

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

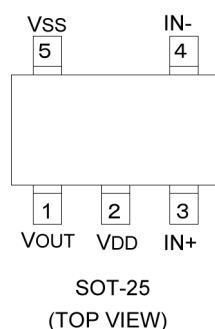
■ GENERAL DESCRIPTION

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 XC221A series 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 CL = 200pF (unity gain connection), the XC221A series will not be susceptible to oscillation.

■ PIN CONFIGURATION



■ APPLICATIONS

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

■ FEATURES

- Operating Voltage Range:** 1.2 ~ 10V (single cell)
: ± 0.6 ~ 5V (+ve/-ve supply)
- Output Signal** : 0.1~2.9V (3V single cell, RL=2k Ω)
- Gain Bandwidth** : 550kHz (15 μ A: 210kHz)
- Slew Rate** : 0.5V / μ S
- High Capacitance Load** : CL=200pF
- Low Supply Current** : 100 μ A, 15 μ A
- Ultra Small Package** : SOT-25 mini mold

■ 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

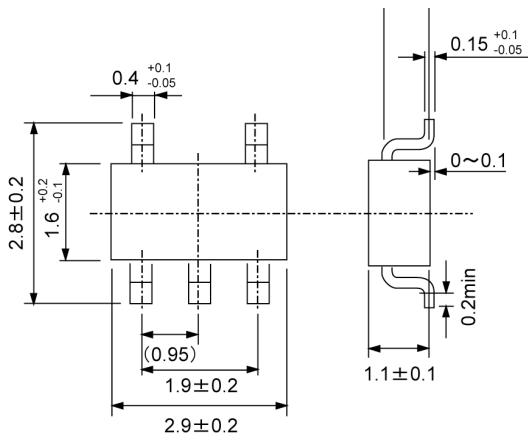
● Ordering Information

XC221A①②③④⑤⑥

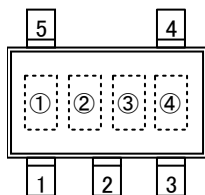
| DESIGNATOR | DESCRIPTION | SYMBOL | DESCRIPTION |
|------------|--------------------------|--------|--------------------------------|
| ① | The Number of Channels | 1 | : One channel |
| ② | Supply Current | 1 | : $15\ \mu\text{A}$ |
| | | 2 | : $100\ \mu\text{A}$ |
| ③ | Internal Standard Number | 0 | : Fixed |
| ④ | Load Capacitance | 0 | : 200pF |
| ⑤ | Package | M | : SOT-25 (SOT-23-5) |
| ⑥ | Device Orientation | R | : Embossed tape, standard feed |
| | | L | : Embossed tape, reverse feed |

■ PACKAGING INFORMATION

● SOT-25



MARKING RULE



SOT-25
(TOP VIEW)

① Represents product series and supply current

| MARK | PRODUCT SERIES | SUPPLY CURRENT |
|------|----------------|----------------|
| 1 | XC221A11 | 15 μ A |
| 2 | XC221A12 | 100 μ A |

② Based on internal standards

③ Represents load capacitance

| MARK | LOAD CAPACITANCE |
|------|------------------|
| 0 | 200pF |

④ Represents the production lot number

0 to 9, A to Z repeated (G, I, J, O, Q, W excepted)

ABSOLUTE MAXIMUM RATINGS

$T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{V}$

| PARAMETER | SYMBOL | RATINGS | UNITS |
|-----------------------------|------------------|-----------------------------|------------------|
| V _{DD} Pin Voltage | V _{DD} | -0.3 ~ 12.0 | V |
| OUT Pin Voltage | V _{OUT} | -0.3 ~ 12.0 | V |
| IN Pin Voltage | V _{IN+} | -0.3 ~ V _{DD} +0.3 | V |
| IN/ Pin Voltage | V _{IN-} | -0.3 ~ V _{DD} +0.3 | V |
| OUT Pin Current | I _{OUT} | ± 100 | mA |
| Power Dissipation | P _d | 150 | mW |
| Operating Temperature Range | T _{opr} | -30 ~ +80 | $^\circ\text{C}$ |
| Storage Temperature Range | T _{stg} | -40 ~ +125 | $^\circ\text{C}$ |

RAIL-TO-RAIL is a trademark of Motorola.

■ ELECTRICAL CHARACTERISTICS

| XC221A1100 | | I _{DD} = 15 μA | | T _a = 25°C | | |
|------------------------------|------------------|--|------|-----------------------|-----------------------|--------|
| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Supply Voltage | V _{DD} | | 1.2 | - | 10.0 | 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 | - | TΩ |
| Large Signal Voltage Gain | AVD | | 75 | 110 | - | dB |
| Common Mode Rejection Ratio | CMRR | 0 ≤ V _{CM} ≤ 3.0V | 60 | 75 | - | dB |
| Power Supply Rejection Ratio | PSRR+ | V _{DD} = 3 to 10V, V _{SS} = 0V, V _{OUT} = 1.5V | 60 | 75 | - | dB |
| | PSRR- | V _{SS} = -3 to -10V, V _{DD} = 0V, V _{OUT} = -1.5V | 60 | 75 | - | dB |
| Output Voltage Range | V _{OUT} | R _L = ∞ | 0.05 | - | V _{DD} -0.05 | V |
| | | V _{DD} = 1.2V, R _L = 47kΩ (to V _{DD} /2) | 0.10 | - | 1.10 | V |
| | | V _{DD} = 3V, R _L = 2kΩ (to V _{DD} /2) | 0.10 | - | 2.90 | V |
| | | V _{DD} = 5V, R _L = 2kΩ (to V _{DD} /2) | 0.10 | - | 4.90 | V |
| | | V _{DD} = 10V, R _L = 2kΩ (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 |

Test Conditions : Unless otherwise stated, V_{DD} = 3.0V, V_{SS} = 0V, V_{CM} = V_{OUT} = V_{DD} / 2, R_L = 1MΩ (to V_{SS}), C_L = 10pF (to V_{SS})

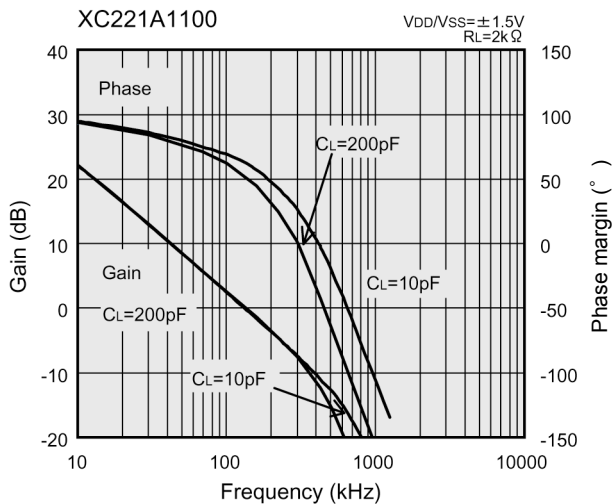
| XC221A1200 | | I _{DD} = 100 μA | | T _a = 25°C | | |
|------------------------------|------------------|--|-------|-----------------------|-----------------------|--------|
| PARAMETER | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Supply Voltage | V _{DD} | | 1.2 | - | 10.0 | V |
| Supply Current | I _{DD} | V _{DD} = 3V | 67 | 100 | 150 | μA |
| | | V _{DD} = 1.2V | 16.75 | 50.00 | 150.00 | 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 | - | TΩ |
| Large Signal Voltage Gain | AVD | | 75 | 110 | - | dB |
| Common Mode Rejection Ratio | CMRR | 0 ≤ V _{CM} ≤ 3.0V | 60 | 75 | - | dB |
| Power Supply Rejection Ratio | PSRR+ | V _{DD} = 3 to 10V, V _{SS} = 0V, V _{OUT} = 1.5V | 60 | 75 | - | dB |
| | PSRR- | V _{SS} = -3 to -10V, V _{DD} = 0V, V _{OUT} = -1.5V | 60 | 75 | - | dB |
| Output Voltage Range | V _{OUT} | R _L = ∞ | 0.05 | - | V _{DD} -0.05 | V |
| | | V _{DD} = 1.2V, R _L = 47kΩ (to V _{DD} /2) | 0.10 | - | 1.10 | V |
| | | V _{DD} = 3V, R _L = 2kΩ (to V _{DD} /2) | 0.10 | - | 2.90 | V |
| | | V _{DD} = 5V, R _L = 2kΩ (to V _{DD} /2) | 0.10 | - | 4.90 | V |
| | | V _{DD} = 10V, R _L = 2kΩ (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 |

Test Conditions : Unless otherwise stated, V_{DD} = 3.0V, V_{SS} = 0V, V_{CM} = V_{OUT} = V_{DD} / 2, R_L = 1MΩ (to V_{SS}), C_L = 10pF (to V_{SS})

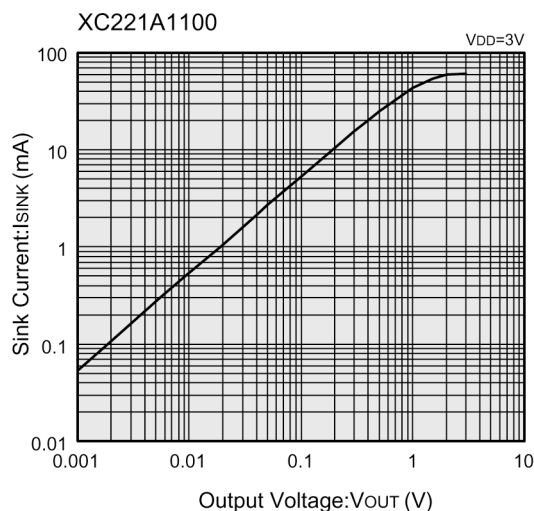
■ TYPICAL PERFORMANCE CHARACTERISTICS

● XC221A1100 <15 μ A>

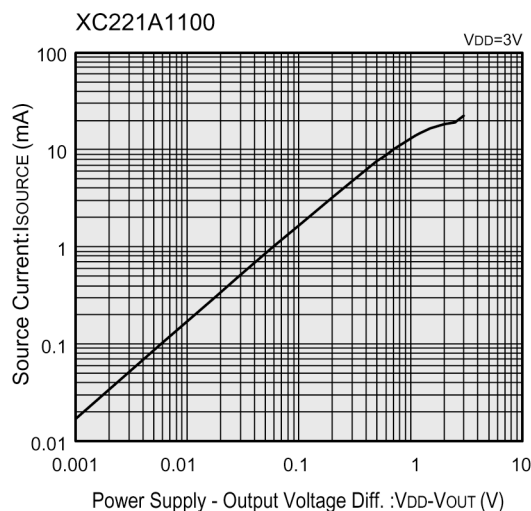
(1) Voltage Gain vs. Phase Margin



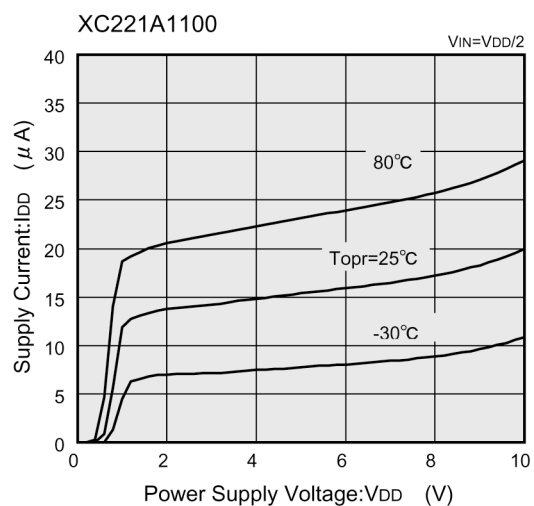
(2) Sink Current vs. Output Voltage



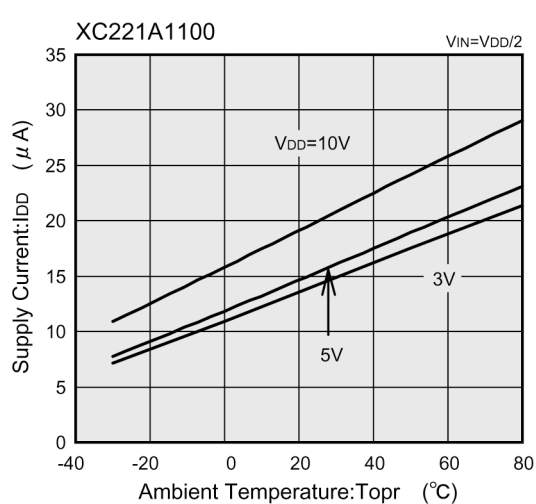
(3) Source Current vs. Output Voltage



(4) Supply Current vs. Power Supply Voltage



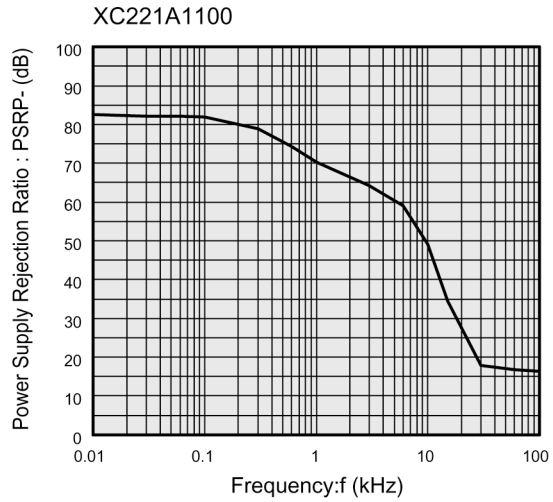
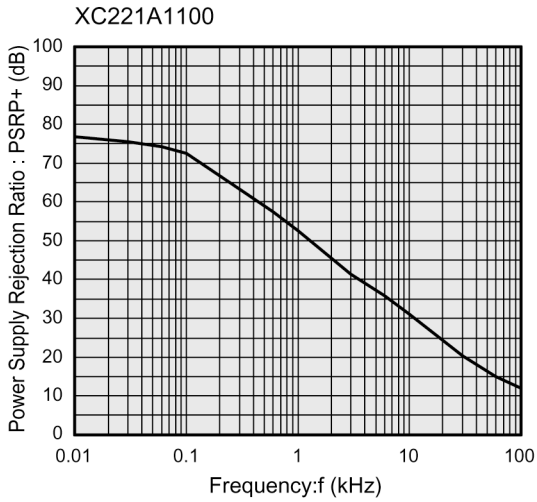
(5) Supply Current vs. Ambient Temperature



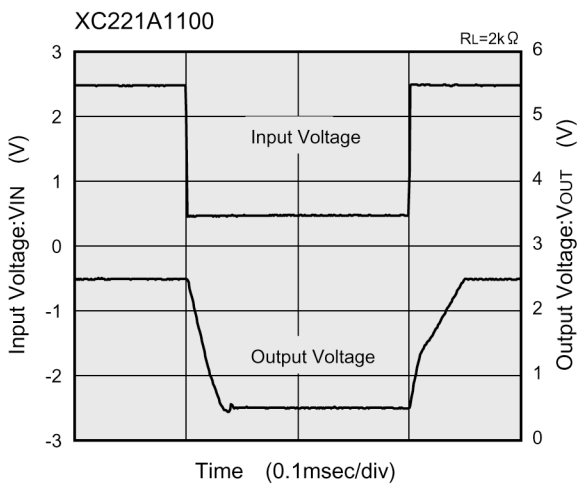
■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

● XC221A1100 <15 μ A> (Continued)

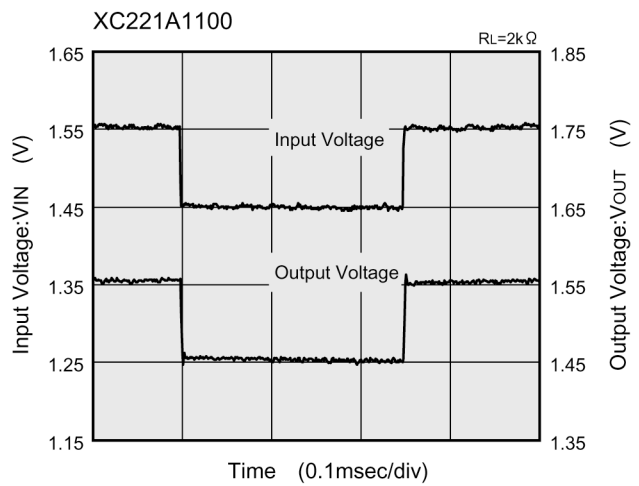
(6) Power Supply Rejection Ratio vs. Frequency



(7) Large Signal Input / Output Response



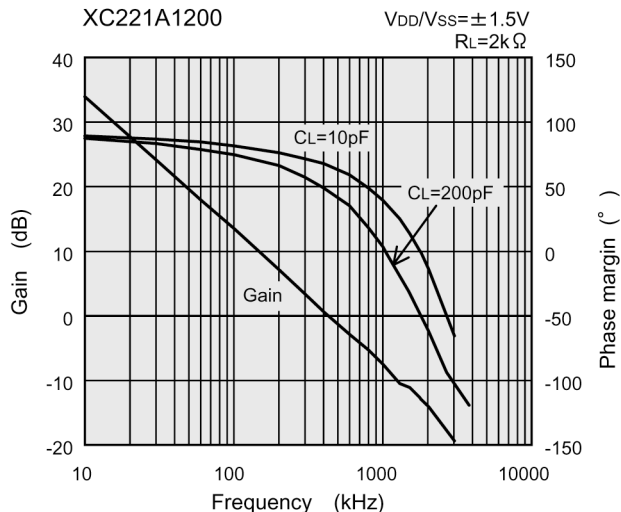
(8) Small Signal Input / Output Response



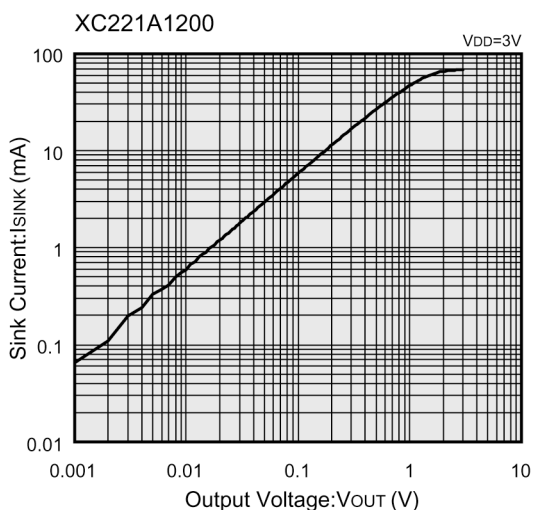
■ TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

● XC221A1200 <100 μA>

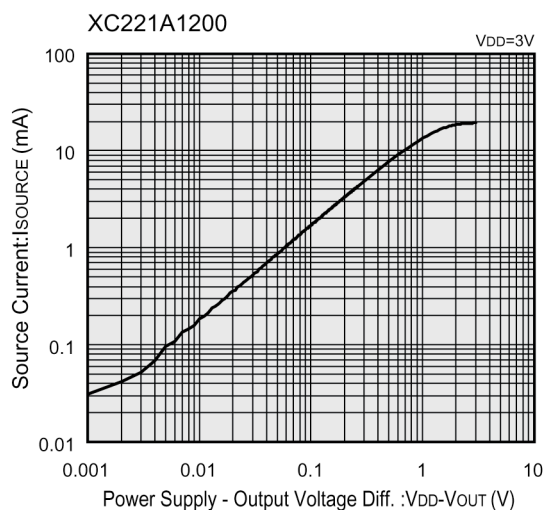
(1) Voltage Gain vs. Phase Margin



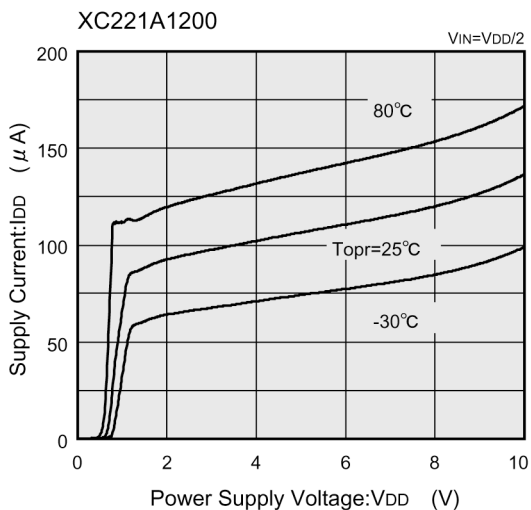
(2) Sink Current vs. Output Voltage



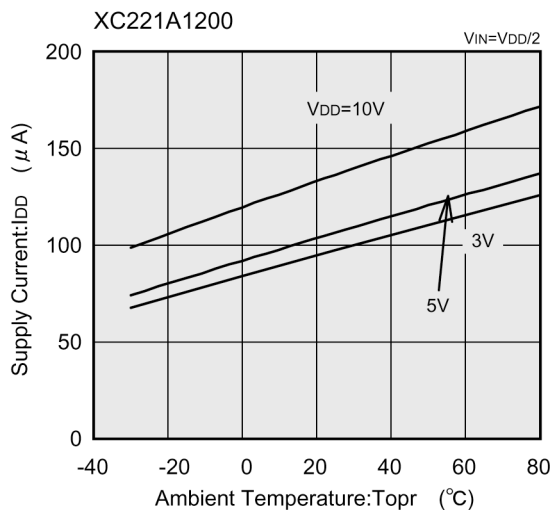
(3) Source Current vs. Output Voltage



(4) Supply Current vs. Power Supply Voltage



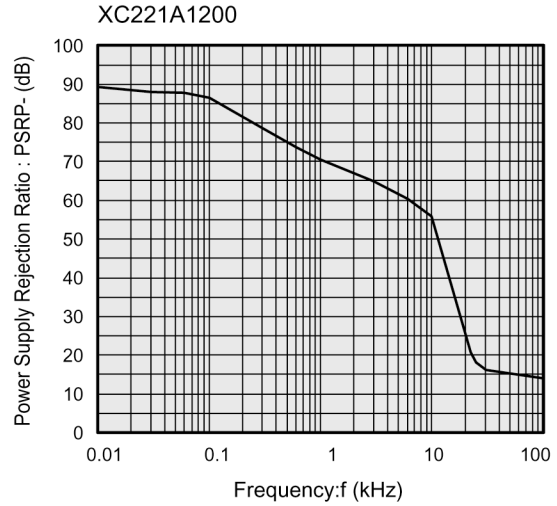
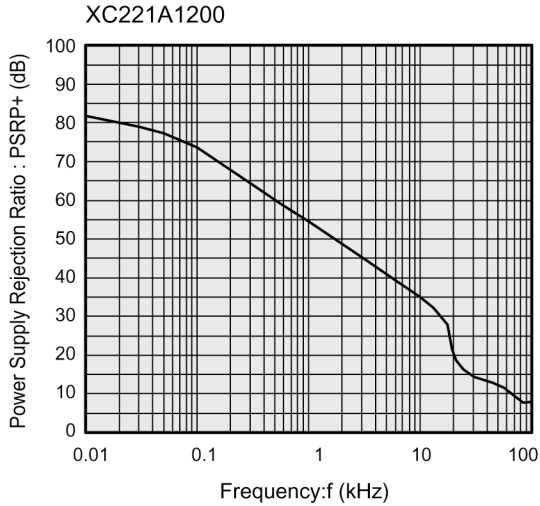
(5) Supply Current vs. Ambient Temperature



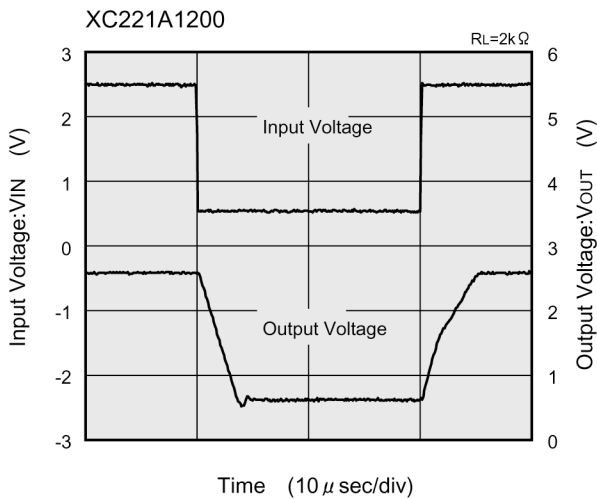
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

●XC221A1200 <100 μ A> (Continued)

(6) Power Supply Rejection Ratio vs. Frequency



(7) Large Signal Input / Output Response



(8) Small Signal Input / Output Response

