

## Low power, Single, SOT-23-5, Rail-to-rail OP Amp

### Features

- Single-Supply Operation: 4V to 6V
- High Output Current:  $\pm 100\text{mA}$
- Low Supply Current:  $500\mu\text{A}$
- Wide Bandwidth: 3MHz
- Slew Rate:  $4\text{V}/\mu\text{s}$
- No Phase Reversal
- Unity Gain Stable
- Small, 5-Pin SOT-23 Package available

### Applications

- Battery-Powered Instruments
- Portable Equipment
- Data-Acquisition Systems
- High-Side/Low-Side Current Sensors
- ASIC Input or Output Amplifier
- Signal Conditioning
- Low-Power, Low voltage Applications

### General Description

The G1213 is a rail-to-rail input and output single-supply amplifiers featuring 100mA output drive current. This high output current makes these amplifiers excellent for driving either resistive or capacitive loads. AC performance is very good with 3.0MHz bandwidth;  $4.0\text{V}/\mu\text{s}$  slew rate and low distortion. All are guaranteed to operate from a +4 to +6 volt single supply.

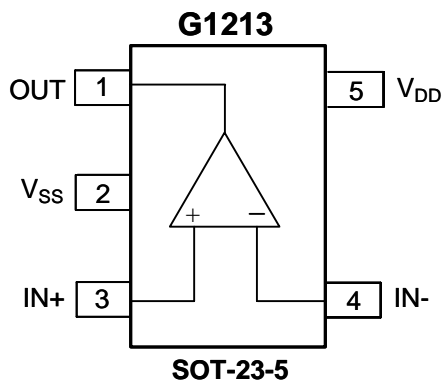
The very low input bias currents enable the G1213 to be used for integrators and diode amplification and other applications requiring low input bias current. The 100mA high output current and supply current is only  $850\mu\text{A}$  per amplifier at 5 volts, allowing low current applications to control high current loads.

Applications include audio amplification for computers, sound ports, sound cards and set-top boxes. The G1213 is very stable and capable of driving heavy 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.

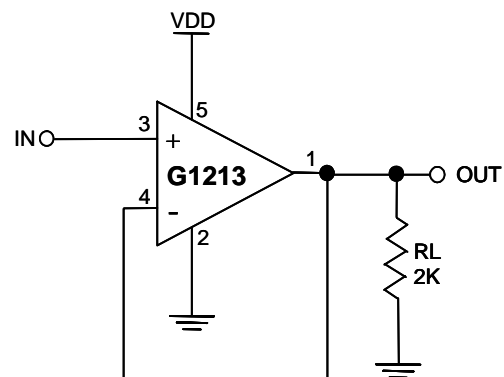
### Ordering Information

ORDER NUMBER	ORDER NUMBER (Pb free)	MARKING	TEMP. RANGE	PACKAGE
G1213	G1213f	13xx	-20°C to +85°C	SOT-23-5

### Pin Configuration



### Typical Application Circuit



Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd.

**Absolute Maximum Ratings (Note1)**

Supply Voltage ( $V_{DD}$  to  $V_{SS}$ ).....+7.0V  
 All Other Pins.....( $V_{SS}$ -0.3V) to ( $V_{DD}$ +0.3V)

Operating Ambient Temperature .....-20°C to +85°C  
 Storage Temperature Range.....-65°C to +150°C

**Notes:**

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

**Thermal Characteristics**

PARAMETER	SYMBOL	VALUE	UNIT
Thermal resistance from junction to ambient in free air SOT-23-5	$R_{thj-a}$	240	°C/W

**Electrical Characteristics**

$V_{DD} = 5V$ ;  $V_{SS} = 0V$ ;  $T_{amb} = 25°C$ ;  $f_i = 1kHz$ ;  $V_{CM} = V_{DD}/2$ ,  $R_L = 2K\Omega$  connected to  $V_{DD}/2$ ; unless otherwise specified.

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supplies</b>						
Supply voltage	$V_{DD}$		4.0	5.0	6.0	V
Single			4.0	5.0	6.0	V
Dual			2	2.5	3.0	V
Negative supply voltage (dual)	$V_{SS}$		-2.0	-2.5	-3.0	V
Supply current	$I_{DD}$	no load	---	0.85	1.2	mA
Total power dissipation	$P_{tot}$	no load	---	4.25	6.0	mW
<b>DC Characteristics</b>						
Input offset voltage	$V_{I(OS)}$		---	±1.5	±6	mV
Common mode voltage	$V_{CM}$		0		5.0	V
Input Bias Current	$I_B$		---	±0.05	---	nA
Input Bias Current Offset	$I_{OS}$		---	±0.05	---	nA
Input Resistance	$R_{IN}$		---	1000	---	MΩ
Large-Signal Voltage Gain	$A_V$		---	80	---	dB
Maximum output current	$I_O$		---	100	---	mA
Output resistance	$R_O$	Open-loop, $R_L = 20\Omega$	---	5.5	---	Ω
Output voltage swing	$V_O$	$R_L = 32\Omega$	1.0	---	4.0	V
		$R_L = 2k\Omega$	0.1	---	4.9	V
Power supply rejection ratio	PSRR	$f_i = 1kHz$ ; $V_{ripple(peak)} = 1V$	---	60	---	dB
Common-Mode Rejection Ratio	CMRR		---	56	---	dB
<b>AC Characteristics</b>						
Total harmonic distortion	THD	Note 2	---	< 0.1	---	%
		$R_L = 2k\Omega$ , Note 2				
Gain-Bandwidth Product	GBWP	Open-loop; No Load	---	3.0	---	MHz
Slew-Rate	SR	Measured from 30% to 70% of 5Vp-p step	---	4	---	V/μs
Phase Margin	PM		---	60	---	deg
Maximum output power	$P_O$	Note 1; $R_L = 32\Omega$	---	135	---	mW
Power bandwidth	B	Unity gain; $R_L = 32\Omega$	---	25	---	KHz

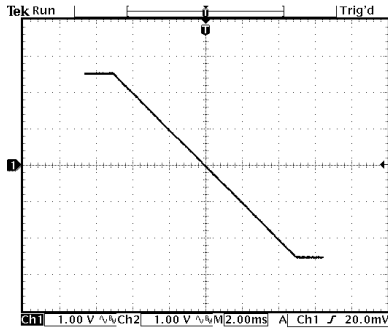
**Notes:**

1. Values are proportional to  $V_{DD}$ ; THD < 0.1%
2.  $V_{DD} = 5.0V$ ;  $V_{O(P-P)} = 4.0V$  (at 0 dB)

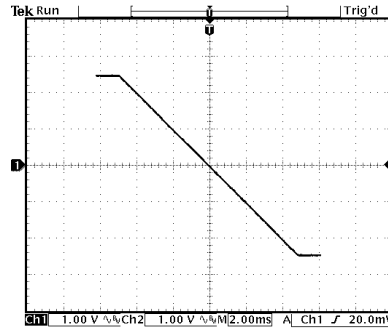
**Output Swing Range Voltage Figure**

Test Condition :  $T_A = 25^\circ\text{C}$ ,  $A_V = -1$

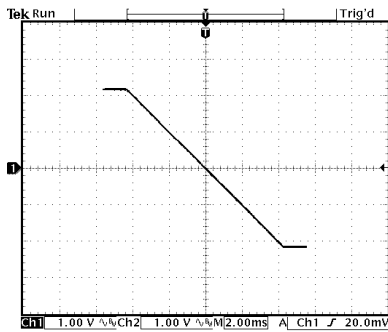
$V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$ ,  $R_L = 2\text{k}\Omega$



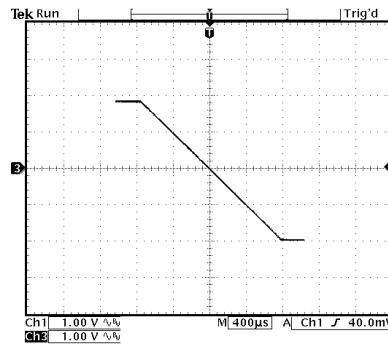
$V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$ ,  $R_L = 250\Omega$



$V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$ ,  $R_L = 32\Omega$



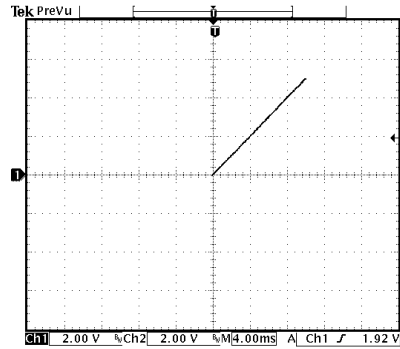
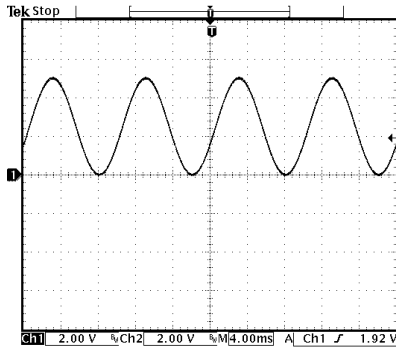
$V_+ = 2.5\text{V}$ ,  $V_- = -2.5\text{V}$ ,  $R_L = 16\Omega$



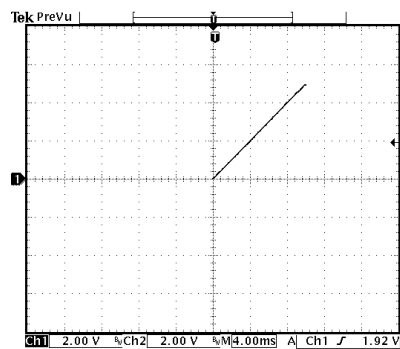
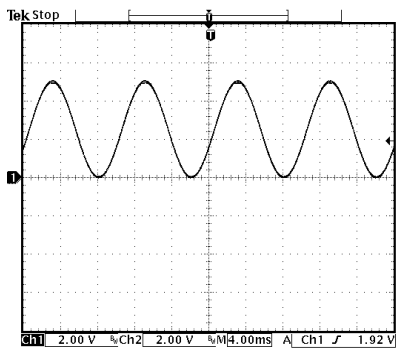
**Input Common Mode Voltage Range Figure**

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

$V_+ = 5\text{V}$ ,  $V_- = 0\text{V}$ ,  $R_L = 2\text{K}\Omega$

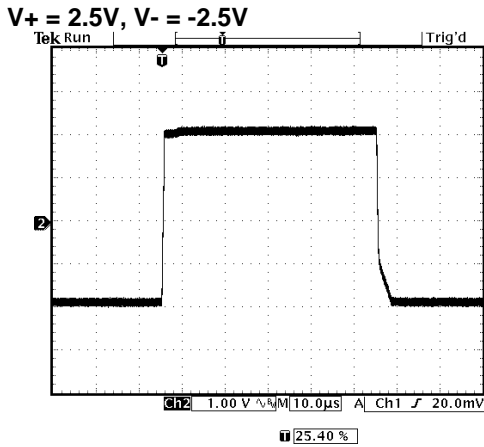


$V_+ = 5\text{V}$ ,  $V_- = 0\text{V}$ ,  $R_L = 250\Omega$



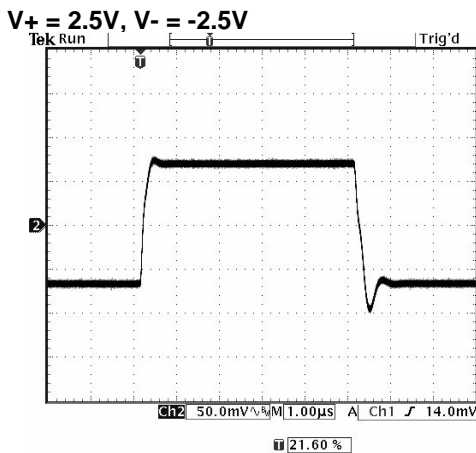
**Large Signal Transient Response Figure**

Test Condition : TA=25°C, AV=1 , RL = 2kΩ

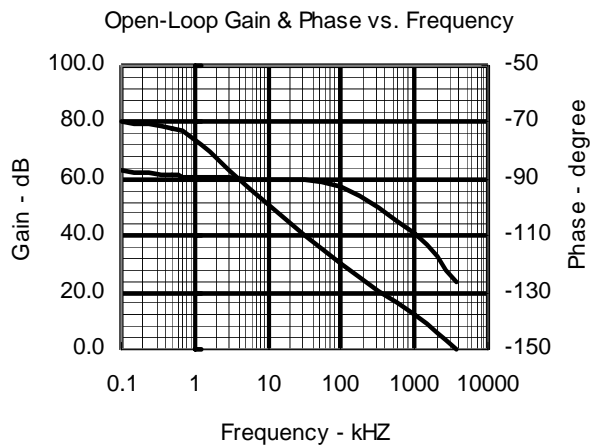


**Small Signal Transient Response Figure**

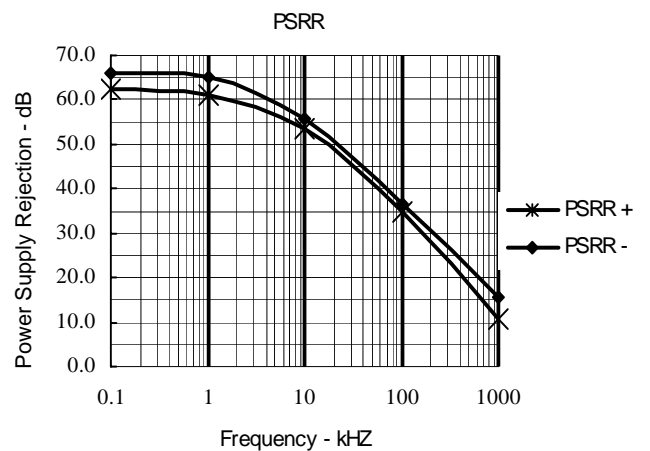
Test Condition : TA=25°C, AV=1, RL = 32Ω



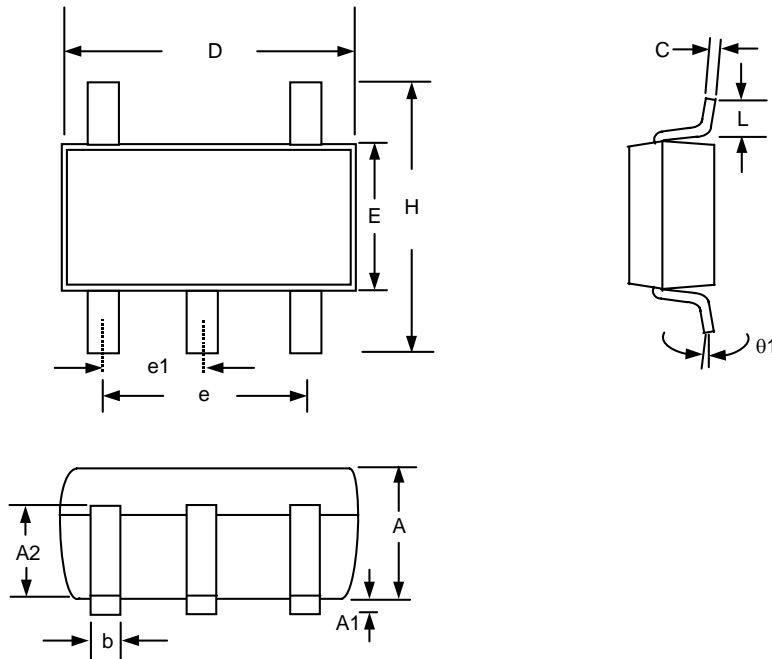
Test Condition: Vs = ±2.5V, TA = 25°C



Test Condition: Vs = ±2.5V, TA = 25°C



## Package Information

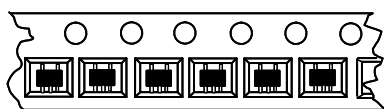


**Note:**

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

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.10	1.30	0.039	0.043	0.051
A1	0.00	-----	0.10	0.000	-----	0.004
A2	0.70	0.80	0.90	0.028	0.031	0.035
b	0.35	0.40	0.50	0.014	0.016	0.020
C	0.10	0.15	0.25	0.004	0.006	0.010
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.40	1.60	1.80	0.055	0.063	0.071
e	-----	1.90(TYP)	-----	-----	0.075(TYP)	-----
H	2.60	2.80	3.00	0.102	0.110	0.118
L	0.37	-----	-----	0.015	-----	-----
$\theta 1$	1°	5°	9°	1°	5°	9°

## Taping Specification



**Feed Direction**  
**SOT-23-5 Package Orientation**

PACKAGE	Q'TY/REEL
SOT-23-5	3,000 ea

GMT Inc. does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and GMT Inc. reserves the right at any time without notice to change said circuitry and specifications.