PRELIMINARY SPECIFICATIONS SUBJECT TO CHANGE

MUSES8920A

High-Quality Sound, J-FET Input Dual Operational Amplifier

FEATURES

(V⁺/ V⁻ = ±15V, Typical value, Ta = 25°C)

- High-quality Sound
- Low Noise 8.0nV/√Hz at f=1kHz
- Low Distortion 0.0004% at f=1kHz
- High Slew Rate 25V/μs
- Gain Bandwidth Product 11MHz
- Low Input Bias Current 5pA
- Operating Voltage ±3.5V to ±17V
- J-FET Input
- Bipolar Technology
- Package Outline (Under Development) DIP8
  SOP8 JEDEC 150mil (EMP8)
  DFN8-X7 (ESON8-X7)

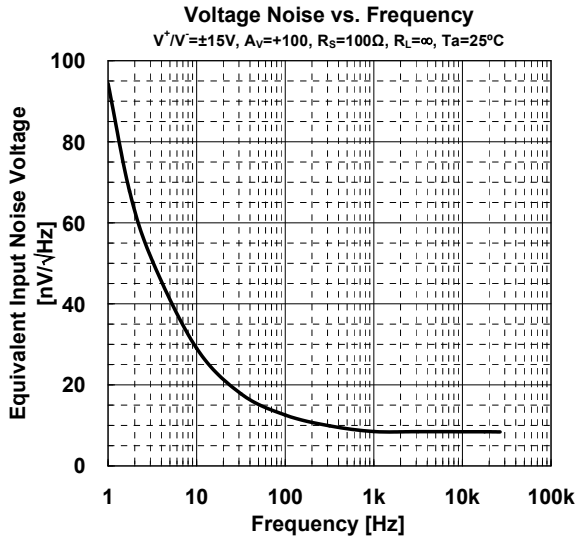
DESCRIPTION

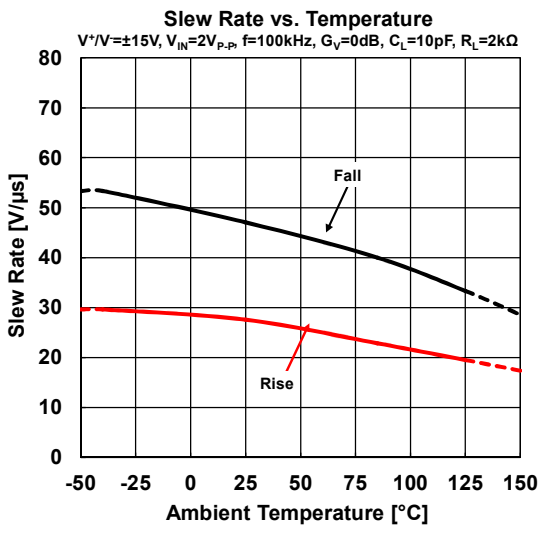
The MUSES8920A is a high-quality sound J-FET input dual operational amplifier, which is optimized for high-end audio, professional audio and portable audio applications.
The MUSES8920A features high-quality sound, low input bias current, low noise, low distortion and high slew rate, and it is suitable for I/V converters, preamplifiers, active filters, headphone amplifiers, and line amplifiers.

APPLICATIONS

- Home Audio
- Professional Audio
- Car Audio
- Portable Audio

Voltage Noise and Slew Rate





■ PRODUCT NAME INFORMATION

MUSES8920A aaa (bbb)

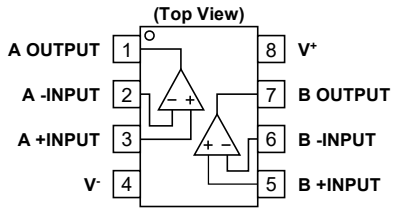
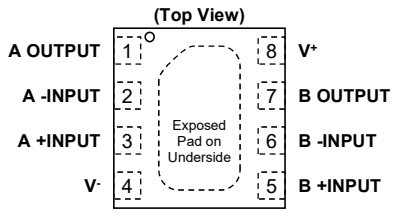
Description of configuration

Suffix	Item	Description
aaa	Package code	Indicates the package. Refer to the order information.
bbb	Packing	Refer to the packing specifications.

■ ORDER INFORMATION

Product Name	Package	RoHS	Halogen-Free	Terminal Finish	Marking	Weight (mg)	MOQ (pcs)
MUSES8920AD (Under Development)	DIP8	Yes	-	Sn2Bi	8920A	510	2000
MUSES8920AE(TE1)	SOP8 JEDEC 150mil (EMP8)	Yes	Yes	Sn2Bi	8920A	76	2000
MUSES8920AKX7(TE3)	DFN8-X7 (ESON8-X7)	Yes	Yes	Sn2Bi	8920A	27	1500

■ PIN DESCRIPTIONS

Product Name	MUSES8920AD MUSES8920AE	MUSES8920AKX7
Package	DIP8 SOP8 JEDEC 150mil (EMP8)	DFN8-X7 (ESON8-X7)
Pin Functions		 * About Exposed Pad Floating or connecting to V-

端子番号	端子名	I/O	機能
1	A OUTPUT	O	Output channel A
2	A -INPUT	I	Inverting input channel A
3	A +INPUT	I	Non-inverting input channel A
4	V^-	-	Negative supply or Ground (single supply)
5	B +INPUT	I	Non-inverting input channel B
6	B -INPUT	I	Inverting input channel B
7	B OUTPUT	O	Output channel B
8	V^+	-	Positive supply

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Supply Voltage	V^+/ V^-	±18	V
Input Voltage [*1]	V_{IN}	V^- -0.3 to V^- +36.3	V
Differential Input Voltage [*2]	V_{ID}	±30	V
Power Dissipation (Ta = 25°C) DIP8 [*7] SOP8 JEDEC 150mil (EMP8) DFN8-X7 (ESON8-X7)	P_D	2-Layer / 4-Layer 980 [*3] / 1400 [*4] 800 [*3] / 1200 [*4] 690 [*5] / 2900 [*6]	mW
Storage Temperature DIP8 SOP8 JEDEC 150mil (EMP8), DFN8-X7 (ESON8-X7)	T_{stg}	 -40 to 125 -50 to 150	°C

[*1] "Input Voltage" is independent of supply voltage.
Normal operating range as operational amplifier is shown in "Common-Mode Input Voltage Range" of "ELECTRICAL CHARACTERISTICS".
[*2] "Differential Input Voltage" is the voltage difference between +INPUT and −INPUT.
[*3] 2-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm, based on EIA/JEDEC standard, 2Layers FR-4)
[*4] 4-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm, based on EIA/JEDEC standard, 4Layers FR-4)
[*5] 2-Layer: Mounted on glass epoxy board (101.5 mm × 114.5 mm × 1.6 mm: based on EIA/JEDEC standard, 2-layer FR-4) with exposed pad.
[*6] 4-Layer: Mounted on glass epoxy board (101.5 mm × 114.5 mm × 1.6 mm: based on EIA/JEDEC standard, 4-layer FR-4) with exposed pad.
(For 4-layer: Applying 99.5 mm × 99.5 mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5.)
[*7] NJM8920AD (DIP8) is ESD (electrostatic discharge) sensitive device.
Therefore, proper ESD precautions are recommended to avoid permanent damage or loss of functionality.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

■ THERMAL CHARACTERISTICS

Package	Measurement Result		Unit
	Thermal Resistance (Θja)	Thermal Characterization Parameter (ψjt)	
DIP8	102 [*8] / 65 [*9]	18 [*8] / 16 [*9]	°C/W
SOP8 JEDEC 150mil (EMP8)	157 [*8] / 103 [*9]	16 [*8] / 12 [*9]	
DFN8-X7 (ESON8-X7)	182 [*10] / 44 [*11]	-	

Θja :Junction-to-Ambient Thermal Resistance
ψjt:Junction-to-Top Thermal Characterization Parameter
[*8] 2-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm, based on EIA/JEDEC standard, 2Layers FR-4)
[*9] 4-Layer: Mounted on glass epoxy board. (76.2×114.3×1.6mm, based on EIA/JEDEC standard, 4Layers FR-4)
[*10] 2-Layer: Mounted on glass epoxy board (101.5 mm × 114.5 mm × 1.6 mm: based on EIA/JEDEC standard, 2-layer FR-4) with exposed pad.
[*11] 4-Layer: Mounted on glass epoxy board (101.5 mm × 114.5 mm × 1.6 mm: based on EIA/JEDEC standard, 4-layer FR-4) with exposed pad.
(For 4-layer: Applying 99.5 mm × 99.5 mm inner Cu area and a thermal via hole to a board based on JEDEC standard JESD51-5.)

■ ELECTROSTATIC DISCHARGE (ESD) PROTECTION VOLTAGE

Parameter	Conditions	Protection Voltage
HBM	C = 100 pF, R = 1.5 kΩ	±1000 V
CDM	DI-CDM DFN8-X7 (ESON8-X7), SOP8 JEDEC 150mil (EMP8) DIP8	±1000 V TBD

ELECTROSTATIC DISCHARGE RATINGS

The electrostatic discharge test is done based on JEITA ED-4701.
In the HBM method, ESD is applied using the power supply pin and GND pin as reference pins.

■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Rating	Unit
Supply Voltage	V^+/ V^-		±3.5 to ±17	V
Operating Temperature DIP8, SOP8 JEDEC 150mil (EMP8) DFN8-X7 (ESON8-X7)	T_{opr}		 -40 to 85 -40 to 125	°C

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

■ ELECTRICAL CHARACTERISTICS

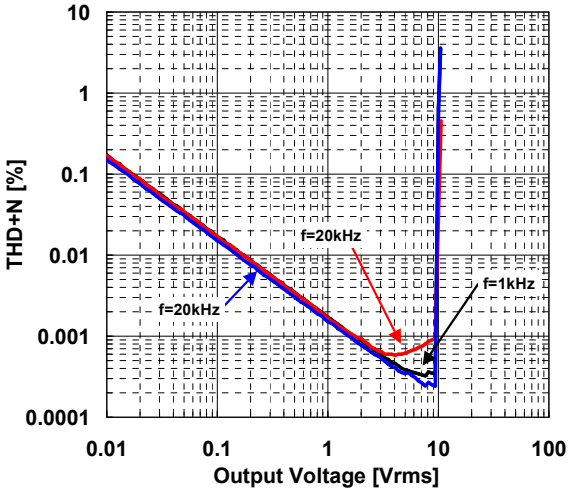
V^+/V^-=±15V, R_L to GND, Ta=25°C, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
DC CHARACTERISTICS						
Supply Current	I_{CC}	No Signal, R_L=∞	-	9.0	12.0	mA
Input Offset Voltage	V_{IO}	Rs=50Ω	-	0.8	5.0	mV
Input Bias Current	I_B		-	5	250	pA
Input Offset Current	I_{IO}		-	2	220	pA
Voltage Gain 1	A_{V1}	R_L=10kΩ, V_O=±13V	106	135	-	dB
Voltage Gain 2	A_{V2}	R_L=2kΩ, V_O=±12.8V	105	133	-	dB
Voltage Gain 3	A_{V3}	R_L=600Ω, V_O=±12.5V	105	130	-	dB
Common Mode Rejection Ratio	CMR	V_{ICM}= ±12.5V [*1]	80	110	-	dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±3.5 to ±17V	80	110	-	dB
Maximum Output Voltage 1	V_{OM1}	R_L =10kΩ	±13	±14	-	V
Maximum Output Voltage 2	V_{OM2}	R_L =2kΩ	±12.8	±13.8	-	V
Maximum Output Voltage 3	V_{OM3}	R_L =600Ω	±12.5	±13.5	-	V
Input Common Mode Voltage Range	V_{ICM}	CMR≥80dB	±12.5	±14	-	V
AC CHARACTERISTICS						
Gain Bandwidth Product	GBW	f=10kHz	-	11	-	MHz
Unity Gain Frequency	f_T	A_V=+100, R_S=100Ω, R_L=2kΩ, C_L=10pF	-	10	-	MHz
Phase Margin	Φ_M	A_V=+100, R_S=100Ω, R_L=2kΩ, C_L=10pF	-	70	-	Deg
Slew Rate	SR	A_V=1, V_{IN}=2Vp-p, R_L=2kΩ, C_L=10pF	-	25	-	V/μs
Channel Separation	CS	f=1kHz, A_V=+100, R_S=1kΩ, R_L=2kΩ	-	150	-	dB
Total Harmonic Distortion	THD	f=1kHz,AV=+10,Vo=5Vrms,RL=2kΩ	-	0.0004	-	%
Input Noise Voltage1	e_n	f=1kHz	-	8.0	-	nV/√Hz
Input Noise Voltage2	V_{NI}	f=20Hz to 20kHz	-	1.1	-	μVrms

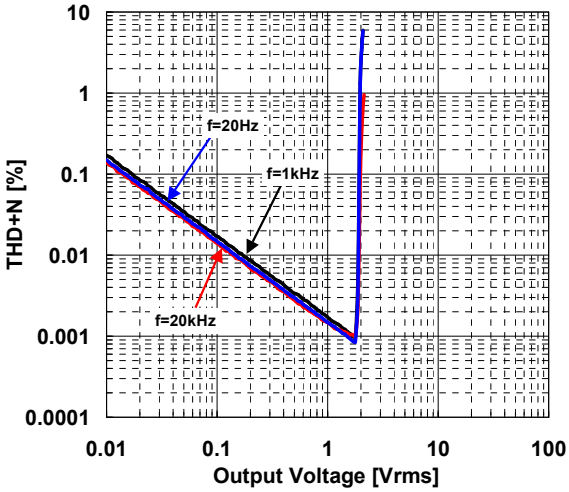
[*1] CMR is calculated by specified change in offset voltage. (VICM=0V to +12.5V, VICM=0V to -12.5V)

■ TYPICAL CARACTERISTICS

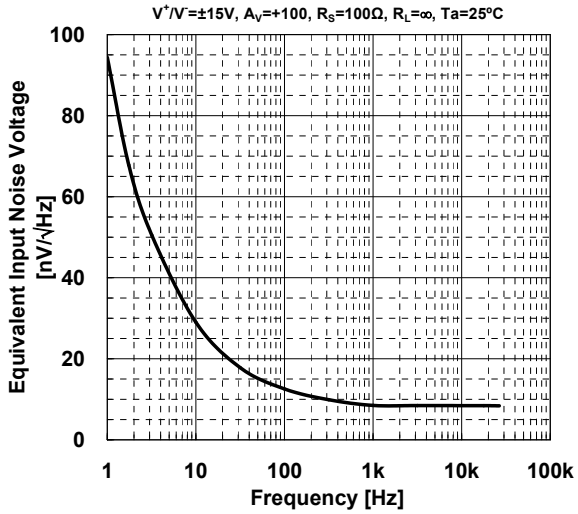
THD+N vs. Output Voltage (Frequency)
V+/V-=±15V, AV=+10, RL=2k, Ta=25ºC



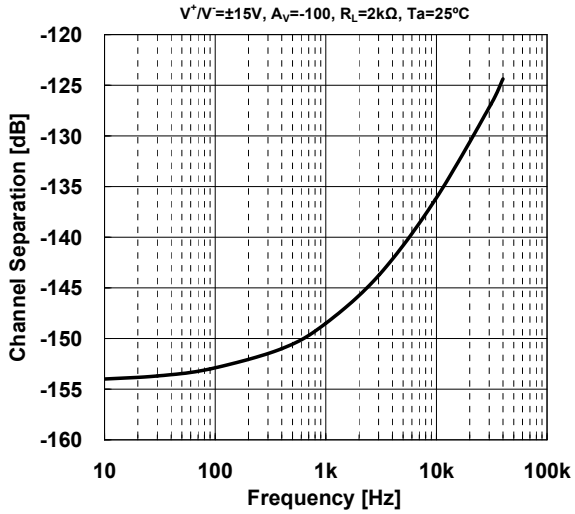
THD+N vs. Output Voltage (Frequency)
V+/V-=±3.5V, AV=+10, RL=2k, Ta=25ºC



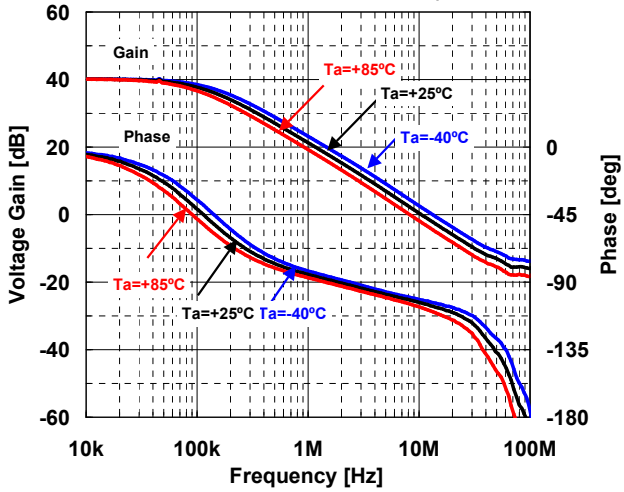
Voltage Noise vs. Frequency
V+/V-=±15V, AV=+100, RS=100Ω, RL=∞, Ta=25ºC



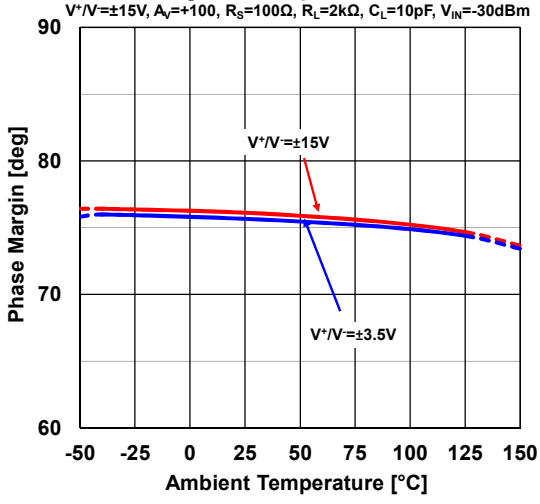
Channel Separation vs. Frequency
V+/V-=±15V, AV=-100, RL=2kΩ, Ta=25ºC



Gain vs. Frequency (Temperature)
V+/V-=±15V, AV=+100, RL=2kΩ, CL=10pF



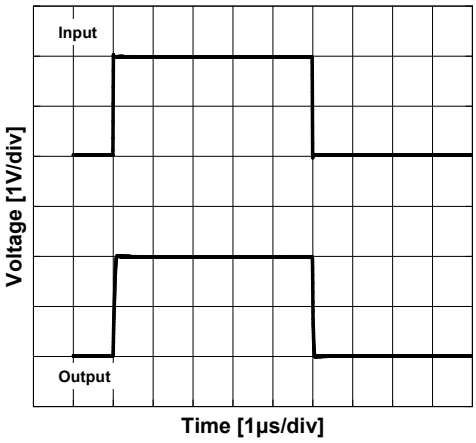
Phase Margin vs. Temperature (Supply Voltage)
V+/V-=±15V, AV=+100, RS=100Ω, RL=2kΩ, CL=10pF, VIN=-30dBm



■ TYPICAL CARACTERISTICS

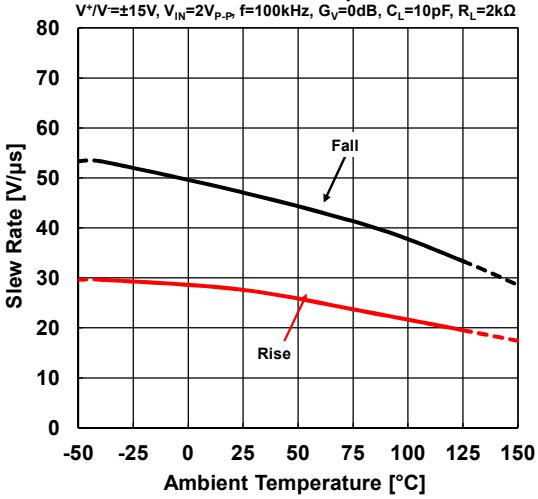
Pulse Response

V^+/V^-=±15V, Gv=0dB, C_L=10pF, R_L=2kΩ, Ta=25°C



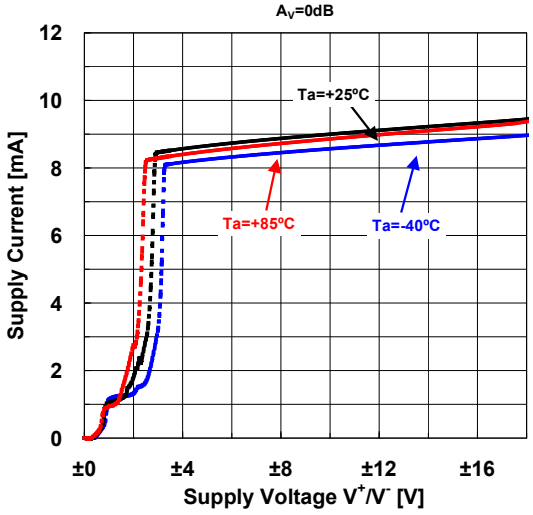
Slew Rate vs. Temperature

V^+/V^-=±15V, V_{IN}=2V_{P-P}, f=100kHz, G_V=0dB, C_L=10pF, R_L=2kΩ



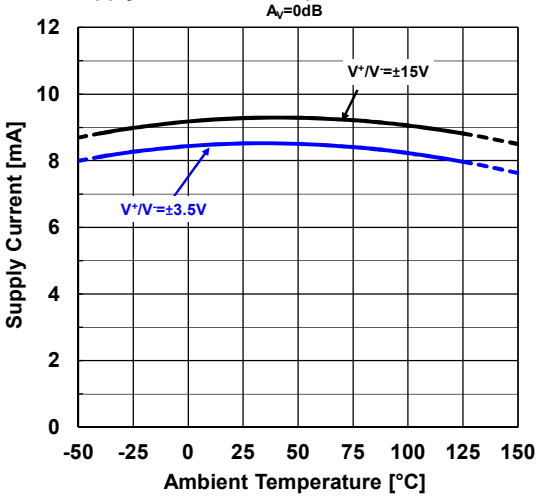
Supply Current vs. Supply Voltage (Temperature)

A_V=0dB



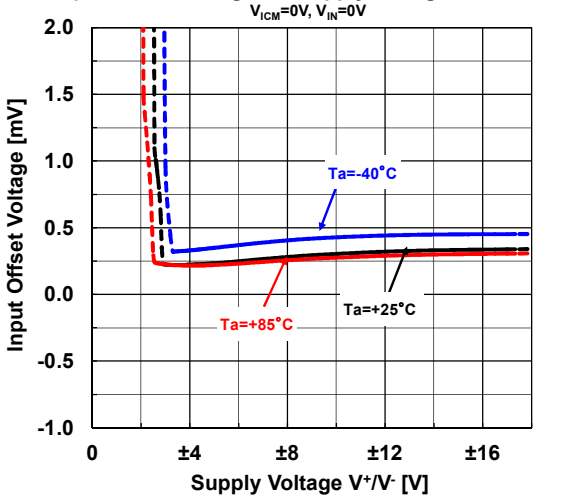
Supply Current vs. Temperature (Supply Voltage)

A_V=0dB



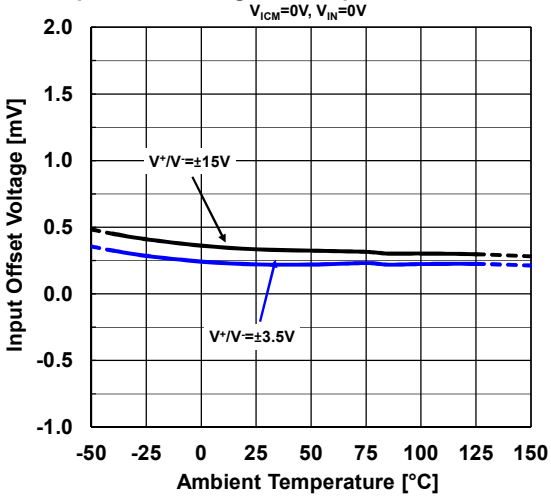
Input Offset Voltage vs. Supply Voltage (Temperature)

V_{ICM}=0V, V_{IN}=0V



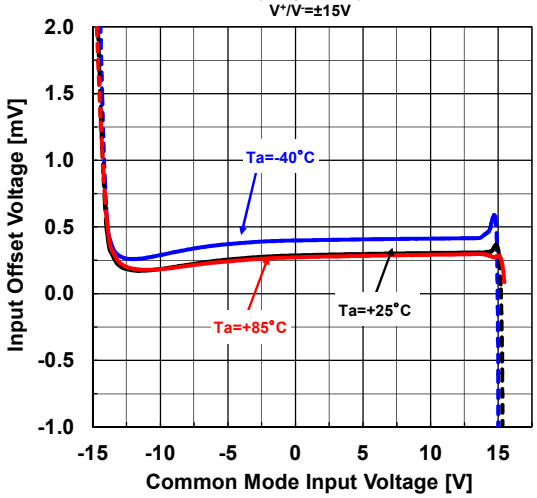
Input Offset Voltage vs. Temperature (Supply Voltage)

V_{ICM}=0V, V_{IN}=0V

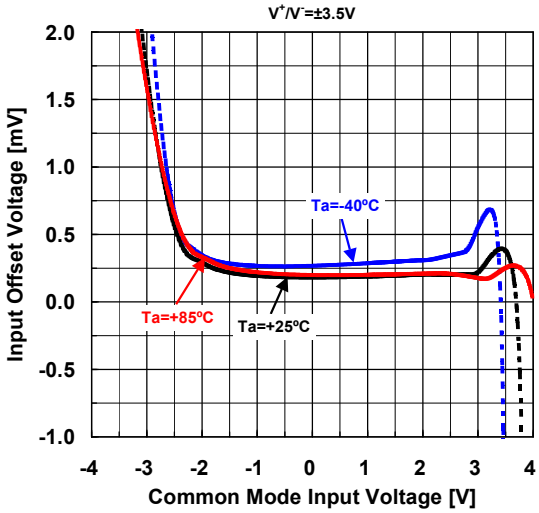


■ TYPICAL CARACTERISTICS

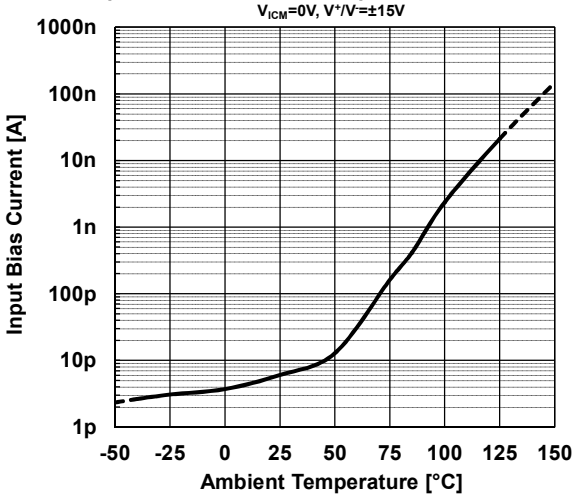
Input Offset Voltage
vs. Common Mode Input Voltage
(Temperature)
V^+/V^-=±15V



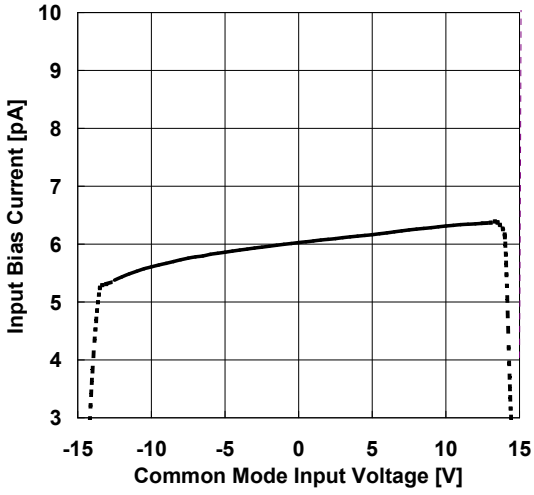
Input Offset Voltage
vs. Common Mode Input Voltage
(Temperature)
V^+/V^-=±3.5V



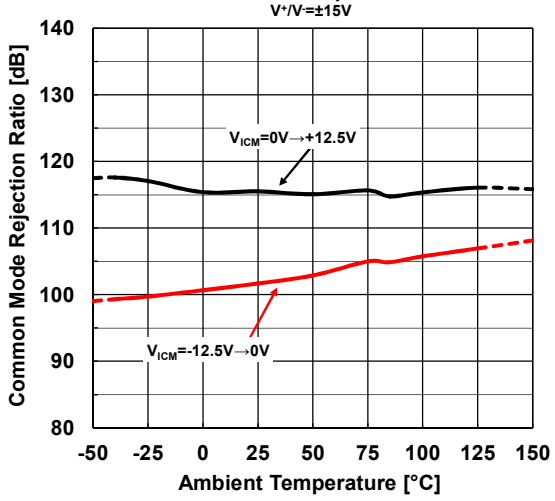
Input Bias Current vs. Temperature (Supply Voltage)
V_{ICM}=0V, V^+/V^-=±15V



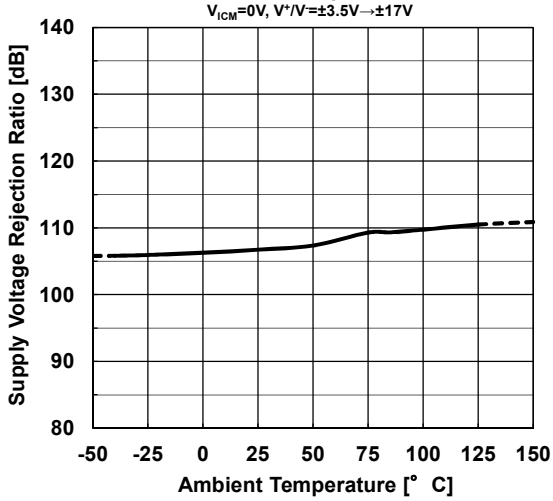
Input Bias Current vs. Common Mode Input Voltage
(Temperature)
V^+/V^-=±15V, Ta=25°C



CMR vs. Temperature
V^+/V^-=±15V



SVR vs. Temperature
V_{ICM}=0V, V^+/V^-=±3.5V→±17V



■ TYPICAL CARACTERISTICS