

XC221A

Series



1.2V Input / Output Rail To Rail CMOS Op Amp

◆Operating Voltage Range (Single Cell)

: 1.2V ~ 10V

◆Input / Output Rail To Rail Operation

◆Gain Bandwidth : 550kHz

◆Slew Rate : 0.5V / μ S

◆Low Power Consumption : 100 μ A

◆SOT - 25 Ultra Small Package

■Applications

- Palmtop computers, PDAs
- Cellular and portable phones
- Portable audio systems
- Various battery powered systems

■General Description

The XC221A1200MR is an input / output rail to rail CMOS Op Amp.

With rail to rail functions, operation is guaranteed from power supplies as low as 1.2V. Moreover, since the XC221 comes in an ultra small SOT-25 package, the series is particularly suited for use with various types of portable phones.

Bandwidths of 550kHz and slew rates of 0.5V can be achieved even with power consumption as low as 100 μ A.

Even with large capacitance levels of $C_L = 200$ pF (unity gain connection), the XC221 will not be susceptible to oscillation.

■Features

Operating Voltage Range: 1.2 ~ 10V (single cell)

: $\pm 0.6 \sim 5$ V (+ ve / - ve supply)

Output Signal

: 0.1 ~ 2.9V (3V single cell, $R_L=2k$)

Gain Bandwidth

: 550kHz (15 μ A: 210kHz)

Slew Rate

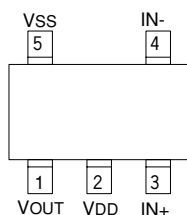
: 0.5V / μ S

High Capacitance Load : $C_L=200$ pF

Low Supply Current : 100 μ A, 15 μ A

Ultra Small Package : SOT-25 mini mold

■Pin Configuration



SOT-25
(TOP VIEW)

■Pin Assignment

PIN NUMBER	SYMBOL	FUNCTION
1	VOUT	Output Pin
2	VDD	Positive Power Supply Pin
3	IN+	Positive Input
4	IN-	Negative Input
5	VSS	Negative Power Supply Pin

Product Classification

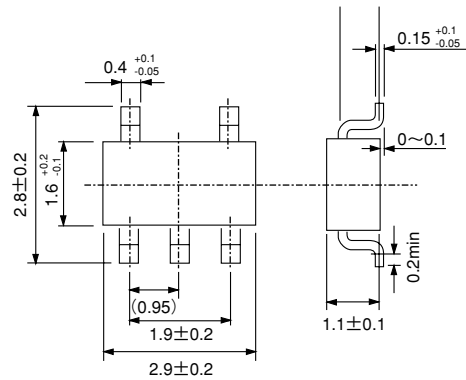
Ordering Information

XC221Axxxxx
↑↑↑↑↑↑
a b c d e f

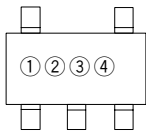
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
a	Represents the number of channels: 1 = one	e	Package Type M : SOT-25
b	Represents the supply current. 1 = 15μA 2 = 100μA		
c	0 = Internal Standard	f	Device Orientation R : Embossed Tape (Right) L : Embossed Tape (Left)
d	Load Capacitance: 0 = 200pF		

Packaging Information

SOT-25



■ Marking



SOT-25
(TOP VIEW)

② Based on internal standards

① Represents the product name and the supply current.

PRODUCT NAME	SUPPLY CURRENT	DESIGNATOR
XC221A11	15 μ A	1
XC221A12	100 μ A	2

③ Represents load capacitance

Load Capacitance	DESIGNATOR
200pF	0

④ Denotes the production lot number
0 to 9, A to Z repeated (G.I.J.O.Q.W excepted)

■ Absolute Maximum Ratings

T_a = 25°C, V_{SS} = 0V

PARAMETER	SYMBOL	RATINGS	UNITS
V _{DD} pin voltage	VDD	-0.3 ~ 12	V
OUT pin voltage	VOUT	-0.3 ~ 12	V
IN pin voltage	VIN+	-0.3 ~ V _{DD} +0.3	V
IN/ pin voltage	VIN-	-0.3 ~ V _{DD} +0.3	V
OUT pin current	IOUT	±100	mA
Continuous Total Power Dissipation	Pd	150	mW
Ambient Operating Temp.	Topr	-30 ~ +80	°C
Storage Temp.	Tstg	-40 ~ +125	°C

RAIL-TO-RAIL is a trademark of Motorola.

Electrical Characteristics

XC221A1100

$I_{DD} = 15\mu A$

$T_a = 25^\circ C$

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power Supply Voltage Range	V_{DD}		1.2	-	10	V
Supply Current	I_{DD}	$V_{DD} = 3V$	10	15	23	μA
		$V_{DD} = 1.2V$	2.5	8	23	μA
Input Offset Voltage	V_{OF}		-	-	20.0	mV
Input Offset Current	I_{OF}		-	1	-	pA
Input Bias Current	I_B		-	1	-	pA
Input Resistance	R_{IN}		-	1	-	$T\Omega$
Large Signal Voltage Gain	AVD		75	110	-	dB
Common Mode Rejection Ratio	CMRR	$0 \leq V_{CM} \leq 3.0V$	60	75	-	dB
Power Supply Rejection Ratio	PSRR+	$V_{DD} = 3 \text{ to } 10V, V_{SS} = 0V, V_{OUT} = 1.5V$	60	75	-	dB
	PSRR-	$V_{SS} = -3 \text{ to } -10V, V_{DD} = 0V, V_{OUT} = -1.5V$	60	75	-	dB
Output Voltage Range	V_{OUT}	$R_L = \infty$	0.05	-	$V_{DD}-0.05$	V
		$V_{DD} = 1.2V, R_L = 47k\Omega \text{ (to } V_{DD}/2)$	0.10	-	1.10	V
		$V_{DD} = 3V, R_L = 2k\Omega \text{ (to } V_{DD}/2)$	0.10	-	2.90	V
		$V_{DD} = 5V, R_L = 2k\Omega \text{ (to } V_{DD}/2)$	0.10	-	4.90	V
		$V_{DD} = 10V, R_L = 2k\Omega \text{ (to } V_{DD}/2)$	0.10	-	9.80	V
Gain Bandwidth	FT	$V_{DD} = 3V$	-	210	-	kHz
Slew Rate	SR	$V_{DD} = 3V$	-	0.07	-	V/ μsec

Measuring Conditions :

Unless otherwise stated, $V_{DD} = 3.0V, V_{SS} = 0V, V_{CM} = V_{OUT} = V_{DD} / 2, R_L = 1M\Omega \text{ (to } V_{SS}), C_L = 10pF \text{ (to } V_{SS})$

XC221A1200

$I_{DD} = 100\mu A$

$T_a = 25^\circ C$

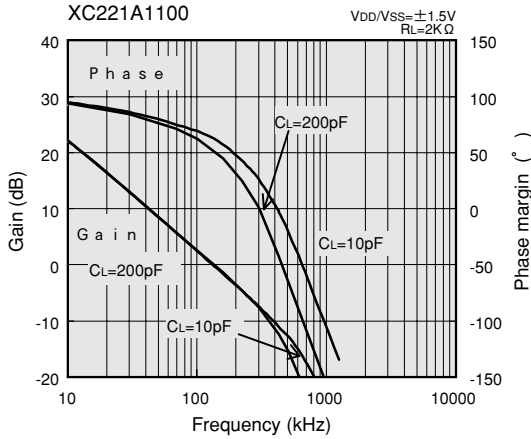
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Power Supply Voltage Range	V_{DD}		1.2	-	10	V
Supply Current	I_{DD}	$V_{DD} = 3V$	67	100	150	μA
		$V_{DD} = 1.2V$	16.75	50	150	μA
Input Offset Voltage	V_{OF}		-	-	20.0	mV
Input Offset Current	I_{OF}		-	1	-	pA
Input Bias Current	I_B		-	1	-	pA
Input Resistance	R_{IN}		-	1	-	$T\Omega$
Large Signal Voltage Gain	AVD		75	110	-	dB
Common Mode Rejection Ratio	CMRR	$0 \leq V_{CM} \leq 3.0V$	60	75	-	dB
Power Supply Rejection Ratio	PSRR+	$V_{DD} = 3 \text{ to } 10V, V_{SS} = 0V, V_{OUT} = 1.5V$	60	75	-	dB
	PSRR-	$V_{SS} = -3 \text{ to } -10V, V_{DD} = 0V, V_{OUT} = -1.5V$	60	75	-	dB
Output Voltage Range	V_{OUT}	$R_L = \infty$	0.05	-	$V_{DD}-0.05$	V
		$V_{DD} = 1.2V, R_L = 47k\Omega \text{ (to } V_{DD}/2)$	0.10	-	1.10	V
		$V_{DD} = 3V, R_L = 2k\Omega \text{ (to } V_{DD}/2)$	0.10	-	2.90	V
		$V_{DD} = 5V, R_L = 2k\Omega \text{ (to } V_{DD}/2)$	0.10	-	4.90	V
		$V_{DD} = 10V, R_L = 2k\Omega \text{ (to } V_{DD}/2)$	0.10	-	9.80	V
Gain Bandwidth	FT	$V_{DD} = 3V$	-	550	-	kHz
Slew Rate	SR	$V_{DD} = 3V$	-	0.50	-	V/ μsec

Measuring Conditions :

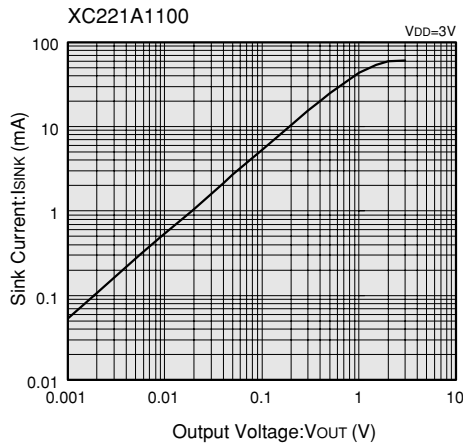
Unless otherwise stated, $V_{DD} = 3.0V, V_{SS} = 0V, V_{CM} = V_{OUT} = V_{DD} / 2, R_L = 1M\Omega \text{ (to } V_{SS}), C_L = 10pF \text{ (to } V_{SS})$

■XC221A1100 (15 μ A) Typical Performance Characteristics

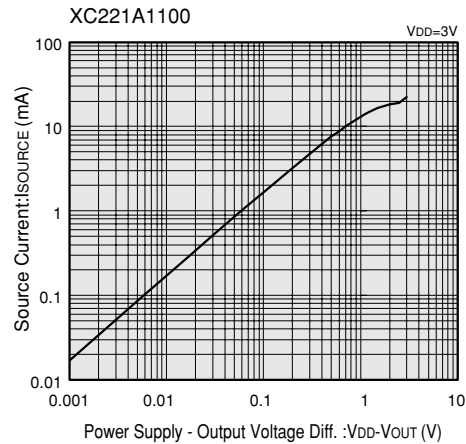
(1) VOLTAGE GAIN, PHASE MARGIN



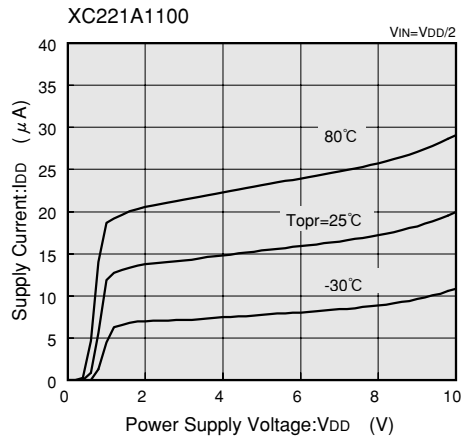
(2) SINK CURRENT vs. OUTPUT VOLTAGE



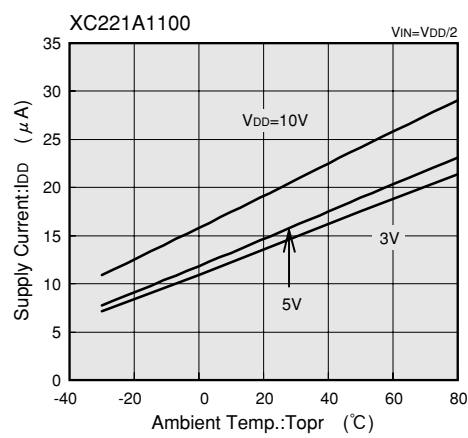
(3) SOURCE CURRENT vs. OUTPUT VOLTAGE



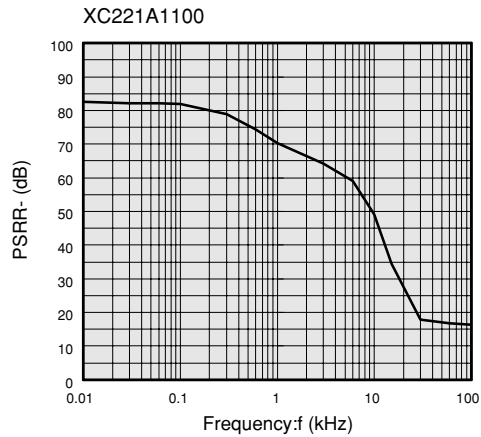
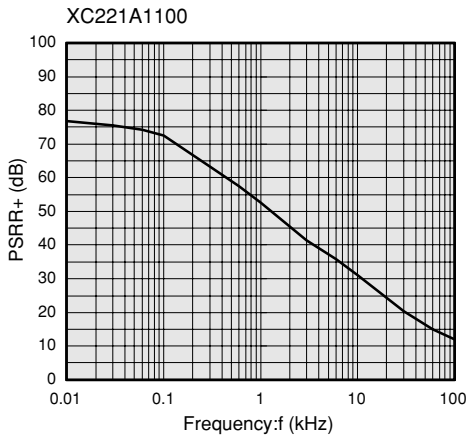
(4) SUPPLY CURRENT vs. POWER SUPPLY VOLTAGE



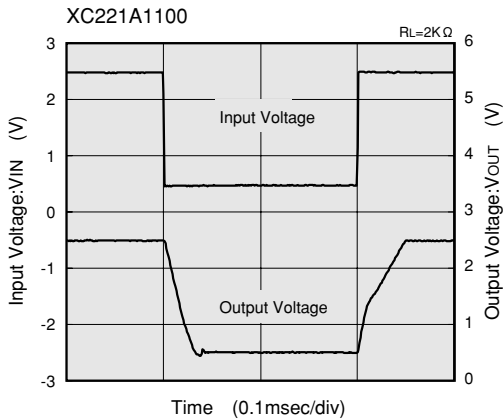
(5) SUPPLY CURRENT vs. AMBIENT TEMPERATURE



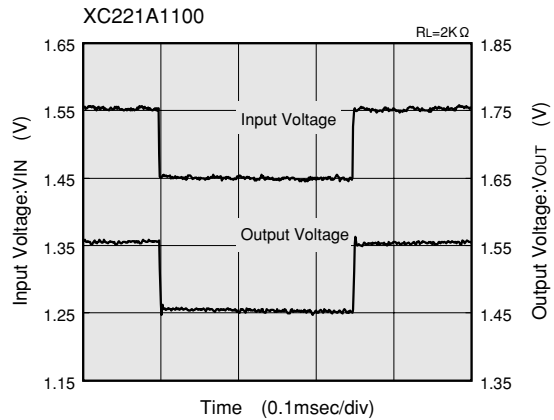
(6) POWER SUPPLY REJECTION RATIO vs. FREQUENCY



(7) LARGE SIGNAL INPUT RESPONSE

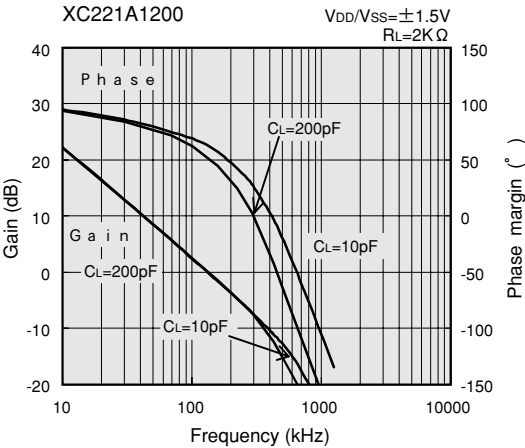


(8) SMALL SIGNAL INPUT RESPONSE

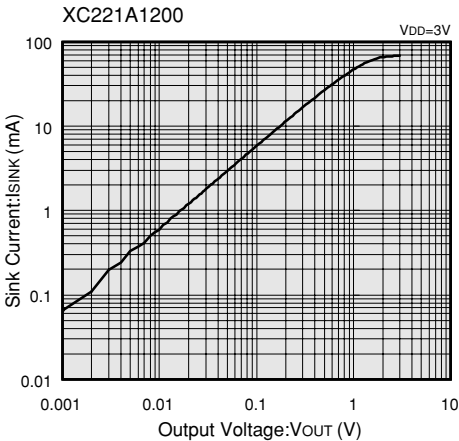


XC221A1200 (100 μ A) Typical Performance Characteristics

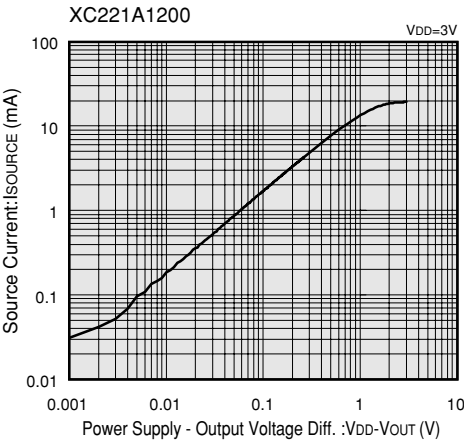
(1) VOLTAGE GAIN, PHASE MARGIN



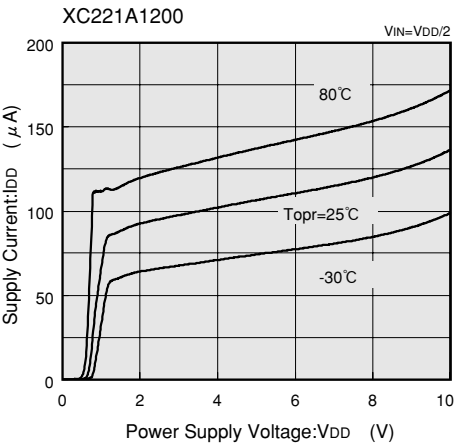
(2) SINK CURRENT vs. OUTPUT VOLTAGE



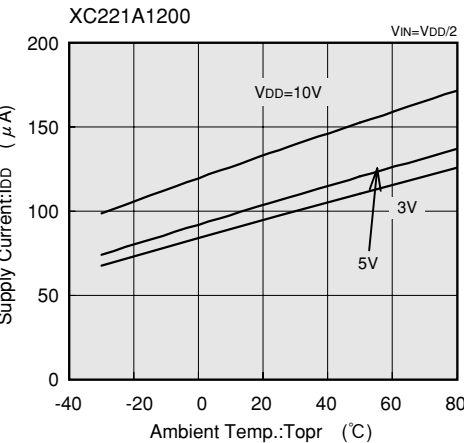
(3) SOURCE CURRENT vs. OUTPUT VOLTAGE



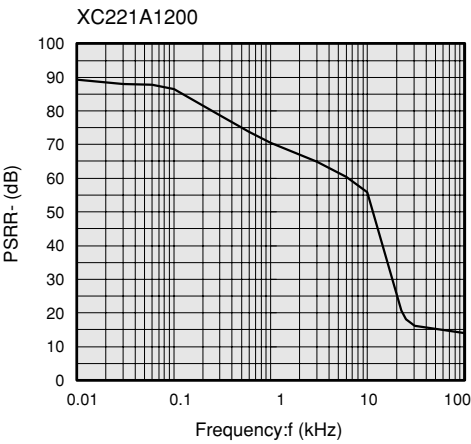
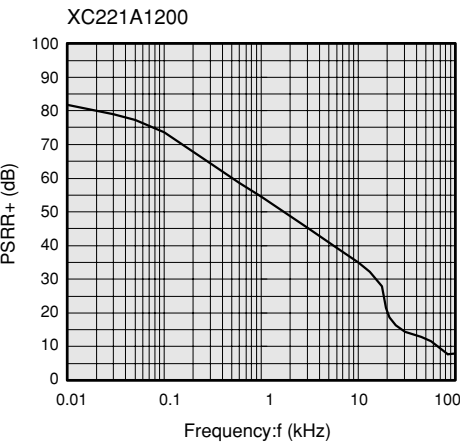
(4) SUPPLY CURRENT vs. POWER SUPPLY VOLTAGE



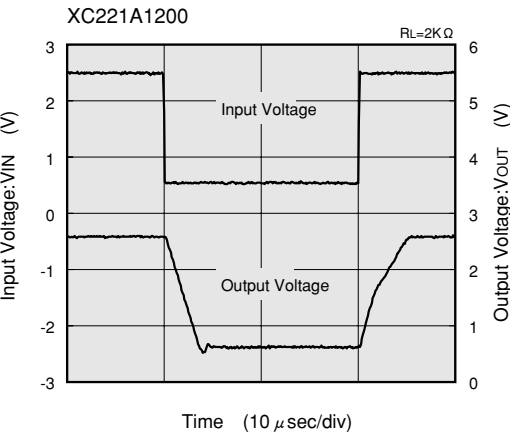
(5) SUPPLY CURRENT vs. AMBIENT TEMPERATURE



(6) POWER SUPPLY REJECTION RATIO vs. FREQUENCY



(7) LARGE SIGNAL INPUT RESPONSE



(8) SMALL SIGNAL INPUT RESPONSE

