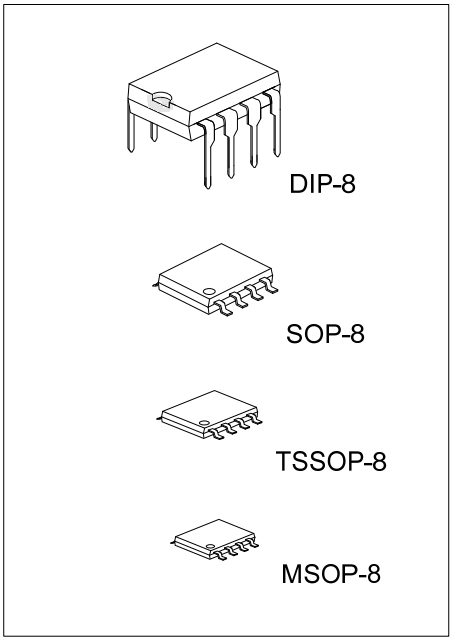
LMV358

LINEAR INTEGRATED CIRCUIT

GENERAL PURPOSE, LOW VOLTAGE, RAIL-TO-RAIL OUTPUT OPERATIONAL AMPLIFIERS



Lead-free: LMV358L
Halogen-free: LMV358G

■ DESCRIPTION

The UTC **LMV358** is the dual commodity op amp with low voltage (2.7-5.5V) versions, LM358, which operate at 5-30V. The UTC **LMV358** offers specifications that meet or exceed the familiar LM358 and is the most cost effective solution for the applications where low voltage operation, space saving and low price are needed. The UTC **LMV358** has rail-to-rail output swing capability and the input common-mode voltage range includes ground. Besides, it exhibits excellent speed-power ratio, achieving 1MHz of bandwidth and 1V/μs of slew rate.

The UTC **LMV358** has bipolar input and output stages for improved noise performance and higher output current drive.

■ FEATURES

(For V^+ =5V and V^-=0V. Typical Unless Otherwise Noted)
*Guaranteed 2.7V and 5V Performance
*No Crossover Distortion
*Gain-Bandwidth Product: 1MHz
*Rail-to-Rail Output Swing
@10kΩ Load V^+-10mV
V^- +65mV
*V_{CM} -0.2V to V^+ –0.8V

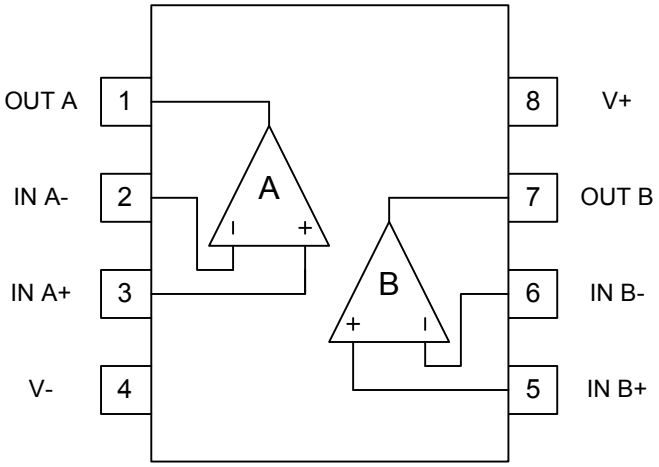
■ ORDERING INFORMATION

Ordering Number			Package	Packing
Normal	Lead Free Plating	Halogen Free		
LMV358-D08-T	LMV358L-D08-T	LMV358G-D08-T	DIP-8	Tube
LMV358-S08-R	LMV358L-S08-R	LMV358G-S08-R	SOP-8	Tape Reel
LMV358-SM1-R	LMV358L-SM1-R	LMV358G-SM1-R	MSOP-8	Tape Reel
LMV358-P08-R	LMV358L-P08-R	LMV358G-P08-R	TSSOP-8	Tape Reel

LMV358L-D08-T
(1) Packing Type
(2) Package Type
(3) Lead Plating

(1) R: Tape Reel, T: Tube
(2) D08: DIP-8, S08: SOP-8, SM1: MSOP-8, P08: TSSOP-8
(3) G: Halogen Free, L: Lead Free, Blank: Pb/Sn

■ PIN CONFIGURATION



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{SS}	2.7 ~ 5.5	V
Supply Voltage (V^+- V^-)	V_{SS}	5.5	V
Differential Input Voltage	$V_{I(DIFF)}$	±Supply Voltage	
Output Short Circuit to V^+		(Note 2)	
Output Short Circuit to V^-		(Note 3)	
Infrared (15 sec)		215	°C
Junction Temperature (Note 4)	T_J	+150	°C
Operation Temperature	T_{OPR}	-40~+85	°C
Storage Temperature	T_{STG}	-65~+150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Shorting output to V+ will adversely affect reliability
3. Shorting output to V- will adversely affect reliability
4. The maximum power dissipation is a function of $T_J(max)$ θ_{JA} and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D=(T_J(max)-T_A)/\theta_{JA}$. All numbers apply for packages soldered directly into a PC board.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Thermal Resistance (Note)	DIP-8	θ_{JA}	130	°C/W
	SOP-8		190	°C/W
	MSOP-8		235	°C/W
	TSSOP-8		155	°C/W

Note: All numbers are typical, and apply for packages soldered directly note a PC board is still air.

■ 2.7V ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
DC CHARACTERISTICS						
Input Offset Voltage	V_{OS}			1.7	7	mV
Input Offset Voltage Average Drift	TCVos			5		μV/°C
Input Bias Current	$I_{I(BIAS)}$			11	250	nA
Input Offset Current	$I_{I(OFF)}$			5	50	nA
Common Mode Rejection Ratio	CMRR	0V≤V_{CM}≤1.7V	50	63		dB
Power Supply Rejection Ratio	PSRR	2.7V≤V^+ ≤5V V_{OUT} =1V	50	60		dB
Input Common-Mode Voltage Range	V_{CM}	For CMRR≥50dB	0	-0.2		V
				1.9	1.7	V
Output Swing	V_{OUT}	R_L=10kΩ to 1.35V	V^+-100	V^+-10		mV
				60	180	mV
Supply Current	I_{SS}	Both amplifiers		1.2	1.7	mA
AC CHARACTERISTICS						
Gain-Bandwidth Product	GBWP	C_L=200pF		1		MHz
Phase Margin	Φ_m			60		Deg
Gain Margin	G_m			10		dB
Input-Referred Voltage Noise	eN	F=1kHz		46		$\frac{nV}{\sqrt{Hz}}$
Input-referred Current Noise	i_n	F=1kHz		0.17		$\frac{pA}{\sqrt{Hz}}$

■ 5V ELECTRICAL CHARACTERISTICS

All limits guaranteed for T_J =25°C, V^+=5V, V^-=0V, V_{CM}=2.0V, V_{OUT}=V^+/2 and R_L>1MΩ, unless otherwise specified.

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
DC CHARACTERISTICS							
Input Offset Voltage	V_{OS}				1.7	7	mV
Input Offset Voltage Average Drift	TCVos				5		μV/°C
Input Bias Current	$I_{I(BIAS)}$				15	250	nA
Input Offset Current	$I_{I(OFF)}$				5	50	nA
Common Mode Rejection Ratio	CMRR	0V≤V_{CM}≤4V		50	65		dB
Power Supply Rejection Ratio	PSRR	2.7V≤V^+≤5V V_{OUT}=1V V_{CM}=1V		50	60		dB
Input Common-Mode Voltage Range	V_{CM}	For CMRR≥50dB		0	-0.2		V
					4	4.2	V
Large Signal Voltage Gain(Note 1)	G_V	R_L=2kΩ		15	100		V/mV
Output Swing	V_{OUT}	R_L=2kΩ~2.5V	V_{OH}	V^+-300	V^+-40		mV
			V_{OL}		120	300	mV
		R_L=10kΩ~2.5V	V_{OH}	V^+-100	V^+-10		mV
			V_{OL}		65	180	mV
Output Short Circuit Current	I_{OUT}	Sourcing, V_{OUT} =0V		5	60		mA
		Sinking, V_{OUT} =5V		10	160		mA
Supply Current	I_{SS}	Both amplifiers			1.5	2.0	mA
AC CHARACTERISTICS							
Slew Rate	SR	(Note 2)			1		V/μs
Gain-Bandwidth Product	GBWP	C_L=200pF			1		MHz
Phase Margin	Φ_m				60		Deg
Gain Margin	G_m				10		dB
Input-Referred Voltage Noise	eN	f=1kHz			39		$\frac{nV}{\sqrt{Hz}}$
Input-referred Current Noise	i_n	f=1kHz			0.21		$\frac{pA}{\sqrt{Hz}}$

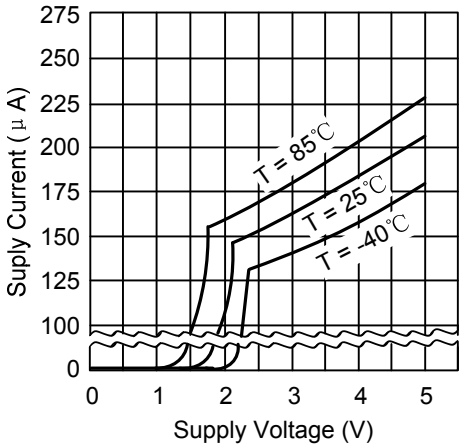
Notes: 1. R_L is connected to V^-. The output voltage is 0.5V≤V_{OUT}≤4.5V.

2. Connected as voltage follower with 3V step input. Number specified is these lower of the positive and negative slew rates.

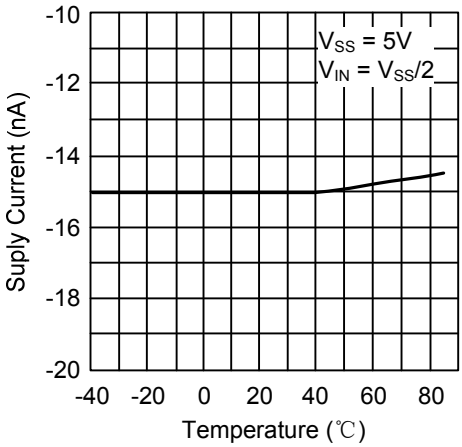
■ TYPICAL CHARACTERISTICS

(Unless otherwise specified, V_E=+5V, single supply. T_A=25°C)

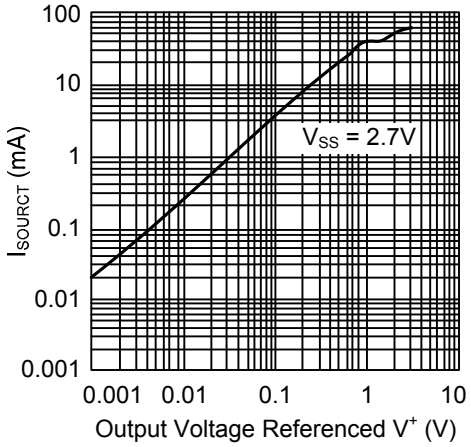
Supply Current vs Supply Voltage



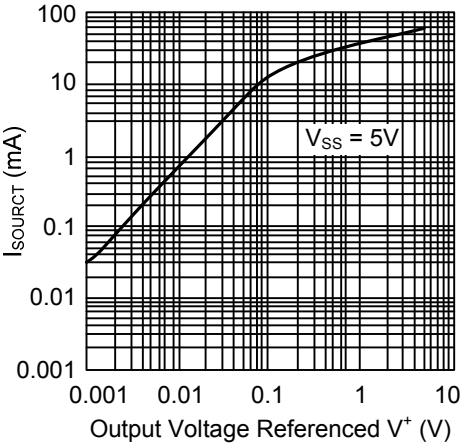
Input Current vs Temperature



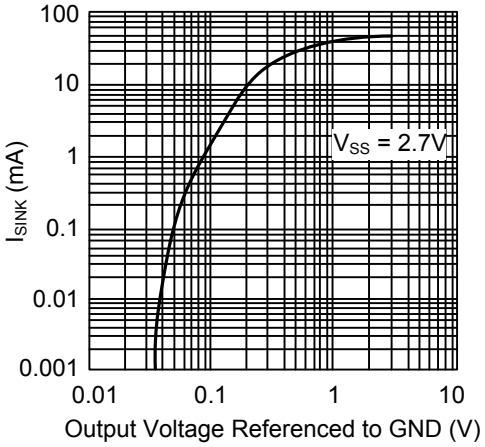
Sourcing Current vs Output Voltage



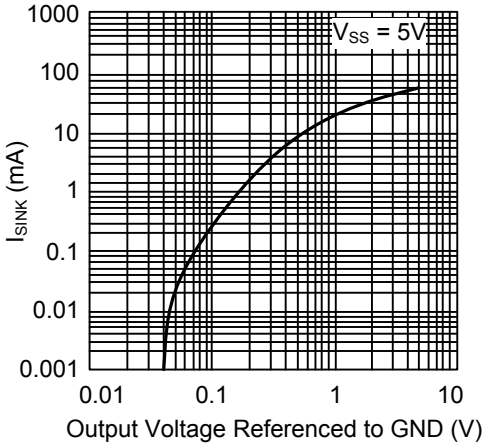
Sourcing Current vs Output Voltage



Sinking Current vs Output Voltage

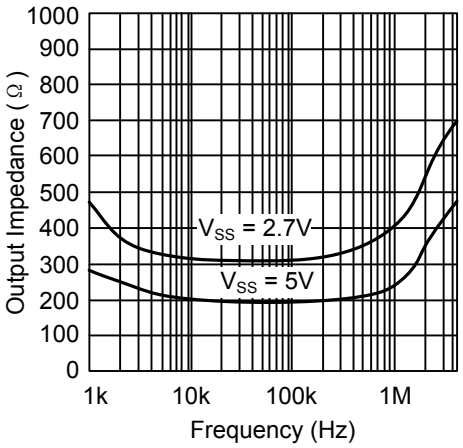


Sinking Current vs Output Voltage

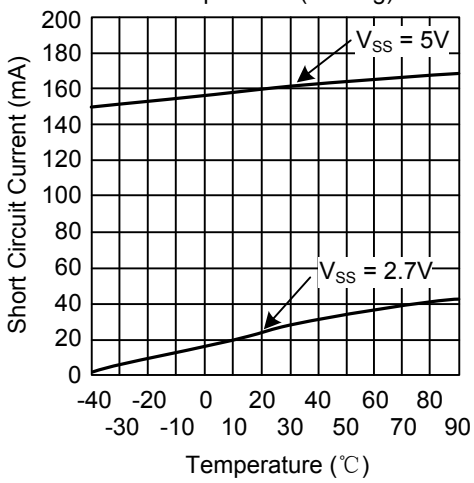


■ TYPICAL CHARACTERISTICS(Cont.)

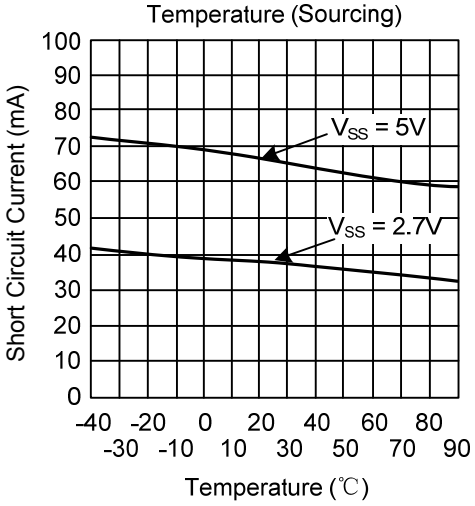
Open Loop Output Impedance vs Frequency



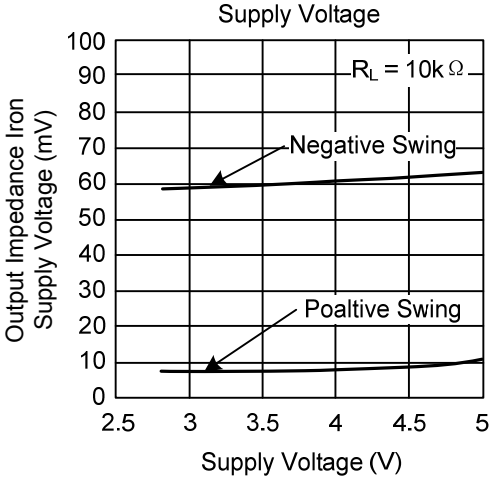
Short Circuit Current vs Temperature (Sinking)



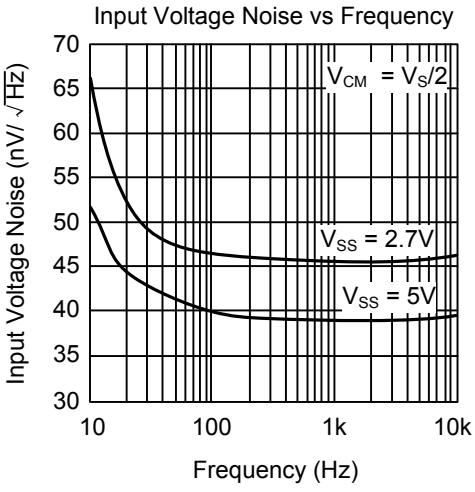
Short Circuit Current vs Temperature (Sourcing)



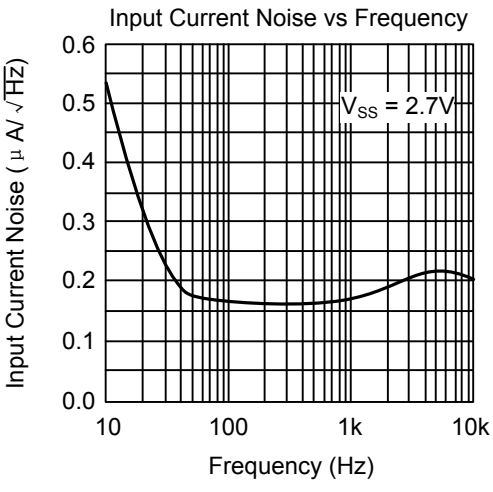
Output Voltage Swing vs Supply Voltage



Input Voltage Noise vs Frequency

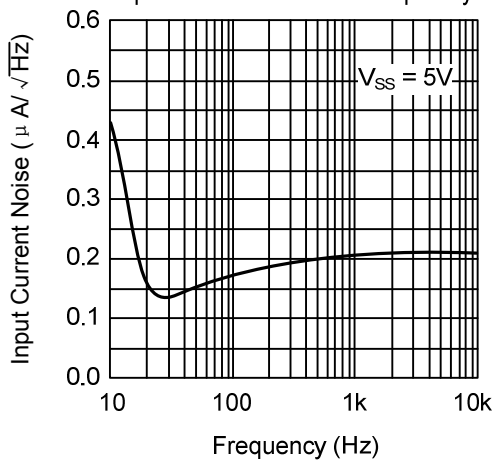


Input Current Noise vs Frequency

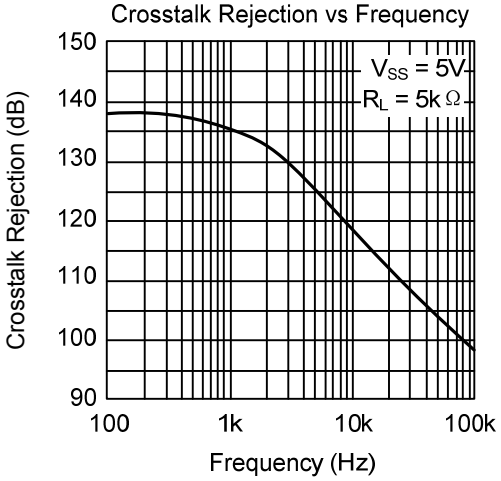


■ TYPICAL CHARACTERISTICS(Cont.)

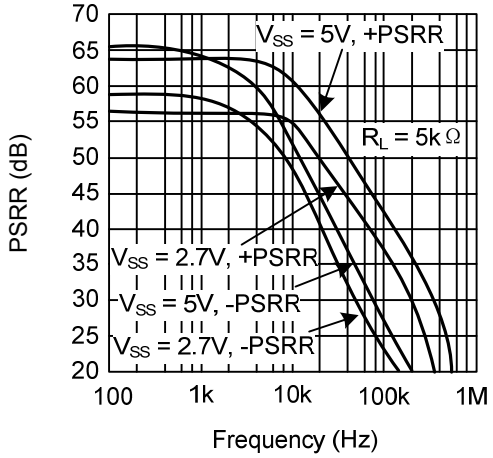
Input Current Noise vs Frequency



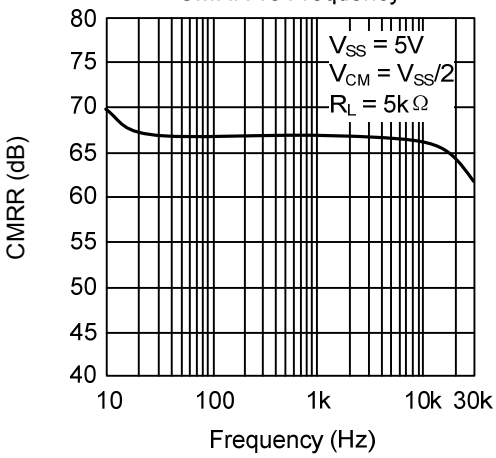
Crosstalk Rejection vs Frequency



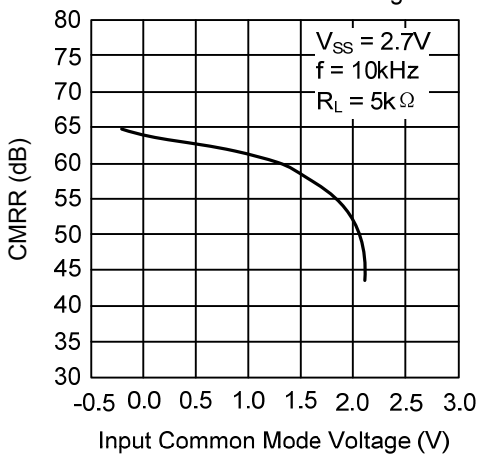
PSRR vs Frequency



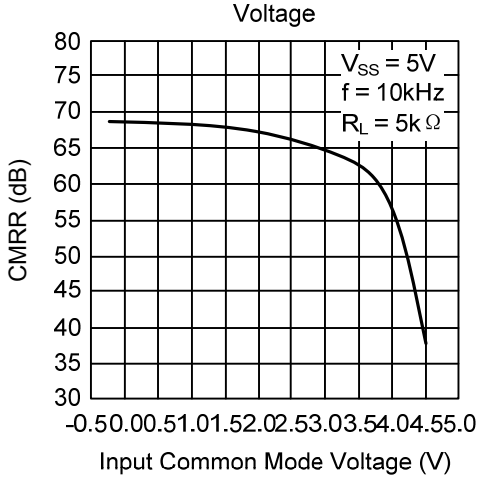
CMRR vs Frequency



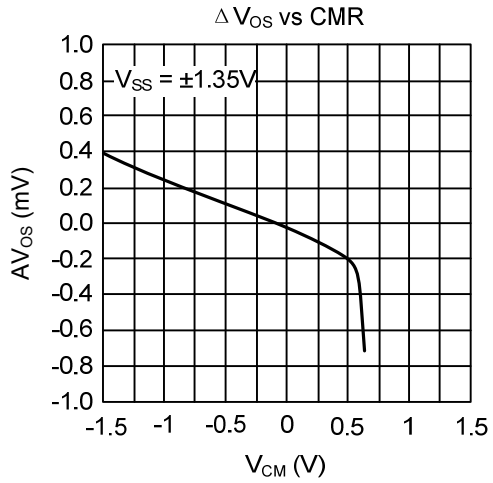
Common Mode vs Voltage

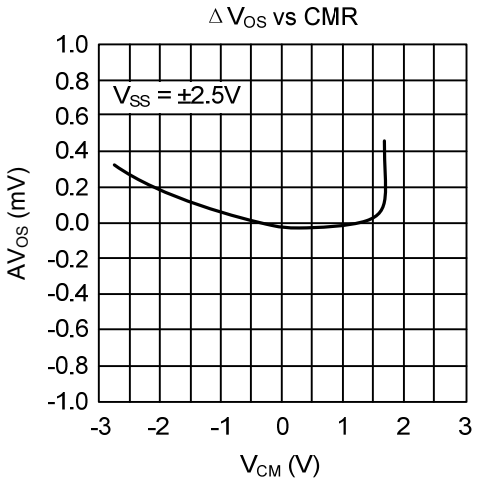


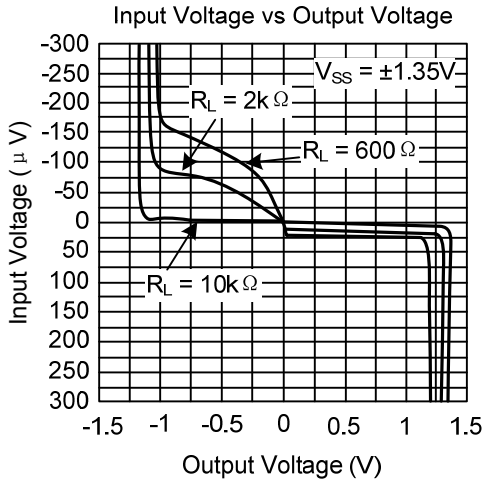
CMRR vs Input Common Mode Voltage

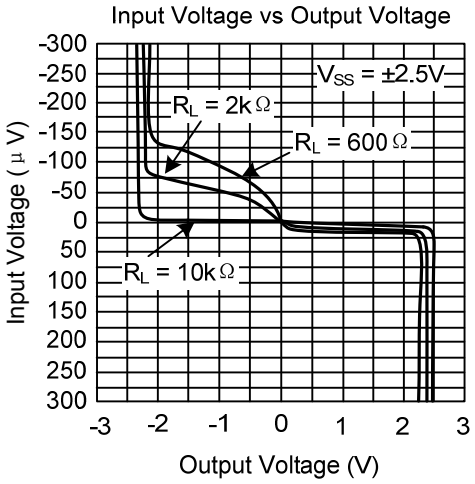


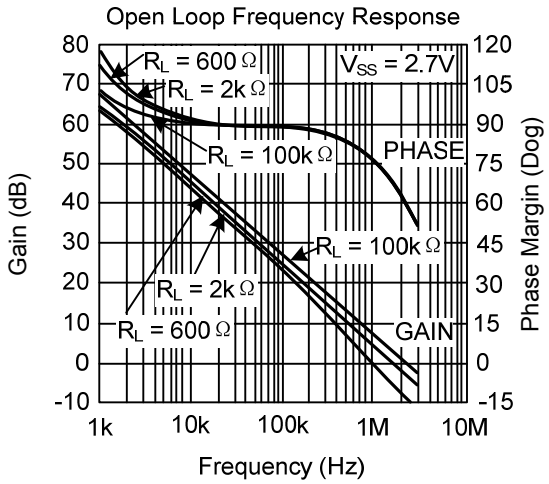
■ TYPICAL CHARACTERISTICS(Cont.)

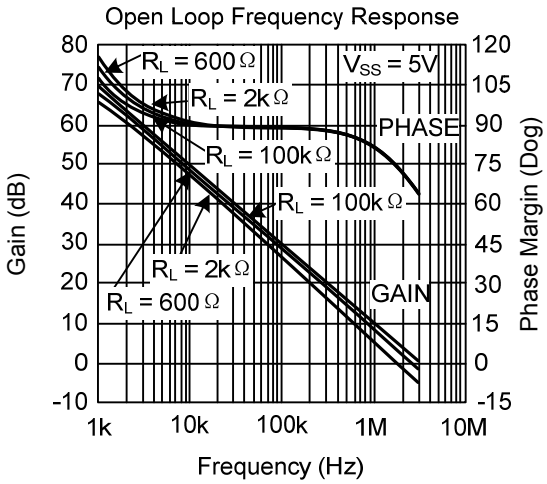






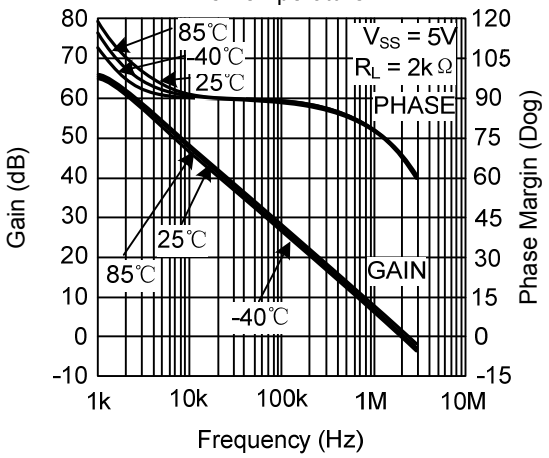




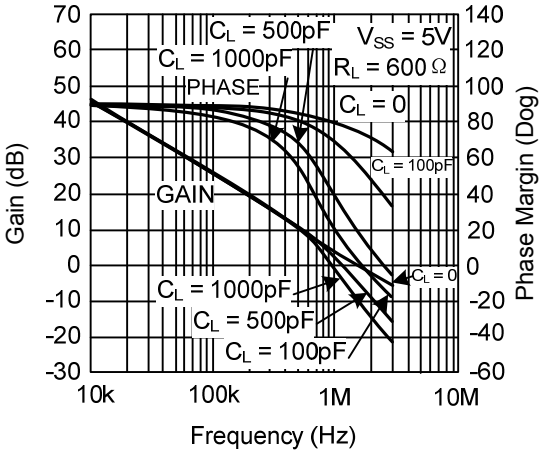


■ TYPICAL CHARACTERISTICS(Cont.)

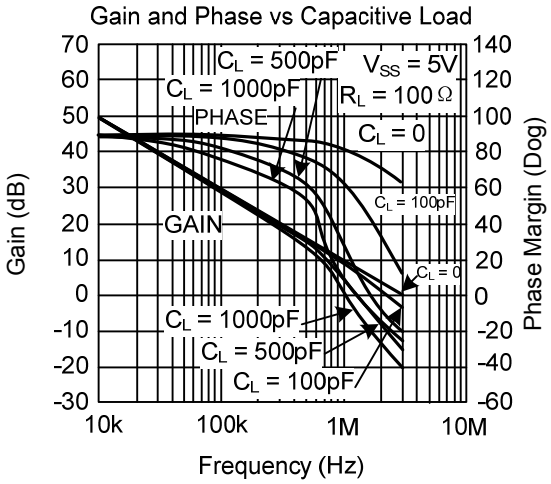
Open Loop Frequency Response vs Temperature



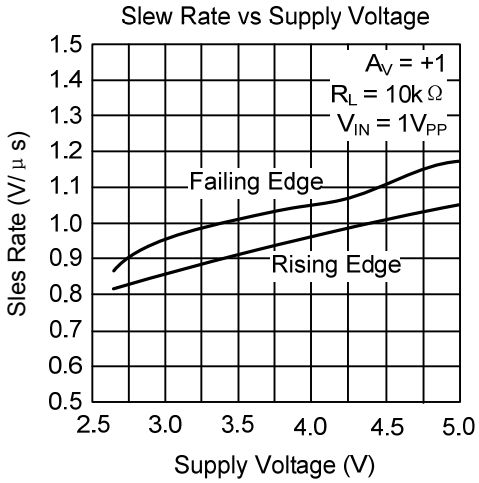
Gain and Phase vs Capacitive Load



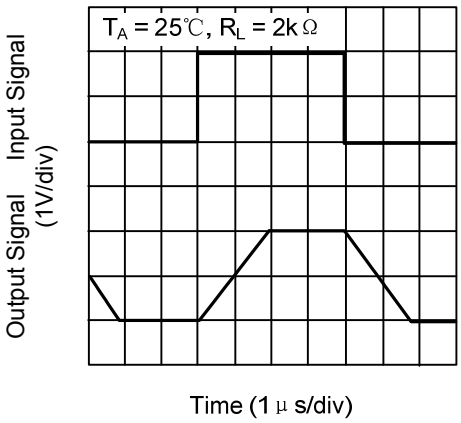
Gain and Phase vs Capacitive Load



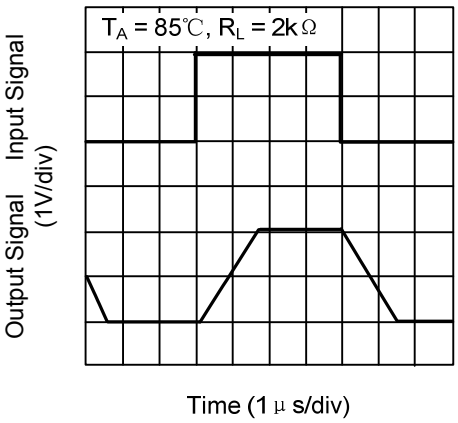
Slew Rate vs Supply Voltage



Non-Inverting Large Signal Pulse Response

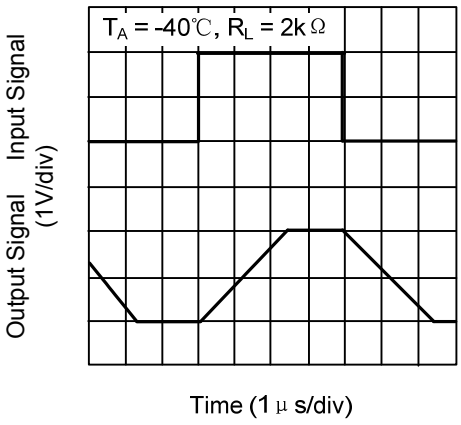


Non-Inverting Large Signal Pulse Response

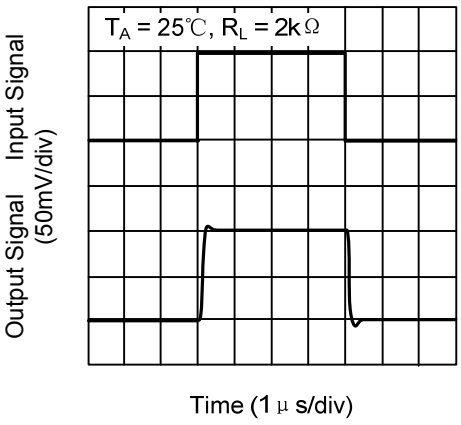


■ TYPICAL CHARACTERISTICS(Cont.)

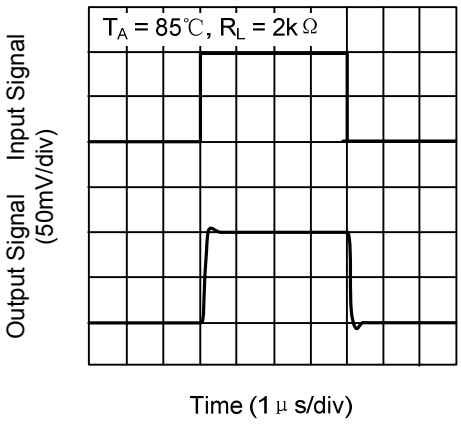
Non-Inverting Large Signal Pulse Response



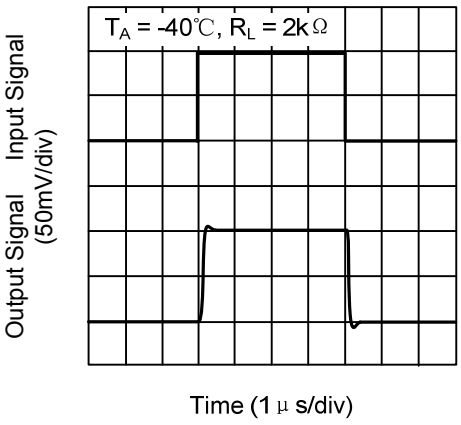
Non-Inverting Small Signal Pulse Response



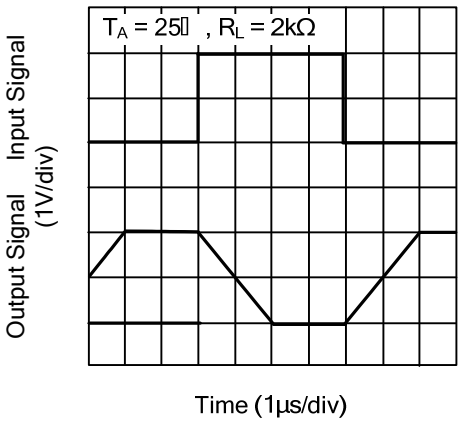
Non-Inverting Small Signal Pulse Response



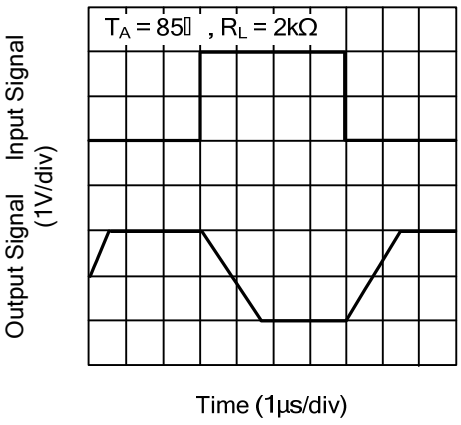
Non-Inverting Small Signal Pulse Response



Non-Inverting Large Signal Pulse Response

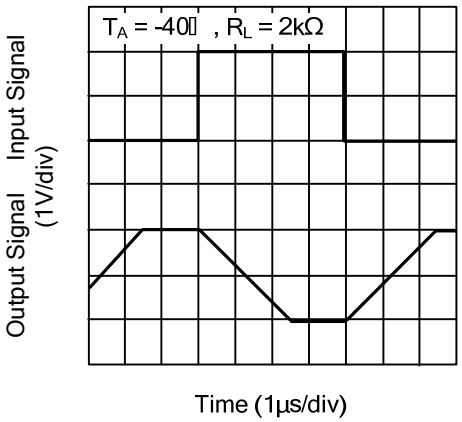


Inverting Large Signal Pulse Response

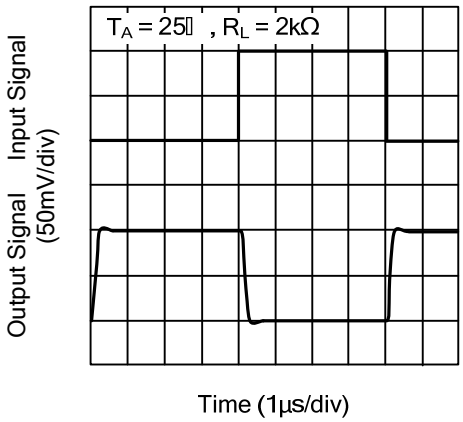


■ TYPICAL CHARACTERISTICS(Cont.)

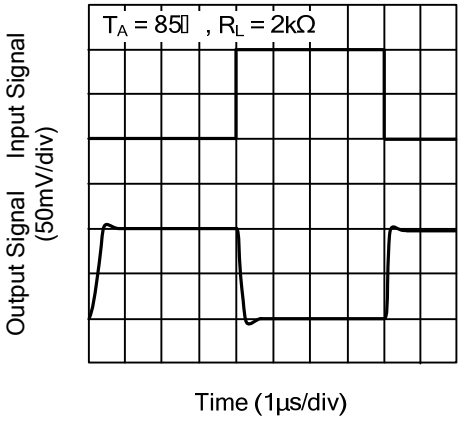
Large Signal Pulse Response



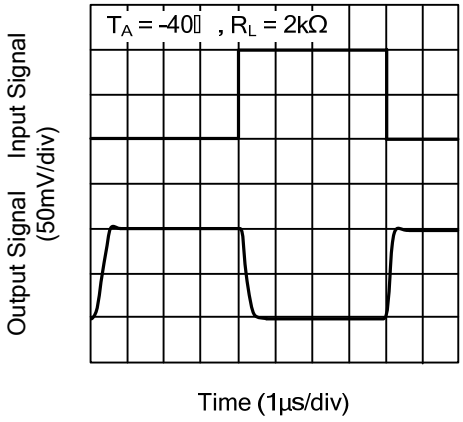
Inverting Small Signal Pulse Response



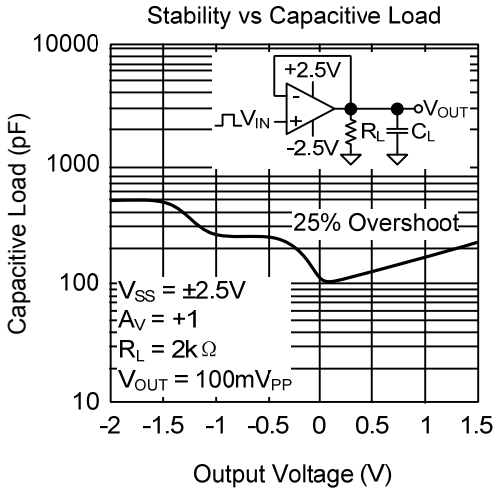
Inverting Small Signal Pulse Response



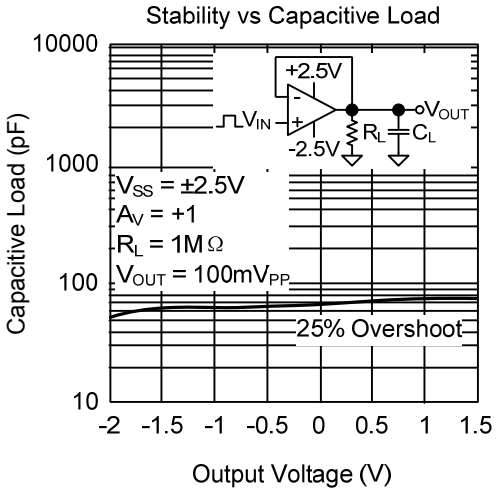
Inverting Small Signal Pulse Response



Stability vs Capacitive Load

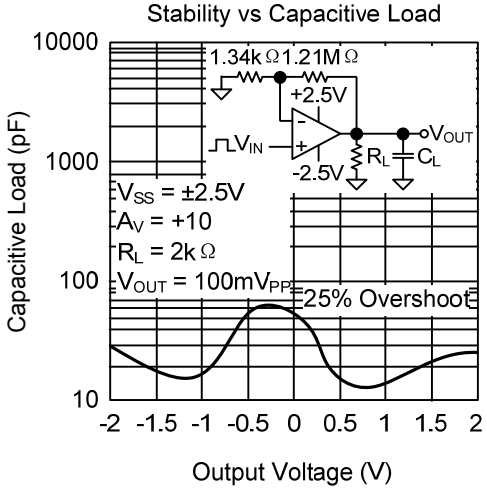


Stability vs Capacitive Load

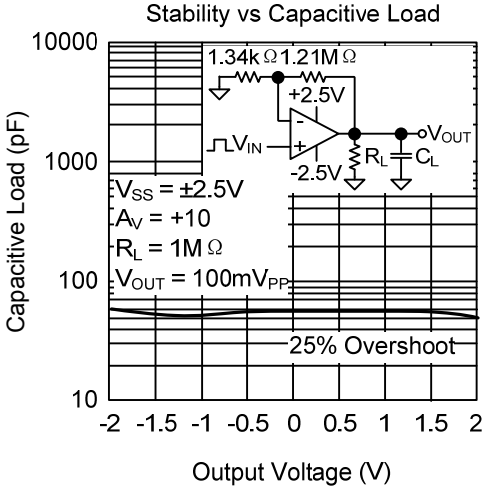


■ TYPICAL CHARACTERISTICS(Cont.)

Stability vs Capacitive Load



Stability vs Capacitive Load



THD vs Frequency