



## Rail-to-Rail I/O OP Amp

### Features

- Single-Supply Operation: 2.0V to 5.5V
- Low Supply Current: 700  $\mu$ A
- Wide Bandwidth: 3 MHz
- Slew Rate: 1 V/ $\mu$ s
- No Phase Reversal
- Unity Gain Stable
- Small, 5-Pin SOT23-5 Package available

### Applications

- Battery-Powered Instruments
- Portable Equipment
- Audio Signal Conditioning
- Multimedia Audio
- ASIC Input or Output Amplifier

### General Description

The G1212 is a rail-to-rail input and output single-supply amplifiers. This high output current makes these amplifiers excellent for driving either resistive or capacitive loads. AC performance is very good with 3.0MHz bandwidth.

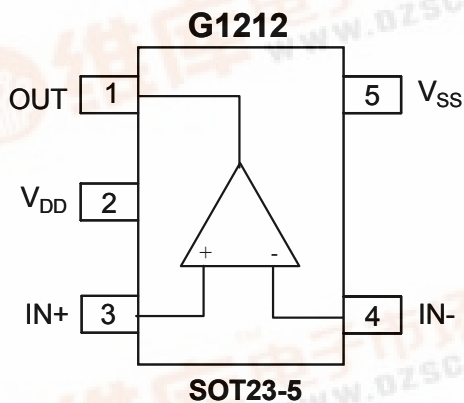
The very low input bias currents enable the G1212 to be used for integrators and diode amplification and other applications requiring low input bias current. The supply current is only 700 $\mu$ A per amplifier at 3.0V, allowing low current applications to control high current loads.

Applications include audio amplification for computers, sound ports, sound cards and set-top boxes. The G1212 is very stable and capable of driving capacitive loads. The ability to swing rail-to-rail at the inputs and outputs enables designers to buffer CMOS ADC/DACs, ASICs or other wide output swing devices in single-supply systems.

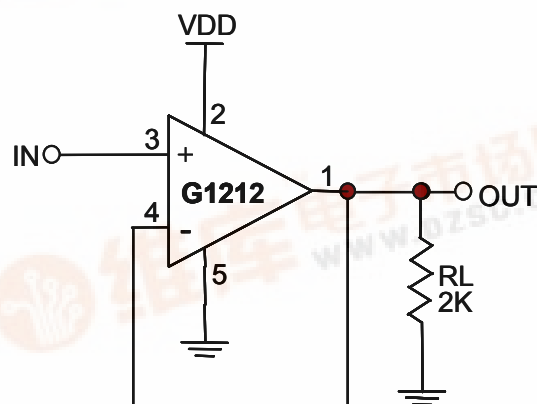
### Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
G1212	0°C to 70°C	SOT23-5

### Pin Configuration



### Typical Application Circuit



**Absolute Maximum Ratings (Note1)**

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>DD</sub>	Supply voltage		0	7.0	V
T <sub>stg</sub>	Storage temperature		-65	+150	°C
T <sub>amb</sub>	Operating ambient temperature		0	+70	°C

**Notes:**

1. Absolute Maximum Ratings are limits beyond which damage to the device may occur.

**Thermal Characteristics**

SYMBOL	PARAMETER	VALUE	UNIT
R <sub>th ja</sub>	Thermal resistance from junction to ambient in free air SOT23-5	240	°C/W

**Electrical Characteristics**

V<sub>DD</sub> = 2V; V<sub>SS</sub> = 0V; T<sub>amb</sub> = 25°C; R<sub>L</sub> > 1MΩ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supplies</b>						
I <sub>DD</sub>	Supply current	no load	-	0.13	0.4	mA
P <sub>tot</sub>	Total power dissipation	no load	-	0.26	0.8	mW
<b>DC Characteristics</b>						
V <sub>I(OS)</sub>	Input offset voltage			±1mV	±15	mV
V <sub>CM</sub>	Common mode voltage		0	-	2.0	V
I <sub>B</sub>	Input Bias Current			±0.05		nA
I <sub>OS</sub>	Input Bias Current Offset			±0.05		nA
R <sub>IN</sub>	Input Resistance			1000	-	MΩ
A <sub>v</sub>	Open Loop Gain			95	-	dB
I <sub>O</sub>	Maximum output current	V <sub>OUT</sub> = ±V <sub>IN</sub> x 90%	-	±12	-	mA
V <sub>O</sub>	Output Voltage Swing	R <sub>L</sub> = 2kΩ	0.04	-	1.96	V
PSRR	Power supply rejection ratio			50	-	dB
CMRR	Common-Mode Rejection Ratio			55		dB
<b>AC Characteristics</b>						
GBWP	Gain-Bandwidth Product	Open-loop; No Load	-	1.0	-	MHz
SR	Slew-Rate	Measured from 20% to 80% of 2V <sub>P-P</sub> step		0.3		V/μs
PM	Phase Margin		-	60	-	deg

**Electrical Characteristics** $V_{DD} = 3V$ ;  $V_{SS} = 0V$ ;  $T_{amb} = 25^{\circ}C$ ;  $R_L = 1M\Omega$ ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supplies</b>						
$I_{DD}$	Supply current	no load	-	0.7	2.1	mA
$P_{tot}$	Total power dissipation	no load	-	2.1	6.3	mW
<b>DC Characteristics</b>						
$V_{I(OS)}$	Input offset voltage			$\pm 1.5$	$\pm 15$	mV
$V_{CM}$	Common mode voltage		0	-	3.0	V
$I_B$	Input Bias Current			$\pm 0.05$		nA
$I_{OS}$	Input Bias Current Offset			$\pm 0.05$		nA
$R_{IN}$	Input Resistance			1000	-	$M\Omega$
$A_V$	Open Loop Gain			90	-	dB
$I_O$	Maximum output current	$V_{OUT} = \pm V_{IN} \times 90\%$	-	$\pm 27$	-	mA
$V_O$	Output Voltage Swing	$R_L = 2k\Omega$	0.04	-	2.96	V
PSRR	Power supply rejection ratio			65	-	dB
CMRR	Common-Mode Rejection Ratio			55		dB
<b>AC Characteristics</b>						
GBWP	Gain-Bandwidth Product	Open-loop; No Load	-	3.0	-	MHz
SR	Slew-Rate	Measured from 20% to 80% of $5V_{P-P}$ step		1		$V/\mu s$
PM	Phase Margin		-	60	-	deg

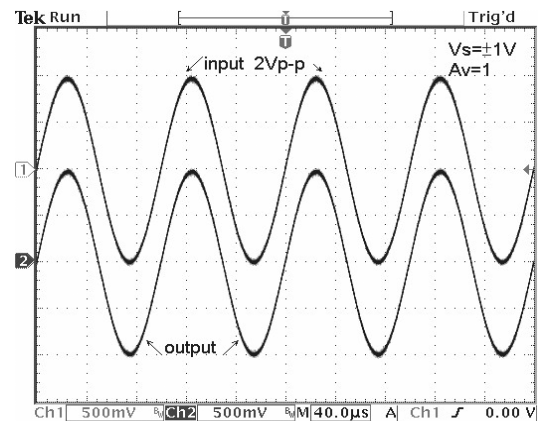
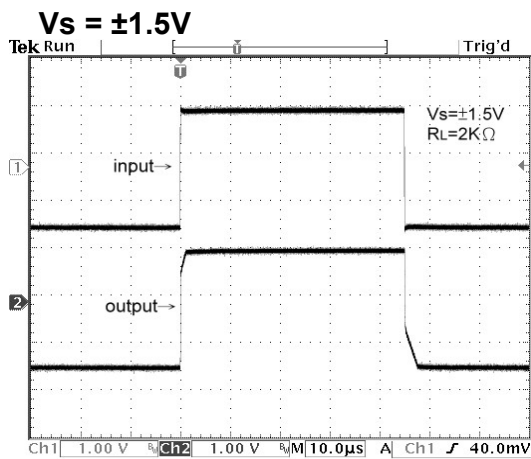
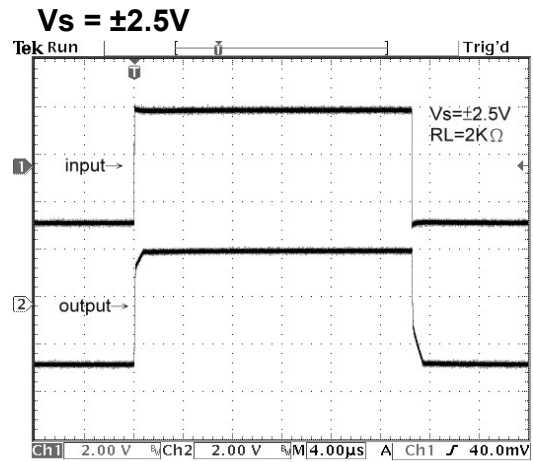
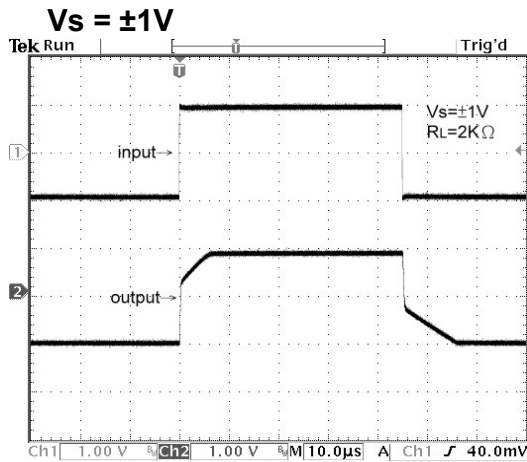
**Electrical Characteristics** $V_{DD} = 5V$ ;  $V_{SS} = 0V$ ;  $T_{amb} = 25^{\circ}C$ ;  $R_L = 1M\Omega$ ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supplies</b>						
$I_{DD}$	Supply current	no load	-	0.9	2.4	mA
$P_{tot}$	Total power dissipation	no load	-	4.5	12	mW
<b>DC Characteristics</b>						
$V_{I(OS)}$	Input offset voltage			$\pm 3$	$\pm 15$	mV
$V_{CM}$	Common mode voltage		0	-	5.0	V
$I_B$	Input Bias Current			$\pm 0.05$		nA
$I_{OS}$	Input Bias Current Offset			$\pm 0.05$		nA
$R_{IN}$	Input Resistance			1000	-	$M\Omega$
$A_V$	Open Loop Gain			65	-	dB
$I_O$	Maximum output current	$V_{OUT} = \pm V_{IN} \times 90\%$	-	$\pm 60$	-	mA
$V_O$	Output Voltage Swing	$R_L = 2k\Omega$	0.05	-	4.95	V
PSRR	Power supply rejection ratio			65	-	dB
CMRR	Common-Mode Rejection Ratio			45		dB
<b>AC Characteristics</b>						
GBWP	Gain-Bandwidth Product	Open-loop; No Load	-	13	-	MHz
SR	Slew-Rate	Measured from 10% to 90% of $5V_{P-P}$ step		6		$V/\mu s$
PM	Phase Margin		-	60	-	deg

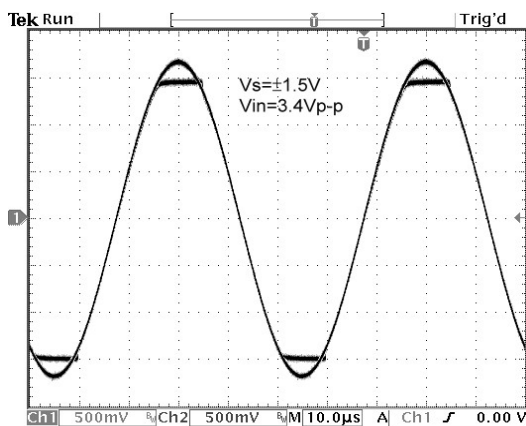


## Large Signal Transient Response Figure

Test Condition :  $T_A = 25^\circ\text{C}$ ,  $A_V = 1$ ,  $R_L = 2\text{K}\Omega$



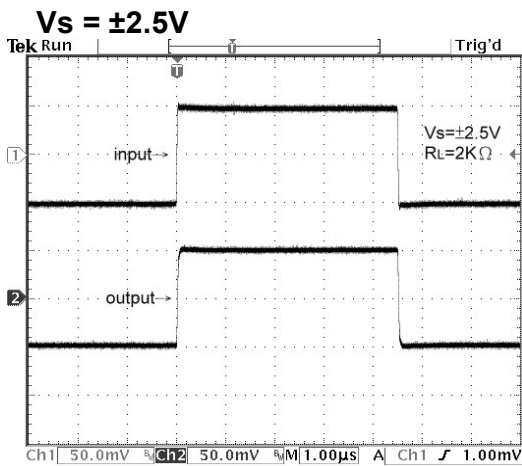
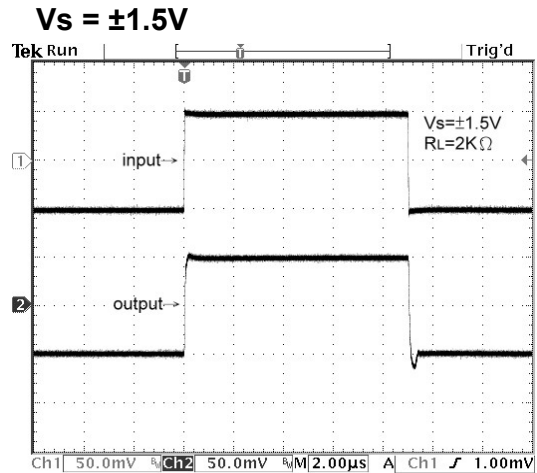
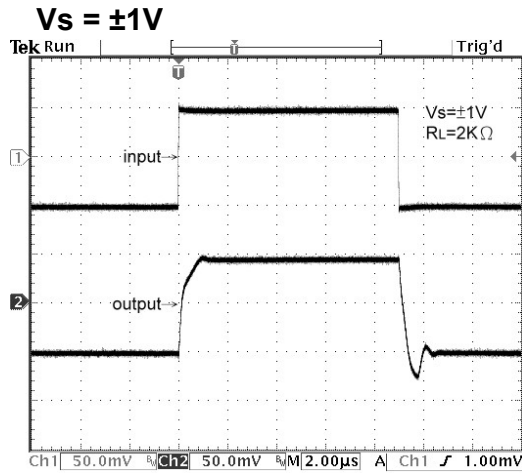
### operation with beyond-the Rail input





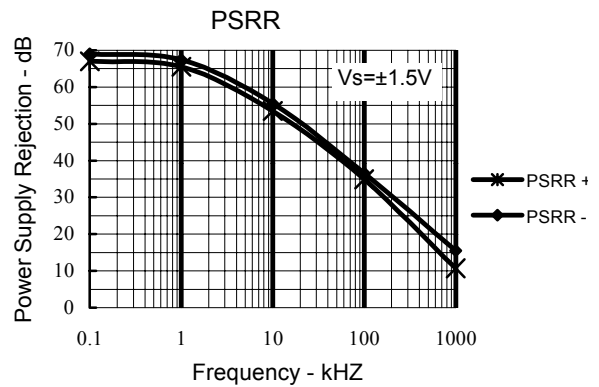
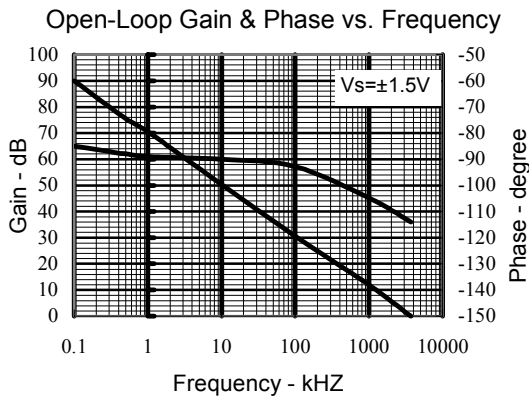
Small Signal Transient Response Figure

Test Condition :  $T_A = 25^\circ\text{C}$ ,  $A_V = 1$ ,  $R_L = 2\text{k}\Omega$



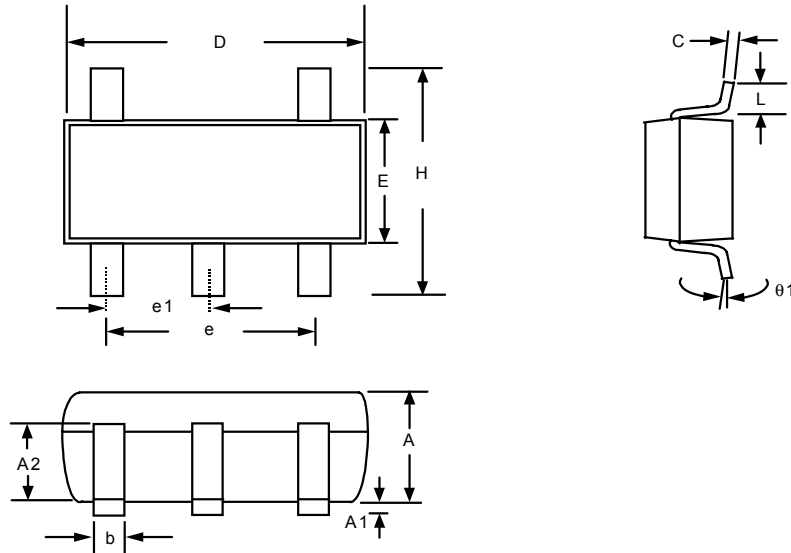
Test Condition:  $V_s = \pm 1.5\text{V}$ ,  $T_A = 25^\circ\text{C}$

Test Condition:  $V_s = \pm 1.5\text{V}$ ,  $T_A = 25^\circ\text{C}$





Package Information



Note:

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance  $\pm 0.1000$  mm (4mil) unless otherwise specified
3. Coplanarity: 0.1000mm
4. Dimension L is measured in gage plane

SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	----	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.40	1.60	1.80
e	----	1.90(TYP)	----
e1	----	0.95	----
H	2.60	2.80	3.00
L	0.37	----	----
$\theta 1$	1°	5°	9°

Taping Specification (Unit: mm)

