



## Rail-to-Rail Output, High Quality Audio, Dual Operational Amplifier

### ■ GENERAL DESCRIPTION

The MUSES8832 is a Rail-to-Rail output High quality audio operational amplifier, which is optimized for high-end audio and portable audio applications.

The MUSES8832 features 2.1nV/√Hz low noise, 10MHz wide gain bandwidth, 0.0009% low distortion, 600Ω drive capability, -40°C to +125°C operating temperature range, and various reliabilities and conveniences are improved.

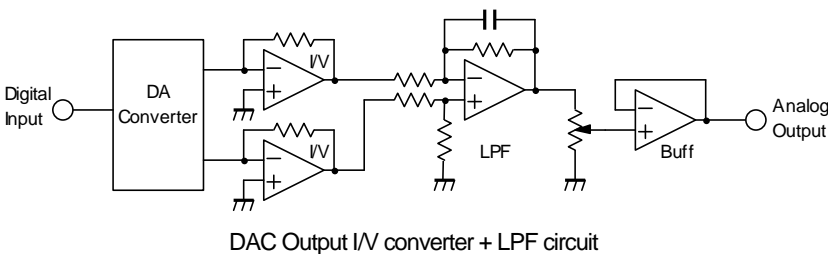
It is the best for audio preamplifiers, active filters, microphone amplifiers, and line amplifiers with excellent sound.

### ■ FEATURES

- Operating Voltage                    +2.7V to +14V  
   ±1.35V to ±7.0V
- Low Noise                                2.1nV/√Hz typ. at f=1kHz  
   0.3μVrms typ. (20Hz to 20kHz)
- Output Current                         32mA typ. (Capability of driving 600Ω loads)
- GBW                                        10MHz typ.
- Low Distortion                         0.0009% typ. at V+=+5V, Vo=1.3Vrms
- Slew Rate                                1V/μs typ.
- Bipolar Technology
- Package Outline                        SOP8 JEDEC 150 mil  
   DFN8-W1 (ESON8-W1) (3.0mm x 3.0mm)
- Operating Temperature Range     -40 to +125°C

### ■ APPLICATIONS

- Portable Audio
- Home Audio
- PC Audio
- Car Audio



### ■ PACKAGE OUTLINE



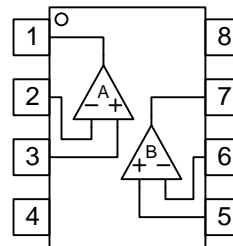
MUSES8832E  
(SOP8 JEDEC 150 mil (EMP8))



MUSES8832KW1  
(DFN8-W1 (ESON8-W1))

### ■ PIN CONFIGURATION

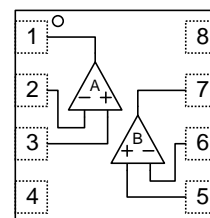
SOP8 JEDEC 150 mil



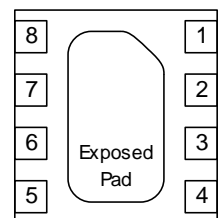
1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. V-
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. V+

DFN8-W1 (ESON8-W1)

Top View



Bottom View



About Exposed Pad  
Connect the Exposed Pad on the GND.



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# MUSES8832

## ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V <sup>+</sup> (V <sup>+</sup> /V <sup>-</sup> )	+15 (±7.5)	V
Input Voltage	V <sub>IN</sub>	+15 <sup>(1)</sup>	V
Differential Input Voltage	V <sub>ID</sub>	±15	V
Power Dissipation	P <sub>D</sub>	SOP8 JEDEC 150 mil: 800 <sup>(2)</sup> DFN8-W1: 650 <sup>(3)</sup> / 2100 <sup>(4)</sup>	mW
Operating Temperature Range	T <sub>opr</sub>	-40 to +125	°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C

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

(Note2) EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 2layers, FR-4) mounting.

(Note3) EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 2layers, FR-4) mounting. The PAD connecting to GND in the center part on the back

(Note4) EIA/JEDEC STANDARD Test board (76.2 x 114.3 x 1.6mm, 4layers, FR-4, Applying a thermal via hole to a board based on JEDEC standard JESD51-5) mounting. The PAD connecting to GND in the center part on the back

## ■ RECOMMENDED OPERATING CONDITION (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sup>+</sup>		+2.7	-	+14.0	V
	V <sup>+</sup> /V <sup>-</sup>		±1.35	-	±7.0	V

## ■ ELECTRIC CHARACTERISTICS

V<sup>+</sup>= +5V, V<sup>-</sup>=0V, Ta=25°C, R<sub>L</sub> to V<sup>+</sup>/2, unless otherwise specified

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I <sub>CC</sub>	No Signal, R <sub>L</sub> =∞	-	7.5	10	mA
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> =50Ω	-	0.1	0.5	mV
Input Bias Current	I <sub>B</sub>		-	4	6.5	μA
Input Offset Current	I <sub>IO</sub>		-	100	500	nA
Open-Loop Voltage Gain	A <sub>V</sub>	R <sub>L</sub> =10kΩ to V <sup>+</sup> /2, V <sub>O</sub> =0.5 to 4.5V	90	115	-	dB
Common Mode Input Voltage Range	V <sub>ICM</sub>	CMR≥90dB	0.5	-	3.7	V
Common Mode Rejection Ratio	CMR	R <sub>S</sub> =50Ω	90	110	-	dB
Supply Voltage Rejection Ratio	SVR	R <sub>S</sub> =50Ω	90	105	-	dB
Maximum Output Voltage 1	V <sub>OH1</sub>	R <sub>L</sub> =10kΩ to 0V	4.9	4.95	-	V
	V <sub>OL1</sub>	R <sub>L</sub> =10kΩ to 0V	-	0.05	0.1	V
Maximum Output Voltage 2	V <sub>OH2</sub>	R <sub>L</sub> =600Ω to V <sup>+</sup> /2	4.8	4.9	-	V
	V <sub>OL2</sub>	R <sub>L</sub> =600Ω to V <sup>+</sup> /2	-	0.1	0.2	V
Output Source Current	I <sub>SOURCE</sub>	V <sub>O</sub> =V <sup>+</sup> -0.5V	10	32	-	mA
Output Sink Current	I <sub>SINK</sub>	V <sub>O</sub> =0.5V	10	20	-	mA
Gain Bandwidth Product	GBW	f=10kHz	-	10	-	MHz
Slew Rate	SR	R <sub>L</sub> =2kΩ	-	1	-	V/μs
Total Harmonic Distortion + Noise	THD+N	A <sub>V</sub> =10, V <sub>O</sub> =1.3Vrms, R <sub>L</sub> =2kΩ, f=1kHz	-	0.0009	-	%
Channel Separation	CS	A <sub>V</sub> =100, R <sub>S</sub> =1kΩ, R <sub>L</sub> =10kΩ, f=1kHz	-	140	-	dB
Input Noise Voltage1	e <sub>n</sub>	f=1kHz	-	2.1	-	nV/√Hz
Input Noise Voltage2	V <sub>n</sub>	f=20Hz to 20kHz	-	0.30	-	μVrms

## ■ NOTE

1. The closed gain should be 6dB or higher to prevent the oscillation. Unity gain follower application may cause the oscillation.
2. Minimize the load capacitor for the better performance. A large load capacitor CL reduces the frequency response and causes oscillation or ringing.
3. Be careful to the circuit of high impedance. Input bias current influences an input noise and output offset voltage.

## ■ POWER DISSIPATION vs. AMBIENT TEMPERATURE

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 MUSES8832  $P_D$  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,  $\theta_{ja}$  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.

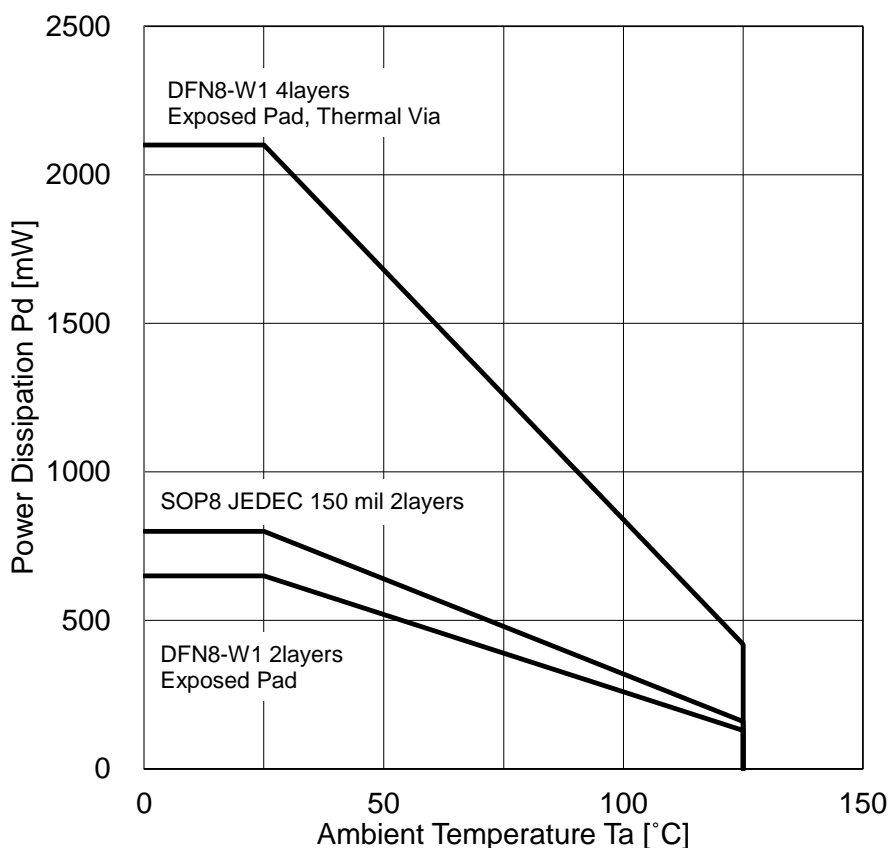
While, the actual measurement of dissipation power on MUSES8832 is obtained using following equation.

$$(\text{Actual Dissipation Power}) = (\text{Supply Current } I_{cc}) \times (\text{Supply Voltage } V^+ - V^-) - (\text{Output Power } P_o)$$

The MUSES8832 should be operated in lower than  $P_D$  of the actual dissipation power.

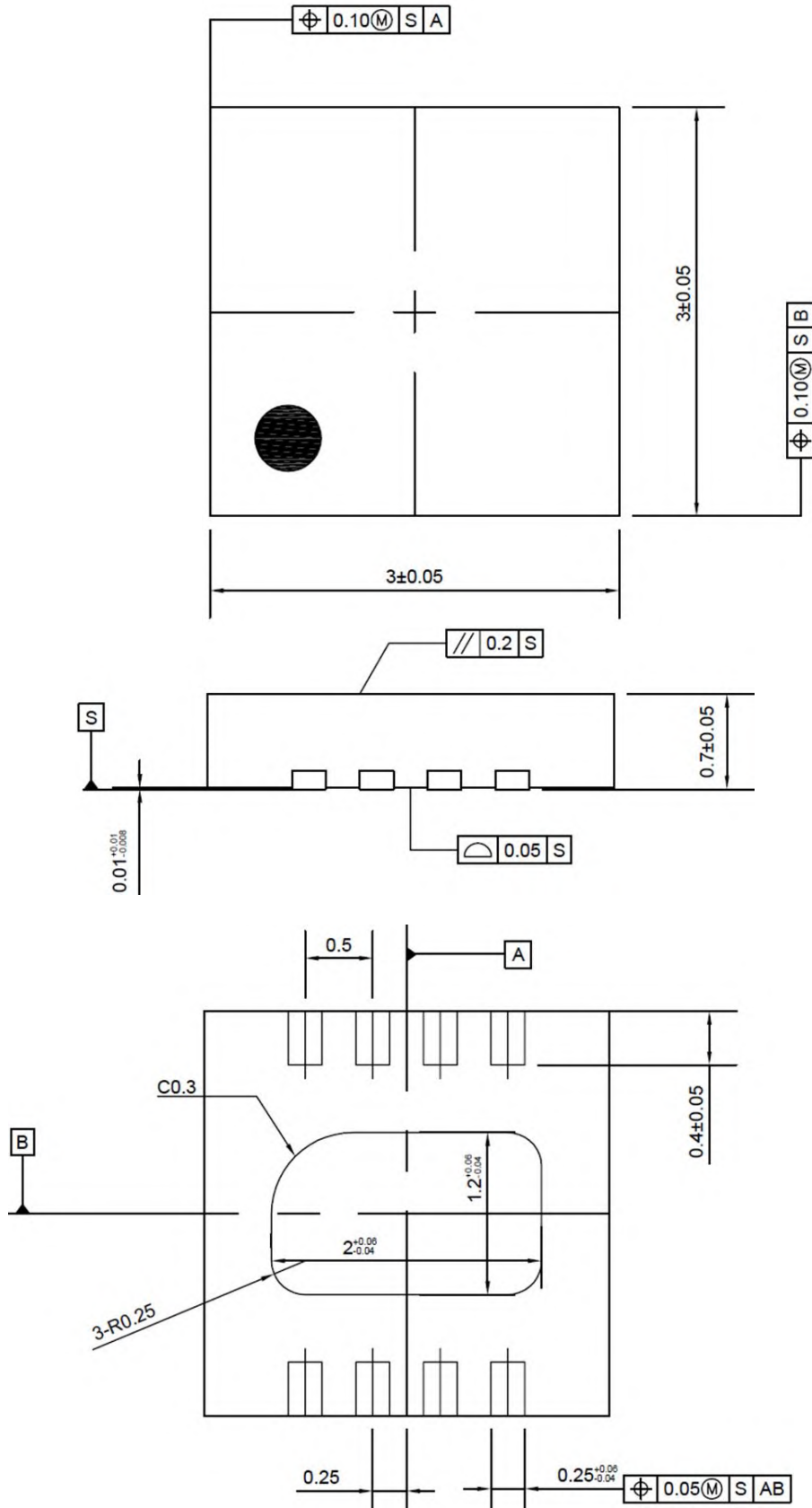
To sustain the steady state operation, take account of the Dissipation Power and thermal design.

Fig 1

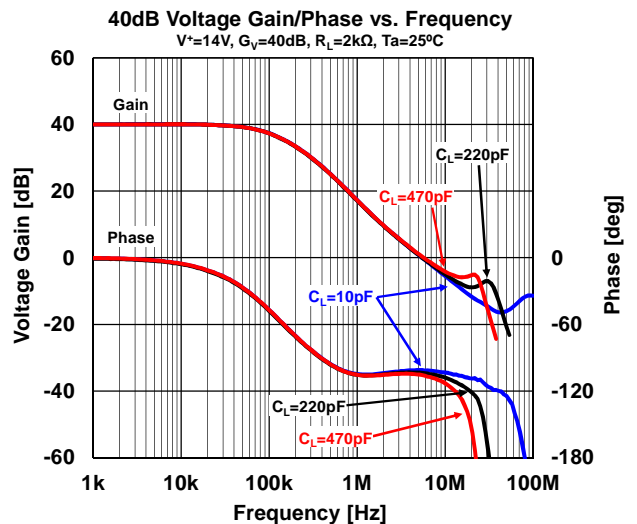
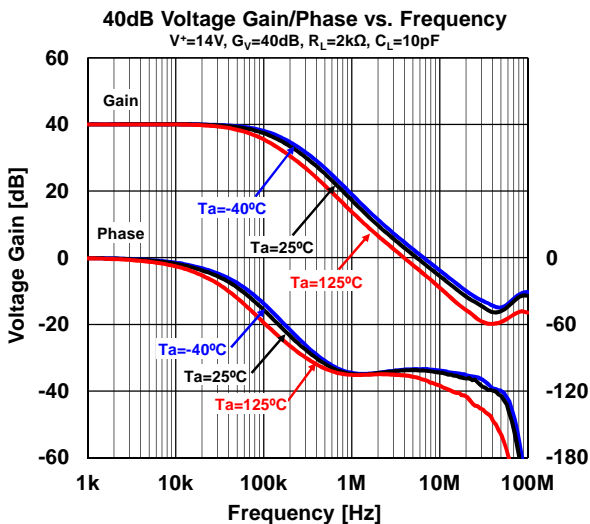
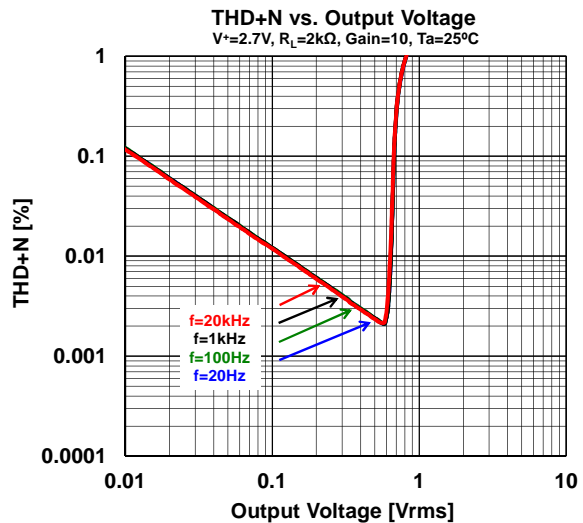
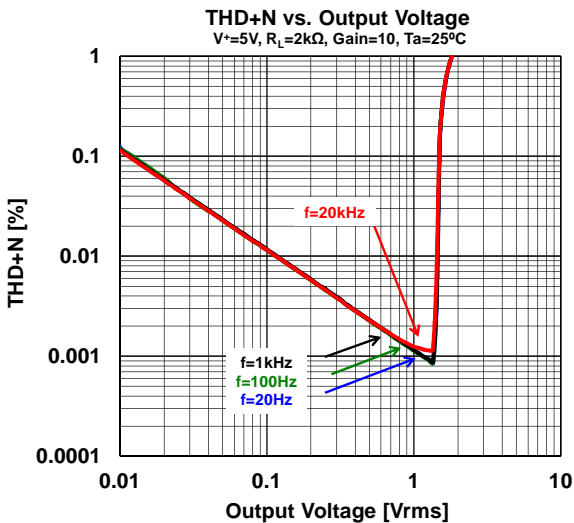
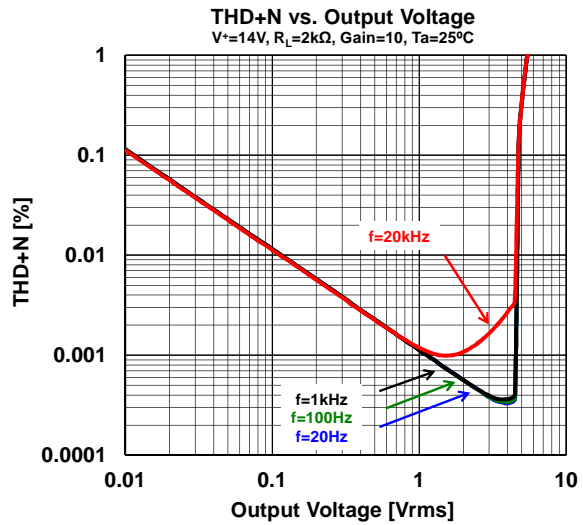
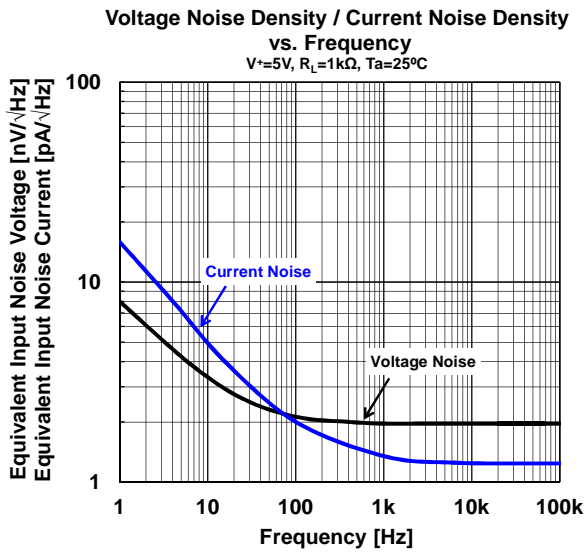


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## PACKAGE OUTLINE (ESON8-W1)

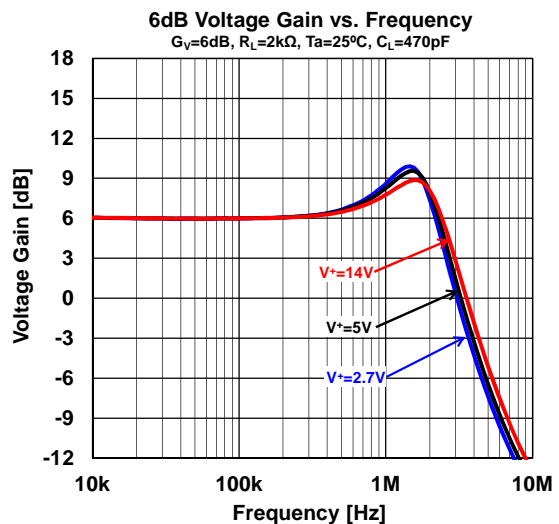
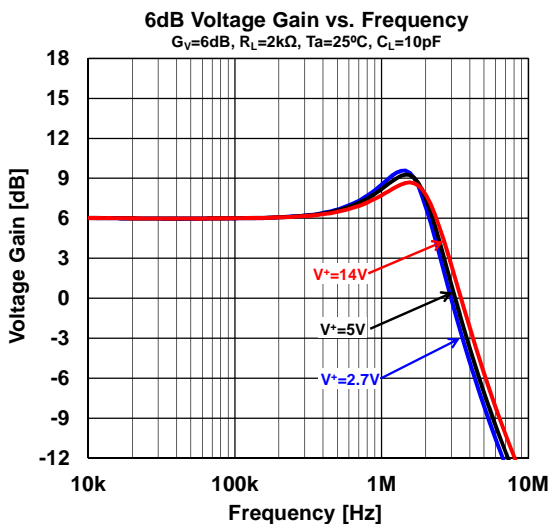
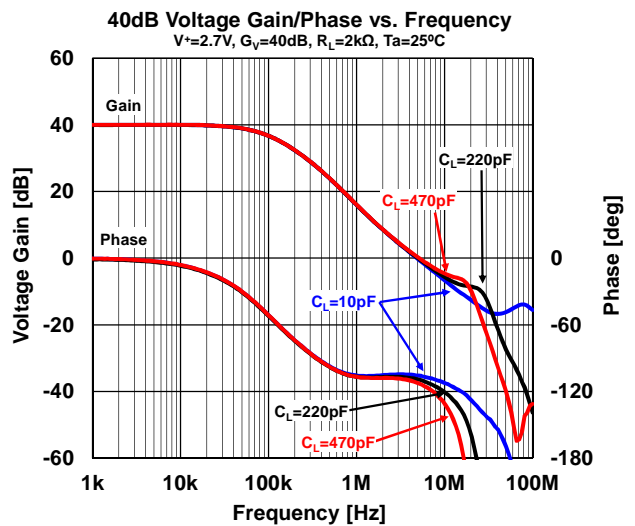
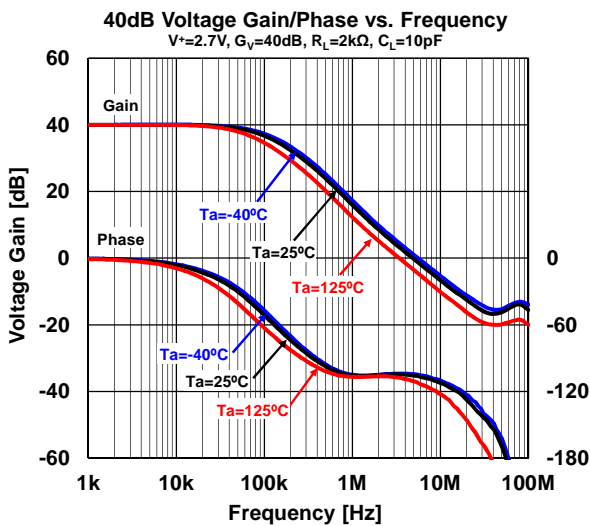
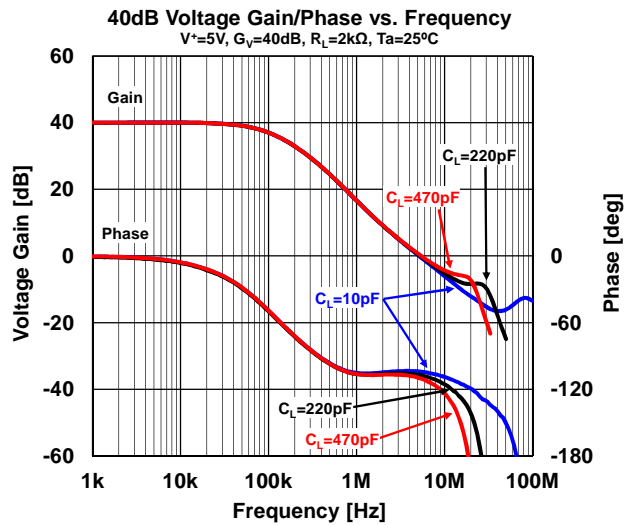
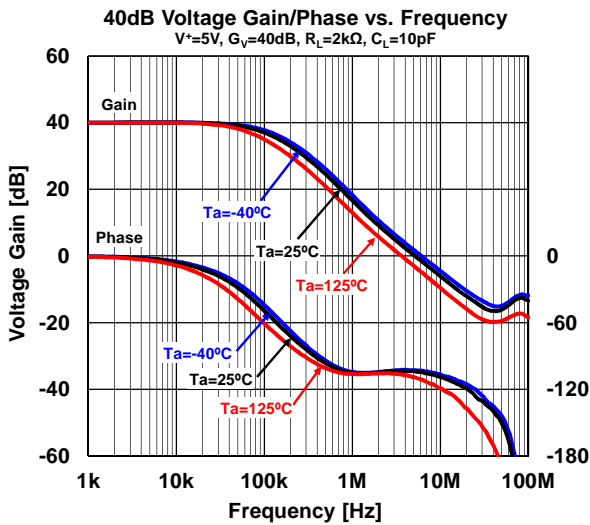


■ TYPICAL CHARACTERISTICS ( $V^- = 0V$ ,  $V_{CM} = V^+ / 2$ , unless otherwise specified)

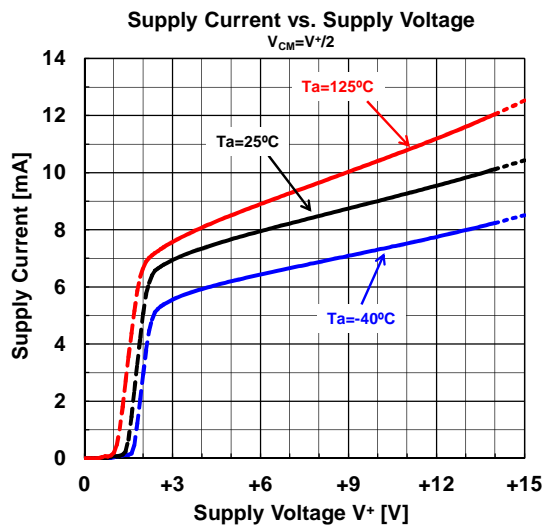
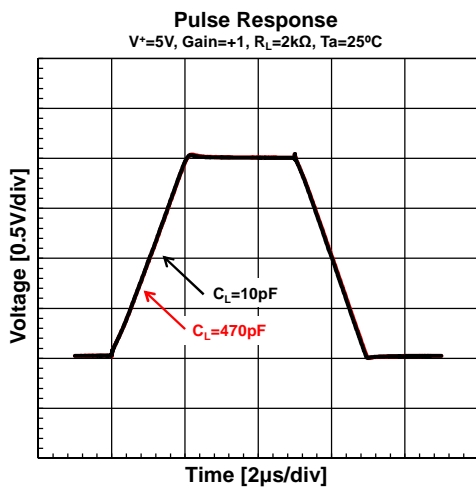
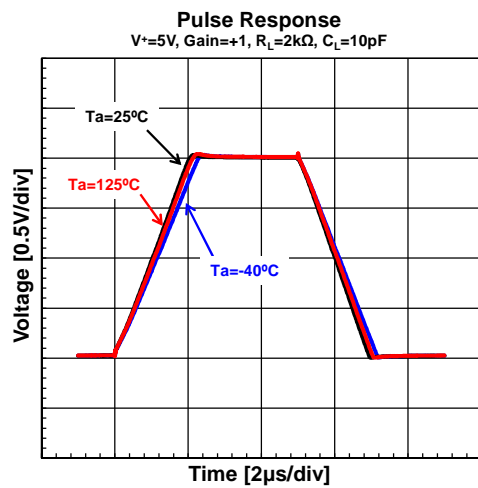
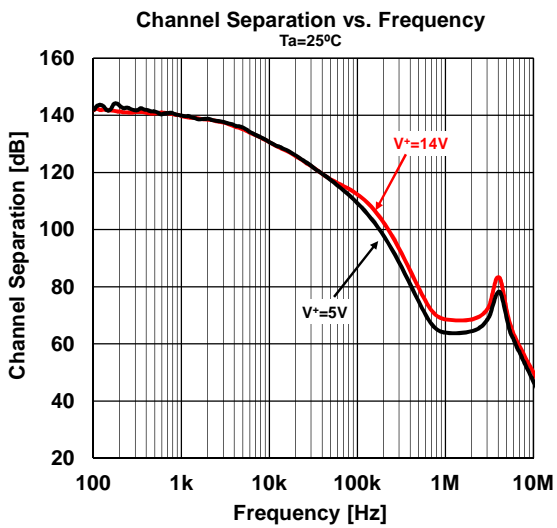
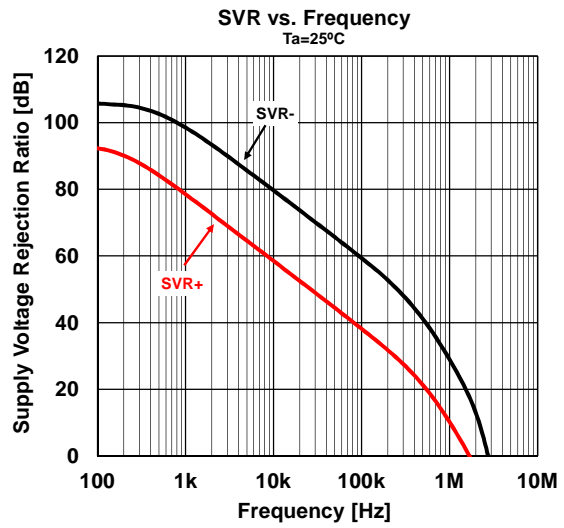
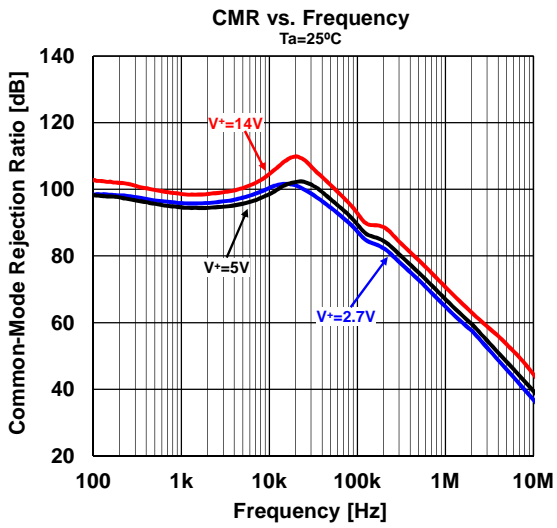


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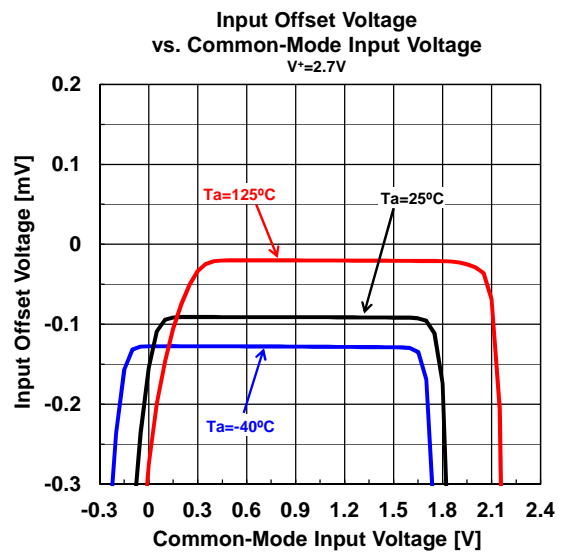
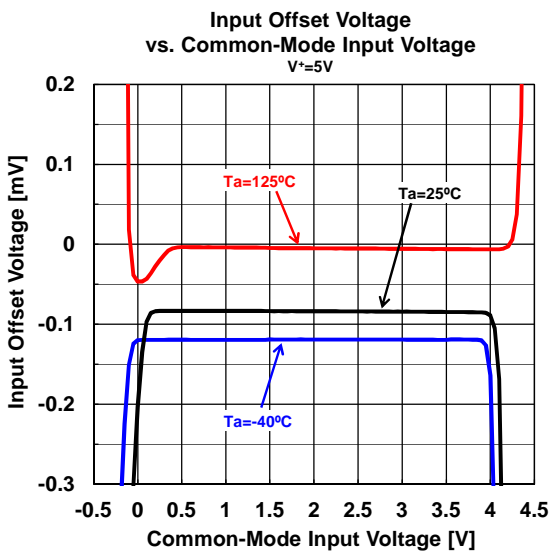
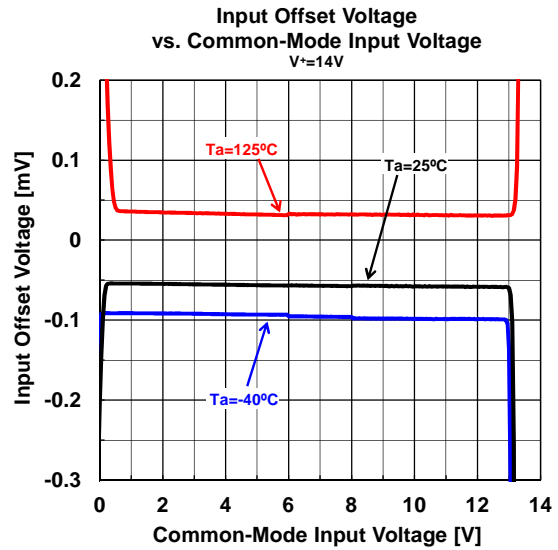
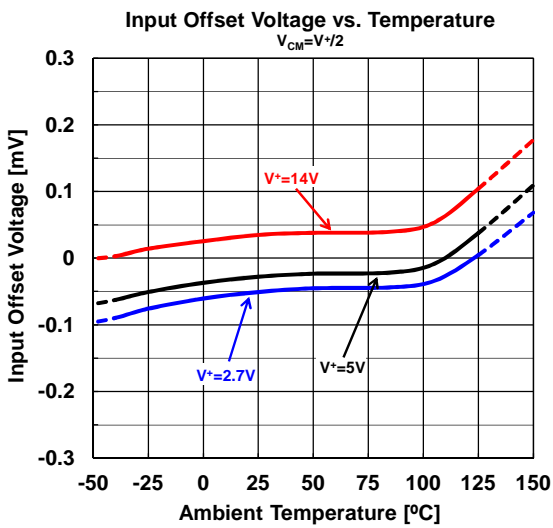
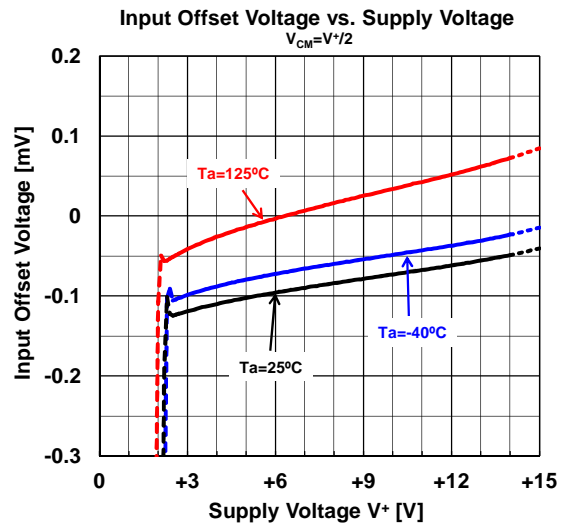
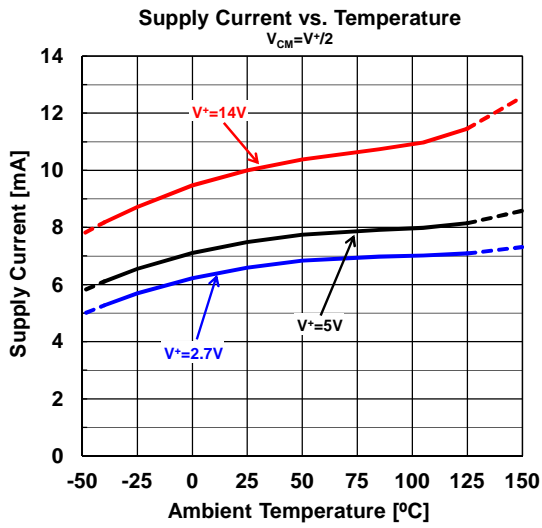


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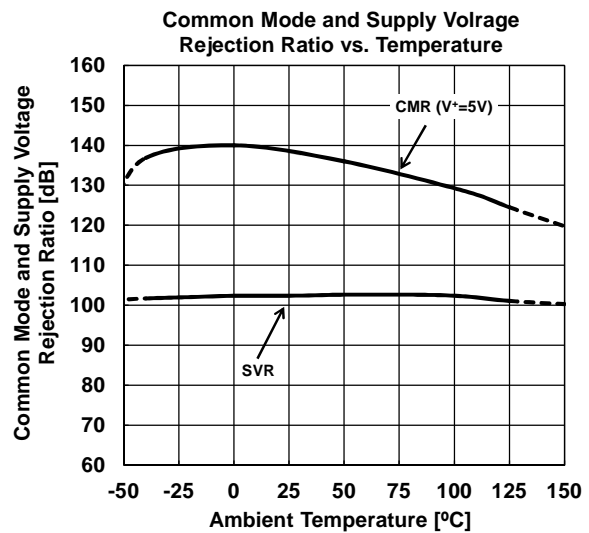
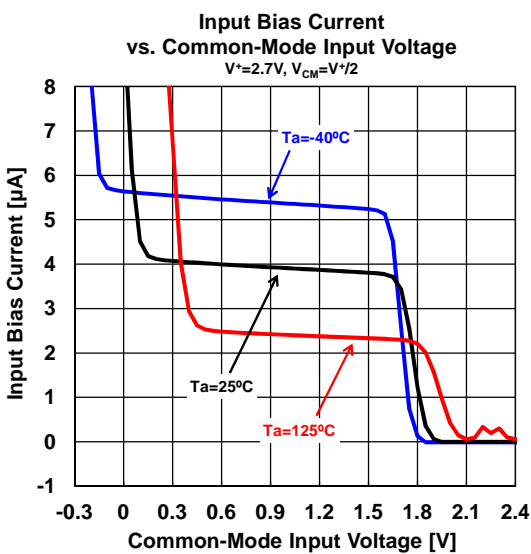
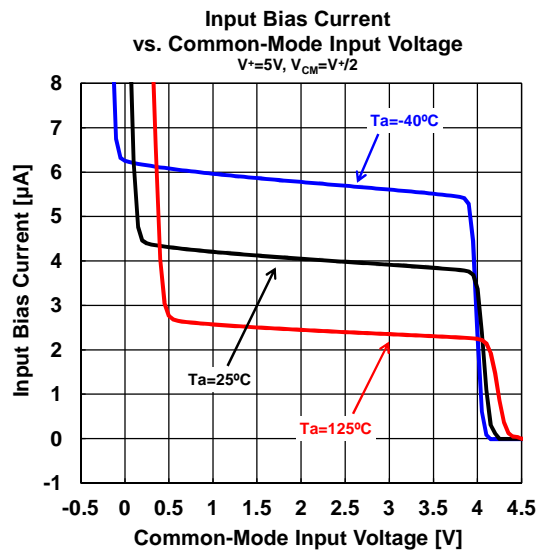
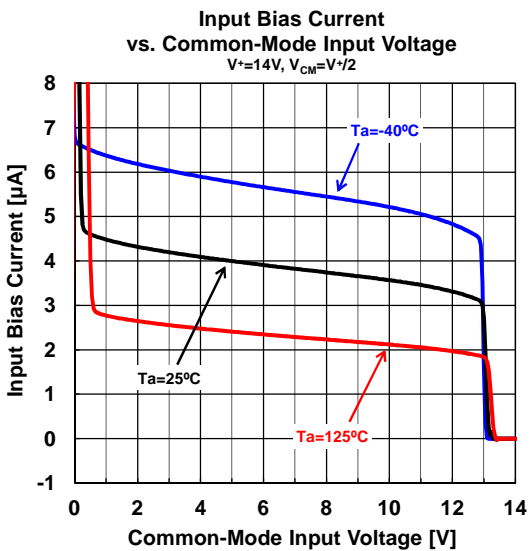
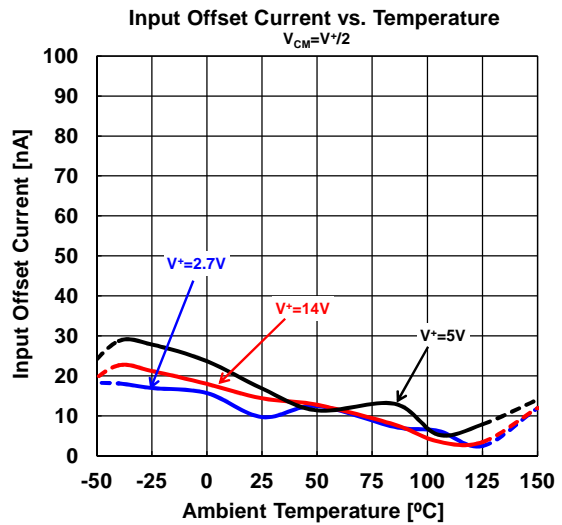
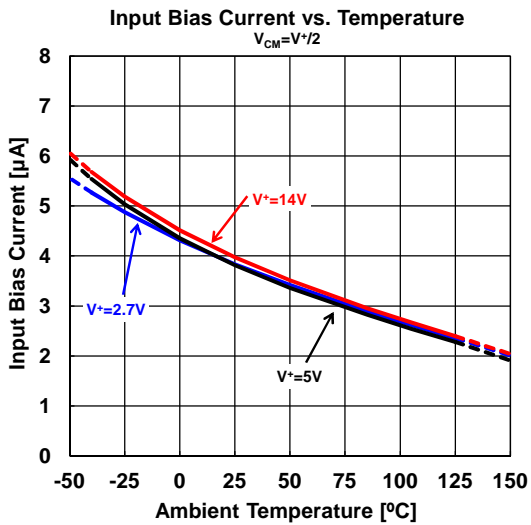
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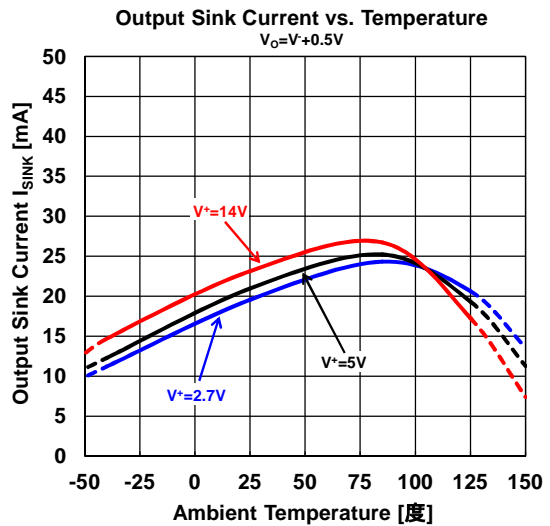
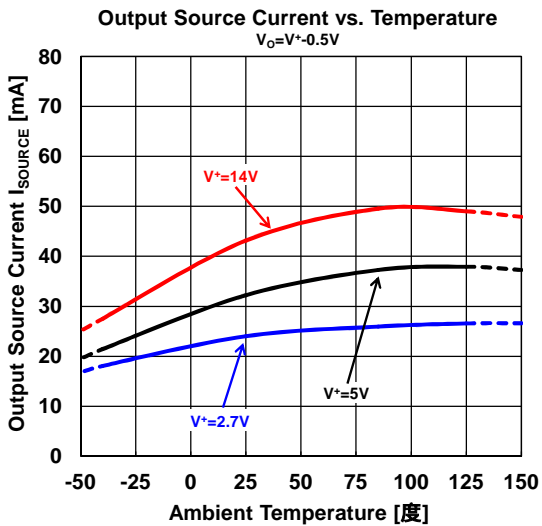
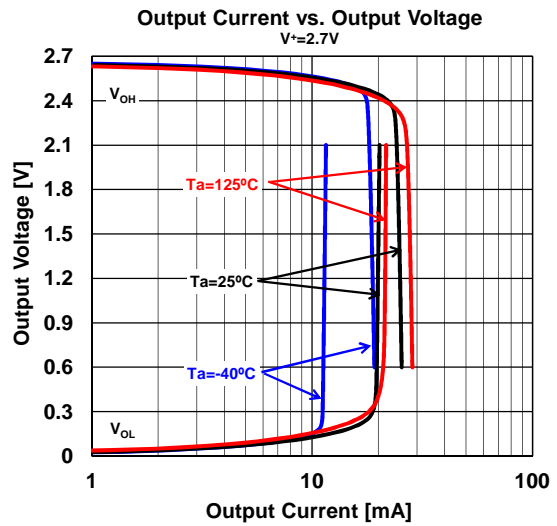
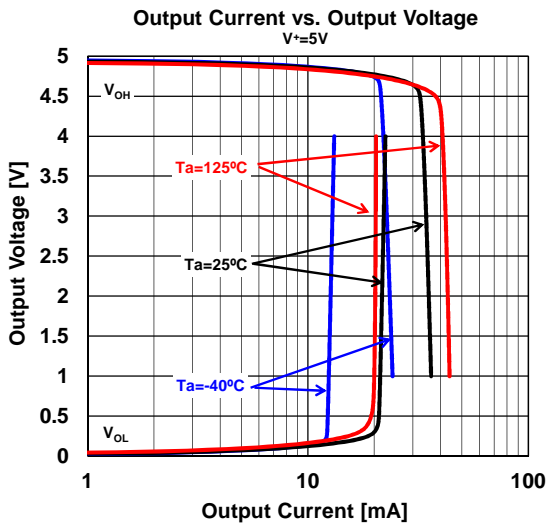
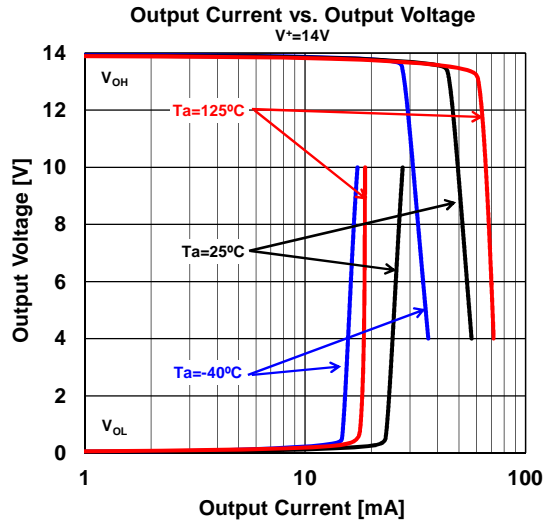
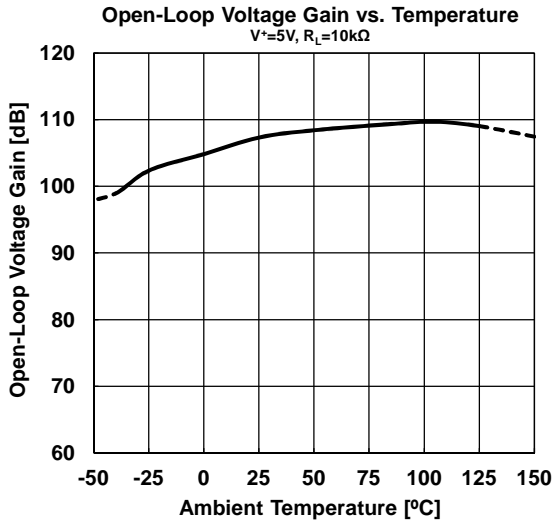


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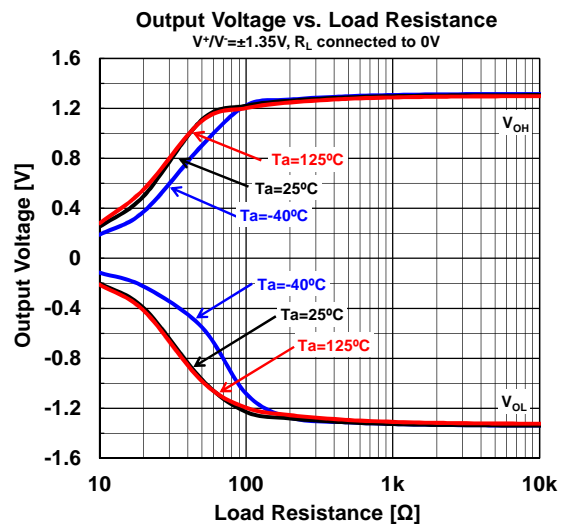
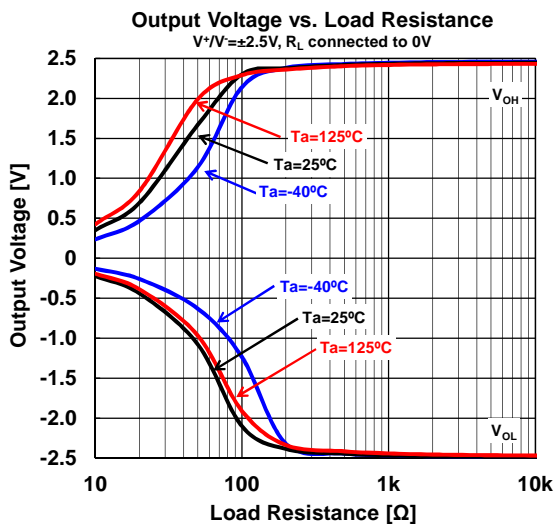
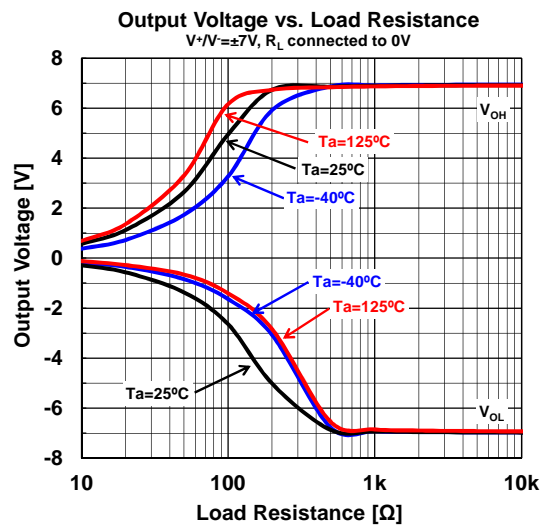
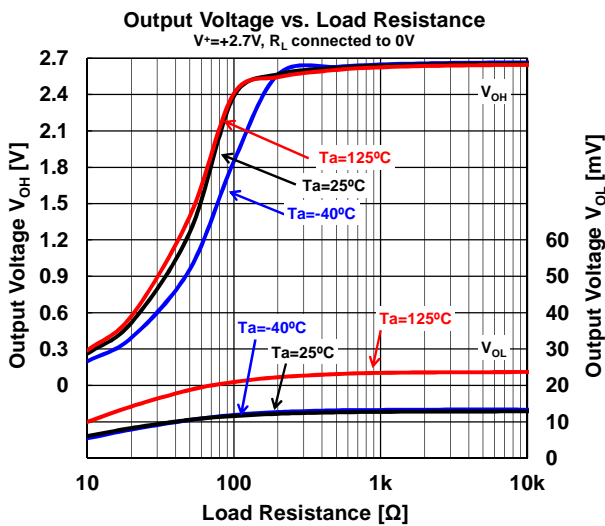
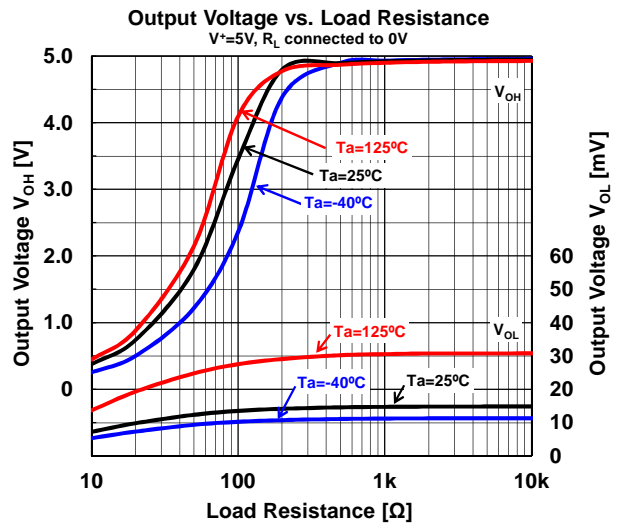
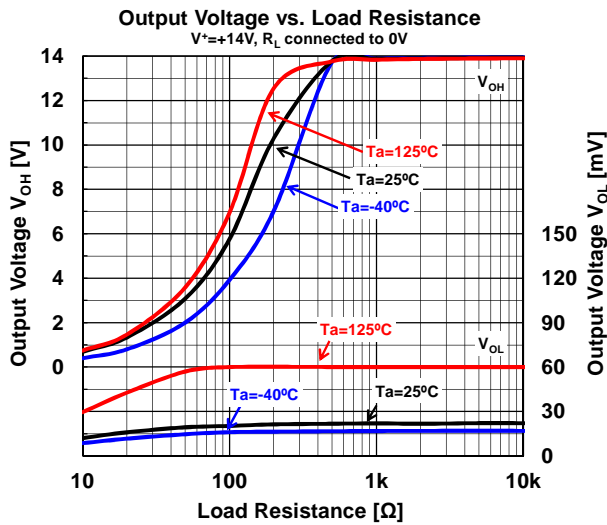


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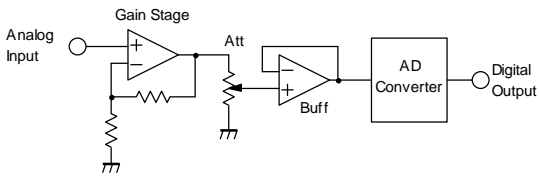


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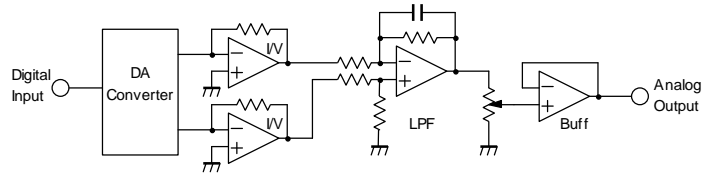


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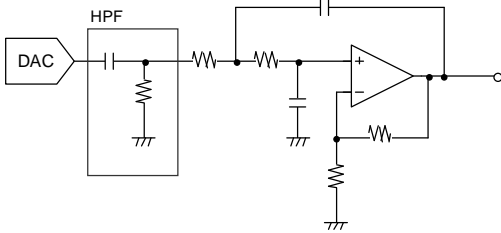
## APPLICATION CIRCUIT



(Fig.1: ADC Input)



(Fig.2: DAC Output)



(Fig.3: DAC LPF Circuit)

## [ CAUTION ]

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