(*1)Total current consumption (Typ.) of operational amplifier and comparator

■ Absolute Maximum Ratings

Table 1

Item	Symbol	Rating	Unit
Power voltage	V_{DD}	10.0	V
Input voltage	V_{IN}	0 to 7.0	V
Differential input voltage	V_{IND}	±7.0	V
Power dissipation	P_D	200	mW
Operating temperature range	T_O	–40 to 85	°C
Storage temperature range	T_S	–55 to +125	°C

■ Recommended Operating Power Voltage Range

Table 2

Item	Symbol	Range
Operating Power Voltage Range	V_{DDope}	1.8 to 5.5V

■ Operational Amplifier Electric Characteristics

1. V_{DD}=5.0V

Operational Amplifier DC (VDD=5.0V) **Table 4** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measurement circuit
Offset voltage		VIO		—	3	4	mV	Fig.2
Input offset current		IIO		—	1	—	pA	—
Input bias current		IBIAS		—	1	—	pA	—
Common-mode input voltage		VCMR		0		4.3	V	Fig.3
Voltage gain (open loop)		GV		70	80	—	dB	—
Max. output swing voltage		VOH	RL=1.0MΩ	4.9	—	—	V	Fig.4
		VOL	RL=1.0MΩ		—	0.1	V	Fig.5
Common-mode input signal rejection ratio		CMRR		60	70	—	dB	Fig.3
Power supply voltage rejection ratio		SVRR		60	70	—	dB	Fig.2
Power supply current	S-89310A	IDD(*1)		—	50	120	µA	Fig.6
	S-89320A	IDD(*1)		—	10	30	µA	Fig.6
Source current	S-89310A	ISOURCE	VOH=0V	120	—	—	µA	Fig.7
	S-89320A	ISOURCE	VOH=0V	25	—	—	µA	Fig.7
Sink current		ISINK	VOL=VDD	20	—	—	mA	Fig.8

Operational Amplifier AC(VDD=5.0V) **Table 5** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Slew rate	S-89310A	SR	RL=1.0MΩ CL=15pF	—	0.07	—	V/µs	Fig.9
	S-89320A	SR		—	0.015	—	V/µs	Fig.9
Cut-off frequency	S-89310A	fT(*2)		—	180	—	kHz	—
	S-89320A	fT(*2)		—	40	—	kHz	—

(*1) For only operational amplifier.
(*2) 100 percentage sampling test of this specification product, isn't conducted.

Note:
Total actual power supply current includes the operational amplifier and the comparator.

2. V_{DD}=3.0V

Operational Amplifier DC(VDD=3.0V) **Table 6** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Offset voltage		VIO		—	3	4	mV	Fig.2
Input offset current		IIO		—	1	—	pA	—
Input bias current		IBIAS		—	1	—	pA	—
Common-mode input voltage		VCMR		0	—	2.3	V	Fig.3
Voltage gain (open loop)		GV		70	80	—	dB	—
Max. output swing voltage		VOH	RL=1.0MΩ	2.9	—	—	V	Fig.4
		VOL	RL=1.0MΩ			0.1	V	Fig.5
Common-mode input signal rejection ratio		CMRR		60	70	—	dB	Fig.3
Power supply voltage rejection ratio		SVRR		60	70	—	dB	Fig.2
Power supply current	S-89310A	IDD(*1)		—	50	120	µA	Fig.6
	S-89320A	IDD(*1)		—	10	30	µA	Fig.6
Source current	S-89310A	ISOURCE	VOH=0V	120	—	—	µA	Fig.7
	S-89320A	ISOURCE	VOH=0V	25	—	—	µA	Fig.7
Sink current		ISINK	VOL=VDD	15	—	—	mA	Fig.8

Operational Amplifier AC(VDD=3.0V) **Table 7** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure ment circuit
Slew rate	S-89310A	SR	RL=1.0MΩ CL=15pF	—	0.07	—	V/µs	Fig.9
	S-89320A	SR		—	0.015	—	V/µs	Fig.9
Cut-off frequency	S-89310A	fT(*2)		—	175	—	kHz	—
	S-89320A	fT(*2)		—	35	—	kHz	—

(*1) For only operational amplifier.
(*2) 100 percentage sampling test of this specification product, isn't conducted.

Note:

Total actual power supply current includes the operational amplifier and the comparator.

3. V_{DD}=1.8V

Operational Amplifier DC(VDD=1.8V) **Table 8** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure -ment circuit
Offset voltage		VIO		—	3	4	mV	Fig.2
Input offset current		IIO		—	1	—	pA	—
Input bias current		IBIAS		—	1	—	pA	—
Common-mode input voltage		VCMR		0	—	1.1	V	Fig.3
Voltage gain (open loop)		GV		70	80	—	dB	—
Max. output swing voltage		VOH	RL=1.0MΩ	1.7	—	—	V	Fig.4
		VOL	RL=1.0MΩ	—	—	0.1	V	Fig.5
Common-mode input signal rejection ratio		CMRR		60	70	—	dB	Fig.3
Power supply voltage rejection ratio		SVRR		60	70	—	dB	Fig.2
Power supply current	S-89310A	IDD(*1)		—	50	120	µA	Fig.6
	S-89320A	IDD(*1)		—	10	30	µA	Fig.6
Source current	S-89310A	ISOURCE	VOH=0V	100	—	—	µA	Fig.7
	S-89320A	ISOURCE	VOH=0V	20	—	—	µA	Fig.7
Sink current		ISINK	VOL=VDD	5	—	—	mA	Fig.8

Operational Amplifier AC(VDD=1.8V) **Table 9** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure ment circuit
Slew rate	S-89310A	SR	RL=1.0MΩ CL=15pF	—	0.07	—	V/µs	Fig.9
	S-89320A	SR		—	0.015	—	V/µs	Fig.9
Cut-off frequency	S-89310A	fT(*2)		—	160	—	kHz	—
	S-89320A	fT(*2)		—	30	—	kHz	—

(*1) For only operational amplifier.
(*2) 100 percentage sampling test of this specification product, isn't conducted.

Note:

Total actual power supply current includes the operational amplifier and the comparator.

■ Comparator Electric Characteristics

1. V_{DD}=5.0V

Comparator DC(VDD=5.0V) **Table 10** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Offset voltage		VIO		—	3	4	mV	Fig.10
Input offset current		IIO		—	1	—	pA	—
Input bias current		IBIAS		—	1	—	pA	—
Common-mode input voltage		VCMR		0	—	4.3	V	Fig.11
Max. output swing voltage		VOH	IOH=20µA	4.7	—	—	V	Fig.12
		VOL	IOL=20µA		—	0.01	V	Fig.13
Common-mode input signal rejection ratio		CMRR		60	70	—	dB	Fig.11
Power supply voltage rejection ratio		SVRR		60	70	—	dB	Fig.10
Power supply current	S-89310A	IDD(*1)		—	50	120	µA	Fig.14
	S-89320A	IDD(*1)		—	10	30	µA	Fig.14
Source current	S-89310A	ISOURCE	VOH=0V	120	—	—	µA	Fig.15
	S-89320A	ISOURCE	VOH=0V	25	—	—	µA	Fig.15
Sink current		ISINK	VOL=0.5V	9	—	—	mA	Fig.16

Comparator AC(VDD=5.0V) **Table 11** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Rise propagation delay time	S-89310A	tPLH	Overdrive =100mV CL=15pF	—	45	—	µs	Fig.17
	S-89320A	tPLH		—	230	—	µs	Fig. 17
Fall propagation delay time	S-89310A	tPHL		—	9	—	µs	Fig. 17
	S-89320A	tPHL		—	45	—	µs	Fig. 17
Rise response time	S-89310A	tTLH		—	3	—	µs	Fig. 17
	S-89320A	tTLH		—	15	—	µs	Fig. 17
Fall response time	S-89310A	tTHL		—	3	—	µs	Fig. 17
	S-89320A	tTHL		—	15	—	µs	Fig. 17

(*1) For only comparator.

Note:

Total actual power supply current includes the operational amplifier and the comparator.

2. V_{DD}=3.0V

Comparator DC Characteristics (VDD=3.0V) **Table 12** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Offset voltage		VIO		—	3	4	mV	Fig.10
Input offset current		IIO		—	1	—	pA	—
Input bias current		IBIAS		—	1	—	pA	—
Common-mode input voltage		VCMR		0	—	2.3	V	Fig.11
Max. output swing voltage		VOH	IOH=20µA	2.7	—	—	V	Fig.12
		VOL	IOL=20µA	—	—	0.01	V	Fig.13
Common-mode input signal rejection ratio		CMRR		60	70	—	dB	Fig.11
Power supply voltage rejection ratio		SVRR		60	70	—	dB	Fig.10
Power supply current	S-89310A	IDD(*1)		—	50	120	µA	Fig.14
	S-89320A	IDD(*1)		—	10	30	µA	Fig.14
Source current	S-89310A	ISOURCE	VOH=0V	120	—	—	µA	Fig.15
	S-89320A	ISOURCE	VOH=0V	25	—	—	µA	Fig.15
Sink current		ISINK	VOL=0.5V	8	—	—	mA	Fig.16

Comparator AC(VDD=3.0V) **Table 13** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Rise propagation delay time	S-89310A	tPLH	Overdrive =100mV CL=15pF	—	30	—	µs	Fig.17
	S-89320A	tPLH		—	150	—	µs	Fig.17
Fall propagation delay time	S-89310A	tPHL		—	6	—	µs	Fig.17
	S-89320A	tPHL		—	30	—	µs	Fig.17
Rise response time	S-89310A	tTLH		—	2	—	µs	Fig.17
	S-89320A	tTLH		—	10	—	µs	Fig.17
Fall response time	S-89310A	tTHL		—	2	—	µs	Fig.17
	S-89320A	tTHL		—	10	—	µs	Fig.17

(*1) For only comparator.

Note:

Total actual power supply current includes the operational amplifier and the comparator.

3. V_{DD}=1.8V

Comparator DC(VDD=1.8V) **Table 14** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Offset voltage		VIO		—	3	4	mV	Fig.10
Input offset current		IIO		—	1	—	pA	—
Input bias current		IBIAS		—	1	—	pA	—
Common-mode input voltage		VCMR		0	—	1.1	V	Fig.11
Max. output swing voltage		VOH	IOH=20µA	1.5	—	—	V	Fig.12
		VOL	IOL=20µA		—	0.01	V	Fig.13
Common-mode input signal rejection ratio		CMRR		60	70	—	dB	Fig.11
Power supply voltage rejection ratio		SVRR		60	70	—	dB	Fig.10
Power supply current	S-89310A	IDD(*1)		—	50	120	µA	Fig.14
	S-89320A	IDD(*1)		—	10	30	µA	Fig.14
Source current	S-89310A	ISOURCE	VOH=0V	100	—	—	µA	Fig.15
	S-89320A	ISOURCE	VOH=0V	20	—	—	µA	Fig.15
Sink current		ISINK	VOL=0.5V	5	—	—	mA	Fig.16

Comparator AC(VDD=1.8V) **Table 15** (Ta=25°C unless otherwise specified)

Item	Model No.	Symbol	Measurement conditions	MIN	TYP	MAX	Unit	Measure-ment circuit
Rise propagation delay time	S-89310A	tPLH	Overdrive =100mV CL=15pF	—	20	—	µs	Fig.17
	S-89320A	tPLH		—	100	—	µs	Fig.17
Fall propagation delay time	S-89310A	tPHL		—	5	—	µs	Fig.17
	S-89320A	tPHL		—	25	—	µs	Fig.17
Rise response time	S-89310A	tTLH		—	1.2	—	µs	Fig.17
	S-89320A	tTLH		—	6	—	µs	Fig.17
Fall response time	S-89310A	tTHL		—	1.2	—	µs	Fig.17
	S-89320A	tTHL		—	6	—	µs	Fig.17

(*1) For only comparator.

Note:

Total actual power supply current includes the operational amplifier and the comparator.

■ Operation Amplifier Measurement Conditions

1. Power supply voltage rejection ratio, Offset voltage

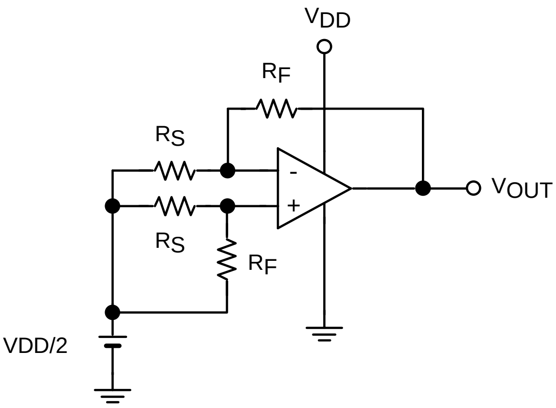


Figure 2

- Power supply voltage rejection ratio
  The power supply voltage rejection ratio (SVRR) can be calculated by value of V_{OUT} measured at each V_{DD} and the following expression.

  Measurement conditions :
  V_{DD1} is defined as V_{DD} and V_{OUT1} is defined as V_{OUT} when V_{DD} is 1.8 V.
  V_{DD2} is defined as V_{DD} and V_{OUT2} is defined as V_{OUT} when V_{DD} is 5.0 V.

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

- Offset voltage(VIO)

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

2. Common-mode input signal rejection ratio, Common-mode input voltage

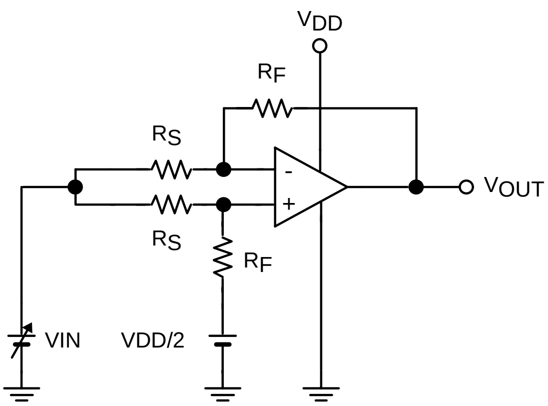


Figure 3

- Common-mode input signal rejection ratio
  The common-mode input signal rejection ratio (CMRR) can be calculated by value of V_{OUT} measured at each V_{IN} and the following expression.

  Measurement conditions :
  V_{IN1} is defined as V_{IN} and V_{OUT1} is defined as V_{OUT} when V_{IN} is V_{CMR}(MAX).
  V_{IN2} is defined as V_{IN} and V_{OUT2} is defined as V_{OUT} when V_{IN} is V_{DD}/2.

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

- Common-mode input voltage
  Common-mode input voltage is a voltage in input voltage range that V_{OUT} can be satisfied the Common-mode input signal rejection ratio specification when V_{IN} is changed.

3. Max. output swing voltage (V_{OH})

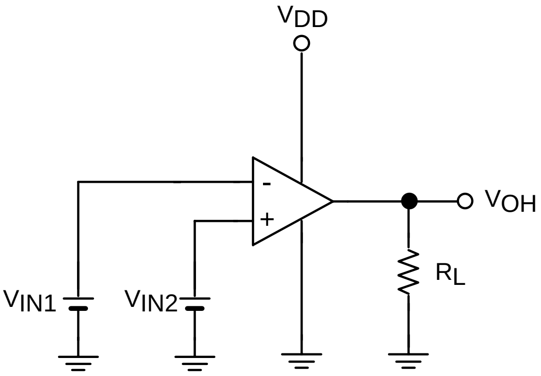


Figure 4

- Max. output swing voltage (V_{OH})

  Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} - 0.5V$

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

  $R_L = 1M\Omega$

4. Max. output swing voltage (V_{OL})

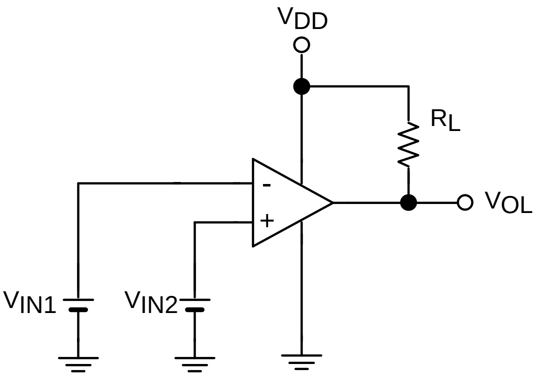


Figure 5

- Max. output swing voltage (V_{OL})

  Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} + 0.5V$

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

  $R_L = 1M\Omega$

5. Power supply current (I_{DD})

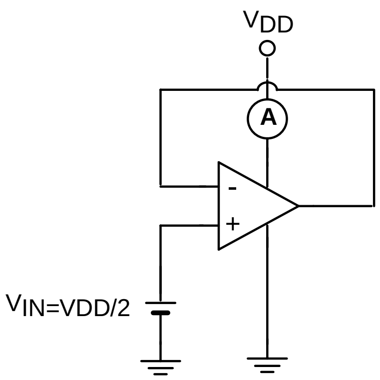


Figure 6

6. Source current (I_{SOURCE})

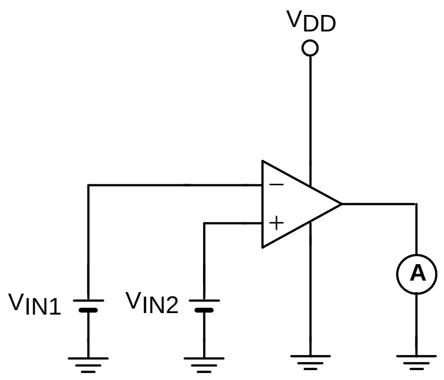


Figure 7

- Source current (ISOURCE)

  Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} - 0.5V$

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

7. Sink current (I_{SINK})

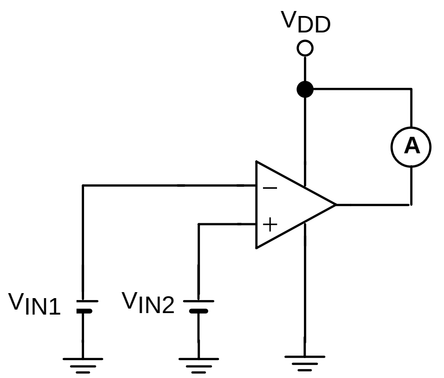


Figure 8

- Sink current (I_{SINK})

  Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} + 0.5V$

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

8. Slew rate (SR): Measured by the voltage follower circuit

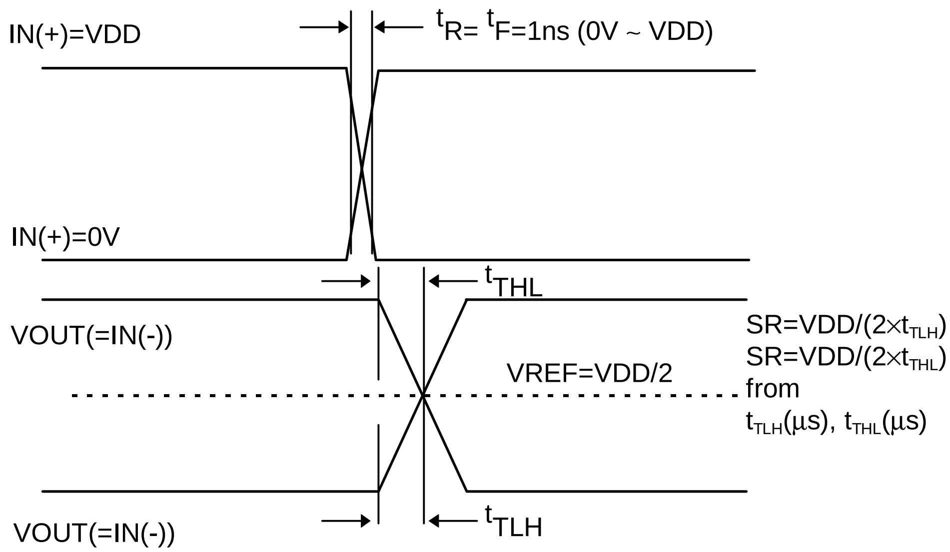


Figure 9

■ Comparator Measurement Conditions

1. Power supply voltage rejection ratio, Offset voltage

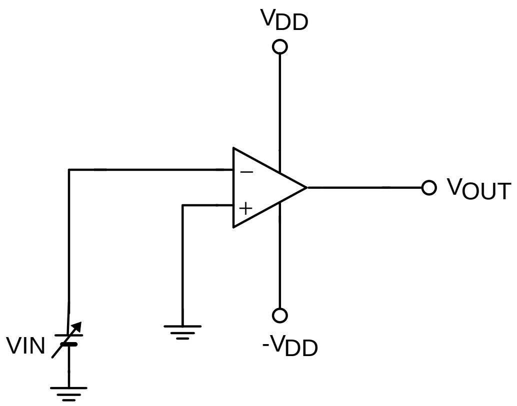


Figure 10

- Offset voltage(VIO),
  Power supply voltage rejection ratio(SVRR)

  The offset voltage (VIO) is defined as V_{IN} when V_{OUT} is changed by changing V_{IN} to GND level. The power supply voltage rejection ratio (SVRR) can be calculated by value of VIO measured at each V_{DD} and the following expression.

  Measurement conditions :
  V_{DD1} is defined as V_{DD} and V_{IO1} is defined as VIO when V_{DD} is 0.9 V.
  V_{DD2} is defined V_{DD} and V_{IO2} is defined as VIO when V_{DD} is 2.5 V.

$$SVRR = -20\log\left(\left|\frac{V_{IO1} - V_{IO2}}{2(V_{DD1} - V_{DD2})}\right|\right)$$

2. Common-mode input signal rejection ratio, Common-mode input voltage

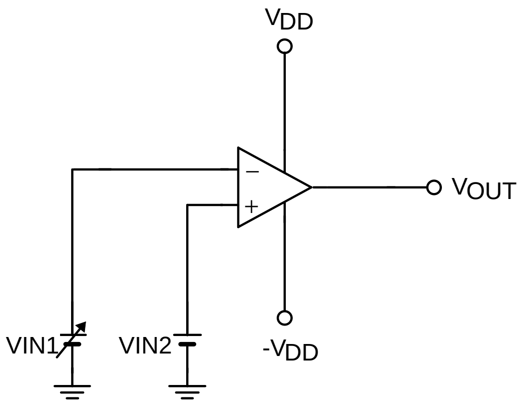


Figure 11

- Common-mode input signal rejection ratio(CMRR)
  When the offset voltage (VIO) is set as V_{IN1} minus V_{IN2} after V_{OUT} is changed by changing V_{IN1}, the common-mode input signal rejection ratio (CMRR) can be calculated by the following expression.

  Measurement conditions :
  V_{DD} =1.5 V
  V_{INH} is defined as V_{IN2} and V_{IO1} is defined as VIO when V_{IN2} is 0.8 V.
  V_{INL} is defined as V_{IN2} and V_{IO2} is defined as VIO when V_{IN2} is 0 V.

$$CMRR = 20\log\left(\left|\frac{V_{INH} - V_{INL}}{VIO1 - VIO2}\right|\right)$$

- Common-mode input voltage(VCMR)
  Common-mode input voltage is a voltage in input voltage range that V_{OUT} can be satisfied the Common-mode input voltage signal rejection ratio specification when V_{IN1} is changed.

3. Max. output swing voltage (V_{OH})

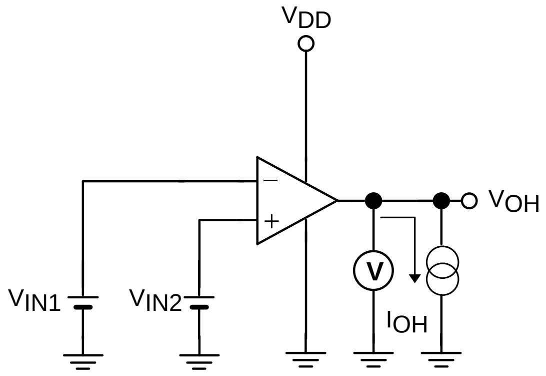


Figure 12

- Max. output swing voltage (V_{OH})

  Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} - 0.5V$

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

  $I_{OH} = 20\mu A$

4. Max. output swing voltage (V_{OL})

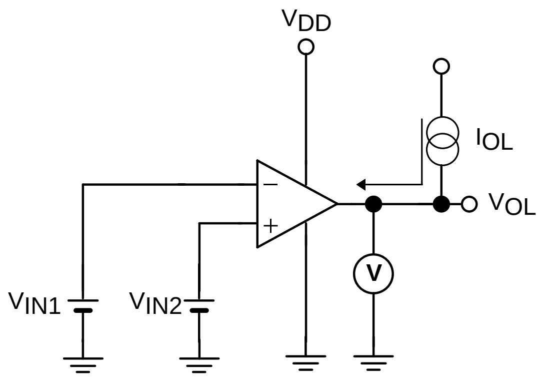


Figure 13

- Max. output swing voltage (V_{OL})

  Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} + 0.5V$

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

  $I_{OL} = 20\mu A$

5. Power supply current(I_{DD})

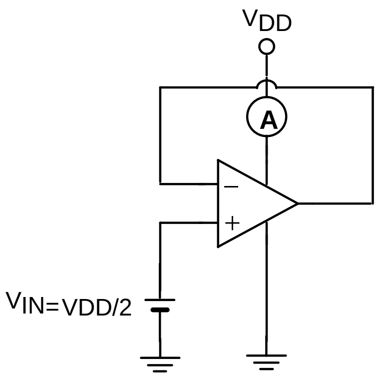


Figure 14

6. Source current (I_{SOURCE})

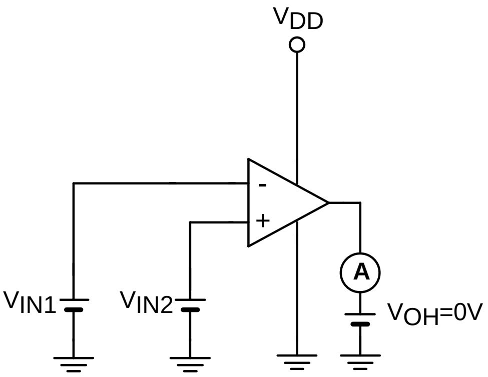


Figure 15

- Source current (I_{SOURCE})

Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} - 0.5V$

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

7. Sink current (I_{SINK})

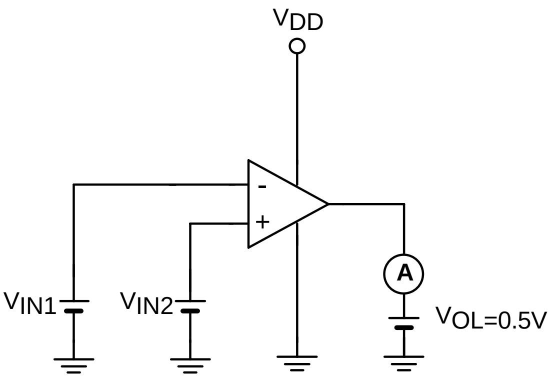


Figure 16

- Sink current (I_{SINK})

Measurement conditions : $V_{IN1} = \frac{V_{DD}}{2} + 0.5V$

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

8. Propagation delay time / Transient response time

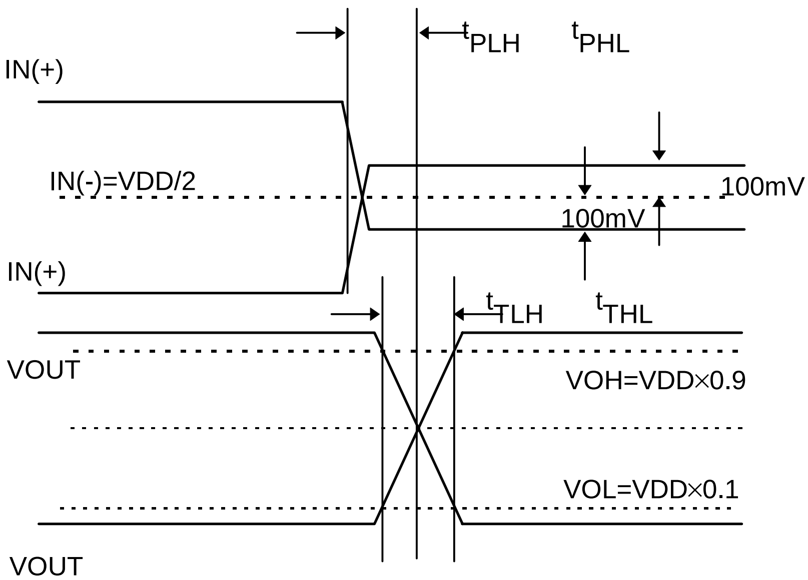
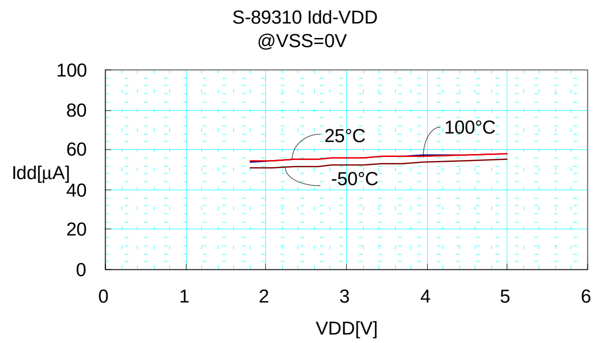
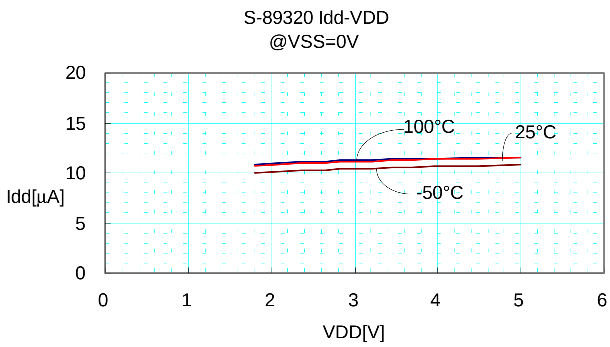


Figure 17

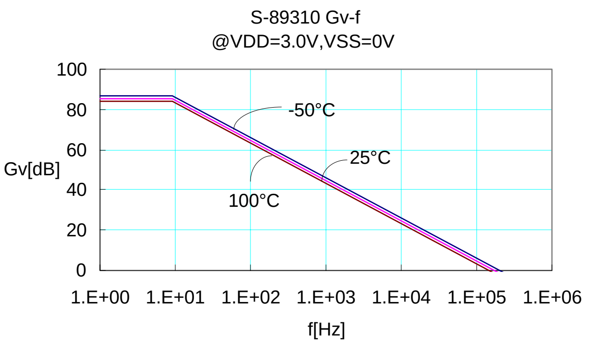
■ Operational Amplifier Characteristics (Each data is typical of each circuit)

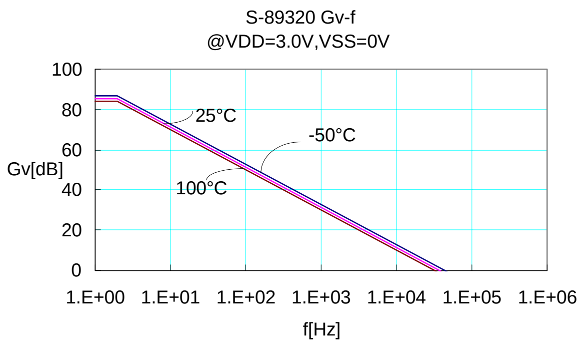
1. Current consumption– Power voltage





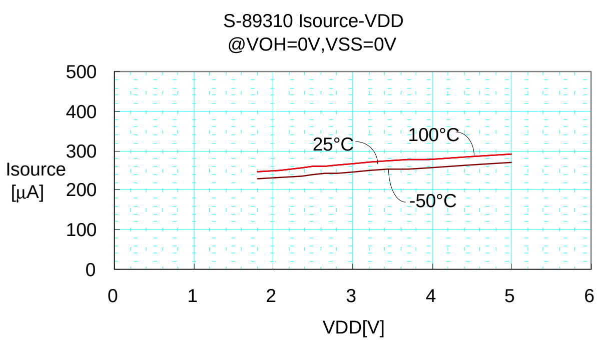
2. Voltage gain– Frequency

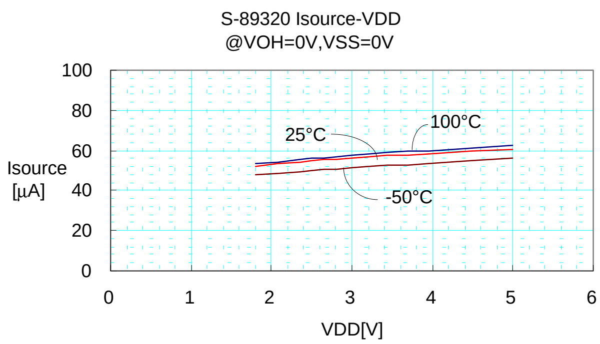




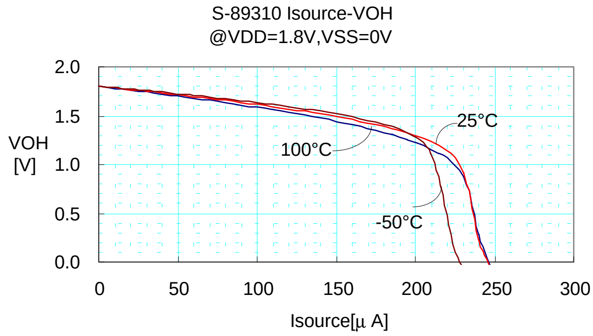
3. Output current

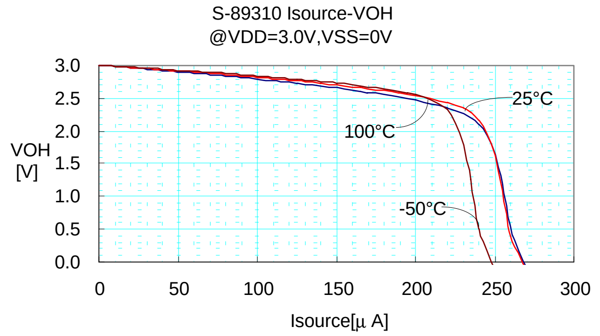
3-1. Isource– Power voltage

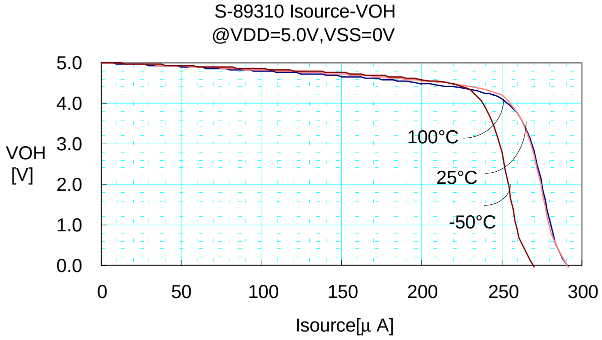


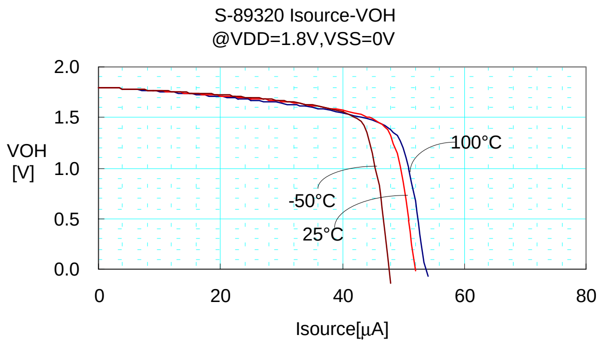


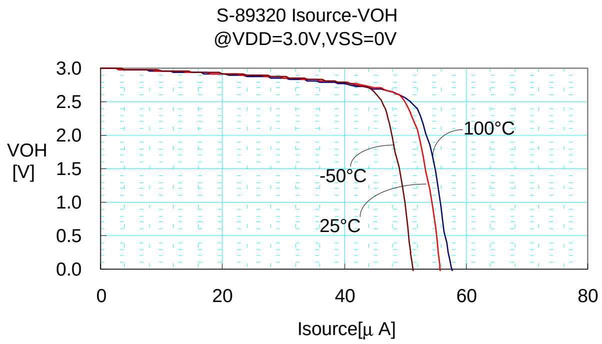
3-2. Isource– Output voltage(V_{OH})

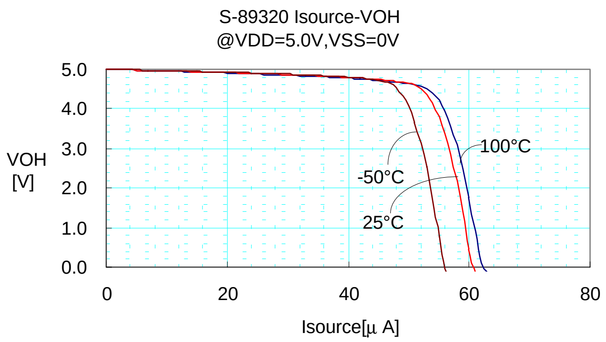




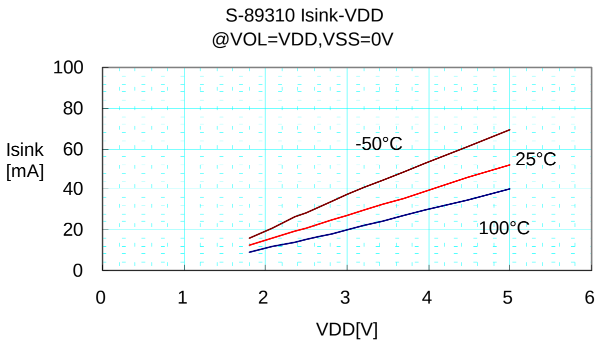


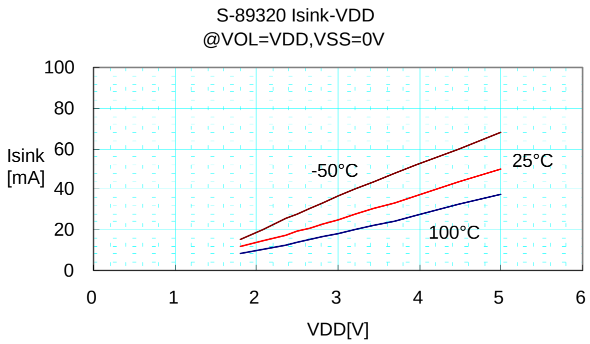




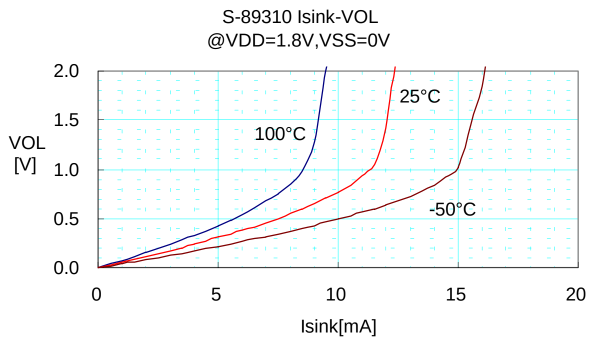


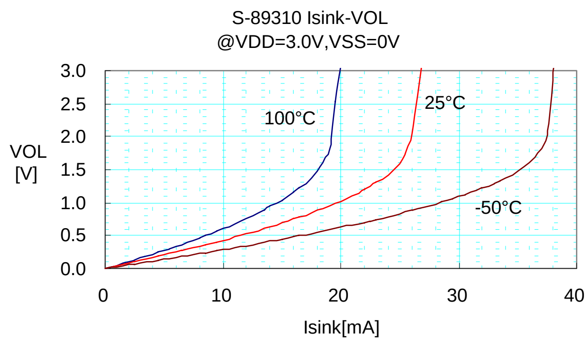
3-3. Isink– Power voltage

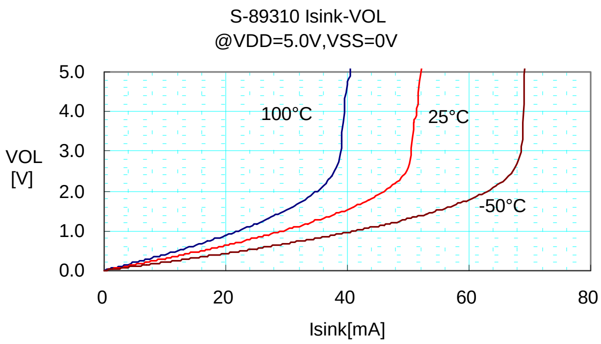


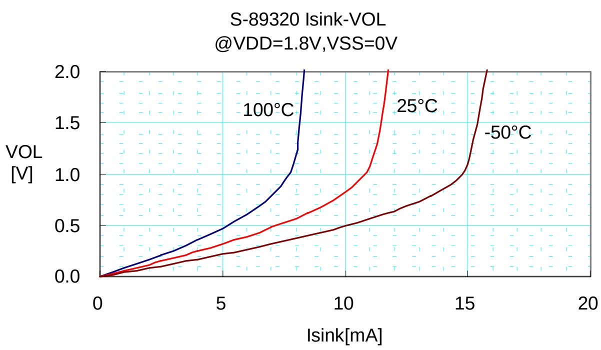


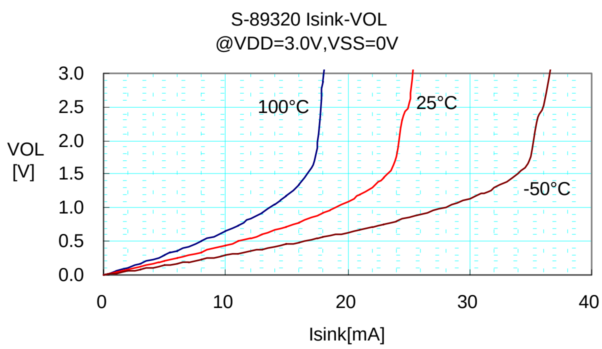
3-4. Isink– Output voltage(V_{OL})

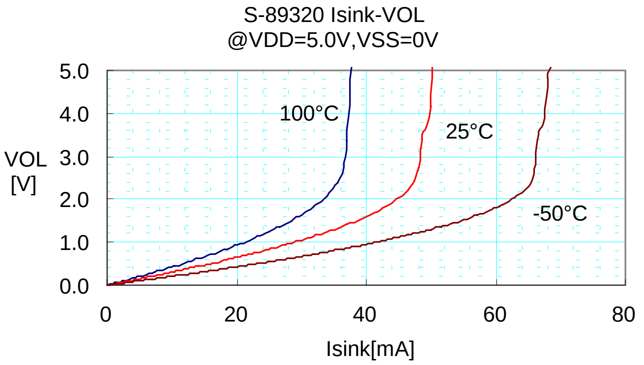






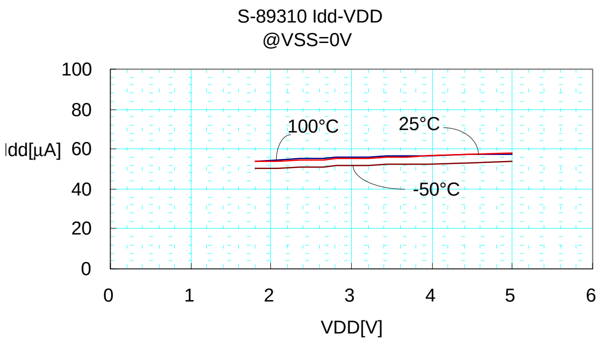


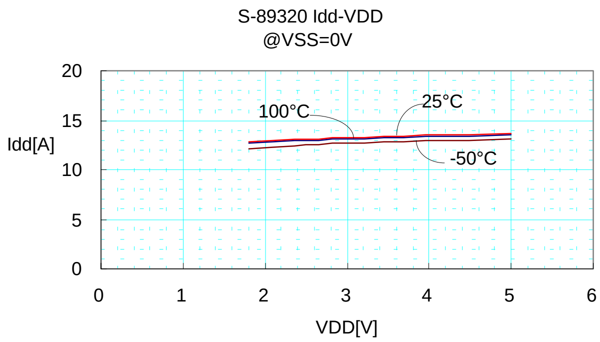



S-89320 Isink-VOL
@VDD=5.0V,VSS=0V
VOL [V]
5.0
4.0
3.0
2.0
1.0
0.0
0
20
40
60
80
Isink[mA]
100°C
25°C
-50°C

■ Comparator Characteristics (Each data is typical of each circuit)

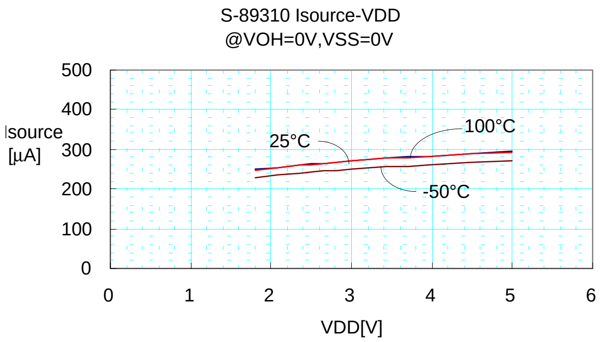
1. Current consumption– Power voltage

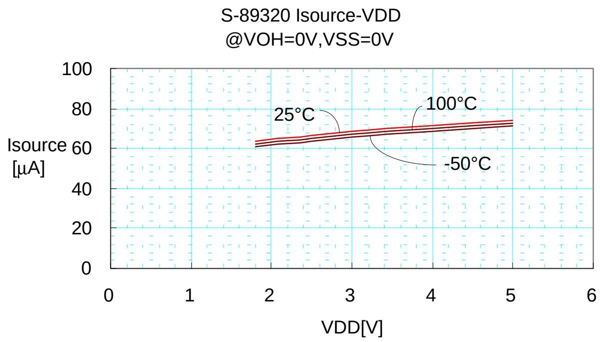




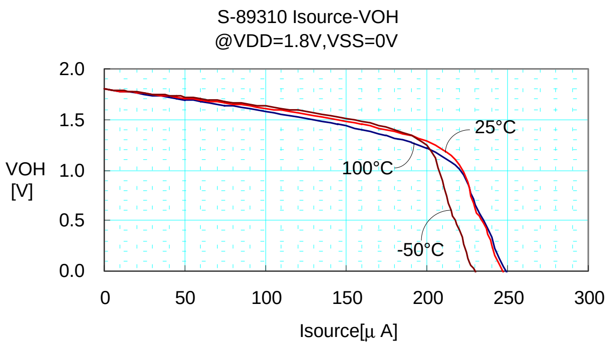
2. Output current

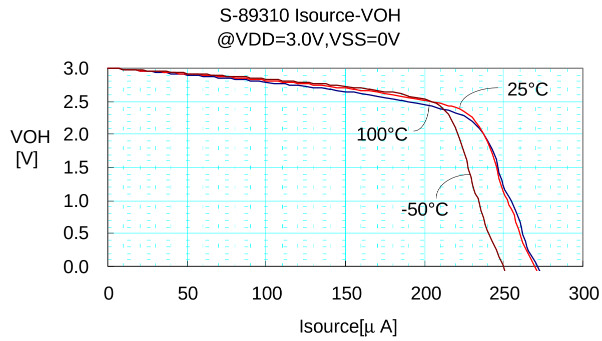
2-1. Isource- Power voltage



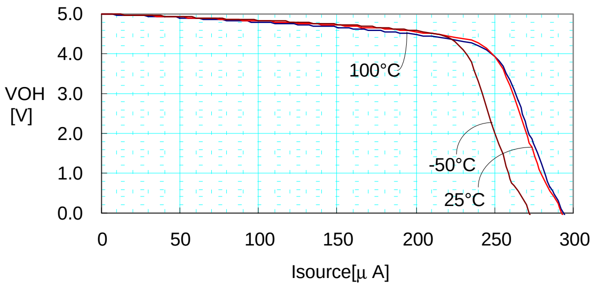


2-2. Isource- Output voltage(V_{OH})

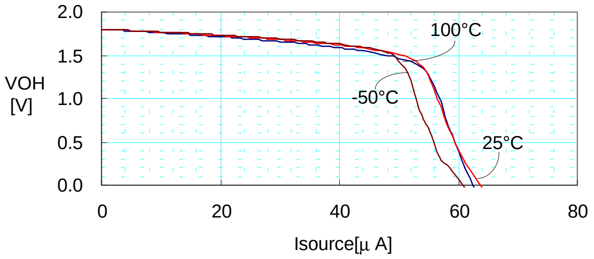




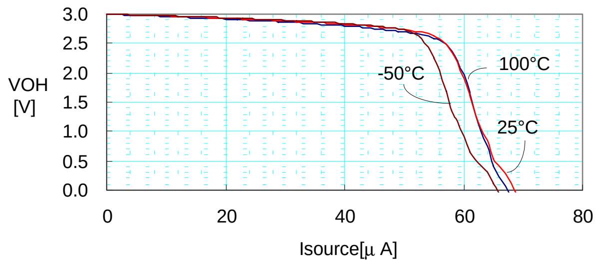
S-89310 Isource-VOH
@VDD=5.0V,VSS=0V



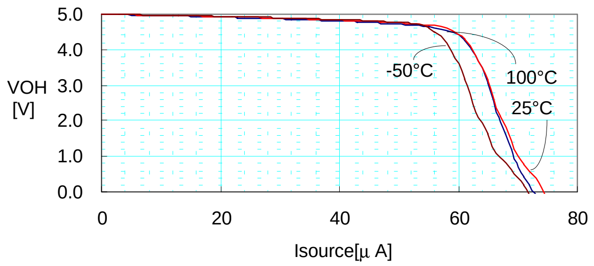
S-89320 Isource-VOH
@VDD=1.8V,VSS=0V



S-89320 Isource-VOH
@VDD=3.0V,VSS=0V

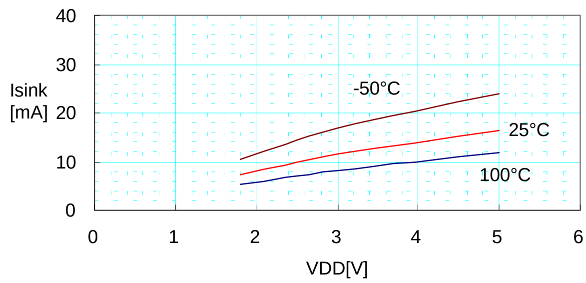


S-89320 Isource-VOH
@VDD=5.0V,VSS=0V

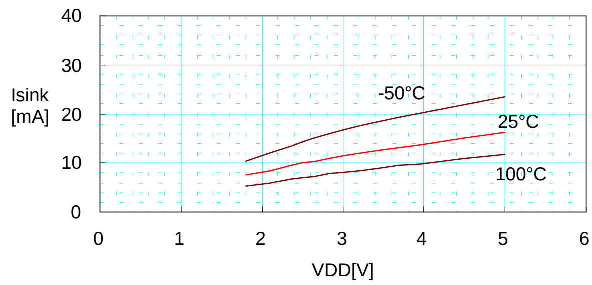


2-3. Isink- Power voltage

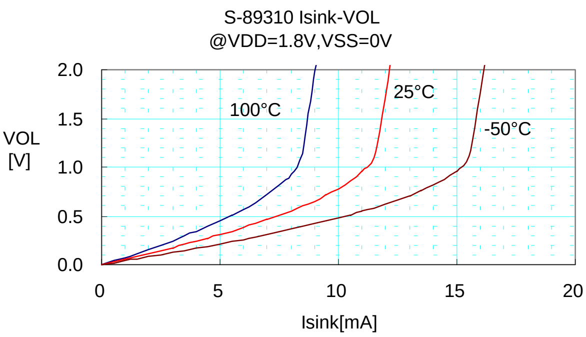
S-89310 Isink-VDD
@VOL=0.5V,VSS=0V

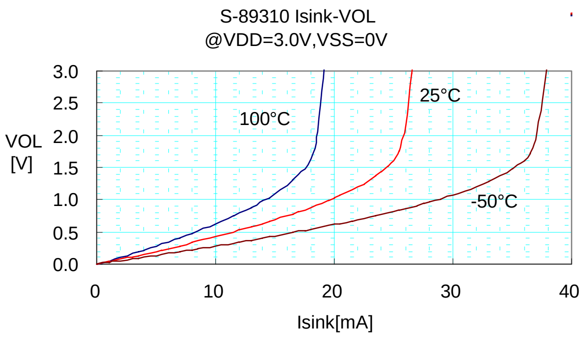


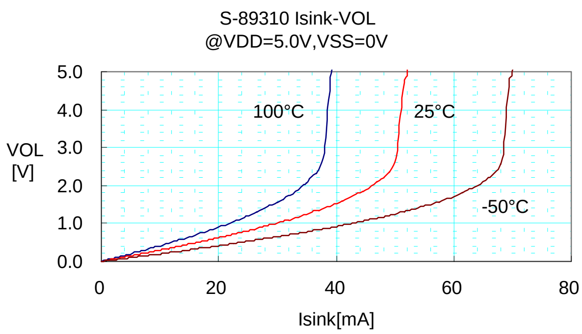
S-89320 Isink-VDD
@VOL=0.5V,VSS=0V

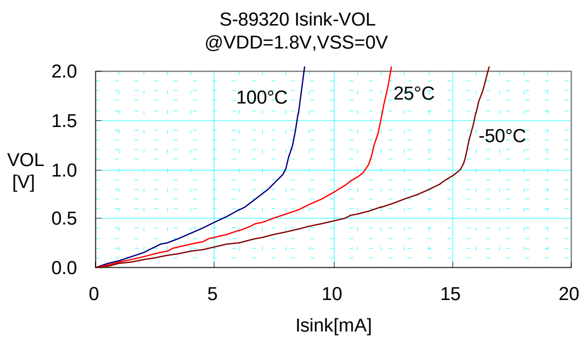


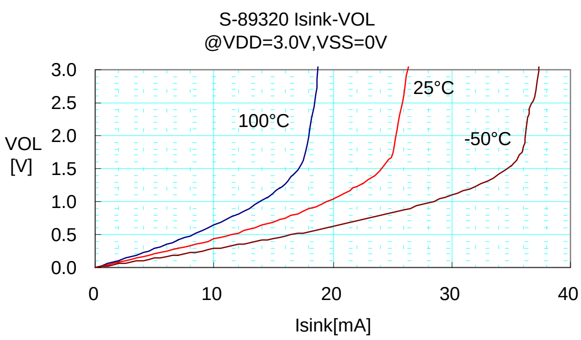
2-4. Isink- Output voltage(VOL)

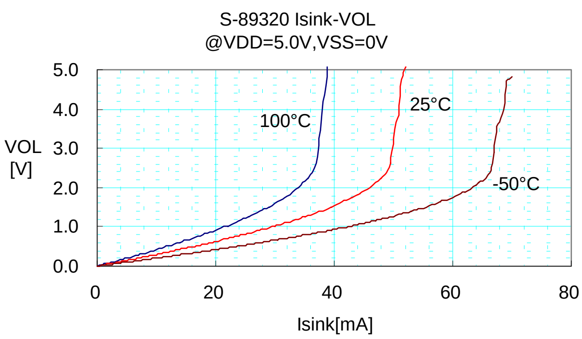










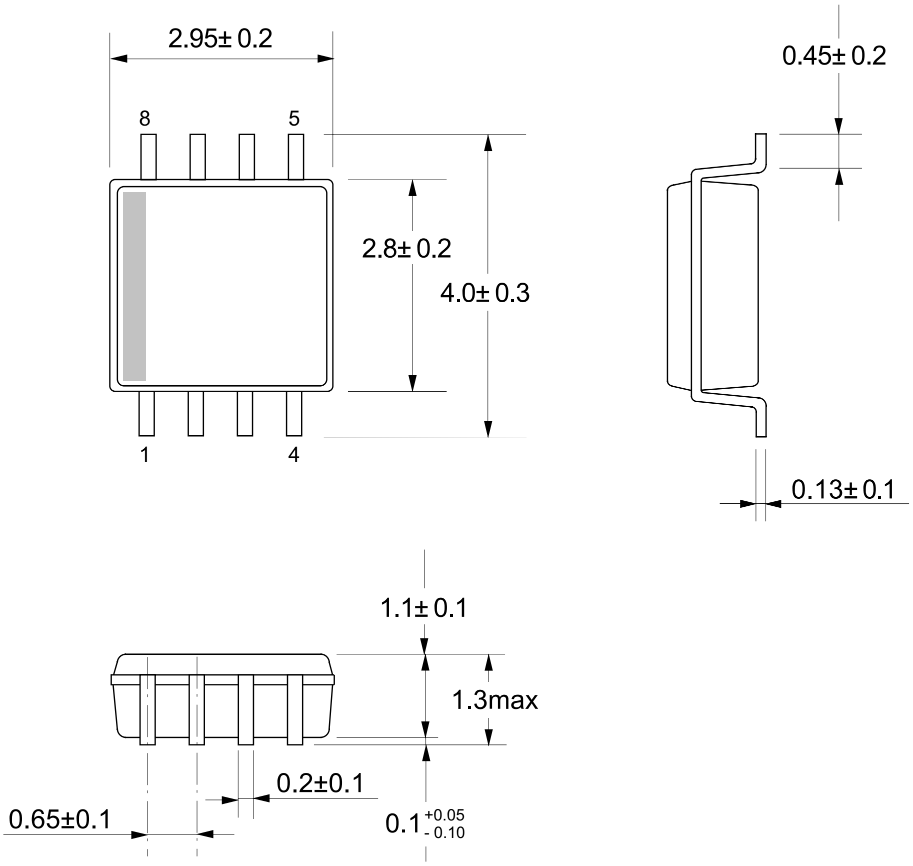


■ 8-pin MSOP

FN008-A 990531

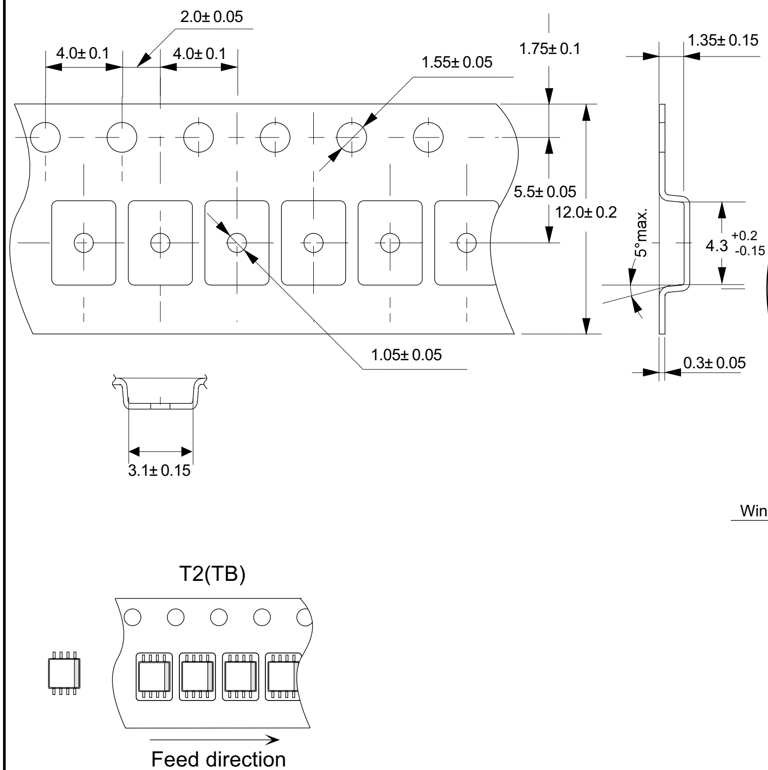
●Dimensions

Unit:mm



No. : FN008-A-P-SD-1.0

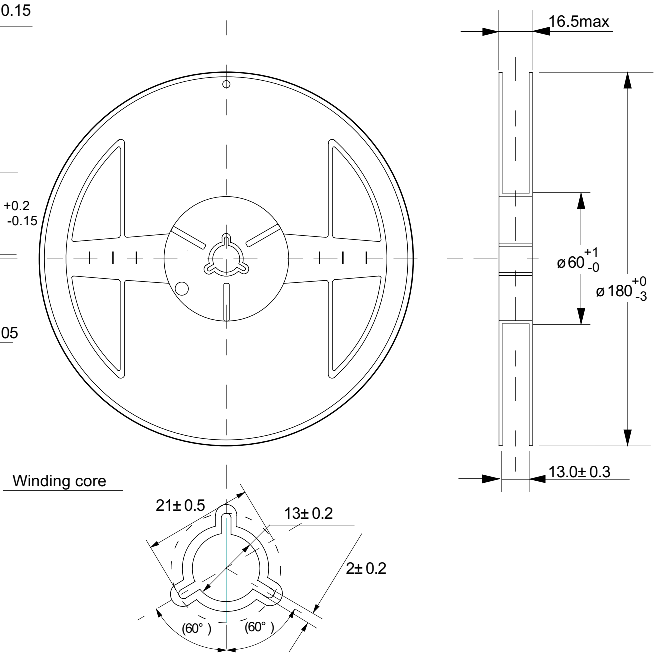
●Taping Specifications



No. : FN008-A-C-SD-1.0

●Reel Specifications

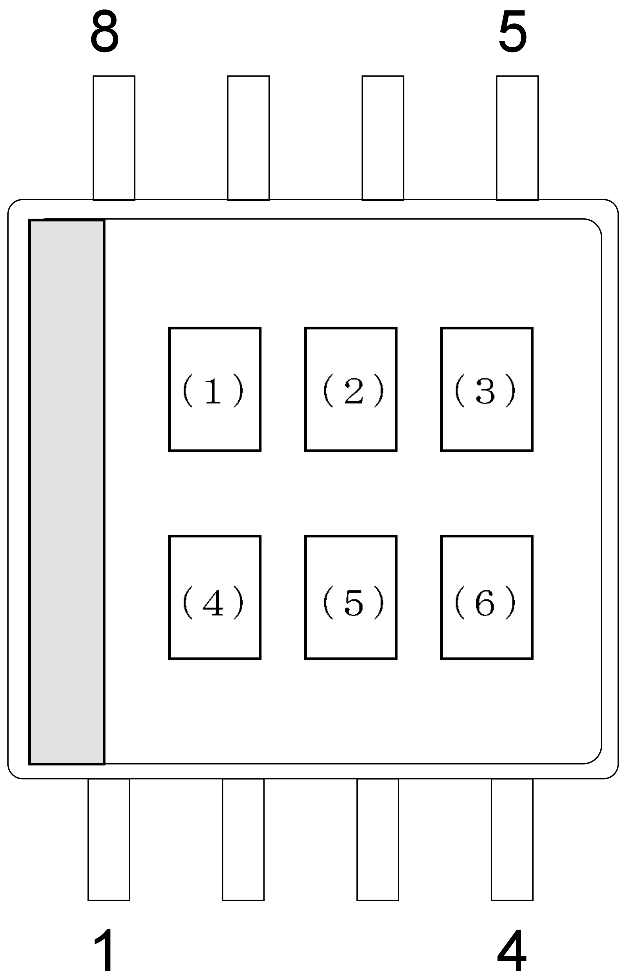
1 reel holds 3000 ICs.



No. : FN008-A-R-SD-1.0

■Markings

● 8-pin MSOP



(1) to (3) : Product name (abbreviation)

(4) : Year of assembly

(5) : Month of assembly

(6) : Week of assembly