Dual Low Voltage Operational Amplifier

General Description

SOP-8

DIP-8

MSOP-8

TSSOP-8

- The LMV358 are low voltage (2.7-5.5V) versions of the dual and quad commodity op amps.
- The LMV358 are the most cost effective solutions for the applications where low voltage operation, space saving and low price are needed.
- The LMV358 have rail-to-rail output swing capability and the input common-mode voltage range includes ground. They all exhibit excellent speed-power ratio, achieving 1MHz of bandwidth and 1V/μs of slew rate with low supply current.
- The LMV358 have bipolar input and output stages for improved noise performance and higher output current drive.
- The LMV358 is available in SOP-8, DIP-8, TSSOP-8 and MSOP-8 packages

RoHS Compliant

Features

(For V^- =5V and V+ =0V. Typical Unless Otherwise Noted)

- Guaranteed 2.7V and 5V performance
- No crossover distortion, space saving package
- Industrial temp. range, V_{CM} -0.2V to V^- -0.8V
- Gain-Bandwidth product; Low supply current: 210μA
- Rail-to-Rail output swing @10KΩ load (V^- 10mV, V+ 65mV)
- RoHS Compliance

Applications

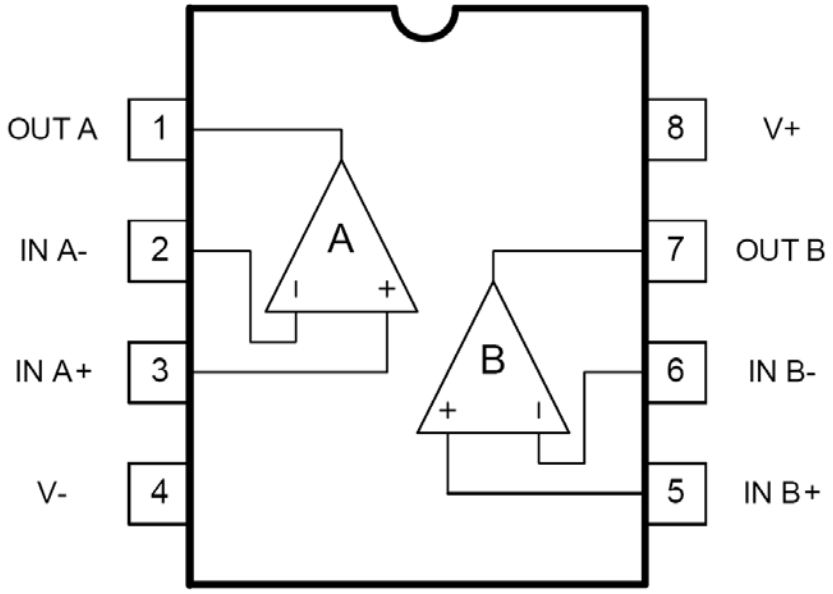
- Battery Charger
- Cordless Telephone
- Switching Power Supply

Ordering Information

LMV358□□□—XX—□□□□

- Circuit Type
- Outline:
  - P8: DIP-8
  - S8: SOP-8
  - TS8: TSSOP-8
  - MS8: MSOP-8
- Factory Location Code
- Package:
  - TR70: 7" Reel
  - TR30: 13" Reel
  - TU: Tube
  - BL: Bulk
  - AR: Tape and Ammo Pack

Internal Block Diagram



Absolute Maximum Ratings

Symbol	Description	Ratings	Unit
V_{CC}	Supply Voltage	2.7 to 5.5	V
$V_{I(DIFF)}$	Differential Input Voltage	±Supply Voltage	V
V_{IO}	Max. Input Offset Voltage	7	mV
-	Output Short Circuit to V^-	Note1	
-	Output Short Circuit to V+	Note2	
R_{thJA}	Typical Thermal Resistance (Note3)	235	° C/W
-	Infrared (15 sec)	-	-
T_J	Junction Temperature (Note4)	150	° C
T_{OPR}	Operating Temperature Range	-40 ~ +85	° C
T_{STG}	Storage Temperature Range	-65~ +150	° C

Note: 1. Shorting output to V^- will adversely after reliability.
2. Shorting output to V+ will adversely affect reliability.
3. All numbers are typical, and apply for packages soldered directly note a PC board is still air.
4. The max. power dissipation is a function of $T_J(max)$ θ_{JA} and T_A. The max. allowable power dissipation at any ambient temperature is $PD=(T_J(max) – T_A)/ \theta_{JA}$. All numbers apply for packages soldered directly into a PC board.

2.7V DC Electrical Characteristics

(V^-=2.7V, V_+=0V, V_{CM}=1.0V, V_{OUT}=V^-/2 and R_L=1MΩ, T_J=25°C unless otherwise specified)

Symbol	Description	LMV358			Unit	Conditions
		Min.	Typ.	Max.		
V_{IO}	Input Offset Voltage	-	1.7	7	mV	
TCVos	Input Offset Current Average Drift	-	5	-	μV/° C	-
I_{BIAS}	Input Bias Current	-	11	250	nA	-
I_{IO}	Input Offset Current	-	5	30	nA	-
CMRR	Common Mode Rejection Ratio	50	63	-	dB	0V≤V_{CM}≤1.7V
PSRR	Power Supply Rejection Ratio	50	60	-	dB	2.7V≤V^-≤5V,V_{OUT}=1V
V_{CM}	Input Common Mode Voltage	0	-0.2	-	V	For CMRR≥50dB
		-	1.9	1.7	V	
V_{OUT}	Output Voltage Swing	V^--100	V^--100	-	mV	R_L=10KΩ to 1.35V
		-	60	180	mV	
I_{CC}	Power Supply Current	-	140	340	μA	Both amplifiers

2.7V AC Electrical Characteristics

(V^-=2.7V, V_+=0V, V_{CM}=1.0V, V_{OUT}=V^-/2 and R_L>1MΩ, T_J=25°C unless otherwise specified)

Symbol	Description	LMV358			Unit	Conditions
		Min.	Typ.	Max.		
GBWP	Gain-Bandwidth Product	-	1	-	MHz	C_L=200pF
Φ(T)	Phase Margin	-	60	-	Deg	-
G	Gain Margin	-	10	-	dB	-
θr1	Input-Referred Voltage Noise	-	46	-	nV/sq(Hz)	f=1KHz
Ir1	Input-Referred Current Noise	-	0.17	-	nV/sq(Hz)	f=1KHz

5V DC Electrical Characteristics

(V^-=5V, V_+=0V, V_{CM}=2.0V, V_{OUT}=V^-/2 and R_L>1MΩ, T_J=25ºC unless otherwise specified)

Symbol	Description	LMV358			Unit	Conditions
		Min.	Typ.	Max.		
V_{IO}	Input Offset Voltage	7	1.7	9	mV	-
TCVos	Input Offset Current Average Drift	-	5	-	μV/° C	-
I_{BIAS}	Input Bias Current	250	15	500	nA	-
I_{IO}	Input Offset Current	50	5	150	nA	-
CMRR	Common Mode Rejection Ratio	50	65	-	dB	0V≤V_{CM}≤4V
PSRR	Power Supply Rejection Ratio	50	60	-	dB	2.7V≤V^-≤5V,V_{OUT}=1V,V_{CM}=1V
V_{CM}	Input Common Mode Voltage	0	-0.2	-	V	For CMRR≥50dB
		-	4.2	4	V	
Av	Large Signal Voltage Gain	10	100	15	V/mV	R_L=2KΩ (Note5)
V_{OUT}	Output Voltage Swing	V+-400	V^--40	V^--300	mV	R_L=2KΩ to 2.5V
		300	120	400		
		V+-200	V^--10	V^--10		R_L=10KΩ to 1.35V
		180	65	280		
I_{OUT}	Output Short Circuit Current	5	60	-	mA	Sourcing, V_{OUT}=0V
		10	160	-	mA	Sinking, V_{OUT}=5V
I_{CC}	Power Supply Current	440	210	615	μA	Both amplifiers

5V AC Electrical Characteristics

(V^-=5V, V_+=0V, V_{CM}=2.0V, V_{OUT}=V^-/2 and R_L>1MΩ, T_J=25ºC unless otherwise specified)

Symbol	Description	LMV358			Unit	Conditions
		Min.	Typ.	Max.		
SR	Slew Rate	-	1	-	V/μs	
GBWP	Gain-Bandwidth Product	-	1	-	MHz	C_L=200pF
Φ(T)	Phase Margin	-	60	-	Deg	-
G®	Gain Margin	-	10	-	dB	-
θr1	Input-Referred Voltage Noise	-	39	-	nV/sq(Hz)	f=1KHz
Ir1	Input-Referred Current Noise	-	0.21	-	nV/sq(Hz)	f=1KHz

Note: 5. R_L is connected to V. The output voltage is 0.5V≤V_{OUT}≤4.5V

Typical Characteristics Curves

(VE= +5V, single supply. TA=25° C, unless otherwise specified)

Fig.1- Input Current vs. Temperature

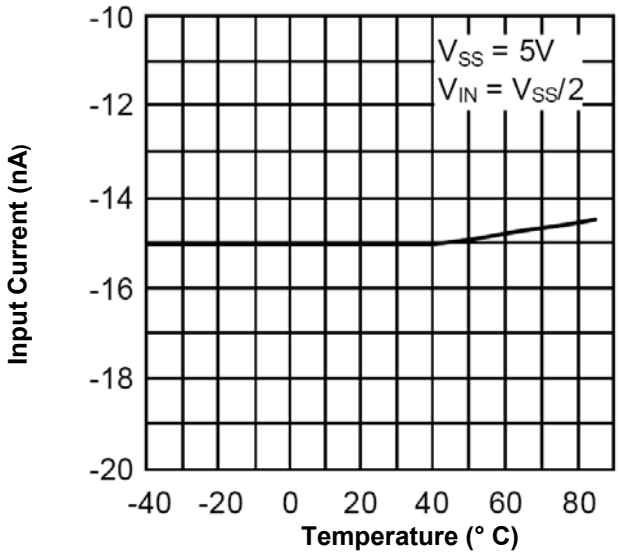


Fig.2- Sourcing Current vs Output Voltage

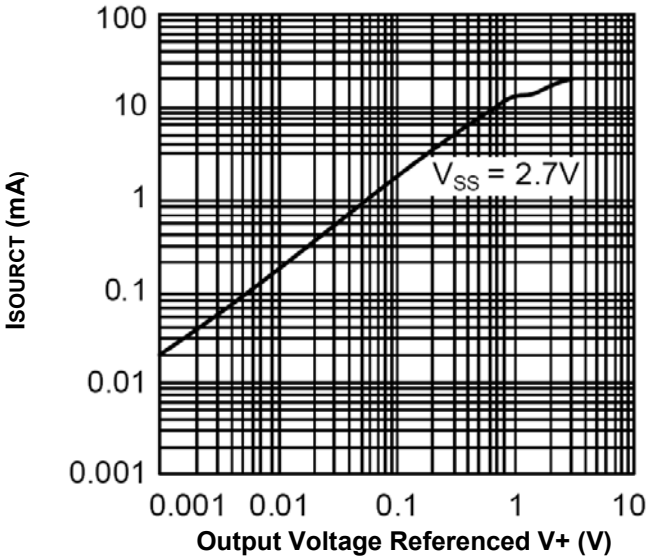


Fig.3- Sourcing Current vs Output Voltage

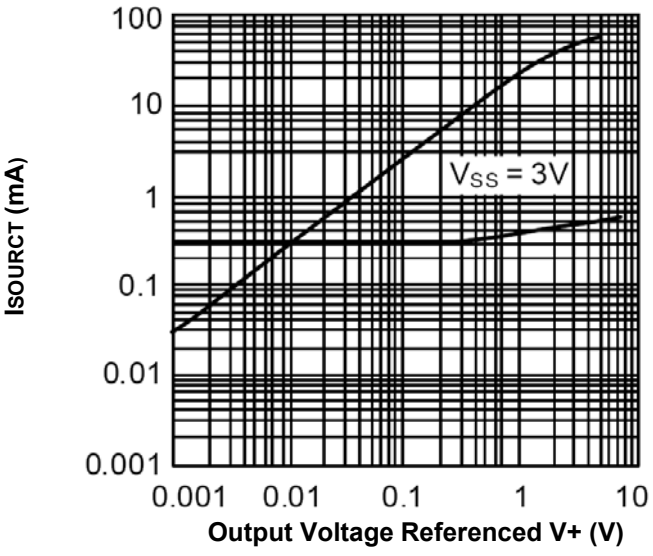
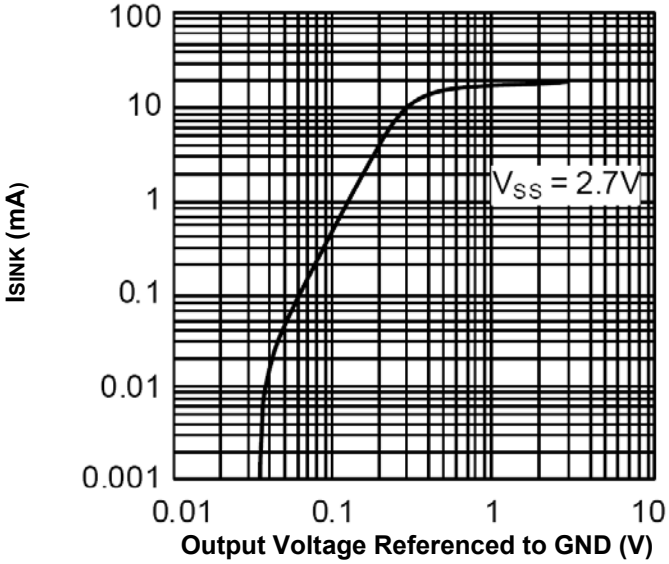


Fig.4- Sinking Current vs Output Voltage



Typical Characteristics (Continued)

Fig.5- Sinking Current vs Output Voltage

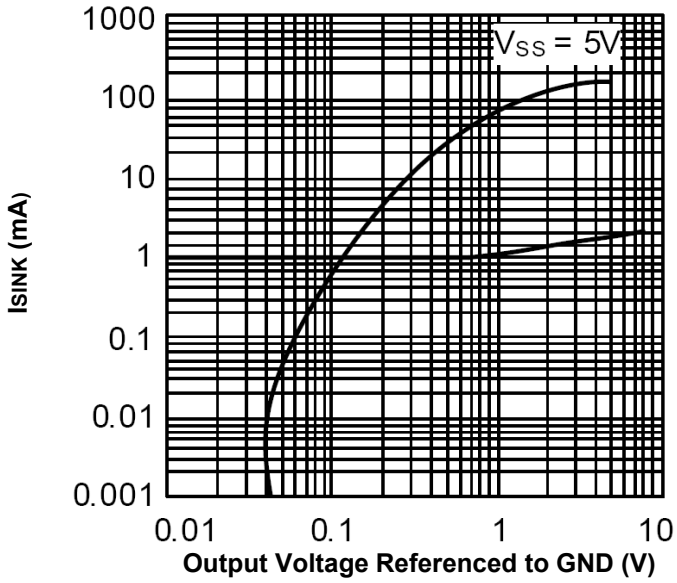


Fig.6- Open Loop Output Impedance vs Frequency

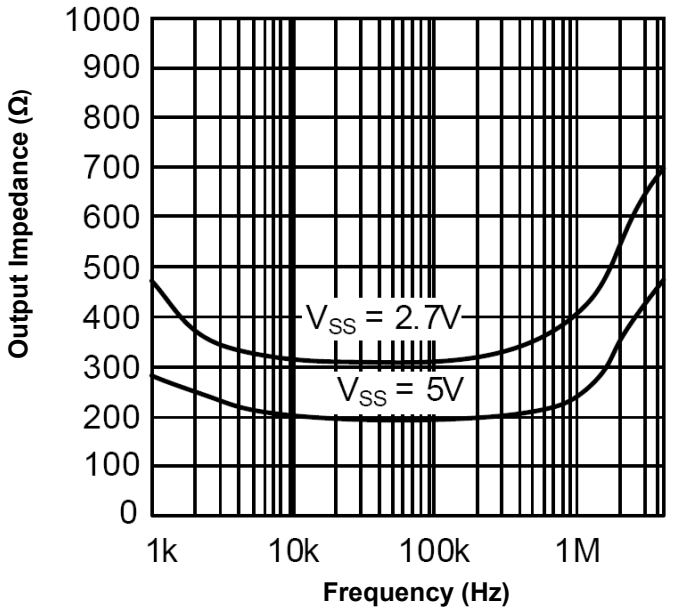


Fig.7- Short Circuit Current vs Temperature (Sinking)

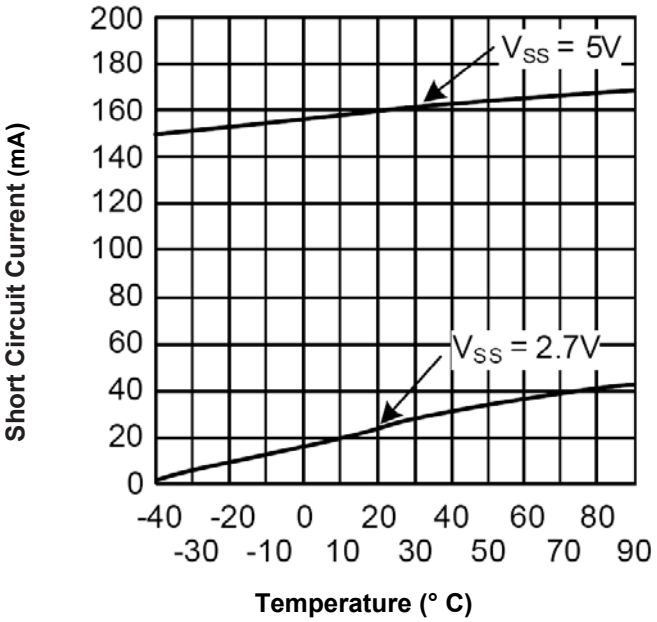
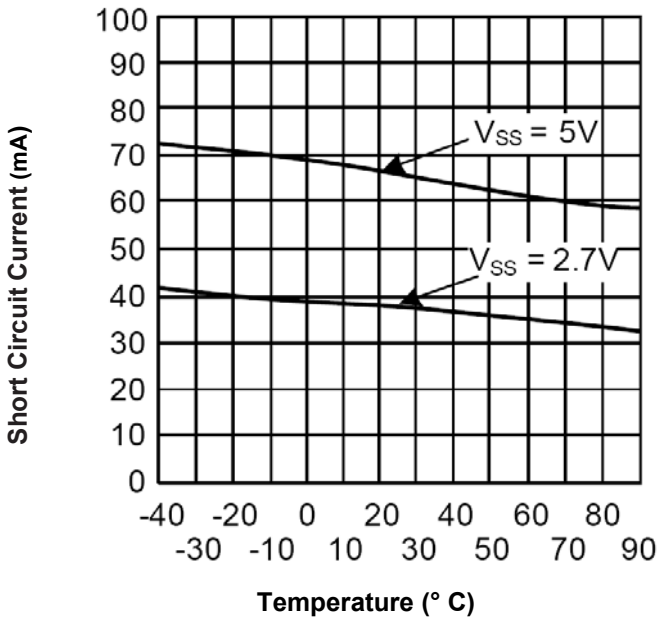


Fig.8- Short Circuit Current vs Temperature (Sourcing)



Typical Characteristics (Continued)

Fig.9- Output Voltage Swing vs Supply Voltage

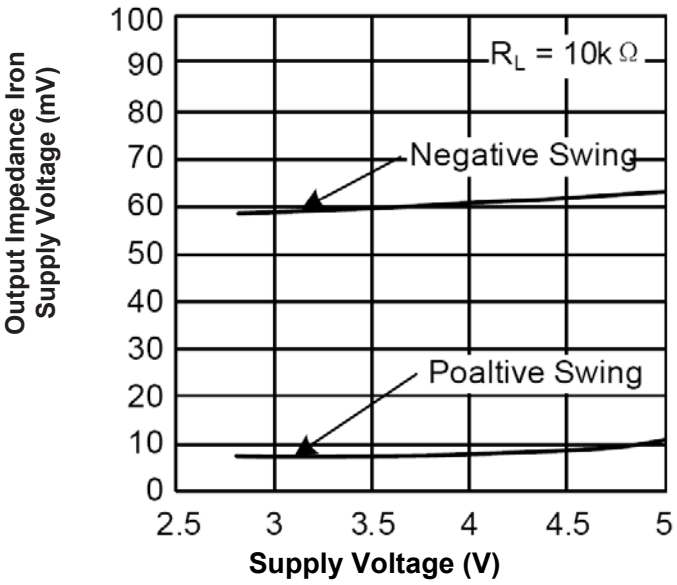


Fig.10- Input Voltage Noise vs Frequency

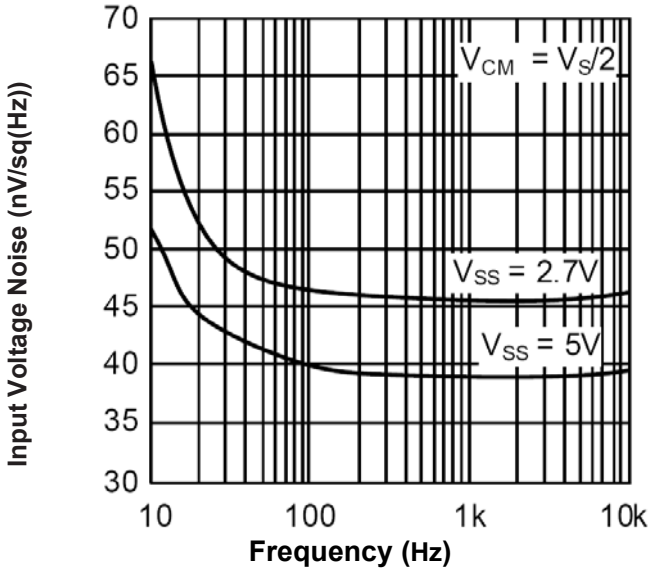


Fig.11- Input Current Noise vs Frequency

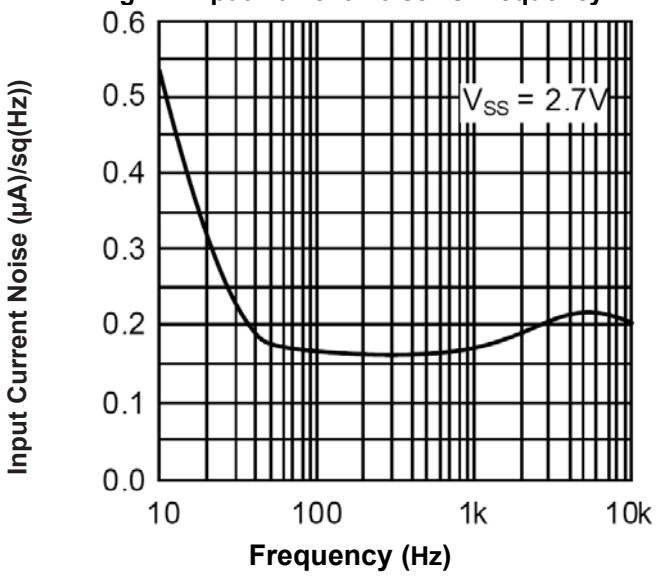
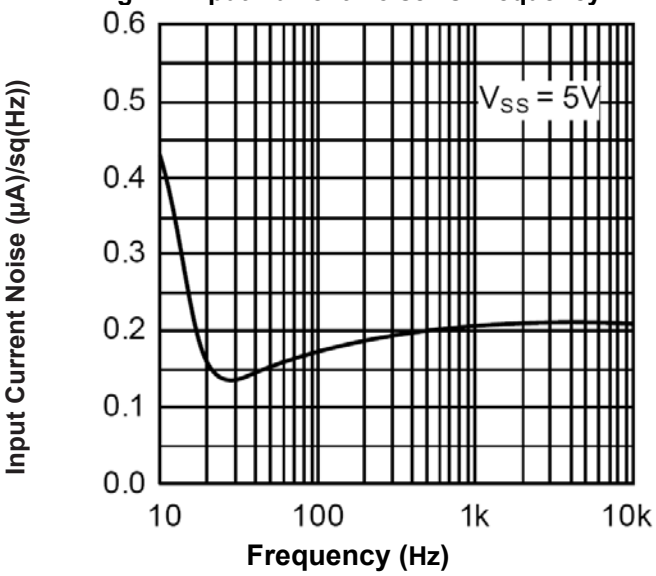


Fig.12- Input Current Noise vs Frequency



Typical Characteristics (Continued)

Fig.13- Crosstalk Rejection vs Frequency

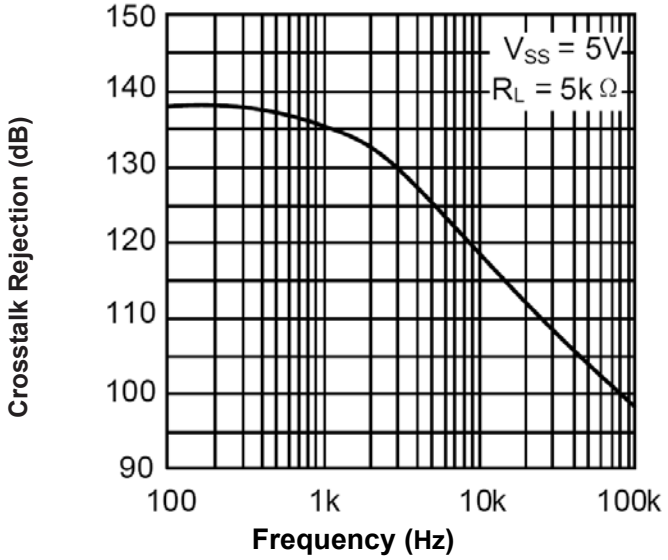


Fig.14- PSRR vs Frequency

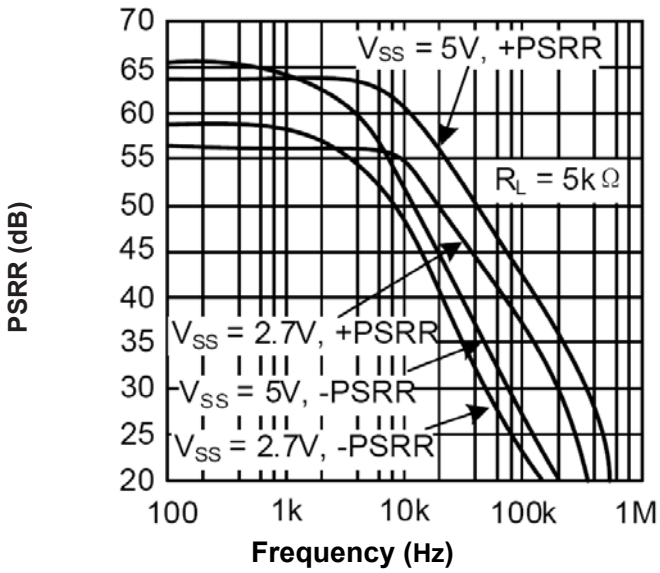


Fig.15- CMRR vs Frequency

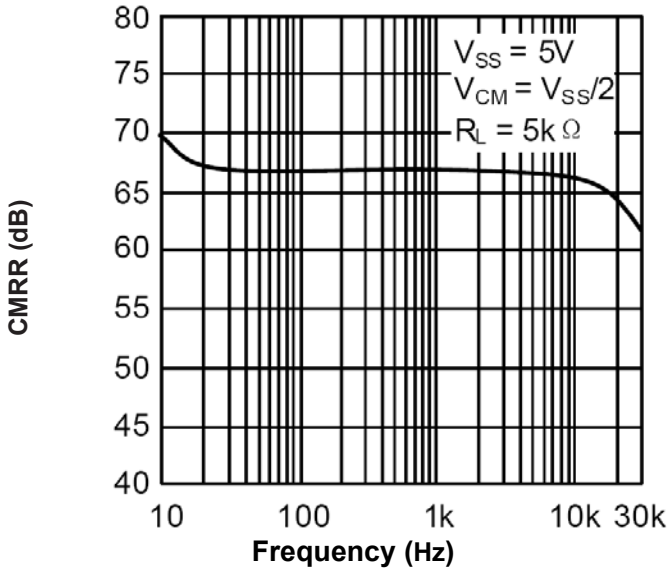
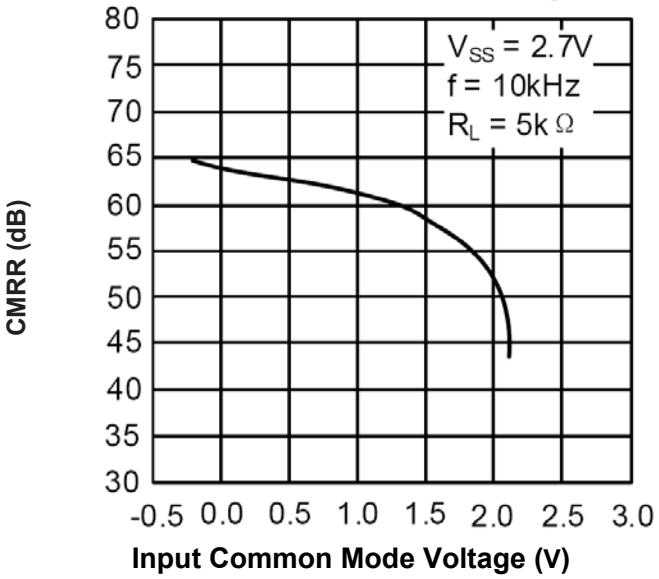


Fig.16- Common Mode vs Voltage



Typical Characteristics (Continued)

Fig.17- CMRR vs Input Common Mode Voltage

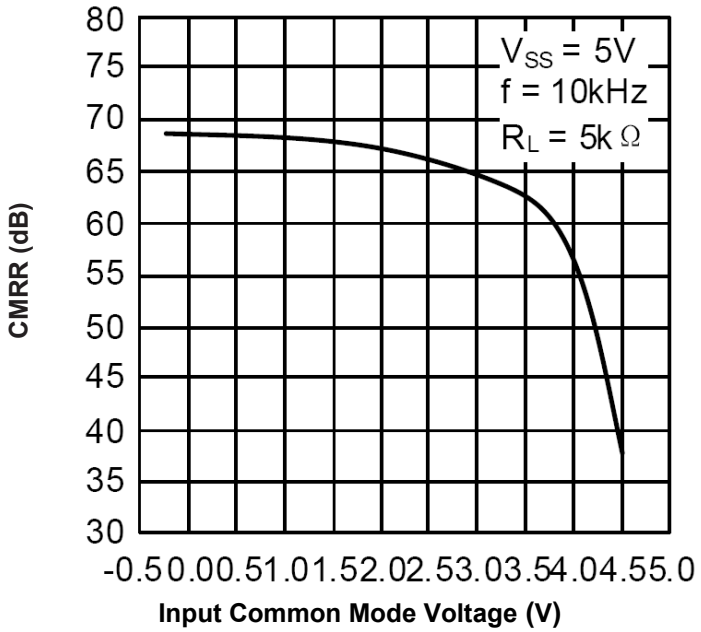


Fig.18- ΔVos vs CMR

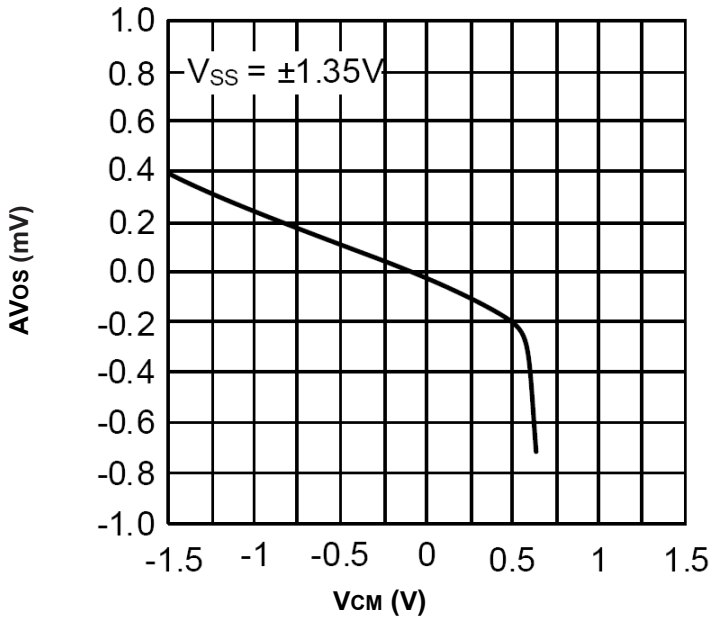


Fig.19- ΔVos vs CMR

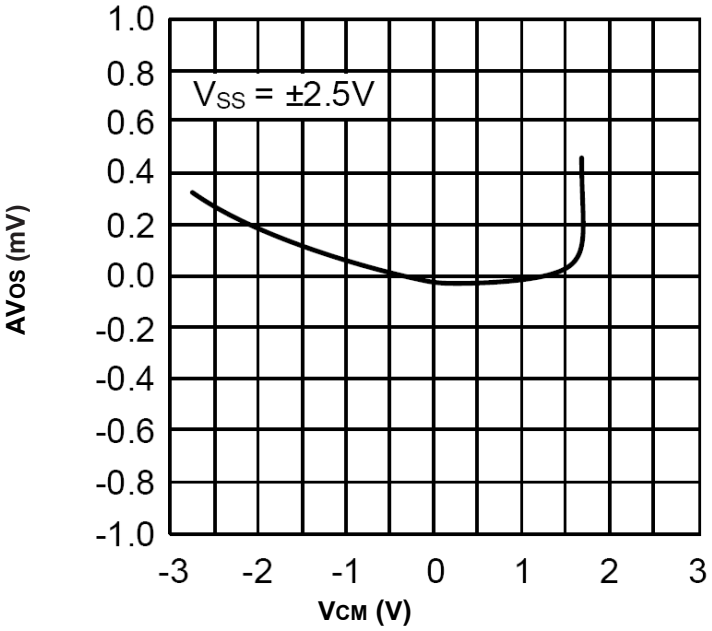
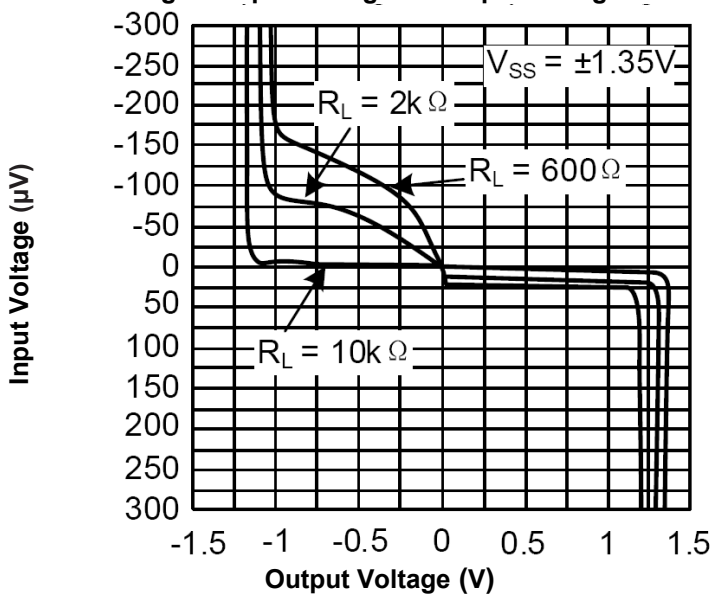


Fig.20- Input Voltage vs Output Voltage



Typical Characteristics (Continued)

Fig.21- Input Voltage vs Output Voltage

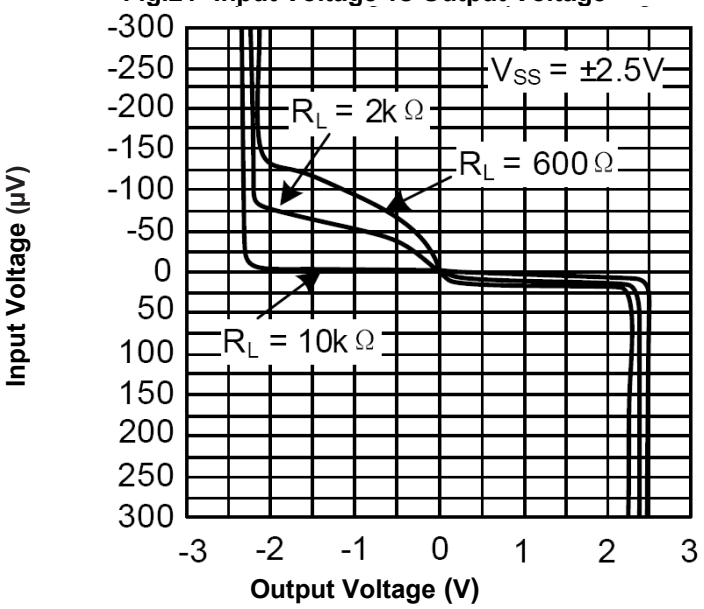


Fig.22- Open Loop Frequency Response

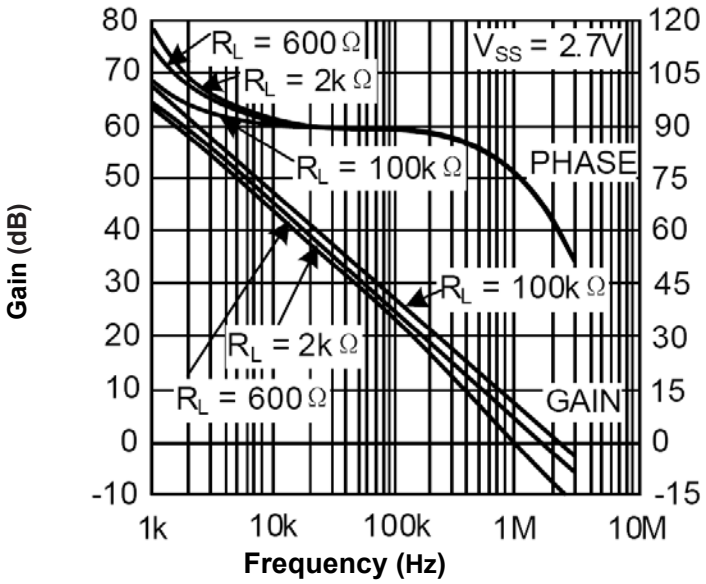


Fig.23- Open Loop Frequency Response

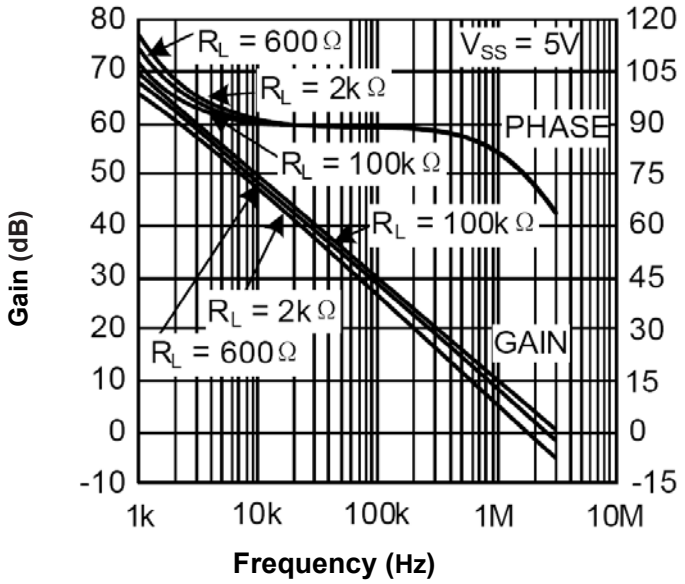
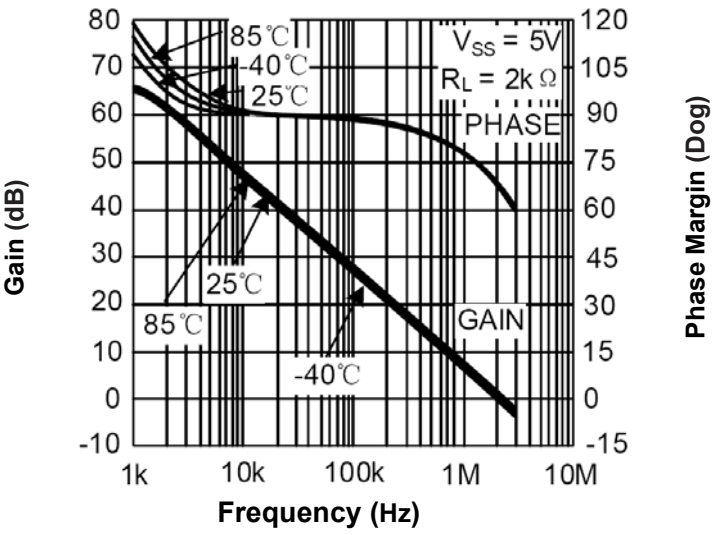


Fig.24- Open Loop Frequency Response vs Temperature



Typical Characteristics (Continued)

Fig.25- Gain and Phase vs Capacitive Load

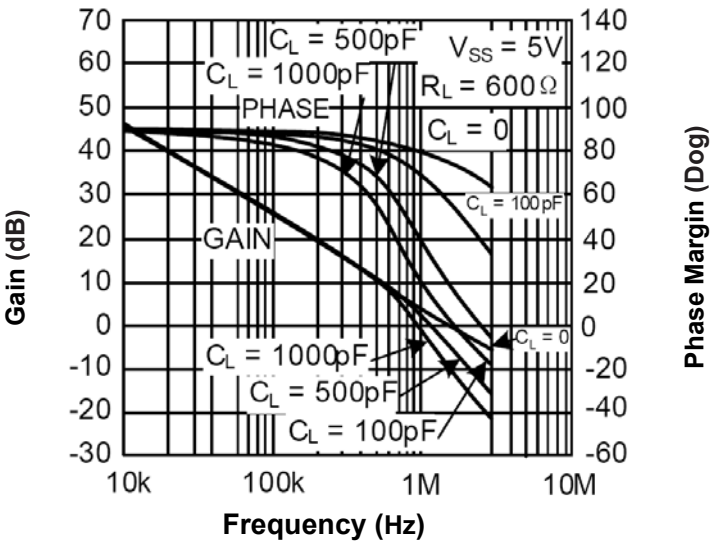


Fig.26- Gain and Phase vs Capacitive Load

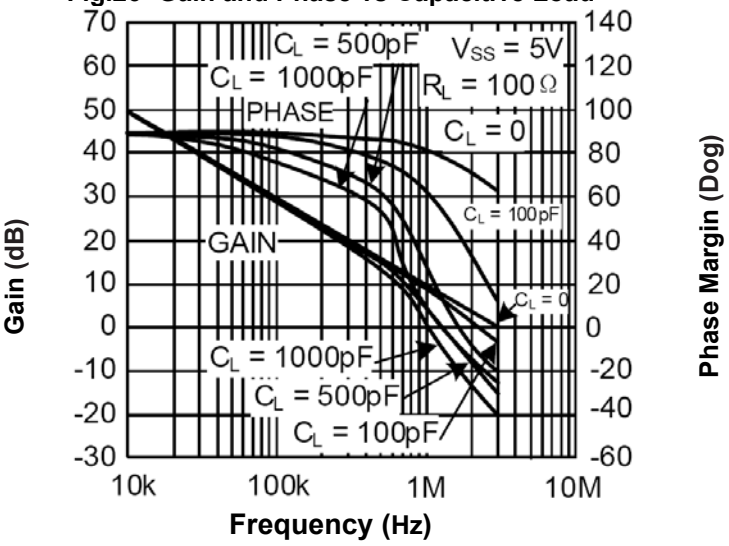


Fig.27- Slew Rate vs Supply Voltage

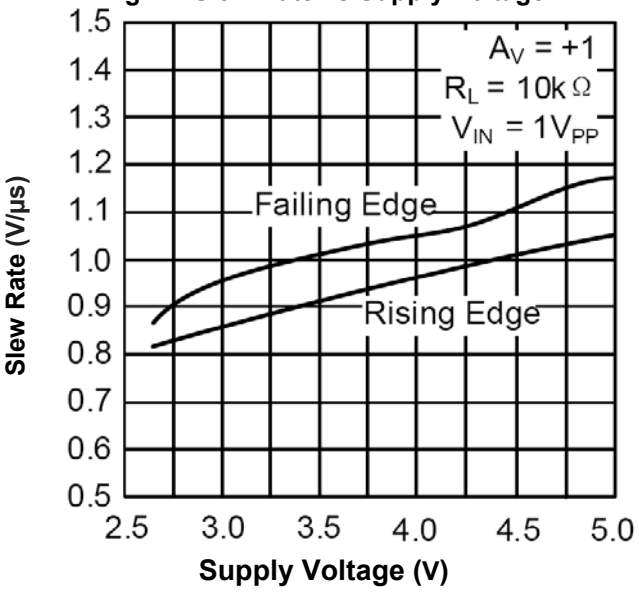
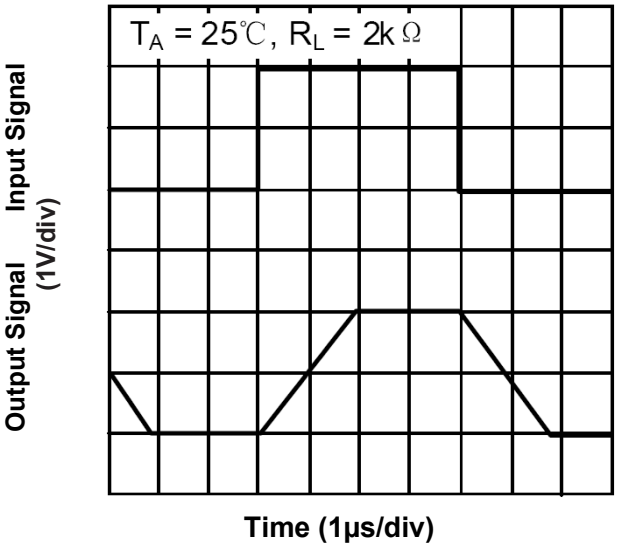


Fig.28- Non-Inverting Large Signal Pulse Response



Typical Characteristics (Continued)

Fig.29- Non-Inverting Large Signal Pulse Response

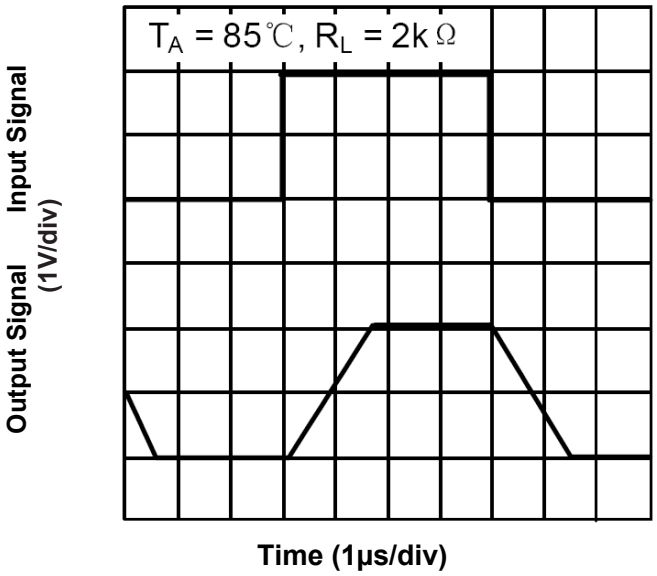


Fig.30- Non-Inverting Large Signal Pulse Response

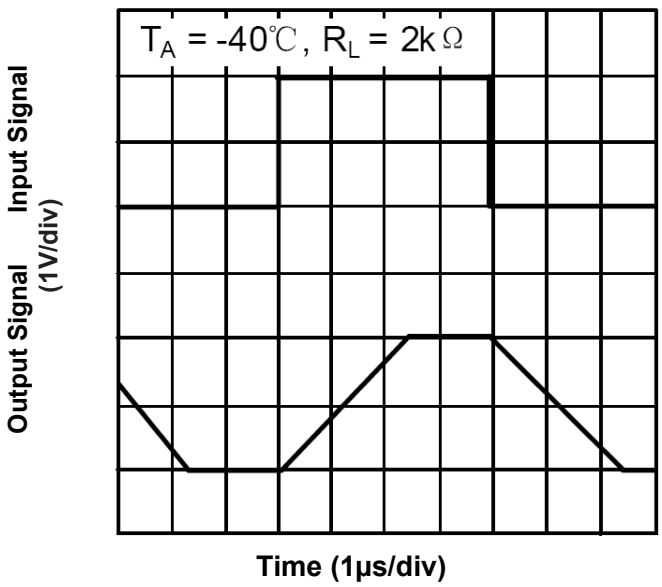


Fig.31- Non-Inverting Large Signal Pulse Response

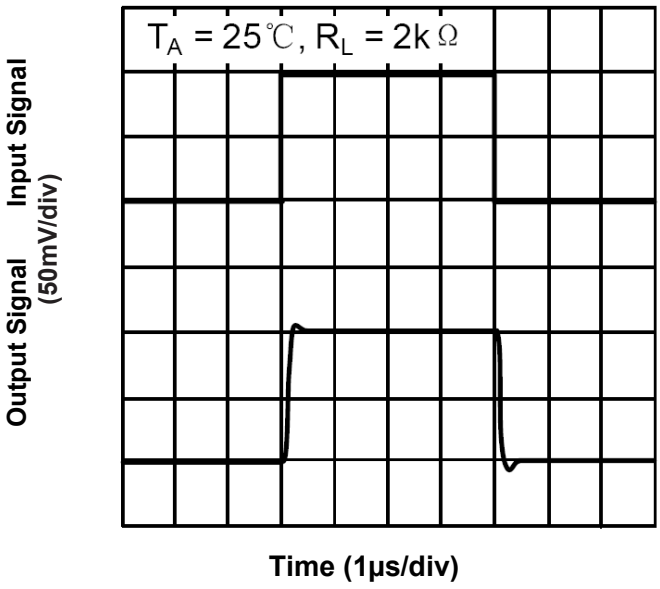
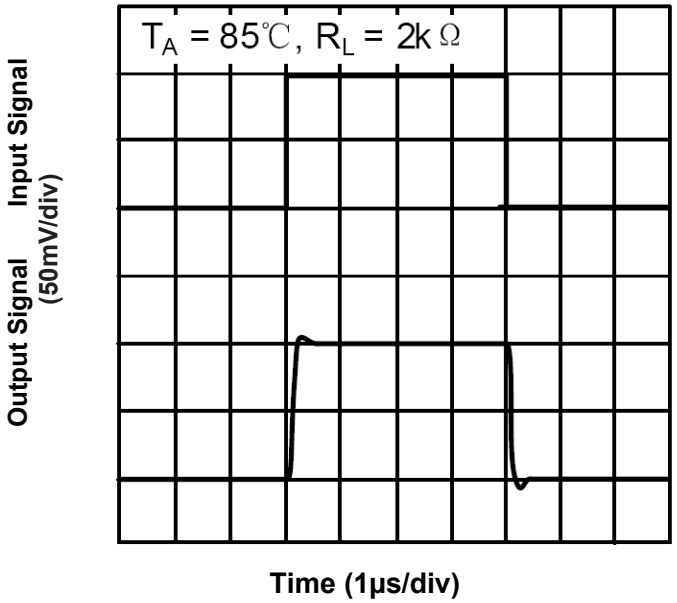


Fig.32- Non-Inverting Large Signal Pulse Response



Typical Characteristics (Continued)

Fig.33- Non-Inverting Large Signal Pulse Response

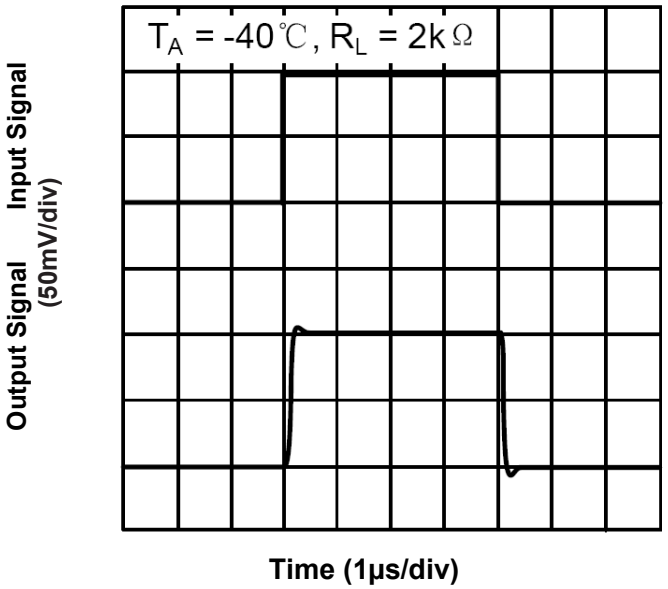


Fig.34- Non-Inverting Large Signal Pulse Response

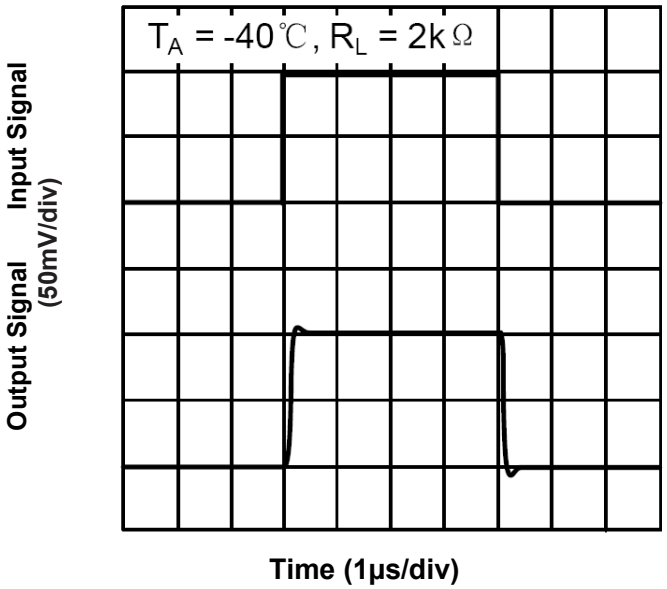


Fig.35- Non-Inverting Large Signal Pulse Response

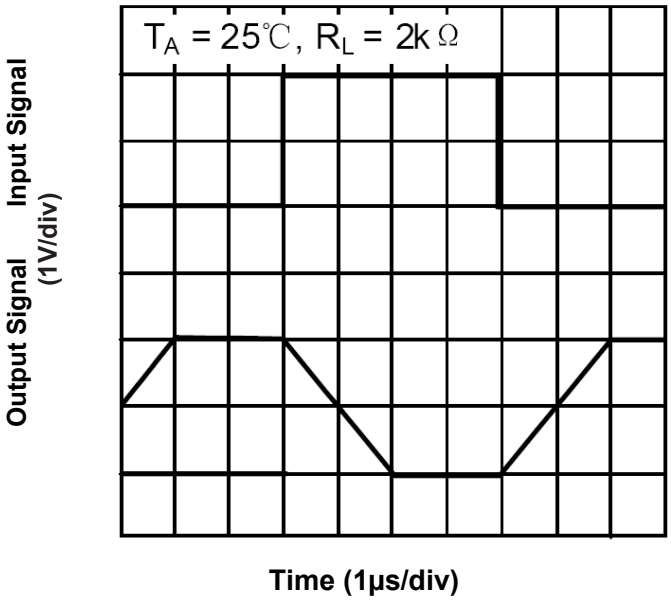
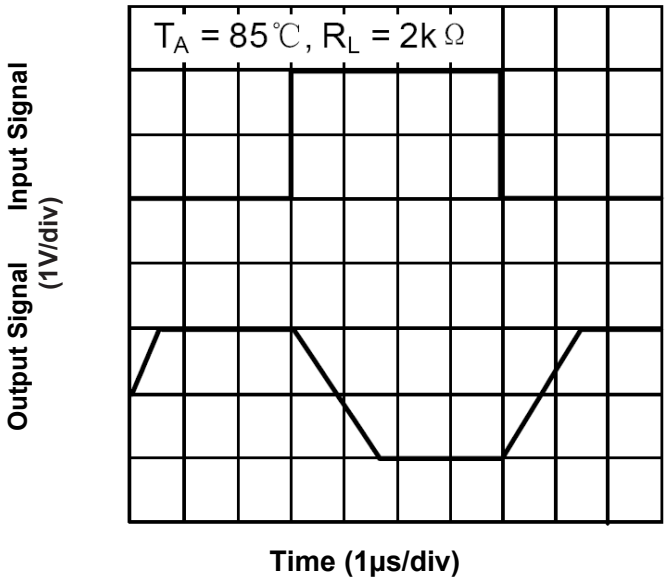


Fig.36- Non-Inverting Large Signal Pulse Response



Typical Characteristics (Continued)

Fig.37- Non-Inverting Large Signal Pulse Response

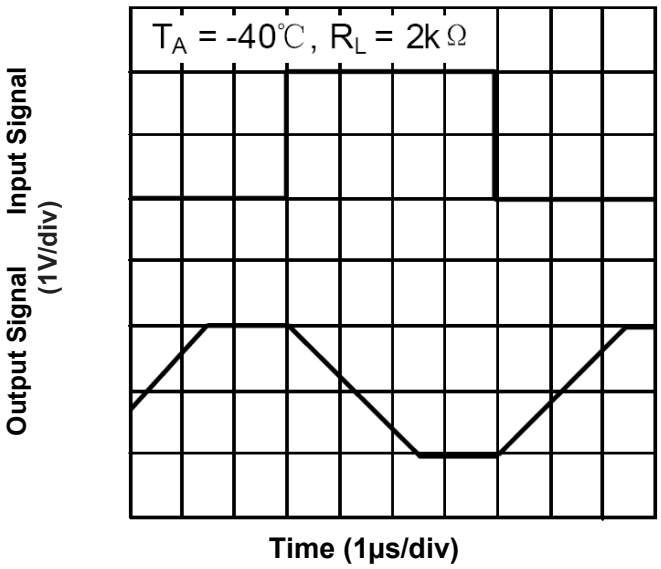


Fig.38- Non-Inverting Small Signal Pulse Response

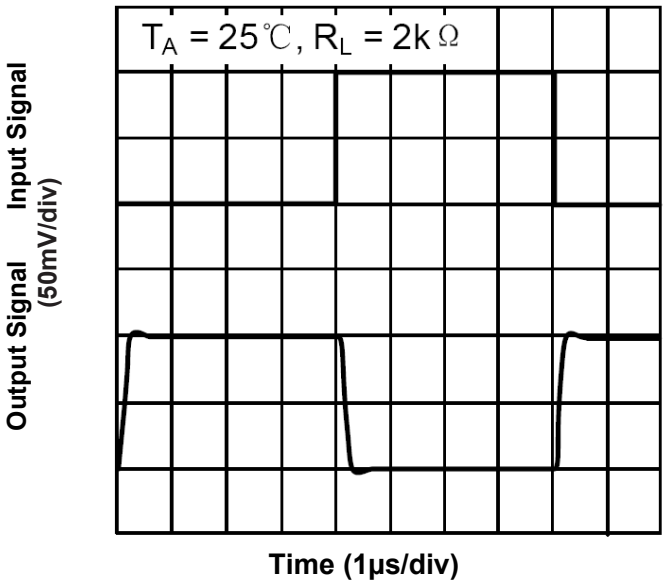


Fig.39- Non-Inverting Small Signal Pulse Response

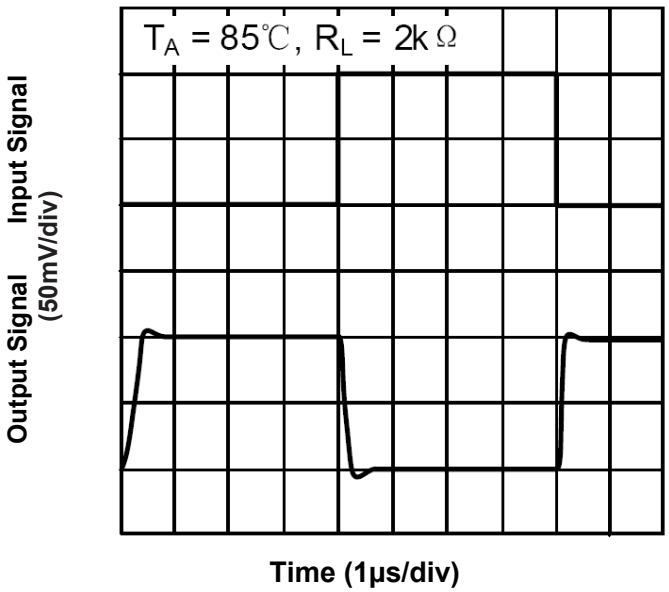
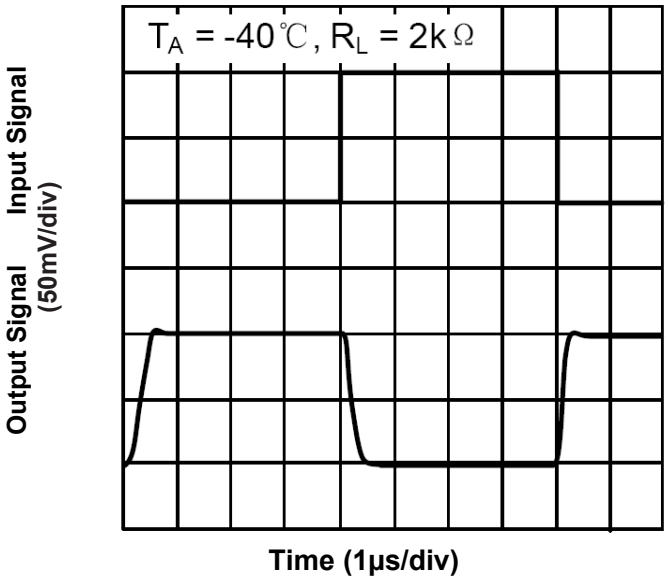


Fig.40- Non-Inverting Small Signal Pulse Response



Typical Characteristics (Continued)

Fig.41- Stability vs Capacitive Load

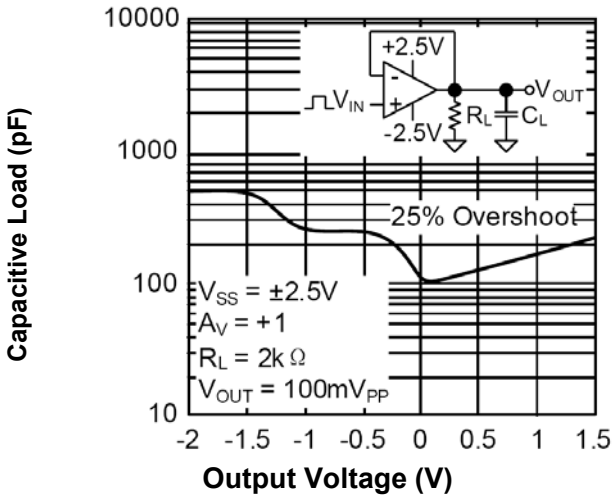


Fig.42- Stability vs Capacitive Load

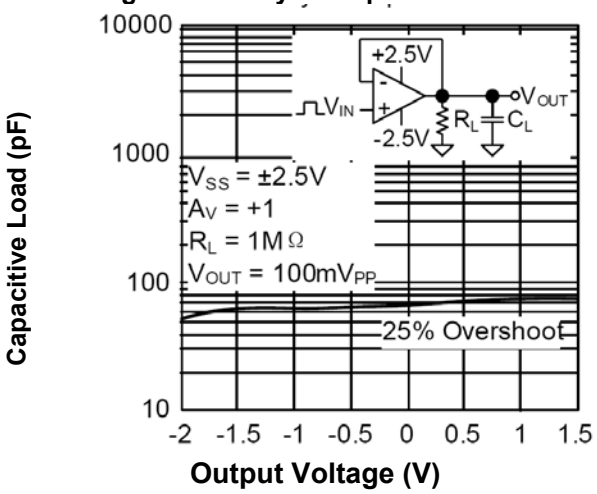


Fig.43- Stability vs Capacitive Load

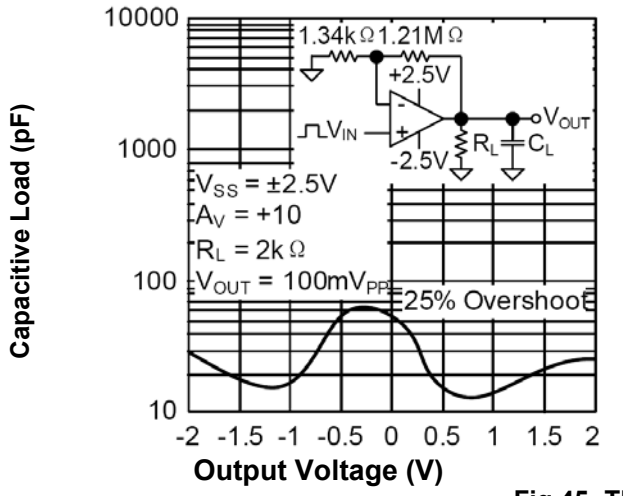


Fig.44- Stability vs Capacitive Load

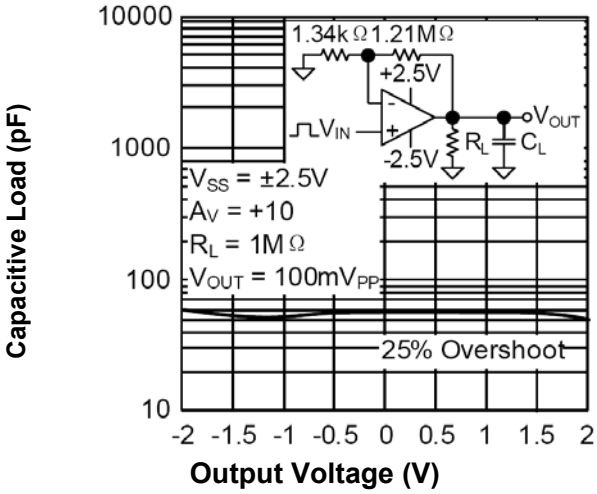
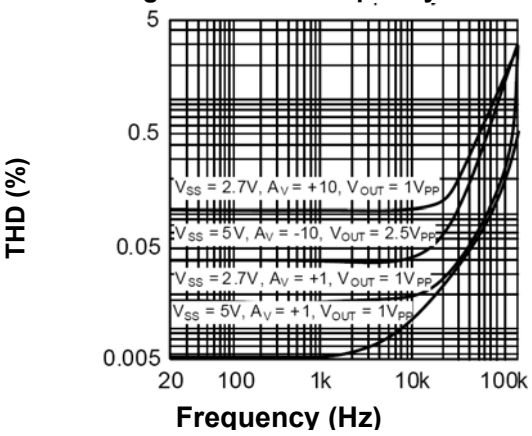
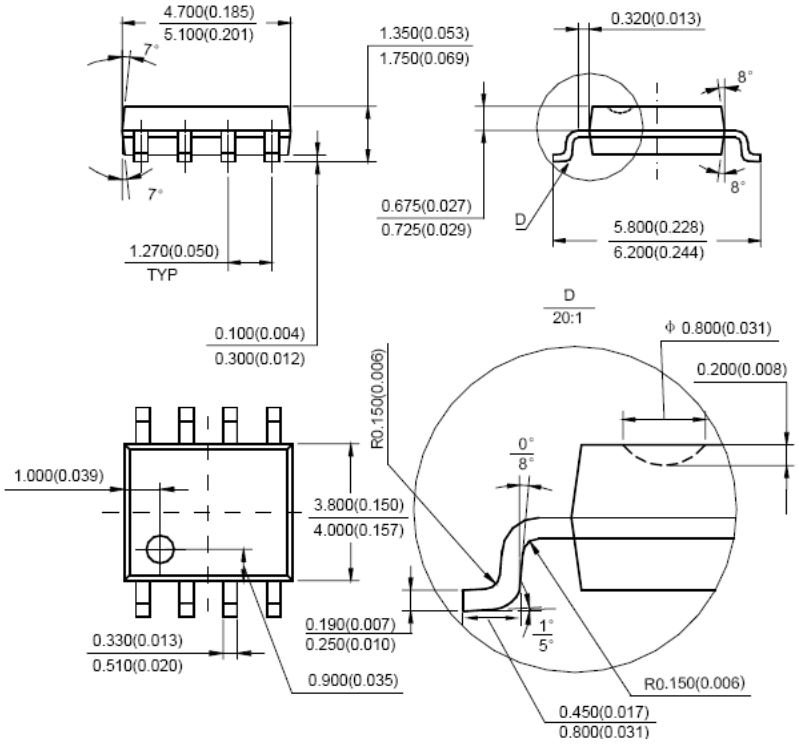


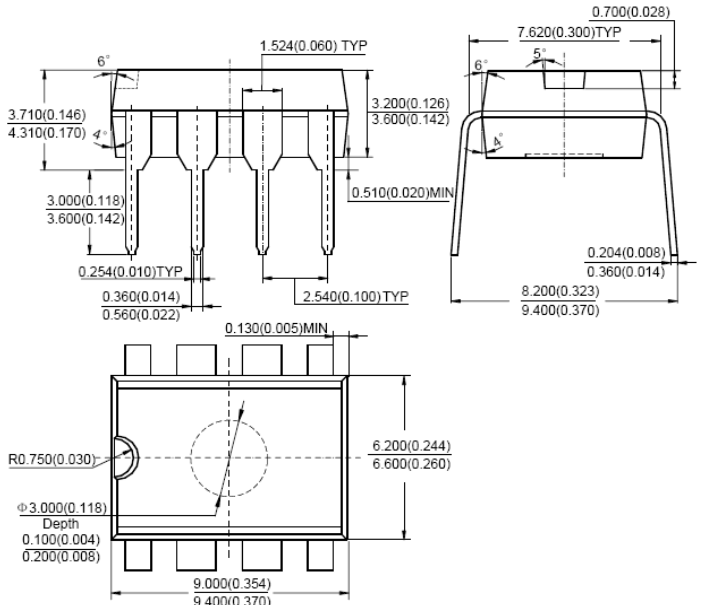
Fig.45- THD vs Frequency



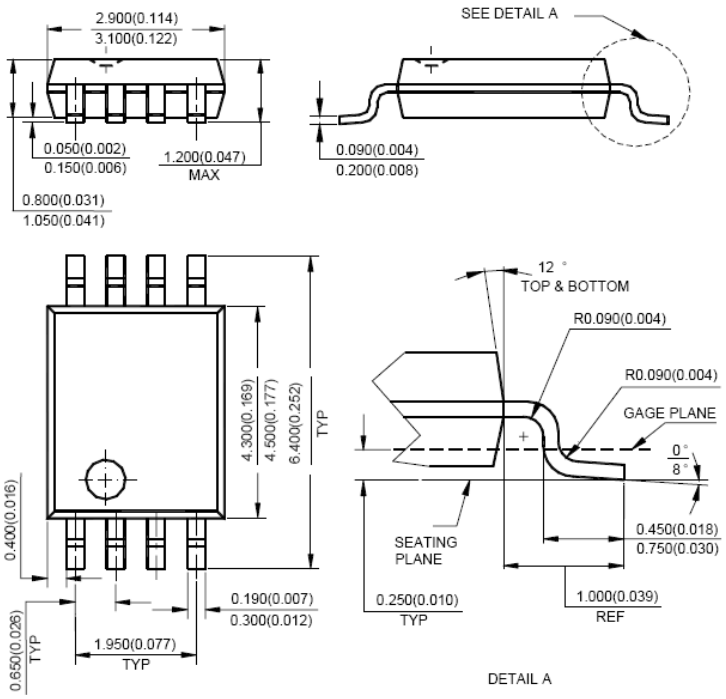
Dimensions in inches (mm)



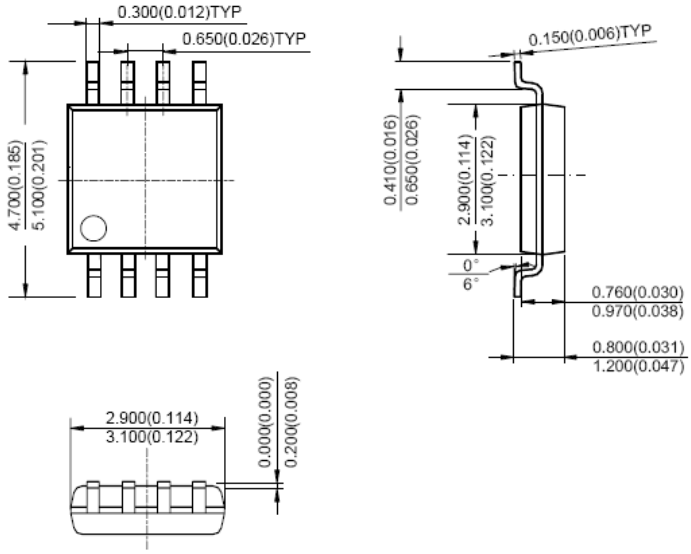
SOP-8



DIP-8



TSSOP-8



MSOP-8

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