



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

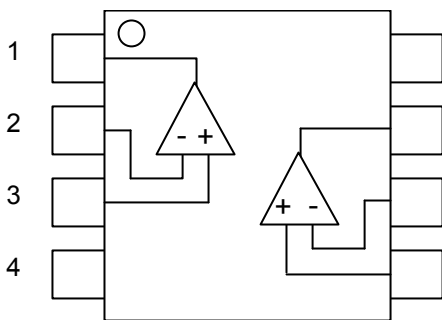
The **MUSES01** is a dual J-FET input high quality audio operational amplifier, which is optimized for high-end audio and professional audio applications with advanced circuitry and layout, unique material and assembled technology by skilled-craftwork.

It is the best for audio preamplifiers, active filters, and line amplifiers with excellent sound.

■ FEATURES

- | | |
|-----------------------|----------------------------------|
| ●Operating Voltage | Vopr=±9V to ±16V |
| ●Output noise | 9.5nV/√Hz at f=1kHz |
| ●Input Offset Voltage | 0.8mV typ. 5mV max. |
| ●Input Bias Current | 200pA typ. 800pA max. at Ta=25°C |
| ●Voltage Gain | 105dB typ. |
| ●Slew Rate | 12V/μs typ. |
| ●Bipolar Technology | |
| ●Package Outline | DIP8 |

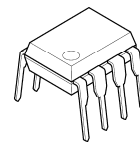
■ PIN CONFIGURATION



PIN FUNCTION

- | | |
|---|-------------|
| 8 | 1. A OUTPUT |
| 7 | 2. A -INPUT |
| 6 | 3. A +INPUT |
| 5 | 4. V- |
| | 5. B +INPUT |
| | 6. B -INPUT |
| | 7. B OUTPUT |
| | 8. V+ |

■ PACKAGE OUTLINE



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■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+V^-	±18	V
Common Mode Input Voltage	V_{ICM}	±15 (Note1)	V
Differential Input Voltage	V_{ID}	±30	V
Power Dissipation	P_D	910	mW
Output Current	I_O	±25	mA
Operating Temperature Range	T_{opr}	-40 to +85	°C
Storage Temperature Range	T_{stg}	-50 to +150	°C

(Note1) For supply Voltages less than ±15 V, the maximum input voltage is equal to the Supply Voltage.

■ RECOMMENDED OPERATING CONDITION (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+V^-	-	±9	-	±16	V

■ ELECTRIC CHARACTERISTICS

DC CHARACTERISTICS ($V^+V^- = \pm 15V$, Ta=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I_{cc}	No Signal, $R_L = \infty$	-	8.5	12.0	mA
Input Offset Voltage	V_{IO}	$R_s \leq 10k\Omega$ (Note2)	-	0.8	5.0	mV
Input Bias Current	I_B	(Note2, 3)	-	200	800	pA
Input Offset Current	I_{IO}	(Note2, 3)	-	100	400	pA
Voltage Gain	A_V	$R_L \geq 2k\Omega$, $V_o = \pm 10V$	90	105	-	dB
Common Mode Rejection Ratio	CMR	$V_{ICM} = \pm 8V$ (Note4)	60	75	-	dB
Supply Voltage Rejection Ratio	SVR	$V^+V^- = \pm 9.0$ to $\pm 16.0V$ (Note2, 5)	70	83	-	dB
Max Output Voltage 1	V_{OM1}	$R_L = 10k\Omega$	±12	±13.5	-	V
Max Output Voltage 2	V_{OM2}	$R_L = 2k\Omega$	±10	±12.5	-	V
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 60dB	±8	±9.5	-	V

(Note2) Measured at $V_{ICM} = 0V$

(Note3) Written by the absolute rate.

(Note4) CMR is calculated by specified change in offset voltage. ($V_{ICM} = 0V$ to +8V and $V_{ICM} = 0V$ to -8V)

(Note5) SVR is calculated by specified change in offset voltage. ($V^+V^- = \pm 9V$ to $\pm 16V$)

AC CHARACTERISTICS ($V^+V^- = \pm 15V$, $T_a = 25^\circ C$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GB	$f = 10kHz$	-	3.3	-	MHz
Unity Gain Frequency	f_T	$A_V = +100, R_S = 100\Omega,$ $R_L = 2k\Omega, C_L = 10pF$	-	3.0	-	MHz
Phase Margin	ϕ_M	$A_V = +100, R_S = 100\Omega,$ $R_L = 2k\Omega, C_L = 10pF$	-	60	-	deg
Input Noise Voltage1	V_{NI}	$f = 1kHz, A_V = +100,$ $R_S = 100\Omega$	-	9.5	-	nV/ \sqrt{Hz}
Input Noise Voltage2	V_{N2}	RIAA, $R_S = 2.2k\Omega,$ 30kHz LPF	-	1.2	3.0	μV_{rms}
Total Harmonic Distortion	THD	$f = 1kHz, A_V = +10,$ $R_L = 2k\Omega, V_o = 5V_{rms}$	-	0.002	-	%
Channel Separation	CS	$f = 1kHz, A_V = +100, R_S = 1k\Omega,$ $R_L = 2k\Omega$	-	150	-	dB
Positive Slew Rate	+SR	$A_V = 1, V_{IN} = 2V_{p-p},$ $R_L = 2k\Omega, C_L = 10pF$	-	12	-	V/ μs
Negative Slew Rate	-SR	$A_V = 1, V_{IN} = 2V_{p-p},$ $R_L = 2k\Omega, C_L = 10pF$	-	13	-	V/ μs

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■ Application Notes

•Package Power, Power Dissipation and Output Power

IC is heated by own operation and possibly gets damage when the junction power exceeds the acceptable value called Power Dissipation P_D . The dependence of the MUSES01 P_D on ambient temperature is shown in Fig 1. The plots are depended on following two points. The first is P_D on ambient temperature 25°C, which is the maximum power dissipation. The second is 0W, which means that the IC cannot radiate any more. Conforming the maximum junction temperature T_{jmax} to the storage temperature T_{stg} derives this point. Fig.1 is drawn by connecting those points and conforming the P_D lower than 25°C to it on 25°C. The P_D is shown following formula as a function of the ambient temperature between those points.

$$\text{Dissipation Power } P_D = \frac{T_{jmax} - T_a}{\theta_{ja}} \text{ [W]} \quad (T_a=25^\circ\text{C to } T_a=150^\circ\text{C})$$

Where, θ_{ja} is heat thermal resistance which depends on parameters such as package material, frame material and so on. Therefore, P_D is different in each package.

While, the actual measurement of dissipation power on MUSES01 is obtained using following equation.

$$(\text{Actual Dissipation Power}) = (\text{Supply Voltage } V_{DD}) \times (\text{Supply Current } I_{DD}) - (\text{Output Power } P_o)$$

The MUSES01 should be operated in lower than P_D of the actual dissipation power.

To sustain the steady state operation, take account of the Dissipation Power and thermal design.

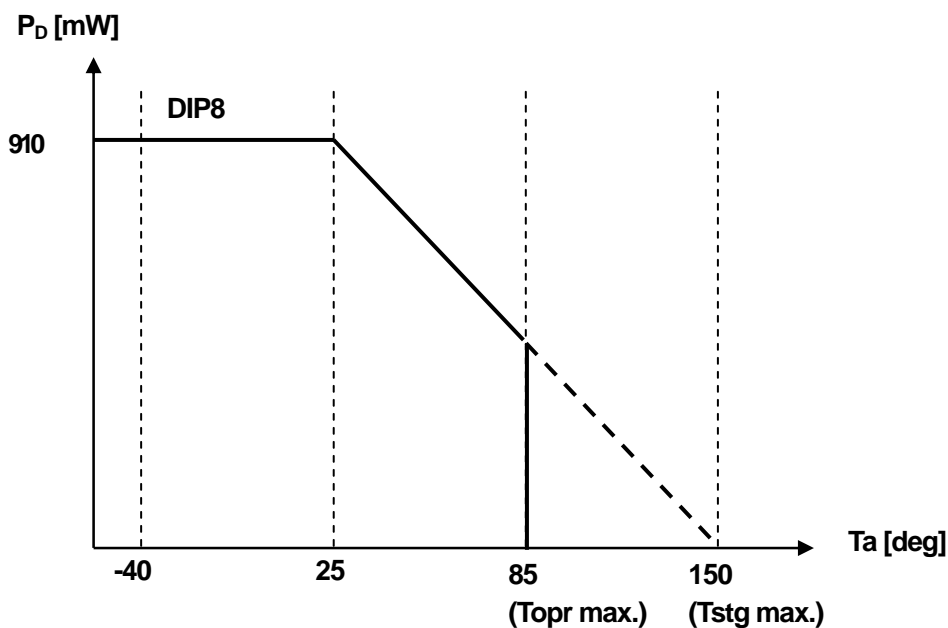
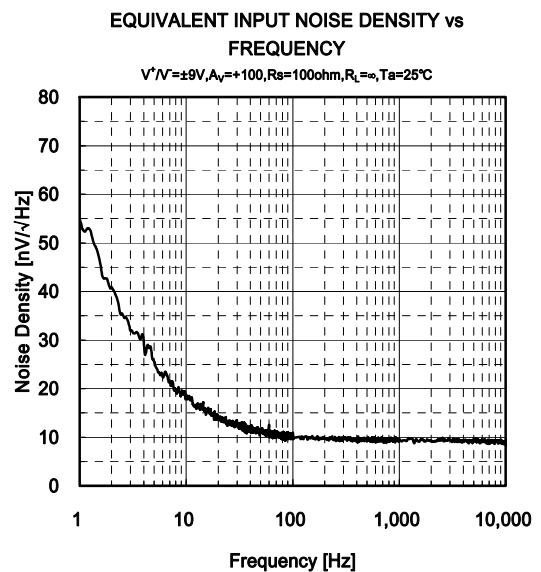
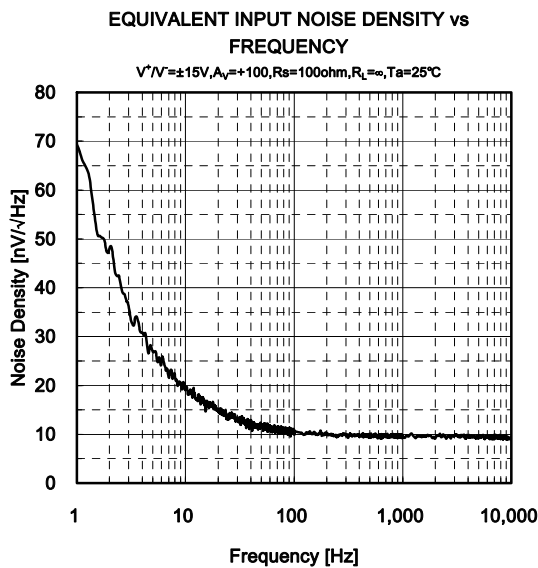
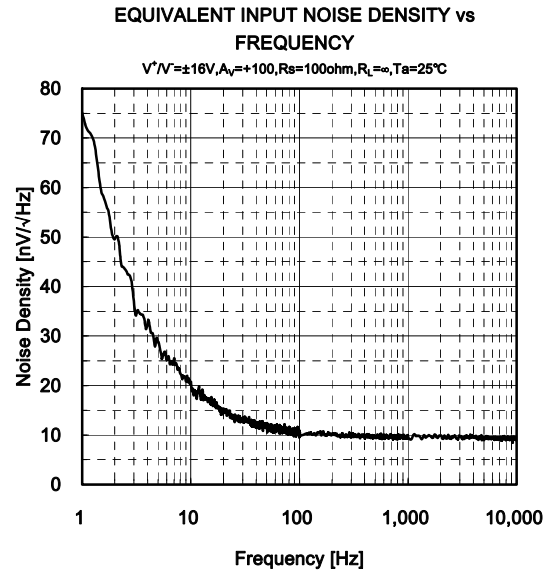
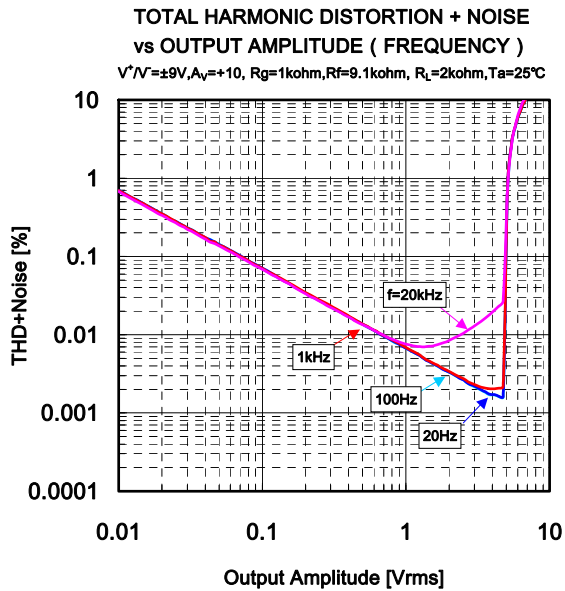
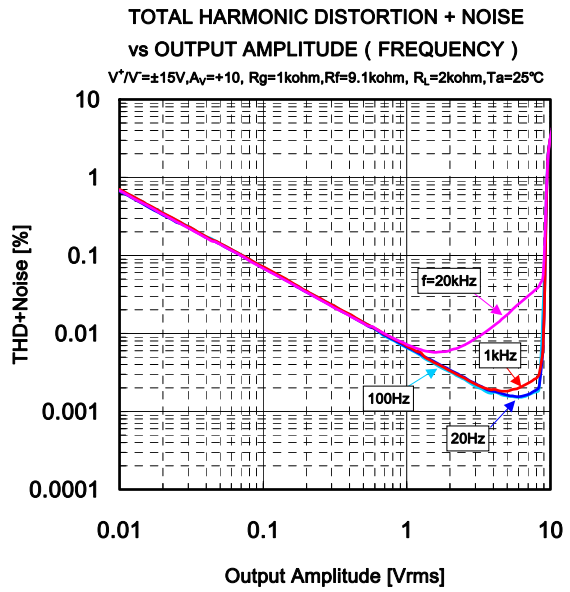
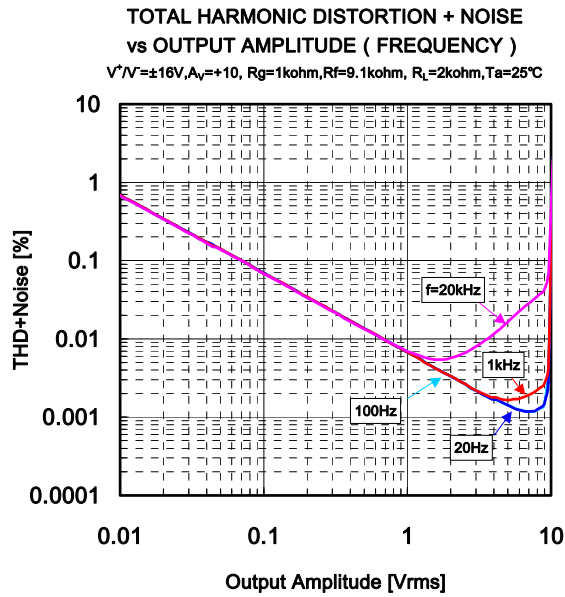
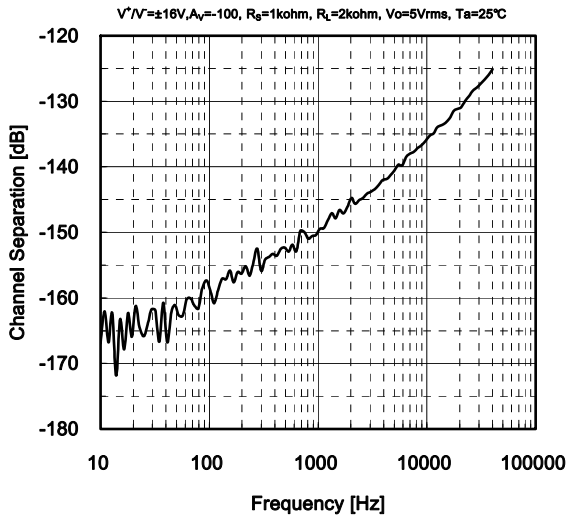


Fig.1 Power Dissipations vs. Ambient Temperature on the MUSES01

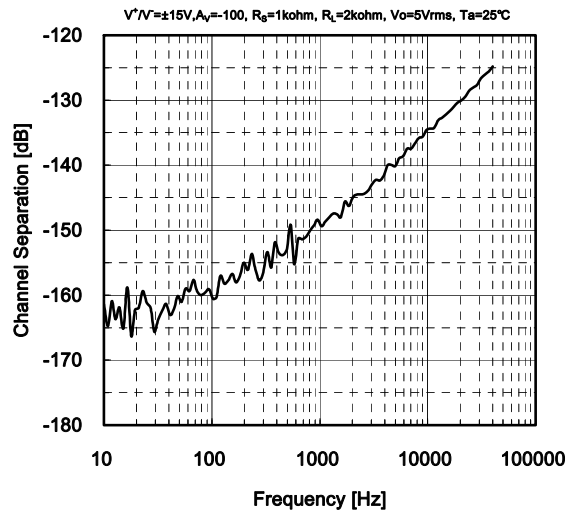
■ TYPICAL CHARACTERISTICS



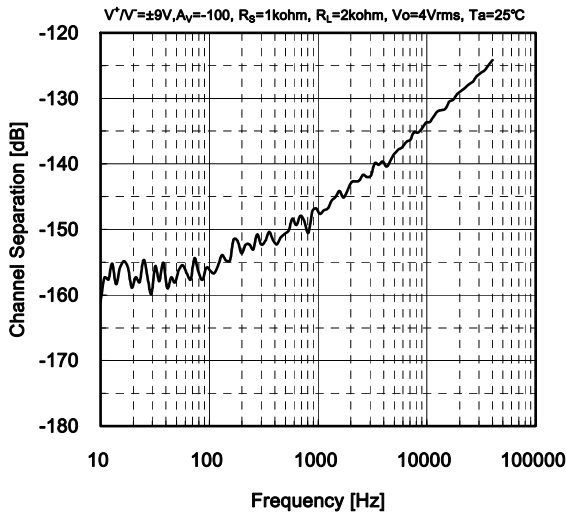
CHANNEL SEPARATION vs FREQUENCY



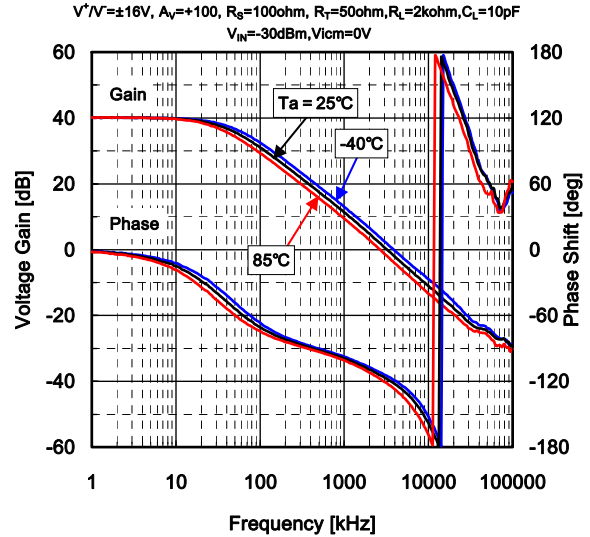
CHANNEL SEPARATION vs FREQUENCY



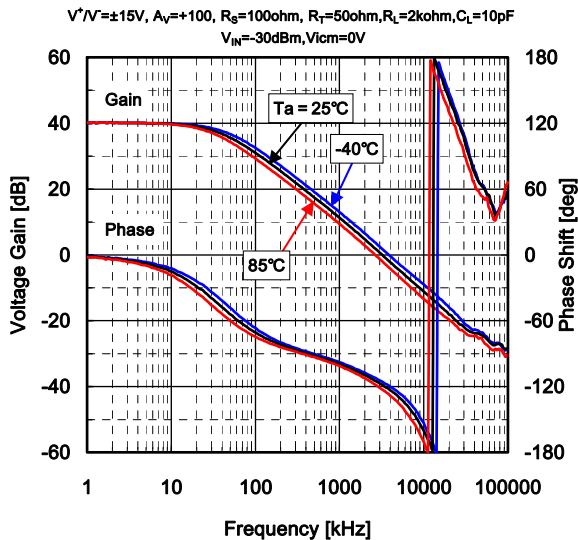
CHANNEL SEPARATION vs FREQUENCY



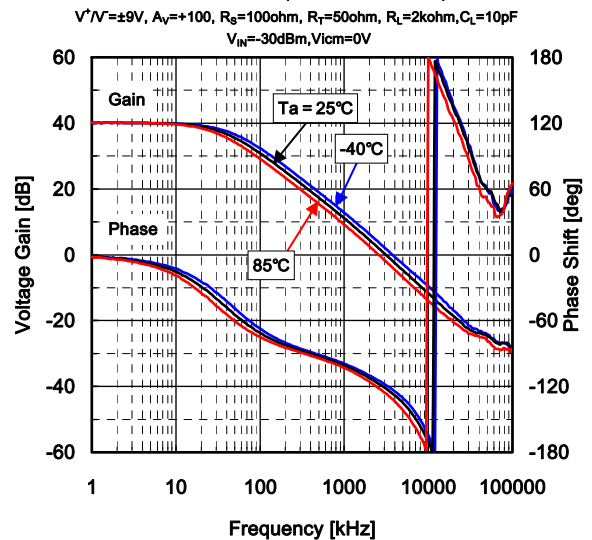
CLOSED-LOOP GAIN/PHASE vs FREQUENCY (TEMPERATURE)



CLOSED-LOOP GAIN/PHASE vs FREQUENCY (TEMPERATURE)



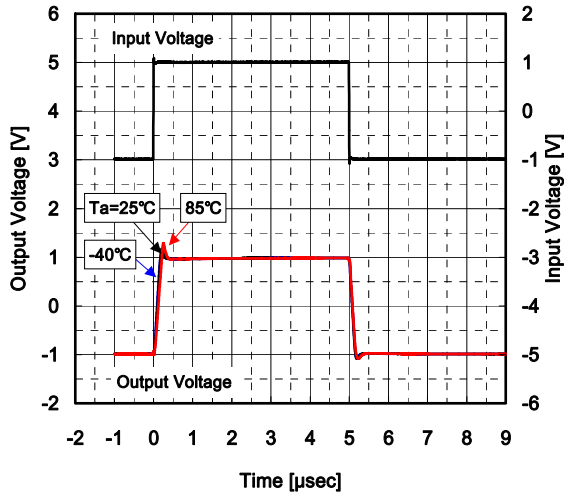
CLOSED LOOP GAIN/PHASE vs FREQUENCY (TEMPERATURE)



TRANSIENT RESPONSE (TEMPERATURE)

$V^+ / V^- = \pm 16V, V_{IN} = 2V_{P-P}, f = 100kHz$

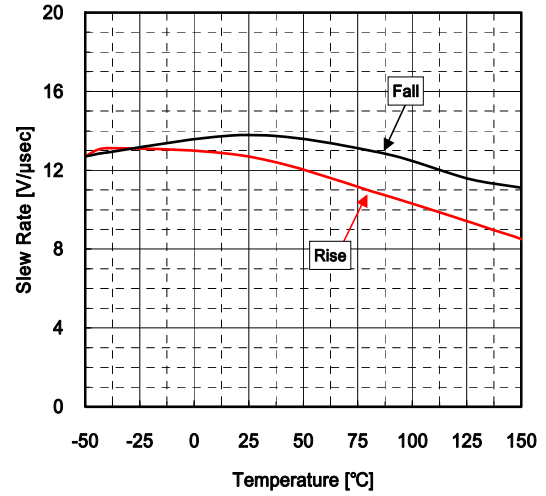
PulseEdge=10nsec, Gv=0dB, C_L=10pF, R_L=2kohm



SLEW RATE vs TEMPERATURE

$V^+ / V^- = \pm 16V, V_{IN} = 2V_{P-P}, f = 100kHz$

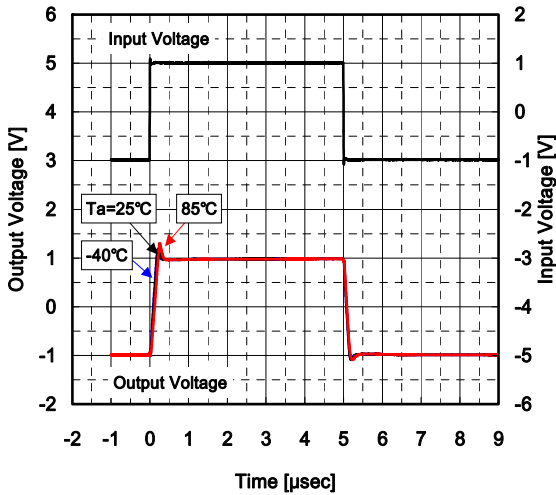
PulseEdge=10nsec, Gv=0dB, C_L=10pF, R_L=2kohm



TRANSIENT RESPONSE (TEMPERATURE)

$V^+ / V^- = \pm 15V, V_{IN} = 2V_{P-P}, f = 100kHz$

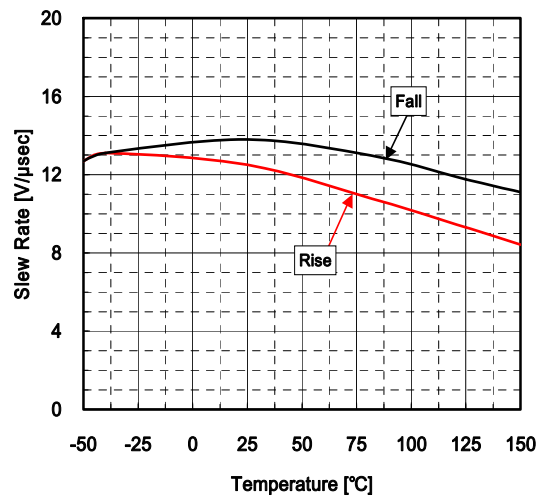
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SLEW RATE vs TEMPERATURE

$V^+ / V^- = \pm 15V, V_{IN} = 2V_{P-P}, f = 100kHz$

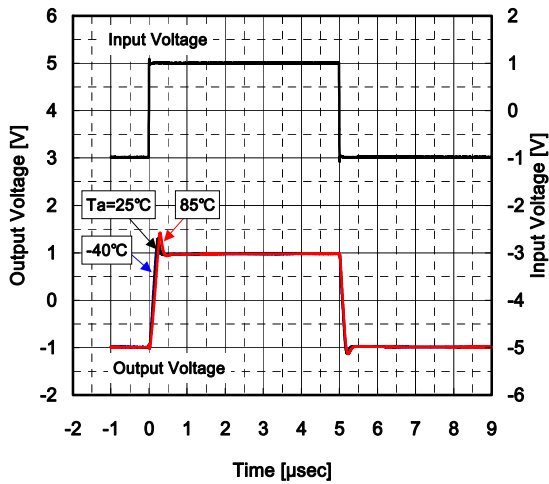
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TRANSIENT RESPONSE (TEMPERATURE)

$V^+ / V^- = \pm 9V, V_{IN} = 2V_{P-P}, f = 100kHz$

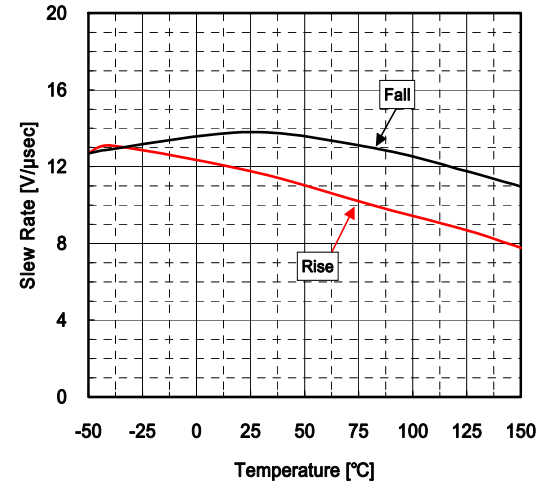
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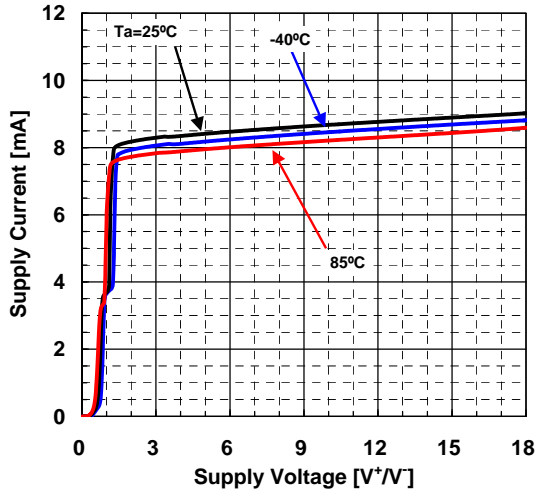
SLEW RATE vs TEMPERATURE

$V^+ / V^- = \pm 9V, V_{IN} = 2V_{P-P}, f = 100kHz$

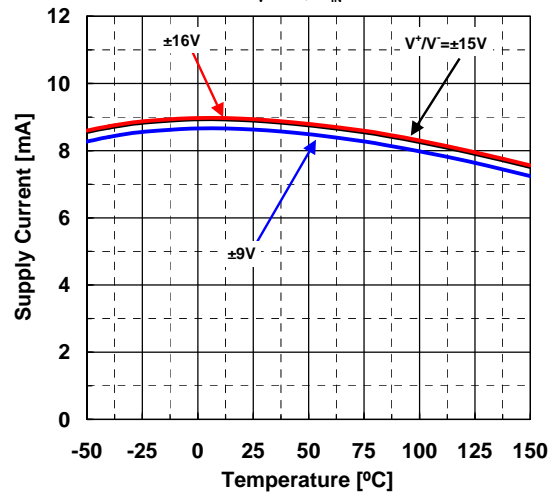
PulseEdge=10nsec, Gv=0dB, C_L=10pF, R_L=2kohm



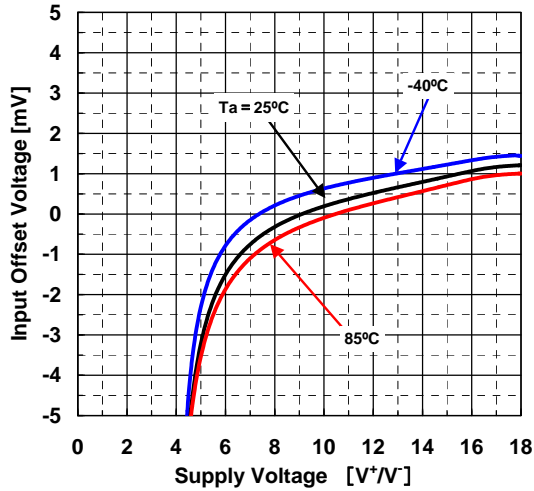
SUPPLY CURRENT vs SUPPLY VOLTAGE
(TEMPERATURE)
 $G_V=0dB, V_{IN}=0V$



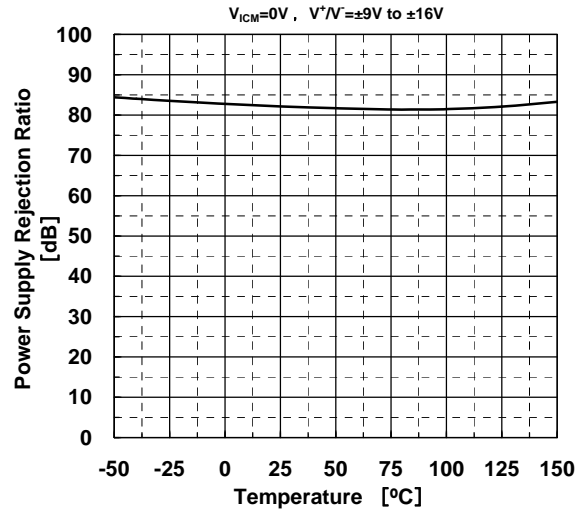
SUPPLY CURRENT vs TEMPERATURE
(SUPPLY VOLTAGE)
 $G_V=0dB, V_{IN}=0V$



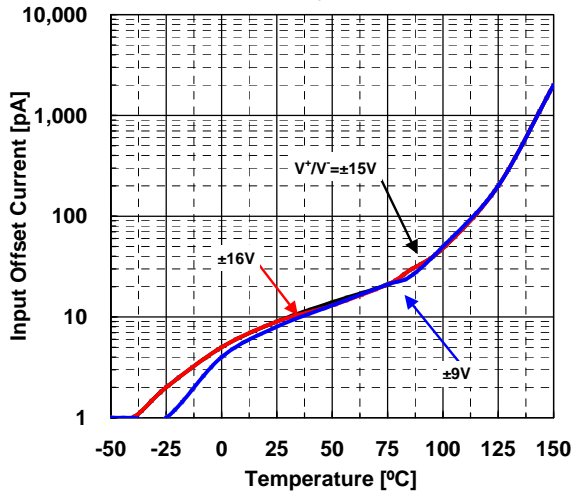
INPUT OFFSET VOLTAGE vs SUPPLY VOLTAGE
(TEMPERATURE)
 $V_{ICM}=0V, V_{IN}=0V$



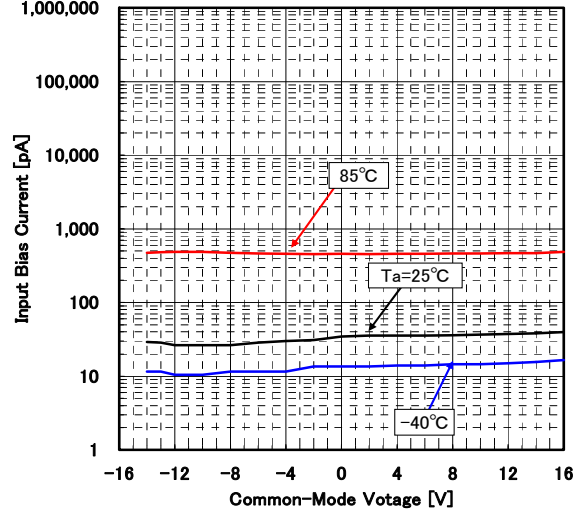
POWER SUPPLY REJECTION RATIO vs TEMPERATURE



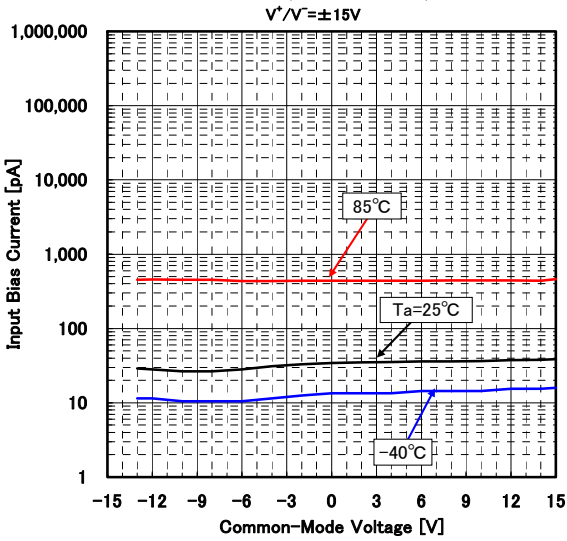
INPUT OFFSET CURRENT vs TEMPERATURE
(SUPPLY VOLTAGE)
 $V_{ICM}=0V$



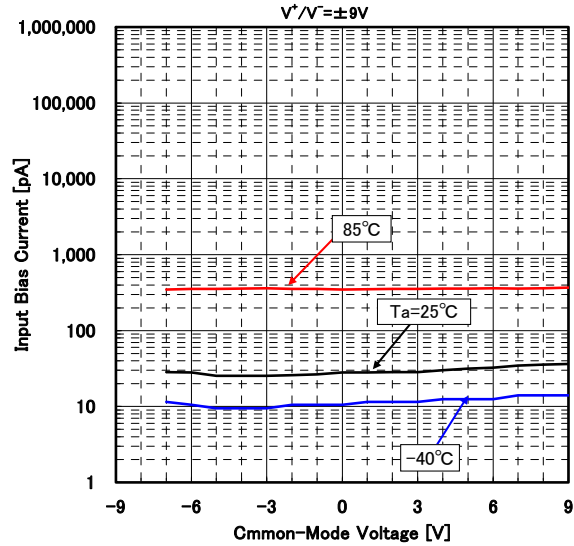
INPUT BIAS CURRENT vs INPUT COMMON-MODE VOLTAGE
(TEMPERATURE)
 $V/V=\pm 16V$



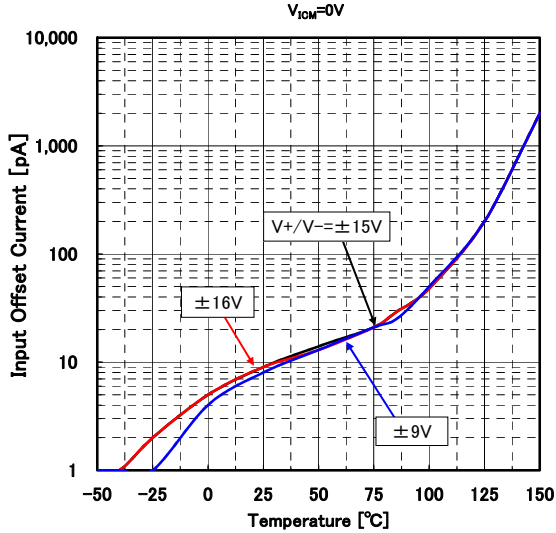
INPUT BIAS CURRENT vs INPUT COMMON-MODE VOLTAGE (TEMPERATURE)



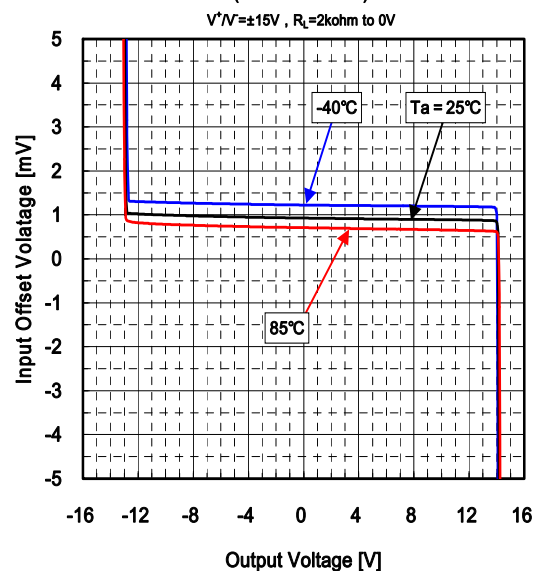
INPUT BIAS CURRENT vs INPUT COMMON-MODE VOLTAGE (TEMPERATURE)



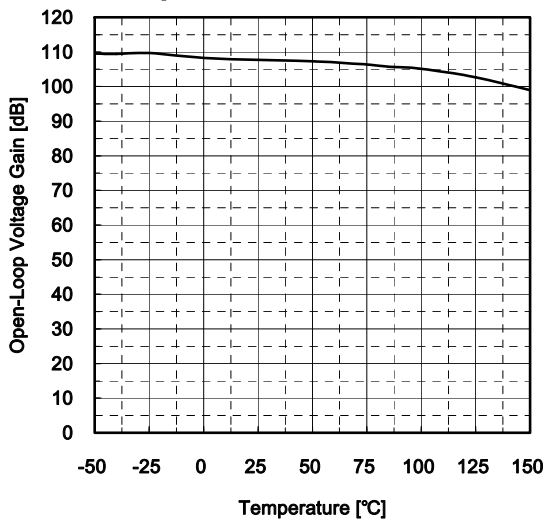
INPUT OFFSET CURRENT vs TEMPERATURE (SUPPLY VOLTAGE)



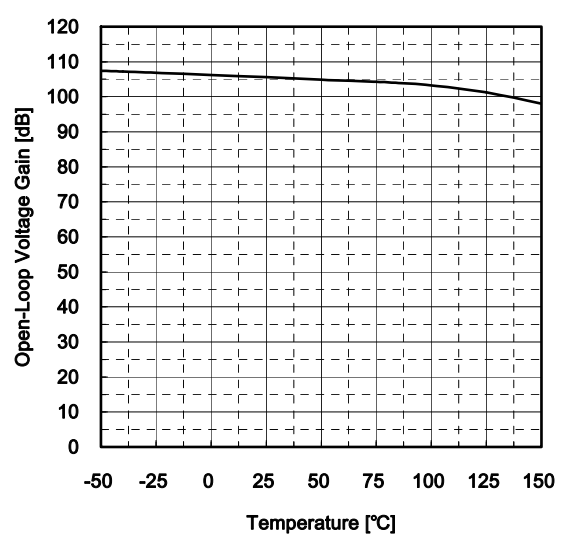
INPUT OFFSET VOLTAGE vs OUTPUT VOLTAGE (TEMPERATURE)



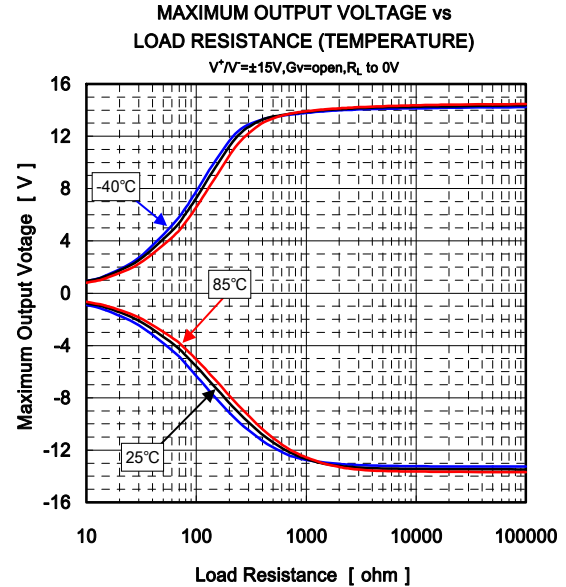
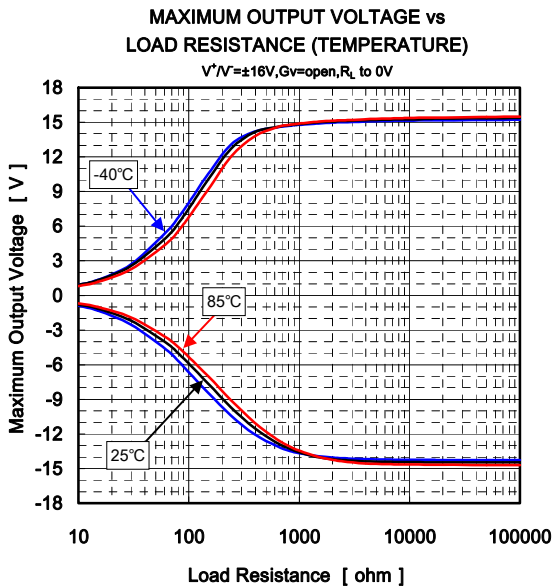
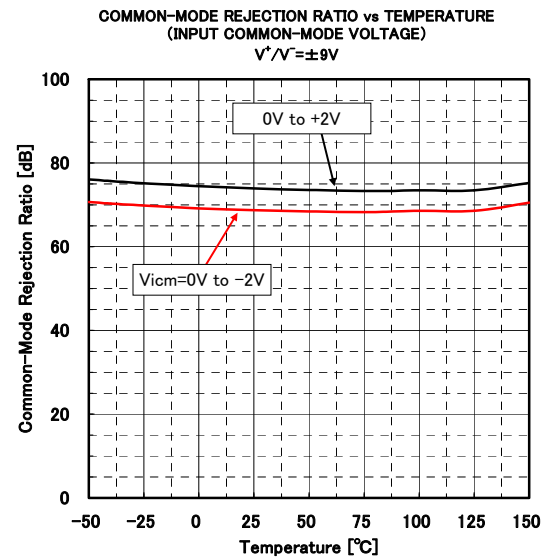
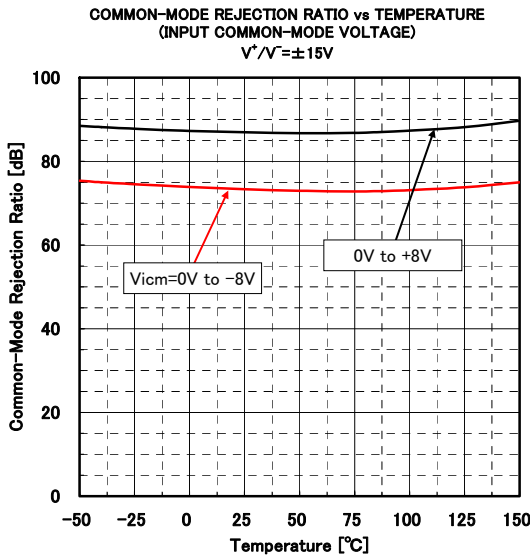
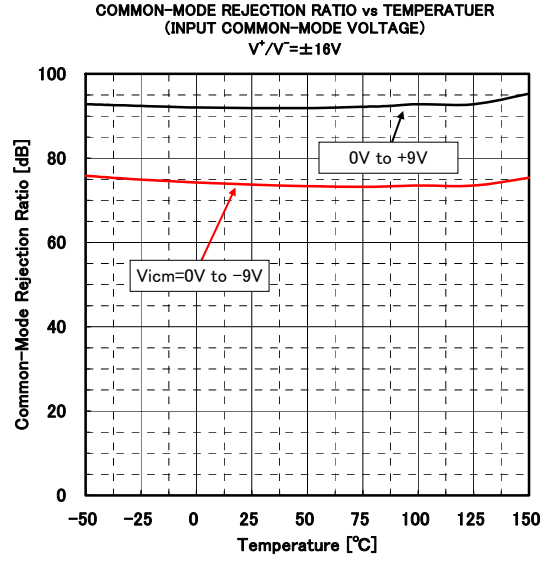
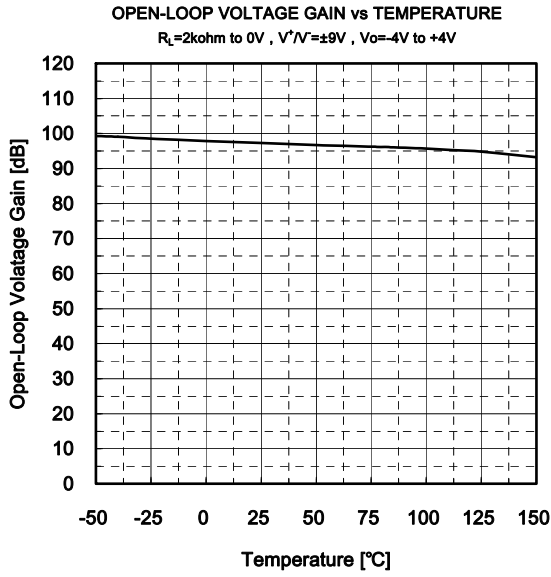
OPEN-LOOP VOLTAGE GAIN vs TEMPERATURE

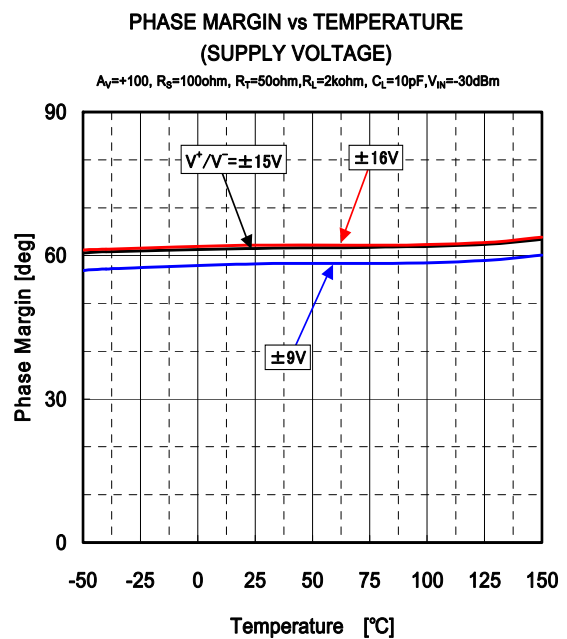
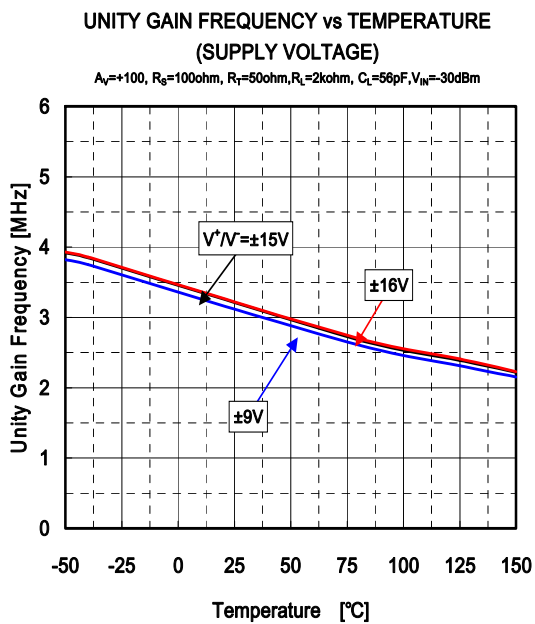
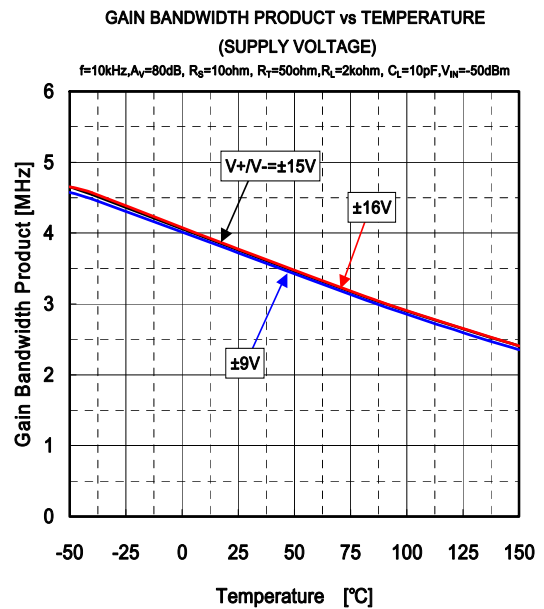
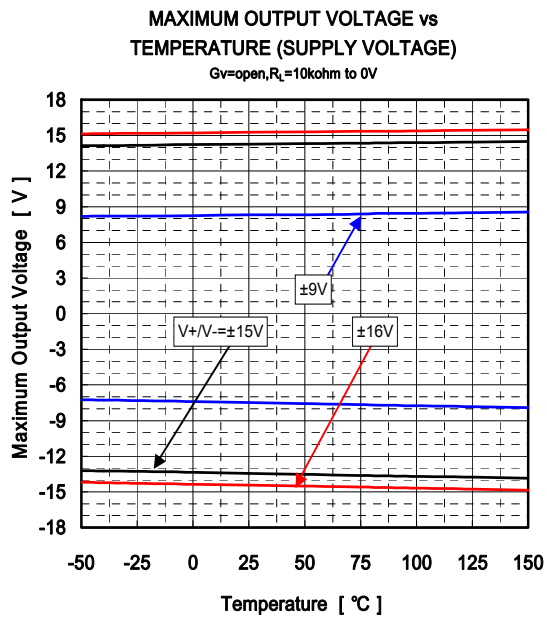
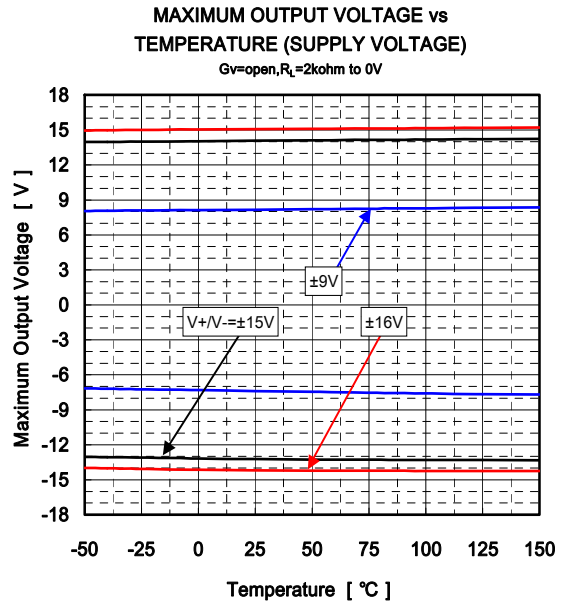
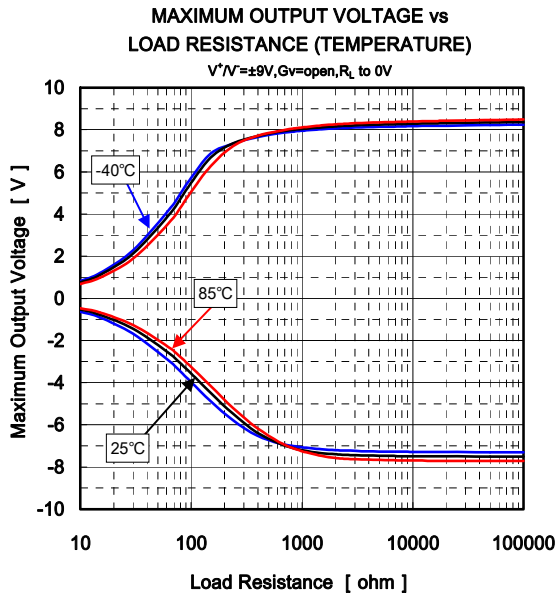


OPEN-LOOP VOLTAGE GAIN vs TEMPERATURE



MUSES01





MEMO

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