



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

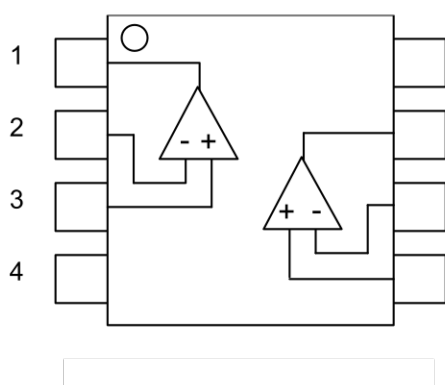
The **MUSES01** is a dual J-FET input high quality audio operational amplifier, which is optimized for high-end audio and professional audio applications with advanced circuitry and layout, unique material and assembled technology by skilled-craftwork.

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

■ FEATURES

•Operating Voltage	$V_{opr} = \pm 9V$ to $\pm 16V$
•Output noise	$9.5nV/\sqrt{Hz}$ at $f = 1kHz$
•Input Offset Voltage	$0.8mV$ typ. $5mV$ max.
•Input Bias Current	$200pA$ typ. $800pA$ max. at $T_a = 25^\circ C$
•Voltage Gain	$105dB$ typ.
•Slew Rate	$12V/\mu s$ typ.
•Bipolar Technology	
•Package Outline	DIP8

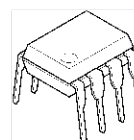
■ PIN CONFIGURATION



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



MUSES01



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MUSES01

■ 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 ($V^+/V^- = \pm 15$ V, 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	$R_L \geq 2k\Omega$, $V_o = \pm 10$ V	90	105	-	dB
Common Mode Rejection Ratio	CMR	$V_{ICM} = \pm 8$ V (Note4)	60	75	-	dB
Supply Voltage Rejection Ratio	SVR	$V^+/V^- = \pm 9.0$ to ± 16.0 V (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 ≥ 60 dB	± 8	± 9.5	-	V

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

(Note3) Written by the absolute rate.

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

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

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

■ 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.

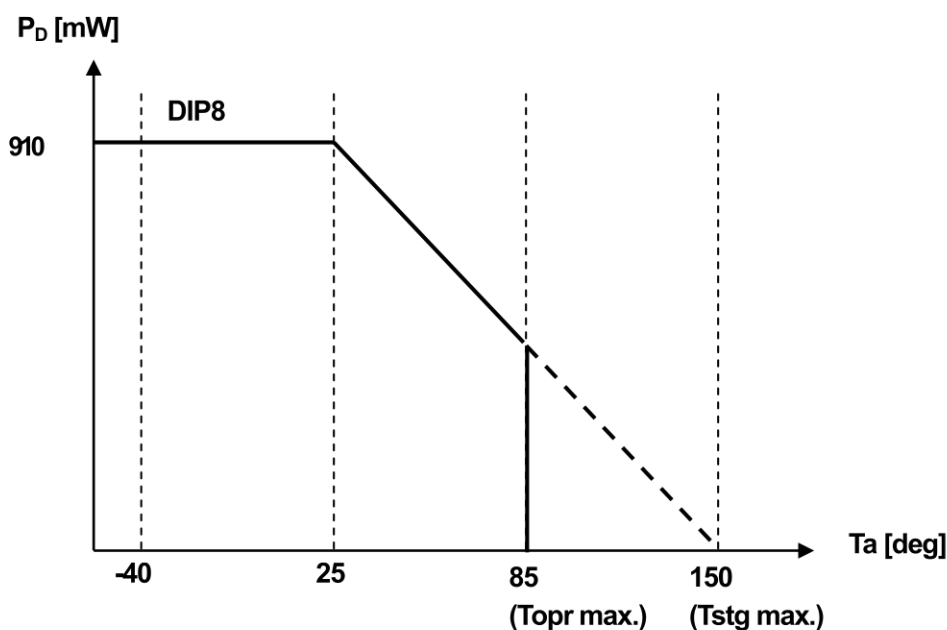
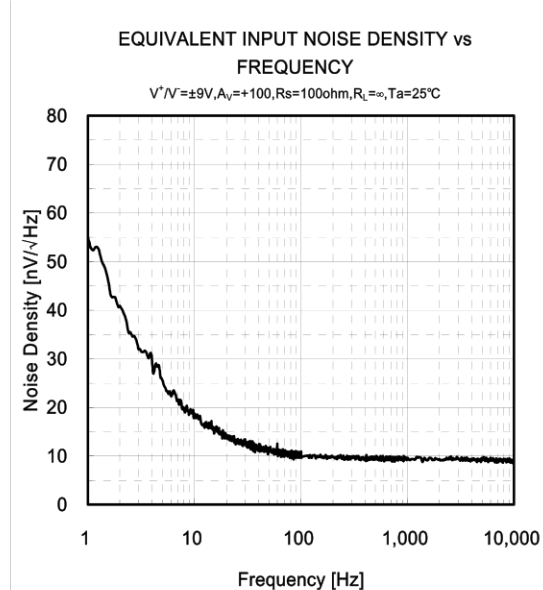
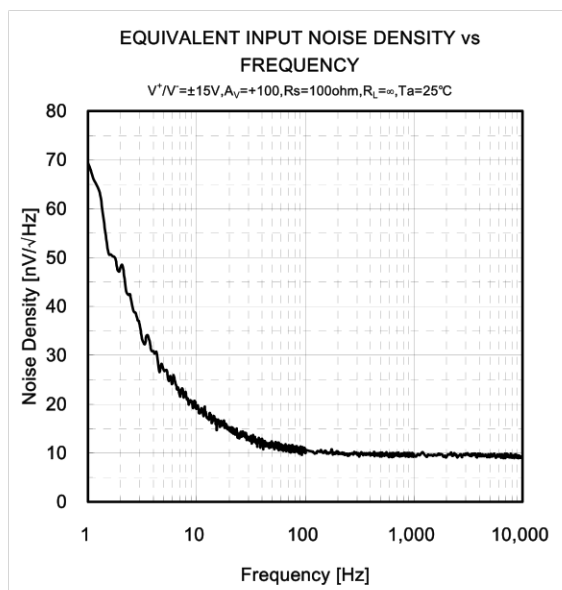
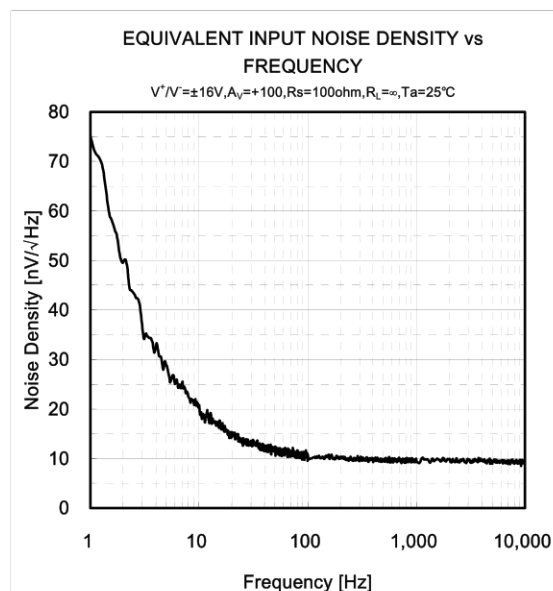
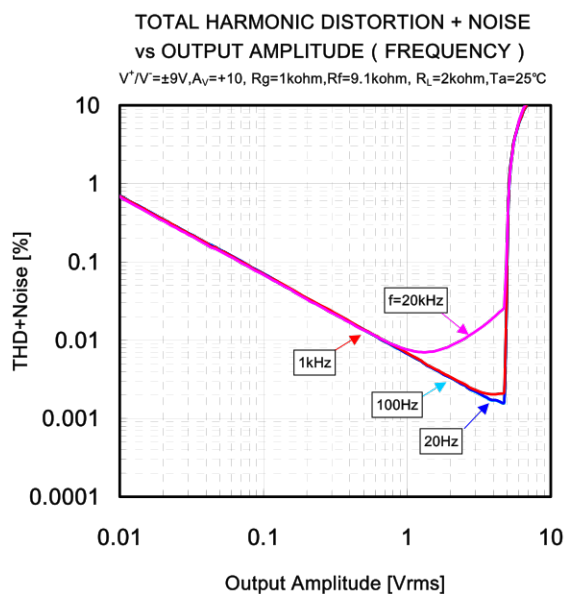
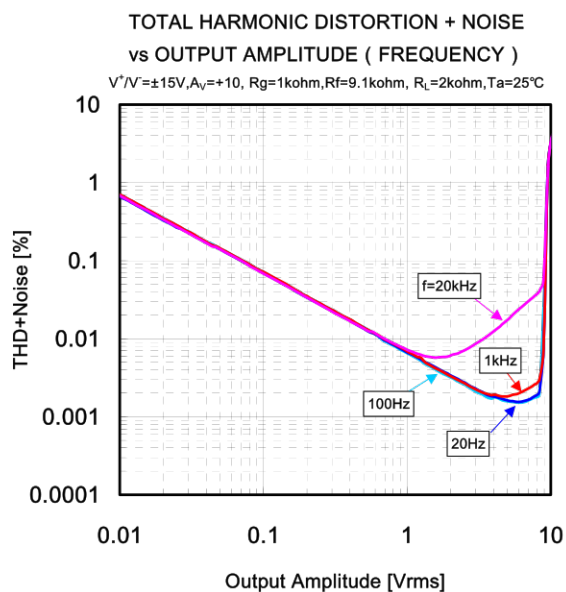
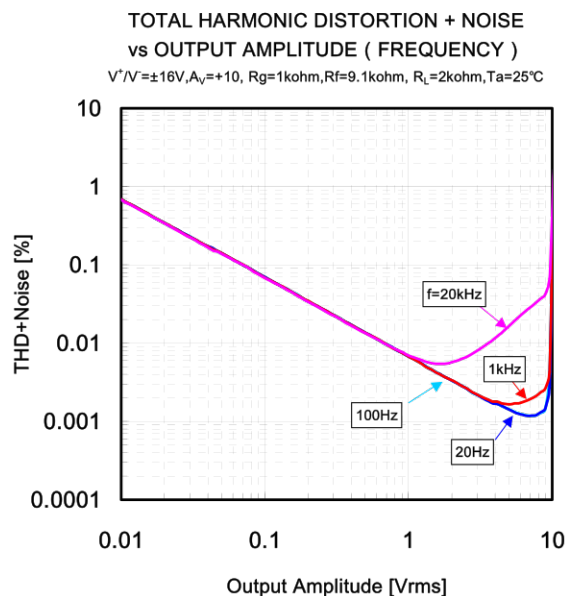
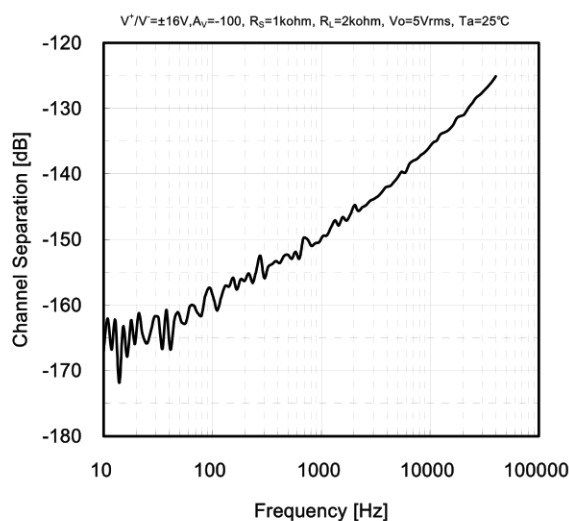


Fig.1 Power Dissipations vs. Ambient Temperature on the MUSES01

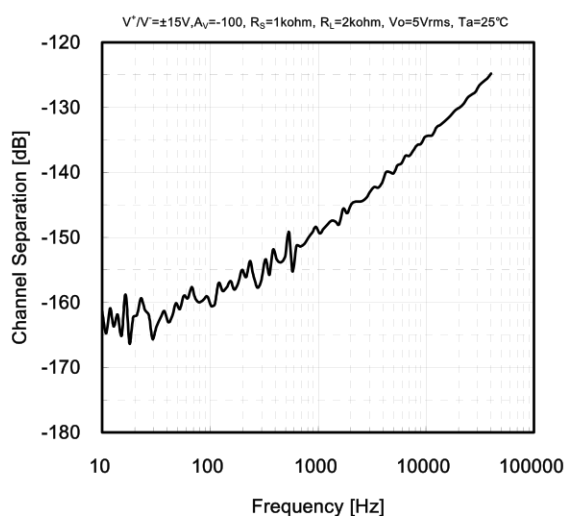
■ TYPICAL CHARACTERISTICS



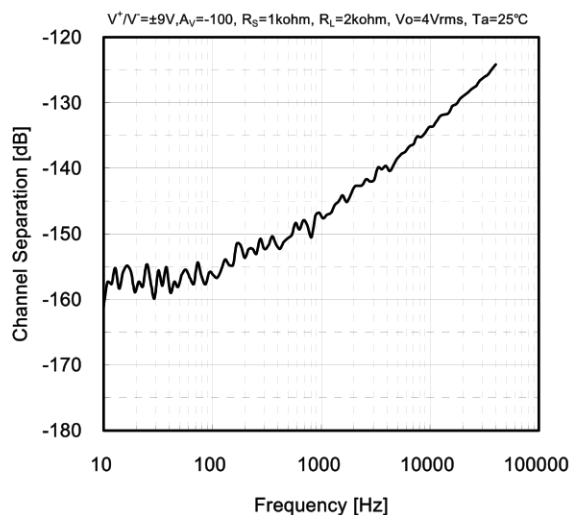
CHANNEL SEPARATION vs FREQUENCY



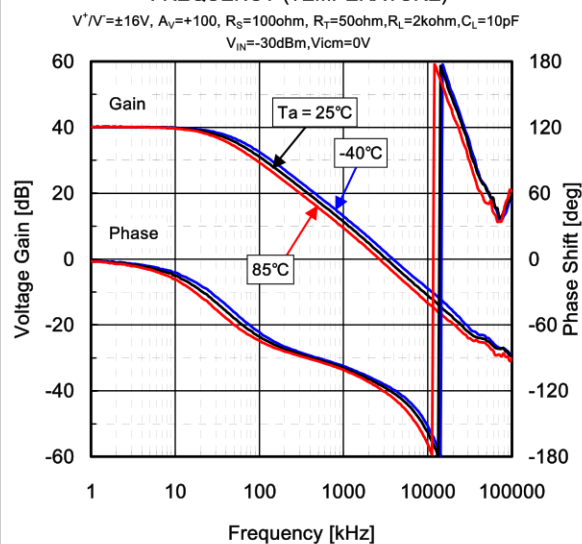
CHANNEL SEPARATION vs FREQUENCY



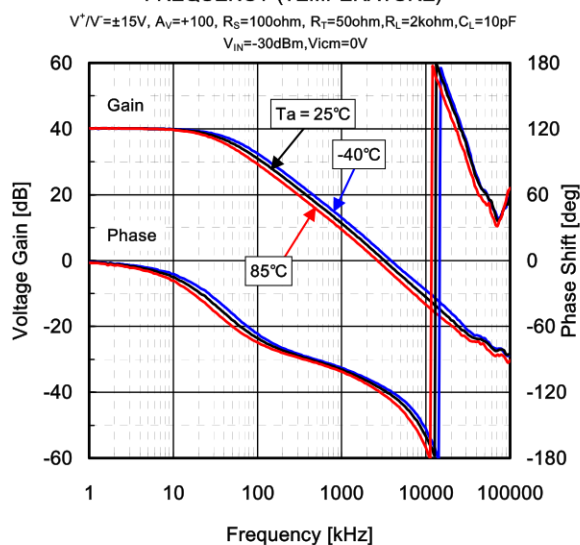
CHANNEL SEPARATION vs FREQUENCY



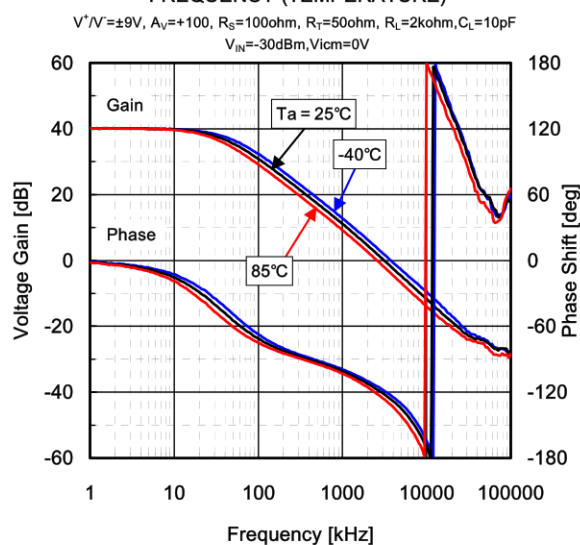
CLOSED-LOOP GAIN/PHASE vs FREQUENCY (TEMPERATURE)



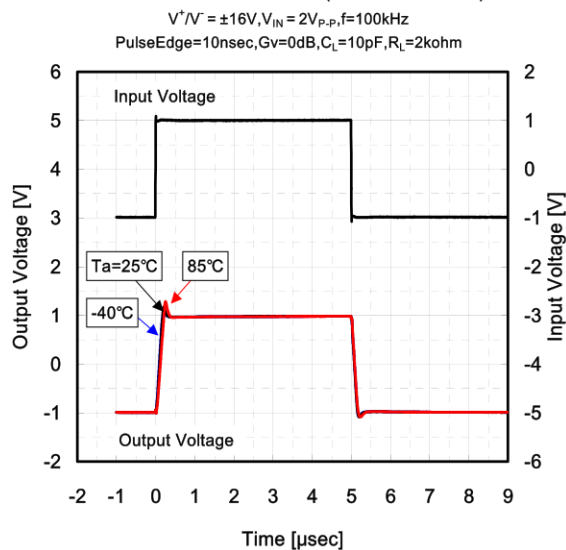
CLOSED-LOOP GAIN/PHASE vs FREQUENCY (TEMPERATURE)



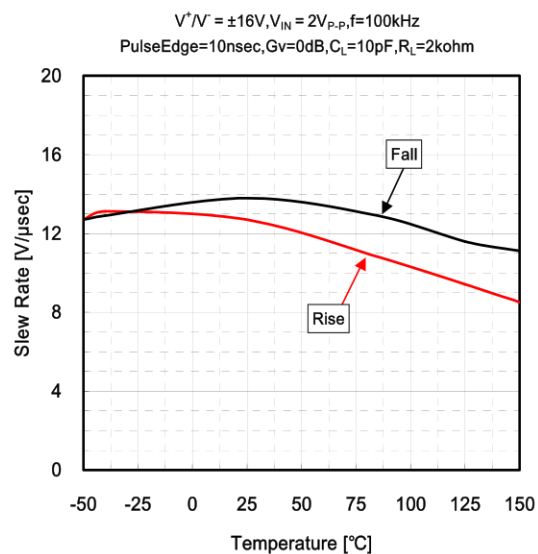
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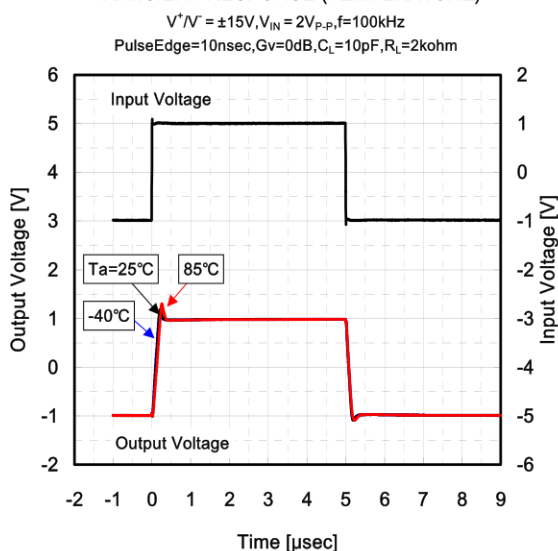
TRANSIENT RESPONSE (TEMPERATURE)



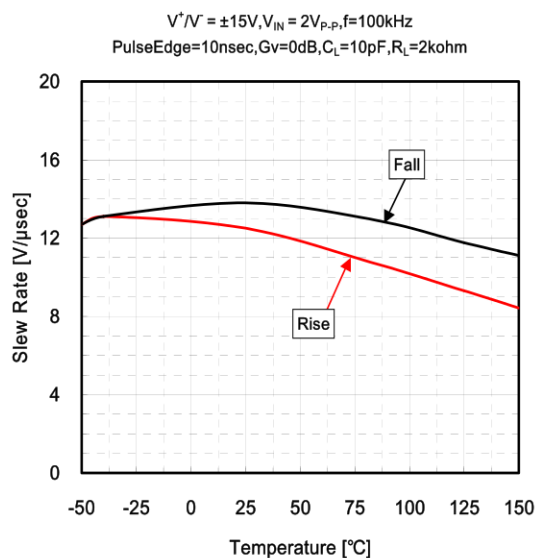
SLEW RATE vs TEMPERATURE



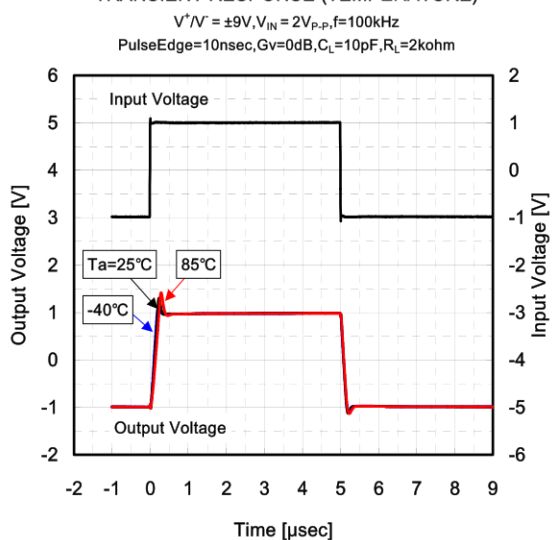
TRANSIENT RESPONSE (TEMPERATURE)



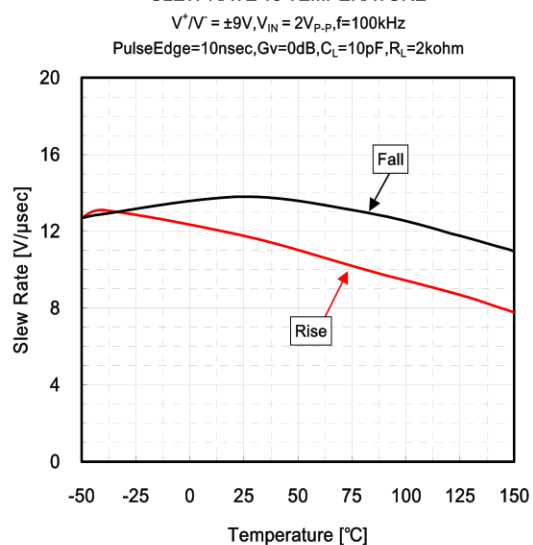
SLEW RATE vs TEMPERATURE



TRANSIENT RESPONSE (TEMPERATURE)

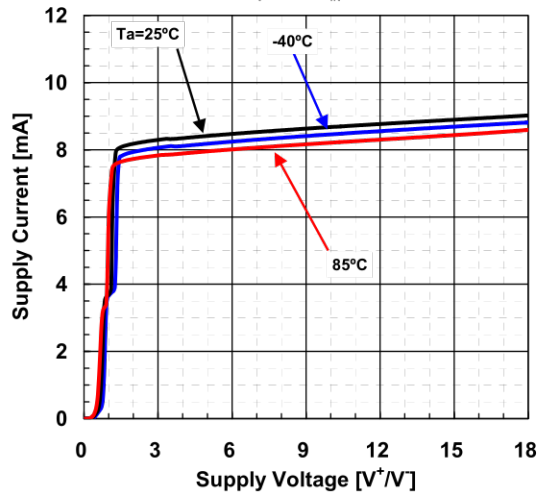


SLEW RATE vs TEMPERATURE



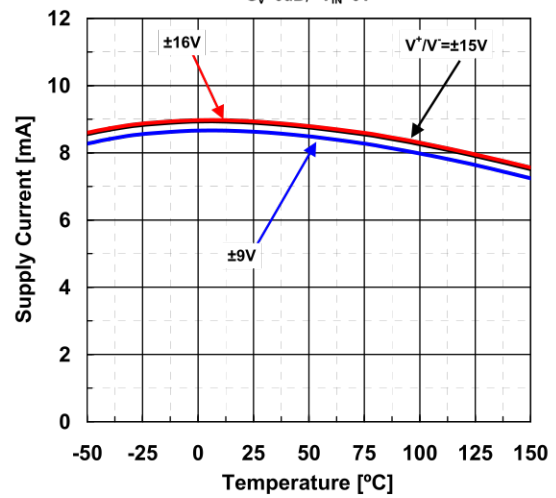
SUPPLY CURRENT vs SUPPLY VOLTAGE

(TEMPERATURE)
 $G_V=0\text{dB}$, $V_{IN}=0\text{V}$



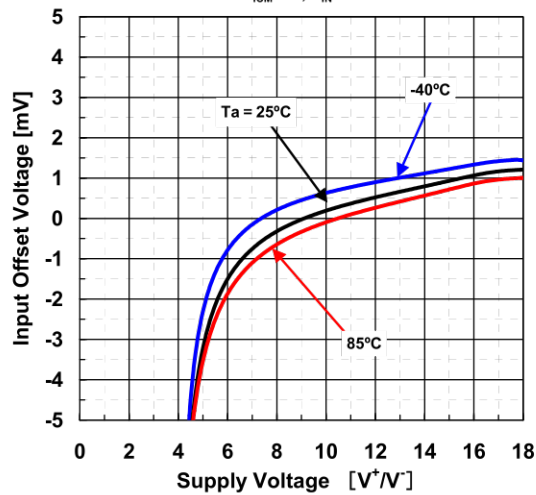
SUPPLY CURRENT vs TEMPERATURE

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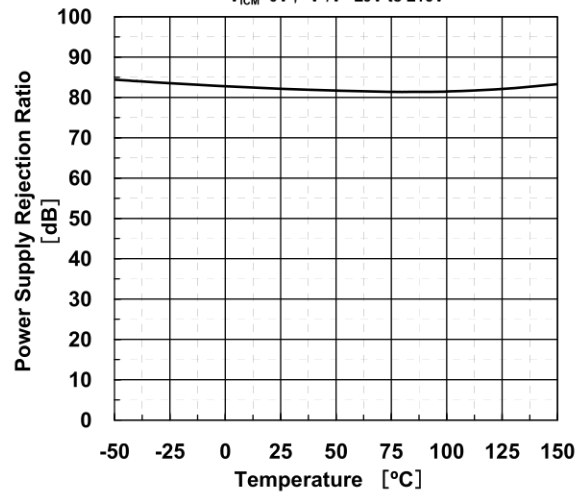
INPUT OFFSET VOLTAGE vs SUPPLY VOLTAGE

(TEMPERATURE)
 $V_{ICM}=0\text{V}$, $V_{IN}=0\text{V}$



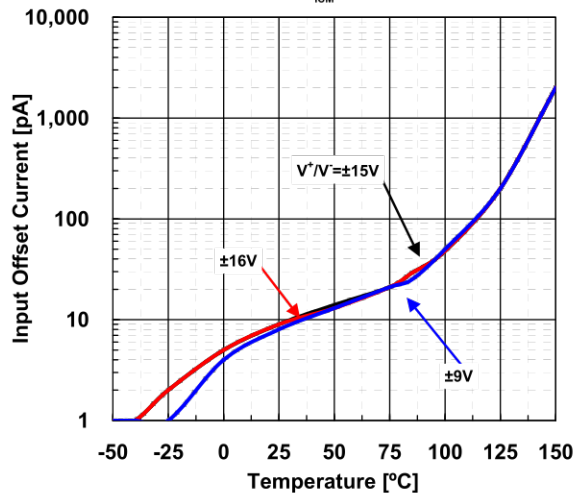
POWER SUPPLY REJECTION RATIO vs TEMPERATURE

$V_{ICM}=0\text{V}$, $V^+/V^-=\pm 9\text{V}$ to $\pm 16\text{V}$



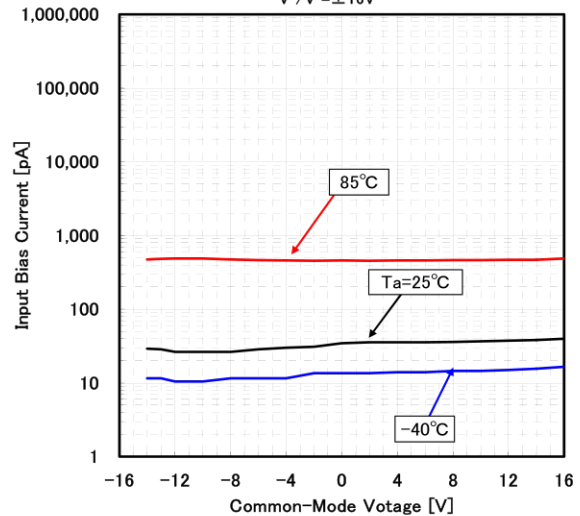
INPUT OFFSET CURRENT vs TEMPERATURE

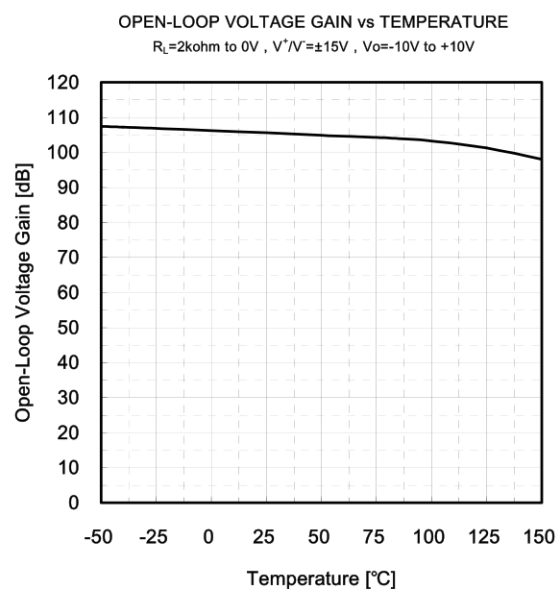
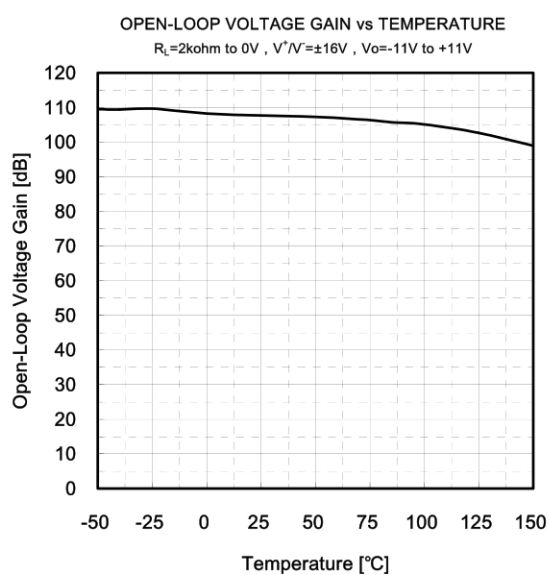
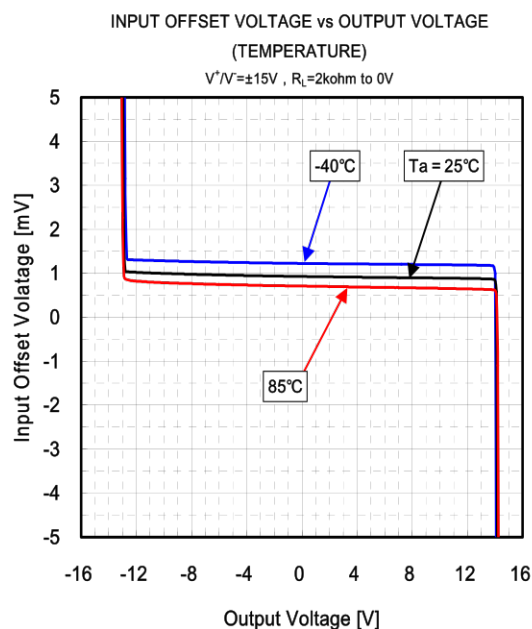
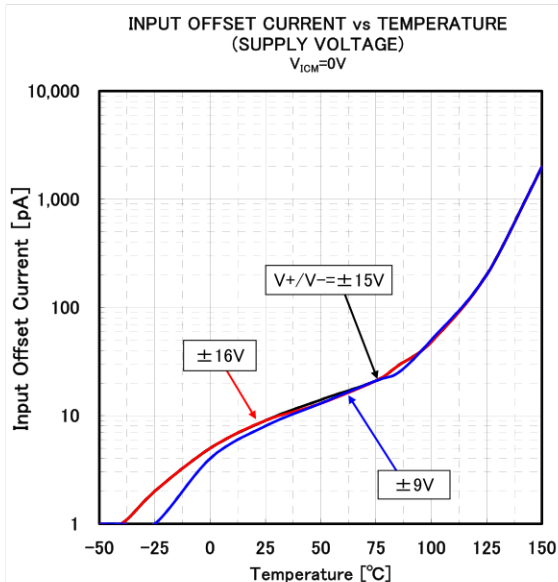
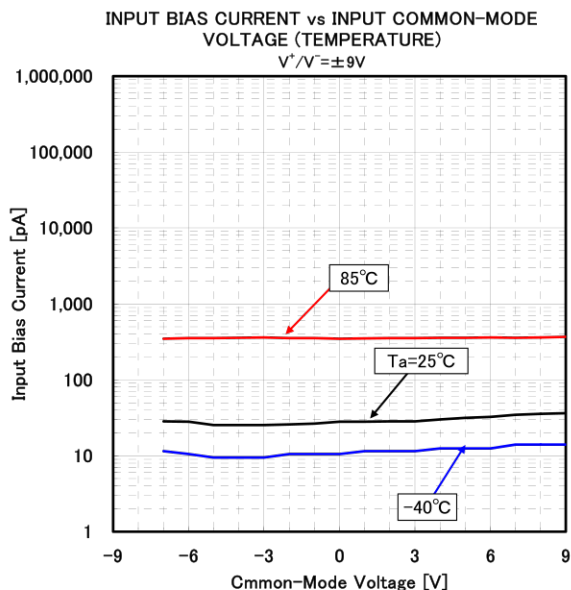
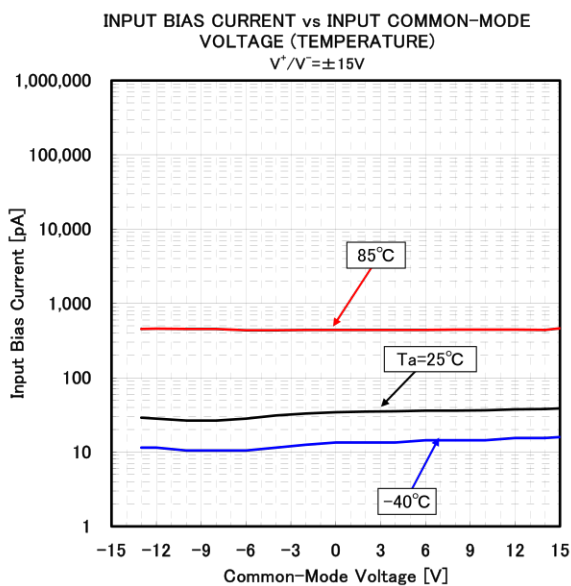
(SUPPLY VOLTAGE)
 $V_{ICM}=0\text{V}$

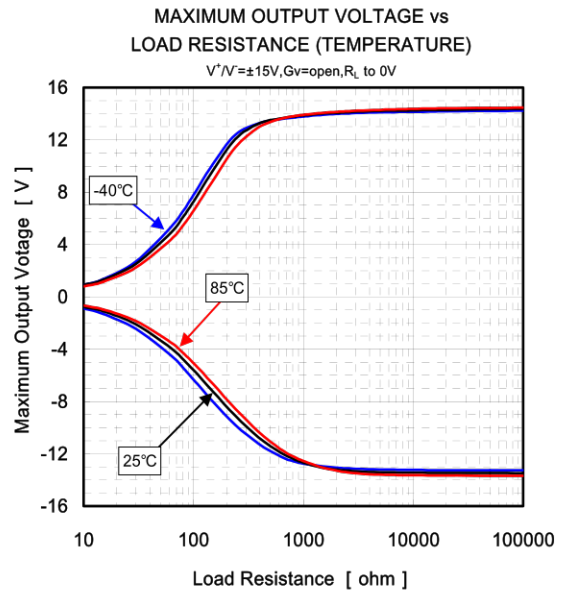
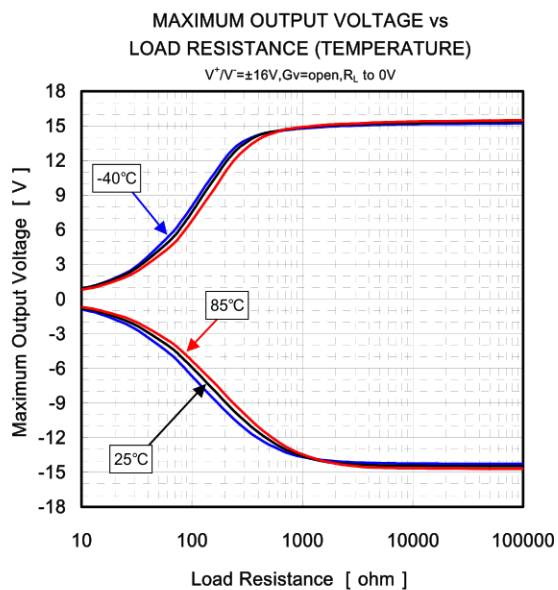
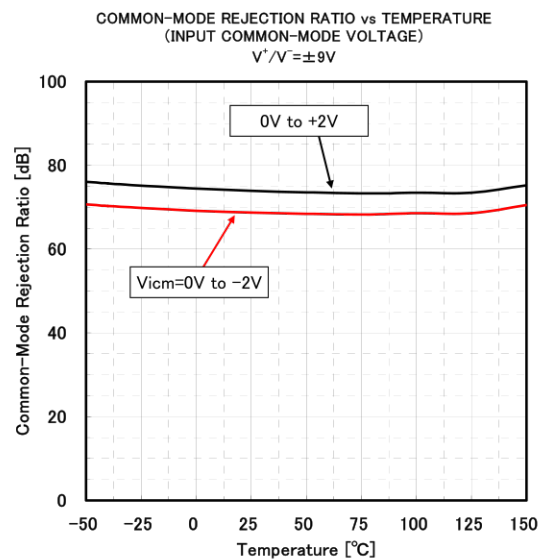
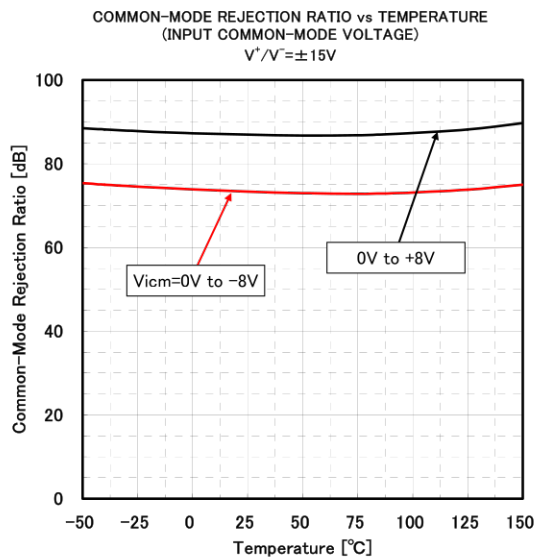
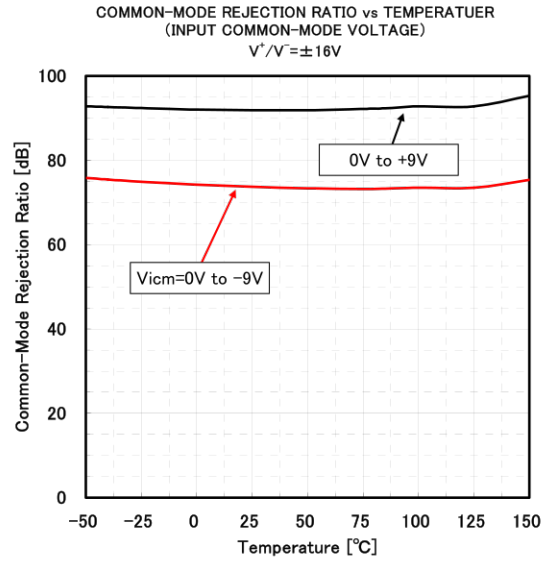
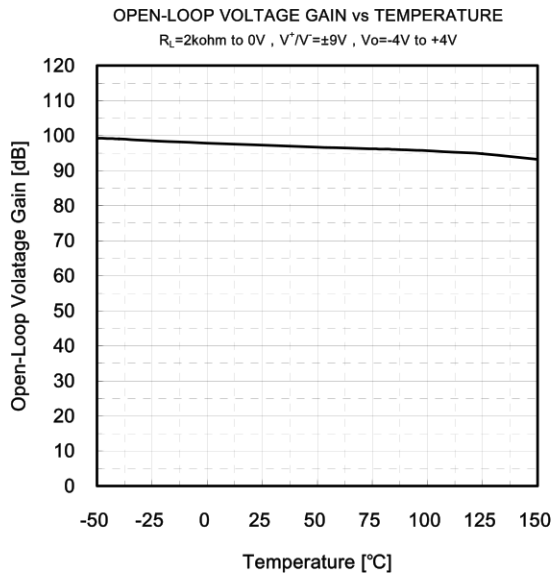


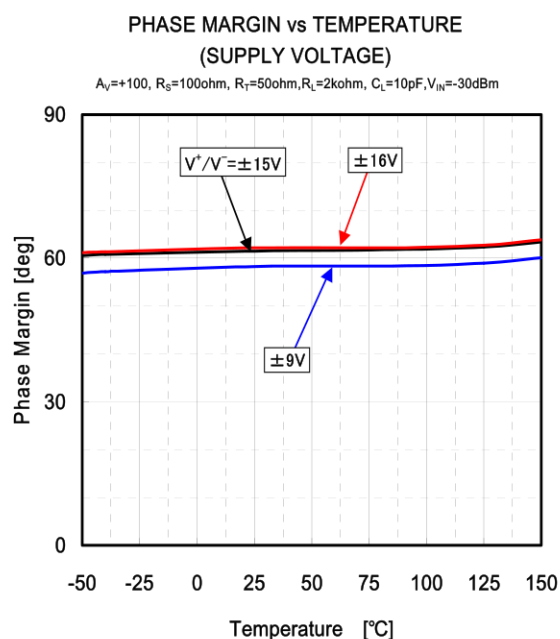
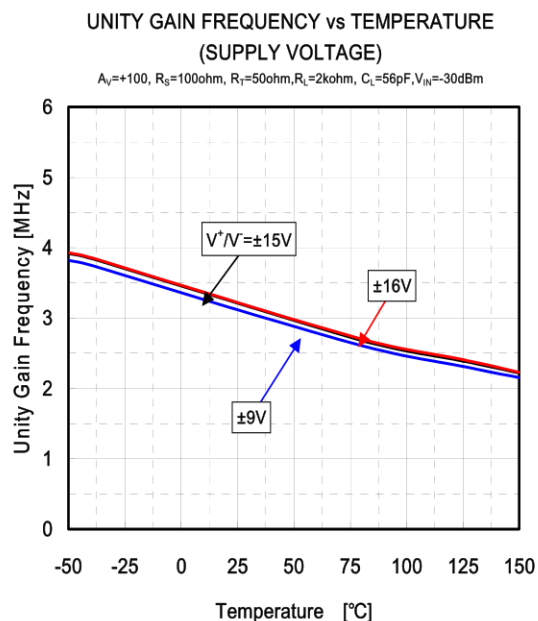
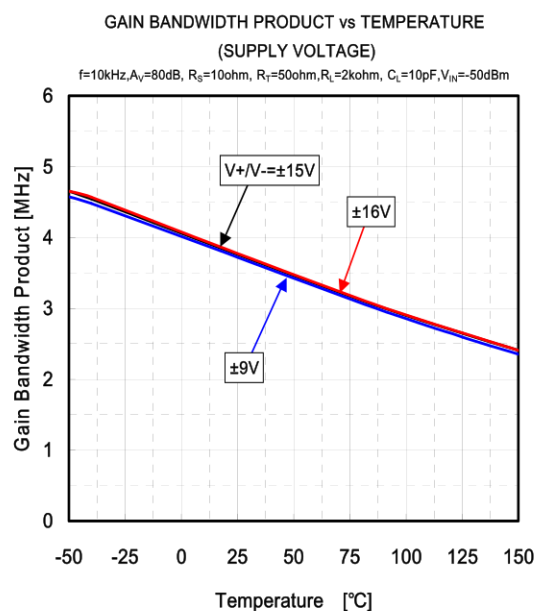
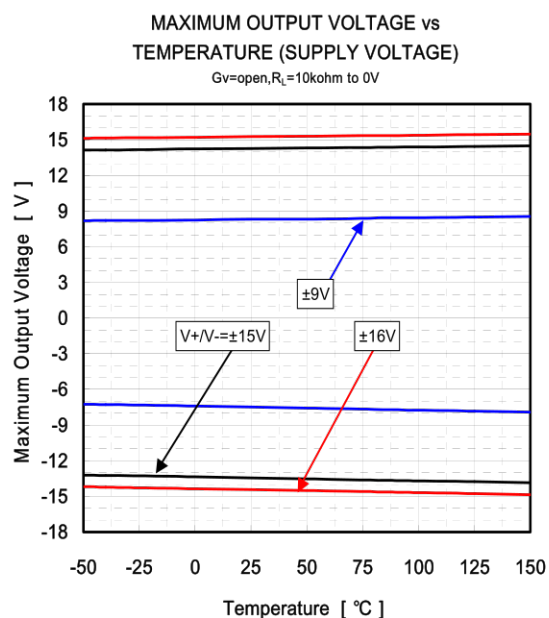
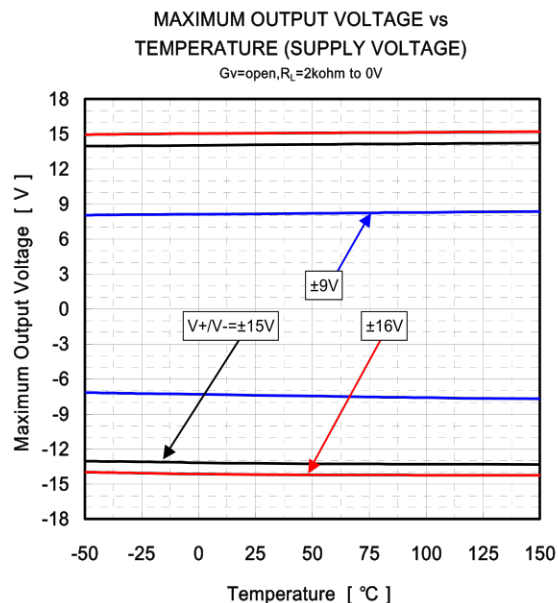
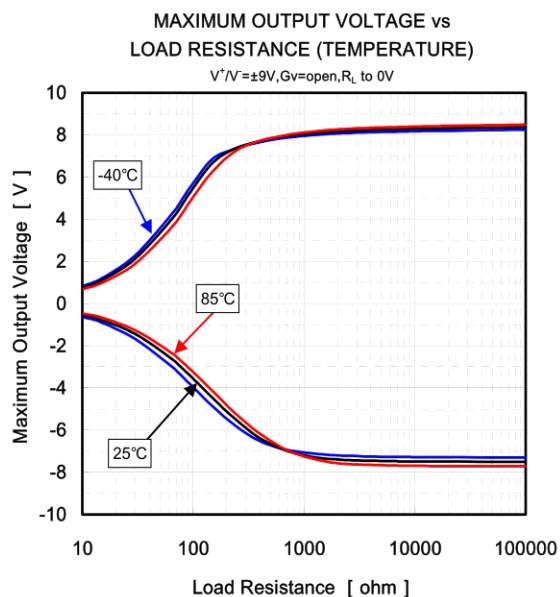
INPUT BIAS CURRENT vs INPUT COMMON-MODE VOLTAGE (TEMPERATURE)

$V^+/V^-=\pm 16\text{V}$









MEMO

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