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Technical Note

Operational Amplifiers / Comparators

Low Noise Operational Amplifiers

BA4558F, BA4558R F/FV/FVM, BA4560F, BA4560R F/FV/FVM, BA4564RFV
BA4580R F/FVM, BA4584FV, BA4584R F/FV, BA8522R F/FV/FVM
BA15218F, BA14741F, BA15532F, BA4510F/FV, BA2115F/FVM

No.11049EBT16

●Description

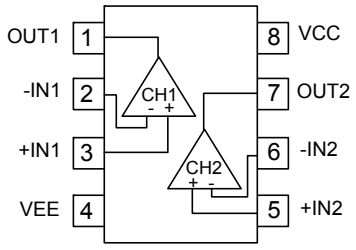
General-purpose BA4558 / BA4560 / BA15218 / BA14741 / BA15532 / BA4510 family and high-reliability BA4558R / BA4560R / BA4564R / BA4580R / BA4584 / BA4584R / BA8522R / BA2115 family integrate two or four independent Op-Amps on a single chip Especially, this series is suitable for any audio applications due to low noise and low distortion characteristics and are usable for other many applications by wide operating supply voltage range.
BA4558R / BA4560R / BA4564R / BA4580R / BA4584R / BA8522R / BA2115 are high-reliability products with extended operating temperature range and high ESD tolerance.

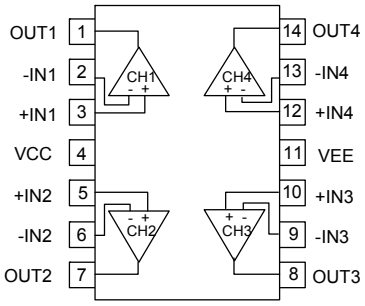
General purpose		High reliability	
Dual	BA4558F	Dual	BA4558R F/FV/FVM
Dual	BA4560F	Dual	BA4560R F/FVM
Dual	BA15218F	Quad	BA4564RFV
Quad	BA14741F	Dual	BA4580R F/FV/FVM
Dual	BA15532F	Quad	BA4584FV
Dual	BA4510F/FV	Quad	BA4584R F/FV
		Dual	BA8522R F/FV/FVM
		Dual	BA2115F/FVM

●Features

1) High voltage gain, low noise, low distortion
2) Wide operating supply voltage
   ±4.0[V]～±15.0[V](split supply)
   (BA4560/BA4558/ BA4558R/BA4560R/
   BA4564R family)
   ±2.0[V]～±16.0[V](split supply)
   (BA4580R/ BA4584/BA8522R/BA15218 family)
   ±2.0[V]～±8.5[V](split supply)(BA4584R family)
   ±2.0[V]～±18.0[V](split supply)(BA14741 family)
   ±3.0[V]～±20.0[V](split supply)(BA15532 family)
   ±1.0[V]～±3.5[V](split supply)(BA4510 family)
   ±1.0[V]～±7.0[V](split supply)(BA2115 family)
3) Internal phase compensation
4) No latch up immunity
5) Internal ESD protection
   Human body mode (HBM) ±5000[V](Typ.)
   (BA4558R/BA4560R/BA4564R/BA4580R/BA4584/
   BA4584R/BA8522R/BA2115 family)
6) Wide temperature range
   -40[℃]～+85[℃]
   (BA4558/BA4560/BA4584/BA15218/BA14741/
   BA2115 family)
   -40[℃]～+105[℃]
   (BA4558R/BA4560R/BA4564R/BA4580R/BA4584R/
   BA8522R family)

●Pin Assignments





SOP8		SSOP-B8	MSOP8	SOP14	SSOP-B14
BA4558F	BA4558RF	BA4558RFV	BA4558RFVM	BA14741F	BA4564RFV
BA4560F	BA4560RF	BA4560RFV	BA4560RFVM	BA4584RF	BA4584FV
BA15218F	BA4580RF	BA4510FV	BA4580RFVM		BA4584RFV
BA15532F	BA8522RF	BA8522RFV	BA8522RFVM		
BA4510F	BA2115F		BA2115FVM		

●Absolute maximum rating (Ta=25[℃])

○BA4558/BA4558R family

Parameter	Symbol	Ratings		Unit
		BA4558 family	BA4558R family	
Supply Voltage	VCC-VEE	+36		V
Differential Input Voltage(*1)	Vid	VCC-VEE	36	V
Input common-mode voltage range	Vicm	VEE～VCC	(VEE-0.3)～VEE+36	V
Operating Supply Voltage	Vopr	8～30 (±4～±15)		V
Operating Temperature	Topr	-40～+85	-40～+105	℃
Storage Temperature	Tstg	-55～+125	-55～+150	℃
Maximum Junction Temperature	Tjmax	+125	+150	℃

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.

(*1) 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.

●Electrical characteristics

○BA4558 family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4558F				
			Min.	Typ.	Max.		
Input Offset Voltage (*2)	Vio	25℃	-	0.5	6	mV	VOUT=0[V]
Input Offset Current (*2)	Iio	25℃	-	5	200	nA	VOUT=0[V]
Input Bias Current (*3)	Ib	25℃	-	60	500	nA	VOUT=0[V]
Supply Current	ICC	25℃	-	3	6	mA	RL=∞ All Op-Amps VIN+=0[V]
Maximum Output Voltage	VOM	25℃	±10	±13	-	V	RL≧2[kΩ]
		25℃	±12	±14	-		RL≧10[kΩ]
Large Signal Voltage Gain	AV	25℃	86	100	-	dB	RL≧2[kΩ], VOUT=±10[V], Vicm=0[V]
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	Ri≦10[kΩ]
Power Supply Rejection Ratio	PSRR	25℃	76.3	90	-	dB	Ri≦10[kΩ]
Slew Rate	SR	25℃	-	1.0	-	V/μs	AV=0[dB], RL≧2[kΩ]
Channel Separation	CS	25℃	-	105	-	dB	f=1[kHz]

(*2) Absolute value

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

●Electrical characteristics

○BA4558R family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃], Full range -40[℃]～+105[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4558R F/FV/FVM				
			Min.	Typ.	Max.		
Input Offset Voltage (*4)	Vio	25℃	-	0.5	6	mV	VOUT=0[V]
		Full range	-	-	7		
Input Offset Current (*4)	Iio	25℃	-	5	200	nA	VOUT=0[V]
		Full range	-	-	200		
Input Bias Current (*5)	Ib	25℃	-	60	500	nA	VOUT=0[V]
		Full range	-	-	800		
Supply Current	ICC	25℃	-	3	6	mA	RL=∞ All Op-Amps VIN+=0[V]
		Full range	-	-	6.5		
Maximum Output Voltage	VOH	25℃	±10	±13	-	V	RL≧2[kΩ]
		Full range	±10	-	-		
		25℃	±12	±14	-		RL≧10[kΩ]
Large Signal Voltage Gain	AV	25℃	86	100	-	dB	RL≧2[kΩ], VOUT=±10[V], Vicm=0[V]
		Full range	83	-	-		
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	VOUT=±12[V]
		Full range	±12	-	-		
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	VOUT=±12[V]
Power Supply Rejection Ratio	PSRR	25℃	76.5	90	-	dB	Ri≦10[kΩ]
Channel Separation	CS	25℃	-	105	-	dB	R1=100[Ω], f=1[kHz]
Slew Rate	SR	25℃	-	1	-	V/μs	AV=0[dB], RL=2[kΩ] CL=100[pF]
Unity Gain Frequency	ft	25℃	-	2	-	MHz	RL=2[kΩ]
Total Harmonic Distortion	THD	25℃	-	0.005	-	%	AV=20[dB], RL=10[kΩ] VIN=0.05[Vrms], f=1[kHz]
Input Referred Noise Voltage	Vn	25℃	-	12	-	$nV/\sqrt{Hz}$	RS=100[Ω], Vi=0[V], f=1[kHz]

(*4) Absolute value
(*5) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

●Absolute maximum rating (Ta=25[℃])

○BA4560/BA4560R/BA4564R family

Parameter	Symbol	Ratings			Unit
		BA4560 family	BA4560R family	BA4564R family	
Supply Voltage	VCC-VEE	+36			V
Differential Input Voltage(*6)	Vid	VCC-VEE	36		V
Input Common-mode voltage range	Vicm	VEE～VCC	(VEE-0.3)～VEE+36		V
Operating Supply Voltage	Vopr	8～30 (±4～±15)			V
Operating Temperature	Topr	-40～+85	-40～+105		℃
Storage Temperature	Tstg	-55～+125	-55～+150		℃
Maximum junction Temperature	Tjmax	+125	+150		℃

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.

(*6) 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.

●Electrical characteristics

○BA4560 family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4560F				
			Min.	Typ.	Max.		
Input Offset Voltage (*7)	Vio	25℃	-	0.5	6	mV	VOUT=0[V]
Input Offset Current (*7)	Iio	25℃	-	5	200	nA	VOUT=0[V]
Input Bias Current (*8)	Ib	25℃	-	50	500	nA	VOUT=0[V]
Supply Current	ICC	25℃	-	4	7.5	mA	RL=∞ All Op-Amps, VIN+=0[V]
Maximum Output Voltage	VOH	25℃	±12	±14	-	V	RL≧10[kΩ]
		25℃	±10	±13	-		RL≧2[kΩ]
Large Signal Voltage Gain	AV	25℃	86	100	-	dB	RL≧2[kΩ], VO=±10[V], Vicm=0[V]
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	VOUT=±12[V]
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	VOUT=±12[V]
Power Supply Rejection Ratio	PSRR	25℃	76.3	90	-	dB	Ri≦10[kΩ]
Slew Rate	SR	25℃	-	4	-	V/μs	AV=0[dB], RL=2[kΩ]
Unity Gain Frequency	GBW	25℃	-	10	-	MHz	f=10[kHz]
Input Referred Noise Voltage	Vn	25℃	-	-	2.2	μVrms	RS=2.2[Ω], RIAA BW=10[kHz]～30[kHz]

(*7) Absolute value

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

●Electrical characteristics

○BA4560R family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Full range -40[℃]～+105[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4560R F/FV/FVM				
			Min.	Typ.	Max.		
Input Offset Voltage (*9)	Vio	25℃	-	0.5	6	mV	VOUT=0[V]
		Full range	-	-	7		
Input Offset Current (*9)	Iio	25℃	-	5	200	nA	VOUT=0[V]
		Full range	-	-	200		
Input Bias Current (*10)	Ib	25℃	-	50	500	nA	VOUT=0[V]
		Full range	-	-	800		
Supply Current	ICC	25℃	-	3	7	mA	RL=∞ All Op-Amps VIN+=0[V]
		Full range	-	-	7.5		
Maximum Output Voltage	VOH	25℃	±12	±14	-	V	RL≧2[kΩ]
		Full range	±10	±11.5	-		Io=25[mA]
Large Signal Voltage Gain	AV	25℃	86	100	-	dB	RL≧2[kΩ], VO=±10[V], Vicm=0[V]
		Full range	83	-	-		
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	VOUT=±12[V]
		Full range	±12	-	-		
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	VOUT=±12[V]
Power Supply Rejection Ratio	PSRR	25℃	76.5	90	-	dB	Ri≦10[kΩ]
Channel Separation	CS	25℃	-	105	-	dB	R1=100[Ω], f=1[kHz]
Slew Rate	SR	25℃	-	4	-	V/μs	AV=0[dB], RL=10[kΩ] CL=100[pF]
Unity Gain Frequency	ft	25℃	-	4	-	MHz	RL=2[kΩ]
Total Harmonic Distortion	THD	25℃	-	0.003	-	%	AV=20[dB], RL=10[kΩ] VIN=0.05[Vrms], f=1[kHz]
Input Referred Noise Voltage	Vn	25℃	-	8	-	$nV/\sqrt{Hz}$	RS=100[Ω], Vi=0[V], f=1[kHz]

(*9) Absolute value

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

●Electrical characteristics

○BA4564R family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Full range -40[℃]～+105[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4564RFV				
			Min.	Typ.	Max.		
Input Offset Voltage (*11)	Vio	25℃	-	0.5	6	mV	VOUT=0[V]
		Full range	-	-	7		
Input Offset Current (*11)	Iio	25℃	-	5	200	nA	VOUT=0[V]
		Full range	-	-	200		
Input Bias Current (*12)	Ib	25℃	-	50	500	nA	VOUT=0[V]
		Full range	-	-	800		
Supply Current	ICC	25℃	-	6	14	mA	RL=∞ All Op-Amps VIN+=0[V]
		Full range	-	-	15		
Maximum Output Voltage	VOH	25℃	±12	±14	-	V	RL≧2[kΩ]
		Full range	±10	±11.5	-		
Large Signal Voltage Gain	AV	25℃	86	100	-	dB	RL≧2[kΩ], VOUT=±10[V], Vicm=0[V]
		Full range	83	-	-		
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	VOUT=±12[V]
		Full range	±12	-	-		
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	VOUT=±12[V]
Power Supply Rejection Ratio	PSRR	25℃	76.5	90	-	dB	Ri≦10[kΩ]
Channel Separation	CS	25℃	-	105	-	dB	R1=100[Ω], f=1[kHz]
Slew Rate	SR	25℃	-	4	-	V/μs	AV=0[dB], RL=10[kΩ] CL=100[pF]
Unity Gain Frequency	ft	25℃	-	4	-	MHz	RL=2[kΩ]
Total Harmonic Distortion	THD	25℃	-	0.003	-	%	AV=20[dB], RL=10[kΩ] VIN=0.05[Vrms], f=1[kHz]
Input Referred Noise Voltage	Vn	25℃	-	8	-	$nV/\sqrt{Hz}$	RS=100[Ω], Vi=0[V], f=1[kHz]

(*11) Absolute value

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

●Absolute maximum rating (Ta=25[℃])

○BA4580/BA4584/BA4584R/BA8522R family

Parameter	Symbol	Ratings				Unit
		BA4580R family	BA4584 family	BA4584R family	BA8522R family	
Supply Voltage	VCC-VEE	+36				V
Differential Input Voltage(*13)	Vid	36				V
Input Common-mode Voltage Range	Vicm	VEE～VEE+36			(VEE-0.3)～VEE+36	V
Operating Supply Voltage	Vopr	4～32 (±2～±16)		4～19 (±2～±8.5)	4～32 (±2～±16)	V
Output current	Iout	±50				mA
Operating Temperature	Topr	-40～+105	-40～+85	-40～+105		℃
Storage Temperature	Tstg	-55～+150				℃
Maximum Junction Temperature	Tjmax	+150				℃

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.

(*13) 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.

●Electrical characteristics

○BA4580R family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4580R F/FVM				
			Min.	Typ.	Max.		
Input Offset Voltage (*14)	Vio	25℃	-	0.3	3	mV	Rs≦10[kΩ]
Input Offset Current (*14)	Iio	25℃	-	5	200	nA	
Input Bias Current (*15)	Ib	25℃	-	100	500	nA	
Large Signal Voltage Gain	AV	25℃	90	110	-	dB	RL≧10[kΩ], VOUT=±10[V]
Maximum Output Voltage	VOM	25℃	±12	±13.5	-	V	RL≧2[kΩ]
Input Common-mode Voltage Range	Vicm	25℃	±12	±13.5	-	V	
Common-mode Rejection Ratio	CMRR	25℃	80	110	-	dB	Rs≦10[kΩ]
Power Supply Rejection Ratio	PSRR	25℃	80	110	-	dB	Rs≦10[kΩ]
Supply Current	ICC	25℃	-	6	9	mA	RL=∞ All Op-Amps, VIN+=0[V]
Slew Rate	SR	25℃	-	5	-	V/μs	RL≧2[kΩ]
Unity Gain Frequency	ft	25℃	-	5	-	MHz	RL=2[kΩ]
Total Harmonic Distortion	THD	25℃	-	0.0005	-	%	Av=20[dB], VOUT=5[Vrms] RL=2[kΩ], f=1[kHz] 20[Hz]~20[kHz] BPF
Input Referred Noise Voltage	Vn	25℃	-	0.8	-	μVrms	RIAA, Rs=2.2 [kΩ], 30[kHz] LPF

(*14) Absolute value

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

●Electrical characteristics

○BA4584 family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4584FV				
			Min.	Typ.	Max.		
Input Offset Voltage (*16)	Vio	25℃	-	0.3	3	mV	Rs≦10[kΩ]
Input Offset Current (*16)	Iio	25℃	-	5	200	nA	
Input Bias Current (*17)	Ib	25℃	-	100	500	nA	
Large Signal Voltage Gain	AV	25℃	90	110	-	dB	RL≧10[kΩ], VOUT=±10[V]
Maximum Output Voltage	VOM	25℃	±12	±13.5	-	V	RL≧2[kΩ]
Input Common-mode Voltage Range	Vicm	25℃	±12	±13.5	-	V	
Common-mode Rejection Ratio	CMRR	25℃	80	110	-	dB	Rs≦10[kΩ]
Power Supply Rejection Ratio	PSRR	25℃	80	110	-	dB	Rs≦10[kΩ]
Supply Current	ICC	25℃	-	12	18	mA	RL=∞ All Op-Amps, VIN+=0[V]
Slew Rate	SR	25℃	-	5	-	V/μs	RL≧2[kΩ]
Unity Gain Frequency	ft	25℃	-	5	-	MHz	RL=2[kΩ]
Total Harmonic Distortion	THD	25℃	-	0.0005	-	%	Av=20[dB], VOUT=5[Vrms] RL=2[kΩ]f=1[kHz] 20[Hz]～20[kHz] BPF
Input Referred Noise Voltage	Vn	25℃	-	0.8	-	μVrms	RIAA, Rs=2.2[kΩ], 30[kHz] LPF

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

●Electrical characteristics

○BA4584R family（Unless otherwise specified VCC=+9.5[V], VEE=-9.5[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4584R F/FV				
			Min.	Typ.	Max.		
Input Offset Voltage (*18)	Vio	25℃	-	0.3	3	mV	Rs≦10[kΩ]
Input Offset Current (*18)	Iio	25℃	-	5	200	nA	
Input Bias Current (*19)	Ib	25℃	-	100	500	nA	
Large Signal Voltage Gain	AV	25℃	90	110	-	dB	RL≧10[kΩ], VOUT=±10[V]
Maximum Output Voltage	VOM	25℃	±6.5	±8	-	V	RL≧2[kΩ]
Input Common-mode Voltage Range	Vicm	25℃	±6.5	±8	-	V	
Common-mode Rejection Ratio	CMRR	25℃	80	110	-	dB	Rs≦10[kΩ]
Power Supply Rejection Ratio	PSRR	25℃	80	110	-	dB	Rs≦10[kΩ]
Supply Current	ICC	25℃	-	11	17	mA	RL=∞ All Op-Amps, VIN+=0[V]
Slew Rate	SR	25℃	-	5	-	V/μs	RL≧2[kΩ]
Unity Gain Frequency	ft	25℃	-	5	-	MHz	RL=2[kΩ]
Total Harmonic Distortion	THD	25℃	-	0.0005	-	%	Av=20[dB], VOUT=5[Vrms] RL=2[kΩ], f=1[kHz] 20[Hz]～20[kHz] BPF
Input Referred Noise Voltage	Vn	25℃	-	0.8	-	μVrms	RIAA, Rs=2.2[kΩ], 30[kHz] LPF

(*18) Absolute value
(*19) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

●Electrical characteristics

○BA8522R family（Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃]）

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA8522R F/FV/FVM				
			Min.	Typ.	Max.		
Input Offset Voltage (*20)	Vio	25℃	-	0.1	1.5	mV	
Input Offset Voltage drift (*20)	Vio/ΔT		-	2	-	μV/℃	
Input Offset Current (*20)	Iio	25℃	-	5	200	nA	
Input Bias Current (*21)	Ib	25℃	-	50	500	nA	
Supply Current	ICC	25℃	-	5.5	9	mA	RL=∞ All Op-Amps VIN+=0[V]
Maximum Output Voltage	VOM	25℃	±12	±13.5		V	RL≧10[kΩ]
			±10.5	±11	-	V	RL≧2[kΩ]
Large Signal Voltage Gain	AV	25℃	86	110	-	dB	RL≧10[kΩ], VOUT=±10[V]
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	
Power Supply Rejection Ratio	PSRR	25℃	76.5	90	-	dB	
Channel Separation	CS	25℃	-	105	-	dB	
Slew Rate	SR	25℃	-	3	-	V/μs	
Unity Gain Frequency	ft	25℃	-	6	-	MHz	
Input Referred Noise Voltage	Vni	25℃	-	1.2	-	μVrms	
Total Harmonic Distortion	THD	25℃	-	0.002	-	%	Av=20[dB], VOUT=5[Vrms] f=1[kHz]

(*20) Absolute value

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

●Absolute maximum rating (Ta=25[℃])

○BA15218/BA14741/BA15532 family

Parameter	Symbol	Ratings			Unit
		BA15218 family	BA14741 family	BA15532 family	
Supply Voltage	VCC-VEE	36		42	V
Differential Input Voltage (*22)	Vid	VCC-VEE		±0.5(*23)	V
Input Common-mode voltage range	Vicm	VEE～VCC			V
Operating Supply Voltage	Vopr	4～32 (±2～±16)	4～36 (±2～±18)	6～40 (±3～±20)	V
Input Current	Ii	-		±10	mA
Operating Temperature	Topr	-40+85		-20～+75	℃
Storage Temperature	Tstg	-55～+125			℃
Output Short Current (*24)	Iomax	±50	-		mA
Output Short Time (*24)	Ts	-	unlimited (only 1CH short)	unlimited	Sec

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.

(*22) 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.

(*23) Don't over input current ±10mA. Built-in resistor for protection because of over current with differential input voltage above 0.5 .

(*24) Limit within Pd.

●Electrical characteristics

○BA15218 family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA15218F				
			Min.	Typ.	Max.		
Input Offset Voltage (*25)	Vio	25℃	-	0.5	5.0	mV	Rs≦10[kΩ]
Input Offset Current (*25)	Iio	25℃	-	5	200	nA	
Input Bias Current (*26)	Ib	25℃	-	50	500	nA	
Large Signal Voltage Gain	Av	25℃	86	110	-	dB	RL≧2[kΩ], Vo=±10[V]
Input Common-mode Voltage Range	Vicm	25℃	±12	±14	-	V	
Common-mode Rejection Ratio	CMRR	25℃	70	90	-	dB	Rs≦10[kΩ]
Power Supply Rejection Ratio	PSRR	25℃	76	90	-	dB	Rs≦10[kΩ]
Supply Current	ICC	25℃	-	5.0	8.0	mA	Vin=0, RL=∞
Maximum Output Voltage	VOH	25℃	±12	±14	-	V	RL≧10[kΩ]
	VOL	25℃	±10	±13	-	V	RL≧2[kΩ]
Slew Rate	SR	25℃	-	3.0	-	V/μs	GV=0[dB], RL=2[kΩ]
Gain Bandwidth Product	GBW	25℃	-	10	-	MHz	f=10[KHz]
Input Referred Noise Voltage	Vn	25℃	-	1.0	-	μVrms	RS=1[kΩ], BW=20[Hz]～30[kHz], RIAA
Channel Separation	CS	25℃	-	120	-	dB	f=1[kHz] input referred

(*25) Absolute value

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

●Electrical characteristics

○BA14741 family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter		Symbol	Temperature Range	Limits			Unit	Condition
				BA14741F				
				Min.	Typ.	Max.		
Input Offset Voltage (*27)		Vio	25℃	-	1.0	5.0	mV	Rs≦10[kΩ]
Input Offset Current (*27)		Iio	25℃	-	10	50	nA	
Input Bias Current (*28)		Ib	25℃	-	60	300	nA	
Large Signal Voltage Gain		Av	25℃	20	100	-	V/mV	RL≧2[kΩ], Vo=±10[V]
Common-mode Rejection Ratio		CMRR	25℃	80	100	-	dB	
Input Common-mode Voltage Range		Vicm	25℃	±12	±13.5	-	V	
Power Supply Rejection Ratio		PSRR	25℃	80	100	-	dB	
Supply Current		ICC	25℃	-	3.0	7.0	mA	RL=∞ All Op-Amps
Maximum Output Voltage		VOH	25℃	10	12.5	-	V	Vin+=1[V], Vin-=0[V], RL=2[kΩ]
		VOL	25℃	-10	-12.5	-	V	Vin+=0[V], Vin-=1[V], RL=2[kΩ]
Maximum Output Current	Source	IOH	25℃	10	20	-	mA	Vin+=1[V], Vin-=0[V], VO=0[V]
	Sink	IOL	25℃	5	10	-	mA	Vin+=0[V], Vin-=1[V], VO=0[V]
Slew Rate		SR	25℃	-	1.0	-	V/μs	Av=1, RL=2[kΩ]
Input Referred Noise Voltage		Vn	25℃	-	2.0	4.0	μVrms	RIAA, Rs=2.2[kΩ], 10[Hz]~30[kHz]
Channel Separation		CS	25℃	-	100	-	dB	f=1[kHz] input referred

(*27) Absolute value.
(*28) Current direction: Since first input stage is composed with PNP transistor, input bias current flows out of IC.

●Electrical characteristics

○BA15532 family (Unless otherwise specified VCC=+15[V], VEE=-15[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA15532F				
			Min.	Typ.	Max.		
Input Offset Voltage (*29)	Vio	25℃	-	0.5	4.0	mV	Rs=50[Ω], RL≧10[kΩ]
Input Offset Current (*29)	Iio	25℃	-	10	150	nA	RL≧10[kΩ]
Input Bias Current (*30)	Ib	25℃	-	200	800	nA	RL≧10[kΩ]
Large Signal Voltage Gain	Av	25℃	80	94	-	dB	RL≧600[Ω], Vo=±10[V]
Common-mode Rejection Ratio	CMRR	25℃	70	100	-	dB	RL≧10[kΩ]
Input Common-mode Voltage Range	Vicm	25℃	±12	±13	-	V	RL≧10[kΩ]
Power Supply Rejection Ratio	PSRR	25℃	80	100	-	dB	Rs=50[Ω], RL≧10[kΩ]
Supply Current	Icc	25℃	-	8.0	16.0	mA	RL=∞ All Op-Amps
Maximum Output Voltage	VOH	25℃	±12	±13	-	V	RL≧600[Ω]
	VOL	25℃	±15	±16	-	V	RL≧600[Ω] VCC=18[V], VEE=-18[V]
Output Short Current (*31)	IOS	25℃	-	38	-	mA	
Slew Rate	SR	25℃	-	8.0	-	V/μs	Av=1, RL=600[Ω], CL=100[pF]
Gain Bandwidth Product	GBW	25℃	-	20	-	MHz	f=10[kHz], RL=600[Ω], CL=100[pF]
Input Referred Noise Voltage	Vn	25℃	-	0.7	1.5	μVrms	RIAA, Rs=100[Ω], 20[Hz]~30[kHz]
Channel Separation	CS	25℃	-	110	-	dB	RIAA Input referred

(*29) Absolute value
(*30) Current direction: Since first input stage is composed with NPN transistor, input bias current flows out of IC.
(*31) In the case of output pin shorting with VCC or VEE. But never over the maximum power dissipation

●Absolute maximum rating (Ta=25[℃])

○BA4510/BA2115 family

Parameter	Symbol	Ratings		Unit
		BA4510 family	BA2115 family	
Supply Voltage	VCC-VEE	10	14	V
Differential Input Voltage (*32)	Vid	VCC-VEE	14	V
Input Common-mode Voltage Range	Vicm	VEE～VCC	(VEE-0.3)～VEE+14	V
Operating Supply Voltage	Vopr	2～7(±1~±3.5)	2～14(±1~±7)	V
Operating Temperature	Topr	-20～+75	-40～+85	℃
Storage Temperature	Tstg	-40～125	-55～150	℃
Maximum Junction Temperature	Tjmax	125	150	℃

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.

(*32) 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.

●Electrical characteristics

○BA4510 family (Unless otherwise specified VCC=+2.5[V], VEE=-2.5[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA4510F/FV				
			Min.	Typ.	Max.		
Input Offset Voltage (*33)	Vio	25℃	-	1	6	mV	Rs=50[Ω]
Input Offset Current (*33)	Iio	25℃	-	2	200	nA	
Input Bias Current (*34)	Ib	25℃	-	80	500	nA	
Supply Current	ICC	25℃	2.5	5.0	7.5	mA	RL=∞ All Op-Amps
Maximum Output Voltage	VOH	25℃	+2.0	+2.4	-	V	RL=10[kΩ]
	VOL	25℃	-	-2.4	-2.0	V	RL=10[kΩ]
Large Signal Voltage Gain	Av	25℃	60	90	-	dB	RL≧10[kΩ]
Input Common-mode Voltage Range	Vicm	25℃	-1.3	-	+1.5	V	
Common-mode Rejection Ratio	CMRR	25℃	60	80	-	dB	
Power Supply Rejection Ratio	PSRR	25℃	60	80	-	dB	Rs=50[Ω]
Slew Rate	SR	25℃	-	5.0	-	V/μs	Av=1

(*33) Absolute value

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

●Electrical characteristics

○BA2115 family (Unless otherwise specified VCC=+2.5[V], VEE=-2.5[V], Ta=25[℃])

Parameter	Symbol	Temperature Range	Limits			Unit	Condition
			BA2115F/FVM				
			Min.	Typ.	Max.		
Input Offset Voltage (*35)	Vio	25℃	-	1	6	mV	VOUT=0[V], Vicm=0[V]
Input Offset Current (*35)	Iio	25℃	-	2	200	nA	VOUT=0[V], Vicm=0[V]
Input Bias Current (*36)	Ib	25℃	-	150	400	nA	VOUT=0[V], Vicm=0[V]
Supply Current	ICC	25℃	-	3.5	5	mA	RL=∞ All Op-Amps, VIN+=0[V]
Maximum Output Voltage	VOM	25℃	±2.0	±2.2	-	V	RL≧2.5[kΩ]
Large Signal Voltage Gain	AV	25℃	60	80	-	dB	RL≧10[kΩ], VOUT=±2[V], Vicm=0[V]
Input Common-mode Voltage Range	Vicm	25℃	±1.5	-	-	V	
Common-mode Rejection Ratio	CMRR	25℃	60	74	-	dB	Vicm=-1.5[V]～+1.5[V]
Power Supply Rejection Ratio	PSRR	25℃	60	80	-	dB	VCC=+2[V]～+14[V]
Slew Rate	SR	25℃	-	4	-	V/μs	AV=0[dB], VIN=±1[V]
Gain Bandwidth Product	GB	25℃	-	12	-	MHz	f=10[kHz]

(*35) Absolute value

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

●Reference Data BA4558 family

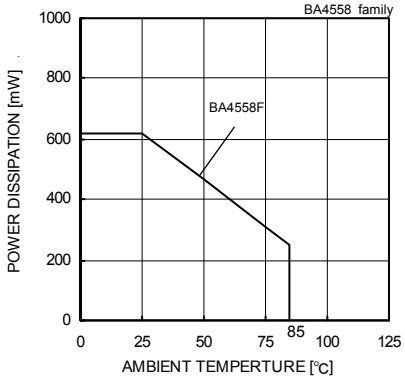


Fig. 1
Derating Curve

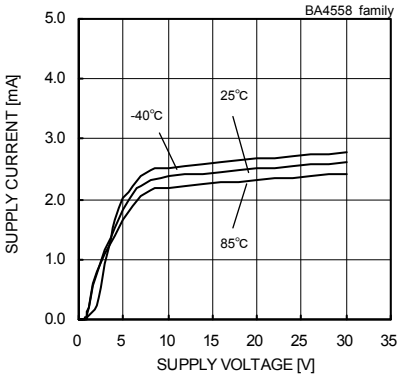


Fig. 2
Supply Current - Supply Voltage

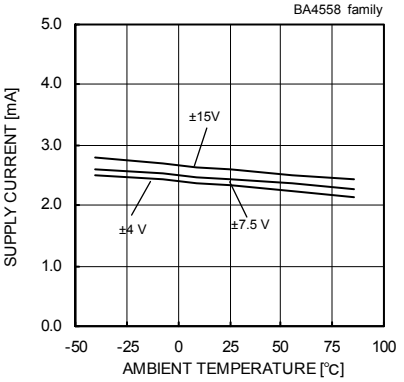


Fig.3
Supply Current - Ambient Temperature

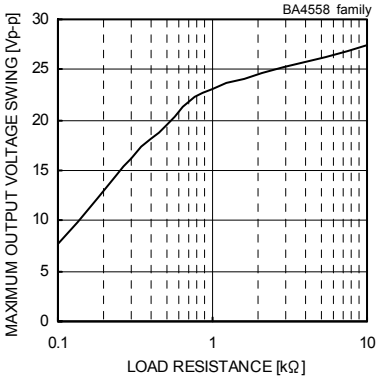


Fig.4
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

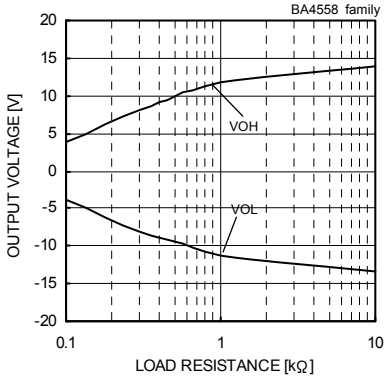


Fig.5
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

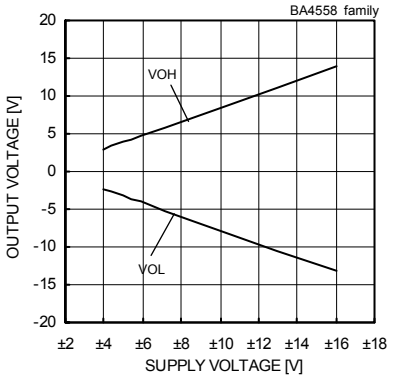


Fig.6
Maximum Output Voltage
- Supply Voltage
(RL=2[kΩ], Ta=25[℃])

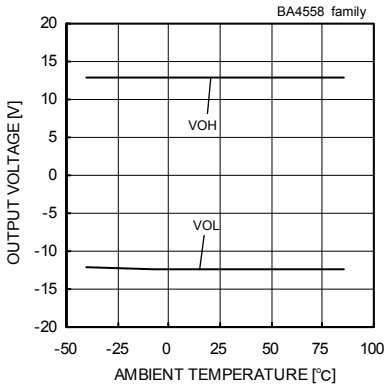


Fig.7
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ])

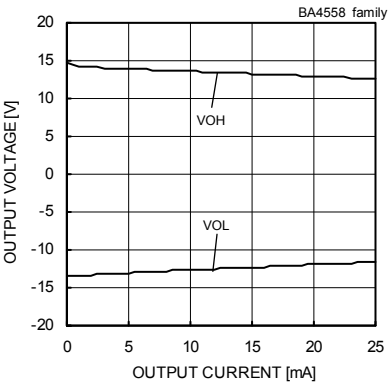


Fig.8
Maximum Output Voltage
- Output Current
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

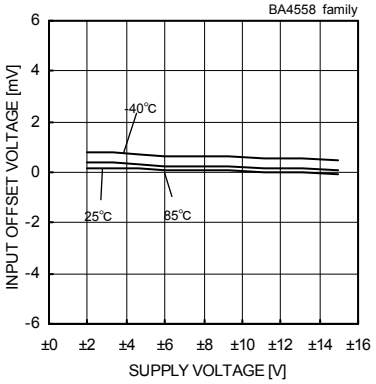


Fig.9
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

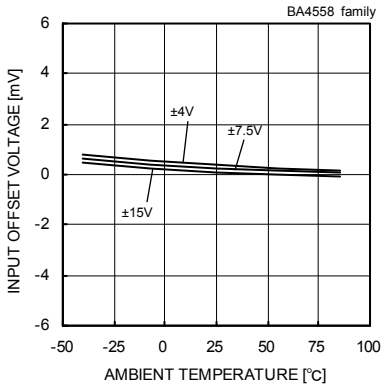


Fig.10
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

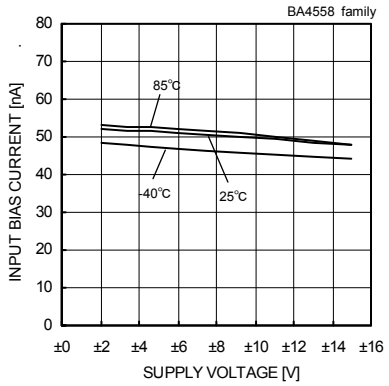


Fig.11
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

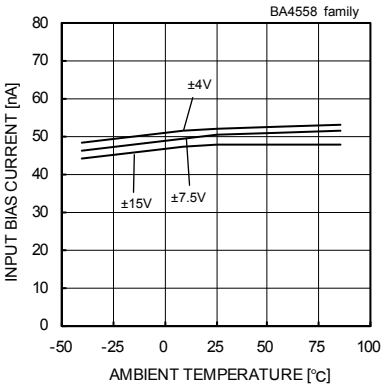


Fig.12
Input Bias Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

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

●Reference Data BA4558 family

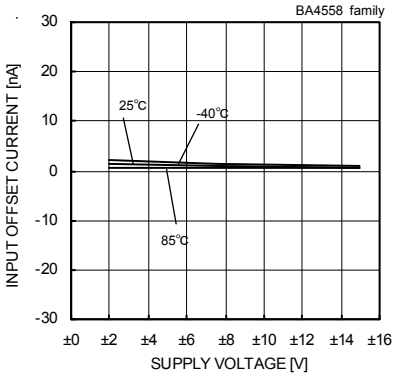


Fig.13
Input Offset Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

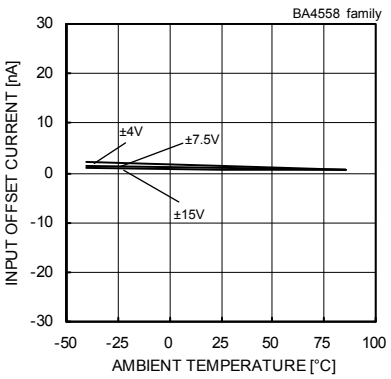


Fig.14
Input Offset Current -
Ambient Temperature
(Vicm=0[V], Vout=0[V])

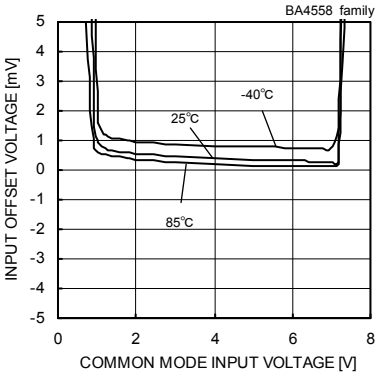


Fig.15
Input Offset Voltage
- Common Mode Input Voltage
(VCC=8[V], Vout=4[V])

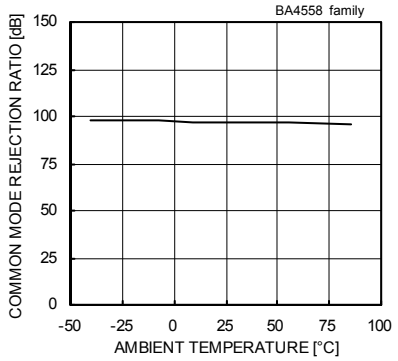


Fig.16
Common Mode Rejection Ratio
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], Vicm=-12[V] to +12[V])

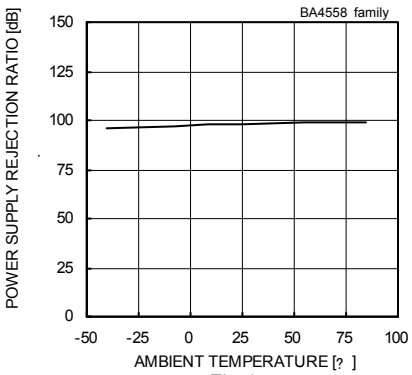


Fig.17
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+4[V]/-4[V] to +15[V]/-15[V])

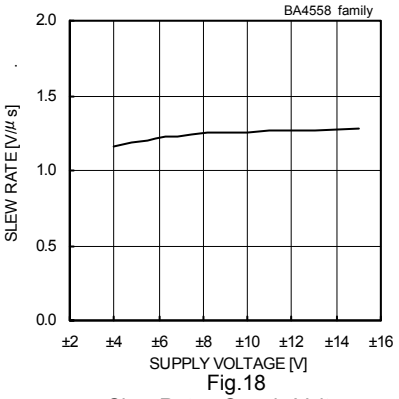


Fig.18
Slew Rate - Supply Voltage
(CL=100[pF], RL=2[kΩ], Ta=25[℃])

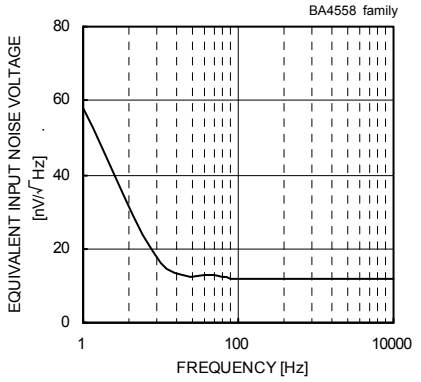


Fig.19
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15[V]/-15[V],Rs=100[Ω],Ta=25[℃])

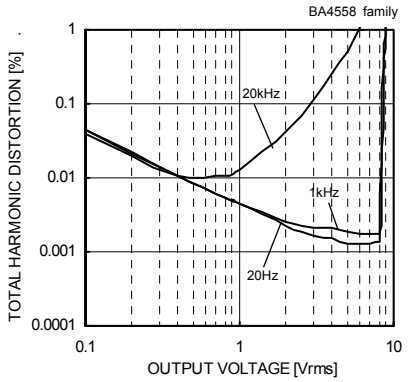


Fig.20
Total Harmonic Distortion -Output Voltage
(VCC/VEE=+15[V]/-15[V], Av=20[dB],
RL=2[kΩ], 80[kHz]-LPF, Ta=25[℃])

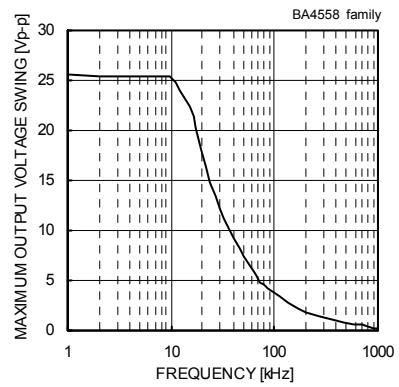


Fig.21
Maximum Output Voltage Swing - Frequency
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ], Ta=25[℃])

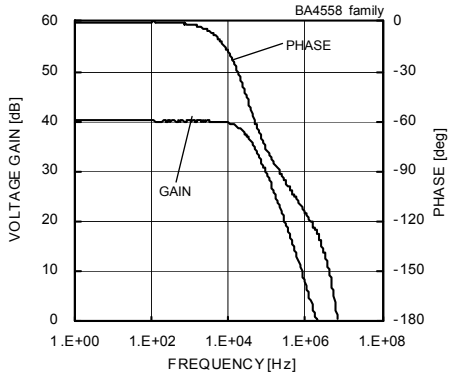


Fig. 22
Voltage Gain - Frequency
(VCC/VEE=+15[V]/-15[V],Av=40[dB],RL=2[kΩ],Ta=25[℃])

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

●Reference Data BA4558 family

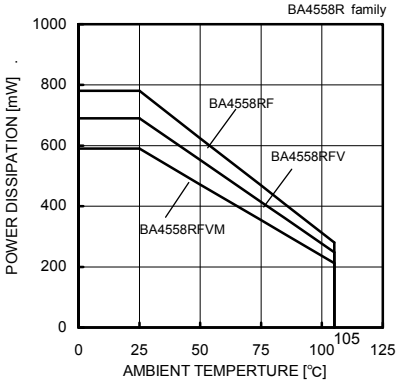


Fig. 23
Derating Curve

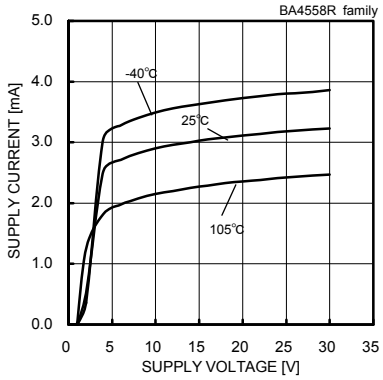


Fig.24
Supply Current - Supply Voltage

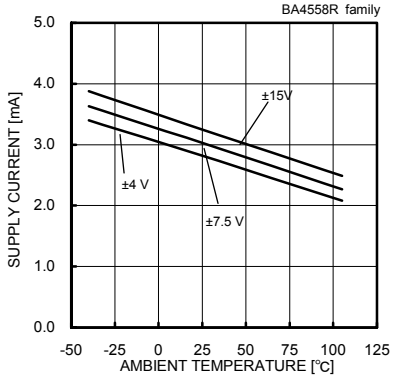


Fig.25
Supply Current - Ambient Temperature

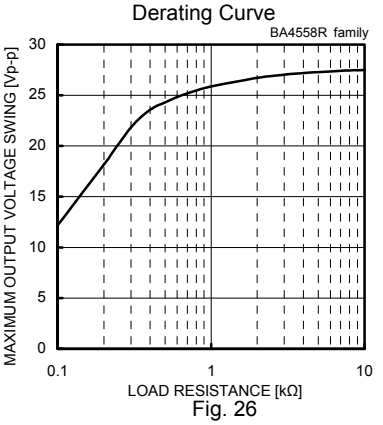


Fig. 26
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

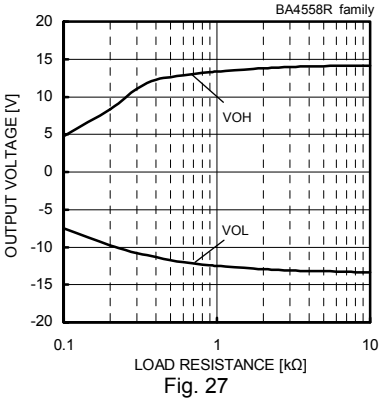


Fig. 27
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

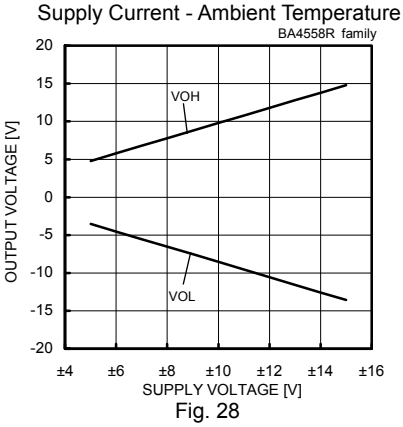


Fig. 28
Maximum Output Voltage
- Supply Voltage
(RL=2[kΩ],Ta=25[℃])

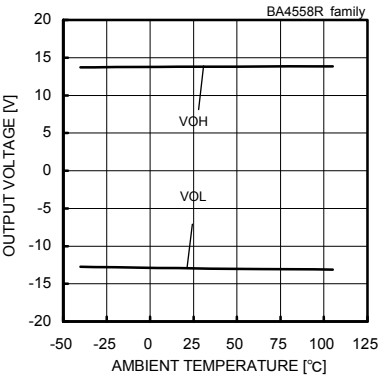


Fig.29
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V],RL=2[kΩ])

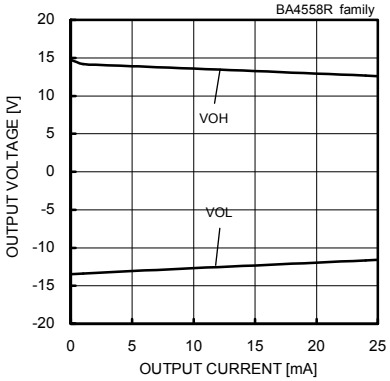


Fig. 30
Maximum Output Voltage
- Output Current
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

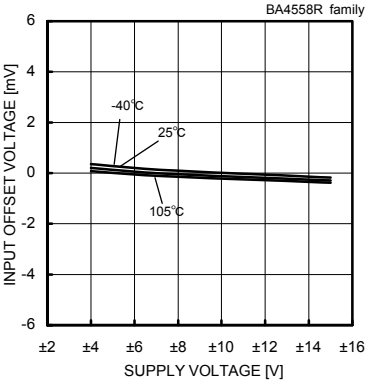


Fig. 31
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

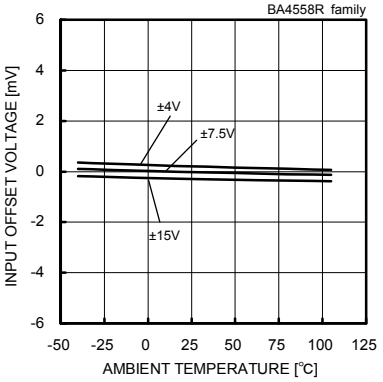


Fig. 32
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

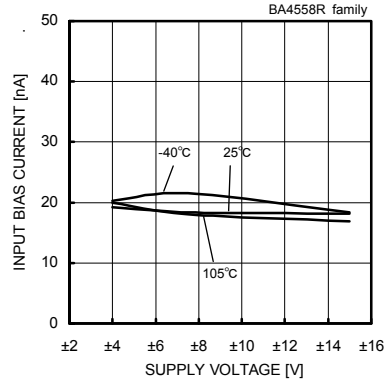


Fig.33
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

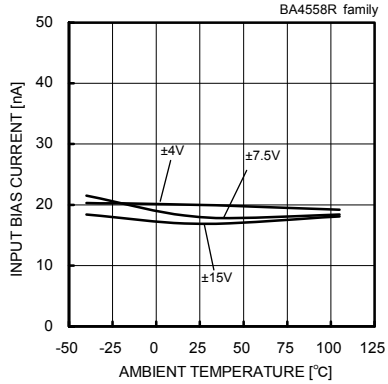


Fig. 34
Input Bias Current - Ambient Temperature
(Vicm=0[V],, Vout=0[V])

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

●Reference Data BA4558 family

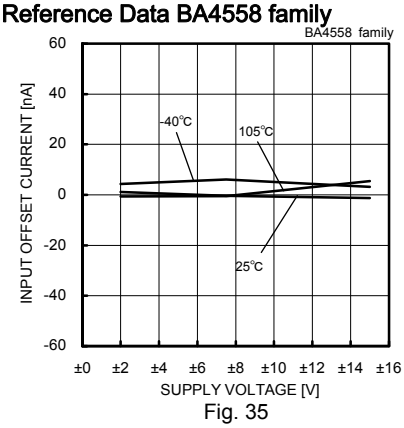


Fig. 35
Input Offset Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

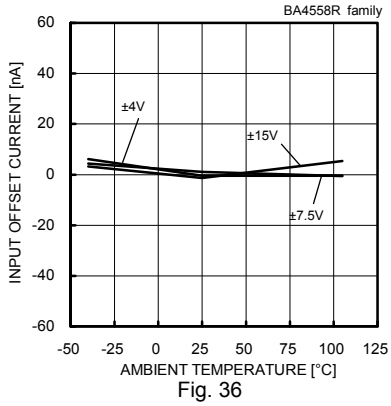


Fig. 36
Input Offset Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

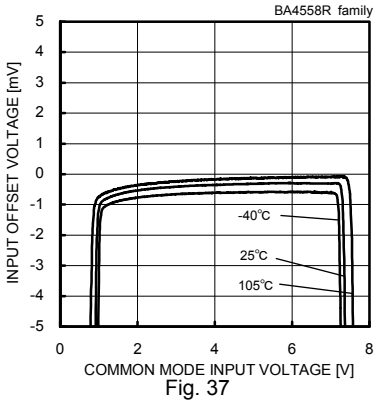


Fig. 37
Input Offset Voltage
- Common Mode Input Voltage
(VCC=8[V], Vout=4[V])

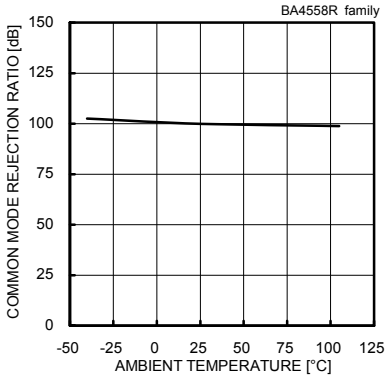


Fig. 38
Common Mode Rejection Ratio
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V],Vicm=-12[V] to +12[V])

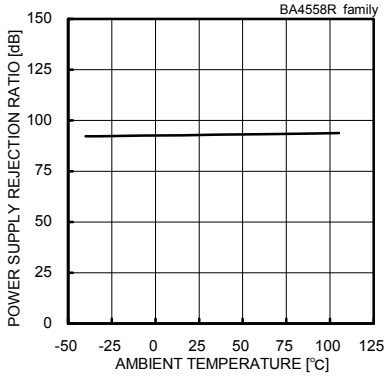


Fig. 39
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+4[V]/-4[V] to +15[V]/-15[V])

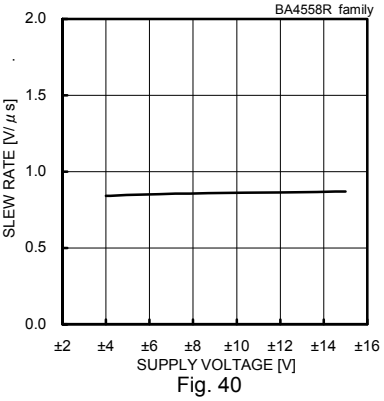


Fig. 40
Slew Rate - Supply Voltage
(CL=100[pF],RL=2[kΩ],Ta=25[℃])

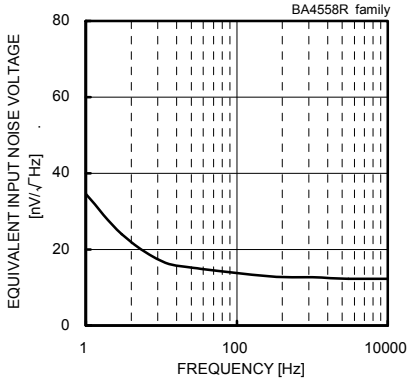


Fig. 41
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15[V]/-15[V],Rs=100[Ω],Ta=25[℃])

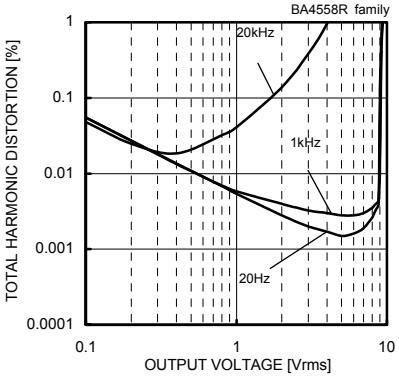


Fig. 42
Total Harmonic Distortion - Output Voltage
(VCC/VEE=+15[V]/-15[V],Av=20[dB],
RL=2[kΩ],80[kHz]-LPF,Ta=25[℃])

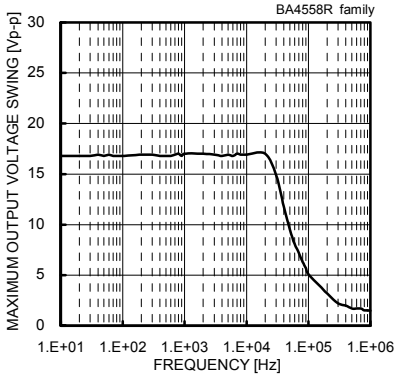


Fig. 43
Maximum Output Voltage Swing - Frequency
(VCC/VEE=+15[V]/-15[V],RL=2[kΩ],Ta=25[℃])

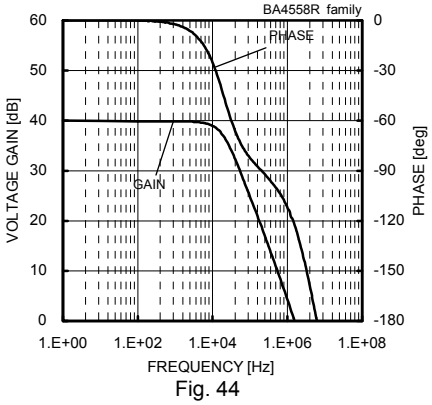


Fig. 44
Voltage Gain - Frequency
(VCC/VEE=+15[V]/-15[V],Av=40[dB],RL=2[kΩ],Ta=25[℃])

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

●Reference Data BA4560 family

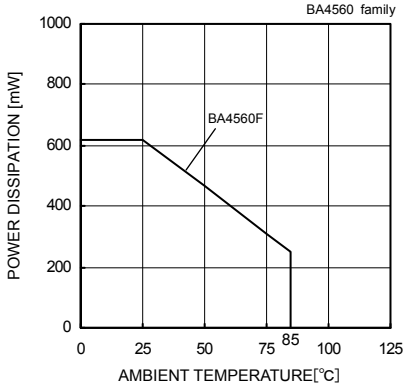


Fig. 45
Derating Curve

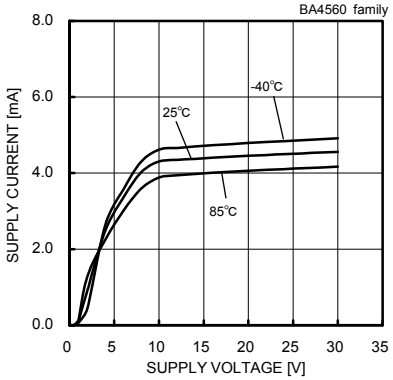


Fig. 46
Supply Current - Supply Voltage

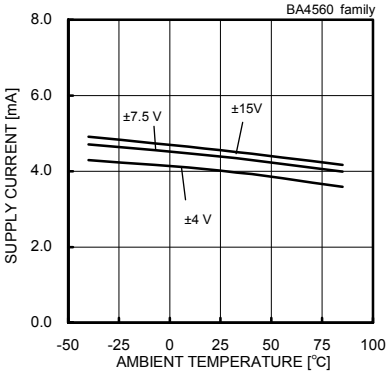


Fig. 47
Supply Current - Ambient Temperature

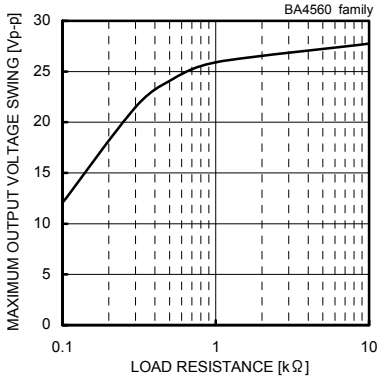


Fig. 48
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

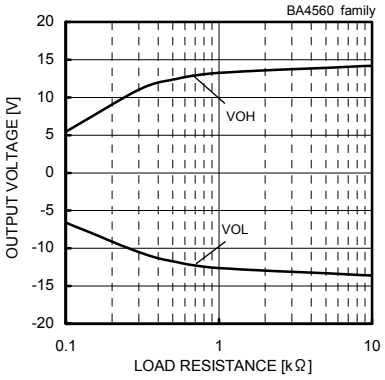


Fig. 49
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

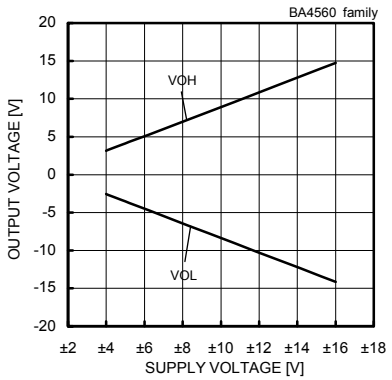


Fig. 50
Maximum Output Voltage
- Supply Voltage
(RL=2[kΩ],Ta=25[℃])

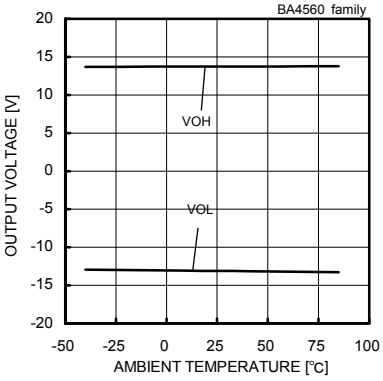


Fig. 51
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ])

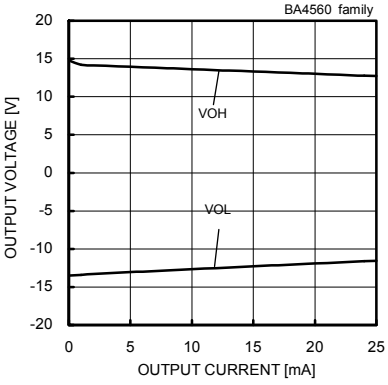


Fig. 52
Maximum Output Voltage
- Output Current
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

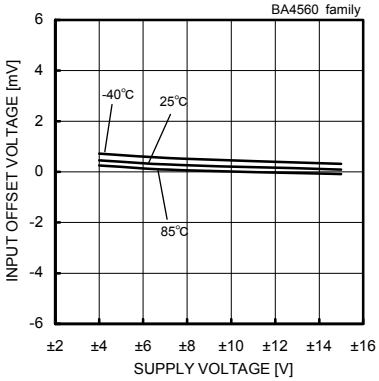


Fig. 53
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

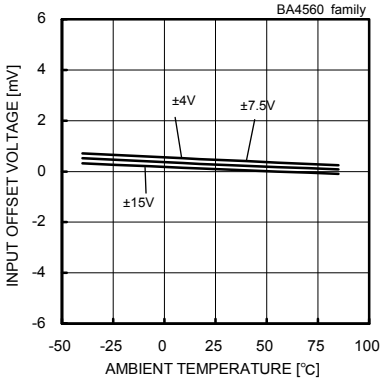


Fig. 54
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

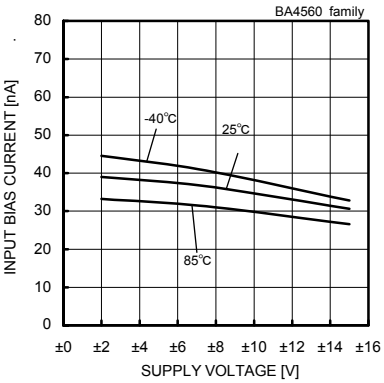


Fig. 55
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

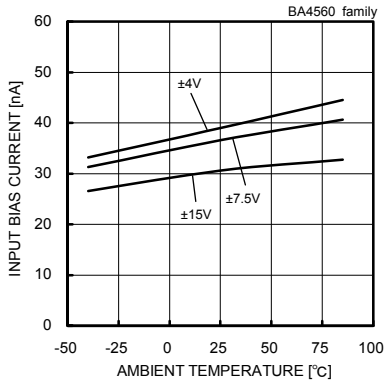


Fig. 56
Input Bias Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

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

●Reference Data BA4560 family

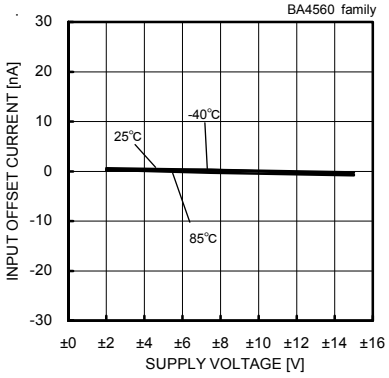


Fig. 57

Input Offset Current - Supply Voltage

(Vicm=0[V], Vout=0[V])

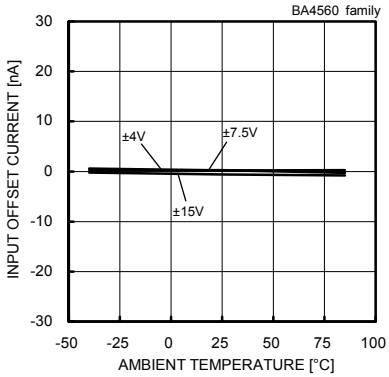


Fig. 58

Input Offset Current - Ambient Temperature

(Vicm=0[V], Vout=0[V])

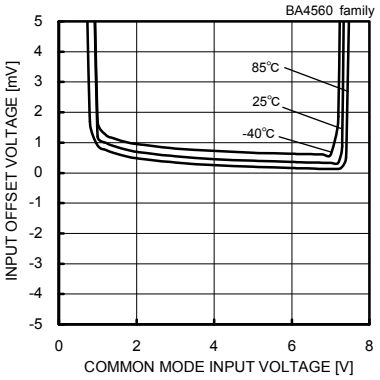


Fig. 59

Input Offset Voltage

−Common Mode Input Voltage

(VCC=8[V], Vout=4[V])

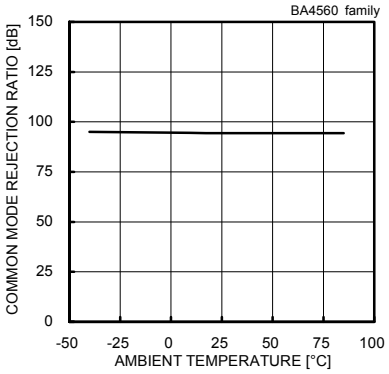


Fig. 60

Common Mode Rejection Ratio

- Ambient Temperature

(VCC/VEE=+15[V]/-15[V], Vicm=-12[V] to +12[V])

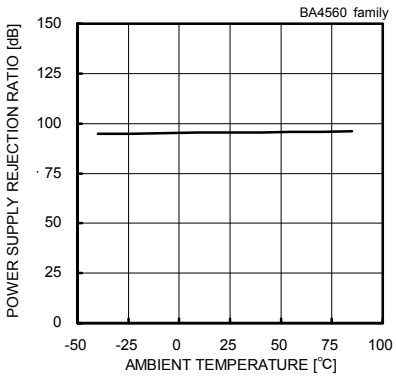


Fig. 61

Power Supply Rejection Ratio

- Ambient Temperature

(VCC/VEE=+4[V]/-4[V] to +15[V]/-15[V])

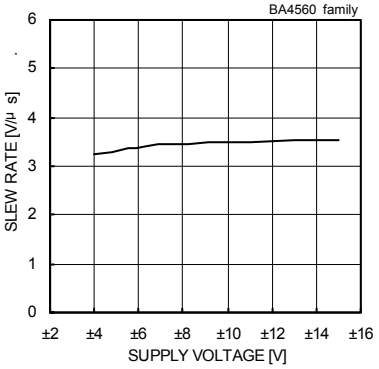


Fig. 62

Slew Rate - Supply Voltage (CL=100[pF],

RL=2[kΩ], Ta=25[℃])

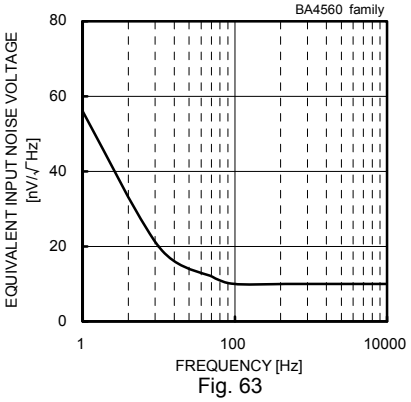


Fig. 63

Equivalent Input Noise Voltage - Frequency

(VCC/VEE=+15[V]/-15[V],Rs=100[Ω],Ta=25[℃])

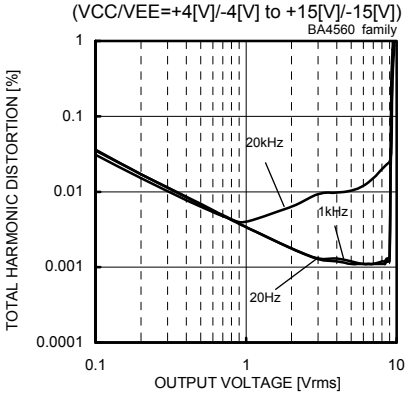


Fig. 64

Total Harmonic Distortion - Output Voltage

(VCC/VEE=+15[V]/-15[V], Av=20[dB],

RL=2[kΩ],80[kHz]-LPF,Ta=25[℃])

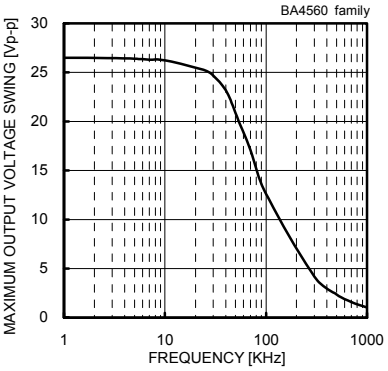


Fig. 65

Maximum Output Voltage Swing - Frequency

(VCC/VEE=+15[V]/-15[V],RL=2[kΩ],Ta=25[℃])

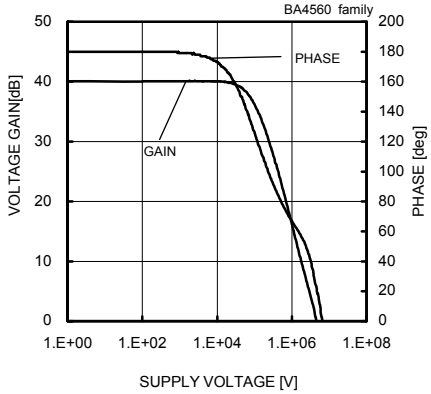


Fig. 66

Voltage Gain - Frequency (VCC/VEE=+15[V]/-15[V],

Av=40[dB], RL=2[kΩ], Ta=25[℃])

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

●Reference Data BA4560R family

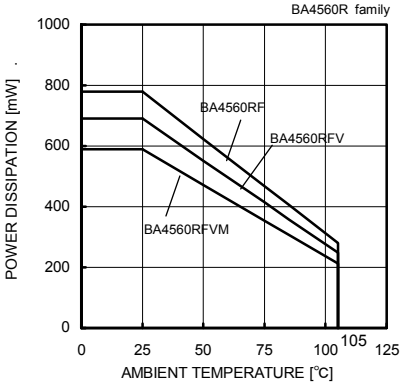


Fig. 67
Derating Curve

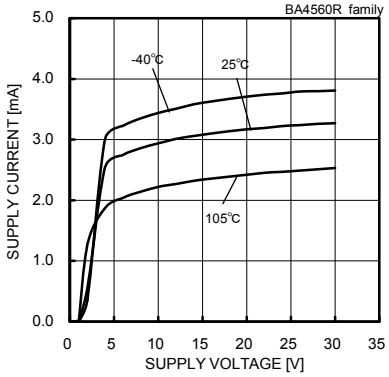


Fig. 68
Supply Current - Supply Voltage

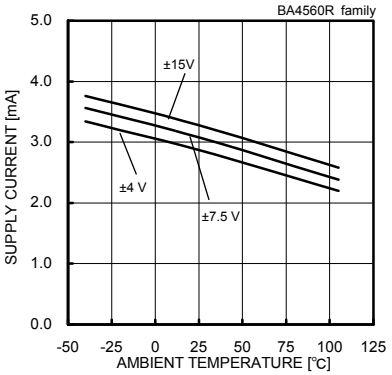


Fig. 69
Supply Current - Ambient Temperature

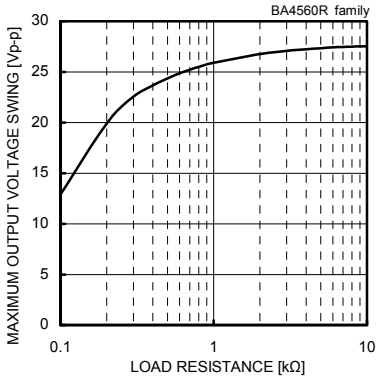


Fig. 70
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

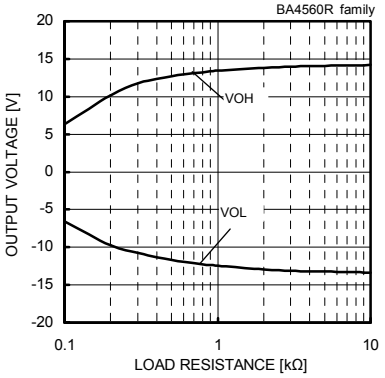


Fig. 71
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

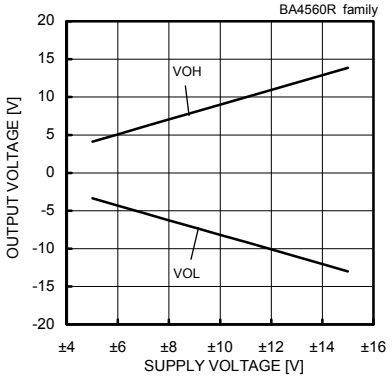


Fig. 72
Maximum Output Voltage
- Supply Voltage
(RL=2[kΩ],Ta=25[℃])

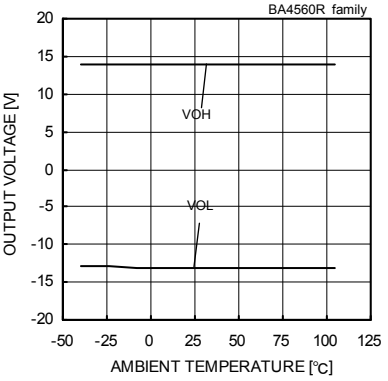


Fig. 73
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ])

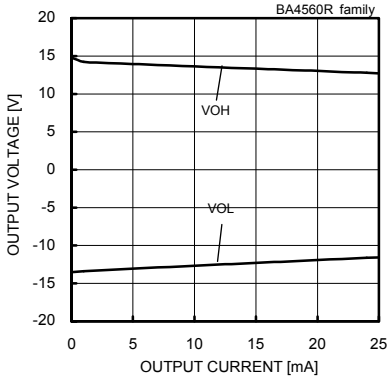


Fig. 74
Maximum Output Voltage
- Output Current
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

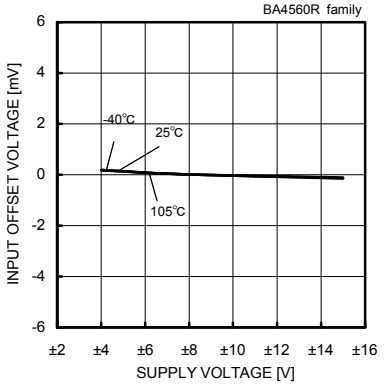


Fig. 75
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

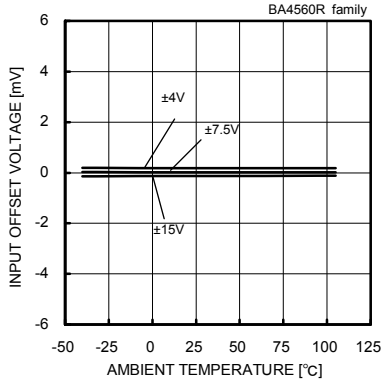


Fig.76
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

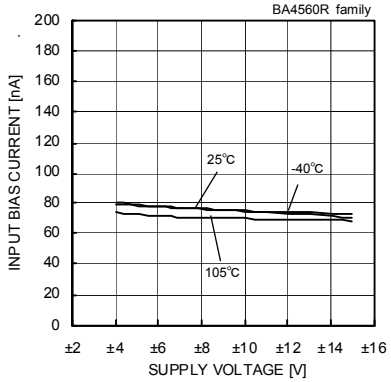


Fig. 77
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

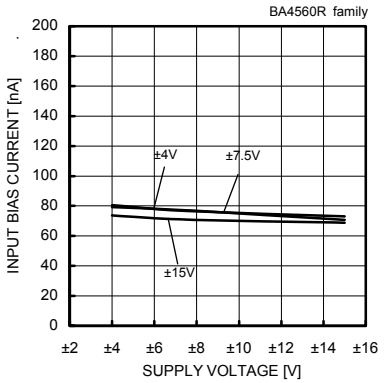


Fig. 78
Input Bias Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

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

●Reference Data BA4560R family

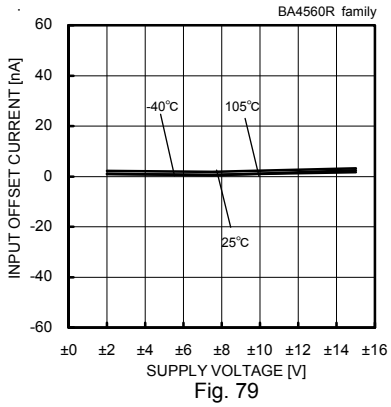


Fig. 79
Input Offset Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

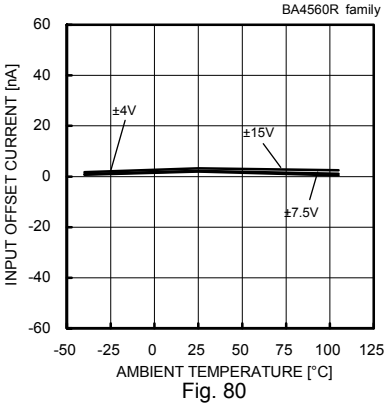


Fig. 80
Input Offset Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

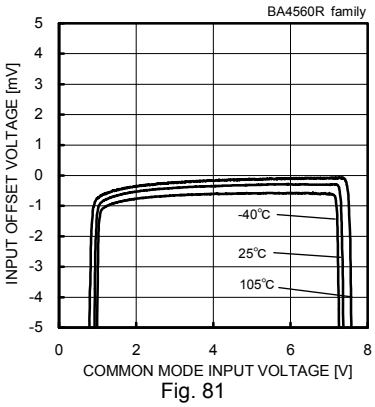


Fig. 81
Input Offset Voltage
−Common Mode Input Voltage
(VCC=8[V], Vout=4[V])

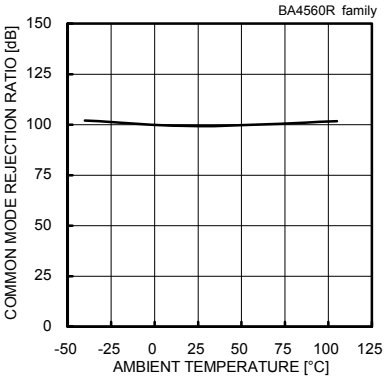


Fig. 82
Common Mode Rejection Ratio
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], Vicm=-12[V] to +12[V])

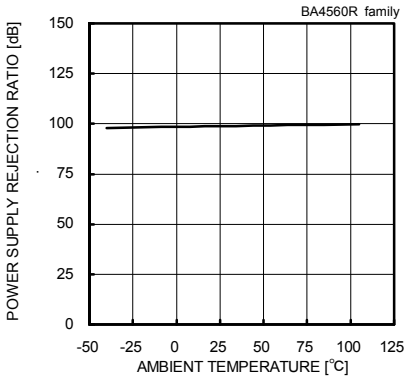


Fig. 83
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+4[V]/-4[V] to +15[V]/-15[V])

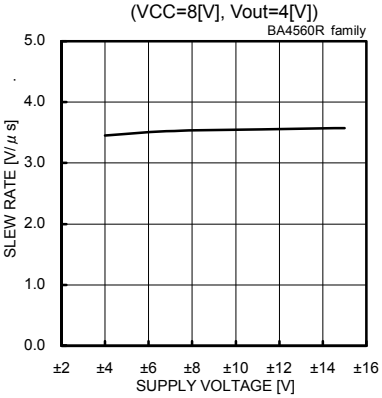


Fig. 84
Slew Rate - Supply Voltage
(CL=100[pF], RL=2[kΩ], Ta=25[℃])

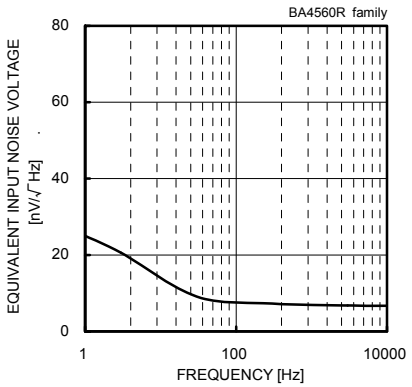


Fig. 85
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15[V]/-15[V], Rs=100[Ω], Ta=25[℃])

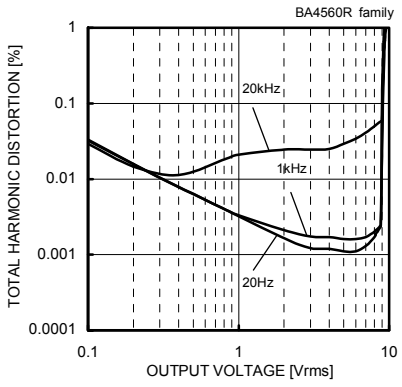


Fig. 86
Total Harmonic Distortion - Output Voltage
(VCC/VEE=+15[V]/-15[V], Av=20[dB],
RL=2[kΩ], 80[kHz]-LPF, Ta=25[℃])

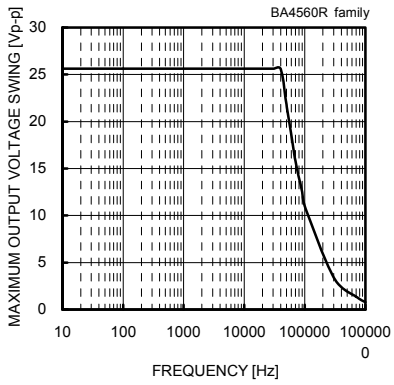


Fig. 87
Maximum Output Voltage Swing - Frequency
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ], Ta=25[℃])

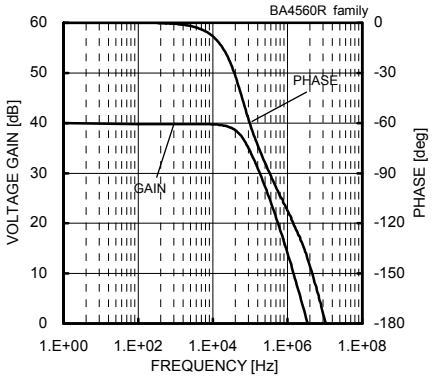


Fig. 88
Voltage Gain - Frequency (VCC/VEE=+15[V]/-15[V],
Av=40[dB], RL=2[kΩ], Ta=25[℃])

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

●Reference Data BA4564R family

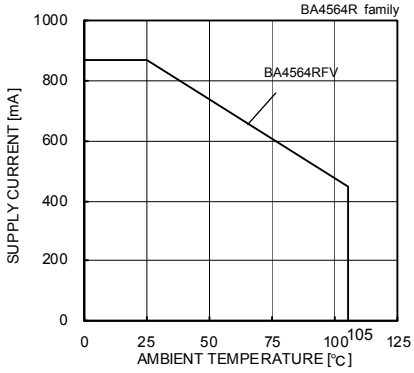


Fig. 89
Derating Curve

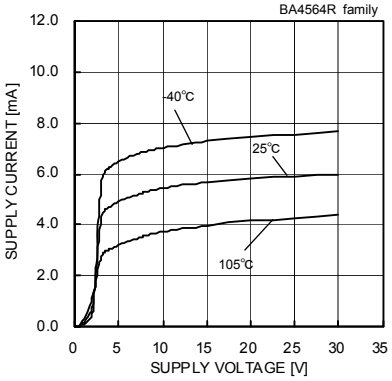


Fig. 90
Supply Current - Supply Voltage

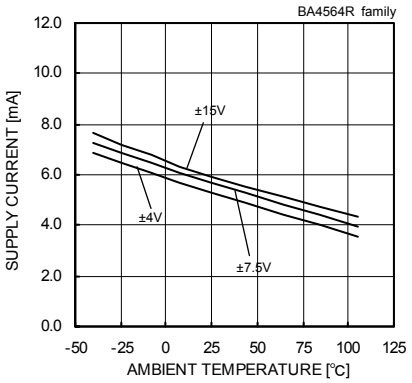


Fig. 91
Supply Current - Ambient Temperature

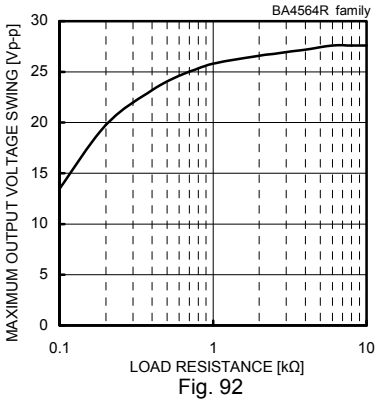


Fig. 92
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

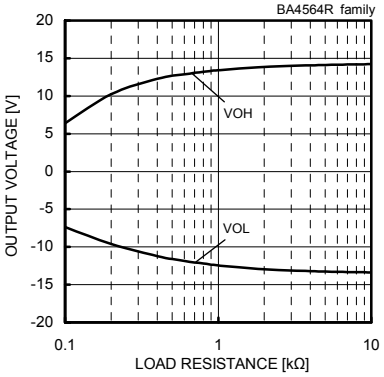


Fig. 93
Maximum Output Voltage
-Load Resistance
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

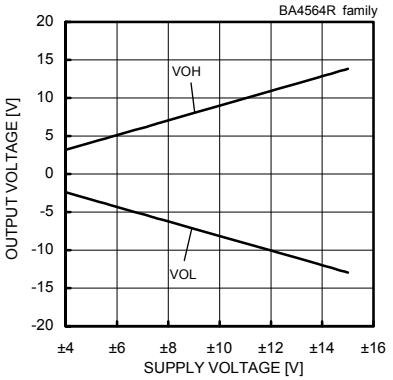


Fig. 94
Maximum Output Voltage
-Supply Voltage
(RL=2[kΩ], Ta=25[℃])

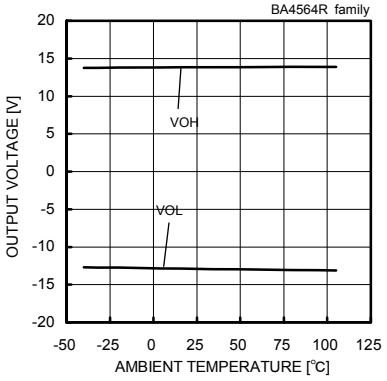


Fig. 95
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ])

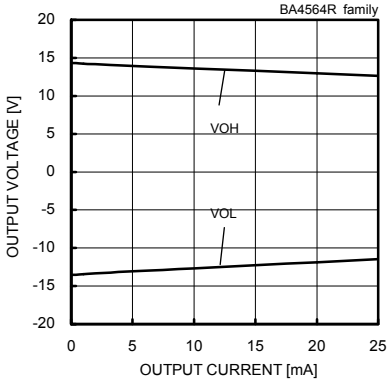


Fig. 96
Maximum Output Voltage
- Output Current
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

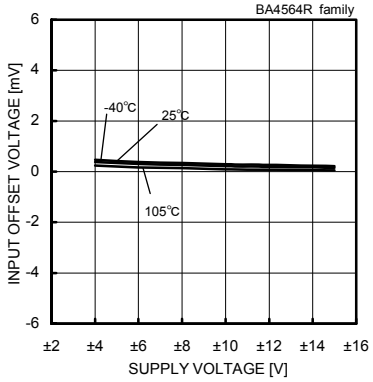


Fig. 97
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

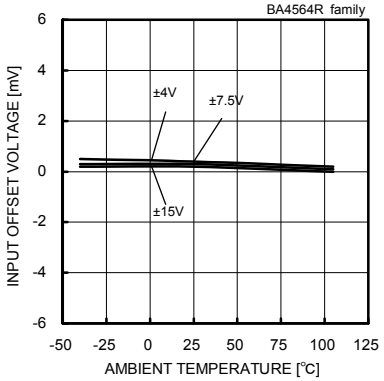


Fig. 98
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

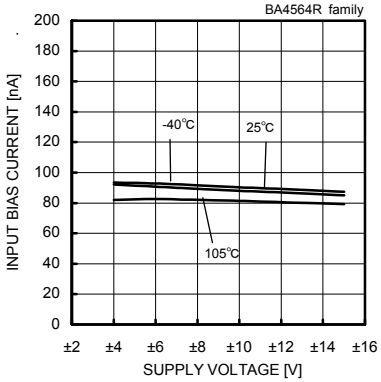


Fig. 99
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

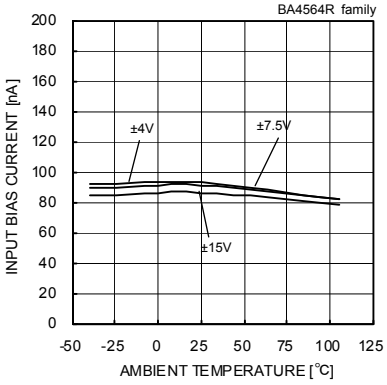


Fig. 100
Input Bias Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

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

●Reference Data BA4564R family

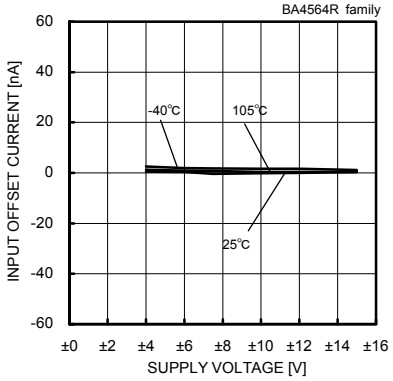


Fig. 101
Input Offset Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

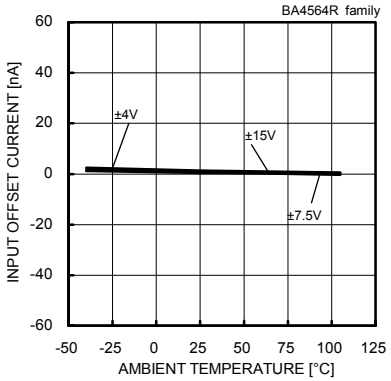


Fig. 102
Input Offset Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

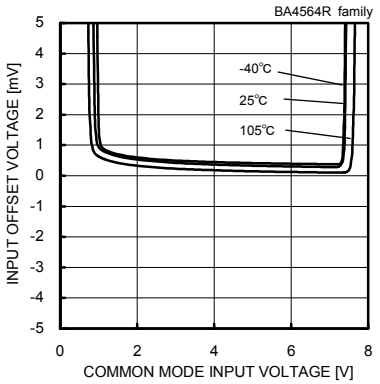


Fig. 103
Input Offset Voltage
- Common Mode Input Voltage
(VCC=8[V], Vout=4[V])

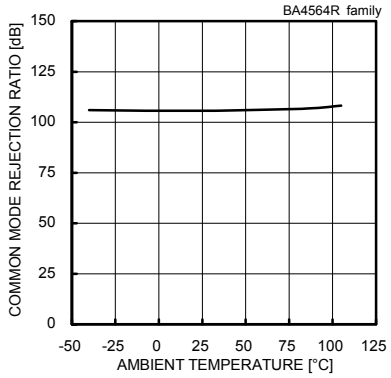


Fig. 104
Common Mode Rejection Ratio
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], Vicm=-12[V] to +12[V])

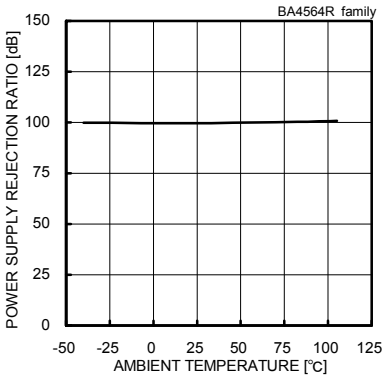


Fig. 105
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+4[V]/-4[V] to +15[V]/-15[V])

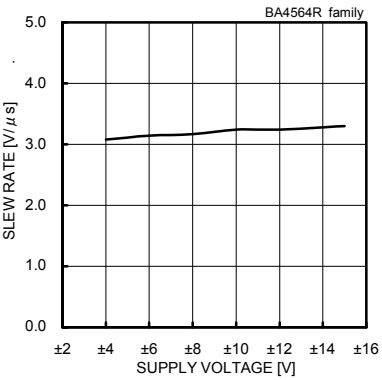


Fig. 106
Slew Rate - Supply Voltage
(CL=100[pF],RL=2[kΩ],Ta=25[℃])

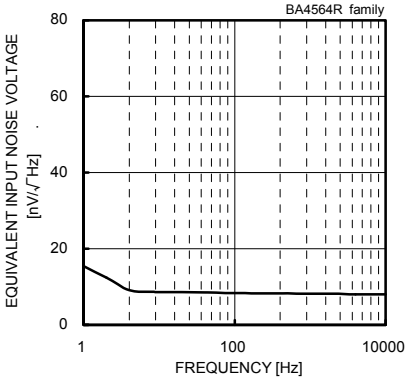


Fig. 107
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15[V]/-15[V],Rs=100[Ω],Ta=25[℃])

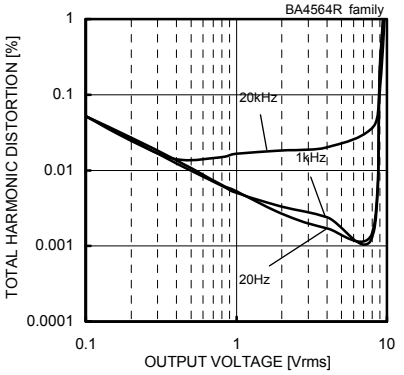


Fig. 108
Total Harmonic Distortion - Output Voltage
(VCC/VEE=+15[V]/-15[V], Av=20[dB],
RL=2[kΩ],80[kHz]-LPF,Ta=25[℃])

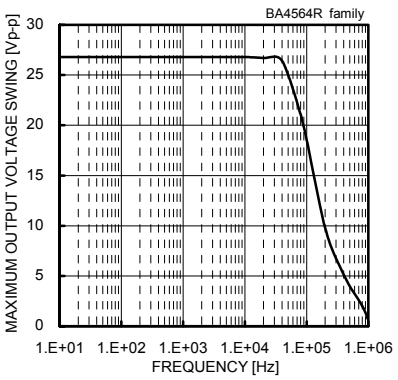


Fig. 109
Maximum Output Voltage Swing - Frequency
(VCC/VEE=+15[V]/-15[V],RL=2[kΩ],Ta=25[℃])

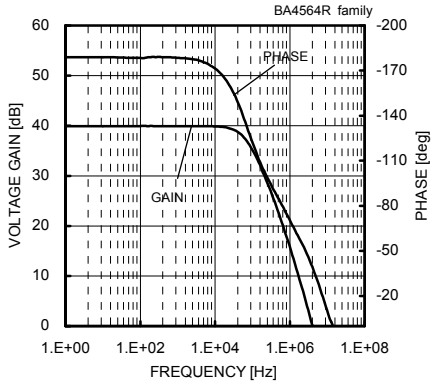


Fig. 110
Voltage Gain - Frequency
(VCC/VEE=+15[V]/-15[V],Av=40[dB],RL=2[kΩ],Ta=25[℃])

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

●Reference Data BA4580R family

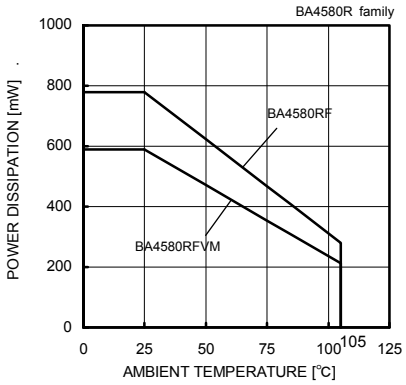


Fig. 111
Derating Curve

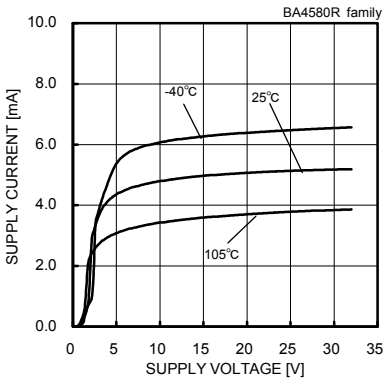


Fig. 112
Supply Current - Supply Voltage

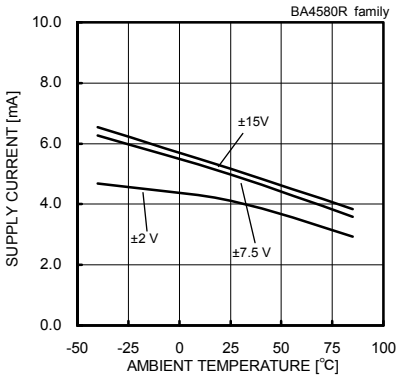


Fig. 113
Supply Current - Ambient Temperature

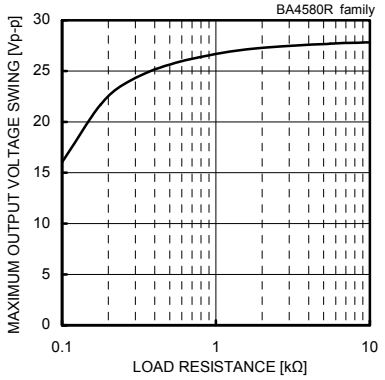


Fig. 114
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

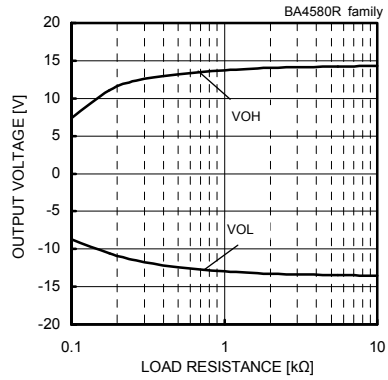


Fig.115
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

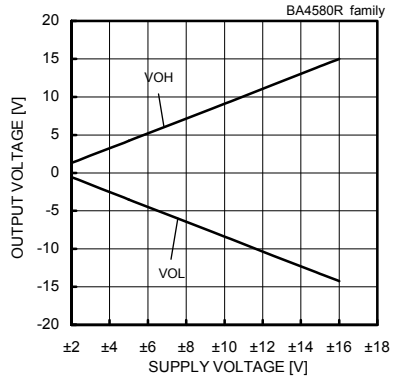


Fig. 116
Maximum Output Voltage
- Supply Voltage
(RL=2[kΩ],Ta=25[℃])

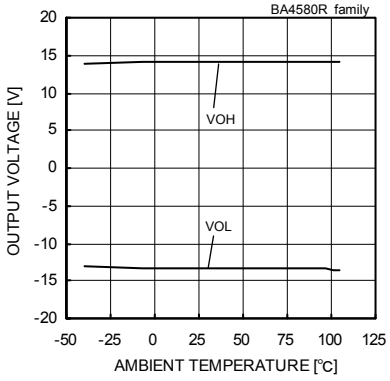


Fig. 117
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ])

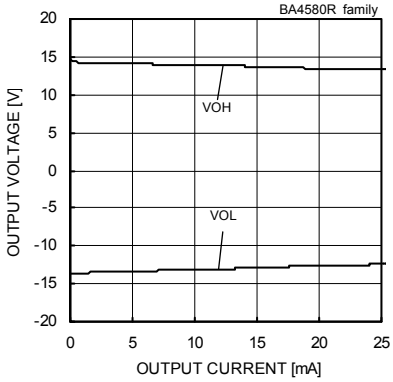


Fig. 118
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

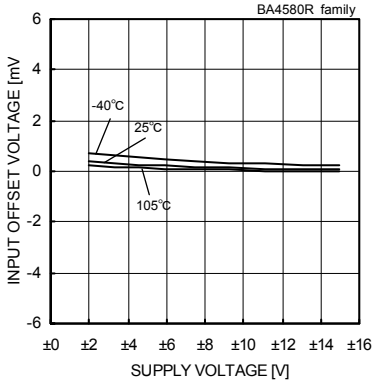


Fig.119
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

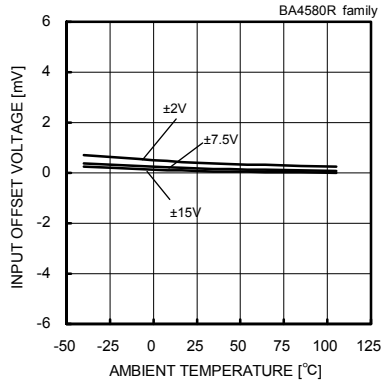


Fig. 120
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

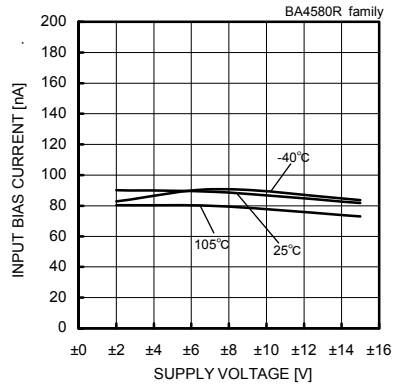


Fig. 121
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

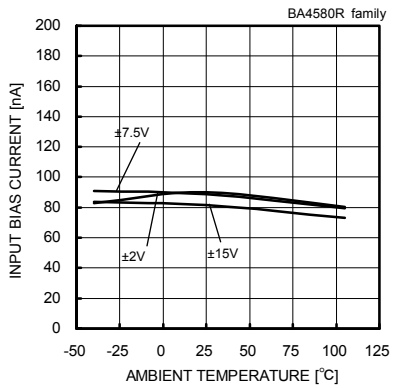


Fig. 122
Input Bias Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

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

●Reference Data BA4580R family

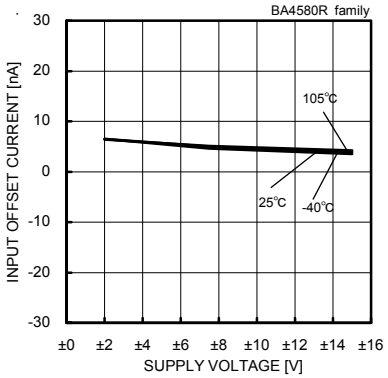


Fig. 123
Input Offset Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

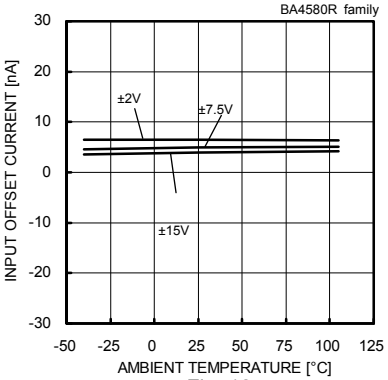


Fig. 124
Input Offset Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

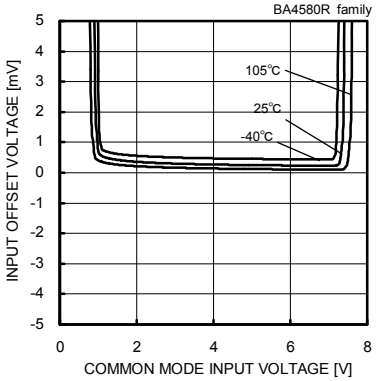


Fig. 125
Input Offset Voltage
- Common Mode Input Voltage
(VCC=8[V], Vout=4[V])

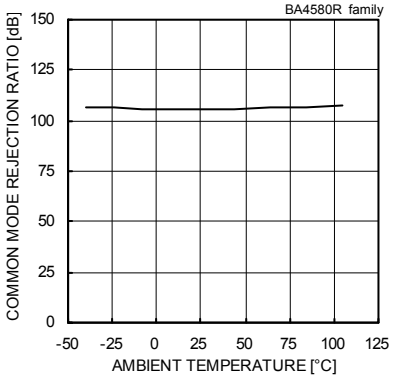


Fig. 126
Common Mode Rejection Ratio
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V],Vicm=-12[V] to +12[V])

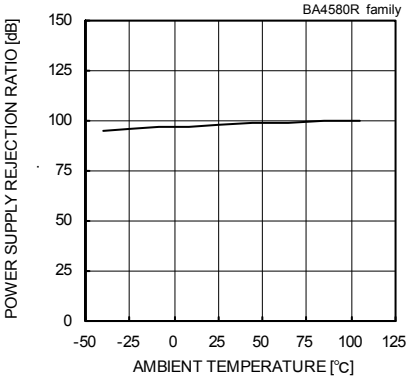


Fig. 127
Power Supply Rejection Ratio
- Ambient Temperature
(VCC/VEE=+2[V]/-2[V] to +15[V]/-15[V])

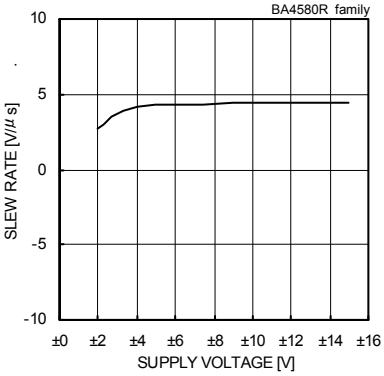


Fig. 128
Slew Rate - Supply Voltage
(CL=100[pF],RL=2[kΩ],Ta=25[℃])

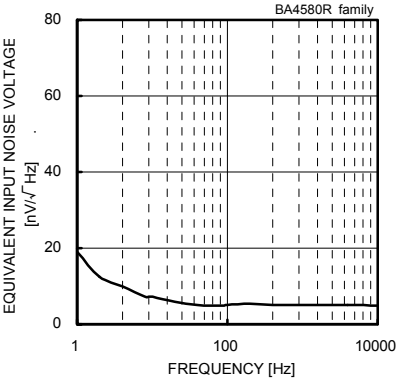


Fig. 129
Equivalent Input Noise Voltage - Frequency
(VCC/VEE=+15[V]/-15[V],Rs=100[Ω],Ta=25[℃])

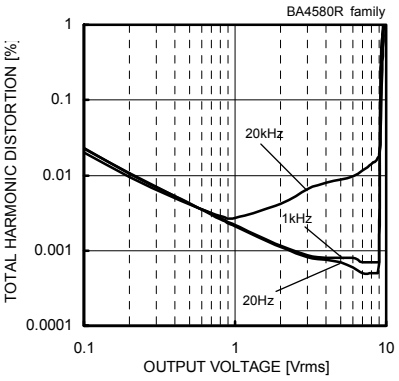


Fig. 130
Total Harmonic Distortion - Output Voltage
(VCC/VEE=+15[V]/-15[V],Av=20[dB],
RL=2[kΩ],80[kHz]-LPF,Ta=25[℃])

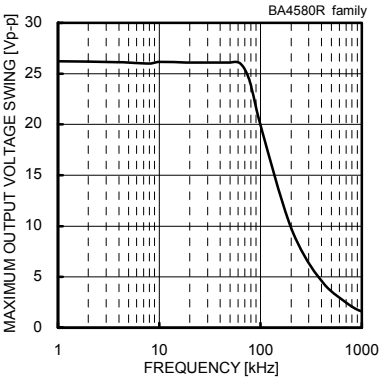


Fig. 131
Maximum Output Voltage Swing - Frequency
(VCC/VEE=+15[V]/-15[V],RL=2[kΩ],Ta=25[℃])

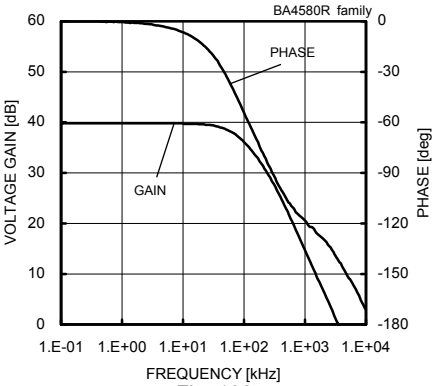


Fig. 132
Voltage Gain - Frequency
(VCC/VEE=+15[V]/-15[V],Av=40[dB],RL=2[kΩ],Ta=25[℃])

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

●Reference Data BA4584 family

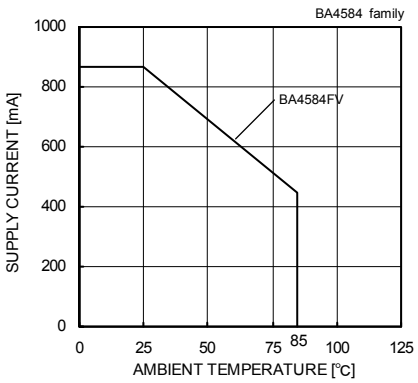


Fig. 133
Derating Curve

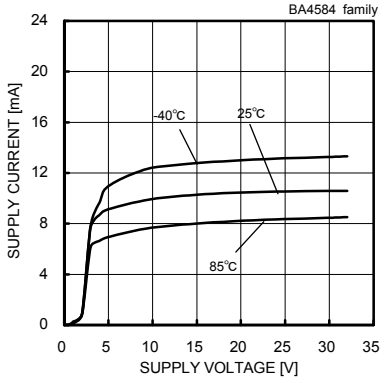


Fig. 134
Supply Current - Supply Voltage

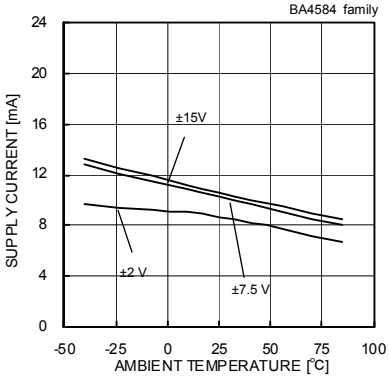


Fig. 135
Supply Current - Ambient Temperature

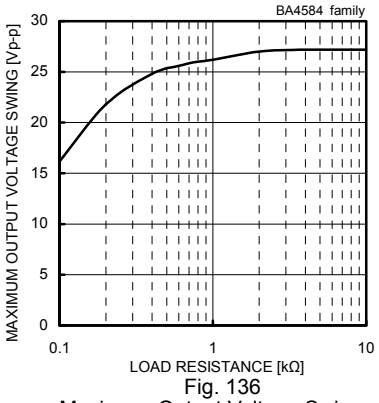


Fig. 136
Maximum Output Voltage Swing
- Load Resistance
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

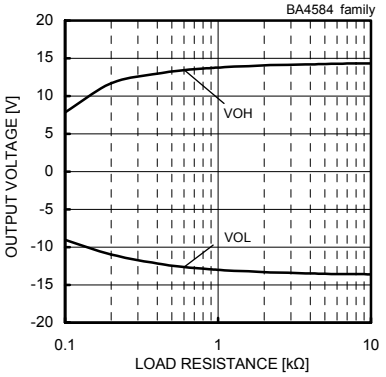


Fig. 137
Maximum Output Voltage
- Load Resistance
(VCC/VEE=+15[V]/-15[V], Ta=25[℃])

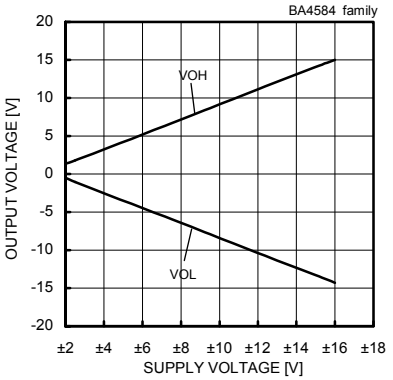


Fig. 138
Maximum Output Voltage
- Supply Voltage
(RL=2[kΩ], Ta=25[℃])

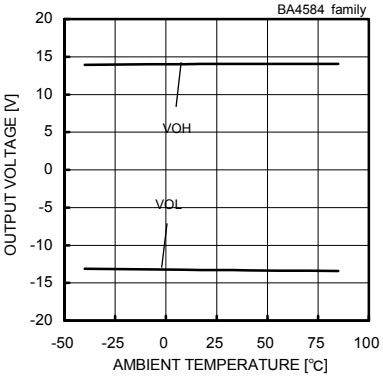


Fig. 139
Maximum Output Voltage
- Ambient Temperature
(VCC/VEE=+15[V]/-15[V], RL=2[kΩ])

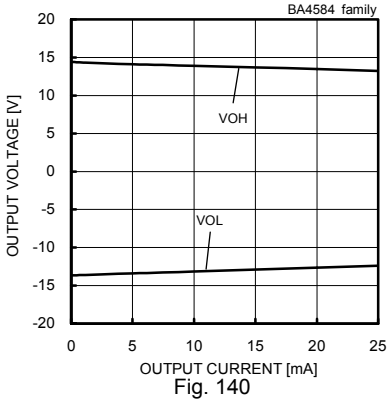


Fig. 140
Maximum Output Voltage
- Output Current
(VCC/VEE=+15[V]/-15[V],Ta=25[℃])

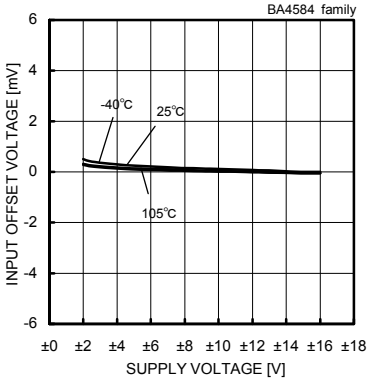


Fig. 141
Input Offset Voltage - Supply Voltage
(Vicm=0[V], Vout=0[V])

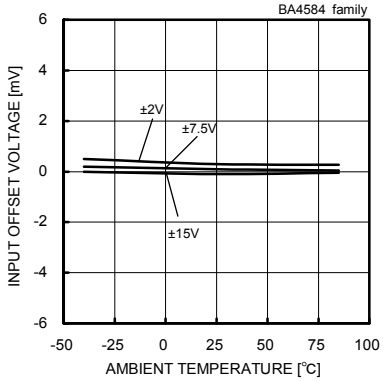


Fig. 142
Input Offset Voltage - Ambient Temperature
(Vicm=0[V], Vout=0[V])

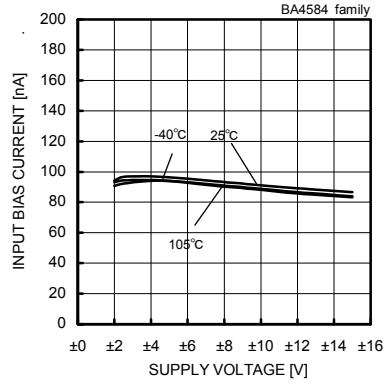


Fig. 143
Input Bias Current - Supply Voltage
(Vicm=0[V], Vout=0[V])

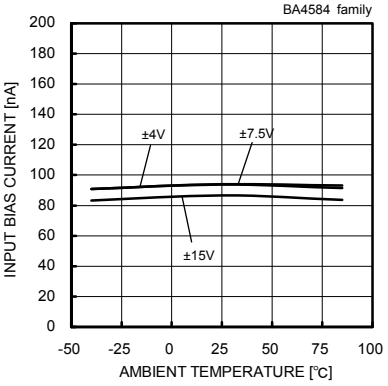


Fig. 144
Input Bias Current - Ambient Temperature
(Vicm=0[V], Vout=0[V])

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