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Operational Amplifiers

Low Noise Operational Amplifiers

BA4560xxx BA4560Rxxx BA4564RFV BA4564WVF

General Description

BA4560xxx for normal grade and BA4560Rxxx, BA4564RFV, BA4564WVF for high-reliability grade integrate two or four high voltage gain Op-Amps on a single chip. Especially, this series is suitable for any audio applications due to low noise and low distortion characteristics and they are usable for other many applications of wide operating supply voltage range. BA4560Rxxx, BA4564RFV, BA4564WVF are high-reliability products with extended operating temperature range.

Features

- High Voltage Gain, Low Noise, Low Distortion
- Wide Operating Supply Voltage Range
- Wide Operating Temperature Range

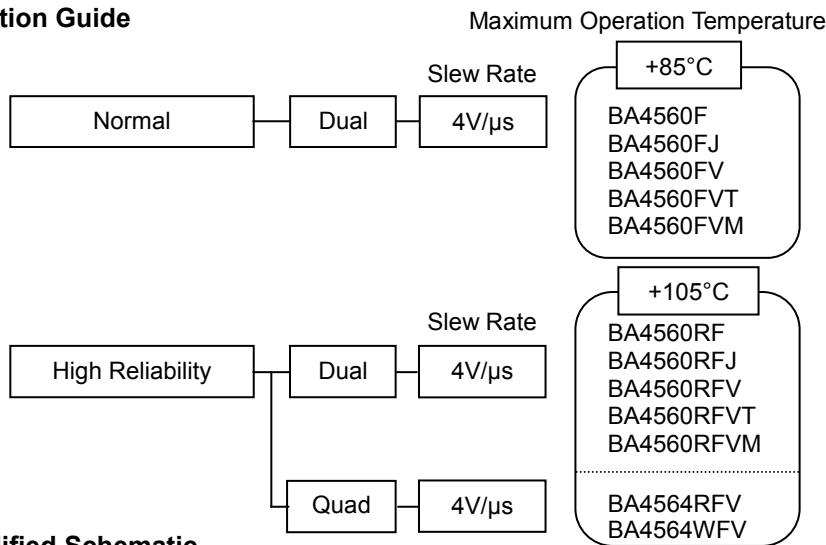
Packages

Packages	W(Typ) x D(Typ) x H(Max)
SOP8	5.00mm x 6.20mm x 1.71mm
SOP-J8	4.90mm x 6.00mm x 1.65mm
TSSOP-B8	3.00mm x 6.40mm x 1.20mm
MSOP8	2.90mm x 4.00mm x 0.90mm
SOP14	8.70mm x 6.20mm x 1.71mm
SSOP-B14	5.00mm x 6.40mm x 1.35mm

Key Specification

- Operating Supply Voltage (Split Supply): ±4V to ±15V
- Temperature Range:
 - BA4560xxx -40°C to +85°C
 - BA4560Rxxx, BA4564RFV, BA4564WVF -40°C to +105°C
- Slew Rate: 4V/μs(Typ)
- Total Harmonic Distortion: 0.003%(Typ)
- Input Referred Noise Voltage: 8 nV/√Hz (Typ)
- Offset Voltage: BA4564WVF 2.5mV(Max)

Selection Guide



Simplified Schematic

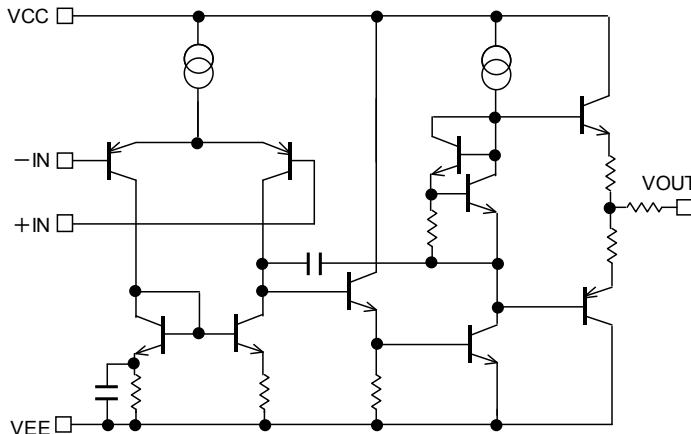
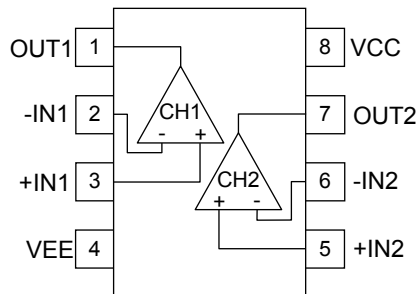


Figure 1. Simplified Schematic

○Product structure : Silicon monolithic integrated circuit ○This product is not designed protection against radioactive rays.

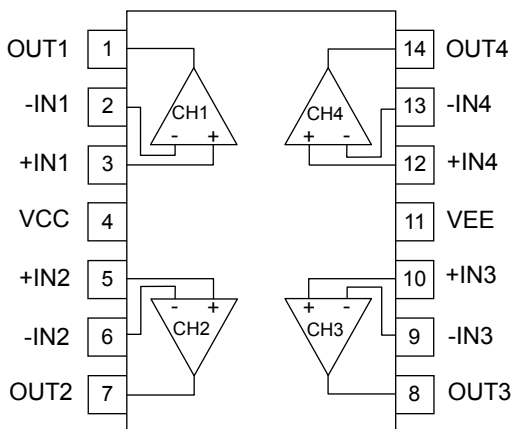
Pin Configuration

BA4560F, BA4560RF : SOP8
 BA4560FJ, BA4560RFJ : SOP-J8
 BA4560FV, BA4560RFV : SSOP-B8
 BA4560FVT, BA4560RFVT : TSSOP-B8
 BA4560FVM, BA4560RFVM : MSOP8



Pin No.	Pin Name
1	OUT1
2	-IN1
3	+IN1
4	VEE
5	+IN2
6	-IN2
7	OUT2
8	VCC

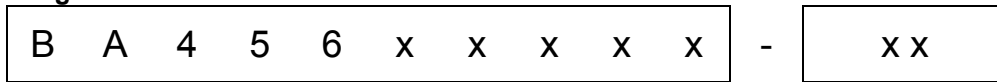
BA4564RFV, BA4564WFV : SSOP-B14



Pin No.	Pin Name
1	OUT1
2	-IN1
3	+IN1
4	VCC
5	+IN2
6	-IN2
7	OUT2
8	OUT3
9	-IN3
10	+IN3
11	VEE
12	+IN4
13	-IN4
14	OUT4

Package					
SOP8	SOP-J8	SSOP-B8	TSSOP-B8	MSOP8	SSOP-B14
BA4560F BA4560RF	BA4560FJ BA4560RFJ	BA4560FV BA4560RFV	BA4560FVT BA4560RFVT	BA4560FVM BA4560RFVM	BA4564RFV BA4564WFV

Ordering Information



Part Number
 BA4560xxx
 BA4560Rxxx
 BA4564RFV
 BA4560WV

Package
 F : SOP8
 FJ : SOP-J8
 FV : SSOP-B8
 : SSOP-B14
 FVM : MSOP8
 FVT : TSSOP-B8

Packaging and forming specification
 E2: Embossed tape and reel
 (SOP8/SSOP-B8/TSSOP-B8/SOP-J8
 SSOP-B14)
 TR: Embossed tape and reel
 (MSOP8)

Line-up

Operating Temperature Range	Operating Supply Voltage (Split Supply)	Supply Current (Typ)	Offset Voltage (Max)	Package		Orderable Part Number					
-40°C to +85°C	±4.0V to ±15.0V	4mA	6mV	SOP8	Reel of 2500	BA4560F-E2					
				SOP-J8	Reel of 2500	BA4560FJ-E2					
				SSOP-B8	Reel of 2500	BA4560FV-E2					
				TSSOP-B8	Reel of 2500	BA4560FVT-E2					
				MSOP8	Reel of 3000	BA4560FVM-TR					
-40°C to +105°C				3mA		SOP8	Reel of 2500	BA4560RF-E2			
						SOP-J8	Reel of 2500	BA4560RFJ-E2			
						SSOP-B8	Reel of 2500	BA4560RFV-E2			
						TSSOP-B8	Reel of 3000	BA4560RFVT-E2			
				6mA				MSOP8	Reel of 3000	BA4560RFVM-TR	
	SSOP-B14		Reel of 2500					BA4564RFV-E2			
	2.5mV								SSOP-B14	Reel of 2500	BA4564WV-E2

Absolute Maximum Ratings ($T_A=25^\circ\text{C}$)

Parameter	Symbol	Ratings				Unit	
		BA4560xxx	BA4560Rxxx	BA4564RFV	BA4564WV		
Supply Voltage	VCC-VEE	+36				V	
Power Dissipation	P_D	SOP8	0.55 ^(Note1,6)	0.69 ^(Note1,6)	-	-	W
		SOP-J8	0.54 ^(Note2,6)	0.67 ^(Note2,6)	-	-	
		SSOP-B8	0.50 ^(Note3,6)	0.62 ^(Note3,6)	-	-	
		TSSOP-B8	0.50 ^(Note3,6)	0.62 ^(Note3,6)	-	-	
		MSOP8	0.47 ^(Note4,6)	0.58 ^(Note4,6)	-	-	
		SSOP-B14	-	-	0.87 ^(Note5,6)	0.87 ^(Note5,6)	
Differential Input Voltage ^(Note 7)	V_{ID}	VCC-VEE	+36			V	
Input Common-mode Voltage Range	V_{ICM}	VEE to VCC	(VEE-0.3) to VEE+36			V	
Input Current ^(Note 8)	I_I	-10				mA	
Operating Supply Voltage Range	V_{opr}	+8 to +30 (± 4 to ± 15)				V	
Operating Temperature Range	T_{opr}	-40 to +85	-40 to +105			$^\circ\text{C}$	
Storage Temperature Range	T_{stg}	-55 to +125	-55 to +150			$^\circ\text{C}$	
Maximum Junction Temperature	T_{JMAX}	+125	+150			$^\circ\text{C}$	

Note: Absolute maximum rating item indicates the condition which must not be exceeded.

Application of voltage in excess of absolute maximum rating or use out absolute maximum rated temperature environment may cause deterioration of characteristics.

(Note 1) To use at temperature above $T_A=25^\circ\text{C}$ reduce 5.5mW.

(Note 2) To use at temperature above $T_A=25^\circ\text{C}$ reduce 5.4mW.

(Note 3) To use at temperature above $T_A=25^\circ\text{C}$ reduce 5.0mW.

(Note 4) To use at temperature above $T_A=25^\circ\text{C}$ reduce 4.7mW.

(Note 5) To use at temperature above $T_A=25^\circ\text{C}$ reduce 7.0mW.

(Note 6) Mounted on a FR4 glass epoxy PCB(70mm×70mm×1.6mm).

(Note 7) The voltage difference between inverting input and non-inverting input is the differential input voltage. Then input terminal voltage is set to more than VEE.

(Note 8) An excessive input current will flow when input voltages of less than VEE-0.6V are applied.

The input current can be set to less than the rated current by adding a limiting resistor.

Caution: Operating the IC over the absolute maximum ratings may damage the IC. In addition, it is impossible to predict all destructive situations such as short-circuit modes, open circuit modes, etc. Therefore, it is important to consider circuit protection measures, like adding a fuse, in case the IC is operated in a special mode exceeding the absolute maximum ratings.

Electrical Characteristics

OBA4560xxx (Unless otherwise specified VCC=+15V, VEE=-15V)

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			Min	Typ	Max		
Input Offset Voltage ^(Note 9)	V _{IO}	25°C	-	0.5	6	mV	V _{OUT} =0V
Input Offset Current ^(Note 9)	I _{IO}	25°C	-	5	200	nA	V _{OUT} =0V
Input Bias Current ^(Note 10)	I _B	25°C	-	50	500	nA	V _{OUT} =0V
Supply Current	I _{CC}	25°C	-	4	7.5	mA	R _L =∞, All Op-Amps, V _{IN+} =0V
Maximum Output Voltage	V _{OM}	25°C	±12	±14	-	V	R _L ≥ 10kΩ
		25°C	±10	±13	-		R _L ≥ 2kΩ
Large Signal Voltage Gain	A _V	25°C	86	100	-	dB	R _L ≥ 2kΩ, V _{OUT} =±10V V _{ICM} =0V
Input Common-mode Voltage Range	V _{ICM}	25°C	±12	±14	-	V	-
Common-mode Rejection Ratio	CMRR	25°C	70	90	-	dB	V _{ICM} =-12V~+12V
Power Supply Rejection Ratio	PSRR	25°C	76.3	90	-	dB	R _L ≤ 10kΩ
Slew Rate	SR	25°C	-	4	-	V/μs	A _V =0dB, R _L =2kΩ C _L =100pF
Unity Gain Frequency	f _T	25°C	-	4	-	MHz	R _L =2kΩ
Gain Band Width	GBW	25°C	-	10	-	MHz	f=10kHz
Total Harmonic Distortion+Noise	THD+N	25°C	-	0.003	-	%	A _V =20dB, R _L =2kΩ V _{IN} =0.05V _{rms} , f=1kHz
Input Referred Noise Voltage	V _N	25°C	-	8	-	nV/√Hz	R _S =100Ω, V _I =0V f=1kHz
			-	-	2.2	μV _{rms}	R _S =2.2Ω, RIAA BW=10kHz to 30kHz

(Note 9) Absolute value

(Note 10) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

OBA4560Rxxx (Unless otherwise specified VCC=+15V, VEE=-15V, Full range -40°C to +105°C)

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			Min	Typ	Max		
Input Offset Voltage ^(Note 11)	V _{IO}	25°C	-	0.5	6	mV	V _{OUT} =0V
		Full range	-	-	7		
Input Offset Current ^(Note 11)	I _{IO}	25°C	-	5	200	nA	V _{OUT} =0V
		Full range	-	-	200		
Input Bias Current ^(Note 12)	I _B	25°C	-	50	500	nA	V _{OUT} =0V
		Full range	-	-	800		
Supply Current	I _{CC}	25°C	-	3	7	mA	R _L =∞, All Op-Amps V _{IN} + =0V
		Full range	-	-	7.5		
Maximum Output Voltage	V _{OM}	25°C	±12	±14	-	V	R _L ≥ 2kΩ
		Full range	±10	±11.5	-		I _O =25mA
Large Signal Voltage Gain	A _V	25°C	86	100	-	dB	R _L ≥ 2kΩ, V _{OUT} =±10V V _{ICM} =0V
		Full range	83	-	-		
Input Common-mode Voltage Range	V _{ICM}	25°C	±12	±14	-	V	-
		Full range	±12	-	-		
Common-mode Rejection Ratio	CMRR	25°C	70	90	-	dB	V _{ICM} =-12V~+12V
Power Supply Rejection Ratio	PSRR	25°C	76.5	90	-	dB	R _L ≤ 10kΩ
Channel Separation	CS	25°C	-	105	-	dB	R ₁ =100Ω, f=1kHz
Slew Rate	SR	25°C	-	4	-	V/μs	A _V =0dB, R _L =2kΩ C _L =100pF
Unity Gain Frequency	f _T	25°C	-	4	-	MHz	R _L =2kΩ
Total Harmonic Distortion+Noise	THD+N	25°C	-	0.003	-	%	A _V =20dB, R _L =2kΩ V _{IN} =0.05V _{rms} , f=1kHz
Input Referred Noise Voltage	V _N	25°C	-	8	-	nV/√Hz	R _S =100Ω, V _I =0V f=1kHz
			-	1.0	-	μV _{rms}	DIN-AUDIO

(Note 11) Absolute value

(Note 12) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

OBA4564RFV (Unless otherwise specified VCC=+15V, VEE=-15V, Full range -40°C to +105°C)

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			Min	Typ	Max		
Input Offset Voltage ^(Note 13)	V _{IO}	25°C	-	0.5	6	mV	V _{OUT} =0V
		Full range	-	-	7		
Input Offset Current ^(Note 13)	I _{IO}	25°C	-	5	200	nA	V _{OUT} =0V
		Full range	-	-	200		
Input Bias Current ^(Note 14)	I _B	25°C	-	50	500	nA	V _{OUT} =0V
		Full range	-	-	800		
Supply Current	I _{CC}	25°C	-	6	14	mA	R _L =∞, All Op-Amps V _{IN+} =0V
		Full range	-	-	15		
Maximum Output Voltage	V _{OM}	25°C	±12	±14	-	V	R _L ≥ 2kΩ
		Full range	±10	±11.5	-		I _O =25mA
Large Signal Voltage Gain	A _V	25°C	86	100	-	dB	R _L ≥ 2kΩ, V _{OUT} =±10V V _{ICM} =0V
		Full range	83	-	-		
Input Common-mode Voltage Range	V _{ICM}	25°C	±12	±14	-	V	-
		Full range	±12	-	-		
Common-mode Rejection Ratio	CMRR	25°C	70	90	-	dB	V _{ICM} =-12V~+12V
Power Supply Rejection Ratio	PSRR	25°C	76.5	90	-	dB	R _L ≤ 10kΩ
Channel Separation	CS	25°C	-	105	-	dB	R ₁ =100Ω, f=1kHz
Slew Rate	SR	25°C	-	4	-	V/μs	A _V =0dB, R _L =2kΩ C _L =100pF
Unity Gain Frequency	f _T	25°C	-	4	-	MHz	R _L =2kΩ
Total Harmonic Distortion+Noise	THD+N	25°C	-	0.003	-	%	A _V =20dB, R _L =2kΩ V _{IN} =0.05V _{rms} , f=1kHz
Input Referred Noise Voltage	V _N	25°C	-	8	-	nV/√Hz	R _S =100Ω, V _I =0V f=1kHz
			-	1.0	-	μV _{rms}	DIN-AUDIO

(Note 13) Absolute value

(Note 14) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

OBA4564WFV (Unless otherwise specified VCC=+15V, VEE=-15V, Full range -40°C to +105°C)

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4564WFV				
			Min	Typ	Max		
Input Offset Voltage ^(Note 15)	V _{IO}	25°C	-	0.5	2.5	mV	V _{OUT} =0V
		Full range	-	-	4		
Input Offset Current ^(Note 15)	I _{IO}	25°C	-	5	200	nA	V _{OUT} =0V
		Full range	-	-	200		
Input Bias Current ^(Note 16)	I _B	25°C	-	50	300	nA	V _{OUT} =0V
		Full range	-	-	500		
Supply Current	I _{CC}	25°C	-	6	11	mA	R _L =∞, All Op-Amps V _{IN} =0V
		Full range	-	-	13		
Maximum Output Voltage	V _{OM}	25°C	±12	±14	-	V	R _L ≥ 2kΩ I _O =25mA
		Full range	±10	±11.5	-		
Large Signal Voltage Gain	A _V	25°C	86	100	-	dB	R _L ≥ 2kΩ, V _{OUT} =±10V V _{ICM} =0V
		Full range	83	-	-		
Input Common-mode Voltage Range	V _{ICM}	25°C	±12	±14	-	V	-
		Full range	±12	-	-		
Common-mode Rejection Ratio	CMRR	25°C	70	90	-	dB	V _{ICM} =-12V~+12V
Power Supply Rejection Ratio	PSRR	25°C	76.5	90	-	dB	R _I ≤ 10kΩ
Channel Separation	CS	25°C	-	105	-	dB	R ₁ =100Ω, f=1kHz
Slew Rate	SR	25°C	-	4	-	V/μs	A _V =0dB, R _L =2kΩ C _L =100pF
Unity Gain Frequency	f _T	25°C	-	4	-	MHz	R _L =2kΩ
Total Harmonic Distortion+Noise	THD+N	25°C	-	0.003	-	%	A _V =20dB, R _L =2kΩ V _{IN} =0.05V _{rms} , f=1kHz
Input Referred Noise Voltage	V _N	25°C	-	8	-	nV/√Hz	R _S =100Ω, V _I =0V f=1kHz
			-	1.0	-	μV _{rms}	DIN-AUDIO

(Note 15) Absolute value

(Note 16) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

Description of electrical characteristics

Described here are the terms of electric characteristics used in this datasheet. Items and symbols used are also shown. Note that item name and symbol and their meaning may differ from those on another manufacture's document or general document.

1. Absolute maximum ratings

Absolute maximum rating item indicates the condition which must not be exceeded. Application of voltage in excess of absolute maximum rating or use out of absolute maximum rated temperature environment may cause deterioration of characteristics.

1.1 Power supply voltage (VCC-VEE)

Indicates the maximum voltage that can be applied between the positive power supply terminal and negative power supply terminal without deterioration or destruction of characteristics of internal circuit.

1.2 Differential input voltage (V_{ID})

Indicates the maximum voltage that can be applied between non-inverting terminal and inverting terminal without deterioration and destruction of characteristics of IC.

1.3 Input common-mode voltage range (V_{ICM})

Indicates the maximum voltage that can be applied to non-inverting terminal and inverting terminal without deterioration or destruction of characteristics. Input common-mode voltage range of the maximum ratings not assure normal operation of IC. When normal operation of IC is desired, the input common-mode voltage of characteristics item must be followed.

1.4 Power dissipation (P_D)

Indicates the power that can be consumed by specified mounted board at the ambient temperature 25°C(normal temperature). As for package product, P_D is determined by the temperature that can be permitted by IC chip in the package (maximum junction temperature)and thermal resistance of the package.

2. Electrical characteristics item**2.1 Input offset voltage (V_{IO})**

Indicates the voltage difference between non-inverting terminal and inverting terminal. It can be translated into the input voltage difference required for setting the output voltage at 0 V .

2.2 Input offset current (I_{IO})

Indicates the difference of input bias current between non-inverting terminal and inverting terminal.

2.3 Input bias current (I_B)

Indicates the current that flows into or out of the input terminal. It is defined by the average of input bias current at non-inverting terminal and input bias current at inverting terminal.

2.4 Input common-mode voltage range(V_{ICM})

Indicates the input voltage range where IC operates normally.

2.5 Large signal voltage gain (A_V)

Indicates the amplifying rate (gain) of output voltage against the voltage difference between non-inverting terminal and Inverting terminal. It is normally the amplifying rate (gain) with reference to DC voltage.
 $A_V = (\text{Output voltage fluctuation}) / (\text{Input offset fluctuation})$

2.6 Circuit current (I_{CC})

Indicates the IC current that flows under specified conditions and no-load steady status.

2.7 Output saturation voltage (V_{OM})

Signifies the voltage range that can be output under specific output conditions.

2.8 Common-mode rejection ratio (CMRR)

Indicates the ratio of fluctuation of input offset voltage when in-phase input voltage is changed. It is normally the fluctuation of DC.

$$\text{CMRR} = (\text{Change of Input common-mode voltage}) / (\text{Input offset fluctuation})$$

2.9 Power supply rejection ratio (PSRR)

Indicates the ratio of fluctuation of input offset voltage when supply voltage is changed. It is normally the fluctuation of DC.

$$\text{PSRR} = (\text{Change of power supply voltage}) / (\text{Input offset fluctuation})$$

2.10 Unity gain frequency (ft)

Indicates a frequency where the voltage gain of operational amplifier is 1.

2.11 Slew Rate (SR)

SR is a parameter that shows movement speed of operational amplifier. It indicates rate of variable output voltage as unit time.

2.12 Gain Band Width (GBW)

Indicates to multiply by the frequency and the gain where the voltage gain decreases 6dB/octave.

2.13 Total harmonic distortion + Noise (THD+N)

Indicates the fluctuation of input offset voltage or that of output voltage with reference to the change of output voltage of driven channel.

2.14 Input referred noise voltage (V_N)

Indicates a noise voltage generated inside the operational amplifier equivalent by ideal voltage source connected in series with input terminal.

Typical Performance Curves

OBA4560xxx

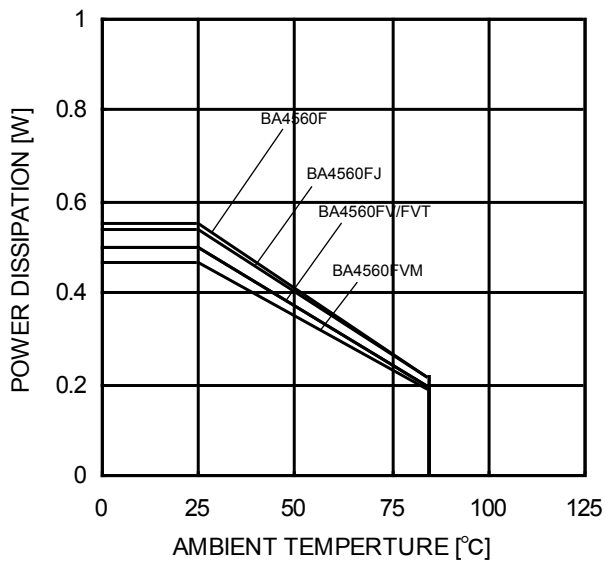


Figure 2.
Derating Curve

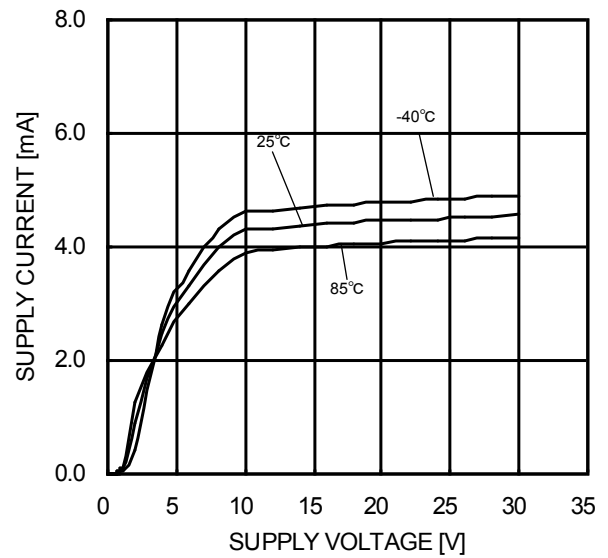


Figure 3.
Supply Current - Supply Voltage

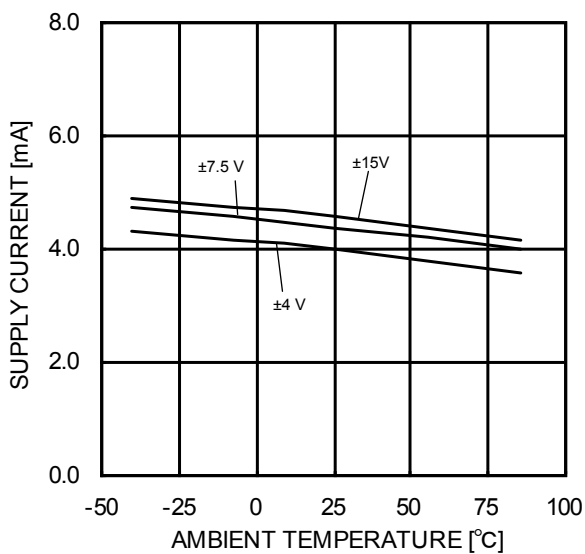


Figure 4.
Supply Current - Ambient Temperature

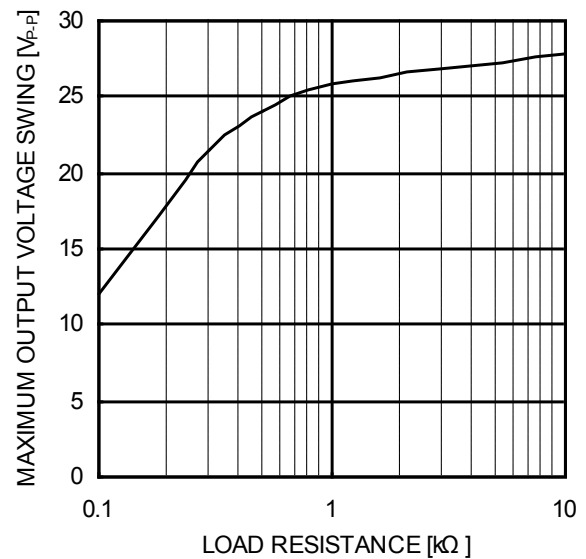


Figure 5.
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15V/-15V, T_A=25°C)

(*)The above data is measurement value of typical sample, it is not guaranteed.

OBA4560xxx

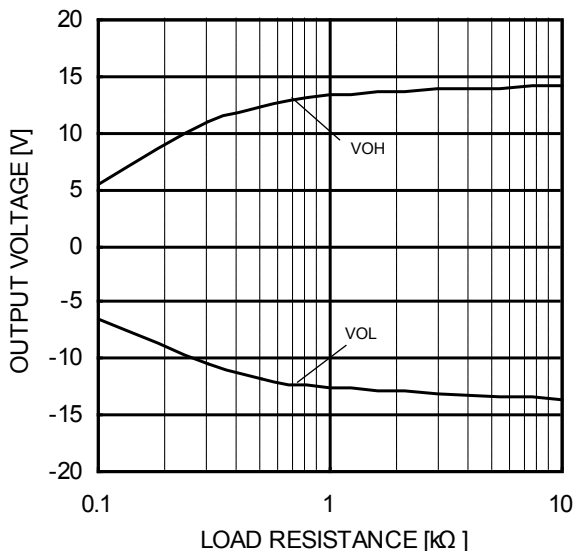


Figure 6.
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15V/-15V, T_A =25°C)

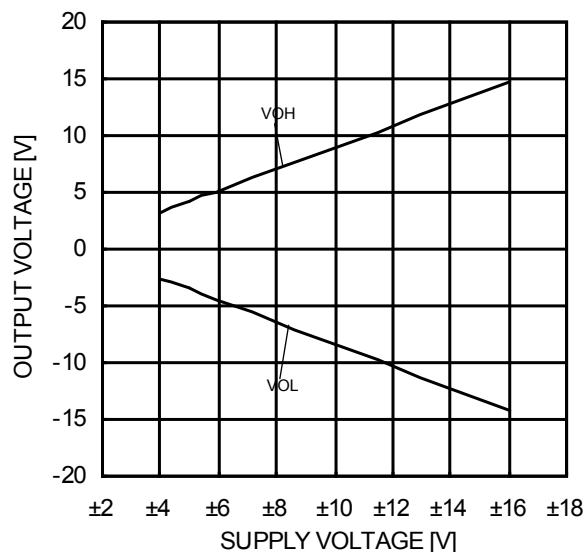


Figure 7.
Maximum Output Voltage
- Supply Voltage
(R_L=2kΩ, T_A =25°C)

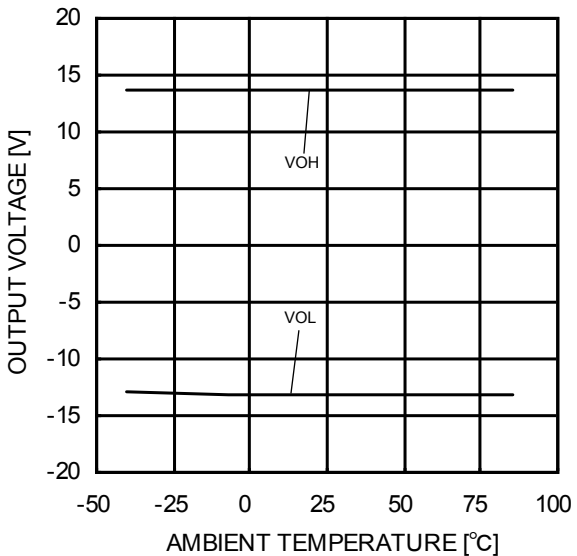


Figure 8.
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15V/-15V, R_L=2kΩ)

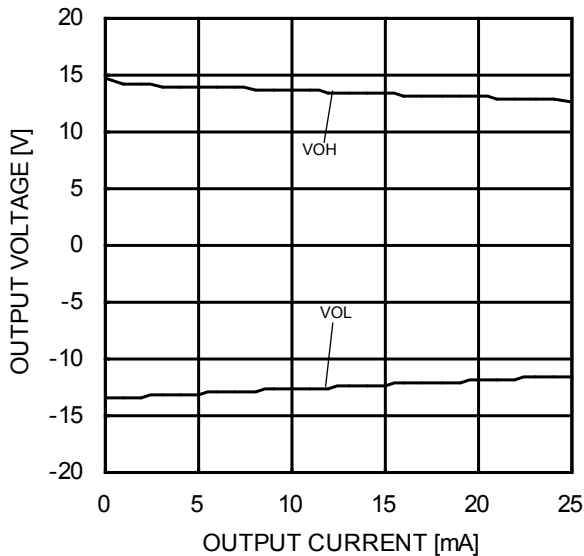


Figure 9.
Maximum Output Voltage
- Output Current
(VCC/VEE=+15V/-15V, T_A =25°C)

(*)The above data is measurement value of typical sample, it is not guaranteed.

OBA4560xxx

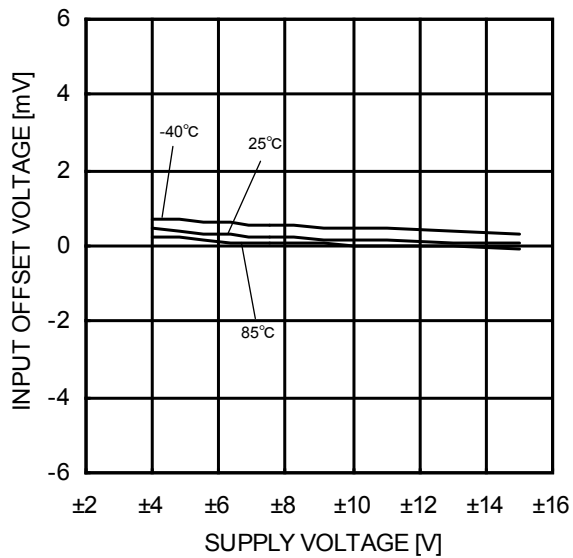


Figure 10.
Input Offset Voltage - Supply Voltage
($V_{ICM}=0V, V_{OUT}=0V$)

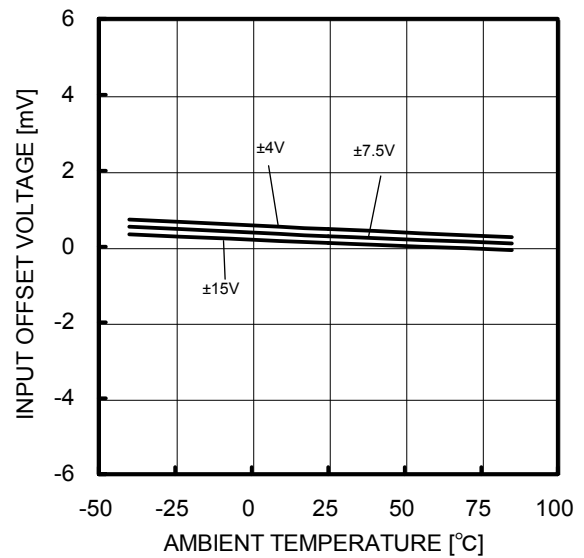


Figure 11.
Input Offset Voltage - Ambient Temperature
($V_{ICM}=0V, V_{OUT}=0V$)

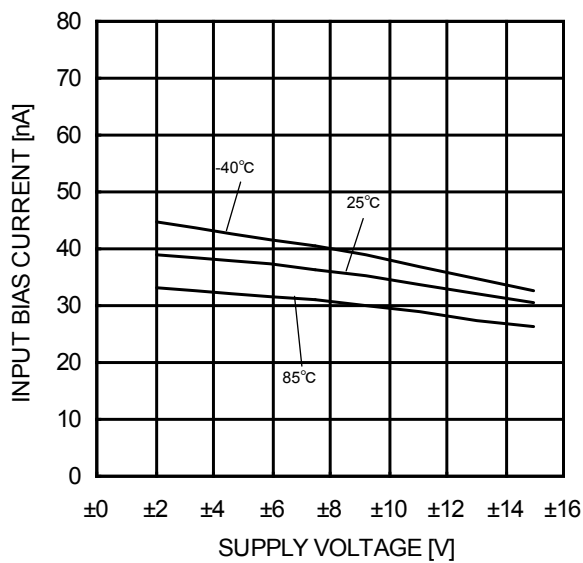


Figure 12.
Input Bias Current - Supply Voltage
($V_{ICM}=0V, V_{OUT}=0V$)

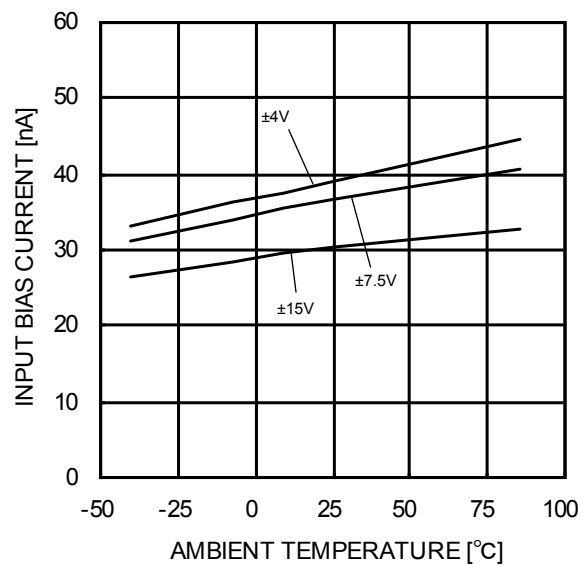


Figure 13.
Input Bias Current - Ambient Temperature
($V_{ICM}=0V, V_{OUT}=0V$)

(*The above data is measurement value of typical sample, it is not guaranteed.

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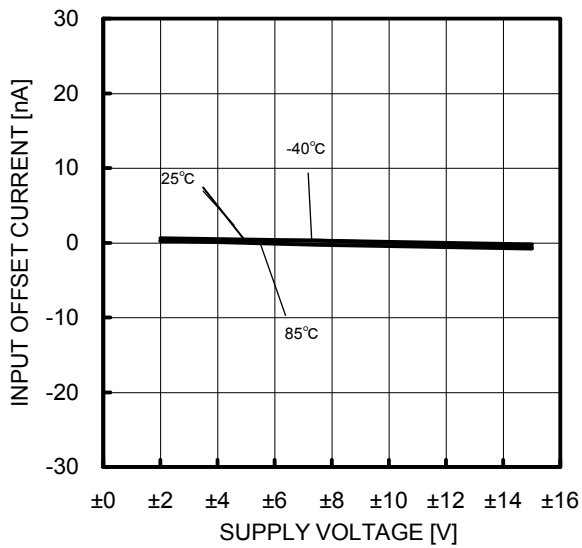


Figure 14.
Input Offset Current - Supply Voltage
($V_{ICM}=0V$, $V_{OUT}=0V$)

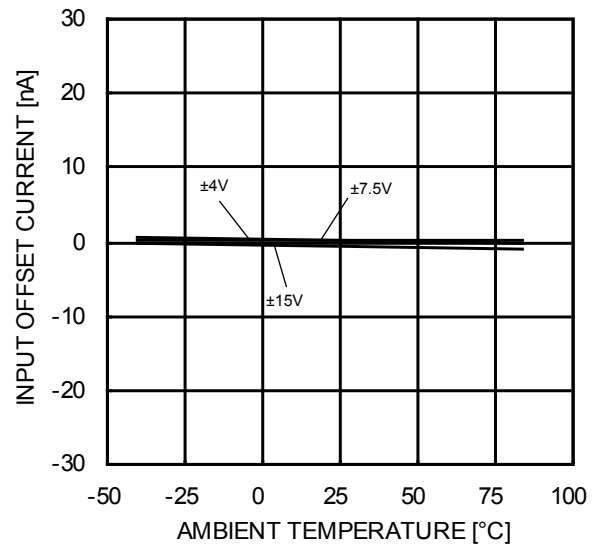


Figure 15.
Input Offset Current - Ambient Temperature
($V_{ICM}=0V$, $V_{OUT}=0V$)

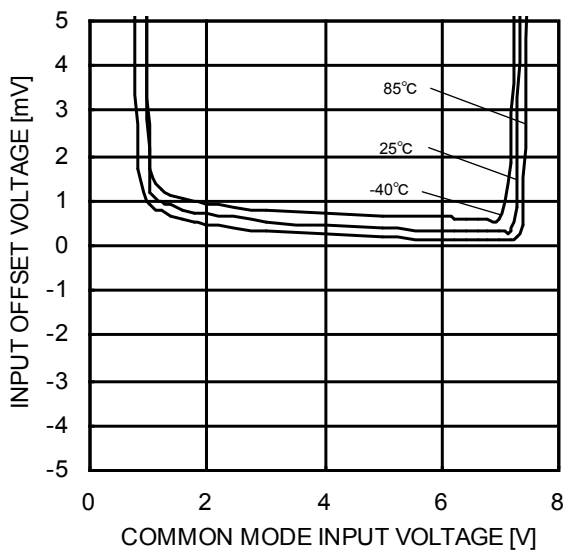


Figure 16.
Input Offset Voltage
-Common Mode Input Voltage
($V_{CC}=8V$, $V_{OUT}=4V$)

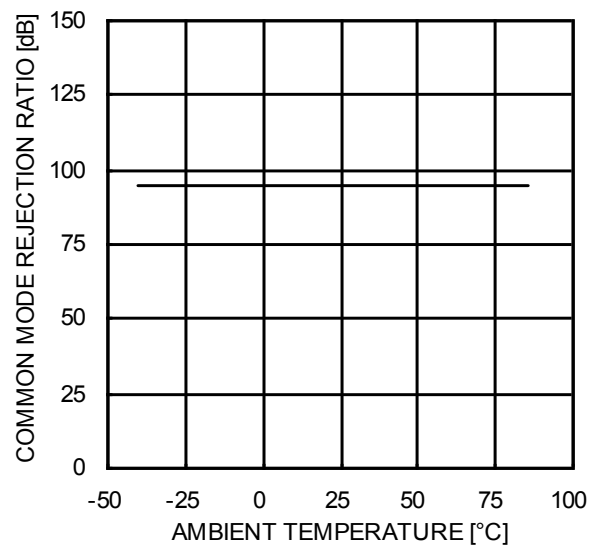


Figure 17.
Common Mode Rejection Ratio
- Ambient Temperature
($V_{CC}/V_{EE}=+15V/-15V$, $V_{ICM}=-12V$ to $+12V$)

(*)The above data is measurement value of typical sample, it is not guaranteed.

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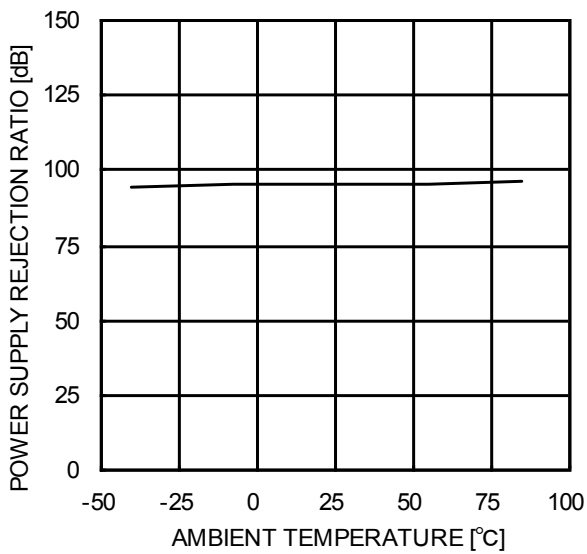


Figure 18.
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+4V/-4V to +15V/-15V)

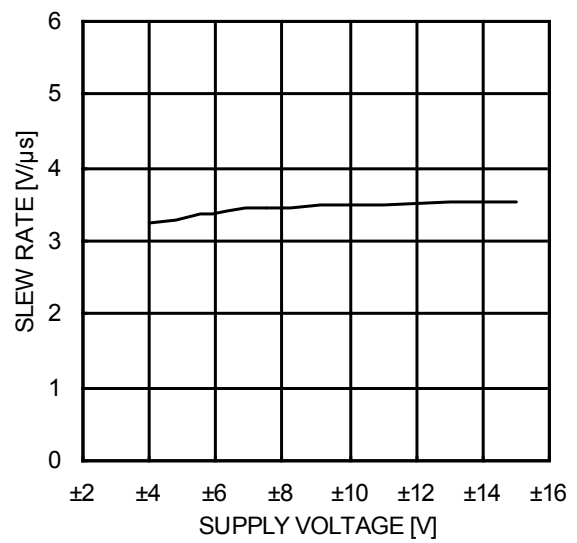


Figure 19.
Slew Rate - Supply Voltage
(C_L=100pF, R_L=2kΩ, T_A =25°C)

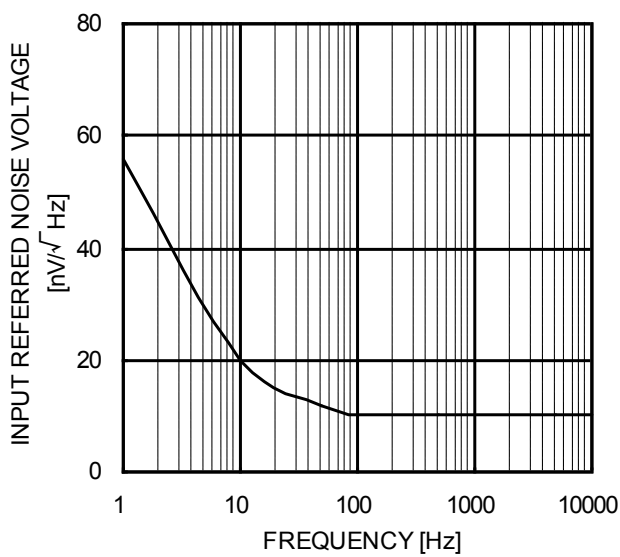


Figure 20.
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15V/-15V, R_S=100Ω, T_A =25°C)

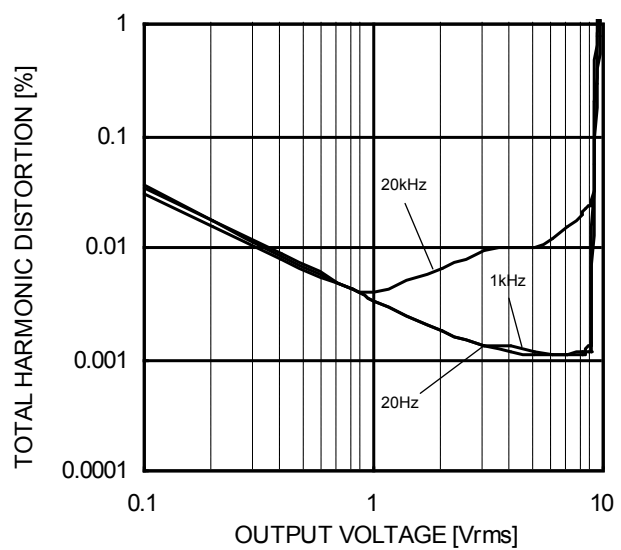


Figure 21.
Total Harmonic Distortion - Output Voltage
(VCC/VEE=+15V/-15V, A_v=20dB, R_L=2kΩ, 80kHz-LPF, T_A =25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

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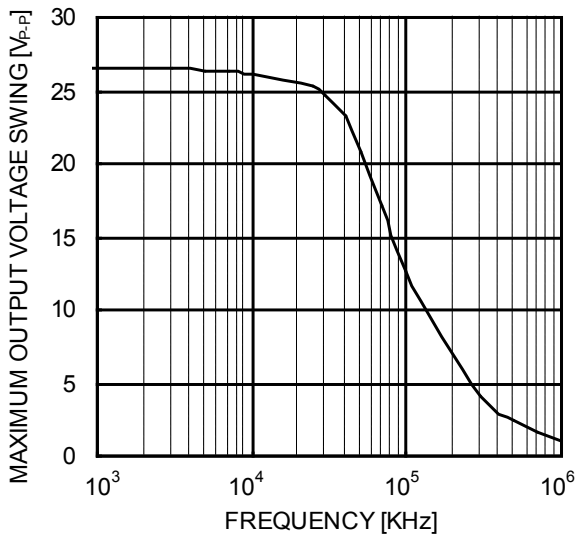


Figure 22.
Maximum Output Voltage Swing – Frequency
(VCC/VEE=+15V/-15V, R_L=2kΩ, T_A =25°C)

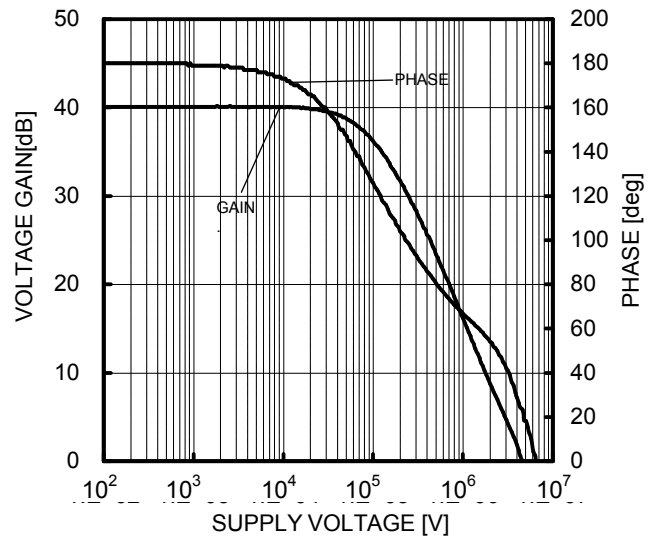


Figure 23.
Voltage Gain - Frequency
(VCC/VEE=+15V/-15V, A_v=40dB, R_L=2kΩ, T_A =25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

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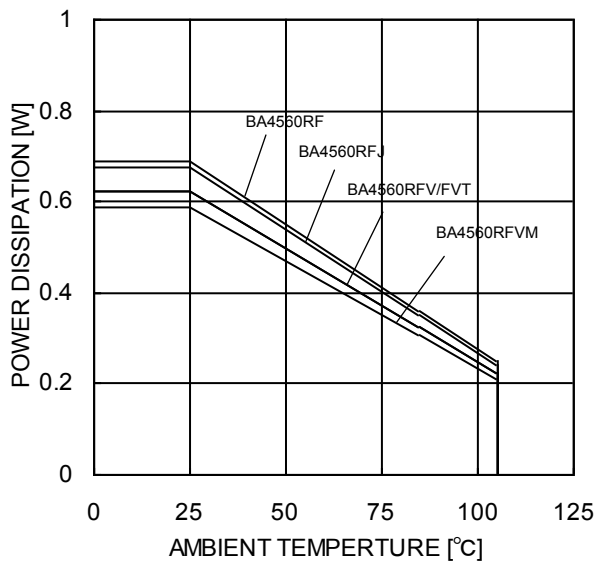


Figure 24. Derating Curve

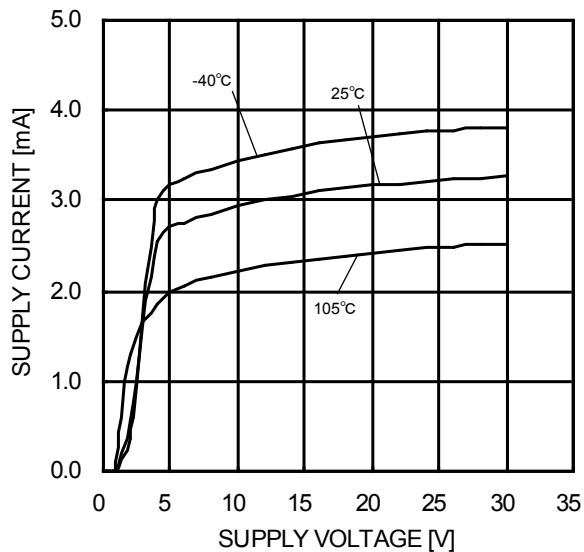


Figure 25. Supply Current - Supply Voltage

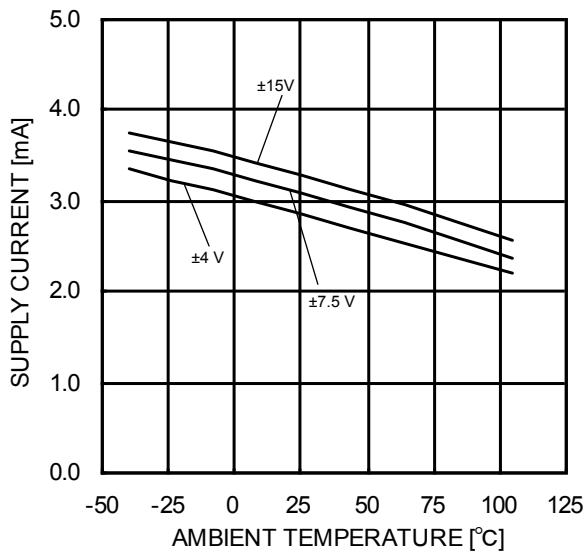


Figure 26. Supply Current - Ambient Temperature

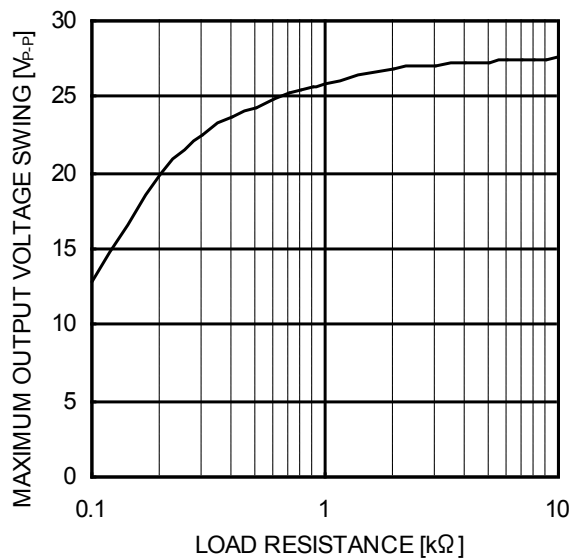


Figure 27. Maximum Output Voltage Swing - Load Resistance
(VCC/VEE=+15V/-15V, T_A =25°C)

(*)The above data is measurement value of typical sample, it is not guaranteed.

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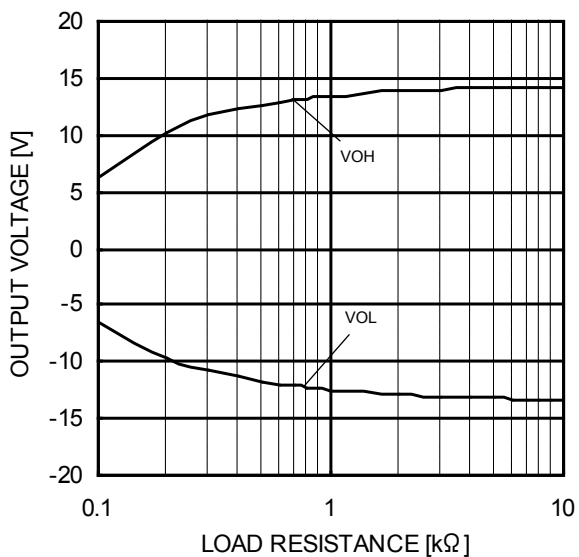


Figure 28.
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15V/-15V, T_A =25°C)

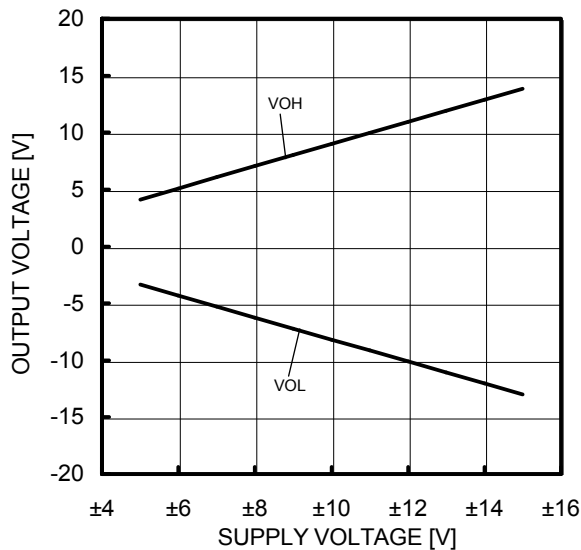


Figure 29.
Maximum Output Voltage
- Supply Voltage
(R_L=2kΩ, T_A =25°C)

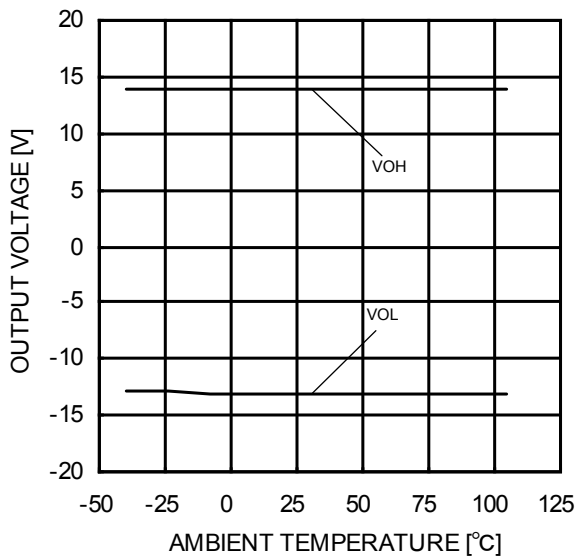


Figure 30.
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15V/-15V, R_L=2kΩ)

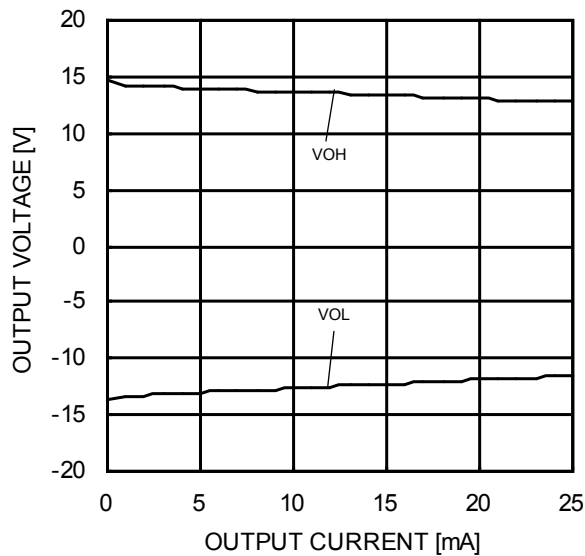


Figure 31.
Maximum Output Voltage
- Output Current
(VCC/VEE=+15V/-15V, T_A =25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

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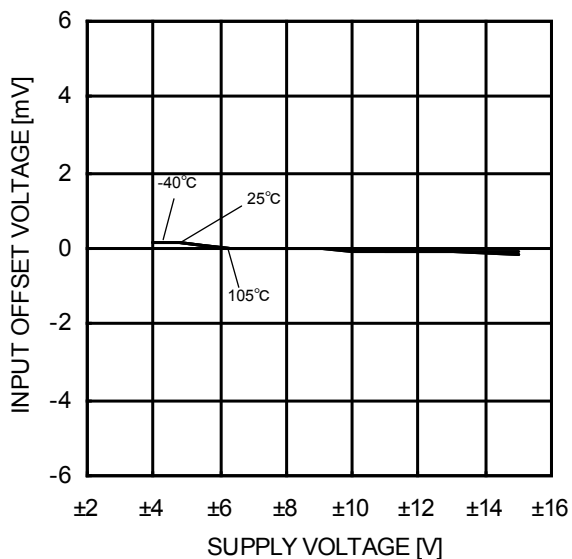


Figure 32.
Input Offset Voltage - Supply Voltage
($V_{ICM}=0V, V_{OUT}=0V$)

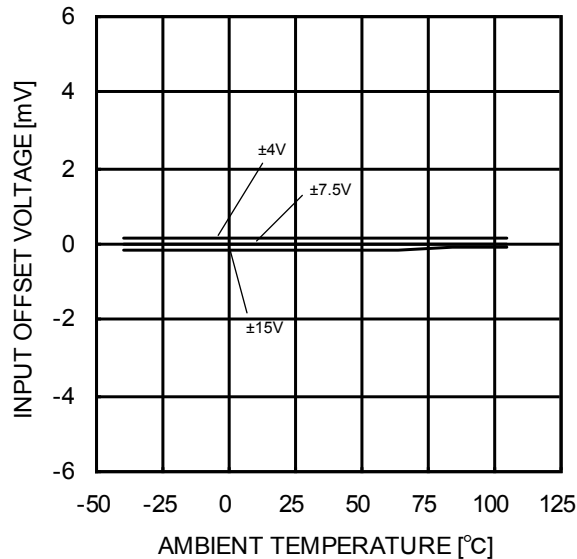


Figure 33.
Input Offset Voltage - Ambient Temperature
($V_{ICM}=0V, V_{OUT}=0V$)

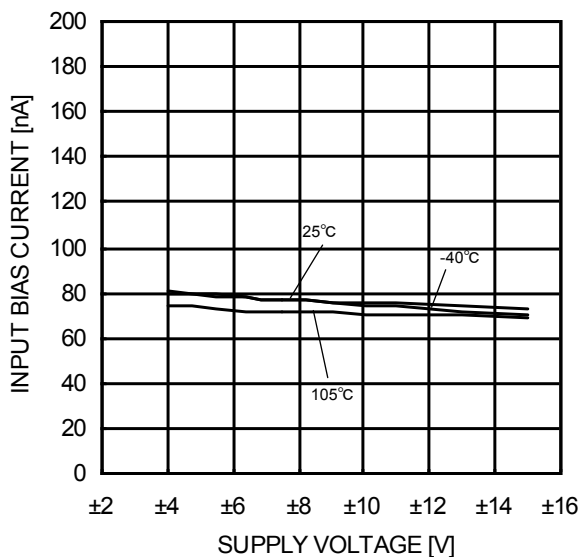


Figure 34.
Input Bias Current - Supply Voltage
($V_{ICM}=0V, V_{OUT}=0V$)

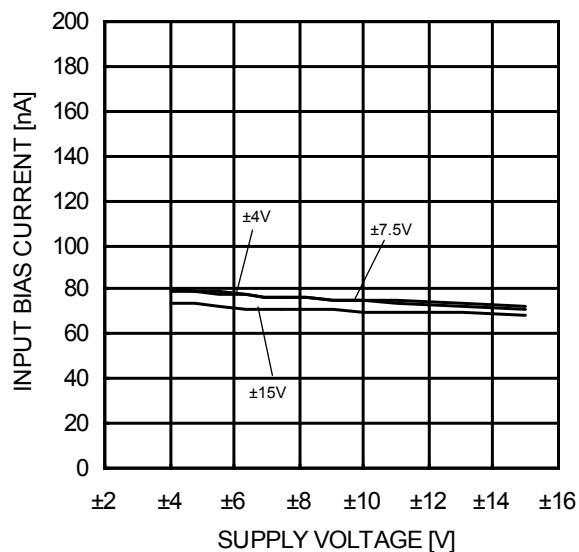


Figure 35.
Input Bias Current - Ambient Temperature
($V_{ICM}=0V, V_{OUT}=0V$)

(*The above data is measurement value of typical sample, it is not guaranteed.

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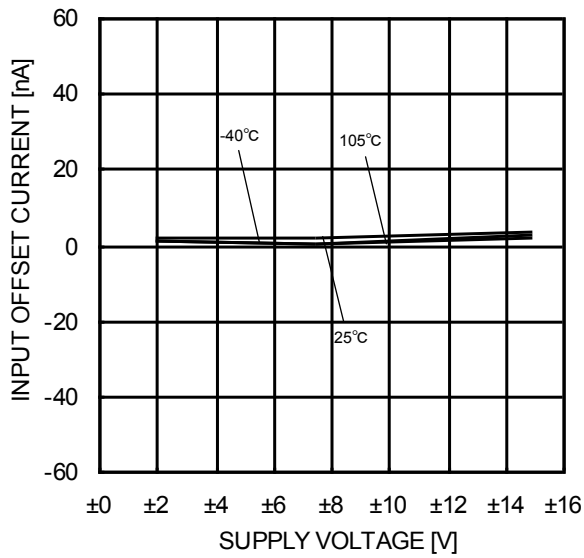


Figure 36.
Input Offset Current - Supply Voltage
($V_{ICM}=0V$, $V_{OUT}=0V$)

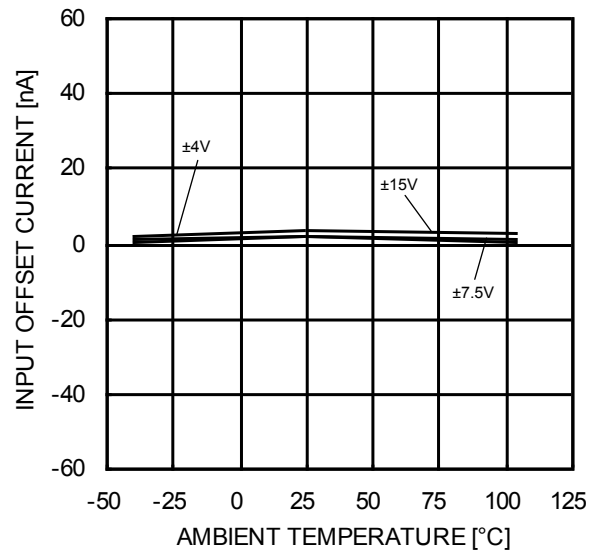


Figure 37.
Input Offset Current - Ambient Temperature
($V_{ICM}=0V$, $V_{OUT}=0V$)

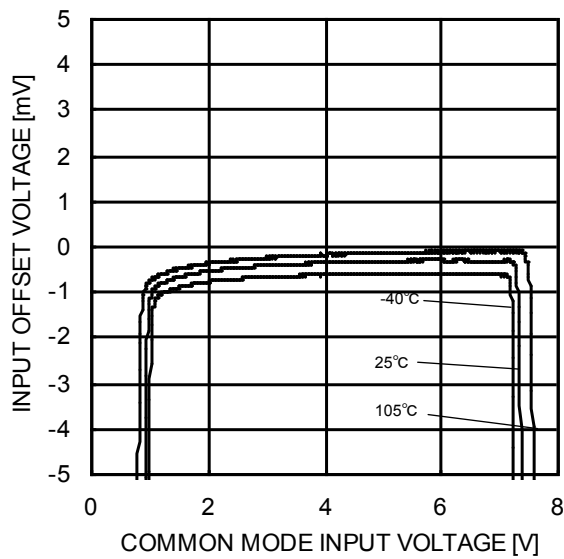


Figure 38.
Input Offset Voltage
-Common Mode Input Voltage
($V_{CC}=8V$, $V_{OUT}=4V$)

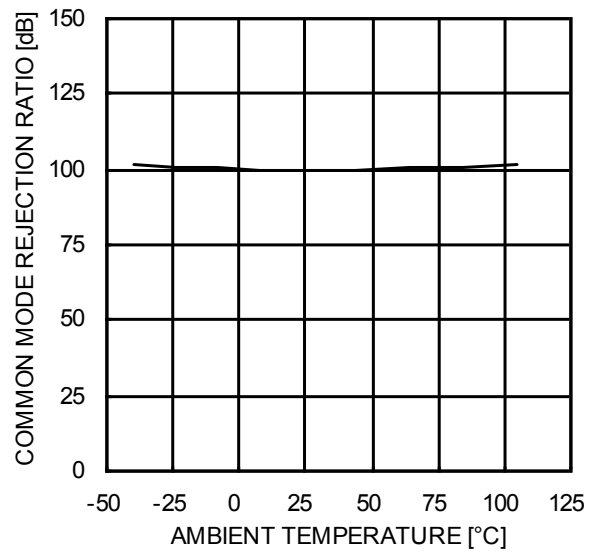


Figure 39.
Common Mode Rejection Ratio
- Ambient Temperature
($V_{CC}/V_{EE}=+15V/-15V$, $V_{ICM}=-12V$ to $+12V$)

(*The above data is measurement value of typical sample, it is not guaranteed.

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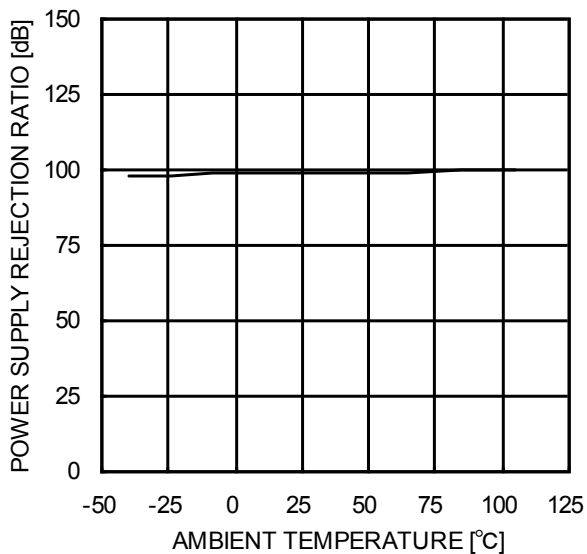


Figure 40.
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+4V/-4V to +15V/-15V)

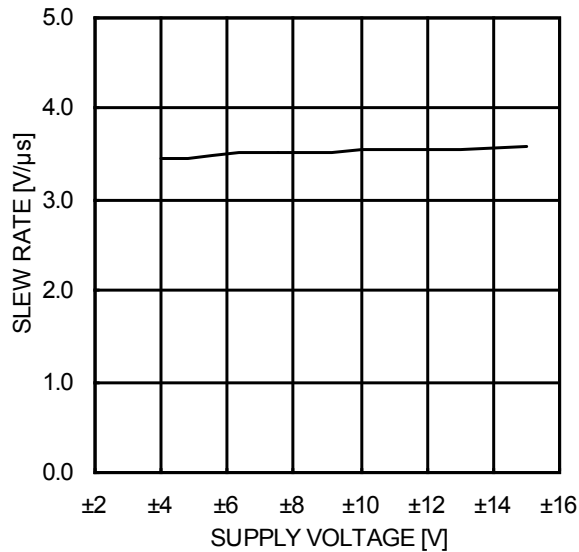


Figure 41.
Slew Rate - Supply Voltage
(C_L=100pF, R_L=2kΩ, T_A=25°C)

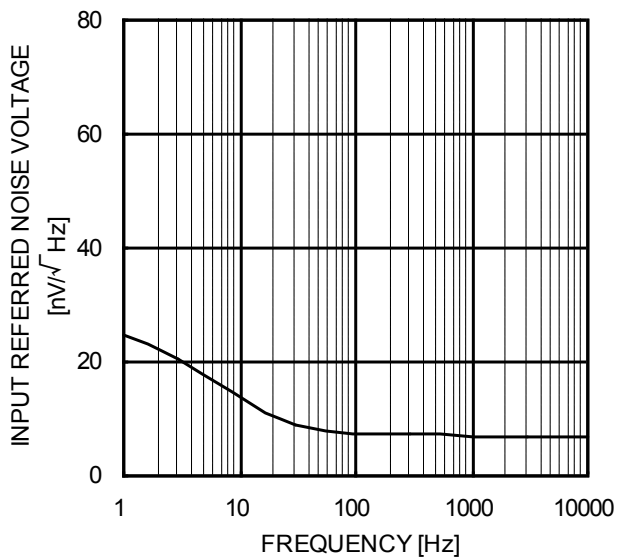


Figure 42.
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15V/-15V, R_S=100Ω, T_A=25°C)

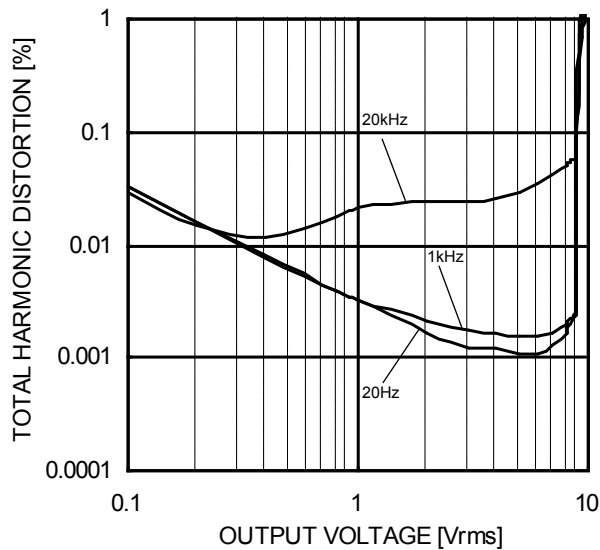


Figure 43.
Total Harmonic Distortion - Output Voltage
(VCC/VEE=+15V/-15V, A_V=20dB, R_L=2kΩ, 80kHz-LPF, T_A=25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

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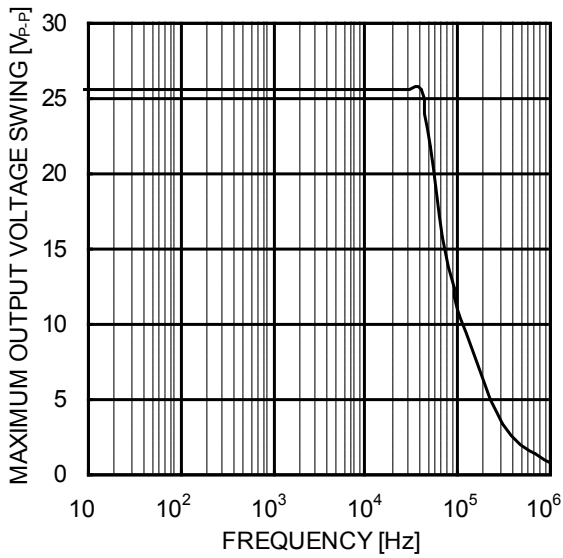


Figure 44.
Maximum Output Voltage Swing - Frequency
(VCC/VEE=+15V/-15V, R_L=2kΩ, T_A =25°C)

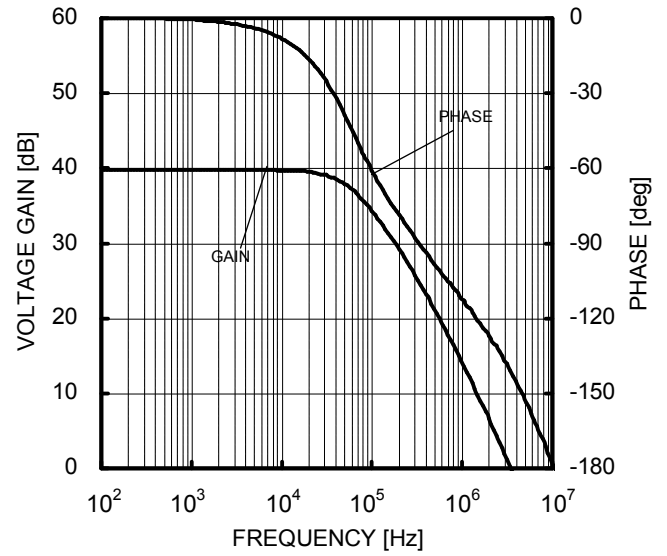


Figure 45.
Voltage Gain - Frequency (VCC/VEE=+15V/-15V,
A_V=40dB, R_L=2kΩ, T_A =25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

OBA4564RFV

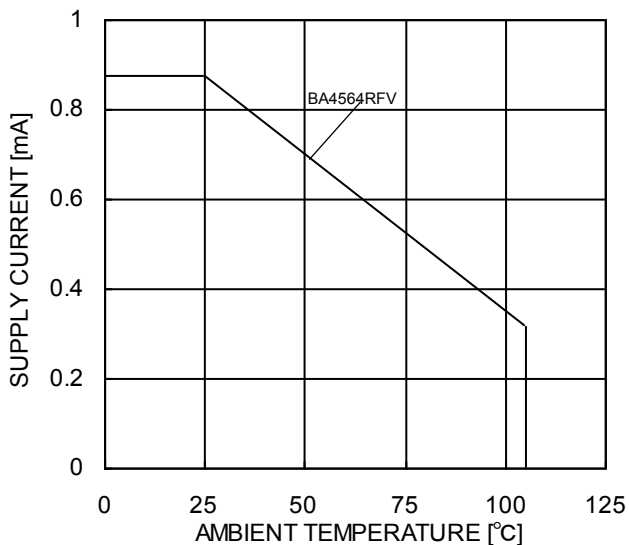


Figure 46.
Derating Curve

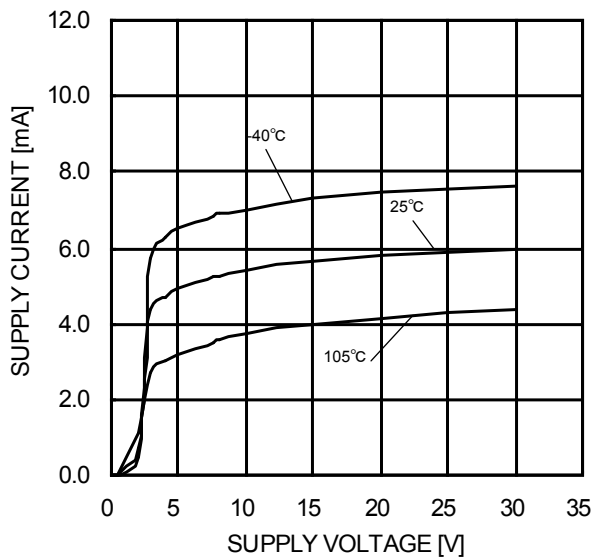


Figure 47.
Supply Current - Supply Voltage

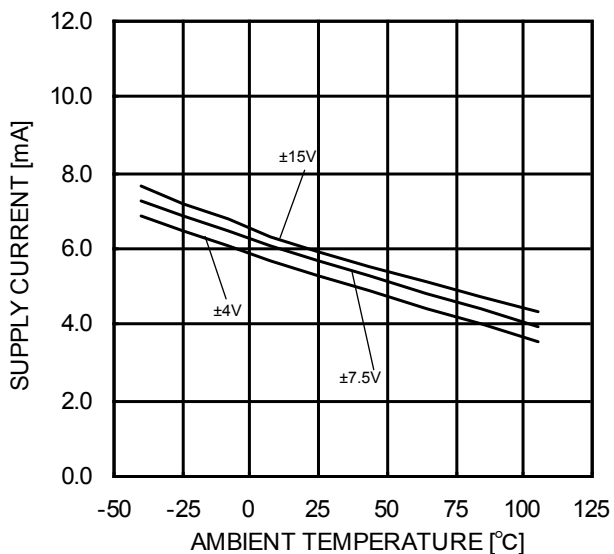


Figure 48.
Supply Current - Ambient Temperature

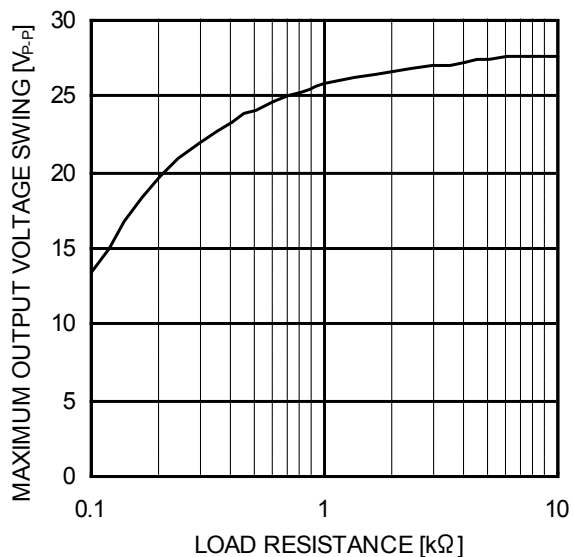


Figure 49.
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15V/-15V, T_A=25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

OBA4564RFV

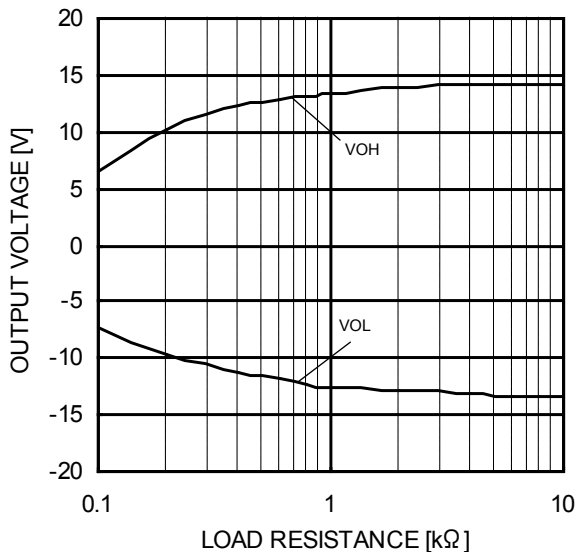


Figure 50.
Maximum Output Voltage
-Load Resistance
(VCC/VEE=+15V/-15V, T_A =25°C)

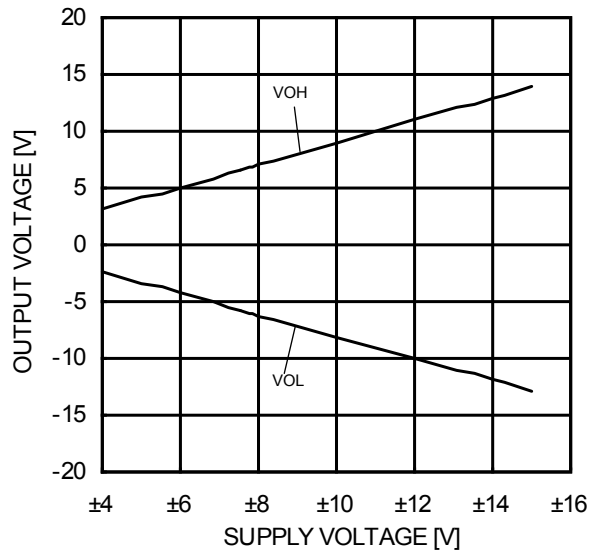


Figure 51.
Maximum Output Voltage
-Supply Voltage
(R_L=2kΩ, T_A =25°C)

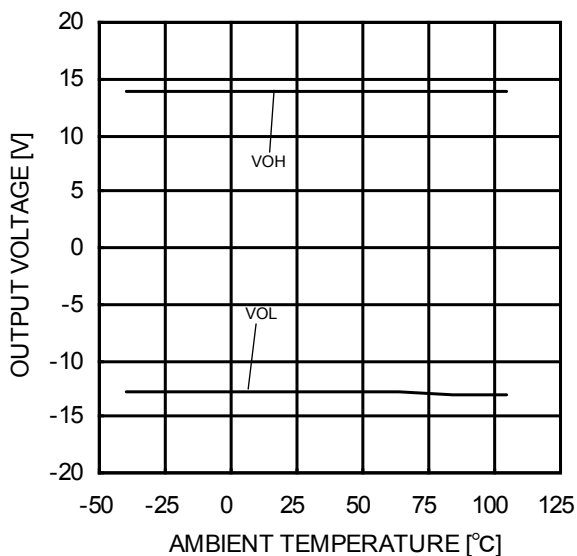


Figure 52.
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15V/-15V, R_L=2kΩ)

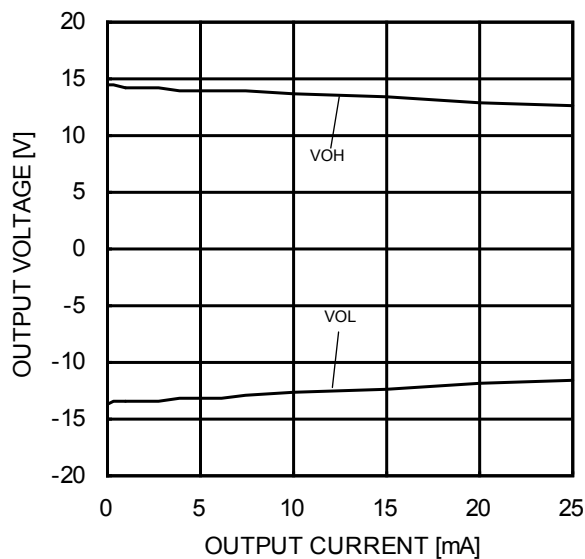


Figure 53.
Maximum Output Voltage
- Output Current
(VCC/VEE=+15V/-15V, T_A =25°C)

(*The above data is measurement value of typical sample, it is not guaranteed.

OBA4564RFV

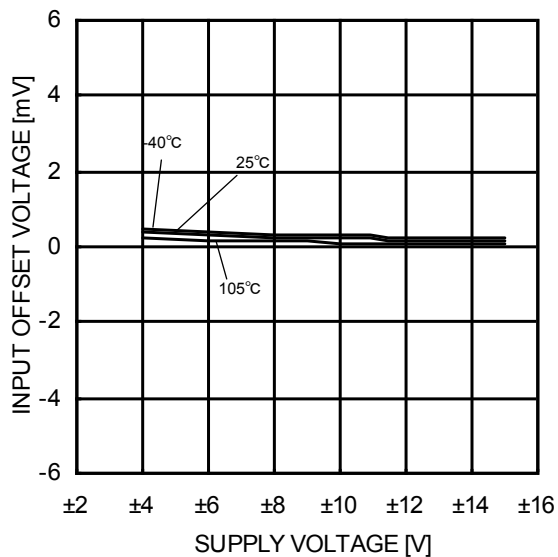


Figure 54.
Input Offset Voltage - Supply Voltage
($V_{ICM}=0V, V_{OUT}=0V$)

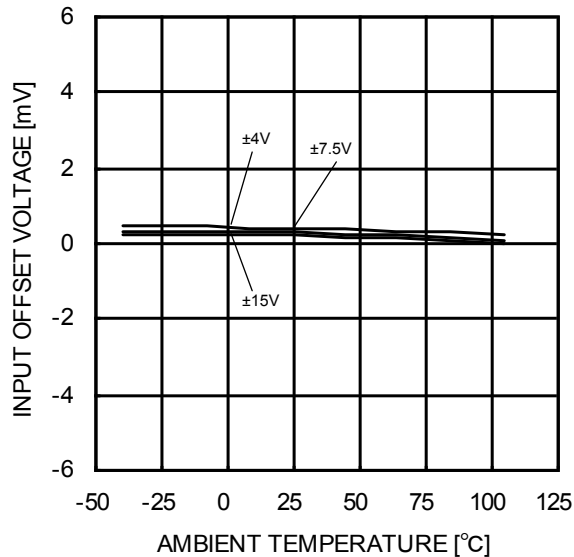


Figure 55.
Input Offset Voltage - Ambient Temperature
($V_{ICM}=0V, V_{OUT}=0V$)

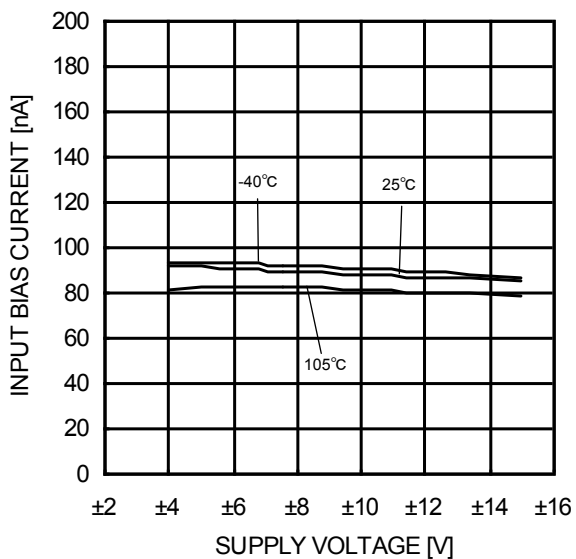


Figure 56.
Input Bias Current - Supply Voltage
($V_{ICM}=0V, V_{OUT}=0V$)

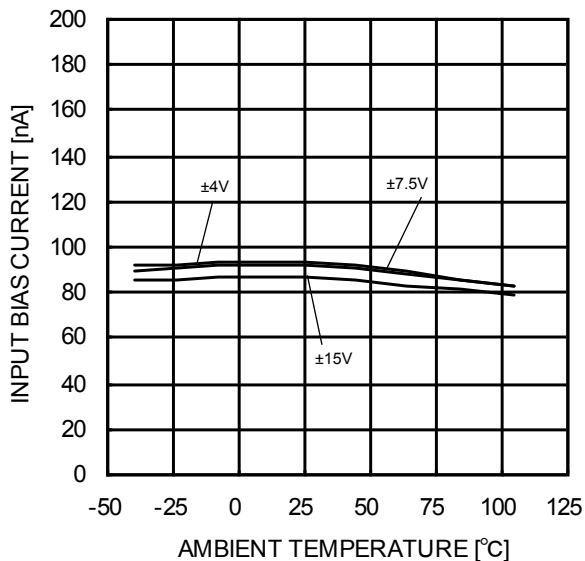


Figure 57.
Input Bias Current - Ambient Temperature
($V_{ICM}=0V, V_{OUT}=0V$)

(*The above data is measurement value of typical sample, it is not guaranteed.